

Some Thoughts about Australian Telecoms

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Abstract: Australia is facing numerous challenges in its attempt to upgrade its telecom infrastructure. This paper summarises the little-known and even less understood history of telecom development in the USA. The authors believe this may provide useful ideas for Australian telecom policy and development that have not yet been considered.

Introduction

As newly-arrived observers of the Australian telecom sector, we see a prosperous nation that looks out on and trades heavily with the most advanced telecom systems in the world in East Asia, the US and Europe. Unfortunately, Australia's own telecom systems lag well behind the rest of the industrialised world ([Akamai 2015, p.30](#)) raising the question of how much of a drag this will put on future economic prosperity. Two different Australian political regimes have attempted to address this issue. From what we have seen neither has been effective. Australia's telecom sector is rapidly sinking in global ranking.

We believe there are alternatives to the approaches taken by both the current and former governments that would be both less costly and more effective. To appreciate these it is necessary to acknowledge the dramatic changes impacting telecoms everywhere. Central is the fact that accelerating technology is revolutionising not only operations but the fundamental role of telecoms in every aspect of society. Key aspects of this technical revolution are:

- a. Greatly reduced, if not eliminated, economies of scale in most parts of the network
- b. Greatly reduced need for central control, and elimination of any need at all for central ownership to manage national networks;
- c. Radically changed nature, scope and cost of telecom services;
- d. Consequent massive explosion in demand that threatens to overwhelm traditional network capability;

- e. Deep penetration of new telecom services into every aspect of economic, cultural and social life, such that failure to accommodate demand will hamstring economic performance.

Taken together, these factors have rendered many of the old telecom paradigms not only obsolete but obstructive. The technical telecom revolution is creating fabulous opportunities. But they are also destroying many of the traditional “truths” that have underpinned the industry for over a century. In this new world, industry structures and public policies that seek to preserve the “old ways,” impose a serious risk to economic prosperity and social advancement. Ultimately they will fail – the forces unleashed by the new telecom are far too powerful to be held back.

Brief History of the Telecom Industry and Its Structure

To appreciate what is happening, a brief review of the history of the telecom sector may suggest lessons for Australia’s current challenges . . . and suggest some ways out of the current impasse.

During the first century of its existence, the “telecom sector”, worldwide, was effectively synonymous with the *telephone* industry. “Telephone” shared many attributes with other “public utility” industries, e.g. power, water, sewage etc.:

- a) a single product: ordinary voice telephone calls (analogous to kilowatt hours, gallons of potable water, gallons of disposed waste, etc.);
- b) a need for a reliable supply for what was considered a civilised standard of living;
- c) a relatively slow rate of technical progress; and
- d) a perceived “natural monopoly”.

Items “a” through “c” were clearly accurate. Item “d”, natural monopoly, while widely considered true, in fact, was not. However, the near universal perception that it *was* true, was enough to “make it true” from the perspective of national policy in virtually every country of the world.

The characteristics which define “natural monopoly” to economists are:

- i) Very low marginal cost to produce an extra single unit of output (which gives an established incumbent a large pricing advantage vs. new competitors);
- ii) High intrinsic (as opposed to artificially created) barriers to entry
- iii) Large economies of scale in general, including large minimum size for efficient operation;
- iv) Key inputs that are not generally available in a market environment; and

- v) Necessity of reliable supply to the population with no or few substitute products or services

Modern broadband telecom does exhibit characteristics (i) and (v) – negligible marginal costs for an incremental unit of output, and high degree of necessity for modern life. But it does not exhibit (ii) through (iv).

On the contrary, modern broadband telecom systems have minimal intrinsic barriers to entry, minimal economies of scale, and few or no key inputs that are not available in the market. Taken together, the actual characteristics of modern telecom systems do not define a natural monopoly. Indeed today telecom shares most of its characteristics with sectors like food, clothing, and transport, with a wide range of essential services riding on basic distributional infrastructure. Like those sectors, the technical and economic basics favour competitive provision. However, all of these necessities for civilised life, including telecoms, **do** call for, and require, public oversight to ensure universal affordable availability, safety and quality standards, prevention of monopoly abuse, etc.

However, whether correctly or not, historically the telephone industry was perceived to be a “natural monopoly” and as a consequence, in virtually every country in the world, telephone service was provided by a single entity. In 1985, at the peak of the “telephone era”, the telecommunications sector of virtually every member country of the International Telecommunications Union not only was dominated by – it almost entirely **consisted of** – a single “Post Telephone and Telegraph” (PTT) monopoly company, typically 100% government owned. In only three countries was this not the case in any meaningful degree: Finland, Canada and the USA.

