Selex ES

A Finmeccanica Company

Selex ES CPLDC&AIDC solutions

Dario Di Crescenzo

Outline

- Selex ES Company
- Selex ES DataLink Solution
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- Selex ES AIDC solution
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

FINMECCANICA TODAY

HELICOPTERS

AgustaWestland
AgustaWestland Tilt-Rotor Company
NHIndustries

Revenues EUR 4,243 mil. | Workforce 13,050

DEFENCE AND SECURITY ELECTRONICS

DRS Technologies
Selex ES

Revenues EUR 5,754 mil. | Workforce 25,183

AERONAUTICS

Alenia Aermacchi
SuperJet International
ATR
Eurofighter GmbH

Revenues EUR 2,974 mil. | Workforce 11,708

SPACE

Telespazio
Thales Alenia Space

Revenues EUR 1,053 mil. | Workforce 4,131

DEFENCE SYSTEMS

Oto Melara
WASS
MBDA

Revenues EUR 1,256 mil. | Workforce 3,963

ENERGY

Ansaldo Energia*

Revenues EUR 715 mil. | Workforce 1,830

TRANSPORTATION

AnsaldoBreda
Ansaldo STS
BredaMenarinibus

Revenues EUR 1,719 mil. | Workforce 6,568

Revenues and Worrkforce for business sector at 31 March 2012

(*) In 2011 Finmeccanica sold 45% of the share capital of the Ansaldo Energia. As a result of this sale, Ansaldo Energia Holding and its subsidiaries have been consolidated on a proportional basis as of the transaction date.

Owned company | Joint venture

3

Selex ES Key facts

- 17,700 people
- Revenues in excess of 3.5 billion Euros
- More than 17% of investment in R&D
- 70% engineers and personnel with technical qualifications
- Worldwide industrial footprint

An international leader

- Industrial and commercial footprint in the US, Germany, Turkey, Romania, Brazil and Saudi Arabia
- Fully owned subsidiaries across the globe

Selex ES Divisions

Airborne and Space Systems

- Radar and Advanced Targeting
- Air Systems, Unmanned Systems and Simulators
- Electronic Warfare
- Avionics
- Space Systems
- Support and Service Solutions

Land and Naval Systems

- Naval & Air Defence Systems
- Land & Battlefield Systems
- Optronics Systems
- Defence Communications Systems
- Support & Service Solutions

Security and Smart Systems

- Homeland Security & Critical Infrastructures
- Cyber Security & Information Assurance
- Air & Vessel Traffic Management Systems
- Automation Systems
- ICT & Networking
- Smart Solutions


Selex ES
A Finmeccanica Company
Security and Smart Systems
We promote technology and application convergence by providing solutions across IT, communications, automation, physical and cyber security to create a smart and sustainable environment for a collaborative and prosperous life

Key Capabilities

Homeland security and CNI protection
Solutions for intelligence, territory control, emergency management, turn key solutions for CNI protection, physical and cyber security.

Networked professional communications
Communications solutions integrating TETRA, DMR ,GSM-R, WiFi, WiMAX and LTE, GSM-R.

Information & Communication technology
Outsourcing & Cloud services, business industry solutions, networking, operation support systems and Enterprise Information Systems.

Air and vessel traffic management
Air Traffic Control, surveillance and weather radars, avionic communications, VTMS and coastal surveillance.

Automation systems
Solutions for postal, logistic operators, express couriers, airports baggage handling systems, Industrial Automation & Control.

Innovative sustainable smart solutions
Integrated solutions for airports, major events, smart and safe cities: Intelligent transportation and inter-modal logistic systems, smart grids, smart buildings, digital identity.


Air Traffic Control


ICT


CNI Protection


Logistics


Cyber Security


Baggage Handling System


Law Enforcement support systems


VTMS


Smart Mobility

Selex ES
A Finmeccanica Company

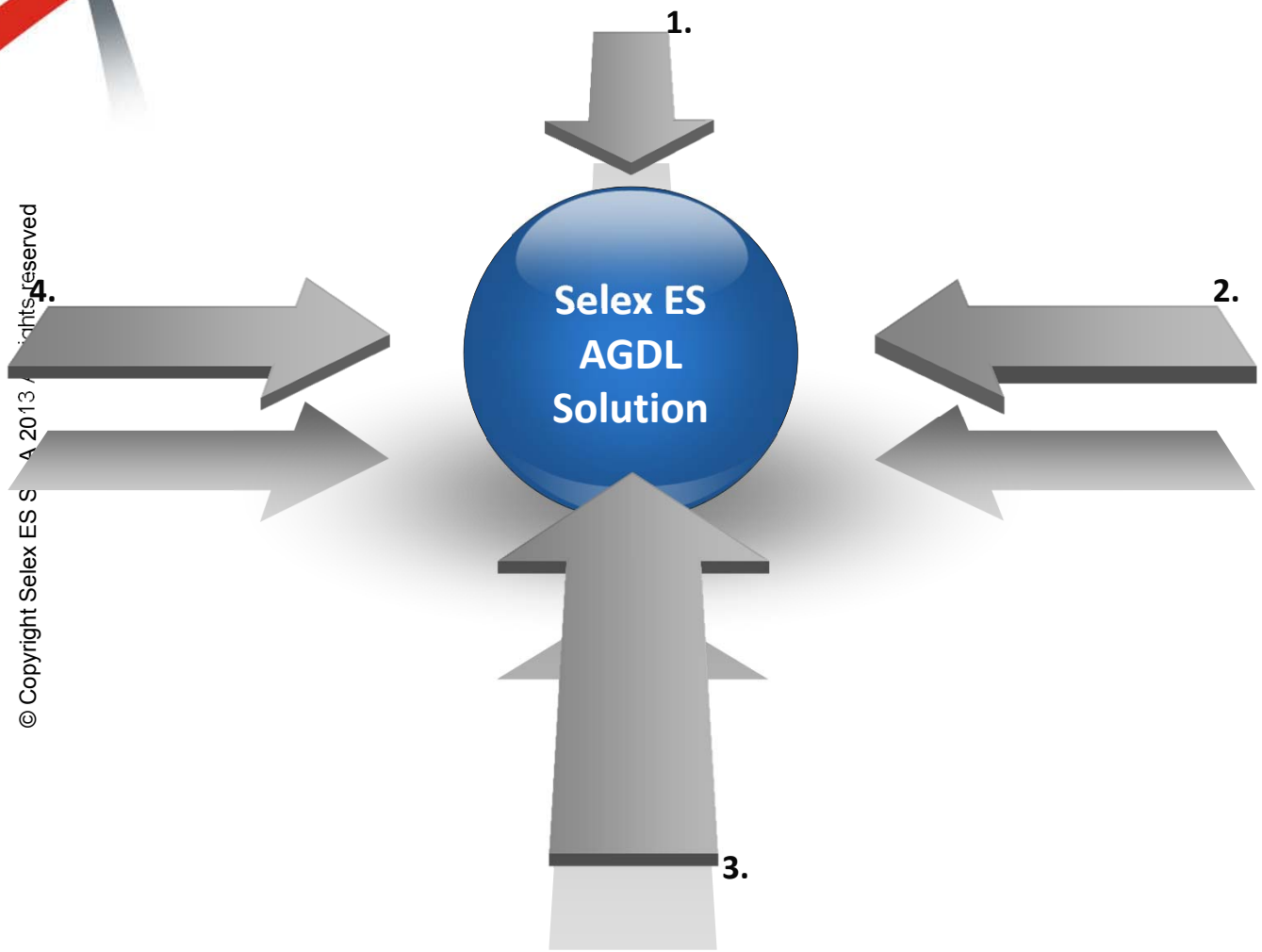
Our Strengths

- More than 150 countries rely on our systems for safe and efficient Air Traffic Management operations
- Our baggage handling systems helped one of our customers reduce its mishandling of baggages by 40%
- We are the Safe City and Main Operation Centre Official Global Partner for the Milan EXPO 2015
- Our solutions monitor 7,500km of coastline in Italy, 24 hours a day, as well as coastlines across China, Russian Federation, Poland, Yemen and Turkey
- More than 50 countries rely on our integrated mobile communications for enhanced operations of their security, police and emergency forces
- Alongside Northrop Grumman we have been awarded the NCIRC Full Operating Capability-FOC to supply a turnkey cyber security capability to NATO, the largest cyber security programme outside the US
- We are the main provider to the Russian Federation for their postal logistics hub
- We have developed the largest southern Europe logistics courier hub for DHL (more than 700m sorters and 2km conveyours).

