FAP Model
Future ATM Profile

System Wide Modeling AP9 - Technical Interchange Meeting (TIM)
Madrid 16 & 17 Nov. 2006

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Content

Introduction

- How the FAP tools are used in the Pan European Capacity Planning Process

- FAP Tools Architectural Overview

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FAP and the ECIP

European Convergence and Implementation Plan

Since 1998, FAP (Future ATM Profile) has been the core component of the European capacity management process, which is the connecting link between project planning (regional CIP objectives) and European target setting.

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The European ATC Capacity Planning Process (1/3)

Medium-term European-wide capacity planning started at PC request in November 1998 :

- For each ACC/TMA unit capacity requirements are assessed from the overall network perspective.
- Corresponding capacity profiles are published in the European Convergence and Implementation Plan.
- ANSPs are required to develop 5-years capacity plans against those profiles, in their Local Convergence and Implementation Plan.
- Progress is monitored and plans are updated yearly.

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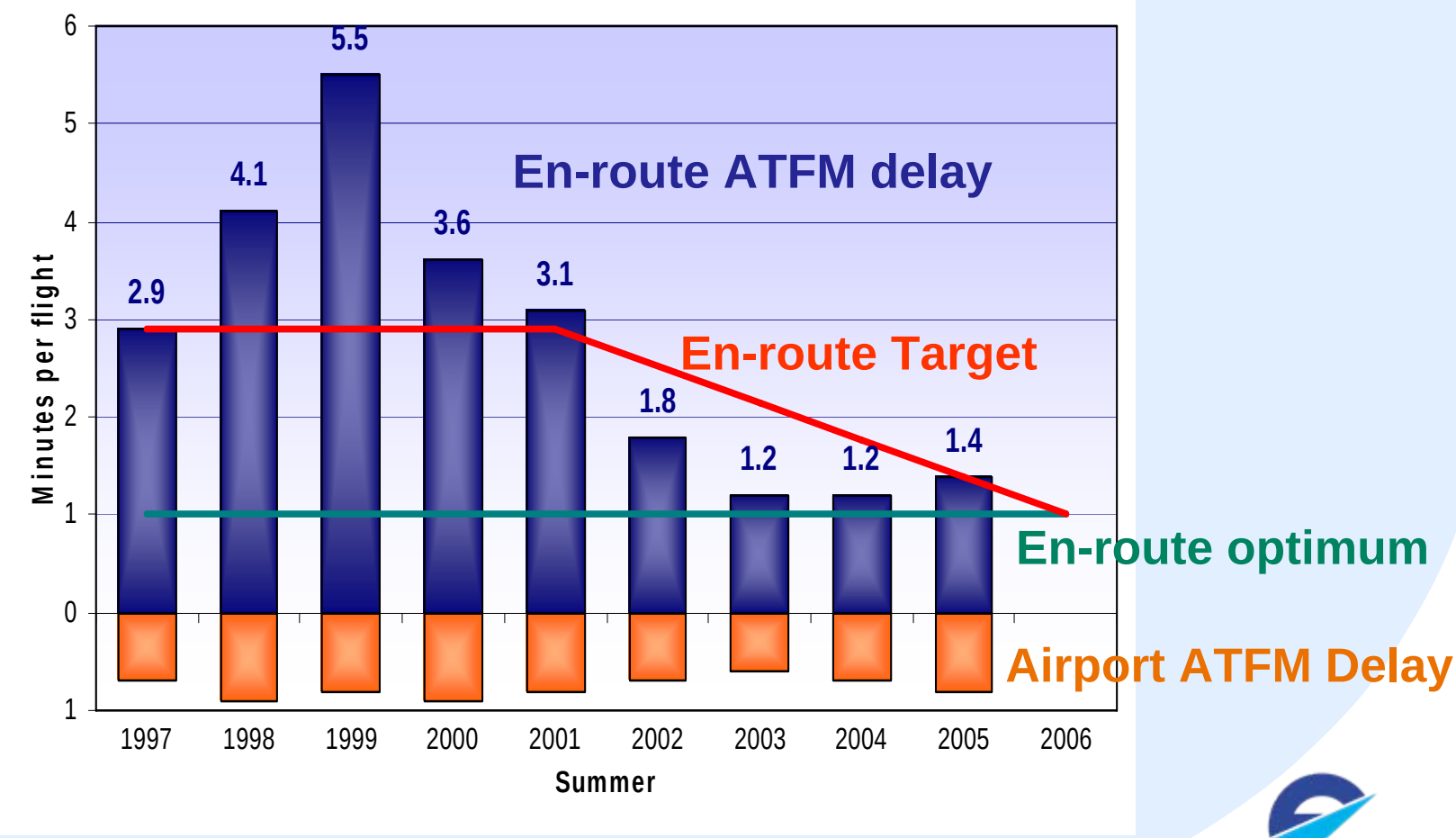
The European ATC Capacity Planning Process (2/3)

Strategic Objective: 1 minute en-route ATFM delay per flight



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The European ATC Capacity Planning Process (3/3)

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FAP - Overview (1/2)

Global Parameters:

Regional Parameters:

The FAP Network Model

Delay Target
Source: Prov. Council

Traffic Growth
Source: STATFOR

Cost of Delay
Source: PRRs

Route Network
Source: SAAM

FAP Platform

Route & Capacity Network
CFMU Slot Allocation
Economic Evaluation

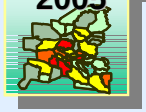
56 days simulated
30 000 flights/day
450 sectors
72 ACCs
120 airports
9000 traffic growth parameters

Sector Capacities and Configuration
Source: ANSPs/CFMU

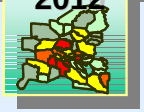
Airport Capacities
Source: Airports / Eurocontrol

Cost for ATC Capacity
Source: ANSPs / CRCO

2005



2012

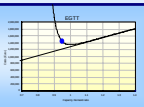


2020

What if Scenarios

Bottlenecks

ROI



Capacity Profiles

Delay Forecast

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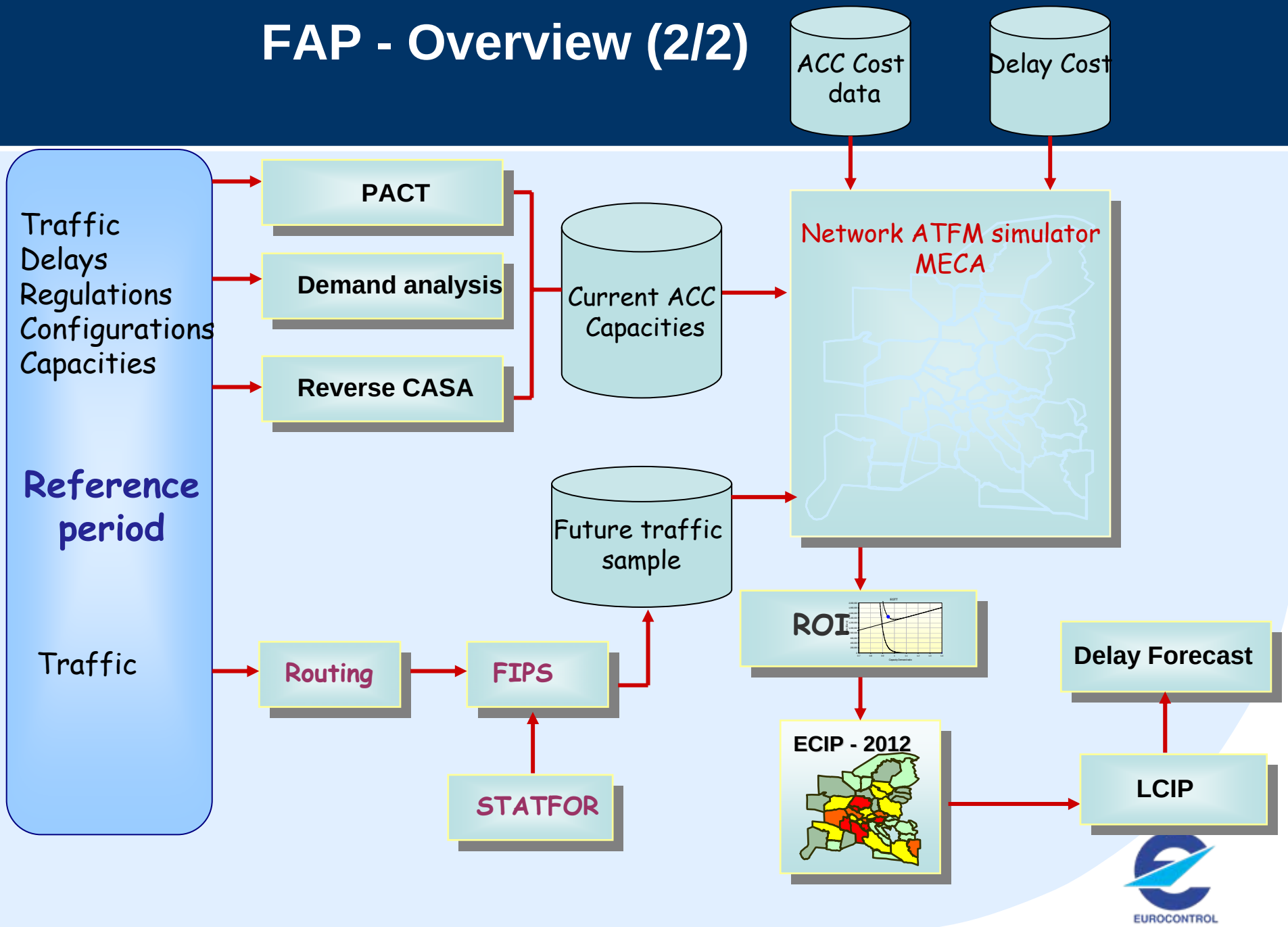
FAP - Overview (2/2)



