THE NON-DUPLICABILITY OF WHOLESALE ETHERNET SERVICES

Promoting Competition in the Face of the Incumbents' Dominance over Last-Mile Facilities

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Preface | THE NON-DUPLICABILITY OF WHOLESALE ETHERNET SERVICES

The evolution of the US and Canadian telecommunications industries has generally followed parallel tracks with respect to technology, competition, and industry structure. Telecom regulation in both countries has numerous similarities as well, along with several important differences. During the 1990s, regulators and other policymakers in both countries adopted measures intended to affirmatively encourage and facilitate the introduction and development of competition where none had previously existed. The incumbent carriers were required, as a *quid pro quo* for earnings and pricing flexibility (and, in the US, as a condition for relief from certain antitrust measures that had been imposed in connection with the 1984 break-up of the former Bell System), to "open their networks" to unbundled access by rival firms so as to jump-start competitive entry, to recognize economies of scale and scope uniquely available to incumbents, as well as to avoid costly and wasteful duplication of incumbent carrier infrastructure. Rules specifying the services and "network elements" required to be unbundled and mandating a cost-based wholesale pricing regime were established. These devices were embodied in telecom reforms in both the US and Canada, and achieved their intended purpose: Competitive entry and investment took off.

But 2001 saw an abrupt change in US telecom policy under which much of the earlier wholesale unbundling and pricing regime would ultimately be dismantled. In Canada, however, regulation of wholesale services and prices persisted until 2008, when a ruling by the CRTC in its "Essential Facilities" proceeding called for phasing out some of the previously-mandated wholesale services that incumbent carriers had been required to provide to rivals. The CRTC's decision to scale back the scope of services subject to its "essential facilities" treatment is premised upon the notion that, for these "next generation" services, "duplication" of such facilities by "efficient" competitors is practical and feasible, making them "non-essential" as inputs to competitor services. That determination, however, fails to consider the practicalities of "overbuilding" existing infrastructure or the importance of ubiquitous network connectivity in attracting revenues sufficient to support such capital outlays. In this report, we explore the matter of "duplicability" in detail, focusing upon the economic considerations that control investment decisionmaking with respect to construction of competitor-owned networks. In our companion report, *the Role of Regulation in a Competitive Telecom Environment*, we compare the effects on competition and investment resulting from regulation vs. deregulation of ILEC last-mile broadband facilities. This report was prepared by Dr. Lee L. Selwyn, President of Economics and Technology, Inc. The views expressed here are those of the author.

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Executive Summary

THE NON-DUPLICABILITY OF WHOLESALE ETHERNET SERVICES

Large enterprises typically operate at multiple locations spread out over an expansive geographic area, ranging in size from primary national and regional headquarters to small, often isolated branch offices spread across urban, suburban and rural areas. Organizations such as these – which include both business corporations as well as government agencies – require modern broadband telecommunications connectivity to interconnect all of these geographically dispersed units. The current standard for business telecom networks of this type involves a packet switching transmission protocol known as *Ethernet*. Notably, while correctly concluding that most "legacy technology" telecom facilities are "essential" inputs to competing services (finding that "(1) the facility is required as an input by competitors to provide telecommunications services in a relevant downstream market; (2) the facility is controlled by a firm that possesses upstream market power such that withdrawing (or, with regard to future applications to consider the essentiality of a non-mandated service, denying) mandated access to the facility would likely result in a substantial lessening or prevention of competition in the relevant downstream market; and (3) it is not practical or feasible for competitors to duplicate the functionality of the facility"), the CRTC *incorrectly* concluded that these same three conditions somehow do not apply with respect to Ethernet.

In fact, these very same three conditions apply with equal force and effect to the facilities that support Ethernet and other "next-generation" services *because the underlying facilities themselves, as well as the economic conditions driving competitive self-supply capital investment decisions, are fundamentally the same*. Facilities construction decisions are made on a building-by-building basis driven by the anticipated revenues relative to the costs involved. In the vast majority of business locations, potential revenues are not sufficient to permit economic recovery of the associated investment. In order to attract a customer's business (i.e., revenues), a competitor needs to be able to serve the customer's overall requirements – both at locations where self-supply is economically practical as well as at locations where it is not. It is with respect to this latter group – which represents the overwhelming majority of business locations even in the largest metropolitan areas – that wholesale services furnished *solely by and available solely from the incumbent carrier* are unambiguously *essential* to the competitor's ability "to provide telecommunications services in a relevant downstream market."

The inability of a competitive telecommunications service provider (TSP) to obtain such services on an economic basis from the incumbent not only prevents the competitor from offering services at locations that it cannot feasibly self-supply, it also operates to undermine the competitor's economic

ability to offer services to multi-location customers even at those locations at which the competitor has deployed facilities of its own. Typically, the vast majority of an enterprise customer's individual locations (from bank ATMs and point-of-sale terminals to branch offices and in some cases even major operational units) are unlikely individually to require levels of service capable of generating sufficient revenue to justify the deployment of a new facility. Without mandated access to ILEC last-mile broadband, these conditions create a death spiral for competition – competitors cannot expand coverage without leasing, and cannot generate the revenues necessary to expand investment without coverage.

In excluding Ethernet and other advanced or next-generation functionalities from treatment as "essential" services, the CRTC has confused these "services" with the underlying facilities that support them. In so doing, the CRTC has failed to recognize that the economic conditions that govern the feasibility or practicality of competitor deployment decisions are the same regardless of whether the facility is copper- or fibre-based. Incumbents enjoy massive economies of scale and scope that no entrant can reasonably hope to duplicate at more than a small number of service locations nationwide. Experience in both the US and in Canada, as well as in the rest of the world, over nearly two decades under "competitive" telecom regimes, consistently bears this out. By categorically *declaring* certain facilities to be "non-essential" and hence not subject to regulatory mandates as to their availability and to regulatory constraints as to their prices, the CRTC overlooks these deployment realities. In so doing, the Commission undermines competitive opportunities *even at those individual locations at which competitor facilities deployment might otherwise be economically viable*. And the Commission's attempt to mitigate the adverse consequences of its action – by deferring full deregulation for several years – does far more to demonstrate the utter shortcomings of its reasoning and analysis than to ameliorate the adverse consequences of its actions. Investment in telecom facilities is made for the long term. If the economic viability of an investment in facilities requires continued access to the incumbents' networks, the impending withdrawal of such access in a short span of time will undermine that viability as thoroughly as if the withdrawal were to occur immediately. The "phase-out" aspect of the CRTC's treatment of facilities that it now declares to be "non-essential" fails to mitigate its impact upon competition and competitors.

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Introduction

In CRTC Telecom Decision 2008-17, the Commission adopted a three-part test for "essentiality" of a facility.[1] It determined that "to be essential, a facility, function, or service must satisfy *all three* of the following conditions:

(i) The facility is required as an input by competitors to provide telecommunications services in a relevant downstream market;

(ii) The facility is controlled by a firm that possesses upstream market power such that withdrawing (or, with regard to future applications to consider the essentiality of a non-mandated service, denying) mandated access to the facility would likely result in a substantial lessening or prevention of competition in the relevant downstream market; and

(iii) It is not practical or feasible for competitors to duplicate the functionality of the facility."

