NBNCo Multicast Feature, Technology and Pricing Overview Comments and Proposed Improvements

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This document provides our feedback to the NBNCo Multicast public pricing and information release of in August 2011 available:

http://www.nbnco.com.au/assets/documents/multicast-product-prcing-overview-aug-11.pdf

Following some initial comments, we will propose, herein, a set of changes to both pricing and technical aspects of the service constructs provided for in that document.

These proposed changes are intended to foster the following outcomes:

- Greater and earlier adoption by RSPs of the multicast service across the Fibre NBN
- Increased network efficiency and flexibility in the distribution of content, via a shared (multi-RSP) multicast access domain in the network.

Review Comments and Observations

* Satellite and Fixed-Wireless Multicast Futures

While this document scope is limited to NBN services over Fibre, it would be productive and appreciated to have some early guidance provided regarding the future intentions of NBNCo with respect to Multicast service over fixed-wireless and/or Satellite technologies.

Satellite, in particular, is a technology that is reasonably well suited to multicast delivery (given that the downstream path is intrinsically a broadcast path, and multicast, in turn, is functionally similar to a filtered broadcast domain.

It is less obvious whether it makes sense to deploy Multicast over the NBN Fixed wireless deployments, as this depends in significant part upon the available per-cell radio bandwidth being dimensioned by NBNCo vs their expected requirements for unicast services.

As the construction tender has been let for the fixed wireless network, surely NBNCo has some idea of whether it will be trying to make multicast work over this technology as part of that tendered design.

* The granularity of the proposed pricing needs to be adjusted

The pricing Principles and Parameters make reasonable sense in structural terms, but we do have some issues with it.

These issues are not in terms of the *quantum* of the unit pricing, but in terms of its *granularity* (the minimum order size) that applies for both customer end Multicast AVC and head end CVC Multicast ingest connections.

We will be more specific about this in the next section.

* Pricing that stimulates strong adoption is important to the success of Multicast

The public NBNCo business model appears to make no direct allowance for any income from the delivery of multicast services.

This implies that the long term overhead cost of operating multicast is so low that effectively anything NBNCo get paid for Multicast is incremental income with very little additional underlying cost. We feel the same way, and hence we submit that pricing should be designed to encourage strong adoption.

We agree that it is, and to that end, while its important to avoid the pricing being so low that it may lead to pathological uses of the multicast service, the main challenge here is that the current pricing model (if not revised as proposed herein) may lead to little or no multicast takeup at all.

*** Telstra's "HFC Advantage" makes it critical to have NBN Multicast be a success**

We postulate that it is in the interests of NBNCo, its RSPs and its RSPs customers that multicast is a success over the NBN.

Of particular relevance here is one of the (many) surprising aspects of the NBN/Telstra 'deal' that the public knows about (so far), via press releases regarding that deal.

In particular: While Telstra will shut down the use of their national HFC network for Internet access purposes, they will leave the underlying HFC network turned on and running for the purpose of distributing PayTV and other video services such as (but not necessarily limited to) Foxtel.

This is a very surprising concession to Telstra relative to other RSPs in the NBN environment. It naturally allows Telstra to exploit the very low (likely fully written-down) cost base of the legacy HFC network to compete with new retail PayTV/Video Services operators seeking to use NBN IP Multicast as a video distribution mechanism.

Indeed it is clear that Telstra *do* intend to exploit that lower, legacy, cost base for video distribution – otherwise they would have had no reason to have argued for the retention of the HFC network for video distribution in the NBNCo 'deal'.

This creates a permanent financial advantage for video content distribution that spans literally millions of households around Australia – and all while Telstra will get a per customer payment for every Internet and voice service disconnected from the HFC over time.

Given this situation, it is only fair and reasonable that NBNCo offers access to IP Multicast services at in a very cost effective manner, in order to ensure that RSPs in general are not unfairly disadvantaged by this situation.

Put another way – the commitment to uniform wholesale pricing in the NBN in general should extend to ensuring the NBN IP Multicast cost base is competitive with the running cost to Telstra of operating the HFC for Foxtel video distribution.

The proposal we make herein regarding pricing changes in this document seeks to address this issue by modifying the granularity of the AVC charging mechanism, in order to provide a more cost effective entry point for currently dominant 'standard definition' grade video services.

Once higher quality and higher bandwidth services become prevalent in the future and multicast per-user consumption rises, NBNCo ultimately recovers the same ultimate multicast income it currently expects, because the unit cost for capacity is not modified by our proposal.

*** The definition of a "Media Stream" vs a IP "Multicast Group" is not totally clear**

The minimum dimensioned "Media Stream" size is identified in the document as being 3 megabits per second.

