

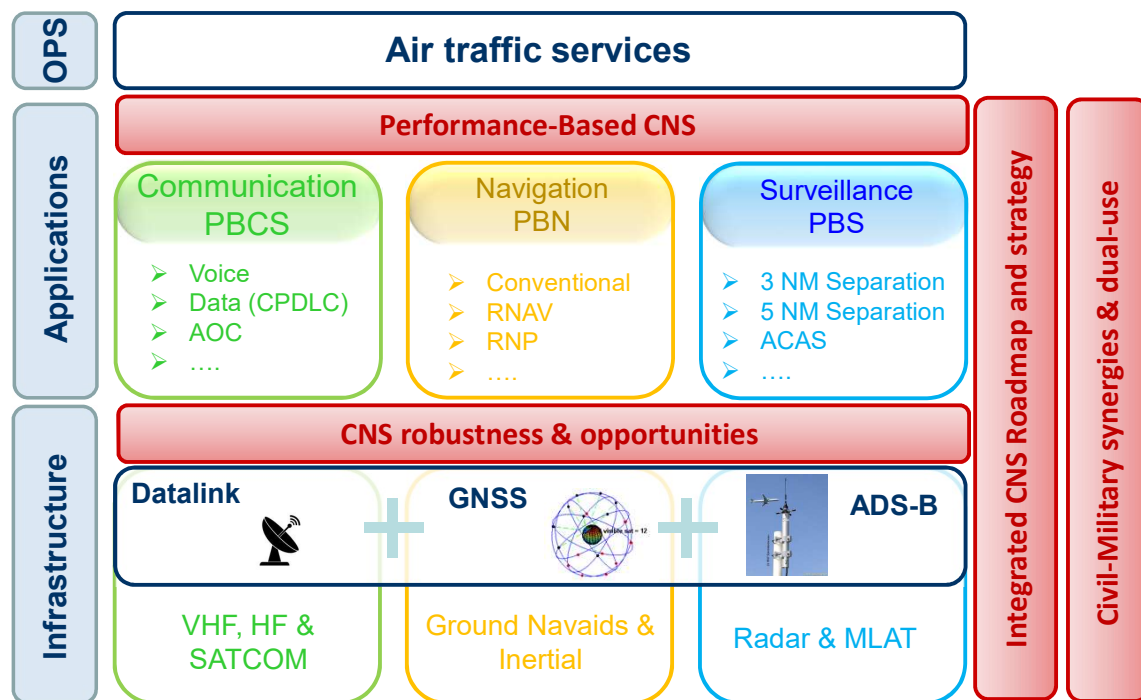


SESAR Communicating

CNS Environment Evolution (PJ14.01.01)

Emilien Robert
SESAR iCNS Research
October 2018

The integrated CNS concept



PJ.14 - EECNS

PJ 14.01.01



Main deliverables:

- CNS Evolution Roadmap and Strategy
- Performance-Based Integrated CNS
- CNS robustness
- Civil/Military information exchange requirements

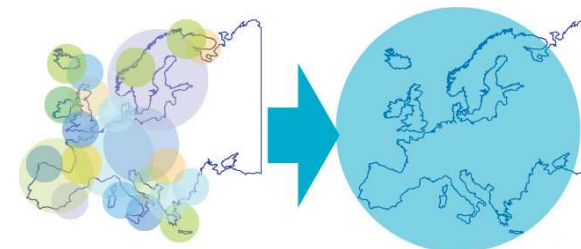
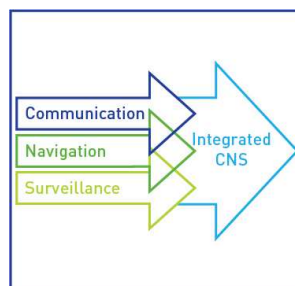
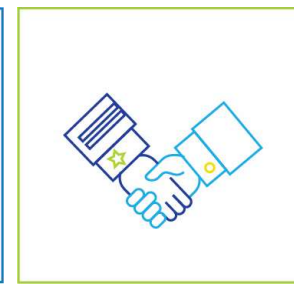
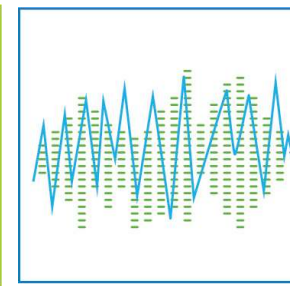
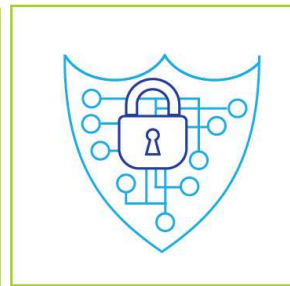
Specific topics

