New QoS Control Mechanism Based on Extension to SIP for Access to UMTS Core Network via Different Kinds of Access Networks

WiMob 2005

Presented by 張俊傑

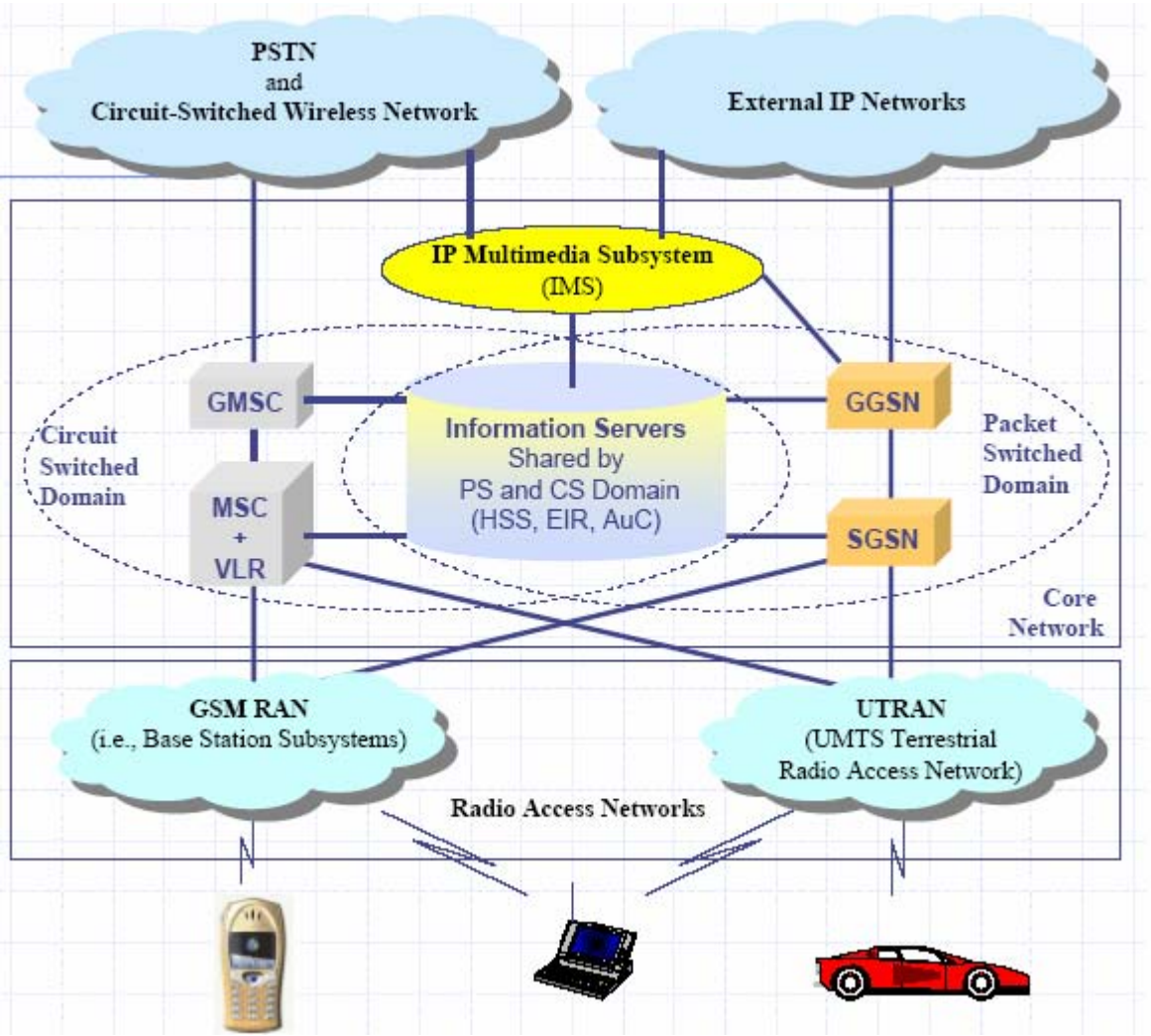
Introduction

- The Universal Mobile Telecommunication System (UMTS) community has been increasingly looking for an architecture that can provide consistent networking-independent end-to-end IP QoS that is an essential for supporting real-time application and services.

