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2021

DECEMBER  
02

# Time as an Enabler - for Revenue Growth

Chris Farrow

2<sup>nd</sup> December 2021



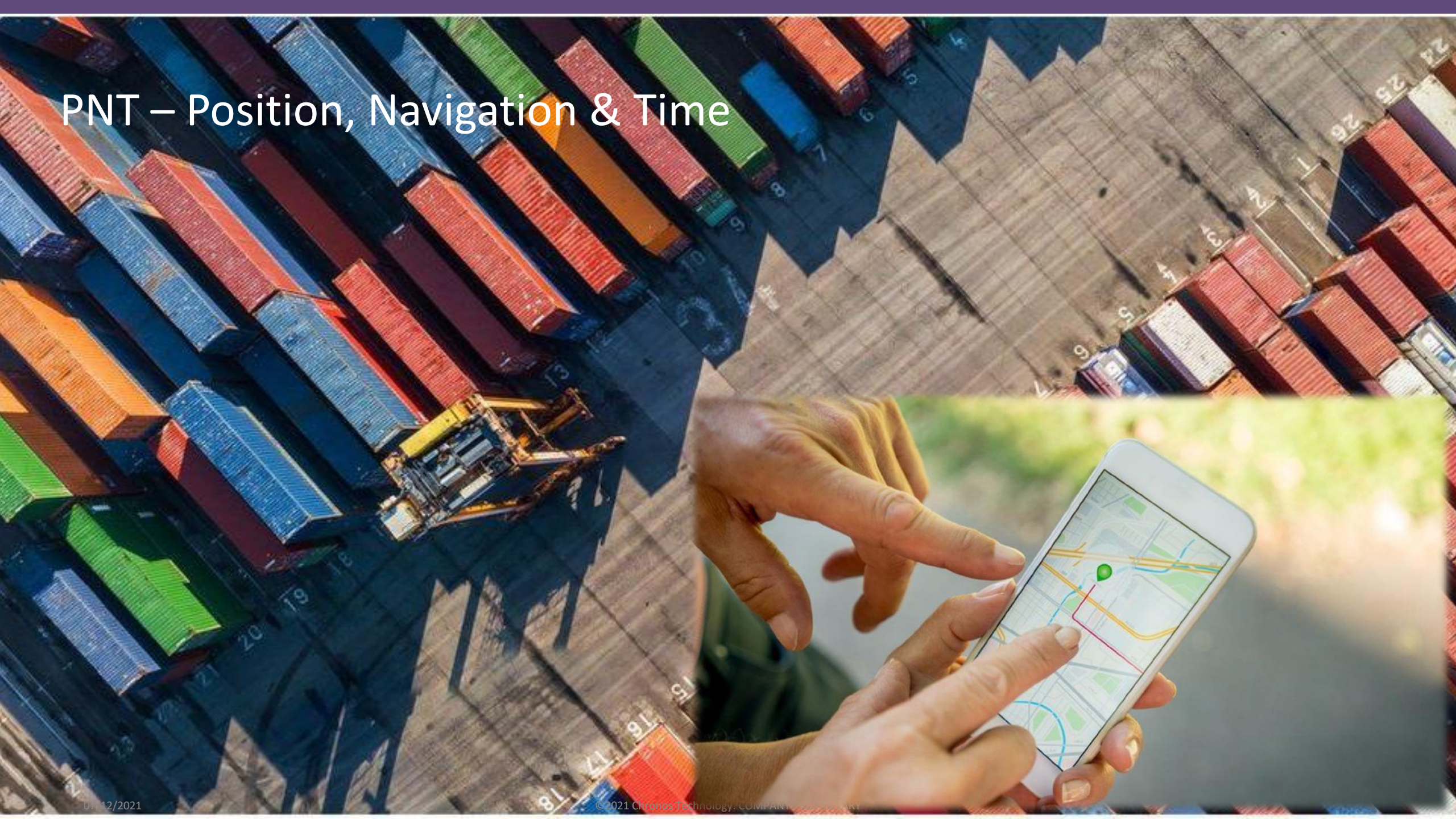
# Time





Time

# PNT – Position, Navigation & Time



# Time in Data Centres:



# Time in Data Centres:

- Typically a “roll your own” approach
- GNSS for NTP & PTP servers (SyncE/DWDM from Telco)
  - ms/ $\mu$ s/ns accuracy dependent on application
- Antenna farms, audit & support responsibility



