Using Virtual Technologies to build the future ATM systems

COOPANS

DATS, 6th February 2023, Norrköping

EUROPEAN PARTNERSHIP

This project has received funding from the SESAR3 Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 874464 & 101017587

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Agenda

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Agenda

Topic
Introduction, Setting the scene – what is a virtual centre?
Virtual Centre Background – COOPANS/Thales
SESAR2020 PJ.16-W1-03 and PJ.15-W1-09
SESAR2020 PJ.10-W2-93
SESAR2020 PJ.32-W3
Outlook SESAR3

Introduction
Set the scene – What is a virtual centre?

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Introduction - Who is COOPANS?

BUSINESS CONCEPT	The COOPANS Alliance capitalises on joint and harmonised system development between members through industry partnership, and positively influencing the European environment to operate a world-class, safe, sustainable and cost-effective system.
VISION	Enabling the next level of ANSP performance for all stakeholders in the ATM value chain.
MISSION	To cooperate efficiently to deliver performance enhancing solutions to our members in time to enable them to improve their overall ATM performance.

COOPANS is an international partnership between the air navigation service providers of Austria (Austro Control), Croatia (Croatia Control), Denmark (Naviair), Ireland (Irish Aviation Authority), Portugal (NAV Portugal) and Sweden (LFV).

Thales is a chosen supplier (industry partner) for COOPANS.

COOPANS partners operate a world class, safe and cost-effective ATM system.

COOPANS has adopted a common managerial approach, whereby the six ANSPs act as one organisation together with Thales with a focus on common success.

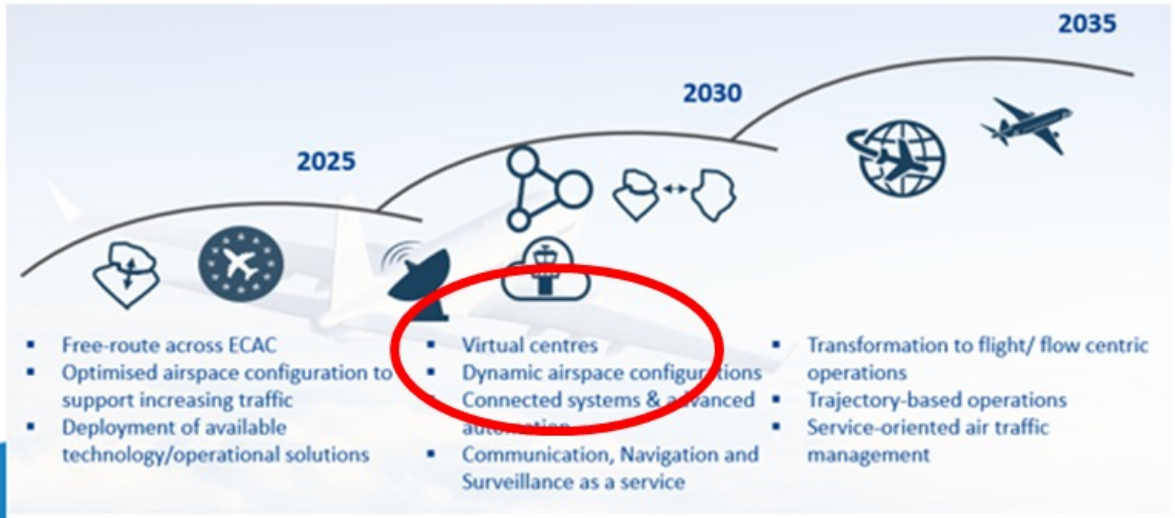
History

2006	Established by LFV Sweden), IAA (Ireland) and Naviair (Denmark)
2010	Austro Control (Austria) joined
2011	Croatia Control (Croatia) joined
2018	Nav Portugal joined

In general we have deployed 2 new software releases in all ATC centres synchronously pro anno.

According to Helios we save approx. 30% of development cost by working together.

