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Telecommunications Heritage Journal editorial address:

John Mulrane, Callystown, Clogherhead,
Co. Louth, A92 C2X8, IRELAND

E-mail: vicechair@thg.org.uk

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Chairman's Welcome

Brenden Hill

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Contents

Cover photo: Two long-standing members at Avoncroft swapmeet,
Max Flemmich, MBE, and Ian Jolly [Michael Stephenson]

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Graeme Marrett

Digital Switching

Reed switches were a necessary diversion from the pursuit of an all-electronic switching system as it had become apparent that technology needed to catch up with exchange design. However, during the 1960s engineers had abandoned the idea of electronic analogue or TDM as a basis for practical switching systems and had instead started to consider Pulse Code Modulation (PCM) as a contender.

PCM was first proposed by Paul M. Rainey, a WE engineer, but because of the delays in obtaining the patent the idea was largely ignored. In 1937, Alec Reeves, an ITT engineer working in France, patented another version. However, at the time no practical application could be found. In the early 1950s three WE engineers, Bernard M. Oliver, Claude Shannon and John R. Pierce, pooled their ideas and patents and with the advance of transistor technology were able to develop the WE T-carrier 24-channel PCM transmission system in 1961, termed T1 by the ITU. In Europe and much of the rest of the world a 32-channel version was developed by 1968 and became the ITU E1 version with 30 speech channels and 2 control channels. Each PCM channel formed a time-slot which was encoded with an 8-bit representation of the sampled speech at 64kb/s. From the mid 1960s onward, telcos started to deploy PCM in favour of traditional Frequency Division Modulation systems. In the UK the GPO installed many 24-channel systems during the 1960s and early 1970s.

In the 1960s engineers realized that PCM provided a suitable digital interface for switching, since junction connections were conveniently already in digital format. Each time-slot could, therefore, be copied and transported across a switch and then reinserted into another PCM system in any given timeslot in order to perform a full exchange switch function. Thus timeslots could be manipulated across multiple systems and if subscriber lines were also PCM encoded then a complete local exchange could be constructed.

In 1964 the Comité consultatif international télégraphique et téléphonique (CCITT, now the International Telecommunications Union, ITU) established a working group to study digital signalling in light of the work in the US. This group produced the 32-channel recommendation G711 released in 1972. In the meantime in 1968 it set up a separate study group for the application of digital signalling to subscriber lines. This was followed by the publication of the Green book in 1972 and the Orange book (working document) in 1976. The final recommendation (Yellow book) was published in 1980 as G705 as the basis for ISDN. It was offered in two versions 2B+D (2 voice channels plus 64kb data) and the Primary Rate interface which provided 30 voice channels (23 in the US) plus a 64kb data channel. Subsequently, many administrations produced their own versions; BT launched its version Integrated Digital Access on 5 June 1985. Despite its grand intentions ISDN never reached its potential. Its reliance on digital exchanges which took time to deploy ensured it entered the market late (particularly in the UK) by which time it was beaten on price for users by 56kb dial-up modems and on performance by ADSL (itself a by-product of ISDN). It remained a niche product for PBX connection and video conferencing.

In parallel with the above, there was also work being done by the CCITT on the concept of common channel signalling resulting from work done by AT&T in the US. The Americans had introduced a processor-to-processor protocol between its transit exchanges in 1976 (sometimes called SS6) which was designed to reduce network congestion. With in-band signalling (for example AC9 or AC11 in the UK) whole groups of trunks could be occupied only to find that the dialled number was busy unobtainable. With common channel, end to end signals could determine whether the call was futile without holding trunks unnecessarily. The CCITT produced a recommendation – the Q700 series – in its 1979 Yellow Book which was designated SS7. Most manufacturers integrated the standard on their SPC switches.

The French PTT's Centre national d'études des télécommunications (CNET) began researching the application of PCM to switching as early as 1962 at its laboratories in Lanion, Brittany. The research was coordinated through SOCOTEL, which included French manufacturers much as JERC did in the UK. The project to develop a digital switch was initiated as prototype Lannionais d'autocommutateur temporel à organisation numérique (PLATON) and launched in spring 1963. Early experiments with timeslot switching were carried out using a Packard-Bell PB250 mini computer. At this stage the PCM standard was not set but through liaison with the European Conference of Postal and Telecom-

Prototype E10N4 - PLATON switch [French PTT] munications Administrations (CEPT) 32 channels were adopted against the 24 of the American system. During the 1960s integrated circuits started to become more widely available and a standard was adopted for TTL logic circuits. It was now possible to build complex systems with off-the-shelf devices. PLATON finally produced a working model of a time switch with 800 lines in July 1969 and a field trial at Perros-Guirec was commenced in January 1970. A combined local-transit switch was opened in Lanion the following January. The result of all this research cumulated in the final product the CIT-Alcatel E10N4 digital switch which was designed to the French PTT requirements. Full production began in 1974 for the domestic market and the first overseas order in Egypt followed in 1975. Further international orders followed later. The first exchanges used a space switched concentrator stage between subscriber lines and the CODEC but later in the 1970s a fully digital switch started production using a Subscriber Line Interface Circuit (SLIC) which was now possible with the advent of Large Scale Integration (LSI) chips.

In order to make an internationally acceptable product development was in 1977 moved to another ITT subsidiary BTMC in Belgium. This evolved slowly into the E12 system which itself got bogged down by unnecessary digression to try to develop an all-ISDN switch. The first switch was late to market at Brecht, Belgium in 1982. ITT attempted to use this switch to enter the North American market but there were huge budgetary overruns and it finally abandoned the attempt in 1986. To some extent the E12 may have contributed to the downfall of ITT. The Belgian factory was sold to Alcatel in 1987.

Ericsson which had created a joint venture with the Swedish PTT, Televerket, called Ellemtel. Televerket which really wanted a digital switch for local consumption and did not really suit Ericsson, however the loss of a major AKE project in Australia to ITT's Metaconta put a different spin on things. Ellemtel developed an overall requirement in 1971 and a

Ericsson AXE-RSS [telefoniemuseum.nl]

detailed proposal of the design the following year. The budgetary requirement was such that Ericsson decided to abandon further AKE development and concentrate on what would become its AXE switch.

AXE used a Time-Space-Time main switching matrix which in its first iteration used reed relays in a configuration not unlike the Philips' PRX. The system consisted of a reedswitch subscriber line concentrator matrix, a time space time switch (TST) on which was terminated incoming E1 PCM carrier circuits, two main processors and a number of regional processors controlling each subsystem. The first installation was at Södertälje, Sweden in 1976. However, the following year as a result of intense work by Ericssons development team LSI based SLIC's became available and the CODEC was moved to the subscriber side thus the reed switches were replaced by solid state switches and by 1978 the fully finished production model was available.

Siemens WSD [Siemens]

In Germany Siemens had some experience with SPC derived from their successful EWS space switch. The EWS had proved to be a great success and it was with great surprise that in 1979 DB announced that it wanted a fully digital network and would no longer purchase EWS . Fortunately Siemens had begun development of a digital switch in 1975 which it named Elektronisches Wählsystem Digital (EWSD). With its experience of SPC and the availability of the processors from the EWS the migration to digital was reasonably smooth. Siemens followed other manufacturers in developing an LSI SLIC which reduced the switch footprint and removed the need for reedswitches. For Siemens the surprise was that for the first time DB went out to open tender and thus it found itself competing with overseas suppliers. Nevertheless, EWSD was finally selected by DB and a major contract followed. EWSD went on to be one of the most successful digital switches worldwide with around 160M lines. In the US AT&T began to work on a digital switch as early as 1966 when someone in Bell labs observed that PCM was being widely deployed, however it was not until 1968 that it was perceived that such a switch may have economic benefits. Until then the No 4 Crossbar tandem (toll) switch had served well. Development began in Naperville in 1970 under the direction of Henry Earle Vaughan. A specification was drawn up and it was decided that a new more powerful processor would be required than that used in the No1 ESS. This became the No1A processor and was deployed also in the No 1A ESS during the 1970s. Nevertheless, development work took some time and it was decided in 1972 to use a solid state TST for the core matrix. The switch would enable the direct connection of PCM absolving the need to have digital to analogue con-

Lucent 5ESS used in a mobile netork [PD]

version as in the current crossbar transit switches. The first switch was commissioned in Chicago in 1976.

Development work on a subscriber line system did not begin in earnest until the mid 1970s and grew out of the improved processors now being used in the No 1A ESS and No 4 ESS which enabled a powerful and cost effective processing solution. Early versions of the No 5 ESS used AT&T's own gated diode crosspoint (GDX) switch to concentrate the subscriber loops onto the first digital stage CODEC, thence to the core TST switch. The GDX was not an ideal solution as the semiconductor was 'leaky' compared to a reedswitch although it was space saving. The first example of the 5ESS was installed in Seneca, Illinois on March 25, 1982. However, it was not until the late 1980s that 5ESS incorporated SLICs into the design and upgraded to a fully digital subscriber line concentration stage to connect to the core Time-Space-Time (TST) switch. For the first time in many years, AT&T decided to tackle the export market with 5ESS and entered a joint venture with Philips, which abandoned further development of its PRX D digital switch, to convert the switch to 32 channel PCM. It met with limited export success and supplied a small number of examples to BT, notably for the upgrade of the 0800 Freefone service.

In the UK, despite Tommy Flowers' early pioneering work with Colossus, after the development of Highgate Wood he became convinced that the development of software to control switching was far too complex. Highgate Wood had been developed along the lines of an electromechanical system with complex circuits effectively doing the work of relays. Flowers' view became the accepted wisdom within Dollis Hill and although development work on electronic switching continued throughout the 1960s, there was no consideration of SPC. Had anyone at Dollis Hill wondered how the Americans, Canadians, Dutch, French, Germans, Japanese and Swedes had overcome this complexity? We shall likely never know the answer. The result of the GPO research following this was the fully digital exchange Empress, installed near Earls Court, London and opened on 11 September 1968. Empress was a tandem exchange based on 24-channel PCM which the GPO had been deploying since the early 60s and thus did not have the additional complexity of a subscriber switch. Empress was entirely a hard-wired logic switch and was a one-off.

