A single RAN strategy can offer double-digit savings for LTE deployment: a real TCO comparison

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LTE has become the wireless technology of choice for mobile operators to offer broadband data services, in an environment of burgeoning demand for mobile and nomadic bandwidth. However, before deploying LTE, operators have to formulate a commercial and technical strategy that aims to maximise revenue and minimise costs as well as meet subscriber expectations. Established mobile operators need to take a holistic view of their legacy multi-technology networks and exploit all synergies to minimise costs and maximise revenue. This article examines the difference between two network strategies for LTE deployment, taking into account key considerations for operators as well as total cost of ownership (TCO).

Operators have two network strategies to consider when deploying LTE.

- **LTE overlay**, which involves deploying a separate LTE radio access network (RAN) alongside any legacy 2G and 3G RAN and core networks.
- **Single radio access network (SRAN)**, which involves installing a single base station unit that provides the functionality of a new LTE base station and also replaces legacy 2G and 3G base stations at every radio site.

SRAN is rapidly becoming the norm. For example, Vodafone has already upgraded 51% of its European sites to SRAN (at March 2013). It aims to increase this to 80% of the sites by 2015.[1]

The advantages and disadvantages of LTE overlay and SRAN have been widely discussed in relevant literature, but only on a qualitative basis.[2] The debate about which strategy leads to the lowest TCO is ongoing, because there is very little quantitative evidence in the literature to support views on this topic.

Our case study presents a 5-year TCO model to help operators choose the best LTE deployment strategy

Below we provide a case study of a detailed 5-year TCO model, based on real costs, which we developed to help a European operator identify its optimum LTE deployment strategy.

Voice over LTE (VoLTE) is still maturing in most markets, so an operator that wishes to provide ubiquitous voice coverage in a cost-effective way needs to implement a 'transitional' solution. Such a solution will typically use a low-frequency band (that is, 2G or 3G at 900MHz), at least until VoLTE becomes mature. In the case study presented here, we assume that the 'transitional' solution involves re-using the existing 2G network in the 900MHz band to provide ubiquitous voice coverage.[3] However, many legacy 2G networks are now reaching the end of their life, so it is difficult and/or costly to support them.

1 Hamilton, Anthony, *XX Santander Global Banking & Markets TMT Conference*, Madrid, 19–20 June 2013.

2 Informa (Zug, Switzerland, 2013), *Deploying LTE in Europe*. Available at www.telecoms.com/wp-content/blogs.dir/1/files/2013/02/Samsung-ITM-whitepaper-final-fp.pdf.

3 It should be noted that an alternative solution is to refarm the 900MHz spectrum to provide ubiquitous coverage with the 3G network (that is, UMTS 900MHz).

We consider three different LTE deployments in order to compare the TCO associated with particular deployment strategies.

- **Base case:** LTE RAN overlay with common existing 2G/3G core network and retention of existing legacy 2G and 3G networks.
- **Scenario 1:** LTE RAN overlay network with a full refresh of the existing legacy 2G RAN, and retention of the existing legacy 3G and core networks.
- **Scenario 2:** SRAN, with full network swap of 2G and 3G access and core networks.

The base case is not a practical option for operators with an end-of-life 2G network, because it does not extend the lifetime of the 2G network. However, it does provide a useful reference against which to compare Scenarios 1 and 2, and to identify any incremental costs associated with the refresh of the legacy 2G and 3G network.

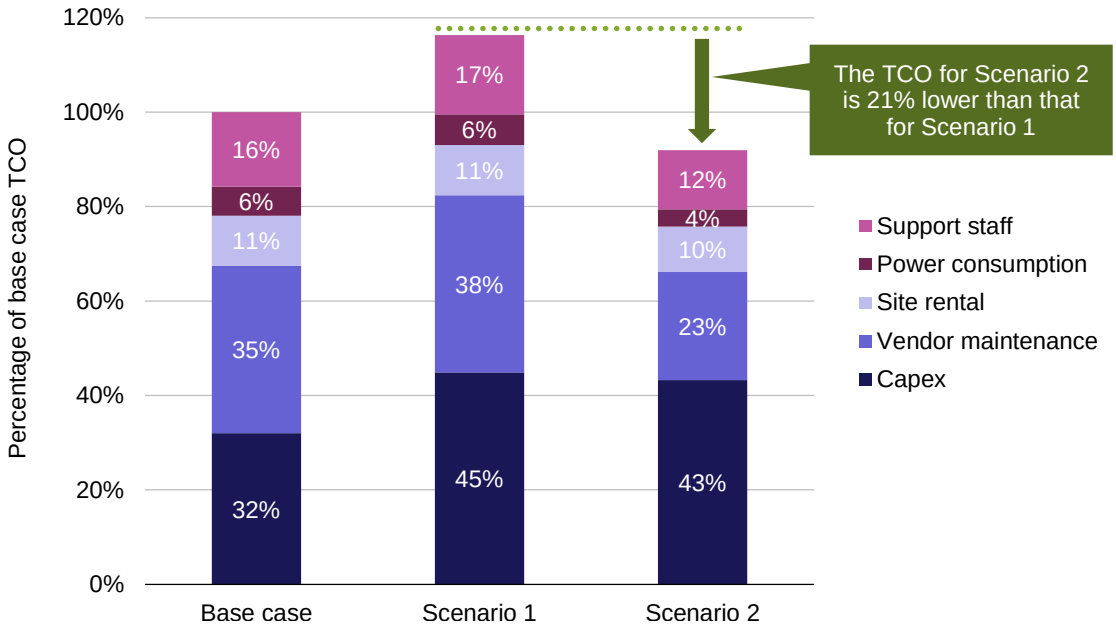
Figure 1 shows the cost items considered for the TCO model.

