Ultra's Experience with A-CDM

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THE ULTRA EQUATION

OBSERVATION + RESPONSE + ANALYSIS + EVOLUTION = HEIGHTENED EFFICIENCY

Objectives of A-CDM

OBSERVATION ➕ RESPONSE ➕ ANALYSIS ➕ EVOLUTION ＝ HEIGHTENED EFFICIENCY

- Improve predictability of operations
- Improve on-time performance
- Optimise utilisation of ground handling resources
- Optimise utilisation of airport infrastructure
- Reduce slot wastage
- Flexible pre-departure planning
- Reduce Apron and Taxiway congestion

UltraAPEX

AIRCRAFT FLOW MANAGEMENT

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A-CDM Core Elements

OBSERVATION ➕ RESPONSE ➕ ANALYSIS ➕ EVOLUTION ═ **HEIGHTENED EFFICIENCY**

EuroControl A-CDM consists of 16 Milestones which map the inbound – turnaround and outbound process of a flight. Using the milestone approach it becomes possible to monitor the whole process and influence where need. From the milestone approach the Target Off-Block Time (TOBT) is derived.

Milestone Approach 1

Variable Taxi Time replaces the standard taxi time and is used for inbound and outbound flights. It reflects the individual taxi time from parking position to the runway in use and vice versa, including contributing factors such as aircraft type, pushback time, local weather conditions and operational restrictions

Variable Taxi Time 2

Pre-departure Sequencing moves the operational concept from first come – first served to best planned - best served. Pre-departure sequencing generates an optimised off-block sequence that takes into account operational considerations and limitations.

Pre-Departure Sequencing 3

CDM in Adverse Conditions enables efficient management of the operation during time where airport capacity is limited. Such adverse conditions would cover local weather conditions such as fog through to on airport situations such as a runway closure

CDM in Adverse Conditions 4

Collaborative management of flight updates enables the exchanges of arrival and departure information with central flow management organisations such as NMOC, DGAC, ANAC, etc.
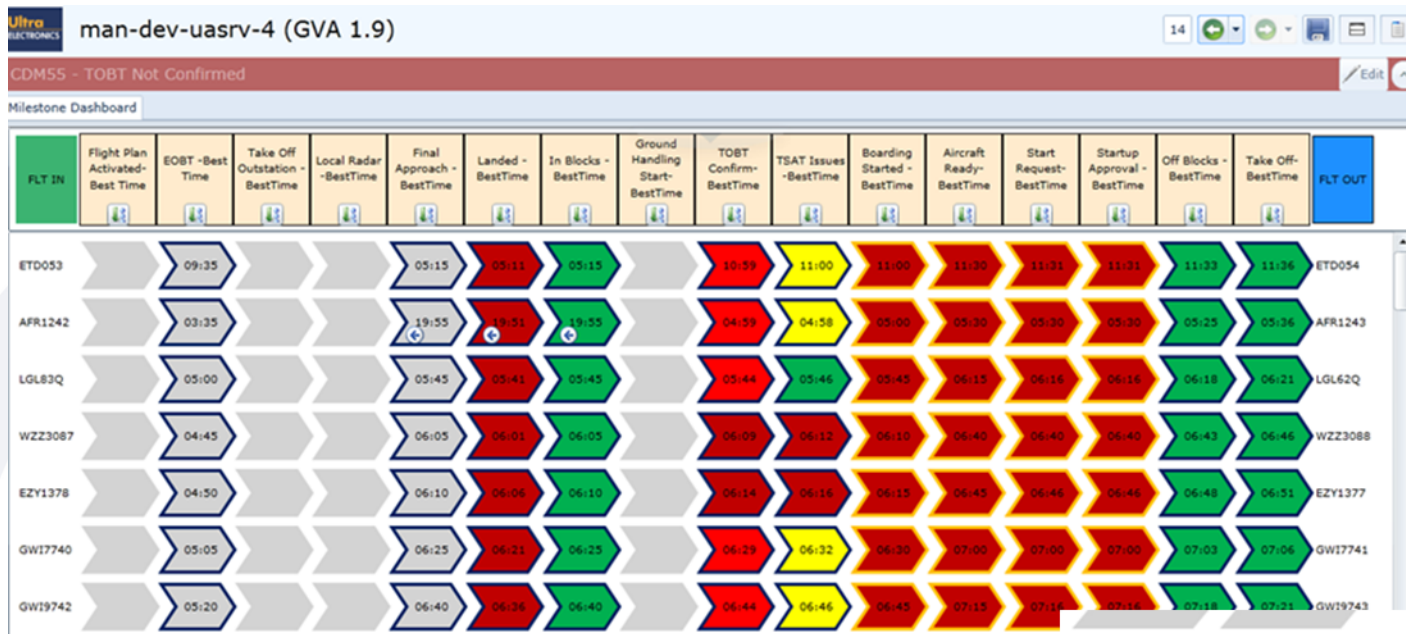
Collaborative Management of Flight Updates 5
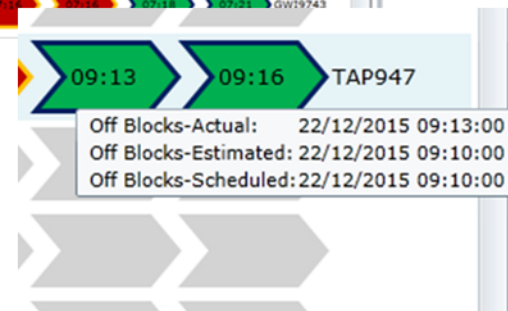
1. Milestone Approach

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The Milestone Dashboard displays the predicted and actual status for each of the 16 EuroControl pre-defined Turn-Round milestones.

