

FIXED MOBILE INTERCONNECTION:

THE FINNISH CASE

This case has been prepared by Arno Wirzenius <arnow@iki.fi>. *Fixed Mobile Interconnection: The Finnish Case* is part of a series of Telecommunication Case Studies produced under the New Initiatives program of the Office of the Secretary General (OSG). The fixed-mobile interconnection case studies program is under the direction of Dr. Tim Kelly <tim.kelly@itu.int>, Coordinator, Strategies and Policies Unit (SPU), and is managed by Lara Srivastava <lara.srivastava@itu.int>. Other cases, including fixed-mobile interconnections in China, India, Mexico, can be found at <http://www.itu.int/osg/sec/spu/ni/fmi/case_studies/>. The opinions expressed in this study are those of the authors and do not necessarily reflect the views of the International Telecommunication Union, its membership or the Finland Government.

Contents

1.1	Geography and Demographics.....	5
1.2	Political system.....	5
1.3	Economy.....	6
2	THE FINNISH TELECOMMUNICATIONS SECTOR.....	6
2.1	Historical Perspective and Structure.....	6
2.2	Fixed Network Structure and Capacity.....	7
3	MOBILE SERVICES.....	7
3.1	Analogue Services.....	8
3.2	GSM 900 and 1800.....	9
3.3	Third Generation Mobile Licences and a New GSM 900 Licence, 1999 and 2000.....	9
3.4	Operators.....	9
3.5	Revenue.....	11
3.6	Connections.....	12
3.7	Traffic.....	13
3.8	Short Message Services.....	14
3.9	PSTN - Mobile Convergence.....	15
3.10	Internet in Finland.....	15
3.11	Mobile Internet in Finland.....	16
4	REGULATION OF FINNISH TELECOMS.....	20
4.1	Evolution of Legislation.....	20
4.2	Licensing Principles and Procedures.....	21
4.3	Price Regulation.....	22
4.4	Regulatory Trends and Major Cases.....	23
5	PECULIAR TARIFF AND INTERCONNECTION STRUCTURE.....	24
5.1	General.....	24
5.2	Terminology.....	25
5.3	Invoicing Agent Service.....	25
5.4	Subscriber Charges 1957 - 1999.....	26
5.5	Subscriber Charges, 1999 Onwards.....	27
5.6	General Interconnection Arrangements.....	28
5.7	Mobile Charges and Mobile Interconnection Charges.....	30
5.8	Technical Arrangements.....	31
5.9	Charging Cases in Mobile Interconnection.....	32
5.10	Negotiation of Interconnection Agreements.....	34
6	QUESTIONS AND ISSUES.....	35
6.1	Will a Market Driven Tariff and Interconnection Regime be Tolerated?.....	35
6.2	Is a Cost Based Model the Only Solution for Setting Interconnection Charges?.....	36

6.3	Will Mobile Tariff Structures Change?.....	36
6.4	Will International Call Termination be De-averaged?.....	37
6.5	How to Interconnect Mobile Data?	38
6.6	What to include in regulated interconnection?.....	38
6.7	Emerging Technologies	38

List of Figures

Figure 1:	Mobile domestic market share by revenue	8
Figure 2:	Mobile penetration per population in Europe, December 1999.	8
Figure 3:	Fixed (local + national long distance) and mobile revenue.....	11
Figure 4:	Domestic average revenue per mobile and fixed user per year.	12
Figure 5:	Fixed and mobile penetration per 100 inhabitants.....	12
Figure 6:	Household telephone penetration.	13
Figure 7:	Fixed and mobile outgoing call minutes.....	13
Figure 8:	Average number of SMS messages per subscriber per month.	14
Figure 9:	Internet hosts per 1000 inhabitants, July 1998.	16
Figure 10:	Relation between fixed and usage costs for mobile business users	36

List of Tables

Table 1:	Some key facts about Finland	5
Table 2:	Mobile licences in June 2000.....	9
Table 3:	Mobile services operating in Finland.....	10
Table 4:	Internet minutes as per cent of fixed call minutes in the Helsinki region.....	14
Table 5:	Distribution of SMS content services.	15
Table 6:	Finnish primary legislation on telecommunications.	20
Table 7:	Licensing developments since 1987.	21
Table 8:	Terms and Definitions	25
Table 9:	Example of division of revenue between access and termination operator.	28
Table 10:	Present charges.	29
Table 11:	Sample mobile tariff packages and charges for domestic calls.	30
Table 12:	Call charges for fixed - mobile calls (US\$).	32
Table 13:	Call charges for mobile - fixed calls (US\$).	33
Table 14:	Call charges for mobile - mobile calls (US\$).	33
Table 15:	Call charges for mobile - international calls (US\$).	33
Table 16:	Call charges for international - mobile calls (US\$). See text above.	34
Table 17:	A small international operator in the USA already differentiates international call prices to fixed and mobile destinations. Prices in US\$ per minute.....	37

COUNTRY BACKGROUND

1.1 Geography and Demographics

Finland is a Northern European republic, with land borders to Sweden, Norway and Russia. Its surface is 337 000 km², slightly smaller than Germany.

Finland was part of Sweden until 1809, when Russia conquered it, and still recognises Swedish alongside Finnish as an official language. It then became a Grand Duchy under the Russian Czar until independence in 1917.

At independence Finland was still mainly an agricultural society. After the Second World War, however, it built up a significant manufacturing industry.

Finland is a rather sparsely populated country (15 inh/km²), with a total population of 5'158'000, of which 60 per cent reside in urban areas. The capital city, Helsinki, is home to around 500'000 people, almost 10 per cent of the total population of Finland (Table 1).

1.2 Political system

Finland is a republic, and its parliament is unicameral with 200 seats. Members are elected for four years using a proportional system. The system results in a multi-party system with no single majority party. There are presently 10 parties with seats in Parliament.

The Head of State is a President, elected by popular vote for six years. The current president is Ms. Tarja Halonen, elected in early 2000.

The Cabinet (Council of State) is a coalition. At present, a coalition of five political parties exists, informally called the "Rainbow Cabinet". Because of these coalitions, political changes are usually rather small even if election results change the relationship between parties.

Finland has been a member of the European Union since 1995.



Table 1: Some key facts about Finland

Area	337 030 km ²
Population (1999)	5 158 000
Population density	15 inh / km ²
Population growth	0.15 % / a
Capital	Helsinki, 500 000 inh
Urban population	60 %
Official languages	Finnish and Swedish
Literacy	100 %
Life expectation	77 yrs
GDP / capita (PPP, 1998)	US\$ 20 100
Main natural resource	Forests (76 % of land area)
Fixed telephones (1999)	2 853 000
Mobile telephones (1999)	3 363 000
Fixed penetration (1999)	55.2 / 100 inh.
Mobile penetration (1998)	57.1 / 100 inh.
Mobile penetration (1999)	65.2 / 100 inh.

Source: Statistics Finland, Telecommunications Statistics.

1.3 Economy

Finland has an industrialised economy based on the free market. Its economy is open and depends mainly on exports (30 % of the GDP). In 1998, exports were US\$ 43 billion and imports were US\$ 30.7 billion. The key economic sectors are wood (timber, pulp and paper), metals, engineering, telecommunications and electronics (e.g. Nokia).

Finland experienced a heavy recession between 1990 and 1992, from which it has successfully recovered. Unemployment is still about 11 per cent¹. Taxation levels are high, and contribute to a good social security system.

Finland is part of the European Monetary Union² since its inception in 1999.

2 THE FINNISH TELECOMMUNICATIONS SECTOR

2.1 Historical Perspective and Structure³

The Finnish telecommunications sector consists of a total of 120 telecommunications operators, of which 47 are incumbent telephone operators⁴. Since the outset, Finland has been a multi-operator country⁵. Observers often have difficulties understanding this structure and its implications for business and regulation.

Finnish incumbent operators are traditionally grouped in two camps:

- present Sonera (formerly Telecom Finland); and
- the Finnet Group.

Initially, Sonera was the state owned Post & Telecommunications Department, which was later converted to a state corporation (Telecom Finland) and finally to a normal limited liability company. The name Sonera was adopted in 1998. For simplicity, this report uses “Sonera” even for periods before 1998.

Sonera operates fixed local telephone services in mainly small and medium size cities and rural areas. Furthermore, Sonera operates virtually all national long distance and international telecommunications until 1994. Sonera also operated all mobile services until 1991. Sonera is still the market leader for mobile, with 63 per cent of the mobile subscriber base in Finland.

The Finnet Group consists basically of 46 local telephone companies, with rather close co-operation, and their Joint Ventures. They operate local telephone and other telecommunications services in their respective areas and had virtually exclusive rights until 1994. They are, and were always, financially independent. At the outset, Finnet companies were not subsidised by mobile, long distance or international services. Most of them were co-operatives, with each share giving the right to one telephone line. The co-operative form is presently giving way to more commercial company forms, separating ownership and subscriptions.

During the period between 1985 and 1994, a step-by-step liberalisation process took place. Full liberalisation of all sectors was achieved by 1994. In 1990, the Finnet Group created a competing mobile operator, Radiolinja, which started offering GSM services in 1991 and became the first GSM operator in the world. In 1994, the Finnet Group created operators for national long-distance and for international telephony, as well as a few other joint ventures. In 1999, Radiolinja had 36 per cent of the mobile subscribers in Finland.

¹ April 2000, source: Statistics Finland.

² The European Monetary Union (EMU) is a union of 11 member countries of the European Union. The EMU is creating a common European currency, the ‘euro’.

³ A detailed description of Finnish mobile telecommunications can be found in *Case Mobile Finland*, Ministry of Transport and Communications, Finland, March 2000, with a summary on <<http://www.mintc.fi/telecom.htm>>.

⁴ June 2000, source <<http://www.mintc.fi/telecom.htm>>.

⁵ The multi-operator nature can be illustrated by the ministerial decision on operators with Significant Market Power (SMP). 46 operators have SMP in local telecoms, 3 in long distance, 3 in international and 3 in mobile, a total of 50 operators (some have SMP in more than one market). Many of the local SMP operators are quite small, even below 2,000 subscribers and less than 10 staff. Due to the special status of the Åland island the combined long distance / international / mobile Finnet operator with SMP in that area is excluded from this study.

Sonera responded to liberalisation by constructing networks for business users in the former Finnet areas. Sonera has also adopted an impressive internationalisation policy, particularly with respect to mobile and value added services.

The Finnet Group is currently in a process of splitting up, with the largest operator, Elisa Communications (formerly Helsinki Telephone Corporation), separating its business from other Finnet companies and taking over significant stakes in previous joint ventures (the most important being Radiolinja) and a few local Finnet companies. The Elisa group is thus in competition with its previous Finnet partners. The "Other Finnet companies" reacted by creating their own mobile businesses (see Chapter 3.3).

Due to the historic multi-operator structure, the introduction of competition in Finland was relatively easy compared with other nations. The two main groups (Sonera and Finnet) had different strengths but about equal overall bargaining power. The key lay in abolishing the previous regional (local services) and sectoral (mobile, long distance and international) monopolies and license existing operators to compete with each other in new geographical areas and sectors.

A number of new entrants have started operations. With respect to mobile services, Telia Finland is the most successful newcomer, with a market share of 1 per cent⁶ in 1999.

2.2 Fixed Network Structure and Capacity

In 1994, the regulator redefined a fixed local telephone call to be a call within one telecommunications area; there are a total of 12 areas, compared to the former 75. These local calling areas are considerably larger than in many other countries, being on average almost 30,000 km². Therefore, fixed local calls can easily cover 100 km in distance.

Due to the evolution of the notion of "local area" and the increase in competition, fixed national long distance revenue has dropped and now represents only some 10 % of local service revenue (rentals and local calls). Presently, operators are no longer bound to this charging structure. Several observers expect national long distance tariffs to disappear altogether⁷, but none of the operators have taken any steps towards cancelling their long distance charges.

The fixed telephone network covers all permanently inhabited sites in the country. Full coverage was achieved in the 1980s, prior to liberalisation. Most vacation homes (about one for every 10 Finns), many of which are located in remote areas and far from permanently inhabited sites, have mobile coverage even though many lack fixed coverage. Facilities-based competition exists for major business users, but not for small enterprises or the residential sector.

Fixed telephony shows clear signs of saturation while mobile telephony is still growing at a rapid rate. The total number of fixed connections is stable or decreasing, but usage is still increasing (mainly due to dial-up Internet access). Some 25 % of households⁸ have opted for mobile services only and have abandoned fixed telephones altogether (See Figure 6).

