



SES/SESAR Airspace Architecture Study Workshop

Workshop document | July 5th



SES/SESAR AIRSPACE ARCHITECTURE STUDY WORKSHOP – Day 1

5-6 July 2018



European Commission, Breydel Building, Avenue d'Auderghem 45, Brussels , Belgium

5 July 2018

Opening session	
10:00 – 10:10	Welcome by SESAR JU Michael Standar, Chief Strategy and External Affairs, SESAR JU
10:10 – 10:30	Background and expectations from the European Commission Maurizio Castelletti, Directorate-General for Mobility and Transport, Head of Unit Single European Sky, European Commission
10:30 – 10:50	Current traffic situation and what if we continue as today Joe Sultana, Director, European Network Manager
10:50 – 11:10	Our approach for the study Florian Guillermet, Executive Director, SESAR JU
11:10 – 11:30	Vision for the future and the link to the European Master Plan Alain Siebert, Chief Economics and Master Plan, SESAR JU
11:30 – 12:00	Discussion with the audience Moderated by Michael Standar, Chief Strategy and External Affairs, SESAR JU
12:00 – 13:00	Lunch
13:00 – 13:30	Options for future airspace design Razvan Bucuroiu, EUROCONTROL, Network Manager Directorate, Head of Network Strategy and Development Division/Acting Head of Operations Planning Unit
13:30 – 13:45	Q&A
13:45 – 14:15	Options for future game changing SESAR solutions David Bowen, Chief ATM, SESAR JU
14:15 – 14:30	Q&A
14:30 – 15:00	Options for future technical solutions and enablers David Bowen, Chief ATM, SESAR JU
15:00 – 15:15	Q&A
15:15 – 15:45	Coffee
15:45 – 16:15	Discussion with the audience Moderated by Michael Standar, Chief Strategy and External Affairs, SESAR JU
16:15 – 16:30	Day 1 wrap-up Florian Guillermet, Executive Director, SESAR JU
16:30	End of day one



#SESAR
@SESAR_JU

SES/SESAR AIRSPACE ARCHITECTURE STUDY WORKSHOP – Day 2

5-6 July 2018



European Commission, Breydel Building, Avenue d'Auderghem 45, Brussels , Belgium

6 July 2018

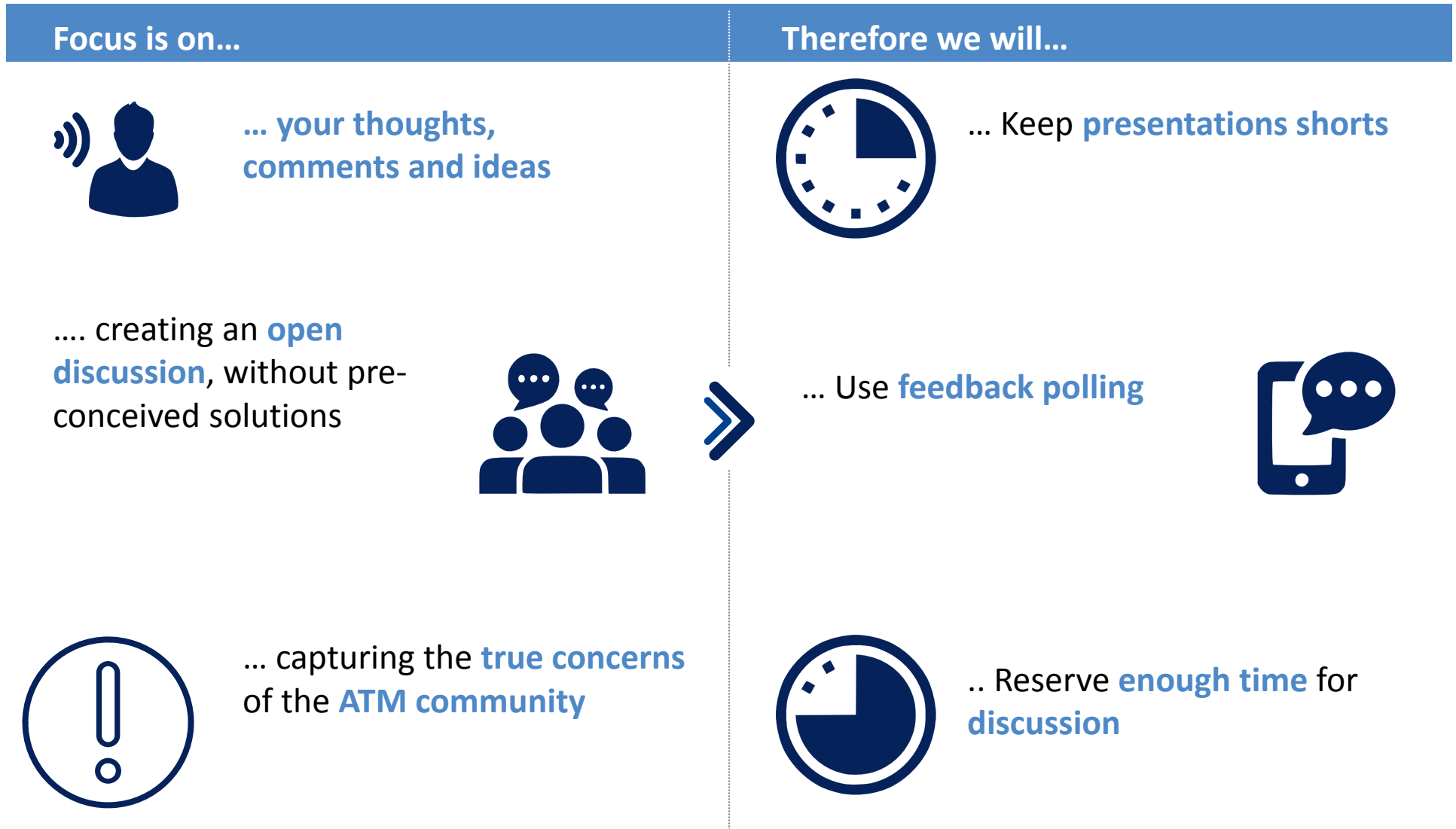
Opening session	
9:00 – 9:15	Welcome and reflections from day 1 Michael Standar, Chief Strategy and External Affairs, SESAR JU
Stakeholder perspectives	
9:15 – 9:30	Perspectives from Airspace Users Achim Baumann, Policy Director, A4E
9:30 – 9:45	Perspectives from Airports Luc Laveyne, Senior Adviser Single European Sky, ACI Europe
9:45 – 10:00	The ANSP Perspective Iacopo Prissinotti, Head of the International Strategies Department, ENAV (representing the A6 Alliance)
10:00 – 10:15	Perspectives from Professional Staff Organisations Luis Barbero, President and Chief Executive Officer, Guild of Air Traffic Control Officers (GATCO)
10:15 – 10:30	The Network Manager Perspective Joe Sultana, Director, European Network Manager
10:30 – 10:45	Perspectives from the Military Defence Sector Christophe Vivier, Head of Unit Single European Sky/SESAR, EDA
10:45 – 11:00	Perspectives from the manufacturing industry Vincent De Vroey, Director Civil Aviation at ASD
10:30 – 11:00	Coffee break
11:00 – 12:00	Discussion with the audience Moderated by Michael Standar, Chief Strategy and External Affairs, SESAR JU
12:00 – 12:30	Conclusions and next steps Florian Guillermet, Executive Director, SESAR JU
12:30	END



#SESAR
@SESAR_JU

Welcome

The plan for today



Background and expectations from the European Commission

Maurizio Castelletti

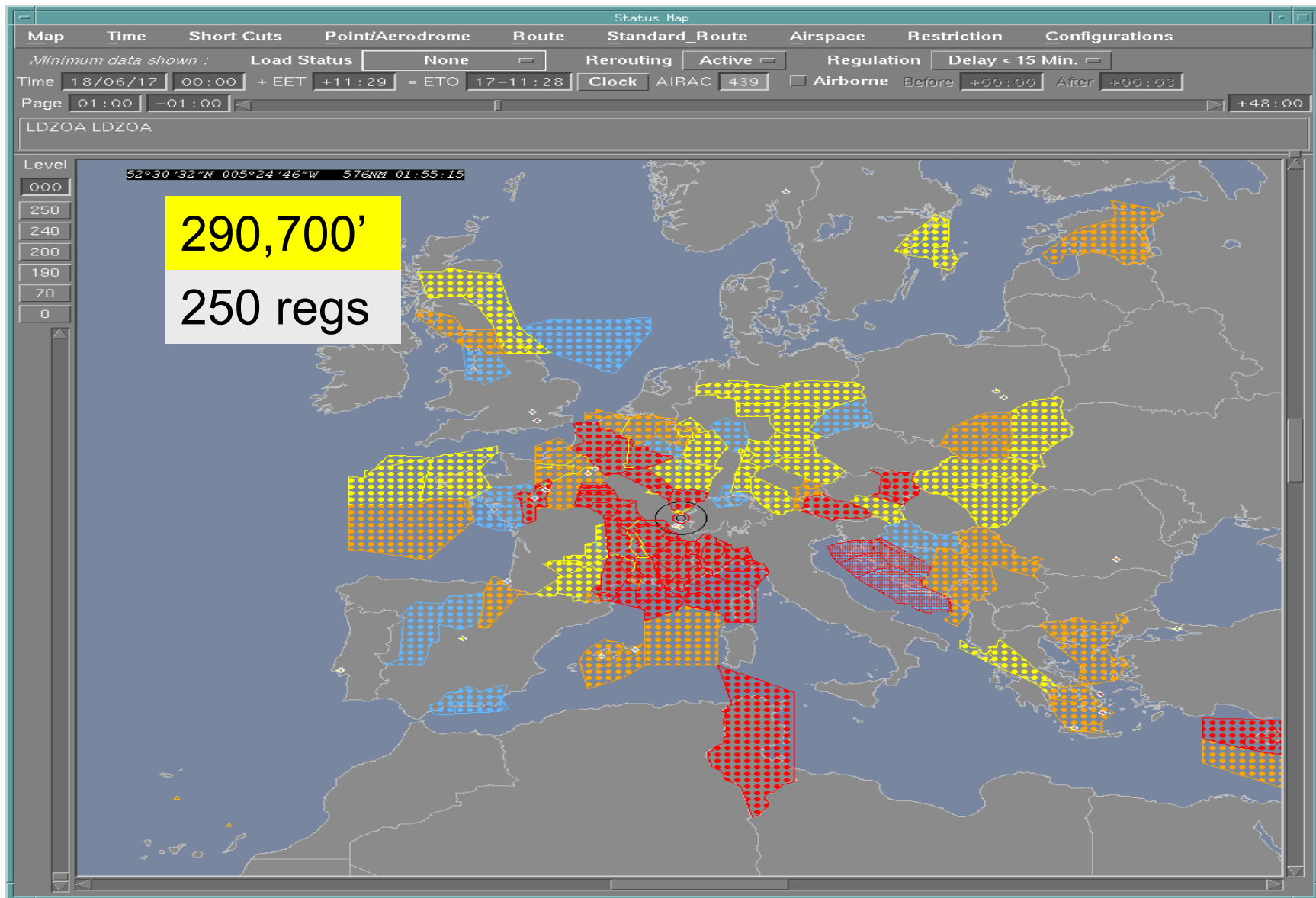
Directorate-General for Mobility and Transport, Head of Unit Single European Sky, European Commission

Current traffic situation and what if we continue as today

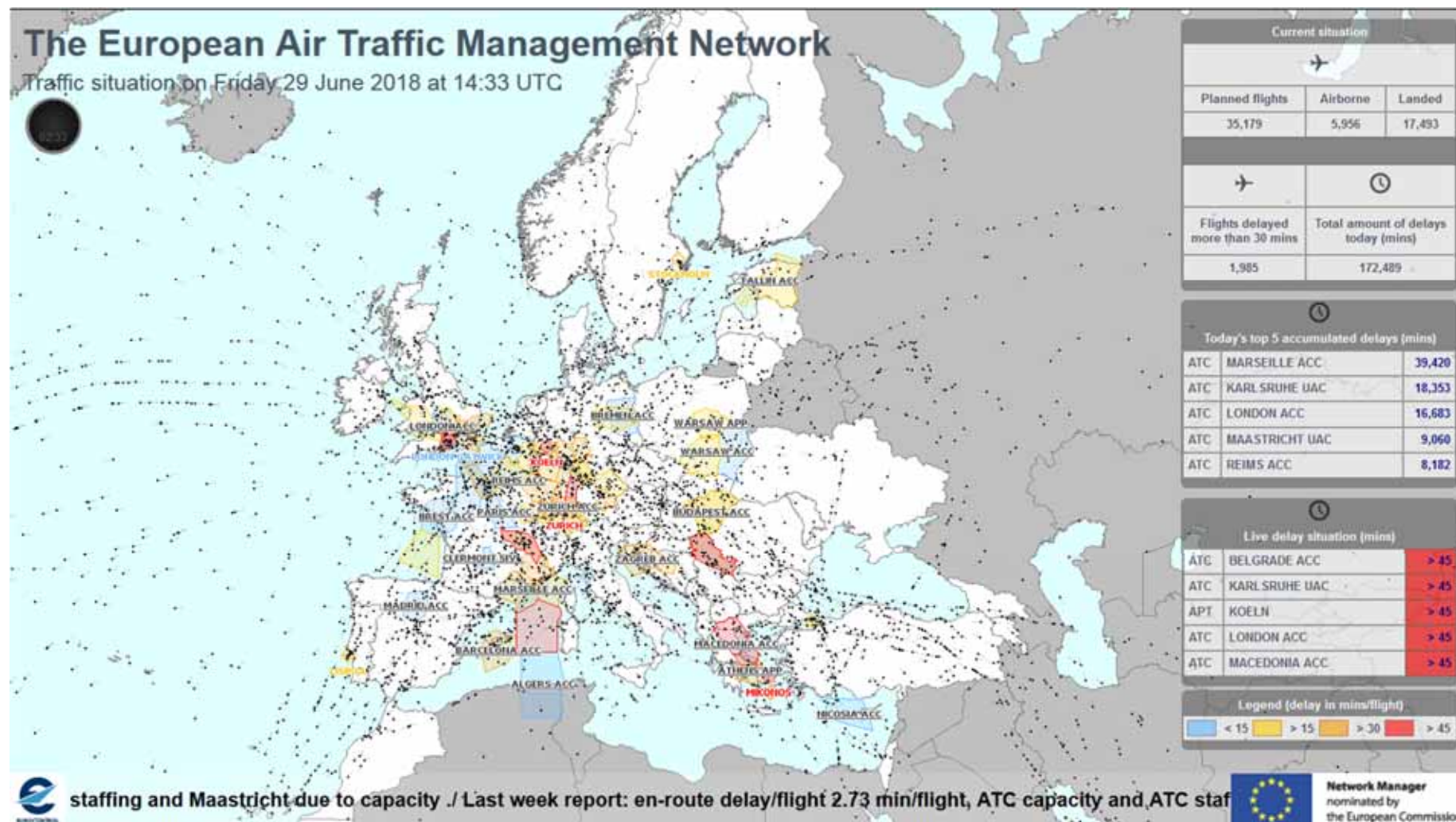
Joe Sultana

Director, European Network Manager

Sunday, June 17th 11.00 UTC



Friday, June 29th 14.30 UTC

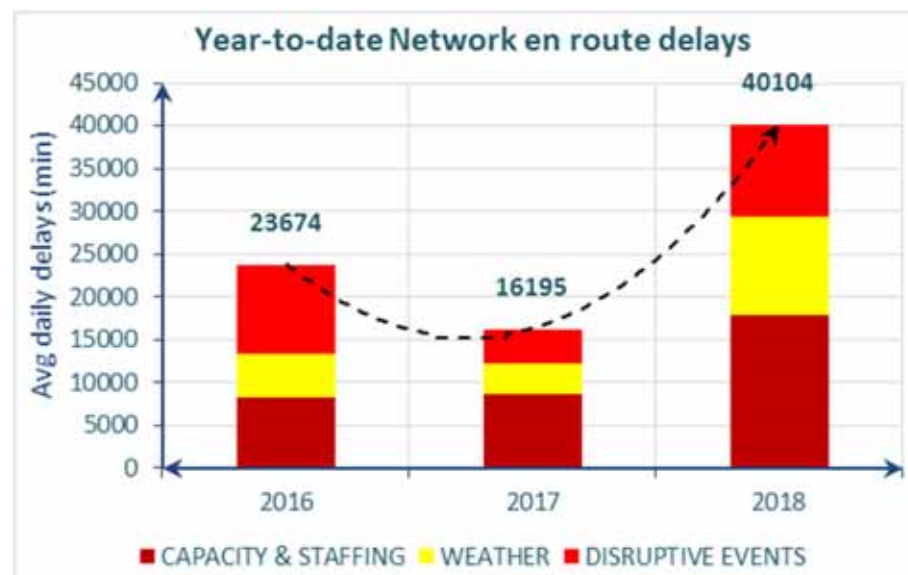


2018 – weather, strikes, capacity/staffing

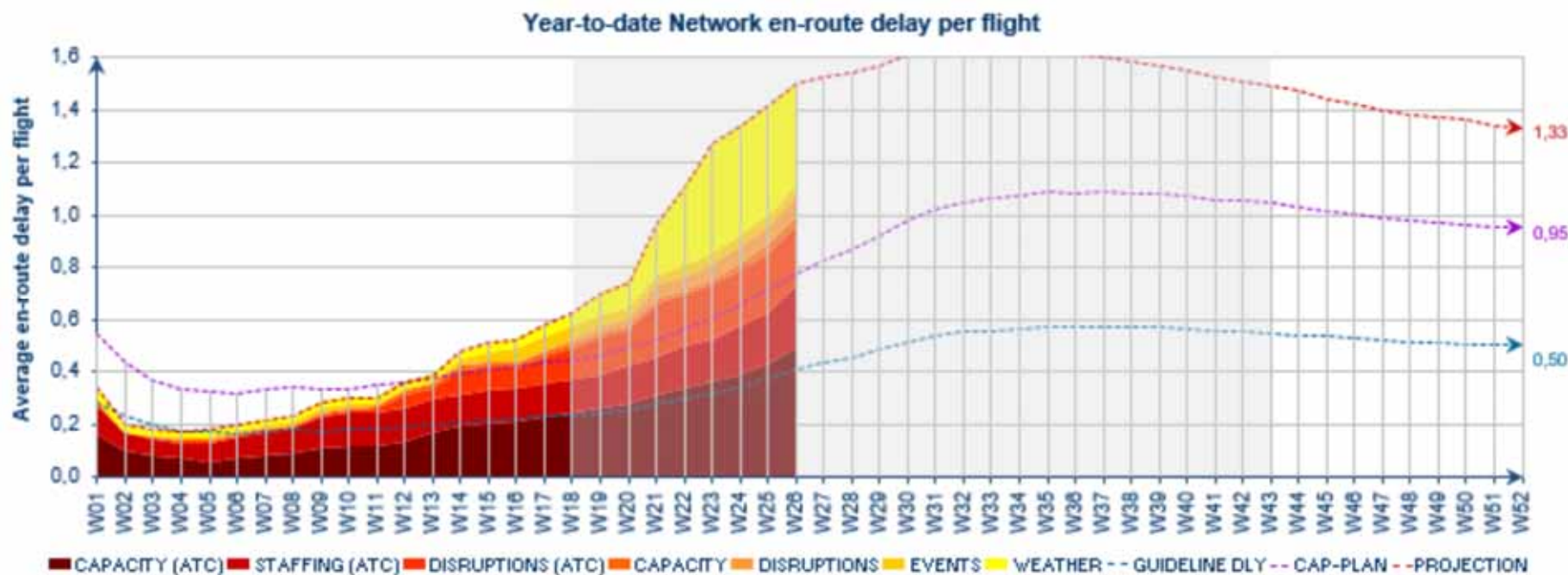
**Traffic increase
+3.8%**



**En-route delay
1.41 min/ft**



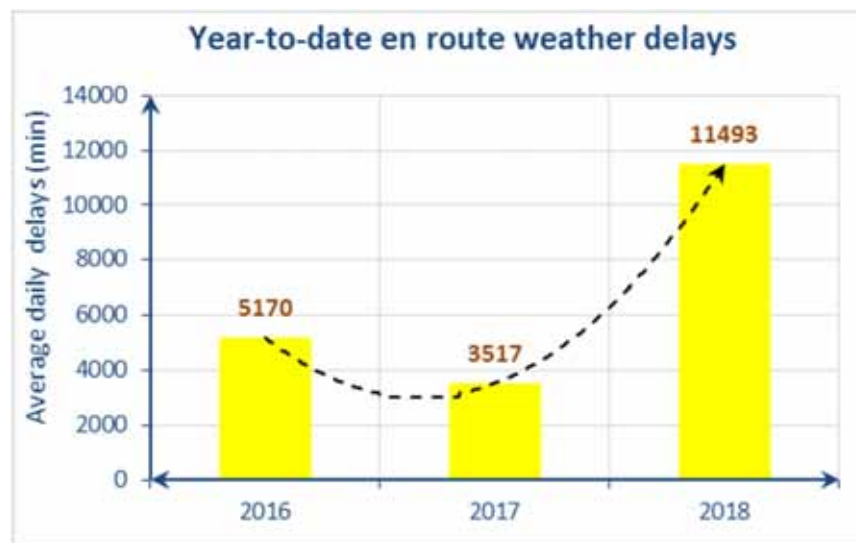
Heading for an average delay of 1.35 min/flight



