Total Airport Management

A holistic approach towards airport operations optimisation

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Overview

- DLR at a Glance
- Motivation for CDM and for TAM
- TAM Approach and Prerequisites
- TAM Benefits

DLR – at a Glance

6900 employees across
33 institutes and facilities at

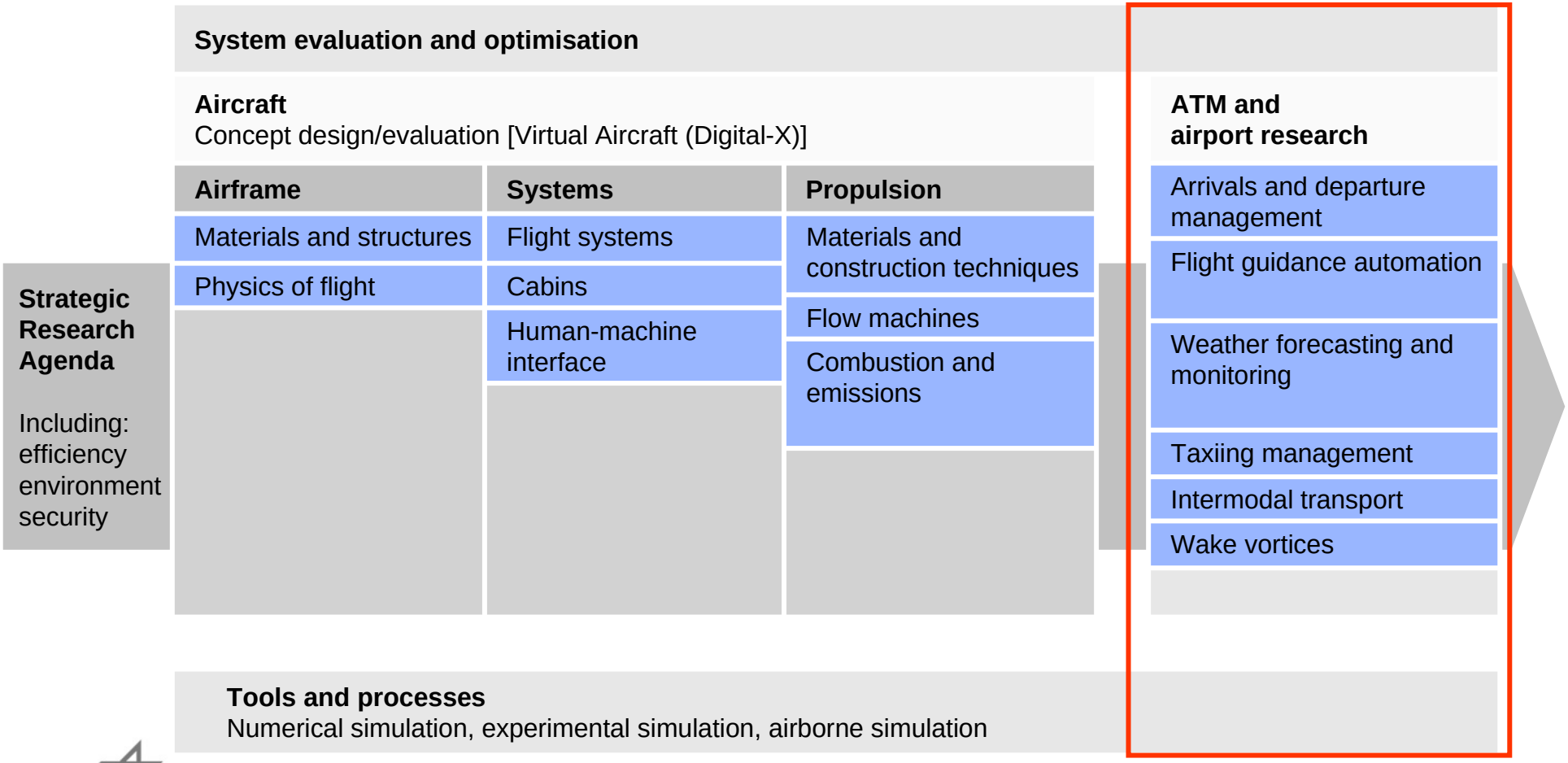
- 13 sites in Germany

Offices in Brussels, Paris and Washington.

Research Areas

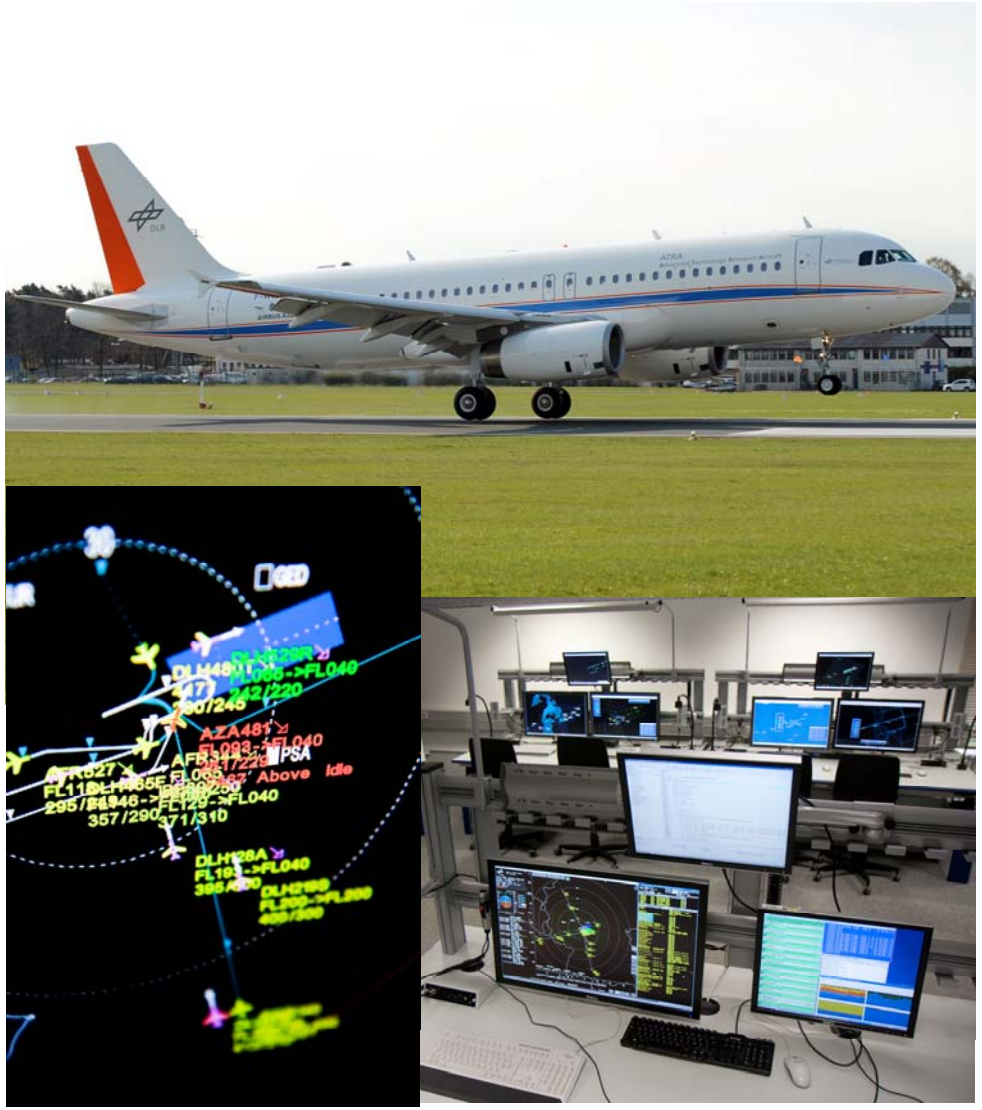
- Aeronautics
- Space Research and Technology
- Transport
- Energy

