iStream Tool Requirements
Strategic & Tactical Phases
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1 Introduction and purpose

For the implementation of the iStream a web base tool shall facilitate process. The tool shall have a high level of automation.

The tool shall be able to collect information from different sources (e.g. e-mail), combine the collected information, and calculate a sequence based upon defined parameters and factors. This is followed by an automatic validation, which after successful validation sends out emails to the participating airlines with the sequence information.

The overall process is split in two phases. The strategic element shall purely provide a heads up regarding the planning framework which is to be considered, while the tactical element is based on a collaborative approach, receiving information and the providing the conclusion out of it for execution by the pilots/ airlines.

- A contact database is required which lists the ICAO and IATA aircraft operator agencies identifier and the email address(es) to be used, including other possible contacts like phone numbers.
- List the acceptable waypoints used in the process (IAFs or entries into the STARs or whatever point is chosen).

2 Strategic phase

The iStream process calculates the strategic sequence

2.1 Goal:

- **Enhance the awareness** of the airlines to plan their flights according to their STA.
- This Strategic phase targets the **Flight Planning phase**.
- The Strategic sequence shall be sent each day at **10:00 LT** latest.
- The strategic sequence is focused on landing times
- The times provided shall be in UTC, where of the mentioned time is wintertime and the one in brackets is summer time.
- The Airlines will have to be aware that they can expect a **TTO within a [-5';+5'] window of their Expected Landing Time**, and so are requested to plan their flights "adjustable" (Cl-ly) within this range.

2.2 Input:

- CSV file from the concerned Airport received via E-mail.

---

1 The point in time has been set to catch the flight-planning phase of the long haul flight within the process.
• Column A
  o STA of the flights (which is an on block time).
  o UTC Time in a simple number format

• Column B
  o The call sign of the flight in IATA format

2.3 Algorithm:
1. Flights with an STA after 06:00 (05:00)^2 shall be disregarded
2. Distribute the Landing Times 05:04-06:00 (04:04-05:00) to all flights in the list (no change in the order)
   a. Earliest landing time is 05:04 (04:04)
   b. The gap between two flights is 2 minutes.
3. Take the average of the landing times for all flights having the same STA and allocate this average to these flights = this is the "Expected Landing Time".
   a. If a calculated “Expected Landing Time” is earlier than the STA -5min, the “Expected Landing Time” is equal to STA -5min.
   b. Create a window of -5/+5m to the expected landing time.
3. Take the average of the landing times for all flights having the same STA and allocate this average to these flights = this is the "Expected Landing Time”.
4. Distribute the Strategic Landing Times:
   a. Assign the Landing Times (calculated in point 2)
   b. If the Landing Times is out of the -5/+5 window of the Expected Landing Time, assign the Start-time of the window + 2 minutes
   c. Increment by 2 minutes for the following flight / Ensure the 2 minutes gap between all flights

2.4 Output:
• Create a visualization which
  o Includes all the planned flights
  o Their Strategic landing time (SLDT)
  o Their Strategic Planning Time Frame
• Present the information to the user (optional as process is automated).
• Distribute the whole information to the airspace users according the address book and the flights identification.
  o If no contact is found for one or more flights, the information shall still be sent to the available contacts.

Example of the intended visualization:

^2 this timeframe is specific for the Zurich arrival context application; it must be defined for the corresponding environment

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3 Tactical Phase

3.1 Goal:
- Collect information about the expected flights
- Update them with the information received from the airspace users.
- Compute the planned Initial Approach sequence
- Send out the tactical arrival sequence daily latest 00:30 (23:30 the day before) to the airspace users, automatically based on two validation criteria: majority of long-haul flights have provided their ETOs and no more than 1 flight has a TTO deviating more than 5min from the ETO. If these validation criteria are not fulfilled, the sequence is canceled.