(assuming statistical wx and no further strikes)

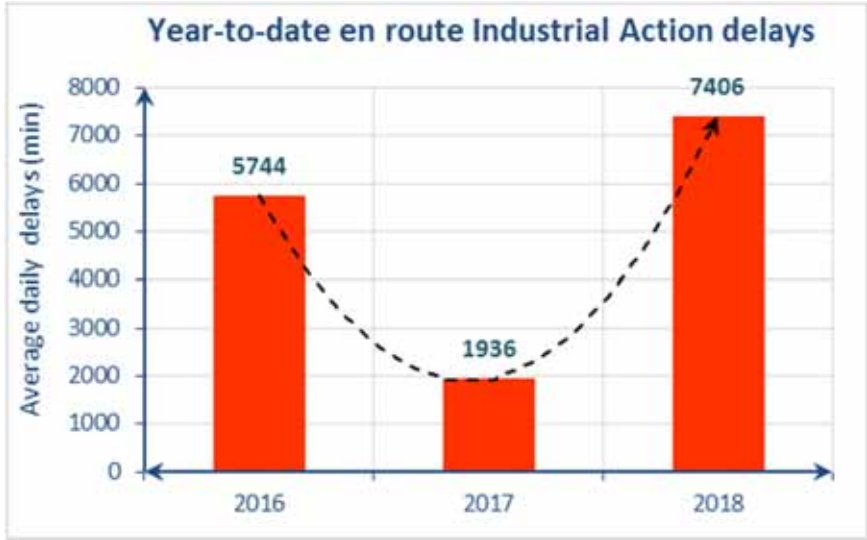
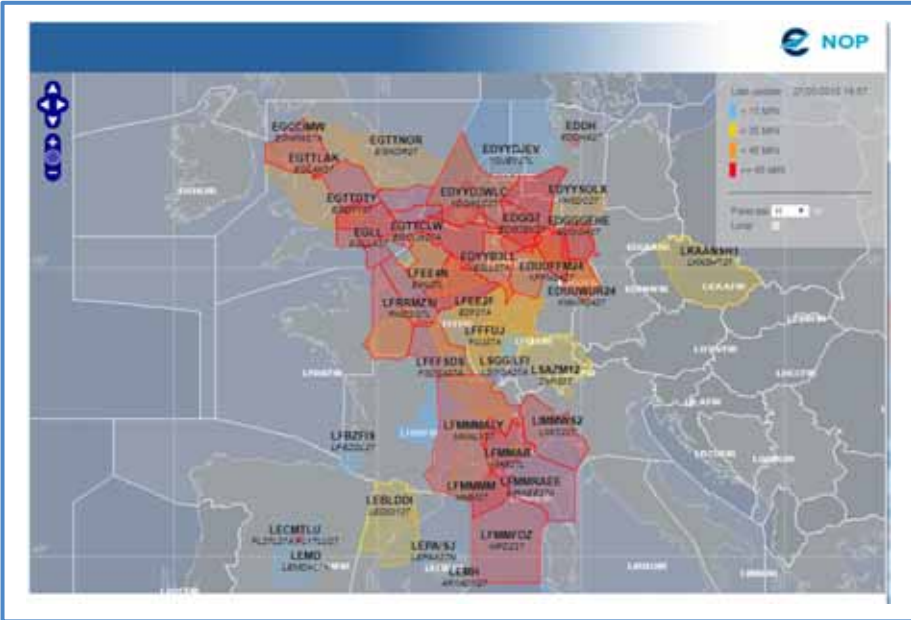
**Weather delays –
huge increase!**

**NM Weather Forum –
mitigation**



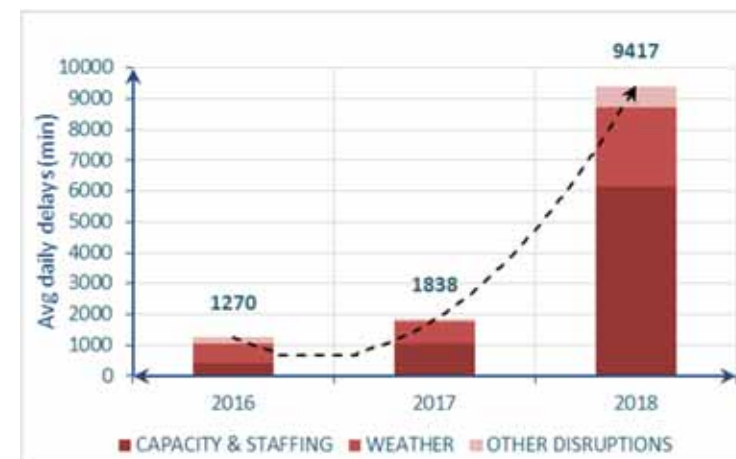
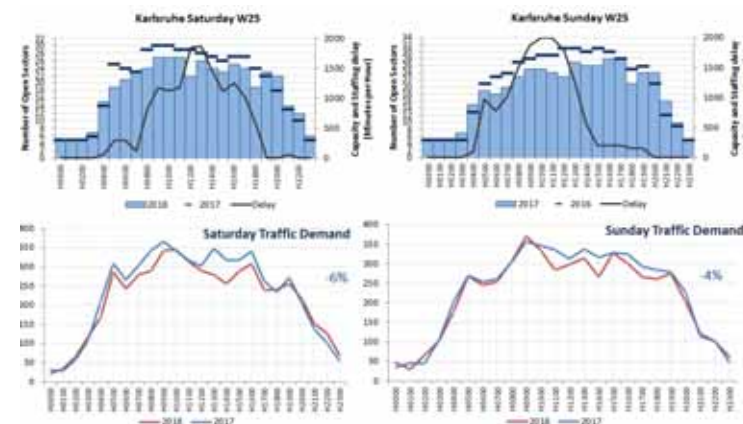
**Industrial actions –
often on weekends**

**NM – leading coordination
of mitigations**



Capacity and staffing

NM 4ACC initiative



End May/Beginning of June 2018



**En route delay
over 3 million minutes**

**Sub-regional approach based on flows and operational needs –
NM/4ACCs + 11 other ANSPs**

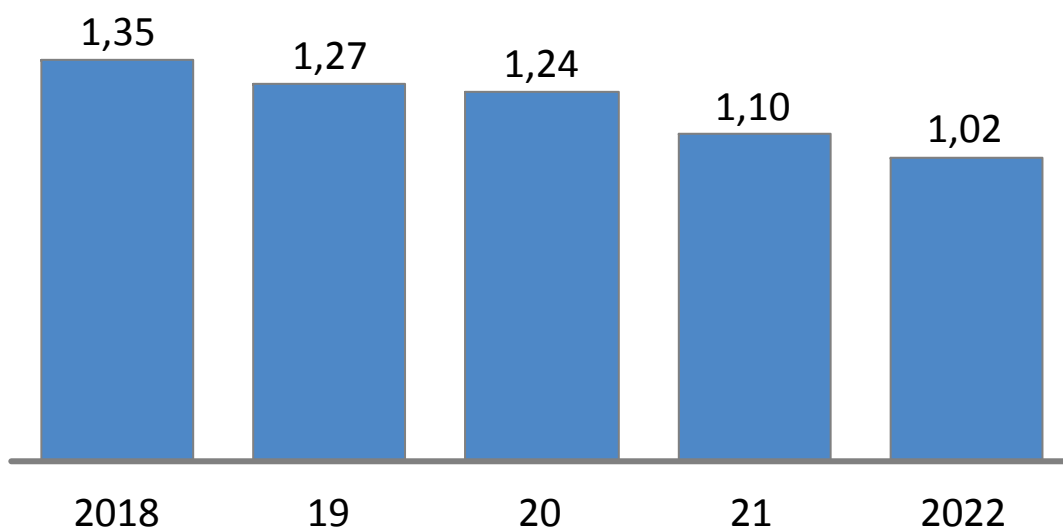
**3 reasons for delays combined –
no mitigation possible for capacity**

2018-2022 Updated Outlook



En-route AFTM delay forecast

Delays in minutes



Traffic growth assumption: baseline growth scenario of **2.4% average yearly growth** 2017-2022

Risks

- Industrial actions
- Weather
- Staffing
- Structural capacity problems

2025-2030-2035 Updated Outlook Assumptions



High traffic growth scenario

- Approximately **3% yearly** traffic growth

Capacity increase

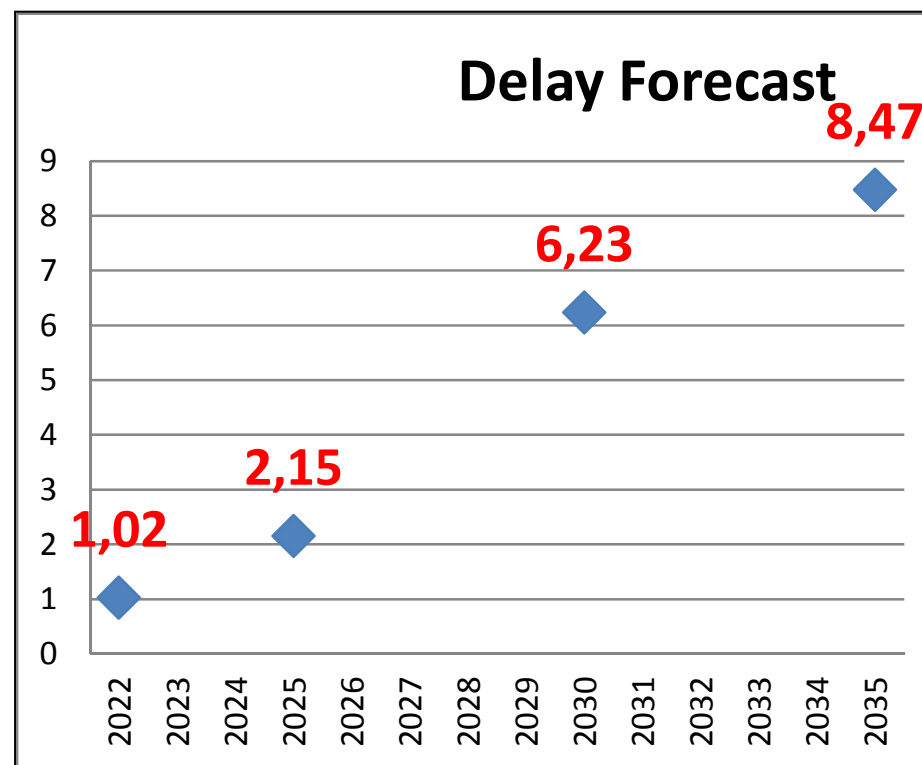
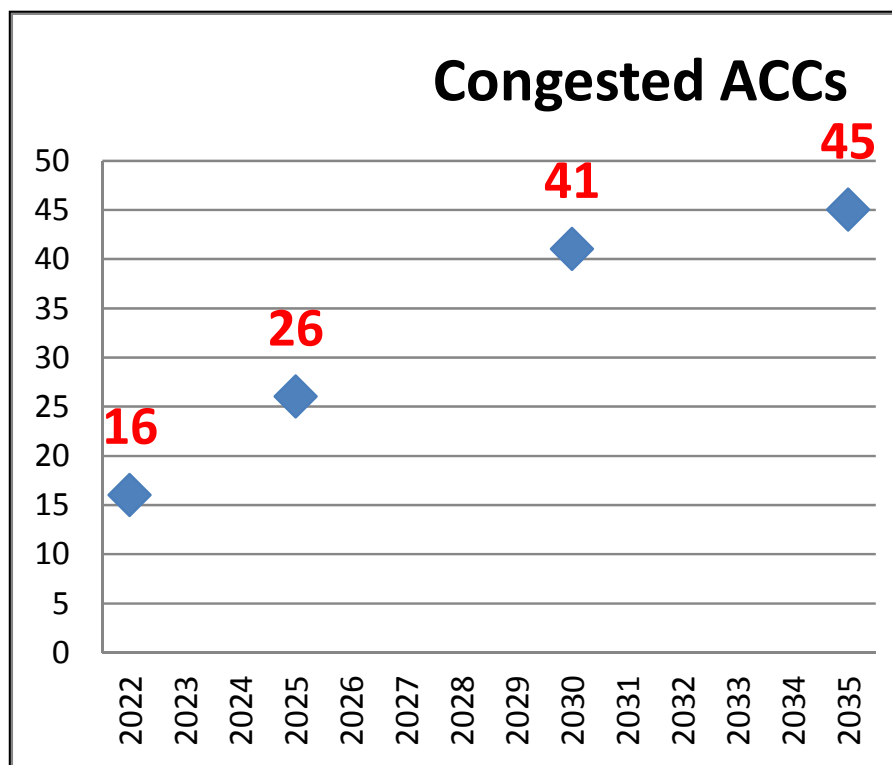
- **2%** per year for congested ACCs
- **3%** per year for less congested ACCs
- Based on **20 years average capacity growth**

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

Preliminary results under best performance ACC assumptions

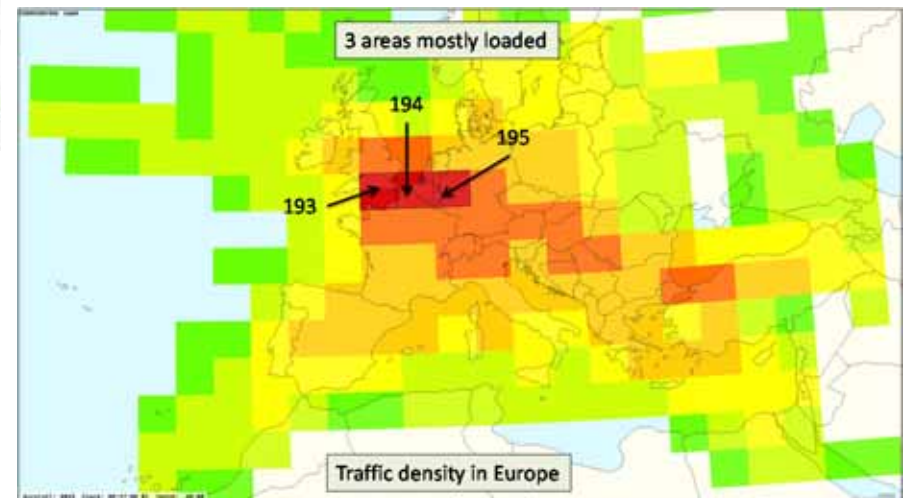
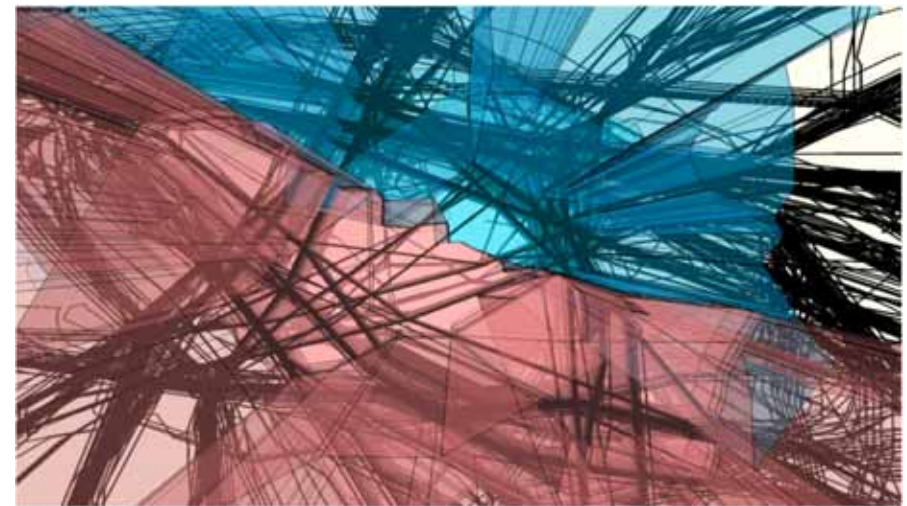
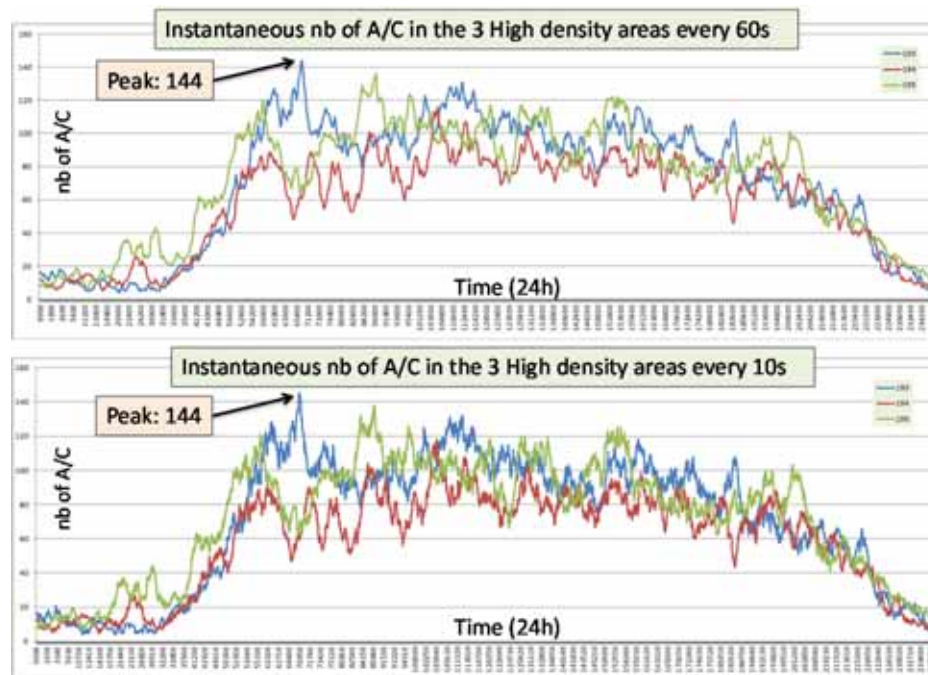


—◆— Congested ACCs

—◆— Delay Forecast

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

Significantly Congested Areas 2024-2025: Traffic Above FL 285



Conclusions



- **3% traffic growth** increase as from 2022 onwards
- High traffic growth **scenario similar to baseline** today
- **Current delays** already high
- **Outlook 2025-2035 worsening** to unsustainable delays
- Assuming that staff shortages are resolved:
 - **20% of flights** delayed by 30 minutes in **2030**
 - **30% of flights** delayed by 30 minutes in **2035**
- Traffic growth, density and complexity **cannot be managed safely anymore** with the current approach
- Need a **game changer**

Our approach for the study

Florian Guillermet

Executive Director, SESAR JU

Outline of the study



- Develop a **proposal for the future architecture** of the European airspace at horizon 2035 and the **main steps to achieve it**

- **Support the development of the SES vision** towards 2035
- Provide high-level requirements for the intended **airspace organisation** and design as well as for the **efficient service provision architecture and enabling infrastructure**
- Leverage technologies and concepts included in the **European ATM Master Plan**
- Develop recommendations for **possible implementation plans** and conditions for success
- Respond to the aviation community, in particular **airspace users' needs**

- **En-route airspace** with appropriate connections to the TMA
- **ECAC region**

High-level approach for the Airspace Architecture Study

The airspace study focuses on...