- GNSS core constellation monitoring
- Ionosphere threat monitoring

CNS Roadmap & Strategy

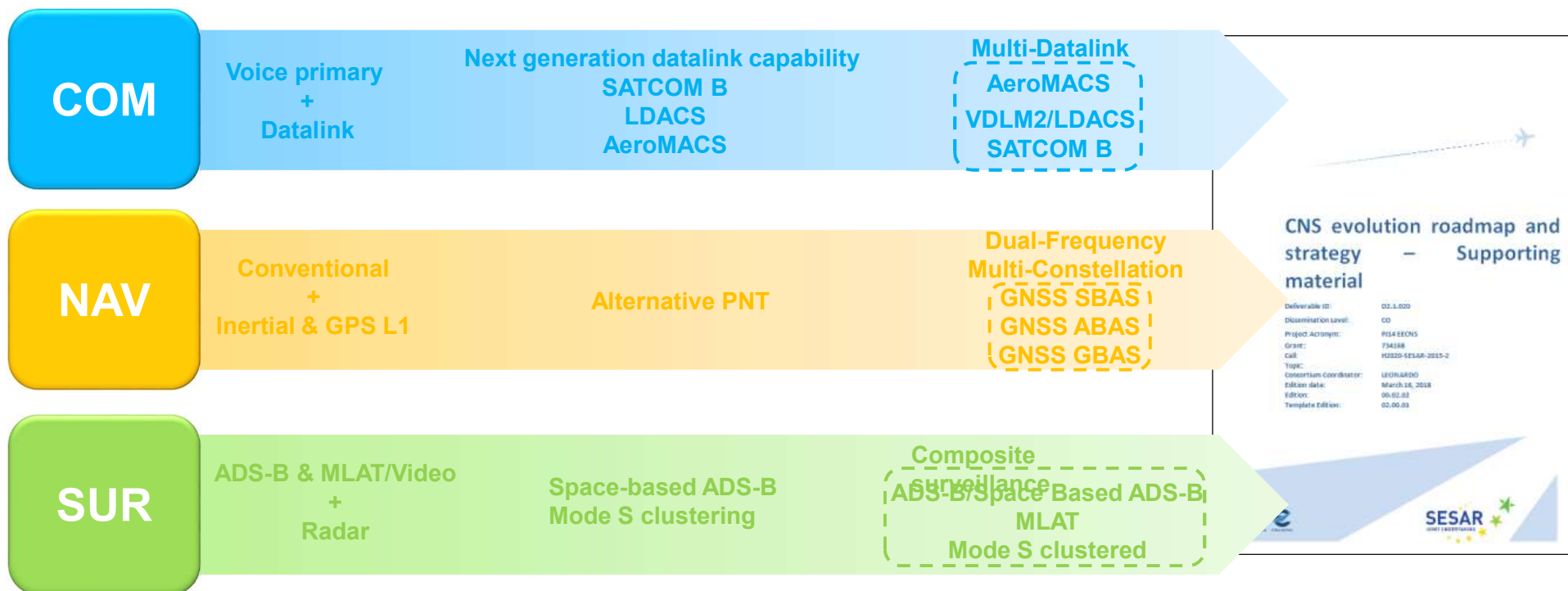
- Top-down approach from the SESAR vision

- Increase **digitalisation, connectivity** and **higher automation** levels
- Implement a **safe, secure and resilient infrastructure**
- Move from physical assets management to **CNS services**
- Develop **performance-based** and **integrated CNS concepts**
- Combine satellite-based airborne and ground-based CNS**
- Rationalize** infrastructure
- Increase **civil-military synergies** and **dual-use**
- Ensure an **efficient** and long-term availability of suitable **spectrum**