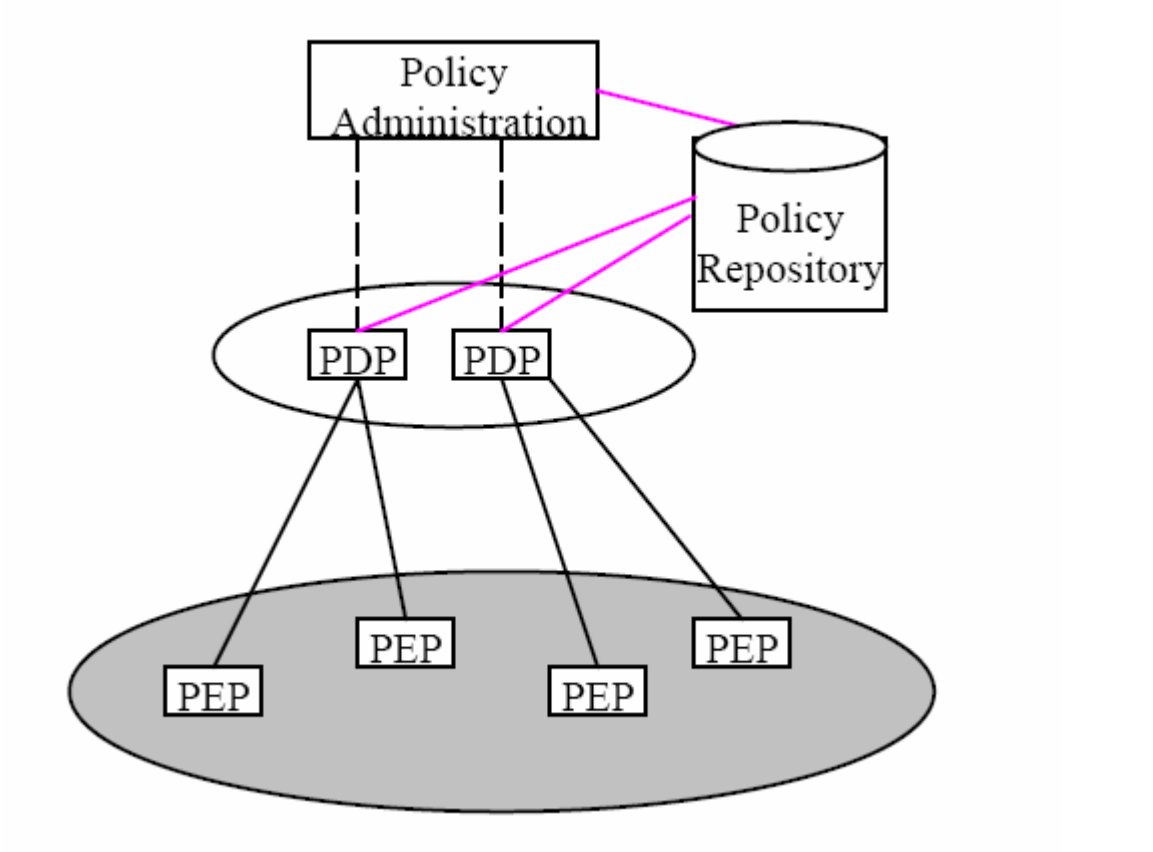
Introduction (cont.)

- From the architecture point of view, there is no a way between the access and core network or even between different domain edge proxies to exchange the policies and limitation of their network dynamically and efficiently.

3GPP Network Architecture



Policy based Architecture



Components of Policy based Architecture

- ***Policy Repository:*** All the policy rules exist in this entity.
- ***Policy Decision Point (PDP):*** This is logically a centralized entity that makes the policy decision according to the policy rules and the dynamic and static information of the network.
- ***Policy Enforcement Point (PEP):*** PEPs enforce the policies in the network.