Aeronautics Portfolio
Air Transport Systems



Facilities – Aeronautics

- Research aircraft
- Cockpit simulators
- Tower simulator
- Airport simulator
- Compressor, combustion chamber and turbine test beds
- Autoclaves
- Material and structural test facilities
- Ground vibration test facility
- Wind tunnels*



* Predominantly under the auspices of German-Dutch Wind Tunnels (DNW)

Challenges for DLR - Institute of Flight Guidance

The Air Transport System of the future will be characterized by

- Growing traffic
- Eco friendliness
- Increased Efficiency
- Safety and Security

Optimizing Air Traffic Management (ATM) and airport processes by

- New ATM- and Airport-Concepts
- Air-Ground-Integration
- Airport-Performance-Modeling

DLR- Institute of Flight Guidance – Organisation

Structure	Resources	Infrastructure	Networks
Departments Air Transportation Controller Assistance Pilot Assistance ATM Simulation Operations Control Human Factors Mgmt. Services Business Manager	~ 140 employees: ~ 70 Scientists 1 Guest Scientists 8 PhD Students 10 Diploma Students 5 Trainees	Fast-Time Simulation Human-in-the-Loop-Simulation Ground Operations Cockpit Data Links Test Aircraft Research Airport A-SMGCS Test GBAS	**AT-One** DLR Institutes Universities Industry Bodies / MoU / Action Plans *Eurocontrol* *NASA / MIT / FAA* *EATRADA, ASDA,*

AT-One
The ATM Research Alliance

- *Centre of Excellence for ATM*

Independent
Innovative
Customer oriented
Complete Network of Research Facilities

AT-One - Facts & Figures

- Strategic Alliance of
  DLR Institute of Flight Guidance and
  NLR Air Transport Division
- Shareholders: 50% DLR, 50% NLR
- Locations:
  Braunschweig, Amsterdam, Brussels
- Total employees: ~ 280
- Yearly Turnover: ~ 35 M€
- Background: additional 1400
  employees in Air Transport Research

One of the largest ATM research organisations in the world

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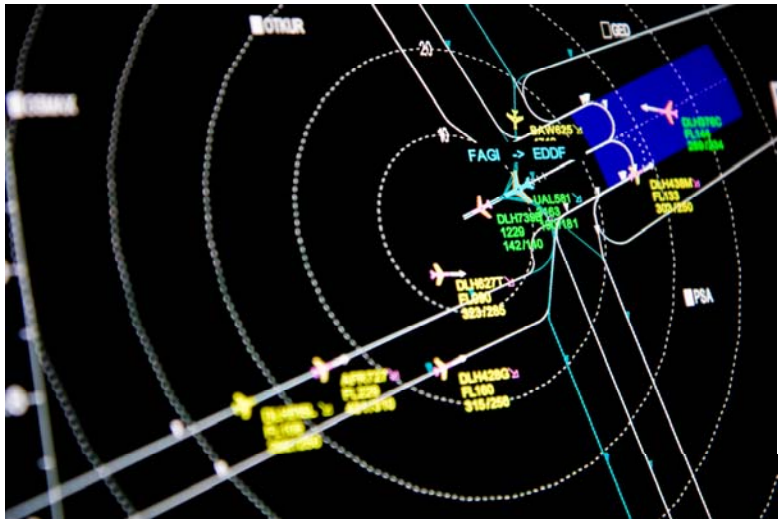


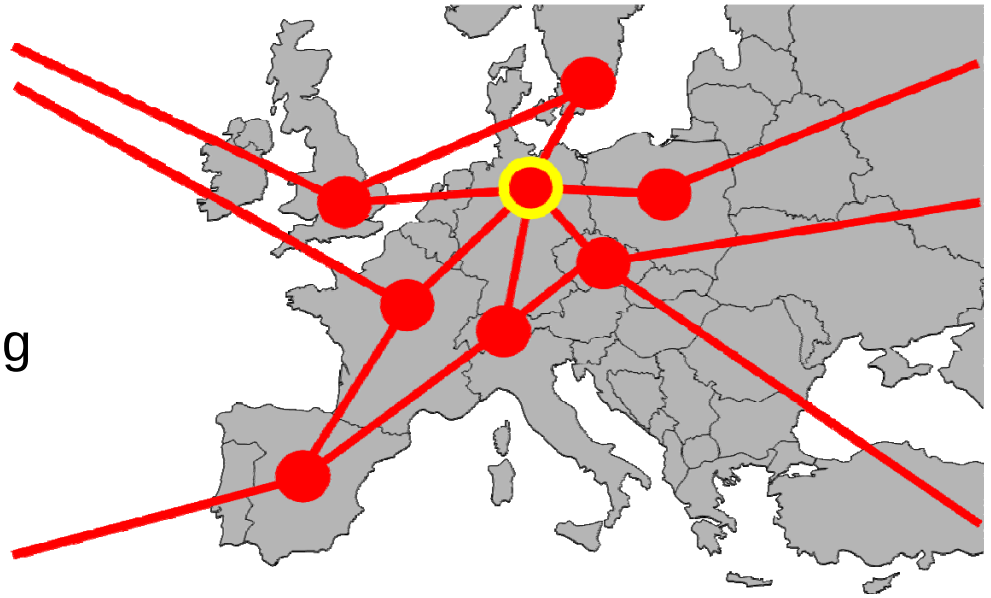
Airport Operations - something in common with…?

