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FROM CARGO TO CODE:

WHY POSITIONING, NAVIGATION AND TIMING (PNT) MATTERS TO AUTOMATION, AI, AND MORE

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PNT Growth Call for Evidence

- In response to the risk of PNT loss - as set out in the National Risk Register - DSIT published the Government Policy Framework for Greater PNT Resilience in October 2023, setting out a clear vision for strengthening our national capabilities.

- Point 9 of this framework aims to develop a PNT growth policy, including R&D programmes, standards, and testing to drive innovation and productivity in the PNT sector.

- The **PNT Growth Call for Evidence** is the first step in delivering that commitment.

We are eager to hear about the challenges you face, the opportunities you see, and your ideas for the growth and adoption of next-generation PNT systems

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The strategic importance of PNT

- Positioning, Navigation and Timing (PNT) services are vital for the UK economy, Critical National Infrastructure (CNI) sectors and wider society. A few examples of the services PNT underpins includes:
    - our finances – high frequency trading and mobile banking
    - our transport – planes, road and rail
    - our telecommunications – 5G and future comms
- The UK's PNT is almost completely provided through Global Navigation Satellite Systems (GNSS), primarily the US Global Positioning System (GPS).

The signals from GPS can **be blocked, spoofed, or simply fail**. That's a **risk not just to national security, but to your business' continuity.**

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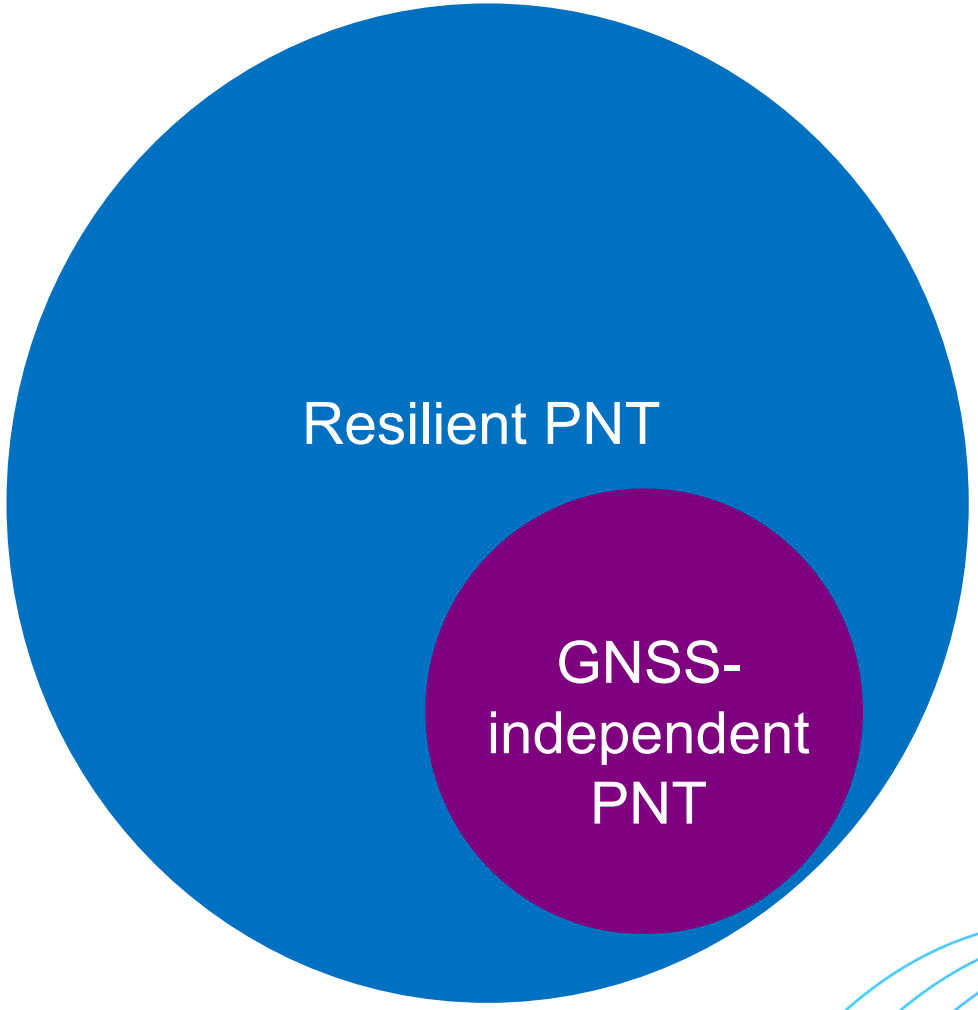
A taxonomy of PNT resilience



- **Understanding your reliance**
- **GNSS-independent redundancy**
- **Testing systems regularly**
- **Staying up to date with tech**

