magicGNSS Precise Product Provision for LEO POD Applications

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D. Calle

L. Martínez

G. Tobías

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INNOVATING SOLUTIONS

Contents

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INTRODUCTION

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magicGNSS **Product Provision Service** has been designed to provide **precise satellites' orbit&clock parameters**, together with Earth Orientation Parameters with a **very low latency**.

For this purpose, files containing the information are typically uploaded to a **SFTP** server.

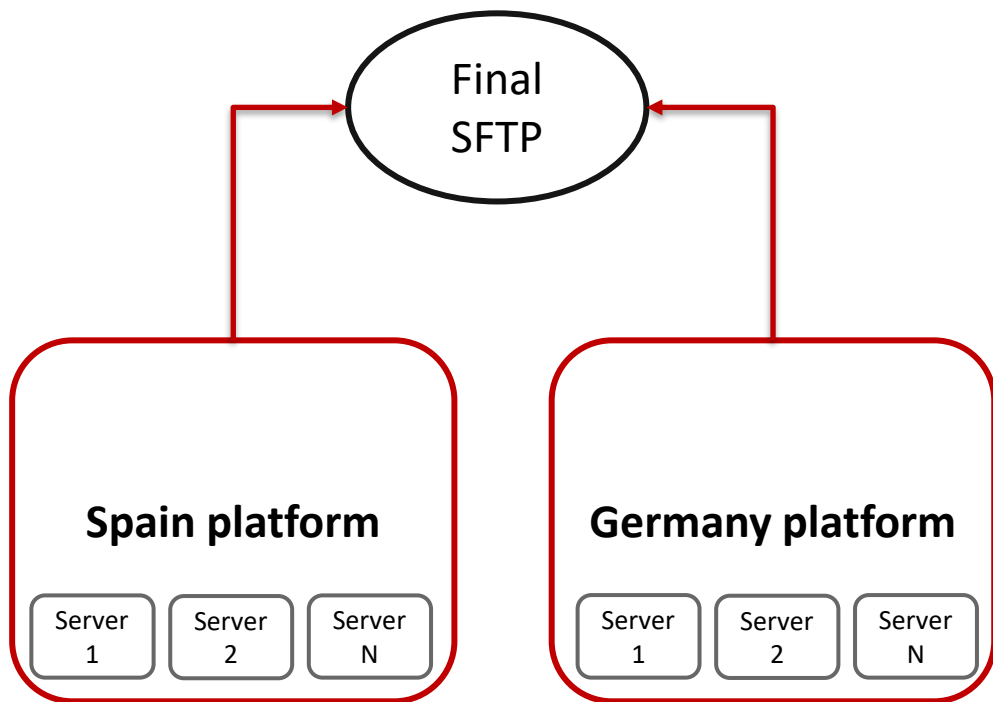Currently, this service is supporting, among other:

- Various EUMETSAT Radio Occultation missions (https://www.eumetsat.int/website/home/Satellites/FutureSatellites/EUMETSATPolarSystemSecondGeneration/index.html)

- Sentinel Mission for ESA (https://sentinel.esa.int/web/sentinel/about-sentinel-online)
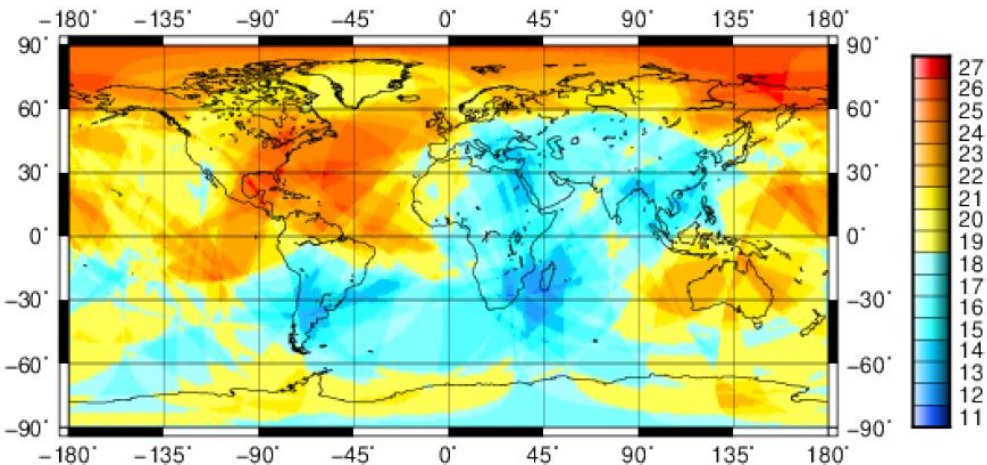
GMV INFRASTRUCTURE

