

# Mobile Pricing and Interconnection Regimes



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Abstract <p>The study is an analysis of two different pricing and interconnection regimes for mobile telecommunications. It examines and compares the regimes with respect to competition, monopoly and regulation.</p> <p>The two regimes are end-to-end-pricing, which means that a call has one end-to-end retail price; and segment pricing, which means that a call has separate prices for different segments, e.g. a call from a fixed to a mobile line has one price for the originating fixed segment and another, separate, price for the terminating mobile segment. This results in significant differences in entry, interconnection and operator relations, customer relations including billing, transparency, and regulation. A comparison of the two helps understand the business fundamentals, such as the impact of regulation on income formation.</p> <p>End-to-end pricing is mainly used in countries that have a history with one operator and where several operators have emerged only recently. Segment pricing is used in countries with a multi-operator history, such as the USA and Finland.</p> <p>The report analyses mobile pricing in four countries: Finland, Sweden, Germany and the UK. It uses a profile comparison of various mobile prices that include termination, all of which are related to underlying costs of mobile communications. The profile analysis indicates that the most overpriced calls are those from a mobile to a mobile line, while the lowest prices are for calls within the same network. Termination is often more expensive than calls within the same network, while the underlying costs are actually the opposite. Such price anomalies result in unofficial or illegal termination that uses standard GSM Gateways.</p> <p>Termination is said to be a monopoly market. The analysis suggests that the monopoly is created by regulatory decisions and definitions. Certain pricing principles support high termination charges.</p> <p>The report includes a number of proposals and suggestions on how to improve the situation, strengthen competition and improve user choice.</p>			
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## **FOREWORD**

There are very few international studies concerning mobile termination and access pricing or regime comparison. The standard used in Finland has always been closer to the American than European model. In view of this, it is of utmost importance to further improve the Finnish model in the spirit of the new European communication statutes. The purpose of this study is to encourage conversation about pricing models by analysing and comparing the two pricing and interconnection regimes used in mobile communications (end-to-end pricing and segment pricing).

Mobile call pricing was studied in four countries: Finland, Sweden, Germany and the UK. The material consisted of price profiles of the two biggest mobile phone operators in each country. The results indicate that international discussion on termination pricing has not focused on the worst defects like termination between mobile networks. This shows in the prices of calls between mobile networks, which are clearly higher than calls from a fixed to a mobile line.

The measures and proposals in the study are on the sole responsibility of the author and they do not represent the official position of the Ministry of Transport and Communications. The Ministry wishes to thank everyone who helped the author by reviewing draft versions of the report. The report will also be published in English. It was drawn up for the Ministry by Consultant Arno Wirzenius from Teleplanning A. Wirzenius Ltd.

In Helsinki, May 2004

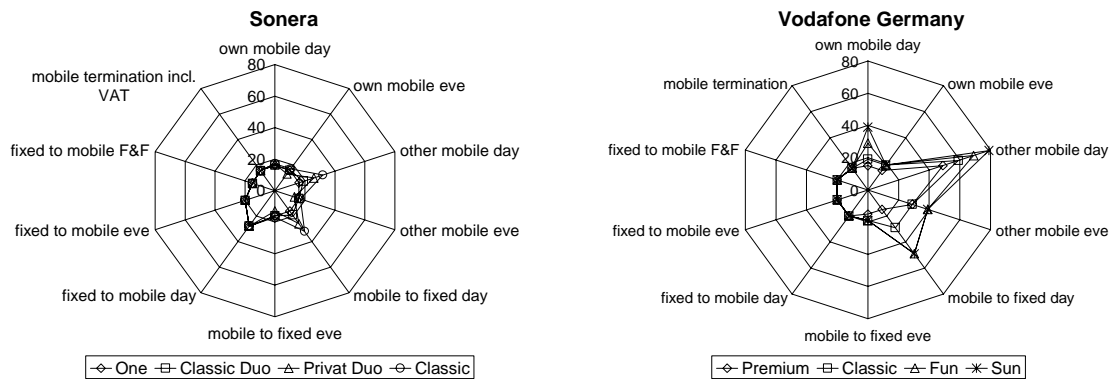
Kari T. Ojala

## EXECUTIVE SUMMARY

This report is an analysis and comparison of two mobile pricing and interconnection regimes, end-to-end pricing and segment pricing. Segment pricing is used in countries with a multi-operator history, while end-to-end pricing is used in incumbent type countries with a single operator history.

The report also includes a presentation and analysis of mobile pricing of eight operators in four European countries, Finland with segment pricing, and Sweden, Germany and UK with end-to-end pricing. The pricing policies in these countries differ considerably. The differences are to some extent related to the different regimes, but also other factors have significant impact. Two profiles are shown in Figure 1.

**Figure 1. Two operator pricing profiles.**



Pricing regimes are analysed from various points of view, including charges for calls in opposite direction and breakdown of various charges. The analysis shows that fixed to mobile calls are priced higher than calls within the same mobile network. The reason is mainly high termination charges or charges for incoming calls in segment pricing, but also call origination may be overpriced. Overpricing occurs in both regimes.

However, the analysis also shows that fixed to mobile are not the most overpriced call cases. Mobile to mobile are the most expensive calls, with a few exceptions, notably Finland. Thus the international discussion on termination charges has not focussed on the most important cases.

Detailed analysis of charges and pricing policies shows that price discrimination is common, in a number of cases. Some of the pricing policies include strong disincentives to lower termination charges.

Mobile charges differ during peak time, with a ratio per operator of up to five times between the most expensive and the cheapest call type. This is an indication of different levels of competition. It is interesting to see that the cheapest call charges are for call types with high underlying cost.

The report discusses and analyses several issues that surfaced during the work:

Regulatory toolkit	The regulatory toolkit appears to include mainly price regulation. Development of structural regulatory means would most likely reduce the need for price regulation, which is more compatible with market economy and fair competition than price regulation
Relations between operators	The end-to-end regime is based on wholesale-retail relations between operators, with only the retail service provider visible to customers. In the segment pricing regime the relations are closer to agent relations, with all service providers visible in the retail market
Billing convention	In the segment pricing, regime a billing convention is used, with the access operator billing segment charges of all operators. The user bill shows the amounts forwarded to participating operators. New operators can start business in the retail market without requiring contracts with each customer
Regulation of charges	The study compares different means of regulating e.g. termination charges, and recommends use of price ceilings using the same operator's retail charges
Charges to compare	In present discussions, fixed and mobile termination charges are often directly compared. The study recommends comparing mobile termination to other mobile charges and fixed termination to other fixed charges. The general level of mobile and fixed charges can be compared
Unofficial termination	Unofficial termination is common, using equipment called GSM Gateways and two consecutive calls utilising pricing anomalies. From an economic point the practice is good, but technically the outcome means substandard services to the public. Removal of price anomalies would remove the sole reason for using unofficial termination
Revenue from incoming calls	The present regulatory framework is designed so that service providers shall take care of customer relations, including marketing. In the same regulatory set-up for end-to-end pricing these service providers do not, however, get any revenue from incoming calls. The study recommends to discuss a change, e.g. transfer of interconnection to service providers
Contractual relations	In the present end-to-end regime the network operator sells termination, while the ultimate buyer is the originating service provider. The originating network operator is a middleman with a parallel interest to sell termination. However, interconnect negotiations are not between the seller and the ultimate buyer, but between two sellers of interconnection. Transferring termination to the terminating service provider may clarify the relationship
WTO and interconnect	The WTO Reference Paper states on interconnection: " <i>rates shall be no less favourable than that provided for its own like services</i> ", which may be interpreted that interconnection rates should not exceed comparable retail rates. Such a ceiling could be imposed, which may remove at least part of the need for regulation of interconnection rates

The chapter ends with a comparison of segment pricing and end-to-end pricing.

## **Major problems and solutions**

The report identifies some major problems and some solutions to such problems.

Termination charges should be compared to a larger set of charges and price structures of the same technology, e.g. mobile to mobile.

Termination is a monopoly market created by regulation. The report suggests structural regulation of markets e.g. by bundling pricing of termination with pricing of more competitive markets such as same network calls. The action would basically retain free pricing, in line with market economy, while regulation of termination charges is less in line with market economy.

Some pricing principles used in end-to-end pricing include price discrimination and support high termination charges. Structural regulation is proposed to remove such discrimination and reflect termination charges in retail prices.

Remove or reduce price anomalies resulting in use of GSM gateways.

## **Major options**

This report shows that analysis of different regimes gives better understanding. The EU could initiate a study of pricing regimes, and include e.g. the US pricing regime that is partially based on segment pricing.

The EU telecom policy has already achieved structural separation, e.g. in local, long distance, international and mobile operators. This structural separation is, however, not visible to users in end-to-end pricing, while it has been made visible in the power sector. Some actions could be initiated to transfer existing structural separation in retail pricing.

The regulatory toolkit could be developed to include various means of structural regulation to be used before regulation of individual charges. This would leave price regulation as the almost last resort.

Service providers could also be paid for incoming calls. This would support the emergence of independent service providers and thus increase competition.

Finland could introduce more alternatives in pricing.

## **Annexes**

The report has two annexes:

- A short description of the Finnish telecommunications sector and a detailed description of its segment pricing features; and
- Description of the price plans of the eight operators included in this study.

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## 1 GENERAL

This analysis of pricing and interconnection regimes is carried out to clarify the pros and cons of the regimes. The ultimate purpose is the development of such regimes. The two main pricing regimes are end-to-end pricing and segment pricing. End-to-end pricing requires a wholesale market, while pure segment pricing does not. In the EU only Finland applies segment pricing, all other EU countries apply end-to-end pricing. No previous comparison of these two is known, neither has a thorough description of the segment pricing regime been found.

The segment pricing regime was created in a multi-operator environment e.g. in the USA and Finland, before the present theories of sector structure, interconnection and competition were developed. The roots probably go back to the 1880's. The regime has been developed over time as a practical business solution between hundreds of operators, without even the existence of a regulator. The USA and Finland are both genuine multi-operator environments, while the end-to-end pricing regime is in use in most countries with a single incumbent history and recent introduction of other operators. This report uses Finland as an example of the segment pricing regime. The Finnish segment pricing regime is described in detail, so that also foreign persons can understand the segment pricing regime and make their own assessment.

The main outcome of the analysis is that several features of the segment pricing regime are worth discussion on an international level. These features address fundamentals of business principles. The analysis also points out deficiencies, which should be corrected. Some of the deficiencies are common for the segment pricing regime and the end-to-end pricing regime.

The report is prepared for the Finnish Ministry of Transport and Communications. The author is solely responsible for the content, nothing in this report can be considered a position of the Ministry, or at the responsibility of the Ministry. The figures presented and calculated are best efforts, and the author apologises for any unintentional mistakes.

The author hopes that the report results in better understanding of the segment pricing regime and a discussion of regimes. The report is aimed at experts in the area of pricing and interconnection; it is not intended to be a text book.

The author wishes to thank the numerous persons who have spent considerable time reviewing drafts and commenting on the contents. The report would not have been possible without their help.

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## 2 ANALYSIS OF MOBILE CHARGES

### 2.1 Approach

The purpose of this Chapter is to analyse mobile pricing structures in four countries. The purpose is diagnostic, to find structures, features, peculiarities, anomalies, pricing patterns and policies; it is not a user cost comparison and should not be used for overall user cost assessment. All baskets and averages are excluded, as they hide the issues that this analysis focuses on.

Price plans by operator (two operators per country) are described in Annex 1. The Annex also describes methodology.

### 2.2 Comparisons of country profiles

A comparison of price profiles by country is interesting. The price plans selected for profile comparison are those price plans with the lowest daytime per minute charges. See Figure 2.

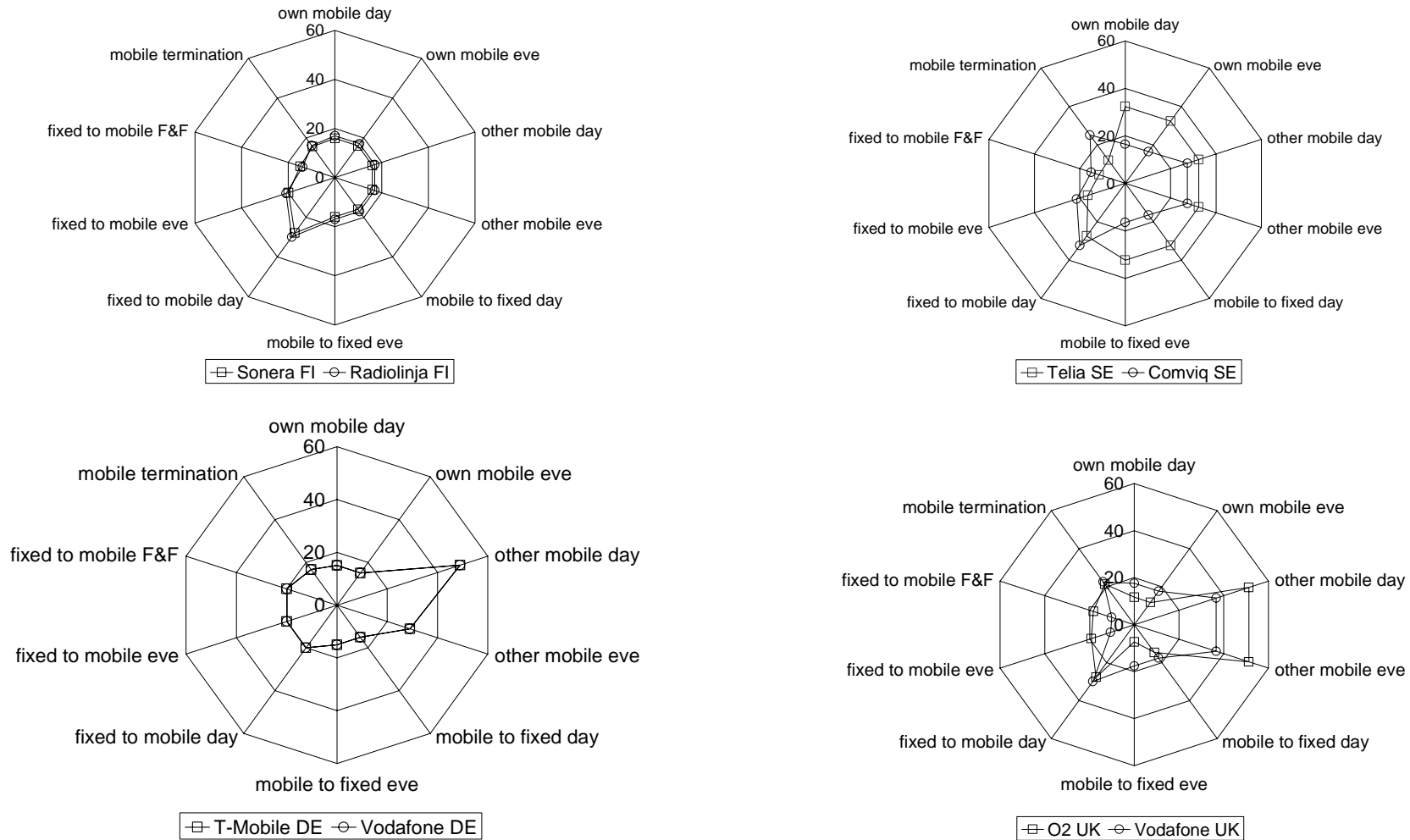
Overall the comparison suggests that the lowest prices can be found in competitive markets, same network calls, and the highest in less competitive markets, in particular mobile to mobile. The sample also indicates that generally outgoing mobile calls (except calls to other mobiles) are at a level of around or below 20 cents per minute. The exception is Telia.

Finland has the least extreme profile. This may, perhaps, indicate that competition works reasonably well in Finland. There may also be other reasons.

The profiles in Finland and Germany of the selected operators are almost identical by country, competition is not that much based on differences in profiles. Comviq in Sweden competes heavily on price with Telia. Note the differences in Swedish termination charges, caused by asymmetric regulation, as Telia has been designated SMP operator.

The UK case is more complicated, profiles differ. The selected profiles suggest that O2 competes on low price for calls in the same network and calls to fixed, while Vodafone competes on incoming evening calls from fixed, in this respect the most pronounced operator in this sample. If Vodafone uses low evening termination charges, it would provide an example that termination charges can be used as competition tools, provided that termination charges are reflected in retail prices. Conclusions on UK should not be firm, as UK per minute mobile tariffs are not good indicators of prices paid.

**Figure 2. Daytime price plans with cheapest per minute prices. All prices euro cents per minute incl. VAT.**



Finnish mobile service providers compete on price for fixed to mobile using Friends and Family type charges for incoming calls. The Swedish and British Friends and Family type services are fixed operator services, not mobile services.

The shape of the profiles indicates major differences between countries. Sonera, Radiolinja and Telia offer uniform pricing for all outgoing calls from mobile. Comviq, T-Mobile DE, Vodafone DE and UK and O2 use high prices for outgoing calls to other mobile network, even in the evenings.

These high prices for mobile-mobile can be understood as a sign of low mobile usage, when large scale transition to mobile only is still in the future. The high prices may be an obstacle for transition. Transition is common practice in Finland, and mobile-mobile calls are apparently much more important for customers in Finland than in the other countries. For a more detailed analysis see Chapter 2.4.

With the exception of Telia, calls from fixed to mobile are more expensive than calls within the same mobile network. Except for Telia, mobile termination charges are mainly at the level of charges for daytime calls within the same network. Telia's regulated mobile termination charge is low. See also Chapter 2.3.

It is also interesting to note that despite the rather high Swedish charges, the portion of mobile revenue of total revenue is lower than in many other countries. See Figure 17. No reason is known, but one possibility may be high price elasticity.

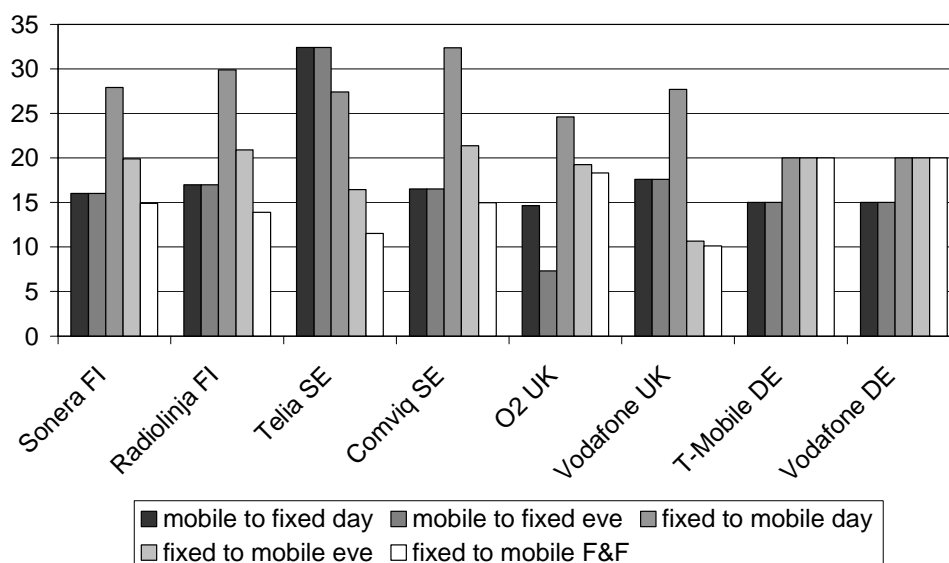
## **2.3 Call charges between fixed and mobile**

### *2.3.1 Charges in opposite directions*

Call charges between fixed and mobile can be analysed in different ways. One common comparison method is to compare call charges in the opposite direction.

This report uses division of total retail charge in origination and termination.

**Figure 3. Call charges in the opposite direction, euro cents per minute, incl. VAT.**



In this sample daytime call charges in direction fixed to mobile are typically more expensive than from mobile to fixed. The sole exception is Telia. Evening charges vary without uniform pattern.

Sonera, Radiolinja, Comviq, O2 and Vodafone UK have the largest differences, while Telia and German operators T-Mobile and Vodafone have the smallest.

The main questions appear to be:

- why are charges different in opposite direction? and
- how do operators charge?

These questions are analysed below.

### 2.3.2 Why different charges?

The general reasons for the difference by calling direction may well be what has been pointed out in the international discussion:

- mobile termination is frequently priced high due to lack of competition;
- the fixed calling user has no choice of operator for termination;
- in some cases regulation of mobile termination charges; and
- in case of asymmetric regulation, abuse of non-regulated termination charges when other termination charges are regulated (SMP operators).

Fixed termination charges are usually regulated in one or the other way, aiming at preventing abuse of termination charges. See also Chapter 3.6.

Segment pricing does not use mobile termination charges for calls from fixed to mobile, the mobile operator sets retail charges and the fixed operator bills this charge separately from its own charge for the fixed segment, which is independent of mobile operator. Both operators are independent in relation to the user. Segment pricing does not prevent abuse, but that abuse is public, while abuse of termination is hidden, and cannot easily be separated from abuse of fixed origination.

### 2.3.3 *How do operators charge?*

The analysis shows that high charges are common, either termination charges or (in segment pricing) retail charges for incoming calls. The fact that daytime complete calls (same network calls) are priced about the same as termination (incomplete calls), or charges for complete evening calls are clearly lower than termination charges, is an indication of dominant (or even monopoly) market power. This occurs even when termination charges are regulated. Price regulation is not always effective, despite the high regulatory cost.

The focus of international discussion on mobile termination charges is based on the assumption that *termination charges are reflected in retail charges*, lower mobile termination charges result in lower retail charges for calls from fixed to mobile. Then, how do fixed operators treat fixed to mobile calls?

Retail charges for fixed to mobile can be analysed by deducting the mobile termination charge of the receiving operator from the end-to-end retail call charge from fixed to mobile. The balance is called *origination charge* of the fixed operator, covering the fixed operator's cost and taxes and its profit margin. The corresponding charge in segment pricing is a normal published retail price of the originating fixed operator, named *local network charge*. See Table 1 and Figure 4.

The Finnish local network charge used in these calculations is Elisa's charge, 9 cents per call + 0.9 cents per minute, calculated as the average minute price for a three minute call, equals 3.9 cents per minute incl. VAT.

