

ASIA/PACIFIC FIXM VERSION 4.1 EXTENSION

1.0 Based on the operational scenarios developed for the SWIM in ASEAN Demonstration, additional data attributes required to be exchanged among stakeholders involving in A-CDM (Airport-Collaborative Decision Making) operation and to support the integration between ATFM and A-CDM were identified. Considering that these data attributes are flight-specific, FIXM would be the appropriate information exchange model to support the aforementioned operations. Consequently, the FIXM version 4.1 Extension was further developed to include these data attributes. **Table 1** shows the list of data attributes currently included in the FIXM version 4.1 Extension developed.

Estimated	Calculated	Target	Actual
		TOBT	AOBT
		TSAT	
	CTOT	TTOT	
ETO	CTO		ATO
ELDT	CLDT		
Other			
Trajectory		Aircraft Track	
• ETO • CTO • ATO • Flight level or Altitude • Waypoint		• Ground speed • Bearing • Flight level or Altitude • Position (Designator or Latitude/Longitude or Relative Point) • Time over position	

Table 1: FIXM version 4.1 Extension Data Attributes

1.1 A system-to-system interconnection test between Singapore and Thailand to validate the exchange of developed FIXM version 4.1 Extension was successfully conducted in March/April 2019 using the Flight Information Update use case, involving the distribution of ATFM and A-CDM related data attributes, designed based on the AMQP (Advanced Message Queuing Protocol) messaging protocol.

1.2 The FIXM version 4.1 Extension aforementioned was presented at and endorsed by the Ninth Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/9) in April 2019. Although the options for identifying and including the data attributes in addition to the ones shown in **Table 1** were discussed at length during ATFM/SG/9, it was agreed by the meeting that, to avoid any further delay in approval and publication of the developed FIXM version 4.1 Extension for the operational use in the Asia/Pacific Region, any additional data attributes such as the ones for A-CDM purposes should be included in the second version of extension to be developed at a later date.

1.3 The FIXM version 4.1 Extension developed is detailed in Appendix below. Noting the near-term need for system-to-system ATFM information exchange between enabled ATFM Nodes, it is proposed that this FIXM Extension be adopted as the Asia/Pacific FIXM version 4.1 Extension and be made available for immediate use by Asia/Pacific Administrations. It is further proposed that this FIXM Extension be presented to the FIXM Change Control Board (CCB) for validation and publication on the FIXM official website.

Based on the anticipation that the future ATFM information services will be highly composite, pulling data from across domains to support ATFM functions from planning, monitoring, and managing through post-event analysis, adapting or combining the existing information exchange models to provide comprehensive ATFM information exchange has scope and structural limitations. Particularly, ATFM information is not flight-specific, related to a single flight, as is FIXM and may contain or use

description of volumes with attributes not currently required for AIXM, while there is no overlap between ATFM functions and IWXXM. Besides, considering that adding new data elements to existing information exchange models would be a lengthy process due to the required coordination and attaining acceptance from the existing information exchange model governing community, the scalability and interoperability of ATFM-related information exchange will be certainly affected. With the analysis on both technical and non-technical factors such as schedule, potential risks, and potential benefits, it was concluded that developing the new and standalone information exchange model for ATFM-related information exchange is the best option.

1.4 Similarly, the assessment on the possibility to utilize the existing information exchange models for the exchange of ATFM Daily Plan (ADP) being currently distributed among ATFM units and related stakeholders in the Asia/Pacific region revealed that developing the new information exchange model is likely the best alternative as the information contained in ADP covers more than one information domains. With this common view, the collaboration between Singapore, Thailand, and USA on the development of ATFM-specific information exchange model has been discussed. Initially, it is agreed that, to not reinvent the wheel, the scope of ATFM information to be included in this new information exchange model being discussed must be clearly identified. For example, the data elements considered flight-specific, e.g. CTOT, CLDT, CTO, etc., should remain under FIXM, while the data elements included in ADP which are applied to a number of flights will be included in the new model.

APAC Flow XSD Description

Namespace	Description
ApacFlow	FIXM Extension containing data attributes to support Air Traffic Flow Management operations in accordance with Distributed Multi-Nodal Air Traffic Flow Management Network concept and Airport-Collaborative Decision Making operations in Asia/Pacific region.

