



Arbeitsgemeinschaft der Vermessungsverwaltungen
der Länder der Bundesrepublik Deutschland



Ready for Galileo?

Jens Riecken,
01.07.2014, Kaliningrad

**CLGE-Conference of the
European Surveyor and
Geoinformation.
F.G.W. Struve – European
surveyor of the year 2014**



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Outline - Ready for Galileo?

The MS Perspective

Example Germany: Satellite Positioning Service SAPOS®

The European Perspective:

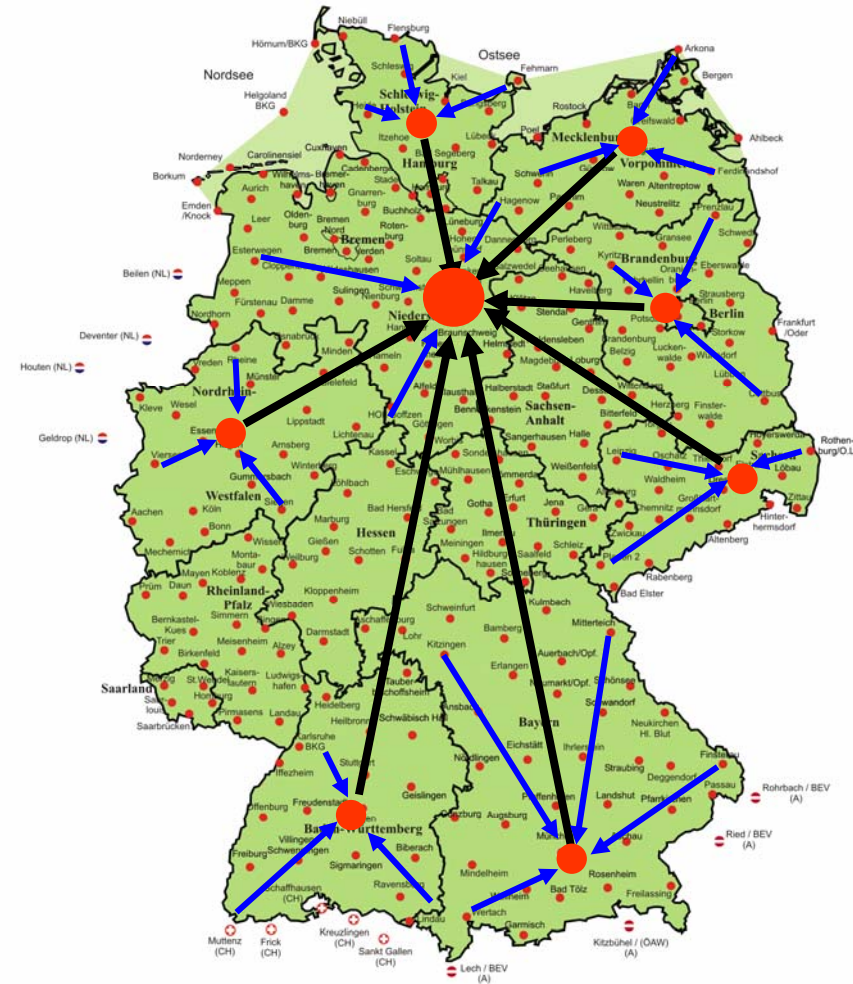
Perspective for the integration of Galileo



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SAPOS[®] - German GNSS system

- More than **270 reference stations**
- Nationwide provision and integration of SAPOS[®]- data
- Exchange of SAPOS[®]- data between the states
- Technical support for the cross-border networking





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SAPOS® - Services - Accuracies

