

NavConvention 2002 - Report on EGNOS Integration and Validations

*Workshop EGNOS, 12. November 2002, Nice
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Overview

I.1 EGNOS System Overview

I.2 AIV Concept

- > Verification Process
- > Implementation Approach

II.1 Status of System Integration

- > Achievements & Major findings
- > Factory walk

II.2 Status of System Validation

- > Achievements & Tools
- > System Qualification

II.3 SIS-0 - Early EGNOS Signal

III. Outlook & Conclusion

I.1 EGNOS System Overview

EGNOS Mission,
Service Levels

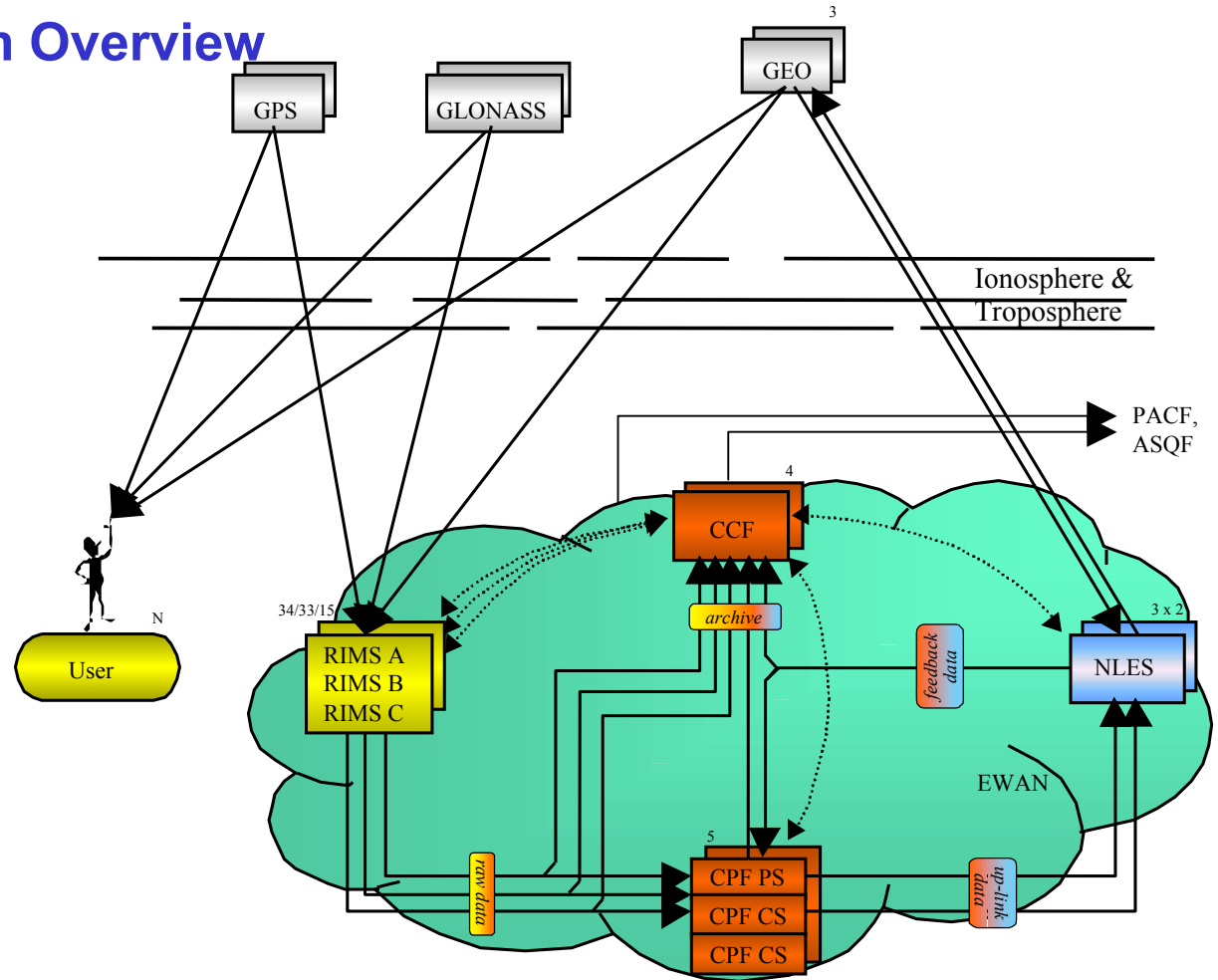
Three closed loops

Multiple Redundancy,
Switching Concept

4 Multicast Groups

'Staged' Archiving

12 External Interfaces