Class	Definition	Reference/Remark
ApacDepartureType	Class containing ATFM data related to departure aerodrome	This class is to be included in extension field under DepartureType class.
Data Attribute	Definition	Reference/Remark
actualOffBlockTime	A time the aircraft is pushed back / vacates parking position (equivalent to airline/handlers ATD – Actual Time of Departure and ACARS=OUT)	ICAO Doc 9971 Manual on Collaborative ATFM, 3rd Edition, 2018
calculatedTakeOffTime	A time calculated and issued by an ATFM unit, as a result of tactical slot allocation, at which a flight is expected to become airborne	ICAO Doc 9971 Manual on Collaborative ATFM, 3rd Edition, 2018
targetOffBlockTime	A time that an Aircraft Operator	ICAO Asia/Pacific Framework for

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	or Ground handler estimates that an aircraft will be ready to startup/be pushed back immediately upon reception of clearance from the control tower	Collaborative ATFM, Version 3, August 2017
targetStartupApprovalTime	A time provided by ATC taking into account TOBT, CTOT, and/or the traffic situation that an aircraft can expect start up/push back approval	ICAO Asia/Pacific Framework for Collaborative ATFM, Version 3, August 2017
targetedTakeOffTime	A time that an aircraft is targeted to be airborne, taking into account TOBT, TSAT, and other factors such as EXOT, wake turbulence, SID, etc.	- ICAO Asia/Pacific Framework for Collaborative ATFM, Version 3, August 2017 - EUROCONTROL A-CDM Implementation Manual, Version 5.0, March 2017

Class	Definition	Reference/Remark
ApacArrivalType	Class containing ATFM data related to destination aerodrome	This class is to be included in extension field under ArrivalType class.
Data Attribute	Definition	Reference/Remark
calculatedLandingTime	A landing time calculated and issued by an ATFM unit, as a result of tactical slot allocation, at which a flight is expected to land on a runway	ICAO Doc 9971 Manual on Collaborative ATFM, 3rd Edition, 2018
estimatedLandingTime	An estimated time that an aircraft will touch-down on the runway (equivalent to ETA - Estimated Time of Arrival)	ICAO Doc 9971 Manual on Collaborative ATFM, 3rd Edition, 2018

Class	Definition	Reference/Remark
ApacAircraftTrackType	Class containing aircraft track data	This class is to be included in extension field under FlightType class.
Data Attribute	Definition	Reference/Remark
actualSpeed	Current aircraft ground speed	
flightLevel	Current flight level	flightLevel can be in the following forms, - Flight level; or - Altitude.

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heading	Current aircraft heading	
position	Current aircraft position	position can be in the following forms, • Designator; • Latitude/Longitude; or • Relative point.
positionTime	Time when all data in this class is reported	

Class	Definition	Reference/Remark
ApacTrajectoryType	Class containing all trajectory elements of a flight	This class is to be included in extension field under FlightType class.
Data Attribute	Definition	Reference/Remark
element	A list of trajectory elements	

Class	Definition	Reference/Remark
ApacTrajectoryElementType	Class containing composition of each trajectory element(s) specified in ApacTrajectoryType	
Data Attribute	Definition	Reference/Remark
level	An estimated flight level of the aircraft at this trajectory element	level can be in the following forms, • Flight level; or • Altitude.
routePoint	A specified position of this trajectory element	routePoint can be in the following forms, • Designator; • Latitude/Longitude; or • Relative point.
actualTimeOver	An actual time of the aircraft over routePoint	
calculatedTimeOver	A time calculated and issued by an ATFM unit, as a result of tactical slot allocation, at which a flight is expected to be over routePoint, i.e. a fix, waypoint, or particular location. The implementation of this constraint may be carried out through tactical ATC intervention, such as speed	ICAO Doc 9971 Manual on Collaborative ATFM, 3rd Edition, 2018

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	control or route extension, or by having the aircraft meet the constrained time through the use of its Flight Management System RTA - Required Time of Arrival function	
estimatedTimeOver	An estimated time at which the aircraft would be over routePoint, i.e. fix, waypoint, or particular location, typically where air traffic congestion is expected	ICAO Doc 9971 Manual on Collaborative ATFM, 3rd Edition, 2018
seqNum	The sequence number of this trajectory element as specified in FlightRouteTrajectoryType class of FIXM version 4.1 Core	

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  elementFormDefault="qualified"
  targetNamespace="http://www.aerothai.aero/apac/1.0"
  version="1.00"
  xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:apac="http://www.aerothai.aero/apac/1.0"
  xmlns:fb="http://www.fixm.aero/base/4.1"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:annotation>
    <xs:documentation>
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      =====
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      and the disclaimer in the documentation and/or other
materials provided with the
      distribution.
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      promote products derived from this specification without
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The authoritative reference for FIXM is www.FIXM.aero.