3.2 Input:
- Gather the expected flights for the concerned airport TFV from NM between 04:30-06:00 (03:30-05:00).
- Gather the expected times over the chosen point (IAF/STAR/other) of the flights within the above list.
  - Collect the flight data for each flight in the above list.
  - Consider the time over the first chosen point (IAF/STAR) mentioned within the flights profile.
3.3 Algorithm:

1. Calculate the Estimated Landing Times (ETO + flying time from IAF/STAR/other point to touchdown = ELDT).
   a. Waypoint A xx min
   b. Waypoint B yy min
   c. Waypoint C zz min
   d. Waypoint D tt min
   e. ...
2. Correct any landing time earlier than 05:04 (04:04) to the aforementioned value.
3. If two landing times are equal or the gap of two minutes is not assured, adjust the sequence.
   a. The flight being closer to its STA
   b. In case flights have the same STA, the flight where the minimum deviation to both provided ETOs is reached
4. Calculate the TTO resulting out of the sequence calculation
5. Present the calculated sequence to the user (optional as process is automated)
   a. Highlight flights which
      i. An ETO has been received via Mail and the TTO is deviating more than 5min from the ETO, expect if the ETO resulted in an ELDT before 05:04 (04:04)

3.4 Output:

- Create a visualization which includes
  o Rank number (Earliest to latest ELDT)
  o Flight callsign
  o IAF/STAR point/other chosen point
  o TTO
- Present the information to the user (optional as process is automated).
  o Option “Send”
  o Option “reset”
     - Users shall be capable of resetting the manual modifications brought, if any (users have the possibility to adjust the order and the corresponding calculations in the background and add or delete flights).
  o Option "cancel"
- Distribute the information to the airspace users according the address book and the flights identification.
  o If no contact is found for one or multiple flights, the information shall still be sent to the available contacts.
4 HMI

This paragraph describes the requirements regarding the look and feel of the tool.

- No possibility to publish twice (greyed out)
- Displayed in ICAO only (as far as possible).
- Mouse over decodes the information.

5 Post-OPS phase

Complete the Excel file (or other format in use for the future) with the Actual Time Over the IAFs or entries into the STARs or whatever point is chosen and the Actual Landing Times from radar/Flight Data Processing System data.

6 Glossary

<table>
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<th>Term</th>
<th>Definition</th>
</tr>
</thead>
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| ETO    | Estimated Time Over  
The time over the IAF as provided by the airline or gathered from the NM systems. |
| ELDT   | Estimated Landing Time  
The time calculated during the creation of the sequence. From the ELDT the TTO can be generated based upon a backward calculation. |
| IAF    | Initial Approach Fix  
The fix from which the approach of the flight starts and the flight is normally in the hands of Zurich Approach, for vectoring. |
| IATA   | International Air Transport Association  
The trade association of the airlines. IATA supports airline activity and helps formulate industry policy and standards. It is mentioned in the requirements as there exist IATA and ICAO abbreviations for airports and airline agencies, and it needs to be clear which one is available. |
| ICAO   | International Civil Aviation Organisation  
It codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth.  
It is mentioned in the requirements as there exist IATA and ICAO abbreviations for airports and airline agencies, and it needs to be clear which one is available. |
STA
Schedule Time of Arrival
The time at which the flight is scheduled to arrive at the gate of his destination airport. Meaning it is reflecting the time he docs onto the gate and not the landing time on the runway.

STAR
Standard Arrival Route
is a standard ATS route identified in an approach procedure by which aircraft should proceed from the en-route phase to an initial approach fix

NM
Network Manager
A unit within Eurocontrol in charge of managing the European network in regard to traffic flow and a key partner in operations for any corresponding measures taken.

TFV
Traffic Volume
Within NM the traffic expected during a defined period and reference location is captured within a traffic volume. This is used for the traffic prediction and represents the basis of the Initial Approach Sequence.

TTO
Target Time Over
The output of the iStream process. The time over the IAF/STAR point of the flight which he shall target to achieve.
iStream - PJ25 WP8 EXE#3
Detailed Specifications

1 Introduction

1.1 Purpose
This document collects the specifications for the four functional packages that were implemented in the iStream application, in the frame of the PJ25 project.

The goal is to provide both the business representatives and the developers with a way to agree on what was expected in the application.