GMV INFRASTRUCTURE

One important point of this service is the **availability and redundancy**, so an infrastructure using different platforms located in two different countries has been designed for this purpose.
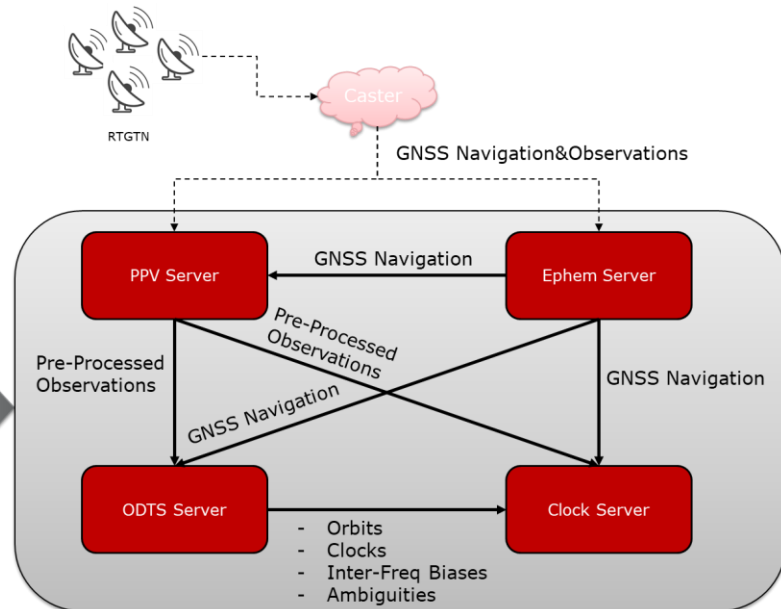
Final
SFTP

Spain platform

| Server 1 | Server 2 | Server N |

Germany platform

| Server 1 | Server 2 | Server N |

Germany

Spain

PRODUCT PLATFORMS


A **stations network** (with SLA) is used to generate the final orbit&clock products, using *magicGNSS* tool suite.

magicGNSS is composed by several modules in charge of generating precise products for different constellations.

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PRODUCT PLATFORMS

Apart from *magicGNSS*, there are other modules in charge of:

- checking the **Quality of Service** with weighting factors between different servers to optimize quality and availability

- generating the **final product** with the desired format using the outputs from magicgnss modules

