JULY 2012 | WHITE PAPER

Use your brain

Making the most of network capacity

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SYNOPSIS

It is commonly observed that human beings do not use the full capacity of their brains. If this is true then it is deeply frustrating, because we don't know how to access the untapped reserves.

The mobile network is the brain that controls the cellular services that we all enjoy and, in this industry, we are forever discussing its 'capacity'. Mostly we talk about how fast this capacity is dwindling or about how urgently it needs to be increased—at significant expense.

This white paper will argue that many mobile operators are not using the whole of their network capacity, often because they don't have the time or aren't being given the right advice—or simply because don't yet know how. But the knowledge exists and, when applied, it can deliver valuable improvements and efficiencies.

Operators will always have to buy more capacity at some point. But unless they gain access to their existing, untapped resources and are able to see the performance of their entire network, from one end to the other, they will never be able to take advantage of its full potential.

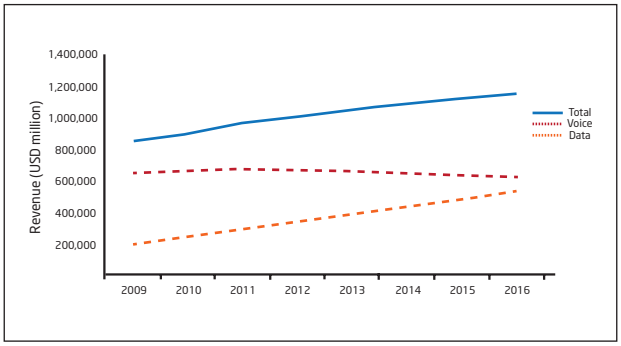
Furthermore, without fully understanding existing resources, operators run the risk that future capex investments will not reap the expected benefits—or may not even actually be necessary.

INTRODUCTION

Modern cellular networks are among the most complex technological structures in the world. They are evolving at a fearsome pace, driven by huge enthusiasm among the global user base for an ever-expanding range of data services. Operators are embracing customer experience as a key means of differentiation, and looking to tiered pricing strategies that will require guarantees around certain KPIs. For these reasons network performance is more important today than ever before.

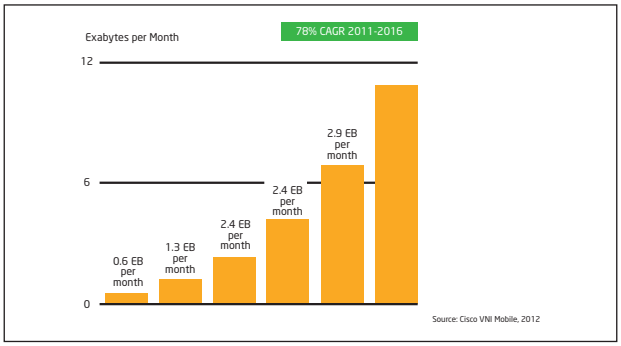
But ensuring optimal performance on a network that is constantly changing is extremely challenging—especially given the disparity between traffic volumes and revenues. As the two charts on this page show, data traffic is set to grow at a far greater rate than the associated revenues. So operators must ensure that their networks are running as efficiently as possible for as little cost as possible.

A mobile network is not a single entity. It is made up of a number of elements and each of those elements must be managed by specialist teams. It follows that each of those teams is motivated to ensure that the performance of their part of the network meets whatever requirement is set by the executive management. Unfortunately it does not follow that, if and when this is done, the network as a whole will be functioning to its full potential.



Service Revenues Forecast

Often, even if the separate engineering teams are hitting all of their targets, network performance will be sub-optimal; and in some cases drastically so. In this situation, the problem will soon become obvious. Services will be failing, independent tests by the regulator will be highlighting shortcomings in the network's performance and—most importantly—customers will be complaining.



Global Mobile Data Traffic, 2011 to 2016

The reason is simple: all too frequently there is nobody within the network operator who is properly positioned to take a step back, form an end-to-end view of the network and recommend the appropriate measures to improve its performance.

Nominally this is the responsibility of the CTO. But practically it is the CTO's job to ensure that the network meets the requirements set out by the executive management team—including the CEO, and the senior managers in charge of finance, marketing, sales, customer experience and service development, among others. In trying to meet all of these needs, the CTO might in fact be giving conflicting targets to his engineering teams.

