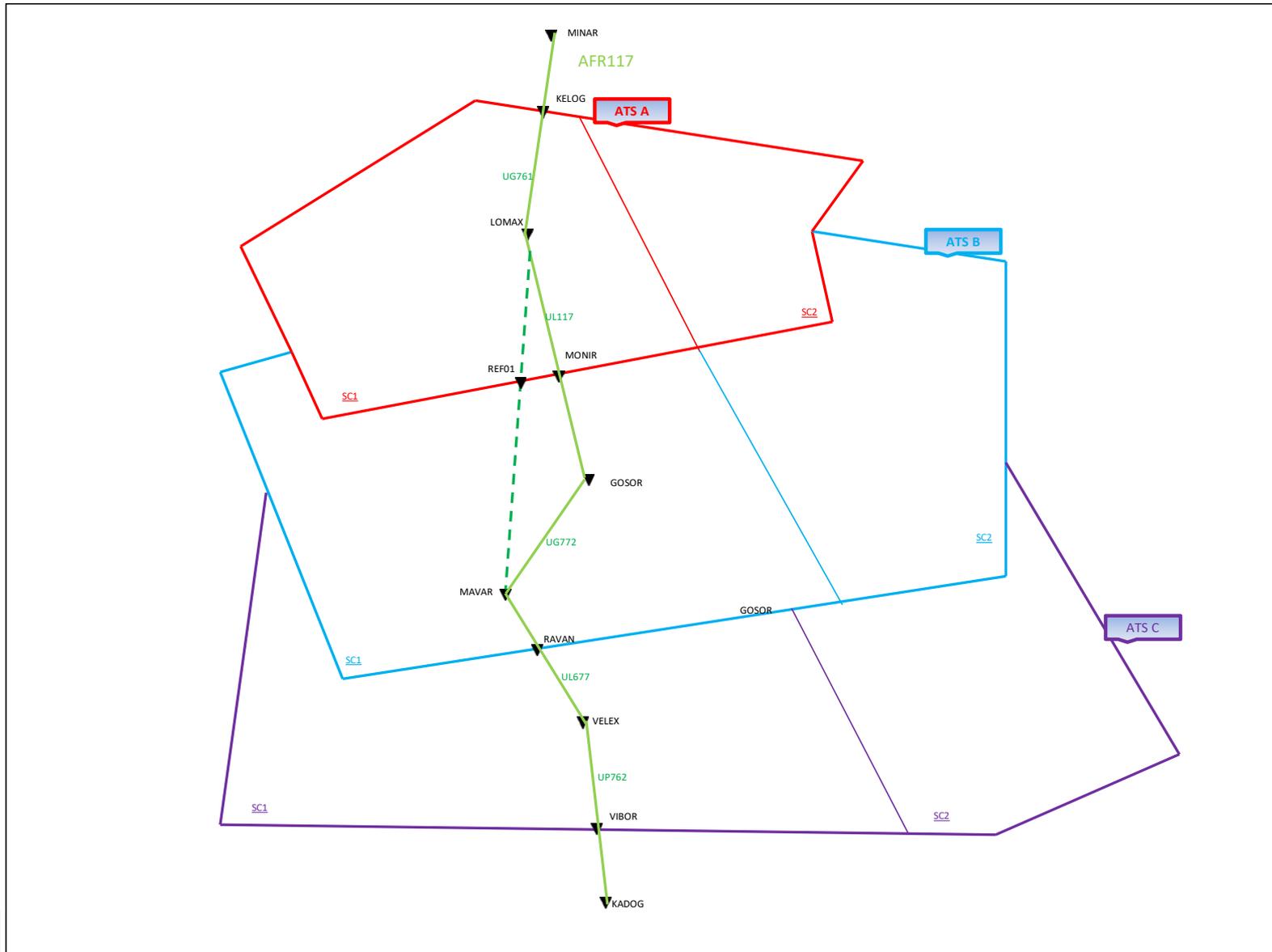# OLDI Use cases

OLDI use cases

- The use cases signify the operational process supported by OLDI coordination exchanges.

