

Digital Voice: Change of Landlines to Digital

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SCOPE / AGENDA

- What is Digital Voice?
- History of the UK Public Switched Telephone Network (PSTN)
- What is changing?
- When is it happening?
- Why is it changing?
- Benefits of change
- Potential Problems

DEFINITION

‘Digital Voice’ is the name of BT / Openreach’s programme for a new phone service, delivered over the broadband network.

Your fixed ‘landline’ connection migrates from the analogue signal between your home and the ‘Public Switched Telephone Network’ (PSTN) to a digital connection via your broadband router to your Provider’s IP network.

Hence the sub-title of this talk – ‘Change of Landlines to Digital’.

What it **isn’t** (*necessarily*):

- The *end* of landlines (as reported by some sources).
- Changing the physical connection of your home into ‘the network’ from electrical (via copper) to optical (via fibre).

QUICK AUDIENCE SURVEY

1. Who has a landline phone?
2. ... if so, how many handsets do you have and are they connected into sockets or wirelessly paired to the main unit?
3. Who has a mobile phone, *with a reasonable signal strength at home*?
4. Who has broadband (via copper or fibre) at home?
5. Who gets their phone and broadband via BT vs other Providers (e.g. Virgin Media-O2, Sky)?

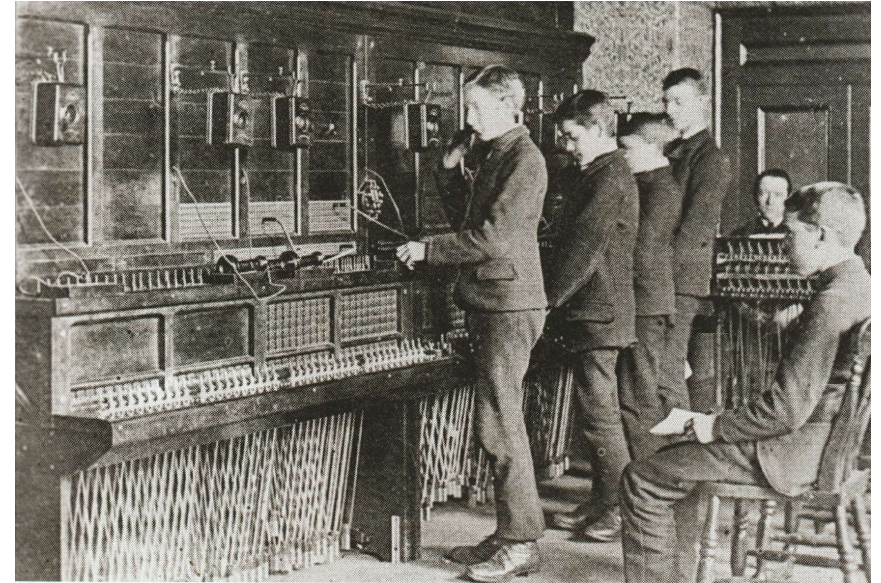
August 1879 – Two manual exchanges were setup in the City of London (1st: 8 customers, 36 Coleman Street, the 'Telephone Company';

2nd: 10 customers, 11 Queen Victoria Street, the 'Edison Company of London')

- Used overhead wires, as considered too complicated to obtain rights to deliver via underground cables.
- Used a single steel wire as copper wasn't strong enough for overhead suspension.

Subsequently, manufacturing techniques improved, and a two-wire copper connection became possible.

- Each 'subscriber' had local batteries to call the operator.
This created maintenance issues and from around 1900 batteries at the exchange became standard practices.
- Connections between 'subscribers' were made via a switchboard and double-ended cords.
- When exchanges were installed in other towns and cities, 'trunk' connections were made between them to permit long-distance calls.

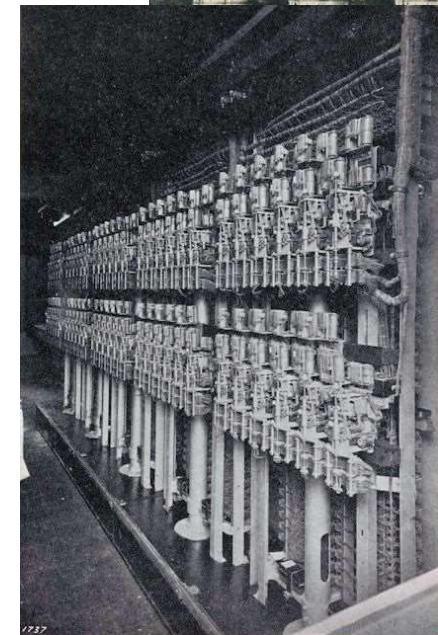
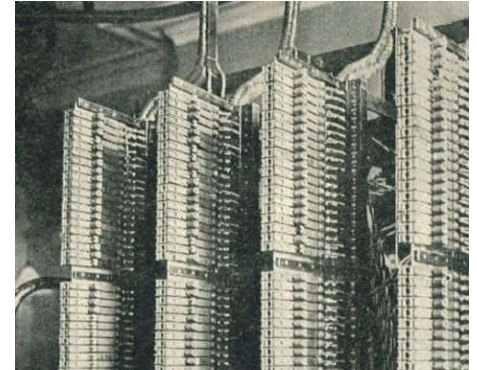