Associated with these milestones are 14 A-CDM alerts.

✓ View the turnaround performance of each aircraft as a series of 16 pre-defined EuroControl milestones

✓ Gives early visibility of developing problems and highlights areas where pre-emptive action can reduce delays and improve turnaround times

2. Variable Taxi Time

Support for default taxi times which can be fine-tuned for particular configurations.

✓ Taxi Times configured for a Stand/Runway pairing and aircraft type

✓ Information is used to configure Taxi In (EXIT) and Taxi Out (EXOT) times for flights

✓ Variable taxi times improves quality of Target Take Off Times and reduce delays at the runway

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3. Pre-departure Sequencer

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The Pre-Departure Sequencer calculates a *Target Startup Approval Time (TSAT)* which is used to calculate a *Target Take Off Time (TTOT) whilst* ensuring adherence to calculated take off times (CTOT) and hence the optimised use of take off slots.
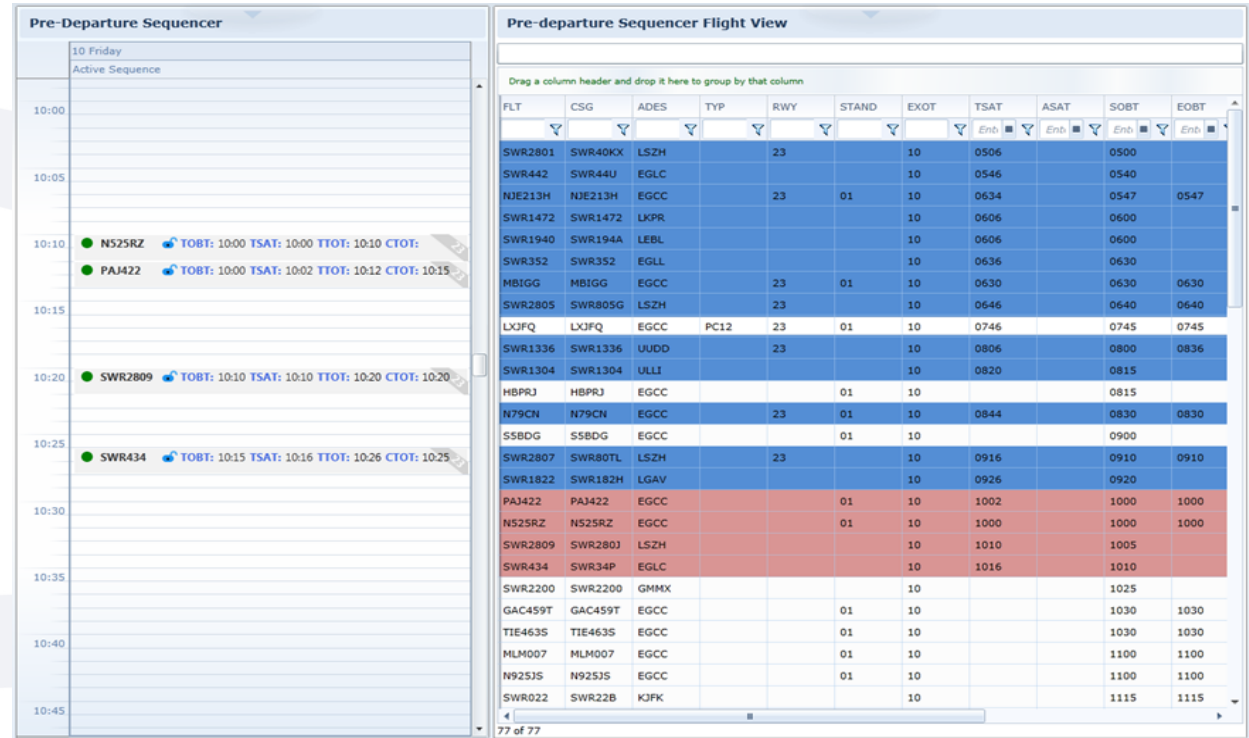
✓ Enhance predictability

✓ Reduce taxi and hold times

✓ Colour coding to highlight important points

✓ Increase punctuality

✓ Improved slot adherence

3. Pre-departure Sequencer

OBSERVATION ⊕ RESPONSE ⊕ ANALYSIS ⊕ EVOLUTION ⊜ **HEIGHTENED EFFICIENCY**

Sequence Reorganisation

Users need to be able to manually lock or unlock flights in the sequence.

Flight sequences should be easily swapped with a right click command on the two selected sequences.

Airlines may be allowed to move slots between their own flights.

4. Adverse Conditions

OBSERVATION ➕ RESPONSE ➕ ANALYSIS ➕ EVOLUTION ➖ **HEIGHTENED EFFICIENCY**

✓ Modify runway capacity in response to operational pressures

✓ Optimise available slot capacity

✓ Integrates with the pre-departure sequencer

✓ View runway status received from integration with ATC systems.

✓ Runway information can be input manually and / or supplied by external systems.

