

Telecommunication Services Engineering (TSE) Lab

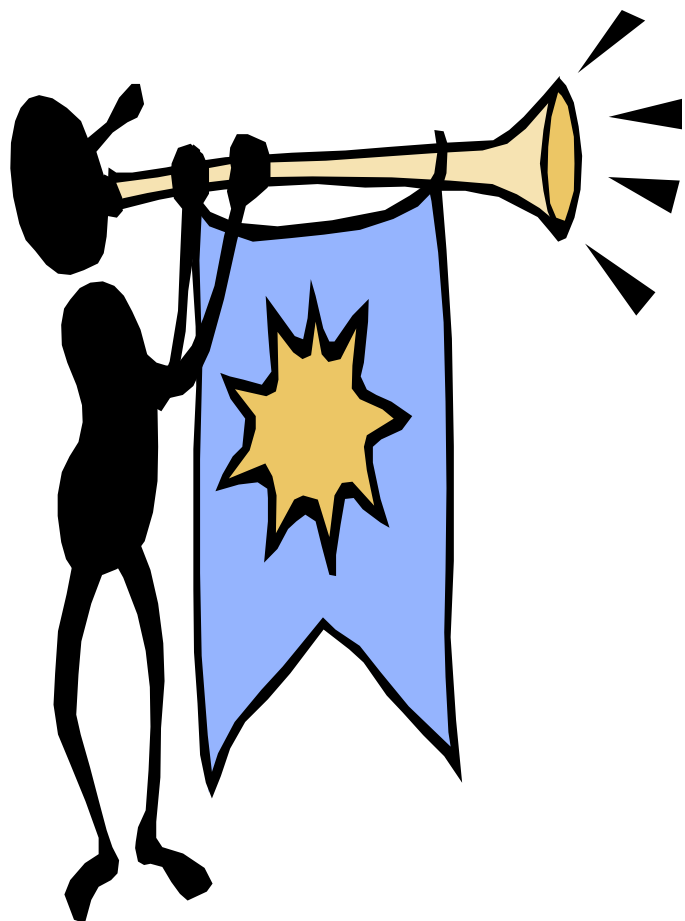


Chapter II –

3G Telecommunication Networks and IP Multimedia Subsystems (IMS)

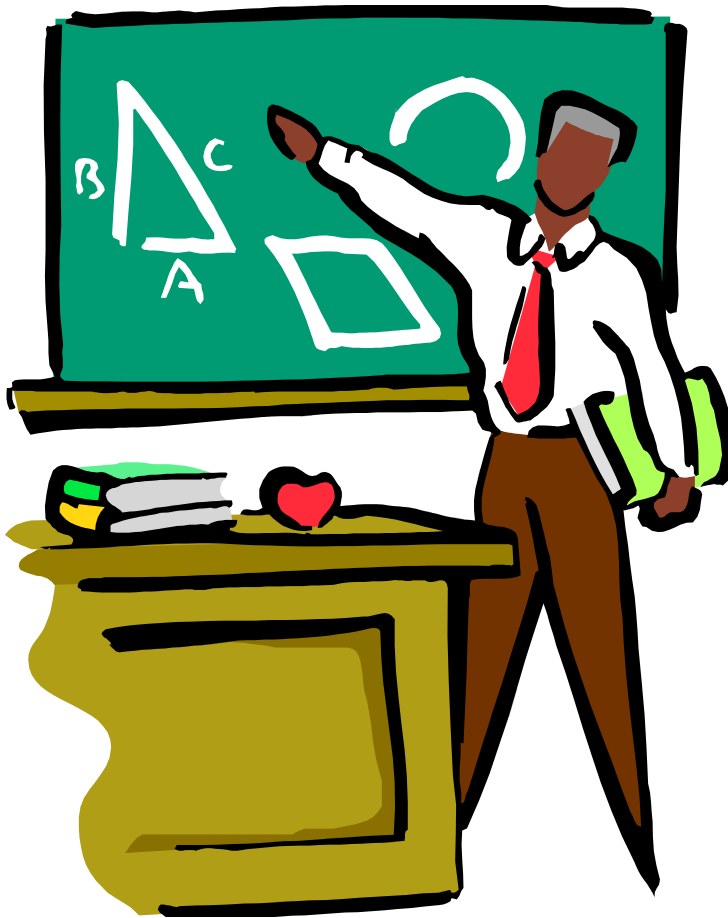
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Outline



