

EXata学习 (05) : UMTS呼叫–Step by Step

目标：建立UMTS呼叫场景，一步一步实现。

参考资料：D:\Scalable\exata\5.1\scenarios\umts\umts_call

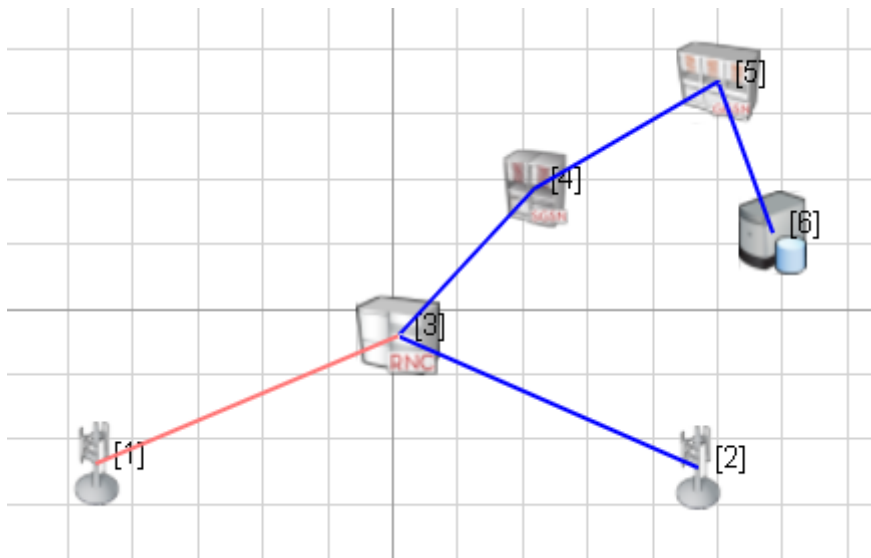
工具：EXata 5.1

1. 创建和配置场景

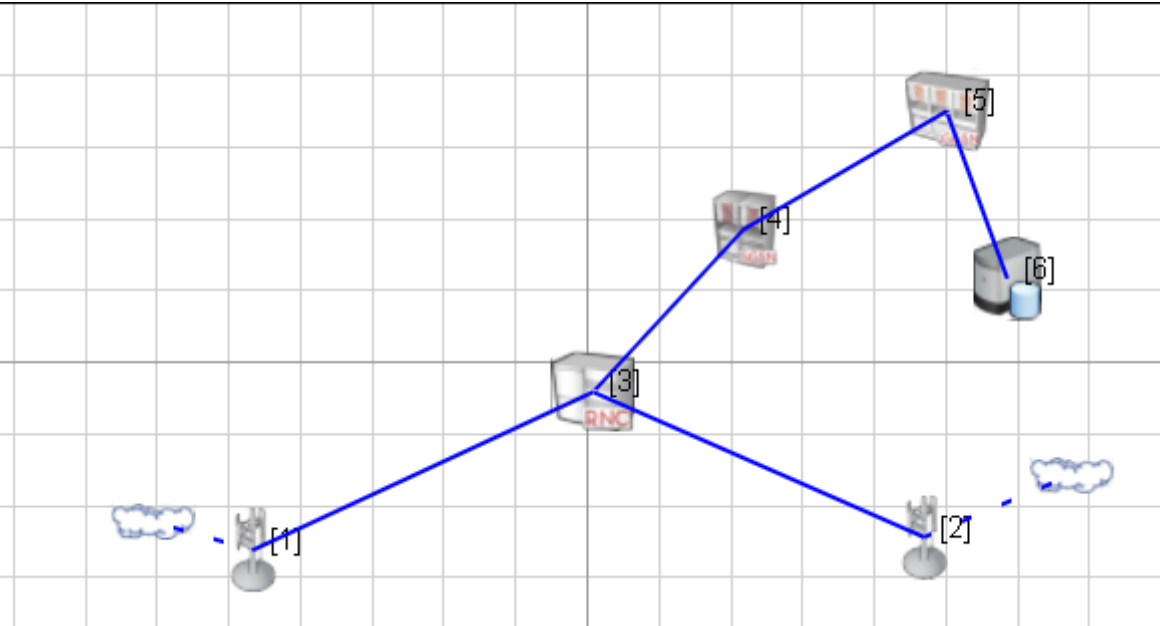
- a. 新建一个场景，Terrain: 1800x1500，命名为myUMTS_Call.
- b. 设定 Channel Properties: 2 channels，频率均为1900MHz。
- c. Simulation Time: 300s

2. 创建网络拓扑

- a. 从 UMTS Devices中选取设备，添加6个网络节点：2个 UMTS–NodeB，1个UMTS–RNC，1个UMTS–SGSN，1个UMTS–GGSN，1个UMTS–HLR。修改其2D和3D ICON。
- b. 暂时不考虑终端，待网络运行正常后再添加终端。·【注：UMTS分为CS和 PS两个域，推测，这里的SGSN应该兼做MSC的功能。】
- c. 添加相应链路，连接相应节点，拓扑如下



- d. 此时运行仿真会有错误提示：“UMTS L3: CELLULAR MAC interface not found”。
- e. 添加两个Wireless Subnet，分别放在两个NodeB附近，并连接相应的NodeB。



f. 此时Table View: Networks能看到2个Wireless Subnet和5条Link【没看到default wireless subnet, 可能是因为没添加终端的原因】

