

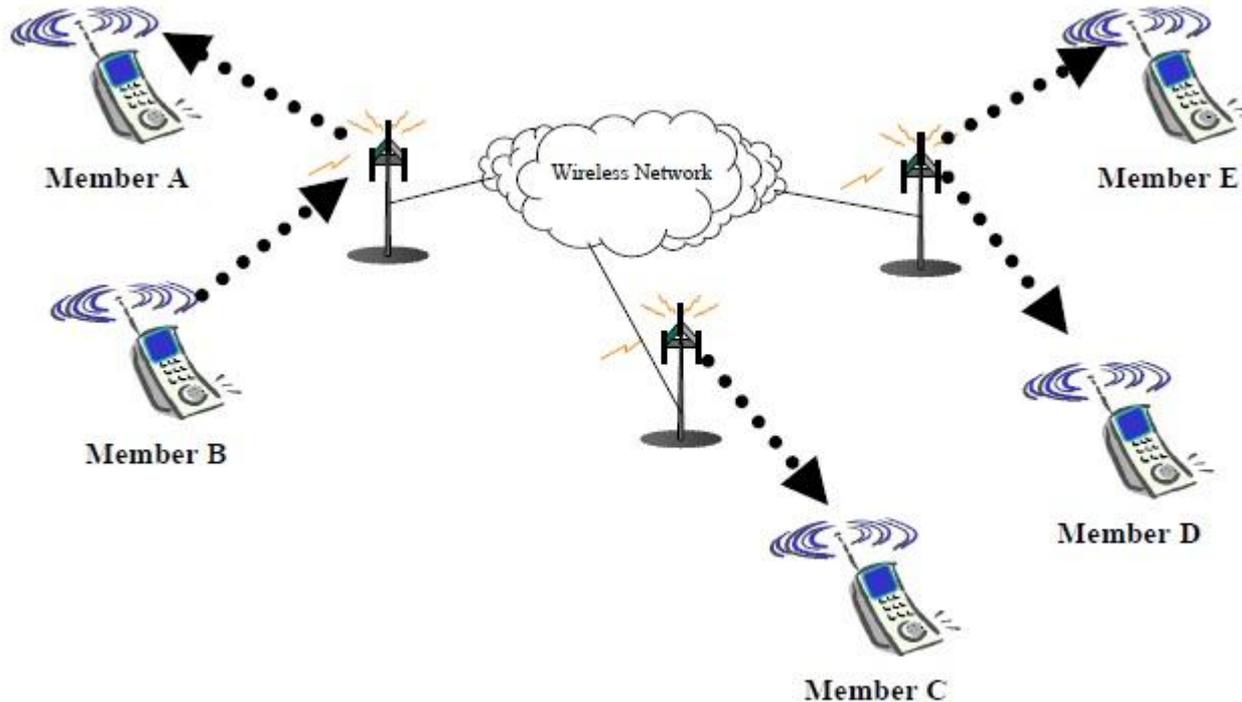
OMA PoC as a Group Communication Service Enabler
For consideration in the GCSE_LTE work item

S2-131147; Intel

OMA PoC as a Group Communication Service Enabler

- **What is OMA PoC?**
 - **PoC session**
 - **PoC Server roles**
 - **PoC Server relationship in PoC Group sessions**
 - **Media flow handling**
 - **Multicast PoC Channel**
 - **OMA PoC + eMBMS simplified architecture**
 - **Identifiers in OMA PoC**
 - **Example call flows**
 - **What needs to be done in GCSE_LTE?**
- **Interworking with ProSe**
 - **GCSE and UE-to-Network Relay**
 - **PoC Relay example call flows**
 - **Group Identifiers revisited**

What is OMA PoC? (1/2)



- Push to talk over Cellular (PoC) is an IMS-based service intended to provide rapid communications for business and consumer customers of mobile networks
- OMA PoC V2.1 allows Audio (e.g. speech, music), Video (without Audio component), still image, text (formatted and non-formatted) and file sharing with a single recipient (1-to-1) or among multiple recipients in a group (1-to-many)

What is OMA PoC? (2/2)

- OMA PoC specifications define the following:
 - System architecture (e.g. PoC Servers, PoC Clients, PoC Server roles, etc.)
 - Control plane procedures (based on SIP signalling)
 - User plane procedures (e.g. talk/media burst control)
 - Procedures for use of Multicast PoC channels (e.g. MBMS)
- Talk and Media burst control is performed via OMA-defined protocols
 - Talk Burst Control Protocol (TBCP)
 - Media Burst Control Protocol (MBCP)
 - MBCP is based on the RTCP Application Packets (RTCP: APP), as defined in RFC3550, but MBCP messages do not conform to the rules for compound RTCP packets or RTCP packet transmission

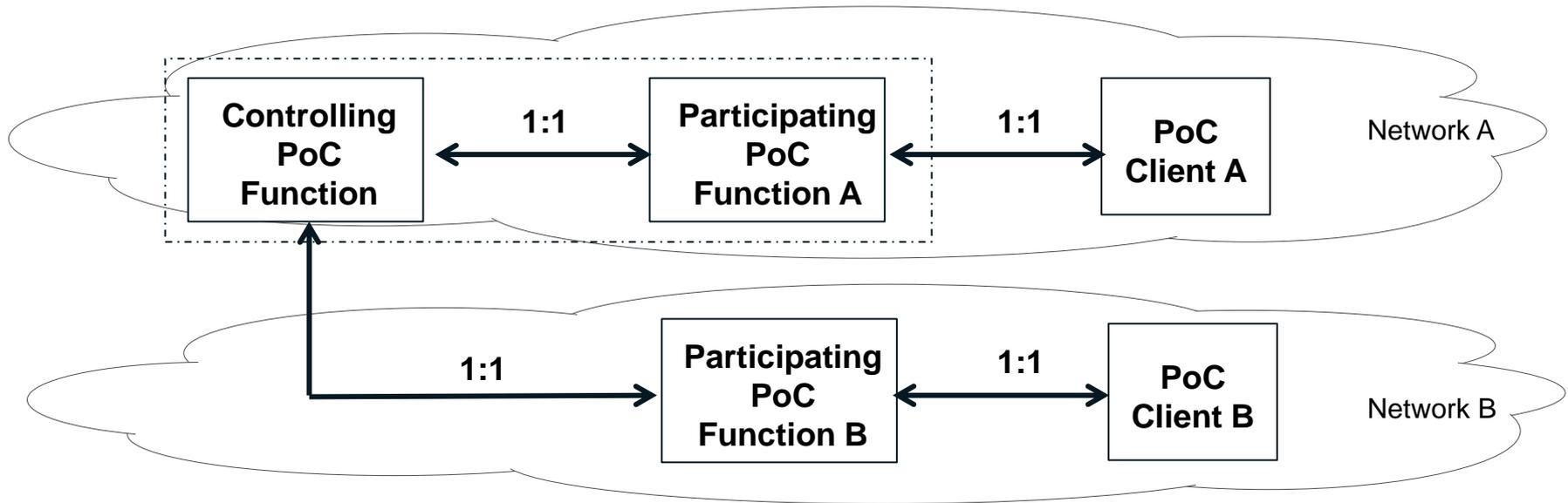
PoC Sessions (1/2)