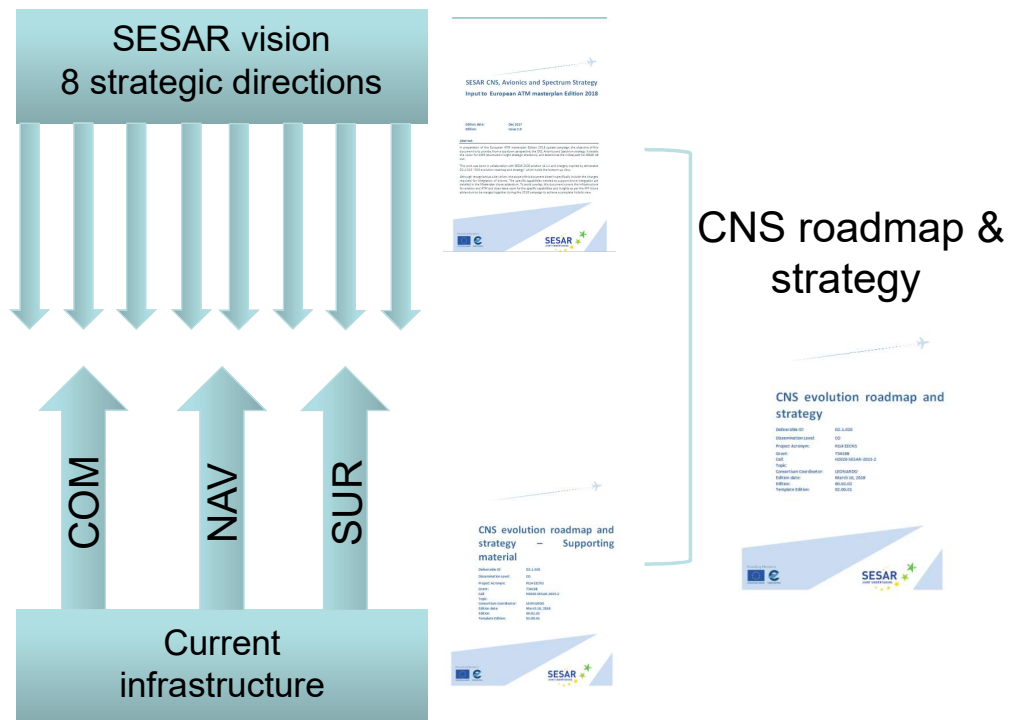
CNS Roadmap & Strategy

- Bottom-up approach from current implementation



CNS Roadmap & Strategy

- Combining the top-down and bottom-up approach

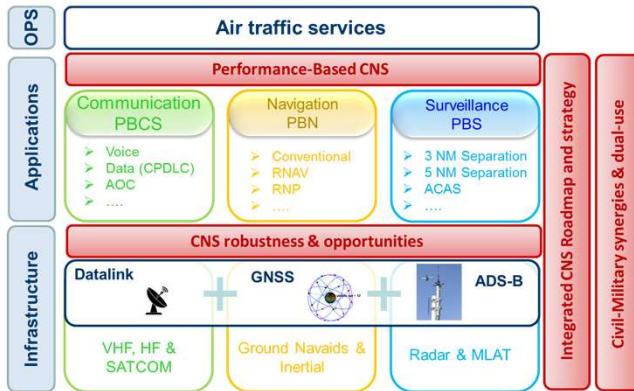


CNS Roadmap development led to:

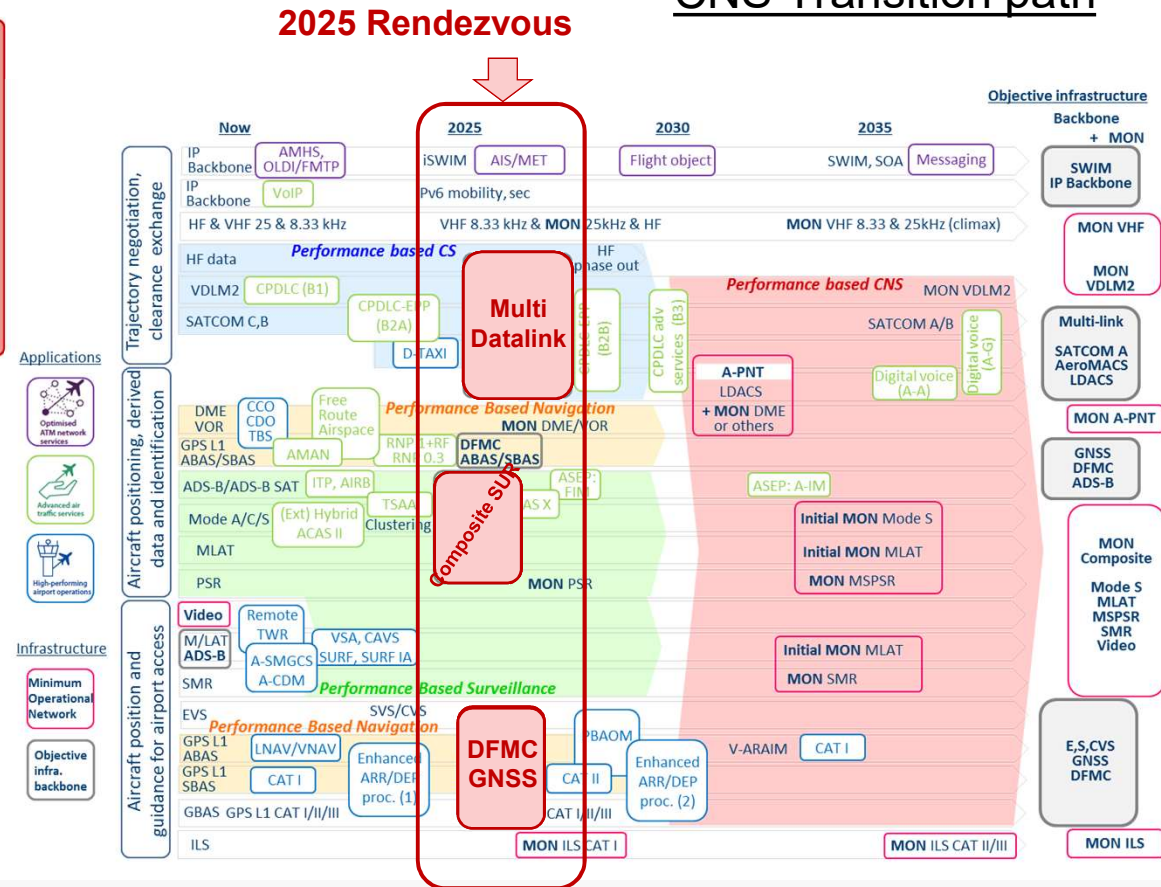
1. Stress the need for an **integrated CNS Concept**
2. Generalization of the **Minimum Operational Network** concept
3. Definition of the **CNS target architecture**
4. Development of a transition path
5. Identification of the CNS rationalisation opportunities



