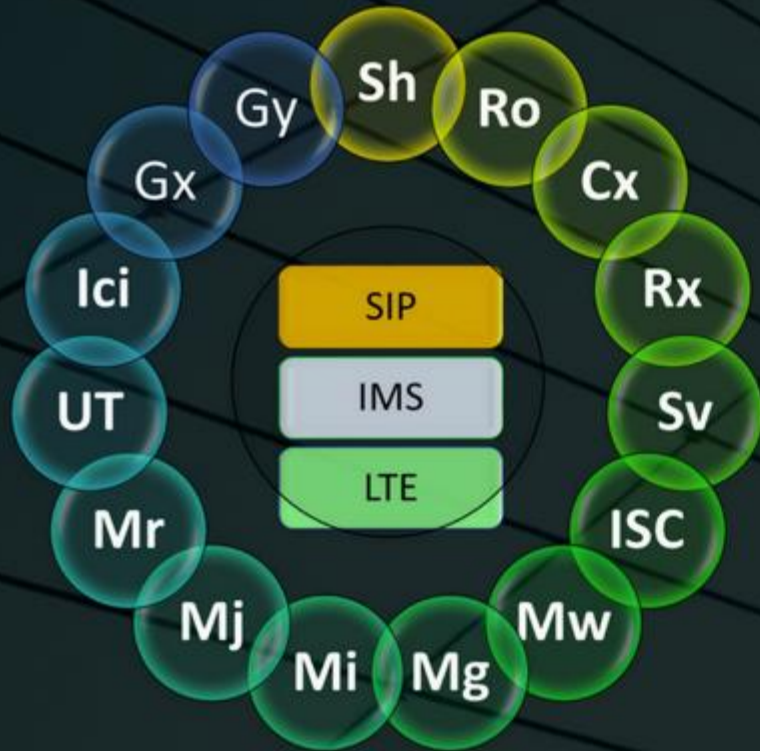
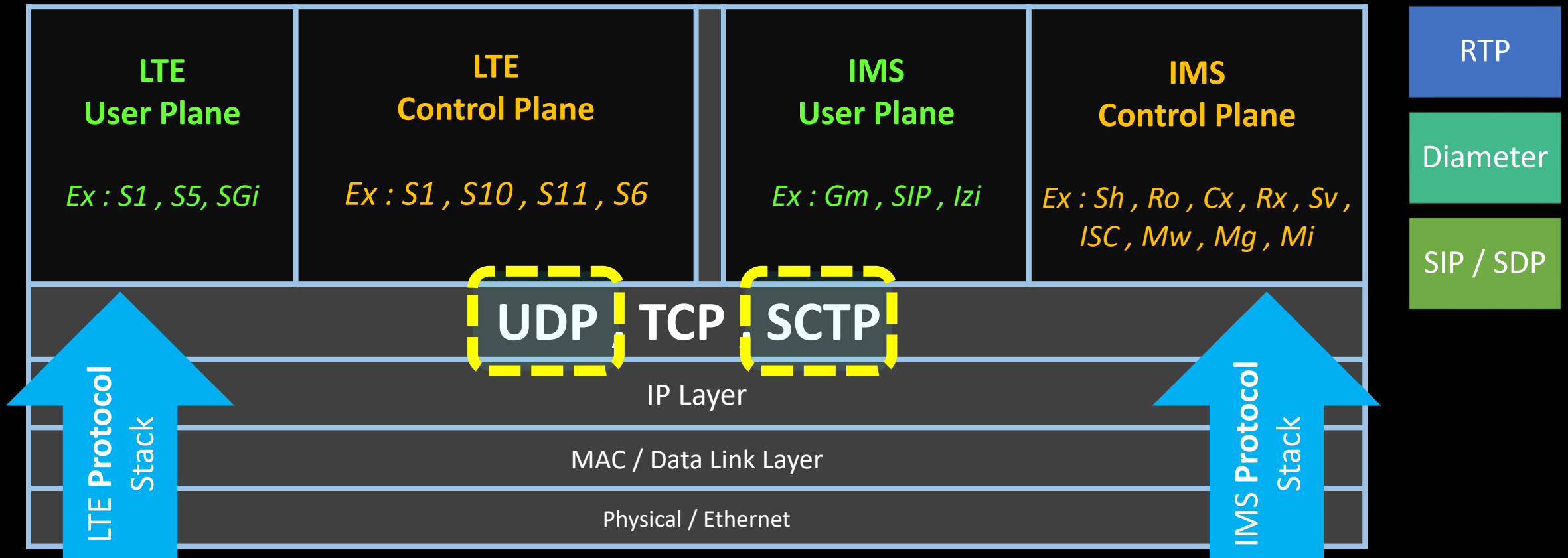
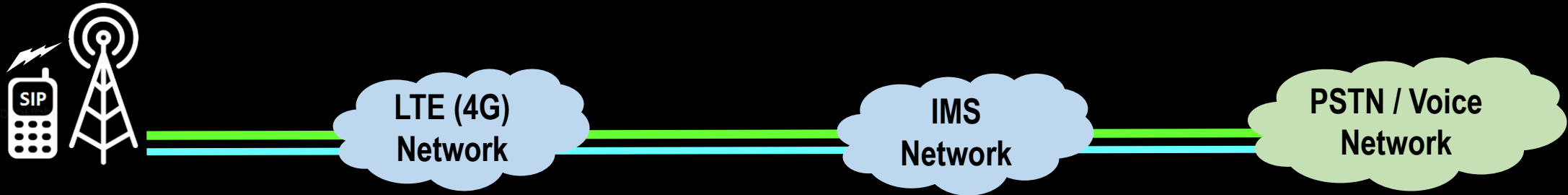


# VOLTE IMS



- **Links**
- **Interfaces**
- **Protocol Stack**

# LTE / VoLTE IMS Protocols Interfaces



# SCTP Vs UDP

## SCTP ( Stream Control Transmission Protocol )

- Requires Strong / Robust Media connectivity
- Provides Super Reliable Communication
- Connection-oriented protocol similar to TCP
- Provides facilities such as multi-streaming and multi-homing
- Better performance and redundancy
- S1AP , X2AP , Diameter ( S6 , Gx , Gy )
- Best Suited for Control Plane & Close Reliable Network such as Billing , Charging & Authentications

## UDP ( User Datagram Protocol )

- Suited for Non-Reliable Media
- Does not guarantee that Data in the order on receive
- Minimal message-oriented transport layer protocol
- Enables two hosts to connect and send short messages to one another
- User Plane : S1U , GTPv1U ( S5 , S8 )
- Control Plane : GTPv2C ( S5 , S8 )
- Best Suited for Long Distance & Open Networks such as Roaming etc..

# LTE / IMS Protocols Interfaces



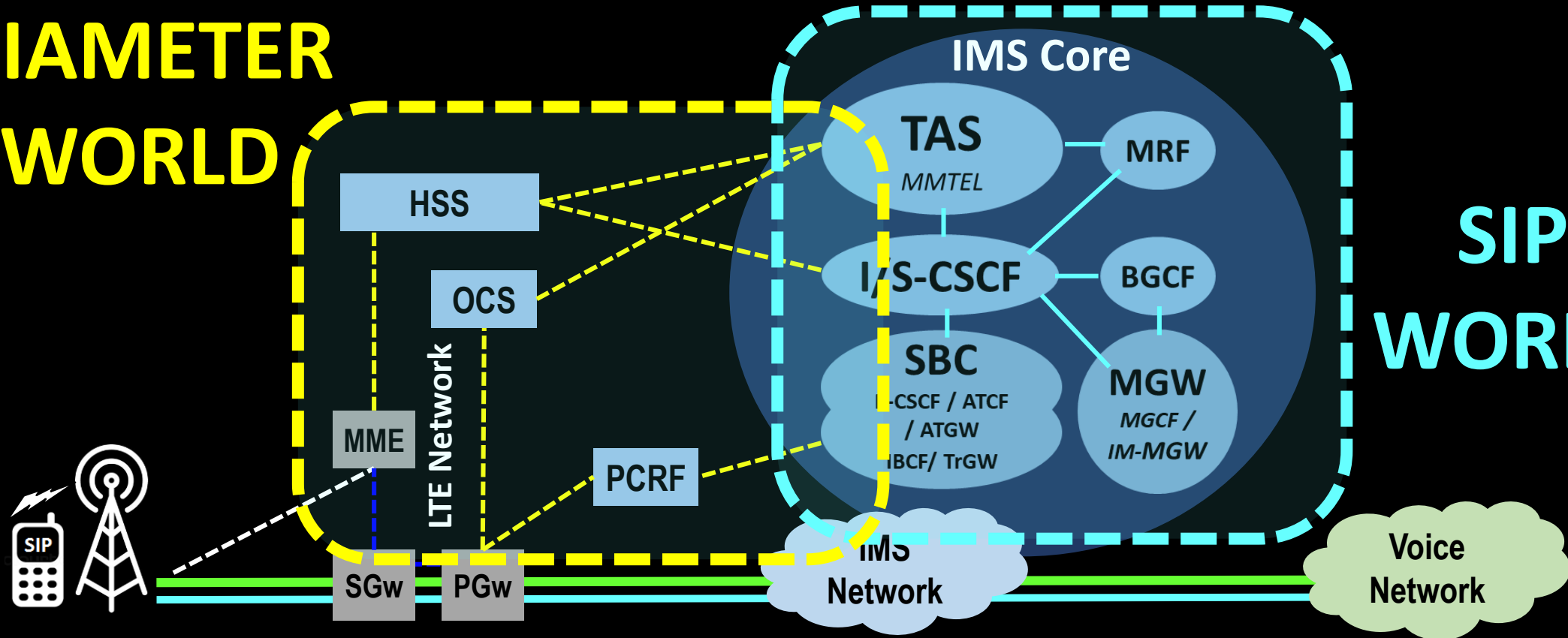
- BICC
- ISUP
- SIP-I

LTE User Plane	LTE Control Plane	IMS User Plane	IMS Control Plane
<ul style="list-style-type: none"> <li>• S1U</li> <li>• S5/S8</li> <li>• SGi</li> </ul>	<ul style="list-style-type: none"> <li>• S1MME</li> <li>• S5/S8</li> <li>• S10</li> <li>• S11</li> <li>• S6a</li> <li>• Gx</li> <li>• Gy</li> <li>• X2</li> <li>• SGs</li> </ul>	<ul style="list-style-type: none"> <li>• Gm</li> <li>• SIP</li> <li>• Izi</li> </ul>	<ul style="list-style-type: none"> <li>• Sh</li> <li>• Ro</li> <li>• Cx</li> <li>• Rx</li> <li>• Sv</li> <li>• ISC</li> <li>• Mw</li> <li>• Mg</li> <li>• Mi</li> <li>• Mj</li> <li>• Mr / Mr'</li> <li>• UT</li> <li>• Ici</li> </ul>
GTPv1U , S1AP , SGi	GTPv2C , Diameter , AP (X2AP , SGSAP , S1AP )	RTP , RTCP	SIP & SDP , HTTP , Diameter , Megaco