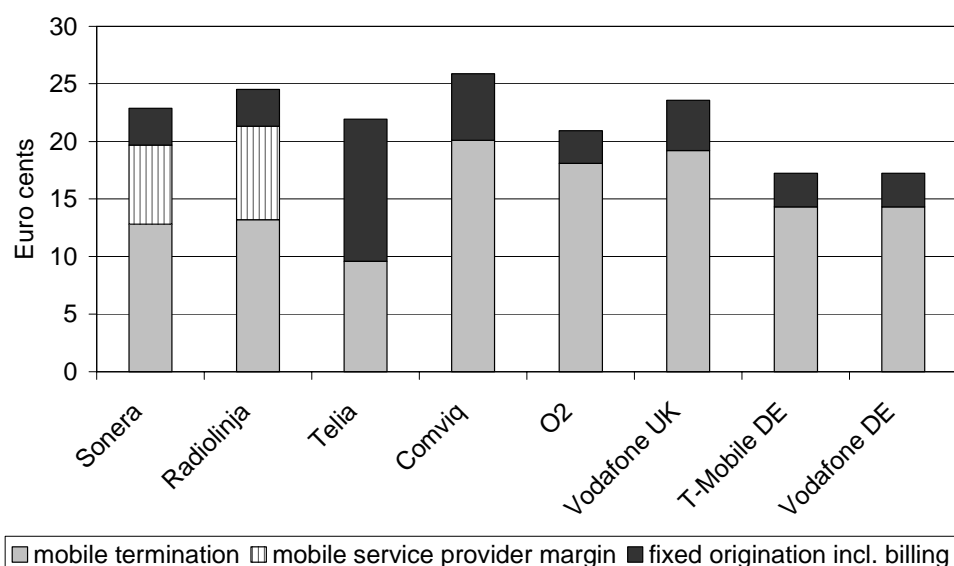
**Table 1. Calculation of fixed operator origination charge for normal daytime calls fixed to mobile, euro cents per minute. The figures in brackets are billing fees paid to the billing fixed operator.**

Called operator	End-to-end price incl. VAT	VAT %	Net of VAT			
			End-to-end price	Mobile termination	Mobile service provider margin	Fixed origination
Sonera	27.9	22.0	22.9	12.8	6.9(-1.0)	3.2(+1.0)
Radiolinja	29.9	22.0	24.5	13.2	8.1(-1.1)	3.2(+1.1)
Telia	27.4	25.0	21.9	9.6		12.3
Comviq	32.4	25.0	25.9	20.1		5.8
O2	24.6	17.5	20.9	18.1		2.8
Vodafone UK	27.7	17.5	23.6	19.2		4.4
T-Mobile DE	20.0	16.0	17.2	14.3		2.9
Vodafone DE	20.0	16.0	17.2	14.3		2.9

The Finnish mobile service provider pays a billing fee (estimated at 5%) to the fixed operator for billing the calling fixed subscriber for the mobile segment. The billing fee also covers bad debt.

The same is shown as a graph in Figure 4.

**Figure 4. Breakdown of fixed-mobile daytime call charges, euro cents per minute, net of VAT. Finnish fixed origination includes billing fee.**



Calculating only normal daytime prices provides a one-sided view. Table 2 shows the corresponding calculation for the cheapest possible fixed to mobile daytime call charges, Friends and Family.

**Table 2. Calculation of fixed operator origination charge for Friends and Family type daytime calls fixed to mobile, euro cents per minute. The figures in brackets are billing fees paid to the billing fixed operator.**

Called operator	End-to-end price incl. VAT	VAT %	Net of VAT			
			End-to-end price	Mobile termination	Mobile service provider margin	Fixed origination
Sonera	14.9	22.0	12.2	12.8	-3.8(-0.5)	3.2(+0.5)
Radiolinja	13.9	22.0	11.4	13.2	-5.0(-0.4)	3.2(+0.4)
Telia	19.2	25.0	15.4	9.6		5.8
Comviq	22.6	25.0	18.1	20.1		-2.0
O2	23.4	17.5	19.9	18.1		1.8
Vodafone UK	26.3	17.5	22.4	19.2		3.2
T-Mobile DE	20.0	16.0	17.2	14.3		2.9
Vodafone DE	20.0	16.0	17.2	14.3		2.9

The Table is interesting. It shows that the Finnish mobile service provider offers Friends and Family at a loss, while the fixed originating operator and the mobile network operator get an unchanged termination charge. The situation is the opposite in Sweden and UK, where the fixed operator absorbs the discount, the mobile network operator gets an unchanged termination charge, and the mobile service provider does not get any revenue from that call.

Finnish Friends and Family charges are used for call diversion, calls to the fixed connection are diverted to the mobile, at the expense of the fixed connection owner using Friends and Family charges. One outcome is that customers over time convert to mobile only and thus reduce use of diversion service.

The analysis shows that the fixed origination charges may be non-discriminatory or discriminatory, even favour the competing mobile operator (Sweden). The logic and reasons behind the various pricing policies are not known, neither are details behind regulation of termination and retail charges.

In the end-to-end pricing regime (as implemented in the EU today) the mobile service provider does not get any money from incoming calls. Sources say that in some cases agreements between the mobile service provider and the network operator include a fee to the mobile service provider.



The example shows that when the mobile service provider is in charge of incoming calls, it may differentiate those calls in the overall competitive service offering, and is ready to make a loss if considered relevant.

The origination charge can be roughly compared to a fixed local call charge or a fixed termination charge (e.g. double transit). See Table 3.

**Table 3. Comparison of the fixed operator daytime origination charge to related charges. Prices euro cents per minute, net of VAT. Billing fee is not included for Finland.**

Called mobile operator	Fixed origination	Fixed local call charge <sup>1</sup>	Fixed termination charge (double transit)
Sonera	3.9	4.3	2.6 - 3.0
Radiolinja	3.9		
Telia	12.3	3.3	1.0
Comviq	5.8		
O2	2.8	4.8	1.6
Vodafone UK	4.4		
T-Mobile DE	2.9	3.4	1.9
Vodafone DE	2.9		

In reality fixed termination may be even local termination, but double transit termination is more comparable to origination.

The charge for origination (charge for entire call less charges paid to the receiving mobile operators) is higher than the local call charge in Sweden, and roughly equal to the local call charge in Finland, Germany and UK. Analysis of only the mobile termination charge or the charge for incoming mobile call is not sufficient, also fixed origination needs analysis.

Fixed origination is non-discriminatory in Finland and Germany, but price discrimination may occur in Sweden. UK is not clear due to pricing structures and because termination charges may have changed.

The pricing principles that appear to be in use are presented in Table 4.

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<sup>1</sup> Source for local call charges and fixed interconnection charges is the ninth EU Implementation Report. Local call charges here are one third of the charge for a three minute call in the Implementation Report.

**Table 4. Pricing principles for fixed to mobile calls (end-to-end pricing).**

<b>Pricing principle</b>	<b>Description</b>	<b>Comments</b>
Non-discriminatory origination plus termination	The fixed operator applies a neutral origination charge and adds the mobile termination charge	The principle is non-discriminatory towards mobile operators and forwards the differences in termination charges to retail charges
Same charge to all or several mobile operators	The fixed operator uses the same charge to all mobile operators independent of differences in termination charges	Price discrimination against operators with low termination charges, the fixed operator absorbs any differences in mobile termination charges
Favour own mobile operator	Apply lower origination charge to own mobile operator	Price discrimination, close to bundling of fixed and mobile services (probably occurs, but not in the cases analysed)
Favour competing mobile operator	Apply lower origination charge to competing mobile operator	Price discrimination against own mobile operator, may be outcome of price regulation or averaging of charges to several competing mobile operators

**Table 5. Tariffs for fixed to mobile daytime calls. All prices are euro cents incl. VAT.**

<b>Country</b>	<b>Tariff</b>	<b>Comments</b>
Finland	27.9 to Sonera, 29.9 to Radiolinja, 20.9 to DNA, consisting of fixed segment charge 3.9 <sup>2</sup> + mobile segment charge (Sonera 24, Radiolinja 26, DNA 17)	Segment pricing means different call charges to every operator, the structure is by definition non-discriminatory
Sweden	27.4 to Telia Mobile, 32.4 to Comviq and Vodafone	Price discrimination against Telia, minor discrimination between non-Telia operators
Germany	20.0 to T-Mobile and Vodafone, 24.6 to E-Plus and O2 (cheapest fixed price plan)	Lower charges to two operators (GSM 900), higher to two operators (GSM 1800), appear to be non-discriminatory <sup>3</sup>
UK	24.6 to O2, 28.3 to T-Mobile, 25.8 to Orange, 27.7 to Vodafone	Different charge to every operator, possibly non-discriminatory

The Finnish retail charges for fixed-mobile are by definition fully non-discriminatory and transparent. Each operator sets the retail charge for its segment, the charges are published in price lists (even if not always easy to find), and payments to operators are shown in user bills.

<sup>2</sup> Each fixed operator has its own charge. The price used here is the fixed segment charge of Elisa, the largest fixed operator in Finland.

<sup>3</sup> E-Plus and O2 both apply termination charges 3.6 cent higher than T-Mobile and Vodafone. Source: EU Ninth Implementation Report.

Telia's tariffs appear to include price discrimination, but astonishingly against Telia's own mobile. The Swedish retail tariff (Telia) does not distinguish between non-Telia mobile operators. The charge does not invite non-Telia operators to lower their termination charges, as the rebate would be an immediate fund transfer to Telia if Telia does not change retail charges correspondingly. The Swedish termination charges of Comviq and Vodafone are within 0.5 cent, and both are 10 - 11 cents higher than Telia's termination charge. Telia clearly favours competing operators.

In Germany the retail tariff to T-Mobile and Vodafone is the same, and they also use the same termination charge. The termination charges of the two other operators are higher, and retail charges reflect differences in termination charges. The retail tariffs are thus most likely non-discriminatory. German fixed retail tariffs depend on the fixed price plan, but the differences appear to be the same within each price plan.

The UK tariffs appear to be related to termination charges and thus possibly non-discriminatory.

It is not possible to make firm conclusions on price discrimination, as exact and up-to-date termination charges are not public. Changes have taken place since publishing the termination charges in the EU ninth Implementation Report, and the retail prices are dated about one half year later. The published termination rates are averaged (e.g. peak / off-peak) rates, which also hampers exact comparisons.

The analysis shows that price discrimination exists and may be an issue. Restriction of price discrimination in an oligopoly type market requires discussion.

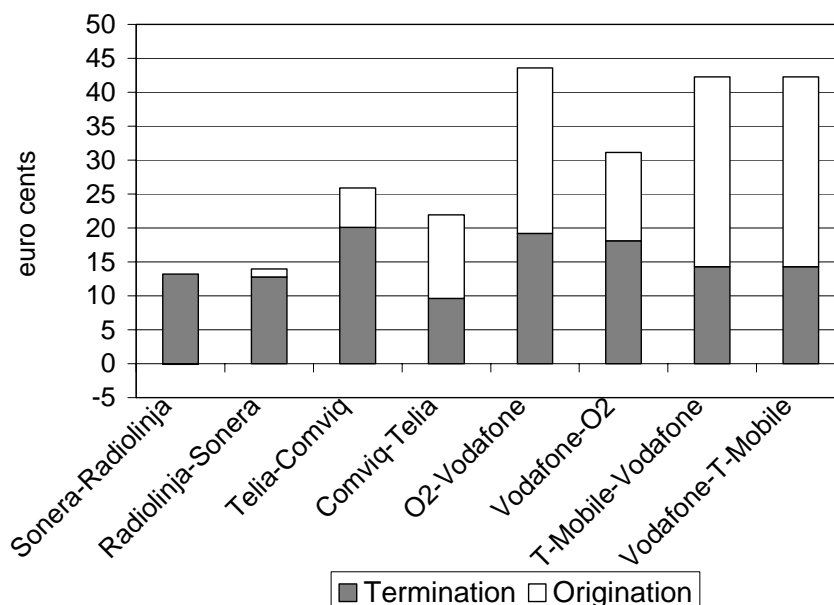
As a whole the analysis would indicate that the high or excessive retail charges for fixed to mobile calls may be due to two factors:

- overpriced mobile termination charges; and
- overpriced charges for fixed origination.

## **2.4 Call charges between mobile operators**

Call charges between mobile operators can also be analysed using call pairs in opposite directions. The charges between the two operators by country selected for this comparison are shown in Figure 5 and Table 6.

**Figure 5. Breakdown of daytime call charges between mobile operators, euro cents, net of VAT.**



**Table 6. Breakdown of daytime call charges between mobile operators, euro cents, net of VAT.**

	Call charge	Origination	Termination
Sonera-Radiolinja	13.1	-0.1	13.2
Radiolinja-Sonera	13.9	1.1	12.8
Telia-Comviq	25.9	5.8	20.1
Comviq-Telia	21.9	12.3	9.6
O2-Vodafone	43.6	24.4	19.2
Vodafone-O2	31.1	13.0	18.1
T-Mobile-Vodafone	42.2	27.9	14.3
Vodafone-T-mobile	42.2	27.9	14.3

Call charges are shown divided in the termination part payable to the receiving operator, and the charge for origination of the call. In mobile-mobile also Finland uses true mobile termination charges, and the billing operator sets the end-to-end price.

The comparison is interesting. Termination charges vary between 10 and 20 cents, but origination charges vary more, -0.1 (!) to 28 cents when Finland is included, and 6 to 28 cents when Finland is excluded. This is the situation even in the price plans selected for comparison, daytime plans with lowest retail charges. If evening price plans were used, the differences would have been larger.

In Finland and Germany, the charges are the same in opposite directions, while calls from the incumbent's mobile operator are more expensive in Sweden. Finland is clearly the cheapest, even if all price plans are compared.

In fact termination charges are usually insignificant from an operator revenue perspective in mobile-mobile if the termination charges are about equal. Traffic is usually balanced, outgoing and incoming about equal, and net payments are small. For that reason the Finnish small margins are logical, the outcome corresponds to *sender keeps all*. Net payments change considerably if termination charges are different, e.g. as an outcome of SMP designation and price regulation of some of the operators (the situation in Sweden).

As a whole the analysis suggests that high mobile termination charges are not necessarily the sole or even most important issue, also the general level of charges is essential. Heavy mobile-mobile call charges are common, except in Finland.

## 2.5 Uniform call charges

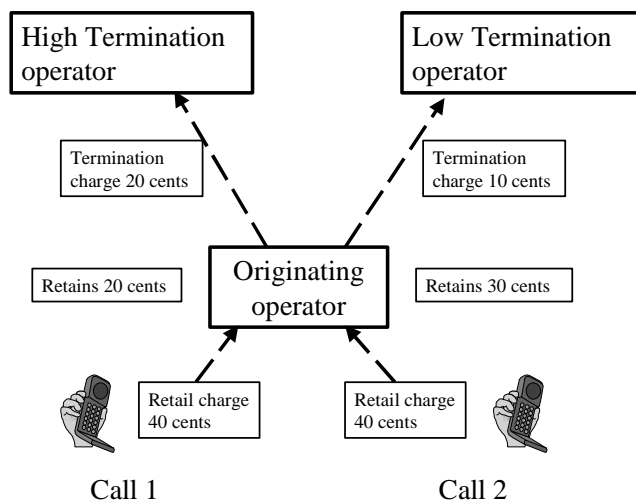
Mobile calls to other mobile operators are in many cases charged at the same rate, independent of called operator. See Table 7.

**Table 7. Call charges to other mobile operators.**

Originating operator	Tariff
Sonera	same charges to any operator within any price plan
Radiolinja	same charges to any operator within any price plan
Telia	same charges to any operator within any price plan
Comviq	same charges to any operator within any price plan
O2 mobile UK	same charges to any operator within any price plan
Vodafone UK	same charge to any operator within any price plan
T-Mobile DE	differs by operator but does not correspond to termination charge
Vodafone DE	differs by operator but does not correspond to termination charge

This means that termination charges are not reflected in retail prices. This principle can be understood as price discrimination against low termination charge operators. The outcome is a strong disincentive for lowering termination charges. See also Figure 6.

**Figure 6. Division of uniform call charge with different call termination charges.**



The situation is simple: If an operator lowers its non-transparent termination charge in a uniform pricing system, the reduction goes direct in the coffer of the originating operator, the user sees no change, the terminating operator cannot benefit from the reduction, and even an expert cannot establish that a change has occurred. The situation is the same in fixed-mobile and mobile-mobile. Even publishing termination charges would not help unless the reduction is transferred into retail charges, which means abandoning the uniform pricing system.

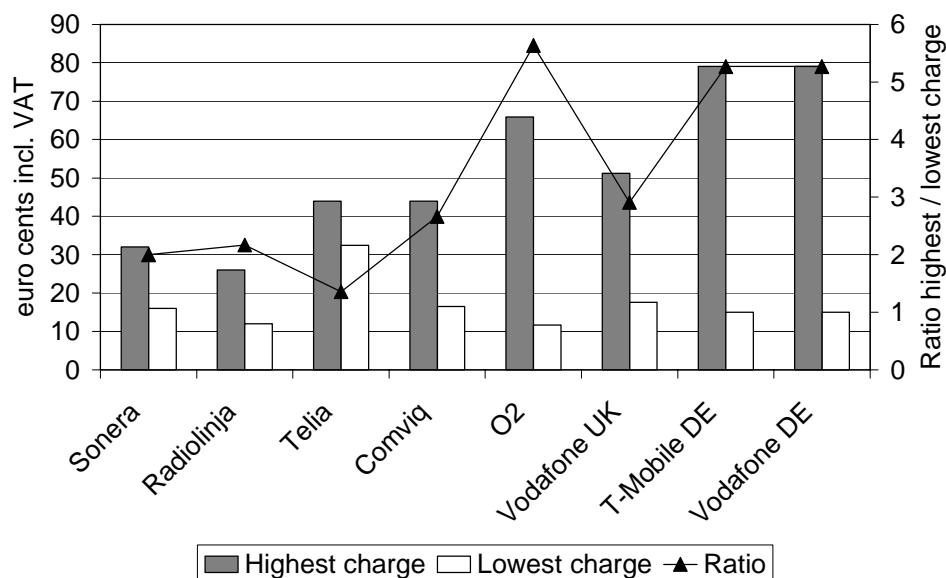
End-to-end pricing hides wholesale price components and prevents operators from using termination charges in price competition. The price discrimination invites keeping termination charges as high as possible. This may be one contributing reason for the present high termination charges.

In segment charging the originating operator would not benefit from lower retail termination charges, the reduction benefits the user automatically, fully and in public, and can be seen in the telephone bills.

## 2.6 Minimum and maximum price

Operators use high charges for some calls (usually less competitive) and low charges for other calls (most competitive). Figure 7 shows the highest and lowest found per minute charges, and the ratio between these two. The prices compared are daytime call charges, indicating different prices for (at least partially) substitutable capacity in the same network.

**Figure 7. Highest and lowest per minute charge for outgoing daytime mobile calls, and ratio. Charges euro cents per minute, incl. VAT.**



The lowest prices are generally for same network calls, using two base stations, the most expensive part of the network. The price differences indicate significant pricing differences for more or less the same capacity, which can be understood as products, or markets, with different levels of competition.

The ratios vary considerably. The lowest ratio is for Telia, because its lowest charge is much higher than the lowest charges of other operators. The highest ratio is for O2 and the German operators. It is beyond the scope of this report to go into more details.

Industry sources state that the cost of a one base station mobile call segment (partial call, origination or termination) is of the order of 70% of a two base station call (complete call, same network call). With cost based pricing the ratio should be slightly below 2, while the largest ratios are 5.

Marketing methods differ between countries. In some countries marketing focuses on handsets bundled with connections, while in other countries usage cost is more important. Same network call charges are usually low, as entrants have low percentage of the same network calls and can emphasise low prices without significant impact on revenue. Established service providers then have to follow.

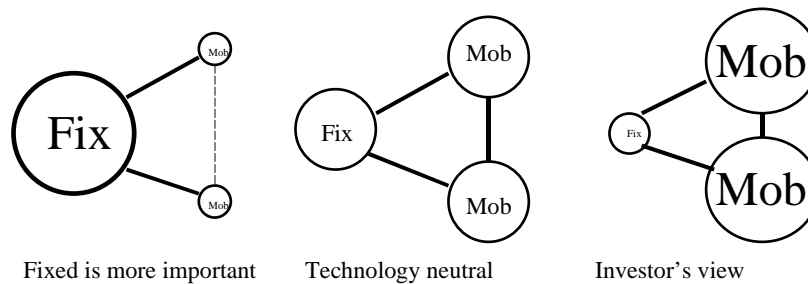
However, high ratios are not sensible, and they indicate that something is wrong. The first thing to do should not be price regulation, it should rather be some structural regulation (e.g. of tariff structures) or similar, if regulation is considered necessary. One main cause of problems is the existence of less competitive submarkets.

### 3 ISSUES

#### 3.1 Overall perception of technologies

The overall perception of the relation between fixed and mobile telecommunications can be illustrated as shown in Figure 8.

**Figure 8. Different perceptions of importance of technologies.**



The traditional perception was that fixed telephony was considered the service providing the highest potential for improved social welfare and other economic and political objectives. The perception is still in use in many different forms. E.g. Universal Service often still based on fixed, for voice, fax and data, but users have shown that they increasingly prefer mobile for voice, arranging their internet usage separately (only at work or at school, own broadband), and abandoning fax. Fixed telephony is called *basic telephony*, a value loaded term. Mobile telephony licences are auctioned, preferably at high fees, and / or spectrum fees are high, while fixed telephony licence fees are nominal. Such an approach is technology discriminatory. In fact, for mobile-only users, *mobile* is basic telephony.

One contributing reason may be that sector professionals at management level have a background in fixed telephony, which is reflected in decisions. Mobile is not considered a real phone, it is merely a toy.

A truly technology neutral approach used to be rare, but it is increasingly acknowledged. The change reflects realities and demand in the market.

#### 3.2 Regulatory toolkit

The approach to regulation can be divided into three levels:

- no regulation;
- structural regulation; and
- heavy-handed regulation.

The three levels can be roughly related to the level of competition. See Table 8.