Details on Aeronautical Radio of Thailand Limited:
<http://www.aerothai.co.th/>

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</xs:documentation>
</xs:annotation>
<xs:import namespace="http://www.fixm.aero/base/4.1"
schemaLocation="../../../core/base/Base.xsd"/>
<xs:import namespace="http://www.fixm.aero/flight/4.1"
schemaLocation="../../../core/flight/Flight.xsd"/>
<xs:import namespace="http://www.fixm.aero/messaging/4.1"
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    The ApacFlow contains information related to Air Traffic Flow
    Management and Airport-Collaborative Decision Making operations.
</xs:documentation>
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</xs:annotation>

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      under FlightType class.
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  </xs:annotation>
  <xs:complexContent>
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        <xs:sequence>
          <xs:element name="actualSpeed"
type="fb:GroundSpeedType" minOccurs="0" maxOccurs="1" >
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              <xs:documentation>
                Current aircraft ground speed.
              </xs:documentation>
            </xs:annotation>
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          <xs:element name="flightLevel"
type="fb:FlightLevelOrAltitudeType" minOccurs="0" maxOccurs="1" >
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              <xs:documentation>
                Current flight level
              </xs:documentation>
            </xs:annotation>
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          <xs:element name="heading" type="fb:BearingType"
minOccurs="0" maxOccurs="1" >
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              <xs:documentation>
                Current aircraft heading
              </xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="position"
type="fb:SignificantPointType" minOccurs="0" maxOccurs="1" >
            <xs:annotation>
              <xs:documentation>
                Current aircraft position
              </xs:documentation>
            </xs:annotation>
          </xs:element>
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use="optional" >
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            <xs:documentation>
              Time when all data in this class is reported
            </xs:documentation>
          </xs:annotation>
        </xs:attribute>
      </xs:extension>
    </xs:complexType>
    <xs:element name="ApacAircraftTrack"
type="apac:ApacAircraftTrackType" substitutionGroup="fb:Extension" />

    <xs:complexType name="ApacArrivalType">
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aerodrome. This class is to be
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            <xs:annotation>
                <xs:documentation>
                    A landing time calculated and issued by an ATFM
unit, as a result of tactical slot
                    allocation at which a flight is expected to land
on a runway. [ICAO DOC 9971 Manual
                    on Collaborative ATFM, 3rd Edition, 2018]
                </xs:documentation>
            </xs:annotation>
        </xs:attribute>
        <xs:attribute name="estimatedLandingTime"
type="fb:TimeType" use="optional" >
            <xs:annotation>
                <xs:documentation>
                    The estimated time that an aircraft will touch-
down on the runway (equivalent to
                    ETA) [ICAO Doc 9971 Manual Collaborative ATFM,
3rd Edition, 2018]
                </xs:documentation>
            </xs:annotation>
        </xs:attribute>
    </xs:extension>
</xs:complexContent>
</xs:complexType>
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substitutionGroup="fb:Extension" />

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        <xs:documentation>
            Class containing ATFM data related to departure aerodrome.
This class is to be included
            in extension field under DepartureType class.
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    </xs:annotation>
    <xs:complexContent>
        <xs:extension base="fb:ExtensionType">
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use="optional" >
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```

