

EUROPEAN
SPACE
WEEK

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ONLINE EDITION

Update of User Requirements

User Consultation Platform #3

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Organised by:



European
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EU Space Programme:



Copernicus

EGNOS



Background

- First User Requirement Document (URD) issued in 2018
- Updated in 2019 after UCP#2
- « Time and Synchronisation » renamed into « Infrastructure »



Objectives of this session

1. Refine, clarify or update GNSS requirements for Timing & Synchronisation described in the URD
2. Identify new GNSS requirements for Timing & Synchronisation

Some values proposed to be validated
Some values missing to gather

Scope:

Requirements discussed in this session are only related to GNSS – not on the overall Timing & Sync function which is dependent of each network architecture



06 USER REQUIREMENTS SPECIFICATION

6.1 SYNTHESIS OF USER REQUIREMENTS ANALYSIS

The requirements have been gathered according to the group of applications described in paragraph 5.1. When a requirement is common to one or two groups the same nomenclature reference is used.

6.1.1 REQUIREMENTS FOR TELECOM

Table 3: Requirements for Telecom

ID	Description	Type	Source
GSA-AMD-USR-REQ-TSC-0010	The Timing & Sync system shall provide an accuracy of 100ns for Telecom applications.	Performance (Accuracy)	(RD11) (RD2) (RC30)
GSA-AMD-USR-REQ-TSC-0020	The Timing & Sync system shall provide frequency accuracies of ± 10 ppb and phase synchronization of ± 1 ps while compensating for delay variations and jitter for LTE (requirement reaches 0.3 ps accuracy for cells external -800MHz).	Performance (Accuracy)	(RD11) (RD2) (RC30)
GSA-AMD-USR-REQ-TSC-0030	The Timing & Sync system shall provide an accuracy of 1 ps for PSTN.	Performance (Accuracy)	(RD11) (RD2) (RC30)
GSA-AMD-USR-REQ-TSC-0040	The Timing & Sync system shall provide an accuracy of 10 ps for PMR.	Performance (Accuracy)	(RD11) (RD2) (RC30)

6.1.2 REQUIREMENTS FOR ELECTRICITY TRANSMISSION

Table 4: Requirements for Electricity transmission

ID	Description	Type	Source
GSA-AMD-USR-REQ-TSC-0050	The Timing & Sync system shall provide an accuracy of 1 ps for PMR applications (Time tagging with accuracy better than 1 ps with a magnitude accuracy of 0.1% or better).	Performance (Accuracy)	(RD11) (RD2) (RD14) (RD24) (RD25) (RC30)
GSA-AMD-USR-REQ-TSC-0060	The Timing & Sync system shall not only be dependent on GPS.	Function (Independence)	(RD11) (RD2) (RC30)
GSA-AMD-USR-REQ-TSC-0070	The Timing & Sync system shall provide continuity of service.	Performance (Continuity of service)	(RD11) (RD2) (RC30)

How to interact, discuss and vote?



Join on sli.do
#1493

We will ask sli.do to:

- Gather your questions during the presentation
- Get your answer to polls



Slido best practices

- Indicate your name and company when asking a question
- Like the questions for improved visibility



Applications covered in the URD



Telecom	Energy	Finance
Satcom Network	Phasor Measurement Unit	Banks
Professional Mobile Radio Network		Stock Exchange
Digital Cellular Network		
Public Switched Telephone Network		



Accuracy

- Telecom: Proposed update for Digital Cellular Network (5G)

Proposed update for DCN:

- AC1** *"The Timing & Sync system shall provide a Timing accuracy of 30 ns to UTC" (ePRTC installed at the core of DCN)*
- AC2** *"The Timing & Sync system shall provide a Phase Sync accuracy of less than 65 ns" (intraband contiguous carrier integration)*
- AC3** *"The Timing & Sync system shall provide a Freq Sync accuracy of 1.10^{-11} "*

- Energy: No change
 - The Timing & Sync system shall provide an accuracy of 1 μ s for PMU applications
- Finance: No change
 - The GNSS system shall provide a T&S function with 100ns to 200 ns accuracy for timestamping.



Availability

- **Telecom:**
 - No quantitative requirement found for the GNSS T&S availability although availability was identified as a “main potential future driver” for GNSS
- **Energy:**
 - Review of public literature highlight the need for high availability in power grids
- **Finance:**
 - UCP#2 led to the following requirement: “The Timing & Sync system shall provide a high level of availability (99.9%)”



Proposed update for all segments:

AV1

“Is this value confirmed (when considered on yearly basis)? And could a different value be considered if calculated on a monthly basis?”

Integrity

- Integrity is recognised as an important feature but no GNSS integrity requirement is addressed in standards (as it depends on network topology and redundancy)
- UCP#2 recognized the importance of integrity monitoring

Proposed update for all segments:

IN1

“The Timing & Sync system shall get access to integrity information with a certain level of confidence”

- Quantified requirement:

IN2

Q: Any input on Alarm limit?

IN3

Q: Any input on Integrity Risk?

IN4

Q: Any input on Time To Alarm?



Other unquantified requirements

- Continuity:
 - *The continuity of a system is the ability of the total system (comprising all elements necessary to maintain craft position within the defined area) to perform its function without interruption during the intended operation*

OT1 Is Continuity a relevant requirement parameter for Infrastructure?

- Time To First Fix
 - TTFF accounts for the time elapsed from the GNSS receiver switch-on until the output of a timing solution within a certain performance

OT2 Is TTFF a relevant requirement parameter for Infrastructure?

- Update rate

OT3 Which Update rate to consider for Telecom? Energy? Finance?



Other requirements – Cross sectorial

- Service availability
 - Worldwide availability is required

OT4

Q: Do you agree?

- Service coverage
 - Availability in urban canyon and indoor (with antennas outdoor) is desirable

OT5

Q: Do you agree?

- Traceability
 - Traceability to UTC shall be demonstrated

Ot.6

Q: Do you agree?



Authentication

- Robust and secure timing is increasingly required in all Infrastructures
- At UCP#2, it was agreed that:
“The Timing & Sync system shall provide robustness against GNSS spoofing threat”
- Some questions to go a step deeper:



- | | |
|------------|---|
| AU1 | <i>Place where the authentication results are needed? At the user equipment (UE) or remotely or both?</i> |
| AU2 | <i>Is Authentication required continuously or on demand?</i> |
| AU3 | <i>Is Authentication to be provided in Real time?</i> |
| AU4 | <i>How long between successive authentications?</i> |
| AU5 | <i>Is a Time Accuracy loss permitted or not?</i> |
| AU6 | <i>What could be the impact of key management procedure (from transparent to cumbersome)?</i> |

Linking space to user needs



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