Real time

EPS

0,3-0,8 m

Provision by
mobile Internet

Data format RTCM

HEPS

1-2 cm

Provision by mobile
Internet and GSM

Data format RTCM

Post Processing

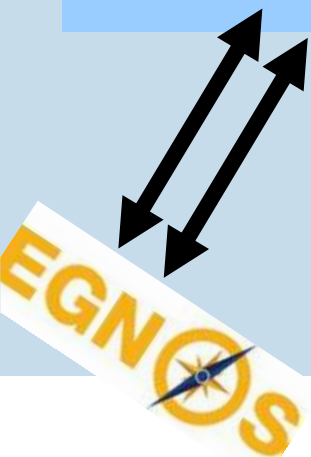
GPPS

< 1 cm

Provision by
Webserver

Data format RINEX

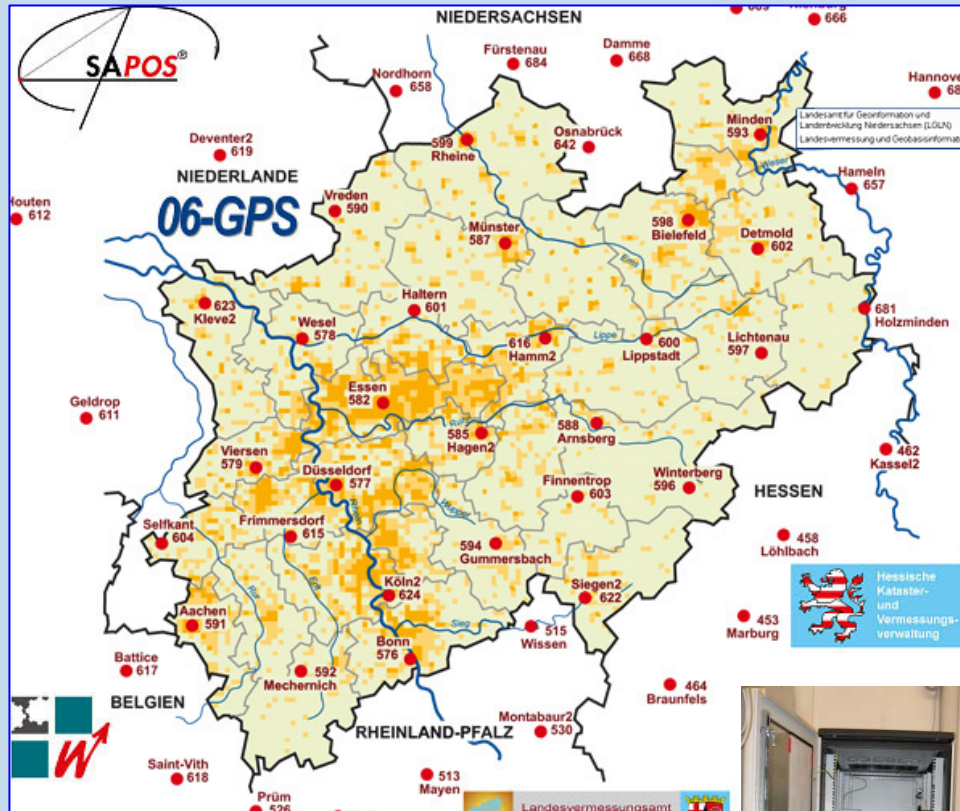
EPS: Real Time Positioning Service
HEPS: High Precision Real Time Positioning Service
GPPS: Geodetic Precision Positioning Service





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SAPOS® in North-Rhine Westphalia