OLDI use case –route modifications in fixed route Network

OLDI use case route modifications -1

- The airspace and flight elements used for this scenario above are fictitious. Only the departure and destination airports exist. The flight trajectories are depicted in green.
- The IFPS distributed the original FPL (FPL-AFR117-IS –A319/M-SRWY/C –EDDF0930 -N0420F350 LOGOS UP117 MINAR UG761 LOMAX UL117 GOSOR UG772 MAVAR UL677 VELEX UP762 KAGOG UP761 ZAZAN –LBSF0200) to ATS A, ATS B and ATS C.
- AFR117 overflies point MINAR.
- ATS A sends an ABI message to ATS B. The route elements contained in the ABI message are:
  - Route segment start – Last overflown fix (MINAR);
  - Points between segment start /end – KELOG, LOMAX and MONIR;
  - Route segment end - The point after the COP (GOSOR), the remaining portion of the route is unknown.

```
-TITLE ABI
-REFDATA
        -SENDER -FAC ATSA
        -RECVR -FAC ATSB
        -SEQNUM 786
-ARCID AFR117
-SSRCODE A2007
-ADEP EDDF
-COORDATA
        -PTID MONIR
        -TO 1008
        -TFL F350
-ADES LBSF
-ARCTYP A319
-ROUTE N0420F350 MINAR DCT KELOG DCT LOMAX DCT MONIR DCT GOSOR
```

OLDI use case route modifications -2

- ATS B sends a LAM message to ATS A, correlates the received ABI with its corresponding flight plan data and attempts to align the AFR117 trajectory with the ABI message route information. The MINAR and KELOG points are disregarded due to their distance from the inbound COP, the remaining part of trajectory (LOMAX MONIR GOSOR) is identical with the portion of previously extracted from the FPL and the ABI message data is used for the timing recalculation over the points.
- ATS A assumes flight AFR117.
- AFR117 overflies point LOMAX.
- AFR117 requests a direct route to MAVAR.
- ATS A clears the flight AFR117 after LOMAX direct to MAVAR. By clearing the flight direct to MAVAR, the ATS A exit point changes to dynamic COP (REF01). The new trajectory for flight AFR117 within the AoI of ATS A is: MINAR KELOG LOMAX REF01 MAVAR. ATS A sends a revised ABI message to ATS B. The route elements contained in the ABI message are:

  - Route segment start - Last overflown point (LOMAX);

  - Point between segment start /end - Dynamic co-ordination point (REF01), which can be omitted as it is the calculated point and it is contained in "coordata" field;

  - Route segment end - The point after the COP (MAVAR). The route after MAVAR is not known and therefore is not provided

OLDI use case route modifications -3

```
-TITLE ABI
-REFDATA
          -SENDER -FAC ATSA
          -RECVR -FAC ATSB
          -SEQNUM 797
-ARCID AFR117
-SSRCODE A2007
-ADEP EDDF
-COORDATA
          -PTID REF01
          -TO 1007
          -TFL F350
-ADES LBSF
-ARCTYP A319
-REF
          -REFID REF01
          -PTID MONIR
          -BRNG 265
          -DISTNC 006
-ROUTE N0420F350 LOMAX DCT MAVAR
```

- ATS B returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point is changed from MONIR to REF01 (reference to MONIR with range and bearing). ATS B keeps the first trajectory point LOMAX according to its distance, inserts the entry point (REF01) and the point after the COP (MAVAR) as provided by ABI message. The ATS B FDP calculates the re-joining point of the received route information with the original route (MAVAR). The remaining route portion is unaltered. The new trajectory for flight AFR117 within the AoI of ATS B is: LOMAX REF01 MAVAR RAVAN VELEX.

OLDI use case route modifications -4

- ATS A sends ACT to ATS B and as bilaterally agreed, without any route information.

