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Special Issue on Billing

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Special Issue on Billing

Regular Features

Michael Hepher

Billing: A Competitive Tool

I am pleased to be able to introduce this special issue of the *Journal* focused on billing.

Over the last few years, it has become obvious to BT and to other telecommunications operators throughout the world that billing is no longer simply an accounting function.

Firstly, the bill is a regular and significant communication channel with our customers. Increasingly, customers are wishing to choose the media by which they receive the information and the format in which it is presented. After all, for the business customer, the bill is an important source of management information.

Secondly, as the markets become more differentiated in the UK and globally, we need to respond with flexible pricing options which are tailored to meet individual needs. Highly functional, easy to manage billing systems are essential in this new environment.

BT's Billing 90s Programme has the objective of delivering a set of highly functional billing systems to meet the needs of the customers at least cost. I am confident that we will see significant changes in billing in the coming years.

Michael Hepher

Group Managing Director,
British Telecommunications plc

Bruce Bond

Service Differentiation: The Billing Challenge

Customers' telecommunications needs are becoming increasingly more demanding. Providing excellent customer service is essential in today's competitive environment, and billing is regarded as a key service differentiator. Recent developments have made significant improvements to the billing service that BT provides, and the company's Billing 90s programme will focus on providing the service needs of the future.

Context

Customers have ever-increasing requirements of their telecommunications suppliers. They also have ever-increasing choice between suppliers willing and able to supply those needs.

In an industry where only the biggest and best will be able to survive to meet that challenge, and where being the biggest means being the best so as to be able to grow and maintain your customer base, it is vital that customers perceive and recognise the value add of BT as a preferred supplier. Across the industry, the creation of service differentiation is, along with the creation of a world-best product portfolio, the ambition of all players. BT is foremost among those, with the customer services system (CSS), Syncordia, Concert™ and international virtual networks leading the way.

'Service' is a chain of processes (Figure 1), always beginning with customer contact, be that proactive (marketing) or reactive (customer reception). To achieve a world-best customer-service culture, each of the components of this chain will be re-engineered over the next few years. Billing is not only one of the key elements of the process, it is also the pivotal element—virtually every contact with the customer leads to a billing event (at least that should be our aim!), and in many cases it is the only other form of contact a customer has with us.

Service Differentiation

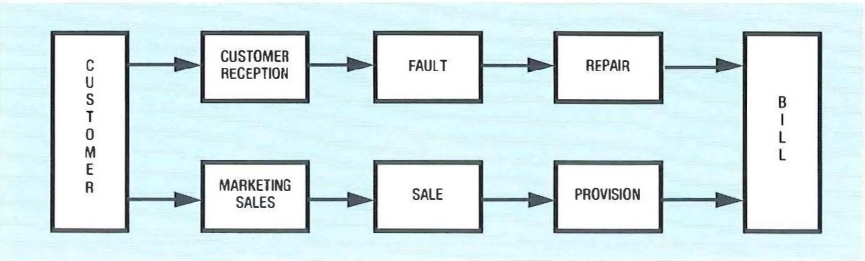
BT's customers are not homogenous. Multinational and large companies, medium and small companies, information intensive individuals, medium- and low-usage personal customers—they all have different needs. Our service to them must recognise these needs and satisfy them in a way that encourages them to want to do business with us rather than with anyone else.

I want to describe some of the elements of our vision for how we recognise those needs, and how we will satisfy and delight them.

Multi-national and large companies

Many companies such as IBM and BP are exploring the feasibility of outsourcing their telecommunications activities to suppliers such as BT. Syncordia has been formed specifically to develop this opportunity, and is already well advanced in developing its customer-focused service culture. We will contract to supply all or parts of a customer's needs at a

Figure 1—The service chain



predetermined price, and to a jointly agreed level of service. This may well involve us installing our own service provision tools on a customers' premises, so that service creation may take place in real time, with no other contact with BT.

For example, IBM UK might be conducting a video conference with IBM in Germany, and have leased a certain satellite link for a predetermined length of time. During the conference, it might become clear that the time-slot needs to be extended, or even that IBM in France needs to be linked in. The IBM UK telecommunications manager would extend the time-slot, or create the Paris/Frankfurt/London link through his Concert™ terminal, transparently to any other contact with BT. Charges for such facilities would be raised via the service level agreement, and billed accordingly.

Other services we might provide, for example, might be the proactive management of a customer's telecommunications inventory to achieve the most cost-effective delivery of service at any single point in time.

Such customers and such service agreements will be supported by tailor-made management information reports and service contact points.

Medium-sized and small companies

Medium-sized companies with several sites or installations sometimes wish to be managed as single entities by suppliers, sometimes as a number of discrete entities (per site, or group of sites, or operating division), and, often, somewhere on the spectrum between the two. For example, a chain of retail outlets might wish for all rental, maintenance and VAT to be analysed and paid centrally, whilst each store would be responsible for ordering service and paying for usage. Alternatively, for example, public switched telephone network (PSTN) service might be managed completely by each outlet, whilst Linkline, private circuit and mobile might be managed centrally.

Our service management systems, and product portfolios must contain the flexibility to meet all such requirements.

Information intensive individuals

Known as I3s, these are our most demanding and potentially most profitable of our personal customers. We are only just beginning to understand their key attributes, but one of the most challenging aspects is the fact that they have blurred edges between their personal and business needs. I am classified by my people as an archetypal I3, so let me share with you what I want out of a telecommunications service, and therefore BT.

Telebanking, teleshopping, home entertainment, follow me, barring of unwanted callers, common mobile and fixed services, office facilities available at home, and vice versa, and whilst I'm travelling, at home or abroad, message management, nominated service agents—Gold Card status; I am prepared to pay for this, but I want guaranteed service at predefined levels of quality. I am a challenge, and there are many like me. Our competitors are keen to attract us to them because we are profitable.

Medium- and low-use residential

Most of BT's 26 million customers fall into this category. We will ignore them at our peril. Our profitability depends on retaining and stimulating this market.

You probably know hundreds of customers who fall into this category, so you know their needs. But we should not regard this as an homogeneous group. Many people are concerned about how much they spend with us. They want advance warning of unusual usage patterns, and flexibility of payment terms. Others have special needs—elderly or sick relatives with alarm systems for example. There are those who work and live in a number of locations over a period of time—they want to take their numbers, their facilities and their bills with them, whether or not they cross BT's boundaries. Many of us are interested in controlling how much time our teenage children spend on the phone!

The Billing Challenge

By now I probably don't need to say much about the challenge that faces us in being able to develop the necessary billing capability.

We can identify, develop and offer all these service components that I have described, and more. The opportunities are limitless. If we don't stay ahead of the game, so are the risks. We must be able to bill for all the services we need to have in our portfolio, and we must be able to do that in a distinctive, yet cost-effective way.

Firstly, we should regard the billing service itself as a service differentiator. Our New Bill is clearly better than anything else in the UK market, and probably in the world. The Syncordia bill is even better. But we need to develop on that good base: bills should have a BT brand image across our portfolio, and should meet our customers' needs. If a business customer wants to include its own internal messages on our bills, then we should help them. The structure of the bill should certainly be capable of being specified by a customer; for example, all international calls in country sequence, mobile bills consolidated with PSTN.

The list of possibilities is endless already, and even more so as we extend our capabilities, and the degree of globalisation: just consider taxation, currency, calendar variations, language, and you get a feel for that problem.

We have a programme in place to address all these issues—Billing 90s. Aside from developing these capabilities, this programme has the task of doing so cost effectively and in a future-proof way—both technologically, and requirements-wise. We cannot afford to have hundreds of

product- or service-specific systems—development and maintenance costs would bankrupt us—but consolidation and commonality across customers or services would be a nightmare, and any change demanded by a new service would probably require so much development effort that the service would never come to market.

I am the client for this programme and I am taking a particular interest to ensure not only that customers get what they need, but that we leverage our development effort to ensure that we make best use of advanced tools and techniques to optimise cost and benefit, and exploit the investment and knowledge in our current systems and infrastructure. Across the company, this programme has the highest level of commitment. We are all working together to ensure that our billing capability gets, and stays, a step ahead of our service capability, and most importantly, ahead of the competition.

Biography

Bruce Bond
Group Products and Services Director

Reporting to the Group Managing Director, Bruce Bond manages BT's portfolio of world-class products and services. A Masters of Business Administration—graduate from the University of Dayton—he also has a Sloan Management degree from the Massachusetts Institute of Technology. He joined the Ohio Bell Telephone Company in 1969 and has held a wide range of posts in the North American communications industry. He joined BT as Director Corporate Strategy in 1989 after leaving his post as Corporate Vice President, Strategic Planning in US West, where he was responsible for coordinating the long-range plans of the 43 US West subsidiaries.

Billing 90s

Customers have increasing expectations and demands of BT's billing service, be they personal customers, for whom the bill is often the only formal contact with BT, or business customers, for whom the bill is a key item of management information.

Similarly, the products and services being developed and launched today, and planned for the future, are placing increasing demands on our billing systems, which in turn is often a contributory factor to protracted product development lead times.

The Billing 90s programme is tasked with meeting the challenges set by our customers, both internal and external, and has a mission of developing the world's best billing capability in the telecommunications industry.

The programme's vision is that BT's billing service will be a significant differentiator in the marketplace within three years.

The programme strategy is to progress on three fronts. Firstly, short-term needs are to be delivered as enhancements and adjuncts to our existing billing systems portfolio. Callbase (public switched telephone network (PSTN) bills on computer disk) and Interbase (PSTN and private circuit bills by electronic data interchange (EDI)), which have recently entered into limited trials, are particular examples. Secondly, a migration plan is being put in pace to move customer and product sets from the present billing platform to a more flexible platform as and when marketing and product plans dictate. Thirdly, our billing processes, and their place within customer service, are being redesigned, and user tools developed, to assist customer-facing divisions in the task of cost reduction and service improvement.

All billing developments are managed under the programme umbrella. In this way, opportunities for investing limited infrastructural investment in tactical solutions so that they may be steered in a more strategic direction are identified, and maximum synergy gained. Where possible, all future billing system development will be generic as opposed to product specific, and investment in short-term developments will be minimised.

Millie Banerjee
Director Integrated Systems,
BT Products and Services Management

Guest Editor

Gerald W. Thames

Syncordia's Billing Service

Comprehensive billing systems are becoming strategic tools as multinational companies look to better understand and manage their international communications costs. This article reviews the single billing information service that supports Syncordia's global network outsourcing solutions.

Introduction

Communications costs represent approximately 4% of a company's operating expenses today, up from less than 2% ten years ago[1]. In real terms, communications expenditures have increased almost 9% each year for the last five years. For a small company, these are not significant numbers. But, for large multinationals, whose communications expenses can exceed ten million dollars per month, the costs are considerable.

Until now, companies could not obtain the data they needed to manage these communications expenditures effectively. As a new communications outsourcing company, Syncordia had the opportunity to build systems from the ground up to support the delivery of communications services to large multinationals. To help these users manage the increasing costs and complexity of their operations, Syncordia has created a single billing information service to support its products and service offerings.

Multinationals may choose to outsource for any of several reasons: to minimise risk outside of their core business, to reduce costs, to maintain flexibility, or to ensure a high service level. Outsourcing enables the customer to apply its management resources to its core business, not to its telecommunications function. These companies also recognise that, in order to manage costs, having accurate billing data in a usable format is essential, first in the management of their telecommunications infrastructure, and ultimately in their overall business operations.

According to a recent Deloitte and Touche survey, multinationals believe that a centralised bill would be a significant factor in their purchasing decision, second only to one-stop shopping[2]. Still, user expectations of billing remain low. This is understandable; until now, increased billing quality and value was not a priority of telecommunications providers. Billing, already an important purchase consideration, will assume a greater profile over the next few years as users require more information.

Rate Expectations

Telecommunications users have defined quality billing to include accuracy, flexibility, timeliness, and the ability to receive the data in an automated format for further analysis. But these goals have been elusive. Network managers and business managers looking to implement charge-back systems for telecommunications have complained that there are too few tools available to support them[3].

Telecommunications bills have historically failed to provide useful support for communications expenditures. While bills have always been detailed and explicit, management has struggled in the exercise of associating costs with the user departments incurring the costs. Under strict regulation, billing was a reflection of the tariff structure. Service providers were required to itemise the services they provided in a standard manner. In some cases, even the format and wording of the bill were prescribed by government regulation. Customers who were intimidated by the technical terminology may have been discouraged from conducting a critical examination of the cost and value of the services provided.

In the battle to increase profits ... users need to seek out any opportunity to decrease the costs of doing business. To do so, they need to know where those costs are.

Perhaps an in-depth analysis of telecommunications costs was not essential a decade or two ago. Now, in the battle to increase profits within a stagnant worldwide economy, and in an increasingly global marketplace, users need to seek out any opportunity to decrease the costs of doing business. To do so, they need to know where those costs are.

Because bills had always reflected tariffs, some services were billed in advance, others in arrears. Rather than providing an end-to-end view of services, carriers were required to bill and subtotal by service category, such as network charges, customer premises equipment and access. In short, the bill was designed for the service provider, not the customer. As a result, the costs incurred by any given user would be dispersed throughout the bill, making analysis time-consuming. Validating invoices and assigning charges to user departments was time consuming and often not worth the effort.

Regulated markets encourage service providers to invest in building their networks, not in easing the administrative burden on their customers. Now that the international market is becoming competitive, telecommunications providers are seeking new ways to differentiate their services. As network services have become more of a commodity, service providers at the forefront recognise that billing represents a new way to add value to their services and derive competitive advantage.

Also, the capabilities of technology have increased the need for improved billing support. The added intelligence in the network has made it possible for service providers and users alike to capture the usage data required for management decision making. Even ten years ago, building the system's capability to analyse or even summarise data by call, by component, or by user would add considerable workload to the customer's already overburdened information-systems professionals. If the service provider can perform the front-end data consolidation of the customer's usage, it becomes cost effective for the customer to analyse the data. The results can then be communicated to the users who have the power to control their expenditures.

Billing Developments

Several of the service providers in the United States are responding to the needs of their customers by providing billing alternatives for their services. They have taken a few small steps by offering itemised billing, consolidated report packages, and multiple billing hierarchies. Replacements for paper invoices include magnetic tape, compact disk, and electronic data interchange (EDI).

But these initiatives solve only part of the problem. Billing information services should enable customers to review communications expenditures and usage, consider their future needs, and adjust their telecommunications profiles according to their business needs. Billing systems must also be able to combine data for all services that a provider sells, with a single summary view and detail. Currently, most billing reflects the physical architecture and usage of the network. The customer's billing infrastructure should be designed to reflect the logical communications requirements of the customer, by tailoring service provision and billing methods to the customer's individual needs, and supporting the customer's business operation dynamically through telecommunications services. Syncordia has taken the next step by working with the customer to develop a logical network design for end-to-end services, including network applications, equipment and systems integration services.

A customer offering is developed to provide a comprehensive end-to-end service, including equipment, applications and systems integration services, and laid out in terms of many logical services. All the logical services are then priced individually and grouped according to the customer's needs.

Network services are priced on a per-kilobit used basis with a fixed recurring charge to recover the costs of accessing the network. Non-network services are packaged by business applications and can be priced with a recurring charge, a usage charge or both. They can include charges for a service, customer premises equipment and people. The service being provided becomes the lowest level of detail for pricing and reporting, whether it is a local area network (LAN) management service or hourly rates for consultancy. Costs for services can then be grouped by application or business unit and allocated according to the customer's business needs.

This provides the customer with an appropriate level of detail to understand costs by application without having to see the component costs or understand the technology that delivers the service.

Because of this unique approach to pricing and service offering design, the billing service is able to capture the customer's schedule of service usage (network and applications) and price each logical service according to a predetermined rate. Any credits, adjustments or taxes can be directly attributed to each logical service, which covers end-to-end costs. Non-network services, such as LAN management, are also given a unique service name and reference. If so desired, each service can be dedicated to a specific customer application. The description of the service which shows up on the invoice report and management reports is determined by the customer, creating a direct relationship between the service offering as designed for the customer and the final billing package received at the end of each billing period.

For the customer, this means that network design and service usage can be driven by the changing demands of the business, and that an accurate picture can de drawn of the costs and benefits of the services. It also suggests that the line between the service provided and the billing

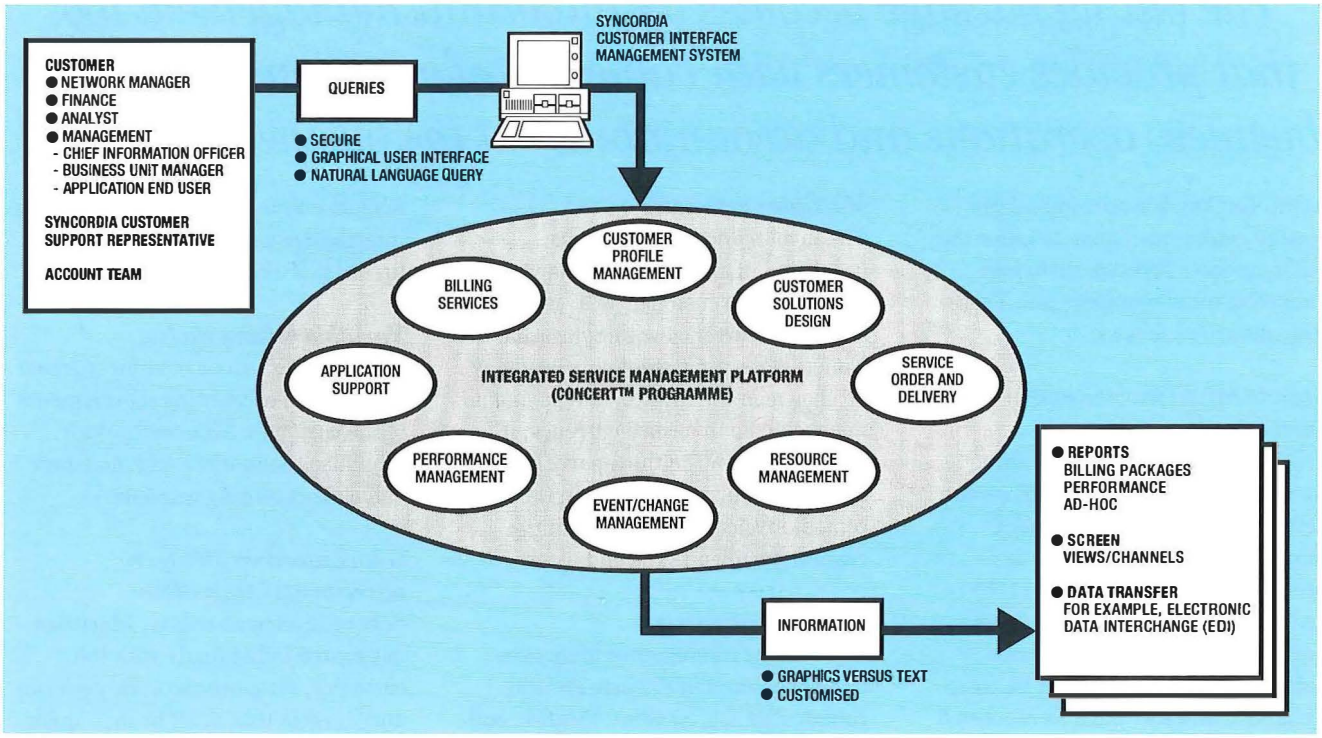


Figure 1—The service management functional model—access to information versus data

methods has become unclear. The Syncordia billing information service can become as much a business solution as access and transport.

The Syncordia Platform

The billing service is an integral component of Syncordia's service level management architecture (SLMA) shown in Figure 1. This architecture contains a repository of information about customers, their networks and their costs. The systems within this framework provide the building blocks that support Syncordia's ability to deliver services from basic connectivity to complete communications outsourcing, manage them effectively and provide useful information about their use.

The databases contain information about the customer's profile, applications, service level requirements, and customised billing requirements. Only one billing system is required to provide the customer with consolidated data by customer application. The enhanced bills can provide customers with more useful information than simple invoices and financial reports supplied by other service providers.

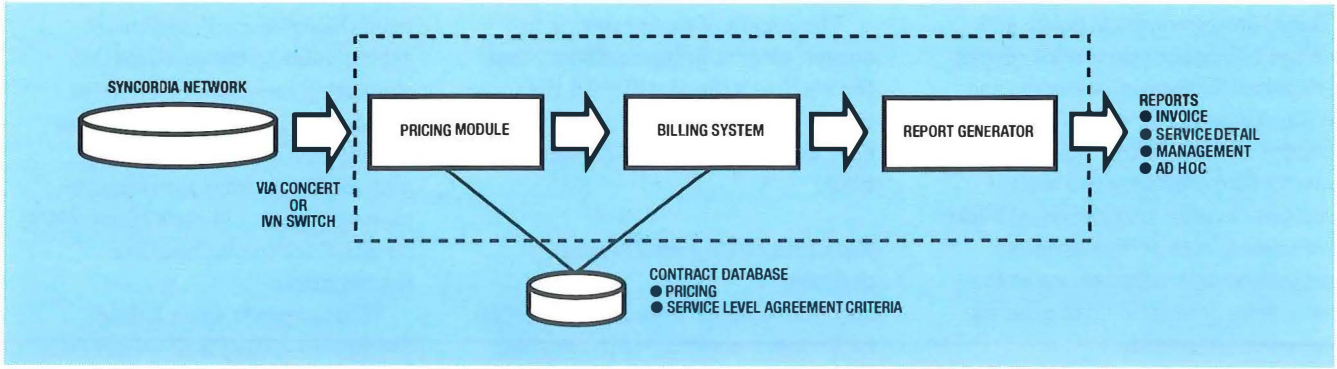
The billing service is a customer support function, not an accounting function. The objective of billing in this manner is to add value to the total business solution provided to the customer.

The billing system itself consists of three separate modules, as shown in Figure 2. The pricing module takes usage information from the network and applies customer pricing information. The billing system module allocates the costs as designated by the customer. Costs can be assigned to locations, organisations or any predetermined classifications of users. The report generator formats the billing information for final presentation to the customer. No predefined forms are used; the organisation of the data is based on the customer's management requirements.

Billing Service Features

The Syncordia billing systems were designed after extensive customer research identified the information needs of global telecommunications

Figure 2—System configuration—modules



The billing package becomes an important management tool that provides customers with valuable information about their business operations and accountability at the business unit level.

users. Ten key features were developed to enable customers to tailor the billing process and reports to individual business requirements. These features are as follows:

Standardised invoice and customised reports
The billing package contains three components: the invoice itself, service detail reports, and management information reports. The invoice provides a formal statement of the account for the customer's accounts payable department. The service detail reports group the invoice costs by service and sort them as requested by the customer.

Standard management information reports are intended to provide both management information and accounting information for the customer. Usage reports showing bandwidth consumption over time simplify the data analysis and provide decision support. Service level agreement violation reports summarise any penalties taken when service level targets were missed. Contract management reports enable the customer to re-evaluate contracted usage commitments against actual usage, monitor the provisioning status of orders, and perform trend analysis.

Management reporting
This capability enables users to analyse data differently than the way they are billed; for example, regional reporting across business units. The feature can also be used to prepare charge-back billing for end users.

Third-party billing
This allows Syncordia to create and deliver billing packages on the customer's behalf for Syncordia services and customer-provided services. With this feature, Syncordia would generate a master billing package to a central customer location and individual billing packages to each of the customer's designated user organisations at the same price or marked up to cover the customer's overhead.

Multiple currencies
The invoice and reports can be generated in almost any stable world currency. The customer will establish a contract currency with Syncordia. Nonetheless, a different currency may be shown on the invoice, and payment may be made in a third currency, if needed. Within the third-party billing option, the currency shown in the central invoice may differ from the currencies billed to the end users.

Multiple languages
The headings on reports and invoices can be produced in English, French, Italian, Spanish, Swedish, Flemish, and German. Other languages will be added according to specific customer needs.

Cost allocation of services
This capability allocates the costs of services to multiple invoice points. The billing system has the capability to allocate the costs for a service between locations or even to a third location such as a corporate headquarters. The costs for a service can be allocated to an unlimited number of invoices as long as the total equals 100%.

Trial billing capability
Syncordia can develop prototype billing packages for the cuqtomer to review as soon as the logical design of the network services has been established. Using the same assumptions as the network design, the trial billing package can provide a model of the actual service charges, their allocation and subtotals. Trial billing packages document the contracted services, customisation and reporting hierarchies.

The benefit of this process is to ensure, prior to implementation, that the services defined will meet the customer's requirements as they were envisioned during contract negotiations.

Variable billing media and delivery
Any combination of media is available for billing, including paper, cartridge magnetic tape or disk. Electronic data interchange will be available in the first half of 1993.

Variable billing cycles
Billing cycles can be modified to meet the internal accounting requirements of the customer. This feature can minimise the number and monetary value of accounting accruals.

Guaranteed service level agreements integration
Service level agreements, which are negotiated individually with the customer, establish network performance targets that must be met under the contract. The integration of the billing system with the network management system enables performance statistics to be collected and matched, to make penalty adjustments and create management reports.

Service Management Support

The system is supported by a worldwide network of customer support representatives, who manage the network and customer data and provide technical assistance. The customer support representative serves as the single point of contact for the customer. As they are the primary users of the system, the customer support representatives have expertise in the technical aspects of the system and the customer profile as well.

The outsourcing relationship is most effective when it represents a long-term partnership for both participants. Its success depends upon the outsourcer's ability to deliver value to the customer, by supporting increased revenues or reducing costs. The billing services provided within the outsourcing partnership promise to reduce the customer's risk and costs of managing its global telecommunications requirements.

What happens when billing services are conceptualised not as an

accounting system but as an information system for the customer? The system is then designed to meet the customer's business objectives. The customer's billing service will simplify invoice verification and processing. This saves workload for the customer and makes it worthwhile to analyse telecommunications expenditures rather than simply verify them. The bill should categorise network costs by application, by location, or by business unit. This facilitates the charge-back process and enables the user to manage telecommunications costs within the overall operations perspective. Bills should also provide information that is useful and easy to understand. The billing package becomes an important management tool that provides customers with valuable information about their business operations and accountability at the business unit level.

Future

In the future, customer billing and information management needs will increase as the vendor community provides more sophisticated services. By providing improved billing services, Syncordia will gain competitive advantage and raise the expectations of its customers. Syncordia believes that the new breed of billing service can provide not only audit support, but also decision support. One user summarises it plainly, 'Once you have control over billing, you have absolute control over your costs'[4].

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Biography

Gerald W. Thames
President, BT North America, and President and Chief Executive Officer, Syncordia

Jerry Thames is President of BT North America and President and Chief Executive Officer of Syncordia, a wholly owned subsidiary of BT. With nearly 20 years of experience in the telecommunications industry, he joined BT in August 1990 to head the global network outsourcing effort that became Syncordia. Previously, he spent 15 years with AT&T, most recently as General Manager, Network Services, with responsibility for all networking operations in the North Eastern United States. He also held executive positions with Martin Marietta Communications Systems and Telecom* USA, a regional network carrier in the United States. While at Martin Marietta, he built the communications system integration company and led a consortium of 13 companies, including MCI, in the US federal government FTS-2000 procurement. As Senior Vice President at Telecom* USA, he had extensive experience marketing a variety of card-based products to the US telecommunications and financial industries. He led the successful introduction of the Telecom calling card and subsequent systems enhancements. He holds Bachelor's and Master's degrees from Mississippi State University and a Master's degree from Massachusetts Insitute of Technology, where he studied as a Sloan Fellow.

Clare Morley

Billing: Providing the Competitive Edge

Billing is a critical component of many carriers' strategies, with billing systems being used as competitive weapons, particularly in the US. Carriers are trying to provide maximum customer choice, while achieving greater accuracy and reliability. The trend is a move towards optical and electronic media, and providing raw data and tools so that customers can produce whatever reports might be required. This article considers how billing has given some companies the competitive edge, with examples of billing capability for virtual network services and number translation services.

Introduction

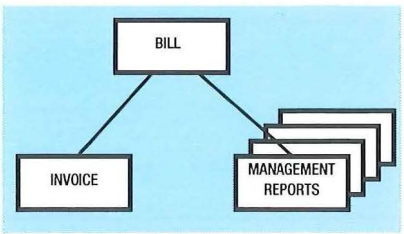
Faced with competitive pressure in a marketplace where it is increasingly difficult to differentiate through product features and functionality, telecommunications companies are trying to gain competitive advantage through service attributes. The bill and the information it contains are a key part of customer service and a vital differentiator in selling to customers worldwide.

Internationally, carriers are at different stages of billing evolution providing state-of-the-art billing for one product but primitive invoicing for another. Within a company, different subsidiaries have widely varying billing capability. The importance of billing is most visible in the US marketplace where it is more advanced than elsewhere in the world although many companies have current initiatives to catch up and aspire to overtake. This article primarily addresses US billing for international products and services.

More than an invoice

The historical view of billing as an invoice requesting payment from a customer concealed a mass of management information that is important to customers. Billing now addresses both invoices and management reporting.

Figure 1—Bill structure



Similarly, network management and billing are overlapping concepts. Historically, billing had only cost fields, and network management dealt with performance parameters. However, billing now includes inventory reporting, busy hour reports and blocked call rates and network management terminals provide real-time call detail and cost comparisons (see Figure 1).

Examples of Billing Capability in Different Product Areas

Virtual network services

Virtual network services provide companies with the power and flexibility of private leased line networks and PBXs, but offer the redundancy, reliability and expandability of the public network. The value-added billing and reporting services that are increasingly being added as features of virtual network services are used to persuade customers to shift from their private networks. These features are targeted at enabling companies to control their costs by minimising their internal communications management activity and delivering management information about communications usage. These value-added billing and reporting services mainly fall into two categories:

- bill consolidation services—tailoring the billing structure across products and hierarchies to match company organisational structures and minimise bill processing;
- detail reporting services—providing call and bill detail information, and processing software, to enable

customers to identify patterns of usage, to identify the intensive communications users in the company, to react to changes in network demand and, with the growing capabilities to match calling patterns with demographic information, to make changes in marketing and sales strategies.

Virtual private networks

MCI has the best overall billing for virtual private network (VPN) services. It has the most consistent product in the industry, both in accuracy and appearance, and the only consolidated product—Portfolio.

MCI is also the only carrier that has implemented electronic delivery of bulk billing data to the customer by CD-ROM. This product, Perspective, is being tested for the company's virtual network service. CD-ROM is ideal for accessing archived data. MCI is testing sending data by its electronic mail product, which has some degree of error checking. AT&T and Sprint rely on diskette delivery for call data.

AT&T has a unique product—the On-Line Call Detail Data system. This gives users the ability to view calls on-line, on a call-by-call basis, within two minutes after a call is completed (real-time). The customer can then apply rates to the data if required. In addition, AT&T also makes some real-time on-line information available through its Customer Network Administration Reports and Customer Traffic Data Reports network management products.

Centrex

Integrated billing and reporting for Centrex services by US Regional Bell Operating Companies (RBOCs) are subject to regulatory restriction. Some services, such as standardised PC financial reporting software, are legally prohibited. This results in a disparity between the advanced reporting features being offered by interexchange carriers for VPNs and those for Centrex from the RBOCs.

Call and station message detail recording is a basic Centrex service, which allows tracking of all outgoing traffic from each station or extension, and is extremely valuable to users as a method of controlling call costs. Such cost-control measures are a prime selling point for Centrex.

Number translation services (Freephone and Premium Rate)

Number translation services is one market where the bill constitutes a key part of the service. Bills for 800 and 900 services (Freephone and Premium Rate) go far beyond informing on costs to the customer. They provide essential business and marketing information in the form of details of callers using their services.

MCI has developed the Caller Profile service which gives customers their callers' names, addresses and demographic information for each matched calling line identification. This information is promoted as a means to carry out market research or develop targeted databases and mailing lists for marketing campaigns. Sprint goes one further with its 900 Neighbours service. This gives detailed information not only on the person who made the call but also on his/her nine closest neighbours, which is very attractive for database marketing activities.

AT&T provides a range of billing options for number translation. Its Call Attempt Profile captures, analyses and then reports on calls made to an 0800 number throughout any 24 hour period. The output shows from which area the calls originate and in what quantities both by the hour and day. AT&T also offers an on-line version of this service.

AT&T's Service Monitor gives customers the information they need to reduce the number of calls that are not completed. The reports, provided daily, weekly or monthly by fax, electronic mail or post, show the incomplete calls plus cause; for example, call not answered within four rings. This service alerts the customer if the call completion rate falls below the specified target. AT&T's Bill Designator names on the bill the 900 service which the customer has called. This can be updated once a month.

Billing Differentiation Strategy

Billing is a critical component of many carriers' strategies with advanced billing systems being used as competitive weapons. Most innovation has been in domestic billing where a single carrier may have complete control. The international multi-carrier environment has slowed the pace of change.

No global competitor is currently strongly differentiated or outstanding on all aspects of billing across all its international product portfolio. Three companies are differentiated on some aspects of global billing. AT&T is differentiated by providing the most information in the most ways. EDS is differentiated through its billing systems design capability, which it also markets to other telecommunications companies and which enables it to provide exactly what a specific customer requires. MCI is differentiated through its consolidated billing, which brings together data relating to different services into a single bill. MCI has developed core billing systems for leading products and then integrated these products to provide portfolios of billing and management reporting information for users. New products can be added to the consolidated billing as they are introduced.

Service delivery

Customer choice covers options for bill format including delivery media, frequency of receipt and currency, and the ability to structure the bill to reflect internal accounting or organisation structure.

An IT executive of a multinational company considering outsourcing said 'Billing issues are important; a consolidated, multilingual bill is something of major interest'.

Carriers are trying to accommodate maximum customer choice over billing whilst achieving greater accuracy and reliability, which are facilitated by standardisation.

Consolidation

Major customers want to be able to specify how bills should be provided to match their own organisational requirements, reporting lines, divisional structures, etc. This may include different combinations of bills consolidated across locations or across services.

The IT executive of one of the largest distributors of credit cards and travel services in the world said, 'We want the ability to break down bills by location and/or function for cost apportionment among divisions'.

Billing systems can be characterised by four phases of evolution from creation, through product-specific billing systems to consolidation with data from the individual systems extracted and aggregated, to integration with a single billing platform for multiple services.

Only MCI and KDD really have consolidated and integrated billing on a formalised basis for business customers of global services. Other carriers are still far away from this. Whilst they have customised systems, these have been developed for specific customers and are not flexible standardised systems. Even consolidation must be preceded by movement to common billing cycles and platforms, and some carriers' management information systems cannot currently handle the number processing that a common billing cycle entails. Most companies with a large portfolio of products have taken a product line approach to billing with separate systems for each product line. This has given them too many systems to migrate readily to integrated billing, for example, AT&T and France Telecom. Post-process consolidation may be a short-term solution for groups of products but has disadvantages such as delays in bill production and inconsistencies.

Media

Use of different billing media is increasingly popular and the trend is towards optical media such as CD-ROM and electronic such as on-line, electronic data interchange (EDI) and enhanced magnetic tape. CD-ROM is particularly useful for archiving large volumes of data but is only currently offered by MCI.

An executive receiving bills in a fully flexible compact disk form described how he could allocate costs to all departments and even individuals as well as change the timing of the billing cycle to meet various department constraints. He thought this was a 'really jazzy way of receiving bills for review'.

Diskette is a useful medium for smaller customers but where one diskette in a series is faulty, then the entire group needs to be reprocessed. Cassette and microfiche, as offered for example by AT&T and Sprint, are decreasing in usage. The sheer quantity of paper involved in providing increased management reports has become unmanageable for all but the smallest customers. Where there is some paper output, pre-printed billing forms are being replaced by laser printed forms, which are more economical and flexible, and provide enhanced capability for customisation and rapid updating.

Reporting

Individual needs for call information differ. In the US more than 180 different types of report are available as well as PC-based programs for traffic data manipulation that generate many hundreds more. Carriers are no longer trying to anticipate all the formats customers might require. The emphasis has switched to handing over raw data to the customer and providing tools so that the customer can produce whatever reports might be required. This customer-designed element must be anticipated in the systems development process.

Customers like to be able to plot billing data graphically for analysis; for example, Sprint's FONView. MCI offers Perspective, a PC-based bill manipulation program that allows customers to analyse the data as required in their own formats.

Customers are also outsourcing their analysis needs to carriers using carrier-provided systems to reduce analytical expenditure both in time and personnel. This will require customer-based manipulation tools (such as Concert™, BT's network management product), traffic analysis programs and not just bill analysis.