Part of the German SAPOS®-network
50 stations in processing

- 27 stations in NRW
- i.g. on public buildings
- Distance apart 45 km

Co-operation with neighboring countries

- Data exchange

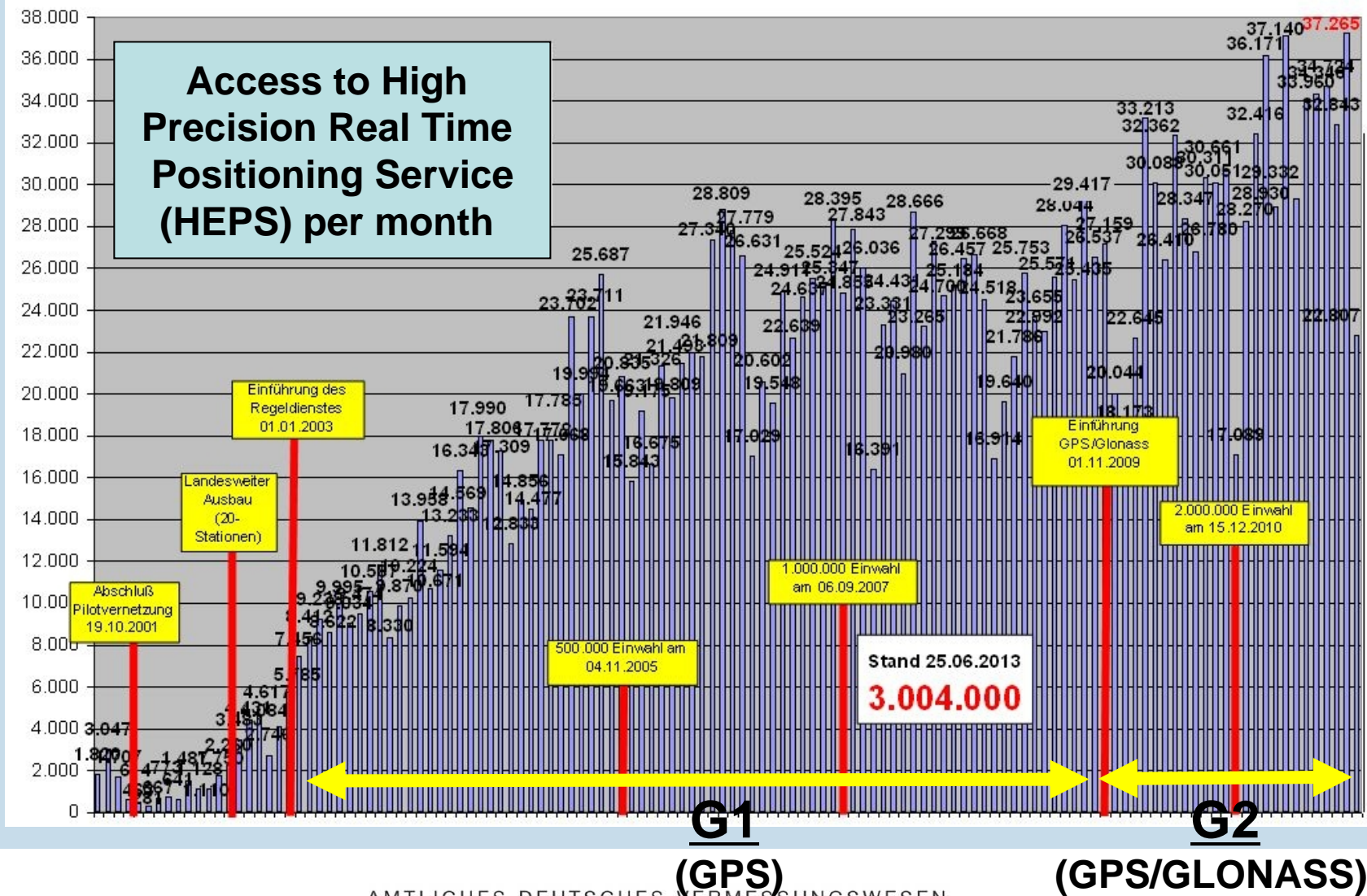
Processing since 2003





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SAPOS® in North-Rhine Westphalia





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Integration GPS/GLONASS in NRW

- Parallel to the G1-service, redundant implementation of G2
- G1 → G2, starting from 01.11. 2009

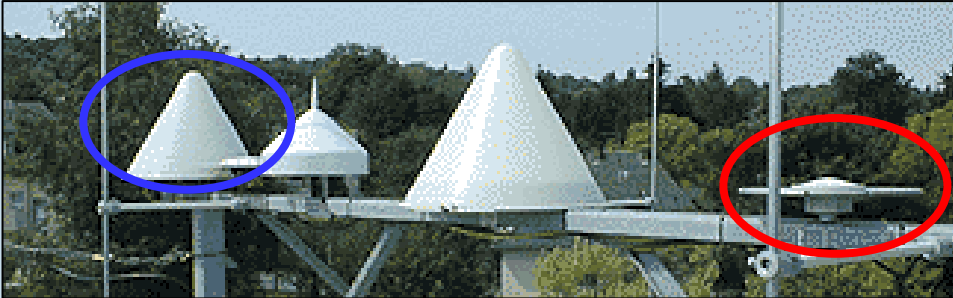
27 reference stations





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antenna calibration

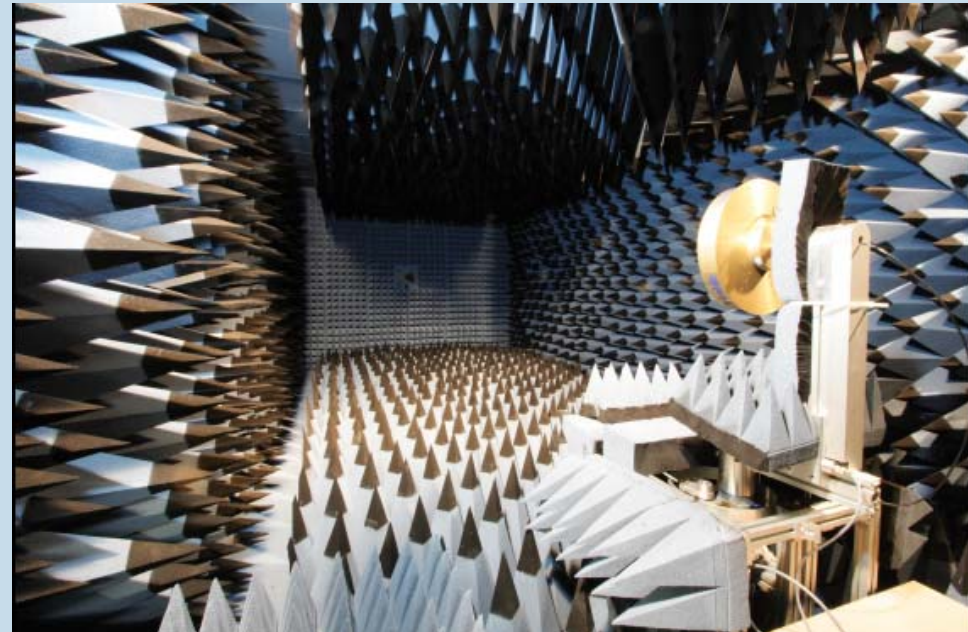


relative antenna calibration



absolute antenna
calibration (roboter)
Geo++
(IGS-Standard)

absolute antenna calibration
(AMK Bonn)