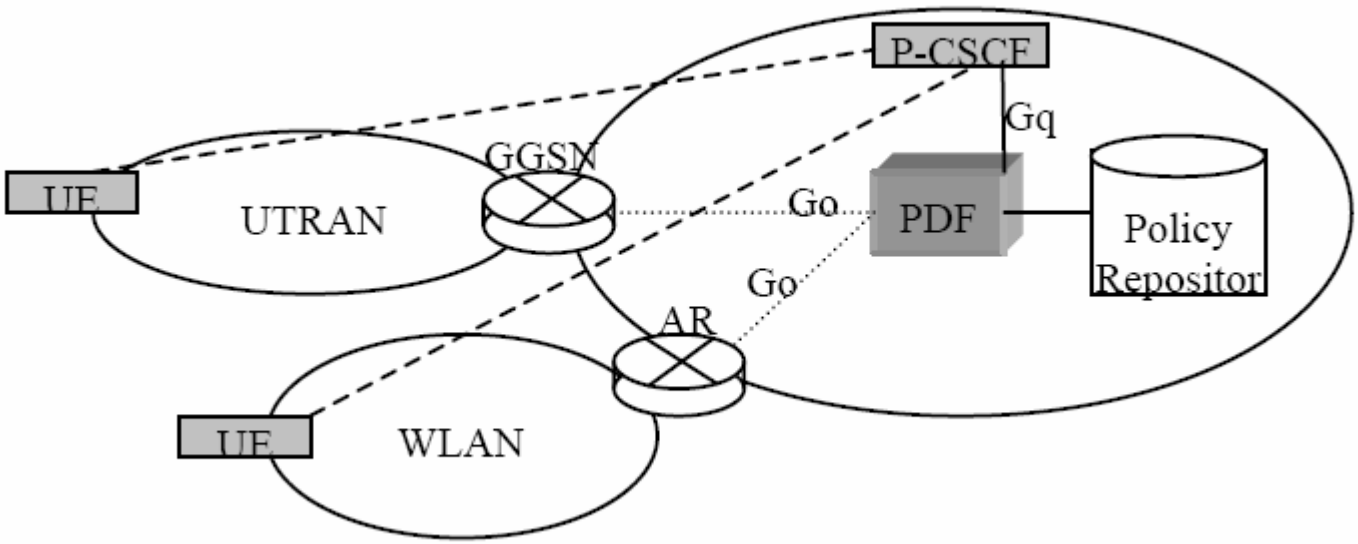
Components of Policy based Architecture (cont.)

- ***Policy Administration System:*** This is the point in which the operator define his policies.