# VoLTE IMS Connectivity Overview

**DIAMETER  
WORLD**

**SIP  
WORLD**



- Diameter , Control Plane
- SIP Protocol , Control Plane
- User Plane

# SIP & Diameter Protocols

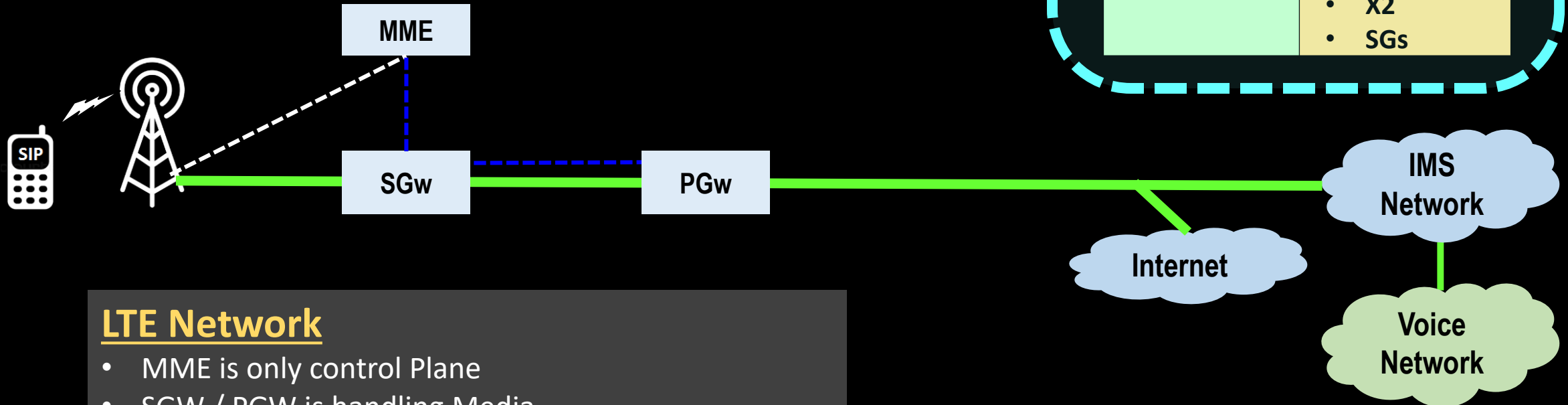
## SIP ( Session Initiated Protocol )

- Used for Controlling Voice / Multimedia Calls & Uses RTP / RTCP for media plane
- SIP manages set-up/establishing, tying together, and tear-down/ terminating of multimedia communications
- 5 Functions of SIP :- a) *User Location* b) *User Availability* c) *User Capabilities* d) *Session Setup* e) *Session Management*

## Diameter

- Evolution of RADIUS (AAA) Protocol - Authentication, authorization, and accounting (AAA) services
- Reliable & Secure ( Runs on TCP / SCTP )
- Supports Failover mechanism to maintain redundancy
- Support for Proxy & Relay Agents
- Support for Capability Negotiation via Mandatory / Optional AVPs
- Provides Dynamic discovery of Peers

# LTE Network – Protocols & Links



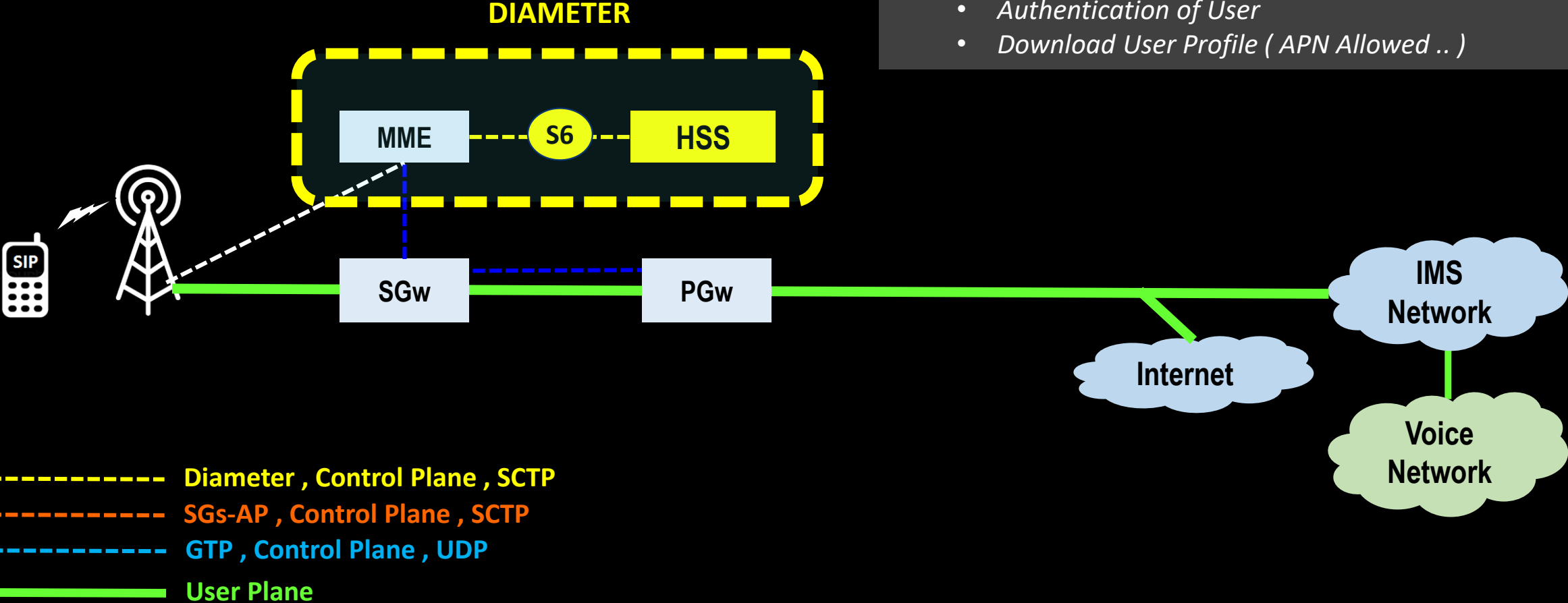
**LTE Network**

- MME is only control Plane
- SGW / PGW is handling Media

# S6a – LTE Protocols & Links

**S6 Interface ( MME to HSS )**

- Diameter Link connects MME to HSS
- Used for :-
  - *Authentication of User*
  - *Download User Profile ( APN Allowed .. )*

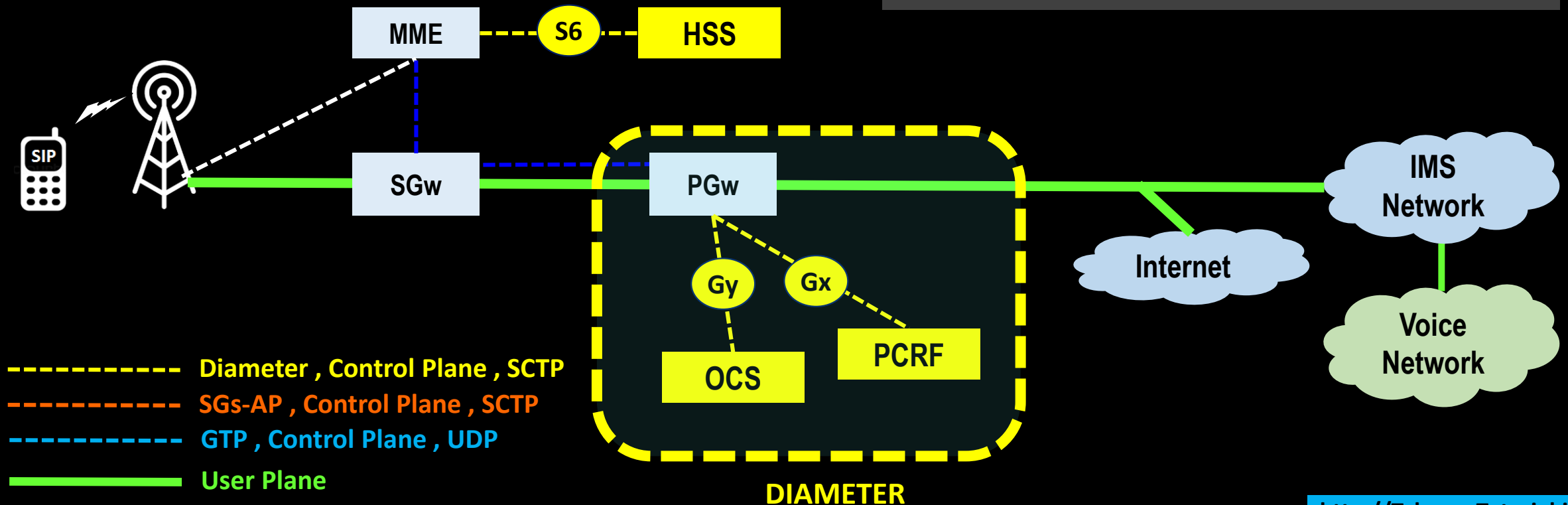




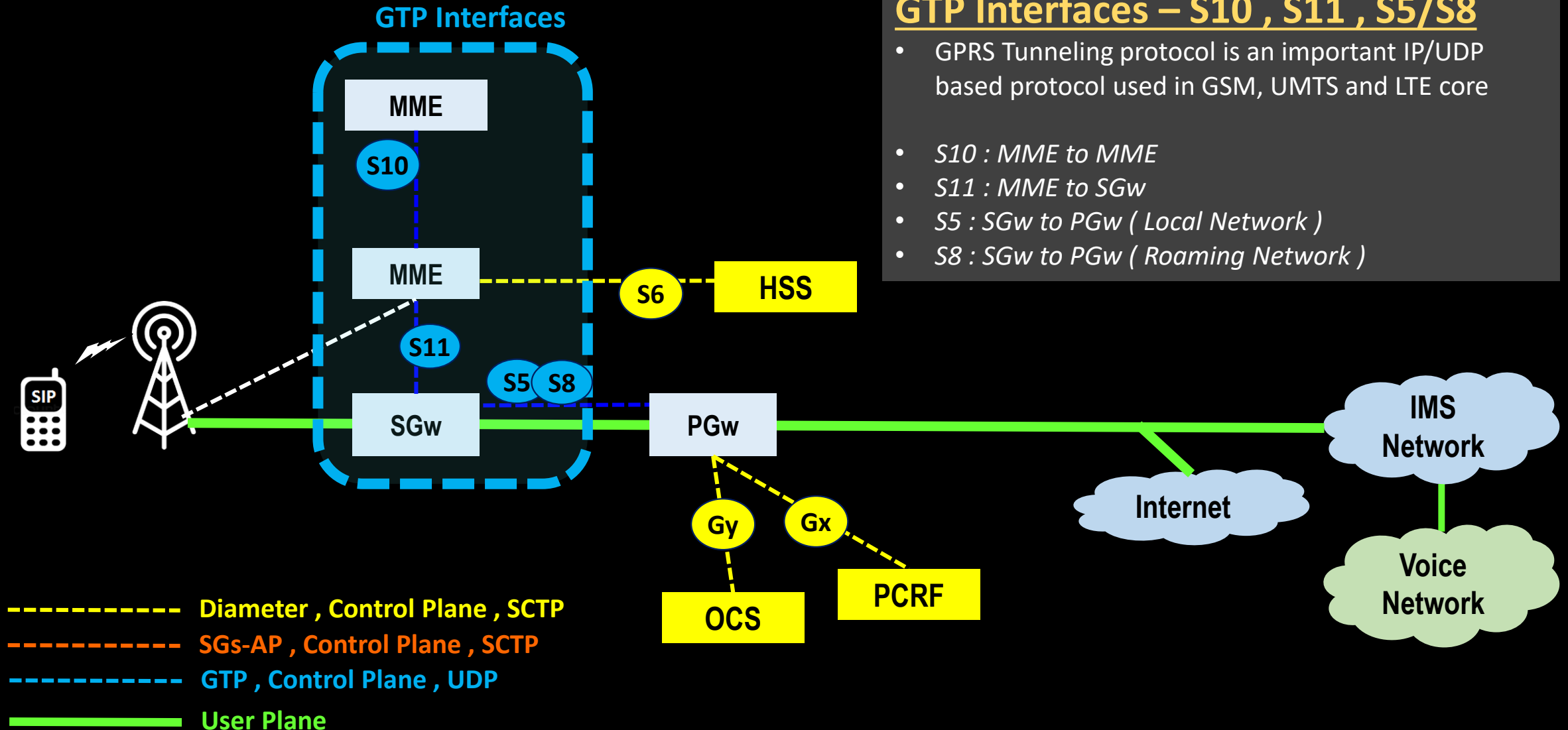
# Gx & Gy – LTE Protocols & Links

## Gx & Gy Links

- Gx : Diameter Link connects PGW to PCRF
  - Used for QOS , Traffic Prioritization
- Gy : Diameter Link connects PGW to OCS
  - Used for Balance Reservation , Internet Quota Allocation & Management , Wallet for Services