Boy Operators, Sunderland Exchange, 1883

HISTORY OF THE PSTN – 2 of 4

1912 – First automatic exchange opened in the UK, in Epsom – based on a patent submitted by an undertaker from Indiana, USA – Almon Brown Strowger.

- This introduced rotary dials in the subscriber's equipment to produce pulses.
- The pulses triggered electromechanical devices to select the called party, eliminating need for operators.
- Long distance (trunk) calls still needed operator assistance.
- At cut-over, there were 320 subscribers, with an initial capacity of 500 lines and space to grow to 1500.
- Epsom continued with automatic working until 1932 when it *reverted* to a manual switchboard and would only return to automatic working with the introduction of STD in 1965.



Inter-War years (1919-1939)

- 1922 – Strowger was selected as the UK standard and would remain in use for most of the 20th Century. Repeater stations introduced to increase range of transmission links.
- 1927 – transatlantic calls to New York using radio.
- Early 1930s – multiplexing many voice connections across transmission links.
- 1931 – trial microwave link between Dover and Calais to demonstrate alternative to cable.

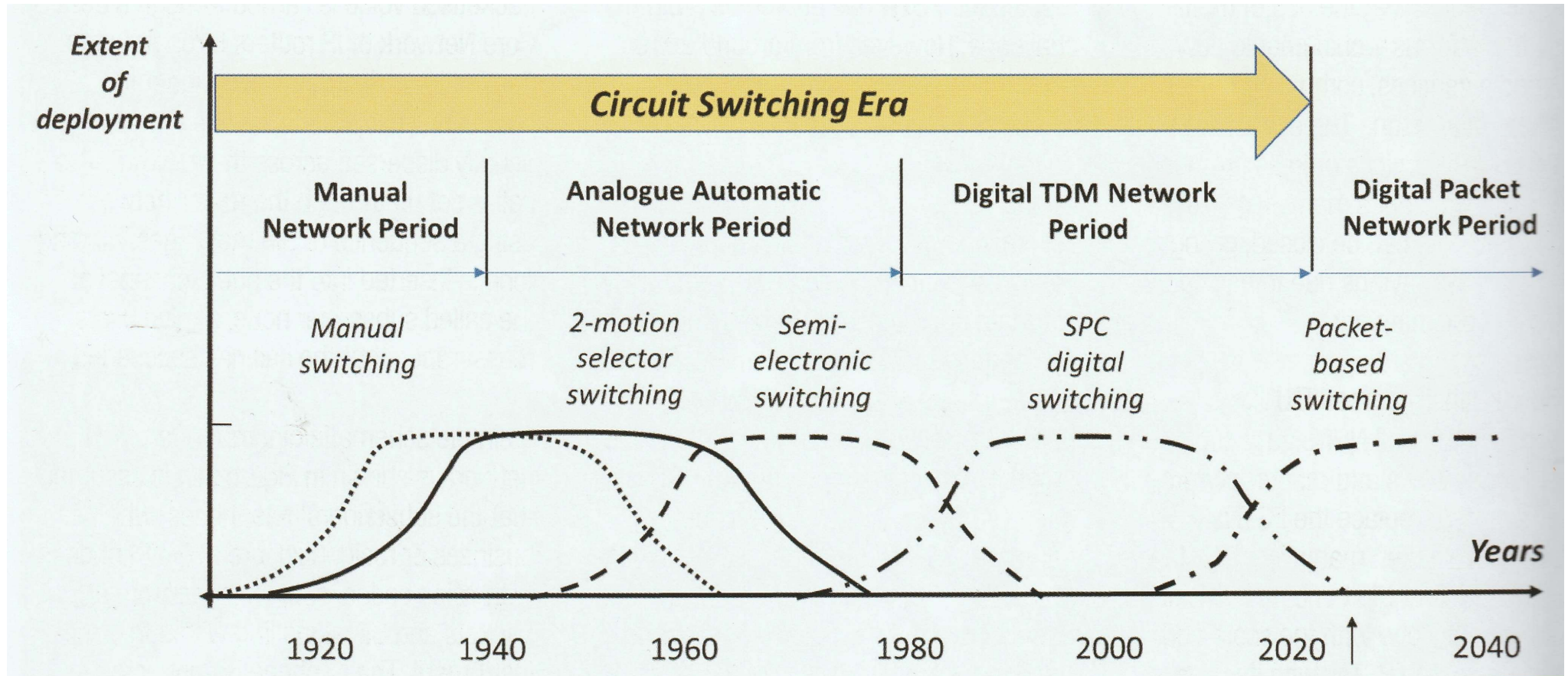
Growth and move to Digital (1945-1979)

- 1958-late 70s – Subscriber Trunk Dialling (STD) introduced to automate trunk (long-distance) calling.
- 1966 – Introduction of PCM (Pulse Code Modulation) on trunk links – first use of digital transmission.
- Many structural changes to support growth in demand.

