# EXata学习(06): UMTS QoS Step by Step

目标:建立一个反映UMTS业务QoS支持能力的场景,来自移动终端访问互联网中的设备。

参考: D:\Scalable\exata\5.1\scenarios\umts\QoS, myUMTSCall

工具:EXata 5.1

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## 1. 基于已建好的myUMTSCall场景:

F:\ex\myUMTSCall\myUMTSCall.config,进行修改;



### 2. 设置场景属性

- a. 命名: myUMTS\_QoS
- b. Channel Properties: 2 Channels: 1.95GHz, 2.15 GHz
- c. Simulation Time: 300sec

## 3. 设置拓扑

a. 删除NodeB[2]及右侧的无线子网,将终端都移到左侧NodeB附近,并加入左侧无线子网;并新增16个UE, 而且同样加入左侧无线子网。选择其中 4 个UE作为业务发起终端,选择绿色ICON,其余选择蓝色。【Tip: 可以选择多个节点,右键Link Selected Nodes to...】



b. 在右侧增加4个default device, 连接到GGSN[5].



c. 目前直接RUN,在PLAY时发生错误,提示"TRACE: Removing trace header that doesn't match!"。判断 UE协议Interfaces配置有误。

## 4. 修改网络协议

- a. NodeB、SGSN、GGSN、HLR配置:略。
- <mark>b.</mark> UE配置:
  - UE比较多时,公共属性可以统一选择一起配置。Table View-》Nodes,选择所有的UE,Node
     Configuration,设定Minimum Cell Selection Rx Level: -84 dBm,其余默认。
  - 接口协议要通过Interface进行配置。选择所有UE(2, 7 thru 25)的Interface,修改Physical Layer,
     MAC Layer和Network Layer

Interfaces			🖾 Help
⊡ Interface 0	Network Layer		
MAC Layer     MAC Layer     MAC Layer     Metwork Layer     Detropy for the second secon	Property	Value	
	[-] Network Protocol	Cellular Layer 3	- 4
Faults	Cellular Layer 3 Protocol	UMTS Layer 3	- 4
	IP Fragmentation Unit (bytes)	2048	
	Enable Explicit Congestion Notification	No	•
	Enable Mobile IP	No	•

1 Interface Properties (Interface 190.0.6.2)

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Interface Properties (Interface 190.0.6.2)

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Interfaces		E H	Help
Interface 0     Development	MAC Layer		
MAC Layer 	Property	Value	
	[-] MAC Protocol	Cellular MAC	4
Faults	Cellular MAC Protocol	UMTS Layer 2	•
	MAC Propagation Delay	1 micro-seconds	•
	Enable Promiscuous Mode	No	•
	Enable LLC	No	•
	Configure MAC Address	No	•

- Interface 0 - Physical Layer	Physic	al Layer	<u> </u>
MAC Layer	Property	Value	
Network Layer     Routing Protocol	Listenable Channels	channel0, channel1	
Faults	Listening Channels	channel0, channel1	
	[-] Radio Type	Cellular PHY	• •
	[-] Cellular PHY Model	UMTS PHY Model	•
	Maximum Transmission Power (dBm)	30.0	
	Minimum Transmission Power (dBm)	-10.0	4
	Enable HSDPA Capability	No	•
	Packet Reception Model		
	Specify Downlink Scrambling Code	No	•
	[-] Specify Antenna Model from File	No	<b>_</b>
	Antenna Model	Omnidirectional	•
	Antenna Gain (dB)	0.0	
	Antenna Height (meters)	1.5	
	Antenna Efficiency	0.8	
	Antenna Mismatch Loss (dB)	0.3	
	Antenna Cable Loss (dB)	0.0	
	Antenna Connection Loss (dB)	0.2	
	Antenna Orientation Azimuth (degrees)	0	
	Antenna Orientation Elevation (degre	0	

■ 此时RUN & Play 已能通过,但尚未配置业务。

c. 互联网Hosts配置:采用默认【问题:在网络的哪一部分、如何保证QoS? 1)在IP包头ToS字段标记优先

级;2)在路由器网络层通过输出队列按优先级进行调度来实现】

#### 5. 添加不同等级的CBR业务

- a. 原理:参考《User Guide》,QoS Modeling一节,在应用层进行QoS等级设定的方法,可以通过在流量产生时可以用 IP 头部业务类型(Type of Class, ToS)字段来表征,路由器在转发时默认按严格优先级(Strict Priority)转发,即只有当高优先级队列为空,才转发低优先级队列中的包。具体说有三种方式:
  - Precendence: ToS的最高 3 bits, 0-7级;
  - DSCP: ToS最高 6 bits, 0-63级;
  - ToS: 整个ToS 8 bits, 0-255级。

Property Source	Value 2		
Source	2		
Destination	r		•
Desunation	27		•
Items to Send	0		K
Item Size (bytes)	590		k
Interval	0.01	seconds	•
Start Time	1	seconds	•
End Time	0	seconds	•
-] Priority	Precedence		•
Precedence Value	DSCP Precedence		
Enable RSVP-TE	TOS		_
Enable MDP	No		•
Session Name	[Optional]		

#### 下图为GGSN的Network Layer队列调度器属性:

Default Device Properties (Default	Device 5)		?	$\times$
General Node Configuration Ir	nterfaces	and Queues		Help
<ul> <li>Physical Layer</li> <li>MAC Layer</li> <li>Schedulers and Que</li> <li>QoS Configuration</li> <li>Cyber</li> <li>ARP</li> <li>DHCP</li> <li>DNS</li> <li>Fixed Communications</li> </ul>	Property	Value		
	IP Input Queue Size (bytes)	150000		
	IP Output Queue Scheduler	Strict Priority	j	-
	Number of IP Output Queues	3		

置不当,可能出错。先按以下值(来自系统QoS场景)设定(Precedence 的值越小,优先级越低):

- 2-27: Precedence 0: item size: 590 bytes, interval: 0.01sec
- 7-27: Precedence 1: item size: 590 bytes, interval: 0.01sec
- 8–27: Precedence 3: item size: 60 bytes, interval: 0.01sec
- 9–27: Precedence 5: item size: 60 bytes, interval: 0.01sec

an one own inmotoj Stooooli too ikaa tahajaj o completed ovo Warning in file ... \libraries \umts \src \layer3\_umts.cpp:2459 node 2: Streaming application with rate 435200 bps beyong the system definition 115200 bps Error in file ... libraries \umts \src \layer3\_umts.cpp:2460 QualNet UMTS Model: Rate & Packet Format Supported (Streaming) Rate Level----Max Data Rate (bps)----Max Data Packet Size (bytes) 14400 1 (TTI 40ms) 40 2 (TTI 40ms) 28800 112 3 (TTI 40ms) 57600 256 4 (TTI 40ms) 115200 544

Refer to QualNet UMTS Model User's Guide on how to change these values

C. 观测运行结果,最明显的差别是端到端延迟(因为在路由器中低优先级包转发时必须待高优先级队列清

空),从上到下的顺序分别为2-27(9.59784sec)、9-27(0.220203sec)、7-27(2.62348sec)、8-27(0.16253sec),即 P=0的平均端到端时延是P=3的59倍。【注: Precedence=3和5端到端延迟在本例 中差别不大】



不同优先级业务的端到端时延:





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