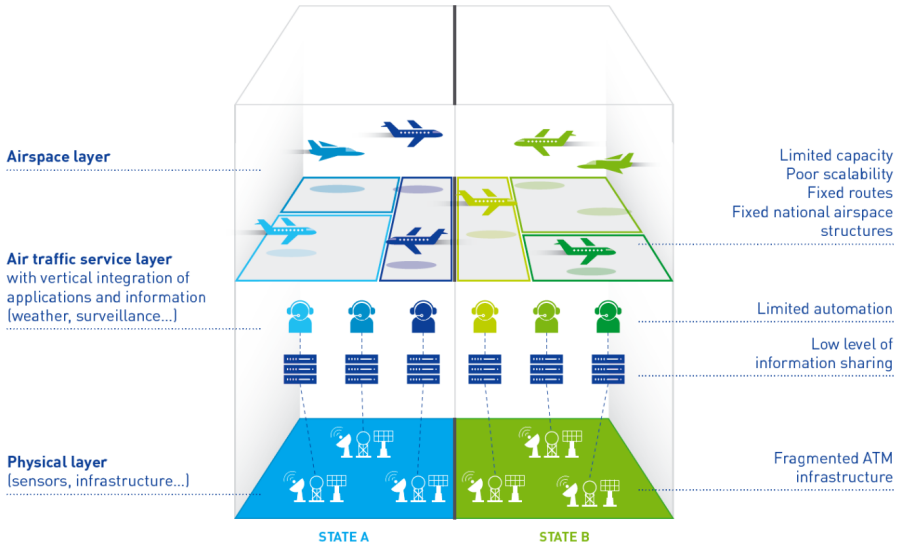
Introduction – SESAR Vision and Roadmap

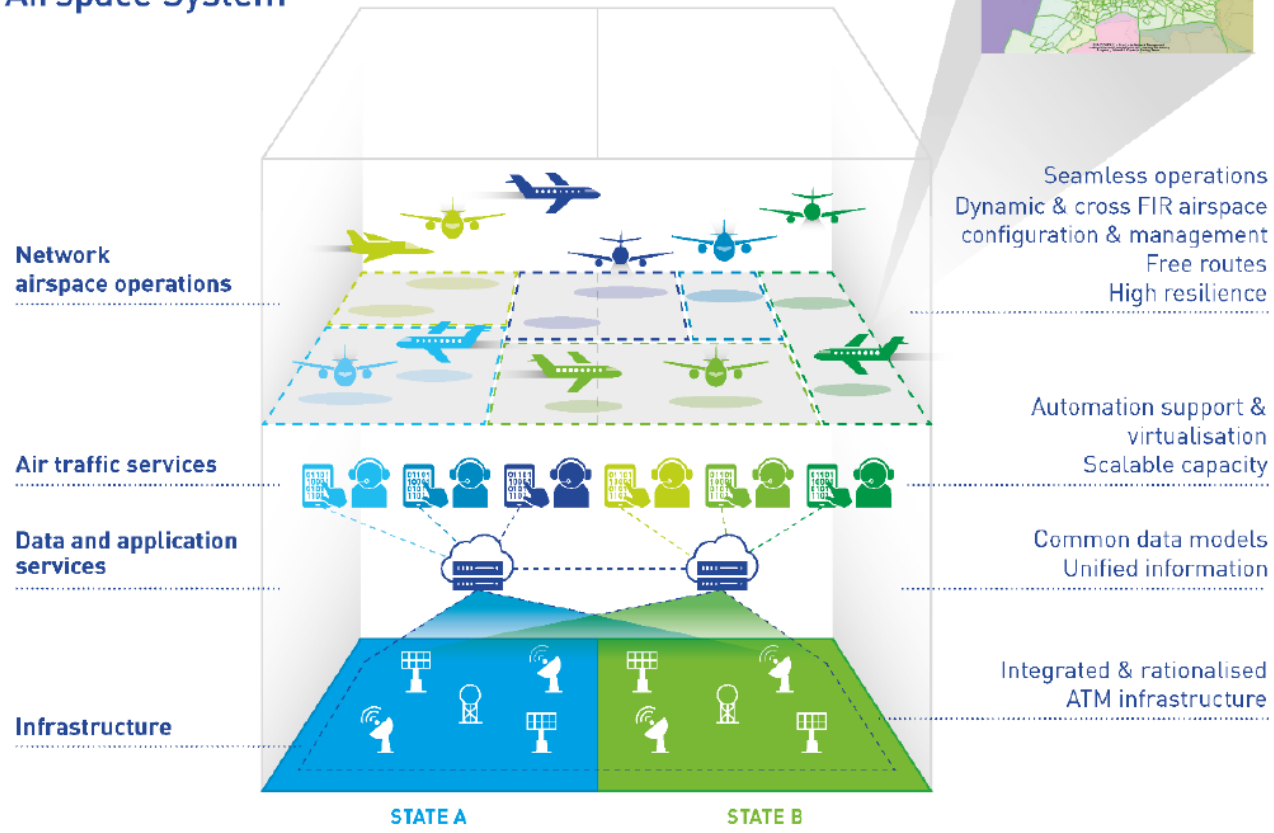


Introduction – Airspace Architecture Study (AAS)

Single European Airspace System

Current architecture

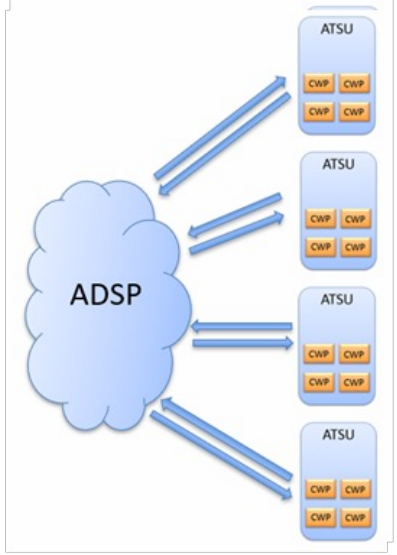


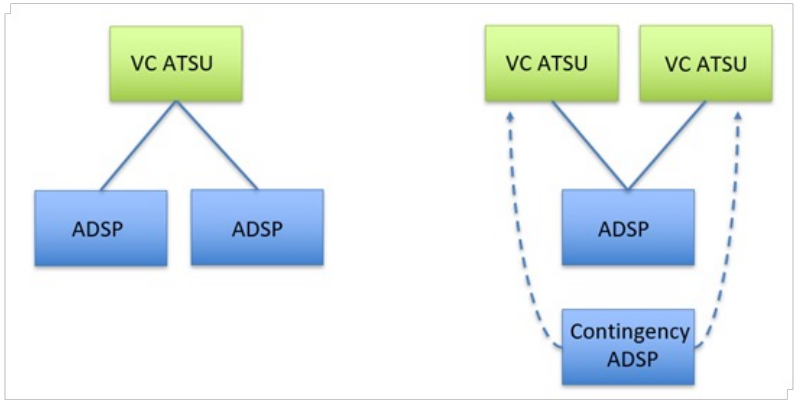


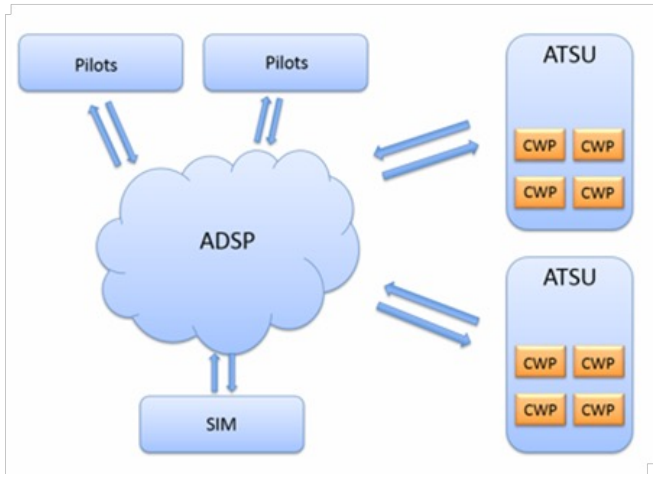
Introduction – What is a Virtual Centre?

Virtual Center definition

A virtual centre is a single ATSU or a grouping of collaborative Air Traffic Service Units (ATSU) using data services provided by an ATM Data Service Provider (ADSP). The concept integrates at least geographical decoupling between ADSP (s) and some ATSU (s), through service interfaces defined in Service Level Agreements. One ATSU may use data services from multiple ADSPs, just as an ADSP may serve multiple ATSUs