-TITLE **ACT**
-REFDATA
        -SENDER E -FAC **ATSA**
        -RECVR -FAC **ATSB**
        -SEQNUM **812**
-ARCID **AFR117**
-SSRCODE **A2007**
-ADEP **EDDF**
-COORDATA
        -PTID **REF01**
        -TO **1007**
        -TFL **F350**
-ADES **LBSF**
-ARCTYP **A319**
-REF
        -REFID **REF01**
        -PTID **MONIR**
   -BRNG **265**
        -DISTNC **006**

- ATS B returns a LAM message and the SFPL for flight AFR117 changes to a coordinated status. There is no update of the SFPL trajectory, as the route information was not provided by the ACT message. The coordination point REF01 is confirmed.

- ATS B sends an ABI message to ATS C. The route elements contained in the ABI message are:

  - Route segment start - Last overflown fix (LOMAX);

  - Point between segment start /end - MAVAR, RAVAN (which can be omitted as it is contained in "coordata" field);

  - Route segment end - The point after the COP (VELEX). The route after VELEX is unknown and therefore is not provided

OLDI use case route modifications -5

-TITLE **ABI**
-REFDATA
        -SENDER -FAC **ATSB**
        -RECVR -FAC **ATSC**
        -SEQNUM **455**
-ARCID **AFR117**
-SSRCODE **A2007**
-ADEP **EDDF**
-COORDATA
        -PTID **RAVAN**
        -TO **1020**
        -TFL **F350**
-ADES **LBSF**
-ARCTYP **A319**
-ROUTE **N0420F370 LOMAX DCT MAVAR DCT VELEX**

- ATS C returns a LAM message and attempts to update the SFPL with the revised ABI message data. The co-ordination point remains the same (RAVAN). The point before the COP (LOMAX) is disregarded according to the distance criteria, while another point before the COP is kept (MAVAR). The entry point is provided by ABI message ("coordata" field) and the remaining route portion is unaltered. The ABI message does not cause a change to the ATS C 2-D trajectory for flight AFR117 and the ABI message data is used for the timing recalculation over the points.

OLDI use case –Enroute cruising level-1
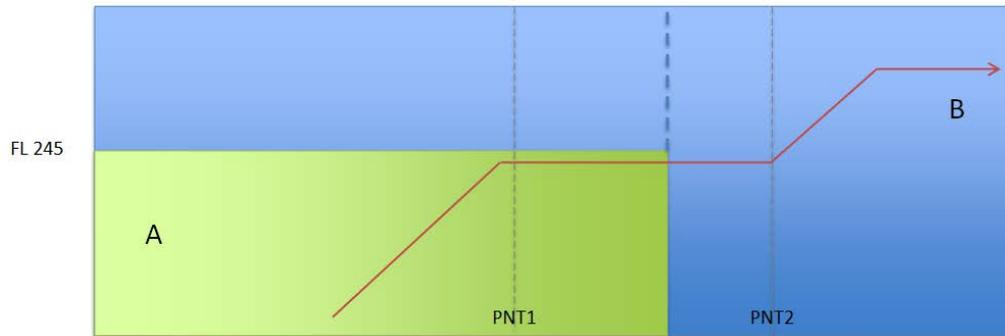
The airspace and flight elements used for this scenario are fictitious.

The airspace data is depicted as:

- ATS A in green

- ATS B in blue

ATS B is divided into two sectors as:

- SC1 on top of ATS A (FL 245-660)

- SC2 on the side of ATS A (FL 000-660)

The boundary between these sectors is depicted in dotted blue. The flight trajectories are depicted in red.

The IFPS distributed the original FPL (FPL –FPL0001-IS –B737/M-SRWY/C –ADEP1010 - N0420F240 PNT1 DTC PNT2/N0420F300 AIRWAY PNTX –ADES0120) to ATS A and ATS B. The transition between ATS A and ATS B is initially through a wall, at level F240, toward SC2.