3 MOBILE SERVICES

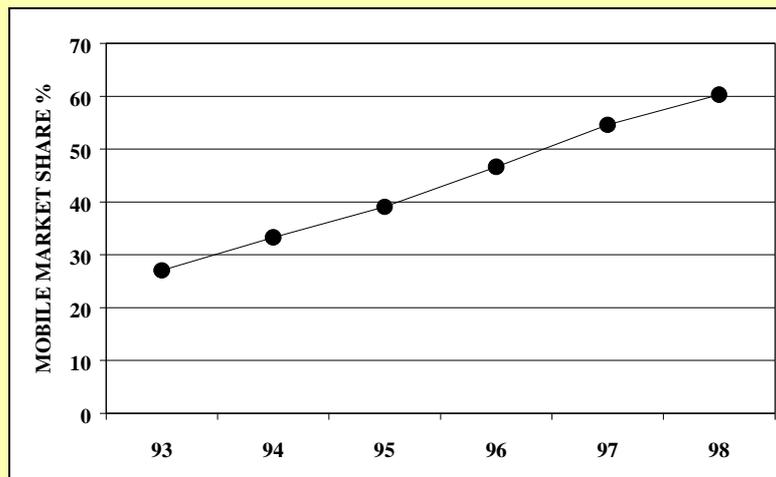
This chapter includes a detailed description of the mobile service sector in Finland. Mobile services in Finland are now at least as important as fixed telephony. Mobile operator revenues, as a portion of total domestic telecommunications revenue, are shown in Figure 1.

⁶ Based on number of subscribers, source Global Mobile February 2, 2000.

⁷ Three countries (Iceland, Norway and Sweden) have abandoned long distance charges in their fixed networks and use only one national call charge independent of distance. This development is called postalisation, referring to uniform letter charges within one country (see e.g. OECD Communications Outlook 1999 page 159). Two small operators in Sweden run flat rate field tests with test customers paying only rental. That rental covers all national calls. Such a development will certainly have a significant impact on interconnection charges.

⁸ March 2000, source: Statistics Finland.

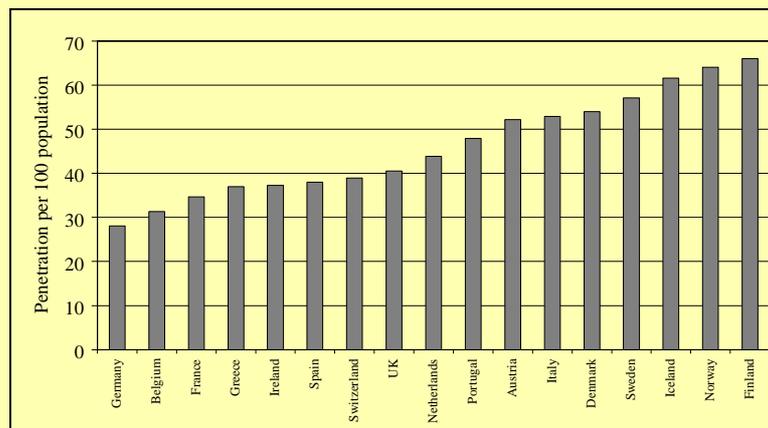
Figure 1: Mobile domestic market share by revenue



Note: Domestic revenue is defined as mobile revenue + fixed local and long distance revenue.
Source: Telecommunications Statistics 1994 - 1999.

For some years Finland has been the world leader in mobile penetration (Figure 2).

Figure 2: Mobile penetration per population in Europe, December 1999.



Source: Global Mobile February 2, 2000.

3.1 Analogue Services

Sonera commissioned the first mobile networks in 1972 (ARP, a semi-automatic network), 1982 (NMT 450) and 1986 (NMT 900)⁹. No special licences were required under those circumstances, as Sonera itself was the regulator.

When the market was first liberalised, no serious request for competing analogue mobile licences was filed. As a consequence, Sonera still holds the monopoly for country-wide analogue mobile services. ARP and NMT 900 will be terminated, but NMT 450 will still be offered to cover remote areas. In the event that GSM 400 emerges as a standard, it will be a strong candidate for the replacement of NMT 450.

The Finnet group operates local trunking services (named Auto-Net), but these services will be terminated in most cities. Similarly, paging services are already closed or closing is announced. GSM technology in its different forms is set to take over in both cases.

⁹ Source: Sonera privatisation prospectus 1999.

3.2 GSM 900 and 1800

The first licenses for GSM operators were granted in 1990 to Sonera and Radiolinja. At that time a duopoly approach was considered a sufficiently liberal and competitive arrangement.

In 1995, three country-wide and numerous local GSM 1800 licenses were granted. The licensing procedure was a combination of a first-come-first-served policy and a beauty contest. A public and open application process had not yet been mandated. Having received some expressions of interest, the Ministry solicited applications from those parties that were active in the Finnish telecommunications market, and granted licences to all applicants. Country-wide licences were granted to Sonera and Radiolinja, both with their own GSM 900 licences, and Telivo¹⁰. Local licences were granted to numerous Finnet companies, only aiming at the provision of local services.

3.3 Third Generation Mobile Licences and a New GSM 900 Licence, 1999 and 2000

In March 1999, Finland was the first country in the world to grant licenses for third generation mobile networks to four operators using the beauty contest procedure specified in the Telecommunications Market Act. In all, fifteen companies applied for a license. In the end, licenses¹¹ were granted to the two existing GSM 900 licensees (Sonera, Radiolinja) and to Telia, which was already operating a GSM 1800 network in three cities under a national licence. The fourth available license was granted to a new consortium, Suomen 3G (later 3G for short), consisting of most Finnet companies outside the Elisa group, with Swedish Netcom as a minority partner. Commercial services will be launched by 1 January 2002. The entire spectrum for third generation mobile networks will be assigned to the operators in equal parts.

In a similar exercise, one new GSM 900 license was granted in January 2000 to the consortium Suomen 2G (known later as 2G for short), out of a total of five applicants. The 2G ownership structure is similar to 3G mentioned above but has no foreign partner involved. 2G will integrate most existing local GSM 1800 networks into one dual band service. The TAC reported that the available frequency band could support only one viable operator. The choice of licensee was essentially based on promised widest coverage.

Neither of these two licensing exercises was challenged in court. Licensing procedures are discussed in greater detail in Chapter 4.2.

3.4 Operators

Table 2: Mobile licences in June 2000.

Licensee	Licences (mostly country-wide)
Sonera	NMT 450, NMT 900 (to be closed year 2000), GSM 900, GSM 1800, third generation mobile
Radiolinja (Elisa subsidiary)	GSM 900, GSM 1800, third generation mobile
Elisa and many Finnet companies	Local GSM 1800 (30 + licences)
Telia	GSM 1800, third generation mobile
2G	GSM 900, operative late 2000
3G	Third generation mobile

Note: 2G and 3G are names of emerging mobile network operators created by "non-Elisa" Finnet companies in response to the on-going break-up of the Finnet Group and to the take-over of Radiolinja by Elisa. See also Chapter 3.4. Third generation mobile licences shall be operative by end of year 2001

Source: Telecommunications Statistics.

¹⁰ See footnote 29.

¹¹ For details see <http://www.mintc.fi/telecom.htm>.

Table 3: Mobile services operating in Finland

Operator	NMT 450	NMT 900	GSM 900	GSM 1800	Third gener.
Sonera	1982 -	1985 - 2000	1992 -	1998 -	2001?
Elisa / Radiolinja			1992	1998 - country-wide + some local	2001?
Telia			service provider with Radiolinja from 1999	1998	2001?
2G			2000	1998 - (30+ local licences)	
3G					2001?

Note: The years indicate start of service, not year of granting the licence. Note that the many local GSM 1800 services operated by Finnet companies are included in Elisa and 2G services.

Source Telecommunications Statistics, Sonera privatisation prospectus 1999, source <http://www.mintc.fi/telecom.htm>.

Finnish mobile operators can be divided into three groups:

- incumbent operators;
- emerging network operators; and
- service providers and others not requiring a mobile network licence.

3.4.1 Incumbent Mobile Operators

There are two incumbent mobile operators in Finland: Sonera and Radiolinja (a subsidiary of Elisa Communications). Both have operated GSM networks since 1991. Together, they shared about 98 % of the mobile market at the end of 1999. Both operate nation-wide networks for GSM 900 and for GSM 1800 in medium and large sized cities.

Finnet companies also have a number of local mobile services outside Radiolinja. These services will eventually be integrated with the 2G networks to offer dual mode services.

3.4.2 Emerging Mobile Operators

Telia, 2G and 3G¹² are the emerging network operators. Telia has built its own GSM 1800 network in the three largest cities. Telia also has a service operator agreement with Radiolinja to offer dual mode services in the entire country. Telia offers these services separately.

One result of the break-up of the Finnet group was the creation, by most Finnet companies outside Elisa Communications (with associates), of two network operator companies, 2G for GSM 900 and 3G for third generation mobile networks. The Ministry granted licences for GSM 900 to 2G and for third generation mobile services (no standard is mentioned in the licence) to 3G. 2G is due to commence operations in September 2000 and 3G in January 2002.

Both companies (2G and 3G) have announced that they will operate as network operators only, and invite service providers to use their network. The same founders also created a separate and independent service provider, a company named 3P. This approach is clearly different from Sonera's and Radiolinja's present approach of vertically integrated operations.

3.4.3 Service Providers and Similar

"Service operator" is a generic term. There is no official definition of a service operator, or a regulator defined clear-cut class of service operators. Even the perhaps better known UK mobile virtual network operator concept is open-ended and not a clear-cut strict legal definition.

A Finnish service operator buys some or many network functions from a network operator at wholesale prices, alternatively implements functions using own facilities, creates his own brand and sells the service to

¹² See Chapter 3.3.

the public. The set-up is individual and an outcome of negotiations between the network operator and the service operator. Furthermore, the set-up is dynamic and changes over time. The only strict rule is that SMP network operators have to sell standardised network functions to service operators at non-discriminatory terms and conditions. The most common terms and conditions can be obtained from such operators, but are not actively published. Individual service provider contracts are confidential, including the division between purchased and self-supplied network functions.

There are a few existing mobile service operators. Telia is already mentioned (see Chapters 3.2 and 4.4.3). Saunalahti (an independent large Internet service provider) and RSL COM (Finnish subsidiary) are also active as mobile service providers (contracts with Sonera). However, their business volume is, so far, not significant.

The picture may change, especially if the present network operators or the new entrants, 2G and 3G, succeed in attracting service operators and / or if some of the existing service providers succeed in their business.

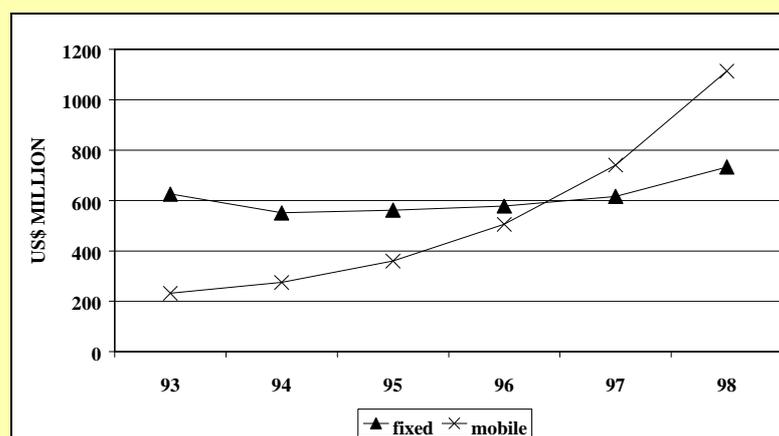
3.5 Revenue

Mobile revenue in a country can be compared to national fixed telephony revenue. In virtually all countries, the mobile market is growing faster than its fixed counterpart. This is also the case in Finland (Figure 3 and Figure 4).

The above shows that fixed telephony is quickly losing market share, even if revenue figures still are stable or even growing. However, much of the growth is due to Internet calls. Elisa Communications reports that Internet traffic accounted for about 40 % of all fixed telephone call minutes in 1999. If alternative solutions (ADSL¹³ etc.) become popular, dial-up Internet traffic via the PSTN may decrease and fixed telephony may lose ground in real as well as relative terms.

A common belief is that the average revenue per mobile user drops when new low volume users join. Figures for the average revenue per user (ARPU) in Finland show a growing trend. The only possible reason for this is that existing users are gradually increasing their usage of the mobile phone. This happens when users with both fixed and mobile lines switch to using their mobile more than their fixed line (Figure 3).

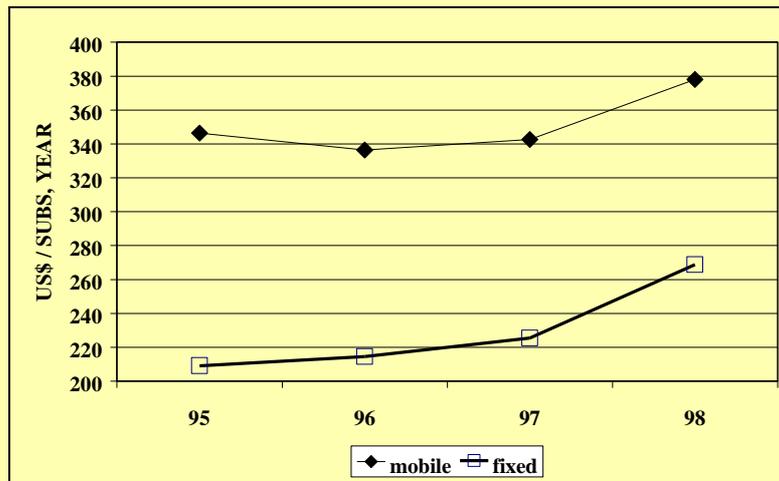
Figure 3: Fixed (local + national long distance) and mobile revenue.