(on-/offline)



EGNOS Performance Summary (AOC)

	AOC LEVEL 1	AOC LEVEL 2	AOC LEVEL 3	
			3A	3B
NSE 95%	100 m (H)	100 m (H)	7.7 m (V) 7.7m (H)	4 m (V) 4 m (H)
Protected Alert Limit	-	556m (H)	20 m (V) 20 m (H)	10 m (V) 10 m (H)
Integrity Risk	10^{-7} /h (2)	10^{-7} /h	2.10^{-7} /appr.	2.10^{-7} /appr.
Time to alert	10 s	10 s	6 s	6 s
Continuity risk Navigation Service	10^{-4} /h	10^{-5} /h	8.10^{-5} /appr.	8.10^{-5} /appr.
Availability	0.98	0.999	0.95 (0.99)	0.95 (0.99)
Service Volume	Any location where 2 or more GEO coverage is achieved.	ECAC	ECAC land masses	ECAC land masses

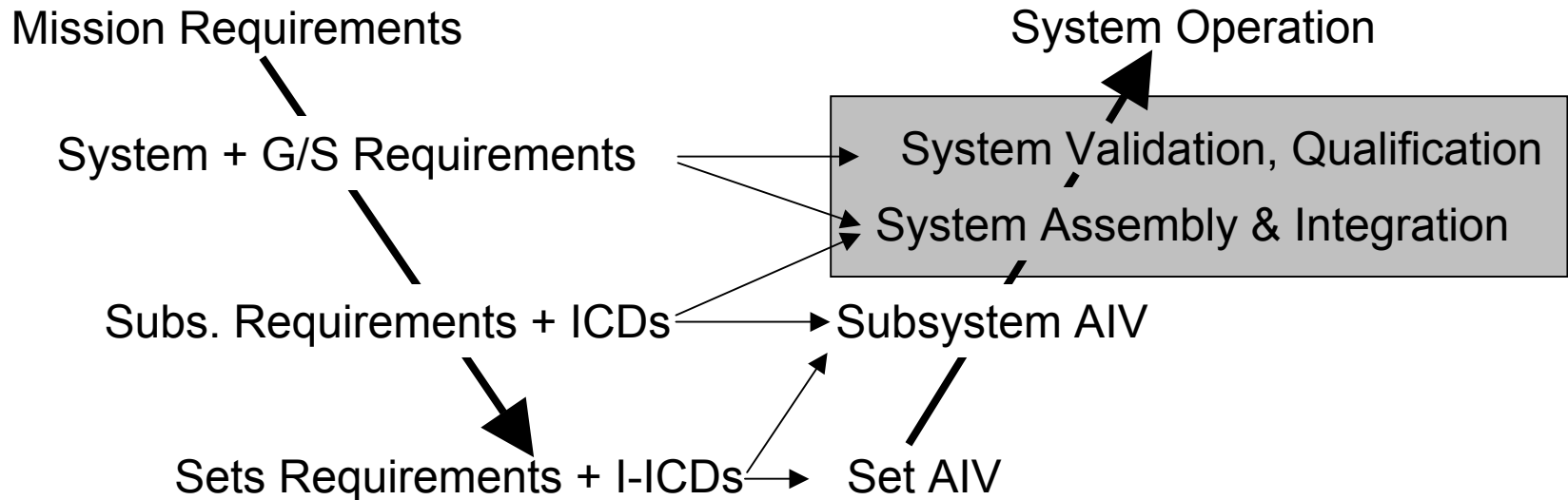
Source: E-RD-SYS-E-001-ESA (SRD) 3.1

(EGNOS System with fault free receiver)

