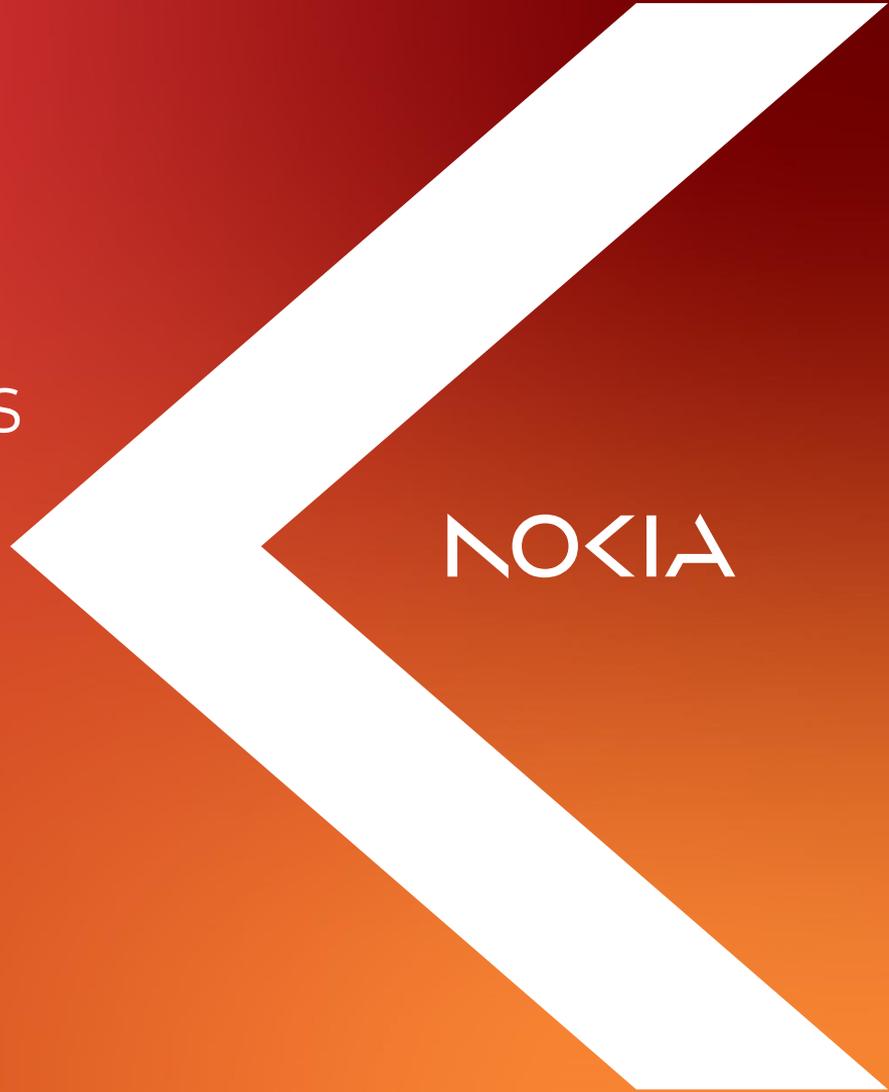


# IMS Data Channel

## Principles and LI implications

The Nokia logo is positioned on the right side of the slide, centered vertically. It consists of the word "NOKIA" in a white, sans-serif font, set against a large white arrow graphic that points to the left. The arrow is composed of two thick, parallel lines that meet at a point on the left edge of the slide.

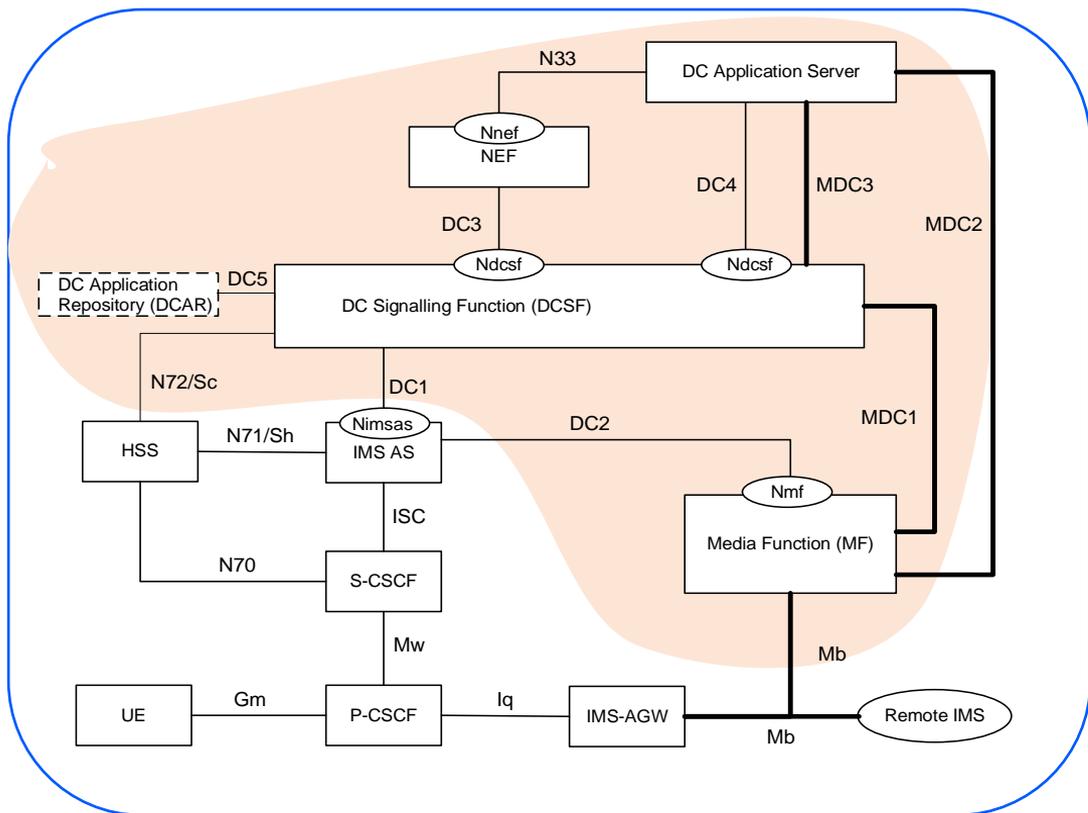
NOKIA

Nagaraja (Nag) Rao; Nokia

# IMS Data Channel (background)

NOKIA

# IMS Data Channel Architecture (TS 23.228, Annex AC)



## • DCSF: Provides signaling for IMS DC (not SIP).

- Receives event notifications from IMS AS and determines whether IMS DC is allowed to be provided for the IMS session.
- Manages the Bootstrap DC and (if applicable) application DC.
- Supports HTTP web server functionality to download DC applications via the MF to the UE.
- Downloads DC applications from the DC application

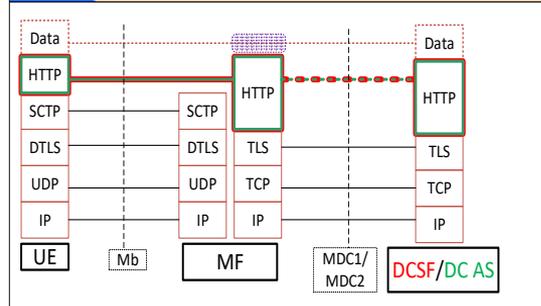
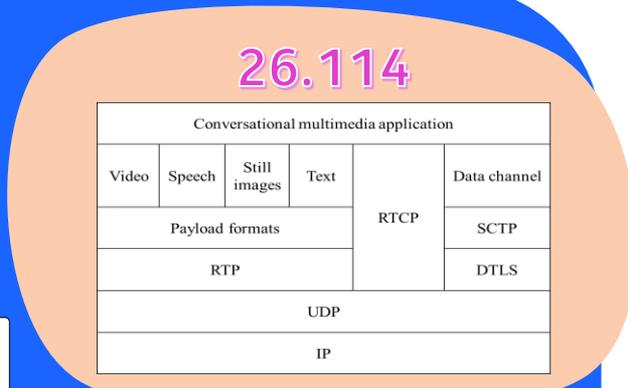
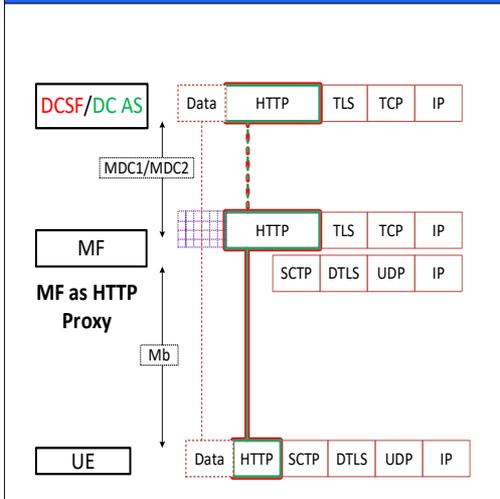
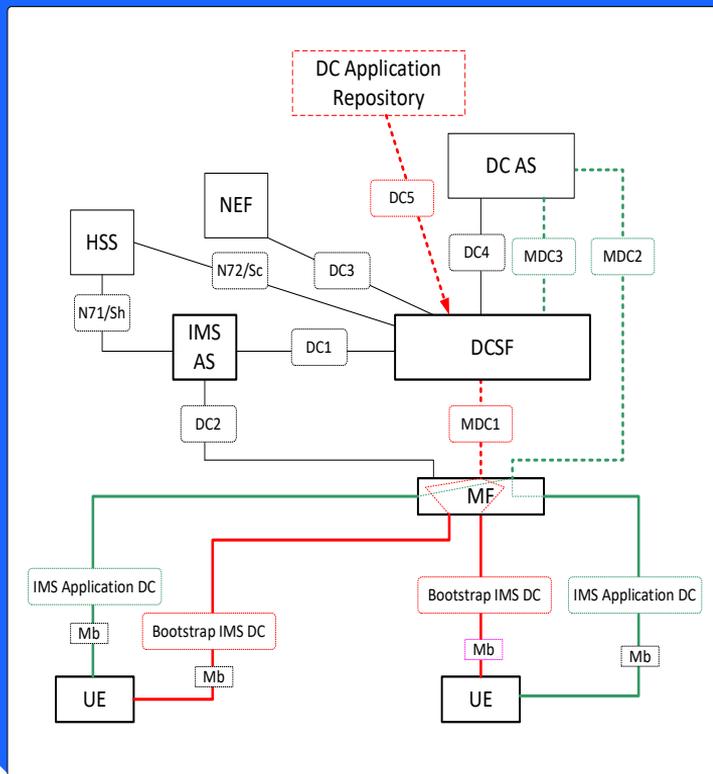
## • MF:

- Manages the DC media resources under the control of IMS AS.
- Anchor P2P application DC between UEs.
- Relay A2P/P2A DCs between the UE and the DC-AS.

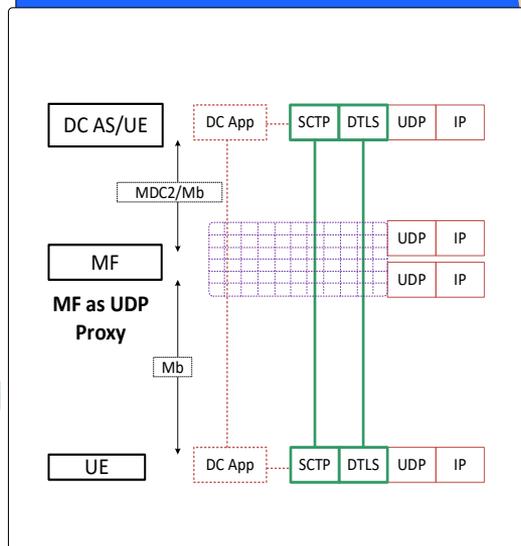
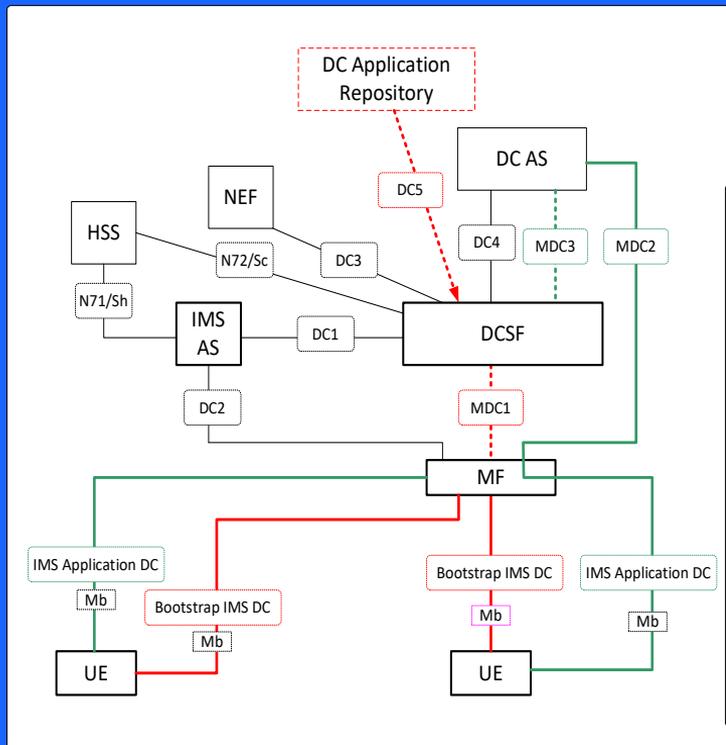
## • IMS-AS:

- Interacts receives the IMS DC control instructions from DCSF and instructs the MF for resource management.
- Interacts with the HSS.

# Data Channels with MF as an HTTP Proxy

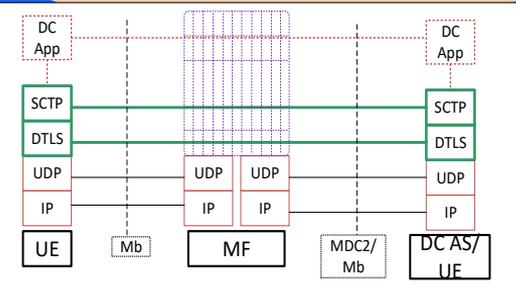


# Data Channels with MF as an UDP Proxy



26.114

Conversational multimedia application					
Video	Speech	Still images	Text	RTCP	Data channel
Payload formats					SCTP
RTP					DTLS
UDP					
IP					



# Data Channel Server – local and remote (3GPP TS 26.114)

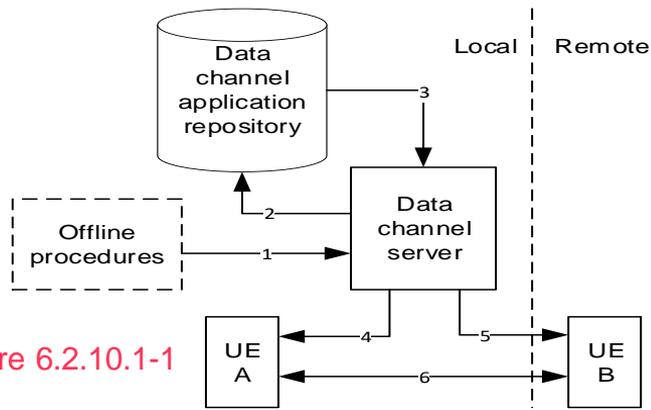


Figure 6.2.10.1-1

NOTE 4 (under figure 6.2.10.1-1): A Data Channel Server in this specification can be further decomposed into a number of functional entities including DC Signalling Function, Media Function (or MRF) and DC Application Server as specified in Annex AC of [167].