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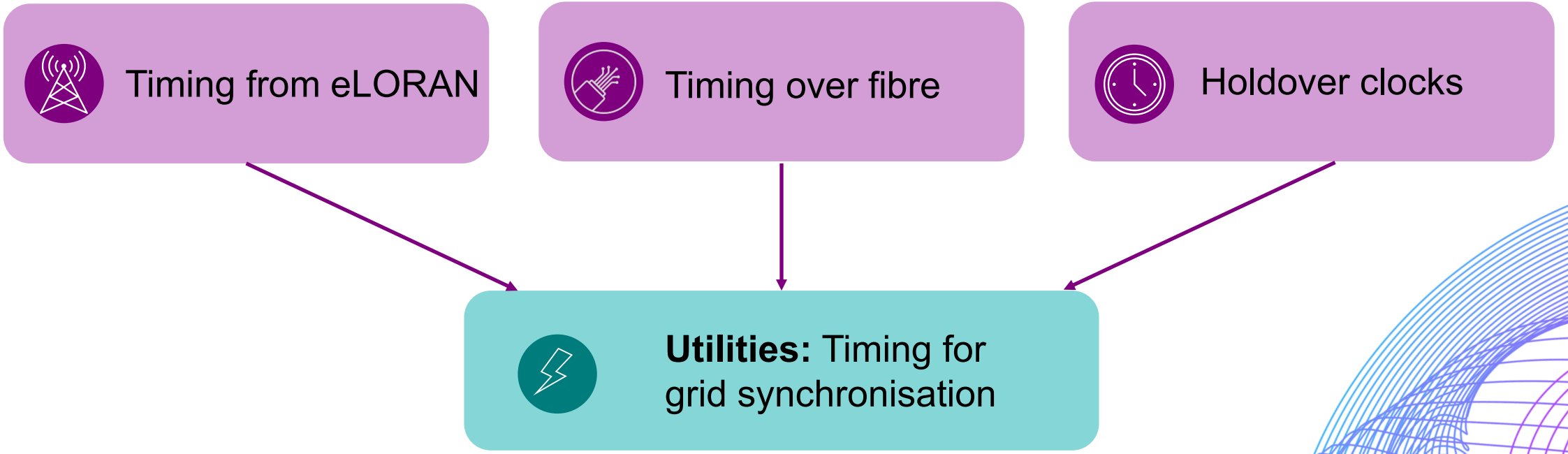
An example PNT system of systems



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GNSS-independent PNT

eLORAN

- eLORAN receiver measures the time it takes for these signals to arrive
- Uses time difference of arrival (TDOA) techniques to determine the receiver's location
- Signals are stronger than GNSS signals
- Can proving timing as well as positioning

UWB (Ultra-Wideband)

- Short-range positioning is ultra-wideband (UWB)
- Very short, low-power radio pulses
- Time of flight measurements between tag and anchor used
- Accurate ranging, ideal for use in buildings or warehouses

LiDAR

- Laser that rapidly emits pulses of light
- Laser beam travels to a target object and reflects back to the sensor
- Sensor measures the time of flight
- Knowing the speed of light, the distance to the object can be calculated

Computer Vision

- Cameras and algorithms to determine a device's location and orientation
- Analyses images to identify visual features and landmarks
- Compare to a database of known locations
- Dead reckoning can be used to estimate movement between captures

Inertial Navigation Systems

- Accelerometer and gyroscope data to calculate movement
- Acceleration data is integrated for change in position
- Gyroscope data is integrated for orientation changes
- Provides a continuous estimate of the object's position and orientation

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GNSS-independent PNT by sector

GNSS Use Cases

Logistics: Synchronised timing for multi-processes in manufacturing line

Transport: Positioning for railway signalling and navigation

Emergency Services: Positioning for navigation

Agritech: Accurate positioning for autonomous tractor guidance

GNSS-Independent Alternatives

Timing: eLORAN

Positioning: Computer Vision, INS, eLORAN

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GNSS-independent PNT by sector

GNSS Use Cases

Telecomms: Synchronised timing for communication

Utilities: Timing for grid synchronisation

Finance: Accurate timing for high frequency trading

Space: Timing and positioning for orbit determination and control

GNSS-Independent Alternatives

Timing: eLORAN

Positioning: Computer Vision

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GNSS-independent PNT by sector

GNSS Use Cases

- **Robotics:** Positioning for exploration
- **AI:** Timing for real-time information exchange
- **Construction:** Positioning for surveying
- **Defence:** Positioning for navigation in hostile environments

GNSS-Independent Alternatives

- Timing: eLORAN
- Positioning: eLORAN, UWB, LiDAR

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Responding to the Call for Evidence

- The National PNT Office will use this call for evidence to inform the development of PNT growth strategy. In particular, this evidence will help the National PNT Office:
  - better understand the UK PNT market landscape and identify where the UK is best positioned for PNT growth
  - highlight the barriers to market entry, commercialisation and user adoption

- The Call for Evidence closes at 11:59pm on Monday 25th August.

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A call to action

- This is your opportunity to shape the future of the UK PNT market in the United Kingdom: to tell us what you know, what you've experienced, and what you believe is possible.

- Please share the link with your colleagues, your networks, your communities and encourage others to contribute!

For an accessible copy of the questions, please email us at npnto@dsit.gov.uk
Sign up to GOV.UK PNT pages alerts here