I.2 AIV Concept

EGNOS Design, Development & Verification is requirement driven:

“AIV shall assemble, integrate and test the EGNOS system in order to verify that it meets the specified system and G/S requirements and is ready for initial operations”



AIV Verification Process

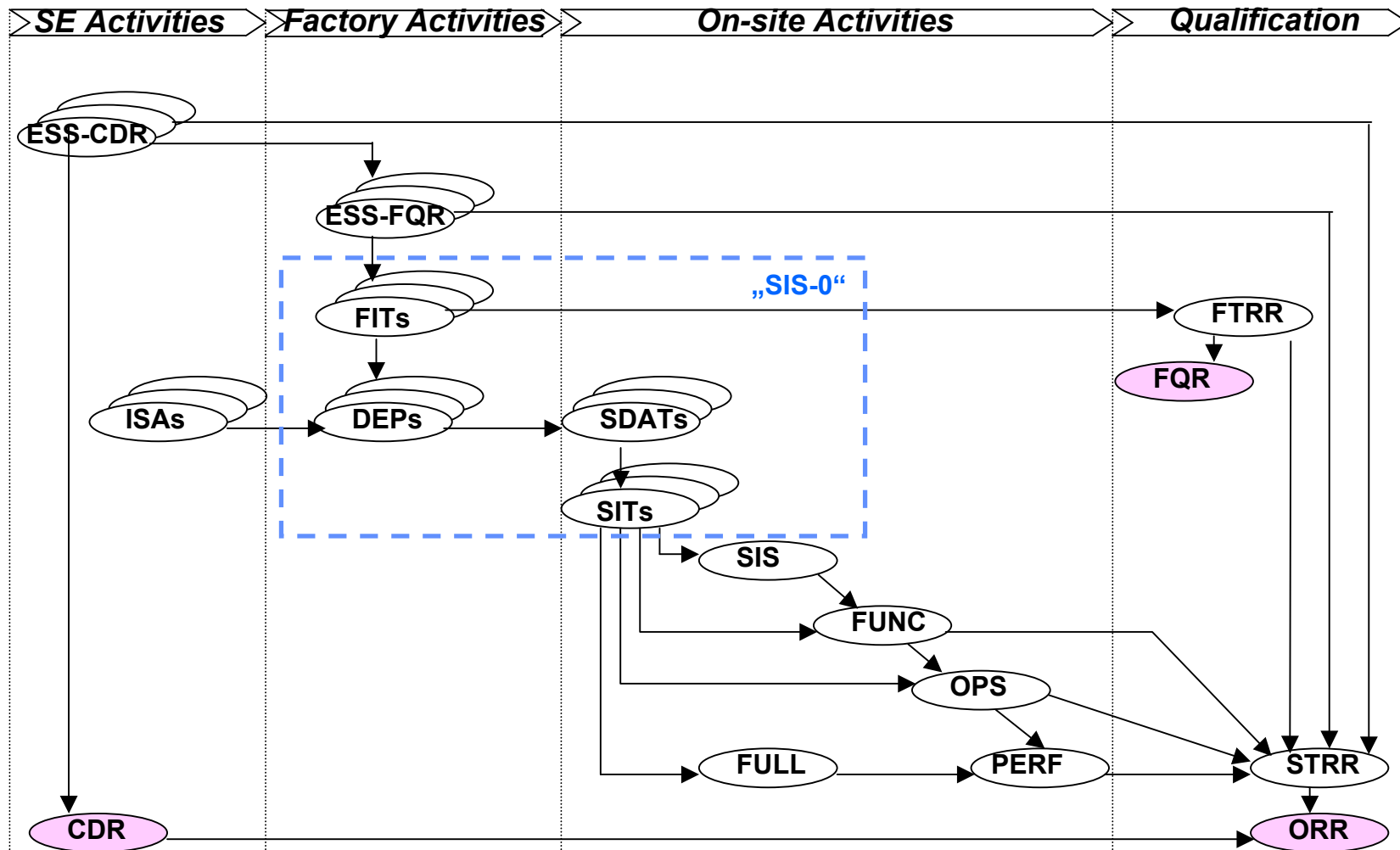
Definition of individual approach to verify the EGNOS requirements

