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\Ite\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 Proterties: 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:



Nodes Groups	Interfaces Netwo	rks 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	Туре	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

Default Device Properties (Defaul	t Device 1)	? ×
General Node Configuration	interfaces	🕰 Help
Mobility and Placement	Routing	Protocol
	Property	Value
BGP Configuration Router Properties	Routing Protocol IPv4	None 🗾 🔳
Transport Layer	Enable IP Forwarding	Yes
Application Layer	Enable IP Forwarding Yes [-] Specify Static Routes Yes Static Route File 1/two UEs bandover 1	Yes 💌 🔳
Network Management User Behavior Model	Static Route File	_1/two_UEs_handover_1.routes-static 🔳
Battery Model	Specify Default Routes	No
External Interface Properties	Enable Multicast	No
File Statistics	Configure Default Gateway	No
Statistics Database	Enable HSRP Protocol	No
Ĩ		

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

ms。

Default Device Properties (Default Device 1)

1

×

?

Interface 0 Physical Layer		MAC Layer	
MAC Layer	Property	Value	
Network Layer Network Layer Network Layer	[-] MAC Protocol	802.3	·
Faults	802.3 Bandwidth	10 Mbps	·
E Interface 1	802.3 Propagation Delay	1 milli-seconds	·
	802.3 Mode	Half-Duplex	-
	MAC Propagation Delay	1 micro-seconds	;
	Enable Promiscuous Mode	No	-
	Enable LLC	No	
	Configure MAC Address	No	_
	Use Station VLAN Tagging	No	

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。

/ireless Subnet Properties (Wireless Subnet 190.0.1.0)	Routing Protocol Router Properties File Statistics III Help
	Physical Layer
Property	Value
Listenable Channels	channel0,channel1,channel2,channel3
Listening Channels	channel0,channel1,channel2,channel3
-] Radio Type	
[-] Station Type	evolved Node B
DL Channel Index	0
UL Channel Index	1
Transmission Power (dBm)	23
Number of Transmission Antennas transmiss	sion power in dBm
Number of Reception Antennas	1
Control Signals Overhead for Uplink	0
[-] Packet Reception Model	BER-based Reception Model
BER Table[0]	DL_BER_MCS0.ber
BER Table[1]	DL_BER_MCS1.ber
BER Table[2]	DL_BER_MCS2.ber
BER Table[3]	DL_BER_MCS3.ber
BER Table[4]	DL_BER_MCS4.ber
BER Table[5]	DL_BER_MCS5.ber
BER Table[6]	DL_BER_MCS6.ber
BER Table[7]	DL_BER_MCS7.ber
BER Table[8]	DL_BER_MCS8.ber
Find	Apply OK Cancel Add To Batch
MAC Layer: MAC Protocol: LT	TE MAC; Station Type:UE(注意:这里选 UE,与PH
Wireless Subnet Properties (Wireless Subnet 190.0.1.0)) ? ×
General Physical Layer MAC Layer Network Layer	r Routing Protocol Router Properties File Statistics 🔑 Help
	MAC Layer
Property	Value
[-] MAC Protocol	LTE MAC
[-] Station Type	User Equipment

Wireless Subnet Properties (Wireless Subnet 190.0.1.0)		?
eneral Physical Layer MAC Layer Network Layer Rou	iting Protocol Router Properties File Sta	tistics 📔 🕮 He
МА	C Layer	
Property	Value	
[-] MAC Protocol	LTE MAC	- 4
[-] 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	NO	•
MAC Propagation Delay	1	micro-seconds 💌
Enable Promiscuous Mode	No	•
Enable LLC	No	•

■ 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。

Nodes	Groups Interfaces	Networks Applications Hierarch	nies				
	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	2	Interface0	N/A	MAC802.3	IP	NONE
190.0.1.2	2	2	Interface1	PHY-LTE	MAC-LTE	IP	NONE
190.0.2.3	3	3	Interface0	N/A	MAC802.3	IP	NONE
190.0.1.3	3	3	Interface1	PHY-LTE	MAC-LTE	IP	NONE
190.0.1.4	ł	4	Interface0	PHY-LTE	MAC-LTE	IP	NONE
190.0.1.5	5	5	Interface0	PHY-LTE	MAC-LTE	IP	NONE
190.0.3.6	5	6	Interface0	N/A	ABSTRACT	IP	NONE

d. 配置 Wired Subnet

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

	General Properties
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 .0
IP Fragmentation Unit (bytes)	2048
Enable Explicit Congestion Notification	No
Enable Fixed Communications	No
[-] Is EPC Subnet	Yes
EPC SGWMME Node ID	1
EPC SGWMME Interface Index	0

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SGWMME配置静态路由),配置 CN 节点静态路由

?	\times

🚇 Help

Node Configuration Interfaces General

Mobility and Placement	Routing	g Protocol
	Property	Value
BGP Configuration Router Properties	Routing Protocol IPv4	None 🗾 🚽
Transport Layer	Enable IP Forwarding	Yes 💌
Application Layer	[-] Specify Static Routes	Yes 💌 🚽
User Behavior Model	Static Route File	_1/two_UEs_handover_1.routes-static 4
Battery Model	Specify Default Routes	No
External Interface Properties	Enable Multicast	No
File Statistics	Configure Default Gateway	No
Statistics Database Packet Tracing	Enable HSRP Protocol	No

■ 运行后发现有进步, 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!

	······································	
MA	AC Layer	
Property	Value	
] MAC Protocol		
[-] 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	4
RRC : Offset of Event A3 (RSRQ) (dB)	5.0	4
RRC : Hysteresis of Event A3 (RSRQ) (dB)	1.0	4
RRC : Periodic Measurement Report Interval	1 seconds 💌	4
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	T

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		<u> </u>
	Property	Value	
	[-] MAC Protocol	LTE MAC	- 4
	[-] Station Type	evolved Node B	- 4
	RRC : Measurement Filtering Coeffi	40	
	RLC · May Retransmission Threshold	R	

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



<mark>b.</mark> 运行



6. 分析运行结果

在两个eNB 各完成一次切换

