Wir machen Schifffahrt möglich.

DGPS navigation service based on VRS with local EGNOS back-up

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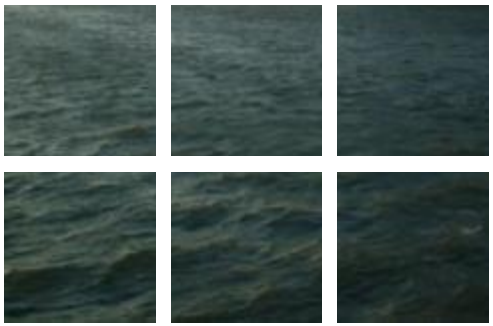
Wasser- und Schifffahrtsverwaltung des Bundes

EGNOS SERVICE PROVISION WORKSHOP, Warsaw, 27-28 September 2016



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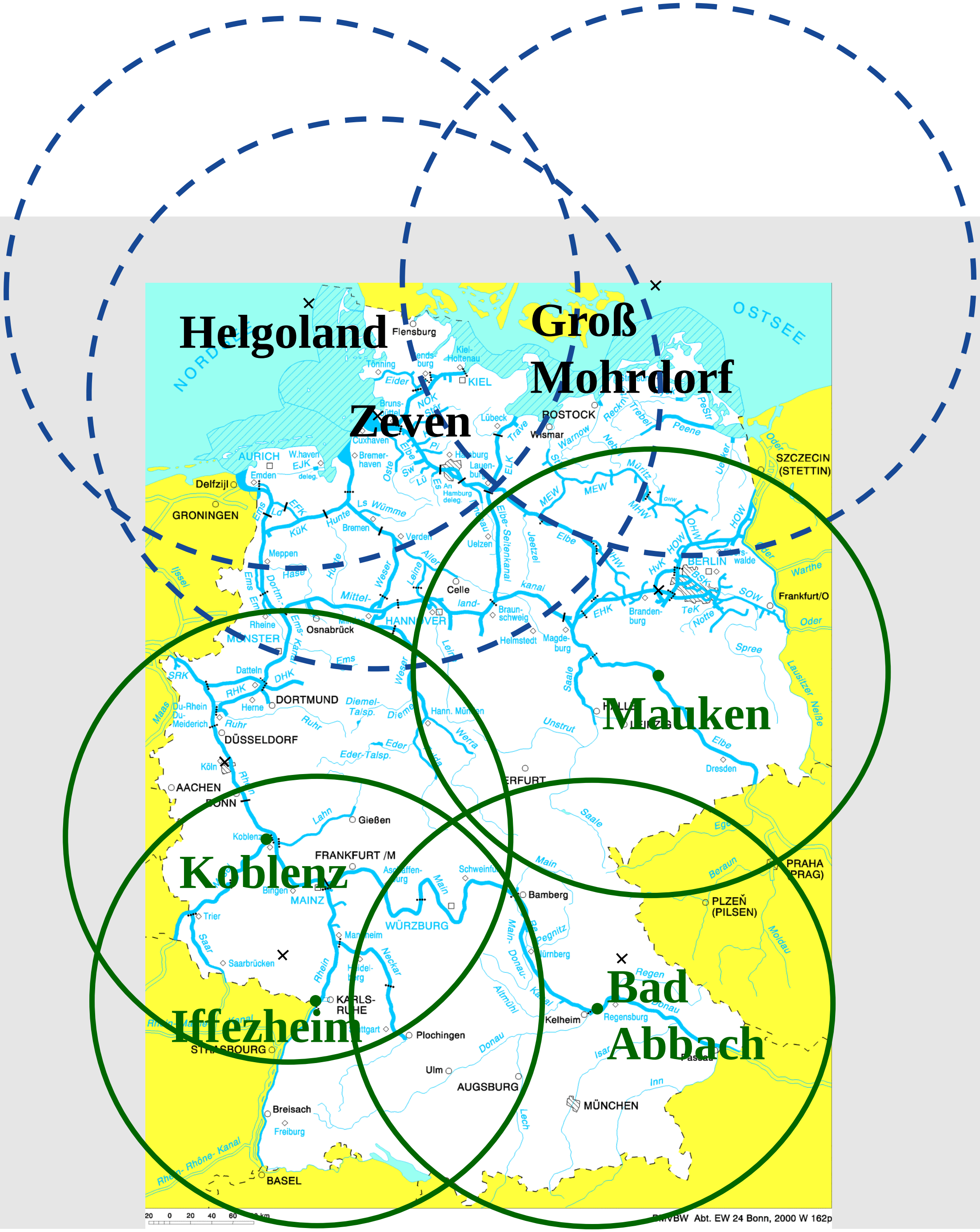
Overview