However, the actual IP Multicast protocol does not define, or control, the sending of 'streams'.

Instead, it defines and controls the operation of a protocol that allows end stations to join, leave, and receive frames from one or more *Multicast Groups*.

Each multicast group is identified with a specific Class D IPv4 address and it can zero or more data flows at any given time.

It is normal and expected activity in IP Multicast to be able to deliver multiple 'streams' of information (not necessarily video, and including for instance control streams and forward error correction data streams) within a single multicast group, defined by a single IP address but differentiated at the UDP port level, to all receivers who are currently members of that group.

We presume that in practice, the term "Media Stream" in this document is really an effective reference to a single multicast IP group, that is in turn defined in practice as being all traffic delivered from a specific single Class D IPv4 source address.

Assuming this is correct, it would help for this to be explicitly stated, just for the avoidance of doubt.

For completeness, this does (validly) allow an RSP to operate a multicast group in which there are a number of data flows occurring, providing the total aggregate data rate to that destination multicast group never exceeds the pre-defined maximum total rate for the multicast group concerned.

Proposed Pricing and Technical Changes

We now move to a set of proposed changes that we believe would benefit all parties concerned by delivering:

- More flexible working of IP Multicast such that, in addition to private multicast domains per RSP, there is also a single 'public' domain per CSA accessible to all RSPs , and
- A revised and improved pricing structure proposal that delivers a more fine grained control over the granularity of capacity purchased by an RSP in the multicast service.

A 'public' Multicast domain

The technical work being undertaken at present by NBNCo with its vendor before IP Multicast is generally available is, we understand, based in significant part around the intention to partition the multicast service so that every RSP has their own 'virtual world' of multicast, entirely isolated from every other RSP's multicast source data and multicast group membership.

While such private domains are likely to have valid future uses (for instance, one could envisage the use of such a domain to support a national network of electronic advertising billboards showing high definition video material), the reality is that the first and most initially prevalent use cases for IP Multicast are in residential IPTV.

The residential IPTV space is based in essence as an evolution of the Satellite TV market. And that market is based on the presumption that all providers of TV channels are broadcasting – and that all consumer set-top-boxes can actually attempt to 'tune in' all the possible channels on the Satellite.

The expectation from content owners who use Satellite to transmit TV channels is that either the channel is 'public' – one that the content owner is happy to have anyone 'tune into' without limitation (as if it was free to air broadcast), or the channel is 'private' to a specific pay TV service that requires per customer fees to be paid.

In the latter case, control in terms of which consumers can watch the channel is achieved with digital rights management (DRM) equipment in both the TV channel head and the channel consumers' set-top-box devices.

In other words, it is Digital Rights Management that secures TV channel distribution rights, and this is considered entirely sufficient by the global TV industry. They literally don't care whether others can 'tune in' to their 'signal' (however disseminated) because the signal itself is encrypted.

This very same DRM is naturally present in all IPTV deployments involving licensed content channels. Having built a trust relationship in certified DRM solutions, the TV content industry uses them universally.

As a specific example, the fetchtv service that Internode sells uses DRM to provide this content security. As a result, even if someone can 'tune in' to a fetchtv data stream, without a valid paid service and a fetchtv supplied set top box, the channel content just can't be decoded.

Conversely, if a given TV channel stream was *intended* to be publically viewable (for instance, re-transmission of digital free-to-air into poor broadcast signal areas), this is sent 'in the clear' and can be viewed by anyone who wishes to do so.

Because of the universal use of DRM with commercial PayTV content, there is actually no need, *at all,* to partition the IP Multicast address space separately per RSP for IPTV purposes, and indeed doing this creates some significant *disadvantages*.

In the single-domain-for-all scenario, then, a single household could concurrently access some or all of the following sorts of video content using NBN IP Multicast:

- Fetchtv (delivered at wholesale to multiple RSPs who in turn sell it end users)
- Foxtel (presuming that they intend to deploy on the NBN)
- Other IPTV providers
- Free to Air (FTA) TV broadcasters (to provide service in poor reception areas)
- Community TV channels (who could use the NBN instead of expensive TV transmitter hardware to send an un-encrypted TV channel, and who could have customers 'tune in' from any IPTV set top box that was configured to do so)

The irony is that this 'single domain for all' technical model is precisely how the NBN Multicast domain is *already* structured "out of the box".

NBNCo currently are intending to undertake significant work with their vendor to break this existing service up into multiple separate virtual domains, partitioned away from each other, instead.

Our point here isn't to stop that work to create private domain support, but rather it is to strongly argue for the preservation of what we already have, in the process.