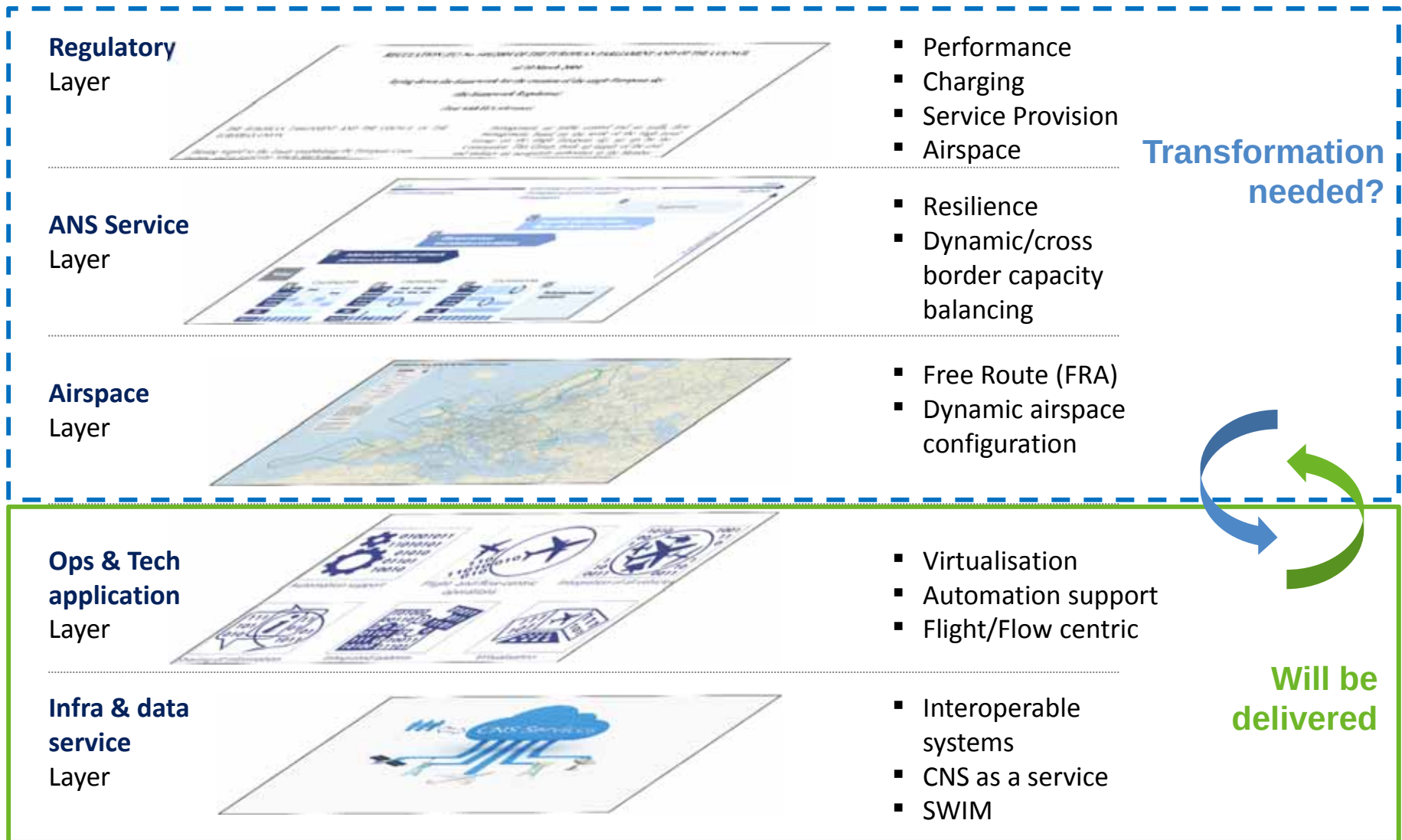
- Developing a **proposal** for the **future architecture** of the European airspace **at horizon 2035** and the main **steps** needed to achieve it
- Developing a **high-level plan to meet the looming capacity challenge**
- Further supporting the **realisation of the SES goals and the Master Plan**

... and is not about

- Another **cost cutting** study
- **Drafting regulations**
- A new **Master Plan**



Layered approach



High-level approach for the Airspace Architecture Study



Where are we today?

We are at the **early stage of the study** and your feedback is important

We need to generate **a common understanding of the problems** we are trying to solve

We want to discuss some of **the solutions and how they can be architected** to address the issues



Q&A
Any
questions?

Vision for the future & link with the Master Plan

Alain Siebert

Chief Economics and Master Plan, SESAR JU

The sector faces challenges on a number of fronts, our focus will be on capacity

Challenges	Sub-dimensions
 Capacity	▪ Increase capacity offered in response to expected long term increase in demand ▪ Improve scalability to adapt to unexpected changes in demand ▪ Optimise capacity utilisation
 Economic efficiency	▪ Cost efficiency ▪ Cost savings related to flight efficiency
 Quality of service	▪ Service resilience and cybersecurity ▪ Service harmonisation across EU
 Environment	▪ Carbon reduction thanks to increased flight efficiency, contributing to carbon reduction commitments

Challenges ahead driven by multiple underlying factors

**Insufficient
ability to scale
up capacity to
demand**

**Limited
interoperability,
connectivity and
data sharing to
optimise
trajectories**

**Slow uptake of
new
technologies**

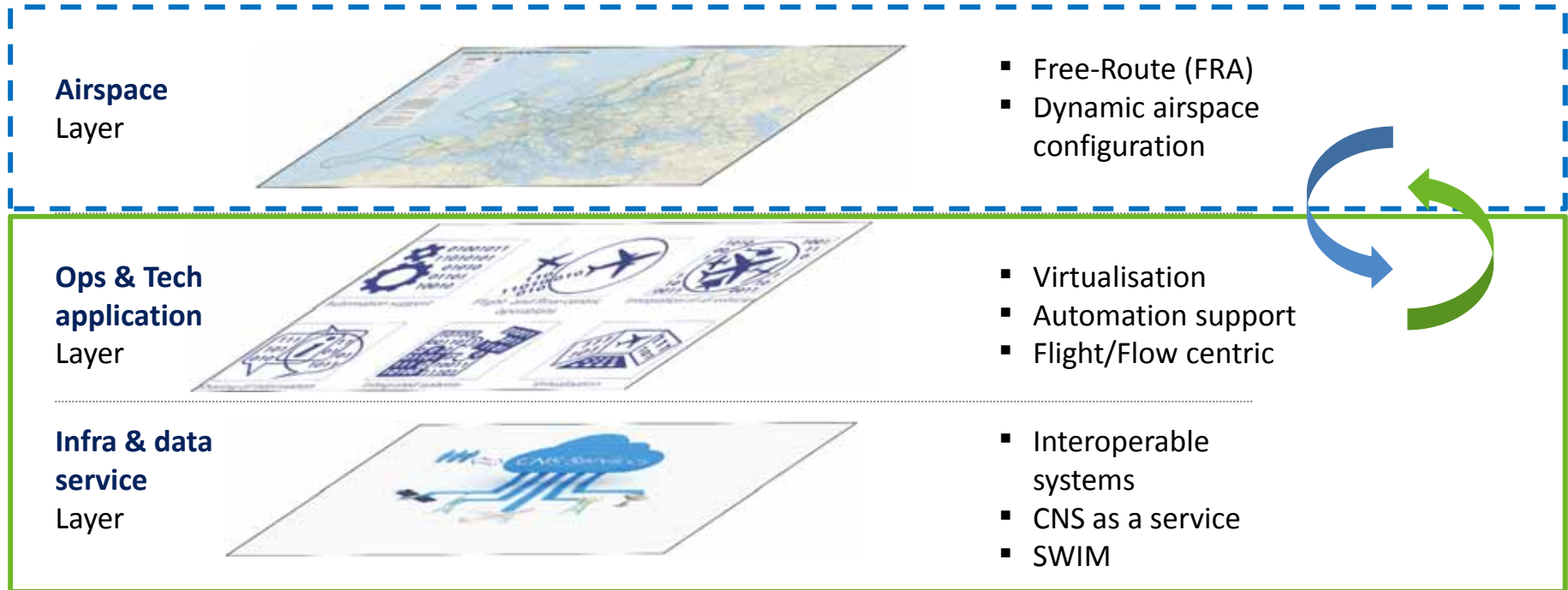
**Limited
flexibility in
managing
resources**

**Insufficient
resilience in the
system to
address unusual
situations**

The Airspace Architecture study aims to achieve the spirit of the Single European Sky

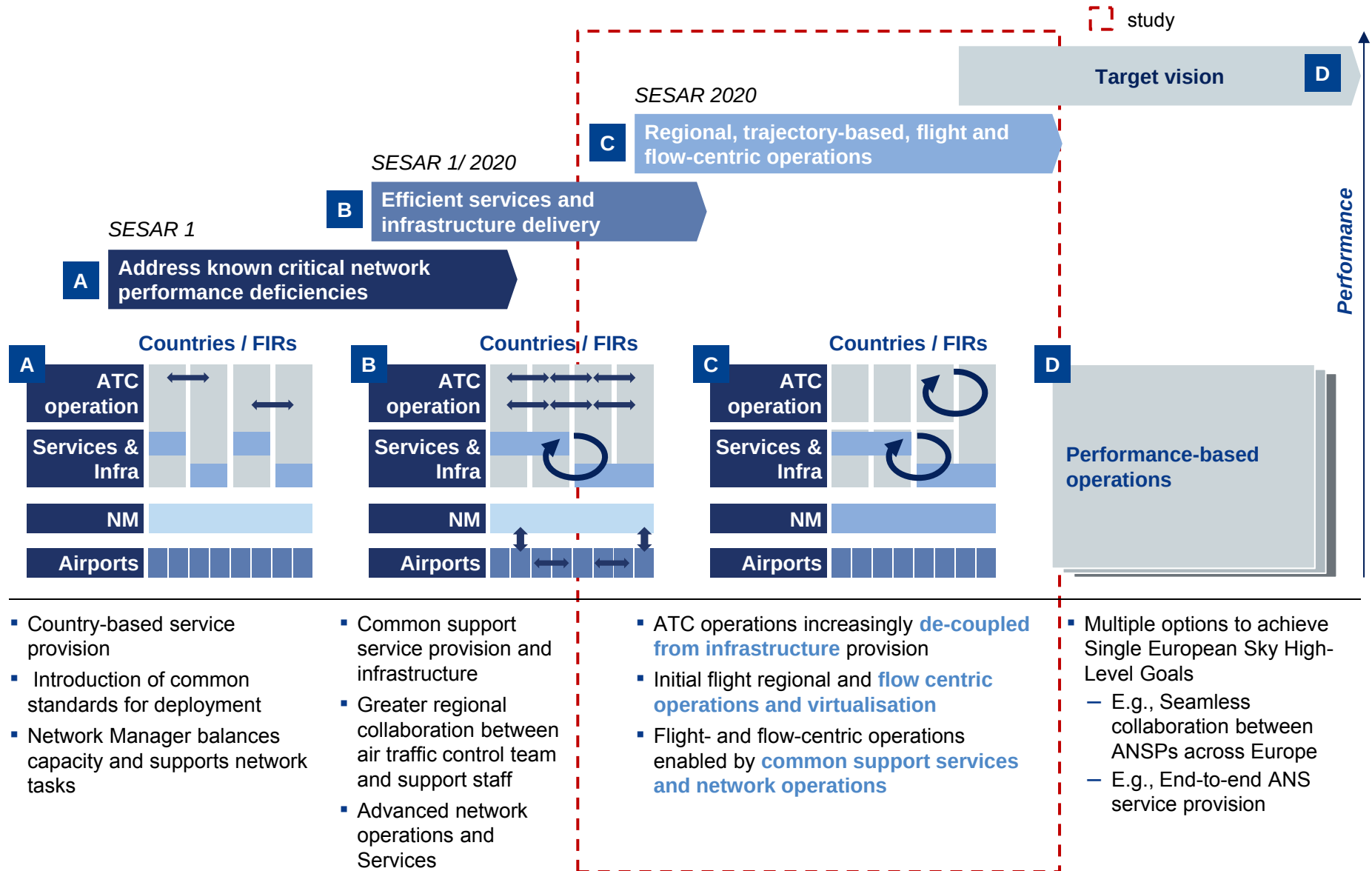


Connecting future airspace configuration with SESAR Solutions



Regulatory and service delivery implications are not the focus of this workshop

Fully consistent with the Master Plan phases



The main operational and technical building blocks of our vision

Vision topics



Vision building blocks



PAN ECAC Free Route airspace to fly optimal route throughout ECAC



Optimised airspace configuration to support increasing traffic



Transformation to flight/flow centric operations to address the scalability limits of sectors



Virtual centres geographically decoupling ATM Service from Air Traffic Service Units (ATSUs)



Dynamic airspace configurations (DAC) allowing network to continuously adapt to demand pattern changes



Trajectory based operations allowing collaborative decision-making



New ways of working, leveraging fully connected systems and advanced HMI



CNS data as a service supporting harmonised quality and availability



Seamless data exchange (SWIM, IOP) across stakeholders to support new concept of operations



Discussion with the audience

Moderated by Michael Standar

Chief Strategy and External Affairs, SESAR JU

Time for lunch!

Options for future airspace design

Razvan Bucuroiu

*Network Manager Directorate, Head of Network Strategy and Development Division,
Acting Head of Operations Planning Unit, EUROCONTROL*



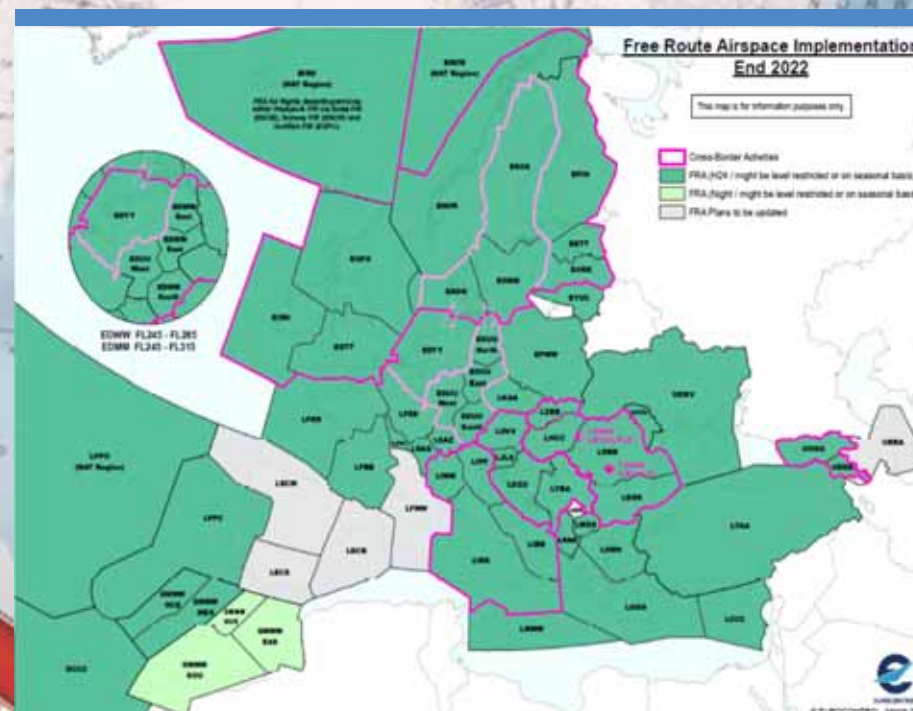
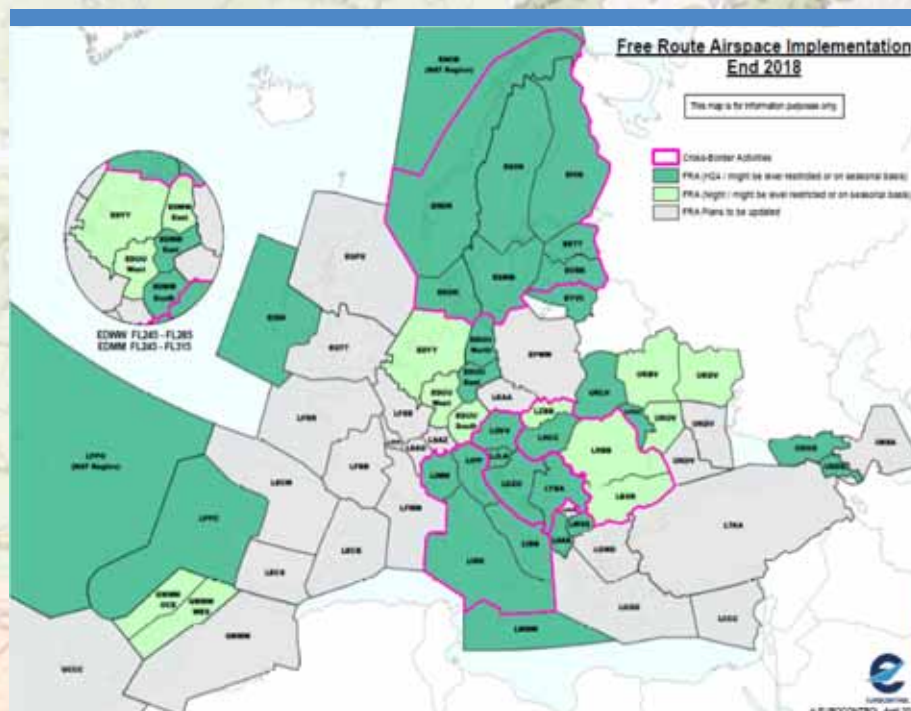
Design of an European airspace structure based on agreed Airspace Design Principles

