



Airspace Architecture study

Second Workshop | 20-21 November 2018



Founding Members



EUROPEAN UNION



EUROCONTROL



AGENDA

17:30 – 17:35

Welcome

Florian Guillermet, Executive Director, SESAR JU

17:35 – 17:45

Background and expectations from the European Commission

Maurizio Castelletti, Directorate-General for Mobility and Transport, Head of Unit Single European Sky, European Commission

17:45 – 18:00

The pressing need of the capacity challenge

Joe Sultana, Director, European Network Manager

18:00 – 18:30

Initial recommendations

Alain Siebert, Chief Economics and Master Plan, SESAR JU

18:30 – 21:00

Networking drink



WELCOME

17:30 – 17:35

Florian Guillermet, Executive Director, SESAR JU



Background and expectations from the European Commission

Maurizio Castelletti

Directorate-General for Mobility and Transport, European Commission

Head of Unit Single European Sky

Brussels, 21 of November 2018



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Airspace Architecture Workshop - The Pressing Need

Joe Sultana

Director Network Management

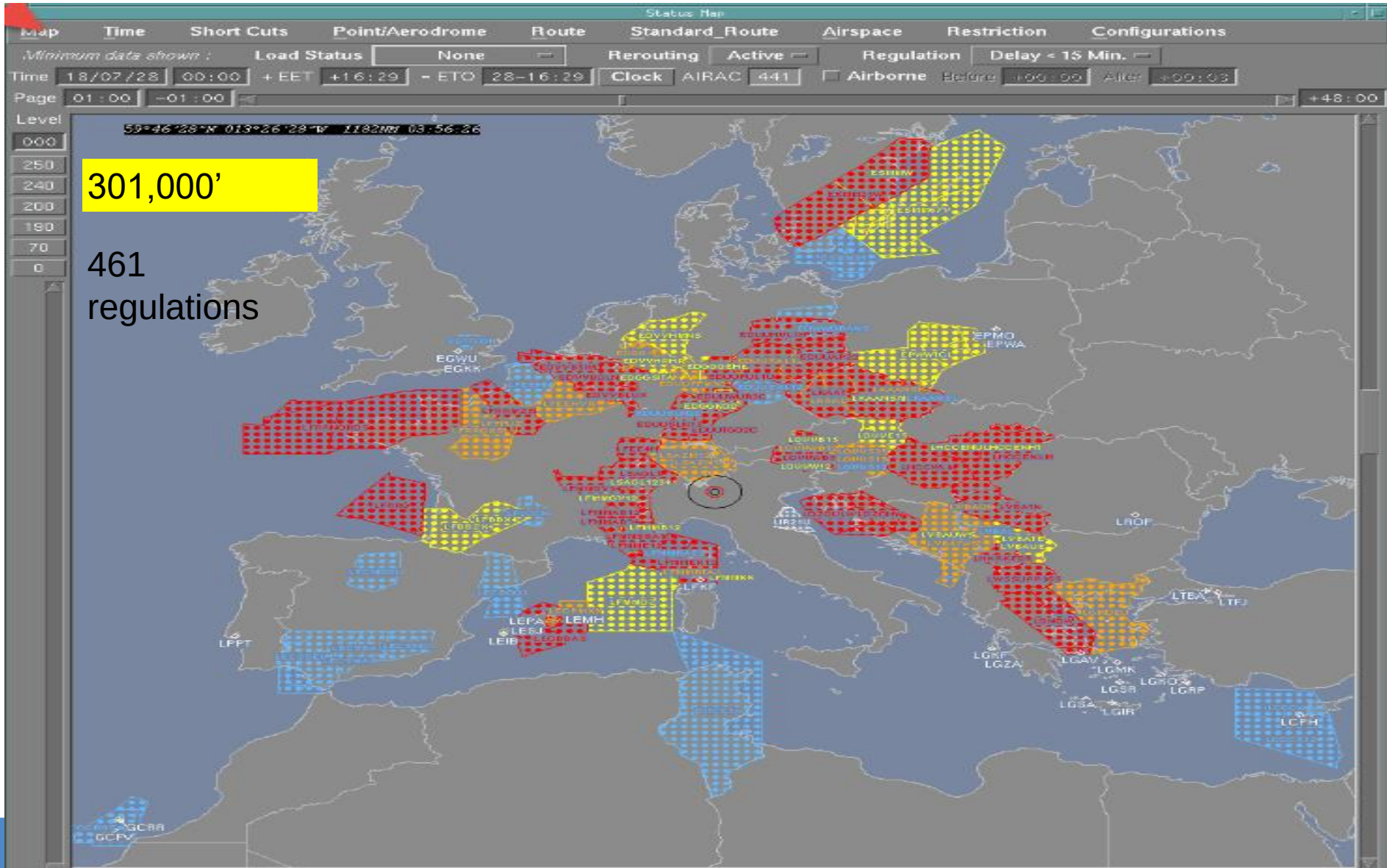
Brussels, 20 of November 2018



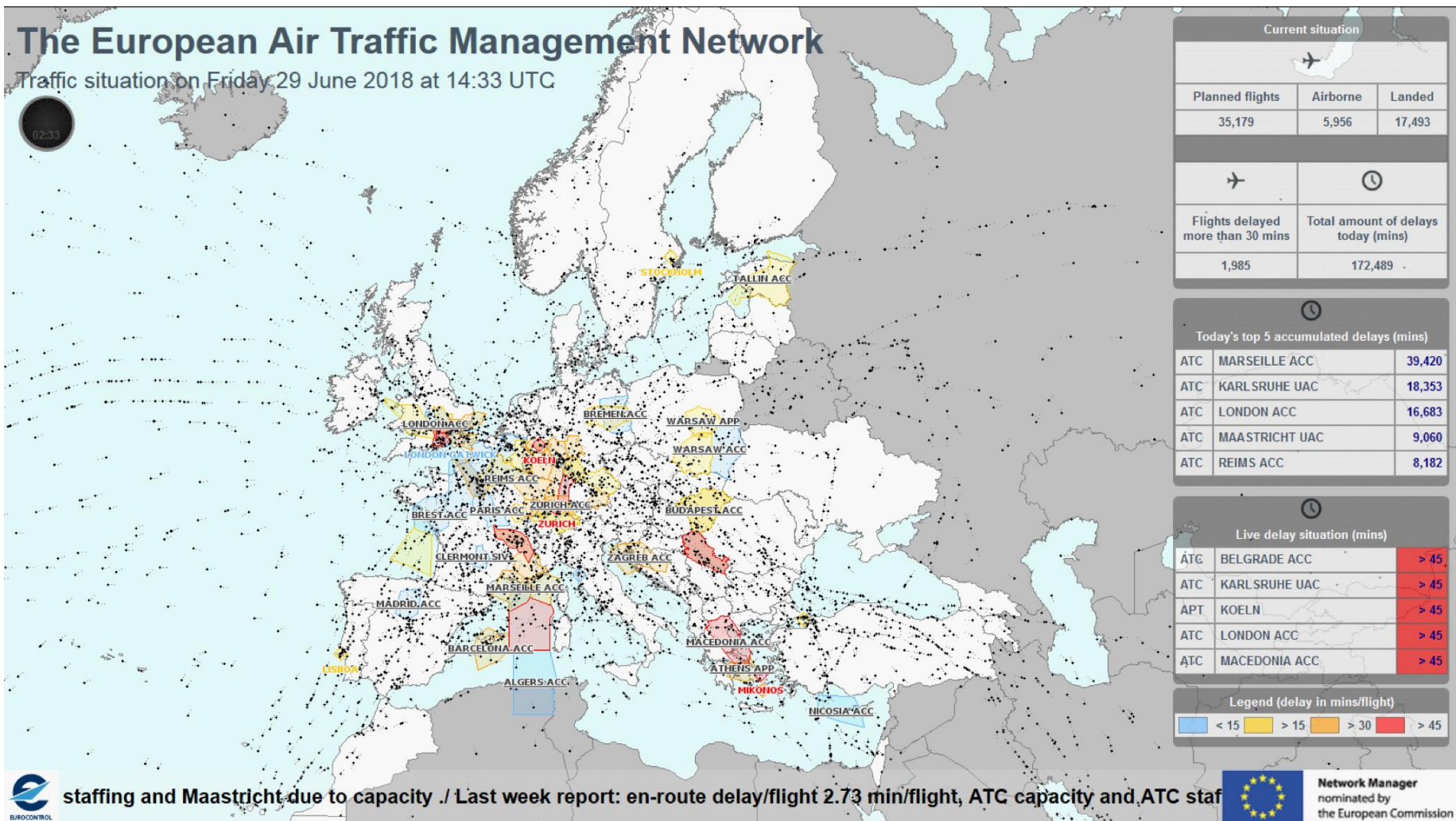
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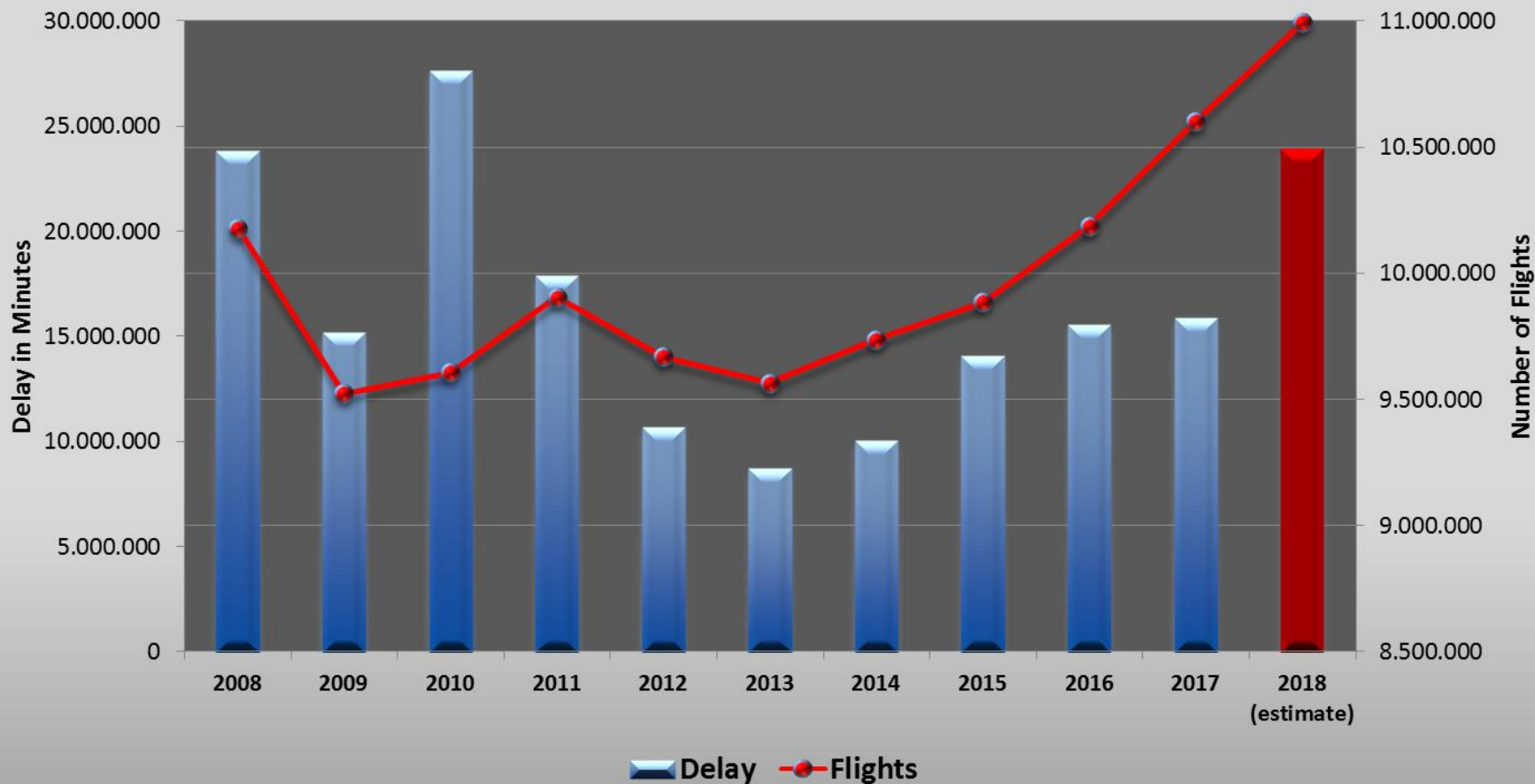
Saturday 29th July 2018

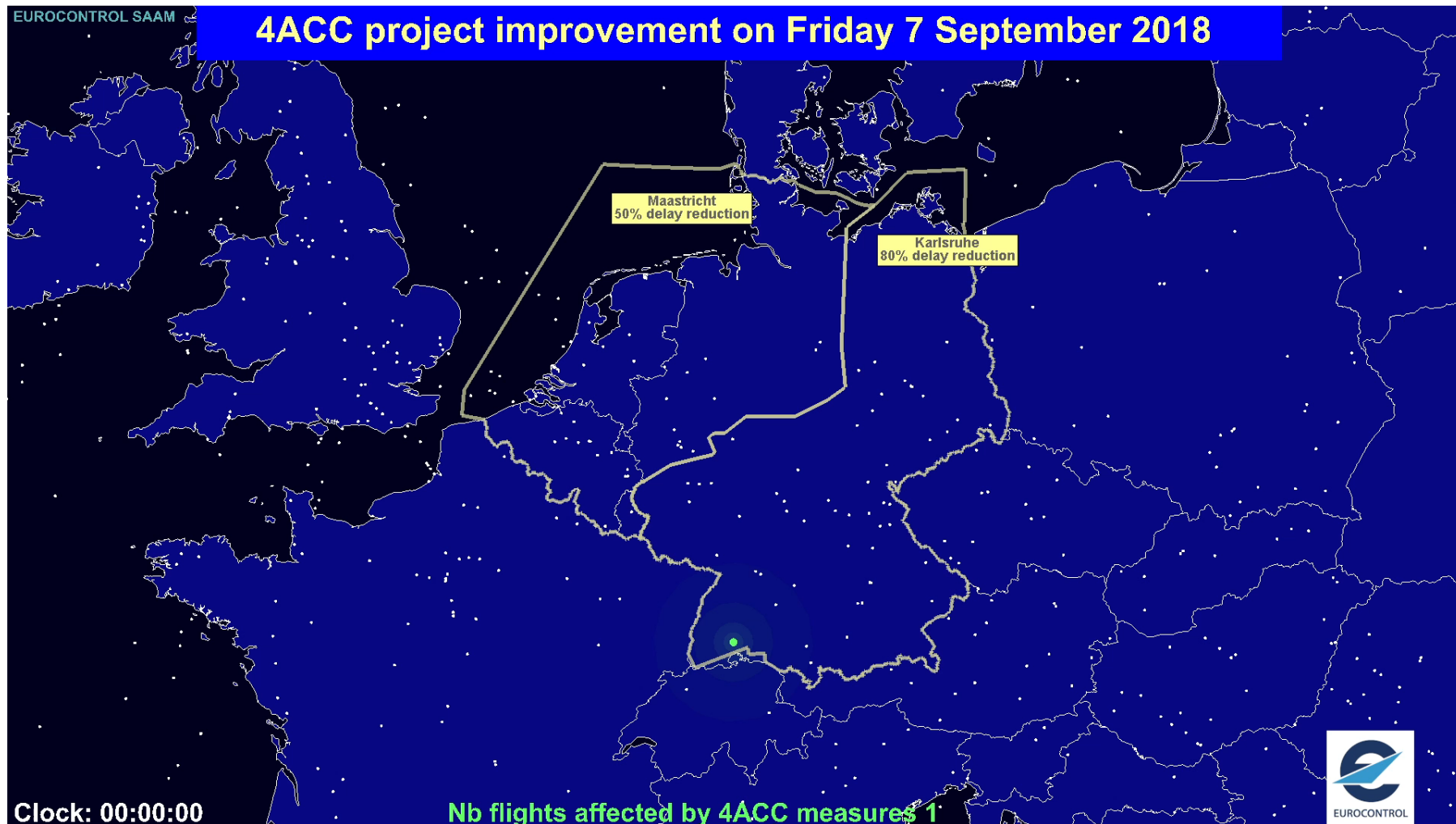


Friday 29th June 14,30 UTC



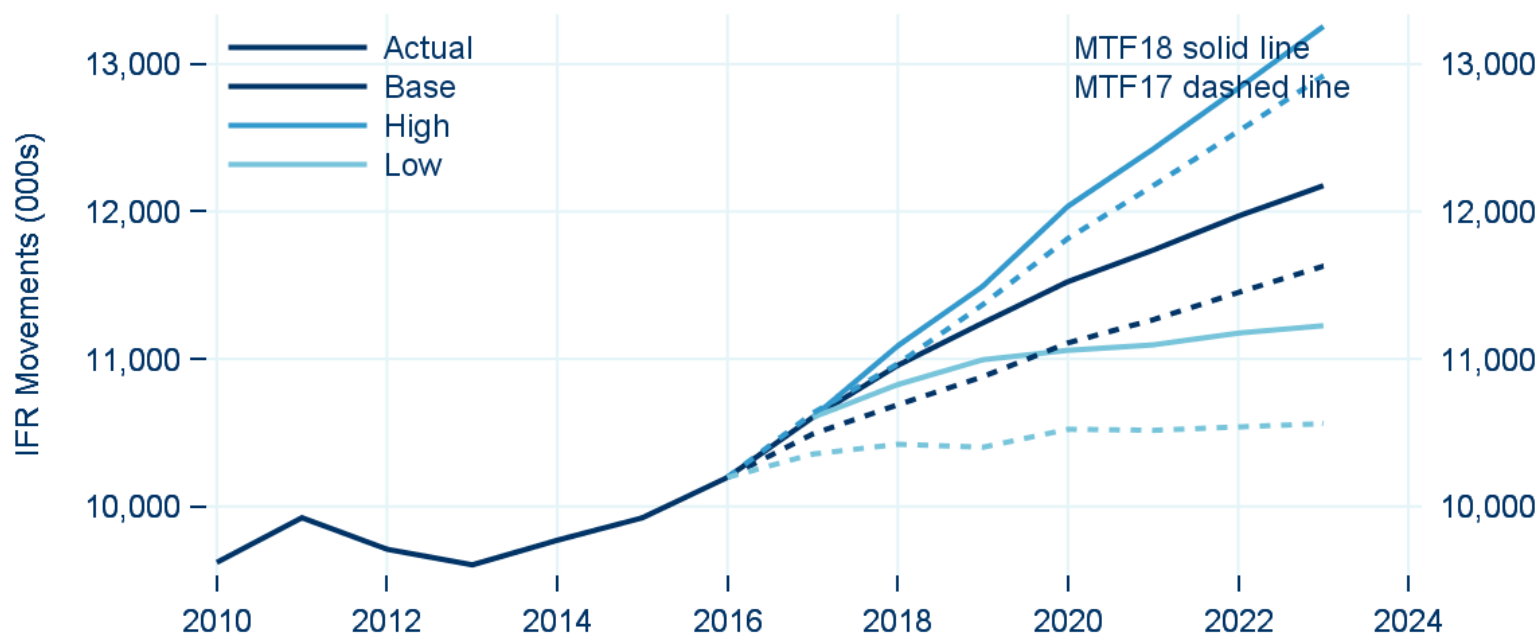
Delays and Flights: 2008 - 2018





Constantly evolving traffic demand

ECAC - Grand Total



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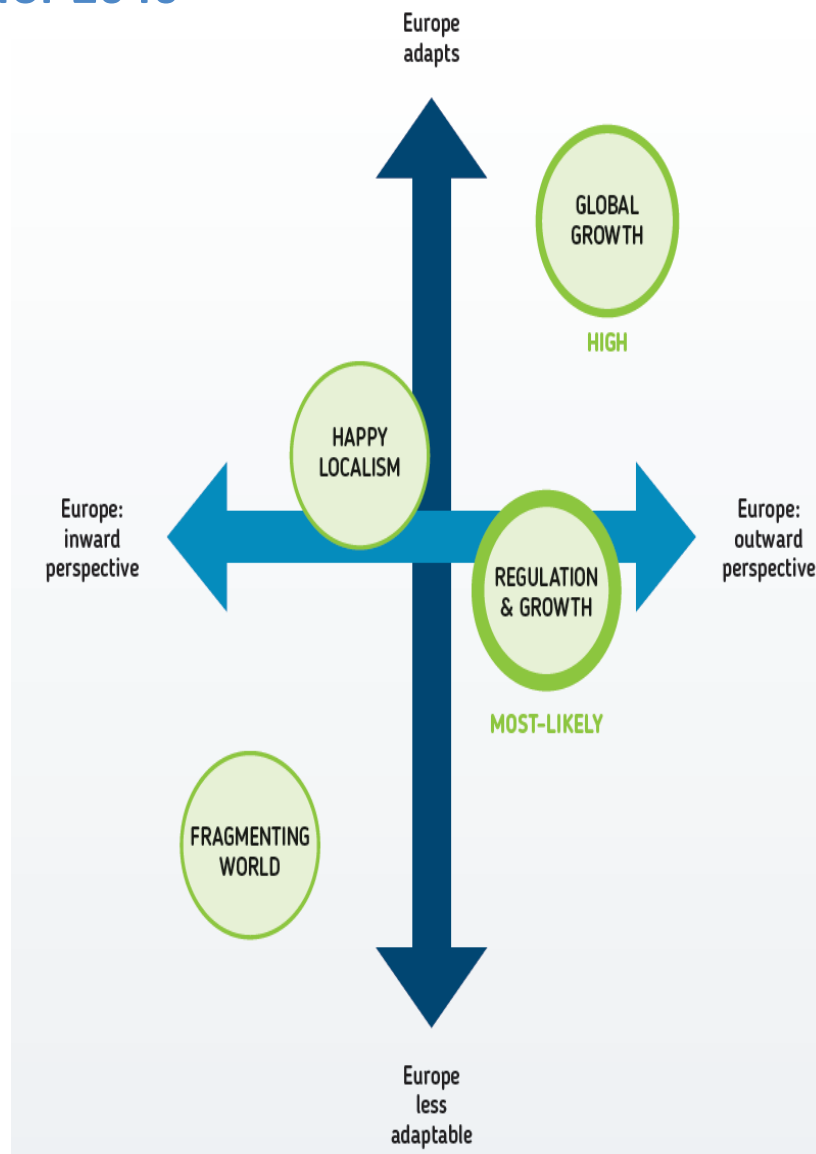
**A European ATM network
responding to variation in traffic changes**