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4. Adverse Conditions

OBSERVATION ⊕ RESPONSE ⊕ ANALYSIS ⊕ EVOLUTION ⊜ HEIGHTENED EFFICIENCY

Taxi time extensions can be applied to all flights for a period of time in response to operational delays such as those caused by adverse weather.
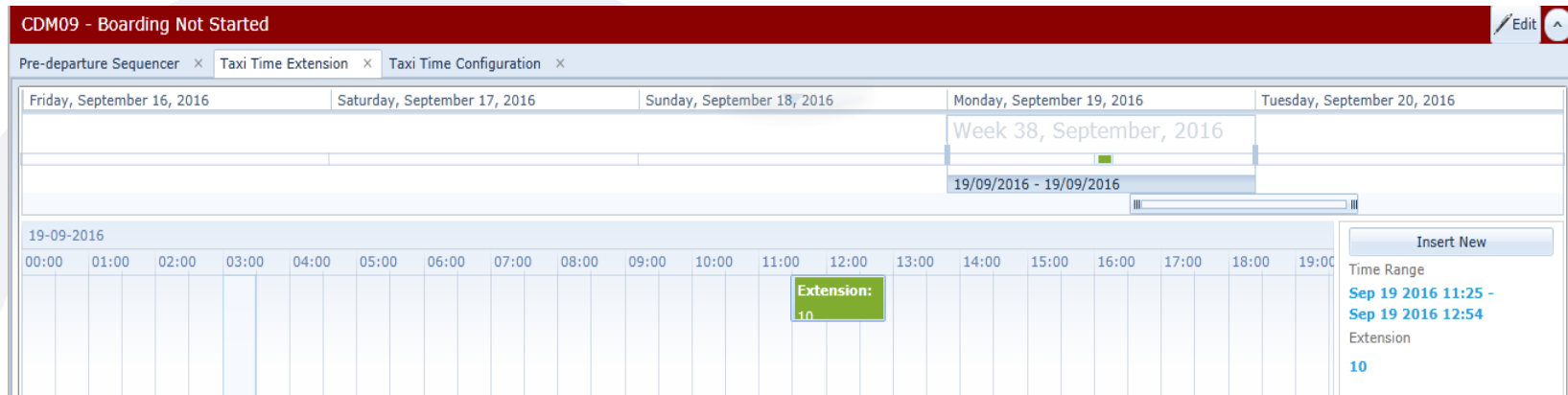
✓ Improves accuracy of TSAT and TTOT times

✓ Ensures resource planning is considering local operating conditions

✓ Reduces delays at the runway

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5. Intra Airport Communication

The diagram shows an example DPI lifecycle and the points along the turn-round process at which DPI messages are generated.
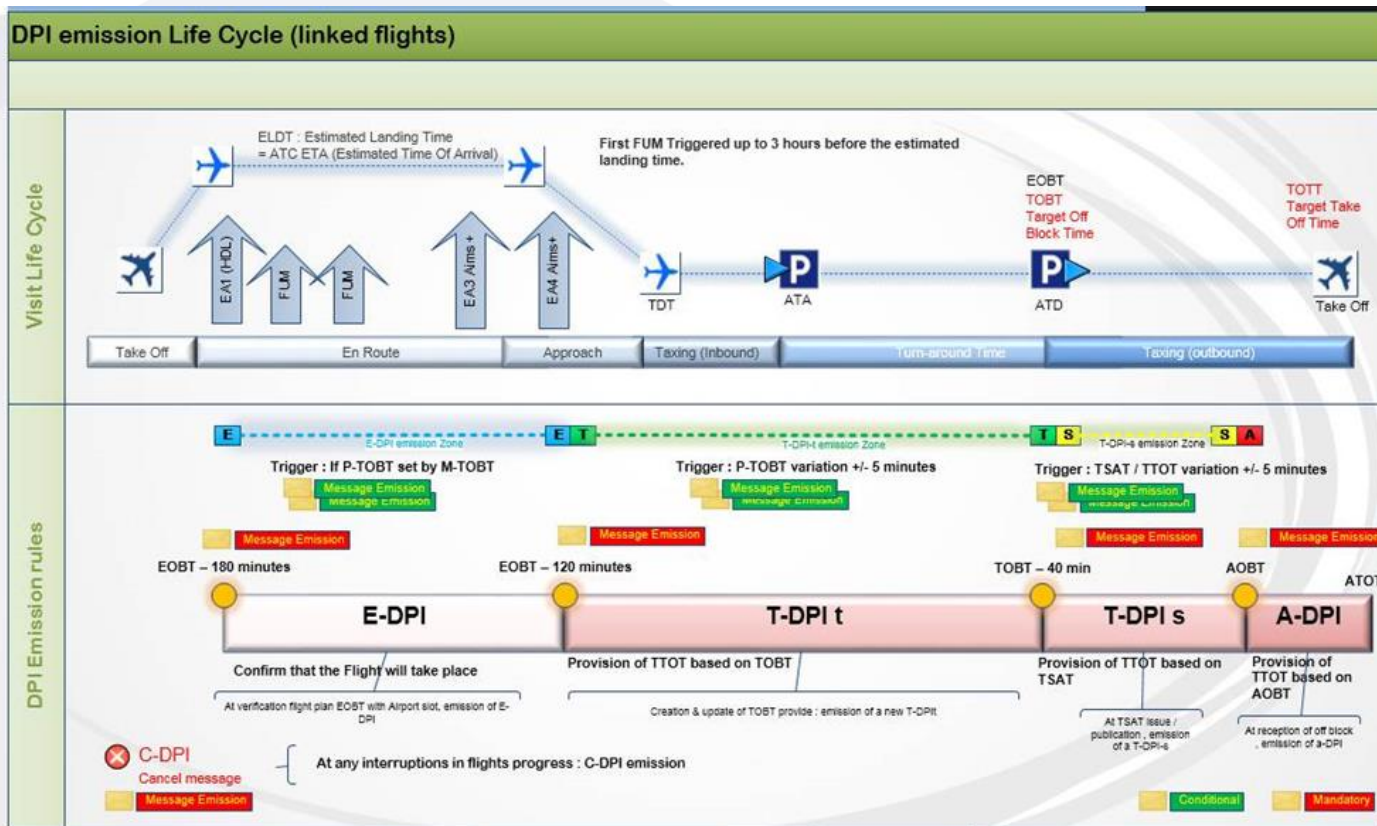
The rules to generate DPI messages need to be configurable so they can be modified to satisfy an airport's local requirements which may change over time.