OLDI use case –Enroute cruising level-2

- ATS A sends an ABI to ATS B. The ECL is not present as the transition is through the wall.

```
-TITLE ABI
-REFDATA
            -SENDER -FAC ATSA
            -RECVR -FAC ATSB
            -SEQNUM 001
-ARCID FPL0001
-SSRCODE A1234
-ADEP ADEP
-COORDATA
            -PTID PNT1
            -TO 1058
            -TFL F240
-ADES ADES
-ARCTYP B737
```

Following coordination between ATS A and ATS B, it is decided that the flight will be sent to B through the ceiling, toward another sector (SC 2). During the coordination, it is also decided that the flight will directly climb toward its next RFL.

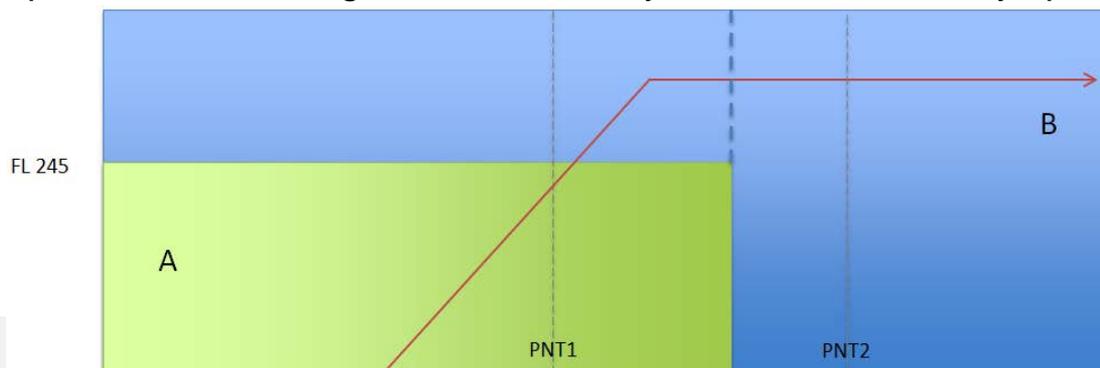# OLDI use case –Enroute cruising level-3

- ATS A sends an ACT to ATS B. The ECL is now present as the transition is through the ceiling. (In this example, we consider that the coordination point is not modified by the change of typology)

```
-TITLE ACT
-REFDATA
            -SENDER -FAC ATSA
            -RECVR -FAC ATSB
            -SEQNUM 002
-ARCID FPL0001
-SSRCODE A1234
-ADEP ADEP
-COORDATA
            -PTID PNT1
            -TO 1054
            -TFL F240
-ADES ADES
-ARCTYP B737
- EFL F300
```

- The reception of this message allows ATS B system to automatically update its view.

OLDI use case –Enroute cruising level-4

- ATS A sends an ACT to ATS B. The ECL is now present as the transition is through the ceiling. (In this example, we consider that the coordination point is not modified by the change of typology).

```
-TITLE ACT
-REFDATA
          -SENDER -FAC ATSA
          -RECVR -FAC ATSB
          -SEQNUM 002
-ARCID FPL0001
-SSRCODE A1234
-ADEP ADEP
-COORDATA
          -PTID PNT1
          -TO 1054
          -TFL F240
-ADES ADES
-ARCTYP B737
- EFL F300
```

