

Peter Hotham
Chief of Technology & Innovation

founding members



SESAR Innovations

7A-1

International ATM & Airports

New Network Solutions



New Generation of Network Management Tools

Francisco Sánchez Romero
AERODAYS 2011 / Madrid / 1st April 2011



Predictable factors

9,5M flights per year



26.000 flights per day



>100 Airlines Doing Their Business



2.000 Airports



35 Armed Forces
Joint Exercises

Unpredictable factors



The Human Factor!

Network Management Principles

- Demand and Capacity Balancing Process
- Provide enough Capacity to fulfil Airspace User Intentions
- Optimized Planning previous to execution
 - Optimized and agreed set of Business Trajectories
- Ability to respond to events in the tactical phase
- Network Operations Plan



Optimized Responsibility Allocation

European Federated Network

SWIM

Regional Subsystem

Regional Manager

Sub-Regional Subsystem

FAB Manager-1

FAB Manager-2

FAB Manager-3

Local Subsystem

Local Network Manager-1

ACC

Airport

AOC

Local Network Manager-2

ACC

Airport

AOC

Collaborative Decision Making

■ System su

Origin	EG..	Applicability
Destination	EDDM	Agreed Periods
Types	RR	Active Periods
Conditions	Not allowed via EDYY	
Refile		
Suggested Alternative Routes	VEULE RESMI GELTA	
Comments	Deps EG.. (except EGGW / EGSS / EGLC)	
Location	EDYY	
On-load Areas	EGTT SFD, LFRR Z, LFF ARML, LFE XEKE, EDMM KPT	
Off-load Areas	EDYY UAC, EDUU	
Status	Published	

ng

RR3EDY1 Deps **EG.. (Except EGGW / EGSS / EGLC)**
 Dest **EDDM**
 Not allowed via EDYY Airspace



Tactical Demand and Capacity Balancing

- Today, Network Management is carried out up to T-3h
 - Extend planning tools up to the Complexity Management Horizon
- Establish mechanisms to react to imbalances at short notice
 - Centre Configurations, Flexible Use of Airspace
 - Local or global rerouting of certain flights, Limited Restrictions



Involvement of all Stakeholders

Airlines

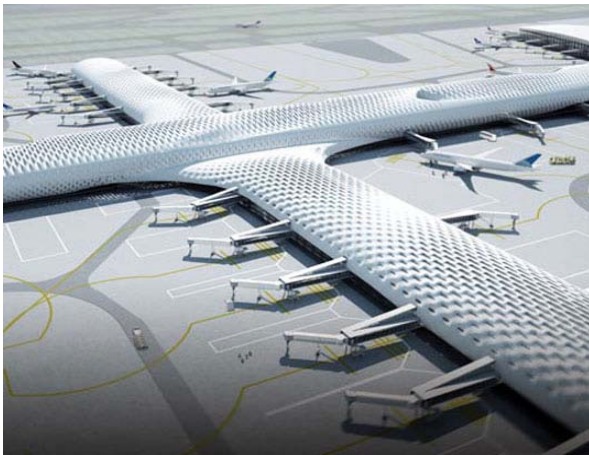


- Early Flight Intent (SBT)
- FP Updates
- Accurate Performance Data

- Updated Capacity
- Relevant AOP information

- Capacity Restrictions
- Updated Trajectories
- Complexity Management

Airports



Network Manager



ANSPs



Any Questions?





indra



Francisco Sánchez Romero
SESAR Programme Director
fsromero@indra.es

Ctra. Loeches 9
28850 Torrejón De Ardóz,
Madrid España
T +34 91 627 11 63
www.indra.es

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7A-2



Sixth European Aeronautics Days

Aerodays 2011

*Innovation for Sustainable Aviation in a
Global Environment*

Session 7A: New Airport Paradigms

- Alejandro Egido –
- Madrid April 1st 2011



Aena



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Airports in SESAR: AOP / NOP

Main Airport Objective

- *“To achieve full integration of Airports into the ATM Network”*
- *To allow knock-on effect transmissions down the Network:*



➤ *Introducing the Butterfly Effect in ATM*

---a small change at one place in a complex system can have large effects elsewhere

From
“Reactive Performance Management”



Airports will obtain Accurate Predictive information of Traffic Evolution

- **Monitored and Transmitted by a fully airborne-airport integrated Network**

Based on Post Analysis

To
“Proactive Performance Management”

Based on a Predictive Network Model



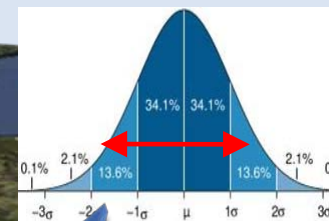


European ATM Network: *Current Status*

CFMU

CFMU ignores how aircraft trajectories will be impacted once they have transited through airports
(Knock-on Effect Blocked at Airports "Black Holes")

CFMU can extrapolate aircraft estimates while they are airborne
(From Radar Position Information)

