JUNIPER NETWORKS

DEFINING YOUR NBN SERVICE OFFERINGS

Tim Nagy
17 April 2013

AGENDA

1. Overview of NBN Connectivity

2. Choosing Your Subscriber Termination Type

3. Automating Subscriber Connections

4. Sample BNG Builds Compatible with NBN

5. Advanced Topics: CoS, Billing Integration

6. Summary

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THE NATIONAL BROADBAND NETWORK

Over 34,500 active connections as of January 2013

>10,000 of those are active fibre connections

Network roll-out map can be found at:
http://www.nbnco.com.au/rollout/rollout-map.html

54,000 projected active fibre connections, >91,000 active total connections by June 2013
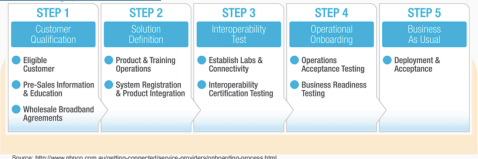

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ESTABLISHING NBN CONNECTIVITY

Service Providers ("Access Seekers") connect in one or more Points of Interconnect (121 POIs in total)

Onboarding process includes connectivity and product testing at an NBN facility

More details at:
http://www.nbnco.com.au/getting-connected/service-providers/onboarding-process.html

STEP 1 Customer Qualification	STEP 2 Solution Definition	STEP 3 Interoperability Test	STEP 4 Operational Onboarding	STEP 5 Business As Usual
● Eligible Customer	● Product & Training Operations	● Establish Labs & Connectivity	● Operations Acceptance Testing	● Deployment & Acceptance
● Pre-Sales Information & Education	● System Registration & Product Integration	● Interoperability Certification Testing	● Business Readiness Testing	
● Wholesale Broadband Agreements				

Source: http://www.nbnco.com.au/getting-connected/service-providers/onboarding-process.html

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NBN WHOLESALE PROVIDERS

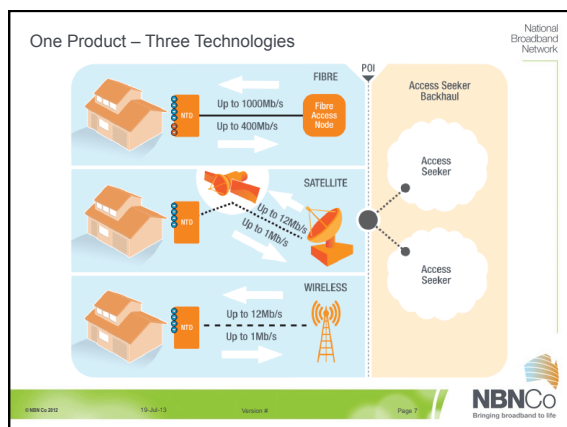Another option is to get connected via a wholesale provider
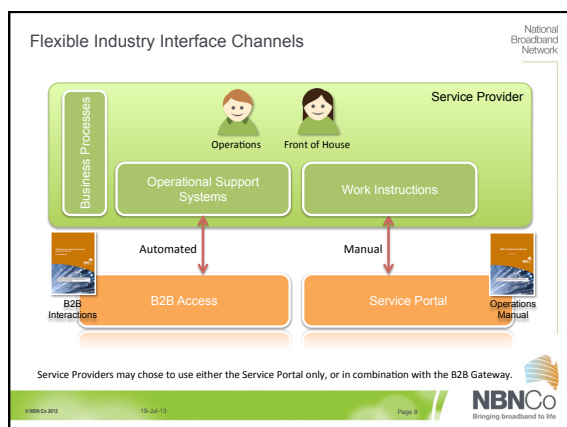- Options range from layer 2 aggregation of all POIs to a white-label retail service

Full list of wholesale providers here:
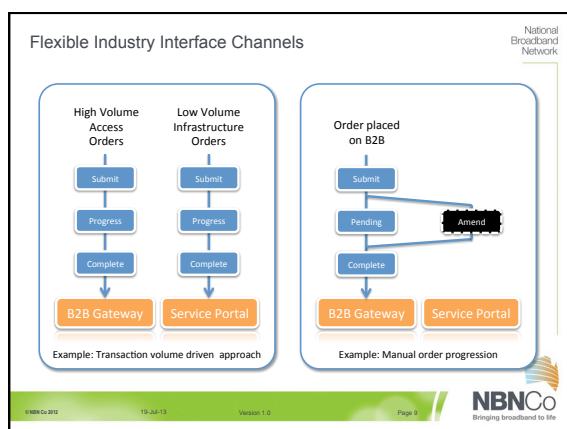http://www.nbnco.com.au/getting-connected/service-providers/wholesale-service-providers.html

