Multicast & Facilities Access

Sydney 31st August 2011

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# Agenda

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The Benefits of Multicast

- Enables Access Seekers to inject their channel line-up one time at each Point-of-Interconnect, & have that content replicated & sent to thousands of End-Users.

- Makes one-to-many video transmission more efficient & economical. Cost effective delivery of IPTV & other video content - saving on backhaul costs.

- Provides new interactivity & innovation opportunities.

[Diagram showing dedicated vs shared multicast access]

- DEDICATED TO A SINGLE END-USER
- SHARED AMONG MULTIPLE END-USERS

- Media Streams Injected Once
- 200Mbps Channel Line-up
- 200Mbps Multicast Domain
- Multicast Access Virtual Circuits

NBN Co Point of Interconnection
Multicast

1. Multicast is a feature available on the fibre access network.

2. NBN Co are currently working through what the potential satellite and wireless versions may look like.

3. Multicast is purchased in addition to the standard ethernet bitstream broadband & telephony.

4. Multicast requires Access Seekers to purchase a Multicast Access Virtual Circuit & a Multicast Domain.
User Network Interface – Data (UNI-D) Port:
- A separate/additional UNI-D port is not required for delivery of Multicast traffic.
- Multicast traffic is delivered over the same UNI-D port being used for delivery of the standard Ethernet Bitstream product.

Multicast Domain:
- A separate Multicast Domain is required for delivery of Multicast traffic.

Access Virtual Circuit (AVC):
- A separate/additional Multicast Access Virtual Circuit is required for delivery of Multicast traffic.

Network-to-Network Interface (NNI) Port:
- Multicast traffic is delivered over the same NNI Port being used to deliver standard Ethernet Bitstream traffic.
1. **Required for each End-User UNI-D** receiving Multicast content.

2. **Terminates on the same UNI-D port** being used for delivery of broadband services.

3. Should be dimensioned at the required combined **simultaneous viewing & recording capacity** of the premises.

4. **Initial size of 20 Mbps.** Additional increments of 10 Mbps, up to a maximum of 60Mbps.
1. One Multicast Domain is required for each POI where an Access Seeker is offering Multicast content.

2. Dimensioned at the total size of all Media Streams offered by an Access Seeker at that POI.

3. Initial size is 100 Mbps. Additional increments of 100 Mbps, up to 1,000 Mbps.
1. ‘Media Streams’ typically consist of a **video channel** or channels.

2. Individual media streams must be injected - each with a **specified bandwidth** - into the Multicast platform.

3. Media stream bandwidths may be specified in **increments of 0.1 Mbps**. Different media streams can be assigned different bandwidths by Access Seekers.

4. NBN Co stipulates a **minimum media stream size of 3 Mbps**.

5. There is a **limit on the number of media streams** which can be offered & simultaneously viewed across all Access Seekers at each POI.

6. A **‘media stream charge’ of $50** per media stream, per month, per POI is applied to any **media streams beyond 200** that an Access Seeker offers at each POI.
### Multicast Pricing

<table>
<thead>
<tr>
<th>Product Component</th>
<th>Pricing per Month</th>
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<tbody>
<tr>
<td>Multicast Access Virtual Circuit</td>
<td>$5 for the first 20 Mbps</td>
</tr>
<tr>
<td></td>
<td>$5 for additional 10Mbps increments</td>
</tr>
<tr>
<td>Multicast Domain</td>
<td>$2.50 per Mbps</td>
</tr>
<tr>
<td></td>
<td>100Mbps minimum size</td>
</tr>
<tr>
<td></td>
<td>100Mbps increments up to 1,000Mbps</td>
</tr>
<tr>
<td>Media Stream</td>
<td>Waived for fewer than 200 media streams per Access Seeker</td>
</tr>
<tr>
<td></td>
<td>$50 each for additional media stream above 200</td>
</tr>
</tbody>
</table>
Some Real-World Examples

- Access Seeker 1 is offering **80 Media Streams** at a POI.
  - 60 standard definition Media Streams at a peak bandwidth of 3.5Mbps
  - 20 high definition Media Streams at a peak bandwidth of 8.7Mbps

- The **Multicast Domain** would therefore be dimensioned at **400Mbps** (60x3.5 + 20x8.7 = 384), costing $1,000 per month per POI.

