The impact of regulation on facility-based competition in telecommunications

A comparative analysis of recent developments in North America and the European Union

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Introduction

Facility-based infrastructure competition in telecommunications - as opposed to service competition - is a declared policy goal in many industrialized countries.[1] In the U.S., the main objective of the 1996 Telecommunications Act was to promote facility-based competition in all markets, in particular in local exchange networks.[2] In the European Union (EU), the liberalization framework put in place between the late 80s and 1998, was to abolish all market barriers to infrastructure and service competition in both the local and the long-distance markets.[3]

This paper investigates if the pro-competitive regulatory telecommunications frameworks in the EU and North America (including the U.S. and Canada) have been efficiently promoting facility-based competition so far. We analyze a number of issues that have recently drawn considerable attention from regulators on both sides of the Atlantic, and that have a major impact on the evolution of local and long-distance infrastructure investment.[4] In the current transition phase to a competitive marketplace the regulatory position on these issues will determine the long-term viability of competition in telecommunications. Areas evaluated include:

- Cost orientation of incumbent operators' interconnection tariffs, in particular
  - the role of asymmetric rate setting obligations in leveling the playing field for interconnection arrangements (exemplified by the recent debate on symmetrical termination agreements between incumbents and new entrants),
  - the impact of Internet access pricing strategies on the construction of advanced data access infrastructure,
  - the impact of lacking cost orientation of Internet traffic in the access network on investment in advanced data access infrastructure (particularly relevant in the U.S.)
- Differential interconnection rates for infrastructure providers, service providers, and resellers and their impact on sustainable facility-based competition,
- Access to unbundled network elements, in particular
  - the impact of geographical availability and price of unbundled network elements (in telecommunications and cable networks) on facility-based competition.

The paper is structured as follows. In the next section, we present the market performance criterion of the analysis, and show that *facility-based* competition is a necessary condition for demand creation and innovation to be maximized in the long-term. In the main part of the paper, we analyze the regulatory issues outlined above and give policy recommendations. The final section summarizes our findings.

Market performance criterion – Efficiency and Innovation

The market performance criterion underlying the analysis is welfare maximizing long-term economic efficiency, including efficient production of existing services (static efficiency) as well as new demand creation and innovation (dynamic efficiency).[5] Static efficiency involves implementing cost-oriented and non-excessive prices, minimizing

cost of production, and ensuring fair network access and interconnection conditions and the absence of predatory pricing. The importance of dynamic efficiency in telecommunications is often understated, although welfare gains through new services that satisfy evolving user needs are a magnitude more powerful than welfare gains through static efficiency, similar to "a bombardment relative to forcing open a door."[6] The most prominent example is the Internet, which is revolutionizing market transactions in the economy as a whole and is currently creating substantial demand for information and inter-active services.[7]

In order to evaluate the impact of regulation on long-term efficiency in telecommunications, it is useful to divide the supply structure in infrastructure (facility-based) providers, service providers and resellers. The basic assumption underlying our analysis is that *facility-based* competition is a necessary condition for long-term efficiency to be achieved in the current technological environment.[8] The latter can be characterized by a large pool of technological opportunities, in particular in the access network,[9] that have the potential to disrupt hitherto dominant technologies. Facility based competition can be inter-modal or intra-modal. For the purpose of this paper, inter-modal competition is competition between different transmission media, for example copper and fiber. Intra-modal competition refers to facility-based operators who use the same transmission medium.

A historical review of major technological innovations in the telecommunications sector suggests that inter-modal facility based competition is the most effective means to foster competition between generic technological alternatives and thus ensure exploitation of demand and innovation potentials in the long run.[10] Additionally, technological rivalry along a given trajectory (intra-modal facility based competition) also increases overall long-term efficiency, (albeit to a lesser extent than inter-modal competition), as it often results in significant innovations.[11] Service competition (competition between service providers) on the other hand generally results in lower prices and only to a minor extent in new network services.[12]

Critics of facility-based competition argue that it leads to static technical inefficiencies in the form of facility duplication (=under-utilization). A variant of this argument is the 'end of technology' view which claims that, since fiber to the home will ultimately provide unlimited bandwidth and functionality, incremental steps like competition on the same infrastructure (intra-modal facility competition) is inefficient.

Two objections can be raised against this argument. First, the network evolution path does typically not lead in a linear way from one dominant network technology to a pre-defined successor technology, e.g. from copper to fiber, without significant intermediate innovations. Rather, technological rivalry along the technological trajectory can fundamentally alter the path. For example facility competition between (fixed) wireless and wireline technologies might lead to a variety of hybrid broadband access solutions with no single transmission medium (e.g. fiber) achieving universal deployment in the long-run.[13] Second, users typically discount expected future utility streams, which introduces a certain bias towards earlier rather than later consumption.[14] For example a typical residential user might prefer limited capacity upgrades today (e.g. several hundred kbps over advanced copper technologies)[15] over larger, but uncertain capacity upgrades in the medium term future (e.g. fiber to the home).

Regulatory Analysis

Cost oriented interconnection rates

In this section we analyze the impact of recent developments in interconnection pricing in the European Union and North America on the evolution of local infrastructure investment and facility based competition.[16] The analysis assumes that local operators' plans to construct advanced access infrastructure are mainly driven by growing demand for high-speed data services, in particular high-speed Internet access. Therefore the regulator should promote competition between technological solutions which effectively address the need for high-bandwidth access to the Internet and other services. Furthermore, we assume that the need for effective competition in the access network can justify regulatory actions, which may favor new entrants over incumbents. Elsewhere we have shown that such 'asymmetric regulation' can result in overall efficiency gains, under the condition that the regulatory actions are likely to promote and increase the robustness of facility-based, inter-modal competition.[17]

European Union

Following full liberalization of voice telephony on 1 January 1998, new entrants in most EU Member States were granted by TOs symmetric interconnection charges for the termination of voice telephony calls on their networks. Since the majority of voice calls terminates on the incumbents' networks, TOs did not oppose new entrants' proposals to charge the same amount as TOs, as they expected large out-payments from new entrants. However, new entrants soon discovered that this regime allowed them to attract large volumes of dial-in Internet traffic onto their networks. Since Internet destined PSTN calls originating on the TO network and terminating on a new entrant's voice switch generate substantial revenue from termination charges, new entrants were able to offer ISPs attractive deals including revenue sharing agreements.[18] This strategy has resulted in new entrants gaining considerable market share in the termination of ISP dial-in traffic.[19] TOs' responses to these inroads include competitive as well as anti-competitive elements and are illustrated below using the example of Belgacom, the Belgian incumbent operator.

In March 1998 Belgacom began to offer a special retail tariff for Internet in-dial calls during off-peak hours. The Internet tariff was aggressive: For the first time Internet calls on the PSTN placed during off-peak hours were cheaper than voice calls. In a subsequent memorandum Belgacom justified the price cut arguing that specific numbering would allow the operator to route the call in such a way that the resources used in the telephone network are more limited.[20] In order to evaluate the operators' argument, we have to divide it into an architectural and a commercial component.

Belgacom's *architectural* proposal represents a potential architectural improvement. The transport of IP packets over the circuit switched voice network is inefficient, because IP traffic is inherently bursty, which leaves part of the voice circuit unused. Since additionally holding times are typically longer for Internet calls than for voice calls, switch congestion arises.[21] A number of technical solutions exist to improve the architecture for Internet calls.[22] They include

- modem pooling,[23] which alleviates congestion at the switch serving the ISP,
- pulling data traffic off the PSTN onto a packet-based data network before the first

voice switch, which (potentially) removes all potential points of congestion (see footnote 21),

- the use of existing data access networks like Frame Relay, which potentially removes all congestion points and offers higher bandwidth, but the option is essentially limited to business customers,
- alternate access technologies like ISDN, xDSL or cable modems, which potentially removes congestion, increases the bandwidth available and can be targeted in particular to the residential market.

