

EXata学习 (09) : LTE Handover 场景 step by step

目标：一步一步建立一个 LTE 切换场景

参考：

~\Scalable\exata\5.1\scenarios\lte\handover\two_UEs_handover_2\two_UEs_handover_1.config

工具：EXata 5.1

1. 创建和配置场景

- a. 创建一个场景，命名为myLTE_handover_1.config,
- b. Channel Properties: 4 Channels, 2.4 GHz, Two-Ray pathloss model, No fading model

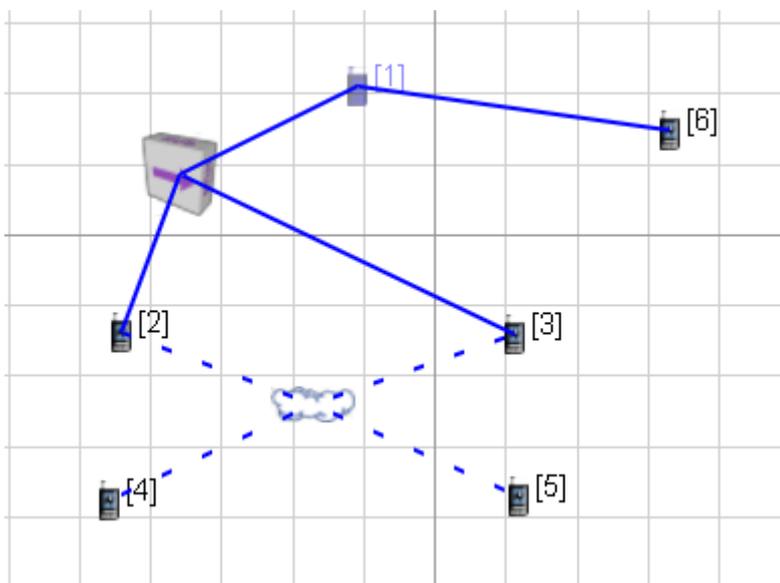
2. 配置拓扑

a. 创建节点

- 添加 6 个 default device，放置合适的位置，分别作为 1 个 SWGMME，2 个 eNB，2 个 UE，1 个 CN 节点。

b. 添加网络

- 添加无线 Subnet，默认网络地址 1.0;
- 添加 Hub，即添加 Wired Subnet，默认网络地址 2.0;
- 将节点 1, 2, 3, 与 Hub 相连，节点 2 thru 5 分别与 Wireless Subnet 相连。
- 连接节点 5 和 6; 必要时修改节点 6 的 IP 地址，为方便，使 IP 地址最低 4 位与节点 ID 一致。注意：CN 节点不属于 Wired Subnet (2.0 网段)，属于 3.0 网段。
- 至此，网络拓扑如下：



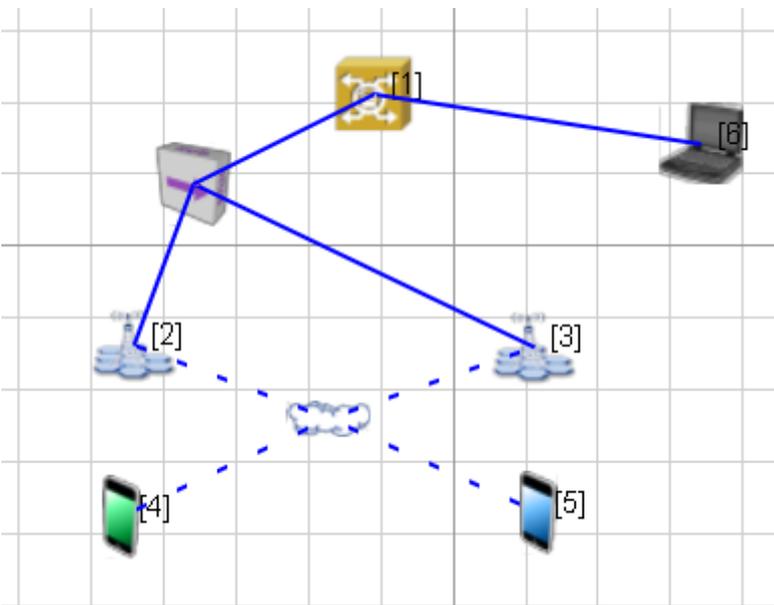
- 目前 Interfaces 信息如下，注意无线接口的 Phy 和 MAC 协议还不对。

Nodes	Groups	Interfaces	Networks	Applications	Hierarchies	
Address	Node ID	Name	PHY Model	MAC Protocol	Network Protocol	Routing Protocol
190.0.2.1	1	Interface0	N/A	MAC802.3	IP	BELLMANFORD
190.0.3.1	1	Interface1	N/A	ABSTRACT	IP	BELLMANFORD
190.0.2.2	2	Interface0	N/A	MAC802.3	IP	BELLMANFORD
190.0.1.2	2	Interface1	PHY802.11b	MACDOT11	IP	BELLMANFORD
190.0.2.3	3	Interface0	N/A	MAC802.3	IP	BELLMANFORD
190.0.1.3	3	Interface1	PHY802.11b	MACDOT11	IP	BELLMANFORD
190.0.1.4	4	Interface0	PHY802.11b	MACDOT11	IP	BELLMANFORD
190.0.1.5	5	Interface0	PHY802.11b	MACDOT11	IP	BELLMANFORD
190.0.3.6	6	Interface0	N/A	ABSTRACT	IP	BELLMANFORD

