Leveraging on ATFM and A-CDM to optimise Changi Airport operations

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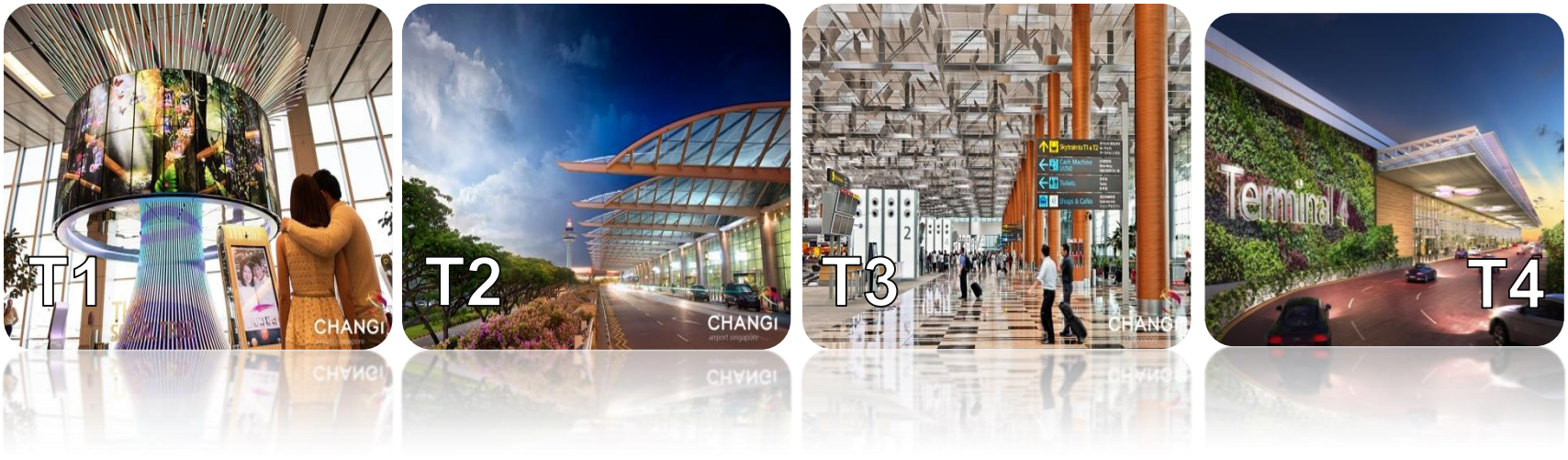
Singapore Changi Airport – Quick fact sheet



- 4 Terminals
- 2 Runways
- 113 contact stands
- 60 remote stands

2016
Statistics

Passenger
58.7 mil
movements

Aircraft
360,490
movements

Air Freight
2.0 mil
tonnes

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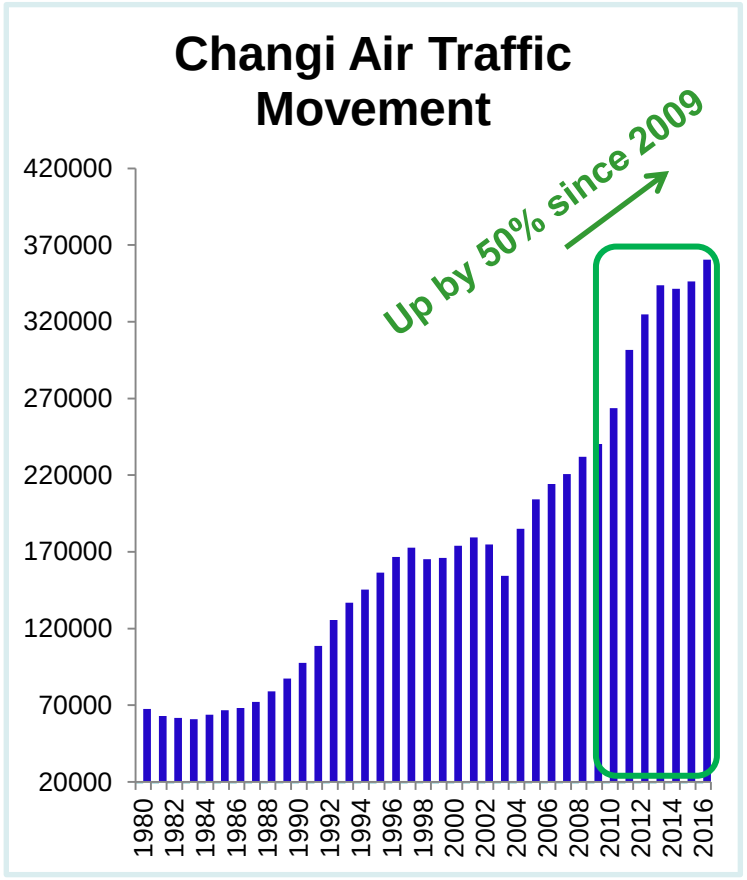
As we expand our airport amidst growing traffic, we also need to optimise current capacity to maintain airspace and airport operations efficiency



