PUBLICATIONS 19/2005
MINISTRY OF TRANSPORT AND COMMUNICATIONS
FINLAND

Charging alternatives for MNO termination

Ministry of Transport
and Communications,
Helsinki, 2005

MINISTRY OF TRANSPORT AND COMMUNICATIONS FINLAND

DESCRIPTION

Date of publication
28 February 2005

Authors (from body; name, chairman and secretary of the body)	Type of publication
J. Kanervisto Consulting	Report
Jukka Kanervisto	Assigned by Ministry of Transport and Communications
	Date when body appointed

Name of the publication
Charging alternatives for MNO termination

Abstract

Termination charges of SMP mobile network operators should be cost-oriented. In the study, retail and wholesale prices and their mutual relationships of major mobile operators in Finland have been investigated. Based on the findings, termination charges of MNOs do not correspond with the real cost of termination and the revenues of call termination are used to subsidize other mobile services. Regulation, which is based on cost orientation of call termination, does not work in practise. Cost calculation mechanisms are so complicated and the number of estimates used in the calculations is so high that the result of the calculation does not necessarily correspond with the real cost of termination. It is to be noted that mobile termination rates in Finland are the third cheapest in Europe.

Pricing distortion creates 1) irrational efforts by fixed network subscribers in order to bypass high call rates to mobile networks, 2) subscription types, where part of the call price paid by the caller is channelled to the called party, 3) subsidy from fixed network subscribers to mobile subscribers, 4) enormous work load for mobile operators, the regulator and courts in order to calculate costs / to verify cost calculations. This is in no relation to the results achieved, and 5) continuous trials, where termination charges are finally resolved by the court even years after the complaint.

In the study, alternative ways to determine mobile call termination charges have been investigated. The study ends up to a proposal where termination rates of mobile network operators would be tied with on-net retail call charges in a manner described in the study in more detail. Based on this proposal, artificial cost calculation mechanisms would not be needed, work load of operators and the regulator would decrease significantly, termination charges would be based on market prices and they would better reflect the natural relation of retail and wholesale prices based on the structure of the network, and appeal processes may decrease. The proposal does not significantly impact on the mutual trade balance of interconnected mobile operators.

Keywords
termination charges, terminating traffic, cost-oriented pricing

Miscellaneous
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Serial name and number	ISSN	ISBN
Publications of the Ministry of Transport and Communications 19/2005	1457-7488 (printed version) 1795-4045 (electronic version)	952-201-338-2 (printed version) 952-201-339-0 (electronic version)

Pages, total	Language	Price	Confidence status
38	English	€ 8	Public

Distributed by	Published by
Edita Publishing Ltd	Ministry of Transport and Communications

PREFACE

This report clarifies mobile termination prices and methodologies. It focuses on one of the most crucial factors in that area: the cost-orientation obligation for operators with significant market power. The report discusses many different aspects of the matter. In global terms, termination pricing in a transparent and fair way is the most difficult issue in telecommunications.

The report provides a variety of models suitable for pricing.

The views and proposals in the report are on the sole responsibility of the author and they do not represent the official position of the Ministry of Transport and Communications.

I wish to thank the author, Mr Jukka Kanervisto from J. Kanervisto Consulting Oy, for work well done.

Helsinki, February 2005

Kari T. Ojala

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1 Executive summary

Cost orientated termination charges

Regulation of mobile network termination charges is based on the cost calculations of call termination. Calculation of cost-based charges is a complicated process and the real cost-oriented charge is almost impossible to calculate. All calculation methods include, in addition to costing figures, figures which are impossible to measure. Those figures have to be estimated. As an example of those figures is the division of common costs and the division of traffic between different services. Division is a necessity because of the fact that the same network elements and functions serve several different services. Other figures to be estimated include risk premiums, reasonable rate of return, depreciation in relation to the economical life of network elements, efficiency of investments, cost efficiency of the network compared with cost efficiency of a new and competitive network, operational and maintenance costs etc. Even the number of names of cost calculation methods demonstrate the complexity of the problem: HCA (Historic Cost Accounting), CCA (Current Cost Accounting), FAC (Fully Allocated Cost), LRIC (Long Run Incremental Cost), LRAIC (Long Rung Average Incremental Cost), FL-LRIC (Forward Looking Long Run Incremental Cost), EPMU (Equal Proportionate Mark Up), Ramsay Pricing, Top-down, Bottom-up, etc. All calculations include therefore so many presumptions that the resulting "cost-oriented" figure may not have much common with the real cost of the service or market oriented price.