Challenges of Growth 2018: Summary & 4 Annexes

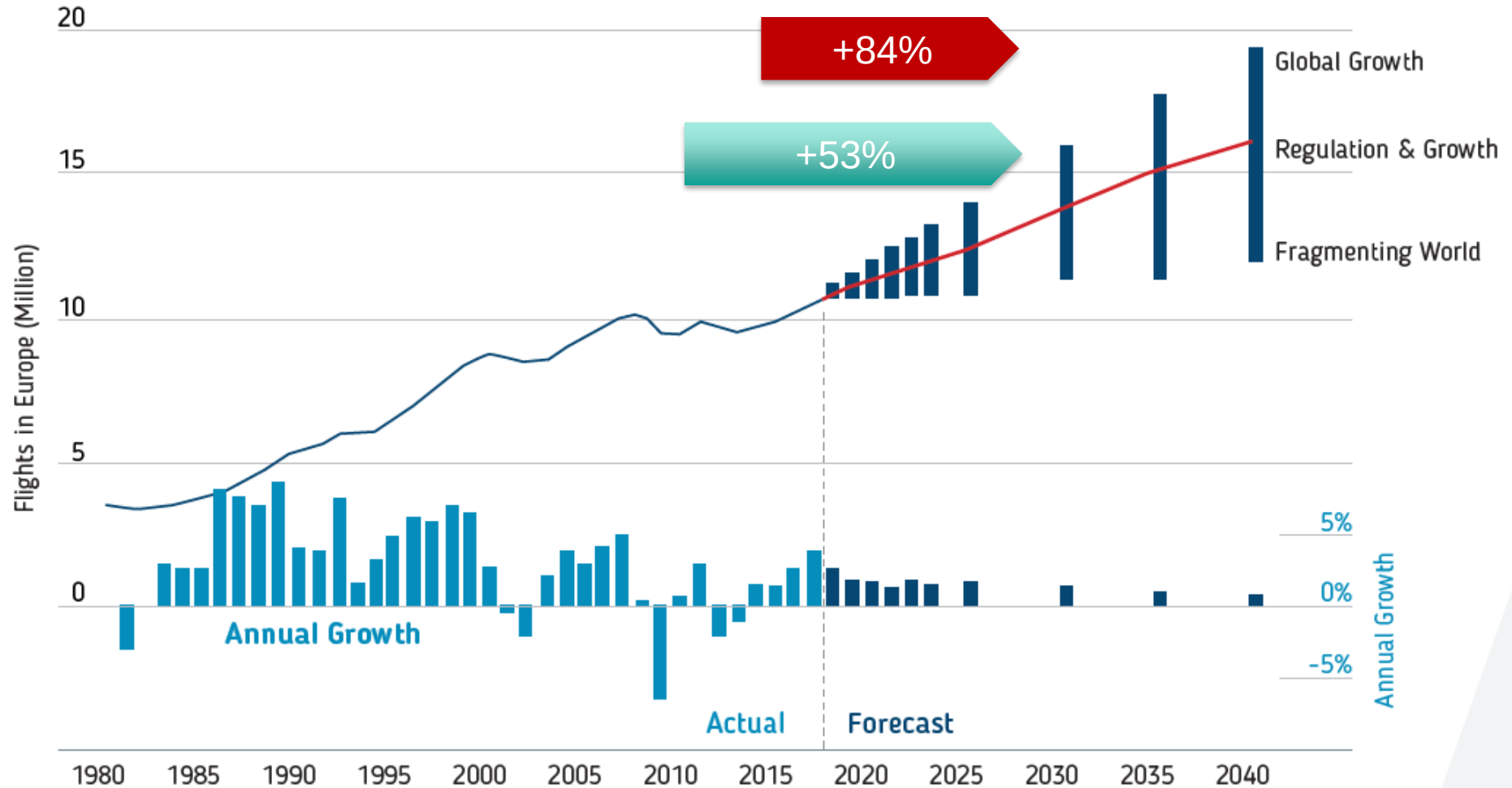


www.eurocontrol.int/articles/challenges-growth

Four scenarios for 2040



Flight forecast for Europe to 2040



2025-2030-2035 Updated Outlook Assumptions

High traffic growth scenario

- Approximately 3% yearly traffic growth

Capacity increase

- 2% per year for congested ACCs
- 3% per year for less congested ACCs
- Based on 20 years average capacity growth

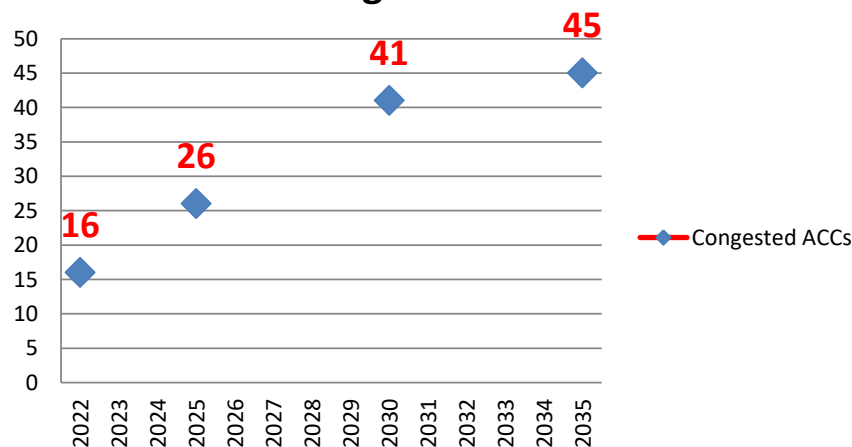
Capacity enhancement between 1999-2018

- B-RNAV
- RVSM
- 8.33 kHz
- A-FUA
- Major airspace re-sectorisation projects
- Enhanced ATFCM

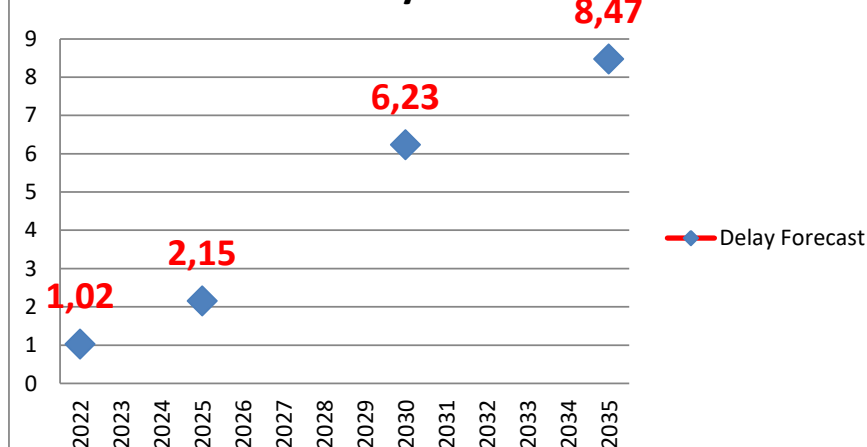
2025-2030-2035 Updated Outlook

Significantly Congested ACCs and Delay Forecast

Congested ACCs

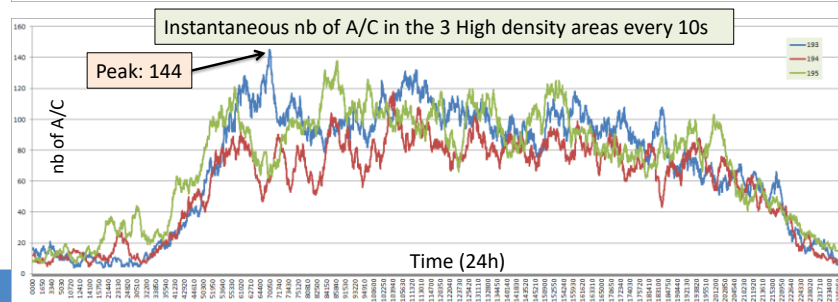
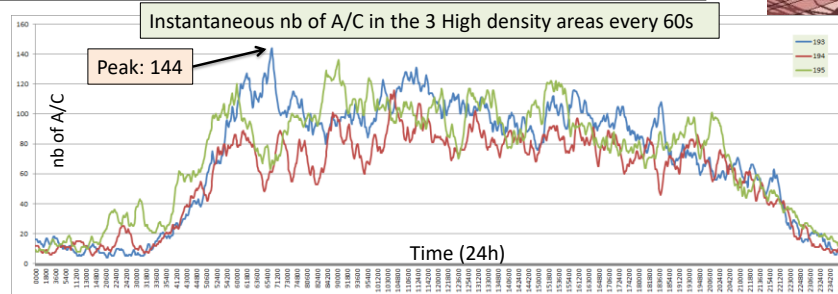
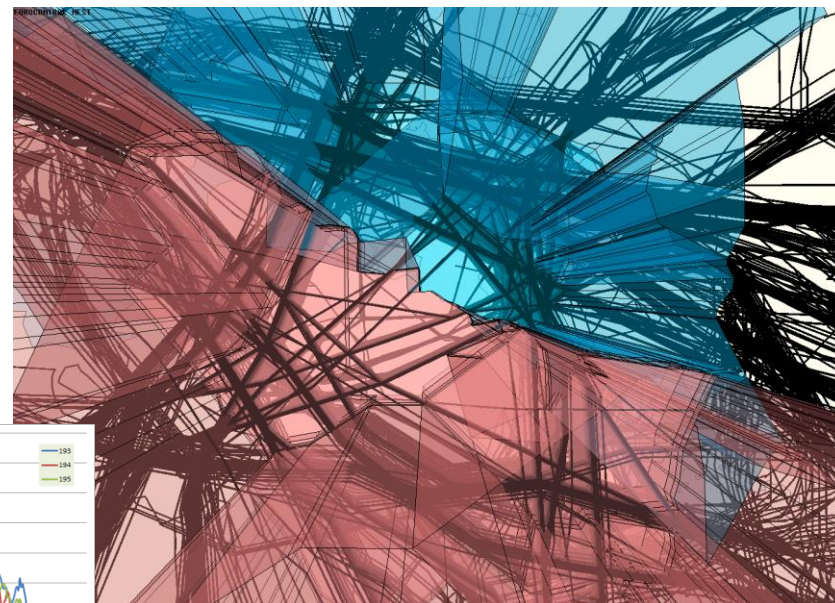
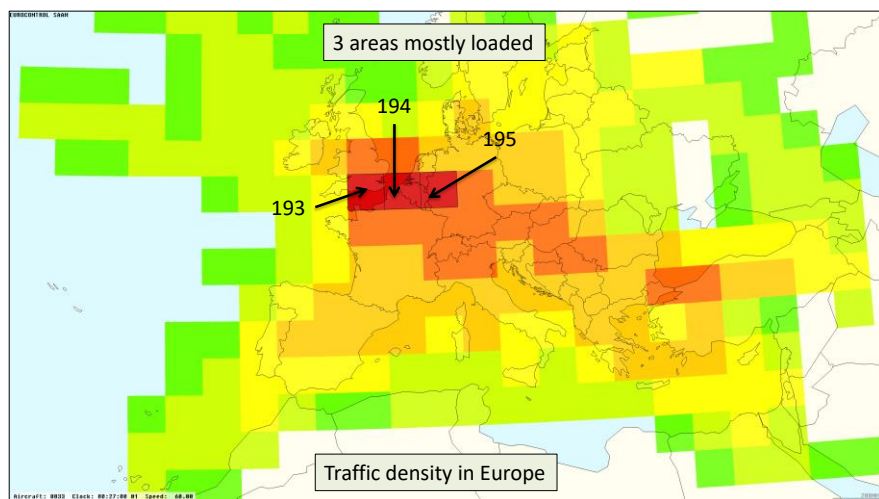


Delay Forecast

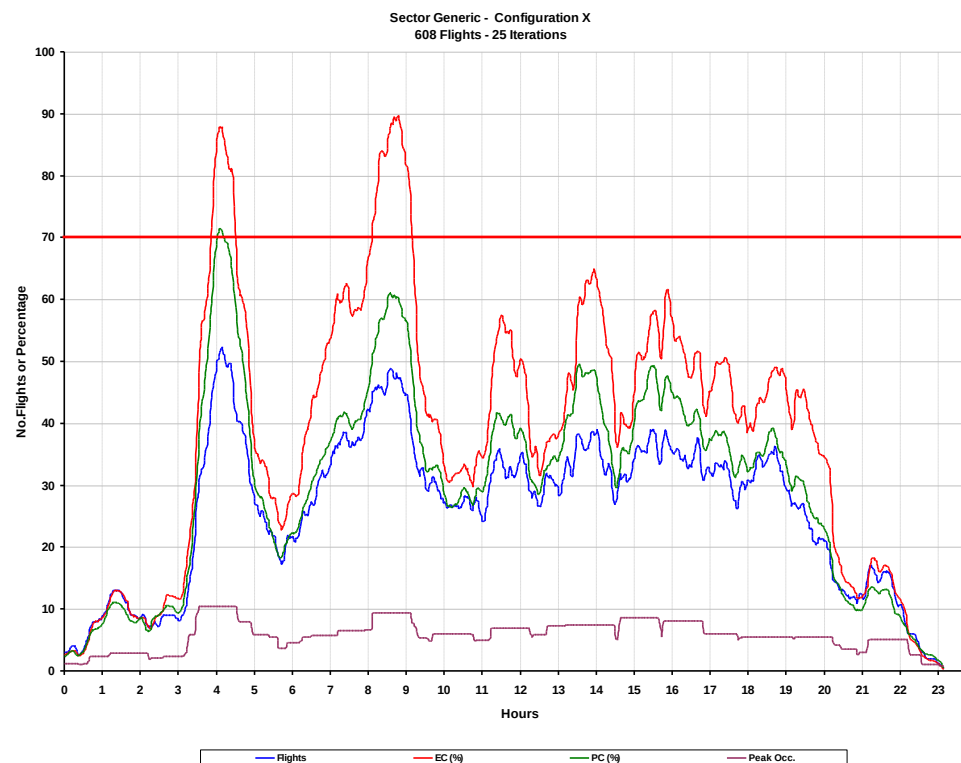


- 2018 already recorded some days with delay around 6-7 minutes/flight

Significantly Congested Areas 2024-2025 Traffic Above FL 285



Structurally Addressing Causes of ATC Workload



- Eliminate airspace structure constraints – Seamless airspace design
 - Harmonised ATM system support – Automate key ATCO tasks
 - Harmonised Operational Procedures
 - Stepped gradual coordinated operational implementation
- Supported by opportunities provided by seamless Free Route Airspace operations
 - Supported by the SESAR 2020 Vision Technology

- Traffic growth, density and complexity cannot be managed safely anymore with the current approach
 - Need a game changer
- Focus on delivery of 4D preferred trajectories
 - From planning into operations
- Addressing ATCO workload
 - Effective, impartial airspace design
 - Operational and technical harmonisation
 - Focused research delivering automation of ATC tasks

Efficient and interoperable CNS/ATM Infrastructure

Focused research, targeted deployment, effective regulation and oversight, efficient impartial network design, operations and systems



Initial recommendations

Alain Siebert
SESAR JU
Chief Economics and Master Plan

Brussels, 21 of November 2018



Founding Members



This is not a new problem and in the long run it cannot be solved with the same approach as in the past

Factors limiting overall capacity



Non-optimal organisation of airspace

Limited use of data communications

Limited availability of VHF frequencies

Factors limiting scalability and resilience



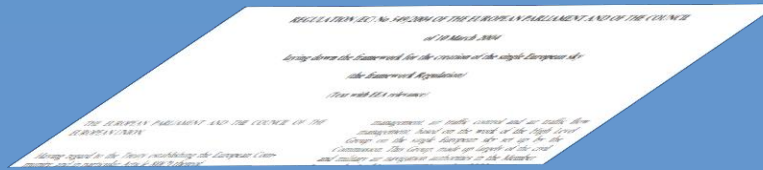
Limited information sharing and interoperability

Limited flexibility in the use of ATCO resources across ACCs

Limited predictability

Limited automation support for ATCOs

Regulatory Layer



ANS service Layer



Airspace Layer



Ops & tech application Layer



Infra & data services Layer



FRAMEWORK LAYERS

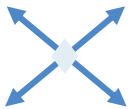
Services are **enabled** by **airspace** and **technology** and **dependent** on the **infrastructure & data services**

TECHNICAL LAYERS

Stronger coupling and **measurement of the impact** through simulations factoring in known deployments and roadmaps from the Master Plan

Two sides of the capacity challenge

Capacity & airspace



How to ensure that the new architecture is able to provide **sufficient capacity** to meet growing demand from all airspace users?

Scalability & resilience



How to ensure that the new architecture is **resilient** to capacity and demand changes and enable **more efficient and more collaborative models** of service delivery?



Proposed solutions coupling airspace & technology

Focus area 1

Increasing net capacity of the network

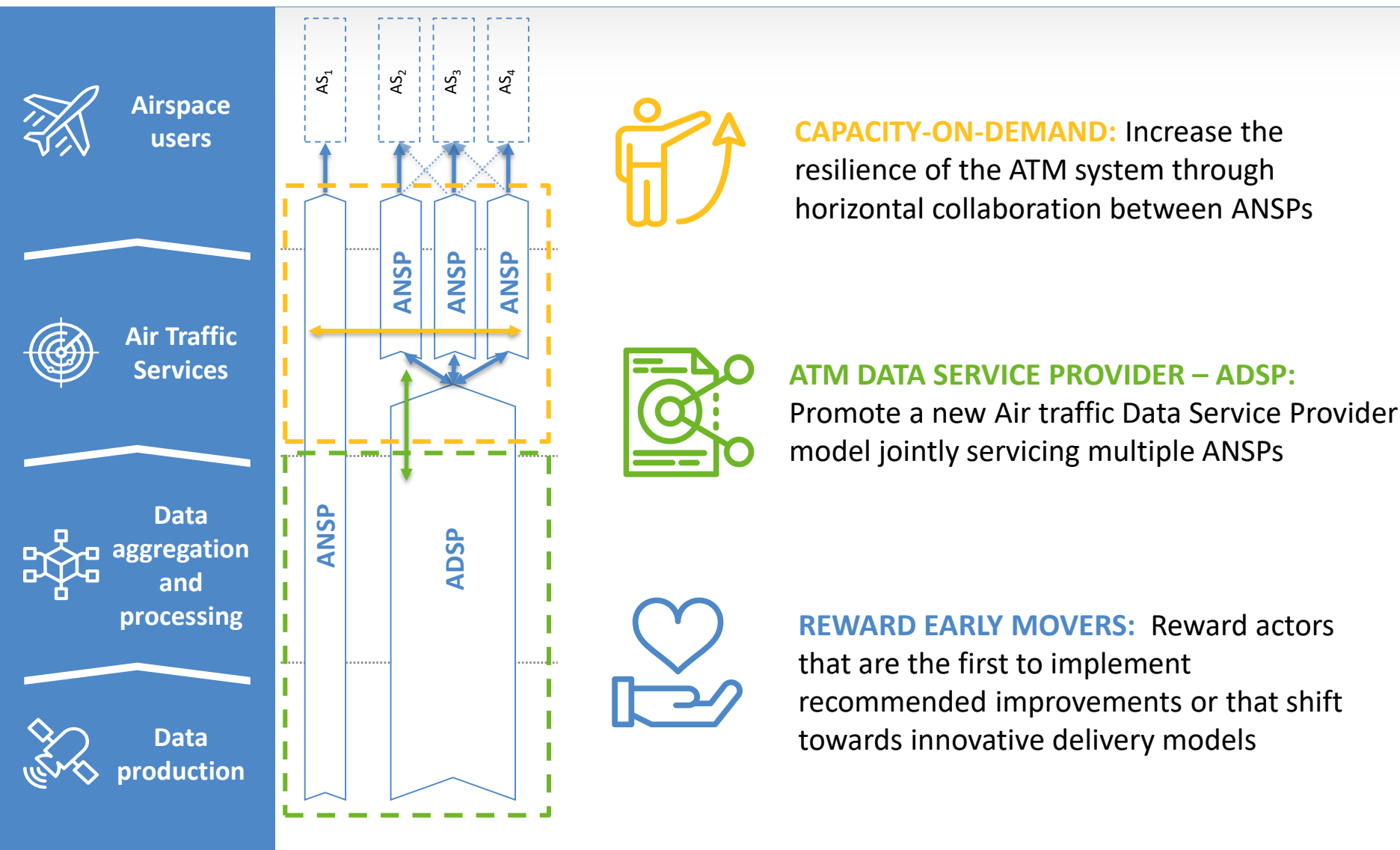
- Optimised airspace organisation
- Operational harmonisation
- Automation and productivity tools

Focus area 2

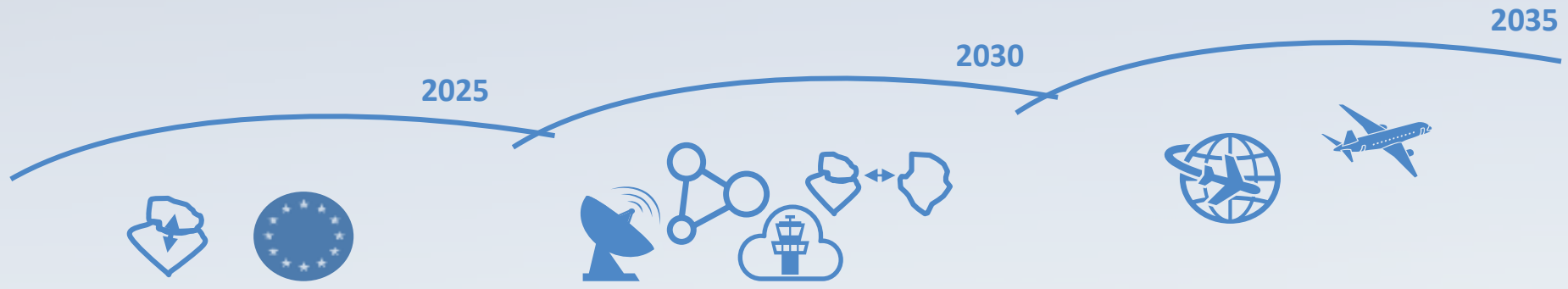
Optimising alignment of capacity with demand

- Dynamic airspace configuration
- Flight centric operations if proven feasible
- Virtualisation and ATM data services
- CNS enhancements
- Sector independent air traffic service operations
- Trajectory-based operations and increased sharing of information to address predictability

There are conditions to increase the chances of success and in particular to secure the implementation timeline



A possible way forward with progressive transition every 5 years



- ECAC-wide implementation of **cross-border Free Route, IOP** and **datalink**
- Launch **airspace re-configuration** supported by **Operational Excellence** Programme
- Set up an **enabling framework** for **ADSP**, **capacity-on-demand** service and **rewards for early movers**, first ADSP is certified

- Implement **virtual centres** and **dynamic airspace configuration** at large scale
- Gradual transition towards **higher levels of automation** supported by SESAR Solutions
- **Capacity-on-demand** arrangements implemented across Europe
- **New ATM Data service provision model** is implemented across Europe

- Transformation to **flight/flow centric operations**
- **Trajectory-based operations**
- **Service-oriented** air traffic management

Capacity



Meeting SES target and 438 million of delay minutes saved between 2019 and 2035

Environment



Between 77 and 143 kg of fuel saved per flight in 2035

Cost efficiency



Total ANS productivity benefits are estimated to amount to EUR 5-7 billion between 2019 and 2035 (EUR 57-73 per flight in 2035)

Net benefits



Potential of EUR 31-40 billion between 2019 and 2035

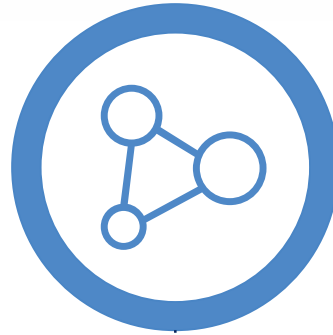


Sufficient to demonstrate that investing in a solution to the anticipated capacity issues is essential for the future of European aviation?



