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ECOsystem: *MET-ATM integration to improve Aviation efficiency*

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ICAO APAC/EUR/MID Workshop on
"Service improvement through integration of
AIM, MET and ATM Information Services"

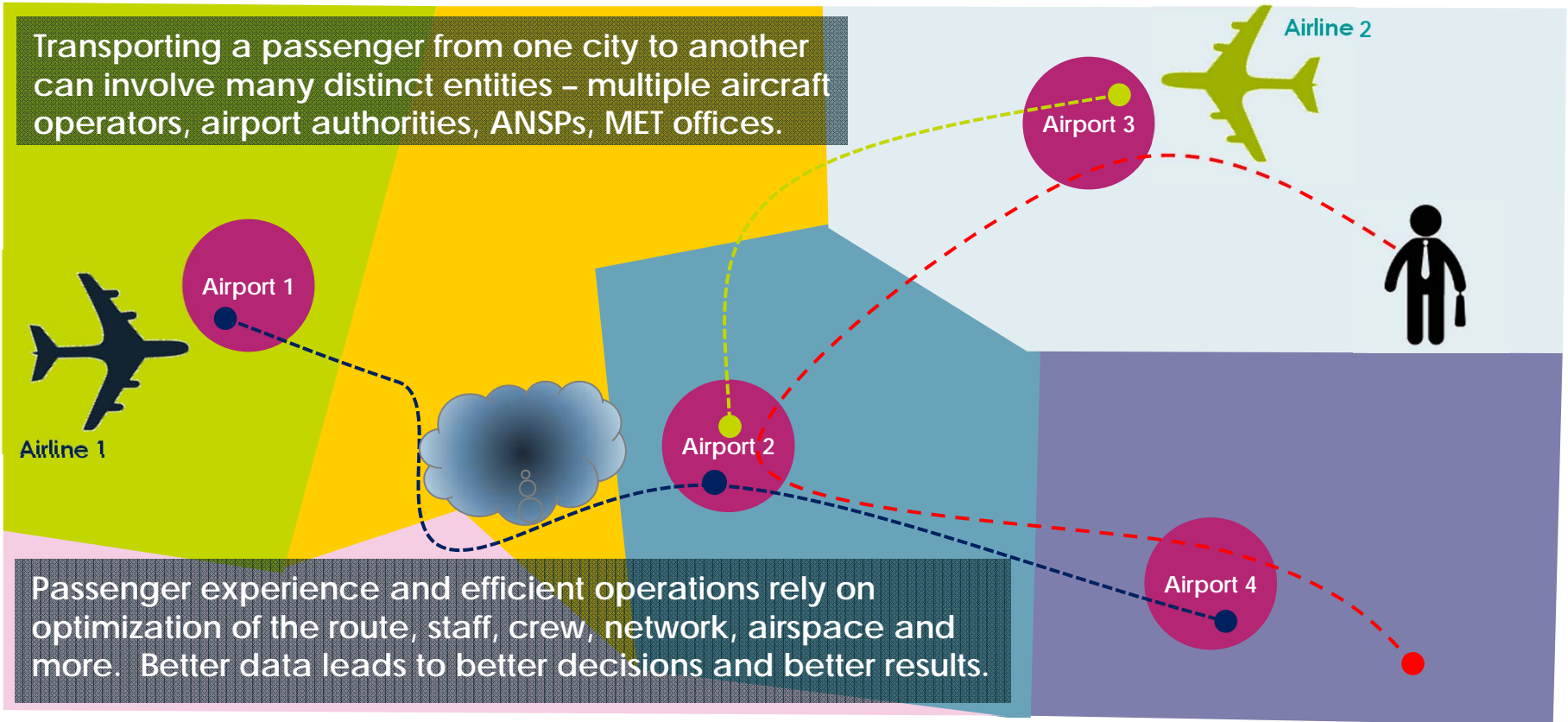
Brussels, October 4th, 2017

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Digital collaboration is the key to optimizing aviation flight operations

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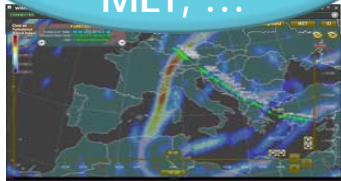
ECOsysteM in the KPIs value chain...



ECOsysteM : a global information sharing & integration platform to improve overall aviation efficiency & PAX experience

ECOsystem: the concept

External constraints
MET, ...



