Slide 1
How to read this report
This report is in Powerpoint, and reading it involves using your computer mouse. We suggest that you shrink the left side window (the slide-sorter window) and leave open the slide page and the notes page. You can read the slides alone, but we recommend that you read the notes pages, below each slide, most of which contain additional comment and explanation.

To get at the slides or the notes, click your mouse pointer on the line between slides and notes, and holding the button on your mouse down, move the dividing line up and down to expand or reduce the page as you need.

Slide 2
The Request for Proposal stated:
"There has been no work of this nature, detail or breadth attempted covering the entire APEC region. The results of this project are expected to throw light onto the nature of the development of the Internet in the Asia-Pacific region and the trends and factors affecting its growth and development. This information will help APEC economies achieve the APII vision. It will inform and educate governments as to the workings of the Internet, how individual economies' Internet policies affect the Internet and vice versa. It will provide a valuable source of information to the region's industry and users, by highlighting the major factors affecting the price they pay for Internet services and for access. It may lead to greater connectivity between APEC economies, which is essential ingredient in the APII vision."

Slide 3
The Internet is understandable
The Internet is understandable, and the issues APEC economies are facing can be explained. This is a story of changes of technology driving changes in the telephone industry, changes which are resisted. The changes are:
•The nature of the telephone business changes;
•The telephone companies face a new, low-cost competitor.
We will explain these changes in this report. To a great extent they were covered in Phase 1, chapter Two "What is the Internet.?"

The strategic issue

The question for APEC member governments is: how closely do they wish to associate their interests with those of their telephone carrier industry? One of the purposes of this report is to try to show governments what the nature of the changes are so that they can assess the risks and rewards of the Internet era. One of the risks is to "bet on the wrong horse".
The factors affecting the use of the Internet are as follows:

A. The nature of the Internet itself, understood as a way of moving signals through any transmission media (wires, the air), compared to legacy telephone systems;
B. The costs associated with the following:
1.Computers
2.Local access to the Internet
3.Long-distance transmission across the Pacific and between Asia-Pacific economies
4.The costs associated with connecting to the Internet in the United States
C. The predominance of the English language and the relative attractiveness of US- based content.
D. Of these factors, the cost of computers in an economy is beyond the scope of this study. It is sufficient to point out that this cost has been coming down drastically, and it will continue its steep decline. Therefore more people will use computers, personal digital devices, and cell-phones, driving up the demand for connectivity. Voice telephone traffic will shrink to less than 1% of data traffic sometime between 2008-2010 AD.
The second factor, the relative attractiveness of US-based content is fact which cannot be addressed by cost reductions, and is otherwise largely outside the power of other APEC economies to affect.

That leaves **three issues about which government policy or private action can do something**: the prices for local access to the Internet, the prices of long-distance trans-Pacific and inter-Asian connectivity, and the price of access to the Internet.

The price of local connectivity to the Internet is a matter for each APEC economy to decide. This price depends on local prices, which are a matter of competition policy within each economy. Low local prices drive up Internet usage.

The price of transoceanic connectivity is a matter of strong dispute within the APEC community. The Internet is party responsible for a change in how telephone companies and others buy rights in bandwidth. Two facts should be noted: much, much more capacity is coming on line in the next few years, and new players are entering the transoceanic transmission business on an Internet model, rather than the traditional half-circuit model that telephone companies are used to.

Finally, the cost of connecting to the Internet in the United States is an issue for all Internet Service Providers (ISPs) who are not themselves Tier-1 carriers. Asian companies are not alone in being concerned at the rates charged and the arrangements they are forced to agree to.

The rest of this report examines these factors:
1.How the Internet changes the telephone business;

2.How local prices differ;
3.How the price and arrangements for international bandwidth are changing under pressure from new Internet-models;
4.How the Tier-1 carriers are behaving.
5.In Module 3, if it is decided to have one, the consultants will explore options for what to do about issues 2,3 and 4, as required. This report in Module 2 lays out the facts.

Slide 4
No notes

Slide 5
The Internet Does Not Conform to the Telephony Model
We emphasize throughout this report that the Internet was designed on a totally different basis than the circuit-switched telephone system. The differences were discussed in the first report of the SFD team – ICAIS1, at Chapter Two. It is important to understand that the Internet represents a *total* redesign of telecommunications. There are no circuits, there are no calls, and there is as little intelligence in the middle as possible. Intelligence in the Internet rests in the computers at each end. By contrast, the telephone system puts intelligence into the network, and subordinates the terminals to the needs of the transmission system.

Settlements among Internet carriers take the form they do for a reason

In telephone systems, companies have an incentive to know what their costs are in regard to every portion of the system, including especially long distance circuits. Prices are charged for the occupation of circuits by duration of call, distance, and bandwidth occupied. Settlements are possible between telephone companies on the basis of known traffic and known costs.

A packet network, of the kind that the ***Internet*** works on, has no exact knowledge of its costs for a given route, because traffic moves on the Internet across all available routes following the path of least resistance . Internet metrics are underdeveloped compared to the circuit-switched telephone system. In a packet-routed network, the costs – most of which are for costs of distance - must be distributed across all of the network. We pointed out that Internet service providers have little or no basis of knowing, and very little incentive to know, what their costs are on any given route. The fact that there might be only one or two pipes between an Asian country and the United States disguises this fact.
But ISPs have costs which must be met, the largest portion of which are costs related to distance. Absent metered calls on the Internet, the size (geographical extent) of a network is a good proxy for the costs it will have to recover.

Internet Traffic Doubles Every Four Months; Voice Telephony Grows at 7-10% a Year

Traffic on data networks already exceeds traffic on telephone systems. The rate of growth is so large that the proportion of telephone traffic will be less than one percent of data traffic between 2005 and 2008. In terms of which model dominates, the age of the telephone system is over; the age of the Internet is here.

Changes in How Data Bandwidth is Paid for Generated this Study

The settlement arrangements of that dominated the telephony era, the half-circuit model, are being replaced by a new model, based on different assumptions. The half-circuit model is as follows: a telephone company would pay for half the cost of installing a cable between two countries, so that no carrier would own an end-to-end connection from landing site to landing site. A settlement would take place between the two companies on the basis of agreed costs and the proportion of traffic passing between them.

In the Internet era, the carrier buys an end-to-end portion of the carrying capacity of the cable. The Tier-1 Internet carriers say, in effect, “if you wish to reach the Internet in the United States, you will pay all the costs of a trans-Pacific cable.”

Many companies have objected to this practice. They claim that US carriers should pay for the 20-30% of traffic that US-based users generate on these trans-Pacific pipes. They are also concerned with the costs imposed by Tier-1 carriers for the right to connect to the Internet once they land in the United States.

APEC member economies wish to understand the nature of the issues under dispute, and they have asked the consultants to report to them on a number of facts concerning Internet usage, traffic and costs.

Slide 6
The Information told a story

The consultants had two sorts of information: information from surveys sent out to APEC member economies, and information that we could gather from various published sources.