**Table 8. Relation between level of competition and level of regulation.**

<b>Level of competition</b>	<b>Level of regulation</b>	<b>Examples for tariffs and termination</b>
Sufficient competition	Little regulation	Obligation to publish tariffs
Oligopoly	Structural regulation preferred, maintains market economy with free pricing	Bundling less competitive market with more competitive market Retail minus rule Move interconnection to service provider
Full or near monopoly	Heavy-handed regulation needed, against full market economy principles	Regulation of individual prices on cost basis or benchmark basis

Traditionally mobile tariffs have not been regulated, the approach has been no regulation. When abuse of e.g. charges for fixed to mobile calls has occurred, the usual reaction so far has been to go direct to heavy-handed regulation by imposing e.g. cost based or cost oriented price regulation of termination charges. Regulation of individual tariffs on the basis of cost is laborious, requires substantial work on a continuous basis (e.g. annual review and possibly annual court cases), and is heavy-handed. The basic principle in a market economy is that players set their prices without regulatory intervention, even if competition is not ideal. Regulatory intervention in individual prices is an indication that the market does not work properly. Structural regulation maintains pricing freedom, even if pricing may well have rules.

The priority of using regulatory tools should be to leave the heaviest tools as last resorts. Thus regulation of individual prices based on laborious and disputable cost calculations should be used only if other means do not suffice. The present practice is partially opposite: benchmark regulation has been used when mandated regulation of individual prices has not turned out to be sufficient.

The regulatory toolkit should include more tools than regulation of individual prices. Lack of other tools may be interpreted as lack of understanding of the regulated sector, which is alarming. This report includes some proposals for structural regulation aiming at correcting some of the anomalies in present mobile charging. An important aim is to achieve a situation in which abuse of less competitive elements is restricted to tolerable level, without needing to resort to regulation of individual prices.

Price regulation in general has three different components:

- definition of tariff structure;
- definition of tariff-setting principles; and
- regulation of individual tariffs or baskets.

Definition of tariff structure may include rules for pricing of installation, rental, usage, but also use of end-to-end or segment pricing, or even that users can

choose between different tariff structures. Tariff structures also include borders between fixed local and long distance, as well as whether mobile should be understood as nationwide service (Europe) or local service (USA). Tariff structures can include relation to numbering, whether users should be able to determine the tariff based on numbering<sup>4</sup>.

Tariff-setting principles includes definition of which entity determines and collects tariffs. E.g. in the segment pricing regime the mobile service provider sets the retail tariffs for incoming mobile calls, while in the end-to-end regime the mobile service provider has no role in tariffs for, and revenue from, incoming mobile calls.

Billing convention is also part of tariff-setting principles. Segment pricing is not relevant without a billing convention.

Definition of tariff structures is normally rather simple ex-ante regulation, but can still be efficient. E.g. the previous Finnish interconnection regime during 1994 - 1999 for long distance meant that local charge included both the originating and terminating local network. The arrangement combined the fixed local call market with fixed origination and termination to one market. The arrangement worked as a ceiling for origination and termination, and was self-regulatory.

Similar arrangements can be used to ensure that less competitive markets follow the prices of more competitive markets.

Tariffs may be capped using some other tariffs (benchmark regulation, retail minus), either own or some other operator's tariffs. Permission to use bulk discounts and e.g. weekend special offers are part of tariff setting principles. The requirement to publish tariffs in an easy and understandable way can be considered a tariff setting principle. This study had some difficulties in finding and understanding tariffs.

Definition of tariff-setting principles may include a requirement to set tariffs based on, or at least related to, cost, and intervention if deemed necessary, usually as an exception. It may also include relations between tariffs, e.g. that termination charges must not be above same network call charges.

Regulation of individual prices or baskets on a cost basis is usually laborious, the regulator has to study cost details in great depth on a continuous basis for each operator. Such regulation can be understood as treating the symptoms rather than the disease.

It would be a slight, but only slight, overstatement to say that each time regulation of individual prices or baskets is applied, it is a lost battle in the process of introducing market economy in telecommunications.

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<sup>4</sup> Note that introduction of number portability removes the connection between numbering and tariffs, in particular for mobile number portability. The area code of a mobile operator does not anymore mean that the applicable tariff is the tariff for calls to the operator using the area code.

### 3.3 Wholesale and agent relations

The two main alternatives for relations between operators are wholesale relation and agent relation. Wholesale is related to end-to-end pricing, while agent relation is related to segment pricing.

In a wholesale relation one operator sets the retail price based on the total cost of the wholesale components bought from other operators, and the cost of its own component. The retail service provider adds its gross margin on top of the total costs. The retailer has full responsibility towards the end-user including pricing, other operators have a wholesale relationship to the retailer and no direct relation to the end-user, and not even a possibility to show their existence in the retail market.

In theory the billing operator for retail tariffs can be any operator involved in setting up a call, but in practice the access operator (the operator providing customer access) is usually also the billing operator. The wholesale relation may thus be understood as a kind of support to access operators, as other operators act as subcontractors.

In the agent relation each operator sets the retail price of its own segment, and the agent cannot change the retail price of another operator. The agent receives its sales provision as part of the retail price, or as an own explicit agent fee. Billing in the agent relation can be either direct from "factory" or can use the billing convention as described in Chapter 3.4 and Annex 1 Chapter 1.5.

The electricity sector has been converted from a wholesale relation towards an agent type relation, when unbundling of power production and transmission required an agent type relation with a billing convention. Similar relations can be seen in travel and in other businesses.

The wholesale relation is at present the most common in most countries, except the Finnish and US telecommunications sectors. Other examples of agent relations in telecommunications are international leased lines (half-circuits) and mobile roaming.

### 3.4 Billing convention

The segment pricing regime requires some arrangements for billing subscribers. The usual method, in use in the USA and Finland, is that the access service provider bills the other segments on behalf of the other service providers. Service providers send billing information to the billing service provider. The roots of the tradition are probably in the 1880's, when the first connections were made between telephone operators. Over time technical implementation has changed, but the main principles have remained the same.

Segment pricing and the billing convention result in detailed user bills, including information on how much of the billed amount is forwarded to other service providers. Bills may include more information than subscribers in reality read, but that is a common feature of transparency.

The billing convention is open to any new entrant and results in much easier entry to market. Once billing agreements are made, each entrant can immediately market its products direct to the entire population without requiring individual agreements with each customer. So far little regulation has been needed. In a pure end-to-end regime new entrants require either contracts with each indirect customer, or entrants have to remain wholesale entities to end-to-end service providers, usually access providers.

The billing convention includes a fee for billing. The fee is of the order of 5-8%, depending on various factors, including volume of billing. The fee covers cost of billing, collection, bad debts, etc.

**Table 9. Summary of assessment criteria of billing convention.**

<b>Factor</b>	<b>Impact</b>
User choice	More choice through easier entry
User prices	No direct impact
Transparency	One bill includes charges to several operators, shows how much is paid to each operator
Competition and entry	Easier entry, small new operators can market their products and charge many users without the need for individual contracts with each indirect user, new operators do not need huge billing systems
Less regulation	No direct impact, traditionally little regulation

Billing convention has been introduced in the power sector, similar to the segment pricing regime.

### **3.5 Regulation of termination charges**

Termination charges can be regulated - if needed - using several methods. The three main methods are:

- cost, commonly used in Western countries;
- relation to the operator's retail charges (cost related charges, internal benchmarking, retail minus); and
- benchmarking (relation to other operators, external benchmarking).

A summary is presented in Table 10.

**Table 10. Summary of price regulation methods.**

<b>Basis</b>	<b>Cost based or related</b>	<b>Own retail minus</b>	<b>Benchmarking based</b>
Usage	The most common practice, also in the EU, "best practice", looks "scientific"	Can be used even if cost information is not available. Finland used retail minus until 1999 for local termination	Can be used if no other reasonably reliable method is practical
General description	The operator receives its cost	The operator receives what it asks from customers	The operator receives the same as other operators
Impact on market	Retains monopoly termination market	Connects monopoly termination market to competitive market	Retains monopoly termination market
Type of regulation	Ex post	Ex ante	Ex ante
Basis	Based on costs, which are business secrets of the operator, frequently submitted "tailored" to regulators, and on cost calculation methods, which are difficult to design and can be easily disputed	Based on public retail charges (several price plan options exist), connecting non-competitive charges to competitive charges	By selecting the benchmarks (other operators) the outcome can vary considerably
Disputes	In practice disputes are common, court cases last years, and decisions are enforceable years too late	The operator publishes its charges. Disputes may occur on which price plan to use	Disputes could be related to which benchmarks to use
Expertise needed	High level experts required throughout: operator, regulator, court	Moderate expertise	Expertise on how to select benchmarks
Accuracy	Accurate if working	Not very accurate	Not accurate
Meets operator's pricing policy	No	Yes	No
Workload on regulator	Large on continuous basis	Small	Rather small
Cost of regulation	Expensive	Cheap	Cheap
Suits light-handed regulation	No	Yes	Yes
Experience	Working in practice as intended is not common	Works in practice	Works. The EU has used benchmarking when cost calculations failed

One more method is used, in particular in developing countries: no basis. When advisors recommend cost as the basis, and cost data are not available, and no other method has been advised, the countries decide interconnection rates without any systematic basis.

Cost as a basis means that the termination charges are decided using some kind of calculation with either historical or forward looking cost data as input. Using the operator's own retail charges as a basis means that the retail charges and termination charges are determined roughly on the same basis. Benchmarking means that the termination charges are de facto determined somewhere else. Benchmarking is useful for comparison, but can be used even for price regulation if nothing else is available.

One major problem with cost as a basis is that costs are business secrets. Operators are reluctant to provide appropriate cost outside the company, to regulators, and in particular to competitors. It is customary that cost information requires audit, as operators tend to provide cost information tailored for regulatory purposes. Court cases are common, delaying decisions, even for years, far beyond practical time limits.

Cost calculation models include a large number of important business strategy decisions, which may differ from the actual strategy decisions used by the operator concerned.

Retail charges in a competitive environment are based roughly on cost, but published and thus easily available, and cannot be disputed. Disputes may occur regarding choice of price plan. Benchmarks should be public, but termination charges are not. Disputes on benchmarks are likely to be regarding choice of benchmarks.

Cost calculations require quite a lot of high level expertise with the operator, regulator and even with the courts. Cost based regulation has turned out to be a good and continuous source of income for consultants, lawyers and other experts. The need for high level expertise is continuous rather than an exception or one time exercise. The outcome is a regulatory model that is expensive for all parties. Regulation based on retail charges and benchmarks require expertise, though limited, ensuring that the comparison method and selected benchmarks are appropriate.

When successful, cost based regulation is accurate. Unfortunately experience has shown that success is more an exception than the main rule. Even the most advanced countries have worked many years to implement cost based regulation, and still the outcome is not guaranteed. Regulation based on retail charges or benchmarks is not equally accurate. Still the EU has been forced to use benchmarking, as cost related price regulation did not turn out to be that efficient.

Cost based regulation is not sensitive to different pricing policies and business strategies. A high-price-low volume operator and a low-price-high-volume

operator may get about the same outcome in regulation. If so, regulation dilutes the pricing policies, which may reduce competition. External benchmarks are similar in this respect, no sensitivity to pricing policies of the regulated operator. On the other hand, if regulation is based on the same operator's retail tariffs, the pricing policies is included in regulation, a low-price-high-volume operator gets a similar low price for termination as well.

An example is Sweden. Without knowing details, it looks like Telia is a high price mobile service provider, and has been able to maintain its market share at that high price level. Telia may well be a very profitable operator, even if possibly losing market share. The regulatory dilemma is: should Telia's termination charges be based on different criteria than its usual retail charges, or should Telia be allowed to price termination in line with its overall retail pricing policy? The present outcome is a regulated termination charge level that is much below Telia's general retail charge level. There are arguments for and against.

There is a major problem with connecting termination charges to retail charges. Termination charges are usually network operator charges, while retail charges are service provider charges. Connecting the prices of these two results in difficulties, it would mean external benchmarking rather than using the prices of the player itself.

In segment charging, the service provider sets the price for incoming mobile calls, not the network operator. By changing the responsibility for termination to the service providers, that problem may be solved, but other - smaller - problems arise. The change would be a change in business relations between players in the mobile market. See Chapter 3.8.

### **3.6 What charges to compare?**

International discussion has focussed on mobile termination and at least some comparisons are between fixed and mobile termination<sup>5</sup>. A better comparison could be:

- the level of fixed and mobile charges as a whole;
- mobile termination related to other mobile charges; and
- the structure of mobile charges.

Many of these issues are analysed elsewhere in this report.

Telecommunications analysts and policy makers should discuss the general level of mobile charges compared to fixed charges. There are reasons for arguing that mobile charges should be higher than fixed charges, but the present differences may be unreasonably large. Termination charges can be understood as part of that discussion rather than a separate issue, as in the present discussion.

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<sup>5</sup> E.g. the EU ninth Implementation Report, Technical Annexes, compares mobile termination to fixed termination rather than to other mobile charges of the same operator.

This report compares mobile termination charges to other mobile charges rather than to fixed termination charges. The reason is that mobile termination is related to the cost and profit of the mobile business rather than related to the cost and profit of the fixed business, and related to the general principles of pricing mobile charges.

The analysis of the structure and level of mobile charges in this report indicates that there appears to be significant imbalance. The magnitude may be similar to the past imbalance in international charges (still persisting in many developing countries). By far the highest charges are between mobile operators, not between fixed and mobile. The lowest charges can be found in the tariffs of some mobile operators for same network calls, in particular evening calls. The imbalance varies from country to country.

### **3.7 Problems with unofficial mobile termination**

Unofficial mobile termination is common, bypassing the official, but high, termination charges.

#### *3.7.1 Reason: cost of official mobile termination*

Termination means the last part of a call, from a point of interconnection to the phone called. Termination is by definition not a complete call, it is only a partial call ("half call").

In a mobile call the most expensive cost element is the base station, not the mobile switches or the backbone network<sup>6</sup>. The base station cost should be understood to include all costs directly related to the base station, such as the backhaul connecting the base station to the switch. Even spectrum cost is closely related to base stations.

A complete call within one network uses two base stations and thus also spectrum twice, while origination (from the calling user to a point of interconnect) and termination (from the point of interconnect to the receiving user) each uses only one base station and spectrum once. Thus the cost of a complete call is higher than origination or termination. The implicit assumption is that origination and termination should be priced below charges for complete calls.

Tariff analysis shows that call charges are set almost opposite: complete calls are priced well below incomplete calls such as origination or termination. The most likely reason is competition: service providers sell connections using price of network internal calls as the main sales argument (to the extent that prices matter), and other calls are less important, in particular incoming calls. The

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<sup>6</sup> For costing information, see Cost Structures in Mobile Networks and their Relationship to Prices, Europe Economics 2001, appendix 1, [http://europa.eu.int/information\\_society/topics/ecom/useful\\_information/library/studies\\_ext\\_consult/text\\_en.htm](http://europa.eu.int/information_society/topics/ecom/useful_information/library/studies_ext_consult/text_en.htm).

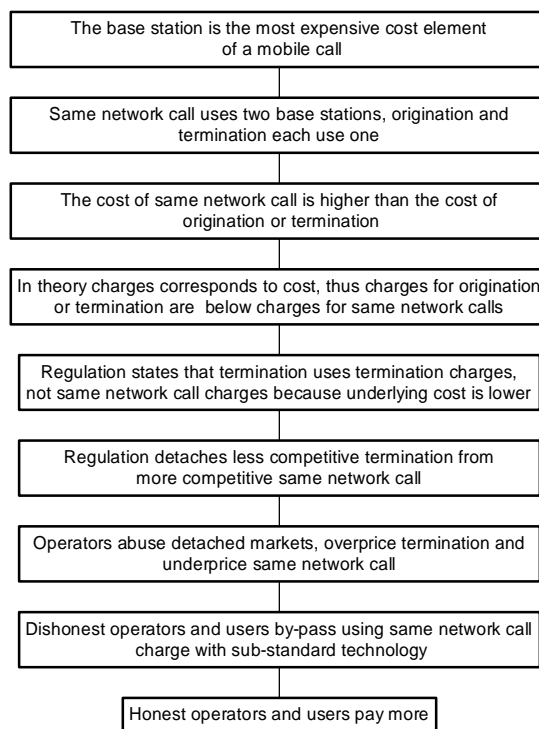


situation invites abuse. The picture is further distorted by the fact that service providers set retail prices for originated calls, but the network operator sets the price for termination.

Present regulation also invites abuse. An operator buying terminating is obliged to pay the termination charge and cannot legally pay the lower charge for a complete call. When such an obligation is set, removing the possibility to pay complete call charges, the operating selling terminating is tempted to set a high charge for termination. This interpretation puts the responsibility for high charges on regulation.

The logic of overpricing is presented in Figure 9.

**Figure 9. Logic of overpricing mobile termination and incoming segment call charge.**



The EU Implementation Reports could include estimates for the magnitude of, and impact of, such by-pass, in particular as vendors openly and publicly advertise such equipment for termination. Some examples of possible savings are shown in Table 11.

**Table 11. Savings on call prices using GSM Gateway. Prices euro cents incl. VAT. GSM Gateway price consists of two call prices, fixed local call + mobile same network call, or two mobile same network calls.**

Call	Replaced by	Official minute price	GSM Gateway price	Saving %
Fixed-Sonera eve, Privat Duo	Fixed local call+ Sonera same network	27.9	5.2+13.0	35
Fixed - Comviq eve	Fixed local call+ Comviq same network	21.4	2.5+2.6	76
Fixed-Vodafone DE eve, evening plans	Fixed local call +Vodafone same network call	39.0	3.1+19.0	43
Vodafone - O2 eve, evening plans	Two same network calls	51.2	7.3+2.9	80

The immediate reaction of many persons is that it would be stupid not to use this option, official, legal or not.

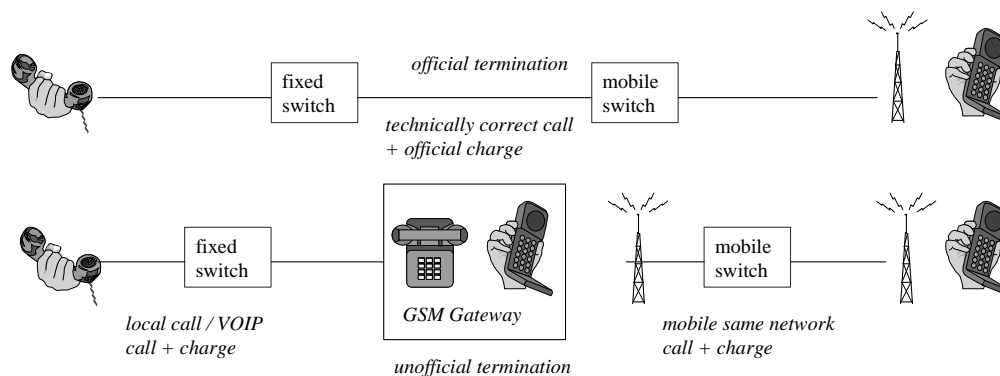
### 3.7.2 Technical solutions for by-passing high termination charges

The technical solution for by-passing high termination charges is two calls after each other. The originating operator (or user) routes the first (fixed) call to a piece of equipment called GSM Gateway, SIM Box<sup>7</sup>, etc. The GSM Gateway is a normal fixed terminal (phone) connected to a normal GSM terminal (mobile phone), it has a SIM card and antenna, and makes the second call as a normal same network mobile call. The second call uses two base stations and is priced as a same network call. The GSM Gateway works in both directions. The other direction (GSM call + fixed network call) is possible, but relevant for users, normally not for operators. Two directions also invite fraud, which has occurred.

Two consecutive mobile calls are also possible.

<sup>7</sup> Several manufacturers produce such equipment, e.g. <http://nokia.com/nokia/0,,47604,00.html>, called Nokia 32 terminal, aimed at individual end-users and small business, and <http://www.teles-communication-systems.com/>, larger scale products for operator termination, corporate business, etc. The latter site is informative. There may be other vendors as well.

**Figure 10. Official and unofficial termination, using GSM Gateway.**



The technical solution of two consecutive calls results in a substandard voice transmission. Each call deteriorates call quality, and double deterioration is beyond limits. In addition it prevents use of Calling Line Identification, and may disturb or prevent use of GSM data, fax and WAP, which is definitely not acceptable when operators use by-pass. From a technical point of view the solution should either not be allowed or should be replaced with a technically appropriate solution.

In the case of a fixed operator (e.g. incoming international operator) by-passing the normal interconnection point and the termination function, the operator charges the calling user normally. Instead of paying the high termination charge, the operator pays a lower same network call, taking advantage of any evening and weekend discounts and special Christmas offers etc.

A user can connect a GSM Gateway to its PABX or even to a normal fixed connection using analogue two-wire interfaces.

These solutions are common, in particular where same network charges are well below termination charges or fixed-mobile charges. No good estimate for the magnitude of unofficial GSM Gateway usage is known. A Finnish operator has estimated that about 15% of incoming international calls use GSM Gateway type solutions, and the portion is growing fast. Substandard voice call quality and working affect users who pay for full mobile call quality.

Technically substandard GSM Gateways may be deemed even illegal as end-to-end transmission quality requirements are not met and Calling Line Identification is not implemented. Another problem is that the GSM Gateways are a significant burden for the base stations that they use and for spectrum. The traffic is heavy, and GSM networks (base stations) are not designed for such large scale stationary use. Large amounts of heavy usage GSM Gateways are a burden also for spectrum usage (double usage), and add to the need for more spectrum, without any sensible technical or economic reason.

Operators appear to be reluctant to act against customers using such gateways. The outcome is that customers themselves suffer from their own actions.

Customers and operators using GSM gateways smile at the discussion about termination charges and fixed to mobile charges. From their point of view the discussion is an academic exercise, as they don't pay those charges. They pay user retail charges instead, these charges are much lower.

### *3.7.3 Lessons learnt*

The practice is in principle similar to other known illegal or semi-legal re-routing applications, taking advantage of price differences or price anomalies. International traffic knows refile and call-back, and mobile tromboning is known in the EU. Arbitrage in securities trading is somewhat similar. From an economic perspective all of these are welcome, as they increase competition and reduce pricing anomalies by utilising these anomalies. From a technical perspective these solutions are substandard. If the underlying reason is inappropriate regulation, such regulation should be repealed.

Removal of present tariff imbalances would remove the rationale for using GSM Gateways, technically substandard solutions with additional cost for users as well as operators. Removal would mean that users and operators do not benefit from using network internal call charges instead of termination charges, or charges for incoming calls in segment pricing.

The outcome provides several lessons:

- market economy creates solutions to by-pass overpricing, even if using technically inferior solutions;
- inappropriate regulatory decisions can worsen the situation;
- setting and regulating termination charges are useless if the charges are bypassed;
- regulation should adopt the pricing used by market economy to prevent abuse; and
- regulation should actively search for, and promote use of, technically acceptable solutions so that arbitrage type market forces correct pricing anomalies.

