Regulating interconnection and promoting competition – an NBN policy gap or an NGN opportunity?

The May 2011 issue of the Telecommunications Journal of Australia[1], was a special issue devoted to "several important policy gaps arising in the implementation of the National Broadband Network." The ACS-TSA then hosted forums in Melbourne and Sydney on 28 and 30 June respectively to air these policy issues.

David Havyatt was invited to provide a ten minute contribution. This paper is an expanded version of that contribution. The key theme of the paper is that interconnection arrangements post the NBN are an important competition issue but they do not involve NBN Co itself. This is a Next Generation Networks policy issue that is not new, but is accelerated by the NBN.[2]

Introduction

The papers in the special issue of the Telecommunications Journal of Australia (TJA) and in particular those presented to the forum identified a number of issues. One key theme was the concern over who was "regulating" the network, how the decision for 121 Points of Interconnect mandated for the NBN by the ACCC would impact on quality of service and whether there was anyone concerned about quality of service.

These comments seem to be based on an assumption that the ACMA as technical regulator has played a role in existing interconnection arrangements, and the idea that somehow or other a range of documents that purport to establish end-to-end service quality do any such thing.

This paper will first outline a particular concern about the use of language in the discussion and encourage participants to not use terms that already have confused meanings. The paper will then outline how current networks interact and how quality of service is provided to customers. The paper then describes the challenges for interconnection in a Next Generation Network environment. Finally the paper addresses the importance of the interconnection regime to competition, and addresses other changes required to promote competition in an NGN environment.

Language

Before launching into the discussion in detail, it is worth observing the role that language plays in the policy debate. Two particular terms provide good examples; the "standard telephone service" and "peering".

As Peter Darling outlines in his paper, the "standard telephone service" is defined in legislation as basically any service capable of making a voice call to another service. All such services pick up a range of regulatory obligations including the ability to call the emergency services person. A sub-category – STS delivered other than by mobile services – has additional requirements, in particular, pre-selection and availability of untimed local calls. Finally an STS delivered as part of the Universal Service Obligation has another range of characteristics including capabilities with regard to power and support for disability services.

There is an additional confusion with the way the USO regime works to assume the regime requires that every service the Universal Service Provider (USP) provides must meet this

STS definition. This is not, technically the case. All that the legislation requires is that the USP must provide such a service if asked.

The separation of USO provision to TUSMA (formerly USO Co) will make this clearer. The "standard" only applies to that which TUSMA procures and the criteria under which TUSMA will make it available. The wider operation of TUSMA is not a focus of this paper though.

In his paper Simon Hackett campaigns against the "closed shop" of "peering". The difficulty here is that he conflates a technical activity of peering with a price arrangement of Sender Keep All (SKA). Peering is a kind of interconnection that is different from an alternative arrangement called transit, but it does not have to be on a SKA.

How interconnection works now

TDM Voice

The interconnection of voice networks first emerged as an issue in an international context, as national networks all tended to be monopolies. As competition policy saw a need for domestic interconnection the existing international interconnection standards were available for adoption.

This sequence has provided a three tiered framework within which interconnection occurs. At the top are "technical standards" for interconnection – in this case ITU standards. Next comes the "arrangements" for interconnection, in this case a set of industry codes (in particular the **G500:2000 Signalling System No. 7 - Interconnection ISUP** and **G538:1999 Interconnection Model**). Finally there are the commercial arrangements that support them, which may or may not involve the ACCC in determining commercial terms that cannot be agreed.

Nowhere in this structure are the interconnection standards "regulated" by the technical regulator the ACMA. If there is a dispute about the technical terms of the interconnection this would ultimately be "resolved" by the ACCC.[3]

There are a variety of kinds of voice interconnection occurring. The two simplest to describe the situation are voice interconnection between direct connect fixed line voice providers, and voice interconnection by fixed line callers to mobile networks.

The variety of interconnection arrangements can be simplified by considering the number of points of interconnection, and whether the location of the called party is known. The fixed line network is divided into 66 Interconnection Call Collection Areas (or ICCAs) each of which contains a Point of Interconnection to Telstra's network (more typically more than one with traffic "splayed" between them). The service provider who is responsible for routing the call knows which ICCA the customer is in and so hands the call over at the PoI for the ICCA they reside in. A path is established by signalling and traffic flows both ways on the same path. The quality of the call is therefore mostly in the control of the calling party's service provider.