Service provider	Phone	Website
AAPT		www.aapt.com.au
Amcom	1800 428 428	www.amcom.com.au
Aurora Energy	1800 650 779	
Clear Networks	1300 855 215	www.clearnetworks.com.au
Eftel	1300 4 EFTEL	www.eftel.com/wholesale.cms
ispONE	1300 663 400	www.ispone.com.au
Nextgen Networks	1300 653 351	www.nextgennetworks.com.au
Optus		www.optus.com.au/wholesale
PIPE Networks	13 PIPE (13 7473)	www.pipenetworks.com
Platform Networks	02 9191 9000	www.platformnetworks.net
Symbio	1300 363 909	www.symbionetworks.com
Telstra Wholesale		www.telstrawholesale.com.au

Source: http://www.nbnco.com.au/getting-connected/service-providers/wholesale-service-providers.html

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One Product – Three Technologies

Flexible Industry Interface Channels

Flexible Industry Interface Channels

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SUBSCRIBER TERMINATION: PPPOE, DHCP, AND L2TP

Three primary mechanisms are available for subscriber termination:

- PPPoE: Point-to-Point Protocol over Ethernet
- DHCP: Dynamic Host Configuration Protocol
- L2TP: Layer 2 Transport Protocol, used for transporting PPP frames over an IP network

Generally speaking, L2TP and PPPoE are viewed as legacy protocols

- Primary disadvantages of PPP are:
  - Overhead added to each frame (8 bytes)
  - No multicast support

All options are supported on MX-Series in combination or separately

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RETAIL SERVICE PROVIDER CONNECTIONS TO NATIONAL BROADBAND NETWORK
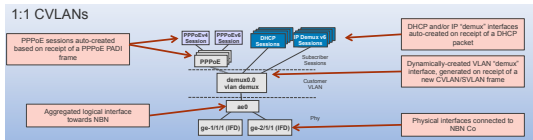
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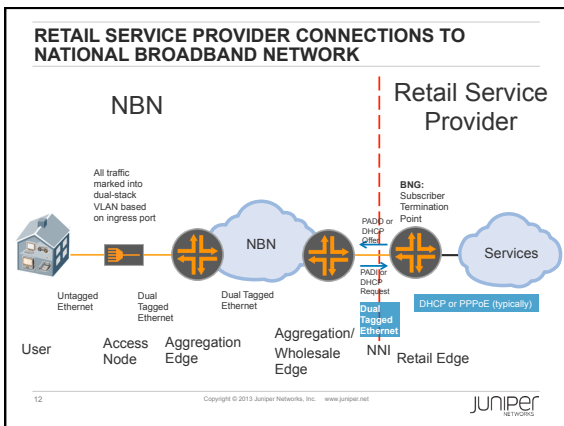
LOGICAL VIEW OF SUBSCRIBER SESSIONS

NBN Co uses the "1:1 CVLAN" model, where every subscriber has a unique CVLAN/SVLAN combination per POI
- Separate broadcast domain per subscriber

Higher-layer PPPoE/DHCP connections layered on top of the Customer VLAN interface

1:1 CVLANs

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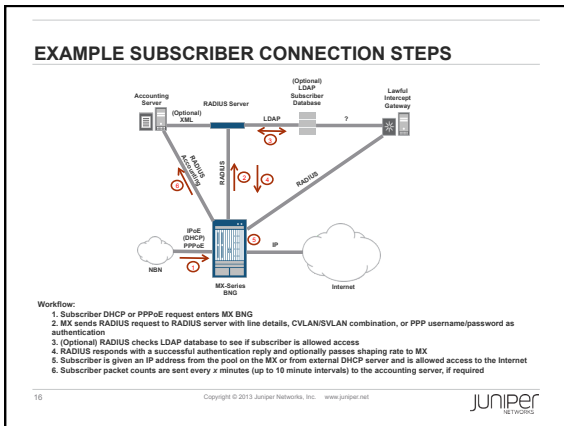

STATIC CONFIGURATION DOESN'T WORK IN 2013

With a fully automated B2B interface and a standardised NNI, there is a compelling argument to fully automate the addition of subscribers to your network

Juniper's principles for NBN automation are:
- Maintain identical config on all routers – zero touch for subscriber adds/deletions/changes
- Automatically sense and create subscriber connections at the router level
- Store customer information in a separate, off-router database