Airlines constraints



Airport constraints



ATC/ATFM constraints

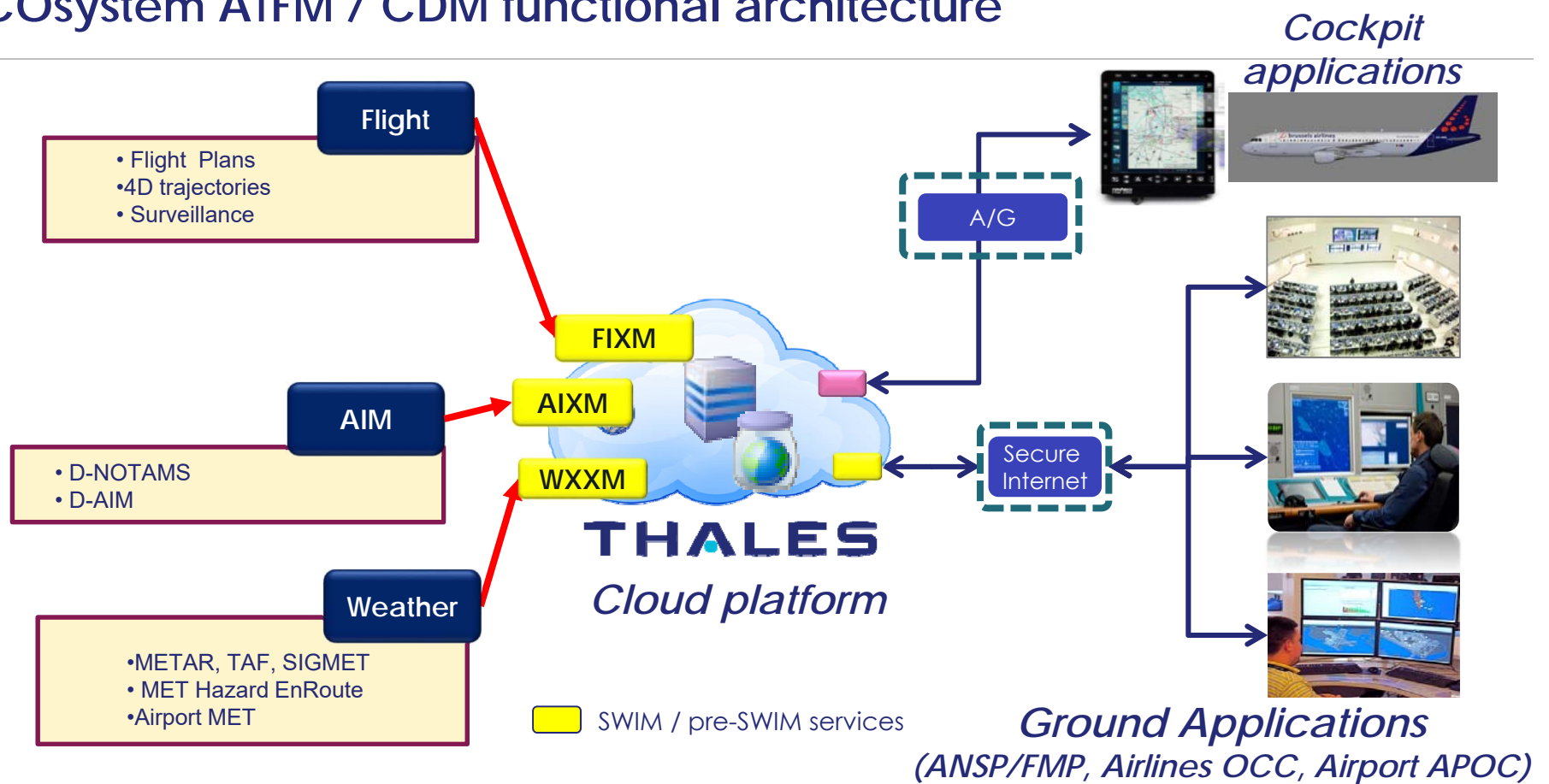


Collaborative Flow / Fleet / Flight Optimization:

- Safety
- Fuel consumption
- Predictability
- Punctuality
- Capacity
- Cost

Improving global efficiency & safety through collaborative
System Wide Information Management