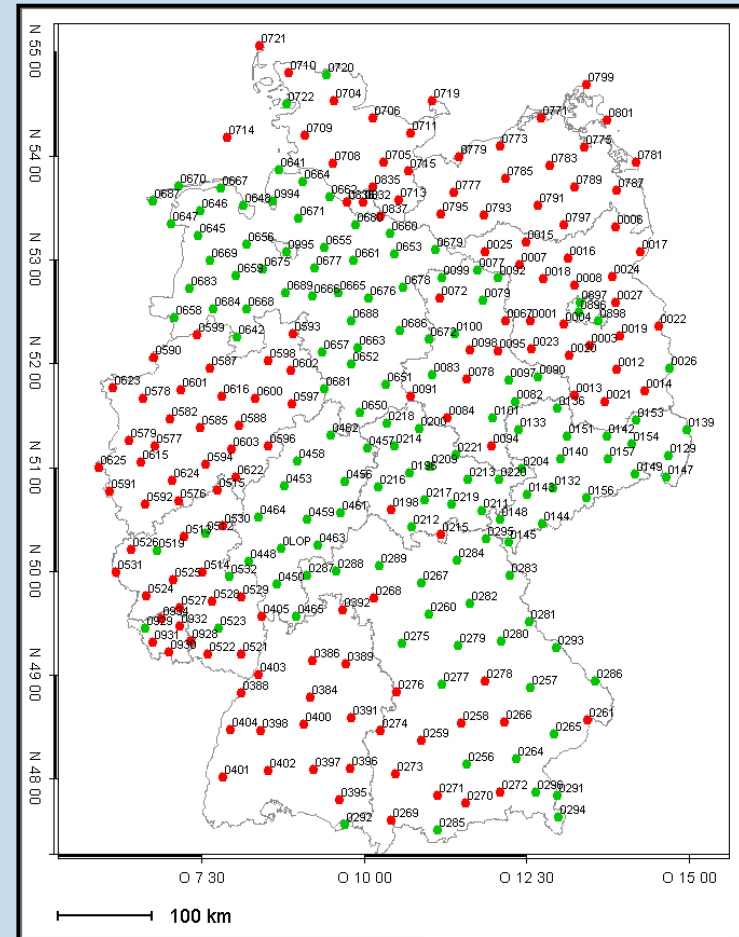
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SAPOS Reference Stations Antennas ready for Galileo



about 270 reference stations

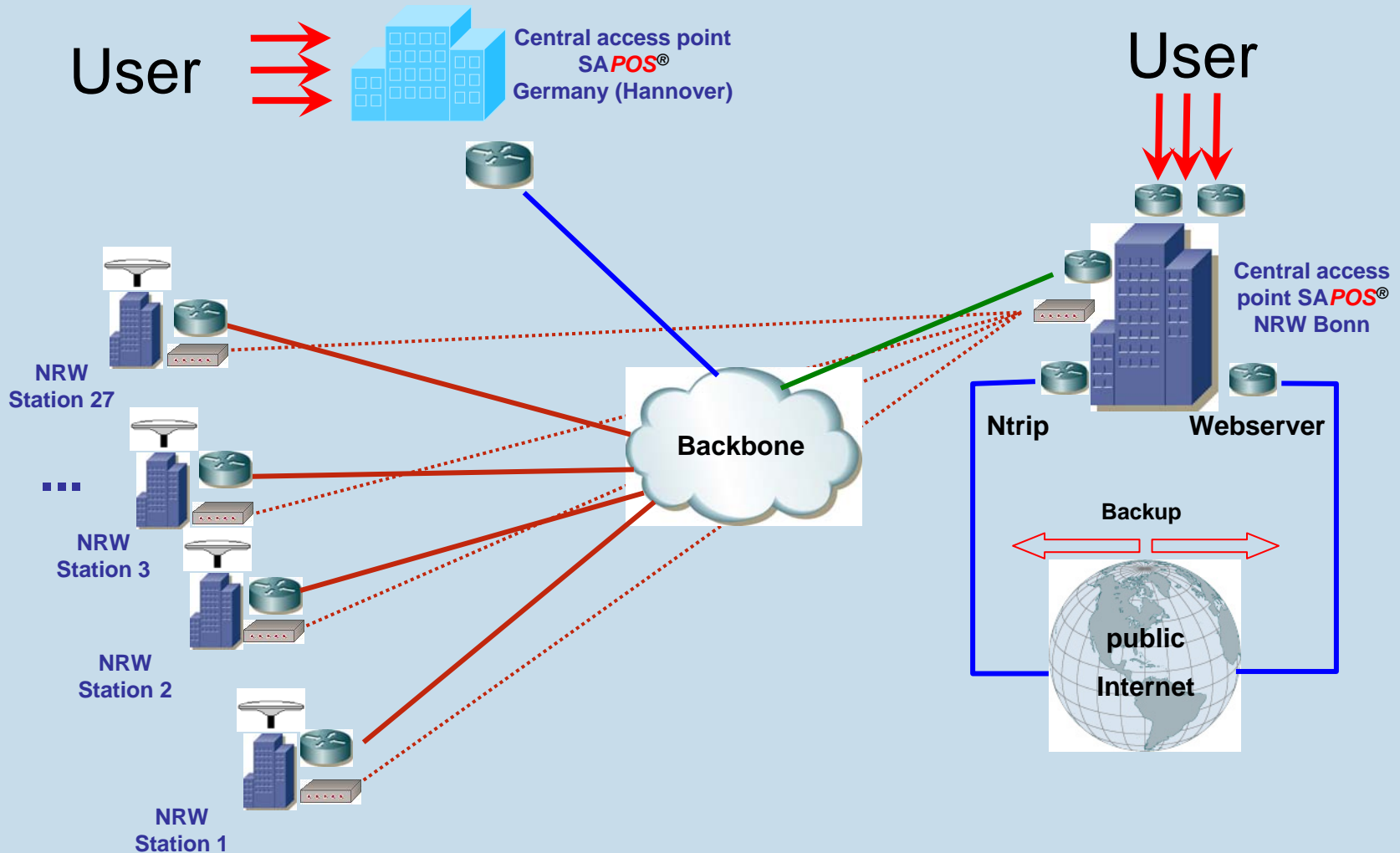
Antennas: currently about 50%
ready for Galileo





