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AERONAUTICAL METEOROLOGY
SCIENTIFIC CONFERENCE

TOPLINK/ECOsystem: New Decision Support services to reduce MET impact on Aviation

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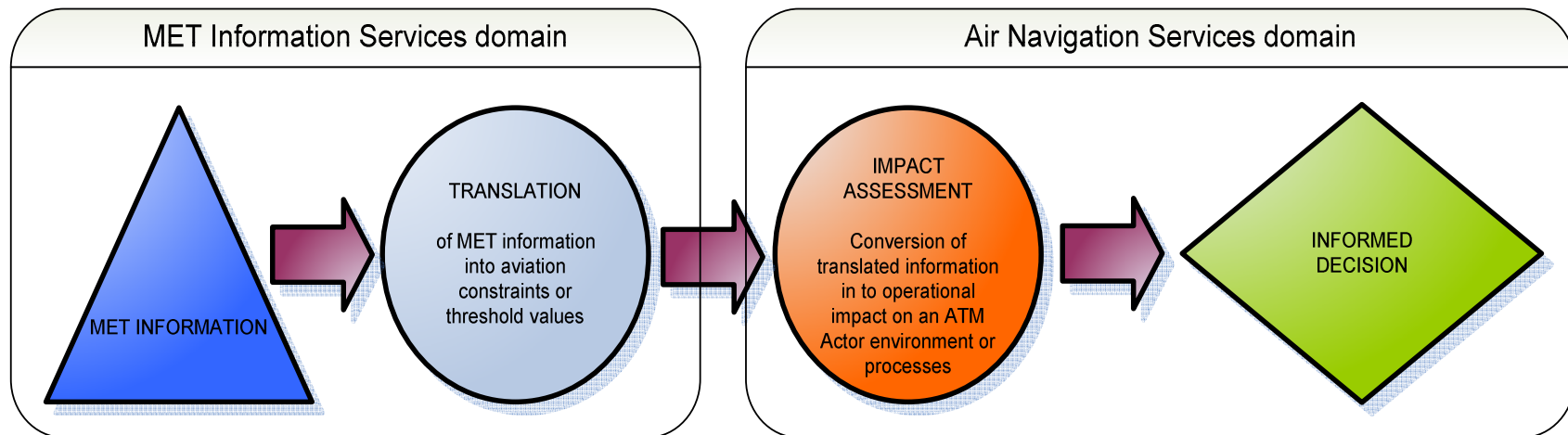
THALES AIR SYSTEMS