Of these three, the USA was by far the largest, most important and most radically different from the rest of the world. It also had, by common acknowledgement at the time, one of the best telephone networks in the world as measured in virtually all dimensions: technical, operational, economic and, perhaps most remarkable, extent of coverage. ([International Telecommunications Union, various years](#)). Coverage is perhaps the most impressive: although an extremely large country with a huge, sparse and scattered rural population, by the end of the 1960s, coverage, at 96%, was effectively universal. The next highest country, Sweden, had reached 89% ([International Telecommunications Union, various years](#)). Much of that, in the USA, had been achieved as a result of the 1950s expansion of the New Deal’s Rural Electrification Administration to include telephone. But the framework was created well before that and coverage was approaching universal by WWII. By 1970 in the USA, virtually every person with a fixed abode who wanted a telephone could get one and more than 96% of the population actually did. ([Mueller 2013](#)).

Elsewhere in the world, there was a perception that the high quality of the US telephone network was the sole achievement of the Bell system which was generally, and incorrectly, viewed as “just another PTT – except privately owned”. AT&T was, indeed, privately owned, but in most other respects it was emphatically **not** like the “usual” PTT. More important, it operated in a very different environment from typical PTTs in other countries. Specifically, although the biggest US telecom company, it only served about 70-75% of the connected population ([U.S. Census various years](#)) and covered only about 25% of the land area. As such it was definitely not a legally-authorized monopoly for the whole country, as PTTs usually were. Nor was it ever the main force driving universality. On the contrary, the US telephone system was built by literally thousands of independent telephone companies of all sorts and sizes (including very small ones) operating under a system that combined elements of voluntary co-operation, regulatory oversight and competition which, though unusual in its structure, was effective in its outcome. As discussed below, the competitive element can be shown to be a major factor in the achievement of the system’s superior results.

Despite the mythology of “economies of scale” there was absolutely no correlation between the economic efficiency of these companies as measured by any of the standard telephony metrics of economic and technical efficiency ([Galbi 2010](#)). The “top twenty” best-performing US telcos, including ATT, contained examples from every size, right down to some with only a few thousand subscribers and up to those with millions. Similarly, at the other end of the performance spectrum, the “bottom twenty” also contained examples from every size. In short, in the only country where a meaningful cross-section sample existed, there was absolutely no relationship between economic or technical performance and size.

Significant indicators of quality of service include:

- percentage of faults cleared within 24 hours,
- percentage of calls that fail during the busy hour,
- number of faults per annum per x number of subscribers.

The most common measure of operational efficiency is the number of Full Time Equivalent employees per 1000 subscribers. For mature companies that are not growing rapidly, this number is a reasonably consistent metric, both within countries and between countries. Numbers below 5 are generally considered to be very good and down near 3 to be excellent. Most of the former “Baby Bells” were in the 3 – 4 range as were the Nordic PTT’s and a few others. The very lowest numbers were associated with some of the small US Telcos. ([ITU, various years](#)).

In the USA, development of this unique sector structure is largely due to historical accident: the telephone was invented in the USA in 1876 by Alexander Graham Bell. He immediately

set about building companies to utilise his invention. Thus the telephone sector in the USA, from its very inception, was privately owned and developed. Bell's company, ATT, grew and prospered and by the time his patent expired in 1894 had penetrated the major cities and built a long-distance system connecting them.

He had not, however, made any significant effort to wire the immense rural areas where the majority of Americans still lived. As a result, when his patents expired a rash of new companies sprang up to build telephone systems in rural areas. By 1900 there were over 6000 of these. In the early 1900s Theodore Vail, CEO of ATT, approached JP Morgan with a scheme to buy up these independent companies and create a unified national monopoly – which they promptly set about doing. In keeping with the “robber baron” ethics of the time, this process was not gentle. A major lever used by Vail to pressure small companies to succumb, was to disconnect them from – or refuse to connect them to – ATT's long distance system.

These tactics produced a strong political backlash that led to pressure from the Federal Government for ATT to “back off” (per the then relatively new Sherman Anti-Trust Act). The outcome was the “Kingsbury Agreement” in 1913, the core of which was ATT's commitment to stop acquiring small companies and to connect any company that so requested to the long distance system. At first ATT continued to skirt the edges of the intent of “Kingsbury” but by the early 1920s it had come into compliance and the map of the US telephone industry was largely drawn. That map consisted of a complex patchwork quilt of independent companies interspersed with areas where ATT had purchased companies prior to 1913. That map remained the basis of the US telephone industry up to the present day ([Mueller 2013](#)).

As the map “congealed,” a regulatory structure evolved that matched the realities of that map, existing regulatory systems for other utilities, and the facts of the US system of State v. Federal system of governance. In this system, long distance telephony was regulated by the Federal Government and was largely (though not entirely) operated by ATT. Local telephony was regulated by the states and operated by the local telcos, including ATT's local operations. Committees nominated by participant companies and convened under the combined auspices of the state regulatory commissions and federal regulators coordinated the interface between the two.