Source: Telecommunications Statistics 1994 – 1999.

¹³ ADSL means Asymmetric Digital Subscriber Line, a technology that offers even megabit data transmission rates piggy-backing on existing analogue telephone subscriber loops.

Figure 4: Domestic average revenue per mobile and fixed user per year.



Source: Telecommunications statistics 1996 - 99. Fixed revenue includes local and long distance.

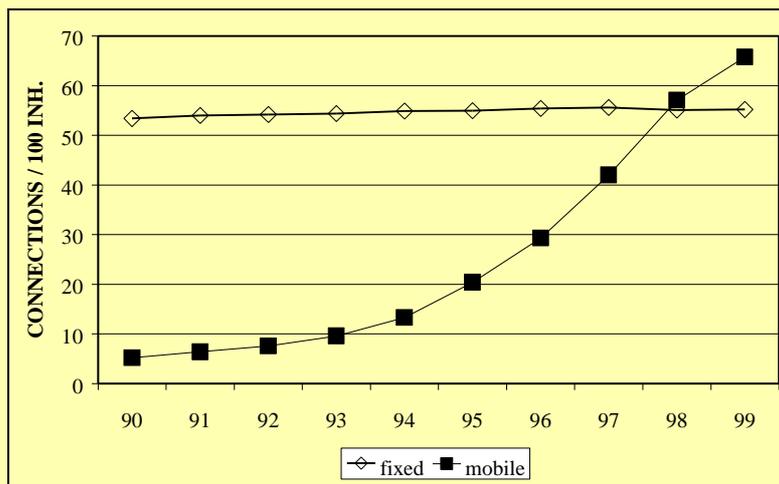
3.6 Connections

Mobile penetration in Finland exceeded fixed penetration in 1998 (Figure 5).

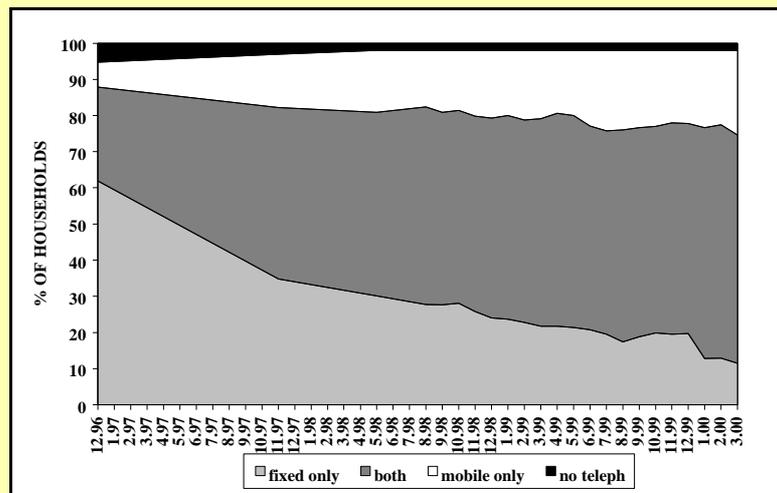
It must be noted that penetration rates can only be an average yardstick. Penetration rates do not indicate anything about the type of users or usage patterns.

Since about 1990, Finnish households have switched from fixed to mobile connections. Household penetration (portion of households with one or more telephones) has decreased for fixed telephony, and is down from 96 % in 1990 to 75 % in March 2000 (Figure 6).

Figure 5: Fixed and mobile penetration per 100 inhabitants.



Source: Telecommunications Statistics 1999.

Figure 6: Household telephone penetration.

Source: 1996 data: Vesa Kuusela, Puhelinteittävyys ja puhelimella tavoitettavuus Suomessa, Statistics Finland 1997. Further data: Consumer Survey, Statistics Finland. Sample size is rather small, measurement uncertainty a few % points.

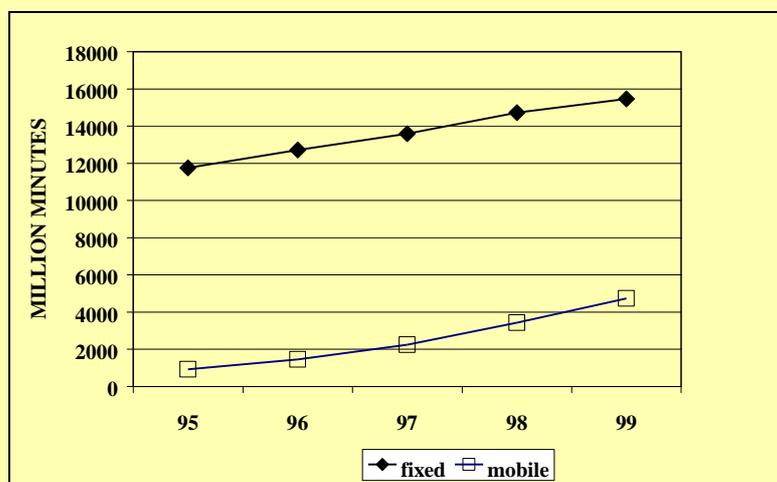
Figure 6 clearly shows that an increasing number of Finnish households are opting for mobile services only. Many of these households are in one or the other way not stabilised: one-person households, students, frequent movers, unemployed persons, or low-income households. An increasing majority use both fixed and mobile lines. The proportion of households with a fixed connection only is down to a mere 12 per cent.

3.7 Traffic

Fixed telephony still leads mobile in terms of outgoing traffic minutes. Mobile originated minutes were a mere 20 per cent of all minutes and mobile originated calls one third of outgoing calls in 1998 (Figure 7).

In the future, this may change. Mobile originated call minutes have been growing somewhat faster than fixed minutes, despite the effect of Internet dial-up connections on the number of fixed call minutes.

Elisa Communications (former Helsinki Telephone Corporation, the capital region Finnet company) reports that Internet minutes are growing fast (see Table 4).

Figure 7: Fixed and mobile outgoing call minutes.

Source: Telecommunications statistics 1999.

Table 4: Internet minutes as per cent of fixed call minutes in the Helsinki region.

Year	% of call minutes
1998	15
1999	30
2000	40

Source: Elisa Communications, quarterly reports, <<http://www.elisa.fi>>.

3.8 Short Message Services

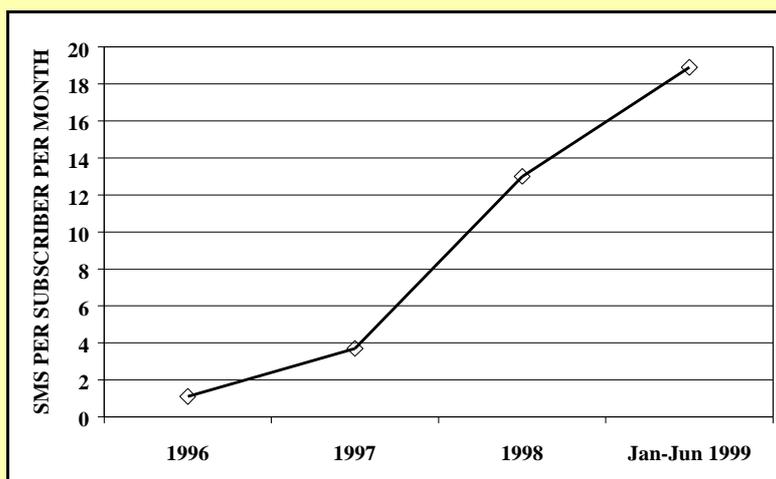
The rapidly increasing number of SMS¹⁴ text messages is contributing to the growth of the mobile sector in Finland (Figure 8). SMS messages are not included in normal traffic statistics. Fixed telephony has no corresponding feature. In the first half of 1999, the average number of SMS messages per connection per month was around 19 (up from 13 in 1998), compared to an average of 47 outgoing voice calls. The popularity of SMS has caused paging services to lose market: Elisa closed its paging service in 1999 and Sonera announced closing its paging service latest 2001.

The charge for sending a normal SMS message is US\$ 0.159 (Sonera) and US\$ 0.148 (Radiolinja). No receiving fee is charged, Calling Party Pays is valid for SMS messages as well.

Presently SMS has three main forms of usage:

- text messages between users;
- platform for corporate interactive applications; and
- automated content services.

The first two use standard pricing, while automated content services use premium pricing. So far, text messages between users is estimated to account for about 85 % of all SMS messages¹⁵.

Figure 8: Average number of SMS messages per subscriber per month.

Source: Sonera privatisation prospectus 1999.

¹⁴ Short Message Service, a GSM feature that allows sending and receiving short (maximum 160 characters) messages from and to handsets. SMS messages may include text, simple graphics (e.g. icons) and even ringing tones.

¹⁵ Source: IDC report *Suomen tekstiviestimarkkinat* for the Ministry of Transport and Communications, January 2000.

Table 5: Distribution of SMS content services.

Service group	Portion	Service group	Portion
News	20 %	Movies, TV and radio	10 %
Games	15 %	Tools	6 %
Leisure and entertainment	14 %	Culture	3 %
Sports	12 %	Others	9 %
Travel	11 %		

Source: IDC report *Suomen tekstiviestimarkkinat*.

Examples of corporate interactive applications are banking (balance enquiries, money transfer), flight schedules and Frequent Flyer applications, mobile invoice balance inquiries, forwarding and notification of e-mail messages.

Content services include, for instance, news, TV programmes, movie programmes, horoscopes, directory and address inquiries, sending post cards, weather, sports, gambling results (lotto etc.), dictionaries (translation of words), etc. Users can subscribe to some of these services in such a way that no enquiry SMS message is needed.

The IDC report estimated that some 300 different services were implemented by late 1999. Distribution of services (not usage) is shown in Table 5.

3.9 PSTN - Mobile Convergence

Finnish operators have been able to develop a number of fixed - mobile service convergence features. Some of them are:

- redirection of calls between fixed and mobile connections;
- direct connections between large PABXs and mobile networks, integrating company mobiles with the PABX and its numbering (call transfer features are still missing in mobile handsets);
- mobile Centrex; and
- 1 - 3 mobile and fixed connections are grouped with discounted call charges within the group.

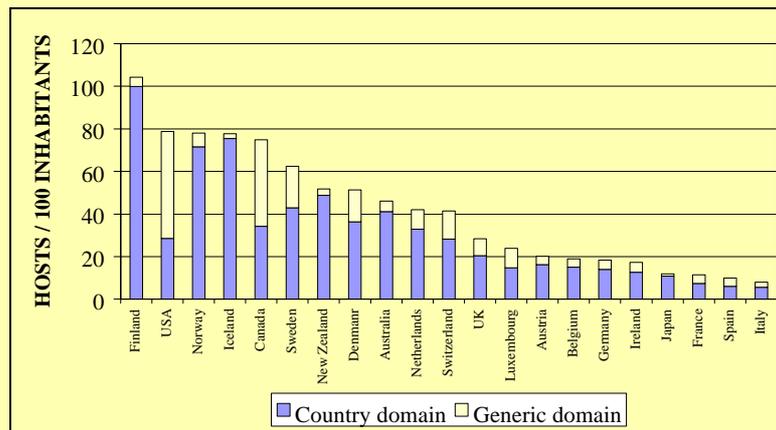
As an outcome of this convergence, it is increasingly common to expect business people and any service field staff (plumbers, installers, etc.) to be available at any time on their mobiles, independent of travelling and often even independent of office hours. In business today, a mobile is rarely considered a mere reserve facility, to be switched on only when making a call in an unusual situation. It forms part of more generalised communication solutions.

3.10 Internet in Finland

In addition to being a mobile leader, Finland is also a leader in Internet penetration. However, while mobile utilisation can be measured using several reliable yardsticks, Internet penetration and usage have no equally reliable yardsticks. At best, Internet yardsticks are reasonable estimates.

One of the most used yardsticks estimates the number of Internet hosts. However, this has a major caveat: the most popular domains (having the largest number of hosts) is *.com* and *.net*. These domains are generic domains¹⁶ that have no "home country". OECD estimated the real number of hosts by country (July 1998), distributing open generic domain hosts over countries (see Figure 9). Even if the data is old, the results may be more accurate than those gained from allocating all hosts under generic domains to the United States.

¹⁶ The generic domains are *.com*, *.net* and *.org* (open for all), *.int* (open for international organisations), *.edu*, *.gov* and *.mil* (open for US relevant organisations). Other top level domains are country domains (e.g. *.ch* for Switzerland).

Figure 9: Internet hosts per 1000 inhabitants, July 1998.

Source: OECD Communications Outlook 1999 p. 86 - 87.

Note: Generic domains included are .com, .net, .org.

Figure 9 shows that Finland was a world leader in Internet host penetration in 1998. Probably the situation has not changed essentially.

The combination of world leader in mobile penetration and usage, and Internet host penetration, makes Finland an interesting country to monitor in terms of mobile Internet development. Other interesting countries with high mobile and Internet penetration include the other Northern European countries (Denmark, Norway, and Sweden). Furthermore, Sweden is the home country of Ericsson, while Finland has Nokia. Both companies are leading communications manufacturers. Nevertheless, the largest markets are in the largest countries, in particular USA.