Problem

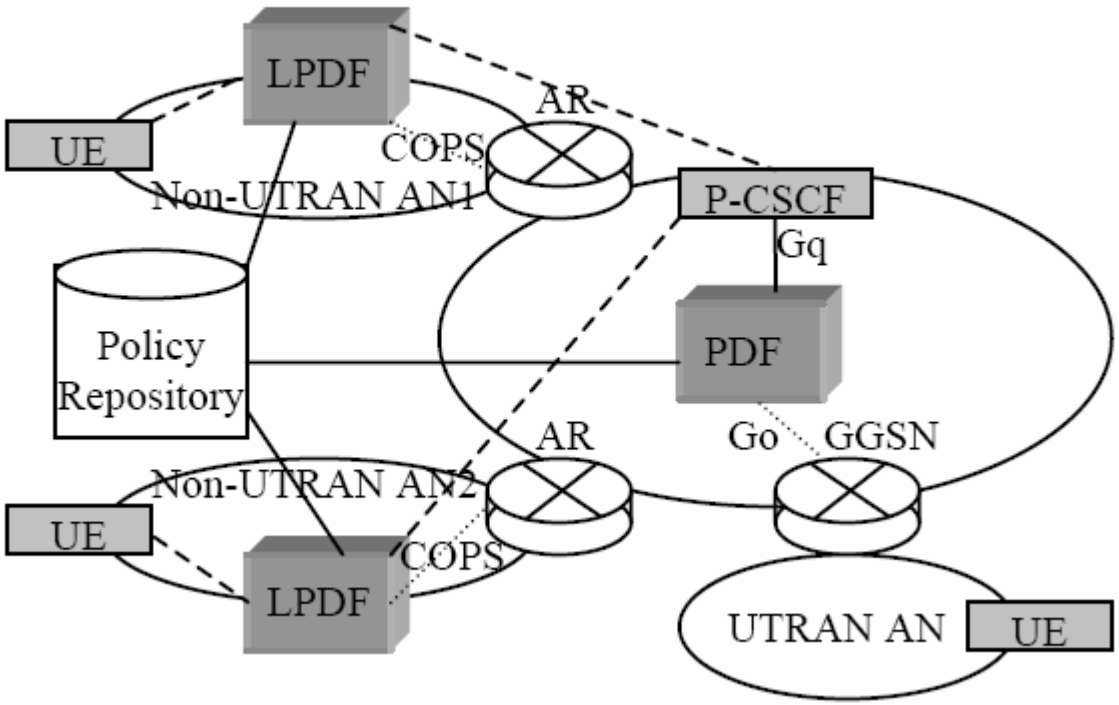
- The end-to-end QoS control mechanism defined by UMTS is limited to a single domain and doesn't work well for multi-domain data path or inter-technology inter-operation.

Modified Architecture for Multi Domain E2E Qos (1)



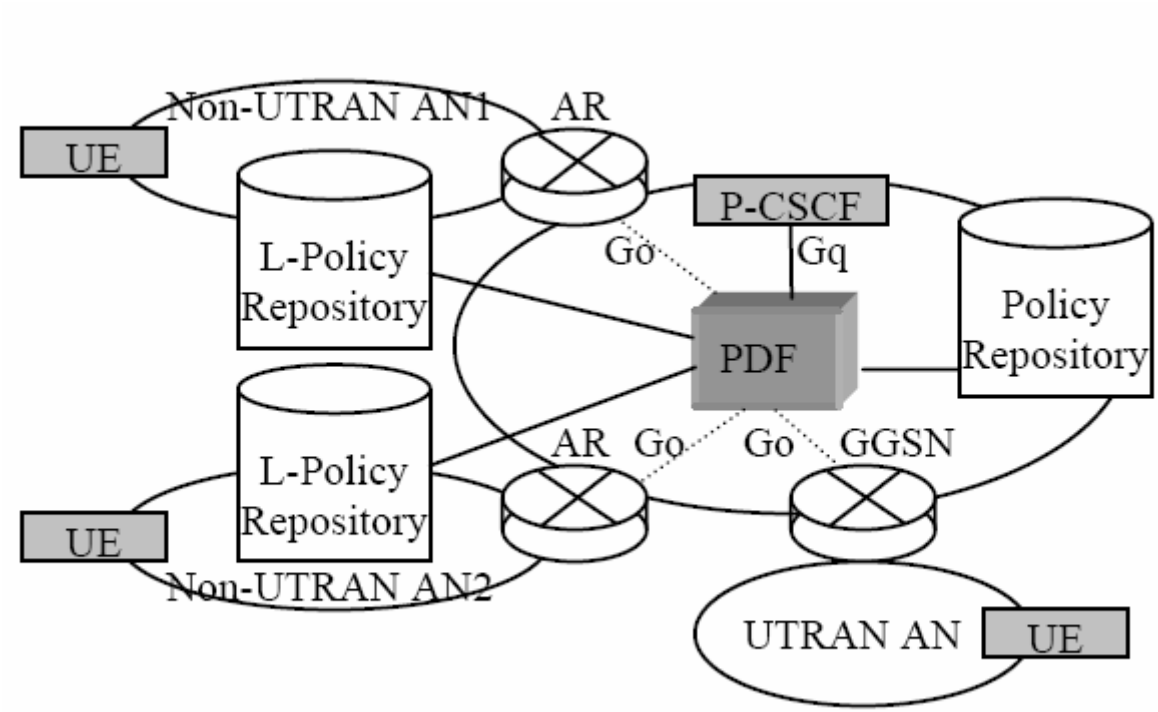
- The operators of all access networks should be the same