- 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



- 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

Cross border FRA Implementation



Achievement of a consistent FRA cross-border implementation

- In process of being achieved

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

Cross border FRA Implementation - Further Assumptions



Achievement of a consistent FRA cross-border implementation during RP3

Areas not having yet a concrete plan:

- Assumption that they will implement down to FL245/TMA level

Other areas as included in the ERNIP

29,000 airspace changes introduced

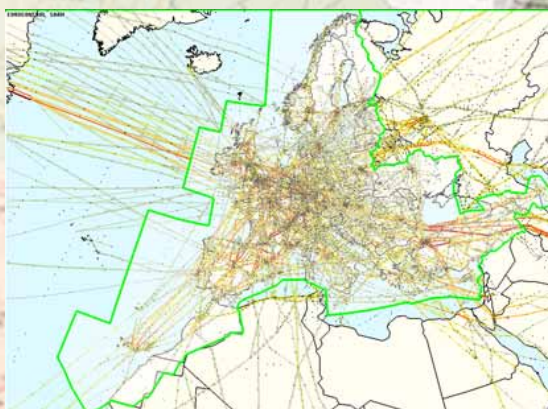
Cross border FRA Implementation

Pan European network

Today

Current route network

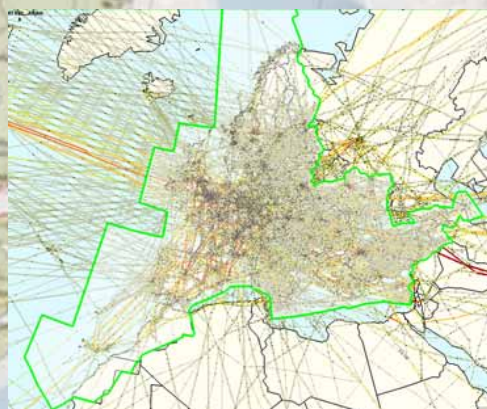
Current traffic flow



RP2

FRA and route network

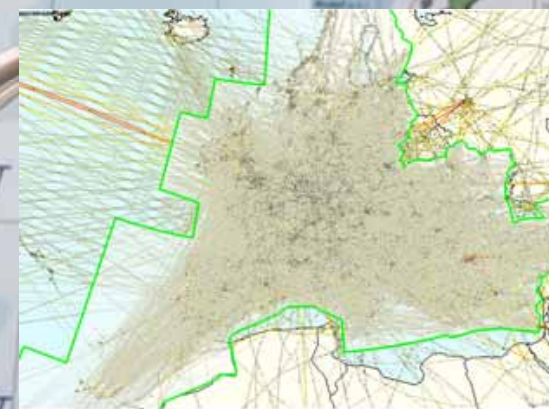
RP2 traffic flow



RP3 - Optimised

Cross boarder FRA

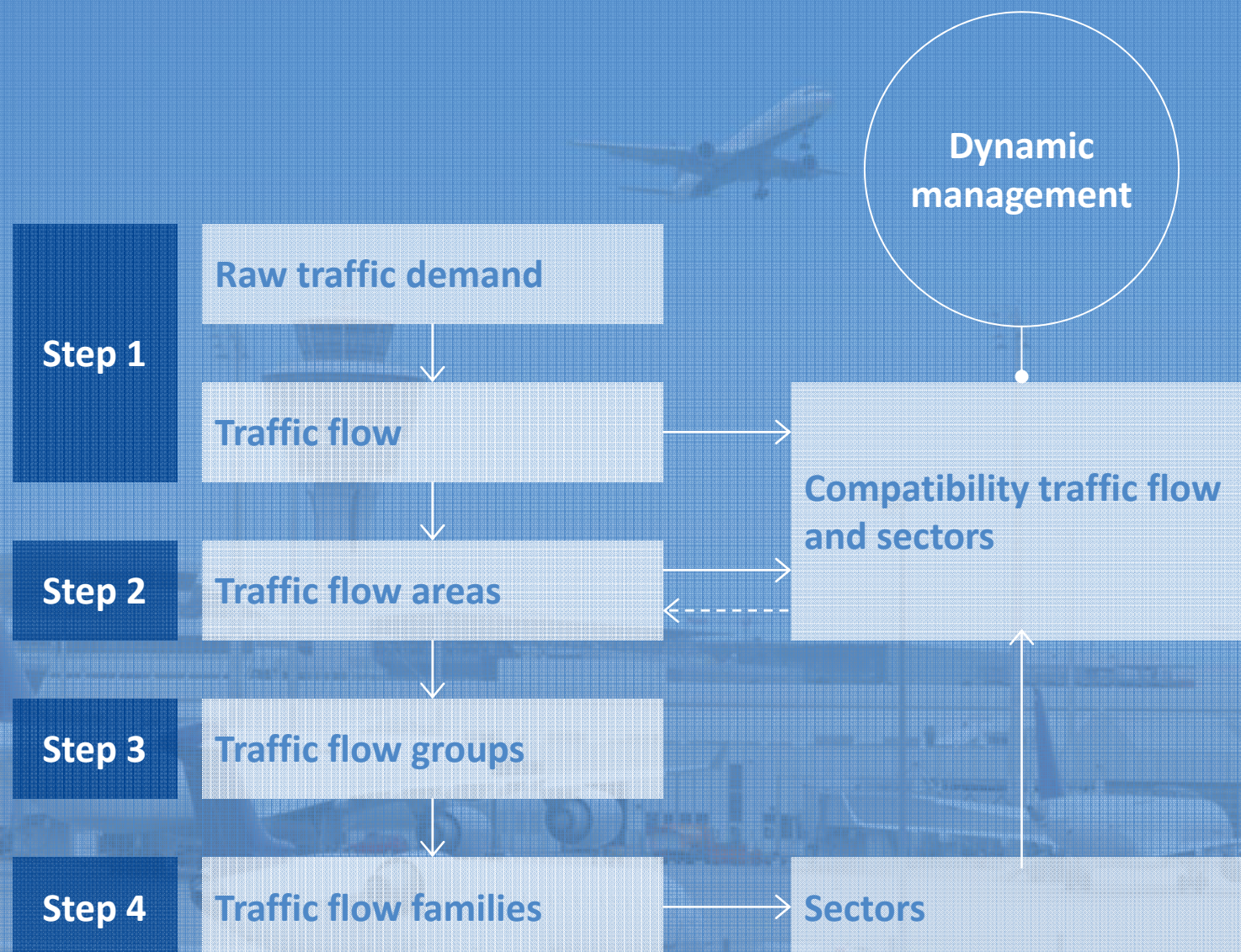
RP3 traffic flow



Trade off between flight
efficiency and network capacity



Building the Airspace Structure Concept



Building the Airspace Structure Concept

List of criteria

Other operational elements

Traffic complexity areas

Traffic demand

1. Traffic flow



2. Traffic flow areas



3. Traffic flow families



4. Traffic flow group



Steps

→ Traffic Flow Area

Airspace volume containing specific traffic flow

→→ Traffic Flow Families

Airspace volume containing specific traffic flow and complex areas which will consist of strongly dependent sectors

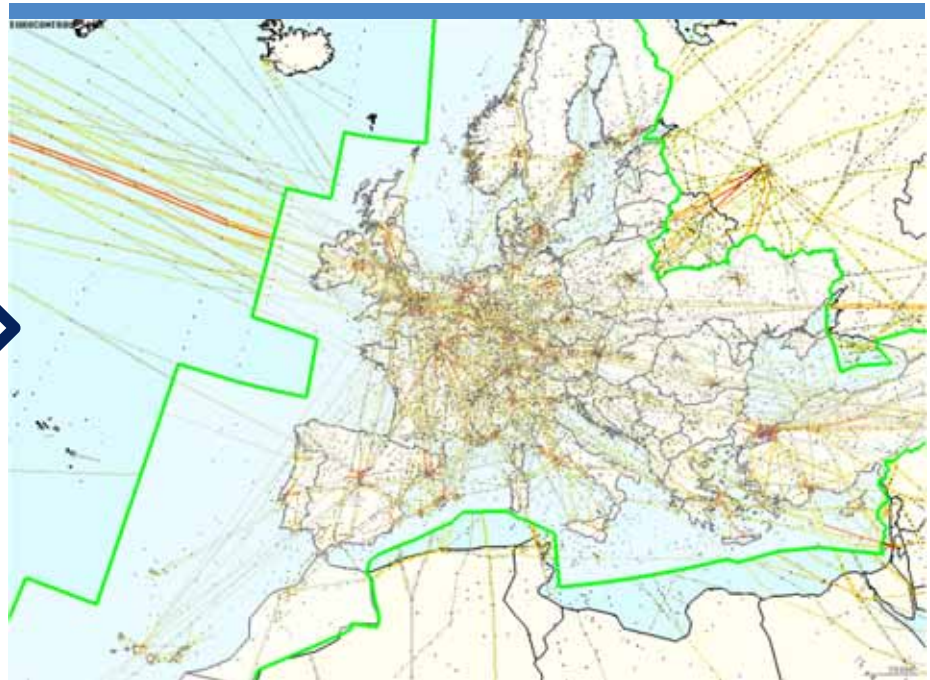
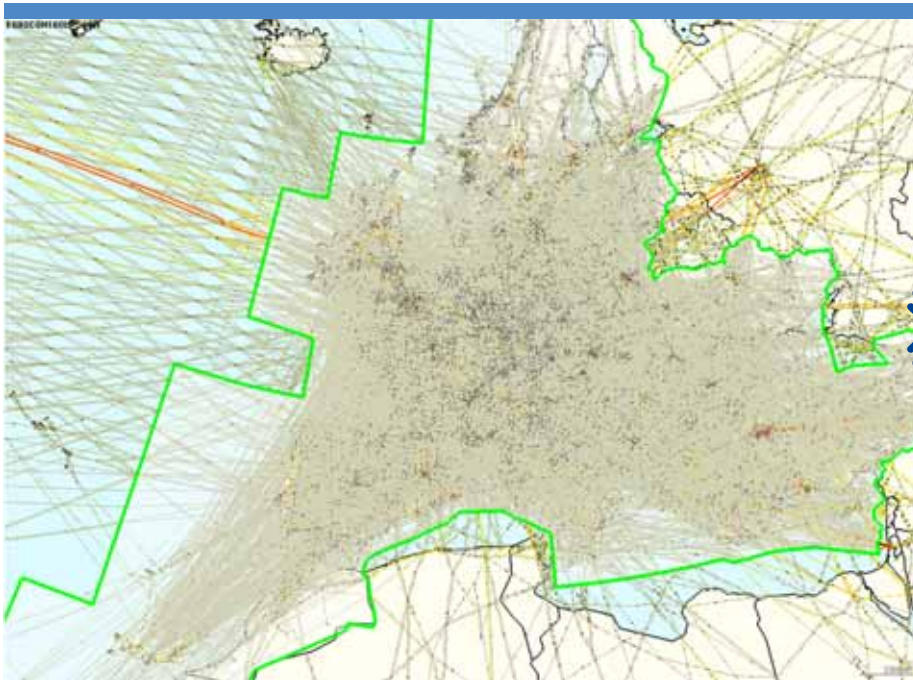
→→→ Traffic Flow Group

Grouping of Traffic Flow Families into large volume of airspace in which we will collaboratively manage operational constraints in a manner that balances operational efficiency

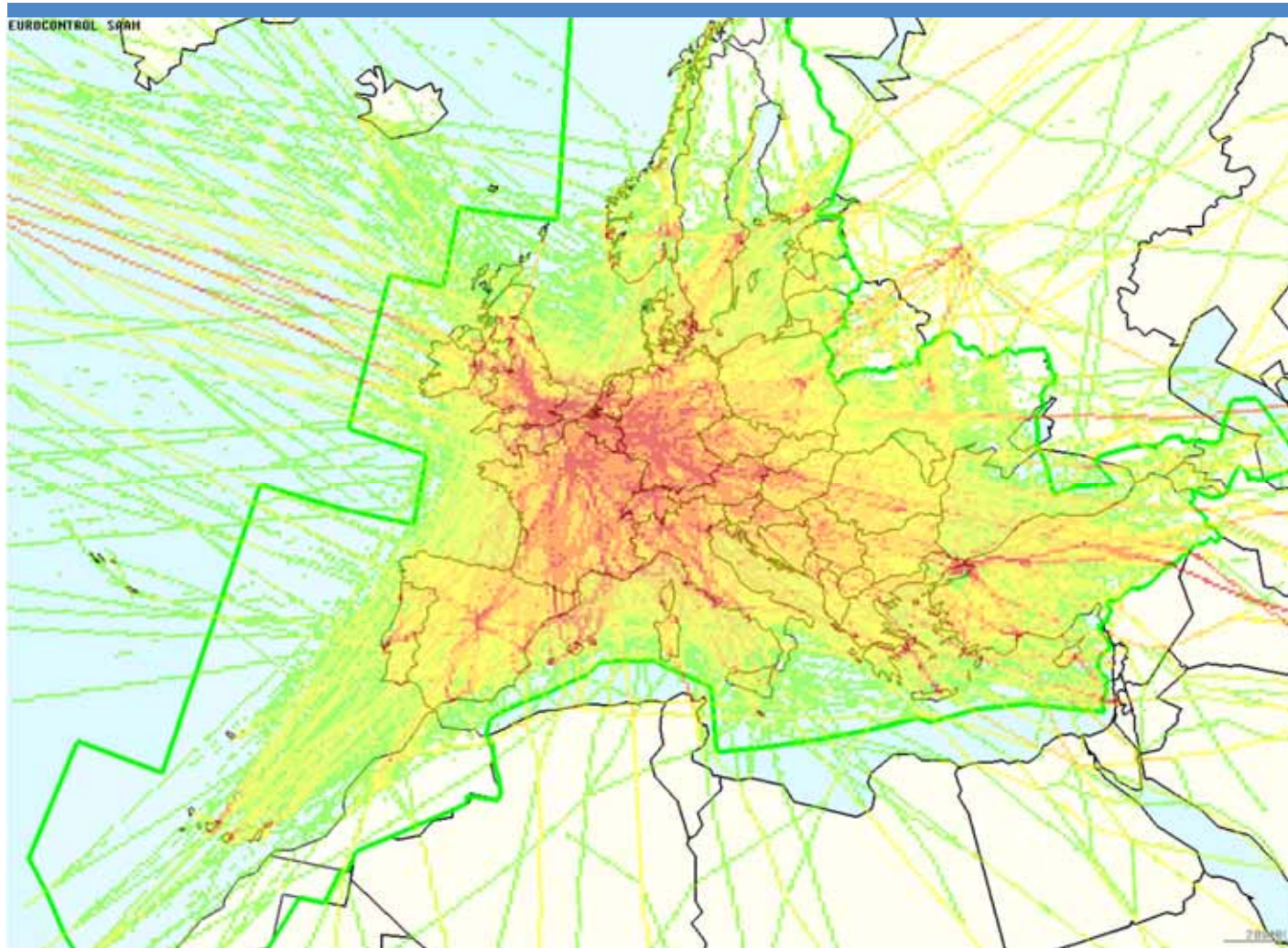
→→→ Sectors

Minimum operational elementary airspace volume

Building the Airspace Structure Traffic Flow Criteria



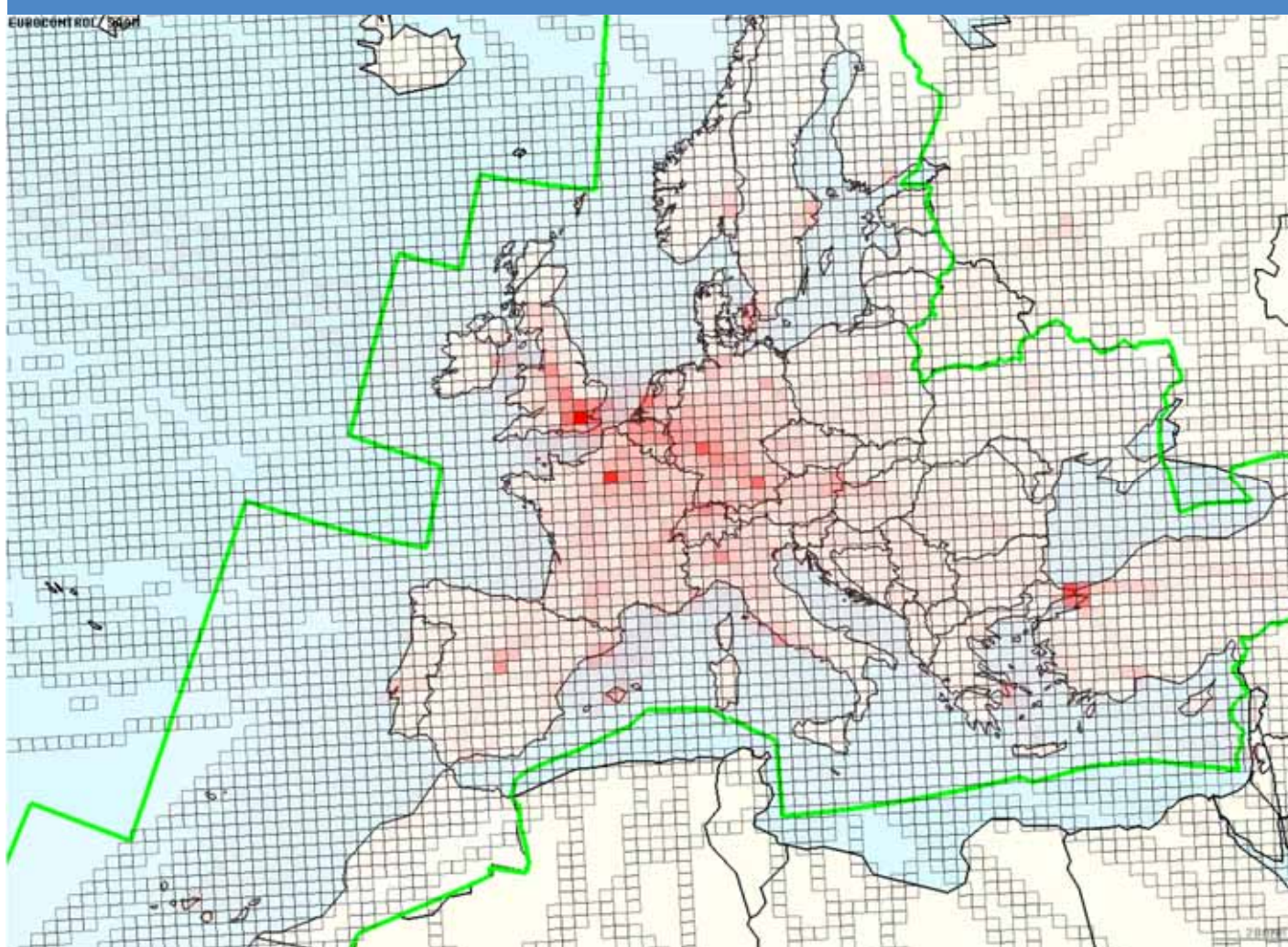
Building the Airspace Structure Density Criteria