- 子网信息如下：

Nodes	Groups	Interfaces	Networks	Applications	Hierarchies
Network Address	Type	Member Nodes			
190.0.2.0	Wired Subnet	{1 thru 3}			
190.0.1.0	Wireless Subnet	{2 thru 5}			
190.0.3.0	Link	{1, 6}			

- 修改节点的名字和 ICON，并 [Save as Portable](#)。



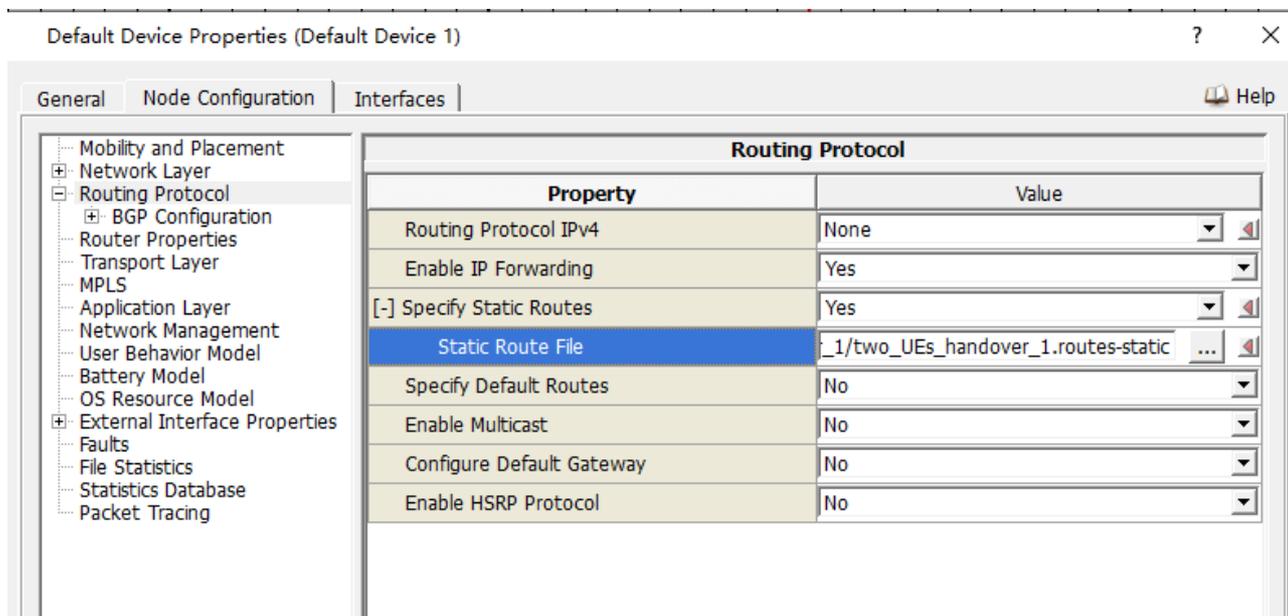
- 目前能够正常 Run 和 Play，但没有业务，且接口协议不对。

3. 配置网络协议

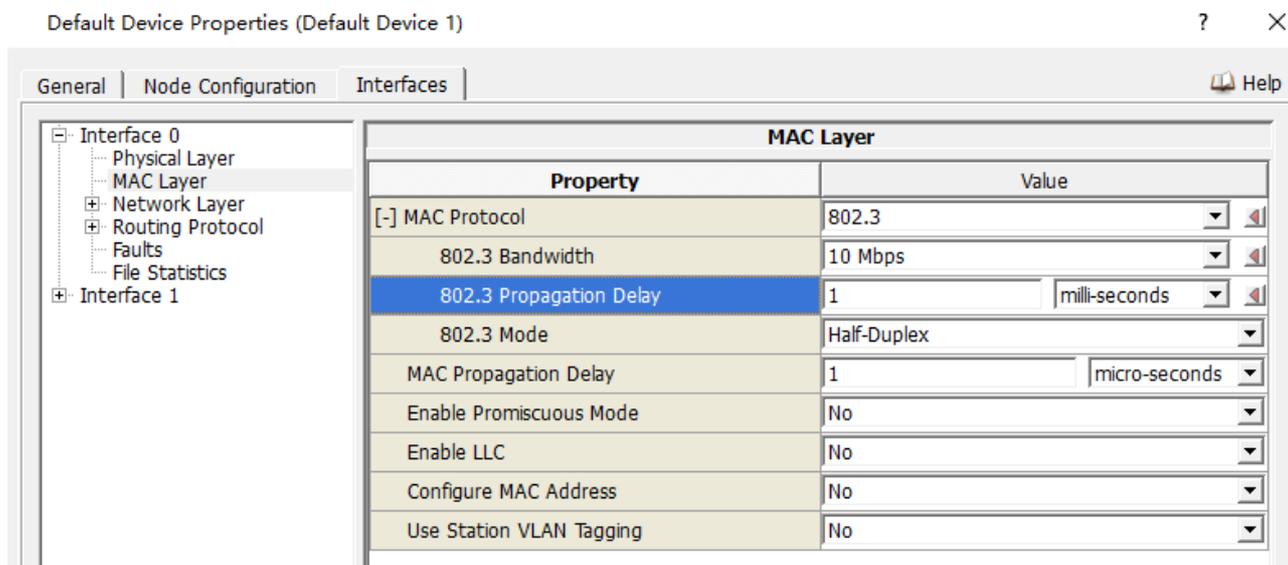
a. 配置 SGWMME

- i. 在 Node Configuration-》Routing Protocol，配置静态路由，Static Route File 选择例子场景中的 *.routes-static文件，注意最后Save as Portable；静态路由规则也很简单，只有 3 条：

```
1 190.0.3.6 190.0.3.6
6 190.0.1.4 190.0.3.1
6 190.0.1.5 190.0.3.1
```