- The reception of this message allows ATS B system to automatically update its view.
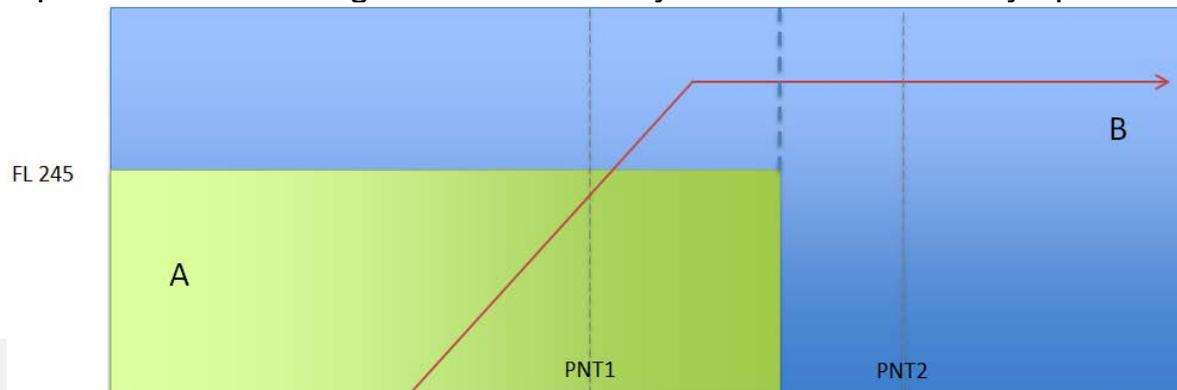
OLDI use case –Re-entrant flight-1
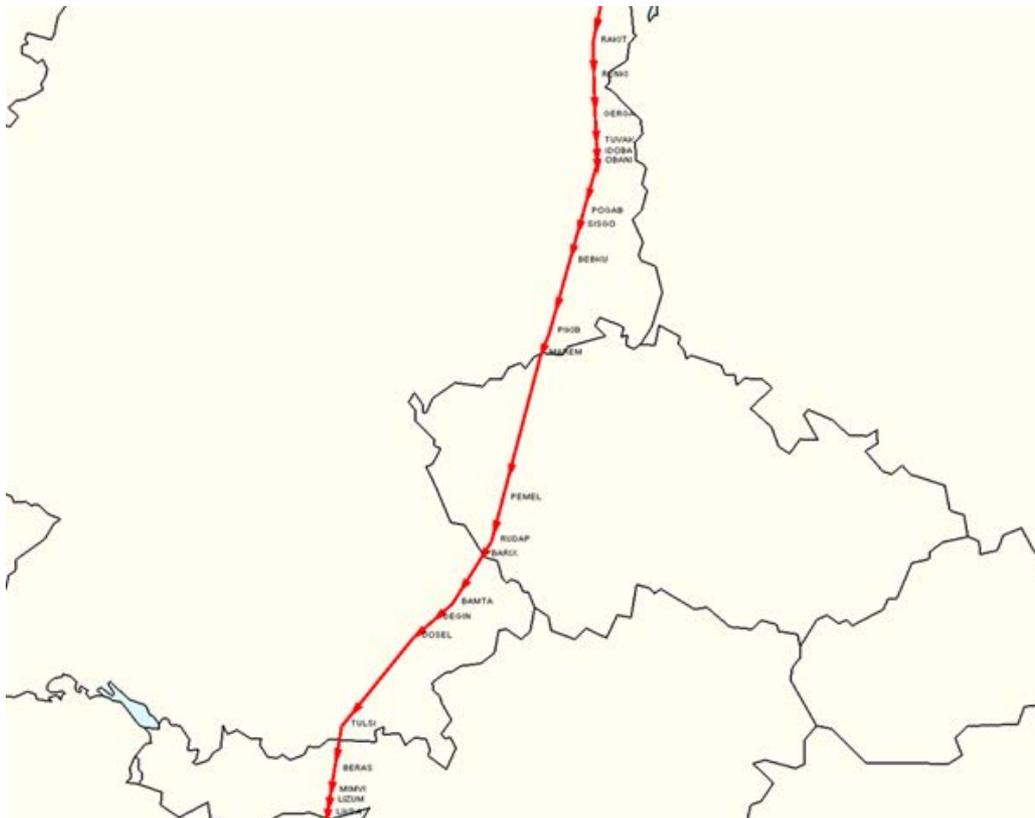
- This case study is based on the real ATS environment (airspace and flight plan data) as illustrated in the left part of slides while the sequence of OLDI messages is fictitious.
- Flight DLH5523 departed from Gothenburg (ESGG) at 14:00 and is planned to land at Roma Fiumicino (LIRF).
- IFPS distributed the original FPL (FPL- DLH5523 -IS –A320/M-SRWY/C –ESGG1440 - N0430F370 LALIL L996 MAXUM M736 SALLO UM44 KOGIM UM725 OBANI UZ36 MAREM P31 RADUP UP31 DOSEL UM736 LIZUM N503 VIC L12 LUMAV M726 GARVA Z806 GIKIN N737 TORLI – LIRF0240 - DOF/180110) to ATC A, ATS B and ATS C.
- Karlsruhe FDP calculates two segments for the flight DLH5523.

