會議報告（出國類別：其他）

3GPP TSG RAN WG3 #71

會議出國報告

派赴國家：台北台灣

出國日期：100 年 2 月 21 日至 100 年 2 月 25 日

報告日期：100 年 4 月 7 日

摘 要

3GPP TSG RAN3 職掌 UTRAN 及 E-UTRAN 架構、RAN 與核心網(CN)的界面協定、LTE 系統基站(eNB)間的界面協定，RAT 之間的移動性規範，本次 3GPP TSG RAN3#71 共約有 120 人參加，此次會議本團隊由一位成員參與 RAN3 相關議題之討論，主要任務是對 E-UTRAN Network Energy Saving (NES)議題提出技術貢獻表達看法、討論參與與進展追蹤。

技術貢獻：

這次會議共有 2 篇 Contributions，2 篇皆在議程中討論。

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一、會議名稱

3GPP TSG RAN1 #64 Meeting

二、參加會議目的及效益

- 參與 E-UTRAN Network Energy Saving (NES)議題提出技術貢獻表達看法、討論參與與進展追蹤。
- 與其他大廠接觸，討論 LTE-Advanced Rel-11 標準技術發展方向

三、會議時間

February 21st – February 25th, 2011

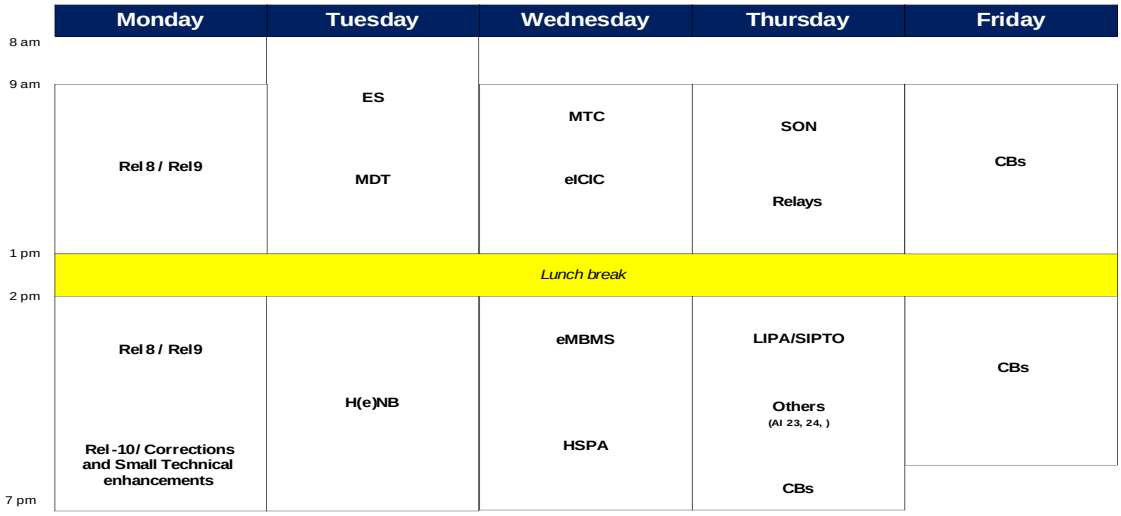
四、會議地點

Le Meridien and W Hotel, Taipei, Taiwan, R.O.C.

五、會議過程：會議議程及會議紀要

（一）會議議程

RAN3#71 Meeting 會議議程如下:



（二）會議紀要

1. Network Energy Saving (NES)議題進展說明：

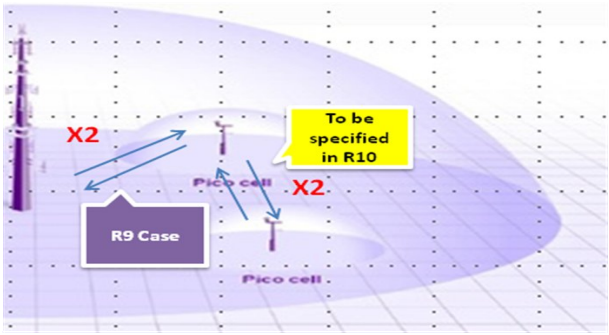
NES 議題安排在第二天上午 8:00 開始，於 11:30 左右結束，此議程總計有 22 篇 Contributions，如下表列所示。