OBSERVATION ⊕   RESPONSE ⊕   ANALYSIS ⊕   EVOLUTION ⊜   HEIGHTENED EFFICIENCY

Local DPI Generation Rules

Rules can be configured to create DPI messages at different stages of the turn-round process for different types of flights.

	Regulated flight = (ATC) slotted flight (flight has CTOT set)		Un-regulated flight = (ATC) non-slotted flight (flight has NO CTOT)	
North Zone (general parking area)	**T-DPI-t**	Send a `T-DPI-t` <u>until</u> **SUT** is set	**T-DPI-t**	Send `T-DPI-t` <u>until</u> TOBT-40
	T-DPI-s	Send a `T-DPI-s` when **SUT** is set *(typically at TOBT-40 mins)*	**T-DPI-s**	Send a `T-DPI-s` when **TSAT** set *(typically at TOBT-40 mins)*
	A-DPI	Send a `A-DPI` when **SUT** is set	**A-DPI**	Send a `A-DPI` as soon when **SUT** is set
South Zone (airport terminals)	**T-DPI-t**	Send a `T-DPI-t` <u>until</u> **HAP** is set	**T-DPI-t**	Send `T-DPI-t` <u>until</u> TOBT-40
	T-DPI-s	Send a `T-DPI-s` when **HAP** is set	**T-DPI-s**	Send a `T-DPI-s` when **TSAT** set *(typically at TOBT-40 mins)*
	A-DPI	Send a `A-DPI` when **TAD** is set	**A-DPI**	Send a `A-DPI` at soon when **TAD** is set

✓ *DPI message generation rules are fully configurable to satisfy local operations*

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DPI Flight View (Local)

FLT	CSG	ADES	SID	ARCTYP	REG	FPL	EOBT-2	TSAT Issue	TSAT	EOBT	TOBT	AOBT	EXOT	CTOT	TTOT	ATOT	DEICE
AFR1143	AFR1143	LFPG	DEP	A320	EIDVK	1200				1600	1600		10		1610		
THY1922	THY1922	LTBA		B737	PHBGM		0405	0525	0602	0605	0600	0603	8	0604	0611		
DLH1229	DLH1K	EDDF	L3N1234	E195	DAEBI	0150	0350	0515	0626	0550	0640	0549	10	0642	0559	0556	
BAW723	BAW723	EGLL	T5N	F2TH	N132DA	0235	0435	0559	0638	0635	0720	0639	8	0651	0647	0650	
TAP949	TAP949G	LPPT	W2T	B772	N37018	0130	0330	0454	0606	0530	0605	0539	8	0540	0547	0545	
AUA578	AUA578G	LOWW	S4N	B733	HBJJB	0207	0425	0548	0626	0625	0625	0628	8	0629	0636	0642	

137 of 137

DPI Viewer   **Message Info**

Drag a column header and drop it here to group by that column

Queued On	Sent On	Message Type	Flight	Errors	Aircraft Identifier	TOBT	TSAT	TTOT	Estimated Taxi Time
19/09/2016 11:16:18		T-DPI-t	EZY6154	0	EZY874L	19/09/2016 12:05:00		19/09/2016 12:14:00	00:09:00
19/09/2016 11:16:03		E-DPI	DWT026	0	DWT026	19/09/2016 14:15:00		19/09/2016 14:25:00	00:10:00
19/09/2016 11:15:28		T-DPI-t	EZS1455	0	EZS853P	19/09/2016 11:45:00	19/09/2016 11:45:00	19/09/2016 12:04:00	00:19:00
19/09/2016 11:15:01		T-DPI-t	UAE090	0	UAE90	19/09/2016 13:15:00		19/09/2016 13:25:00	00:10:00
19/09/2016 11:12:09		T-DPI-t	KLM1930	0	KLM1930	19/09/2016 12:28:00		19/09/2016 12:45:00	00:17:00

Message Data
- TITLE DPI
- DPISTATUS TARGET
- ARCID EZY874L
- ADEP LSGG
- ADES EGGD
- EOBT 1155
- EOBD 160919
- TOBT 1205
- TAXITIME 0009
- TTOT 1214
- ARCTYP B737
- REG N66ZB

✓ Process Flight Update (FUM) messages.