- **PoC Session** is a SIP Session established by the OMA PoC procedures
- There are four types of PoC Sessions:
 - **1-1 PoC Session:** a feature enabling a PoC User to establish a PoC Session with another PoC User
 - **Ad-hoc PoC Group Session:** a PoC Group Session established by a PoC User to PoC Users listed on the invitation. The list includes PoC Users or PoC Groups or both
 - **Pre-arranged PoC Group:** a persistent PoC Group. The establishment of a PoC Session to a Pre-arranged PoC Group results in the members being invited
 - **Chat PoC Group:** a persistent PoC Group in which a PoC User individually joins to have a PoC Session with other joined PoC Users (i.e. the establishment of a PoC Session to a Chat PoC Group does not result in other PoC Users being invited)

PoC Sessions (2/2)

- According to the communication method used, the PoC Group Sessions can also be categorised as:
 - **1-many PoC Group Session:** a PoC session with many participants and in which all participants can communicate with each other
 - **Dispatch PoC Group Session (a.k.a. 1-many-1 PoC Group Session):** a PoC session established by a PoC user to a *Pre-arranged* PoC Group, in which one participant is **PoC Dispatcher** (a.k.a. *Distinguished Participant*) and other participants are **PoC Fleet Members** (a.k.a. *Ordinary Participants*)
- The PoC Dispatcher sends media to all PoC Fleet Members, and receives media from any PoC Fleet Member
- The PoC Fleet Member is only able to send media to the PoC Dispatcher and is likewise only able to receive media from the PoC Dispatcher

PoC Server Roles (1/2)

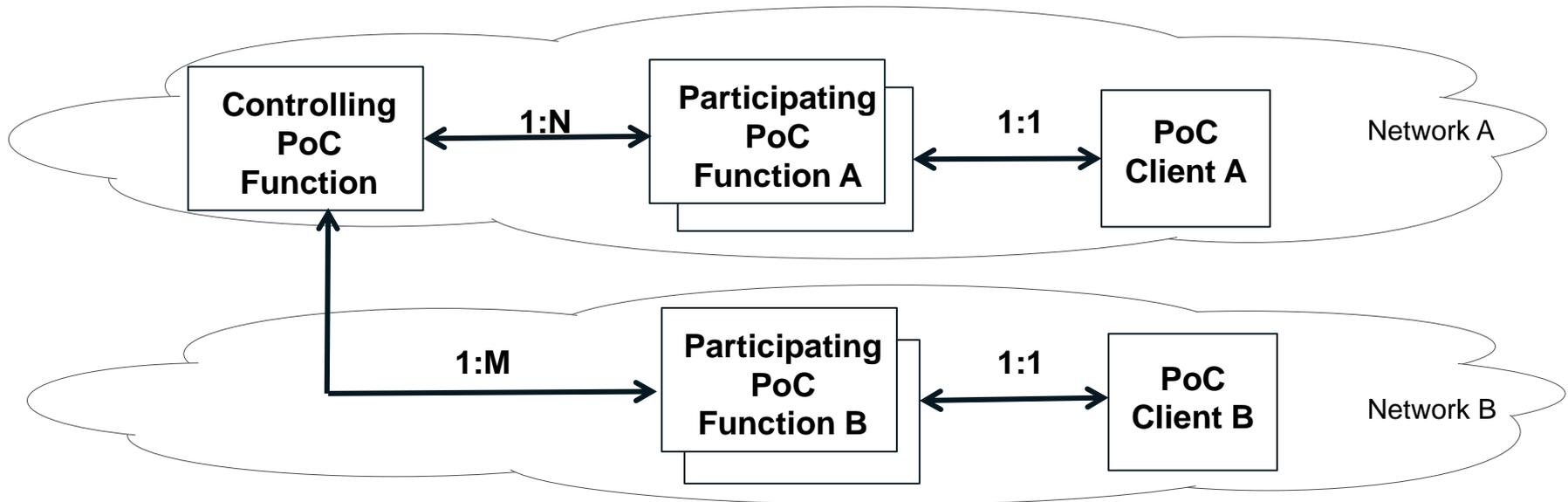


- A PoC server takes the role of a **Controlling PoC Function** or **Participating PoC Function**
- The role determination takes place during the PoC session setup and lasts for the duration of the whole PoC session

PoC Server Roles (2/2)

- **Controlling PoC Function**: provides centralised PoC Session handling, which includes Media distribution, Talk/Media Burst Control, policy enforcement for participation in PoC Group Sessions, and Participant Information
- **Participating PoC Function**: mostly relays TBCP/MBCP messages and RTP media between the PoC Client and the Controlling PoC Function. Also performs policy enforcement for incoming PoC Sessions and decides to use a unicast or multicast PoC channel in a cell
- For 1-1 PoC Session and Adhoc PoC Group Session the PoC Server of the inviting user shall be capable of performing the Controlling PoC Function
- For Chat PoC Group and Pre-arranged PoC Group Session the PoC Server hosting the PoC Group shall be capable of performing the Controlling PoC Function