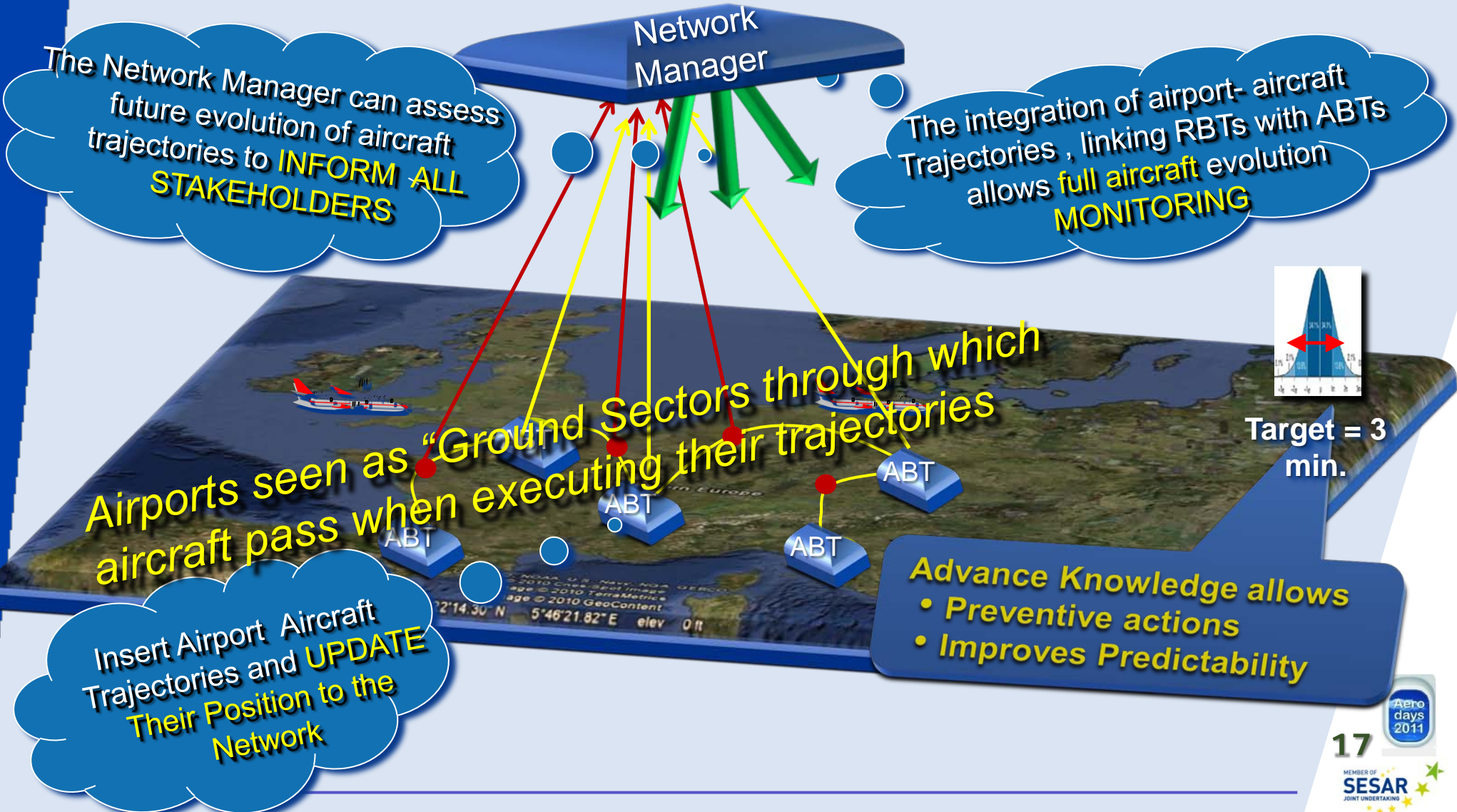


20 Minutes

Network Fragmentation = Poor Predictability

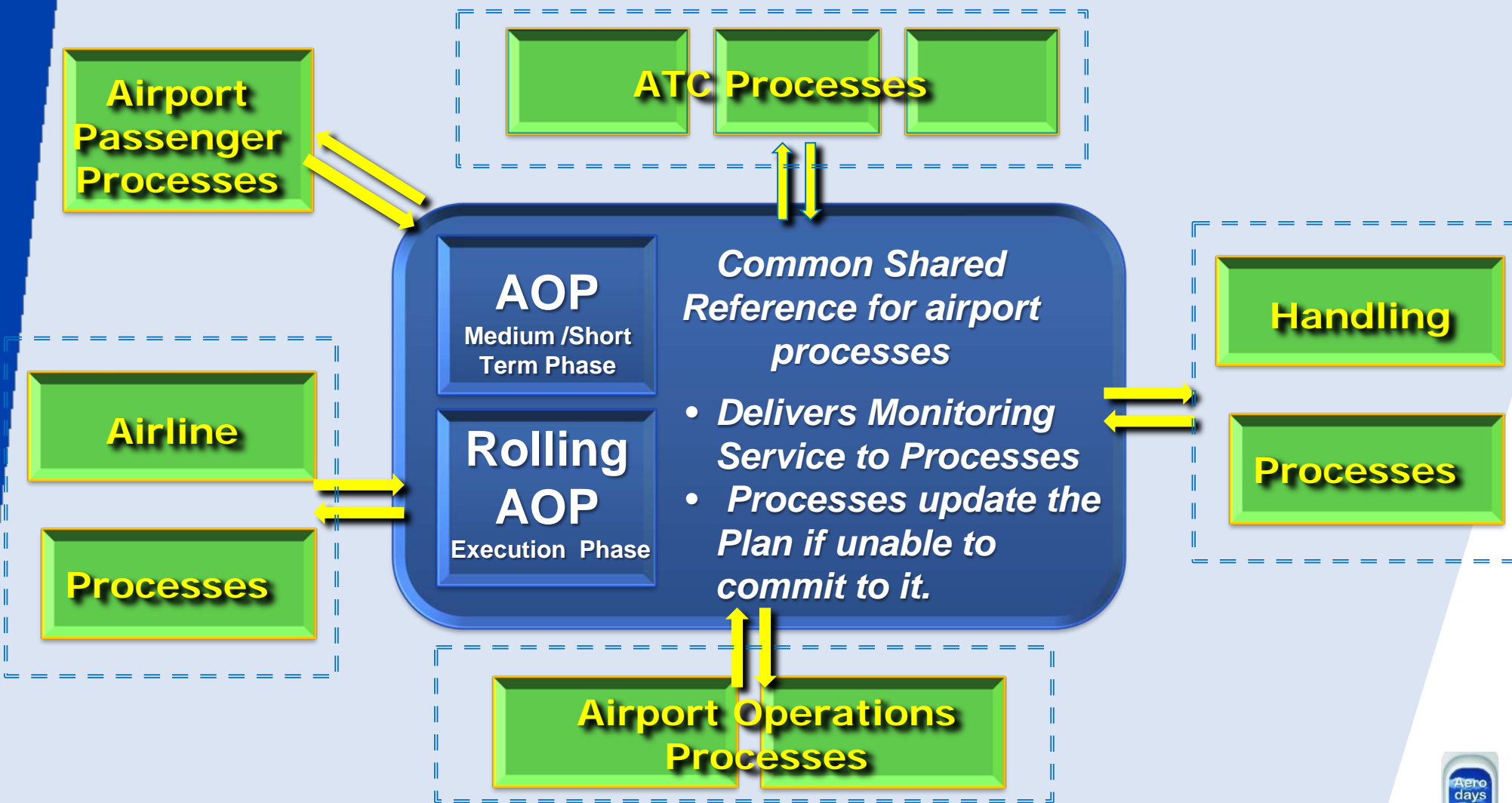


European ATM Network: SESAR Approach





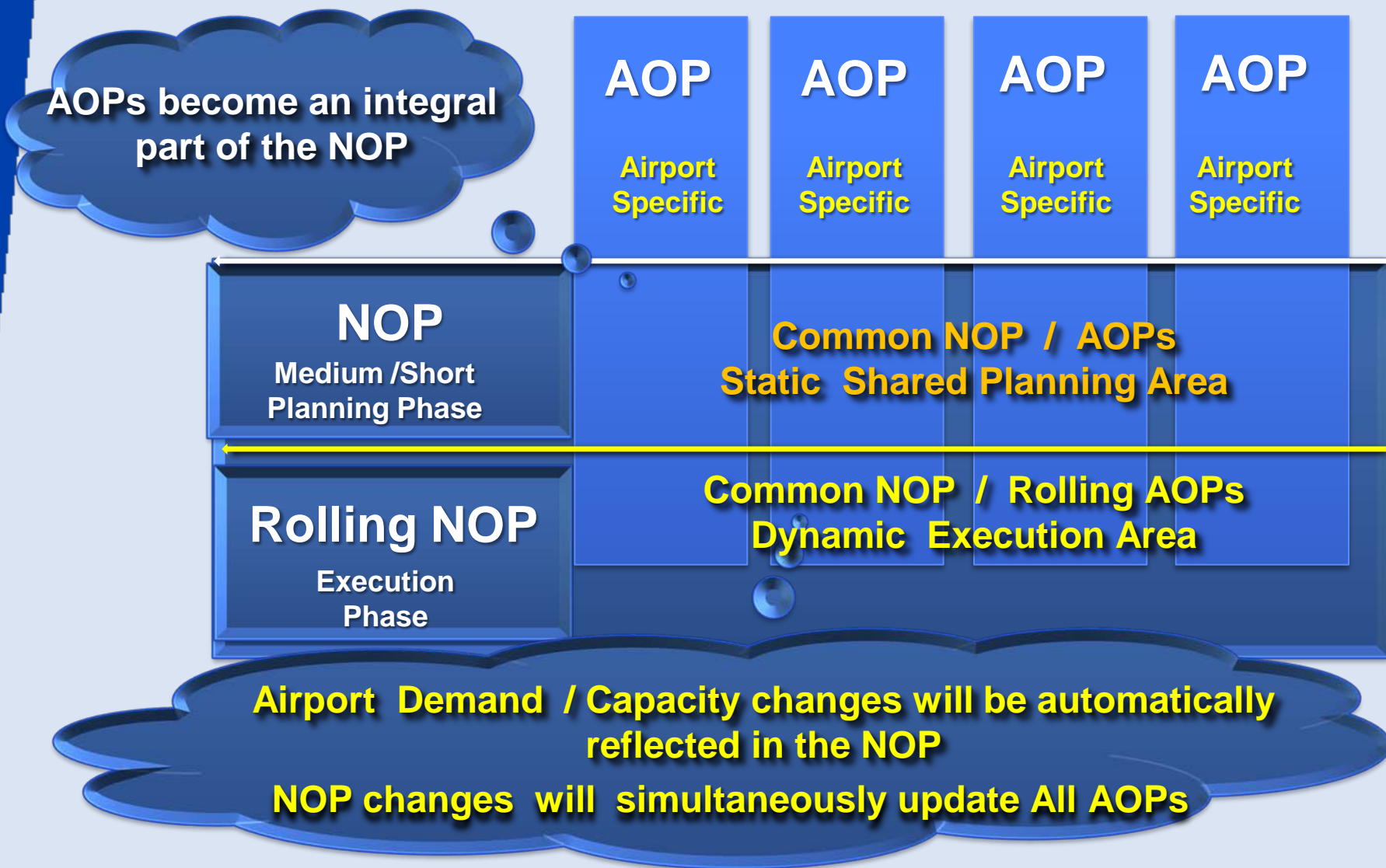
Airport Operations Plan Architecture



A Common Shared Static/Rolling Plan for all APT Stakeholders



Airport Operations Plan Architecture

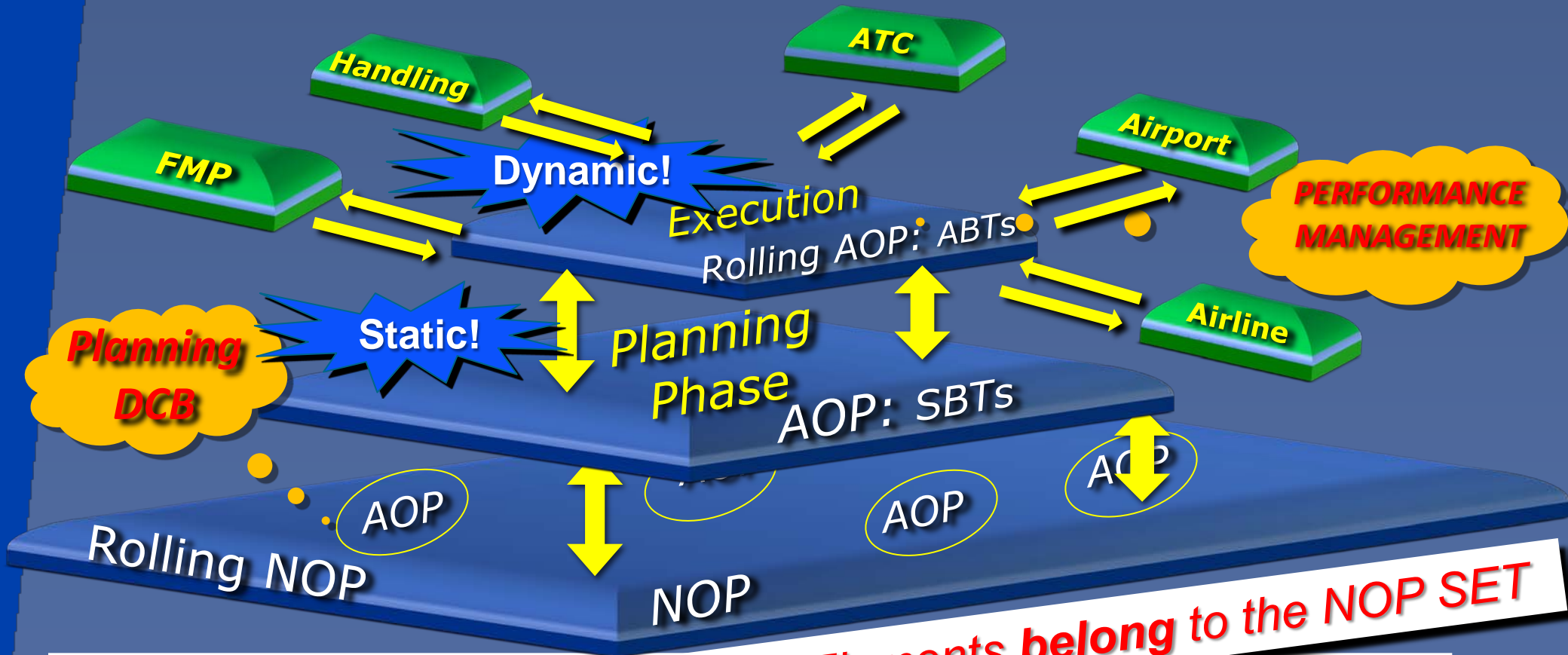




Airport Operations Plan Architecture

Execution: As soon as an SBT is confirmed & becomes an RBT

- *AOP BTs become active: Target Reference for execution units*
- *Execution units will update ABTs if unable to commit to them*