In the end we found that surveys were returned from some countries but not all, and that information was frequently incomplete. Accordingly, we had to rely on published sources of information.

The information that turns out to be decisive is:

- •Local telephony costs
- •Costs of ISP services
- •Long distance bandwidth costs
- •Long distance bandwidth availability now and in the near future

We were able to

- •set forth basic indicators of Internet penetration, costs, domestic industrial structure concerning ISPs and telephone companies;
- •describe investments in infrastructure.In fact, published sources of information turned out to be sufficient to answer the major questions asked by the Terms of Reference.

We found that other types of information, listed below, are interesting to know but do not really help to answer the issues at the core of Internet charging arrangements.

•host counts, sites, traffic types, network access points (NAPs)
•proportion of traffic by type, and by national/international
•It would have been desirable for APEC Tel if more economies, and more ISPs within the economies, had responded to the survey. We recognize that there are conflicts of interest between smaller ISPs and the telcos (former or actual PTTs), between the telcos and the large Tier-1 data carriers, and among all the commercial interests involved.

Presenting the Information in a manner accessible to a non-technical audience

At the heart of the dispute are changes in the balance of power among companies brought about by a new technology that radically alters how business is conducted among carriers. Carriers are performing new functions – carrying Internet data traffic. A few Tier-1 Internet carriers – the first to climb to the top of the Internet food chain - are imposing new rules of how the carriage of traffic is paid for. As we have explained, and will continue to explain throughout, changes in payment arrangements for Internet traffic are caused by changes in the nature of the underlying business of telecommunications.

Slide 8
A Slightly more technical Comparison of the Internet with Telephony

The Internet's basic design is to allow a diverse collection of computer networks to interoperate. This model involves an end-to-end communications structure that makes no binding requirements on the underlying transport elements. As Geoff Huston writes in his *ISP Survival Guide*:

"The radical foresight embraced by this abstraction is, even today, difficult to fully appreciate."

The overall architectural philosophy of the Internet protocol combines the use of smart hosts (terminals) and a dumb switching network. It does not attempt to impose a restrictive or fixed data flow upon the connected host systems. The distributed network protocol (IP) undertakes a simple, well-defined task. Additional functions are placed in the hosts (the computer terminals) rather than by trying to add functions into the network.

The opposite model – telephony – is that of dumb terminals on a smart network. In this case the hosts require the network to behave predictably under all circumstances, which in turn requires a static partitioning of the network into fixed service elements. Here each terminal can either connect to an available fixed service element or be denied service completely. In telephony, the fixed service element is roughly a 64kilobit/second circuit opened end-to-end, on a clock-synchronized basis, with a centrally-maintained addressing scheme, where seconds of use are accounted for.

The Internet tries to take functions out of the network; telephony relies on the functions residing in an intelligent network to make the whole thing work.

In telephony, the services are integrated with the carriage of the signal. These can be described as vertically-integrated services. Like a railroad, telephony requires central coordination. The vehicles that can get on and off the railroad, and where they can move must be carefully controlled, if the system is going to work.

In the Internet, the Internet protocols span across the underlying networks, allowing new services to be added without changes to the underlying machinery of communication. The foremost example is the World Wide Web, which was invented years after the basic protocols of the Internet were devised.

Instead of strict controls and central planning, the Internet allows a variety of traffic to get on its pathways. Packet loss is used as a feedback mechanism to tell signals what routes to avoid. In this way, the Internet relies as little as possible on network operations, and places as much of the functions as it can in the endpoint, in the computer terminal (the host).

Slide 9
There are no rules or laws defining how Internet networks are to be connected.

In many countries telephone companies are under legal obligations to exchange traffic, that is, interconnect, and are not able to refuse to connect to customers or other competitors. They have obligations not to “discriminate unjustly or unduly”, to give advantages or preferences to themselves. These interconnection arrangements are overseen by a regulator. This voice

competition has been introduced in many countries because of effective regulation of network connection arrangements.

For a number of reasons, data carriage has not been regulated to the same extent. The Internet rides on top of data carriers' facilities. No rules have been applied to these carriers, and they may arrange to connect with whom they please on terms that they mutually agree to.

About 7 very large carriers dominate the Internet in the United States.

Most would agree that they are: Cable and Wireless, GTE Internetworking, PSINet Inc., Sprint Corp.,UUNet Technologies, AT&T, Qwest Communications International Inc.

Smaller carriers connect to them either at public exchanges or through private arrangements.

Smaller carriers can connect t the tier-1 carriers at public metropolitan area exchanges (MAEs) or Network Access Points (NAPs). However smaller carriers also connect privately by high-speed lines, and these links are referred to as "direct connections".

These arrangements are kept secret.

These contracts contain non-disclosure agreements, and stiff penalties apply to any breach of secrecy. Accordingly, information on peering arrangements, or direct connections, is hard to come by.

Source:
The Internet *global routing table* showed around 70,000 networks as of January 1, 2000, according to the NANOG (North American Network Operations Group) list serve of January 3, 2000. The number of *autonomous system numbers* (ANS), which uniquely identify networks on the Internet, was about 6,300 on the same date. Take your pick.

Slide 10
Bilateral – Sender pays

In telephone company arrangements, sender pays. The imbalance between traffic on any given route is worked out by settlements.
Internet – Sender Keeps All
The original model for the Internet was sender-keep-all. This has proven to be unsustainable, and carriers have rapidly resolved into peers and smaller clients paying for direct connections . Peers allow sender keep all.

Slide 11
Bilateral, with transit fees

This is the model for traffic exchanges between carriers of unequal size. Providers measure how much traffic each is carrying from the other's network. If the ratio is close, they split the costs of the private connection. If not, they apportion the traffic against the cost of the connection. This formula hurts the supplier of content, in that 1 kilobit of request can generate 1 megabit of download. The smaller request comes from the backbone network, the download comes from the content provider.

Peering has two elements

Peering is an agreement to exchange
a) traffic and
b) route advertisements at a network access point (NAP).

Routes are paths to a particular Internet resource. If Network A fails to receive route advertisements from Network B, then Network B will disappear as far as users of Network A are concerned. Peering disputes and technical problems can make portions of the Internet disappear from any given point of view from time to time.

In the voice telephone network, a simple rule applies: caller pays. The originating network pays a fee to the terminating network. The transactions are counted and the balance of traffic can be determined. The value of the imbalance can be calculated, and this cash value is a *settlement*.

In the Internet, three factors work against settlements.
1.Customers do not pay per minute charges
2.Technically it is difficult to know who initiated the transaction.
3.Traffic is asymmetric; a click of 1 kilobit can induce a return of megabits.

This is more fully explained in the Notes to slide 11 (next page).

No one knows who should pay, how much he should pay, why he should pay, or exactly who "he" is. It seems like *everyone* is getting a free ride. Thus settlements of the kind found between telephone companies have never been possible in the Internet, under current rules.

Moreover, the network you peer with has the power to interfere your network, more easily than with telephone interconnection. So IP backbone networks are careful with whom they deal.

