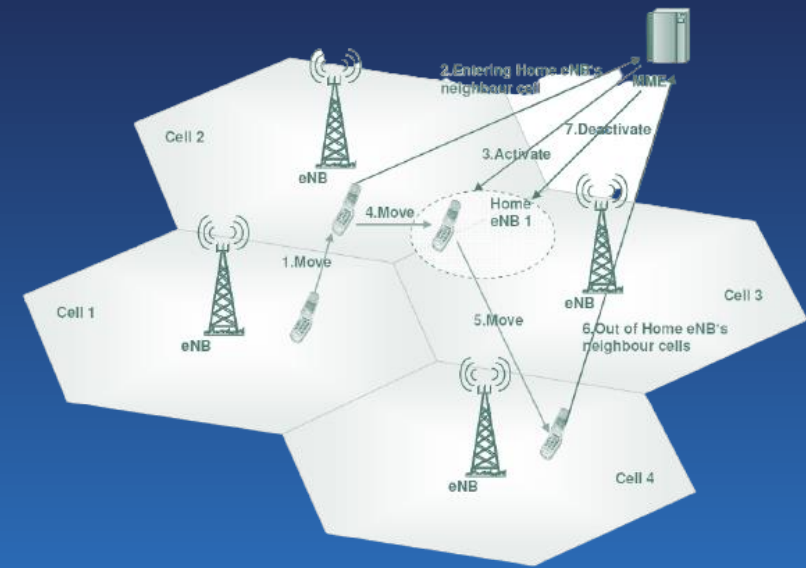


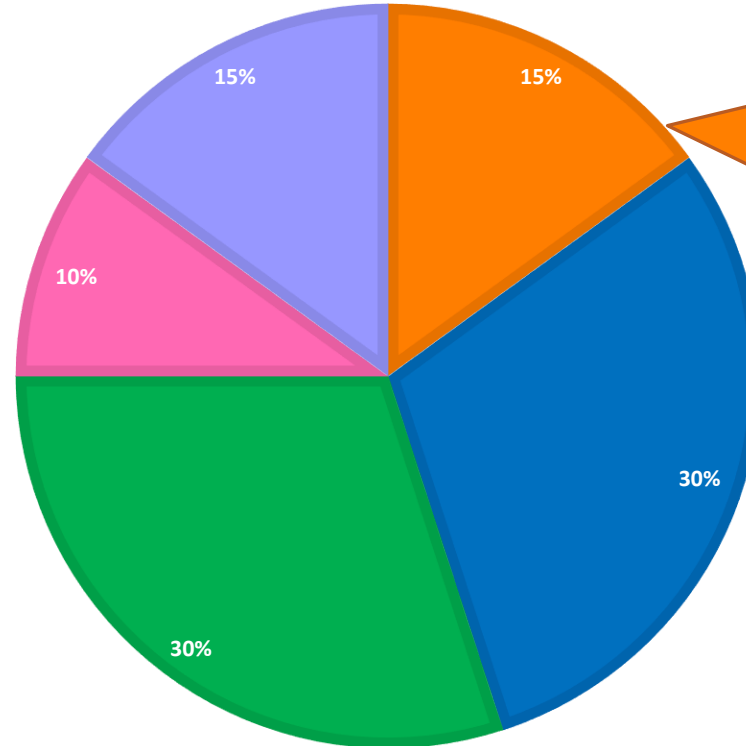
3GPP SON Series: Energy Savings (ES)



