3GPP SON Series:

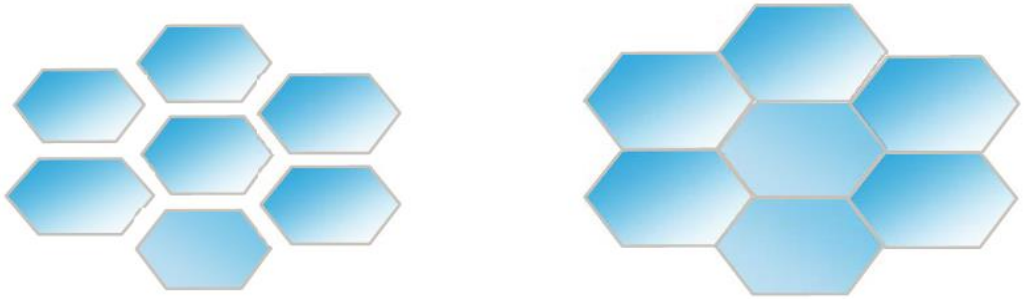
Coverage and Capacity Optimization *(CCO)*

@3g4gUK

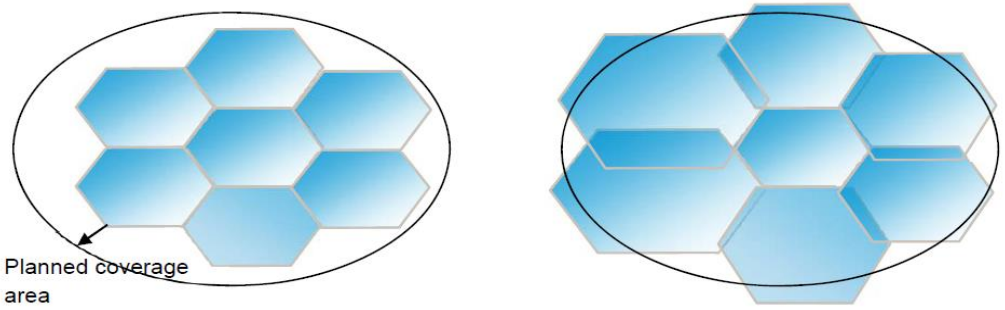
Coverage and Capacity Optimization (CCO)

- This has traditionally been the key area of optimization.
- This is carried out over a rather long time-scale, in the order of days or weeks, by capturing and reacting to long-term changes in physical environment, load imbalance, and UL/DL mismatch.
- The network should periodically be automatically able to adjust the key RF parameters once the cells have been deployed.
- The key RF parameters are:
  - Power of the cell
  - Antenna configuration (eg., tilts of the antenna)
- CCO is more of an ‘automatic cell planning’.

CCO Examples



Optimization of IRAT coverage holes: before (left) and after (right)



Isolated island coverage optimization

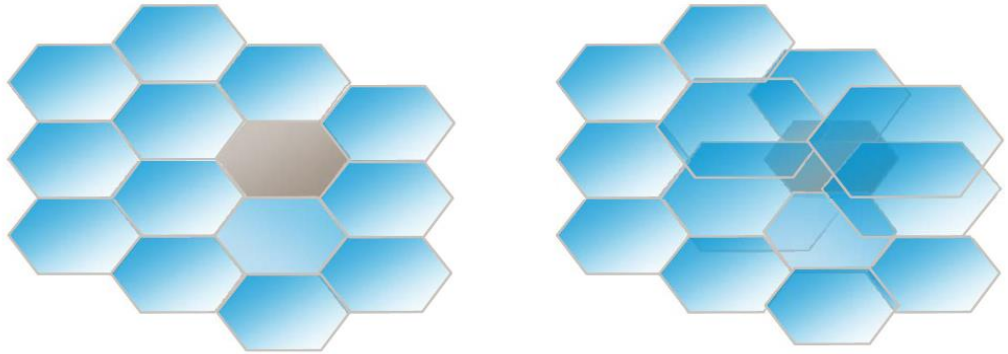
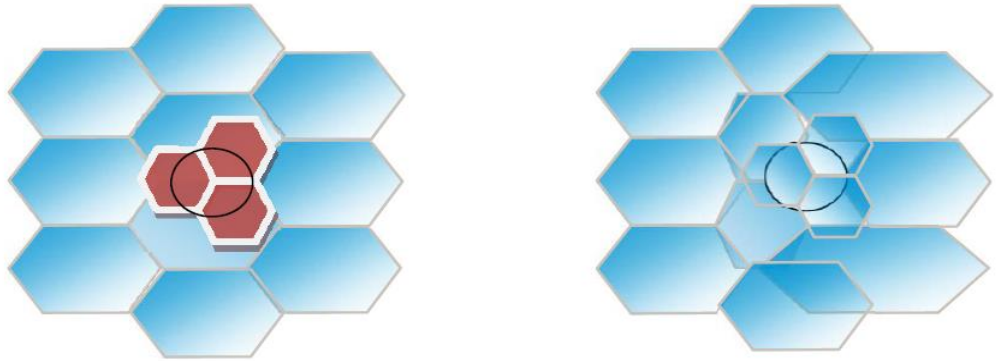


Illustration of coverage gap optimization: before (left) and after (right)



Optimization of coverage with newly added capacity sites

Coverage and Capacity Optimization: A typical operational task is to optimize the network according to coverage and capacity. The traditional way is to find the problems by drive tests and use planning tools to find possible solutions. This use case aims at discovering the coverage and capacity problems automatically through the measurements at the eNB and those reported by UEs. It minimizes the human intervention and reduces the feedback delay.

Objective:	Expected results:	Possible Solutions:
• Optimization of network coverage • Maximize the system capacity *Source: Reference [1]*	• Continuous coverage • Increased capacity of the system • Interference reduction • Controlled cell edge performance • Savings on drive tests • Minimized human intervention in network management and optimization tasks • Self-healing in case of equipment (e.g., eNodeB) failure by automatic reconfiguration of surrounding eNodeBs.	The input of Coverage of Capacity Optimization function can be: • UE measurements on the signal strength of current cell and its neighbours • UE signaling/reporting • Timing Advance (TA) • Radio Link Failure counters • Coverage triggered mobility counters • Traffic load distribution measurements The output is optimized radio configuration parameters, which may include: • Downlink transmit power • Downlink Reference Signal Power Offset • Antenna tilt The procedure can be as follows: 1. Measurements are collected from inside eNB and UE reports. 2. Problems are detected concerning the coverage and capacity. 3. Problems are described and given to Planning Tool. The Planning Tool adjusts the radio related parameters to solve the problems and optimize the coverage and capacity of the system. 4. Adjusted parameters are given to Coverage and Capacity Optimization function. 5. The Optimization function updates the parameters, which are used to deploy and operate the system.

Further Reading on MRO

- Self-Organizing Networks (SON) in 3GPP Long Term Evolution by Sujuan Feng and Eiko Seidel, Nomor Research (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