Formatting

Bills have to be well-designed and easy to read to be as useful as possible to customers. No company offers a standardised worldwide format for billing. Customer needs such as languages and currency vary by region and local subsidiary businesses

Portfolio

Portfolio is a billing service from MCI designed for large corporate customers with multiple invoices who want to improve definition and control of billing services. It was introduced in 1990 with an initial two-stage roll-out, separating reporting and billing, with reporting implemented first.

It is the best example of a consolidated system in use in the marketplace and therefore of architectural interest. Portfolio covers 15 services now, with expansion to include further services planned. Differences between service-specific billing cycles have caused problems with timely information collection and delays in issuing reports.

Portfolio has a clear and distinctive format, although its double-side page, which was a response to pressure from environmental groups, is not popular with users.

FONView

Sprint's FONView is a PC-based long-distance call management system. It provides customers with billing data on PC diskettes, which can then be downloaded into spreadsheets for manipulation and analysis. This product includes invoice summary information, call detail, custom reporting and graph data including a 12-month rolling history and time-of-day, busy-hour analysis.

Perspective

MCI Perspective is a PC-based bill manipulation program. Customers are sent data on CD-ROM or electronic mail each month and then can manipulate the data using a PC and the software provided to generate reports as required. The package includes graphical capability including pie and bar charts. Customers can review the billing information to track call patterns, monitor fraud and compare costs to earlier periods.

often have different focuses. Customers need flexibility and access to a broad base of information. This may include access to billing information through different media, not necessarily the bills themselves.

Clear formats are appreciated by customers; for example, where billing for several services is consolidated into a single bill. BT's International Featurenet reporting goes one step further using graphics and colour in reports. Sprint has used bill formats as a mechanism to take advantage of the opportunity the carrier has each month to 'talk' to the customer through the bill with built-in marketing message lines at the bottom of each page and additional message pages where necessary. MCI Portfolio has a distinctive format with a specific typeface and layout and an orange stripe across the top of the pages.

Metrics

Metrics are fundamental to the performance of the billing process and to customer expectations. The range of reports and their formats might be exactly what the customer needs, but unless the content is accurate and timely they will be of little value. Metrics include bill accuracy, how quickly and predictably the billing information is sent out and how frequently. Frequency is measured as the delivery cycle. Metrics also include the quality of bills, ranging from how easily the bill can be read, consistent formats across services and provision of management information.

Accuracy

A vice-president of a major multinational company laughed when asked about accurate bills. He said that he 'had never received an accurate bill from any IT vendor', and that he 'had 20 people assigned to reconcile bills full time'.

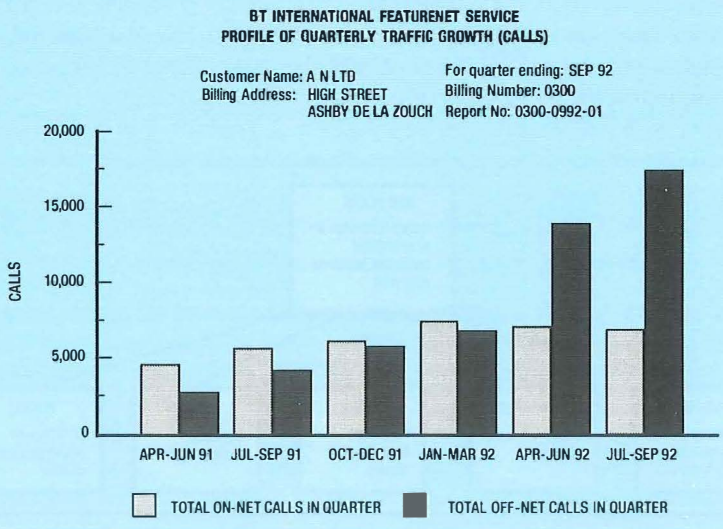
Concerns over bill accuracy are gradually decreasing. Of the major US carriers, MCI has avoided the major customer-affecting billing problems by gradually increasing the number of products included in its consolidated billing. Sprint and AT&T are still plagued with accuracy problems affecting billing for certain products in their portfolios. Internationally, KDD has integrated the most services with the fewest customer-affecting problems but benefits from a narrow portfolio with only international products.

Speed

Most companies send out their bills for international products within 10-20 days. This is slower than for domestic products although billing for electronic messaging products including international is much faster. Sprint sends out bills for The Meeting Channel approximately 5 days after the bill cut-off date. KDD consistently sends out bills for its international portfolio to the customer within 7 days after the bill cut-off date. AT&T's goal for mail-out is 8

International Featurenet

Billing for BT's virtual private network International Featurenet provides graphical information and includes use of colour.



days but it is currently doing market research to find out if this is quick enough to satisfy customer requirements.

Moves towards cross-service billing can cause mail-out delays; for example, MCI has had delays of 60–90 days with the first Portfolio bill mail-out because of the need to await output from different product billing cycles before consolidation.

Readability

Readability is an assessment of whether customers are happy with the bill layout, including how clearly the bill shows the reason for each charge. Use of references that have to be looked up in separate tables for decoding are often confusing for customers; for example, some of KDD's bills.

Billing systems

Standardisation

When customers are provided with a unique system, they cannot use other customers to help check their bills. Standardised billing systems are a strength of carriers compared to the systems companies such as EDS, IBM and DEC, who offer total customisation. Totally customised systems have caused problems, for example, AT&T's Tariff 12. This was a marketing deal offering bulk discounts to individual high-volume customers. Each contract was unique and much of the billing had to be manually processed with subsequent delays, errors and inconsistencies.

Carriers are migrating towards standardisation of billing cycles on the 1–31 day cycle with multinational carriers and service providers also moving towards standardised platforms. If billing standards are agreed, carriers will be forced to merge platforms and systems. Cable and Wireless is meeting this requirement by developing standard software modules for major portions of billing systems which subsidiaries then customise for the local market (services, language, currency, etc.).

Real-time rating

Real-time rating opens up the opportunity to provide a whole range of new services allowing customers to impose budgetary limits over expenditure. This will require merging of billing systems with applications developments. Rated call detail is very important in monitoring for fraudulent use. The AT&T SDN card guarantee, which allows a customer to set limits for card use in dollar amounts, is an example that is already in the marketplace.

Cellular One (a subsidiary of McCaw Cellular Communications) is installing a real-time billing system for cellular telephones in Las Vegas. This system provides for immediate customer credit verification as well as real-time information on telephone usage and charges.

Architecture

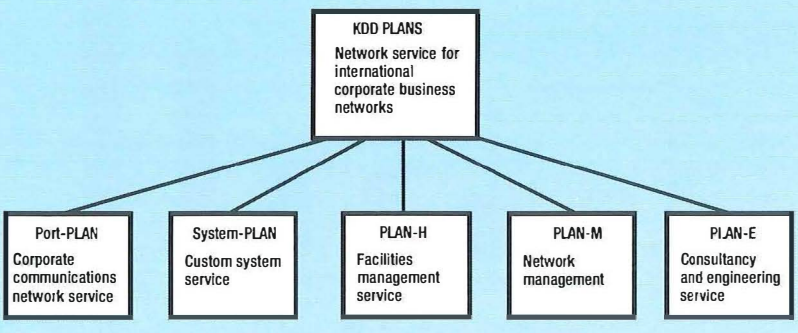
KDD has a single unified billing system, MASS, which gives major architectural advantages. This integrated system allows KDD to provide cross-service billing across product lines and across customer locations without post-processing or use of third-party systems.

MCI's Portfolio billing service product also has an interesting architecture. It is the best example of a consolidated system in use in the marketplace.

MASS

KDD has a single unified billing system that gives major architectural advantage. Introduced in 1989, MASS (Market and Accounting Support System) is a cross-service billing and customer database system. This integrated system allows KDD to provide cross-service billing across product lines and across customer locations without post-processing or third-party systems.

Programming 'hooks' were built into the MASS system to allow it to communicate with a wide variety of other computer systems to share database information, call charge rates, integrate discount plans, etc. KDD's integrated architectural approach has helped the company to design and implement services and features in a very short time. Some of these are relatively complex; for example, the PLANS series of products.



Conclusion

None of the companies mentioned is currently outstanding on all aspects of billing across their international product range and they must enhance their billing to remain competitive as customers' awareness of the choice of global products increases.

New media particularly those that can store large volumes of data are replacing paper. Customers want sophisticated billing that presents them with a few pages of regular, critical information plus the data and

software to produce analysis and reports as required.

The key to billing differentiation in the future will depend on who can provide the most control to the customer in managing billing information and integrating it into their business processes and who can make their systems flexible enough to deliver individual customer requirements as and when they arise.

Acknowledgements

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Biography

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Jack L. Hancock

Billing Development in a US Regional Bell Operating Company

Increased competition, higher demands for customer service, and the introduction of new products and services have all put growing demands on legacy billing systems. This article discusses how one US Regional Bell Operating Company (RBOC), Pacific Bell, has developed a new billing system to meet the opportunities offered in the free market.

Introduction

This article highlights the development of a new strategic billing system at Pacific Bell, a US Regional Bell Operating Company (RBOC). It describes the pressures for change which have been placed on legacy billing systems. It characterises Pacific Bell's billing vision and the barriers to achieving that vision. Practical approaches to implementing change are shared, as well as a general description of the technical solution. Finally, the benefits to Pacific Bell and its customers are outlined.

The Current Billing Environment

Billing systems in US RBOCs, such as Pacific Bell, have been throwbacks to a bygone era. Developed over twenty years ago, they were designed primarily to process simple voice telephone usage of both residence and business customers. Enjoying the captive markets their monopolies provided them, RBOCs could focus primarily on the service quality of their networks. Billing was viewed as a financial function.

The RBOCs are under severe pressure to change their systems on a number of fronts. Government deregulation and the creation of free markets lead the assault on the capability of the typical RBOC billing system. Generally, the terms under which deregulation is introduced provide a 'level playing field' to encourage broad participation in the marketplace.

From this comes increased competition in two forms. First, new products and services are introduced by existing competitors. Second, new entrants surface to capture niche market opportunities. In both cases, the existing billing systems are incapable of quickly adapting to accommodate new service offerings by the RBOCs.

Pressure for change also comes from the rapid introduction of new technology. Legacy systems frequently cannot take advantage of new hardware, operating systems and systems software. Even more important, new products and services using virtual networks and information services cannot be handled in the old systems. Often, products and services have literally had to be redesigned to accommodate the limitations of the old systems.

Finally, the most significant pressures come from customers, who have become increasingly sophisticated. In addition to demanding new products and services, they expect dramatically higher levels of customer service. Billing is the primary means for ongoing contact with customers. They expect quick response to inquiries about calls and charges. They want to know immediately how new calling plans will save them money. Billing also creates data that is valuable, particularly to business customers. This data must be presented in a format tailored for each customer to more effectively run his or her business. Customers are clearly demanding billing tailored to their individual needs. The current systems simply cannot meet those demands.

Pacific Bell recognises the need to migrate away from systems and processes that limit the business to ones that facilitate customer focus.

The Billing Vision of the Future

Pacific Bell's billing vision of the future attempts to remedy the pressures placed on the old billing system and capitalise on future opportunities. Fundamentally, Pacific Bell recognises the need to migrate away from systems and processes that limit the business to ones that facilitate customer focus. This decision is the result of a rigorous internal examination of systems, processes and capabilities.

More significantly, it reflects extensive market research. Pacific Bell spent over 18 months collecting data from customer visits, focus groups, priority customer panels, customer satisfaction surveys, account team interviews, service representative focus groups and product manager interviews. The findings indicate the broad diversity of customers. Customers naturally value their own processes, not Pacific Bell's. They expect flexibility and demand customer control. Ease of use is a way to significantly differentiate oneself in the marketplace. The billing vision of the future is a direct result of these findings.

The specific aspects of the conclusions and the resulting billing vision are outlined below.

Flexible rating and pricing

The new system must allow the business to price, promote and sell products and services by market segment and/or geographic boundaries while:

- supporting both short and long-term discount schemes,
- eliminating lengthy turnaround time to introduce new products and services,
- reducing the high cost of introducing price changes,
- tailoring prices to differences that customers are willing to pay for products and services,
- creating new demand for older products and services through creative pricing and packaging,
- retaining high margin/high value customers through tailored price contracts, and
- producing discount information for the customer that is currently not available on the bill.

Customer-focused invoicing

The invoice must be adaptable to meet the unique characteristics of the customer:

- organisational structure,
- information needs,
- level of detail required,
- media alternatives desired, and
- delivery options.

Customers must be given the ability to select the invoice format which meets their specific needs. The business must also be able to respond quickly to changes in these needs and reflect those changes on the customer's invoice. The customer must be able to receive a single bill, for all products and services, for all locations.

The business must eliminate invoicing as a bottleneck to introducing new products and services to the market. It must lower the cost of developing new formats and maintaining existing formats. It must develop a platform for producing many customer documents besides the invoice while reducing redundant functions and inflexibility in the old system.

Flexible product structures

The business needs one standard manner in which to define all products and services it offers. Such a standard structure reduces the time and effort needed to define new products as well as minimising the cost of introducing new products into the billing system. In addition, a single product structure provides the means of relating products together for management reporting at various points throughout the structure.

Dynamic customer account structures

Customer account structures should be of a recursive, bill-of-materials nature, able to support infinite levels of relationships. Specifically, they are to support three types of accounts:

- billing (invoice-level),
- intermediate (profit centres), and
- detailed (network connections).

Billing for third parties

The billing system must be a viable billing alternative for other companies and must provide 'private label' billing capabilities at competitive prices. It must also attract other companies who want their billing data included on the bill.

Billing as a product

The new billing system should not only allow the business to match competitors' campaigns, but also to gain competitive advantage. It must allow the business to serve its markets by tailoring pricing, service and billing to individual customer demands.

The billing system will allow the development of new pricing programmes and promotions for existing services, and essentially create new services simply by creating new pricing schemes.

A customer-focused organisation

Finally, it is essential that the organisational structure of the business supports accountability and focuses on the customer. To that end, Pacific Bell created the Billing Services Group within its Product and Technology Support Group. This group has end-to-end responsibility

Pacific Bell decided to concentrate on a billing system that would allow it to handle change rapidly and respond quickly to the market.

for all matters related to billing. See Figure 1.

Barriers to Achieving the Vision

In order to achieve this vision at Pacific Bell, four main areas had to be addressed.

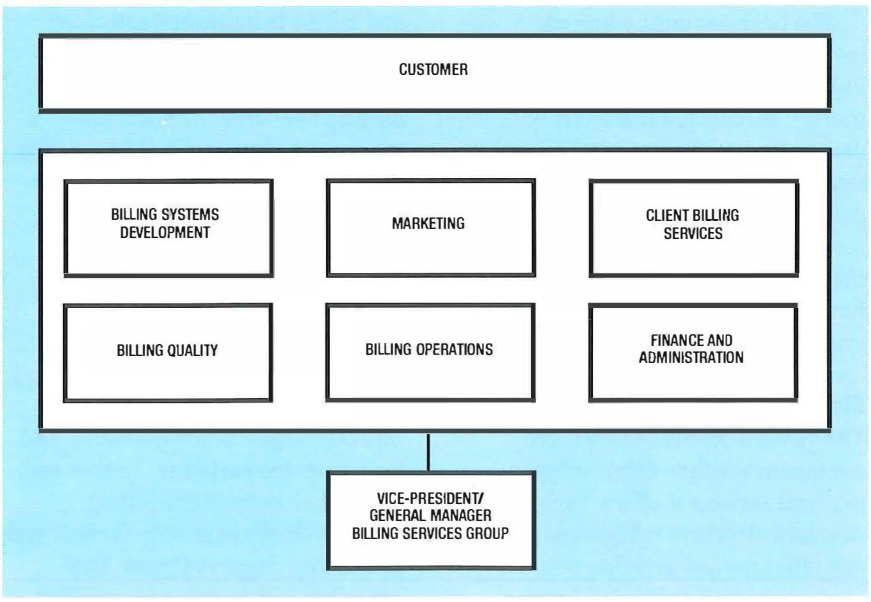
Firstly, the information systems organisation had relatively limited experience in large development projects. Prior to divestiture, American Telephone & Telegraph (AT&T) developed the major systems used by the regional telephone companies. The systems organisation at Pacific Bell then made the modifications required to incorporate these systems into the local environment. To acquire the additional resources and large systems installation skills required, Pacific Bell partnered with an outside systems integrator, Andersen Consulting. Andersen had successfully implemented large telecommunications systems and provided a full complement of computer-aided software engineering (CASE) tools needed for this type of development effort. Teaming with Andersen also allowed for an effective technology transfer to Pacific's own internal development organisation.

Secondly, available resources were an issue. Besides the obvious, limited capital resources, there also were limited people resources. Various systems development life-cycle phases required significantly different staffing levels. Peak resource requirements were often best addressed through the use of contractors, particularly programmers.

Thirdly, senior management was rightly concerned about the high cost and risk associated with these projects. Additional complexity was introduced as some of the larger projects spanned multiple budget planning cycles. Project management needed to sustain these multi-year projects over several budgeting periods. It was also recognised that the benefits of a new billing system may be limited for certain products and customer segments. Numerous mature, stable products may not need the sophisticated rating and pricing capabilities of the new system. Furthermore, there were significant numbers of customers who did not subscribe to products and services which required enhanced billing capabilities. Pacific Bell had to determine what role legacy billing systems could play for such customers.

Finally, there were significant systems issues to address. The legacy billing systems contained very large, complex, monolithic programs. Frequently these programs were poorly documented with varying program structures and location-specific data. Architectures were often non-strategic and generally dedicated to either on-line or batch.

Figure 1—Billing services group



Achieving the Vision

While formidable, the barriers described above were not insurmountable. A number of considerations, as detailed below, can significantly enhance the successful implementation of a new billing system.

Re-examine business processes

The billing system serves as the core strategic information system at Pacific Bell. It serves to track customer accounts, handle customer inquiries, and even plan for new products and services. It allows analysis of revenue streams to facilitate market segmentation and sales analysis.

The new billing system must not be engineered merely to automate those processes which are currently manual, or replicate poor mechanised processes. The new billing system provides a fundamental opportunity for the business to change. Three important questions had to be asked:

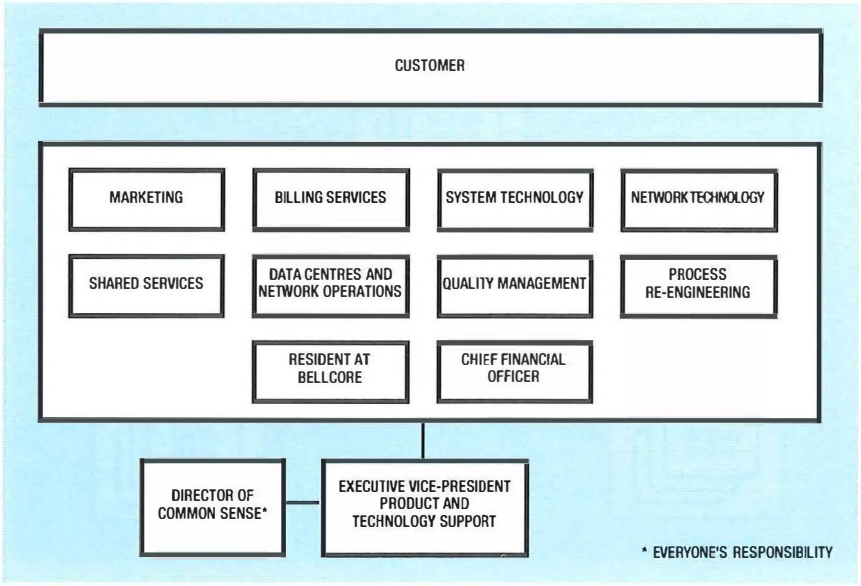
- Why should we change?
- What should we change?
- How should we change?

Answering these questions helped Pacific Bell review its priorities and develop an information and systems plan. Pacific Bell decided to concentrate on a billing system which would allow it to handle change rapidly and respond quickly to the market. Essentially, it chose to focus on what the customer values.

Invest in robust infrastructure components

A key factor in the successful development of the new billing system is to

Figure 2—Product and technology support group



invest in appropriate infrastructure components. A strong applications development methodology is important, because it provides guidance to developers throughout the development life cycle. Of no less importance is a set of well-developed, documented and enforced standards and procedures that define how the development life cycle will use and integrate with the methodology. Finally, the development effort must have access to a toolset that adequately supports the development process. These tools must support all phases of the development from requirements gathering through coding and testing. From a full function, custom programmer's workbench to investment on Andersen Consulting's Design/1 CASE tool, Pacific Bell availed itself of some of the best tools currently available.

Define end-state data and application architecture

The development of an end-state application architecture is crucial. In conjunction with the development of Pacific Bell's new billing system, a new application architecture platform was developed. The architecture was developed to comply with Bellcore's operations systems computing architecture (OSCA) principles and provides many of the features and functions available with other current generation application architectures.

The architecture provides an overall framework for all new application development and ensures that the next generation of Pacific Bell applications will have a common look and feel. In the long term this will simplify maintenance and support costs associated with these systems.

Pacific Bell's billing architecture includes the definition and integration of end-state data and application architecture components. A number of strategic data areas that are critical to the corporation have been identified. As part of the business vision, each of these areas was developed into a centralised information repository which can be integrated with future application systems. This central repository will eventually eliminate the need for redundant data storage and will support the integration of all Pacific Bell systems.

Tie information systems organisations into the product development process

In many systems development efforts, it is typical for the development organisation to be insulated from the users. Organisational barriers exist which cause detrimental results. All too often the users 'throw requirements over the wall' and the developers 'throw back the completed system'. Both parties have important roles during all phases of the development effort. The Pacific Bell Product and Technology Support Group is one approach to addressing this point. See Figure 2.

Develop a migration strategy

There are a number of alternative migration strategies to consider. One may migrate to the new system by selected products, selected customer segments, and/or selected business functions. Pacific Bell specifically chose to avoid one possible alternative, namely, 'the big bang'; that is, migrating all products, all customers and all functions simultaneously.

A number of considerations that yield a very effective migration approach are listed below:

- determine the vision first,
- take small, discrete steps,
- take frequent check points,
- deliver success early,
- provide overall programme management,
- group projects to limit building interfaces and stop gaps,
- avoid stranded investment,
- plan to minimise organisational impact on the users, and
- focus on data, not discrete applications.

Include stakeholders in the system development life cycle

The successful implementation of a new billing system will inaugurate significant change for the business and its customers. Development of a plan which involves the appropriate stakeholders throughout the life cycle is critical. Customers, service representatives and billing operations personnel provide much more than requirements. They validate assumptions, designs and procedures. Involving the media provides an opportunity to reduce costs associated with notifying customers of the changes which will occur. These are just a few examples.

Prototype and pilot new approaches

Finally, Pacific Bell believed it was critical to avoid designing applications in a technical vacuum. It required

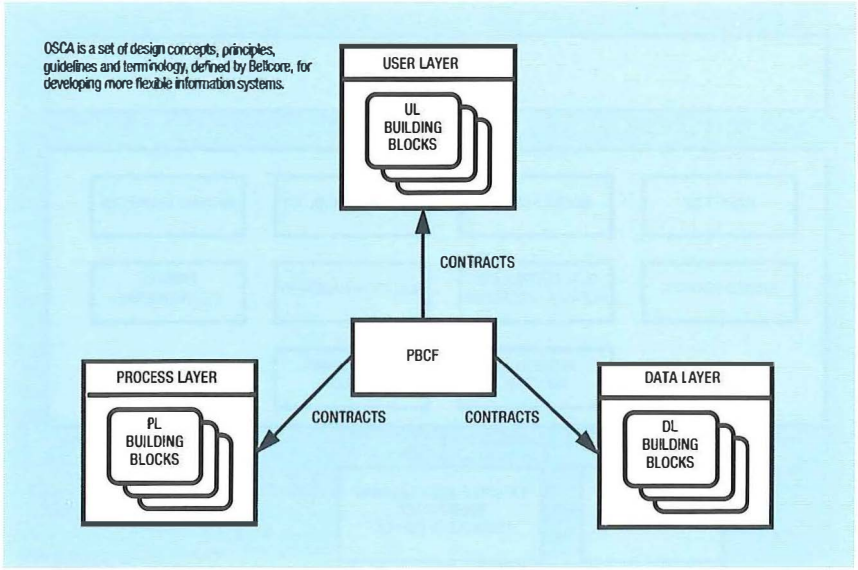


Figure 3—OSCA™

each new application module to be tested in its internal human factors laboratory, where actual users provide 'hands-on' input. Prototyping disasters in the laboratory save making huge investments in the wrong technology.

The Billing Solution

Layered architecture approach

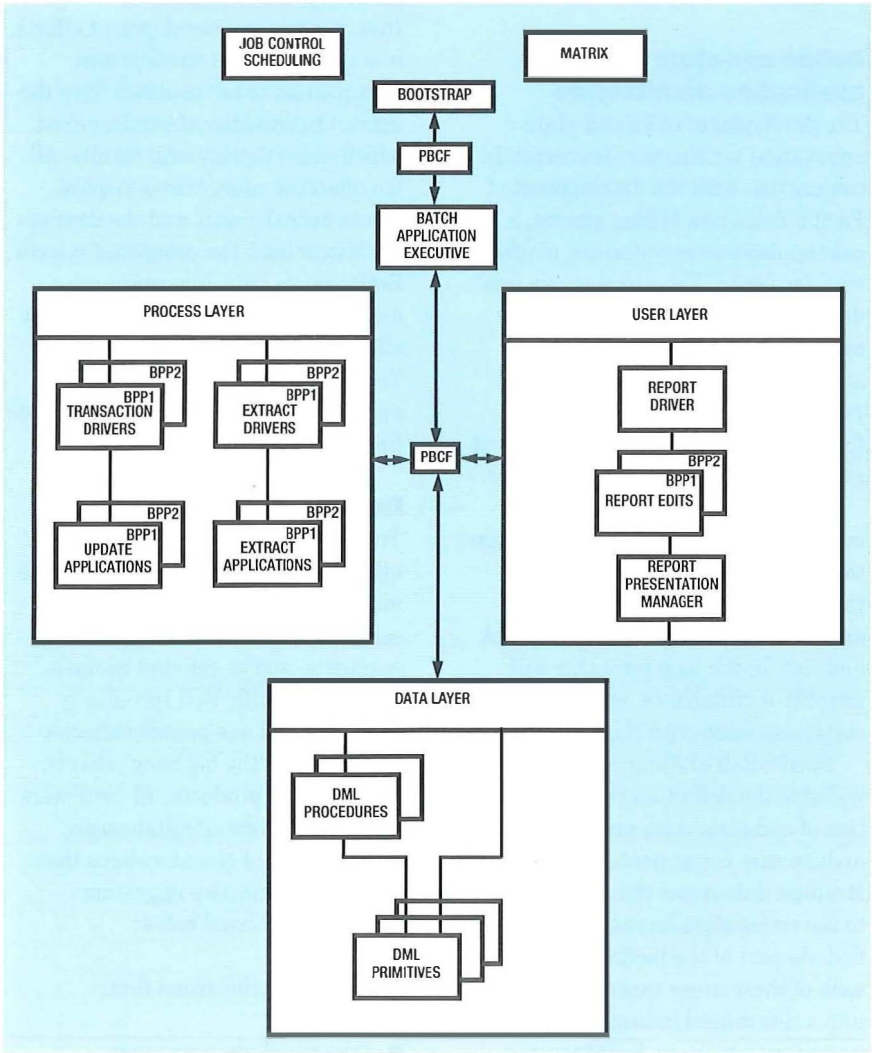
In accordance with Bellcore's OSCA, the system architecture is divided into three layers: user, process and data. A communications fabric provides services for message and data exchange between architecture layers through a well-defined interface. See Figure 3.

A layered architecture isolates users, data and application code from changing technologies. For example, the addition of intelligent workstations requires modification to only the user layer. Functionality and technology are separated by architecture, thus removing technical aspects of the system from application programs. Finally, the layered approach also provides the ability to utilise a logical data view which is independent of the physical data storage. The data layer allows the manner in which data is physically stored to be transparent to the application program. The result is a simpler and more maintainable system which is also easier to develop.

Batch execution architecture

The batch execution architecture insulates functional batch applications from overall process control, technical processing requirements and physical data access. Under the batch architecture, the applications are independent of the physical structure of the execution architecture environment. See Figure 4.

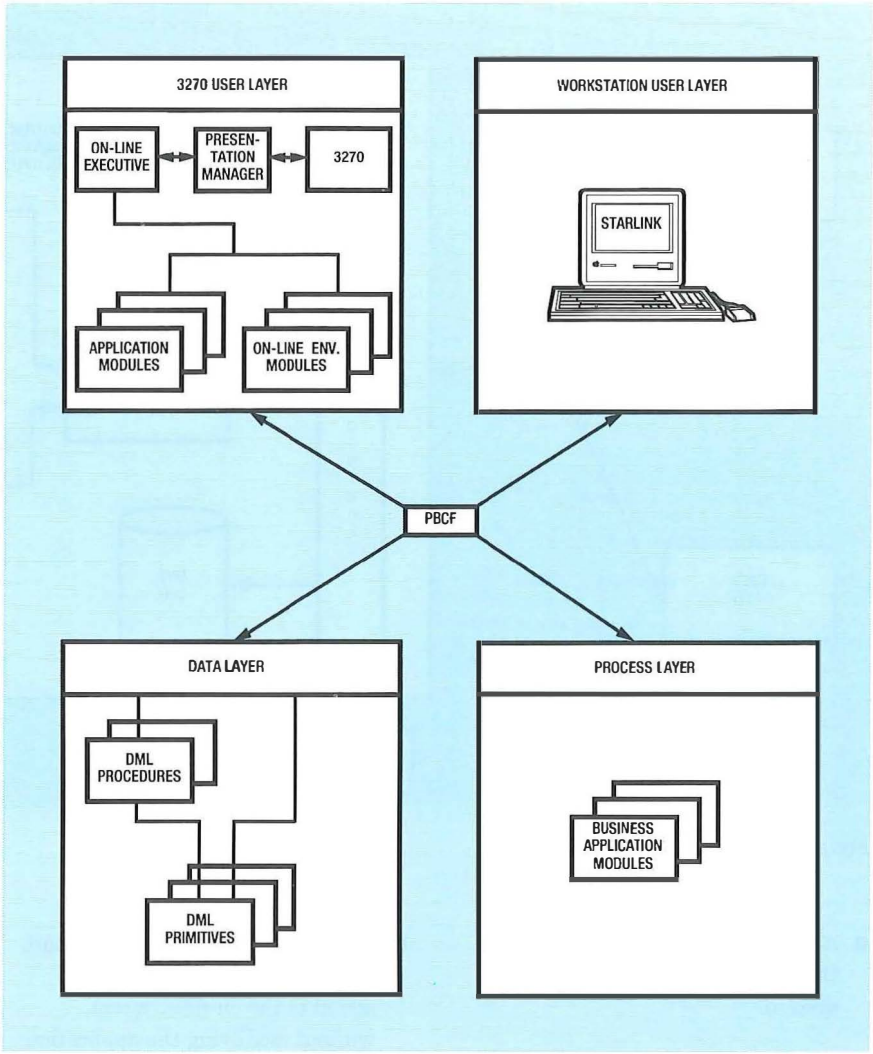
Figure 4—Batch architecture



The batch execution architecture provides for:

- Batch bootstrap module. This is the entry point to the batch environment. The bootstrap module processes parameters that include system identification, process identification and concurrent task number.
- Batch application drivers. These drivers control processing for logical units of work within the batch execution architecture.
- Overall process control. Complex technical logic required to control batch processing is performed by the batch application executive (for example, DB2 plan switching, etc.)

Figure 5—On-line architecture



- Checkpoint processing. Checkpoint processing is controlled by the batch application executive.

- Checkpoint frequency, stored in system parameter tables, can be defined by time or number of transactions processed.

- File control. Computing environment modules send standard messages to the data layer to open/close input and output files.

- Concurrent processing.

- Abend handling. A common module processes all situations requiring abnormal termination of the batch job.

On-line execution architecture

The purpose of the on-line execution architecture is to standardise and facilitate some of the 3270 user layer functions necessary to support on-line transaction processing utilised in the customer information control system (CICS) environment, enabling application designers and programmers to concentrate on the actual business functions of the system. See Figure 5.

The on-line execution architecture provides for:

- Conversation control. Navigation between conversations and the flow within dialogues are kept external to the application modules. This enables application screens to be assigned to more than one conversation. Standard system actions, such as HELP and CANCEL are fully controlled by the execution architecture and do not require unique application logic.

- Fast-path. Allows experienced users to bypass menu and prompt screens and proceed to the primary processing screens.

- On-line help. Allows system developers and users to maintain conversation, screen and field-level help panels. The on-line execution architecture help modules manage the display of help screens associated with the current conversation.

- Dynamic menus. Menu definitions are stored in a parameter table and on-line execution architecture and security modules manage the creating and display of menu screens.

- Security. An on-line security facility interfaces with security software and automatically verifies user and user group authorisation to dialogs, screens, functions and records.

- Context data management. The architecture automatically saves and retrieves on-line context data for use by the application modules.

- Abend handling. A common module is provided to process all situations requiring abnormal termination of the on-line exchange.

Controls architecture

Process-to-process, as well as intra-process, controls are provided for within the computing environment utilising Unitech Audit and Control Reporting (U/ACR). File integrity, financial integrity and textual controls are supported. See Figure 6.

The controls architecture at Pacific Bell addresses:

- Accounts for all processing inputs/outputs.

- Accounts for the various methods in which a transaction can be processed: correct, error, dropped and recirculated.

- Provides intermodule and intramodule file control balancing.

- Ensures revenue by category is recognised at the correct point in the system and is not counted multiple times, lost or incorporated into another category.

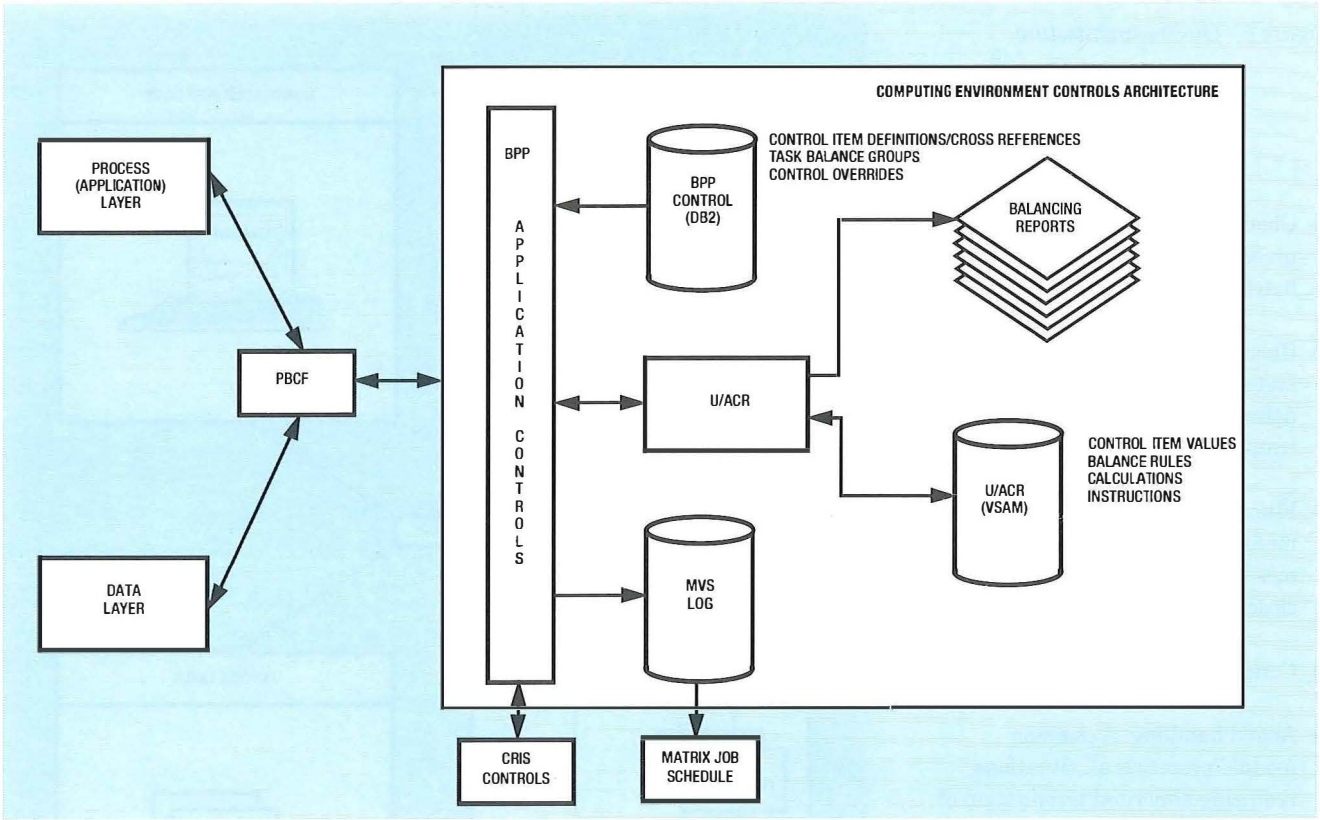


Figure 6—Controls architecture

- Accounts for all revenue types at the appropriate points in the system.