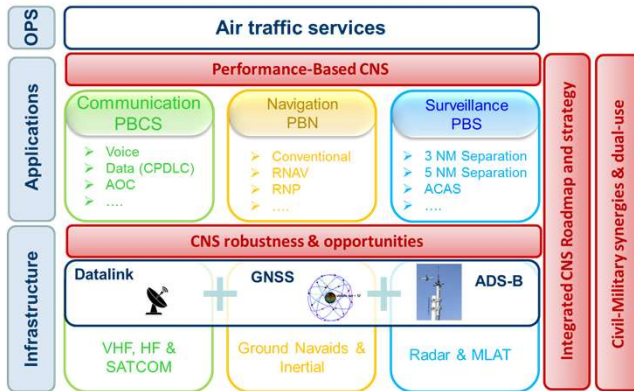
CNS Roadmap & Strategy



CNS Transition path

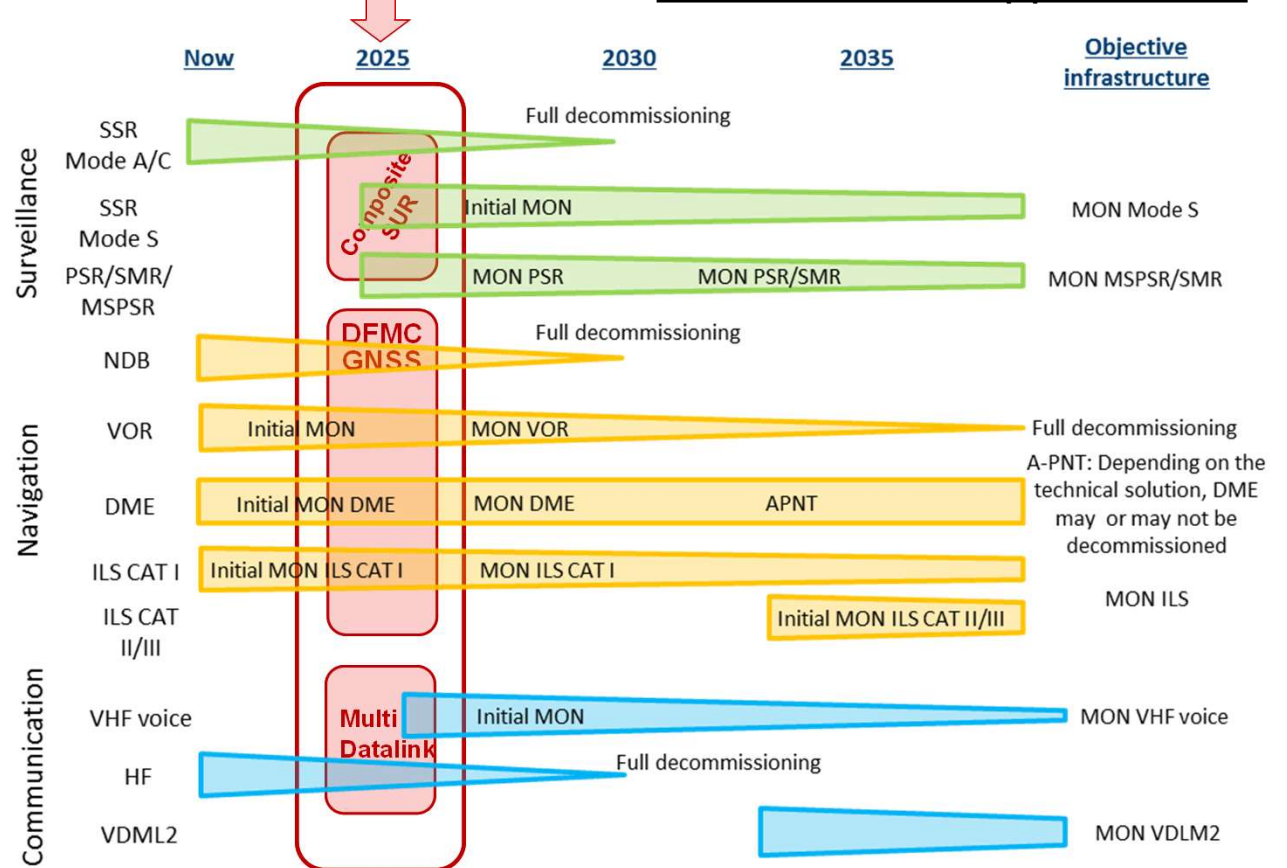


CNS Roadmap & Strategy



2025 Rendezvous

Rationalisation opportunities



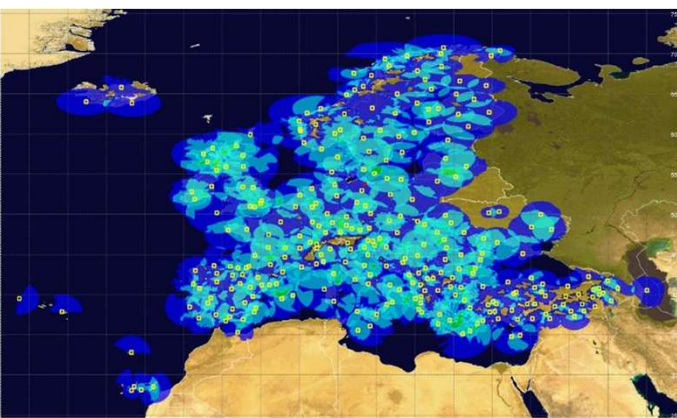
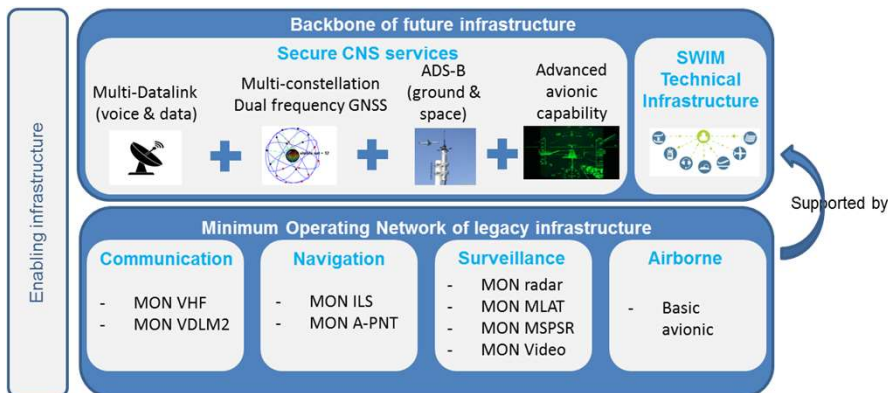
