Airport Collaborative Decision Making (A-CDM) – and Beyond

Airport Collaborative Decision Making (A-CDM) has been a focus point at airports as well as within the aviation industry for quite some time and will continue to be in the years to come. It has been acknowledged in the recent years that A-CDM is first and foremost a process, an initiative providing a framework to the various stakeholders.

- But is A-CDM possible without supporting IT solutions? Most likely not.
- And can A-CDM be enhanced by IT solutions going beyond the core elements? Certainly yes.

At Harris we have identified a total of 3 phases in the context of the A-CDM implementation all being continuously supported by consulting services ensuring that processes and procedures align with the solutions put in place.

	Phase 1 A-CDM Implementation Preparation	Phase 2 A-CDM Implementation	Phase 3 Beyond/Enhanced A-CDM
Description	▪ Definition of A-CDM processes and procedures ▪ Gap-Analysis of the underlying IT Infrastructure	▪ Implementation of A-CDM processes and procedures as well as IT solutions to enable A-CDM	▪ IT solutions enhancing A-CDM by providing more precise information as well as enhance situational awareness
A-CDM Elements	▪ Enabling Information Sharing	▪ Information Sharing ▪ Milestone Process ▪ Variable Taxi-Time Calculation (VTTC) ▪ (Collaborative) Pre-Departure Sequencing ▪ A-CDM in Adverse Conditions	▪ Support of A-CDM processes through improved Arrival and Departure predictability and forecast horizon ▪ Capacity planning enhancing A-CDM resource utilization ▪ Linking A-CDM information with Air Traffic operations as per ICAO ASBU requirement.
IT Solutions	▪ AODB (third party)	▪ Harris A-CDM Milestone Portal ▪ Harris VTT ▪ Harris PDS	▪ Harris Airside Monitor ▪ Harris ATC decision support systems: AMAN, Extended AMAN, DMAN and AMAN/DMAN coupling ▪ Harris Dynamic Stand Allocation
Underlying & Supporting Services	Consulting Services provided by a Harris partner		

2.0 A-CDM AND BEYOND

Transparency and the sharing of information are fundamental principles of A-CDM. It has been extensively communicated that firstly there is no A-CDM solution that fits all and secondly that A-CDM is not about IT systems and solutions but about the underlying processes. Together with our consulting partners, we can provide a complete A-CDM solution addressing your specific airport needs and covering the core elements:

Information Sharing – Information Sharing is the first and most important component of A-CDM as it creates the data and information foundation for common situational awareness.

Milestone Approach – aims at achieving common situational awareness by tracking the progress of a flight from the initial planning to the take-off. Predictability during the aircraft's turn-round process is improved by the implementation of the Target Off-Block Time (TOBT). TOBT and the Milestone Approach are two essential elements required for the implementation of the remaining A-CDM elements.

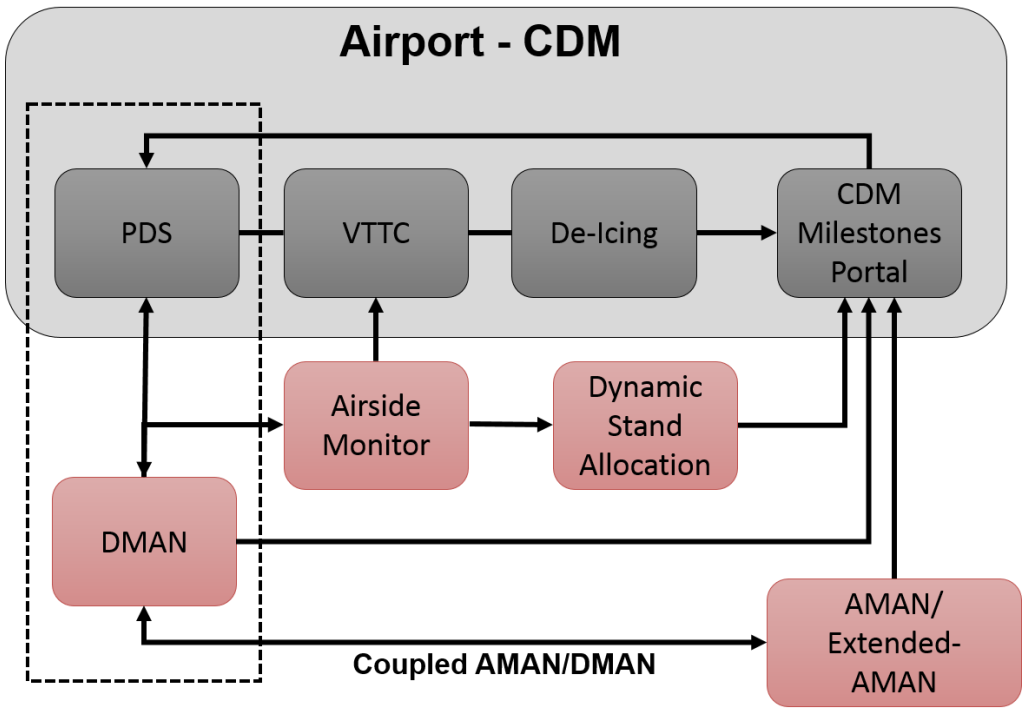
Variable Taxi Times (VTT) – VTTs replace single static values for taxi times with variable times, which are adapted to the airport layout. With VTTs in place, the link between off-block time and take-off time becomes more accurate.