- If customers of Access Seekers buy a “**Single Set-top Box: Watch One, Record One**, HD Package”, this would require a **20Mbps Multicast AVC**, priced at $5 per month per End-User.

- If customers of Access Seekers buy a “**Dual Set-top Box: Watch One, Record One**, HD Package”, this would require a **40Mbps Multicast AVC**, priced at $15 per month per End-User.

- The Access Seeker is offering fewer than 200 Media Streams, so **no media stream charge** would be levied.
Access Seeker 2 is offering **240 Media Streams** at a POI.
- 200 standard definition Media Streams at a peak bandwidth of 3.2 Mbps
- 40 high definition Media Streams at a peak bandwidth of 7.9 Mbps

The **Multicast Domain** would therefore be dimensioned at **1,000Mbps** (200x3.2 + 40x7.9 = 956), costing $2,500 per month per POI.

If customers of Access Seekers buy a “**Single Set-top Box: Watch One, Record One, HD Package**”, this would require a **20Mbps Multicast AVC**, priced at $5 per month per End-User.

If customers of Access Seekers buy a “**Dual Set-top Box: Watch One, Record One, HD Package**”, this would require a **40Mbps Multicast AVC**, priced at $15 per month per End-User.

The Access Seeker is offering more than 200 Media Streams, so a **media stream charge of $2,000 per month** would be levied (ie. 40x$50).
1. Available for sandpit testing in late-2011.

2. Available for sale to End-Users in mid-2012.
Merv Chessells
Product Engineering
Access Seeker delivers one copy of each media stream at the NNI, saving on backhaul.

Layer 2 Multicast feature examines upstream IGMPv3 messages to build the Multicast tree (sparse mode).

Multicast feature transports a media stream only while a downstream host is joined.
• Media stream delivery downstream between NNI and UNI-D.

• Multicast signalling (IGMPv3) upstream between UNI-D and NNI:
  – Messages on the multicast domain (first Join, last Leave, periodic Membership Reports).
  – Messages on the unicast CVC for Access Seeker visibility (all successful messages).
• **Multicast Domain Admission Control:**
  - Admission is based on Multicast Domain bandwidth and the peak bandwidth per Media Stream (configured peak or instantaneous, whichever is larger).

![Multicast Domain & Access Virtual Circuit Bandwidth Diagram]

• **Multicast Access Virtual Circuit Admission Control:**
  - Admission is based on the Multicast Access Virtual Circuit bandwidth, not on the number of concurrent media streams.
• Access Seekers define a peak bandwidth per media stream
  – Where a media stream exceeds the configured peak bandwidth, all frames are discarded until the instantaneous bandwidth remains below the configured bandwidth for a predefined period of time.
  – Access Seekers should note that no signalling notification is received over the NNI when a media stream is suspended.

![Diagram showing stream blocked, alarm raised, sliding window, and stream admitted with configured peak bandwidth, instantaneous peak bandwidth, and capacity management peak bandwidth labels.]
Facilities Access

Tim Stone - August 2011
Enables Access Seekers or backhaul providers to:

1. **Connect their backhaul** to the NBN Co access network at each Aggregation Node.
2. **Pre-terminate transmission links** to an NBN Co ODF housed in each Aggregation Node.
3. **House active equipment** in each Aggregation Node for the purpose of grooming & aggregating NBN Co traffic.

Benefits:

- Offers the **lowest possible barrier to entry** for Access Seekers wishing to enter a region & offer NBN Co services.
- Allows Access Seekers to **modify their network architecture as their business grows** (eg. Transmission link growth, diversity, supplier changes, etc).
- **Reduced site visits** to Aggregation Nodes in many cases.
- **Zero-charge** NBN Co connection between Access Seekers & backhaul providers. Zero-charge NBN Co ODF Termination Point product to enable backhaul providers to pre-terminate transmission links.
- Racks will enable Access Seekers & backhaul providers to house active equipment.
1. Access Seekers will need to order Facilities Access from NBN Co for each Agg. Node they wish to connect to.

2. **Three product components:**
   1. Cross Connect
   2. ODF Termination Point
   3. Co-Located Racks

3. Available as both a ‘Basic’ & ‘Active’ solution:
   - Basic solution connects NNI to backhaul (no racks required).
   - Active solution includes rack-space to house Access Seeker or backhaul provider equipment.