The inappropriate regulatory decision is that operators must use termination charges and cannot use same network call charges for termination or incoming call charges. This decision detaches pricing of termination from pricing of same network calls, and the regulatory decision thus creates a monopoly market (the termination market). Trying to regulate termination charges is treating the symptoms (abuse of monopoly) instead of treating the disease (creation of the monopoly termination market).

Without regulatory involvement, the originating operator would perhaps have been treated as a large customer, and paid bulk retail charges, lower than present

termination charges. If the terminating operator could choose between the normal retail charge for a same network call or the termination charge, at least the worst form of abuse of termination would be avoided, as the retail charge would act as an automatic ceiling.

Theories of setting and regulating termination charges using any methodology are useless if such termination charges can be bypassed with significant profits. Regulatory arrangements have to be not only fair and reasonable, but also practical.

Technically appropriate GSM Gateway type equipment facilitates the possibilities that operators and customers can use alternative prices, and thus apply pressure operators and service providers to correct pricing anomalies without the need for price regulation possibly distorting competition. Finland has large numbers of PABXs directly connected to mobile switches with interfaces suitable for replacing GSM Gateways. However, the pricing anomalies have not been corrected.

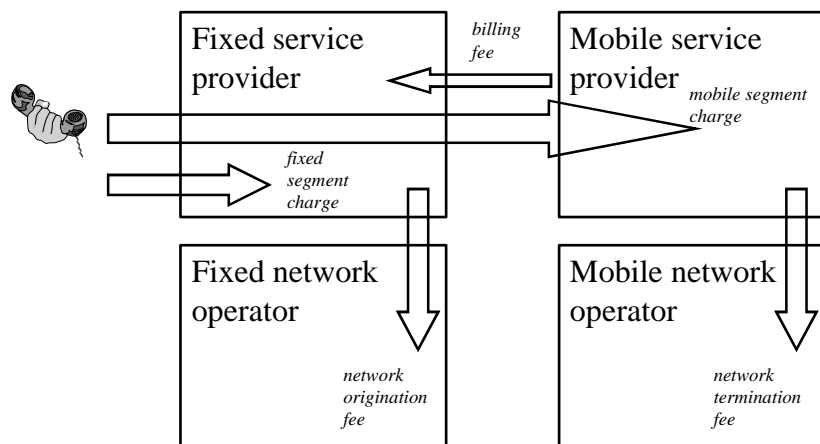
### 3.8 Role of service provider in incoming call

The possibility of introducing several separate and independent service providers operating in the same network has been an EU policy for a long time. The practice has not been that successful, but is now increasingly working in Finland, with some 10 - 15% of mobile connections. The underlying regulatory basis is e.g. accounting separation of network operations and service provision in integrated operators included in EU legislation.

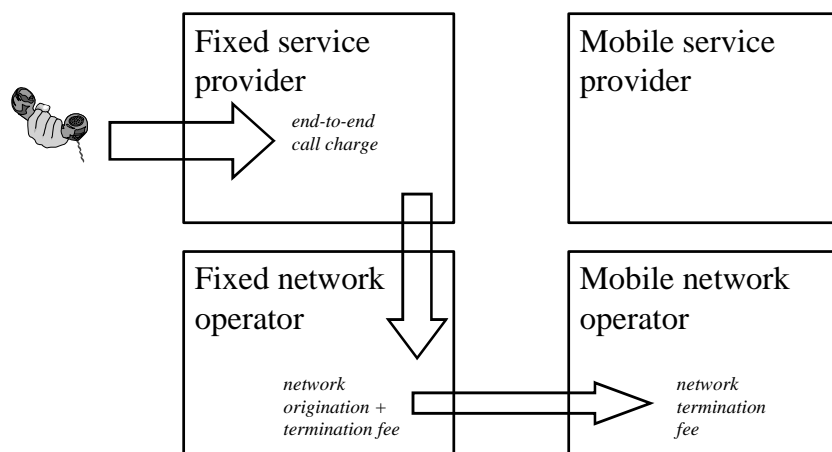
Neither origination nor termination includes much direct involvement of the service provider, the involvement is mainly billing of calls. Network operators take care of switching and other required actions. On the other hand, no call is possible unless the service provider has sold the connections to customers involved. In the increasingly competitive mobile service provision, with number portability, service providers require support rather than network operators, as the competitive pressure is increasingly on the service providers.

The segment pricing regime ensures some revenue for the mobile service provider also for incoming calls, whereas the present termination regime defines termination to be a pure network operator business. The Access Directive, Article 4, states: *Operators of public communications networks shall have the right and, when requested by other undertakings so authorised, an obligation to negotiate interconnection...* Figure 11 and Figure 12 present money flow in the two regimes.

**Figure 11. Money flow in segment pricing regime for fixed to mobile call.**



**Figure 12. Money flow in end-to-end pricing regime for fixed to mobile call.**



The question arises: *Should the service provider be paid for incoming calls?* If the service provider is paid for incoming calls, one possible solution would be that interconnection charges are the responsibility of the service provider rather than the network operator. The rationale for and against such a margin are summarised in Table 12:

**Table 12. Rationale for and against paying service providers for incoming calls.**

<b>Arguments for</b>	<b>Arguments against</b>
In normal business the entity that sells the key product (connection) should get some revenue from usage (calls)	Present practice is that interconnection is considered network operator business
A mobile service provider plans its business, pricing, even dealer network taking into account revenue sources, resulting in possible discrimination of poor people who receive calls more than make calls	The service provider is not directly involved in set-up of incoming calls or billing of incoming calls
The service provider is not directly involved in set-up of any call. There is no reason to treat incoming and outgoing calls differently	
Regulation should be neutral, also with respect to call direction	
Termination charges can be capped using retail charges if service provider is responsible for interconnection	
The network operator's business relation is with the service provider, not with other network operators, may simplify relation	
Service provision is more competitive than network operation, strengthens competitive elements, network operators compete for service providers	
Strengthens the concept of separate service providers	

In the end-to-end regime a mobile service provider can possibly take over interconnection revenue (with some additional cost) by converting to a Mobile Virtual Network Operator, if such an operator is given the right to interconnection. Such a conversion requires investment in some network elements, such as switch and Home Location Register, and employing some technical staff. A conversion mainly for the purpose of taking over interconnection revenue may be considered artificial.

If applying the two models as retail pricing options, which is easy in Finland, the mobile service provider has very different business concepts for incoming calls in the two regimes. In segment pricing it is a player and gets revenue, in end-to-end pricing the mobile service provider has the marketing cost for the connection but no revenue.

The outcome from discussions with various parties has been that a transfer of responsibility for interconnection to service providers, together with price capping using the service provider's own retail charges, should be discussed.

Lack of revenue from incoming calls may be one of the reasons why the concept of independent service providers has not been that successful.

### **3.9 Contractual relationship in termination**

Telephony has three main business areas for calls:

- same network calls;
- calls to other networks; and
- incoming calls.

Experience has shown that same network calls are most competitive, while incoming calls are least competitive. In a sector structure with service providers and network operators, the network operator agrees on same network calls and outgoing calls with the service provider in his own network (see Figure 12), and on incoming calls with another network operator. The least competitive business has been separated from the more competitive businesses.

The negotiation set-up for same network calls and outgoing calls are rather straightforward, the buyer and the seller have opposite objectives with regard to price level.

The negotiation set-up for incoming calls is different. The real buyer is the originating service provider, the seller is the terminating network operator. The originating network operator is merely a middleman. The two network operators are both sellers, as both terminate calls from the other party. Termination charges are agreed between two sellers, to be paid by third parties, a cartel type set-up that invites abuse.

In the segment pricing regime (see Figure 11) the network operator and the service provider agree on all three businesses, thus there is a more normal negotiation set-up with seller and buyer agreeing.

If agreements on termination were transferred from the network operator to the service provider, the network operator would have only one contract partner in a normal business set-up. The service provider would still try to increase termination charges, but those charges could rather easily be capped based on the same service provider's normal retail charges, using some formula. Pricing freedom would remain.

### **3.10 World Trade Organisation and interconnection**

All EU countries have committed themselves to the WTO Reference Paper<sup>8</sup>. Thus it can be understood as a "directive for the EU", and at least most parts of the document should be duly implemented.

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<sup>8</sup> [http://www.wto.org/english/tratop\\_e/serv\\_e/telecom\\_e/tel23\\_e.htm](http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm).



The Reference Paper includes the following text:

*Interconnection with a major supplier will be ensured at any technically feasible point in the network. Such interconnection is provided.*

*(a) under non-discriminatory terms, conditions (including technical standards and specifications) and rates and of a quality no less favourable than that provided for its own like services or for like services of non-affiliated service suppliers or for its subsidiaries or other affiliates;*

*(b) in a timely fashion, on terms, conditions (including technical standards and specifications) and cost-oriented rates that are transparent, reasonable, having regard to economic feasibility, and sufficiently unbundled so that the supplier need not pay for network components or facilities that it does not require for the service to be provided; and*

*(c) upon request, at points in addition to the network termination points offered to the majority of users, subject to charges that reflect the cost of construction of necessary additional facilities.*

For mobile networks, the network termination points (air interfaces) offered to the majority of users are generally not technically feasible points. A point of interconnection (POI) has to be constructed separately for the purpose. It is ironic that the GSM Gateways in fact use the network termination points offered to the majority of users, in line with the WTO Reference Paper. The underlying cost for a good POI is lower than for user termination points.

The wording *...and rates ... no less favourable than that provided for its own like services* is interesting. It can be understood so that retail rates could - or should - be used as a ceiling<sup>9</sup>. Neither the EU nor the Finnish legislation or regulatory practice have included that ceiling. If it were implemented, it would most likely have prevented many of the present problems with regulation of termination rates and generally mobile interconnection.

The ceiling includes a lot of simple common sense.

Neither the segment pricing regime nor the end-to-end pricing regime have fully met the WTO Reference Paper in this respect. The required regulatory changes are small. Finland should not introduce an end-to-end pricing regime that does not fully meet the Reference Paper.

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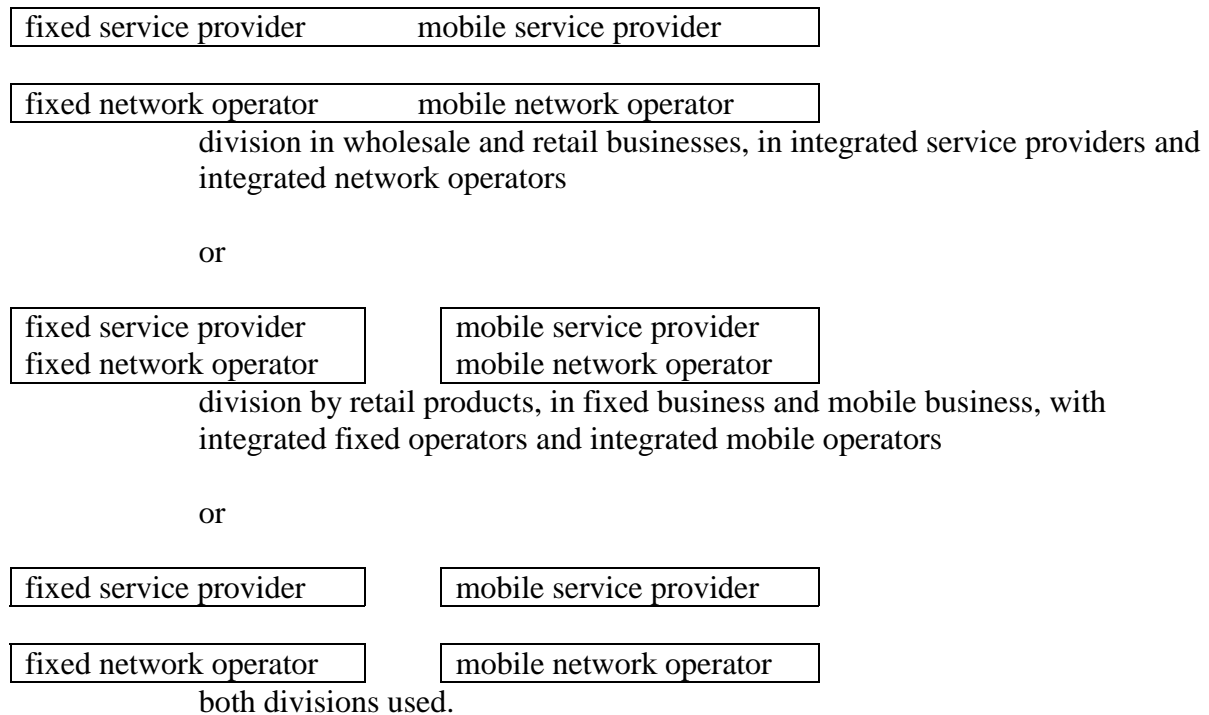
<sup>9</sup> The original meaning may refer to network operators offering network capacity to service providers, who in turn sell services to end-users. Prices for network capacity should be higher than corresponding services.

### 3.11 End-to-end pricing or segment pricing?

#### 3.11.1 Extending structural separation to pricing

Structural separation of telecommunications can be implemented in very different ways. The three main methods are shown in Figure 13.

**Figure 13. Different ways of implementing structural separation in telecommunications.**



The European approaches differ. The official structural separation is the third alternative, with both divisions used, emphasising non-integrated service providers. The purpose of accounting separation is to ensure fair treatment of non-integrated service providers.

From the customer point of view the picture is different in the end-to-end regime and the segment pricing regime. In the end-to-end regime the customer can see only one service provider for each call. The scene looks like the first alternative, with integrated service providers. The customer cannot judge how much each party charges.

In the segment pricing regime the customer can see different service providers with their own prices for the fixed and mobile segments. The scene looks separated, and the customer can judge how much each party charges, and thus make decisions based on that information.

In reality few customers use this information, they rather rely on press information or similar. The situation is, however, the same for the press, which has to rely on published retail charges to assess prices.

The situation can be compared to other sectors. Retail prices for any products with several components are usually either one price for the entire product, or each component or segment is priced separately (segment pricing). A tourist can buy travel, accommodation, sight-seeing and meals separately, even travel components separately, unbundled, such as travel to airport and the air ticket. This is considered normal. It is comparable to the segment pricing regime, with the travel agent acting based on a billing convention.

The travel bureau can also package the various components into one product, a complete vacation including travel, accommodation, sight-seeing trips and meals. This is related to the end-to-end pricing regime in telecommunications.

One price is usually convenient for the customer, easy to understand and compare, and in addition sometimes also the cheapest (e.g. tourist trip package), but not always. Telecommunications differs from travelling in the sense that usually the first telecommunications operator (access operator) sets the price for the entire package. The airport taxi, not the travel bureau, would sell the entire trip including airfare and accommodation.

Recent development in power (electricity) pricing is a step from an end-to-end wholesale regime to segment pricing and sales agent type regime. The reason for the change has been the desire to unbundle power production and transmission. The only example in the EU of similar unbundling of prices in telecommunications is the present Finnish segment pricing regime.

Properly implemented, segment pricing gives the customer the option to choose operators for the various components of the total connection. Even in the present situation, without the choice option, it adds to transparency and consumer information as the customer knows the price for each separately priced segment. It is a form of unbundling or structural separation, means that are generally considered useful in restricting the disadvantages of non-competitive network economies or even natural monopolies.

Partial structural separation is implemented on an organisational level also in an end-to-end regime, with different operators for different segments, but with one retail price for the entire call. Segment pricing extends that structural separation to retail prices, similar to the newly introduced structural separation in the power sector with separation of retail prices for power and for transmission of power. End-to-end pricing corresponds to the old power regime, and segment pricing to the new power regime. The Finnish regime does not include all the possible choices and separate prices that could be used in segment pricing.

### 3.11.2 Comparison of end-to-end pricing and segment pricing

The differences are shown in Table 13.

**Table 13. Differences between pricing regimes.**

<b>End-to-end pricing</b>	<b>Segment pricing</b>
One operator sets end-to-end price including a margin added to the wholesale termination charge	Each operator sets the retail price for its own segment and no other operator can change it
Easy to understand user cost, one price	User have to use two prices instead of one
Not transparent with regard to segment prices	Transparent with regard to segment prices
Differences in underlying wholesale prices may not be reflected in retail prices	Wholesale prices are not used, all prices are retail prices
Requires customer contract with the billing operator (usually access operator), billing convention rarely used	Customer contracts not required due to the billing convention
Terminating charges are generally not public	The prices of call segments are public
The terminating operator cannot apply retail campaign pricing, e.g. Friends and Family, and Christmas offers	The terminating operator can apply retail campaign pricing, e.g. Friends and Family, and Christmas offers without informing other operators in advance
Only end-to-end charges are shown on user bills	The user bill shows how much of the billed amount is forwarded to other operators (billing convention)

Then which regime is best? There is no clear answer, it depends on which factors are stressed.

If ease of understanding user charges is important, then the end-to-end pricing model is preferable. However, when introducing number portability, ease of finding out user charges was sacrificed in order to increase competition. That would indicate that ease is less important than competition. Separation of power production and transmission prices made understanding of pricing of power more difficult, but the increased transparency and competition was considered more valuable than ease of understanding charges.

Balancing wholesale and retail charges is also difficult. The international discussion on mobile termination has focussed on wholesale charges rather than on the retail charges, indicating that wholesale charges are more important than retail charges. The author believes that retail charges are more important, real competition is on retail level. If wholesale competition is not reflected in retail charges, then the objective of competition for the benefit of the users is lost.

User billing is approximately equal in the two regimes.

In segment pricing, the terminating mobile operator can change the retail price without advance information to originating operators. In end-to-end pricing, the termination charge is part of an interconnection agreement, and can only be changed by amending that agreement. Even then the terminating operator cannot ensure that the new price is transferred into retail prices.

Segment pricing is more transparent than end-to-end pricing. The prices of each segment are public, and there is no need to hide termination charges because they don't exist. In segment pricing the user bill shows how much of the billed amount is paid to each operator.

In order to be practical, the tariff regime must not complicate usage. In practical terms, calling is equally easy in both regimes if preselection of operators is used: only a one time choice, ordering preselection of the preferred operator. Call-by-call operator selection using prefixes is also possible in both regimes.

An overall assessment is shown in Table 14.

**Table 14. Summary of assessment criteria of segment pricing.**

<b>Factor</b>	<b>Impact</b>
User choice	No direct impact, choice is not dependant on pricing regime
User prices	The outcome is not bad, Sonera and Radiolinja are among the 3 - 10 cheapest of 30 EU operators <sup>10</sup>
Transparency	Segment pricing provides a breakdown of prices and is thus more transparent. No termination charges. Payments to segment operators are shown on user bills
Competition and entry	Both regimes restrict operators that can sell calls or call segments (see below). The end-to-end regime at present discriminates against independent service providers, entry is easier in segment pricing. In segment pricing, mobile service providers can apply Friends and Family pricing, and campaign pricing, for incoming mobile calls
Less regulation	Interconnection negotiations are easier in segment charging, as normal termination charges are not part of interconnection agreements, only technical interconnection issues are needed. Segment pricing may need less regulation as all charges are retail charges, not termination charges which may need more regulation

In a pure end-to-end pricing regime the terminating operator is not allowed sell its own products in the retail market unless he sells the entire call based on customer contracts with calling subscribers in other networks. The originating operator has the right to sell its own products, origination, and termination, the product of another operator.

<sup>10</sup> Source: EU ninth Implementation Report of the EU, Technical Annexes, using the 2003 values. The report uses the OECD new mobile baskets.

In a pure segment pricing regime operators sell their own products in the retail market, not products of other operators. The originating operator is not allowed to sell termination, and the terminating operator is not allowed to sell origination.

**Table 15. What products is an operator allowed to sell in the retail market direct to end users in different cases.**

	<b>End-to-end pricing</b>	<b>Segment pricing</b>	<b>Both</b>
<b>Originating operator</b>	May sell own and others products, bundled	May sell own products but not others' products	May sell own and others' products, no restrictions
<b>Terminating operator</b>	Not allowed to sell own or others' products	May sell own products but not others' products	May sell own and others' products, no restrictions

Both regimes include some degree of entry discrimination, even if the ban on selling own products is strange. From a competition point of view both should be allowed, which would remove entry discrimination. This is easier in Finland than in other EU countries, and Finland could act as a forerunner in this respect.

Segment pricing is used in US telephone call charging. Long distance charges include only the long distance segments, the local segment is included in the flat rate rental. In mobile, Receiving Party Pays is used, which is another form of segment pricing. This study does not cover the USA, it requires another study.

Compared to tourism and travelling, telecommunications is a one-choice industry. End-to-end and segment pricing are - at present - both one-choice regimes, even if Finland in theory has both available. In practice there is only one way to buy. Introduction of alternatives would give users more choice, most likely also introduce more competition and possibly open the market for "telecom travel bureaux" or "insurance brokers" packaging segments.

A good response to the question in the heading would be not end-to-end pricing *or* segment pricing but end-to-end pricing *and* segment pricing.

## 4 IDENTIFIED PROBLEMS AND POSSIBLE SOLUTIONS

### 4.1 General

This chapter summarises some problems identified in this study, and possible solutions. The purpose is to invite discussion on the topics.

### 4.2 Not only termination charges

The analysis of prices shows that there are problems with termination charges and with price levels of fixed to mobile calls. However, in several countries the highest charges are for mobile-mobile calls, while same network calls are underpriced. Termination charges may not be the largest problem.

The ratio between the highest and lowest charges during peak time, when network capacity is scarce, is high, even above 5.

In some cases fixed origination appears equally overpriced as mobile termination.

#### **Proposed solution:**

Do not limit analysis to fixed-mobile termination. Study the entire mobile price structure, e.g. using radar presentation as in this study. Also study fixed origination. Compare mobile segment prices to other mobile prices, as they use the same underlying network capacity. Compare general mobile price level to general fixed price level.

### 4.3 Termination is a monopoly market

Termination is defined by regulatory decision to be a market separate from the competitive same network call market, which provides players opportunities to abuse the created monopoly market. The WTO Reference Paper states that "*interconnection should no less favourable than that offered to own like services*", which is opposite to the present practice. The present practice is a kind of price discrimination.

Excess termination charges are commonly bypassed using substandard GSM Gateways, using same network call charges instead.

#### **Proposed solution:**

Two main alternative approaches are:

- treat the symptoms: lower high prices using price regulation; and
- treat the disease: redefine markets so that abuse is limited, and retain pricing freedom in the redefined, more competitive market.