Each telephone company had its designated territory – mostly an artefact of where they happened to be operating at the time that the regulations came into being in each state. Inside its territory each company had a nominal monopoly but, in turn, was subject to rate and QOS regulation and a mandatory obligation to provide service on a non-discriminatory basis to anyone who wanted it. Despite the apparent “local monopoly”, the reality was that

this system had several dimensions in which each licensed telephone company faced meaningful de-facto competition:

- a) The proximity of other telcos meant that customers were aware of what nearby companies were offering, the quality of their services, prices etc. Thus, they could, and frequently did, petition state regulators to force their own company to match the best practices of other nearby ones.
- b) In extremis, groups of customers — even whole towns — could petition the state regulator to move them to the district of another company which had better, cheaper services. Even a single customer could say, for example, that their business required a particular service, or better technology in order to survive/prosper and therefore they wanted to receive service from another, better, company — even if that company was some distance away. Although such petitions were usually not granted, sometimes they were . . . and the fact that they **could** be, forced companies to pay attention to their customers in order to head off such petitions. This created a constant pressure on telcos to stay abreast of their neighboring companies. This pressure applied not only to quality of service and prices for existing telephone customers but was even stronger in cases where a local telco failed to serve a part of its territory. The un-served customers could petition to be moved to another company's district — and, not infrequently, convince their neighbors, even “served” neighbors, to join them. This applied to all telcos, big and small.

While hardly “pure competition,” the fact was that all local telephone areas in the US were “contestable markets” to a meaningful extent.

Even ATT faced the above pressure. Further, unlike its PTT counterparts elsewhere, ATT, although dominant on the national and international level, was explicitly NOT a legal monopoly on the national level. On the contrary, ATT was highly exposed to regular and serious anti-trust actions brought against it both by competitors and by the US Government. These were an important part of the US telecom landscape throughout the 20th century — up to and including the final anti-trust suit that led to the break-up and de-facto dissolution of ATT. We have already mentioned the Kingsbury Agreement, but there were numerous others. In most cases, they were settled before they went to court, but such settlements (both formal and informal) resulted in significant changes in structure and behaviour. Examples include ATT's agreement to exit the radio field and to sell most of its international interests. In 1956 one of the most important such changes was the agreement by ATT to stay out of the computer and data processing industry. (This seminal agreement is discussed further below).

Despite the continuous competitive tension between and among the many thousands of telcos in the US, the whole system operated, technically, extremely well. It was coordinated

through a series of industry-named committees that operated under the auspices and oversight of both the State Utility Commissions (through their national organisation the National Association of Regulatory Utility Commissioners, “NARUC,” and federal regulators (after 1934, this was the Federal Communications Commission, “FCC”). These committees dealt with everything including numbering plans, signal protocols, dB loss standards, division of revenues etc. Although ATT was the biggest player in this system, and certainly carried the most weight, it was not a “dictator”: there were counter-weights in the form other large technically sophisticated players such as GTE, United and Continental (each larger than most national PTTs), the political power of the rural independents, and the gimlet eyes of state and federal regulators watching from the edge of the room but not participating in the negotiations themselves unless there was an impasse or perceived abuse. The system worked very well indeed. Indeed, according to the quality of service and efficiency indicators cited earlier, it worked as well or better than the vast majority (and, arguably, all) of national networks that were centrally owned and controlled by a single monopoly and for which data are available. This flies directly in the face of the standard myth that central control and ownership are essential for effective operation of even traditional telephone networks.

In summary therefore:

The US telephone system was based on unique mixture of elements:

- a) a large number of telco participants who, while nominal monopolies in their assigned areas, were also subject to a constrained but significant degree of de-facto “quasi-competition”;
- b) a regulatory framework that focused on pricing, QOS and coverage; and
- c) voluntary co-operation, monitored but not directed by regulators, which coordinated the overall operation of the network.

The successful operation of this system proved that several characteristics of “natural monopoly” did not, in fact, apply to telephony. In particular: the US telephony sector demonstrated that:

- i) there were no significant economies of scale in the sector;
- ii) successful technical co-ordination did not require central dictatorship let alone central ownership. (NB: the successful operation of the global telephone network, which was also managed co-operatively by independent national PTTs under the auspices of the ITU, is further evidence of this fact).

Telecom Sector Transformation

In the USA the system came apart fairly rapidly beginning in the 1970's due to two central forces:

- a) the accelerated development of technologies that permitted non-members of the "telco club" to bypass the system entirely; and
- b) the adoption of new rules and laws that resulted in different industries competing in the same economic market under different legal rules.

The first was natural and unavoidable, the second was unwise and a clear mistake.

Technological disruption

The first disrupter was microwave transmission, which enabled non-traditional players (especially pipelines and railroads who had long stretches of their own rights-of-way) to "bypass" the telephone industry's transmission infrastructure and offer services to large companies by utilising spare capacity in the formers' internal networks. The second was introduction of better peripheral devices (keyed handsets, etc.). Initially such devices were "dumb" and legalisation of their connection to the network in the 70's was thought to be "benign". However, "dumb" devices quickly became a lot more "intelligent" and interconnection of non-telco CPE quickly expanded to include sophisticated electronic network intelligence, such as powerful PBX's, which could be located just "outside" the "edge" of the telephone network and substitute for functions previously performed by the "central" intelligence owned by the telcos.

