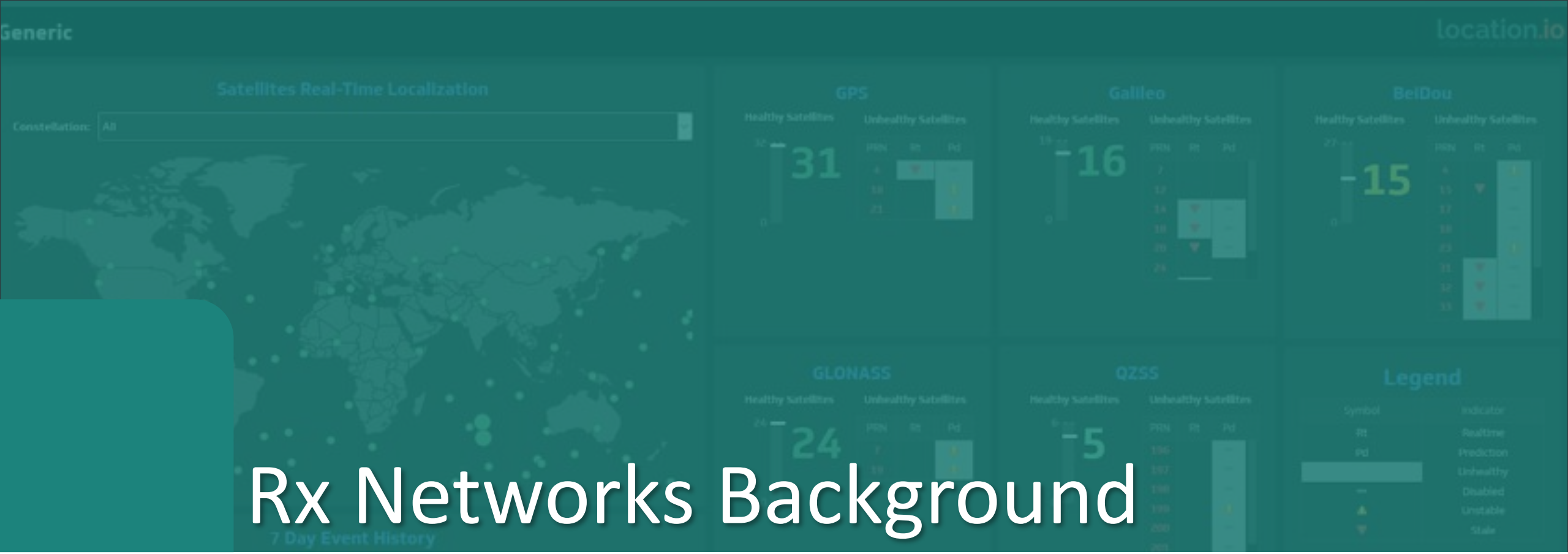
ESA NAVISP

January 17, 2022

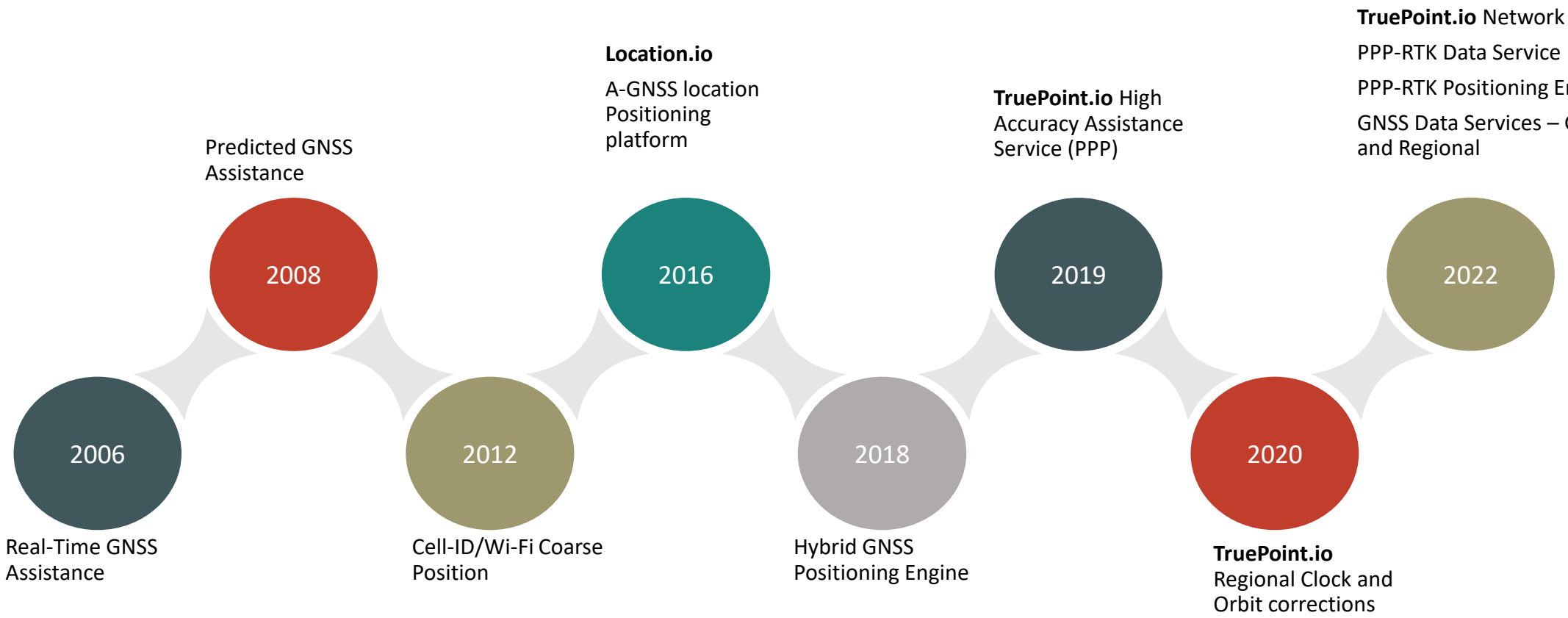
NAVISP-EL2-103 Final Presentation

Development of Precise Point Positioning Realtime Kinematic (PPP-RTK) Client Engine



Rx Networks Background

Rx Networks -- Innovation Timeline



Project Overview and Outcomes

Context and Rationale

- NAVISP HAAS Program
  - Vendor-diversified Reference Station with Better Coverage
  - Multi-constellation Supported Precise Orbits & Clocks
  - Geo-redundant Production Service Released
  - Highly Flexible and Scalable Integration Capability
  - Total development costs: € 1,036,005
    - CSA €500,000 funding
    - Completion Date: August 26, 2019