The author's preference would be to treat the disease.

One possible solution is to bundle the monopoly termination market with the more competitive market for same network calls, including moving the responsibility for termination to service providers. Create a price cap for all service providers using its own retail charges. Termination charges should not exceed the retail charges for same network calls. That would perhaps have been the probable maximum price with unregulated interconnection, and regulation should not worsen the situation.

Another parallel price cap could be set by stating that termination charges shall not exceed [70%] of peak time same network retail charges, unless the service provider proves that the real cost is higher. This means that cost analysis would be an exception rather than the main rule. Similar proposals have been put forward earlier. The price cap can be implemented fast.

Two main rationale exist for imposing the cap on all service providers:

- termination is a monopoly market; and
- the cap would remove the reason for using substandard GSM Gateways.

#### **4.4 Pricing models support high termination charges**

The differences in price for fixed-mobile and mobile-mobile calls in the end-to-end pricing regime do not always reflect termination charges, particularly not the differences. This is especially the case when using uniform prices for calls to any other mobile network (or mobile service provider). The outcome is that lowering termination charges would result in a fund transfer to the originating operator, usually a competitor, meaning that there is no incentive to lower termination charges, in fact an incentive to increase termination charges.

The pricing practice strengthens the disadvantages of the monopoly market of termination charges.

##### **Proposed solution:**

Retain segment charging in Finland, which automatically transfers changes in charges for incoming calls directly in end-user prices. Origination is priced non-discriminatorily.

In the wholesale-retail end-to-end pricing regime, structural regulation of prices could require tariffs to be non-discriminatory and reflect differences in termination charges in retail prices (possibly implemented in the UK?). One possibility is that operators set a price for non-discriminatory origination, and add the termination charge.



#### **4.5 GSM Gateways are technically inferior and waste scarce spectrum**

The sole reason for the existence of GSM Gateways is price anomalies. From an economic point of view use of the equipment is positive, making arbitrage type solutions possible, thus increase competition and apply pressure on operators and service providers to correct or at least decrease price anomalies.

Present technical implementation is mainly substandard and wastes spectrum. Such solutions should not be used. In practice it is not realistic to expect that technical rules can reduce the use of such substandard equipment as long as the price anomalies exist.

##### **Proposed solution:**

Remove the reasons for using GSM Gateways, price anomalies. Termination should not be more expensive than same network calls, as cost relations clearly indicate that the cost of termination is lower than the cost of a same network call.

Regulators should actively work for introduction of technically acceptable equipment and solutions, so that arbitrage type solutions are possible, and even offer such arbitrage as authorised business, if authorisation is deemed required. In an ideal case, this and other similar solutions would reduce the need for price regulation, even if not completely remove it. This would be valid not only for fixed-mobile termination and retail charges, but also for mobile-mobile. Technical solutions already exist, e.g. connections between PABXs and mobile switches, similar to official interconnection interfaces. Operators may route traffic through PABXs and utilise company retail charges for termination.

## **5 MAJOR OPTIONS**

### **5.1 General**

This chapter includes major options that aim at overall development of the sector.

### **5.2 Study of segment pricing**

The EU could make a thorough study of segment pricing and end-to-end pricing, including related concepts such as wholesale-retail and billing convention, from a sector restructuring and competition point of view. This study should be available before making further decisions on pricing regimes. The study should also include other countries than Finland with segment pricing, e.g. the USA.

The study may result in adoption of certain elements of the segment pricing regime in the end-to-end pricing regime and vice versa, or adoption of end-to-end *and* segment pricing as alternatives for customer choice.

Even this brief study shows that segment pricing has some significant advantages that should not be discarded without analysis. Segment pricing also has disadvantages, which should be corrected.

### **5.3 Structural separation**

The EU has already achievements in structural separation of telecommunications, with separate competing mobile, long distance and international operators. This achievement provides a reasonable foundation for a market economy, even if not yet complete and not properly working competition in all parts.

This structural separation is visible to customers only partially, only in segment pricing. Users do not have a chance to find out how much the individual operators involved in the same call are charging for their input. The EU could add transparency to the existing structural separation to be visible to users in retail charges, such as segment pricing, similar to the separation already implemented in power (electricity). The purpose would be strengthened competition, even if users had more alternatives and thus more work on selecting appropriate alternatives.

Customers may be given the right to competitive purchasing of calls, not only on an end-to-end basis from one single supplier per call, but also on the basis of several self-selected suppliers for call segments.

## 5.4 Structural regulation before heavy-handed price regulation

The EU and its national regulatory bodies could consider the introduction of various means of structural regulation before applying price regulation. Price regulation is not compatible with market economy, and should be left as an almost last resort, to be mainly used as an exception rather than as the rule and first means. Most structural regulation is more compatible with market economy.

This report is not focussing on structural regulation, even if it includes some examples of structural regulation. Possibilities are abundant, imagination is the limit.

Various less competitive markets could be paired with more competitive markets using regulatory means. One example: termination of calls was separated from same network calls using regulatory definition, which created a monopoly market for termination. By reversing that regulatory definition termination of calls would not be more expensive than same network calls.

A solution for further lowering the ceiling closer to cost would be to set the ceiling for termination at X% (X between 50 and 100%) of the charge for a complete same network peak time call.

Transfer of termination from network operators to service providers is another form of structural regulation.

Tariff setting can have rules, e.g. that differences in termination charges must be reflected in retail charges, which automatically avoids price discrimination.

Assessment of regulation should include assessment of use of structural regulation, and priorities between structural and behavioural regulation.

## 5.5 Pay service providers for incoming calls

One of the EU policies has been to support creation of independent service providers, to increase competition at least in service provision. The foundation of any enterprise is revenue, reward for successful marketing efforts. Customer acquisition is more important than ever in mobile telephony after introduction of number portability. One third of the mobile business is service provision, two thirds is network operation (Finnish order of magnitude).

At present mobile service providers do not benefit from incoming calls in the end-to-end regime, only in the segment pricing regime. Incoming calls are possible only after the service provider has sold the connection, but the seller does not benefit, only the network operator. Revenue flow affects the entire business plan of service providers: marketing, sales outlets, customer care, pricing, etc. Lack of revenue from incoming calls means that service providers focus on customers who make calls, and neglect customers receiving more calls

than making. Such customers are usually poor, which means neglecting the poor, even neglecting low-income rural areas.

Regulation should be non-discriminatory, also in respect of calling direction and revenue sources.

One possibility to arrange for payments for incoming calls would be to transfer responsibility of setting and collecting charges for termination from the network operator to the service provider. The move would transfer the monopoly market from a less competitive entity (network operator) to a more competitive entity (service provider).

The move would change the relation between service providers and network operators, and possibly clarify the roles of those two. Network operators would get revenue only from service providers, which would strengthen the competition between network operators for good service providers.

When service providers are responsible for termination charges, capping termination charges using same network call charges of the same service provider would be easier.

Payment for incoming calls will result in rebalancing of tariffs, lowering outgoing mobile call charges.

There are certainly problems with moving termination responsibility to service providers, e.g. in international interconnection. Some solutions need to be worked out.

## **5.6 More choice in pricing in Finland**

Finland may consider allowing / mandating offering segment pricing *and* end-to-end pricing, at user's choice. Any operator could offer end-to-end pricing in parallel to the existing segment pricing.

Finland may consider introduction of segment pricing in mobile-mobile, retaining end-to-end pricing as an alternative. Charges for the origination part of a mobile call (for international calls) and receiving calls (fixed-mobile) are already included in mobile price plans. The sum of charges for origination and for receiving calls is today higher than call charges. Introduction of segment pricing for mobile-mobile would focus attention on balanced pricing, possibly resulting in the lowering of charges for incoming calls.

Depending on the outcome, other traffic cases may be considered later.

Some prerequisites should be met before introducing more choice:

- charges for incoming calls (segment pricing) as well as charges for termination (end-to-end pricing) should be capped using same network calls, using common sense and meeting the WTO Reference Paper requirements;
- end-to-end pricing should not remove revenue from service providers, which today receive revenue from incoming calls; and
- termination should possibly be transferred from network operators to service providers.

## 6 TERMINOLOGY

This report tries to use normal terminology as far as possible. Some terms used may need clarification, as they may be used differently elsewhere.

Local network charge	The originating fixed operator charges the local network charge to the calling fixed subscribers for the fixed segment of a call outside that network
Network operator	A network operator operates its own network to the extent that it has been given the right, and in some cases obligation, to <b>interconnect</b> with other entities. Interconnection is the most important issue for the topic of this report. A network operator can have a complete own network, or be a Virtual Network Operator using part of the network of a (full) network operator. A network operator does not offer services to the public. A network operator can be part of a vertically integrated entity with a service provider as another part. The definition may differ from other sources
Operator	The term is used in this report as a generic term for network operators, service providers and integrated entities. The context indicates which is relevant.
Origination	Origination means arranging for the first segment in a call, from the calling subscriber's access point to a point of interconnect
Service provider	A service provider offers telecommunications services to the public, using the network of a network operator. The service provider <b>does not enter into interconnect agreement</b> . A service provider can be part of a vertically integrated entity with a network operator as another part. A service provider may also be called "reseller". The definition may differ from other sources
Termination	Termination means arranging for the last segment in a call, from the point of interconnect to the called subscriber's access point

## 7 ABBREVIATIONS

F&F	Friends & Family, a generic term for a group of connections between which telephone calls are charged at a discounted rate
GBP	Pounds of Great Britain
GDP	Gross Domestic Product
GSM	Global System for Mobile communications
MHz	Megahertz, unit for certain radio frequencies
OECD	Organisation for Economic Co-operation and Development
PABX	Private Automatic Branch Exchange
POI	Point of interconnect
SEK	Swedish Krona
SIM	Subscriber Identity Module card
SMP	Significant Market Power
VAT	Value Added Tax
WTO	World Trade Organisation

## ANNEX 1

### 1 FINNISH TELECOMMUNICATIONS

Finnish telecommunications differs from all other EU countries as it has always been a true multi-operator environment, with century-long history in interconnection. The only other EU country that until recently has had several operators was Denmark, but the four operators merged in 1995 to form a national incumbent. Before liberalisation in the early 1980's the UK had one separate city operator, Kingston.

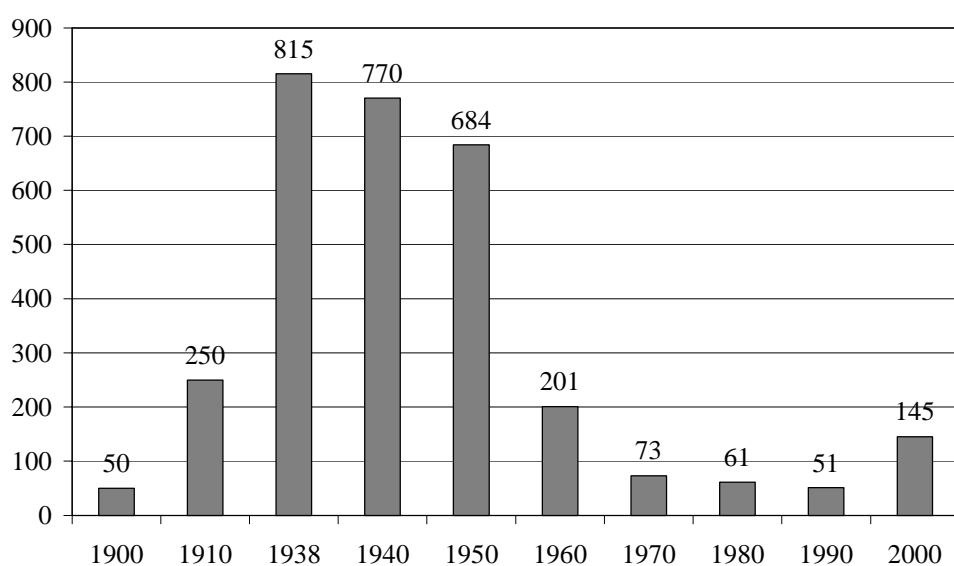
A more detailed presentation of Finnish telecommunications can be found in *Finnish Telecom Policy*, a publication of the Ministry of Transport and Communications ([www.mintc.fi](http://www.mintc.fi)).

#### 1.1 Sector structure and history

The first telephone connection in Finland was commissioned in 1877, one year after the invention of the telephone. Local telephone companies (telcos) were founded from 1882 onwards, using a multitude of corporate forms. Many of the telcos were co-operatives. In the initial years there was no state involvement in the sector.

New small telcos were created on a continuous basis. In 1938 the number was 815, with a total of about 150,000 connections. The average size was thus a mere 180 subscribers. The vast majority of the telcos were simply a small manual switchboard e.g. in a corner of a farm kitchen. See Figure 14.

**Figure 14. Number of licensed or authorised telecom operators in Finland. Source: Ministry of Transport and Communications.**





The very small telcos were not viable, particularly when automatic switching was introduced. The solution was mergers and take-overs, not bankruptcy. The merger rate increased from the 1950's, and new operators were created after liberalisation in the 1990's.

Even if no legal or formal monopoly existed, competing licences were usually not granted. Thus each telco had a de facto monopoly in its local service area.

The predecessor of Sonera, a traditional state department, was created after independence, taking over the former telegraphy business run by the Russian administration. It started telephony service in some areas, took over some local telcos, and the largest long distance operator in 1934. Sonera also ran international telephony as a monopoly. The general approach of Sonera was overpriced long distance and international charges and subsidised local charges. The situation was to some extent understandable as Sonera had more rural areas (3/4 of the land area, 1/4 of the lines) than the local telcos (1/4 of the land area, 3/4 of the lines).

Liberalisation was introduced in steps from mid 1980's, with open competition in all sectors from 1994 onwards, and no entry restrictions from 1996, except mobile, due to spectrum capacity limitations.

Key data about the telecommunications sector is shown in Table 16.

**Table 16. The Finnish telecommunications sector in 2002 in a nutshell. Sources: Telecommunications in Finland 2002.**

<b>Yardstick</b>	<b>Finland</b>	<b>Comparison</b>
Total operator revenue	euro 5012 million	
- as portion of GDP	3.6 %	OECD 3.35 (2001)
Fixed telephones	2,726,000	
Mobile telephones	4,516,000	
Fixed penetration	52.4 / 100 inh.	OECD 54.3 (2001)
Mobile penetration	80.4 / 100 inh.	OECD 53.9 (2001)
Fixed penetration	121 / 100 househ.	
Mobile penetration	178 / 100 househ.	
Broadband penetration	3.3 / 100 inh.	OECD 3.8

## 1.2 Camps in the multi-operator system

Finland has three main telecommunications camps:

- Elisa;
- Finnet; and
- Sonera.

Elisa's roots are in the private local telephone company (co-operative) in the capital, Finnet's roots are in the other private local telephone companies elsewhere in the country. All of them were local monopolies. Sonera's roots are in the state owned telegraph and telephone department, with monopoly in long distance and international and in part of the local telephone business.

All three camps have undergone significant changes after liberalisation of telecommunications, starting in the mid 1980's. Elisa and Finnet were one camp until the late 1990's, but the camp was split.

From a sector policy perspective the most important and positive feature is that a third significant national operator camp has emerged. Finland will continue to be one of the most competitive markets. Few other countries have three country-wide facilities based full-service operators. The exception of competition is fixed telephony connections to residential users and to small and medium size enterprises.

**Table 17. Market share based on gross revenue and connections in 2002. Source: Tietoliikennemarkkinat Suomessa 2003.**

<b>Camp</b>	<b>Gross revenue (euro million)</b>		<b>Connections (million)</b>			
	<b>euro</b>	<b>Share %</b>	<b>Fixed</b>	<b>Mobile</b>	<b>Total</b>	<b>Share %</b>
Sonera	2374	50	851	2516	3367	46
Elisa	1587	34	943	1345	2288	31
Finnet	769	16	819	713	1532	21
Other	186	4	80	0	80	1
<b>Total</b>	<b>4719</b>	<b>100</b>	<b>2693</b>	<b>4574</b>	<b>7267</b>	<b>100</b>

The Table shows that Sonera alone has 50 % of the total market by revenue. Elisa has one third, Finnet one seventh, and all other, including entrants, together a mere 4 %. The market share by connections is different.

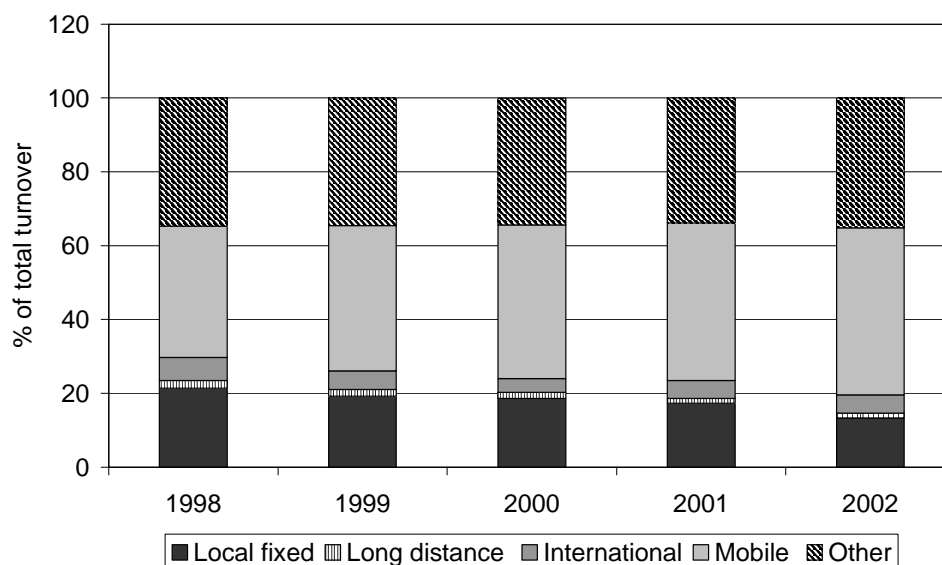
### 1.3 Overall trends

The main sectors in telecommunications are:

- local (fixed);
- long distance (relevant only for fixed, not for mobile in European type mobile telecommunications);
- international;
- mobile;
- data communications; and
- other.

The Finnish distribution of total revenue (turnover) is shown in Figure 15 and Table 18.

**Figure 15. Distribution of total operator revenue in 2002, per cent. Source: Telecommunications in Finland 2002.<sup>11</sup>**



**Table 18. Distribution of total operator revenue in 2002, per cent. Source: Telecommunications in Finland 2002.**

	1998	1999	2000	2001	2002
Local fixed	21.4	19.2	18.6	17.3	13.3
Long distance	2.1	1.9	1.6	1.3	1.3
International	6.2	5	3.8	4.9	5
Mobile	35.6	39.3	41.6	42.6	45.2
Other, incl. data & cable	34.7	34.6	34.3	33.9	35.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

The comparison uses revenue rather than connections, as revenue is the most relevant yardstick in most businesses and across sectors, easily understood even by outsiders. The number of connections is commonly used as a yardstick, but losing relevance with the emergence of prepaid, and relevant only for those telephony operators offering connections, not for other sectors such as data communications, long distance and international services, etc. Telephony can also be compared using call minutes or other traffic yardsticks. A thorough comparison would use several yardsticks.

Mobile is the largest subsector, and growing. For that reason mobile deserves most attention. A large and growing sector also attracts investors.

<sup>11</sup> Note that the figures are turnover, gross revenue. In a multi-operator environment such figures include some components twice, such as interconnection. The best information would be value-added, but such data is unfortunately not available.

"Other" is the second largest sector. It includes cable television and e.g. data communication and data security services.

Local fixed telecommunications is diminishing, but still the third largest sector. For historical and political reasons fixed telephony has generally received more attention than it now deserves based on its market share. Most Universal Service policies are based on fixed telephony despite market development showing that the preferred service for voice is increasingly mobile, in particular pre-paid mobile.

A number of countries<sup>12</sup> have abolished national long distance charges in fixed telephony, while many others have increased the size of local call areas, either voluntarily or by regulatory decisions. In Finland, the most sparsely inhabited country in the EU, the national long distance market still exists as a retail sector, but it is a mere 1.3% of total revenue.

International telecommunications is also a minor sector in countries in which competition has forced down the charges to a cost based level, and correspondingly, usage has grown.

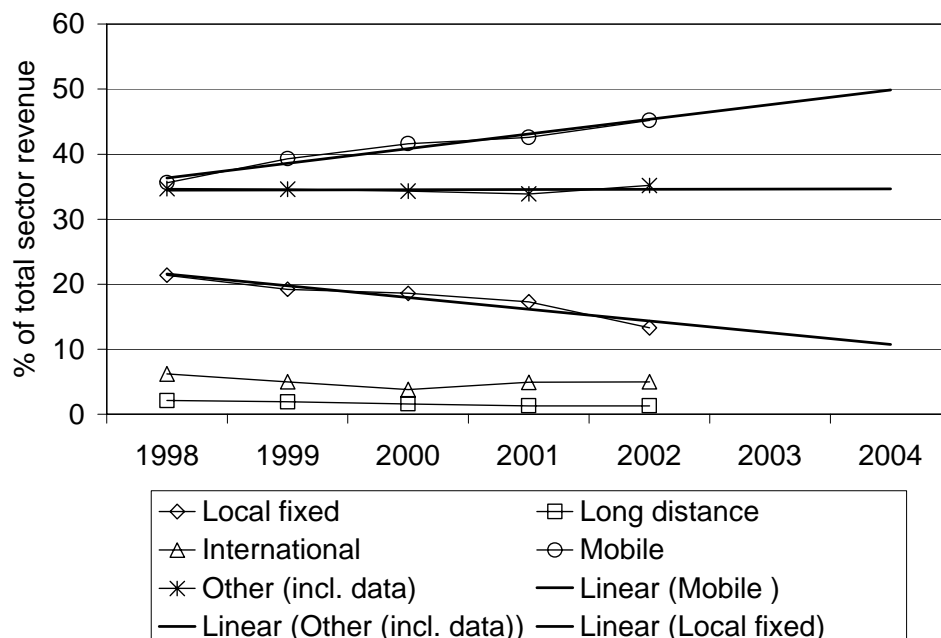
Due to technical development, the importance of distance is generally diminishing, also on an international level. For that reason long distance and international do not deserve that much attention. The cost of the distance element is still important in marginal applications, on very long routes with very low traffic, such as remote areas in national traffic, and in developing countries, often due to overpricing.

