VoLTE IMS

SIP Registration Flow
VoLTE Registration

- LTE Attach
- Default Vs Dedicated Bearer
- IMS Bearer
- SIP and IMS Registration
- TAS Registration

Disclaimer: Views expressed in this blog or Video are strictly mine and not of my employers or Equipment Manufacturers
VoLTE UE Behavior

1. LTE Attach

2. IMS Registration
   - Enables VoLTE Services
   - Ex: Calls, SMS, Supplementary Services etc..
VoLTE IMS Registration

1. LTE Attach
2. Default Internet EPS bearer
3. Default IMS EPS bearer
4. SIP / IMS Registration
5. Dedicated Bearer: MO / MT Calls

IMS

LTE Bearer

Internet

EPC LTE Network

CSCF

GW

TAS

PSTN N/W

Other IMS

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EPS bearer

Default EPS Bearer
- Established during LTE Attach
- Allocate IP address to UE
- **Used for Always connected bearer**: - Internet Connectivity (QCI: 6-9) - SIP Signaling Connectivity (QCI: 5)

Dedicated EPS Bearer
- Established during call
- No IP Address Allocation
- Linked to particular Default EPS Bearer
- Have a specific (usually guaranteed) QoS
- **Used for On-Demand bearer for**: - Voice Call (QCI: 1) - Video Call (QCI: 2)

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### What if LTE Radio is Congested??

<table>
<thead>
<tr>
<th>Priority</th>
<th>QCI</th>
<th>Resource Type</th>
<th>Packet Delay Budget</th>
<th>Packet Error Loss Rate</th>
<th>Example Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>non-GBR</td>
<td>100ms</td>
<td>$10^{-6}$</td>
<td><strong>Volte</strong>, IMS Signaling</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Guaranteed Bit Rate (GBR)</td>
<td>100ms</td>
<td>$10^{-2}$</td>
<td><strong>Volte</strong>, Conversational Voice</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td></td>
<td>50ms</td>
<td>$10^{-3}$</td>
<td>Real Time Gaming, V2X messages</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Guaranteed Bit Rate (GBR)</td>
<td>150ms</td>
<td>$10^{-3}$</td>
<td><strong>Volte</strong>, Conversational Video (Live Streaming)</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td></td>
<td>300ms</td>
<td>$10^{-6}$</td>
<td>Non-Conversational Video (Buffered Streaming)</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>non-GBR</td>
<td>300ms</td>
<td>$10^{-6}$</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
<td>100ms</td>
<td>$10^{-3}$</td>
<td></td>
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<tr>
<td>8</td>
<td>8</td>
<td></td>
<td>300ms</td>
<td>$10^{-6}$</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td></td>
<td>300ms</td>
<td>$10^{-6}$</td>
<td></td>
</tr>
</tbody>
</table>

**Internet Services**, Video (Buffered Streaming) TCP-Based (for example, www, email, chat, ftp, p2p and the like)

[http://TelecomTutorial.info](http://TelecomTutorial.info)
VoLTE UE Attach and IMS Registration

- Default Bearer **QCI = 6**
  - Internet

- Default Bearer **QCI = 5**
  - SIP Registration

- Dedicated Bearer **QCI = 1**
  - Voice Call

EPC LTE Network

SIP

IMS

CSCF

TAS

GW

PSTN N/W

Other IMS

http://TelecomTutorial.info
LTE Attach & Default Internet EPS Bearer

1. LTE Attach
2. Default internet EPS bearer
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UE found IMS Service is supported
VoPS = Yes

MME found subscriber can support SRVCC
SRVCC Operation

HSS
Location Update

Create Session request
Create Session resp.

MME

SAE GW

Gx QCI=6

PCRF

LTE Attach & Default Internet EPS Bearer

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Default **IMS EPS bearer**

1. **LTE Attach**
2. Default internet EPS bearer
3. Default IMS EPS bearer
4. **SIP / IMS Registration**
5. Dedicated Bearer : MO / MT Calls

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**Diagram:**
- UE
- MME
- PCRF
- SAE GW
- IMS
- Gx, QCI=5
- IMS APN
- Return P-CSCF IP

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SIP Registration: 1st Attempt

- **UE** sends a SIP REGISTER (IMPI, IMPU, IP@) request to the **P-CSCF**.
- **P-CSCF** forwards the request to the **I-CSCF**.
- **I-CSCF** sends a SIP REGISTER (ATCF STN-SR) request to the **S-CSCF**.
- **S-CSCF** sends the request to the **HSS**.
- **HSS** responds with a **Cx: UAR (IMPI)** message.
- **HSS** also sends a **Cx: UAA (Server Capabilities)** message.
- **S-CSCF** sends the Server Capabilities message to the **I-CSCF**.
- **I-CSCF** receives the Server Capabilities message and sends a **MAR** message.
- **I-CSCF** sends a **MAA** message containing **rand, xres, ck, ik, autn**.
- **Mw** receives the request and sends a **401 Unauthorized** message.
- **Gm** also receives the request and sends a **401 Unauthorized** message.

**Authenticate UE** and **Send Challenge** messages are exchanged between **I-CSCF** and **P-CSCF**.

The diagram shows the flow of messages and the authentication process for SIP registration.
SIP Registration: 2nd Attempt

1. LTE Attach
2. Default Internet EPS bearer
3. Default IMS EPS bearer
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SIP Registration: TAS Update

1. LTE Attach
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ISC: SIP REGISTER (ATCF STN-SR, ATCF-Mgmt-uri, ATCF-Path)
ISC: 200 OK (REGISTER)

Sh: UDR (Repository Data)
Sh: UDA
MAP Messages (RD & ISD)

SIP Basic Data

Supplementary Service Data

HSS

TAS Regn.

http://TelecomTutorial.info
SIP Registration : TAS Update

1. LTE Attach
2. Default internet EPS bearer
3. Default IMS EPS bearer
4. SIP / IMS Registration

Ready
Thanks

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