At around the same time as Empress was commissioned Tommy Flowers retired and his successor was Roy Harris who almost immediately went on two years sick leave. At the same time the Monopolies and Mergers Commission ordered the disbandment of the Bulk Supply Agreement (also known as 'the ring' incorporating the main manufacturers) and thus JERC collapsed leaving further TXE4 development unfinished and only some four years later did it resume. In Harris' absence research was split into two teams under Nick Martin and Charles Hughes. In this chaos somewhere within Dollis Hill SPC interest was revised and experimental work was undertaken using a Honeywell 516 commercial computer.

Meanwhile Harris returned to work in 1970 and instead of resuming his previous post was now asked to set up a new development group with the manufacturers to replace JERC. This was entitled the rather vague Advisory Group on System Definition (AGAD). This quickly morphed into a number of committees and subgroups that started debating what a future switch would look like. Thus it was at this stage that the term System X was born – X because it was unknown. Originally System X

Empress exchange [BT Archives]

became something of a joke, but the management called the nay-sayers bluff and actually adopted the name for the new switch. All these groups rapidly descended into a talking shop. The manufacturers were highly sceptical of the GPO's agenda and wary of each other, in particular Plessey and GEC were suspicious of STC as another ITT subsidiary in Belgium was known to have a working model of an SPC digital switch. Thus between 1970 and 1974 little resulted from the countless meetings. Discussions centred around the previous philosophy of hardware oriented functionality and so there was virtually no consideration of processors and software design.

All this was exacerbated by the impending move of the research group from Dollis Hill to Martlesham Heath in Suffolk. Finally, in April 1972, it was decided that a specific processor should be selected in order that the software architecture could be defined. The arrangement of processors was also considered; should there be a central control or multi-processors controlling sub-systems? Research was carried out to assess the suitability of commercially available systems and the outcome was that none appeared to have the reliability necessary for a telecommunications system. A processor selection committee was set up to determine the way forward. It was known that GEC already had the Mk 1P working in London sector exchanges and was working on its improved 2BL multi-processor. Plessey had developed its System 250 multiprocessor which was already deployed in the Ptarmigan battlefield communications system. For reasons that are unclear the committee opted for the GEC processor despite the fact that it only existed on paper.

In April 1974 GPO senior management decided to kickstart the project and created the new TSSD (Telecommunications Systems Strategy Division) headed up by Harris. Work started in defining the system in more detail and it was decided to divide development between the manufacturers. The mutual distrust between the manufacturers ensured that it took a further two years to finalize the legal contracts between them and the GPO. Thus it was not until 1976 that the real work began. The division of the work meant that it was spread over 9 different sites and all were working on software that was to be run on an as yet unready processor. Moreover, the discord between all the partners ensured that progress was glacially slow and TSSD had little control over the project. As with all large software projects it was becoming behind schedule and the answer adopted by the participants was to employ more and more programmers which resulted in diminishing returns. One of the reasons expounded by the GPO for the lateness of the project was that there was a shortage of programmers. However, in the end System X consumed by an order of magnitude more time than Ericsson and other manufacturers elsewhere had needed. It was clear that the GPO's failure to recognize in the early 1960s the importance of developing SPC had cost it dear. It is estimated that the total effort amounted to more that 3000 man years, compared to 5ESS 300 man years and AXE 100 man years. The financial cost bourne entirely by the GPO (and hence its subscribers) was estimated to be £1B.

System X finally became a reality when the first switch was opened at Baynard House, London on 1 July 1980 as a tandem exchange, hence no subscribe line complexity. The first local unit was commissioned the following year at Woodbridge, Suffolk. These extended delays did at least mean that System X missed the early reed matrix subscriber concentrator stage needed in other systems. STC withdrew from the project in 1982 to concentrate on TXE4 for which it had an exclusive agreement with the GPO. System X was both too late and too expensive to be successful at export, indeed its only successes were for the Channel Islands administrations and Colombia.

Thus the fundamental design of PCM digital switching was conceived. Thereafter all digital switches were basically the same, the only differences were in the method of control (software, configuration of processors, etc). Most early switches used an analogue subscriber concentration stage until LSI had advanced sufficiently to economically introduce the ubiquitous SLIC. The North Americans of course used 24-Channel PCM (T1) while elsewhere 30-Chan-

Typical System X exchange [BT]

nel PCM (E1) was the standard. Similar technology was used in mobile switches.

There were many other digital switches developed and introduced during the 1970s and 1980s. Some notable systems include Northern Telecom with its DMS 100 introduced in 1979 and GTE its No 5 EAX introduced 1982. In Japan NTT introduced its D70 digital switch for the domestic market but each telecom company produced a digital switch, Fujtsu's Fetex 150 and NEC NEAX 61 being among the most successful exports. Digital switches for public switching were manufactured in Korea and India among others.

Conclusion

This brings us to the end of evolution of telephone switching in the copper world. Modern developments are based around the so-called SoftSwitch principle which is a type of packet switch. The world of telephony has come full circle with the subscriber equipment once again requiring local power.

There was much talk during the 1980s and 1990s of computer-telephony integration. The surprise was that Ethernet should be the winner. Originally conceived by Xerox in 1973 largely by Robert Metcalfe. As usual Xerox failed to see the potential of its product and thus Metcalfe left Xerox to join the Digital Equipment Corporation (DEC) which promoted it as a serious competitor to IBM's Token Ring. Ethernet initially was considered a best-efforts medium as its simplicity led to data loss due to 'collision' which was when two or more computers attempted to send data simultaneously over the shared bus. This drawback was eliminated by the introduction of switches giving each computer a separate link. Ethernet was still a first-come, first-served medium a feature which could be problematic for real time applications such as speech. As microprocessor technology developed it became possible to speed up the network and still allow for each packet to be examined for routing data and internal flags. This allowed prioritising data packets to ensure such data was dealt with first. This article does not intend to give a full description of packet switching but information can be easily found on the web.

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-

BT Group announces sale of BT Tower to MCR Hotels

Press release

BT Group has agreed to the sale of the BT Tower for £275m to MCR Hotels, who plan to preserve BT Tower as an iconic hotel, securing its place as a London landmark for the future.

As the UK heads rapidly into an all-digital future, a number of network operations that were traditionally provided from BT Tower are now delivered via BT Group's fixed and mobile networks. For example, the Tower's microwave aerials were removed more than a decade ago, as they were no longer needed to carry telecommunications traffic from London to the rest of the country.

The BT Tower has long been an important site for BT Group's Media & Broadcast business, as one of the key global interchange points for live television. As part of its long-term strategy, the Media & Broadcast division has already been migrating services onto its cloud-based platform, which will allow a more straightforward move to more modern and efficient premises. This will enable the division to continue to sit at the heart of UK and global media distribution.

Brent Mathews, Property Director, BT Group said: "The BT Tower sits at the heart of London and we've been immensely proud to be the owners of this important landmark since 1984. It's played a vital role in carrying the nation's calls, messages and TV signals, but increasingly we're delivering content and communication via other means. This deal with MCR will enable BT Tower to take on a new purpose, preserving this iconic building for decades to come."

Tyler Morse, CEO and owner of MCR Hotels, said: "We are proud to preserve this beloved building and will work to develop proposals to tell its story as an iconic hotel, opening its doors for generations to enjoy."

The tower at night [BT]

Linked numbering systems

John Buckley

Linked numbering

Years ago, most of the country's approximately six thousand telephone exchanges had numbers consisting of an exchange name and a two- to five-digit number, or even a single digit number at some manual exchanges. To dial from one exchange to another, where this was possible (remember that only local calls could be dialled before 1958), it was necessary to look up a dialling code for the name of the exchange you wanted. Dialling codes varied from place to place, so there was no one code for any one place. In this context, there grew a need for urban linked numbering systems. Big towns and cities needed them when they were served by multiple exchanges, and the exchange area boundaries were neither intuitive nor obvious to people. These systems had co-ordinated numbering across a group of exchanges, so that you dialled the same digits regardless of which was your exchange; the linked numbering system behaved as though it were a single exchange.

For example, here is the linked numbering system of Blackburn in the 1960s.

2xxxx Pleasington
3xxxx Accrington
4xxxx Wilpshire
5xxxx Blackburn
6xxxx Blackburn (growth)
7xxxx Darwen

To a present-day mind, this idea must seem obvious. With modern exchanges, linked numbering is ubiquitous and unremarkable: a numbering scheme is simply a matter of what one puts in the data build and data fill of the exchanges. However, with Strowger exchanges, linked numbering was difficult to engineer, and that is why it is historically interesting. At main exchanges, in this case Blackburn, linked numbering was of course straightforward. The levels of the first selector led to junctions to the relevant satellite exchanges. One of the levels, 5 in this case, was the local level leading to second selectors at the main exchange. However, what about the satellites? How did they engineer linked numbering there?

Group selector satellite working

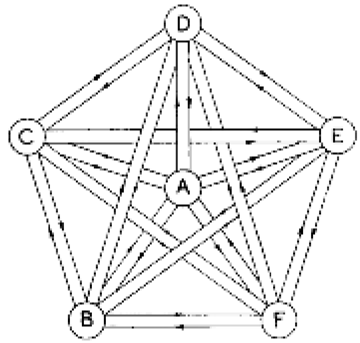


FIG. 363. MULTI-EXCHANGE AREA WITH DIRECT ROUTES BETWEEN EXCHANGES

Group selector satellite scheme

There were five solutions, and the first is obvious, the "group selector" method. Each satellite replicated the configuration at the main exchange. The first selector gave access to the other satellites, and so there was full interconnection of all the exchanges. This became the standard method by the 1960s and was the method used for Accrington and Darwen in the Blackburn system. Before the 1960s, however, there was a serious issue of network economics working against this solution. You cannot efficiently load small routes carrying small amounts of traffic, such as would be the case between the different satellites. Given the high cost of transmission in the 1920 and 1930s it was worth paying the price (of course there were costs) of concentrating the traffic between satellites by switching it through the central point. The key issue was then how to do that with Strowger exchanges, given that each digit and the information it contained was available once, and once only, to step a ten-way switch.