Outline

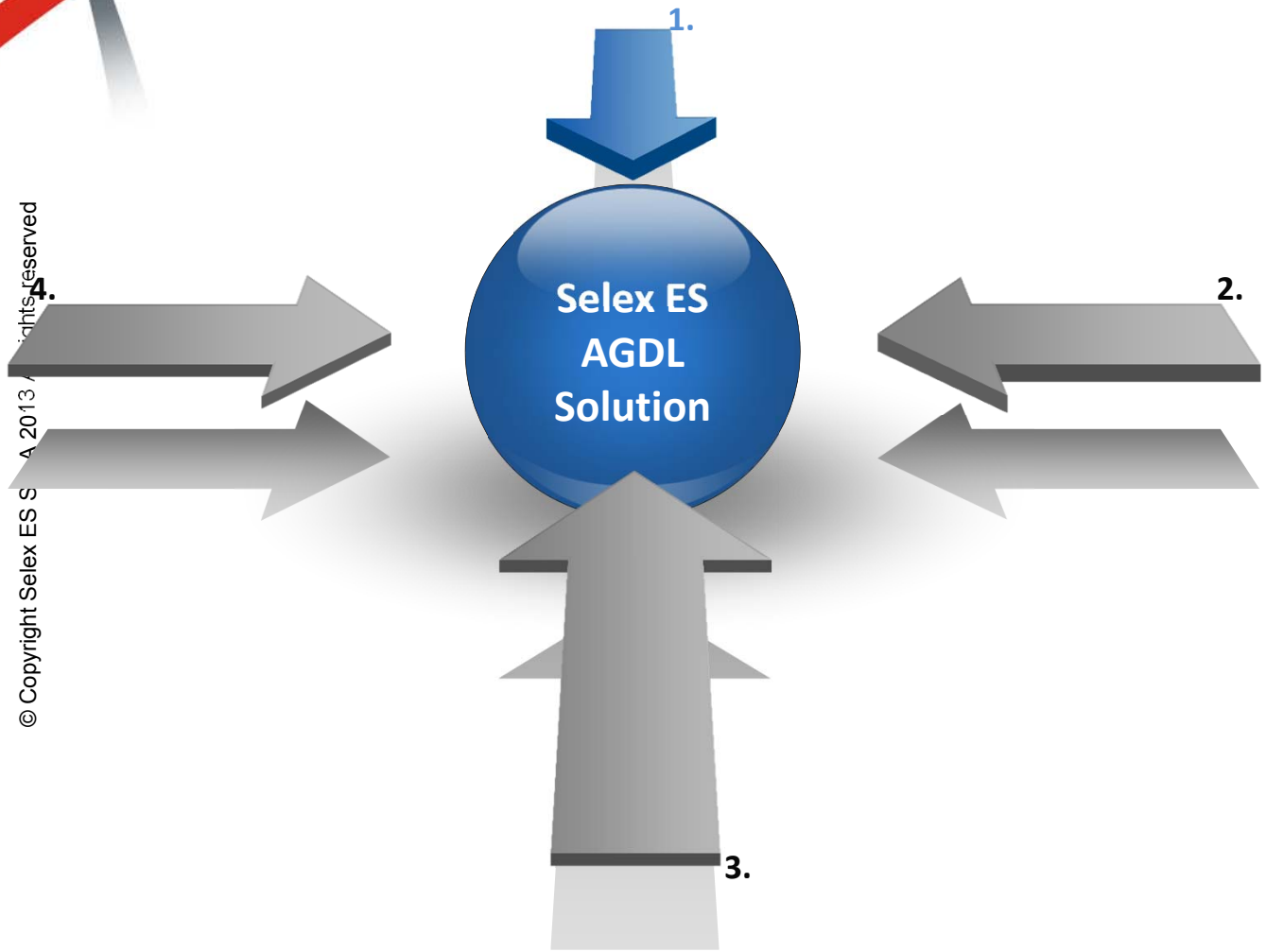
- Selex ES Company
- **Selex ES DataLink Solution**
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- Selex ES AIDC solution
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