Modified Architecture for Multi Domain E2E Qos (2)



- L-PDF should support SIP and acts as a SIP proxy
- Then, by upgrading the existing proxies, a flexible and dynamic policy control for end-to-end QoS control will be possible.
- This push more cost but is more dynamic for policy enforcement according to the local policies.
- This method is more suitable for the access networks which had this kind of proxy for their local services regardless of their connection to core network of UMTS

Modified Architecture for Multi Domain E2E Qos (3)



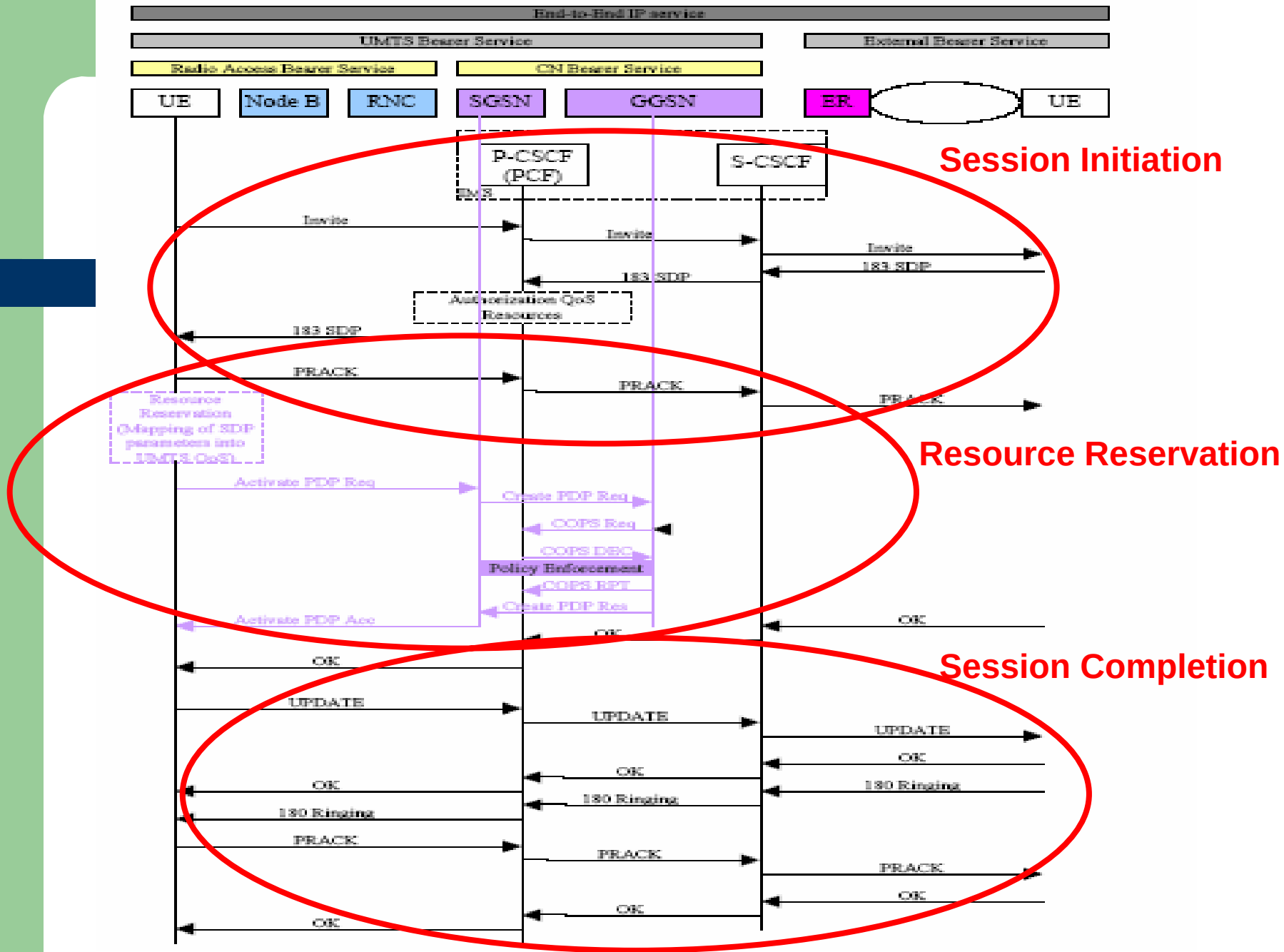
- There is no need for supporting the session signaling in the access networks and then the cost will be decreased.
- But, the policy exchange can’t be as dynamic as the previous architecture
- The S-PDF may be the bottle-neck of the system.