Exchange	Code	Exchange	Code	Exchange	Code
Aberford	92832	Garforth	92831	Meltham	9785
Addingham	946	Guiseley	942	Menston	942
Arthington	988	Halifax	96	Milnsbridge ★	930
Barwick-in-Elmet	92839	Harewood	92836	Mirfield	958
		Haworth	934		
Batley ★	954	Hebden Bridge ★	9688	Morley	955
Bingley	89	Heckmondwike ★	989	Normanton	95188
Blubberhouses	947	High Flatts	9788	Ossett ★	948
Bretton ★	959	Holmfirth ★	949	Otley	944
Brighouse ★	987	Honley as for Huddersfield		Pudsey	981
Burley-in-Wharfedale	945	Horbury ★	95181	Queensbury	838
Calder Valley	986	Horsforth	984	Rawdon	983
Cleckheaton	832	Huddersfield	97	Ripponden	9689
Crofton	95186	Idle ★	81	Rothwell	92834
Cross Hills	933	Ilkley ★	851	Skelmanthorpe	980
Cullingworth	936	Keighley	80	Slaithwaite	950
Denholme	837	Kirkburton	9783	Stainland	9686
Dewsbury ★	959	Leeds	92	Steeton	935
Drighlington	985	Lofthouse Gate	95187	Thorner	92833
Elland	957	Lothersdale	937	Thornton	839
Flockton ★	959	Marsden	9787	Wakefield	951

BRADFORD OR SHIPLEY   February 1964   P.T.O.

Typical dialling code card

Full satellite working

The second solution was the "full satellite exchange" method, crudely known as "tromboning". All calls starting at a satellite went unconditionally to the main exchange. The rest is obvious; own exchange calls at the satellite required a second junction back from the central exchange. As this was wasteful of transmission, the method was viable only at small satel-

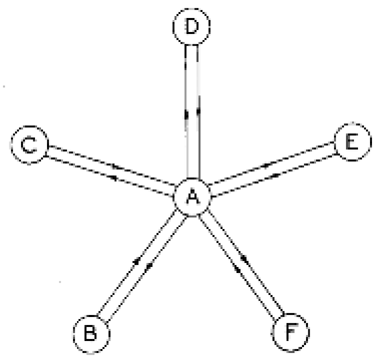


FIG. 364. MULTI-EXCHANGE AREA WITH MAIN EXCHANGE SERVING AS TANDEM SWITCHING POINT FOR SATELLITE-TO-SATELLITE TRAFFIC

Trombone working

lites with little own-exchange traffic. Full satellite exchanges were for this reason rare. Late examples in the early 1960s were I believe Castleton, Milnrow and Norden exchanges (closed in the later 1960s) in the Rochdale linked numbering system. It is interesting to note that nowadays, network economics are different beyond recognition from distant decades, and tromboning is inherent in the operation of the digital remote concentrators that now serve most exchange sites.

Discriminating-selector-repeater (DSR) satellites

The third solution, introduced for early linked numbering systems with pre-2000 Strowger equipment, was the "discriminating-selector-repeater" (DSR) technique. A modified selector at the satellite had an associated junction hunter which engaged a route to the main exchange before returning dial tone. The dialled digits stepped both the local 1st selector and that at the main exchange in parallel. Relays in the DSR detected if the local digit had been dialled, and if so, "local discrimination" took place: the link to the central exchange was dropped and the call continued locally. Typically, the local 1st selector restored and continued to function as a 2nd selector to complete the call. If local discrimination did not take place, then the call continued over the junction and via the main exchange. This was an effective solution, though the price was the artificial junction occupancy during the set-up phase of own-exchange calls, and the added costs of having specialised equipment at the satellite. This technique has been surprisingly long-lived in both public and private networks. It formed the basis of linked numbering at adapted UAX13's in the 1970s and 1980s, and at the TXE2 reed relay local exchanges.

Type 2000 discriminator satellites

The fourth solution, the discriminator satellite method, was introduced at the time of the 2000-type Strowger equipment. Pleasington and Wilpshire used this method in the Blackburn system. Like the DSR, this solution relied on specialised equipment at the satellites. It used common equipment, that is a unit associated with the 1st selector at the satellite but only during the set-up phase of a call, after which it became available for another call. The 1st selector had a discriminator hunter to find a free discriminator, after the finding of which it returned dial tone. The discriminator stored the dialled number and examined the early digits. If the discriminator detected the local digit, local discrimination took place, and the remaining digits were repeated to the selector which functioned as a 2nd selector to complete the call. If non-local discrimination took place, the selector stepped to a pre-defined junction hunting level to find a link to the main exchange, after which the entire dialled number was forwarded. Discriminator working introduced a post-dialling delay.

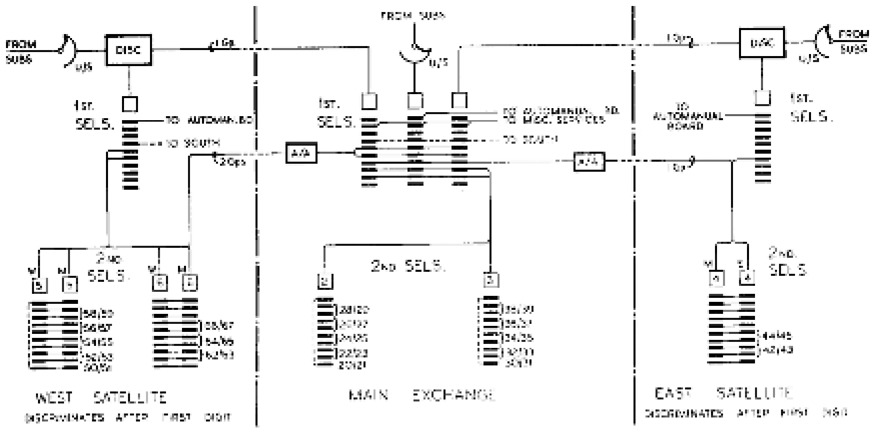


Fig. 367. Satellite Scheme with Discrimination Facilities

Partial interconnection

The DSR and discriminator techniques were tolerant of partial interconnection, where a satellite had a link or links to others but not all the satellites. This was neither common nor intended to be common, but where this happened, levels of the satellite first selector were taken up for accessing these routes, reducing overall numbering capacity.

5- and 6-digit working

The standard 5-digit linked numbering system such as shown at Blackburn could support only six exchanges, given the reservation of initial digits 1, 8, 9, and zero, or only five if as at Blackburn a level was reserved for main exchange growth. If one wanted more satellites than this, there was a problem to be solved. Historically, this was handled by "level sharing", once common but becoming rarer by the 1960s. The Bolton linked numbering system was an extant example with the Daubhill satellite on 61xxx – 64xxx, and Horwich on 66xxx – 68xxx. Very few satellites in the early era used anything like the

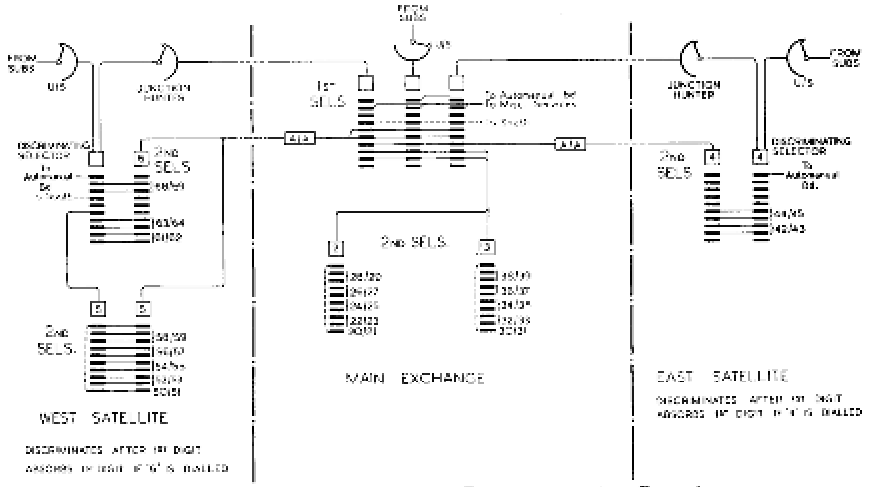


Fig. 368. Satellite Trunking Scheme with Discrimination and Digit Absorption

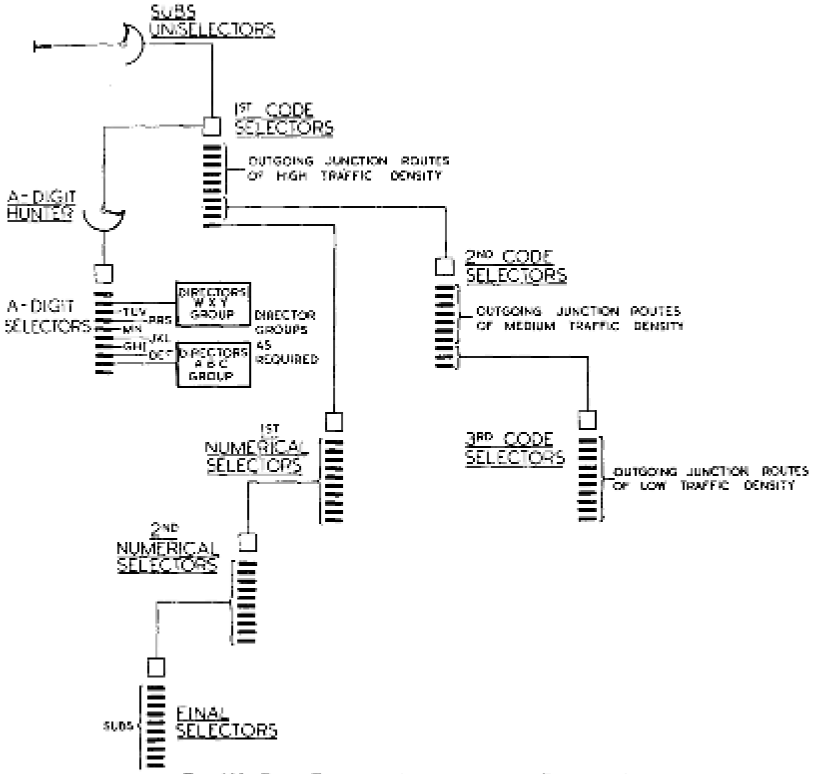


FIG. 392. BASIC TRUNKING ARRANGEMENTS OF DIRECTOR EXCHANGE

10,000 number capacity of a five-digit first selector level, hence this method. With rapid growth from the 1950s, level sharing entailed the risk of needing to reorganise numbers too often. This led inevitably to 6-digit numbering, starting with the Leeds Moortown satellite in 1952. DSR and discriminator systems could handle 6-digit numbers, and the need to examine two digits to perform local discrimination. Fourteen, one in six, of the 85 linked numberings systems had 6-digit numbering for at least one satellite by 1970.