- Status of German DGPS radio beacon network
- Motivation for recapitalization
- VRS features and concept
- EGNOS as local backup solution
- Conclusion

German Radiobeacon Network



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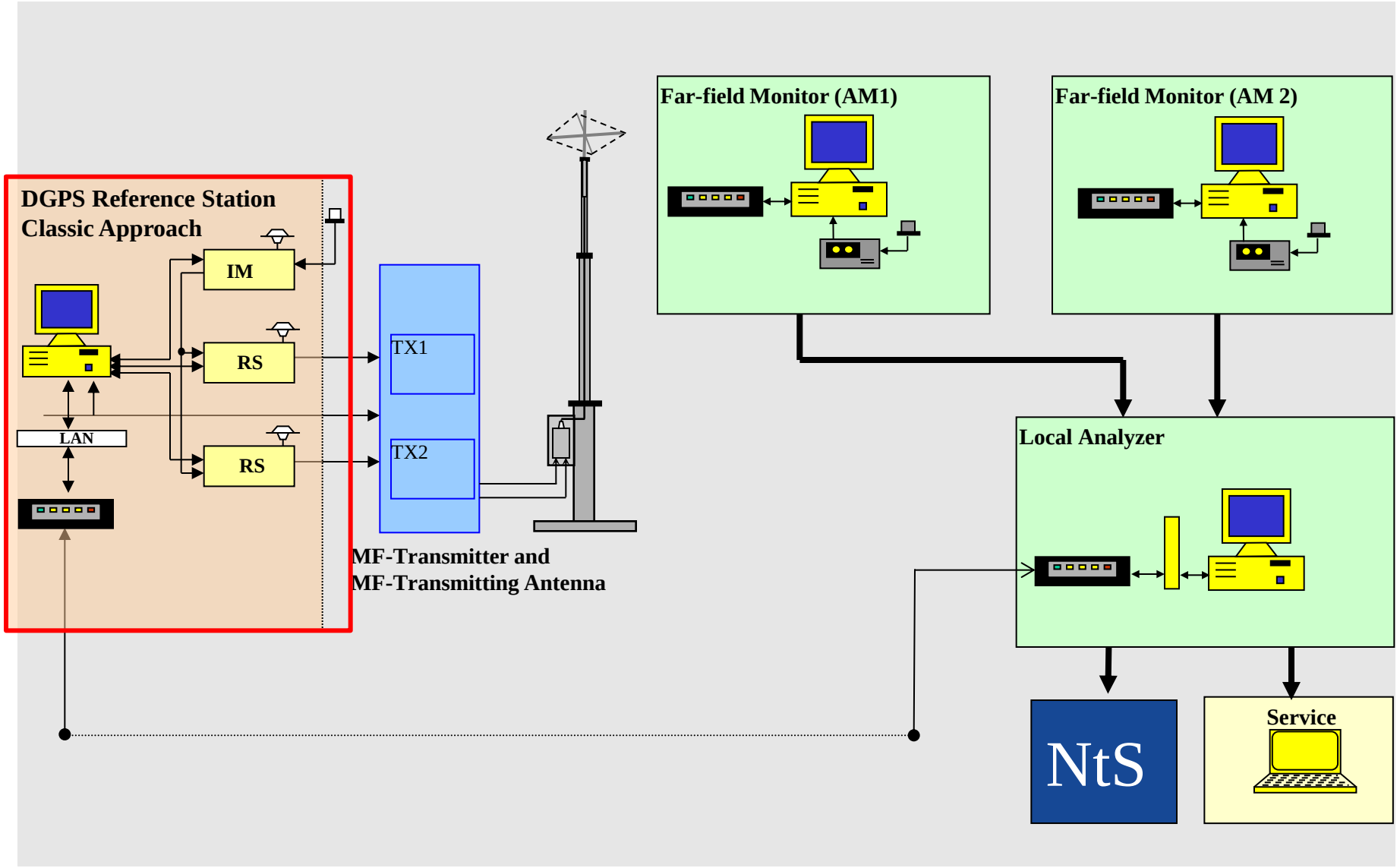
German Radiobeacon Network

System components (Classic Approach)



Reasons to recapitalize the DGPS-Network

- The coastal radiobeacon network was build up between 1994 and 1995
- The Inland radiobeacon network was build up in 2003
- Hard- and Software reaches life time end
- System becomes difficult to maintain

Reasons to recapitalize the DGPS-Network

- Remote Control Software is based on Windows NT
- Only a few spareparts exists for reference- and monitor-receivers
- Current system doesn‘t fulfill the requirements to separate services
- No possibility to transmit AIS message #17