1.2 Scope
This document is limited to the application extensions that are covered by PJ25 Work Package 8 Exercise #3.

2 Functional Packages

2.1 Statistics

2.1.1 General specifications
All statistics results are displayed on one Web page. The web-page shall be accessible via the iStream website, via a new tab named "Post-OPS statistics" (next to the current existing ones: "Phases / Documentations / Administration).

2.1.2 Date Range Selection
On top of the page a date range can be selected by the user, and the statistics can be refreshed to include data in this date range.
The reference for the term 'Date' is the iStream sequence date.
When the page is first accessed in a session, the statistics are immediately displayed, with the default 1-day date range: last sequence date.

2.1.3 Efficiency Indicator

2.1.3.1 Functionality
At the top right of the page, a Green or Red indicator is displayed, based on
Nb of differences between the calculated sequence and the arrival sequence (position order)

Nb of Gaps > 5 mins

This indicator must be Green if:

**Max 2 différences** (max 4 aircraft moved from their original position number)

**AND**

**Max 2 gaps > 5 min** (gap = time difference between 2 Actual Landing Time)

Otherwise the indicator must be Red.

2.1.3.2 Special Rules

When the user opens the statistics page, the indicator will reflect the situation of the latest flown sequence.

The user will normally not access the statistics before 08:30LT. At that time, all ATL should be available from the NM, except in the rare case of cancelled or late flight.

The indicator should base itself on data retrieved at 08h15LT

If at least one ALT is missing at 08:15 then the indicator is not calculable and this should be indicated to the user, with the missing callsigns indication.

No history of this indicator will be stored in the system.

2.1.4 Frequency on ETO reception / per airline (received before deadline)

2.1.4.1 Data to display

<table>
<thead>
<tr>
<th>Period</th>
<th>Airline</th>
<th>Total flights</th>
<th>Updated flights</th>
<th>Percentage of updated flights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date range</td>
<td>Airline callsign/name</td>
<td>Nb of flights in the date range for this airline</td>
<td>Nb of flights having ETO (valid and processed mail) update in the period</td>
<td>Updated flights/Total flights</td>
</tr>
</tbody>
</table>

2.1.4.2 Special rules

- **Sorting:** Alphabetical airline call-sign.
- 'Out of window' flights are included in 'Total flights'
2.1.5 Frequency iStream cancelled due to missing ETO (more than 2 missing airlines), and who is missing in these cases (top 3 airlines)

2.1.5.1 Data to display

<table>
<thead>
<tr>
<th>Period</th>
<th>Cancelled due to missing ETOs</th>
<th>Total sequences</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Range</td>
<td>Number of sequences cancelled where more than 2 airlines did not send ETOs by mail</td>
<td>Number of sequences in data range</td>
<td>Cancelled sequences/Total sequences</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Period</th>
<th>Top 3 missing airlines</th>
<th>Participation in cancelled sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Range</td>
<td>Airline name</td>
<td>Number of cancelled sequences in the date range, where this airline has not sent ETOs by mail</td>
</tr>
<tr>
<td></td>
<td>Airline name</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airline name</td>
<td></td>
</tr>
</tbody>
</table>

2.1.6 Frequency (nb days) & list of flights of too early ETOs (landing before 06:04) & corresponding STA

2.1.6.1 Data to display

<table>
<thead>
<tr>
<th>Date</th>
<th>Call Sign</th>
<th>IAF</th>
<th>ETO</th>
<th>ELDT</th>
<th>STA (from strategic sequence)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1rst sequence date</td>
<td>Call sign 1</td>
<td>IAF</td>
<td>ETO</td>
<td>ELDT</td>
<td>TOTAL</td>
</tr>
<tr>
<td>selected range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total nb of flights in the report</td>
</tr>
<tr>
<td>Same for every day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total number of days in the selected range</td>
</tr>
<tr>
<td>in the selected date range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.1.6.2 Special rules
The report must contain only the flights that correspond to the following condition:
- ‘Too early ETO’ : ELDT < 06h04 LT.
2.1.7 List of successful / cancelled sequences and reasons