The above is an indication of overall usage of the Internet, and an important subset of Internet usage is e-commerce. In that respect, Finland, although not a leader, maintains an average level of usage in Europe¹⁷.

Finnish Internet purchases per inhabitant per annum is around US\$ 160 (estimate for 2000), about one third of that of Switzerland, the leading country. On the other hand, the average value of a Finnish Internet purchase is around US\$ 145, the highest in Europe. Contributing factors may be that Finnish credit card usage is lower than in many other countries, partially due to a highly developed banking system with direct debit cards and customer operated bank transfers. Finns reluctantly give their credit card numbers in Internet transactions. Only 15 % of Finnish Internet purchases are paid by credit card, compared to 90 % in the UK.

Internet banking is already a major e-commerce application in Finland. All banks in Finland offer Internet banking. In June 2000, the total number of Internet banking agreements¹⁸ reached 1.83 million, out of a total of 5.9 million "active customers". The population of Finland is around 5.16 million, however, there is a degree of overlap, with some people having more than one account or agreement.

3.11 Mobile Internet in Finland

Nobody knows how mobile Internet will develop or what services will be popular on third generation mobile networks. However, an impressive number of initiatives exist and analysts predict a rosy future.

Present Internet-like services are based either on SMS or on data calls to a Mobile Internet Service Provider (MISP), often the mobile operator. In the future, mobile packet radio will also be used.

Mobile Internet will differ from fixed Internet primarily due to the small monochrome screen on the mobile handset, a small and somewhat awkward interface (tiny keyboards), and a much slower and higher cost of data transmission (file transfer up to 100 times as expensive).

¹⁷ Sources: Helsingin Sanomat, Kymen Sanomat (Finnish daily newspapers) 29 June 2000.

¹⁸ Source: Helsingin Sanomat 28 June 2000.

Nevertheless, mobile Internet is being talked about with great excitement and so much effort is being made that some significant results can be expected. A Cap Gemini report¹⁹ forecasts that 78 per cent of the US population could be using wireless data applications by mid 2001, compared to 3 per cent in 2000.

The perhaps most far reaching scenarios expect mobile phones to become popular *de facto* wallets, and mobile operators to enter banking business or taking over banks.

3.11.1 SMS based services

The Finnish Ministry of Transport and Communications has estimated that SMS revenue may grow up to some 10 % of total mobile operator revenue in the year 2000. This is a strong indication of the potential business opportunities for mobile Internet. In particular, it shows that users are ready to pay for content.

SMS is clearly suitable for services needing one short question and one short answer. The maximum length of a message is 160 characters. The question should be easy to formulate and to 'understand', so that repeated questions are not required. Typical examples of current SMS-based services include the following:

- directory services, providing names and telephone numbers;
- flight schedules;
- weather forecasts;
- TV and movie programmes;
- short e-mail messages;
- various entertainment services: jokes, horoscopes, etc.;
- sports and gambling (e.g. lotto) results; and
- icons, ringing tones.

External content providers offer most of these services.

However, what makes the Internet unique is its interactivity. Charges for SMS are on a per message basis. Therefore, services needing much interactivity will probably become too expensive to be widely used via SMS. It does not seem likely that SMS will become the method of choice for interactive mobile Internet applications.

3.11.2 Data Calls, Premium Rate Calls

The other service presently available for mobile Internet is a mobile data call (circuit switched call). Data calls offer much more interactivity at a reasonable price. However, this is only the case if the session is a short one, not as long as normal Internet sessions.

Data calls are a platform for mobile Internet applications. Data calls are presently used also when mobile telephones are connected to laptops for normal Internet connections. The speed is much slower than fixed Internet and in many cases not sufficient for regular use of normal Internet.

Premium rate calls are used for payment services. For example, some vending machines (e.g. snacks, soft drinks) have telephone numbers and calling that number delivers the item from the vending machine and adds the price of the purchase to the telephone bill.

3.11.3 GPRS and Third Generation Mobile

GPRS²⁰ is expected to be an interim data service, to be used for several years until third generation mobile services are widely used. GPRS (as well as later on third generation services) will be "on" all the time, and does not need special connection and disconnection of a call. Data transfer to and from the handset will take place on demand, when needed.

GPRS is also only a platform on which to implement services. The pricing structure is not yet clear, and neither is interconnection of GPRS. Both may have an impact on success. BT-Cellnet is said to be the first

¹⁹ Source: www.usa.capgemini.com.

²⁰ General Packet Radio Service.

operator with a working GPRS and, as yet, they do not have a GPRS tariff published on their web site (26 June 2000). Finnish GPRS is due to be commissioned in the year 2000.

3.11.4 WAP

Present mobile Internet is mainly based on WAP. WAP is a temporary gateway standard for Internet-based services using a mobile WAP-capable handset. The browser in the handset determines the user interface, and the browser uses the WAP functions for communication with (mobile) Internet. Communication with normal Internet is not realistic or even possible.

Present browsers are text based. Operation is presently similar to using a text based Internet browser (lynx or similar) using keyboard keys (similar to cursor, enter and escape) on a very small screen. Future browsers will most probably be graphic. A user can tailor his opening screen to his own preferences, which is excellent for users that know what they use frequently.

WAP is assumed to be a temporary solution until a more developed interface standard emerges. However, WAP may be possibly useful even in a GPRS environment, for example, if it could offer efficient optimisation of data communications cost.

Present WAP-based services are to a large extent the same as public SMS services. The main advantage is that the user interface is easier and more interactive, almost doing away with the need for a paper user-manual (or similar). Corporate WAP-based services (e.g. mobile banking, see Chapter 3.11.5) are emerging, with an extended scope, but present WAP-based services are still in their infancy.

3.11.5 Mobile commerce

Mobile commerce services are mostly in their start-up phase. Numerous companies are active in creating services and concepts needed for mobile commerce. Thus, no figures can yet be provided with any degree of relevance for measuring markets and successes.

Because mobile commerce deals with financial transactions between many participants on both sides, various support services (verification, authentication) are needed to enhance privacy and security. The problem is essentially the same as for fixed Internet commerce.

Mobile commerce may perhaps focus on goods and services that do not need a large colour screen.

Virtually all major trading businesses in Finland are working on mobile commerce in one way or the other. The outcome is still to be seen.

An important application of mobile commerce is mobile banking. Present mobile banking applications are based on data calls and WAP²¹ capable handsets. Presently all major banks in Finland offer mobile banking.

Mobile banking is an important development for the banks. The main advantages for banks are as follows:

- banks rationalise, users do the manual data entry work, and the bank can use fully automatic transaction processing (83 % level achieved in 1998²²);
- an increasing number of households abandon their fixed telephones and thus do not have dial-up Internet access from their homes. This is particularly valid for young people;
- mobile phones have a potential to at least partially replace cash and pay cards; and
- identification of a mobile caller is easier and safer than identification of a fixed caller.

Mobile banking currently has the following features in Finland

- checking account balances and transactions of personal accounts;
- paying invoices, and monitoring payments;
- money transfer between personal accounts;

²¹ Wireless Application Protocol.

²² Source: Finnish Bankers' Association, www.pankkiyhdistys.fi. E.g. cheques are presently considered outdated and are used only in exceptional cases.

- checking Visa card accounts;
- approving direct debit invoices;
- buying and selling shares on stock exchanges; and
- banking news and e-mail exchanges with the bank.

Mobile banking involves a contractual arrangement between the customer and the bank. The telecommunications operator so far offers only the communications component. In the future, the operator or some external body may also offer security type services.

3.11.6 Issues

Ownership of users and user data

One of the important features in present SMS and WAP services is that mobile operators "own" the user interface in the sense that they alone have access to user databases. Mobile operators set the retail prices and invoice users. Service and content providers do not have direct contact with users and customers - they are in a sense in a subcontractor position to the mobile operator.

This situation (one of vertical integration) may possibly be among the main problems for mobile Internet and may hamper its development. Service development needs competition. If content provision is considered a mere "add-on" to the mobile connection, content provision may perhaps not develop on its own. Finnish content providers are concerned, and are trying to ensure direct contact with users.

Digital television for Internet?

Digital television may be a potential Internet channel²³. The network will come as terrestrial, satellite and cable ones, most of them probably financed from broadcasting. The standard includes point-to-point communications features (including mobile), as an add-on service to an existing network. The network is one-way and a separate return channel is needed. Internet usage is thus in principle possible, but the outcome is uncertain and only time will tell if the point-to-point communications possibilities will evolve into reality, and particularly if mobility will be used. The next few years will not yet see a major success, as new user terminal equipment (black boxes or new television sets) are needed.

Finnish Sonera has already agreed to buy a significant stake in the national terrestrial broadcast network operator in Finland, presently owned by the national broadcasting corporation and serving all public broadcasters in the country. The Finnish Competition Authority has acted to prevent that deal. The case is still in the courts.

Mobile data pricing

A straightforward comparison of transfer capacity and price per call minute suggests that the cost of mobile data transfer (cost per megabyte) is up to 100 times as expensive as fixed telephony dial-up data transfer. The impact of this difference may be significant in the long run, when aiming at mass markets. Mobile services may be developed with a high degree of optimisation of transferred data. Present Internet pages are designed with no optimisation whatsoever, causing long waiting times, for example. The outcome may be that mobile Internet differs very much from fixed Internet. Time will tell.

One thing is certain: the underlying cost of mobile data remains significantly higher than the corresponding cost of fixed data (fixed Internet).

²³ A Forrester Research report Mobile Commerce (www.forrester.com) in March 2000 forecasts that Interactive Digital TV will overtake the Internet as Europe's primary e-commerce platform.

4 REGULATION OF FINNISH TELECOMS

4.1 Evolution of Legislation

A brief history of recent telecommunications legislative developments in Finland should start in 1996 (see Table 6). In that year, discretionary licensing power was abolished; leasing transmission capacity to other operators was mandated; price regulation powers were abolished, but the Ministry retained the right to mandate price setting principles. For the most part, these were based on principles of reasonableness in pricing.

The 1997 Telecommunications Market Act improved the rights for operators to lease capacity from other operators, separated network and service provision, and created special requirements for operators with significant market power (SMP).

In late 1999, the Ministry issued a White Paper discussing amendments to the Act. The amendments were to cover two major issues:

- the obligation to lease unused capacity of existing analogue telephone copper loops to anybody; and
- the obligation to offer national roaming on GSM (second generation) to third generation mobile operators outside their coverage area.

The obligation to lease unused capacity refers to the leasing of the data-over-voice frequency band used by e.g. ADSL²⁴. Thus anybody can offer ADSL and ADSL based services in the PSTN network. This obligation is in addition to the previous obligation to lease local loops, and is ahead of EU policies in this regard.

The national roaming right for third generation mobile network operators to roam on existing GSM networks outside their own geographic coverage areas is a transitional arrangement for a maximum of eight years, possibly with exceptions for the rural and remote parts of Finland.

The proposed amendment was sent to Parliament in June 2000.

The Ministry has declared an intention to replace present legislation with a Communications Market Act. The scope of the new act would cover all communications networks (including broadcasting) and, as such, is meant to respond to emerging convergence trends. The Communications Market Act is expected to come into force no later than 2002.

Table 6: Finnish primary legislation on telecommunications.

Year	Legislation
1886	Finnish Senate Decree (secondary level legislation), approved by the Russian Czar (Finland was under Russia until 1917), that the Finnish Senate may issue licences for installing telephone lines. No amendments (during 101 years!)
1987	Telecommunications Act, giving Government discretionary powers to issue telecommunications licences. Present Sonera did not initially need a licence. No exclusive rights were in the Act; exclusivity was implemented by licensing. Regulation was transferred from Sonera to the Ministry. Amendments in 1988, 1990, 1992, 1993, 1995 (twice), 1996
1988	Radio Act and Telecommunication Administration Act, creating an independent regulator also handling frequency administration. Amendments 1988, 1992, 1995
1997	Telecommunications Market Act, removing most licensing (remains only for mobile operators due to scarcity of frequencies), only notification is needed. One amendment in 1999 and another under preparation
2002 (planned)	Planned Communications Market Act, aiming at uniform and neutral approach to all networks: telecommunications, broadcasting, etc. No details are available yet

Source: Telecommunications Statistics. Most telecommunications specific legislation and regulations can be found in English on the Ministry and TAC web sites: <<http://www.mintc.fi/>> or <<http://www.thk.fi/>>.

²⁴ ADSL means Asymmetric Digital Subscriber Line.

In general, Finnish legislation has followed liberal EU trends, and is for the most part at the forefront of European liberalisation efforts. The general trend in Finland has been to rely on competition law rather than on sector-specific legislation. This liberal approach has been simpler to apply than in most other countries. Competition began with two equally-sized operator camps, with strengths in different subsectors.

Some of the EU legislation was specifically designed for an environment with a single vertically integrated giant incumbent and new entrants starting from scratch. These features do not fit with a more competitive and segmented environment, such as Finland. Finland did not join the EU until 1995. Therefore, Finnish peculiarities were included in EU legislation only in the form of later amendments, if at all.