AOP Sub-sets Elements belong to the NOP SET

Conclusion

“Full integration of Airports into the ATM Network will enable Knock-on Effect Transmissions down the ATM Network”:

The Butterfly Effect !



TO KILL the Butterfly !!

Proactive Mitigation Actions will be possible, to actually meet The Main Airport Target



Aerodays 2011

Thanks for your Attention

Session 7A: New Airport Paradigms

- Alejandro Egido –
-Madrid April 1st 2011

founding members



SESAR Innovations

7A-3

The logo for innaxis features a stylized orange swirl on the left that transitions into the word "innaxis" in a black, lowercase, sans-serif font. The letter "x" is highlighted in orange. Below the "x" is the tagline "Innovation for a Complex World" in a smaller, red, sans-serif font.

innaxis
Innovation for
a Complex World



Managing Complexity

Air Transport Complexity

Tens of thousands of daily operations in Europe

Fragmentation in processes throughout the network

Information flow

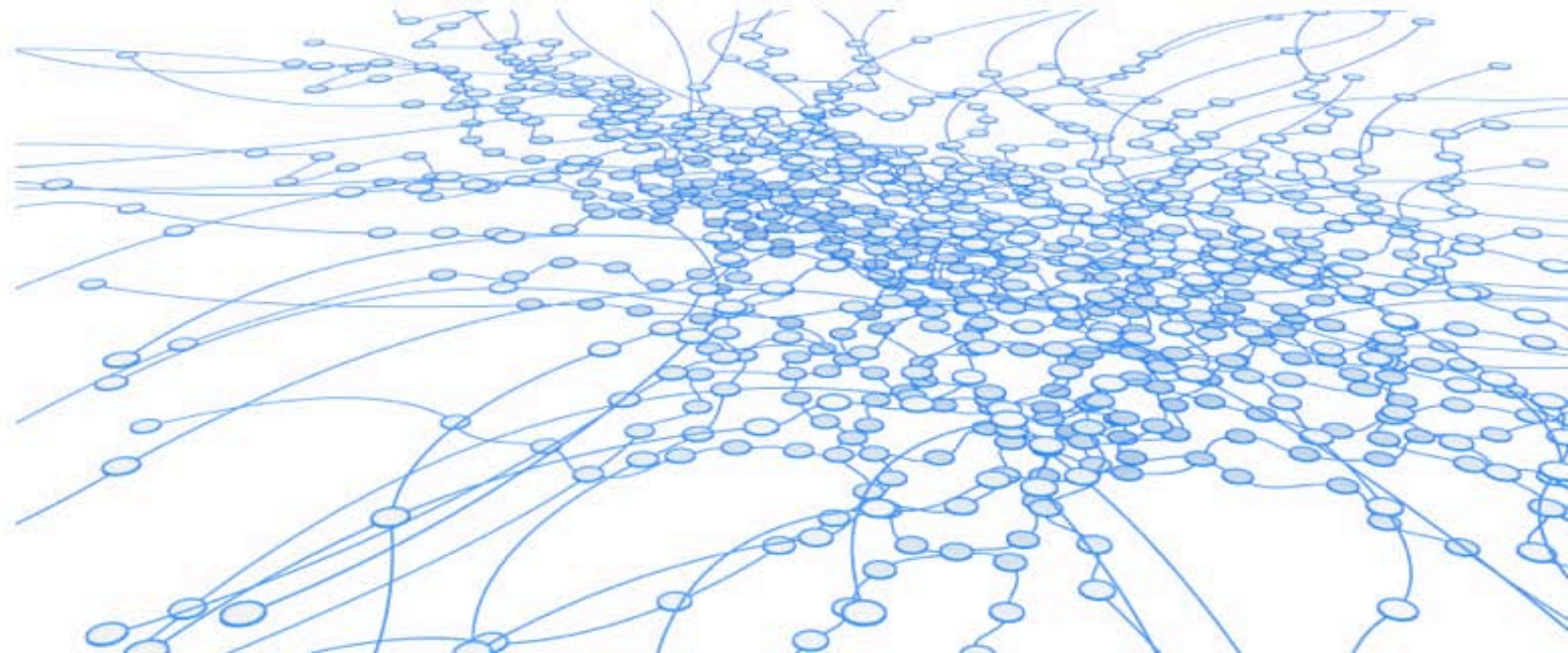
Large number of stakeholders

Heterogeneity in users goals, requirements



Why Complexity?

Why complexity is becoming an important research thread to techno-social systems?