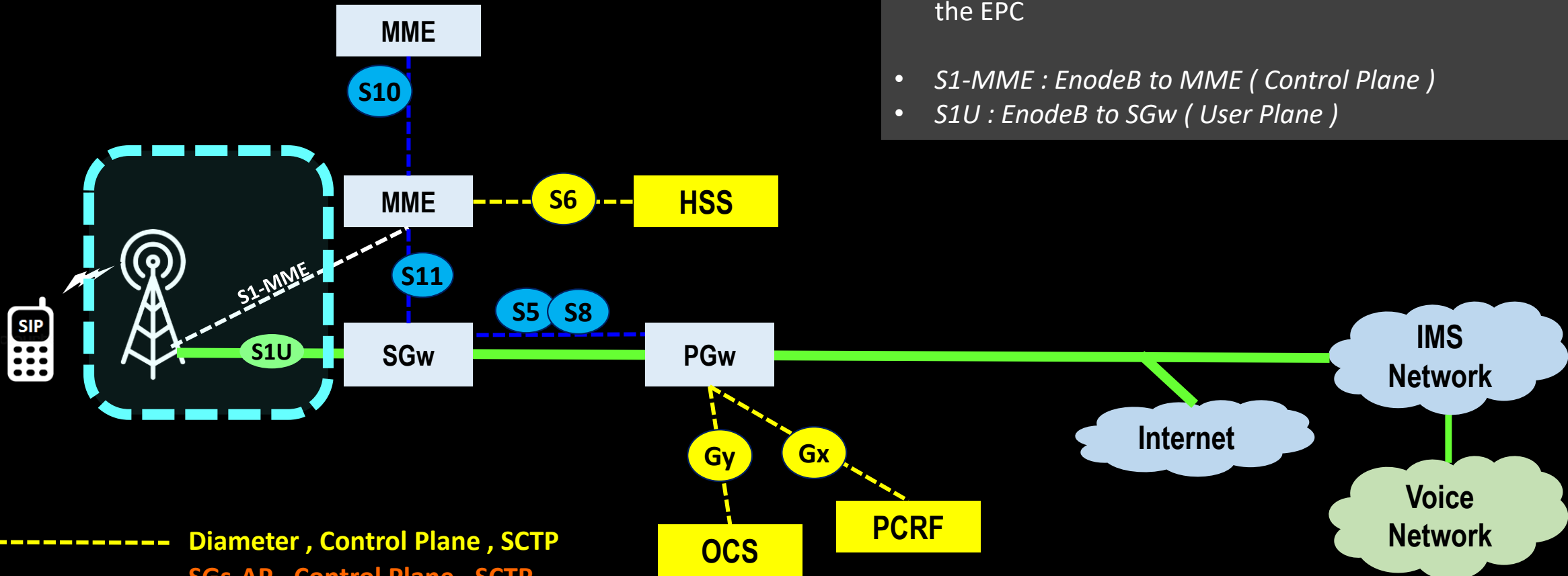
# GTP Interfaces – LTE Protocols & Links



# S1MME / S1U – LTE Protocols & Links

**S1 Interface**

- The S1 interface in LTE is used between ENodeBs and the EPC
- S1-MME : EnodeB to MME ( Control Plane )
- S1U : EnodeB to SGw ( User Plane )

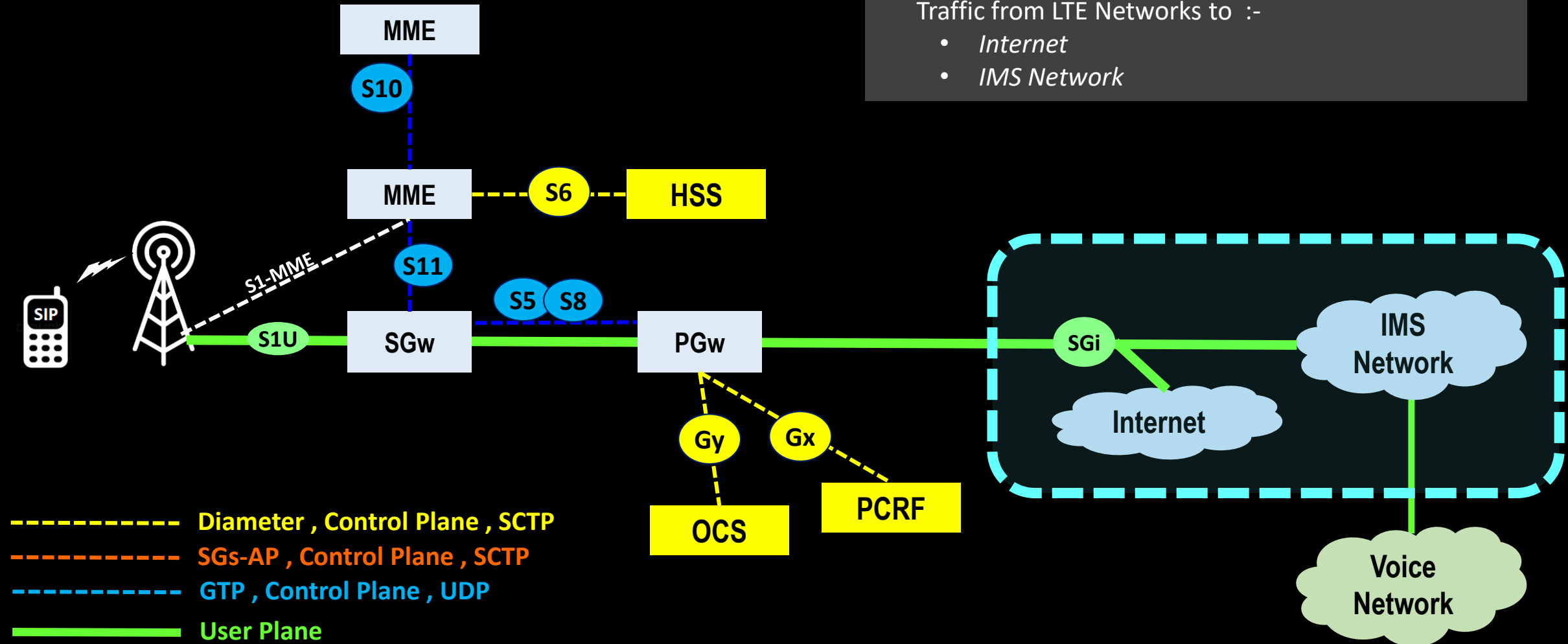


- Diameter , Control Plane , SCTP
- SGs-AP , Control Plane , SCTP
- GTP , Control Plane , UDP
- User Plane

# SGi Link – LTE Protocols & Links

**SGi Interface**

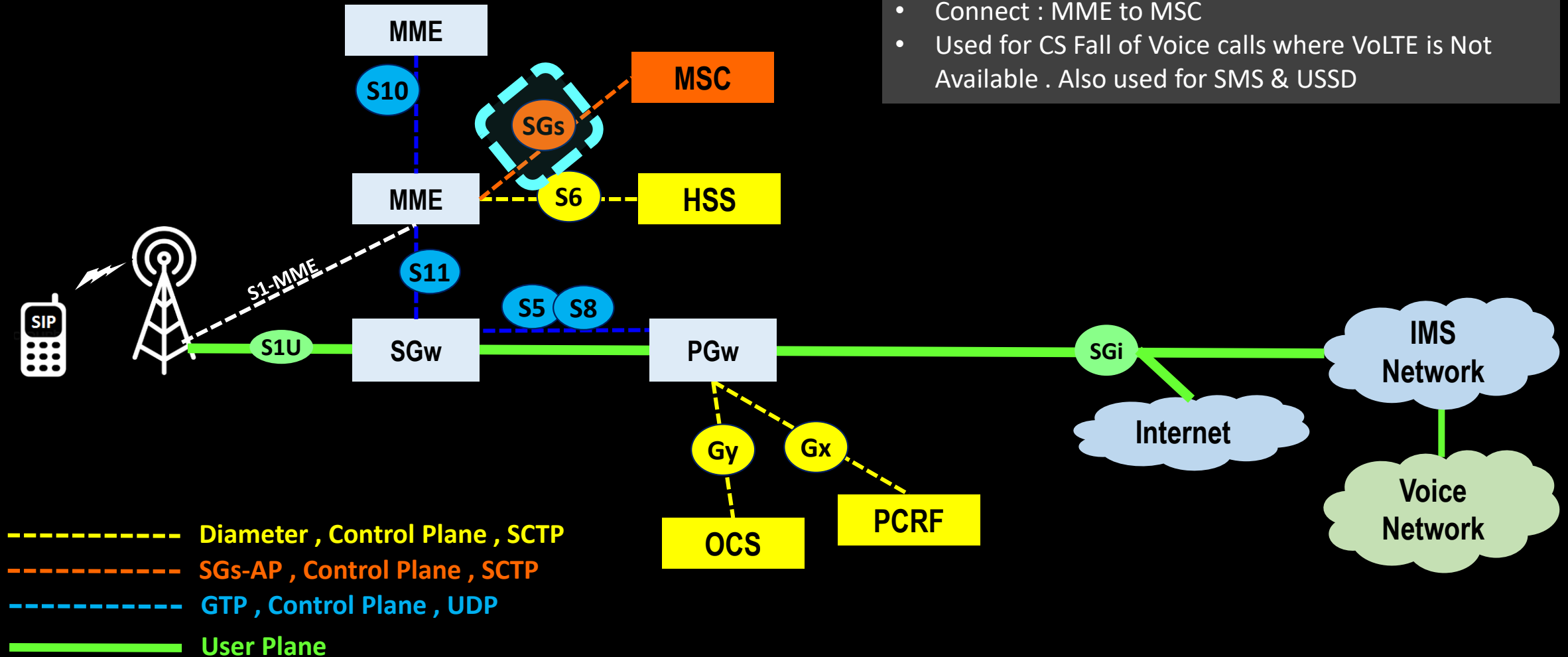
- SGi link is IP / TCP Interface Used as Exit path for Traffic from LTE Networks to :-
  - *Internet*
  - *IMS Network*