✓ Details of the FUM messages received can be viewed

✓ Generate standard Departure Planning Information (DPI) messages.

✓ DPI messages generated for a particular flight or for all flights over a period of time can be viewed in the "DPI Viewer"

✓ Provides an audit trail of information sent to central flow management unit

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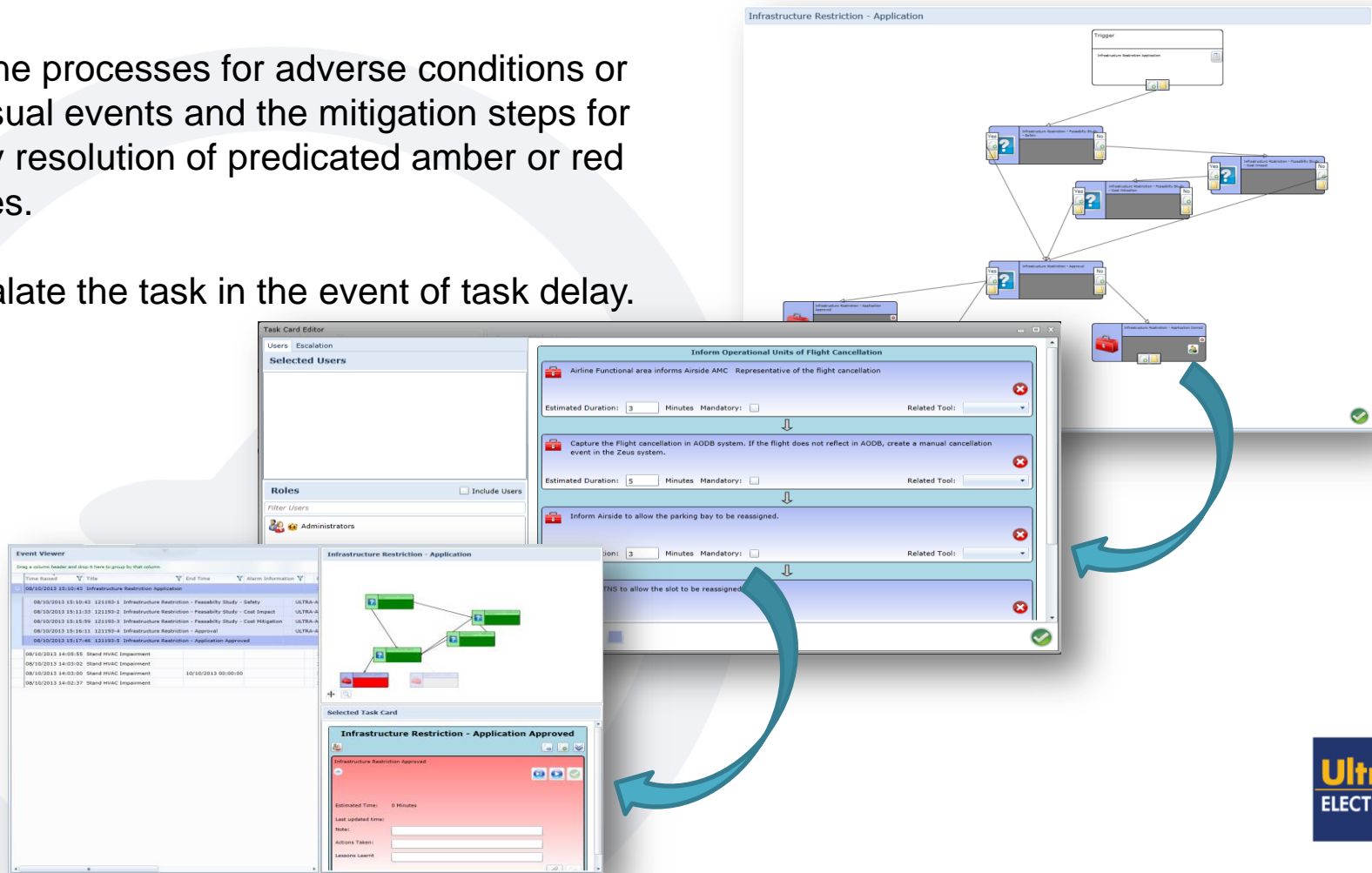# Events, Alerts and Tasks

OBSERVATION ➕ RESPONSE ➕ ANALYSIS ➕ EVOLUTION ➖ **HEIGHTENED EFFICIENCY**

✓ Implement the 14 A-CDM alerts

✓ Define processes for adverse conditions or unusual events and the mitigation steps for early resolution of predicated amber or red states.

✓ Escalate the task in the event of task delay.