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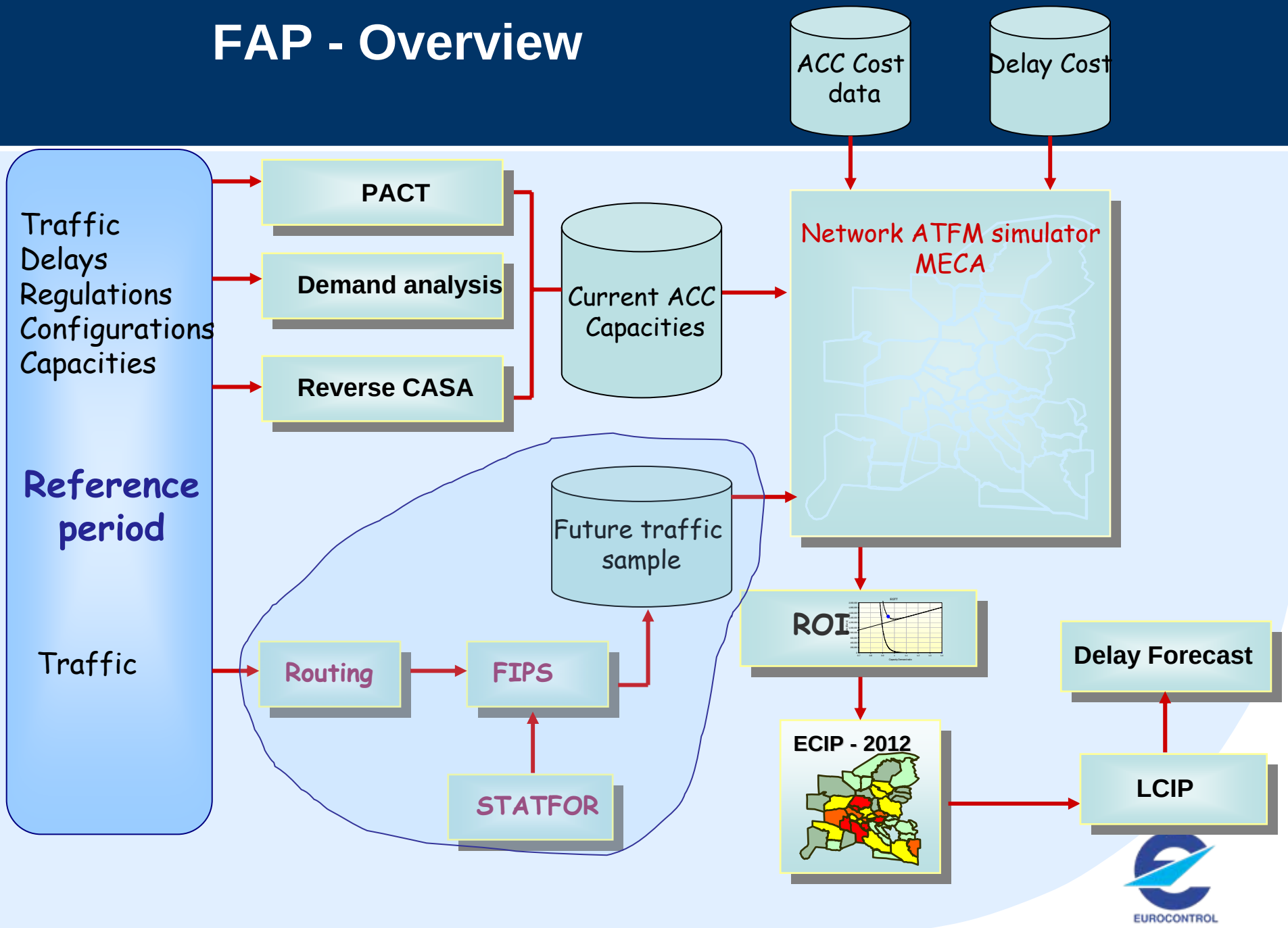
FAP Simulation Process

- Modeling Traffic growth

FAP - Overview



Future Traffic (1/5)

Routing

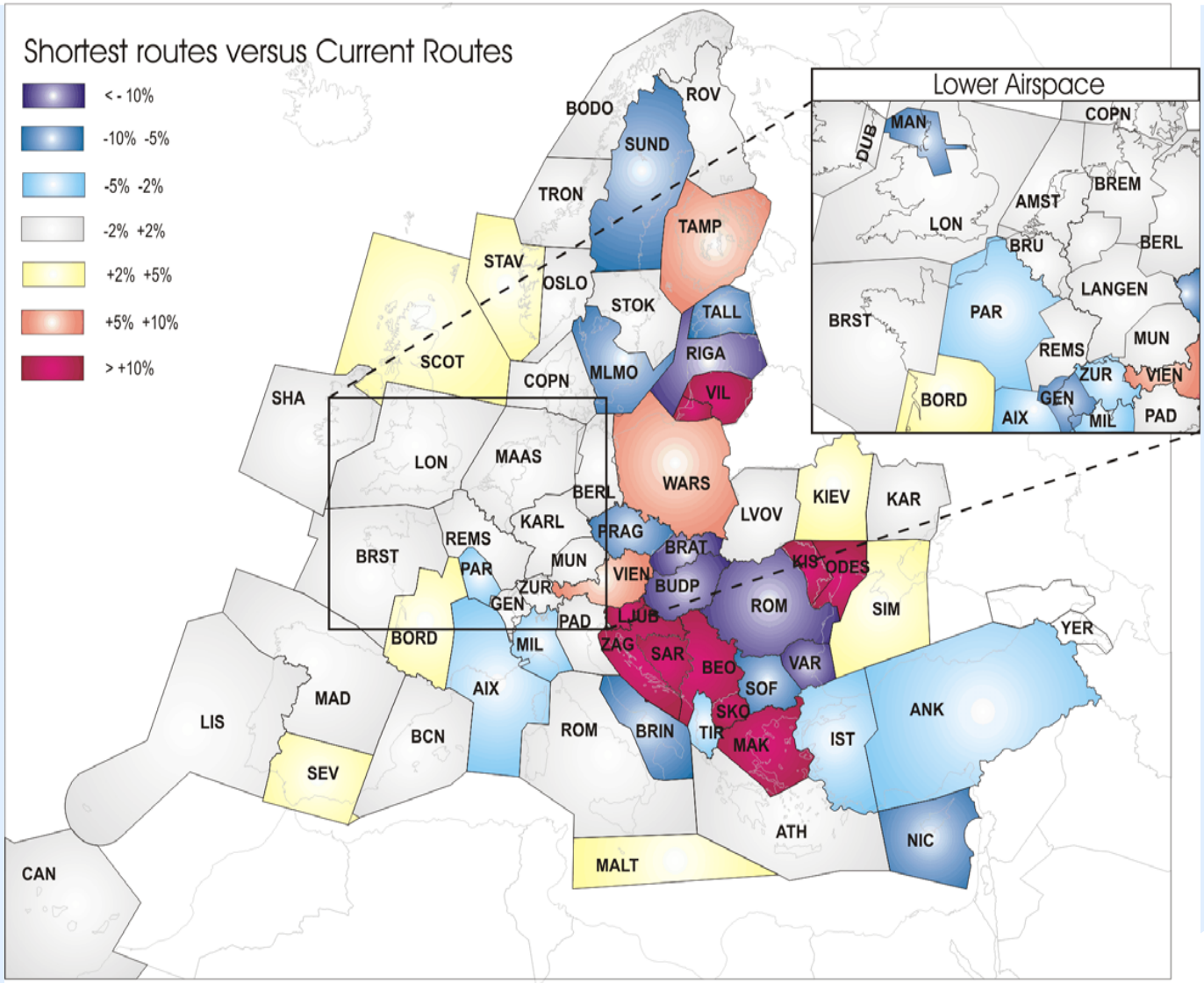
Shortest Routes on ARNV5x

Use of SAAM

System for air traffic Assignment and Analysis at a Macroscopic level

Future Traffic (2/5)

