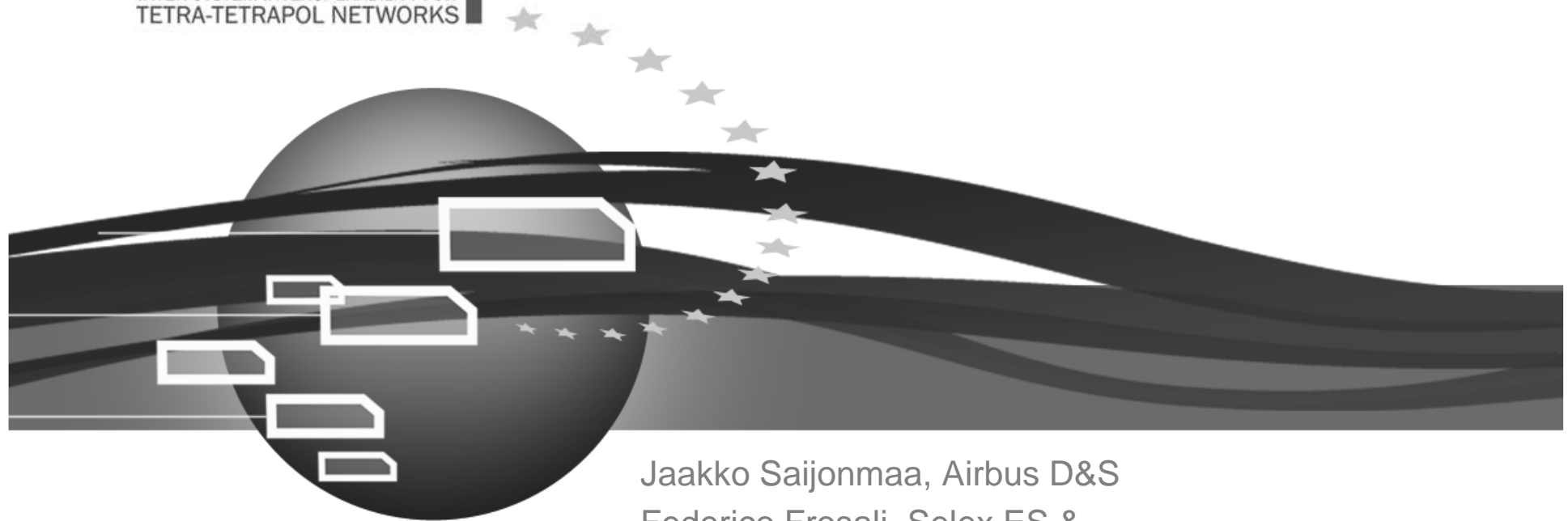


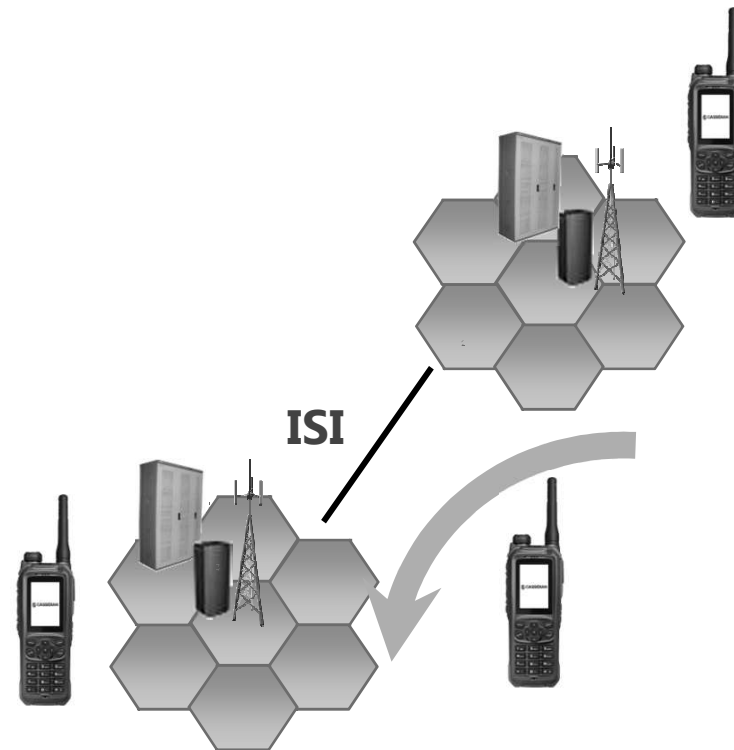


CROSS-BORDER Communications with ISI



Jaakko Saijonmaa, Airbus D&S
Federico Frosali, Selex ES &
Christian Bjerrum-Niese, Motorola Solutions

- Introduction
 - Developments so far
 - Connectivity options
- ISI Use cases
 - Supported use cases
 - Interoperability test results
- Next Generation ISI
 - ISI over IP
 - ISI Cloud
 - ISI IOP certificates
- Conclusion