With traffic expanding exponentially, network access points become network constriction points, that is to say, sources of problems. It makes more sense for large Internet carriers to interconnect with each other locally than to swap traffic at centralized and public exchange points hundreds of miles away. This leads to further power of the very large carriers, because it intrinsically allows large players to limit such exchanges to others like themselves (peers), and to exclude smaller players and new entrants. The Internet carriers do not have common carriage obligations, such as telephone companies have, to carry traffic on a non-discriminatory basis.

Thus, under the current structure, which is a free-for-all unregulated by any external authority, a network connects to any other network where it pleases, with as much bandwidth as it pleases, and with whom it pleases.

Slide 12
Why have telephony settlement models not been adopted in the Internet environment?

Much of the reason why settlements have not been developed in the Internet world may derive from a lack of political authority, but there are profound *technical* reasons, which should be heeded
.

A number of critical differences exist between the telephony models of interconnection and the Internet environment, which have confounded all attempts to map telephony settlement models into the Internet.

1.The absence of *calls* on the Internet

The Internet does not have “state” – knowledge of how resources are being consumed by packets. Unlike a telephony call, no concept of state initiation exists to pass a call request through a network to lock down a network path in response to a call. The Internet undergoes no state change in response to a (TCP) Transport Control Protocol session, and therefore, no method is readily available to identify that a call has been initiated, and by whom.

2. Packets may be Dropped

Packet loss is a normal aspect of the Internet, but paying only for packets successfully delivered would be the normal way one would account for them.

3. Packet header contents are within the explicit control of the end user, not the provider.

In this way, the relative packet flows between two providers can be arbitrarily manipulated by any client, if so desired.

4. The routes a packet may follow are not under the original service provider's control.

This is in the nature of packet switching.

5. Routing information is not uniformly available.

Complete information is not available to the Internet regarding the status and reachability of every possible Internet address. An intermediate transit provider can never be completely assured that a packet is deliverable. A packet based accounting for interconnection is the only rational basis for an inter-provider settlement mechanism. Unfortunately, such a system is vulnerable. Arbitrary numbers of packets can be passed across an interconnection in either direction under the explicit control of an end-user or a provider. Such a system is not suitable for a large scale and high-value settlement structure.

(With acknowledgments to Geoff Huston, *ISP Survival Guide*)

Slide 13
The Commercial Argument, from the Telecommunications carrier Point of View

Some telecommunications carriers on the western side of the Pacific have argued that the growth of the APII is hindered by what are perceived to be inequitable charging arrangements for capacity to Internet hubs in North America. For example, on December 6, 1999, Telstra, the largest Australian carrier, claimed that, as a result of these inequitable charging arrangements, Australian users must pay more for Internet access than they otherwise would have to under more equitable arrangements (as is the case in the traditional telecommunications accounting rate settlement regime, as explained in Module 1).

Telstra has claimed that money paid to US Internet carriers will be between US$254.6million and US$318.25 million in the coming financial year. In addition, Australian ISPs will have to pay an estimated US$111.39 million in service costs to enable US carriers to access Australian content.

"Telstra and a number of other major carriers in the Asia-Pacific region are concerned that the prohibitive charges are hindering the uptake of the Internet and crippling the growth of e-commerce in this part of the world", read the press release on the subject from Telstra.

Slide 14
The Commercial Dispute, from the Internet-centred point of view

Since the Internet is based on a model where costs of distance (and costs of everything else) are distributed across all users, traditional cost sharing based on old telco models does not work.

All costs of an Internet network, of which the costs of distance are by far the largest, are distributed equally across all network users. If two networks of different size exchange traffic then a settlement must be made on the relative size of the networks. This follows from the fact that there appears to be little basis for assigning costs to a particular route, because of how signals route themselves through a network, or to a service, because the service is merely signal transport capacity.

This is complicated further because international costs are still distance sensitive.Thus the pricing behaviour of Tier-1 carriers may appear to be inequitable, in the sense that they can extract high prices from those seeking access to the Internet in US. But there is also a rational foundation why large networks behave as they do. In part the reasons are explained by pure economic power, in extracting economic rents from smaller networks. But we cannot ignore the costs of actually running networks of their size, which generate large internal distance-sensitive costs as they criss-cross the continental United States and Canada, and the world.

Slide 15
Cost Structure of an ISP

Discussions with people who run ISPs and backbone networks have supplied us with the following insights into cost structures. The picture may vary from network to network, and purely trans-oceanic networks without local access may have a different cost structure, but this picture is a model, based on the assumptions set out below.

Generally as a rule of thumb, everything is multiples of 10 on the Internet.

For every $1 you spend on backbone link, you will spend $10 on a regional link. And for very $1 you spend on a regional link you will spend $10 on an access link. Most likely this model extends to trans Ocean links, so a trans Oceanic link cost is 1/1000 of typical Tier 1 ISPs costs. Of course there is more exceptions to this rule than there are those in concurrence. Global Crossing for example has very few regional links or access links so its costs will be heavily dominated by its overseas costs. MCI/UUnet or Sprint, however more closely follow this rule of thumb model .

The breakdown:

1. For every 10 dial customer you have one dial port - cost $5/month
2. For every 100 dial ports you have one T1 circuit and radius server - 1.5Mbps - cost $1000/mo

3. For every 100 T1 (access circuits) you have 1 regional circuit OC3 plus routers and switches - cost $10,000/month

4. For every 100 OC3 regional circuits you have one backbone OC-48 circuit plus core routers, severs, POPs etc - cost $500K per month

To serve one customer the breakdown in costs is as follows:
Assume an ISP with one OC-48 backbone:

Backbone - $.5million/month
100 OC3 - $1m/month
10,000 T1 - $10m/month
Access Ports -$5m/month

Total $16.5m per month

Therefore on a per customer basis:
Backbone is 3% of costs
Regional network is 7% of costs
Access network is 60% of costs
Access port is 30% of costs

Trans-oceanic link costs are trivial compared to the access and port access costs. More importantly if a country has high internal T1 and OC3 costs then it will be at a serious disadvantage.

Slide 16
Discussion: APPENDIX 1 – ICAIS BASIC INDICATORS AND INTERNET DENSITY

The purpose of developing a set of APEC Internet Basic Indicators is twofold: First, APECTEL considers it vital to track the explosive growth of the Internet amongst member economies. Secondly, knowledge of the scale and scope of the technology's development throughout the region is a necessary precursor to any assessment of the role of international charging arrangements (ICAIS).

Module 2 of the study has endeavoured to establish the empirical foundation underpinning any future policy effort regarding ICAIS.

Slide 17
Discussion of Basic Indicators

How widespread is the Internet within APEC economies? APEC encompasses both global technology leaders for whom the Internet is now an integral part of daily economic life, as well as developing economies for whom any significant use of the Internet remains a distant goal. This latter group of economies continues to grapple with the challenges of establishing basic telephony service.