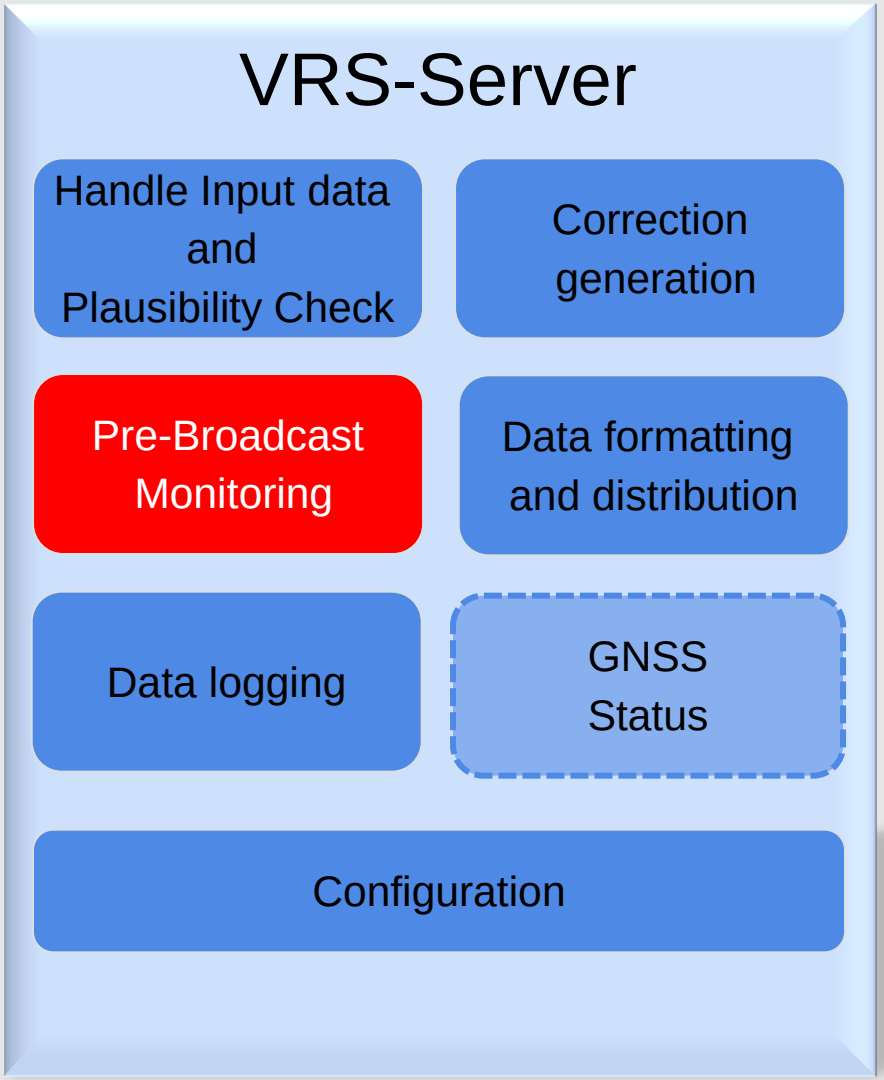
Recapitalization based on IALA R-121 (Network Approach using VRS concept)

- The VRS concept is based on GNSS corrections and integrity messages generated at a central VRS-Server