1. UMTS key components
2. IP Multimedia Subsystem (IMS)
3. 3.5G

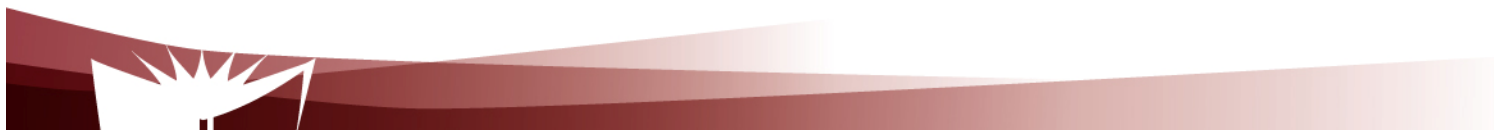
UMTS – Key components



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UMTS

Universal Mobile Telecommunications System (UMTS)
3GPP 3G Networks



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Key components

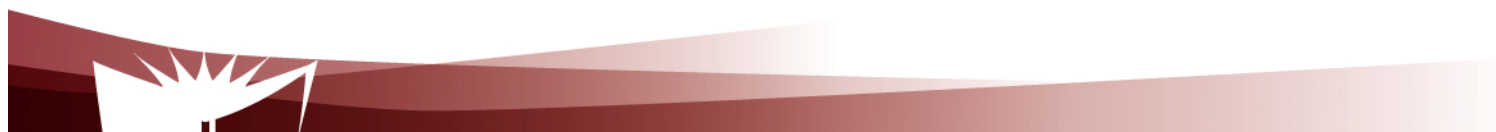
1. Legacy

- Circuit switched part (GSM)
- Packet switched (GPRS)

2. NGN portion

3. Interworking Legacy \leftarrow ----- \rightarrow NGN portion

Focus of this course: NGN portion



Key components

Services (value-added services) also called application / services

Services (Basic service) also called call/session

Transport (Below IP + IP + transport layer) also called bearer

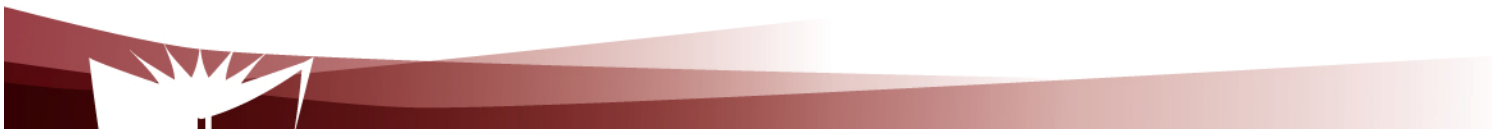


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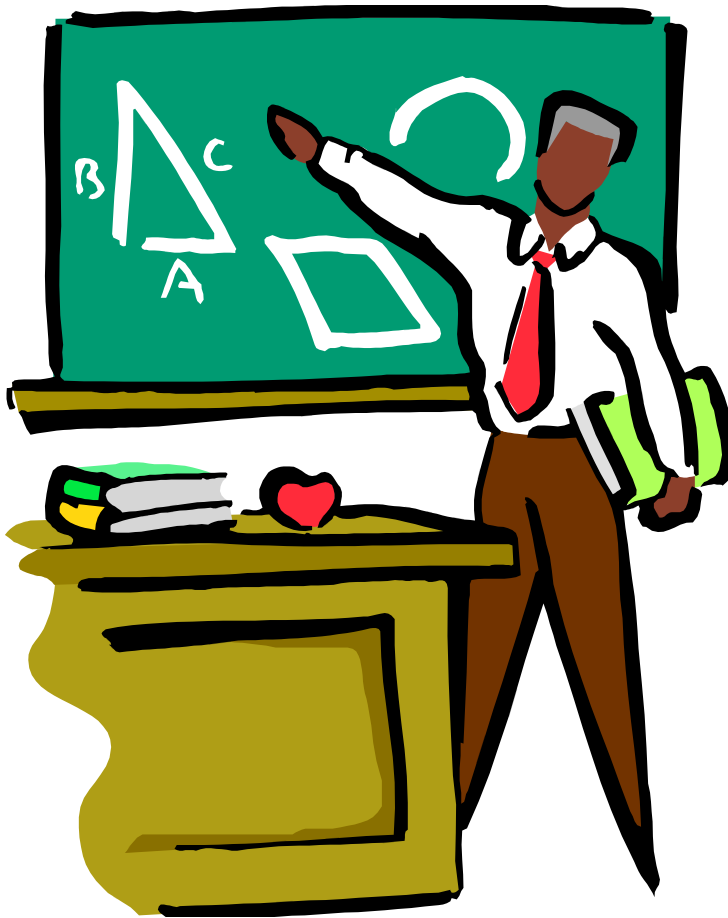
Key components

