Total Airport Management as the Enabler for SESAR Collaborative Airport Planning

Florian Piekert   (DLR/AT-One)
Alan Marsden   (EUROCONTROL Experimental Centre)
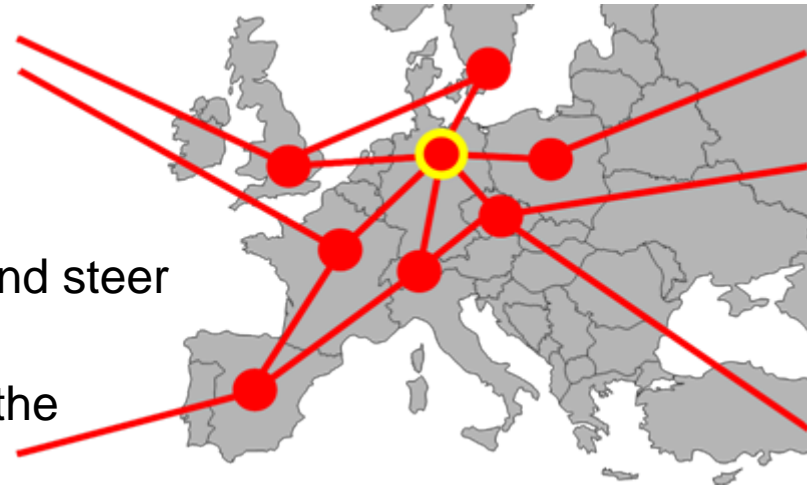
March 6th 2009
EIWAC/ENRI workshop on ATM/CNS 2009

Motivation for a Change (I)

Existing ATM system fragmentation in Europe

- ➢ various ANSPs (~40) interact to control and steer the Network.
- ➢ Airports currently are **isolated** islands in the Air Traffic Network, but
- ➢ problems at one airport (adverse weather, industrial action,…) can affect the entire network!

Lack of information sharing between network, airports and airport stakeholders

- ➢ incomplete, outdated, partly unreliable, totally missing

Competing interests of airport stakeholders may worsen the situation

ATM system customers' wishes are not implemented optimally

Motivation for a Change (II)

There is a need for

- ➢ more dynamic and responsive ways to incorporate the customer's priorities,

- ➢ pro-active instead of re-active planning in predicted bottleneck situations,

- ➢ fair and transparent means of handling competing interests at an airport,

- ➢ improved predictability of the system „airport" at and within the network,

- ➢ performance measurement with a common set of performance indicators to drive a harmonization process between the different airports' performances,

- ➢ …

Motivation for a Change (III)

Performance-based airport operations enable a performance-based Air Traffic Management system

Expected benefits

➢ More efficient airport operations,

➢ less operational costs,

➢ environmental benefits (less fuel consumption, less CO_2, …),

➢ enabling of the system to cope with the future traffic demand.

Approach (I)

Question: start a new system from scratch?

- ➢ Define new procedures for every stakeholder?
- ➢ Define new decision competencies and domains for every stakeholder?
- ➢ …
- ➢ What is the possible acceptance level?