# Security

- GNSS Jamming & Spoofing ***IS REAL!***



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About

Software-Defined GPS Signal Simulator

Readme MIT License

Releases 1

gps-sdr-sim Latest on 10 Sep 2018

Packages

No packages published

Contributors 18

File	Commit Message	Time Ago
extclk	HackRF TCXO	6 years ago
player	LimeSuite bug workaround for LimeSDR mini	3 years ago
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.gitignore	Add the option to define a custom user motion size	3 years ago
LICENSE	Update LICENSE	7 years ago
Makefile	Add missing dependency to Makefile	2 years ago
README.md	Update URL to Ephemeris data	12 months ago
bladerf.script	Add bladerf.script, and update README.md	6 years ago
brdc3540.14n	Created	7 years ago
circle.csv	Created	7 years ago
getopt.c	Initial commit	7 years ago

# But how common is it?



gps spoofing reports



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**Spoofing**, is an intelligent form of interference which makes the receiver believe it is at a false location. During a **spoofing** attack a radio transmitter located nearby sends fake **GPS signals** into the target receiver. For example, a cheap SDR (Software Defined Radio) can make a smartphone believe it's on Mount Everest!

<https://www.septentrio.com> › insights › what-spoofing-an...

[What is GPS Spoofing and how to secure GPS Security ...](#)

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<https://www.linkedin.com> › pulse › thousands-gnss-jammi...

[Thousands of GNSS jamming and spoofing incidents reported ...](#)

2 Dec 2020 — Aviation association Eurocontrol says it received 3,500 reports of GPS disruption in 2019, an all-time high. **Jamming** is widespread across the central and Eastern Mediterranean, likely due to electronic warfare between conflicting factions in Syria, Libya and elsewhere in the region.

<https://safety4sea.com> › cm-understanding-gps-spoofin...

[Understanding GPS spoofing in shipping: How to stay ...](#)

31 Jan 2020 — Concerning the incident, a master that was sailing in the Black Sea contacted the US Coast Guard Navigation Center (NAVCEN) to report the ...

<https://www.csoonline.com> › Security

[What is GPS spoofing? And how you can defend against it ...](#)

7 May 2019 — Instead of showing the accurate location, the cars were reporting that they were in Buckingham, England, in the year 2036. **GPS spoofing** is ...

<https://www.cs.ox.ac.uk> › files › gps PDF

[On the Requirements for Successful GPS Spoofing Attacks](#)

by NO Tippenhauer · Cited by 440 — In 2001, the Volpe report [8] identified that (malicious) interference with the civilian GPS signal is a serious problem. Starting with this report, practical spoofing ...

People also ask



gps spoofing reports



People also ask

Does GPS spoofing still work?

Can Fake GPS be detected?

Can you tell if someone is spoofing their location?

Can you still GPS spoof Pokemon go?

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Feedback

<https://www.bbc.co.uk> › news › technology-47786248

[Study maps 'extensive Russian GPS spoofing' - BBC News](#)

2 Apr 2019 — Thousands of incidents have been logged of Russia spoofing navigation signals, a report suggests.

<https://www.maritimeglobalsecurity.org> › media PDF

[Jamming and Spoofing of Global Navigation Satellite Systems ...](#)

Meaconing countermeasures. 8. APPENDIX A: Reporting of jamming and spoofing events. 9. GPS problem reporting. 9. Galileo incidents report form. 9. Tracking ...

<https://www.gpsworld.com> › spoofing-in-the-black-sea...