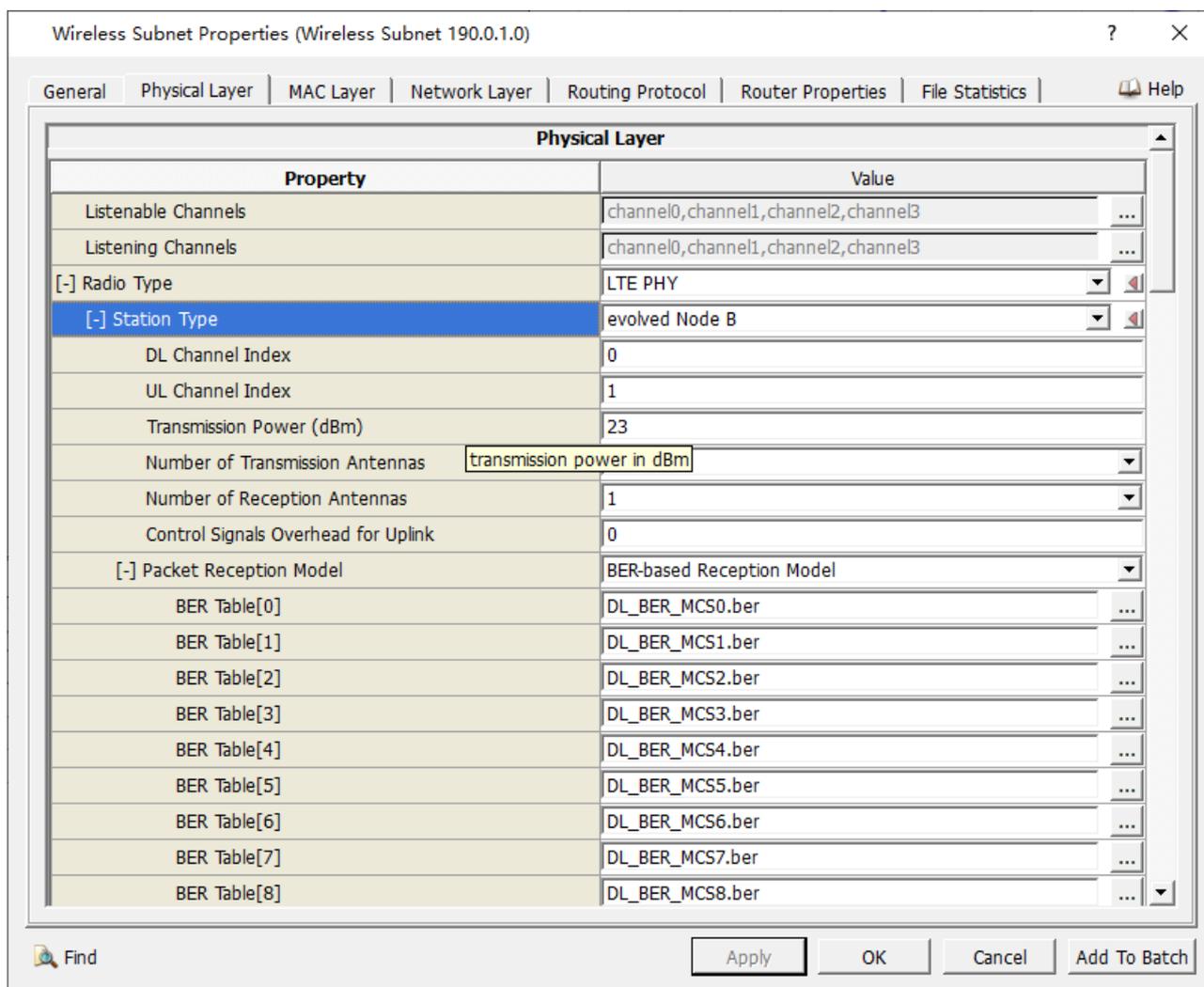


- ii. Interfaces→Interface 0 (Wired Subnet接口) MAC Protocol, 802.3 BW 设为 10 Mbps, 传播时延 1 ms。