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Performance Monitoring

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Timely provision of accurate information is central to achieving the A-CDM objectives. Such performance monitoring needs frequent review to ensure data accuracy such as Calculated take-off time (CTOT) vs Actual take-off time (ATOT).
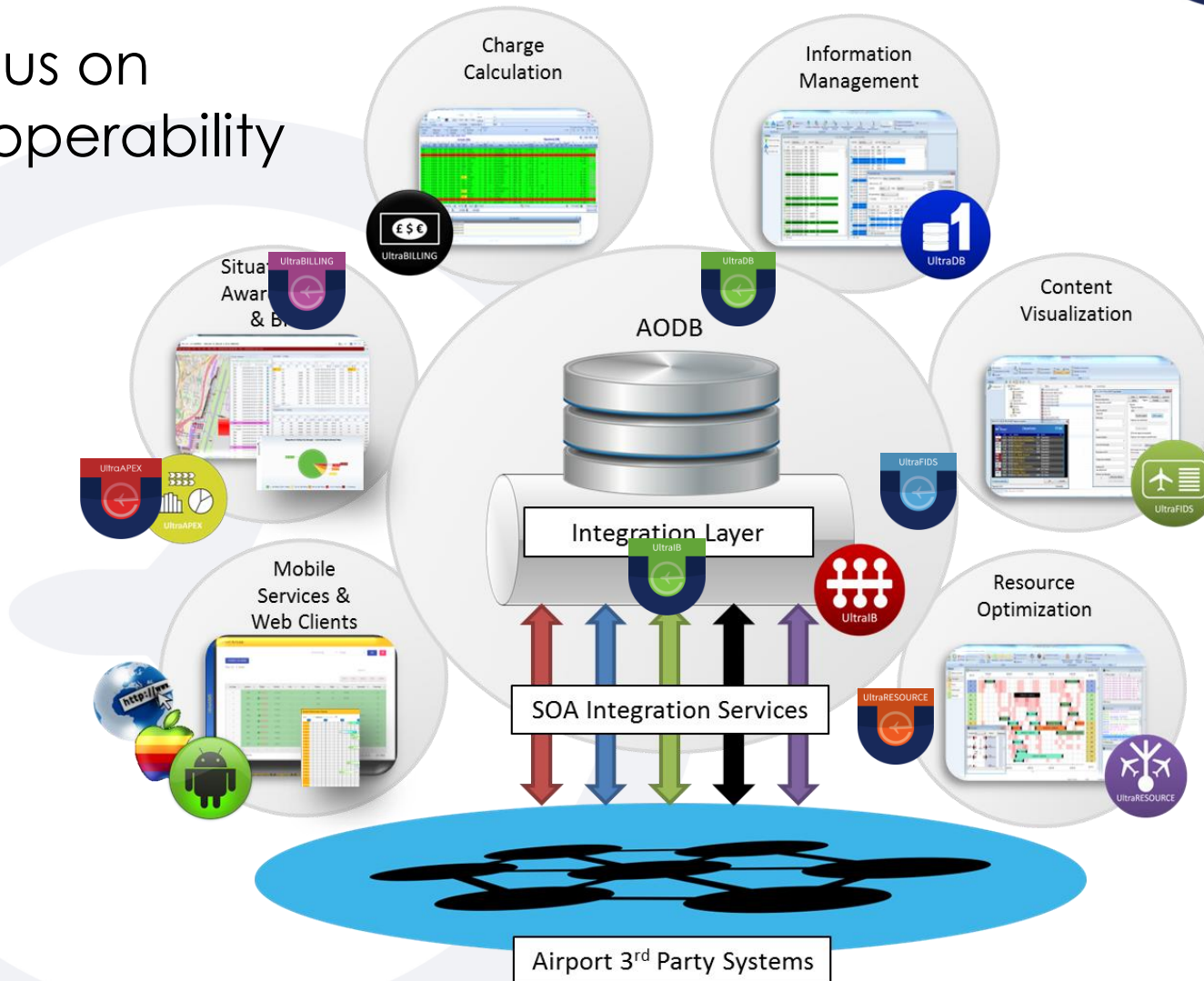
Total Airport Management