NGN portion

- Transport (Radio access network known as UTRAN – UMTS Terrestrial Radio Access Network)
 - Below IP
 - Radio technology: WCDMA (X Mbits):
 - IP + TCP/UDP
- Services (Basic + value added services)
 - IP Multimedia Subsystem (IMS)
 - Overlaid on top of the IP transport



IMS Basics



1. Layering
2. Protocols
3. Entities

IMS Basics - Layering

Services (value-added services) also called application / services

Services (Basic service) also called call/session

Transport (Below IP + IP + transport layer) also called bearer



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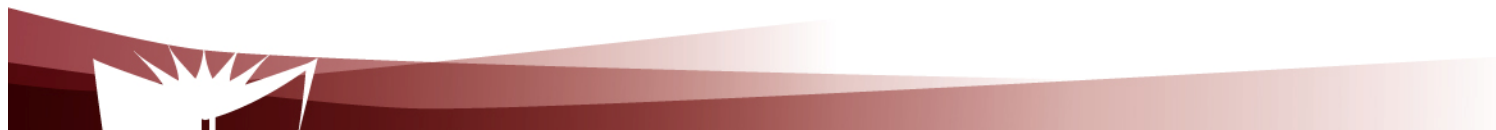
IMS Basics - Layering

Basic services – Call / session layer

- Signalling entities
- Data bases
- Interworking with 2G

Value added services layer

- Application servers
- Media resources



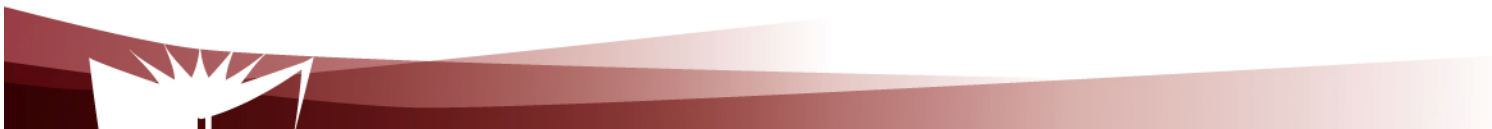
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IMS Basics - Protocols

Key protocols: Session Initiation Protocol (SIP) – An IETF protocol

Establishment, modification and tear down of multimedia sessions

- **Used in conjunction with other IETF protocols**
 - QOS related protocol (e.g. RSVP)
 - Media transportation related protocol (e.g. RTP - RFC 1889)
 - Others (e.g. SDP - RFC 2327)



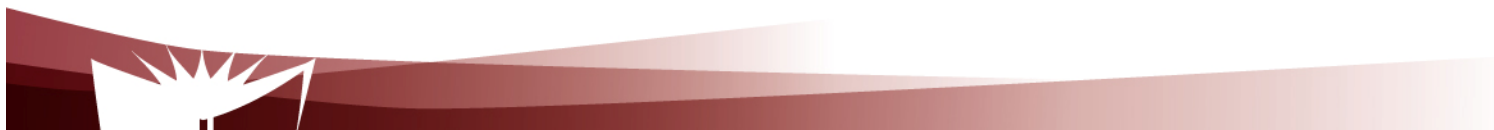
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IMS Basics - Protocols

Authentication, authorization and accounting: Diameter – Another IETF protocol

- Base protocol, RFC 33588, 2003
 - Basic commands (e.g. Re-Auth-Request, Re-Auth-Answer, Accounting-Request)
- Application protocols
 - Extend the basic commands