Unfortunately, in setting down the third of these "conditions," the CRTC fails to provide any substantive guidance for assessing such "practicality" or "feasibility." However, in CRTC Telecom Decision 2008-118, the Commission does offer some insight as to its basis for making such an assessment. In justifying its original conclusion (in Telecom Decision 2006-17) that Ethernet services are not essential, the Commission applies what amounts to an "if it's been done somewhere, it can be done anywhere" analysis:

> The Commission notes that the record indicates a high incidence of competitor self-supply or alternative supply of fibre-based access and transport facilities. The Commission considers that the reported level of alternative supply demonstrates the existence of competition in the upstream market for such facilities.[2]

1. Telecom Decision 2008-17, at paras. 36-37.

2. Telecom Decision 2008-17, at para. 118.

Notably, the Commission does not quantify the "high incidence" to which it refers, nor does it provide any guidance as to how this value should be calculated. Indeed, inasmuch as evidence presented to the Commission showed the presence of competitor-owned facilities at only a low single-digit percentage of all commercial buildings in Canada, it is nowhere apparent – and the Commission does not explain – how it interprets this minimal presence as constituting a "high incidence" of competitive facilities deployment or how it applies its "high incidence" standard to the facts before it. Put simply, if the Commission determines that duplication of a particular type of incumbent carrier facility – e.g., a fibre-based access or transport facility – has been done *somewhere* by *somebody* at some (unspecified) "level of alternative supply," then it concludes that, by inference, the same *type* of facility must be deemed to be capable of duplication *anywhere* by *anybody*.

I am aware of nothing in the record of CRTC 2006-14 that would support such an inference or leap of faith, and indeed there is *compelling evidence* as to its fundamental invalidity. Moreover, in making its determination "that these services do not meet the third criterion of essentiality regarding duplicability,"[3] the Commission never even attempts to address the question of *where* a competitor must find it practical or feasible to duplicate the facility's functionality. That is, it expressly avoids the critical question of the scope of the geographic market for duplicability. When, in Telecom Decision 2008-118, the Commission rejects "a national scale" as too broad, it again fails to provide any analysis, economic rationale, or other guidance for assessing the feasibility of deploying competitor facilities to an individual facility, across a particular urban area, or at any geography other that national. The Commission compounds this error in seemingly failing to acknowledge that, without wholesale access, what the competitor is forced to duplicate is not merely a particular service (e.g., Ethernet, CDN) but rather the *physical transmission facility* required to provide one or more of these services.

In determining that Ethernet and certain other next-generation services are "duplicable" and hence "non-essential," the CRTC has failed to established or quantify any threshold conditions of "practicality" or "feasibility" of duplication upon which that determination was based.

Determination as to the "practicality" or "feasibility" of duplication requires a good deal more than these types of superficial, anecdotal "it's been done" observations. It requires an understanding of the economic issues affecting both the costs of facilities deployment and the revenues potentially available therefrom. In the context of a telecommunications *network*, each location interacts with all other network points, such that "practicality" or "feasibility" of duplication must necessarily be considered not on a location-by-location basis, but in the larger context of network effects and network economics.

MTS Allstream likely has the most extensive competitor network in Canada, including the most extensive competitor local access/transport infrastructure, altogether representing approximately $3-

3. Telecom Decision 2008-118, at para. 10.

billion in infrastructure investment *outside of its Manitoba ILEC operating territory*.[4] MTS Allstream presented evidence to the CRTC that, while it was engaged in the construction of its core and national backbone network, the company has over the past 15 years also invested in building interoffice transport and building accesses. Today, about 6%, or some 2,300 of the 38,000 commercial buildings outside of Manitoba at which MTS provides service are being provisioned using MTS Allstream owned facilities.[5] Even though MTS has constructed 13 fibre networks in metropolitan areas across Canada outside of its ILEC operating areas in Manitoba, these facilities reach less than 5% of all commercial buildings.[6] The experience in the US is quite similar, with the vast majority – sometimes as high as 99% – of locations at which competitive TSPs require service involving the use of access facilities obtained from incumbent LECs.[7] In finding that "the reported level of alternative supply demonstrates the existence of competition in the upstream market for such facilities," the CRTC is, in effect, saying that inasmuch as MTS has deployed its own facilities to 2,300 locations, it should be able to deploy "such facilities" to each of the remaining 35,700 locations. The Commission has neither cited nor offered any factual or analytical support for that conclusion or for the inference upon which it is based. The Commission's categorical *declaration* that *it is* practical and feasible for competitors to duplicate the functionality of all facilities anywhere in Canada that are used to support services involving the Ethernet protocol has no basis in fact or record evidence.

In drawing this inference, the CRTC has applied the "feasibility/practicality" test on a facility-by-facility basis rather than with respect to a competitor's overall business model. One could perhaps argue that, when looked at in isolation, *any* facility is physically capable of being duplicated as long as cost and other highly relevant practicalities are ignored. While specific "build vs. lease [from the ILEC]" decisions may be made on a location-by-location basis, the decisions themselves will be driven

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4. MTS Allstream Application to Review and Vary Telecom Decision CRTC 2008-17, May 21, 2008, at 7,

5. *Id.*

6. *Id.*

7. For example, in Comments submitted in the FCC's *Special Access Rulemaking*, Sprint Nextel Corporation, the largest interexchange carrier and the largest wireless carrier in the US not affiliated with a Bell operating company, noted that "for both its wireline and wireless businesses, Sprint Nextel relied on incumbent LECs' special access services for 96.4% of all DS1 and DS3 customer terminating circuits (including circuits terminating at cell sites) in the top 50 MSAs in 2006, including services for which incumbent LECs have been granted pricing flexibility as well as services for which incumbent LECs are still subject to price caps." Comments of Sprint Nextel, filed in WC Docket 05-25,/RM-10593, *Special Access Rates for Price Cap Local Exchange Carriers*; *AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services* ("Special Access Rulemaking"), filed August 8, 2007, at 30. Sprint advised that "[e]ven in large urban areas, for example, Sprint Nextel remains dependent on BOC special access to meet its DS1 and DS3 needs. For example, in 2006, Sprint Nextel purchased 98% of its DS1 and DS3 circuits in Chicago from AT&T; 97% of its DS1 and DS3 circuits in Boston from Verizon; and 99% of its DS1 and DS3 circuits in San Francisco from AT&T." *Id.* Sprint noted that it "constantly seeks alternatives to these two BOCs, but has had a striking lack of success in doing so. Responses to Sprint Nextel's most recent alternative vendor questionnaire in January 2007, which was sent to 77 potential alternative vendors, show that only 16 such vendors had fibre facilities reaching only approximately 1% of over 52,000 Sprint Nextel cell sites nationwide ...." *Id.*, at iii.

by complex interactions involving proximate network connectivity, as well as broader cost (supply) and revenue (demand) conditions. All else equal, the competitor's "business case" for construction of a given facility at a given location is materially affected by many highly specific factors, including:

(a) the overall extensiveness of the competitor's network of owned as well as leased facilities;

(b) the location's proximity to a point on owned facilities where connectivity can be made; and

(c) the revenue that is potentially available at that location.

The CRTC appears to recognize the influence of revenues and costs in the "build it or lease it" decision:

> In the Commission's view, practicality of duplication relates predominantly to the economic ability of competitors to self-supply or use third-party supply for upstream facilities. The Commission considers that a facility can be practically duplicated if a reasonably efficient competitor could expect to earn sufficient revenue to justify investing in the construction of a given facility. As such, the Commission considers that all potential revenue and costs must be factored into the duplicability analysis.[8]

Unfortunately, this fundamentally correct economic conclusion is not implemented in the Commission's decision, because it never actually evaluated any of the realities confronting a competitor at "a given [*prospective*] facility."

Obviously, it would be impractical for a regulatory decision to address individual business case analyses on a project-by-project basis. However, even in establishing a framework of general applicability, there needs to be specific criteria for assessing this "economic ability to self-supply," and these criteria need to reflect the practical realities being confronted by "a reasonably efficient competitor" when that competitor evaluates, on a project-by-project basis, whether it "could expect to earn sufficient revenue to justify investing in the construction of [the] given facility." But this is not what the Commission has done. Rather, it has simply taken the existence, in some locations, of some existing competitor fibre and facilities that can (although not optimally) be used to provision Ethernet, as evidence of a "high incidence" of duplicability at all other locations.