CNS Robustness

CNS Robustness concept:

- A backbone of recent technologies, in the form of secure CNS services
- Supported by a MON of legacy infrastructure, which will remain mainly open.

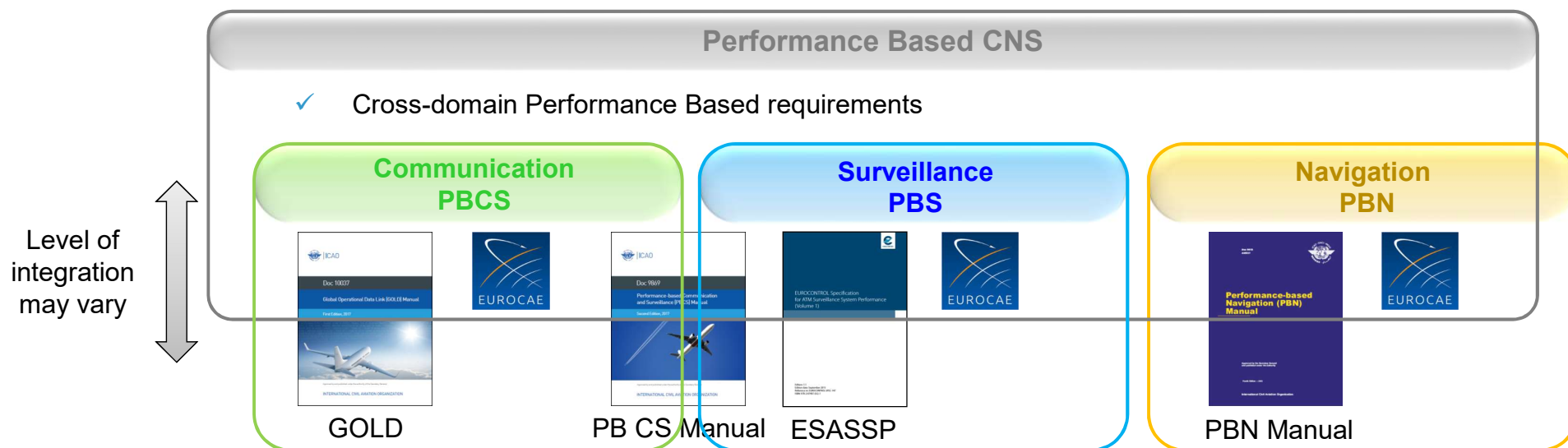
CNS Robustness deliverable:

- Cyber-security assessment on DL, GNSS and ADS-B
- MON definition & requirements for COM, NAV and SUR



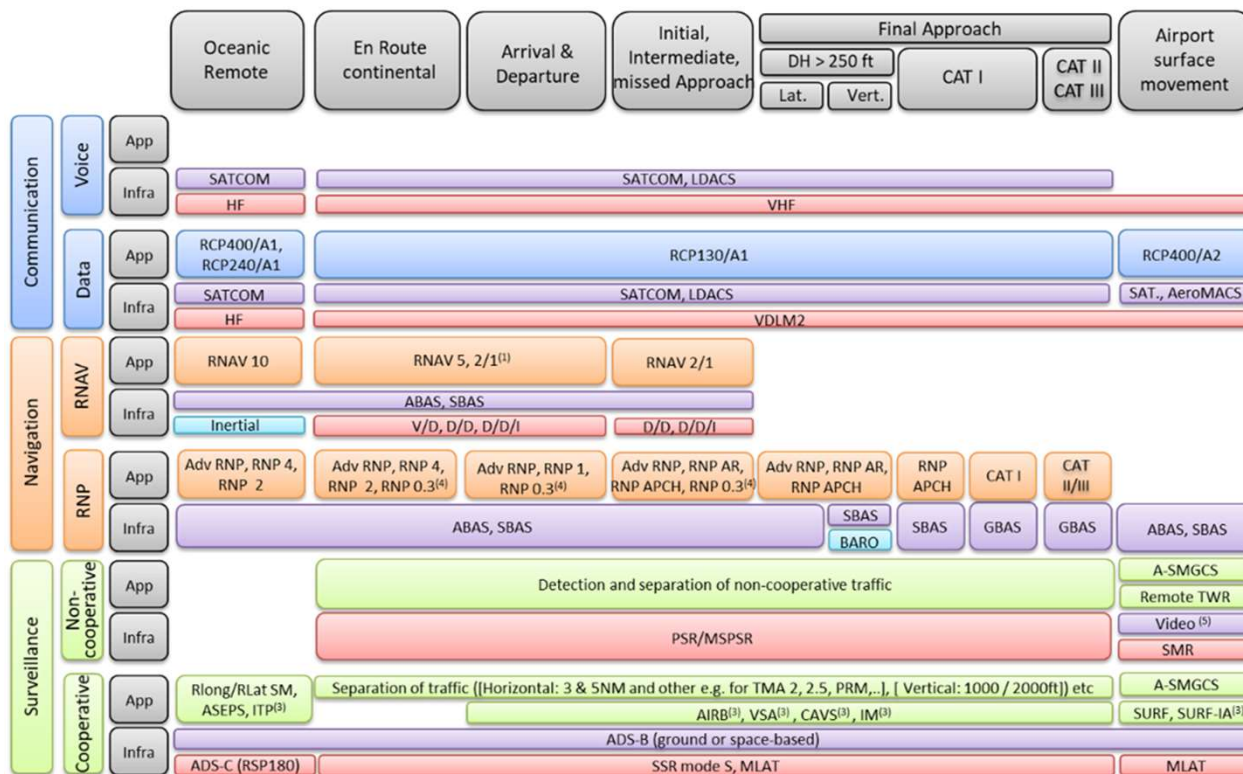
Optimized VOR/DME Minimum Operational Network

Performance-Based CNS



- PB CNS deliverable aims at assessing the similarities and differences between the three C, N and S PB concepts, and will propose a way toward more harmonization
- V1 available since summer, V2: sept 2019

Performance-Based CNS



- COM & PBCS applications
- NAV PBN And GBAS applications
- SUR & PBS applications
- CNS backbone
- Minimum Operational Network (MON)
- Independent airborne capability
- V/D: VOR/DME
- D/D: DME/DME
- D/D/I: DME/DME/Inertial
- (1) RNAV 2/1 can only be supported by DME/DME or GNSS
- (2) Only for ADS-C application
- (3) ADS-B IN application
- (4) For HEL only
- (5) For remote tower application