1

Launch **airspace re-configuration** and **Operational Excellence** programmes to achieve quick wins



2

Realise **virtual de-fragmentation of European skies**



3

Create SES framework that **rewards early movers**

1 Launch airspace re-configuration supported by an Operational Excellence programme to achieve quick wins



- i **Launch an EU-wide airspace re-configuration programme** in which the Member States, Network Manager, air navigation service providers, civil airspace users and military should **work together** to define and implement an optimal cross-FIR and flow-centric redesign of airspace sectors. This optimised airspace design should be consistent with already agreed upon design principles at European level.



- ii **Launch an EU-wide Operational Excellence programme** in which the Network Manager, air navigation service providers, civil airspace users and military should work together to achieve operational harmonisation aligning ACC capacity and ways of working to **best practices** through systematic operational excellence throughout the Network (also leading to geographically independent ATCO validations).

2 Realise virtual de-fragmentation of European skies

The Commission should



- i Review policy options which, on their own or in addition to FABs, could effectively deliver a virtual defragmentation of European skies and potentially generate higher levels of resilience by **encouraging industry-based alliances to deliver core interoperability through common service delivery**



- ii Options could include the implementation of a certification and remuneration framework for **ATM Data Services Providers (ADSPs)** taking also into account possible restructuring of ANSP services as well as an EU framework for **on-demand cross border use of services (Capacity on Demand)**



- iii Continue to support **timely delivery of SESAR solutions** contributing to the delivery of the target architecture

3 Create SES framework that rewards early movers

The Commission should



- i Review its **incentivisation policy** to reward actors who are the **first to implement** the high-level milestones identified in the proposed transition strategy



We will present and discuss an illustrative list of such potential incentives examples (not exhaustive) tomorrow



Airspace Architecture study – DAY II

Second Workshop | 20-21 November 2018



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WELCOME

08:30 – 08:45

Michael Standar, Chief Strategy and External Affairs, SESAR JU

Focus is on ...

Therefore we will ...



Answering your **questions** and bringing **clarifications**

Reserve enough time to answer your questions



Creating an **open discussion**



Foster discussion and **exchanges** through the panels



Capturing **feedback** from the entire ATM community

Collect your questions to the following email:
communications@sesarju.eu





AGENDA FOR DAY II

(1/2)

8:45 – 10:00	Coupling airspace, technology and data solutions • Ruben Flohr, Acting Chief ATM, SESAR JU • Razvan Bucuroiu, EUROCONTROL, Network Manager Directorate, Head of Network Strategy and Development, Division / Acting Head of Operations Planning Unit
10:00 – 10:30	Q&A with the audience
10:30 – 11:00	COFFEE BREAK
11:00 – 12:30	Panel discussion & Q&A with audience: how can airspace change and technology work together to help address the challenges ahead? • Achim Baumann, Policy Director, A4E (representing the European Airspace User Community) • Christophe Vivier, Head of Unit, Single European Sky / SESAR, EDA • Gauthier Sturtzer, Professional Staff Organisation representative, ETF • Iacopo Prissinotti, Head of the International Strategies Department, ENAV (representing the A6 Alliance and CANSO) • Luc Laveyne, Senior Adviser Single European Sky, ACI Europe • Vincent De Vroey, Director Civil Aviation at ASD
12:30 – 13:30	LUNCH



AGENDA FOR DAY II

(2/2)

13:30 – 14:00	How to achieve a smooth transition? - Alain Siebert, Chief Economics and Master Plan, SESAR JU - Razvan Bucuroiu, EUROCONTROL, Network Manager Directorate, Head of Network Strategy and Development, Division / Acting Head of Operations Planning Unit
14:00 – 14:30	Q&A with the audience
14:30 – 15:40	Panel discussion & Q&A with the audience: How fast will we be able to structurally solve the challenges identified? - Achim Baumann, Policy Director, A4E (representing the European Airspace User Community) - Christophe Vivier, Head of Unit, Single European Sky / SESAR, EDA - Gauthier Sturtzer, Professional Staff Organisation representative, ETF - Iacopo Prissinotti, Head of the International Strategies Department, ENAV (representing the A6 Alliance and CANSO) - Kari Siekkinen, Chief Advisor ATM and ADR at Finnish Transport Safety Agency, Trafi - Nathalie Dejace, Head of ATM/ANS, EASA
15:40 – 16:00	Coffee break
16:00 – 16:15	Wrap up and conclusions Florian Guillermet, Executive Director, SESAR JU
16:15 – 16:30	Closing words Maurizio Castelletti, Directorate-General for Mobility and Transport, Head of Unit Single European Sky, European Commission



Coupling airspace, technology and data solutions – Section 4

Ruben FLOHR – SESAR JU – Acting Chief ATM

Razvan BUCUROIU – Network Manager – Head of Network Strategy and Development Division / Acting Head of Operations Planning Unit

Brussels, 21 of November 2018



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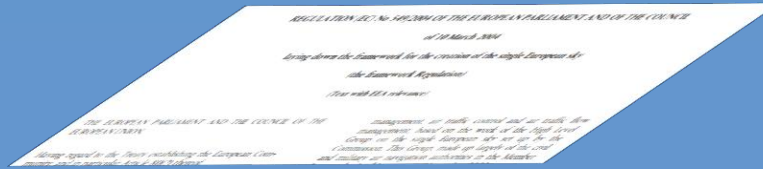


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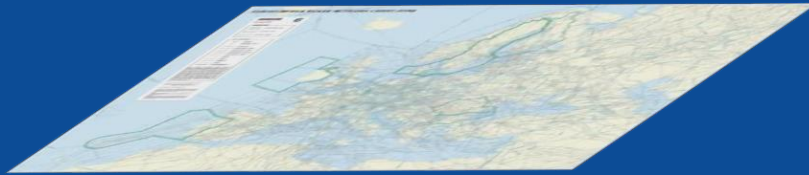
Regulatory Layer



ANS Service Layer



AIRSPACE LAYER



OPS & TECH APPLICATION LAYER



INFRA & DATA SERVICES LAYER

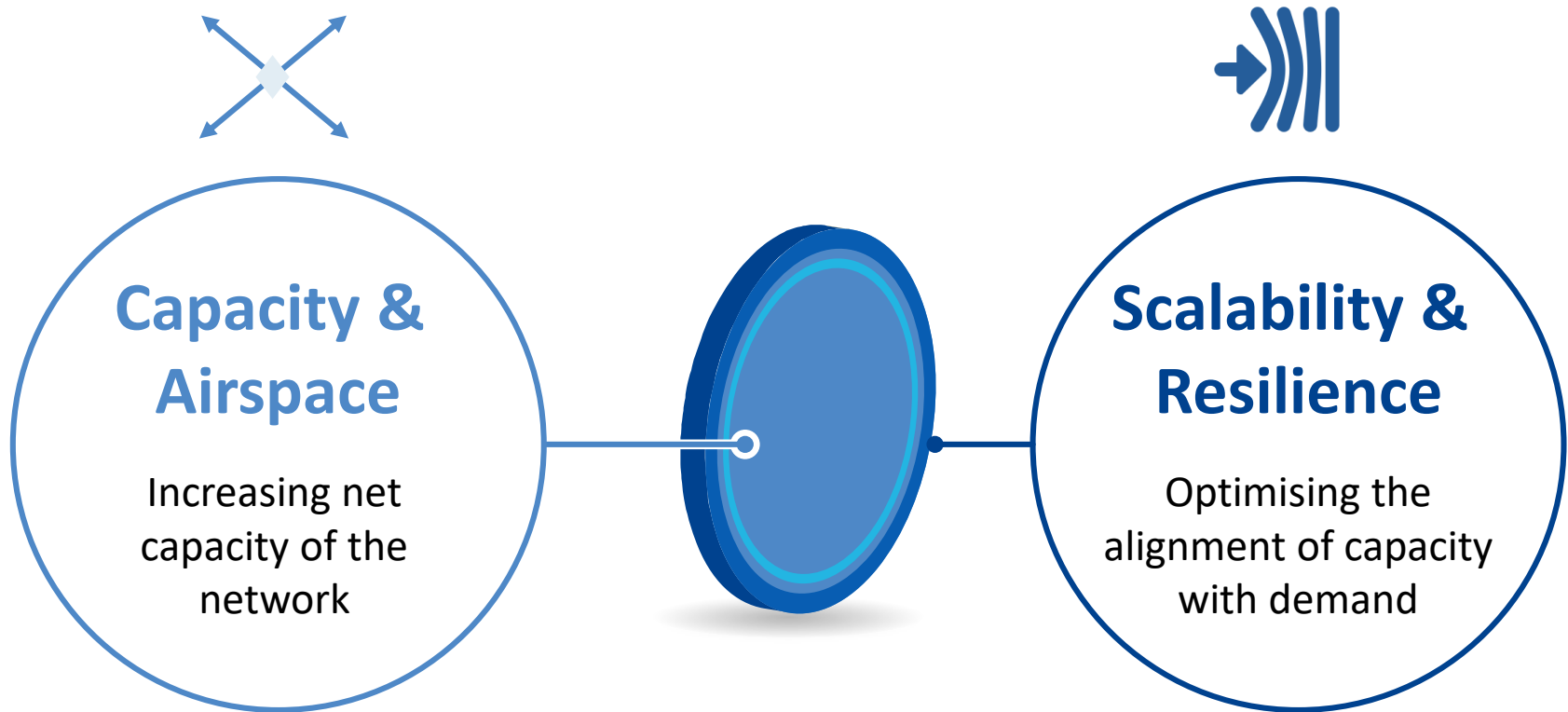


FRAMEWORK LAYERS

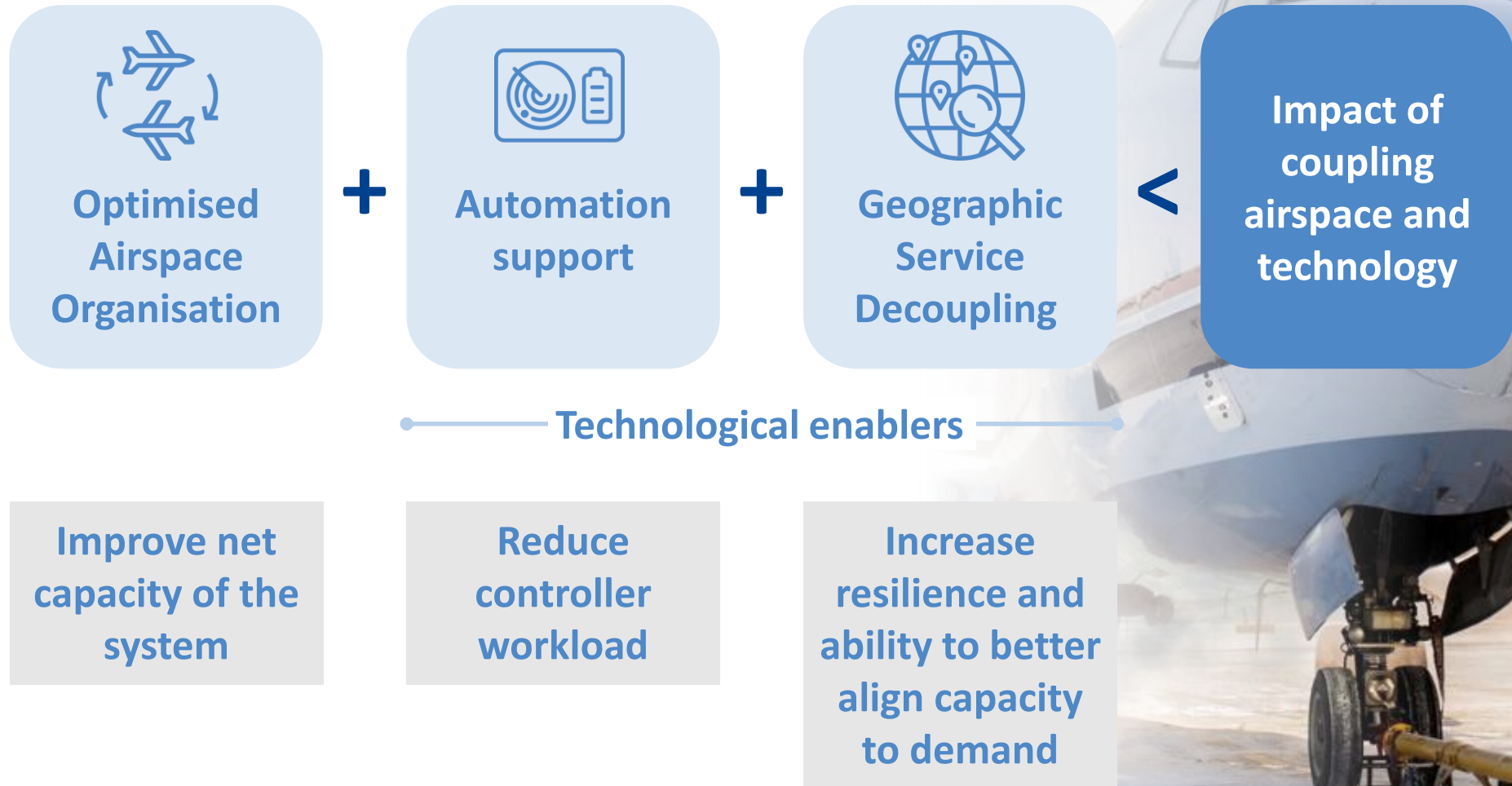
Services are *enabled by airspace and technology* and *dependent on the infrastructure & data services*

TECHNICAL LAYERS

Stronger coupling and measurement of the impact through simulations factoring in known deployments and roadmaps from the Master Plan

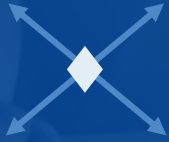


Coupling the airspace design and technological enablers



Two sides of the same capacity problem

FOCUS AREA 1



Capacity & airspace

- i Optimised Airspace organisation
- ii Operational harmonisation
- iii Automation and productivity tools

FOCUS AREA 2

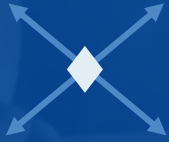


Scalability & resilience

- i Trajectory based operations
- ii Virtualisation and ATM data services
- iii Dynamic airspace configuration
- iv Flight centric operations if proven feasible
- v Sector independent Air Traffic Service
- vi CNS Enhancements

Two sides of the same capacity problem

FOCUS AREA 1



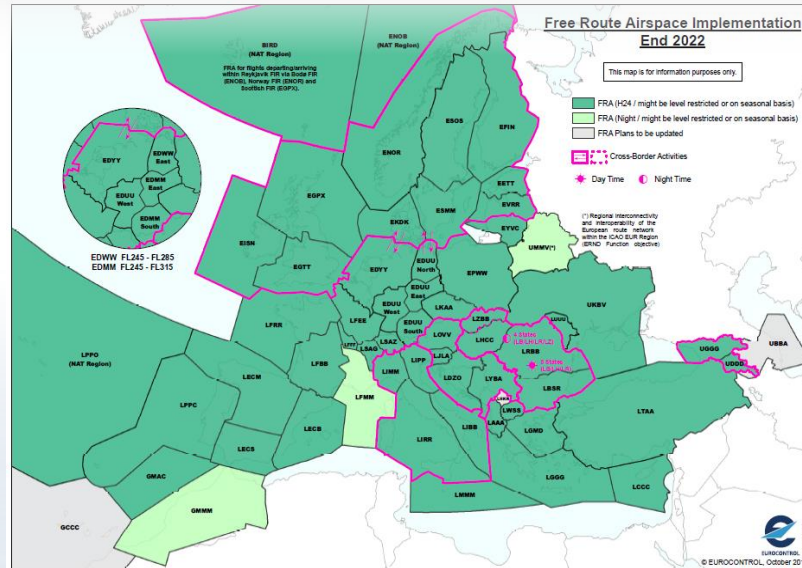
Capacity & airspace

FOCUS AREA 2



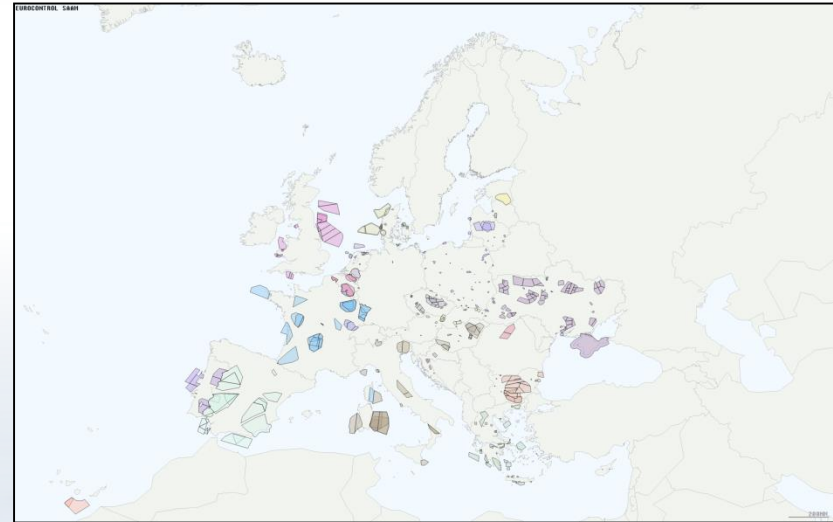
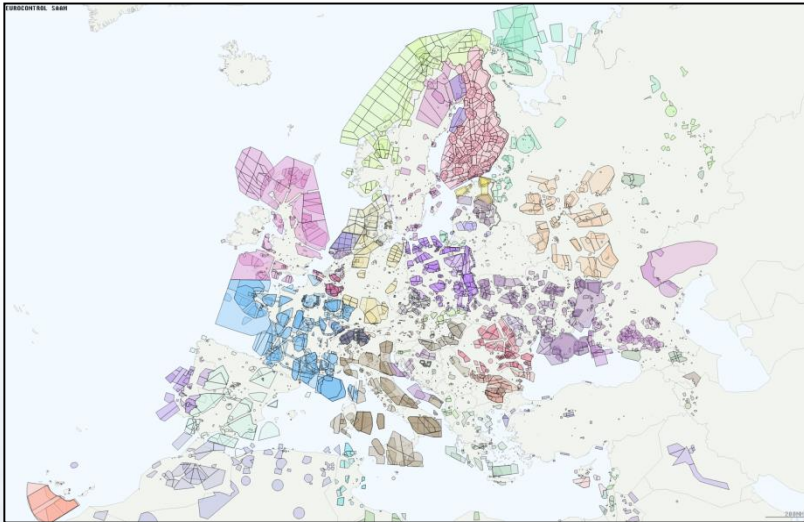
Scalability & resilience

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- Achievement of a **consistent FRA cross-border** implementation
 - In process of being achieved and down to TMA level
 - Further opportunities for cross-border implementation to be looked into
- Significant and natural enabler for **network harmonisation**
 - In process of being achieved
- Natural enabler for **enhanced design** of the lower airspace
- Natural enabler for sectorisation based on **traffic flows**
- Natural enabler for **systems harmonisation**

A-FUA Implementation



- 5-10 amendments to the **civil/military coordination** procedures annually
- Annual system support evolutions
- Several **military exercises** daily
- 3000 civil/military airspace structures **dynamically updated** on a daily basis
- 5-10 major **military exercises** yearly
- Further improvements under discussion for the next 5 years, including SESAR evolutions on more **dynamic airspace management**

Design of an European airspace structure based on agreed Airspace Design Principles

- Responding to civil and military airspace users requirements
- Responding to operational requirements
- Irrespective of national / FAB / FIR boundaries
- Not bound by division between lower / upper airspace
- Taking into account traffic forecasts
- Responding to performance requirements
- Vertical and horizontal inter-connectivity
- ATC sectors designed along traffic flows alignments and allowing adaptable sector configurations
- Agreements on service provision across national / FAB / FIR boundaries



Criteria and assumptions

- Main criteria and assumptions
 - **Capacity** and **Environment** / flight efficiency performance
 - Achievement of a consistent **FRA cross-border** implementation
 - Application of steps defined in the European Route Network Improvement Plan Part 1 – **Technical Specifications for Airspace Design**
 - Building on already **implemented and on-going** projects
- Stepped implementation **over RP3 and RP4**
- Aimed as a **significant contributor** to meeting performance targets
- Aimed at **reducing ATCO workload** through enhanced airspace design solutions