Difference Shortest / Current Routes



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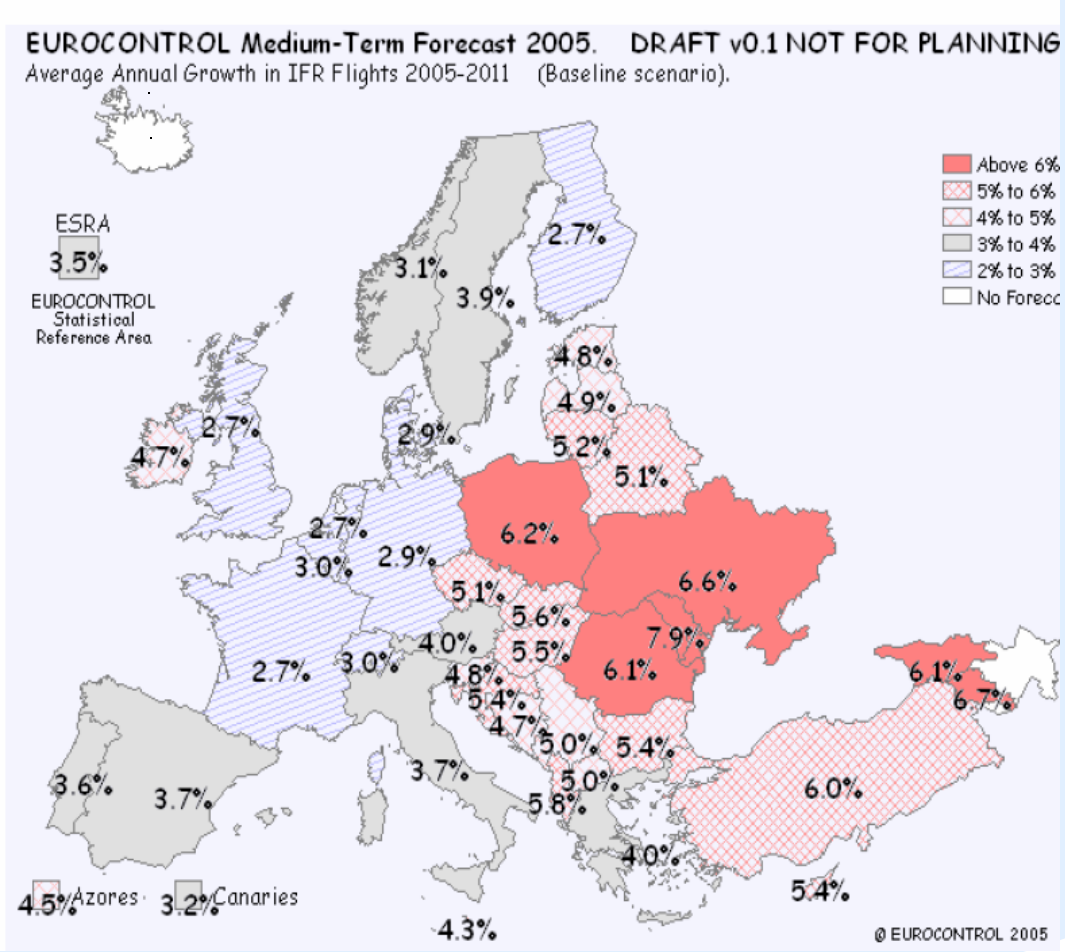
Future Traffic (3/5)

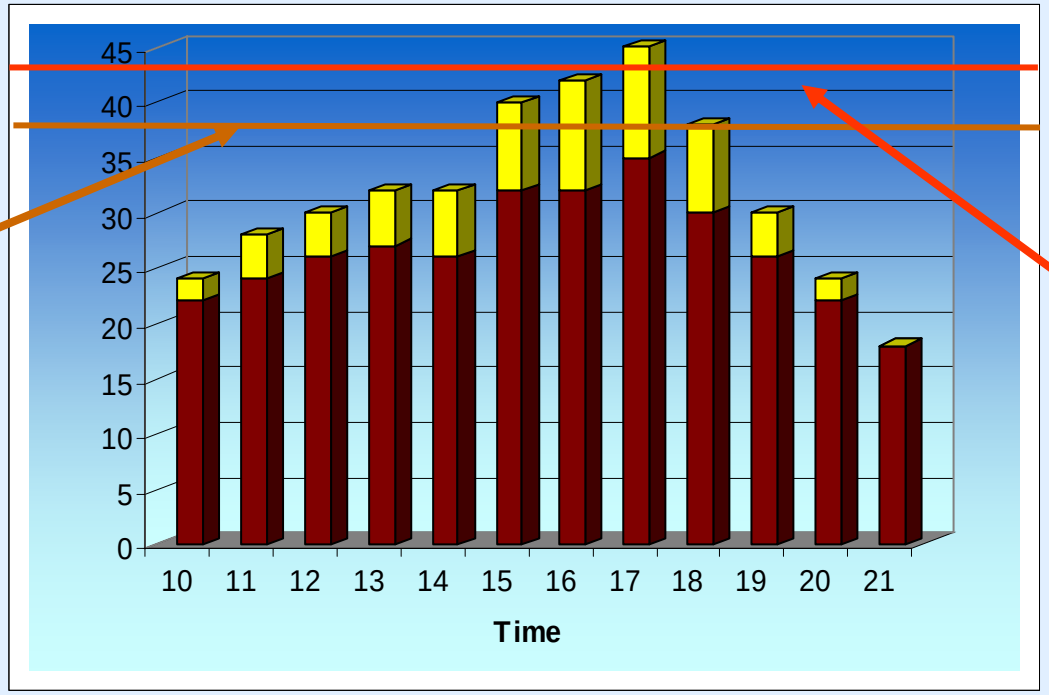
STATFOR: Yearly city-pair forecast (low – base – high)

ID	Scenario	TrafficType	DepICAO	ArrICAO	YR0	FC1	FC2	FC3	FC4	FC5	FC6	FC7
1793	Base	Com	EDDF	LIRF	3183	3170	3212	3132	3296	3361	3400	3451



Future Traffic (4/5)

Airport access and delay



Capacity:
Above this, any demand is "regulated" (delayed)

Theoretical Limit
Above this any demand is "unaccommodated"

Why ? Allows simultaneous modelling of unaccommodated demand (slot limits) as well as delay due to insufficient runway capacity.

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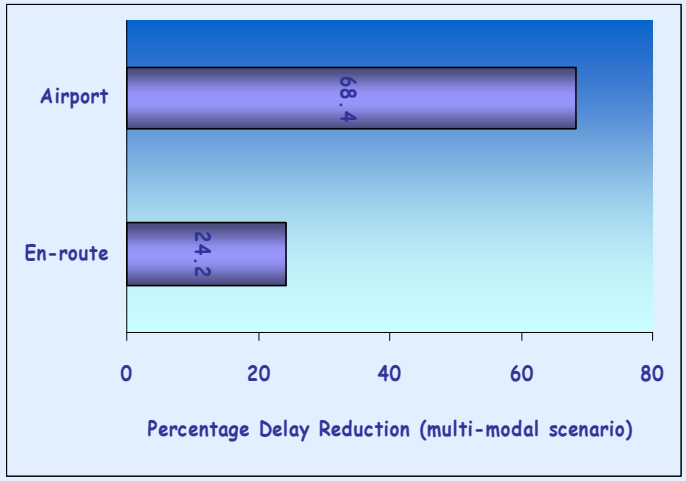
Future Traffic (5/5)

Additional factors

Schedule smoothing (“spreading the peaks”)