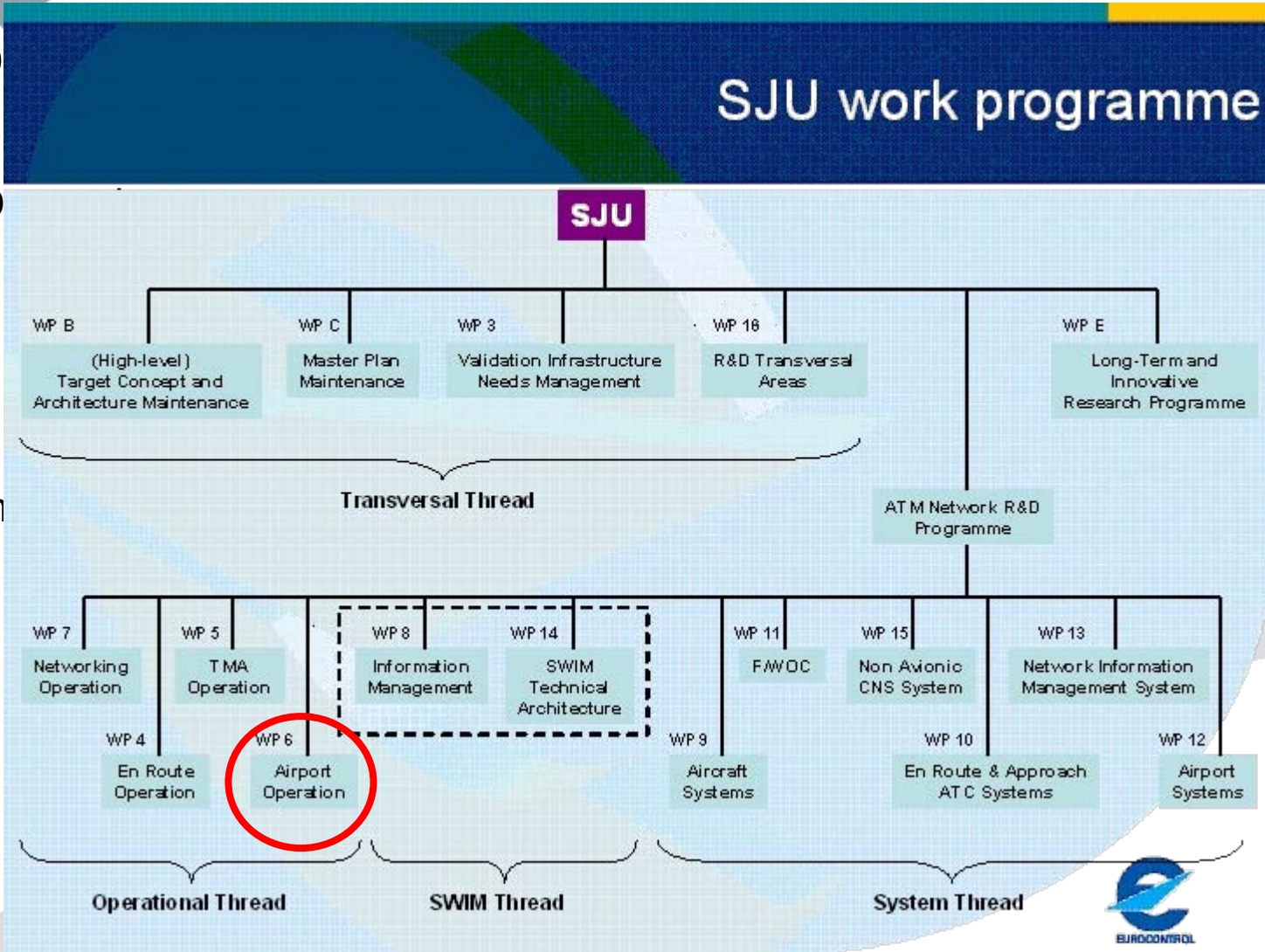## (Nearly) NONE.

The only possible approach can be:

- ➢ Re-Use existing solutions as building blocks
- ➢ Maintain decision domains

SJU work programme

Top-D...

Bottom...

courtesy of SJU/C.Meckiff

Motivation for Total Airport Management (TAM) (I)

NEED FOR IMPROVEMENT

Local optimization at airport 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

Motivation for Total Airport Management (TAM) (II)

A-CDM

NEED FOR IMPROVEMENT

Information Sharing among stakeholders

Local optimization at airport stakeholders

…but some problems are inherent

Planning

tive)

Data Share

s, real-

Flexibi

"*Study of airport processes associated with… common planning process, common situational awareness and common performance framework, as well as the tools to visualise the predicted performance… as these do not exist today, nor do the procedures*"

SESAR (2.2.2) R&D Requirement 1

Shared v

enefits.

Where do we take Airport-CDM from here?

Motivation for Total Airport Management (TAM) (III)

A-CDM ▶ TAM

NEED FOR IMPROVEMENT

Joint Airport Operations Planning & Execution

Information Sharing among stakeholders

Local optimization at airport stakeholders

From A-CDM to TAM – Expected *Benefits*

Agreed Performance Measures

Agreed Airport Configuration

AOP: Joint Plan

Agreed Performance Targets

Improved Predictability

Based on commonly agreed performance indicators, TAM will allow for an assessment and visualization of future airport performance.

Introduction of common databases and systems.

This will allow operators to configure the airport according to agreed "scenarios" most applicable at the time of decision.

Demand and capacity management are organized to meet agreed performance targets for different time horizons. Also able to change the performance objective.

Based on an environment which is designed around the philosophy of information sharing. Past performance used to identify future requirements.