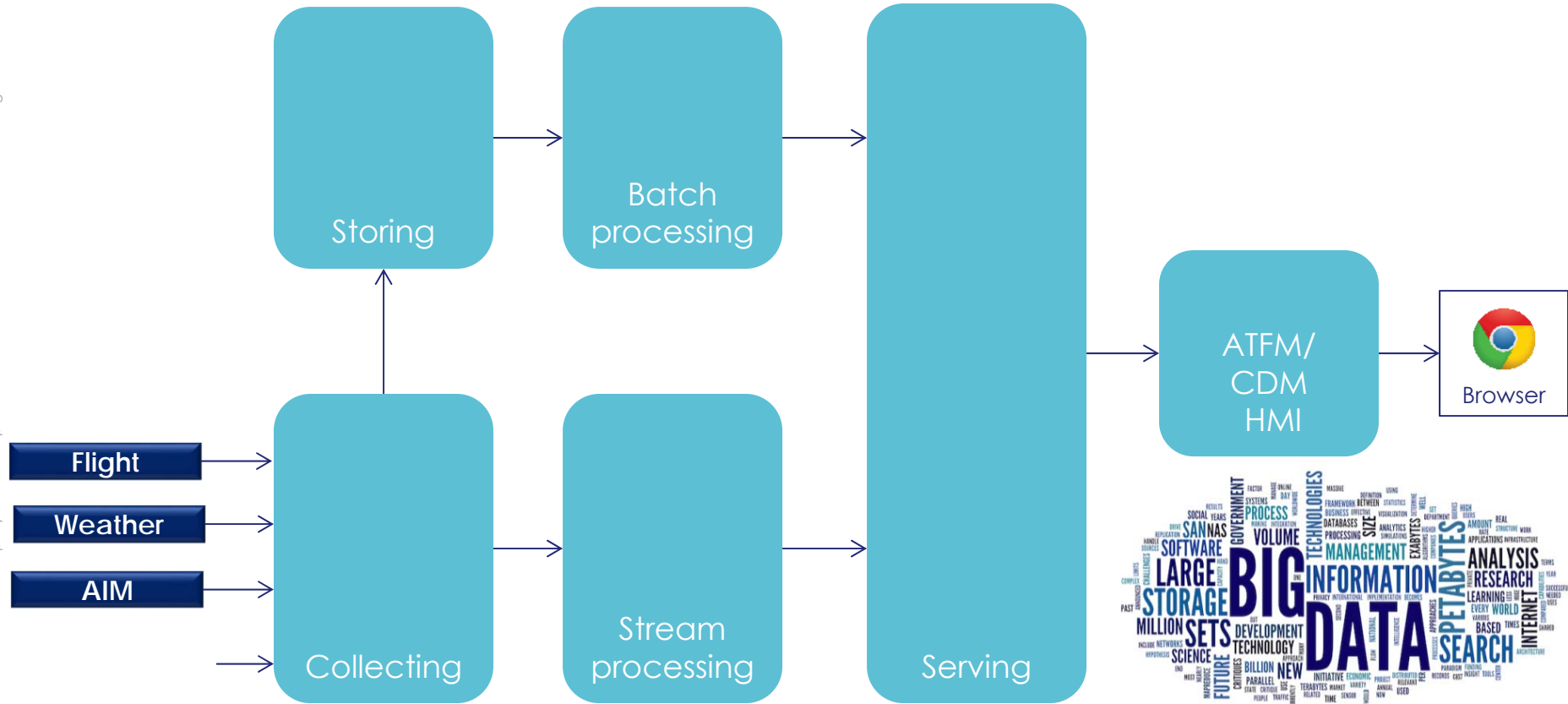
ECOsystem ATFM / CDM functional architecture



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ECOsysteM - Lambda architecture

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ECOsysteM enablers

Information exchange through SWIM « Yellow Profile »

Advanced Flight Information (FIXM 4.0)

- 4D Trajectory
- FPSD (Flight Specific Performance Data)
- GUFI (Global Unique Flight Identifier)

Advanced MET Information

- Digital Geolocalized regulatory MET messages (METAR, TAF, SIGMET, ...)
- MET hazards geolocalized objects (Cb, CAT, icing, ...)