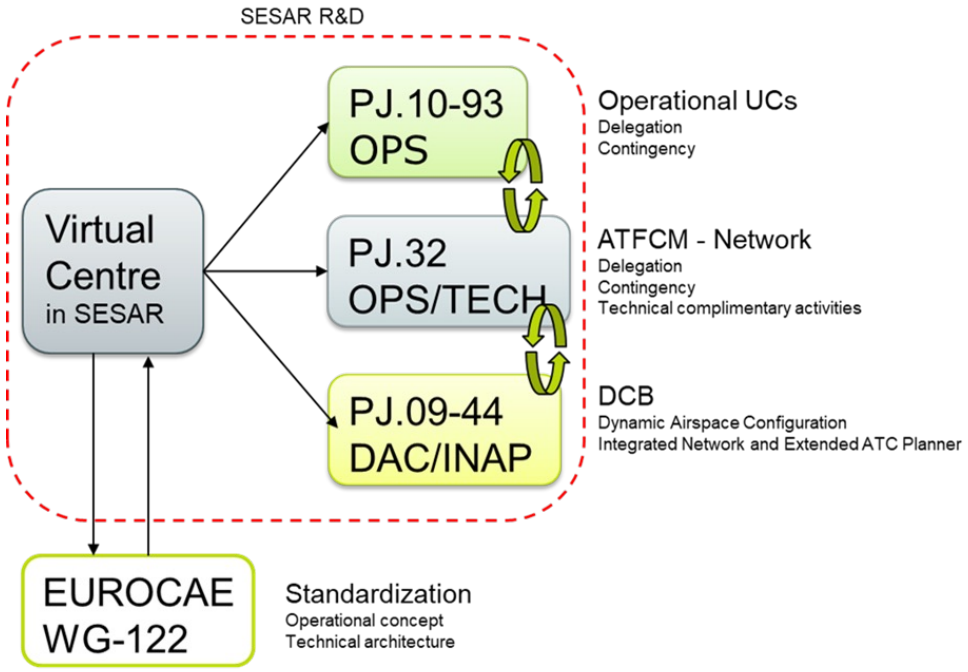


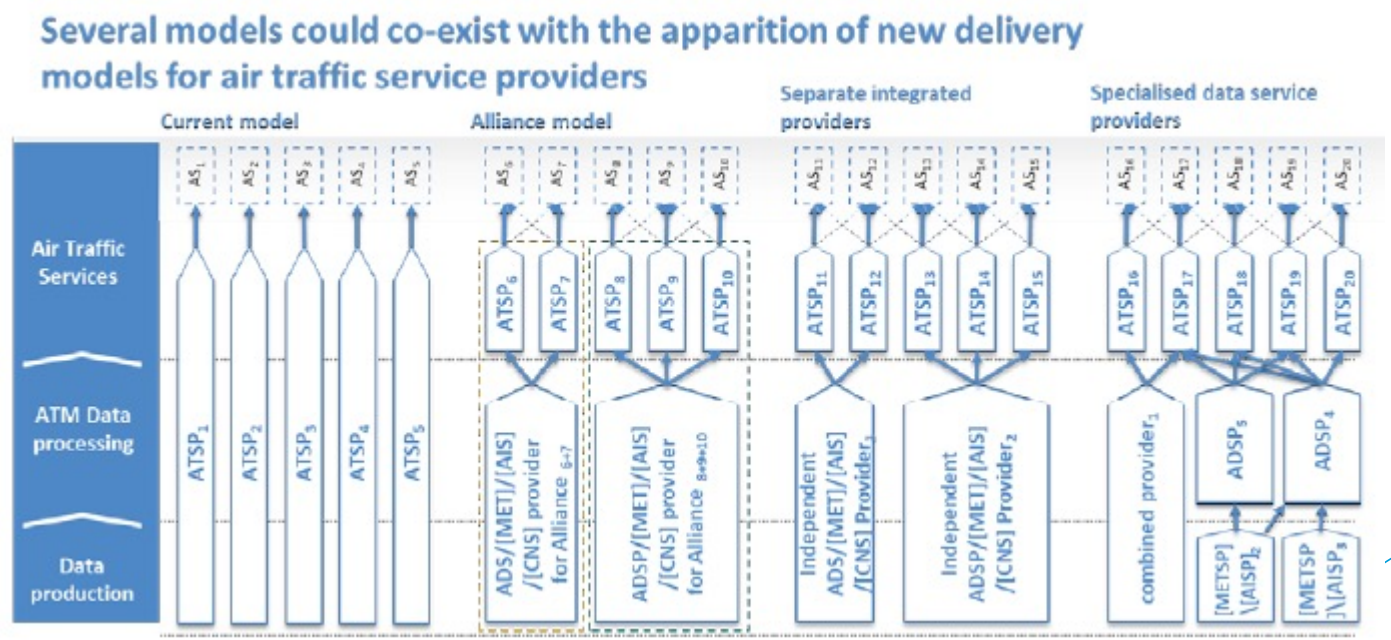


Introduction

Virtualization:

- ✈ Virtualization is about data management – the right data, at the right place, at the right time.
- ✈ Increase interoperability – standardized services - SOA





COOPANS/THALES
VC Background

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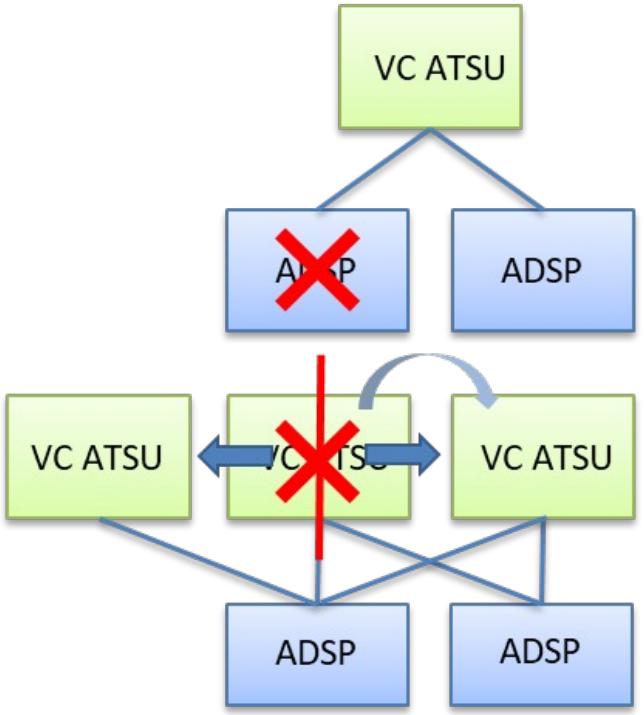
COOPANS/THALES VC Background

Drivers for VC implementation:

- Increased flexibility
- Training
- SW test and development
- Better use of operational resources
- Expected capacity increase on global level
- Rationalization of infrastructure
- Contingency/continuity



COOPANS/THALES VC Background

Early assumptions:

- Virtualization can be done with legacy interfaces
- Cross border sectorization including DAC
- Operational efficiency
- The nature of the COOPANS consortium might have big benefits of virtualized systems, even if only between members.
- Rationalization of infrastructure
- Test and training will be first in line
- Potential showstoppers
  - ATCO licenses (specific toolset, automation support), Native language reqs., State/Company sensitive data (MIL, business), State independence, regulatory reqs.
- Investigative approach in SESAR

sesar JOINT UNDERTAKING

PJ.W2 PROSA

SESAR2020 PJ.16-W1-03 and PJ.15-W1-09

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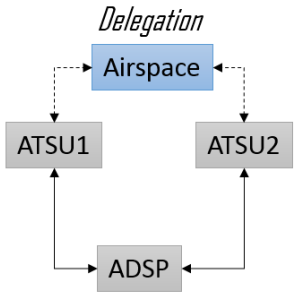
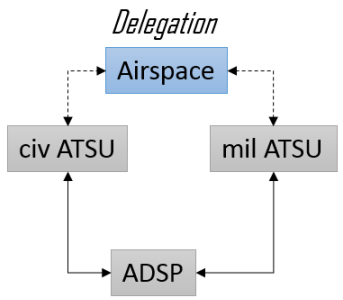
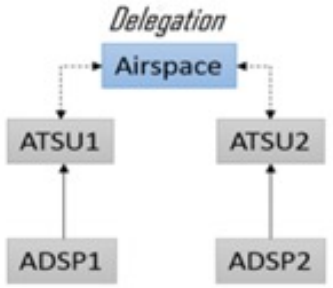
SESAR2020 PJ.15-W1-09 and PJ.16-W1-03

Sol.15-09: Data Services for Virtual Centre

- PJ.15-09 - operational solution, focusing on the operational aspects of ATS delegation based on a Virtual Centre architecture.
- Reached V1 in SESAR 2020 W1.
- Definition of Use Cases and initial OPS requirements (Night Delegation, Static Delegation, Dynamic Delegation, Contingency Delegation, MIL, etc..)
- Many assumptions on legal/regulatory aspects with a first investigation on transition topics.
- 1 EXE – Night Delegation



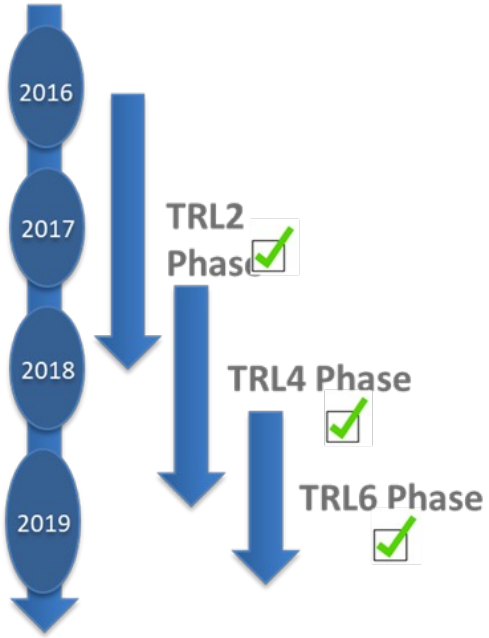




SESAR2020 PJ.15-W1-09 and PJ.16-W1-03

Sol.16-03: CWP/HMI

- Thales acted as Solution Leader
- PJ.16-03 - technological solution, dealing with definition and development of standardized services.
- TRL2-TRL6 in SESAR2020 Wave1 (2016-2019)
- ***COOPANS/THALES*** set up a common exercise to validate the technical feasibility of cross border delegation using two ATSUs connected to a cloud.



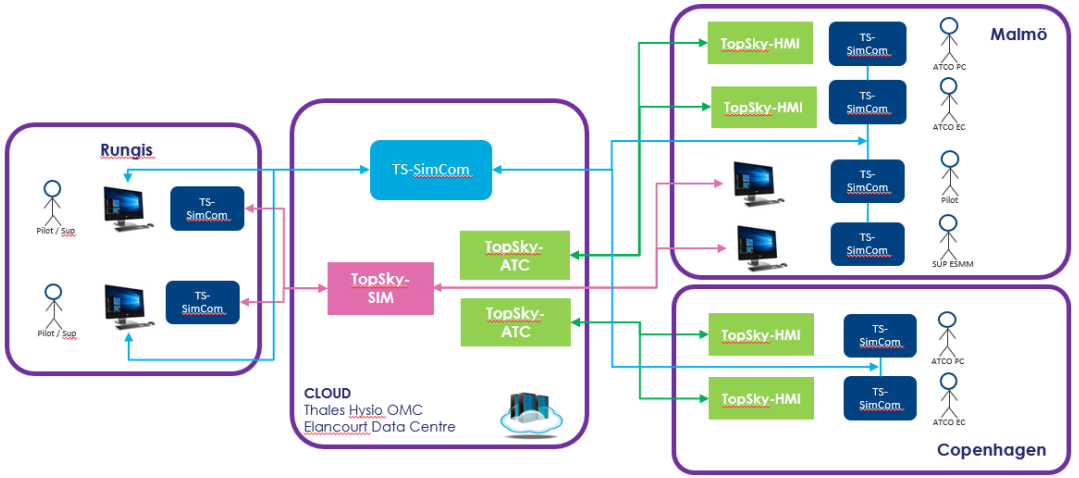
SESAR2020 PJ.15-W1-09 and PJ.16-W1-03

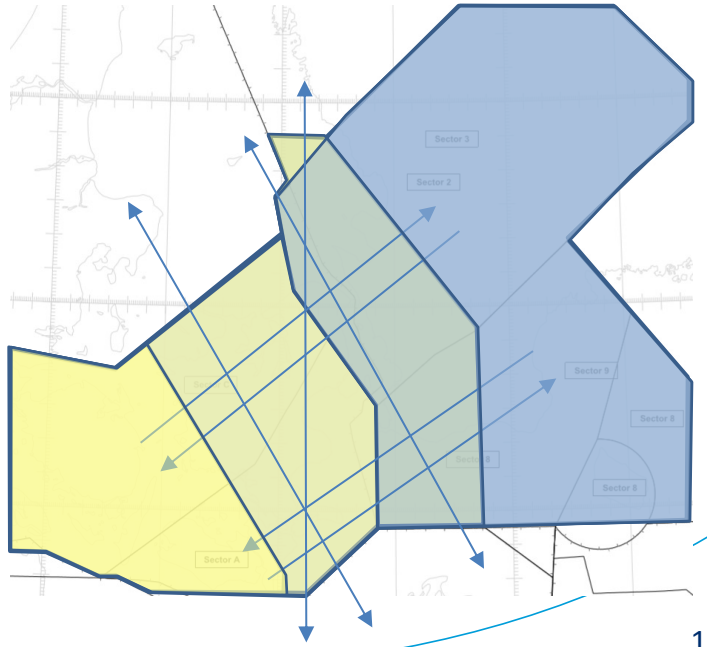
Sol.16-03: CWP/HMI

- ***COOPANS/THALES*** worked on legacy interfaces but on a virtualized platform.