It is difficult to extrapolate general trends from the Basic Indicator figures. However, certain trends are evident and certain facts behind the numbers shown must also be explained:

•Usage growth beyond accurate ability to pinpoint: statistical information about the Internet is immediately obsolete

In Asia alone, the number of Internet users is predicted to increase by ten-fold within the next five years[1]. The number of Internet users in Japan increased by four million in 1999 alone[2], in China the number of users was predicted to increase during 1999 “by 5 to 8 million” from a base of four million[3], and even in Russia the overall number of Internet users is expected to more than double from 1.2 million in early 1999 to over 3 million by 2001[4].

Every APEC economy has seen at least a doubling of the number of users during 1999. This expansion is reflected in a commensurate growth in the number of domain names and host servers, although not in the number of ISPs. Some of these growth figures reflect low absolute numbers: Vietnam reports an expected 1999 doubling of overall Internet usage from 11,000 to 22,000.

The sheer pace of this growth makes any statistical compilation little more than a snapshot. Nevertheless, this baseline database will, as updated periodically, provide a useful indicator of the relative growth the Internet within APEC economies.

•The number of ISPs is not growing relative to the growth of the net: consolidation is occurring and a hierarchy is emerging

The figures reflect an emerging hierarchy of ISPs at both the regional and economy level, as discussed in the ICAIS Issues Paper prepared for Module 1 of the Study. Even in economies boasting a sizeable number of ISPs, the market shares of the largest ISPs are such that the largest four or five ISPs

overwhelmingly control domestic markets. With the exception of the USA, the largest ISPs in each APEC economy are affiliated to established domestic telecoms carriers.

Domain Names • Domain Names are not an entirely accurate "map" of Internet geography

As was noted in the Module 1 Issues Paper, the .com, .edu, .gov and .mil Domain Names are registered in the USA. Consequently, a Malaysian or Canadian "dot.com" will be shown in the statistics as a US Domain Name. This skews the figures, especially in economies such as Canada where use of the dot.com Domain is more common than the ".co.ca" registry. However, most economies have substantial numbers of dot.coms. Similarly, many ISPs offer the ability to register Domain Names in other jurisdictions. Indeed, some non-APEC jurisdictions have become favoured simply because of an appealing domestic Domain Name suffix, such as ".tv" (actually Tuvalu) or ".is" (actually Iceland). In addition, the expansion of AOL, PSINet and other US-based ISPs also boosts US-based figures that may in fact represent non-US based entities.

Despite these caveats, non-US domain traffic increased by 30% in the first half of 1999, and now constitutes 44% of all domain traffic, according to StatMarket, a market data company. Three APEC economies are found in the Top 10 of non-US domain traffic: Japan (which strongly leads global non-US domain traffic), Canada, and Australia [5].

Tele-density and Internet Host Density
•Telephone Teledensity and Internet Host Density are linked, with caveats

The linkage between teledensity and Internet host density would seem to be obvious. But the figures in 1-2 reveal certain subtleties. The spread of the Internet in APEC economies is certainly linked to the development of basic telecommunications infrastructure; as a general point, it is absolutely true that greater teledensity leads to greater host density. However, the figures show that Mexico, for example, has a greater host density than several economies that have higher teledensities. In addition, the host density figures for certain economies are, in the authors' view, much too low, and reflect the inevitable time lag in working with published figures in a fast-changing environment. We expect to see vastly higher host density figures for all economies, given the growth of the Internet, while overall teledensity will only grow incrementally, especially in more advanced economies.

[1] Yankee Group figures, Aug 1999, reprinted in NUA Internet Surveys, 27 August 1999, www.nua.ie/surveys
[2] Nikkei Net Business survey, Sept 1999, reprinted in NUA Internet Surveys, 10 Sept 1999, ibid.
[3] Xinhua News Agency, June 1999, reprinted in NUA Internet Surveys, 14 July 1999, ibid.

[4] International Data Corporation via Teleglobe Press Release, 11 August 1999.
[5] StatMarket "Stat of the Week", 30 Jun 1999, at www.statmarket.com/SM

Slide 18
International Capacity Issues: Details with regard to Appendix 2

Appendix 2 provides a snapshot of the status of international capacity development in late 1999. It is an economy-by-economy survey of current initiatives. As with Appendix 1, the overall level of development is such in this sector that this section is almost immediately obsolete. New international initiatives are announced almost daily.

Slides 18 –25
No notes

Slide 26
Local Access and Pricing

Consumers throughout the world have experienced the frustration of using the public switched telecommunications network (PSTN) for Internet access; Many consumers in the Asia-Pacific region experience even greater frustration as a result of local loop pricing decisions: usage sensitive, metered access dampens demand and raises the total cost of Internet access.

High local loop access charges add to the region's comparative disadvantages that include the need to route Internet traffic over great distances, frequently using distance-sensitive submarine cables; limited number of in-region peering points, comparatively greater demand for out-of-region content; long haul pricing rates that favour transit via the U.S./Canada; and a long haul infrastructure that provides faster response times for out-of-region traffic

Slide 27
No notes

Slide 28
There is reason to believe that the 20% figure is low; in any case it is already obsolete. See the graphs on the next page.

Slide 29
On the right, data traffic surpassed voice traffic in 1998, according to "Next Generation Networks: A Practical View of Network Evolution", by Grant Lenahan,

Executive Director, NGN Solutions, Bellcore.
http://www.telcordia.com/newsroom/knowledgebase/index.html

On the left, data traffic will surpass voice traffic in 2002, according to Kerry Coffman, AT&T Labs (Lightwave Networks Research, kgc@research.att.com) We used the Coffman estimates in the previous slide.

Slide 30
Discussion: APPENDIX 3 –DOMESTIC CHARGING ARRANGEMENTS

The consultants were asked, as a central element of Module 2, to provide a compilation of domestic charging arrangement information. Domestic charging arrangements are important for the ICAIS study.

Primarily the objective of the ICAIS study is to assess the role of international charging arrangements in helping or hindering the growth of the Asia-Pacific Information Infrastructure and e-commerce throughout the region. Experience from the world of telephony shows that international retail collection rates –what the end-user pays- have often declined far more slowly than declines in international accounting rates – what carriers pay.

ICAIS cannot be looked at in isolation from these other cost components. By looking at international charging arrangements for Internet services as one part of the overall economics of the APII, the APECTEL ICAIS Task Force can provide more balanced, empirically-based advice to Ministers.

Slide 31
Discussion: Conclusions from Appendix 3

The findings reveal that domestic factors do weigh heavily on the growth of Internet access. Figures in Appendix 3 should be viewed in the context of overall Internet usage figures reported in Appendix 1. The key findings are as follows:

•Interconnection / Local Telephone Access is key

This is a vital point. Internet usage has spread most quickly and most pervasively in economies offering low cost, flat rate local telephony. The Internet and, in particular, e-commerce rely on the ability of the user to “surf” without worrying about inordinate charges for local telephone access. For those economies where metered access is historically accepted and unlikely to change, there are certain trends apparent that mitigate this as a disincentive to use the Internet:

(1) Cheaper Metered/Flat Rates for Specific Dial-Up Numbers

The introduction of cheaper metered service has been especially successful in Japan[1], given the rapid increase in local Domain Names and overall net usage. Outside APEC, France Telecom has offered flat rate pricing for ISP access numbers as a means of promoting Internet usage as well as its own ISP, Wanadoo[2].

