



CENTRE NATIONAL D'ÉTUDES SPATIALES

REGINA Network

**« REseau GNSS pour l'IGS et la Navigation »
= GNSS Receiver Network for IGS and
Navigation**

■ A network of GNSS receivers

- ◆ Worldwide coverage

- ◆ Real-time NTRIP streams to IGS casters and CNES caster, 1 Hz data
- ◆ Consolidated data with files of 15mn, 1h and 1 day

- ◆ **GPS/GLONASS/GALILEO/SBAS multi-frequency signals**
 - GPS L1/L2/L2C/L5, GLONASS L1/L2, GIOVE-GALILEO E5a/E5b/AltBocE5, E1BC, SBAS L1/L5, waiting for E6 commercial receivers

- ◆ 30 stations within 3 years
- ◆ First stations, installed in Papeete THTG, Kourou KOUG (Leica receivers), and Dionysos DYNG (Trimble receiver)

- ◆ Will include also existing CNES IGS stations (Toulouse, Grasse, Libreville, Hartebeestoeck, Kerguelen) in upgrading phase

■ A Mission Center

- ◆ Located in Toulouse, in CNES plant
- ◆ Real-time acquisition of NTRIP streams and broadcast to registered users via CNES caster
- ◆ Acquisition of consolidated 15' data files and conversion to IGS RINEX2&3 files
 - Basic 15' 1 s sampling files, 1s/30s hourly and 30s daily files
- ◆ Dissemination of consolidated data
 - to IGS/EUREF data centers (IGS, IGN, BKG, OLG)
 - To registered users
- ◆ Configuration and control of receivers
- ◆ Archiving

■ REGINA objectives

- ◆ Development of scientific applications
- ◆ Precise orbit & synchronization restitution, fundamental for some missions (altimetry...)
- ◆ Contribution to success of GALILEO
- ◆ GNSS/GALILEO expertise
- ◆ Demonstration of new services

■ CNES / CLS is an IGS Analysis Center since 2007

- ◆ Very good GPS and GLONASS IGS products using last CNES technique for ambiguities (orbit/clocks, Earth orientation...)

■ CNES participate in the Real-Time IGS pilot project

- ◆ Products : NTRIP receiver streams & Orbit/clocks corrections
- ◆ Real-Time PPP activities
 - 30 worldwide stations required for precise real-time satellite clocks (DoC \geq 6)