World Wide Web	SWIM System Wide Information Management
Google France	Finding Information
WIKIPEDIA	Prepare and Deliver Information

Motivation - Current Challenges (I)

Currently European ATM-System is fragmented

- Various ANSPs (~40) control and steer
- virtually no information sharing between Airports
- Problems at one single airport escalate throughout the entire network



Insufficient share of information between stakeholders

- data incomplete, outdated, possibly unreliable or missing
- opposing targets due to competing interests
- no integrated approach connecting landside and airside

Motivation - Current Challenges (II)

Stakeholders are opting for an optimization of their own processes and operations but:

- minor knowledge of impacts on other stakeholders caused by decisions made
- own process optimization suffer from limited “situational awareness”

Stakeholders are compromising the system by

- phantom flights - CFMU planning is based on wrong data
- resulting in an overdemand caused by phantoms -> SLOT!?
- selection of the best fitting phantom and cancels the remaining

Motivation - Requirements for TAM

A need for:

- a performance increase of the ATN
- more dynamic and responsive ways of incorporating the airspace users' and passenger needs
- pro-active instead of re-active planning
- possibilities to cope with competing interests at an airport in a fair and transparent manner
- an increase of the predictability of the "system airport"

SESAR (Single European Sky ATM Research) prescribes a performance-based ATM-System. Therefore it is required:

Only performance based airport processes enable a performance based Air Traffic Management System

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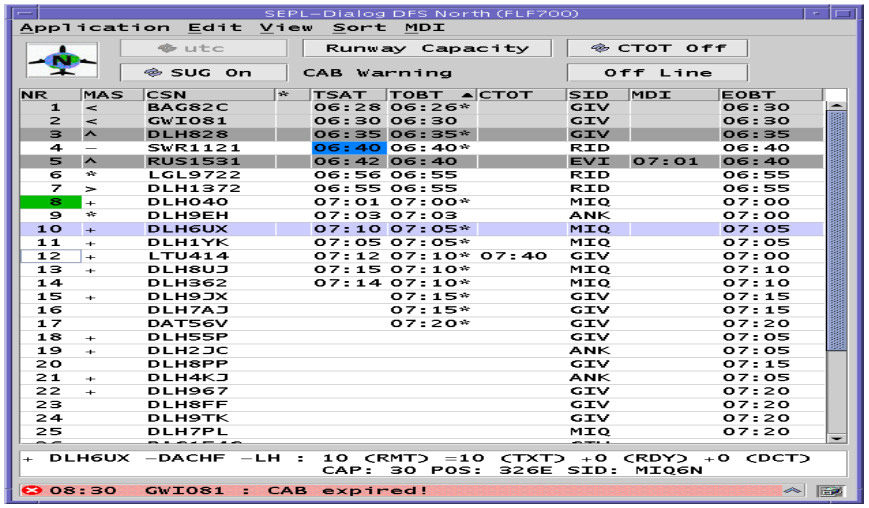
Approaches - Information Sharing (I)

Local Optimization of individual Stakeholders

Building blocks… Airport-CDM as a Baseline…



Collaborative Predeparture Sequence

CDM in adverse conditions

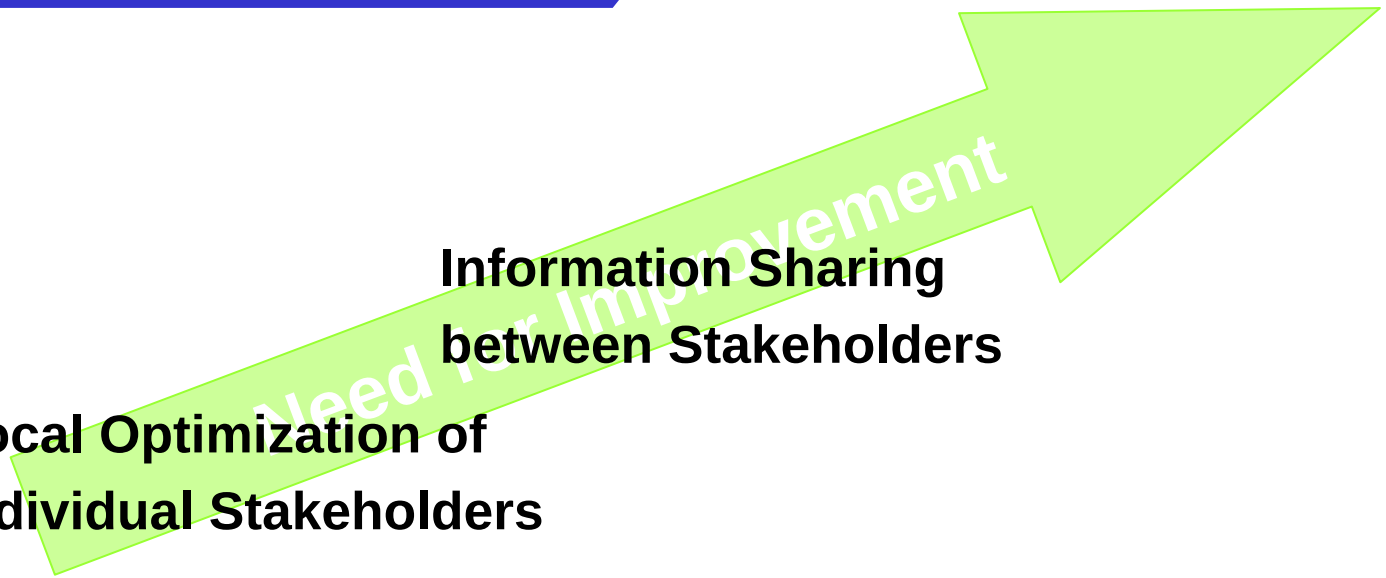
Collaborative Management of Flight Updates