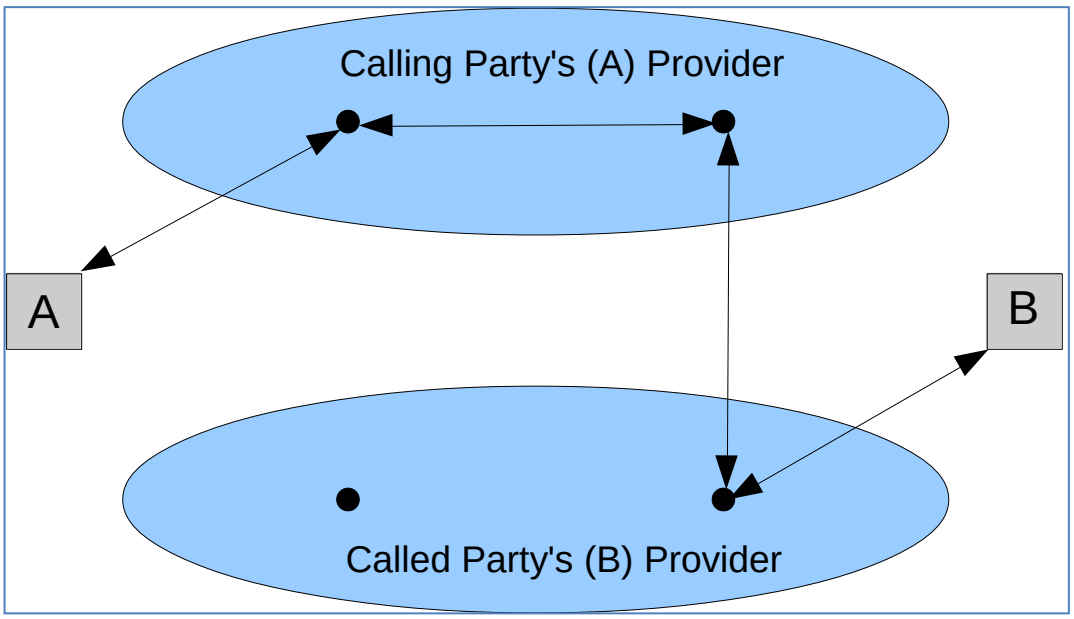

Figure 1 Fixed voice routing – far end handover

Calls to mobile networks are different. Firstly the mobile networks tend to only have five points of interconnection based in the five mainland state capitals. Secondly the service provider on the fixed network only knows which network the called party is on and so the call is handed over at the nearest point of interconnection (near end hand over). In this case the bulk of the call and the termination of call quality is in the hands of the called party's network.

These models all assume that every network is directly connected to every other network. In reality many operators buy part of the connection from another operator as a transit service. The one operator who has not been a major transit provider has been Telstra, and the few transit services it offered were not heavily subscribed due to their pricing.