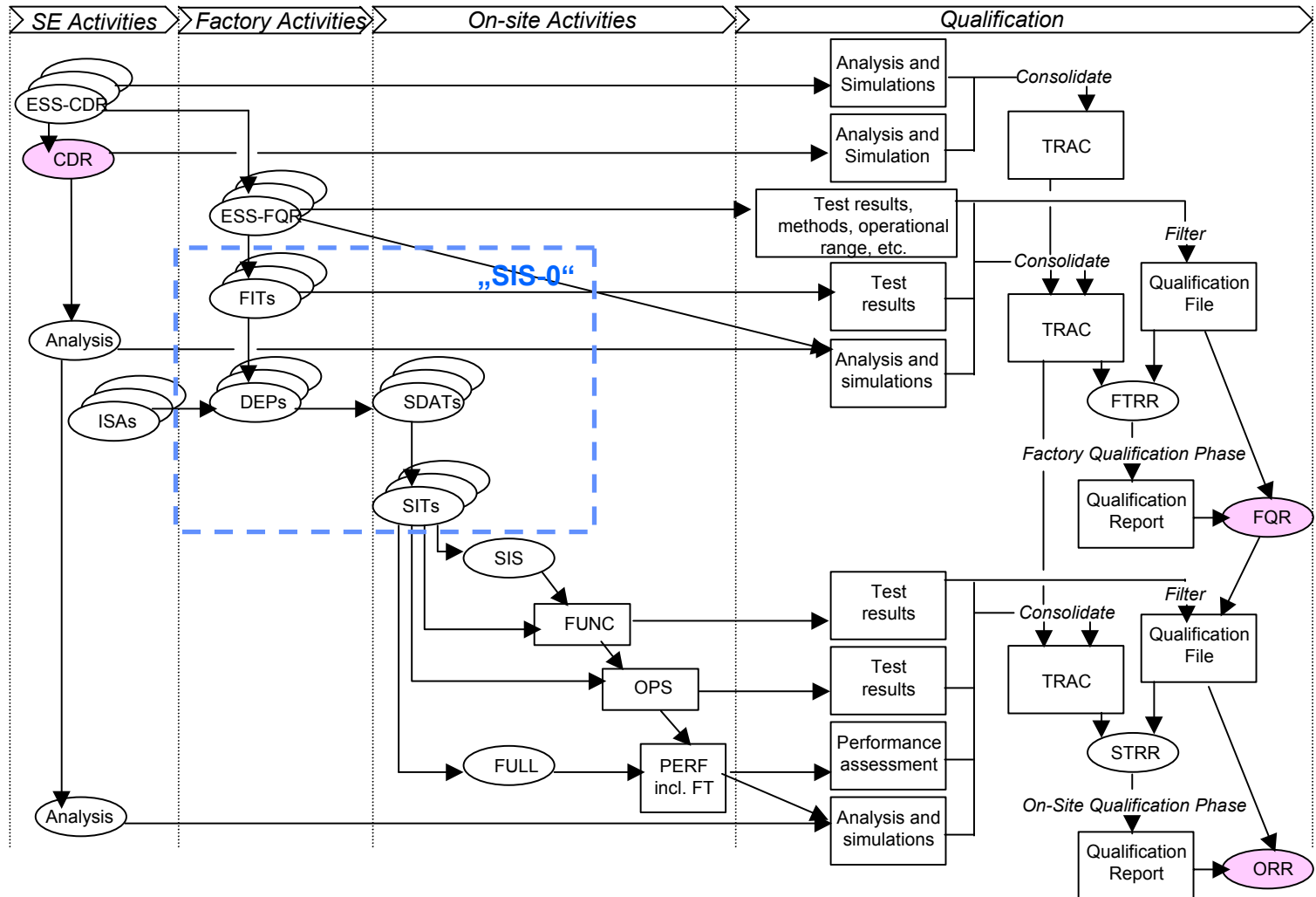
Identification the verification activities