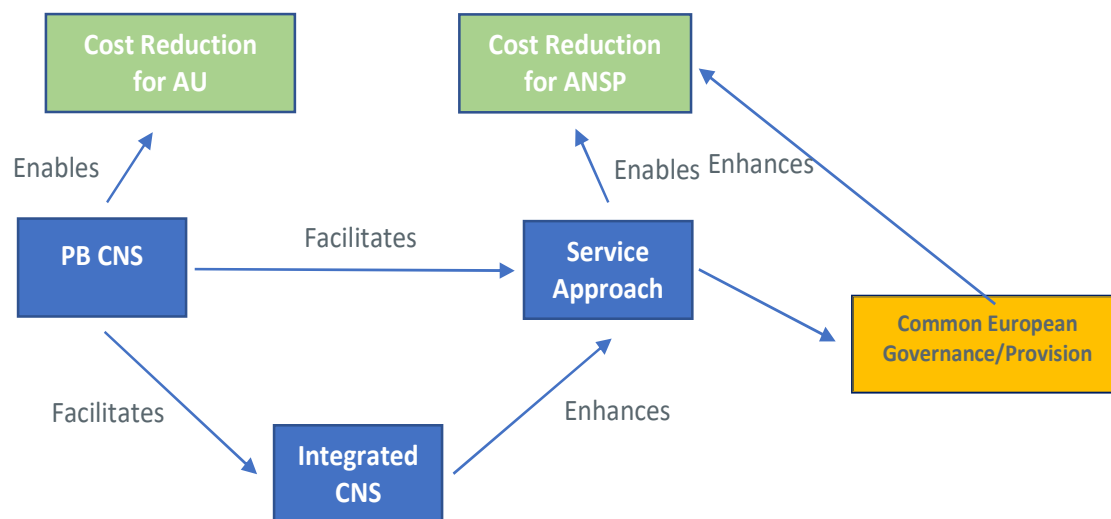
➤ Applications are identified by

- COM & PBCS
- NAV PBN & GBAS
- SUR & PBS

➤ Infrastructure is identified by:

- CNS backbone
- MON
- Independent airborne capability

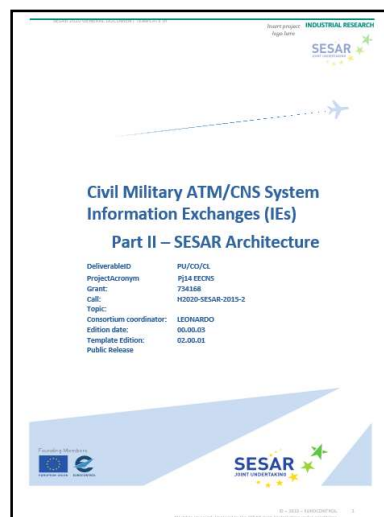
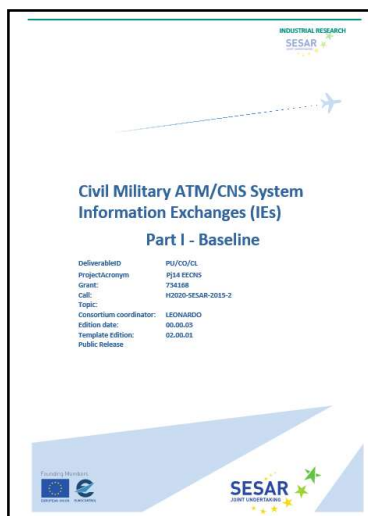
Performance-Based CNS



➤ Recommendations

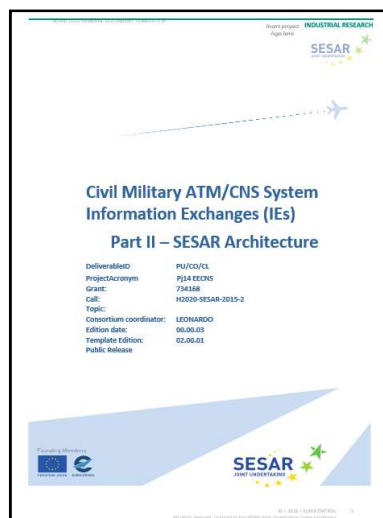
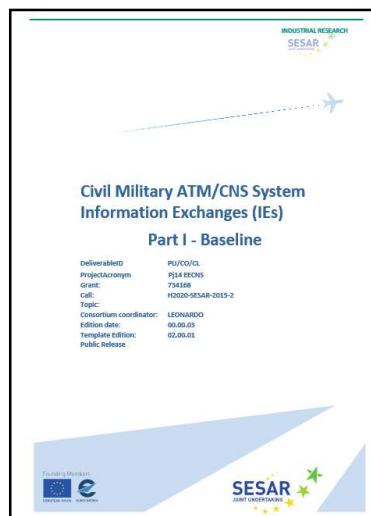
1. Fully define Performance Based requirements applicable to each airspace type and flight phase, within C, N, S and Spectrum constraints – this would be a continuation and evolution of work that is already on-going at ICAO, Eurocae and SESAR;
2. Make due account of the role that aircraft-derived flight data will play in future concepts and how PB specifications can be applied;
3. Promote migration to service-based approach to providing C, N and S capabilities, thus increasing the flexibility of service provision for ANSPs;
4. Exploit opportunities for CNS infrastructure rationalisation from an ANSP perspective;
5. Move to express performance-based requirements without reference to 'traditional' C, N and S system boundaries;
6. Promote the cross-domain application of technologies based on a harmonised performance-based specification framework;
7. Define a harmonised approach to security management across the CNS and flight data provision domains, supporting ATM;
8. Promote opportunities to rationalise equipment required to be carried by airspace users.