(2) "Freeserve" Services

Another option to promote Internet usage in a metered environment is to offer ISP services without any separate ISP access charge, a model pioneered by Dixon Freeserve in the UK. Freeserve is now Britain's largest ISP and BT has adopted a similar pricing (or non-pricing) structure for its ISP. In this model, the user *only* pays the metered local telephone access charge as there is no monthly fee. The ISP, in theory, will make money from advertising revenue on its home page and in other ancillary e-commerce services. It is not clear at this time whether this is a model that enables ISPs to prosper. Nevertheless, it has been credited with a sizeable expansion of the Internet in Britain.

•ISP Access Rates do not differ dramatically within the APEC Economies

Within the economies surveyed, the cost of ISP access varied but most of it was in a range between $15 and $25 a month, ranging from a low of $3.21/month in Vietnam to $44.00/month in Korea. It is important to note that these monthly figures are also premised upon the most popular residential ISP rate plans that offer full Internet and web access. What constitutes a basic plan varies from no free hours (Vietnam, Russia), to 15 hours a month (Japan), to unlimited usage (which usually means 120-150 hours; Canada, Chile, Hong Kong China, Mexico, New Zealand, Peru, USA).

In addition, most ISPs offer very low priced e-mail accounts or special student discounts. Likewise, most ISPs offer higher-priced plans for businesses, and Appendix 3 also surveyed rate plans for 64k and, if available, E-1 dedicated access (see below).

Installation fees and other charges are not a major factor in obtaining ISP service, except perhaps in Mexico, where the sampling of ISPs reveals installation charges equivalent to about 10 months of access payments.

In those economies offering monthly plans with a given number of hours, the charges for additional hours are largely nominal or proportionate to the monthly charge. The exception to this was found in Malaysia, where the sampling of ISPs reveals somewhat higher hourly charges beyond the 30 hour/month plan.

•ISP Access Rates do *not* themselves determine the affordability of Internet access

While the figures show that nominal ISP access rates do not vary hugely within the region, such figures do not address the affordability of such services relative to domestic incomes. In a 1999 study, Ben Petrazzini and Mugo Kibati demonstrated that at purchase power parity (PPP) Internet access was, for example, 485 times more expensive in Armenia than in Finland. At nominal rates Armenia was six times as expensive[3].

The Internet, in some developing APEC economies, remains limited to a small number of largely professional class users. In certain economies this may remain so for several years, and this may be especially true in economies where basic telecommunications infrastructure is lacking. However, even where these more fundamental economic issues come into play the Internet is growing at an ever-escalating pace.

•ISP competition creates somewhat more favourable basic service user pricing

It is generally the case throughout the region that a larger number of ISPs leads to lower prices and a more comprehensive package of services within the ISP basic service price. But the differences between highly competitive ISP environments and economies that have only 1 or 2 ISPs is nevertheless not as great as one might otherwise expect. The data support a variety of possible explanations for this:

(1) Even in nominally competitive environments, ISP market power is held by a small number of market leaders (see above), who also tend to drive pricing in the market.

(2) To the extent that ISPs and carriers on the western side of the Pacific have inherently higher cost structures (see below), this has not been wholly reflected in end user pricing.

(3) Where competition does not exist in local access or international gateways, all ISPs in a given economy will face the same monopoly cost elements.

•Domestic Private Line / Dedicated Service pricing varies enormously

For business and e-commerce users, there is a strong relationship between competition and price. This is obscured somewhat, as noted above,

where several ISPs are able to resell the private line services of the monopoly/duopoly carrier(s). Of equal significance, and not shown in the figures, is the extent to which ISPs in competitive environments may offer e-commerce customers a far richer array of internetworking services than is the case in monopoly environments. In several economies independent ISPs can sell nothing greater than a 64k line; higher capacity services are the preserve of the incumbent telecommunications carrier.

[1] NTT News Release, 1 July 1999
[2] SOURCE
[3] Ben Petrazzini and Mugo Kibati, “The Internet in Developing Countries,” ACM, June1999.

Slide 32
Discussion: INTERNATIONAL CHARGING ARRANGEMENTS

As discussed in the Issues Paper and in the deliberations at APECTEL 19 and APECTEL 20, the role of ICAIS in the overall growth of the APII is a matter of some debate. The data-gathering exercise undertaken within Module 2 of the ICAIS Study reveals the following points:

1.Backbone carriers and ISPs outside North America must provide wholly-owned circuits to North American NAPs.
2.North American carriers and ISPs may employ these same circuits to gain access to Internet data on the western side of the Pacific, creating a perception of “free ridership”.
3.Trans-Pacific and intra-Asian capacity is more expensive and less competitive than is the case within North America, on trans-Atlantic routes, or within Europe. This situation has, relatively speaking, been exacerbated during 1999 as Atlantic and European prices have plummeted.
4.There is only a tiny “competitive capacity market” for trans-Pacific or intra-regional capacity compared to North America or Europe.
5.North American and other backbone carriers are expanding rapidly in the Asia-Pacific region (See Appendix 2).
6.The rapid deployment of new capacity will dramatically reduce international charges, irrespective of the structure of the charging arrangements.
7.The traditional telecommunications half-circuit charging model may be used on new routes and on some cooperative (traditional) cables between intra-regional points.
8.Purely Internet/data carriers/ISPs are less likely to favour this model, preferring to either establish their own NAPs within the Asia-Pacific region or require international carriers to link to their North American NAPs.

9.Developing economies will suffer from a comparative disadvantage due, in part, to higher-cost ICAIS. This relative situation will continue as new capacity lowers costs on primary routes.

The next section reviews each of these points in the context of the supporting data:

1.Backbone carriers and ISPs outside North America must provide wholly-owned circuits to North American NAPs.

Initial top-down and questionnaire data show that Asia-Pacific backbone carriers must provision entire wholly-owned circuits to the North American NAPs. This undeniably adds an additional cost to the carriers in question, and is not equitable in the traditional telecoms sense. These additional costs are passed on to smaller ISPs throughout the region, although there is not any evidence to show that end-user costs or the spread of the Internet are directly influenced by ICAIS[1]. Current ICAIS arrangements may lead to higher overall costs for e-commerce in the region, but here too there is no direct evidence.

2.North American carriers and ISPs may employ these same circuits to gain access to Internet data on the western side of the Pacific, creating a perception of “free ridership”.

The questionnaire data show that there is an asymmetrical traffic flow between Asia and the US. Far more data is shipped from the US than vice versa, although there is anecdotal evidence that the asymmetry is lessening and that traffic is moving towards balance. Certainly, carriers/ISPs and other organizations report that in larger economies most traffic is now domestic, as are the most popular websites and e-commerce entities[2].