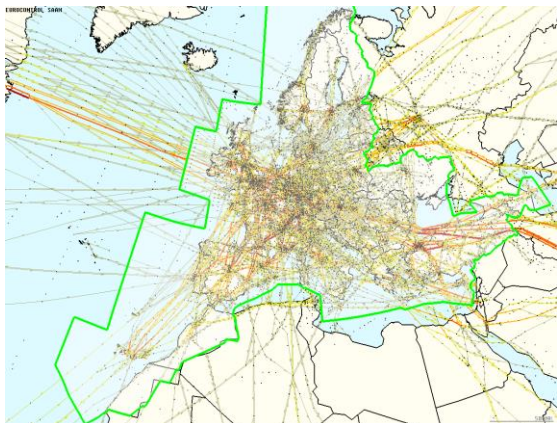
Pan European Network

European Network Design

Current

Current Route Network

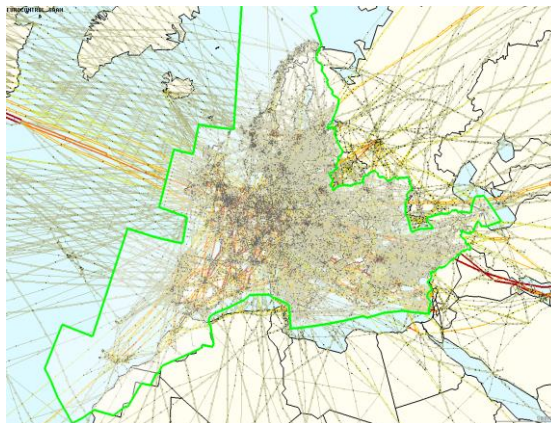
Current Traffic Flow



RP2

FRA and Route Network

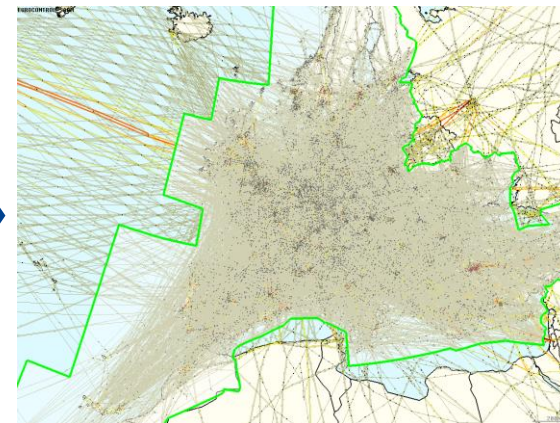
RP2 Traffic Flow



RP3 – Optimised

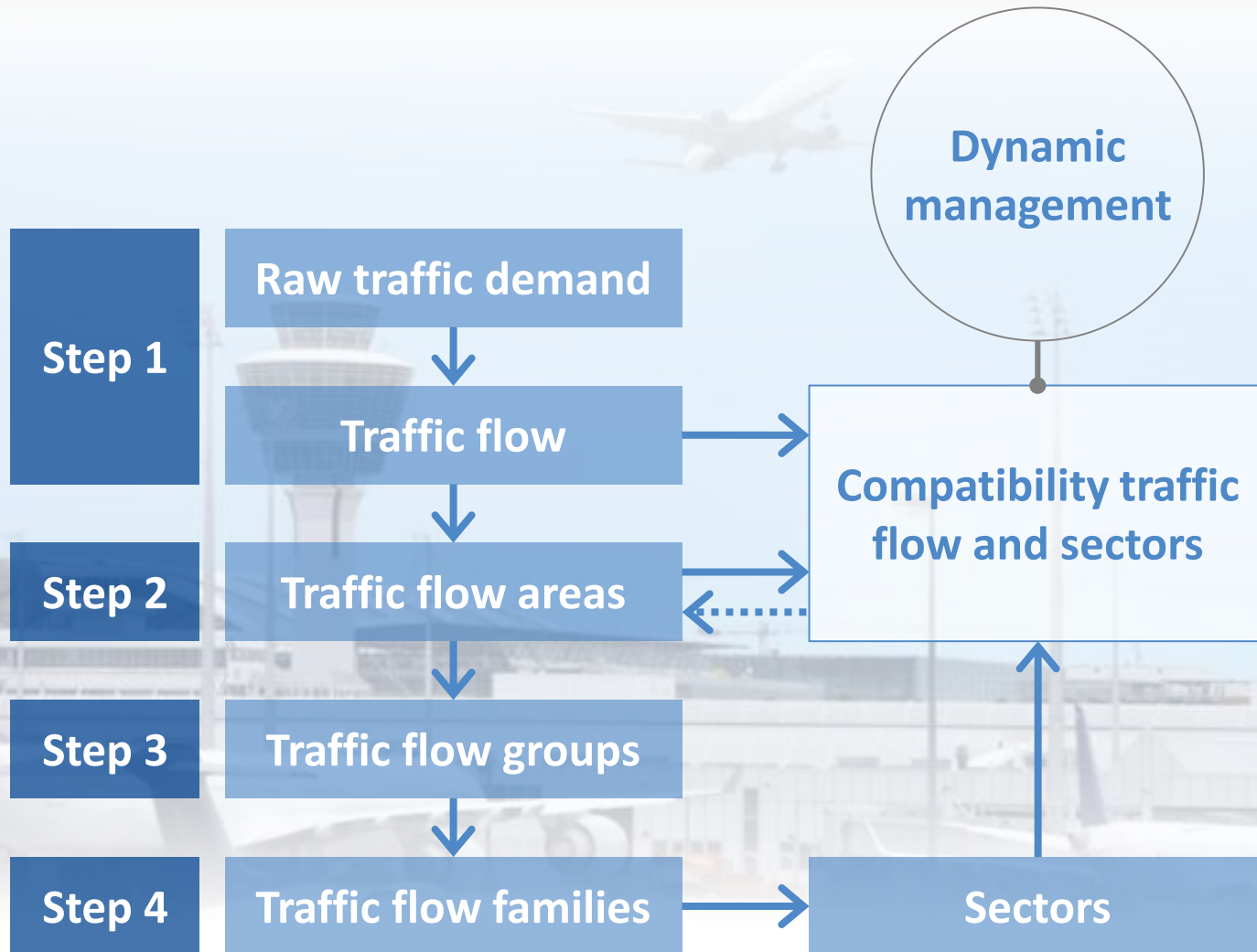
Cross Border FRA

RP3 Traffic Flow

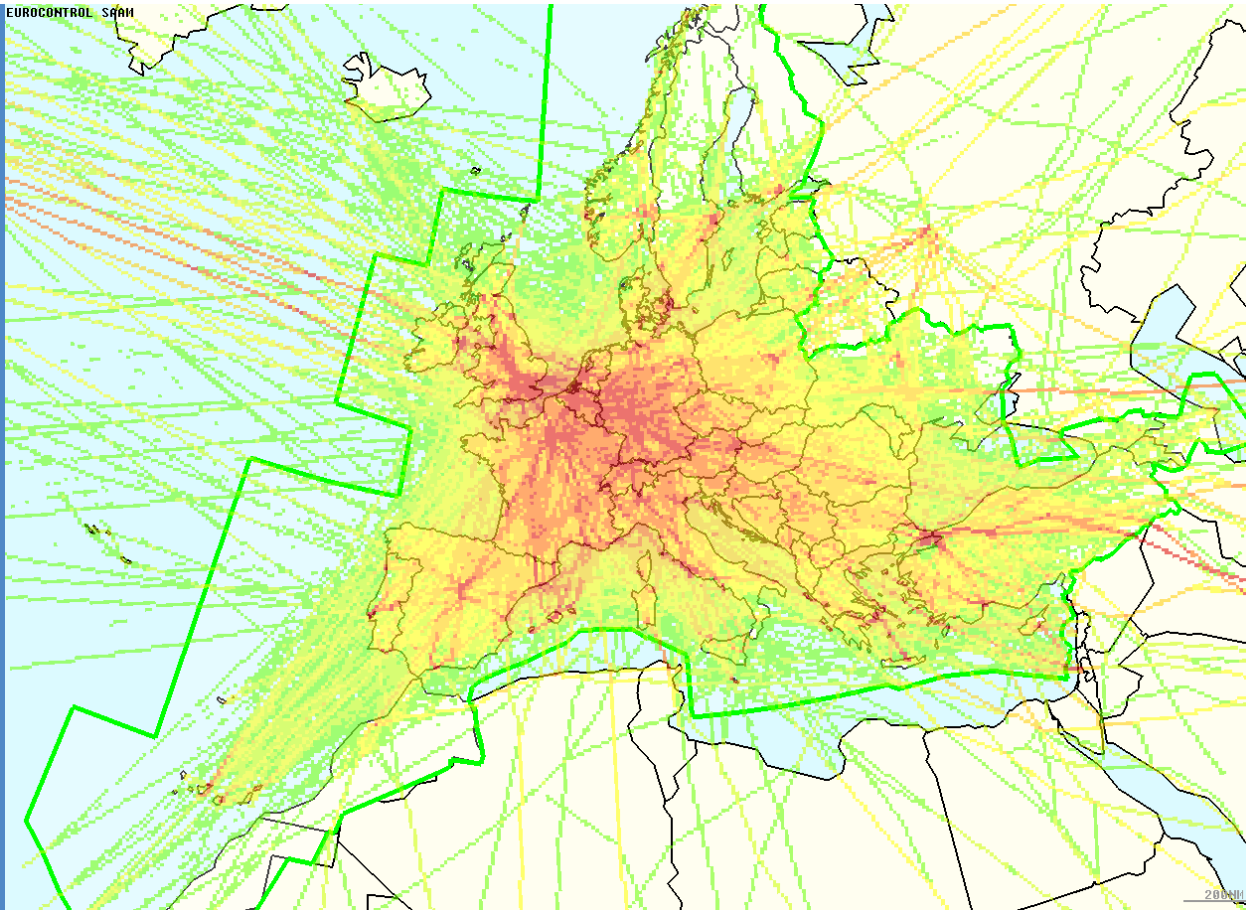


Trade off between flight efficiency and network capacity

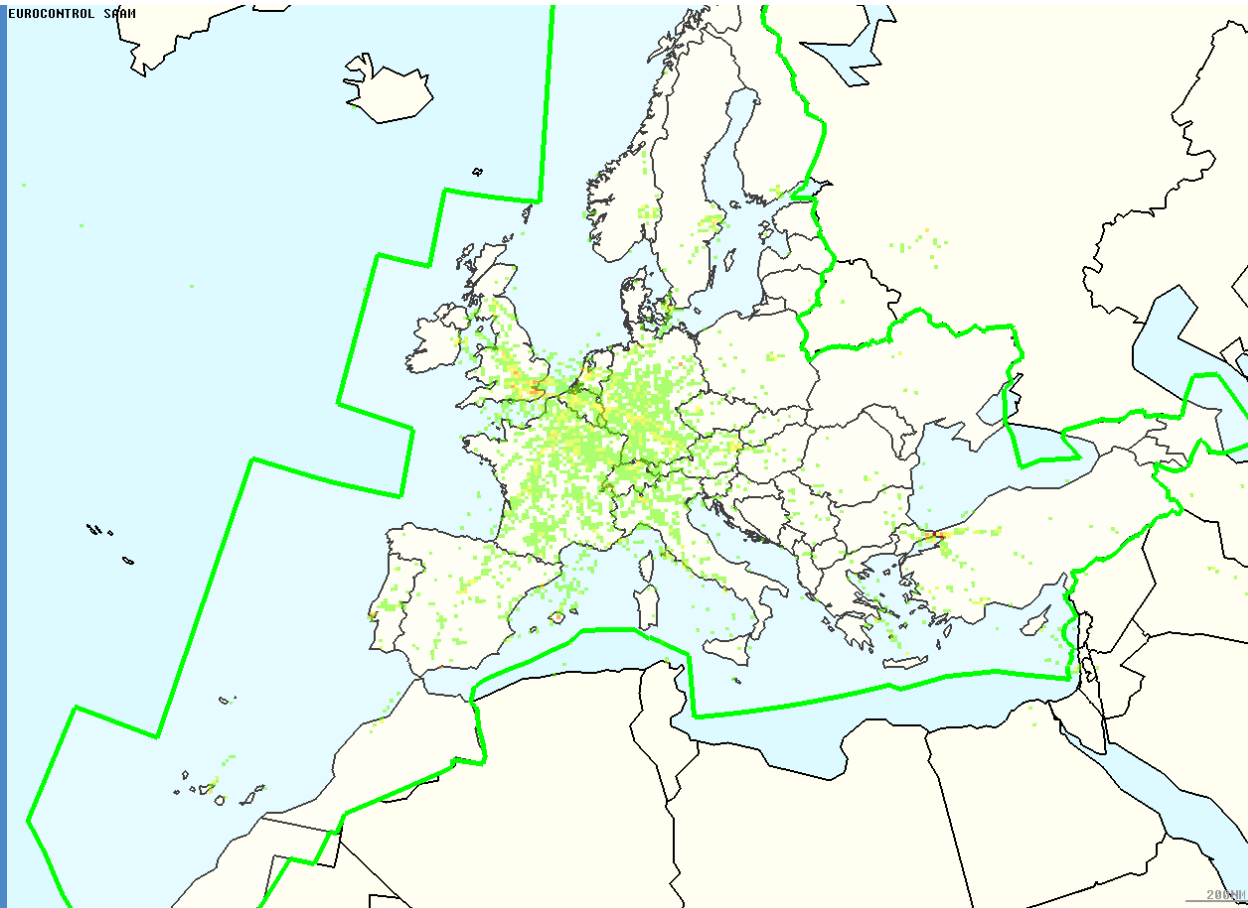
Building the Airspace Structure Concept



Building the Airspace Structure Density Criteria



Building the Airspace Structure Conflict Density Criteria



Building the Airspace Structure Complexity Criteria

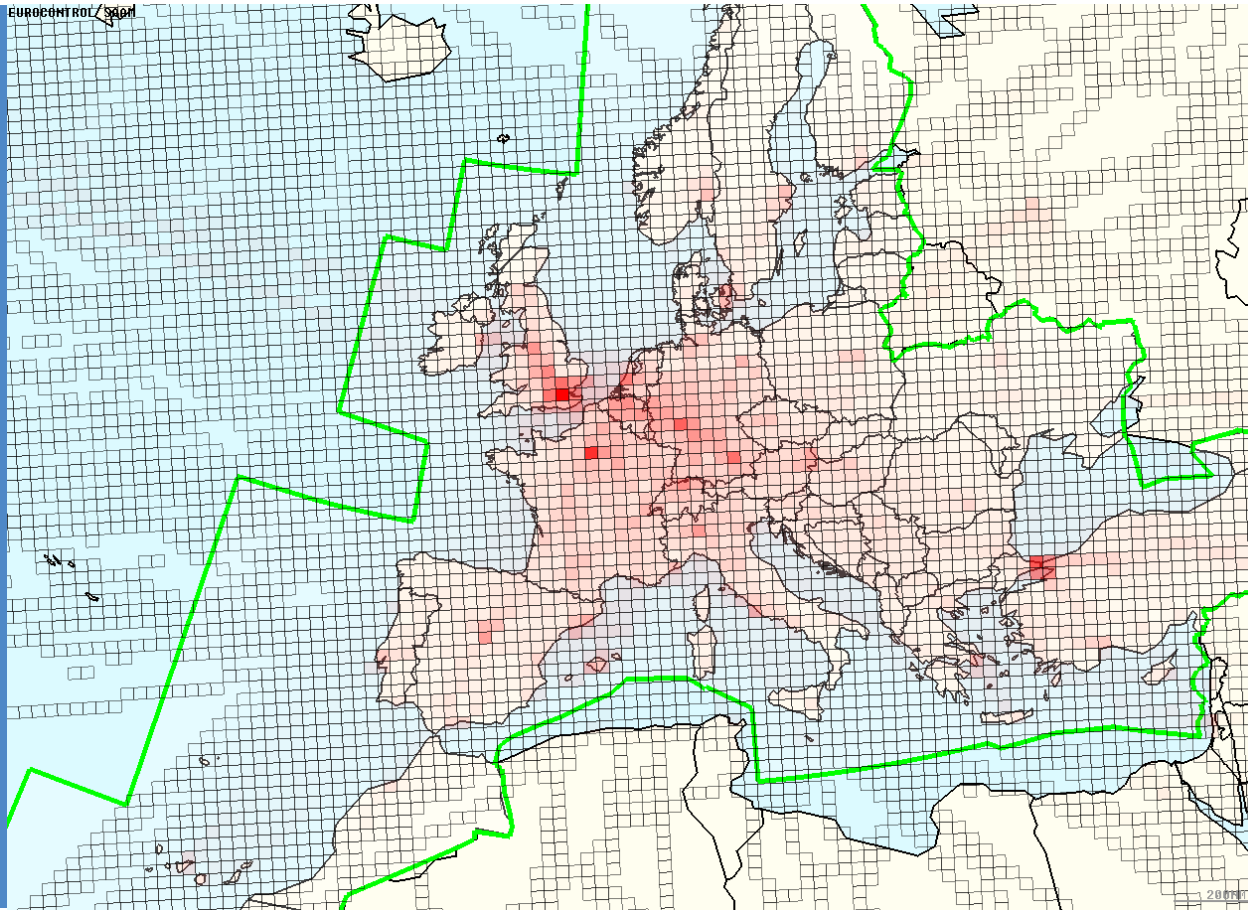
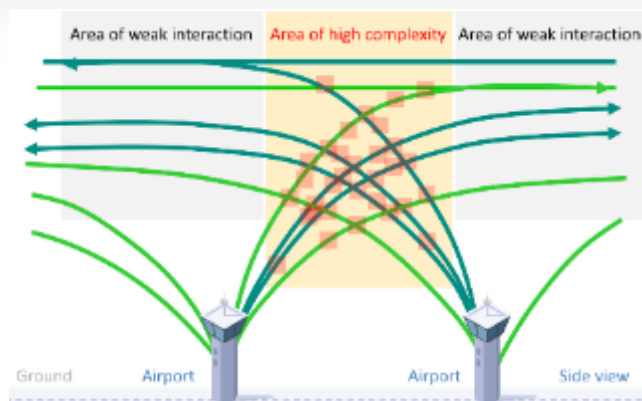


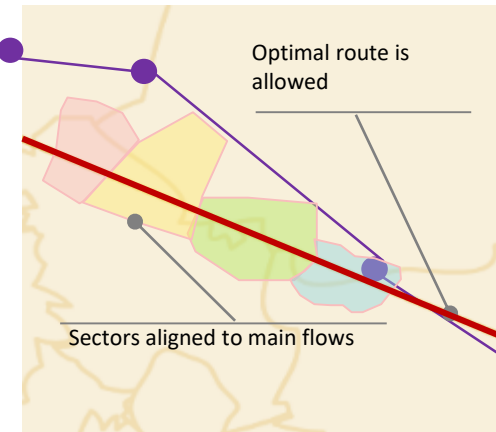
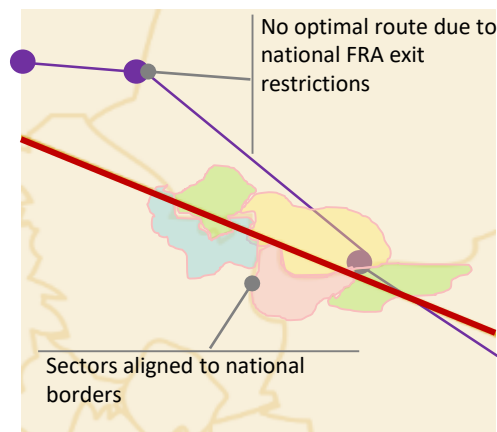
Illustration of two key design principles for new airspace configuration

Illustration

Group high complexity area under same operational areas



Align sectors with flight flow



■ Simulation route

— Country border

● National FRA entry point

■ AS-IS route

■ Sector

Building the Airspace Structure: Main Entry Gates and ...

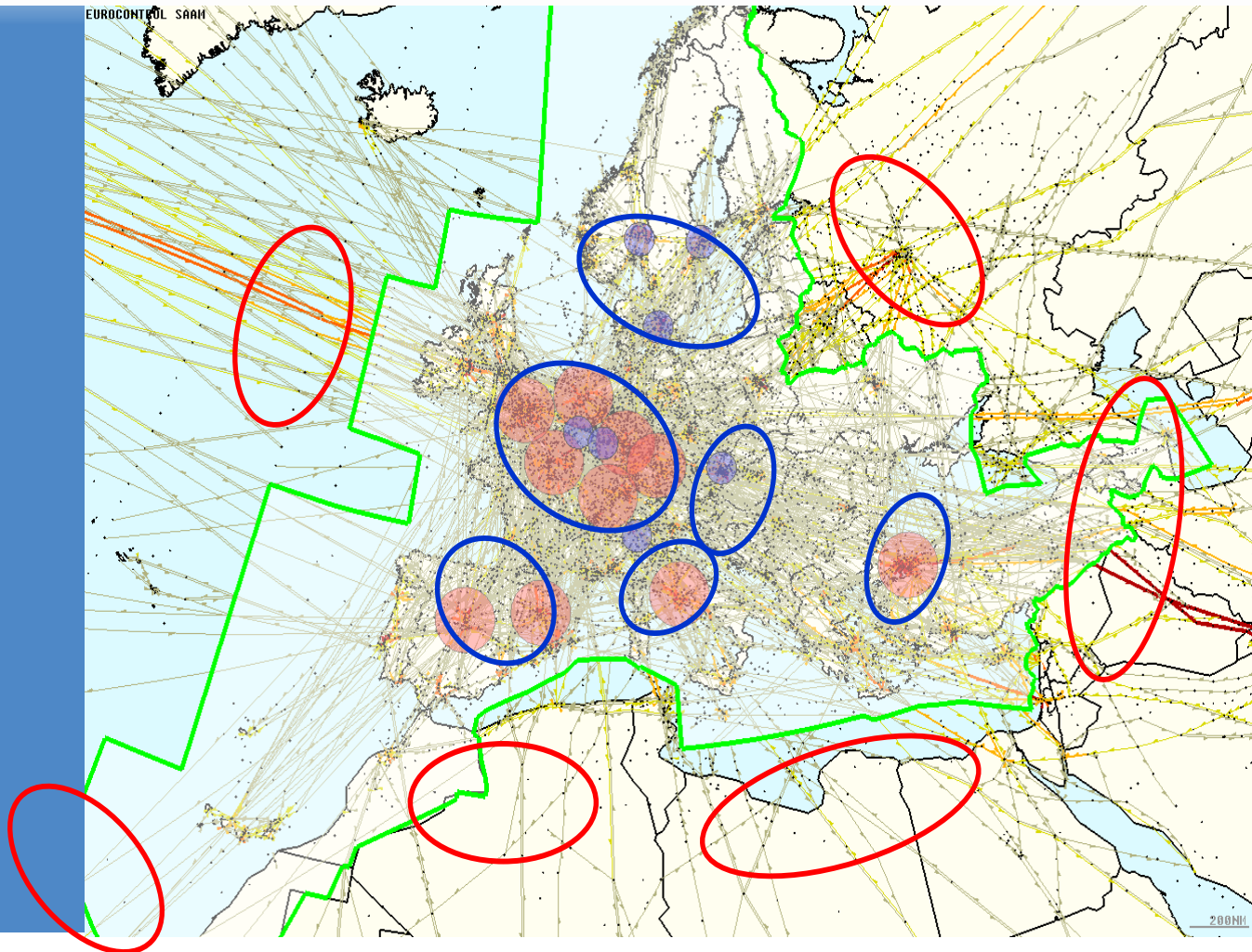


Illustration of what new sectorisation could look like

FOR ILLUSTRATIVE PURPOSES

Network optimisation sectors

EUROCONTROL SAH

Network Optimisation

Version 07

EUROCONTROL - Directorate Network Management
Network Operation Management Unit / Operations Planning
Airspace, Network & Capacity Planning Team

Building the Airspace Structure Traffic Flow Families and Sectors



Harmonised
operational
concept and
system support



Sector capacities
assessed with fast
time simulation
tools based on
real models



Demand in all
sectors checked



Aimed to reduce
workload through
boundaries at
areas of low
interactions



Several
possibilities for
combination
of sectors



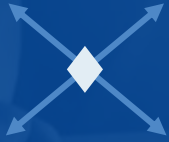
Reducing
unnecessary
sector splits



Possibility to
open additional
sectors in the
longer term

Two sides of the same capacity problem

FOCUS AREA 1



Capacity & airspace

FOCUS AREA 2



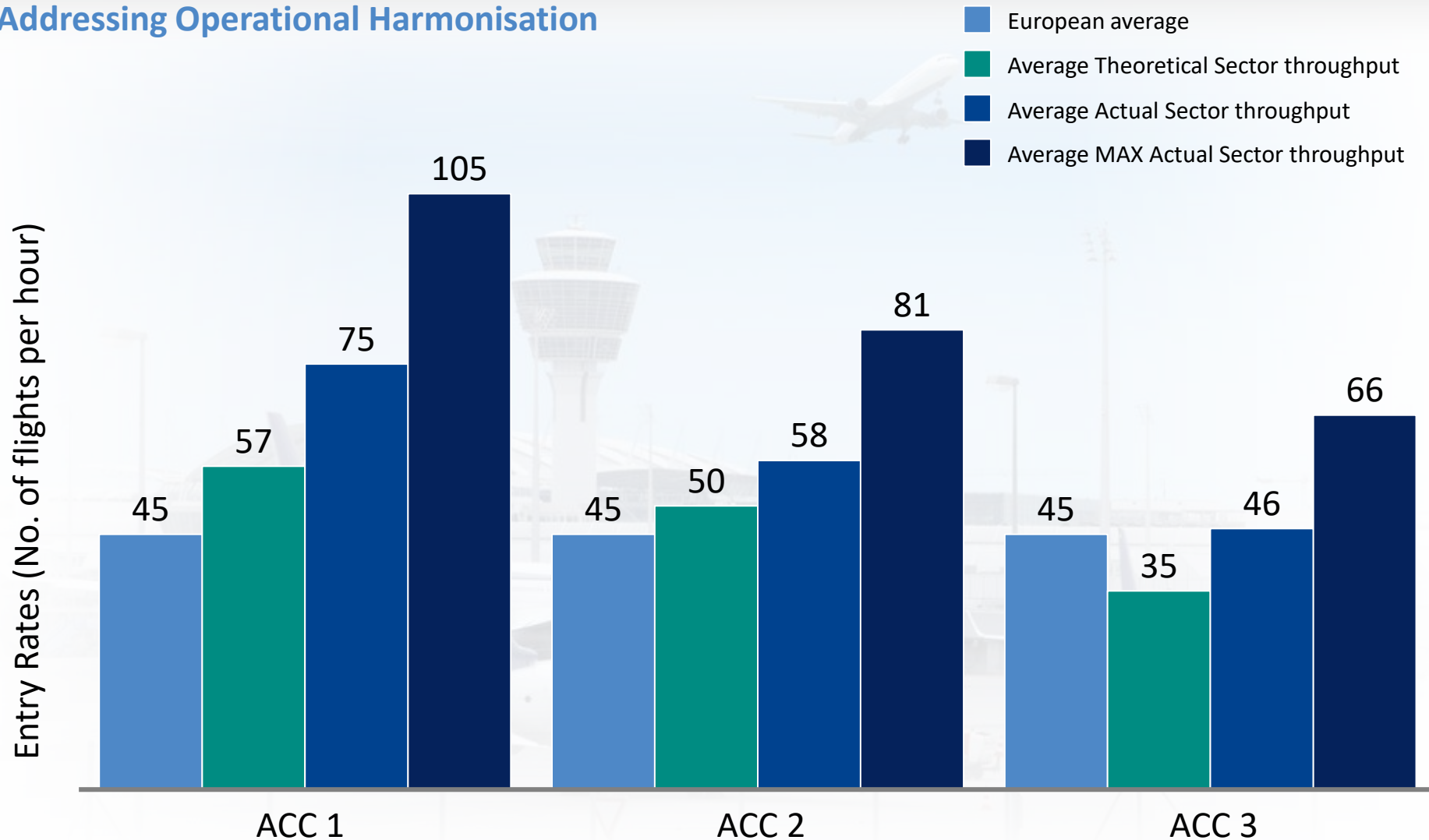
Scalability & resilience

- i Optimised Airspace organisation
 - ii **Operational harmonisation**
 - iii Automation and productivity tools
-
- i Trajectory based operations
 - ii Virtualisation and ATM data services
 - iii Dynamic airspace configuration
 - iv Flight centric operations if proven feasible
 - v Sector independent Air Traffic Service
 - vi CNS Enhancements