From A-CDM to TAM – Generic *Requirements*

Agreed Performance Measures

Agreed Airport Configuration

Agreed Performance Targets

Improved Predictability

TAM Requirements

Common computer aided (performance) simulations.
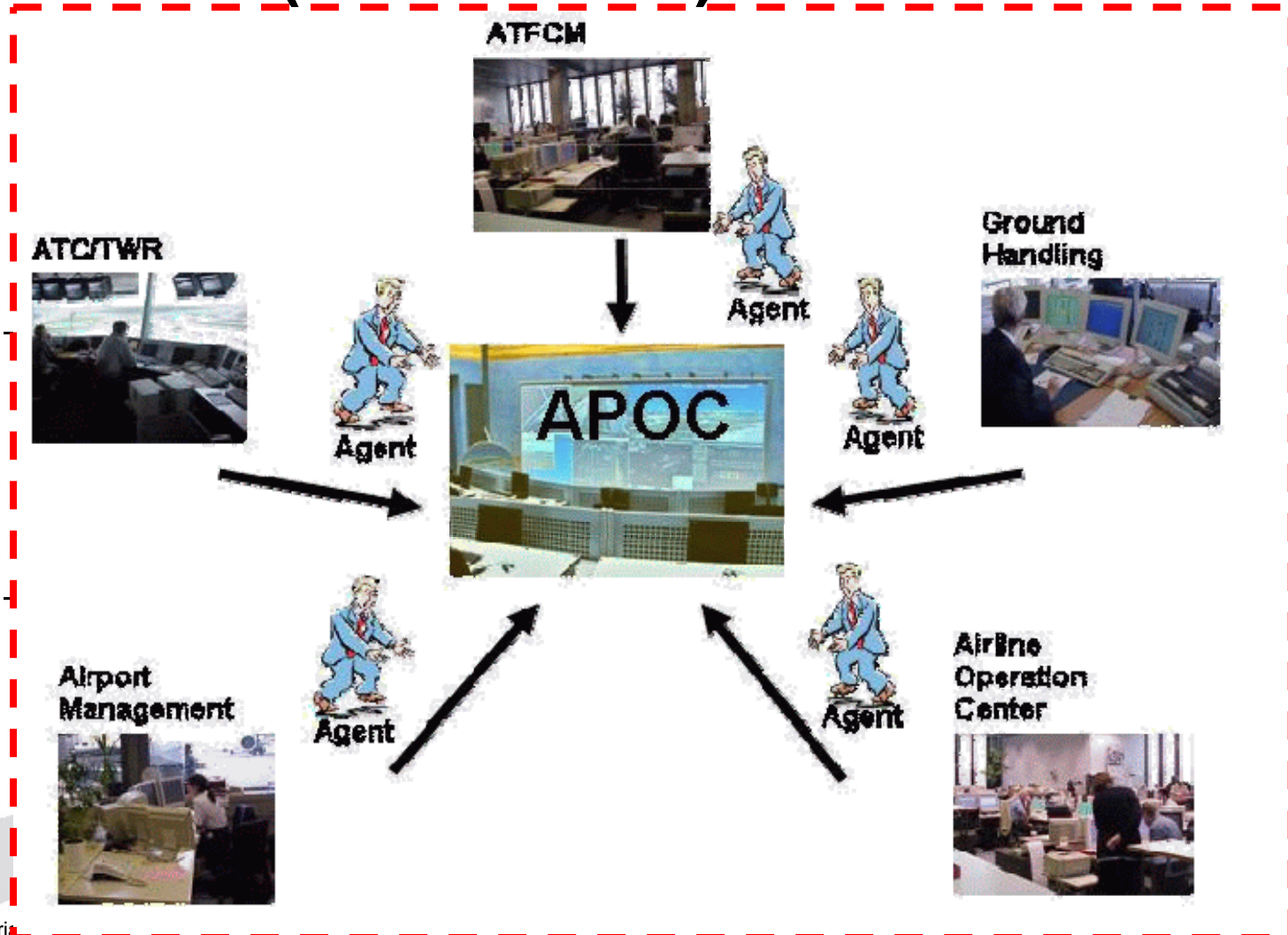Common monitoring leading to a more adaptive system.

Representation of information via common displays based on common data sources.

Creation, agreement and maintenance of the airport operational plan (AOP) including performance trade-off analysis.

Common decision-making for a leading to a common understanding of future system evolutions.

Scope of TAM (time horizon)

TAM – Specific requirements to be addressed

Who will be the main actors?