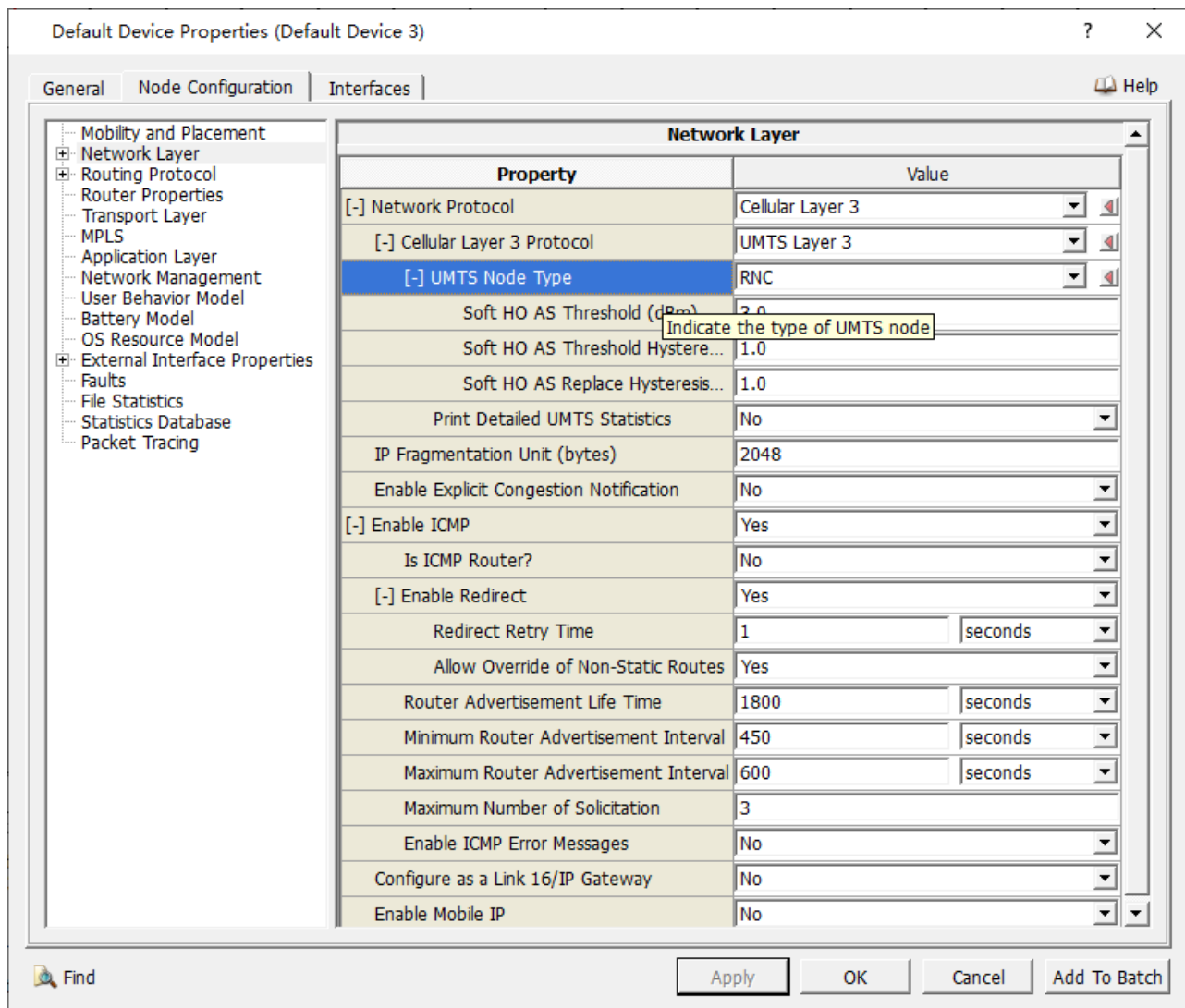
Nodes	Groups	Interfaces	Networks	Applications	Hierarchies
Network Address			Type		
190.0.6.0			Wireless Subnet		{1}
190.0.7.0			Wireless Subnet		{2}
190.0.1.0			Link		{3, 1}
190.0.2.0			Link		{3, 2}
190.0.3.0			Link		{3, 4}
190.0.4.0			Link		{4, 5}
190.0.5.0			Link		{5, 6}