Frequency capping

Substitution and inter-modal transport links



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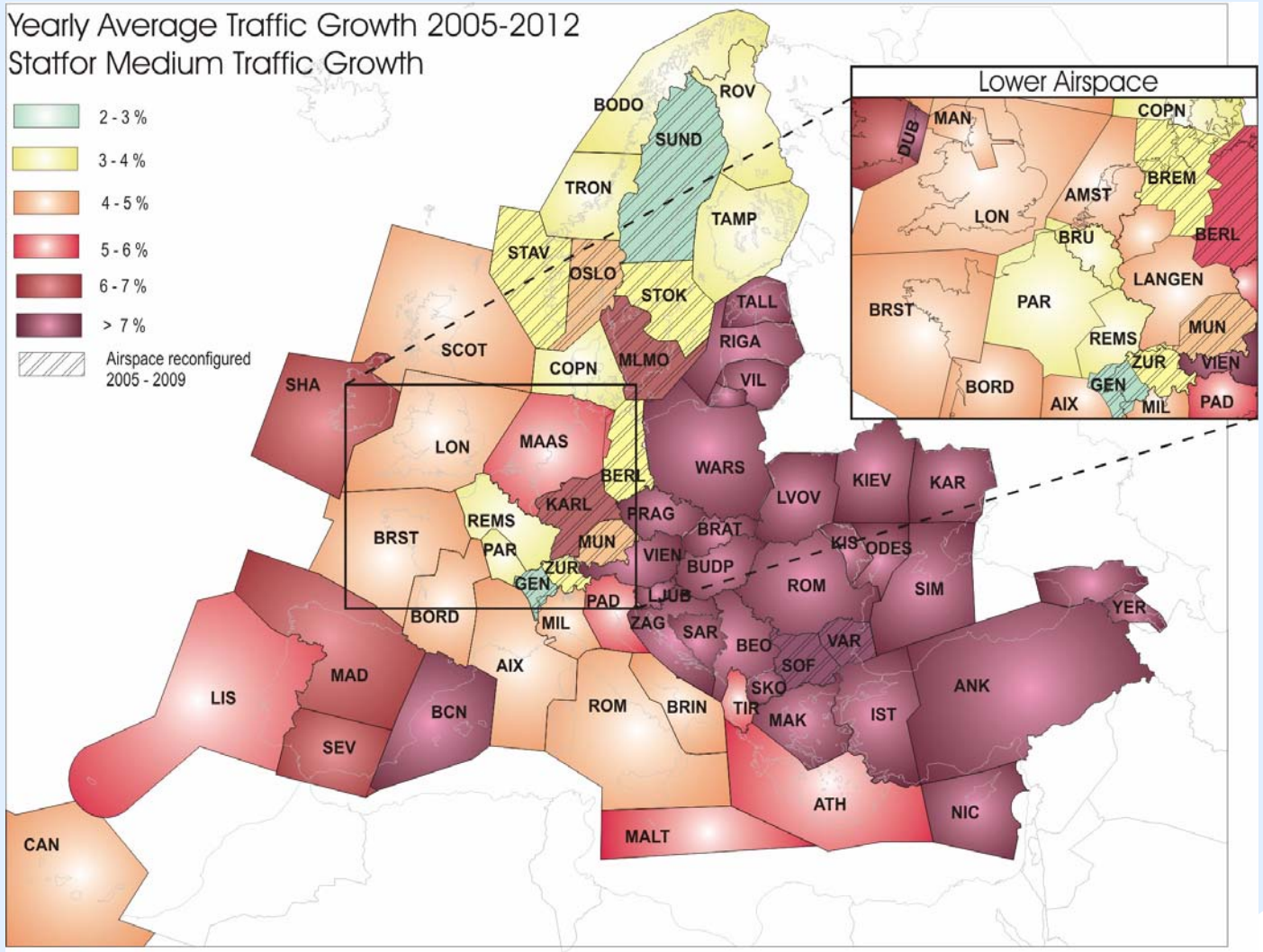
traffic growth per ACC



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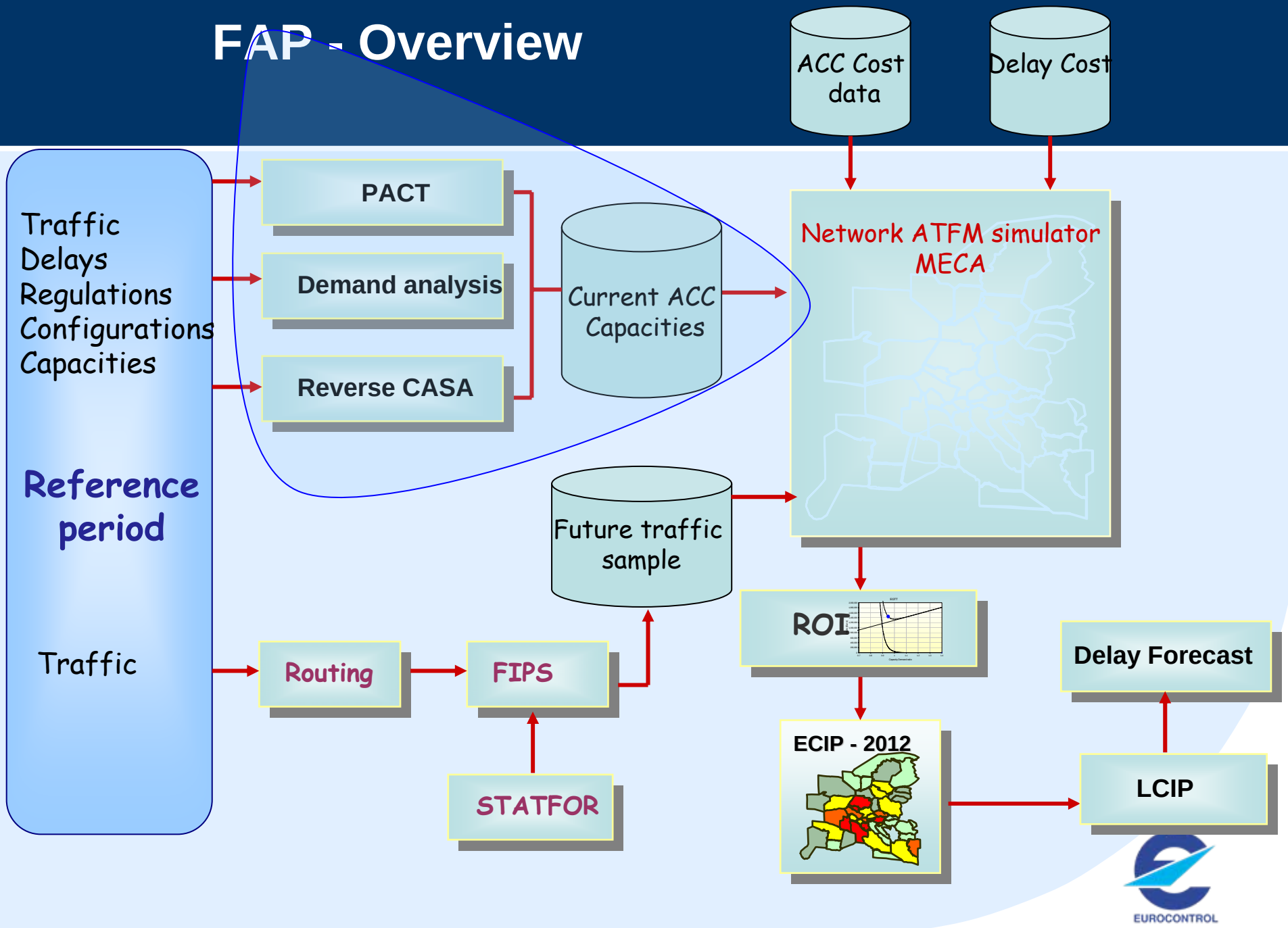
FAP Simulation Process

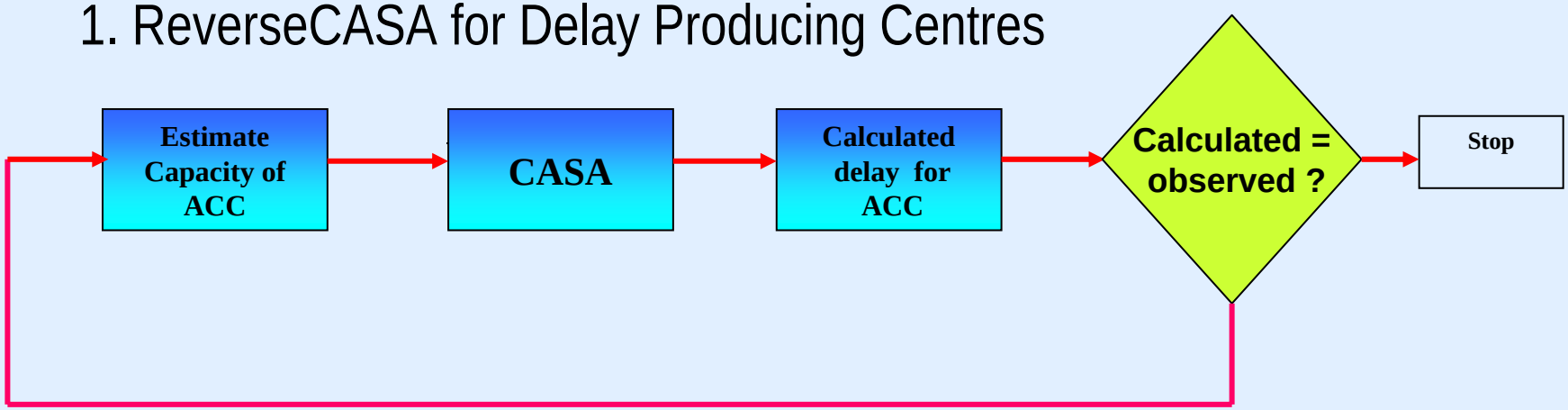
- Measuring ACC capacity
- Translating local capacity growth to ACC and network capacities