- Definition of their roles.

- Definition of their internal and external interfaces.

What events (alarms etc.) will trigger a decision?

What **is** the decision making process?

How are decisions fed into updating the AOP?

What data is required for TAM?

What technology support / public and private data support will be necessary?

What will be the key performance indicators?

A TAM Prototype – DLR's internal project FAMOUS

FAMOUS ("Future Airport Management Operational Utility System") aims for a validation of the TAM concept (FAMOUS duration 2007-2010).
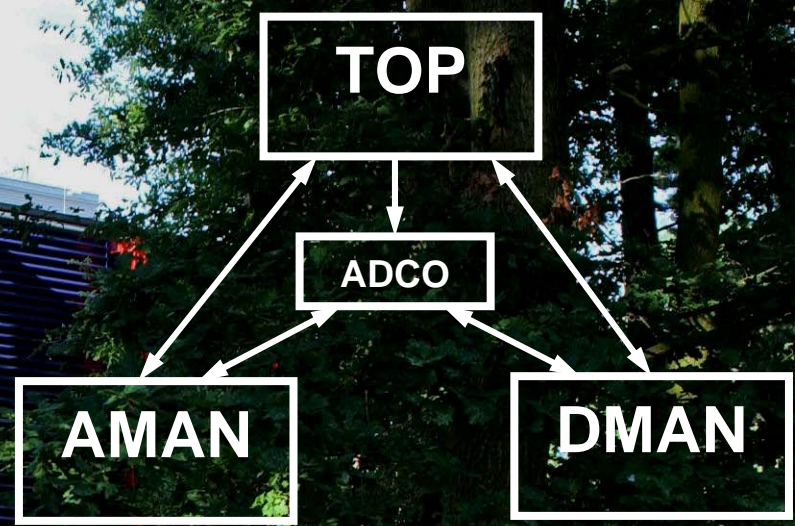
The FAMOUS Operational Concept Document (OCD) delivers

> ➢Descriptions of the agents, their roles and their responsibilities,

> ➢Design ideas for working positions for agents and a moderator,

> ➢Ideas for alarm and event triggering by performance compliance monitoring,

> ➢Use Cases (CDM workflows),

> ➢Flow of information and communication,

> ➢Logical elements of AOP and NOP, Key Performance Indicators/Areas,

> ➢The overall workflow within the Airport Operation Center (APOC).

FAMOUS – Workflow in the APOC
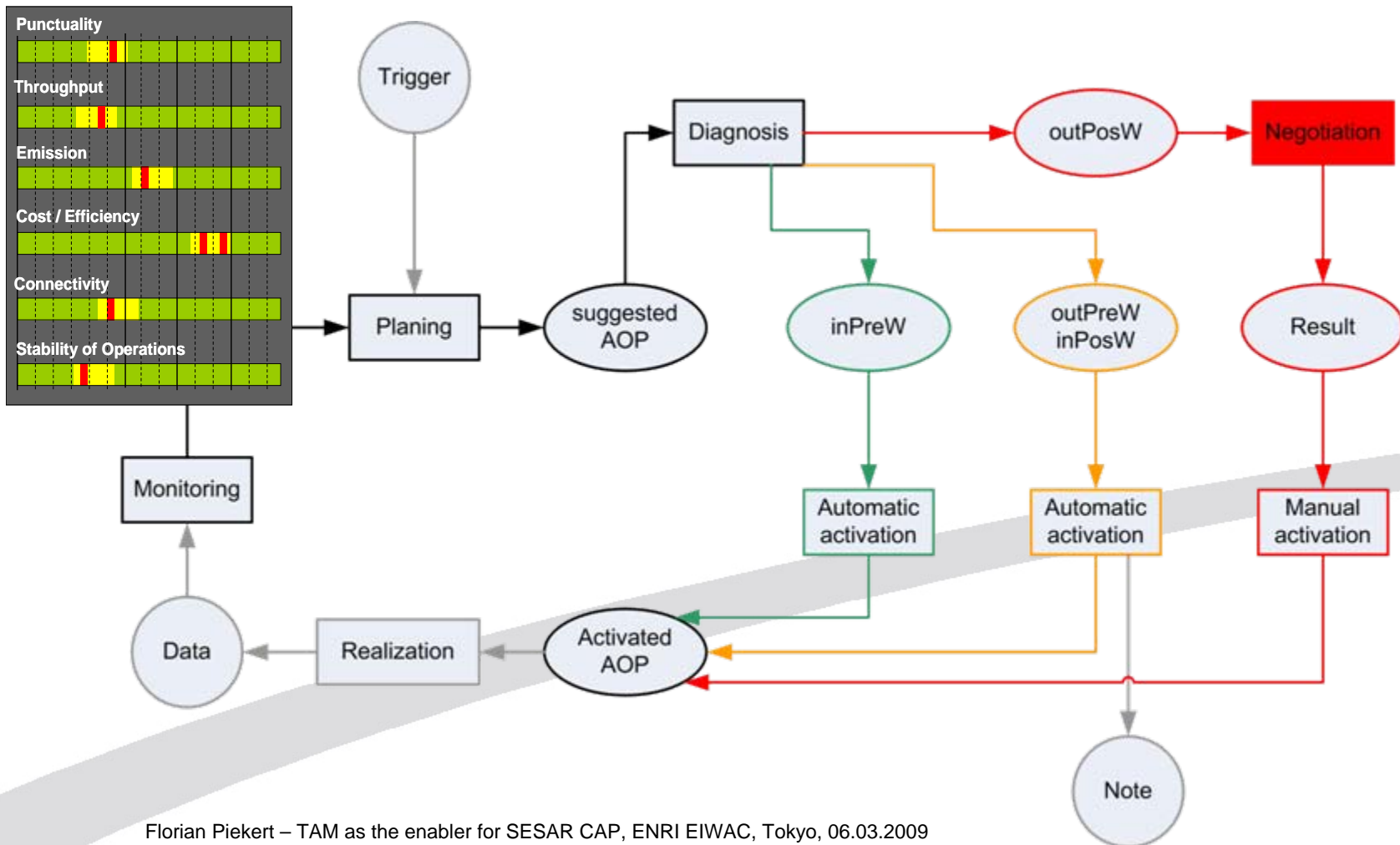
FAMOUS - TAM Simulator Environment