4.2 Licensing Principles and Procedures

The 1987 Telecommunications Act gave discretionary licensing powers to Government, as in most other countries. For this reason, licensing was subject to heavy lobbying, based on a "first come first served" basis, but also following a trend to balance the rights of the two main players (Sonera and the Finnet camp).

Initial steps towards liberalisation were relatively small. The first fully liberalised subsector was terminal equipment, as of 1987. Further licensing steps are presented in Table 7.²⁵ Licensee selection criteria are mentioned in the Act. Thus, the Ministry does not have significant discretionary power, even if any beauty contest must necessarily include elements of such power. According to the Act, a licence will be granted if the following criteria are met²⁶:

- the applicant has sufficient financial resources to attend to the duties of a telecommunications network operator;
- the applicant complies with the provisions and regulations on telecommunications; and
- radio frequencies are available for the telecommunications service referred to in the application.

Table 7: Licensing developments since 1987.

1988	Telephony and data communications for business users were partially liberalised.
1990	Sonera lost its last privileges and was granted a licence similar to other operators. Two competing GSM licences were granted. Data communications was opened to full competition.
1990 - 91	Regional radio trunking networks were licensed. Data communications for business users was fully liberalised.
1992	Switched data communications was exempted from licensing. Competing licences were granted for local and national long distance services, but with ceilings. Limited competition in long distance and international telephony started.
1994	Full competition started in national long distance and international telecommunications. The first service operator licences were granted.
1995	The first GSM 1800 licences were granted, with further (regional) licences in subsequent years. Commercial service provision started, however, only in 1998.
1997	The Telecommunications Market Act repealed most licensing requirements, but retained a notification requirement. Mobile licences were still needed, but new licences had to be granted using a beauty contest procedure with criteria specified in the Act.
1998	Minor mobile services (trunking, paging, etc.) were exempted from licensing. International termination of telecommunications was exempted even from notification.
1999	Service operators were given the right to buy invoicing service or invoicing data bases from access operators. Four third generation mobile licences were granted using a beauty contest procedure. See also Chapter 3.3.
2000	A third GSM 900 operator was licensed using a beauty contest procedure. See also Chapter 3.3.

Note: The years indicate the year of the licence, not the year of starting service.

Source: Telecommunications Statistics 1991 - 1999 and Ministry of Transport and Communications.

The above are in a sense a list of pre-qualification criteria.

²⁵ See also Chapter 3 for a more detailed description of licences and licensees.

²⁶ Telecommunications Market Act Section 7.

If radio frequencies limit the number of licences, the general objectives of the Act mentioned in Section 1 are to be used for the selection of licensees. Section 1 specifies that services should be:

- in accordance with the reasonable needs of the users of telecommunications;
- competitive with each other;
- technically advanced;
- of good quality;
- functionally reliable and secure; and
- reasonably priced.

The Act does not mention licence fees. No licence fees are presently levied, which means that licences are free of charge. The TAC²⁷ levies fees for radio frequencies, but the fees are only meant to cover administrative costs.

The stated Finnish policy is that any fees would be automatically passed over to customers, as operators do not have any other source of revenue. Different services should be treated equally so that competition is not distorted. High mobile operator charges (as applied in many other countries) can be understood as a special mobile tax, even if the word "tax" is not used. Such charges would distort competition between fixed and mobile services. The Finnish understanding is that mobile is presently the only viable alternative to fixed telephony for voice services.

Furthermore, high licence fees would result in deals with special or exclusive rights, which may result in compensation claims if further development alters the environment. Changes to terms and conditions of licences are easier to impose if licence fees are insignificant or nil.

The primary licensing principle applied in Finland has been to keep the individual licences as short as possible, and include all matters common to several or all licensees in mandatory regulations. This principle has been strictly followed, and the outcome is that individual licences are short and to the point (one or a few pages). This eases significantly the process of amending terms and conditions, as no or little negotiation is required. This principle also ensures a level playing field.

The policy is to nurture competition rather than to create subsidy systems needing continuous regulatory oversight. For the same reason, Finland has no specific universal service policy, since such a policy would mean that the regulator (or policy maker) picks the winner (usually fixed telephony). In Finland, users may choose the service they prefer, and the regulator tries to be neutral with respect to technical alternatives and operators.

4.3 Price Regulation

Finnish telecommunications tariffs are generally not price regulated. Out of the three main components of price regulation, two have been partially applied:

- tariff setting principles (reasonable, cost oriented, etc.) are applied in Finland – the regulator can intervene if needed;
- tariff structure is to some extent applied in Finland (separation of connection, rental and usage charges); and
- regular approval of individual tariffs, which is not required in Finland.

The above is also valid also for interconnection pricing.

The rules for calculating cost-based charges are set on a generic level, that is to say that instructions on how such calculations are to be done have been issued by the Ministry in the form of regulations. It is generally considered impossible to create a uniform mandatory system to be applied by all 50 operators with

²⁷ Telecommunication Administration Centre, telecommunications regulator.

Significant Market Power. The regulation is available in English on the Ministry's web site²⁸. These regulations are prime examples of the light-handed regulatory approach adopted in Finland.

4.4 Regulatory Trends and Major Cases

4.4.1 Overall Trends

Until 1987, like in many other countries, Sonera regulated the entire sector, including its own competitors.

Following the enactment of the 1987 Telecommunications Act, the Ministry of Transport and Communications handled all sector specific regulation. The Telecommunications Administration Centre (TAC) was created in 1988. Initially the Ministry was responsible for financial regulation (monitoring financial performance, handle tariff matters etc.) and TAC for technical matters. Today, the Ministry has transferred much of the responsibility for financial matters to the TAC. The Ministry has the right to overrule TAC decisions, but has not used this right in practice.

The Ministry as well as the TAC tend to use informal influence (telephone calls, negotiations etc.) and issuing general level regulations and guidelines rather than official determinations in individual cases. This has been possible due to the business culture in Finland. Finns generally tend to avoid court cases and prefer negotiations. A slow trend towards tougher attitudes can be seen, forcing the Ministry as well as the TAC to official determinations in individual cases.

In addition, an emerging significant regulatory player is the Finnish Competition Authority (FCA), the Finnish competition watchdog. The FCA or any operator can bring cases to the Competition Council, a special court for competition issues in any sector.

The intention behind regulatory policy has been to foster a light-handed approach and a reliance on market forces rather than on regulatory intervention. This light-handed approach can be seen in licensing (very few mandatory requirements), in regulation (existing regulations are not many and not detailed), and in enforcement (in a number of cases the Ministry and / or the TAC have decided not to intervene, or to refer the case to the FCA). The general trend is to apply general competition and business legislation, and to enact sector-specific legislation only when needed.

For mobile communications, there have been two main regulatory cases, the first relating to mobile access charges for outgoing international traffic, and the second to national roaming (Telia).

4.4.2 Mobile Access Charges for International Traffic

Outgoing international calls from fixed connections were traditionally charged "international call charge + local call charge".

In the 1980s, the vertically integrated Sonera did not charge for access (corresponding to the local call charge) for outgoing international calls from mobile phones. At the time Sonera had a monopoly in mobile as well as international calls. Thus international calls from mobiles were slightly cheaper than calls from fixed connections (as the fixed subscriber had to pay a local call charge).

Following the introduction of competition in international traffic, The Ministry ordered mobile operators to charge for access. Presently the charge for mobile access to international services is the same as for a call to a fixed telephone.

4.4.3 The Telia National Roaming Case

The Ministry granted a country-wide GSM 1800 licence to Telivo²⁹ in 1995. The licence or regulations did not refer to national roaming on GSM 900 networks. Subsequently, in 1997, Swedish Telia bought 100 % of Telivo. Telia also bought the State Railway's telecommunications business.

Telivo / Telia then built its own network covering the three largest cities, and started negotiations with Sonera and Radiolinja regarding national roaming on GSM 900 networks outside these areas. Telia wanted to apply averaged international roaming terms and conditions for roaming outside the three main cities. The

²⁸ See <http://www.mintc.fi/telecom.htm>, norms 1300.htm for most user tariffs and 1393.htm for interconnection.

²⁹ Telivo was the telecommunications arm of IVO, the state-owned power company in Finland. Telia bought part of Telivo in 1996 and all in late 1997. The name was changed to Telia in 1997.

negotiations did not result in agreements, as both Sonera and Radiolinja offered such roaming at non-averaged (higher) prices. Their main argument was that Telia's request was a type of cherry-picking. Typically, city networks with high traffic per cell are profitable but rural areas with low traffic are non-profitable. However, rural areas require high investments to ensure the necessary coverage required for good service. Telia's strategy was to avoid rural investments while also avoiding paying a premium for that advantage. Both parties agreed that all technical problems were essentially solved and that the disagreement existed only with respect to price.

Telia's main arguments are that additional country-wide networks are not realistic. If competition is desired, some kind of co-operation (national roaming, service provider agreement or similar) is the only realistic approach.

Telia subsequently asked the TAC for a determination. The TAC determined that such agreements should be closed on commercial terms and conditions, and that the TAC did not mandate national roaming at international averaged prices. The legislation does not specifically mention roaming, either at the national or international level. Telia appealed against the decision.

In an attempt to solve the problem, Telia applied its Swedish - Swiss roaming agreement to implement national roaming on Sonera's network. Sonera terminated its roaming agreement with Swisscom and prevented Telia's Finnish subscribers from roaming. Telia then filed a complaint with the European Commission. The Commission referred it to the Ministry for mediation. Telia also referred the case to the FCA. The FCA also decided against Telia. Telia appealed against the decision.

Finally, Telia entered into a service provider agreement with Radiolinja in 1999, and simultaneously, dropped its complaints against Radiolinja. Telia now offers, since December 1999, country-wide GSM services with rather aggressive pricing and marketing. Sonera's case has yet to be resolved.

4.4.4 National Roaming Legislation

In order to create a level playing field for third generation services, the Ministry issued a proposed amendment of the Telecommunications Market Act, which is described in Chapter 4.1.

5 PECULIAR TARIFF AND INTERCONNECTION STRUCTURE

5.1 General

The Finnish telephone sector has a peculiar tariff and interconnection structure, due to its long multi-operator history. **Understanding the peculiarities of the Finnish tariff structure is essential in order to grasp the interconnection situation in Finland³⁰.**

The main differences are the following:

- Local fixed operators act as invoicing agents for long distance, international and mobile operators;
- End-to-end retail call charges are not in use in many interconnection cases. Retail call pricing applies to call segments (e.g. local access, long distance segment, mobile segment, international segment), and therefore users commonly pay two separate charges for one call;
- In particular, Finnish local operators decide on charges for local calls only - they do not decide on charges for subsequent segments even if they invoice those charges;
- Long distance, international and mobile operators charge fixed users, usually through local fixed operators; and
- Interconnection access and termination charges are not often used - retail charges are used instead.

³⁰ An interconnection pricing model generally based on the previous revenue based Finnish interconnection regime principles can be found on www.iki.fi/arnow/publ.htm (Half-call Interconnect Pricing). The reader should note that the mobile portion of that paper is not the working Finnish model, it is a proposal for a particular project.

These peculiarities are explained in greater detail below. The main notion to bear in mind is the clear separation in Finland between retail charges and interconnection charges.

The result of this system is that the telecommunications sector is more segmented than in other countries, as each segment is sold and charged directly to all telephone subscribers. This does not necessitate a contract between the calling subscriber (fixed or mobile) and the long distance, international or mobile operator.

5.2 Terminology

This report uses the following terminology in a consistent way. The terminology is adapted for Finland and differs partially from what is used in other countries (Table 8).

Retail prices include VAT; interconnection charges are net of VAT. Exceptions to this rule are mentioned separately.

5.3 Invoicing Agent Service

For calls originating on the fixed network, local fixed operators act as invoicing agents for long distance, international and mobile operators (as well as for premium rate services). This means that long distance, international and mobile operators set the retail charges for their own call segments, and forward the charging information to the local fixed operator on a call-by-call basis. The local operator then invoices the subscriber and collects the money.

Table 8: Terms and Definitions

Term	Definition
Technical terms	
Access	Access means the connection from the calling subscriber to the first POI. For fixed - mobile access means the connection to the local POI, for mobile - fixed it means the connection to the destination local POI, for mobile - international it means the connection from the handset to the POI between the mobile operator and the international operator.
POI	Point of interconnection
Termination	Termination means the connection from the last POI and the called subscriber. For fixed - mobile it is the connection from the first local POI to the mobile handset (note: no termination charge exists for this traffic case, the charge is a retail charge), for mobile - fixed it is the connection from the destination local POI to the called fixed subscriber, for international - mobile it is from the POI between the international operator and the mobile operator to the mobile handset
Retail charges	
Local network tariff	A local network tariff is the charge to the calling subscriber for the access segment, different from most other countries where the long distance operator offers end-to-end charges. <i>This tariff is perhaps the most difficult charge to understand and it should not be mixed with a local call charge</i>
Interconnection charges	
Access charge	An access interconnection charge is also defined, so that access operator can charge e.g. the long distance or mobile operator for access if that operator wants to offer end-to-end call charges. Access interconnection charges are rarely used in practice. The access charge is an alternative to the local network charge, but charged to an operator rather than to a subscriber
Termination charge	A termination charge (when applicable) is an interconnection charge that is paid for termination. A termination charge is not charged directly to the subscriber

Source:

This operation is a pure invoicing agent activity. The local operator does not have the right to amend the charge set by the other operator, or to add any margin. This means that it is not a reseller, as resellers would add their own margin.