- Three-country Pilot (3-CP) in 2003
 - Between Be, Ge and NL end users
 - Strong input in TETRA standard and TCCA IOP
- Swe-Ge cross border TETRA trial in 2010
 - Used BOSNET and RAKEL operational TETRA networks
 - Airbus-Airbus ISI ph1
- SISF ISI test in Romania in 2010
 - Airbus-Motorola TETRA ISI ph1
 - Border police - Phare project users
- TETRA TCCA ISI IOP definitions and test cases for ISI ph3 exist today
 - Airbus- Airbus TETRA ISI IOP certificates 2008, 2012
 - Airbus-Motorola TETRA ISI IOP certificate 2008
 - Basis for ISITEP interoperability



WHY TETRA ISI FOR CROSS BORDER COMMS

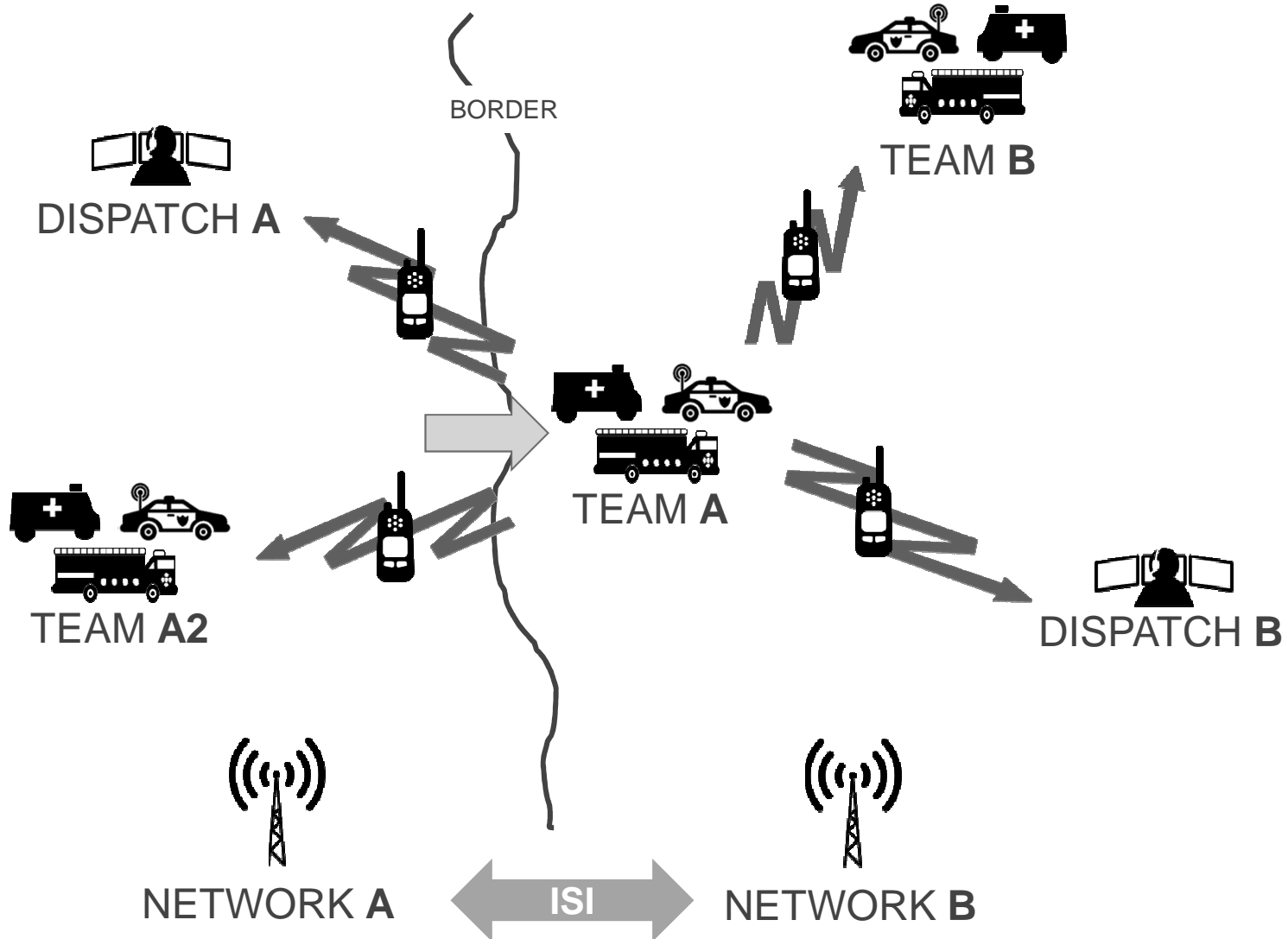
COMPARISON OF METHODS FOR TETRA – TETRA INTEROPERABILITY

Functionality	Terminal GW	Control Room GW	TETRA ISI
Clear Group Calls	●	●	●
E2EE Group Calls	●	●	●
Group addressed SDS	●	●	●
TPI/TCI	●	●	●
Clear Individual Calls	●	●	●
E2EE Individual calls	●	●	●
Individual SDS	●	●	●
Terminal migration	●	●	●
Authenticate from home	●	●	●