(Collaborative) Pre-Departure Sequencing – With the Pre-Departure Sequencing (PDS) function the Target Startup Approval Times (TSATs) is calculated, providing an optimized off-block sequence of aircrafts that allows absorbing expected delay, e.g. due to slots, on stand.

Collaborative Management of Flight Updates – Sharing arrival and departure information across a network of airports allowing the timely (re-)allocation of resources, especially of flow management slots during congested times.

CDM Under Adverse Conditions – When the components of A-CDM described above are in place, the last step is to implement CDM in adverse conditions, which includes implementing additional procedures that are adhered to during an emergency or when there are major disruptions from weather (e.g. de-icing, low visibility).

Harris A-CDM solutions have been operational at multiple airports over years such as Gatwick Airport as well as Singapore Changi Airport. Both airports utilized the Harris PDS and DMAN solutions for their outbound traffic



The benefits of A-CDM are known within the aviation industry and A-CDM is an important first step to optimize the airport's airside capacity and achieve a better utilization of the given resources. However, through experience, we have learned at Harris that A-CDM does not stop with the initial implementation but is a continuous process of reviewing and improving the solution. Our solution portfolio goes beyond A-CDM and is a natural extension enhancing the overall milestones concept and supporting the optimization of airside resources. Furthermore the Harris solutions address some of the challenges introduced by the A-CDM implementation such as flight delays being absorbed at the stand.