OBSERVATION ⊕ RESPONSE ⊕ ANALYSIS ⊕ EVOLUTION ⊜ HEIGHTENED EFFICIENCY

- Focus on Inter-operability

Charge Calculation

Information Management

UltraBILLING

UltraDB

Situational Awareness & BI

Content Visualization

AODB

UltraAPEX

UltraFIDS

Integration Layer

UltraIB

Mobile Services & Web Clients

UltraIB

Resource Optimization

SOA Integration Services

UltraRESOURCE

Airport 3rd Party Systems

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Seasonal Schedule

IATA
SSIM

ANAC NATIONAL CIVIL AVIATION AGENCY – BRAZIL
HOTRAN

中国航信
TravelSky

PDC-Aviation
SCORE

Seasonal Schedule
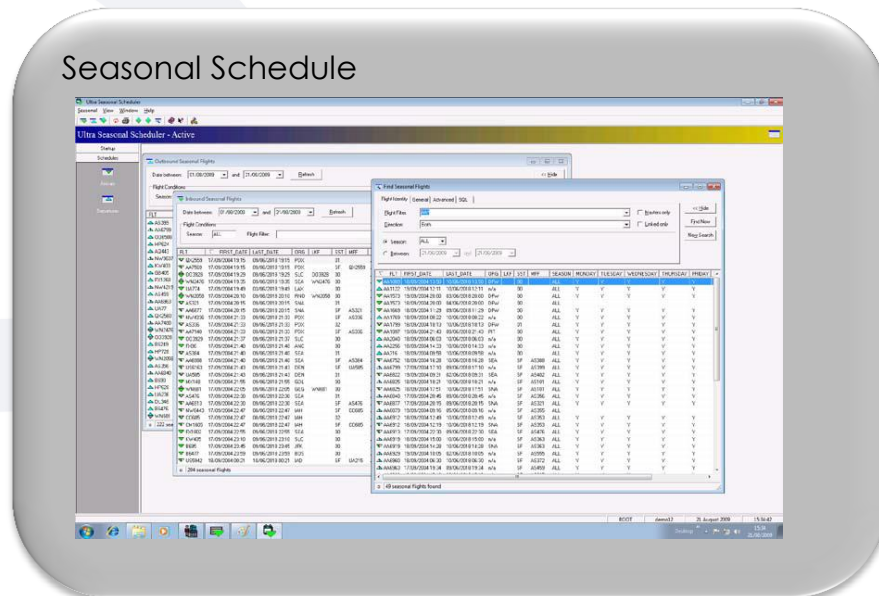
CSV File

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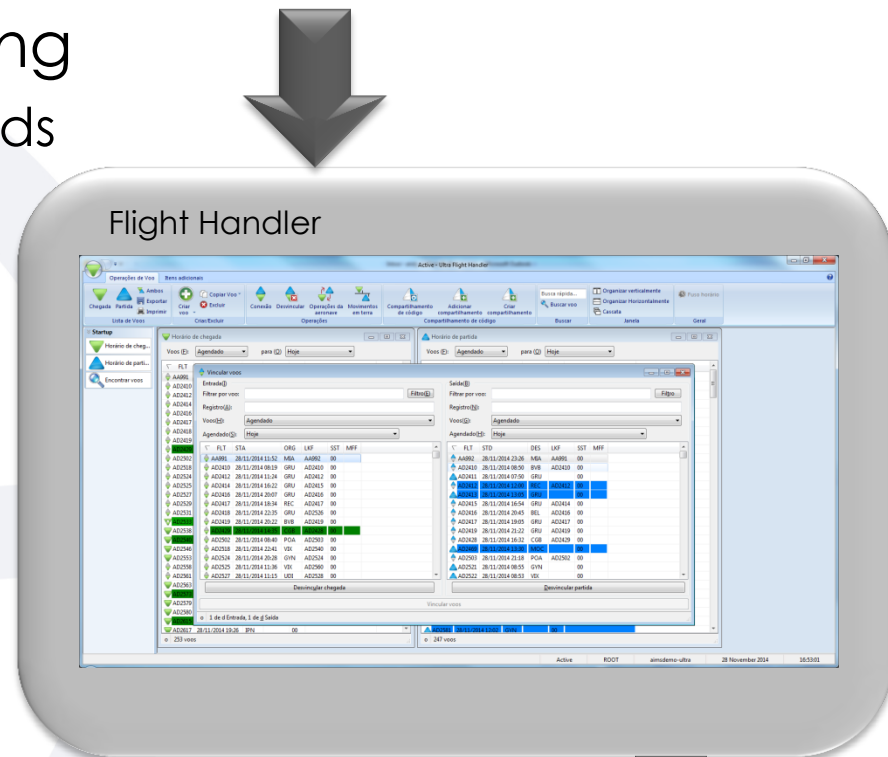# Flight Handler

OBSERVATION ⊕ RESPONSE ⊕ ANALYSIS ⊕ EVOLUTION ⊖ HEIGHTENED EFFICIENCY

- Default Data Population
- Automatic Flight Linking
  - Multiple Linking Methods
    - Registration Number
    - Carrier
    - Data Time

Flight Handler

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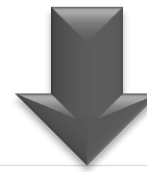ELECTRONICS

Resource Planners

OBSERVATION ➕ RESPONSE ➕ ANALYSIS ➕ EVOLUTION ➖ **HEIGHTENED EFFICIENCY**

- Airport Wide Resource Optimization
  - Fixed
  - Mobile
- Intelligent Rulebase
- Template Capability
- What If? Scenarios
- Sandbox Capability

Resource Planners

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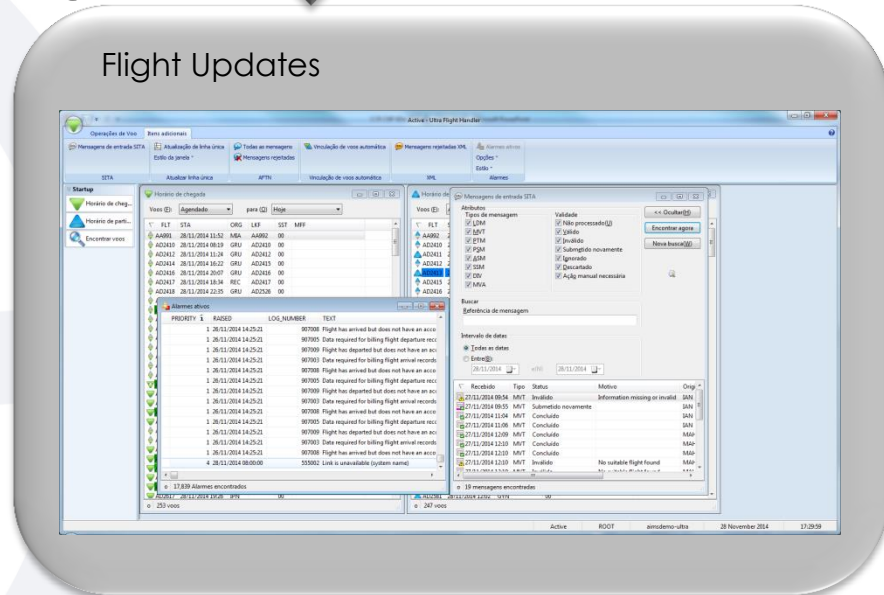# Flight Updates