Investigation of charging distortion

According to recital 20 of the CEC Access and Interconnection Directive[1],

> *"In particular, operators with significant market power should avoid a price squeeze whereby the difference between their retail prices and the interconnection prices charged to competitors who provide similar retail services is not adequate to ensure sustainable competition".*

This means that one of the criteria for sustainable competition is the adequacy of difference between retail and wholesale prices.

In this report, charging distortion has been investigated by comparing retail charges to those wholesale charges to which retail charges are based on. Price/cost analysis is based on the following presumptions: 1) operators' charges for call termination are cost-based and 2) cost of call termination is of the same magnitude as cost of call origination and 3) cost of on-net call is of the magnitude of sum of call origination and call termination. The latter two presumptions are based on the structure of a mobile network, where call origination uses the same network elements than call termination and on-net call uses the same network elements as call termination and call origination.

[1] DIRECTIVE 2002/19/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 March, 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive)

Retail and wholesale prices of the Finnish mobile operators are analysed in the report "MVNO-Pricing Structures in Finland" [2] in more detail. The results of this investigation demonstrate that the share which is left to a mobile operator for call origination (includes the share of both service operator and network operator) is significantly less than the termination charge which the operator collects from other operators (includes only the share of the network operator). The share which an operator receives from on-net call (includes both the shares of service operator and network operator) is in all cases significantly less than the cost of an on-net call calculated by the "cost-oriented" termination charge. In some cases the on-net charge can be less than the charge for call termination collected from other operators. It was found out that for the price/cost calculations the presumption 1) (= call termination is cost-based) is not true. It is evident that the termination charges of mobile operators are significantly higher than their costs.

The report demonstrates also that mobile network operators sell their radio-access (unregulated product) at significantly cheaper price than call termination (regulated product). Cost difference of these products is marginal. Two products with almost the same cost, have two significantly different prices: High regulated price (for call termination) and low unregulated, market oriented price (for radio access).

Excess "cost-oriented" termination charge or insufficient or missing price control results in:

- Irrational means, by which the pricing anomaly is by-passed by individual subscribers (calls to mobile are made from mobile phones rather than from fixed networks. Enterprises use GSM-gateways in their PABXs in order to route calls to mobile numbers directly via the mobile subscription rather than through the fixed network).
- In some subscriptions, a subscriber gets compensation from incoming calls. This demonstrates clearly the pricing anomaly. A share of call price paid by the caller is channelled to the call recipient.
- Subvention from fixed network subscribers to mobile subscribers
- Unreasonable work load both for mobile operators and regulators by developing cost calculation mechanisms and by supervision of termination charges. The work load is in no relation to the achieved benefits
- Appeal process and court decisions, by which interconnection charges are resolved by the Supreme Administrative Court several years after the first complaint.

Pricing problems of call termination cannot be resolved by the demand of cost orientation, if it does not result in cost-oriented termination charges. Current cost calculation mechanisms have not lead to cost-oriented prices. In spite of 6 years of regulation, call termination in the Finnish mobile networks is everything else but cost-oriented. In this respect, regulation of call termination has failed. Mobile operators use their call termination revenues to subsidize other mobile services. Major concerns exist regarding calls from fixed networks to mobile networks. Call termination has become a

[2] MVNO-Pricing Structures in Finland, December 2004

significant source of excess revenues although just this was intended to be avoided with the cost-oriented regulation of SMP operators.

It is to be noted that termination charges of Finnish mobile operators are third cheapest within 27 European countries. If termination charges in Finland subsidize other mobile charges, what might be the situation in other European countries? In order to avoid pricing anomaly, pricing of call termination should be tied with market prices or by other means to reasonable relation with costs and pricing of on-net calls.