- Supports balancing of revenue subtotals and totals.

Rating and pricing

Pacific Bell's Billing Project Phase 1 (BPP1) was the first in a series of projects to develop the new billing system. The major system characteristics are:

- Integrated invoicing (regulated and non-regulated products and services). All charges are integrated into one bill/invoice.

- Rating and pricing flexibility. Changes in rating and pricing structures such as simple unit rates and tiered rates can be easily and quickly implemented.

- Product revenue reporting. Reports for the revenue generated by product can be originated and viewed on-line.

- Third-party billing capability. This integrates third-party billing information into the customer bill.

- New product introduction support. New product structures can be added to the on-line system without modifying the application.

- Integration with existing systems. BPP1 interfaces with the legacy billing application system and U/ACR controls such as file integrity, financial integrity and textual controls.

- DB2, CICS/COBOL II and CASE tools. The technical environment includes distributed processing (involving six data centres throughout California), MVS/XA, CICS, and DB2. All of the applications are developed in COBOL II.

See Figure 7.

Flexible formatting

Pacific Bell's Billing Project Phase 2 (BPP2) is the second in the series of projects to develop a new billing system. BPP2 replaces a variety of existing functions associated with producing customer service records (CSRs) and bills. It is a complex, high-volume invoicing application. It is focused on providing enhanced customer billing outputs on a variety of media types such as paper, magnetic tape, floppy disc, microfiche and EDI. The application is primarily batch and is very performance intensive. It is a transaction-based application that has been engineered to be very flexible and table driven. Very complex output types and significant volumes require a sophisticated format and print architecture on the back end of the billing system. The major system characteristics of BPP2 are :

- Flexible formatting. BPP2 is a table-driven application. Two-hundred DB2 tables are used to drive the formatting requirements of the bill and customer service record outputs. Hence, future changes in formatting requirements will entail making modifications to the DB2 tables.

- Support summary billing where one invoice is created for multiple accounts. BPP2 supports account aggregation where various charges are rolled up to one charge total.

- Support a wide range of customer presentation options:

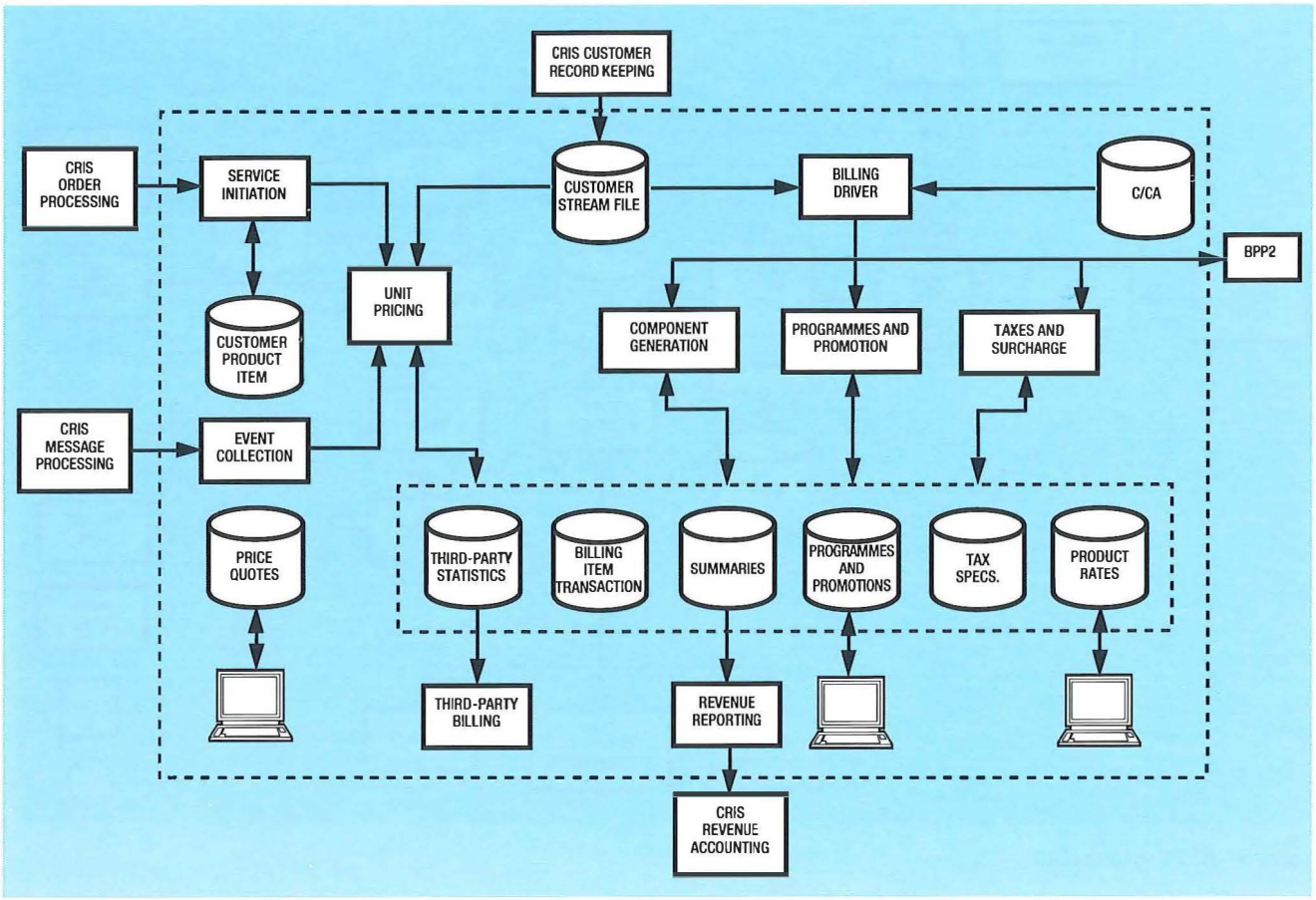


Figure 7—BPP1 system flow

—Level-of-detail reporting. BPP2 can generate bills at the detailed or summary level.

—Toll-sequenced bill formats. Charge details can be sequenced according to specified criteria.

—Media delivery. Bills and customer service records can be presented in various media types such as EDI, magnetic tape, paper and microfiche.

—Additional copies. Multiple copies can be ordered.

—Stacking. BPP2 supports the stacking presentation format where the customer can request bills for multiple billing groups to be mailed to one address.

—Integration. BPP2 supports and provides for the uniform cross-referencing of multiple media types.

- Alternate media formats. Formats are supported for EDI, tape, floppy disc and microfiche, as well as paper.
- Reprints. Bill reprints can be ordered up to 90 days after the statement date.

See Figure 8.

Enhanced aggregation

California is geographically divided into ten local access transport areas (LATAs). Pacific Bell has the franchise to provide service within the LATAs, but is precluded by regulation from providing inter-LATA service. It is expected that the California Public Utilities Commission (CPUC) will shortly rule to remove most of the current restrictions on intra-LATA competition. The removal of these restrictions will allow for intra-LATA toll competition between local exchange companies (LECs), such as Pacific Bell, and inter-exchange companies (IECs).

Pacific Bell is in the process of enhancing the BPP system to provide the company with additional billing flexibility. Two billing projects provide the foundation for many of the changes planned for this phase of the development effort. These projects will provide:

- a uniform source for customer information, and
- enhanced customer and account aggregation. See Figure 9.

A new billing aggregation platform (BAP) is under development to standardise and facilitate some of the desired billing functions requested by various user groups within Pacific Bell. The BAP will address a wide variety of rating and discounting capabilities specified in the requirements. An integral part is a new on-line graphical user interface 'input' system. It will take information obtained by the service representative from the customer and input it into the billing system without the use of service orders. These projects are scheduled for release during 1993.

Benefits

Clearly, both Pacific Bell and its customers benefit from the implementation of the new billing system. Billing is no longer a 'bottleneck'. Pacific Bell now has a strategic architecture with extensibility that

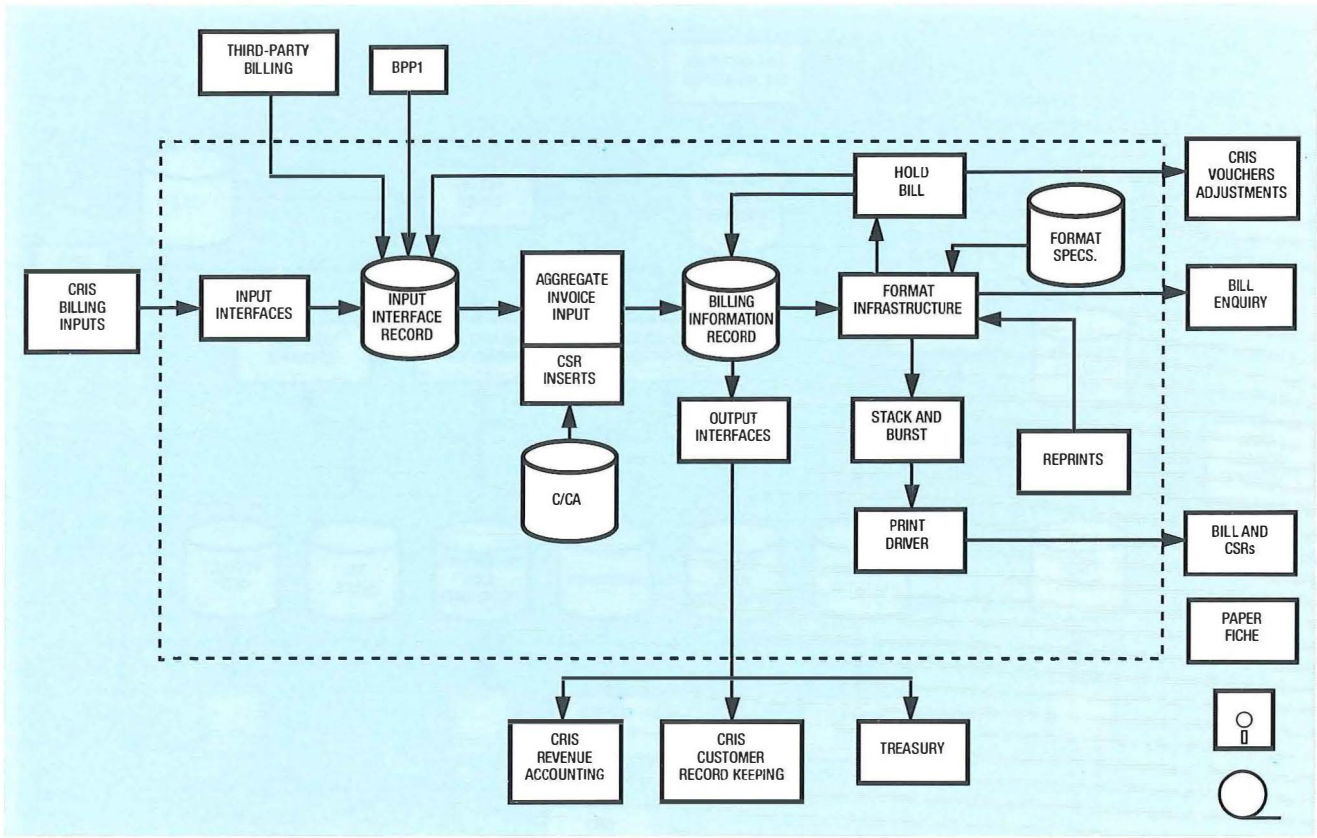


Figure 8—BPP2 system flow

creates a base for all application development, Being table driven, it is highly flexible. It takes advantage of standard system software, reusable code and common services. Use of application shells and models allows for consistent enforcement of standards. It is tunable for high performance and integrates human factors engineering to provide a highly user friendly system.

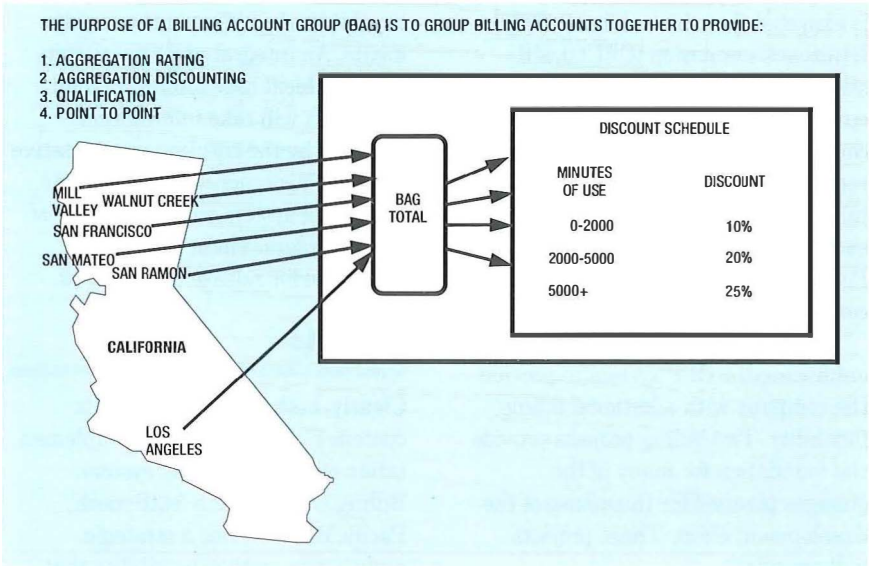
Pacific Bell has dramatically improved its ability to introduce products into the market. It can rapidly introduce new pricing schemes and make the subsequent savings visible to its customers. The resulting discounts can be based on product and/or customer attributes allowing for the development of pricing strategies, not only to stimulate product usage, but also to maintain and increase market share. There is now a platform for introducing revenue-producing billing products into the market.

Productivity of Pacific Bell's systems developers and its users has increased, while development costs, maintenance costs and timeframes have decreased. Equally important, billing queries into its business offices have decreased, thus creating additional opportunities for its service representatives to consult with their customers.

Customers benefit as well. As billing information is now presented in formats which customers find meaningful, they can readily verify their invoices. Customers can select alternative formats, media and delivery options based upon their needs. As customer requirements change, Pacific Bell can readily respond. Customers can receive one bill for all products and services, and for all locations, and they can select products and services with prices tailored to their individual needs.

The concluding benefit is that Pacific Bell now has a new means by which to differentiate itself in the market by offering billing services which increase customer satisfaction.

Figure 9—Enhanced aggregation



Conclusion

Customer needs will continue to evolve, so the billing system development effort will never end. Pacific Bell will continue to deliver new capabilities to its customers to meet their ever growing expectations. Pay-per-use billing, foreign language billing and graphical performance statements are examples of future opportunities to give better service to customers. Priorities will be based on feedback from customers. How well these growing expectations are met will shape the future success of the business.

Biography

Jack Hancock
Executive Vice President, Pacific Bell Product and Technology Support Group

Jack Hancock was appointed Executive Vice President of Pacific Bell's Product and Technology Support Group in August 1990 as part of a strategic restructuring of the business. He is now responsible for integrating the work of 8500 employees engaged in product development and support, engineering and support of the Pacific Bell public network, internal information systems, and the centralised functions of systems and telecommunications operations, data protection, real estate, procurement, and common company services. From 1978, when he retired from the US Army with the rank of Major General, until joining Pacific Bell in 1988, Jack held a number of vice-presidential appointments in several companies directing management information systems. He holds a bachelor's degree from West Virginia University and an MBA from George Washington University, and has served as a member of several National Executive Level Advisory Boards for the US Federal Government. He is a member of the US Armed Forces Communications and Electronics Association, the Association of Computer Machinery, and the Institute of Electronic and Electrical Engineers.

Glossary

BAG Billing account group
BAP Billing aggregation platform
BPP1 Billing Project Phase 1
BPP2 Billing Project Phase 2
CASE Computer and software engineering
C/CA Customer/Customer Account. Project to provide a uniform source for customer information.
CICS Customer information control system. IBM's on-line monitor.
CRIS Customer record information system
CSR Customer service record
DB2 IBM relational database management system
DML Data Manipulation Language
LATA Local access transport area
MOU Minutes of use
MVS/XA Multiple Virtual System Extended Architecture
NETSYS Pacific Bell's architecture standard
OSCA Operations system computing architecture. Bellcore's architecture standard.
PBCF Pacific Bell communication fabric
U/ACR Unitech audit and control reporting
VSAM Virtual Storage Access Method

Geoff Mason

Evolution of BT's Billing Systems

The drive to improve customer satisfaction and perception of BT billing, whilst delivering greater information and pricing flexibility to cope with changing market demand, has led to rapid evolution and radical re-engineering for BT's billing systems. This article describes the market and legislative drivers for change, the evolution of systems and the history of projects which led to the inception of the Billing 90s Programme.

Introduction

In the last 15 years, BT's billing systems have undergone major change, in a constant drive for improvement. Within two years of implementation of the largest systems development in Europe, a very radical review of its customer-facing systems had been undertaken, culminating in a very ambitious programme of billing system re-engineering and development.

History

BT's principal service for many years has been telephony, charged to the customer on the basis of call usage and line rental. Unlike North America, where most of the US telcos' core billing systems have been in existence for 25 years (albeit with many major developments), BT's telephony billing systems have been completely replaced twice in the last 15 years.

Given that BT's initial product base was very restricted, the main drivers for change had been operational efficiency and optimisation of new technology, rather than market needs. In 1978, BT began implementation of the new billing system (NBS), a series of automated batch processes based on ICL 2900 computers. However, customer data was resident on several systems, each with their own, separately maintained, reference files and this gave rise to complex reconciliation procedures and sometimes caused discrepancies affecting both billing efficiency and the customer bill.

Billing and customer information were provided to the customer-facing teams on paper or microfiche and were, therefore, difficult to manage and inhibited appropriate responsiveness to the customer. The liberalisation of the UK market in 1981 and the Government's stated intent of privatising BT, coupled with growing awareness of other telecommunications companies' capabilities (particularly the US market), increased customer expectations of and demands on BT. Therefore, BT initiated short-term developments (1–2 years) to improve the existing customer-handling and interface systems and reviewed their longer-term fitness for purpose to meet the changing market and regulatory demands. This latter initiative culminated in the largest ever in-house system development undertaken in Europe, known as the *customer services system* (CSS), which produces all BT's current telephony bills (see below).

In 1983, BT started implementing an on-line system to speed the customer order-handling process and supply consistent information to the engineering and billing systems. A parallel but unrelated initiative, Modern Day Billing, was being spearheaded by London Region to provide a terminal interface to the core billing environment, to give extra facilities to the customer-facing teams, to remove much of the paper-based activities and, consequently, to increase the speed and accuracy of the response to the customer.

However, NBS and the customer-handling systems were based on antiquated technology which provided slow response times; this, together with the inconsistencies in customer handling, reconciliation problems, lead times on development and costs associated with inter-system communications, left the company some way short of a robust platform from which to serve its customers.

Customer Services System Billing

In 1981, BT undertook a major review of both its customer interface and internal information needs. This review, which included billing, assessed best practices internationally, evaluated the applicability of externally available systems to BT's future needs and operations and analysed the lessons learnt from previous systems developments. One outcome was the rationalisation of 61 geographically-based Telephone Areas into 30 Districts, with the concept of a District database containing all the relevant data for the Districts' customers and a series of common application programmes to assist the provision of uniform delivery of information.

The objectives of this approach were to provide a single source of information on a customer and his relationship with BT, to minimise customer and performance-affecting reconciliation difficulties and to support the single-point-of-contact principle. This single-point-of-contact principle was conceived to overcome a constant customer complaint, referred to as the *BT Shunt*, whereby, in order to resolve a problem, customers were passed from one department to another as individual customer-facing employees did not have sufficient information available to resolve the totality of the enquiry. It was also anticipated that significant cost reductions could be achieved through rationalisation of activities.

As no external offering matched BT's requirements, a major internal development programme ensued to provide a fully integrated systems environment covering order handling, repair, maintenance and billing needs as well as giving BT the tools for workforce and stores management, productivity measurement and control. Using on-line transaction processing (OLTP) on IDMS and IBM 3900s/Amdahls, it would provide a real-time environment where the customer-facing teams could always avail of current information and status reports across a customer account.

CSS was implemented in Thameswey District in 1985 as a pilot: the original time-scales for national implementation were three years from pilot. However, the enormity of the challenge undertaken, significant problems with data cleansing, reconciliation and consolidation from disparate sources onto the CSS databases, and the decision by the company to introduce itemised call billing in 1987 (with major software and database sizing issues requiring resolution if the 75% nationwide availability by 1990 could be achieved) delayed the completion of implementation in all Districts until early-1990. Nevertheless, it represents a significant achievement and has led to major improvements in working practices, speed of response and customer satisfaction.

Currently, CSS exists as 29 separate physical databases, based on the original District structure and, therefore, 29 different geographic areas; in 1991, CSS produced approximately 100 million telephony bills for BT's 25 million customers. It services 20 000 regular on-line users and a further 20 000+ use it occasionally as part of their working life. CSS processes itemised call data from all BT's modern exchanges, which cover over 86% of the customer base, and has recently been enhanced to provide pricing options, allowing customers to choose pricing packages tailored to their needs and use of the telephony service. Additionally, as most business customers have a presence across some, if not all, of the District organisations, transaction switching has been implemented between the physical databases to give customer-facing teams easier access, to reduce the artificial system boundaries and to help improve the one-stop service to customers.

CSS billing consists of two main functions:

- The batch processing areas that deal with the capture of data, production of bills, non-payment reminders and the interface to the accounting and income analysis processes.

- The on-line facilities that allow speedy and accurate access to the billing information held on the database. These are used by the customer service centres while answering customers' enquiries on billing matters and to update customer account records.

Figure 1 provides an overview of the complex CSS billing modules, their interfaces to other feeder and billing systems and the external non-BT environment.

CSS billing receives all the information pertaining to the customer's account and indebtedness to BT, either from other CSS subsystems or by interfacing with other pre-billing systems, and generates all telephony bills for BT's customers.

CSS takes the information, constructs and produces the customer bill, and the financial information is passed to BT financial accounting systems to form part of BT's statutory accounts. The base billing data is obtained as follows:

- Directly dialled call information (meter readings, itemised and star service calls) from the exchanges is passed through the call logging subsystem into CSS.

- Information on operator-controlled, Chargecard and international transfer charge calls are passed to CSS through the telecom input billing system.

- Information on orders recently received, chargeable repairs, maintenance contracts and equipment rented by the customer is obtained from within CSS.

- The CSS customer debtor ledger provides information on bills outstanding or credits due for presentation on the bill.

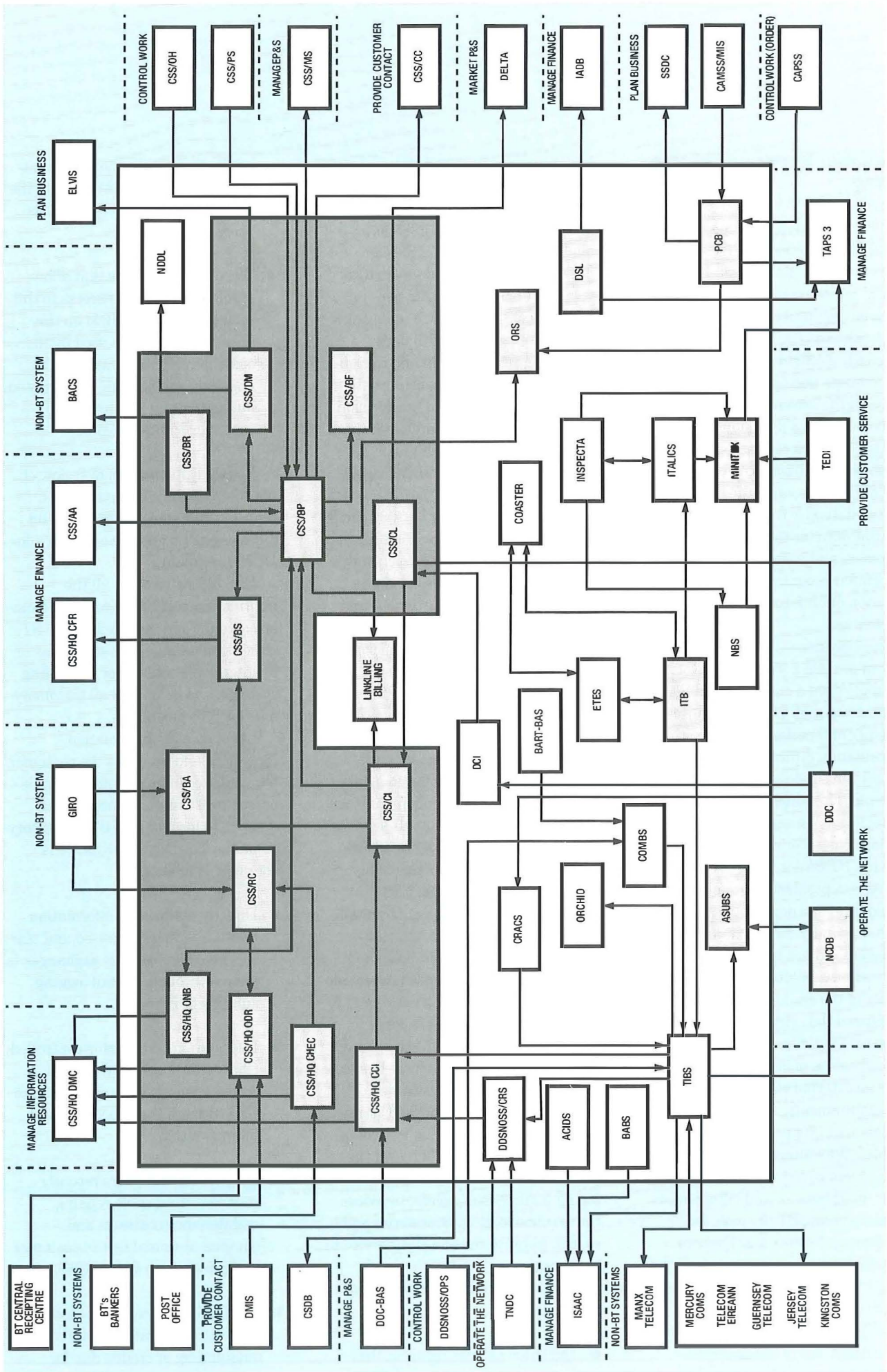
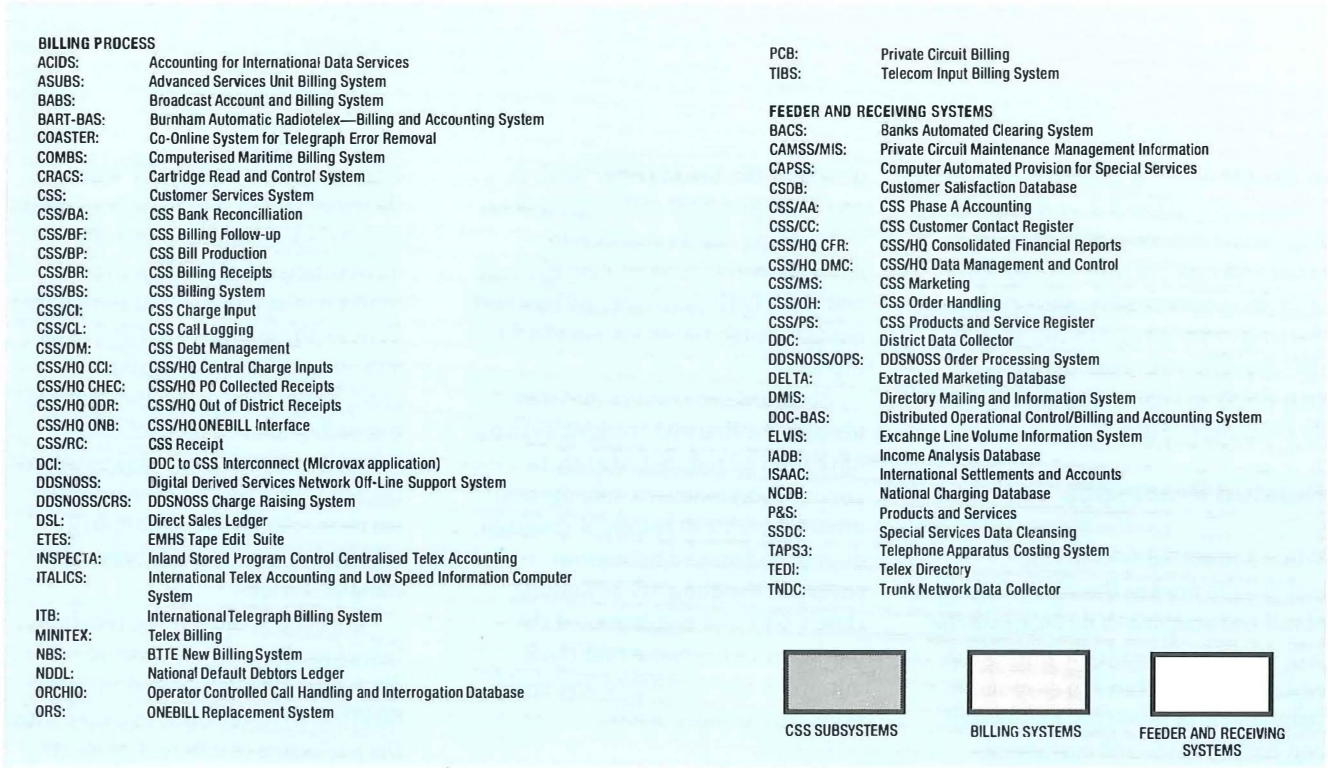


Figure 1—Billing process



Key to Figure 1

The development and implementation of CSS has brought major benefits to BT, particularly:

- The integrated database supports the philosophy of a single point of contact for all customer requirements and enquiries on telephony products and services.

- Rapid access to all data through the on-line facilities allows swift and accurate resolution of customer queries or complaints.

- The same applications software is run at all CSS sites which assists in the maintenance of overall integrity of financial and other data.

However, the design of the system has limitations:

- The size and complexity of the integrated CSS database and the CSS billing applications operating thereon make change very time consuming and complex.

- The type of database and the way in which customer account data is held do not readily allow reorganisation of, particularly, business customers' data to reflect their organisational changes and linkages between accounts.

- Until recently, all CSS sites worked independently and the recent implementation of the inter-District transaction switching does not yet fully support total customer and user transparency.

- As CSS only supports telephony service billing on a geographic basis, significant effort is and has been expended on providing a consolidated billing system, called *ONEBILL* (the subject of another article in this edition of the *Journal*), to large customers; this takes billing data for all products and services across disparate billing systems and produces a composite bill.

Other Billing Systems

In addition to telephony, BT has a well-established product and billing system base in private circuits, both UK and international, Telex and outright sales and leasing agreements for customer equipment. These are self-contained billing systems, most of which were developed in the mid-1980s, and they use a combination of on-line transaction processing and batch processing, but suffer from the fact that interfaces with the order-handling systems and call-recording systems are predominantly manual and, therefore, inefficient and error prone, if not supplemented by onerous control checks.

This is particularly true of the UK private circuit billing system where the order-handling, maintenance and repair systems are entirely separate from the billing system and cause some significant reconciliation problems.

More recently, the international private leased circuit billing system was introduced. Using a more modern technological base (Oracle on DEC 6410), this system has automatic interfaces with its order-handling facility. While a modern development, it only addresses a single product and cannot easily be expanded to bill other products.

The private circuit and Telex markets were the first areas to be addressed aggressively by competitors: customers' requirements of the billing support processes, for both level and type of information as well

as flexible tariffing packages and bill presentation across BT's product set, have become increasingly sophisticated and time critical. The current systems cannot readily support these demands without significant manual intervention and would require significant re-engineering and cost to do so automatically.

Related Processes

While automated systems are essential to process the vast volumes of call transactions that constitute the bill, it is also necessary to have clear and robust procedures to govern the relationship between the billing staff and both systems and customers. BT has evolved a common organisational structure in each of its geographically diverse UK operational units and, by using the skills and experience of these key staff, has created common processes and procedures. These procedures are maintained and regularly reviewed centrally to ensure overall relevance and consistency, although updates are undertaken by lead teams in the operational units, and these are quality-assured by a combined central/operational team.

The operational billing organisations comprise teams responsible for credit vetting, invoice production and scheduling, credit management and debt recovery, receipting, non-voice billing and major customer accounts. All are measured and targeted using both customer-oriented and finance-based goals. While most contact with customers is handled by the customer reception and customer service teams, complex billing issues are resolved by the appropriate specialist billing team. Each team receives specialist training (initial plus regular update) in the relevant discipline, together with customer management training.

Recent initiatives include the development of a credit vetting process utilising on-line access to an external agency to determine customers' credit status in line with best commercial practice. This is supported by the use of power diallers and high/abnormal call usage assessment, using expert systems, to facilitate better account management and serve both customer and business needs through minimisation of debt exposure.

Standardised enquiry and complaint recording and tracking systems have been introduced recently to provide comprehensive management information about causes of customer dissatisfaction and to improve customer handling. BT is working closely with the regulator and the marketplace to ensure that these initiatives are responsive and appropriate to customer needs.

Growth of Systems

In the mid-1980s, the telecommunications industry began to experience a rapid increase in the number of products being developed and subsequently becoming available to customers. The products were sometimes discrete developments derived from technological advances, but more often were created as a result of the application of related industry developments to telecommunications (credit card, chargecard). At the same time as the explosion in the number of products available put pressures on the system supplier, so too did the resultant reduction required in the time-scale for product evolution. Consequently, most telecommunication companies found themselves designing and implementing increasing numbers of product-specific billing systems.

In BT, the growth occurred initially in the international arena with the then British Telecom International organisation responsible for developing and operating many separate systems. In the home market, similar pressures led to the creation of other product specific systems. The situation was further compounded by the utilisation of some of the feeder systems to do limited vetting and pricing tasks, although the latter did not fit readily with the original system design. BT was, therefore, able to bill for new products and services, but at the cost of an increasingly complex data capture, conversion and billing infrastructure. This, as the pressure to launch new and/ or complementary products grew, began to hinder BT's ability to respond quickly to product line initiatives as either too many systems needed to be changed or there were too many changes simultaneously required to an already excessively complex system.

Market demand for the redefinition of products on the basis of discounting structures and complex tariffing arrangements, together with the packaging of different products under a single pricing offer, further complicated the task for the billing systems and future developments.

At the same time as the rapid increase in billing systems for new products, the industry also experienced a substantial growth in the demand for billing data as a source of both customer and management information. This led to a significant change in the way information needed to be presented both on supporting details for the basic invoice and for BT management to understand the implications and successes (or otherwise) of their business decisions. It also required far more information in support of each item appearing on the bill. The decision to introduce itemised billing, albeit at a 10-unit threshold, was as a result of this demand but, in itself, created complementary pressures as the processing burden increased significantly on the data capture, transfer and bill production systems.

Itemised Billing and Income Integrity

Early offering of itemised call billing to a limited number of customers in the central London area revealed some disconcerting results and an Income Integrity Steering Group was set up in late-1987 to review the ability of the process to adequately

manage the data volumes and provide the appropriate levels of control and auditability over BT's major revenue stream. The concern and change in emphasis were occasioned by the fact that metered call data was registered on an incremental basis and could be recovered in the event of systems failure; however, itemised call data was volatile real-time financial data and required different types of control to ensure its accuracy, completeness and consistency.

Additionally, BT's modern exchanges, System X, AXE10 and TXE4Es, each contain their own files identifying tariffs and routes and each successful itemisable call was, therefore, priced in real time at the point of data generation; with more than 6000 exchanges in the UK network, managing the consistency and accuracy of each exchange tariff table to published tariffs was a significant task.