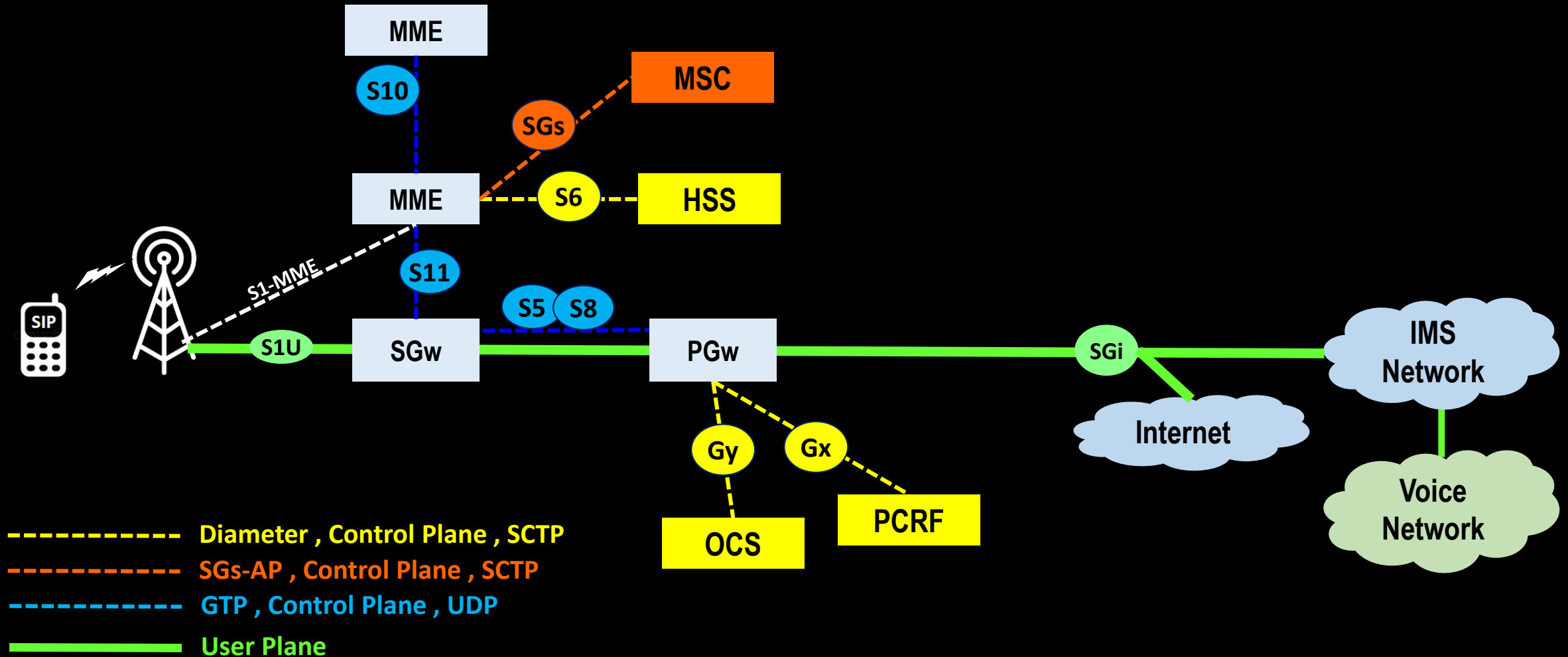
# SGs Link – LTE Protocols & Links

## SGs Interface

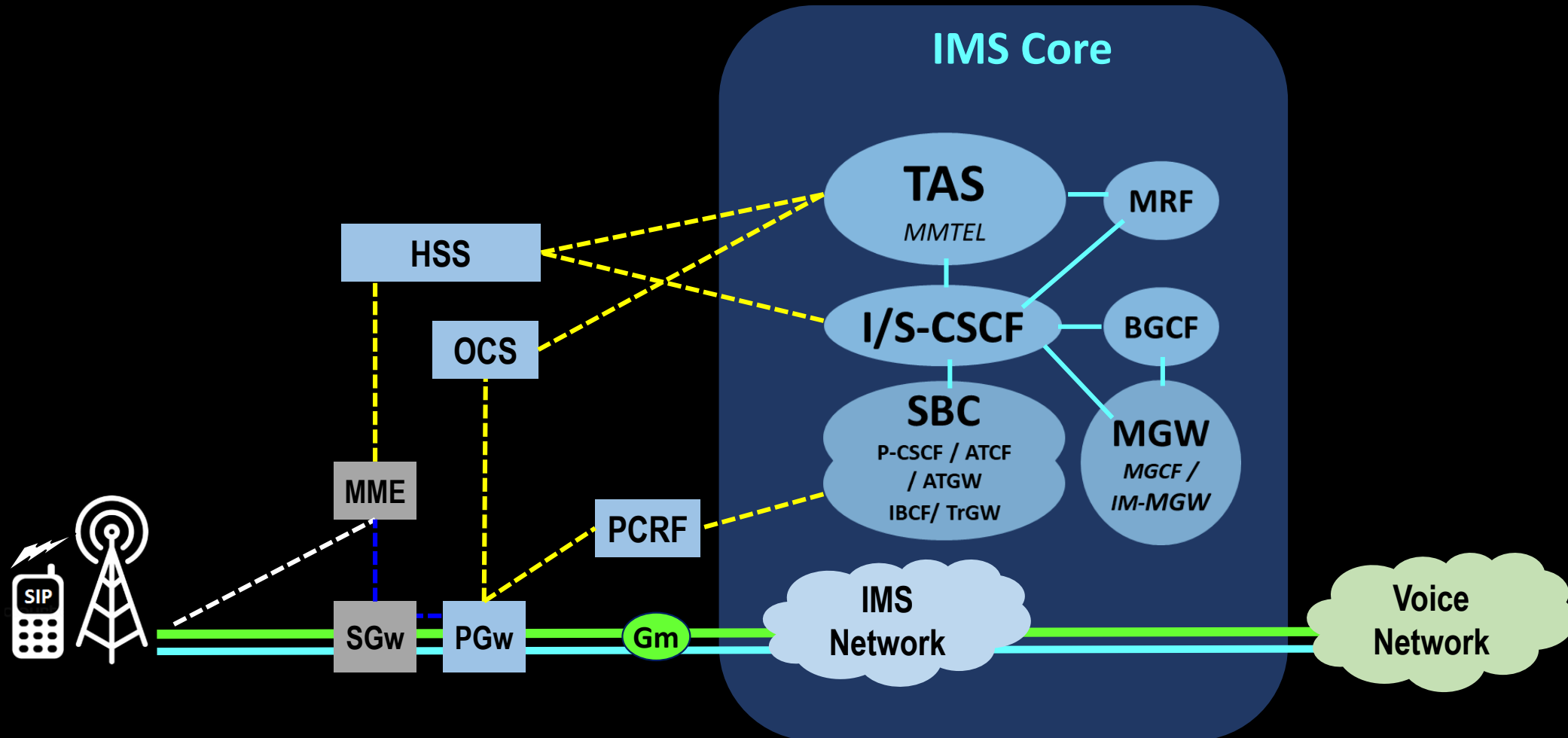
- Runs on SGsAP Protocol over SCTP
- Connect : MME to MSC
- Used for CS Fall of Voice calls where VoLTE is Not Available . Also used for SMS & USSD



# Complete LTE Network – Protocols & Links

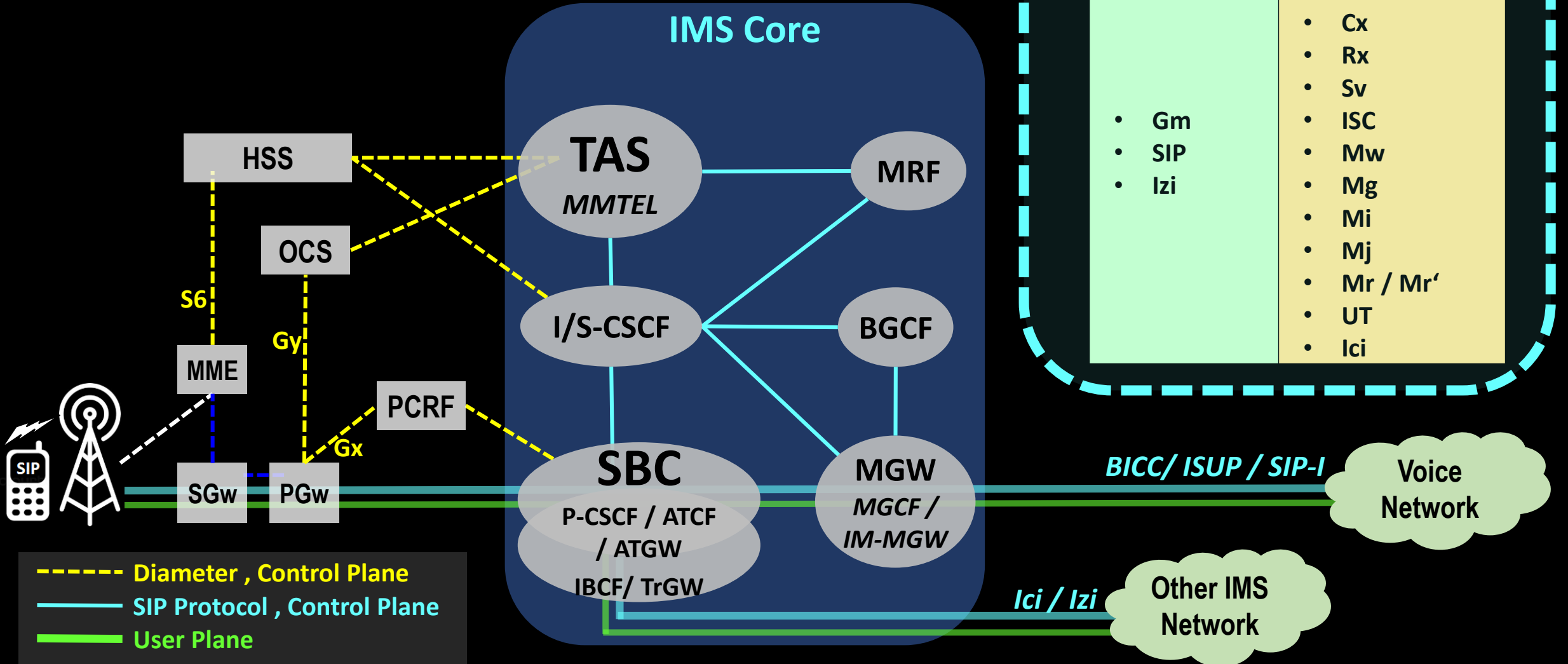


# VoLTE IMS Connectivity Overview



- Diameter , Control Plane
- SIP Protocol , Control Plane
- User Plane

# VoLTE IMS Connectivity Overview





# Rx

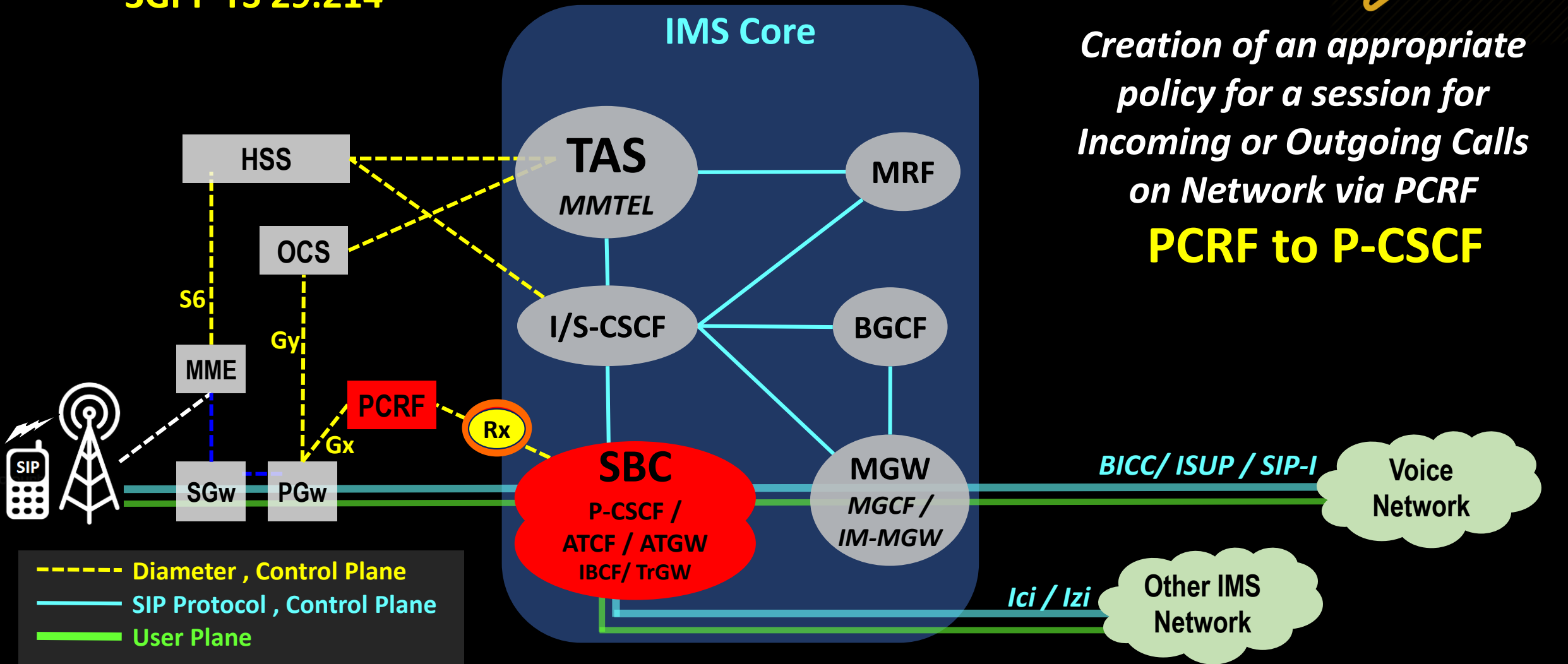
## DIAMETER



WHY?