NAVISP PPP-RTK Project

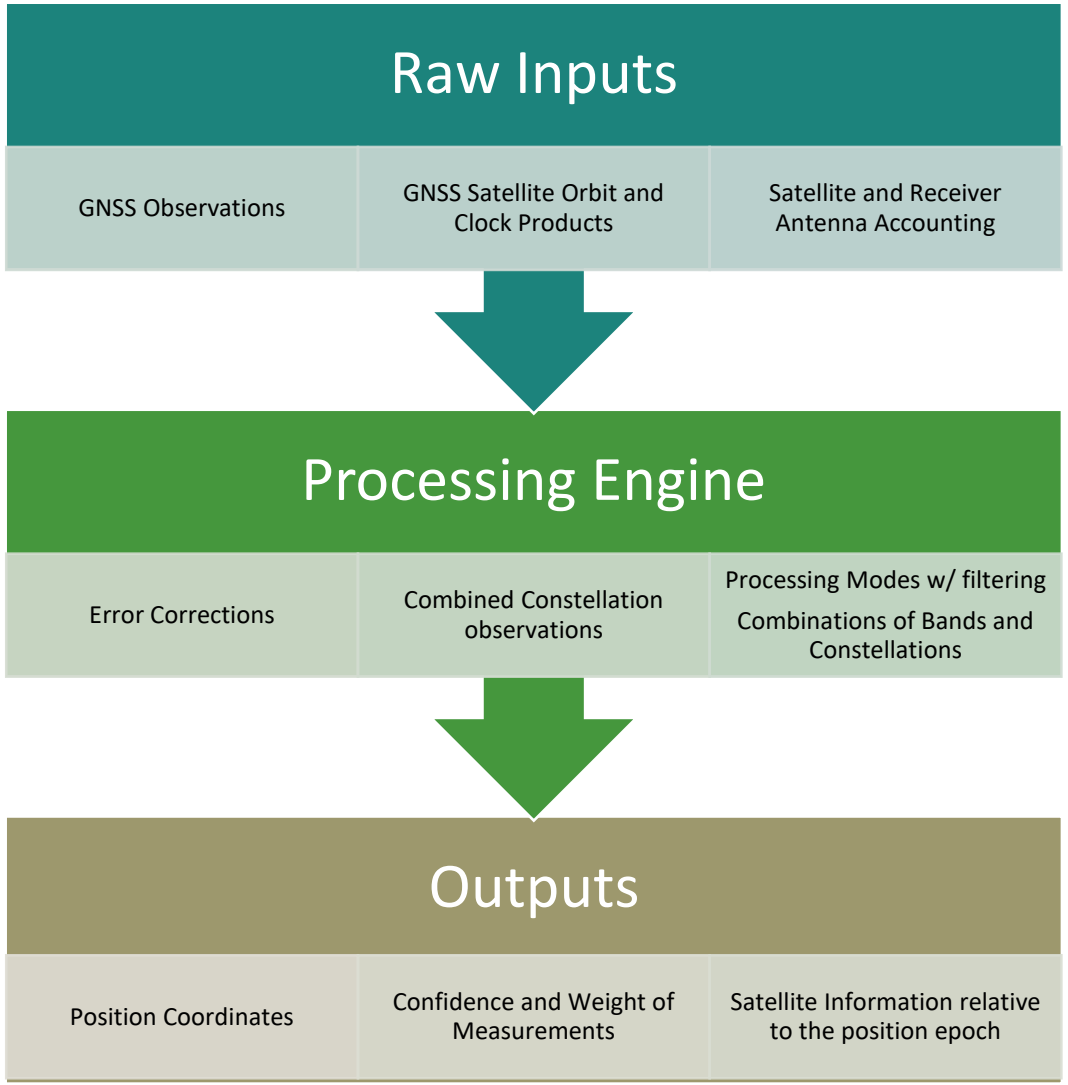
NAVISP Project Overview

Item	Description
PPP-RTK Data Service	Precise corrections with Regional coverage to feed the PPP-RTK positioning engine
PPP-RTK Positioning Engine	Development of a PPP-RTK client engine for the use of SSR corrections including code and phase bias, with optimization of the observation data and integration of regional reference network(s).
Summary	Total development costs: €533,044 CSA Funding: €200,000 Completion Date: September 14, 2022

PPP-RTK Functionality

	Description
Errors corrected	Orbit error, Clock error, Code bias, Phase bias, STEC ionosphere correction, Troposphere correction
Approach	SSR (State Space Representation)
Accuracy	< 10cm
Mean convergence time	< 1 minute
Largest service area	Regional
Frequency	Supports single and multiple frequencies
Required Bandwidth	Low-Medium
CORS Network baseline radius (km)	< 200 km
L-Band Delivery	Yes (optional)
Positioning Engine	Yes (optional)