Together these developments enabled competitors, often including large customers, to create complete telecom networks that could use or by-pass the main network as and when it was convenient and profitable to do so. These "new" non-telco networks offered cheaper, more flexible services than the "orthodox" telcos were able or willing to provide. The pressure from major corporate telecom users for cheaper, more flexible services generated a long series of regulatory and court battles, all of which the telcos lost. Ultimately the concept of "interconnection" of non-telco "devices" to the network expanded to include the interconnection of entire, free-standing competitive telecom networks.

The first arena in which this occurred was long-distance telephony, because that was where the integrated telephone industry had traditionally chosen to accumulate a large part of its surpluses. But with the entry of competitive long distance, these surpluses were quickly eliminated and competition moved to the local area. Most of the political and legal war was fought between big business on one side and the telephone industry on the other. Ordinary

citizens were not much involved and initially cared little. Nevertheless the war was fierce and continued over a period of nearly 20 years starting in the mid/late '70s and finally ending with the passage of the *Telecommunications Act* of 1996, which ended the last vestiges of monopoly, even in the local telco areas.

The reason the telcos could not possibly win in the end was the simple fact that the new technologies were so flexible that it was impossible to “solve” the telephone industry’s dilemma by simply moving the regulatory definition of the boundary of the “monopoly network.” No matter where the regulatory system defined the “boundary” of the “monopoly network” to be, competitors could design and build alternative networks just “outside” this boundary, tap into the network to reach customers, bring their traffic “outside”, transmit or otherwise manipulate it, then tap back into the network at the same or different point to deliver the message or “product”. As this process advanced, the entire foundation of the telephone system in the USA – and ultimately worldwide – was irreversibly undermined. As we shall see, this technological and economic process has continued and accelerated in the modern environment of IP, packet switching and software-defined “edge” intelligence.

Public policy disruption and asymmetry

The second great force eroding the old telephone system was the creation of different legal regimes for different companies competing in the same telecom space. The first of these was that as a result of the 1956 federal anti-trust settlement between AT&T and the Federal Government and a number of other subsequent decisions, it became US policy that data services, including transmission of data and, ultimately, the Internet, were “computer services,” and not “telecommunications” in the meaning of Title II of the Communications Act of 1934 and, hence, were not subject to regulation. Since AT&T had agreed in 1956 to stay out of “unregulated data services” it was excluded from these vast and expanding markets. ([U.S. Court of Appeals 1995](#)).

Although originally thought to be a minor matter, over time this became a severe restriction as the “computer and data” market expanded. This was a bitter pill because AT&T considered itself the founder and pre-eminent computer company in the world (with good reason – considering that it invented the transistor, did by far the most basic research in the field, held the most patents and, in the form of telephone switches was, in fact, the largest computer producer in the world). Exclusion from the exploding “data” market plus the erosion of its own telephone market prompted it in 1982 to settle another federal anti-trust suit with a “deal” that freed it from its exclusion from the computer and data industries – but at the cost of breaking up the Bell network into approximately 30 components.

The majority of the resulting entities were local telcos, the “Baby Bells”. These, along with the independent telephone companies, municipals and co-ops continued to be regulated as “common carriers” subject to price regulation, obligation to serve, quality standards, etc. at both the federal and state levels. They also now faced the obligation to provide non-discriminatory interconnection to any and all long-distance companies – not just ATT Long Lines.

The second major public policy event was passage of the Cable Act in 1985. (47 U.S.C. Chapter 5, Sub-Chapter V-A). When the Cable industry was young it consisted primarily of small rural communities where TV coverage was poor. It responded by building “community” towers on the highest nearby hill in order to bring in distant signals and “pipe” them down their towns, hence the standard nickname for the industry “CATV”, meaning “Community Antenna TV”. In view of this origin and nature, Congress and the FCC were generally supportive and regulation in the early years was light and benign. However, the industry rapidly “grew up” during the ‘70s as aggregators bought up the majority of small operators. Eventually a few major players came to dominate what became a very aggressive oligopoly and by providing business data transfer and voice communications it began competing in the same market space but without the same obligations required of telecom “Title II” common carriers.

The telcos objected to the asymmetric treatment of the Cable companies compared to themselves and vigorously campaigned for either classification of cable companies under Title II or release of telcos from Title II regulations. They argued that either option would create a “level playing field” but the then current situation patently did not. This unleashed a huge political battle that ultimately involved a large part of the US electorate – a battle in which nearly all groups (telcos, local and state officials, unions, consumer groups, etc.) were on one side and the cable companies were on the other. But despite what looked like a political mismatch, the cable companies won hands down and got a special law governing their industry which was, to say the least, “highly favourable,” and which gave them a substantial regulatory advantage vis-a-vis their main competitor, the telephone industry.