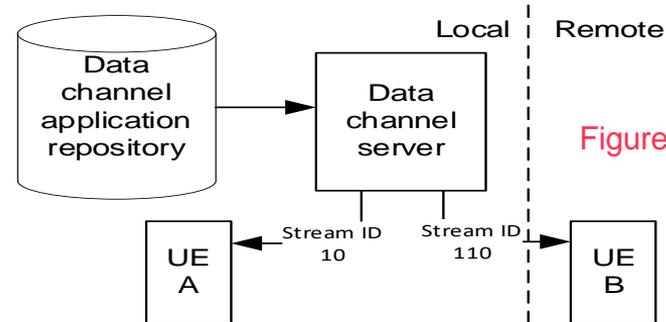


Figure 6.2.10.1-3

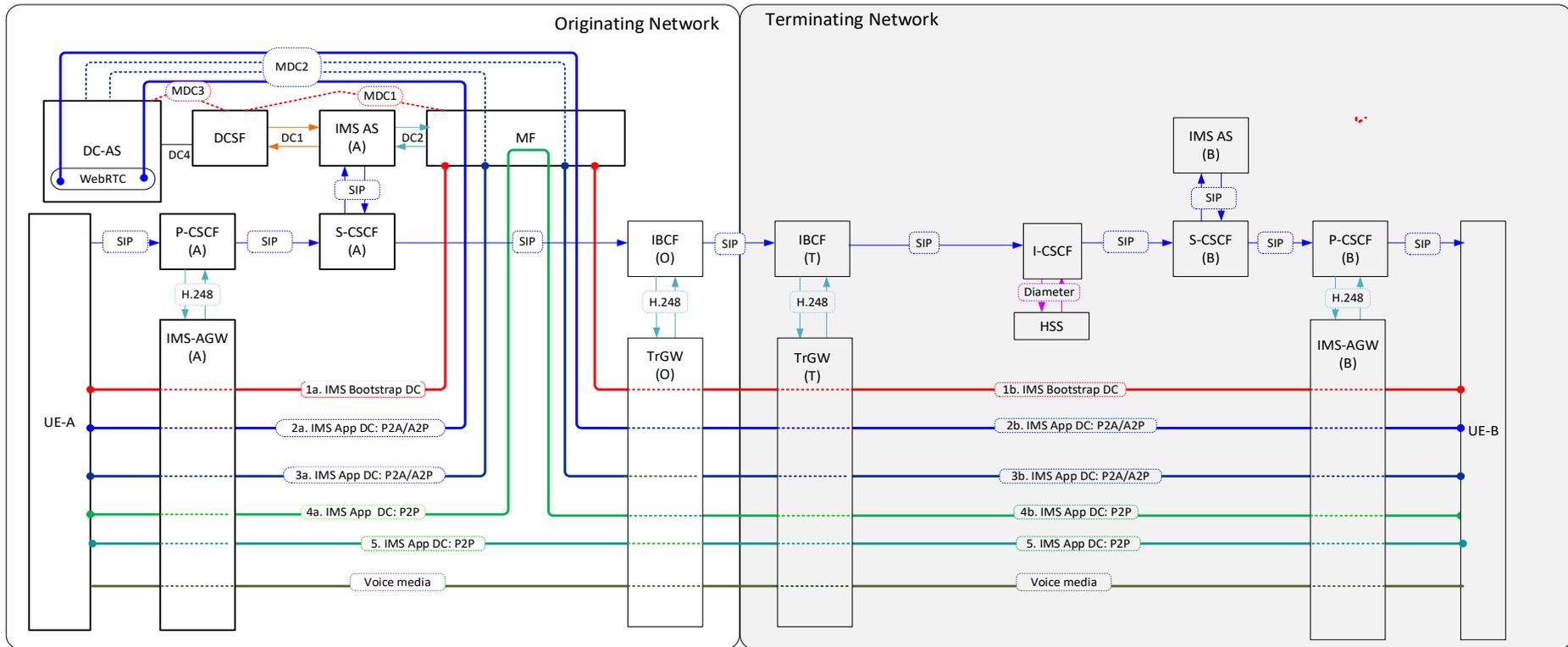
Table 6.2.10.1-2

Stream ID	Content Source
0	Local network provider
10	Local user
100	Remote network provider
110	Remote user

# IMS Data Channel setups (non-LI)

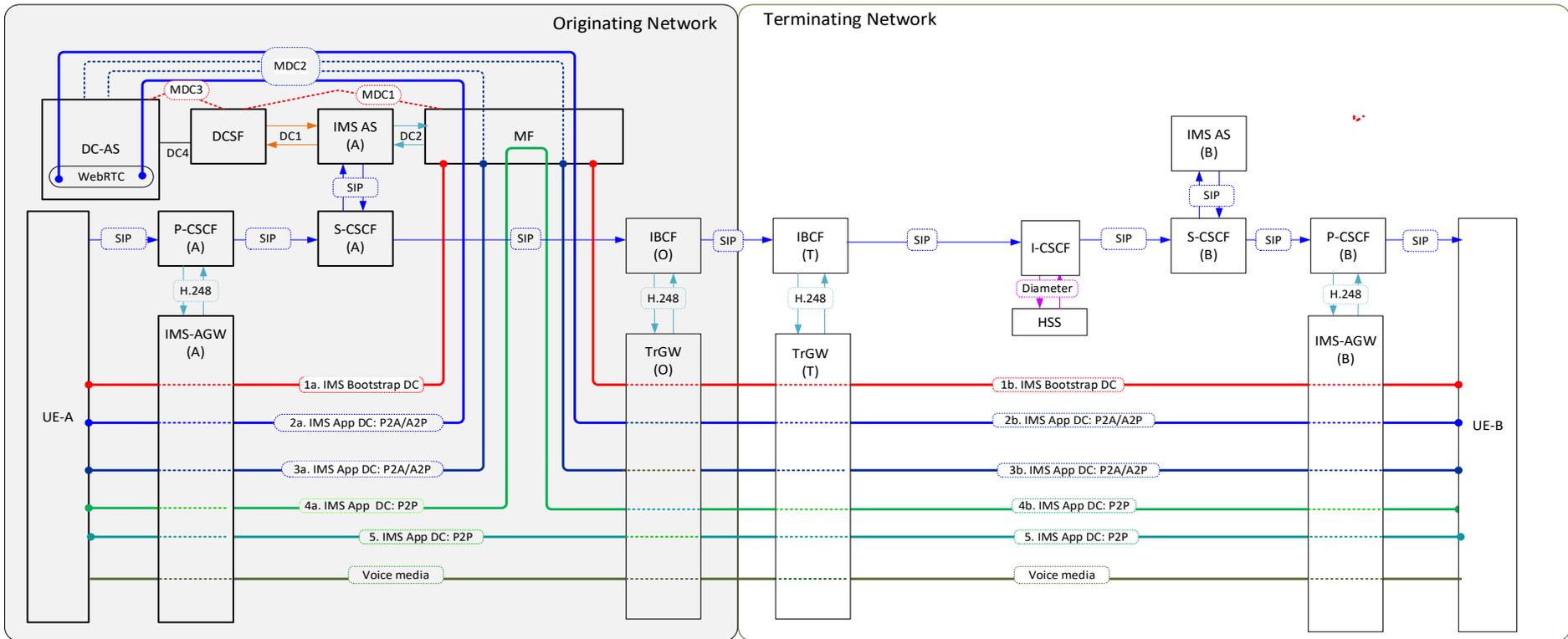
NOKIA

# IMS Bootstrap DC and Application DC setup initiated by UE-A (DC server at originating end)



(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
(3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

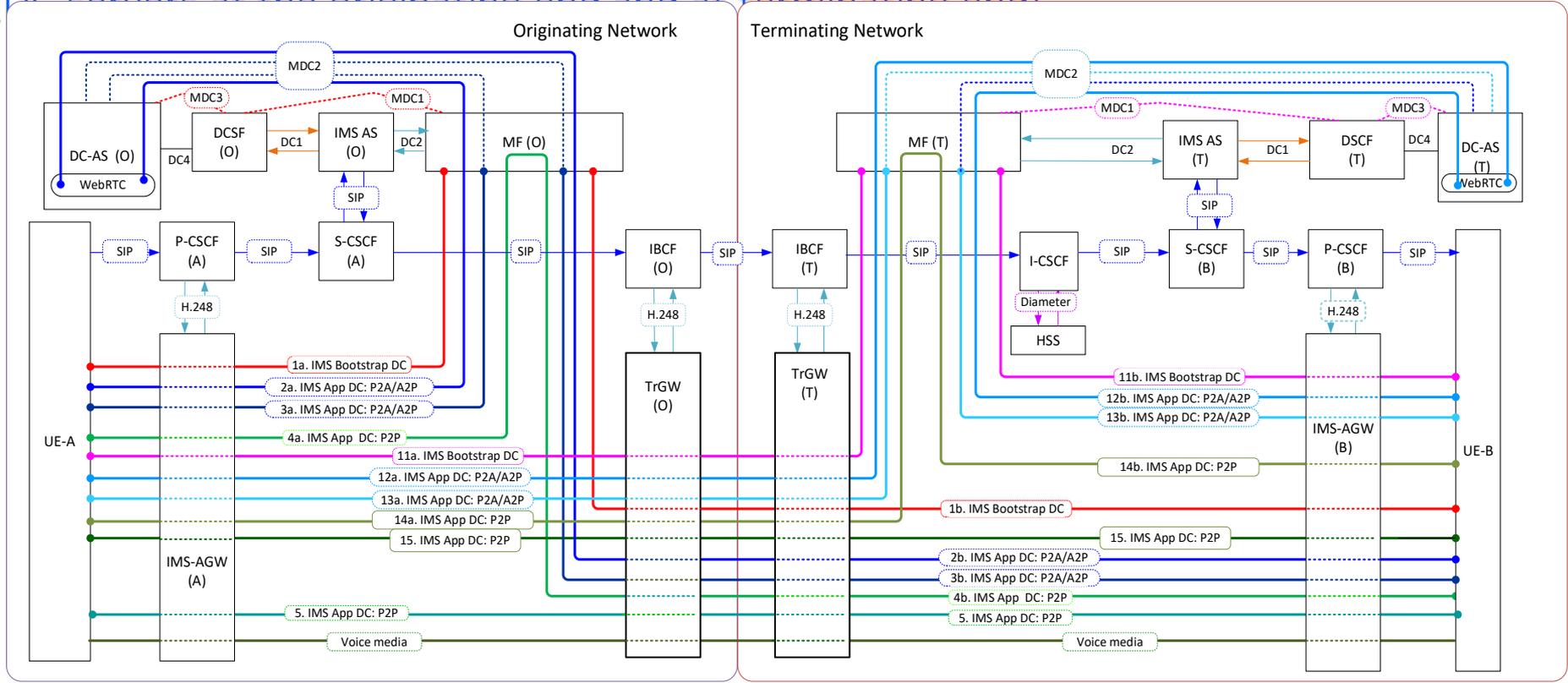
# IMS Bootstrap DC and Application DC setup initiated by UE-B (DC server at terminating end)



(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

# Separate IMS Bootstrap DC and Application DC setup initiated by UE-A and UE-B

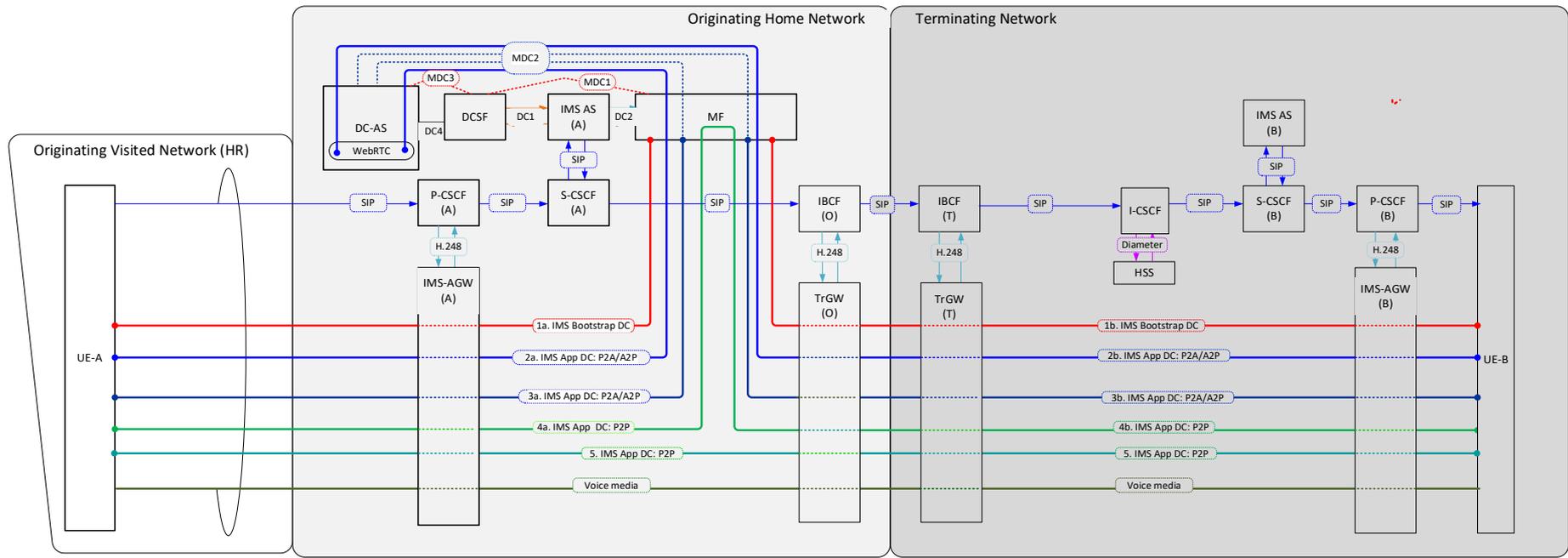
(DC servers at the originating end and at terminating end)



(2a/2b//12a/12b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b/13a/13b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

# Roaming with Home-routed (HR)

IMS Bootstrap DC and Application DC setup initiated by UE-A  
(DC resources, at originating end, HPLMN)



(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
(3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