The above architectures lead to varying efficiency gains and regulators in the EU should ensure that incumbent operators' Internet access prices accurately reflect the gains achieved in a particular case.[24] For example, the number of data POPs (points of presence) in today's TO networks in the EU is typically much more limited than the number of voice POPs. Therefore it can be expected that it will take Belgacom (or any other TO) several years to implement options 2 or 3 to a large extent.[25] Thus, although in the case of Belgacom's special rate Internet tariff it is conceivable that the operator realizes some efficiency gains from modem pooling, it is unlikely that these economies lower the cost of Internet calls below the cost of voice calls.[26] In summary, only if TOs can prove that the construction of efficient data network architectures effectively results in cost savings, should regulators authorize aggressive Internet tariffs like the one above.[27]

Furthermore, Belgacom, in order to win back ISPs from new entrants, announced in September 1998 that it would only apply its special retail tariff to customers of ISPs connected to competitors' networks if the latters' termination rates would not exceed a reference level (determined unilaterally by Belgacom) that was much lower than the termination rate applied hitherto.[28] Even though the debate is never explicitly led in terms of cost orientation, Belgacom's and other EU TOs' implicit justification for cutting termination rates is to make them more accurately reflect the actual cost a new entrant incurs for terminating the call.[29]

Although it is correct to point out that the addition of voice switches by new entrants to terminate Internet calls entrenches an inefficient network architecture, unilateral cuts of termination charges by TOs have to be considered an abuse of market power. The regulatory framework deliberately did not impose cost orientation on new entrants (whereas it does impose cost orientation on TOs).[30] This asymmetric provision is economically justified as it allows new entrants to counter-balance TOs' potential to abuse their market power by negotiating any market advantage they can. In case of termination charges, the result is a legitimate (albeit accidental) advantage in favor of new entrants.[31] However, although this advantage makes facility based competition more viable, it is now the regulator's task to adjust the regulatory framework in order to create incentives for new entrants and TOs alike to invest in data access networks for IP traffic.

We close by noting that conservative EU Member States, instead of leveling the playing field between new entrants and incumbents in the Internet access market, may, either by inaction, or more determinedly, allow for the existence of anti-competitive interconnection rules which result in 'defending' incumbents' market share in the Internet access market. In the case of Belgium, although the regulator did not allow Belgacom to impose the discriminatory reference level described above on new entrants as it had put forward in September 1998, recent developments suggest that the regulator, by means of its control over numbering arrangements, is clearly prepared to endorse the existence of a special retail tariff system for Internet access through specific number

ranges. Indeed, in a letter dated 5 January 1999, the regulator proposed to phase out (subject to a 1 year transition period) the use of geographic numbers for Internet access, and in the future allow Belgacom to apply its retail-level discount for Internet dial-in calls specifically (and in fact exclusively) to calls placed through the 078 XA number range.[32] New entrant operators expressed serious concerns that this arrangement at the level of numbering, de facto endorsing differential retail tariffs, could constitute a prelude to differential interconnection rates for the 078 XA range as opposed to other number ranges.

U.S.

In the U.S. the need for more data oriented access network architectures for growing Internet traffic volumes has been debated since the mid-90s. Until now the local telephony companies have largely responded with regulatory strategies to obtain more favorable interconnection conditions for Internet traffic, and have only to a minor extent invested in advanced data access networks.[33]

ILECs' main regulatory goals are a) to rapidly terminate 'reciprocal compensation' agreements with CLECs, and b) to levy some form of access charges on ISPs for Internet usage of the local network. At the core of ILECs' regulatory strategy is the argument that ISPs under the current regulatory regime do not adequately pay for the usage of the local telephone network since they are exempted from access charges.[34] ILECs argue that traffic to ISPs should be considered inter-state instead of local (intra-state)[35] which may provide the legal basis for charging ISPs access fees and rapidly terminating reciprocal compensation agreements.[36]

In its Access Reform Order of May 1997 the FCC maintained that ISPs as 'enhanced service providers (ESPs)' are treated as 'end users' for purposes of the access charge rules and therefore do not have to pay the per-minute access charges that long-distance companies pay to local telephone companies.[37] Traffic between ISPs and the local network is thus considered local and as such subject to reciprocal compensation rules. In order to evaluate the FCC's rulings, we consider its impact on cost orientation of ILECs', ISPs' and CLECs' services.

Cost orientation of ILECs' Internet access services. As the FCC concluded in its 1997 Access Charge Reform Order, the rate levels of access charges appear to significantly exceed the incremental cost of providing these services.[38] This finding together with the 1996 Telecommunications Act's general bias towards policies that allow the Internet to 'flourish'[39] are at the basis of the FCC's decision that levying traditional usage based access charges would unduly hinder the Internet market. On the other hand, the proponents of usage charges argue that the current charging mechanism for ISPs' local lines does not cover cost. ISPs typically purchase local business lines, which include a flat monthly charge and a per-minute charge for outgoing calls. Because ISPs mostly *receive* calls from their subscribers, they generally do not pay any per-minute charges.[40] As a result, most observers agree that subjecting ISPs to some kind of usage charges would improve the overall cost orientation and send efficient investment signals to local operators.[41] Thus the real debate is about the level and form these usage charges should take.[42]

We believe that since the access market is currently characterized by a large pool of technological opportunity, regulation, in order to satisfy rapidly evolving user needs, should promote as much *technological competition* as possible.[43] Metered access charges

as required by LECs may not be compatible with that goal since they encourage LECs to keep investing in the existing circuit switched network for data traffic. However, a per call charge, based on forward looking incremental cost might be consistent with investment incentives in advanced data networks.[44]

Cost orientation of CLECs' services. Following the opening of local exchange markets by the 1996 Telecommunications Act incumbent local exchange carriers (ILECs) and new entrants (competitive local exchange carriers – CLECs) in most cases negotiated 'reciprocal compensation' agreements which entitle CLECs to receive symmetric payments when they deliver to ISPs calls from ILEC customers made over traditional phone lines. Similar to more recent developments in the EU described above, CLECs turned this provision to their advantage and captured substantial market shares of the dial-up access market via the PSTN. Incumbent local exchange carriers are now attempting to put an end to reciprocal termination agreements, since they are facing large out-payments to CLECs.

Similar to the EU, asymmetric regulation between a dominant firm that is subject to cost orientation (the ILEC) and a new entrant that is not subject to this obligation (the CLEC) resulted in an accidental advantage of the new entrant, i.e. large out-payments for terminating ISP calls. This outcome is desirable as it counter-balances ILECs' market power and makes facility-based competition more sustainable.[45] Importantly, it is unlikely that CLECs will be able to fully carry over reciprocal compensation into the next round of interconnection agreements which will be negotiated in the 1999/2000 timeframe. Thus CLECs' cost advantages through reciprocal compensation are temporary and do not distort investment incentives to a significant extent.

Differential interconnection rates for infrastructure providers, service providers, and resellers

There is general agreement that resale and service competition provide important benefits to the consumer in addition to facility based competition. For example resale-stage entry enables competitors to start operations more rapidly and on a wider geographical basis, it leads to reduced costs and expanded service offerings (at least to some extent), and it allows new entrants to rapidly build a customer base and brand recognition which in turn helps financing facility construction.[46] However, resale and service competition do not improve overall market performance if they replace the incentive to construct facilities. A necessary condition for resale and service competition to be incentive consistent with facility based competition is that the price level for resale connections lies above the termination / origination charges that service providers have to pay which in turn is greater than the interconnection price that infrastructure providers have to pay. In summary,

resale rates should be > interconnection rates for service providers > interconnection rates for infrastructure operators.

Failure to ensure this condition can considerably stifle the incentives to invest in infrastructure and/or penalize existing infrastructure investment.

A case in point is Germany. In early 1998 the incumbent operator Deutsche Telekom granted nation-wide call origination to service providers interconnecting at a minimum of one point of interconnection (which can be achieved by operating a minimum of one

switch).[47] Since in addition the interconnection rates increased only moderately with distance, and Deutsche Telekom had not fully re-balanced its retail tariffs (long-distance charges were still considerably above cost in 1998), service providers benefited from a very attractive combination of call origination and call termination on a nation-wide scale at a cost of 10.8 Pfennig[48] (6.4 cents), enabling them to undercut Deutsche Telekom's retail long-distance rates by a substantial margin.