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IMS Basics – Functional entities

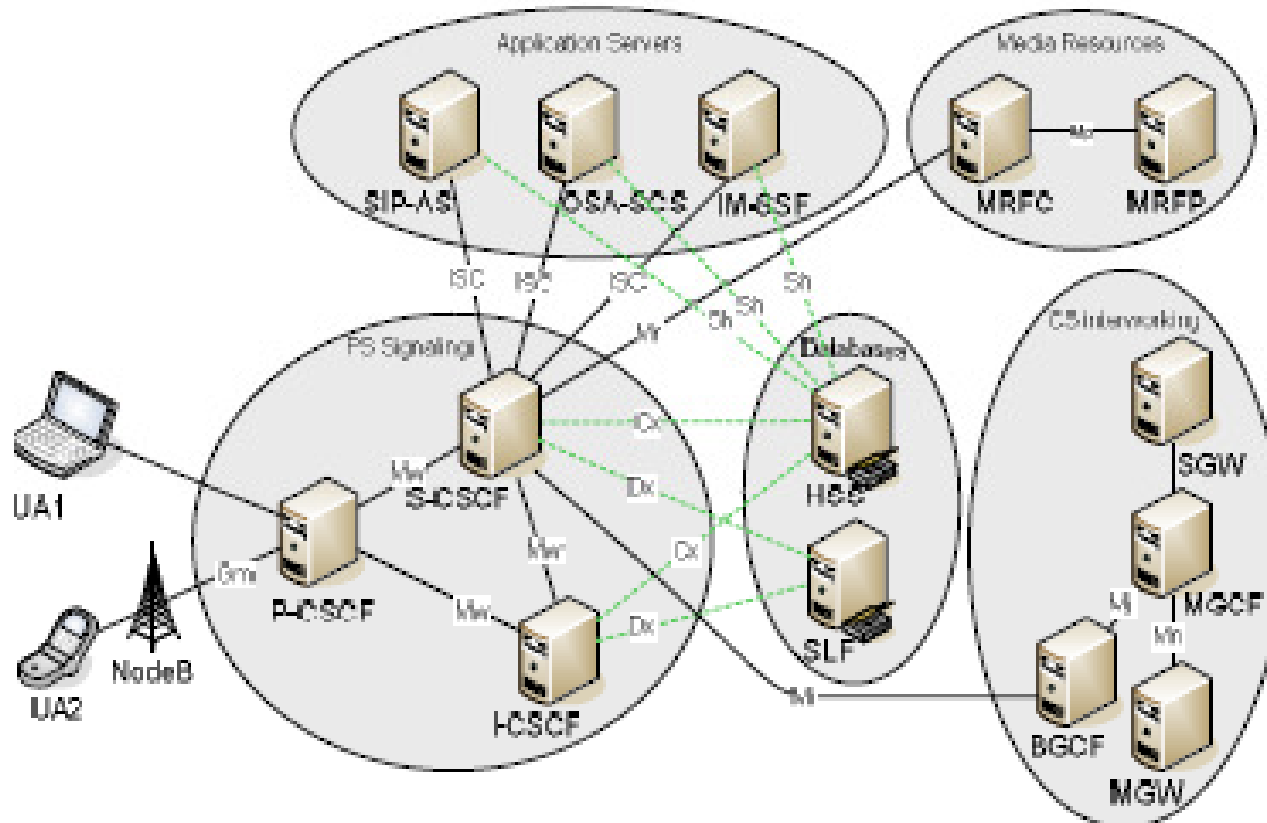


Figure 1: IMS Core Network Components and Interfaces (SIP interfaces with solid lines, DIAMETER interfaces with dashed lines)

Note: Taken from J. Fabini et al., IMS in a bottle, ICMB 2006

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IMS Basics – Functional entities

Signaling entities

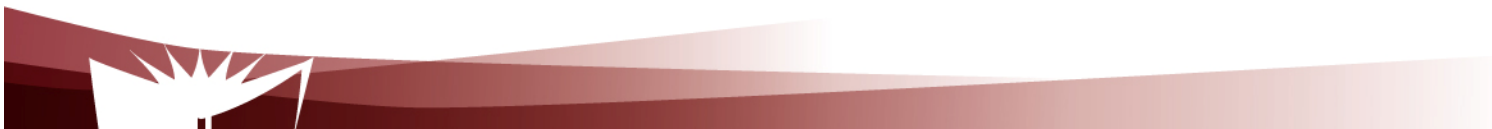
Call Session Control Function (CSCF) “The switch”