Alternatives for cost-oriented termination charges

In this report, other alternatives than cost-oriented pricing have been investigated in order to find out a reasonable charge level of call termination. Examples of those alternatives are inter alia:

- Competitive pricing of call termination
- Sender Keeps All mechanism
- Termination charges calculated from on-net retail prices
- Termination charges calculated from on-net wholesale prices
- Releasing mobile-to-mobile traffic from regulation
- Releasing fixed-to-mobile traffic from regulation
- Making termination charges visible to callers

From these alternatives, only tying termination charges to on-net retail charges offers an alternative to the cost-oriented pricing. From other alternatives:

- Competitive pricing of call termination is impossible in practise
- Sender Keeps All mechanism is not suitable in circumstances where Input/Output relation of interconnection differs from ratio 50%/50%. Furthermore, it would result in a significant change to the trade balance of current operators.
- If termination charges were calculated from unregulated on-net wholesale charges, it would turn wholesale charges transparent and presumably lead to SMP obligation also for other services than call termination. A reasonable level of wholesale prices would need several strong service providers / MVNOs which were not owned or influenced by network operators.
- Release of mobile-to-mobile traffic from regulation might be possible if interconnected mobile operators would have similar negotiation power and if mobile termination charges could be different regarding traffic from fixed and mobile operators. In the Finnish market, no countervailing negotiation power exists and the current regulation makes termination charges independent of the origination network.
- Regulation between fixed and mobile network cannot be released because of the fact that no such mechanism exists that would result in a sufficient negotiation power between fixed and mobile networks in order to define termination charges based on the proper competitive environment

Trade Balance of Interconnected Mobile Network Operators

The trade balance of two interconnected operators is calculated by subtracting the outbound termination costs from inbound termination revenues. The analysis of mobile operators trade balance demonstrates that the difference between the termination rates is more important to the interconnected operators than the absolute level of termination charge. In fact, the termination rate of the Finnish mobile operators could be made in half without any change in the trade balance if, at the same time, mutual difference of their termination charges would be slightly changed.

Termination charges based on on-net retail charges

Termination charge could be tied with mobile-to-mobile on-net charge in several alternative ways. However, in order to tie termination rates to retail rates, the regulator needs legal power more than is granted by the current Communications Market Act.

In this report, an alternative for cost-oriented termination rate is presented. Termination rate would be defined in relation to mobile-to-mobile on-net rate as follows: 1) An average on-net rate would be defined by on-net retail call rate of all mobile service providers, weighted by subscriptions. 2) This average “national” on-net retail rate would be as a basis for the definition of a “national” termination rate. 3) “National” cap termination rate would equal to the “national” on-net retail rate. Termination rate of any mobile network operator could not exceed this cap rate. 4) Termination rates of individual operators would be lower than the cap rate, in counter relation to their subscription market share. Therefore, the termination rate of Sonera would be the lowest (as having biggest market share) and the termination rate of Finnet would be the highest (as having the lowest market share). Termination rate of Elisa would be between the two operators. In defining the termination rate, the share of the market share is justified because of the economies of scale. Economies of scale are automatically taken into account in the cost calculations of individual operators.

The proposed solution has the following positive influences:

- termination rates would be tied with public retail market prices and system would be strictly transparent
- the development of termination rate would automatically follow the development of market
- proposed solution would not request operator specific cost calculations. Instead of cost calculation, individual public retail rates would be investigated and calculated. The work load of operators in defining termination costs would cease and the work load of the regulator would decrease significantly
- proposed solution would lead to termination rates near to rates corresponding their costs compared to costs of on-net calls (below the rate of on-net call)
- proposed solution would decrease the cross subsidy paid by the fixed network subscribers
- proposed solution would not impact to the current interconnect trade balance of operators

- court procedures would decrease significantly or cease, depending on the way how unambiguously the calculation mechanisms could be defined

The proposed solution is illogical in a way: wholesale rates would be defined by the retail rates. It is to be noted, however, that mobile operators can define their retail rates without knowing or without publishing their wholesale rates. Therefore, wholesale rate does not necessarily exist if it is not made public by regulations. With calculations based on costs of call conveyance, the definition of termination cost has not been successful. By the proposed solution, the wholesale rate would still be based on calculations and would not reflect the real cost of call termination. However, termination rate that is based on the retail rate would better reflect the natural relation between wholesale and retail rates, the matter that is taken as a criterion in the Access Directive, whereby the difference between retail prices and the interconnection prices charged to competitors who provide similar retail services is not adequate to ensure sustainable competition.

Cost calculations of all wholesale services

In order to verify the correctness of currently calculated termination rates, also cost calculations of call origination and on-net calls would be needed. Having cost calculations of call origination and on-net calls, regulators would be able to compare costs of call termination to call origination and on-net calls. If cost of call termination would significantly differ from costs of call origination or cost of on-net call would significantly differ from sum of costs of call origination and call termination, operators would be requested to justify reasons for the difference. Verification would be made only for the regulator in order to verify the right level of termination. It would not be used for pricing of call origination and on-net services, if these services are not defined under obligation of SMP operators.