The review identified several areas for improvement and a programme was immediately initiated to upgrade the transaction processing power of the end-to-end billing route, improve the audit and control mechanisms and reporting and, most significantly, develop and implement the national charging database (NCDB); this is now the single source of tariffing data for most of BT's product base and is used to regularly validate the exchange tariff tables and implement changes nationwide in the event of tariff revisions or other updates. Although originally developed for internal use, it is now provided to all interconnecting companies, under the licence agreement, as the standard BT reference file. It is also available, at a licence fee, for commercial use and has been employed very effectively by BT's Accounts Managers to assist customers in competitive pricing analyses.

Project Bluesky

As outlined above, the combination of non-telephony product specific billing systems, the changing market needs and BT's international aspirations were having a major impact on the overall billing systems environment. Equally, customers' demand to be treated as single entities according to their requirements, and not as systems constraints dictate, and the importance of billing to their operations became extremely pressing. The dynamics of the telecommunications industry and BT's Vision to become the most successful worldwide telecommunications company provided the final catalyst for the creation of Project Bluesky in September 1989 . The objective of this project was to undertake a major structural review of the pan-BT, pan-product billing environment to define the future business requirements from data capture and billing processes and construct a development programme to meet those requirements and support the business into the twenty-first century.

The Bluesky project was undertaken by a team comprising BT people representing every major division, assisted by Coopers and Lybrand Deloitte consultants who provided both a business- and industry-wide view. It took into account both the current and anticipated market environment, the drivers for change, previous studies and the existing systems base, but began by capturing the business requirements and a vision of the future through over 80 senior management interviews across BT and analysis of emerging trends in the UK and international marketplace.

It was recognised that billing was an, as yet, under-utilised marketing tool and, as a prime customer contact, should be exploited as such. Equally, the ability to bill in a more comprehensive and customer-oriented fashion was critical to the timely and successful launch of new products and services in an increasingly competitive industry. Any viable strategy also needed to take account of investment in the existing billing infrastructure while providing a measurable and achievable step-by-step improvement plan.

Bluesky Strategy Findings

An exhaustive and comprehensive report was produced in mid-1990 that proposed a major billing development programme spanning the next seven years. The paramount objectives for billing, as identified by the project, are to meet market needs, support BT's aspirations and provide an effective contribution to the business, thereby ensuring customer and shareholder satisfaction. The drivers for change are as follows:

Products and services

There is and will continue to be an exponential growth in products and services due to:

- technological advances such as the integrated services digital network (ISDN), intelligent networks, virtual networks and services, personal communications, asynchronous transfer mode;
- increasing international presence and collaborative agreements;
- customer expectations, based on BT's and other companies' offerings and performance.

This requires a billing environment that can support the rapid introduction and enhancement of services to the market, is capable of managing non-UK originating billing data, can support international one-stop shopping and can produce customer-tailored bills covering all or any product and service.

Regulation

BT operates under a strict regulatory regime in the UK which is not likely to recede in the next five years. Additionally, as it broadens its international scope and with burgeoning pan-European standards, BT will need to comply with other regulatory bodies' rulings and deal with increasing interconnection requirements. Billing will need to be able to manage the increasing complexity of intercon-

Billing must be organised to understand, assess and change to meet customer requirements for bill content, structure and format in a timely and cost-effective fashion

nection billing data capture for the purposes of inter-company settlements, comply with mandatory standards in order to operate in BT's chosen markets and provide the appropriate billing data and income analysis tools to the business.

Competition

As competition increases at home and BT increasingly becomes an aggressive competitor abroad, billing is both a marketing instrument and a source of information to the business. It must be more customer friendly and responsive and a positive differentiator. Increasing competition provides customers with more routing choice and, as has happened in the US, billing becomes more complex as data sources and flows multiply and can lead to customer confusion. Sales channel and product revenue information are critical to good business decisions: billing is a key source of data and, therefore, must be timely, pertinent and accurate.

Market needs

Billing must be organised to understand, assess and change to meet customer requirements for bill content, structure and format in a timely and cost-effective fashion, fitting seamlessly with the other support functions that BT provides. There is increasing specialisation within and across customer market segments and the ubiquitous approach that has been taken to billing the customer no longer applies. This is particularly true of the larger business customers, as their organisations tend to be dynamic and they wish their billing to keep pace with their change. The level of billing data and the method by which it is presented to the customer has significantly increased in importance with the growing number of products and services, and confidence in the accuracy of the financial values is key to customer control and verification.

The customer wants to be able to negotiate his own price package, which may range from a set of predefined options, such as volume-related discounts, route specific pricing, to total price customisation, as with AT&T's Tariff 12. The billing process must be capable of supporting such arrangements effectively and efficiently and must provide appropriate information to allow the customer and the business to assess and review such contractual agreements.

Finance, integrity and control

Billing must have the facilities to enable BT's receivables to be maximised, debtor days minimised and bad debts avoided. Bills presented to customers must be demonstrably accurate, valid, complete and in line with agreed tariffs for the services provided by BT and/or its agents.

Globalisation

Operating as a major global service provider places particular requirements on the billing process. Multinational customers will increasingly require their bills produced in several different currencies and languages sent to different overseas locations, and one-stop billing arrangements, where BT will either bill on behalf of other companies or be a contributor to another company's one-stop agreement. Equally, as a mandatory requirement, local taxation laws will need to be adhered to and local accounting standards met.

The billing data capture and routing requirements for a global operation are very complex and the billing process may need to manage many disparate technological and organisational entities in order to meet the overall customer requirements. Global tariffing structures and inter-company accounting present a significant challenge.

Actions Taken

The findings of the Bluesky Strategy Study led to a focus on immediate improvements to the billing service to meet the needs of customers and the business including billing via electronic data interchange (EDI), Diskbill, ONEBILL, and further pricing options. Feasibility studies were also initiated to determine the appropriate technical platform, including the optimum network and communications architecture to manage the movement of data effectively and efficiently from generation point to billing and, thence, to the customer.

The findings of the feasibility studies led to the major development programme vital to the future success of BT and now known as *Billing 90s*.

Biography

Geoff Mason
BT Group Finance

Geoff Mason joined BT (then the Post Office) in 1971 from university. He spent 5 years in what is now BT DPS (now BT Development and Procurement) as, successively, programmer, system analyst, and systems programmer, before a three-year secondment to a firm of chartered accountants and a further year with a firm of management consultants. He returned to BT in 1980 to work on supplier tender analysis, and then moved to set up BT's Computer Audit function. He was promoted to Deputy Chief Internal Auditor, and then after two years moved to London as Territorial Finance Manager in 1986. He was appointed as Controller, Billing and Receivables Division in July 1988.

Adrian Hosford

The New Bill: Communicating Value

A key task for BT's Customer Communications Unit (CCU) is to ensure that the company's New Bill is as clear and effective as possible for customers. This means using the best information design techniques and integrating the values and style of the new BT brand. Further, it is CCU's task to communicate these changes, and their benefits, to BT's customers.

Introduction

BT issues around 100 million bills each year, serving a customer base of 29 million. Every single bill is an opportunity to communicate effectively, to deliver information and to help the customer. However, the recent dramatic increase in services available to even the most basic single-line residential customer, when added piecemeal to the established bill format, resulted in a complicated and unfriendly document; the effect of this could be measured directly in the growing number of complaints and queries from customers confused by their bills.

In 1989, Cambridge-based information design (ID) specialists Seigel and Gale were commissioned to redesign the BT bill. The ID discipline combines appropriate language, layout and structure, to communicate information in the most effective way to a specific audience, in this case the recipients of a BT bill.

The project developed and expanded over two years, from a redesign to a completely new bill. But the aim has remained to give customers a much clearer and more easily understood bill, to allow them to see clearly how much they are spending, and what, exactly, they are spending it on. In other words, to put customers in control.

The key principles are:

- information divided between 'bill' and 'statement';
- key elements rephrased in 'customer-friendly' terms; for example, *telephone account* becomes *phone bill and statement*;
- clarification of the calculation process;
- creative use of space and type to give the bill a logical structure and more accessible layout; and
- information customised to suit each customer.

In addition to the customers' requirements, BT had its own business requirements that had to be built into the design. Not least of these was the New Bill's crucial role in the cashflow of a multi-billion pound company. Both BT Personal Communications (PC) and BT Business Communications (BC) were bringing new payment option schemes to the market in 1990–91. This highlighted the importance of a flexible design (and systems) to cope with increasingly frequent product and service launches, and changes in a demanding and rapidly developing market.

Information Design and the BT Bill

Siegel and Gale's essential concept underwent extensive customer research, from which specific requirements emerged and were confronted by the designers. As a result, the information is ordered in such a way that the eye lights on what the customer wants to see, in the order in which customers considered their priority. Thus figures are shown first, on the left hand side, with substantiation following on the right; for example,

6.552	Direct dial calls
27.93	Advance charges 31 Dec 91-29 Feb 92

The payment due is then clearly shown in large, bold, type.

In order to reduce the amount of data on the bill that is not relevant to a particular customer, the new design is almost entirely *table-driven*; in other words, instead of large amounts of mandatory text there are *information fields*, defined by size and place on the page. Their positions are hard-coded elements and the contents of each field can be input quite simply. This approach results in the system only listing categories (for example, network services charges) if they are actually relevant to that particular customer.

To support the table-driven approach, a sub-project has been undertaken to ensure that the contents of fields were both immediately understandable to customers and held in common by all the relevant parts of the company. For example, one table holds the official name of every BT product and service, and is held in common by engineering, product groups, billing and marketing. Every product and service had to be renamed in (as nearly as possible) plain English; thus TUDORPER EXL PTE CCT.FTTD CAP. UNIT BOARDUNIT became 'Tudor: per EL/pc fitted capacity unit' on customers' bills.

A further example is the 4000 or so exchange names shown on call itemisation. Some of these, Newcastle Upon Tyne for example, are quite long and have to be abbreviated, without appearing to be typographic errors. It was for this reason that 'Newcstle' was rejected.

Every change to the design had to be communicated to those responsible for billing systems (who would actually implement it) in the form of a *typographical specification*—a formal document for which Siegel and Gale had responsibility. It was, obviously, of the greatest importance that this was totally error-free.

ID and Corporate Identity

One device crucial to the ID specialist is the typographical hierarchy, which is the way in which different typefaces (*fonts*) are used, manipulated and positioned to communicate the relative importance of different pieces of information on a page. Much work had already been done on this for the new BT corporate identity. This sets out to ensure that BT communicates with its customers with a consistent tone and style. The corporate identity work includes, apart from the now famous 'piper', instructions on the use of fonts, 'white space' (the arrangement of design elements on a page), language and images.

In November 1991, corporate identity specialists Wolff Olins, who developed the BT identity, were consulted on the visual aspects of the New Bill, which, it was felt, should be brought closer in line with the, now well established, corporate identity. Their brief did not include ID or layout. This work resulted, among other things, in the design of blue-tinted continuous stationery featuring the 'piper' logo, which has become an important feature of the New Bill. Research has shown that this gives a 'warmer' feel, is regarded as 'business-like' and makes a strong, positive, corporate statement.

The resulting New Bill is a core design; the same design (but not information) is common to PC and BC quarterly bills, budget account statements and direct debit statements. Other bills not produced by the customer services system (CSS); for example, Telex or mobile are being drawn into line by the use of common continuous stationery and typography.

Additional Design Issues

The back of the bill was revised by BT's in-house ID specialists, and a version was prepared in Welsh.'This was a comparatively simple operation, as the information is pre-printed onto the continuous stationery and does not impinge on the billing systems.

Less straightforward is the design of 'reminder bills', which could not, and should not, be a red version of the standard bill. Although not actually part of the New Bill project, these have been redesigned according to ID principles, but have retained a plain, strictly functional, design.

In addition to the new bill, BT's Customer Communications Unit (CCU) is involved with the development of customised billing systems for business customers, including ONEBILL, electronic data interchange (EDI) (Interbase) and discbill (now marketed as Callbase).

Communicating the Benefits

By March 1992, with all the major elements of the New Bill defined, the CCU campaign manager, in association with the rest of the project team, developed a campaign plan and communications plan for the launch of the New Bill. The key element here is to strike the correct balance, between standalone activity and that which places the bill in its context in the BT-wide *Putting Customers First* campaign.

The customers' reaction to any service improvement, regardless of the scale and complexity of the project, tends to be 'why wasn't it done in the first place'. It was most important when developing the communications plan to keep the customers' perspective. But it was equally important to demonstrate to customers that the New Bill is an important tool to help them understand their communications costs and, therefore, control their communications more effectively, and not just a clearer invoice from the telephone company.

Marketing charged the CCU to communicate the following:

- why there has been a change and its benefits to customers;
- what is different about the New Bill, and why;
- that the New Bill is just another part of BT's continuing commitment to putting customers first—another service improvement developed as a direct result of customers' requirements.

PC and BC each had specific messages for their respective audiences, which CCU had to build into their plan:

- ***Personal Communications*** The New Bill is part of the billing improvements package which includes Braille bills, large print and Welsh language versions, as well as payment options such as Supportline.

  The New Bill supports customers' ability to understand the new range of pricing/service options; for example, Supportline, Standard Discount and Customer Options.

- ***Business Communications*** The New Bill is one further step in a plan to meet business customers' billing requirements; for example, Customer Options.

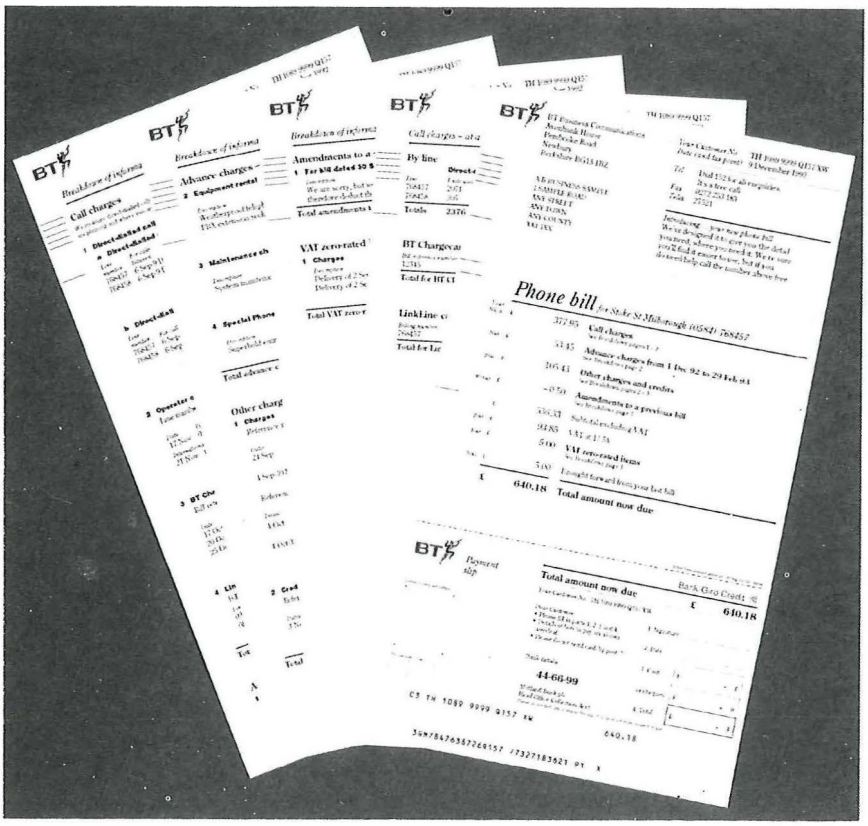
There is now a new phone bill; this will be followed by redesign of other bills; for example, mobile, private circuits, etc. Furthermore, other billing formats, for example, discbill, are being developed for business customers.

The communications package surrounding the launch had to meet these communications objectives and at the same time minimise the number of queries that would, inevitably, be generated by any change to the customers' bill. In particular, budget account customers would be seeing their charges and payments, and the VAT involved, in a completely new way.

From the start, the most crucial areas were identified: briefings to customer-facing staff, and literature to accompany the first New Bill to be received by each customer, explaining the changes to the bill, and pointing out the benefits.

Customer Communications: Development and Research

The development and execution of a communications plan requires CCU to orchestrate the activity of a variety of specialist suppliers, selecting a 'lead media' and ensuring that all the various elements—advertising, direct mail, etc.—confront the campaign objectives in a coordinated fashion. Wherever possible, the agencies' work is tested by customer research.



BT's New Bill (reproduced here in black and white, the New Bill is printed in BT's corporate colours with the use of tone on the page)

Direct marketing specialists Craik Jones, who produced the 'BT Commitment', developed a suite of material including a 'bill stuffer' (inserted with the bill in each envelope), information leaflet and a poster for use at bill payment points in BT shops, and a staff briefing pack. The advertising agency, Saatchi and Saatchi, produced a set of story boards for a possible television advertisement in the style of the Putting Customers First campaign.

CCU planners, in association with customer research specialists Martin Hamblin, developed a research package to test customers' reactions to the New Bill and the communications material that would be associated with it. Representative business and domestic customers were tested at a series of sessions held throughout the country. The results of this research were then used to finalise the communications plan.

It was no surprise that the New Bill, business and domestic versions, were easily understood and popular with the research groups. That much had already been determined over two years of development. More interesting were the questions which it raised in research subjects' minds. In particular, how could they subscribe to additional value-added services; for example, itemisation and network services. In other words, the New Bill was accepted and assimilated at once, but invoked questions about BT's other offerings.

Research confirmed that promotional activity could be split between that which would herald the New Bill—'Coming soon...'—and that which would support it on arrival. Considering that the item in question was a bill, 'coming soon', redesigned

or not, would not necessarily be seen as a positive message. On the other hand, the reaction to the bill on first sight was sufficiently positive that the messages required by the marketing groups could usefully be communicated at that point.

Pre-release television and press advertising were therefore discounted, but research had confirmed that a dedicated item of literature will have to accompany each bill, pointing out the benefits and explaining the reasons. Further, it will have to guide customers to enquiry points covering additional value-added services. What it must not do is 'explain the bill', as this undermines the perceived quality of the design.

In addition to the bill stuffer, there will be supporting material in the form of leaflets and promotional posters at the bill payment point in BT shops, as well as public relations activity at national and zone level.

A surprise result from research was a very positive response to the idea of a promotional message on the outside of the bill envelope. It had long been held that customers would regard this as 'junk mail', but, in fact, such a message is now so familiar a device that the research groups thought it a valid way of communicating, particularly in relation to the New Bill. Unfortunately, at this stage, such a message is not possible for technical reasons. But, as throughout this project, another piece of useful information had been obtained about BT's customers' attitudes and expectations.

Concurrently with this activity, a briefing pack has been developed for customer-facing staff. 'Selling in' a new development, to the BT people on whom it will have the most impact, is a crucial part of any campaign. It ensures that the customers' expectations, once raised, are met or exceeded. The production of such supporting material by CCU is regarded as being of equal importance to that targeted directly at customers.

Now, the New Bill must be tied in with other related projects, such as itemised billing and network services, new welcome packs and user guides. Every opportunity must be taken to ensure that customers understand how to get the most from what is, after all, their most regular communication from BT.

Conclusion

'Reconsider what you get from the company that provides your communication service. BT has changed. It is now putting customers first.'

The 'key message', that underlies all the Putting Customers First and UK brand communications activity, sums up the work put into the New Bill project by large numbers of people, in a wide range of disciplines. Throughout the project, exhaustive customer research has built a fund of knowledge and an understanding of billing-related problems and solutions that will benefit future projects throughout the company. ID is being applied to forms, contracts and user guides and, if the reaction of research groups to the New Bill is a faithful indicator, this will benefit company and customers alike.

Biography

Adrian Hosford
Director BT Customer Communications Unit

As Director of the Customer Communication Unit, Adrian Hosford is responsible for the management and coordination of all communications between the BT brand (BT's service and product offer) and BT's customers worldwide. This includes management of the BT brand expression, the development of a customer communication strategy and plan, and the delivery of a customer communication service to all internal BT divisions. Adrian joined BT from ICL in 1984 where he was Worldwide Advertising and Direct Marketing Manager. Prior to ICL he worked in the marketing services industry holding several UK and global positions with major advertising agencies.

Richard Rockliffe

Implementing BT's New Bill

The current telephone bill for the public switched telephone network has largely remained unchanged for many years. It has been the topic of much criticism concerning its 'unfriendly' nature and confusing presentation. The New Bill project has been undertaken specifically to address these criticisms and provide a flexible framework to allow new products to be launched quickly.

Introduction

In recent years, the impact of the presentation of an invoice (or bill) on customers has been widely recognised. In some businesses where services are provided remotely, the bill may well be the only contact that the customer has with the supplier, and it should convey a clear image of the company to its customers. This is especially the case for BT and its public switched telephone network (PSTN) service, where over 100 million bills are issued annually.

Each of those bills is tailored to reflect the services a particular customer has used in a specific period of time. BT is thus presented with a set of unique technical challenges that need to be addressed to ensure the business obtains its revenue in a timely manner. Many of these challenges revolve around the issue of size, both in terms of the extent of customer base and the greatly differing natures of those customers.

The BT PSTN bill has had broadly the same format for the past 20+ years, with additions to accommodate the billing of new facilities as they have been offered to customers. Over time, the presentation of the information on the bill, while remaining financially accurate, became rather untidy and confusing. The bill has therefore become the subject of much criticism from both inside and outside the company.

The New Bill project was undertaken to correct many of the deficiencies identified during extensive market research and to demonstrate a commitment to 'Putting Our Customers First' in providing a much more user-friendly and self-explanatory bill.

A further key driver was the need for flexibility in the way the information is presented, thus allowing the bill to keep pace with the ever-changing business environment BT faces.

This article concentrates on the technical aspects of such an undertaking.

Outline Of Billing

To give some understanding of the task and the challenges that the New Bill project has faced, it is worth taking a few moments to give some details of the history and the basis of the current system used for PSTN billing.

Brief history

The early billing systems—telephone billing (TB) and national billing (NBS)—had almost entirely been batch-orientated systems with only a small amount of on-line collection of input data, added near the end of the systems' life.

The current PSTN billing system was first implemented in March 1986 as part of BT's customer services system (CSS) project. CSS supports many other customer-facing activities including ordering, provisioning, fault repair, accounting, receipting, follow-up and debt management, in addition to billing.

CSS was built around a single, logical, integrated IDMS database with a complete range of on-line services being provided using IBM's CICS teleprocessing monitor. The whole service is operated in an MVS environment. This is described in greater detail below.

Integrated CSS

As explained above, CSS comprises over 50 individual sub-systems covering a complete range of customer-facing activities. The original design logic was to have all data regarding a specific customer stored in a single place so that all enquiries from or about that customer could be actioned by one person with access to the system. The introduction of CSS

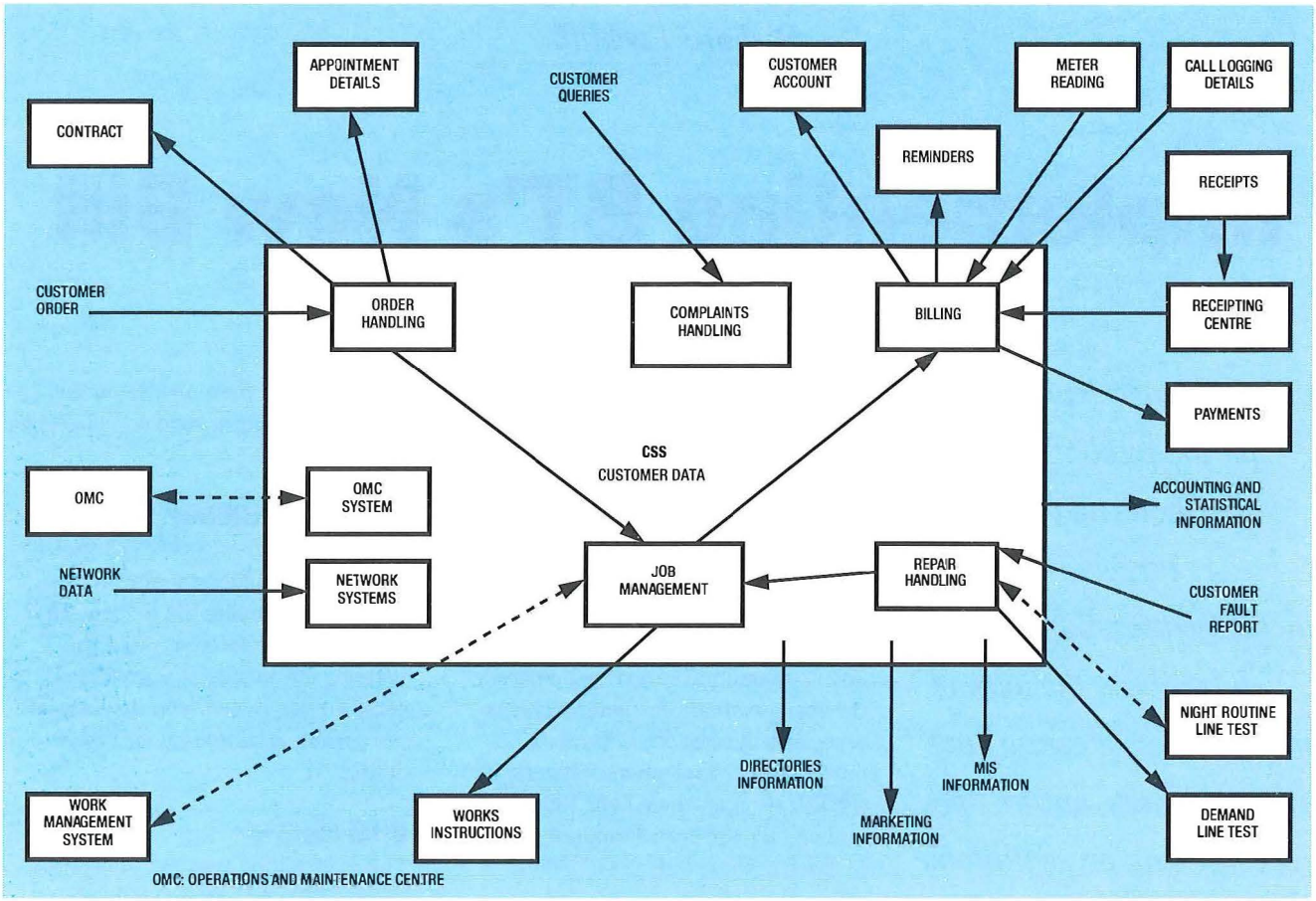


Figure 1—Functional implementation of CSS

enabled a revolution in working practices for BT people dealing with customer queries. Figure 1 demonstrates the functional implementation of the system, which is linked, in data terms, by the IDMS database.

While billing under CSS introduced many additional facilities for the operational running of the service, little change was made to the actual format of the bill.

Main billing functions

At first sight, billing can appear to be a fairly simple and straightforward process, and indeed for many companies this is the case. All that is needed is for the customer to be billed for the services and products they have used and purchased. When we look more closely at BT's PSTN billing needs, this simple process suddenly gains complexity for a number of reasons; for example:

- a customer base of 23 million;
- variations in customer requirement; that is, from the simple, single-line customer to the multiline multinational company;
- number of products on offer;
- combination of continuous service, rental and one-off charges.

Billing is not just a matter of producing a bill. It involves many complex business activities in addition to bill production. The major functions are described below (see Figure 2).

- *Accounting* This ensures that invoices issued and receipts received including any adjustments are accounted for accurately, and fed to the accounting and general ledger systems.
- *Billing follow-up* The issue of a reminder if a customer fails to pay his/her bill by the due date.
- *Debt management* The process to progress the collection of overdue payments including the issue of standard letters.
- *Input validation and reporting* Validating and checking the input from exchanges, foreign telecommunications operators, etc., and collecting the data in appropriate sequences for billing.
- *Printing of cheques* Not only the ability to refund over-payments, but to control that activity in terms of accounting and ledgering these activities.
- *Receipting* Collecting and registering the payments made by customers by whatever method they have selected to do this; for example, cash, cheque, budget account, direct debit etc.
- *Statistics* Producing a range of reports to assist management and control of the total billing process.

Some of the key areas of the billing sub-systems affected by the New Bill are described below.

Bill production

The production of the bill is the heart of the system and this is usually achieved by an overnight batch process. This process takes the base data as delivered to each CSS system,

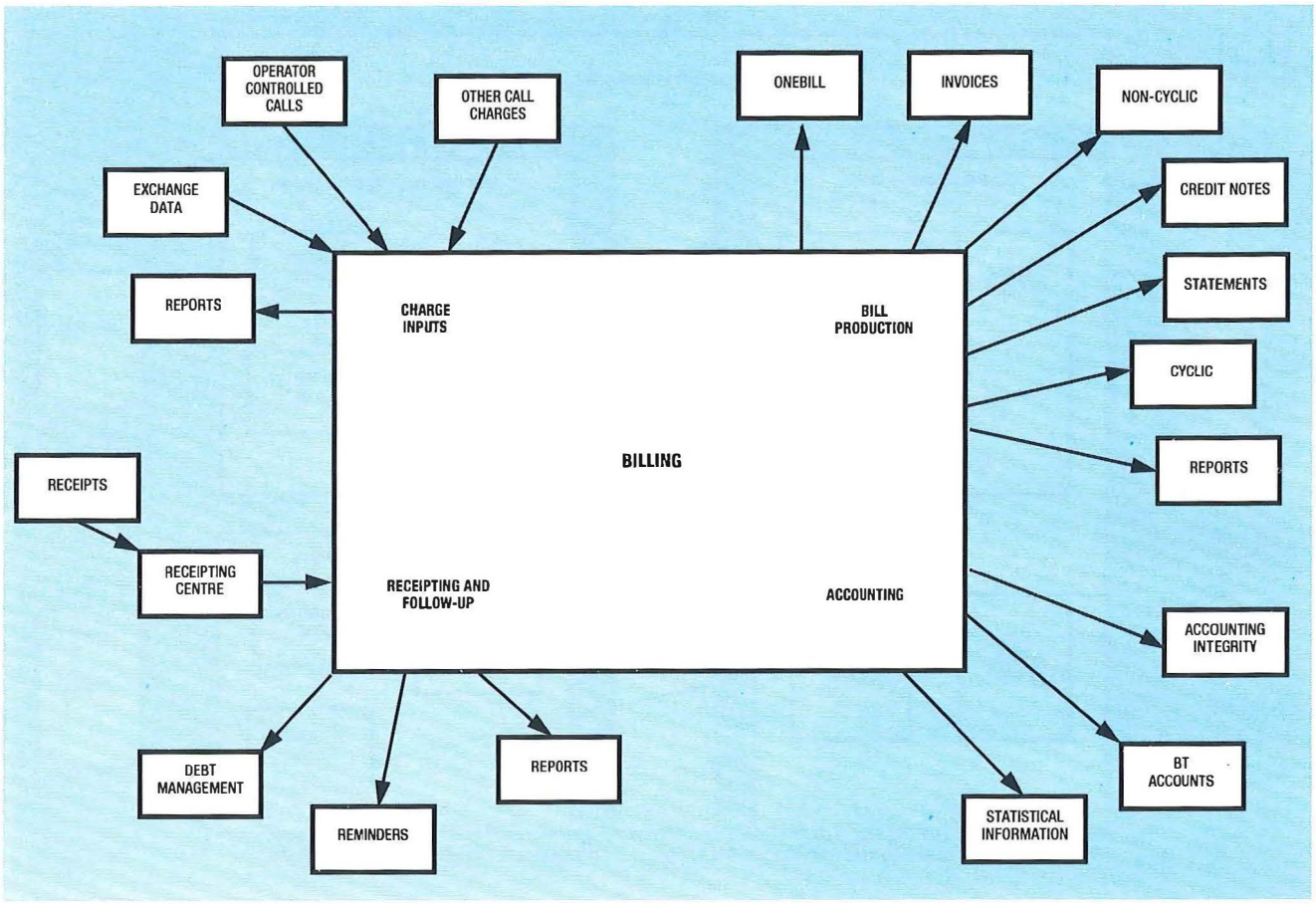


Figure 2—Billing main inputs and outputs

collects it together for each customer and provides a bill. This is either on a regular cycle (for example, monthly, quarterly) or on an ad hoc basis as circumstances dictate (for example, initial bill for a new customer or a final bill for those customers ceasing service).

On-line facilities

These provide the capability to deal immediately with any customer queries while the customer is on the telephone. The facilities range from being able to display an invoice that has already been produced and sent to a customer, to modifying an invoice to reflect up-to-the-minute changes that need to be reflected on the bill.

Additionally, it is vital to support a whole range of other services such as:

- producing bills in Braille or large print for those people with reading difficulties (These facilities are produced in conjunction with the Royal National Institute for the Blind.);
- collecting all the bills for a business customer with premises in different geographical locations into a single invoice termed *ONEBILL*;
- producing bills on non-paper media; for example, diskette; and
- producing bills in the Welsh language.

Volumes

The significant size of the system supported has already been mentioned above, and it seems sensible at this stage to give some key volumetric information.

customers supported	23 million
bills produced yearly	100 million
itemised calls daily	15 million
revenue in pounds daily	24 million

Operating environment

CSS operates in an MVS environment with COBOL programs using an IDMS database for data storage. The on-line transactions are serviced by the CICS TP (teleprocessing) monitor. While logically CSS is a single system, in order to accommodate the size of operation, 29 separate images of the system are running CSS nationally on a geographical basis. These individual systems are connected together for on-line access, which makes CSS one of the largest MVS interconnected systems in the world.

The technical implementation of each system is shown in Figure 3.

The CSS system supports the following volumes:

- 1400 gigabytes of data held on magnetic disks;
- 14 million screen exchanges per day;
- average of less than 2 seconds response time;
- batch 400 000 bills per night in a 6–12 hour 'window';
- 5 million lines of COBOL statements;
- 60 000 connected terminals;
- 1340 on-line transactions available for execution;
- more than 3000 different screen presentations.

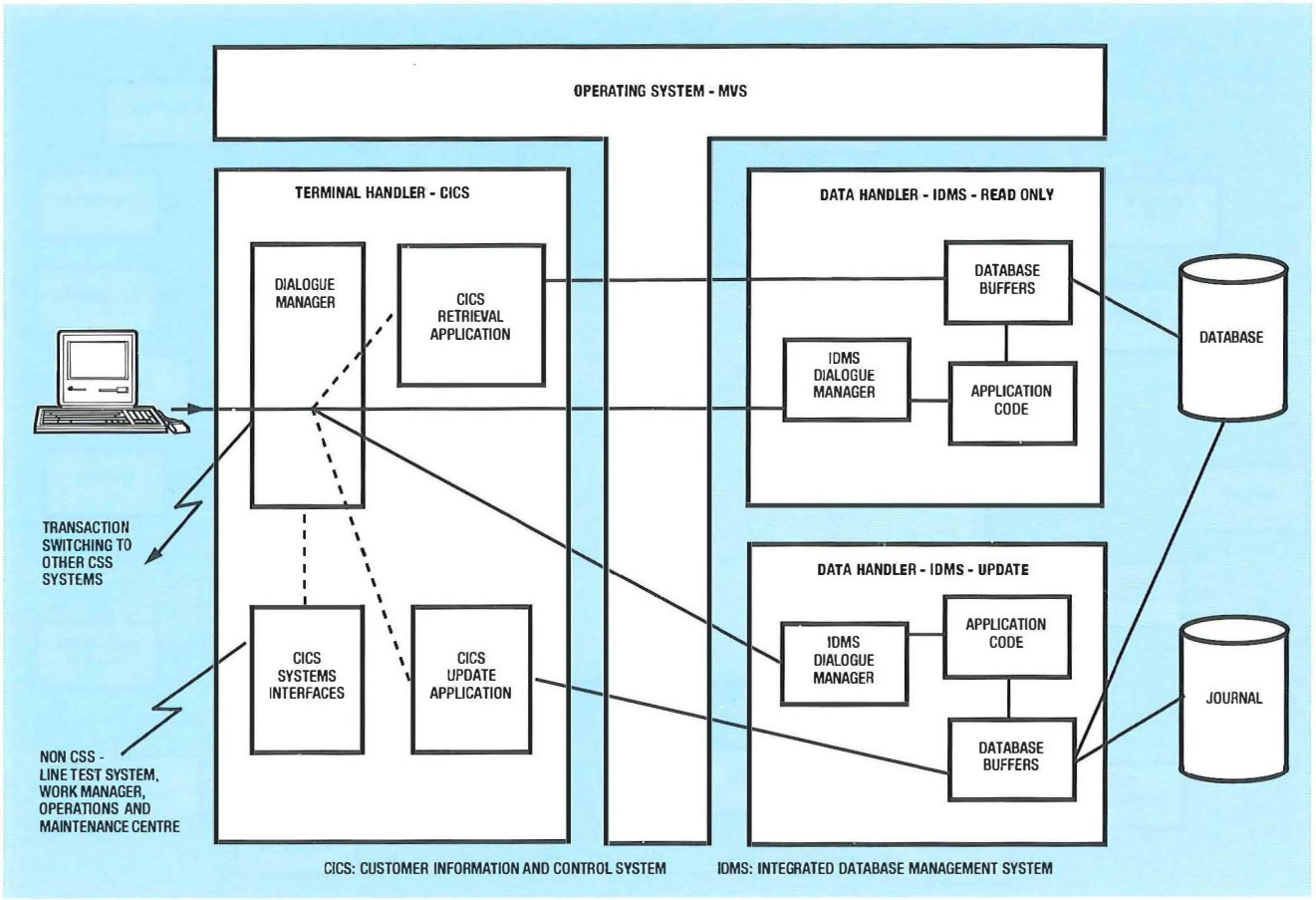


Figure 3—CSS architecture

New Bill Requirements

The main business drivers for New Bill are detailed in a separate article in this issue of the *Journal*. However, it is important to understand what they are in order to assess the technical challenges incurred. Simply put, the main drivers were to:

- produce clearer, simpler bills for the customer—no jargon;
- reduce the number of customer queries on bills;
- enhance BT's image; and
- provide a flexible, adaptable framework to accommodate future business changes more easily without recoding.