FAP - Overview

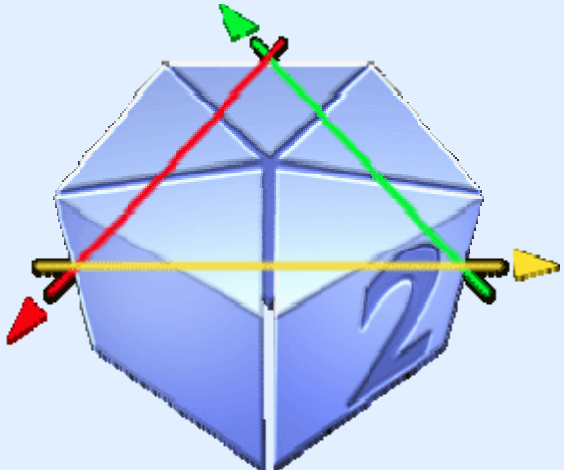


ACC Capacities

1. ReverseCASA for Delay Producing Centres



2. PACT (Portable ACC Capacity Tool)



available to all ANSPs

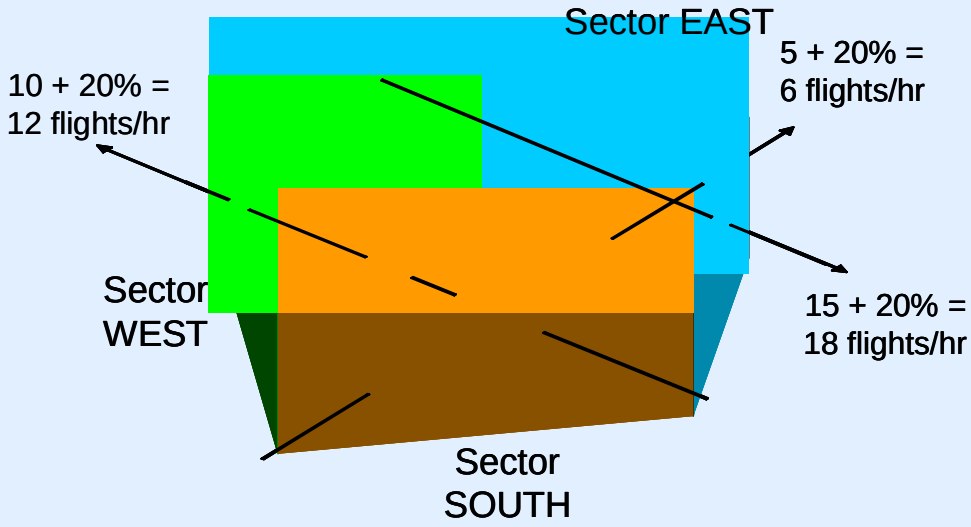
http://pact.eurocontrol.fr/

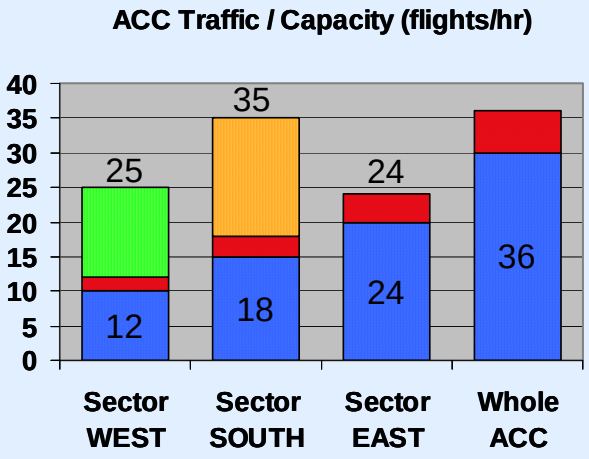
PACT Methodology

- ACC Capacity example
  - Increase the ACC traffic until a sector becomes saturated

Sector EAST is saturated after a 20% Increase

ACC Capacity = 36 flights/hr





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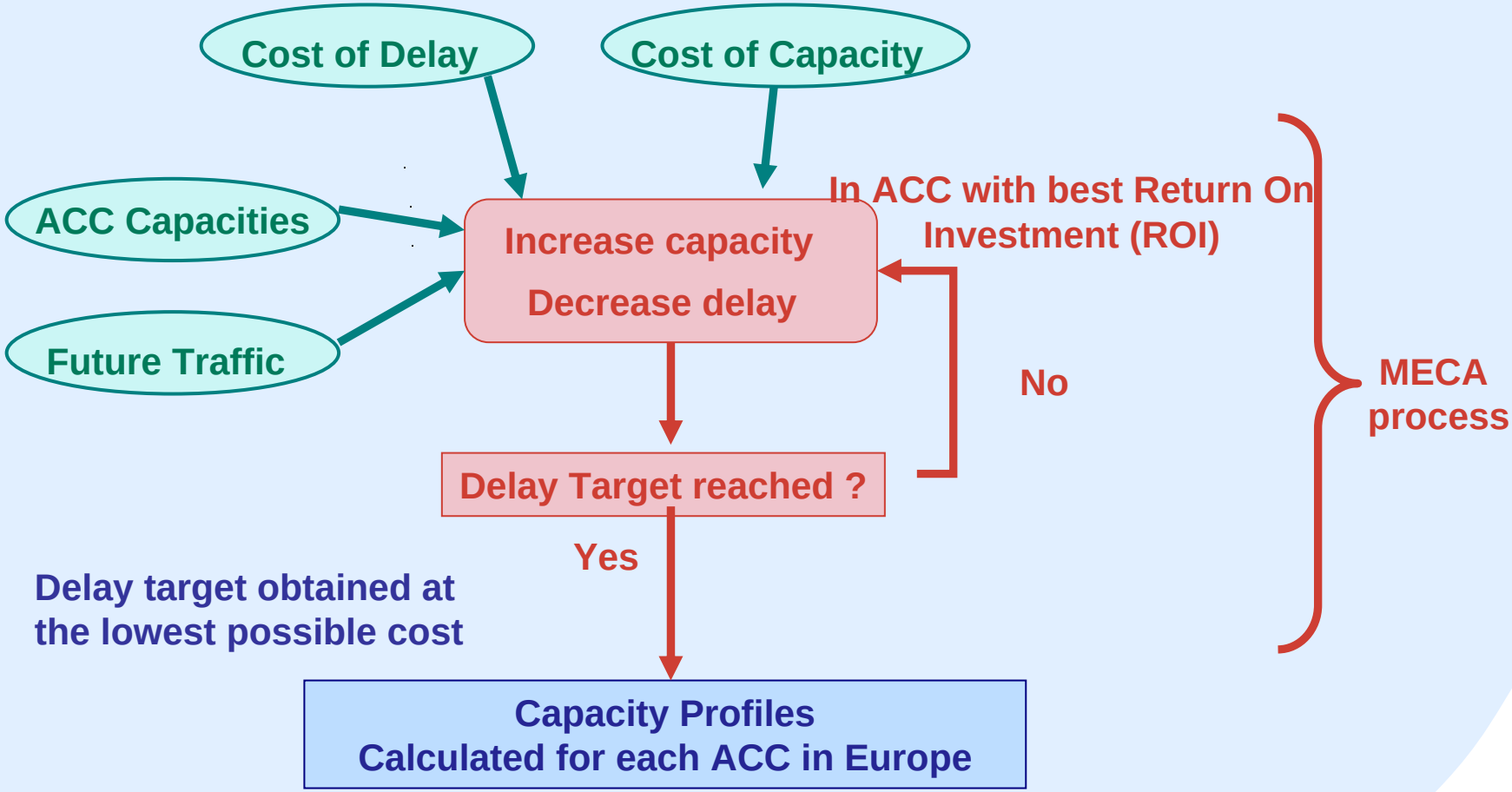
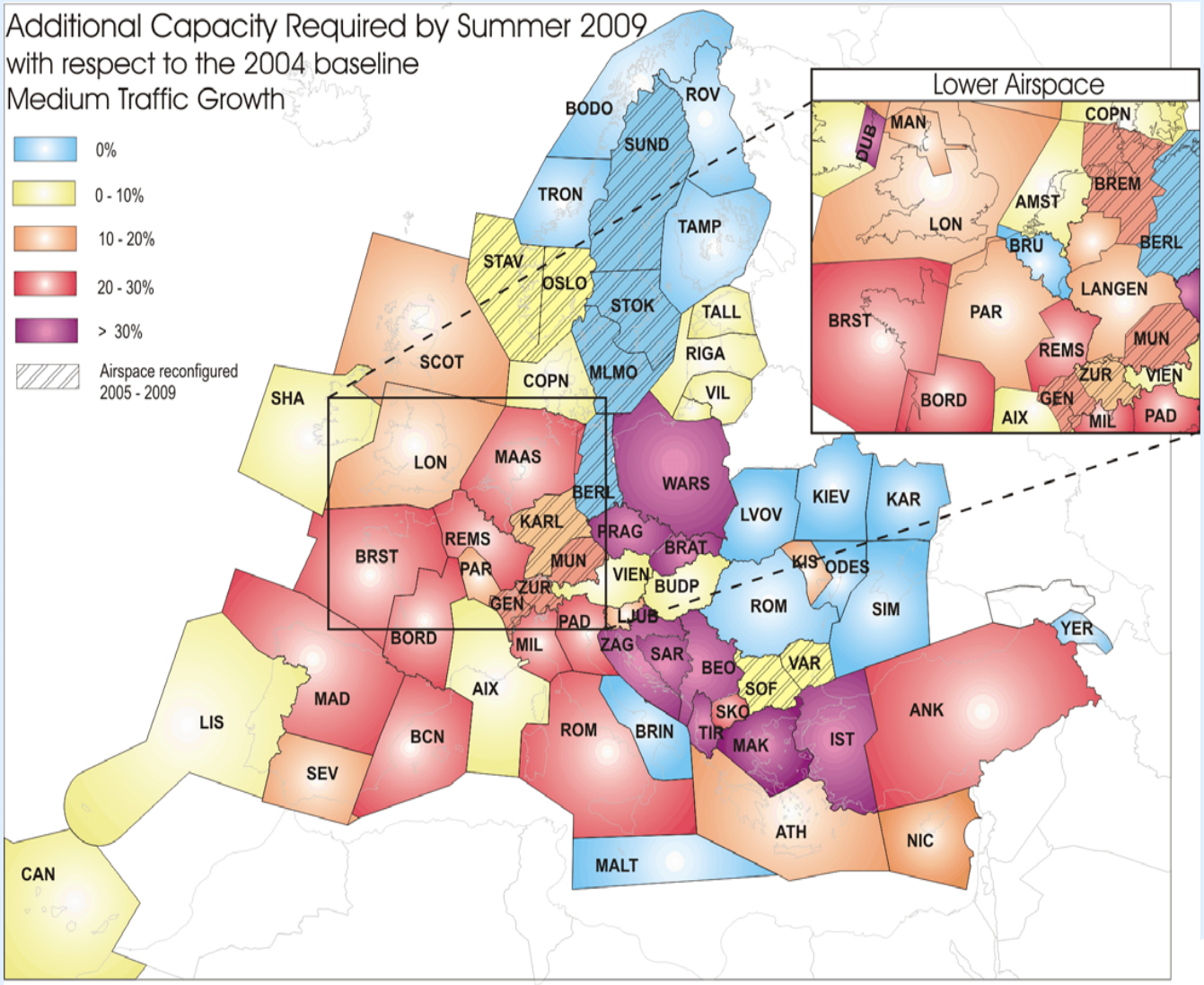
Capacity Profiles (MECA)