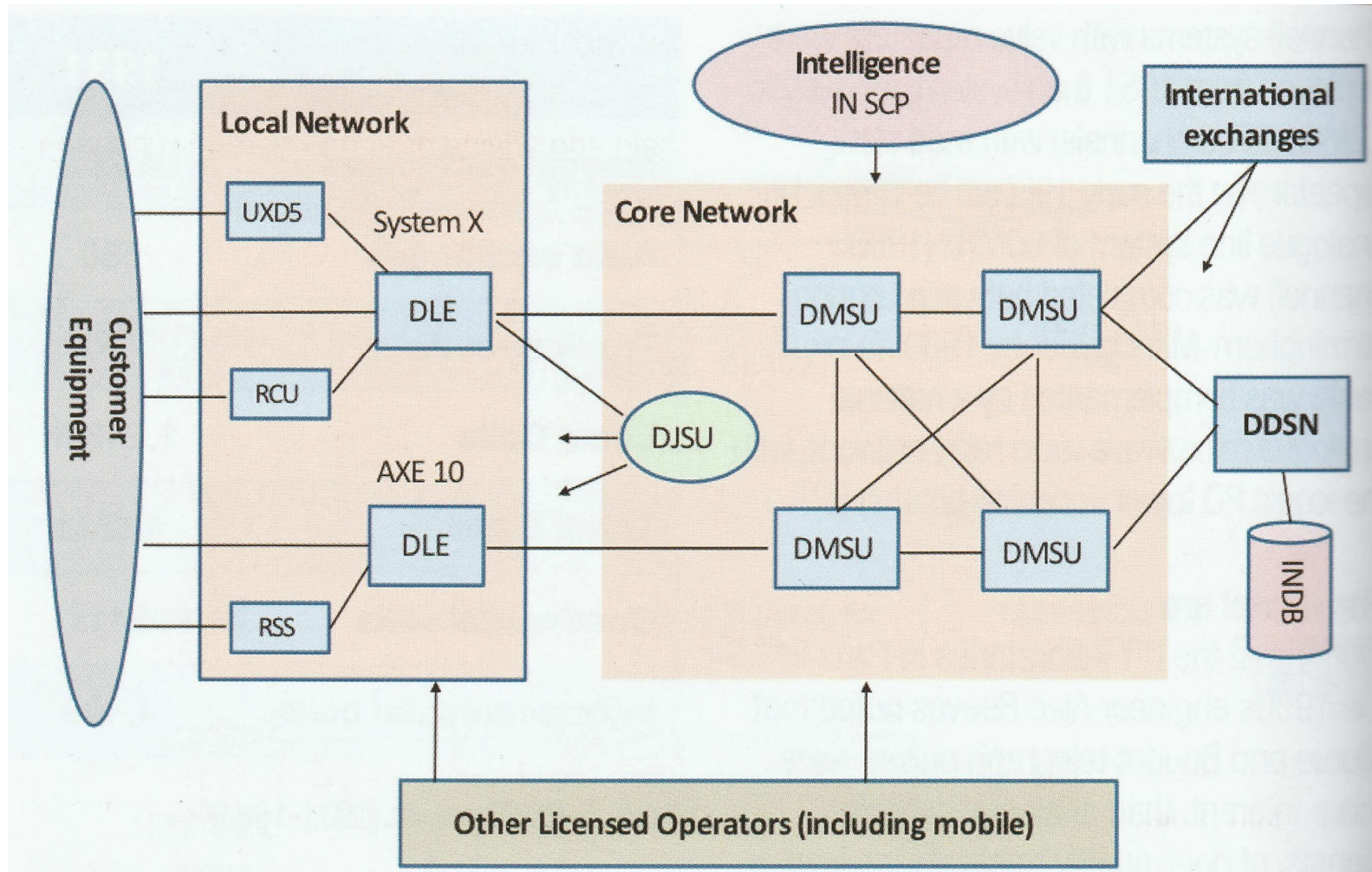
Stored Program Control (1979-today)