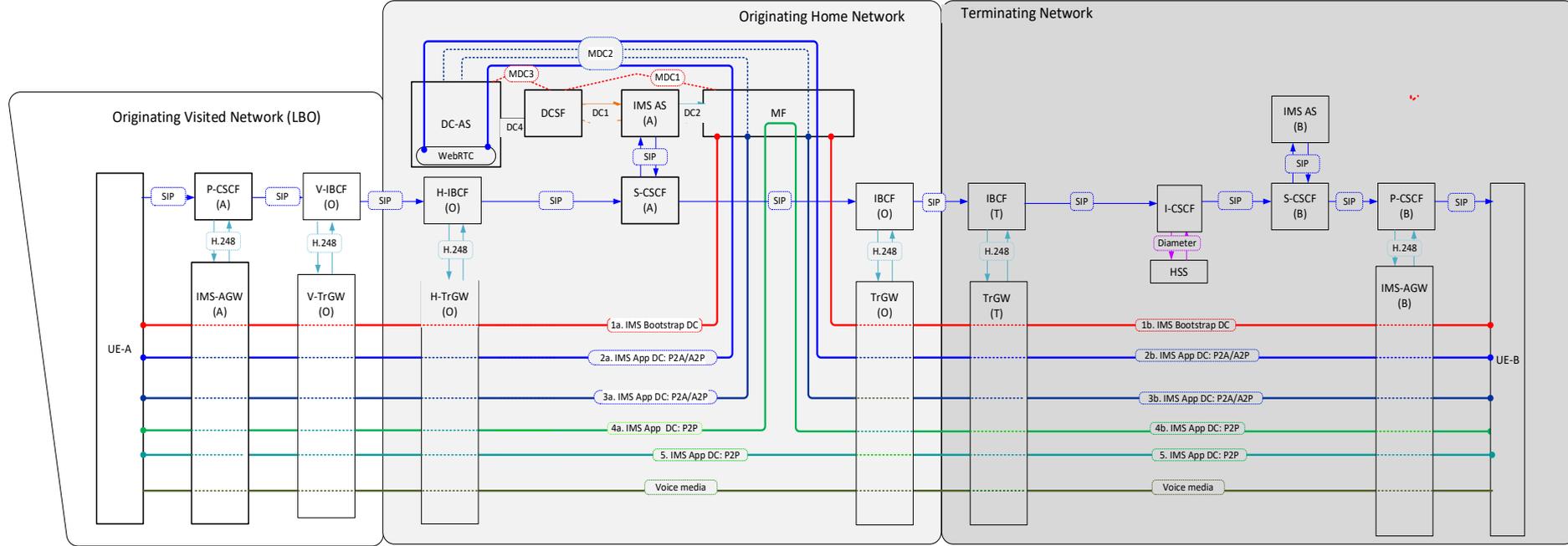
UE-B could also be roaming



# Roaming with local breakout (LBO)

Disclaimer: LBO-based roaming architecture is not considered for IMS DC in SA2.

## IMS Bootstrap DC and Application DC setup initiated by UE-A (DC resources, at originating end, HPLMN)



(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

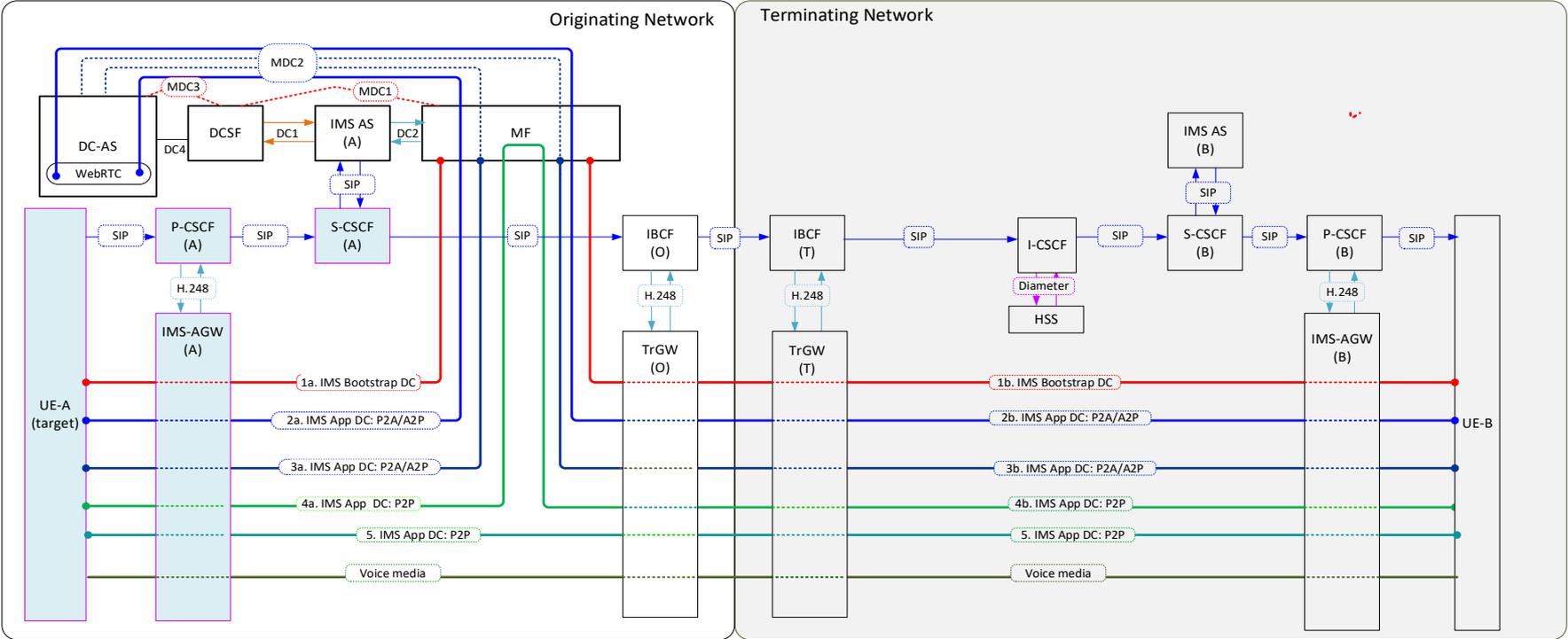
UE-B could also be roaming



# IMS Data Channels with IMS LI

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# Current IMS LI (originating network) with IMS Data Channels setup by UE-A (target)

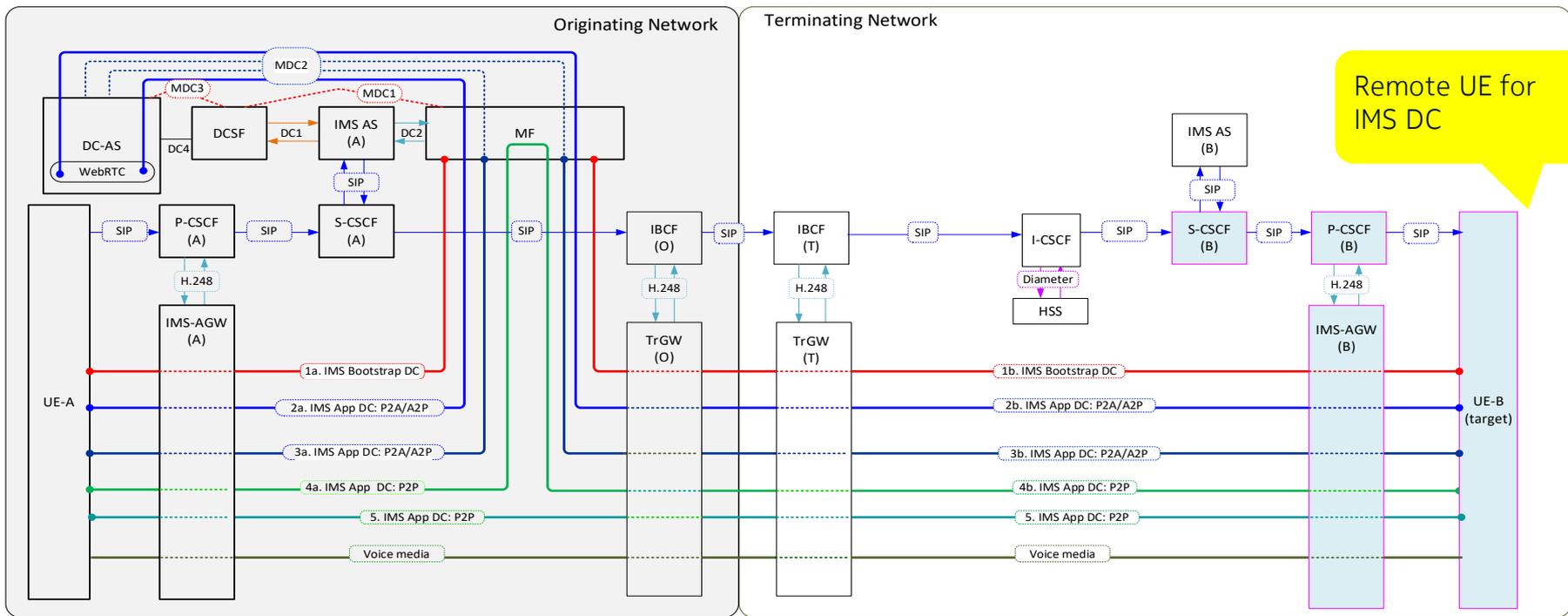


(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

For IMS sessions with UE-A as the target (originating network):

- S-CSCF (A) provides the IRI-POI functions.
- P-CSCF (A) provides the CC-TF functions.
- IMS-AGW (A) provides the CC-POI functions

# Current IMS LI (terminating side) with IMS Data Channels setup by UE-A (non-target)



(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

For IMS sessions with UE-B as the target (terminating network):

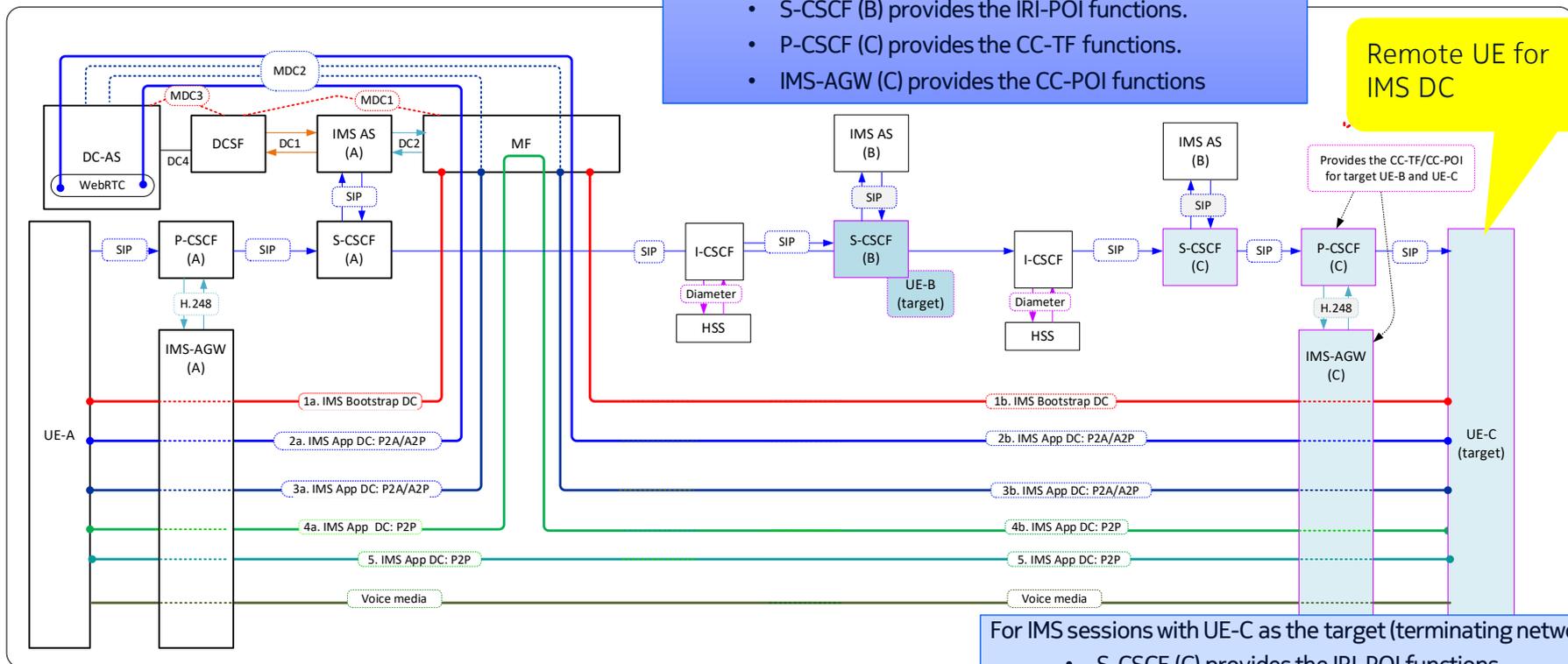
- S-CSCF (B) provides the IRI-POI functions.
- P-CSCF (B) provides the CC-TF functions.
- IMS-AGW (B) provides the CC-POI functions

# Current IMS LI (terminating side) with IMS Data Channels setup by UE-A (non-target)

For IMS sessions with UE-B as the target (terminating network):

- S-CSCF (B) provides the IRI-POI functions.
- P-CSCF (C) provides the CC-TF functions.
- IMS-AGW (C) provides the CC-POI functions

