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| Chief Architect | Cognizant | Marouan Aouri |  |  |
| Solution Architect | Cognizant | Karim Fathi |  |  |

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|  |  |  |  |  |

The latest approved version of this document supersedes all other versions, upon receipt of the latest approved version all other versions should be destroyed, unless specifically stated that previous version (s) are to remain extant. If any doubt, please contact the document Author.

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# Document Control

## Distribution List

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Organisation** | **Role** | **Email** |
| Karim Fathi | Cognizant | Solution Architect |  |
| Marouan Aouri | Cognizant | Chief Architect |  |
| Awel Dico | Etihad | Lead Enterprise Architect |  |

Table 1: Distribution List

## References

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| --- | --- | --- | --- | --- |
| **Ref** | **Document** | **Author** | **Status** | **Version** |
| 1 | [OPS\_ESB\_HLD](https://midfield.eyintranet.etihad.ae/EAOESB%20Project/Solution%20Architecture/OpsESB-R1.1-HLD-v2.2.5.docx) | Karim Fathi | Approved | 2.2.4 |
| 2 | ICD | Karim Fathi | Draft |  |
| 3 | ICP | Karim Fathi | Draft |  |
| 4 | [OPSESB-Common Services](https://midfield.eyintranet.etihad.ae/EAOESB%20Project/Forms/AllItems.aspx?RootFolder=/EAOESB%20Project/Solution%20Architecture/LLDs/Ops%20ESB&FolderCTID=0x012000F71F224B9CACED47827805AE0A957794&View=%7b4BAD9B91-D281-4B38-8265-57605D2FE608%7d) | Cognizant | Approved | 1.1 |
| 5 | [OPS\_ESB\_Special\_Scenario LLD - v0.1](https://ch1hub.cognizant.com/sites/SC6503/EAO_ESB/Shared%20Documents/OPS%20ESB%20DEV/Interfaces/Special%20Scenarios/LLD) | Arnab Raychoudhury | Approved | 1.0 |

Table 2: Reference

## Terminology

|  |  |
| --- | --- |
| **Term** | **Definition** |
| OPS-ESB | Operations Enterprise Service Bus |
| ESB | Enterprise Service Bus |
| AODB | Airport Operational Database |
| LLD | Low Level Design |
| HLD | High Level Design |
| ODS | Operational Data Store |
| IBM ACE | IBM App Connect Enterprise |
| PAX | Passenger |
| MQ | IBM WebSphere Message Queue |
| SABRE IX | Sabre Intelligence Exchange |
| OAL | Other Airline (Airlines other than Etihad) |
| XML | extensible Mark-up Language |
| DSN | Data Source Name |
| AID | Application Information Document |
| APM | IBM Application Performance Monitor |

Table 3: Terminology

# Purpose & Background

A low level design is detailed in-depth design that will go into configuration and implementation level details for the solution. A completed and signed of High Level Design (HLD) must be available before starting a low level design to ensure that the solution meets the requirements. The Low Level Design (LLD) is not a deployment implementation guide.

## Executive Summary

This LLD document details the design of Booked Passenger Load Shared Service flow.

## Objectives

The objective of this document is to describe the low level design for the Booked Passenger Load Shared Service.

## Design Assumptions

|  |  |
| --- | --- |
| **Ref** | **Design Assumption** |
| DAS001 | MS SQL by default is capable of caching the frequently read data hence the subsequent reads are faster |
| DAS002 | For any non-mandatory field, if the value doesn’t exist in the ODS the corresponding element tag will not exist in the output xml. |
| DAS003 | Since the messages are generated by OPS-ESB as per the XML schema, OPS-ESB won’t do runtime schema validation for each message. |
| DAS004 | If the flight has no Booked Load detail from ODS then it will not be send to the consumers. |
| DAS005 | The padding of zero to make a flight number 3 digit is already implemented in the provider adapters, hence not required in Shared services |
| DAS006 | SABRE-AC flow is expecting to share the loads where the flight should be in range of T-0Hrs to T+24Hrs so, separate cron job is configured. |
| DAS007 | NEO PAX Consumer is expecting to share loads of EY flights and NEO AIDX Consumer is expecting to share OAL flights so, separate input property file is created for NEO Consumers. To filter EY and OAL flights a new child element (AirlineIATA) is added in the input property file. |

