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Where is the Money?

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In a world where statistics consistently show that smart phones and tablets are driving data consumption through the roof, one has to step back and ask: what is this tsunami of data actually doing to the CAPEX budgets of the operators?

A good starting point for examining the demand side of the equation is a look at the Cisco (News - Alert) Visual Networking Index, which attempts to predict future data demand by taking into account the bandwidth demand per smart phone, tablet or laptop, and then factoring in the impact of new applications driving increased demand. All of this demand is then tempered by operators encouraging more data offload onto WiFi (News - Alert) networks and the elimination of all you can eat data plans. The net result shows that Cisco predicts an 18-fold increase in mobile network traffic by 2016.

However, what the study doesn't answer is whether the mobile network CAPEX and OPEX (News - Alert) spend can deliver networks capable of supporting this increase in demand, or whether the demand will be frustrated by lack of capacity on the networks themselves. When looking at the projections of total spend by operators in the telecom and IT sectors, you will indeed see a steady but moderate growth in spending being predicted by the various analysts who cover this space. The rate of increase in network investment, however, does not come close to matching the 18- fold increase in data demand predicted by Cisco.

The only way to bridge the gap is to assume that we as an industry can somehow continue to deliver cost per bit reductions so that the expenditure operators can afford will deliver the data capacity that the users will demand. The alternative is to conclude that there will be a large frustrated demand by the community of users.

So, let's look at how we have performed on the cost reduction agenda. The first thing that we need to realize is that the right metric to consider is the cost per bit transported, not the cost per unit of hardware. In an environment where demand is clearly outstripping capacity, a system that costs 20% more but delivers twice the bandwidth is a good choice.

Secondly, we have to look at the total cost of ownership over a five or ten year period. In many instances, the equipment CAPEX is only a small portion of this cost and other factors, such as space or spectrum leasing or maintenance costs, can account for up to 80 percent of the total cost of ownership. It is impossible to provide a comprehensive answer to the question of the industry's performance on the cost reduction agenda – especially in a short column such as this – as there are simply too many variables. It is instructive, however, to look at a couple of examples.

Throughout the world, microwave systems are used for the majority of mobile backhaul connections, so they are a good example for examining historical cost reduction performance. The past few years have seen a number of advances in microwave systems such as higher modulation rate (up to 2048 QAM), adaptive modulation, native packet systems, baseband bulk compression, dual carrier radios and support for wider channel widths; all of which have had the effect of increasing the throughput of a single link by a factor of 10. At the same time, cost reductions in the overall supply chain have resulted in lower equipment costs, so the cost per link has actually fallen while the capacity has increased. The net result is a cost per bit reduction of 20 times. As this is just the equipment cost, and much of this cost reduction has already been delivered, we need to look at other factors to get a view as to where the network cost per bit is heading.

The emerging trend towards more densely packed base stations provides an example of where we can expect the cost per bit reductions to go in the future. When comparing the total cost of ownership of the proposed microcells (outdoor mounted small base stations positioned on lamp poles or light standards near the street level) to the macro cells (large multi-sector base stations mounted on towers

of building roof tops) which are used in today's network deployments, we see an indication of where the network cost per bit can be expected to go from here.

This is a more complicated comparison, taking into account such factors as site leasing costs, spectrum costs, power, site engineering, maintenance as well as the CAPEX. What we see is that although the CAPEX as a percentage of the total cost of ownership goes up in the microcell case, the cost per bit is reduced by almost an order of magnitude. This is because, again, the total network capacity is increased and some of the ongoing costs that dominate a total cost of ownership calculation, such as site leasing, are expected to be much lower in the microcell case.

The reconciliation between the demand side as expressed by studies such as the Cisco Visual Networking Index and what the network operators can afford to deliver is very complicated, but there is definitely some indication that the required scale of cost per bit reduction is being delivered by existing and upcoming technologies.

As they say in the investment world, past performance is no guarantee of future performance, but between the per link cost per bit reductions and the impact of the small cell architectures discussed above we do have visibility of cost reductions sufficient to deal with the near term capacity demand increases. There is no doubt that the demand side will continue to force technologists to continue to deliver further cost reductions but as with most other areas of technology we are not done innovating in mobile backhaul networks yet Of course, even this complex story is not all that needs to be considered.

Even if we can achieve the cost per bit reductions that allow operators to affordably deliver as much capacity as the new devices and applications demand, there is still the issue of having enough spectrum available to deliver all these services – but that is a story for another day.

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