With this in their pocket, cable companies were able to attract major financing and attack the telcos effectively in the most lucrative markets. This assault became even more effective with the rise of the Internet because the latter was deemed to be “data service” and anything distributed over it was exempt from regulation, which includes, of course, VOIP telephone service. VOIP enabled cable to compete effectively in the very heart of the telephone industry’s main market without being subject to similar regulation. As the Internet grew in importance, cablecos were at a technical advantage as well because cable networks are, inherently, able to offer greater speeds more easily than traditional “twisted pair” telephone

networks — even when the latter are upgraded to DSL, ADSL etc. As a result, the telcos, especially the Baby Bells who were concentrated in the dense markets that the cablecos most wanted to penetrate, found themselves at a competitive disadvantage.

From the break-up of ATT and the passage of the cable Act in 1985, to the end of the century, the US telecom sector was characterised by a titanic struggle between “Big Telcos” (primarily Baby Bells) and “Big Cablecos”. Due the major regulatory advantages created by the legal distinction between “data” and “telecom” and the effective de-regulation of cable companies, the latter gradually dominated the struggle. In response the two largest remaining Bells, Verizon and ATT, initially reduced their commitment to wireline telecommunications and concentrated on wireless. Most recently, however, these large former telcos have become active in overbuilding portions of their networks with fibre-to-the-premises (see below).

Although some of the US history is unique, it still holds lessons for others — especially regarding the folly of creating a situation in which different companies compete in the same space under different rules. No other country has quite the same arrangement for cable as the USA but the “data” vs “telecom” is not unlike the “services” vs. “infrastructure” issue that most countries, including Australia, are struggling with: how to design and establish a regulatory boundary between two industries that, in fact, operate very close to each other, without creating an unfair and ultimately destabilising dual legal regime, is not an easy task. What at first may seem intellectually obvious becomes very murky over time as the players utilise advancing technology to “game” the system. Ultimately, the result can be an irrational, unfair and unsustainable regime, which defeats the original purpose.

Although these issues are profoundly complex and the technical and economic foundations are changing all the time, the mists are beginning to clear and the real outlines of a sound policy framework are beginning to emerge. This is especially true in the USA and Europe.

In this new world, many of the characteristics of the traditional telephone industry which were enumerated at the beginning of this paper clearly do not hold:

- a) The services offered are now extremely diverse. Instead of “Plain Old Telephone Service” (POTS) i.e. black telephone and voice calls, we have an immense variety of video, data, and voice services; a variety which is growing and changing almost every day;
- b) The need for centralised network co-ordination (never as strong as alleged) has been radically undercut by IP-software-defined distributed intelligence, and packet switching. The Internet, in particular, now, by far the most important telecommunications medium, needs little coordination at all beyond codifying and

registering “addresses” (the analogue to old phone numbers) and updating the protocols for sending messages (primarily IP and its derivatives)

- c) Economies of scale, to the extent they ever existed, continue to erode;
- d) The capacity of modern telecom networks (especially optical fibre-based ones) is now beyond enormous — indeed, in principle, virtually infinite.
- e) Technological change has accelerated. The growth of “services” and the demands they place on the underlying infrastructure are growing exponentially.
- f) The capacity of regulation, by itself, to protect public interest is limited. On the contrary, powerful monopolies *create a powerful tendency toward “regulatory capture”*. This is especially true for sectors like telecom that are both critical to the entire economy and highly technical. Further, this holds true regardless of whether such monopolies are “publicly” or “privately” owned and regardless of the professed ideology of the government or regulators in question. *One of the most important lessons emerging from recent USA telecom history, is that to be effective in bending powerful carriers toward the public good, regulation should be combined with meaningful competition.*

Nowhere, including in the USA, has the legal/regulatory environment fully caught up with technological and structural changes in the industry. That said, some countries are clearly further along in this important task than others!

Barriers to Progress

The struggle in the USA (which is by no means over!) to find a rational and sustainable legal regime that balances society’s interests with the realities of technology and economics, is instructive because of its history of having developed the only telecom sector based on a combination of significant competition among a large number of players and a regulatory framework that focused on managing that competition rather than abolishing it. The fact that the system produced one of the best telephone systems in the world is a very important lesson for the future.

Since the end of the “telephone world”, the USA has not handled the subsequent changes nearly as well as it did the “telephone age” — largely, we would argue, because of the irrational asymmetries introduced by the unique (and, in our view, unwise) Cable Act and the crude distinction between “data” and “telecom” developed by a number of judicial and regulatory decisions. As a result the USA fell from being the clear leader in the old telephone world to its current rank somewhere between 15th and 20th.

In addition, the USA has strayed from its historical preference for multiple entrants and allowed the major incumbent cable and telco oligopolies to collude in order to prevent newcomers from challenging their combined “club”. For much of the period from 1985 to 2000 these efforts were largely successful.

However, the USA is too open, diverse and dynamic for the restrictive actions of the main incumbents to succeed forever. In fact, new players are now entering the sector and are beginning to succeed at rates that are starting to make a real difference. In this process, Fibre-to-the-Premises (FTTP) is playing a major role because, once in place, it trumps all other current technologies. In principle, a single strand of modern optical fibre can carry an almost infinite amount of traffic. Actual traffic capacity in any specific case is, of course, limited by the electronics on the ends of the fibre. But the cost of such electronics is relatively low and falling – making it easy and cost-effective to upgrade fibre networks as and when demand justifies it.

