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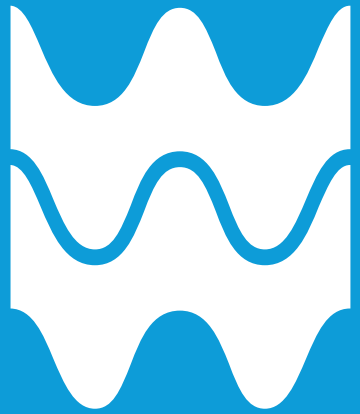
PSTN/CSD Replacement – Project Diffodd

Strategy, Technologies, Risks And Challenges



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What do we do?

Welsh Water is the sixth largest of the ten regulated water and sewerage companies in England and Wales. Responsible for providing over three million people with a continuous, high quality supply of drinking water and for taking away, treating and properly disposing of the wastewater that is produced, we are fully committed to delivering best quality service at least possible cost.

Welsh Water is owned by Glas Cymru a single purpose company with no shareholders and is run solely for the benefit of customers.

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Cessation of Comms Services

- **Open Reach have announced that they intend to “SWITCH OFF” ALL PSTN Circuits by 2025**

- **Cellular Networks will ALSO cease**
  - **CSD (dial up), and legacy SMS by 2025**
  - **2G, 3G Networks by 2025 where 3G is expected by end of 2022**

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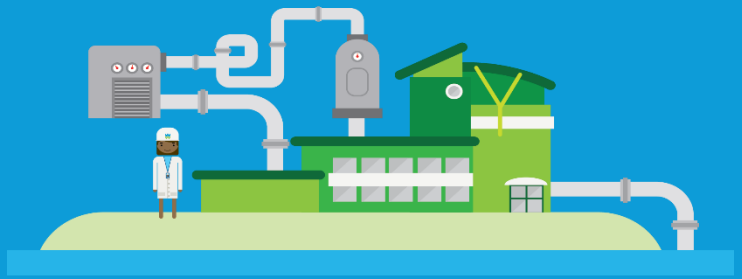
Why are these services so important to us ?



Our assets are not staffed “24/7 365” . We utilise remote monitoring via on site outstations (RTU’s) and into the regional telemetry system to alert us to failures, and to support remote asset intervention practises. These number 4000 in total, distributed across Welsh Water’s operating area.

Nigh on all these assets utilise “PSTN or CSD” dial up as the preferred communication medium.

As a business we rely heavily on the regional telemetry system to ensure we deliver a high quality of service to our customers

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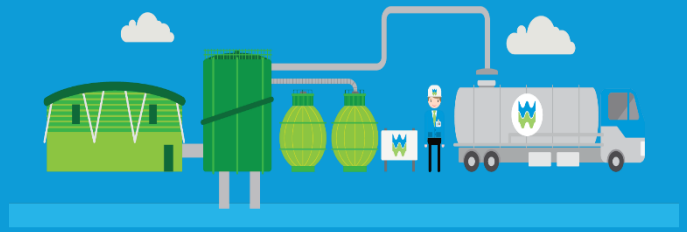
Immediate and obvious challenges



Many of assets are in rural locations, where it is unlikely that we will have fibre coverage by the time PSTN switches off. This means that the we will need to look at alternative connectivity e.g. mobile coverage or satellite. In some instances, mobile will not be an option, and the 2G/3G switch off will make this even harder.

Keeping costs to a minimum.

Power and sufficient space cannot be always guaranteed.

Global semi-conductor shortage

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Impact of no robust alternative communications

Drinking water

Put at risk our ability to supply safe, clean drinking water to our customers taps

Protecting the environment

Significantly compromise our ability to take away, treat and properly dispose the waste water that is produced.

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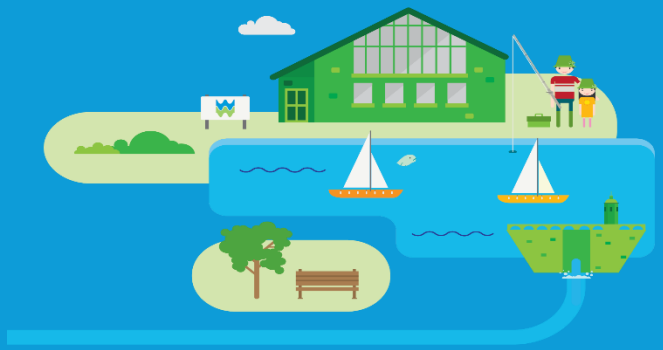
But its not all bad news…



The move away from “dial up” does provide some real and genuine opportunities, which can make us more efficient and hopefully provide an even better service to our customers.