Remote UE for IMS DC

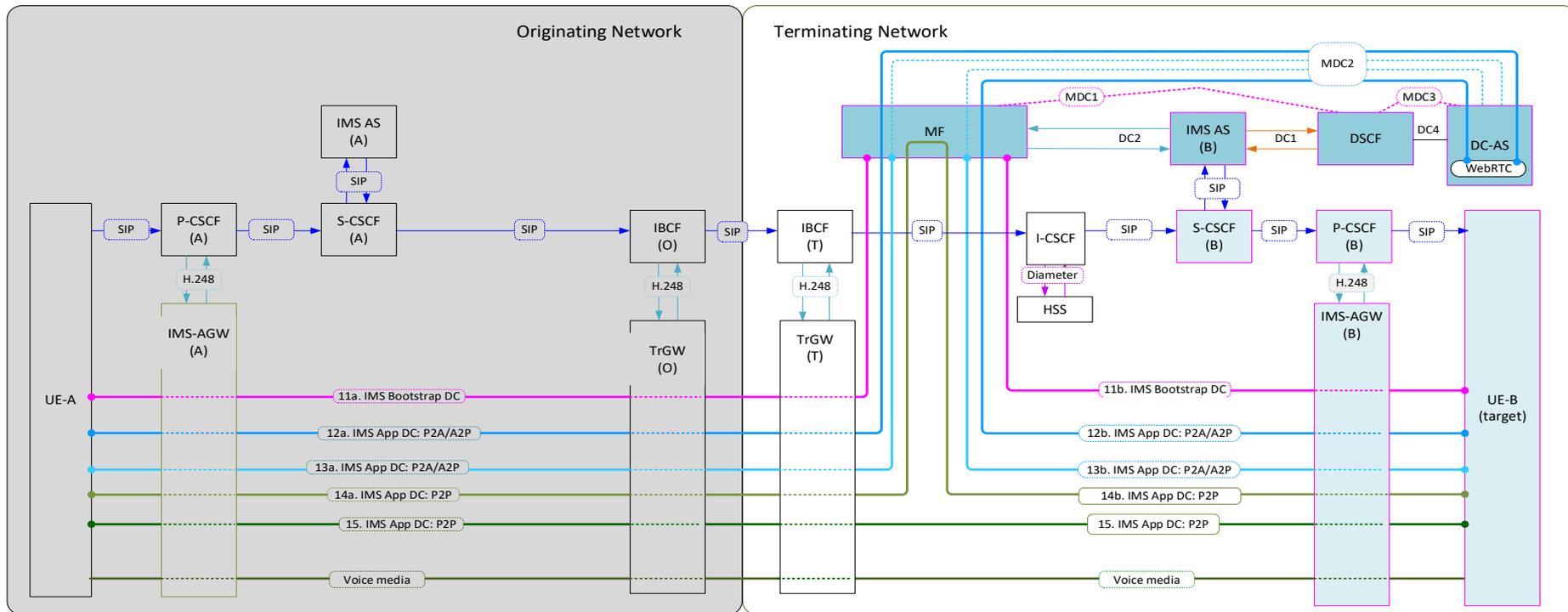


(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

For IMS sessions with UE-C as the target (terminating network):

- S-CSCF (C) provides the IRI-POI functions.
- P-CSCF (C) provides the CC-TF functions.
- IMS-AGW (C) provides the CC-POI functions

# Current IMS LI (terminating network) with IMS Data Channels setup by UE-B (target)



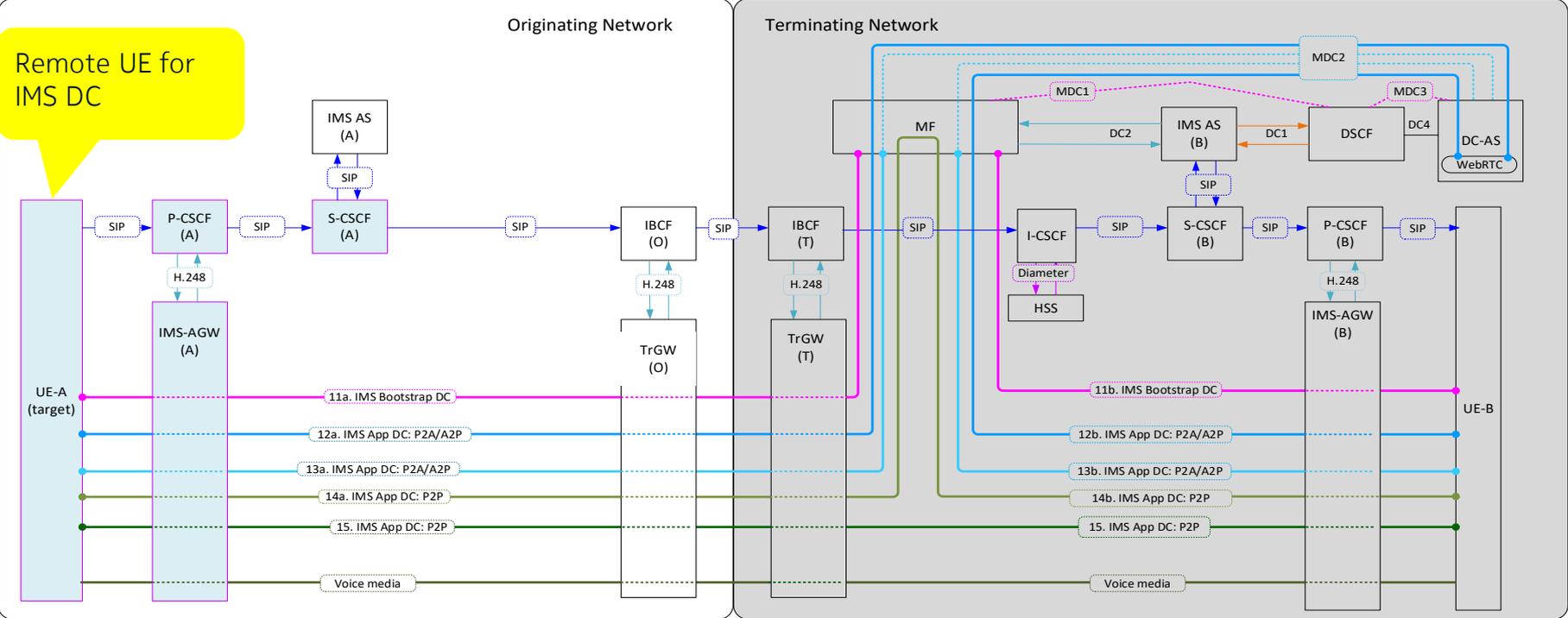
For IMS sessions with UE-B as the target (terminating network):

- S-CSCF (B) provides the IRI-P OI functions.
- P-CSCF (B) provides the CC-TF functions.
- IMS-AGW (B) provides the CC-POI functions

(12a/12b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (13a/13b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

# Current IMS LI (originating network) with IMS Data Channels setup by UE-B (non-target)

Remote UE for IMS DC



For IMS sessions with UE-A as the target (originating network):

- S-CSCF (A) provides the IRI-P OI functions.
- P-CSCF (A) provides the CC-TF functions.
- IMS-AGW (A) provides the CC-POI functions

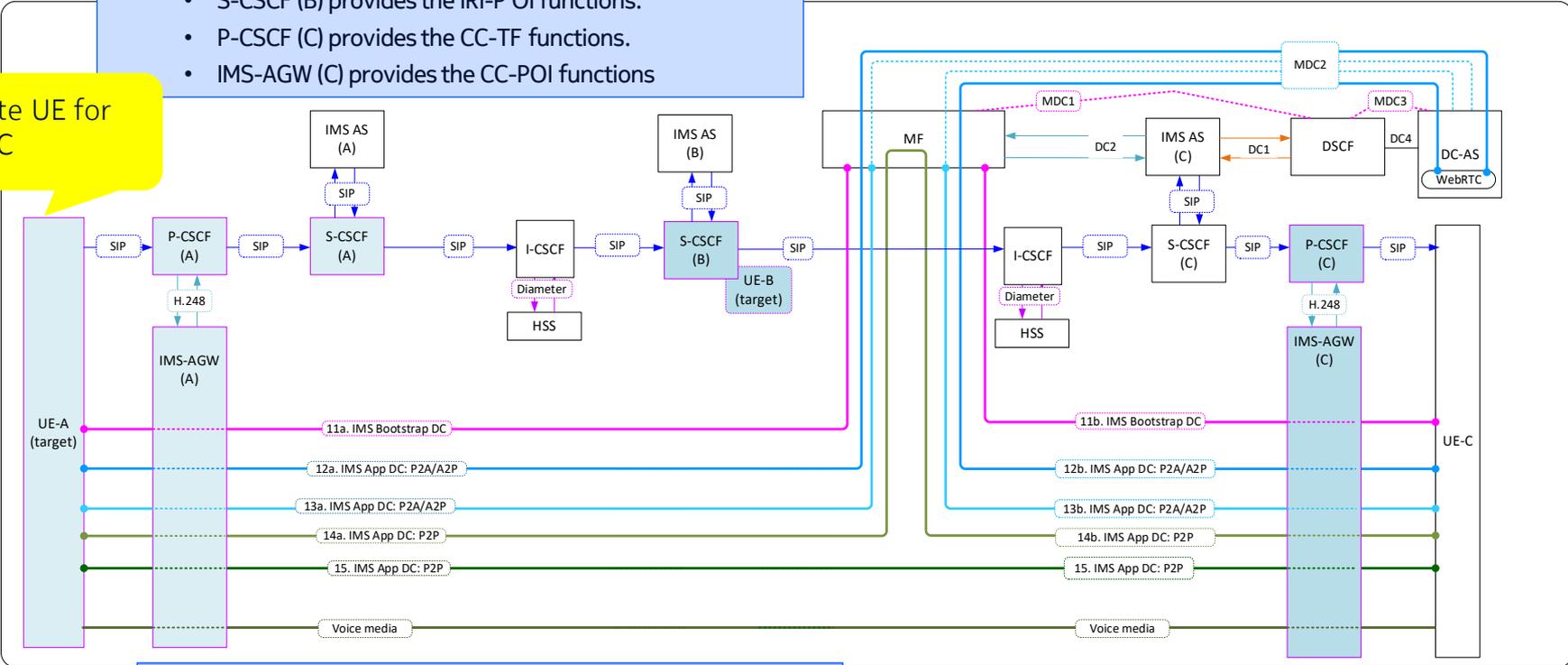
(12a/12b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (13a/13b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

# Current IMS LI (originating network) with IMS Data Channels setup by UE-C (non-target)

For IMS sessions with UE-B as the target (originating network):

- S-CSCF (B) provides the IRI-P OI functions.
- P-CSCF (C) provides the CC-TF functions.
- IMS-AGW (C) provides the CC-POI functions

Remote UE for IMS DC



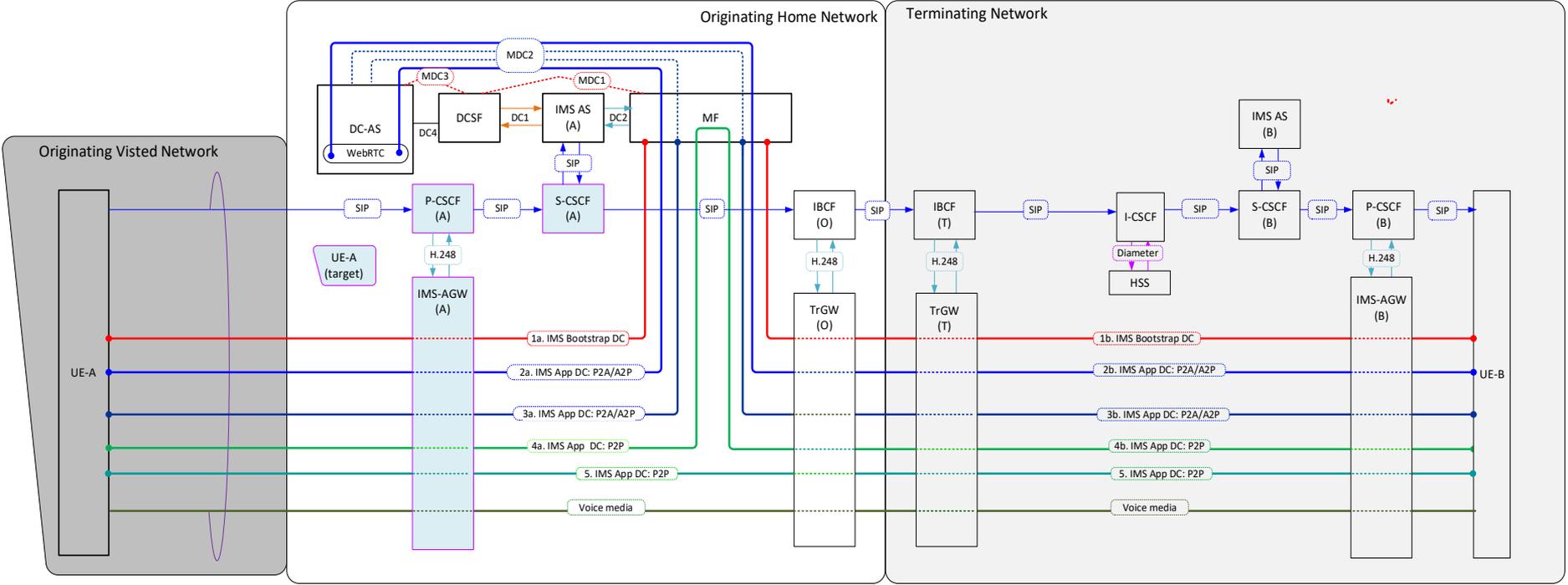
For IMS sessions with UE-A as the target (originating network):

- S-CSCF (A) provides the IRI-P OI functions.
- P-CSCF (A) provides the CC-TF functions.
- IMS-AGW (A) provides the CC-POI functions

(12a/12b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (13a/13b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

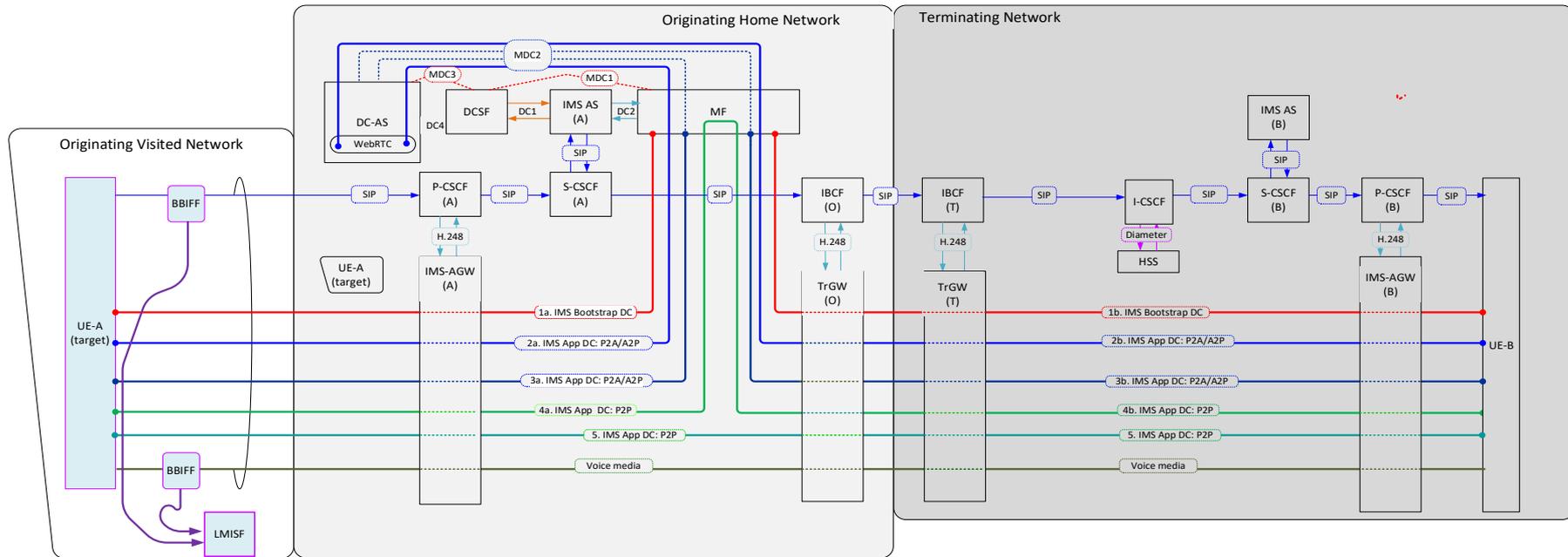


# Current LI in HPLMN - Roaming with Home-Routed (HR) IMS Bootstrap DC and Application DC setup initiated by outbound roaming UE-A (target)