g. 此时仍无法正常运行，提示“Unsupported or disabled PHY model”。

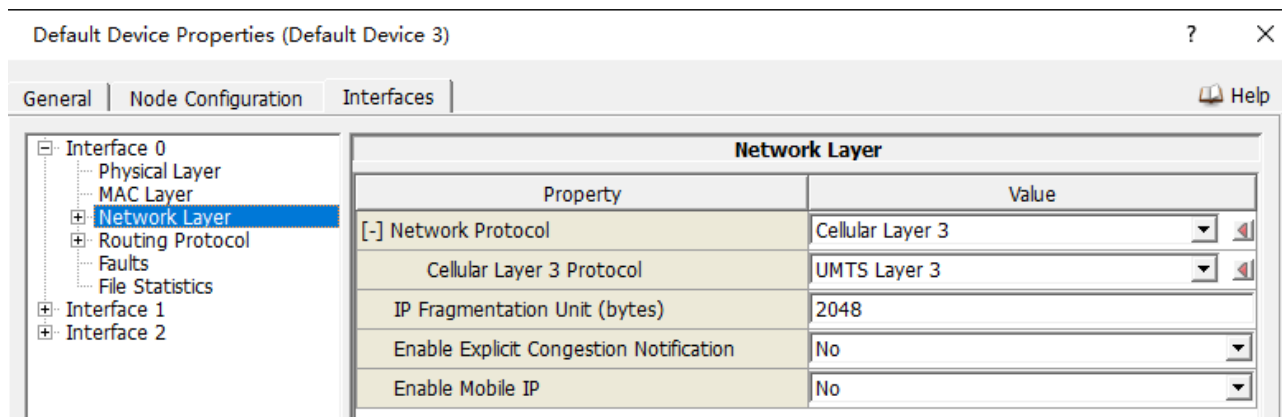
3. 配置网络协议

a. 配置RNC

- 采用默认配置，如下所示（比GSM Models更加自动化，由于Devices已经区分了网络节点类型），

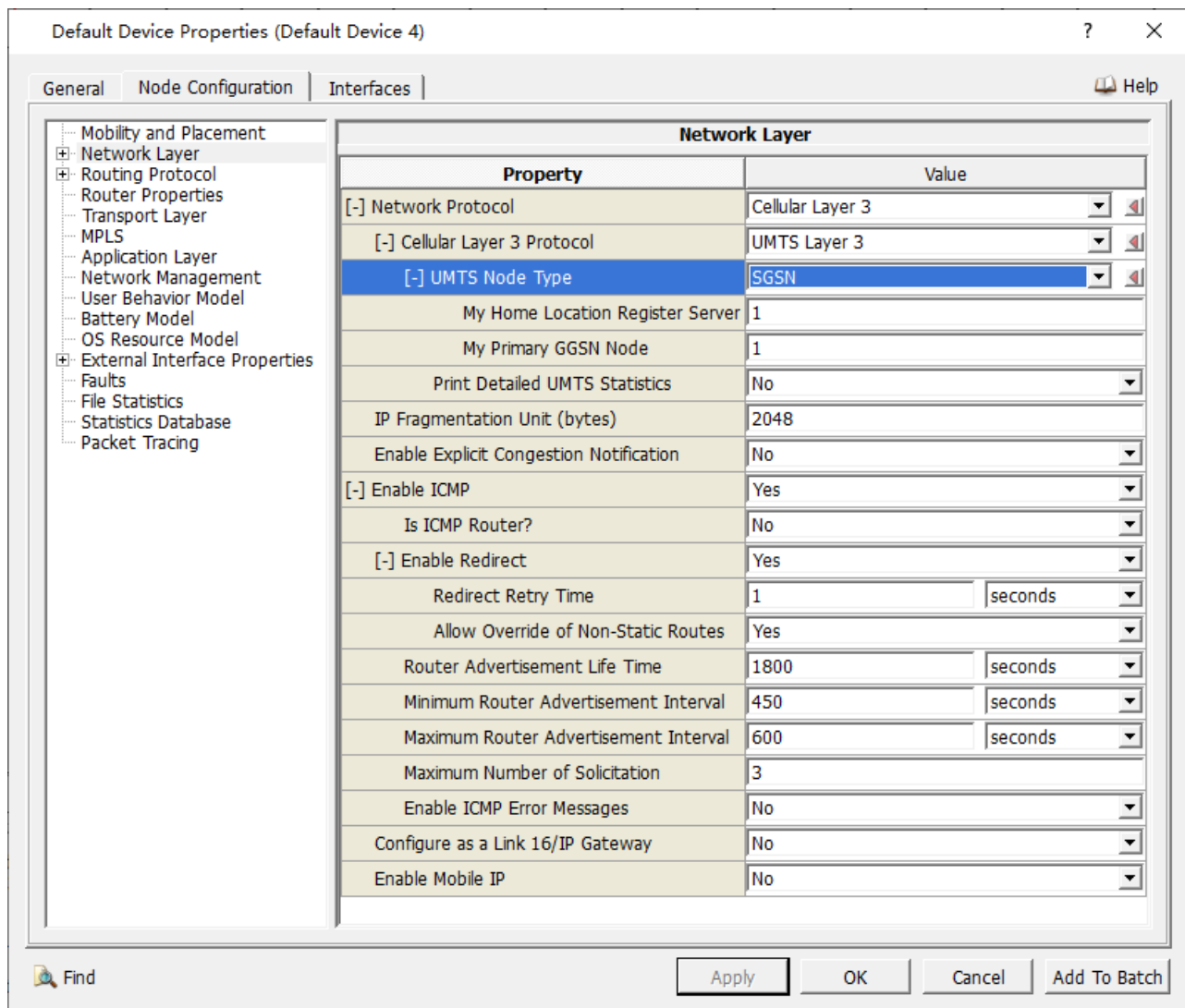


- Interfaces页卡也可采用默认

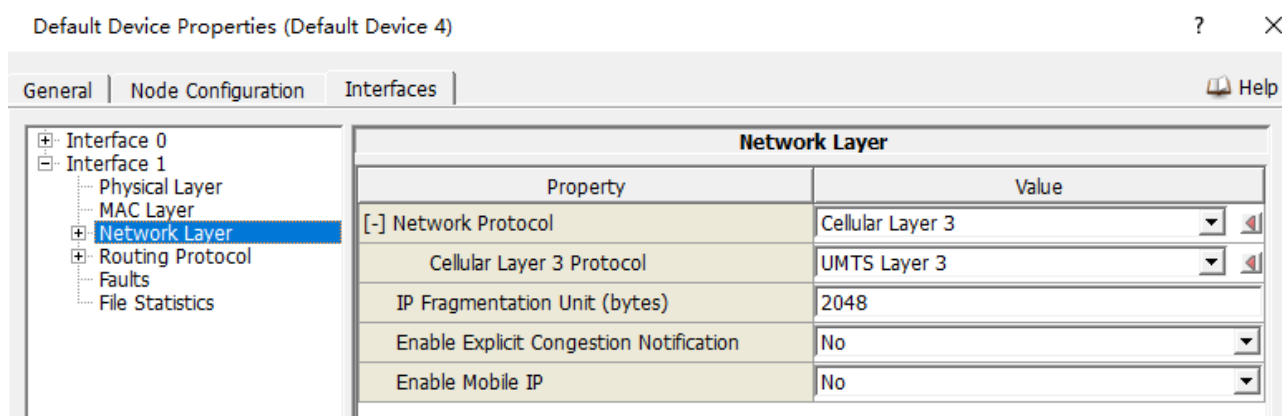


b. 配置SGSN

- Node Configuration采用默认配置即可【注意：My Home Location Register Server和My Primary GGSN Node故意暂未设置】

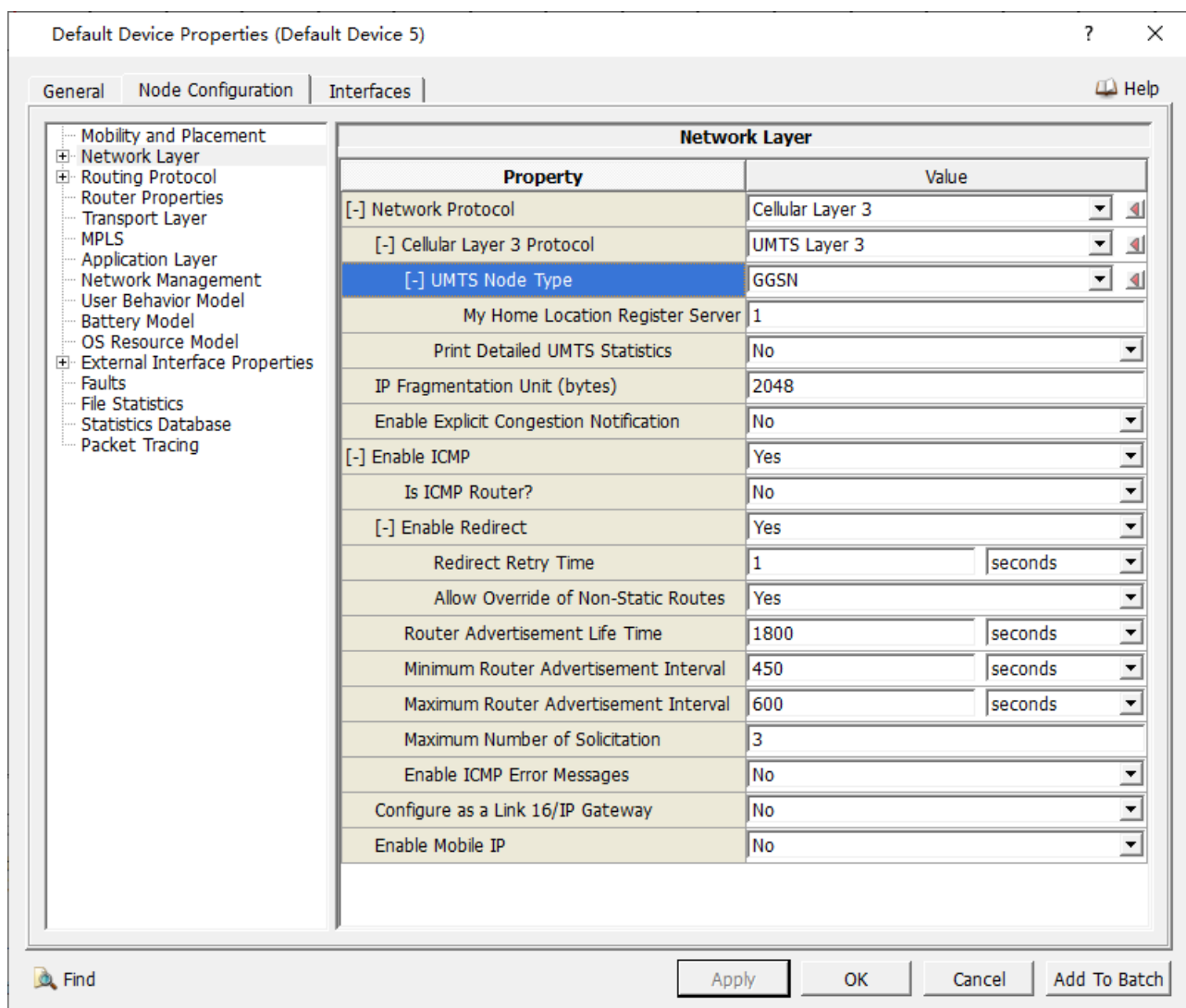
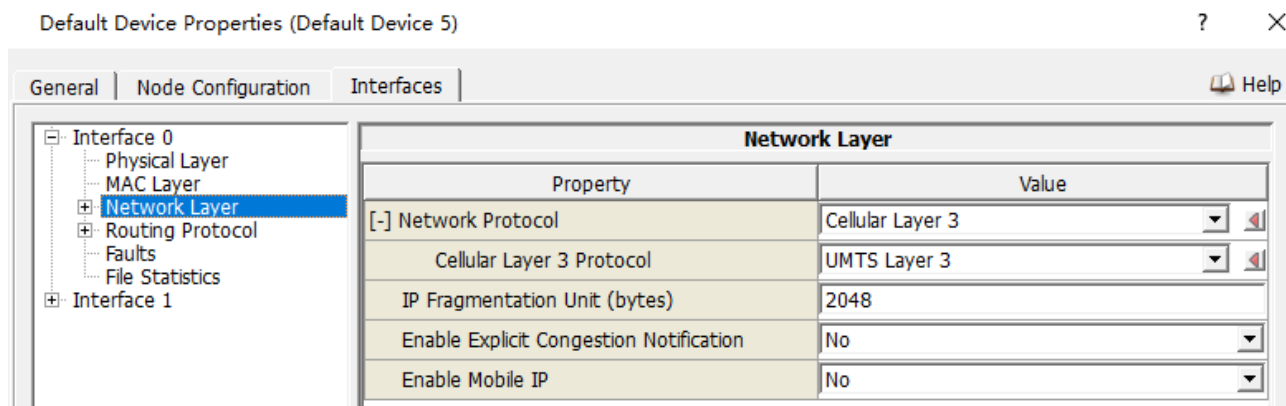