R3-110593	Potential solutions to support the signalling-based option for the compensation mode	CATT	Disc		Noted
R3-110660	Report on TR restructuring	CMCC	Appr	R3-110910	Revised
R3-110661	Way forward on Energy Saving Evaluation	CMCC	Appr		Noted
R3-110731	Evaluation of Cell Wake-up Solutions for Energy Saving	Qualcomm Incorporated	Disc		Noted
R3-110737	BS probing evaluation and comparison	KPN B.V., TNO	Appr		Noted
R3-110759	Enhancement of IoT based Cell Wake Up in Hotspot Deployments	Nokia Siemens Networks	Disc		Noted
R3-110760	Evaluation of hotspot wake-up algorithm based on signalling of IoT information	Nokia Siemens Networks	Disc		Noted
R3-110842	Considerations Energy Saving TR 36.927	Ericsson	Appr		Noted
R3-110843	Text proposal: Energy Saving TR 36.927	Ericsson	Appr		Noted
R3-110845	Coordination in Compensation ES scenario	Mitsubishi Electric	Appr		Noted
R3-110846	ES solutions evaluation	Mitsubishi Electric	Disc		Noted

R3-110847	Network Sharing in Inter-RAT energy saving	TeliaSonera	TP		Noted
R3-110848	Network Sharing in Inter-eNB energy saving	TeliaSonera	TP		Noted
R3-110849	Evaluation and comparison of potential solutions for ES	Alcatel-Lucent Shanghai Bell, Alcatel-Lucent	Appr		Noted
R3-110888	Generalized Framework for Network Energy Saving Solutions	CHTTL	Disc	(R3-110662)	Noted
R3-110891	Compensation Mode in Network Energy Saving	CHTTL	Disc	(R3-110663)	Noted
R3-110910	Report on TR restructuring	CMCC	Appr	(R3-110660) R3-111013	Revised
R3-111013	TR update for Energy Saving response	CMCC	Disc	(R3-110910) R3-111069	Revised
R3-111014	Evaluation table for Energy Saving	CMCC	TP	R3-111057	Revised
R3-111057	Evaluation table for Energy Saving	CMCC	TP	(R3-111014) R3-111071	Revised
R3-111069	TR Update based on online discussion	CMCC	Appr	(R3-111013)	Agreed
R3-111071	TR 36.927 Update	CMCC	Appr	(R3-111057)	Agreed

根據 RAN Plenery #47(2010.03)由 CMCC 帶頭立項的 RP-100393:Study on Network Energy Saving for E-UTRAN SI(updated in RAN#48 RP-100674)，目標是於 RAN#51(2011.03)完成 Study 可用於 E-UTRAN Cells 的(1)Inter-RAT(2)Inter-eNB(3)Intra-eNB 方案。RAN3 為主要 WG，負責研究並找出可作為未來 Release11 可作為(1)Inter-RAT (2)Inter-eNB 的節能方案，並完成 TR36.927:「Potential Solutions for Energy Saving for E-UTRAN」，作為後續標準化的依據。由於基地台耗能佔行動網路耗能的 70%~80%(手機 2%~10%、核網 10%~20%)，基地台節能能從關鍵處節省能源消耗，為營運商節省成本。之前在 Release 9，RAN3 依據 SON 精神，制定了 Inter-eNB 的

Energy Saving 方案，基於階層式佈建拓墣，當基地台評估自己不需提供服務時，即可透過 X2 Interface 告知鄰近基地台將關閉的訊息，若要開啟則由鄰近細胞透過 X2 Interface 送出 Reactivation Request 給 Deactivated Cell，如圖一所示，另外亦可由 OAM 調控基地台開關，但該機制因即時性及跨系統性問題可能無法正確及有效率開關的基地台，本 Release 10 SI 從網路節能應用場景討論起，除延伸到 Inter-RAT/Intra-eNB Use Cases 及 Compensation Mode in Inter-eNB Use Case，在與 Ericsson 主導的 Release 9 Solution 相容的前提下，還要找出更為動態有效的節能方案，並且評估這些可能 Solutions 的可行性。