(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

# Current LI in VPLMN - Roaming with Home-Routed (HR) IMS Bootstrap DC and Application DC setup initiated by inbound roaming UE-A (target)

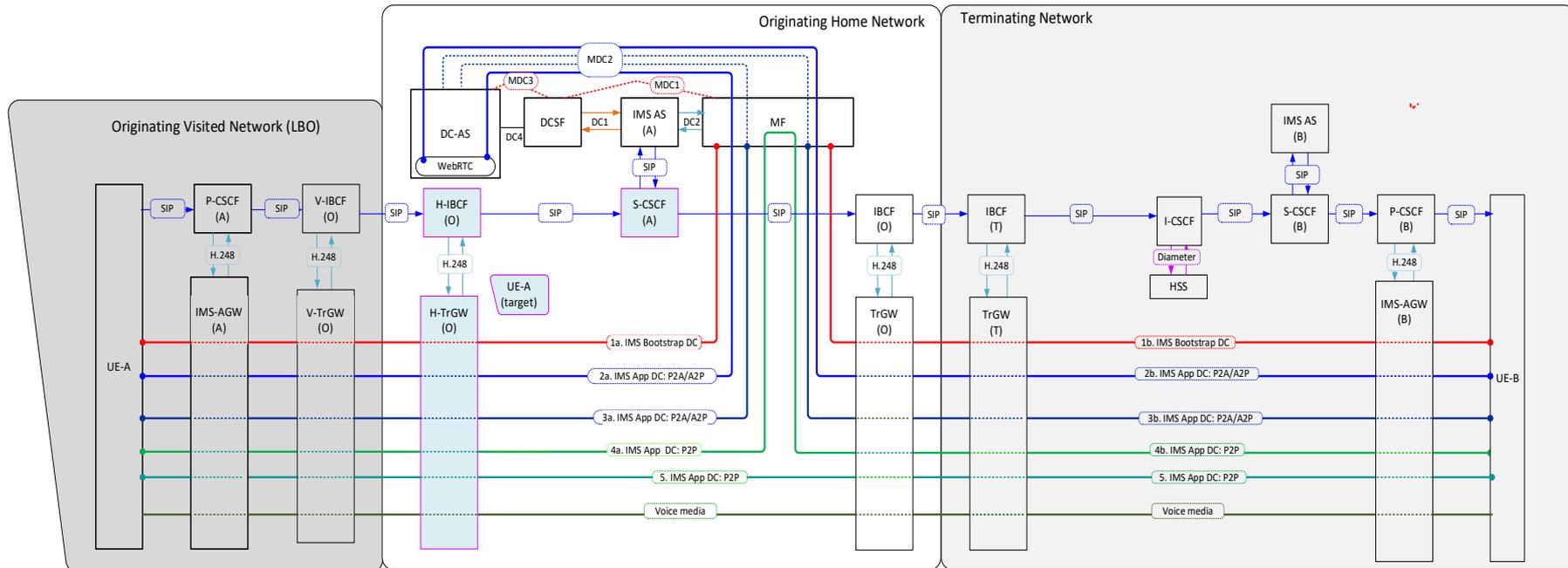


(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

The packets that flow through the VPLMN (all QoS Flows/Bearers) have to be in clear

# Current LI in HPLMN - Roaming with local breakout (LBO)

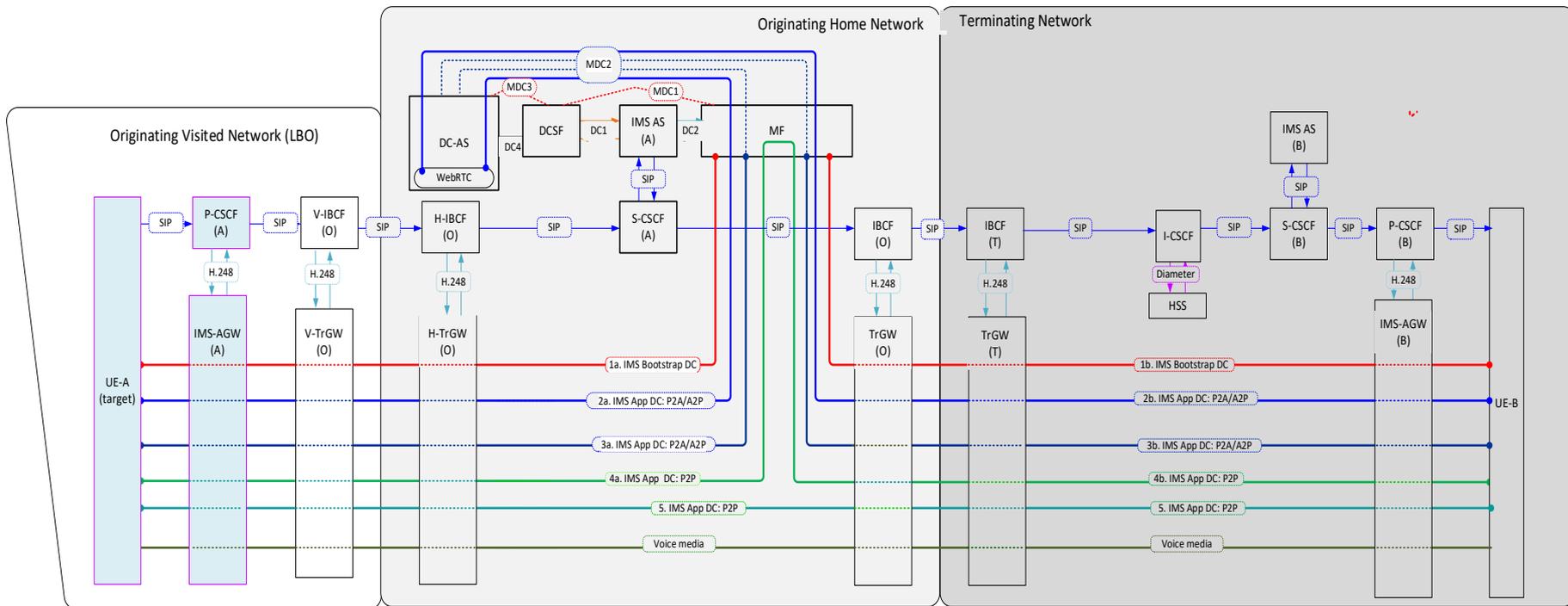
## IMS Bootstrap DC and Application DC setup initiated by outbound roaming UE-A (target)



(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

# Current LI in VPLMN - Roaming with local breakout (LBO)

## IMS Bootstrap DC and Application DC setup initiated by inbound roaming UE-A (target)

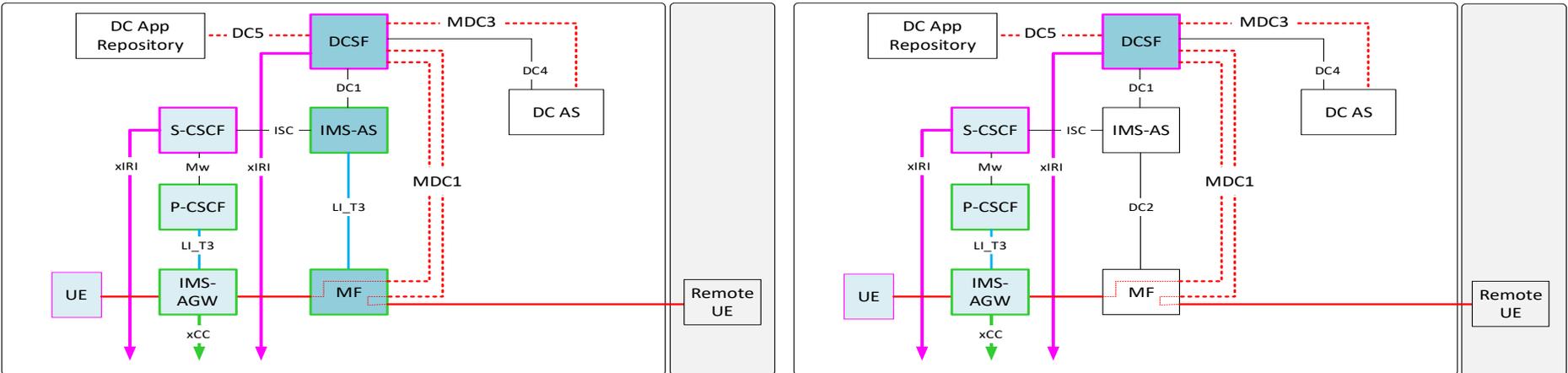


(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

# IMS Data Channel specific LI options

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# IMS Bootstrap Data Channel



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

## LI views:

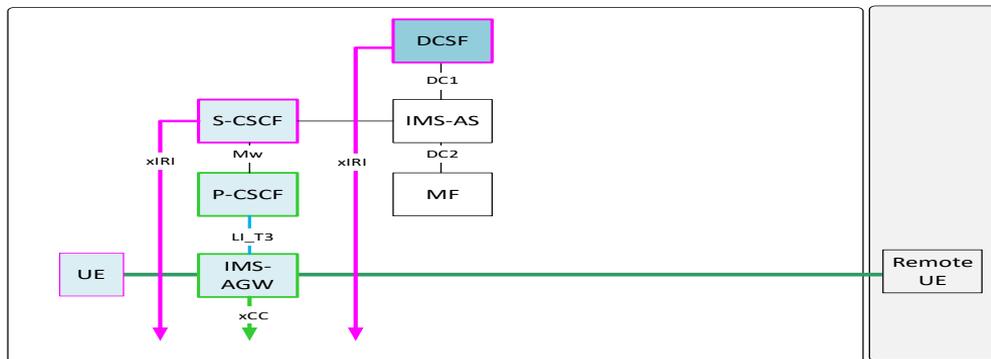
The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

## Content interception:

- Approach 1: Add CC-POI to MF with CC-TF in IMS-AS.
- Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.



# P2P IMS Application Data Channel directly between the two UEs



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

Once, the IMS media channel is setup (in this case, the P2P IMS Application Data Channel), the two UEs can exchange information over it. MF is not on the media path.

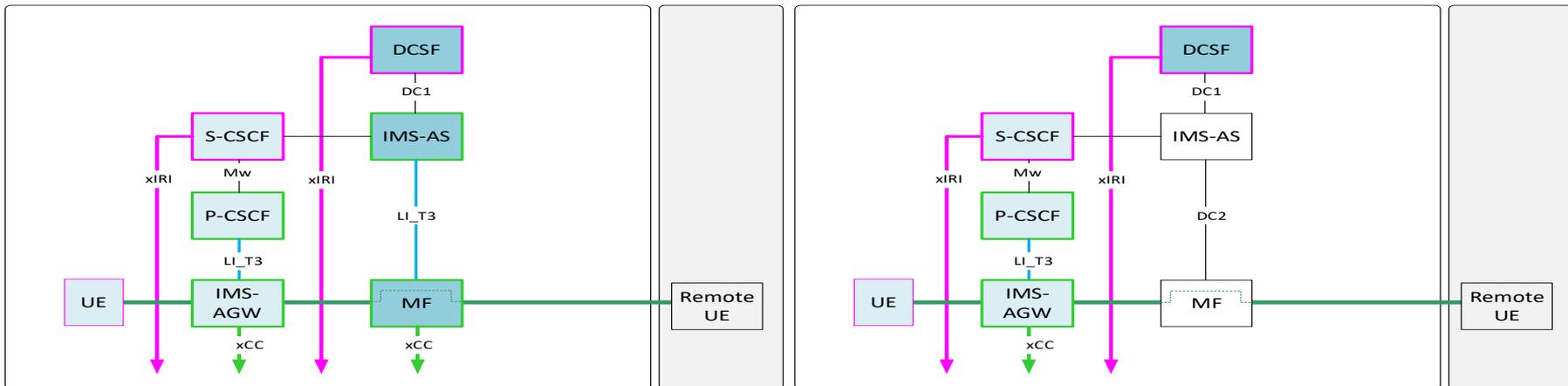
## LI views:

The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

Content interception:

- If media is encrypted:
  - Approach 1: Disallow this scenario from happening to all UEs.
  - Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs, as today

# P2P IMS Application Data Channel via MF



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

Once, the media channel is setup (in this case, the P2P IMS Application Data Channel), the two UEs can exchange information over it, via MF.

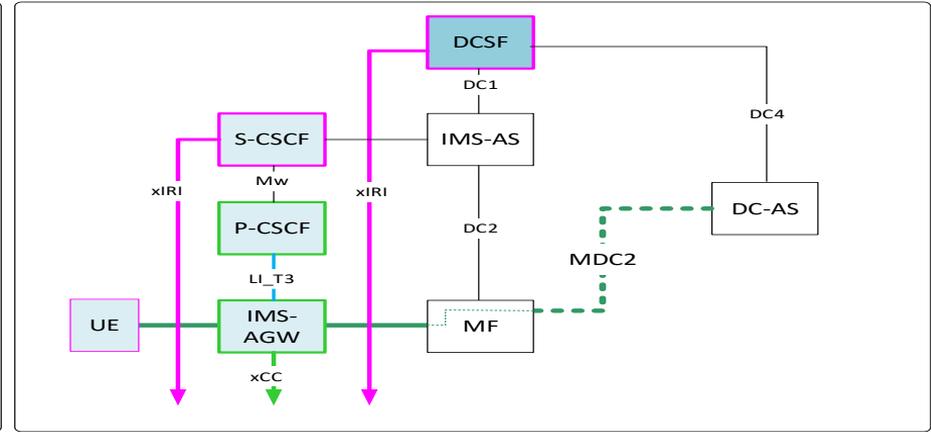
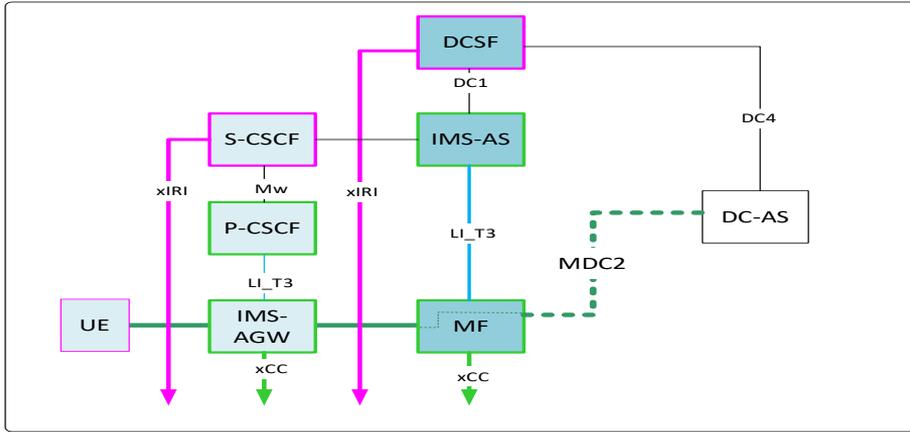
## LI views:

The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

Content interception:

- If media is encrypted:
  - Approach 1: Add CC-POI to MF with CC-TF in IMS-AS.
  - Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs, as today.