- Interfaces也可以采用默认配置



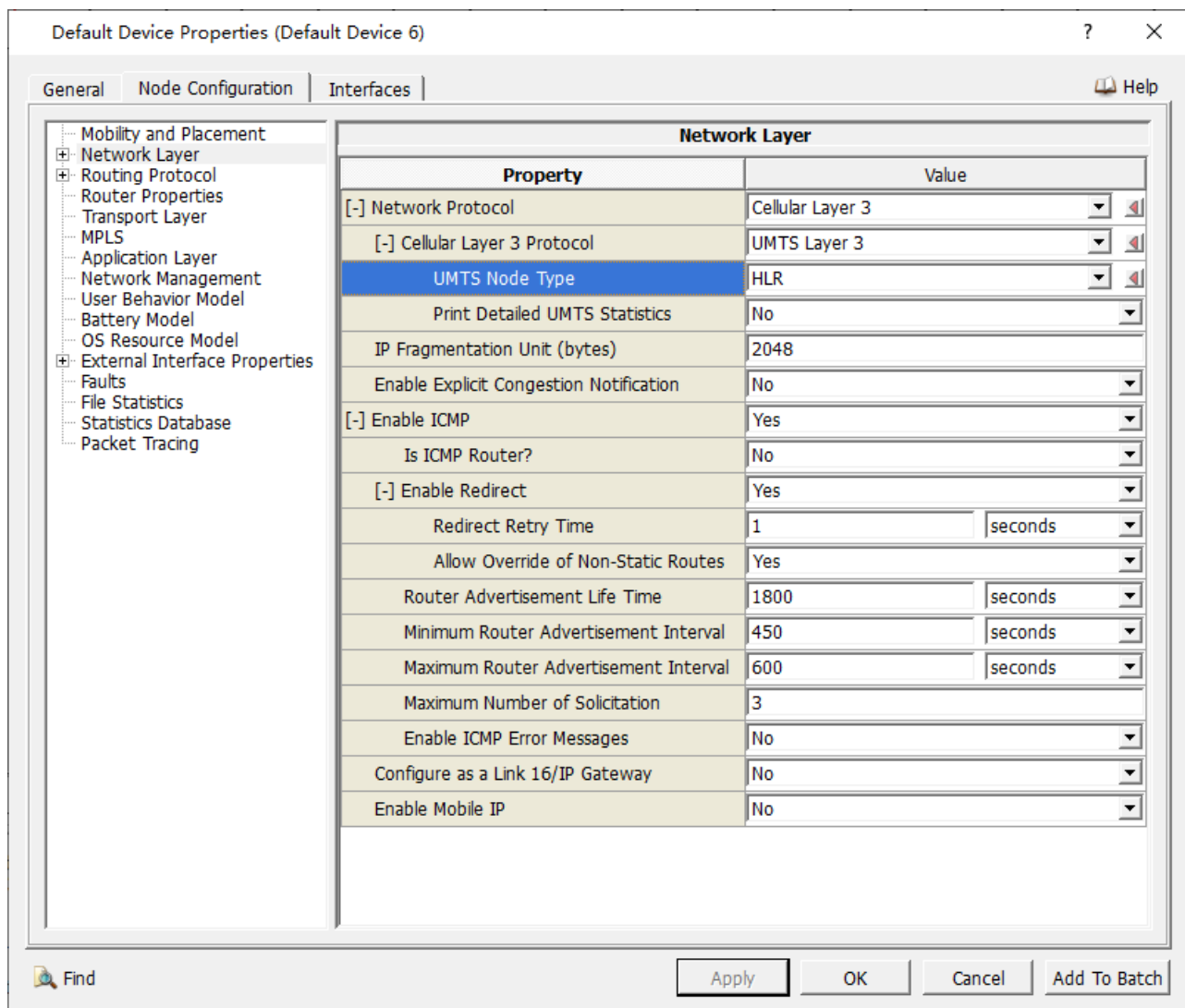
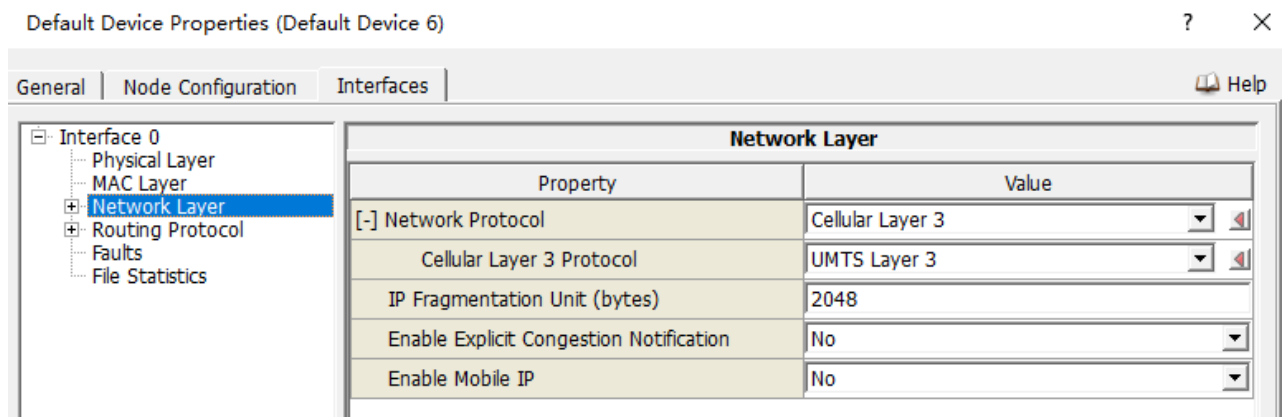
c. 配置GGSN:

- 同上，Node Configuration和Interfaces均采用默认配置【注意：My Home Location Register Server 故意暂未指定】



d. 配置HLR

- 同上，Node Configuration和Interfaces均采用默认配置【问题：GGSN-HLR接口为什么不是 MAP 协议？】



e. 配置NodeB（注意：涉及无线属性）

- NodeB1: Node Configuration, 仿照umts_call场景修改小区选择与重选的电平参数，注意上下行选用不同的Channel，如下图

Default Device Properties (Default Device 1) ? X

General Node Configuration Interfaces Help

- Mobility and Placement
- Network Layer
- Routing Protocol
- Router Properties
- Transport Layer
- MPLS
- Application Layer
- Network Management
- User Behavior Model
- Battery Model
- OS Resource Model
- External Interface Properties
- Faults
- File Statistics
- Statistics Database
- Packet Tracing

Network Layer

Property	Value
[-] Network Protocol	Cellular Layer 3
[-] Cellular Layer 3 Protocol	UMTS Layer 3
[-] UMTS Node Type	NodeB
Downlink Channel	0
Uplink Channel	1
Minimum Cell Selection RX Level ...	-84.0
Cell Search Threshold (dBm)	-84.0
Cell Reselection Hysteresis (dB)	3.0
Print Detailed UMTS Statistics	No
IP Fragmentation Unit (bytes)	2048
Enable Explicit Congestion Notification	No
[-] Enable ICMP	Yes
Is ICMP Router?	No
[-] Enable Redirect	Yes
Redirect Retry Time	1 seconds
Allow Override of Non-Static Routes	Yes
Router Advertisement Life Time	1800 seconds
Minimum Router Advertisement Interval	450 seconds
Maximum Router Advertisement Interval	600 seconds
Maximum Number of Solicitation	3
Enable ICMP Error Messages	No
Configure as a Link 16/IP Gateway	No
Enable Mobile IP	No

Find Apply OK Cancel Add To Batch

- Interfaces配置：Physical Layer主要修改Listenable和Listening Channels，以及射频参数；MAC层：MAC Protocol改为“Cellular MAC，协议自动修改为“UMTS Layer 2””，如下图：

Default Device Properties (Default Device 1) ? X

General | Node Configuration | Interfaces | Help

Interface 0
Interface 1
 Physical Layer
 MAC Layer
 Network Layer
 Routing Protocol
 Faults
 File Statistics

Physical Layer

Property	Value
Listenable Channels	channel0,channel1
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
Enable HSDPA Capability	No
Packet Reception Model	PHY UMTS
Specify Downlink Scrambling Code S...	No
[-] Specify Antenna Model from File	Specify the downlink scrambling code set index for a NodeB
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 (degrees)	0
Temperature (K)	290.0
Noise Factor	10.0
Energy Model	None

Find Apply OK Cancel Add To Batch

Default Device Properties (Default Device 1) ? X

General | Node Configuration | Interfaces | Help

Interface 0
Interface 1
 Physical Layer
 MAC Layer
 Network Layer
 Routing Protocol
 Faults
 File Statistics

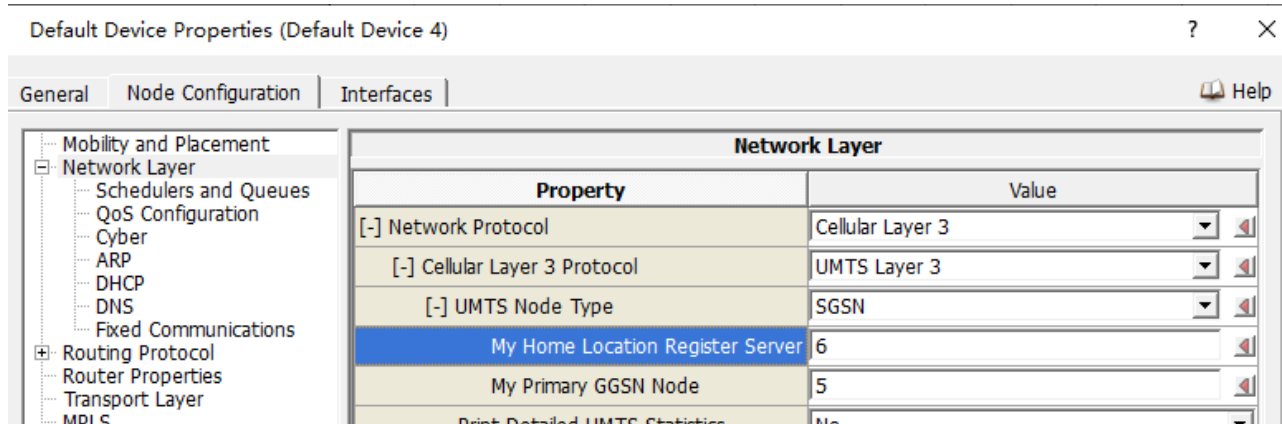
MAC Layer

Property	Value
[-] MAC Protocol	Cellular MAC
Cellular MAC Protocol	UMTS Layer 2
MAC Propagation Delay	1 micro-seconds
Enable Promiscuous Mode	No
Enable LLC	No
Configure MAC Address	No