圖一: Release 9 Inter-eNB Energy Saving 方案

本次會議為 SI 結束前最後一次，根據之前訂出的 Scenarios，及由各家提出並已納入 TR36.927 的相應解決方案，包括:

(1) Switching on based on Predefined Low-Load Periods;

(2) Switching on based on IoT Measurement;

(3) Switching on based on UE Measurement;

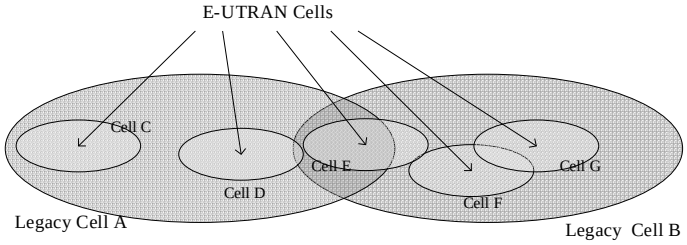
(4) Switching on based on Positioning;

此次會議主要工作，是要做最終的 Evaluation，也就是方案間適用性及效能相互比較，由於牽涉未來自家技術可否標準化，各廠商各有堅持，在主議程並沒有達成共識，主席裁示會議期間由有興趣的廠家另行討論，參與討論的廠家對於 Evaluation Table 字字珠璣必較，因此共有週二下午到晚上及週四下午的 Offline 及週五上午 8:00~10:00 Online 冗長的琢磨討論，最終確立了三種 Use Cases 的 Evaluation Table，由本 SI 的 Rapporteur CMCC 代表整理後提交並獲大會同意通過。

R3-111069	TR Update based on online discussion	CMCC	Appr	(R3-111013)	Agreed

其結果摘錄於下:

For Inter-RAT:



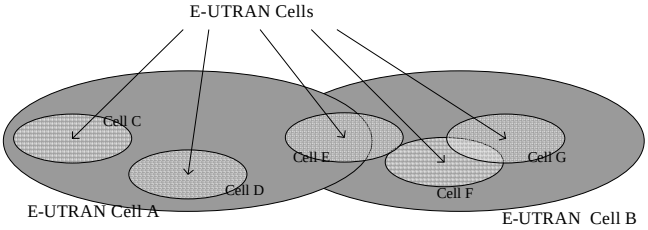
Criteria	Cell switch on/off based on centralized OAM decisions	Cell switch on/off based on signalling across RATs; assistance for switch on decisions base on:				
		No assistance	OAM Predefined 'low load periods' policies	IoT measurements	UE measurements	Positioning information
Feasibility	Feasible	Feasible	Feasible	Feasible	Feasible.	Feasible
Applicability	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable

Backward compatibility	Yes	Yes	Yes	Yes	Yes	Yes
Complexity (*Note 1)	Medium: - Common O&M or synchronised O&M between RATs is required. - complexity also depends on the requested level of information to be provided from the RAN to O&M.	Medium: – Additional network signalling is needed for activate and deactivate unnecessary cells.	Medium: - OAM sync is not needed. - Statistics information is needed.	High: - IoT measurements of legacy RAT is needed in the hotspot cell in ES mode.	High: - Creation of a new cell state (probing phase) for neighbour relation handling	Medium: - need to collect position information for significant number of UEs.
Potential ES gain (*Note 2)	- Medium since OAM based solution is relatively static	- Low because many neighbouring sleeping eNBs are turned on even if these eNBs are not useful.	- Medium since it has the risk of statistic information is unable to reflect the real conditions.	- High, but possibly limited accuracy of IoT measurement and thresholds may reduce the efficiency of the method. - Accuracy	- High Because most useful cell could be selected. - This is possibly reduced by energy consumption during the probing phase.	- Medium UE positions and link budgets are not fully correlated. The method may therefore have a limited efficiency. - Additional gain could be

				could be increased at the cost of complexity		obtained at the cost of complexity
Specification impact	No impact on RAN specifications.	Inter-RAT signalling for cell switching on/off	Inter-RAT signalling for cell switching on/off	-Inter-RAT signalling for cell switching on/off - IoT measurements reporting may be added for accuracy.	Inter-RAT signalling for cell switching on/off and probing trigger	Inter-RAT signalling for cell switching on/off
OAM impact	High	Low	Medium	Low	Low	Medium because location and coverage information is needed.
eNB impact	Not foreseen	Low	Low	High, because additional UL receiver	Medium, new "probing" cell state.	Low
UE impact	Not foreseen.	Not foreseen.	Not foreseen.	Not foreseen.	Negligible, additional measurements will be required during probing phase.	None to low depending on the positioning mechanism