Consider a simplified example of two of these essential elements; the transmission network and the radio access network:

It is very expensive to deploy and maintain a high bandwidth link to each NodeB or eNodeB in an operator's network; especially if those links are E1 lines. The CFO will want cost managed downwards, so the CTO will require the transmission department to provision the lowest possible bandwidth. Meanwhile the CMO, the head of sales and the head of Customer Experience (where there is one) will want to be able to tell the market that the service they're delivering is the best available. And that means the highest possible throughput on the radio access network.

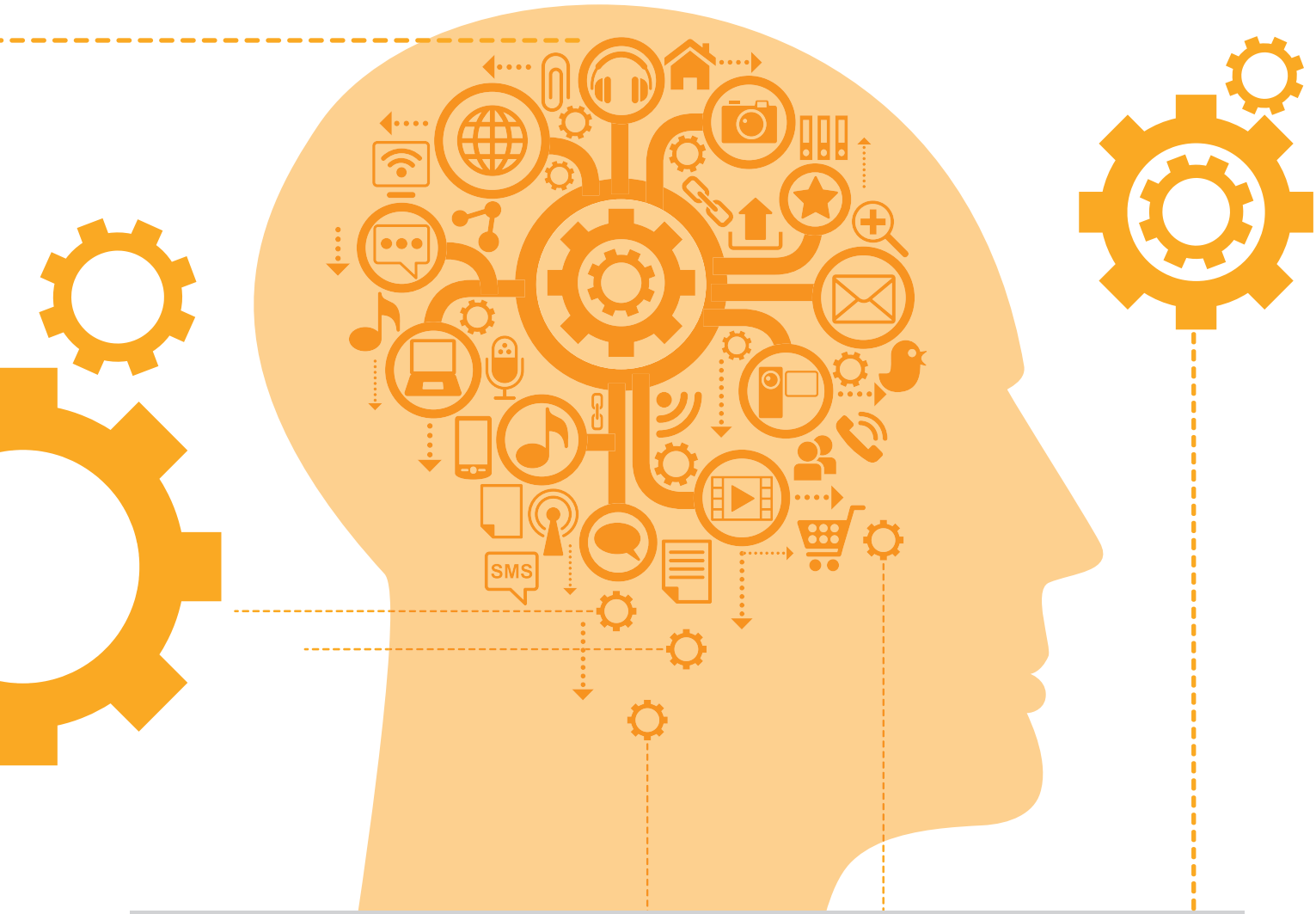
If the RAN is engineered to perform at its optimum level, the transmission team will struggle to manage their cost of provision. If the transmission team gets that cost down by limiting bandwidth, it will simply create a bottleneck that impacts the performance of the RAN. And yet both teams are working to optimise their network elements in line with their KPIs.