Operational harmonisation

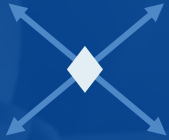
NM input on best practices

Addressing Operational Harmonisation



Two sides of the same capacity problem

FOCUS AREA 1



Capacity & airspace

FOCUS AREA 2



Scalability & resilience

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Level of Automation reached in the study

Study scope

"Main task owner"

Human operator

System



	Level	Definition	Execution	Environment monitoring	Fallback	System autonomy	Automation level		
							Phase A	Phases B/C	Phases D
Human operator monitors the environment 	0 No automation	The full-time performance by the Human operator of all aspects of the control task							
	1 Operator assistance	Anticipation and proposal of action by an assistance system using information about the environment and with the Human operator performing all remaining aspects of the control task							
	2 Partial assistance	Anticipation and execution of some aspects of the control task by an assistance system in nominal conditions with the Human operator performing all remaining aspects of the control task, ready to take back control immediately if needed							
Automated Air Traffic control system monitors the environment 	3 Conditional automation	Anticipation and execution of most aspects of the control task in nominal conditions. The Human operator supervises the system, ready to intervene upon system request							
	4 High automation	The system performs all aspects of the control task system in nominal conditions. The Human operator supervises the system. In most non-nominal conditions, the system is capable of defining and implementing solutions and in the absence of human interventions							
	5 Full automation	The system performs all aspects of the control task for all conditions that can be managed by the Human operator							

Delivered in SESAR 1

In the pipeline with SESAR 2020

- 4D Trajectory Exchange
- Extended Arrival Management horizon
- Advanced short ATFCM measures, STAM
- CTOT and TTA
- Automated support for traffic complexity detection and resolution
- **MTCD and conformance monitoring tools**
- Extended flight plan



In the pipeline with SESAR 2020

In the pipeline with SESAR 2020

- Extended arrival management across overlapping AMAN operations
- Mission trajectory driven processes
- Management of dynamic airspace configuration
- Collaborative network management
- **Advanced separation management**
- ATC planned trajectory performance improvement
- Improved performance in the provision of separation
- **High productivity controller team organisation**
- Trajectory based operations
- Network Prediction and Performance
- Trajectory based planning system
- RBT revision uplink supported by datalink increased automation
- Automation supporting flight-centric ATC and improve distribution of separation responsibility in ATC
- **Collaborative advanced planning**
- SWIM TI Purple profile for Air/Ground Safety-Critical Information Sharing



- New SESAR controller tools increase controller productivity and safety, highly rated by controllers.
- Much more than an improved HMI, revolutionary use of tactical trajectory for CD&R and MONA.
- MONA deemed necessary in FRA (where each flight has its own user-defined route).
- Highly precise in its 6/7 minutes look-ahead time.
- Includes “what-if” function and suggested rates of climb/descent with colour coding.
- Initially validated in lower airspace (especially challenging), adaptation and validation on additional environments (including high en-route sectors) is ongoing in SESAR 2020

LVL BUST
GMI1962 34 EMS 100
92↑ 32 BASUM 100
1000

Selected Flight Level

GMI1962 34 EMS 100
92↑ 17 * BASUM 100
1000

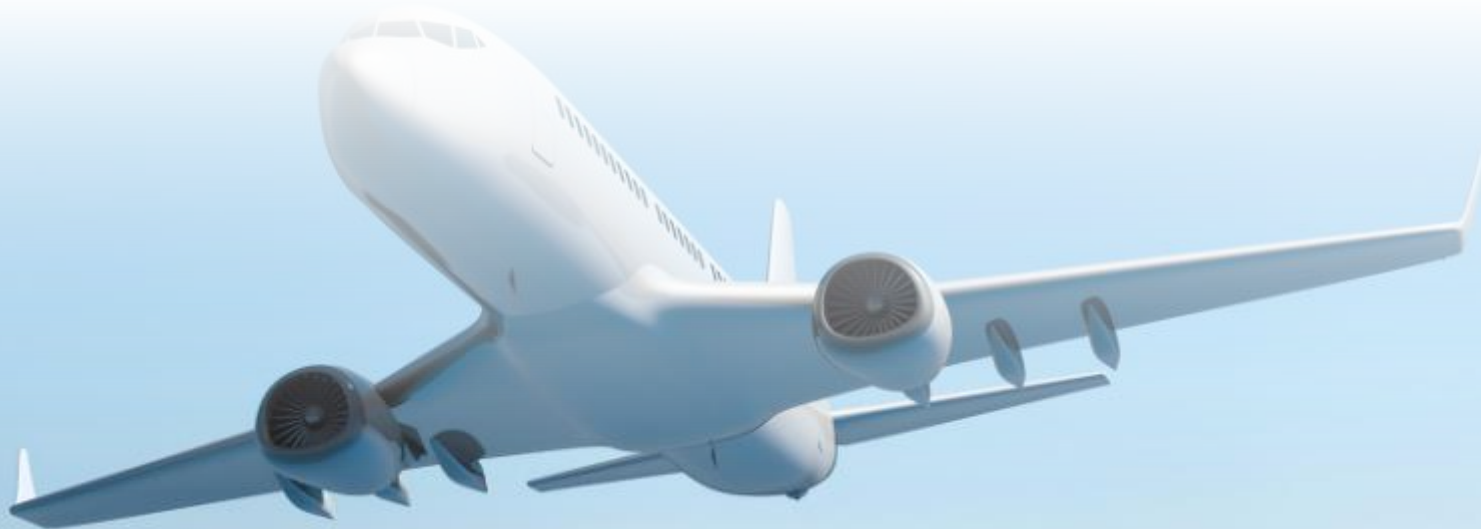
Vertical Rate Deviation
* = Rate was given

NEAR
GMI1962 34 EMS 100
92↑ 32 BASUM 100
1000

Near no Tactical Trajectory

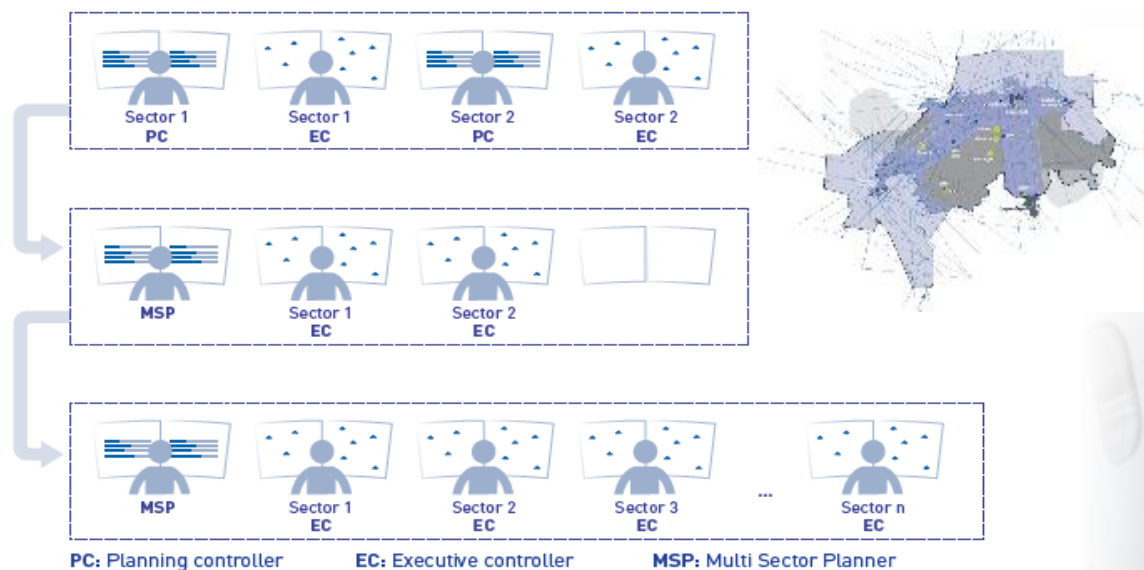


- Use of A/G synchronization (EPP) and CPDLC for advanced separation management concepts.
- Extension of the SESAR 1 concepts with more precise ground trajectory and improved algorithms (“what-if” and “what-else” functions).
- CPDLC prefilled messages with constraints presented for controller approval and uplink, with particular focus on vertical constraints.
- MONA is extended to monitor compliance with the new clearances.



High productivity controller team organisation

- For both en-route and TMA/E-TMA, en-route is the most challenging.
- Holistic view beyond the Multi Sector Planner (MSP) solution and its various local implementations.
- Linked to collaborative control with unplanned boundaries, for coordination-free transfer between executive controllers supported by the same planner.
- Boundaries between sectors may be adjustable by the MSP for workload-balancing purposes.



Collaborative Advanced Planning extension

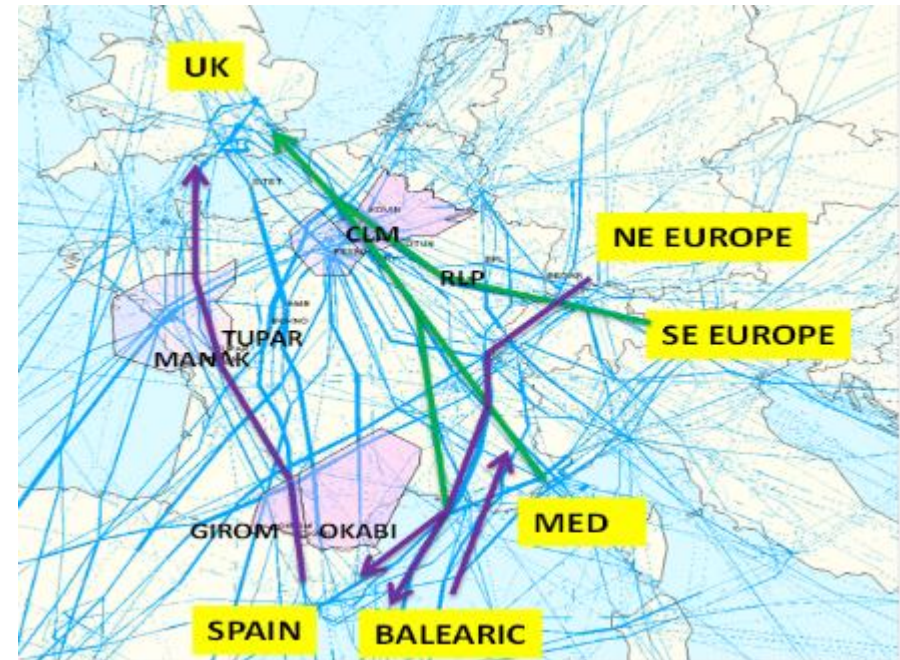
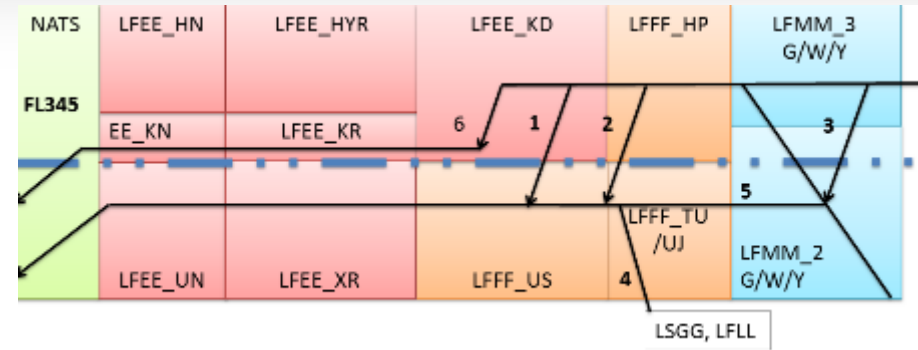
New concept developed by DSNÁ in 2015 for coordination of re-routing, at first only 3 ACCs and a handful of AUs.

Concept extended to other ANSPs, and now including synchronization with NM for increased predictability, could support re-routing.

Latest test in the MADRID-LATEK traffic flow showed potential for savings:

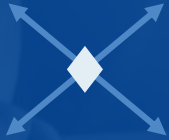
Regulations avoided in **12/15** days.

Total savings over **4.000** minutes



Two sides of the same capacity problem

FOCUS AREA 1



Capacity & airspace

- i Optimised Airspace organisation
- ii Operational harmonisation
- iii Automation and productivity tools

FOCUS AREA 2

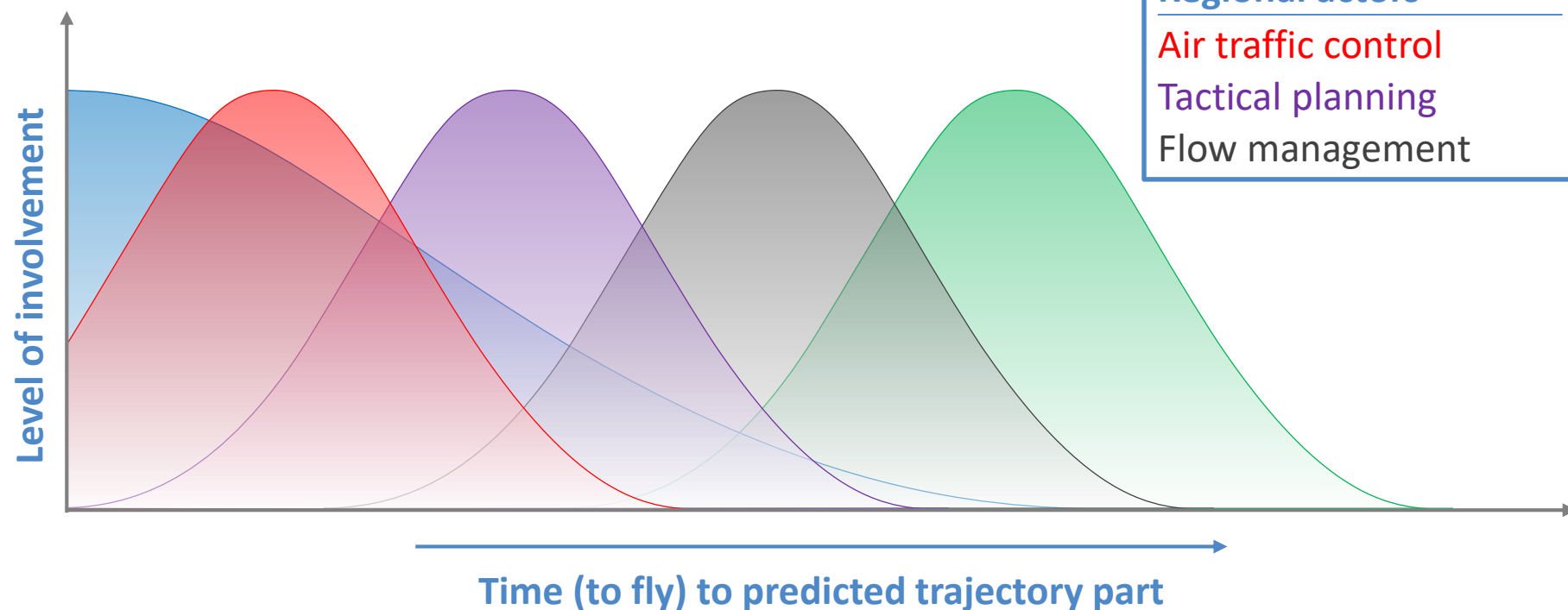


Scalability & resilience

- i **Trajectory based operations**
- ii Virtualisation and ATM data services
- iii Dynamic airspace configuration
- iv Flight centric operations if proven feasible
- v Sector independent Air Traffic Service
- vi CNS Enhancements

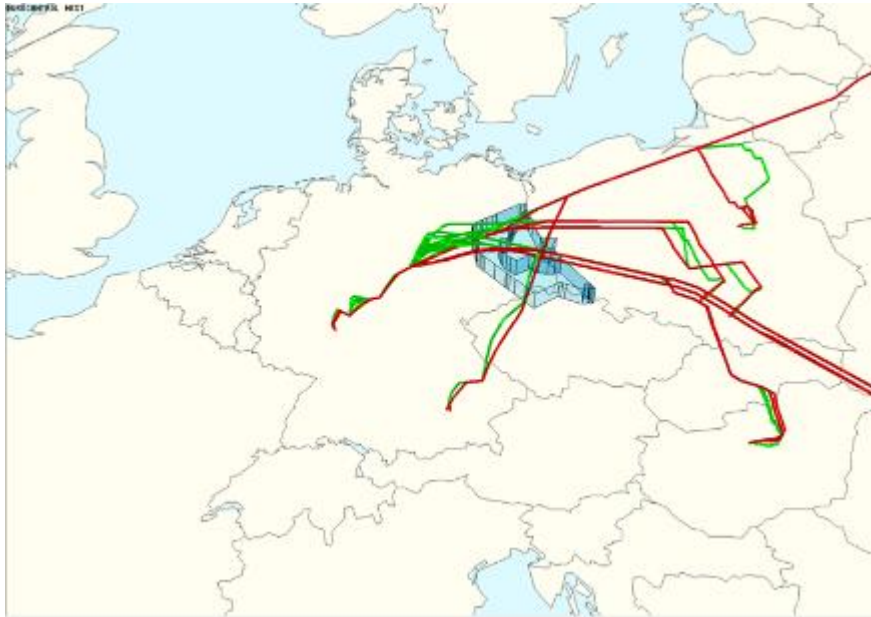
Coherent management of 4D trajectories through all phases of flight

1. Increased predictability through better connectivity & sharing of information
2. Improved multi-stakeholder collaborative decision making
3. Reducing Air Traffic Controller workload primarily through support of decision making

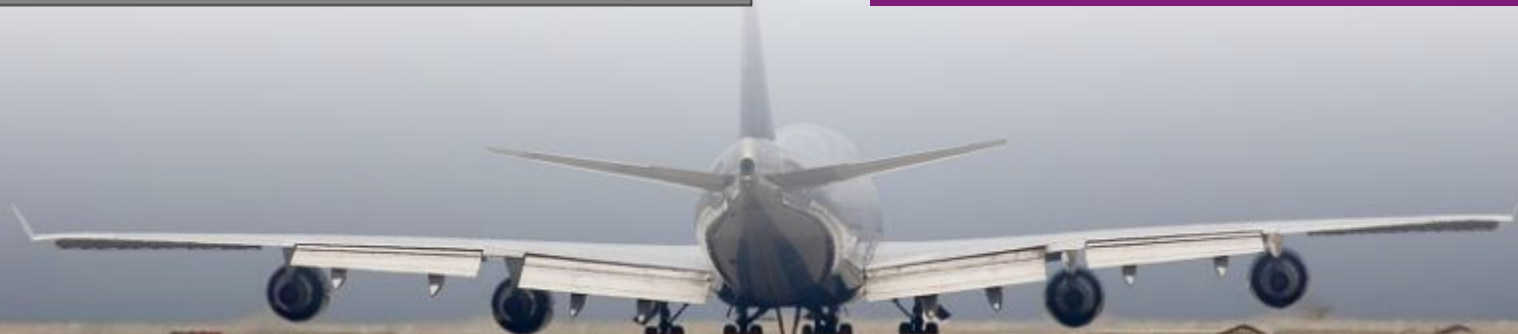
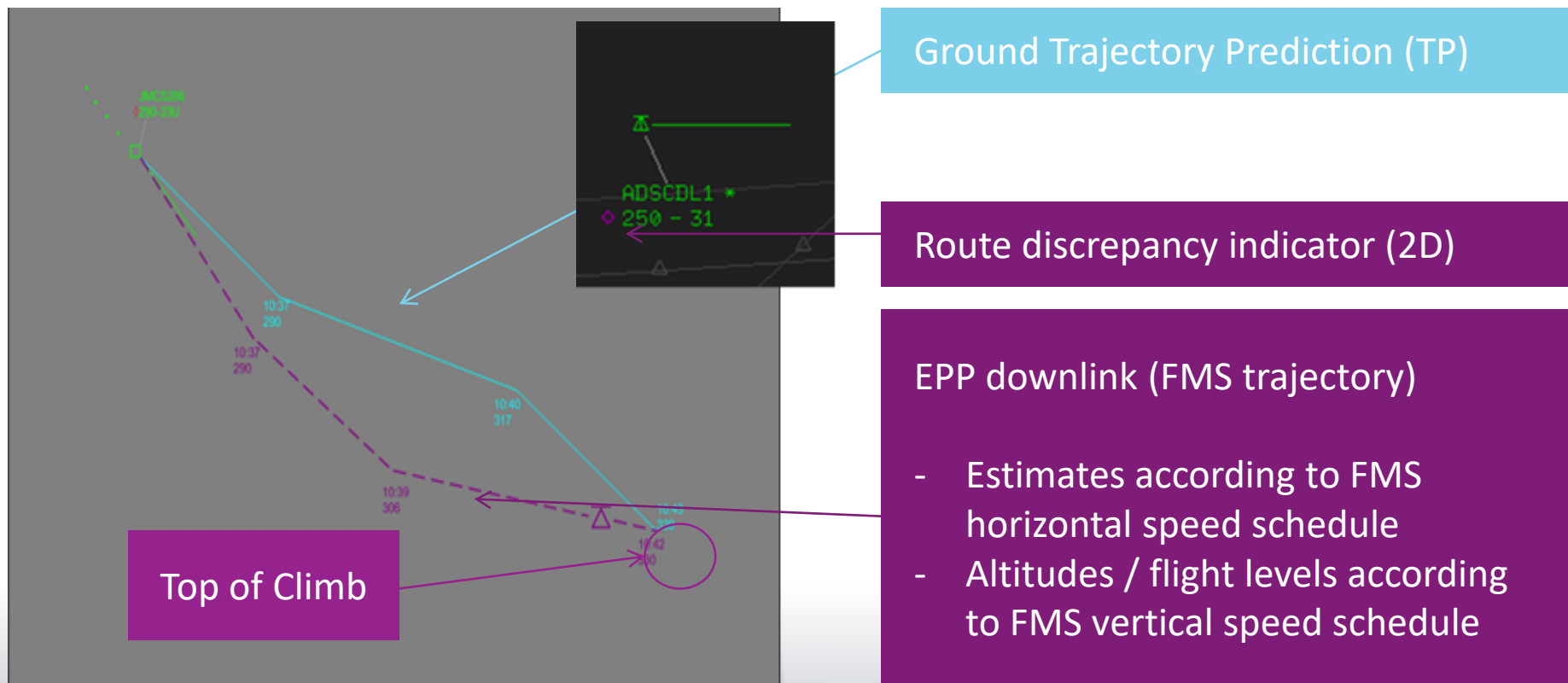


Extended flight plan

- Included in the PCP (AF#4).
- Extension of the ICAO 2012 FPL, with flight-specific additional information (4D trajectory)
- Benefits validated in SESAR 1 include increased FPL acceptance rate and improvements to DCB (due to better prediction of sector flight-list).
- Additional benefits by using the 4D trajectory in ATC TP are under validation in SESAR 2020: use of flight-specific data rather than BADA.



