GEARS
GalilEo Authenticated Robust timing System

Critical Network Infrastructure Requirement Analysis

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GSA-User Consultation Platform

Speaker: Gilles Boime

GEARS project is granted by GSA contract GSA/GRANT/05/2017 under Fundamental Elements framework of the Galileo programme

European Global Navigation Satellite Systems Agency

PROJECT MAIN GOALS

- OBJ#1 Improving performances and resilience of Galileo and GNSS Timing receiver
- OBJ# 2 Develop and demonstrate the effectiveness of unique Galileo services to operators
- OBJ# 3 Strengthen market adoption through Standardisation activities

- OBJ#1 & 2 => Develop a model receiver to demonstrate affordable and unique functionalities that strengthen availability and trustability of Galileo services for critical infrastructures operation.
- OBJ#3 Work with standardisation bodies and professional groups of stakeholders

END USER' REQUIREMENTS: METHODOLOGY

Stakeholders' survey:

- global technical and functional request for timing and synchronisation applications
- environment and standardisation request in the targeted application domain
- stakeholder's expected benefits from a new timing and synchronisation (T&S) appliance.

Also gather sales channel, distributors and representative worldwide feedback for critical network application through partners sales management tool.
Analysis resulted in specification for timing requirements.

Stakeholders committee members:

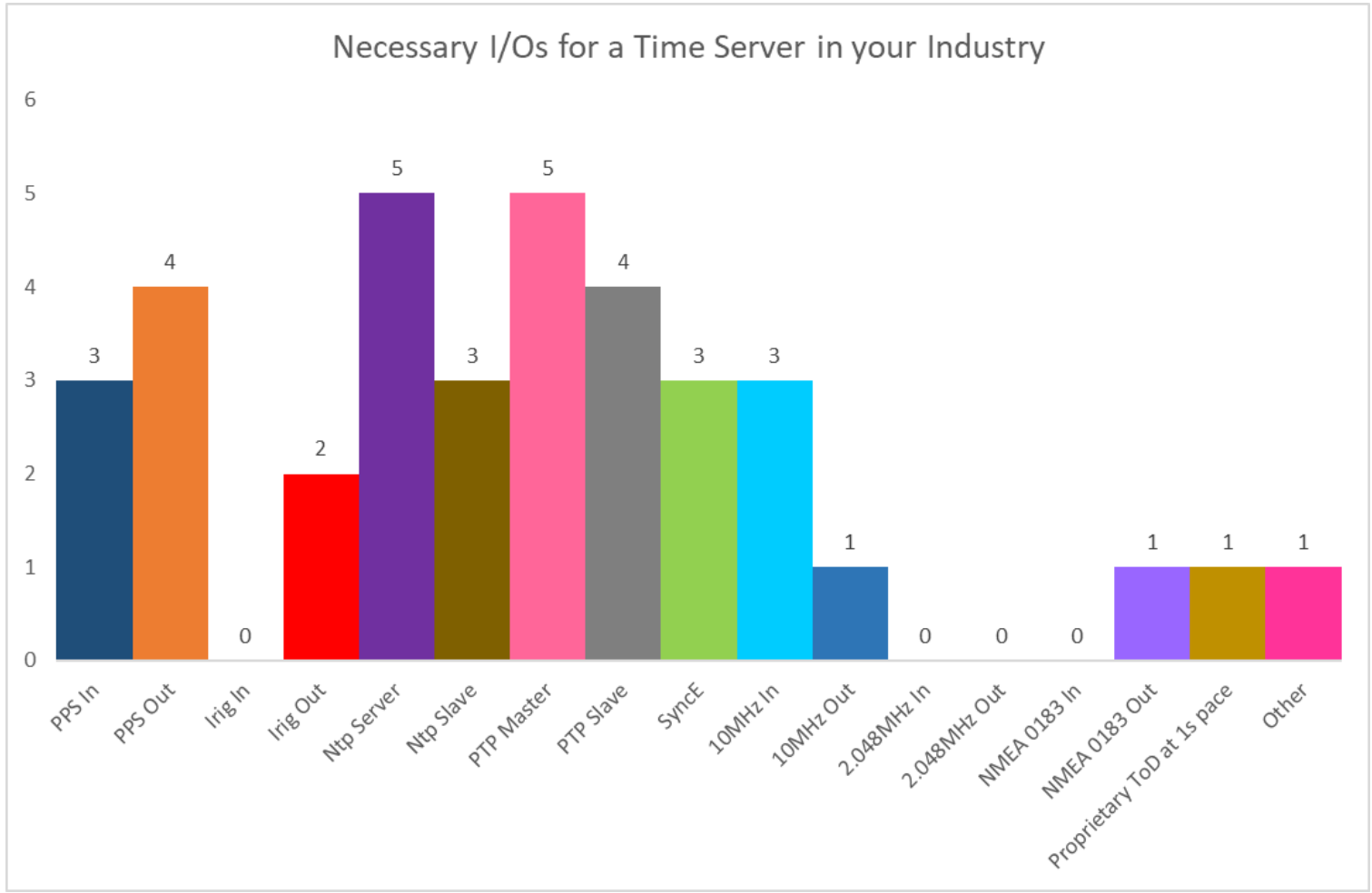
CREDIT SUISSE
l'Observatoire de Paris
citihub consulting
VSL Dutch Metrology Institute
STAC SECURITIES TECHNOLOGY ANALYSIS CENTER
Joint Research Centre JRC
VTT
NLS FINNISH GEOSPATIAL RESEARCH INSTITUTE FGI
orolia
NavCert
FDC
nlr
European Global Navigation Satellite Systems Agency