Complexity aggravates uncertainty

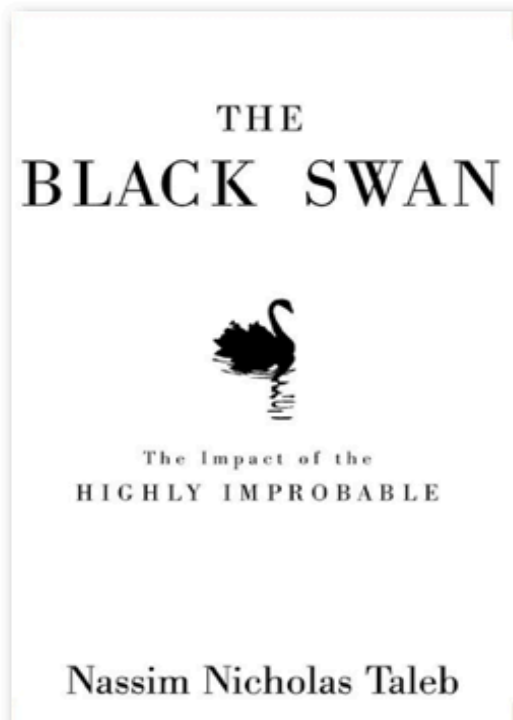
*Human minds are not good at accepting uncertainty
Most would choose unhappiness before uncertainty.*



*Many scientists have operated under the false belief that
their mathematical tools could eliminate uncertainty.*



Real World uncertainty



“Gambling is sterilized and domesticated uncertainty”

“In real life you do not know the odds; you need to discover them and the sources of uncertainty are not defined.”



info@ComplexWorld.eu

Making a difference in ATM

Scientific revolution made us feel that we were in possession of tools that would allow us to grasp the future



*Limits that non-linearities put on forecasting!
Sensitivity to initial conditions!*

ComplexWorld WhitePaper

+

Working Groups

+

PhD Programmes

+

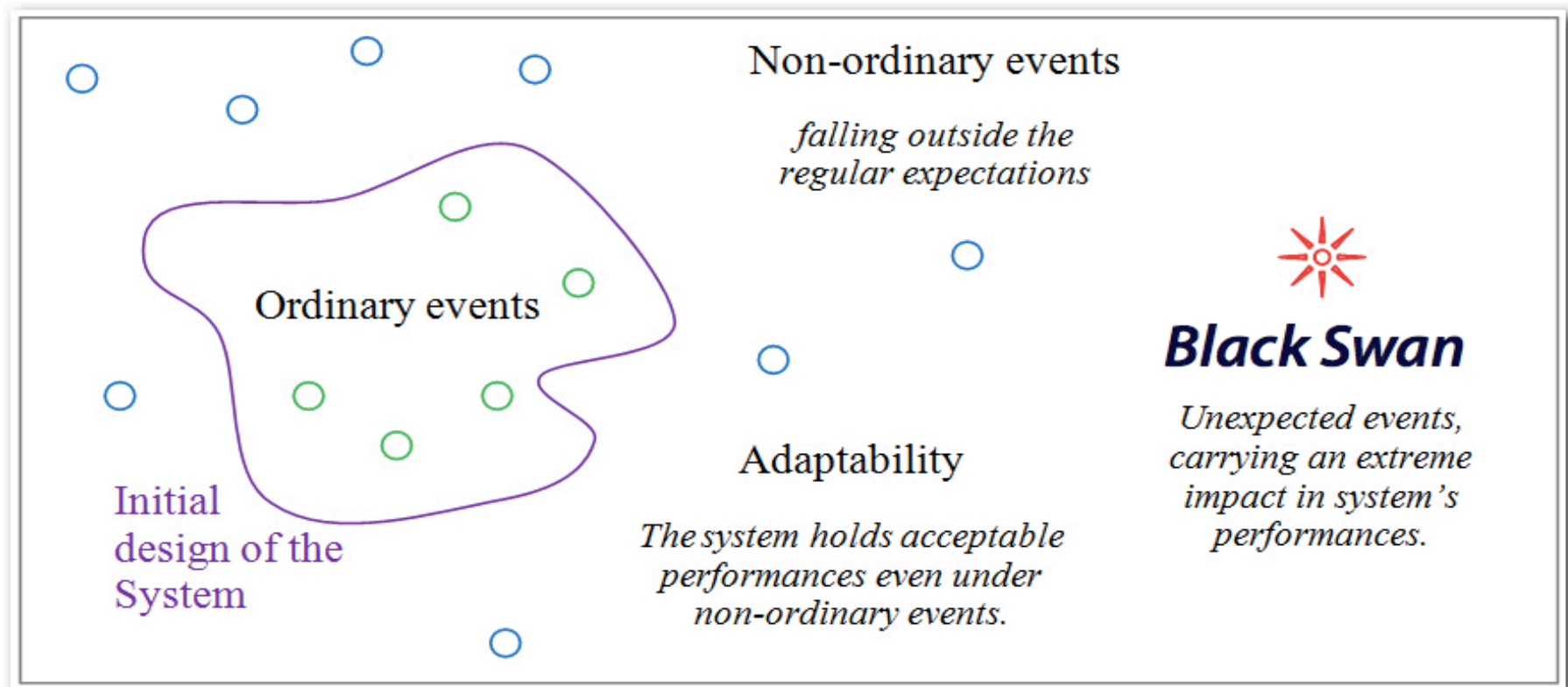
WP-E Projects

Robustness

*Much easier to deal with extreme events
if we focus on robustness than
improving predictions.*



Resilience



Thanks!