IP communication provides a more frequent “close to real-time” asset data feed which can be more dense.

Opportunities to introduce better data analytics into our business processes, gain improved insight into our assets, and to embrace anomaly detection

IIOT can enrich the current data set further and provide further added value

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Scale Of The Challenge

What does this mean for DCWW?

- **Above ground assets:**

  - PSTN Assets ~ 2,500

  - Cellular CSD Assets ~ 1,568

Over 4,000 Sites are impacted and at risk

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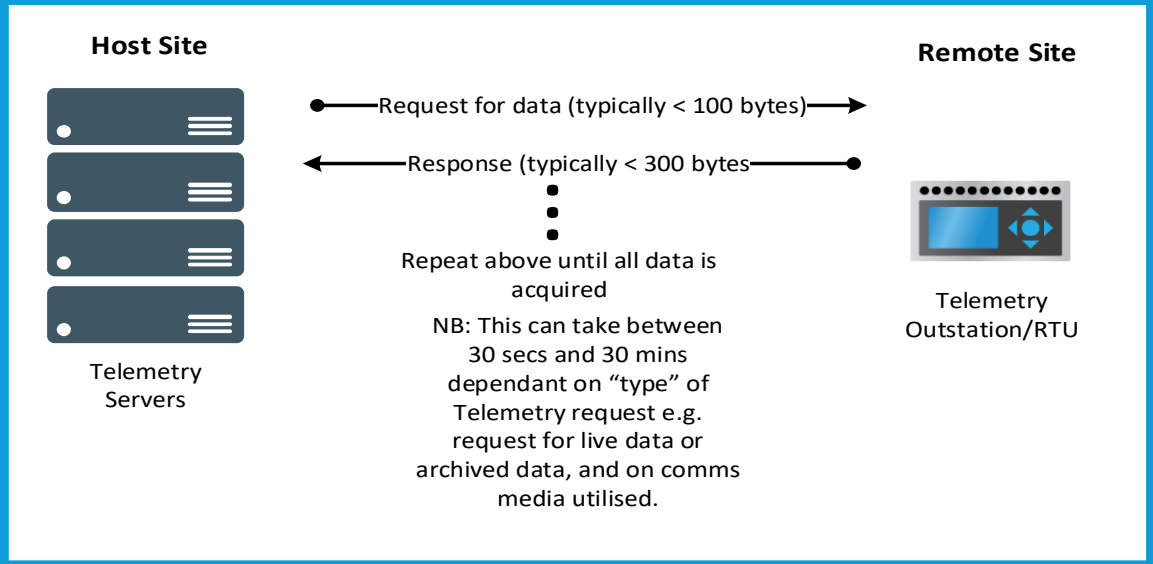
Telemetry Communications

- **Typical M2M type application data flow per RTU**



AVM per RTU between 20MB and 100MB

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Current Strategy

- **We are:**

  - to upgrade affected Sites to use digital/IP based comms media only, utilising “future-proofed” technologies that **will still be available post 2025**

  - ensuring “soft” handover/upgrade and minimal impact to Services, utilising Terminal Servers (internal to Modems/RTRs or external) to serially connect to legacy O/S, where required

  - actively engaging with current Telemetry Supplier to modify telemetry application protocols and Servers/Devices to match DCWW’s new IP only based comms strategy;

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Strategy for Replacement Continued

- **We are:**

  - currently rolling out a phased replacement program to 4G, prioritising replacement of Cellular CSD first (as CSD is at risk and costs are excessive)

  - to continue to ensure the highest comms availability is available at Key Assets by utilising two different private comms media/providers

  - actively researching, and testing, current and future IP based communication technologies (and Equipment) inc 4G/5G/IOT, BT/Open Reach, Radio & Satellite

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Current/Future DCWW Comms??