The Milestones Approach

Variable Taxi Time Calculation

Airport CDM Information Sharing

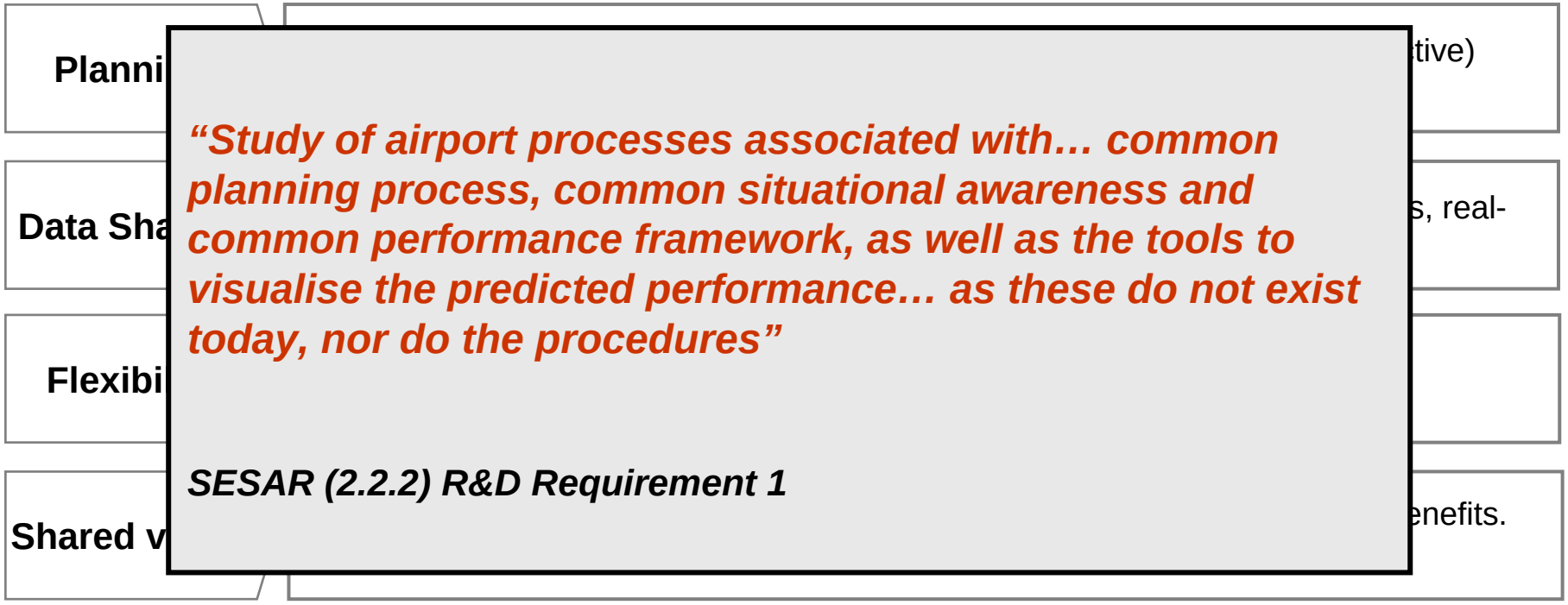
Approaches - Information Sharing (II)



Information Sharing between Stakeholders

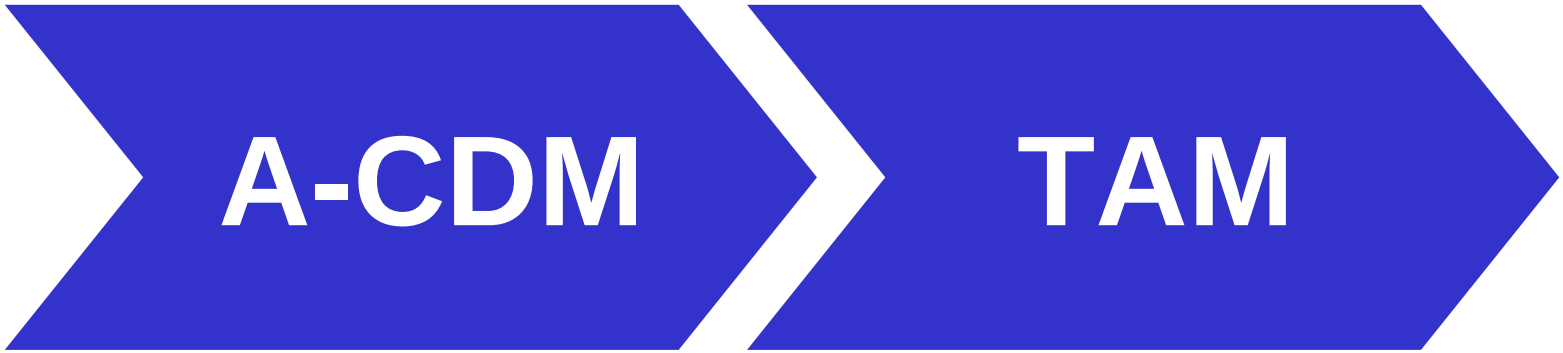
Local Optimization of individual Stakeholders

…but some problems are inherent



Where do we take Airport-CDM from here?

From A-CDM to TAM



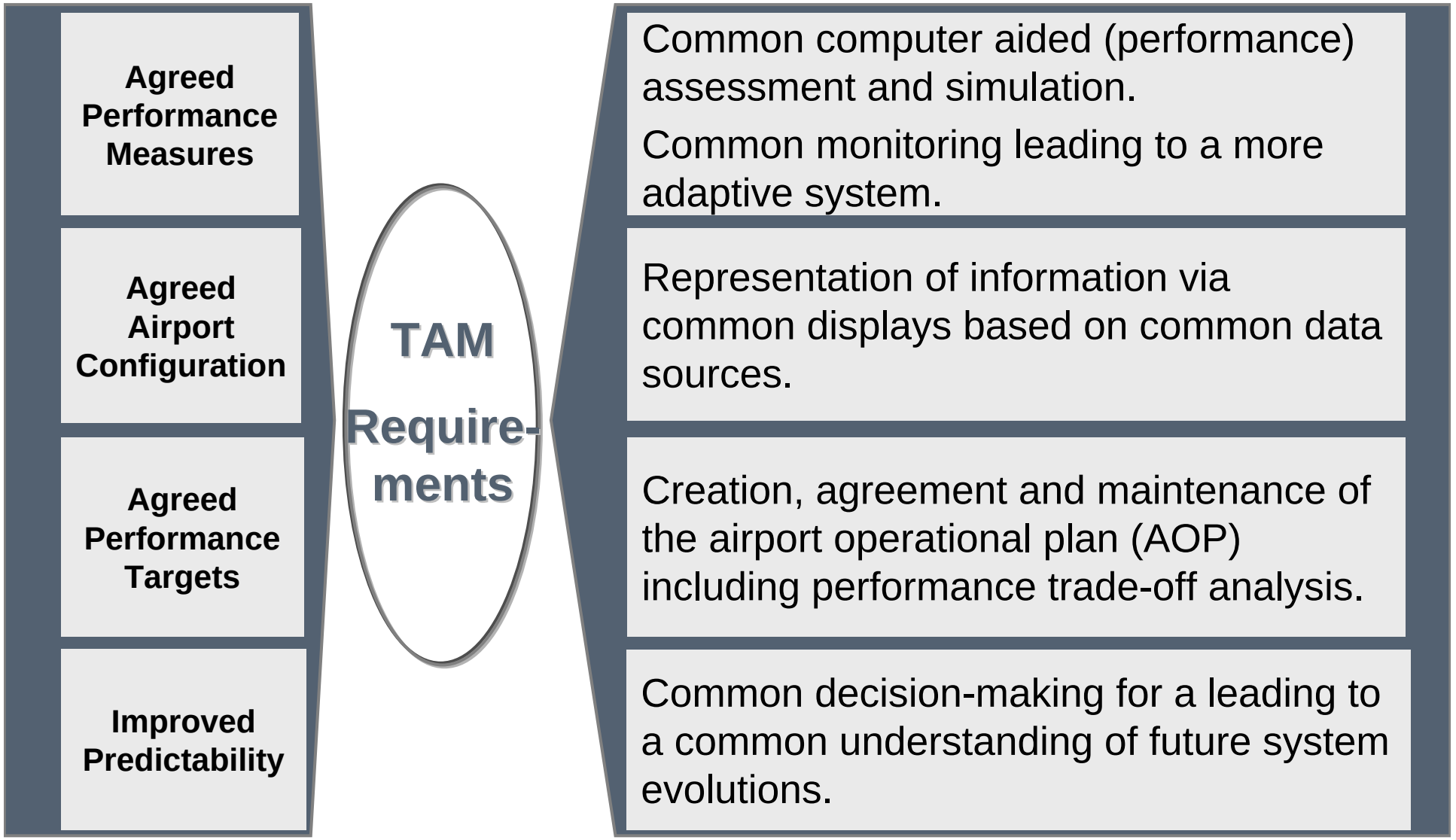
Joint Airport Operations
Planning & Execution
-> Global Optimization