Future development of importance may be estimated for maybe two years using regression lines. See Figure 16.

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<sup>12</sup> In Europe at least Belgium, Denmark, Estonia, Iceland, Norway, Sweden. Very small countries never introduced long distance charges. UK has partial implementation.

**Figure 16. Estimate of future development of market development in Finland using regression lines.**

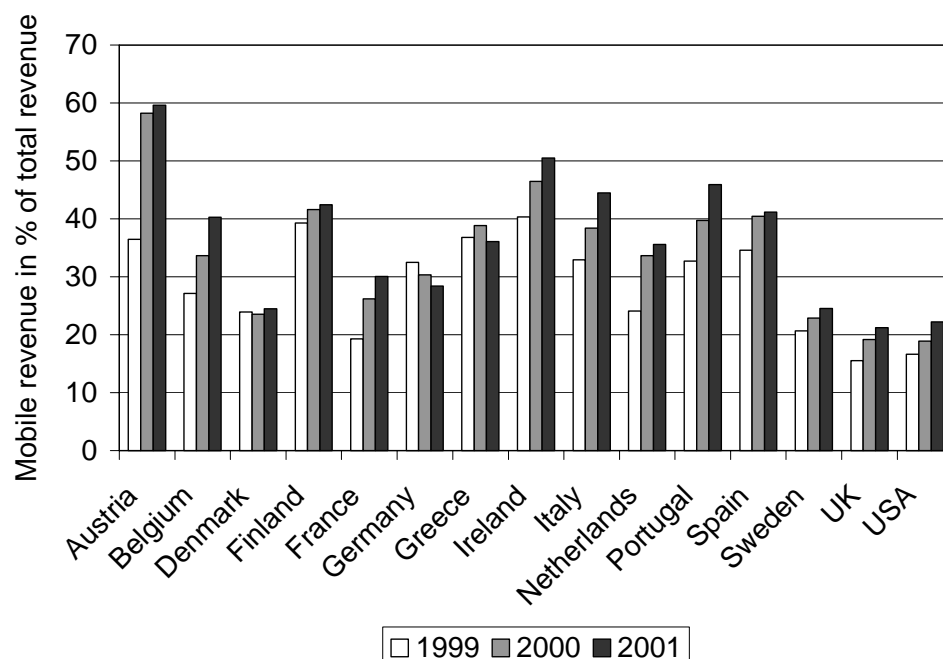


This linear extrapolation predicts that mobile revenue reaches 50% in 2004, and local fixed telephony revenue decreases below 10 % in 2004. The forecasts point out that mobile deserves most attention, local fixed telephony appears to be a sunset technology for voice, and perhaps no longer deserves that much attention. In particular, new entrants cannot be expected to be interested in a small sunset market. Policies should focus on the future rather than on the past.

Other countries show similar patterns, at least with regard to mobile revenue. See Figure 17.

It is interesting to note that the mobile market shares e.g. in Sweden and UK are among the lowest. No reason is known, but possibly price elasticity and impact of pricing patterns may explain part.

**Figure 17. Mobile revenue as % of total telecommunications revenue. Source: OECD Communications Outlook 2003.**



The EU Implementation Report would benefit from a market development trend analysis. The present rather strong focus on fixed telephony may be seen in a different light if the market for fixed telephony is found small and shrinking. Such an analysis would give a better understanding of which sectors can be expected to attract new investors.

## 1.4 Segment pricing substitutes interconnection charges

### 1.4.1 General description

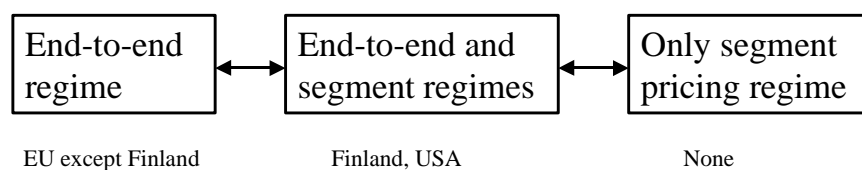
Segment pricing means that each operator sets the retail call price for its own segment, without wholesale components such as interconnection. End-to-end pricing means that one operator buys segments from another operator at wholesale prices, and sets the price for the entire call.

The original reason for segment pricing was the multi-operator sector, with independent local operators and long distance operators. No party accepted other parties to have power to influence their retail call prices.

### 1.4.2 Application of segment pricing

The Finnish regime is a partial segment pricing regime, not a full segment pricing regime. See Figure 18.

**Figure 18. Examples of application of pricing regimes.**



A pure segment pricing was not technically possible when the present regime was developed, due to originally manual, and later analogue, switching.

When automatisisation of long distance was implemented in 1958, charging was technically implemented using charging pulses. Monitoring such pulses was technically possible even in old analogue switching technology. Customer charging was based on total number of pulses, without distinguishing between various operators, call types or call segments. Improved billing, distinguishing operators, call types and call segments has been introduced later.

The exceptions from the general segment pricing rule are:

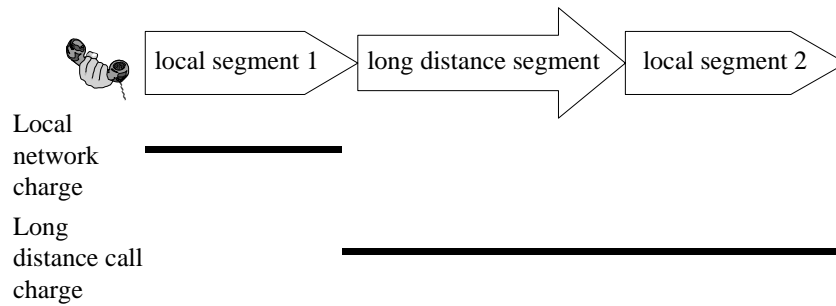
- local calls with more than one operator involved;
- the terminating local segment in long distance calls;
- mobile to mobile; and
- mobile to fixed.

In the case of long distance one price is set for the long distance segment + terminating local segment and a termination charge paid to the terminating operator. In other cases end-to-end prices are applied and termination charges paid to terminating operators.

#### *1.4.3 Description of charging by call type*

The following Figures present Finnish call charges when more than one operator is involved. Please note the term *local network charge* (covering only local segment 1, originating local segment). See also the description of the EU intervention in interconnection in 1999 (see Annex 1 Chapter 1.6.3). The Figures show the present situation, after the 1999 intervention.



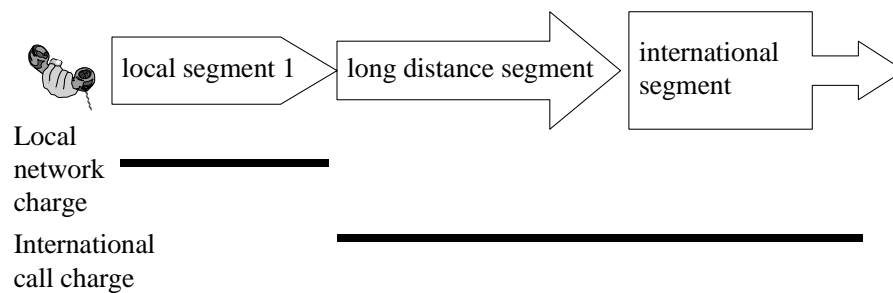
**Figure 19. National long distance call.**

Legend for Figure 19:

**Retail charge:** local network charge + long distance call charge.

Local network charge covers local segment 1.

Long distance call charge covers long distance segment + local segment 2.

**Figure 20. Outgoing international call.**

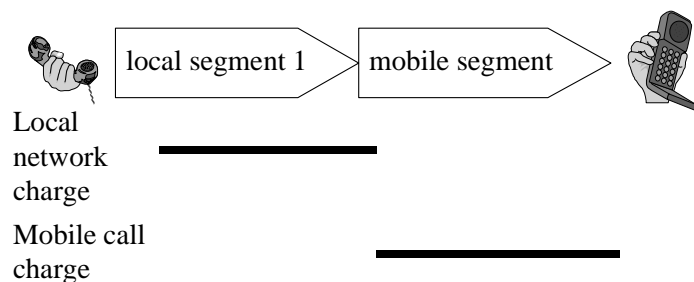
Legend for Figure 20:

**Retail call charge:** local network charge + international call charge.

Local call charge covers local segment 1.

International call charge covers long distance segment + international segment.

Outgoing calls from mobile networks: mobile-fixed network call charge + international call charge.

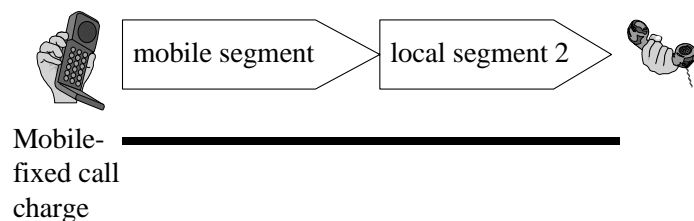
**Figure 21. Fixed to mobile call.**

Legend for Figure 21:

**Retail call charge:** local network charge + incoming mobile call charge.

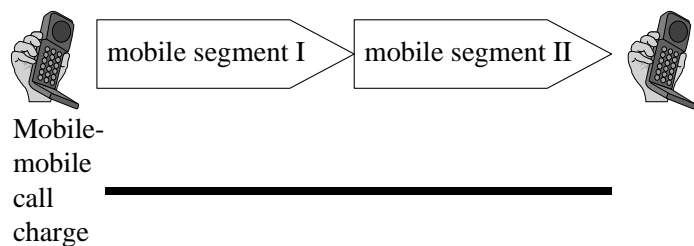
Local network charge covers local segment 1.

Incoming mobile call charge covers mobile segment and is charged to the calling fixed user.

**Figure 22. Mobile to fixed call.**

Legend for Figure 22:

**Retail call charge:** outgoing mobile call charge (end-to end pricing).

**Figure 23. Mobile to mobile call.**

Legend for Figure 23:

**Retail call charge:** mobile-mobile call charge (end-to end pricing).

The above Figures 19 - 23 present only the most common retail prices. Other traffic cases (e.g. premium rate services) are also included in the system in a corresponding way.

No retail charges are charged to the receiver for receiving calls, except for call forwarding and international roaming, which are not included in the above cases.

#### 1.4.4 Breakdown of charge for incoming mobile call

The retail charge for incoming mobile calls from a fixed network (charged to the fixed caller) differs from the termination charge used in the end-to-end regime. The mobile service provider sets the charges for incoming calls and sells the service to fixed subscribers. The calls may be e.g. normal priced calls or Friends and Family calls. The mobile service provider pays the mobile network operator a termination charge independent of call type.

A breakdown in four components makes it more easily comparable with countries using end-to-end pricing:

- VAT;
- termination charge for the mobile network operator (comparable to other countries, the mobile service provider pays the mobile network operator);
- billing fee for the fixed operator billing for the call; and
- a margin for the mobile service provider.

The breakdown is detailed in Table 19, with explanations below the Table.

**Table 19. Breakdown of Finnish retail charges for incoming mobile calls. All figures euro cents per minute. See comments below. F&F means Friends and Family.**

	Sonera			Radiolinja		
	Day	Eve	F&F	Day	Eve	F&F
Retail charge for incoming mobile call	24.0	16.0	11.0	26.0	17.0	10.0
Of which VAT	4.3	2.9	2.0	4.7	3.1	1.8
<b>Retail charge net of VAT</b>	<b>19.7</b>	<b>13.1</b>	<b>9.0</b>	<b>21.3</b>	<b>13.9</b>	<b>8.2</b>
Billing fee 5% of retail charge to fixed operator	1.0	0.7	0.5	1.1	0.7	0.4
Termination charge to mobile network operator	12.8	12.8	12.8	13.2	13.2	13.2
Balance, mobile service provider margin	5.9	-0.3	-4.2	7.0	0.0	-5.4

Comments on Table 19 (see also Figure 24):

This breakdown is not publicly used in Finland, it is developed for this report for better understanding of the regime as compared to a termination regime. The exact figures depend on the contracts between the service provider and network operator.

The standard price for incoming calls to mobile is shown separately in the price list, not together with outgoing call charges, and not always that easy to find in operator price lists.

*Friends and Family (F&F)* type calls (Sonera's service name *Home call*, Radiolinja's service name *Heimo*) are offered for calls between one fixed connection and some 5 - 10 mobile phones, in any direction. They are services offered by the mobile service provider, at discounted price. The service is possible only because of the segment pricing regime, as the mobile service provider offering the service is not involved in incoming calls in the end-to-end regime.

The mobile service provider offers F&F service to fixed subscribers at a loss. The price is lower than the mobile termination charge paid to the mobile network operator. The fixed service provider charges the same origination price independent of type of call (normal call or F&F). F&F charges or other discounted fixed to mobile charges occur in other countries (Sweden and UK in this selection), but the fixed operator deducts the discount from its own margin, not the mobile service provider.

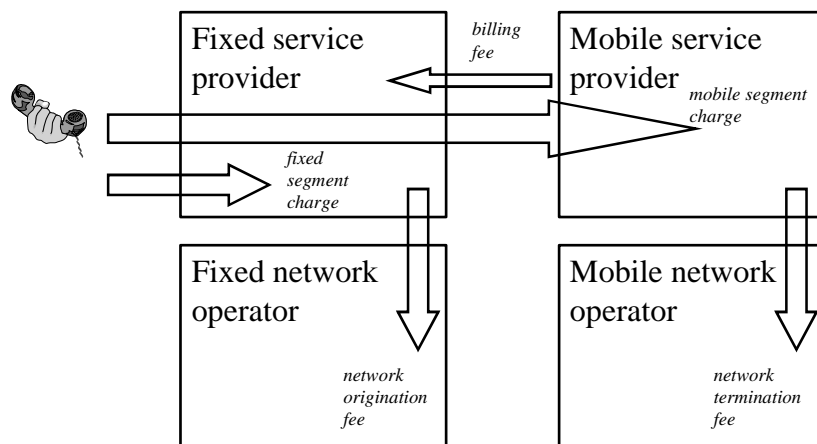
The mobile service provider uses the fixed service provider for billing the calling fixed customer for the mobile segment (billing convention, see Annex 1 Chapter 1.5). The mobile service provider pays the billing operator a fee to cover billing costs and bad debts. The fee is here assumed to be 5% of the retail charge. The fee varies (sources say 5 - 8%) and is not public.

After deducting VAT, billing fee and termination charge from the retail charge, there is a balance, positive or even negative. That balance has no commonly used name, and in this report it is called *mobile service provider margin*. The rationale is that any participating player should get revenue from any call, preferably so that net revenue (margin) is roughly independent of calling direction. An incoming call would not take place if the service provider had not sold the connection. Customer acquisition is costly, particularly after number portability was introduced. In the end-to-end termination regime the mobile service operator does not get any revenue from incoming calls, as termination is defined in regulation as a network operator business.

The difference in the regimes raises the question: ***does the mobile service provider deserve payment for incoming calls, also in the present termination regime?*** See also Chapters 3.8 and 5.5.

Money flow in the Finnish segment pricing regime is shown in Figure 24.

**Figure 24. Money flow in segment pricing regime.**



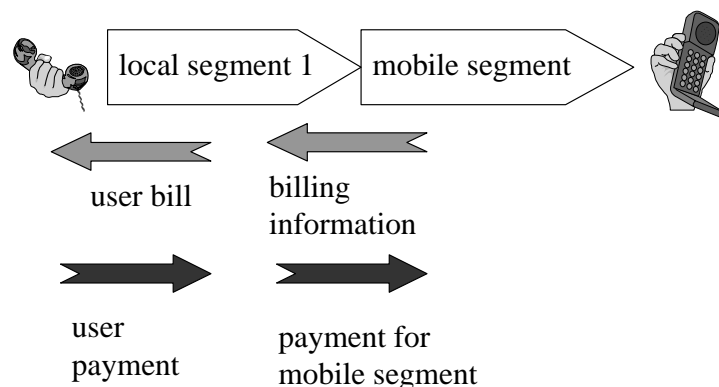
Should Finland for one reason or the other convert to end-to-end pricing (proposals have been put forward), the impact on the revenue of separate service providers needs study, as they would lose revenue. The present portion of call revenue of the mobile service provider from incoming mobile calls is not disclosed, but may perhaps be of the order of 20% (author's guess). End-to-end pricing (or more exactly the present termination regime in such end-to-end pricing) discriminates against mobile service providers compared to segment pricing. The differences are reflected in call price structures. A change would possibly force mobile service providers to increase outgoing call charges.

### 1.5 Call billing convention

In an end-to-end charging regime no billing convention is used. In the segment charging regime a billing convention is necessary. Setting call segment charges independently does not mean that the operator setting the charges also bills the user.

The billing convention means that the originating local fixed, or mobile, operator invoices the call charges on behalf of all parties involved in the call. The billing operator is also responsible for any bad debts. In order to compensate for billing cost, bad debts etc., the originating operator retains an agreed portion (some 5 - 8 per cent) of billed amounts and forwards the balance to the other operators (long distance, international, mobile, etc.). See Figure 25 for structure of fixed-mobile billing and payments.

**Figure 25. Main structure of call billing convention.**



The billing convention also means that the billing operator in the segment pricing regime acts similarly to an agent, not as a retailer as is the case in the end-to-end pricing regime.

This arrangement means that customers receive one single bill for all telephone charges to that connection. Figure 26 shows a simplified example.

**Figure 26. Simplified example of user bill for fixed connection, net of VAT. Charging between operators is based upon pulses, thus pulses shown indicate amount forwarded to other operators.**

	Amount	Unit price	Total	Goes to
<b>Local calls</b>				
Local call minutes	77	0,0098	0,75	<i>fixed local operator</i>
Number of local calls	30	0,0803	2,41	<i>fixed local operator</i>
<b>Long distance calls</b>				
Song Networks pulses	350	0,0673	23,56	<i>Song Networks</i>
Local network charge minutes	437	0,0057	2,49	<i>fixed local operator</i>
Local network charge number of calls	54	0,0574	3,10	<i>fixed local operator</i>
<b>Calls to mobile</b>				
Radiolinja pulses	22	0,0673	1,48	<i>Radiolinja</i>
Local network charge minutes	7	0,0057	0,04	<i>fixed local operator</i>
Local network charge number of calls	2	0,0574	0,11	<i>fixed local operator</i>
Sonera pulses	621	0,0673	41,79	<i>Sonera</i>
Local network charge minutes	275	0,0057	1,57	<i>fixed local operator</i>
Local network charge number of calls	40	0,0574	2,30	<i>fixed local operator</i>
<b>Total</b>			<b>79,60</b>	

Other call types are billed similarly.

## 1.6 Interconnection

### 1.6.1 Period 1958 - 1993

This description starts with the interconnection regime created for automatic telephone service commissioned in 1958.

Originally no termination charges were in use. *Sender keeps all* (or *Bill and keep*) was used for outgoing calls, the originating local operator retained the entire local call charge. Incoming local call segments were handled free of charge, for national as well as for international calls. The traffic was reasonably balanced, originated and terminated call minutes were about equal. Arrangement for reliable monitoring of traffic (number of calls and call minutes) would have been expensive in analogue switching, part of which was as old as from the 1920's and 1930's.

A similar arrangement was in use for international and subsequently on mobile. The local operator used local call charge for outgoing calls, and handled incoming calls free of charge. The mobile and international call charge covered the segment from the POI between local and long distance networks onwards.

### 1.6.2 Period 1994 - 1999

When mobile services became more important, the situation changed. Mobile traffic was not well balanced, initially mobile was used significantly more for outgoing calls than for incoming calls. Also other call types emerged such as premium rate calls and toll-free calls. Termination charges had to be introduced and *sender keeps all* was abandoned. Digital switching technology was already widely employed, easing such a change.

The solution was agreed between the operators without regulatory involvement, and was introduced in 1994. The local call charge (functioning as a price cap) was split into two parts, for the originating and terminating local segments. The termination charge was standardised, the same in the entire country, and did not differ between the 40+ operators.

The long distance operators acted as clearing-houses. The originating local operator paid termination charges to the long distance operator for the total of originating minutes, and the long distance operator paid the terminating local operator the same amount. Due to the clearing-house concept, there was no need to separate between destination local areas. The long distance operator then paid the termination charges to the destination local operator without separation by originating local areas or originating local operator.

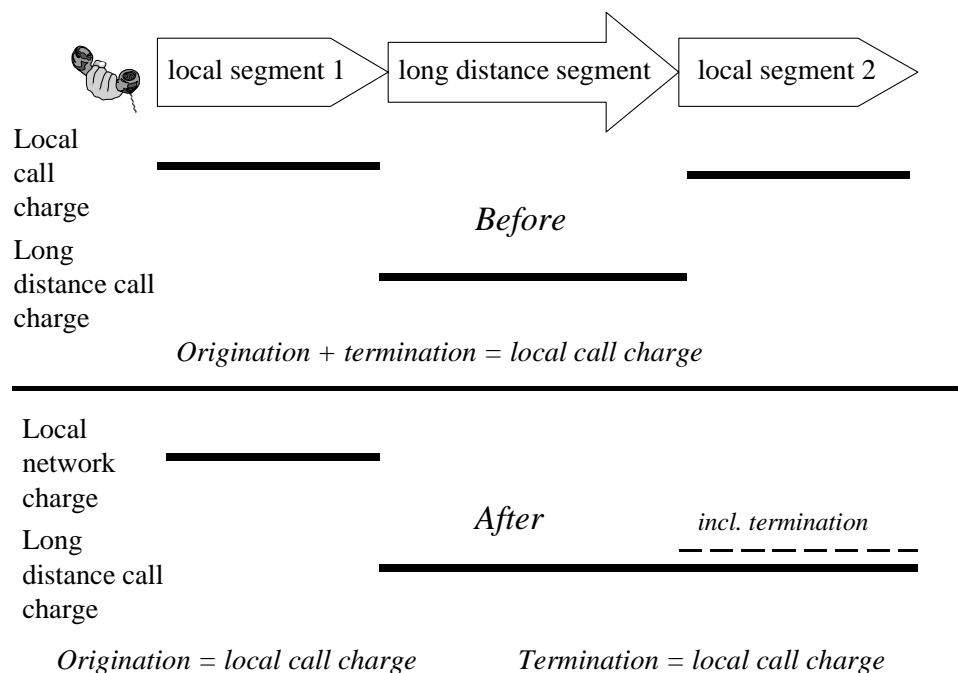
The originating local operator charged a normal local call charge, paid the termination charge and kept the balance as origination charge. The local call charge was an automatic ceiling. The interconnection market was part of the overall local call market, not an independent market.