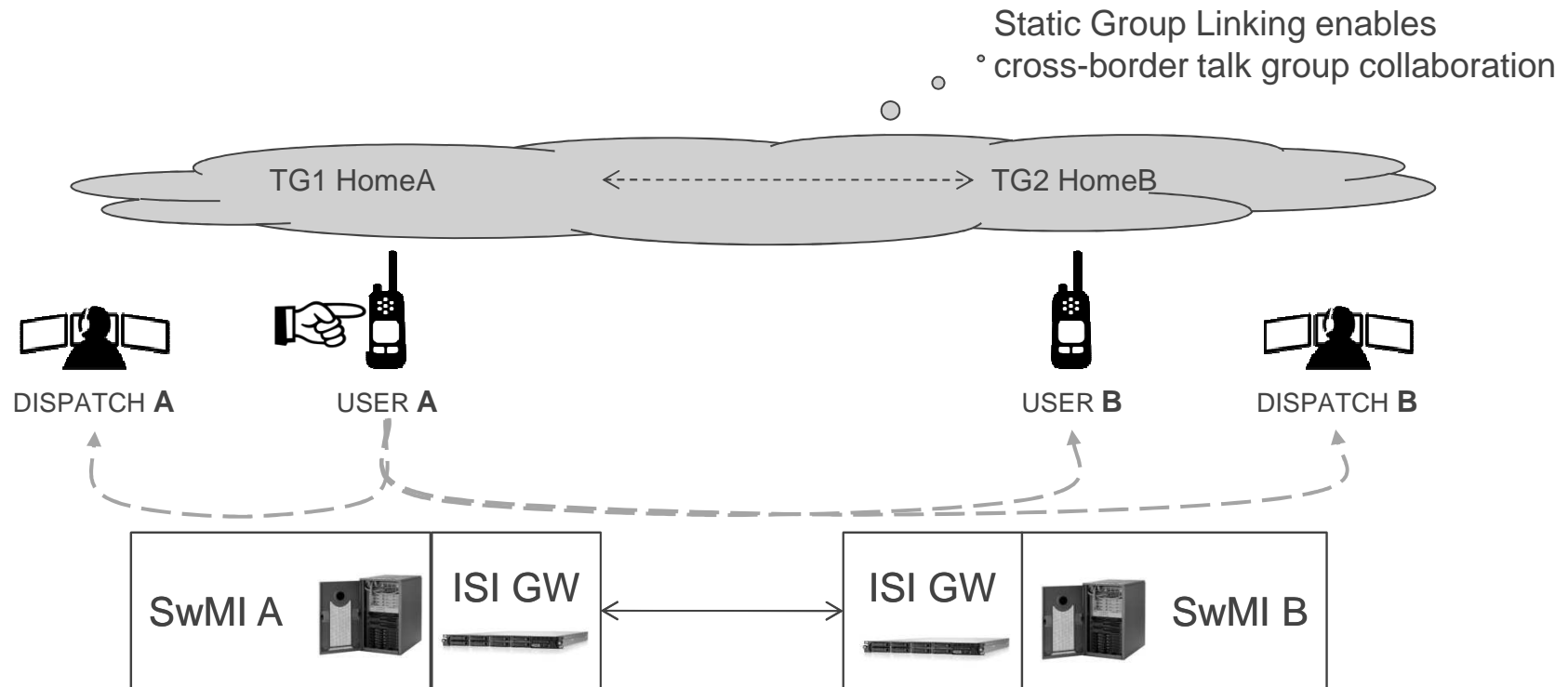
ISI USE CASES



CROSS-BORDER OPERATIONS



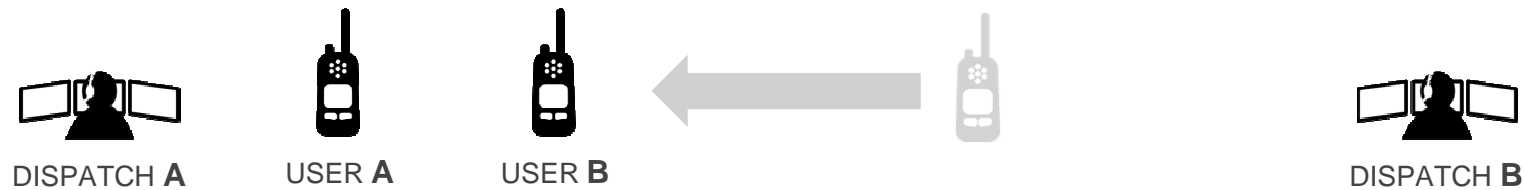
CROSS-BORDER GROUP CALL WITHOUT MIGRATION



Static Group Linking between:

- TG1 in Network A and TG2 in Network B
- Can also be implemented by an "back-to-back" gateway (very basic)

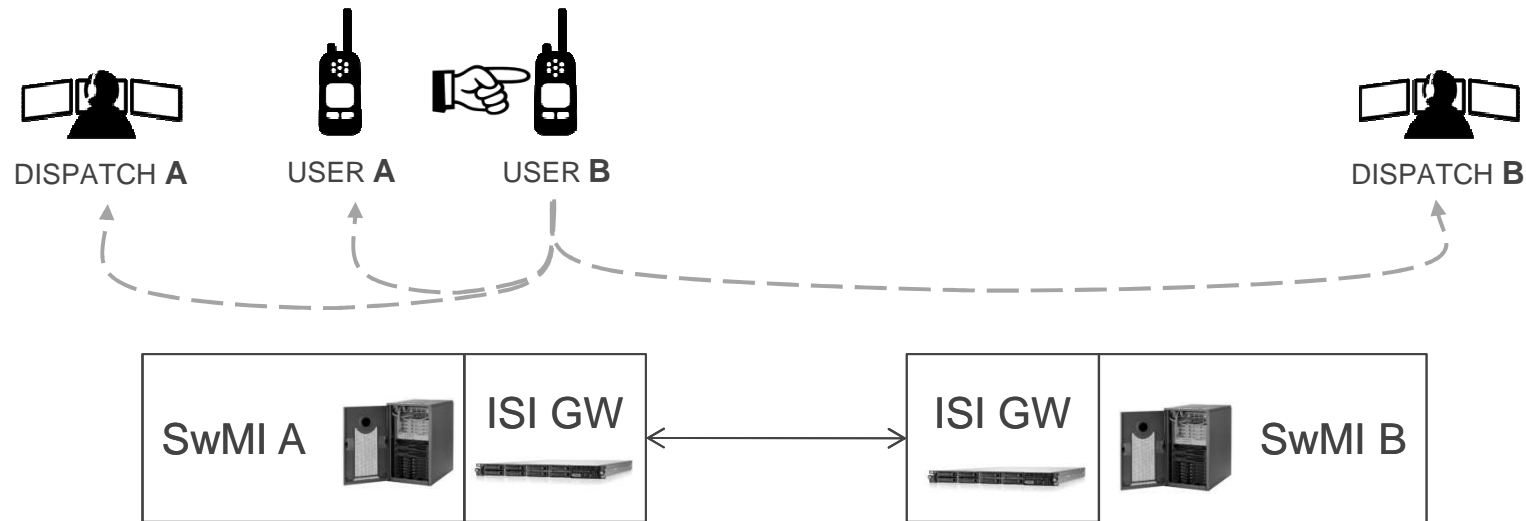
AIR INTERFACE MIGRATION OF SUBSCRIBER



Radio migration:

1. Change network
2. Authenticate from home network
3. Change talk group
(if same group address used, terminal can continue on the same selected group)