No other technology comes close to the capability, durability and low cost of “fibre everywhere” (another word for “FTTP”, “FTTH” or “FTTX”). Despite rhetoric that may assert otherwise, this is what telecom companies actually do with their own money wherever they have to make decisions in the open market without government subsidies or protections. Indeed, it is a pretty good rule of thumb that, if one observes actual new investment by a telecom company in obsolete copper-based assets, then that constitutes *prima facie* evidence that the company in question is either:

- a) benefiting from uneconomic legal protection of one sort or another (usually from the government); or
- b) investing the taxpayers’ money rather than their own.

Circumstantial evidence of the gradual erosion of both of those supports for investment in copper is the fact that the most recent global data show that copper-based connections fell by 18.7% in Q4 2015 while FTTH and FTTX connections increased by 60.6% and 14.7% respectively (point-topic.com 2016). Australians should think about this when considering the fact that Telstra and NBN are investing sizeable amounts of money in new copper infrastructure – possibly the only major telco in any advanced country where that is occurring.

When incumbents resist fibre it is usually for two reasons:

- a) it destroys the basis of the traditional telecom monopoly, the need to bundle services together with infrastructure; and
- b) it renders their legacy copper networks obsolete and uncompetitive – thereby destroying their value.

Thus they will often oppose competitors' deployment of fibre even in "under-served" areas where they do not expect to invest in new infrastructure. This is exactly how the major telco and cableco incumbents have behaved in the USA and in many other countries including Australia. The methods used have often been ruthless and political. In the US they include impeding access to utility poles and conduits, lobbying for laws that restrict or prohibit new entrants, discriminatory access and pricing practices — and many others. However, the market's desire for better service has not evaporated; indeed, it is accelerating. As a result, a new process of industry restructuring has begun.

Currently in the USA we are seeing a change from the oligopolistic rivalry that followed the Bell breakup and passage of the 1995 Communications Act to a process that is analogous but not identical to that which occurred in the early part of the 20th century regarding telephony. Typically, the ex-Bells wanted nothing to do with FTTP, preferring to milk their still very profitable legacy copper networks to deliver whatever limited connectivity they could manage. To this end they were vociferous in denying the need or desirability of universal fibre, calling it: "unnecessary", "wasteful", "inappropriate" etc. and classifying as "broadband" anything that was better than dial-up service. Their hand was forced, however, by the aggressive expansion of Big Cable, whose Coax and HFC networks could more easily be re-engineered to sustain much higher speeds over longer distances than could be managed with the Baby Bells' preferred "Band-Aid broadband over twisted copper wire" retrofit technology: DSL.

Big Cable has moved to consolidate its position in parts of the metropolitan portions of the Bell areas. However, FTTP trumps both cable and DSL whenever/wherever it is installed. The worst fears of both Bell telcos and major cablecos were aroused when Google, a company whose financial, technical and political weight matches that of the incumbent telcos and cablecos, launched ambitious FTTP networks directly in the heart of some of the most attractive "metropolitan turf". This has clearly rattled the Bells and the cablecos who have suddenly acquired a new-found enthusiasm for fibre and are responding with aggressive FTTP programs in these same core areas. ATT started out with a fibre-to-the-node service but is now upgrading those to FTTP. But, just like its telco and cableco rivals, Google has shown no appetite for going into Bell rural areas. It is these areas that have seen the biggest rash of "unconventional" competitive start-ups: municipalities, other local governments, new co-ops, Public/Private Partnerships, etc. ([Broadband Communities Magazine 2016](#)).

Another important development in "Bell" rural areas is the growing trend of the major Bells to vacate these areas altogether by selling them off to various independent telcos. This has let loose a dynamic merger and acquisition scramble in those areas. M&A in this arena is not

entirely new – that is why there are now 1200 or so "independent" telcos, instead of the 6000 that existed before WWII and approximately 3500 that existed in 1975.

But the large amount of territory coming on the market as ATT and Verizon exit non-metropolitan areas has introduced a whole new dimension to this process, as other companies who are more willing to invest in rural fibre purchase those former Bell properties. Frontier Communications is an example: it started life as a local power company (Citizens Utility in Connecticut), began moving into telecom about 20 years ago when GTE sold a group of rural exchanges in the process of merging with NYNEX (one of the spun-off "Baby Bells") and they have been "rolling up" rural telecom properties ever since. Some of these properties are traditional independent telcos and some are rural properties of former Bell companies, which the latter wants to sell off. Today Frontier is the sixth largest local exchange company in the USA with approximately 9 million access lines – primarily concentrated in rural areas. They acquired significant rural territory from Verizon and ATT and are now aggressively seeking to partner with local governments to extend FTTP further.