For Inter-eNB Use Case:

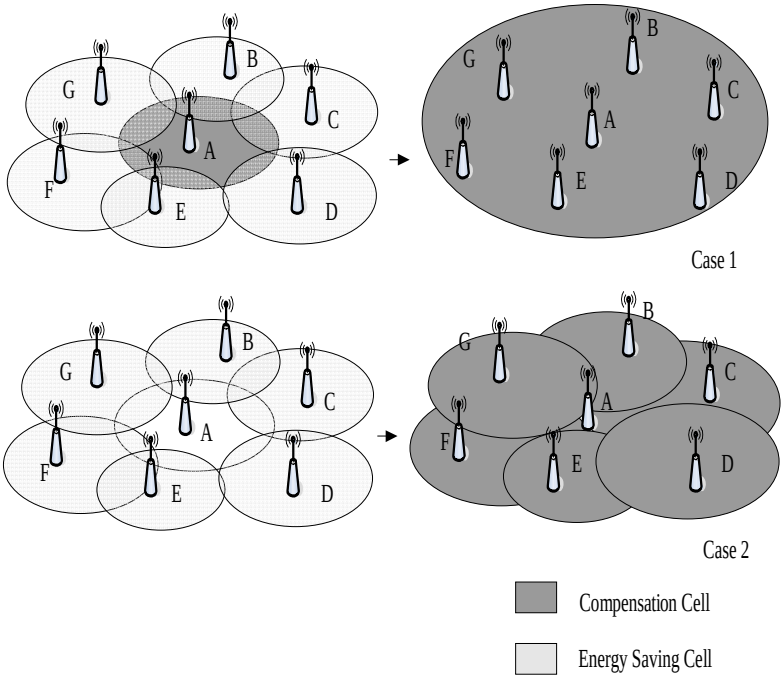
- Scenario 1:



Criteria	Baseline Rel-9	Switching on based on predefined low-load periods	Switching on based on IoT measurement	Switching on based on UE measurement	Switching on based on positioning
Feasibility	Feasible	Feasible	Feasible	Feasible	Feasible
Applicability	Applicable	Applicable	Applicable	Applicable	Applicable
Backward compatibility	Yes	Yes	Yes	Yes	Yes
Complexity	Low: – Additional network signalling is needed for activate and deactivate unnecessary cells.	Low: - Specific configuration information is required and will need to be updated.	Medium: - IoT measurements and signalling is needed between hotspot cells in energy saving mode and coverage cell.	Medium: - interference issue during probing phase for intra frequency case- Creation of a new cell state (probing phase) for neighbour relation handling	Medium: - need to collect position information for significant number of UEs.
Potential ES gain (*Note 1)	- Low because many neighbouring sleeping eNBs are turned on even if these eNBs are not useful. (TBD)	- Medium since it has the risk of statistic information is unable to reflect the real conditions. (TBD)	- High, but possibly limited accuracy of IoT measurement and thresholds may reduce the efficiency of the method. - Accuracy could	- High because most useful cell could be selected. - This is possibly reduced by energy consumption during the probing phase.	- Medium UE positions and link budgets are not fully correlated. The method may therefore have a limited efficiency.

			be increased at the cost of complexity (TBD)	(TBD)	- Additional gain could be obtained at the cost of complexity (TBD)
Specification impact	Covered by R9 solution.	None	X2 signalling for reporting IoT measurements	X2 signalling for probing trigger messages	S1 signalling for UE positioning retrieval
OAM impact	Covered by R9 solution.	Low	Low	Low	Medium (need for detailed coverage information).
eNB impact	Covered by R9 solution.	Low	Medium, additional UL receiver for inter-frequencies	Medium, new "probing" cell state.	Medium, location client in the eNB
UE impact	Not foreseen.	Not foreseen.	Not foreseen.	Not foreseen for intra-frequency case, Negligible for inter-frequency case	None to low depending on the positioning mechanism