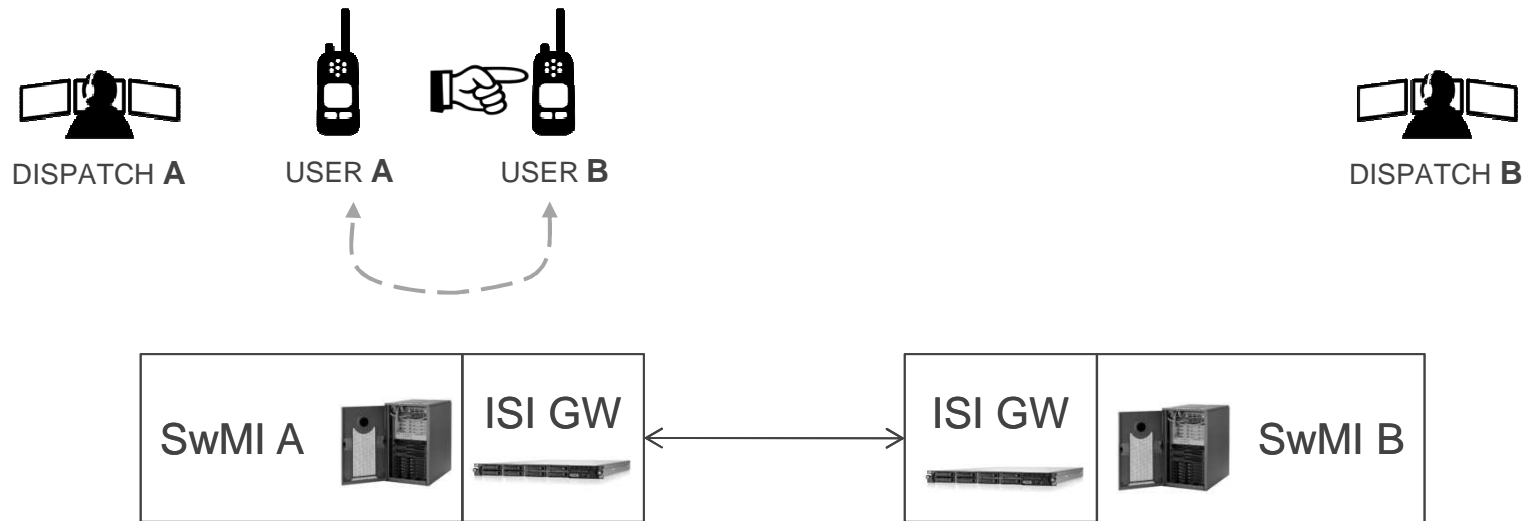
GROUP CALL BETWEEN MIGRATED AND LOCAL USER



Static Group Linking between:

- TG1 in Network A and TG2 in Network B
- Terminals and dispatchers from both networks can join (if access granted)

INDIVIDUAL CALL BETWEEN MIGRATED AND LOCAL USER



- User B dials User A with full address (incl . country/network code)
- Full duplex call is established (btw any terminal and dispatcher)
- Terminal and dispatcher must support dialling with full TETRA addresses

ISI TEST RESULTS



- With ISI between Motorola and Airbus TETRA systems you can make:
 - Migration & Authentication
 - Individual Calls
 - Telephony Calls
 - Group Calls
 - Group Patching
 - Emergency Calls
 - Exchange Short Data and Status messages
- Interoperability tested on
 - Airbus R6.0 SCD3
 - Motorola D8.3
- Test results shared with DNK and MSB in August 2015
 - Results of 66 IOP test cases