# P2A/A2P IMS Application Data Channel with MF anchoring as HTTP Proxy



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

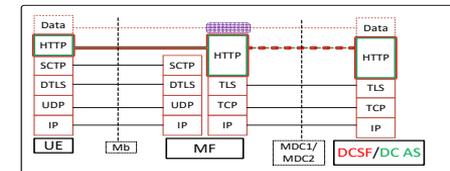
Once, the media channel is setup (in this case, the P2A/A2P IMS Application Data Channel), the UE can exchange information over it with Application (in DC AS), via MF. Here, MF provides the anchoring point as an HTTP Proxy.

## LI views:

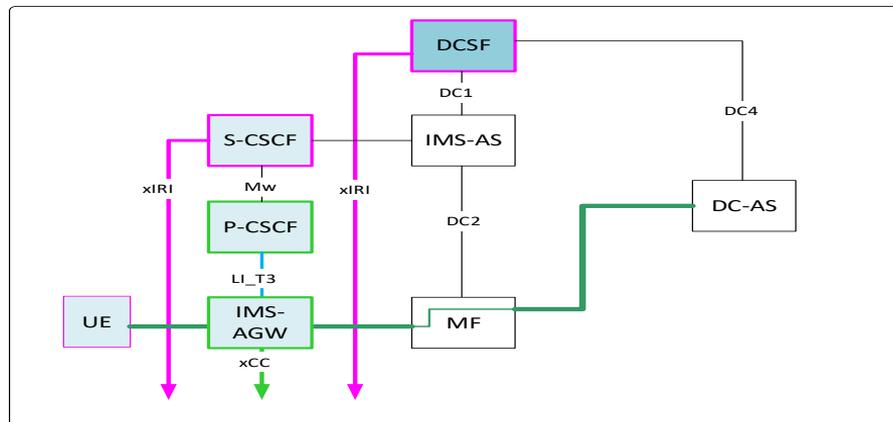
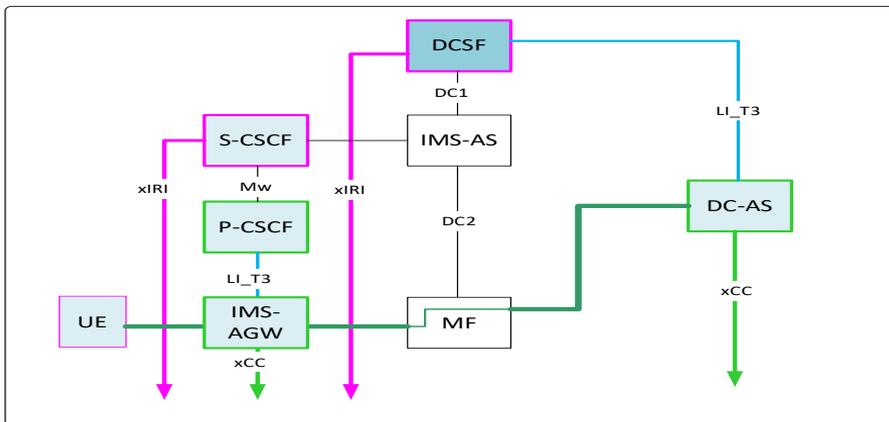
The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

Content interception:

- If media is encrypted:
  - Approach 1: Add CC-POI to MF with CC-TF in IMS-AS.
  - Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.



# P2A/A2P IMS Application Data Channel with MF anchoring as UDP Proxy (case 1)



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

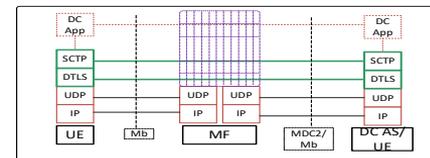
Once, the media channel is setup (in this case, the P2A/A2P IMS Application Data Channel), the UE can exchange information over it with Application (in DC AS), via MF. Here, MF provides the anchoring point as an UDP Proxy. DC-AS is in the same provider that serves the UE.

## LI views:

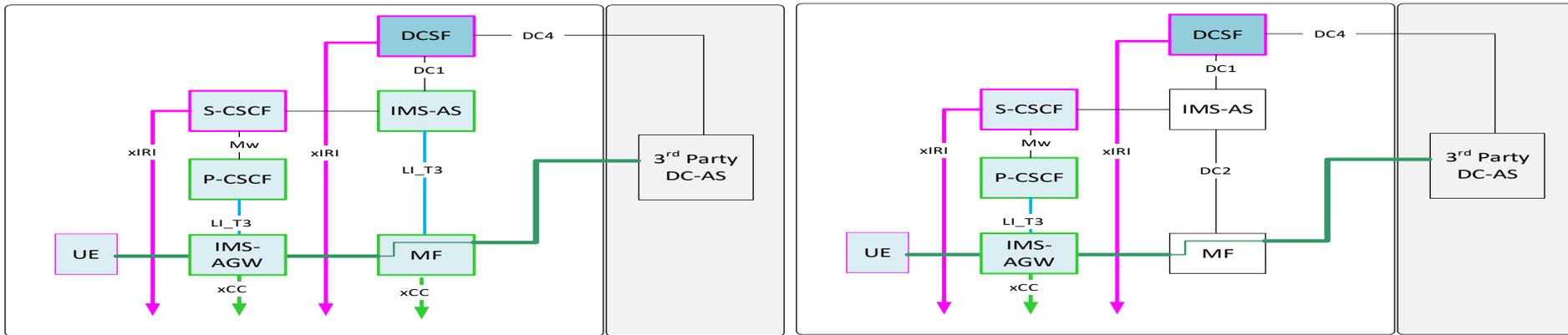
The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

Content interception:

- If media is encrypted:
  - Approach 1: Add CC-POI to DC-AS with CC-TF in DCSF.
  - Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.



# P2A/A2P IMS Application Data Channel with MF anchoring as UDP Proxy (case 2)



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

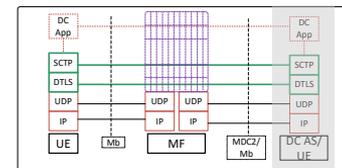
Once, the media channel is setup (in this case, the P2A/A2P IMS Application Data Channel), the UE can exchange information over it with Application (in DC AS), via MF. Here, MF provides the anchoring point as an UDP Proxy. DC-AS is at 3<sup>rd</sup> party provider.

## LI views:

The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

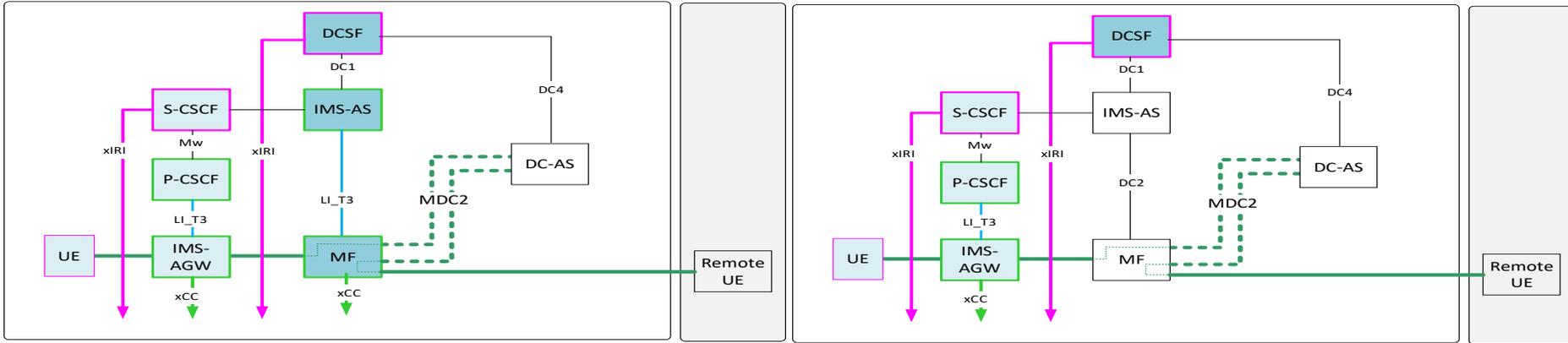
## Content interception:

- If media is encrypted:
  - Approach 1: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys
  - Approach 2: CC-POI in MF with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.



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# P2A2P IMS Application Data Channel with MF anchoring as HTTP Proxy



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

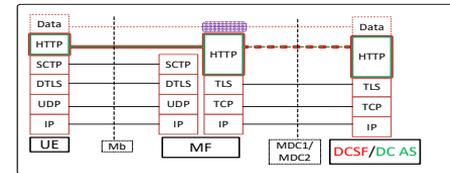
Once, the media channels are setup (in this case, the P2A/A2P IMS Application Data Channels), the UEs can exchange information over it with Application (in DC AS), via MF. Here, MF provides the anchoring point as an HTTP Proxy.

## LI views:

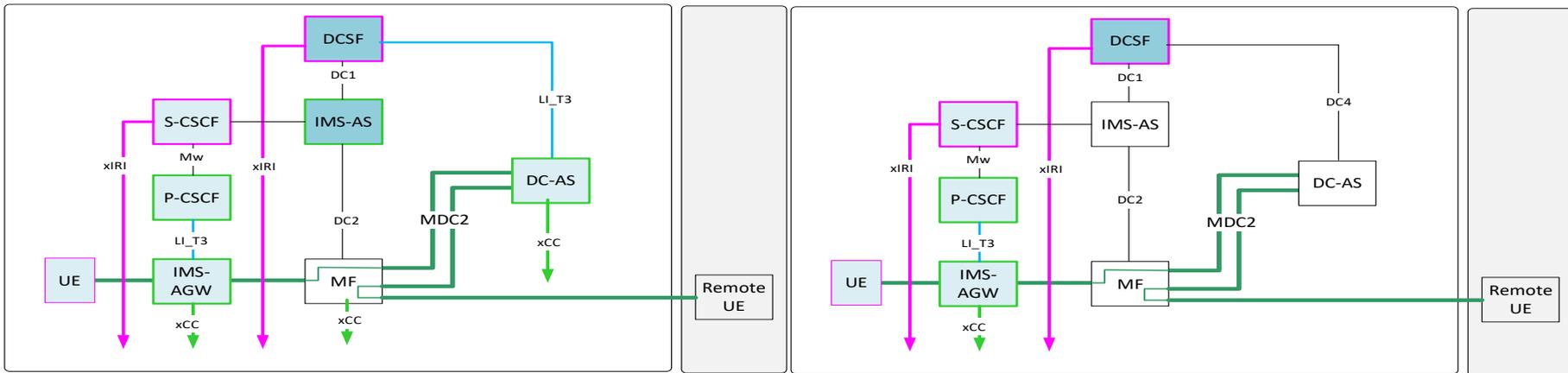
The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

## Content interception:

- If media is encrypted:
  - Approach 1: Add CC-POI to MF with CC-TF in IMS-AS.
  - Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.



# P2A2P IMS Application Data Channel with MF anchoring as UDP Proxy (case 1)



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

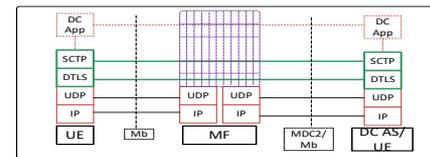
Once, the media channels are setup (in this case, the P2A2P IMS Application Data Channel), the UEs can exchange information over it with Application (in DC AS), via MF. Here, MF provides the anchoring point as an UDP Proxy. DC-AS is in the same provider that serves the UE.

## LI views:

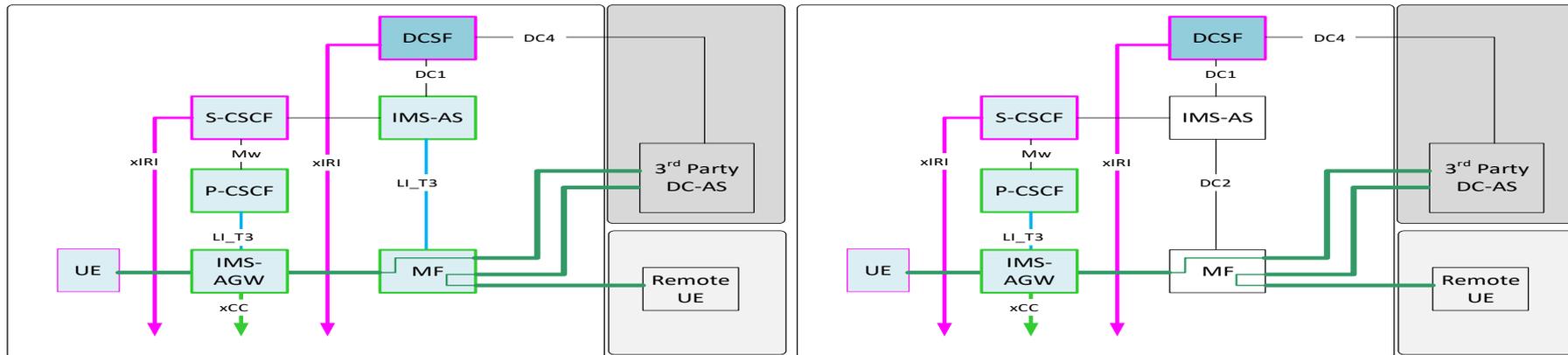
The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

Content interception:

- If media is encrypted:
  - Approach 1: Add CC-POI to DC-AS with CC-TF in DCSF.
  - Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.



# P2A/A2P IMS Application Data Channel with MF anchoring as UDP Proxy (case 2)



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

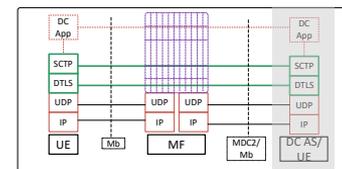
Once, the media channel is setup (in this case, the P2A2P IMS Application Data Channel), the UEs can exchange information over it with Application (in DC AS), via MF. Here, MF provides the anchoring point as an UDP Proxy. DC-AS is at 3rd party provider.

