Next Generation Network Architectures

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IT'S HOW WE CONNECT

Introduction

Sunny Yeung - Senior Technology Specialist, Telstra Wireless Network Engineering

Technical Lead for Wireless IPv6 deployment
Wireless Mobile IP Edge/Core Architect

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Future Technologies

Future Technologies

There are a may new technologies that will be commercially available within the next 5 years.

Each of these will have a significant impact on how users will both use the network, and on how the network will operate.

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Future Technologies

Is your network sufficiently prepared to support these technologies in terms of Scalable, Available, and ease of management?

How much visibility do you have of these new technologies and their impact to the network so that you can plan for these changes to maintain optimal network operation or take steps to automate?

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Future Technologies

Voice over LTE

Video over LTE

5G

Software-Defined Networking

Network Function Virtualization

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Future Technologies

100G Backhaul

Virtual Evolved Packet Core

Segment Routing

Internet of Things

IPv6

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Future Technologies

Fantastic buzzwords for Engineers and Managers. But what is the realistic impact of these technologies on the network and the future architecture? How can they be integrated into the network?

What is the real requirement of the network?

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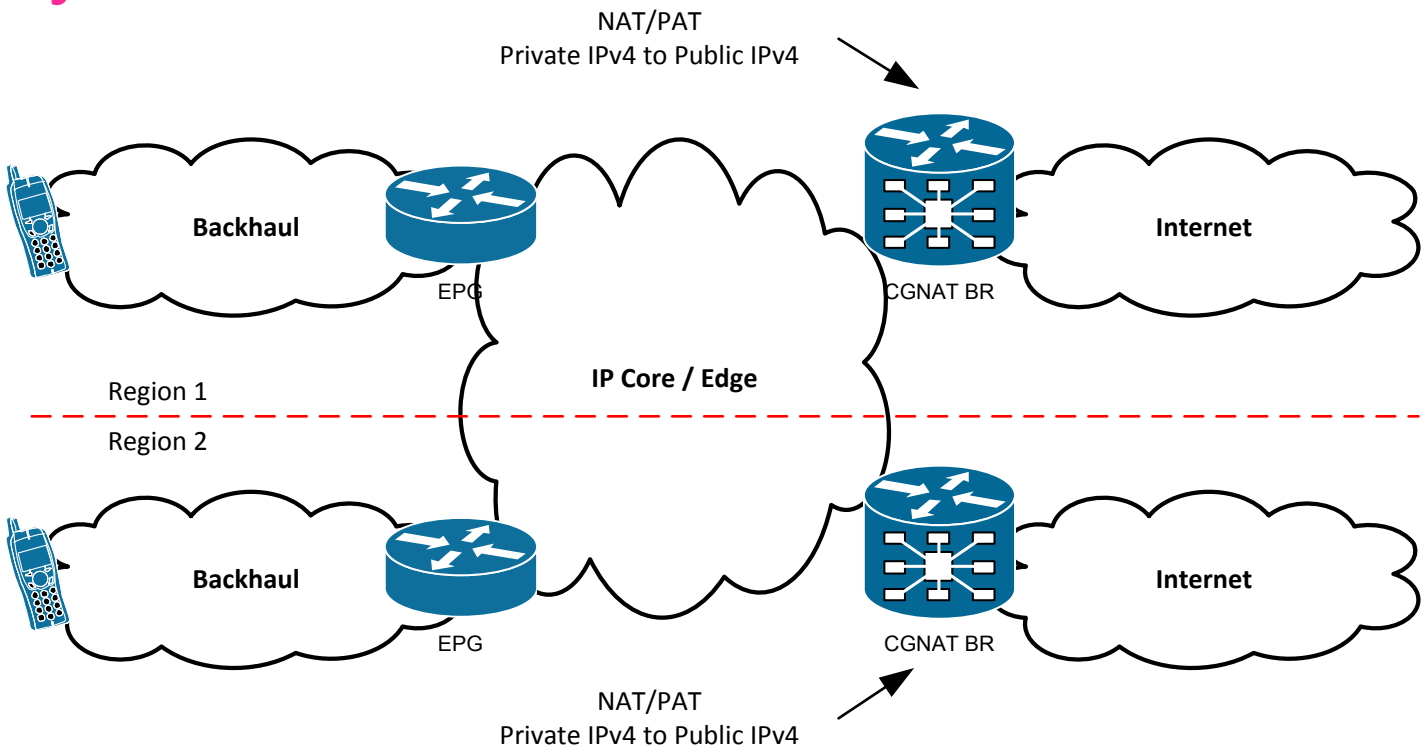
Today’s Wireless Network Architectures