END USER' REQUIREMENTS: I/O LEGACY

Inputs and Outputs / Legacy signals

Main requirements :
- PPS In&Out
- 10MHz In&Out

Irig out as an option



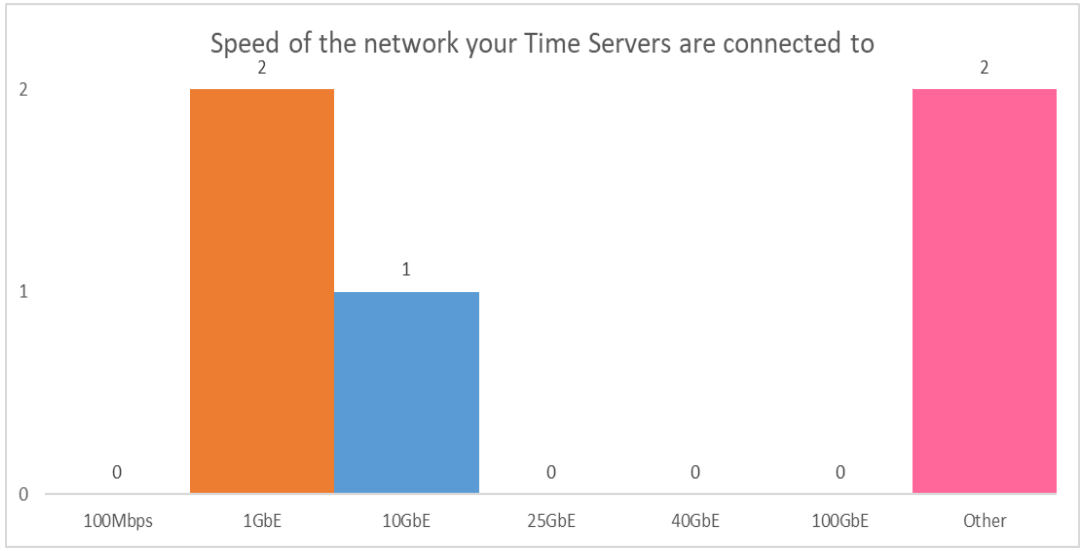
END USER' REQUIREMENTS: I/O NETWORK

Inputs and Outputs / Networking:

- Mainly 1GbE with requirements for 10GbE in Finance
- PTP and NTP coexistence

Main PTP Profiles :

- Telecom (ITU-T G8265.1, G8275.1, G8275.2)
- Enterprise (IEEE1588-2008 Default, IEC 62439-3 annex C)
- Broadcast (AES67, SMPTE ST-2059-2)
- Power (IEC 61850-9-3, IEEE C37.238-2017)



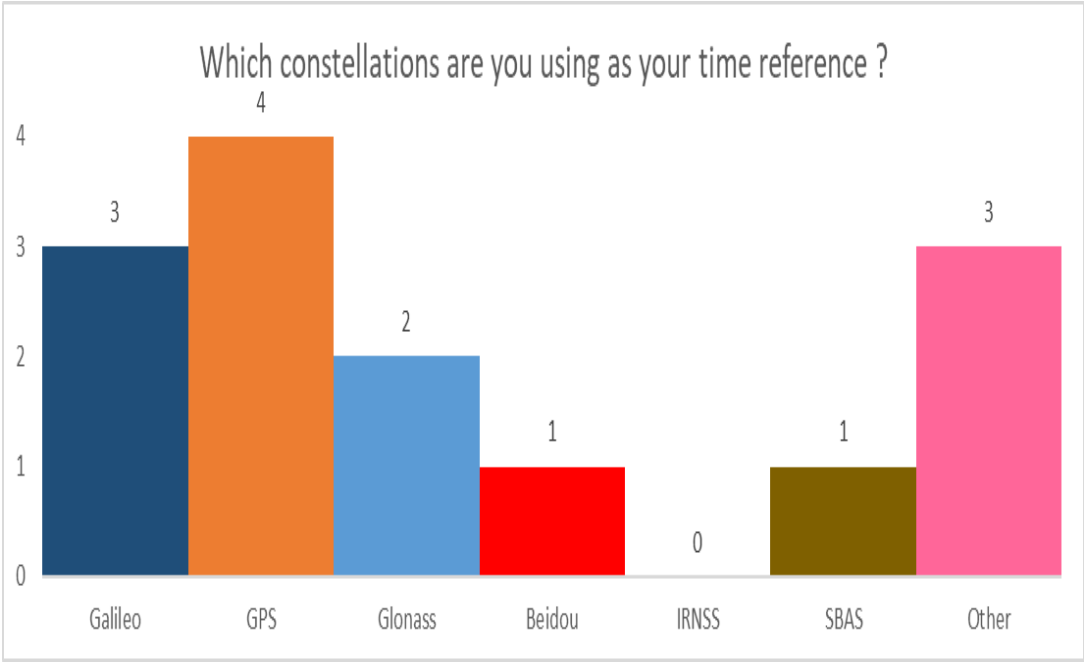
	Telecom	Energy	Finance	Protocol of choice
<1µs	5G Base-stations (Technical)	Synchrophasors, Wide Area Power Oscillation Damping (Technical)	High Frequency Trading (Regulatory)	PTP
<100µs and >1µs	LTE Base-Stations (Technical)	Sequence of Events Recording (Regulatory and Technical)	Automatic Trading (Regulatory)	PTP
>100µs	Billing, Alarms (Regulatory and Technical)	Substation Local Area Networks (Technical)	Voice Trading (Regulatory)	NTP