Director working

The fifth and last approach to linked numbering was a heavyweight solution, using full number translation. Like the discriminator, the director system used common equipment, in this case a register-translator known as a "Director". The director system had 7-digit numbers, presented to customers as the first three letters of an exchange name, then a 4-digit number. Dial tone was returned when the 1st selector, known as a "1st code selector", had located a free director, which stored all digits dialled. The first three "code" digits were translated into a routing code which was pulsed out to reach the required exchange, then the four so-called "numerical" digits were regenerated. The director system introduced a post-dialling delay. The system was very flexible, preserving the dialled numbers not only from variation from place to place, but also buffering them against variation over time as junction and tandem exchange networks were reorganised. The director system was employed in London from 1927, then for Manchester (1930), Birmingham (1931), Glasgow (1937), Liverpool (1941) and Edinburgh (1950).

Exchange naming

Director areas apart, the general idea of linked numbering was to make a linked numbering system look like and behave like a single exchange. Accordingly, the separate identities of the satellite exchanges were usually concealed under a common group name such as "Leeds". In 24 systems however, for example Blackburn, Middlesborough and Newcastle upon Tyne, some satellites kept their separate exchange names at places where the group name might have been too confusing or have offended local sensitivity. For outgoing and incoming local dialling codes, linked numbering systems generally behaved as a unity. Where direct routes called for differentiated codes for different satellites, then their exchange names had of course to be distinct. This was rare, but happened at Wolverhampton with Bilston, and at Leamington Spa with Warwick and Kenilworth.

Concluding thoughts

Up to the 1960s, the UK network had six metropolitan director areas containing about 450 exchange units, and about 375 exchanges in 85 non-director linked numbering systems. 25 of these had only two exchanges (one satellite), a further 25 had three or four while 24 had five or six. Of the remainder of the bigger ones, the largest, Newcastle upon Tyne, had 16 exchanges. These systems were mostly to be found in the industrial heartlands of the North and Midlands, and regional centres elsewhere. They were notably missing around the fringes of London because linked numbering in the periphery of a director area exerted constraints on numbering within the director area. The 1970s ushered in a new era with rapid growth and exchange modernisation, and a linked numbering system under every area code became standard policy. This was achieved substantially by 1990 and completely by 1995 with the closure of the last Strowger exchanges, Crawford, Crawfordjohn and Elvanfoot in upper Clydesdale on June 23rd of that year.

Reference

The diagrams are taken from: Telephony, Atkinson J., Pitman London,1950, Vol 2.

The Lego Phone Box

Richard Haydon

The Lego Phone Box, introduced in the Spring 2024 Journal, has now been purchased and completed. I hope the photos will give you an idea of what a nice model this is and what to expect if you decide to purchase one yourself.

The set comes in 11 bags plus some extra parts along with an instruction manual and a set of stickers to apply during the build.

Starting with Bag 1, I empty the contents on to a tray and then just follow the instructions in the manual. At each stage you are told which pieces are required and how to assemble them. This is very much a "traditional" Lego build and is really not that challenging.

Working your way through the bags you will get to the stage where you need to decide if you want the interior to have the old "A-B" box or the more modern style with the push button keypad. Being of on age that remembers the old "A-B" boxes I have chosen to model this. It is a shame that they have not been able to include a dial on the telephone although it would be a very small sticker to try to apply if they did.

With the interior completed and stickers applied (a fiddly job which I do not enjoy) the box itself will be completed at which point it is time to start the base that it will stand on with the lamp post, railings, flowers, etc.

Once completed the telephone box can be placed on the base to form what I think is a nice little diorama.

A nice touch is the interior light which is operated by pressing a discreet button in the middle of the roof.

So, what is good and what is not with this model. I don't like the door handle, it is far too big and completely the wrong shape, however you do have to bear in mind that whilst Lego do create special bricks for certain models they very often use a stock brick which is what I think they have done here. The eagle eyed amongst you will also notice that there are only 5 rows of windows where there should be 6. Lego have used a standard window and 6 rows of them would

have made the model too large so a compromise was made. At the end of the day a Lego model never tries to be an exact replica of the original but a representation in bricks and I think they have achieved this with the K2 phone box.

Is it worth the price of £99.99? I think so, Lego models are expensive, but they do have a second-hand value – particularly if you don't build them! I bought the Lego Appollo Saturn 5 Rocket in May 2022 for £104.99. For some reason I've never got round to building it and it is still sealed in it's box. After a few years of production Lego "retire" their models at which point they are only available on the secondary market, the Saturn 5 was retired a while back and is now selling for around £200.00!

Finally, THG member Mike Fletcher sent me a photo of his completed model, he splashed out a further £21.99 on a lighting kit from "Game of Bricks" which adds lights around the "telephone" signs and in the streetlamp and road sign.

If I have inspired you to have a go at building this model it is available online from the Lego store https://www.lego.com/en-gb/product/red-london-telephone-box-21347 or have a look on Ebay where there are plenty of offers including pre-owned ones. I have found a place for mine next to the telephone extensions from my CB935 2+4.

PABX1 5/24 with a cordless switchboard

Brenden Hill

Brenden has owned Strowger equipment for some time. Here he describes his experiences with a new acquisition, a PABX 1.

Introduction

For many years I have had an interest in Strowger-based switching systems which first started when I joined British Telecom as an apprentice in 1981.

This interest has continued and in recent years I have become the custodian of some Strowger equipment, which includes a UAX13, Director and Non-Director equipment.

Acquisition

In 2022 I had the opportunity of acquiring a PABX1 where the then current owner wanted to move it on to a new home. A number of THG members advised me that this was an opportunity not to miss, and a deal was done to secure the PABX1. I drove over to the current owner's home, and, with the help of some other THG members, it was loaded into a suitable van for the drive home and moved into my garage. The PABX1 came with a full set of original diagrams & notes, plus some spare relay sets and connecting circuits (selectors), although some of these had to be cannibalised to keep others serviceable.

PABX 1 history

The PABX1 originated from the early 1950s and was the desire by the GPO to standardize the design of PABXs which it offered, with the output being PABX1, 2 and 3. The PABX1 was offered as either a 4+15, 5+24, 7+35 or a 10+49. The first number being the number of exchange lines, and the second the number of extension line circuits. There was also a Manual extension line circuit, inter-switchboard line circuits, level "0" and Enquiry circuits. All of these increased the use and functionality of the PABX, which was further enhanced by the cordless switchboard, which could be wired into the PABX1 to provide operator services.

From a design perspective much of the circuit operation follows conventional GPO Strowger practice. The main departure from previous designs is found with the cordless working and the inclusion of special features such as enquiry transfer, ring when free and night service. The Connecting circuits consist of 2000-type two-motion selectors with associated 50-point uniselectors working as line finders. Relays are of standard 600 and 3000 type design, with the only unusual one being a vibrating relay in the ring and tone circuit.

Numbering Scheme

The numbering scheme is as follows:

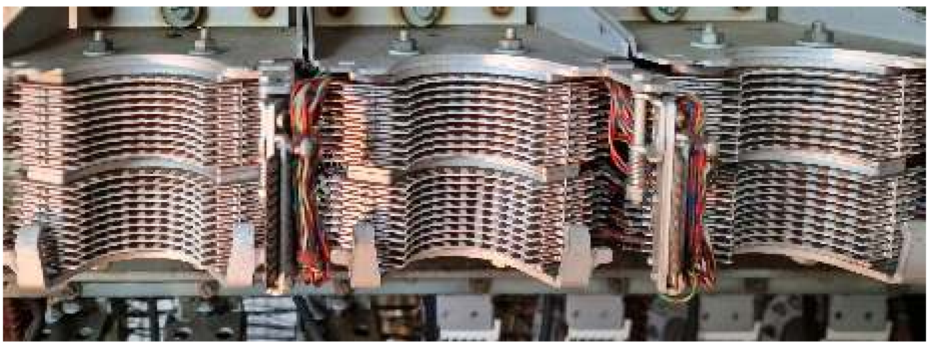
The extensions are numbered 21 to 69, with level 1 being left spare.

7 - is the direct access to inter switchboard lines

8 - Night Service, with access to incoming lines and inter switchboard calls.

9 - Direct access to main exchange, ie outgoing calls over the PSTN

0 – Operator



Switch banks

Operation

For the basic outline of the circuits, the connecting circuits provide a discriminating point and control the routing of the call. The first free connecting circuit will be seized, but the first free choice is continuously changed, which ensures that use and wear is spread across them. For outgoing calls the Connecting circuit initially acts as a discriminator causing a free exchange finder to find the calling extension. Once the calling extension has been found, then the Connecting circuit releases, leaving the outgoing call connected directly. For manual calls these are under control of the operator using the cordless switchboard.

Provenance

Moving back to the current time I don't have any history on where my PABX1 was first installed, subsequent years of service, and ultimate preservation. It is dated 1965 with the permanent relay sets being Battleship Grey and Connecting circuits being much later and in Light Straw.

Challenge

The first challenge was to mount the main cabinet onto the plinth, which had previously taken four people to achieve. With one of my sons and some planks of wood I was able to slowly raise the height of the cabinet until it could be slid off the wooden planks and onto the plinth.

Having never worked on a PABX1, I decided to read up on how it worked and importantly how to wire up extensions and exchange lines. Once I completed this I gave the whole unit a good clean, removing some 60 years of dust and grime. Overall it was in good condition with only some minor corrosion to the iron work. With seven Connector circuits to choose from and four bank positions, I selected the best four to be cleaned up and lubricated. For the three remaining selectors they had either missing relays or some open-circuit coils. Fortunately a few years

Relays and finders


Switch relays (Left) Exchange line relays (right)

before I had been given a couple of dropped selectors, where the relays were serviceable, and this yielded sufficient coils to repair the remaining three.