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SAPOS®-NRW (2013) telecommunication – a big issue





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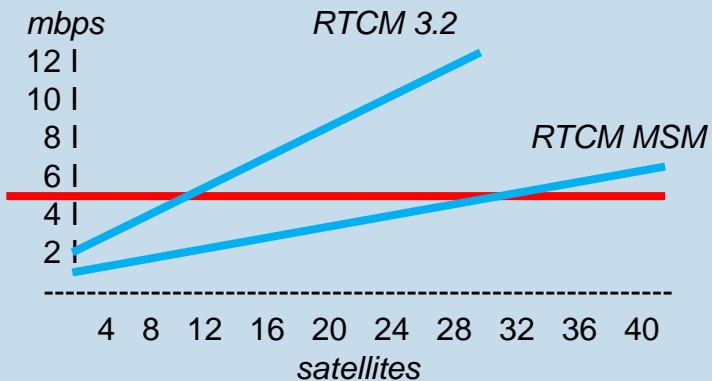
Telecommunication – a big issue

Need for Standardization

**Interoperability (RTCM) vs.
individual company solution**

limited data capacity

Need for Implementation





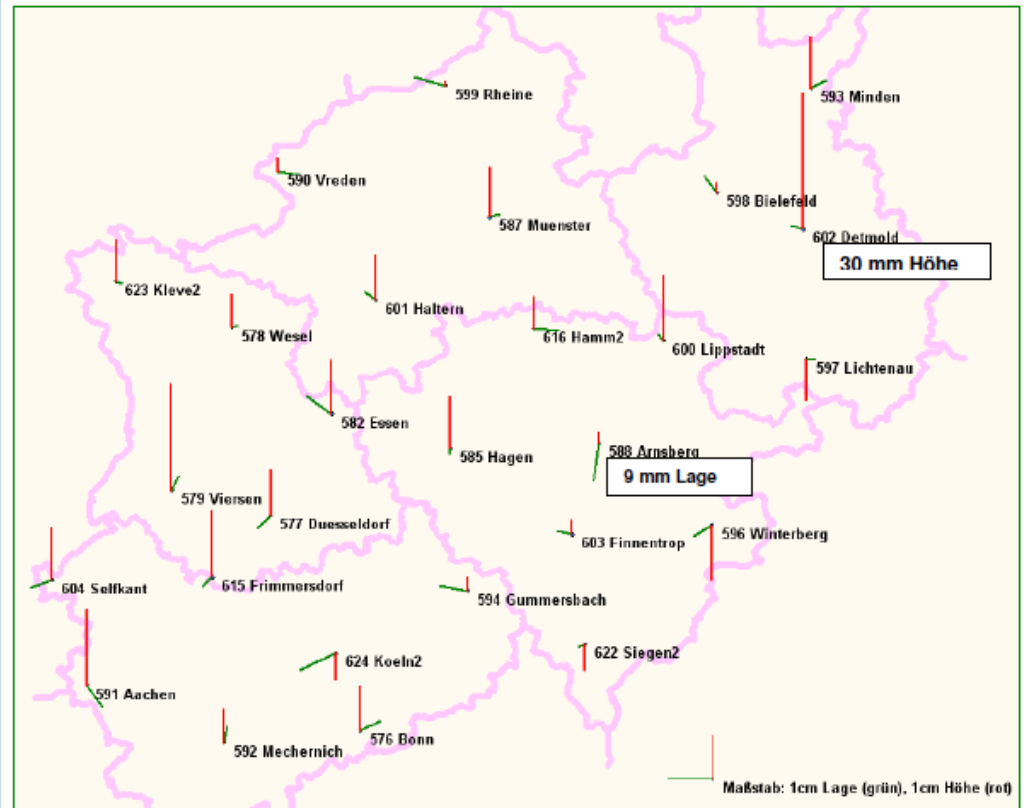
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Geodetic Reference SAPOS® implementation&tests

The integration of
GLONASS

The geodetic reference

Differenzen zwischen dem G1- und G2-Netz
Vorzeichen
Endgültige G2-Koordinatenlösung
minus
G2-Koordinaten polar an G1 gerechnet
Stand 1.11.2009





Galileo

The European Perspective:

- SA^{POS}® in the context of Galileo
- technical issues / ready for Galileo
- time scale (estimation)

- the view of CLGE

next 5 slides provided by:



European Commission
DG Enterprise and Industry
Unit Galileo and EGNOS

- Applications, Security, International Relations

25.06.2014

Policy Developments

2013 has been instrumental in shaping and securing the long term programme structure

- ✓ New Regulations adopted for the European GNSS Programmes and for the European GNSS Agency**
- ✓ Funding secured for EGNOS and Galileo for the new financial framework 2014-2020**
- ✓ Exploitation tasks conducted by the European GNSS Agency under delegation**
- ✓ System design and development tasks conducted by the European Space Agency under delegation**