RAN OpEx

RAN OPEX

Power Consumption Site Rental Operations Manpower Other Hw & Sw



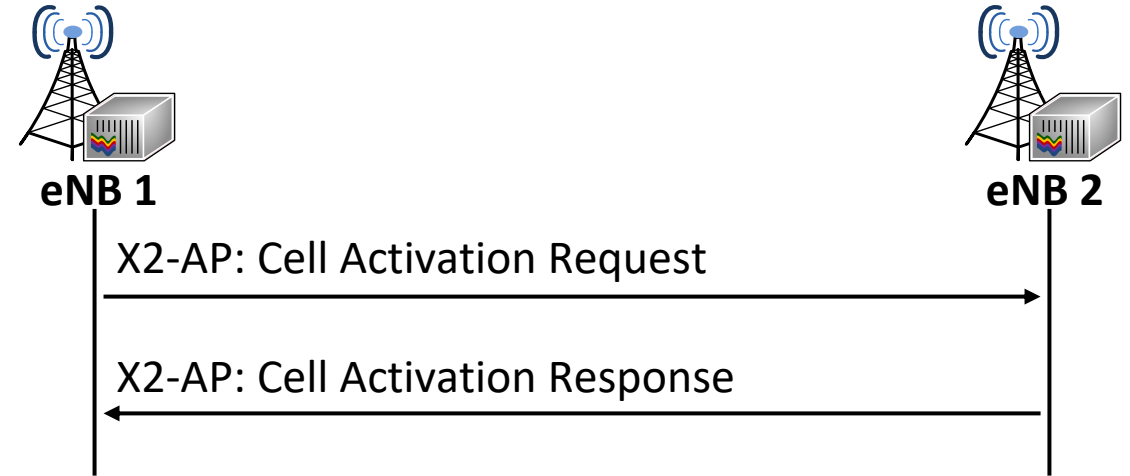
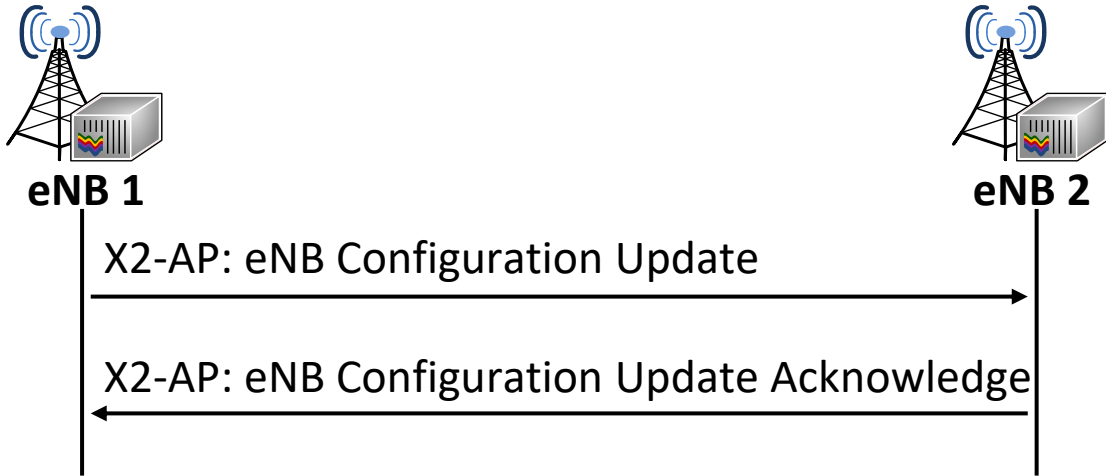
Power Consumption

- 5G has increased the power consumption with massive MIMO being the main culprit
- One solution being used in practice is to switch off equipment in the night

Energy Saving Approaches

- Switch-off cells that are lightly loaded or not in use during off-peak hours
 - Switching cells off should not create coverage holes
 - Power Amplifiers are the biggest source of power consumption for an eNB, cell switch-off is essentially only the transmitter/receiver being switched off.
- Adapt the Transmission Power
- Adapt the multi-antenna schemes (Single antenna, SIMO, MIMO, Beamforming)

Cell Activation / Deactivation for ES



Served Cells To Modify		0 .. <maxCellineNB>		Complete list of modified cells served by the eNB	GLOBAL	reject
>Old ECGI	M		ECGI 9.2.14	Old E-UTRAN Cell Global Identifier	-	-
>Served Cell Information	M		9.2.8		-	-
>Neighbour Information		0 .. <maxnoofNeighbours>			-	-
>>ECGI	M		ECGI 9.2.14	E-UTRAN Cell Global Identifier of the neighbour cell	-	-
>>PCI	M		INTEGER (0..503, ...)	Physical Cell Identifier of the neighbour cell	-	-
>>EARFCN	M		9.2.26	DL EARFCN for FDD or EARFCN for TDD	-	-
>>TAC	O		OCTET STRING (2)	Tracking Area Code	YES	ignore
>Deactivation Indication	O		ENUMERATED(deactivated, ...)	Indicates that the concerned cell is switched off for energy saving reasons	YES	ignore