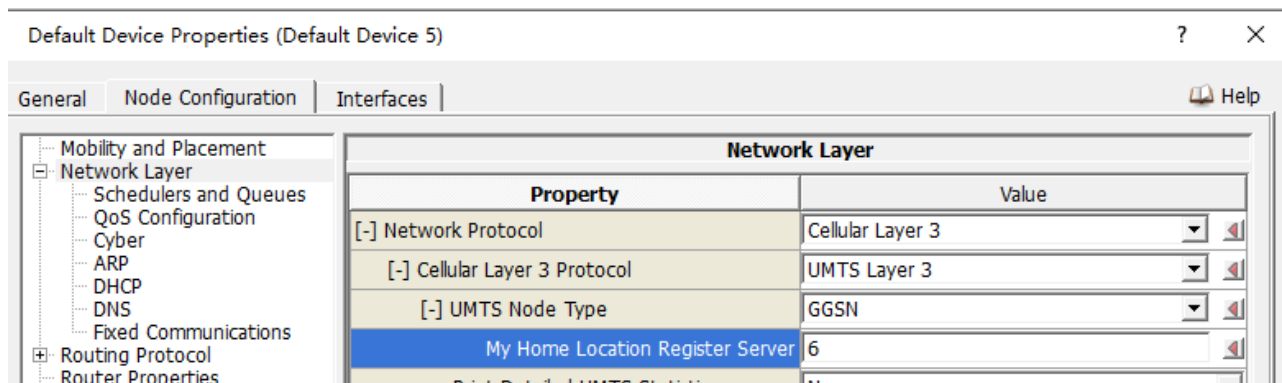
- NodeB2做相应修改。
- 运行场景，出现**错误提示**“Node4(GSN): Wrong value of UMTS-HLR-SERVER. It must be the node ID of the HLR server.”，表明**GSN节点配置HLR节点ID有误**。

f. 修订GSN节点配置【**注：在这里补充GSN节点配置**】

- SGSN修改如下



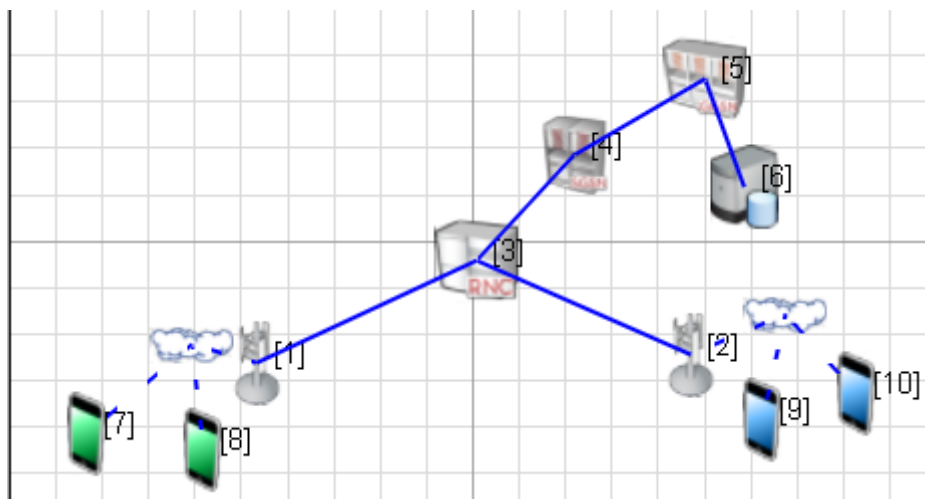
- GGSN修改如下



- OK! 至此，在没有UMTS终端和业务情况下，网络已搭建完成，场景能够正常运行。

4. 终端添加和配置

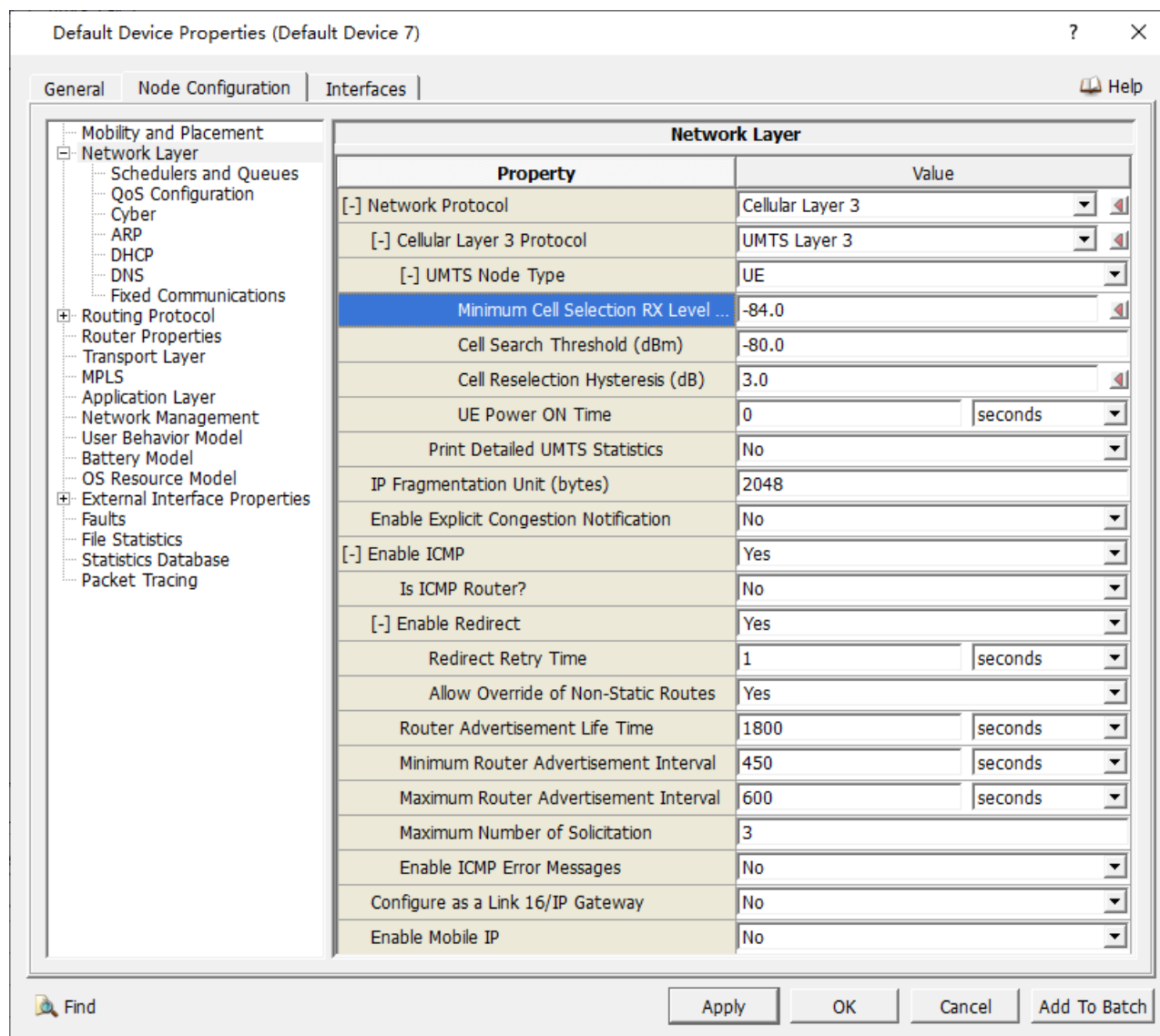
- 添加4个UMTS UE device，一边2个，分别位于NodeB1和NodeB2附近，并加入两个Wireless Subnet；
- 修改4个UE的 2D和3D ICON，各选择Blue和Green，此时效果如下：