- > System Engineering Activities
 - At system and subsystem levels
 - Based on RAMS studies, ESDV, I&CoS work plan, ESTB
- > Factory Verification Activities
 - At subsystem Level
 - On the System Integration Platform
- > On-site Verification Activities
- > Testbed & tools development
- > Verification traceability database and recording

Implementation of the process including results traceability and consolidation

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II.1 Status of System Integration

Pre-Integration Phase 05/02 - 10/02, SIS-0 Phase started 10/02

Established chains:

- > CCF - FEE - FEE - RIMS A/CPF/NLES (RIMS B/C configured; testing started),
- > RIMS A - FEE - FEE - CPF (RIMS B/C configured; testing started),
- > RIMS A - FEE - FEE - CPF - FEE - FEE - NLES (RIMS B/C configured; testing started),
- > ESTB - RIMS A - FEE - FEE - CPF

ESSes configured for SIS-0 (system parameters; not yet tuned)

Check-out of ESS interfaces (except external interfaces) and basic functionality

Navigation

Status of System Integration

Major system level findings about:

- > Monitoring & control maturity and operating/configuring EGNOS,
- > time synchronisation,
- > tcp connection handling,
- > 'gateway',
- > Navigation Message generation,
- > measurement data decoding,
- > 'site dependence'

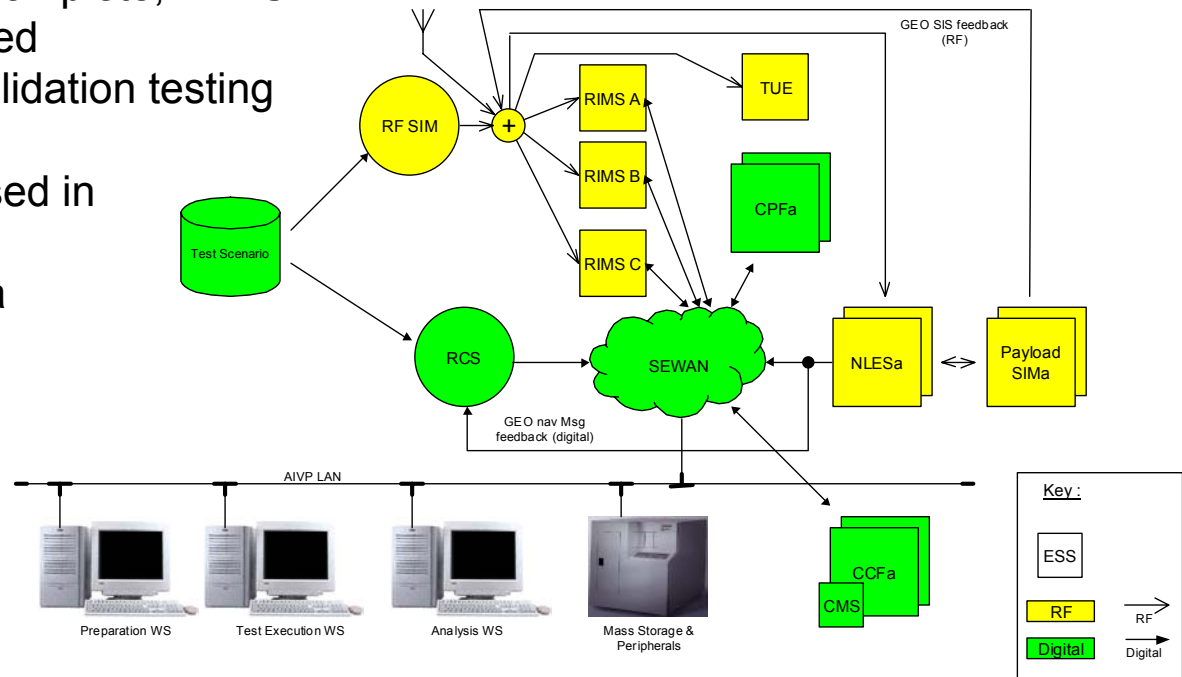
Pre-Integration was very valuable to advance