Capacity Profiles



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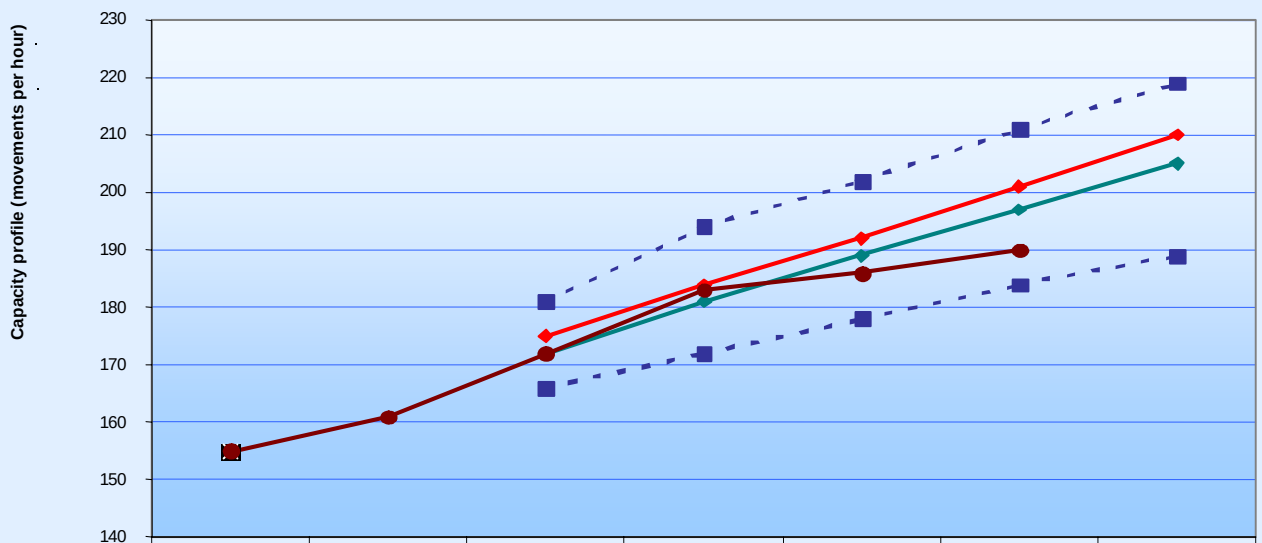
Planned ACC Capacities (Mid-Term)

Use of Local Convergence and Implementation Plans (ANSPs):



	2003	2004	2005	2006	2007	2008	2009
Capacity Profile - Reference			175	184	192	201	210
Capacity Profile - High			181	194	202	211	219
Capacity Profile - Low			166	172	178	184	189
Capacity Profile - Current routes			172	181	189	197	205
Baseline	155						
LCIP 2004-08 plan	155	161	172	183	186	190	

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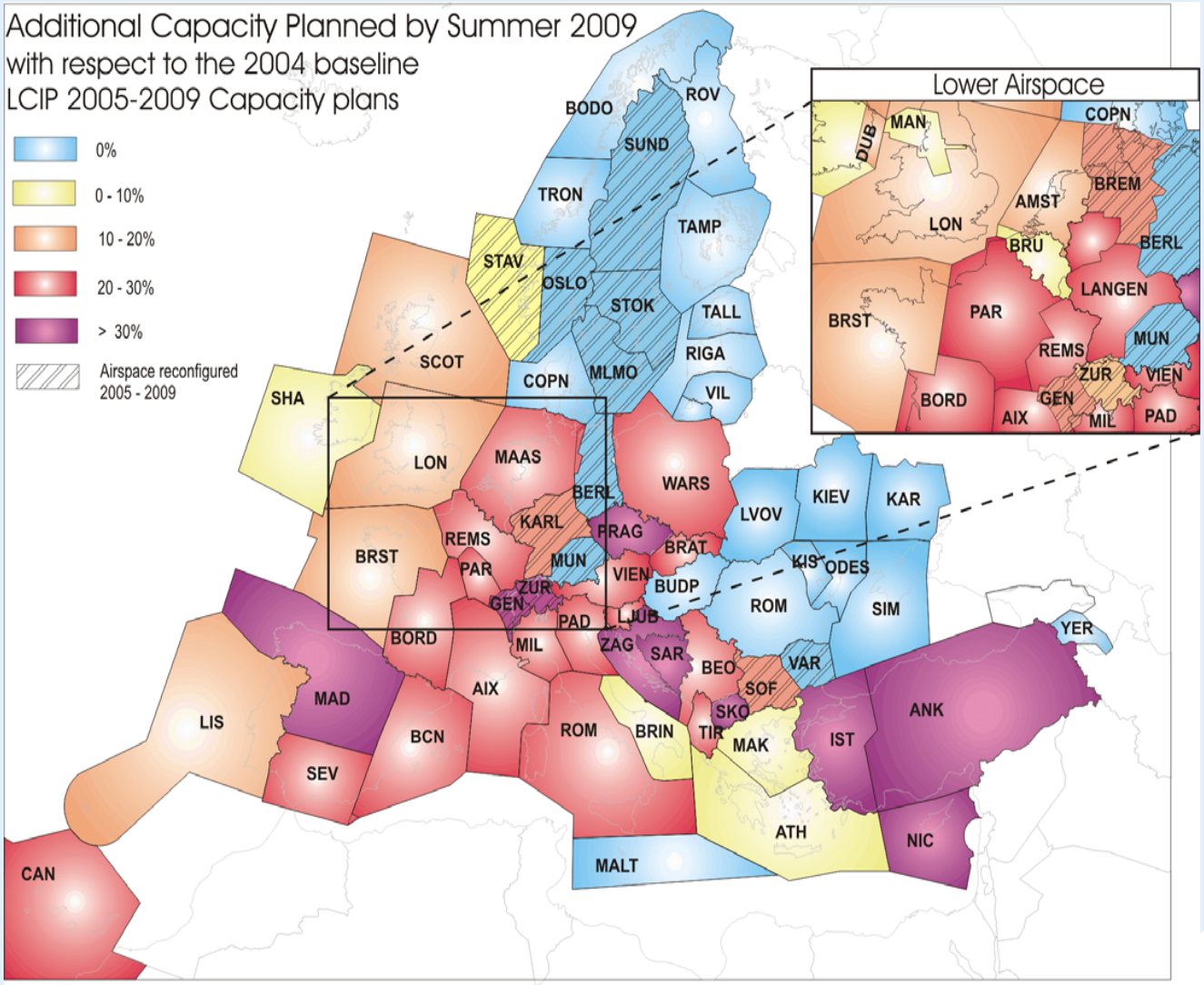
LCIP