This alternative would be a slight improvement to the current cost calculation mechanism where cost orientation obligation is applied only for call termination. It would demonstrate the level of termination cost compared with the level of cost of call origination and to the level of cost of on-net call. Solution would increase the work load of both operators and the regulator. The cost of call termination would still be independent of market prices and the inaccuracy of calculation parameters would still be subject to pricing distortion. It would not still clarify the adequate difference between wholesale and retail rates.

Conclusions

As a first option, this report proposes tying of termination rates to weighted average of retail on-net rates in a manner by which:

- termination price cap would be defined as a weighted average, VAT exclusive on-net rate of all mobile service providers
- termination rates of individual mobile network operators would be defined below the price cap inverse to their subscription market share

- for the calculation of average weighted on-net retail rates, a calculation mechanism should be developed along with mechanism to include subscription market share into the calculation of individual termination rates.

Termination rates based on on-net retail rates would be applied also to traffic from fixed network.

As a second option, network operators would be requested to provide the regulator, in addition to cost calculation of call termination, also cost calculations for call origination and on-net calls in order to verify the relationship of cost of call termination, call origination and on-net call. Operators would be obliged to justify major difference between costs of call origination and call termination as well as major difference between on-net cost and combined cost of call origination and call termination.

Opinions and views presented in this report are solely born by the author. They do not necessarily reflect the opinions and views of the Ministry of Traffic and Communications, neither the Finnish Communications Regulatory Authority nor the interviewed operators.

2 Pricing problems of call termination

2.1 Inadequacy of regulations

Pricing of call termination has been regulated by the EU since 1998. In accordance with the old interconnection directive[3], interconnection charges have to be transparent and be based on interconnection costs involved. This obligation has been valid only for operators, who have been defined by the national regulator as having Significant Market Power (SMP) in the national market of interconnection. Cost orientation has been made mandatory in the 1998 Interconnection Directive.

Interconnection charges of SMP operators have been subject to obligation of cost orientation already during six years. The manner on how interconnection regulation has been influenced to the level of interconnection charges can be estimated by comparing interconnection charges (wholesale rates) to the retail rates of mobile service providers.

Based on the structure of mobile networks, the cost of call termination is about the same as the cost of call origination and the cost of mobile-to-mobile on-net call is approximately the combined cost of call origination and call termination. If the charge of call termination is based on costs, it should be reflected in the retail rates of mobile-to-mobile on-net and off-net calls.

In the report of ”MVNO-Pricing Structures in Finland” [4], the difference of retail and wholesale rates of Finnish mobile operators have been studied using the regulated “cost-oriented” termination rate as a reference.

Comparison is made by using retail and wholesale rates valid in November 2004. Comparison is presented in the appendix Retail and wholesale prices. In the report, presented simplified price/cost analysis demonstrates that call termination subsidize significantly other mobile services and causes a significant price distortion. With exacerbating it could be said that wholesale rates are higher than retail rates. Termination rates have become a significant source of revenue for mobile operators although the purpose of cost orientation obligation of SMP operators has been opposite.

Distortion in retail pricing is in large extent due to the regulated wholesale termination rates which significantly differ from unregulated wholesale rates of call origination and on-net calls. Regulated termination rate is something else than the unregulated rate by which the mobile network operators sell almost the same product to their service providers in the form of radio access to their customers.

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[3] Directive 97/33/EC of the European Parliament and of the Council of 30 June, 1997 on interconnection in Telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP)

[4] MVNO-Pricing Structures in Finland, December 2004

It is to be noted that the applied termination rates in Finland are the third lowes amongst 27 European countries. If termination rates in Finland subsidize significantly other mobile rates, what would be the case in other European countries?

2.2 The problems of cost-oriented pricing

A beautiful idea of interconnection regulation is to tie termination rate to the cost of call termination. Cost may include a reasonable rate of return. This would mean that an operator requesting interconnection is entitled to pay only for interconnection services, not for the services which it has not ordered. An operator selling interconnection, could not, therefore, by pricing prevent of hamper the operation of interconnected operators. It is not obliged to sell its products under costs. Regulation allows a reasonable rate of return on call termination.