OLDI use case –Re-entrant flight-2

- DLH5523 departs from Gothenburg (ESGG).

- Malmo ACC (ESMM) sends an ABI message to Karlsruhe UAC (EDUU).

  ```
  -TITLE ABI
  -REFDATA
          -SENDER -FAC ESMM
          -RECVR -FAC EDUU
          -SEQNUM 082
  -ARCID DLH5523
  -SSRCODE A7421
  -ADEP ESGG
  -COORDATA
          -PTID SALLO
          -TO 1435
          -TFL F340
  -ADES LIRF
  -ARCTYP A320
  ```

- EDUU sends a LAM message to ESMM and:
  - Identifies that the affected segment is the first one;
  - Processes the received coordination data for the affected flight plan. The first segment becomes active but it is not yet coordinated.

OLDI use case –Re-entrant flight-3

- Malmo ACC (ESMM) sends an ACT message to Karlsruhe UAC (EDUU).

  -TITLE **ACT**
  -REFDATA
        -SENDER -FAC **ESMM**
        -RECVR -FAC **EDUU**
        -SEQNUM **098**
  -ARCID **DLH5523**
  -SSRCODE **A7421**
  -ADEP **ESGG**
  -COORDATA
        -PTID **SALLO**
        -TO **1435**
        -TFL **F340**
  -ADES **LIRF**
  -ARCTYP **A320**

- EDUU sends a LAM message to ESMM and:

  - Identifies that the affected segment is the first one;
  - Processes the received coordination data for the affected flight plan. The first segment becomes coordinated.

- Flight DLH5523 is transferred to EDUU.

OLDI use case –Re-entrant flight-4

- Flight DLH5523 is transferred to EDUU.
- EDUU sends an ABI message to Prague ACC (LKAA).
- LKAA send a LAM message to EDUU and the received ABI message is correlated with its system flight plan.
- EDUU sends an ACT message to LKAA.
- LKAA sends a LAM message to EDUU and the ACT message is correlated with its system flight plan.
- LKAA sends an ABI message to EDUU.
- EDUU sends a LAM message to LKAA and:
    - Identifies that the affected segment is the second one;
    - Processes the received coordination data for the affected flight plan. The second segment becomes active, not yet coordinated.
- Flight DLH5523 is transferred to LKAA.
- LKAA sends an ACT message to EDUU.
- EDUU sends a LAM message to LKAA and:
    - Identifies that the affected segment is the second one;
    - Processes the received coordination data for the affected flight plan. The second segment becomes coordinated.
- Flight DLH5523 is transferred to EDUU.
- The system flight plan related to flight DLH5523 is terminated by the LKAA FDPS.
- EDUU sends an ABI message to Padova ACC (LIPP).

- LIPP sends a LAM message to EDUU and the system flight plan is updated with the ABI message content.

- EDUU sends an ACT message to LIPP.

  -TITLE **ACT**
  -REFDATA
          -SENDER -FAC **EDUU**
          -RECVR -FAC **LIPP**
          -SEQNUM **325**
  -ARCID **DLH5523**
  -SSRCODE **A7421**
  -ADEP **ESGG**
  -COORDATA
          -PTID **LIKDA**
          -TO **1537**
          -TFL **F360**
  -ADES **LIRF**
  -ARCTYP **A320**

- LIPP sends a LAM message to EDUU and the system flight plan is updated with the ACT message content.

- Flight DLH5523 is transferred to LIMM.

- An adaptable time parameter after the boundary point is overflown, EDUU FDP terminates the system flight plan for DLH5523.

