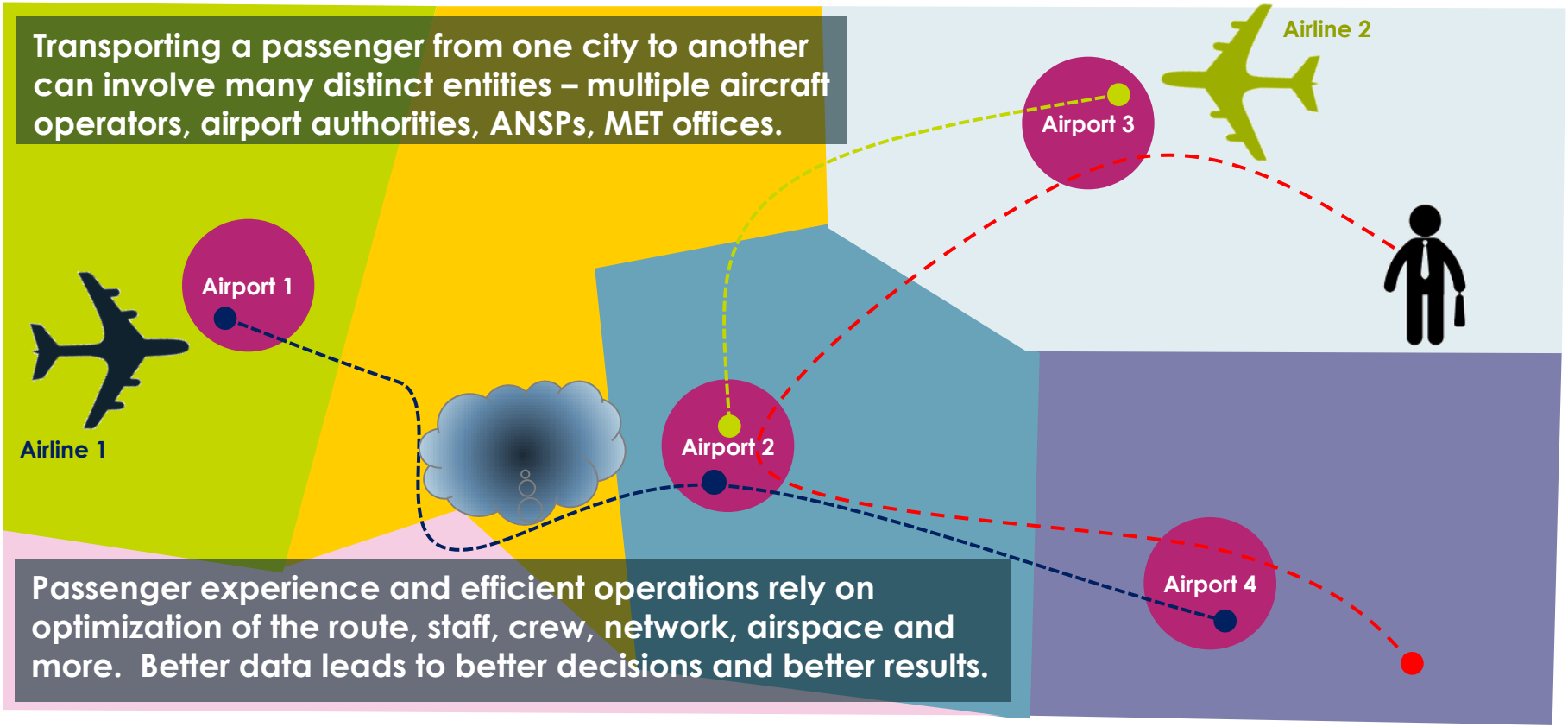
THALES

ECOSYSTEM

Application of Big Data to Aviation Operations

Todd Donovan
14 December 2016
ICAO ATFM Seminar – Dubai, UAE

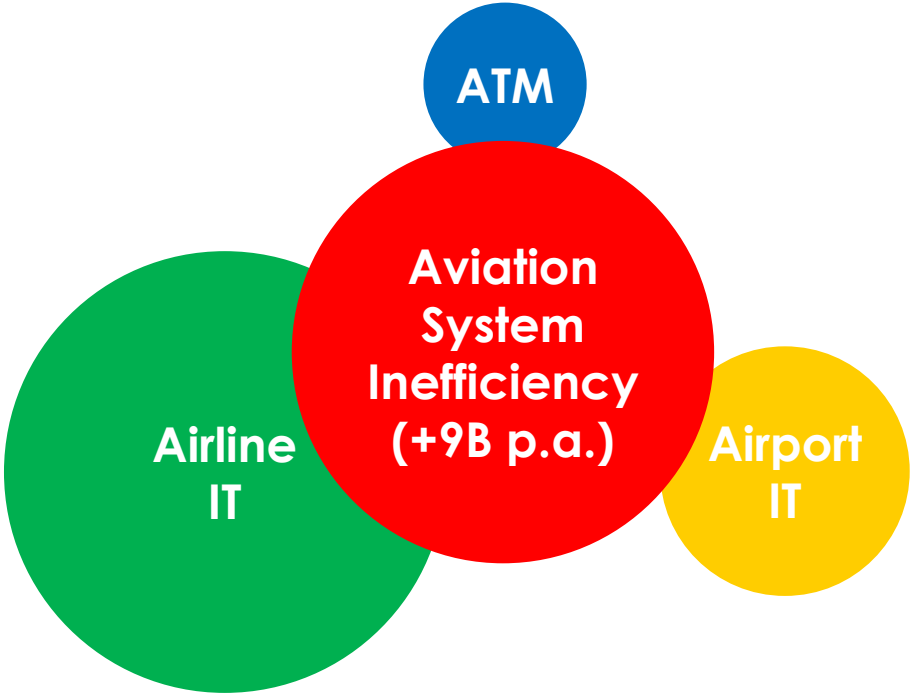
Digital collaboration is the key to optimizing aviation flight operations



OPEN

THALES

Why do we need big data and collaborative systems?



- **Different organizations have different drivers**
  - ANSP = safety focused
  - Airlines = efficiency focused
  - Airport = capacity focused
- **Global standards for data sharing missing**
- **Most valuable and inaccessible data is captured in each stakeholder's systems**
- **Incentive to share data is low – very little optimisation between stakeholders**