Table 4: Design Assumptions

## Design Decision

|  |  |
| --- | --- |
| **Ref** | **Design Decision** |
| DDS001 | SABRE-AC Consumer is expecting to share the loads where the flight should be in range of T-0Hrs to T+24Hrs (where T is current Timestamp) so, separate cron job is configured. |
| DDS002 | NEO PAX Consumer is expecting to share loads of EY flights and NEO AIDX Consumer is expecting to share loads of OAL flights so, separate input property file is created for NEO Consumers. To filter EY and OAL flights a new child element (AirlineIATA) is added in the input property file. |

Table 5: Design Decision

## Design Dependency

|  |  |
| --- | --- |
| **Ref** | **Design Dependency** |
| DDP001 | The ESB solution is dependent on DB configurations. The changes in these configurations could lead to code change. |
| DDP002 | In case of any changes in outgoing message structure/schema, it will lead to the shared service code changes. |

Table 6: Design Dependency

## Design Risks

As of now there are no identified risks now.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ref** | **Design Risk** | **Impact**  **(L/M./H)** | **Likelihood**  **(L/M/H)** | **Mitigation** |
|  |  |  |  |  |

Table 6: Design Risks

## Design Issues

As of now there are no identified issues.

|  |  |  |  |
| --- | --- | --- | --- |
| **Ref** | **Design Issue** | **Impact**  **(L/M/H)** | **Mitigation** |
|  |  |  |  |

Table 7: Design Issues

## In-Scope

This section will highlight the OPS-ESB development scope,

* This document is limited to integration between OPS-ESB and Booked Passenger Load Shared service.
* Develop interfaces to integrate within OPS-ESB for Booked Passenger Load.

## Out-of-Scope

* Any infrastructure setup activities (E.g. Load balancer, Gateway and platform level configurations).
* Any changes within upstream or downstream application systems (Systems beyond the consumers and providers).
* Any infrastructure setup activities.

# Proposed Detailed Design

This section describes the interaction between Booked Passenger Load as a consumer and ODS

## Overview

OPS ESB stores Flight Information, Booked Passenger Load from Etihad flights information provider systems in the ODS. This data will further be enriched and sent to external consumers.



Figure 1 Overview Diagram

## Block Diagram



Figure 2 End to End Data Flow Block Diagram

The cron job is configured to trigger the scripts on regular interval to pick the property file which holds the query parameters and places it into Booked Passenger Load Shared Service Queue. This message triggers the Booked Passenger Load Shared Service, the shared service will fetch the booked loads from the ODS as per the operational window(s) defined in the property file and composes a message per flight as per the schema and puts into the consumer queue.

## Integration Design

### Shared Service: Booked Passenger Load



Figure 3 Booked Passenger Load Flow Chart

Pre requisite:

Scheduler place the message in the Booked Pax Load shared service input queue with retrieval time window.

1. IBM ACE flow fetch the message from OPS-ESB MQ and audit the input received mark as AUDIT\_A.

2. IBM ACE flow will fetch the flight records from ODS based on Best known time/Scheduled time as per configurable property. For more details about best known time, please refer ICD section 5.1.1.3.

3. IBM ACE will check if any flight records found,

* If yes, proceed to step 4
* If no, proceed to step 8 and the custom message will be logged as AUDIT\_B.

4. IBM ACE flow will filter the AIMS and AODB flights from the result set of step 2 and ignores the linked flights to avoid sending the duplicate messages.

5. IBM ACE flow will fetch the booked load data for the flights.

6. IBM ACE will check if any booked load records found,

* If yes, proceed to step 7
* If no, proceed to step 8 and the custom message will be logged as AUDIT\_B.

7. Map each flight information to a single message in XML format as per the mapping sheet and send it to the consumer queue .Repeat step 5 to 8 for each flight found.