The system was simple, which is needed in a true multi-operator environment, and worked without regulatory involvement. It was self-regulatory, as the termination charges were paid from the local call charges on a revenue sharing basis. Termination charges were set at about half the average local call charges. The system still maintained the principle of keeping local call retail prices (covering outgoing segment + terminating segment) fully separate from long distance segment prices (covering only the long distance segment).

### 1.6.3 EU intervention in 1999

However, the system was based upon retail charges<sup>13</sup> and did not correspond to the EU principles of operator specific cost oriented interconnection charges. The EU intervened (without any assessment of the impact), and required each local operator to set its own termination charges based on its own cost. Furthermore, the termination charges should be included in the long distance charges and not in the originating local segment charges. The agreement on uniform termination charges needed for the self-regulatory feature could also be said to be a cartel.

**Figure 27. Charge structure before and after intervention.**



The changes required by the EU were implemented. The changes removed the self-regulatory feature (the sum of origination + termination charges equals local call charge, a ceiling function). It blurred the boundaries between operators and

<sup>13</sup> The Finnish local call charges have traditionally been non-subsidised, and thus they are in reality cost based. The local operators have to survive on their revenue from local calls, as they have little other revenue.

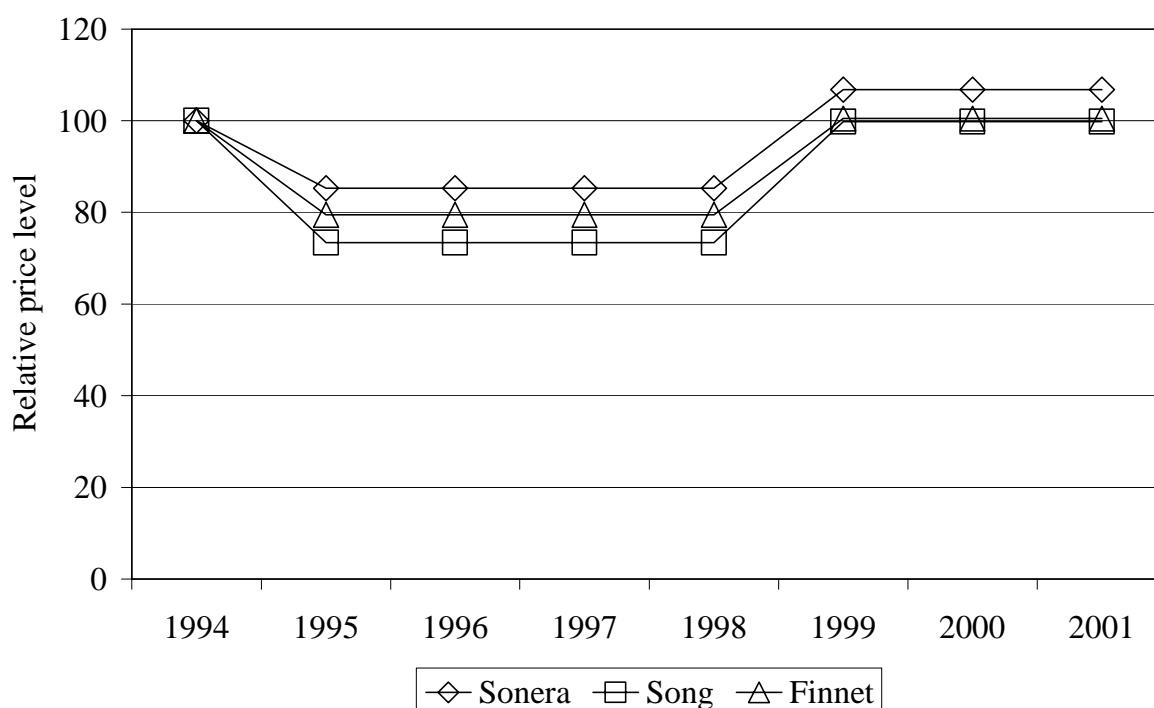


their charges, long distance operators were no longer charging pure long distance charges. The impact on charges was the following:

- the terminating local operator increased the termination charge, up to full local call charge;
- the long distance operator included that new termination charge in long distance charges and increased prices; and
- the originating local operator increased the local origination charge, up to full local call charge.

Regulatory intervention was needed to counter the increases. The situation, even after the regulatory intervention, was an increase of retail tariffs and an expectation that further intervention may be necessary, possibly with repeated court cases so common in other countries. See Figure 28.

**Figure 28. Relative price level development of national long distance call charges. Year 1994 is 100. EU intervention was effective in May 1999. Source: Telecommunications statistics 2002.**



The situation before the intervention was one local call market, which included origination and termination due to the ceiling function. The intervention detached two new markets, origination and termination. Both new markets work as de facto monopoly markets, less competitive than the local call market.

A summary of the impact of the intervention is summarised in Table 20.

**Table 20. Impact of EU intervention in interconnection in 1999.**

<b>Factor</b>	<b>Impact</b>
User choice	No change
User prices	Increased
Transparency	Less clear division between retail charges for local and long distance
Competition and entry	No change
Less regulation	Created need for regulation

The overall impact was negative. It is probably not easy to reverse the intervention, even if the outcome suggests that reversing would be justified.

No thorough analysis of the reason for the failure of the intervention has been carried out. The author's understanding is that the legislation applied was designed for an incumbent type environment (and needed in such environment), but such legislation is not suitable for a true multi-operator environment, and should be cautiously enforced.

Denmark merged all traditional operators, and created one incumbent. Finland has not done that, but it would have eased application of the incumbent type legislation.

## ANNEX 2

### 1 MOBILE CHARGES IN FOUR COUNTRIES

#### 1.1 Methodology

Mobile retail tariffs vary. Price plans are targeted at different user groups, depending on operator pricing choice, e.g.:

- pre-paid - post-paid;
- small users - heavy users;
- daytime (business users) - evening and weekend (residential) users;
- same network calls - cross network calls;
- low rental high call charge - high rental low call charge;
- single band (900 MHz) - dual band (900 + 1800 MHz);
- discounts for long calls (typically after 5 minutes);
- bulk discounts after some minimum monthly spending - increased prices after some minimum spending;
- etc.

All price plans included in the comparison are normal post-paid, assuming that those price plans include cheaper charges than pre-paid. Charges based on business customer contracts have not been included. Only price plans currently available for new subscriptions are included. The price plans with the cheapest and the most expensive per minute call prices are included.

All charges presented are per minute, excluding a possible set-up charge or minimum charge, minutes included in rental, etc. Special discounts to possible small groups (Friends and Family type) are included only for fixed to mobile<sup>14</sup>. Minutes included in rental and cheaper minutes for long calls (beyond e.g. 5 minutes) are ignored, as well as bulk discounts after a minimum spending.

The approach is an attempt to find a user price that reflects the marginal cost of the service provider for additional call minutes. Such cost is comparable to wholesale termination charges, one of the problematic prices in interconnection.

The source for all mobile pricing information is the retail price list on the relevant operator's web site. Web site tariffs were checked 7 February 2004.

For termination charges the source is the EU's ninth Implementation Report, without which many of the calculations in this report would not have been possible. Several persons suggested, and even submitted, more up-to-date information on termination charges. Such information is confidential, and readers of this report would not have one single public source for all termination

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<sup>14</sup> A guess on the importance of friends and family tariffs is that maybe 20 - 30% (increasing portion) of fixed - mobile calls in Finland are charged using such discounted tariffs. Source: various discussions with stakeholders. Exact figures are business secrets.

charges. The Implementation Report is one of the few public sources for termination charges, and even that source averages peak and off-peak charges.

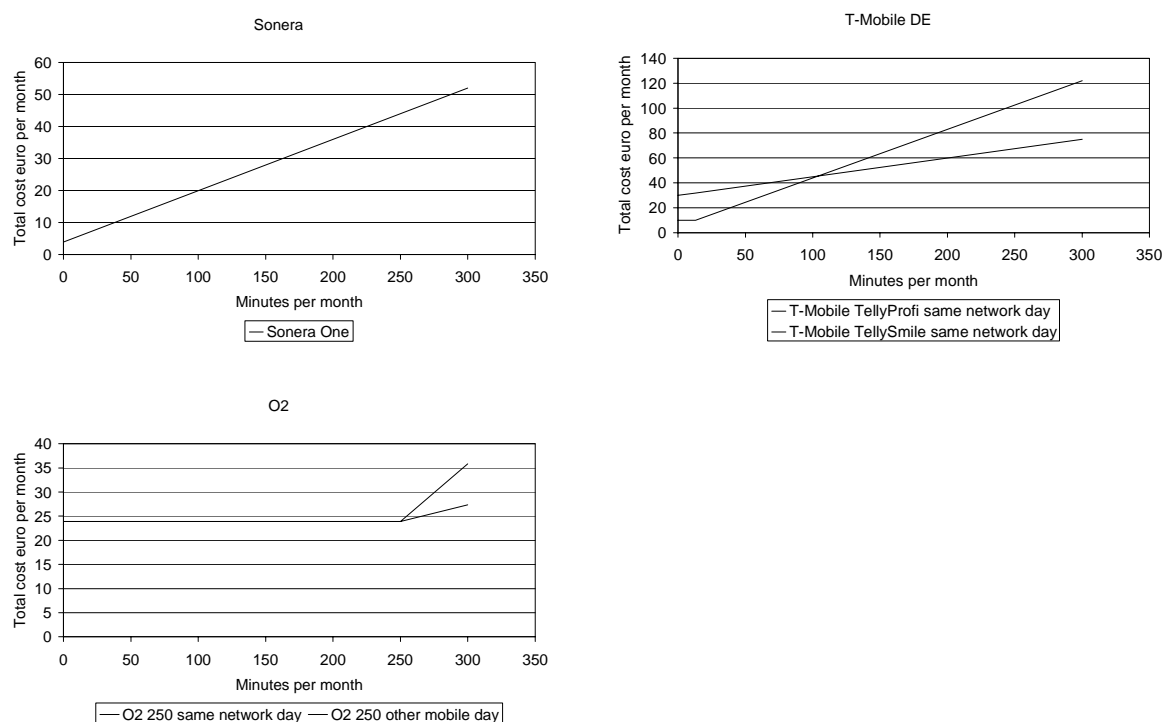
The source for operator market shares is a price comparison of digital mobile call charges<sup>15</sup> published by the Finnish Ministry of Transport and Communications, using the original source Mobile Communications, April 2003. Exact figures on market shares have little importance in this analysis.

Exchange rates used are: one euro corresponds to 0.6832 GBP and 9.1175 SEK. Exchange rates are of 6 February 2004. VAT rates are Finland 22%, Germany 16%, Sweden 25%, and UK 17.5%.

## 1.2 Comments on operator pricing

One important factor is operator pricing principles. Three very different pricing principles were found, and are illustrated in Figure 29

**Figure 29. Three different pricing principles. The selected operators represent pricing principles typical for their country. Finland and Sweden have similar pricing.**



Finnish operators use the principle of a rental and after that per minute charge for all minutes. Swedish operators use similar principles. The charge may or may not vary by call type depending on price plan.

<sup>15</sup> Digitaalisten matkapuheluiden hinnat vuonna 2003, Kansainvälinen vertailu, Ministry of Transport and Communications June 2003.

German operators use similar principles, but they have alternatives with higher rental corresponding to lower per minute charge. Per minute charges vary by call type.

British operators use the principle that the rental is the main customer charge, and that rental includes a certain amount of minutes which do not have per minute prices for various call types. Additional minutes (exceeding those included) are priced higher than average minutes included in the rental. The pricing principle means *negative* bulk discount<sup>16</sup>.

The author's opinion is that it is not possible to get a reasonably reliable estimate for typical per minute user price for different types of British mobile calls (e.g. same network calls, calls to fixed and calls to other mobiles). Nevertheless this study has to use the published per minute charges, as no other per minute charges were found. The alternative would be to abandon UK and include another country in the comparison. Readers should be cautious when making conclusions based on the British data presented.

During the work questions arose about the validity of standard tariffs, when a considerable portion of mobile traffic is said to use special tariffs, e.g. business tariffs, tie line tariffs<sup>17</sup>, Friends and Family, other discounts, etc. The argument may well be partially valid. Some typical per minute prices are, however, needed for the purpose of finding pricing patterns, pricing differences and anomalies, etc.

### 1.3 Price plans by operator

The profiles of post-paid price plans of the two largest operators for each of the four selected countries are shown below. The presentation does not show each and every price plan for those operators that have many, when the principles of the operator's price plans anyway are obvious and those principles are included in the presentation below. Night and weekend prices are not shown. The differences in prices and structures are anyway so large that additional operators or price plans would not change the outcome of this analysis. The price plans with the cheapest and most expensive per minute call prices have been included.

Conditions vary in different countries for a number of reasons, e.g. radio spectrum allocation principles that vary between countries. Some countries have single band operators, 900 MHz operators and 1800 MHz operators, while other countries have dual band operators. Spectrum prices vary considerably (spectrum auctions or administrative assignments).

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<sup>16</sup> Somewhat similar pricing is known in the power sector. That is based on the high marginal price for power production in situations when the total power production is near its ceiling, and is thus cost based. Telecommunications does not have such cost factors.

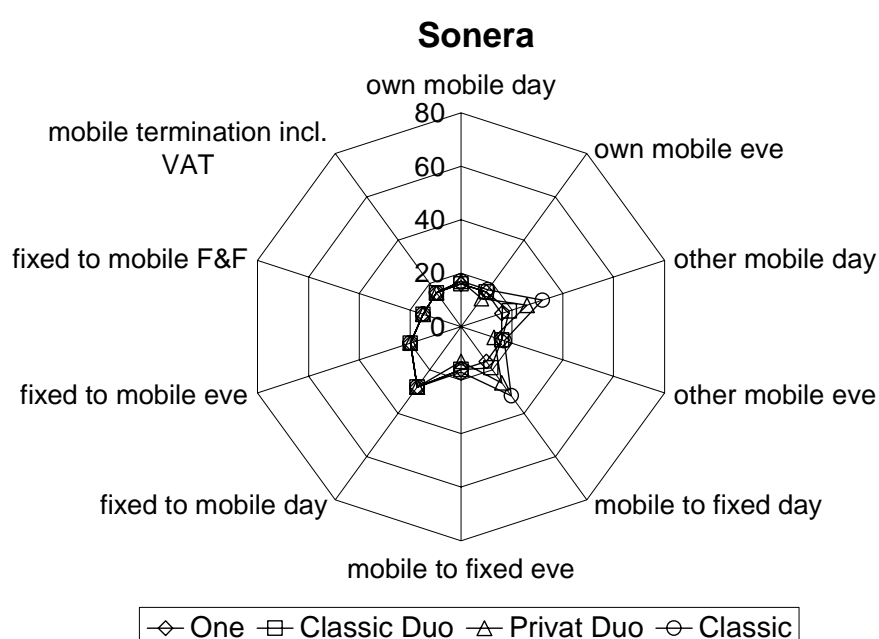
<sup>17</sup> Tie lines are used for direct connections (leased lines) between e.g. large PABXs and mobile networks, usually incorporating the company's mobiles in extension numbering (the PABXs internal numbering). Such arrangements has special charges and may be negotiated on a case by case basis.

In order to ease comparison and understanding of order of magnitude, the scale of the graphs is the same.

Each comparison either includes VAT or not. Comparison of retail charges is mainly including VAT, while comparisons with focus on wholesale charges and fees are net of VAT. Prices are thus not always comparable between two individual comparison tables.

### 1.3.1 Sonera, Finland

**Figure 30. Sonera's profile. All prices per minute, euro cent incl. VAT.**



**Table 21. Sonera's mobile price plans. All prices per minute, euro cent incl. VAT.**

Connection type	One	Classic Duo	Privat Duo	Classic
own mobile day	16.0	16.0	17.0	17.0
own mobile eve	16.0	16.0	13.0	17.0
other mobile day	16.0	19.0	26.0	32.0
other mobile eve	16.0	16.0	13.0	17.0
mobile to fixed day	16.0	19.0	26.0	32.0
mobile to fixed eve	16.0	16.0	13.0	17.0
fixed to mobile day	3.9+24.0	3.9+24.0	3.9+24.0	3.9+24.0
fixed to mobile eve	3.9+16.0	3.9+16.0	3.9+16.0	3.9+16.0
fixed to mobile F&F eve	3.9+11.0	3.9+11.0	3.9+11.0	3.9+11.0
mobile termination incl. VAT	15.6	15.6	15.6	15.6

The charge for fixed to mobile consists of two parts: the fixed operator sets the charge for fixed origination<sup>18</sup>, and the mobile operator sets the charge for the mobile termination segment to be paid by the calling fixed subscriber. Note that also evening and Friends & Family (F&F) discounted prices are mobile service provider products sold to fixed subscribers. Sonera's F&F service is named Home Call, and may include 8 connections, of which one fixed, the remainder are Sonera mobiles.

Price plan *Classic* is a single band (900 MHz) price plan, while other price plans are dual band. A single band plan may be expected to disappear, most handsets are anyway dual band. Higher charges are also used (but not shown) for dual band price plan users with single band phones.

Sonera is the leading mobile operator in Finland, with 54% of the total number of GSM connections<sup>19</sup>. Sonera was the third largest fixed operator in Finland, with 27% of fixed connections<sup>20</sup>, but has surpassed the previous second operator camp, Finnet, after a take-over of a local operator (Auria) from Finnet.

Sonera's apparent business approach is low-price-high-volume, aiming at fixed users switching over to mobile usage. Most charges are below 20 cents per minute, except daytime charges for evening price plans, and charges for incoming calls from fixed. The differences between the various charges are not that extensive.

The highest charges are from mobile to mobile and mobile to fixed.

Sonera has price plans for daytime users and for private users, with modest discounts for evening use. One daytime price plan has uniform pricing, same price for any domestic call from a mobile, 16 cents per minute. This plan has been selected for further comparisons.

The highest daytime minute price is 32 cents, the lowest 16 cents. The highest minute price is for the old price plan (*Classic*) for single band (900 MHz only). The highest price for a dual-band price plan is 26 cents. The ratio between the highest and lowest daytime minute price is 2.0 (1.6 if *Classic* is excluded).

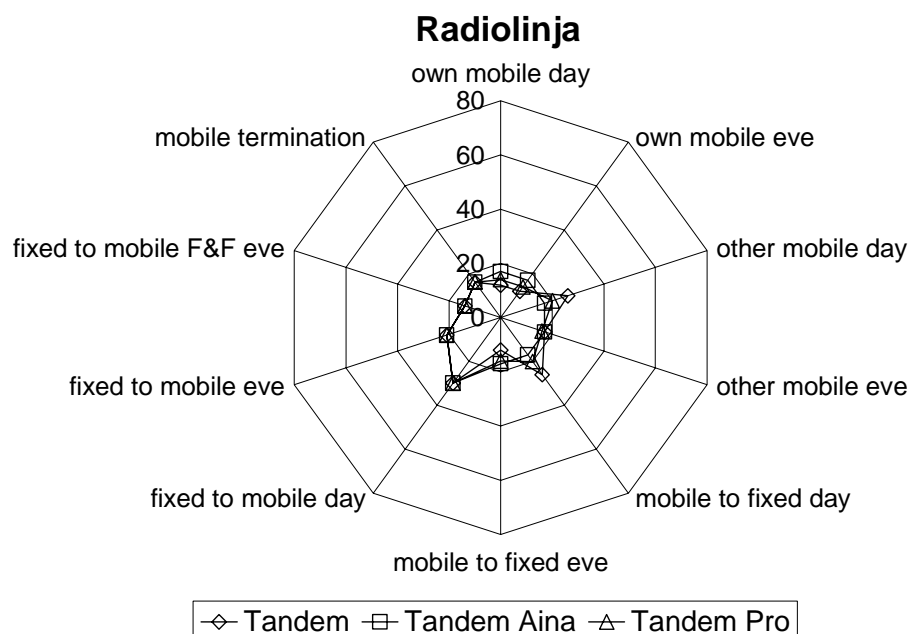
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<sup>18</sup> The fixed segment charge used here is Elisa's charge. Finland does not have one incumbent, but Elisa is the largest fixed operator with about 35% market share. Some other operators have lower charges.

<sup>19</sup> Source: Tietoliikennemarkkinat Suomessa 2003, Focus Consulting.

<sup>20</sup> Source: Tietoliikennemarkkinat Suomessa 2003, Focus Consulting.

## 1.3.2 Radiolinja, Finland

**Figure 31. Radiolinja's profile. All prices per minute, euro cent incl. VAT.****Table 22. Radiolinja's mobile price plans. All prices per minute, euro cent incl. VAT.**

Connection type	Tandem	Tandem Aina	Tandem Pro
own mobile day	12.0	17.0	14.0
own mobile eve	12.0	17.0	14.0
other mobile day	26.0	17.0	20.0
other mobile eve	17.0	17.0	16.0
mobile to fixed day	26.0	17.0	20.0
mobile to fixed eve	12.0	17.0	16.0
fixed to mobile day	3.9+26.0	3.9+26.0	3.9+26.0
fixed to mobile eve	3.9+17.0	3.9+17.0	3.9+17.0
fixed to mobile F&F eve	3.9+10.0	3.9+10.0	3.9+10.0
mobile termination incl. VAT	16.1	16.1	16.1

The charge for fixed to mobile consists of two parts: the fixed operator sets the charge for fixed origination<sup>21</sup>, and the mobile operator sets the charge for the mobile termination segment to be paid by the calling fixed subscriber. Note that also Friends & Family discounted prices are mobile service provider products sold to fixed subscribers.

<sup>21</sup> The fixed segment charge used here is Elisa's charge. Finland does not have a distinct incumbent, but Elisa is the largest fixed operator with about 35% market share. Some other operators have lower charges.



Radiolinja's F&F service is named Heimo, and may include 9 connections, of which a maximum of one is fixed, the remainder are Radiolinja mobiles.

Radiolinja is the second largest mobile operator in Finland, with 29% of the total number of GSM connections<sup>22</sup>. Radiolinja's owner is Elisa, the largest fixed operator in Finland, with 35% of fixed connections<sup>23</sup>.

Radiolinja's apparent business approach is similar to Sonera's, low-price-high-volume, with similar price plans. Like Sonera, the price spread is moderate.