The local operator receives an invoicing fee for the invoicing service. The invoicing fee varies between 4 and 10 per cent of the invoiced amount. The fee also covers bad debts. If a subscriber does not pay his long distance or mobile charges, the local fixed operator absorbs that bad debt but still pays corresponding charge to the long distance or mobile operator.

The local operator also charges the caller for his own service. This local network tariff covers the charge for access from the subscriber connection to the local Point of Interconnection (POI). This means that the caller normally pays two charges for interconnected calls.

Mobile operators also act as invoicing agents, but mainly for international and premium rate services. Thus mobile operators invoice for outgoing international calls independent of which international operator the mobile user selected.

5.4 Subscriber Charges 1957 - 1999

When subscriber dialled long distance telephony was introduced in 1957, a new subscriber tariff structure was created. Fully independent local monopoly operators with their own tariffs operated the majority of local telephony. Long distance and international telephony was operated by the state-owned Sonera as a monopoly. Neither allowed the other to intervene in its user tariffs.

The outcome was a system where both parties set their own user tariffs. Users paid two separate tariffs for national long distance: one price for the long distance segment (between the local network parts) and another price for the two local call parts (access in the own end + local termination at the other end). All charges were based on charging units (electric pulses). Sonera sent its long distance charging pulses to the local operator at the POI. The local operator then forwarded the pulses to the subscriber's charging counter. The local operator added its own charging pulses for the local call charge. The system was essentially the same for Sonera's own local service customers.

The local operator invoiced the subscriber for all pulses. The local operator paid the long distance operator for all charging pulses received at the POI (minus an invoicing fee of some 4 - 10 % also covering bad debts).

Thus, the format for national long distance charges was:

$$\textit{long distance charge} + \textit{local call charge}$$

Note that the long distance charge was not an end-to-end charge, i.e. it did not cover the originating access segment. The local call charge would vary depending on the local operator.

This means that the long distance operator price list specified call charges in the following format:

$$\text{US\$ } 0.080 / \textit{minute} + \textit{local call charge}$$

Usually, the local call charge was a call-set-up charge (one pulse, optional) and a per minute charge (pulses at regular intervals). Some local operators used (off-peak) tariffs with only a set-up charge. Subscribers had to know their own local call charges. The local call charge could be, for instance:

$$\text{US\$ } 0.79 / \textit{call} + 0.013 / \textit{minute}$$

This peculiar tariff structure had both advantages and disadvantages. Advantages included the following:

- + each operator decided the end-user charges itself and also sent the relevant charging pulses to the subscriber counter, and other operators could not change that charge;
- + there was no subsidisation between long distance and local services;
- + the system was created by the market and not by a regulator;
- + no regulatory intervention was needed as the charging system was, in effect, self-regulatory (the sum of charges for the two local segments equalled the essentially cost based local call charge which worked as a continuous price cap);

- + no need for cost calculations that tend to become geared towards the desired result and therefore need continuous regulatory oversight;
- + the system partially prevents impact of vertical integration in sales, as market segments have to be priced and sold separately (end-to-end pricing supports vertical integration);

Some of the disadvantages of the structure were as follows:

- as a whole, the subscriber tariff structure was somewhat complicated, especially for foreigners;
- the system did not fully meet the EU directives (originally written for a different environment) and had to be amended;
- even if the system was self-regulatory and similar to a price cap, it amounted nevertheless to a form of pricing cartel;
- "model Finland" technical solutions were needed in switching and signalling, with plenty of charging pulse messages in the common channel signalling network³¹; and
- end-to-end pricing (one price for the entire call) for long distance calls was not possible, which some observers believe is better and more convenient for the customer.

The same dual pricing structure (one local call charge and one international call charge) was applied for mobile and international calls as well. The mobile and international call charge covered the originating long distance segment.

A typical international call charge in the international operator's tariff sheet was thus

US\$ 0.51 / minute + local call charge

Similarly, a typical call charge to a mobile subscriber would be:

US\$ 0.29 per minute + local call charge

The local call charge also covered the termination call charge in the distant local fixed network, even if the subscriber usually did not know that (Chapter 5.6).

Following the transposition of EU directives on interconnection into national legislation, this pricing structure had to be changed and new cost-based charges had to be set, for the local network tariff, access charge and termination charge.

5.5 Subscriber Charges, 1999 Onwards

Due to standardised EU requirements for termination, Finland's unique charging system had to be changed. The local access operator was to be permitted to charge only for access (the name of the new charge for the access segment was *local network tariff*) and the long distance operator was to include local termination charges at the distant end. Thus the new tariff structure became:

long distance charge + local network tariff

or

US\$ 0.096 / minute + local network tariff

Subscribers still pay two charges for long distance calls. Many subscribers did not even notice the change. The new tariff structure (as written in tariff sheets) looked the same. The only visible difference was that the name for the local call charge was changed to "local network tariff".

The same changes were applied to mobile and international calls as well.

³¹ Such technical solutions are usually more expensive and in principle should increase the price of switching. However, anecdotal evidence of switching equipment prices suggests that the increase is not significant. Finnish switching equipment price levels are in line with international price levels. The Finnish switching equipment market has traditionally been fully competitive which may counterbalance the Finnish peculiarities. Presently three switching equipment manufacturers are active in Finland: Ericsson, Nokia and Siemens.

5.6 General Interconnection Arrangements

This chapter focuses on interconnection charges, that is to say fees exchanged between operators for routing calls via their networks.

5.6.1 Sender Keeps All, until 1994

Initially, no local fixed network termination charge was paid. *Sender keeps all* was used for the two local segments (access and termination, the sum of which was the local call charge), assuming that traffic in opposite directions was reasonably balanced. In such cases the net termination charges (outpayments less inpayments) would be zero or close to zero. This principle was used during 1957 - 1994.

This principle was applied for local, long distance, international and mobile traffic. This means that there were no interconnection charges to be paid by any operator.

5.6.2 Revenue Division and Clearing House, 1994 - 1999

However, imbalances increased with increasing mobile and premium rate traffic. In 1994, local termination charges were introduced, with a uniform termination charge for the entire country (a kind of pricing cartel, but not one which tended to maximise revenue). The charge was initially US\$ 0.032 per call + 0.0064 per minute, without any off-peak discount.

Each fixed local access operator charged a local call charge to the calling subscriber, paid that termination charge to the (subscriber-selected) long distance operator with no break-down by destination, and kept the remainder. The termination charge was paid for all relevant calls without the need for break-down by destination operators. The long distance operator then forwarded the termination charges to terminating local operators without the need for a break-down by access operator. The long distance operator was a kind of clearing house. The clearing house concept made the system practical.

The long distance charge covered only the long distance segment and was charged directly as a retail tariff to the calling subscriber, using the access operator as invoicing agent. Thus, the long distance charge was separate and not part of the above calculation. The calculation was equally valid for local call interconnection with two local operators.

The concept relied on the *revenue division principle*, and not a termination charge principle. Because the revenue to be divided (local call charge) was already by and large cost-based, the charges were also indirectly cost-based. Moreover, the local call charge acted as a price cap.

The revenue division principle can be defended in a competitive environment: the same price is set for all customers, end-users and operators.

5.6.3 Cost Based Charges from 1999 Onwards

In order to meet the EU requirements for interconnection and cost based termination, the obligation for paying local termination was changed in 1999. The originating local operator no longer collects and pays termination charges. This responsibility was transferred to the long distance segment operator. The access operator no longer charges a full local call charge but merely a local network tariff (the charge for the segment from the caller to the local POI).

The new termination charges had to be based on cost calculations, and not on a portion of the local call charge.

Table 9: Example of division of revenue between access and termination operator.

Item	Tariff US\$	Charge US\$
Local call charge to the subscriber	0.064 / call + 0.0160 / minute	0.112
Termination charge	0.032 / call + 0.0064 / minute	0.051
Left for access operator		0.061

Note: Revenue division for a three minute call. The figures in this table do not include VAT, not even for user charges.

The initial outcome of this exercise was that the self-regulatory feature of the price cap vanished. The sum of the local network tariff and the termination charge exceeded the local call charge. One operator even tried to use a full local call charge for the local network tariff.

Even if no regular price regulation existed, the Ministry (still the financial regulator at the time) had the right to intervene if it considered prices to be unreasonable or against price setting regulations. The Ministry ordered the previous termination charges to continue and ordered new calculations.

In February 1999 the Ministry issued an order establishing a one-year ceiling for subscriber paid access charges (60 % of local call charges, valid until end June, 2000), in practice higher than in the old system. Few, if any, operators go below this ceiling. Thus the outcome would have been an overall price increase, should several long distance operators not partially absorb the local termination charges.

The outcome remains to be seen.³² Starting from July 2000 no ceiling exists. The Ministry or the TAC may need to intervene again, depending on the tariff decisions by operators. Present charges are laid out in Table 10.

Elisa will slightly amend prices from 1 July 2000, increasing call set-up charges and lowering the time dependent portion. Elisa call prices are only for voice calls. Elisa has different (lower, not shown) call charges for Internet access calls, provided that the ISP makes a special agreement.

Moreover, access interconnection charges were mandated. The introduction of access interconnection charges gave the right, for instance to long distance and mobile operators, to buy access service from the local access network provider and provide end-to-end call charges.

However, this did not happen in practice. Virtually all operators still use the previous system with the subscriber paying the local network tariff as a separate retail charge. There are differing opinions on whether this is a good solution or not. Access charges are, however, used e.g. in freephone services (800 services).

Table 10: Present charges.

	Sonera	Elisa	Finnnet average
Local network tariff (subscriber charge)	0.072 / call + 0.0058 / min	0.048 / call + 0.0066 / min (peak) 0.048 / call + 0.0037 / min after first 10 minutes (off-peak)	
Termination charge, local calls, capital region	0.027 / call + 0.0048 / min	0.027 / call + 0.0048 / min	0.027 / call + 0.0056 / min
Termination charge, local calls, rest of country	0.027 / call + 0.0056 / min	N/A	
Termination charge, other calls, capital region	0.0137 / min	0.0137 / min	0.0143 / min
Termination charge, other calls, rest of country	0.0145 / min	N/A	
Local call charge (subscriber charge end - to end, for comparison)	0.121 / call + 0.0096 / min	0.080 / call + 0.0109 / min (peak) 0.080 / call + 0.0063 / min after first 10 minutes (off-peak)	

Source: Operator data. Prices in US\$.

³² An observer comment would perhaps be that cost based systems are not that easy to implement. Even in Finland, with a relatively high respect for law and order, cost calculations seem to be strongly geared towards a desired result. Furthermore, a regulatory price ceiling is easily interpreted to be a price floor, i.e. a permission to charge even above cost.

Thus the main difference relative to other countries still remains: the originating local operator does not set charges for mobile, long distance or international. Such services are usually charged directly to the calling subscriber. Collection of charges may be done through the originating local operator, or via a direct invoice to the subscriber, especially if the subscriber has a customer relationship with the long distance operator.

5.7 Mobile Charges and Mobile Interconnection Charges

Like most other European countries, the basic mobile charging principle in Finland is CPP, or Calling Party Pays. This means that the initiator of the call is responsible for the cost of the call. For fixed to mobile calls, the fixed subscriber pays for the call and therefore mobile subscribers receive calls (and SMS messages) at no cost. Similarly, the mobile subscriber incurs the cost for calling a fixed line. The exception to this principle occurs when the called party has made some special arrangements, such as:

- call forwarding (called party pays possible additional cost for forwarding, the calling party pays for the call that he dialled but not for forwarding); and
- international roaming (called party pays for call forwarding abroad).

Sonera and Radiolinja forward calls originally dialled to a mobile number to most normal fixed or mobile networks in Finland, free of charge. Telia, on the other hand, charges for call forwarding. A connection charge and a charge for activation of the service may be levied to the mobile subscriber. Mobile Centrex services have special tariffs.

Table 11: Sample mobile tariff packages and charges for domestic calls.