Small gains in aviation operations efficiency = large value / benefits

THALES

Key Customer Pain Points and Industry Drivers

ANSP PRODUCTIVITY

0.86

FLIGHT HOURS 

per

ATC OPS HOURS 

FLIGHT DELAYS

10-20 MIN per 

SCHEDULED FLIGHT TIME INCREASE

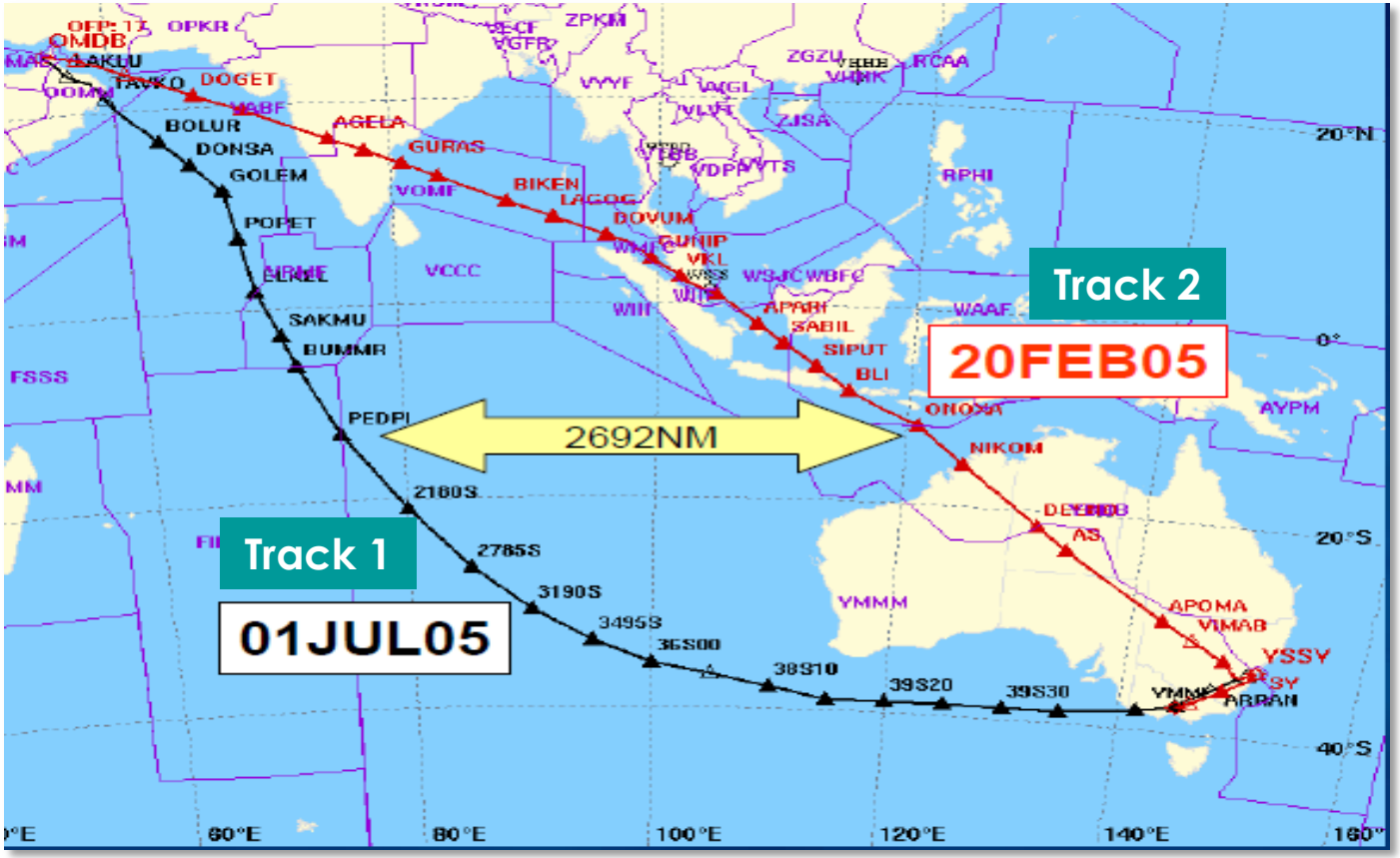
+9-33%  in PAST 15 YEARS

Increased productivity is the key to ANSP performance.
Planning & coordination is the key to improved airline performance.

OPEN

THALES

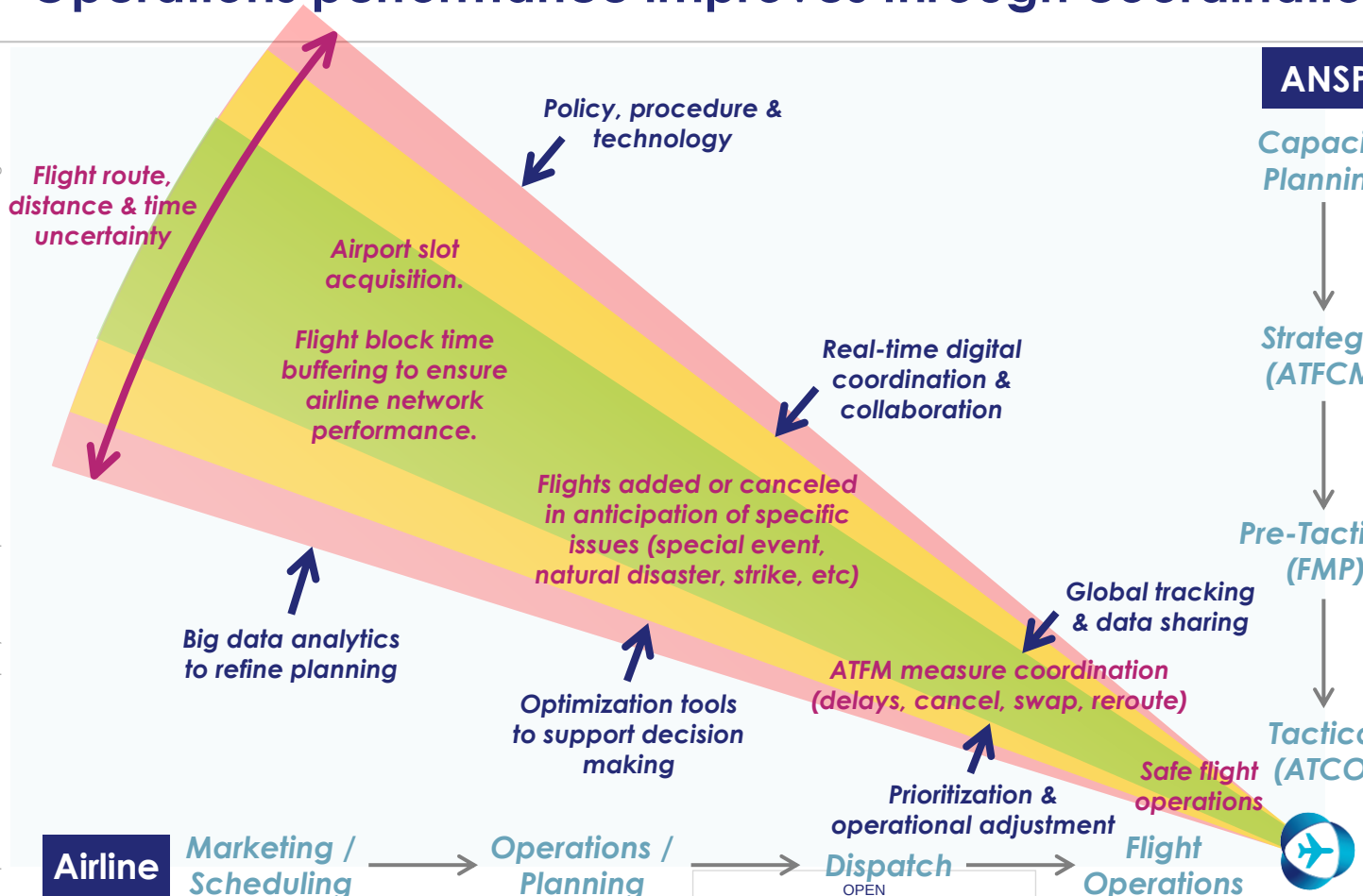
Same City Pair – Very Different Flights!