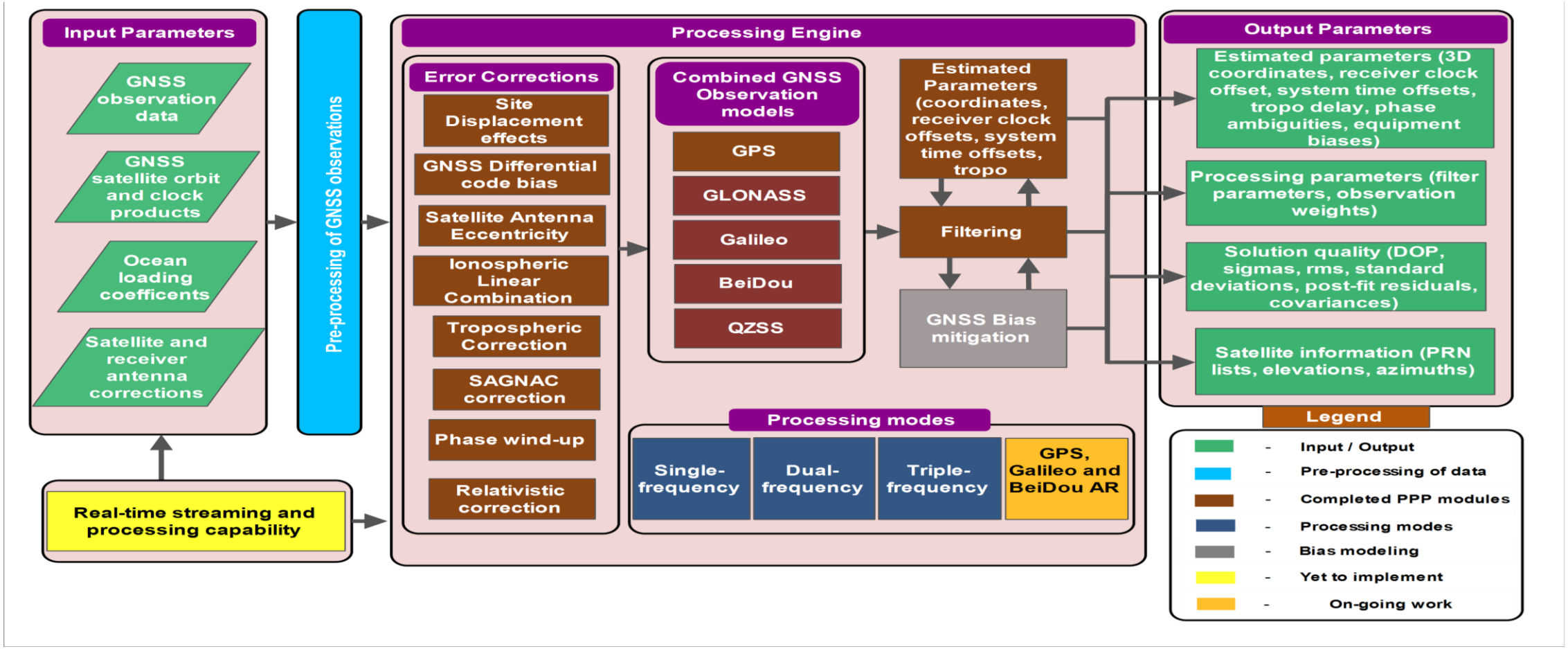
Position Engine Architecture



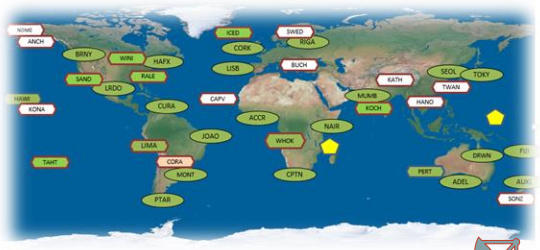
- Well-developed and sophisticated and piecewise GNSS measurement processing in software
- Versatility and configurability in processing and combining various formats
- Process GNSS data in various formats using PPP technique with as much configurability as possible

Improvement in convergence time for decimeter position accuracy within 60 seconds

Position Engine Architecture



TruePoint.io PPP-RTK Architecture



RX Global Reference Network (PPP)

#1

Regional Network (PPP-RTK)

#9

Global Aggregator

#2

#3

RTCM Generator and E2

#4

Global Orbit/Clock/ CodeBias /PhaseBias

#5

Regional Weather Corrections with Slant IONO

#6

#7

NTRIP Corrections

PPP

PPP-RTK

#8

#10

PPP Client

PPP-RTK Client

#10

Open/Closed Standard

NTRIP Proprietary RTCM Message

LPP

SSRZ/CSSR/SAPA/IGS (Roadmap)

Company Growth--Customers

Company Growth—High Precision for Smartphones

Rx Vancouver, BC, Canada – October 18, 2022 – Rx Networks TruePoint.io today announced its high precision solution can be integrated with Snapdragon® mobile platforms to enable precise positioning on smartphones.

Company Growth—Electric Scooter Tracking

Scooter rentals, higher accuracy provides better management, return to designated parking and faster recover of lost assets

Company Growth—Asset Tracking

Ultra-low power Asset Tracker, small form factor, offline first--Highly-mobile cellular IoT products need to handle unreliable connections gracefully by implementing mechanisms to retry the failed sending of data.

Nordic nrf9160 dk Cellular IoT Development

Company Growth—High Precision Receivers

GNSS Corrections play a vital role in high-accuracy positioning for Precision Receivers

rx networks

rx networks

Business Model

- Correction Data subscription service
  - Per unit/device per year/per month or measured rate
  - Bundled with hardware provider (white label) or direct subscription to Rx Networks
  - Server to server licensed correction stream, flat fee with volume tiers (IoT model)
- Receiver hardware agnostic
  - Support multiple formats both open and proprietary
  - Customization to PE to optimize accuracy
- Position engine license bundled with subscription service or licensed separately

ESA/NAVISP

Key Benefits of NAVISP

- Strong focus on commercial need and viability for our solution
- Assists in determining ROI and market engagement plan
- Advisor has a broad view of the market needs and requirements, beyond just Galileo, but the entire GNSS ecosystem
- Assists in identifying European partner companies regarding forming a consortium for joint country ESA funding

Thank You!

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