ComplexWorld.eu



*First ComplexWorld
Annual Conference - 6-8.July 2011*



David Pérez - dp@innaxis.org

innaxis.org/dp

SESAR Innovations

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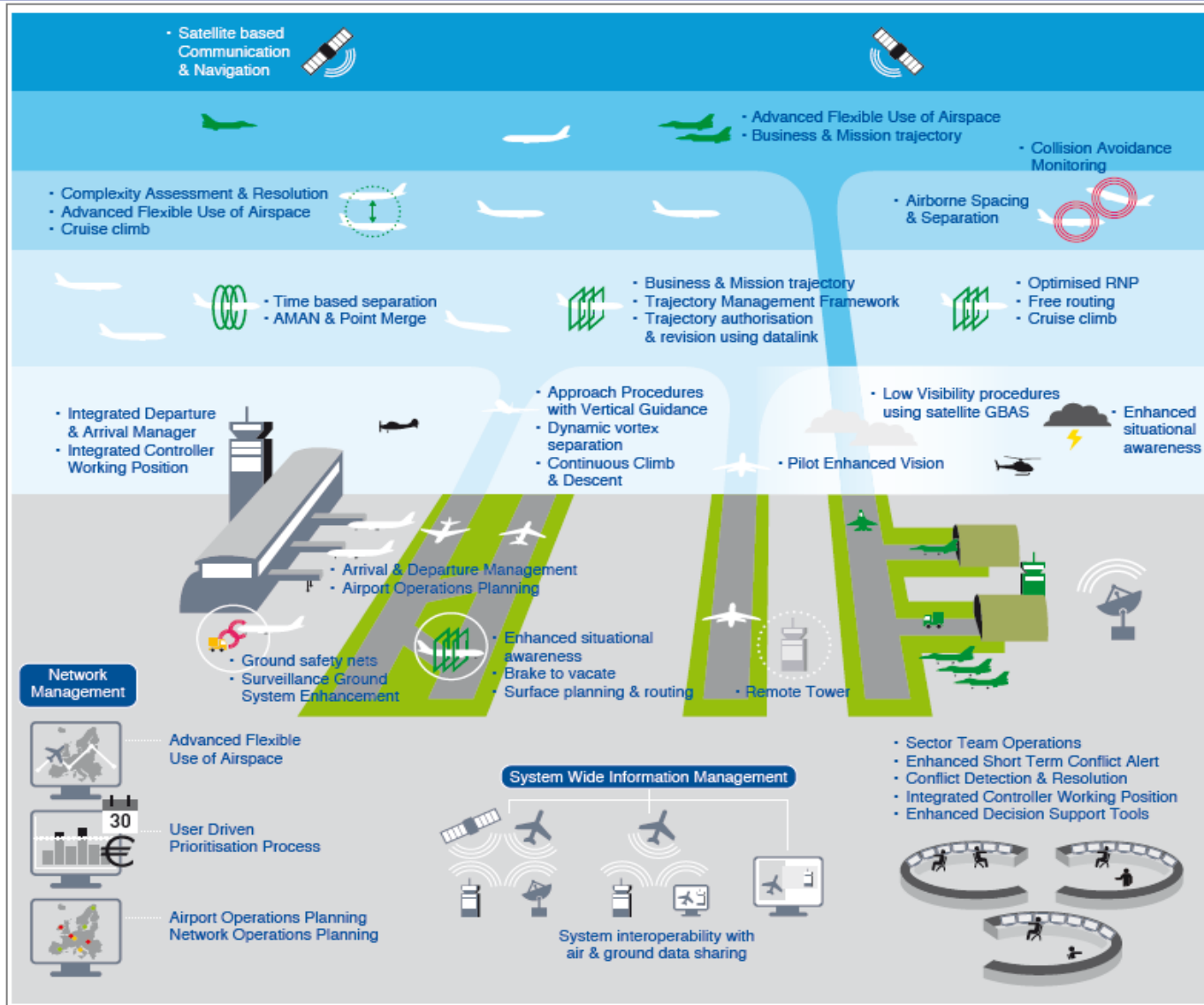
From Research to Implementation

SESAR Validation activities

Cristiano Baldoni
ENAV SESAR Contribution Manager
Head of SESAR Unit



The SESAR Air Traffic Management system



SESAR Approach

- Focus on “*preparing SESAR products for implementation*” and identifying options for an early deployment
- Achieve a level of operability and technical maturity to support industrialisation and deployment decision
- Iterative prototyping-to-trials cycles focused on achievable goals with recognised performance benefit and implementation value
- Operational shadow mode and live trials, bringing validation and verification as close to the target operational environment as possible



To this end, it has been decided to put Validation focus on the so called “**Industry Based Platforms**” (IBP)



The Industry Based Platforms

- Within the SESAR Framework **each industry member** will build and verify its set of awarded **prototypes** in the System Work Packages and projects
- A given industry member is responsible **to integrate** those prototypes in its **Industry Based Platform (IBP)** in line with the System decomposition
- In accordance to resources available to a ground industry member, its own IBP may cover **different operational domains** as the result of integrating necessary components and prototypes from:
 - its own portfolio and activities
 - Or
 - different origins and in particular, from different supply industry SJU Members



IBP evolution and the Validation Platforms

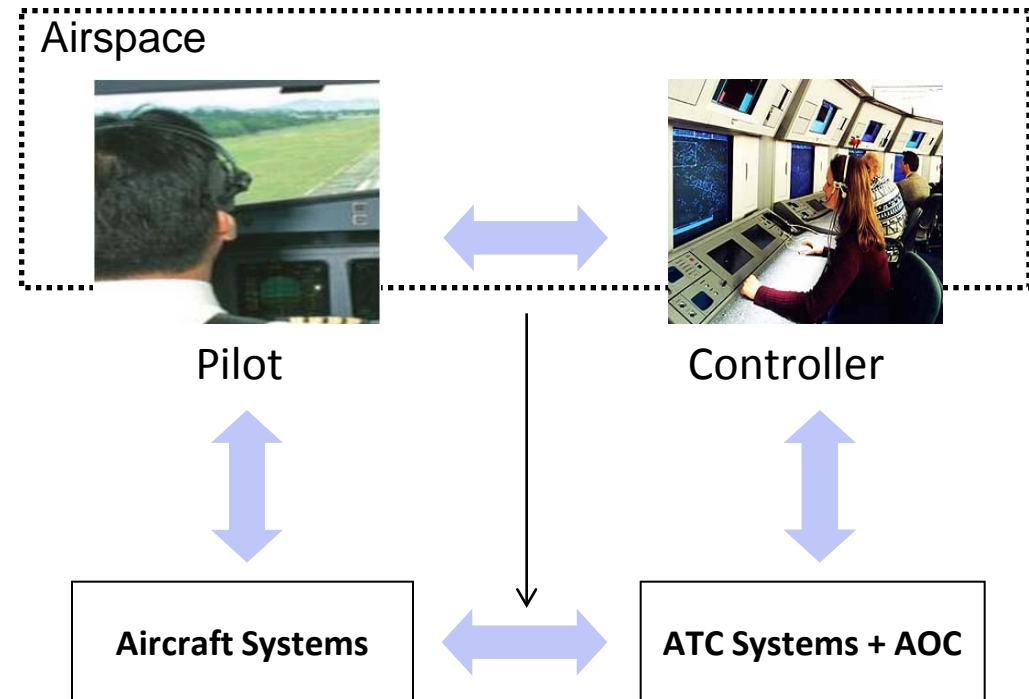
- The **evolution of the IBP** is structured through an **incremental process** in accordance with projects **deliverables** and **timeline**.
- An IBP can be:
 - Instantiated as the **Validation Platform** devoted to a particular Service Provider for its SESAR Operational Validation tasks
 - Accommodated in the Service Provider **Pre-Operational infrastructure**
- Several Validation Platforms instantiating the same or different IBPs can be **federated** using **SWIM embedded IBP capabilities**



And on airborne side...