Information Sharing
among stakeholders

Local optimization at
airport stakeholders

NEED FOR IMPROVEMENT

TAM – Generic Requirements



TAM – Main Prerequisites

A-CDM is the baseline

& TAM Concept

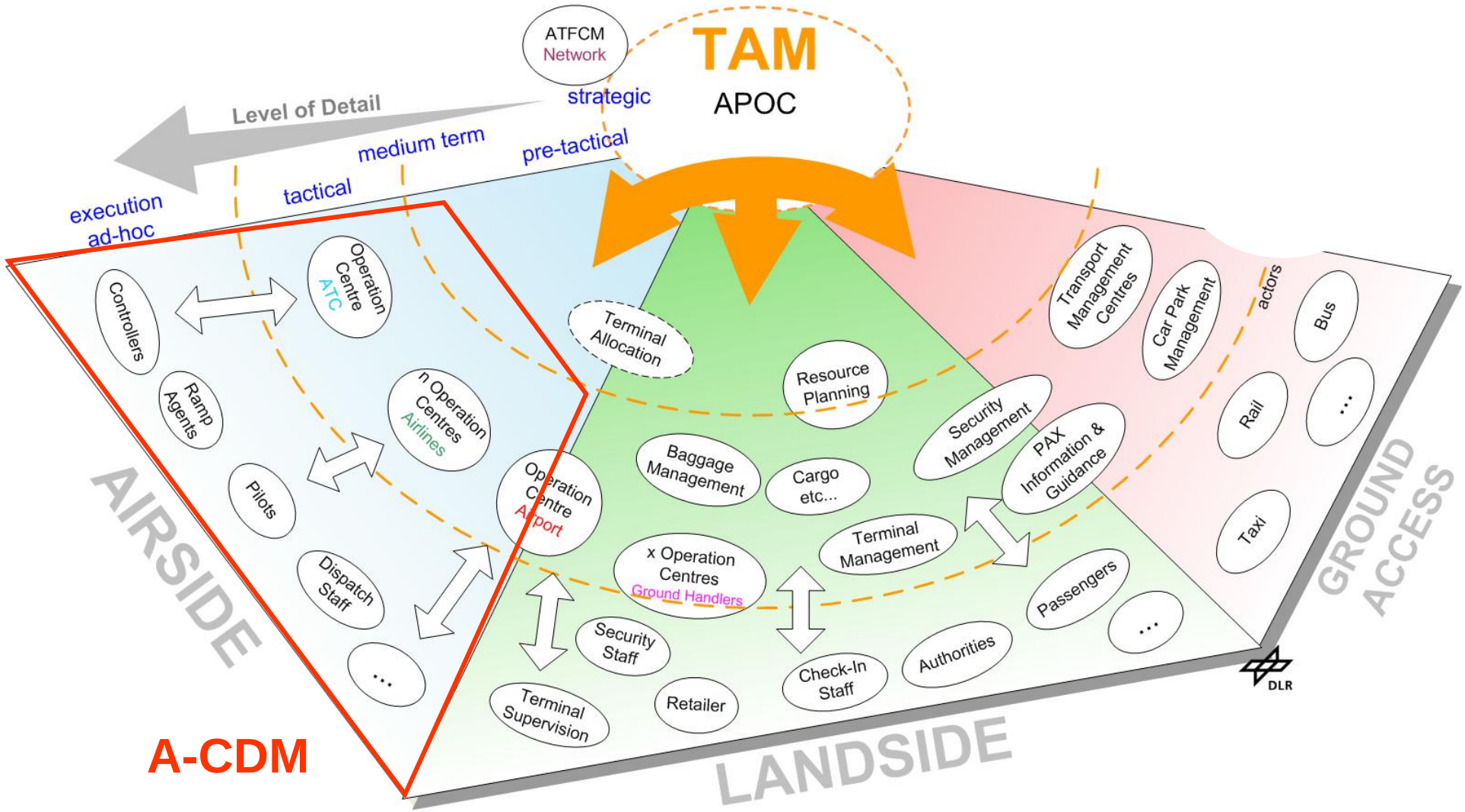
& Technologies / Facilities

- Airport Operations Control Center (APOC)
- Interfacing with tactical management tools and centers (A-SWIM), integrating an Airport Operational Database (AODB)
- Development of new tools (e.g. Total Operations Planner – TOP)
- …