2.1.7.1 Data to display

<table>
<thead>
<tr>
<th>Date</th>
<th>Sent</th>
<th>Cancelled</th>
<th>Reason if cancelled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(missing ETOs / no NM synchronization / no Strategic Sequence / more than 1 flight indicated in red / Other)</td>
</tr>
<tr>
<td>1rst sequence date in selected range</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>....</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last sequence date in selected range</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of Sent sequences</td>
<td>Number of Cancelled sequences</td>
<td></td>
</tr>
<tr>
<td>PERCENTAGE</td>
<td>Percentage of sent sequences / total nb of sequences in date range</td>
<td>Percentage of sent sequences / total nb of sequences in date range</td>
<td></td>
</tr>
</tbody>
</table>

2.1.8 Adherence ATA / ELDT (ETO provided by airline)

2.1.8.1 Data to display

<table>
<thead>
<tr>
<th>Period</th>
<th>Airline</th>
<th>Flight</th>
<th>Nb of flights</th>
<th>Adherence ATA-ELDT (sum in minute)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date range</td>
<td>Name</td>
<td>Call sign</td>
<td>Number of flights in date range with this call sign</td>
<td>Sum of abs (ATA-ELDT) for all flights with this call sign</td>
<td>Adherence ATA-ELDT / nb of flights</td>
</tr>
</tbody>
</table>

2.1.8.2 Special rules

For this table, only the flights with an ETO received by mail (and taken into account for the sequence computation; i.e. received before the deadline in the correct format) are counted.

As no ATA is in the current iStream database, since the beginning of production, the ATA for these past flights will be imported from the Flight Data Processing system.

A mechanism will be implemented for PJ25 to retrieve the ATA for the flights during the Live Trial.
2.1.9 Adherence ATA / ELDT (ETO not provided by airline)

2.1.9.1 Data to display
Same as in 2.1.6

2.1.9.2 Special rules
For this table, only the flights with no ETO received by mail (or received, but not considered for the sequence; i.e. incorrect format) are counted.

2.1.10 Adherence ATA / ETA (ETO provided by airline)
This statistics block has identical requirements as the one in 2.1.8, but uses ETA (Estimated time over + flight time) instead of ELDT.

2.1.11 Adherence ATA / ETA (ETO not provided by airline)
This statistics block has identical requirements as the one in 2.1.9, but uses ETA (=Estimated time over + flight time) instead of ELDT.

2.1.12 Average spacing in minutes between each arriving aircraft, over the chosen point (IAF, STAR entry point or other) and on the RWY Threshold during the hour (06:04 – 07:00 LT)

2.1.12.1 Data to display

<table>
<thead>
<tr>
<th>Period</th>
<th>Point</th>
<th>Average gap b/w flights</th>
<th>Nb of gaps of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Day 1 in date range</td>
<td>IAF 1</td>
<td>Sum of gaps/nb of flights over this IAF</td>
<td>Nb of gaps of 1 min in date range for IAF</td>
</tr>
<tr>
<td>Day n in date range</td>
<td>IAF 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RWY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total range</td>
<td>IAF 1</td>
<td>Sum of gaps/nb of flights over this IAF</td>
<td>Nb of gaps of 1 min in date range for IAF</td>
</tr>
<tr>
<td></td>
<td>IAF 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 2.1.12 Special rules
The gap calculation is made based on actual flight data.
The RWY gaps are calculated based on the actual landing time (ATA)

### 2.1.13 List of unexpected flights (flights not found in Strategic phase but are in NM flight list)

#### 2.1.13.1 Data to display

<table>
<thead>
<tr>
<th>Period</th>
<th>Flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1 in date range</td>
<td>Call sign 1</td>
</tr>
<tr>
<td></td>
<td>…</td>
</tr>
<tr>
<td></td>
<td>Call sign n</td>
</tr>
<tr>
<td>…</td>
<td>&quot;</td>
</tr>
<tr>
<td>Day n in date range</td>
<td>&quot;</td>
</tr>
<tr>
<td>TOTAL</td>
<td>Total nb of unexpected flights in data range</td>
</tr>
</tbody>
</table>