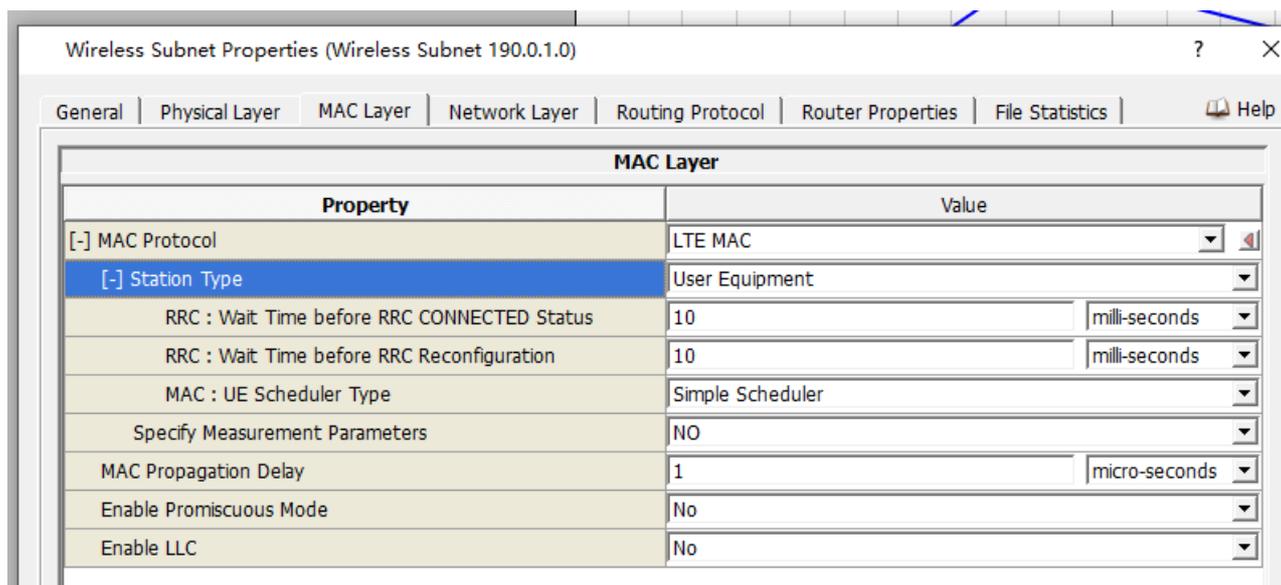


b. 配置 Wireless Subnet

- Physical Layer: Listenable Channels、Listening Channels: 勾选全部 Channel; Radio Type: LTE PHY; Station Type: eNodeB; Packet Reception Model: BER-based Reception Model, 并加载 BER Table File, 这些文件要从例子场景中拷到本场景目录下, 选择第一个 BER Table 文件, 然后 OK→ Save as Portable, 即可。



- MAC Layer: MAC Protocol: LTE MAC; Station Type: UE (注意: 这里选 UE, 与PHY 层不同)



- 配置完 Wireless Subnet, 注意到各 eNB、UE的 LTE Interface 协议已自动与 Wireless Subnet 的一致。

C. 配置接口路由协议

- 注意到例子 场景中所有 Interfaces 的 Routing Protocol 都为 None, 选择所有接口, 设定 Routing Protocol 为 None。

Address	Node ID	Name	PHY Model	MAC Protocol	Network Protocol	Routing Protocol
190.0.2.1	1	Interface0	N/A	MAC802.3	IP	NONE
190.0.3.1	1	Interface1	N/A	ABSTRACT	IP	NONE
190.0.2.2	2	Interface0	N/A	MAC802.3	IP	NONE
190.0.1.2	2	Interface1	PHY-LTE	MAC-LTE	IP	NONE
190.0.2.3	3	Interface0	N/A	MAC802.3	IP	NONE
190.0.1.3	3	Interface1	PHY-LTE	MAC-LTE	IP	NONE
190.0.1.4	4	Interface0	PHY-LTE	MAC-LTE	IP	NONE
190.0.1.5	5	Interface0	PHY-LTE	MAC-LTE	IP	NONE
190.0.3.6	6	Interface0	N/A	ABSTRACT	IP	NONE

d. 配置 Wired Subnet

- General-》 Is EPC Subnet: Yes; EPC SGWMMME Node ID: 1 (根据实际情况填写)

Wired Subnet Properties (Wired Subnet 190.0.2.0) ? X

General | Routing Protocol | Router Properties | ARP | File Statistics | Help

Property	Value
2D Icon	hub.png
3D Icon	hub.3ds
Scale Factor for 3D Icon (percent)	100
[-] MAC Protocol	802.3
802.3 Bandwidth	100 Mbps
802.3 Mode	Half-Duplex
802.3 Propagation Delay	2.5 micro-seconds
Enable Promiscuous Mode	No
Enable LLC	No
[-] Network Protocol	IPv4
IPv4 Network Address	190 .0 .2 .0
IPv4 Subnet Mask	255 .255 .255 .0
IP Fragmentation Unit (bytes)	2048
Enable Explicit Congestion Notification	No
Enable Fixed Communications	No
[-] Is EPC Subnet	Yes
EPC SGWMMME Node ID	1
EPC SGWMMME Interface Index	0

Find Apply OK Cancel Add To Batch

e. 配置 UE

- Node Configuration: Routing Protocol: Routing Protocol IPv4: None

4. 加载应用

a. 4-6之间添加 CBR

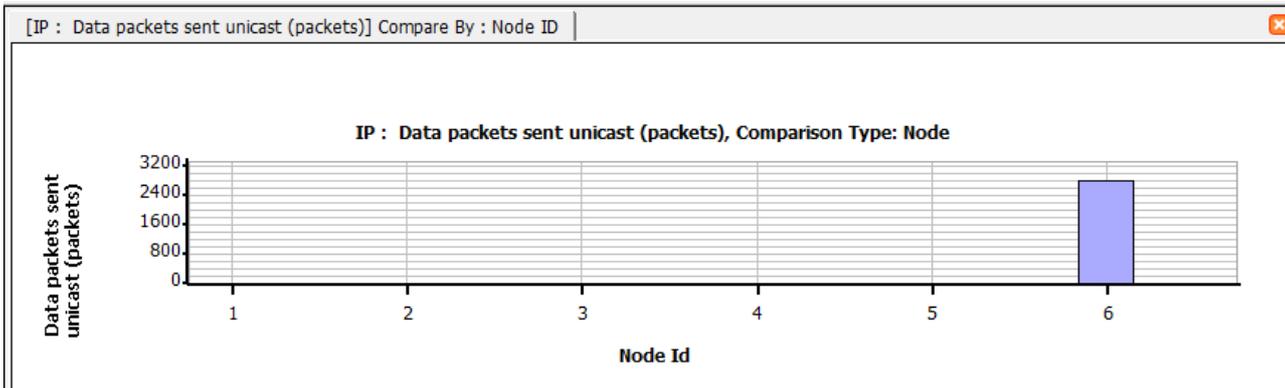
- 目前情况, 问题: 双向数据均无法收发。
- 检查发现 CN 节点未配置静态路由 (由于SGWMMME配置静态路由), 配置 CN 节点静态路由