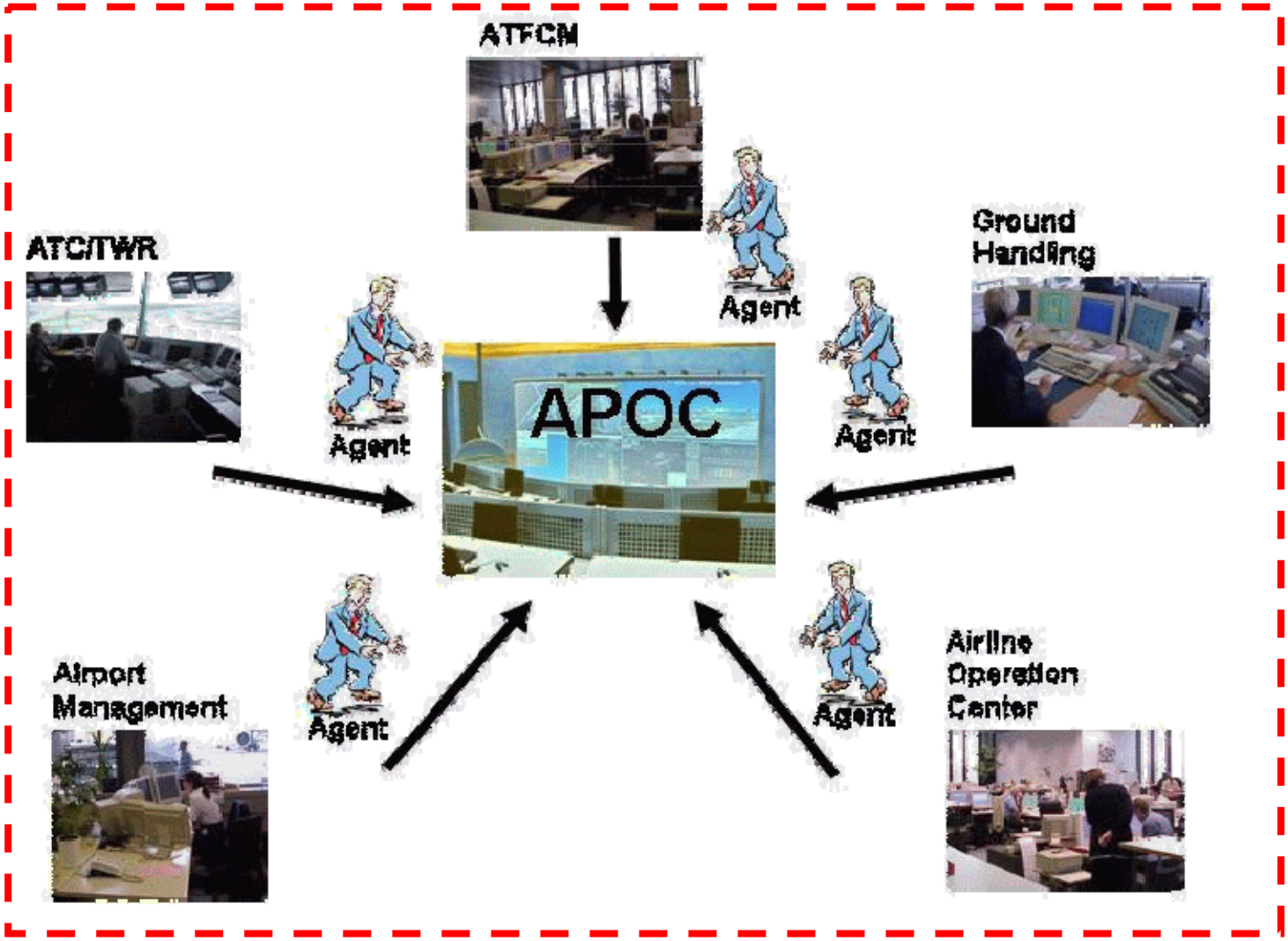
& Cultural Changes

- holistic approach integrating airside and landside
- benefits from global optimisation vs. local optimisation
- working together towards common agreed goals
- …

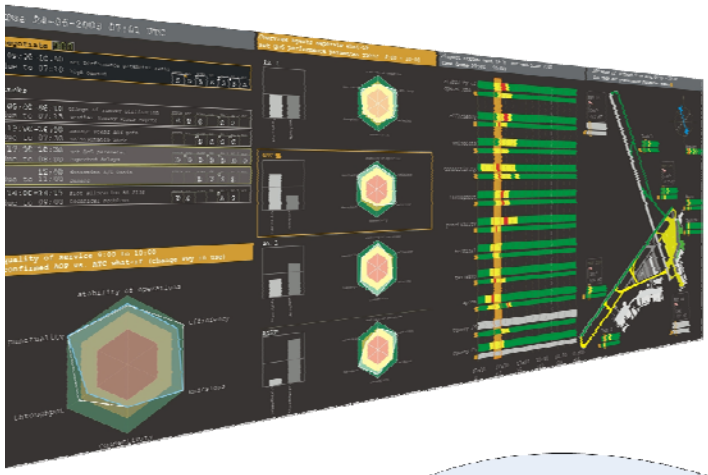
Approaches – Pre-tactical and Holistic Management

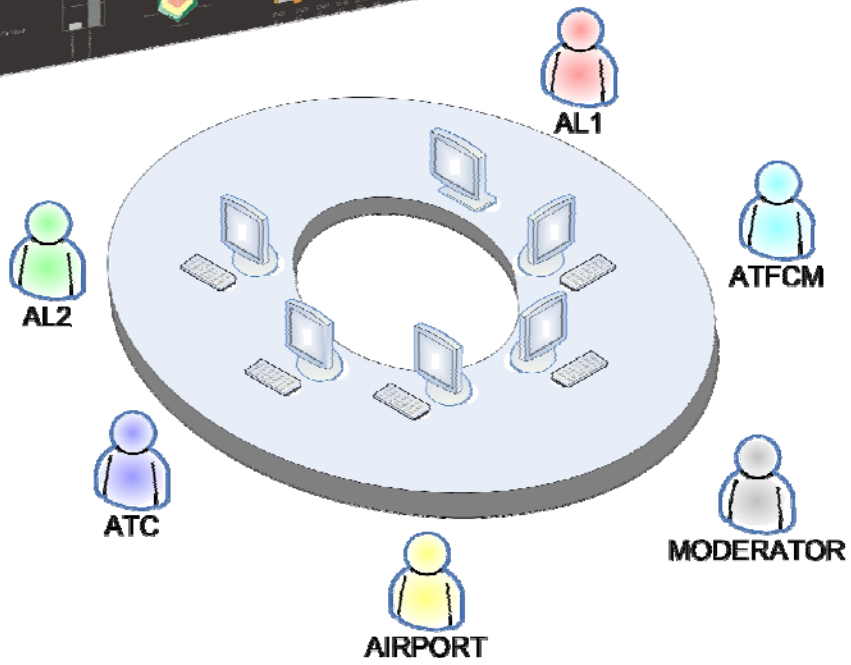


Approaches – Airport Operations Control Center (APOC)