- 1979 – ‘PO Telecommunications’, GEC, Plessey and STC exhibited 1st *System X* switch in Geneva.
- 1979 – internally developed UXD5 switch (based on a PBX) introduced as cost-effective solution for very small exchanges (150 subscribers).
- 1986 – Ericsson’s AXE-10 switch enters service as competitive local exchange switch (*System Y*).
- 1980 onwards – SPC introduction / analogue retirement:
 - 1980 – first ‘tandem junction unit’
 - 1981 – first local exchange (Woodbridge)
 - 1985 – first trunk exchanges
 - 1987 – 500th local exchange commissioned
 - 1988 – 1000th local exchange commissioned
 - 1990 – last analogue trunk exchange closed
 - 1995 – last Strowger exchange closed
 - 1998 – last analogue local exchanges switched over. **The network is now completely digital.**

EVOLUTION OF TELEPHONY



CURRENT PSTN - DIAGRAM



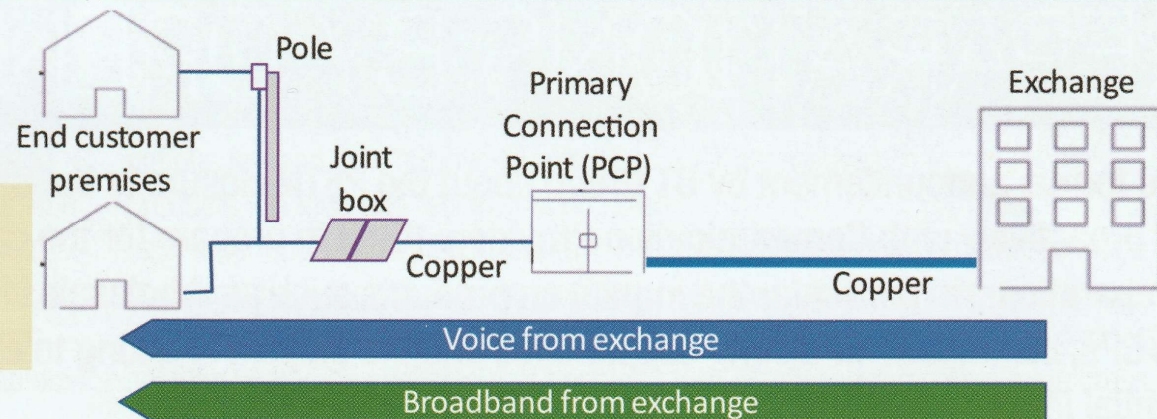
CURRENT PSTN - SIZE

	BT⁹²	VM⁹³	Kcom⁹⁴	Total
Lines	15,000,000	4,380,000	165,000	19,545,000
Business	4,000,000	n/a	18,305	
Consumer	11,000,000	n/a	146,695	

CURRENT ACCESS NETWORK

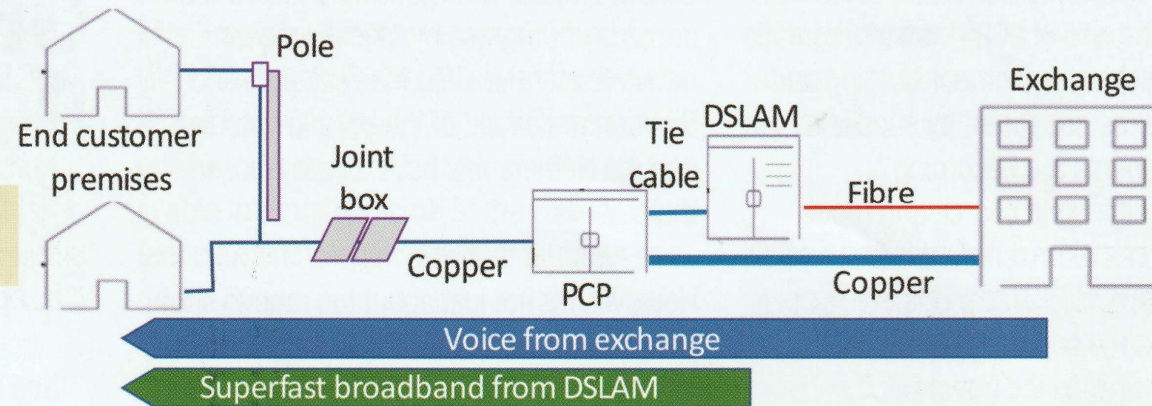
Connectivity products:

- PSTN voice (WLR)
- WLR + Broadband (SMPF)
- MPF voice + Broadband



Connectivity product:

- FTTC + WLR/MPF voice



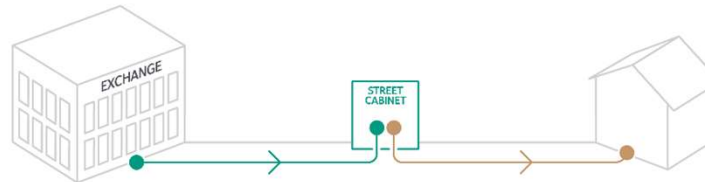
BROADBAND PRODUCTS

● Fibre wire
● Copper wire

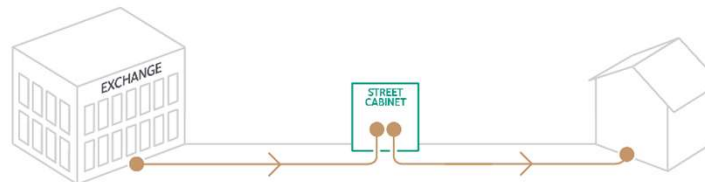
**Ultrafast
Full Fibre
broadband
(FTTP)**



**Superfast
broadband
(FTTC)**



**Standard
broadband
(ADSL/Copper)**



SUMMARY OF CHANGES*

* More details and mitigations covered on following slides.

Factor	Change?	Details
The Physical 'Line' coming into your home	Maybe	If you or your Provider decide to upgrade from Copper to Fibre as part of migration, an engineering visit is necessary.
Broadband Router	Maybe	Newer routers will already have a phone socket. Older ones will need replacement.
Telephone Number	No	No need for BT customers' numbers to change.
Phone Equipment	No	Any phone that you currently plug into a master socket can be plugged into your router after Digital Voice migration.
No. of Extensions in House	Yes	You won't be able to plug phones into extension sockets.
Other Equipment (e.g. Healthcare alarms, medical pendants)	Maybe	Older equipment that depends on analogue telephony features to operate will need upgrading or replacement.
Dialled Numbers	Yes	All calls require area code, including 'local' calls.
Cost	No	All information I have seen shows no increase in cost to customer.
Resilience to Power Cuts	Yes	In a power cut, your phone will not work (even for 999 calls).
Extra Features	Yes	Multi Call, Call Waiting, Call Protect, Call Diversion, Three-Way Calling, Permanent Withhold Number, Voicemail – all free of charge.

PHYSICAL LINE CHANGES

Ken, Claire and I were all told (by BT) that ‘To support the transition, your broadband will be upgraded, for free, to Full Fibre’.

I can find no evidence that all DV migrations will include Full Fibre upgrades and plenty of confirmations that the broadband upgrade is not necessary.

If you are upgraded to Full Fibre (aka Ultrafast Broadband or FTTP), there will need to be an engineering visit involving:

- An external junction box (15cm x 13cm) on the outside of the property.
- A hole drilled through your wall.
- A box inside the property (ONT – Optical Network Terminal, 13cm x 11cm) which will also require a power socket.
- A cable from the ONT to your router.



ROUTER CHANGES

Your router will need changing if either:

- You are being upgraded to 'Full Fibre' as part of the Digital Voice migration, **or**
- Your current device doesn't have a voice port and associated functionality to convert your phone to digital.

BT are providing people with the Smart Hub 2 as part of migrations. The voice port has a green socket, and it may be covered with a black sticker which is easily peeled off. The new device is provided free of charge, and I imagine that there will be a reply-paid box/bag in which the old device can be returned to be recycled properly.

EXTENSIONS

If service is delivered over copper, your router should be connected into the Master Socket.

Your main/only phone should be connected into the router.

You can't plug any existing phones you may have into extensions as the analog signal from the phone will be incompatible with the digital service provided from the socket.

If service is delivered over fibre, your router can only be connected to the ONT (Optical Network Terminal).

Your main/only phone should be connected into the router.

You can't plug any existing phones you may have into extensions as those extensions will be dead once your copper connection to the network has been replaced by fibre.

If you need extra handsets within the house, either:

- *use DECT (i.e. wireless) handsets that connect back to the master handset, **or***
- *use DV adaptors that connect your existing (wired) handsets into the router.*

OTHER EQUIPMENT

Applies to any equipment (other than telephones) that relies on your analogue phone service to operate, for instance:

- Healthcare alarms (migration, emergency response alarm)
- Medical pendants (e.g. wearable fall detection device)
- Security systems (e.g. burglar alarms, panic buttons)

It's your responsibility to source any replacement equipment – contact the provider of the equipment to determine whether it will work with Digital Voice, will need re-configuration or will need replacement.

Contact your Provider to let them know if you have such devices and/or are a vulnerable customer. They can delay migration, if need be (but not indefinitely).

DIALLED NUMBERS

There's no longer any such thing as a 'Local Exchange' and your call may be controlled from anywhere within the IP (i.e. Broadband) network. Hence you need to enter the full telephone number, even for 'local' calls (i.e. 01986 87xxxx instead of just 87xxxx).

There is no longer a price difference between local and trunk / long distance calls, so there is no penalty in using the full number for a local call.

Suggestion: Update the address book (in your phones) now, so that it is ready for migration.

COST

If your Provider has a Digital Voice product, you shouldn't pay more for it.