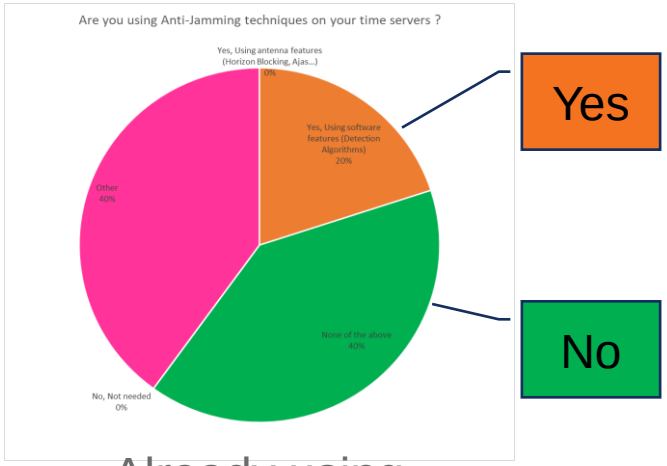
END USER' REQUIREMENTS: INPUT GNSS

Inputs and Outputs / GNSS

Multi-constellation as a standard :
- Galileo
- GPS

Anti-Jamming capabilities seen as necessary



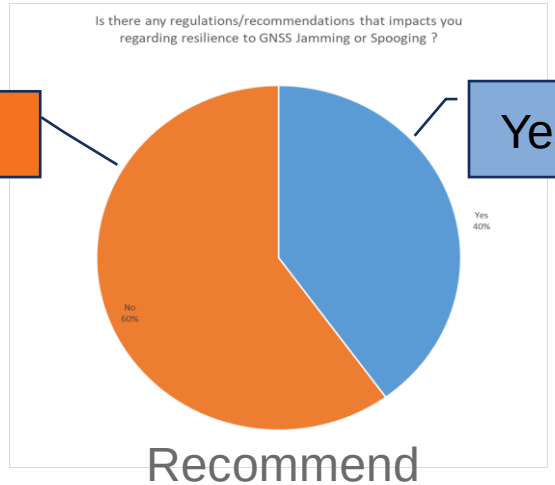


Yes

No

Already using