PoC Server Relationship in PoC Group Sessions

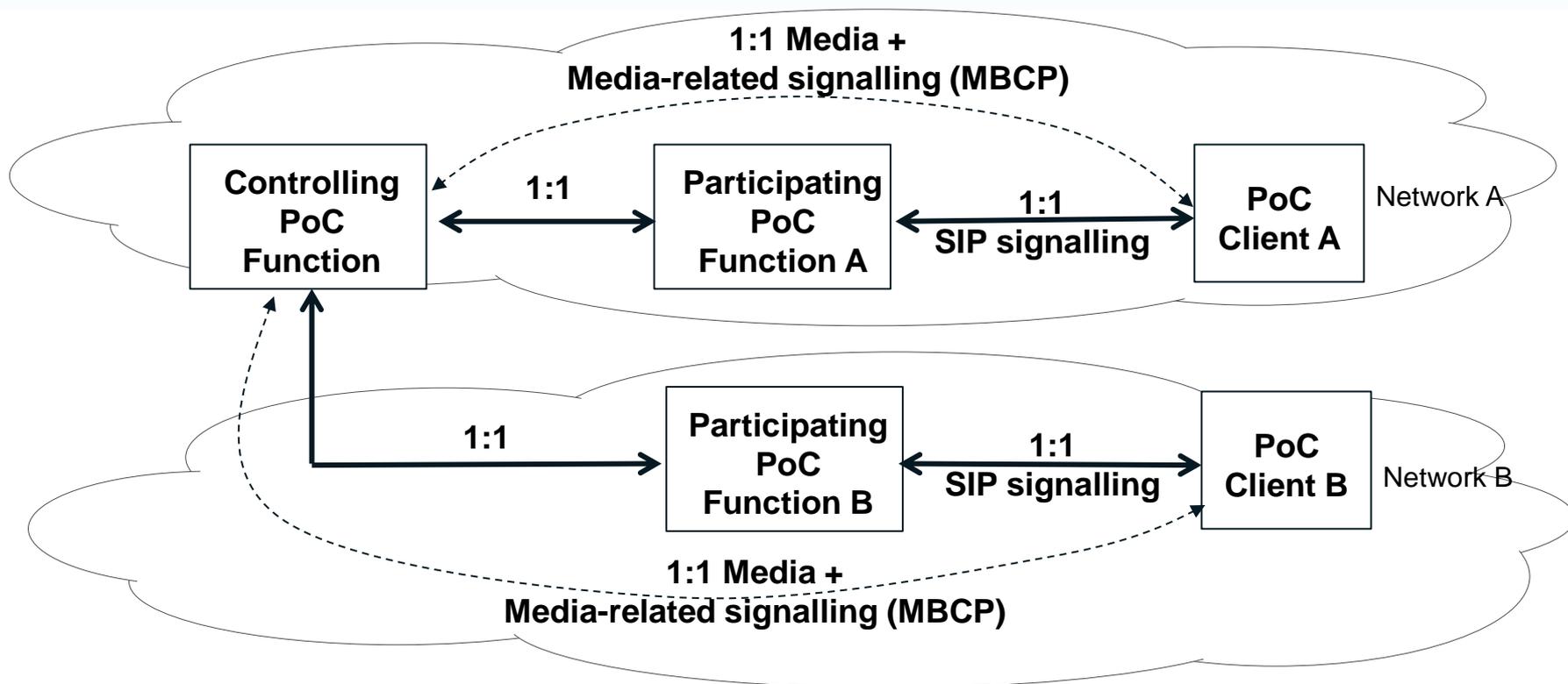


- In a PoC session there is only one PoC server performing the Controlling PoC Function
- There are as many Participating PoC Functions as there are PoC Clients
 - Obviously, a single PoC Server may perform several Participating PoC Functions for the same PoC session

Media Flow Handling

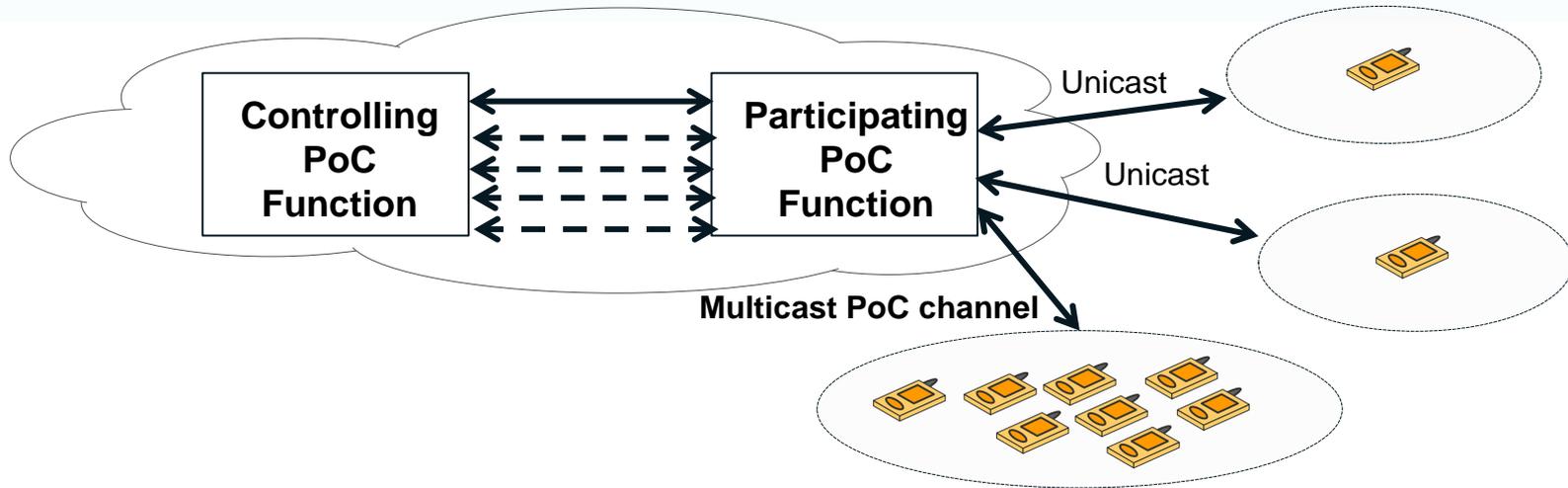
- In all types of PoC Sessions (i.e. 1-1, 1-many, 1-many-1) the RTP Media transfer is half-duplex i.e. only one Participant is permitted to originate RTP Media at a time
- All RTP Media to and from all PoC Clients in a PoC Session is sent through (and possibly replicated by) the Controlling PoC Function
- Talk/Media Burst Control messages are processed by the Controlling PoC Function
- The Participating PoC Function MAY also achieve the RTP Media replication function, if the Participating PoC Function and the Controlling PoC Function support the Traffic Optimisation option (see slide #12)
- The transport path between the PoC Client and the Controlling PoC Function is established on a per PoC Session basis. When the PoC Session is established the Participating PoC Function decides whether to include itself into the transport path (see slide #11)