Rx

3GPP TS 29.214



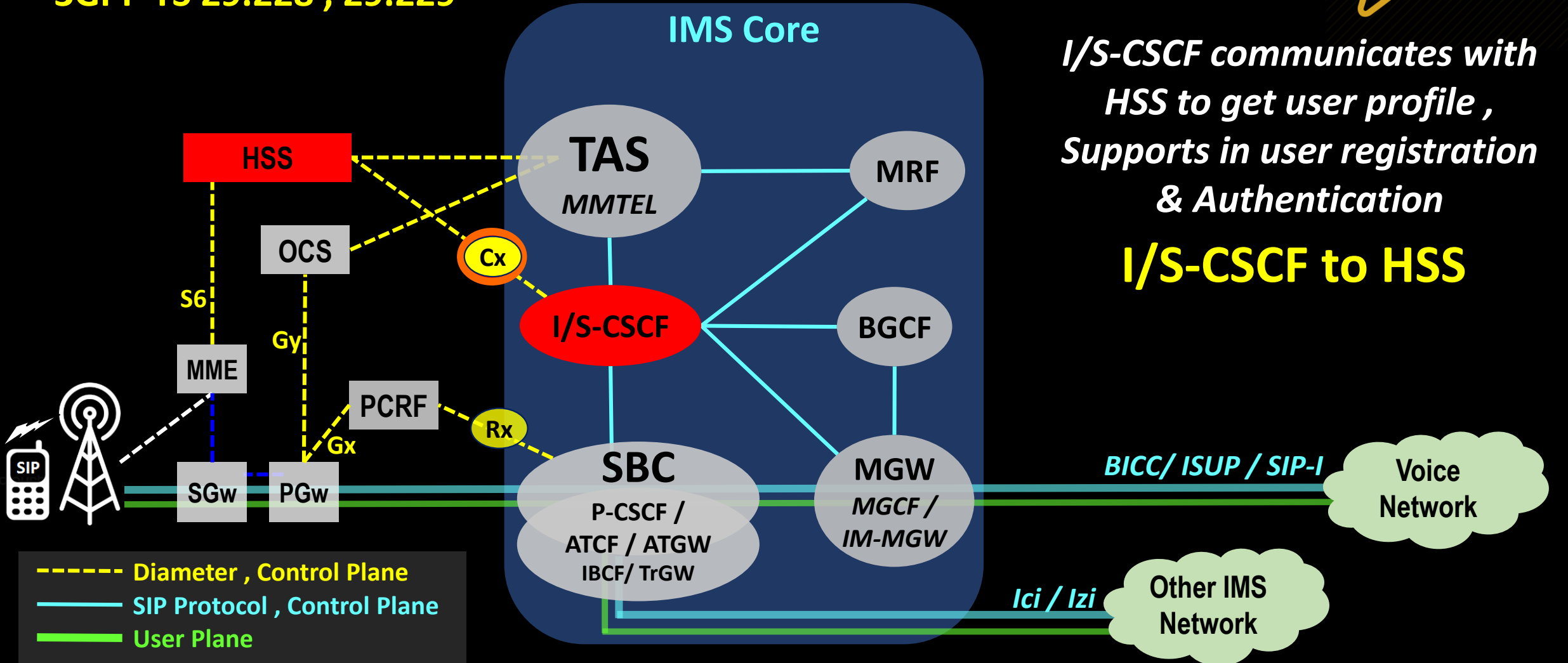
*Creation of an appropriate policy for a session for Incoming or Outgoing Calls on Network via PCRF*  
**PCRf to P-CSCF**

- Diameter , Control Plane
- SIP Protocol , Control Plane
- User Plane

# Cx

## DIAMETER

3GPP TS 29.228 , 29.229



# Sh

## DIAMETER

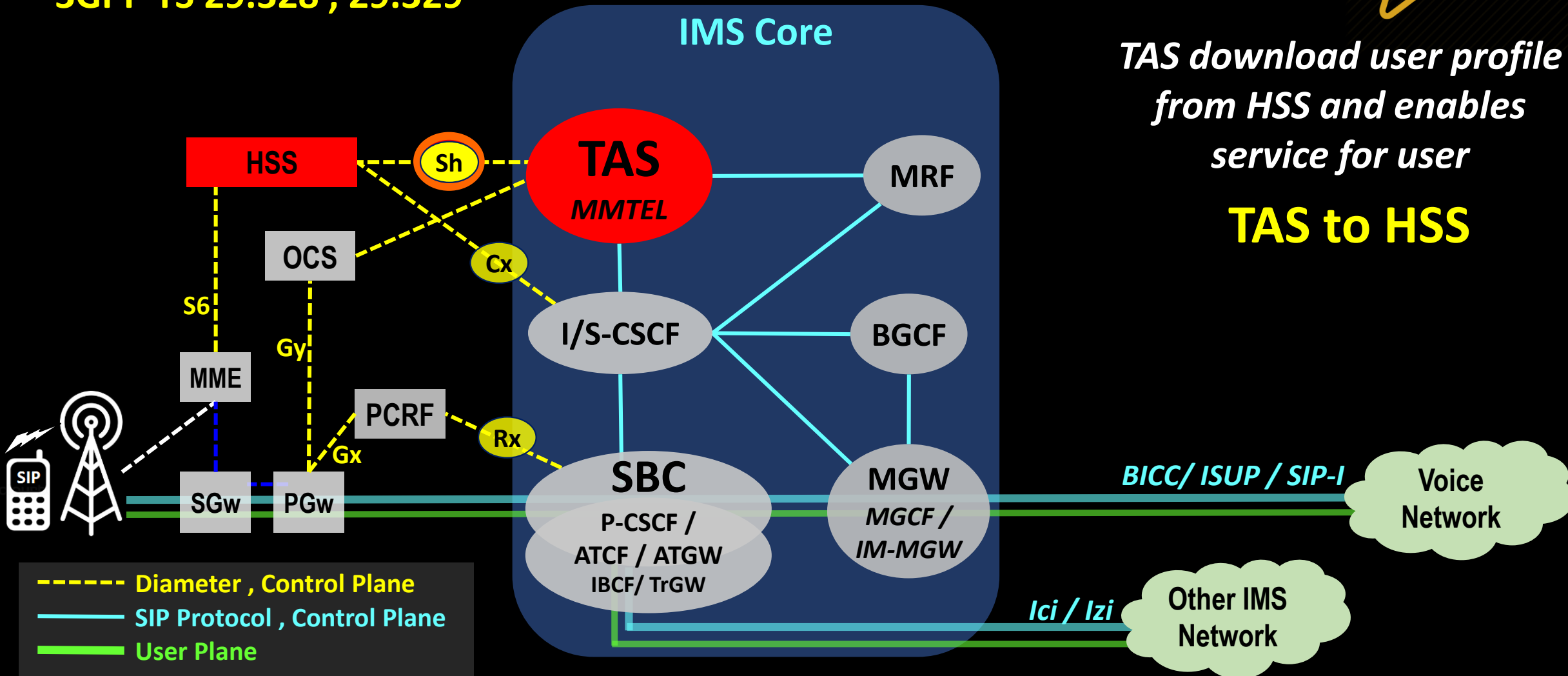
3GPP TS 29.328 , 29.329

WHY?

Sh

TAS download user profile from HSS and enables service for user

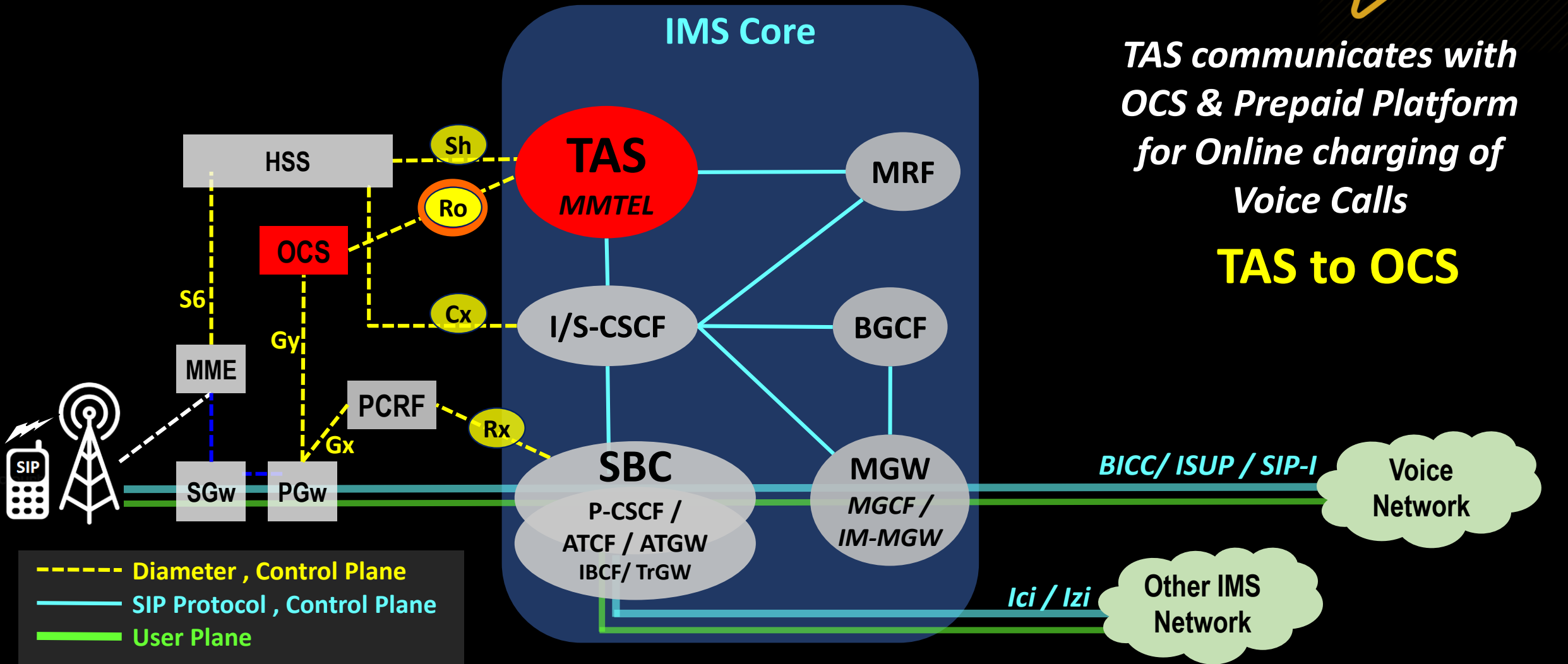
### TAS to HSS



- Diameter , Control Plane
- SIP Protocol , Control Plane
- User Plane

# Ro

## DIAMETER



*TAS communicates with OCS & Prepaid Platform for Online charging of Voice Calls*

### TAS to OCS

- Diameter , Control Plane
- SIP Protocol , Control Plane
- User Plane

# Gm

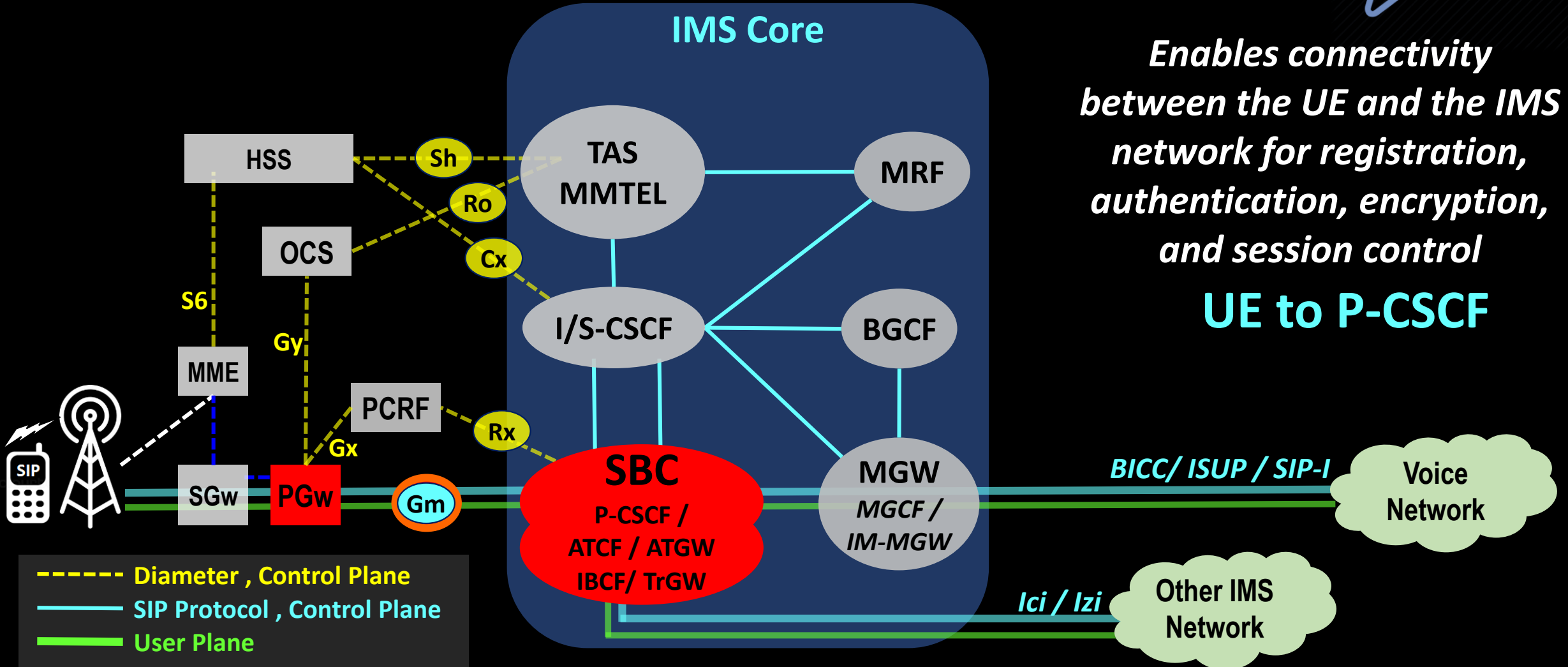
## SIP / SDP

WHY?