Another Problem

- From the signaling point of view, in the current session signaling, the only QoS parameters that can be indicated by the user are codec and bit-rate
- The user may wishes to have the choice in selecting the level of QoS for the same service because of the cost or end-device capabilities.
- For example, with the current QoS parameters in SDP, “video call” will be exactly mapped to a certain QoS class beyond of user choice but for a long international video call, the caller may desires an acceptable QoS but not a high quality to reduce his costs.

Extensions of SIP

- Traffic Information (TI)
  - The traffic type of the connection with bandwidth and packet size
- Sensitivity Information (SI)
  - The parameter like end-to-end delay, delay jitter and maximum packet loss


End-to-End IP service
UMTS Bearer Service
External Bearer Service
Radio Access Bearer Service
CN Bearer Service
UE
Node B
RNC
SGSN
GGSN
ER
UE
P-CSCF (PCF)
S-CSCF
Session Initiation
Invite
Invite
Invite
183 SDP
183 SDP
Authorization QoS Resources
183 SDP
PRACK
PRACK
PRACK
Resource Reservation (Mapping of SDP parameters into UMTS QoS)
Resource Reservation
Activate PDP Req
Create PDP Req
COPS Req
COPS DEC
Policy Enforcement
COPS RPT
Create PDP Res
Activate PDP Acc
OK
OK
OK
Session Completion
UPDATE
UPDATE
UPDATE
OK
OK
OK
180 Ringing
180 Ringing
PRACK
PRACK
PRACK
OK
OK
OK

QoS Mapping Using Extension of SIP

Table 1: Mapping of SDP media to UMTS QoS Classes defined by 3GPP

Media inside of SDP	UMTS QoS Class
Audio	Conversational or Streaming
Video	Conversational or Streaming
Application	Conversational
Control	Interactive Priority 1
Data	Interactive Priority 3
Others	Background

Table 2: Different QoS level and their mapping to QoS classes

Real Time Media and QoS level	UMTS QoS Class
Audio, Video High Quality	Conversational
Video Acceptable	Streaming
Audio Acceptable	Interactive Priority 1
Audio,Video Poor	Interactive Priority 2

Test Results

Table 3: Results of resource admission control in signaling phase

	Traffic Load in Access Network	Asked QoS Level	Conflict Detection Location	Conflict Detection Time	Reaction Location to Conflict	Delay before Reaction
Arch1	High	High Quality	Core Network	**After** Resource Reservation Process	CN	383ms
Arch2	High	High Quality	Access Network	**Before** Resource Reservation Process	AN	48ms
Arch3	High	High Quality	Core Network	**Before** Resource Reservation Process	CN	72ms

Best !!

Conclusion

- This paper describes an new architecture with modified functional elements existing in IMS of UMTS to resolve the existing limitations in the architecture and control end-to-end QoS over the data path between different technologies and domains in heterogeneous wired-wireless networks beyond 3G.