Key Points



1. A comprehensive solution
2. International Standards
3. A fully integrated solution
4. Scalable and Flexible

Key Points

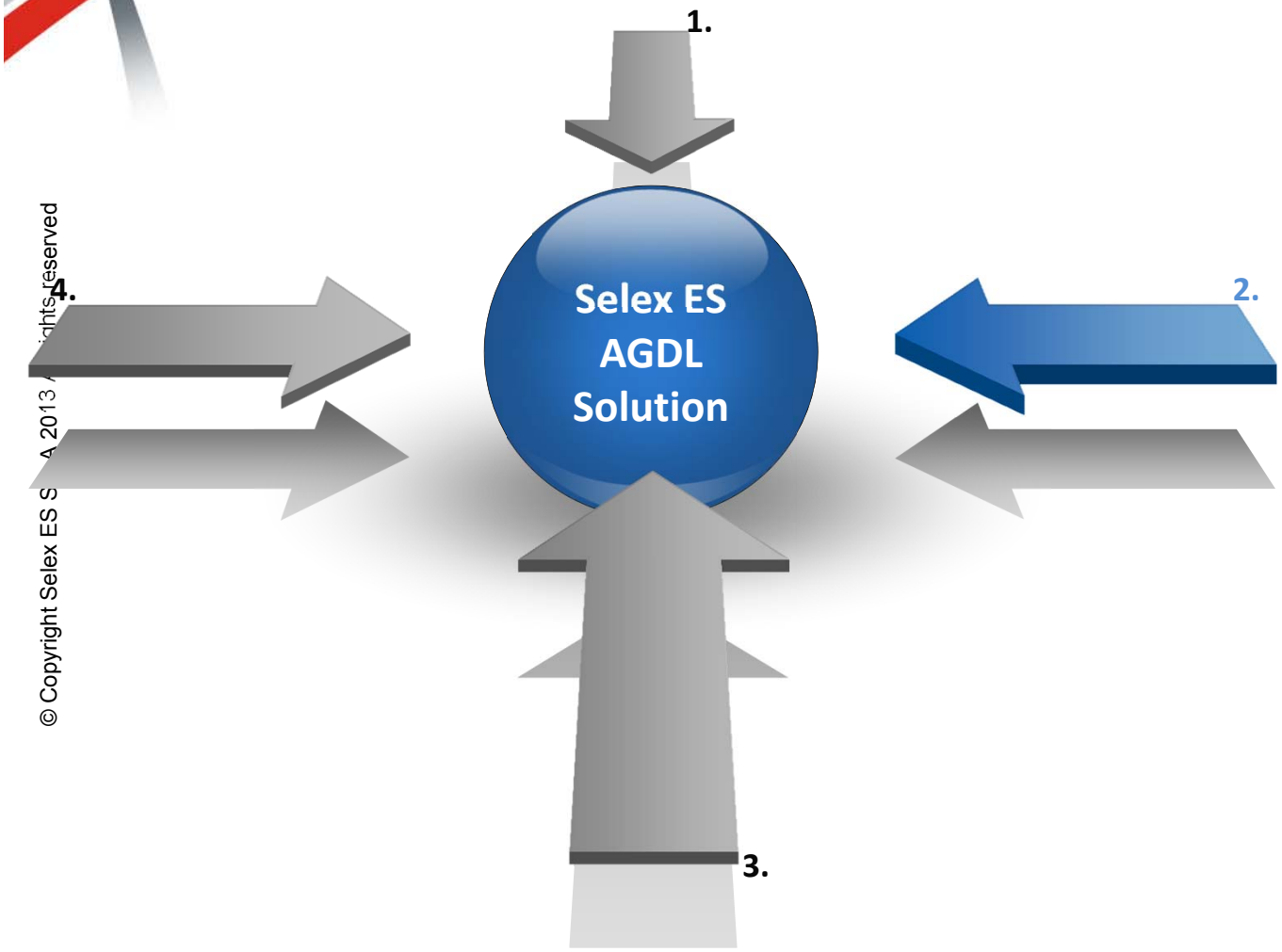


1. A comprehensive solution

Selex ES AGDL solution supports all Data-Link services for En-Route and Airport environments:

- **DCL**
- **D-ATIS**
- **AFN/CM Applications**
- **CPDLC**
- **ADS-C**

Key Points

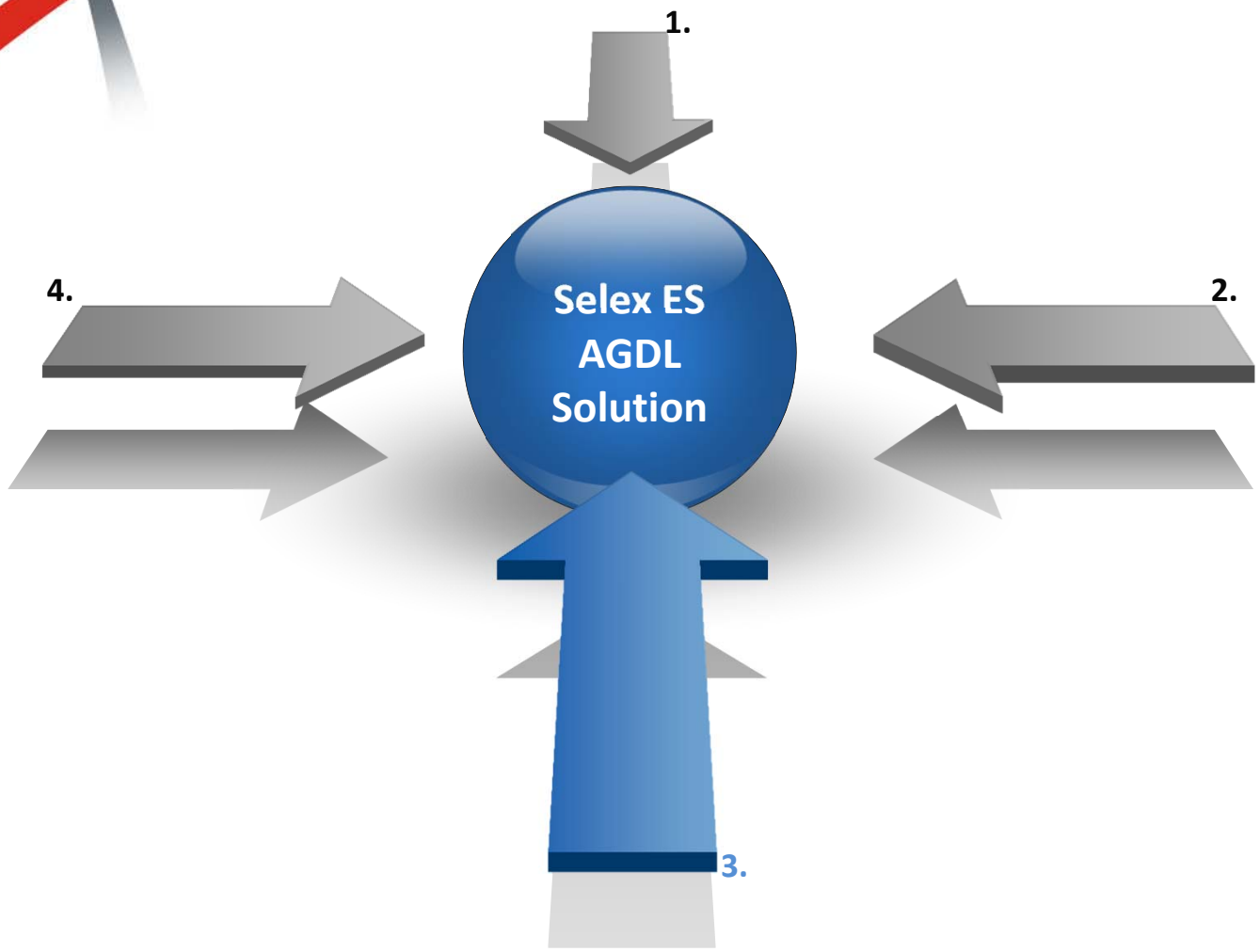


2. International Standards

Selex ES ATM systems are based on state-of-the-art solutions directly derived from international standards recommendations:

- **ED 85/A for DCL application**
- **ED 89/A for D-ATIS application**
- **ED-100 and GOLD for CPDLC (FANS equipped aircraft)**
- **ED110/B for CPDLC (ATN equipped aircraft)**