General | Node Configuration | Interfaces | Help

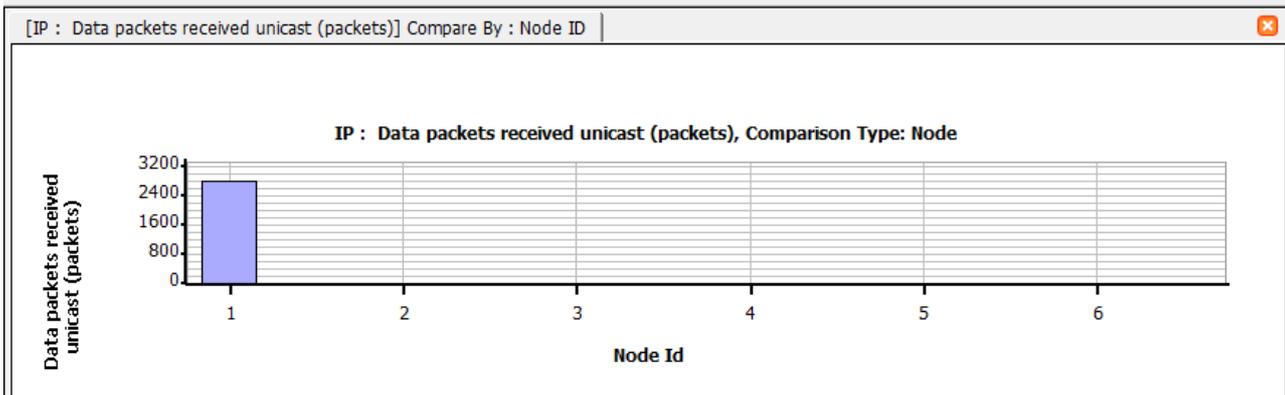
Routing Protocol

Property	Value
Routing Protocol IPv4	None
Enable IP Forwarding	Yes
[-] Specify Static Routes	Yes
Static Route File	_1/two_UEs_handover_1.routes-static
Specify Default Routes	No
Enable Multicast	No
Configure Default Gateway	No
Enable HSRP Protocol	No

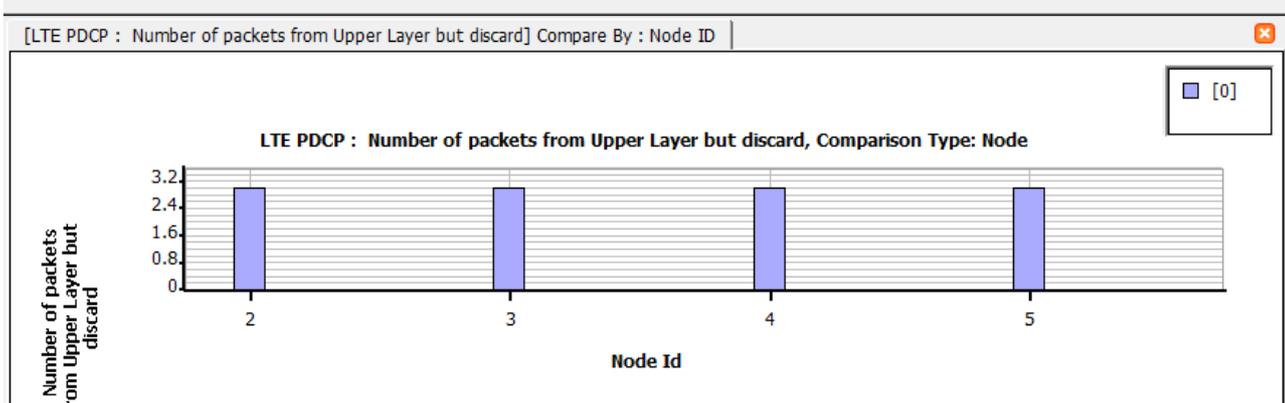
- 运行后发现有了进步，节点 6 发出的包达到了 SGWMME[1],但没有继续前传。