OPEN

THALES

Operations performance improves through coordination

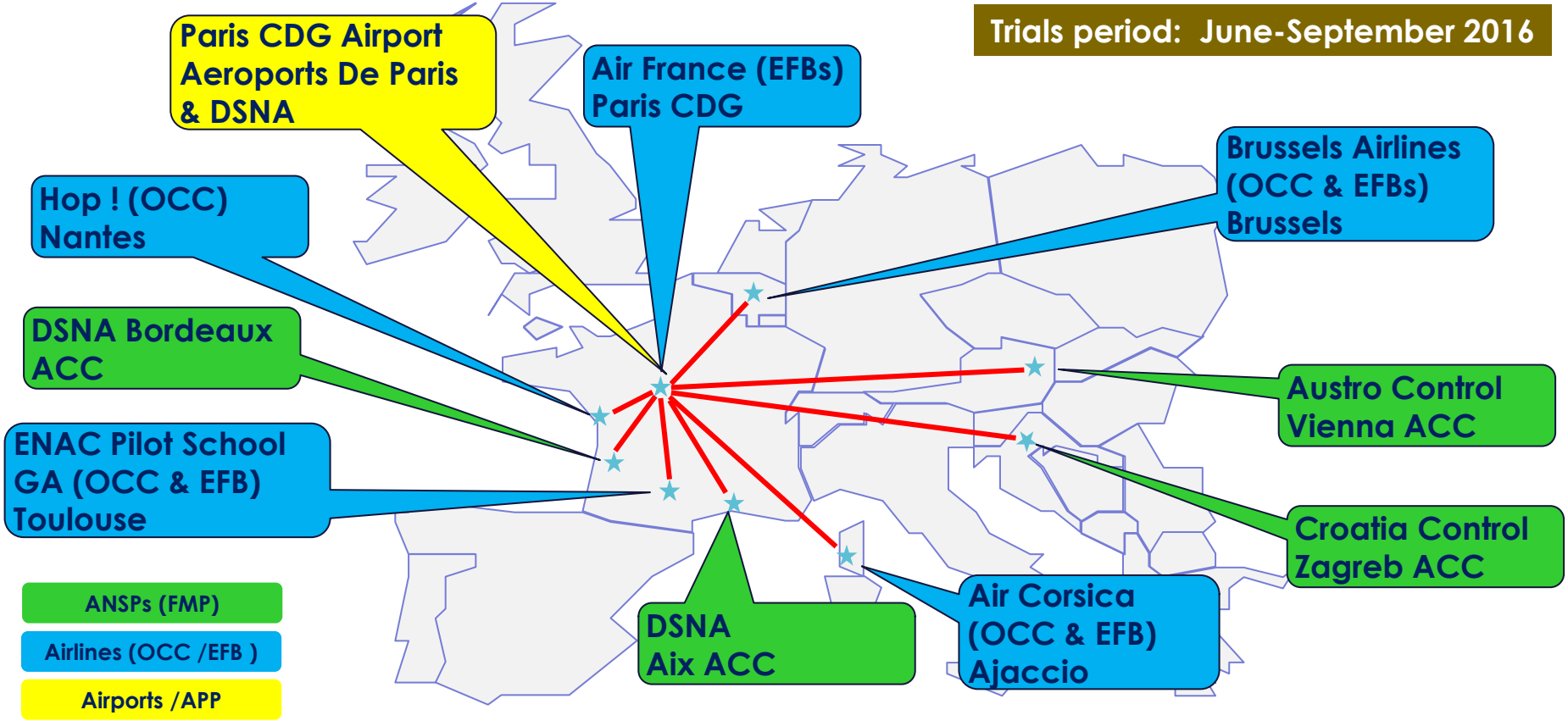


Airlines, ATC & Airports are following analogous processes to plan, refine and operate their services.

Performance improves thru collaboration & data sharing.