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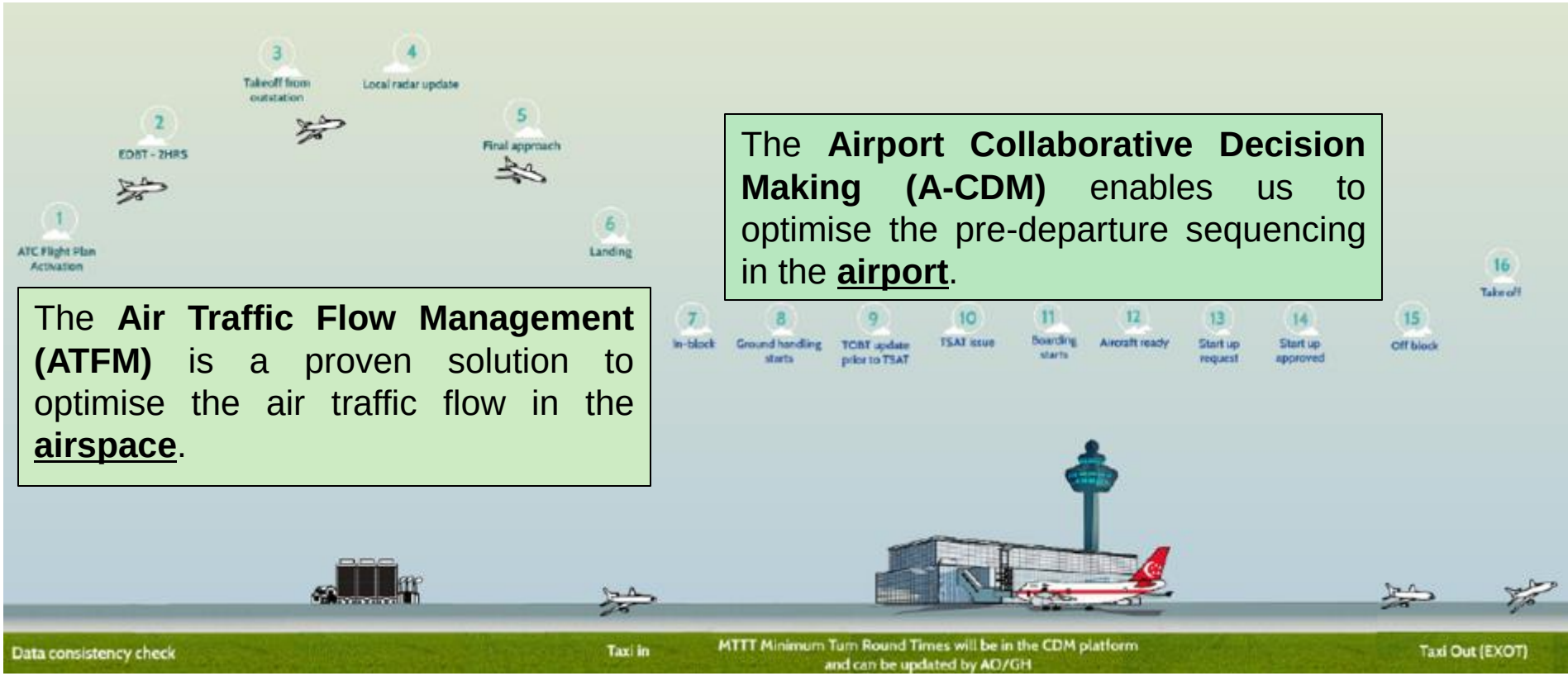
A-CDM and ATFM were identified to be the best solutions to optimise the utilisation of both airport and airspace capacity

The **Air Traffic Flow Management (ATFM)** is a proven solution to optimise the air traffic flow in the **airspace**.