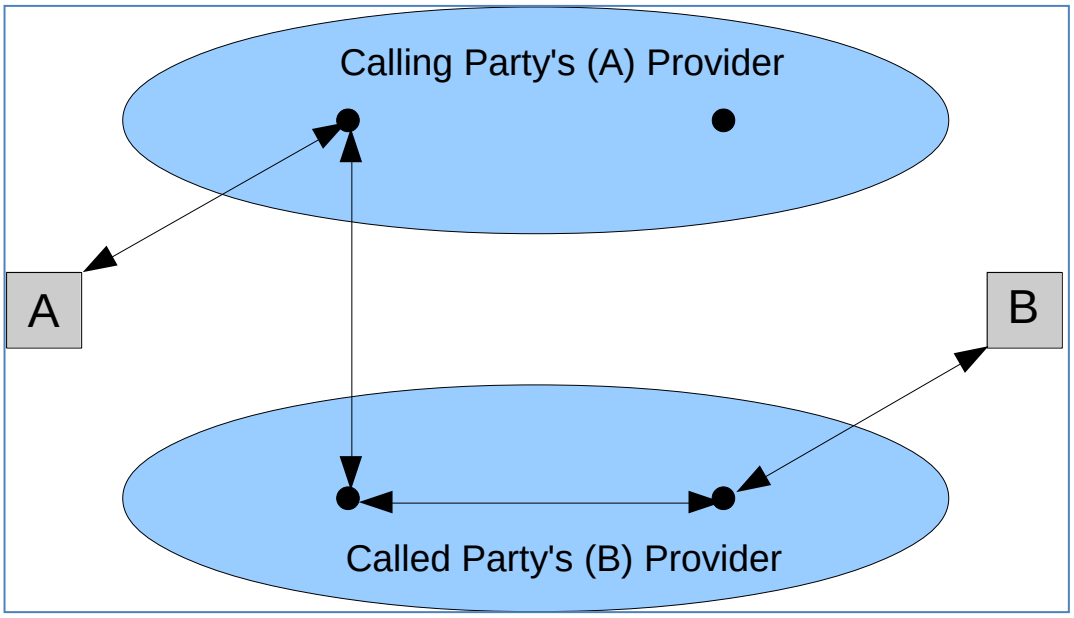

Figure 2 Call to mobile routing – near end handover

A key feature of the arrangements is that switches are manually "loaded" with routing data instructing switches what to do with each group of numbers. In some cases what is "loaded" is a separate Intelligent Network element that is interrogated. The IN element is

still either manually loaded (e.g. configuring routing for a 1800 number) or automatically loaded (as occurs to identify networks under Mobile Number Portability).

In some cases operators have only a limited routing table and have a default transit arrangement. That is, anything not specifically identified is just handed over to the transit provider to route.

Technically speaking the routing occurs through the signalling system, and the entire route is determined before actual connections are made.

Internet

Internet interconnection is vastly different. Firstly these were networks that grew up being interconnected. Secondly that interconnection happened amongst a community of like minded individuals. Thirdly it happened initially within one country.

As a consequence the standards that exist are those of the IETF not the ITU. Secondly there are no Australian documents describing the arrangements, everything has been conducted by agreement.[4] This includes the relevant financial arrangements.

The process for general internet traffic routing is known as "hot potato" routing. There is no circuit path connected, and the networks have no knowledge of where the relevant machines are geographically. As a consequence the traffic is handled differently in each direction and is handed over at the nearest point. This "hot potato" routing means traffic can pass by different routes in the two directions.

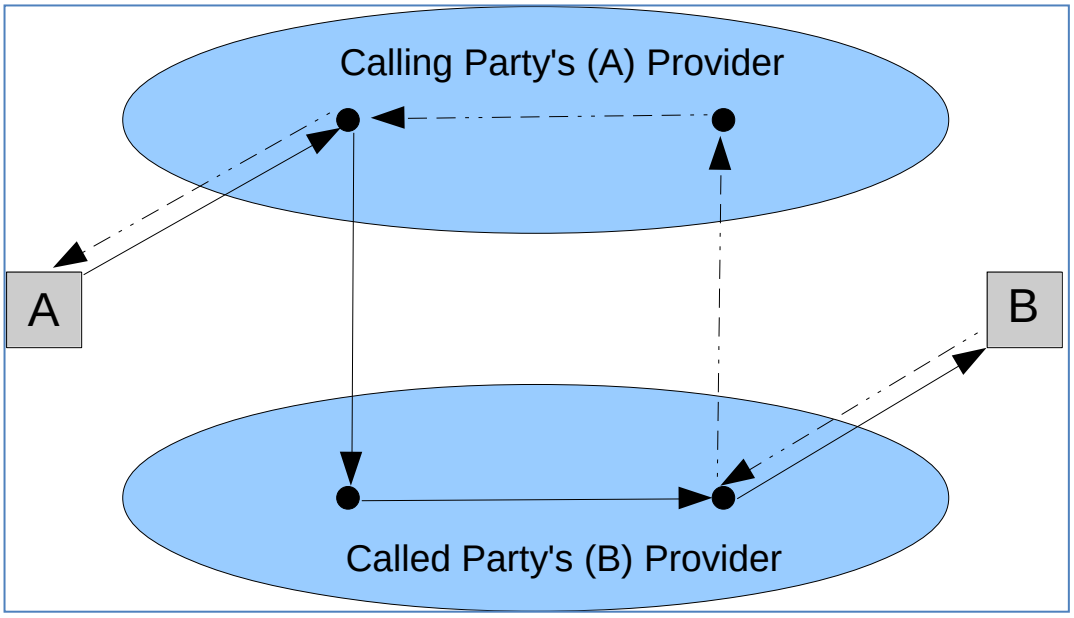

Figure 3 Internet routing - hot potato

The information used for routing is the IP address. Where a request is made using a domain name (web browsing, e-mail) the first step is to look-up the IP address in the Domain Name Server.