- historical partnership CNES / IGN since 1986 for DORIS program



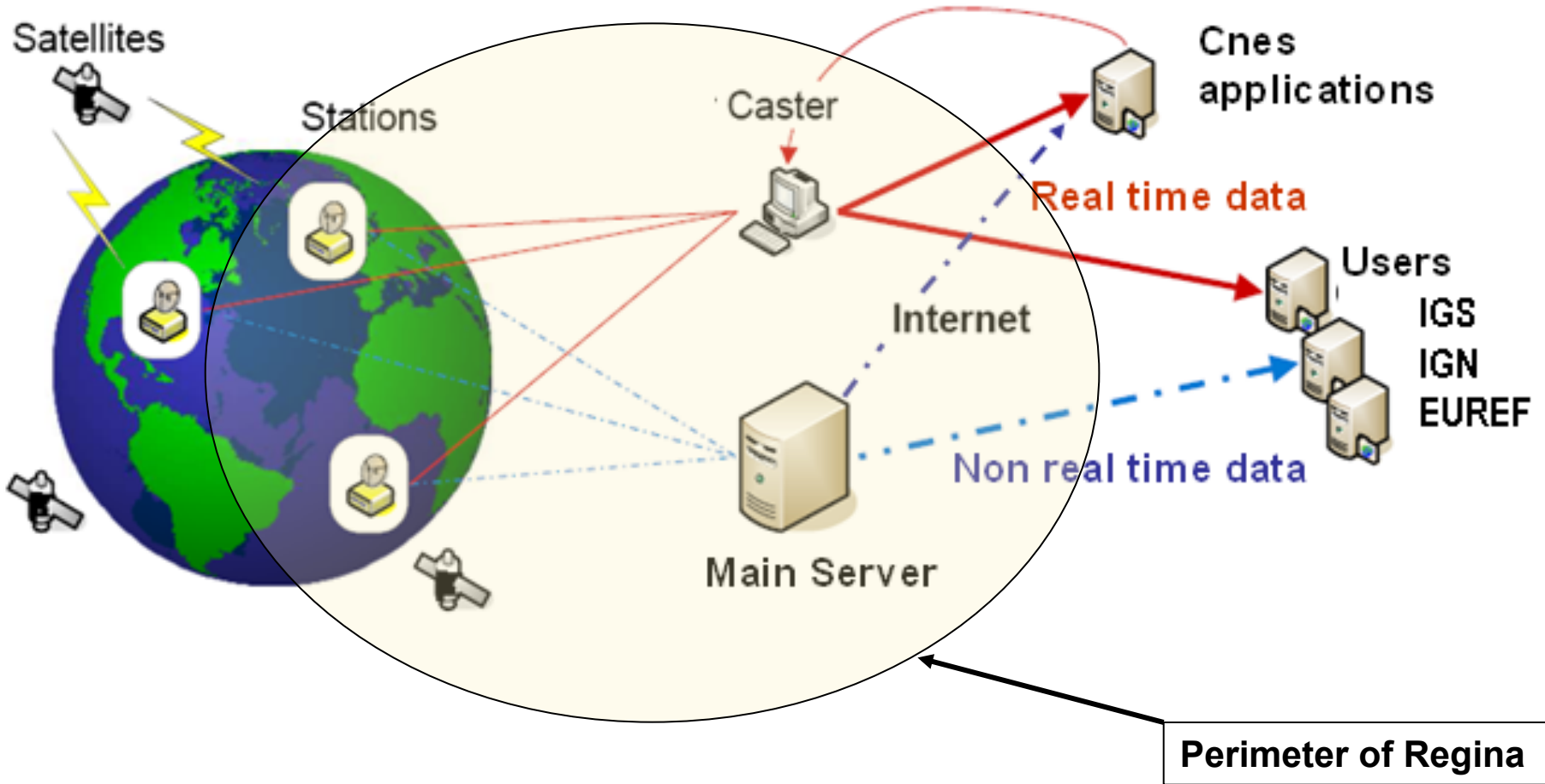
- IGN is an IGS data center since 1994



- IGN is an ITRF (International Terrestrial Reference Frame)