This fee, which is not expected to be modified before January 1, 2000, is at the core of substantial gains in market share that service providers have realized since the German market was liberalized on January 1, 1998.[49] MobilCom, the second largest long-distance operator in Germany after Deutsche Telekom, alone possessed a 10% market share at the end of 1998, with all new entrants holding a market share of 30% at that time.[50] MobilCom had started out as a GSM reseller (without switches or infrastructure), and has evolved over time into a service provider for fixed voice telephony, benefiting from Telekom's attractive combination of origination and termination rates, which incidentally allowed the operator to compete head on with the new facility-based providers like o.tel.o or Arcor on equivalent terms.[51]

This situation is inefficient, since the market success of MobilCom and other service providers is likely to pre-empt - at least temporarily - incentives to invest into competing infrastructures. This is due to the fact that these companies cannibalize traffic from facility-based competitors like o.tel.o and Arcor, which, as a result, are likely to downward revise their rollout plans. The bias towards service competition and against facility-based competition will persist, as long as interconnection tariffs are not sufficiently differentiated.

In contrast to Germany, a number of countries are effectively using asymmetric regulation between resellers / service providers and facility-based operators to protect infrastructure investment incentives. In the U.S. for example, the FCC, following the 1996 Telecommunications Act, began to regulate local resale rates, and state regulators have since then maintained a positive difference between the wholesale rates which are set at a discount from retail rates[52] and the interconnection rates which are cost-based (typically set at TELRIC - long-run incremental cost). As a result, the large majority of competing local carriers invest in their own facilities in order to benefit from lower interconnection rates, whereas resale competition plays a minor role.[53]

In Canada resale competition played an important role in long-distance markets, with resellers accounting for roughly 30% of all new entrants in 1996.[54] Two years later, when introducing competition in local markets, the regulator (CRTC) considered that resale in long-distance markets had to some extent pre-empted facility construction. As a result, the CTRC, in contrast to the U.S., did not mandate (wholesale discounted) resale of the incumbent local exchange carriers' services at all.[55] This leaves Canadian competitive local exchange carriers with very few options other than to build directly to end user locations. It has been argued that, although this may result in delays regarding the availability of competition to suburban and rural areas, it may also prompt more rapid development of alternative infrastructure, in particular in the area of wireless technologies.

In the UK facility-based operators had for many years enjoyed more favorable interconnection conditions than service providers. In the early and mid-90s operators typically had to hold a PTO (Public Telecommunications Operator) license in order to be granted by the licensing authority DTI 'relevant connectable system status', which in

turn entitled them to (favorable) interconnection conditions with the incumbent BT under condition No. 13 of its license. The essential criterion for obtaining a PTO license was a requirement to make 'significant investment in infrastructure'. By contrast, service providers, which operated under class licenses (e.g. the Telecommunications Services License) rather than individual licenses like the PTO license, did not enjoy relevant connectable system status and were therefore not entitled to interconnect with BT under condition No. 13.

The main difference between the two interconnection regimes can be summarized as follows: Whereas PTOs were entitled to cost-oriented interconnection rates (which were directly determined by the regulator Oftel in the mid-1990's and are now subject to a network price-cap under Oftel supervision), service providers were entitled to 'retail-minus' schemes, stripping out marketing and debt recovery costs that are not incurred by BT when selling network services to a service provider rather than to an end-user.

This differential treatment ensured that service competition did not unduly replace the incentive for infrastructure investment, with the (efficient) result that infrastructure-based competition is firmly entrenched in the UK. Indeed, facility-based operators holding PTO licenses (e.g. Mercury Communications - now Cable&Wireless Communications -, numerous cable operators, Energis, COLT, WorldCom, etc.) account for the large majority of competition on the UK telecommunications market,[56] with service providers only playing a minor role.[57]

Access to unbundled network elements

In this section we investigate in how far the regulatory approach to unbundling in the U.S., Canada and the EU promotes the construction of alternative infrastructure, and thus long-term efficiency. We analyze the unbundling debates in telecommunications as well as cable television networks. Our findings can be summarized by the following recommendations, which are further elaborated in the next sub-sections:

- The availability of unbundled network elements should be limited to *essential facilities.* This ensures optimal incentives to invest into own infrastructure, at the same time enabling carriers to complete their service scope on the basis of unbundled network elements, thus making multi-carrier competition for broadband services more viable in the long run.
- Prices for unbundled network elements should be based on *actual* incremental cost plus a mark-up to recover a portion of shared and common cost rather than hypothetical minimum cost standards like TELRIC (total element long run incremental cost).

Rationale. Why and where ?

The view one takes about unbundling[58] depends on the competition model one adheres to. The opponents of unbundling contend that its extensive use by new entrants locks the telecommunications sector into the bandwidth limitations of existing transport media (e.g. copper) for an extended period. The non-availability / limited availability of unbundled loops, they argue, is likely to accelerate the development of generic alternatives like fixed wireless, mobile or fiber networks.[59] A variant of this argument is the 'end of technology' view which claims that, since fiber to the home will ultimately provide unlimited bandwidth and functionality, incremental steps like further exploitation

of existing copper infrastructure, are inefficient. The proponents of unbundling claim that it lowers barriers to entry and completes competing carriers' own facilities, thus introducing multi-carrier competition for broadband services faster and making it more viable in the long run.[60]

Our own view is that unbundling should be clearly limited to instances where it is instrumental to the promotion of long-term *inter-modal facility-based competition*. This performance criterion implies that the primary objective of unbundling must be to ensure the viability of new entrants, which have the potential to compete on the basis of different transmission technologies.[61] Linking unbundling to this objective effectively meets opponents' objections.[62] A necessary condition for unbundling to promote inter-modal competition is its limitation to market segments where competitors do not have sufficient incentives to build their own facilities. To put it differently, unbundling is inefficient where it leads operators to purchase unbundled network elements where they would have constructed own facilities otherwise. This suggests the use of the concept of 'essential facilities' to delimit unbundling. In one definition an essential facility " … is used to describe a facility or infrastructure which is essential for reaching customers and/or enabling competitors to carry on their business, and which cannot be replicated by any reasonable means."[63] The limitation of unbundling to essential facilities as defined above ensures that facility based carriers complement rather than replace their own infrastructure with unbundled network elements.

Price of unbundled network elements

The price for unbundled network elements should reflect the operators' cost of building own facilities. It has been argued that hypothetical minimum cost standards like TELRIC (total element long run incremental cost) result in prices for unbundled network elements which are below the actual costs of many or all of the potential entrants.[64] The development of facility-based local competition in the U.S. provides support for this argument. Before the 1996 Telecommunications Act was passed, long-distance operators like AT&T, several cable companies, and others (MCI Metronet, etc.) had announced ambitious plans for facility-based local competition. When following the 1996 Act many U.S. states were setting prices for unbundled network elements, which essentially followed the TELRIC methodology, most of these plans for facility-based competition were cancelled.[65]

Given the above it seems more appropriate to base costs for unbundled network elements on *actual* rather than hypothetical incremental cost plus a mark up to recover a portion of shared and common cost.[66]

Unbundling in the U.S.

In this section we review the unbundling policy in U.S. telecommunications. We show that in the voice area the U.S. deviates in several areas from an efficient policy based on the essential facility concept. However, the FCC has recently moved to a more facility-based competition approach in the data area.

ILECs

Widespread availability of unbundled network elements (UNEs) harms facility-based competition. Essential facilities as defined in this paper are basically limited to local

copper loops and collocation facilities in certain low-density areas. However, the 1996 Telecommunications Act requires incumbent LECs to provide requesting telecommunications carriers nondiscriminatory access to network elements on an unbundled basis at *any* technically feasible point.[67] As a result, the set of UNEs which was identified following the 1996 Act goes far beyond essential facilities. It includes a number of loop, switching, transport and signaling elements and extends to the whole (geographical) local access market.[68]

The market development in the U.S. since 1996 shows that widespread availability of non-essential UNEs has not significantly advanced intra-modal facility competition (based on unbundled elements) and has harmed inter-modal facility competition. First, the extent to which UNEs are used by facility-based competitors remains limited. The reason is that ILECs' perception that they have to sell 'every bits and pieces' of their network does not make them cooperate easily and new entrants often lack the technical resources necessary to engineer sophisticated element unbundling arrangements. A similar situation arose in the development of Open Network Architecture (ONA), where a large number of separate 'building blocks' were identified for provision by the RBOCs, most of which were never used by competitors.[69] Second, the availability of non-essential unbundled network elements a) in all market segments, b) at hypothetical TELRIC prices, which might actually lie below CLECs' actual costs, was a major reason for many CLECs to re-evaluate their business plans for facility-based entry and as a result to cancel their plans to roll out own access facilities.