8. CRTC Telecom Decision 2008-17, at para. 41.

The *Essential Facilities* decision fails to recognize that the broad-based economic availability to competitors of wholesale ILEC access and transport facilities at cost-based rates *enhances the business case for construction of competitor-owned facilities*.

Importantly, the Commission's decision also fails to take into account the fact that the broad-based economic availability to competitors of wholesale ILEC access and transport facilities at cost-based rates actually operates to *enhance the business case for competitor construction of its own facilities*, stimulating competitor investment and strengthening its competitive position overall. Rather than encouraging competitors to leverage the reach of the ILEC network as a springboard for more competitive investment, the CRTC seems to view the availability of ILEC facilities as creating a *disincentive* for such competitive investment ("why build if we can lease"). As we show, and as experience both in the US and in Canada confirms, this conclusion is unjustified.

Rather than discouraging competitive facilities investment, the availability of economic access to the incumbents' networks has had precisely the opposite effect. In our companion paper, *The Role of Regulation in a Competitive Telecom Environment*, we compare competitor and incumbent investments made under alternative regulatory climates – in the US prior to 2001, when ILEC's were required to make last-mile wholesale services available to their rivals at regulated, cost-based rates, and following 2001, when such regulatory mandates were relaxed and in some cases eliminated entirely. It is also particularly instructive to compare competitor investment levels in the US and Canada during the same time period – 2001 through 2007 – when overall economic conditions in both countries were similar, but where regulation of wholesale ILEC services, which had been largely discontinued in the US, was still in effect in Canada. In Figure 1 below, we compare US and Canada competitive TSP capital expenditures during this period. As competitors in the US pulled back on their capital spending or left the market altogether due to the unavailability of economic access to ILEC facilities, their counterparts in Canada expanded their networks.

Factors affecting revenues

Telecommunications is a *network-based* industry. Network-based industries exhibit unique economic properties – *network effects* – that influence both the demand for and the supply of its services.[9] With respect to *demand*, the economic value of a network to its users – which directly influences the amounts that users are prepared to pay for its services – increases exponentially with the number of points served. As shown in the diagrams in Figure 2 below, the number of potential point-to-point connections that can be created on a network increases exponentially with the number of individual "nodes" on the network. For example, only one possible point-to-point connection can be created on a network serving only two nodes (A-B). A network with three nodes can support three different point-to-point connections (A-B, A-C and B-C); a network with four nodes can support six different point-to-point connections (A-B, A-C, A-D, B-C, B-D and C-D), and so on. This relationship between the potential number of point-to-point connections (C) and the number of locations served by the network (n) can be stated as:

$$C = n(n-1) / 2$$

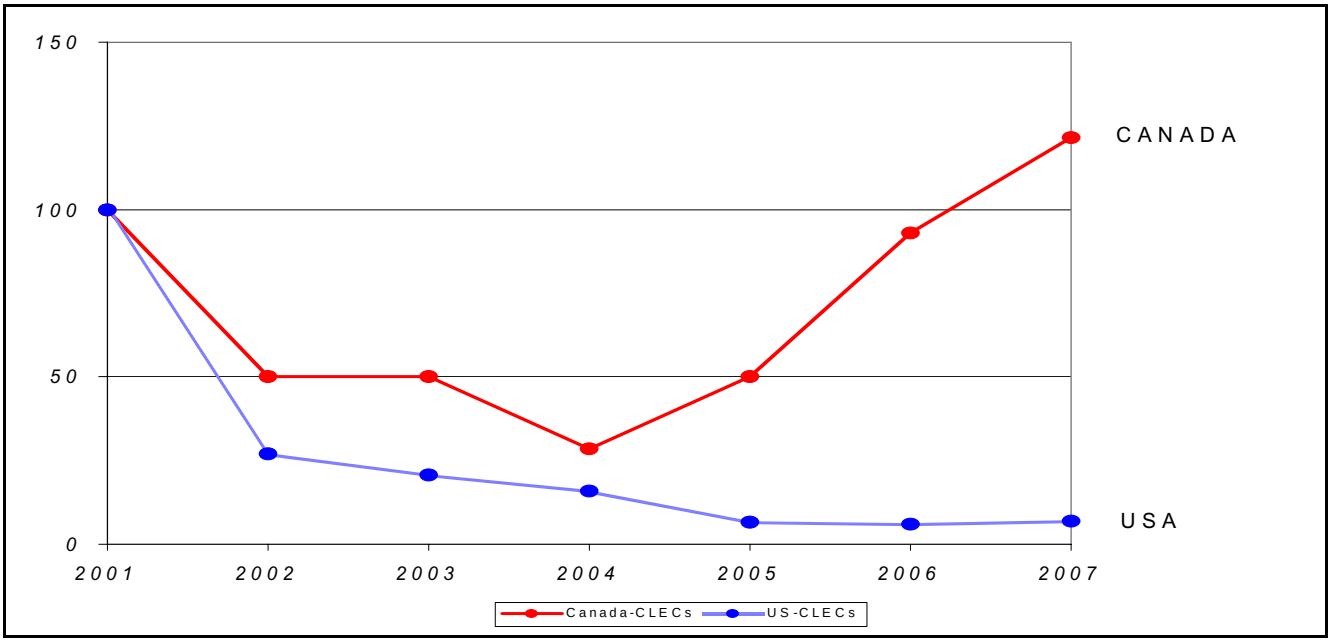

Figure 1. Beginning in 2001, US regulators and courts relaxed and eliminated regulations mandating competitor access to incumbent carrier networks, and as a consequence competitive carrier capital spending all but dried up. In Canada, where wholesale services remained subject to availability mandates and price regulation, competitor facilities investments escalated.

9. Michael I. Katz & Carl Shapiro, *Systems Competition and Network Effects*, 8 J. Econ. Persp., Spring 1994, at 93, 96; see also, Nicholas Economides, *Public Policy in Network Industries*, NYU Law & Econ. Res. Paper No. 06-49, at 4 (Sept. 2006), available at http://ssrn.com/abstract=936469.