TOP

ADCO

AMAN

DMAN
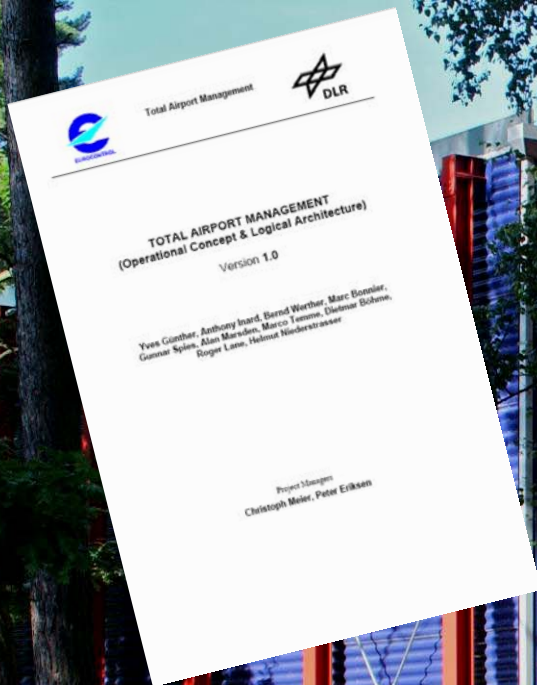
Decision Support Tools for APOC

Total Airport Management (TAM) Concept

TOTAL AIRPORT MANAGEMENT
(Operational Concept & Logical Architecture)
Version 1.0

Yven Günther, Anthony Inard, Bernd Werther, Marc Bonnier,
Gunnar Spies, Alan Marsden, Marco Temme, Dietmar Böhme,
Roger Lane, Helmut Niederstrasser

Project Managers
Christoph Meier, Peter Eriksen
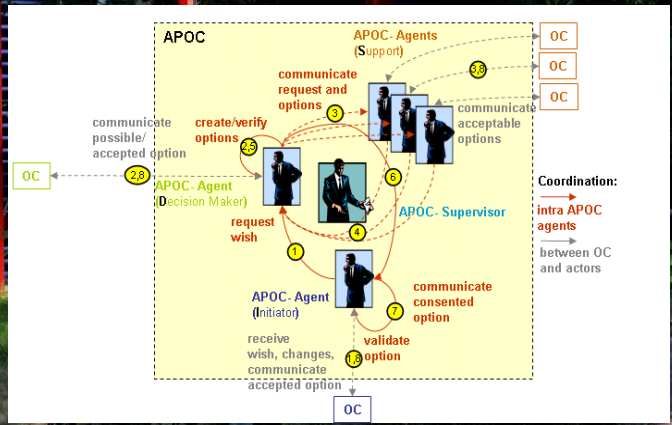
Decision Making Processes in Airport Operations Center (APOC)