- Scenario 2:



Criteria	Cell switching on/off based on OAM decisions (existing)	Cell switching on/off based on signalling exchange
Feasibility	Feasible	Feasible
Applicability	Applicable	Applicable
Backward compatibility	Yes	ES-capable cells don't use Rel.9 autonomous switch off to avoid coverage holes Impact on ANR/HO parameter setting
Complexity	High, because the OAM should coordinate the cell switching on/off	High. A certain coordination and synchronization of cell reconfigurations is needed to avoid creating coverage holes, or excessive interference levels during transitions
Potential ES gain (*Note1)	Low (less flexible compensation schemes). Long term statistics may lead to a conservative approach	High (flexible compensation schemes). In addition the mechanism could improve network robustness by permitting compensation in case of cell outage.
Specification impact	None	Signalling between multiple cells is needed, as well as definition of compensation mechanisms providing interoperability. Enhancement on ANR/HO parameter setting
OAM impact	High. OAM has to define compensation cell and its candidate energy saving cells, and how to switch on/off	Low
eNB impact	Low, some functionalities are required for guarantee UE’s coverage, e.g. ICIC	High, eNB must be able to adapt coverage (power / tilt / azimuth). Compensation coordination function has to be implemented in compensation nodes. More limited impact on ES-capable cells.
UE impact	Not foreseen.	Not foreseen.

2. 本團隊提案說明

前次會議本團隊提出基站間交換耗能資訊的方法，以有效促進基

站開關決策，已納入 TR，並因對現有標準影響很小，各廠商對此方案無爭議，本團隊此次於 R3-110888 進一步提出一通用框架，用以涵蓋於 ES 場景中基站各種可能的狀態，在 R3-110891 則提出 Inter-RAT 也應考量 Compensation Scenario，會場上 CMCC 質疑是否等同於 Inter-eNB Compensation Scenario，本團隊回答 Macro Cell 參與 Compensation Mechanism，就不適用於現有 Inter-eNB Compensation Scenario，另外 DT 代表發言表示 Scenario 似乎不能反映實際網路建設狀況，主席請 DT 代表表達其確切考量，但 DT 代表無回應，主席最後裁示本公司與 CMCC 私下就提案內容進行溝通。經與 CMCC 代表溝通，但由於 TR 已進入最後階段，本次會議提出新 Scenario 時間上不恰當，因此結論沒有加入本公司提案內容。

R3-110662	Generalized Framework for Network Energy Saving Solutions	CHTTL	Disc							Revised
R3-110888	Generalized Framework for Network Energy Saving Solutions	CHTTL	Disc							Noted

Discussion: Presented by Jessica Tang (CHTTL). This contribution presents a generalized framework for ES related process with state transition among use cases to give a picture of ES area need for standardization. Identified Rel-9 solution is categorized with evaluation flow within the framework. Then an ES parameter exchange based method is proposed.

Decision: Noted

R3-110663	Compensation Mode in Network Energy Saving	CHTTL	Disc							Revised
R3-110891	Compensation Mode in Network Energy Saving	CHTTL	Disc							Noted

Discussion: Presented by Jessica Tang (CHTTL). This contribution discusses compensation mode ES for both inter-eNB and inter-RAT scenario 1. According to the ES and Grade of Service benefit, the following proposals are made:
1: Include compensation mode in scenario 1 for both inter-eNB and inter-RAT use cases
2: Include the presented ES parameter exchange as one solution for the case in proposal 1

Andreas Neubacher (DT): this scenarios includes simplifications which do not reflect real networks.

六、心得及建議

本次會議本團隊以參加 E-UTRAN Network Energy Saving (NES) 議題為主，所提方案已基本上獲得其他與會公司認同，但因 Study Item 已進入最後階段，目前提出新 Scenario 時機並不恰當，預期可作為下

個 release 的努力方向，持續追蹤相關議題。