Gm

*Enables connectivity between the UE and the IMS network for registration, authentication, encryption, and session control*

### UE to P-CSCF

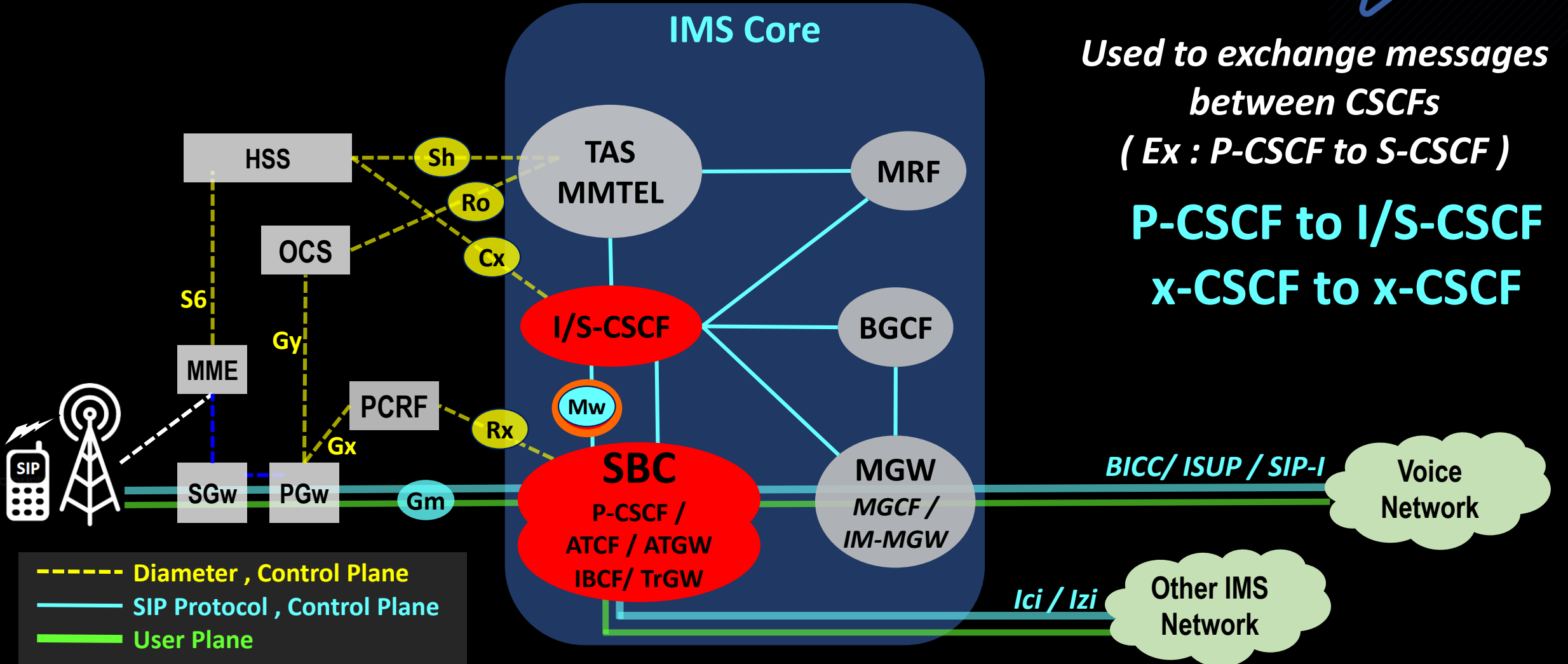


Mw

SIP / SDP

WHY?

Mw

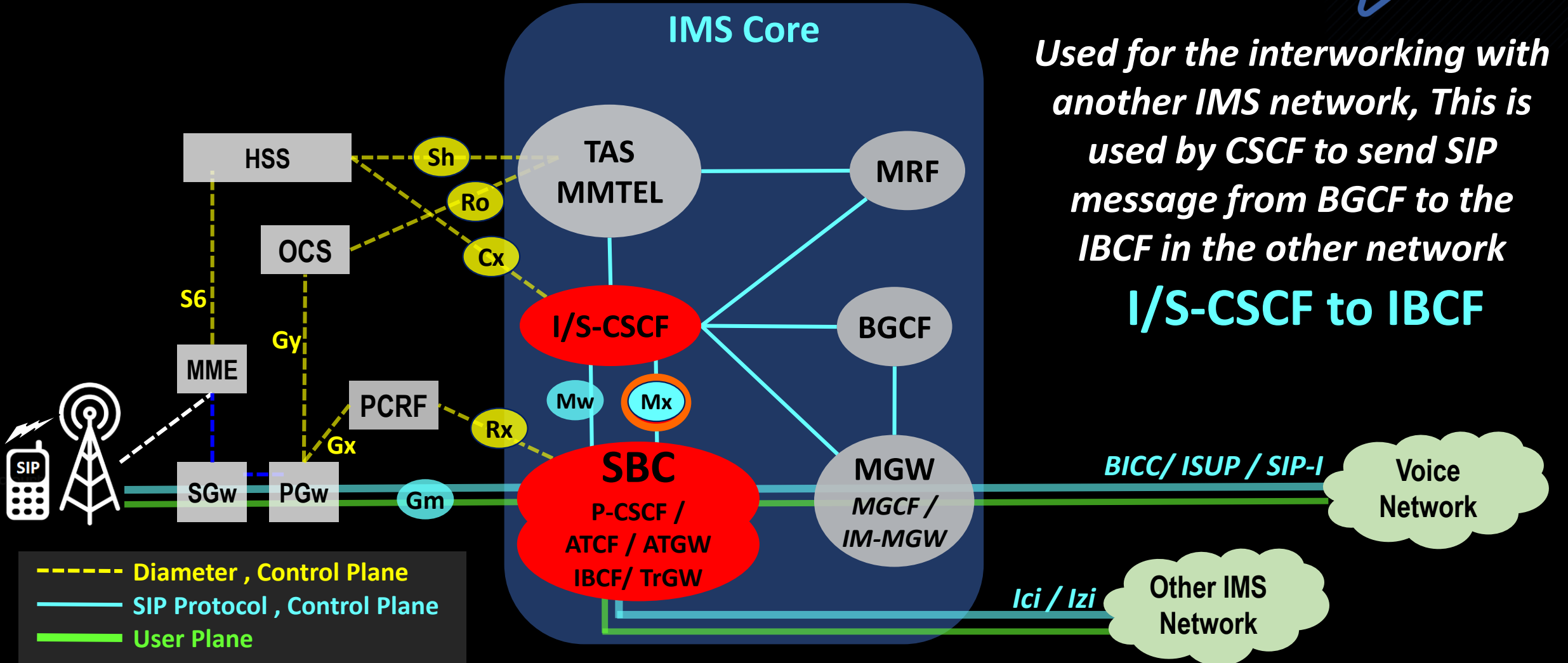


Mx

SIP / SDP

WHY?

Mx



Used for the interworking with another IMS network, This is used by CSCF to send SIP message from BGCF to the IBCF in the other network

**I/S-CSCF to IBCF**

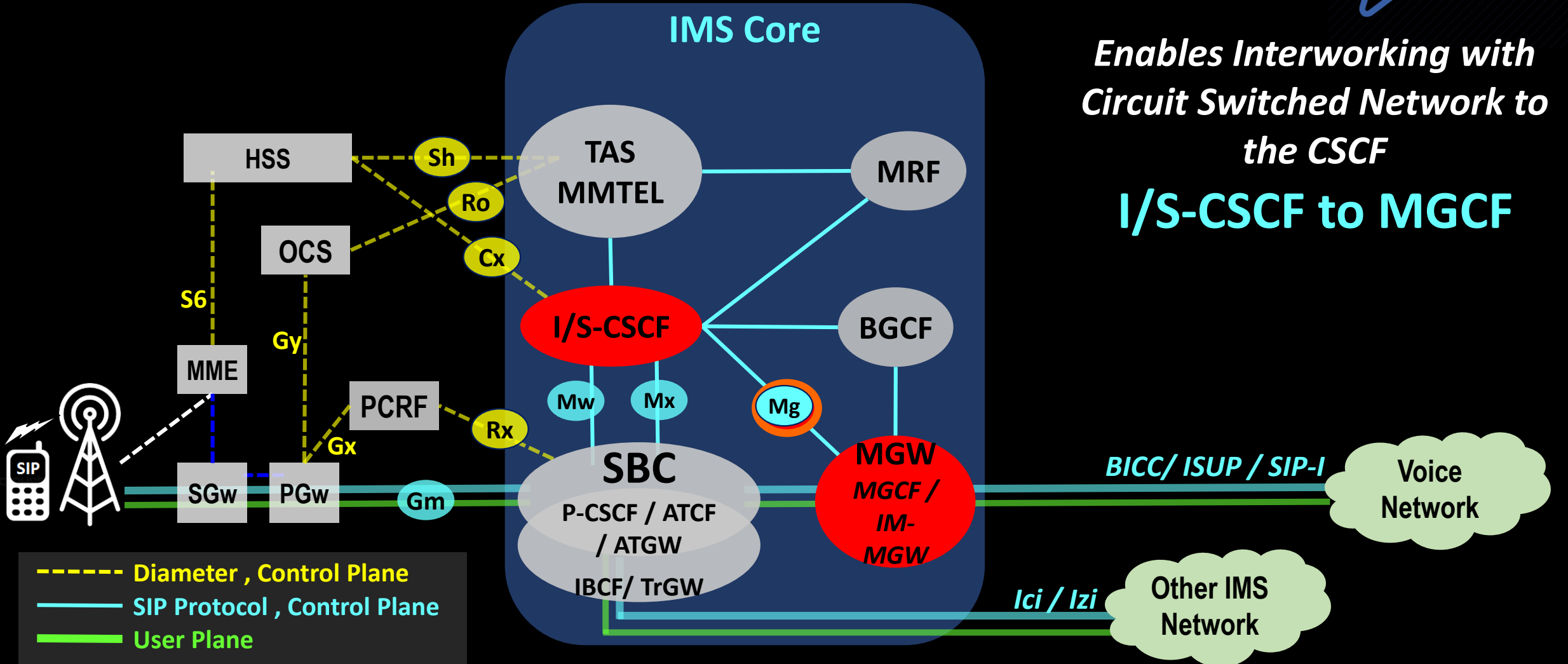
Mg

SIP / SDP

WHY?