- sending the final product through **SFTP** to the client

SERVICE PROVISIONING SPECIFICATIONS

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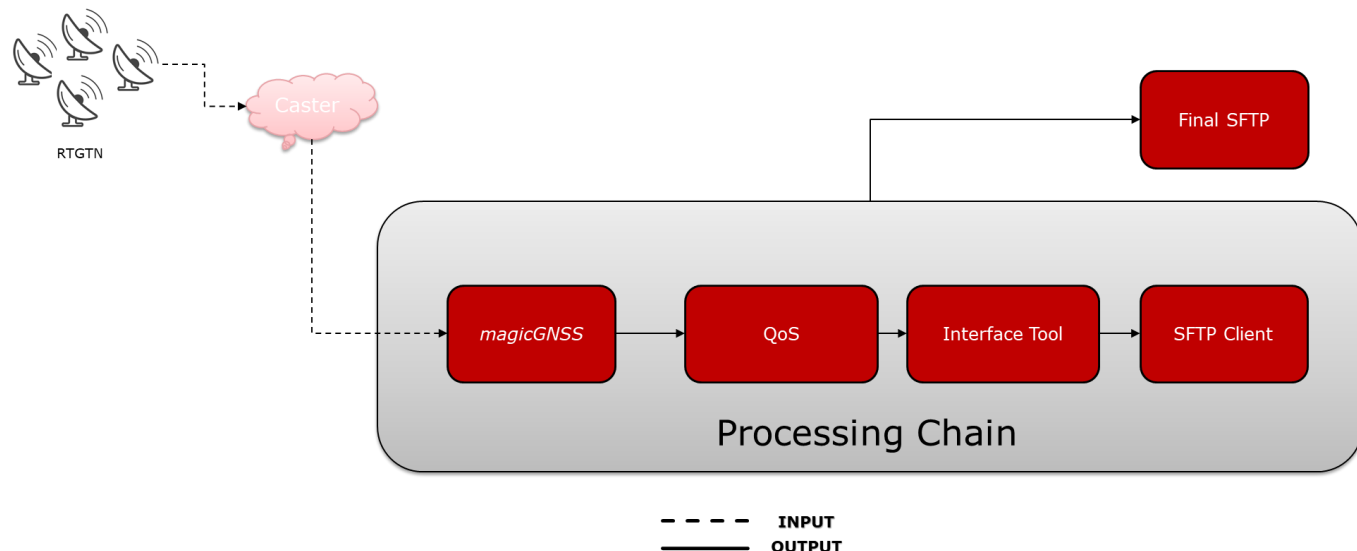
SERVICE PROVISIONING SPECIFICATIONS

Service is focused on **standard formats to maximize compatibility**.

Detailed **service tailoring has been performed** to cope with each customer's specific needs.

Main file-based products are:

Product	Frequency	Latency	Rate	Estimation Arc Coverage	Prediction Arc Coverage	Format
SP3 orbits and clocks	10/15 minutes	2 min	30 sec	24 hours	24 hours	SP3c/d
RINEX Clock files	10/15 minutes	2 min	10 / 30 sec	24 hours	24 hours	RINEX clk v3.02
EOP	Hourly	2 min	12 hours	4 days	3 days	IERS
Navigation RINEX	Hourly	2 min	Depending on the constellation	24 hours	-	RINEX nav v3.02

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SERVICE MONITORING

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SERVICE MONITORING

Another important point of a Near Real Time service is the monitoring of the system itself. In order to do that,

several technologies are used:

- **Nagios and Prometheus** for Real-Time alerts.

SERVICE MONITORING

Another important point of a Near Real Time service is the monitoring of the system itself. In order to do that, several technologies are used:

- **Grafana** for HW and system Real-Time monitoring.
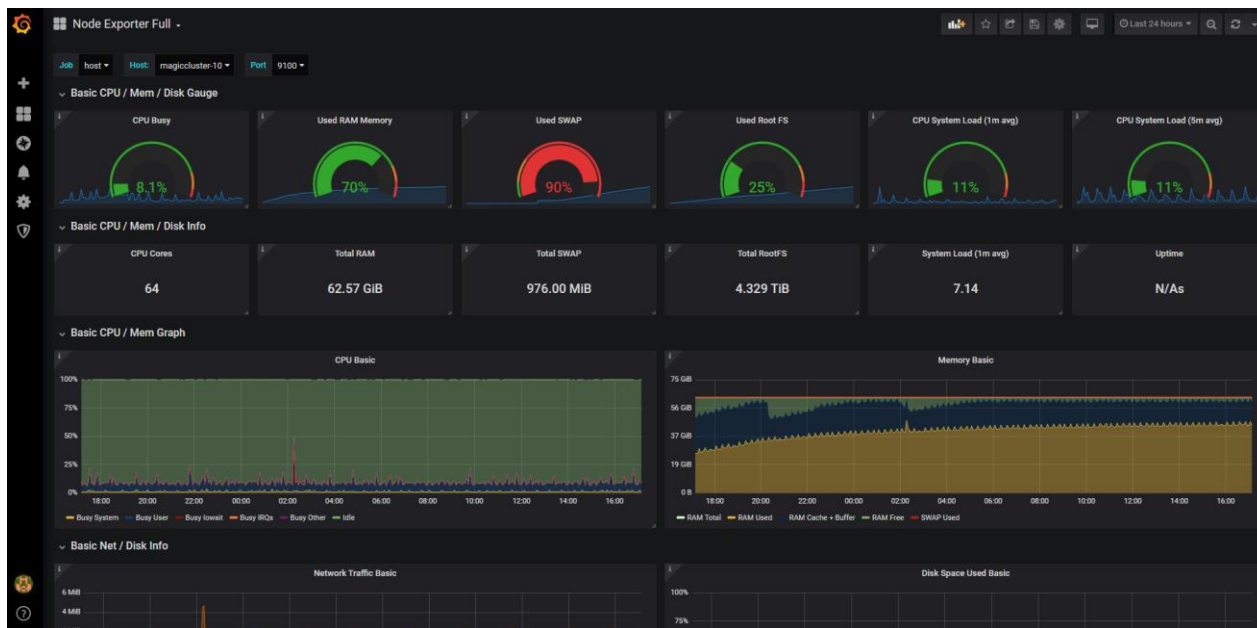
SERVICE MONITORING