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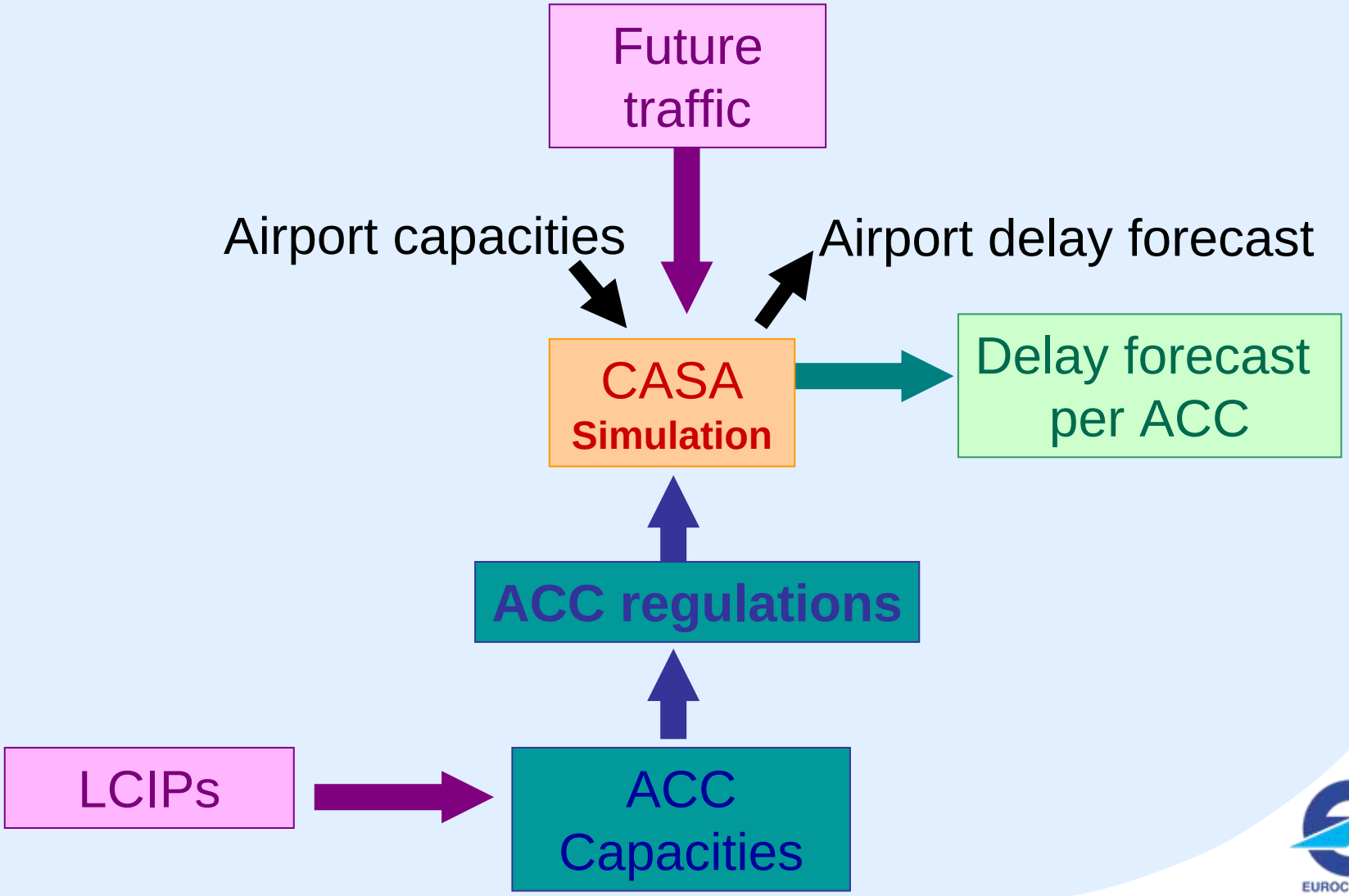
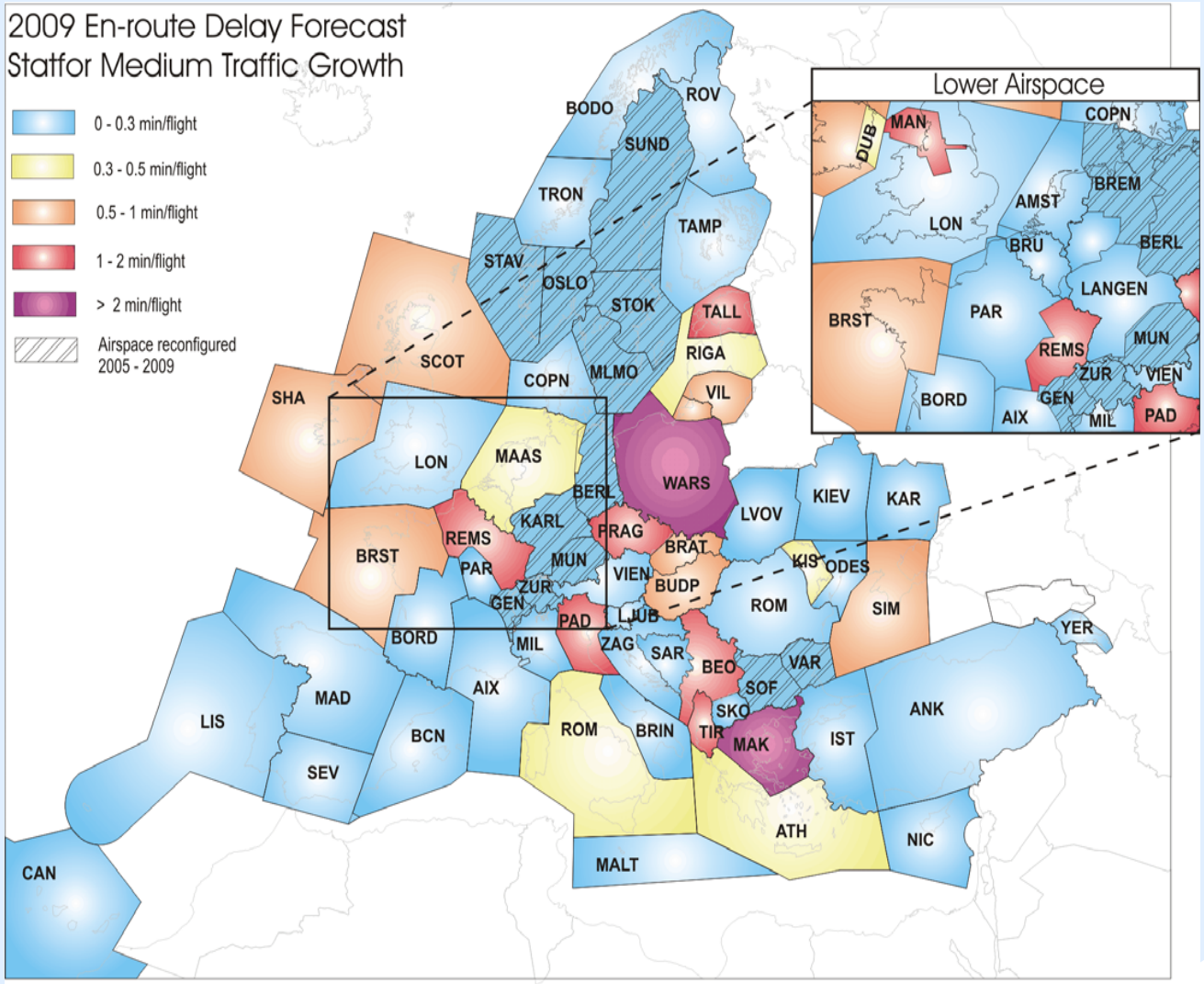
Delay forecast - Methodology