Mg

### IMS Core



Enables Interworking with Circuit Switched Network to the CSCF

### I/S-CSCF to MGCF

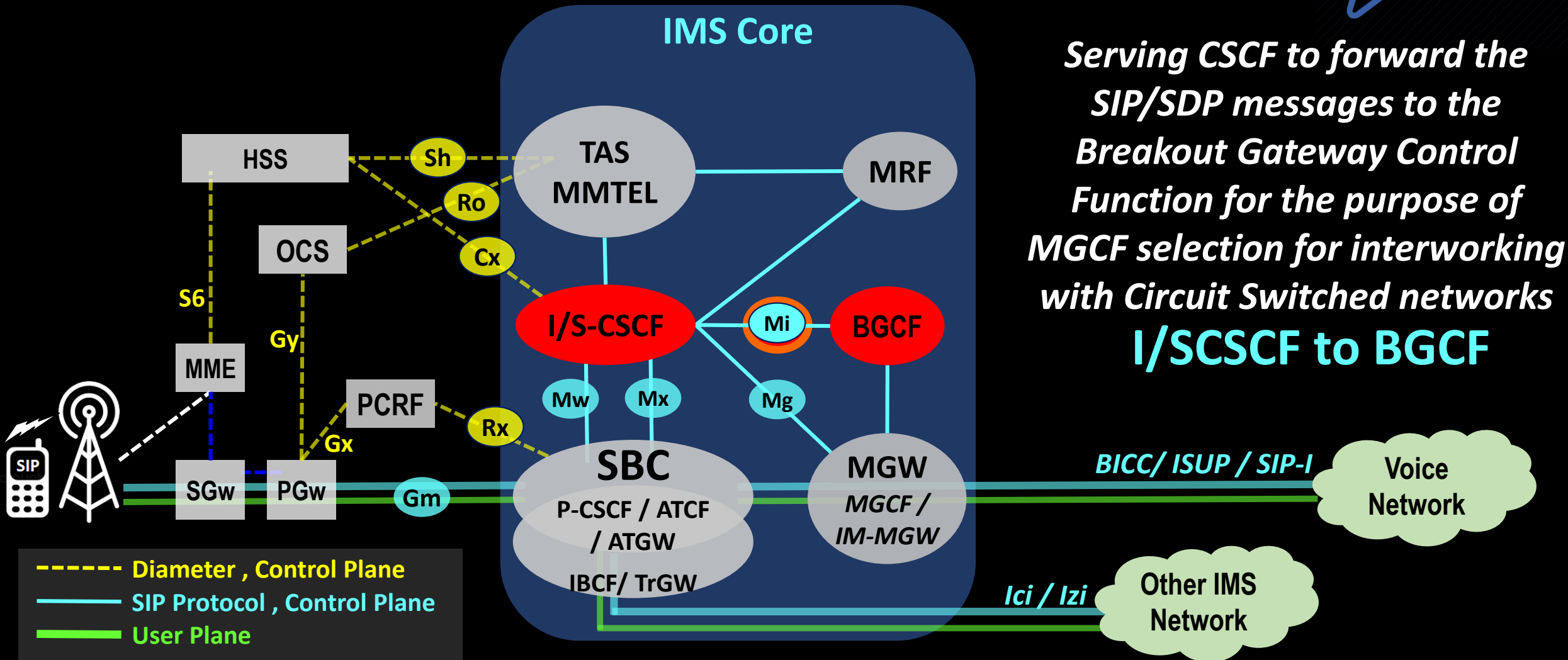


Mi

SIP / SDP

WHY?

Mi



*Serving CSCF to forward the SIP/SDP messages to the Breakout Gateway Control Function for the purpose of MGCF selection for interworking with Circuit Switched networks*  
**I/SCSCF to BGCF**

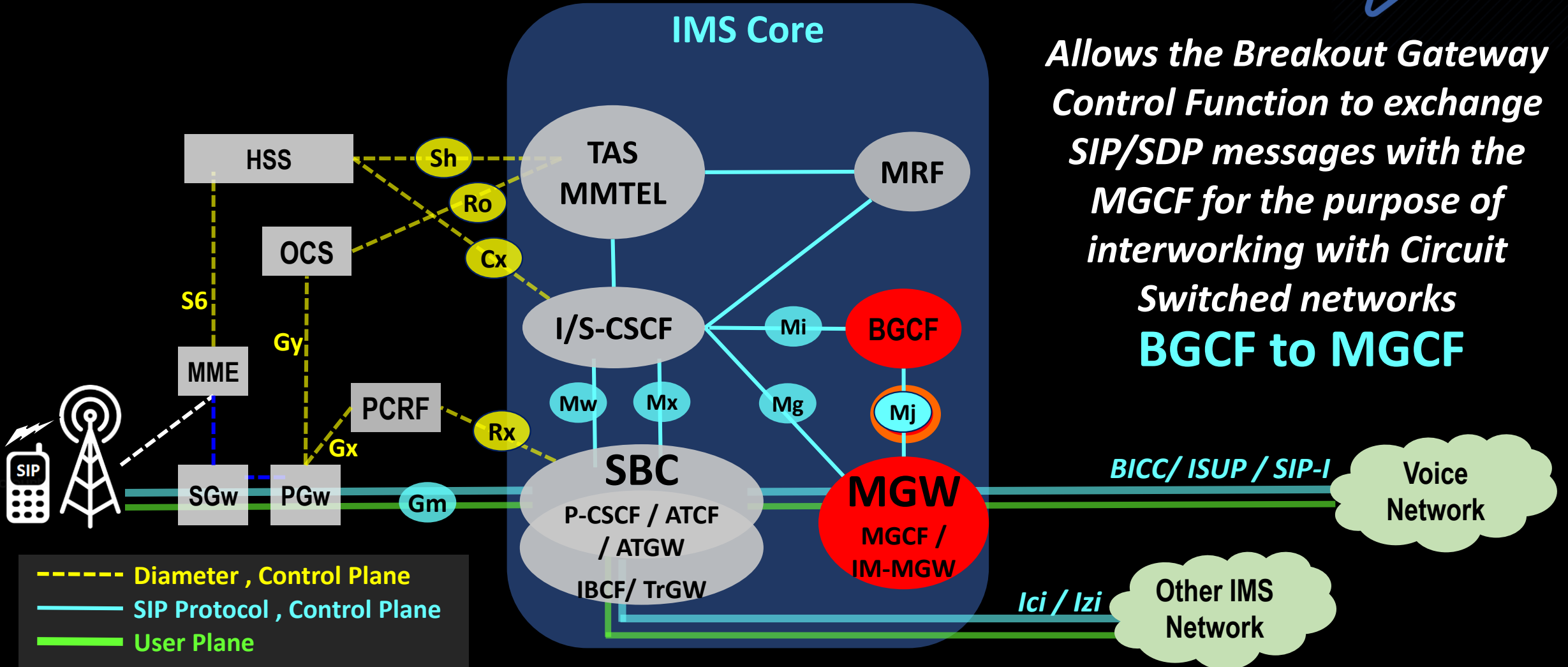
----- Diameter , Control Plane  
 ——— SIP Protocol , Control Plane  
 ——— User Plane

Mj

SIP / SDP

WHY?

Mj



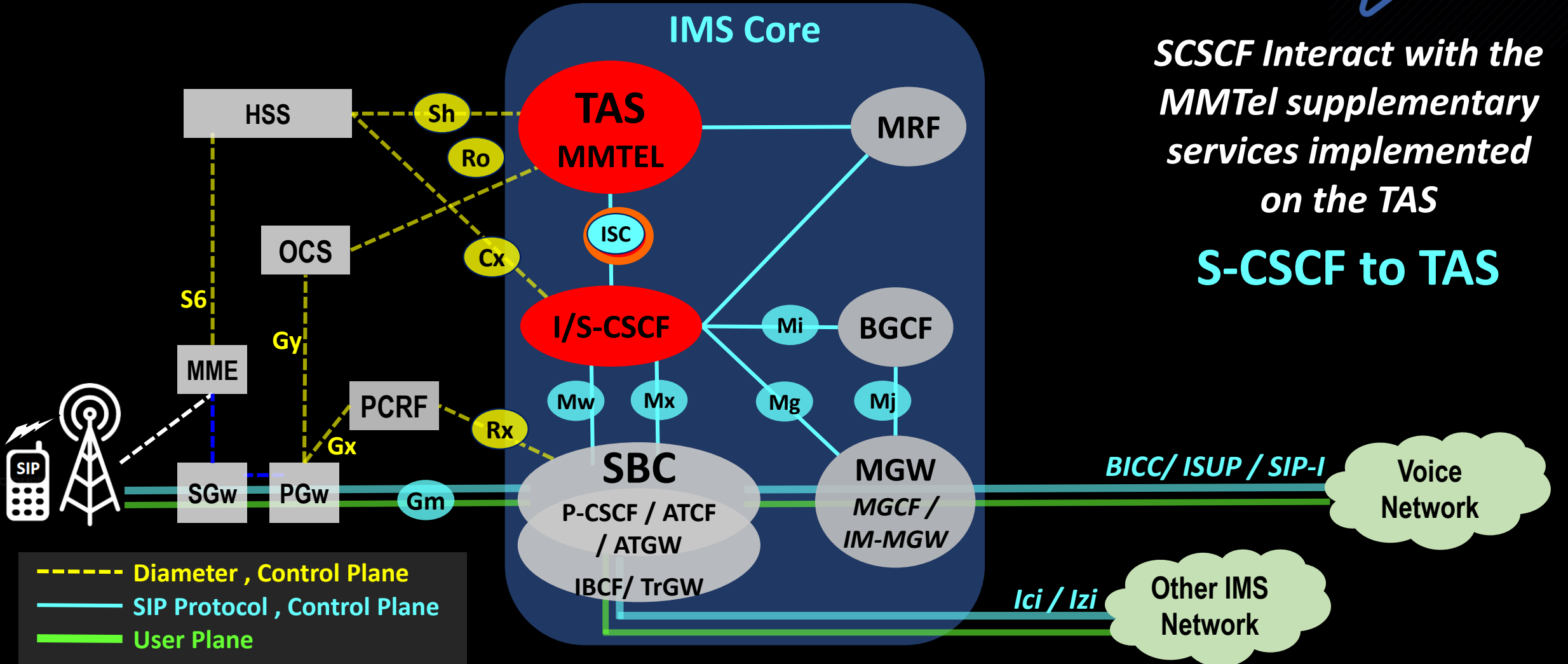
*Allows the Breakout Gateway Control Function to exchange SIP/SDP messages with the MGCF for the purpose of interworking with Circuit Switched networks*  
**BGCF to MGCF**

# ISC

## SIP / SDP

WHY?

ISC



*SCSCF Interact with the MMTEL supplementary services implemented on the TAS*

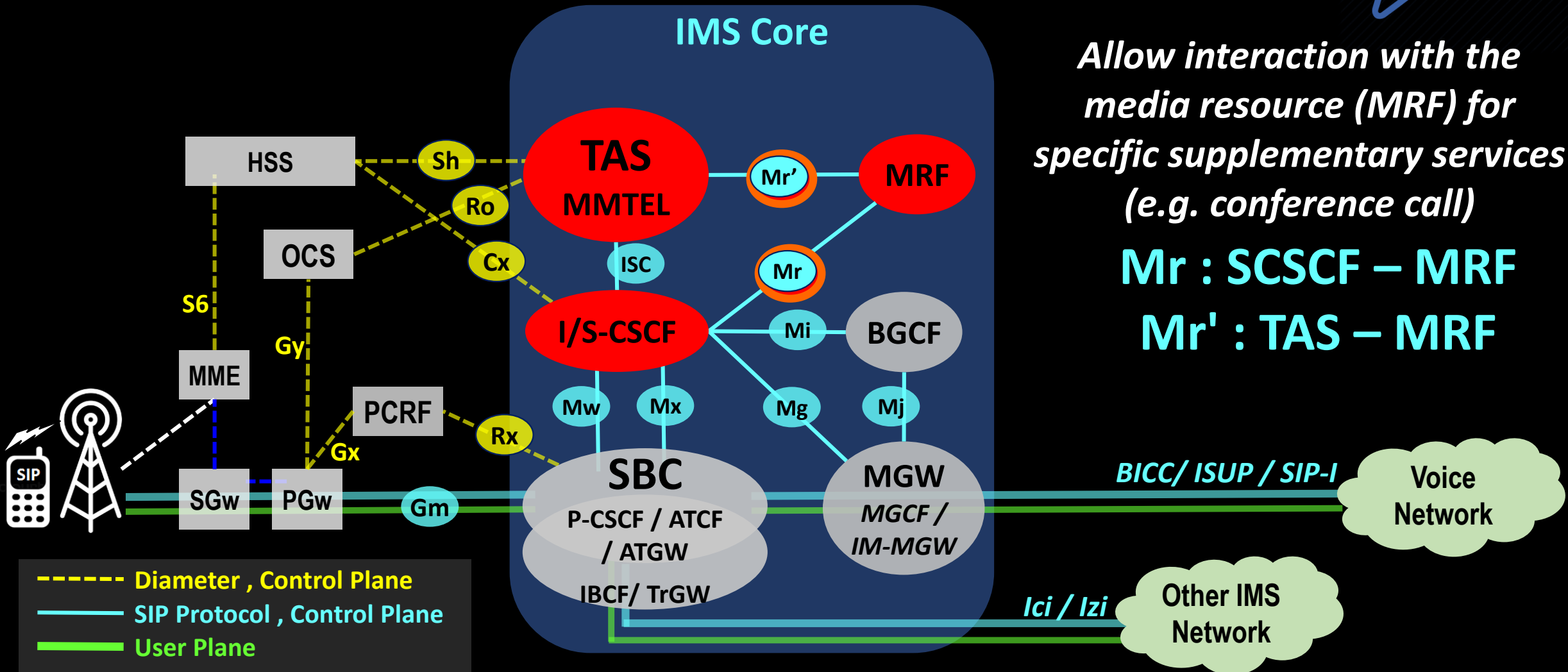
### S-CSCF to TAS

Mr &  
Mr'

SIP / SDP

WHY?