Much research was undertaken, over a period of 2 years, before the final design of the bill was produced. As you can imagine, the ever-changing business environment coupled with the changes brought about by the regulator, has made it difficult to achieve a mutually acceptable layout.

From a technical viewpoint, the development is very complex and large, involving more than 100 000 lines of COBOL code. This was completed by a team of between 30–60 people over a period of seven months.

In terms of changes to CSS, this is so far the largest change that has been incorporated since CSS went live in 1986 and is greater in size than the entire billing capability that was installed at that time. In summary, the guts of the existing billing system have been replaced!

System Impacts

The New Bill involves a complete change in design and layout, with new data and additional sections added to ease readability. The bill is still made up of two distinct parts:

- summary sheet—the 'legal' VAT document, which can only comprise a single sheet;
- breakdown pages; that is, the detailed description of the charges on the summary sheet.

While for most personal customers a single statement sheet may be followed by two or three breakdown pages, for a business customer there may well be 10s or even 100s of breakdown pages to a single summary. This means that many rules are needed about what appears on the summary page as opposed to what is shown on the breakdown page. The development has involved writing or amending more than 400 software components. As well as the normal development requirements and challenges, there have been a number of specific requirements which are worth highlighting:

Typographical fonts

The existing bill is made up using a standard single font. The New Bill uses many fonts in different sizes and typefaces. Although typographical fonts have been produced for many years by computer, in terms of the volume (number of invoices to be produced) and performance (speed of processing) required, this project is unique in the technical problems to be solved. Investigation and evaluation were undertaken to determine the

products that were available on the market for such a development. It quickly became clear that no products readily fitted all the requirements, and an amount of compromise was necessary. It was eventually decided to use IBM's DCF (Document Composition Facility)/SCRIPT using printer hardware that had AFP (Advanced Function Printing) capability. This product set gave the best opportunity for success. While it was clearly recognised that DCF was primarily a function-rich word processor, the functions offered provided the best match to the technical requirements for high-volume high-quality printing.

Table-driven format of bill

The business finds itself in an ever-changing environment and there is a need to be able to change the presentation of the bill in the shortest possible time. To achieve this flexibility, the bill layout, including legends, fonts, etc., is driven by a complex set of rules contained within an updatable table. This table is maintained centrally and currently contains some 6000+ entries defining the bill layout. The table is transmitted over the communications network to the 29 CSS sites processing billing, and then loaded into linear data sets (LDSs) on those systems. The need for optimal performance has always been a key driver of the design, and exhaustive testing was necessary before the use of LDSs was deemed appropriate. This facility enables the relatively large table to be retained in memory and hence to be available instantly to both on-line and batch services without the need to access it from disk, with the degradation of performance this would entail.

Interpret typographical fonts on dumb character terminals

Products are available on the market that allow typographical fonts to be viewed on character terminals. However, the implication of system performance and hardware costs was considered unacceptable. It is vital that when dealing with queries, customer-facing staff are able instantly to view on-line the bills that the customer has received. To this end, a process has been developed to enable the new bill format to be replicated on-line. This was made more complex because the New Bill uses several fonts on the same line and differing font sizes that overlap lines. This problem was solved by carefully adapting the table-driven data and identification of the key data items that are essential for display.

Computer operations changes

Computer operations have always had the challenge of producing an enormous number of bills each night and ensuring their despatch via the Post Office to very tight time-scales. The New Bill has placed significant extra demands upon them in the area of high-quality volume printing. It has been necessary to replace many of the currently installed mainframe and local laser printers to enable them to cope with the demands of typographical printing on such a vast scale. Each bill is unique and, therefore, as the data and its relative position changes on each printed sheet, the printer must remain aligned throughout. Typographical fonts are essentially placed onto the page by absolute millimetre references and any slippage or inadvertent moving of the paper now becomes critical. This is especially the case for the bottom line which contains a set of optical character recognition (OCR) digits used on the bill counterfoil, to receive and register customer receipts. Additionally, printed down the left-hand side are a set of optical mark reader (OMR) indicators which control the subsequent bursting, folding and despatch equipment. When 400 000 bills have to be produced in 6–12 hours each night things have to be right!

Implementation

This is another area which has provided many challenges. BT cannot stop billing for any significant period, and hence must be able to cut over in a minimal amount of time at all 29 sites. The implementation is a mammoth task which requires a considerable amount of planning. This involves allowing the final, existing bill runs to complete, converting the existing data on each system, installing the new software and start processing the New Bill batch runs. Coupled with this, both the computer-operations and customer-facing divisions need to be aware of the detail of the changes and be ready to cope with enquiries from customers. This cut-over exercise has to be completed in less than 48 hours while allowing CSS to remain operative for service to customers for most of this period.

Other changes

Several other changes have been required involving many sub-systems other than billing. These have extended from fairly simple changes, such as allowing the destination country of an international call to be printed, to significant accounting changes, such as the ability to cater for budget accounts in a new, clearer way. Alongside the New Bill changes, many other new features are being issued for live running in parallel on CSS. The level of control and expertise needed to organise such changes is enormous and only excellent teamwork and cooperation have enabled such a mammoth task to be achieved in the time-scale.

Project Management

The management and organisation of the project have been key to this development. There has been a need to coordinate the activities of many separate teams to achieve the necessary final product. Because of the size and complexity of the billing process, the design and control of the overall project have revolved around several key individuals with the necessary skills and experience. Close, day-to-day management was required throughout. The testing of such a large change needed to be very

stringent because of the very sensitive nature of billing to BT's customer base and the company's image. The project organisation was put in place with this in mind.

Requirements specification

With any large and radical change, there is always a need to ensure that the developers and the business specifiers are speaking the same language. With the current competitive environment and the key nature of billing, there is a need to be flexible, but there is also a need to clarify the requirement to ensure a fully tested and reliable product is delivered to the field. These parallel needs can cause conflict. Good team work and understanding of the common goal have enabled any difficulties to be kept to the minimum.

Other developments

As mentioned above, CSS is an integrated system that supports many business functions other than billing. Essential changes in other functions across the company have needed to be developed and implemented in parallel. This has required excellent control and change management procedures to be in place to ensure that any interdependencies were identified and controlled to ensure total system integrity without affecting adversely the provision of the New Bill.

Summary

This project has been a major undertaking for the company, not least from the software development viewpoint. The key nature of the billing systems to the business has meant that very significant technical challenges have had to be met to secure the firm base for the collection of BT's income. There have been few existing reference sites available, either in terms of size of operation or facilities offered, where confidence in the validity of the chosen technical solution could be validated. BT has had to rely on significant amounts of internal testing and proving of assumptions, especially in the area of performance. The most valuable asset in this development has been the total commitment by the team to the success of this project. Without the excellent cooperation of all parts of BT, this major implementation would not have been possible.

Biography

Richard Rockliffe
BT Development and Procurement

Richard Rockliffe is currently the BT Divisional Manager responsible for the software development and maintenance of BT's major billing systems. He works in BT's internal software development shop, ISD, which employs some 2000+ computing professionals. He has more than 20 years of experience in computing ranging from computer operations, through systems development and operating systems software support. He has worked on all types of equipment and operating systems from mainframes to PCs. He has been involved closely in the New Bill development since its inception in 1990.

Glossary

CICS Customer Information Control System—IBM's MVS teleprocessing monitor.
CSS Customer services system
IDMS Integrated Database Management System
LDS Linear data sets
MVS Multiple Virtual Storage—IBM mainframe operating system
PSTN Public switched telephone network

Joanna Kenny and John Evans

Quality Commitment on Billing

There is an obvious quality commitment on billing to produce accurate and reliable bills. BT is not only concentrating on ensuring income integrity, but actively searching for a means of demonstrating that this quality is inherent in the process and is capable of being recognised by all customers.

Introduction

It has long been recognised by BT that, to achieve its vision of becoming the most successful worldwide telecommunications group, quality must be built into each and every activity undertaken by the company. This objective is closely identified in the BT Quality Policy with the key quality imperative, 'the pursuit of excellence in customer service', a commitment that can be expressed as the total quality management aim of meeting customers' requirements first time every time.

For many customers, bills for service are their most regular contact with BT. The quality of these bills, therefore, can have an enormous effect on their view of the company and the quality of the product and services it provides. Indeed, the ability of the company to provide bills that meet customer requirements is considered by BT to be one of the factors behind a customer's choice between BT or one of its competitors.

There is, therefore, a major commitment to make visible to the customer the inherent quality in the bills that have been presented. Recognising that this achievement can be equated to the successful provision of customer requirements, BT has made considerable efforts to identify what these may be, both for billing systems in general and for those related to specific products. As a result, a series of major initiatives in billing service developments is being progressed which are further discussed in other articles appearing in this edition of the *Journal*.

Underlying all customer requirements for billing, however, is the fundamental demand for the accurate and reliable bills that are their right. Providing the assurance that this basic requirement has been fulfilled is the essential keystone for ensuring the quality that is vital for billing success and ultimately for the achievement of BT's vision.

Customers' perception of billing quality is dominated by their view of the over 100 million bills that are produced each year for the public switched telephone network (PSTN). For this reason, although the same standards of quality are applied to all services, the success or failure of the BT quality commitment will inevitably stand or fall on the quality of the bills achieved for the PSTN.

This article reviews the work of BT to ensure not only the accuracy and reliability of all bills produced for the PSTN, but also the recognition by customers that this billing quality exists.

The Challenge

Success in achieving and maintaining quality in billing is measured not by BT, but by customers' perception of that achievement: in other words, customers' view of how well their quality requirements have been met.

However, as yet, despite the high level of billing accuracy that is in reality achieved, BT cannot claim the full confidence of customers in the PSTN bills it produces. It is clear from the number of queries received by BT which dispute the size of their bills that some customers place little reliance on the accuracy of the figures supplied to them.

Indeed, from the authors' experience, anyone unguarded enough to confess in a social environment to an involvement in BT billing is likely to

The quality commitment on billing, therefore, must apply to the complete end-to-end charging process

be bombarded with immediate illustrations of this lack of confidence, although not usually with any justification for that view.

The problem for BT was summarised by Sir Bryan Carsberg, then Director General OFTEL, in his announcement of the introduction of the approval scheme for metering and billing systems of public telecommunications operators (PTOs) on 30 April 1992.

'Since taking up my appointment as Director General Telecommunications in 1984, I have been conscious that many members of the public do not have confidence in the accuracy of PTOs' metering and billing systems even though the evidence suggests that errors are rare and that underbilling is much more likely than overbilling.'

The challenge to BT, therefore, lies not only in the absolute necessity to continue to produce accurate and reliable bills, but also to bring about a change in the perception of their customers so that the quality of BT billing is generally recognised.

Billing—Quality of the End-to-End Process

The production of bills should not be considered in isolation. The billing system for any service is merely the visible customer-facing component of a complex process, which includes service provision, usage recording, data collection and transfer, as well as the control of the environment that supports the entire process.

The accuracy and reliability of the bills produced rely on the quality of the data on which they are based and the quality of the source of that data—a classic case of 'garbage in, garbage out'.

The quality commitment on billing, therefore, must apply to the complete end-to-end charging process. It is this complete process-based approach that BT is using to identify opportunities for ensuring the quality of the billing end product that the customer actually receives.

Quality Control of the Billing Process

The first step in convincing the customer of billing quality must be for BT to have complete assurance of the accuracy and reliability of the bills produced.

To provide this assurance, BT has developed a control approach with the following objectives:

- the prevention of errors,
- the implementation of an effective control environment, and
- the verification of billing quality by audit.

Prevention of errors

It is risking stating the obvious to remark that confidence in billing quality can never be obtained if bills contain inaccuracies. The first objective of any quality action plan must, therefore, be to ensure that errors are prevented.

Correcting a problem after it has occurred is always more expensive and frustrating than anticipating errors and taking corrective action. The secret of error prevention is understanding the processes that support the activity. A series of integrity studies has been carried out to identify where opportunities for error in the charging/billing process are likely to occur. Each charging variable in the process has been identified and, where material, appropriate enhancements have been implemented to reduce any risk to a minimum. Control measures have been implemented such that if the process moves out of control, it is realigned. The aim is to keep all the variables within tolerance levels. To facilitate this, a series of management reports has been introduced which indicates the effectiveness of control applied to the network (end-to-end billing process), provide failure trend information and advise of the possibility of individual call charge failures.

The most likely cause of error in any process that is not totally automated is undoubtedly human failure. With the introduction of modern exchange technology, which now covers over 80% of the network, with a 100% coverage scheduled by the end of 1995, human intervention in the charging process has been reduced to a minimum, but some manual activities will always be required.

In addition to progressing automation where appropriate, therefore, a major emphasis has been placed on the human angle. The implementation of quality management systems (QMS) over all operational processes and procedures will ensure that a nationally consistent and rigorous approach is taken at every stage. A common set of procedures and targets across the end-to-end process will highlight the extent to which compliance to standards is achieved and prompt any necessary corrective actions.

Implementation of an effective control environment

It would be unrealistic to assume that human error can be avoided entirely. BT has therefore implemented extensive control systems whose objective is to capture and rectify virtually every potential billing error before these could affect a customer's bill.

The use of automation in no way reduces the stringency of external controls that are required to ensure appropriate documentation, separation of duties, authorisation etc. Indeed, in some ways these are even more important as system data is less visible. The first essential, therefore, is to ensure that proper control is established over the completeness and accuracy of input and processing.

The fundamental building block of the BT drive for accuracy and reliability of billing is the income integrity approach, illustrated in Figure 1. This ensures that all billing systems, both established and under development, are analysed from a control perspective which looks to ensure that all bills

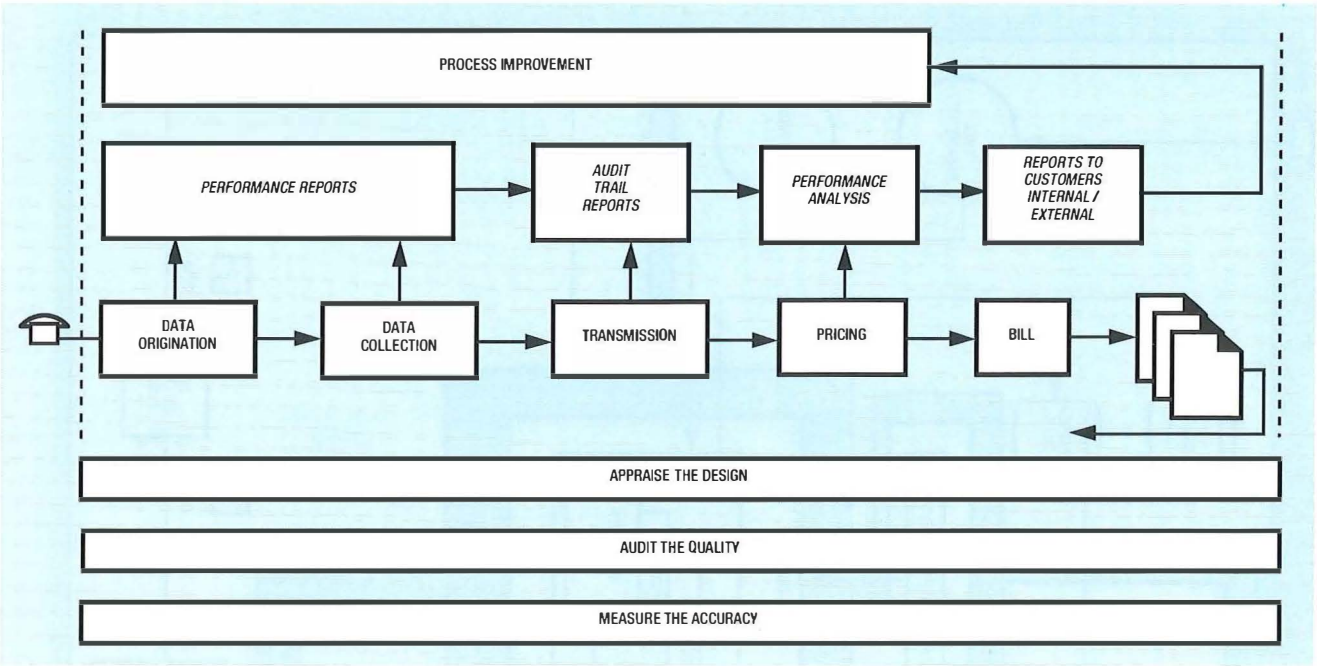


Figure 1—The approach to income integrity

produced are accurate, complete, reliable and timely, by confirming that:

- systems are designed to rigorous standards,
- systems are operated in the prescribed manner, and
- access to information is tightly controlled.

A specific income integrity function, which reports directly to cross-functional senior management via the Income Integrity Steering Group, has been set up to establish standards and ensure compliance to those standards. Standards have now been established for:

- software design,
- control levels and audit trail,
- security of access,
- security administration,
- categories of confidentiality,
- operational procedures,
- file handling,
- output control standards, and
- contingency requirements.

It is interesting to note that the drive to achieve the customer demand for accuracy encompasses the business requirement to ensure the reduction of revenue loss, the security of the system

The verification of billing quality by audit

The role of BT's Internal Audit Division in providing an independent review of all areas affecting accuracy of billing throughout the process has long been recognised as an essential tool in the development of quality.

Audit can contribute in two ways:

- at the process design stage, and
- through regulatory audits.

The involvement of Internal Audit during product development has enabled them to contribute to discussions on the controls at an early stage. This has the advantage of ensuring that error-prevention routines are embedded in process solutions before development takes place.

Regulatory audits provide a powerful check that the control regime is being applied consistently and uniformly throughout the organisation. The opportunity has been taken to establish linkage between the income integrity compliance monitoring/reporting structures and the regulatory audit process, with the former providing input to the development of forthcoming audit plans. This ensures that issues are surfaced and reviewed on a regular basis. Within this relationship, care has been taken to ensure that Audit's independence is preserved.

BT's external auditors provide an added dimension. Their focus on the accuracy and validity of the company's accounts and, in particular, turnover, completes the overall integrity framework.

The Control Environment in Operation

The generation of call usage charges provides a useful example of the operation of the control environment approach. The main control points for the call charging process, illustrated in Figure 2, can be identified as:

Measurement of the call

Telephone exchanges, both digital and analogue, in order to avoid any possibility of overmetering, are designed with a bias towards under recording. Failure of a switch, therefore, although possibly inconvenient to a customer, will never lead to overcharging; in fact, the reverse is true.

Charging the call at the correct rate

To ensure correct charging, the single definitive source of charging rates is

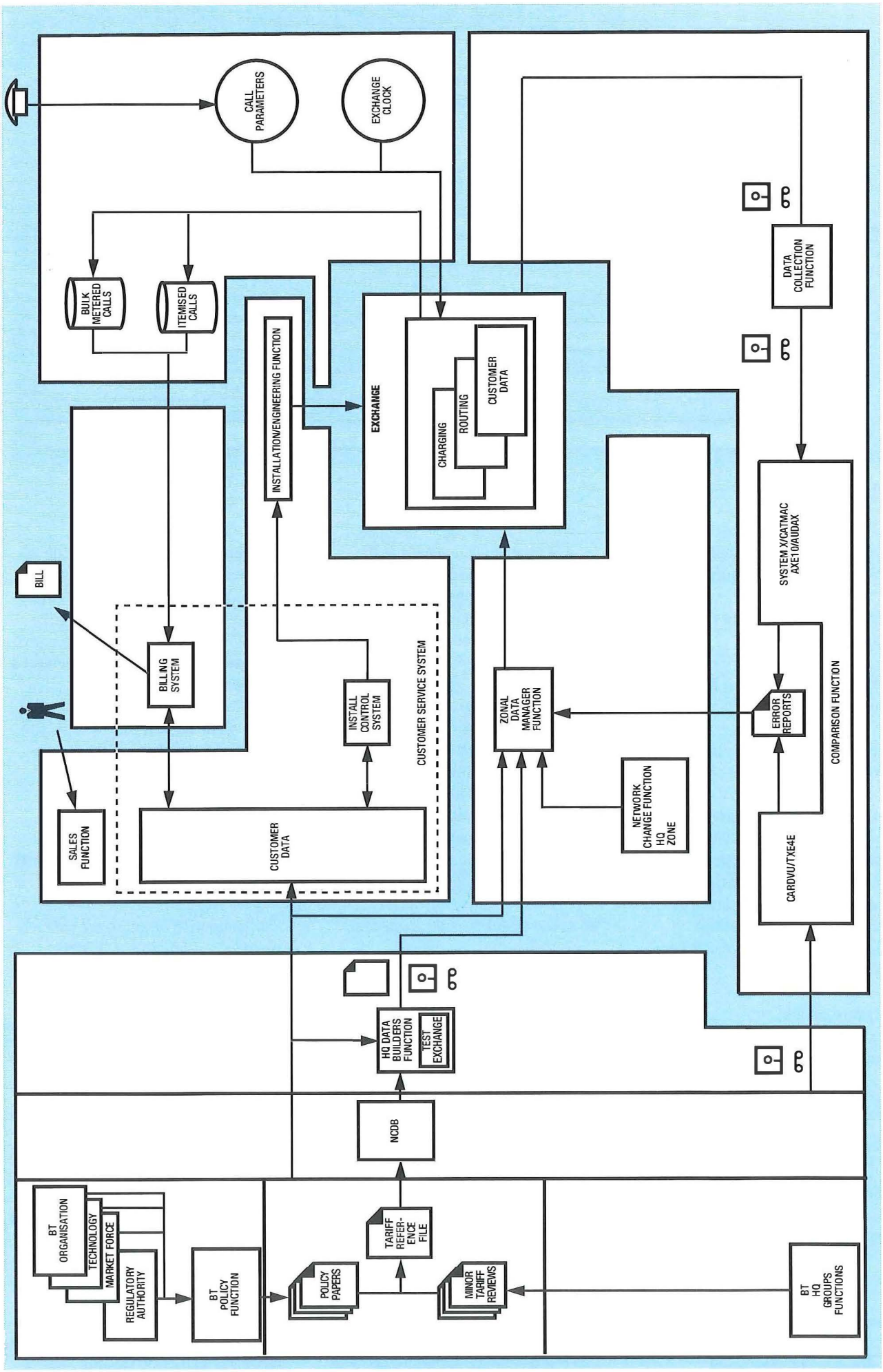


Figure 2—PSTN call charge accuracy

maintained in the national charging database (NCDB), against which rates held by the exchanges are matched on a regular basis[1].

Transferring the call to the billing system

Full automatic reconciliation controls are applied to ensure that data is not lost or corrupted.

Presentation of the call on the bill—itemisation

A major step to increasing the level of confidence in billing for both BT and its customers has been the introduction of itemised billing for PSTN customers.

Now that the option to receive the details of all calls of 10 units and over has been provided to all customers covered by modern exchange technology, there has been a notable difference in the level and nature of the queries received by billing offices. Previously it would appear that customers had little appreciation of the level of use of the telephone both by themselves and, in particular, by other members of their household. Since itemisation, the number of queries made have noticeably decreased and those that do occur tend to question individual calls that customers do not recognise.
Thus, in theory, the successful introduction of call itemisation is of great benefit to both BT and the customer and a significant contributor to the perception of the quality of the bill.

In practice, of course, life is not so simple and some customers have found that the provision of this additional information has not always been conducive to the quality of domestic harmony.

Independent Assurance of Quality—The Meter Approval Scheme

The above discussion details the means by which BT is satisfied internally of the quality of the charging process. Convincing those outside BT of this quality, however, is not a simple or straightforward matter, since internal evidence is not necessarily in a form that would satisfy any external assessor.

As an example, the known undermetering tendencies of exchange equipment referred to above is, to BT, an inherent part of their design, so inherent in fact that the production of objective proof of this statement was not immediately and independently available.

For this reason, BT welcomed the appointment in 1988[2] of the British Approvals Board for Telecommunications (BABT) by the Department of Trade and Industry to perform the functions conferred on the Secretary of State with respect to the approval of the metering systems of PTOs and have given full support to the development with BABT of an appropriate Meter Approval Scheme.

This scheme, which covers the metering and associated billing systems of both BT and Mercury, is the first of its kind for any telecommunications operator worldwide. Considerable effort from both BABT and BT, working together, has been required to set up an appropriate framework to support the approval of this large and complex area. Ultimately, all BT metering services will be encompassed within the scheme, but the initial implementation has concentrated on the call charges generated by the PSTN.

BABT has approached the establishment of the Meter Approval Scheme in two stages:

- the establishment of a metering standard, and
- confirmation that BT meters meet Meter Approval Scheme objectives.

The metering standard

The metering standard, OTR003[3], which was developed by BABT with the PTOs, was formally designated by OFTEL on 4 March 1992.

Under this, BT's meters would breach the standard limits set if more than 1 call in each 50 000 should overmeter or if more than 1p in each £1000 should be overcharged, while more relaxed limits have been set for the older analogue exchanges. These are stringent targets, far tougher than the standard achieved by other similar metering for bulk product or service, but BT is confident that its metering systems perform well within these limits.

BABT has also required standards to be set for undermetering since its view is that undercharging also affects the customer's view of quality. For example, BABT has identified the BT policy of not billing for calls interrupted by a physical fault on an exchange as an example of undermetering. Fortunately, the incidence of this is not sufficiently high to cause concern in terms of the metering standard and BT has little, if any, evidence of customer concern on this point.

Meter approval scheme objectives

The objectives for the Meter Approval Scheme have been formally defined by BABT as:

- establishing, through appraisal, that the meter system design is inherently capable of meeting the standard;
- ensuring, through the formal approval of the quality system operated by the PTO, that the meter system has been implemented, and is being operated such that the inherent accuracy is likely to be realised in practice; and
- ensuring, through measurement, that the meter system performs in practice as expected, and that measured metering accuracy is within the limits required by the standard.

Progress against these objectives was summarised by the annual BABT report to OFTEL[4] produced in May 1992:

'Significant progress towards approval of meters used in BT has been made during 1991. However, the Report states that the necessary results from comprehensive measurement and quality management systems are not yet available. Were it possible to give an "interim approval" based on the evaluation done to date it is likely this would have been given.'

BABT requirements for the implementation of quality management systems will be resolved by BT's continuing progress towards the formal registration of all BT activities to ISO9001/BS5750 Part 1 standards scheduled for 1993 and in particular to the specific development of QMS over the metering and billing process within the operational units.

To meet BABT measurement requirements, in addition to the general development of integrated performance monitors over the metering and billing process, it has proved necessary to provide a specialist measurement system to give an independent measure of the accuracy of exchange equipment to demonstrate compliance with the standard. This system, believed to be the first of its kind, will provide a single measure of call charge accuracy derived from the results of a series of approximately 1200 Monolog call loggers[5] installed on a statistically valid sample of lines. Full implementation of the loggers is nearing completion and early results are currently being analysed.

BT anticipates that, after the confirmation that the metering systems employed in the PSTN are compliant with the standard, formal approval should be granted within the coming year.

Conclusion

A final question remains for BT—will the assurance of billing quality confirmed by registration of QMS over metering and billing activities and BABT approval of the meter systems actually affect the perception of the customer and achieve the general recognition of the accuracy and reliability of BT bills?

If not, the challenge to obtain customer confidence in billing will remain and BT will continue to use all endeavours to ensure this prime objective.

Whatever success is achieved by current initiatives, the quality commitment on billing will remain as the on-going driver for excellence and will continue to be the foundation on which all billing systems are established.

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Biographies

John Evans
BT Group Finance

John Evans currently heads the Income Integrity and International Operations units within Group Finance Billing and Receivables. He joined BT in 1961 in the London West Area and progressed through the ranks on a variety of duties, predominantly in Finance, Management Services and Billing, and periods in Personnel and Estate Management proved to be enjoyable excursions. During his career, John qualified as an accountant (ACMA). He has been involved in a number of projects, including Modern Day Billing and Total Remittance Processing, and latterly he project managed the introduction of itemised billing. In his current position, he has led the drive to ensure meter and billing accuracy and in this respect has been involved in BT's tactical and strategic programmes and future billing architecture programme.

Joanna Kenny
BT Group Finance

With a degree in mathematics, Joanna Kenny joined BT in 1970 as a systems analyst, working both on computerised engineering maintenance systems and the development and implementation of the national billing system (NBS). After two years as a lecturer in data processing, she transferred to the Internal Audit Division in 1983 as a Computer Audit Manager where she obtained an ACCA accountancy qualification. In 1989, after a period developing the accounting systems of the TFS project, she joined Group Finance Billing and Receivables as Call Charge Quality Programme Manager responsible for all cross-functional tasks required to support the formal approval of BT metering systems.

Mike Ricketts and Helen Davis

EDI Billing

This article outlines the current BT marketing approach and engineering solution to meeting customer requirements for billing services. One of BT's greatest strengths is the skill of its engineering workforce. The development of the electronic data interchange (EDI) billing services demonstrates how this engineering expertise can be harnessed to produce a significant marketing advantage over BT's competitors.

Introduction

Over the last two years, BT has been working closely with one of its major customers (IBM) to develop an electronic data interchange (EDI) telecommunications billing service. The objective was to improve IBM's understanding of how its telecommunications budget was being spent by producing an efficient method of entering this information onto the company's financial systems, which are all computer based. Telecommunications bills are now regularly transmitted to IBM over the BT EDI*Net network, which is in turn connected to IBM's EDI service, Information Exchange.

BT has always regarded billing as a vital service to its customers, and bills are always delivered on time. This in itself gives rise to a major logistical exercise which can be achieved only by investing heavily in computers. BT has 41 separate billing systems, dealing with telephony, telex, mobile services, private circuits and so on. Each system comprises several computers. Taking telephony as an example, the service is supported by 27 IBM mainframe computers producing 400 000 telephone bills and 250 000 reminders each day. From these figures it can be seen that billing has to be managed carefully.

In recent years, the technology revolution has drastically changed working practises for many business organisations.

Even the smallest companies have computerised inventory management systems, and monthly cash flow analysis forecasts form the basis of most senior management decisions. To run these financial models, information must be accurate and up to date. This is where EDI billing comes into its own, allowing fast input of information into computer systems while dispensing with keying errors.

The Marketing Approach

The telco competitive environment UK and worldwide

Modern management theory stresses customer service as the key factor for success in business. One aspect of customer service is the provision of management information to customers allowing them to relate the costs of particular products and services to the business benefits gained from them. In this sense, telecommunications is no different from any other service and, in an environment where communications is the lifeblood of business, it is often a 'big budget' item.

Additionally, the marketplace is becoming increasingly competitive, and BT has to compete with not only companies in the UK but also with global giants such as AT&T if it is to have a future. The industry will soon be like most other business areas with national government interests substantially reduced and the markets for each service increasingly fragmented.

In this environment, marketing advantage is often achieved by highlighting very small differences in the product or being the first to claim the use of a specific process or ingredient. Consequently, the bill becomes a major weapon in the marketing communications arsenal as it is a regular means of contact with company financial controllers.

If charges are poorly presented or ambiguous, the bill can become a liability as competitors can exploit these ambiguities on cost and service grounds.

If a competitor can raise a doubt in your customer's mind, especially the

real savings for customers were to be found in dispensing with keying information into electronic accounts-payable and inventory management systems

financial controller, you are likely to lose the business.

Customers' views on BT billing

BT regularly surveys its customers using many techniques ranging from focus groups to telephone surveys. In this way, BT has been able to build up a picture of how billing is viewed for all business sectors and is able to measure changes in levels of acceptability of the current billing services.

With increasing competition in the UK, and with ambitions of being a major global player, BT has become aware of increasing levels of customer sophistication in cost management. The result is that the bill is now being viewed by both BT and customers as having two functions: firstly an invoice, and secondly a source of information on network usage. This has significant implications on bill presentation. In short, customers want to be able to understand their bills and control their costs.

Current approaches to billing by BT and other telcos

To establish itself clearly as the major telecommunications company, while defending against competition at home and dealing with market fragmentation, BT must do more than merely improve the existing telephone bill format.

One cannot ignore the information technology revolution that brought structural changes and introduced new working methods into even the most traditional of our industries. A radical new approach is needed to complement the existing bill. Modification of the current paper bill is a start, but the question needs to be asked as to how far this process should go. The answer can only be provided by BT's customers.

It is, however, marketing's role to anticipate customer requirements and, to this end, BT has looked at the world's most sophisticated market—North America. Here, various telecommunications companies have introduced hierarchical paper reporting systems; however, none of these have proved totally acceptable. The main problems are:

- customers cannot easily analyse large volumes of paper,
- the telephone company bill cycles do not match customers' accounting periods, and
- the need for customers to key information into their computers adds delays to the payment process.

BT's engineering competitive edge

BT has traditionally been an engineering service company. It has a highly skilled and well qualified workforce with specific skills in network service management. Added to this, BT is the largest user of computers in the UK. This combines to enable BT to offer practical engineering solutions to customers' communications problems. By focusing this effort, the company has been able to combine EDI technology with billing computer software to offer EDI billing and analysis packages.

This overcomes all the drawbacks encountered with paper bills.

The Driving Forces Within BT for Changing the Billing System

During the last 12 months, BT has established within Products and Services Management (P&SM) a billing programme team, which supplies senior management focus and enables major investment decisions to be taken and quickly implemented.

Previously, all billing marketing systems development was the responsibility of Finance Billing and Receivables Group (FB&R), a part of BT's Finance Division.

During 1989/90, through normal day-to-day contact with customers as well as market surveys, it was established that many manufacturing and retail companies were looking to trade electronically by using EDI. Part of this activity included the sending and receiving of bills.

This market development coincided with BT's own interests in the purchase of the US company Tymnet. However, there is little point in acquiring a technology capability without having customer applications to drive network revenue. For this reason, there was intense interest and senior management support for developing administrative services over EDI. The result was a two-pronged BT strategy based on firstly being an EDI network supplier and secondly supporting and using network intensive applications.

Customer research quickly established that sending information electronically was insufficient. The real savings for customers were to be found in dispensing with keying information into electronic accounts-payable and inventory management systems. For this reason, BT needed to find a customer with which to work who not only had an in-depth EDI engineering resource, but who also used the latest technologies in its business processes and account systems.

By 1990, IBM was already established as a working partner of BT due to its involvement with existing billing systems, especially the ONEBILL system, which offers customers a consolidated billing service. Through these activities, IBM was included on a short list of possible business partners. Coincidentally, IBM was at that time looking to expand its investment in EDI. Investigations proved that IBM was a leading company in the UK, developing computerised business processes, and so it was the obvious choice from BT's perspective to become involved in the EDI Billing Project.

BT EDI Implementation

Refer to the EDI overview diagram, Figure 1.