Another important point of a Near Real Time service is the monitoring of the system itself. In order to do that, several technologies are used:

- **Grafana** for performances analysis.

SERVICE PERFORMANCES

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SERVICE PERFORMANCES - SUMMARY

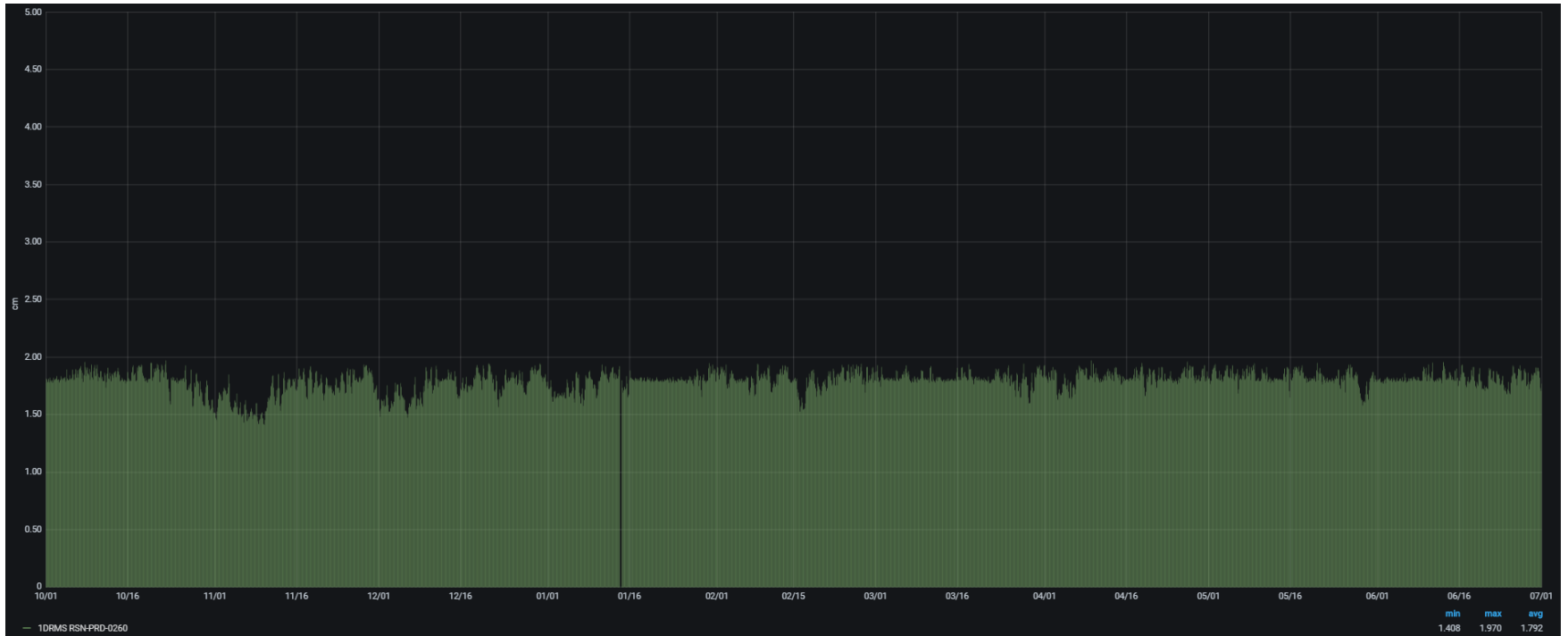**Performaces summary for GPS and Galileo constellation from 1st of October 2019 to 1st of July 2020**