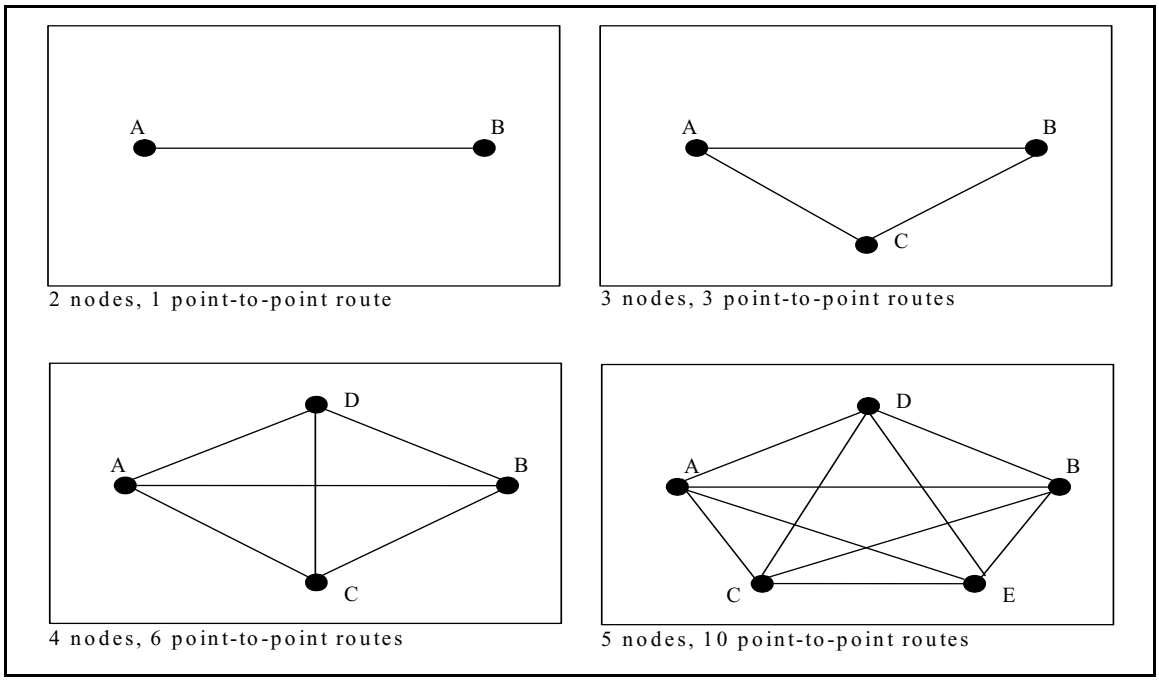

Figure 2. The number of potential point-to-point connections that can be created on a network increases exponentially with the number of individual "nodes" on the network.

Table 1 below demonstrates this relationship between the number of points served and the number of possible two-point connections for hypothetical networks of various sizes:

Table 1

Network Externalities Grow Exponentially as the Number of On-Net Nodes Increases

Number of On-net buildings (n)	Possible Point-to-Point Connections ($n(n-1)/2$
2	1
3	2
4	6
5	10
10	45
100	4,950
1,000	499,500
10,000	49,995,000

A more valuable network – one that reaches more locations – has exponentially greater revenue opportunities and can attract more customers and command higher unit prices than a small network with limited connectivity.

This competitive disadvantage inherent in relatively small networks can, however, be entirely overcome if the small network is able to access and incorporate components of the incumbent's network, in effect offering its customers the same connectivity and extensiveness as that being offered by its much larger rival. Thus, all else equal, when a competing carrier is able to augment its own facilities with additional facilities leased from the incumbent, the value of its own facilities is increased because it is able to offer its customers greater connectivity *at each of its owned service points*. By increasing the value of – and hence the revenue potentially available at – each owned service point, the business case for deployment of owned facilities is improved, stimulating greater facilities investment on the part of the competing carrier. Put differently, a competing carrier's economic ability to invest in its own infrastructure will be significantly enhanced if it is able to economically gain access to the incumbent's network than if such access is denied or priced at an uneconomic level. The competing carrier will invest more capital and build to more locations with access to the incumbent's network than in its absence. Indeed, if access to the incumbent's network is withdrawn or denied, the economic value of the competitor's owned facilities may well decrease to the point where it is no longer viable and would be forced out of the market altogether.[10]

Consider the following. As noted above, MTS Allstream currently provides service at approximately 38,000 commercial buildings (outside of Manitoba) of which only about 2,300 are served via facilities owned by MTS Allstream. Because the company is able to lease facilities from incumbents, it is able to offer single-source connectivity, both regionally and nationally, to customers whose telecom requirements embrace both owned and leased facilities. Suppose that a hypothetical banking institution has 1,000 locations across Canada of which only 50 are currently being served via facilities owned by a competitive (non-incumbent) service provider. In order to offer single-source connectivity to the bank, the carrier will need to lease facilities at each of the remaining 950 locations from the local ILEC. If access to those ILEC facilities becomes unavailable or uneconomic, the competing carrier will no longer be able to offer single-source connectivity to the bank and, as a result, may lose the bank – and the revenues it provided – as a customer *even at those locations that are on the carrier's own network*.[11]

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10. The physical presence of a competing carrier in a given building presents a competitive challenge to the incumbent only to the extent that the entrant is able to provide customers in that building with the connectivity they require between that building and other sites. Incumbent carriers with ubiquitous networks can almost always provide the required connectivity precisely because they serve virtually every building within their overall footprint. Where a carrier owns facilities to only a small fraction of the potential locations at which such connectivity might be required, it can compete with the ubiquitous incumbent only to the extent that it can obtain access to those locations where it does not have its own facilities deployed.

11. In the US, the impetus for Ethernet development has come not from incumbent carriers, but from competitive TSPs. Time Warner Telecom, which describes itself as "one of the top three business Ethernet service providers nationwide," recently underscored this point to the FCC: "Changing market conditions are also making CLECs more reliant on ILEC

Stated more generally, the revenues available at any given location are influenced by the specific demand at that location together with the aggregate connectivity that the carrier is able to offer to that location. These are generally referred to as "demand-side network effects." Not all network-based industries exhibit demand-side effects. For example, in the case of water, natural gas, and electric power distribution networks, the customer's sole concern is with *delivery* rather than with *connectivity*. Our hypothetical bank needs water and electricity at each of its locations, but gains little (other than perhaps some minimal administrative convenience) by purchasing the entirety of its needs from a single source. In the case of telecom, connectivity to the rest of its network (and, for that matter, to the rest of the world) is the key driver of value, without which the physical telecom access link at each individual location would be essentially worthless. Importantly, though, even where demand-side effects are minimal or non-existent, the presence of "supply-side network effects" – economies of scale and scope – are present in most, or even all, network industries, creating efficiencies that confer significant cost advantages to larger, more extensive networks.

Factors affecting costs

Construction of network infrastructure – whether legacy (copper) or next generation (fibre) involves extremely high fixed costs and minimal volume-sensitive costs. Supply- or cost-related network effects arise due to the extensive economies of scale and scope extant in the construction and operation of telecommunications networks.

- *Economics of scale* arise due to the combined effects of high fixed costs and low volume-sensitive costs. The average cost per unit of traffic – i.e., the total cost of a facility (fixed plus variable) spread over the traffic carried thereon – decreases as the total volume of traffic increases. All else equal, the cost per unit of traffic on a network that carries large volumes of traffic will be less than the cost per unit of traffic on a network that supports a more limited volume of traffic.

- *Economies of scope* arise because a more extensive network (in terms of the total number of points served) will typically carry more traffic across each link in its network than one with fewer points served. This network effect can be seen in the following diagram (Figure 3). In the case of the two-point network that connects points T and U, the only traffic that can be carried across the T-U link is traffic that originates at one of these points (T or U) and terminates at the other. In the larger network, the same T-U link can carry, in addition to the T-U traffic, traffic between V and

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facilities even as some CLECs like TWTC continue to construct high capacity loops to businesses in those cases where the economic case makes sense. Customers are increasingly demanding that their service providers take advantage of the efficiencies offered by IP to integrate all of their communications needs on a single network serving all (or virtually all) of a customer's locations. This development has increased the number of ILEC loop facilities that TWTC must purchase, because it is inefficient for TWTC to deploy its own loop facilities in many of the new locations that TWTC must now reach." Comments of Time Warner Telecom, Inc., *I/M Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, FCC GN Docket No. 07-45, filed May 16, 2007 ("*Time Warner Comments*"), at 11.

U, between W and U, between X and U, between T and Y, between T and Z, between V and Y, and between V and Z. In fact, each individual link on this network is capable of carrying traffic between multiple pairs of points.