THALES

SESAR: TOPLINK “Large Scale Demonstration” project



OPEN

THALES

TopLink “Flight Rerouting” Use Case 1: improved horizontal diversion

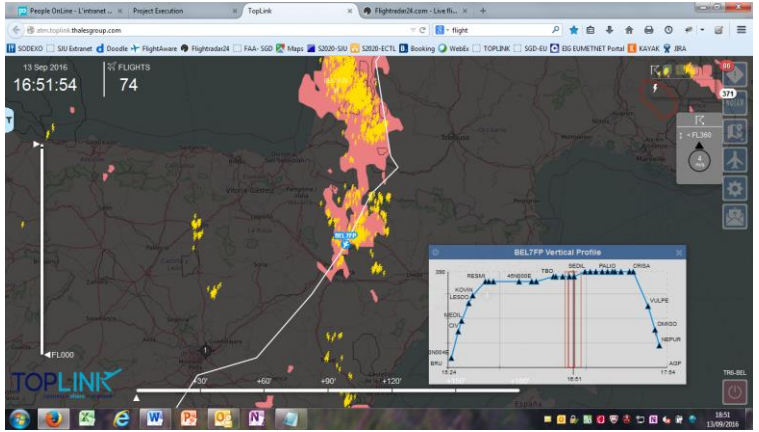
Planned route

Actual route

Alternative route

Actual scenario:
« last minute deviation » based on Weather Radar info, to avoid severe convection over the Pyrenees

TOPLINK expected benefit:
Early rerouting decision 45 mn in advance (western avoidance route)



BEL7FP 13/09/2016 BRU-AGP	Planned	Actual	TOPLINK benefit vs actual (est.)
Take-off	15:28	15:24	
Arrival	17:57	18:08	
Track miles	983 NM	1039 NM	
	Impact of weather		
Arrival delay	0	+11 mn	- 7 mn
Extra flight duration	0	+15 mn	- 7 mn
Extra track miles	0	57 NM	- 40 NM
Extra cost (est.)	0	+ 599 €	- 420 €

OPEN

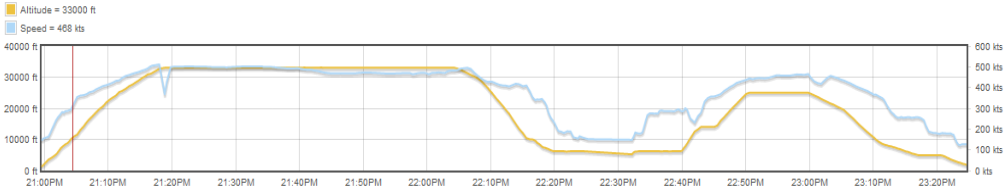
THALES

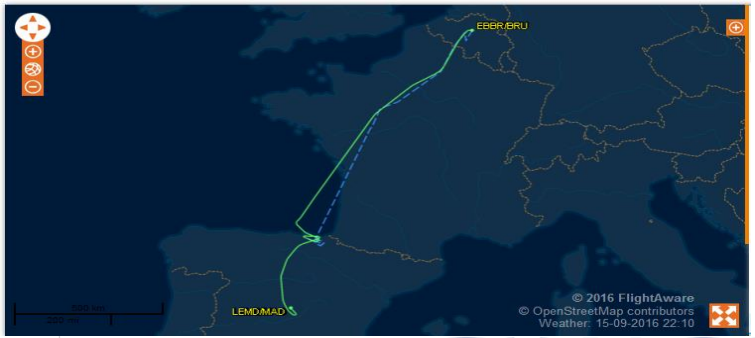
TopLink "Flight Rerouting" Use Case 2: Avoid diversion

Actual scenario:
20 mn holding over BIO
due to severe thunderstorm,
then diversion to MAD
Then PAX back to BIO by bus (395 km)
Aircraft back to BIO through ferry flight

TOPLINK expected benefit:
Ground delay at departure in BRU 60 mn
then flight as planned

BEL14Z 15/09/2016 BRU-BIO	**Planned**	**Actual**	**TOPLINK benefit vs actual (est.)**
Take-off	20:45	20:45	
Arrival	22:28	23:24 (MAD) 05:00 (BIO) by bus	
	Impact of weather		
Arrival delay	0	+390 mn	- 330 mn
Extra travel duration	0	+390 mn	- 330 mn
Extra cost (est.)	0	+ 10 133 €	- 8 093 €