The **Airport Collaborative Decision Making (A-CDM)** enables us to optimise the pre-departure sequencing in the **airport**.



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In airport level, we have worked with CAAS, the airlines and their ground handlers to implement Changi A-CDM.

2013-14	2015	2016
Achieved buy-in from stakeholders	Formulated A-CDM procedures	Conducted operational trials

31 October 2016:
Full implementation

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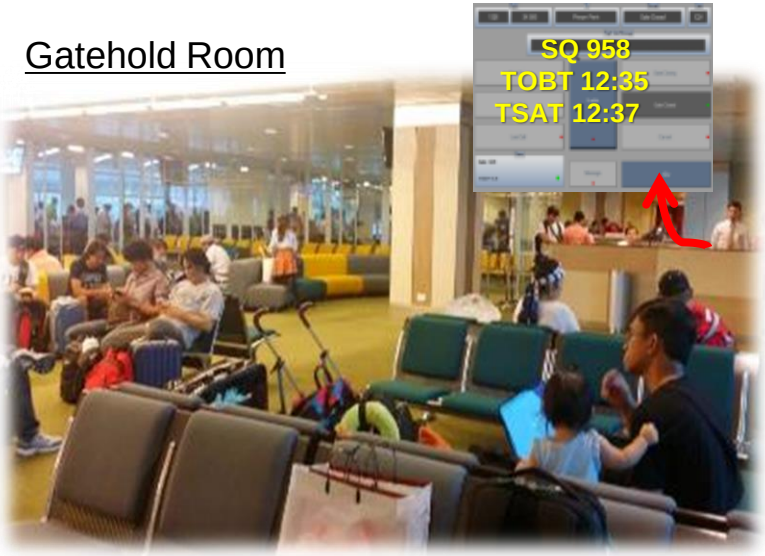
Changi A-CDM greatly helps to achieve common situational awareness and optimise our pre-departure sequencing

Gatehold Room



Changi Tower

Ramp

Operations Control Centre

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Example of A-CDM benefits in Changi Airport

- **Optimising pre-departure sequencing** to maximise runway capacity

- Reduction in taxi-out time by an average of **90 seconds** during the peak hours , despite increases in traffic volume.

- **Improved predictability** of departure flight timings so that any potential holding can be made known to stakeholders

- Airport community better able to **optimise the resource utilisation**.

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There is still some information gap that limits local airport from maximising A-CDM benefits.

- Standalone A-CDM will mean it is purely isolated in a local network without information on regional constraints.
  - only local constraints are considered e.g runway capacity

- Delays due to en-route airspace/destination aerodrome constraints will not be known early without Calculated Take-Off Time (CTOT) being issued by relevant ATFM units

- ATFM measures such as Miles-in-Trail and Minutes-in-Trail which are frequently used in today's context do not provide the level of predictability as CTOT

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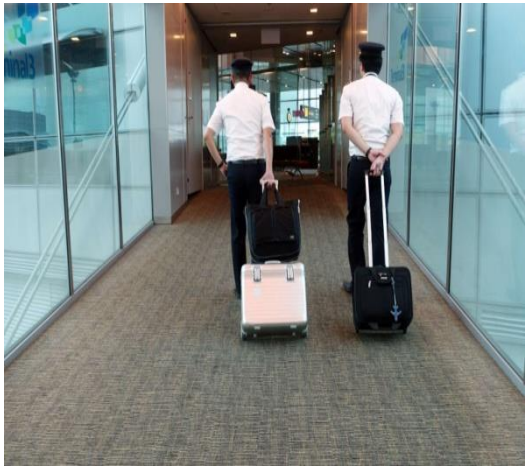
Limitation of standalone A-CDM in Changi

Disembarking of passengers



Flight crew hours exceeded

- Pilots are only informed of delays due to en-route constraints when requesting for ATC clearance
  - En-route weather
  - Flow restriction
- Information is too late for re-allocation of resources and better decision making process during the turnaround phase e.g. allocation of tug tow, delay boarding of passengers..etc