Product	Constellation	Min	Max	Mean
Orbits (RMS)	GPS	1.4 cm	1.9 cm	1.7 cm
Clocks (Sig)		0.05 ns	0.07 ns	0.06 ns
Orbits (RMS)	Galileo	2.4 cm	5.6 cm	3.6 cm
Clocks (Sig)		0.03 ns	0.23 ns	0.11 ns

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SERVICE PERFORMANCES – ORBITS

Orbit performances from 1st of October 2019 to 1st of July 2020
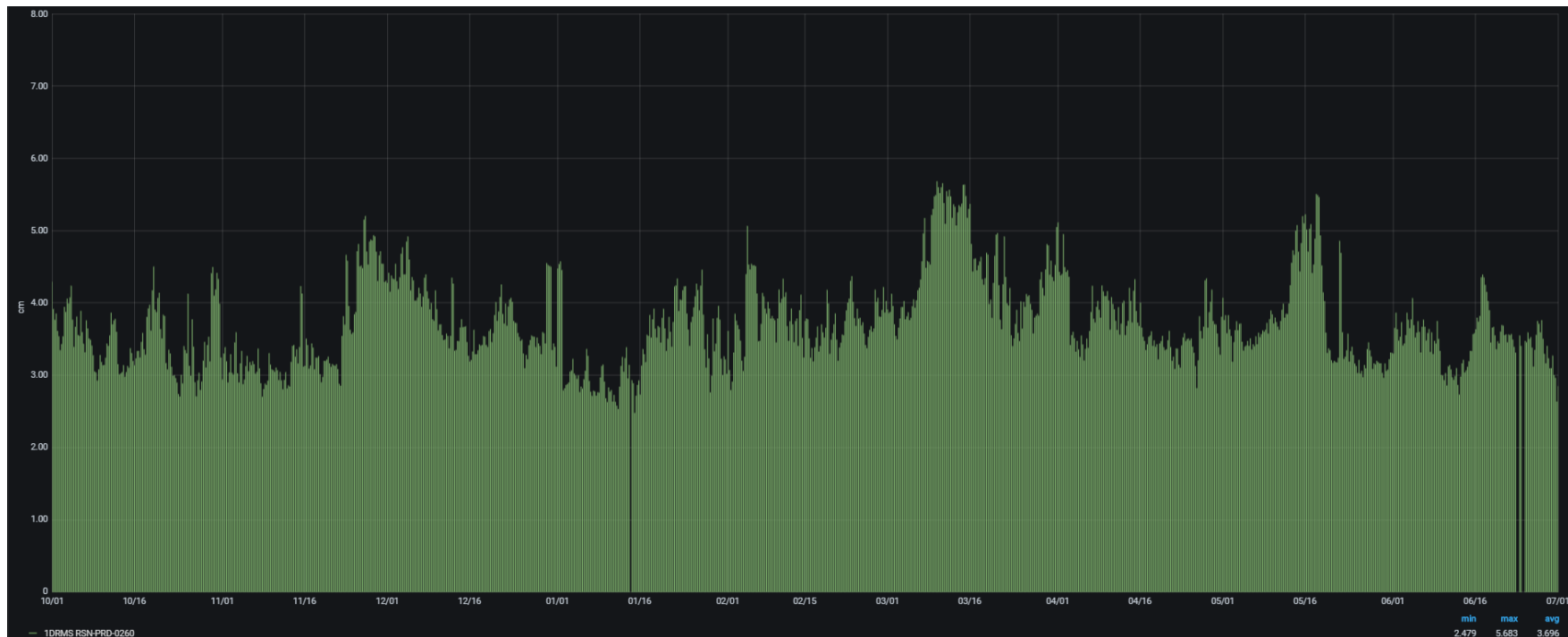
Analyzing the 24 hour of the estimation arc of each product delivered every 10 minutes