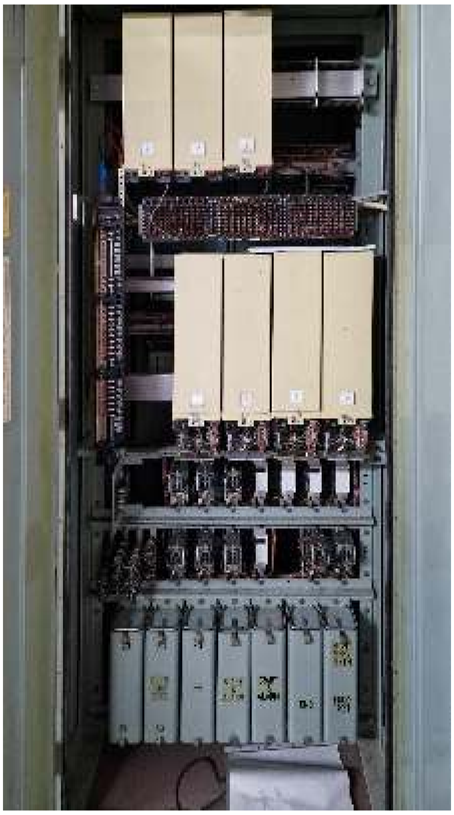
First test

Once I had provided some power onto the PABX1 and connected a couple of extensions, I was able to see what worked and what didn’t. From initial checks it worked with few issues, so it was time to wire up some exchange lines to my UAX13. The PABX1 came with three exchange relay sets, although one had a broken test jack which was easily repaired. Consulting the diagram notes, it stated that if connecting to a UAX13, the earth on one of the K relay contacts needed to be sleeved out, as the PABX1 was earth calling. I was then able to dial 9, where the Connecting circuit found a free Exchange line finder and then released. I was then presented with dial tone from my UAX13 and I was able to dial the relevant number.

Switchboard

My attention then moved to the cordless switchboard which although complete was very dirty and a few of the coloured ovals were missing. I cleaned up the U points which are mounted on the base and searched through my selection of cable to connect it up to the tag blocks on the front of the PABX1. Initial checks have confirmed that I can dial into the PABX, and that the marker circuits work for transferring calls. I do need to work through a few faults, which will be done during 2024.


Rack empty


Rack filled

TNET-Plus and Data Communications Networks

Terry Idle, Martin Kennedy & Edward Smith

Introduction

In the mid-1980s the communications industry was faced with a challenge in how to most efficiently meet customer needs in the advent of privatisation. Within BT, it was rapidly understood that a more integrated and coherent computer system was needed to achieve this, but this led to the challenge of how to provide operatives with access to the new and legacy systems, without a proliferation of terminal devices on their desks.

We will explain, the technical difficulties involved and how they were resolved. Although many of the technologies involved have since passed into obsolescence; one technology, which at the time was highly novel, has evolved into a position of some prominence in the modern telecommunications world. This is Ethernet, which at the time looked very different to the modern implementation.

The paper will first look at the challenges involved in connecting together different computer systems and how they were resolved. We will then spend some time looking at the implementation of Ethernet used. Finally we consider how the technological solution evolved as a product.

Technical Background

Like most communications architectures, the functions provided in data communications architectures, were arranged in a number of layers: at the time that T-NET Plus was devised, a seven layer approach was utilised with rival offerings coming from IBM with their Systems Network Architecture (SNA) and the International Standards Organisation with their seven layer Open Systems Interconnect (OSI) seven layer architecture. At the time OSI was being adopted by the bulk of the computer industry as part of their own proprietary architectures, with IBM championing the cause of SNA. An overview of the two models is provided in Figure 1. BT's new Customer Support Service (CSS) was to be provided on a combination of IBM and ICL computer mainframe systems.

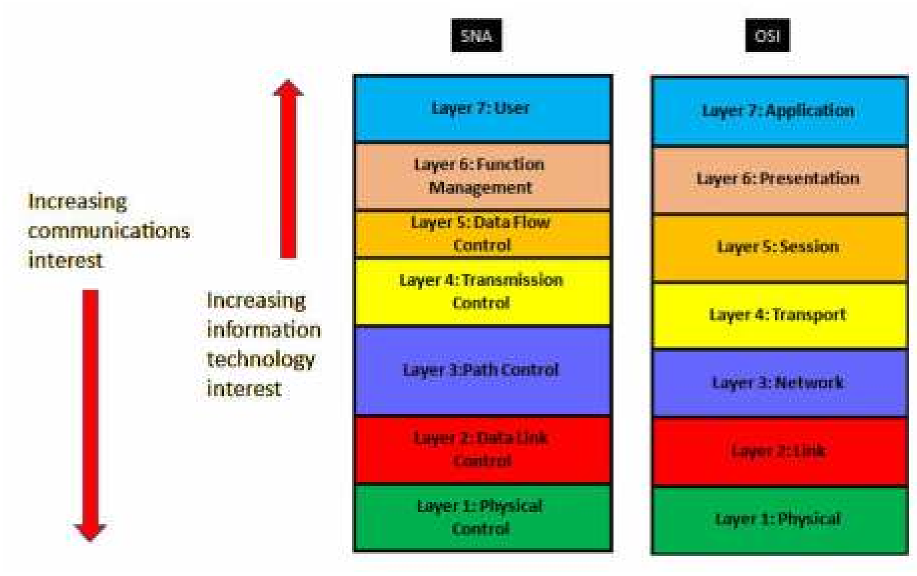


Fig. 1 – Comparing the OSI and SNA protocol stacks

The SNA and OSI protocols were completely different; however the functionality to be provided by the 7 layers was broadly similar this, being:

- Layer 7 – governs the interface to the application
- Layer 6 – describes how information is presented within the protocol flow
- Layer 5 – concerning the management of information flow between application elements
- Layer 4 – defines the management and sequencing of data flows across the computer network.
- Layer 3 – states how information is directed between end points across different network elements.
- Layer 2 – governs the transfer of information between two directly connected network entities at the logical level.
- Layer 1 – describes the physical transfer of information across a communications link at the electrical level.

To achieve connectivity between user terminals and the disparate systems involved, the most visible inconsistencies to be managed were:

- The widely differing protocol standards used across the target computer ranges
- How information flow was to be managed across the network
- The different screen presentation standard to be used by different vendors.

The Technical Solution

The technical solution was a joint effort between BT and the Digital Equipment Corporation (DEC) and implementation was carried out by a project team of about 30 people, with the high level design coming from BT and DEC contributing strongly to the low level design and being crucial to the implementation. The BT team drew in expertise from diverse divisions including: BT Labs at Martlesham, CSS and DPE (Data Processing Executive), Business Systems, BT Applied Technology (Leeds) and Mid-Yorkshire District (the organisation chosen for the initial implementation). A schematic of the solution is shown in Figure 2.

The main work horse of the System was the DEC MicroVAX 2, shown in Figure 3, with about 100 MicroVAXes deployed on the Mid-Yorkshire District implementation. The MicroVAX was a 32 bit microcomputer, which could perform a range of functions depending on the software loaded. Asynchronous computer terminals were directly cabled to V24 ports on DEC terminal servers.

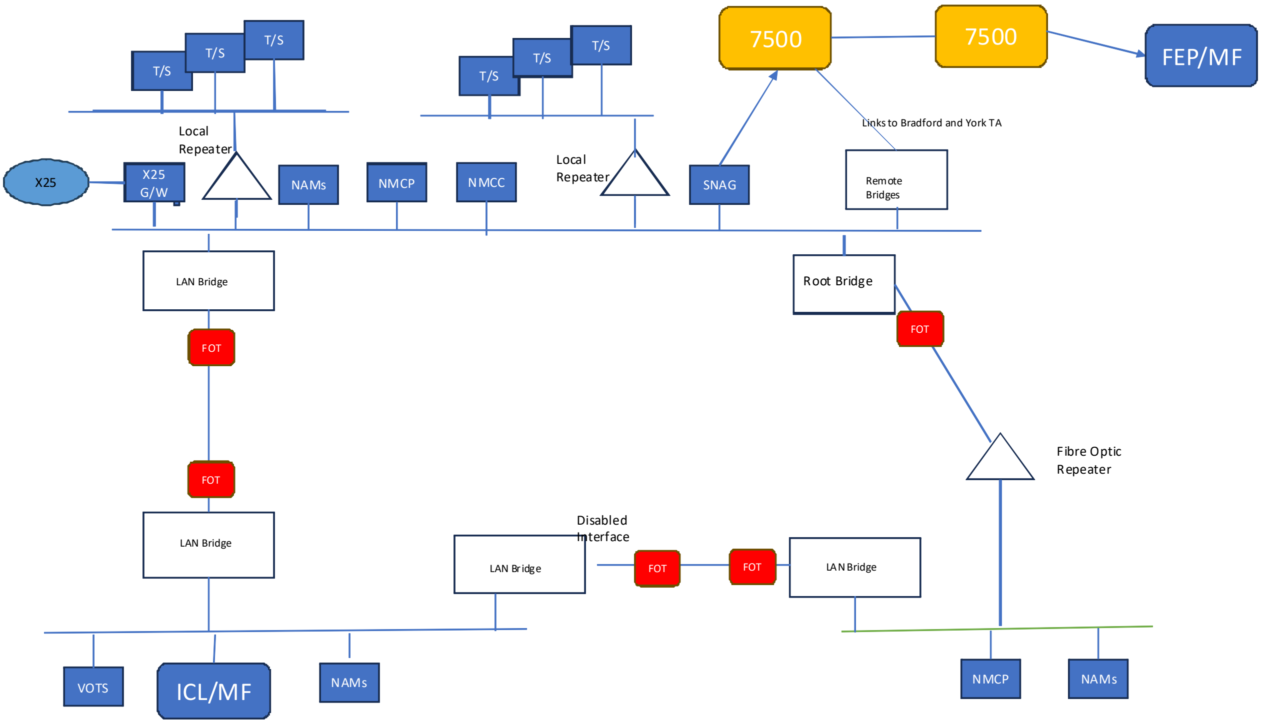


Fig. 2 – T-NET Plus Schematic

Figure 3 – the DEC MicroVAX 2 [robs-old-computers.com]

The terminal servers were attached to the Ethernet Cable using Beesting attached transceivers (although it was not used in the project, we illustrate the principles of the transceiver using the Cabletron device shown in Figure 8). The Terminal servers used the DEC propriety Ethernet Local Area Transport (LAT) protocol to communicate with DEC hosts. Asynchronous printers were also connected to Terminal Server ports, the hosts utilising a technique known as reverse LAT to connect to these ports, enabling the host to direct print queues to the printers. The majority of connections between the DEC MicroVAXes and Gateways used DEC's proprietary DECnet Ethernet protocol. The gateways provided protocol conversion from DECnet protocols to SNA protocols for IBM mainframe access, DECnet to X25 protocols for access to remote small offices using a private X25 network, and DECNet to VOTS (VAX OSI Transport Service) for ICL mainframe access. This OSI software was implemented on a MicroVAX, and provided an OSI layer 4 interface to ICL 2900 systems running the VME operating System and supporting such systems as the New Billing System and Mechanisation of Order Handling, which were due for replacement by CSS.