	Sonera			Radiolinja		
	Classic	Business Duo	Privat Duo	Usage	Tandem Pro	Tandem
Network and typical usage	GSM 900 only, typical for moderate users	GSM 900 + 1800, typical for business users	GSM 900 + 1800, typical for private users	GSM 900 only, typical for moderate users	GSM 900 + 1800, typical for business users	GSM 900 + 1800, typical for private users
Connection	7.84	7.84	7.84	7.54	7.54	7.54
Rental	3.21 / month	9.80 / month	19.29 / 6 months	9.64 / month	9.61 / month	4.66 / month or 18.32 / 6 months
Peak definition	workdays 7.00 - 17.00	workdays 7.00 - 17.00	workdays 7.00 - 17.00	workdays 8.00 - 18.00	workdays 8.00 - 18.00	workdays 8.00 - 18.00
Evening definition (eve)				workdays 18.00 - 22.00 + Sat & Sun 8.00 - 22.00	workdays 18.00 - 22.00 + Sat & Sun 8.00 - 22.00	workdays 18.00 - 22.00 + Sat & Sun 8.00 - 22.00
Night definition				any day 22.00 - 8.00	any day 22.00 - 8.00	any day 22.00 - 8.00
Summer definition	15 June - 15 Aug	15 June - 15 Aug	15 June - 15 Aug	15 May - 15 Aug	15 May - 15 Aug	15 May - 15 Aug
Call to same operator handsets	peak & off-peak 0.159			peak & eve 0.159 night 0.101	any time 0.135	peak & eve 0.116 night 0.047
Call to fixed network	peak 0.31 off-peak 0.159			peak 0.29 eve 0.159 night 0.101	peak 0.21 eve & night 0.154	winter peak 0.32 summer peak 0.24 eve 0.116 night 0.101
Call to other mobile network	peak 0.31			peak 0.29	peak 0.21	winter peak 0.32

mobile network	off-peak 0.159			eve & night 0.159	eve & night 0.154	0.32 summer peak 0.24 eve & night 0.159
Calls from 1800 cells to same operator handsets		peak & off-peak 0.159	peak 0.159 off-peak 0.130			
Calls from 900 cells to same operator handsets		peak & off-peak 0.159	peak & off-peak 0.159			
Calls from 1800 cells to other telephones		peak 0.194 off-peak 0.159	peak 0.25 off-peak 0.130			
Calls from 900 cells to other telephones		peak 0.31 off-peak 0.175	winter peak 0.40 summer peak 0.25 off-peak 0.159			
Calls between family contract (or similar) handsets	any time max 0.145	any time max 0.145	any time max 0.145	any time 0.106	any time 0.106	any time 0.106
Data call (9.6 kbit/s) surcharge	0.109 / min	0.109 / min	0.109 / min	0.084 / call	0.084 / call	0.084 / call
Calls from fixed network (mobile segment only)	peak 0.25 off-peak 0.159	peak 0.25 off-peak 0.159	peak 0.25 off-peak 0.159	peak 0.25 eve & night 0.159	peak 0.25 eve & night 0.159	peak 0.25 eve & night 0.159
SMS message	0.159	0.159	0.159	0.148	0.148	0.148
Mobile termination charge (mobile - mobile only)	peak 0.191 off-peak 0.125	peak 0.191 off-peak 0.125	peak 0.191 off-peak 0.125	peak 0.196 off-peak 0.125	peak 0.196 off-peak 0.125	peak 0.196 off-peak 0.125

Sources Sonera and Radiolinja.

Note: The Table includes some typical tariff packages for mobile services. Call prices are US\$ / minute. Empty cell means "not applicable". The charges shown are only most common charges, a number of additional possibilities (discounts etc.) exist. Both operators have three more tariff packages for voice, and some for data. The Table should give an indication of the order of magnitude.

International calls are excluded from the Table. International call charges are the international operator's charge + a mobile call charge to "other telephones".

VAT included except for termination charge.

5.8 Technical Arrangements

Like the rest of Europe (and unlike North America), the Finnish mobile network is a country-wide network, and integrated with the long-distance network³³. The mobile operator may use a fixed long distance network operator as subcontractor, essentially for leasing transmission capacity. Such subcontracting cannot be considered "interconnection". Local mobile networks operated by a number of Finnet companies are exceptions to this. Local mobile services have not been successful.

³³ A more detailed presentation of the differences between North American and European licensing regimes can be found at www.iki.fi/arnow/publ.htm (Mobile Licensing Principles).

Calls to and from mobile phones do not normally have a separate local and a long distance tariff, but are only subject to a national mobile tariff³⁴. International calls are still charged separately for the international segment.

This also means that interconnection between fixed and mobile networks is carried out in each local call area, at one POI (Point of Interconnection). The parties may agree on more than one point, if both parties benefit.

This arrangement means that fixed - mobile calls are routed from the calling line to the POI in that particular local call area. Mobile - fixed calls are routed via the mobile network (this definition includes using a long distance network as subcontractor) to the POI in the destination local call area. Similarly, there is one POI between any two mobile networks, unless the parties agree on more than one POI.

For international traffic, there is one POI between the mobile network and any international operator. In principle, the POI is close to the facilities of the international operator and is used for both directions of traffic.

Routing national mobile calls (fixed - mobile) abroad and back again (mobile tromboning), in order to bypass mobile call charging, is not permitted.

The above is valid for country-wide mobile networks. Local mobile networks are interconnected to the fixed local network, just as a local network would be in the same local call area.

5.9 Charging Cases in Mobile Interconnection

Due to the peculiar Finnish subscriber charging system, mobile interconnection charges are not widely used. In many cases, retail call charges are used where other countries use interconnection charges (access or termination). In order to understand the peculiarities of the Finnish case, it is essential to grasp the basics of general (PSTN) interconnection and tariffs outlined above.

In order to give an overview of these peculiarities, sample call charges are included below (Tables 12 to 16). The tariff package used is the dual mode package for business users (Business Duo / Tandem Pro), as it is generally the preferred package for an individual heavy user. Other tariff packages would give different results.

5.9.1 Fixed to Mobile Calls

For fixed - mobile calls, the calling party pays a separate local network tariff (for the segment from the caller to the local POI) to the local fixed operator and the mobile call charge to the mobile operator. This is different from most other countries, where the local access operator sets the charges for the entire call and pays a mobile termination charge to the mobile operator. No interconnection termination charges exist in this case.

5.9.2 Mobile to Fixed Calls

For mobile - fixed calls, the calling party pays only the mobile call charge. The mobile operator then pays the local fixed termination charge to the local fixed operator (there may be a local tandem operator, but the local operators share the local termination charge). The termination charge covers the segment from the destination local POI to the called subscriber.

Table 12: Call charges for fixed - mobile calls (US\$).

	Sonera	Elisa
Local network tariff (charged by the originating fixed network operator to calling subscriber)	0.072 / call + 0.0058 / min	0.048 / call + 0.0066 / min (peak) 0.048 / call + 0.0037 / min after first 10 minutes (off-peak)
Mobile charge (charged by the destination mobile operator to the calling subscriber)	peak 0.25 off-peak 0.159	peak 0.25 evening & night 0.159

Source: Operators.

³⁴ See footnote 7.

Table 13: Call charges for mobile - fixed calls (US\$).

	Sonera	Elisa
Mobile charge (charged by the originating mobile network operator to the calling subscriber)	peak 0.194 off-peak 0.159 (from GSM 1800 cell)	peak 0.21 eve & night 0.154
	peak 0.31 off-peak 0.175 (from GSM 900 cell)	
Fixed termination charge (charged by the destination fixed network operator to the mobile operator)	capital 0.0137 elsewhere 0.0145	0.0145

Source: Operators.

5.9.3 Mobile to Mobile Calls

For mobile - mobile calls (between two different mobile networks), the caller pays a mobile call charge to his own operator, and the originating operator pays a mobile - mobile call termination charge to the terminating mobile operator. This is the only case in Finland where a full mobile termination charge exists, comparable to other countries. The POI lies between the two mobile networks.

Table 14: Call charges for mobile - mobile calls (US\$).

	Sonera	Elisa
Mobile charge (charged by the originating mobile network operator to the calling subscriber)	peak 0.194 off-peak 0.159 (from GSM 1800 cell)	peak 0.214 eve & night 0.154
	peak 0.31 off-peak 0.175 (from GSM 900 cell)	
Mobile termination charge (charged by the destination mobile network operator to the originating mobile operator)	peak 0.191 off-peak 0.125	peak 0.196 off-peak 0.125

Source: Operators.

5.9.4 Mobile – Originated International Calls

For mobile - international calls, the subscriber pays separate charges for the mobile access (a normal mobile - fixed call charge) and for the international segment (including termination at the distant end). The POI is at or near the international operator's premises.

Table 15: Call charges for mobile - international calls (US\$).

	Sonera	Elisa
Mobile charge (charged by the originating mobile network operator to the calling subscriber)	peak 0.194 off-peak 0.159 (from GSM 1800 cell)	peak 0.21 eve & night 0.154
	peak 0.31 off-peak 0.175 (from GSM 900 cell)	
International call charge (charged by the international operator to the calling subscriber)	depends on country, same as for fixed	depends on country, same as for fixed

Source: Operators.

Table 16: Call charges for international - mobile calls (US\$). See text above.

	Sonera	Elisa
Theoretical international call termination charge according to RIO (should be charged by the mobile operator to the international operator)	peak 0.191 off-peak 0.125 (not charged)	peak 0.196 off-peak 0.125 (not charged)
Charge actually paid (not a mobile termination charge)	0.036	0.036

Source: Operators.

5.9.5 Incoming International Calls on the Mobile Network

For incoming international - mobile calls, the mobile operators include a mobile call termination charge in their Reference Interconnection Offer (RIO³⁵). The termination charge in the RIO is the same as for termination of a mobile - mobile call.

In practice, no such termination charges are paid, because in many cases they exceed the settlement rate for the incoming international calls. The charges presently paid are the same as for fixed networks (for the long distance and the local segment). The mobile operators want to underline that the charges are not in the form of mobile termination charges – rather, they are meant to cover only the long distance segment from the international operator to the mobile switch, but not the mobile leg of the transmission.

The same problem exists in one form or the other in many other countries³⁶. As one of the persons commenting a draft of this paper said: "There is no good solution to the issue".

The POI is at or near the international operator's premises.

5.9.6 Incoming and Outgoing SMS Messages

Domestic SMS messages are subject to a termination charge, which is roughly equivalent to half of the retail charge. For most international incoming messages no termination charge is levied, but the *sender keeps all* principle is applied, assuming that SMS traffic in both directions is about equal. However, some operators allow for the transmission of Internet-originated messages, thus causing heavy imbalance.

The SMS termination charge is US\$ 0.064.

5.9.7 Other interconnection cases

It is to be noted that the above cases do not include an interconnection case between mobile and long distance. This is because the Finnish mobile networks include the long distance component.

Local Finnet operators operate many small local mobile networks essentially as part of their fixed local service. These local mobile networks are interconnected as local fixed networks.

5.10 Negotiation of Interconnection Agreements

The negotiation of interconnection agreements is considerably eased by the RIO arrangement, which is compulsory for operators with significant market power (SMP), according to European Union legislation. SMP operators have a non-discrimination obligation, thus any significant deviations from the RIO are not allowed.

A request for interconnection should typically include the following elements:

- a network plan for the next three years;
- a suggested POI;

³⁵ A RIO is a mandatory public offer that each operator with Significant Market Power (SMP) shall publish and that is binding for the operator.

³⁶ See also Chapter 6.4.

- an estimate of traffic volumes at the POI for the next three years;
- a traffic forecast per teledistrict (numbering area) for each traffic case;
- technical information for implementation of the POI;
- a suggestion as to the interconnection schedule; and
- written proof that the requesting party has submitted a notification to the Ministry of its intention to operate a telecommunications network, or that the TAC has issued telecommunications operator prefixes and / or subscriber numbering capacity to the requesting party. Basically, the requesting party needs to prove that it is a telecommunications operator.

The agreement usually includes a billing agent service agreement. The parties may also need bank guarantees as security for payments.

Interconnection agreements are quite detailed. A number of other matters have to be agreed or at least checked (such as technical details and availability of sufficient expertise).

6 QUESTIONS AND ISSUES

This chapter includes questions and issues that have emerged during the preparation of this report. This report does not pretend to offer answers or solutions, but rather, it tries to "problematise" and to formulate questions and issues.

6.1 Will a Market Driven Tariff and Interconnection Regime be Tolerated?

The Finnish tariff structure and interconnection regime is clearly different from most other countries. The basis for this structure is, however, a 100+ year old and working multi-operator structure. It has evolved and has been refined during decades. The structure is (was) virtually totally market driven, with little or no regulatory involvement. In particular, the EU has acted in several ways to change these towards a uniform EU practice that is based on one incumbent countries.

The conflict between objectives and practical implementation of interconnection regulations is interesting:

- the general long term objective is that telecommunications should evolve as a normal market with market driven structures; and
- the practical implementation is increased reliance on regulator driven interconnection based on, or related to, cost. This requires cost calculations to be approved by the regulator on a continuous basis.

This second trend is a strong one. It forms the basis, for instance, for EU interconnection directives and is increasingly used and recommended for developing countries. No dissent is allowed, even if arguing that alternative solutions are market driven and working in a satisfactory manner. In some cases "only one truth" is permitted.

When applied with regulatory fervour, it seems that the trend prevents the use of a market driven model. We have seen one such case in Chapter 3.10.

In some respects, it is contradictory that although the EU was created to enhance a free market economy, but it is in this case aiming at a uniform, centrally controlled, regulator-driven model. Even the extreme expression "*telecommunism*" has been heard in certain circles.

A feature of a normal market economy is that detailed cost data are business secrets, and are not disclosed outside the small core management group of the company. This is diametrically opposed to the notion that the regulation of charges should be cost-based or cost-related and approved by an external regulator with detailed insight into, and to some extent control of, operator costs.