If they don't, and you still want a home phone, you will need to sign up with another provider. The cost of their Digital Voice product may be more than what you are paying for PSTN today.

POWER CUTS

Currently, your phone will work in a power cut, ***as long as the instrument doesn't require power***. In future, it won't as your router (and Optical Network Terminal, if used) will be down.

Advice that I've seen is that people should use a mobile phone in the event of domestic power outage, so it's a good idea to keep a charged power bank available to maintain connectivity. I haven't (yet) seen a solution for alarms and call buttons, but it may be possible to use a local WiFi hotspot on a mobile to provide connectivity.

An alternative is use of a UPS or home battery system (e.g. Tesla Powerwall). Most UPS only provide power for short outages on critical equipment. Home battery systems can support much more.

BT statement on keeping connected during a power cut:

If you don't have a mobile phone or are in an area with no mobile signal, please contact us on **xxxx xxxx xxx**.

Customers who need extra support may be offered a battery backup unit to make sure you can still make calls. The unit will keep you connected for a short time if there is a power cut. We advise that you limit your usage to essential calls only to preserve battery life during any outage. If you believe you will need a battery backup unit, please contact us.

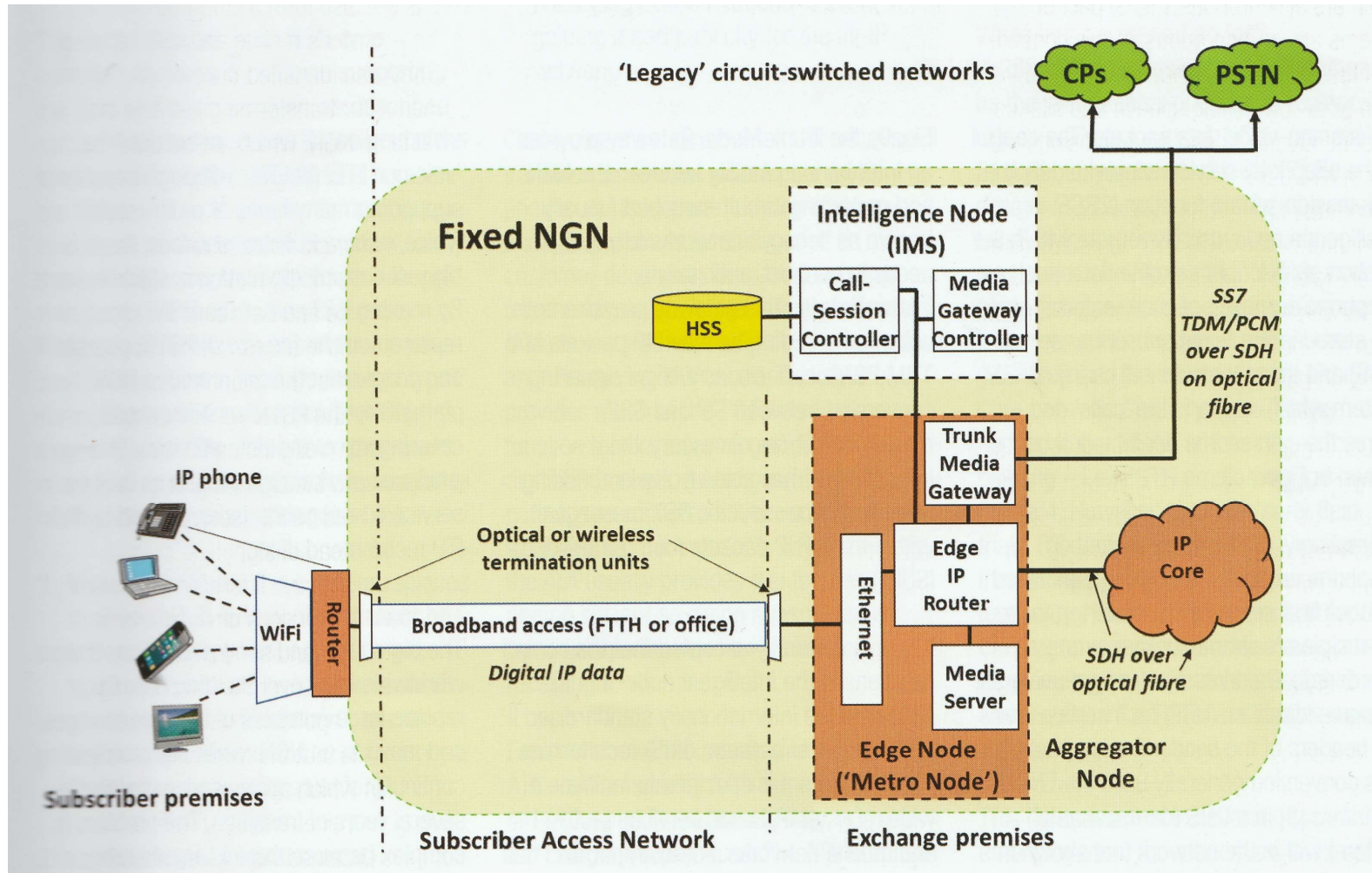
EXTRA FEATURES

Feature Name	What you get
Multi Call ¹	Using multiple digital home phones, more than one person can make a call at once.
3 Way Calling ¹	Chat with 2 other people at the same time.
Caller Display	See who's calling and decide whether to answer.
Call Diversion	Divert calls to any phone, including your mobile.