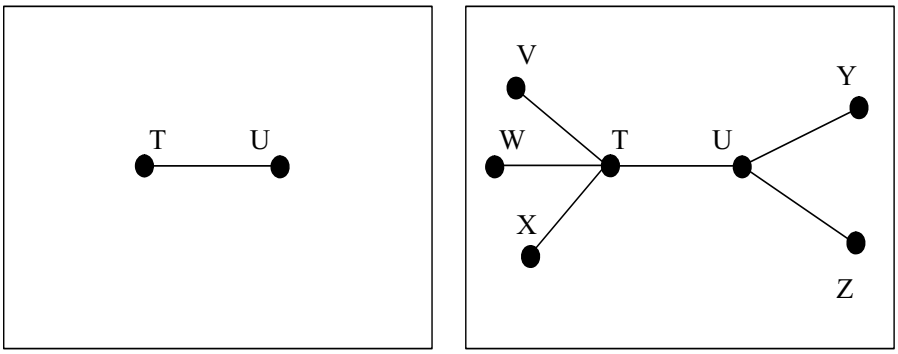

Figure 3. A more extensive network (in terms of the total number of points served) will typically carry more traffic across each link in its network than one with fewer points.

The business case applicable to any individual network link is thus critically dependent upon the overall connectivity of the complete network. The business case for construction of the link between T and U is far more difficult to make in the 2-point network than in the 7-point network. The provision of a facility to a particular building that will be economically practical for a large network (such as that of an incumbent LEC) will frequently be impractical for a small network, such as that of a CLEC.[12]

Incumbent LECs possess networks with near-ubiquitous coverage and connectivity, and an embedded customer base of a size sufficient to enable the ILEC to achieve maximum scale and scope economies. Entrants possess none of these advantages. The US Federal Communications Commission (FCC) recognized this disparity early on in its process of implementing the federal *Telecommunications Act of 1996*:

> Congress addressed these problems in the 1996 Act by mandating that the most significant economic impediments to efficient entry into the monopolized local market must be removed. The incumbent LECs have economies of density, connectivity, and scale; traditionally, these have been viewed as creating a natural monopoly. As we pointed out in the NPRM [Notice of Proposed Rulemaking], *the local competition provisions of the Act require that these econo-*

12. Airline "hubs" are a manifestation of this network effect. Without the connectivity available at an airline hub, individual flights will generally carry only traffic that originates and terminates at the two endpoints. By introducing the ability to change planes at the hub, each flight segment will carry *both* the end-to-end demand on that segment, as well as the demand between the non-hub end of the segment to all other endpoints served out of the hub, thus significantly increasing the traffic load on each flight segment. See, Lee L. Selwyn, "Assessing Market Power and Competition in the Telecommunications Industry: Toward an Empirical Foundation for Regulatory Reform," *Federal Communications Law Journal*, v. 40, no. 2, April 1988, at 202-206.

> *mies be shared with entrants*. We believe they should be shared in a way that permits the incumbent LECs to maintain operating efficiency to further fair competition, and to enable the entrants to share the economic benefits of that efficiency in the form of cost-based prices.[13]

Indeed, as the traffic-carrying capacity of switching and transmission facilities expands (with, for example, the introduction of fibre optics in place of copper or coaxial cable), network-related scale and scope economies actually increase both in magnitude and in importance. Using currently available technology, a single glass fibre strand can be configured to carry in excess of 129,000 voice conversations, and that capacity limit is continuously expanding.[14]

The single largest element of the cost of deploying telecom facilities – copper or fibre – is their physical placement – securing rights-of-way and building access, the construction of underground conduits and trenches, the erection of poles, crossbars, guys, and other structures, the installation of the cable itself, and (with respect to fibre) the construction of lateral fibre cable connections from the carrier's fibre backbone into individual buildings. These costs are not affected by the traffic capacity of the fibre cable itself. While the cost of a fibre cable increases (although less than proportionately) with the number of strands within the sheath, as does the cost of the optical electronics (optronics) associated with the facility, these capacity-sensitive costs – and particularly in urban areas – are small relative to the fixed non-capacity-sensitive construction costs. For this reason, the more traffic a carrier can place on a given facility, the lower the cost per unit of traffic becomes.

Non-capacity-sensitive costs associated with the physical placement of fibre facilities are, however, significantly impacted by the *proximity* of any given location to other service points on a provider's network. If the carrier does not have backbone fibre deployed near the building under consideration, its costs to construct a lateral connection to that building could be substantial or even prohibitively expensive. Even where backbone facilities are nearby or directly in front of the subject building, the location at which access to that facility may be achieved could well be some distance away.[15]

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13. *In the Matter of Local Competition Provisions in the Telecommunications Act of 1996*, CC Docket No. 96-98, *First Report and Order*, 11 FCC Rcd 15499, 15508 (1996). Emphasis supplied.

14. Capacities far greater than that have been achieved. For example, Alcatel-Lucent offers optical equipment that can transmit up to 1.6 Terabits per second over a single strand of fibre. The Alcatel-Lucent website describes the WaveStar® OLS 1.6T, a long-haul optical line system that achieves the 1.6 Tbps bandwidth by transmitting data over 160 wavelength channels on the same single strand. See, http://www.alcatel-lucent.com/wps/portal/products/detail?LMSG_CABINET=Solution_Product_Catalog&LMSG_CONTENT_FILE=Products/Product_Detail_000171.xml&LMSG_SUBCATEGORY=Core+DWDM+Systems&LMSG_PARENT=Product_Families/Product_Family_000026.xml&LMSG_CATEGORY=Optics (accessed March 9, 2009).

15. In the case of copper twisted pair cables that have traditionally been used to carry voice telephone service to subscriber locations, or coaxial cable that has traditionally been used to carry cable television (and more recently, cable-based Internet access) to residential subscribers, "taps" can inexpensively be made at numerous points along the cable route,

This is graphically demonstrated by a map that was submitted to the FCC by SBC in 2003 (before the elimination of legacy AT&T and MCI as independent companies). The SBC map, reproduced as Figure 4 below, shows competitor fibre deployed along streets in the San Francisco financial district as well as the locations at which SBC's Pacific Bell ILEC unit was at that time supplying special access services to competitive carriers (including pre-merger AT&T and MCI) for their use in serving their customers. An analysis of this map reveals more than 436 instances where SBC special access services were being provided to competitor customer locations on streets where competitive fibre was in place but which was not being used to serve these customers.[16] Evidence submitted by (pre-merger) MCI to the FCC put the cost of constructing a lateral connection, given an existing fibre ring, to be in the range of $65,000 to $250,000.[17] (Pre-merger) AT&T submitted evidence in a subsequent phase of that same FCC proceeding that put the cost of a pair of multiplexers required for each lateral – *with dark fibre to the building already in place* – at approximately $47,000.[18]

As the San Francisco map demonstrates, there are numerous – 436 or more – instances where a competitor's customer at a building physically adjacent to a competitor-owned fibre route is nevertheless being served by the competitive TSP using facilities leased from the ILEC, *because the revenues available to the competitor at such locations were not sufficient to offset the capital investment that would have been required in order for the competitor to construct a lateral connection to that building*. Relying upon such evidence, the FCC, in its 2003 *Triennial Review Order*, concluded that, at a service level of less than three DS-3s at any given location, the available revenues would not be sufficient to support competitor construction of a connection to that building.[19]

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typically at a telephone pole directly in front of the customer's home. In the case of fibre optic cable, access points involve complex optical electronic equipment whose costs must be included in the business case for a lateral connection (the fibre optic counterpart of a "drop wire") into any given building. The fact that a carrier has fibre cable running immediately adjacent to any given building does not guarantee that providing connectivity to that building can be economically justified, and will be considered only where there is sufficient revenue opportunity to permit recovery of the capital investment costs involved in provisioning the lateral connection.

16. Attachment A of SBC Communications *ex parte*, filed August 18, 2004 in CC Docket No. 01-338, *Review of the Section 251 Unbundling Obligations for Incumbent Local Exchange Carriers*. The San Francisco results are not atypical; ETI analyzed data for other SBC and found similar results.

17. Declaration of Edwin A. Fleming on behalf of WorldCom (MCI), filed April 4, 2003 in CC Docket No. 01-338, *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, at 3.