4D trajectory exchange EPP (EPP availability on ground)



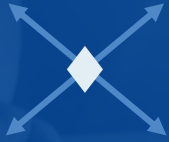
RBT revision uplink supported by datalink and increased automation

- Builds on SESAR 2020 CPDLC and the IOP threads.
- Objective is to leverage ATN B2 (4)
- Introduces advanced automation concepts (e.g., automatic descent clearances delivered by the system unless controller intervenes).
- Further increases in controller productivity and improved service to AUs (e.g., auto-loadable clearances, more timely descents...).



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FOCUS AREA 2



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Resilience of the ATM system



Ability to adjust to expected and unexpected disturbances (staffing problems, weather disturbances, system failures, cyber-attacks, temporary surge in needed capacity) in order to sustain required operations and secure sufficient capacity.

Continuity of air traffic services

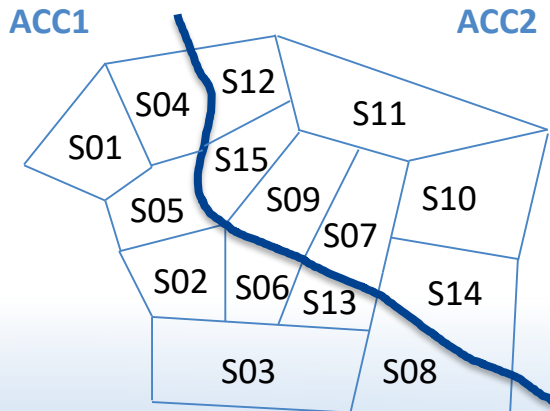


By temporarily decoupling the controller working position (CWP) from the airspace served.

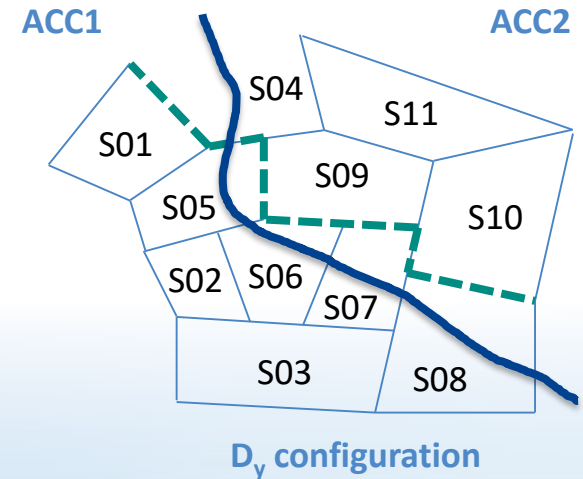
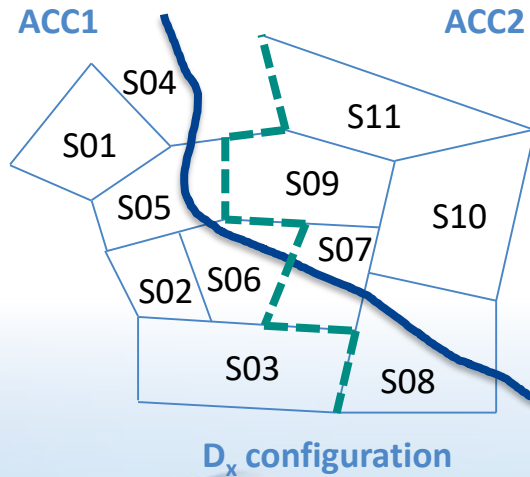


Dynamic management of cross-FIR sectors

Traditional sectorisation along borders

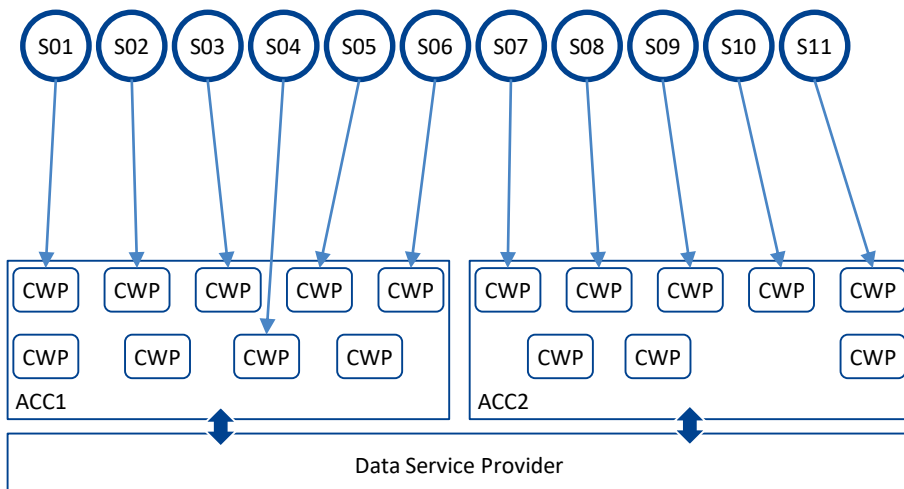


Sectors designed across borders and operated by one centre or the other depending on the flow

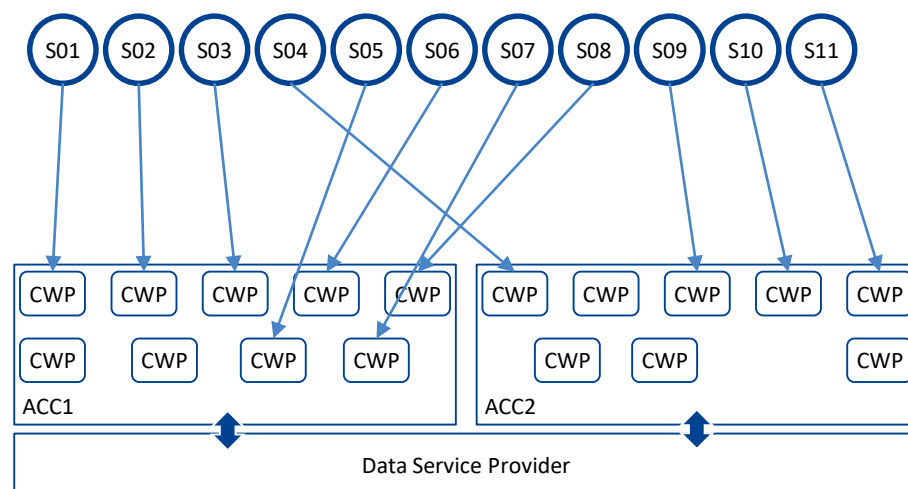


Virtualisation and service orientation could be associated with new service delivery models

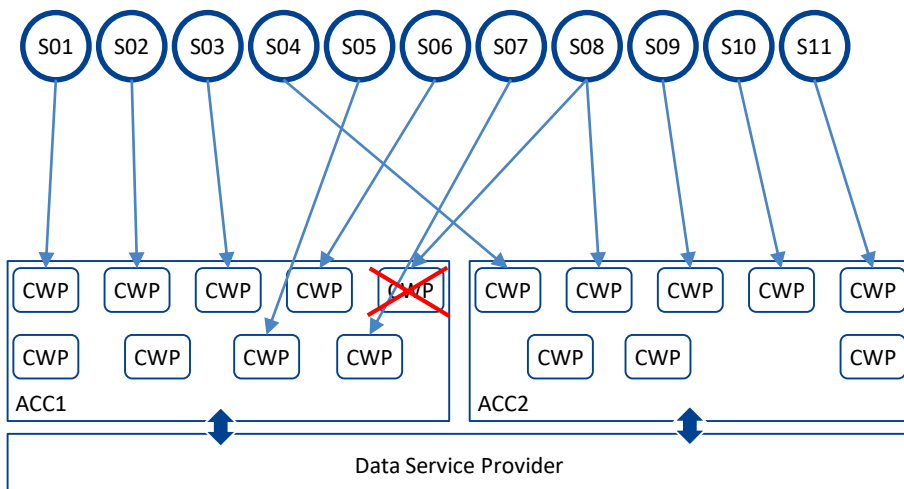
D_x configuration



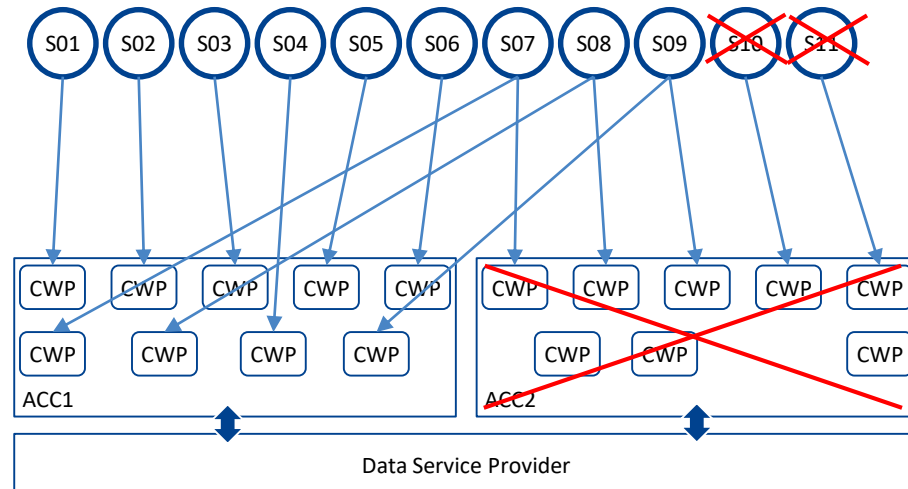
D_y configuration



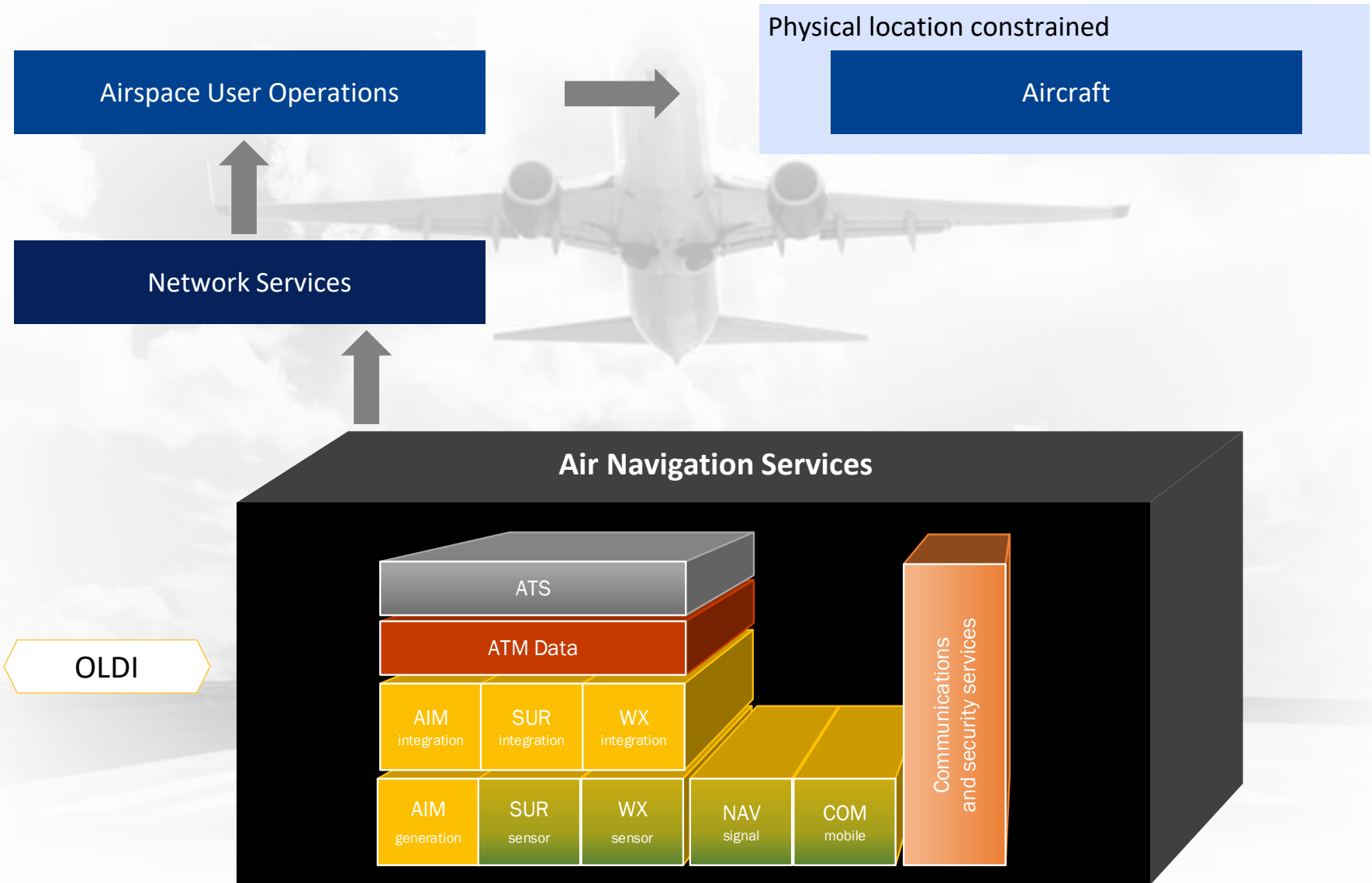
CWP-S8 failing in ACC1 – reconfigured to ACC2



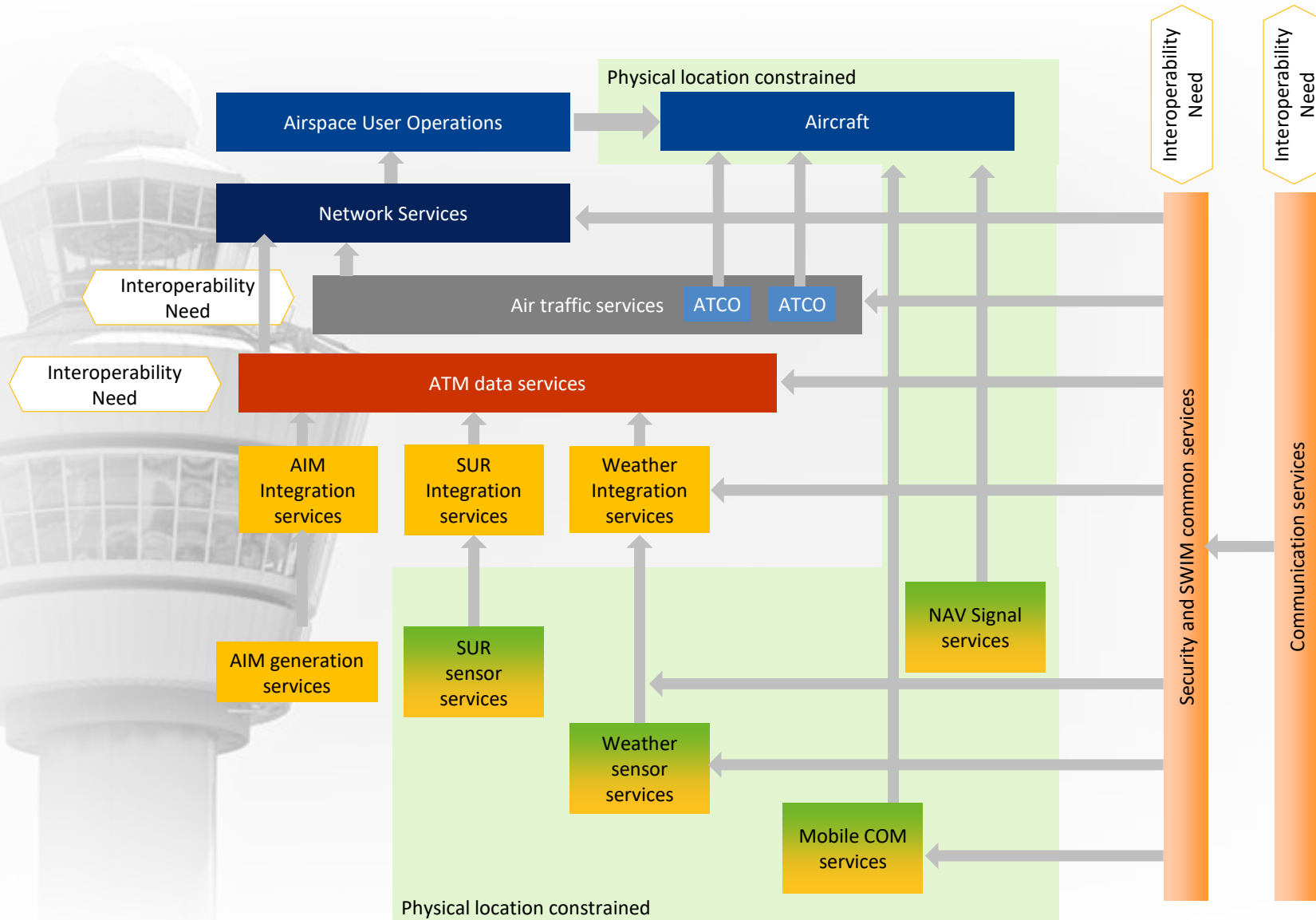
ACC2 power failure – all cross-border sectors taken by ACC1

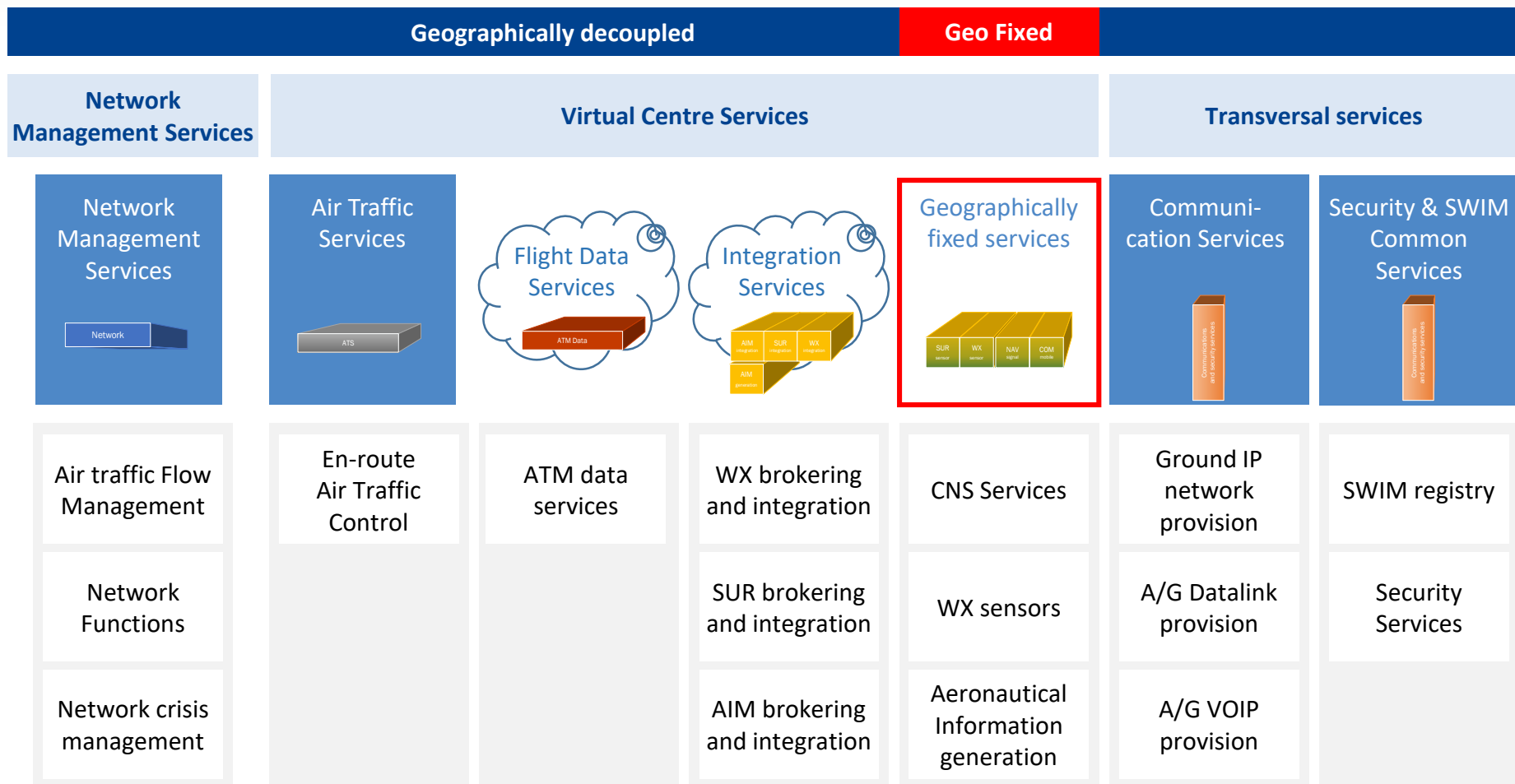


Current architecture



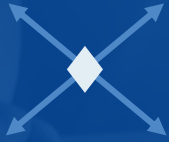
Target architecture





Two sides of the same capacity problem

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FOCUS AREA 2



Scalability & resilience

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Dynamically manage airspace configurations

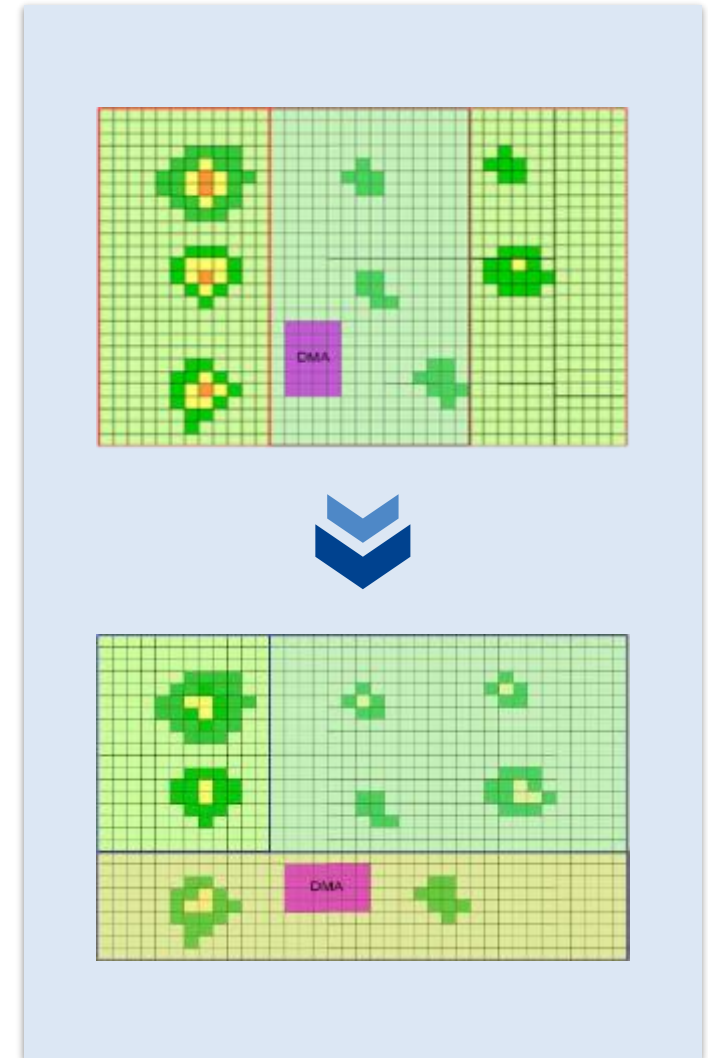
Takes dynamic sectorisation to the next level, both in fixed-route airspace and in FRA (more challenging!).

