



# CENTRALIZED SELF-ORGANIZING NETWORKS (C-SON) TO THE RESCUE FOR RE-FARMED NETWORKS

WHITE PAPER

## C-SON SOOTHES NETWORK MANAGEMENT HEADACHES OF RE-FARMED NETWORKS

Mobile Network Operators (MNOs) facing challenges in managing and maintaining re-farmed networks can turn to C-SON automation to solve these challenges. C-SON implementation across all tiers of technology (LTE, UMTS and GSM) is required... and is a reality today.



## EXECUTIVE SUMMARY

There is no question that spectrum re-farming/carving brings benefits to both Mobile Network Operators (MNOs) and their customers. Re-farming allows both re-use of infrastructure, and a faster - less costly - market entry than building 'from scratch' on new spectrum. In addition, UMTS and LTE run on re-farmed GSM spectrum can also provide better coverage, improving Quality of Service for end customers.

Of course, existing GSM subscribers rightly expect to have the same Quality of Service after a re-farming as before. Achieving this can pose a challenge to an MNO as they are now running a full GSM network on reduced spectrum – sometimes as little as 25% of the original spectrum. Network management is a real issue and one which operator resources are often stretched to handle.

An automated approach is in order. Centralized SON (C-SON) brings many network optimization capabilities to an MNO. Cellwize elastic-SON™ provides the needed automated approach for harmonization and optimization of a re-farmed network, through its multi-vendor and multi-technology (multi-RAT) capabilities. elastic-SON brings value to LTE as well as GSM and UMTS networks.

# RE-FARMING REAPS REWARDS

As network technologies advance, mobile usage increases, and competition gets fiercer, MNOs are under increased pressure to get ahead of - or at least keep pace with - the services, speed, and Quality of Experience (QoE) that other operators are offering. This often leads to bandwidth constraints, driving operators to new network technologies. When looking to deploy new networks, operators have options, one of which is re-farming their existing spectrum to accommodate newer Technologies.

Re-farming has been undertaken by MNOs for a number years, starting with re-farming of GSM 900MHz radio frequency band to accommodate UMTS/HSPA in the 900MHz frequency band (also termed UMTS 900) as a means to extend the benefits of broadband connectivity to rural and suburban areas, and improve in-building coverage. The use of the 900 MHz band significantly reduced the number of cell sites needed to cover rural and suburban areas, providing major CAPEX and OPEX savings for UMTS deployments<sup>1</sup>. The CAPEX and OPEX savings, plus the better Quality of Service/Experience from improved coverage make spectrum re-farming a solid business decision by MNOs.

In 2011, the European Commission adopted technical rules on how the GSM 1800 MHz band should be opened up (re-farmed) to advance 4th generation (4G) mobile technology communications, using Long Term Evolution (LTE)<sup>2</sup>. This helped accelerate 4G/LTE adoption, with industry experts arguing that re-farming the 1800-MHz band was arguably the fastest and most cost-effective way to extend mobile broadband coverage<sup>3</sup>, certainly as compared to buying new spectrum at auction. 1800MHz re-farming continues at a strong pace today as MNOs continue their evolution to LTE.

With the success of these re-farming initiatives, one can easily imagine that as LTE matures, there will be a need for more spectrum, and carving (re-farming) from UMTS to support LTE will start happening. This paper focuses on re-farming of GSM networks; many of the principles can be expected to apply in the potential future situation of carving UMTS spectrum to support LTE.

While the benefits of re-farming are great, the resulting network is left with some challenges that must be managed.

900MHz  
band  
SIGNIFICANTLY  
REDUCES ...  
CAPEX &  
OPEX  
FOR UMTS  
DEPLOYMENTS

<sup>1</sup> UMTS900 Operator Case Study: Elisa Corporation - [http://www.gsacom.com/gsm\\_3g/info\\_papers.php4](http://www.gsacom.com/gsm_3g/info_papers.php4)

<sup>2</sup> Europa Press Release database: *Digital Agenda: technical rules agreed for using 4G wireless broadband devices on GSM frequencies*, 18 April, 2011 - [http://europa.eu/rapid/press-release\\_IP-11-480\\_en.htm](http://europa.eu/rapid/press-release_IP-11-480_en.htm)

<sup>3</sup> 1800 MHz: the unsung mobile broadband hero, Dan Warren, GSMA Total Telecom.com 11 July, 2011 - <http://www.totaltele.com/view.aspx?ID=466175>

## RE-FARMING HEADACHES

The trend of network modernization is driven by emerging technologies such as UMTS900 and LTE1800 rollout strategies, currently a strong phenomenon in certain areas of the world such as EMEA. Modernization projects typically consist of network equipment infrastructure swap, either from a new or incumbent vendor. It goes without saying that network modernization includes re-purposing spectrum to enable these technologies, a.k.a re-farming.