2014 -2020: New framework

REGULATION (EU) No 1285/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 11 December 2013
on the implementation and exploitation of European satellite navigation systems and repealing
Council Regulation (EC) No 876/2002 and Regulation (EC) No 683/2008 of the European
Parliament and of the Council



- ✓ A stable 7 years perspective
- ✓ A new governance scheme driven by exploitation

2014-2020

❑ 1, 930 B€ for Galileo Deployment

❑ 3 B€ for Galileo Exploitation

❑ 1,580 B€ EGNOS Exploitation

Article 9 Resources

1. The financial envelope for the implementation of the activities referred to in Article 7(1), (2) and (3) and for covering the risks associated with those activities is set at EUR 7 071,73 million in current prices for the period from 1 January 2014 to 31 December 2020.

The annual appropriations shall be authorized by the European Parliament and the Council within the limits of the multiannual financial framework.

The amount referred to in the first subparagraph shall be broken down in the following categories of expenditure in current prices:

(a) for the activities referred to in point (a) of Article 7(1), EUR 1 930 million;

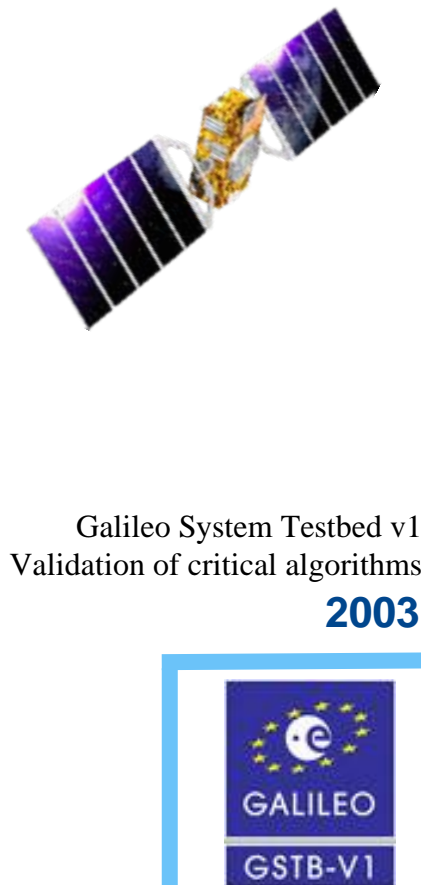
(b) for the activities referred to in point (b) of Article 7(1), EUR 3 000 million;

(c) for the activities referred to in point (c) of Article 7(1), EUR 1 580 million;

(d) for the activities referred to in point (d) of Article 7(1) and in Article 7(3), EUR 561,73 million.

Galileo implementation plan

Galileo is implemented in a step-wise approach



Galileo System Testbed v1
Validation of critical algorithms

2003



GIOVE A/B
2 test satellites
2005/2008



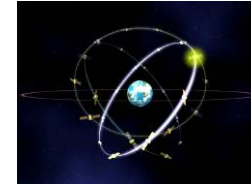
In-Orbit Validation
4 fully operational satellites and
ground segment

2013



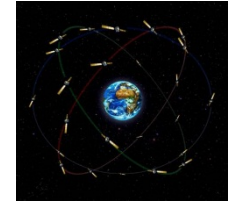
Early Services
for OS, SAR, PRS,
and demonstrator for CS

2015







Full Operational Capability
Full services, 30 satellites

2020




Galileo services

Early services for OS, SAR and PRS will be provided from 2015

Open Service (OS)	Freely accessible service for positioning, navigation and timing	
Public Regulated Service (PRS)	Encrypted service designed for greater robustness and higher availability	
Search and Rescue Service (SAR)	Assists locating people in distress and confirms that help is on the way	
Commercial Service (CS)	Delivers authentication and high accuracy services for commercial applications	