## LI views:

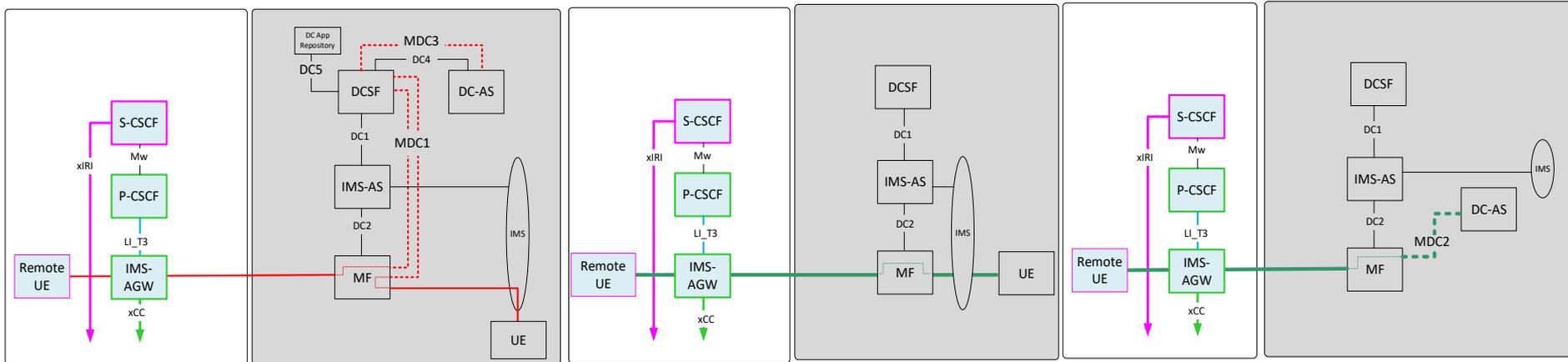
The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

Content interception:

- If media is encrypted:
  - Approach 1: CC-POI in MF with encrypted CC; undefined method to provide keys.
  - Approach 2: CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.



# Remote UE is the target with IMS Data Channels established in the other network



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel is same as any other IMS session setup.

Once, the media channel is setup (all IMS Data Channels), the UE can exchange information over it with the (IMS Bootstrap Data Channel, P2P IMS Application Data Channel, P2A/A2P IMS Application Data Channel).

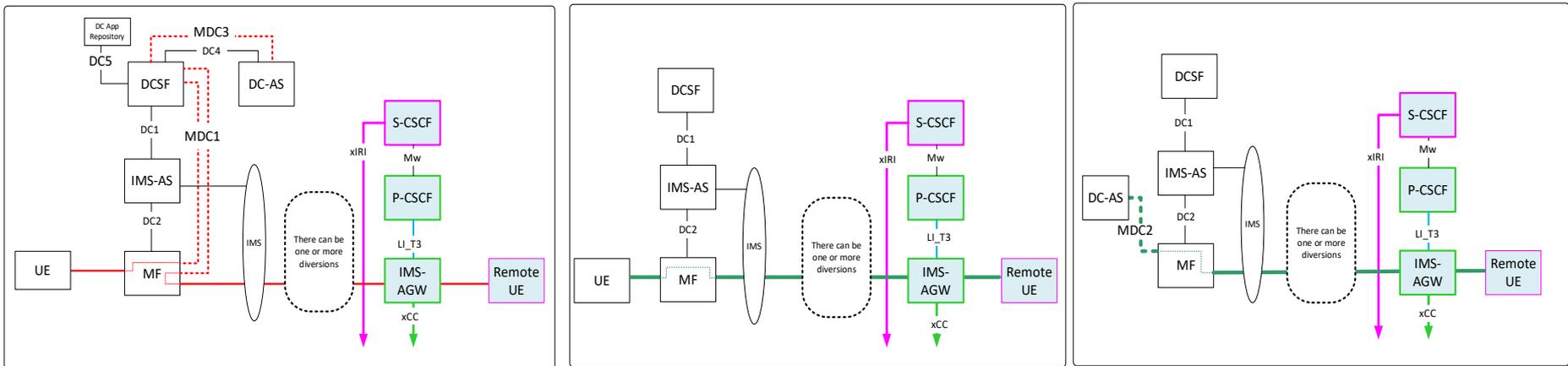
## LI views:

The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Since the IMS Data Channel specifics are handled in the other UE's network, IMS Data Channel Specific LI cannot be provided.

Content interception:

- If media is encrypted:
  - CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.

# Remote UE is the target, IMS Data Channels are setup by the other party



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel is same as any other IMS session setup.

Once, the media channel is setup (all IMS Data Channels), the UE can exchange information over it with the (IMS Bootstrap Data Channel, P2P IMS Application Data Channel, P2A/A2P IMS Application Data Channel).

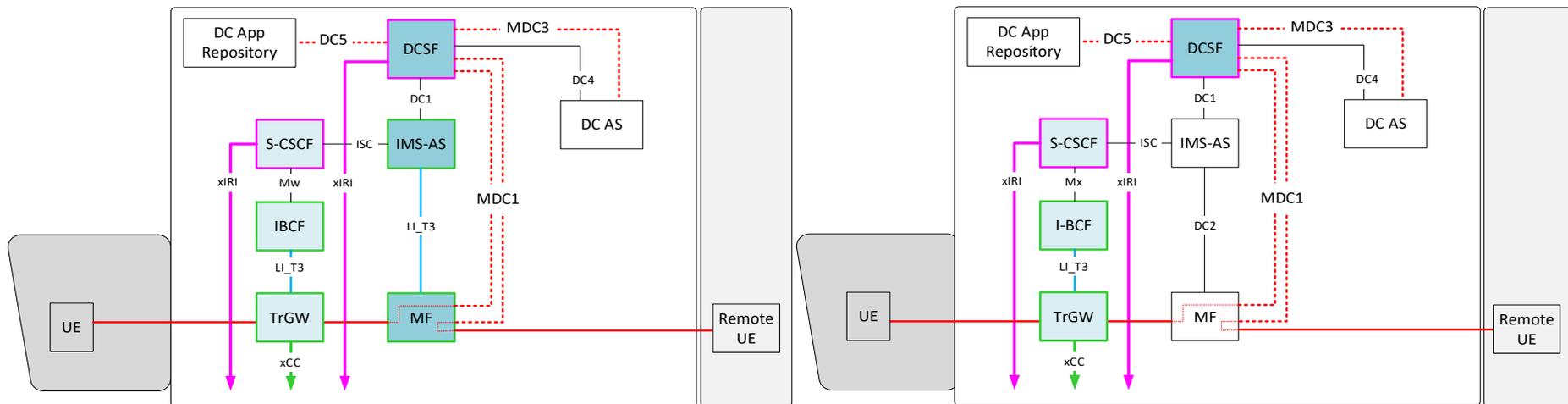
## LI views:

The IRI-POI in S-CSCF (or P-CSCF) can continue to provide the IRI-POIs. Since the IMS Data Channel specifics are handled in the other UE's side of session, IMS Data Channel specific LI is provided.

Content interception:

- If media is encrypted:
  - CC-POI in IMS-AGW with encrypted CC; undefined method to provide keys.
- If media is not encrypted, the CC-POIs in IMS-AGWs can continue to provide the CC-POIs as today.

# Roaming (LI in HPLMN) - Bootstrap DC



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

## LI views:

Home-routed roaming is assumed.

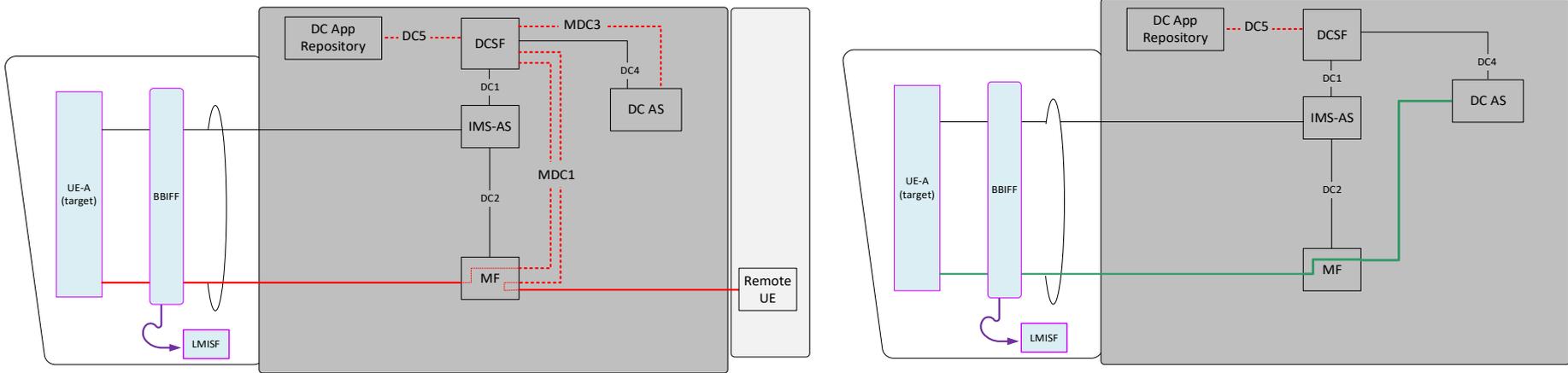
The IRI-POI in S-CSCF (or IBCF) can continue to provide the IRI-POIs. Add IRI-POI to DCSF to provide any IMS Data Channel specific IRIs.

Content interception:

- Approach 1: Add CC-POI to MF with CC-TF in IMS-AS.
- Approach 2: CC-POI in TrGW with encrypted CC; undefined method to provide keys.

The same principles to P2P, P2A, A2P, P2A2P IMS Data Channels.

# Roaming (LI in VPLMN with HR): two examples: Bootstrap DC and P2A Data Channel with MF as UDP proxy



The SIP signaling along with the SDP offer/answer procedures associated with an IMS Data Channel are same as the procedures used any other IMS session setup.

## LI views:

The N9HR LI can continue to provide the IRI-POIs with the pre-conditions required for N9HR is being deployed. IMS Data Channel specific IRIS cannot be provided as the related NFs are in HPLMN (like the conferencing case with N9HR).

### Content interception:

- If media is encrypted:
  - N9HR LI with encrypted CC; undefined method to provide keys.
- If media is not encrypted, then N9HR LI.

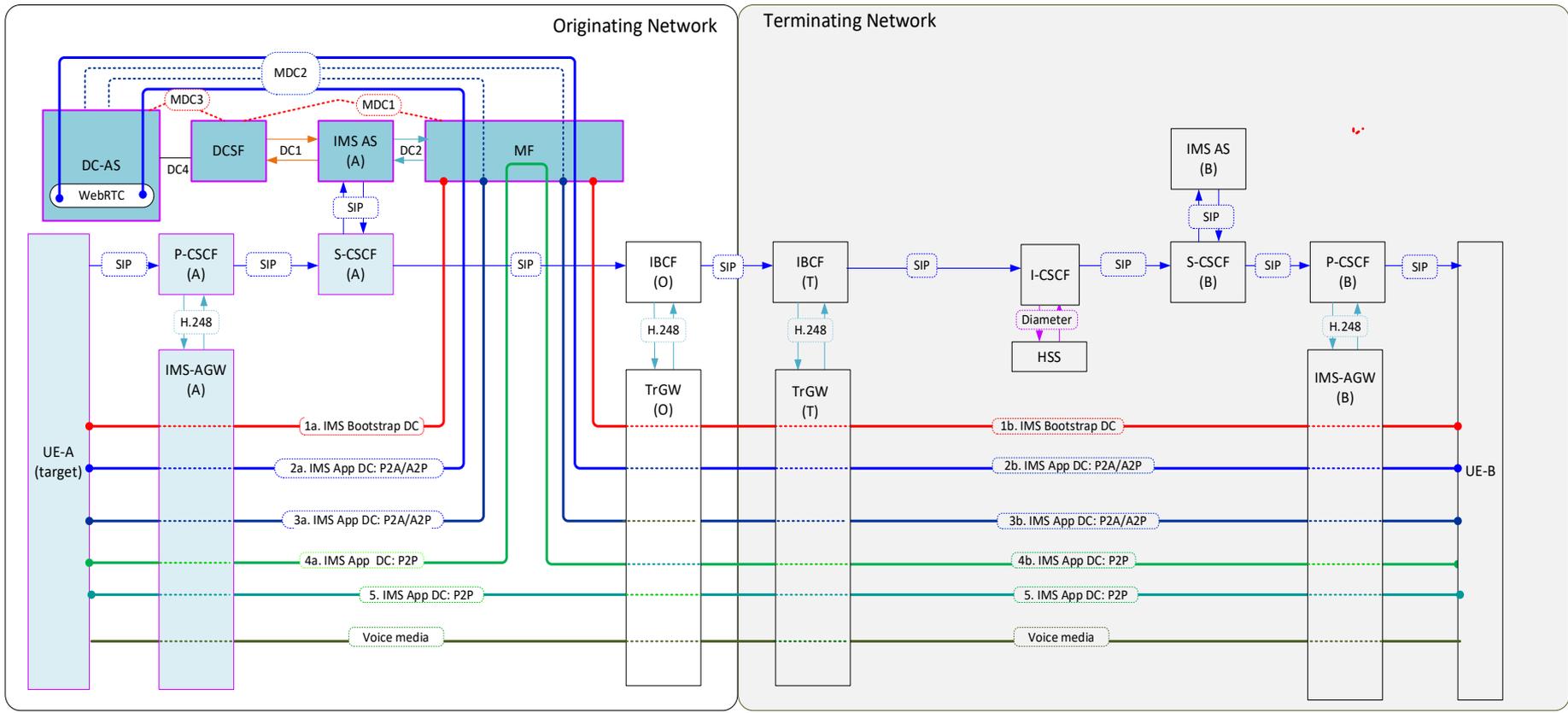




# Summary

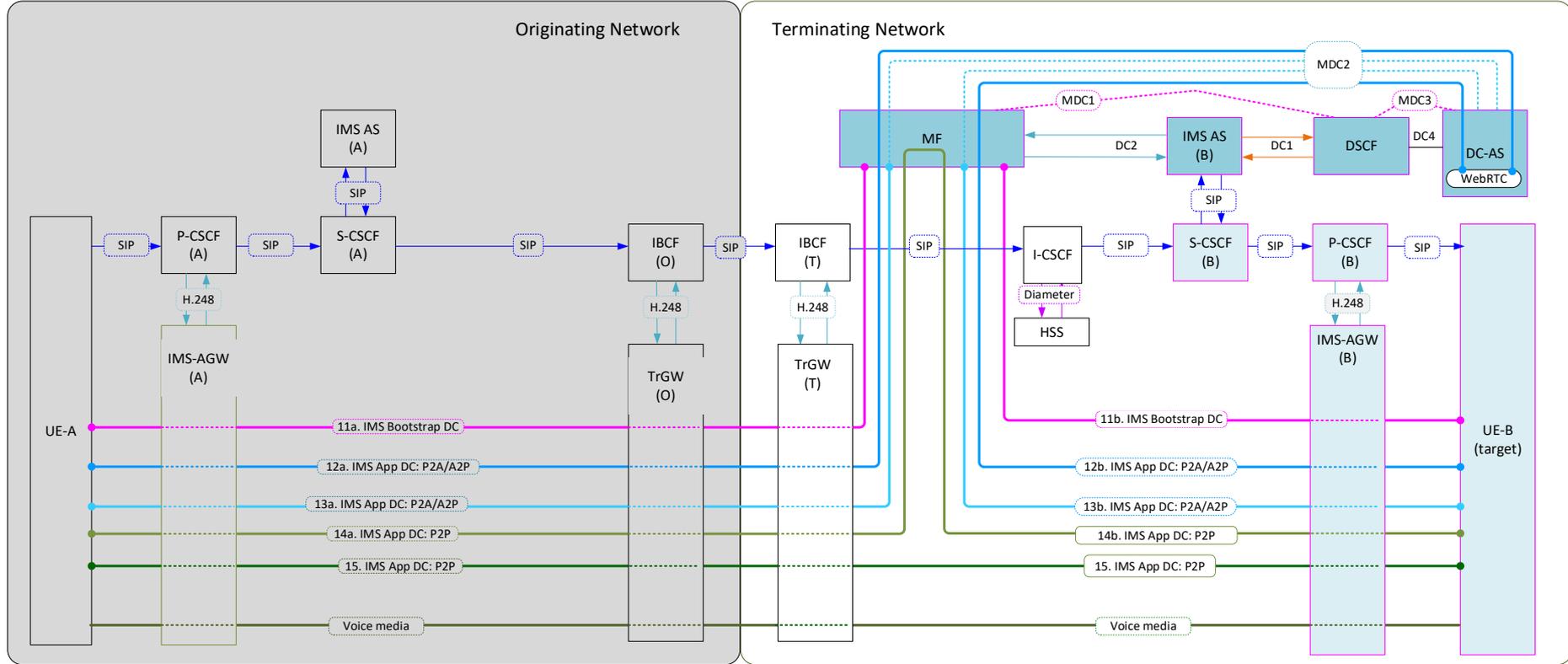
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# IMS Bootstrap DC and Application DC with LI (originating end)