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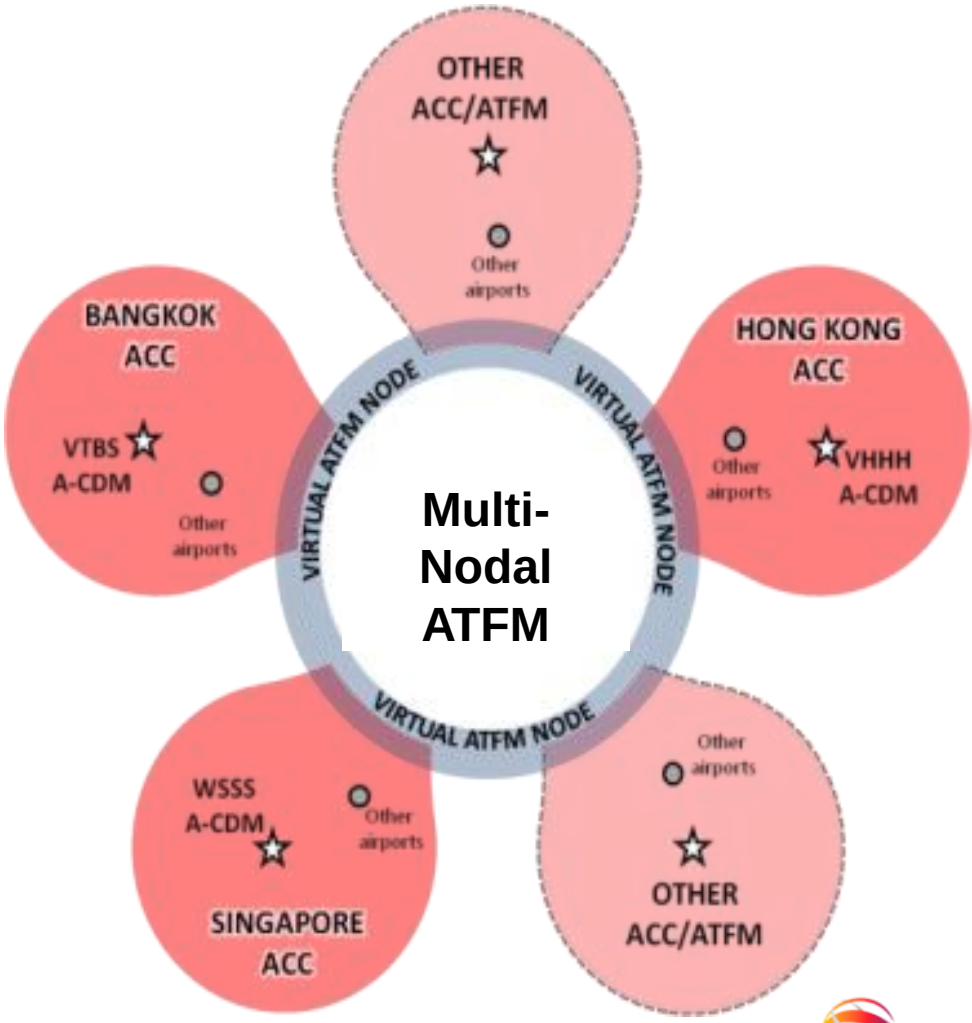
Linking Changi A-CDM to Multi-Nodal ATFM in Asia

- Plans to link ATFM and A-CDM frameworks, through the application of CTOT, to create seamless air traffic flow operations within Changi Airport
- Participating Airports share local A-CDM information such as TOBT/TSAT to each other for advanced traffic planning.
- Accords greater flexibility to airspace users to manage delays through collaboration and negotiation with ANSPs and Airport Operators within existing ATC procedures and constraints



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Although it is still at trial stage, we have seen great benefits from ATFM model

- **[Example 1] Singapore Airspace Closure during National Day Parade and its rehearsal**
  - CTOTs were generated and shared to airlines to delay the inbound flight at up-station instead of air holding.

- **[Example 2] Changi Airport Terminal 2 fire incident**
  - Terminal 2 was closed during the evening peak hours
  - CTOT were generated to the neighboring ANSPs to delay the inbound flight at up-station instead of air holding

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Full integration of A-CDM and ATFM in near future will further materialise greater benefits.

- **to achieve common situational awareness**
  - Helps airlines and airports to make the best decision.
- **to optimise resource utilisation**
  - Optimal departure and arrival sequencing.
  - Fuel saving for airlines due to reduced holding.
- **to enhance passenger experience**
  - Less delay
  - Better understanding on delay

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Thank you

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