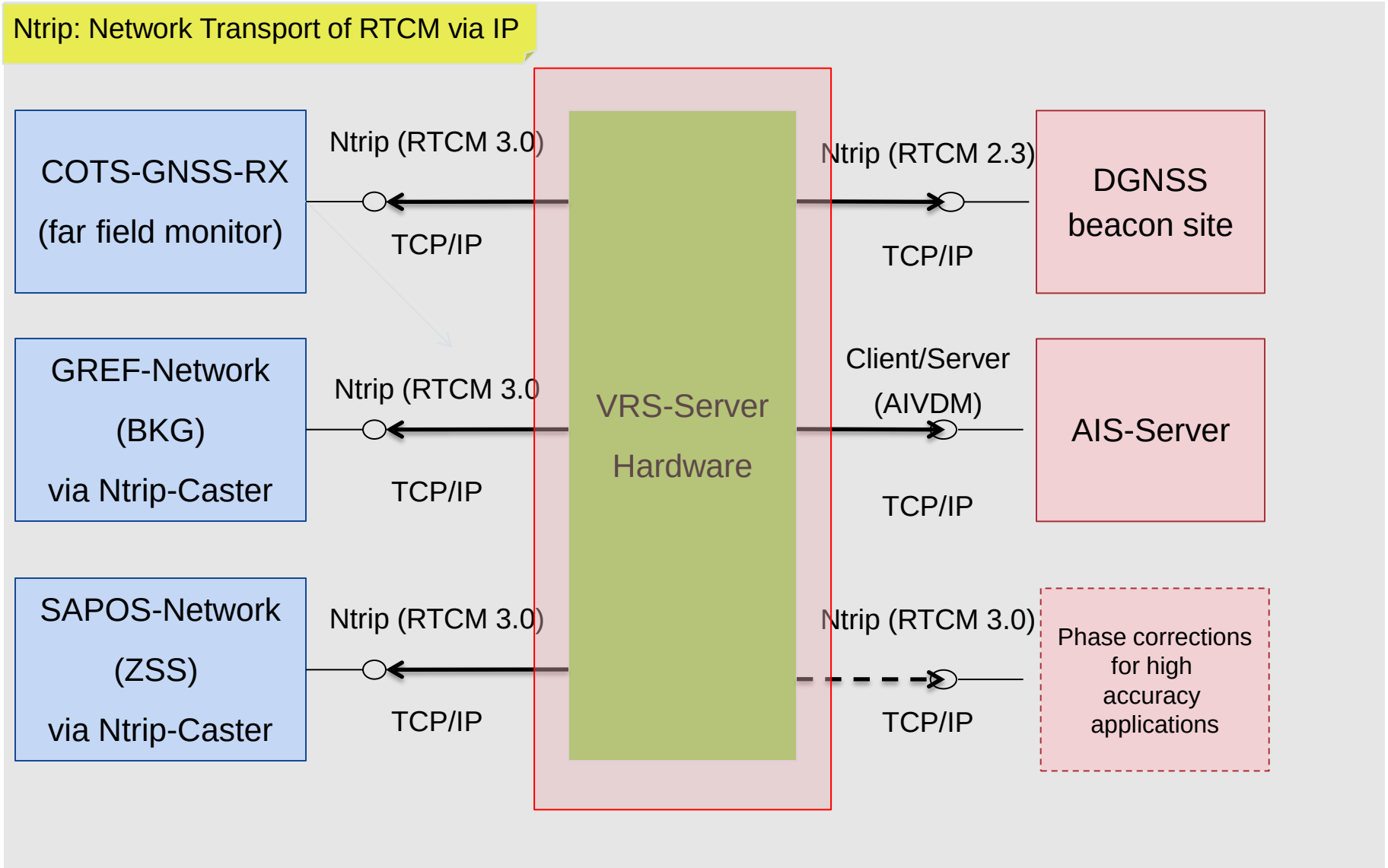
- The VRS concept supports the idea of separating the DGNSS functionality into different shore-based services:
  - DGN (DGNSS correction data service)
  - MF (medium wave service)
  - AIS service.

- The generated corrections will be transmitted from:
  - MF-Beacons (Conform to IALA R-121),
  - AIS-Shore stations (Conform to IALA A.124) and
  - future VDES for enhanced position accuracy.