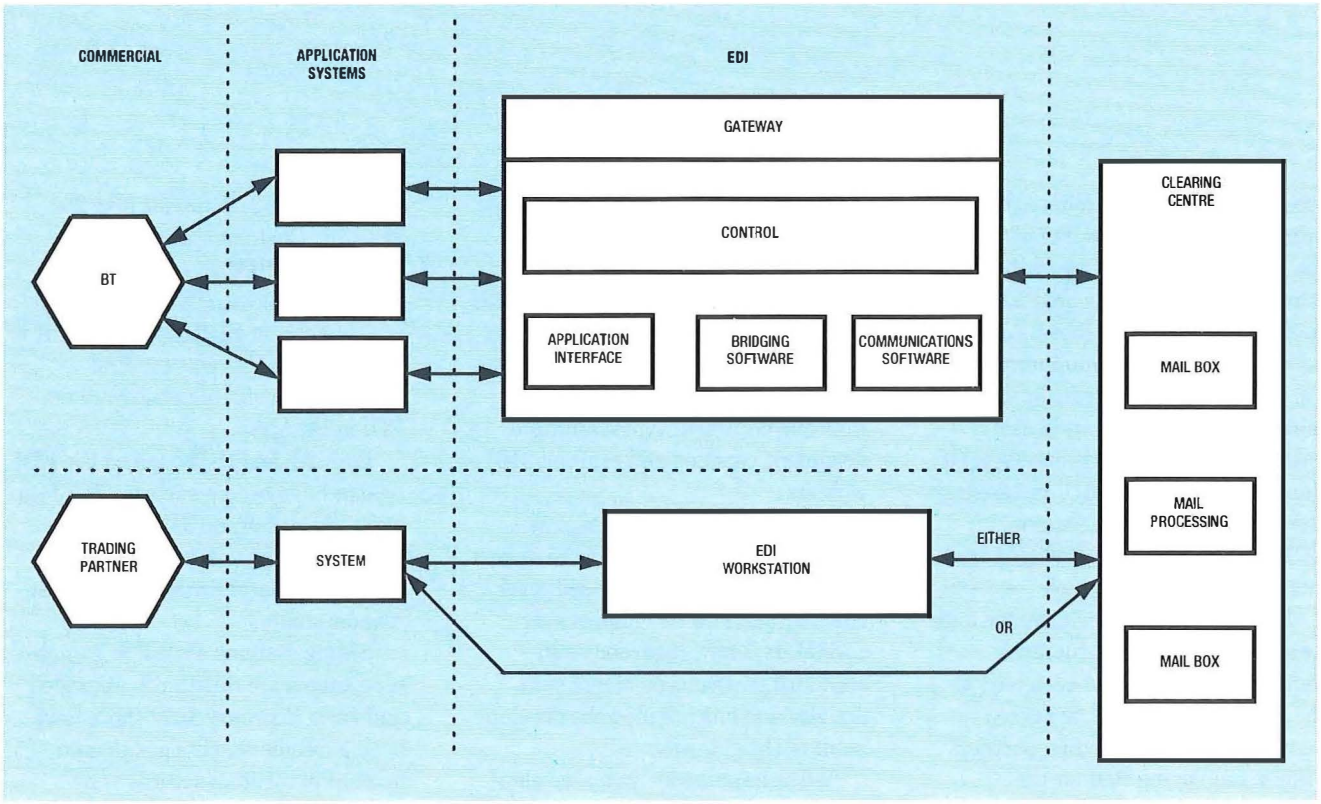


Figure 1—EDI overview

As stated previously, BT's strategy for EDI was twofold: firstly as a network provider and secondly as a supporter and user of network intensive applications.

As a network provider, BT's first EDI offering was based on the Telecom Gold service. In 1989, BT acquired the US company Tymnet with its worldwide data network. In addition to this network, BT bought the EDI*Net business—a leading provider of EDI services. BT Tymnet Europe was formed and the UK EDI*Net service was launched in 1991. Such services are termed *carriers*, *clearing centres* or *value-added data services* (VADS).

BT has been a user of EDI for many years. The first use was Group Procurement Services (GPS) placing orders with a single supplier. These orders were channelled through an EDI hub system which constructed an EDI message from the sending system's data and forwarded that message to a Telecom Gold service. The GPS experiment gave BT the opportunity to evaluate both the technical and the business issues of using EDI. As a result, it was decided that EDI should be developed as an integral component of business applications strategy.

It was determined that the most effective way to develop the strategy was to have a corporate EDI gateway system to replace the existing hub (which was dedicated to EDI output from only one BT computer system). The EDI gateway would control the EDI flows into and out of the company to and from any BT computer system.

The reasons for adopting the gateway approach were:

- centralised expert knowledge,
- non-proliferation of EDI-specific software,
- reduction in implementation effort (no need for each system to replicate work already done),
- reduction in long-term costs (operational support, software costs, maintenance, enhancement),
- corporate image and direction,
- infrastructure development for BT-wide use, and
- opportunity for central trading statistics—management information system (MIS).

This approach has resulted in a gateway being installed on an IBM 3090 at the EDI computer centre using Internet to link with computer systems based at other sites. It comprises three major parts: construction and translation of EDI messages, communications and control, and applications interface software.

Once data has been structured into an EDI standard format, it is termed the *EDI message*. This message contains not only the applications systems data but also the control data as specified by the standard adopted. The Interbridge proprietary bridging software package is used for the construction and translation of EDI messages.

For outbound data, the internal system provides the gateway with an in-house data file in a format that is defined by the BT EDI Implementation Team and is dependent upon the EDI message structure (which is itself dependent upon the data required to support the business process). The in-house file is passed through a

construction table to produce the EDI message. The trading partner receiving the EDI message will have a complementary table, which is used to translate the message into its own in-house file format. Inbound messages are passed through a translation table that produces an in-house format file from the EDI message. Of the several published EDI messaging standards, the United Nations EDIFACT is BT's preferred standard due to its global application.

The table defines the message and its subdivisions. The structure, content and meaning of each part of the EDI message must be agreed between BT and its trading partners prior to employing EDI for the exchange data. The same table may be used to construct the EDI message for many or all the trading partners receiving a particular EDI document.

Having constructed an outbound EDI message, the EDI gateway sets up a communications link to the EDI carrier service EDI*Net in order to transmit the message, via the carrier, to the trading partner. For inbound messages, a communications link is established to enable the gateway to check for messages to be received from the carrier.

The ODEX proprietary software package is used for communications, exchanges being controlled by the ODETTE protocol. This protocol defines a complete set of controls to ensure both section and file integrity. It also supports failure and restart processing. In addition, it defines the end-to-end response process for audit purposes. The ODEX software controls the interface of the VTAM communication software on the IBM machine with the X.25-based Global Network Services (GNS) system. It is capable of controlling multiple virtual calls over one X.25 connection as well as multiple physical X.25 connections. The connection to GNS is via two 48 kbit/s lines with automatic switching should the first line fail.

The controlling and applications interface software is a bespoke system that runs under MVS/ESA using Middleware/CICS, COBAL, DB2 and TSO architecture. The underlying rationale is flexibility with the EDI gateway providing EDI exchanges with multiple trading partners; multiple EDI standards; multiple document types; multiple document versions and multiple EDI carriers.

The GPS application has now expanded to the point of where almost 2000 order lines a day are sent over EDI with an annual value of over £188M. It is now regarded as the standard for this type of business activity and has justified the development of the gateway.

With the gateway under development, there was an opportunity to use it as the interface for other EDI applications.

This is where the timing of BT's involvement in the EDI billing application proved fortuitous. In fact, the next application became the EDI ONEBILL initiative.

The ONEBILL is a consolidated or summary invoice and not the more usual VATable invoice. In order to transmit the ONEBILL, it was necessary to design in collaboration with IBM a summary invoice which conformed to the EDIFACT standard.

BT and IBM agreed jointly to trial the EDI ONEBILL. In addition to proving the use of the EDI message for the exchange of ONEBILL data, this trial involved interconnecting two carrier networks: BT's EDI*Net and IBM's Information Exchange. More usually a trading partner would subscribe to EDI*Net and log on to that carrier directly in order to receive his data. The proposed trial with IBM therefore had an in-built complication.

The trial started during the autumn of 1991. The EDI message for ONEBILL was designed and tested by BT. The BT EDI Implementation Group developed both the EDI gateway system and, specifically for this trial, the module to take the existing output from the ONEBILL system, reformat it to EDI gateway specifications and submit it to the gateway. Customer acceptance testing with IBM was completed in January 1992 with the first parallel run (paper and EDI) in February. It is believed that this was the first transmission of a telephony bill via EDI in Europe.

Both BT and IBM deemed the EDI trial to have been a success. The data was uploaded onto IBM's host machine in approximately half a minute compared with 2-3 weeks for manual input.

Billing systems as well as computer systems are constantly upgraded and since February 1992 there have been a number of changes to take account of tariff structures and system developments. BT is now well placed to take advantage of this technology.

BT Billing Services as Perceived by a Customer—IBM

Company telecommunications

IBM has 38 major locations and 15 000 staff in the UK. Each of these staff has a telephone and a computer terminal on his/her desk. Extensive voice and data networks connect them together using over 15 000 BT lines costing £14M per year invoiced on 34 000 bills.

Over the years, IBM has developed its own telecommunications administration group with an application that is used to manage telecommunications spend. This application has 20 000 inventory records that track the 'status' of all telecommunications lines and equipment from placement of order to installation. It can tell how many of any item that IBM has, in which IBM location it is installed, where in that building it is terminated and its use. The application contains all the tariff information necessary to enable IBM to predict the value and due date of the 34 000 BT invoices so that IBM can check and authorise payment.

Existing BT billing services

One of the greatest benefits to IBM in previous years has been the introduction of BT's ONEBILL system, which IBM commenced using in August 1986, making one payment per month by direct debit. This has saved approximately one quarter of a person by not having to open, authorise and make payment for each individual bill.

The added bonus of having one point of contact for all BT billing problems and queries, instead of having to deal with every BT area, has considerably increased customer satisfaction. Having a major customer account team in BT, with whom IBM has regular quarterly reviews has helped IBM to streamline its telecommunications administration.

IBM has itemised rental shown on all invoices, which enables it to keep close watch on what is being billed for compared to what is actually received.

IBM has taken full advantage of BT's Customer Options 40, 50 and 70 to help minimise telecommunications spend.

Required improvements to BT billing services

IBM currently has five people in its Telecommunications Administration Group, one of whom is entirely devoted to the data entry and checking of the 34 000 BT bills received throughout the year.

The group is always looking for ways to improve processes by automation and hence reducing cycle time and workload. As EDI is one of IBM's strategies, it was seen as a solution to help reduce this workload and consequently use the manpower for other work.

Functionality required from BT's billing service

The main requirement was to be able to receive all billing information electronically. The other was for ONEBILL to be more flexible to giving more information and different choices of format and charge grouping.

Setting Up the Project—The IBM View

Project goals

The main goals of this project were:

- as a joint project both companies would work together as a partnership towards a common goal—to transmit BT billing information via EDI;
- to automate a highly labour-intensive activity and save headcount;
- to review the telecommunications administration database and processes;
- to utilise new technology and processes; and
- to take EDI as far as possible; for example, private circuit billing and itemised rental information.

Method of Working

EDI was first mentioned as one of IBM's requirements for BT's billing at the IBM/BT management meeting in May 1990. Various discussions and meetings followed over the next few months with the first IBM/BT EDI billing project meeting being held in November 1990. This meeting set the terms of reference for the project and began the requirements-gathering process for both parties.

One important item that came out of this meeting was that it was felt that more could be gained from this project if it was given backing by senior management from both companies. Consequently, IBM ISL director, the late John Griffiths, and BT's director of Business Communications Anthony Booth, gave their sponsorship to the joint project.

A steering committee was set up to oversee the project from a management point of view with meetings called only if the participating professionals deemed it necessary to resolve any problems that could not be done at their level.

Having identified the key players from both companies, the joint project was soon underway. Both parties had to produce various documents, business cases and plans for both internal and joint use. The two plans merged once both companies discovered they were doing virtually the same things internally but using different terminology. This simplified the process and certainly helped the progress of the project.

By April 1991, regular project reviews were held to ensure the project was going according to joint plan. One of the first stages was to identify the billing data that BT was going to transmit in the EDI message. To do this, IBM had to review its telecommunications administration processes and use of business data to ensure that items not really needed were excluded and nothing vital was left out. From this review, IBM produced an internal and external design document that was used as the basis for its requirements for this project. It was agreed that the EDI standard UN/EDIFACT would be used, and the message would be based on INVOIC 90.1.

It soon became clear that the project would have to be split into several phases due to IBM's data requirements being greater than that available from BT at the time.

The first phase would be to transmit and receive BT's ONEBILL statement information as produced from its ONEBILL FOCUS system. The next phase (phase 1a) would be to receive BT's ONEBILL information from its new ORS system. Phase 2 would be to explore what further information could be transmitted, with IBM providing an input to the level of detail to be transmitted; for example, charges by private circuit number, details of itemised rental on telephony invoices.

It has to be remembered that this project had several sides to it. In

addition to the business data, both the EDI message guide and the translation software had to be written and, most of all, the technical problems of linking two networks together had to be addressed.

All this work was jointly managed and carried out by both companies working together as a team.

Meetings continued throughout 1991 with the business data being mapped to the EDI message and the BT EDI Gateway being completed by the end of August. Both companies were then ready to commence rigorous testing of the interconnection, the gateways, the translation software and the EDI message. Testing continued, with minor adjustments, until the end of 1992.

Part of the testing phase was a volume test. A file of 42 750 records was transmitted by BT. After the EDI message had been translated, the file took only 8·5 minutes to load into IBM's telecommunications administration application; this was much faster than anyone had anticipated. This number of records is larger than the number of invoices normally received from BT in any one year.

In December 1991 and January 1992, IBM helped BT in the production of an EDI message guide for ONEBILL statement information. At this point, the two companies were able to sign the Operational Attachment, which details the technical and business contacts for the day-to-day management of the electronic connection. This document is updated as and when necessary.

The first parallel run, with BT still producing and sending the paper version of the ONEBILL summary, took place successfully in February 1992, with a second parallel run also successful in March 1992.

In April 1992, IBM received the first production run of BT's EDI ONEBILL summary; that is, only the EDI file with no paper copy from BT. This meant that both parties were able to sign off phase 1 of this project and the formal signing of the Interchange Agreement took place.

In May 1992, IBM began testing files from BT's new ONEBILL ORS system with parallel runs in July and August. In August 1992, IBM and BT completed the full interconnection of the two networks and phase 1a of this project was signed off.

Implementing EDI billing

As IBM has had experience of other EDI billing projects, implementation of this was fairly quick and simple. IBM already had a gateway, MEDIATOR, so the addition of a new application took only one man-month. MEDIATOR consists of an infrastructure on which IBM can 'hook' a new EDI application with the minimum of effort. This project was the first to prove the concept.

The IBM telecommunications administration database needed minimal amounts of new code written to enable the EDI file to be loaded into it and programs that already existed to check the manually entered billing information needed small changes.

In total, the application changes took approximately one person one week to write and test. Overall, IBM's time commitment to the project was six man-months.

The Outcome of this Joint Project

IBM view

IBM has seen this project as a great success. The time to load the EDI ONEBILL summary into the telecommunications administration application has taken an average of 30 seconds instead of 2-3 weeks manual data entry. This means a saving of 27% of one person's time.

Not only has this project realised workload savings, it has resulted in four 'firsts':

- the use, by BT, of its gateway system to provide a central translation point for all of its transmissions;
- the transmission, by BT, of billed data using EDI;
- IBM ISL's receipt of data electronically using the EDI invoice business transaction (previously only transmitted); and
- the first step towards full interconnection of more than one network in Europe—IBM's Information Network and BT's EDI*Net network.

The BT view

BT has proved that its billing service can be significantly improved by developing working partnerships with its customers. By using the BT engineering resource, it can exploit new technologies.

Recognition of Success

Part of all IBM's EDI projects require an Interchange Agreement to be signed by IBM and its trading partners. The Interchange Agreement between IBM and BT was signed by IBM ISL Director, the late John Griffiths, and BT's Managing Director of Business Communications, Anthony Booth, at BT's Headquarters on 29 April 1992. The key people, both from IBM and BT, who made this project possible attended this celebration and were presented with signed certificates in recognition of a significant telecommunications achievement.

The Future

IBM has been extremely impressed with this BT initiative since it has delivered significant improvements to its business operations.

BT now intends to run a pilot service with up to 12 customers to verify these findings of improved service. Assuming that the benefits are replicated with the 12 customers, BT will look to launch a national EDI billing service during 1993.

Biographies

Mike Ricketts
BT Business Communications

Mike Ricketts is the Marketing Manager for Billing Services, reporting into the Customer Services Marketing Unit, which is a part of BT Business Communications National Customers. A Member of The Chartered Institute of Marketing, he has worked for the last 12 years for BT in various sales management and marketing roles. He has specialised in the delivery of new electronic services and applications using X.400, EDI, voice and image processing.

Helen Davis
IBM Information Solutions Limited

Helen Davis has worked for IBM for nine years in its Internal Telecommunications area and is currently the Group Leader for Telecommunications Administration in IBM Information Solutions Limited European Telecommunications Centre Network Implementation and Support department. This group has responsibility for the administration of all public telecommunications operator (PTO) lines, services and equipment for IBM's voice and data networks within the UK. This work is controlled by an SQL/DS database written and managed by herself. Among Helen's many responsibilities are the financial planning for the voice and data networks, the cost evaluation of each PTO supplier and service and the implementation of EDI for PTO administration.

Glossary

CICS IBM's transaction processing system for large volume users, normally the end users of fully developed operational systems.
EDI Electronic data interchange
GNS Global Network Services
GPS BT's Group Procurement Services
ISL Information Solutions Ltd.
MVS/ESA IBM's primary large mainframe operating system.
ODETTE A protocol specifically for EDI transactions which includes the generation of the end-to-end response process (EERP), whereby an EERP is returned to the sender when an EDI interchange has been successfullyy received by the recipient trading partner.
ODEX A communications package developed by Data Interchange Ltd. specifically for EDI transactions and supporting the ODETTE protocol.
PTO Public telecommunications operator
TSO IBM's access method for technical users (development and support) with the accent on functionality rather than volume.
VTAM IBM's communications interface between hosts (mainframes) and all other external devices (for example, terminals, printers, etc.).

Geoff Payne

The ONEBILL Development

BT's business customers require a consolidated bill covering charges for all services provided by BT. The ONEBILL replacement system (ORS) was designed to overcome the constraints imposed by BT's current billing systems. This article describes ORS, and how its implementation was achieved in comparatively short time-scales by using a combination of team working and alternative systems development techniques such as rapid application development (RAD) and Information Engineering Facility (IEF).

Background to the ONEBILL Development

There is no doubt that BT's business customers want optimum value for money for services provided by BT, but equally important these services must be delivered and administered in a way that mirrors their working methods. Very often it is the ability to do this that makes the difference between retaining or losing the customer.

The way in which BT's major corporate business customers are billed is no exception to this need. They expect to be told how much to pay, in total, for all the services provided and want to be presented with the details of these charges in a way that best suits their accounting practices. In essence, they want to be provided with a consolidated bill or *ONEBILL*.

Unfortunately, the way in which BT has historically organised itself, and hence its billing systems, makes these simple concepts very difficult to achieve. BT's major billing systems such as customer services system (CSS) for telephony services, and private circuit billing (PCB) for private services are organised geographically, billing for services being provided in a given vicinity. (It is worth noting that this is often determined by the areas served by groups of exchanges.) Also, the systems are product oriented, providing bills for a given product or service. A major customer's bills are consequently produced from many databases in many different locations, by using many different systems on a variety of hardware. Drawing together these bills to construct a ONEBILL and administering billing on a customer basis represents a significant, manually intensive, expensive and generally daunting task.

Before BT was reorganised under Project Sovereign, attempts to automate the provision of a ONEBILL saw the emergence of many District- (Area) devised solutions, based on a range of hardware ranging from microcomputers to mainframes. This resulted in a duplication of effort, and, more importantly, an inconsistent approach to the customer.

In an attempt to overcome this, the best of these local solutions in terms of facilities and capability, FOCUS ONEBILL, was adopted and supported centrally as an interim national standard. This was developed initially by East Midlands District operational and computing groups, and, as its name suggests, it was written in FOCUS, ran on IBM mainframe machines and was a crude distributed approach to the problem. The adoption of a common solution did, however, enable the Districts to create a standard offering to major customers, and this in itself created a demand as extra facilities were developed.

In response to competition, the requirements of BT's major customers came very much more to the fore. Large geographically dispersed customers were having difficulties reconciling the thousands of bills that were being sent each month, and were becoming more and more interested in the ONEBILL service. It became increasingly important to have a robust ONEBILL system that could support many more major customers, and would allow flexibility of presentation, delivery, and pricing. BT Business Communications' major customer account teams (MCATs) had been established with responsibility for providing a single point of contact for major customers on all their billing issues nationally and for administering the ONEBILL service. Any system therefore not only needed to be capable of supporting a larger

customer base and meeting increasingly complex customer requirements, but also needed to provide the MCATs with a facility that was efficient to operate.

After a detailed technical review, it was decided that the FOCUS system would not be capable of providing this level of performance or flexibility, and an alternative solution was devised—the *ONEBILL replacement system* (ORS).

ONEBILL Development—A Review

The decision to replace the FOCUS ONEBILL system was taken in July 1991. BT's future billing architecture was still in its formulation, so the decision was based on the facility being an interim solution that had to be justified over a two to three year time-scale. On this basis, a business case was approved by the BT Business Communications (BC) board.

BT Development and Procurement Information System Division (D&P ISD) was asked to develop the system.

A steering committee consisting of senior BC, D&P ISD and Group Computing Services (GCS), and Finance Billing and Receivables (FBR) managers was formed to oversee the overall development. A project manager from FBR was nominated, and work packages were identified. Key to the delivery was the adoption of a joint team approach involving experts from several business units. Overall project plans were recorded and tracked on the project planning tool Project Managers Workbench (PMW).

Because of the need to develop the system very rapidly, strategic development methods as authorised via the ISD Technical Architecture group were used. The techniques employed were rapid application development (RAD) for requirements definition and quality assurance of design specifications; and Information Engineering Facility (IEF), which is a computer-aided systems engineering (CASE) tool, to document the requirements, model the system and generate code of on-line transactions. D&P contracted the support of James Martin Associates to assist in these techniques. (The details of this approach are discussed in the appendix to this article.)

The first RAD workshop was attended by senior managers from BC, FBR and D&P and agreed the high-level requirements which included:

- the need to replicate current FOCUS ONEBILL functionality and conversion from it,
- the ability to serve up to 2000 major customers,
- significant improvements in end-user operability,
- automation of interfaces to CSS and PCB,
- accommodation of a variety of likely future requirements such as flexibility of presentation of billing data and whole customer discounting, and
- provision of a variety of delivery mechanisms such as magnetic media and electronic data interchange (EDI) (which was to be developed in parallel).

This was followed by a series of workshops involving team members (including end users) to determine the detailed requirements.

During the design and development phases of the project, an FBR staff member was permanently located with the ISD development unit and acted as liaison with the rest of the team and other business divisions for resolving issues. The IEF and RAD approach meant that screen layouts and some functionality could be demonstrated, discussed, altered and run through at the many detailed team workshops that occurred throughout the development phase. This contrasted pleasantly with the more traditional methods of writing full and wordy specifications (although a certain amount of this was inevitable).

Hardware requirements were agreed with GCS, who also ensured that the information systems units (ISUs) nationwide were fully briefed and prepared for the system.

In parallel, requirements for end-user training were established, and Training Division was asked to formulate the appropriate training events.

The detailed requirements for acceptance testing were also identified, including the need to set up a joint FBR and BC acceptance test team. Detailed test plans were devised and approved, and the acceptance testing phase began early in 1992.

During this period, the conversion process was exhaustively rehearsed. Each of the 29 FOCUS ONEBILL files in the country was trial converted and the data inconsistencies that were identified were reported back to the MCATs for rectification before live conversion.

Extensive state-of-readiness checking was carried out on the MCATs and the GCS ISUs. This activity, largely coordinated by GCS, included checking everything from communications links to stationery supplies.

The system went to pilot for major customers managed by Southern London and Mid Yorks MCATs in May 1992. Surprisingly few problems were encountered, and national roll-out was achieved over three weekends by 6 July 1992.

It is worth noting that the ORS development team achieved full national implementation, from scratch, in 11 months.

The development met all the requirements originally agreed, although the CSS interface is only partially automated. (Full automation is expected during the first half of 1993.)

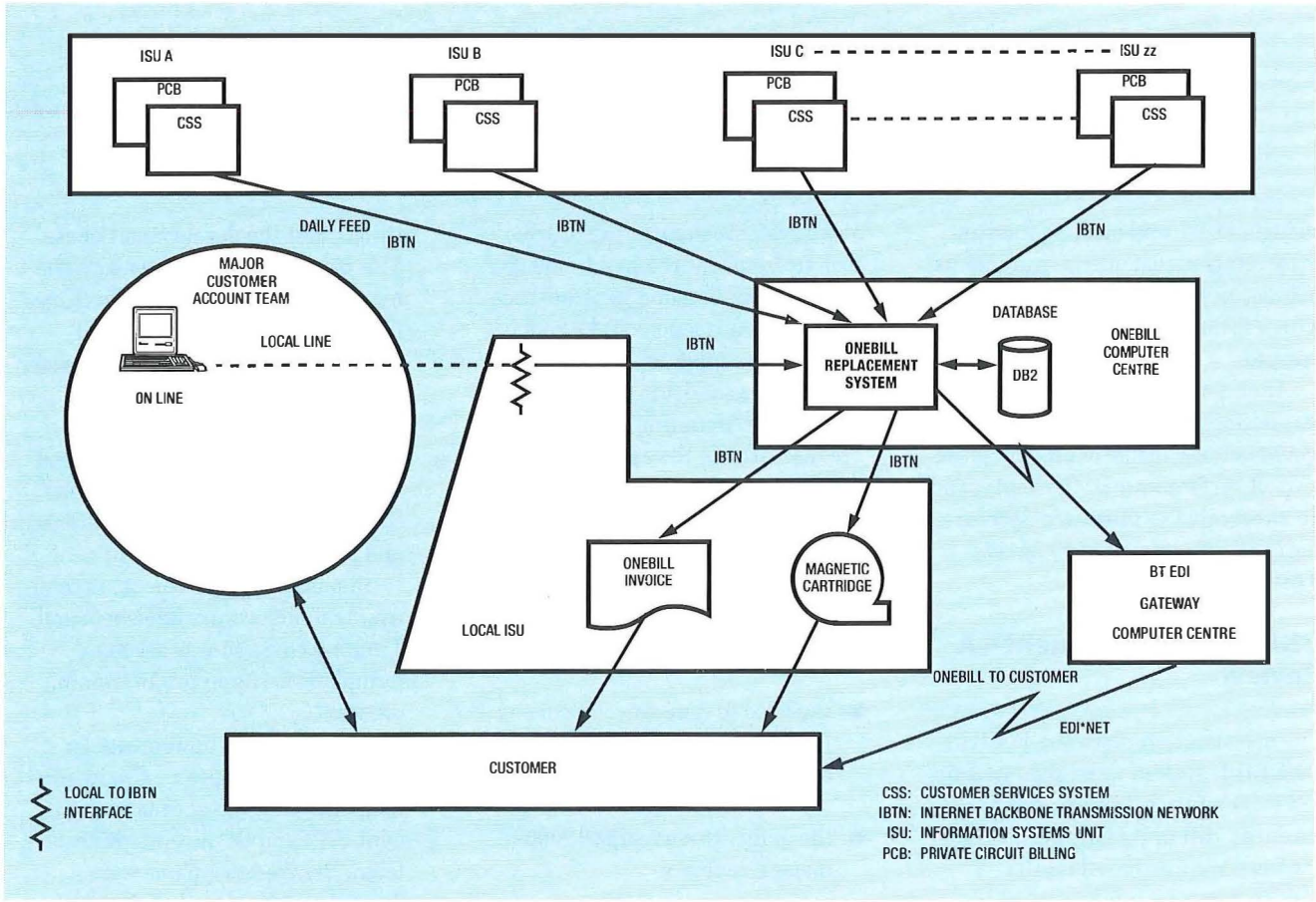


Figure 1—ORS system

ONEBILL System

Overview

The ORS is capable of producing a ONEBILL with the following features

- presentation on a legal VAT document of a total charge for all services included (charges for any service billed in the UK can be included),
- calculation and presentation of whole customer discount,
- summary of total charges for each service included in the ONEBILL,
- details of charges (as defined by the customer) for all services included,
- analysis of charges by customer-defined cost centre, and
- inclusion of supporting details from the source billing systems.

ORS automatically captures summary billing information from CSS and all billing and statement details from PCB. Billing information for other services (for example, mobile services) is currently input manually. ONEBILLs can be produced to customer requirement on a weekly, fortnightly or monthly basis. Customers can receive their ONEBILL on paper, magnetic cartridge or via electronic data interchange (EDI). Payment is made by direct debit and is fed back to the source billing systems for accounting purposes.

Some 900 major customers are currently supported through ORS and this is expected to grow to 2000 by spring 1993 and 13 500 by the end of 1993. Currently, 1250 ONEBILL invoices are produced each month. On average, the total revenue passing through ORS is currently £50M per month. This is expected to rise to over £300M per month by the end of 1993.

System description

(See Figure 1.) ORS is written in a combination of 50% COBOL generated from IEF and 50% hand-crafted COBOL. The system runs under IBM's MVS operating system using IBM's CICS 3.1 as the teleprocessing monitor.

Currently the system serves the country from one site at the ONEBILL computer centre and runs on an AHMDAHL 5995 model 4550M mainframe computer.

Its database is managed by the DB2 database management system, and is currently 30 gigabytes in size. (This will grow to 90 gigabytes when the full CSS download facility is implemented.)

The system is fairly evenly split between batch and on-line processes.

Batch process

This is concerned with the generation of the ONEBILL. It consists of 360 batch processes which act in three stages:

- collection of billing data from the source systems,
- generation of the ONEBILL, and
- output of the ONEBILL on customer-specified media.

Collection of data

The collection and processing of data to generate a ONEBILL is a complex operation. The achievement of this in a secure and robust fashion forms a large element of the design of the system.

Summary bill details are transmitted to ORS from each of the 29 CSS sites throughout the day, and loaded onto the ORS database each night. CSS is informed as to which bill details should be sent to ORS by means of a table, held in each CSS site, and maintained by ORS. The bill statement details (for example, itemised call details, rental details etc.) are still printed by CSS, and diverted to the MCAT for manual incorporation with the ONEBILL.

Private circuit bill details are also loaded on to the ORS database on a daily basis, fed from the PCB sites. In this case, the PCB system records the fact that the bill is for a ONEBILL account and automatically diverts the data to ORS. The complete statement is transferred, and PCB invoices for ONEBILL customers are printed by ORS when the ONEBILL is requested.

The CSS and PCB transfers are achieved by using the file transfer process (FTP) and are carried over BT's Internet backbone transmission network (IBTN). Approximately 100 megabytes of data is transferred and loaded into ORS as part of the batch overnight suite. This will increase to approximately 1·5 gigabytes when full CSS statements are downloaded automatically.

ONEBILL generation

ONEBILLs are produced as a result of requests from users. ORS detects which invoices are to be included within the ONEBILL, calculates the total payable, and produces the customer-specified analysis. Customer information that is held on the ORS database is also incorporated into the ONEBILL invoice. Discounts are calculated on the total charge for all the services (of a particular type) and applied at this stage. This facility supports the recently announced option 2000 discount scheme.

ONEBILL output

Once formulated, the ONEBILL can be output either on paper, on magnetic cartridge or passed directly to the customer using EDI.

For paper output, the ONEBILL data is transferred for printing via FTP on the IBTN to the ISU physically closest to the MCAT responsible for the customer. The invoices are sent from there to the MCAT where the complete ONEBILL is dispatched to the customer after suitable reconciliation checks and manual collation with the individual bills from CSS and other systems (ORS prints PCB bills). This local printing ensures that the ONEBILL is sent to the customer in the shortest possible time.

ONEBILLs to be output to magnetic media follow the same route as paper outputs.

ONEBILLs transferred via EDI are sent from the ONEBILL computer centre via the IBTN to the EDI computer centre, where they are presented to the EDI gateway system for conversion to EDIFACT message standards. From here they are transmitted across BT's EDI*Net service to the customer.

On-line system

The system supports up to 200 on-line users in 25 sites throughout the country. Communication is provided over the IBTN with local terminals linked via a variety of LANs or direct access to the local ISU, then to the ONEBILL computer centre via the IBTN. It is expected that the system will grow to 400 on-line users by spring 1993 and to 650 by the end of 1993.

There are over 70 on-line transactions. These are used to control the following:

- set up and maintenance of ONEBILL customers' data, giving details of ONEBILLs to be produced, services to be included, types of analysis, cost centre details, output media (for example, magnetic cartridge) etc;
- extract of source invoices from CSS and PCB, and facilities to verify that this has been done correctly;
- manual input of invoices from other billing systems such as mobile and Telex;
- generation of a ONEBILL;
- set up and maintenance of whole customer discount details; and
- submission of requests for management information reports.

ORS Database structure

Central to the whole system and its inherent flexibility is the design of the ORS database. Figure 2 shows the structure in simplified form, with the major entities and relationships only (the less critical components are omitted for clarity).

The customer record is the highest entry level to the system, although the ONEBILL account record is equally of value. Customers may own one or more ONEBILL accounts, depending on how they wish to consolidate their invoices.

The ONEBILL account is truly the heart of the system, as it is the level at which most of the processing decisions for the ONEBILL are made. Thus decisions regarding the presentation of the ONEBILL—EDI, paper or magnetic media—are made at the ONEBILL rather than customer level. This gives great flexibility in BT's dealings with customers: a customer having multiple ONEBILLS may choose to have totally different options for each account owned.

The ONEBILL account owns many local accounts, and is the unit for invoicing. Remembering that the feeder systems (CSS and PCB primarily) are geographically dispersed, the local accounts are controlled by the locations defined to the system. These locations align with the

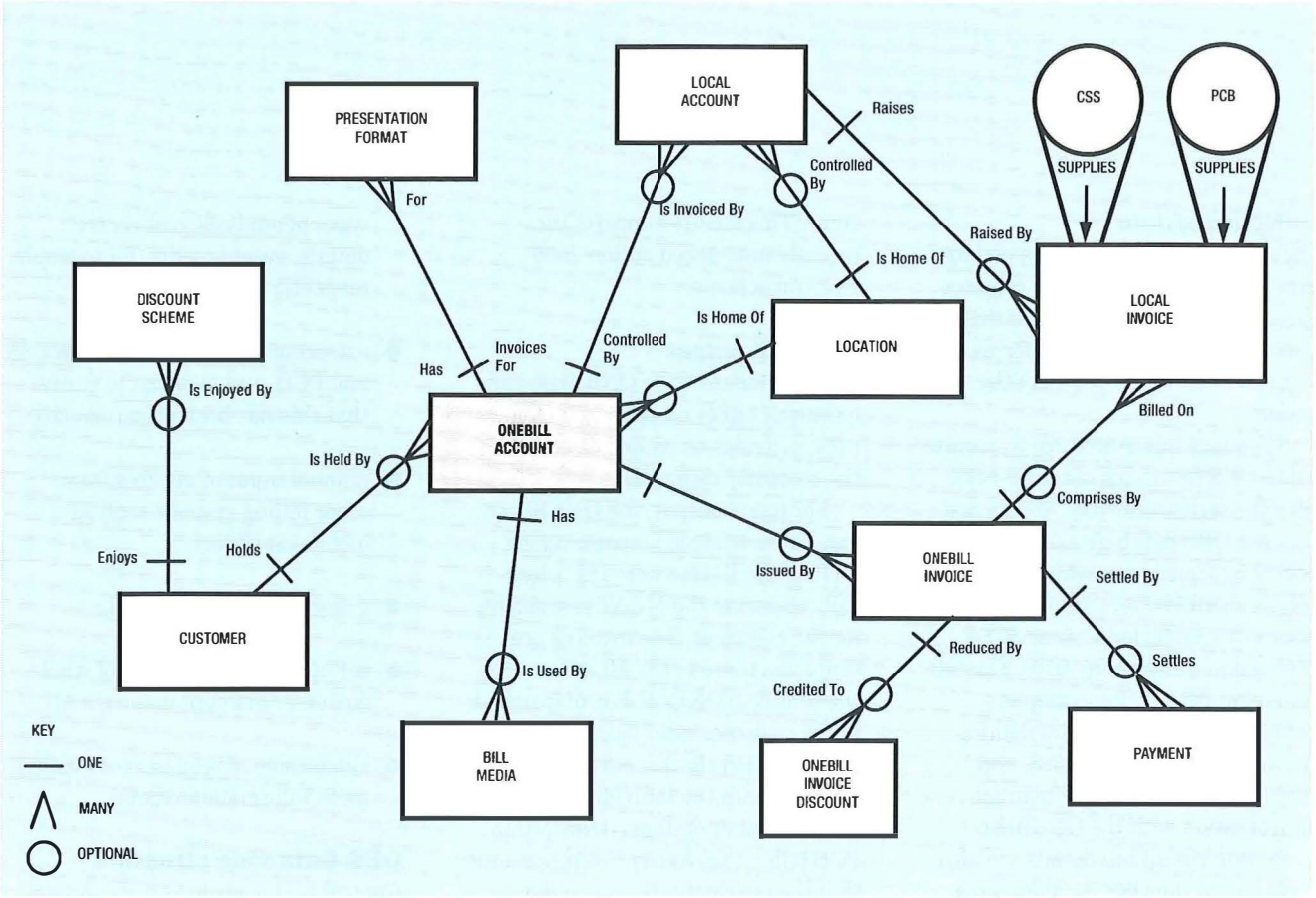


Figure 2—ORS—simplified entity model

old District boundaries, which also match the CSS/PCB boundaries. Thus the local accounts raise local invoices which are fed from the CSS systems and PCB systems.