Stepwise approach: from smarter sector-bandboxing to dynamic definition of sectors based on increasingly smaller volumes.

Most advanced concept requires sector-independent controller validation.

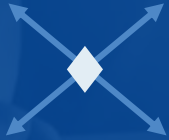
Full integration with ASM by supporting both trajectory requests with embedded ARES and independent ARES requests.

CDM process



Two sides of the same capacity problem

FOCUS AREA 1



Capacity & airspace

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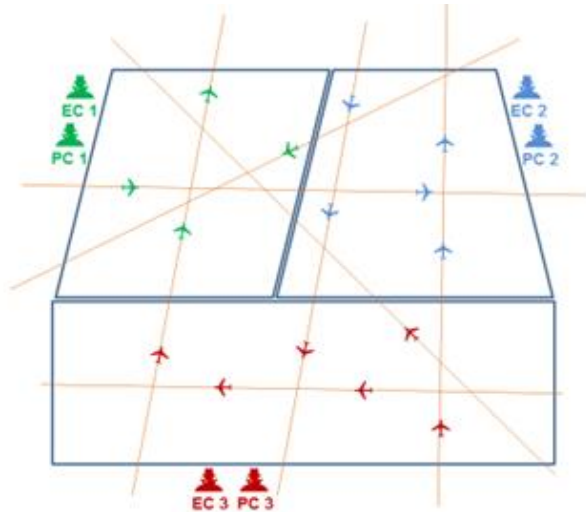
FOCUS AREA 2



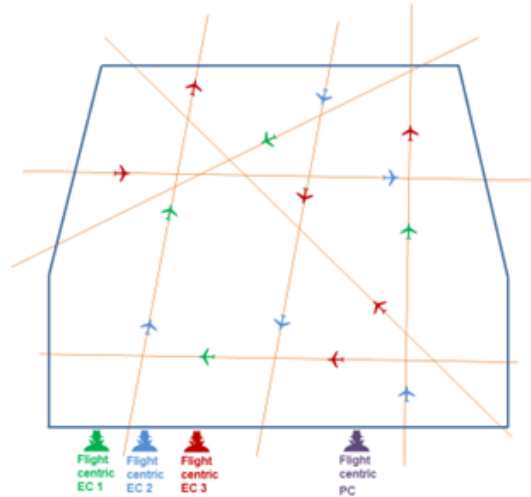
Scalability & resilience

- i Trajectory based operations
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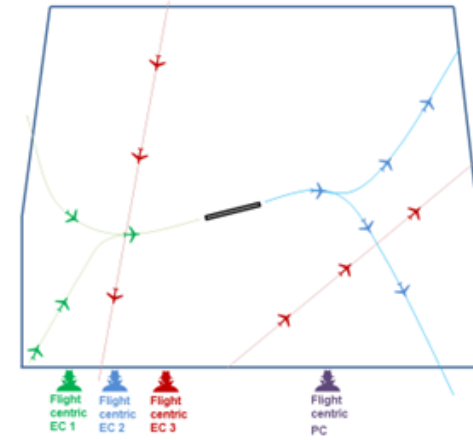
Evolution towards new working models



Operating method with sectorisation



Flight centric ATC, example workload based traffic assignment



Flight centric ATC, example flow based traffic assignment

Overcomes the **limitations** of **further sector splitting**.

Different flights within the same piece of airspace are **assigned to different controllers**

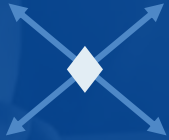
Leading to **balanced** workload **adapting to demand**

Distributed flight-centric team allows pooling of controller resources between ANSPs.

Unambiguous responsibility for separation. **Research ongoing**

Two sides of the same capacity problem

FOCUS AREA 1



Capacity & airspace

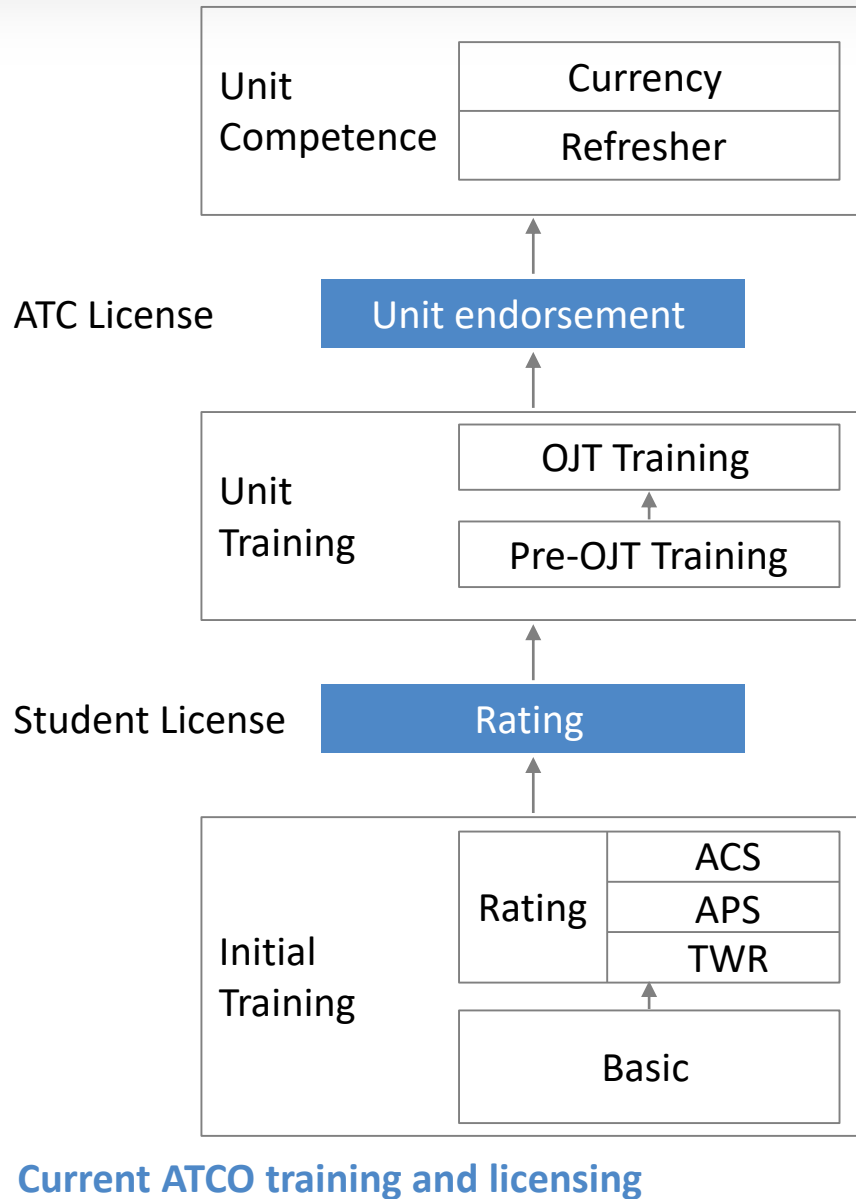
FOCUS AREA 2



Scalability & resilience

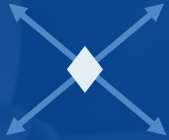
- i Optimised Airspace organisation
- ii Operational harmonisation
- iii Automation and productivity tools
- i Trajectory based operations
- ii Virtualisation and ATM data services
- iii Dynamic airspace configuration
- iv Flight centric operations if proven feasible
- v **Sector independent Air Traffic Service**
- vi CNS Enhancements

ATCO training and licensing



Two sides of the same capacity problem

FOCUS AREA 1



Capacity & airspace

- i Optimised Airspace organisation
- ii Operational harmonisation
- iii Automation and productivity tools

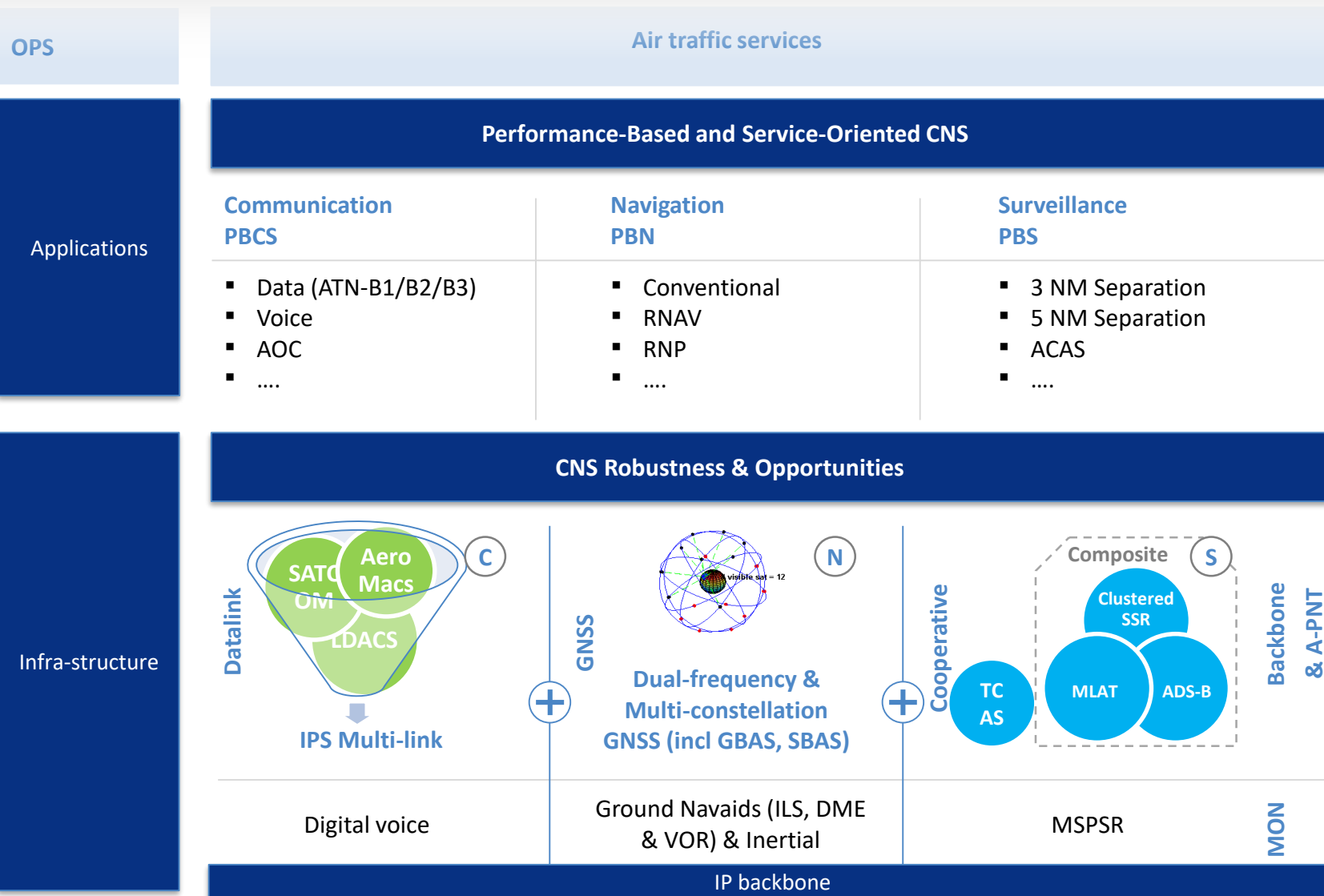
FOCUS AREA 2



Scalability & resilience

- i Trajectory based operations
- ii Virtualisation and ATM data services
- iii Dynamic airspace configuration
- iv Flight centric operations if proven feasible
- v Sector independent Air Traffic Service
- vi **CNS Enhancements**

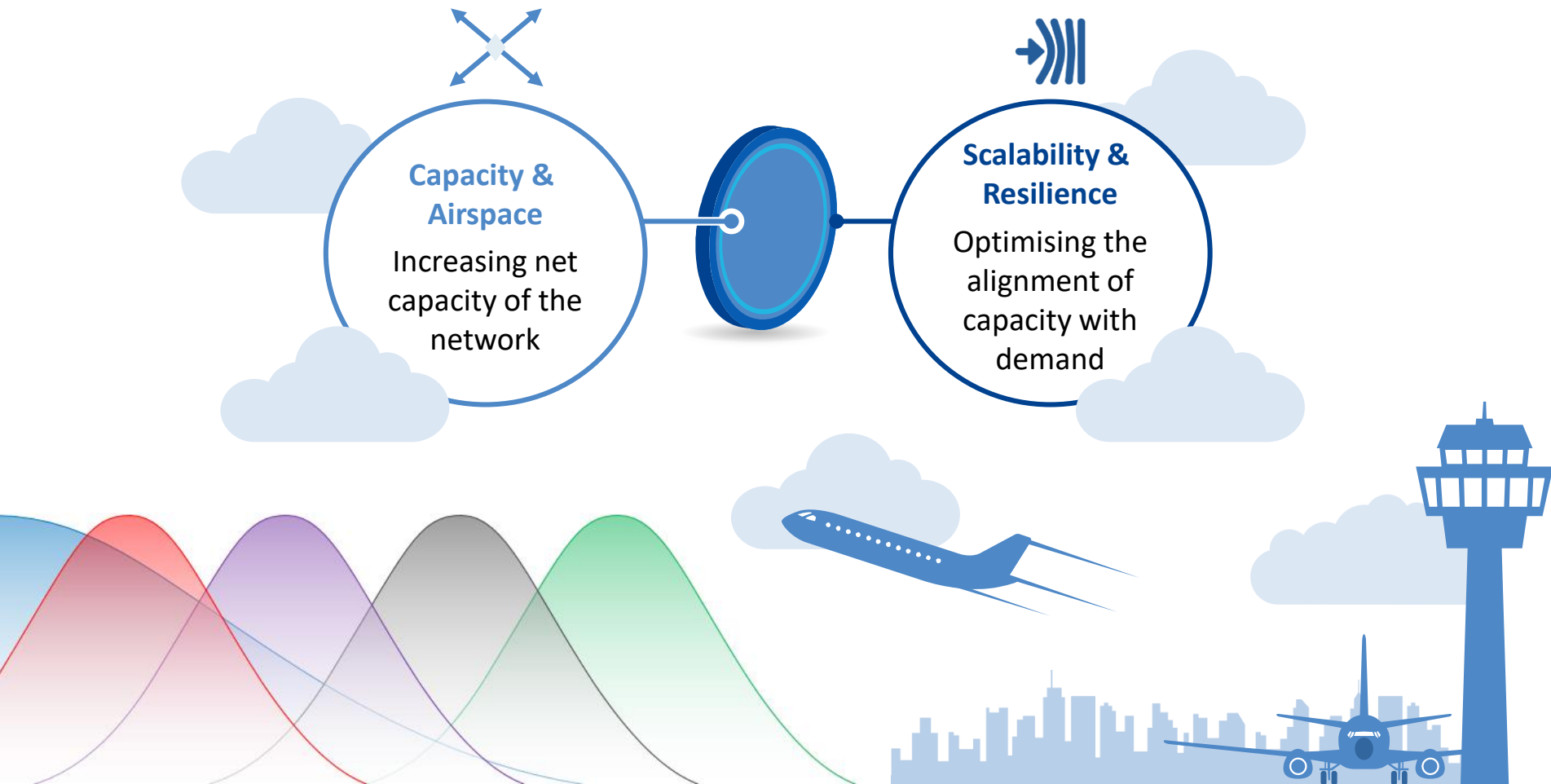
CNS as a service, through European wide harmonized and performance based services



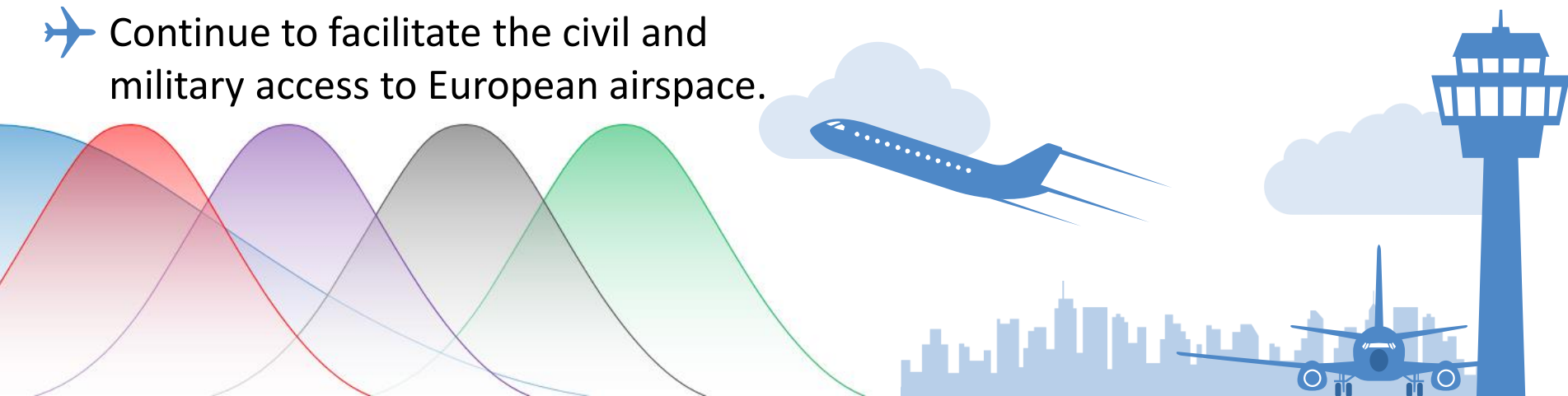
Integrated CNS Roadmap and strategy

Civil/ Military interoperability

Both advanced airspace concepts and service orientation have a strong link to automation, which in turn requires improved air-ground communications.



- ✈ Increased ATM capacity and scalability to handle all en-route airspace air traffic safely and efficiently
- ✈ Allow all flights to operate along (or at least as close as possible to) user-preferred routing across the entire ECAC airspace.
- ✈ Promote an optimal use of ATM resources, reducing current inefficiencies and ATM costs for airspace users and society.
- ✈ Increase the overall resilience of the system to all types of incidents, in terms of safety, efficiency and capacity.
- ✈ Continue to facilitate the civil and military access to European airspace.



Panel discussion and Q&A with audience: How can airspace change and technology work together to help address the challenges ahead?

Send your questions to the following email: communications@sesarju.eu



11h00
to 12h30

- » **Mohr Manfred**, Assistant Director RSFO (Regional Safety and Flight Operations) / SESAR 2020 Technical Manager, IATA
- » **Christophe Vivier**, Head of Unit, Single European Sky/SESAR, EDA
- » **Gauthier Sturtzer**, Professional Staff Organisation representative, ETF
- » **Iacopo Prissinotti**, Head of the International Strategies Department, ENAV (representing the A6 Alliance and CANSO)
- » **Luc Laveyne**, Senior Adviser Single European Sky, ACI Europe
- » **Vincent De Vroey**, Director Civil Aviation, ASD



How to achieve a smooth transition?