FAMOUS – Technical Approach & Architecture

APOC Tools

- **TOP, TOP-Clients, TAPAS**

Tactical planning support tools

- **SGMAN, TMAN, AMAN, DMAN, …**

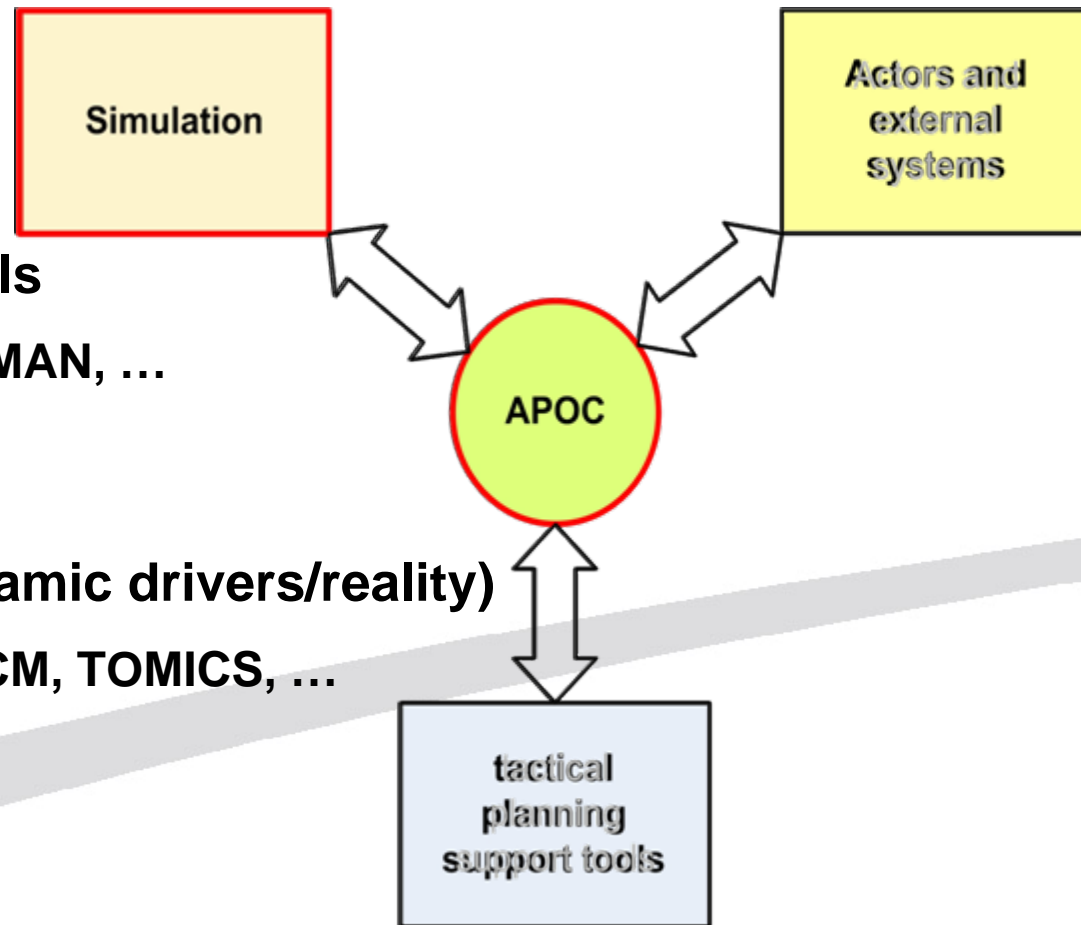