When the ONEBILL is generated, it is constructed by using the relevant local invoices.

On payment of the invoice, the settlement is recorded on the system.

ORS—Future Perspectives

As BT's major customers make increasingly greater demands, so additional requirements for ORS are being defined. Also, as more customers are included, operational efficiency is becoming increasingly important. Some of the new features already planned include:

- full statement download from CSS,
- enhanced customer-specified analysis and presentation,
- additional discount options,
- automatic general ledger feed,
- generic interfaces to other source systems,
- interface to the banks automated clearing system (BACS),
- enhanced magnetic media capability, and
- increase of ONEBILL coverage to 13 500 customers.

Additionally, the way ORS will be integrated with, and its functionality migrated onto, BT's future billing architectures is being actively considered.

Full statement download

In the short term, full statement download from CSS poses the most significant challenge for the ONEBILL development team. At present, CSS still prints the telephony bills for manual inclusion with the ONEBILL. The planned full statement download from CSS will remove that effort, by fully automating the transfer of all telephone statement data to ORS. It will also significantly improve the opportunity to perform more detailed data analysis for the customer, and allow more flexibility in the type of whole-customer discounts that can be provided.

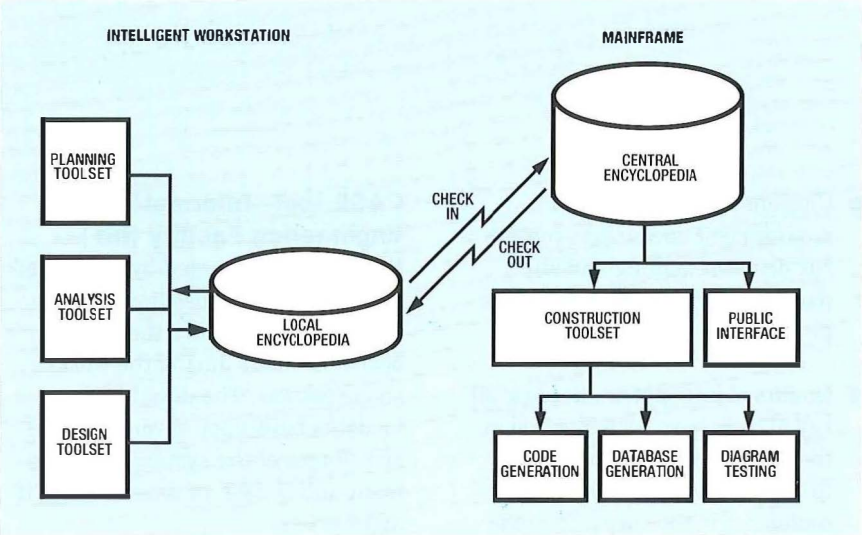
This is a major change to ORS, not least in the volumes of data that it will be required to manage. It is estimated that this will increase the database size from its current 30 to 90 gigabytes. In addition, the development raises major technical issues regarding data transmission through the network (with an anticipated 1·5 gigabytes of data being transferred each night), management of the data on ORS, processing times and especially batch processing within the agreed daily timeframe.

However, this is seen as the highest priority for the system and work has started to investigate and address the technical issues, with a view to delivering the capability in the first half of 1993.

Migration to BT's future billing architecture

Functionality provided by ORS will migrate onto BT's future billing

Figure 3—IEF simplified schematic



architectural platforms. While retaining the ONEBILL concept, the more flexible architectures will offer greater flexibility in meeting major customer needs in pricing, presentation and customer access. In the meantime however, significant work will be needed to enable the facilities provided in the early stages of implementation to be interfaced into ORS.

Conclusions

The ORS was developed to meet the billing needs of BT's major customers, and the BC MCATs supporting them. It was designed to overcome the constraints inherent in the installed computer systems, and automates what was becoming a heavy manual process.

The development had to be completed in relatively short time-scales. This was achieved by a high degree of team working between people from a variety of business units, and the careful use of the alternative development techniques RAD and IEF.

The system that has emerged will provide a good platform for satisfying customer requirements. Eventually it will be replaced by applications that conform to BT's future radical billing architectures.

Appendix: The Use of RAD and IEF During the ORS Development—A Review

The use of RAD with the CASE tool Information Engineering Facility (IEF), see Figure 3, figured greatly in the development of ORS. This addendum gives an in-depth review of how these new techniques were used, and what the benefits and drawbacks were.

Rapid application development (RAD)

Rapid application development (RAD) is a process that involves close interworking between systems developers and their customers throughout the development life cycle of the system to define the facilities required. It is initiated by workshops being run to define the requirements; these are refined by further workshops and the output is used to model the system and, ultimately, define its contents. Workshops are the key technique used during requirements planning and system design. The key players (those with the required business knowledge and skills) are gathered together in a controlled structured environment in order to determine the exact requirements of the system. They are the owners of the workshop, supported by the technical staff.

An essential element of RAD is the concept of *timeboxing* throughout the system development. This process involves constant re-evaluation of the scope of the system against the remaining development time-scales. If it becomes apparent that the full functionality cannot be delivered in that time, then the scope must be limited accordingly.

As the name suggests, its purpose is to facilitate rapid development of systems. To succeed in this, several criteria **must** be met:

- It is imperative that the business users be involved in the RAD process throughout the life cycle of the project.
- The workshops need to have clear scope and well-defined objectives or they will tend to lose focus.
- The workshops must be recognised as the place where decisions are made and potential issues and problems are addressed.
- Business users and development staff must be committed to timeboxing.
- In addition, it is imperative that the correct people attend the workshops, otherwise systems can be built on incorrect assumptions which may prove fatal to success.

RAD was used on ORS with great success in screen design, report design and prototyping of the on-line system. During these activities, development staff and business users worked in close liaison to define the system.

It proved less useful when defining the interfaces between the feeder systems (CSS and PCB) and ORS. This is because it is easy in workshops to overlook the complications that are likely to arise in connecting systems. Thus, on ORS, it was discovered that judicious use of RAD was required in some circumstances.

RAD workshop benefits

The use of RAD workshop techniques gives several potential benefits:

- Commitment. Because the key players have attended the workshops and have been party to the decisions made, then everyone should be committed to the end results of the workshop.

- Consensus. The workshop environment encourages consensus decision-making and all participants are involved in that process.

- Quality of information. Because all key players have been involved in the process, and have been party to the discussions, the level of confidence in the output from the workshop can be high.

RAD—potential drawbacks

Special care must be taken in several areas.

- Much effort may be required. Workshops should not be seen as a quick and easy way to shorten development time-scales. It can take a considerable amount of effort to plan and organise a successful workshop. In addition, the need for skilled and experienced workshop leaders and scribes must be recognised.

- Commitment from the business users is vital. If the process is to work, then they must be fully committed to it and be prepared to devote the required amount of time before and after the workshop. The workshop process makes the demands on their resource highly visible.

- The process must be clearly understood. Everyone involved must be clear what is required of them and what the aims and objectives are.

- Workshops are not a panacea to all the difficulties associated with solving the intricacies of building a system. Neither are they necessarily suitable for all stages of requirements capture and design; for example, they are considerably easier to use on systems that have evolved using RAD techniques than to apply when enhancing those that did not.

CASE tool—Information Engineering Facility (IEF)

RAD is complemented by the use of a CASE tool, because it allows the developers to capture the design decisions made during the workshop sessions. The detail of the model is built upon through successive stages of the system's development and is used in construction, if appropriate.

In the case of the ORS system, the output from the RAD workshops was modelled using the Information Engineering Facility (IEF) CASE tool. This product is a full life-cycle tool; that is, it may be used from business area analysis through to code generation, or it may be used for the business analysis component only. In the ORS system it had initially been thought that the latter approach would be adopted, but, in the event, because the requirements capture had been so successful, it was agreed to continue use of IEF through to code generation.

IEF benefits

Significant benefits were derived from the use of the tool which included

- Prototyping. Requirement specifiers and end users could see at an early stage the screen and limited processing. Using RAD workshops, the screen could be tailored there and then to meet users' requirements.

- The facility is particularly good for screen design, and first-cut database design. However, it is imperative that the resultant database design is rationalised by experienced database administrators.

- Requirement, model and design, along with database design, are held as one coherent model. This significantly improves impact analysis allowing the developer to be more responsive to change.

The drawbacks were as follows:

- It was found that the facility is not as effective in the definition of printed reports and batch interfaces to other systems. This has to be overcome by hand crafting COBOL modules for inclusion into the system.

- Use of the facility precludes use of middleware (that is, the generic software written by BT that is used to parametrise the way in which code interfaces with CICS). Many facilities (such as access control and abnormal-end (abend) management) had therefore to be hand coded.

- At present, only a limited skill base exists within BT for the use of IEF.

Acknowledgements

The author would like to acknowledge Catherine Doran, D&P ISD CSMS, who made a significant contribution to the article; Richard Jones, FBR, and J. O'Leary, BC Controller Global Customer Accounts.

Biography

Geoff Payne
BT Group Finance

Geoff Payne works within Group Finance Billing and Receivables as Manager Billing Systems Development and Testing. A member of the British Computer Society, he joined BT in 1973 as a programmer and has worked for most of his career within computer systems development and information technology. Latterly, he joined Finance first as system department manager then as System Development Manager looking after UK billing system development, maintenance and testing.

Glossary

BACS Banks automated clearing system
BC Business Communications
CASE Computer-aided systems engineering
CICS Customer Information Control System—IBM's MVS teleprocessing monitor. CICS is a trade name
COBOL Common Business Orientated Language
CSS Customer services system
DB2 Database2—IBM's 'relational database' product. DB2 is a tradename.
D&P ISD BT Development and Procurement Information Systems Division
EDI Electronic data interchange
EDIFACT EDI messaging standard
EDI*Net BT's EDI product. EDI*Net is a trade name
FBR Finance Billing and Receivables
FTP File transfer process
FOCUS Fourth-generation programming language with database and query language
FOCUS ONEBILL The predecessor system of ORS
GCS Group Computing Services (of D&P)
IBM International Business Machines
IBTN Internet backbone transmission network—BT's internal data transmission facility.
IEF Information Engineering Facility produced by James Martin Associates. IEF is a trade name.
ISD Information Systems Division (of D&P)
ISU Information Systems Unit
JMA James Martin Associates—a wholly owned subsidiary of Texas Instruments—suppliers of IEF.
LAN Local area network
MCAT BC's major customer account team
MVS Multiple Virtual Storage—IBM mainframe operating system
ORS ONEBILL replacement system
PCB Private circuit billing
RAD Rapid application development

Lorne Mitchell

Inter-Network Billing: Cooperating with the Competition

Accounting arrangements between existing PTT's and emergent network operators must be addressed at the outset of any interconnect agreement. This article outlines experiences from US telcos and presents BT's seven-point plan for servicing its wholesale customers' billing needs.

Introduction

The telecommunications industry in Europe is facing a decade of change and challenge. European state PTTs have traditionally held a monopoly over the supply of telephone lines to their end customers. In the future, they are likely to be faced with regulatory pressures to open up their markets. They will be encouraged to form commercial agreements with new operators, who will be competing against them for retail market share.

This article discusses some of the problems that PTTs might face in this new environment, focusing on the billing process between network operators. The thesis is based on the experience of BT in the United Kingdom where many of the ideas have been developed from first principles. Examples have also been used from both the United States and from colleagues involved in international telephony. Drawing upon this experience, a seven point plan is presented for wholesale billing arrangements.

The primary aim of the article is to stimulate debate in this important area of the evolving European telecommunications market.

This article is based on a paper presented by the author at the 31st European Telecommunications Congress, held in Granada, Spain, 27 September-2 October 1992. The author received the award for Best Presentation for his paper.

Pressures on European PTTs in the Single Market

One of the basic assumptions of this article is that, for the rest of this decade, European PTTs will face increasing regulation to encourage competition for telecommunications services.

Traditionally, these PTTs have held a monopoly over the provision of post, telegraph and telecommunications services—hence the term PTT (Figure 1). The customer paid a national tariff for each call, and more usually the government took the excess profits to subsidise other areas of the state.

However, in the new market, extra pressures are placed on the PTT by

Figure 1—Traditional role of the PTT

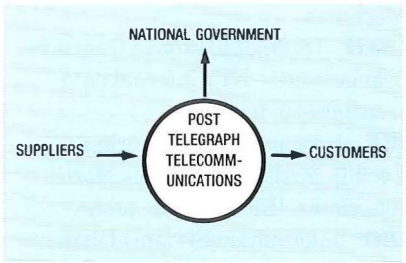
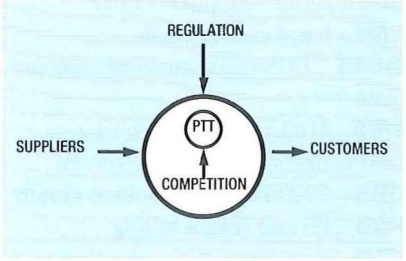


Figure 2—Pressures on PTTs in a deregulated environment



the regulatory bodies, both at the national and European level. This complicates the role the PTT has with its suppliers and customers (Figure 2).

The following is an extract from the current proposal on Open Network Provision for voice telephony which has been prepared for DG XIII of the European Commission:

'The Community attaches very great importance to the improvement in telecommunications and to the growth of trans-European telecommunications networks and services'

One of the three basic goals of the proposal is:

'To improve access to the public telephone network infrastructure for all users, including service providers'

This directive will pose many new challenges for existing European PTTs. They will be forced to do business with new service providers, who, in turn, will be challenging their position as the state monopoly provider.

At this stage, it is worth looking at a model of a PTT (Figure 3)—which will certainly not be new to many readers of this publication. The company conducts its affairs in layers of management, starting with network/nodal management and moving up through service management to business management.

We are currently witnessing an unprecedented fall in the cost of technology. Technical solutions which until now have been prohibitive at the service and network management layers because of cost, size or complexity are becoming increasingly more achievable. As quality of service becomes the main competitive differentiator, the pressure on operators to exploit this trend has never been greater, and will continue well into the next century.

Inter-network billing is a complex subject to cover in a short article. Yet if we place two pyramids next to one another (Figure 4), some of the problems of interconnection are highlighted.

Examples from the US and UK show that what has tended to happen

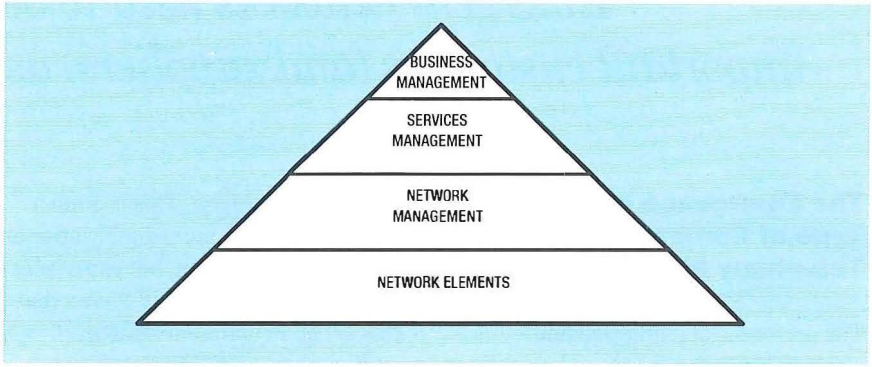


Figure 3—Basic model of a telco

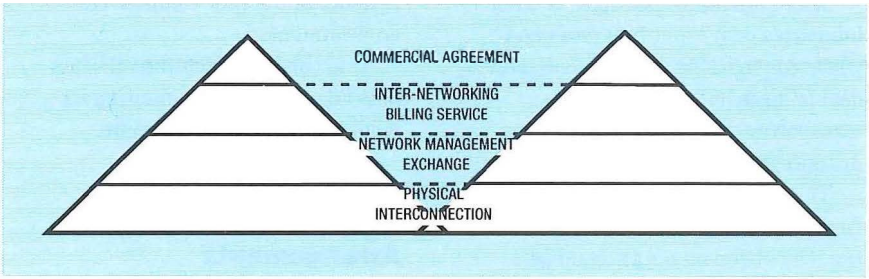


Figure 4—Model of interconnecting telcos

in the past is that initial energy is spent on finding lower-level engineering solutions to allow connection of different exchanges without disrupting either network. Billing and accounting arrangements were left until later, often leading to large amounts of money being disputed with very little back-up information.

For example, in the first five years after 'divestiture' in the US, up to 50% of the bills between operators were disputed because of lack of accurate information. This in turn led to a considerable cost for each operator because the disagreements had to be cleared, normally taking several months of painful negotiation. Much of the credit for resolving this problem can be attributed to an industry-wide initiative which was set up to agree on common standards across the interfaces.

There is increasing recognition throughout the global telecommunications industry that the flexibility of advanced billing systems is a critical factor in satisfying customer demands for new services. Indeed, billing has become a service in itself—and one which PTTs can gain significant competitive advantage.

But the greatest potential of 'billing power' as a competitive tool only occurs in those countries where deregulation has encouraged the growth of these new services. Perhaps the best example in this area comes from the US, where MCI has created a reduced 'family and friends' tariff. Customers can choose the few numbers that they use most frequently. These numbers will then be billed at a lower rate than other calls.

Inter-company billing is, in fact, a service in its own right.

This innovative approach has been accredited with winning MCI significant additional market share from AT&T and Sprint.

Perhaps one of the most important conclusions that many telecommunications companies have come to in the US is that inter-company billing is in fact a service in its own right, and should be resourced appropriately from the outset of any commercial arrangement between two operators.

Emergent networks need to be treated as important customers (and suppliers) as well as competitors.

The Emergence of a New Type of European Telephony Market

The pressures of regulation and competition so far described lead to the natural emergence of a new type of telecommunications customer—for want of a better term called the 'wholesale' customer.

There are many examples of other industries being split into retail and wholesale markets. Wholesalers tend to deal in large bulk consignments, transporting their goods over longer distances than their retail counterparts.

The traditional way of defining the European market for telecommunications has been on a national basis with the retail market as its main focus. (See Figure 5).

As competition is brought into the marketplace, national boundaries become less relevant. The important interfaces become those between companies, rather than countries. As a result, a new wholesale telephony market emerges. (Figure 6).

This trend is already happening in many parts of Europe, as existing PTTs are interconnecting with cellular operators, resellers and other service providers.

Initially, PTTs could see these new networks as competitors to their own retail customer base. This is quite a natural approach immediately after a period of deregulation, but experience from both the US and UK shows that this is not an optimum strategy.

Emergent networks need to be treated as important customers (and suppliers) of traffic both from (and to) the existing PTT's network. Only then will the end customer derive the full benefits of the new competitive environment.

It is this approach that BT has now adopted in implementing its wholesale billing programme.

A Seven-Point Plan for Inter-Network Billing Arrangements

BT has taken up the challenge of meeting its wholesale customers' billing needs by implementing a seven-point plan which is outlined below (see Table 1):

1. Manage the Wholesale Market as a Customer Group

The first step was to recognise the emerging wholesale market as an important customer group. A special organisation was set up with representatives from all interested business functions. It was separated from the retail part of the business to ensure that full regard was given to confidentiality and fair trading.

2. Offer an Integrated Service Portfolio to these Customers

This special organisation then set out to develop an integrated set of services ranging from ordering provisioning, maintenance and repair of circuits through to the collection of billing data from exchanges. These

Table 1 A seven-point plan for inter-network billing

1	Manage the wholesale market as a customer group
2	Offer an integrated portfolio
3	Create reciprocal billing arrangements
4	Collect sufficient billing data
5	Move the tariffing process off the exchange
6	Build trust through integrity and audit
7	Use project management to focus on the customer

Figure 5—Simple network

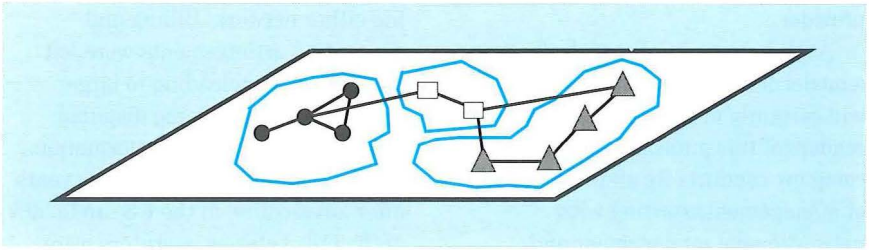
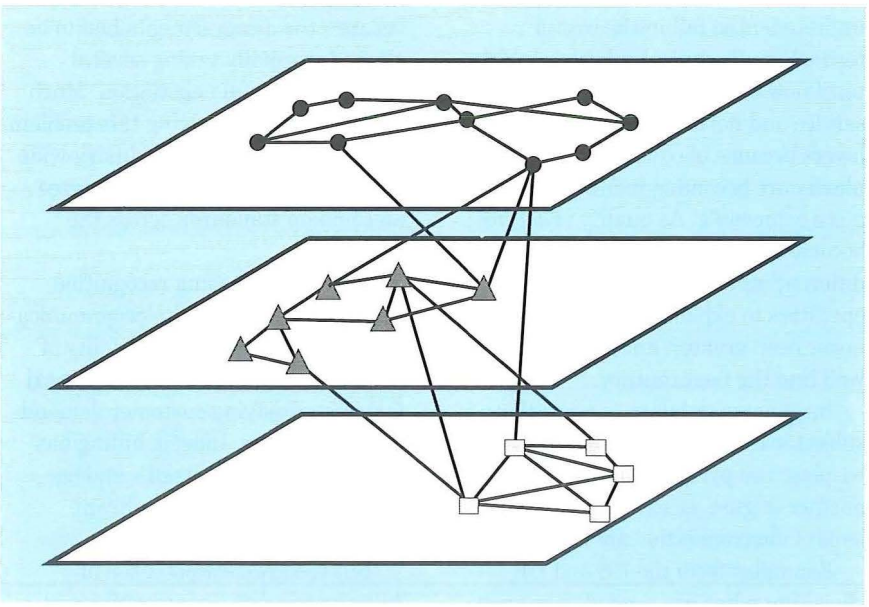


Figure 6—Complex interlocking networks



AT&T encourages local operators to measure the quality of their billing process. This should be a position that all inter-network agreements strive towards.

services were consolidated into a portfolio which was offered to the different types of emergent operator. It has been found that a clear definition of these services is vital when it comes to resolving billing disputes.

3. Create Reciprocal Billing Arrangements

One of the main lessons from both the US and UK is that billing arrangements need to be thought about from the outset of any interconnect agreement. This is particularly true for call accounting, where it is important to define which operator is responsible for collecting billing information for which direction of traffic. The second operator needs to collect only sufficient information to verify the prime source.

There are a number of strange customs associated with inter-operator billing, particularly in the international scene. One particular oddity is that it is considered quite normal for operators to collect information from their own networks and then tell other administrations how much money they will be paid based on that information. It is as if a customer kept a record of every telephone call he made at home, and then told the telephone company how much money he will send them at the end of the month! This is hardly a satisfactory arrangement for the retail sector, but is often the only way to satisfy wholesale interconnect agreements.

From first principles, it is easy to show that, if both operators end up duplicate-recording the same information, the end-customer will have to pay for unnecessary processing costs for an end-to-end call. This might appear obvious. However, commercial reality is often more complicated and the theory of 'prime source billing' is often difficult to put into practice.

4. Collect Sufficient Billing Data from Exchanges

Once interconnect billing agreements have been struck, auditable billing data needs to be collected to back up the commercial relationship. In the early days, BT's billing system was not set up to record public switched telephone network (PSTN) traffic passing between operators. A new project was created to address this deficiency.

For simpler agreements, it is possible to use information which has been collected for retail billing purposes, further sorting it by the trunk carrier to which the call had been routed. The US Regional Bell Operating Companies use such a method for accounting between themselves and the three major trunk carriers (AT&T, Sprint and MCI).

However, BT found that for many types of agreement, a new stream of billing information had to be collected from the interface exchange and that additional capacity had to be found on an already busy network in order to record the interconnect traffic. This was because 'transit' calls passing between trunk operators were often charged at different tariffs.

The principle here is that the more complex the agreement, the more costly it is to implement a billing solution. It is important that this principle is understood early in the negotiating process between operators.

5. Move the Tariffing Process off The Exchange

On traditional analogue networks, a major part of the billing processing was done on the exchange. Calls were normally given a number of 'charge units' depending upon the time of day, distance and duration of the call. Prices were added in the billing system by multiplying the total number of charge units by a fixed price.

With digital exchanges the scene has become very different. Exchanges can generate 'raw' information and have the burden of calculating charge units taken away to a downstream processor. This means that customers can receive far more detailed information on their bills. Indeed 'itemised bills' are now commonplace in most modern networks. This trend can be applied equally to the wholesale market, should the two operators require such detailed information to back up their agreements.

It is interesting to note that in the US, a thriving software industry has grown up to service the inter-network billing process. For mobile billing, third party clearing houses sort billing records across many different states and/or companies, ensuring that end customers receive their bills on time. Smaller operators favour this arrangement, because they do not have the time or capital to invest in developing their own in-house systems. Such opportunities are likely to become more widespread in Europe.

6. Build Trust through Data Integrity and Independent Audit

One of the major elements to any successful relationship is the building of trust. In billing terms this translates into the trust that each operator has in the data integrity of the other's data capture and billing systems.

In BT, a considerable amount of time and energy has been invested from the outset in ensuring that the data integrity and audit facilities within the billing stream are to the highest standards. Principles of total quality management have been applied throughout the programme.

In the past two years, AT&T has initiated a radical approach to this problem. They do not audit the accuracy of every bill that they receive from the local RBOCs. Instead, the local operators are encouraged to measure the quality of their own billing process. This includes ordering, provisioning and call recording. The entire process is split into several 'audit points', each with agreed quality levels. So long as the bill reaches these levels during a bill run, the bill is accepted.

This approach saves AT&T a considerable amount of time and money in bill verification and dispute handling. It is a sign of maturity of an inter-network partnership and should be a position that all inter-network agreements strive towards.

7. Use Project Management to Focus Energy on the Customer

Throughout the whole process of implementing BT's inter-network billing plan, great emphasis has been placed on team-work to bring together all of the business' energies to focus on its wholesale customers' needs. This has not only involved spanning functional boundaries, but is also reaching out to the wholesale customers themselves, by involving them in the development and testing of the system.

This extended project management goes a good way towards creating a 'network partnership', where the relationship between each operator becomes more focused on serving the end customer by reducing costs and improving quality on all levels of the interface—a cost which always appears indirectly on the end-customer's bill.

Conclusion

This article has outlined the likely emergence of a new wholesale European telecommunications market. Analysing some of the likely pressures on existing PTTs in the next few years, it has stressed the importance of early investment in time and energy, not only in the technical aspects of the relationship, but also in inter-network billing arrangements (Figure 4).

With proper management of the commercial interface and a realisation that the wholesale market is composed of customers as well as competitors, relationships between PTTs and other networks need to be shaped into information-sharing partnerships, where the ground rules and commercial standards will need to be sufficiently robust to satisfy EC requirements for fair trading and consumer protection.

Fortunately, in the UK, the competitive position is giving us a head start in developing this practise. It is surely incumbent on European PTTs to recognise the pivotal role that they have in building the commercial infrastructure that will accelerate, rather than inhibit regional economic growth.

Biography

Lorne Mitchell
BT Group Finance

Lorne Mitchell gained a B.Sc. Honours degree in Engineering and Management from Durham University in 1980. He was a Captain in the Grenadier Guards from 1980-86, having various technical jobs including two years as Regimental Signals Officer. He joined BT in 1986 as a systems analyst on accounting and billing systems. He was sponsored on a part-time MBA at Henley from 1989–92, and is currently project manager on the Inter-Network Call Accounting Programme.

Tim Jeanes

31st European Telecommunications Congress

This article reports on the 31st European Telecommunications Congress, held in Granada and Seville, Spain, from 27 September–2 October 1992, organised by the Federation of Telecommunications Engineers of the European Community (FITCE).

Introduction

The 1992 annual congress of the Federation of Telecommunications Engineers of the European Community (FITCE) was hosted by the Asociación Española de Ingenieros de Telecomunicación (AEIT)—the Spanish Association of Telecommunications Engineers—in Granada, for the presentation of technical papers, and Seville, for technical visits, during September/October 1992.

Granada, with its long history of co-existence between different cultures, was a most appropriate setting for the theme of the Congress—'Telecommunications and the Single European Market', and Seville provided a unique venue in EXPO '92 for the technical visits.

This proved to be an extremely popular combination attracting a record 900 attendees, with all available places being taken by July. Applications to attend were still being received up until the week before the event and, needless to say, this ensured that there was no lack of prospective papers to choose from.

Opening Ceremony

The Congress was opened on the afternoon of the 27 September in the Granada Exhibition and Congress Palace close to the city centre and was marked by the attendance of a number of prominent guest speakers. Doña Elena Salgado Mendez, the Spanish Secretary General of Telecommunications, opened by noting that 1992 had been a particularly significant year for Spanish telecommunications. The launch of the first Spanish satellite for television, civil and defence communications had enabled Telefónica, the major Spanish telecommunications service provider, to demonstrate its capabilities at the Olympic Games and EXPO '92 as well as opening up the possibility of access to services for the more isolated areas of the country. This was the start of a ten year plan that would see the investment of some 500 billion pesetas in the telecommunications infrastructure.

Don Javier Nadal Ariño, the Spanish Director General of Telecommunications noted that since the last congress in Spain 9 years ago, when the themes were Cellular Radio, Satellites and Wideband Networks, there had been major advances not only in the field of technology but also in people's perceptions of the importance of telecommunications. At the 21st Congress, Spanish engineers were aggrieved that their society was largely unreceptive to the potential impact of telecommunications; however, with increasing European contact the place of telecommunications engineers in Spain was now viewed in a much broader context; not just from a technical point of view, but also in the fields of social, regional and financial development.

Colin Shurrock, President of FITCE, also spoke of the broadening of interest of telecommunications engineers to provide the necessary focus on customers' rising expectations, reflected in demands for higher quality and lower prices. He stated

that the enthusiasm of telecommunications engineers, and especially the younger generation, would be required to meet these challenges and that FITCE provided unique opportunities in this area.

In closing, Don Antonio Lopez Barajas of Telefónica de España said that no other decade had seen so much change in the telecommunications world as the last one, with market forces, not technology, giving the lead to service providers. Client needs would, in future, require anticipation to guide technological development; this would in turn lead the FITCE Congress to taking a much wider view than it had done previously. He also raised the point that one of the next major challenges for the European telecommunications community was the emerging requirements of the ex-Eastern Bloc countries as they struggled to achieve social and economic equality—the subject of a future congress perhaps?

Technical Papers

The theme of 'Telecommunications and the Single European Market' provided a wide range of papers not only of a purely technical nature but also on the importance of telecommunications in economic and regional development. Regulatory and policy aspects were also covered, being particularly appropriate in the run up to legislation which will, in 1993, provide a much more open market in telecommunications across the whole of Europe.

The standard of presentation had yet again improved, although the short time allowed for each paper (24 minutes) restricted the potential content and question and answer sessions.

In total 41 papers were presented and a brief summary of those from BT authors is given below:

'Inter-network Billing: Cooperating with the Competition' by Lorne Mitchell
This paper explored the principles which can be used to structure accounting agreements between telecommunications companies in the Single European Market. It highlighted the development stages required to achieve maturity and what their likely impact will be on both end customers and the operators involved. It concluded that considerable savings could be made if Europe heeded the lessons learnt in the USA and UK. (An article based on Lorne Mitchell's paper is included in this issue of the *Journal*.)

Lorne Mitchell, BT—winner of the Best Presentation Material award

Mike Raistrick, BT—winner of the Most Promising Young Engineer award

'People Planning—The Poor Relation in Telecommunications Planning' by Les Brand (BT) and Diana Winstanley (Imperial College, London)
The paper addressed the important function of 'people planning' and the ramifications and challenges of the Single European Market to this. It noted that people plans are rarely integrated into the overall business strategy, merely reflecting short-term operational needs, and showed that this needs to be considered to deal effectively with large-scale technical and social changes.

'Anatomy of a Strategic Study: Access Network Modernisation' by Tim Parsons
The paper examined the perception of the access network as a 'bottle-neck' or barrier to the provision of cost-effective, high-quality telecommunications services to meet customers' evolving requirements. It reviewed a recent strategic study carried out by BT of its UK access network and highlighted some of the key strategic issues which have shaped the envisioned structure and operation of this network for the future.

'Outsourcing and Communications Facilities Management' by Mike Raistrick
The paper sought to clarify the underlying concepts of communications facilities management (CFM) and outsourcing, and why customers are increasingly seeking these new services. This radically new customer/supplier relationship has many advantages, but there are bound to be difficulties and problems for both sides; the paper also addressed these issues to give a complete view.

Congress Awards

Three awards were presented at this year's FITCE congress. The Paper Selection Committee, chaired by Andy Valdar of the UK and including Mariano Medina of Spain plus representatives from France, Germany, the Netherlands and Italy, awarded the Best Technical Paper Award to John Lysaght (Telecom Eireann) for his paper 'The PTT Engineer: From Natural Monopolist to Endangered Species?'.

The award for Best Presentation Material went to Lorne Mitchell (BT) for his paper entitled 'Inter-Network Billing: Cooperating with the Competition' and for Most Promising Young Engineer to Mike Raistrick (BT) for his paper on 'Outsourcing and Communications Facilities Management'.

FITCE commissions are set up to study problem areas which are common to all member countries and to bring about a new perspective through shared experience and research.

Study Commission Reports

Of considerable importance to congress and the Federation is the progress that is being made by the study commissions that are currently investigating the local loop and network performance. FITCE commissions are set up to study problem areas which are common to all member countries and to bring about a new perspective through shared experience and research. They provide one of the major tangible benefits of FITCE and are important in promoting the value of such a federation.

The Local Loop Commission, whose membership includes Mike Parry and Peter Smith of BT, noted that with the ever increasing customer demand for greater bandwidth, focus on the local loop is now of paramount importance. The Commission's objectives are to make a contribution to the planning and maintenance of the local loop in terms of customer needs, timing and economics of solutions. This had proved to be extremely difficult with the wide diversity of current statuses and geographies of access networks across Europe, but many innovative approaches had been studied in various countries and progress was being made. Work in the next year would culminate in the identification of a template local loop strategy and the production of a paper for presentation to the 1993 congress.

The Network Performance Commission was established in November 1991 to provide a framework of quality of service (QOS) and network performance parameters based on customer requirements as opposed to purely technical measures. The starting point was a paper published by Dvorak and Richters in the IEEE Communications Magazine of October 1988, although this was found to have considerable scope for improvement. Tony Mullee of BT, the Commission Chairman, reported on a generic framework that had been developed which could facilitate the capture of customers' QOS for any telecommunications service. Antony Oodan of BT, the Commission Secretary, demonstrated the two-dimensional matrix which comprised service quality criteria on one axis and service function on the other indicating how it could be applied to varying telecommunications services. It is hoped that this could lead to a common European set of network monitors and promote a common European approach to QOS and performance. Work for the forthcoming year will involve developing these ideas and the production of a 'delta document' for submission to the European Telecommunications Standards Institute (ETSI) showing how the FITCE framework could integrate with existing QOS documentation.

The work of both commissions was well received by Congress especially since the opportunity to work with such bodies as ETSI and CCITT would considerably enhance the status and authority of FITCE in the telecommunications world.

Closing Session

A review of the technical sessions was led by Bill Medcraft who congratulated all on the production of papers. It had been made clear that the regulatory, policy and people issues were bringing about great change in what had previously been a relatively stable environment; with all the associated transitions in the role of telecommunications engineers. The segmentation of markets and the introduction of such technologies as synchronous digital hierarchy, asynchronous transfer mode, frame relay and others would accelerate this process, but with the vast spectrum of customers across Europe it was important that the small customer should not be overlooked and service providers must continue to strive to understand truly their requirements.