NETWORK  
MODERNIZATION  
IS DRIVEN BY  
EMERGING  
TECHNOLOGIES

Once spectrum has been re-purposed, MNOs indeed can reap the benefits of enhanced performance and cost savings from the new technology. However, they still need to deliver GSM services to customers, who have no reason to accept degradation in service availability. And, regardless what service a subscriber has, it should be remembered that network traffic, especially voice, continues to run over GSM. This is expected to continue for some time, as GSM is forecasted to make up just under half mobile network connections (excluding machine-to-machine) in 2015<sup>4</sup>. In addition, a significant portion of machine-to-machine (M2M) traffic today is over GSM, and is expected to remain on GSM for some time<sup>5</sup>. In this challenging environment, the operator must run the GSM network with reduced spectrum in harmonization with UMTS and LTE, facing many challenges, including a higher demand on scarcer resources and a more complex network to manage.

When the different technical 'layers' of the new network are not harmonized, the MNO can experience both inefficiencies and the potential for network performance issues that could lead to poor Quality of Service (QoS) to end customers. While initially the re-farmed network will work well, issues can result over time given the "squeezing" of GSM traffic into less spectrum. For example, if we look at a GSM network that initially worked over 20MHz, but in a re-farming process had 15MHz carved out to support UMTS or LTE services, we can see that the MNO then needs to support its GSM services and traffic with the remaining 5MHz of spectrum. That's a challenge. It's very difficult to reach an acceptable performance level on the same network with 25% of the original available spectrum. This challenge gets even harder if resources and skill sets are scarce, which is another source of headache for an MNO.

As new technologies are implemented, an MNO's network engineering staff often evolves its capabilities in pace with the newer technologies- this same staff is being stretched to also deal with new network equipment infrastructure. Combine that with the fact that technical GSM network expertise is becoming scarcer in the market, and many MNOs find themselves without the right (or enough) skills to manage the new environment. This is

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<sup>4</sup> GSMA Mobile Economy 2014 report - <http://www.gsamobileeconomy.com/>

<sup>5</sup> For more information on M2M/Internet of Things network management challenges, see Cellwize white paper "CENTRALIZED SELF-ORGANIZING NETWORKS (C-SON): ESSENTIAL FOR M2M & IOT"

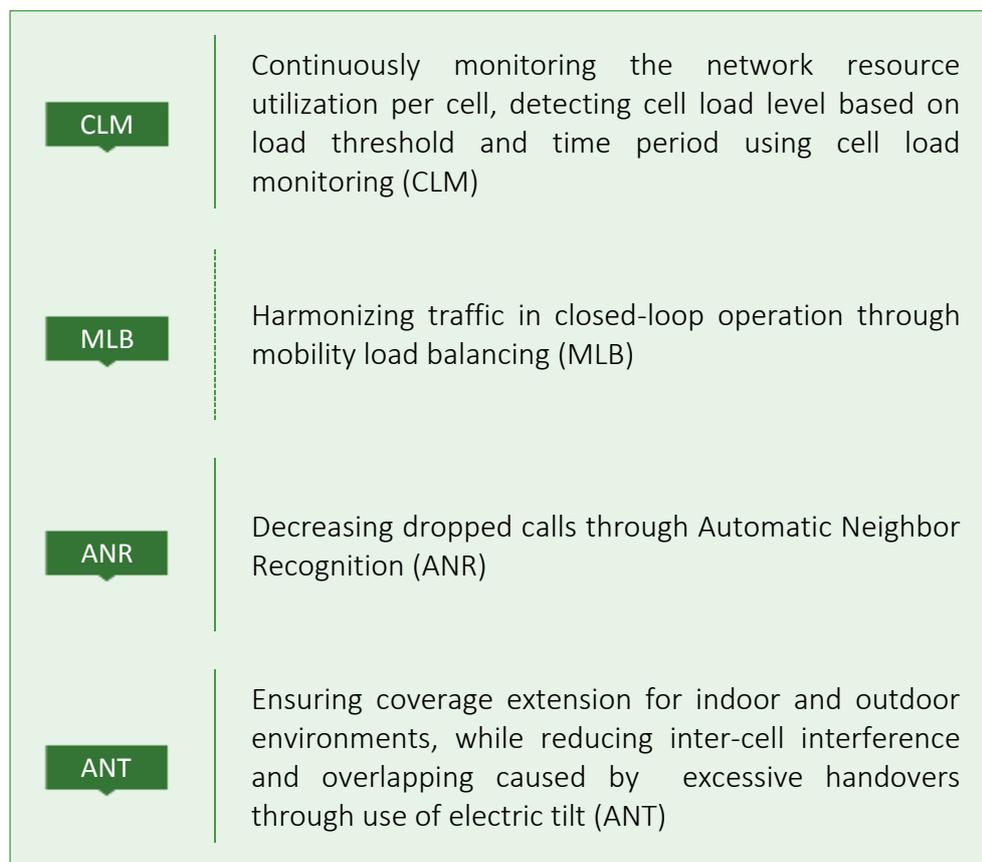
obviously a situation that needs to be addressed, and addressing the situation through automation is the most efficient approach.