In data unbundling the FCC has moved towards a more facility-based competition approach. With the growing importance of data, especially Internet traffic, CLECs, following the 1996 Act, required ILECs' high speed data offerings, in particular DSL, to be provided on an unbundled basis similar to UNEs defined for the basic copper loop. In mid-1998 the FCC ruled that incumbent carriers should be exempted from sharing their DSL access multiplexers (DSLAMs) with competitors if they deploy them through a separate data subsidiary that is subject to the same terms and conditions as CLECs.[70] With this decision the FCC: (1) has moved towards the limitation of unbundling to essential facilities (although this is not explicitly stated), and (2) has created an incentive for the ILECs to reveal which facilities are essential, by imposing separate data subsidiaries.

(1) The exclusion of DSLAMs from the list of network elements to be unbundled is economically justified. The market has proven that DSLAMs are not essential facilities. Several CLECs, including Covad, Northpoint, and Rhythms NetConnections, are making substantial investments in DSLAMs, and combine these facilities with unbundled ILEC collocation facilities and loops to offer high-speed data access services.[71]

(2) The fact that the ILEC must deploy DSL services through a separate subsidiary exerts pressure to reveal which network elements cannot be economically produced by the subsidiary and are thus by definition essential. Such elements have then to be provided to competitors at the same conditions as to the subsidiary. Although this policy has been criticized for creating incentives for the ILEC to charge excessive prices to its subsidiary,[72] it shows the FCC's commitment to limit unbundled provision of network elements to essential facilities. This approach is, as discussed earlier in this paper, consistent with the promotion of intra- and inter-modal facility-based competition. Additionally, the separation of essential bottleneck inputs from

> competitive operations creates an incentive for the bottleneck owner to establish best practice usage conditions to ensure efficient operations of its subsidiary.[73] The recent experience with unbundling in the U.S. (for example in the area of operating support systems) shows that active co-operation of the incumbent considerably facilitates the regulator's task to set effective network usage conditions.[74]

The ILECs' incentive to reveal essential facilities through subsidiary operations can be illustrated by the debate on sub-loop unbundling. The unbundling requirements of the 1996 Telecommunications Act are currently interpreted by most States as pertaining to end-to-end local copper loops only. There is currently no requirement for sub-loop unbundling. However, in the case that the ILEC operates digital line carriers to the local distribution frame (LDF), from where individual customer premises are connected with copper lines, the copper segment between the customer premises and the LDF becomes the essential facility for ADSL providers. Hence, copper sub-loops that constitute essential facilities should fall under the unbundling requirement.

If subloops cannot be economically constructed by an ILEC's subsidiary, the ILEC will wish to provide this facility to its subsidiary which implies that competitors will have access to subloops at the same conditions. Additionally, the use of subloops by competitors creates an incentive for the ILEC to establish best practice usage conditions for the facility, which in turn can be used by the regulator to ensure transparent, non-discriminatory supply conditions. It should be noted that regulatory intervention might still be needed to ensure availability of essential facilities to competitors as ILECs, in order to deter entry at the service level, might decide not to offer certain essential facilities to their subsidiary at all.

Cable networks

Unbundled provision of cable networks' basic transmission capability from enhanced service offerings like Internet access, has recently received much attention in the U.S., triggered by AT&T's June 1998 announcement that it would acquire the largest U.S. cable operator, TCI. AT&T / TCI had proposed to offer customers for about $40 a month a high speed Internet connection based on cable modems. This fee was also to include access to the @Home service, which is partially owned by TCI and provides an email account and other features similar to those provided by AOL and other Internet and online services. Under the AT&T / TCI proposal, customers would have been able to access any other online service, such as AOL, but for an additional fee. AOL on the other hand was seeking an arrangement with the proposed AT&T-TCI company to purchase separate broadband connections on a wholesale basis, and at a lower price than the combined access / @Home offer, in order to provide a broadband version of its own on-line service. Bundling of basic broadband transmission capability with the @Home service was seen by many Internet Service Providers including AOL, Sprint, and others as a discriminatory attempt by the AT&T / TCI venture to extend their control of the cable access infrastructure into the market for high-speed Internet access.

An important milestone in the cable unbundling debate was reached in December 1998, when Portland and Multnomah County were the first U.S. government entities to require, in their cable franchise areas, nondiscriminatory access for outside providers to the high-speed internet cable modem platform planned by TCI Cable and AT&T, as a condition of approving the two operators' proposed merger. With their unbundling decision Portland and Multnomah County are de-facto imposing common carrier regulation onto cable operators. This approach has so far not been endorsed by the Federal Communications Commission, which has traditionally forborne from imposing certain common carrier

obligations including unbundling on cable operators.[75] The legal basis for this forbearance is provided by the 1984 Cable Act, which exempted cable television operators from common carrier regulation insofar as they provide 'cable service.'[76] Internet access over cable modems has so far de-facto been treated as a cable service, although the FCC has yet to address the issue formally.

In order to evaluate the long-term efficiency impacts of cable unbundling, let us recall that cable is of major importance to ensure inter-modal facility competition with existing wireline access networks.[77] Cable modems allow data transmission at up to 10 Mbps per user today, compared to a maximum speed of 56 kbps over PSTN modems. They are expected to provide voice services as well as early as the end of 1999. Speed and service scope will make them the major competitor of incumbent telephone operators' high-speed access services on the basis of xDSL.[78] For cable networks' competitive potential to be fully exploited, cable operators have to invest in substantial network upgrades necessary to provide telecommunications services.[79] Bundling of basic transmission capability over cable with high-speed Internet access services is an effective means to ensure a sufficient return on this upgrade investment.

Only if evidence indicated that cable high-speed data communications platforms themselves occupied a 'bottleneck' or 'essential facilities' position vis-a-vis ISP or on-line service provider access to end users, regulatory intervention to ensure availability of unbundled high-speed access over cable would be called for. However, there is currently no record evidence that the cable Internet platform stands as an essential barrier to ISPs reaching their customers. Even if, as discussed earlier in this paper, users are likely to prefer early availability of broadband services, given the current demand levels in the residential market,[80] it is unlikely that cable modem access constitutes an economic bottleneck in any geographical market at the current time.[81] Nevertheless, if, in the future, cable becomes the dominant provider of high-speed, broadband access to data networks and the Internet, application of the bottleneck / essential facility analysis may warrant mandatory unbundling.[82]

In summary, the regulatory obligation to unbundle the basic cable transmission capability from enhanced services like Internet access, exemplified by the Portland / Multnomah county decision, does not optimally promote the construction of cable platforms as facility alternatives to incumbent telephony operators, given that cable modem platforms do currently not stand as an essential barrier to service providers like ISPs.

Unbundling in the European Union

Unbundling is not subject to sector specific regulation at EU level,[83] but has been addressed in the generic framework of EU Competition rules. The Commission's Notice on the Application of the Competition Rules to Access Agreements in the Telecommunications sector states that 'in order to determine whether access should be ordered under the competition rules, account will be taken … of the following elements, …: … access to the facility in question is generally essential in order for companies to compete on that related market.'[84] Although this statement could be interpreted to limit unbundling (which is a special form of access) to essential facilities, the Commission has not issued such an interpretation and thus leaves it de-facto up to Member States to decide in which market segments operators with significant market power are mandated to unbundle local loops. In fact, Commission statements addressed more specifically at the unbundling issue, do not link the obligation to provide unbundling to essential facilities at all, stating instead that 'refusing to unbundle where such unbundling would allow competitors to invest in infrastructure which would upgrade the narrowband copper telecommunications network to broadband capability could,

depending on the circumstances, constitute a separate abuse under Article 86(b) - that of limiting production, markets or technical development. ….'[85]

The above criteria are compatible with wide-ranging unbundling requirements, which have been put in place in several EU Member States. As the case study of Germany below shows,[86] universal unbundling requirements raise the risk that new entrants will pre-dominantly offer broadband services on the basis of existing, unbundled copper networks and only to a limited extent invest in new facilities and transmission media.

Germany

Since the beginning of 1998, new entrants as well as individual subscribers in Germany are entitled to the exclusive operation of the incumbent Deutsche Telekom's local loop serving a given subscriber. The price for unbundled loops was provisionally set by the regulatory authority in 1998 at DM 20.65 (= $ 12.15, $1=DM1.70) and the unbundling requirement covers all geographical market segments.