Some standalone computers with directly connected terminals were provided with network connectivity by using DEC Terminal Servers; these were connected to the host's ports using crossover V24 cables. Crossover cables were required as both ends of the connection had V24 DTE ports. PRISM was one such system that was connected in this way. Network user's connectivity was achieved by logging onto to a NAM Microvax 2 subject to PACES verification/ authorisation using the LAT protocol, the user was logged into the network and then chose the menu option to connect to the host. The NAM then initiated a reverse LAT connection to one of the DEC Terminal Server ports connected to that

Fig. 4 DEC VT100 terminal (top) and IBM 3270 [Creative Commons]

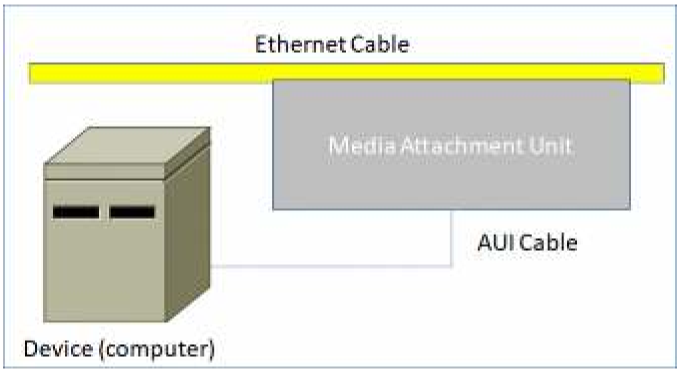


Fig. 5 End devices connected to an Ethernet segment

host and the user then logged onto the host. The NAM also provided any required terminal emulation specific to that host.

There were some key differences between the presentation protocols of the major manufacturers, but the biggest contrast was between the protocols used by asynchronous minicomputer terminals and the more sophisticated protocols used by mainframe computers. Microvitec's M1779, which was an enhanced version of a DEC VT220 terminal was the main asynchronous terminal, the M1779 was capable of supporting 24 to 30 line screen formats in full colour, giving a screen big enough to display both IBM 3270 and also various ICL screen formats and to accommodate formatted screens; with screen formatting being executed using VT100 control characters embedded in the output stream.

The concept of a data field – an area of the screen associated with a particular item of data – had to be managed at the application level by the host, which required the host (or in the case of T-NET the terminal emulation software) to track the position of the cursor on the screen. This required the minicomputer to process each character as it arrived – a characteristic which would become embedded in DEC's Local Area Transport (LAT) protocol.

IBM and ICL host computer systems, such as the IBM 3270, were more sophisticated, due to the terminals being plugged into a device known as the cluster controller, which provided a degree of additional intelligence and storage. Thus using command characters embedded in the output from the host, to build a map of the users screen within the cluster controller, allowing some areas of the screen to be defined as fields, which could be form filled independently of the host before being submitted as a formatted message, when the user pressed send. This differential between character-based and screen-based manipulation made conversion between the two formats particularly tricky.

The Network Access Modules (NAMs) received user data and converted the interactive sessions from the hosts to a form that the Microvitec M1779 and Videocomm asynchronous terminals used by the project could display. The printer queues were managed by the Network Management Control Points (NMCPs), which used reverse LAT sessions to connect to the printer ports on the Terminal Servers. The NAM software was developed by the DEC contract support team.

The network management centre controlled all the access from MicroVAXes configured as an NMCC (Network Management Control Centre), using an application known as PACES (Personal Access Control Entry System). Every user was registered and access provided only to nominated systems, controlled using a database, known as ISIS. Another 6 microVAXes (in the case of Mid-Yorkshire) provided a network management control point NMCP, with access to them controlled by the database.

The information in the PACES database included: the user's username, their location and location of the user's printer; it was responsible for granting host system access.

Fig. 6 N Connector, joiner and CAT5E patch cable [mattmillman.com]

There was one NMCC per District for centralised control and a number of NMCPs for handling all Printer queues, PACES distribution and building new MicroVAXes. The NMCC and NMCP required versions of the MicroVAX (known as Q5's) mounted in standalone cabinets and provided sufficient disc capacity utilising 2 hard drives of 600M. All the other MicroVAXes were rack mounted and had only one disc. The NMCC held the PACES database, and distributed it to the NMCP's, which then downloaded the information and relevant software to the NAMs and gateways.

There were a number of computer centres serving the whole of the county Wide Area Network (WAN) access was provided using either the Packet SwitchStream (PSS) network or a private network based on Timeplex 7500 Time Division Multiplexors and Kilostream links.

The SNA gateway devices were based on the DEMSA-AB device, which was developed from earlier generations of DEC processors. A device supporting serial connections was selected because the Districts wanted to stick to standard IBM communications in the computer centres; they had invested in IBM 3705 Front End Processors, devices which offloaded some of the data communications work load from the IBM mainframe.

In system-wide testing, the system performance of the overhead of the IBM terminal emulation within the NAMS was bench marked, by testing with 50 BBC micros programmed up by a graduate student and this allowed response times, particularly to the terminals, to be verified.

Ethernet

One of the more novel aspects of this model at the physical layer was Ethernet, which with a data rate of 10M was extremely fast in its day. Ethernet was developed at Xerox Parc between 1973 and 1974, became commercially available in 1980 and was standardised as IEEE 802.3 in 1983. The variant available was known as 10Base5, which could carry signals at a distance of up to 500m over a single thick coaxial cabling, which could be extended through devices operating at OSI layer 1 (repeaters) or layer 2 (bridges), the latter providing the opportunity to filter traffic on the basis of the relative locations of the end points and to provide appropriate resilience levels.

Fig. 8 Cabletron ST-500's (90 Series) MAU [mattmillman.com]

A single 10Base5 Ethernet segment could be 500m long, Beehive Sting transceivers were used to connect the Transceiver to the Ethernet; these were connected every 2.5m, with the cable being marked at each spot. The transceiver was clamped to the cable and a special boring tool was used to cut through the sheaf to make contact with the cable's core. (Care was required to avoid shorting the cable, a feat once achieved by a junior manager in Aberdeen, which took down the Ethernet, fortunately before the installation was live so no harm done).


Fig. 7 AUI drop cable [mattmillman.com]

How the equipment attached to the Ethernet communications cable is unusual and is summarised in Figure 5.

The connection to equipment could be made using made using connector known as N connector, which is shown in Figure 6 and had an impedance of 50 ohms.

AUI Drop cables, that used male and female 15-pin D-sub connectors, connect a node to the Media Attachment Unit (MAU) and to the end device. These cables had a maximum length of 50 metres and taps could only be placed at 2.5M intervals (this was due to the nature of the signal).

Ethernet uses a technique known as CSMA/CD – Carrier Sense Multiple Access with Collision Detect; before transmitting to the Ethernet the end device checked to ensure the Ethernet was free and if free the node transmitted. If the medium was busy the end node backed off and tried again. After transmitting its packet the end node monitored the Ethernet and if the voltage was higher than expected then it assumed there had been a collision and the end node would then wait a predefined period before trying to resend its data packet

AUI drop cables were often very large and rigid due to their shielding.

MAUs functioned as the transceiver, converting the primitive signals from the AUI interface to what is required on the physical Ethernet media, as well as performing collision detection. They came as 10BASE5 networks, using a Vampire Tap or more rarely an N-connector. Alternatively they could be purchased with a tap for so called "cheaper net" 10BASE2 networks, using BNC connectors and lower specification coaxial cable, or without a tap.

Vampire taps were the most common means of connection to the coax segment. The bottom half was plastic, to eliminate ground loops by ensuring the braid remained electrically isolated from the metal case of the MAU. The top half is extruded aluminium. Each contains three prongs (two to connect to the braid, and one to the centre conductor). A few spikes in a coaxial cable could equate to significantly less reflection and insertion loss than cutting the cable and running through a couple of N connectors.

There were racks built that had the Ethernet coiled/ looped up to allow terminal servers to be connected, some districts used BICC fan out units that allowed multiple devices to utilise a single transceiver, in essence 'Ethernet in a box', with 12 AUI ports, these could be a single point of failure.

Fig. 9 - AMP 228752-1 Vampire Tap [mattmillman.com]

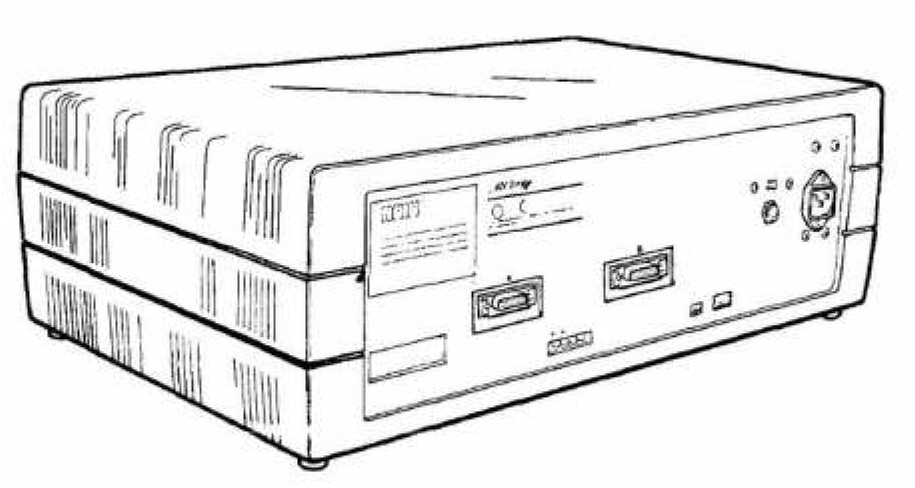


Fig. 10 – DEC LAN Bridge 100 [DEC]

A large building could have multiple 500m segments, connected by BICC local repeaters, although the Ethernet rules allowed only 2 serial repeaters in any one system. If more than 3 serial segments were needed, then local LAN bridges were used, however a local Ethernet system could only have a total of 7 bridges. The use of local bridges allowed Ethernet rings to be built. The LAN bridges used keep-alive frames to ensure that one of the bridges shutdown one of its interfaces, there was a logical Ethernet BUS. One bridge was configured as the root bridge and was master, the bridge furthest away from the root shutdown one of its ports, it kept this interface shut until keep-alives were lost then came on line.