Figure 1: Capex and opex items considered in the TCO model [Source: Analysys Mason, 2013]

Capital expenditure	Operational expenditure
• RAN equipment capex (LTE, 2G and 3G) • Core equipment capex (Evolved Packet Core, 2G/3G core) • OSS capex • Backhaul capex • Support services capex • Cost of change capex (transformational costs) • Other capex	• Existing network vendor maintenance (2G, 3G) • Incremental network vendor maintenance (LTE) • Existing infrastructure running costs (such as power, site rental and operational personnel) • Incremental infrastructure running costs (such as power, site rental and operational personnel) • Other opex

Figure 2 illustrates the results of the modelling exercise for the three scenarios.

Figure 2: Five-year TCO comparison between an overlay LTE and SRAN strategy [Source: Analysys Mason, 2013]



Our analysis suggests a significant cost saving associated with the SRAN strategy

The modelling exercise resulted in the following observations about the costs associated with the different deployment strategies.

- Scenarios 1 and 2 have similar capex requirements. In Scenario 2 (SRAN), each radio site is equipped not only with LTE but also with new 2G and 3G equipment to completely replace the legacy RAN. However, in Scenario 1, only the 2G RAN is replaced (not the 3G RAN). This implies that the 3G RAN can be replaced at no additional cost compared to Scenario 1 (overlay solution). This unexpected result is explained by the fact that the SRAN naturally achieves economies of scale by using universal hardware cards for all access technologies.[4] In some cases, SRAN vendors may also offer attractive pricing to encourage an operator to swap legacy equipment.

- The opex associated with Scenario 2 (SRAN) is 32% lower than for Scenario 1, and 28% lower than for the base case. This reduction in opex is mainly driven by the fact that separate vendor maintenance contracts for the 2G, 3G and LTE networks are more costly than a single maintenance contract associated with a single RAN network. In our case study, vendor maintenance costs represent about 50% of the overall opex of the base case. The vendor maintenance costs associated with a SRAN solution are 39% less expensive than those for an overlay network. A significant proportion of vendor maintenance savings come from the removal of end-of-life equipment, for which the operator has to pay a maintenance premium (the maintenance of end-of life equipment represented most of the vendor maintenance opex costs in the base case). Other sources of cost savings under Scenario 2 (SRAN) are associated with a reduction in power costs. In our case study, the power costs associated with an SRAN solution are more than 50% lower than those for an overlay solution, but the overall contribution of power costs is significantly smaller (less than 10% of opex for the base case) than that of vendor maintenance costs. Scenario 2 (SRAN) also enables cost savings on operational staff for the operator, because it is less expensive to maintain a SRAN when the different technologies all use the same hardware.

Overall, we found that **the TCO associated with an SRAN is 21% lower than that associated with an equivalent overlay solution** (which includes a 2G network refresh); bearing in mind that an SRAN deployment also enables a full refresh of the legacy 3G network and generates annual opex savings of 30%.

However, the opex cost savings can only be achieved if an SRAN solution is deployed as a 'big bang' swap, to minimise the length of time the SRAN and the legacy networks co-exist. Such a radical network transformation is challenging and resource-intensive for operational teams, but full network swaps are becoming more common and vendors can use their experience of previous swap projects to mitigate the risks.

A final consideration is that each operator will have a unique starting point and cost base that may dictate a different LTE strategy.

Analysys Mason supports mobile operators worldwide on a wide range of issues related to the deployment of LTE, including commercial and technical strategies, procurement, spectrum valuation and strategy, auction support, network costing for product profitability, and business models. If you would like to discuss the contents of this article or other issues related to LTE deployment strategies, please contact us.

[4] Only the software load changes to change the function of a card to 2G, 3G or LTE.