Delay forecast



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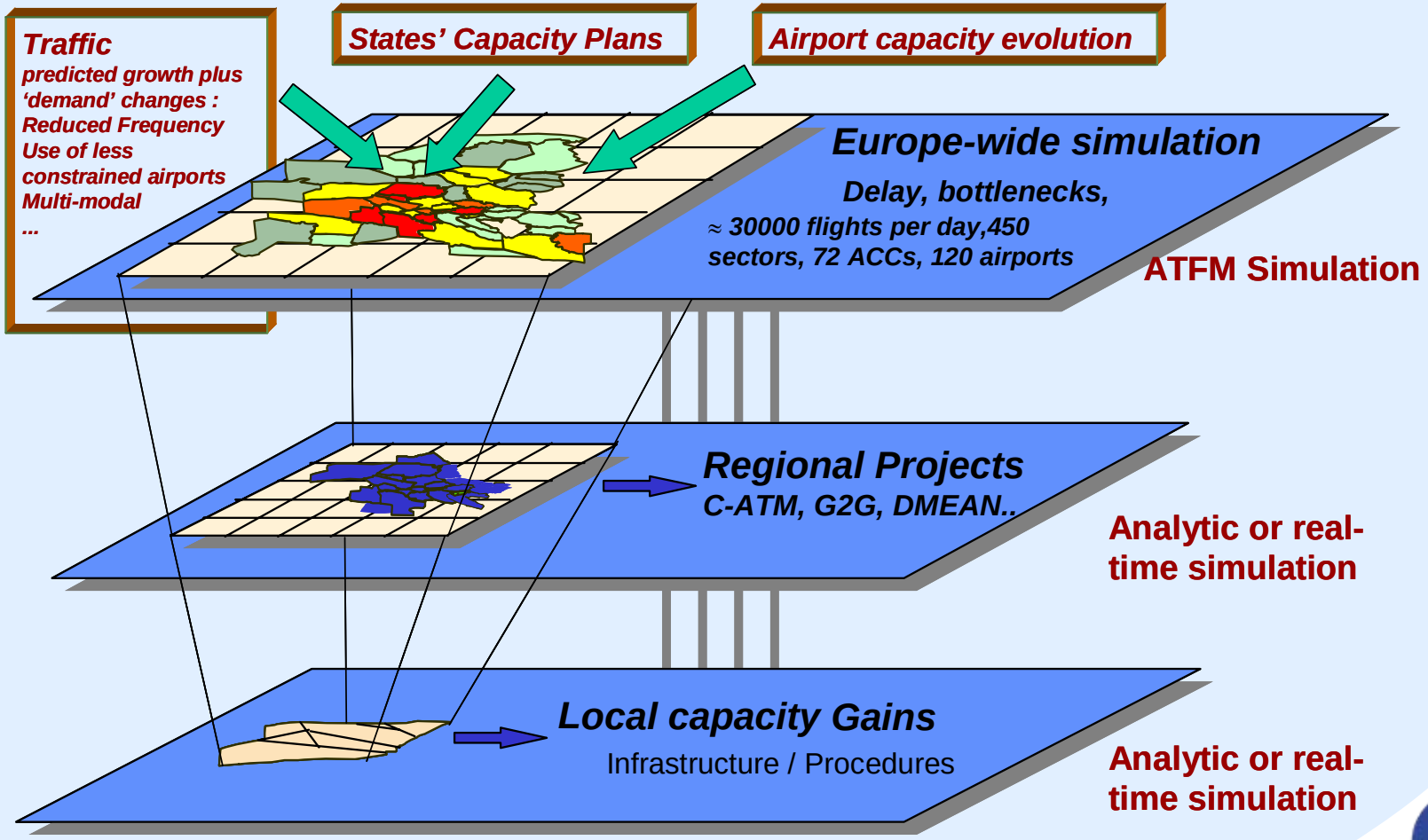
FAP

Benefit Assessment

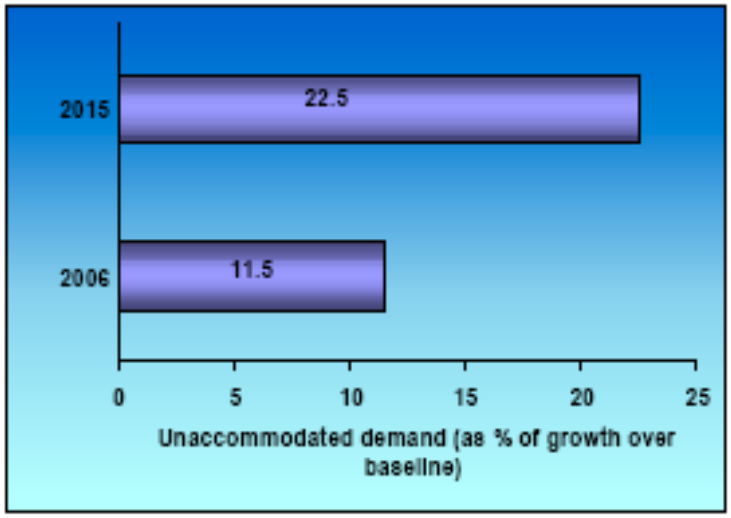
From a Local to a European perspective



Benefits – System Access

- Benefits can be assessed in terms of:
  - System Access

The adjacent diagram indicates at the overall network level the potential demand growth that could not be accommodated at 2006 and 2015. ***This figure indicates that some 22.5% of the predicted traffic augmentation beyond 2001 cannot be accommodated by the system as a result of the modelled airport capacity constraints.***



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Benefits – Trajectory length and Cost

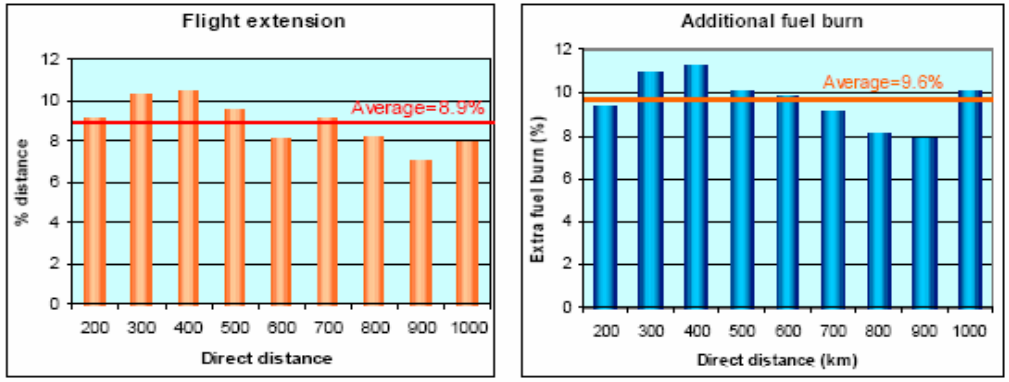

Figure 56: Flight extension and additional fuel burn (actual vs. theoretical optimum)

	Low bound	High bound
Theoretical maximum benefit (based on measured flight extension of 8.9% and fuel burn of 9.6%)	€ 1 000M	€ 2 500M
Estimated achievable benefit (based on 2-5% flight efficiency gain)	**€ 200M**	**€ 1 400M**

Figure 57: Potential benefits in flight efficiency

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Benefits – Capacity and Delays

- Benefits can be assessed in terms of:
  - Workload and Capacity
  - Delay and Cost

Year	Total ATFM Delays (Minutes)	ATFM Delays > 15 minutes			Costs of ATFM delays		
		En route	Airport	Total	En-route	Airport	Total
2001	27.6 M	16.2 M	5.7 M	21.9 M	€1 150 M	€400 M	€1 550 M
2002	18.0 M	9.0 M	4.9 M	13.9 M	€650 M	€350 M	€1 000 M
2003	14.8 M	5.7 M	5.5 M	11.2 M	€400 M	€400 M	€800 M

Figure 28: Estimated ATFM delay costs (including reactionary)

The delay costs are computed for passenger flights, i.e. some 75% of all flights in Europe. The estimate cost of ground delay is €83 per minute in average for an aircraft of 140 seats. In order to account for other traffic (freight, military and general aviation), an approximate figure of 15% is added, which reduces the average estimated cost of ground delay to €71 per minute.

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Questions

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