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Broadband services and ubiquitous internet access are a big part of today's government policies. Emerging countries, such as India, China and other Asian and African countries are putting significant emphasis on Internet access as well as on moving many critical services to function on top of the Internet. The Digital India initiative launched by the Prime Minister recently and the emphasis on e-Governance makes internet access a critical service for all citizens, where infrastructure will be offered as a utility to every citizen; governance and services will be on demand and citizens will be digitally empowered.

Most people in a country obtain their internet access through fixed line broadband connections at home or mobile broadband connections on their phone or tablets, provided by service providers (Bharat Sanchar Nigam Limited and Airtel in India). Emerging countries consist predominantly of mobile users and eschew fixed line services, either out of convenience or lack of infrastructure.

Today's broadband services need very high levels of reliability particularly with so many critical services and businesses built on top of ubiquitous broadband access. This is particularly an issue in the rural areas of India where internet access is barely functional, leave alone ubiquitous. As more services, news and information become available primarily over the Internet, not providing equal access to information will undermine democracy in the future, because an effective democracy depends on an equally informed and educated citizenry.

Beyond government services, private business services are also strongly pushing the need for seamless internet access. E-commerce companies such as Flipkart, Amazon and Snapdeal are pushing the boundaries by providing products and services that consumers can access from the comfort of their homes. While the current e-commerce business is a fraction of the traditional brick-and-mortar business, the future lies strongly in the direction of e-commerce.

Beyond e-commerce, other business opportunities such as education especially MOOCs – massive open online courses – and banking relies on the availability of internet. The emergence

of Internet of Things (IOT) – a $ 19 trillion market, according to Cisco - means that more and more of our lives are moving online. While some of us may find the constant online access to be intrusive, the benefits far outweigh that perception.

For such services to grow, it is important for broadband access to become seamless. Admittedly this is not an easy problem to solve, particularly in rural India. Infrastructure facilities in rural India haven't kept pace with technology improvements and access is not growing as fast as the demand. It is important that both the government and service providers do all they can – policy changes, infrastructure rollouts, better monthly plans, etc – to help the citizens get access to these services.

Expenditure and revenue generation

There are two important goals for broadband service providers – increase in revenue generation and reduction in operational expense. Today, revenue generation and operational expenditure reduction act in opposite ways - to generate new revenue and provide new services, Service providers have to increase their operational expense by managing more equipment and creating and operating new functionality. Addressing these two requirements in a balanced manner are key requirements for vendors.

Some ways to control the operational expense of turning on and running new services are:

- Centralised manageability

Today, deploying and delivering new services requires changing multiple equipment from different vendors and in multiple geographies. New equipment may need to be brought up and existing equipment upgraded. Interoperability of the diverse and heterogeneous equipment is a key problem to solve. This scenario is not conducive to rapid deployment of new services.

It is important that service providers have a single network-wide view of their operations. More importantly, very high quality modeling and configuration tools are critical, without which, operators will find it very hard to deploy an optimised network at low operational cost. Centralised management allows the operator to get a holistic view of the network.

Centralised management systems will work out the details of each of the devices and provide a service level interface to the operator, with the management system working out the interoperability of the different devices under the hood. Service providers need to be able to create new service level interfaces without constant interaction with the equipment vendor since every round trip to an equipment vendor tends to take significant time. Programmability and modularity in vendor equipment software is the key to achieving rapid service deployment.

- Centralised services

A good management system can hide the unwanted details of the devices and provide a single view to the service provider. But the management system itself becomes much more complex in a large and heterogeneous network. A centralised control and services model can provide the right solution. Centralised control is not applicable in all contexts, but subscriber services are the perfect use case. Once a subscriber has authorised himself into the network, subscriber service management is typically driven from a central point. With the convergence of subscriber services across fixed and mobile networks, centralised subscriber services and management allows for provisioning new services that can work across all types of networks and in a more rapidly deployable manner.

The key part of deploying a new service is the ability to introduce the service in a sandbox environment, test it in a small circle of users and then slowly expand the service as it gets more popular. This is a very key aspect of managing new services - service providers do not have to provide significant upfront capital investment before a new service is completely validated as a revenue generator. When a service provider wants to expand the service, they don't have to add significant capital investment either - the centralised service management provides a single location where scale is needed.

- Powerful analytics

A combined centralised management and services system can provide extremely powerful analytics that can help the service provider understand the network, its usage and how to better optimise the network. The analytics system can provide real time feedback on the performance characteristics of the network and, once sufficient data has been collected, the analytics system can begin to predict the network requirements based on certain characteristics - times of day, days of the year or a specific social event such as a new viral video. Network planning and orchestration becomes much more simplified and predictable. This allows for real-time and

dynamic provisioning of services based on demand from the network rather than the current model, which is less efficient.

Summary

Clearly broadband is a key infrastructure requirement for a growing economy like ours. The government and service providers need to push universal broadband access as a key goal in the near future. Service providers can reduce their operational expense while providing new revenue generating features, in a rapidly deployable manner, through the use of a centralised subscriber services and management system. This allows for better analytics that to predict and design networks that can handle changing demands of subscribers such as video, gaming and other mobile services.

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