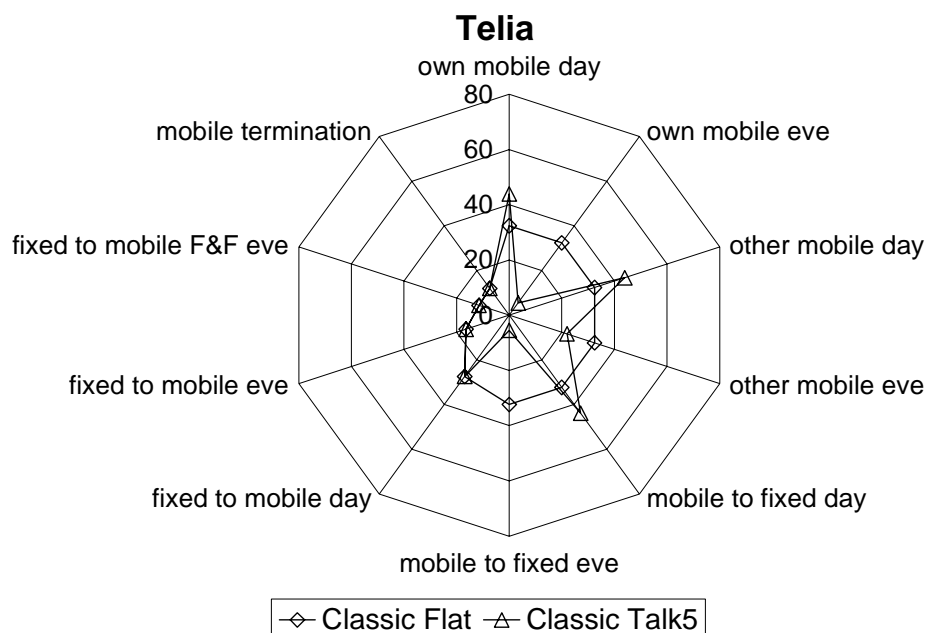
The highest charges are from fixed to mobile.

The daytime price plan has uniform pricing, same price for any call from a mobile, 17 cents per minute. This plan has been selected for further comparisons.

The highest daytime minute price is 26 cents, the lowest 12 cents. The ratio between the highest and the lowest daytime minute price is 2.2.

### 1.3.3 Telia, Sweden

**Figure 32. Telia's profile. All prices per minute, euro cent incl. VAT.**



<sup>22</sup> Source: Tietoliikennemarkkinat Suomessa 2003, Focus Consulting.

<sup>23</sup> Source: Tietoliikennemarkkinat Suomessa 2003, Focus Consulting.

**Table 23. Telia's mobile price plans. All prices per minute, euro cent incl. VAT.**

<b>Connection type</b>	<b>Classic Flat</b>	<b>Classic Talk 5</b>
own mobile day	32.4	43.9
own mobile eve	32.4	5.5
other mobile day	32.4	43.9
other mobile eve	32.4	21.9
mobile to fixed day	32.4	43.9
mobile to fixed eve	32.4	5.5
fixed to mobile day	27.4	27.4
fixed to mobile eve	16.5	16.5
fixed to mobile F&F eve	11.5	11.5
mobile termination incl. VAT	12.0	12.0

Telia is the leading mobile operator in Sweden, and also the fixed incumbent operator. Telia's market share of GSM connections is 46%.

Telia's business approach appears to be high price, possibly at the expense of market share. Very cheap evening rates in evening price plans may be understood as an indication of imperfect competition or demand patterns.

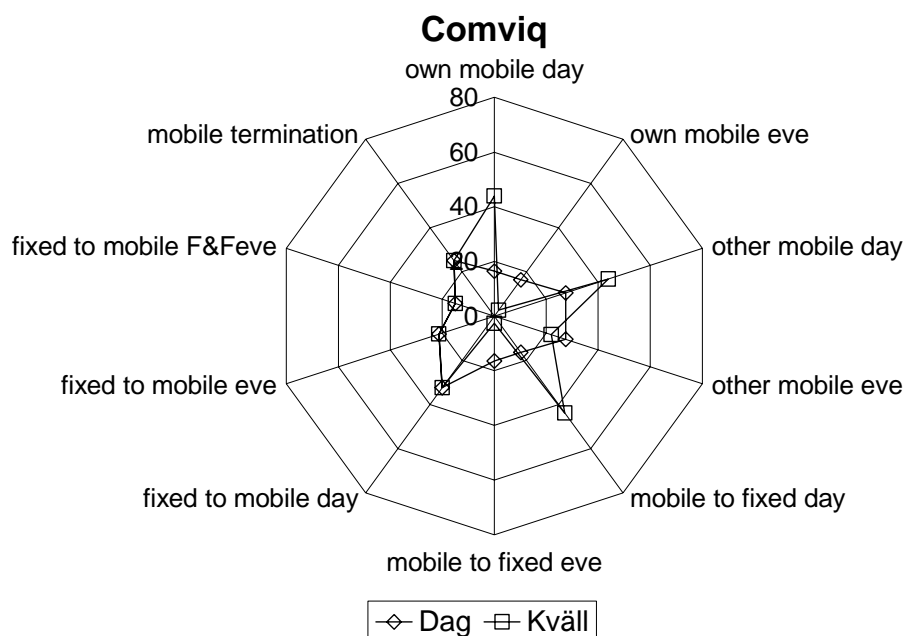
Telia's daytime and evening price plans differ considerably. Evening charges in evening price plans for calls to same operator mobile or to fixed are low, 5.5 cents per minute, below the mobile termination charge (10 cents). Telia's mobile termination charge is the lowest in the EU.

Telia has a daytime price plan with fully uniform pricing, any national call 32.4 cents. This plan has been chosen for comparison with other countries.

Telia fixed has an F&F service named Telia Favorit, with 30% discount to 5 connections in Sweden, fixed or mobile.

The highest daytime minute price is 43.9 cents, the lowest 32.4 cents. The ratio between the highest and lowest daytime minute price is 1.4.

## 1.3.4 Comviq, Sweden

**Figure 33. Comviq's profile. All prices per minute, euro cent incl. VAT.****Table 24. Comviq's price plans. All prices per minute, euro cent incl. VAT.**

Connection type	Dag	Kväll
own mobile day	16.5	43.9
own mobile eve	16.5	2.6
other mobile day	27.4	43.9
other mobile eve	27.4	21.9
mobile to fixed day	16.5	43.9
mobile to fixed eve	16.5	2.6
fixed to mobile day	32.4	32.4
fixed to mobile eve	21.4	21.4
fixed to mobile F&F eve	15.0	15.0
mobile termination incl. VAT	25.1	25.1

Comviq is the second largest mobile operator in Sweden. Comviq's market share of GSM connections is 39%.

Comviq has one daytime and one evening price plan. Evening charges for evening price plans are very low, 2.6 cents per minute, well below the mobile termination charge (20 cents).

Comviq's daytime price plan has two charges (16.5 cents for national calls, except 27.4 cents for calls to other mobiles). The general approach appears to be that Comviq uses price as a main competition tool for calls in the own network

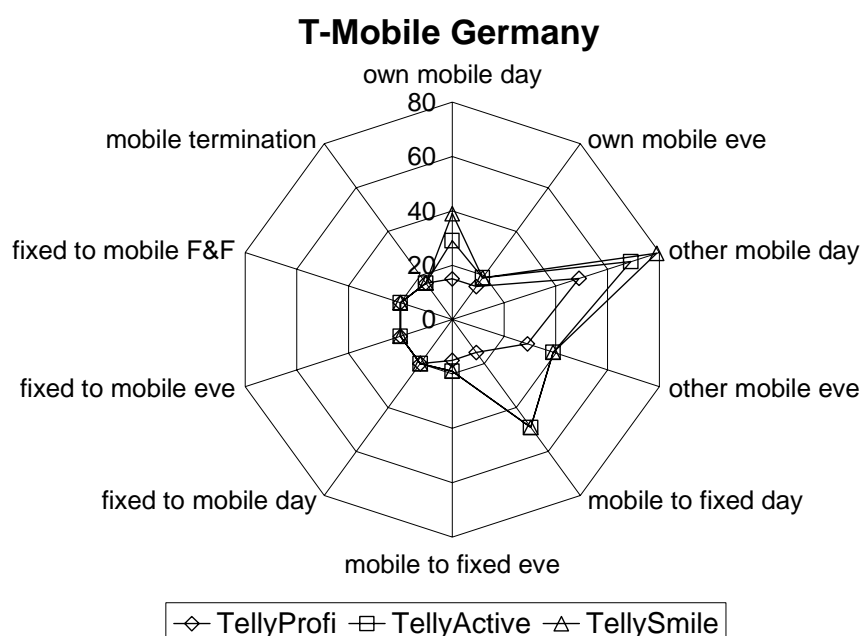
and to fixed networks. The daytime price plan (Dag) has been chosen for comparison with other countries. Prices for calls to other mobile operators correspond to termination charges as termination charges are about the same.

Telia fixed has an F&F service named Telia Favorit, with 30% discount to 5 connections in Sweden, fixed or mobile.

The highest daytime minute price is 43.9 cents, the lowest 16.5 cents. The ratio between the highest and lowest daytime minute price is 2.7.

### 1.3.5 T-Mobile, Germany

**Figure 34. T-Mobile's profile. All prices per minute, euro cent incl. VAT.**



**Table 25. T-Mobile's price plans. All prices per minute, euro cent incl. VAT.**

Connection type	TellyProfi	TellyActive	TellySmile
own mobile day	15.0	29.0	39.0
own mobile eve	15.0	19.0	19.0
other mobile day	49.0	69.0	79.0
other mobile eve	29.0-39.0	39.0-49.0	39.0-49.0
mobile to fixed day	15.0	49.0	49.0
mobile to fixed eve	15.0	19.0	19.0
fixed to mobile day	20.0-24.6	20.0-24.6	20.0-24.6
fixed to mobile eve	20.0-24.6	20.0-24.6	20.0-24.6
fixed to mobile F&F eve	20.0-24.6	20.0-24.6	20.0-24.6
mobile termination incl. VAT	16.6	16.6	16.6

T-Mobile is the largest mobile operator in Germany, with a market share of 44% of GSM connections. It is part of the Deutsche Telecom group, the fixed incumbent in Germany.

T-Mobile's price plans vary mainly based on rental, but not much due to other features. High rental gives lower call charges, but the charge structure is rather similar. There is no distinct daytime price plan or evening price plan.

The most expensive calls in all price plans are daytime calls to other mobiles, 49 - 79 cents, much higher than mobile termination charges for other operators. The regulator has the power to regulate termination charges<sup>24</sup>.

Call charges fixed to mobile depend on the fixed price plan. The profile graph includes the cheapest, while the table includes the range.

Call charges to other mobile operators shown in the profile graph are to Vodafone. Call charges to the two other mobile operators are the same during daytime but in the evening time higher than calls to Vodafone, and are included in Table 25. The differences in price do not correspond to the differences in termination charges.

The price plan chosen for comparison with other countries is TellyProfi, the price plan with the lowest minute prices.

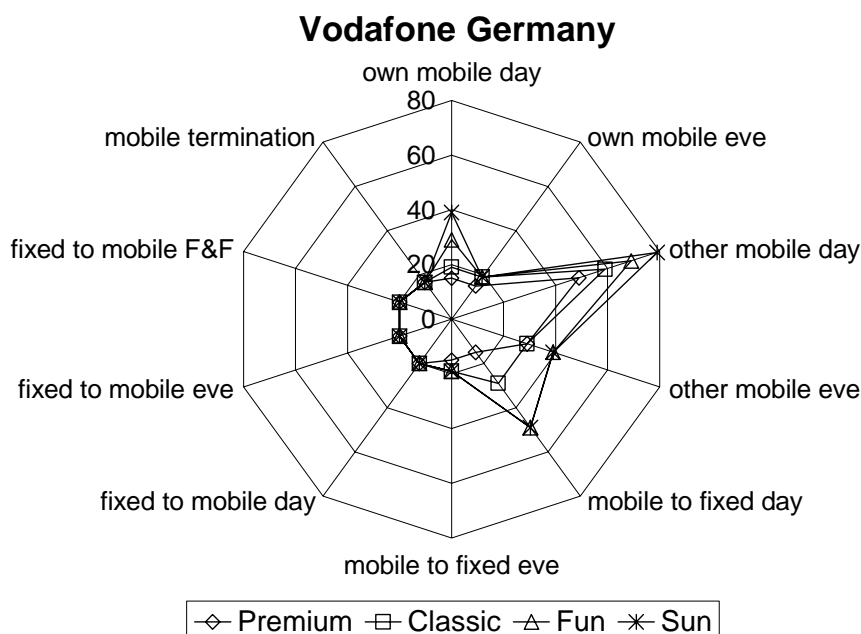
There is no F&F price plan for fixed to mobile in Germany, but there are F&F type price plans for mobile to fixed.

The highest daytime minute price is 79 cents, the lowest 15 cents. The ratio between the highest and lowest daytime minute price is 5.3.

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<sup>24</sup> Source: OECD Communications Outlook 2003.

## 1.3.6 Vodafone, Germany

**Figure 35. Vodafone's profile. All prices per minute, euro cent incl. VAT.****Table 26. Vodafone's price plans. All prices per minute, euro cent incl. VAT.**

Connection type	Premium	Classic	Fun	Sun
own mobile day	15.0	19.0	29.0	39.0
own mobile eve	15.0	19.0	19.0	19.0
other mobile day	49.0	59.0	69.0	79.0
other mobile eve	29.0-39.0	29.0-39.0	39.0-49.0	39.0-49.0
mobile to fixed day	15.0	29.0	49.0	49.0
mobile to fixed eve	15.0	19.0	19.0	19.0
fixed to mobile day	20.0-24.6	20.0-24.6	20.0-24.6	20.0-24.6
fixed to mobile eve	20.0-24.6	20.0-24.6	20.0-24.6	20.0-24.6
fixed to mobile F&F eve	20.0-24.6	20.0-24.6	20.0-24.6	20.0-24.6
mobile termination incl. VAT	16.6	16.6	16.6	16.6

German Vodafone is the second largest GSM operator in Germany, with a market share of 37% of GSM connections.

Vodafone's price plans are very similar to T-Mobile's price plans. Thus most comments for T-Mobile are also valid for Vodafone.

Call charges fixed to mobile depend on the fixed price plan. The profile graph includes the cheapest, while the table includes the range.

Call charges to other mobile operators shown in the profile graph are to T-Mobile. Call charges to the two other mobile operators are the same during daytime but more expensive in evening time than calls to T-Mobile, and are included in Table 26. The differences in price do not correspond to the differences in termination charges.

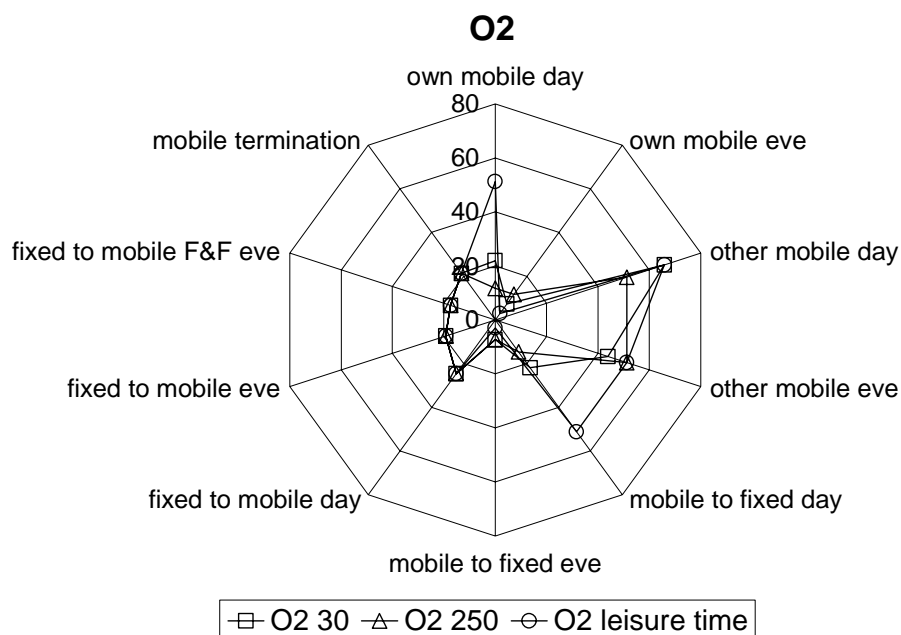
The price plan chosen for comparison with other countries is Premium, the price plan with the highest rental and lowest minute prices.

There is no F&F price plan for fixed to mobile in Germany, but there are F&F type price plans for mobile to fixed.

The highest daytime minute price is 79 cents, the lowest 15 cents. The ratio between the highest and lowest daytime minute price is 5.3.

### 1.3.7 O2, UK

**Figure 36. O2's profile. All prices per minute, euro cent incl. VAT.**



**Figure 37. O2's price plan. All prices per minute, euro cent incl. VAT.**

<b>Connection type</b>	<b>O2 30</b>	<b>O2 250</b>	<b>O2 leisure time</b>
own mobile day	22.0	11.7	51.2
own mobile eve	7.3	11.7	2.9
other mobile day	65.9	51.2	65.9
other mobile eve	43.9	51.2	51.2
mobile to fixed day	22.0	14.6	51.2
mobile to fixed eve	7.3	7.3	2.9
fixed to mobile day	24.6	24.6	24.6
fixed to mobile eve	19.3	19.3	19.3
fixed to mobile F&F eve	17.3	17.3	17.3
mobile termination incl. VAT	21.3	21.3	21.3

O2 is one of four about equal mobile operators. O2's market share of GSM connections is 24%.

Readers should be aware of the fact that British mobile pricing does not allow for obtaining typical per minute prices for different types of calls included in the rental. Only minutes exceeding included minutes have per minute prices by call type, but such minutes are priced high and are intended to be exceptions in usage. This report uses prices for additional minutes, and therefore conclusions are cautious.

O2 has several price plans, of which three are shown. The plans differ mainly with regard to rental, and call charges are correspondingly cheaper. There are minor differences in pricing structure.

The price plan chosen for comparison with other countries is O2 250.

The most expensive calls are to other mobile, 44 to 66 cents. Mobile termination charges are regulated<sup>25</sup>. Prices for calls to other mobile operators do not depend on termination charges.

Calls to the fixed network vary between 2.9 and 51.2 cents.

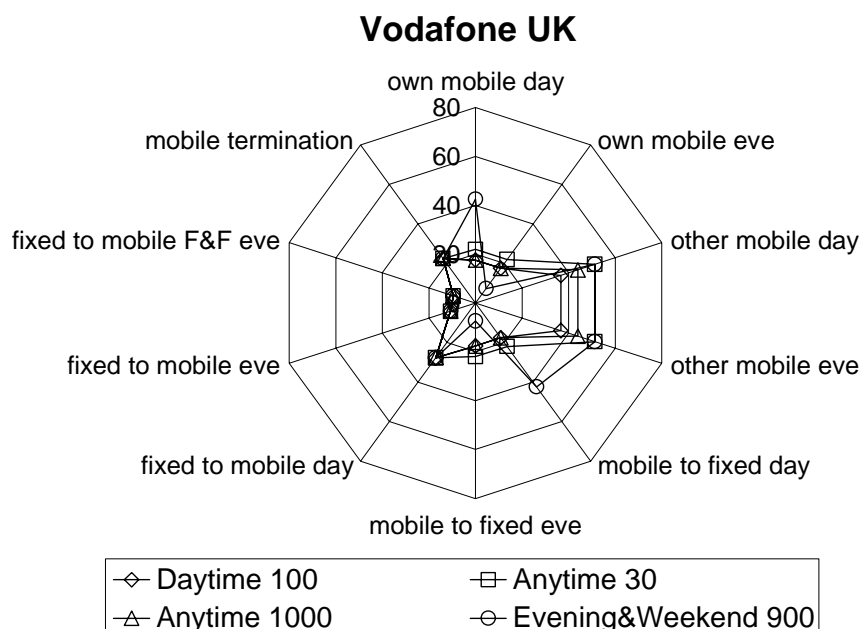
BT fixed offers an F&F service, which can include one mobile, with 10% discount.

The highest daytime minute price is 65.9 cents, the lowest 11.7 cents. The ratio between the highest and lowest daytime minute price is 5.6.

<sup>25</sup> Source: OECD Communications Outlook 2003.



## 1.3.8 Vodafone, UK

**Figure 38. Vodafone's profile. All prices per minute, euro cent incl. VAT.****Table 27. Vodafone's price plans. All prices per minute, euro cent incl. VAT.**

Connection type	Daytime 100	Anytime 30	Anytime 1000	Evening & Weekend 900
own mobile day	17.6	22.0	17.6	42.4
own mobile eve	17.6	22.0	17.6	7.3
other mobile day	36.6	51.2	43.9	51.2
other mobile eve	36.6	51.2	43.9	51.2
mobile to fixed day	17.6	22.0	17.6	42.4
mobile to fixed eve	17.6	22.0	17.6	7.3
fixed to mobile day	27.7	27.7	27.7	27.7
fixed to mobile eve	10.7	10.7	10.7	10.7
fixed to mobile F&F eve	9.6	9.6	9.6	9.6
mobile termination incl. VAT	22.5	22.5	22.5	22.5

Vodafone is about equal in size to O2, with a market share of 24% of GSM connections.

Readers should be aware of the fact that British mobile pricing does not allow for obtaining typical per minute prices for different types of calls included in the rental. Only minutes exceeding included minutes have per minute prices by call type, but such minutes are priced high and are intended to be exceptions in usage. This report uses those prices for additional minutes, and therefore conclusions are cautious.

Vodafone has several price plans of which four are shown. The plans vary mainly based on rental, which includes a varying amount of included call minutes, in daytime type plans to any network, but in the evening price plans excluding other mobile networks. High rental may give somewhat lower call charges.

Daytime calls to other mobiles are the most expensive in all price plans, 37 - 51 cents, well above the mobile termination charges for other operators. The regulator has the power to regulate termination charges.

Calls to the fixed network vary between 7 and 42 cents.

The price plan chosen for comparison with other countries is Daytime 100, the price plan with the lowest minute prices.

BT fixed offers an F&F service, which can include one mobile, with 10% discount.

The highest daytime minute price is 51.2 cents, the lowest 17.6 cents. The ratio between the highest and lowest daytime minute price is 2.9.