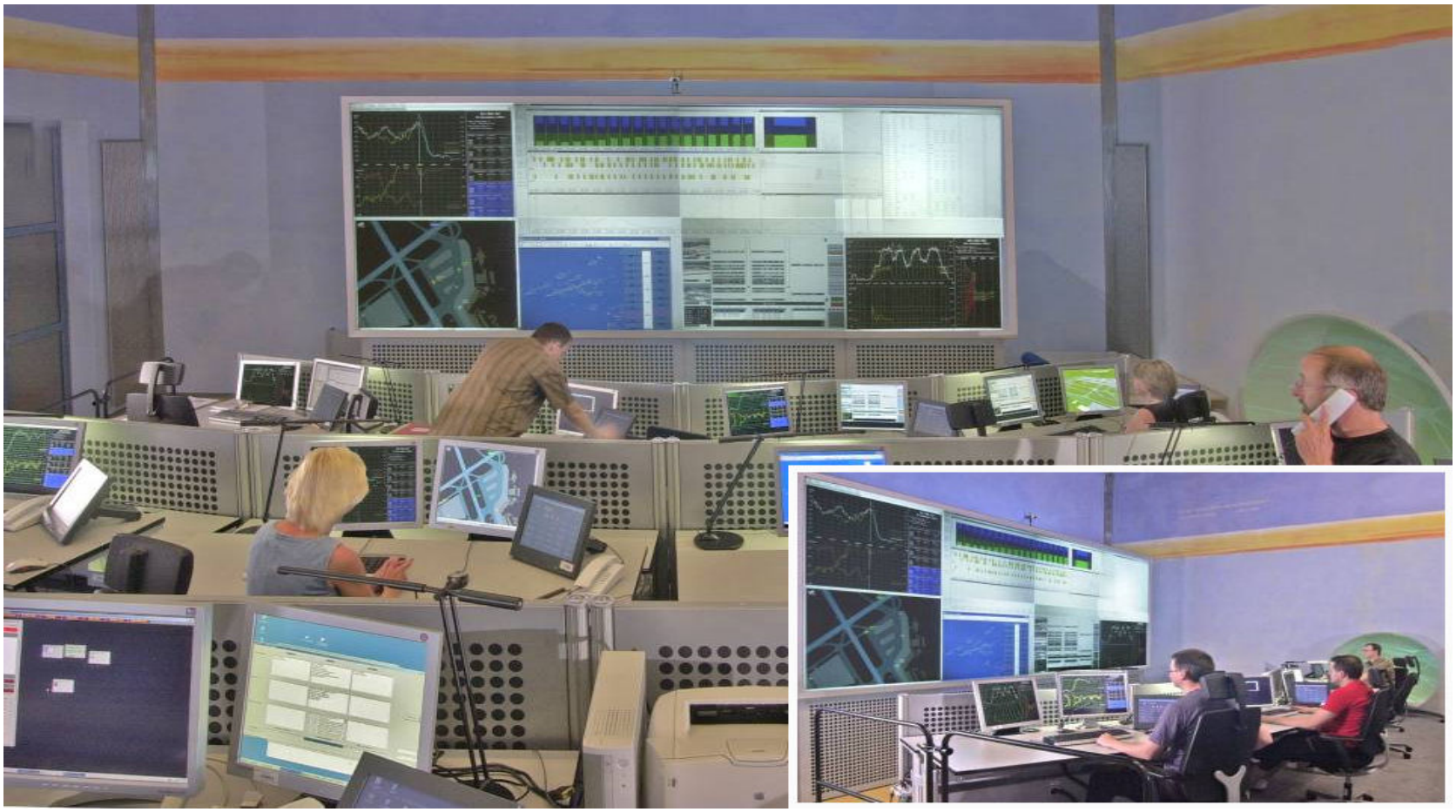
Approaches - Joint and Collaborative Negotiation





- creation of a joint and common situational awareness
- transparent und fair handling by introduction of strict rules and regulations
- taking into account sensitive business data and privacy
- „Use Cases“ for often recurring default situations
- enabling „What-If“-exploration to find alternative solutions
- introduction of an arbitrator

Approaches - Validation Plattform ACCES



- Validation Infrastructure: ACCES – Airport and Control CEnter Simulator
  a working- and simulation environment and flexible infrastructure