However, carriers/ISPs expect both the scale and, to some extent, asymmetry of the trans-Pacific flow are expected to continue as overall usage continues to rise. On the one hand, this exacerbates the sense of some carriers/ISPs that North American carriers/ISPs enjoy a “free ride” for their Asian data flows over facilities owned by Asian carriers. However, North American carriers/ISPs are also increasingly self-terminating their own Asia-bound traffic over their own nascent facilities to their own Asian POPs (See Appendix 2 and below).

3.Trans-Pacific and intra-Asian capacity is more expensive and less competitive than is the case within North America, on trans-Atlantic routes, or within Europe.

This situation has, relatively speaking, been exacerbated during 1999 as Atlantic and European prices have plummeted

This situation has changed since the publication of the Module 1 Issues Paper and continues to evolve rapidly. Surveys of on-line capacity exchanges such as Band-X, Arbinet and others[3] show a dramatic decrease in trans-Atlantic and intra-European capacity prices. Band-X maintains an index of wholesale prices that the London-based firm started in late 1998:

Band-X index at July 1999 (100=Oct 1998):-
LA-Beijing: 92.3- London-HK: 90.6- LA-Tokyo: 84.0-

London-Sydney: 85.5- London-Brussels: 39.3- NY-London: 50.0-

NY-Frankfurt: 42.8 London-Paris: 23.8

Trans-Pacific capacity has only declined slightly in price compared to trans-Atlantic and, dramatically, intra-European capacity. Most striking, the price of London-Paris circuits is less than one quarter the price found only one year ago.

4.There is only a tiny "competitive capacity market" for trans-Pacific or intra-regional capacity compared to North America or Europe.

Beyond the on-line bandwidth exchanges noted above, the presence of a vibrant reseller and second-tier facilities-based carrier market in North America and Europe has driven prices down through sheer competition. There is little spare capacity globally, and certainly no capacity glut, but prices continue to decline despite high demand. This is due to the emergence of a competitive capacity market.

Such a market is only beginning to emerge in Asia. Carriers/ISPs and observers both expect this to change utterly within the next 24 months as new capacity comes into use:

"If the cost of capacity in the Asia-Pacific region follows the trend on the trans-Atlantic route…carriers will see the price of trans-Pacific circuits falling to around one-fifth of their current level within the next two years, and by the same amount again within the following two years"[4]

Slide 33
Discussion: International Charging Arrangements, continued

5. North American and other backbone carriers are expanding rapidly in the Asia-Pacific region (See Appendix 2).

Appendix 2 and the Capacity section of Module 2 both detail the rapid expansion of capacity in the Asia-Pacific region. There will be a twenty-fold increase in the amount of telecommunications capacity in the region between mid-1999 and the end of 2000, with further dramatic increases as new systems come on line in 2001 and 2002[5].

6.The rapid deployment of new capacity will dramatically reduce international charges, irrespective of the structure of the charging arrangements.

The current economics of ICAIS will change as a consequence of this massive growth in capacity. As outlined in the original APECTEL ICAIS Terms of Reference, it will be the challenge of Module 3 to analyze the existing data and current state of change to put forward an account of ICAIS arrangements that are possible or likely in the emerging environment.

7.The traditional telecommunications half-circuit charging model may be used on new routes and on some cooperative (traditional) cables between intra-regional points

There seems to be an emerging environment wherein traditional carrier-sponsored consortium cables (eg TPC-5, APCN-2, China-US) will co-exist with private cable systems (FLAG, Pacific Crossing PC-1, Project Oxygen). North American carriers and ISPs are participants in several traditional trans-Pacific cable systems[6]. Similarly, a traditional telecoms-style half-circuit or equal peering model may exist between carriers/ISPs exchanging relatively equal amounts of traffic. Module 3 must assess whether such structures could be implemented APEC-wide or if a purely commercial/contractual environment will prevail.

8.Purely Internet/data carriers/ISPs are less likely to favour this model, preferring to either establish own NAPs within the Asia-Pacific region or require international carriers to link to their North American NAPs

As part of the Module 2 data gathering exercise, North American carriers and ISPs unambiguously expressed a desire to maintain the current ad hoc ICAIS structures. The questionnaires and discussion revealed little taste for either a telecoms-style half-circuit settlement model or any other formal settlement mechanism for Internet traffic flow.

9.Developing economies will suffer from a comparative disadvantage due, in part, to higher-cost ICAIS. This relative situation will continue as new capacity lowers costs on primary routes.

As in other forms of commerce, developing economies will have a comparative disadvantage in e-commerce as a result of the higher costs of bandwidth. This is true for both international and domestic capacity. Nevertheless, this situation will improve enormously in absolute terms as new capacity comes on line, as satellite technology allows greater Internet access on "thin routes", and as developing economy carriers/ISPs can link into the Internet through the growing number of regional NAPs, saving the costs of paying for wholly-owned circuits to North America.

However sizeable this absolute progress, developing economies' relative cost structures will remain higher than that of the major hubs:

"The main beneficiaries of Asia's bandwidth explosion will be the region's telecoms hubs, where major cables have their landing points. Developing countries are likely to have to wait longer, since there is less demand for broadband services[7]"

This will also be true for Latin America, especially as Peru and Chile are now enjoying fibre access for the first time via the Pan American Cable system (PanAm). Mexico benefits somewhat from easy cross-border access to the US Internet and does not have the ICAIS concerns expressed by other economies, but Mexico's national regulator has detailed the challenges of achieving truly national high-capacity coverage within Mexico[8]. Significantly, Mexico's Internet links with the rest of Latin America are almost wholly via the United States.

[1] Ben Petrazzini and Mugo Kibati, "The Internet in Developing Countries", ACM, June 1999, Ibid. Petrazzini and Kibati note the concerns expressed in the Asian carriers' joint declaration on ICAIS, but state that capacity between the US and Asia is far cheaper than within Asia: "The lack of low cost regional IP backbones is one of the main reasons ISPs around the world are willing to pay for a connection to the US".
[2] For example, see "Statistical Report of the Development of China Internet", CNNIC, Jan 1999, at www.cnnic.net.cn/englishdata; Computer Economics Inc., "English Will Dominate Web for Only Three More Years", news release, 9 June 1999; StatMarket, "Foreign Domains Account for Nearly 50% of All Internet Traffic", StatMarket, 30 Jun 1999, at www.statmarket.com/SM
[3] See www.band-x.com, www.arbinet.com, www.rateexchange.com, www.bandwidthmarket.com, www.ace-asia.com.

[4] Nick Ingelbrecht, “Asian Carriers Face Bandwidth Tsunami”, Total Telecom, 4 October 1999, www.totaltelecom.com/secure/view.asp?ArticleID=24077&Pub=285.
[5] Ibid.
[6] Telstra, “Telstra Plans For Internet Future” Telstra press release, 24 June 1999; Hans Lombardo, “Ten Telecoms Agree To Lay Asia-Pacific Submarine Cable”, asia.internet.com, 17 June 1999.
[7] Ingelbrecht, op.cit., p.4.
[8] COFETEL, “Estadisticas de Interes sobre Telecomunicaciones”, 11 August 1999, www.cft.gob.mx.