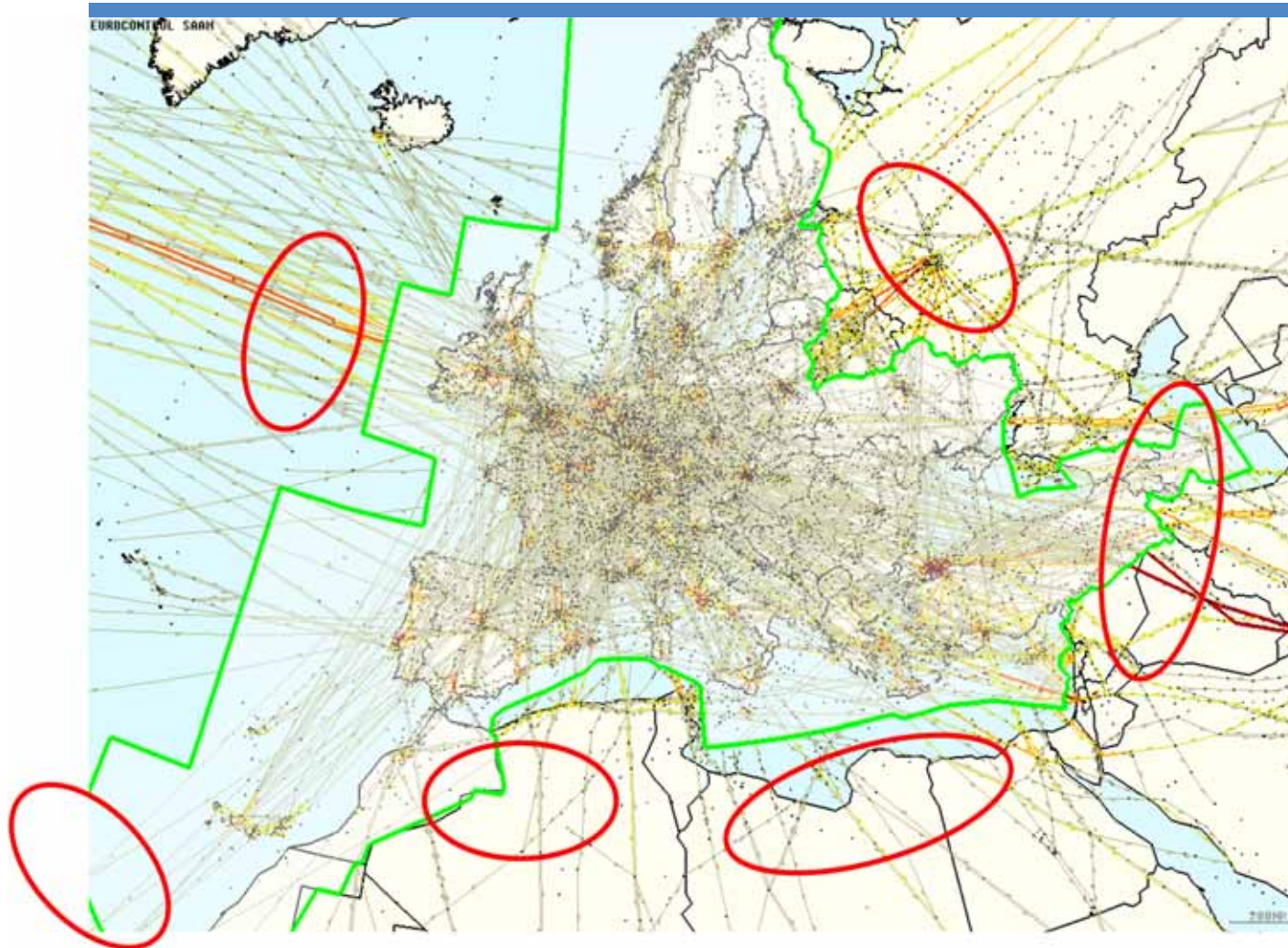
Building the Airspace Structure Conflict Density Criteria



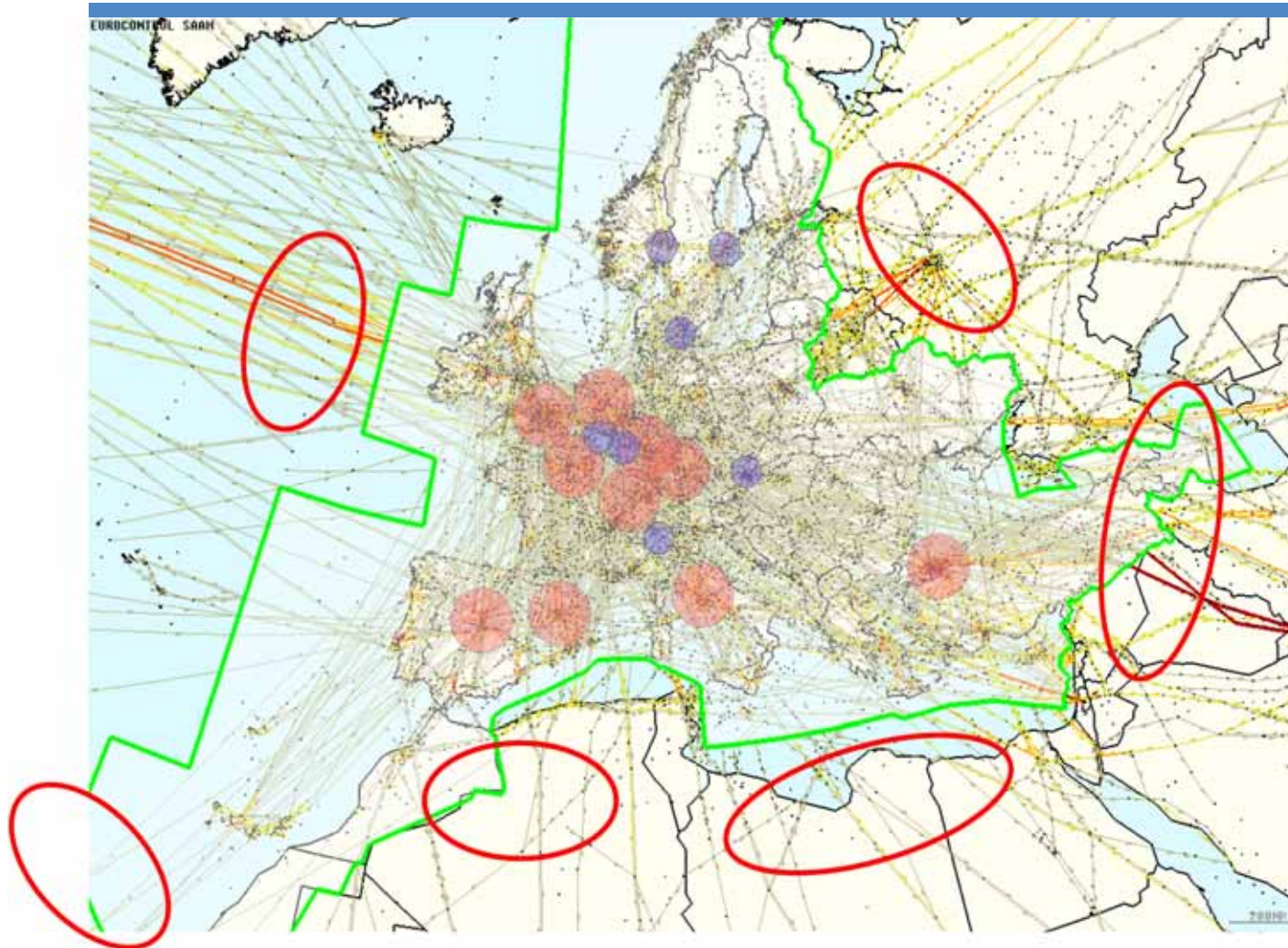
Building the Airspace Structure Complexity Criteria



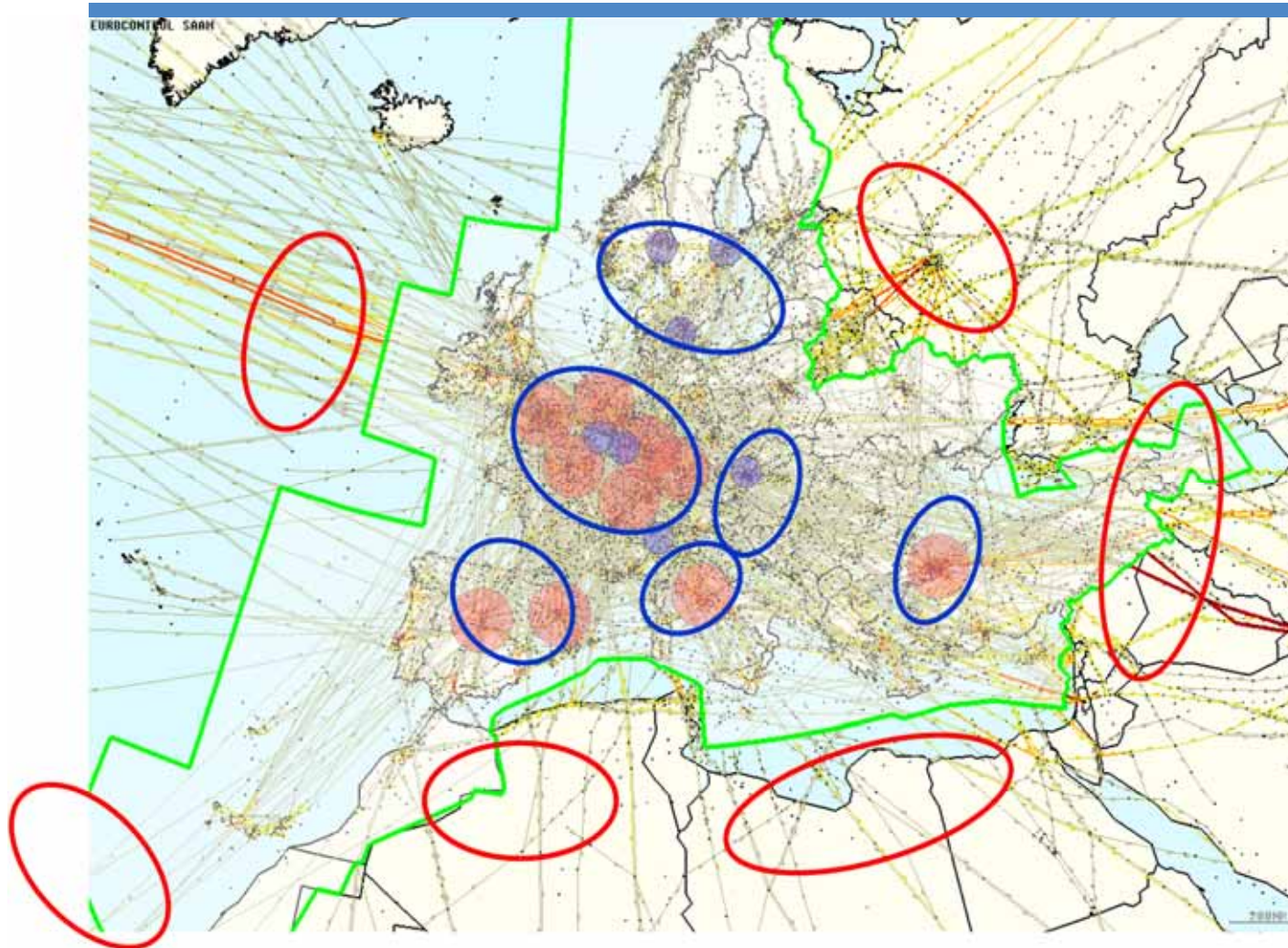
Building the Airspace Structure Main Entry Gates



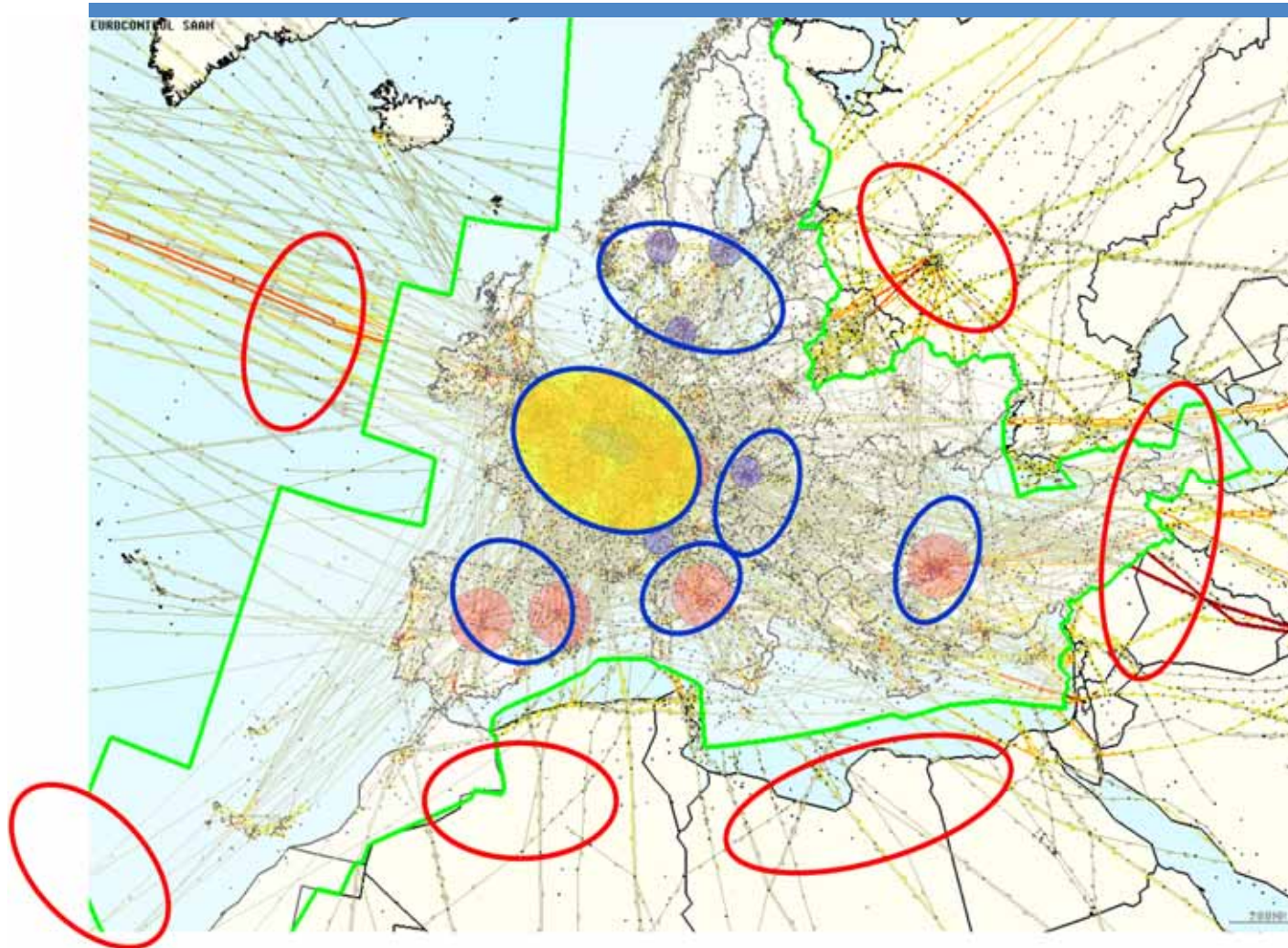
Building the Airspace Structure Main Entry Gates



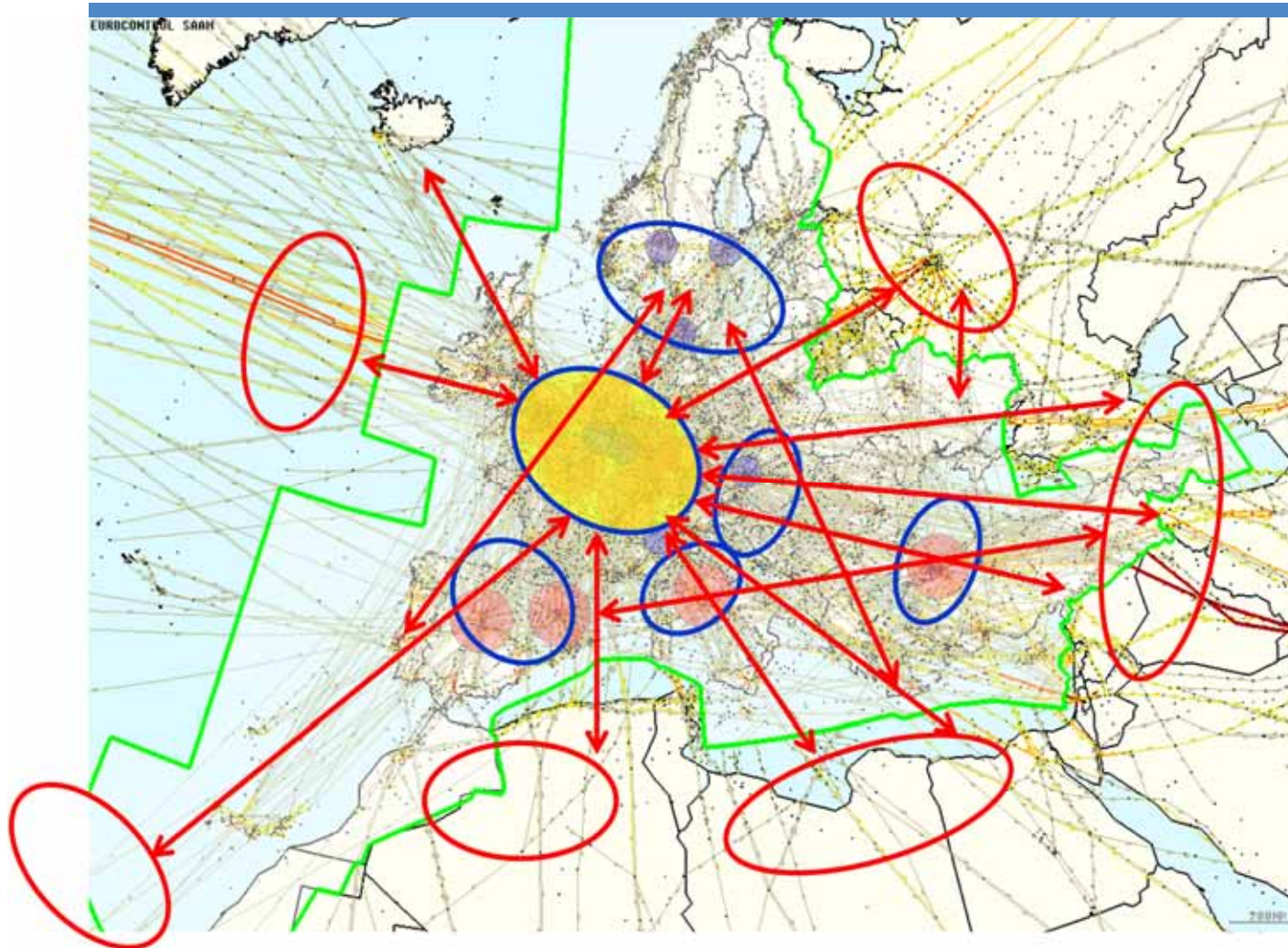
Building the Airspace Structure Main Entry Gates