Today's Wireless Network Architectures



RFC1918 IPv4 Private Address space used for UE assignment for each APN.

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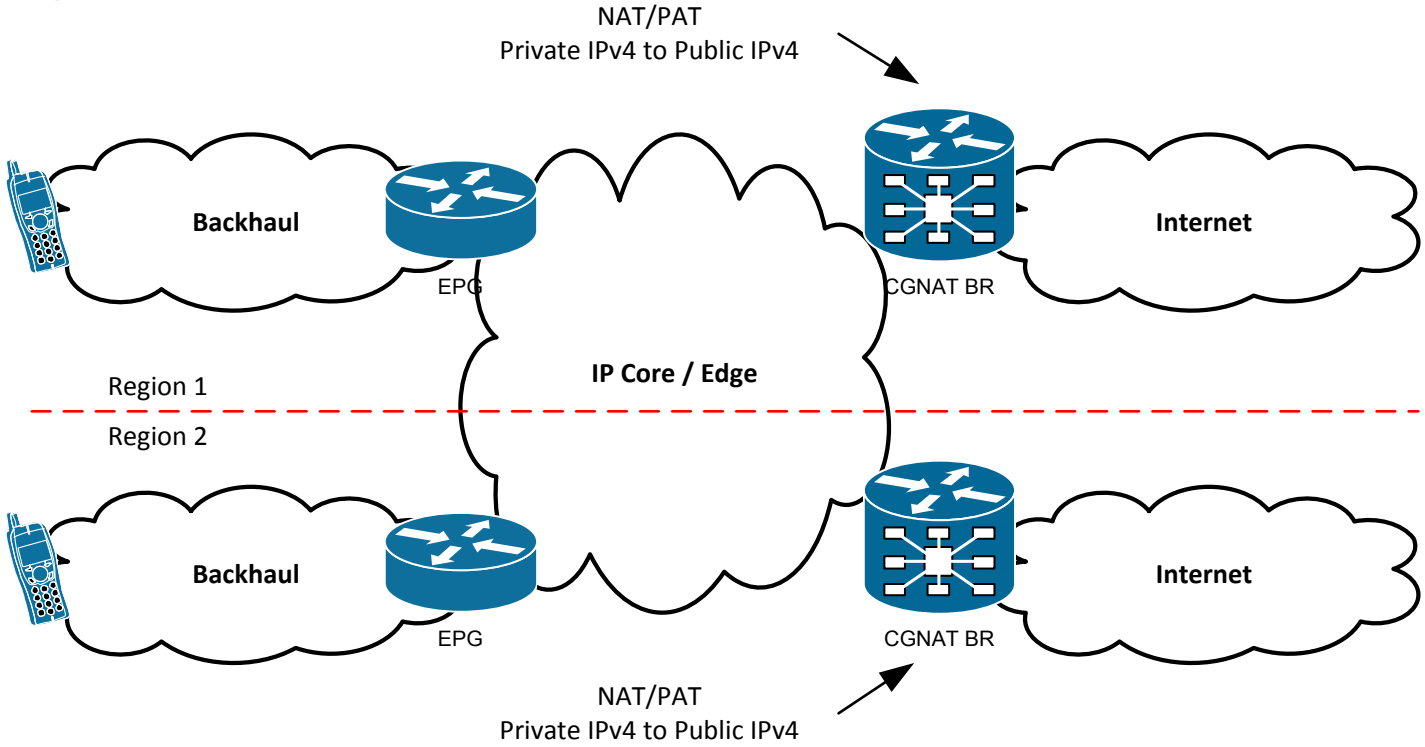
Today's Wireless Network Architectures



CGN performs NAT/PAT 44 - PAT substantially reduces Public and Private IPv4 address demand, but does not prevent IPv4 address depletion.