- > readiness of system test environment
- > first system level testing of ESSes (prototypes)
- > first demonstration of system operation
- > improvement of program planning basis
- > preparation of tests for early SIS

Status of System Integration

AIVP Status

- > AIVP prototype plus integration add-ons in use in system factory
- > RF part development complete, NLES network already installed
- > Unit tests complete, validation testing running
- > FCA (SCAR) was passed in October
- > First part of FTRR data package under review



Status of System Integration

System
Factory at
Langen -

Overview



Status of System Integration

System
Factory at
Langen -

CCF
Operator's
Seats



Status of System Integration

System
Factory at
Langen -

RIMS
A/B/C



Status of System Integration

System
Factory at
Langen -

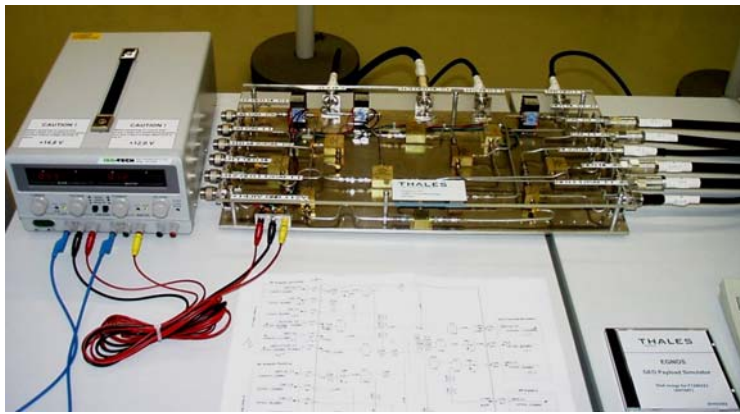
CPF



Status of System Integration

System
Factory at
Langen -

NLES & RF
Pallet



II.2 Status of System Validation & Qualification

System CDR achievements

- > RAMS studies & ESDV (final update at SFQR), I&CoS work plan (completed)
- > Feedback on SQP and FQP received
- > ESS qualification checklists completed, staggered review at TATM & Alcatel

Completion of Factory & Site Test Procedure generation

- > Factory TPs are in submission to Alcatel for Review
- > Site procedures in progress

Analysis Environment

- > Specification and development plan complete, implementation started
- > TUE availability prior to SIS-0 milestone currently under negotiation

System Qualification

- > Processing of qualification checklists for RIMS C & CCF started
- > TRAC updated and transition to DOORS running

II.3 SIS-0 - Early EGNOS Signal

Objective is to

- > advance the most risky site activities (first time deployment, NLES/GEO integration)
- > switch-on the EGNOS signal as early functional demonstration (with unqualified performances)