6 to 10 November 2017, Météo-France, Toulouse

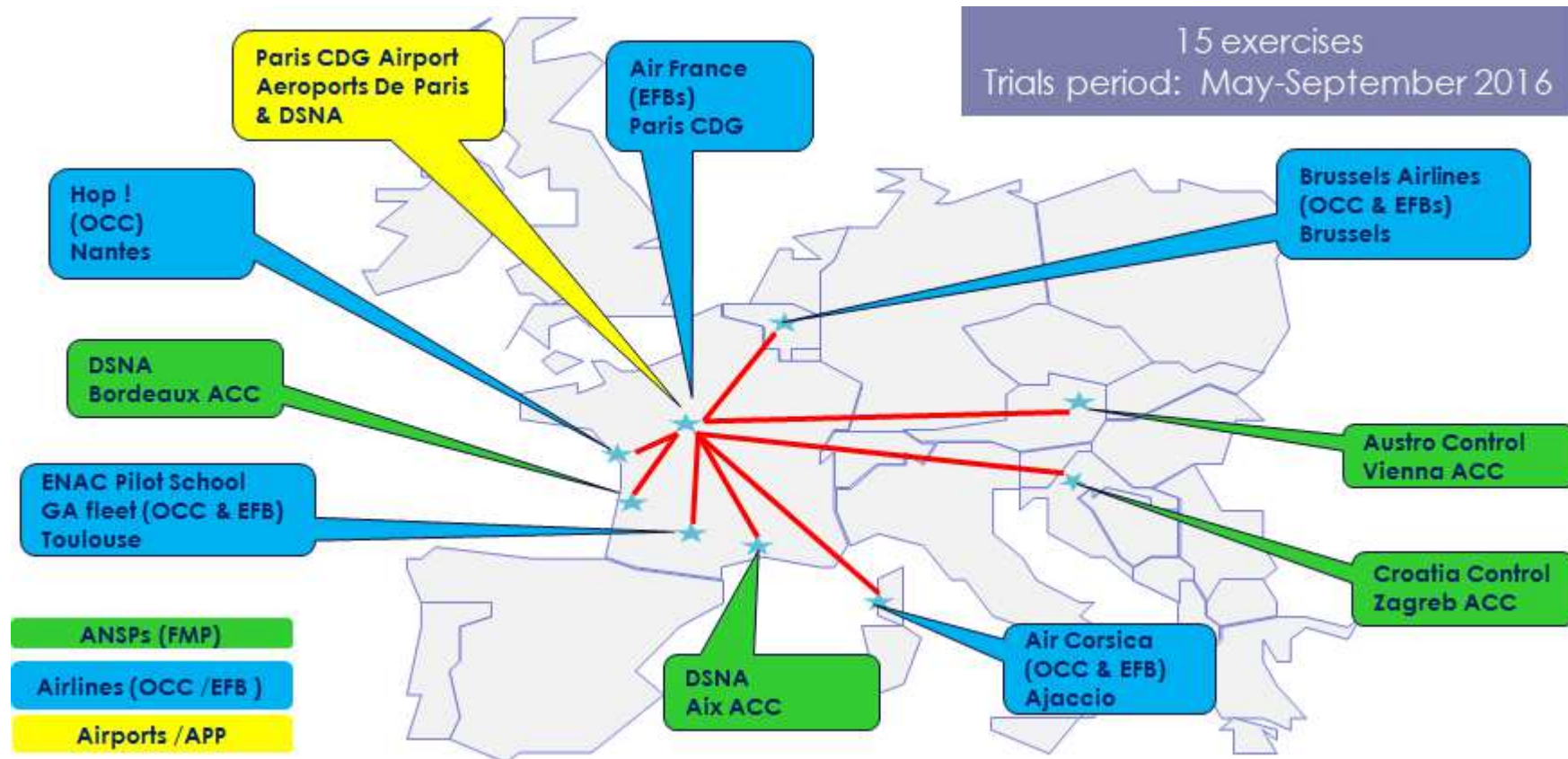
ECOsystem: the concept



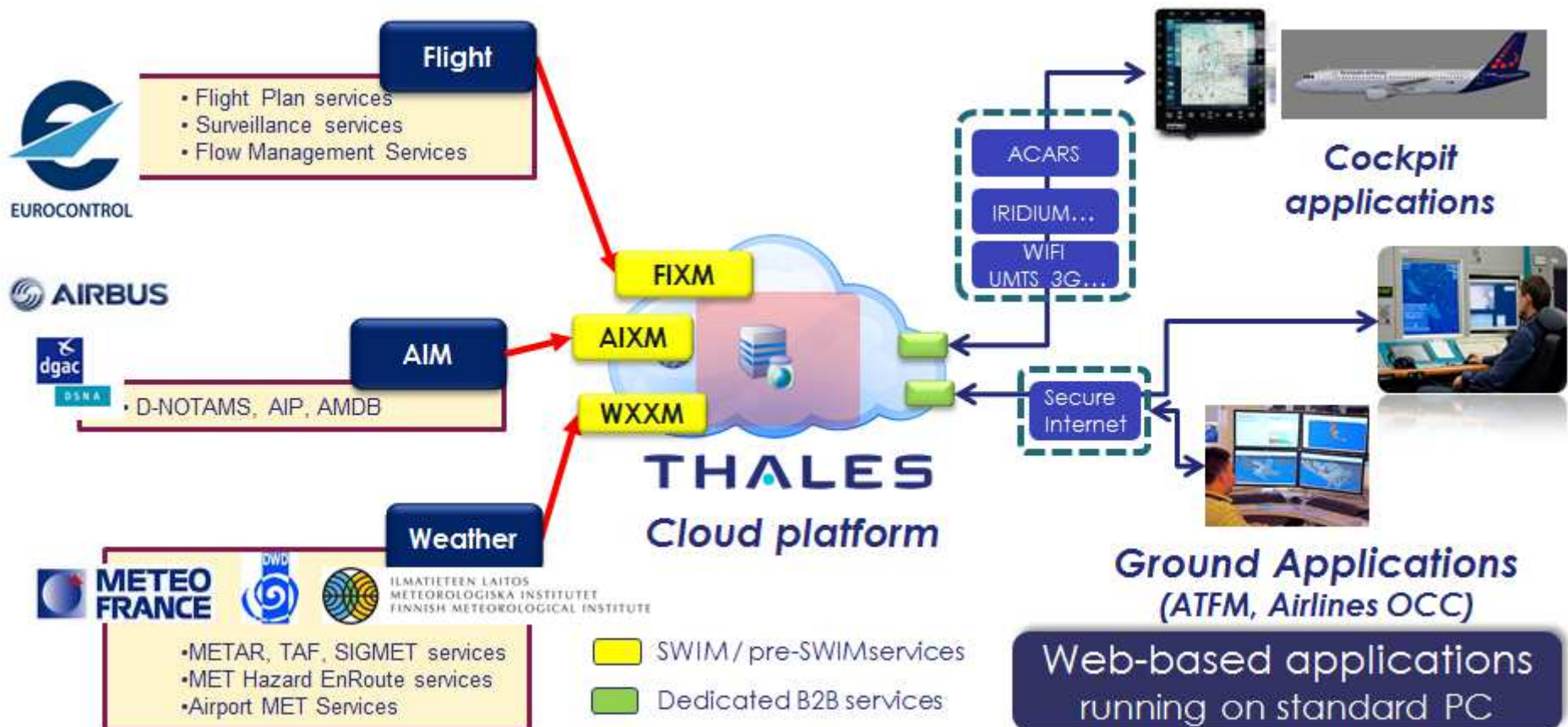
MET-ATM integration architecture



TOPLINK : SESAR « Large Scale Demonstration » project



TOPLINK Platform architecture



TOPLINK: « ATFM » position



- **Shared awareness**
 - Common situational picture (weather, traffic, airspace,...)
- **Assessment & alerts**
 - Assessment of impacts on user's operations, through customized KPIs and metrics
 - Customized alerts
- **Mitigation**
 - “What-if” scenarios (regulations, ...)
 - Collaborative Decision Support

« Improved regulations » Use Case: operational concept

- Current status:

- **Departure ground slots** are allocated to planned Flights (before take off) when the capacity of control sectors (or arrival airports) is expected to be degraded due to MET hazardous events
 - e.g. thunderstorms en route or on airports, fog on arrival airports
 - applied **2 to 4 hours in advance**
- The capacity degradation is in general **over estimated** in space and time due to the uncertainty (or sometimes absence) of MET forecasts

- Benefit mechanism:

- **Better nowcast & forecast of MET hazards** (0 to 4 hours ahead) enable a **better « tailoring » of regulations** in space and time to avoid unnecessary penalization of flights
- TOPLINK / ECOsystem **used by ANSPs**, results in direct **benefits** on **Airlines KPIs**

From an ANSP point of view, ECOsystem can be used as
an incentive to attract more traffic (hence more overflight fees)

“Improved regulations” Use Case: experimental results

Airspace	Current		Benefit TOPLINK	
	Delays (mn) (1)	Cost (k€) (2)	Delay reduction (mn) (3)	Cost reduction (k€)
	All Airlines			
LOW (En Route)	18742	880	2623	126
LDZO (En Route)	12747	570	1936	91
LFBB (En Route)	45951	2159	11258	529
	Brussels Airlines			
Total EU (En Route)	3651	171,6	1800	85
	HOPI			
	1704	79,8	255	12
	All Airlines			
LFPG (CDG Approach)	39026	1834	6650	312

(1): Sources: Eurocontrol

(2): Estimation based on average cost of ground delays, source Univ Westminster

(3): Estimation based on a joint analysis of actual regulations and TOPLINK Tool capabilities

Reference period:

June-Aug 2016
(3 months)

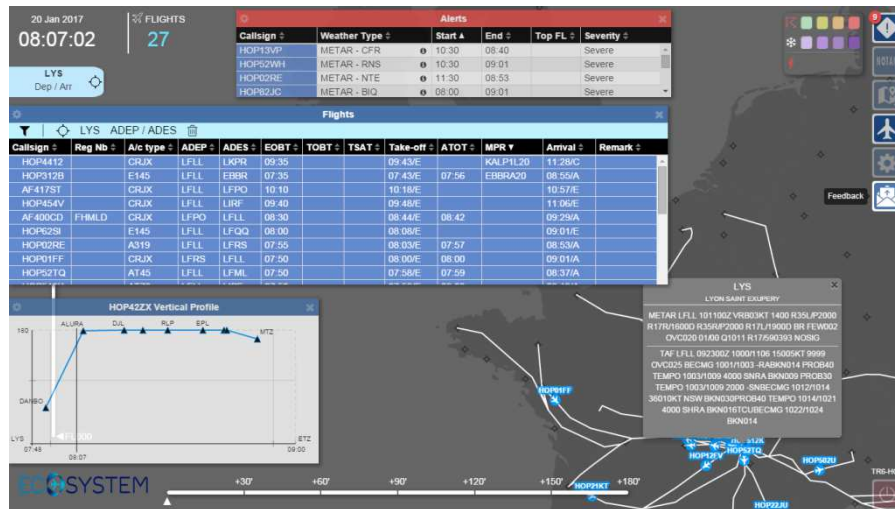
Extrapolation:

12 months
EU En Route Airspace
All airlines

20 to 50 M€

cumulated gain p.a.