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        <xs:documentation>
            The time the aircraft pushes back / vacates
parking position (equivalent to airline/handler
            ATD - Actual Time of Departure and ACARS=OUT).
[ICAO Doc 9971 Manual on Collaborative
            ATFM, 3rd Edition, 2018]
        </xs:documentation>
    </xs:annotation>
</xs:attribute>
    <xs:attribute name="calculatedTakeOffTime"
type="fb:TimeType" use="optional" >
        <xs:annotation>
            <xs:documentation>
                A time calculated and issued by an ATFM unit, as
a result of tactical slot allocation,
                at which a flight is expected to become airborne.
[ICAO Doc 9971 Manual Collaborative
                ATFM, 3rd Edition, 2018]
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        </xs:annotation>
    </xs:attribute>
    <xs:attribute name="targetOffBlockTime" type="fb:TimeType"
use="optional" >
        <xs:annotation>
            <xs:documentation>
                A time that an Aircraft Operator or Ground
handler estimates that an aircraft will
                be ready to startup/be push back immediately upon
reception of clearance from the
                control tower. [ICAO Asia/Pacific Framework for
Collaborative ATFM, Version 3, August
                2017]
            </xs:documentation>
        </xs:annotation>
    </xs:attribute>
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type="fb:TimeType" use="optional" >
        <xs:annotation>
            <xs:documentation>
                A time provided by ATC taking into account TOBT,
CTOT (Calculated Take-Off Time)
                and/or the traffic situation that an aircraft can
expect start up/push back approval.
                [ICAO Asia/Pacific Framework for Collaborative
ATFM, Version 3, August 2017]
            </xs:documentation>
        </xs:annotation>
    </xs:attribute>
    <xs:attribute name="targetedTakeOffTime"
type="fb:TimeType" use="optional" >

```

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        <xs:annotation>
          <xs:documentation>
            A time that an aircraft is targeted to be
airborne, taking into account TOBT, TSAT,
            and other factors such as EXOT, wake turbulence,
SID, etc. [ICAO Asia/Pacific Framework
            for Collaborative ATFM, Version 3, August 2017]
[EUROCONTROL A-CDM Implementation
            Manual, Version 5.0, March 2017]
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  <xs:element name="ApacDeparture" type="apac:ApacDepartureType"
substitutionGroup="fb:Extension" />

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      <xs:documentation>
        Class containing composition of each trajectory element(s)
specified in ApacTrajectoryType
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    </xs:annotation>
    <xs:complexContent>
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          <xs:element name="element"
type="apac:ApacTrajectoryElementType" minOccurs="0" maxOccurs="2000" >
            <xs:annotation>
              <xs:documentation>
                A list of trajectory element.
              </xs:documentation>
            </xs:annotation>
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        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:element name="ApacTrajectory" type="apac:ApacTrajectoryType"
substitutionGroup="fb:Extension" />

  <xs:complexType name="ApacTrajectoryElementType">
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specified in ApacTrajectoryType.

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        </xs:documentation>
    </xs:annotation>
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        <xs:element name="level"
type="fb:FlightLevelOrAltitudeChoiceType" minOccurs="0" maxOccurs="1"
>
            <xs:annotation>
                <xs:documentation>
                    An estimated flight level of the aircraft at the
trajectory element.
                </xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="routePoint" type="fb:SignificantPointType"
minOccurs="1" maxOccurs="1" >
            <xs:annotation>
                <xs:documentation>
                    A specified position of this trajectory element
[routePoint can be in the following
                    forms, fix; waypoint; or particular location]
                </xs:documentation>
            </xs:annotation>
        </xs:element>
    </xs:sequence>
    <xs:attribute name="actualTimeOver" type="fb:TimeType"
use="optional" >
        <xs:annotation>
            <xs:documentation>
                The actual time of aircraft over routePoint
            </xs:documentation>
        </xs:annotation>
    </xs:attribute>
    <xs:attribute name="calculatedTimeOver" type="fb:TimeType"
use="optional" >
        <xs:annotation>
            <xs:documentation>
                A time calculated and issued by an ATFM unit, as a
result of tactical slot allocation,
                at which a flight is expected to be over routePoint,
i.e. a fix, waypoint, or particular
                location. The implementation of this constraint may be
carried out through tactical
                ATC intervention, such as speed control or route
extension, or by having the aircraft
                meet the constrained time through the use of its Flight
Management System RTA - Required
                Time of Arrival function. [ICAO Doc 9971 Manual on
Collaborative ATFM, 3rd Edition,
                2018]
            </xs:documentation>
        </xs:annotation>
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        </xs:annotation>
    </xs:attribute>
    <xs:attribute name="estimatedTimeOver" type="fb:TimeType"
use="optional" >
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                A estimated time at which an aircraft would be over
routePoint, i.e. fix, waypoint
                or particular location, typically where air traffic
congestion is expected. [ICAO
                Doc 9971 Manual on Collaborative ATFM, 3rd Edition,
2018]
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specified in FlightRouteTrajectoryType
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