This leads to a more general policy question: will a market-created and market-driven regime be tolerated, or must it be replaced with a standardised regulator-driven regime? If the long-term policy is to aim at normal markets, why not allow a market driven structure, even if it is to some extent limited, to continue in parallel rather than enforce a standardised regime everywhere?

If market-driven regimes are not allowed, where will the EU (and others) get working and tested examples of structures when the present regulator-driven regimes are replaced with more market driven regimes? Or is the aim at normal markets only a form of lip service?

Yardsticks for measuring the success of various regimes should perhaps be customer price and quality, not how well various directives are met.

6.2 Is a Cost Based Model the Only Solution for Setting Interconnection Charges?

The most important resources for a regulator to run a cost-based or cost-related interconnection regime are:

- continuous access to reliable and up to date cost data; and
- availability of high level economic and financial expertise

The experience in Finland is that such expertise may not be realistic for a competitive market with many operators. In particular, if the regulator is meant to approve interconnection charges in advance each time charges change, or costs change, the task is will prove to be onerous. A system based upon subsequent checks, usually initiated by complaints, may perhaps work in Finland, even if the first attempt seems to have failed.

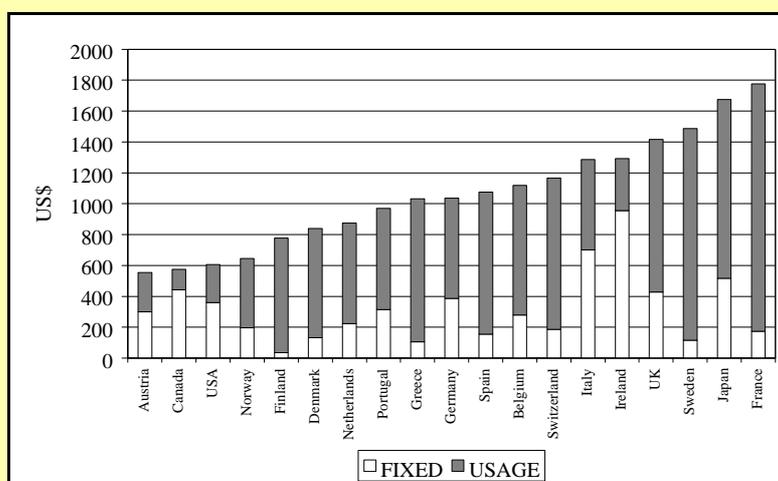
In the experience of the author most developing countries do not have the needed data and / or resources. Some do not even always have basic customer invoicing software or traffic monitoring facilities. It is more or less impossible for these countries to use such cost-based models. For instance, the few economists available in several of the smaller countries may be needed in the Central Bank rather than in a regulator. The present situation is that a number of countries use models with no underlying systematic approach at all.

What is probably needed, at least as an interim solution, is a range of simpler models that can be applied without continuous work and continuously available expertise. The ITU could assist in creating such models. It may be that such models are limited and incomplete, but they could certainly be of some assistance.

6.3 Will Mobile Tariff Structures Change?

The cost structure of mobile services (not including terminal equipment) is told to be mainly traffic (usage) dependent. The most expensive network part is the base station network (dimensioned based on traffic) rather than the switch (partially dimensioned based on number of subscribers). This would suggest that mobile operator usage revenue should be higher than fixed revenue. See FigureFigure 10 for a comparison of some countries based on a mobile business user basket comparison.

Figure 10: Relation between fixed and usage costs for mobile business users.



Note: Fixed means connection charges and rentals, usage means call charges and SMS messages.
 Source: Teligen.

The cost structure mentioned above would also suggest that call charges could be related to the number of base stations (one or two) involved in the call. This means that a mobile - mobile call with two base stations involved should be more expensive than a mobile - fixed (or vice versa) call with only one base station involved. If so, the present tariff structure would change considerably. The outcome would probably also ease termination charge imbalances.

6.4 Will International Call Termination be De-averaged?

In Finland, mobile termination charges for incoming international calls cannot be applied. The problem is said to be common elsewhere as well. Presently international settlement rates are based on fixed networks only, as in most cases, the mobile traffic portion is insignificant. The Finnish situation is different, the portion of mobile calls (perhaps not call minutes) may grow beyond fixed traffic within a few years. This suggests that the future may see different (de-averaged) international mobile and fixed termination charges, settlement charges as well as charges from the incoming international exchange to the mobile user. Other solutions may also be possible, but no adequate solution has yet surfaced. The problem is probably less important in countries where the mobile receiver pays the mobile segment for incoming calls (RPP or Receiving Party Pays).

If termination charges differ, it may have an impact on retail prices as well (to the extent that prices are based on cost). Separating mobile and fixed (fixed) destinations in the same country is already a reality. See Table 17 for one example of a small international operator in the USA that differentiates charges for international calls to fixed and mobile destinations in the same country.

A potential mechanism for such differentiation is that the operator in this case has established a point of presence in the destination country, bypassing the accounting rate arrangements. In such a case, the operator probably has to pay national termination charges rather than averaged international settlement charges. Subsequently, user prices may perhaps be more in line with actual cost than averaged charges.

Table 17: A small international operator in the USA already differentiates international call prices to fixed and mobile destinations. Prices in US\$ per minute.

Destination	Fixed	Mobile / cellular ³⁷	Mobile premium
Argentina	0.39	0.48	23 %
Australia	0.14	0.22	57 %
Austria	0.15	0.53	253 %
Belgium	0.12	0.30	150 %
Brazil	0.33	0.40	21 %
China	0.35 - 0.42	0.82	95 - 134 %
Colombia	0.33 - 0.44	0.44	0 - 33 %
Costa Rica	0.57	0.57	0 %
Denmark	0.15	0.65	333 %
Egypt	1.09	1.09	0 %
Finland	0.18	0.34	89 %
France	0.13	0.21	62 %
...			
Norway	0.14	0.44	214 %
...			
Sweden	0.12	0.36	200 %

Source: <<http://cognigen.net/opex/irates.cgi>, 26.5.2000>.

³⁷ The price list uses both words: mobile and cellular. Technically cellular may be fixed (non-mobile) as well.

Averaged international charges are a product of the prevailing accounting rate system that is under increasing pressure. The above is one more indication on how competition applies increased pressure on prices and is expected to result in changes in the accounting rate system.

Large scale use of differentiation is still to be seen. But the above suggests that there is a potential lever for major changes. Co-existence of averaged and de-averaged charges (termination charges as well as user charges) may provide the possibility for arbitrage. The pressure will increase if and when postalisation occurs in fixed telephony³⁸.

6.5 How to Interconnect Mobile Data?

Present interconnection of mobile data is based on circuit switching, and is thus similar to interconnection of mobile voice. Interconnection of mobile packet switched data is an open case. Even customer pricing of mobile packet switched data is open or, at best, not stabilised. Initial prices and price structures - when first set - may not be the final outcome.

When fixed packet switched data networks were introduced in the 1980's, they were priced at premium levels. In addition, transfer was priced by packet and not by volume of transferred data (bytes). The application software decided the amount of data (bytes) per packet, and thus software developers had a considerable impact on user cost. Subsequently, other forms of data communications took over. Similar features (overpricing related to market willingness to pay) may occur in mobile packet switched data, and may have a significant impact on the introduction of mobile Internet services.

The bulk of mobile data will most likely communication between a mobile handset and Internet (the mobile portion). Every mobile operator will offer Internet connection, thus GPRS data interconnection will not be needed. No applications needing termination of data calls from other operator's GPRS networks to handsets are in the pipeline, thus GPRS termination is not yet needed. Interconnection within Internet is the same as for fixed Internet, and outside the scope of this report. In the future new interconnection cases will probably emerge, but can be expected at earliest in IMTS-2000 networks.

6.6 What to include in regulated interconnection?

Some sources have proposed the inclusion of content interconnection, e.g. Internet data, in regulated interconnection. Such an approach would extend regulation beyond the general approach of minimising regulatory intervention.

The Finnish policy is clear: regulatory intervention should be minimised. Regulation of interconnection should be limited to bottleneck-type facilities, leaving other matters to the market. Even bottleneck facilities should be left to the market unless the abuse of dominant power is shown or likely. The bundling of bottleneck facilities with other services should be prevented. Furthermore, regulation of interconnection is based on telecommunications legislation, and contents provision is not telecommunications.

6.7 Emerging Technologies

In the next few years, other mobile data services may emerge. One of the possible candidates is digital television. Digital television standards include point-to-point communication features, but television lacks return channels. Digital television may perhaps also be used for mobile communications.

Other radio-based technologies are also being developed. Only the future will show what type of technologies will be successfully implemented.

A number of new interconnection issues may then emerge. Many of those issues may be new and not predictable.

³⁸ See Footnote 7.

LIST OF PEOPLE INTERVIEWED OR COMMENTING DRAFTS**Ministry**

Mr. Antti Kohtala	Director	Ministry of Transport and Communications
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Regulator

Mr. Jukka Kanervisto	Senior Adviser	Telecommunications Administration Centre
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Mobile operators

Mr. Tapani Pökkä	Senior Vice President	Sonera Corporation
Mr. Mikko Varhe	Business Development Manager	Sonera Corporation
Mr. Kari Helminen	(left Radiolinja)	Radiolinja Ltd.
Ms. Jaana Salmi		Radiolinja Ltd.
Ms. Riitta Tiuraniemi	Technical Director	Suomen 3G Ltd.

Lawyer

Mr. Jari Sotka	Associate Attorney	Krogerus & Pirilä
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LINKS TO WEB RESOURCES

Unfortunately most sites are aimed at Finnish customers, thus English information is not always available or is quite limited related to the Finnish (possibly also Swedish) pages.

Government sites

Ministry of Transport and Communications

Finnish telecommunications policy and legislation, rather complete in English <<http://www.mintc.fi/>>

Telecommunications Administration Centre

Finnish telecommunications regulator, with most regulations in English <<http://www.thk.fi/>>

Finnish telecommunications operators

Sonera

Leading Finnish mobile operator, with significant fixed business as well <http://www.sonera.fi/>

Finnet Association

Association of (incumbent) private operators, with links to Finnet Group members <http://www.finnet.fi/>

Elisa Communications

Largest Finnish private operator, number two in mobile <http://www.elisa.fi/>

Telia

Swedish Telia's Finnish subsidiary, number three in mobile <http://www.telia.fi/eng/>

Suomen 3G Oy (Finland's 3G Ltd.)

Upcoming third generation network operator, site only in Finnish <http://www.kolmegee.fi/>

Suomen 2 G Oy (Finland's 2 G Ltd.)

Upcoming second generation GSM network operator, site only in Finnish <<http://www.suomen2g.fi>>

Saunalahti Ltd.

Mobile service provider, site only in Finnish <<http://saunalahti.fi/>>

RSL COM Finland Ltd.

Mobile service provider, site only in Finnish <<http://www.rslcom.fi/>>

Internet operators

Internet is a normal business in Finland. Thus Internet service providers are not centrally registered, and nobody knows how many Internet service providers are active. The number is probably in the tens (educated guess).

Furthermore, as they serve domestic customers, their sites are mainly in Finnish that is impossible to understand for non-Finnish persons.

The following list includes six of the perhaps largest service providers:

<<http://fi.soneraplaza.net/>>, only Finnish, corporate site <<http://www.sonera.fi/>>, also some English information

<<http://kolumbus.fi/>>, only Finnish, corporate site <<http://www.elisa.fi/>>, also some English information

<<http://saunalahti.fi/>, with corporate information in English

<<http://fi.thk.net/>, also English

<<http://www.kpnqwest.fi/>, with parent company information in English

<<http://www.nicity.com/>, only Finnish

Sample corporate sites

These sites have at least some relevant information in English.

<<http://www.merita.fi/e/>> (major bank)

<<http://www.leonia.fi/english/>> (major bank)

ABBREVIATIONS

2G	Suomen 2G Oy (Finland's 2G Ltd.), GSM 900 network operator
3G	Suomen 3G Oy (Finland's 3G Ltd.), third generation network operator
3P	Suomen 3P Oy (Finland's 3P Ltd.), mobile service operator for 2G and 3G
ADSL	Asymmetric Digital Subscriber Line
ARP	Autoradiopuhelin (car radio telephone)
CPP	Calling Party Pays
EMU	European Monetary Union
EU	European Union
FCA	The Finnish Competition Authority
FIM	Finnish markka, currency unit, 1 FIM = 0.16072 US\$ (30 June 2000)
GDP	Gross Domestic Product
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
IDC	International Data Corporation Ltd.
IVO	Imatran Voima Osakeyhtiö, Finnish power company (presently Fortum Ltd.)
MISP	Mobile Internet Service Provider
NMT	Nordic Mobile Telephone
OECD	Organisation for Economic Co-operation and Development
PABX	Private Automatic Branch Exchange
POI	Point of Interconnection
PSTN	Public Switched Telephone Network
RIO	Reference Interconnection Offer
RPP	Receiving Party Pays
RSL COM	RSL COM Finland Oy
SMP	Significant Market Power
SMS	Short Message Service
TAC	Telecommunications Administration Centre
US\$	United States' dollar
USA	United States of America
WAP	Wireless Application Protocol