- ***Focus on technical aspects,*** yet delivering a first operational impression

- Dynamic cross border delegation of ATS Services
- Airspace volumes and traffic created for EXE
- EC/PC EKDK, EC/PC ESMM, SUP EKDK, SUP/Tech SUP ESMM,
- Operational procedures created based on PJ.15-09 V1 OSED





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PJ.W2 PROSA

SESAR2020 PJ.10-W2-93

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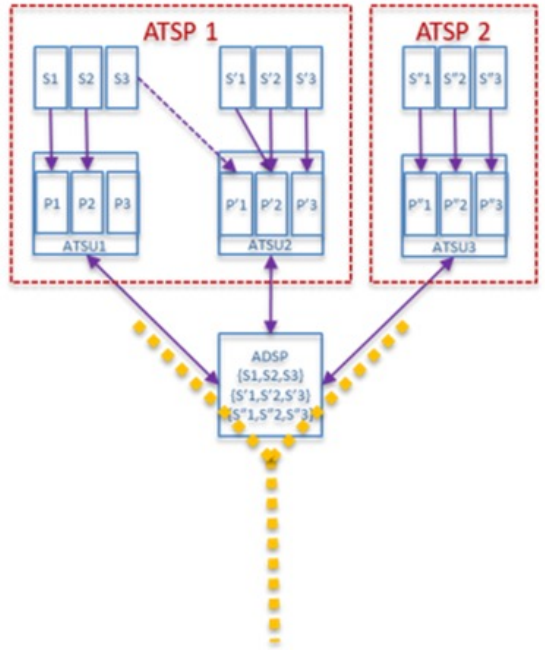
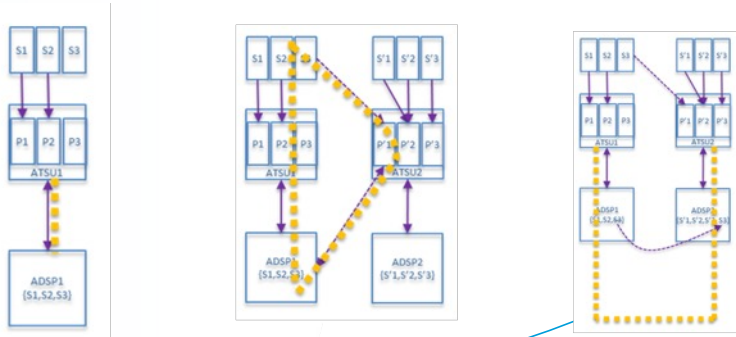
SESAR2020 PJ.10-W2-93