Another example is TDS, based in Madison, Wisconsin. It started as a local independent, bought a number of similar companies and now has some 108 subsidiaries – mostly rural – all over the USA and is the seventh largest local exchange company in the US (approximately 6 million lines). TDS has been aggressively rolling out FTTP for the last 7 to 8 years. Last year it stated that it expects to have FTTP in place on 25% of all its access lines by the end of 2016. (NB: Because many of the subsidiaries of these and other local telecom conglomerates still operate under their original local name, outside observers may not realise that they are part of a larger entity).

There are at least a score or more of other similar "conglomerates" ranging gradually down the size scale to some who only own a few subsidiaries. These companies are, due to their historic roots, much more comfortable with rural areas and much more inclined to invest in new FTTP infrastructure there. There are also "failures". The whole of Hawaii was sold off to a non-telecom consortium headed by Carlyle Group, which subsequently went bankrupt. Verizon sold all of its northern New England properties to a mid-level independent conglomerate, FairPoint Communications of North Carolina, which also went bankrupt. Both subsequently came out of bankruptcy and remain in operation but are much weakened and do not have the resources to pursue aggressive conversion to fibre.

In those rural areas where there are no private competitors willing to enter the market in competition with the large telcos and/or cableco incumbent, numerous communities have turned to their local governments to build fibre networks as public utilities. This movement

started in the mid-90's and at first faced tough going against ferocious opposition from "Big Cable" and "Big Telcos".

This opposition succeeded in having such projects outlawed entirely in 19 states and severely hamstrung in a number of others. In addition, at that time FTTP technology was not yet quite ripe for easy, mass deployment. This further hampered the "muni FTTP" movement. By the turn of the millennium, some 10 or 15 had been established and were succeeding. The movement began to accelerate with another 20 or so starting up between 2000 and 2005. The response from the Big Incumbents was to escalate the battle on the political front, as described earlier, rather than to respond by building better networks. But the competitive movement has continued to grow. By 2010 there were approximately 100 FTTP projects up and running throughout the country and there are now over 450 such projects, with new ones being announced almost every week. ([Institute for Local Self-Reliance 2015](#)).

As the growing viability of FTTP is demonstrated by these diverse and successful initiatives, Federal government policy has finally moved toward active support (after initial negativity), partly through grant and loan funding to both private and public entities, partly by upgrading the definition of broadband to a *minimum* of 25Mbps down/5Mbps up as a requirement for anyone building network with Federal funds, by requiring "open access" and "non-discriminatory interconnection" (which incumbent telcos and cablecos consider anathema), by overturning state prohibitions on municipal telecom development, and by repurposing the former "high cost" telephone fund to help defray the cost of Internet delivery in hard-to-reach areas, among others. Most recently the FCC has ruled that it has Title II (regulatory) jurisdiction over the provision of Internet access. This will enable it to apply more equitable regulatory conditions to all carriers. Finally, the palpable success of fibre projects among the 1000+ independent telcos and the 200+ local government projects is finally convincing new purely commercial players to enter the market.

Thus, in the USA competition in telecom – almost exclusively with FTTP technology – is now spreading rapidly and widely, to rural as well as metropolitan areas. As this proceeds there is also an emerging general awareness – and even a nascent consensus – that the right telecom policy for the 21st century consists of three main elements:

- i) A national telecom infrastructure consisting of "universal FTTP on the ground plus universal wireless cloud above resting on the universal fibre foundation below" is the right one for the 21st century;
- ii) The viability, efficiency, flexibility and "future-proofness" of the broadband-based telecom system requires that competition be an essential ingredient and driver of the modern telecom sector.

- iv) However, telecom is so critical to the economy and social concerns are so important that competition must be managed in such a way as to prevent the emergence of monopolistic practices and abuses, must support adequate technical co-ordination and must ensure universal affordable availability.

Most important it is becoming clear that such a regime is not only optimal — it is practical, realistic and achievable.

This broad realisation is spreading in other countries as well, most of which do not have the long history of “managed competition” in telecom as has been the case in the USA.

Which countries first reach the goal of “universal future-proof fibre foundation plus universal wireless cloud based on the fibre foundation” is not easily predicted at this point. As of the beginning of 2014, the leaders in the percentage of connections that were fibre were Japan, Korea, Singapore, Holland, Belgium, Canada and the USA — but things can change. What is virtually certain is that those countries that get there first will have an advantage in the “new economy.”

Implications for Australia

Australia appears to be quite far back in the pack. According to Akamai’s latest report Australia now ranks 48th in the world in terms of average connection speed and 60th in terms of peak speeds. ([Akamai 2015](#)). Nor does there appear to be a convincing path forward. The sector is dominated by a semi-official duopoly between NBN and Telstra. It is difficult not to see this as, *de facto*, a mechanism for transferring money from the Federal Treasury to Telstra and a few large construction companies to build a self-serving patchwork network composed largely of obsolescent copper and Band-Aid additions like satellite. FTTP appears to play a minor role in NBN/Telstra plans according to its roll-out map/plan.