OLDI use case –SSR code management-1
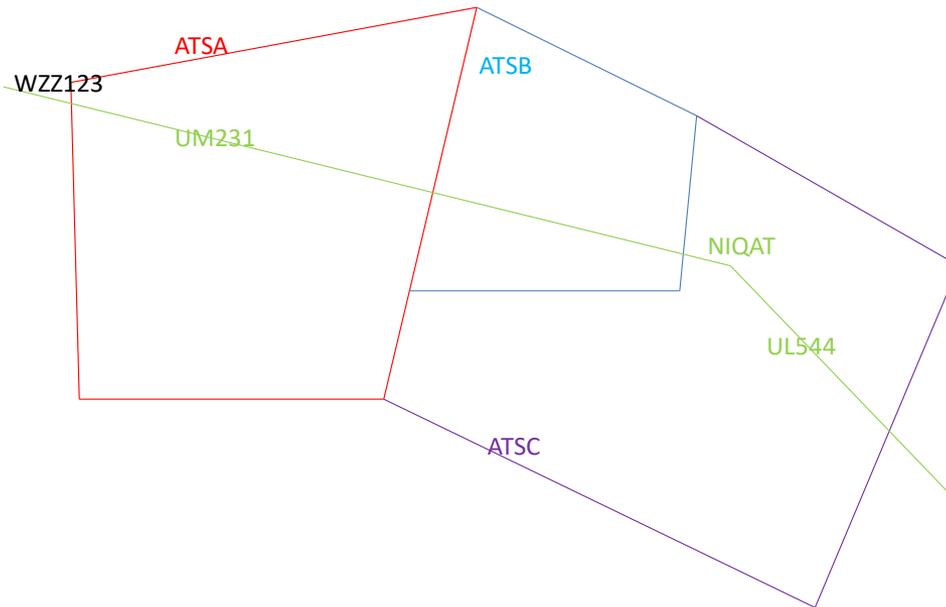
This example depicts the case when the ABI message is sent with a code that is still to be assigned to the flight by the transferring unit. This example is illustrated by Figure above. It involves 3 ATS units with Areas of Responsibility (AoR) presented in red for ATS A, in blue for ATS B and in purple for ATS C. ATS A and ATS B allocate their codes based on ORCAM, while ATS C is CCAMS capable. ATS B is a rather small ATS unit and the maximum transversal time in any direction of flight is less than 15 minutes.

The flight WZZ123 departed from LGAT at 07:30 and it is planned to land at EDDM.

IFPS distributed the original FPL (FPL-WZZ123-IS – B737/M-SRWY/C –LGAT0730 -N0420F370 MIRIX UM761 BELOG UM231 NIQAT UL544 RADOX UL601 – EDDM0200) to ATC A, ATS B and ATS C.

OLDI use case –SSR code management-2

- **09:50** WZZ123 overflies the entry point of ATS A, the flight is assumed by ATS A and a discreet SSR code 5667 is assigned.

- **09:52** ATS A sends an ABI message to ATS B.

```
-TITLE ABI
-REFDATA
        -SENDER -FAC ATSA
        -RECVR -FAC ATSB
-SEQNUM 768
-ARCID WZZ123
-SSRCODE A5667
-ADEP LGAT
–COORDATA
        -PTID OUT01
        -TO 1012
        -TFL F370
-ADES EDDM
-ARCTYP B737
```

- **09:52** ATS B returns a LAM message and tries to update the system flight plan (SFPL) with the ABI message data. The SSR code management function identifies that SSR code 5667 is not retainable within ATS B AoR and it identifies that a new SSR code 4421 needs to be assigned. ATS B uses the current code 5667 to correlate WZZ123 and assigns 4421 as next SSR code.

- **10:01** ATS A sends an ACT message to ATS B, with SSR code 5667.

- **10:01** ATS B returns a LAM message and updates the SFPL with the new time at the COP contained in ACT message. The correlation is kept as well as the new SSR code to be assigned.