The low price[87] for unbundled loops and wide availability is likely to deter alternative facility-based, in particular inter-modal competition. In segments where facility competition is increasingly being established (typically the larger cities in Germany), unbundling can effectively re-enforce the viability of existing facility-based competitors. Several national, city, and other regional carriers are currently completing their own network infrastructure with unbundled loops.[88] However, *new* facility-based, in particular inter-modal competition, can be deterred to a large extent by low-cost unbundled loops. A case in point is competitive entry on the basis of fixed wireless technologies. The low-cost availability of unbundled loops in Germany in 1998 has essentially pre-empted the business cases of several wireless local loop operators, with the result, that by the end of 1998 all respective trials had been abandoned.[89] Additionally, intra-modal (wireline) facility-based competition can be deterred in lower-density market segments. The reason is that outside of major city areas, higher investment risk due to lower demand is likely to tilt competitors' business cases towards the use of unbundled loops and against the construction of own facilities.

In its unbundling proposal Deutsche Telekom had put forward in 1998 a price of DM 47.26 ($27.90, $1=DM1.70) per unbundled loop, based on its cost calculations. At the same time its competitors argued that the price should not exceed DM 15. Shortly before the regulator was due to take a decision on the issue in November 1998, Telekom withdrew its proposal. As a result, the provisional rate of DM 20.65 will stay unchanged until early 1999, when the regulatory authority is again expected to announce a decision. Although press statements indicate that the withdrawal in late 1998 was necessary, since neither "Telekom nor its rivals would have accepted the regulatory authority's decision,"[90] the withdrawal was also likely to be the result of a change in Deutsche Telekom's perception as to the impact of unbundling on its long-term market position. Previously Deutsche Telekom had fought loop unbundling, because of its low price and the conjectured impact on operational complexity and costs. The withdrawal might be a sign that the carrier begins to understand that the extensive use of unbundled loops allows to perpetuate its dominant position in the access network, especially in market segments where the competitive business case for facility construction is weaker, i.e. outside the major cities.[91] As long as competitive carriers refrain form building their own high-bandwidth facilities in such market segments, Deutsche Telekom will have the first-mover opportunity to pre-empt facility entry in the long run by constructing fiber or other high-bandwidth access networks. As explained in previous sections, in order to prevent

viable alternative inter-modal competition to be deterred in the access network, unbundling should be limited to market segments where competitors do not have sufficient incentives to build their own facilities (low density areas).

Cable networks

Similar to the U.S., in the EU unbundled provision of basic transmission services on cable networks is receiving increasing attention, although, unlike the U.S., no regulatory authority has so far mandated unbundled provision.[92] As in the U.S., we argue that cable unbundling should only be mandated if cable high-speed platforms constitute an essential facility for ISPs and other high-speed service providers. However, we believe that the legal and regulatory framework in the EU is more likely to lead to a transparent and economically efficient outcome than in the U.S.

In the U.S., cable services are exempted from common carrier regulation. As a result, rigorous linkage of certain supply obligations (like unbundling) to market dominance - as is employed for common carriers - does not apply. This opens the door for state regulatory authorities to second-guess which supply structures warrant supply obligations like unbundling. In the case of the Portland / Multnomah decision discussed above, the regulatory authority stipulated non-discriminatory access to the cable modem platform planned by TCI on legal and procedural grounds, without any analysis of the (long-term) economic benefit of such an obligation.[93]

In contrast, the regulatory framework in the European Union imposes that only telecommunications operators with significant market power can be imposed certain obligations of transparency and non-discrimination, including, if a Member State so chooses, unbundling requirements (see section 'European Union' above). Although cable services are currently excluded from nearly all transparency and non-discrimination provisions, the unbundling rules deducted from the EU competition policy framework can be interpreted to equally apply to cable networks (insofar as they are telecommunications operators). Therefore, the EU regulatory framework provides an unambiguous criterion to evaluate requests for cable unbundling: As long as there is no evidence that cable operators command significant market power in the Internet access market, regulatory intervention to mandate unbundled cable access is not called for.

Unbundling in Canada

The Canadian policy approach to unbundling in telecommunications is largely consistent with the promotion of long-term facility-based competition. The unbundling provisions of the Canadian Radio-television and Telecommunications Commission's May, 1997 decision on local competition are mostly based on the essential facility concept defined above.[94] The CRTC regards a network or service element as essential that (1) is monopoly controlled, (2) required by a CLEC as input to provide services, and (3) cannot be economically duplicated. This definition ensures that facility based carriers complement rather than replace their own infrastructure with unbundled network elements. The CRTC identifies central office codes, subscriber listings, and local loops in certain geographical bands as essential facilities.[95] The Commission finds that local loops that are situated in small urban and rural areas meet the essential facility criteria and stipulates mandatory unbundling in these areas (Bands C&D). The Commission argues that in all other bands, mostly high density areas, CLECs would not be able to provide a significant number of loops on their own infrastructure in the early stages of competition.

Therefore, in order to rapidly provide choice to customers, the CRTC stipulates mandatory unbundling in these areas as well, but limits it to five years (Bands A&B).[96] Whereas the availability of mandatory unbundled loops in low-density areas can be expected to promote infrastructure competition in the long run, the provision of unbundled loops in high-density areas runs the risk of pre-empting viable infrastructure-based competition during an extended period of time.

The prices mandated by the CRTC for unbundled loops involve actual incremental cost with a mark-up of 25% in order to cover shared and common costs.[97] As noted above, prices based on actual cost (rather than hypothetical minimum incremental cost standards like TELRIC) ensure that viable business cases for facility-based entry are not pre-empted due to the availability of low cost unbundled loops. The pricing principles developed by the CRTC are likely to re-enforce the emphasis on facility-based competition. For example, it has been argued that the CRTC cost standards yield the use of unbundled loops in certain high-density areas (Band B) uneconomical, which may prompt more rapid development of wireline and wireless alternatives.[98]

We conclude that the Canadian unbundling policy in telecommunications is in line with the promotion of long-term facility-based competition. However, the sunset clause mandating the availability of unbundled loops in high-density areas during five years runs the risk of delaying the benefits of sustainable infrastructure-based competition.

Conclusions and Policy Recommendations

In this paper we analyzed to what extent recent regulatory policies in the EU, the U.S. and Canada efficiently promote facility-based infrastructure competition in telecommunications. The following summarizes our conclusions:

Cost orientation of incumbent operators' interconnection rates.

1. Recently operators with significant market power in the EU have begun to pursue aggressive retail pricing strategies for Internet access services as well as price discrimination between Internet access and voice telephony. These strategies are potentially non cost-oriented, and entail a risk of impeding desirable facility-based competition. As stipulated by the European telecommunications regulatory framework, they should only be authorized by regulators if cost oriented, i.e. matched by the construction of more efficient data architectures in the access network for Internet traffic.

2. In the U.S. non-cost oriented usage charges for local network services distort investment incentives in the access network. Major steps to ensure optimal investment in advanced access technologies include the reform (reduction) of local access charges, and increased cost orientation of Internet traffic on the local network (e.g. through the introduction of per-call charges for ISPs).

3. The recent debate on symmetrical termination agreements between TOs and new entrants in the EU (as well as between ILECs and CLECs in the U.S.) shows that asymmetric rate setting obligations between the incumbent and new operators can help counter structural market advantages that the incumbent possesses when negotiating interconnection with new entrants, thus making facility based competition more sustainable.

Differential interconnection rates for infrastructure providers, service providers, and resellers.

We found that for infrastructure investment to be efficiently promoted, the interconnection price for facility-based operators should be lower than the termination / origination charges that service providers have to pay, which in turn should be lower than the price level for resale. We illustrated for the U.S., Canada and the UK, that such asymmetric regulation between resellers / service providers and facility-based operators has proven an effective means to protect infrastructure investment incentives. Furthermore, we illustrated, using the case of Germany, that failure to ensure this condition can penalize incentives to invest in infrastructure.

Access to unbundled network elements

Our analysis of the unbundling policy in telecommunications as well as cable networks in the U.S., Canada and the EU suggests that the following conditions should be met for unbundling to optimally promote the construction of alternative infrastructure, and thus long-term efficiency.

- The availability of unbundled network elements should be limited to *essential facilities.* This ensures optimal incentives to invest into own infrastructure, at the same time enabling operators to extend their service scope into areas where infrastructure investment is not viable.