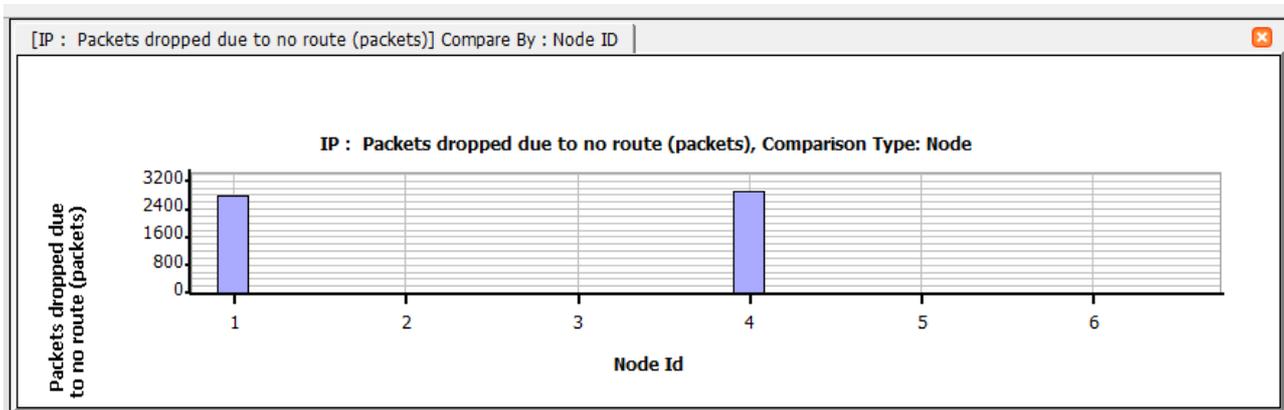
- 节点SGWMME[1]收到后没有继续前传（发送节点没有节点 1）



- 无线接口的PDCP接收应用层之后即被丢弃【丢包数目很少，不是主要问题】



- 查看 IP 层丢包原因，发现还是由于路由配置（Due to no route）的问题



- 对比本例与参考场景 config 文件的差异，发现本例 Wireless Subnet 的 MAC 层缺少 Measure Parameter配置。这设置会在后面的切换发挥作用，但这不是影响数据收发的关键！

Property	Value
[-] MAC Protocol	LTE MAC
[-] Station Type	User Equipment
RRC : Wait Time before RRC CONNECTED Status	10 milli-seconds
RRC : Wait Time before RRC Reconfiguration	10 milli-seconds
MAC : UE Scheduler Type	Simple Scheduler
[-] Specify Measurement Parameters	YES
RRC : Events for RSRP Metric Handover Report	Observe A3 Event
RRC : Events for RSRQ Metric Handover Report	No Events Observed
RRC : Offset of Event A3 (RSRP) (dB)	5.0
RRC : Hysteresis of Event A3 (RSRP) (dB)	1.0
RRC : Offset of Event A3 (RSRQ) (dB)	5.0
RRC : Hysteresis of Event A3 (RSRQ) (dB)	1.0
RRC : Periodic Measurement Report Interval	1 seconds
RRC : Number of Measurement Reports Sent	4
RRC : Coefficient of Filter Measured RSRP Value	6
RRC : Coefficient of Filter Measured RSRQ Value	7
RRC : Type of Measurement Gap	Every 80 subframes
MAC Propagation Delay	1 micro-seconds
Enable Promiscuous Mode	No
Enable LLC	No

- i. 终于找到问题!!! 原来是eNB的Station Type 类型不对! 它跟随 Wireless Subnet将无线 MAC 层的 Station Type设置成了 UE, 改为 eNB即可。==> Wireless Subnet 配置完要核对 eNB 无线接口 MAC 层的 Station Type == eNB !!!

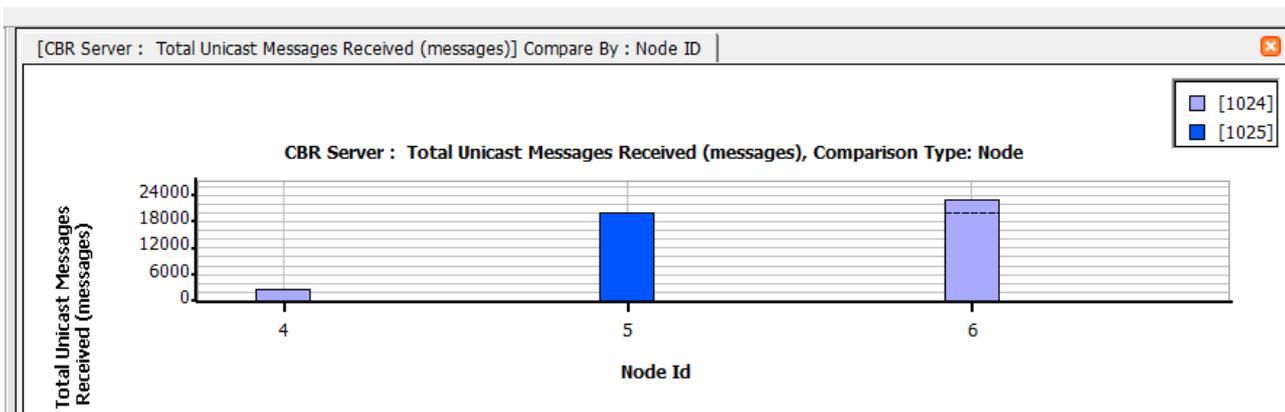
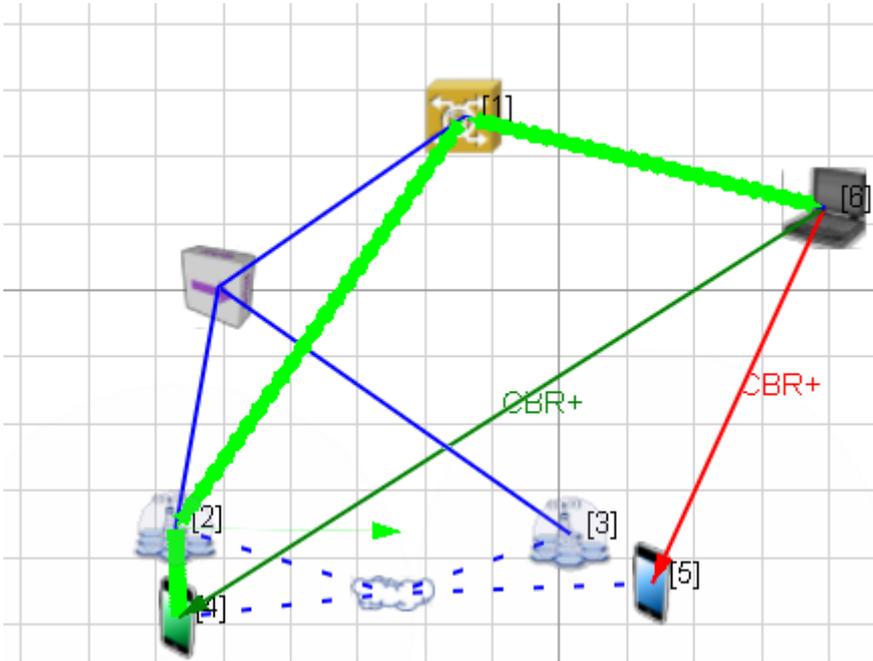
General | Node Configuration | Interfaces | Help