As one would expect in a tightly monopolised market, costs appear to be greatly inflated compared to competitive international norms and performance standards are astonishingly low for such wealthy a country. There are few private players who are able or permitted to enter, and those that have been grandfathered-in suffer substantial regulatory handicaps. Early attempts at innovation and local initiative in wireline seem to have largely atrophied. In effect Government has re-imposed a regime from the world of 50 years ago. Most astonishing is the degree to which both main parties appear to be committed to this approach. True, Labor wants this archaic duopoly “bus” to be driven toward “FTTH” street while the Liberals have told the driver to head toward “MTM” street. But which destination is preferred pales compared the inappropriateness and dysfunctionality of the bus itself.

This is not auspicious for Australia's position in the new global economy in which the most dynamic driving force is the Internet and all that rides upon it. Economic success in the 21st century without world class Internet services is hard to imagine. And it is even harder to imagine how current Australian policy can ever produce a world-class telecom and internet system.

What to do? – Conclusions and Recommendations

The first challenge Australia faces is reflected in the old adage: “you can't fix a problem you don't first admit you have!” That said, with the “fools walk in....” temerity of a newcomers, we feel it may be worth talking about possible remedies. That requires acceptance of the lessons to be drawn from the history described above; i.e.:

1. There are no appreciable economies of scale in today's telecom.
2. There is no need for central ownership or central direction in order to make today's telecom networks work in synchrony with each other.
3. Technology of telecom networks themselves and of the services that utilise them is advancing at exponential rates. Thus, all systems must be flexible and capable of rapid adaptation. No single vision, regardless of how brilliant and “far sighted”, will remain applicable and optimal for long. “Future-proof” – meaning the ability to adapt easily to change in any dimension (organisational and economic as well as technical) – must be a central goal of public policy.
4. Government's role is twofold: to enforce a level competitive playing field; and to ensure universal affordable availability of these basic services. That role does not require, nor is it aided by, monopoly of any kind, including any owned and operated by the government itself.

Based on these principles the following actions should be considered:

- i) Open the long and medium distance wholesale backhaul market to any and all who want to enter . . . and loosen licence requirements for such entrants
- ii) Open up access to undersea cables
- iii) Encourage construction of more undersea cables to open up international access for more domestic carriers
- iv) Permit development of “carrier hotels” by anyone who is willing and able to develop them where long haul carriers can co-locate and offer services to anyone who builds connecting network into the “hotel”
- v) Remove constraints on access to poles and conduits
- vi) Encourage new entrants in rural and other underserved/difficult areas with public money being made available *only as a last resort* and, even then, via

- revolving loan funds and loan guarantees rather than via grants or discriminatory “protections” against competition;
- vii) Determine what legal barriers may exist to innovative forms of finance for new entrants in underserved areas (such as crowd-funding, public sector revenue bonding, etc.);
 - viii) Determine how best to reduce or eliminate such barriers and what constraints or regulatory oversight may be required to enable efficient use of such financing mechanisms
 - viii) Encourage/facilitate joint ventures involving both public and private sector entities and including co-operatives;
 - ix) Restructure the provision of subsidies to disadvantaged areas and groups so that they go directly to the recipients and thereby provide the capacity to pay for infrastructure and services themselves, rather than being dependent on monopolies who are far away and care little. This is **both** less costly to the public purse **and** more effective for target areas and groups.

POSTSCRIPT.....and prognosis

Unfortunately, our near-term prognosis is mostly gloomy. We truly wish we could say otherwise. In our assessment, the current Australian telecom situation is at a dysfunctional impasse. It has retrogressed to the darker days of the old telecom monopoly system – something no other industrialised country in the world has done as far as we are aware. In this climate we are not sanguine that a program like that outlined above is politically likely in the near or medium term.

Despite this gloomy short-term forecast, there are opportunities to begin untangling the knot. One place to start is by explicitly encouraging and enabling independent local FTTP networks to be built in those rural areas designated for non-FTTP development under the NBN. Such networks should be encouraged in any way available—mostly regulatory relaxation—but **not** with government grants. We predict that, if pursued aggressively, this will stimulate a significant number of such networks in non-metropolitan areas that, frankly, need high quality broadband the most. Government grants should be considered only in extremis and in only those areas where it is clear that there is no other way.

We make this suggestion because we have built and operated such networks ourselves in much more challenging environments than those in Australia. We have looked closely at a number of possible sites for such networks here – including in the far northern sections of Western Australia. So far we have not seen anywhere that a viable commercial FTTP local network could not be built and operated. The key issues are very mundane:

- i) access to poles where these exist, or Rights of Way for burying cable where there are no poles— in both cases at fair, cost-based rates that do not include deliberate non-cost barriers to entry;
- ii) non-discriminatory access to wholesale back-haul at prices that reflect costs and do not include monopoly overcharging;
- iii) protection from deliberate predatory actions by monopolies seeking to kill newcomers in order to “set an example”;
- iv) if outside retail service providers do not come forward on reasonable terms then the local network must be allowed to provide retail services itself.

We believe that government has the power to ensure those conditions — and without costing a penny of taxpayer money.

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