8. IBM ACE will log the details as AUDIT\_B in Audit DB.

**AUDIT\_A: T**he incoming message will be logged into the Audit db as “**Received a Request From Cron Job**”

**AUDIT\_B: T**he outgoing message will be logged into the Audit db as “**Messages Posted To Respective Consumer Queue**” and the Custom messages(if required) will be logged. For Example the custom message will be logged as **“The ODS\_FLIGHT\_ID is not falling under operational window time”**, when ODS\_FLIGHT\_ID is not in best known operational time**.**

#### **Cron Job Configuration and Shell Script Details –**

* The Cron Job is scheduled to execute the shell script (SendXml2Queue.sh) at specified intervals.
* The Property file (along with the file path), Queue name and Queue manager name are passed as command line argument to the shell script which is specified after the shell script name separated with space in the Cron Job.
* The Cron Job and Property file is configured for this consumer. New Cron Job and Property file will be configured in the future for new consumers.
* References/Links for Cron Job: <https://crontab-generator.org/>
* The Shell script access the command line parameter by their position number where $1 parameter is Property file, $2 parameter is Queue Name, $3 parameter is Queue Manager Name and places the Property file in the Queue which will trigger the message flow. Refer the shell script below,



#### **Booked load Property File Details –**

* Input Property file for Booked Passenger Load interface will provide details for time window for which ESB has to pick Booked passenger Load and Flight information from ODS. Please refer below sample property file,







##### Booked load Property File Fields:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Field Name** | **Definition** | **XPath** | **Data Type** | **Sample** |
| StartTimeOffset | This will specify start date offset interval | SharedService\_BookedPassengerLoad/Window/StartTimeOffset | String | 24 |
| EndTimeOffset | This will specify end date offset interval | SharedService\_BookedPassengerLoad/Window/ EndTimeOffset | String | 72 |
| ScheduleOperationTimeIdentifier | This will specify the operation time identifier either Best Known Time or Scheduled. | SharedService\_BookedPassengerLoad/Window/ScheduleOperationTimeIdentifier | String | Scheduled |
| BlockTime | This will specify the block time IN block or OFF block. This will be an optional field. If no field is specified then shared service will pick best available time[first priority will be OFF block time then IN block time] | SharedService\_BookedPassengerLoad/Window/BlockTime | String | IB |
| AirlineIATA | This will specify the Airline code. If the action is Include, need to pick the flights having the specified Airline code. If the action is Exclude, pick the flights which does not have the specified Airline Code. | SharedService\_BookedPassengerLoad/Window/BlockTime@Action="Include" | String | EY, 9W |
| QueueName | This will specify the name of Consumer Queues. | SharedService\_BookedPassengerLoad/Window/DestinationList/ QueueName | String | EY\_A\_OPSESB\_SHRDSERVC\_BOOKEDPAXLOAD\_01 |

## Message Flow Implementation

**EY\_OPSESB\_ODS\_BOOKED PASSENGER LOAD:**

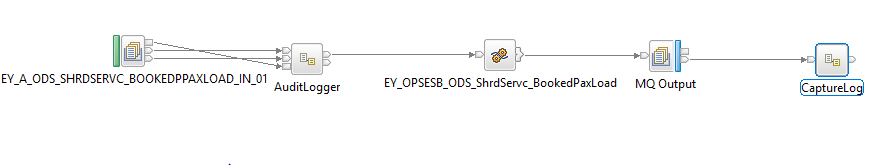


Figure 4 Booked Passenger Load Message Flow

* **EY\_A\_ODS\_SHRDSERVC\_BOOKEDPAXLOAD\_IN\_01**:  This MQ Input node will pick the incoming message from Shared Service Booked PAX Load dedicated Queue.
* **AuditLogger:** This Sub flow is used to handle the Audit logging and Exception handling scenarios. This logging will be pre-transaction processing. This sub flow will log the message Id, timestamp and payload on arrival on each message. For more details, please refer [common services LLD](#_References)
* **EY\_OPSESB\_ODS\_ShrdServc\_BookedPaxLoad:** This Compute node retrieves the booked passenger load information from ODS and constructs the XML message based on the mapping sheet mentioned in [section 3.5](#_Mapping_specification).
* **CaptureLog:** This Sub flow will capture log for each transaction and it will enter into Audit DB. This logging will be post transaction processing. For more details please refer to the [common services LLD](#_References)
* **MQ Output:** This MQ Output node will receive message from Compute Node and sends to destination list queue [defined in the “Booked Load Property File Fields”].