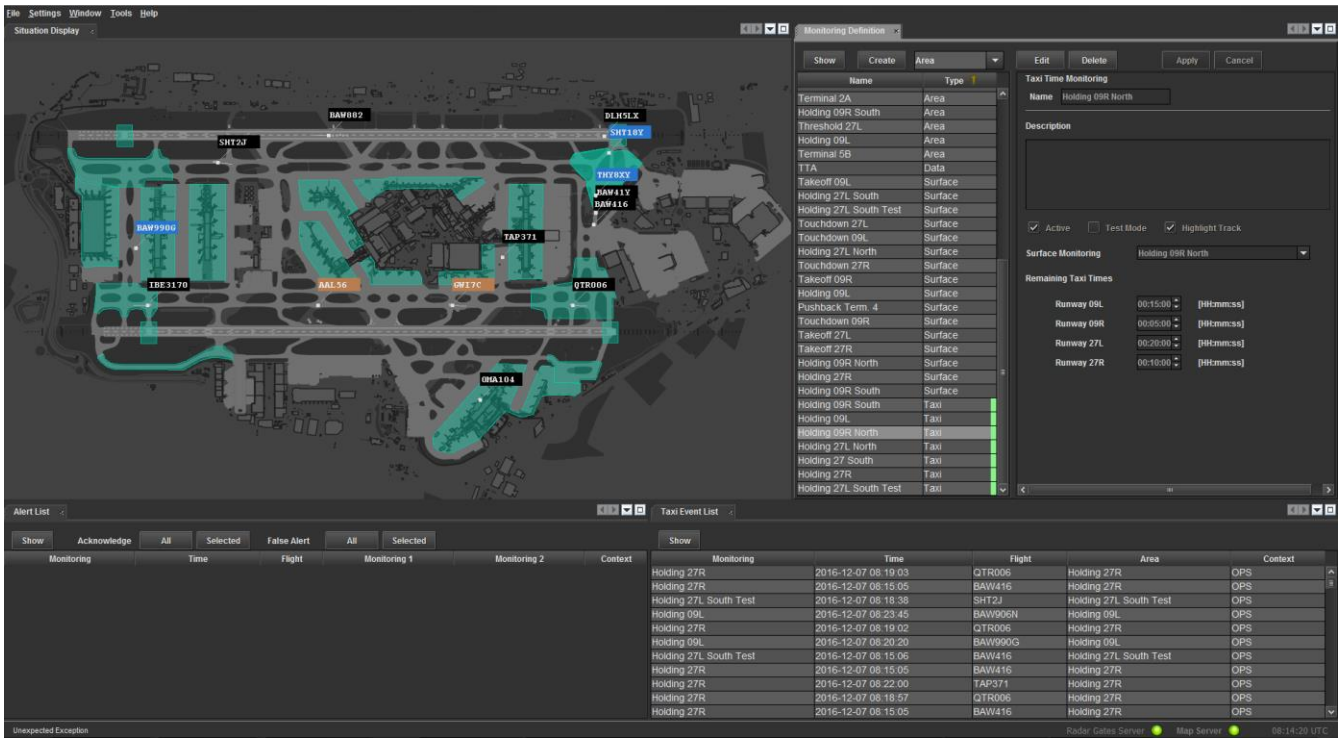
2.1 AIRSIDE MONITOR: PROCESS & MILESTONE MONITORING AND REVIEW

Our Airside Monitor supports both the monitoring as well as the improvement of the overall A-CDM process with the following functionality:

- Providing situational awareness and aircraft visibility once the aircraft has touched down on the runway or has left the stand
- Automated update of remaining taxi time either to the stand or to the runway updating information for the departure sequencing and scheduling process
- Event based alerting functionality e.g. providing alerts upon milestone discrepancy or monitoring of de-icing holdover times

All recorded data is available within the analytics part of the Airside Monitor and can be utilized for data analysis. Relating this to the improvement process of A-CDM, the Airside Monitor analytics part allows the analysis of actual taxi times in order to compare them to the current planned time used within the A-CDM process and provides insight on the accuracy of these times.

At London Heathrow the Airside Monitor is currently providing updated taxi times to the TSAT Generator for updating the calculated Target Take-off Times.



Harris Airside Monitor

2.2 MITIGATING IMPACT ON RESTRICTED AIRPORT RESOURCES

Stand & Gates are in general a limiting resource at airports even prior to A-CDM. The resource challenge will be enforced by the introduction of the pre-departure sequencing in the context of A-CDM as PDS/DMAN aims at absorbing calculated departure delays on the stand in order to minimize taxi delays and fuel burn. Existing Stand & Gate Management systems rely on schedule times and updates received through the flight information system. Hence delays for both arrival and departure flights are not necessarily known to the allocation system, which leads to a lack in situational awareness of the gate occupation in the near future and the potential conflicts arising from that. This often results in a non-optimal use of stands and gates that are expensive resources at an airport. Dynamic Stand Allocation is focusing on the trajectory of the aircraft using more accurate times for landing, on-block, off-block and take-off by utilizing the data provided by existing Harris solutions such as AMAN, DMAN and the Airside Monitor. More dynamic data enables a dynamic stand and gate adjustment at an appropriate time horizon before arrival. This allows a timely update of the actual stand and gate occupation in order to improve stand utilization.

The more accurate data will enable a better utilization of stands as the more precise data allows a better prediction of the stand occupation.

2.3 ACCURATE AND PREDICTIVE ARRIVAL MILESTONES

The general objective of the Arrival Manager (AMAN) is to manage the flow of arriving aircraft in order to make best use of the available Air Traffic Management (ATM) resources, such as runways and airspace. The importance to the airport and the A-CDM process is that the AMAN calculates Target Landing Times (TLDT) for a flight as soon as the flight enters the operational horizon of the AMAN which in general is identical to the Flight Information Region (FIR) or the area where track data is available. The Extended Arrival Manager (E-AMAN) will allow extending the horizon into the en-route airspace and will therefore improving delay prediction and providing more accurate information even earlier in the process. Reliable arrival times, when provided to the A-CDM system, can be used by the airport to estimate or amend the Target Off-Block Time for the linked departure in case of a short rotation.

2.4 ENABLING COLLABORATION WITH AIR TRAFFIC CONTROL

As the stakeholder concept within A-CDM does include the involvement of the Air Navigation Service Provider, it is beneficial to both airport and ANSP to provide extend the sequencing process beyond pure pre-departure sequencing by implementing a Departure Management Solution (DMAN). The DMAN provides A-CDM compliant PDS functionality incorporating a number of ATC relevant features. In order to optimize the runway capacity, the DMAN can be coupled with AMAN.

Air Traffic Management

Harris provides highly reliable, critical components for air traffic management systems worldwide. Our highly reliable, customized solutions keep global Air Navigation Service Providers (ANSPs), airports and airlines ahead of the rapidly growing demands of the flying public.