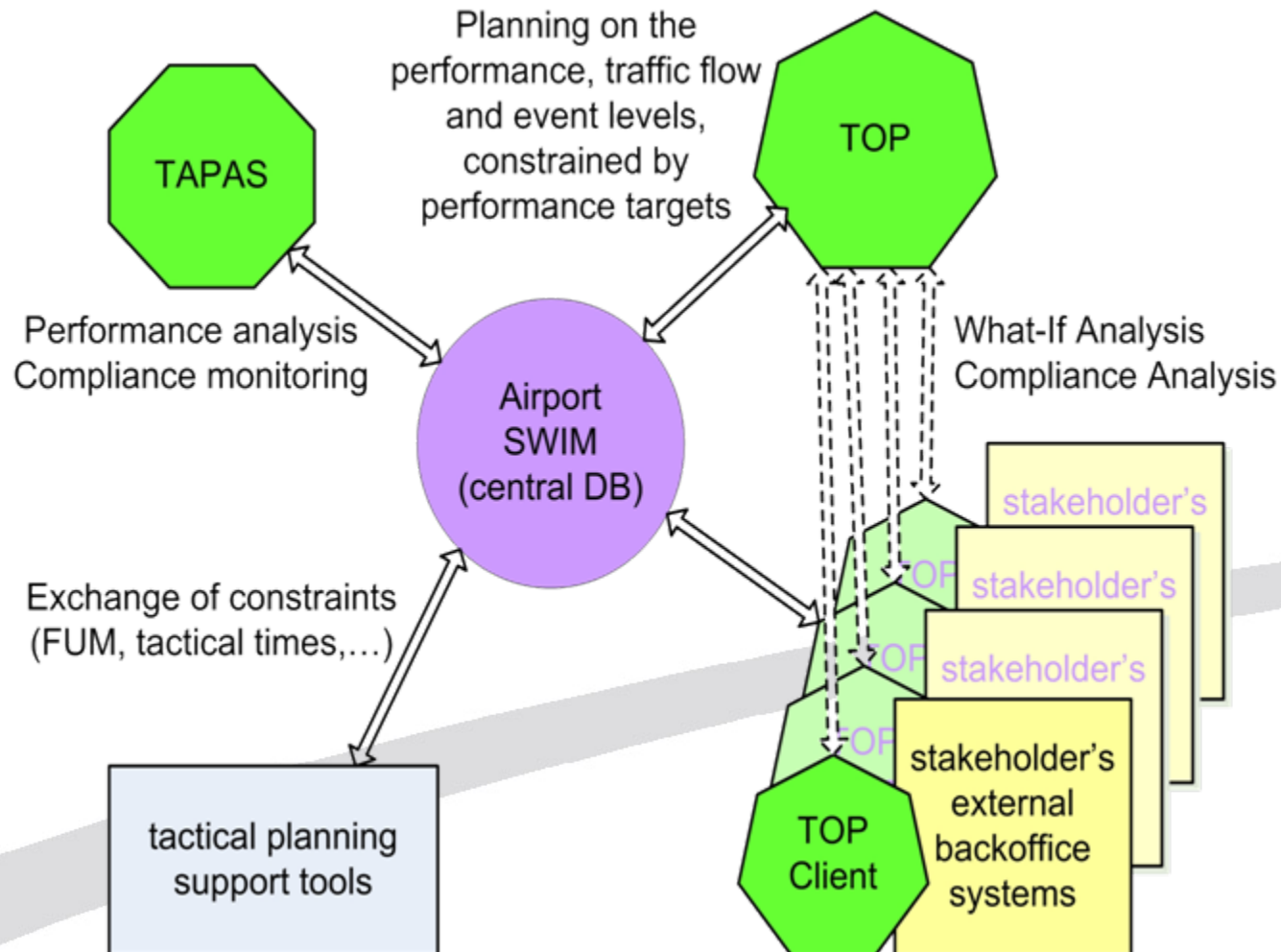**Simulation Environment (dynamic drivers/reality)**
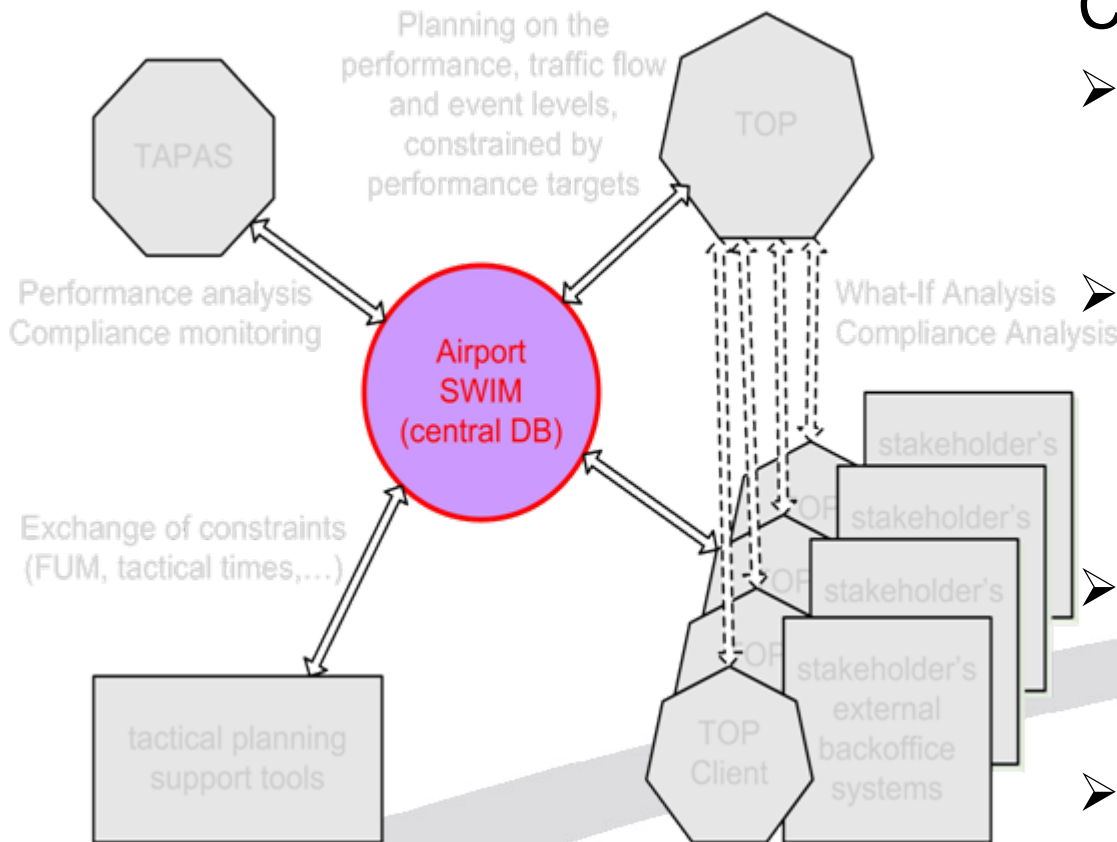
- **TRAFSIM, ASGARD, ATFCM, TOMICS, …**