Key Points



3. A fully integrated solution

AGDL services are fully integrated in the SATCAS environment

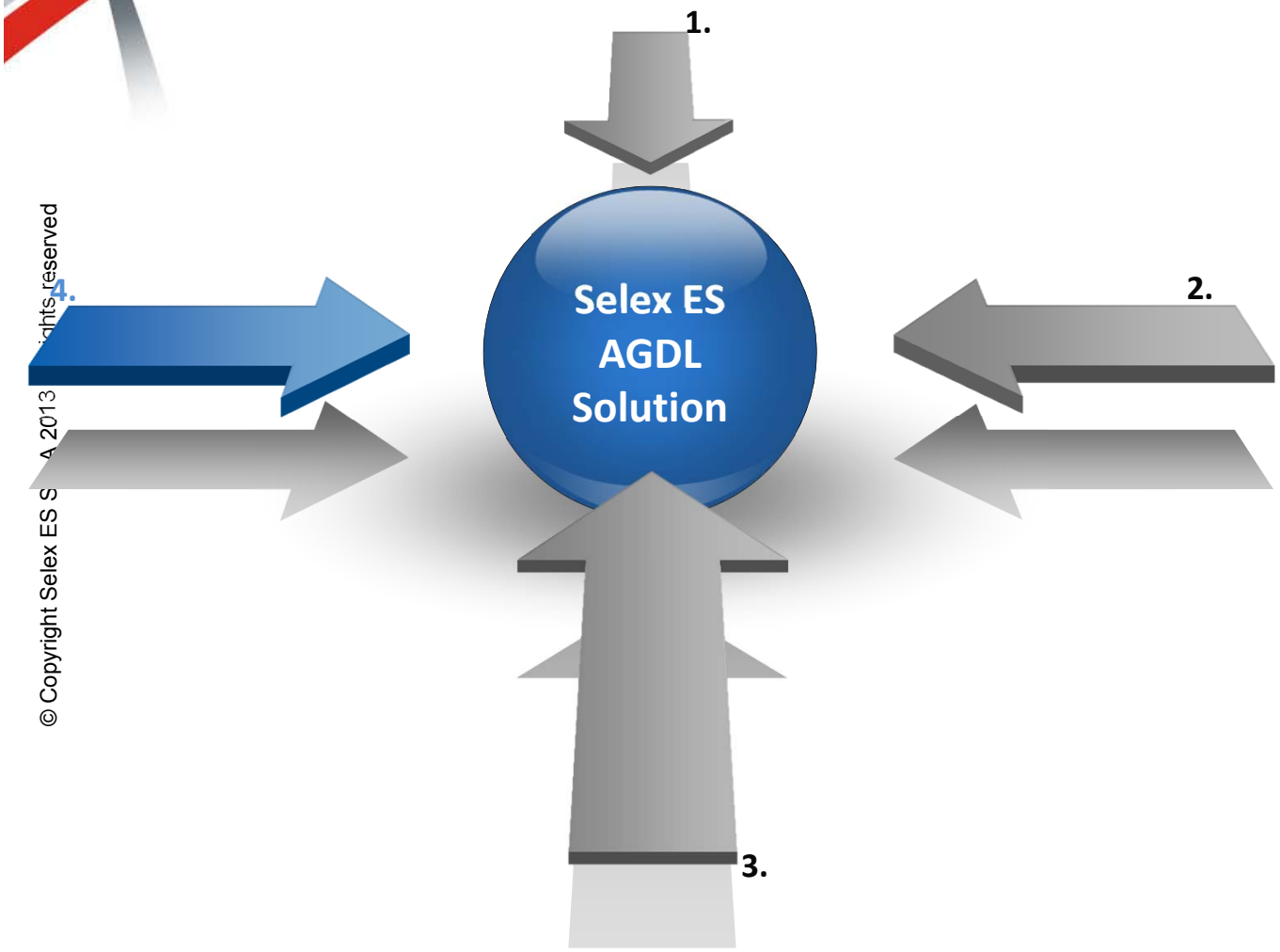
CPDLC and DCL HMI is directly available on controller positions and is harmonised with SATCAS HMI principles

DCL and CPDLC orders are fully integrated with the FDP system

Recording and Playback of AGDL services is integrated in the legal SATCAS recording

Control and Monitoring of AGDL services is integrated in the SATCAS technical maintenance platform

Key Points



4. Scalable and Flexible

Each AGDL service can be separately configured in the system. The Selex ES Solution allows to add AGDL capabilities following a stepped approach.

Selex ES AGDL solution can be configured to interface any Service Provider through any Network.

Outline

- Selex ES Company
- **Selex ES DataLink Solution**
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- Selex ES AIDC solution
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

Datalink Supported Applications (1/2)

- **AFN (ATS Facility Notification) / CM (Context Management) Application:**
  - Management of the link to ACARS/ATN Service Provider network
  - Management of Logon and Contact functions (through the DLIC service)

- **CPDLC (Controller Pilot Data Link Communication) Application:**
  - Management of the link to ACARS/ATN Service Provider network
  - Management of Connection/Disconnection, Transfer of aircraft control between sectors/FIRs, Uplink/Downlink message handling, Dialogues and Archiving (through ACM and ACL services)

- **ADS-C (Automatic Dependent Surveillance-Contract) Application:**
  - Management of the link to the ACARS Service Provider network (on ATN is being experimented in SESAR)
  - Management of ADS-C contracts (periodic, event, on-demand)
  - Performing of ADS-C tracking

Datalink Supported Applications (2/2)

DCL (Departure Clearance) Application:

- Management of the link to the ACARS Service Provider network
- Management of ACARS DCL messages (RCD, CLD, CDA and FSM)
- DCL orders are fully integrated with the FDP system

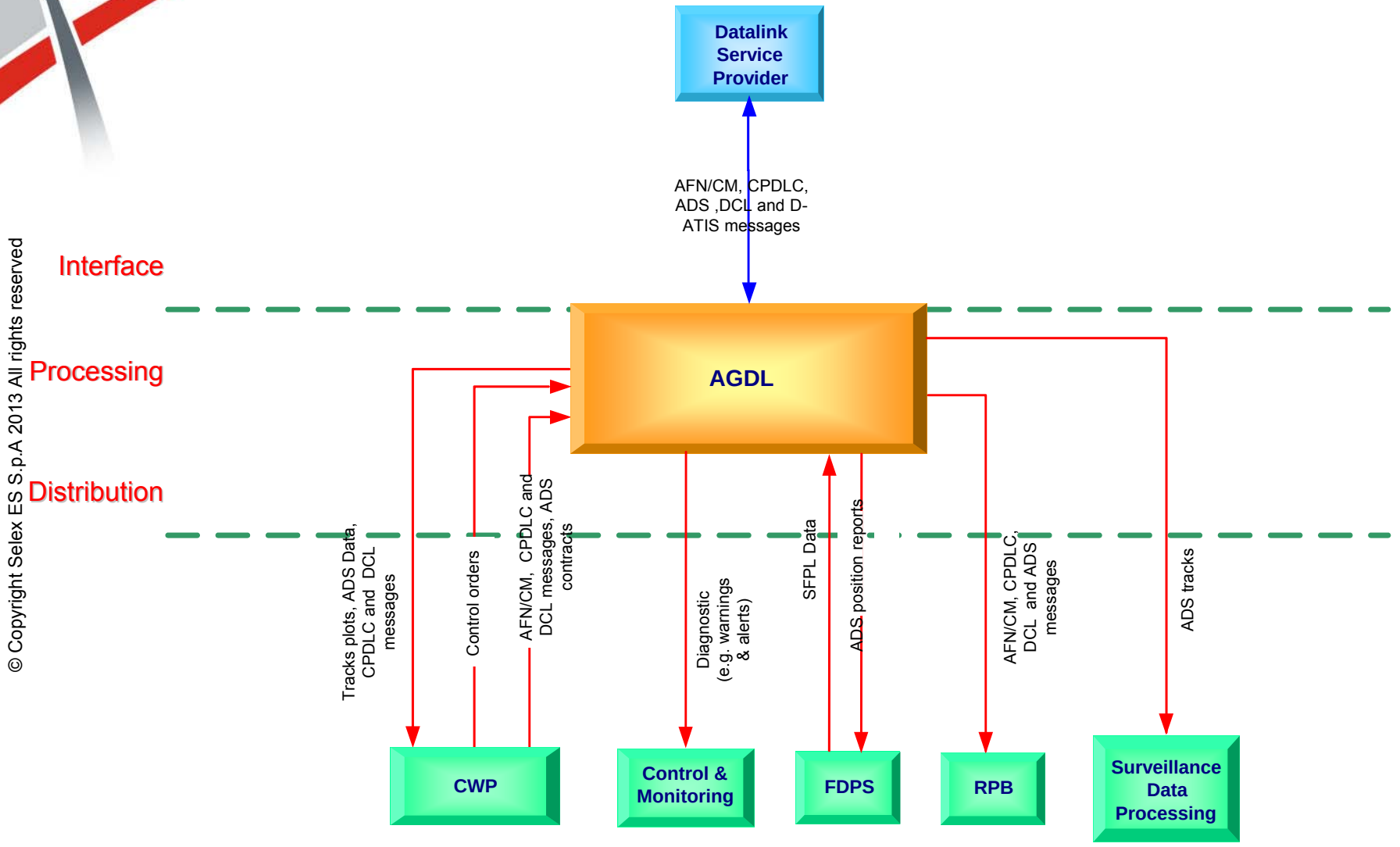
D-ATIS (Datalink-Automatic Terminal Information Service) Application:

- Management of the link to the ACARS Service Provider network
- Management of contract request (demand and update mode)
- Transmitting ATIS information via datalink

Outline

- Selex ES Company
- **Selex ES DataLink Solution**
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- Selex ES AIDC solution
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

AGDL Architecture

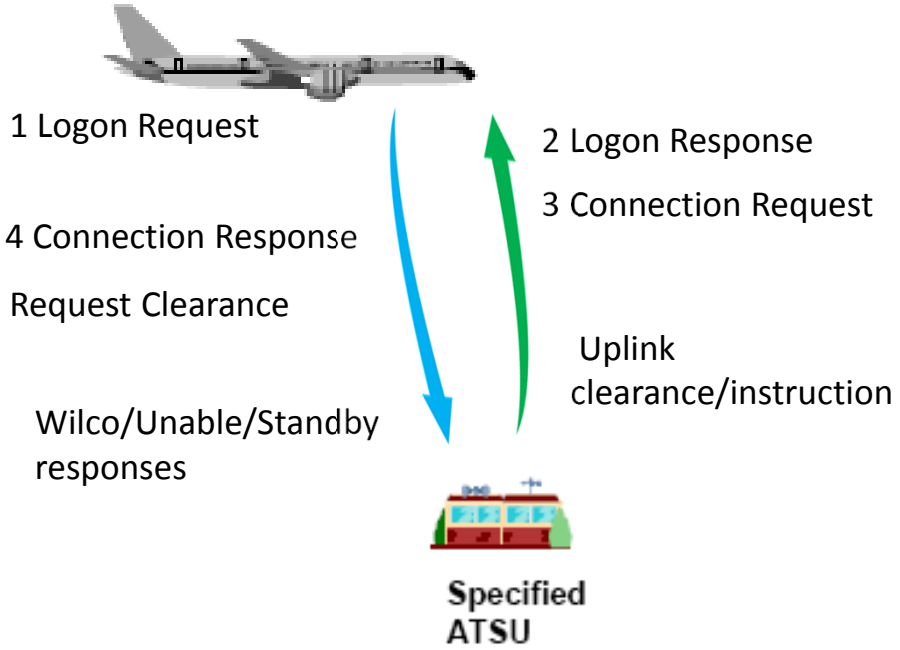


Outline

- Selex ES Company
- **Selex ES DataLink Solution**
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- Selex ES AIDC solution
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

Controller-pilot Data-link Communication (CPDLC) and AFN (ATS Facility Notification) / CM (Context Management) Application

The CPDLC application provides the CNS/ATM system with data link communications services, i.e. clearances, expected clearances, requests, reports and related ATC information. A "free-text" capability is also provided to exchange information not conforming to defined formats.



CPDLC Order: Two types of implementation

CPDLC Orders fully integrated with the FDP System

- The order can be executed in RT or DL modality
- In DL modality the controller executes the order towards the system and sends the appropriate CPDLC message to the aircraft with one action only
- In RT modality the controller executes the order towards the system without sending any CPDLC message to the aircraft

CPDLC Orders not integrated with the FDP System

- The controller executes an order for updating the FDP system and another one for sending the CPDLC message to the aircraft (two different actions are needed)
- This configuration is applicable for customers requiring to manage also CPDLC messages not related to ATC clearances (e.g. Crossing Constraints and Lateral Offset).

CPDLC: HMI features

Track Label with CPDLC functionality: allows the controller to manage CPDLC uplink and downlink messages.

CPDLC Message Out Window: displays uplink messages sent to the aircraft.

CPDLC Message In Window: displays all downlink messages. From this window the Controller can select and send to the flight the response message, by means of some push buttons:

- UNABLE
- STANDBY

CPDLC History Window: displays -on request- all the CPDLC messages exchanged between an aircraft and the ATSU.

CPDLC FLIGHT LIST: displays the status of datalink communications

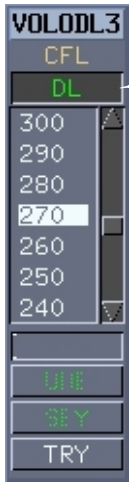
- Status of the CPDLC connection
- Status of the CPDLC dialogues

CPDLC: choice window from track Label

Examples of Choice Windows used for the management of CPDLC messages:

- Level order
- Speed Order
- Route Order

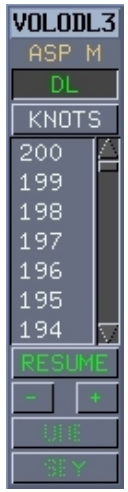
CW: Level Order



Clicking on the DL or RT button the controller can execute the order in RT or DL modality

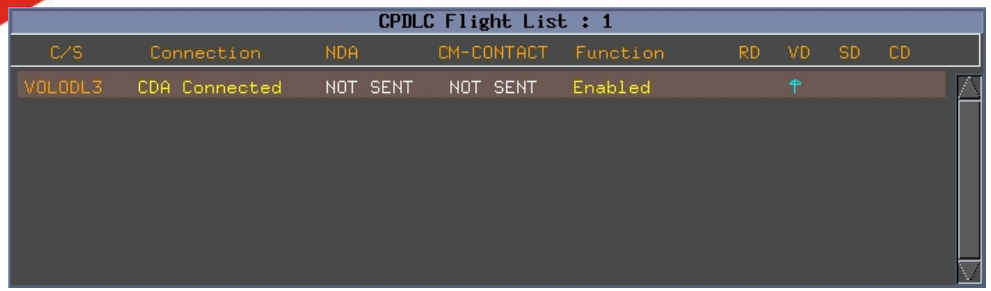
CW: DCT Order

CW: Speed Order



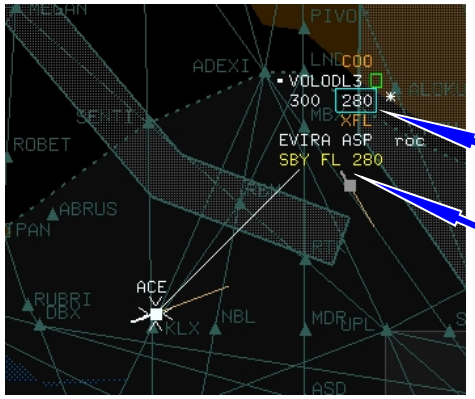
Stand By and Unable buttons permit the controller to answer Standby or Unable to a CPDLC downlink request

Uplink Message Management



The status of the CPDLC Connection and the status of the CPDLC uplink Dialogue are shown