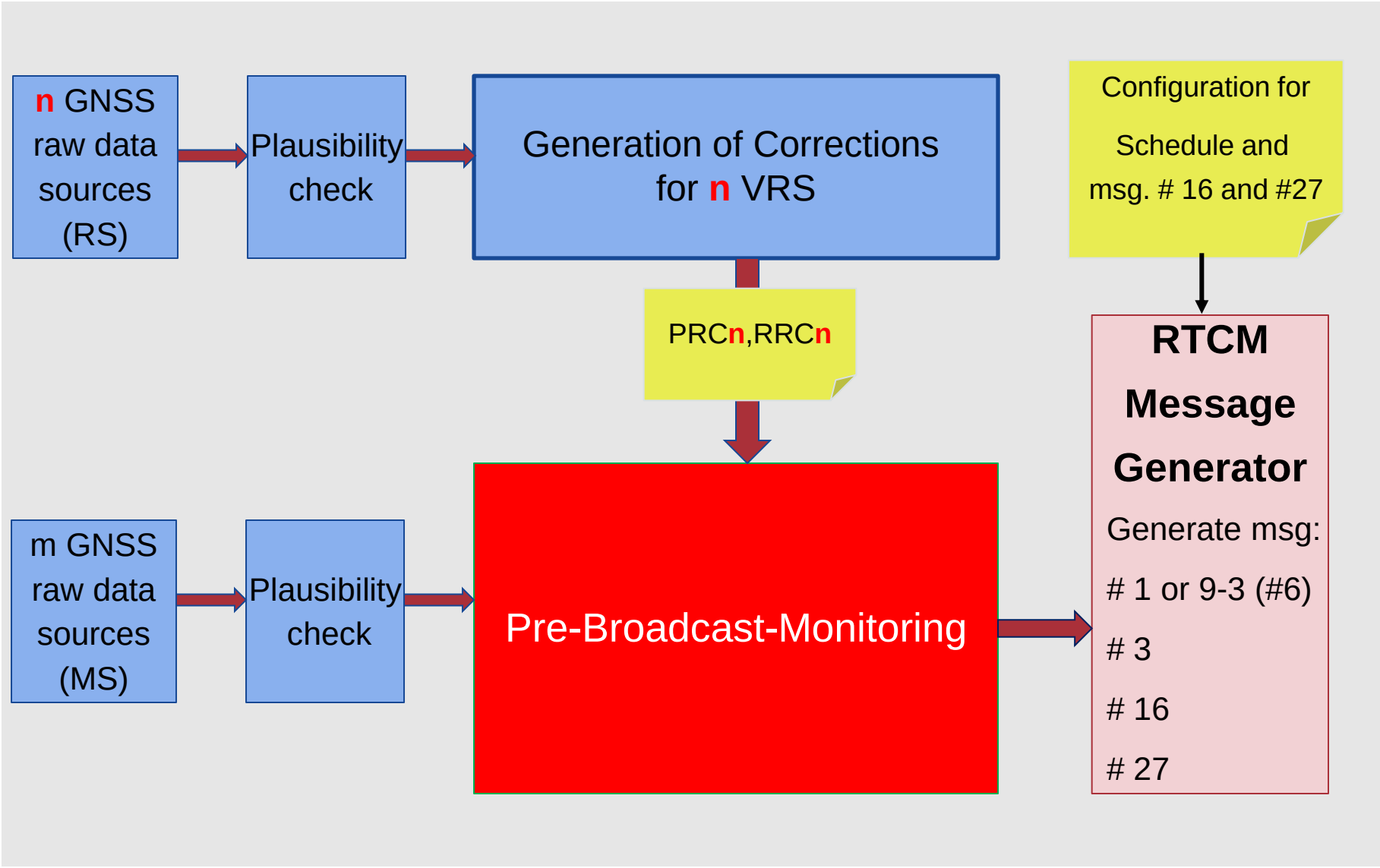
VRS Server Functionality



VRS Server with In- and Outputs



VRS Server Functionality (schematic)



VRS Feautures

- Advantages:
  - The GNSS-receivers (used for data input) could be off-the-shelf
  - Future GNSS-Signals (GLONASS and Galileo) integration is easy
  - The software is based on well-known principles
  - The concept can be realized with moderate investment costs
  - Performance enhancements can be expected
  - Several radio communication links can be served

- Disadvantages:
  - Availability of the service dependent on communication links

Planned Recapitalization of IALA radiobeacon inland service based on the network approach (IALA R-121) with local EGNOS backup