OPEN

THALES

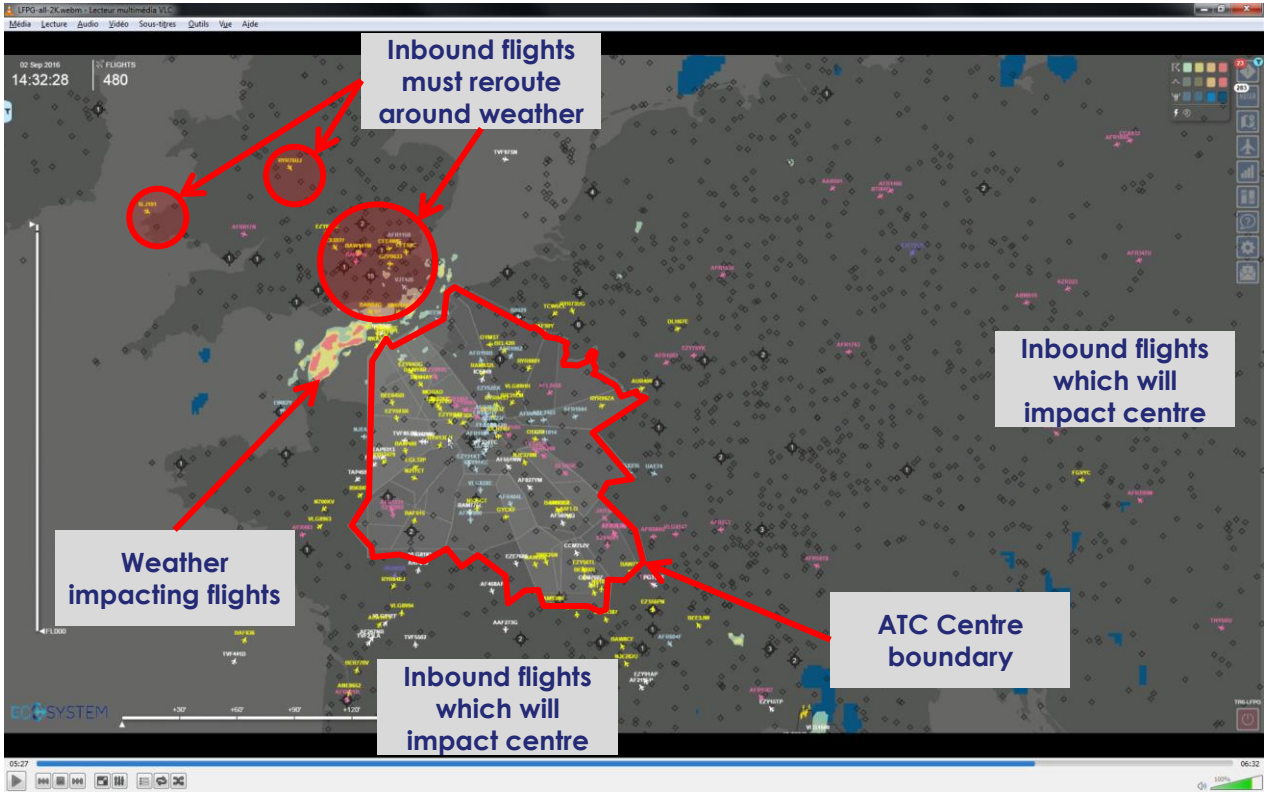
Extending ATC View beyond the “Local” Situation

Air Traffic Control Centres typically do not have access to location & status of flights outside their airspace

Flight path is substantially impacted by weather / winds

Flight time is impacted by airline / airport operations & congestion in airspace from origination & destination

Therefore there is a high degree of uncertainty as to when and where a flight will arrive for ATC management