– Sections 5, 6 & 7

Alain SIEBERT – SESAR JU – Chief Economics and Master Plan

Razvan BUCUROIU – Network Manager – Head of Network
Strategy and Development Division / Acting Head of Operations
Planning Unit

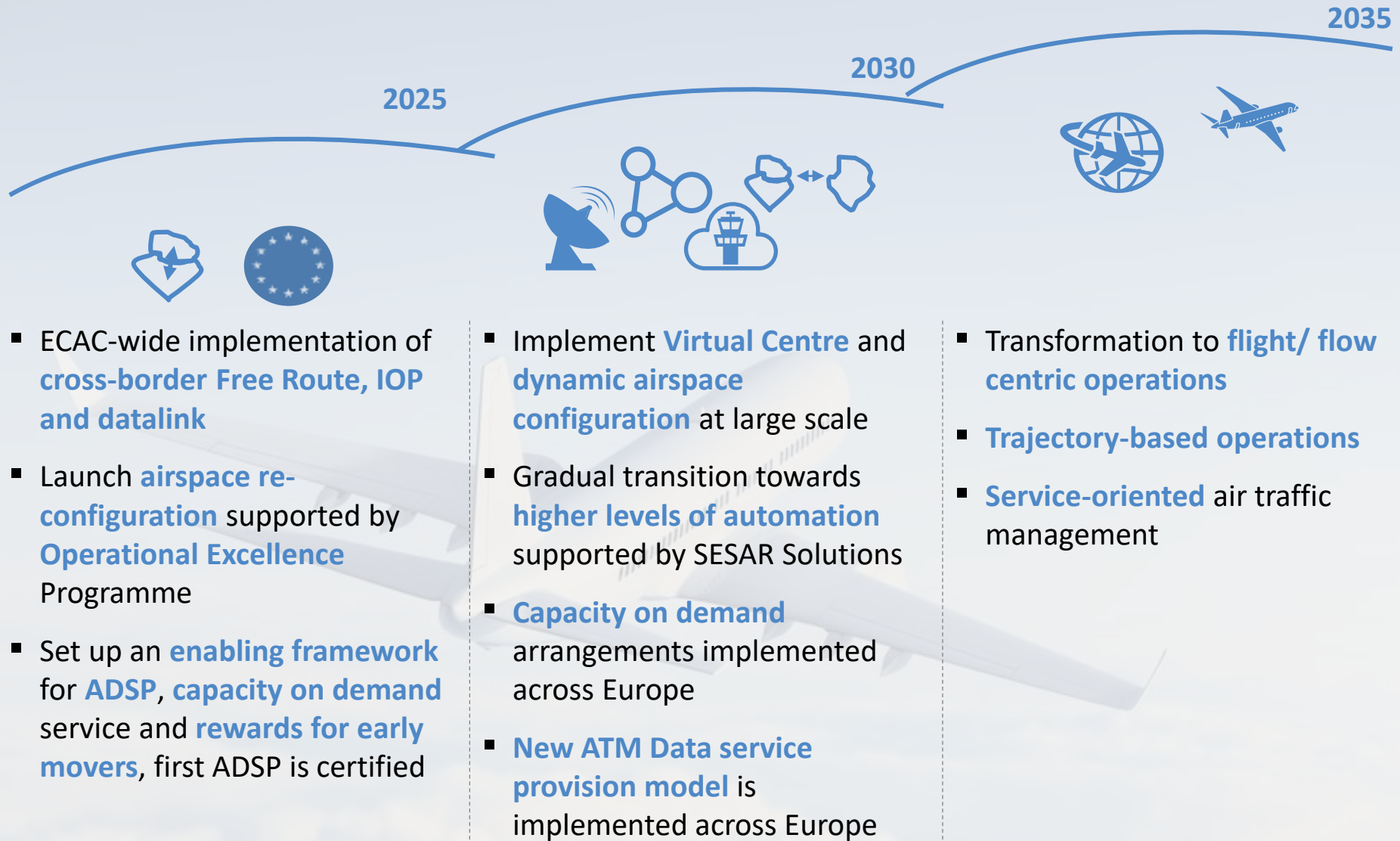
Brussels, 21 of November 2018



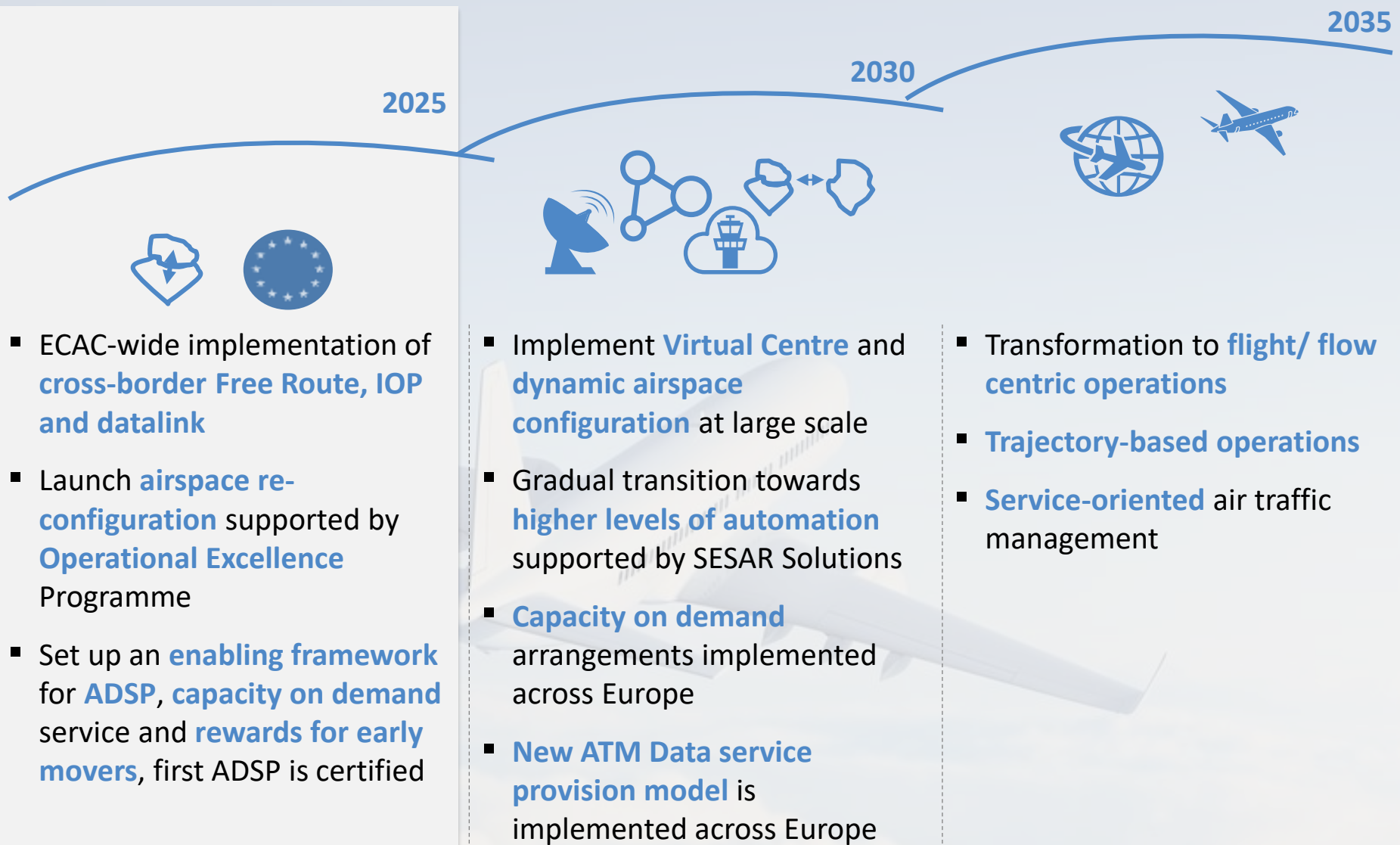
Founding Members



A possible way forward by bringing progressive transition every 5 years

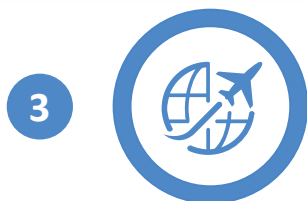


Where we propose to focus

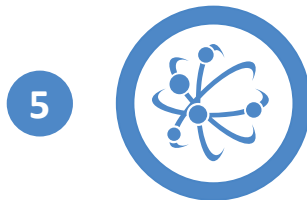


AF

SIMPLIFIED FOR CLARITY REASONS



- Free Route implementation is structuring for future airspace
- There should be no room for interpretation in the law, **cross-border implementation is a must**



- IOP is the foundation for seamless and interoperable ATM in Europe
- It needs to **become a reality!**



- Network Collaborative Management and Initial Trajectory Information Sharing are also important **continuous exchange of up-to-date and consistent flight information between all actors**



- Datalink paves the way for Initial Trajectory Information Sharing
- We are stressing the importance of necessary technological upgrades that will ensure a stable and reliable ATN/VDL Mode 2 service



**Timely
deployment of
the PCP**



**Successful
implementation
of the datalink
recovery plan**

Network-centric airspace reconfiguration programme



Analysis at a network level of potential improvements in airspace organisation



Propose and **validate** new airspace organisation where relevant



Deliver and **implement** an optimised airspace organisation at European level

Operational Excellence Programme

Identify best practices and quick-wins across all stakeholders (e.g., operational procedures, rostering, collaborative DCB processes) and **set up** of implementation roadmap



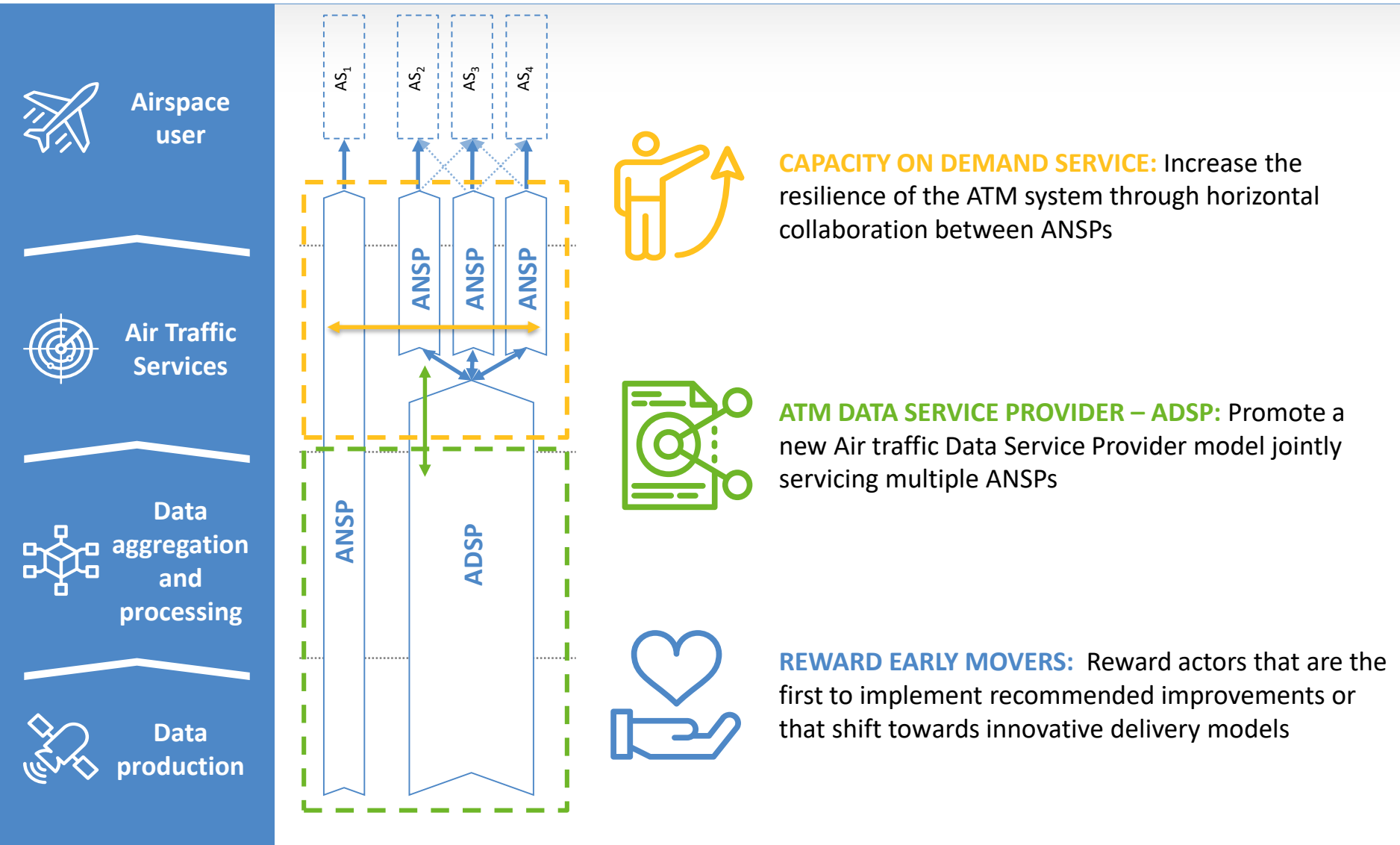
Implement operational changes as planned



Monitor benefits brought by the implemented changes and **update** operational excellence plan accordingly

A collaborative decision making process involving all stakeholders

Setting up an enabling framework for ADSP, capacity on demand service and rewards for early movers





Capacity on Demand would allow sharing of capacity across ANSPs, increasing resilience of the system

What are we trying to achieve ?

- Resilience is the **intrinsic ability of ATM to adjust its functioning** to disturbance, so that it can sustain required operations and ensure capacity under both **expected and unexpected** conditions:



Staffing



Weather



System failures



Cyber-attacks



Other operational issues

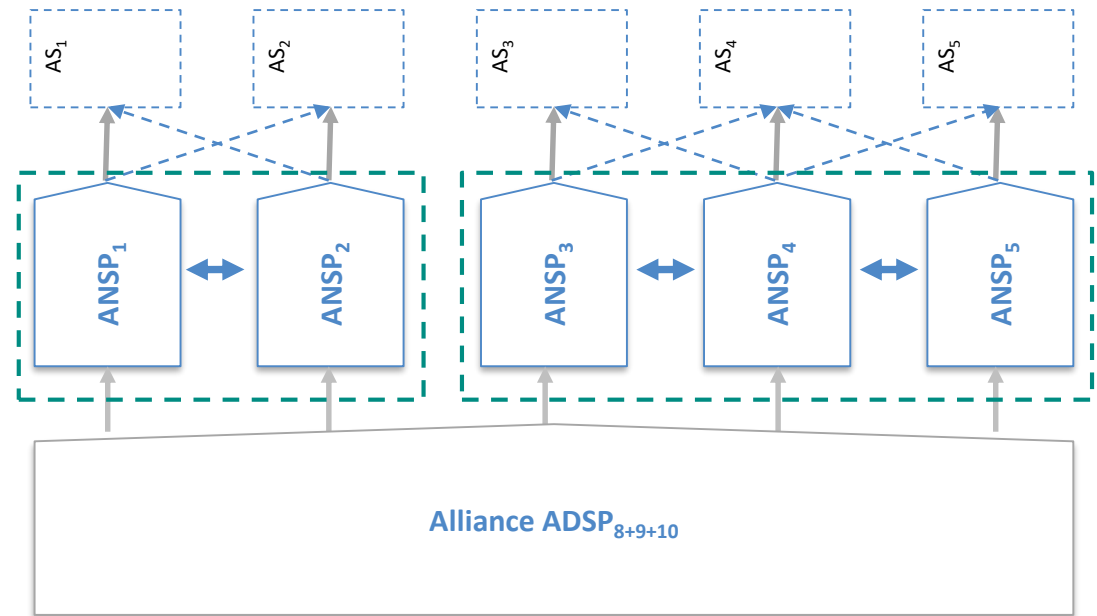


Inefficiencies and high level of stress



What will Capacity on Demand deliver?

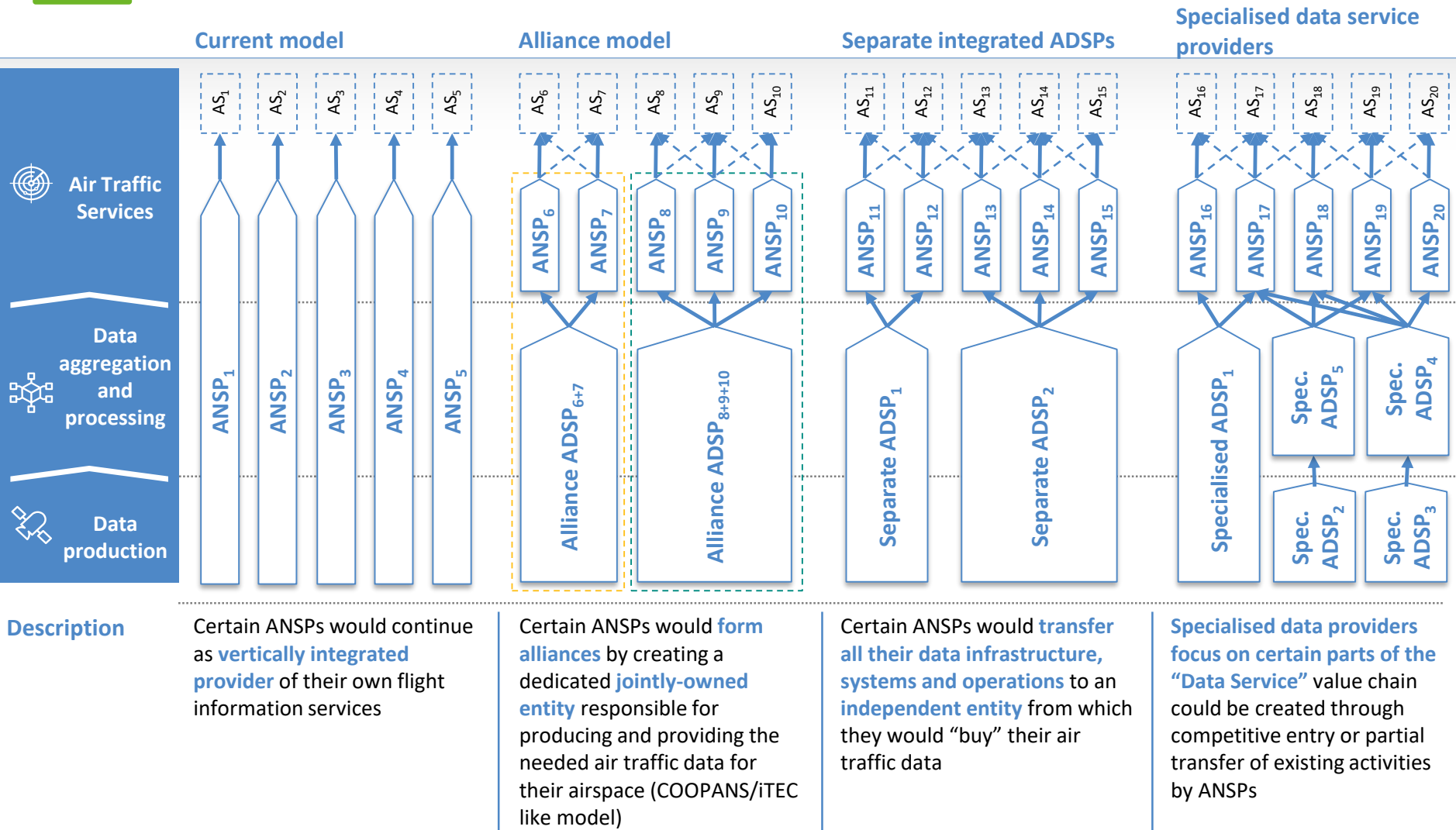
- The goal is to ensure the continuity of services and available capacity during periods of disturbance or high traffic demand by **temporarily decoupling the controller working position (CWP) and the airspace served** through the **remote provision of air traffic services based on bilateral agreements**
- In other words, the main question is how to **enable horizontal one-on-one collaboration for ANSPs to let them develop their own model for resilient Air Traffic Service**







Several models could co-exist with the apparition of new delivery models for ATM data service providers



← Realisation of an example of ATM data service provision model →



List of potential rewards for early movers

The goal is to reward actors who support and/or are the first to implement the change towards the new delivery models



Air space users

- Incentives could be provided for airspace users to **invest in SESAR related technologies** by lowering en-route charges for those having installed it (for example through modulation of charges) ensuring that they **pay only for services uses**;
- Additionally, or alternatively, **preferential ATM services** could be accorded to airspace users that are equipped with SESAR technologies during a pre-determined transition phase (for example through the concept of Best Equipped Best Served).



Service providers

- **Promote SESAR related investments and service delivery during performance scheme** implementation to support the transition;
- **Allow a profit margin** to be made for 1-on-1 agreement of provision of remote ATS capacity (resilient services);
- **Reward the achievement of specific KPIs** (e.g., cost-sharing for operational performance programme or certain investment subject to reaching certain operational or performance targets);
- **Allow faster cost depreciation and decommissioning of legacy assets** for actors installing new systems and services.
- **European guarantees** (equity or debt) could be provided for the first actors to enter the market or shift to a new delivery model (e.g., first ANSPs creating a joint ADSP);
- **Direct financial support mechanisms** (e.g., conditioned grants, faster depreciation of legacy assets) could be introduced to stimulate the launch of ADSPs meeting certain desired conditions (e.g., transfer of CNS infrastructure to a new ADSP entity, ADSP covering more than one State).



Assumptions from simulations

AS-IS

- Traffic forecast: high-growth scenario
- All operational changes inserted in the NSP
- Deployment of PCP as scheduled
- Yearly increase of ACC capacity (+2% and +3%)

Run 1

- All previous features from AS-IS
- ECAC-wide cross-border FRA (2025 plus)
- Optimised airspace reorganisation
- Upward-alignment of ACC capacity to the level of current well-performing ACCs

Run 2

- All previous features from run 1
- Subset of SESAR 2020 solutions
- Datalink as primary mean for A/G comm (90% equipage rate)



Results from simulations for 2035

AS-IS

- Annual delay per flight of 8.5 min/flight and extension of trajectory of 7 NM
- 35 ACCs will have delays higher than 2 min/flight

Run 1 & 2

- Flight efficiency: potential gain of 18 NM per flight
- Average maximum theoretical sector throughput can increase from 45 flights/hour to 68 (run 1) and to 107 (run 2)

**AS-IS
simulation
in 2035**

8.5

**Minutes average
en-route delay per
flight vs 0.9 minutes
in 2017**



**Full imple-
mentation
of the
transition
plan in
2035**

0.5

**Minutes average
en-route delay per
flight**



Preliminary impact assessment

Preliminary overall results from combined analysis

KPA	Impact (Order of magnitude)	Value € billion 2019-35
Capacity 	438 million of delay minutes saved between 2019 and 2035	34
Environment 	77 and 143 kg of fuel saved per flight in 2035	3-6
Cost efficiency 	ANS productivity gains equivalent to 57-73 € per flight in 2035	5-7



Preliminary results of the CBA analysis indicate a considerable **net benefits potential of €31-40 billion** (or €13-17 billion in NPV) over the 2019-2035 period

Panel discussion & Q&A with audience: How fast will we be able to structurally solve the challenges identified?



14h30
to 15h40

Send your questions to the following email: communications@sesarju.eu

- » **Achim Baumann**, Policy Director, A4E
(representing the European Airspace User Community)
- » **Christophe Vivier**, Head of Unit, Single European Sky/SESAR, EDA
- » **Gauthier Sturtzer**, Professional Staff Organisation representative, ETF
- » **Iacopo Prissinotti**, Head of the International Strategies Department, ENAV
(representing the A6 Alliance and CANSO)
- » **Kari Siekkinen**, NCP Chair FAB working group
- » **Nathalie Dejace**, Head of ATM/ANS, EASA



1

Launch **airspace re-configuration** and **Operational Excellence** programmes to achieve quick wins



2

Realise **virtual de-fragmentation** of European skies



3

Create SES framework that **rewards early movers**

Airspace architecture study workshop

Wrap up

Florian Guillermet

Executive Director, SESAR JU

What's on the table?



Proposed solutions **coupling airspace** and **technology** with **preliminary impact assessment**



Conditions for success and in particular to **secure the implementation timeline**



Preliminary recommendations to achieve quick wins, defragmentation of effort and speed up implementation

Key takeaways from today's discussions

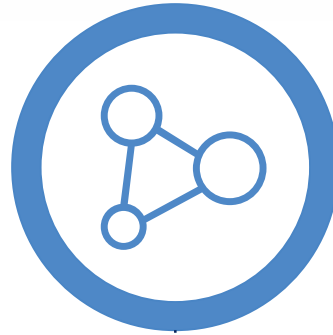
- ✓ This workshop has confirmed that we are going in the right direction
- ✓ In order to accelerate change, we need to start somewhere (i.e en-route airspace). Other initiatives are required resolving issues with TMA/airport capacity.
- ✓ The **target architecture is not an alternative** to the European ATM Master Plan, rather it is a wider framework that will increase the benefits of SESAR deployment.
- ✓ A **successful transition** requires **cross-stakeholder commitment, strong political support** and a **project-management approach** - This is not something that can be achieved by any one stakeholder alone.

Are preliminary recommendations confirmed?



1

Launch **airspace re-configuration** and **Operational Excellence** programmes to achieve quick wins



2

Realise **virtual de-fragmentation of European skies**



3

Create SES framework that **rewards early movers**

What comes next?

Integrate
workshop
feedback
from
stakeholders

Finalise study
findings

Deliver study
to the
European
Commission



Closing words

Maurizio Castelletti

Directorate-General for Mobility and Transport, Head of Unit Single European Sky, European Commission