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Today's Wireless Network Architectures

Classic MPLS Core

- IGP + LDP
- No IGP/LDP synchronization
- IPv4 transport

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Today's Wireless Network Architectures

IP Edge

Access-Layer for network. IGP + EGP based using OSPF/IS-IS/BGP.

Policy Based Routing.

Virtual Routing Functions for 3GPP interface type traffic separation.

NAT44 translations for CGNAT Border Router to Internet.

CDNs located in ISP.

Performs all other network functions like NMS, DNS, Header Enrichment etc.…

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Today's Wireless Network Architectures

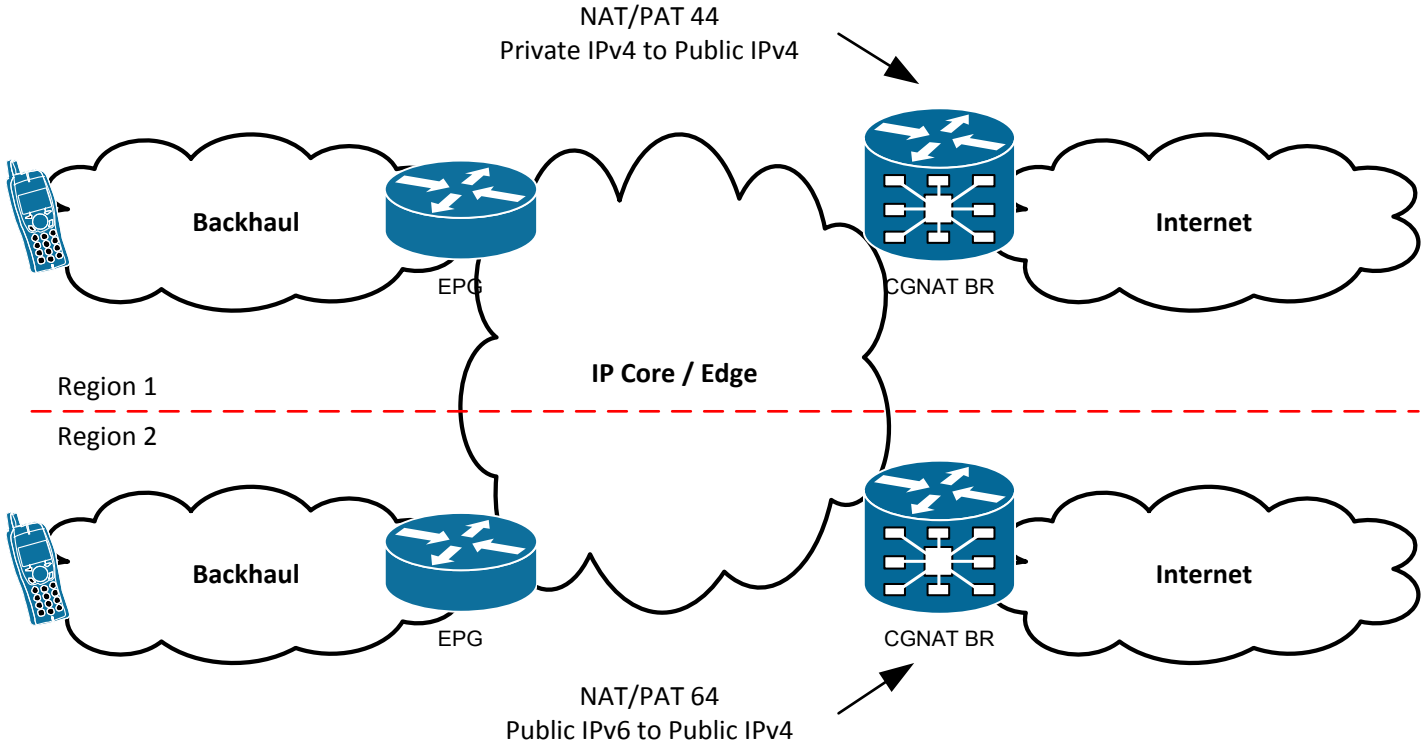
Backhaul

L2VPN / L3VPN or MPLS

Static Routes and manual site provisioning

The IPv6 factor

IPv6 Wireless Network Architectures



RFC1918 IPv4 Private Address space used for legacy UE assignment for each APN, and IPv6 GUA for IPv6-capable UEs