Option with Direct Media Flow



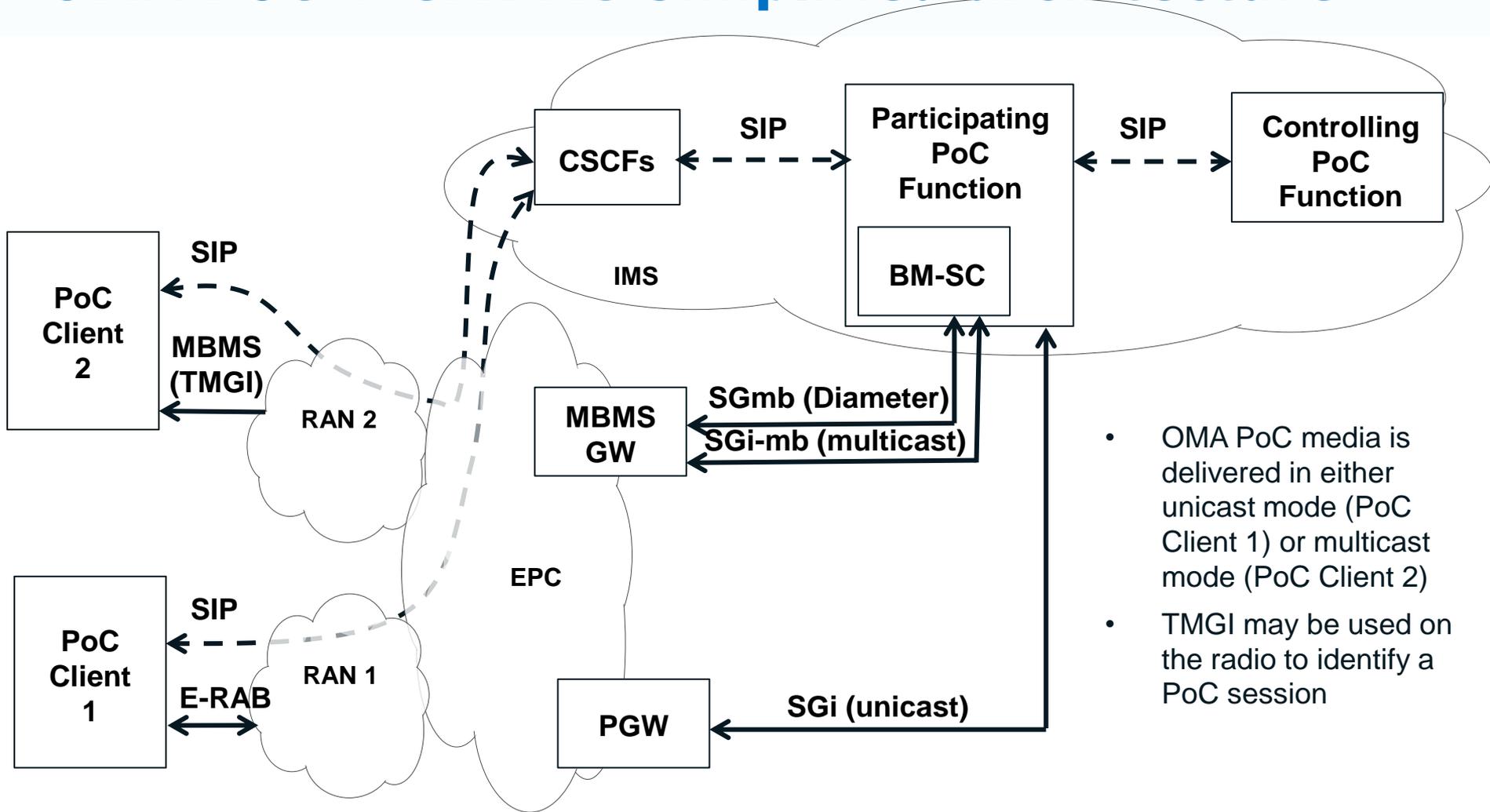
- As an option, and based on policies in the Participating PoC Function, the media and media-related signalling (e.g. media floor control, media burst control) may follow a direct communication path between the PoC Client and the Controlling PoC Function

Multicast PoC Channel



- **Multicast PoC Channel:** a bearer shared between one or more PoC Session to transport one or more media streams per PoC Session using the underlying multicast access networks capability to distribute media streams on a multicast/broadcast bearer e.g. MBMS. The Multicast PoC Channel is uniquely identified by TMGI in the case of MBMS
- The decision to use a Multicast PoC Channel in a PoC Session is taken by the server performing the Participating PoC Function
- As an option, the Participating PoC function can use the Traffic Optimisation feature in order to reduce the number of media streams between the PoC Servers