The end result being a lower cost to operate and maintain the network

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EXAMPLE SUBSCRIBER CONNECTION STEPS

Workflow:
1. Subscriber DHCP or PPPoE request enters MX BNG
2. MX sends RADIUS request to RADIUS server with line details, CVLAN/SVLAN combination, or PPP username/password as authentication
3. (Optional) RADIUS checks LDAP database to see if subscriber is allowed access
4. RADIUS responds with a successful authentication reply and optionally passes shaping rate to MX
5. Subscriber is given an IP address from the pool on the MX or from external DHCP server and is allowed access to the Internet
6. Subscriber packet counts are sent every *x* minutes (up to 10 minute intervals) to the accounting server, if required

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BROADBAND NETWORK GATEWAY HARDWARE OPTIONS – JUNIPER MX-SERIES

MX 3D Family
Same Trio Chipset, Same Services
Extending Scale, Reach & Access

80 Tbps
40 Tbps
5.3 Tbps
2.88 Tbps
960Gbps
20Gbps   40Gbps   60Gbps   80Gbps

MX 5 | MX 10 | MX 40 | MX 80 | MX 240 | MX 480 | MX 960 | MX - 2010 | MX - 2020

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TWO OPTIONS FOR NBN BROADBAND NETWORK GATEWAYS

Mid Scale: MX5

Scaling:
- 16,000 PPPoE or DHCP subs
- 4,000 L2TP subs
- 20-80 Gbps throughput

Can start at MX5 (20 Gbps) and upgrade with license keys to MX80 (80 Gbps)

Large Scale: MX960

Scaling:
- 128,000 PPPoE or DHCP subs
- 32,000 L2TP subs
- 5.3 Tbps throughput

MX240/480/960 are virtually identical in price, so buy the largest chassis that you can fit in your rack

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SAMPLE MID-SCALE BUILD OF MATERIALS

Part Name	Part Description
MX5-T-AC	MX5 AC chassis with timing support - includes dual power supplies, MIC-3D-20GE-SFP, Junos, S-MX80-ADV-R, S-MX80-Q & S-ACCT-JFLOW-IN-5G licenses.
S-MX80-SA-FP	Subscriber Management Feature Pack License on MX80 Series
S-SA-4K	Subscriber Access Feature Pack License Scaling Limit to 4K Subscribers, MX and M Series

Notes:
1. Purchase additional S-SA-##K licenses to grow subscribers
2. Optics are separate – uses SFP optics
3. Can grow to 80 Gbps with purchase of MX5->MX10, etc., licenses

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SAMPLE LARGE-SCALE BUILD OF MATERIALS

Part Name	Part Description
MX960BASE3-AC	MX960 Base Bundle, AC power
JUNOS-WW-64	Junos 64-bit Internet Software Worldwide Version
RE-S-1800X2-8G-UPG-BB	Routing Engine, Dual Core 1800Ghz with 8G Memory
PWR-MX960-4100-AC-BB	MX960 4100W AC Power Entry Module, Base Bundle
SCBE-MX-BB	MX-series Enhanced Switch Control Board, Base Bundle
MX-MPC2-3D-EQ-R-B	MX-MPC2-3D-EQ line card bundle, price includes full scale L3, L2 and L2.5 features
S-SA-FP	Subscriber access feature pack license for MX240, MX480, MX960
S-SA-4K	Subscriber Access Feature Pack License Scaling Limit to 4K Subscribers, MX and M Series

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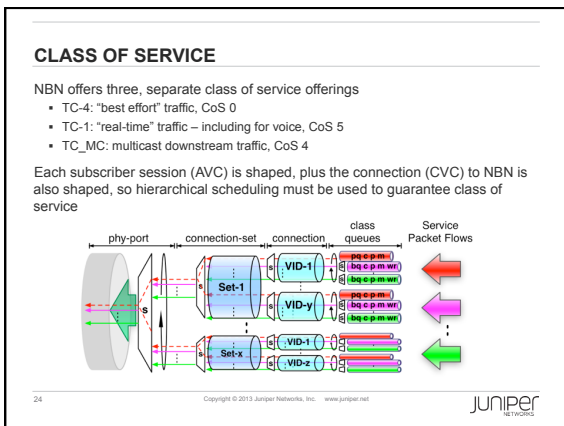
OPTIONAL ADD-ONS TO THE BUILD