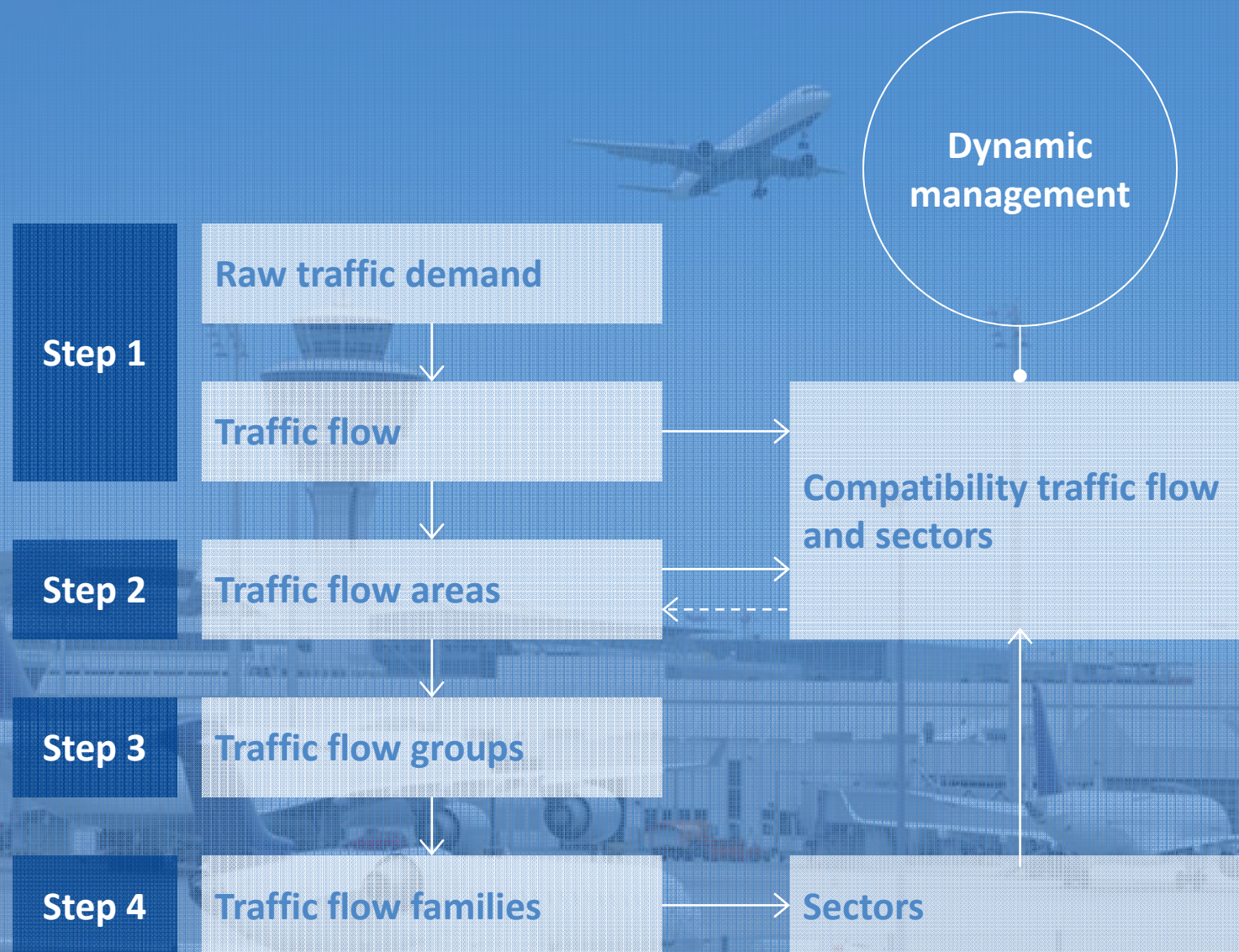
Building the Airspace Structure Main Entry Gates



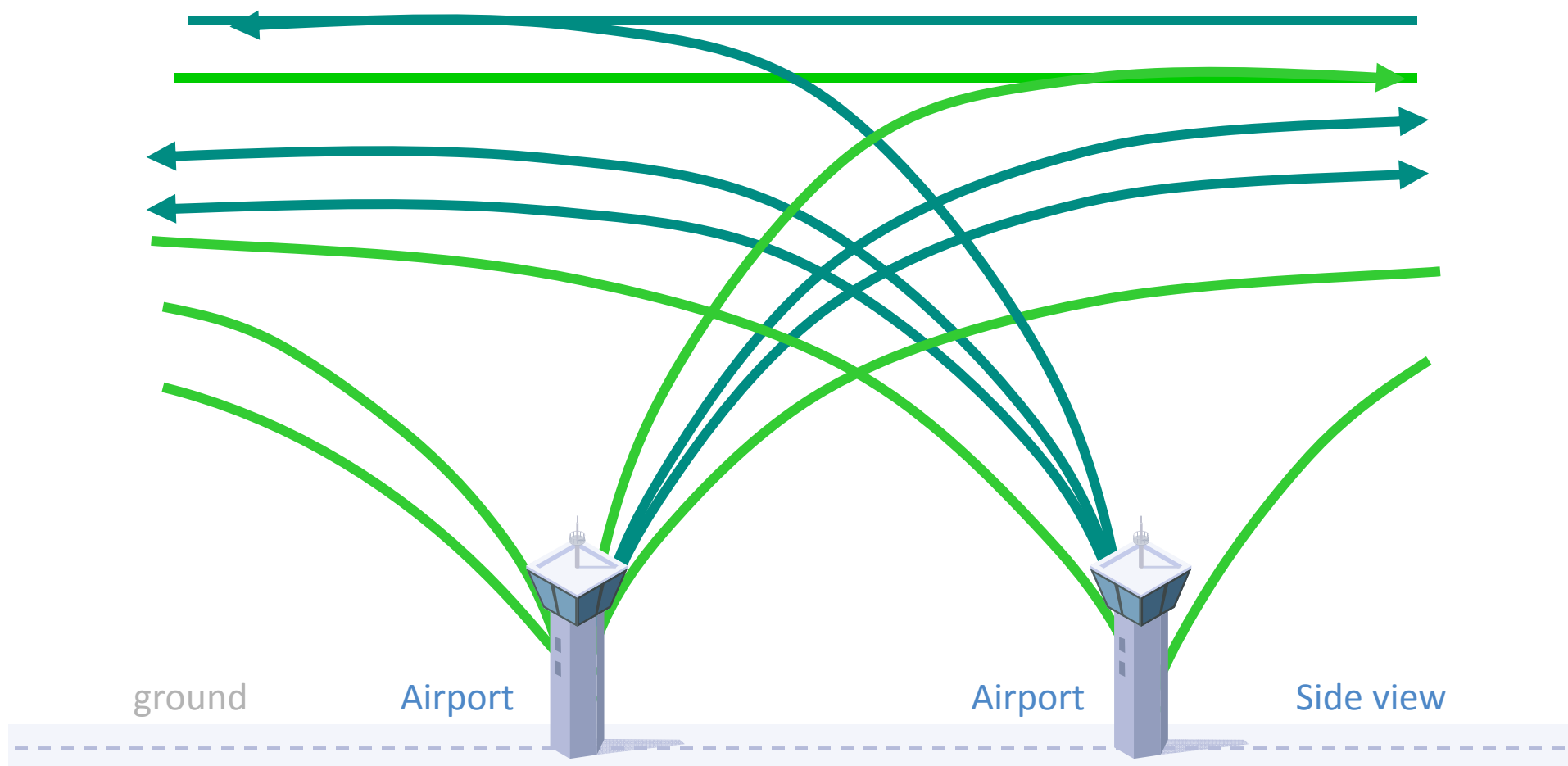
Building the Airspace Structure Main Entry Gates and Traffic Flows



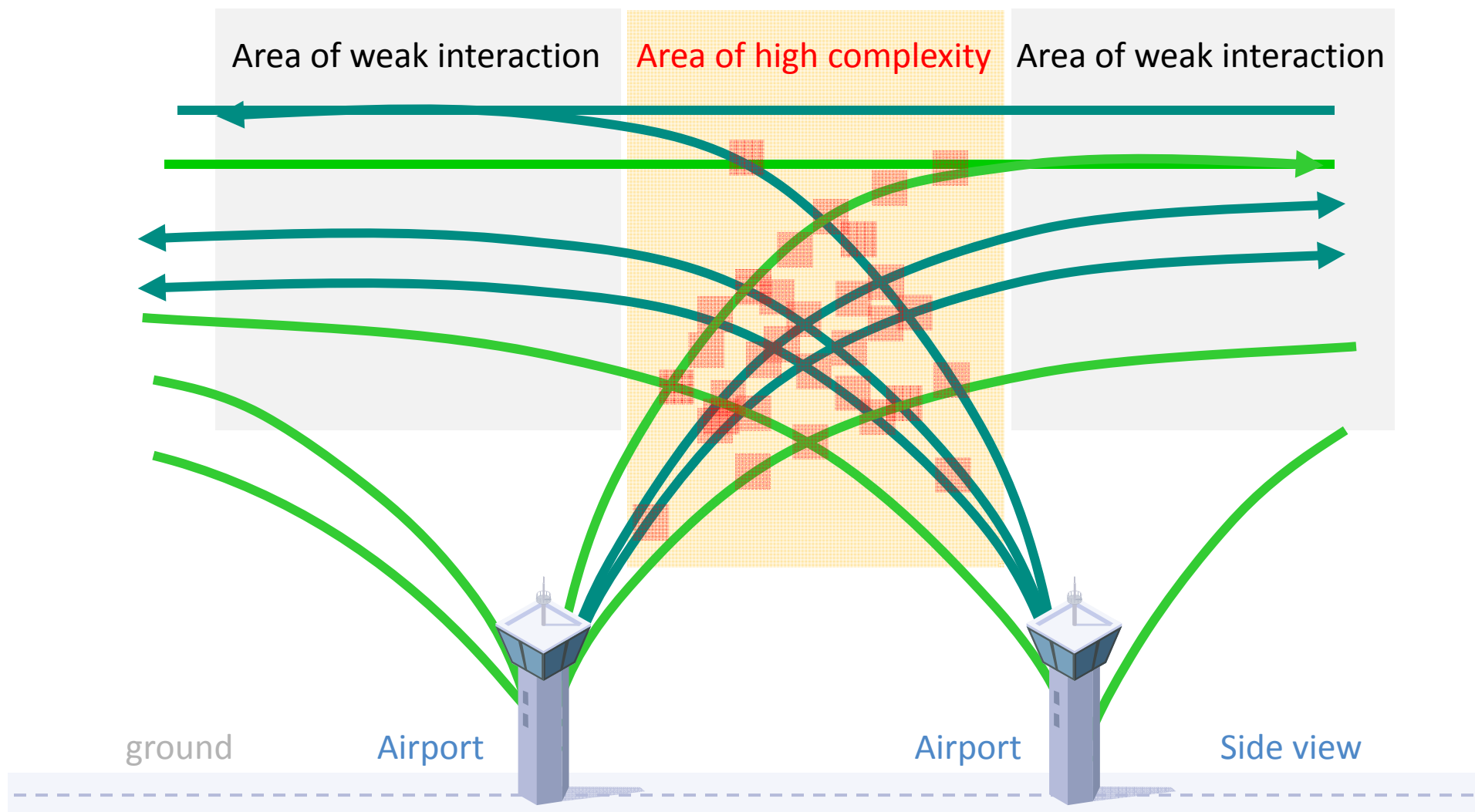
Building the Airspace Structure Concept



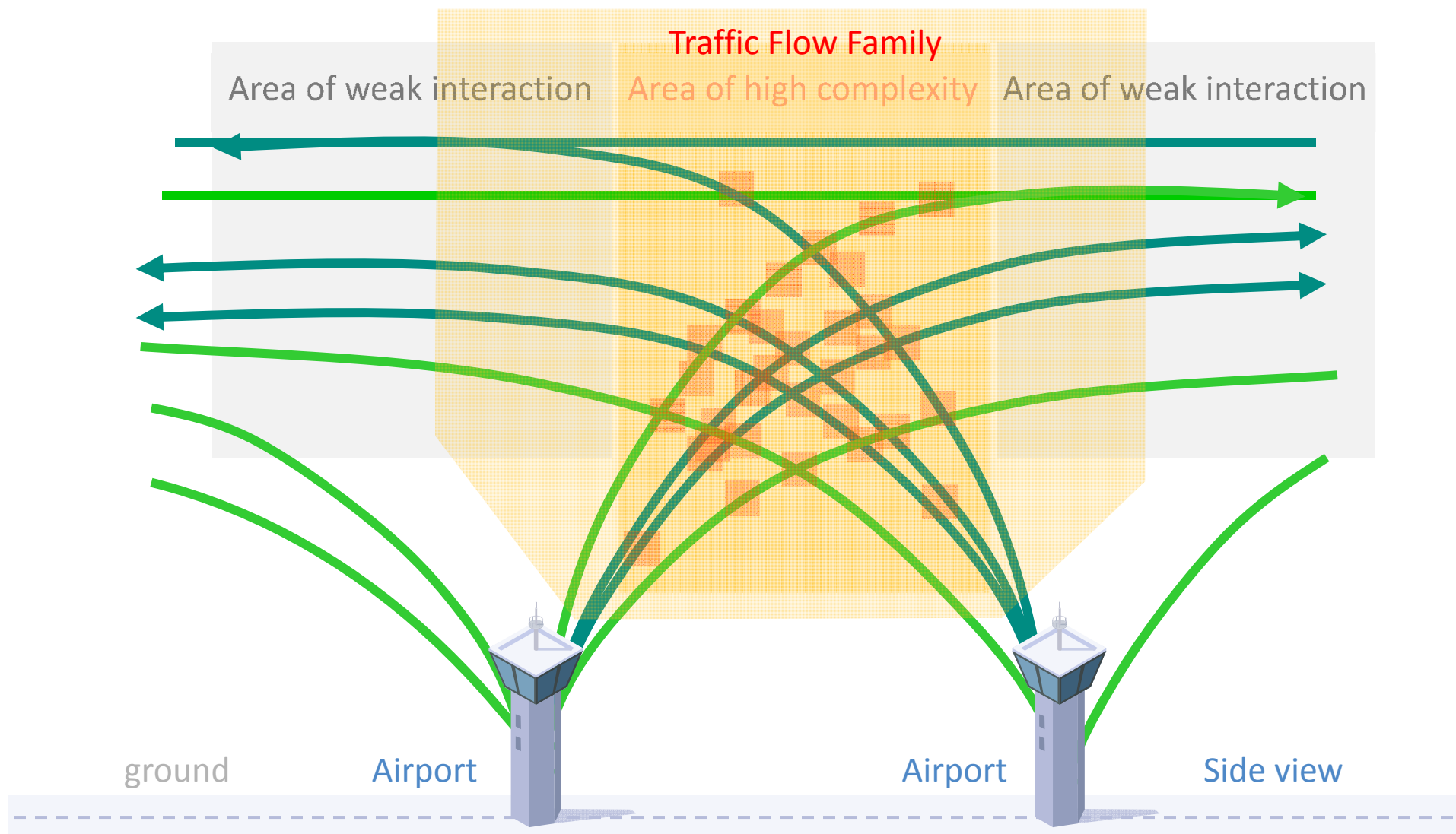
Building the Airspace Structure Traffic Flow Families and Sectors



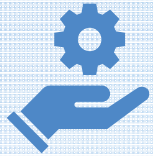
Building the Airspace Structure Traffic Flow Families and Sectors



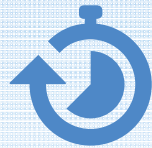
Building the Airspace Structure Traffic Flow Families and Sectors



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



- **Operational benefits**
 - Better use of existing airspace capacity
 - Environment benefits
 - Cost effectiveness
 - Reduced workload
 - Simplified operation
- **Move towards a true harmonisation**



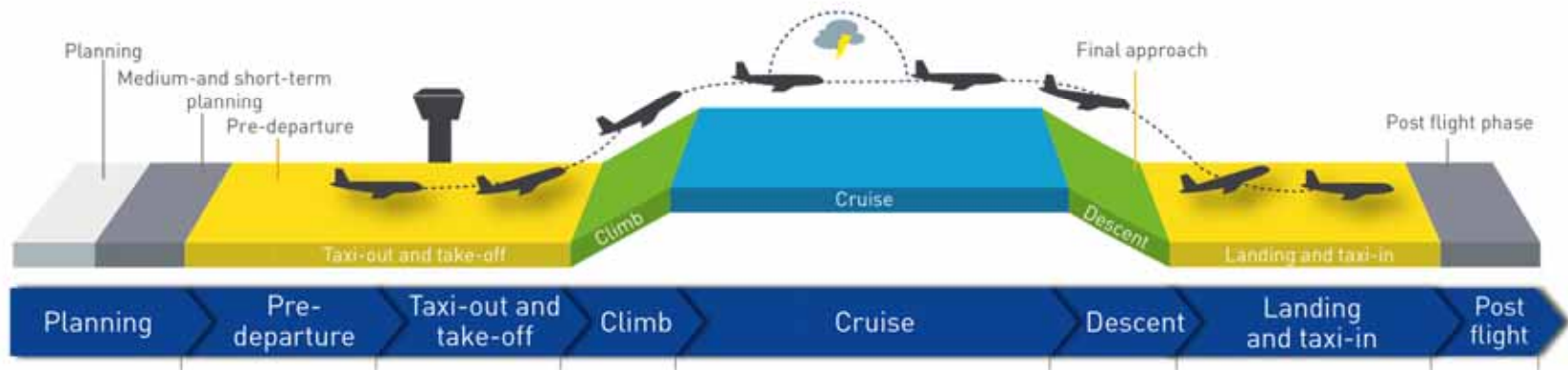
Q&A
Any
questions?