Sol.10-93: Delegation of ATM service provisioning among ATSUs

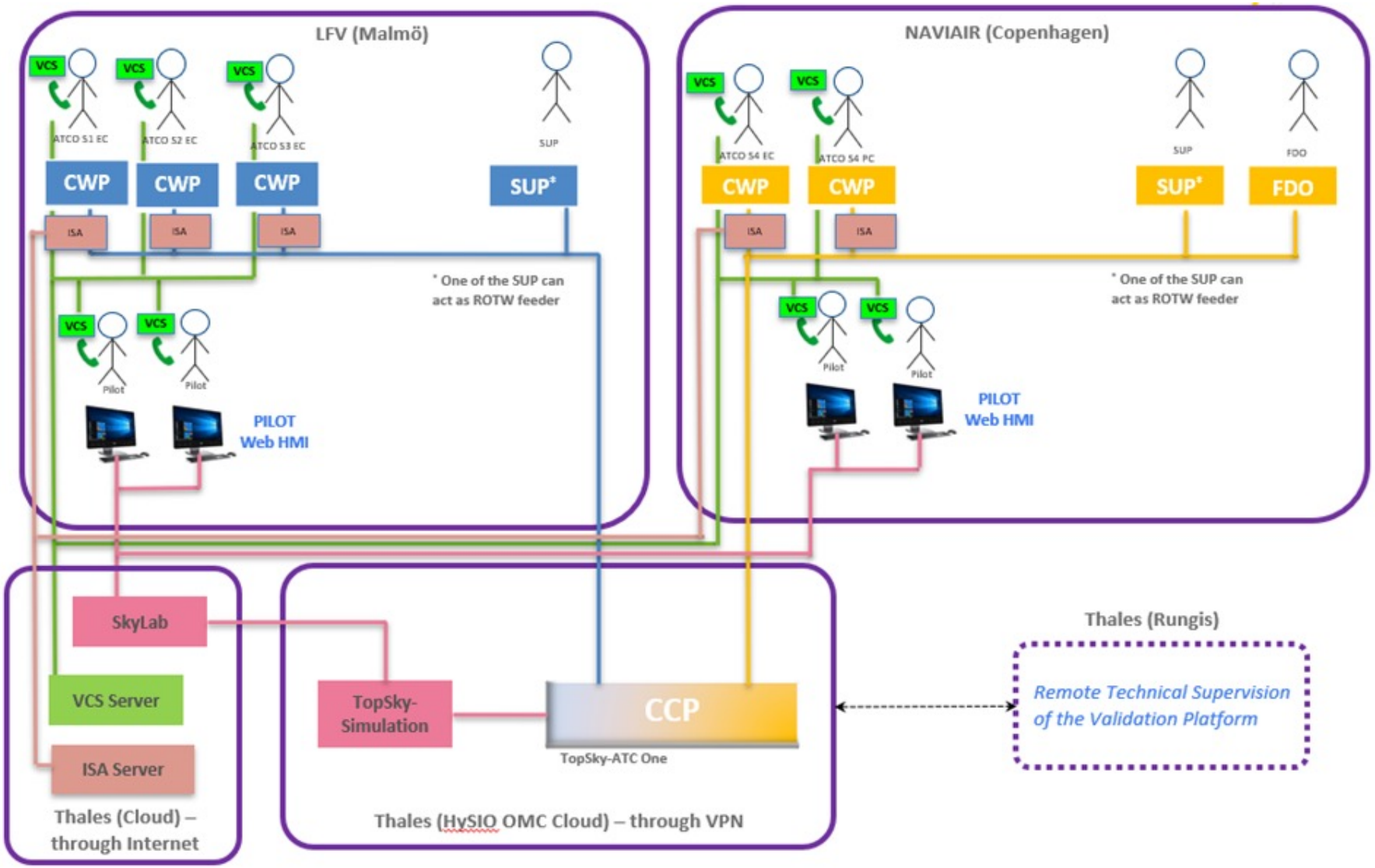


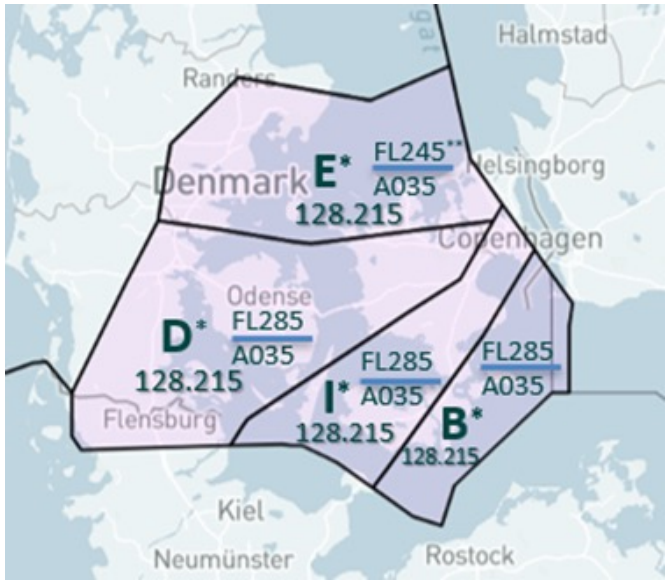
- Continuation of PJ.15-W1-09 maturing the operational concept
- Deeper analysis of operational impact, requirements, safety, use cases, transition factors, etc.
- Technologically supported by PJ.32-W3 VC
- Y-, D- and U-architecture, WG-122

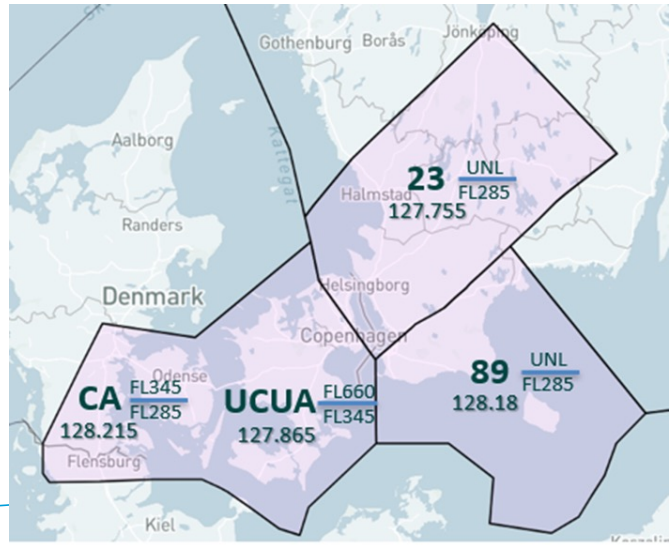
- ***EXE005 COOPANS/THALES***: Delegation of ATM services among ATSUs. The exercise was mainly ***focussed on the operational aspects, human acceptability and feasibility in relation to cross border delegation*** between ATSUs to support workload distribution.
- Cloud based platform (Y) in Paris supporting two remote ATSPs, Copenhagen and Malmoe.



SESAR2020 PJ.10-W2-93

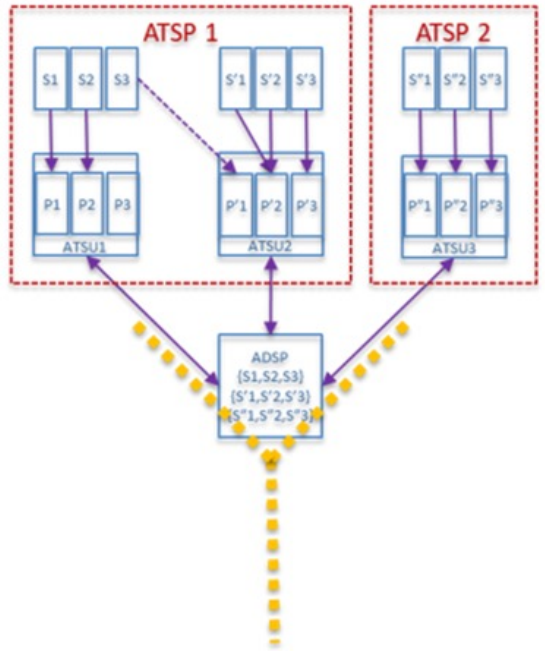






SESAR2020 PJ.10-W2-93

Sol.10-93: Delegation of airspace among ATSUs



- 3 Days in week 43 - 2022, Copenhagen, Malmoe and Paris
- ***EXE005 COOPANS/THALES***: Delegation of ATM services among ATSUs. The exercise was mainly ***focussed on the operational aspects, human acceptability and feasibility in relation to cross border delegation*** between ATSUs to support workload distribution.
- ***Exercise results***:
  - Delegation of ATS concept was considered acceptable
  - No major difference compared to internal split/collapse of sector(s)
  - More difficult in high traffic conditions, yet acceptable
  - Additional tools support might be needed (mainly HMI)
  - Familiarity with the neighboring airspace was a benefit for the ATCOs
  - Preservation of high capacity requires familiarity with airspace
  - Delay in system response and available toolset was a limiting factor

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PJ.W2 PROSA

SESAR2020 PJ.32-W3

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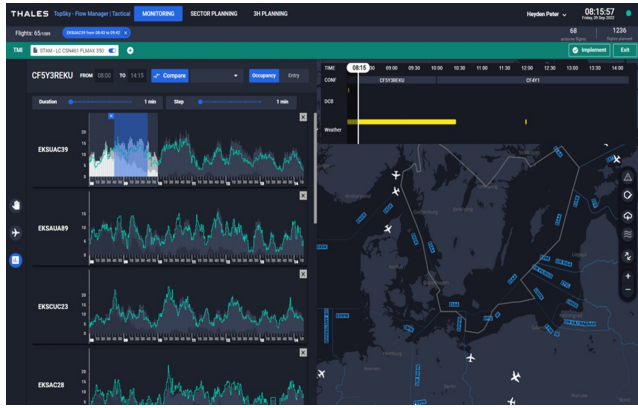
SESAR2020 PJ.32-W3