18. Declaration of Anthony Fea and Anthony Giovannucci on behalf of AT&T, filed October 4, 2004 in WC Docket No. 01-338, *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, at footnote 9.

19. *In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket No. 01-338; CC Docket No. 96-98; CC Docket No. 98-147, *Report and Order and Order on Remand and Further Notice of Proposed Rulemaking*, 8 FCC Rcd 16978, 17156-7 (2003).

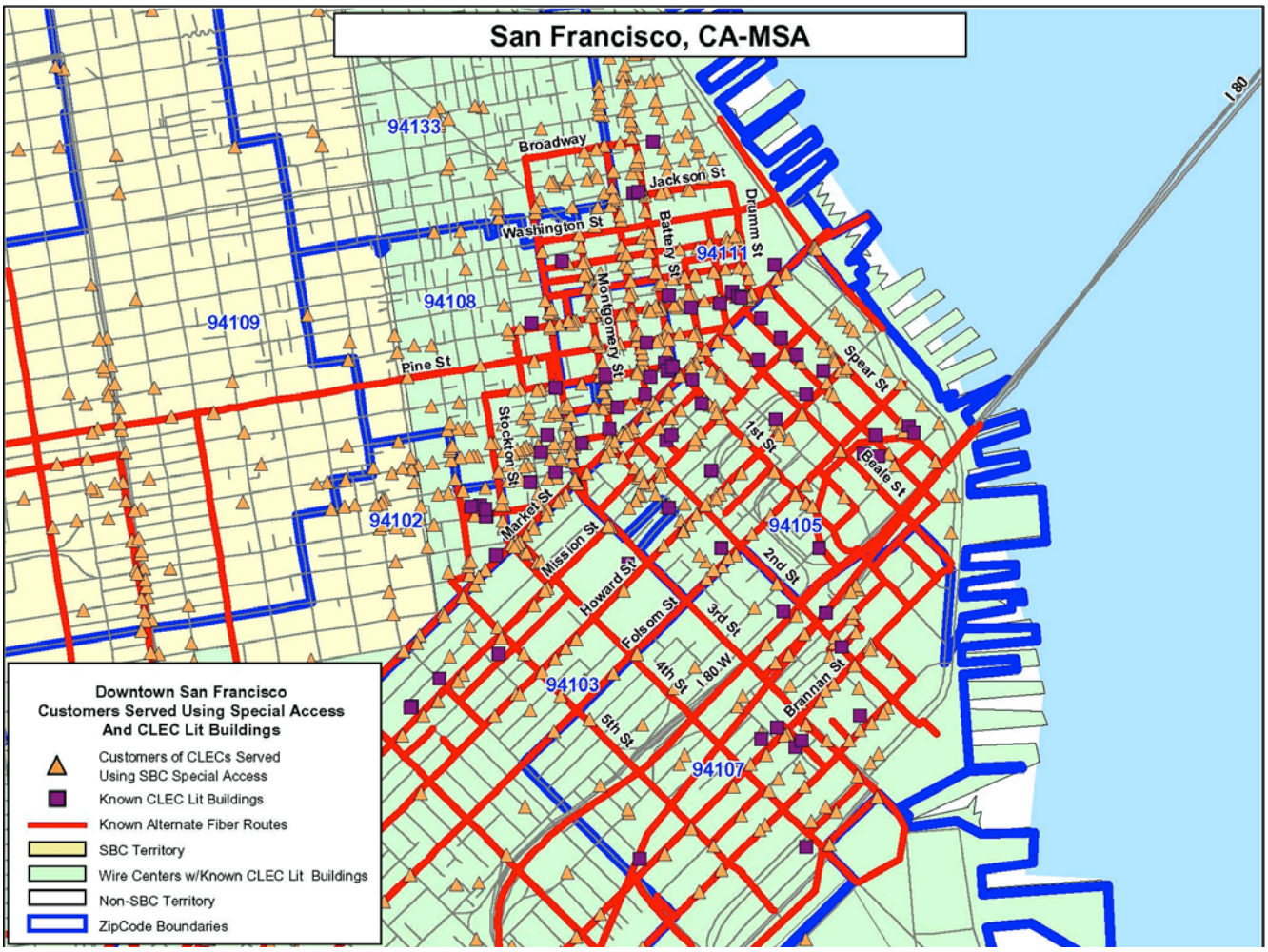

Figure 4. Competitive fibre optic cable deployment and use in the San Francisco financial district showing CLEC enterprise customers being served using Special Access even where CLEC fibre routes are adjacent to the customer's building.

Here ILECs possess an unmistakable incumbency advantage that would be nearly impossible for any competitor – even the largest – to overcome. In virtually every existing multi-occupant commercial building, the ILEC inherits a base of customers potentially purchasing a full range of services – plain old basic voice telephone service ("POTS"), PBX trunks, Centrex lines, digital transmission services for voice and data transmission including Internet access, and dedicated private line type services. With their embedded customer and service base, ILECs can combine legacy and next generation demand, POTS and dedicated services, and in some cases even residential with enterprise services, all on the same physical facilities. The advantage of being able to add new services on top of an established base (typically including customers on every floor of the building) makes it highly likely that the ILEC will be able to produce more revenue at any given location than is available to a competitor at that same location. By contrast, competitors must base their business case for new construction on the more limited revenues available to them at the location(s) involved. As such, there are many instances where an ILEC can profitably serve a particular building where a competitor (confronting higher costs and/or lower revenues) cannot. Whenever this is the case, the competitor's economic barrier to entry can only be overcome through its ability to obtain access to the ILEC's facilities at cost-based rates that capture the ILEC's scale and scope economies.

The economic properties of telecom networks – high fixed costs, significant economies of scale and scope, and formidable economic barriers to entry – apply to access facilities irrespective of the bandwidth of the facilities involved *or the types of services that are provided over those facilities*.

Significantly, the CRTC appears to have been well aware of these economic issues, and acknowledged that there was broad agreement among many parties as to their importance and validity:

> Parties concurred that duplicability relates primarily to the barriers to entry and impediments faced by competitors in supplying their own facilities or using those of an alternative supplier. Commonly cited examples included economic barriers – such as the ability to recover costs, payback periods and timeliness of cost recovery, sunk costs, economies of scale and scope, and incumbent cost advantages; technical barriers – such as compatibility with other networks and technologies, and access to support structures; and legal barriers – such as access to buildings and municipal rights-of-way. *Most parties submitted that economic ability relates to the relative costs of obtaining the functionality as compared to the revenue potentials related to that functionality.*[20]

These economic properties of telecommunications networks – high fixed costs, significant economies of scale and scope, and formidable economic barriers to entry – apply irrespective of the traffic capacity (bandwidth) of the facilities involved *or the types of services that are provided over those facilities*. Moreover, these economic properties are no different for next generation networks than

20. Telecom Decision 2008-17, at para. 18, emphasis supplied.

they are for legacy networks, and they are not materially affected by the passage of time. Thus, when the CRTC bases its distinction between "Conditional Essential" (category (b)) and "Non-essential" (category (f)) services simply on differences in bandwidth (low- vs. high-speed) and technology (legacy vs. next generation), it relies upon characteristics that are essentially irrelevant to the feasibility of competitive deployment and, in so doing, fails to consider the truly relevant economic conditions that act as barriers to competitor entry.[21]

Experience in the US confirms that competitive carrier-owned facilities have been deployed at a minuscule fraction of all commercial buildings – even in what purport to be the most competitive US markets – and while there is a higher incidence of CLEC-owned facilities at higher capacity levels (OC-3 and above), the ILECs continue to overwhelmingly dominate this segment as well.[22] Canadian experience is similar, as demonstrated by the small percentage of locations being served by MTS Allstream for which owned facilities are being used.[23]