We argue for the preservation of one 'public' multicast domain as well as the upcoming private ones.

For the purpose of this document, lets call this 'Domain 0'.

In ‘Domain 0’, then:

- Any RSP could designate that a given UNI-D has its multicast AVC associated with Domain 0 instead of with an RSP-private domain (or ideally with both one private and the single public domain at the same time).
- Any content source (TV channels) could supply data into Domain 0 by using any RSP as their commercial service provider for this ingest task. In other words, a content source can deal with any RSP of their choosing and ask them to send multicast streams into Domain 0 on their behalf, with the RSP operating (in effect) as a multicast content aggregator.
- A content source that wished to directly deliver data into Domain 0 could also become accredited and sign up directly as an RSP in its own right if it wished to do so.
- NBNCo would be required to arbitrate upon the assignment of Class D Multicast addresses to each RSP that wished to send data into this (shared) Domain 0. This is a simple administrative function where NBNCo would maintain an allocation of IP ranges per RSP based on their reasonably expressed (and purchased) multicast streaming requirements.
- Groups of multicast addresses should be allocated to suit the reasonable requirements of each RSP’s existing IPTV service if possible. In some limited cases, IP renumbering might be required if an existing content provider into Domain 0 has already used the same range. This is neither difficult nor costly for a subsequent content source to do.

Advantages of this approach:

- High efficiency delivery of multicast data
- Ability to develop an ecosystem of ‘multicasters’ who provide their content into the NBN efficiently for any interested RSP to access. With only ‘private’ domains, this ecosystem can never develop.
- With only ‘private’ domains, multiple copies of multicast data will ultimately be sent on the NBN un-necessarily (e.g. multiple copies of free to air rebroadcast, multiple copies of fetchtv for each fetchtv commecial retail partner, etc).
- This approach harnesses the existing, default, behaviour of the NBN multicast environment (today).

<u>Revised/Improved pricing structure</u>

The current per-customer AVC pricing proposed for Multicast is on the basis of this baseline charge:

> $5 per month for 20 Megabits of Multicast-enabled AVC

The commercial reality of the residential IPTV market is that it is a very low margin enterprise, and it is not tenable to justify a minimum cost of $5 per

month per customer service for multicast delivery, plus the considerable total costs to perform (paid) content ingest at up to 121 points of interconnect.

The minimum Multicast Stream size proposed by NBNCo is 3 megabits per second, per stream – and we agree that this is a reasonable minimum size for video service applications (where a viable 'Standard Definition' outcome can be achieved at the circa 2.5 megabits per second level, and certainly within 3 megabits total, in most cases).

However, the disparity between the minimum stream size (3 megabits) and the minimum customer-side AVC size (20 Megabits) creates both a technical (size) mismatch at the entry level and also constitutes a serious economic barrier to adoption of multicast services.

Initially in the network streaming services will, in the main, be single-screen, standard definition (where 3 megabits is sufficient), and will progressively move toward multi-screen, higher definition outcomes.

When those upgrades over time (multi screens and high definition) do occur, they will logically be based on higher retail costs, and hence it becomes tenable to fund a correspondingly higher wholesale charge from NBNCo at that point.

Looking again at the 3 megabit stream size and the 20 megabit minimum AVC size, then, there is an obvious and (we believe) reasonable approach that will make the numbers line up, and that will drive realistic initial takeup of Multicast in the NBN.

This approach is simply to charge for AVC capacity with a minimum AVC size of 3 megabits (rather than 20 Megabits) and to field an incremental Multicast AVC price table that is created in multiples of 3 megabits per second.

Based on the NBNCo baseline of $5 per 20 Megabits of multicast AVC, this is the resulting pricing table for AVC delivery capacity from 3 megabits up to the (NBNCo defined) maximum per-user multicast AVC size of 60 megabits per second:

Multicast AVC Megabits	Monthly Price
3	$0.75
6	$1.50
9	$2.25
12	$3.00
15	$3.75
18	$4.50
21	$5.25
24	$6.00
27	$6.75
30	$7.50
33	$8.25
36	$9.00
39	$9.75
42	$10.50
45	$11.25
48	$12.00
51	$12.75
54	$13.50
57	$14.25
60	$15.00

We feel that offering a granularity of 3 megabits per second, as per the table above, provides a reasonable tradeoff for RSPs between cost and flexibility/size-for-purpose.

Allowing an entry point at 3 megabits will, we submit, drive a very much higher takeup of multicast services than is likely to occur with the current NBNCo proposed pricing model.