4. Facilities Access is orderable for all 121 Agg. Nodes, across all access technologies (fibre, wireless & satellite).
   - 111 will be housed in facilities leased from Telstra.
   - 10 will be housed in NBN Co leased/owned facilities.
Cross Connect

1. Provides point-to-point connectivity between:
   a) NNI Port & Backhaul
   b) NNI Port & Rack
   c) Rack & Backhaul
   d) Rack & Rack

2. Provided as pairs of **Single-Mode fibre only**, Multi-Mode fibre is not supported.

3. Access Seekers are not permitted to install their own cross connect cabling within the Aggregation Node.
1. Active equipment permitted only for the transmission of data to & from NBN Co End-Users. Not a Content Distribution Network (CDN).

2. Lockable half & full racks. Up to 2 racks per Access Seeker.

3. 19 inch equipment racks with depth of 1,000mm.

4. Access from the front and rear, but not sides.

5. -48V DC @ up to 3kW telecommunications power per full rack.
1. **Ordered by backhaul providers** to establish a presence at the Aggregation Node.

2. Providers **install backhaul** fibre to the NBN Co **ODF Termination Point**.

3. Single Mode Fibre backhaul will be accepted.

4. In **Telstra-owned facilities**, the Access Seeker will arrange physical build of transmission links into the facility (access to duct, installation of fibre) **through Telstra** directly, & will terminate on the designated NBN Co ODF.

5. In **NBN Co-owned facilities**, the Access Seeker will arrange physical build of transmission links into the facility (access to duct, installation of fibre) will be organised **through NBN Co**.
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<th>Product Component</th>
<th>Pricing</th>
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<tr>
<td>Racks</td>
<td>Setup (one-off)</td>
</tr>
<tr>
<td></td>
<td>$1,500 per full rack</td>
</tr>
<tr>
<td></td>
<td>$900 per half rack</td>
</tr>
<tr>
<td>Racks</td>
<td>Recurring (monthly)</td>
</tr>
<tr>
<td></td>
<td>$2,000 per full rack</td>
</tr>
<tr>
<td></td>
<td>$1,200 per half rack</td>
</tr>
<tr>
<td>Cross Connect</td>
<td>No Charge</td>
</tr>
<tr>
<td>ODF Termination</td>
<td>No Charge</td>
</tr>
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</table>
1. Orders will be able to be placed in Oct.-Nov. 2011.*

2. Product will become active when the first Aggregation Nodes come online in late 2011/early 2012.

* Assuming the Telstra agreements with NBN Co become binding.
Vaskos Tsiatis
Product Engineering
Relationship of Facilities Access Product Components

- Street Pits & Duct
- Building Entry Service (RSP to acquire directly from Telstra)
- NBN Co Optical Distribution Termination Point
- Co-Location
  - RSP Rack
  - RSP Active Equipment
- Cross Connects
- Aggregation Node
- NBN Co Equipment
- NBN Co Access Network

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Facilities Access Technical Overview

Access Seekers may choose any of the product components which suit their Interconnection requirements. They would typically suit:

- Access Seekers with Backhaul interconnect requirements (own or via 3rd party)

- Access Seekers with hosted equipment requirements (Co-location)

- Access Seekers that chose to use an Aggregator already established at the Aggregation node

- Access Seekers who are Telstra TEBA customers and are already present in the Aggregation Node
Cross Connect Overview

NBN Co shall be responsible for the following cross connect functions:

• Performing all cross connects within the ODF TP

• Providing the materials to perform the cross connection within the ODF TP

• Providing the hardware and cabling between the Access Seeker rack and ODF TP

• Providing pre-cabling and pre-terminating 24 single mode optic fibres within the NBN Access Seeker rack and the ODF TP.

• Performing ongoing maintenance of the cross connect
ODF Termination Point Overview

NBN Co will provide:

- Two ODF racks at each Aggregation Node (A and B diverse) for Access Seekers to terminate their Single Mode lead in fibre cables.

- Fibre trays (orderable as either 24 or 72 fibres)

An Access Seeker may only order up to two fibre trays in an Aggregation Node
Service demarcation / Network Boundary

• The definition of NNI Network Boundary is dependent on the Facilities Access product component which an Access Seeker purchases.

• Where an Access Seeker uses the Co-location product and requests connectivity to the NBN Co NNI, the demarcation of the NNI service will be at the optical interface on the fibre patch panel provided within the Access Seeker rack.