### Configurable Properties

|  |  |
| --- | --- |
| **Properties** | **Values** |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#dataSource | Data Source Name |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#DB\_Schema | Database Name |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#DB\_Name | DB Schema name |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#MQOutput.connection | For Client connection value should be 'CLIENT' |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#MQOutput.destinationQueueManagerName | Destination Queue manager Name |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#MQOutput.queueManagerHostname | Destination Queue manager Host Name |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#MQOutput.listenerPortNumber | Destination Queue manager Port number |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#MQOutput.channelName | Destination Queue manager Channel Name |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#AuditLogger.InterfaceID | Unique id of each process interface |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#AuditLogger.IsAuditLogRequired | Flag to determine whether audit log details required |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#AuditLogger.StatusText  ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#CaptureLog.StatusText | Process step description |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#AuditLogger.ProcessStep  ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#CaptureLog.ProcessStep | Value of process step |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#AuditLogger.IsMsgDetailsRequired  ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#CaptureLog.IsMsgDetailsRequired | Flag to determine whether message details need to be logged |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#AuditLogger.IsPayloadRequired  ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#CaptureLog.IsPayloadRequired | Flag to determine whether payload needs to logged |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#CaptureLog.IsParentChildRelationRequired | Flag to determine whether details need to be carried to the subsequent application |
| ey.opsesb.sharedservice.EY\_OPSESB\_SS\_BOOKEDPAXLOAD#Validate.validateMaster | This is for output xml message validation |

## Mapping Specification

Mapping Sheet: Mapping sheet gives details of all fields mapping from ODS to Booked Passenger Load shared service. This sheet will be referred as base document to validate the data in ODS and how IBM ACE will map to XML message.

Mapping sheet:



## Error Handling

In the event of errors from OPS-ESB side, whether validation error or system level errors/exceptions, an exception is raised and logged in OPS-ESB Audit database. The specific error is also logged in the logs and transferred to Etihad application monitoring (APM) in place. APM operator will take action as per the agreed SOP of Business As Usual (BAU) activity.

Below list of error codes managed by OPS-ESB.

|  |  |  |  |
| --- | --- | --- | --- |
| **Error codes** | **Category description** | **Subsequent Action** | **Example** |
| 3000-3999 | Data issue while formatting the incoming value | Error details will be updated to **Audit tables** including tracking id and payload | Error during converting date to UTC |
| SQL error Codes | ODS generated errors | Error details will be updated to **Audit tables** including tracking id and payload. | Any missing mandatory fields expected by ODS during insert or update |

Table 8: Error Codes

# Operability

This section describes about system operability. These changes / update will be done at organization level as mentioned below. For more details, refer to AID (Application Information Document)

* Cron Job should be present in only one of the ACE MQ server.

Refer [HLD](https://midfield.eyintranet.etihad.ae/EAOESB%20Project/Solution%20Architecture/OpsESB-R1.0-HLD-v2.1.1.docx) for more details.

# Capacity & Sizing Methodology

Multiple instance of the flow are configured to facilitate the throttling and work load management.

## Capacity and Sizing

Please refer to [HLD](https://midfield.eyintranet.etihad.ae/EAOESB%20Project/Solution%20Architecture/OpsESB-R1.0-HLD-v2.1.1.docx) for more details on Capacity and Sizing.

# Non-Functional Design considerations

For more details on Non-Functional design considerations refer to [HLD](#_References)

# Testing Considerations

All design solutions that will be deployed or will utilise Etihad downstream systems must follow the Etihad route-to-live process of Testing/Development, Pre-Production and Production.

Based on cron job schedule shell script will be executed and property file will be sent to Booked Passenger Load input queue.

For more information on how to change the cron scheduler timing, refer the section 3.3.1.1 in this document.

For more details on project level testing strategy refer “[Testing Strategy](https://midfield.eyintranet.etihad.ae/EAOESB%20Project/Forms/AllItems.aspx?RootFolder=%2FEAOESB%20Project%2FTesting&View=%7b4BAD9B91-D281-4B38-8265-57605D2FE608%7d&InitialTabId=Ribbon%2EDocument&VisibilityContext=WSSTabPersistence)”.

## Development and Test

As part of integration development team will do unit testing. Unit test cases will be captured and uploaded in to shared folder.

[Link to UTC](https://ch1hub.cognizant.com/sites/SC6503/EAO_ESB/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2Fsites%2FSC6503%2FEAO%5FESB%2FShared%20Documents%2FUnit%20Test%20Case%20Log%2FESB%20Unite%20Test%20Docs)

# Special Scenario

For any special scenario related information, refer to the [Special Scenario LLD](https://ch1hub.cognizant.com/sites/SC6503/EAO_ESB/Shared%20Documents/OPS%20ESB%20DEV/Interfaces/Special%20Scenarios/LLD)