An incremental and structured approach will be applied, through **air/ground integration**, using iterative prototyping-to-trials cycles:

- Airborne ATM functions/systems have to be integrated in a real aircraft architecture (that is already defined)
- Functional definition is generally performed using simulated functions (mock-ups) in a research simulator and in a simulated ATC environment



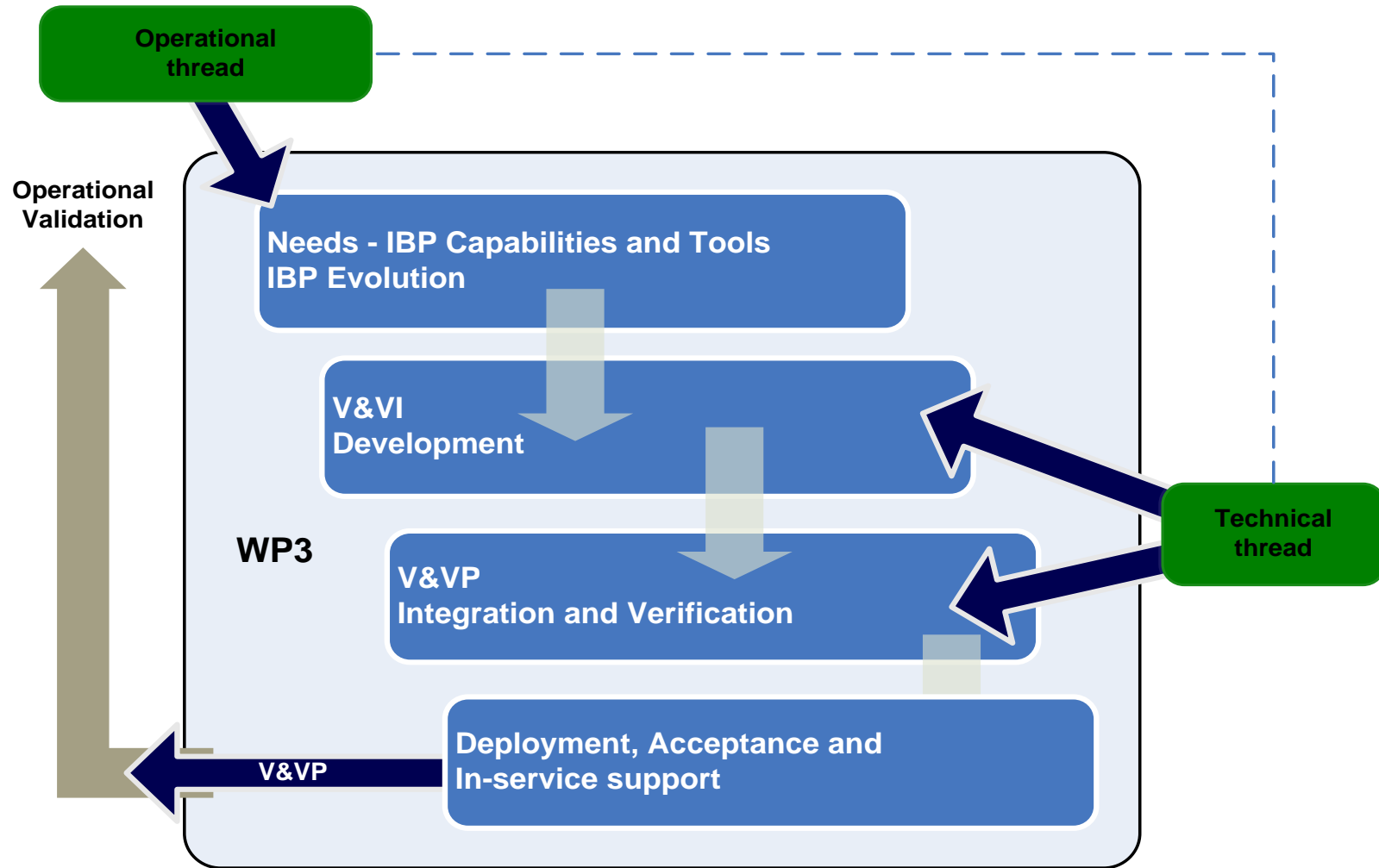
Benefits from IBPs

Such process will:

- 1 Make the best use of the level of resources already allocated to all
- 2 Focus on “preparing SESAR products for implementation” and identifying options for an early deployment
- 3 Foster continuous maturity assessment within consistent verification and validation environment
- 4 **Facilitate the industrialisation of the IBP to become the future version of the System in operation, at the completion of the deployment cycle**