Slide 34
Consequences

The requirement to provision lines all the way to North American access points adds cost, and appears inequitable two ways: 1) Asia/Pacific ISPs may previously have been able to access Tier-1 ISPs indirectly, e.g., the “hot potato” routing scenario and 2) ICAIS violates traditional telecommunications settlements which is characterized by cost sharing and joint provisioning to a geographical midpoint.

These additional costs are passed on to smaller ISPs throughout the region, although we have found no evidence yet to show that end-user costs or the spread of the Internet are directly influenced by international factors.

Current ICAIS arrangements may lead to higher overall costs for e-commerce in the region, but here too we have been unable to find direct evidence, either of its existence or its significance.

Slide 35
No notes

Slide 36
Discussion: ICAIS Findings – Pacific Bandwidth

Trans-Pacific capacity has only declined slightly in price compared to trans-Atlantic and, dramatically, intra-European capacity. Most striking, the price of London-Paris circuits is less than one quarter the price found only one year ago.

Slide 37
Discussion: ICAIS Findings: Emergence of Asia-Pacific Bandwidth Market

Beyond the on-line bandwidth exchanges noted above, the presence of a vibrant reseller and second-tier facilities-based carrier market in North America and Europe has driven prices down through sheer competition. There is little spare capacity globally, and certainly no capacity glut, but prices continue to decline despite high demand. This is due to the emergence of a competitive capacity market where non-value adding transmission capacity has become a commodity.

Such a market is only beginning to emerge in Asia. Carriers/ISPs and observers both expect this to change utterly within the next 24 months as new capacity comes into use:

"If the cost of capacity in the Asia-Pacific region follows the trend on the trans-Atlantic route…carriers will see the price of trans-Pacific circuits falling to around one-fifth of their current level within the next two years, and by the same amount again within the following two years"[4]

The turmoil in the trans-Pacific bandwidth market is reflected in the rapid profusion of data pipelines built at ever greater capacity for ever cheaper costs per bit.

For example, to deal only with cable systems reaching Australia, the SEA-ME-WE cable system was completed in 1999, cost US $1,300 million, and carries 20 gigabits/second (Gbit/s). Southern Cross will be completed in 2000, cost $940 million (for a different route), and will carry 40 Gbit/s, upgradeable to 120 Gbit/s. To illustrate this capacity, the MAE-East, the largest peering point in eastern North America, handles about 1.9Gbit/s on a typical working day.

Slide 38
No notes

Slide 39
Discussion: Detailed Discussion of Points 6-9

•*The rapid deployment of new capacity will dramatically reduce international charges, irrespective of the structure of the charging arrangements*.

The current economics of ICAIS will change as a consequence of this massive growth in capacity. As outlined in the original APECTEL ICAIS Terms of Reference, it will be the challenge of Module 3 to analyze the existing data and current state of change to put forward an account of ICAIS arrangements that are possible or likely in the emerging environment.

7.The traditional telecommunications half-circuit charging model may be used on new routes and on some cooperative (traditional) cables between intra-regional points

There seems to be an emerging environment wherein traditional carrier-sponsored consortium cables (eg TPC-5, APCN-2, China-US) will co-exist with private cable systems (FLAG, Pacific Crossing PC-1, Project Oxygen). North American carriers and ISPs are participants in several traditional trans-Pacific cable systems[6]. Similarly, a traditional telecoms-style half-circuit or equal peering model may exist between carriers/ISPs exchanging relatively equal amounts of traffic. Module 3 must assess whether such structures could be implemented APEC-wide or if a purely commercial/contractual environment will prevail.

8.Purely Internet/data carriers/ISPs are less likely to favour this model, preferring to either establish own NAPs within the Asia-Pacific region or require international carriers to link to their North American NAPs

North American carriers and ISPs have declined to change the current ad hoc ICAIS structures. The questionnaires, research and discussion revealed little taste for either a telecoms-style half-circuit settlement model or any other formal settlement mechanism for Internet traffic flow.

9.Developing economies will suffer from a comparative disadvantage due, in part, to higher-cost ICAIS. This relative situation will continue as new capacity lowers costs on primary routes.

As in other forms of commerce, developing economies will have a comparative disadvantage in e-commerce as a result of the higher costs of bandwidth. This is true for both international and domestic capacity. Nevertheless, this situation will improve enormously in absolute terms as new capacity comes on line, as satellite technology allows greater Internet access on "thin routes", and as developing economy carriers/ISPs can link into the Internet through the growing number of regional NAPs, saving the costs of paying for wholly-owned circuits to North America.

However sizeable this absolute progress, developing economies' relative cost structures will remain higher than that of the major hubs:

> "The main beneficiaries of Asia's bandwidth explosion will be the region's telecoms hubs, where major cables have their landing points. Developing countries are likely to have to wait longer, since there is less demand for broadband services[7]"

This will also be true for Latin America, especially as Peru and Chile are now enjoying fibre access for the first time via the Pan American Cable system (PanAm). Mexico benefits somewhat from easy cross-border access to the US

Internet and does not have the ICAIS concerns expressed by other economies, but Mexico's national regulator has detailed the challenges of achieving truly national high-capacity coverage within Mexico[8]. Significantly, Mexico's Internet links with the rest of Latin America are almost wholly via the United States.

Slide 40
Issues for Further Analysis

The core issue is that the current methods for allocating the value of interconnection, that is, peering and transit fees, provide little guidance as to how to make investments, which is based on the value the services which the Internet provides. It provides strong incentives to provide services end-to-end within a company's network so as to avoid that problems associated with valuing interconnection, which problems have given rise to this study.

Declining Bandwidth Prices

Some parties assert that rapidly declining bandwidth prices will not change the nature of the problem, but may even exacerbate it. As the price of trans-Pacific bandwidth declines, traffic will increase. The bite taken by "inequitable" charging arrangements – that is, charging arrangements based on the current unregulated model - may decline for each transaction, but the number of transactions will climb, leaving Asian and Australian economies in the same disadvantaged position. In short, declining unit costs will be met by vastly increased demand for bandwidth, which may leave Asian and Australian economies in the same relative position.

However, when the price of bandwidth declines to 10% or 5% of its former unit cost, people are better able to afford the services made available by these lower prices *as long as these price savings are passed on to consumers*. Second, telecommunications services compete for the spending dollar of every household against every other item of possible expenditure. People might freely choose to spend more on these services, even if they depend on "inequitable" international charging arrangements, if the value they perceive for these Internet-related services is higher than other potential items they could purchase.

Growing household expenditure on an item is not necessarily a bad thing. Failure of a sector to pass on cost declines to consumers would be a sign of an inadequately competitive structure.

The private sector is seeking ways of getting around the problem. Private sector companies are seeking ways of getting around the perceived problem by:

- Improving intra-Asian connectivity;
- Mirroring and caching web material locally, rather than going back and forth from North America;

•Developing larger networks so they can peer with the existing Tier-1's; and
•Pushing out networks into the interior of the United States and taking advantage of the competitive conditions inside that country.