Operator and External regulations starts requiring Anti-Jamming capabilities



No

Yes

Recommend

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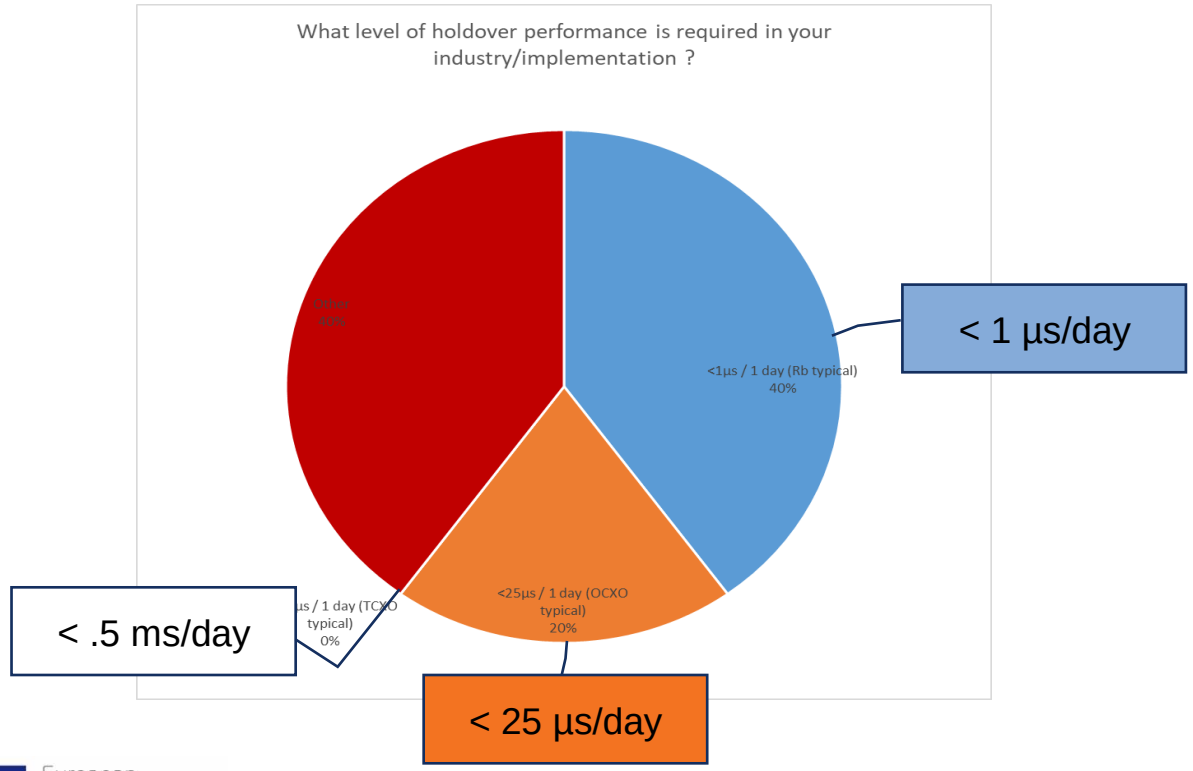
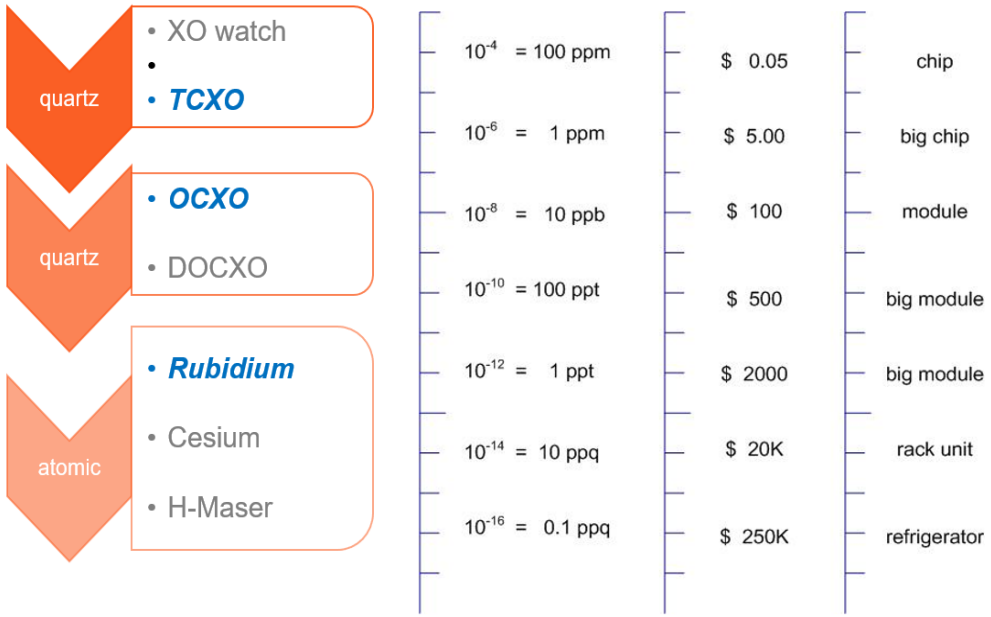
END USER' REQUIREMENTS: HOLDOVER

Timing performances (Frequency Standard)