Preference

- Cellular M2M Services – 4G/5G Networks
- Utilise and expand DCWW OTS **Private** Fibre and DSL Connectivity

Where there is no 4G/5G Coverage from any Provider, utilise:

- Satellite based Services – BGAN/VSAT/TSAT/LEO
- CAT-M and NB-IOT (not yet tested for telemetry at DCWW)

Investigate “other” viable options:

- BT/Open Reach – IP only products available post 2025
- SD-WAN
- Radio based – Licenced links

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The Plan

Complete all by Dec 2024…

Priority and Order

1. Survey all Sites for feasibility for M2M from any UK Cellular LTE MNO – **well underway**
2. Convert all CSD Sites to M2M – **well underway**
3. Convert PSTN Sites to M2M - **underway**
4. Convert PSTN to “other” technologies (where no 4G coverage is available) – **investigating now**

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Technologies Considered To Date

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Cellular

- Provision Private LTE M2M Services so all UK MNO operators can be made use of in Wales - complete
- Provision new Private APN for NB-IoT and CAT-M - not yet available in Wales

Satellite

- Continue to use VSAT Satellite Services where appropriate – tested and proven
- Provision new Private APN for BGAN Satellite Services - to be tested
- Explore new satellite services i.e. LEO/NEO emerging technologies e.g. Starlink, OneWeb, Iridium Certus – researching now

Terrestrial

- Continue to use Private MPLS ccts available at key major assets – tested and proven
- Explore SOGEA availability and feasibility for FTTP and FTTC new technologies – not yet tested
- “Other” radio technologies - ??

Known Issues to Replacement Programme

Unproven Emerging Technologies

- A number of technologies, esp Satellite based, are only now emerging, where latest LEO technologies require large antennas for operation.
- Large antennas not feasible to be used at majority of DCWW Remote Assets
- Avoidance of terrestrial “transitional” products

Power issues

- All new comms technologies require power to operate, where PSTN was “self-powered”
- A minority of DCWW have no power available, and so use battery source

Worldwide Component Shortage

- Affecting procurement of not only replacement Telemetry O/S but of new communication Devices

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Satellite Technology

BGAN

- Advantages: “low profile” device and antenna
- Disadvantage: very high Opex (running) costs

VSAT

- Advantages: proven private communications technology to DCWW
- Disadvantage: poor visibility and monitoring of Network, large antennas required for service (> 0.5m)

LEO/NEO (Broadband, e.g. Starlink, OneWeb)

- Advantage: low AVM costs for broadband type usage
- Disadvantages: Large (> 0.5m), heavy Antennas required for broadband connectivity, and LOS issues at most DCWW Rural Locations, constellations not yet complete for full coverage, no commercial grade offering as yet (home/domestic use only)

LEO IoT (e.g. Certus 100)

- Advantages: “low profile” device and antenna
- Disadvantage: Not proven technology, very high Opex (running) costs? issues with LOS as above

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Terrestrial/Wired

Open Reach vs CPs

- Confusion as to programme delivery and dates of delivery to geographical areas, and dates for cessation of legacy circuits
- No visibility of programme for upgrades of areas (specifically DCWW Assets) to new IP technologies

Feasibility of new technologies

- Distance from DCWW to “Network” i.e. Exchange of StreetCabinet will be too long for replacement broadband service
- Currently unproven to work with DCWW Telemetry applications and Devices

Costs of new technologies

- Very high costs to provision new communications especially where “Network” not close to DCWW asset.
- Costs are mainly for broadband usage, so high throughput and AVM tariffs, not really suitable for telemetry?