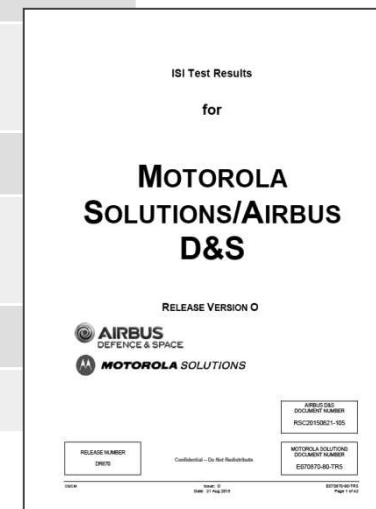




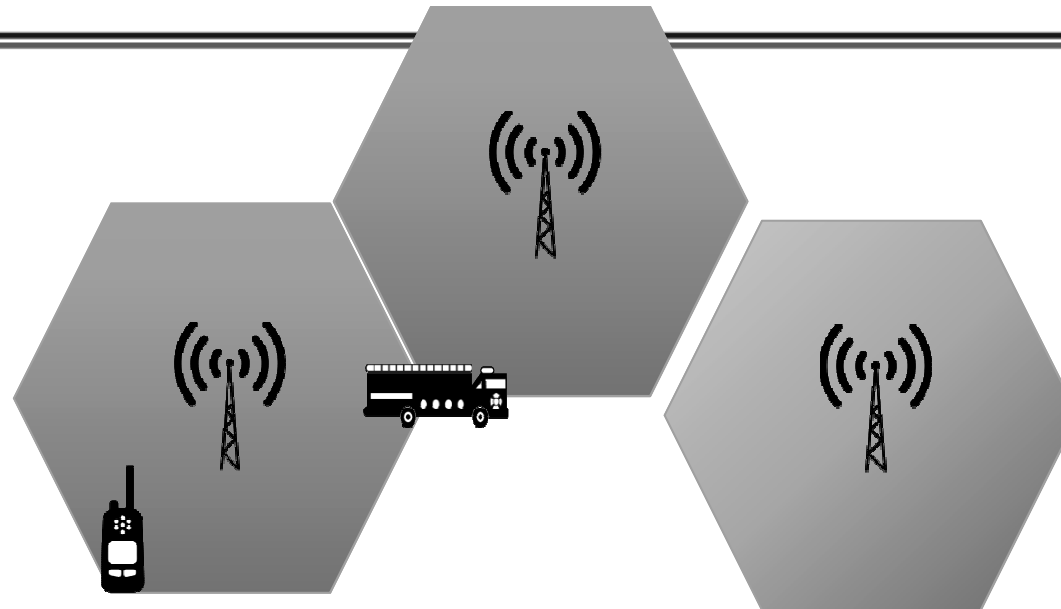
ISI SERVICE OVERVIEW

- based on Motorola-Airbus interoperability tests

IOP test case family	Use case
Migration	Terminal migration to/from foreign SwMI
Individual Call	Individual call <ul style="list-style-type: none"> • between any terminal located in any SwMI
Telephone Call	Inbound telephone interconnect for visiting foreign terminals Outbound telephone call handled locally by visited SwMI
Individual Short Data	Send SDS from terminal to terminal/fixed host: <ul style="list-style-type: none"> • from any terminal located in any SwMI
Group Short Data	Send SDS from terminal to local linked group (with limitations)
(Individual Status)	Show rejection of Individual status messages
Group Status	Send Status from any terminal to local linked group
Group Call	Group call <ul style="list-style-type: none"> • between any terminal located in any SwMI
Group Combining	Patching of homed talkgroups to linked talkgroups
Emergency Call	Emergency Group Call <ul style="list-style-type: none"> • between terminals and dispatchers in any network
Authentication	Authentication of visiting terminals
Encryption	Delivering key material for Air Interface Encryption



- Individual Short Data from MS-ISDN source
 - MS-ISDN addressing not supported inside Motorola network
 - MOT ISI GW rejects when MS-ISDN source from Airbus network sends Short Data message
- Group-addressed Short Data
 - Different interpretations of group addressing of SDS
 - Works when either
 - Airbus is controlling SwMI
 - Store & Forward is deactivated in Airbus SwMI
 - Sent from a Control room application



MIGRATION ACROSS BORDERS (ISI)

NEIGHBOURS

CURRENTLY NO KNOWLEDGE OF
NEIGHBOURS ACROSS ISI BOUNDARY

INITIATION OF HANDOVER

NOT DEFINED : COULD BE USER INITIATED OR
“AUTOMATIC” ON LOSS OF COVERAGE

CALL IMPACT

BREAK IN COMMS FOR TIME IT TAKES TO
FIND NETWORK & REGISTER

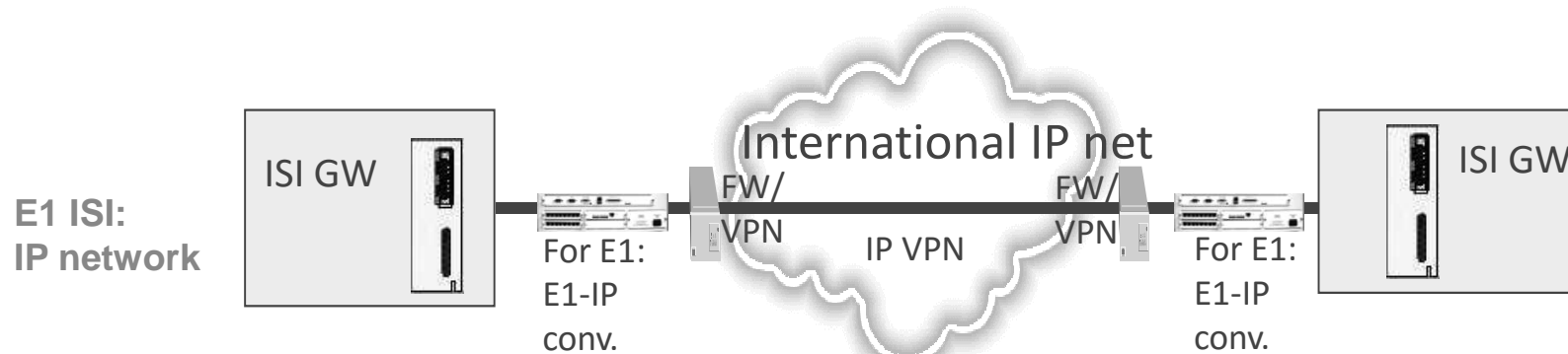
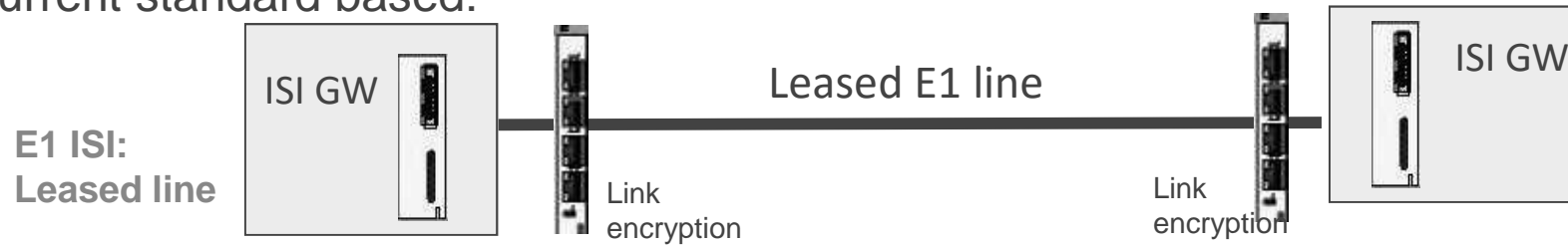
- ISI over IP
- Visited network is able to register visiting terminals having the same ISSI's as local ones.
- Home network is able to determine which terminal is allowed to migrate
- Pre-provisioning of the visiting ITSI ranges
- Authentication of the visiting ITSI by its home network
- Air Interface Encryption (AIE)
- Individual Voice Call (phone alike)
- Individual sending of short data messages
- Voice group call using linked group
- Group sending of short data messages using linked group
- Group sending of status messages using linked group
- Voice group call using local group
- Group sending of short data messages using local group
- Group sending of status messages using local group
- Locally sending, by DGNA, a local GSSI to a visiting ITSI