Options for future game changing SESAR solutions

David Bowen, Stig Brandwold, Ruben Flohr

ATM experts, SESAR JU

Building blocks of the SESAR vision



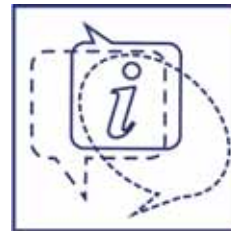
Automation support



Flight- and flow-centric operations



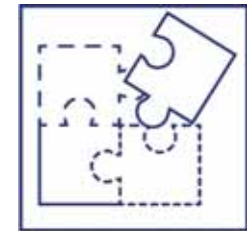
Integration of all vehicles



Sharing of information

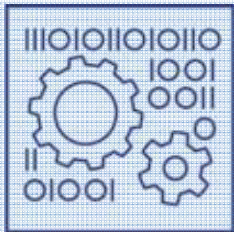
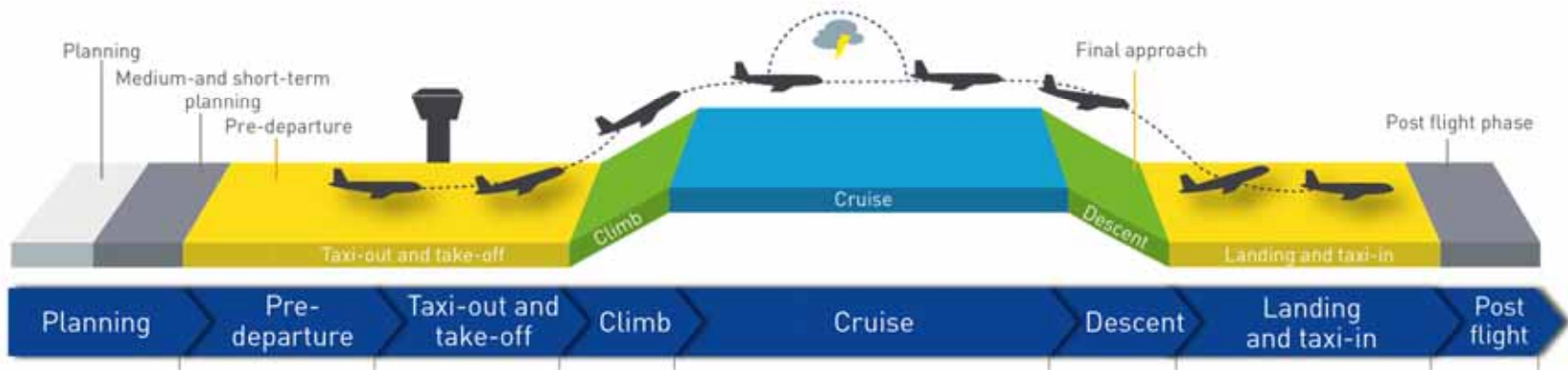


Virtualisation

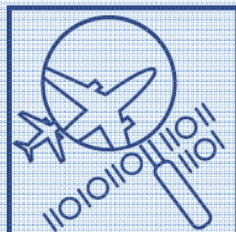


Integrated systems

Building blocks of the SESAR vision - Options for future game changing SESAR solutions



Automation support



Flight- and flow-centric operations



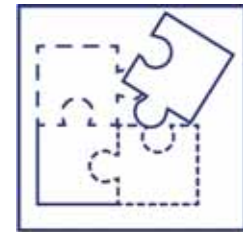
Integration of all vehicles



Sharing of information



Virtualisation



Integrated systems



Automation support



Benefits

- Improved safety and quality of service
- Improved operational efficiency
- Increased capacity
- Scalability

Challenges

- Human factor: balancing automation and human role
- Certification of systems



© Eurocontrol



Addressing challenges: the human machine interface (HMI)



Multi touch inputs



- A **new interaction means** with the air situation display of the controller working position (CWP)
- **More efficient data inputting** without increasing the failure rate

Automatic speech recognition



- Transforms audio signals into a sequence of words, which are transcribed and can be used for further **applications such as visualisation** on an HMI

Attention guidance



- The controllers' **visual or mental focus is actively directed** to a specific spot at the CWP HMI

User profile management systems



- Automated **HMI customisation** thanks to user authentication, application of ID cards or biometric technology
- **Automatic coupling** between predefined profiles and new customised HMI settings



Facilitating team organisation



Multi sector planner (MSP)

- Changes to the controller team structure may lead to:
 - **Airspace changes**, promoting a more flexible division of airspace
 - Changes to reflect **traffic flows and regions of complexity**

Flight-centric operations

- **Removal of sector boundaries** and set-up of one controller in charge of an entire flight through a large airspace

Collaborative control

- New operating procedures are in place so that the **traditional requirement to coordinate traffic** at all sector boundaries can be **removed**
- **Constraints are only applied** when a particular separation problem occurs or when traffic management requires so



Automation support



SESAR 1 delivered...

A number of supporting tools were developed to provide a higher level of automation to controllers, E.g., tactical controller tool (TCT), medium term conflict detection (MTCD), monitoring aids (MONA)

SESAR 2020 is validating...

- Enhanced medium-term conflict detection (MTCD)
- New tactical controller tool (TCT) to increase situational awareness
- Analysis of performance on conflict detection and resolution (CD&R) based on trajectory prediction accuracy and adjustable parameters
- Conflict detection and resolution aid to the tactical controller
- Conformance monitoring to both the tactical and planner controller
- The “What-if”-probe
- Improved trajectory prediction and situational awareness for controllers





Flight- and flow-centric operations



Benefits

- All actors understand the operational needs and constraints, leading to increased predictability
- Easier collaboration
- Better decision-making
- Multi-stakeholder optimisation

Challenges

- Trajectory negotiation principles
- What is optimal in the network of network?



© Shutterstock/06photo





From...

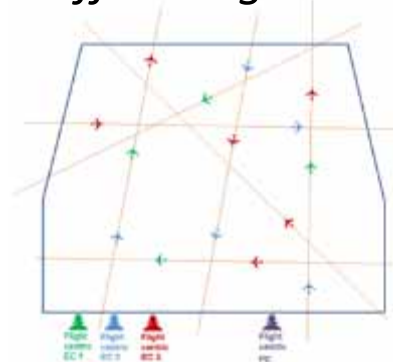
**Operating method with
sectorisation**



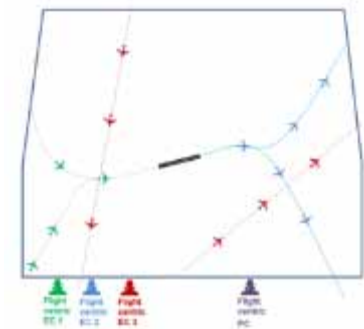
To...

Flight-centric ATC

*Workload based
traffic assignment*



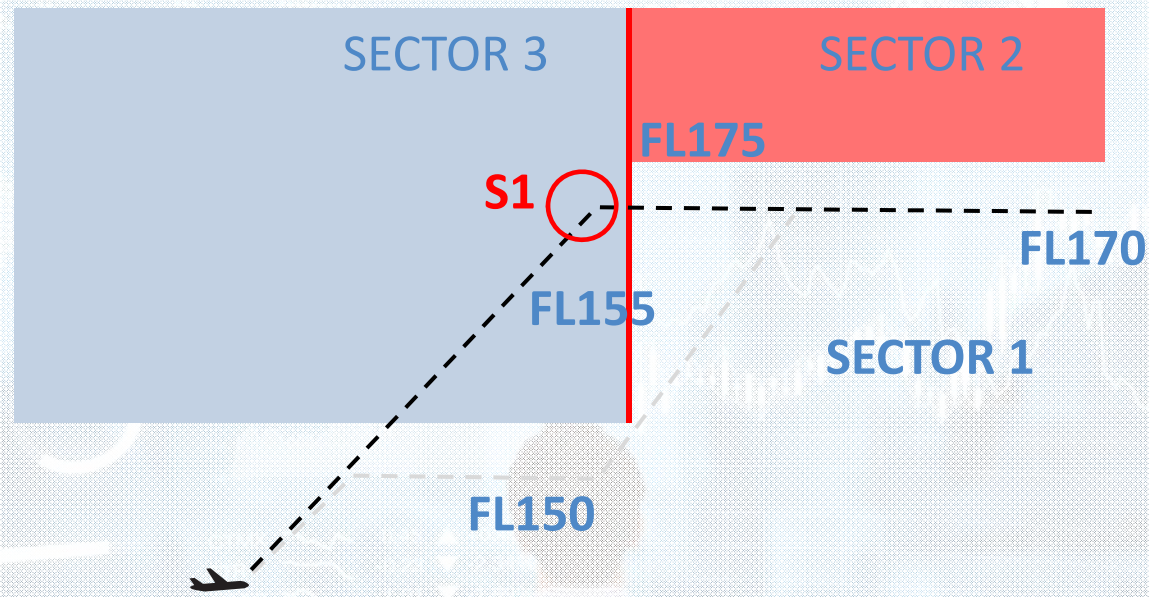
*Flow based traffic
assignment*



- Controllers are **no longer in charge of managing the entire traffic** within a given sector
- Instead, they now are **responsible for a certain number of aircraft** throughout their flight segment within a given airspace



Collaborative control

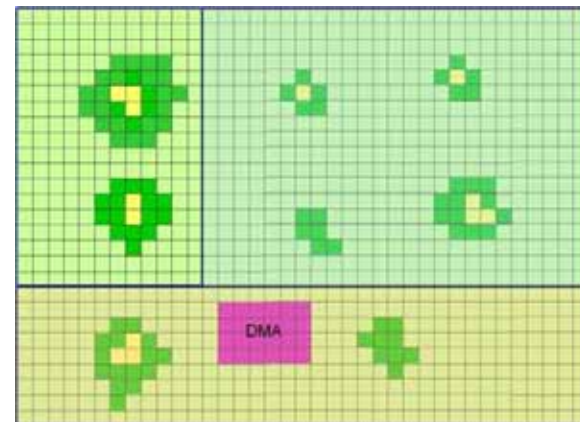
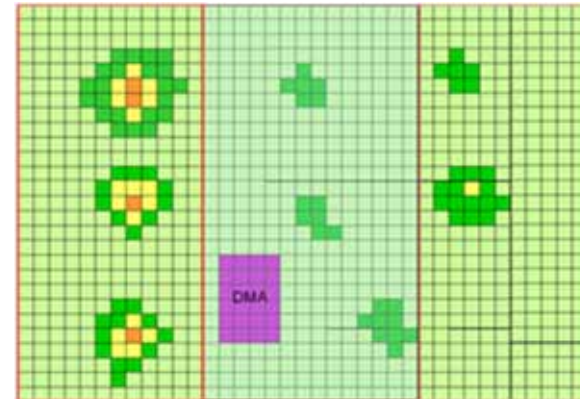


- Allows for the definition of a **collaborative multi-sector area**, within the airspace of a single ATS unit
- A **single planner role** is allocated
- **Traditional inter-sector coordination** with reference to a coordination point is no longer required



Dynamic airspace configuration

- Dynamically shapes the ATC sector and volumes to **fulfil the airspace users demand**
- Includes **dynamic mobile areas (DMAs)**
- Identifies **sectors configurations** based on workload forecasts, complexity level and ATCO availability
- Is in line with **defined local and network KPIs**, as well as operational strategy and targets
- Provides **interface** between advanced airspace management and demand capacity balancing, network planning, flight planning, and trajectory management in free route airspace operational environment





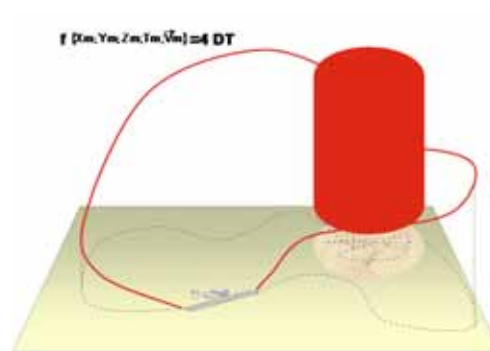
Dynamic Mobile Area (DMA)



Definition

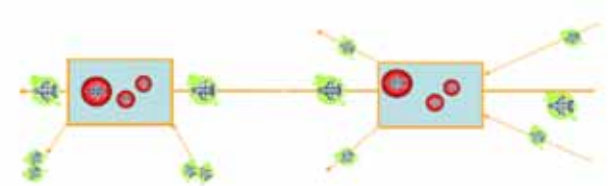
An **integral part of the mission trajectory (MT)** described by a 4D data set, where the velocity parameter is equal to zero

DMA Type 1: Pre-defined



- Airspace is planned according to **time and/or distance constraint** parameters from a reference point as specified by AU (e.g. aerodrome of departure)

DMA Type 2: Ad-hoc



- Airspace is planned and used at **any geographical location** along the trajectory

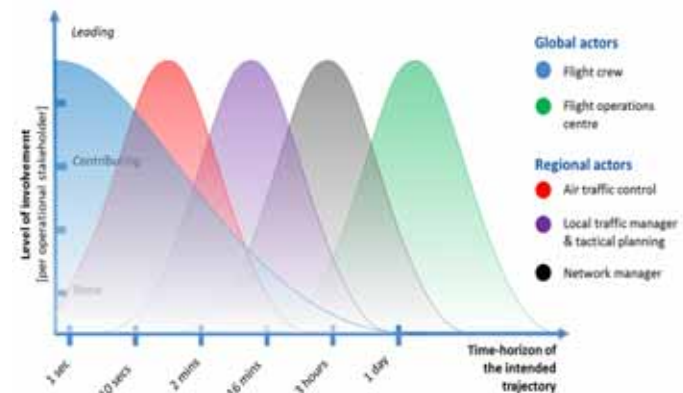


Definition

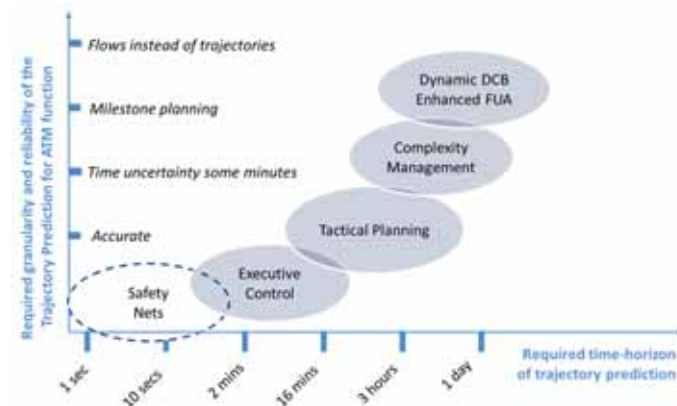
- Allow aircraft to fly their **preferred trajectory**
- Require full integration of the flight information to enable a **synchronised view** of the trajectory between different stakeholders
- Define the **operational and technical procedures** needed to manage this synchronised view of the trajectory



Multi-stakeholder framework

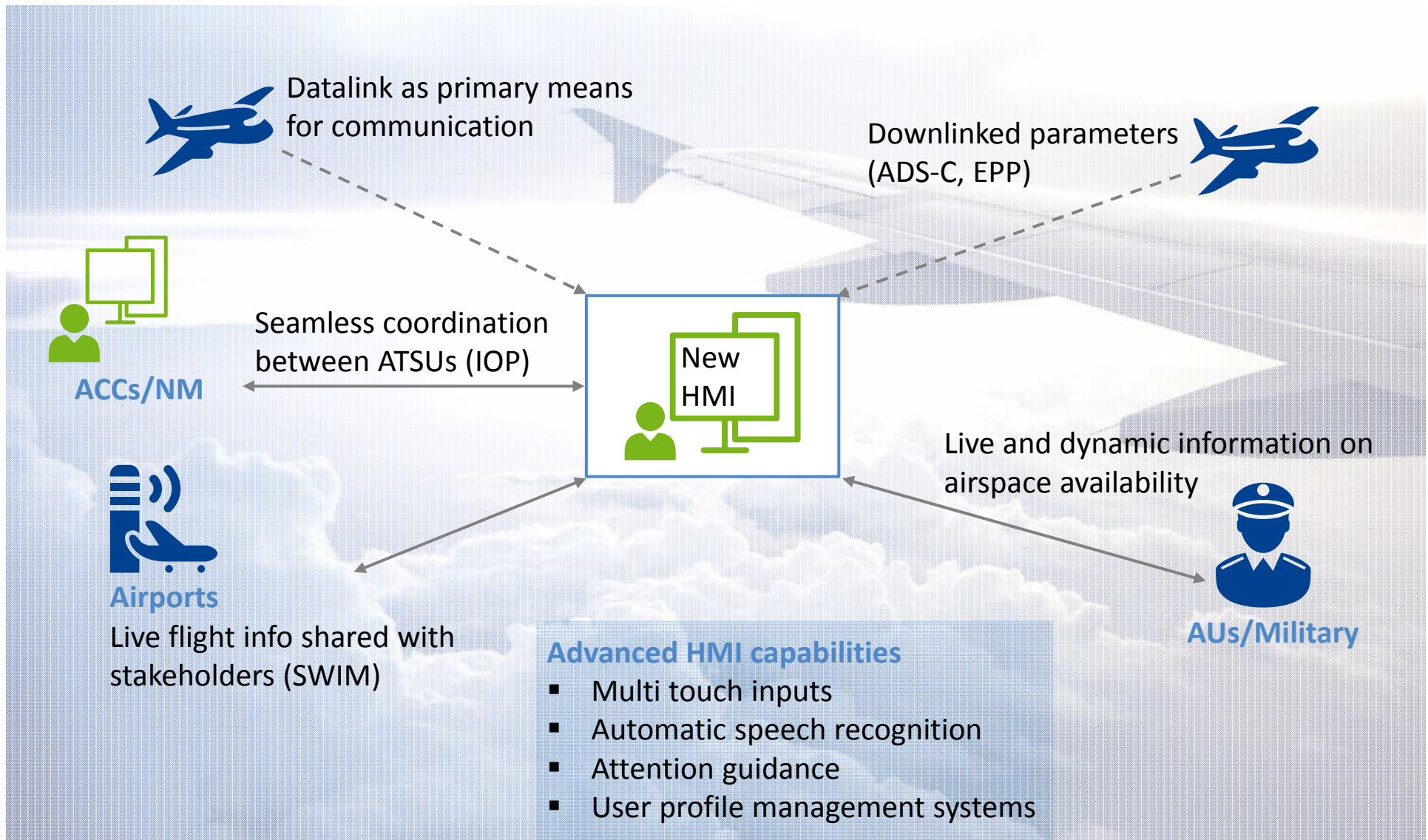


Layered planning



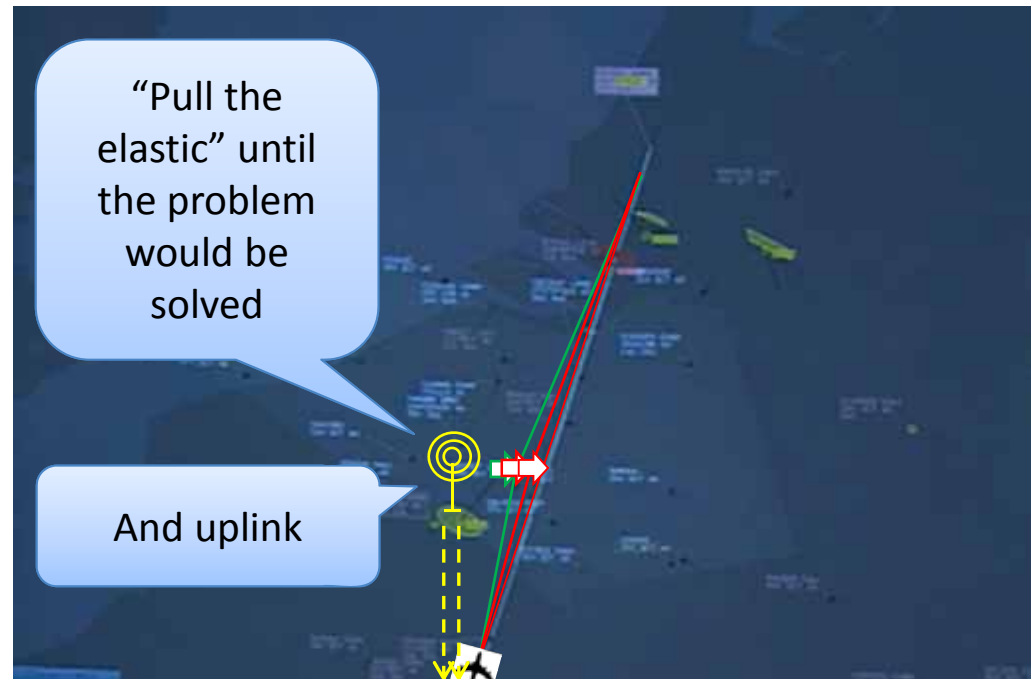
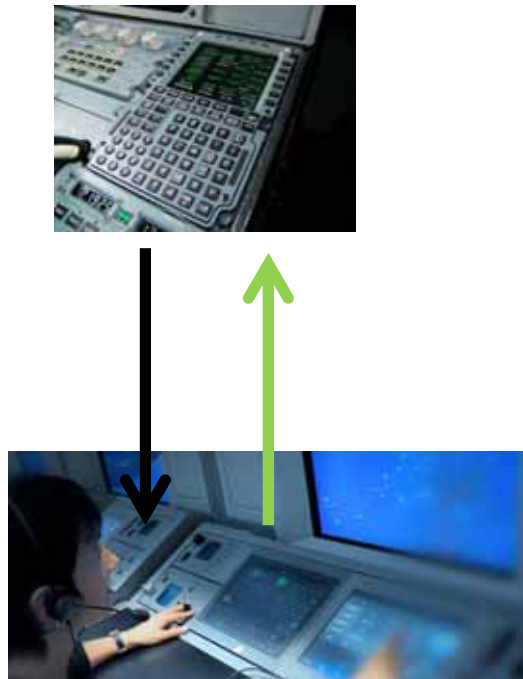


The ATCO as part of an integrated ATM ecosystem supported by an advanced HMI and automation





TBO example: Uplink lateral trajectory revision



Planned in SESAR 2020

- Many ground-systems have the possibility for the ATCO to register intention in ground system
- Let's now share it



Flight- and flow-centric operations



SESAR 1 delivered...