Advanced Aeronautical Information

- D-AIM
- D-NOTAMS

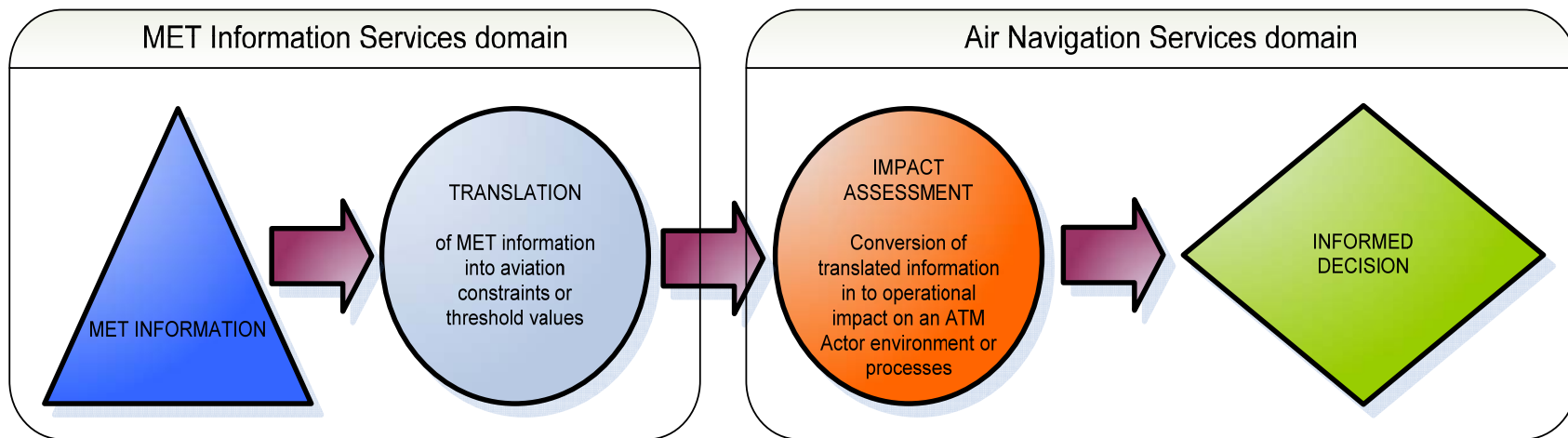


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MET-ATM integration architecture

MET Service Provision

ECOsysteM: Data integration & processing



MET-ATM integration Use Case N°1: « Improved weather regulations »

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
- 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
- **Reduced delays** by avoiding unnecessary penalization of flights

ECOsysteM used by ANSPs/FMPs
Direct benefits on Airlines KPIs

ECOsystem FMP HMI

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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)
- Decision Support

“Improved regulations”: SESAR 1 (TOPLINK) experimental results

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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
	HOP!			
	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.

MET-ATM integration UC N°2: « Collaborative pre-flight optimization »

Air Traffic Flow Managers (FMP):

- More accurate forecast of traffic load in En Route and Approach airspaces
- Improved Arrival & Departure management through more accurate ETAs
- Better anticipation of the impact of weather conditions on traffic flows

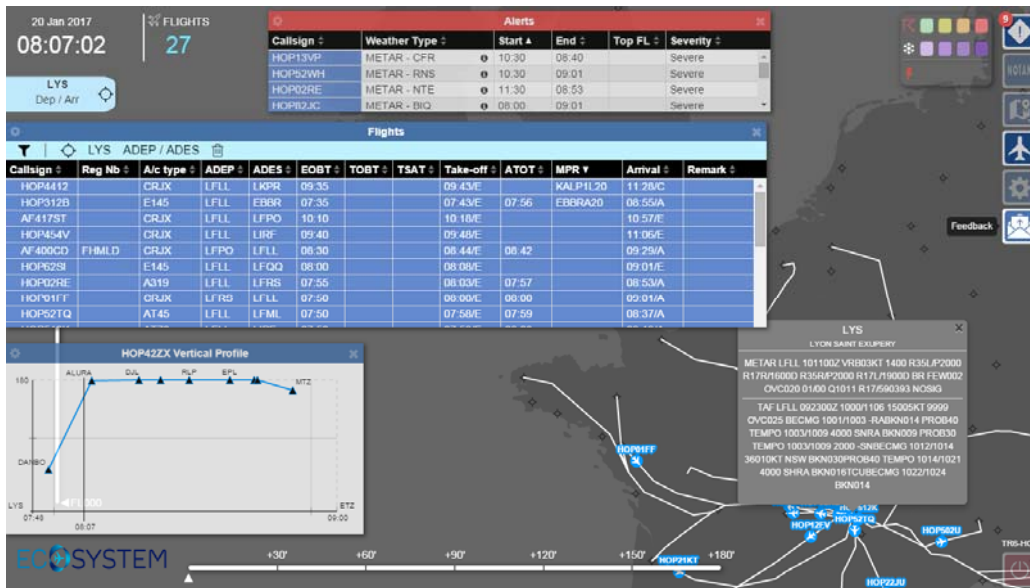
Airspace Users (OCC):