- **10:06** ATS B sends an ABI message to ATS C, the SSR code contained in ABI message will not be the current SSR code assigned by ATS A, but the SSR code that will be assigned by ATS B. The current SSR code might be provided as previous SSR code data item in order to facilitate an early correlation of the flight, but this field is not part of the ABI message specification -it is only included as an optional field for the BFD and CFD messages.

```
-TITLE ABI
-REFDATA
        -SENDER -FAC ATSB
        -RECVR -FAC ATSC
        -SEQNUM 009
-ARCID WZZ123
-SSRCODE A4421
-ADEP LGAT
-COORDATA
        -PTID OUT28
        -TO 1026
        -TFL F370
-ADES EDDM
-ARCTYP B737
```

- **10:06** ATS C returns a LAM message and updates the SFPL with the ABI message data. However, the correlation cannot be established, as code 4421 is still not yet assigned.

- **10:06** ATS B sends a BFD message to ATS C in order to provide a notification about the current SSR code in use.

OLDI use case –SSR code management-4

```
-TITLE BFD
-REFDATA
        -SENDER -FAC ATSB
        -RECVR -FAC ATSC
        -SEQNUM 015
-ARCID WZZ123
-SSRCODE A4421
-PREVSSRCODE A5667
```

- **10:06** ATS C returns a LAM message and updates the SFPL with the BFD message data. The SSR code in the received ABI (to be assigned by ATS B) is stored as current SSR code, while the SSR code in the BFD message (currently used by ATS A) is stored as previous SSR code. In order to avoid miscorrelation, ATS C might ensure the correlation geo-check (match in previous SSR code between the track and updated SFPL with BFD message and that track is contained within an eligibility volume based on the flight expected position) is applied. If the geo-check is successful, the correlation can be established.

- **10:07** ATS C generates a code request (COR) to CCAMS. It should be noted that an automatic generation of COR message could be differently sequenced, after the reception of ACT from ATS B at 10:15. The CCAMS service receives the code request and identifies that A4421 cannot be retained. ATS C receives CAM messages with CCAMS code 0227, to be applied when ATS C assumes the flight. This code ATC C stored as next SSR code.

- **10:11** ATS A instructs the flight WZZ123 to contact ATS B by sending a COF message.

```
-TITLE COF
-REFDATA
        -SENDER -FAC ATSA
        -RECVR -FAC ATSB
        -SEQNUM 851
-ARCID WZZ123
```

- **10:12** ATS B indicates the establishment of radio contact with the flight WZZ123 by sending a MAS message.
  -TITLE **MAS**
  -REFDATA
        -SENDER -FAC **ATSB**
        -RECVR -FAC **ATSA**
        -SEQNUM **311**
  -ARCID **WZZ123**

- **10:12** ATS B instructs flight WZZ123 to change to SSR code 4421.
- **10:13** The pilot changes the SSR code and flight WZZ123 squawks 4421.
- **10:13** ATS A terminates the SFPL for flight WZZ123; therefore this code change is irrelevant to ATS A. ATS B maintains the correlation as the new code is stored in the next SSR code field of the SFPL. ATS C maintains the correlation as the newly assigned SSR code was already notified.
- **10:15** ATS B sends ACT to ATS C with SSR code 4421.
- **10:15** ATS C sends a LAM message to ATS B and updates the SFPL with the new time at the COP.
- **10:25** ATS B instructs the flight WZZ123 to contact ATS C, by sending a COF message.
  -TITLE **COF**
  -REFDATA
        -SENDER -FAC **ATSB**
        -RECVR -FAC **ATSC**
        -SEQNUM **051**
  -ARCID **WZZ123**

OLDI use case –SSR code management-6

- **10:26** ATS C indicates the establishment of radio contact with the flight WZZ123 by sending a MAS message.

  -TITLE **MAS**
  -REFDATA
          -SENDER -FAC **ATSC**
          -RECVR -FAC **ATSB**
          -SEQNUM **597**
  -ARCID **WZZ123**

- **10:26** ATS C instructs flight WZZ123 to change to SSR code 0227 received by CCAMS.
- **10:26** The pilot changes the SSR code and flight WZZ123 squawks 0227.
- This example shows that, if the BFD message is not exchanged, ATS C cannot correlate the flight between 10:06 (when ATS B sent the ABI message with the planned SSR code to be assigned, but not with current code) and 10:13 (when the flight is assumed by ATS B and the SSR code is changed by the pilot)