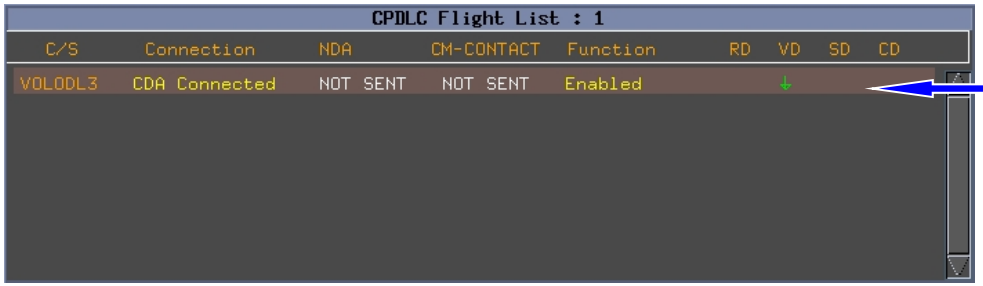
The pilot response is shown in the CPDLC Out Window near the controller's request



When a CPDLC message is sent or a pilot's response is received, appropriate information are shown in the track label:

- **The field of the label which the uplink message refers to is displayed with a frame with an appropriate colour depending on the pilot response (WILCO/UNABLE/ERROR/TIMEOUT)**
- **In the AI line (5th) the pilot response (SBY/UNB/ERR/TOUT) with the value of the request is displayed**

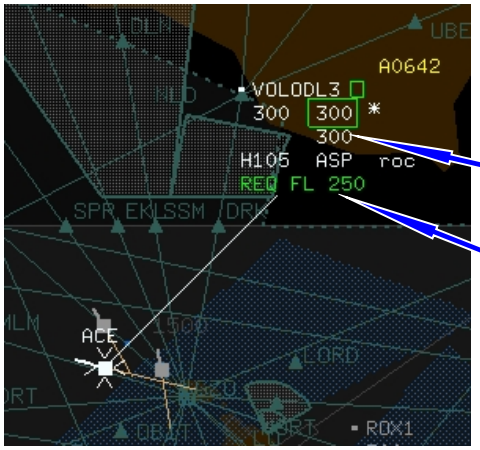
Downlink Message Management



The status of the CPDLC Connection and the status of the CPDLC downlink Dialogue are shown

The string of the message is shown in the CPDLC Message In Window in appropriate color

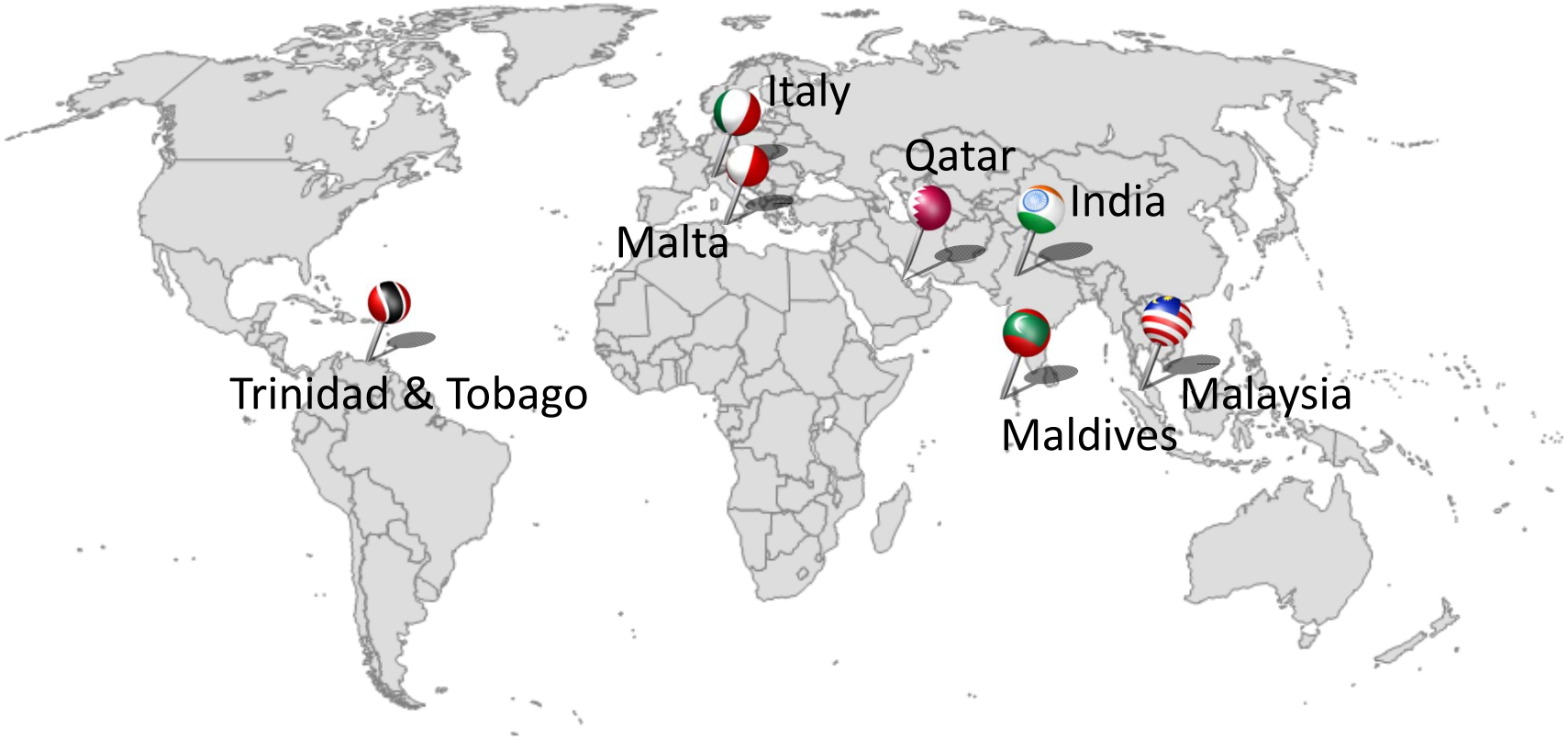
The controller can answer to a downlink request clicking on the appropriate button directly in the CPDLC Message In Window



When a pilot request is received appropriate information are shown in the track label:

- **The field of the label which the downlink message refers to is displayed with a green blinking frame**
- **The pilot request is displayed in the AI line (5th line)**

Reference



AGDL Worldwide Achievements

Outline

- Selex ES Company
- Selex ES DataLink Solution
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- **Selex ES AIDC solution**
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

AIDC – ATC Interfacility Data Communications

Purpose:

To reduce the need for verbal coordination between adjacent ATC Unit

Infrastructure:

AFTN

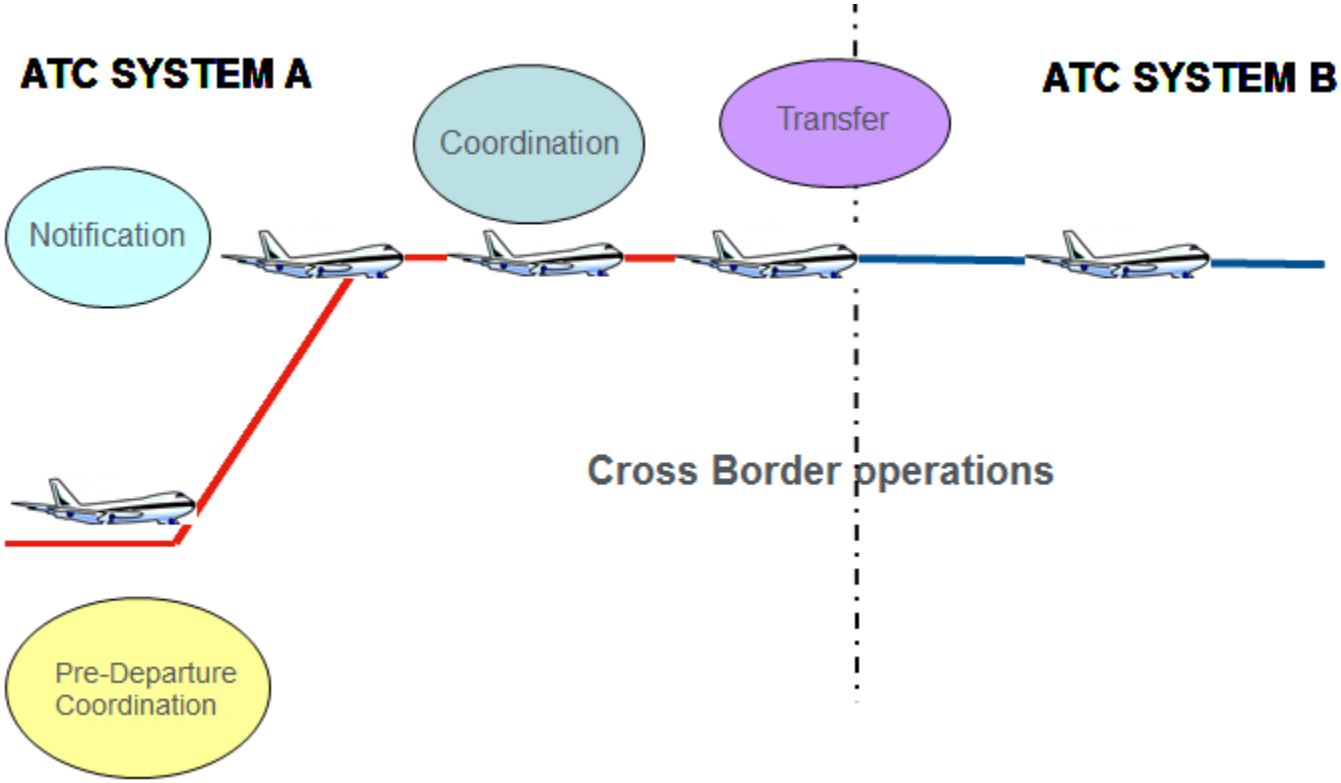
Procedure:

Message receiving, process, storing, delivering for display and transmitting according to the standard "ASIA/PACIFIC Regional Interface Control Document(ICD) for ATS Interfacility Data Communications(AIDC) Version 3.0 – September 2007"

Message fields are conform to ICAO fields definite in ICAO PANS-ATM 4444 15 Edition rules and the relevant Amendment 1 to ICAO Doc 4444 PANS-ATM

Selex ES
A Finmeccanica Company

AIDC
General Concept



MEMBER OF SESAR JOINT UNDERTAKING

1. Notification Phase

Upstream Unit
- to provide advance boundary information and revisions for the next ATC Unit;
- to update basic flight plan data;

Downstream Unit
- to receive missing flight plan data relevant to a flight that is expected to enter in the area of interest of the ATC Unit;

2. Coordination Phase

Upstream Unit
- to provide co-ordination conditions to the receiving ATC Unit
- to negotiate co-ordination conditions

Downstream Unit
- To activate the flight
- to update the basic flight plan data with the most recent information;
- to facilitate distribution and display of flight plan data to the controller working positions involved;
- To negotiate co-ordination conditions

Selex ES
A Finmeccanica Company

3. **Transfer of control Phase**
   - Upstream Unit
     - To transfer the flight
   - Downstream Unit
     - To assume the flight
4. **Re-negotiating**
   - Upstream Unit
     - to re-negotiate co-ordination conditions while the aircraft is near the common boundary
   - Downstream Unit
     - To re-negotiate co-ordination conditions while the aircraft is near the common boundary

Outline

- Selex ES Company
- Selex ES DataLink Solution
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- **Selex ES AIDC solution**
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

AIDC Messages

NOTIFICATION	
ABI	•Automatically transmitted a VSP time before the ETO at the COP. •Begins the notification phase •Provide advance boundary information and revisions to the next ATC Unit
COORDINATION	
EST	•To transmit automatically details of a flight to the downstream unit before the transfer of control; •Used in case of standard boundary condition •Transmitted for ACTIVE or LIVE flights
CPL	•To transmit automatically details of a flight to the downstream unit before the transfer of control; •Used in case of no-standard boundary condition •Transmitted for ACTIVE or LIVE flights
PAC	•Pre-departure co-ordination of a flight where flight time from departure to the COP is less than the VSP time for EST message transmission. •Transmitted for ACTIVE flights

AIDC Messages

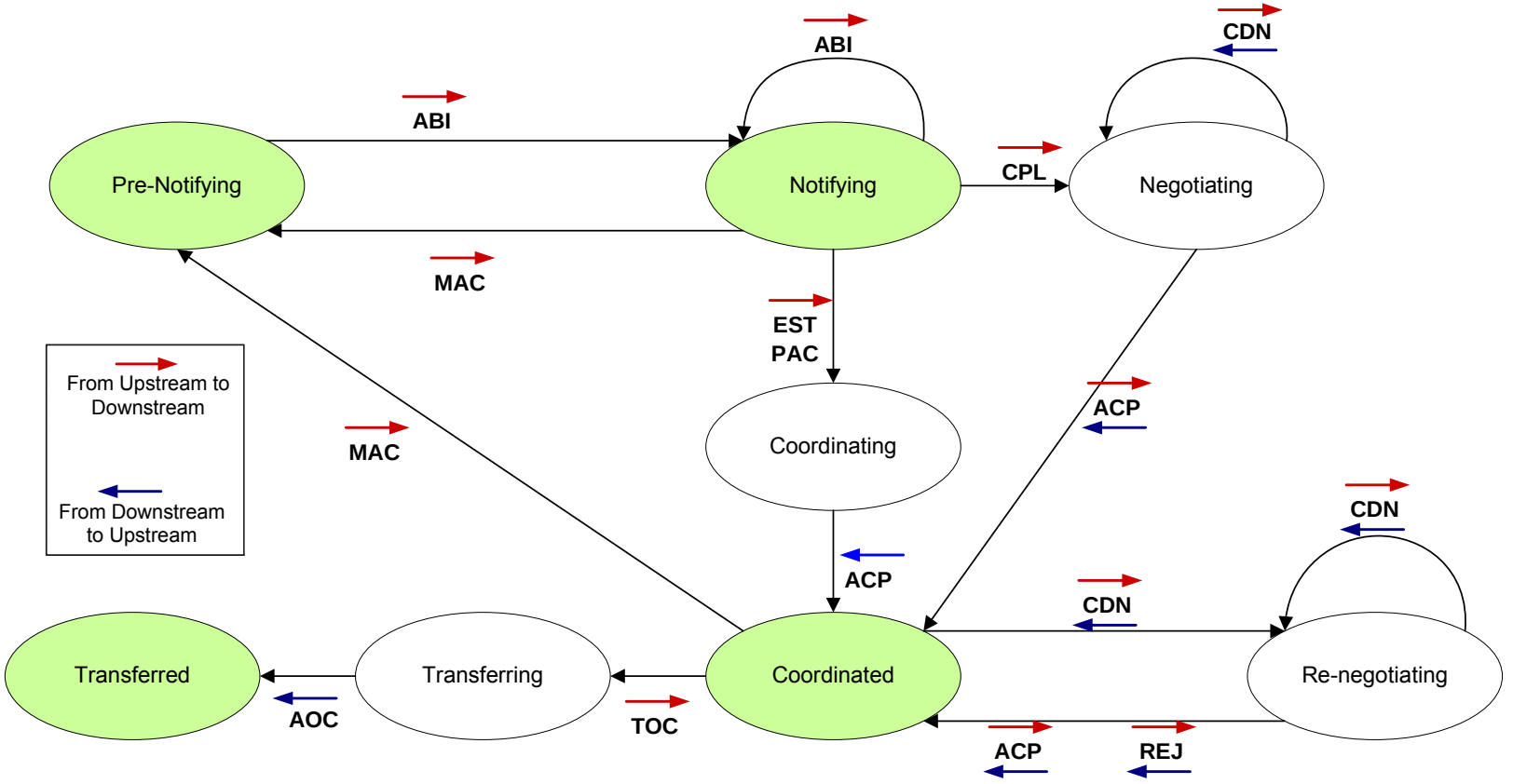
CDN	•To counter-propose the CPL/EST estimated boundary conditions •To propose new coordination conditions after the initial dialogue has been completed
ACP	•To accept the initial dialogue coordination conditions •To terminate a re-negotiation dialogue with a new mutually agreement
REJ	•To reject the conditions proposed in the re-negotiation dialogue
MAC	•To inform the downstream unit that a previous notified flight will no longer do so
TRU	•To update previously agreed coordination conditions
TRANFER OF CONTROL	
TOC	•To inform the downstream unit that it now has the control authority for the aircraft
AOC	•To inform the upstream unit that the downstream unit has now the controlling ATSU