The Internet protocols are built around the idea of a self-managing network. Network information is propagated through the network rather than through manual entry into routing tables.

The way this works in interconnection is through the Border Gateway Protocol. When two networks are connected then each "advertises" to the other the routes that are available through the link. This is contrasted with the commercial relationship of transit where the traffic is sent irrespective of what the address is.

A consequence of a peering relationship will be that the peer can wind up carrying the traffic for further than it would as a transit provider. (Is this correct)

There are many varieties of agreement in the Australian Internet space. There are partial peering agreements, there are SKA transit arrangements (for content rich sites) and even some who trombone traffic through the USA in preference to domestic transit.

VoIP

Voice over IP interconnection is then another mixed bag. If the VoIP is carried over the public internet then it will be subject to the hot potato interconnection regime. Where it is carried over a provider's own network it is probably carried over some version of a QoS (such as MPLS) enabled architecture.

Most VoIP interconnection still occurs at CCS7/TDM switches. A particular concern is that multiple hops can see multiple conversions.

In his paper Simon Hackett relates the provision of direct IP based VoIP interconnection directly to the question of SKA based peering of all IP. It is not immediately apparent that the two issues are as obviously joined.

How quality of service is provided

The quality of service for TDM voice is notionally provided by a couple of industry codes on end-to-end performance.

In reality these are never used or referred to.

The quality of a call is managed in a piece-wise fashion by each participant managing the quality of their own service and ensuring the adequacy of the capacity at the points of interconnection. That interconnecting switches worked properly was really driven by an interconnection testing regime conducted by Telstra, as the party that had the most to lose from interconnection standards damaging all networks.

Functionally the same thing happens with the Internet. There are a number of differences, however. The first is that the global nature and the network of network characteristic of the Internet means greater trust is placed on the capabilities of each network. In reality this comes down to a very tight control of those who get to "interconnect" (peer) rather than just buy transit services.

The second is that Internet traffic modelling is not as exact as is TDM voice traffic, and capacity planning is a bit more rule of thumb. The fact that most applications will ork despite some congestion results in very patchy performance.

Equally the Internet standards usually don't stop more people joining an already congested link, unlike TDM voice where "busy tone" is received.

Interconnection challenges

The NBN doesn't particularly change anything. Its network of 121 POIs is very similar to the Telstra voice POI hierarchy. For data it is very similar to the way Telstra currently provides wholesale broadband.

However, the proportion of TDM versus IP interconnection will change. It would be a pity if services were being unnecessarily converted back to TDM standards merely for the greater regulatory protection of that regime.

Consequently it is time for a formal set of IP interconnection documents in Australia including rules for SIP interconnection. This is not something that needs to happen tomorrow, but it does need to happen before the NBN reaches its interconnection peaks.

On previous occasions when this has been discussed in industry forums one objection has been that the necessary underlying international standards don't yet exist. This is something we need to adapt to as we build the world's leading fibre-to-the-home network.

The number of Australians attending any international standards conference has dried up to a trickle, at best. This is particularly true of both IETF and ITU meetings. Given that the solutions for most policy challenges hinge on what technical standards are available, we need to take a bigger interest.

More generally the European, North American and North Asian firms all use these bodies as ways to establish their technology advantages. Australia as the 15th largest economy on the planet certainly isn't big, but it a long way from the smallest. We need to take the opportunity to practice "middle power diplomacy" in getting world standards available for our network needs.

On top of the IP interconnect constructs we need Voice over IP constructs so that voice interconnection doesn't need to be converted back to TDM. Finally we need an agreed migration program.

Competition

Interconnection is, and has always been, a competition issue. The initial US experience with competition demonstrated the disadvantage that an entrant could face by having to use extraordinary dial codes.