- Improved /dynamic (re-) optimization of flight plans based on ATC - and weather- constraints
- Collaborative decision making between Airline & ATFM
- Improved Flight Monitoring and fleet management thanks to anticipated / real-time sharing of flight information

Improved flow, fleet & flight management
in multiregional operations

ECOsystem « Airline OCC » HMI

Fleet supervision



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

Collaborative pre-flight optimization : improved horizontal rerouting (from TOPLINK)

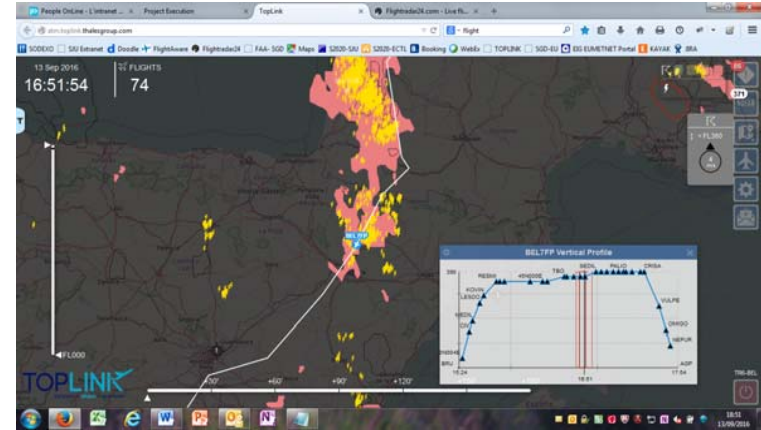
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- Planned route
- Actual route
- - - Alternative route

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

ECOsystem benefit:
Pre-flight rerouting
decision (western
avoidance route)



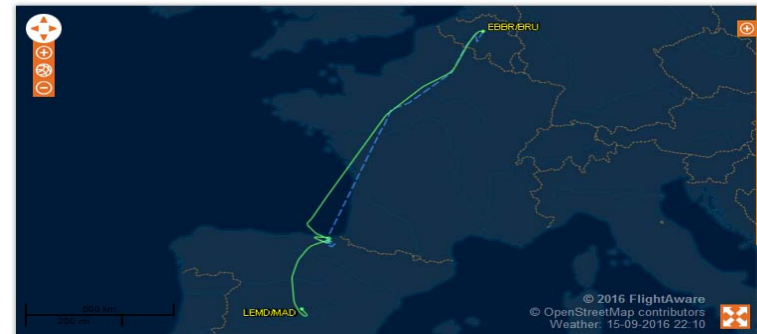
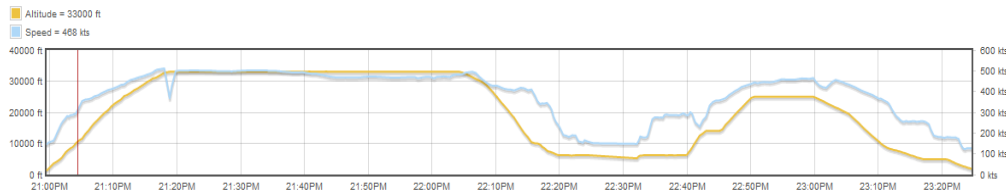
BEL7FP 13/09/2016 BRU-AGP	Planned	Actual	TOPLINK benefit vs actual (est.)
Take-off	15:28	15:24	
Arrival	17:57	18:08	
Track miles	983 NM	1039 NM	
Impact of weather			
Arrival delay	0	+11 mn	- 7 mn
Extra flight duration	0	+15 mn	- 7 mn
Extra track miles	0	57 NM	- 40 NM
Extra cost (est.)	0	+ 599 €	- 420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

Collaborative pre-flight optimization : Avoid diversion (from TOPLINK)

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

ECOsysteM benefit:
 Ground delay at departure in BRU 45 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 €



Conclusion

SWIM enables the integration of

- Multiple Flight Information sources
- Multiple Aeronautical Information sources
- Multiple MET information sources

Data consolidation and processing enables:

- Better anticipation of impacts, customized for each stakeholder
- Early assessment of possible resolutions, and optimized decision making
- Improved Punctuality, Predictability, Cost efficiency

ECOSYSTEM

a global data integration platform supporting
planning, monitoring, optimization, & post-analysis operations

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Questions?

THANK YOU FOR YOUR KIND ATTENTION !

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