OMA PoC + eMBMS simplified architecture



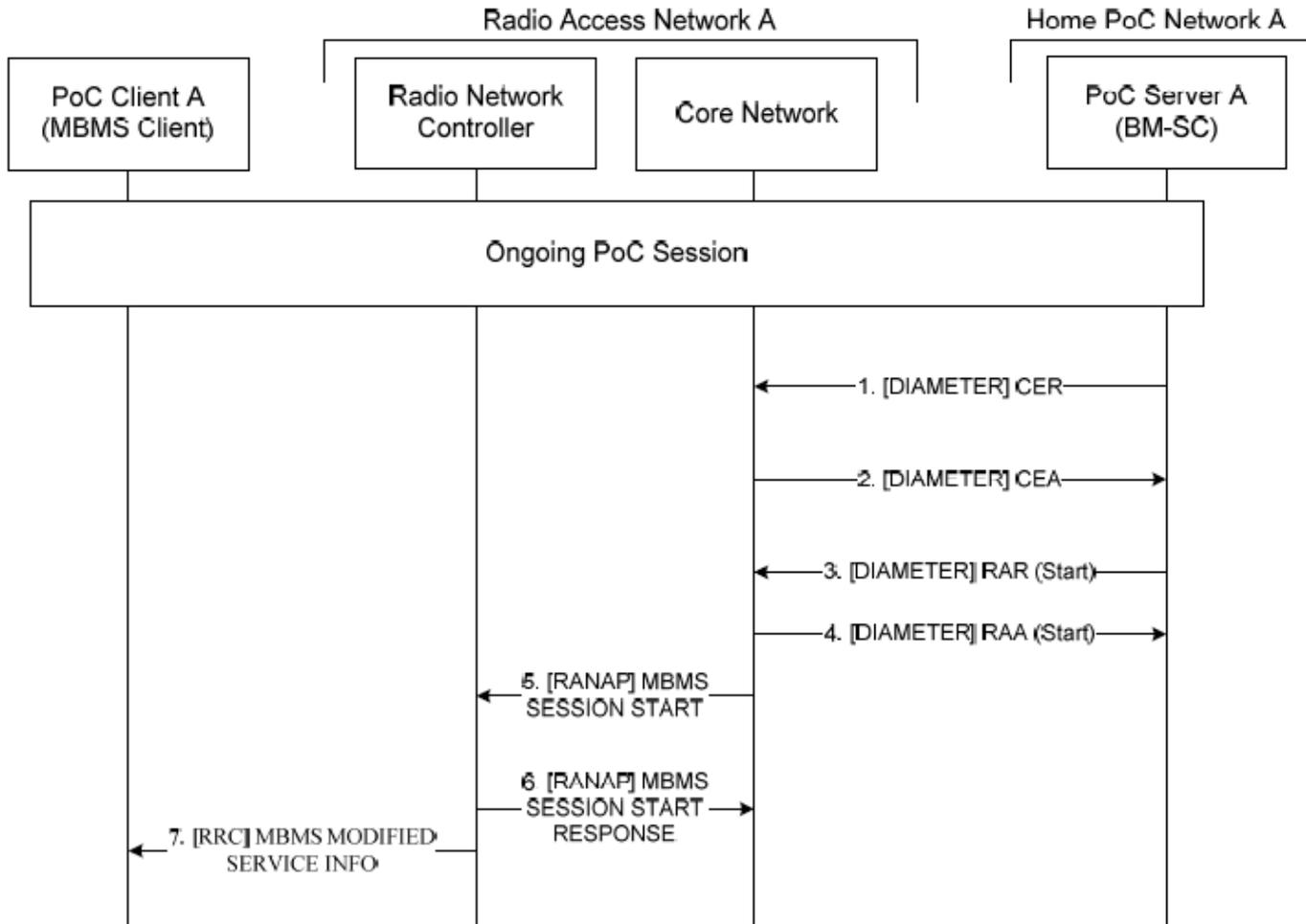
- OMA PoC media is delivered in either unicast mode (PoC Client 1) or multicast mode (PoC Client 2)
- TMGI may be used on the radio to identify a PoC session

Identifiers in OMA PoC

- For 1-1 PoC Session and Ad-hoc PoC Group Session
 - Each participant is identified by a user-specific SIP URI (*“Personal SIP URI”*) or TEL URI
- For Pre-arranged PoC Group and Chat PoC Group Session:
 - The group itself is identified by a group-specific SIP URI (*“Group SIP URI”*)
- A Multicast PoC Channel is identified via
 - A unique IP multicast address on SGI-mb
 - TMGI at EPC/RAN level
- Multiple PoC sessions can share the same Multicast PoC Channel
 - The PoC Client relies on the destination port number to discriminate between different PoC sessions

Example call flows (1/2)

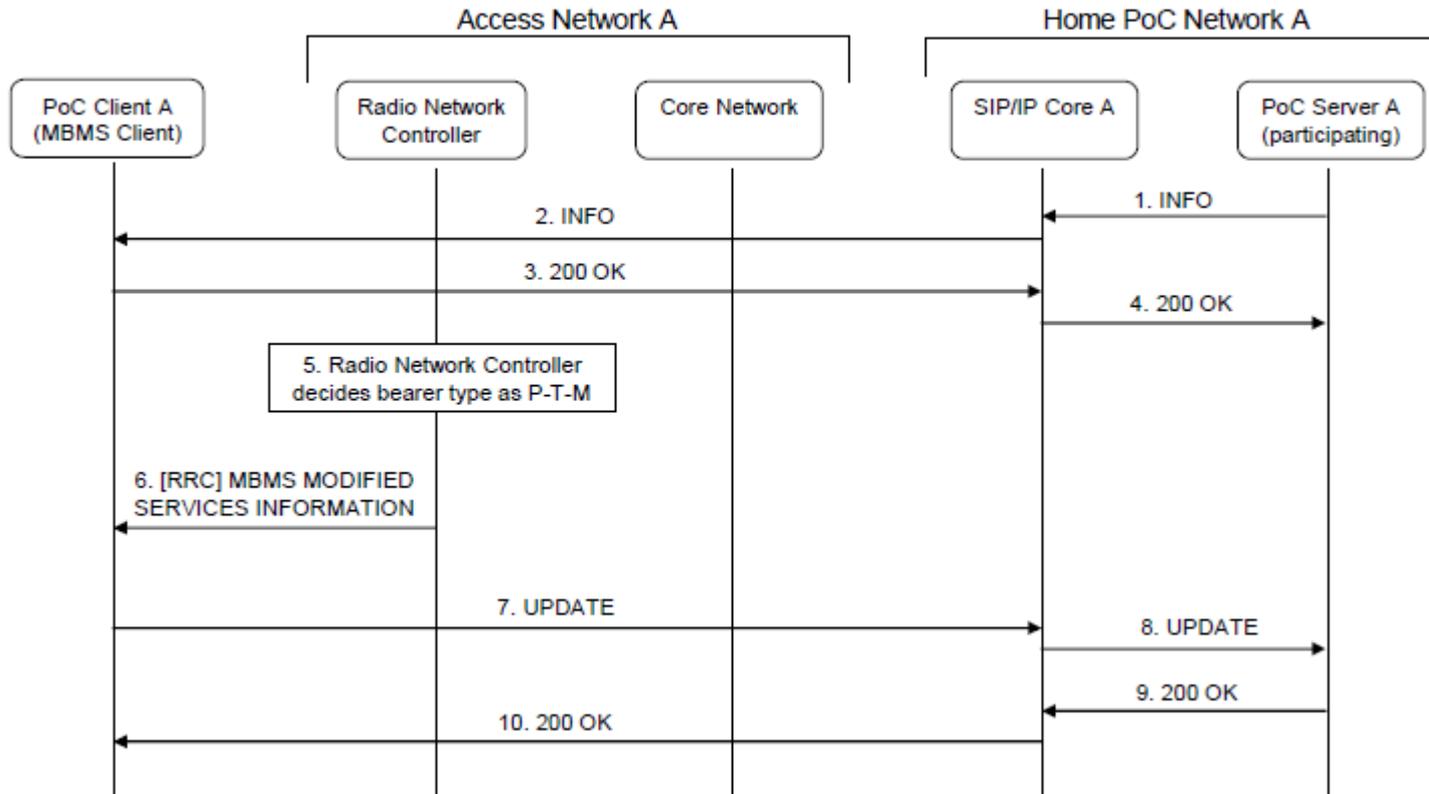
Establishment of a Multicast (MBMS) Channel