Realisation is based on

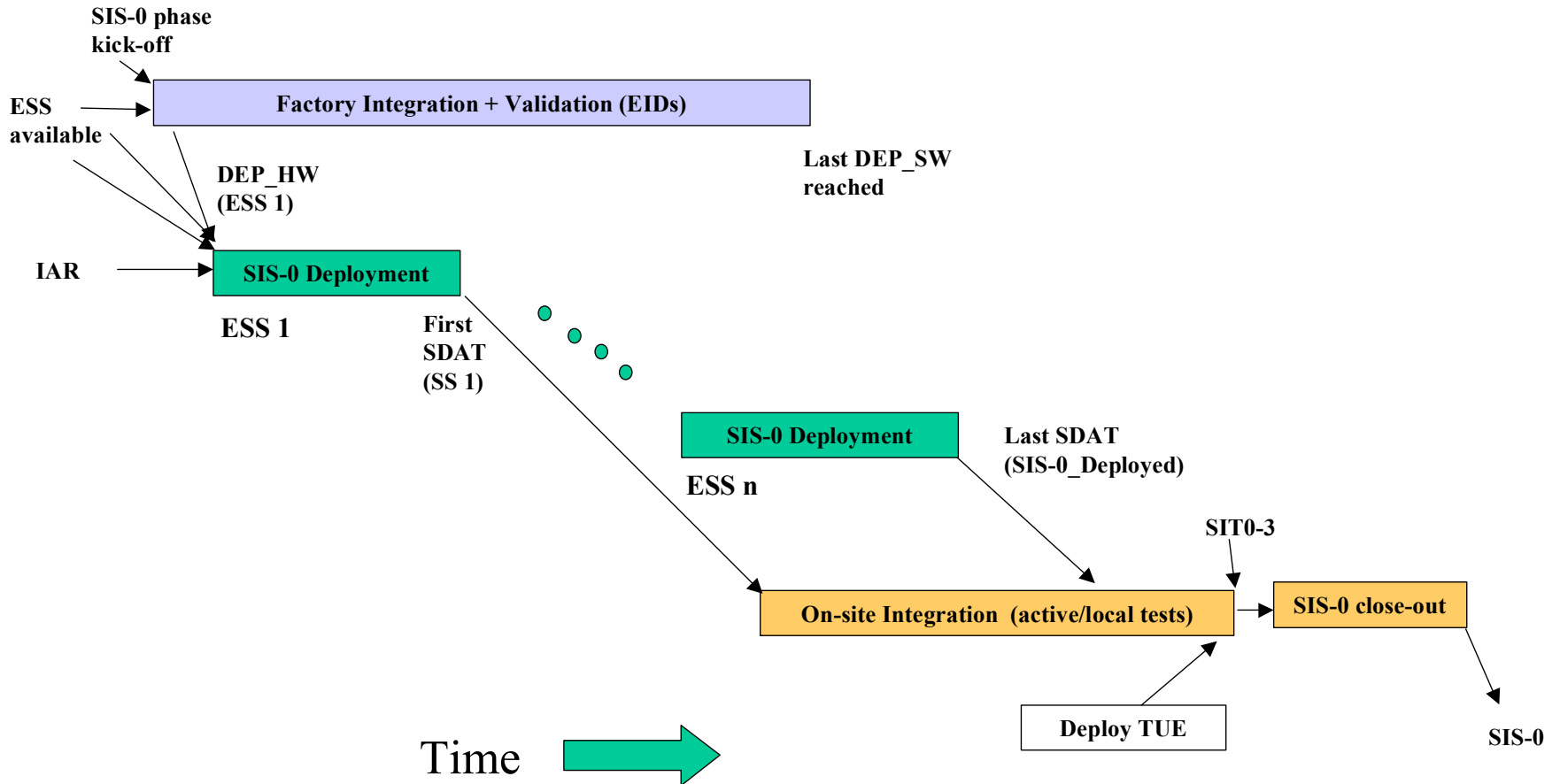
- > 6 out of 10 RIMS sites, 1 NLES (Fucino/Italy on IOR-W, 1 MCC (Langen/Germany)
- > not yet formally qualified sites + subsystems
- > this 'early EGNOS' will be upgraded in parallel with nominal factory activities to join smoothly into the nominal site activities