In an ideal world these two teams—along with all the others—would communicate the conflicts inherent in their targets and work to find a solution. But this is not an ideal world, and all too often the time and inclination to communicate are lacking—largely because these teams are so focused on hitting the targets that have been set.

It is far easier for someone with an independent, external point of view—one that appraises the network both as a whole and as a series of individually managed components—to identify these problems. More importantly, an external network optimisation specialist is also better positioned to identify the solutions.

The situation is complicated by the fact that mobile networks are in a constant state of flux, with operators regularly introducing new nodes, updating software, bringing new services online and provisioning new devices. Those devices, of course, are receiving frequent OS updates and being loaded with new applications by their owners on a weekly, or even daily basis.

Every day the mobile network is changing, and yet the mobile operator may not be aware of all the shifts. Periodic network assessments and optimisation processes can track changes in the network, gauge their impact and make the necessary adjustments.



INDEPENDENCE IS ESSENTIAL

Of course all mobile operators work closely with their network equipment suppliers, and those vendors tend not to use third party specialists for optimisation. The network vendors have huge expertise in technology, one can reasonably argue, so why is there any need to employ another organisation?

The answer is that vendors generate a lot of their revenue by selling infrastructure, and it is in their DNA to respond to performance issues in their customers' networks by recommending the purchase of more infrastructure. This approach persists despite the increasing importance of managed services and outsourcing to vendors' balance sheets, and despite the fact—as they are always keen to stress—that the service and supply elements of their business are separately run.

This is their business, after all, and there's nothing wrong with them trying to sell more product.

But an independent optimisation specialist will be far more likely to give two particular types of response to an operator's network performance problems than a vendor—and both are critically important to operators. The first is that, if further capex is required, the independent player has the experience and the freedom to recommend whichever product from whichever vendor is best suited to any given situation. The second is that perhaps there is no capex spend required in the immediate term at all. The optimisation specialist derives revenues by squeezing every last drop of performance out of the network.

Kapsch has often seen equipment deployed in the core network that doesn't perform well. A prime example is units that are intended to do traffic compression and TCP optimisation. But TCP doesn't need to be optimised; in fact it works best when just left alone. Anything you try to do with TCP apart from reducing the maximum segment size can only impair its performance—but operators are still using these TCP optimisation products because they are convinced by equipment vendors that their networks will perform much better if they use these extra boxes. And most of the time the effect is quite the opposite.

SWEAT YOUR ASSETS AND FOLLOW THROUGH WITH THE TESTS

Mobile operators invariably generate more information about the performance of their network than they are using in their own process of optimisation. Working with an optimisation specialist allows the full breadth of the network to be mined for essential data, meaning operators don't have to spend money on their own expensive monitoring tools, while at the same time creating a truer picture of the quality of service they are providing.

In some instances it is in fact the case that the network will perform more efficiently if certain previously deployed components are removed as a result of the measurement process, actually reducing the cost of running the network, while improving its output.

In other scenarios equipment that has been deployed may not have been properly configured, or may be failing to interoperate with other network elements.

In many cases new network equipment is deployed without key interoperability tests being performed that will highlight issues between kit from different vendors. As we have seen, mobile operators are under enormous pressure to build out their network as quickly and cheaply as possible. Thorough interoperability testing is a frequent casualty of these pressures.

Often operators simply won't ask their equipment suppliers to carry out the interoperability tests because they take too long, or are too expensive. Depending on the network elements being deployed, interoperability tests can cost anywhere between €50,000 and €500,000 and delay deployment as both vendors take several weeks to conduct their share of the tests.

If a problem is identified during the test it can take time for all parties to reach an agreement as to where the fault sits; which piece of kit or which vendor has, in this instance, not conformed to the specifications. Then there needs to be a decision as to who is going to be responsible for fixing the problem. It is not surprising that operators are wary of initiating this process.

And even when they do commission interoperability tests the results are not always as helpful as they could be. Equipment can pass a vendor's test and reach deployment stage but the checks carried out after deployment are often designed to test whether or not the equipment enables the function it is intended to enable, rather than to establish how effectively it enables that function.