- Diameter signalling to request an MBMS bearer in selected cells
- Notification of new MBMS channel availability using RRC signalling

Example call flows (2/2)

Switching to a Multicast (MBMS) Channel



- The network uses *SIP INFO* to announce the Multicast PoC Channel availability
- UE relies on RRC notifications to tune to the appropriate MBMS channel
- UE uses *SIP UPDATE* to switch to the Multicast PoC Channel

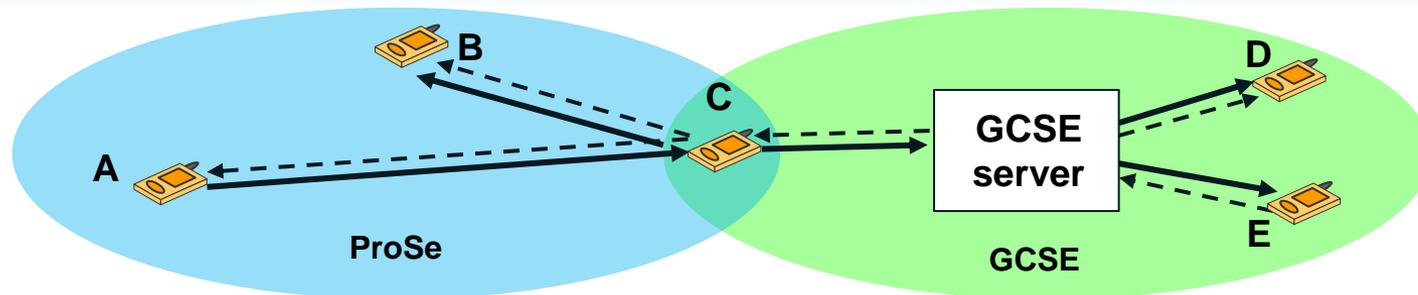
What needs to be done in GCSE_LTE?

- On transport (EPS) level:
 - For OMA PoC delivery over unicast channels (i.e. EPS bearers) – probably nothing
 - For OMA PoC delivery over multicast channels, some MBMS enhancements may be desirable (e.g. faster establishment of MBMS channel, more efficient notifications in RRC)
- On application (IMS) level:
 - Trimming down the overall OMA PoC functionality (i.e. throwing away functionality that is not needed for Public Safety networks)
 - SIP signalling may need to be optimised in some cases to improve scalability (e.g. when switching from unicast to a multicast channel)
 - New “*PoC Relay*” functionality for interworking with ProSe
 - refer to the next section

Interworking with ProSe

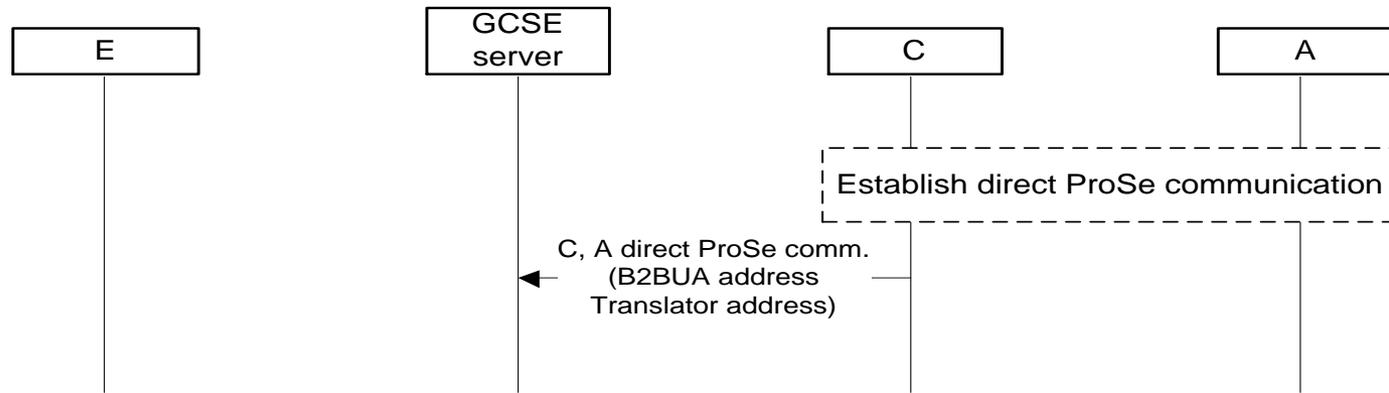
- **UE-to-Network Relay**
- **PoC Relay example call flows**
- **Group Identifiers revisited**