Requirements for IWW Applications

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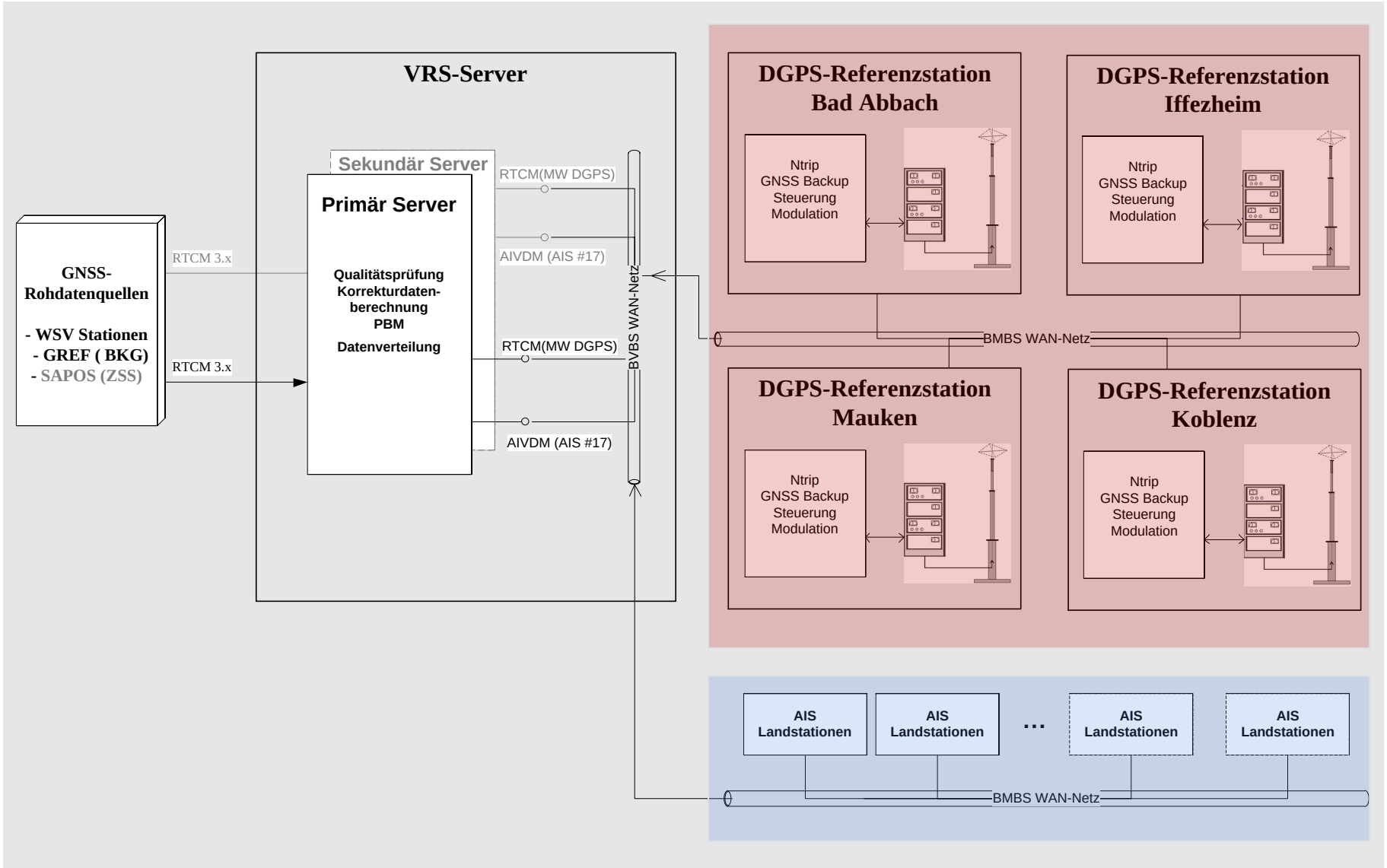
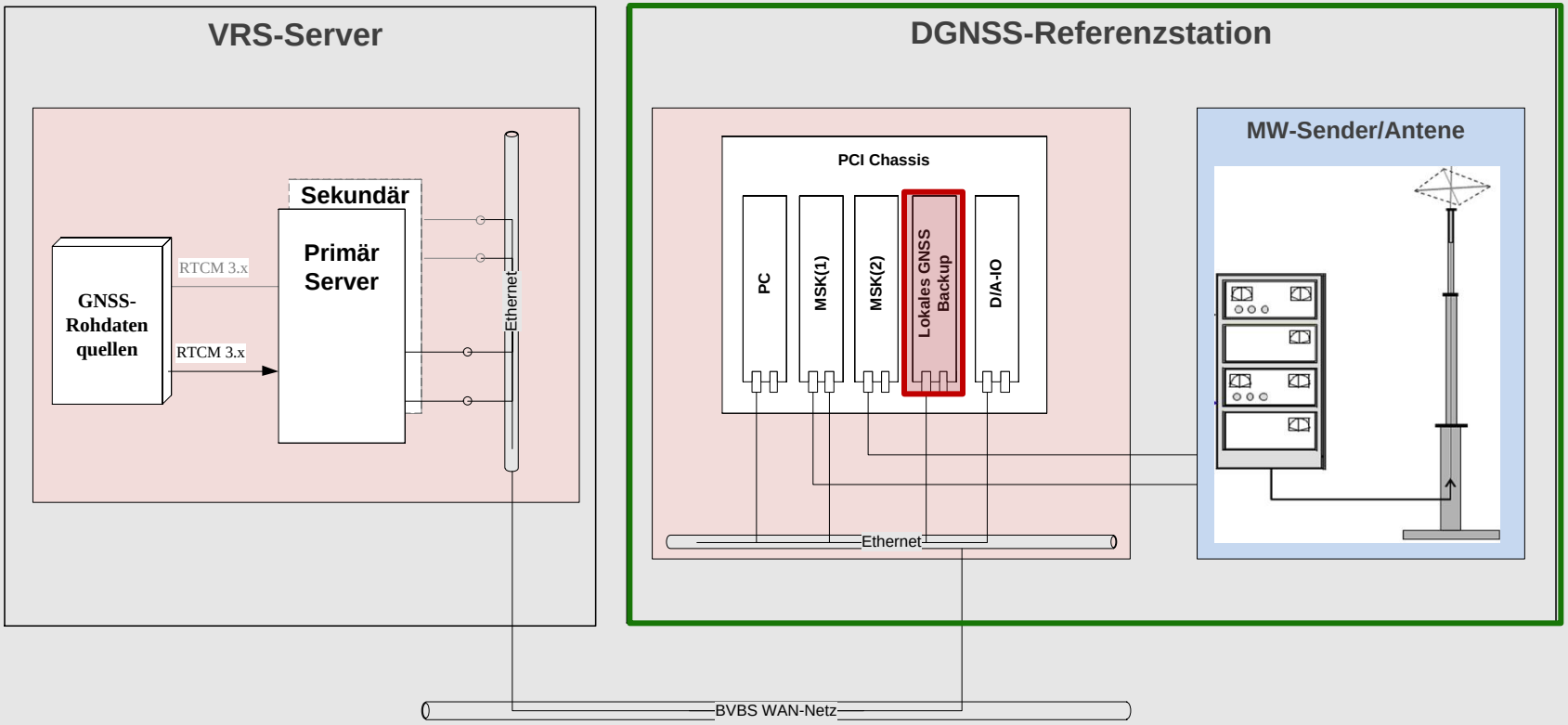
Application	Accuracy [m]	Integrity
Inland ECDIS (IES) Navigation	< 5	IMO A.915(22)
Inland AIS (VTT)		
- Medium-term ahead	15-100	-
- Short-term ahead	10	IMO A.915(22)
- Lock/Bridge operation	1	IMO A.915(22)
Future Applications (IRIS-EU-II SuAc 2.2)		
- Ship Guidance Systems	0,1	TBD
- Bridge waring system	0,1 (3D)	TBD
- Autopilot	0,5	TBD