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Radio/Cellular

LPWAN

- LoRA and SigFox discounted as not included as part of LTE (3GPP) Service and so not supported nationally by MNOs
- NB-IoT and CAT-M to be tested, as included and nationally supported by UK MNOs
- NB-IoT may not be suitable for DCWW current telemetry applications and current dataflow usage
- NB-IoT – not high enough AVM monthly models/tariffs as telemetry usage per RTU/mth is typically between 20MB and 100MB.
- CAT-M – game changer wrt “usable” extended coverage in Wales?? Needs testing…

LTE

- Gaps in LTE coverage, especially over Wales landmass, DCWW working with major MNOs/CPs to investigate how white spots can be reduced.
- Questions as to priority of data usage for Utilities/CNIs over “commercial” usage

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Wales' Coverage Issues

- **Approx only 61% of Wales' landmass is currently covered "well" by 4G!**
- **Not-spots ~ 10%**

- **New Government backed initiative SRN (Shared Rural Network) for "not spots" to increase landmass coverage….**
- **to cover 80% landmass… but not until 2026!!**

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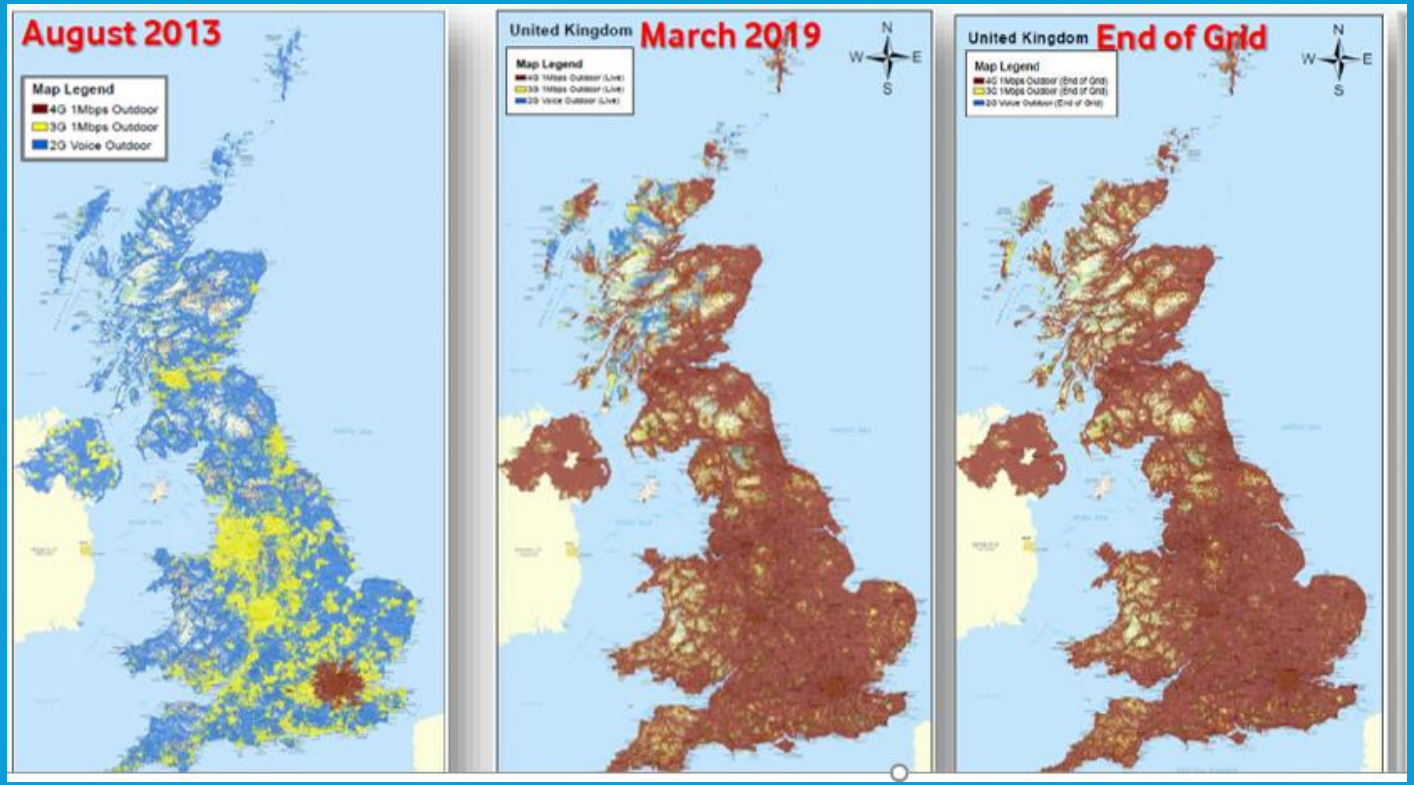
Typical Wales 4G Coverage – holes!!