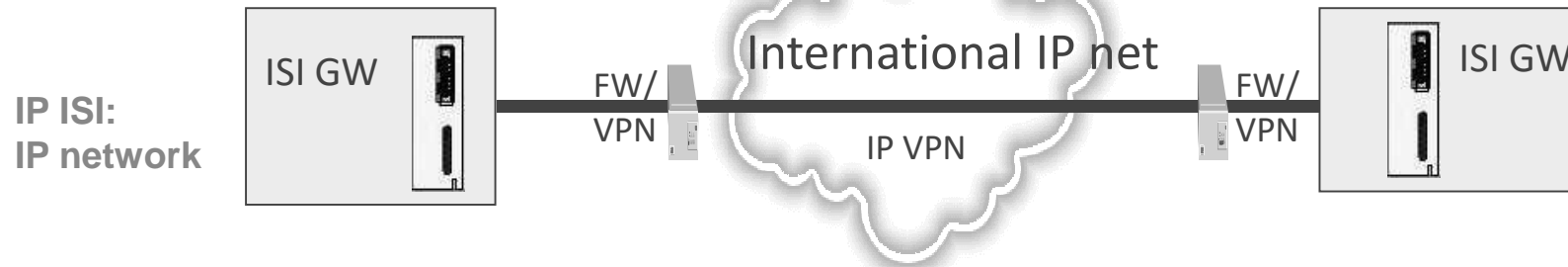
NEXT GEN ISI

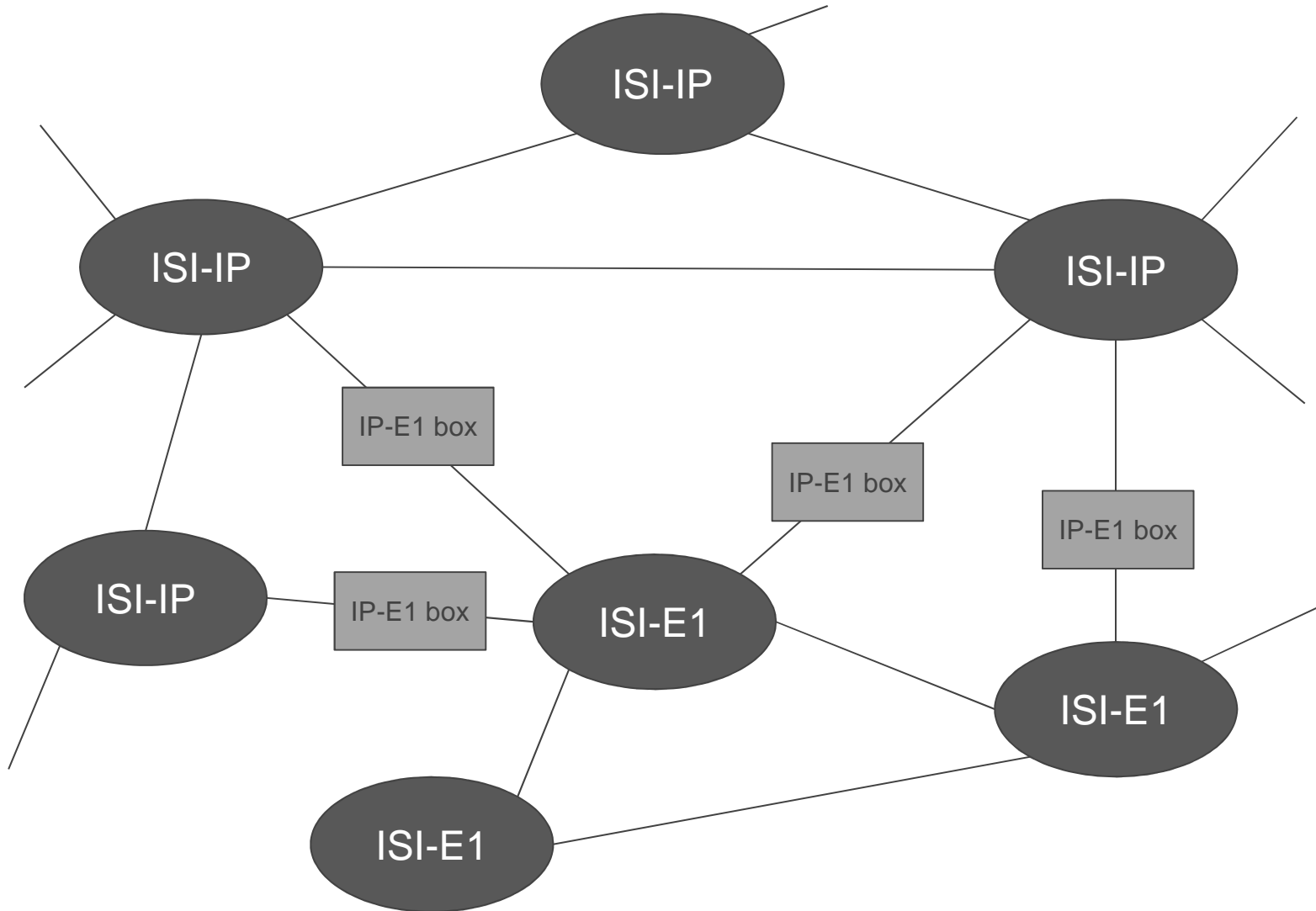


Current standard based:



New standard based:



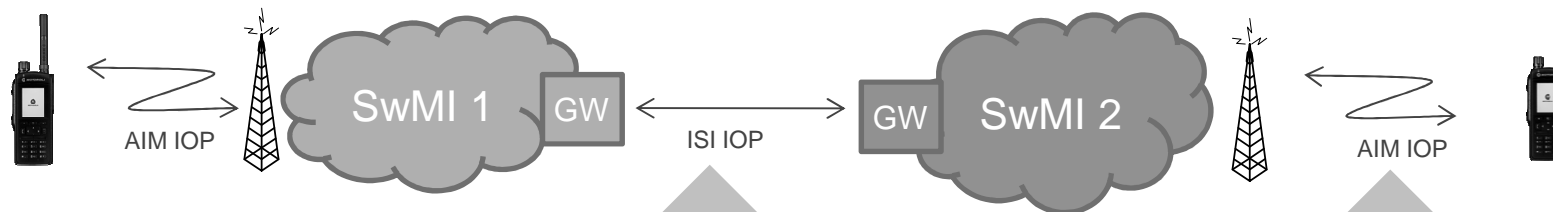




TCCA defined ISI IOP Phases 1-4

	Feature	Scenario
Phases 1 & 2	Authentication	
	Individual Call	<ul style="list-style-type: none"> • Individual call to a subscriber from the home SwMI (while migrated) • Individual call to a subscriber from the visited SwMI (while migrated) • Individual call to a subscriber from another SwMI (while migrated) • Individual call to a foreign subscriber (not migrated)
	Group Call	<ul style="list-style-type: none"> • Group call when located in group home SwMI • Group call when not located in group home SwMI
	Telephone Call	<ul style="list-style-type: none"> • Outgoing Calls • Incoming Calls
	Status	
Phase 3	Short Data Service	
	Mobility Management	<ul style="list-style-type: none"> • Migration authorisation by the home SwMI, through preprovisioning in foreign SwMI • Group access mgmt by the group's home SwMI, through pre-provisioning in the foreign SwMI
	Air Interface Encryption	<ul style="list-style-type: none"> • DCK Encryption
	Emergency Call	
	End-to-End Encryption	
Phase 4	Supplementary Services	<ul style="list-style-type: none"> • Call Line Identification Presentation • Talking Party Identification • Preemptive Priority Call • Late Entry • Air-to-Ground-to-Air Operation