OPEN

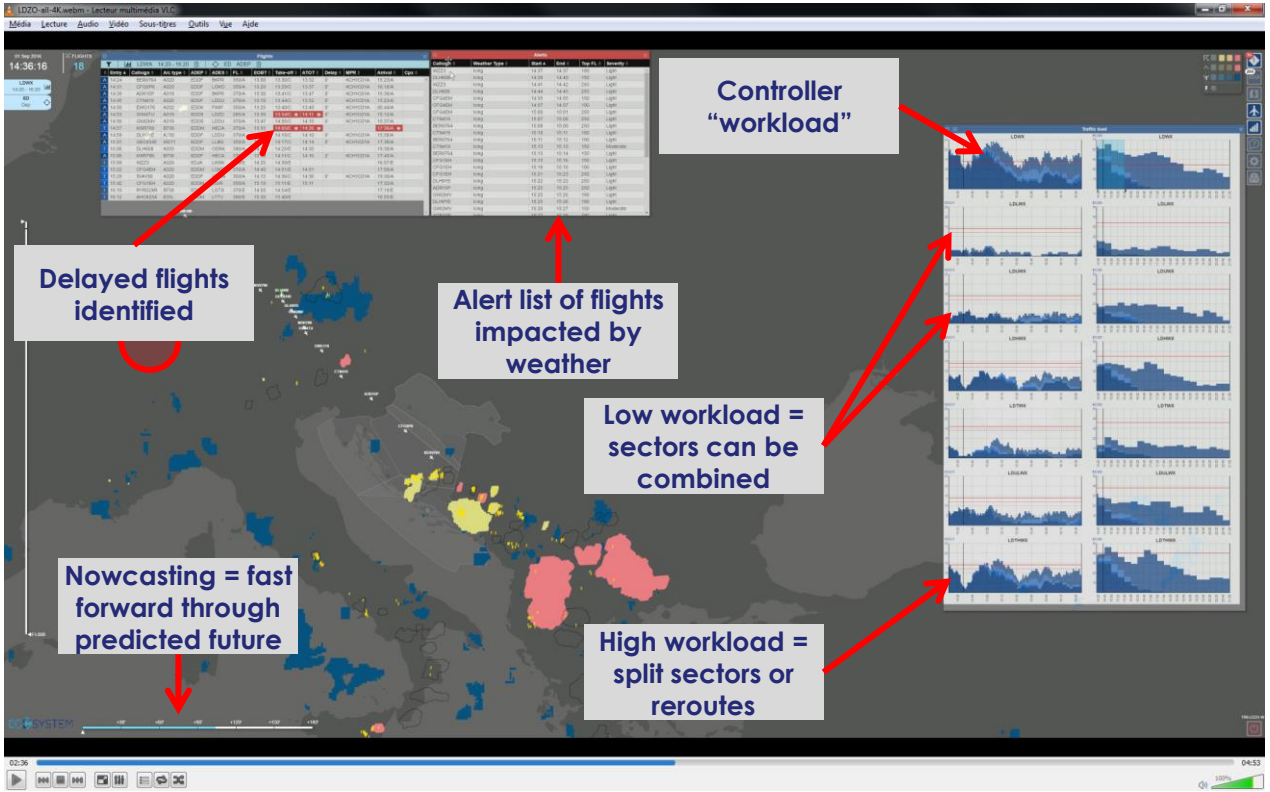
THALES

Leveraging Big Data to Enable Better Predictions & Results

Flight and weather behavior predicted using models and historical behavior (machine learning).

Interactions between weather and flights predicted creating alerts. Flight rerouting used to address alerts and maintain safe flight operations.

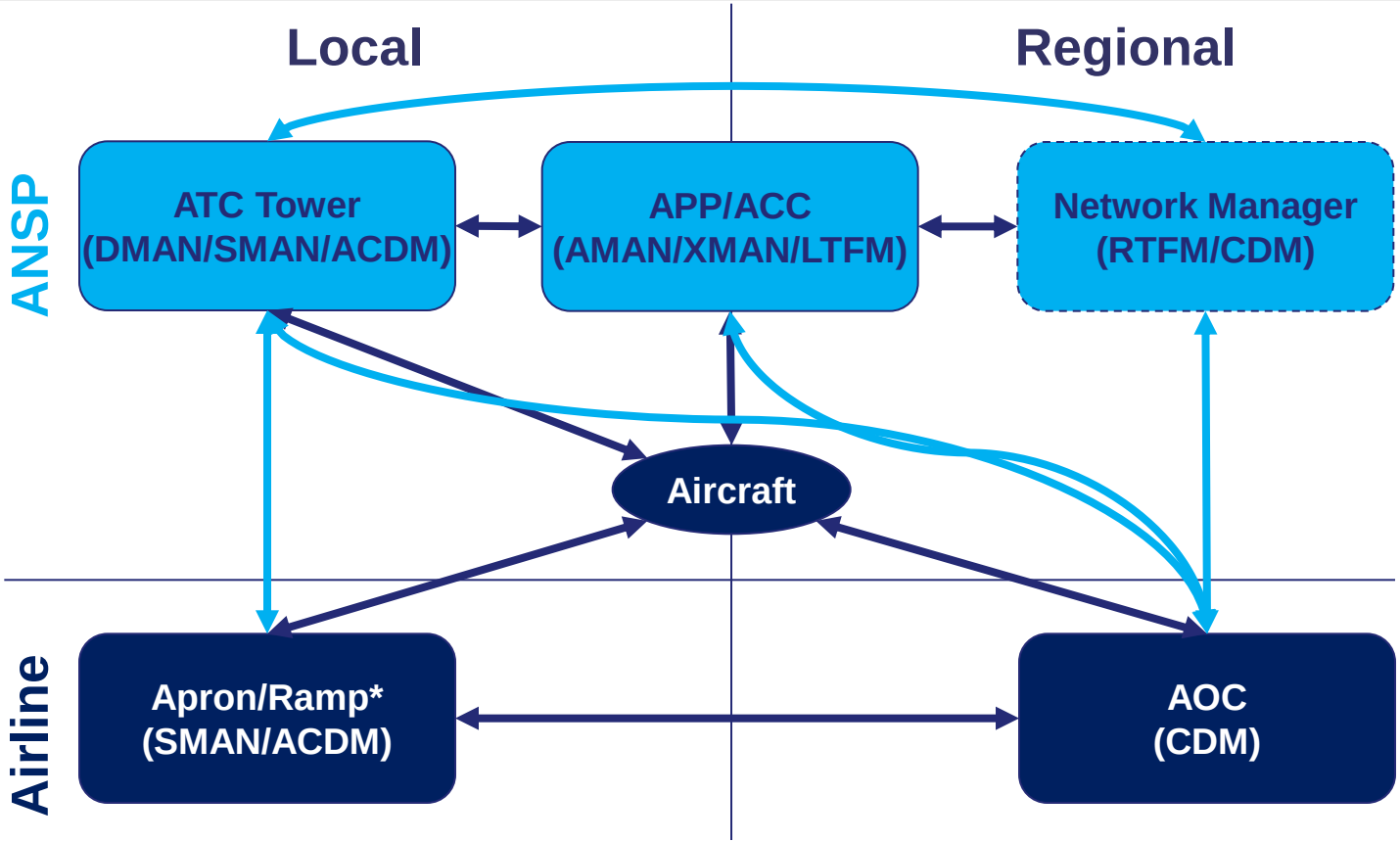
Updated flight routes and times reflected in air traffic controller workload allowing sector combination / splitting to adjust staffing levels and costs of service provision.