IMS Data Channel specific LI is when local UE is the target

# IMS Bootstrap DC and Application DC with LI (terminating end)



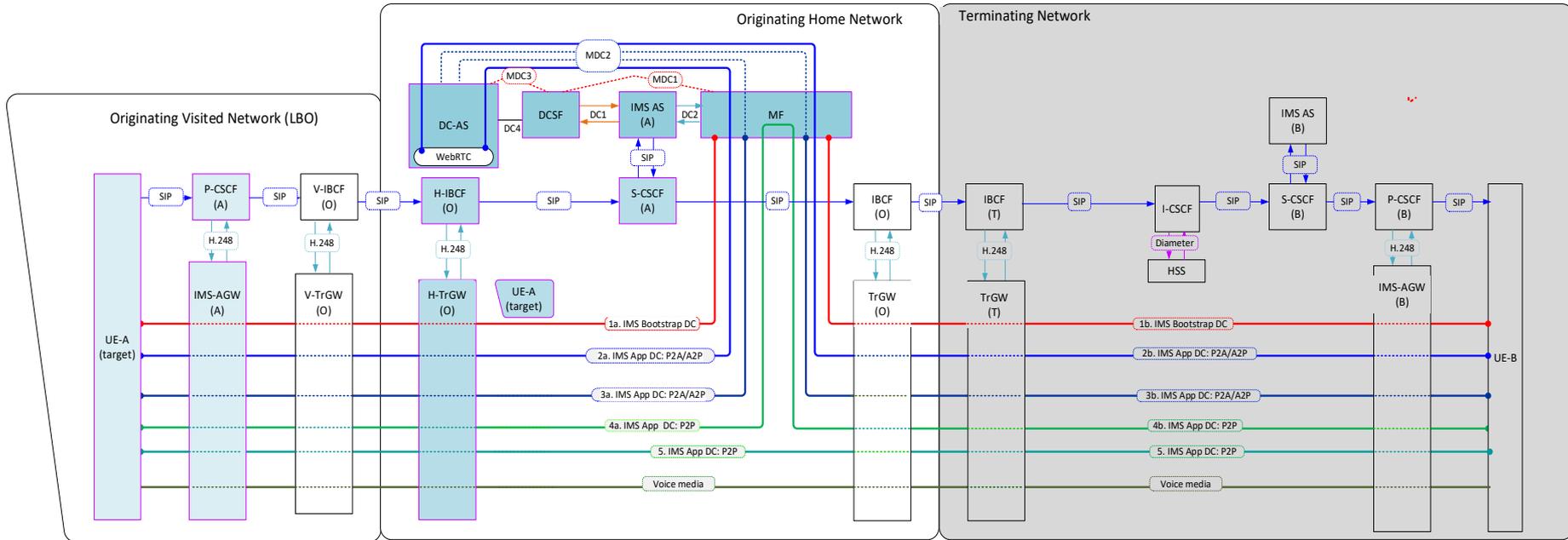
IMS Data Channel specific LI is when local UE is the target





# IMS Bootstrap DC and Application DC with LI (roaming case - LBO)

Disclaimer: LBO-based roaming architecture is not considered for IMS DC in SA2.



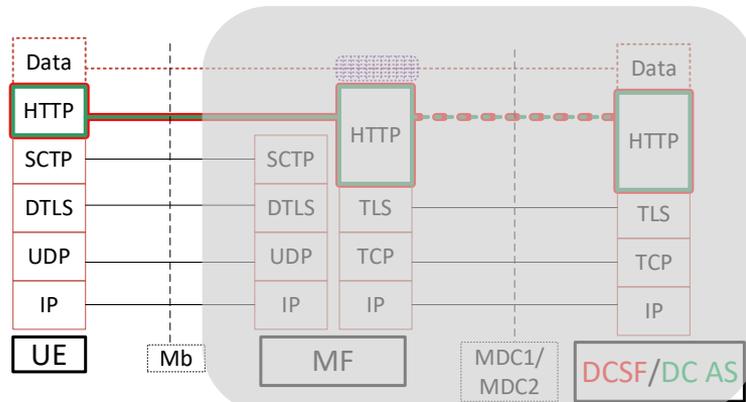
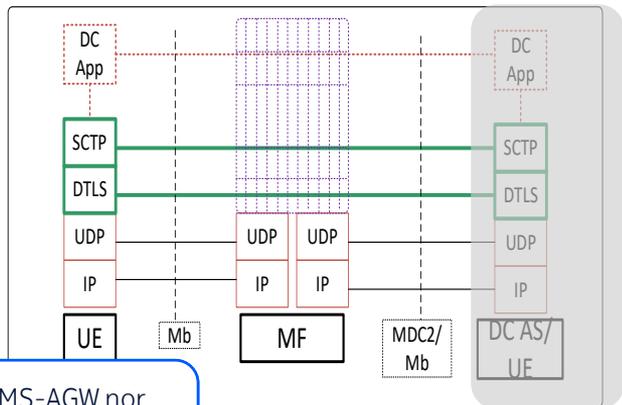
(2a/2b): P2A/A2P IMS Application Data Channel with MF as an UDP Proxy  
 (3a/3b): P2A/A2P IMS Application Data Channel with MF as an HTTP Proxy.

IMS Data Channel specific LI in HPLMN only

# Challenges

**#1:** MF as a UDP proxy, DC AS (WebRTC Server) is provided by third party

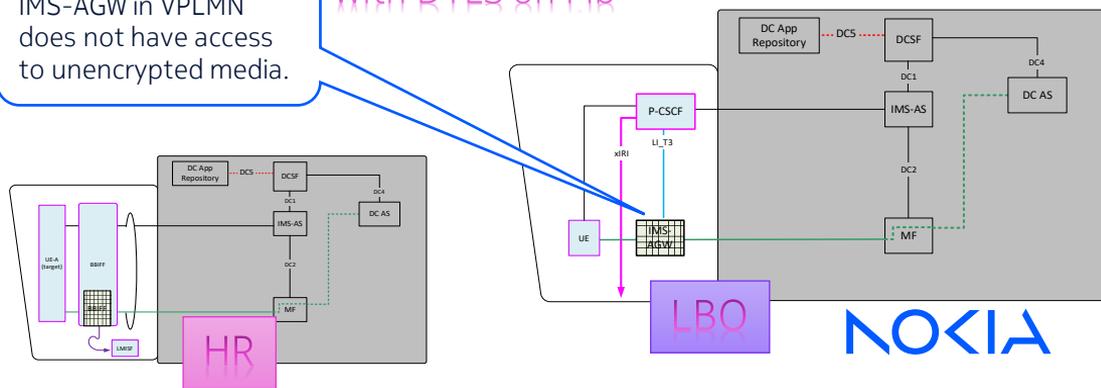
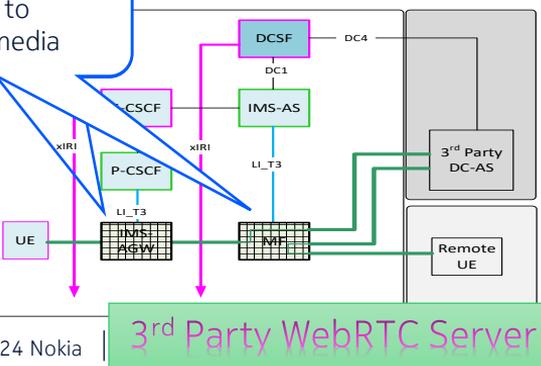
**#2:** Roaming (LBO or Home-routed): All IMS DC contents are encrypted even with MF as an HTTP Proxy.



Neither IMS-AGW nor MF has access to unencrypted media

IMS-AGW in VPLMN does not have access to unencrypted media.

With DTLS on Mb



# 3GPP TS 24.186

The Nokia logo is displayed in a blue, sans-serif font. It is positioned in the lower-left area of the slide, partially overlaid by a large blue graphic element that consists of a vertical bar on the left and a diagonal bar extending from the top-left towards the bottom-right.

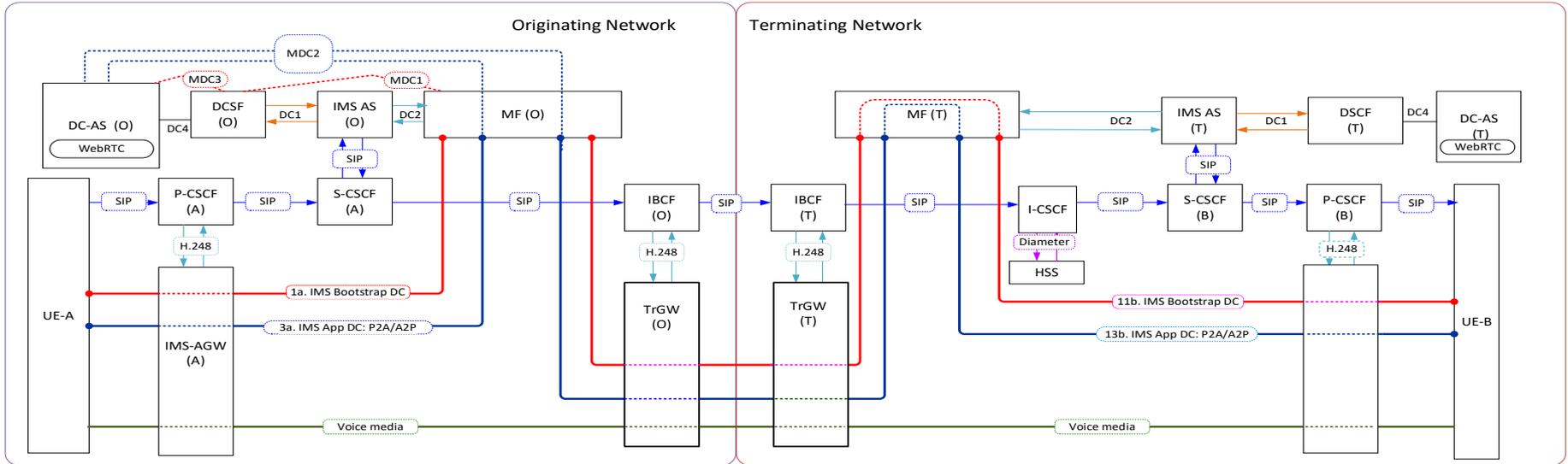
### 9.3.3.2 Procedures at the serving IMS AS for the terminating UE

Is this the way?

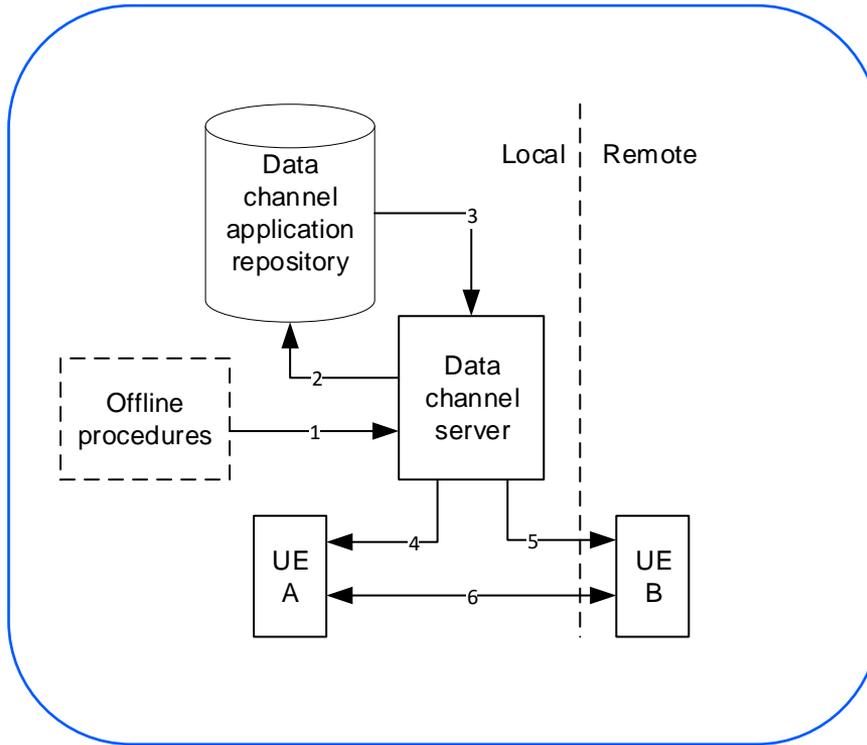
#### 9.3.3.2.1 IMS bootstrap data channel establishment in conjunction with MMTel session setup

Upon receipt of a SIP initial INVITE request with the SDP offer including IMS data channel media descriptions from the originating network, if the IMS AS determined that the terminating registered UE:

- 1) supports IMS data channel capabilities and is authorized to use IMS data channel, the IMS AS shall notify the DCSF about a session establishment request event and shall not send a INVITE request to the S-CSCF until receiving an acknowledgement from the DCSF. Based on the received Media instruction set from the DCSF, the IMS AS shall select the MRF (or MF) and request the MRF (or MF) to allocate required data channel media resources:



## Different in TS 26.114



NOTE 4: A Data Channel Server in this specification can be further decomposed into a number of functional entities including DC Signalling Function, Media Function (or MRF) and DC Application Server as specified in Annex AC of [167].

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