APPLICATION MANAGEMENT	
LAM	•Automatically sent for each message that has been received, found free of error
LRM	•Used to reject a message which contained invalid information
ASM	•To confirm that the adjacent centre's ATC application system is online
GENERAL INFORMATION	
MIS	•To transmit operational information
EMG	• To transmit operational information that require immediate attention

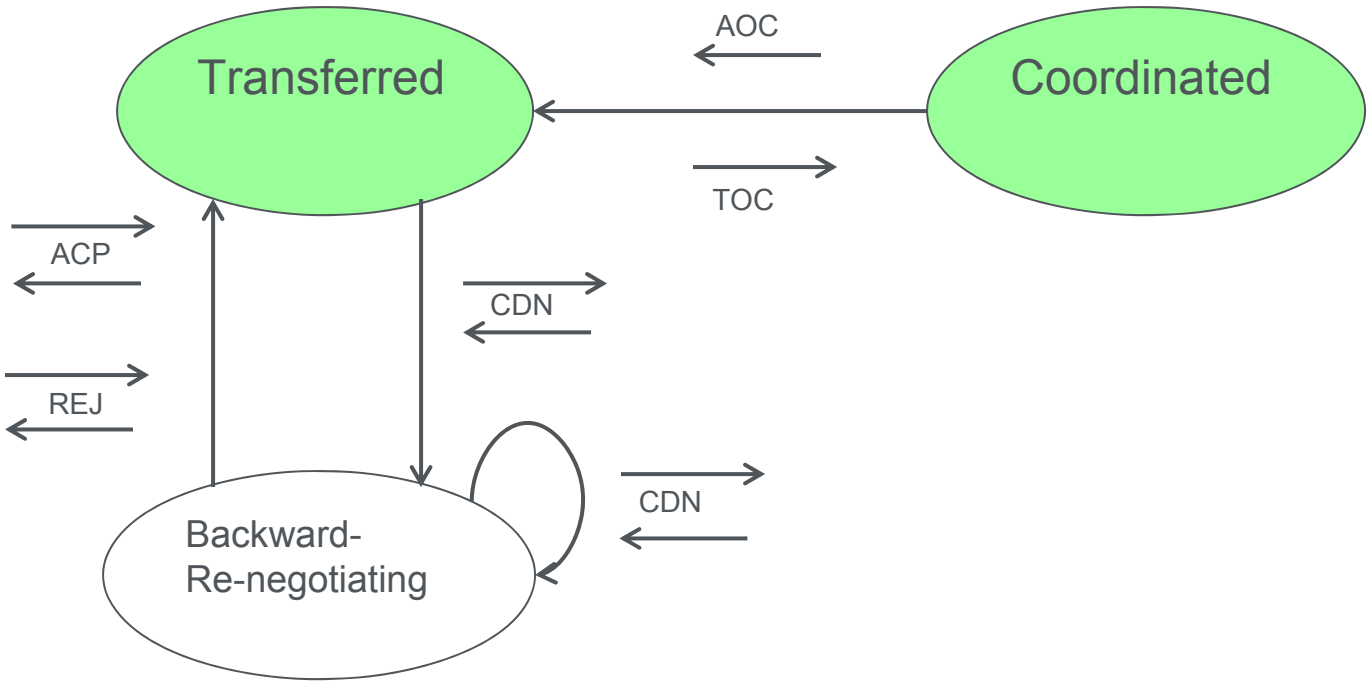
Outline

- Selex ES Company
- Selex ES DataLink Solution
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- **Selex ES AIDC solution**
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

Flight State Transitions Diagram



Flight State Transitions Diagram



Selex ES
A Finmeccanica Company

Examples

Hyderabad	Nagpur
(ABI-TEST6-LIRF-BUSBO/1235F300-VAAH-8/IS-9/B744/H-14/N0450F300 ATAPO HIA BUSBO	
(EST-TEST6-LIRF-BUSBO/1239F300-VAAH)	
	(ACP-TEST6-LIRF-VAAH)
(CDN-TEST6-LIRF-VAAH-14/BUSBO/1245F280)	
	(CDN-TEST6-LIRF-VAAH-14/BUSBO/1245F260)
(ACP-TEST6-LIRF-VAAH)	
(TOC-TEST6-LIRF-VAAH)	
	(AOC-TEST6-LIRF-VAAH)

LRM Message handling

When a LRM message is received for a transmitted message, it is sent to the “Incorrect AIDC queue” in order to be corrected and re-transmitted

From the “Incorrect AIDC queue” the operator is easily enabled to :

- correct manually in free text modality the message
- transmit the message
- delete the message
- browse the queue

Outline

- Selex ES Company
- Selex ES DataLink Solution
  - Key Points
  - Supported Applications
  - General Architecture
  - Focus on CPLDC
- **Selex ES AIDC solution**
  - General Concept
  - Messages
  - Flight State Transitions and example
  - Configuration and presentation

ATS and COPs Configuration

For each remote ATS Unit it is possible to select:

- the messages to be transmitted
- the optional fields for each message
- the “wait for coo” option

From FDP client position it is possible to configure the following parameter for each COP:

- Time interval before the COP ETO for the transmission of the first ABI
- Time interval before the COP ETO for the transmission of the EST/CPL
- LAM time out values
- Flight level variation threshold (XFL) for the transmission of revised ABI and CDN
- ETO variation threshold for the transmission of revised ABI and CDN
- Filter to identify the “standard coordination conditions”

Message presentation

All messages received and transmitted are shown on the CWP – Control Working Position:

- on FHI – Flight Hooked Information it is displayed the name of the RX/Tx messages in coordination out/in color
- on LABEL the XFL/PEL field is displayed in coordination out/in color
- on LABEL reminder are presented in line 0 (e.g. TOC)

The level coordination is shown in dedicated Coordination windows.

All messages received and transmitted are archived in specific list on FDP client position.

Selex ES
A Finmeccanica Company

SELEX-ES S.p.A.

Via Tiburtina Km 12.400
00131 Rome, Italy
+39 06 41501 – info@selex-es.com

Thank you for the attention!