Moreover, these economic properties of telecom networks and the disparities they create as between ILECs and competitive TSPs are neither temporary nor transitional; they are permanent conditions that competitors will not be able to overcome merely as a result of the passage of time. In that regard, the CRTC's designation of certain services as "non-essential subject to phase-out," where the "phase-out period" is hard-wired solely with respect to the passage of time, is devoid of any economic rationale or foundation and, indeed, none is even advanced in the CRTC ruling. The Commission appears to recognize this point insofar as the services it treats as "Conditional essential" and "Conditional mandated non-essential" in that, while providing for the possibility of a change in designation at some point in the future, would require an affirmative demonstration in the case of "Conditional essential" that "functionally equivalent wholesale alternatives are sufficiently present such that withdrawing mandated access would not likely result in a substantial lessening or prevention

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21. In its Comments to the FCC's Broadband Services Inquiry, Time Warner Telecom highlights this key point: "It is important to emphasize that the ILECs' dominance in the broadband transmission market is not restricted to traditional TDM-based services. Rather, their market power extends to packetized services that yield revenue opportunities equal to or below those offered by a single TDM-based DS3. While Ethernet provides new and innovative features, *it is delivered over the same copper and fibre loops used to provide TDM-based services*. Yet, the economic analysis of loop deployment does not change with the introduction of new and innovative technologies. The same trench must be dug, the same fibre must be laid, and similarly priced electronics must be attached to deliver Ethernet and other packetized services. To the extent that the revenue generated by an Ethernet loop does not justify the cost of construction, CLEC deployment is of course not possible, and ILECs will retain their dominant position." Time Warner Comments, at 11, emphasis supplied.

22. U.S. Government Accountability Office, *FCC Needs to Improve Its Ability to Monitor and Determine the Extent of Competition in Dedicated Access Services*, Report to the Chairman, Committee on Government Reform, House of Representatives, GAO-07-08, November 2006, pp. 19-22. The GAO is a research unit of the United States Congress, and reports its results to the Congress. See also, *The Role of Regulation in a Competitive Telecom Environment: How Smart Regulation of Essential Wholesale Facilities Stimulates Investment and Promotes Competition*, Economics and Technology, Inc., March 2008, at p. 7-11.

23. Fn. 4, *supra.*

of competition in the relevant downstream market"[24] and in the case of "Conditional mandated non-essential" that "the reasons for mandating these services are no longer present."[25] However, the Commission's designation of specific services as "non-essential subject to phase-out" – the last of the six categories on the CRTC's list – is more of a "default" group that is defined in the negative, rather than the result of any affirmative analysis. According to the CRTC:

> Services in the non-essential subject to phase-out category are those that the Commission has determined do not meet the definition of an essential service and that have not been classified as conditional mandated non-essential, public good, or interconnection services.[26]

Indeed, while noting that "the record indicates a high incidence of competitor self-supply or alternative supply" with respect to Ethernet and other high-speed services, and on that basis determined that such services were duplicable,[27] nowhere in either the initial Essential Facilities Decision 2008-17 or the review and vary Decision 2008-118 is there any *affirmative* discussion as to what constitutes a "high incidence" or how the existence of putatively duplicate facilities at a small number of commercial sites can support an inference that all such services are "duplicable" at all locations nationwide.

In determining that Ethernet and certain other next-generation services are "duplicable" and hence "non-essential," the CRTC has failed to distinguish between "services" and the underlying "facilities" that are used to provide them.

Facilities vs. Services

The Commission's classification paradigm for determining essentiality or non-essentiality is expressly directed at the underlying *facilities* – the platforms upon which individual *services* are constructed. To be considered "essential,"

(i) The *facility* is required as an input by competitors to provide telecommunications services in a relevant downstream market;

(ii) The *facility* is controlled by a firm that possesses upstream market power such that withdrawing (or, with regard to future applications to consider the essentiality of a

24. Telecom Decision 2008-17, at para. 57.

25. *Id.*, at para. 78.

26. *Id.*, at para. 111.

27. *Id.*, at para. 118.

> non-mandated service, denying) mandated access to the facility would likely result in a substantial lessening or prevention of competition in the relevant downstream market; and
>
> (iii) It is not practical or feasible for competitors to duplicate the functionality of the *facility*.

This focus upon *facilities* is basically sound. However, the Commission notes that "]i\n this Decision, a reference to a facility is to be taken as a reference to a facility, function, or service (or all three), as appropriate in context."[28] This failure to distinguish between "facilities" and "services" may well explain the Commission's apparent misunderstanding of the Ethernet issue. *Facilities* – copper or fibre distribution plant and associated drop wires and lateral connections into individual buildings, inter-office transport plant, and supporting structures (poles, conduits, cross-connect frames, remote terminals – are the *physical infrastructure* upon which *services* are provisioned and offered. Thus, if "[i]t is not practical or feasible for competitors to duplicate the functionality of the *facility*," then it is similarly not practical or feasible for competitors to duplicate (i.e., self-supply) the functionality of any *service* that requires the use of such a facility without the competitor being provided with *access to the incumbent's facility*. The Commission correctly applied this principle to services classified as "Conditional essential" and "Conditional mandated non-essential." For example, with respect to Unbundled Local Loops ("ULLs"),

> The Commission considers that new and existing competitors, other than cable companies, face significant impediments in developing network facilities equivalent to the ILECs' ULLs. The Commission also considers that as a result of these impediments, which include construction costs relative to potential revenue and the need to negotiate municipal and other agreements, it would not be practical or feasible for such competitors to duplicate the functionality of ULLs.[29]

And with respect to low-speed CDN access facilities,

> The Commission considers that new and existing TSPs face significant impediments in developing competing network access facilities on a scale equivalent to the ILECs' low-speed CDN access facilities. The Commission also considers that it would not be practical or feasible for competitors to duplicate the functionality of such facilities. ...[30]

Yet in defining "non-essential *services* subject to phase-out" as "those that the Commission has determined do not meet the definition of an essential *service* and that have not been classified as conditional mandated non-essential, public good, or interconnection services," the Commission appears to have lost sight of these critically important distinctions and linkages, because competitive

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28. *Id.*, at fn. 5.

29. *Id.*, at para. 64.

30. *Id.*, at para. 71.

TSPs face *the very same* "significant impediments in developing competing network access facilities on a scale equivalent to the ILECs'" with respect to Ethernet and other next-generation services as TSPs face with respect to ULLs and low-speed CDN access facilities.

Legacy vs. Next Generation Protocols

Although it is useful as an analytical device to make the distinction between facilities and services, it is sometimes difficult to draw a bright line between them. This is because any given *facility* will, in most cases, be shared among several services (being provided to multiple users), by dividing up the capacity into some number of discrete channels of varying bandwidths or data rates (e.g., DS-0 voice grade channels, DS-1 channels with data rates of 1.544 mbps, DS-3 channels carrying data rates of 45 mbps, OC-3 channels with data rates of 155.5 mbps, and so on).[31] Going from a facility that, in its undivided state, might support data rates exceeding one gigabit per second, to the "services" typically provided over that facility, requires the carrier to "slice" the full bandwidth into smaller "logical" units, using some form of multiplexing or channelization. The available bandwidth will be sliced in different sized segments depending upon the service or combination of services to be offered over the facility.