- Prices for unbundled network elements should be based on *actual* incremental cost plus a mark-up to recover a portion of shared and common cost rather than on hypothetical minimum cost standards like TELRIC (total element long run incremental cost).

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[1] We define an infrastructure (=facility based) provider as an operator that constructs or buys raw transmission facilities (i.e. new or unbundled ducts and fiber/coax/copper/etc. cables), connects transmission equipment to them and runs the necessary operations to provide telecommunications transmission capacity on these links. A telecommunications service provider is an operator that purchases or leases transmission capacity from an infrastructure provider and adds switches or other communications equipment in order to offer telecommunications services to customers. A reseller is an entity that purchases traffic on a wholesale basis from a service provider. The reseller carriers out retail functions including marketing and billing and sells the service under its own brandname. However, the service is carried end-to-end on the service provider's network.

[2] FCC statements have repeatedly stressed the goal of facility-based competition as opposed to service competition. See TR Daily, 'CLECS Set Sights on 25% Local Market Share by 2003.' 3 December 1998; at: http://www.tr.com.

[3] Commission of the European Communities, Directive of 13 March 1996 amending Directive 90/388/EEC with regard to the implementation of full competition in telecommunications markets. *OJ L 74/13 (96/19/EC)*, 1996, whereas (7).

[4] See for example European Commission, ONP Committee, The 1999 Review of the Telecommunications Regulatory Framework, ONPCOM 98-42, 11 September 1998, Brussels.

[5] Non-economic goals like universal service are excluded from the analysis.

[6] Schumpeter, Joseph A., *Capitalism, Socialism and Democracy*. 2nd edition, 1950, 140.

[7] Other examples include advanced data services, which led to substantial productivity improvements in many industry sectors, or product innovations in transmission services, which led to bandwidth increases and cost reductions in the order of several magnitudes. See footnote 10 for examples.

[8] See for similar viewpoints Taschdjian, M., 'Alternative Models of Telecommunications Policy: Services Competition versus Infrastructure Competition'. *Twenty-Fifth Annual Telecommunications Policy Research Conference,* Alexandria, September 27–29, 1997; Stehmann, O. and Borthwick, R.,

'Infrastructure competition and the European Union's telecommunications policy.' *Telecommunications Policy*, 1994, **18**(8), 601-615.

[9] For an overview of major competing access technologies see for example IIR, *Access Networks 99. Proceedings*. 8th Annual Global Summit, London, 28-29 January 1999.

[10] Examples of technologies that were introduced as a direct result of facility-based competition between competing transmission media include most advanced data services (LAN interconnect services at native speed, Frame Relay, High Speed Internet access, ATM in the U.S., FDDI), as well as transmission technologies / services (WDM, dark fiber, fractional bandwidth services, bandwidth on demand services, etc.). Kiessling T, *Optimal market structure policy in telecommunications.* Nomos, Baden-Baden, 1998, chapter 3.4.

[11] A number of network innovations illustrate this point throughout the paper. For example varying xDSL implementations on (unbundled) copper loops lead to competition in high speed data access services, including services for high-speed Internet access, high-speed transparent data channels to corporate LANs, tele-medicine, and home working. Matthews, J. and May, A., *Extending Copper. The Incumbent's Local Loop*. Ovum, London, 1998, Appendix 1. See also section 'Access to unbundled network elements' below. Another example is the development of ISDN at the end of the 80s which was considered by many an incremental innovation that would only temporarily extend the life of copper loops in the network. However, the development of ISDN led to important technological spillovers. The development of ISDN included the introduction of the CCITT signaling system no. 7 which led to the separation of control information (the D channel in ISDN) and user data (the B channel in ISDN), an innovation that significantly fertilized the development of intelligent networks.

[12]Taschdjian, M. *op cit* Ref 8, 25.

[13] Matthews, J., *Wireline Alternatives. The New Entrant's Local Loop*. Ovum, London, 1998, chapter B; Analysys, *Multimedia: Strategic Implications for Telecoms Operators*. Analysys Publications, Cambridge, 1997, section 3.4.

[14]The discount rate can be assumed to be particularly high at times of large demand growth and technological opportunity. Kiessling, Thomas, 'Market structure, standardization and exploitation of demand and innovation potentials in Telecommunications'. *Information Economics and Policy*, 1998, forthcoming.

[15] Asymmetric Digital Subscriber Loop (ADSL) services are now becoming widely available in North America and the EU, offering typical downstream speeds of up to 1 Mbps. See Harrison, J. et al., *ADSL: Prospects and Possibilities*. Study prepared for the ADSL Forum, July 1998; at: http://www.adsl.com/adsl_forum.html.

[16] Although certain services in this section fall outside EU and U.S. regulatory definitions of interconnection, e.g. ISP termination on the PSTN, they fall under the wider definition of interconnection as 'linking of telecommunications networks.'

[17] Kiessling, T. and Blondeel, Y., 'The EU Regulatory Framework in Telecommunications. A Critical Analysis.' *Telecommunications Policy*, 1998, **22**(7), 572-573. See for a recent paper opposing this view Waverman, L. and Shankerman, M. and Pupillo, L., 'Asymmetric Regulation of Converging Markets: Problems, Pitfalls and Potential'. *Twenty-Sixth Annual Telecommunications Policy Research Conference*, Alexandria, October 3-5, 1998.

[18] Scales, I., 'ISPs cash in on call revenues'. *Communications Week International*, 21 September 1998, 4. The market impact of such agreements is considerable. For instance, a revenue sharing agreement between Dixons, an electronics chain in the UK, and Energis, an infrastructure operator in the UK, allowed Dixons to launch an ISP service in late 1998 with no subscription charges (the customer only pays PSTN call charges). The ISP had captured 485000 customers (40% of which were new customers) after 6 weeks of operation, and subsequently became the largest ISP in the UK.

[19] In Belgium for example the incumbent (Belgacom) had 100% of ISP dial-in PSTN traffic before January 1, 1998, the date of full PSTN liberalization. By September 1998 the incumbent had lost more than 50% of that market share to Telenet, WorldCom and others, which is representative of the ISP dial-in market in the EU in general.

[20] Belgacom, *Memorandum on Internet in-dial Calls*, 3 September 1998, 1.

[21] Switch congestion due to Internet traffic typically arises at three points in the network: the switch at which the ISP connects to the operator (the terminating switch), the transport network, and the originating end user switch. Often the point of greatest congestion is the switch serving the ISP, because many different users call into the ISP simultaneously.

[22] See for an overview: Werbach, Kevin, *Digital Tornado: The Internet and Telecommunications Policy*. OPP Working Paper Series No. 29, Federal Communications Commission, March 1997, IV C 2,

58ff.

[23] In this solution ISPs concentrate their modem banks in a central location of the voice network, so that Internet traffic can be aggregated at high-capacity points.

[24] Since they command significant market power, incumbent operators in the EU are obliged to set cost oriented prices. This principle of cost orientation was first established in 1990 for operators that possessed special or exclusive rights. Council of the European Union, Directive of 28 June 1990 on the establishment of the internal market for telecommunications services through the implementation of open network provision. *OJ L 192/1 (90/387/EEC, 24.07.90)*, 1990, Annex II, 3 (b). The principle currently applies to operators with significant market power (all special and exclusive operator rights were abolished on January 1, 1998). See European Parliament and Council of the European Union, Directive 97/51/EC of 6 October 1997 amending Council directives 90/387/EEC and 92/44/EEC for the purpose of adaptation to a competitive environment in telecommunications. *OJ L 295/23 (97/51/EC)*, 1997.

[25] Belgacom for example began to offer an option 3 type ADSL service in 1999 (under this service arrangement, IP traffic on the PSTN is pulled off onto ADSL exchanges before the voice access switch). The offer is limited to about 10% of Belgacom's local voice access areas (60 voice switches out of 600 nationwide). De Meyer, W., *'Examining Belgacom's Commercial Roll-Out of ADSL.'* Access Networks 99. IIR's 8th Annual Global Summit, London, 28-29 January 1999.

[26] Operators in the EU and the U.S. have argued that additional economies arise because the use of circuit switched networks for Internet connections allows to distribute the load on the network more equally, with the percentage of load that occurs in the peak hour being lower compared to voice telephony connections. Again, the resulting savings in circuits are likely to be too small to justify considerable differences in the usage price of Internet over PSTN versus voice telephony over PSTN. See Kiessling, T., 'Rapporteur Rapport.' Hurley, D. (ed.), *Next Generation Communication Technologies: Lessons from ISDN*. MIT Press, forthcoming.