OCXO is the minimum, Rb Option necessary

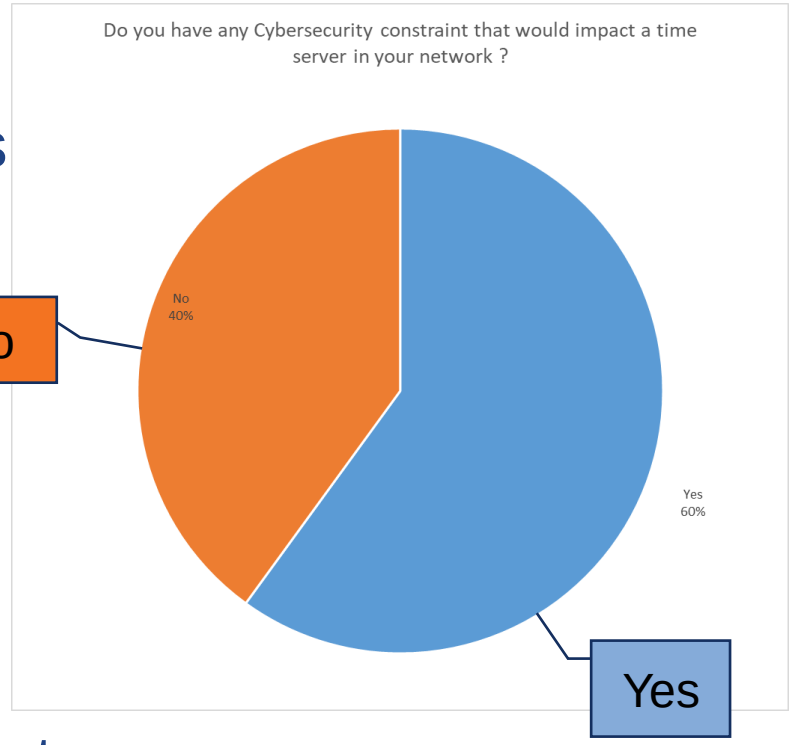




END USER' REQUIREMENTS: CYBER-PROTECTION

Cybersecurity

No transnational regulations
ENISA Recommendations translated by national agencies



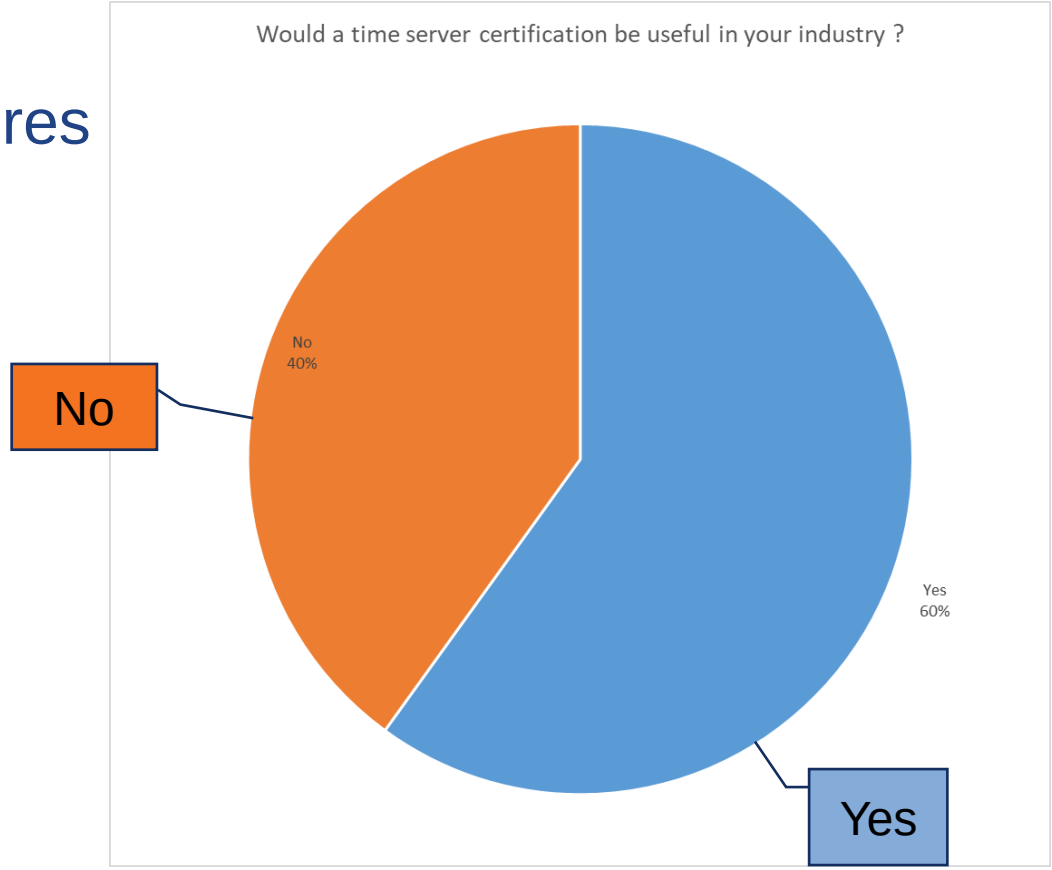
Certification to be selected, if necessary at productization stage