Achievement criteria

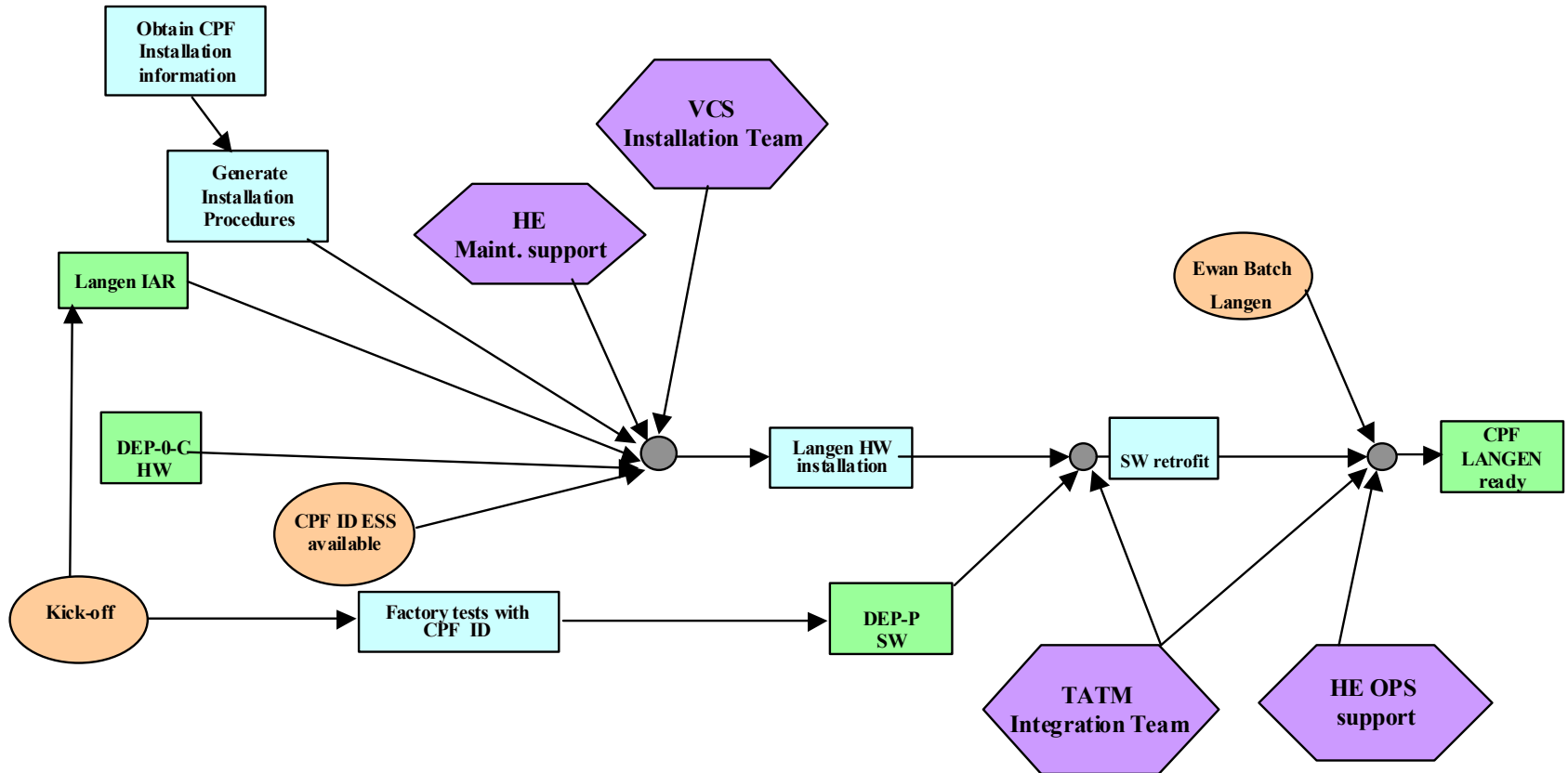
- > EGNOS signal at least 12h without interruption (stability, data collection)
- > Navigation Messages 0 (every 6 sec !), 1, 18, 9, 2-5, 6, 25, 2, 25, 26 at least
- > Comparison of position with reference and with/without SIS-0 corrections (using TUE/TBUE)

Factory testing is running, deployment has started last week (MCC Langen)

SIS-0 Logic



SIS-0 Logic, MCC Example



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III. Outlook & Conclusion

- ✓ Completion of SIS-0 factory testing by mid-December 2002
- ✓ In parallel, first site activities are starting
- ✓ In parallel, subsystems qualification & acceptance completion

 EGNOS is entering into ,real life' !