In closing, the Spanish hosts were congratulated on an excellent congress, and a particular message that was carried forward was that FITCE must make every effort to encourage young engineers to become involved with the Federation to meet the many challenges that the future of telecommunications will bring.

FITCE General Assembly

The proceedings in Granada were completed with the General Assembly of the Federation, the most authoritative body of FITCE. A number of key actions were agreed including the development of a first class Revue, the encouragement of Regional Congresses and the promotion of FITCE as a credible professional body. It was recognised that to achieve this a more complete understanding of members' needs would be required and the FITCE Secretariat would need to be strengthened.

The General Assembly also approved the establishment of a new study commission to investigate the ongoing professional development of engineers, and concluded with the formal handover of the chain of office from the outgoing President, Colin Shurrock, to the new incumbent Dr Dimitrios Kouremenos, Director General of OTE (Hellenic Telecommunications Organization).

Technical Visits

1992 presented the unusual opportunity of having a 'two centre' congress. With all the technical papers having been presented in Granada by 30 September, on the morning of 1 October all delegates transferred to Seville where technical visits had been arranged at the EXPO '92 site. These comprised the Pavilion of European Telecommunications Operators, The Retevision Pavilion, The Hispasat Pavilion and a digital PABX provided by Telefónica.

Social and Cultural Events

One of the great appeals of the annual congress is the opportunity for delegates to meet and discuss matters in a social environment while also enjoying the culture and history of the

host country. Delegates were fortunate in being able to attend visits ranging from a night time tour of the historic Alhambra Palace perched dramatically on the hills overlooking Granada to the splendid Spanish pavilion at the Seville EXPO '92 where they experienced a magnificent sound, light and firework display on the adjoining lake.

1993 Congress Venue and Themes

The 32nd FITCE Congress will be hosted by the Belgian Association of Telecommunications Engineers (BITT/ UPITT) and will take place in Antwerp, cultural capital of Europe for 1993, from 29 August to 4 September. The theme for the congress will be 'Broadband Networks and Services in the Europe of Tomorrow and the impact on Residential and Business Users'.

Conclusion

The 3lst FITCE congress was a thought-provoking and stimulating event. The increasing importance of focusing on customer requirements was apparent and reflected in the wide range of topics covered by papers. The opening of the European market will provide many challenges, but, with a clear customer focus, telecommunications engineers can rise to the challenge and continue to provide an increasingly important service to the community. The study commissions maintain their excellent work and their output is poised to lend greater credibility to the Federation as a significant factor in the arena of European telecommunications.

The Asociación Española de Ingenieros de Telecomunicación is to be congratulated on hosting such a notable and educating event, especially considering the large number of delegates involved. Thanks are also extended to Telefónica, DG Tel, Retevision, Hispasat and all other sponsors for the warm and generous hospitality extended to all delegates.

A final special vote of thanks from all UK delegates goes to Mick Saunders for his considerable efforts in arranging all of their travel and accommodation requirements.

Biography

Tim Jeanes
BT Worldwide Networks

Tim Jeanes joined the then British Post Office in Bristol in 1972 as a Technician (Improver) on exchange construction. On promotion he became responsible for internal planning in the Bristol Telephone Area and subsequently for data management and analogue offload/ digital onload for National Networks South West Region. Since then he has been Switching Manager in the Central Territory Office, part of the Work Management Programme, the Network Administration Implementation Programme and, post-Sovereign reorganisation, Transmission Manager for North Wales. He is currently the Worldwide Networks Process Implementation Manager for Wales and West Zone.

book review

ISDN Explained

John M. Griffiths et al

and

ISDN—The Integrated Services Digital Network: Concept, Methods, Systems

Peter Brocker

It is somewhat rare to be asked to review two books covering the same subject at the same time. In this case, the integrated services digital network (ISDN) has been the subject of inummerable papers, articles and books since its inception in the early-1970s. Today much of the early theory is becoming reality right across the globe giving more practical evidence of the complex task being undertaken in the creation of the ISDN. These two books draw upon both the theory and the practice to produce two fully comprehensive texts.

The two books have much more in common, both are in their second international editions, both are authored and edited by research personnel fully familiar with their subject, and both contain chapters dealing with similar aspects such as Network Organisation, Customer Access and Signalling systems. There, however, the similarity ends as the books adopt very different approaches to this complex subject. To a large degree, the differences are an indication of the different approaches adopted to the provision of ISDN services within the UK and Germany and serve to highlight the difference in approach in a competitive environment versus one where a monopolistic situation still exists.

The 50 pages dedicated to applications in John Griffiths' book contrasting with the eight in Peter Brocker's serve as a reminder that in the competitive environment, clear understanding of the customers' needs is essential to success.

ISDN Explained adopts a building block approach with chapters dealing clearly with the fundamentals of Telephony, Digital Signalling PCM and Transmission. For someone familiar with the aspects, the book introduces their relevance to ISDN through discussion of the international standards and the Open Systems Interconnection (OSI) reference model.

The area of Customer and Network Signalling Systems is a complex one, but to appreciate fully the potential power of the ISDN, a level of understanding is necessary. The OSI model is used to explain the functionality of the layers in ISDN terms; the reader can progress further to understand the actual bit structures and procedures in detail or gain an overview depending on his/her knowledge level. As one would expect in a book focused on the UK, private network signalling systems (DPNSS, QSig) are also discussed.

For those familiar with the basic principles, then the chapters on Frame Mode Services and Broadband offer a good, up-to-date view of the evolution of the ISDN to include new services and new technologies, such as synchronous digital hierarchy (SDH) and asynchronous transfer mode (ATM).

ISDN—Concepts, Methods and Systems adopts a similar building block approach, but very quickly moves into details of standards and structures. Newcomers to the subject of the ISDN will quickly lose their way in the multitude of references to standards contained within the text. In the early chapters emphasis is placed on standards definitions for services and the relationships of ISDN services with those of other telecommunications networks (packet, PSTN) and services (Teletex, videotex) some of which a UK reader may be unfamiliar with. Network organisation for an ISDN is well covered with various migration strategies discussed along with the impact of ISDN on network dimensioning and traffic routing.

As one would expect, the chapters on signalling and customer interfaces cover the subject in depth and offer a particularly good description of the integration of ISDN and packet services along with a discussion on Signalling System No. 7 using the ISDN User Part (ISUP). A useful annex contains a listing of all standards relating to the ISDN.

Good use of diagrams and charts is made throughout both books, and references are listed clearly at the end of each chapter.

ISDN Explained offers something to readers of all levels of understanding and is equally at home as a reference book or an introductory text. In particular, the questions provided at the end of each chapter with answers will help many readers check their understanding.

ISDN—Concepts, Methods and Systems is a good reference book for ISDN standards but its style and organisation will make it difficult reading for those looking for an introduction to the topic.

'ISDN Explained' published by John Wiley and Sons. £19·95. xiv + 239 pp. ISBN 0–471–93480–1.

'ISDN—The Integrated Services Digital Network: Concept, Methods, Systems' published by Springer-Verlag. DM 148·00. xiv + 258 pp. ISBN 3–540–54819–X.

Reviewed by Alan J. Knight, Manager, ISDN Service Development, BT Products and Services Management

events

Cable and Satellite '93 Exhibition
Olympia, London. 5–7 April 1993. Further details from Reed Exhibition Companies, 021 705 6707.

VANS Conference
Kensington Hilton, 179–199 Holland Park Avenue, London W11. 22–23 April 1993. Cost: £695. Bookings and further details from: IIR Ltd, 071–412 0141.

15th International Conference on Energy in Telecommunications—INTERLEC 93
Palais des Congrès de Paris, France. 27–30 September 1993. Further information from: Conference Secretariat, Tel: +33 1 44 49 60 60, Fax: +33 1 44 49 60 44/49.

industry news

New ITU Structure

The Additional Plenipotentiary Conference of the International Telecommunication Union (ITU) (7–22 December 1992) closed with the signature of a new Constitution and new Convention of the Union.

The conference, under the chairmanship of Ambassador B. de Riedmatten, Permanent Observer of Switzerland to the United Nations Office and Permanent Representative to the other international organisations in Geneva, was attended by more than 800 delegates from 140 countries and by observers from 16 international and regional organisations as well as liberation movements.

The ITU's new structure is organised into three sectors: development, standardisation and radiocommunication.

The standards-setting activities of the CCITT and CCIR have been consolidated into a telecommunications Standardisation Sector. The rest of the CCIR activities—essentially those tasks related to the efficient management of the radio-frequency spectrum in terrestrial and space radiocommunications—has been integrated into a new Radiocommunications Sector along with the activities of the IFRB.

Although the role and functions have been redefined, the structure of the Development Sector remains essentially unchanged, given the restructuring of the ITU development machinery in 1990. An assessment of its structure and operational effectiveness will be made when sufficient time has elapsed to provide the type of feedback required. The conference however has given the Development Sector its first ever Director.

In his closing address, ITU Secretary-General Peka Tarjanne stated that this conference was only the first step in the ITU reform process. He added: 'We have restructured the ITU so that our three fundamental sectors of activity—radiocommunications, standardisation and development—have been given a framework in which they can operate more efficiently.'

'The challenge', he said, 'is to use these new structures to tackle the fundamental problems of international telecommunications, not only to better achieve our goals of development of telecommunications networks and services in a harmonised, and efficiently regulated and managed manner, but to ensure that telecommunications contribute to human development by promoting economic growth as well as the improvement of our environment—social, cultural, political and natural.'

Growth through Competition

Everyone can benefit from the further liberalisation of the telecommunications market in the European Community (EC). That is the conclusion of a major study of the future financial performance of Europe's telecommunications sector, undertaken by Cambridge-based telecommunications strategy consultants Analysys.

The study was carried out in the context of the European Commission's 1992 Review of the Situation in the Telecommunications Services Sector. 'We found that if specific measures to promote liberalisation and competition are taken soon, the EC telecommunications market could grow almost fourfold in real terms over the next 20 years to more than ECU 320 billion,' said David Cleevely, Managing Director of Analysys and leader of the study team.

'The European telecommunications operators can expect to lose market share to new competitors, but this will be more than offset by the overall expansion of the market. Given freedom to compete, operators can maintain their profitability despite having to finance major investments in network development.' But without these changes, the study projects that the rate of growth will be almost halved.

The report argues that expansion will occur only if a number of specific regulatory actions are taken.

It recommends that the provision of services (including voice) and physical networks should be opened up to competition. Specifically, it recommends early liberalisation of international intra-European voice telephony, and freedom for existing operators and new entrants to compete in all market segments, with adequate measures—particularly interconnection and equal access—to enable competition to be viable. It also argues for measures to safeguard service provision to low-usage and remotely-located customers.

These measures, according to the Analysys findings, are financially sustainable. The study's conclusions are backed up by detailed financial forecasts on a country-by-country basis, which shows that telecommunications operators can maintain profitability and positive cash flows at the same time as financing necessary investments.

A key conclusion of the Analysys work is that additional assistance will be necessary if all parts of Europe are to benefit from the expansion of the telecommunications market.

If the peripheral regions of the EC are to keep pace with expansion in the rest of the Community, the investments required will be greater than can be fully covered by commercial operations; assistance will therefore need to be directed at specific regions where financing requirements are particularly burdensome.

For Eastern Europe, Analysys recommends that the EC should consider annual assistance of ECU 100 million, rising to ECU 500 million by 2000 (a total of about ECU 3 billion over nine years from 1992 to 2000).

New Submarine Cable

Northern Telecom's STC Submarine Systems Division is to be the sole supplier for CANTAT-3 the $370M optical-fibre telecommunications link under the Atlantic.

The order was awarded by a consortium of Teleglobe Canada Inc (leading the project), Deutsche Bundespost Telekom, Telecom Denmark, the Iceland PTT, and BT. Due for completion in 1994, the project will be the first direct optical-fibre link between Canada and Europe. Intended to provide multimedia communications, it is claimed to be the first long-haul cable to operate the new international synchronous

transmission standard, SONET/SDH, as well as the first to offer 30 000 circuits per fibre pair.

Germany and France Take ISDN Lead

Competition tariffs have pushed Germany and France to the forefront of ISDN use in Europe, according to a recent Dataquest Europe report. In Germany, basic-rate ISDN connections reached a milestone of 100 000 at the end of August, while sales of primary-rate connections totalled 9000. Pascal Meriaux, marketing manager for France Telecom's ISDN service Numeris, said in a recent presentation that France Telecom topped its 1992 target of signing 300 000 B-channel ISDN customers in August by 20 per cent.

The European ISDN terminal adaptor market reached $79M in 1991 and is forecast to grow to $270M by 1996. According to the report, approximately 80 000 basic-rate ISDN lines were in use in Europe by the end of 1991, a number of which is forecast to grow to over one million by 1995. Sales of primary-rate ISDN connections totalled 13 000 in 1991 and are forecast to grow to 77 000 by 1995.

According to Dataquest Europe, the introduction of pan-European ISDN standards is expected to boost the ISDN equipment market from 1993 onwards. ISDN applications are expected to be plentiful in 1996, opening up new markets. For ISDN to be successful in other European countries, says Dataquest Europe, PTOs will have to ensure the ISDN tariffs are competitive and will need to be more aggressive in ISDN marketing.

BT Wins SuperJANET Contract

The Universities Funding Council has announced the go-ahead for the new SuperJANET (Joint-Academic-Network), and has awarded the contract, worth £18million over four years, to BT. BT is to collaborate with the Science and Engineering Research Council/Universities Funding Council on design and implementation.

To be used for the transmission of voice, data and images, the network is initially to connect six academic institutions, and will use synchronous digital hierarchy technology in conjunction with BT's new Switched Multimegabit Data Service (SMDS). Running at 1000 Mbit/s, the network will be around 1000 times faster than the existing JANET network, which it will complement.

The six-site pilot will connect Cambridge, Edinburgh and Manchester Universities, the Imperial College of Science, Technology and Medicine, University College London, and the SERC Rutherford Appleton Laboratory. SuperJANET will eventually serve about 50 sites with the potential for more if funding is available.

Initial applications will include distance teaching, electronic publishing, library document distribution, medical imaging, multimedia information services, distributed group communications and advanced data visualisation.

Standardisers Listen to Market Influence

Some 200 industrialists, trade unions and consumer representations met standardisers in Brussels during November 1992 to discuss the future direction of European standardisation.

The two-day conference, entitled *Standards for Europe—1993 Onwards*, was organised by the Joint President's Group of CEN, CENCELEC and ETSI, the three European standards bodies. The objective was to allow the market operators from the European Community (EC) and the European Free Trade Association (EFTA) who are confronted with European standards, but not always involved in the standard-making process, to receive direct information about future prospects of European technical harmonisation, and to offer their own views on their expectations from the European standardisation system.

The conference resolved:

- To produce simpler and more widely available information on their activities.
- To set firmer priorities in the vast catalogue of standardisation work items currently under consideration.
- To involve more smaller and medium-sized enterprises in their work.
- To adopt a project-management approach to standards-making and communicate the dates when standards meeting Euro-directives will be available.
- To ensure a greater market acceptability of standards.
- To build on worldwide standards and recommendations and for regional standards bodies to move towards a convergence of standards.
- To ensure a greater quality in standardisation programmes.
- To communicate clearly the requirements for visibility to conformity.

New GSM Agreement

Vodafone Limited and Sonofon, one of Denmark's mobile telephone network operators, have signed a bilateral agreement covering international roaming between their respective pan-European mobile telephone networks. The new agreement allows Sonofon's GSM subscribers to make calls in the UK via Vodafon's GSM network and Vodafone's subscribers to make calls in Denmark via Sonofon's network and yet still be billed by their respective home network operators. Both operators expect to sign similar agreements with other European GSM network operators.

GSM is an international mobile telephone system designed to provide pan-European coverage. It has been adopted by 27 operators in 18 European countries. The system, now called *Global System for Mobile Communications*, will also be introduced into countries outside Europe.

The European roaming area will open up as more GSM operators introduce their services and sign roaming agreements regulating billing and other operational matters.

BT news

A Single Number for a Single Market

BT has made available the new pan-European number for contacting the emergency services. The number—112—runs in parallel with 999. The 999 number, will continue to provide the excellent service that it has given for more than 50 years.

The new pan-European number is being phased in throughout the European Community to give a common number for all EC citizens to ring when they need to contact the emergency authorities, no matter what country they are in. The UK is one of the first countries to introduce the number. Other countries will be introducing it over the next few years.

BT Trials New Caller Display Service

BT is conducting the first UK trial of Caller Display, a service which enables customers to see the number of the person calling them before they answer.

The trial is taking place in the Elgin area of North Scotland. Triallists have a special display unit attached to their telephone line. This shows the telephone number of the caller for calls originating from the exchanges participating in the trial. Around 23 000 other customers served by these exchanges have the option to withhold display of their number. The identity of calls originating outside the trial area are not being displayed.

Caller Display is the first of a new generation of network services that BT plans to introduce, and which are dependent on calling line identity (CLI) technology. Other services could include the facility to ring back a busy number automatically when it is free; to return the last call even if the calling number is not known; to activate a trace on the last call received; or to be alerted by a distinctive ringing tone on specified incoming calls.

The Caller Display service gives greater control of the telephone to customers by restoring the balance of power between the person making a call and the one receiving it. Without CLI, the person receiving the call has only the choice of picking up or leaving the incoming call, which could prove to be either welcome or unwanted.

A similar system based on CLI technology is available on local calls in some parts of North America, and has had a dramatic and permanent effect in reducing malicious and hoax telephone calls. However, the North American system was introduced without a consistent policy of consultation or consideration of privacy and regulatory issues. This has led to the service being banned in some states.

BT is fully aware of the privacy and regulatory implications and, for this reason, has undertaken a major consultation exercise with customers, consumer groups, the Office of Telecommunications (OFTEL), the Data Protection Registrar, law enforcement agencies and the caring organisations. In addition, one set of research was conducted entirely among ex-directory customers to focus on their particular concerns.

BT's Caller Display service will include a free facility for customers to withold the identity of their number each time they make a call.

The trial in Elgin will continue until the end of March, and will be followed by a further period of review and consultation. A trial of some of the additional CLI-based services will be launched before final decisions on national availability are taken.

BT Helps St Petersburg Upgrade International Telecommunications

St Petersburg, Russia's principal port and the commercial gateway to the West, can now boast some of the latest telecommunications services thanks to an agreement with BT.

The venture will enable the city to cater for the needs of a growing number of multinational corporations moving into the region, which is a significant base for the maritime, aviation, space, chemical and computing industries.

Services offered under the venture will include international direct dialling to more than 200 countries, international private circuits and videoconferencing. Another service—Home Direct—will allow visitors to St Petersburg to call back to their own countries using a special freephone number, either direct or via an operator in their country.

The new services will be provided over a satellite earth station which BT installed and which went 'live' in November.

Andrew Gibson, BT's Director for Eastern Europe, said: 'BT is committed to supporting its multinational customers as they expand into Russia. St Petersburg is becoming a strategic commercial hub for many multinational companies and, as such, modern telecommunications services are essential.

'The agreement will ensure that St Petersburg and its business community and residents are given high-quality international communications. This will be a vital factor to the economic growth of the city and its status as a business, tourist and social centre.'

First Ever International Video Telephony Trials Launched

BT and five other telecommunications companies in Germany, France, Netherlands, Italy and Norway are conducting a customer trial, known as *EVE-2*, that will lead to a European video telephony service by the middle of 1993.

The service will allow users to dial up a face-to-face meeting between the six countries using the international integrated services digital network (ISDN2).

Taking part in the trial, which will last for nine months, are a number of international companies from each country, together using more than 100 video telephones. The participants from the UK include IBM ISL Ltd., Mars (UK), Lucas Automotive, Highlands and Islands Enterprise, Highlands Regional Council, Motorola, Martin Dawes Communications, University of Southampton, Robert Gordon University and the RNID.

The aims of the trial are to evaluate the market structure along with user and terminal requirements in order to help the successful development of videophone products and services. International management consultants, Coopers and Lybrand, will monitor the trial to evaluate the benefits of videophones.

A number of products made by different manufacturers are being used.

BT Launches Lowest Cost Videoconferencing System

Face-to-face meetings between people at their desk-tops are now possible following BT Visual and Broadcast Services's launch of its VC7000 videoconferencing system.

Costing just £7500, BT describes the VC7000 as the lowest-cost videoconferencing unit in the world. It allows small groups of people to see each other and show documents and objects regardless of their location. It can also be used for giving presentations, showing product designs and holding training sessions.

BT believes that this low price will vastly increase the size of the visual services market. Traditionally, users of videoconferencing have been large corporations, but the launch of this unit will enable smaller companies to reap the benefits of visual communication.

The launch of the VC7000 is the first step towards the visual services mass market. It will radically alter the way people do business by allowing them to have instant face-to-face meetings with colleagues, customers and suppliers regardless of location.

The unit is manufactured by the Norwegian company Tandberg and complies fully with the CCITT's H.320 series of international videoconferencing standards. It works over BT's dial-up digital network ISDN, at 64 and 128 kbit/s.

Because the unit conforms to international standards it will interwork with any currently existing standards-compatible product, including all the BT H.320 equipment that has been sold in the last three years.

BT anticipates that this is the first of many new products which will come onto the market in the next few years. It is vital that such equipment meets recognised standards because customers must be able to buy kit which is compatible with equipment manufactured by other companies. The price of equipment will fall only if manufacturers can produce it in large quantities, which is dependent on confidence that the market will continue to grow.

BT Wins Contract for Australia's Largest Private Telephone Network

BT has won a £350M contract for an advanced private telephone and data network for the New South Wales Government. BT is also to make a major commitment to the Australian telecommunications market.

Under the contract, BT will design, implement and manage the network that will ultimately link all New South Wales Government departments and public sector agencies. More than 5000 sites will be connected in total to the system, which will link 120 000 telephones, 23 000 computers and more than 73 departments and agencies—making it Australia's largest private telephone network.

The alignment of BT and New South Wales Government objectives has led to a State development programme which includes use of local goods and services to implement the network and a wider procurement programme.

This programme was designed in conjunction with the New South Wales Government to encourage the local telecommunications industry to focus on developing international competitiveness

BT also plans to set up a software engineering centre in Sydney which will establish strong links with local universities. The company has already set up a programme of research fellowships, to fund local researchers undertaking projects in association with BT's research laboratories at Martlesham Heath.

The New South Wales network will be able to transmit voice, data and video and will support the latest telecommunications services such as the integrated services digital network (ISDN), videoconferencing and electronic data interchange.

The contract, which will be carried out by BT's wholly-owned subsidiary, BT Australia Pty Ltd, is scheduled to be completed in two years.

Pilot EDI*Net/X.400 Gateway

As part of its drive to develop simple-to-use electronic data interchange (EDI) services, BT has announced the availability of a pilot gateway between EDI*Net and the BT Messaging Services.

The gateway will allow a BT Messaging Services user to send EDI messages via X.400 to an EDI*Net user and vice versa, giving trading partners the benefits of EDI, with the freedom of choice to select the service most suited to their needs and budgets.

The gateway will prove invaluable to X.400 users (typically large corporations) who have invested in an X.400 infrastructure for use with interpersonal mail and EDI and who wish to deal with trading partners that have no such capability and no understanding of X.400.

The gateway works by either receiving an X.400 message from a user of BT Messaging Services, stripping off the X.400 envelope and passing it to the EDI*Net service where it is placed in the recipient's mailbox for collection; or receiving a message forwarded from an EDI*Net user's mailbox, and adding the relevant X.400 information for delivery to the intended BT Messaging Services recipient.

BT's EDI*Net Interconnects with AT&T and IBM

In a move that will simplify the use of electronic data interchange (EDI) and cut costs to customers, BT has announced the interconnection of its EDI*Net service with AT&T's and IBM's EDI services.

The interconnection will allow EDI users to communicate with their

trading partners regardless of the network they are using, and at no extra charge to BT EDI*Net customers.

Further benefits of interconnectivity will mean that EDI users do not need to pay multiple subscriptions to different EDI suppliers. They will also be able to select the EDI network that conforms most closely to their needs, rather than those of their trading partners.

The interconnections, which will be available throughout Europe, will be via CCITT X.25 using the European standard, ODDETTE File Transfer Protocol (OFTP), for additional resilience and security between network services.

Since the launch of EDI*Net in the UK, BT has set about promoting interconnections to all other EDI VANS. BT pioneered this policy in the US and now has 24 interconnections globally.

PC Videophone Compatibility Extended

BT and IBM are set to extend their collaboration on multimedia by making PC videotelephony available to other operating systems, including Apple, PS2 and PC compatibles.

BT and IBM have previously announced that they would cooperate on a personal computer videophone product using specially developed software. This latest agreement will greatly expand the potential market for BT's visual services.

BT's PC videophone hardware, which conforms to the CCITT H.320 series of international videotelephony standards, and IBM's Person-to-Person 2 (P2P) software will allow people to participate in desk-top conferences by enabling them to see each other and exchange documents via their PCs. IBM's P2P software can also be used with H.320-compatible video over public telephone networks.

BT and IBM UK will have a PC videophone product comprising a PC card, camera and handset on the market by the third quarter of 1993. The expanded P2P support for this technology will be available soon after.

IBTE Local-Centre Programmes 1992–93

Further details can be obtained from Local-Centre Secretaries, see p. 316.

East Anglia Centre

17 March 1993: *Tunnel Vision* by Paul Falkner, BT Cordiale. To be held at St Peters House, St Peters Street, Colchester, from 14.00–16.00 hours.

Lancs & Cumbria Centre

2 March 1993: *The Local Access Network* by Peter Lisle. To be held at the Harris Conference Centre, 253 Garstang Road, Preston, from 14.00–15.45 hours, coffee from 13.30.

Liverpool Centre

Meetings to be held at Bradford Hotel, Tithebarn Street, Liverpool, commencing at 12.45 hours. Buffet available from noon by prior arrangement with the Local-Centre Secretary.

17 March 1993: *The Mersey Tunnels* by J. T. Gillard, General Manager, Mersey Tunnels, Liverpool.

21 April 1993: *A Review of Access Network Strategy* by Keith Oakley.

London Centre

Lectures will be held at the Assembly Rooms, Fleet Building, 40 Shoe Lane, London EC4V 3DD commencing at 12.30 hours. Buffet lunch at noon.

10 March 1993: *Chaos in Communications* by Dr. David Leakey, ex BT Group Technical Advisor.

28 April 1993: *A Review of Network Access Strategy* by Keith Oakley.

Martlesham Heath

All lectures will be held in the Staff Restaurant Coffee Lounge, BT Laboratories, Martlesham Heath, commencing at 16.00 hours.

23 February 1993: *Managing Top Down, Bottom Up and Side to Side*, by Jeremy Thorn, Managing Director, Bridon Ropes.

9 March 1993: *The Role of Business Communications* by Alfred Mockett, Managing Director, BT Business Communications.

23 March 1993: *The Non-Deterministic World* by David Leakey.

Manchester Centre

30 March 1993: *Safety Management* by Ken Clark, BT Chief Safety Officer. To be held at RB/UMIST, Theatre F14, commencing at 12.30 hours.

North Downs Centre

All lectures are to be held at the Boxley House Hotel, Boxley, Maidstone, Kent, commencing at 13.30 hours. Buffet available from 12.45 hours.

17 February 1993: *The Nuisance Call Bureau* by Paul Hamilton, NCB, Canterbury.

16 March 1993: *Tunnel Vision—Communications and the Channel Tunnel Project* by Jerry Lyne, BT Cordiale.

13 April 1993: *Private Network Business in BT* by John Bateman.

North Wales

17 February 1993: *Safety in BT is No Accident* by Ken Clark, Chief Safety Officer. To be held at The Beauchamp Hotel, Shrewsbury, commencing at 13.00 hours following a buffet.

10 March 1993: *The Cable Challenge* by Laurie Baddeley, PC Marketing Operations Manager. To be held at Whittington House, Oswestry, commencing at 14.00 hours.

Northern Ireland

Meetings will be held at the Business Centre, Dial House, commencing at 12.00 hours.

3 March 1993: *Donegal Multi-Access Subscribers Radio System* by Oliver Foley, Telecom Eireann.

7 April 1993: *The Stock Market Viewpoint* by Hilary Morrison, Vice-Chairman, Cunningham-Coates Ltd.

5 May 1993: *Private Services Organisation* by John Bateman, Product Futures Manager.

IBTE

Severnside Centre
All lectures will be held in the 6th Floor Conference Room, Mercury House, Bond Street, Bristol commencing at 14.15 hours.

3 March 1993: *The Cable Challenge* by Mr. L. Baddeley, PC Marketing Manager Wales and West.

7 April 1993: *ISDN* by Mr. D. Mansell, ISDN 30 Project Manager.

South Downs Centre
All lectures will take place at the Lecture Theatre, Worthing Central Library, Richmond Road, Worthing, and commence at 12.45 hours. Buffet lunch from noon.

9 March 1993: *Syncordia. A Global Strategy* by Dick Lechmere, Syncordia Operations and Planning Manager.

Staffordshire Centre
All meetings are to take place at the BT Training College, Stone, commencing at 13.45 hours.

15 February 1993: *BT Finance—Who Does What* by Tom Leitch, Senior Management Accountant, PC Midlands.

15 March 1993: *A Worldwide Opportunity* by John Butler, Director, Policy and Planning, BT Products and Services.

Thames Valley Centre
17 February 1993: *Personal Computing Services* by Dawn Mills, Group Computing Services, Northern Home Counties. To be held in the Boardroom, Telecom House, Reading, commencing at 12.00 hours. Buffet lunch provided.

17 March 1993: *Communications for British Aerospace Farnborough* by Ian Fielding, Customer Systems, Leeds System Centre. To be held at the Sports and Social Club, Aldershot, commencing at 12.00 hours. Buffet lunch provided.

14 April 1993: *Facility Management / Global Services* by Gary Matcham, Quality Manager, Global Customer Services. To be held in the Boardroom, Telecom House, Reading, commencing at 12.00 hours. Buffet lunch provided.

West of Scotland Centre
17 March 1993: *BT's Finances—Myths and Realities* by Barry Romeril, BT Finance Director. To be held in Lecture Theatre 1, Herriot Watt University, Riccarton, commencing at 13.00 hours.

14 April 1993: Visit to Civil Aviation Authority, Scottish Area and Oceanic Control Centre, Atlantic House, Ayr.

Yorks and Lincs Centre
Meetings will be held at the Congreve Room, West Yorkshire Playhouse, Quarry Hill Mount, Leeds, commencing at 13.00 hours.

16 February 1993: *Vision O.N.E. (Optimised Network Evolution)* by Colin Almond, Telecommunications Systems Group, GPT Ltd.

17 March 1993: *The Computer Industry in the 90s: Parallels with BT* by Nigel Young, Digital Equipment Corporation.

21 April 1993: *The Role of Operator Service in BT* by David Ward, Head of Operations Support, Operator Services.

next issue

Articles planned for the April 1993 issue of the *Journal* include:

- Service marketing.
- ISDN standards.
- Payphone testing.
- BT's internal networks.
- Digital line-of-sight radio to an offshore platform.
- Transmission quality with advanced transmission techniques.
- BT's Telex network.
- Network Operational Principles for Third-Generation Mobile Systems
- Is the Telco Engineer an Endangered Species?

[*Editor's note*: Final contents may be subject to change.]

notes and comments

Contributions to the Journal
Contributions of articles to the *Journal* are always welcome. Anyone who feels that he or she could contribute an article (either short or long) on a telecommunications engineering- or business-related topic is invited to contact the Managing Editor at the address given below. Guidance notes for authors are available and these will be sent on request.

Field contributions
The Board of Editors is particularly keen to increase the number of field contributions published in the *Journal*. For example, novel engineering solutions to field problems could form the basis of very interesting short articles. Items of this nature would be very welcome, and potential authors are encouraged to contact the Managing Editor (see below).

Notification of Changes of Address
IBTE Members and *Journal* subscribers who change their address should ensure that they notify the *Journal* office on the address-label slip provided with every copy of the *Journal*.

All enquiries related to distribution of the *Journal* should be directed to the IBTE Administration Office (see below).

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All correspondence and enquiries relating to editorial matters and distribution of the *Journal* should be sent to: *BTE Journal* Editorial Office/ IBTE Administration Office, Post Point G012, 2-12 Gresham Street, London EC2V 7AG. (Telephone: 071-356 8050. Fax: 071-356 7942.)

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IBTE Local-Centre Contacts

The following is a list of Local-Centre contacts to whom enquiries about the Institution may be directed. Where no Membership Secretary details are shown, membership enquiries should be directed to the Local Secretary.

Centre	*Local Secretary*	*Membership Secretary*
Aberdeen	Jim Martin (0224 752688)	George Cameron (0224 752857)
East Anglia	Terry Birdseye (0702 373330)	Keith Phillips (0206 717244)
East Midlands	Dave Bostrom (0533 534212)	Ian Bethell (0602 478587)
Lancs & Cumbria	Trevor Hughes (0706 40840)	John Nicholson (0254 666237)
Liverpool	John Johnson (0925 415705)	Clive Maude (051–229 4074)
London	Mike Burgess (071–587 8147)	Peter Martin (071–492 6138)
Manchester	John Halton (061–200 9216)	
Martlesham Heath	Kevin Rose (0473 647534)	Ian Gilbert (0473 645500)
North Downs	Nick Smith (0227 474823)	
North East	Richard Jackson (091–261 3560)	
North Wales & Marches	Peter Clay (0743 274205)	
Northern Ireland	David Elliott (0232 240353)	
Scotland East	Graham Neilson (031–668 5878)	Lewis Shand (031-668 5482)
Severnside	Ian Davis (0272 206701)	Dean Shephard (0272 206457)
South Downs	Graham Lindsay (0273 222234)	
South Midlands	Jim Coley (0234 274840)	Keith Sanford (0234 274043)
South Wales	Peter Coleman (0222 691622)	Keith Voyce (0443 480033)
Staffordshire	Ray Piper (0785 813483)	Paul Field (0785 762419)
Thames Valley	Stephen Graham (0252 337104)	Dave Prout (0734 501244)
West Midlands	Gary Chattaway (0203 228396)	Paul Jervis (021–233 8162)
West Scotland	Graham Wellby (041–220 3997)	Jill Maxwell (041–220 5837)
Westward	Rob Rand (0392 212681)	Chris Gould (0392 212663)
Yorks & Lincs	Steve Wood (0532 378316)	Paul Horncastle (0532 376548)

Associate Section Zone Committee Contacts

The following is a list of Associate Section Zone contact points to whom enquiries about the Associate Section should be directed.

Zone Committee	*Contact*	*Telephone No.*
London	Peter Stevens	071–829 4541
Midland	John Sansom	0604 230635
North East	Tim Toulson	0742 708037
Northern Home Counties	Andy Edmonds	0473 645171
Northern Ireland	Brian Walker	0232 232565
North West	Phil Holt	061–600 8111
Scotland	Bill Lindsay	0382 302629
Southern Home Counties	Martyn Harvey	0424 752444
South West	David Sanders	0272 230729
Wales	Ferg Brown	0952 249886

IBTE National HelpLine — 071-356 8008

THE FEDERATION OF TELECOMMUNICATIONS ENGINEERS
OF THE EUROPEAN COMMUNITY (FITCE)

32nd European Telecommunications Congress

CALL FOR PAPERS

The 32nd FITCE Congress, which will be held in Antwerp, Belgium, from 29 August–4 September 1993, will be based on the theme:

'Broadband Networks and Services in the Europe of Tomorrow and the Impact on Residential and Business Users'

FITCE is inviting challenging papers on this theme, covering one or more of the following aspects:

- switching and transmission aspects
- local loop (fibre to the curb/home)
- applications for business users
- applications for residential users
- economical and legal aspects

If you are interested in submitting a presentation, please prepare a summary of no more than 250 words giving a clear indication of the theme and coverage of the proposed paper. The summary, which should be prepared on the standard FITCE form, should include details of your full name, place and date of birth, job function or title, company, business address and business telephone and facsimile numbers. The summary should be sent before **22 February 1993** to:

Paul Nichols, IBTE Office and Publications Manager, Post Point G012, 2–12 Gresham Street, London EC2V 7AG (Telephone: 071–356 8022; Facsimile: 071–356 7942).

Copies of the FITCE standard form are available from the above address, and will be sent on demand.

The FITCE UK representative will advise authors of selected papers during early-April 1993, after the final programme has been determined.

The full text of a selected paper, which is required by 15 May 1993, should be about 2000 words to allow for a 20 minute presentation and 10 minutes for questions and debate.

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