[27] It should be noted that the business case for the construction of a data access network for IP traffic is relatively weak. The reason is that the flat rate pricing structure of the Internet translates into moderate operator revenues, which in turn do hardly justify the upgrade investment in the access network. See also section 'U.S.'.

[28] These differential dial-in interconnection rates were rejected by the regulator. Under Belgacom's proposal, this reference level would have consisted, for the most common interconnection mode (single transit), of an off-peak setup charge of 0.11 BEF (0.003 $), and an off-peak per minute charge of 0.15 BEF (0.004 $). Belgacom, *Memorandum on Internet in-dial Calls*, 3 September 1998. At the same time, Belgacom had put forward in a draft of its Reference Interconnect Offer a proposed interconnection termination rate of 0.23 BEF (0.07 $) off-peak setup charge and 0.41 BEF (0.012 $) off-peak per minute charge (the rates which were eventually approved by the regulator for 1999 are lower, i.e. an off-peak setup charge of 0.177 BEF (0.005 $) and an off-peak per minute charge of 0.377 BEF (0.011 $) for single transit interconnection.

[29] In some cases, new entrants' incremental investment to terminate ISP dial-in PSTN traffic is negligible (if the new entrants already operates voice switches, it is typically limited to a few line cards).

[30] See footnote 24.

[31] Additionally, it is a temporary cost advantage, since the underlying contractual arrangements are typically re-negotiated every year. Symmetric termination charges do therefore not distort long-term investment incentives.

[32] BIPT, 'Numéros d'accès à Internet à des tarifs spéciaux pour les utilisateurs finals' (sic!). 5 January, 1999.

[33] See footnote 41.

[34] See for example Southwestern Bell's response to the FCC's Internet Access & Information Service Provider NOI (CC Docket No. 96-263, FCC 96-488) at http://www.fcc.gov/Bureaus/Common_Carrier/Comments/access_reform/samples/SUMMARY.htm. Access charges are typically paid by inter-exchange carriers to local exchange carriers for the usage of the local network.

[35] The intra-state nature of ISP calls was confirmed by Court decisions in a number of U.S. States.

[36] The FCC has recently found that a new ADSL service offered by GTE and targeted at ISP calls, is interstate in nature and therefore subject to federal jurisdiction. Federal Communications Commission, 'FCC Says GTE's ADSL Internet Access Service is an Interstate Service'. *News Report No. CC 98-41*, 30 October 1998. The FCC is currently evaluating if it authorizes access charges for ISP calls.

[37] Federal Communications Commission, First Report & Order In the Matter of Access Charge Reform. *FCC 97-158*, 16 May 1997, section VI. B. Treatment of Interstate Information Services; http://www.fcc.gov/ccb/access/fcc97158.html. This decision was upheld by the U.S. Court of Appeals in October 1998, when it rejected ILEC claims that the Commission had erred in exempting ISPs from access charges.

[38] Federal Communications Commission *op cit* Ref 37, chapter II.

[39] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56, (codified at 47 U.S.C. §§ 151 et. Seq.), at § 230(b)(2).

[40] http://www.fcc.gov/Bureaus/Common_Carrier/Factsheets/ispfact.html.

[41] In fact, insufficient cost recovery of Internet access is considered to be one of the major roadblocks to the construction of advanced access networks. As a result, the extent of investment in data access, in particular in the area of residential lower speed access, is very limited. In early 1999 only a small number of ILECs (including GTE, US West, Bell South, and Ameritech) had committed plans to re-direct Internet dial-in calls onto data access networks at the local switch level. Furthermore, the slow rollout of high-speed access on the basis of ADSL (the number of access ADSL access lines in the U.S. amounted to less than 500000 at the end of 1998) can be partially attributed to ILECs' low revenue expectations from Internet access.

[42] See for a summary of the debate: Werbach, Kevin, *Digital Tornado: The Internet and Telecommunications Policy*. OPP Working Paper Series No. 29, Federal Communications Commission, March 1997, IV.

[43] See also section 'Market performance criterion – Efficiency and Innovation'.

[44] Such a per call charge could well include usage based elements in order to reduce congestion on the circuit switched network. For example Werbach, 1997, IV. C. 3. a. proposes that a pricing structure that incorporated usage charges only for a small percentage of users (for example, those that were connected more than a certain number of hours per month), might reduce switch congestion without affecting the vast majority of Internet users.

[45] Even if CLECs that terminate Internet destined voice traffic, essentially (inefficiently) introduce an additional voice switch layer in the short term, the asymmetric cost advantage resulting from reciprocal compensation helps to make infrastructure based competitors more viable in the long term.

[46] Beard, T.R., Kaserman, D.L., and Mayo, J.W., 'The role of resale entry in promoting local exchange competition'. *Telecommunications Policy*, 1998, **22** (4/5), 316-318.

[47] The case of Germany is somewhat exceptional in the European Union with most other countries only allowing call origination from an interconnection point in a limited geographical area. For instance, in order to achieve nation-wide call origination in France, a new entrant operator must interconnect with France Télécom in at least 1 point in each of 18 transit zones.

[48] The highest interconnection rate (over 200 km) was set at 5.4 Pfennig for termination as well as origination.

[49] Telekom has subsequently attempted to reverse the situation, but has deployed a confusing and ineffective strategy. Whereas in early 1998 it had granted interconnection rates to a variety of new entrants under questionable circumstances (including to entities which *were not* entitled to these rates pursuant to European Parliament and Council of the European Union, Directive 97/33/EC of 30 June 1997 on interconnection in telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP). *OJ L 199/32 (97/33/EC, 26.7.97)*, 1997, Art. 4), later in 1998 it refused to enter into interconnection negotiations with voice telephony providers and operators of public telecommunications networks which *were* entitled to these rates. This zig-zag strategy led to lengthy regulatory proceedings with the result that Telekom in early 1999 still had not obtained approval for its (economically desirable) proposal to limit the granting of low interconnection rates to operators which interconnect at a certain number of pre-determined points.

[50] Norton, K., 'MobilCom May Introduce Flat Fee for Local Calls,' at: http://www.totaltele.com/news/view.asp?articleID=20820&Pub=TT&categoryid=627. 23 December 1998.

[51] The latter only possessed a minor interconnection cost advantage over service providers like MobilCom thanks to a greater number of points of interconnection, enabling them to benefit from lower call origination and call termination rates for short-distance calls. See BMPT, 'Bötsch trifft erste Interconnection-Entscheidung.' Press Release No. 82/97, 12 September 1997, and footnote 48. Given that service providers' investment was minimal, compared to facility operators' large sunk investment in transmission and switching infrastructure, the low interconnection rates led to a considerable overall cost advantage.

[52] In its 1996 Local Competition Order for example the FCC recommended default resale discounts of 17-25%.

[53] Due to the cited discount rates local resale of telephone services is considered a low margin business in the U.S. See M. Cimatoribus, A. De Tommaso, and P. Neri, 'Impacts of the 1996 Telecommunications Act on the US Model of Telecommunications Policy: Lessons for Europe'. *Telecommunications Policy,* 502f. In 1997 the total revenue share of local service competitors amounted to 3.2% (with incumbent local exchange carriers holding 96.8%), whereas local resellers' revenue amounted to less than 0.2% of total local revenue. Federal Communications Commission, *Local Competition.* http://www.fcc.gov/ccb/stats , December 1998, Table 2.1.

[54] J. Lemay and R.K. Yates, 'Convergence and competition: A Canada/US Comparison of policy choices and market success.' *ITS Twelfth Biennial Conference,* Stockholm, Sweden, June 1998, Table 5, 21.

[55] The regulator only mandated resale at retail tariffs. Janisch, H., So Near and Yet So Far: A Comparative Analysis of Network Unbundling and Local Competition in Canada.' *Twenty-Sixth Annual Telecommunications Policy Research Conference,* Alexandria, October 3-5, 1998, 2.

[56] Although in recent years the DTI has been interpreting the criterion of 'significant investment in infrastructure' in a particularly lax way (for example by granting PTO licenses and the associated relevant connectable system status to non facility-based operators), the facility-based carriers' investment and resulting market share can be considered to result largely from the earlier policy.