The local bridges used were DEC LAN bridge 100s. A remote Bridge manufactured by BRIDGE was considered but due to its prohibitive cost was rejected as the cost was up to £100K; an alternative bridge manufactured by ICL was available, but this was not ideal and was problematic. RAD bridge -routers based on a Wyse micro-computer and a LAN card and WAN card, were an improvement. These were bridges and not routers and used a similar protocol to DECNET.

Connections between buildings could be either through Fibre Optic repeaters or alternatively Local LAN bridge100 utilising Fibre Optic Transceivers; maximum length for these fibre optic links was 4km, but required LAN bridges on each end.

Conclusion

T-NET Plus initially went live in Mid-Yorkshire, as CSS went live but all the communications managers from the Districts were initially hostile to the approach. In Leeds centre there were 6 buildings, all on LAN, there were a small number of remote sites that either had X25 PADs or higher user population sites had LANs connected back to the core using dual remote Bridges.

Ultimately, it was rolled out across all BT Districts such as North of Scotland and North Downs and Weald. External sales were also pursued, with the product name being selected in line with the name selected for BT's existing Ungerman-Bass-based LAN switching products. The two products however had little in common. TNET Plus by today's standards may look clunky and expensive, but at the time it was devised, it was bleeding edge technology and served a vital business purpose, at a time of dramatic change within BT.

Visit to the RAF Signals Museum at Henlow

Sam Hallas

As announced in the Autumn 2023 Journal, the Signals Museum at RAF Henlow is to close following the sale of the site. At the Committee's request I contacted the Curator, Alf Fisher, and he kindly agreed to welcome a party of THG members in March 2024. A total of 29 members met at the Museum to sign in at the Guardroom.

The museum holds a wide selection of communications equipment dating from the earliest times during the 1914-18 War to more recent times with teleprinters and radar displays.

The museum volunteers explained the workings of the equipment to our members and were most helpful.

Following discussions, the Signals Museum close-down date was slightly extended to allow the Museum to take an active part in the commemoration of the 80th anniversary of D-Day on 6th June. It was also been agreed that there were to be extra open days on the 18th May and 8th June,

Although it is sad to see such a collection broken up, there is some good news. Alf tells me that a large proportion of the exhibits have found new homes with other museums and collectors.

Pictures show volunteers talking to THG members and the members inspecting the teleprinter display.

Spring swapmeet at Avoncroft Museum

Yes. It really is a phone!

Close inspection

Weird and wonderful

Future collector?

The Guesten Hall

More stuff

Even more stuff

Yet more!

Some new kiosks in the collection

Pictures: Ruby Monnery & Sam Hallas

John Novack

Dennis Hock

Long-time telephone collector and small dog lover, John Novack, passed away on Sunday January 7, 2024. He lived for many years in Falling Waters, West Virginia until a couple of falls at home led to a short stay at the hospital. His daughter is taking care of the four dogs that were his faithful companions (John is pictured right with Sampson). John was a compassionate, strong-willed man who lived his entire life on his own terms but those terms nearly always included generosity and willingness to help others. He will be missed.

For those that met John in person or on the telephone one couldn't help but be impressed with his deep knowledge on an impressive range of electronic and telephonic topics. He was an avid collector of set and switching equipment and had an impressive switch-room with Strowger SXS, XY, Telenorm and key telephone systems. He had a wonderful belly laugh and many of his friends and close acquaintances tried to relate humorous stories to John just to hear it.

For those that only knew John from email posts on the various email lists he was perhaps best known for his phrase, "Need has nothing to do with it". John felt strongly that one should do or collect what one wanted and not limit one's vision to some preconceived notion. Hopefully, John's friends will keep using that phrase so that we can all pause and remember John fondly when we hear or read it.

John was an early adopter of CNET and, being the generous person that he was, helped dozens of people get connected to Asterisk, often preparing Thin Clients with AstLinux and helping the recipients integrate their new CNET node with whatever equipment each person wanted interfaced. Recently, there are more younger members joining CNET who already have a working knowledge of Linux but in the early days of CNET there were a lot of collectors knowledgeable in electromechanical switching systems but uncomfortable with the idea of putting together an Asterisk system. John filled that void and was instrumental in the early growth of CNET.

John was always interested in trying to support and grow the telephone collecting organizations. He was a long time member of ATCA, TCI and serving for many years in leadership roles on the TCI Board of Directors as vice president and president. John was also a long time member of the TCI Show and Event Committee, working tirelessly to make the TCI shows as enjoyable as possible.

Photos by Remco Enthoven

Telecoms firms to protect vulnerable customers

Press release

Technology Secretary Michelle Donelan has secured a further agreement with telecoms companies to protect vulnerable customers as landlines are upgraded.

Companies in charge of maintaining the UK's internet and phone infrastructure have agreed to new measures to protect vulnerable customers as their landlines are upgraded to a new digital network.

Seven network operators – including Openreach, CityFibre and Community Fibre – have signed up to new protections which will ensure people who rely on personal alarms to call for help are not left without a working device during the migration. Nearly two million people use these vital alarms in the UK.

It follows the Technology Secretary convening telecom firms after becoming aware of serious incidents occurring during the digital migration

The charter follows ongoing and active collaboration from telecoms operators, and is a positive step to make sure safety continues to be at the heart of the nationwide switchover – providing reassurance to vulnerable households.

Digital Infrastructure Minister Julia Lopez said: "When a person needs urgent medical attention, they must have confidence that their call for help will be responded to as quickly as possible".

THG Online Virtual Swapmeet Group On Facebook

Ruby Monnery

We have now reached 209 members of the OVS.

Many members know the swapmeet group is good for all-year-round wants and sales but when it's close to a swapmeet it means members can show any bigger and heavier items to see if anyone is interested before they load them in their car. On the lead up to the Avoncroft swapmeet we had a large amount of items posted in the group; at least 75 posts were made, some with multiple items for sale which could be collected there. The dates and information for the swapmeets can be found in the journal and on the public THG website.

Also members will know Max Flemmich asked the OVS admins for help posting his items for sale from his museum disposals. We were more than happy to help Max as he's always been such an integral part in teaching all things telecommunications from his Darvel Telephone Museum and has even been on TV with his collection! This was done in the lead up to the Avoncroft swapmeet and as many items as possible were brought along which was no small feat for Max as he travelled from Scotland. A lot of items were bought by members and collected at the swapmeet with a few bigger items to be collected from Max at a later date. We feel honoured to have helped Max and pleased to know the items have gone to THG members and museums across the country. The interest in the large number of items Max was offering to THG members meant we got at least 10 new members to the OVS, some joining Facebook especially.

A reminder to all members who wish to join the OVS, If you wish to join we ask that your Facebook profile has the same name as in your membership. This has been a rule since the beginning of the OVS to make sure there is full transparency to all members who wish to buy and sell. It also means that if you are bringing anything to a swapmeet the members know exactly who you are. If there are any concerns or queries to do with this rule or any other rules please email me using the email below. You can also email me with any queries and concerns to do with the other social media platforms for the THG.

In the group simply post a picture of what you have for sale, want or have to swap. The post is then visible for members to see who can then comment or message you via Facebook Messenger itself.

A few notes to be reminded of; although this is made for THG members, the THG accept no liability for any transactions made. Any buying or selling is between you and the other person. If any issues arise, like an item has been damaged or lost, talk to the courier and/or PayPal – the same as you would for any transaction. The THG has no legal responsibility with any transactions or money that has changed hands. Please keep this in mind; the same as you would for any physical Swapmeet. The transaction is purely between yourself and the other party; no one else is involved and you deal direct with them.

For anyone who wants to join, head onto Facebook and type in THG Online Virtual Swapmeet. Once you click to join make sure you answer all the questions and tick whether you agree to the rules. Please make sure you do this!

If you ever have any questions or need help please email me; socialmedia@thg.org.uk

An Update On THG Social Media

Ruby Monnery

As many members may know we also have a THG account on Instagram, Threads, Mastodon and X (formally Twitter). These are steadily growing and we have also gained paid up THG members after they found the group online. Having multiple different social media platforms means that the THG can appeal to a huge demographic of people.

QR Code and Landing page

In the past month I have made a landing page with a QR code for all the various THG pages. A landing page is basically a directory for all the THG websites that you can go to and click where you want to go. It makes it easier for members to find any assets of the group, for example the THG Documents, THGR, all the social media accounts and the public and membership websites are there. It brings them all together to in one place for simplicity.

A QR code is a pattern of black and white squares that can be scanned by the camera of a typical smartphone-when it "sees" the QR code it will immediately take you to the landing page. You can download a free QR code reader on your smartphone from your usual App store. You can find QR codes on all sorts of things now and our one will hopefully be used in the future on posters and leaflets to try and gain new members at events or museums. The QR code also makes it more enticing for younger people as they can just scan it and check out the other pages when they are free to do so.