External systems

- **Lufthansa DAS, …**

FAMOUS – APOC system architecture

FAMOUS – The World – Simulation Components

Planning on the performance, traffic flow and event levels, constrained by performance targets

TAPAS

TOP

Performance analysis Compliance monitoring

What-If Analysis Compliance Analysis

Airport SWIM (central DB)

stakeholder's

stakeholder's

Exchange of constraints (FUM, tactical times,…)

stakeholder's

stakeholder's external backoffice systems

tactical planning support tools

TOP Client

Central Database (SWIM)

➢ enable dynamic APOC operations within the FAMOUS experiments,

➢ dynamic drivers are required to provide the interaction with

➢ the "outside World" and

➢ intra-stakeholder systems,

➢ simulate real-life events and reactions on APOC plan implementation,

➢ simulate components not emphasized within FAMOUS, but required for completeness.

FAMOUS - Outlook

Immediate next steps:

> Complete the integrated environment with APOC tools and dynamic simulations.

Test- and Validation Campaigns

> April 2009: Episode-3 gaming exercises

> May 2009: LuFo4 WFF Lufthansa TAM validation trials

> July 2009: FAMOUS Phase I TAM validation campaign

> July 2010: FAMOUS Phase II TAM main validation campaign

Publicity

> TAM congress (October 2009 in Braunschweig)

> ATC Global 2010 (Integrated APOC demonstrator)

> FAMOUS Dissemination workshop end of 2010

Questions?

TAM – Further Sources of Information

World Wide Web

http://www.tams.aero/

http://www.dlr.de/fl/

http://www.eurocontrol.int/eec/public/standard_page/RA_Airport.html

http://www.sesarju.eu/public/subsite_homepage/homepage.html

eMail

Peter Eriksen	**Florian Piekert**
EUROCONTROL Experimental Center	**DLR, Institute of Flight Guidance**
Business Area Manager	**TAM Programme Manager**
Airport Throughput	**Department of Operations Control**
Peter.Eriksen@EUROCONTROL.INT	Florian.Piekert@DLR.DE

Alan Marsden
Alan.Marsden@EUROCONTROL.INT