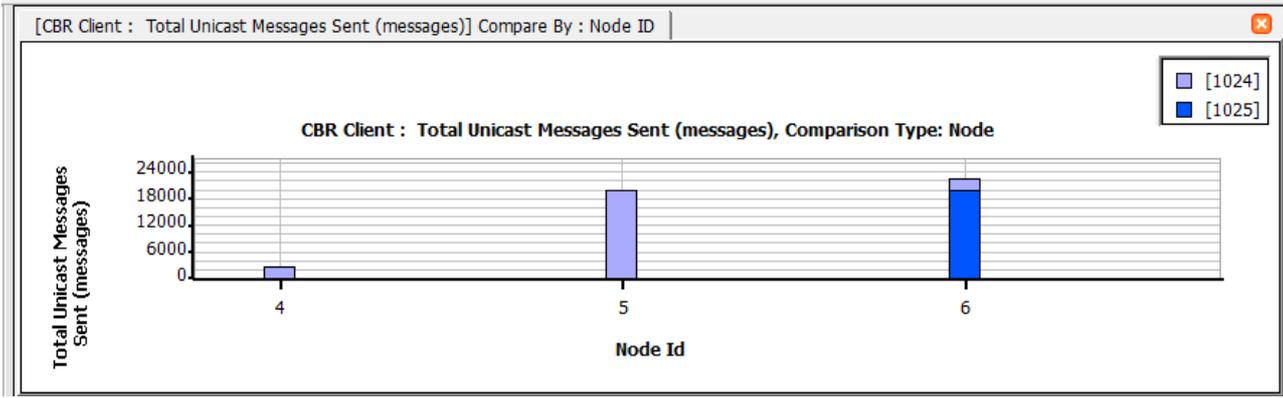
- [-] Interface 1
- [-] Interface 0
 - Physical Layer
 - MAC Layer
 - Network Layer
 - Routing Protocol
 - Faults
 - File Statistics

MAC Layer	
Property	Value
[-] MAC Protocol	LTE MAC
[-] Station Type	evolved Node B
RRC : Measurement Filtering Coeffi...	40
RLC : Max Retransmission Threshold	8