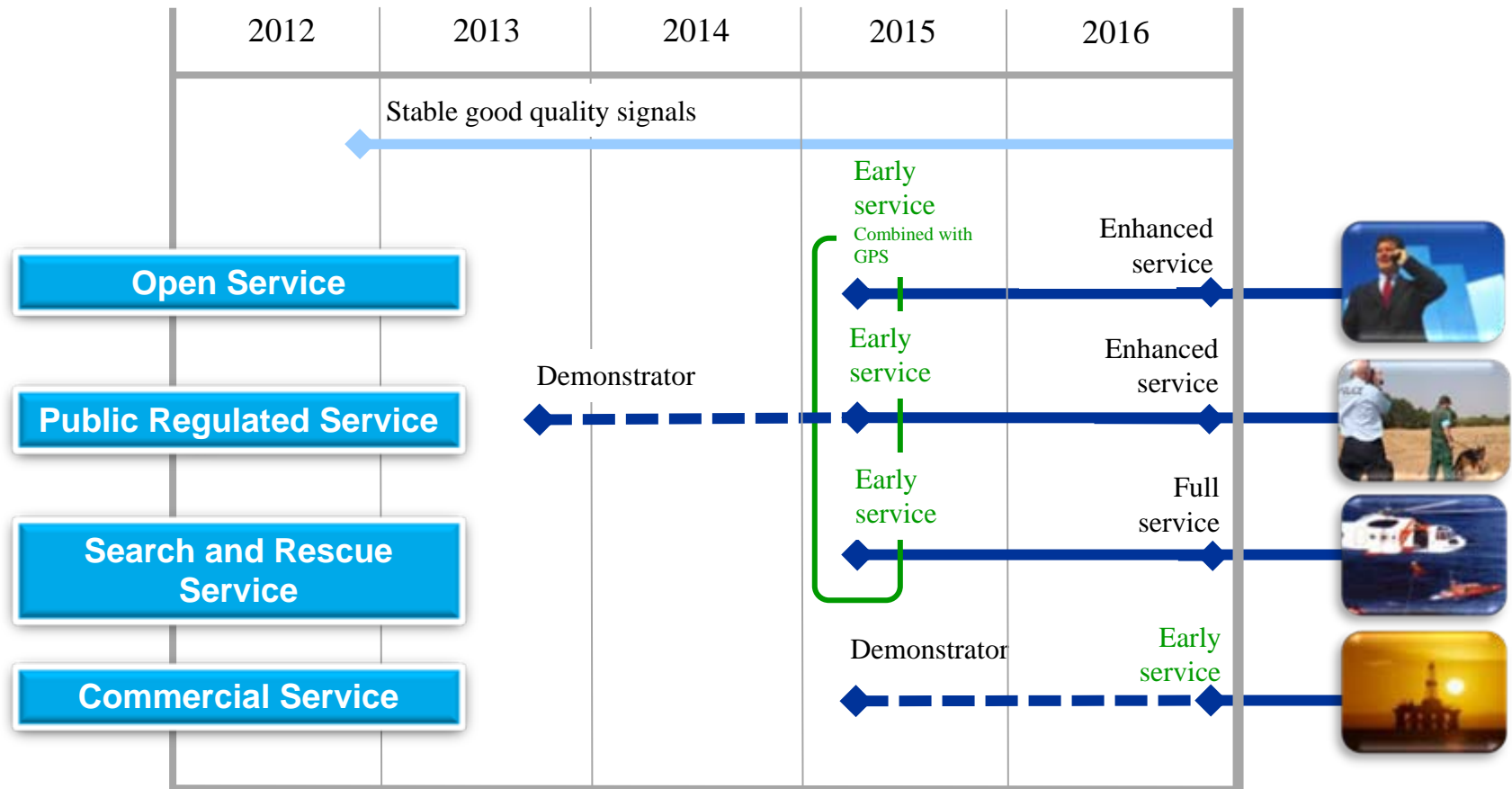
The former "Safety-of-Life" service is being re-profiled:

Integrity Monitoring Service	Provides vital integrity information for life-critical applications	
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“the intention is to have a sufficient number of satellites available to ensure early services”

Galileo services provision timeline

Early services will be provided from 2015 with a gradual transition towards full services as more satellites become available



“the intention is to have a sufficient number of satellites available to ensure early services”

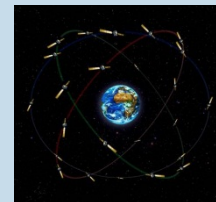
The adoption of the Galileo implementation plan to SAPOS®

SAPOS® ▲
 G3 (GPS/GLONASS/Galileo) ●
 2018 ●●●●●●●●

Galileo implementation & tests
 2016/17 Full Operational Capability
 Full services, 30 satellites
 2020

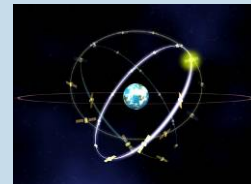
SAPOS® on duty
 DGNNS – G2 (GPS/GLONASS)
 Galileo taskforce
 2010

Early Services
 for OS, SAR, PRS,
 and demonstrator for CS
 2015



AdV-decision "future SAPOS®"
 Integration of GLONASS and Galileo
 2006

In-Orbit Validation
 4 fully operational satellites and
 ground segment
 2013



SAPOS® on duty
 DGNNS - G1 (GPS)
 2003

GIOVE A/B
 2 test satellites
 2005/2008



Galileo System Testbed v1
 Validation of critical algorithms
 2003





Ready for Galileo?

The position of CLGE:

- 1) Umeå Statement 2011 (CLGE seminar):
„The Geodetic Infrastructure in Europe – today and tomorrow”
- 2) CLGE’s contribution to the public consultation about the applications of EU satellite navigation programmes (Galileo and EGNOS)

Spatial data ... has become of increasing importance for the development of society. The economic potential and the benefits for society are immense and will further increase with INSPIRE, Egnos and Galileo.

The surveying community ... must be able to meet the requirements of European society, industry and users in order to create and maintain a homogeneous, sustainable geodetic infrastructure and guarantee its availability.



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Thanks to GNSS-services the surveying and mapping processes are around 30% faster by using 30% less staff. Therefore it is essential to have the GNSS-services available. Galileo will guarantee this! Moreover in combination with the existing services (GPS and GLONASS) it will lead to better accuracy and even faster solutions, so it will produce additional benefit.