## C-SON AS A HEADACHE REMEDY?

Cellwize delivers the first ever elastic-SON™ solution, a lean and effective system that optimizes the mobile network in response to changing circumstances and needs. elastic-SON delivers a network that can stretch and contract to meet an operator's business and operational priorities, in line with subscriber needs. It does this by rerouting resources dynamically - in near real-time - to improve coverage, capacity and quality. Coverage can be extended for under-utilized sectors, as well as for overloaded cells in real-time. The result is a network that is focused on delivering the best possible performance when and where it is needed. Cellwize handles multi-vendor networks and all wireless technologies (multi-RAT) - GSM, UMTS and LTE.

Once a re-farmed network is in operation, use of Cellwize elastic-SON brings the performance levels of the resulting network back very close to that of the original network.

This is achieved by:

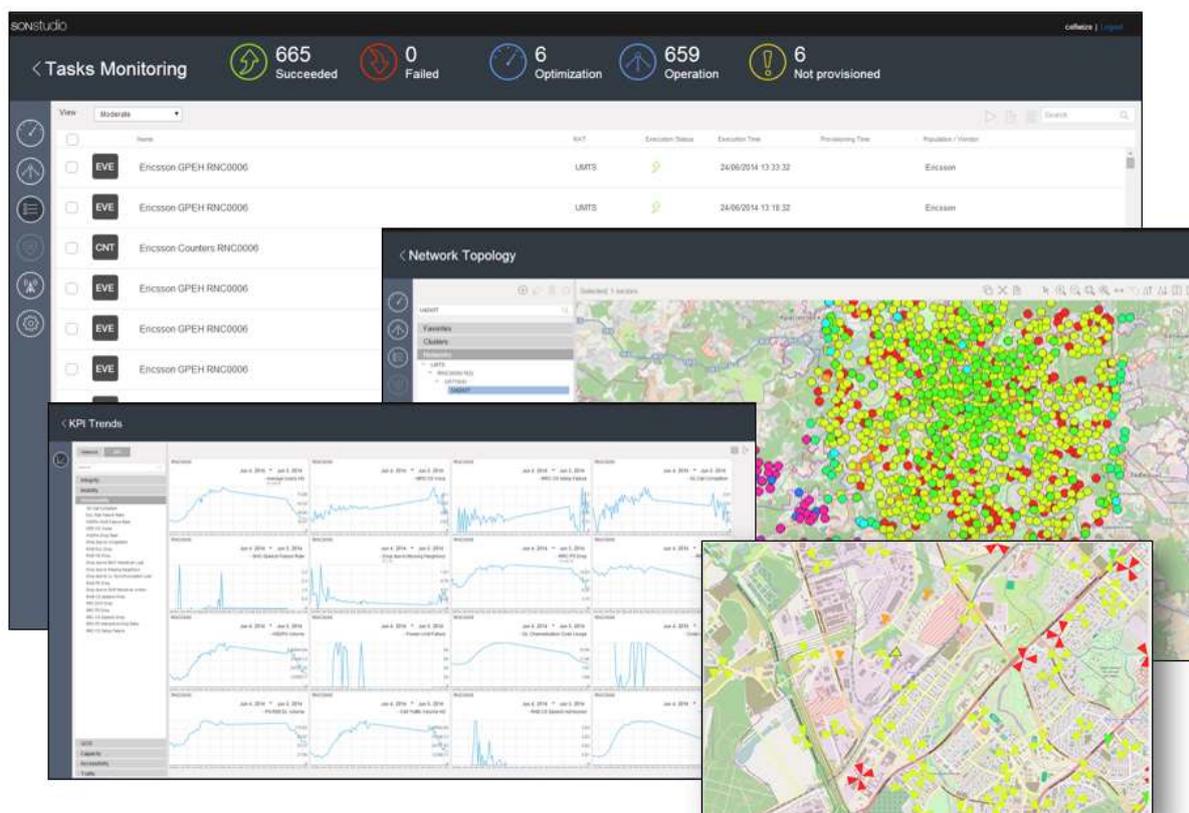


ELASTIC-SON  
BRINGS BACK  
PERFORMANCE  
LEVELS  
VERY CLOSE TO  
THE ORIGINAL  
NETWORK

Since the re-farmed network could include any combination of GSM, UMTS and LTE, it is important to be able to optimize all technologies. Cellwize does this, harmonizing the traffic across and simplifying the operation of multi-technology and multi-vendor networks. In fact, some operators who selected Cellwize to optimize their LTE networks, have found additional benefits in applying elastic-SON to their re-farmed legacy networks. And, as discussed above, the automated nature of elastic-SON increases the operator's operational efficiency - helping to address the resource issue that many MNOs face.

Much of the speed and efficiency of elastic-SON is due to its web-based 'front end': **SONStudio**. This administration and configuration application enables full control of all SON activities. For example, a user can define and schedule optimization tasks for network clusters or individual sectors; schedule periodic operational procedures and data acquisition processes; monitor all task instances and executions; and provision tasks. **SONStudio** displays a network topology view for all radio access technologies. It also provides network guard options for controlling undesired situations and allows the definition of constrains, limitations and policies to be enforced by the various elastic-SON optimization modules.

SONSTUDIO  
DISPLAYS A  
NETWORK  
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RADIO ACCESS  
TECHNOLOGIES