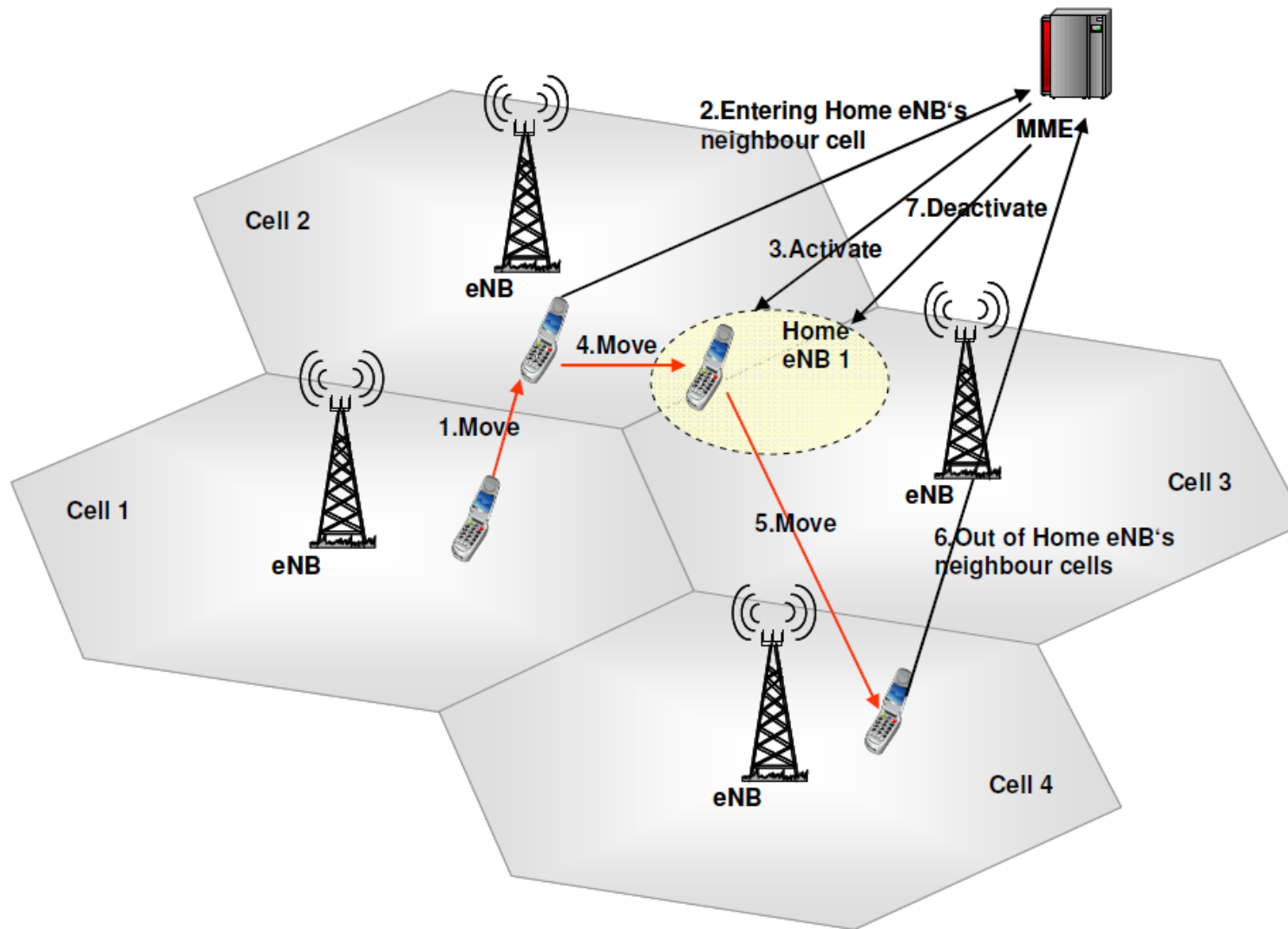
Release 11

49

3GPP TS 36.423 V11.3.0 (2012-12)

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.13		YES	reject
Served Cells To Activate		1 .. <maxCellineNB>			GLOBAL	reject
>ECGI	M		9.2.14		-	-

Range bound	Explanation
maxCellineNB	Maximum no. cells that can be served by an eNB. Value is 256.



Home eNB Activation and Deactivation

Source, Nomor Research. See Reference [1]

References and Further Reading

- Self-Organizing Networks (SON) in 3GPP Long Term Evolution by Sujuan Feng and Eiko Seidel, Nomor Research ([link](#))
- Self Organizing Networks for 3GPP LTE by Aderemi A. Atayero, Oluwadamilola I. Adu and Adeyemi A. Alatishe ([link](#))
- From 4G to 5G: Self-organized Network Management meets Machine Learning by Jessica Moysen and Lorenza Giupponi ([link](#))
- 3G4G: Self-Organizing Networks / Self-Optimizing Networks ([link](#))
- The 3G4G Blog: SON ([link](#))

Thank You

To learn more, visit:

3G4G Website – <https://www.3g4g.co.uk/>

3G4G Blog – <https://blog.3g4g.co.uk/>

Telecoms Infrastructure Blog – <https://www.telecomsinfrastructure.com/>

Operator Watch Blog – <https://www.operatorwatch.com/>

Connectivity Technology Blog – <https://www.connectivity.technology/>

Free 5G Training – <https://www.free5gtraining.com/>

Free 6G Training – <https://www.free6gtraining.com/>

Follow us on Twitter: <https://twitter.com/3g4gUK>

Follow us on Facebook: <https://www.facebook.com/3g4gUK/>

Follow us on LinkedIn: <https://www.linkedin.com/company/3g4g>

Follow us on SlideShare: <https://www.slideshare.net/3G4GLtd>

Follow us on YouTube: <https://www.youtube.com/3G4G5G>