Ready for Galileo?

The position of CLGE, 2014:

CLGE strongly supports Galileo as an additional GNSS system and the European contribution to world wide satellite navigation and positioning.

CLGE strongly requests the European surveying community to implement and use Galileo.

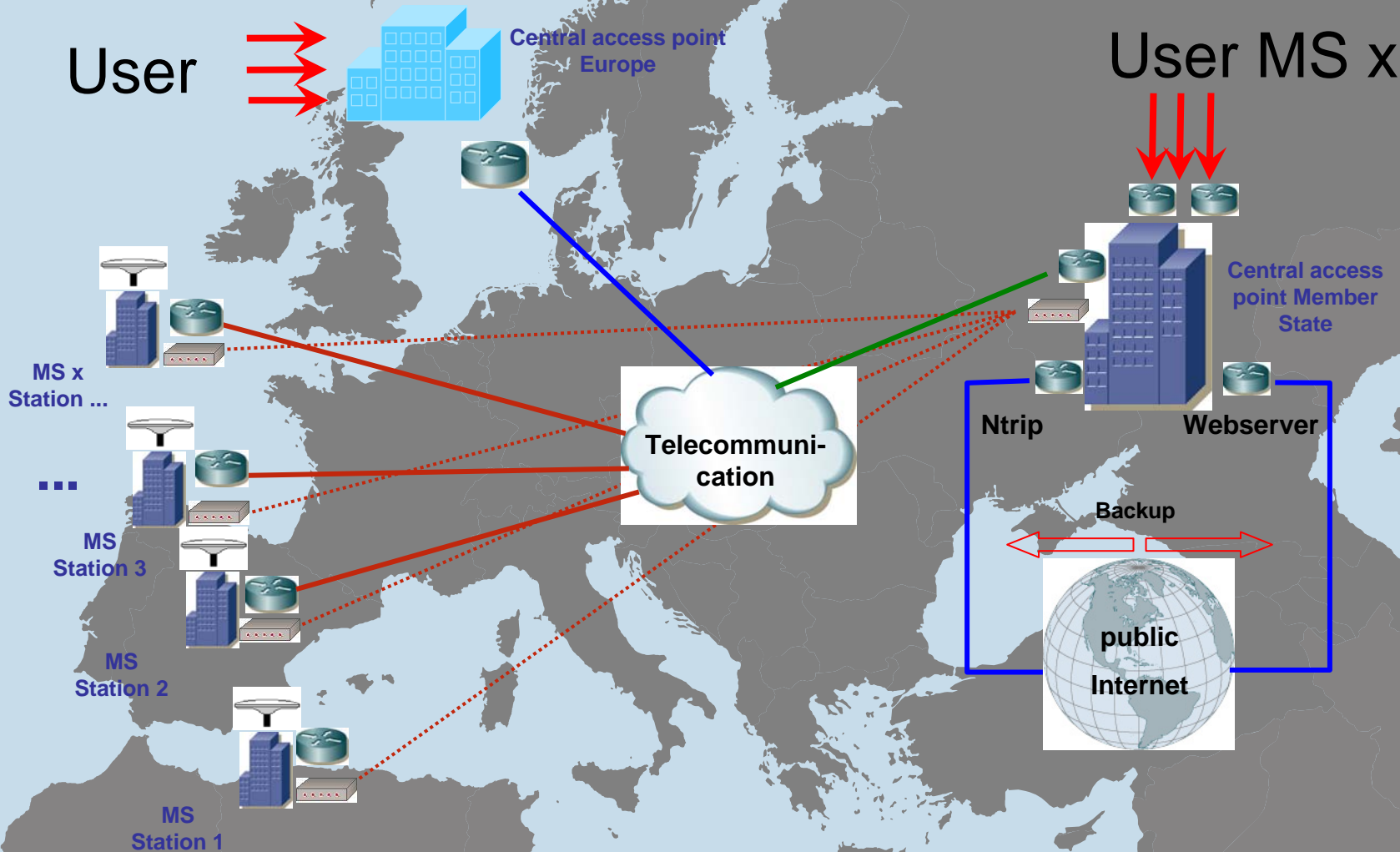
CLGE expects a sustainable implementation of Galileo without further delays.

CLGE sees the need for further standardization to guarantee interoperable solutions.

CLGE expects technical innovation in the context of precise point positioning (PPP) and sees the need for an increasing multinational cooperation.



Galileo and beyond (vision 2030): A high precision European harmonized geodetic reference Infrastructure (as part of INSPIRE)





Ready for Galileo? the situation in the MS

Discussion

	Yes	May Be	No
Galileo and/or Beidou (G3/4)?			
Time schedule available ?			
Technique ready / resources (€) available ?			
Interoperable standards (RTCM) vs. individual company solution ?			
Precise Point Positioning (PPP) on the agenda?			
Common European approach?			

Galileo and/or Beidou (G3/4)?

Time schedule available ?

Technique ready / resources (€) available ?

Interoperable standards (RTCM) vs.
individual company solution ?

Precise Point Positioning (PPP) on the agenda?

Common European approach?



Thank you for your attention!