[57] This is illustrated by the fact that no provider relying on the Telecommunications Services License has been effectively providing voice telephony on a significant scale, for the simple reason that it was impossible to compete with the cost structure of PTOs.

[58] Network elements like local loops, access multiplexers, etc. are provided on an unbundled basis if they are made available individually and in a manner that allows requesting carriers / users to combine such elements in order to provide telecommunications services, that is they have to be adequately supported by the provider. Bonnet T.W., *Telewars in the states: telecommunications issues in a new era of competition.* Council of Governors' Policy Advisors, Washington, D.C., 1996, 165.

[59] Janisch, H. *op cit* Ref 55, 3.

[60] Federal Communications Commission, First Report & Order In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996. *FCC 96-325*, 8 August 1996, section V. B.

[61] See section 'Market performance criterion – Efficiency and Innovation'.

[62] In particular, 'the end of technology argument' was addressed in section 'Market performance criterion – Efficiency and Innovation'. We showed that inter-modal competition (facilitated among others by complementary unbundled network elements) is the most efficient means to ensure the exploitation of demand and innovation potentials in the long run.

[63] European Commission, Notice on the Application of the Competition Rules to Access Agreements in the Telecommunications Sector. *OJ C 265/2 (98C 265/02, 22.08.98).*

[64] Grieve, W. and Levin, S.L. 'Telecom Competition in Canada and the U.S.: The Tortoise and the Hare.' *Twenty-Fifth Annual Telecommunications Policy Research Conference,* Alexandria, September 27–29, 1997, 18.

[65] These cancellations were also partly motivated by revised cost calculations of building local networks and frustrated attempts by inter-exchange carriers to enter local markets. However, the availability of low cost unbundled loops was the decisive factor in the carriers' make / buy decision.

[66] This approach has been followed in Canada. See section 'Unbundling in Canada' below.

[67] Telecommunications Act of 1996, Pub. L. 104-104, 110 Stat. 56 (Feb. 8, 1996), § 251(c)(3).

[68] Federal Communications Commission *op cit* Ref 60, section V. J.

[69] Vogelsang, I., *Federal Versus State Regulation in U.S. Telecommunications.* Wissenschaftliches Institut für Kommunikationsdienste GmbH monograph, No. 134, October 1994.

[70] Engebretson, J., 'En route to real competition'. *Telephony,* 10 August 1998, 88.

[71] Engebretson, J. *op cit* Ref 70, 88.

[72] Critics argue that excessive prices for network elements are an effective means to squeeze competitors that rely on these elements while they are neutral for the ILEC itself (the money simply flows form one part of the ILEC to another).

[73] A number of examples in U.S. telecommunications regulatory history illustrate this. One of the earliest examples were the technical requirements to hook up terminal equipment to the telephone network. The FCC realized that only Bell Labs had the expertise to define best practice terminal requirements. By imposing separate subsidiaries for terminal equipment the FCC created a strong

incentive for Bell Labs to define such requirements for the terminal market.

[74] Telecommunications Reports, 'MCI, NYNEX Locked in Dispute Over Order Processing Interface'. 6 January 1997; at: http://www.tr.com/tronline/tr/1997/tr7001/tr700125.htm.

[75] See Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor, Fifth Report and Order, 98 F.C.C. 2d 1191 (1984) (Competitive Carrier Fifth Report and Order); cited in Esbin, B., *Internet Over Cable: Defining the Future In Terms of the Past.* OPP Working Paper Series No. 30, Federal Communications Commission, August 1998, section VI B 4. Unbundling/Competitive Neutrality.

[76] Esbin, B. *op cit* Ref 75, footnote 329.

[77] Following recent market studies cable modems will account for the majority of all broadband access lines in the next 3-5 years (with the rest being divided between xDSL, satellite and fixed wireless services). See Harrison, J. *op cit* Ref 15, Executive Summary.

[78] See Matthews, J *op cit* Ref 13, 59ff., for an overview of cable modem technology.

[79] A recent business case of a European cable operator assumed about $530 per customer for equipment alone (including cable modems and other incremental equipment), assuming that the network is capable of two-way communications. United Pan Europe Communications, Registration Statement under the Securities Act of 1933, filed with the Securities and Exchange Commission (SEC), Form S-1/A of 4 February 1999; at: http://www.uih.com.

[80] Recent studies suggest that residential broadband demand will not become a mass market before 2001. Harrison, J. et al. *op cit* Ref 15.

[81] The essential facility test effectively addresses the concern of unbundling proponents who argue that unbundling is necessary to stop cable operators from attempting to tie-in access technologies to the consumer's information sources. They recall that this was the (non-desirable) result in the U.S. cable TV market, where most cable programmers are owned or controlled by the owners of the cable transmission systems. Whereas it can be argued that the owners of cable transmission systems within a franchise area effectively control an essential facility in the market for cable TV, this case can not (yet) be made for the market of communication services.

[82] In a recent report the FCC supports the view that cable unbundling is not warranted at this time, stating that 'the record, while sparse, suggests that multiple methods of increasing bandwidth are or soon will be made available to a broad range of customers. On this basis, we see no reason to take action on this issue [cable unbundling] at this time.' Federal Communications Commission, CC Docket No. 98-146, 2 February, 1999, A. Access to Broadband Systems.

[83] Unbundling has not been addressed by the EU core regulatory framework in telecommunications. In particular, no unbundling requirements are mandated by the ONP Interconnection Directive. European Parliament and Council of the European Union *op cit* Ref 49.

[84] European Commission, Notice on the Application of the Competition Rules to Access Agreements in the Telecommunications Sector *op cit* Ref 63, para 91 a.

[85] Coates, Kevin, 'Competing for the Internet.' *EC Competition Policy Newsletter*, 1998, No. 1, February, section 'unbundled local loops.' In fact, the deduction of unbundling requirements from Art. 86 makes it difficult to limit such requirements to essential facilities. Art. 86 prohibits abuses by undertakings of a dominant position, but can only be invoked if the company in question has a dominant position in a substantial part of the EU market, whereas essential network facilities are typically limited to a geographical sub-market (e.g. low-density areas) within a Member state.

[86] We take Germany as example since its unbundling policy is most advanced in the EU. Other EU Member States that recently stipulated unbundling include Austria, Denmark and Finland.

[87] The average unbundled local loop price for 18 U.S. states was at $ 15 in 1998. See Lemay, J. and Yates, R.K. *op cit* Ref 54, 25. Thus in 1998 unbundled local loops in Germany were about 20% cheaper than in the U.S., whose unbundled loop prices were one of the lowest internationally.

[88] In early 1999 more than thirty operators had concluded contracts with Deutsche Telekom for unbundled loops. http://www.regtp.de/kurzbuendig/listtanschl.htm.

[89] May, A., *'The Business Case for WLL in High speed networks.'* Access Networks 99. IIR's 8th Annual Global Summit, London, 28-29 January 1999, 5. A further reason for the non-viability of wireless local loop operations are the low interconnection rates in Germany. See section 'Differential interconnection rates for infrastructure providers, service providers, and resellers.'

[90] Salz-Trautman, P. *op cit* Ref 88.

[91] However, Deutsche Telekom's most recent price proposals for unbundled loops (e.g. DM 37,30 in January 1999) suggest that the operator has resorted again to a (short-term) strategy of cost recovery. Regulierungsbehörde für Telekommunikation und Post, Press Release, 20 January 1999.

[92] Operators requesting unbundled access from cable TV operators in the EU include for example AOL Bertelsmann.

[93] Mt. Hood Cable Regulatory Commission, Resolution No. 98-15, 14 December 1998. http://www.mhcrc.org/CurrentIssues/res98-15.htm.

[94] CRTC, Telecom Decision CRTC 97-8, Local Competition, B. Definition of Essential Facilities.

[95] CRTC *op cit* Ref 94, IV. E. The Commission notes that loops using a variety of technologies, ranging from simple metallic pairs to fiber optic systems, should be made available on an unbundled basis, as long as they fall under the essential facility criterion. CRTC *op cit* Ref 94, IV. F.

[96] Lemay/Yates *op cit* Ref 54, 23.

[97] CRTC *op cit* Ref 94, IV. G. Pricing of Essential Facilities.

[98] Lemay/Yates *op cit* Ref 54, 24.