## CONCLUSION

The network management and harmonization challenges that have come to light after several years of GSM to UMTS - and more recently GSM to LTE spectrum re-farming – must be addressed to fully realize the positive gains which were the purpose of re-farming. This is especially true given GSM connections will continue to make up a significant portion of global mobile traffic. Operating a GSM network in drastically reduced spectrum is a challenge, especially if Quality of Service is to be retained (a definite customer expectation). That challenge becomes harder as internal network engineering resources become stretched. The situation calls for an automated approach.

While C-SON brings many automated network optimization capabilities to an MNO, a C-SON solution is only useful in a re-farmed network if it harmonizes all technologies. Only one C-SON on the market today supports GSM alongside UMTS and LTE - Cellwize. The Cellwize elastic-SON solution provides the needed automated approach for network harmonization and optimization, with its multi-vendor and multi-technology (multi-RAT) capabilities.

The fact that Cellwize supports GSM networks (as well as UMTS and LTE) sets it apart from other C-SON solutions on the market and makes it the only C-SON that can bring immediate benefits to a re-farmed network. The automated nature of elastic-SON both addresses the resource issues that many MNOs face with their re-farmed networks, and increases the operator's operational efficiency.

# ABOUT CELLWIZE



Cellwize provides cutting-edge SON (Self Organizing Network) solutions to mobile operators. Mobile networks empowered by Cellwize continuously react to real-time changes and match capacity, coverage and quality with evolving usage patterns and users' needs.

Our elastic-SON™ platform utilizes Big Data processing to transform volatile networks into user-centric and over-performing mobile networks across multiple vendors and wireless technologies (Multi-RAT). Our agile and proven technology improves network management and reduces on-going CAPEX and OPEX investments.

Cellwize Value-Driven SON™ concept supports NPS and loyalty programs, offering operators in-depth insights and actions on their radio networks, enabling them to differentiate their offering, provide superior personalized user experience and use network analytics to enable revenue generation.

Cellwize was founded by Telecom professionals and its technology was designed by RF experts mastering network topology and behaviors. Cellwize is headquartered in Singapore with R&D and sales offices across the EMEA region.

More about elastic-SON™ by Cellwize: <http://www.cellwize.com>



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