Planned new system components - general system architecture



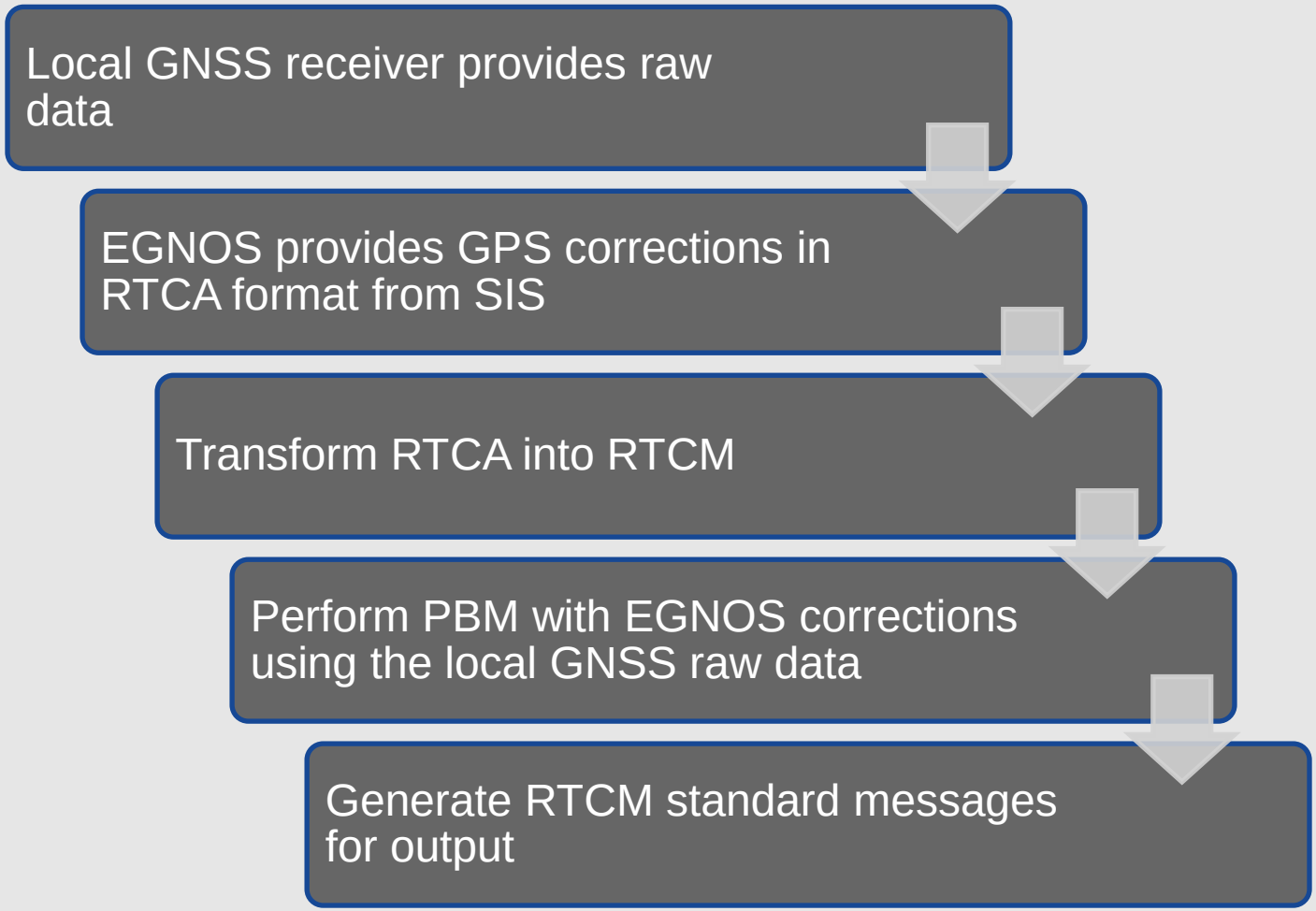
Planned new system components - local radio beacon site