[Spoofing in the Black Sea: What really happened? - GPS World](#)

11 Oct 2017 — Between June 22-24, a number of ships in the Black Sea reported anomalies with their GPS-derived position, and found themselves located at ...

<https://www.zdnet.com> › Topic › Security

[Report deems Russia a pioneer in GPS spoofing attacks | ZDNet](#)

28 Mar 2019 — C4ADS concluded that GPS spoofing attacks are emerging as a viable disruptive strategic threat and are now at high risk of proliferation among ...

<https://www.wired.co.uk> › article › russia-gps-spoofing

[To protect Putin, Russia is spoofing GPS signals on a massive ...](#)

27 Mar 2019 — C4ADS's report focussed on GPS spoofing in Russia but also says it has seen the technology used in Crimea and Syria. "GPS spoofing or ...



# But how common is it?

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**Spoofing**, is an intelligent form of interference that sends false location data to a receiver. During a **spoofing** attack a **signals** into the target receiver. For example, a hacker can make a smartphone believe it's on Mount Everest.

<https://www.septentrio.com/insights/what-is-gps-spoofing-and-how-it-works/>

**Thousands of GNSS jamming and spoofing incidents**

2 Dec 2020 — Aviation association Eurocontrol reported a significant increase in jamming and spoofing incidents in 2019, an all-time high. Jamming in the Mediterranean, likely due to electronic warfare, and elsewhere in the region.

<https://safety4sea.com/cm-understanding-gps-spoofing/>

**Understanding GPS spoofing in a real world scenario**

31 Jan 2020 — Concerning the incident, a maritime security expert contacted the US Coast Guard Navigation Center.

<https://www.csoonline.com/Security/>

**What is GPS spoofing? And how is it done?**

7 May 2019 — Instead of showing the accurate location, a GPS spoofing attack can make a receiver believe it is in Buckingham, England, in the year 2000.

[https://www.cs.ox.ac.uk/files/gps/PDF/On the Requirements for Successful GPS Spoofing.pdf](https://www.cs.ox.ac.uk/files/gps/PDF/On%20the%20Requirements%20for%20Successful%20GPS%20Spoofing.pdf)

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by NO Tippenhauer · Cited by 440 — In 2001, researchers at the Center for Advanced Defense Studies (C4ADS) reported that interference with the civilian GPS signal is a practical spoofing ...

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## Ghost ships, crop circles, and soft gold: A GPS mystery in Shanghai

15 Nov 2019 — On a sultry summer night in July 2019, the MV Manukai was arriving at the port of Shanghai, near the mouth of the Yangtze River.



<https://www.thedrive.com/chinas-mysterious-spoofed-gps-crop-circle>

## China's Mysterious Spoofed GPS "Crop Circle" Has Something ...

19 Nov 2019 — China's Mysterious Spoofed GPS "Crop Circle" Has Something Interesting At Its Center. Something appears to be physically ...

<https://radionavlab.ae.utexas.edu/>

## Mystery GPS 'Crop Circles' in Shanghai

Mystery GPS 'Crop Circles' in Shanghai. December 2019: Researchers at the Center for Advanced Defense Studies (C4ADS), a nonprofit ...

ports

ask

spoofing still work?

Can be detected?

Someone is spoofing their location?

Can GPS spoof Pokemon go?

iPhone GPS?

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[bbc.com/news/technology-47786248](https://www.bbc.com/news/technology-47786248)

**Study maps 'extensive Russian GPS spoofing'**

Thousands of incidents have been logged of Russian-linked electronic warfare ...

[rti.org/media/1000000000/rti-report-2019-08-08-09-09](https://www.rti.org/media/1000000000/rti-report-2019-08-08-09-09)

**and Spoofing of Global Navigation Satellite Systems**

intermeasures. 8. APPENDIX A: Reporting of spoofing incidents. 9. Galileo incidents reporting.

[world.com/spoofing-in-the-black-sea-what-really-happened](https://www.world.com/spoofing-in-the-black-sea-what-really-happened)

**the Black Sea: What really happened**

Between June 22-24, a number of ships in the Black Sea reported their GPS-derived position, and found themselves in the wrong location.