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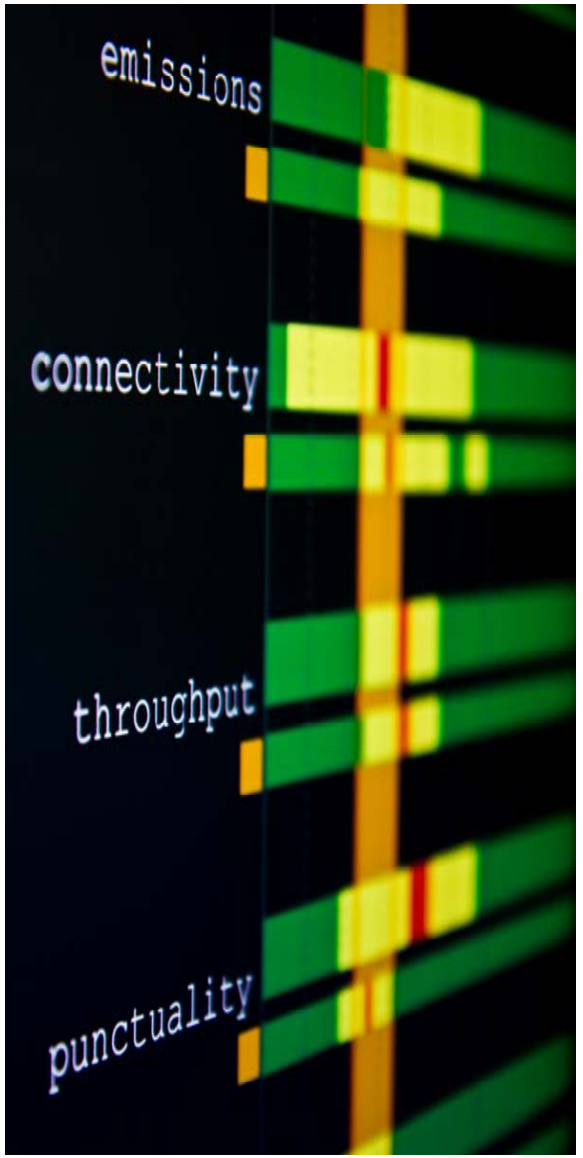
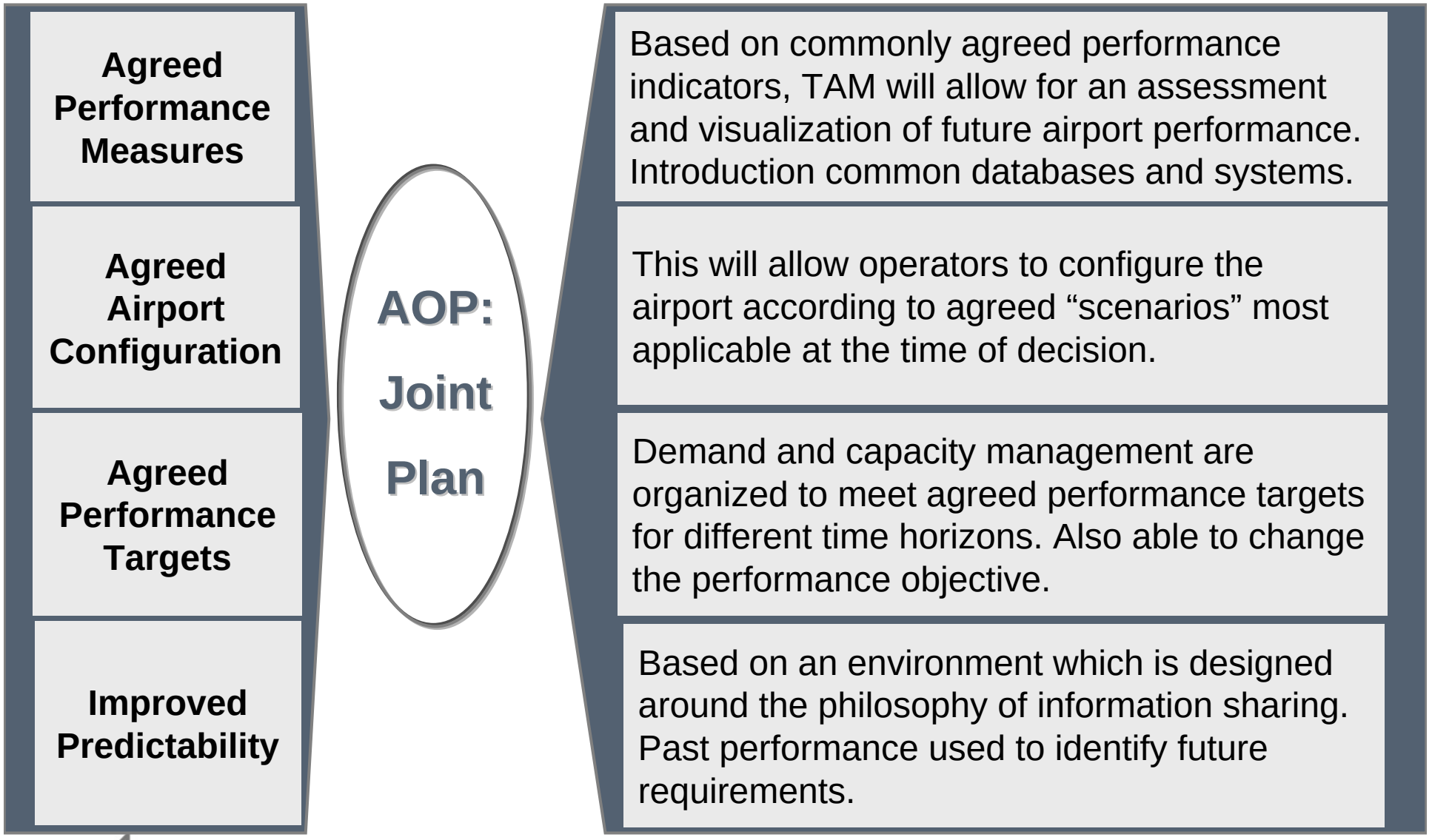
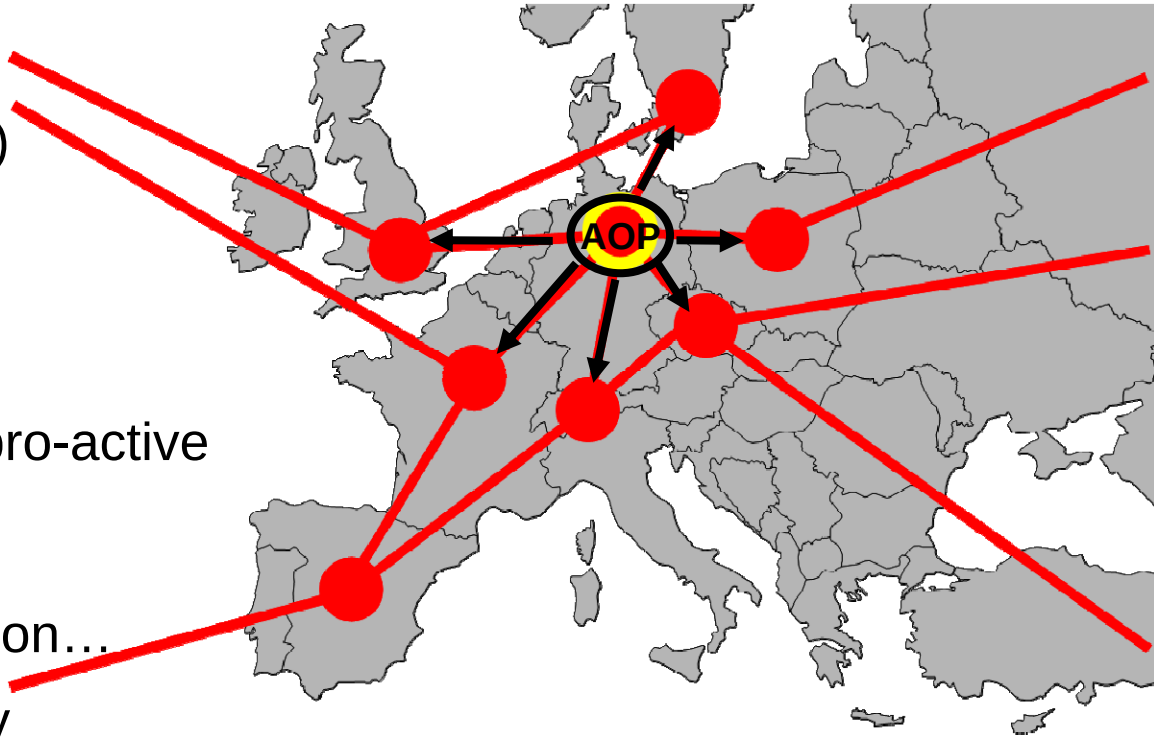


TAM – Expected Benefits (I)



TAM – Expected Benefits (II)

- Agreed Airport Operations Plan (AOP)
- AOP includes a performance level commitment to ATN
- Early planning and pro-active operations increasing airport‘s predictability; better resource utilisation…



- NOP - receives early planning data for more efficient and optimal sector capacity and trajectory planning
- The user‘s wishes submitted by 4D-business trajectories potentially can be much more efficiently be incorporated

Conclusion

Total Airport Management (TAM)

- will be the successor of A-CDM, for pre-tactical planning and execution of AOP
- is the holistic approach (landside and airside) towards airport operations optimisation
- leads to commonly agreed performance targets - global optimisation @ airport
- will change stakeholders cultures…

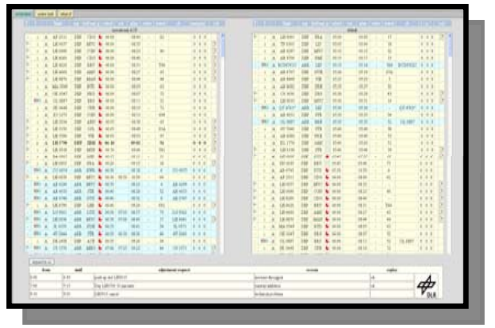
The work of DLR in TAM context

Development of Concepts

- Operational- , technical- , simulation- and validation- concept
- Airport Operations Plan (AOP)
- Negotiation procedures (with system support)
- Bonus malus system (to avoid cheating)

Functionalities and Tools

- Flight planning system, Total Operations Planner (TOP)
- Client working positions
- Display for video wall
- Common used database
- Interfaces to tactical systems
- Simulation environment for test campaigns
- Systems for analyzing, rights control, data fusion etc.



Thank You!

Questions?

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