GCSE and UE-to-Network Relay



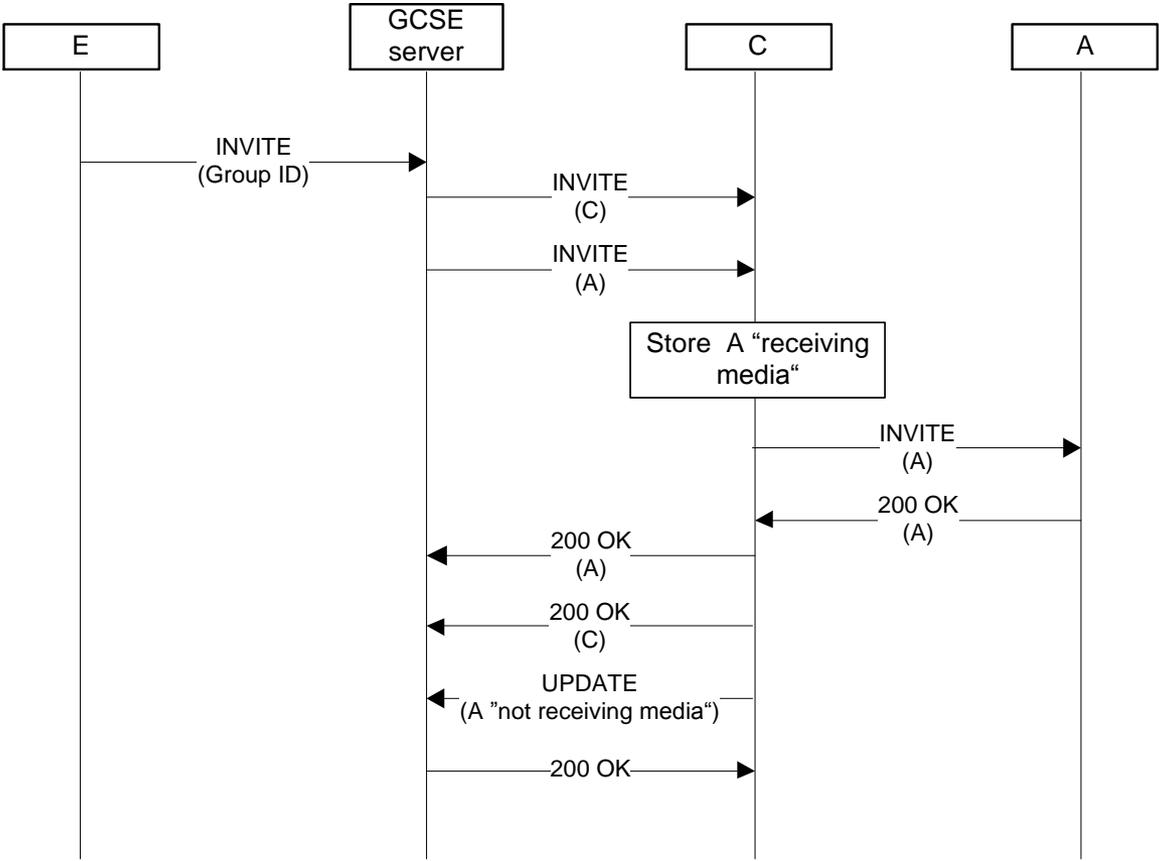
- This use case introduces a UE-to-Network Relay
 - “GCSE server” in this figure designates an OMA PoC Server (both Controlling and Participating PoC Function)
 - C, D and E are in network coverage; A and B are out of coverage, but within the range of C
 - C acts as a UE-to-Network Relay
- Can be solved with a “*PoC Relay*”, a new proposed functionality for C
 - IMS-based
 - IP connectivity assumed in the ProSe domain (between A and C, and between B and C)
 - A and B explicitly register with C at IMS layer, requesting relay service for specific group (identified via its unique *Group SIP URI*)
 - C may need to be explicitly authorised to act as relay by the GCSE server
 - C relays group communication between the ProSe and GCSE domains
 - C may also need to duplicate traffic (see figure)
 - Uplink ProSe delivery (A=>C; B=>C) is unicast
 - Downlink ProSe delivery (C=>A; C=>B) can be either unicast or multicast
 - Floor control still performed in the GCSE server

PoC Relay example call flows (1/3): *Registration*



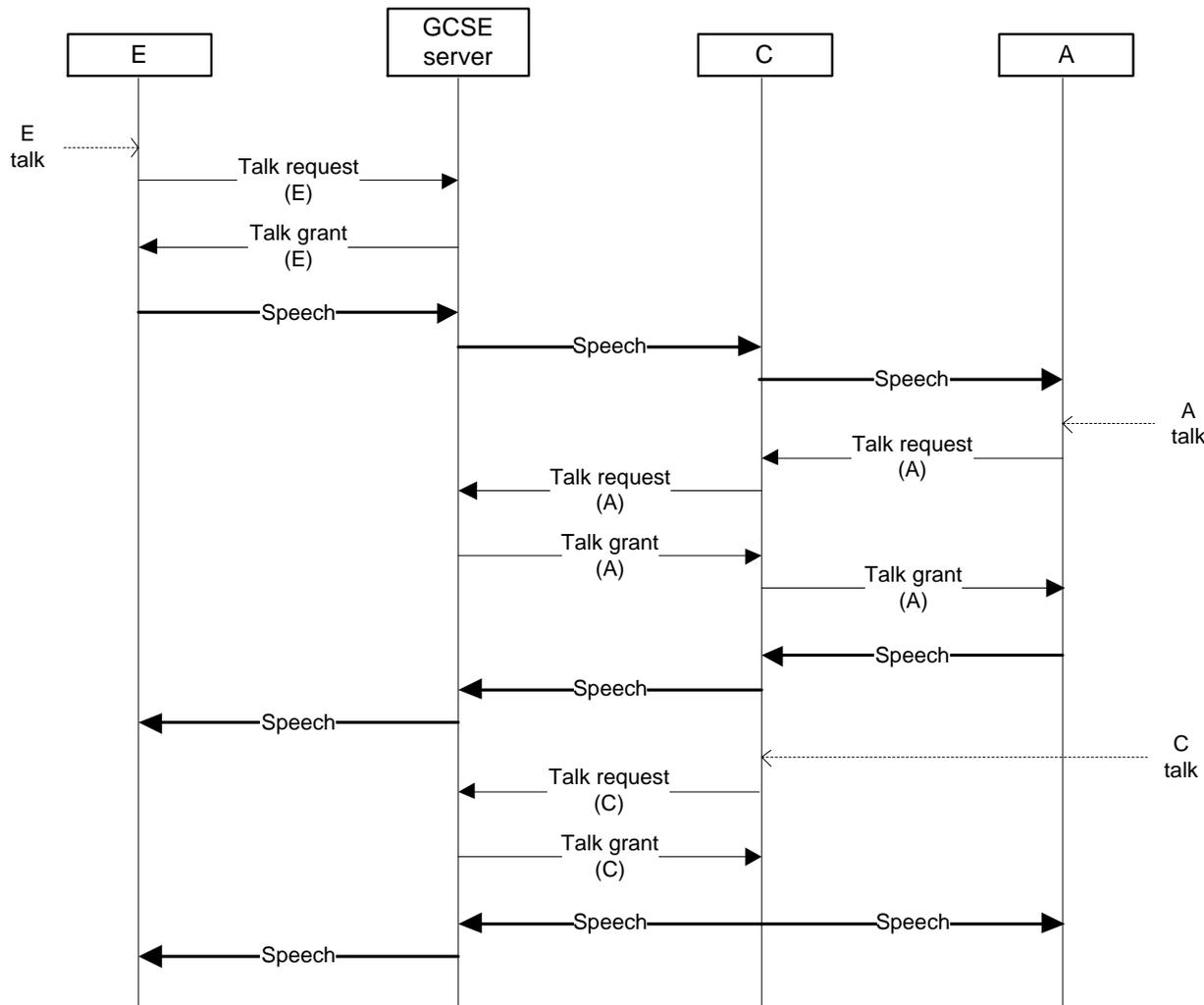
- The call flows in this one and the next two slides describe the operation of a “*PoC Relay*”, a new IMS functionality residing in C (i.e. the UE-to-Network Relay)
 - A and C establish direct ProSe communication link
 - C informs the GCSE server that it can act as a relay for A and indicates the relevant SIP address of C’s Back-To-Back User Agent (B2BUA) for group communication control data relay and C’s RTP translator address for RTP/RTCP data relay