Slide 41
Let us be careful about "bargaining power"

We observe this bargaining power exercized by the very largest carriers and make no other conclusion about it. We have no evidence that this bargaining power is collusive, illegal, or arises in any other fashion than from the size of the network and the attractiveness of English language web-sites found in the United States. No inference of anti-competitive behaviour can be drawn from this observation.

It is important to deal only with what can be changed.
Of these four factors, factor two (hubs, peering and local telephone prices) is directly under the control of APEC economies; the influence of factors three and four cannot be changed soon.

We have maintained that high local prices for telecommunications, and an absence or scarcity of intra-regional peering and exchange points (as APIA reports have noted) is a formula for not seizing the benefits of the Internet era. Factor one (peering and market power) can be addressed by four different approaches, which we outline in the next slides.

Slide 42
Issues for Analysis in Module 3
Tier-1 carriers

The problem described by observers has remained the same throughout the study period. Larger carriers require smaller Asian and Australian carriers to provision lines all the way to the United States and Canada, and pay to connect to the Internet there. No one disputes the existence of this behaviour; parties are strongly divided as to whether it can be called "inequitable" or not, and whether anything useful can be done about it. Businesses are working out strategies for reducing and getting around the problem.

New models of doing business are giving a competitive advantage to large networks and there is also reason to consider that membership in the club of Tier-1 carriers can only be gained by being of comparable size, and even then it may not be enough. As this report has shown, some of the underlying causes of this behaviour are rational.

The Consequences of Higher Prices Caused by a lack of Settlement Regime

The Internet charging problem ought to be analyzed according to certain questions. One of them is: Is the uptake of the Internet being inhibited, and if so, why? By higher prices caused by the lack of international settlement procedures? And what role do higher international prices play against other domestic pricing factors?

The difficulty of assembling conclusive evidence that Internet charging arrangements inhibit the uptake of the Internet, and electronic commerce generally, include these:

What are the relative effects of

1. Computer prices
2. Internet access prices
3. Local telephone prices
4. Long distance telephone charges (if applicable)
5. Data (Internet) bandwidth prices (paid by carriers and passed on to consumers)
6. Internet connection charges (paid by carriers and passed on to consumers)

These questions boil down to how much of the household income is spent on telecommunications services, and how much disposable income is available for these kinds of electronic goods and services relative to housing, food, and transportation?

Telecommunications charges passed on to the consumer continue to be the largest variable in the affordability of Internet services. But how much of the cost is derived from a) local telecommunications charges, b) Internet access prices and c) costs deriving from the lack of settlement arrangements?
And when these factors are known – if they could be known – we still do not know whether they inhibit the uptake of the computer and the Internet. People buy and consume electronic products and services because they are relatively good value compared to other things, so that Asians and Australians might still consume more Internet-related services, even if they were relatively more expensive than they are in North America, if they conclude that the Internet is a better deal than, for instance, extra shoes or a vacation, or a cell phone or more restaurant meals.

The evidence that the uptake of the Internet is slowed by inequitable *international* pricing arrangements might be derived from multi-national comparisons of Internet penetration and usage, weighted against disposable income available to the household. If a society found that its rate of Internet usage was lower than a comparably rich economy, it could look to the various factors that go into Internet consumption (computer costs, local telephony costs, Internet access costs) and see which is playing the largest role. The assumption

we make here is that people will consume more of anything if it is cheaper. Keeping telecommunications as cheap as technology will allow is the only rational strategy for an information age. Internet charging arrangements are one part of such a strategy. To the extent that local pricing or international charging arrangements slow the uptake of the Internet and electronic commerce in any economy, governments have a right to be concerned.

Slide 43
Four Ways of Proceeding

1. Analysis of Expenditure

This analysis asks whether Internet penetration is slowed and expenditure too high, relative to comparable economies. We described how such an analysis might be conducted in the notes page to the previous slide. Such a process involves tracking household and possibly business expenditure, and domestic computer ownership. Success of this approach would depend on the adequacy of the statistics gathering of the national statistical agency.

2. Address the Dispute in the Context of Trade Policy

Trade policy seeks to promote open, transparent and nondiscriminatory access to markets without regard to nationality. The private, selective peering process may constitute a refusal to deal and a form of discrimination, because most of the Tier-1 carriers are corporate citizens of the United States.

However, the Tier-1 carriers may have discriminated on the basis of legitimate business factors, e.g., subscriber numbers, available bandwidth, or number of Points of Presence.

Trade fora may serve as an appropriate place to evaluate whether and how private peering promotes or frustrates market access and the free flow of trade in services.

It would be appropriate to examine whether the respective merits of the WTO and the OECD for dealing with the issues of international charging arrangements.

3. Build out Networks as Fast as Possible

This approach assumes that the correct approach to Internet settlements is to build one's network to global size as fast as possible, and not to await results

from a political or regulatory approach. This is the course that Tier-1 carriers themselves are pursuing, following the logic that size matters, and that, in the absence of an agreed international settlement regime, nothing else will matter but size of network. “If you can’t beat them, join them”. In the absence of a settlement regime based on the old settlement rules, this is a rational course of action.

4. Conduct an Economic Analysis

The insight behind the proposed economic analysis is that a model can be drawn of where costs occur in the Internet, and that development of this model will allow a more accurate discussion of the concept of inequity. Even if the prices and other data that would support this analysis are not available in the public domain, it is still useful to set forth a framework in which the discussion of “inequity” can take place on the basis of prices and models, rather than pure opinion.
The assumptions underlying this model are set forth here:

1. The cost of DOMESTIC distance is single largest component of any network, including the Internet.

2. Because the Internet is a structure where cost of distance is averaged over all users, the international cost of distance cannot be separated out and treated as an isolated issue. (The architecture of the Internet does not really recognize national boundaries.)

3. The Internet DOES have an existing settlement mechanism but it is different from traditional telephony. It consists of transit and peering charges.

4. The Issue: Is the Internet settlement system fair and equitable and based on transparent processes? AND does it take into account the fact that APEC ISPs pay for the full trans-Pacific link?

5. To date peering and transit charges are cloaked in non-disclosure agreements (NDAs) and trade secret agreements.

6. However, it is proposed that an econometric model can be developed for Internet settlement charges based on publicly available data and use US domestic prices as a benchmark.

7. This proposed model would show *relative* importance of costs of domestic distance,international links, bandwidth, metered charges and ISP links.

8. The proposed econometric model would also help APEC ISPs in assessing whether they are getting fair and equitable peering charges from US Tier 1 ISPs, given the fact that they are paying for the trans-Pacific link.

9. The econometric model may also show that in fact it is to Asian ISPs self interest to pay for the trans Pacific links and that US Tier 1s in fact are being disadvantaged by this arrangement. If this were true it would explain why carriers like Global Crossing are expanding their networks to Asia as quickly as possible. There will be a lot less competition for a US ISP if it terminates in Asia than if the Asian ISP terminates in the very competitive US market.

10. Even if all the data cannot be found in the public domain, the econometric exercise will allow the ISPs that have the data to argue more effectively in some future forum where these arrangements are under review.