Permanent Withhold Number	Stop your number being shared with the people you call.
Call Protect ²	Safeguards you against unwanted calls, using AI screening to help block scam calls and notifying you of any suspected nuisance calls.
Call Waiting	Get an alert if someone calls while you're on the phone.
Voicemail ²	Dial 1571 for your messages. You'll hear a specific tone when you have a message. <i>'Essential voicemail' is free. 'Advanced voicemail' is available for a monthly charge.</i>

¹ – Feature only available if you have bought a new 'Digital Home Phone'.

² – Feature is *better* if you have bought a new 'Digital Home Phone'.

FUTURE NGN



TIMETABLE

Original timescales were 31-Dec-2025 or earlier, with migrations planned by region.

Experience gained from early migrations (particularly readiness of Providers and their customers) has put this back and there is no published timetable for migrations.

Age UK reports that:

BT is currently switching customers that:

- haven't used their landline in the last 12 months
- haven't contacted an Alarm Receiving Centre in the last 24 months
- live in an area where specific measures are in place to check if people have a telecare alarm system
- aren't known to be vulnerable or have additional needs.

I've no evidence that this is true, but it sounds believable...

Programme completes on **31-Jan-2027** – 2 years time.

WHY IS IT CHANGING?

Cost

PSTN is old beyond its asset life, leading to increased cost:

- Spare parts are scarce.
- Suppliers don't have people with the knowledge (and no-one wants to train to support obsolete technology).

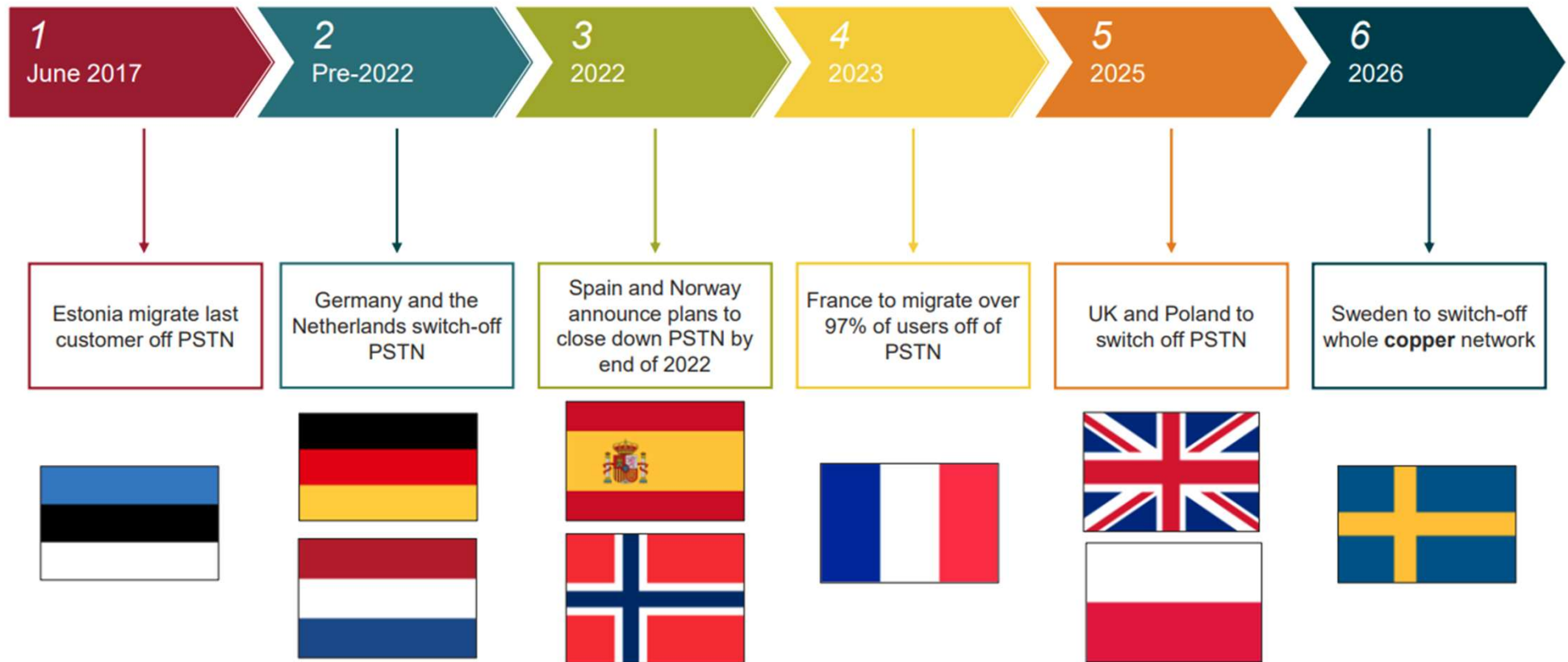
Power

- PSTN uses vast amounts of power to run (and cool) – 313 GWh per year (0.1% of total UK usage).