Experience shows that some combinations of elements from different vendors perform less well than others. All of the major equipment vendors excel in certain areas, and all of them have their weaknesses. Crucially, however, the quality of support offered by vendors can vary significantly from market to market. This underlines once more the importance of an independent, third party optimisation specialist.

OPTIMISATION IS A PEOPLE ISSUE

A network can only perform as well as the engineers in charge of its operation and it is essential that the right people are involved in any project concerned with optimisation. The operator employees with the best insights to offer are those at the network's coal face. They understand better than anyone else on the payroll the limitations and shortcomings of their network and experience tells us that they can find it frustrating trying to ensure that their feedback passes up through the layers of middle management.

Any optimisation specialist will most likely be pitching to the CTO and this creates a unique opportunity to channel primary information about network issues directly to the board member responsible for authorising essential improvements. The pre-project research phase conducted before any optimisation project involves close interaction with the coal-face engineers. So when the recommendations are made, they are based on data that has not been diluted by filtering through the internal management structure.

WHERE ARE THE BIGGEST PROBLEMS?

There are two ways of looking at the problems in the network; either in terms of service or in terms of network component. It is essential that the right questions are asked, however. Often operator engineers might ask the optimisation specialist to improve the responsiveness of Facebook, for example. But that is not a parameter that can be measured. What can be gathered, on the other hand, are statistics on the performance of Facebook at certain locations, at certain times of the day and on certain devices. The analysis of these statistics, correlated with reference measurements, can help to improve the quality of the statistics being gathered.

You Tube is another service that is a nightmare for network operators, because it is a very popular, bandwidth-hungry service, using between 0.5 to 5Mbps per video stream. If it doesn't get what it wants then it stalls on the screen, and that's an unhappy experience for the end user. The latest iPad has a huge resolution and, when we get a lot of users watching video on that device, the networks are really going to feel the impact.

Partly because of the popularity of these services, the RAN takes a serious pounding. Kapsch has found through thousands of man-hours spent optimising mobile networks around the globe that, 70 – 80 per cent of the time, the RAN is the area of the network that most requires attention. The backhaul layer is the next element most frequently at fault, followed by the capacity and configuration of the core.

Given that a typical operator will have anywhere between 10,000 and 30,000 cells in its network it is hardly surprising that the RAN requires the most attention. This situation is unlikely to change as network architectures evolve to accommodate thousands of small cells. You can't drive test a building full of indoor cells so—particularly as the industry moves towards LTE—the situation is going to become more difficult to manage.

LTE also brings with it another interoperability requirement, as operators cannot rely on single mode devices to deliver familiar service and coverage levels to end users. Furthermore, consumers today understand the benefits of mobile data networks, and are wise to the promises inherent in the deployment of new technology. Operators will have far less time to get LTE right than they have had with previous network rollouts.

CONCLUSION

The need for high quality network optimisation is only going to increase as network evolution gathers pace. More users want access to more services that use more network resource. The greater the demand, the faster operators are going to have to work, and the more difficult it will be for them to ensure optimal performance at the point of deployment.

Kapsch believes that only a specialist in network optimisation that is independent of the operator can offer a truly network-wide view of performance and diagnose any ailments that require treatment. Further, only a specialist that is independent of the equipment vendors that have supplied the operator with its network infrastructure can offer a truly unbiased assessment of the need for further capex, and of the products towards which that capex would be most effectively directed.

The network is the brain behind the mobile service that customers experience. If the operators aren't using their brains to their fullest potential, that service can never be good enough.

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Kapsch CarrierCom is a global supplier and independent system integrator of telecommunication solutions for providers of access, core and transmission networks. In seven R&D centers in Europe and Asia, Kapsch CarrierCom develops applications and services for next generation networks and innovative OSS / BSS solutions. In addition, Kapsch CarrierCom provides an end-to-end service spectrum, which ranges from consulting, designing, installing and integrating, to maintaining, operating and supporting entire networks.

In the public operator segment, Kapsch CarrierCom's customers include service providers such as the companies of the Telekom Austria Group, eircom in Ireland and Chunghwa Telecom in Taiwan. Kapsch CarrierCom is part of the Kapsch Group and has its headquarters in Vienna, Austria.

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