- EPP downlink
- AOP integration into NOP
- Extended flight plan
- Extended Arrival management
- Short Term ATFCM measures (STAM)
- Slot swapping as part of user-driven prioritisation process (UDPP)

SESAR 2020 is validating...

- Mission Trajectories
- Trajectory Management (updating, revision and sharing)
- Performance Based Trajectory Prediction
- Flight-centric air traffic control





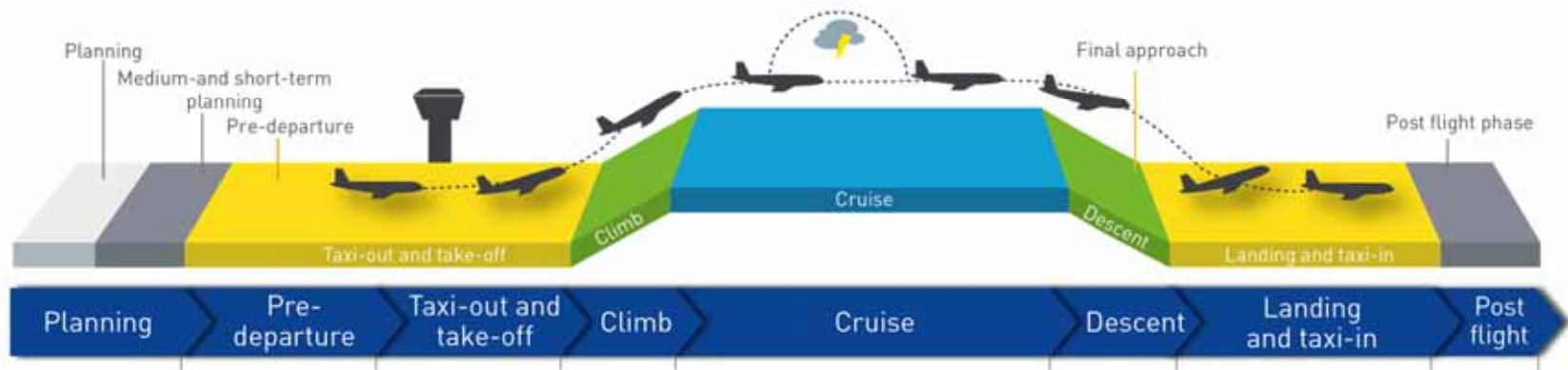
Q&A
Any
questions?

Options for future technical solutions and enablers

David Bowen, Ruben Flohr

ATM experts, SESAR JU

Building blocks of the SESAR vision - Options for future technical solutions and enablers



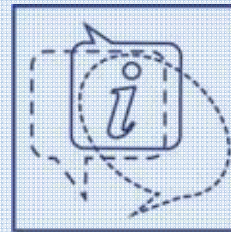
Automation support



Flight- and flow-centric operations



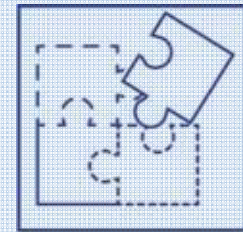
Integration of all vehicles



Sharing of information



Virtualisation



Integrated systems



Sharing of information and a new architecture



Benefits

- Cost efficiency
- Agility in future evolution
- Availability of the right information at the right time (through filtering, alerting and visualisation)

Challenges

- Cyber security
- Transition
- Global uptake



© ESA-P. Carril

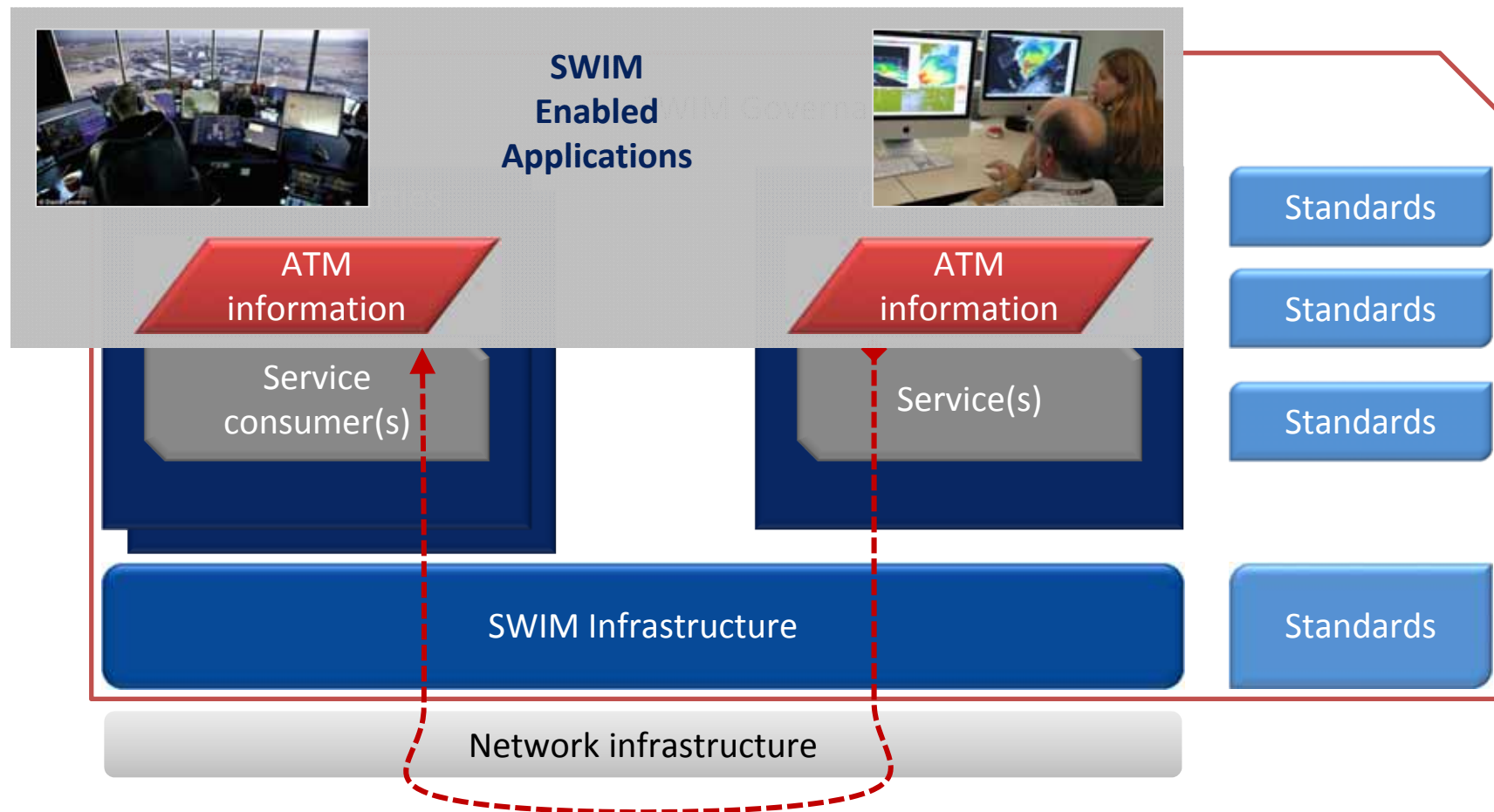




System-wide information management

SWIM is not (just) a set of services, but rather **the future way of service development**

SWIM consists of **standards, infrastructure** and **governance** enabling the management of **ATM information** and its exchange between **qualified parties** via **interoperable services**



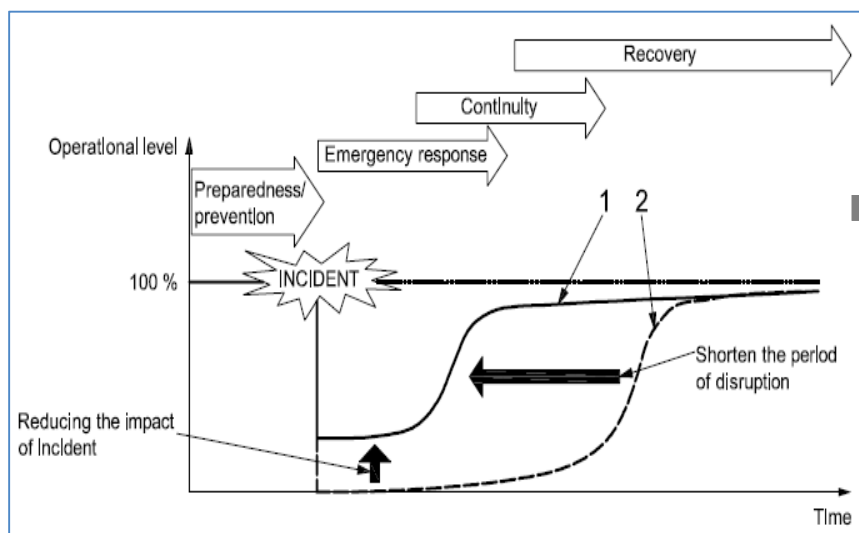


Cyber resilience

Resilience is the ability to prevent **disruptions**, to prepare for and adapt to **changing conditions** and to respond and recover rapidly from disruptions to ensure the **continuity of services** at an acceptable performance level

Cyber resilient architecture

High level requirements for industrialisation, deployment and operations



Identify
Protect
Detect
Respond
Recover

Alternate paths
Graceful degradation
Independent functional
duplication
Limited exceptions
Modular systems
architecture

Elements of cybersecurity



Sharing of information and a new architecture



SESAR 1 delivered...

- SWIM concept
- Yellow profile (low cost G/G)
- Initial set of SWIM services

SESAR 2020 is validating...

- Purple profile (A/G)
- IOP+ blue profile
- Green profile (civil-military)





Virtualisation

Benefits

- Increased safety and resilience
- Increased cost efficiency through rationalisation and standardisation of systems and services
- Increased flexibility and workload balancing between ATSUs
- Increased capability for contingency planning

Challenges

- Regulatory framework supporting cross border service provision
- Staff training



© LfV



© skyguide S.A. 2018



Virtual centre

Elements of definition

- A single **air traffic service unit** (ATSU) or a grouping of collaborative ATSUs
- Using data services provided by **ATM data service provider** (ADSP)
- **Geographical decoupling** between ADSP (s) and some ATSU (s)
- **Service interfaces defined** in service level agreements
- **Flexibility and performance** (at least support or improve the operational performance)

Common Services

- Fully standardised
- Open standards
- Vendor independent
- Competition

Use cases

Cost effectiveness

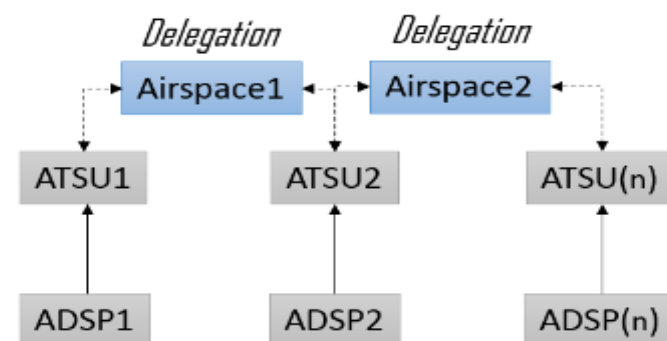
- Rationalisation of infrastructure
- Competition in technical evolution
- Shared ATCO training

Business continuity

- Data center outage
- ATCOs not available

Operational flexibility

- Static delegation of airspace
- Dynamic cross-border ATCO resource allocation



Load balancing between several ATSUs



Virtualisation

SESAR 1 delivered...

- Feasible high level architecture

SESAR 2020 is validating...

- Technical architecture, quality of service (QoS)
- Business models
- Controller working position (CWP) harmonisation
- Common services business models





Integrated systems

Benefits

- All actors understand all operational needs and constraints, leading to increased predictability
- Easier collaboration, better decision-making
- Multi-stakeholder optimisation

Challenges

- Trajectory negotiation principles
- What is optimal in the network of network?



© Top: Heathrow Airport , Bottom: PANSA



Flight Object exchange - IOP concept



- Move from point-to-point exchange to **real-time sharing of flight data information** between stakeholders
- A **seamless trajectory calculation** between ATC systems and the network
- **Increased predictability** of traffic
- Means for **better informed decision-making**

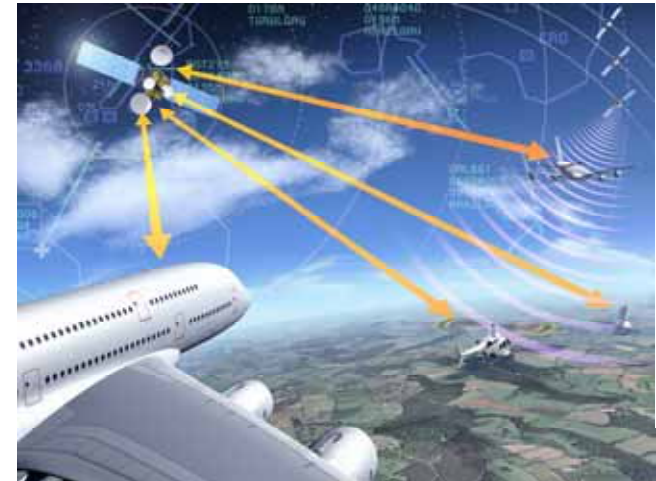




Communications, navigation & surveillance – an integrated approach



- **Combined** satellite-based, airborne and ground-based CNS
- Moving focus from physical assets to **delivery of services**
- Rationalised but **resilient infrastructure**
- Increased **civil-military synergies and dual use**
- **Performance-based navigation** integrated CNS
- Efficient use and long-term availability of **suitable radio spectrum**



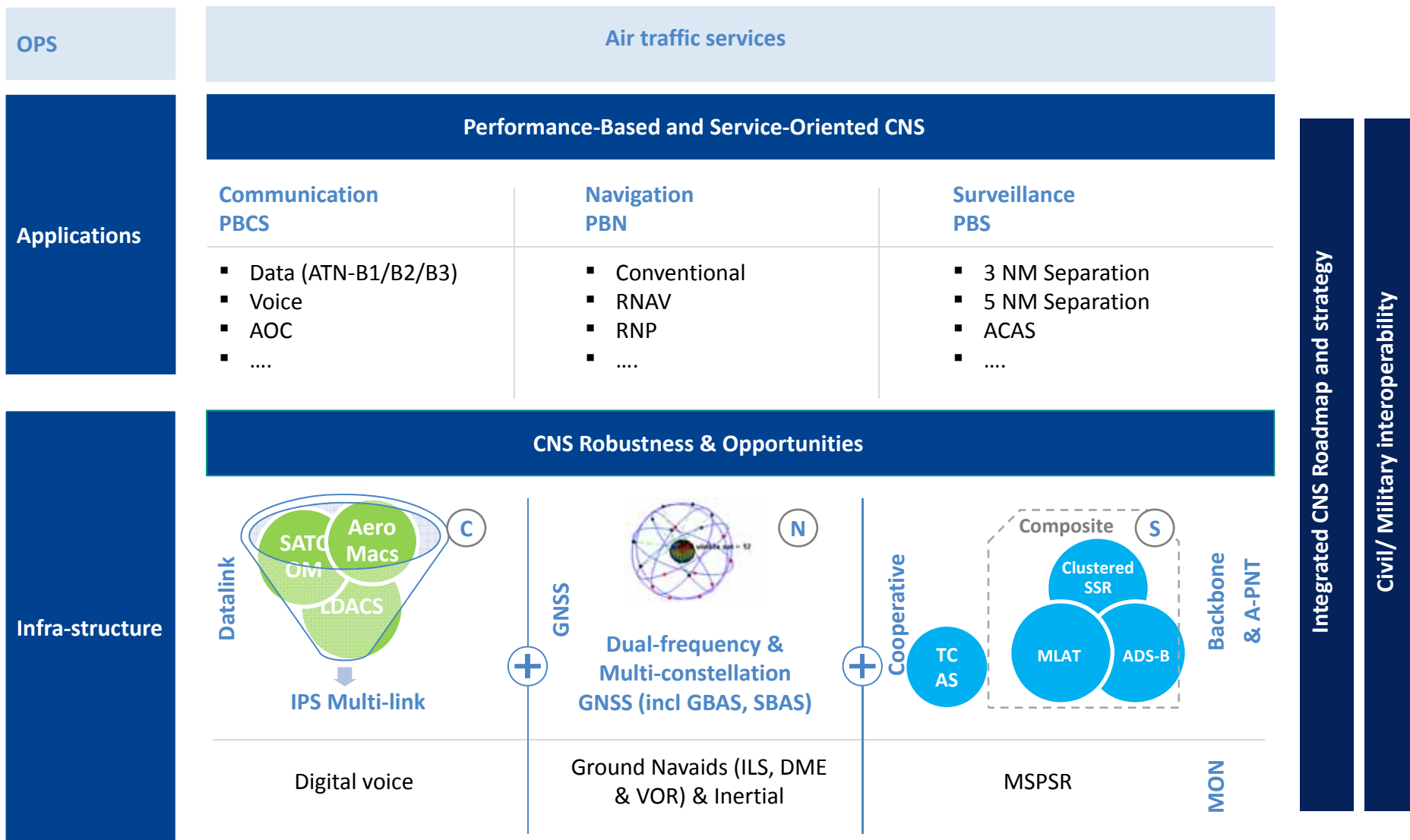
© ESA-P. Carril



© Shutterstock Maksim Kabakou



Toward an integrated CNS supporting the evolution



Integrated CNS Roadmap and strategy

Civil/ Military interoperability



Q&A
Any
questions?

Day 1 – Wrap up

Florian Guillermet

Executive Director, SESAR JU



- We all share this sense of **urgency** - so what are we waiting for?
- There are **constraints which are inhibiting the performance** of the system – are we clear on which ones?
- From a SESAR perspective, we have one plan & vision under which we all operate: **European ATM Master Plan** coupled with **the ICAO GANP** - so why continue debating the vision?
- **Technology is available** or in the pipeline – can we now move on to talk about services?
- **Airspace configuration** and design can provide solutions for the network – are we ready for it?
- We need to look at **the overall architecture** – can we connect technology, airspace and services? Can we start using modern technology to deliver better and safer services?
- Thank you for **day 1!** - any elephant in the room?



Thank you very much
for your attention!