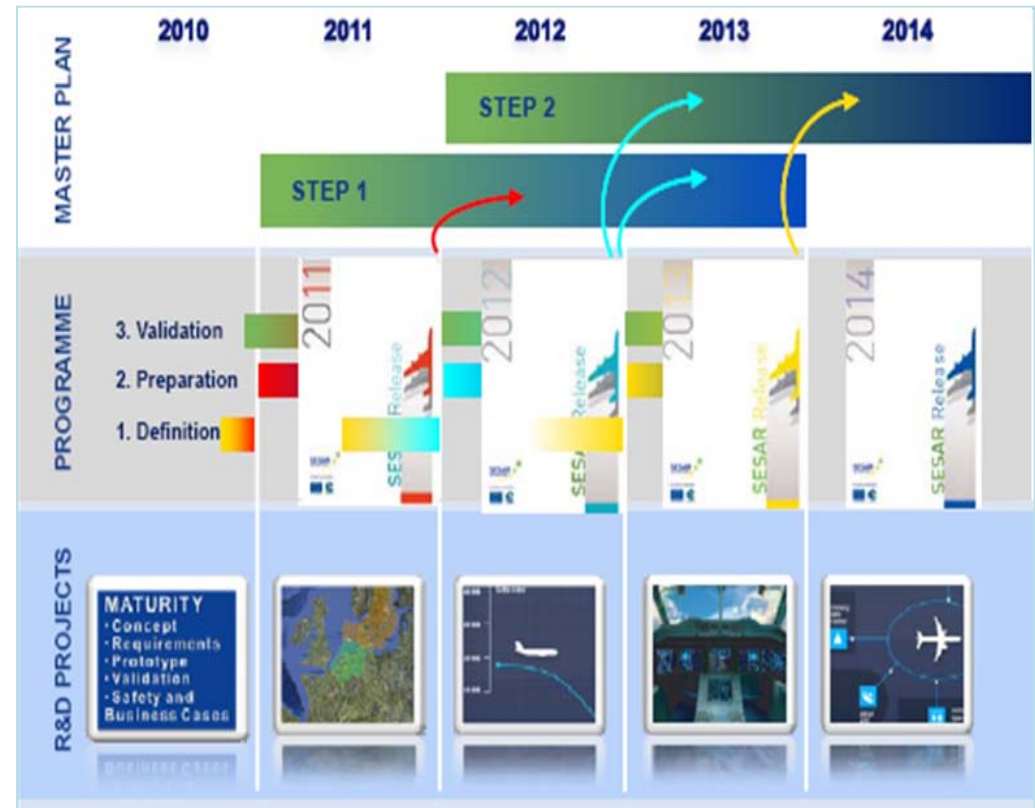
SESAR validation high level process



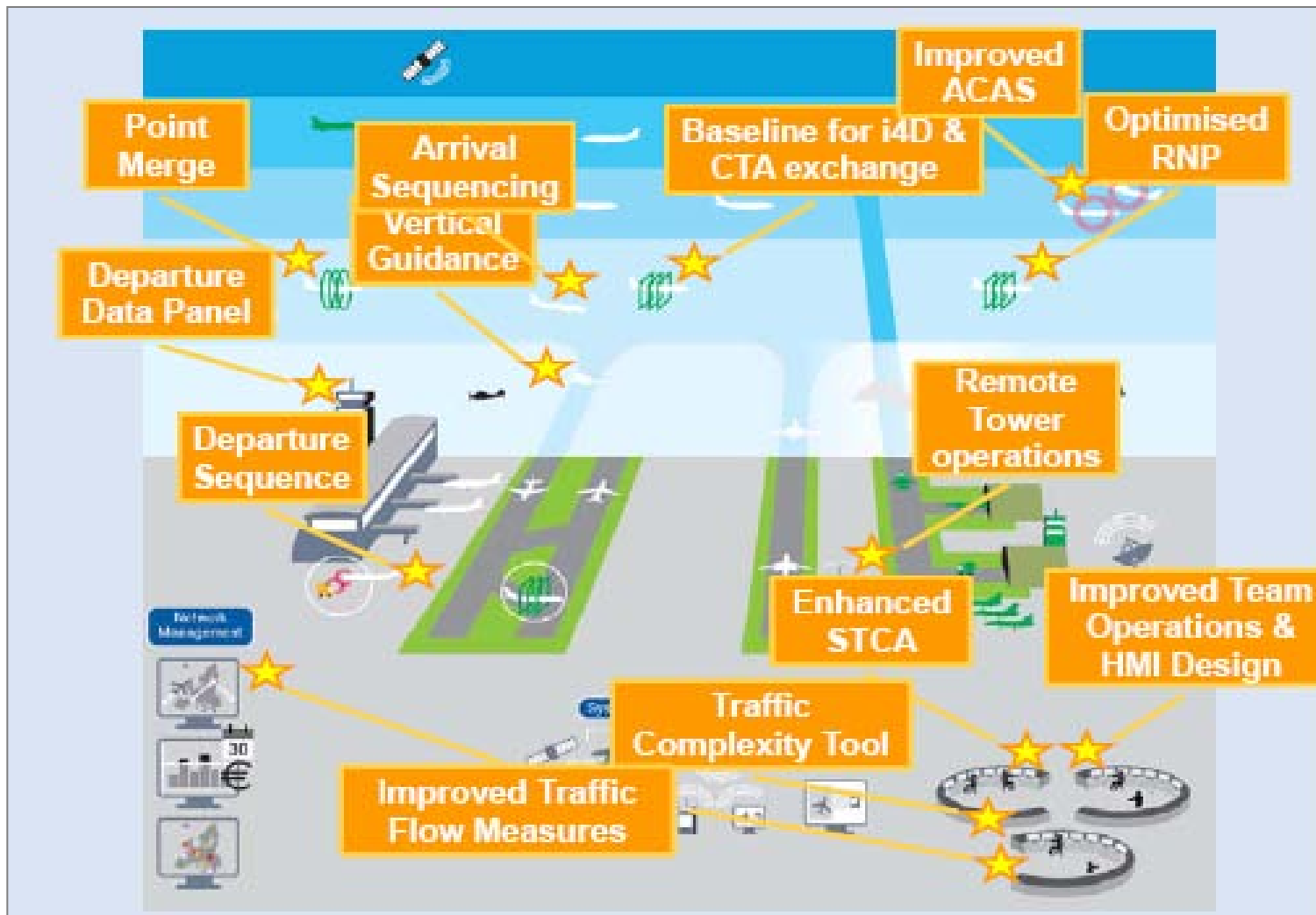
The SESAR Releases

- The aim of a SESAR Release is to present to the aviation community new or improved air traffic management **solutions** at a **pre-industrialisation stage, ready for deployment**.
- The **first SESAR Release** will be accomplished by the **end of 2011** and will contain **29 validation exercises** conducted by the SESAR members and covering:
 - the areas of efficient and green terminal airspace operations
 - the initial 4D trajectory
 - end to end traffic synchronisation
 - integrated and collaborative network management

Delivery approach through releases



Release 1 scope



SESAR Release Plan 2011

2011

SESAR Release



2011

SESAR Release



Main validation sites of the SESAR Release 2011



Follow SESAR deliveries!

Download the Release plan for 2011 at:

http://www.sesarju.eu/sites/default/files/documents/reports/sesar_release_Print_DEF.pdf



QUESTIONS & ANSWERS

www.sesarju.eu