[4mat.com/Topic/Security/News/Russia-a-pioneer-in-GPS-spoofing](https://www.4mat.com/Topic/Security/News/Russia-a-pioneer-in-GPS-spoofing)

**News: Russia a pioneer in GPS spoofing**

C4ADS concluded that GPS spoofing attack is a significant threat and are now at high risk of proliferation.

[defence.co.uk/article/russia-gps-spoofing-putin](https://www.defence.co.uk/article/russia-gps-spoofing-putin)

**Putin, Russia is spoofing GPS signals**

C4ADS's report focussed on GPS spoofing technology used in Crimea and Syria. "GPS spoofing ..."

## To protect Putin, Russia is spoofing GPS signals on a massive scale

27 Mar 2019 — To protect Putin, Russia is spoofing GPS signals on a massive scale ... Russian-linked electronic warfare ...

BBC News app · *Installed*

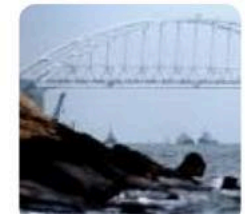
## Study maps 'extensive Russian GPS spoofing' - BBC News

2 Apr 2019 — Study maps 'extensive Russian GPS spoofing' · Russian President Vladimir Putin has a bubble of spoofed GPS signals ...

[www.nbcnews.com](http://www.nbcnews.com)

## Russia 'spoofing' GPS to keep drones away from Putin, report says

26 Mar 2019 — Russia manipulates global navigation systems by sending out false location data to civilian ships or other ...



# Issues with “roll-your-own” time solutions

- GNSS Interference – unintentional & intentional
  - Jamming & Signal Availability - Engineer sufficient “Holdover”
  - Spoofing – only the very latest receivers have a chance of detecting
    - GNSS Firewall new product category
- PTP – high precision time over ethernet for MiFID II, 5G etc.
  - Asymmetry measurement & calibration
  - On-path support & Inter-Op
- NTP – security & scalability