SERVICE PERFORMANCES – ORBITS

Orbit performances from 1st of October 2019 to 1st of July 2020

Analyzing the 24 hour of the estimation arc of each product delivered every 10 minutes

SERVICE PERFORMANCES - CLOCKS

Clock performances from 1st of October 2019 to 1st of July 2020
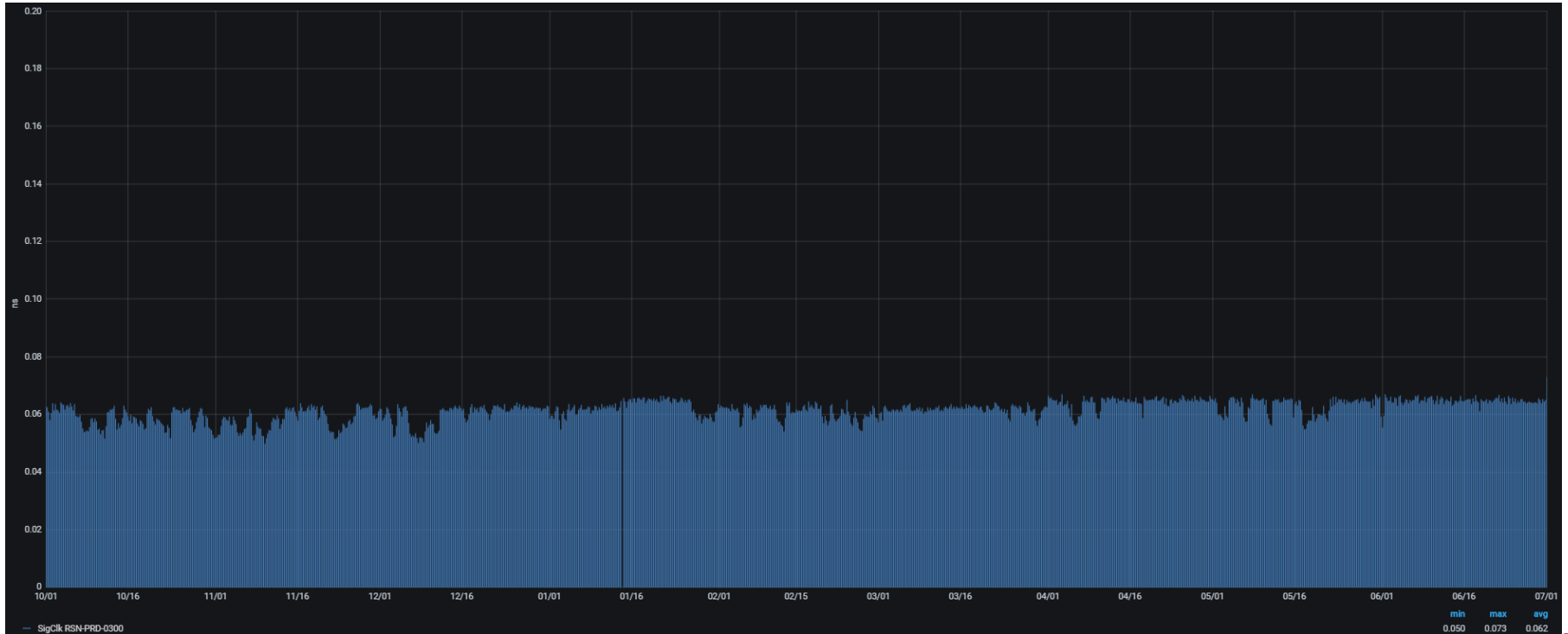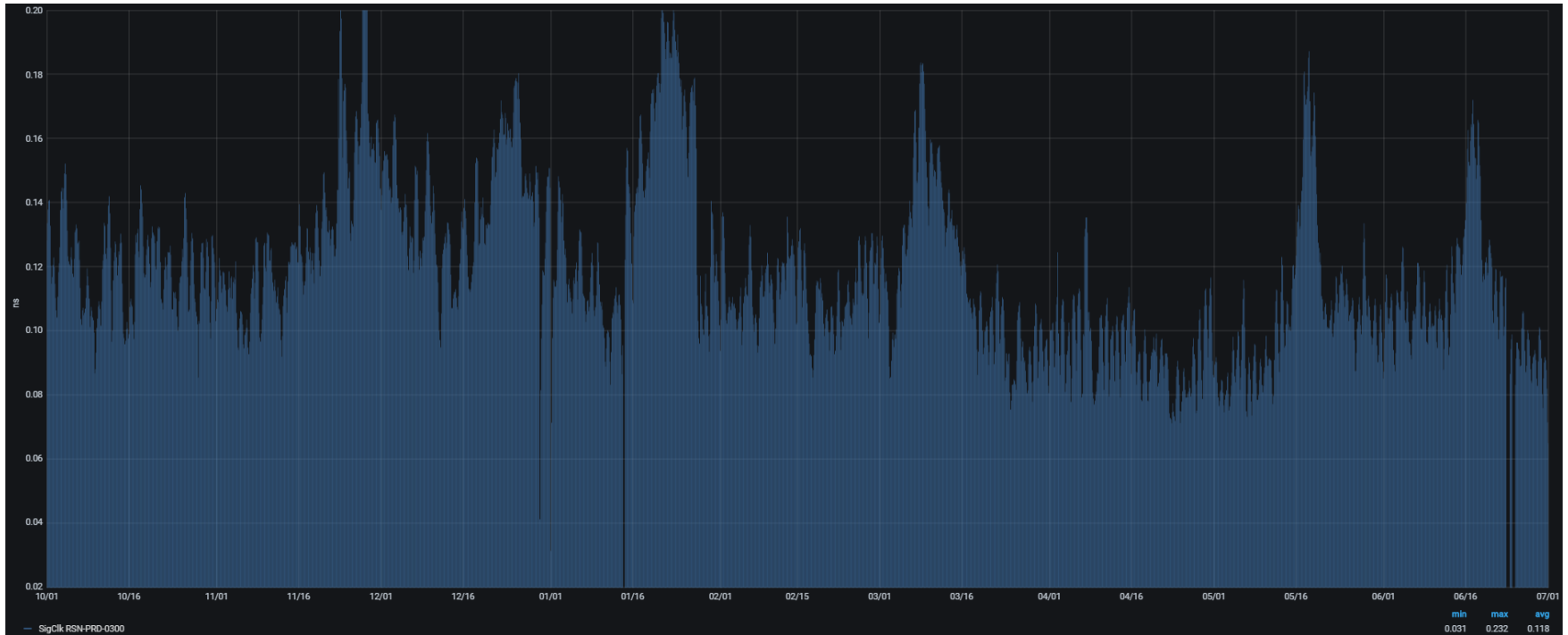
Analyzing the 24 hour of the estimation arc of each product delivered every 10 minutes

SERVICE PERFORMANCES - CLOCKS

Clock performances from 1st of October 2019 to 1st of July 2020

Analyzing the 24 hour of the estimation arc of each product delivered every 10 minutes

CONCLUSIONS

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CONCLUSIONS

- **Precise GPS products with reduced latency are becoming more and more demanded** for Atmospheric, Oceanic, Land, Climate Change monitoring Missions.

- Latest missions are equipped with multi-GNSS receivers on-board, being able to provide **accurate products for all GNSS constellations is crucial**.

- Availability and continuity are critical for not impacting the LEO missions.

- GMV has managed undertake these challenges and develop and operate an infrastructure **capable of coping with the aforementioned needs**.

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Thank you!!

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