- SOA Standards Integration Capability
- Many Legacy Adapters
- Type B Message Handling
- Prioritised Inputs
  - External Feeds
  - Manual Updates

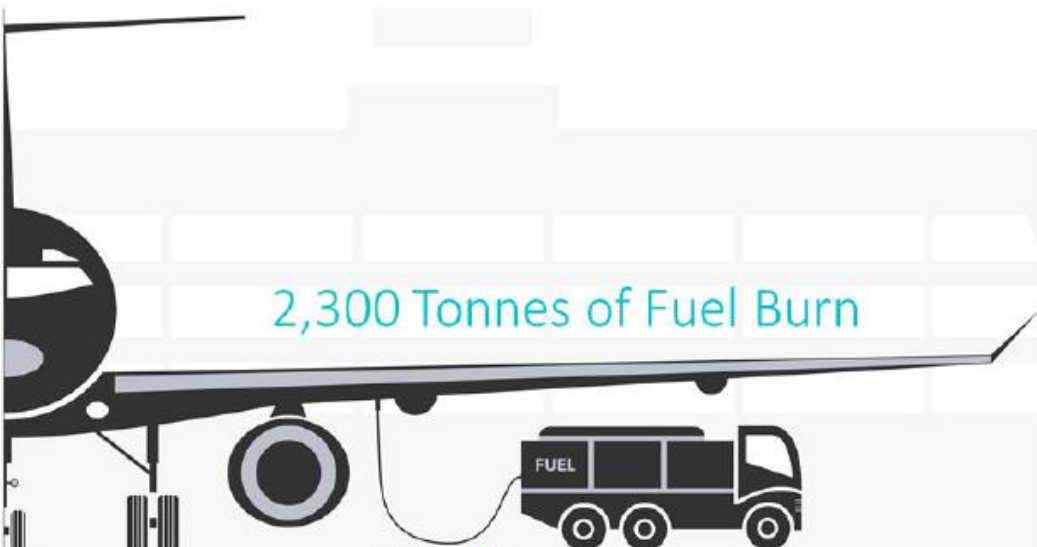Flight Updates

Zurich A-CDM Case Study

THE ULTRA EQUATION

OBSERVATION ⊕ RESPONSE ⊕ ANALYSIS ⊕ EVOLUTION ⊖ **HEIGHTENED EFFICIENCY**

7,300 Tonnes of CO_2
78.9 Tonnes of CO
8.8 Tonnes of NOx

2,300 Tonnes of Fuel Burn

FUEL

20,500 Minutes of Delay

190,000 Minutes of Taxi

€ 1.8 Million in Fuel
1.9 Million in Delay

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Some useful links

OBSERVATION ➕ RESPONSE ➕ ANALYSIS ➕ EVOLUTION ➖ HEIGHTENED EFFICIENCY

- http://www.eurocontrol.int/sites/default/files/publication/files/2012-airport-cdm-manual-v4.pdf
- http://www.eurocontrol.int/sites/default/files/publication/files/a-cdm-impact-assessment-2016.pdf
- https://www.zurich-airport.com/business-and-partners/flight-operations/a-cdm-en
- https://www.zurich-airport.com/~/media/flughafenzh/dokumente/business_und_partner/flugbetrieb/acdmopsmanualv1220151214en.pdf https://www.zurich-airport.com/~/media/flughafenzh/dokumente/business_und_partner/flugbetrieb/acdmzrhdocumentationv1020151214en.pdf
- http://www.ultra-as.com/ultraapex

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The Success of our Customers

2016 SkyTrax Airport Awards™

WORLD AIRPORT AWARDS

BEST AIRPORTS BY REGION

BEST AIRPORT: NORTHERN EUROPE
Helsinki-Vantaa

BEST AIRPORT: EASTERN EUROPE
Budapest

BEST AIRPORT: WESTERN EUROPE
London Heathrow

BEST AIRPORT: AFRICA
Cape Town

BEST AIRPORT: ASIA
Singapore Changi

BEST INTERNATIONAL AIRPORT: CHINA
Beijing Capital

BEST DOMESTIC AIRPORT: CHINA
Shanghai Hongqiao

BEST AIRPORT: RUSSIA/CIS
Moscow Domodedovo

BEST AIRPORT: NORTH AMERICA
Vancouver

BEST AIRPORT: C AMERICA/CARIBBEAN
Panama Tocumen

BEST AIRPORT: MIDDLE EAST
Doha Hamad

BEST INT'L TRANSIT AIRPORT
Seoul Incheon

WORLD'S TOP 10 BEST AIRPORTS

1 Singapore Changi

2 Incheon, S Korea

3 Munich

4 Tokyo Haneda

5 Hong Kong

6 Centrair Nagoya, Japan

7 Zurich

8 London Heathrow

9 Kansai, Japan

10 Doha Hamad

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Thank You

- Questions?

Our airport installed base

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