TOPLINK: « Airline OCC » position



- **Shared awareness**
 - Common situational picture (weather, traffic, airspace,...)
- **Assessment & alerts**
 - Assessment of MET impacts on user's operations, through customized KPIs and metrics
 - Customized alerts
- **Mitigation**
 - “What-if” scenarios (horizontal rerouting, FL change, ...)
 - Collaborative Decision Support

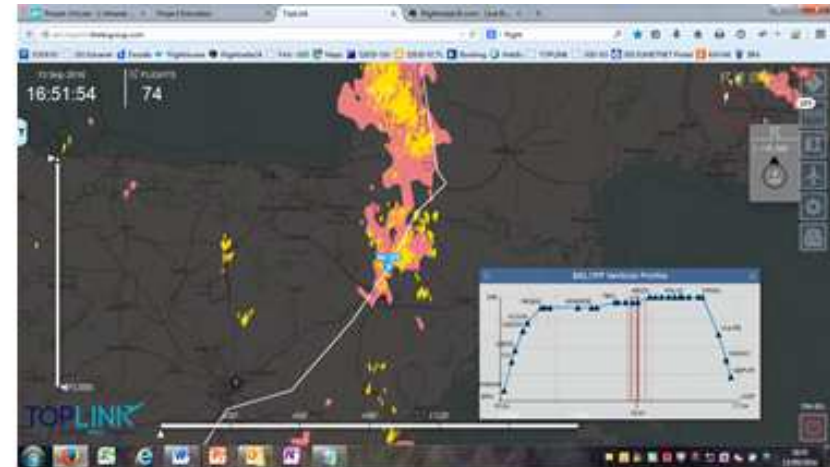
TOPLINK “Flight Rerouting” Use Case 1: “improved horizontal diversion”



- 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)



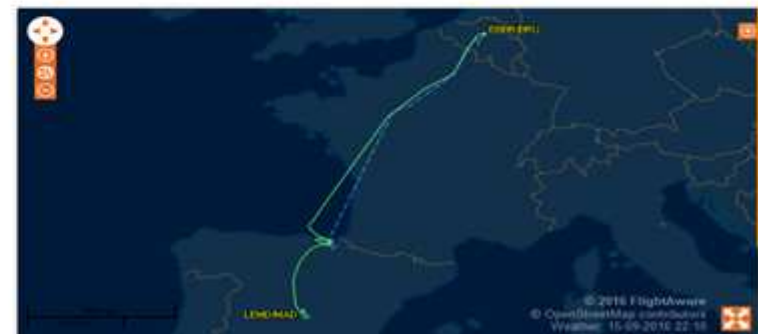
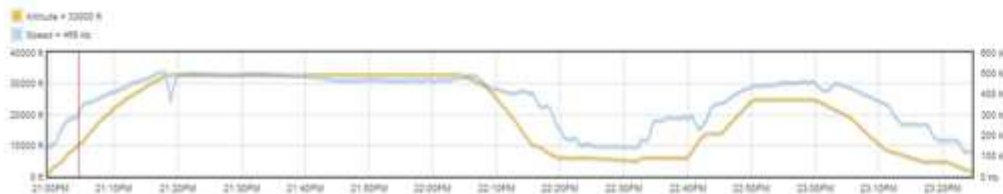
<i>BEL7FP</i> 13/09/2016 <i>BRU-AGP</i>	Planned	Actual	TOPLINK benefit vs actual (est.)
Take-off	15:28	15:24	
Arrival	17:57	18:08	
Track miles	983 NM	1039 NM	
	Impact of weather		
Arrival delay	0	+11 mn	- 7 mn
Extra flight duration	0	+15 mn	- 7 mn
Extra track miles	0	57 NM	- 40 NM
Extra cost (est.)	0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

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 €



TOPLINK « Flight Rerouting » Use Case 3: « Low altitude (FL190) ferry flight »

Brussels Airlines OCC feedback (in TOPLINK messaging system):

Date	Time	Title	Description
16/09/2016	13:33	SN2038 BHX- BRU return inflight	Due to a not retractable gear after take-off a/c had to return to BHX. A/C could have been dispatched ferry with gear down to BRU for repair on the condition there were no icing conditions en route. Toplink tool consulted and feedback was negative as severe icing conditions all the way. A/C was grounded at BHX and repair will have to be done locally.
17/09/2016	14:54	SN9938 BHX- BRU techni- cal ferry	Monitoring SN9938 BHX-BRU ferry flight. Technical issue: Gear not locked when retracting. A/C has to return gear down to BRU for repair on condition there are no icing conditions en route. Max altitude permitted 'gear down' procedure FL190. Return would never have been possible without the Toplink tool.