PoC Relay example call flows (2/3): *Session setup*



- User E initiates a group call with C and A by sending an INVITE to the GCSE server.
- The GCSE server initiates communication sessions with C and A by sending INVITEs to C and A. The INVITE to A includes a Route header value “gcr.C@operator.com” in order to force the request to be routed through C.
- C inserts a B2BUA for relaying group communication SIP messages to A.
- The INVITE for A indicates that A receives media. Therefore C stores the A’s status as “receiving media”.
- C sends the INVITE to A via its direct connection to A.
- A accepts the call by sending back a 200 OK response.
- C’s B2BUA forwards the response to the GCSE server. C also sends back another 200 OK response for itself.
- C sets A’s session to “not receiving media” at the GCSE server by sending an UPDATE.

PoC Relay example call flows (3/3): *Floor control*



- E requests the right to speak from the GCSE server and after receipt of permission sends speech data via RTP/RTCP to the GCSE server.
- The server forwards the data to C, but not to A since A's status is "not receiving media" at the server.
- C forwards the data to A since the stored status for A is "receiving media".
- A requests the right to speak from the GCSE server. C forwards the request and response.
- After receipt of talk permission A sends speech data via RTP/RTCP to C. C forwards the data to the GCSE server.
- The GCSE server distributes the received data to E, but not to A since A's status is "not receiving media" at the server and not to C, because C is A's relay and therefore already received the data.
- C requests the right to speak from the GCSE server and after receipt of permission sends speech data via RTP/RTCP to the GCSE server and to A.

Group Identifiers revisited

- The application layer (IMS) identifiers should be common for both GCSE and ProSe
 - “*Personal SIP URI*” to uniquely identify the user
 - “*Group SIP URI*” to uniquely identify a Public Safety group
- A transport layer group identifier (similar to TMGI in MBMS) may be needed in ProSe transport layer
 - e.g. a Layer-2 identifier that uniquely identifies a PoC session
 - To be studied further as part of ProSe *ad hoc* mode (see S2-131145 submitted for this meeting)

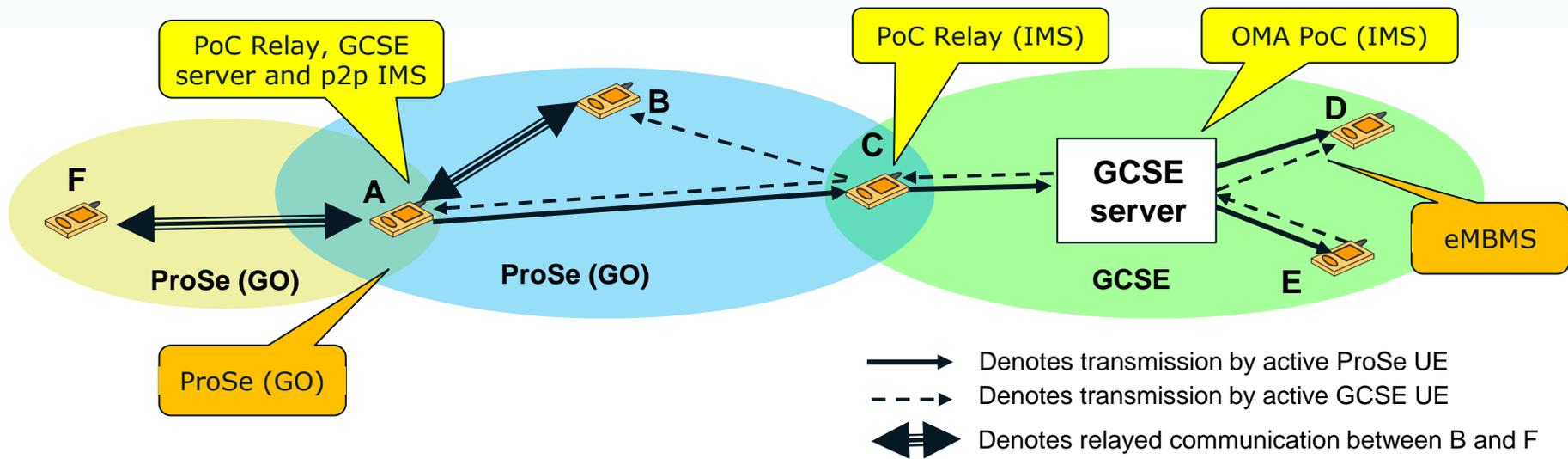
Proposal

- It is proposed to agree to use OMA PoC as the basis for GCSE_LTE
 - Possible work split between 3GPP WGs/SWGs is illustrated in the table
 - Colour code indicates work split between **GCSE_LTE** and **ProSe**

Expected work	In IMS SWG	In main SA2 stream	In RAN groups
GCSE_LTE proper (excluding ProSe interworking)	<ul style="list-style-type: none"> • Select minimum OMA PoC functionality that is needed for Public Safety; • Any IMS-level optimisations for multicast PoC channels (optional) 	<ul style="list-style-type: none"> • Any EPC-level eMBMS enhancements (optional) 	<ul style="list-style-type: none"> • Any RAN-level eMBMS enhancements (optional)
GCSE_LTE i/w with ProSe	<ul style="list-style-type: none"> • Define a PoC Relay functionality 	<ul style="list-style-type: none"> • SA-related “transport layer” ProSe aspects (IP addressing, service discovery, authentication, etc.; e.g. see S2-131145) 	<ul style="list-style-type: none"> • RAN-related “transport layer” ProSe aspects (PHY/MAC, Group Owner mode, etc.; see S2-131145)

Backup

Summary of GCSE and ProSe functions



- C acts as a **UE-to-Network Relay**
- A acts as a **UE-to-UE Relay** between B and F
- A must NOT relay group communication between F and C (because there can be max 1 relay on the path)