We believe this is *so* important that *not* this so may lead to almost no take-up of multicast services for video in the NBN. It is a bootstrap issue and it has to be treated as such.

Again, note that the effective unit cost here is the same as that proposed by NBNCo (its still $5 per 20 Megabits of multicast AVC), and the pricing has simply been re-factored to make it more accessible and fair to all RSPs.

Turning now to the cost to deliver ingest multicast data at an NNI POI by an RSP, we propose again to offer a smaller granularity outcome than that proposed by NBNCo, to encourage cost effective bootstrap participation.

The NBNCo ingest pricing is based on an ingest rate of $2.50 per CVC megabit per month. However it currently stipulates a minimum monthly Multicast CVC size of 100 Megabits (hence $250 per month).

At issue here are two factors:

First, because of the change from a 14 POI to a 121 POI model, ingest costs are massively multiplied, and such any 'overhead' costs become rapidly un-tenable at the 100-megabits-minimum level for a national coverage model.

Second, and again as a consequence of the 121 POI model, it will be economically untenable for RSPs to backhaul 100 or 200 or more megabits of multicast data back from each of the 121 POIs to their own (generally) per-state main points of presence for this purpose.

This drives a need to change the Multicast CVC deployment model for the NBN in order for it to be tenable for RSPs to participate viably in a 121 POI realm.

The change we propose is twofold – one technical change and one pricing granularity change.

We propose that NBNCo to permit RSPs to connect their multicast domain and operate it in a 'sparse' manner – such that multicast data is only sent when there is at least one customer actively using that data in a given CSA.

This has some implications for the technical interface into the NNI, as it requires the NBN interface to actively participate in group 'joins' and 'leave' operations through the NNI port instead of assuming that all expected multicast groups are present all of the time.

More importantly, returning to the issue of price, this also means that an RSP operating at (say) a nominal 200 megabits of multicast content in total, may statistically see only a small fraction of that total being in active use to a given CSA at a given time.

If we use the example of an IPTV service where, statistically, only 10% of the total possible channels are in active use in the busy hour, this would imply that only 20 megabits of connectivity would be needed to operate a nominally '200 megabit' multicast ingest point. In effect, the Multicast CVC is being operated at a nominal 10:1 ratio.

This sort of ratio based dimensioning is already used in the NBN design for TC_1 traffic delivered for voice purposes to UNI-V ports. For this purpose, RSPs order an 'N:1' TC_1 CVC, with "N" being reasonably expected to be perhaps 50:1 or more in practice (for voice traffic).

(For clarity - the actual working ratio would be entirely up to each RSP and may be adjusted over time as operational experience is gained with the workload and traffic patterns applicable to their specific customer base)

Returning to the point:

Our proposal, therefore, is that RSPs are permitted to deliver multicast data into a multicast NNI CVC delivery point with a much smaller minimum CVC than 100 megabits, and that multicast traffic is delivered to the CVC only for streams that are actively being consumed by at least one downstream customer.

We propose that the new multicast CVC pricing table start at 15 megabits per second (A 5:1 ratio against a 3 megabit minimum per-customer media stream size), and that expansions of the CVC are charged in increments of 15 megabits per second thereafter.

Based on the NBNCo pricing of $2.50 per CVC megabit per month, this is the Multicast feed-in CVC pricing table that results:

Multicast CVC Megabits per CSA	Monthly Price
15	$37.50
30	$75.00
45	$112.50
60	$150.00
75	$187.50
90	$225.00
105	$262.50
120	$300.00
135	$337.50
150	$375.00
165	$412.50
180	$450.00
195	$487.50
210	$525.00
225	$562.50
240	$600.00
255	$637.50
270	$675.00
285	$712.50
300	$750.00

Summary

We submit that these changes to the NBNCo pricing and technical models for IP Multicast will serve to substantially increase the chances of participation in the Multicast realm by RSPs.

They will also (via the proposed "Domain 0" construct) create the seeds of a whole new public content delivery mechanism on the NBN.

It will promote the highly efficient distribution of content from a single content provider to the customers of multiple RSPs.

At the same time, it will promote the distribution of content from multiple content sources, concurrently, that can be delivered at the same time to the premises of a single customer (for instance, this could include free to air TV reticulation, community TV channels, fetchtv IPTV linear channel programming and Foxtel, all at once, all to a single UNI-D attached end customer network, without requiring any direct coordination or explicit interworking arrangements between those multiple content sources).

We believe that the potential for such technically rich outcomes justifies some effort to make this implementation mode available to RSPs, and we submit that the revised pricing model we have described here is also a critical enabling factor to ensure that overall multicast services demand is strong and viable in the long term on the NBN.