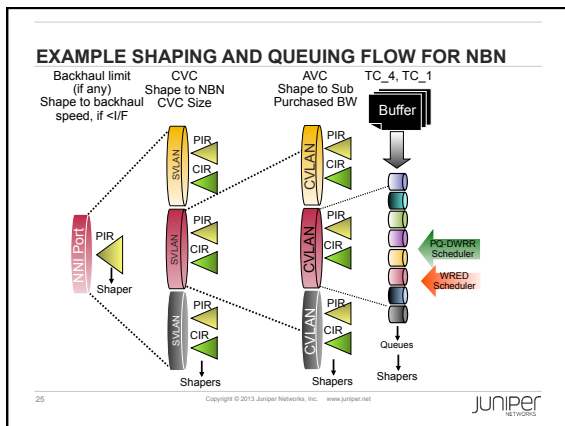| Part Name	Part Description
(MX240/480/960 Only) S-SSM-FP	Subscriber Service Management Feature Packet License (RADIUS/SRC Based Service Activation and Deactivation) Per-Service Accounting Features for Subscribers, MX and M Series
(MX5-80 only) S-MX80-SSM-FP	Subscriber Service Management Feature Packet License (RADIUS/SRC Based Service Activation and Deactivation) Per-Service Accounting Features for Subscribers, MX80 Series
S-SSP-FP	Subscriber Traffic Lawful Intercept Feature Pack License, MX and M Series
S-LNS-IN	Software License for LNS

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CLASS OF SERVICE

NBN offers three, separate class of service offerings
- TC-4: "best effort" traffic, CoS 0
- TC-1: "real-time" traffic – including for voice, CoS 5
- TC_MC: multicast downstream traffic, CoS 4

Each subscriber session (AVC) is shaped, plus the connection (CVC) to NBN is also shaped, so hierarchical scheduling must be used to guarantee class of service

EXAMPLE SHAPING AND QUEUING FLOW FOR NBN

CLASS OF SERVICE – ROUTER-GENERATED PACKETS

TC-4 and TC-1 services require that all packets entering the service be marked with 802.1p bits 0 or 5, respectively

Note: sample configurations have the "rewrite-rules" command under "host-outbound-traffic" to ensure that router-generated packets, such as DHCP and PPPoE packets, are correctly marked

Without this command, router-generated packets are by default marked using CoS 6 or 7

USAGE-BASED BILLING SYSTEM INTEGRATION

Two options are available for usage-based billing:
- J-Flow (Netflow) with inline statistics being generated on the ASIC
- RADIUS accounting – accounting records sent every few minutes to the RADIUS or accounting server showing byte counts for each interface

While either option is feasible, J-Flow for billing tends to put a heavy load on the servers that process the records. It's not unusual to take more than an hour to process and sort an hour's worth of traffic, making this solution unusable.

RADIUS accounting requires little processing, however, and is generated per user by default. Virtually all billing systems can natively handle RADIUS accounting records and tie these to the username.

LAWFUL INTERCEPT

Two approaches are available for lawful intercept:
- RADIUS signaling of intercept targets
- DTCP – an XML interface over SSH to the router that signals intercepts

Either method is feasible with both resulting in the same ASIC-based, wirespeed output of intercepted traffic to a monitor port.

In both cases, intercepted users are not visible in the CLI on the MX-Series.

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NOW IS THE TIME TO CONSIDER NBN CONNECTIVITY

With over 10,000 fibre users already and over 50,000 forecast by mid-2013, now is the time to connect to NBN

NBN has taken care of the access network for you – and this is traditionally the most difficult part of subscriber networks – so all that is required is an NNI and a Broadband Network Gateway

With a modest investment, you can start offering services on NBN almost immediately

ADDITIONAL RESOURCES FOR NBN DEPLOYMENTS

Juniper

Day One Guide for Subscriber Management – an 88-page guide detailing how subscriber management works on MX-Series:
http://www.juniper.net/us/en/community/junos/training-certification/day-one/networking-technologies-series/dynamic-subscriber-management/

NBN

Product specifications for fibre access and UNI-V:
http://www.nbnco.com.au/industry/service-providers/agreements/wba.html
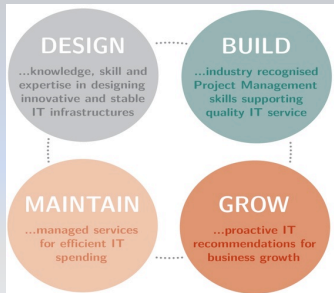
everywhere

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References