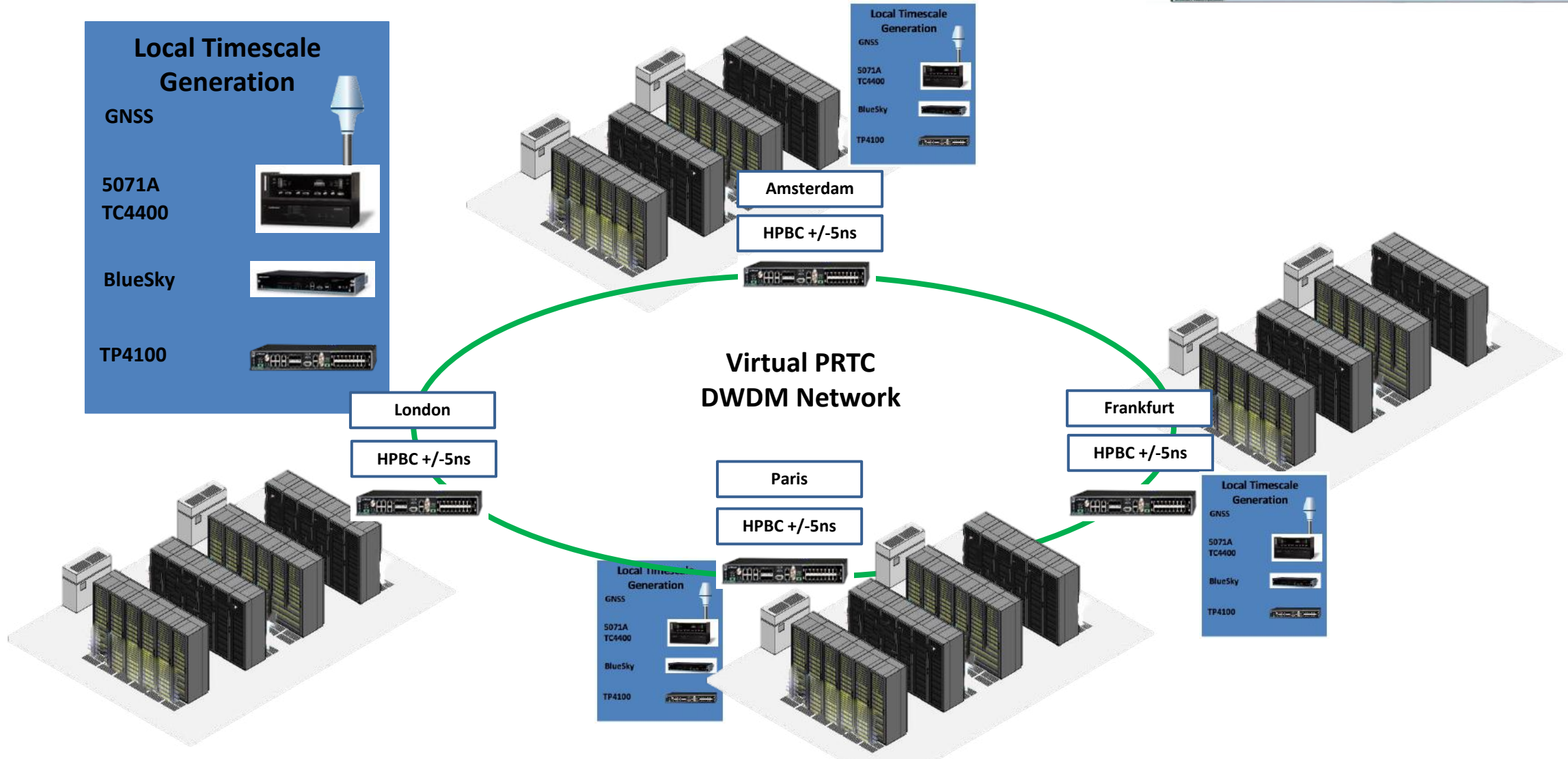


# Proposal: Time-as-a-Service

- Integrated time as part of DC infrastructure
- Managed service, offered to clients
  - *Space, Power, Cooling & Time*
- Secure, Resilient, Traceable & Managed
  - Local, UTC-traceable timescale
  - Offered to clients as PTP, NTP etc.