Legacy networks have relied mainly upon "time-division multiplexing" ("TDM"), X.25, Frame Relay or other transmission protocols to accomplish this function. TDM involves the assignment of a specific time interval, or "time slot" to each of the various channels that is to share the facility in a fixed rotation. For example, a DS-1 channel may be broken up into 24 DS-0 voice grade channels by assigning to each DS–0 channel every 24th bit in the DS-1. X.25 and Frame Relay are early packet-switching protocols. Later, so-called "Next Generation" protocols include Ethernet, Internet Protocol ("IP") and MPLS. These (like Frame Relay and X.25) rely upon individual "packets" that are assembled and transmitted as required, rather than through fixed interval reservations that may go unused if there is nothing to transmit when the user's time slot is reached. Packet-oriented protocols, such as Frame Relay, Ethernet, IP, and MPLS, may also be used to accomplish the facility sharing function.[32]

Each of these transmission protocols offers its own set of benefits and drawbacks, and the choice of which one to use will be heavily influenced by the nature of the service or application that is to be supported. For example, TDM may be most efficient for circuit-switched voice transmission, while Ethernet may be more suited to Local and Wide area Data Networks ("LANs" and "WANs"). All of

31. There are some exceptions to this rule, where the entire facility is sold as a single unit, without any service provisioning (e.g., dark fibre, unbundled local loops).

32. The temporal description often used to distinguish between "legacy" and "Next Generation" transmission protocols is something of a misnomer. Ethernet, for example, was invented in 1973 by Robert M. Metcalfe of Xerox Laboratories as a frame-based computer networking technology for local area networks (LANs), yet is considered "Next Generation" with respect to CRTC essential facilities policy.

these protocols require similar, if not entirely identical, underlying transmission facilities and, in fact, can and do frequently share the same physical facility.

When a competing carrier leases a portion of a shared facility from the incumbent or a third-party carrier, the "sharing" must necessarily be accomplished through some form of multiplexing, which means that the owner of the underlying facility, rather than the lessee, will be responsible for providing the multiplexing functions and for delivering a derived channel. While a channel of a given bandwidth supporting a particular transmission protocol could be thought of as a "service" rather than a "facility," it is still inextricably linked to the underlying facility since there is no practical means to provide one without the other. As such, if the owner is only required to offer its TDM-based services as "essential" services, the competitor seeking to provide Ethernet services over this facility is confronted with the costly and inefficient task of reprovisioning the service – cobbling together bandwidth from "slices" that are mis-sized for the required use and purchasing additional, costly electronic equipment. Such a costly and inefficient process can hardly be considered a practical or feasible approach to duplicating the functionality of "Next Generation" services.

The CRTC's conclusion that *Ethernet* is somehow amenable to duplication (although, to be precise, the Commission never makes an affirmative finding to that effect[33]) while the underlying facility itself does not satisfy the practicality/feasibility standard makes no sense: If it is not practical or feasible for competitors to duplicate the (actual) *physical facility*, then it is no more feasible for a competitor to self-supply – i.e., duplicate – the logical channel derived from that physical facility, irrespective of the form in which the channel is itself provided.

Duplicability on a "national scale"

In Telecom Decision 2008-118, the Commission states that "MTS Allstream submitted that ILEC broadband Internet-Protocol-based local access and transport services are not practically or feasibly duplicable on a national scale. It argued that a reasonably efficient competitor only builds where there is a business case to do so, and to serve a single national customer with Ethernet services involves a significant network investment with an excessively long payback period."[34] Based upon that understanding, the Commission concluded that "the third condition for essentiality ... does not require that duplication by competitors be on a national scale. The Commission considers that such a requirement would amount to a condition that facilities-based competition must occur nationally on a complete

33. Under the Commission's approach in Telecom Decision 2008-17, Ethernet and other "next generation" services fall into the "non-essential" category by default once the Commission fails to consider them along with other (functionally similar) services that it affirmatively classifies as essential. They are simply treated as a residual of other affirmative classifications. This classification by non-inclusion accounts for the rather limited and vague explanation that the Commission is able to offer for its decision with respect to Ethernet services.

34. Telecom Decision 2008-118, at para. 13.

end-to-end basis before ILEC services could be deemed to be non-essential."[35] The Commission appears to have missed the point. MTS Allstream's position is more accurately summarized as follows:

- The business case for duplicability is essentially a two-step process: Is it practical for the competitive TSP to establish *any* facilities presence within a given metropolitan area and, if so, at which specific, individual locations is such deployment economically practical and feasible?

- The CRTC's "if it's been done somewhere, it can be done anywhere" theory of duplicability assumes that it is economically feasible and practical for an entrant to duplicate the incumbent's network at *every* location throughout an entire metropolitan area. But an "efficient competitor" could only justify such a total overbuild of the existing ILEC infrastructure if it had the ability also to replicate the incumbent's scale of operations and thereby achieve comparable economies of scale and scope. In any event, such an overbuild would amount to a squandering of Canada's economic resources while doing little or nothing to enhance its overall productive capacity.

- Because the telecommunications market is national in scope and individual enterprise customers have telecom requirements that extend across multiple metropolitan and non-metropolitan markets, a uniform, nationwide policy with respect to wholesale services is critical to spur broad-based competitive investment and competition.

Whatever geography is adopted for purposes of assessing "duplicability," the conclusion is still fundamentally the same: Duplicability is only feasible at those locations where "a reasonably efficient competitor could expect to earn sufficient revenue to justify investing in the construction of a given facility."[36] And that is certainly at far less than at *all* potential locations, whether one is looking at a geography consisting of all of Canada, an individual province, a single metropolitan area, a single wire center serving area, or even a single city block. The decision to construct facilities within a metropolitan area, or to a specific building, will necessarily be made on a case-by-case basis given the economic and other considerations pertinent to such a decision. There is no basis to conclude that because *some* locations satisfy the practicality/feasibility conditions that all others will do likewise, yet that is precisely what the CRTC seems to have done.

So long as competitors continue to be dependent upon incumbent carriers for *some* of the facilities required to provide next generation services to their customers, those facilities are no less essential than they are for the provision of legacy services at corresponding locations. There is thus no basis for the Commission to have concluded that Ethernet or other next generation services are any more

35. *Id.*, at para. 17.

36. Telecom Decision 2008-17, at para. 41.

"duplicable" than services that the Commission classified as "Conditional essential" or "Conditional mandated non-essential."

Conclusion

The distinction that the CRTC has drawn as between Ethernet and certain other next-generation services, on the one hand, and most other services and the underlying facilities from which they are provided, on the other hand, fails to give proper recognition to the economic conditions of demand and supply that characterize all types of telecommunications networks. These "network effects" are common to most network-based industries. On the demand side, network effects create greater exponentially greater value to each service point on a larger network – one with more service points or "nodes" – than on a small one. Competitors cannot realistically expect to replicate an incumbent carrier's near-ubiquitous network, not would such replication be economically prudent or in the public interest. This inherent competitive and economic disadvantage of small networks can be largely overcome by requiring that the large incumbents – whose core infrastructures were built out under government-protected monopoly status – make their facilities, together with their economies of scale and scope – available to entrants.

These network effects apply with equal force to legacy and next-generation services and to the facilities that are used to produce them. The temporal distinction that the CRTC has drawn – based solely upon the date at which the incumbents' investments had been made, is arbitrary and without any economic merit, since "now" is by its very nature a shifting moment in time – what is "tomorrow" will soon become "yesterday," blurring any distinction between "old" and "new" technology that the Commission has sought to establish.

Experience in both the US and Canada demonstrates that all telecom stakeholders – incumbent carriers, competitive telecommunications service providers, consumers (residential, small business, enterprise and government), and the national economy overall, will all benefit when entrants are assured, on an ongoing and permanent basis, economic access to the incumbent carrier networks. Failure of the Government to require that incumbent carriers make *all* last mile services – including Ethernet and other next-generation services and facilities – available to competitors at reasonable wholesale rates will result in less competition overall, less investment in Canada's telecom infrastructure, higher retail telecom prices, and substantial economic harm to Canadian business and the Canadian economy overall.

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