You can scan the QR code at the top of P.25, or simply follow this weblink:

https://lnk.bio/TelecommunicationsHeritageGroup

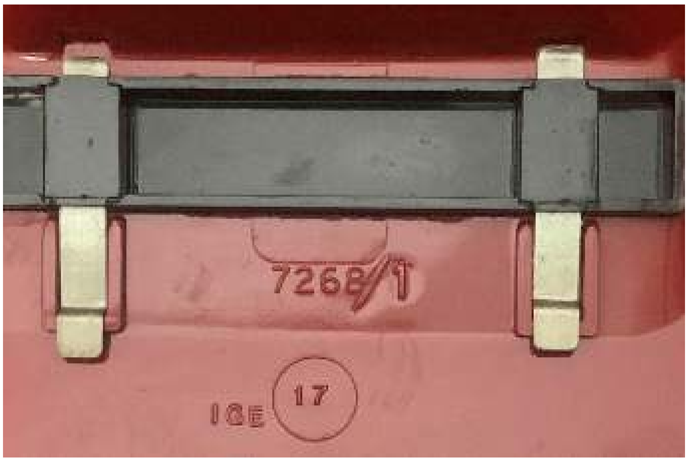
As always if you need help please email me (Ruby) at socialmedia@thg.org.uk

THG Facebook group – recent activity

Jason Workman

The new Facebook group has continued to grow incredibly well with membership now over 570. New members are asking to join everyday and a lot of good content has been posted there. Within the group Ruby has added a new feature, “Restoration Sunday” where members can post projects they are working on. So far the response has been great with members posting weekly updates on restoring a PABX5 and a Mercury payphone kiosk amongst others.

One discussion that was on both the IO group and the Facebook group was about the colour of blanking plates on red 711 wall telephones. Of course many of you know that some wall telephones have been reproduced in latter years, some with matching red blanking buttons, but did the original ones have red or just black ones? Many people posted their red 711’s with original red blanking plates and the clues were the moulding markings showing they were original. It appeared some later ones used black blanking plates so maybe after an initial batch did they switch to using black blanking plates as these red telephones were not supplied to the general public.



711 blanking plate [Geoff Ackling]

Red 711 with red blanking bar [Andy Grant]

Mercury payphone [Martin Richardson]

While on the subject of limit production telephones one of our regular contributors posted some rather unique examples. A metallic limited edition Viscount telephone from STC and a mirrored finish BT Response 120 to commemorate 500,000 being produced in the UK.

On a slightly more serious note one member posted asking for advice on where his fantastic collection of GPO clocks could be displayed once he was no longer around. A difficult subject to discuss but it was met with some good advice from the membership who were helpful with their suggestions. A timely reminder for us all (if you pardon the pun) and a reason we need to attract younger folks in to the hobby to carry it on. It’s quite easy to forget that many under the age of 25 will never have used a dial telephone or dealt with the days of dial up internet – only being used to mobile telephones and broadband. Most will have never used a payphone, this was displayed in the clearest way possible – a user of X (formally Twitter) had posted on there asking if payphones actually existed in real life or were they just a prop

Response 120 [Mark Strongman]

Clock collection [Simon Taylor]

Limited edition Viscount [Mark Strongman]

used in films to aid the narrative as they had never seen a payphone!

Our social media guru Ruby is actively using different forms of social media to gain new young members (being a young member herself) as she explains after her OVS article.

The Facebook group is an excellent way to share videos, pictures and questions/ comments easily and quickly with other like-minded individuals. When joining the Facebook group make sure to answer the questions so you can be added quickly! It is free to join. All you need to do is sign up to Facebook and search in "groups" for "The Official Telecommunications Heritage Group" and you can then request to join subject to admin approval. Fake names and profiles will not be approved and remember please answer the questions when joining yourself or inviting a friend to join as well as ticking the box if you agree to the rules – this helps us to filter out any spambots etc. The new group can be found be searching on Facebook for "The Official Telecommunications Heritage Group" or if reading this journal electronically following this link https://www.facebook.com/groups/888167579081427

Finally the admins of the new group would like to thank everyone for their support in building the new group and providing content and making it into the group it has become over the last few months.

Puzzle page

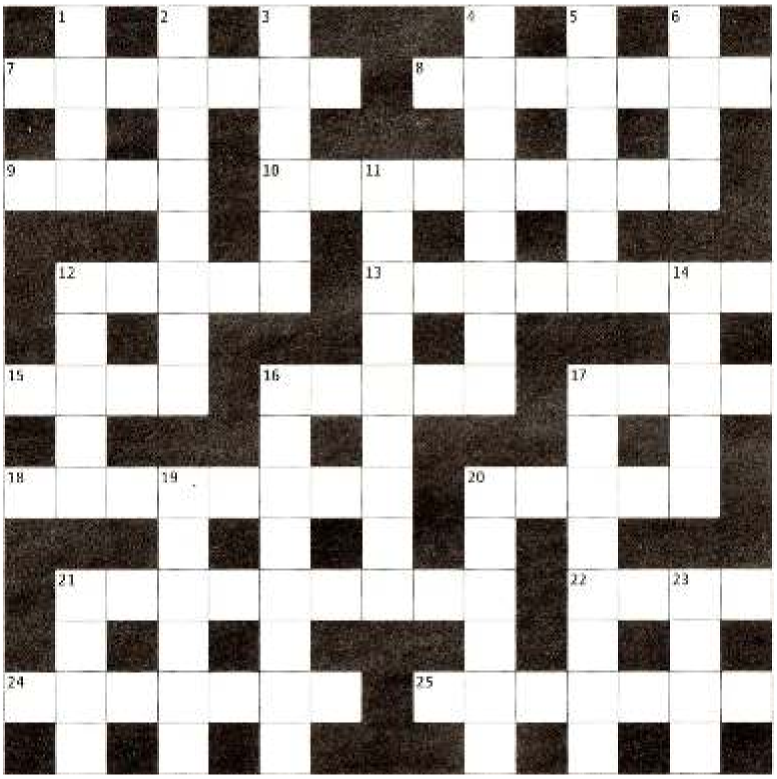
John Cranston

Another THJ cryptic crossword

A glittering prize is the incentive to complete this cryptic-ish crossword. It's a copy of Exchange Equipment Planning, a 24-page booklet in a gloriously art-deco cover. It was issued in September 1939 as part of the GPO Green Paper series. If offered for sale on Ebay, it could fetch anything up to 50p, so well worth having a go. It will be awarded to the sender of the first correct solution – or the nearest to being correct – opened on 1 August 2024.

Please send your entry and all abuse to cranston1955@gmail.com. The answers will be printed in the next edition of the THJ.

.**John Cranston**



ACROSS:

7. Colonial ruler's call connect system (7)
8/17dn. Phone firm encircles wetter elastic (7,8)
9. Musical interval is unobtainable, say (4)
10. Office worker who may have operated bellset no 39 (9)
12. Lavatory seat partly detached (5)
13. Laid out a new device for placing a call (8)
15. Throw away German tie (4)
16. First of all, select outgoing line and read from The Sun (5)
17. Point of Poplar exchange in former years (4)
18. Potentiometer hotter as needs adjusting (8)
20. What Paste Polishing no 5 gives to your phone, Michael? (5)
21. Bury mushroom and start to tap, tap… (9)
22. Charge for an old middle-distance call (4)
24/25. Site of world-first exchange (modified Panel with radiation switching) (2,5,7)

DOWN:

1. Barker's old system of providing clearance for landing (4)
2. On this spot above river crossing, a city with dial-less automatic phones once (8)
3. Rodent eating small dessert (6)
4. Southern voter could be up-and-around (8)
5. Proposed London exchange name never used: BEAch (6)
6. Phone pioneer Elisha sounds rather dull (4)
11/12. Sledge, beginning to leave after pudding, delivers Fairy of the Phone star (9,5)
14. Without AFN, 01-267 would have been a naval hero (5)
16. Drench rust with a tea solution (8)
17. See 8
19. Perform better in ring folder for departing emails (6)
20. Placing one in deceptive operation (6)
21. Computer's IP address laid bare? (4)
23. Queue for a telephone connexion (4)

Answers to the crossword in THJ issue 127:

ACROSS: 6. Simplex 7. Trunk 9. Mica 10. Radiophone 11. Whistles 13. Gambit 15. Lead 17. Error 18. Urge 19. Defrag 20. Watchdog 23. Darlington 26. Inch 27. Lodge 28. Telecom.

DOWN: 1. Ambassador 2. Floral 3. Axed 4. Strowger 5. Bush 6. Smith 8. Kinking 12. Straw 14. Mouthpiece 16. Eyeball 17. Engineer 21. Tinkle 22. Ofcom 24. Lydd 25. Tate.

The winner of the puzzle in THJ issue 126 was Mark Nimmins.

Events - Swapmeet (- Speculative announcement!)

I am pleased to announce that a THG swapmeet will be held at the Mathiesen Community Centre, 4 Mathiesen Rd, Bradville, Milton Keynes, MK13 7AG on Saturday nth October 2024.

The swapmeet will open to THG members at 10:00 and close at 13:00. There are 20 tables that are available to be booked. There is a charge of £5.00 per table and I will collect this from the table holders on the day.

Tables must be booked in advance with me the events organizer, Laurence Rudolf, telephone 0330-321-1844 (option 5) or e-mail events@thg.org.uk If you are booking a table you will have access to the hall from 09:00 for those who have taken a table and are setting up.

The community centre is just a couple of miles from the telephone museum which is itself situated inside the Milton Keynes museum, McConnell Drive, Wolverton, Milton Keynes, MK12 5EL. The director of the Milton Keynes museum, Bill Griffiths, has again very kindly agreed to wave the museum's admission charge on nth October so that THG members can visit the telephone museum without incurring any charge.

Laurence Rudolf

Last year's swapmeet

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THG Committee & support

President.....Andrew Emmerson, **president@thg.org.uk**
Hon. Vice President.....Ivor Flint, **honVP@thg.org.uk**
Chair.....Brenden Hill, **chair@thg.org.uk**
Vice Chair.....John Mulrane, **vicechair@thg.org.uk**
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Membership Secretary.....Alex Clark, **membership@thg.org.uk**
Treasurer.....Mike Stephenson, **treasurer@thg.org.uk**
Archivist and DTP.....Sam Hallas, **archive@thg.org.uk**
Events.....Laurence Rudolf, **events@thg.org.uk**
Surplus Equipment Co-ordinator.....Brenden Hill, **salvage@thg.org.uk**
Social Media and OVS.....Ruby Ella Monnery, **socialmedia@thg.org.uk**
Journal.....John Mulrane, **vicechair@thg.org.uk**
Assistant Journal Editor.....Jason Workman, **jason@thg.org.uk**
Co-opted Committee Support
Documents website.....Peter Walker, **documents@thg.org.uk**

This police post is on the Victoria Embankment between Waterloo and Blackfriars bridges.
The sign on the front of the police post reads "Police Telephone was free for use of the public. This telephone is no longer operational please use nearby payphone". [Richard Haydon]