- 此时，RUN可以，但PLAY会出错，提示“TRACE: Removing trace header that doesn't match!”，应该是UE的Interface配置问题所致。

d. 配置UE (7)

- Node Configuration 配置按下图参数，注意修改了射频参数，与NodeB保持一致。



- Interfaces 配置：Physical Layer主要添加了Listenable和Listening Channels，添加了全部2个Channel；修改Radio Type为Cellular PHY，相应自动修改了PHY Model；提高了最低发射功率到 10.0 dBm；设置Packet Reception Model为PHY UMTS，其他采用默认值。MAC Layer主要修改MAC Protocol为Cellular MAC，Cellular MAC Protocol 自动调整为UMTS MAC，其他采用默认值；Network Layer修改为Cellular Layer 3，协议为 UMTS Layer 3。如下图：

Default Device Properties (Default Device 7) ? X

General | Node Configuration | Interfaces | Help

Interface 0

- Physical Layer
- MAC Layer
- Network Layer
- Routing Protocol
- Faults
- File Statistics

Physical Layer

Property	Value
Listenable Channels	channel0,channel1 ...
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
Enable HSDPA Capability	No
Packet Reception Model	PHY UMTS
Specify Downlink Scrambling Code S...	No
[-] Specify Antenna Model from File	No
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 (degrees)	0
Temperature (K)	290.0
Noise Factor	10.0
Energy Model	None

Find Apply OK Cancel Add To Batch

Default Device Properties (Default Device 7) ? X

General | Node Configuration | Interfaces | Help

Interface 0

- Physical Layer
- MAC Layer
- Network Layer
- Routing Protocol
- Faults
- File Statistics

MAC Layer

Property	Value
[-] MAC Protocol	Cellular MAC
Cellular MAC Protocol	UMTS Layer 2
MAC Propagation Delay	1 micro-seconds
Enable Promiscuous Mode	No
Enable LLC	No
Configure MAC Address	No

General | Node Configuration | Interfaces | Help

Interface 0

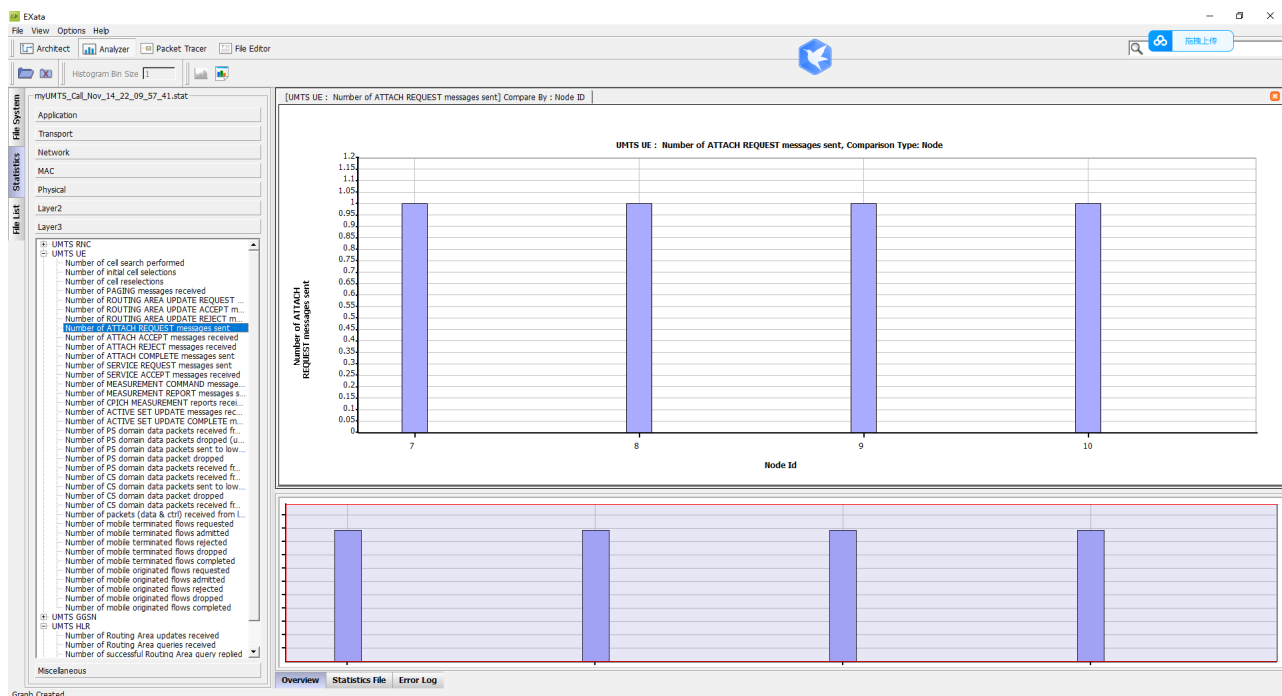
- Physical Layer
- MAC Layer
- Network Layer
- Routing Protocol
- Faults
- File Statistics

Network Layer

Property	Value
[+] Network Protocol	Cellular Layer 3
Cellular Layer 3 Protocol	UMTS Layer 3
IP Fragmentation Unit (bytes)	2048
Enable Explicit Congestion Notification	No
Enable Mobile IP	No

e. 同样修改其他3个UE。

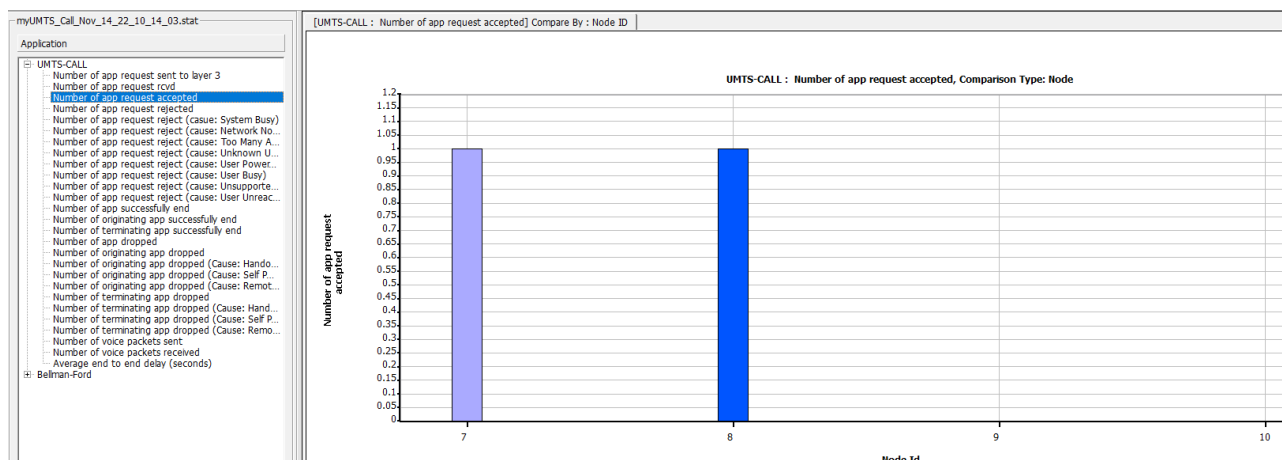
f. 至此，RUN和PLAY都没有问题，只是没有加载业务。查看运行结果，能观察到UE的RAU、Attach等UMTS Layer 3过程