b. 在5-6之间添加两个 CBR 业务

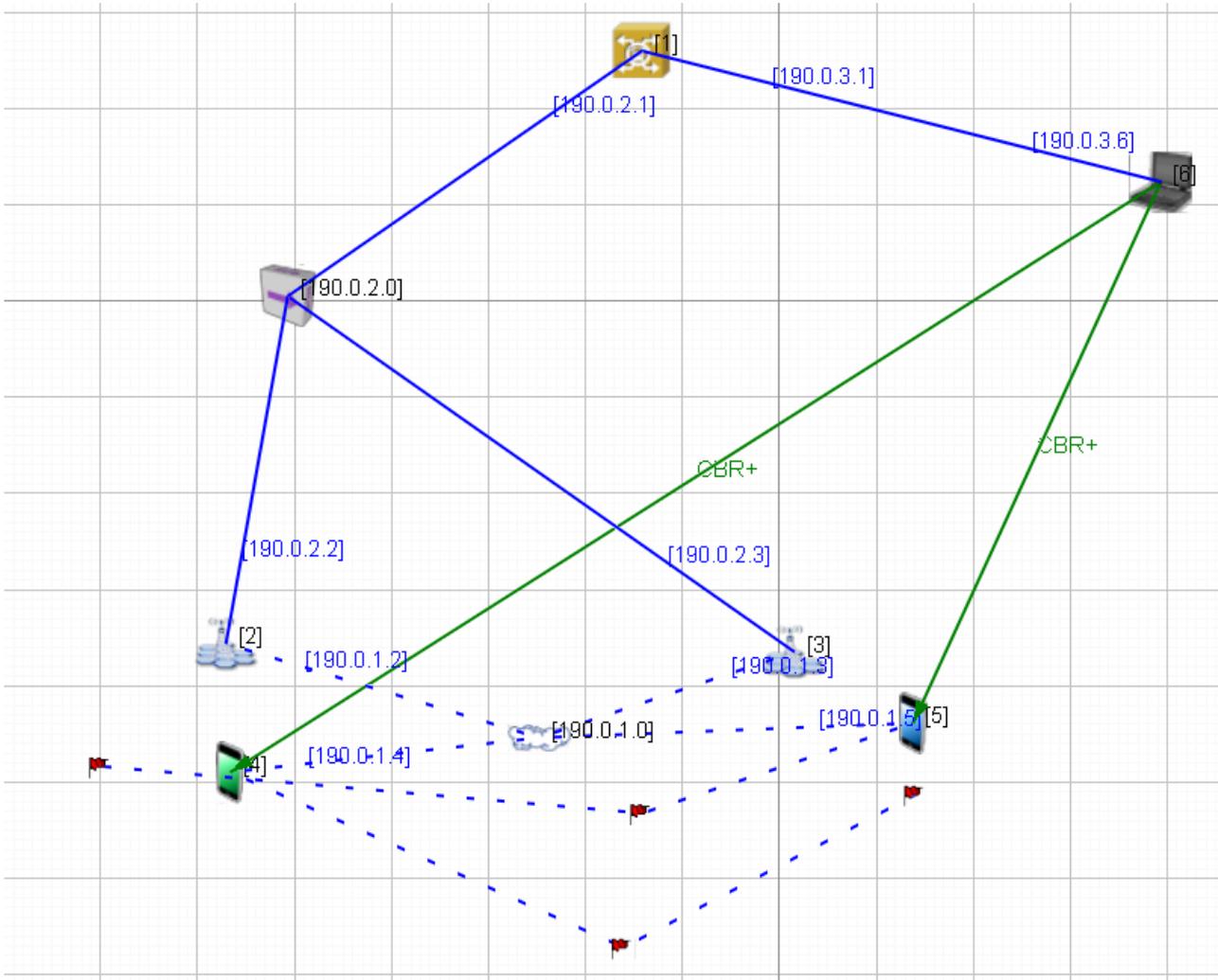
- 运行正常：4-6、5-6之间的 CBR 业务均正常收发。



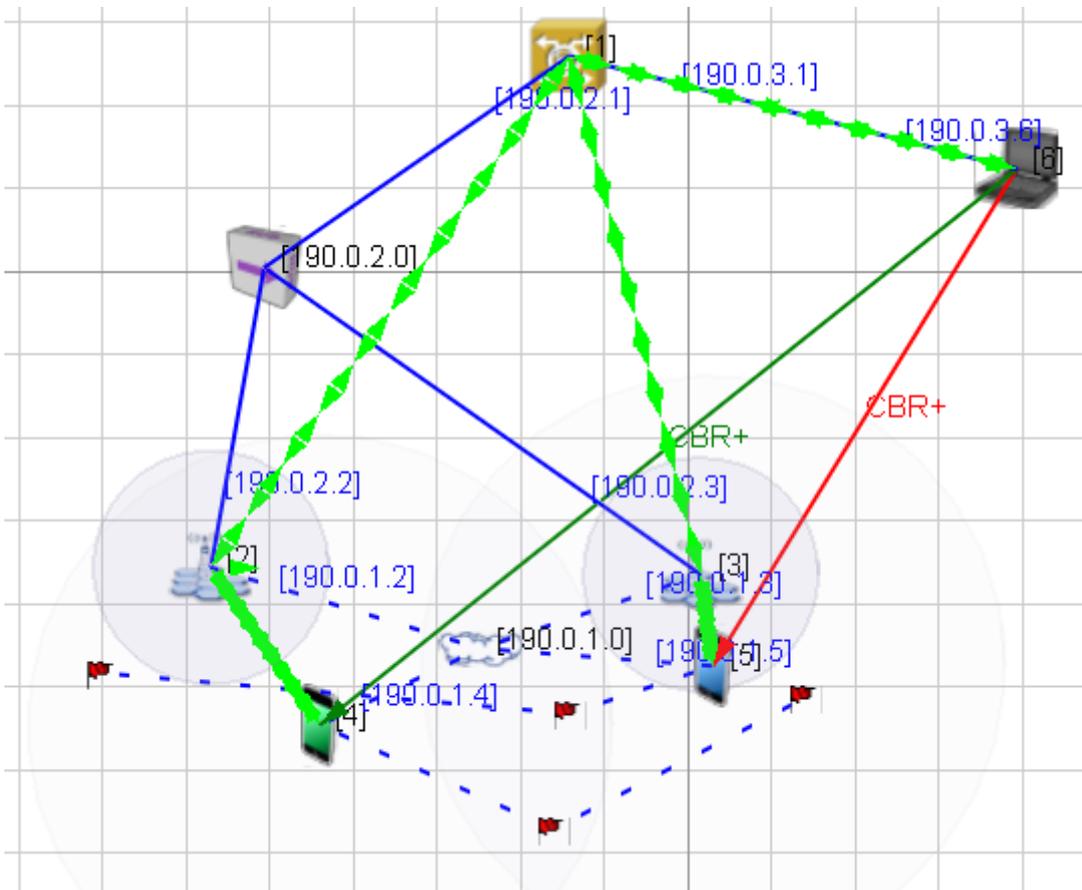


5. 增加移动性

a. 利用小红旗进行两个 UE 轨迹设定



b. 运行



6. 分析运行结果

在两个eNB 各完成一次切换