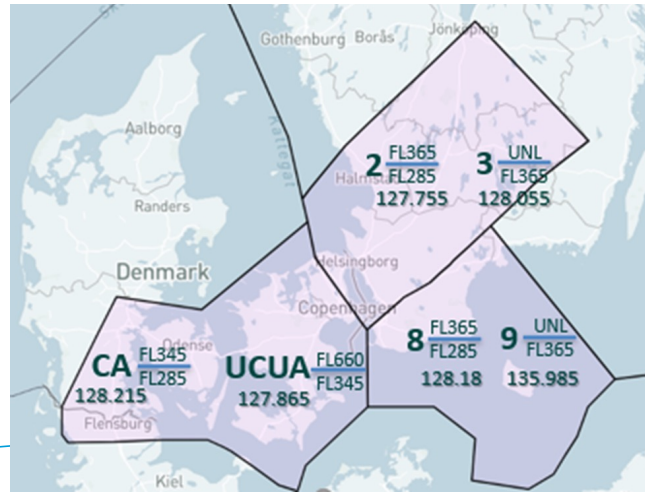
PJ.32: Virtual Centre

- ATFCM in a Virtual centre environment
- Technical support to PJ.10-W2-93
- Delegation of ATFCM (or not) and impact on Network/NM/Operation

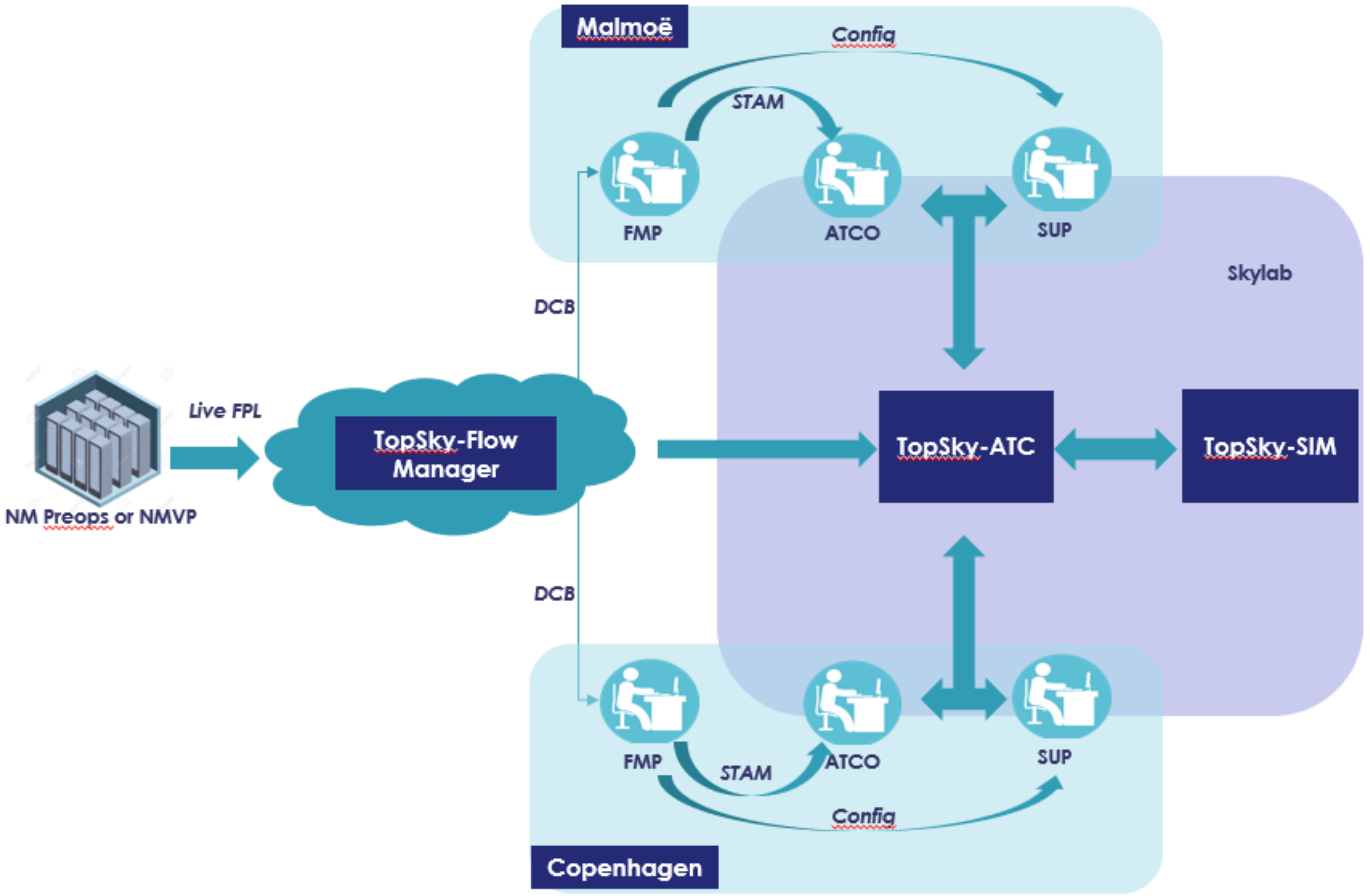


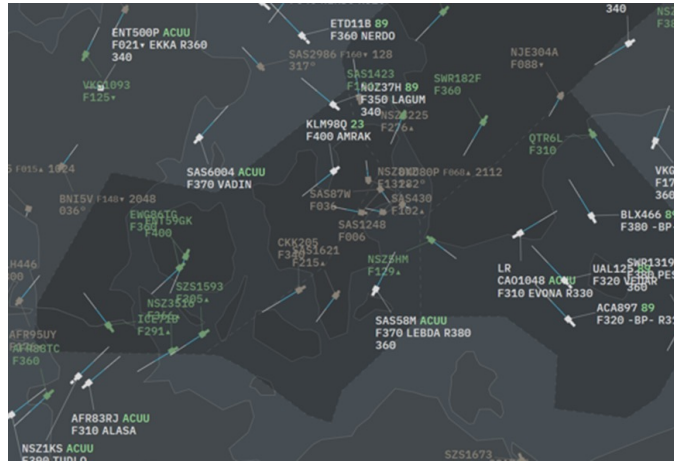
PJ.32-W3-EXE103: ATFCM aspects of Airspace Delegation Assessment, different ANSPs

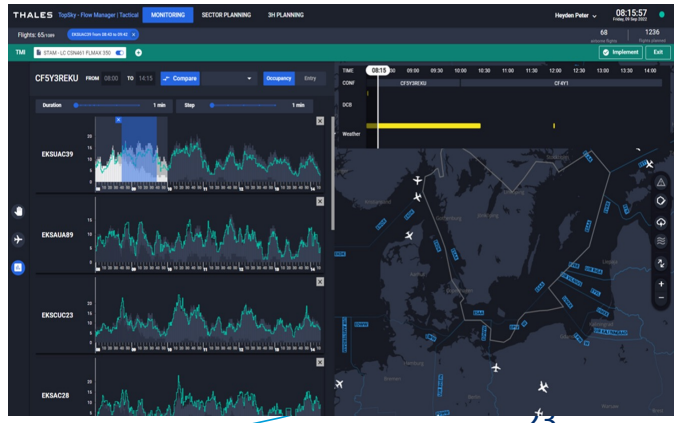
- Assessing load balancing between ***multiple ATSUs from different ANSPs*** with local coordination with NM information. ATFCM support on local or network level should enable identification of ***most optimal sector configuration between two neighbouring ATSUs from different ANSPs.*** This should allow for ***distribution of workload and reduction of complexity over the boundary*** between participating partners and hence allow for a potential capacity increase.