PJ14.01.01 “Civil Military ATM/CNS System Information Exchanges (IEs)”



- Both documents describe the system-related civil-military CNS information exchanges supporting ATM.
- They identify information flows between civil and military as well as the associated performance, quality of service (QoS) and security attributes.
- They cover all information that is of potential interest to civil-military ATM/CNS system interoperability including:
 - trajectories / flight data,
 - airspace management data,
 - surveillance data,
 - aeronautical information data,
 - meteorological data, etc.

PJ14.01.01 “Civil Military ATM/CNS System Information Exchanges (IEs)”



- The documents should be considered as a guidance to support the civil-military system interoperability work to be conducted in the framework of any ATM research, Development or deployment activities.
- Measures to improve civil-military ATM/CNS system interoperability must be decided by the National Authorities or International Organizations, such as NATO, on the basis of Information Exchanges that are identified in the document.
- **Part I : focuses on the current ATM architecture.**
- **Part II : focuses on the SESAR ATM architecture.**

Next steps for a future CNS?



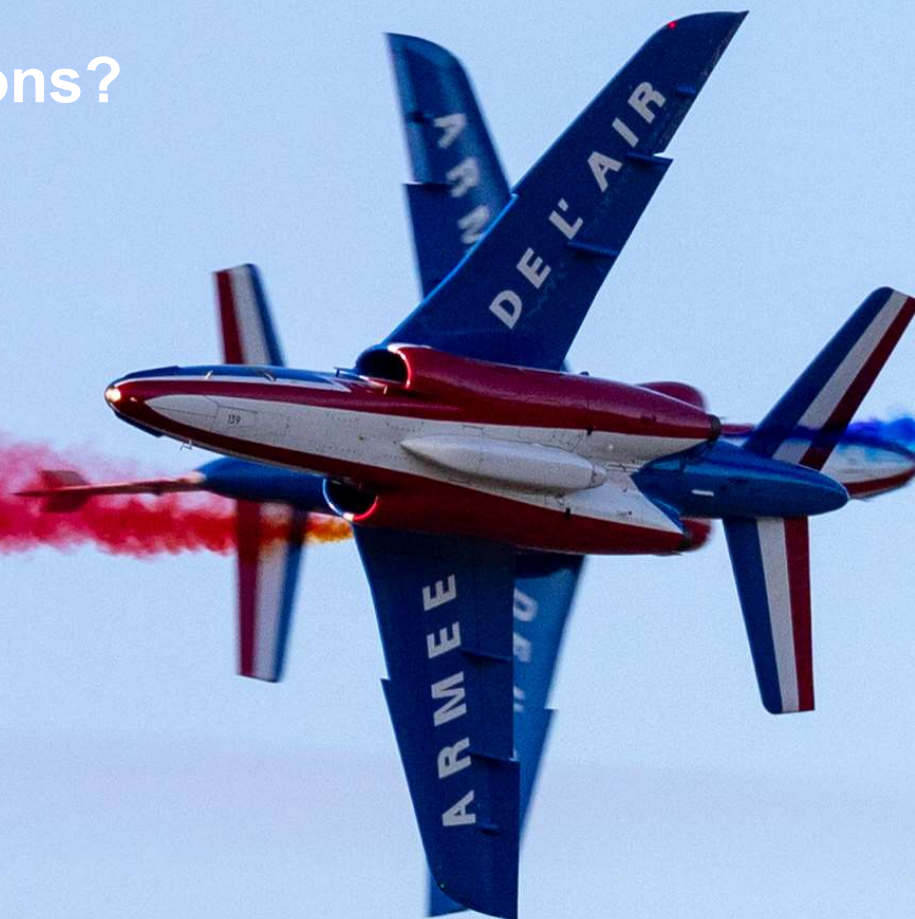
- A top-down policy
- A joint and collaborative leadership and framework
- A neutral and international organisation as architect to operate the “CNS-HUB”
- A seat for every CNS/ATM-U-space stakeholder

Way forward

- **Toward a combined CNS Service-based approach and Performance-Based Approach**
 - Service oriented approach will be the focus of the future Integrated CNS solution in SESAR W2
 - Performance-Based is supported at ICAO level following ANC13

- **2025 rendezvous & key questions for a future implementation:**
 - Clarify Service-based (e.g. Governance allowing for a streamlined decision making while giving a seat to all stakeholders, ensure long term availability, service fee control, ...)
 - Which business models?

Any questions?



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