Far more simply is the idea that you are likely to get a "better" call if both parties are directly connected to the same network. Consequently the largest players are likely to have the least incentive to commence the work on a new interconnection regime. Now may be an appropriate time for a nudge from the policy makers and regulators that activity is required.

But there are other technical features of the policy regime that impact competition.

There has been a lot of talk about numbering, but there is really nothing wrong with the construct of a geographic number. However the local number portability model was built on the assumption that a service is ported at the same time as infrastructure is changed. That will not be the case under the NBN and a new model is required.

Similarly "pre-selection" is a precompetitive move designed to allow easy selection of long distance provider without changing local provider. In the NBN enabled voice access world this is a concept that no longer makes sense. We need to end pre-selection for NBN enabled voice while retaining it for copper.

The really big issue is whether the requirements of fixed and mobile integration mean that only the mobile operators can truly play in this game. The reason is that to maintain something like a VoIP call as connectivity moves from the household NBN connected broadband to a mobile connection requires activity in the core of the mobile network. It is possible to make that core functionality available to wholesale customers, but will the mobile operators have an incentive to do so?

Finally, the greatest threat to the promise of NGNs is private network standards such as the iPhone Facetime and the Blackberry Playbook Video Chat. The rules by which such standards can be forced to interconnect may well be an early piece of Australian intervention.

Conclusion

There aren't policy gaps that create a crisis in the NGN enabled by the NBN. There are, however, important pieces of work to complete.

These pieces of work are important for promoting competition and as a consequence may not be pursued vigorously by those who already have market power.

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[1] *Telecommunications Journal of Australia* Vol 61 No 2 May 2011 available at http://www.tja.org.au/index.php/tja/issue/view/14/showToc

[2] This paper is based on David Havyatt's comments to the ACS-TSA policy forum held in Sydney on 30 June 2011. This version prepared 1 July 2011.

[3] I am consciously using the original 1997 concept of negotiate/arbitrate. It is to be hoped that the post 2010 model of access determinations will still see the possibility of agreed interconnection arrangements.

[4] At this point there will be some who will insist that the interconnection arrangements between the "gang of four" were "mandated" by the ACCC. All the ACCC ever did was issued a notice that said one set of arrangements was anti-competitive. How the new arrangements were made was still an agreement. Furthermore there is evidence the parties were heading to that resolution without the ACCC's intervention.

[5] All referencing by Endnotes

About DigEcon Research

Purpose

DigEcon Research is a stand alone research body. Ultimately, its pursuit is policy research, the focus of which is the meaning and significance of the Digital Economy. This policy research encompasses both economic and social research.

Researching the significance of the Digital Economy

The concept generally referred to as the Digital Economy is frequently discussed but there is little shared meaning in the term. A key definitional issue is whether the Digital Economy is something yet to happen or in which we are now embedded.

DigEcon Research focuses on the analysis of social and economic change rather than an analysis of a notionally static "Digital Economy". Analysis of the change as it occurs should highlight those areas where there is genuine policy choice rather than merely a need to adapt policy to changes that have already occurred.

Before Thomas Kuhn popularised the idea of "paradigms" J.K.Galbraith railed against the "conventional wisdom". There is no denying that what Kuhn called "normal science" or the repeated application of existing theory to new problems results in most practical developments. It is equally true that the application of existing theory to problems they were not designed for results in, at best, vacuous solutions and, at worst, wildly dangerous outcomes.

The Digital Economy challenges the fundamental concepts of neo-classical economics. It also challenges most of the precepts of how societies are organised. In this context policy research needs to focus on what is different, not on what is the same. The Digital Economy is not just a matter of means of production but about the fundamental structures of social organisation.

Work program

This research is designed both to inform policy makers and to assist those who would seek to influence policy makers or to make business decisions. DigEcon Research however does not provide strategy recommendations nor undertake policy advocacy on behalf of any party.

A key element of the research will relate to the direct regulation of the converging industries of telecommunications, media, consumer electronics and information technology. However, the agenda encompasses the wider economic and social policy issues.

The scope of the research agenda will ultimately depend upon the researchers who wish to participate in what is more an idea than an entity.

In the crowded Australian research field there are a number of "bodies" that share some of the objectives of DigEcon Research. DigEcon Research aspires to contribute to the work of these and any other researchers in the field.