This month's technology topic looks at Software Defined Networks and their benefits and costs in regulated deregulated markets.

Software Defined Networks are presently promoted as a new way of managing multi point and point to point cable, copper, fibre and wireless connectivity. Software Defined Networks support the ability to establish private or public virtual networks and enable multiple operators and service providers to provision or acquire shared delivery and/or storage and/or server bandwidth, also known as 'The Cloud'.

The claim is that this reduces delivery cost and creates additional revenue opportunities through differentiated services that can be dynamically provisioned to meet immediate dynamically changing needs.

The Software Defined Network Layer can be conceptualised as a virtual software switch or router exercising centralized control over remote network devices.

Data flow in a traditional network is controlled by switches and routers each of which has a data plane, control plane and management plane. The data plane also known as the data forwarding plane carries data packets from one port to another in accordance with a set of rules programmed into the device hardware. The control plane applies the logic required to programme the data plane. The management plane allows an administrator to reconfigure the device.

A router decides on where to route a packet or packet flow on the basis of the associated prioritisation. This is achieved in various ways depending on whether it is an IP flow or ATM or Ethernet or commonly IP over any combination of these.

An SDN controller centralizes these control and management plane functions in software running on a server. The assumption is that the controller has a better overview of network routing functions.

This is not very different from traditional service provisioning in which information fed back from individual routers for example on buffer occupancy provides the information needed to decide on routing and traffic prioritisation.

The purpose of the abstraction layer is therefore to make it easier for multiple parties to deliver services from common shared platforms with cost savings realised from more efficient utilisation of shared resources.

It can be argued that software defined networks are a consequence of deregulation. Initially this involved the unbundling of long distance and local loop provision which meant that multiple level service level agreements needed to be established and managed for the users sharing these resources or being served by these resources.

Over time deregulation has extended to almost all parts of telecommunication network provisioning including fixed and mobile wireless networks and more recently mobile broadband networks.

The principles of deregulation are well established and understood. Deregulation increases market competition. Reduced prices stimulate market demand and improve market efficiency. Margin is maintained by improving technical efficiency.

This is where things do not always quite go to plan.

Perversely deregulation often results in a decrease rather than increase in technical efficiency.

There is for example no convincing evidence that unbundling long distance and local loop access has realised any throughput efficiency gains. In cellular and wireless broadband, spectral allocations designed to maximise auction income have made it impossible for operators to realise theoretically achievable increases in spectral efficiency.

The result is that operating margins get squeezed. Operators successfully shift some of the pain to the vendor supply chain but the net result is industry consolidation with many countries now reverting to becoming effective duopoly markets.

The only real beneficiaries of this process are insolvency practitioners and the merger and acquisition industry.

In retrospect what has happened is that the costs of deregulation have generally been underestimated and the benefits of deregulation over estimated. This is because these are not in practice deregulated markets but regulated deregulated markets, deregulated markets where rules and regulations apply.

Service level agreements provide an example of the underestimated costs of regulated deregulation. These are intrinsically adversarial agreements open to dispute. Service levels need to be measured and managed, disputes need to be arbitrated and refunds need to be negotiated and agreed.

And the process involves hundreds of millions of lines of software code. We have never come across a convincing model that captures the capital and operational cost of software code on a per million line basis. It could be estimated from operator ICT budgets but for certain can be stated as significant and increasing over time. Our hunch is that the cost is probably significantly more than the savings achieved from the sharing of delivery resources and as such it should be separately identified as a liability on company balance sheets.

If this is the case then the operators in the strongest fiscal position going forward position are those that own and manage their own networks. Insourcing is going to be the new management mantra. You read it here first. Just think what would happen if you could prove that eliminating a million lines of code from your network yielded a 1% increase in EBITDA?

The final technical point is that the concept of centralized control as a mechanism for improving end to end delivery efficiency is not consistent with either legacy network theory or observed behavioural practice.

Provided packets or packet flows are prioritised accurately at the network edge it is perfectly valid to launch traffic into a network and allow distributed switches and router nodes to find the fastest and or lowest cost path. If they don't arrive in time you have under provisioned your network.

It is fashionable to suggest that profit in the telecommunications industry can only be realised from a process of continuous change and innovation.

The contrary argument is that profit may be more effectively maximised by reinventing the past or at least not abandoning existing systems that can still be shown to have substantial optimisation potential.

And always be wary of substituting software for hardware

A close examination of a software switch will yield the common sense realisation that most of the heavy lifting in these devices has to be realised with hardware accelerators.

The software functionality delivers flexibility but the associated cost will be clock cycles (power drain and latency) and expensive fast memory.

The hardware based network is dead. Long live the hardware based network.

The traditional Telco is dead. Long live the traditional Telco.

Resources

http://public.dhe.ibm.com/common/ssi/ecm/en/qcw03016usen/QCW03016USEN.PDF

https://www.opennetworking.org/sdn-resources/meet-sdn

The inter relationship of market and technology efficiency is discussed in RTT's fourth book '**Making Telecoms Work- from technical innovation to commercial success'** available from the **RTT book shop.**

Also in the Book shop is the new (second) edition of **LTE and the Evolution to 4G Wireless** published by John Wiley and Agilent Technologies and edited by Moray Rumney.

This takes you through the practicalities of Release 10 and Release 11 through 15 and includes insights on the test and measurement implications of each Release for conformance testing and manufacturing test.

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This is the donation page

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Contact RTT

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