OPEN

THALES

Allocation of ATFM/CDM functions to logical organizations / facilities



In complex environments, close coupling is required between all operational roles to achieve optimization while ensuring fairness and equity.

ATFM/CDM blends policy, procedures and technology.

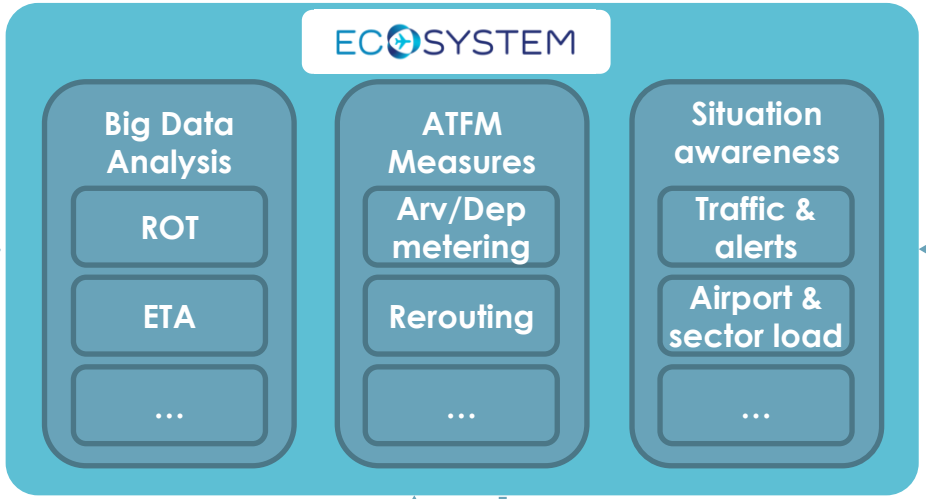
* Provided by airport in some locations

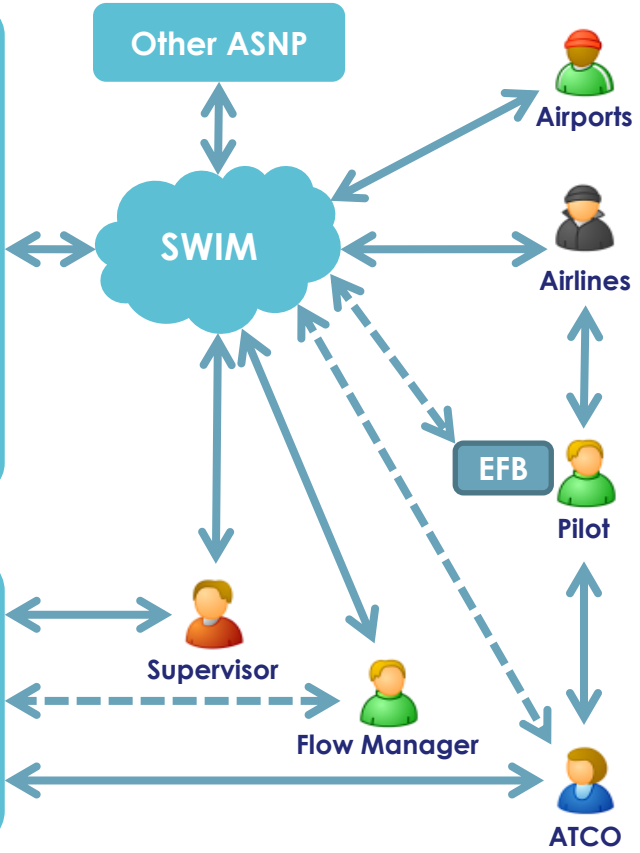
THALES

TopSky-ATC and ECOsystem work together to improve decisions

Global data sources:
- Surveillance
- Flight Plans
- Aero data
- WX/Meteo
- Flight Schedules
- Remote ATFM measures
- Remote airport status

Local data sources:
- Surveillance
- Flight Plans
- Aero data
- WX/Meteo
- System status





THALES


THALES
THANK
YOU
FOR
YOUR
ATTENTION