- REGINA station network implementation

REGINA SYSTEM VIEW



- **First step : 15 sites equipped with REGINA stations by mid 2012**

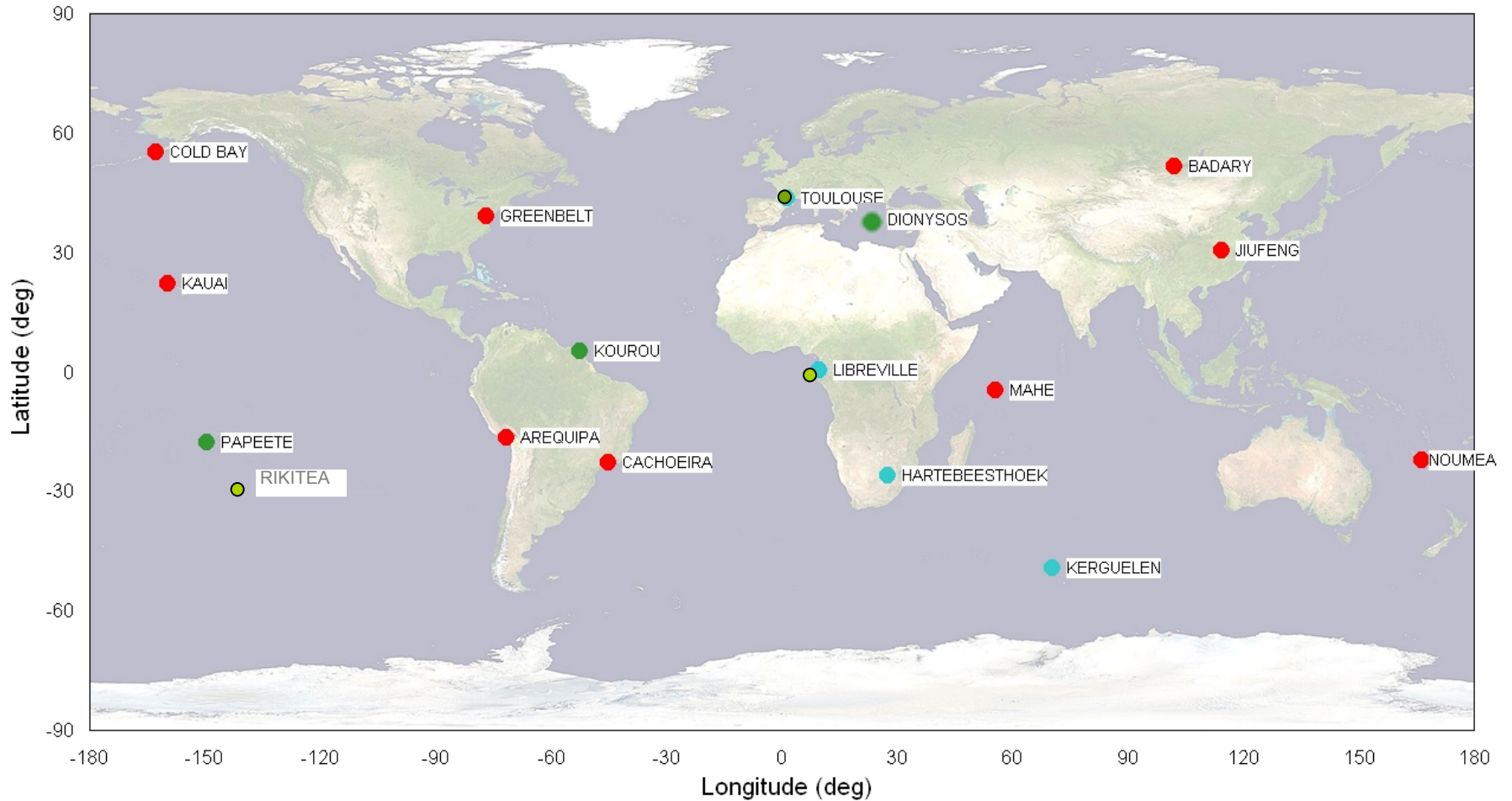


■ **Mission Center**

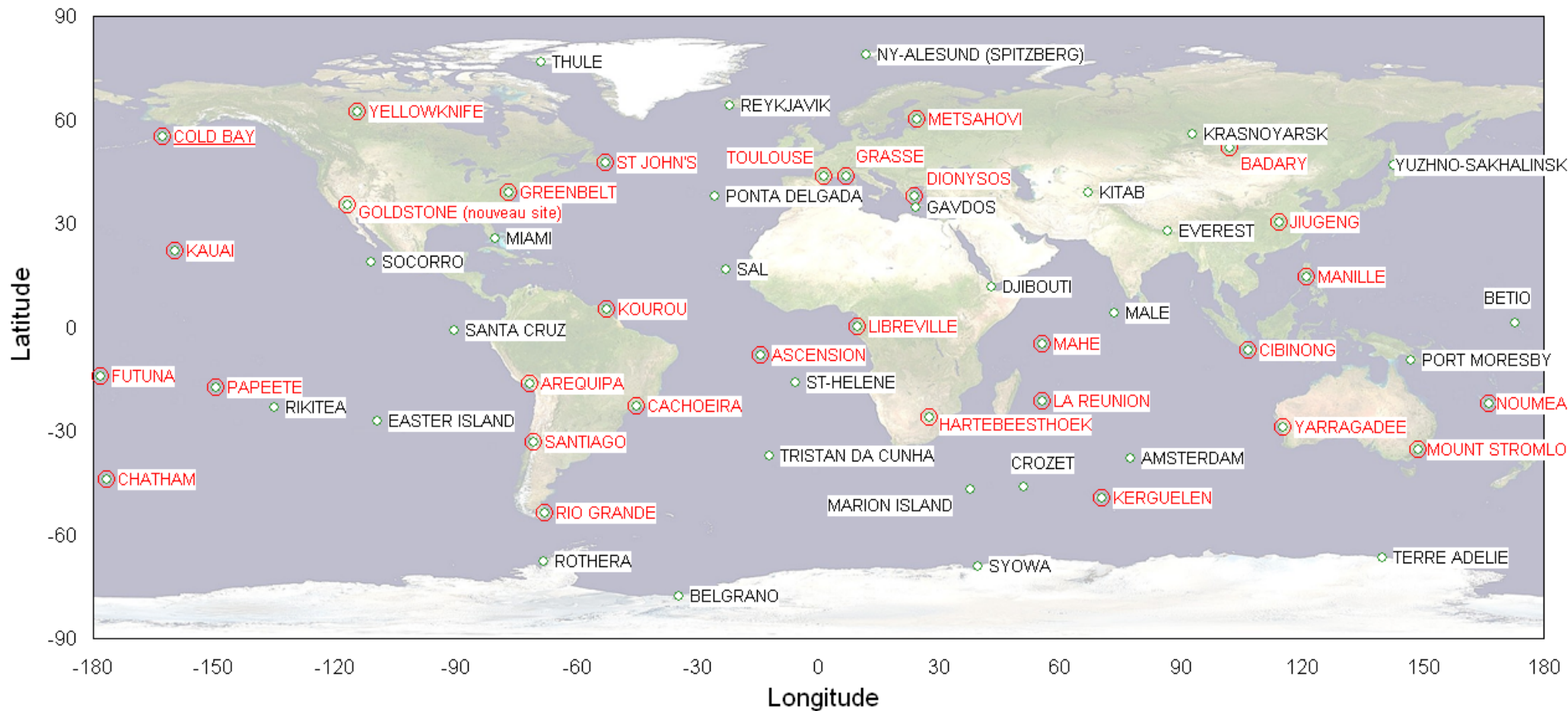
- ◆ In development phase
- ◆ Will start operation early 2013
- ◆ Will replace the « old » CNES mission center that will be upgraded to fill the gap.

PRELIMINARY DEPLOYMENT EXPECTED BY MID-2012

- Newly equipped sites with GPS/GLONASS/GIOVE-GALILEO/SBAS receiver
- Existing site to be upgraded
- Future sites



PRELIMINARY REGINA SITES AT COMPLETION (in red)



■ Hosting sites pre selection criterias

- ◆ Global coverage of the network and complementarity with other networks
- ◆ Low geometric masks (minimum obstructions above 15°)
- ◆ Co-location with other geodetic observatories or infrastructure : Doris, VLBI, SLR
- ◆ Communication network availability
- ◆ Security and logistical aspects

■ Sites requirements

- ◆ Location secure and viable over long term
- ◆ Minimum access control for the receiver unit
- ◆ At least 1 km from powerful microwave sources, independent of the receiver operating frequency
- ◆ Continuous internet connection, minimum 64 kbps,
- ◆ AC Power supply
- ◆ External reference frequency, 5 or 10 Mhz if available

■ On site hardware installation of :

- ◆ Professional GNSS receiver, with cable,
 - Trimble NETR9
 - Leica GR10
 - Septentrio Polar X4
- ◆ Multi GNSS antenna installed on a monument
- ◆ Specific interface equipments for network or power (UPS, firewall, battery,...)
- ◆ Receiver + specific equipments installed in a rack

■ GNSS receivers are receiving only units in the frequency band 1.1 – 1.6 GHz

- ◆ Operating temperature - 40 to + 65 °C
- ◆ Storage Temperature – 40 to + 85°C
- ◆ Humidity 100 % condensing
- ◆ Power consumption less than 10 W