Technology

- Difficult to develop new services based on old technology.
- Other countries are well-advanced in their migration to Digital Voice and the UK can take advantage of solutions that have global scope.
- Older equipment is less tolerant of temperature – either spend more on cooling or watch it degrade rapidly.
- It enables switch from Copper to Full-Fibre – with further power benefits.

EUROPEAN PROGRESS



BENEFITS

1. **Reliability** – PSTN failure rate has been increasing year-on-year.
2. **Increased security** – Enhanced Call Protect uses AI to reduce the incidence of scam calls. Average customer receives 3 spam calls per month. Calls from overseas that pretend to be from the UK will be blocked.
3. Other extra free-of-charge **features**.
4. Potential **broadband speed** increase, free of charge (if BT move you onto full fibre as part of the migration).
5. **Better Telecare** – existing devices have a failure rate as high as 20% and often require visits to update hardware and software.
6. **Power Savings** – PSTN consumes 313 GWh per year. Switching it off will result in some power increase on other networks and consumers will be powering ONTs if they are upgrading to full fibre.
7. Digital Voice is a necessary pre-requisite to **retiring the copper access network**.
Once copper-based broadband (ADSL, FTTC) has been replaced by full-fibre, energy usage will reduce from 2.4 W per customer to 0.3 W per customer. Once PSTN and copper access have been retired, there will be a net saving of 550 GWh per year.

POTENTIAL PROBLEMS

1. Finding replacements for Home Alarms, Call Buttons etc.
2. What happens during power cuts
3. Interraction between network-based Answering Services and home-based answer-phones.

OTHER QUESTIONS

1. Is migration mandatory?
Yes, it's a national infrastructure project and has to happen for many reasons.
2. What if I don't currently have a broadband service? **[1.1m people currently have a landline without broadband]**
If your provider offers Digital Voice, they will provide you with a broadband connection and you will have the option of having a voice-only service or taking their Broadband product as well (at a cost).
3. What if my phone and router are in different rooms?
You will need a Digital Voice adaptor. Plug this into a power socket near the phone, plug the phone into the adaptor and then synchronise the adaptor to the router/hub using WiFi.
4. What if I no longer want to have a phone service?
*You could cancel your phone service before the migration **or** keep it until migration (on the hope that you might get a free Broadband upgrade) and then cancel it...*

PRODUCTS



Digital Voice Adapter - £20



Battery Backup Unit - £85



BT Essential Digital Home Phone - £30



EE Home Phone Plus - £45

SOURCES

“Digital Voice – our next generation home phone” – BT’s website – <https://www.bt.com/broadband/digital-voice>

“Moving landline phones to digital technology: what you need to know” – Ofcom’s website – <https://www.ofcom.org.uk/phones-and-broadband/landline-phones/future-of-landline-calls>

“SWITCHING OFF THE PSTN: MIGRATING FROM ANALOGUE TO DIGITAL LANDLINES”, Frontier Economics - <https://www.bt.com/bt-plc/assets/documents/about-bt/all-ip/migrating-from-analogue-to-digital-landlines.pdf>

Virgin Media article on Digital Voice Switchover - <https://www.virginmedia.com/help/digital-voice-switchover>

Sky article on Internet Calls - <https://www.sky.com/help/articles/about-internet-calls>

The Journal of the Institute of Telecommunications Professionals: Vol.16, Part 1, 2022 – Public Switched Telephone Networks, Important insights and strategies for change:

- PSTN Closure – Strategies for Change
- PSTN Closure – An Interoperability Perspective
- PSTN Closure – Preparations by Openreach
- The UK Public Switched Telephone Network – 1879 to 1999

Openreach Installing Full Fibre - <https://www.openreach.com/help-and-support/full-fibre-broadband-installation-checklist#accordion-b43490109a-item-56113228ba>

Age UK article – <https://www.ageuk.org.uk/information-advice/money-legal/consumer-issues/changes-to-landline-telephones/>

Which article – <https://www.which.co.uk/reviews/broadband/article/digital-voice-and-the-landline-phone-switch-off-what-it-means-for-you-aPSOH8k1i6Vv>