Mr Mr'



Allow interaction with the media resource (MRF) for specific supplementary services (e.g. conference call)

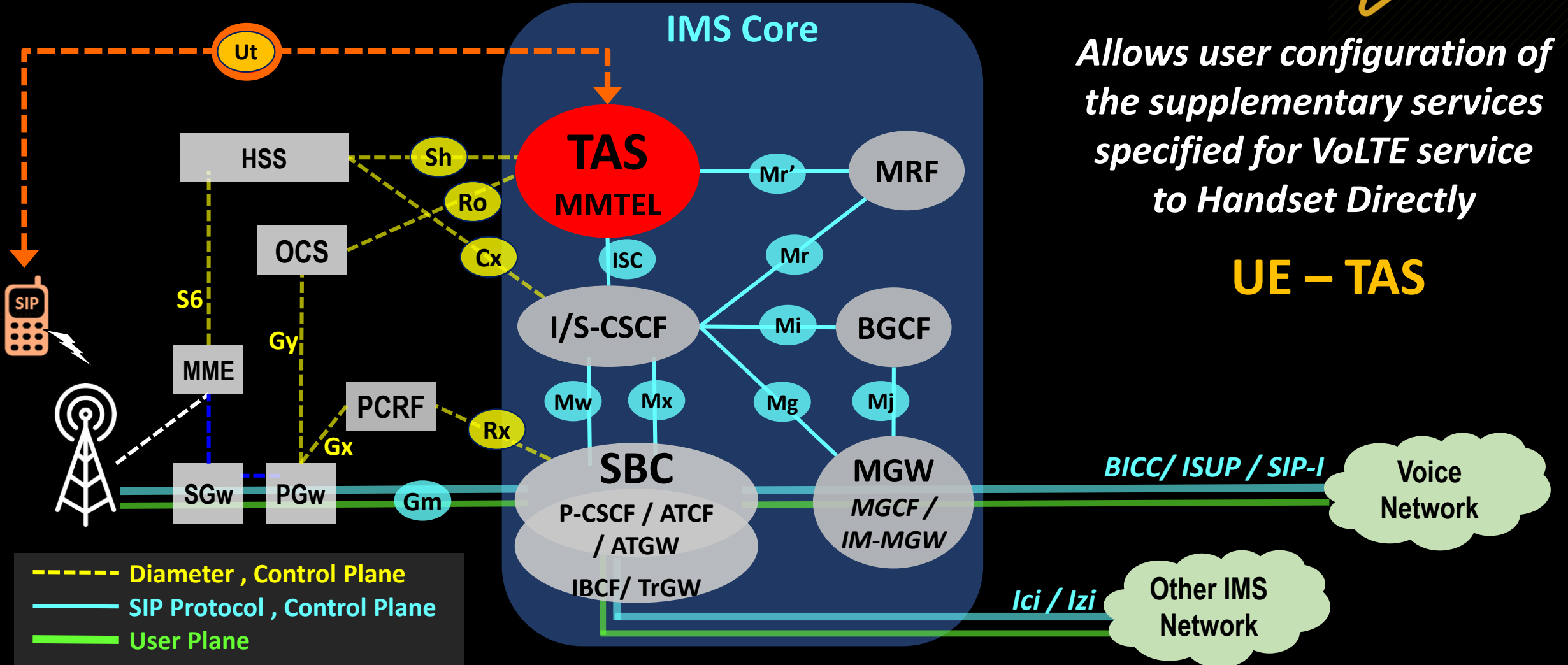
Mr : SCSCF – MRF

Mr' : TAS – MRF

Ut

XCAP

3GPP TS 24.623



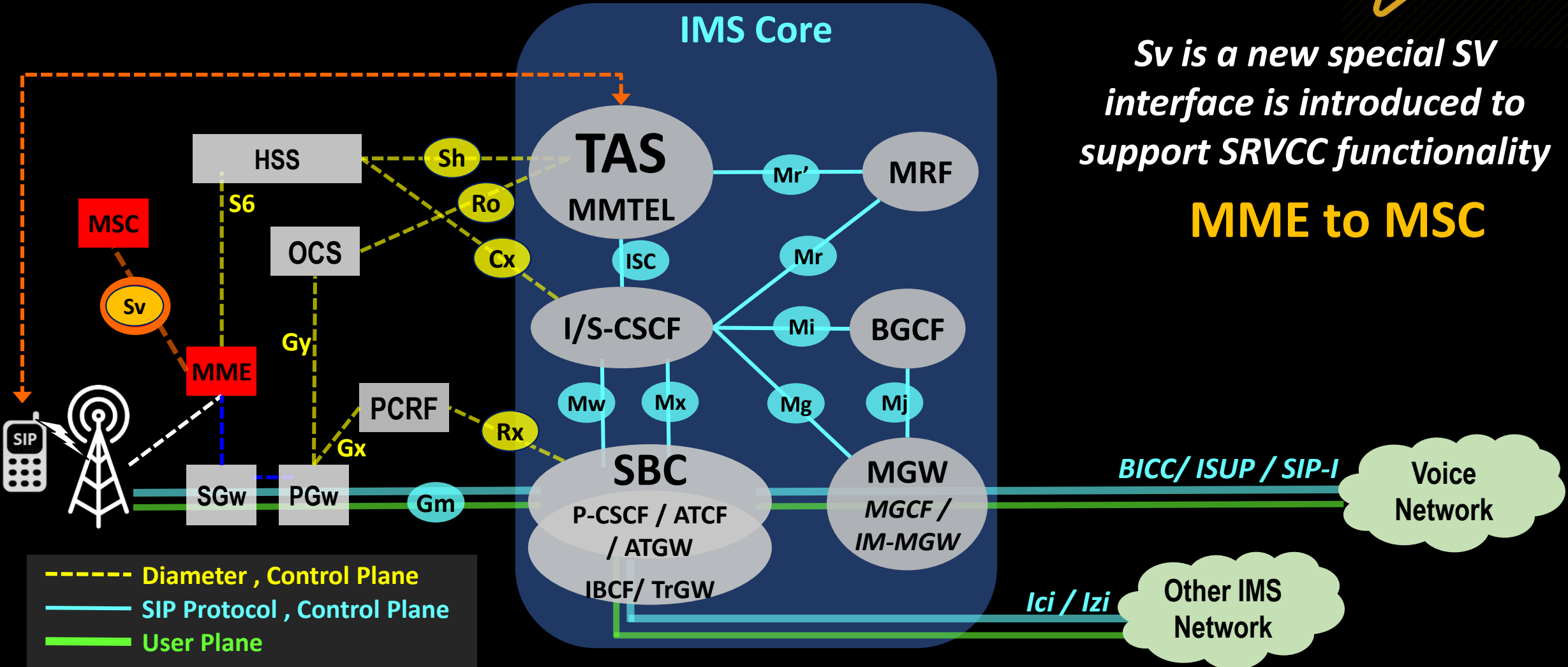
Sv

GTPv2

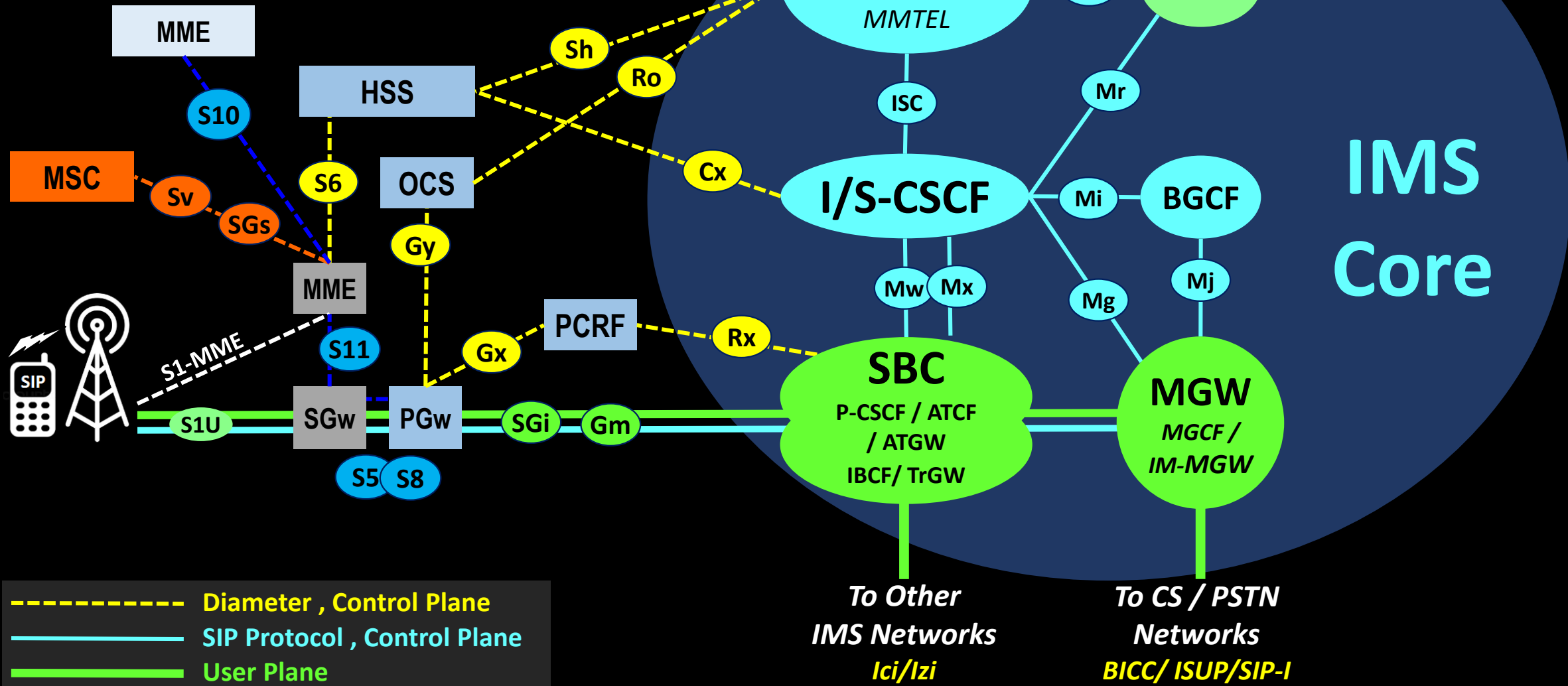


*Sv is a new special SV interface is introduced to support SRVCC functionality*

**MME to MSC**



# LTE / VoLTE IMS Network



<https://telecomtutorial.info>



Free Download – Video

Free Download – Presentation



**Vikas Shokeen**