Proxy-CSCF:

- Location

Either visited network or home network

- First contact point in the IM network
- Outbound / In-bound SIP proxy (All requests from/to IMS terminals go through it)
- Forward SIP requests in the appropriate direction (Terminals or IMS network)
- Several functions
 - Security
 - Generation of charging information
 - Compression and decompression of messages



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IMS Basics – Functional entities

Signalling entities

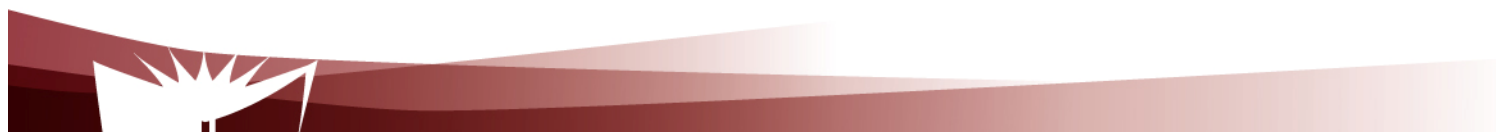
Call Session Control Function (CSCF)

Serving CSCF (S-CSCF):

Always located in home domain

SIP proxy + SIP registrar with possibility of performing session control

- **Binding between IP address (terminal location) and user SIP address**
- **Interacts with application servers for value added service purpose**
- **Translation services (Telephone number / Sip URIs)**
- **Routing**



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IMS Basics – Functional entities

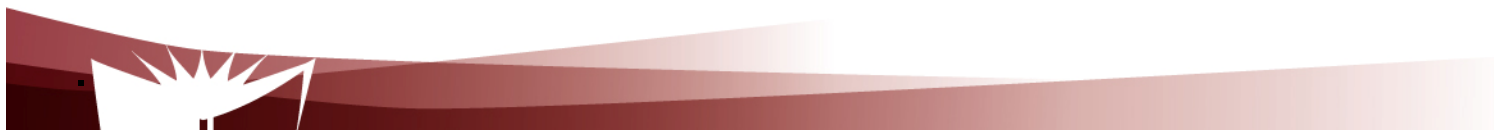
Signalling entities

Call Session Control Function (CSCF)

Interrogating CSCF (I-CSCF):

SIP proxy located at the edge of an administrative domain

- Listed in the domain name server (DNS)
- There may be several in the same network for scalability reasons



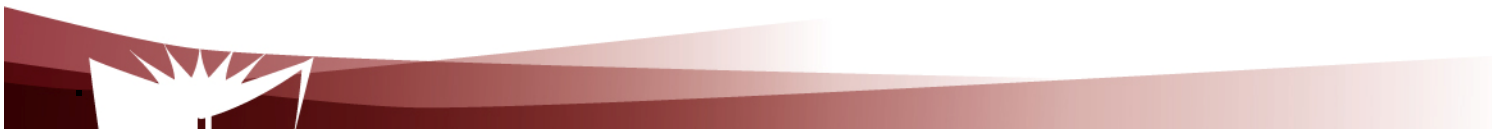
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IMS Basics – Functional entities

Data bases

Home Subscriber Server (HSS)

- Evolution of the HLR
- All user related subscription data (e.g. profile)
- A network may contain one or several
 - Subscriber Location Function (SLF) maps users to specific HSS



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IMS Basics – Functional entities

Interworking

Media Gateway Function (MGF):

Signaling conversion between PSTN/2G and IMS

Media Gateway (MG)

Media conversion between PSTN/2G and IMS

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IMS Basics – Functional entities

Media Resources (Used for conferences)

Media Resource Function (MRF)

- Source of media (media mixing, announcement playing)

- Two parts

 - Control part: MRFC

 - Media Part: MRFP

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IMS Basics – Functional entities

Application servers (Used for a wide range of services)

Application server (AS)