PJ.32-W3-EXE103: ATFCM aspects of Airspace Delegation Assessment, different ANSPs







PJ.32-W3-EXE103: ATFCM aspects of Airspace Delegation Assessment, different ANSPs

- 2 consecutive weeks in October with live/shadow traffic from NM Pre-OPS
- ***Exercise Results***
  - Integration of EAP/LTM/STAM measures in CWP (ATC) worked well even without FMP/ATCO direct interaction
  - Operationally acceptable, yet licensing/training/procedures must mature further
  - Selection of the right ATS delegation is feasible
  - Local knowledge by FMPs are a presumption
  - Cross border delegation could support staffing and contingency (planned) issues during planning phase
  - DAC is more interesting (part of sector) than full elementary sector
  - Feedback loop to FMPs to be developed
  - Differentiation FMP/NM measures might be needed

Outlook on SESAR3

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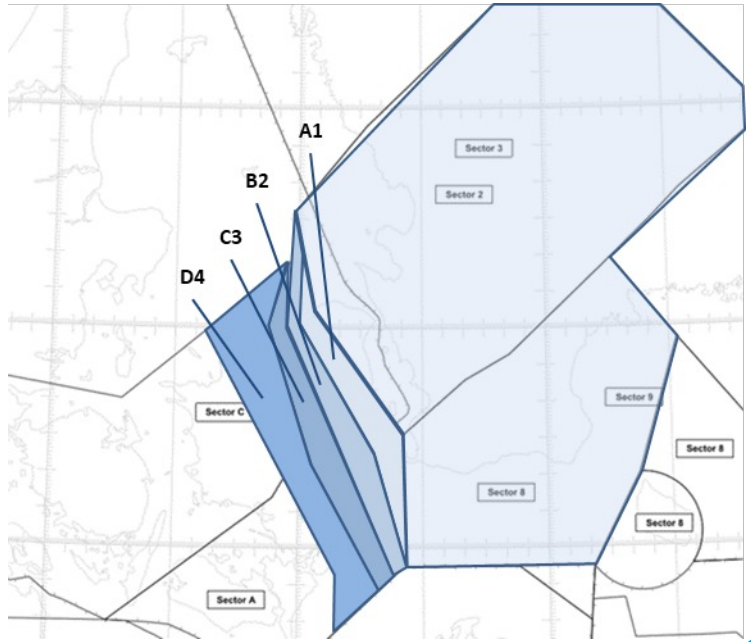
Outlook on SESAR3

Mantras:

- S2020: Cross border and DAC
  - Technically OK, Operationally OK
  - Legal, regulatory, resilience and liability issues still open question
- S3: Provide ANS in any “COOPANS airspace” from any COOPANS site
  - Geographical decoupling of ADSP and ATSU
  - Business continuity concepts across state borders
- S3: Cost efficiency solutions for innovation-, test- and training environments



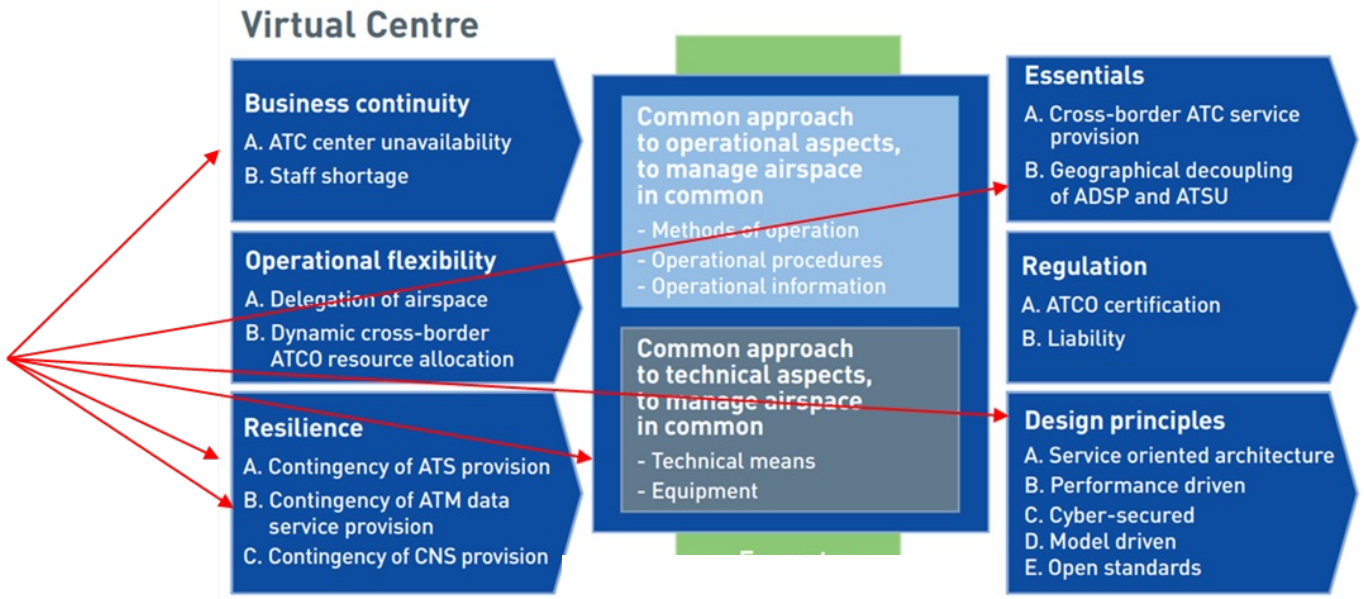
- **ATCO licenses** (specific toolset, automation support), Native language reqs., State/Company sensitive data (MIL, business), State independence, regulatory reqs.

Outlook on SESAR3

SESAR3 interest:

- ***RELEASE (ER)***
- ***ISLAND (U-architecture)***
- NM TBO-TBO Connectivity
- TBO ATCO Task Automation
- ***DSD Business continuity and Open ATM Standard***

COOPANS focus:



Thank you for you attention !

28