TOPLINK performance results: synthesis

Improved Ground Regulation

- > **Small gains on many flights**
- > Better forecast of MET hazards enable a better use of regulations in space and time avoiding unnecessary penalization of flights
- > Used by ANSPs for direct benefit on Airlines KPIs
- > Quantitative assessment reached with a good confidence level – validating prior TOPMET results

20+
M€ p.a.

Other Use Cases

- > Airspace & airport **capacity**
- > **Safety and passenger comfort**
- > Benefits are clearly reported by end-users, but can be only **qualitatively** assessed at the current stage

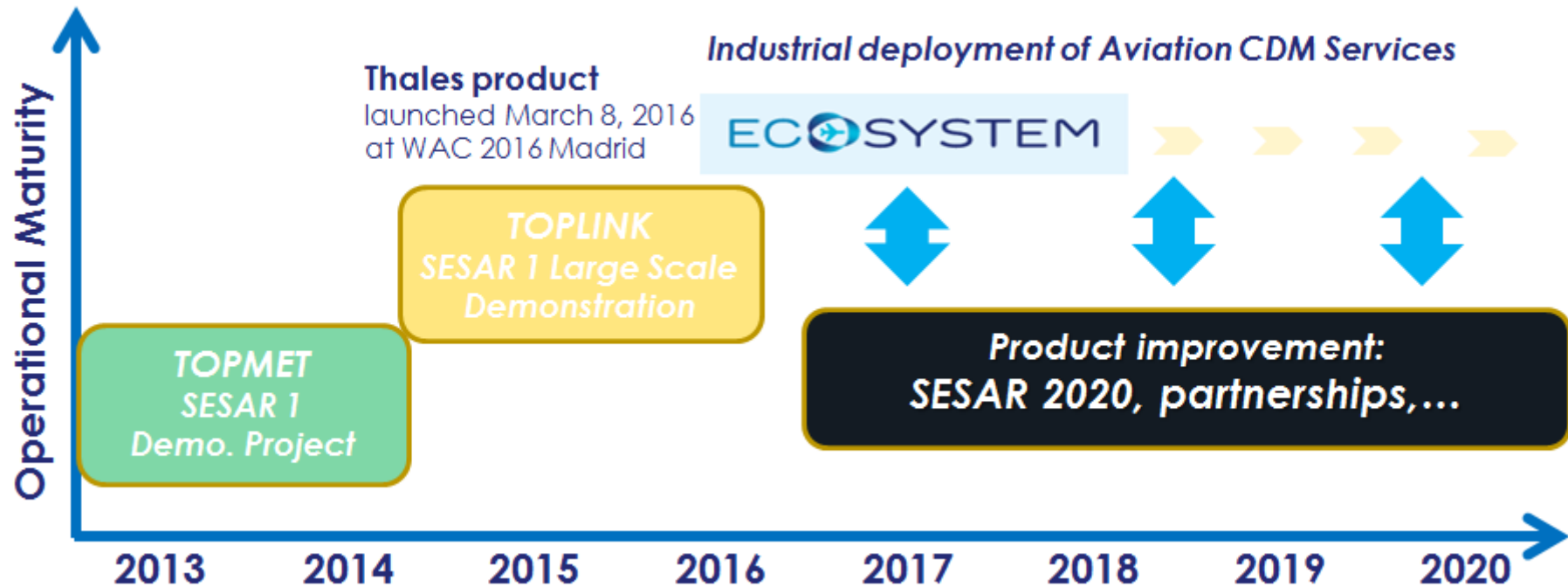
Support to Flight Rerouting

- > **Large gains on few flights**
- > Better forecast of weather impact on flights, enabling early and better rerouting decisions to avoid disruptions
- > Used directly by airline taking into consideration expected ATC situation
- > Based on a case-by-case (flight by flight) analysis

Up to
-70%
Delay*

*[*reduction through ECOsystem of the delay induced by weather effects on the initial FPL]*

From SESAR demonstrations to operations...



ECOsysteM delivers improved operational efficiency through new collaborative capabilities based on shared MET, AIM, Traffic information



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Thank you

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