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Typical DCWW Remote Installations

Each have their “challenges” - LOS issues, remoteness, lack of power etc!!

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Other Replacement Issues

- **In addition:**

- **There is currently no viable “wired” alternative to PSTN where Site is located too far from Exchange or nearest Open Reach Cabinet!**

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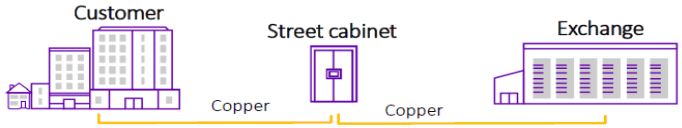
Openreach Services “today”

Broadband End-User Access technology choices available today

All with a PSTN voice service today

Copper ADSL, ADSL2+: speeds up to 17Mb downstream

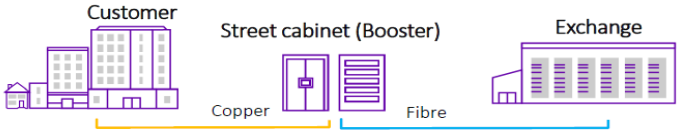


Copper >29.7m premises (99%)

Fibre to the Cabinet (FTTC) : speeds up to 80Mb downstream (Superfast speeds)

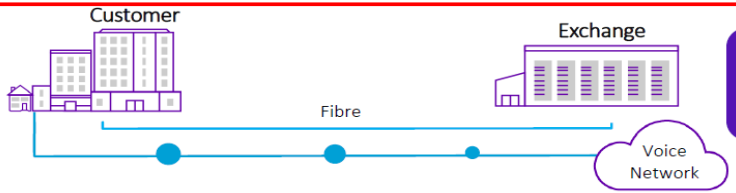
28.5m premises (95%)

G.Fast: speeds up to 330Mb downstream (Superfast and Ultrafast speeds)



2.3m premises (8%)
Target 5m by end 2020

Fibre to the Premise: speeds up to 1Gb downstream (Superfast, Ultrafast and Hyperfast speeds)



1.6m premises (5%)
Target 4m by end 20/21
Ambition 15m premises by 2025

9

BT

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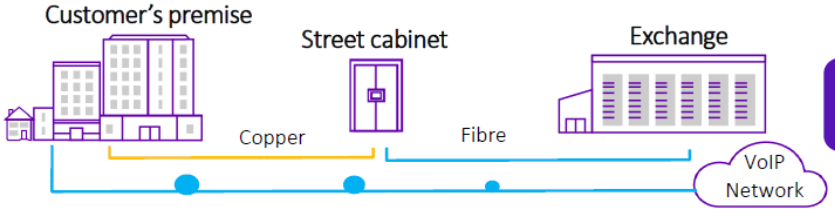
Future Open Reach Services

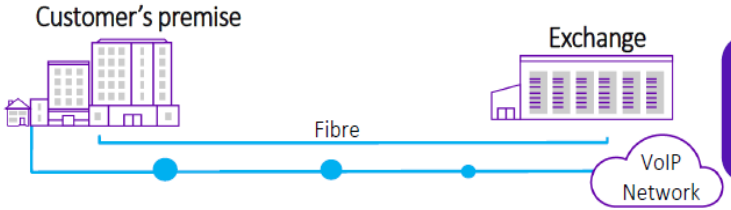
Openreach will in the future provide the access and Communications providers will provide IP voice services – supported by SOGEA & FTTP as the strategic future

Single Order GEA (SOGEA)
speeds up to 80Mb downstream



28.5 million premises (95%)

Fibre to the Premise:
speeds up to 1Gb downstream
(Superfast, Ultrafast and Hyperfast speeds)



1.6m premises (5%)
Target 4m by end 20/21
Ambition 20m premises by 2025

- **Developing services for lower speeds (0.5Mbps) – so hopefully lower Opex Costs – but only useful if can get ANY service to our Remote Sites**

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Problem Statement

We require a robust, resilient, cost effective and secure communication solution with a minimal implementation footprint to address gaps in our current mobile coverage areas……