# Proposal – Time-as-a-Service



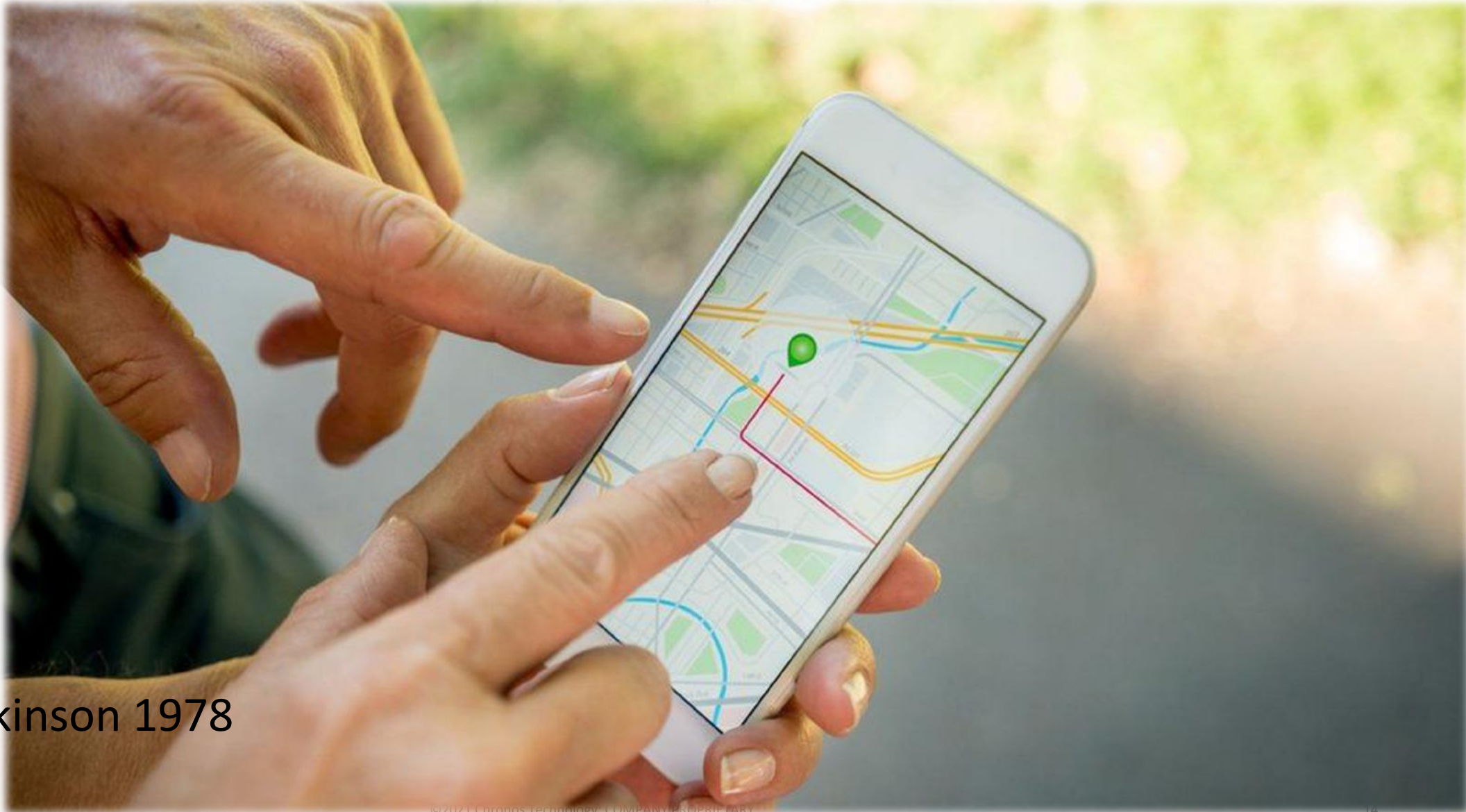
# Deutsche Börse AG as an example

- **Time Services:**
- Highly accurate PTP & White Rabbit based time service
- Fully managed, calibrated and audited to meet EU MiFID II directive

The screenshot shows the Deutsche Börse Group website. At the top right, there is a clock showing 11:58:42 CET, and links for Contact, Rulebooks, and Deutsche Version. Below this is a search bar with two input fields: 'Search term' and 'Name/ISIN/WKN'. A dark blue navigation bar contains the following menu items: Our company, Products/services, Insights, Investor relations, Media, Career, Sustainability, and Regulation. Below the navigation bar is a breadcrumb trail: Deutsche Börse Group > Products/services > Information technology > Connectivity services > Time services. On the right side of the page, there is a 'print' icon. The main content area is titled 'Time services' and features a graphic of three overlapping circles. Below the title, it states: 'State-of-the-art network time synchronisation with the T7 trading infrastructure'. There are two expandable sections: 'Time Service (PTP)' and 'Time Service (White Rabbit)'. At the bottom, there is a 'Contact' section with the heading 'Connectivity products', a phone icon and number '+49 (0) 69-2 11-1 16 90', and an email icon and address 'accessproducts@deutsche-boerse.com'. The footer contains the text '©2021 CITIBUS TECHNOLOGY. COMPANY PROPRIETARY'.

# Foresight!

## Automobile Navigation System



- *Credit:*  
Brad Parkinson 1978

# Summary

- Delivering secure, precise, traceable time is complicated
- Take away the pain for clients – offer TaaS
- Time-as-a-Service is an investment that shows leadership and differentiation





**Thank you for listening**

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