CGN performs NAT/PAT 44 and NAT/PAT 64

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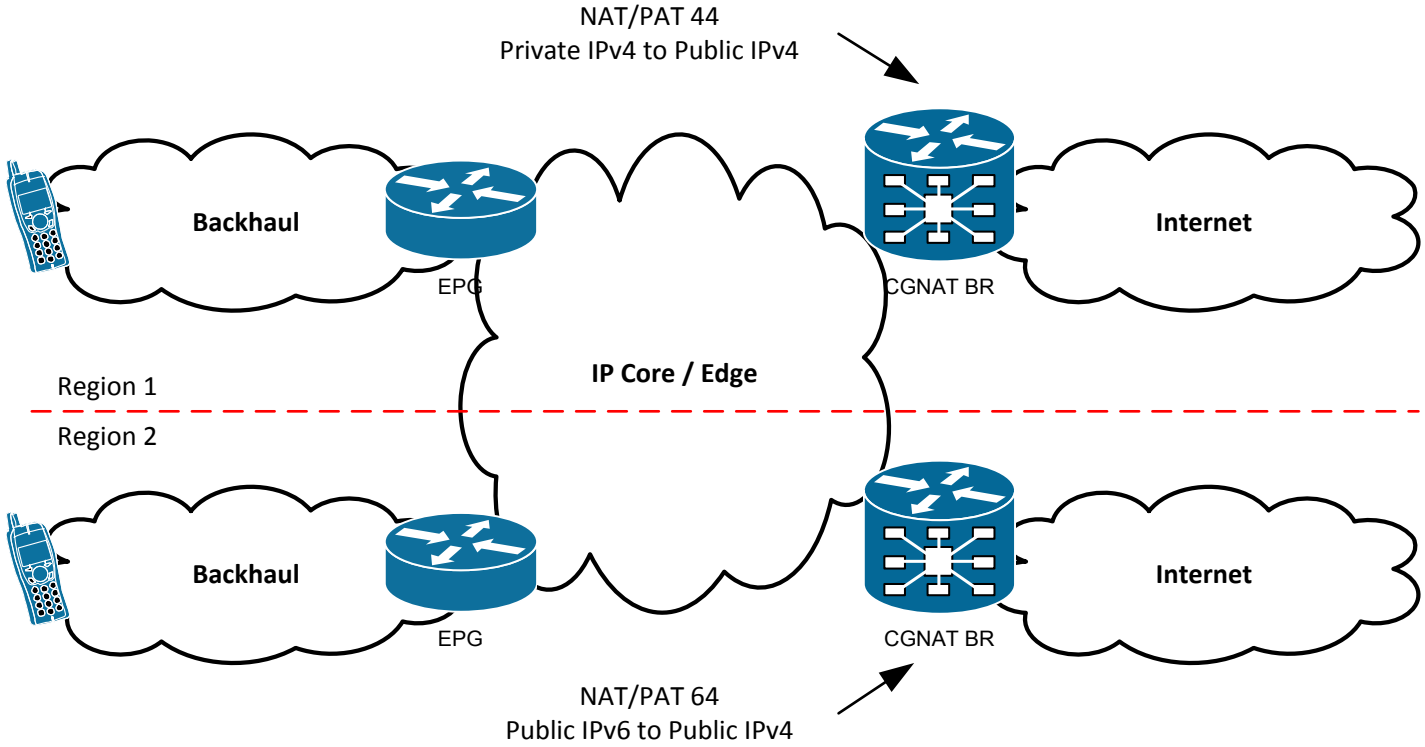
IPv6 Wireless Network Architectures



Backhaul is maintained as IPv4 transport

Core is 6VPE Dual-Stack enabled

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IPv6 Wireless Network Architectures

Classic MPLS Core

IGP + LDP

No IGP/LDP synchronization

IPv4 transport + 6VPE

IPv6 Wireless Network Architectures

IP Edge

Access-Layer for network. IGP + EGP based using OSPFv3/IS-IS/MP-BGP.