	Supplementary Services	<ul style="list-style-type: none"> • Enable/Disable • Individual DGNA • Preemptive Priority Call • Barring of Outgoing Calls • Barring of Incoming Calls
	Air Interface Encryption	<ul style="list-style-type: none"> • OTAR of GCK • OTAR of SCK
	Packet Data	

Reference: TCCA document TF10-56-22r1



Inter-System Interface

- TCCA specifications for ISI Inter-System Interface
 - Mobility Management (003-01)
 - Individual Call (003-02)
 - Short Data Service (003-03)
 - Lower Layers (003-04)
 - Speech Format (003-05)
 - Group Call (003-06)
 - All TIPs, Test Cases and TIC-RTs available
- IOP dual-vendor session
 - Two SwMIs/GWs
 - Radio terminal needed as testing (tool) equipment

Air interface

- Certified according to V+D Air Interface Specification
 - Air Interface Migration (001-06)
 - All TIPs, Test Cases and TIC-RTs available
- IOP multi-vendor session
 - Hosted by the SwMI manufacturer (Motorola, Airbus, Selex)
 - Motorola, Sepura, Airbus, Selex, and other subscribers are invited for testing



CONCLUSIONS

- Motorola, Selex and Airbus working together to enable TETRA ISI
- ISI IOP Phase 3 functionality ready for operational usage
- ISITEP trials shall prove it works