5. 添加和配置UMTS Call应用

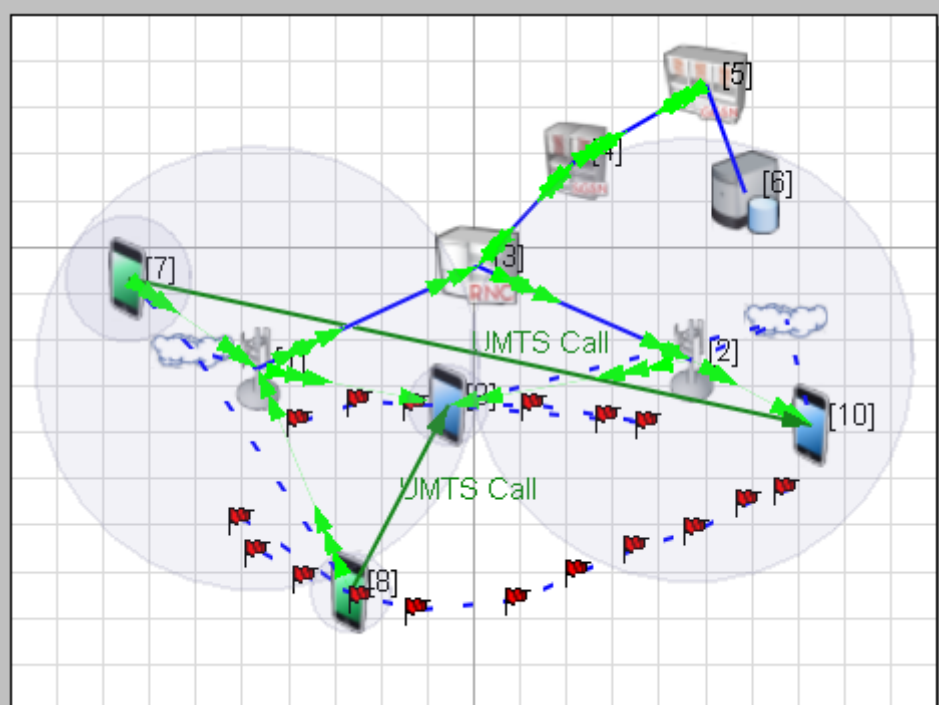
a. 8-9、7-10之间，各添加一个UMTS Call应用，并设定其开始时间（Start time）和持续时间（Duration time）

b. RUN、PLAY并观察运行结果。



6. 添加运动轨迹

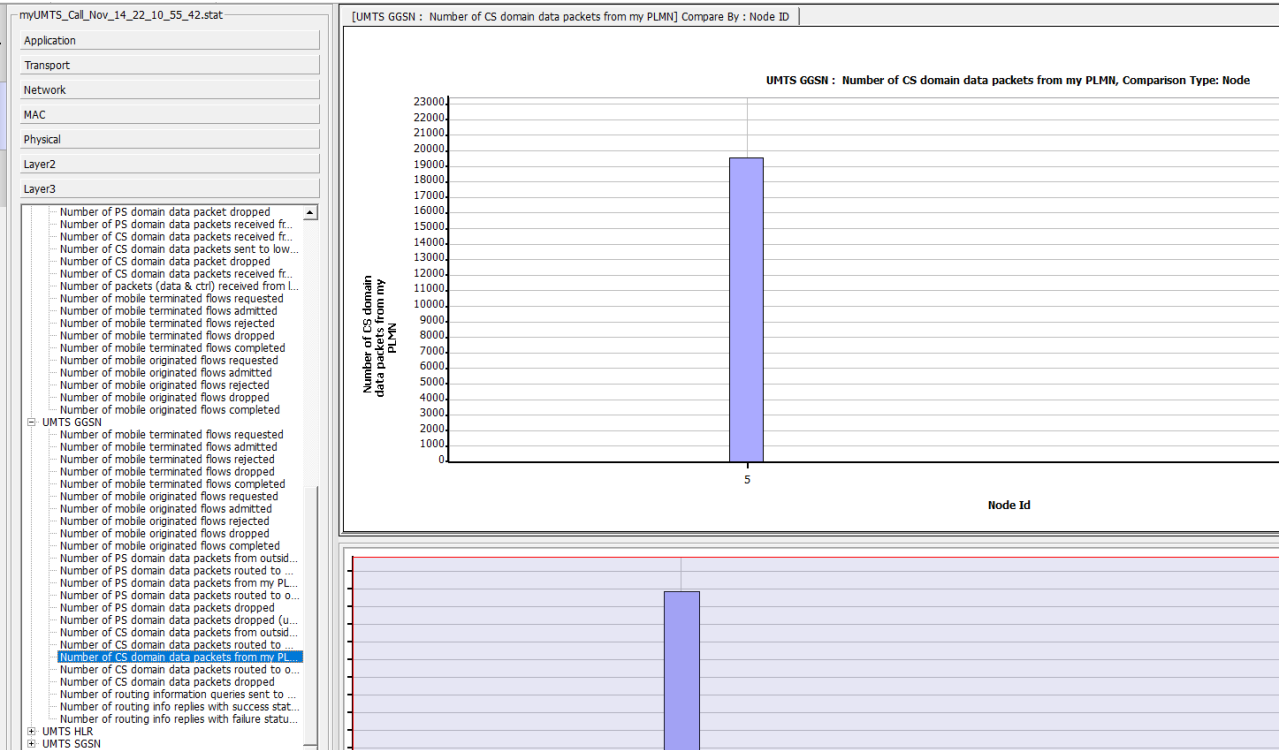
a. 采用WayPoint方法，让[8]和[9]在通话中间互换位置。



b. 重新运行，并观察切换统计【未找到】

7. 后记

a. 目前EXata支持的UMTS Library中，SGSN兼做CS域MSC使用，这个可以从Analyzer的结果中看到：当UE之间是UMTS Call时，SGSN收发的是CS域的Data Packets，如果UE之间是CBR业务，则SGSN收发的是PS域的Data Packets，这个可以从umts的handover运行结果看出来。



b. 目前分析结果中缺乏Radio Link Setup等切换相关信令的统计【！！！】