Policy Based Routing.

Virtual Routing Functions for 3GPP interface type traffic separation.

NAT44 and NAT64 translations for CGNAT Border Router to Internet.

CDNs located in ISP.

Performs all other network functions like NMS, DNS, Header Enrichment etc….

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IPv6 Wireless Network Architectures

Backhaul

L2VPN / L3VPN or MPLS

Static Routes and manual site provisioning

What are we actually building for?

What is the issue?

People want more Video

Solutions

Bandwidths need to be increased to 100G +

Place CDNs closer to the user. The less hops the better!

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What is the issue?

Some Future Technologies require lower latency in the IP Core/backhaul/Edge

Solutions

Network architecture to reduce hops, and simplify the reliance on Policy-Based Routing and routing protocols. E.g. Segment Routing

Regionalization of the network – bring content and exit points closer to the user.

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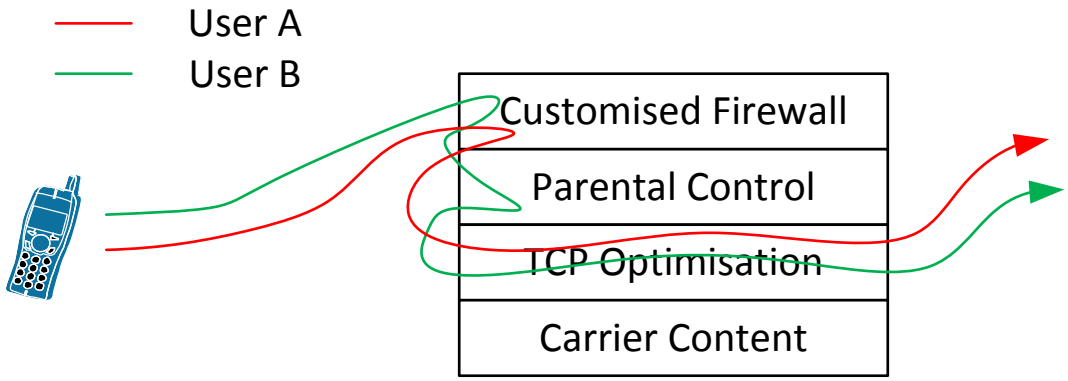
What is the issue?

Multiple ‘touch-points’ for additional carrier services requires complex policy-based routing to occur



Solution

Introduce Software-defined Networking to help with traffic steering. Associate with PCRF functions (Gx) that recognize specific subscribers and push users on a specific traffic path

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What is the issue?

Lots of ‘things’ want/need to be connected to each other to do a lot of ‘things’

Solution

Ensure the architecture is based on IPv6 address allocations to end-devices

Bring in Cloud-like architectures that offer flexibility, scalability, and connectivity for devices to go anywhere they need to go

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What is the issue?

The Network should be as easy to provision as simply ‘checking boxes’ on a checklist of the required functions.

The network should be able to recognize issues / problems, and automatically ‘self-heal’ and provide incentives to inconvenienced customers (customer advocacy!)

Simplified Network Management and Operational support

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What is the issue?

Solution

Bring in Cloud-like architectures that offers flexibility and scalability.

Use network visibility tools and technologies to feed information into the SDN network.

Introduce Segment Routing – simplified networking compared to classic MPLS.

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A possible next generation network architecture:

Simplified perspective:

Simplify the IP Core/Backhaul/Edge using Segment Routing and SDN for traffic steering.

Edge services should just ‘connect’ to the core.

100G Backhaul?