Most relevant functional entity in the context of this course

Host services and execute services

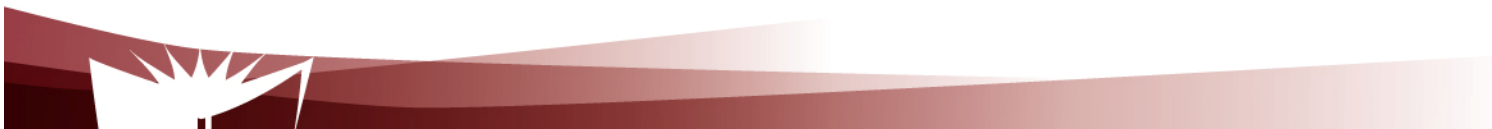
Communicate using SIP

Two types

SIP AS: Signaling specific architecture (Services can work only in SIP environment)

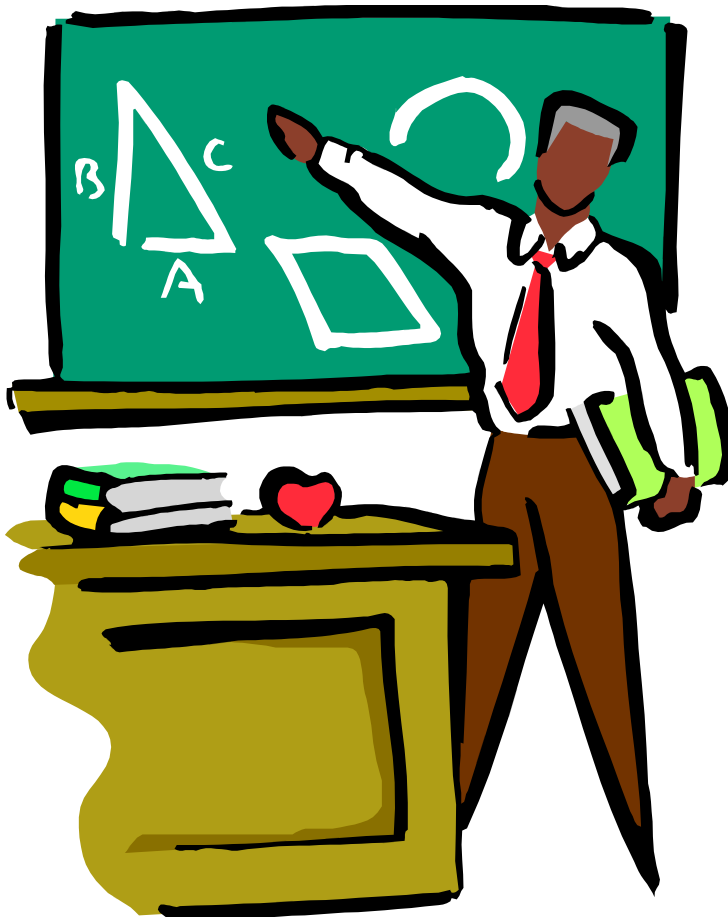
Open Service Architecture – Service Capability Server (OSA/SCS)

- Signaling neutral architecture
- Happens to work in a SIP environment, but can work in other environments



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A word on 3.5 G

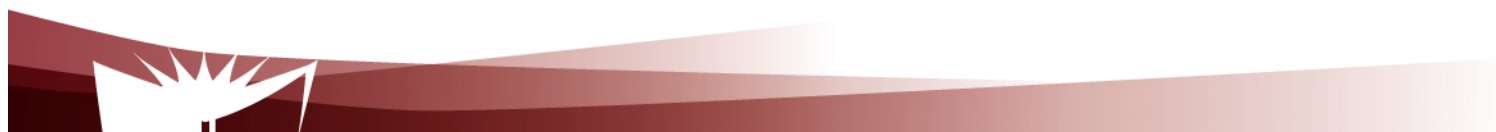


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3.5G

More bandwidth

- High Speed Packet Access (HSPA)
 - Downlink: xx Mb/s
- Evolved High Speed Packet Access (HSPA+)
 - Downlink: xx Mb/s (around 80 Mb/s)



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References

1. G. Camarillo and M. A. Garcia-Martin, The 3G IP Multimedia Subsystem (IMS), Wiley, Third Edition, 2008