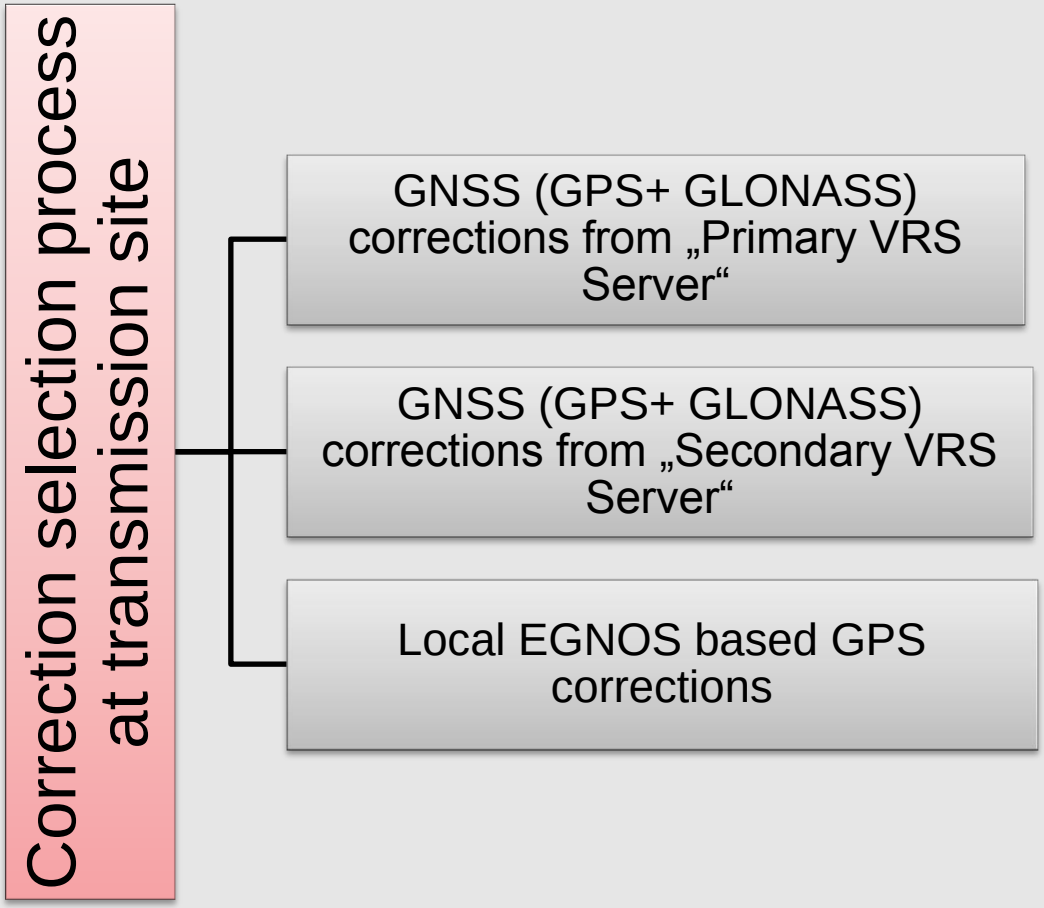
- Reception of GNSS-Corrections from central VRS-Servers
- New Hard- and Software for modulation and remote control
- Local Backup to mitigate network interruptions

Local Backup functionality

- Based on a local GNSS receiver and EGNOS



GNSS correction selection hierarchies



Conclusions

- The existing German radio beacon network is currently based on the classic approach (old IALA R-121)
- Recapitalization is required and will be performed using the network approach based on VRS concept (new IALA R-121)
- To mitigate network limitations a local backup based on EGNOS SIS data will be used
- The WSV is currently implementing this solution for the IWW network

Thank you for your attention

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