END USER' REQUIREMENTS: CERTIFICATION

Certification

General feeling that independent testing should be available

Need to work on standards and testing procedures to build technical reference for certification



STANDARDISATION TO SUPPORT MARKET CONFIDENCE

To harmonise evaluation of timing and synchronisation service resilience for operators of network a standardisation approach will clarify performances and help to transfer knowledge from vendors to operators.

Operators need to gain confidence in resilience

Classify performances wrt of application request through linked functions:

- T&S performances (e.g. 100 µs, 1 µs, 50 ns ; ETSI TS 103 246-3 ; ITU-T G.8xx)
- Stress level & period (e.g. 1 h, 1 day, 10 days)
- Level of confidence for performances (e.g. 95%, 99.9%, 99.99999%)

Need to set approach for threat stress to be applied (expected development with CEN-CENELEC TC5 “Space” or ETSI TS-SES).

STANDARDISATION TO SUPPORT MARKET CONFIDENCE: THREAT DEFINITION

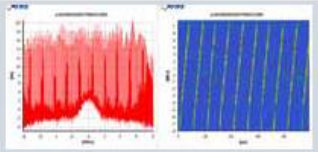
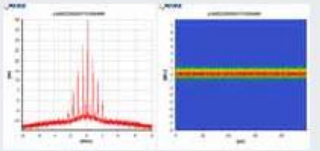
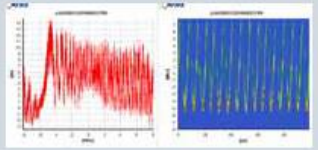
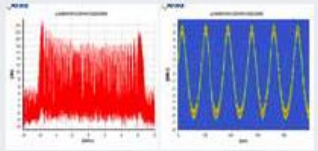
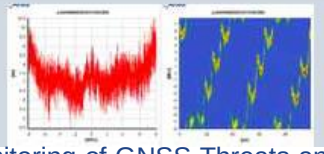
Approach 1: test performances with predefined thread (Type of approach to define threat from common surveyed real observation with RF monitoring sensors), refer to STRIKE 3 –D4.2 – Draft Standards for Receivers Testing against Threats

But STRIKE 3 D.4.2 document is limited to jamming threat over L1 and E1 band and observed data will takes years to be included in standard release

University of Texas "Texbat" 8 types of Threat

To be released EN 16803-4

SCENARIO OF INTERFERENCE SHALL BE ASSESSED PER APPLICATION

Type of signal	Example Plots	Reason for choice
Wide Sweep – fast repeat rate		Very common (total number of events, and number of sites)
Narrow band at L1		Example unintentional signal – this type seen on multiple occasions and at multiple sites
Triangular		Common (and number of sites)
Triangular wave		Common (and number of sites)
Tick		Quite common. Evolving threat (new type).

From "Outcomes of Long Term Monitoring of GNSS Threats and Receiver Testing, Michael Pattinson – NSL, 12th Annual Baška GNSS Conference 6-9 May 2018"

STANDARDISATION TO SUPPORT MARKET CONFIDENCE: THREAT DEFINITION

Approach 2: Use RF GNSS band Threat explored with regard to technology accessibility through a Common Criteria like methodology and goals assessment

Type and level of threat are re-assessed at each certification renewal

Certification is only valid at date

Regulation shall stress certification renewal period regarding application domain

More complex and much higher cost to market than Approach 1 but higher confidence.