### 2.2 Optimize short-haul adherence

#### 2.2.1 Business purpose
Test (in coordination with NM) and trial new B2B service to optimize short-haul flights’ adherence (API TargetTakeOffTime)

#### 2.2.2 Functional changes
- Compute the arrival sequence, as today
- For each 'short-haul' flight in the sequence: Send callsign+TTO to NM, using the new B2B API service

#### 2.2.3 Open points
- 'Short-haul', 'Long-haul', others: the definition is based on airport of departure. This information is stored in the Airspace Users database.

### 2.3 TTO Forward

#### 2.3.1 Business purpose
Test (in coordination with NM) and trial new B2B service in order to exchange our local iStream sequence to NM (API TargetTimeOver).
2.3.2 Functional changes

- Compute the arrival sequence
- At 01:31 LT (just after the sequence is computed), and for each flight in the sequence, send the TTO to NM, using the new B2B service (API TargetTimeOver)*.
  It must be ensured, whatever the setup for the Live-Trial, that the TTOs are corresponding to the sequence computed and sent to the airlines on the operational iStream instance.
- If the sequence is Cancelled, this function must not be executed (no TTOs sent).

2.4 Retrieve the ETFMS profiles

2.4.1 Business purpose
Collect the estimated flight data at different times in the cycle to evaluate the effect of sending the TTOs.
It is designed for post-analysis purposed in order to study if the API functionality correctly updates the flights' profiles.
All the API B2B functionalities must be kept ready for the future if NM put into operations/updates the service.

2.4.2 Functional changes
- Retrieve the Estimated Times at IAF/STAR entry/other point & Estimated Landing Times at the following times:
  - Before the TTOs are send (ex: 0100 LT)
  - After the TTOs are sent (ex: 0200 LT)
  - After the IFPS zone boundary (entry into European continent, so time is 0430 LT by default)
- Retrieve the Actual time at the chosen point (if existing) and Actual Landing Time at the following times:
  - After the end-of sequence time (ex: 08:00LT)
  - For a last update (ex: 12:00LT)
  This retrieval must collect the data for flights included in the sequence window, and also the flights after the sequence window, until the execution time of the request, to be able to retrieve data of late flights.
- Timings (times at which the retrievals is performed) will be stored in a configuration file.
- If the sequence has been cancelled (in production istream), this retrieval should not be done.
3 System Setup for Tests and Live-Trial

During the Tests and the Live Trial, the normal iStream process will continue, and will still be the one sending the sequence as it does now.

To be able to do the Tests and the Live Trial, a specific setup is needed, with modifications done to the production iStream system.

This section describes this particular setup, corresponding to the following diagram:

3.1 iStream Production System

The current iStream production system will continue to run, operated as it is currently, but with the following additions:

- The statistics page, as specified in the previous section.
- The more flexible recognition of the Airline mail subjects
- The updated list of chosen points and landing times

3.2 iStream PJ25 System

This platform will be used in parallel with the iStream Production System.

From the functional point of view, it will be have the same features as the iStream Production System, plus:

- ATA Retrieval for flights in the sequence
- TTO Forward
- Retrieve the ETFMS profiles, as specified in the previous chapter.
- The PJ iStream system will receive the same inputs as the production System, but will not send any mail to the airport, FMP and airlines.

3.3 Test Phase

The following principles apply for the Test phase:

- The PJ25 System will use its own Database to store the additional data needed for the PJ25 project. This minimizes the risk of incident for the Production system, while the PJ25 features may not yet be stable.

For the Test phase it will be needed to ensure that the sequence decision (Send/Cancel) is mirrored from the Production system to the PJ25 system.

3.4 Live Trial Phase

The following principles apply for the Live-Trial phase:

- Both systems will use the Production database, ensuring that the data will be the same.

On request from the users, the PJ25-specific functions sending data to NM should be switched off (TTO forward, Short-haul Regulations). This request must be received by technical team before 17:00 the day before the activities must be stopped.