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A possible next generation network architecture:

Simplified perspective:

Virtual Evolved Packet Core for non-centralized locations

Virtual Machines for NMS and other network functions such as DNS

CDNs placed closer to the user and IPv6 enabled

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Considerations for a virtualized world

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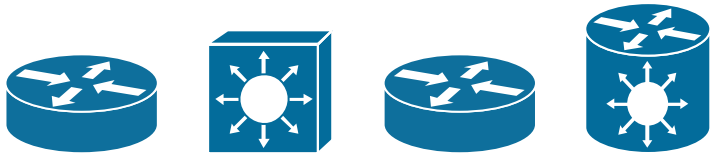
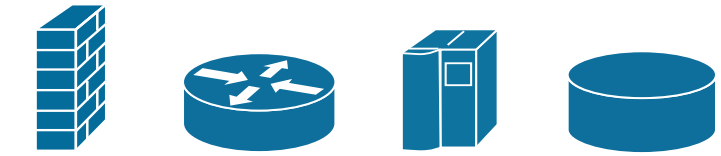
What is the issue?

Service Providers want to virtualize network functions to reduce OPEX/CAPEX expenditure





Throughput and the number of connections are the biggest issues with virtualization.

Functionality is available everywhere. How do you resolve 100G interfaces with x86 and VMs?

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Where can we start?

- Route Reflector
  - It's a glorified database. Why can't it exist on an x86 box? There is no major throughput requirement

- Firewalls
  - Only a small percentage of traffic traverses it. Why not virtualize it and make it part of the service chain and sell it as a service?

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Where can we start?

- DNS
  - It's a server. It can exist on a VM today.
- Syslog / SNMP / Radius / TACACS
  - These are NMS systems that can exist on a VM today.

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Before you begin…

Are you sure the VM system is IPv6 capable?

Is the application IPv6 ready?

Do potential clients need to be IPv6 ready also to take full advantage of the network architecture?

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It’s a carrier / content world

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It’s a battle between the titans

Most traffic from users is encrypted nowadays compared to a few years ago.

If a customer raises an issue, is it the carrier’s fault or the content provider’s problem? How does a carrier actually carry out any troubleshooting in this environment?

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It’s a battle between the titans

IPv6 content in some networks may cause some issues with efficiency in network troubleshooting. Eg. Dual-Stack. How does one actually identify which protocol the end-user is actually using at any one time?

Carriers cannot be held responsible if an application fails. But customers will generally not care whose fault it is. **It is just expected to work!**

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Are carriers becoming obsolete?

Increasingly Apps and content providers are performing the functions previously provided by a carrier service:

Video over 3/4G? We all use facetime or other app

Carrier provided content? We have a global source of news – and people also have new sources such as twitter/Instagram

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Are carriers becoming obsolete?

The content provider is not concerned with how the user reaches its content. But their users demand that it be fast!

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Are carriers becoming obsolete?

A simplified and converged Fixed/Wireless core is a must for the future carrier network architecture, for carriers to survive into the next decade.

Regionalization must be prevalent. With the partnership of IX's, OTT services must be provided locally to reduce latency for users.

WiFi is NOT everywhere. Cellular Services will still be required – especially in regional areas. The role of the carrier is very much here to stay.

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Are carriers becoming obsolete?

Anyone can build pipes. But it takes real engineering and management to maintain these pipes, and construct a solid, robust, simple, and intelligent internetwork to provide customers of both carriers AND content providers a fantastic internet experience.

Without a carrier or IX, are you going to be able to reach your potential global audience?

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Conclusion

Conclusion

Yes! All the Buzzwords are great for customers and carriers. But Analyze! Analyze! and Analyze!

Use your current investments wisely. Do you really need SDN right now? If you introduce it, what are the ramifications?

Capacity and Throughput are critical. Can your cloud/VM environment really handle what your hardware appliance is doing today and into the future?

Conclusion

Don’t over-virtualize a carrier core network.

A next-generation network architecture is a network architecture that is lower latency, automated, simpler to manage, easier to configure, self aware, with high throughput. It works closely with content providers and utilizes network intelligence to optimize the traffic path.

Start planning today before its too late!

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CONTACT

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Contact

Sunny Yeung

Senior Technology Specialist
Telstra Wireless Network Engineering

sunny.yeung@team.telstra.com

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