• Where an Access Seeker uses the ODF TP product and requests connectivity to the NBN Co NNI, the demarcation of the NNI service will be the optical interface on the fibre patch cable provided at the ODF TP.
Co-Location Overview

NBN will:

- Build up to 15 RSP racks per site
- Provide full height and half height options

An Access Seeker may order up to two racks in an Aggregation Node. Racks will be allocated on a first-come-first-served basis.
Co-Location Overview

Full height rack dimensions:

- External rack dimensions of 2195mm high and 1000mm deep as per ANSI/EIA RS-310C
- Internal depth clearance between the front and rear doors of 955mm
- 42 usable rack units
- 19 inch rail spacing
- Four rail posts.
- Use of the four posts can sustain up to 600 kilograms of static weight per rack
- Rack units shall be individually numbered to provide ease of installation
- Top access fixed cable trays will be provided
Co-Location Overview

**Half height rack dimensions**

- External rack dimensions of 2195mm high and 1000mm deep as per ANSI/EIA RS-310C
- Internal depth clearance between the front and rear doors of 955mm
- 18 usable rack units
- 19 inch rail spacing
- Four rail posts.
- Use of the four posts can sustain up to 300 kilograms of static weight per rack
- Rack units shall be individually numbered to provide ease of installation
- Top access fixed cable trays with a minimum width of 150mm will be provided
- A fixed, vented dividing shelf shall provide segregation between top and bottom rack divisions.
- Cabling to bottom subdivision protected from top subdivision
Co-Location Overview

Doors

• Front and rear lockable doors will be provided as standard on each rack.
• Doors provided shall be ventilated by mesh and provide an equivalent open area of at least 63%.

Locks

• NBN Co shall:
  – Provide locks fitted to front and rear rack doors
  – Provide each rack door with a three point locking system
  – Manage keys and lock access authorisation
  – Manage the issuance and revocation of keys and access authorisation
  – Provide a method by which the lock can be re-keyed
Facilities Access Technical Overview

Door alarms

- All Access Seeker racks will be fitted with door switches on front and rear doors to allow an Access Seeker to monitor door state (open/close).

- If Access Seekers wish to monitor the door state, they will need to provide their own monitoring equipment and connect it accordingly to the door switches.

- Door switch can be configured as either NO or NC.

Door alarms/door state on Access Seeker racks are not monitored by NBN Co.
Facilities Access Technical Overview

Cable specifications

- NBN Co will provide 24 pre-cabled and pre-terminated single mode fibres in each full rack and each half rack division. The cables will be run between the NBN Optical Distribution Frame Termination Point and the fibre patch panel within each of the Access Seeker racks for the purposes of providing connectivity between the Access Seeker’s own equipment and NBN Co equipment.

- The pre-terminated fibre cabling within the rack will present 24 terminated fibres, on a 1 RU patch panel with SC/APC connectors.

- The pre-cabling of each rack is provided by NBN Co to negate the requirement for an Access Seeker to perform their own cabling between the NBN ODF TP and their rack.

- The Access Seeker shall be responsible for providing, maintaining and installing their own single mode patch leads between the fibre patch panel within the Access Seeker rack and their own equipment.
Co-Location Overview

Power

• -48VDC (positive earth) electrical supply will be provided at each rack.

• Full height racks are provisioned with a 3.0 kilowatts of available power.

• Half height racks are provisioned with a maximum of 1.5 kilowatts of available power.

• Should an Access Seeker require up to a maximum of 5.0 kilowatts of power for a single rack, they may purchase (if available) a directly adjacent rack. The adjacent rack used to provide the additional power shall not be used by the Access Seeker to house active equipment.

• If an adjacent rack is not available, the 3.0 kilowatt per rack limitation shall apply.
Co-Location Overview

Power

NBN Co will provide a 10 Position DC Power Distribution Unit in each rack (or rack division)

The PDU is split into two planes (A and B) and connected to diverse feeds. Note: may not be available at all sites.

Access Seekers must provide their own Pluggable Breakers.

• 165A Circuit breaker
• 50A Circuit breaker
• 40A Circuit Breaker
• 20A Circuit Breaker
• 2A Circuit breaker
Power

- NBN Co does not provide an Alternating Current power supply within the Access Seeker racks.

- Access Seekers shall not generate an Alternating Current power supply within their rack.
Facilities Access - Q & A Session

August 2011

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