Calculation of cost-oriented price is a complicated process and real, cost-oriented price is almost impossible to calculate. All calculation methods, in addition to costing figures, include variables which have to be estimated. These are for example the division of costs and traffic to different services. Division is needed, because the same functions, the same network elements serve several different services. Other estimated figures are risk premiums, reasonable rate of return, the level of depreciation in relation to economical life of different network elements, efficiency of investments, costs in relation to the costs of a new, competitive network, division of operation and maintenance costs to different services etc. The list could be expanded. The complexity of calculations and costing models can already be seen from the applied terminology: HCA (Historic Cost Accounting), CCA (Current Cost Accounting), FAC (Fully Allocated Cost), LRIC (Long Run Incremental Cost), LRAIC (Long Rung Average Incremental Cost), FL-LRIC (Forward Looking Long Run Incremental Cost), EPMU (Equal Proportionate Mark Up), Ramsay Pricing, Top-down, Bottom-up, etc.

Application of different calculation models to different calculation purposes may be arguable and all the calculations include so many presumptions that the resulting ”cost-oriented” price may not necessarily reflect the real cost call termination.

The problems of call termination cannot be decreased by the demand of cost orientation, if it does not lead to the cost orientated rates. Current calculation mechanisms have not lead to cost-oriented termination rates. Current regulation has failed in this respect. In order to remove price distortion, termination rates should be made market oriented in a way or another or by other means to force them to right relation with on-net costs and prices.

2.3 Practical consequences of price distortion

2.3.1 By passing the fixed network

For the reason of excess pricing, calls from fixed network to mobile subscribers are made from mobile phones rather than from fixed network terminals although the total cost of call would favour call from the fixed network. This can be seen not only from the

behaviour of individual subscribers but also usage of so-called GSM-gateway equipment connected to the PABXs of the fixed network. Calls of PABX user to mobile subscribers are routed from the GSM-gateway directly to mobile network via mobile network subscription in order to by-pass highly priced fixed to mobile call and mobile call termination.

2.3.2 Compensation paid on incoming calls

Excess pricing of call termination has led to subscription types where subscribers have been paid compensation on receiving calls. When calling party pays the call, excess pricing leads to distortion where part of the call price is channelled to called party.

2.3.3 Subsidy from fixed network subscribers to mobile subscribers

Until March 2005 fixed network operators have not been able to buy call termination from mobile operators. Traffic from fixed networks to mobile networks has been operated and priced by mobile operators. Fixed network operators have received fixed network call origination charges. With this pricing scheme, mobile service operators receive a share that is significantly more than they receive for calls originated in the mobile networks (ref. excel sheet retail and wholesale prices).

Change in the Finnish Communication Market Act in March 2005 changes the existing termination practise in this respect. According to the amended Act, fixed network operators are able to buy call termination from mobile network operators. When current mobile termination rates are four to five times the termination rates of fixed networks, the trade balance of a fixed network operator is always significantly negative. When mobile termination rates are significantly more than related costs of call termination, excess revenues can be used to subsidize other mobile services.

2.3.4 Unreasonable work load for operators and regulators

The burden of proof that charges are derived from actual costs including a reasonable rate of return on investment shall lie with the organization providing interconnection to its facilities. The creation of a cost accounting system has been a huge task for mobile operators not only in Finland but also in other European countries. For the regulators, supervision of cost orientation is also a task of significant work load. Different cost accounting systems have been developed during several years by the regulators of EU and EEC countries, following the guidelines of the CEC. When it is evident that current call termination rates subsidize significantly other mobile services and taking into account that termination rates in Finland are third cheapest within 27 European countries[5], a conclusion can also be made that regulation may not be very successful in any European countries. The work load used in developing cost calculation mechanisms and supervision their implementation is in no relation to the low benefits achieved.

[5] IRG MTR Snapshot – July 2004. http://irgis.icp.pt/admin/attachs/388.pdf

2.3.5 Court circle

The burden of proof that termination charges are cost-oriented lies with the mobile operator. There is no common, transparent and unambiguous means to calculate termination charges in such a way that they would correspond with real costs of call termination. The Regulator investigates the calculations made by mobile operators and when verification results in a decision for tariff changes, it usually leads to an appeal circle, which, at worst, can take several years for each operator until final and legally binding decision is obtained. For example, a complaint made for Sonera's mobile termination rates in 1998 was finally solved by the Finnish Supreme Administrative Court in 2004. The first appeal court was previously Administrative Court but today Supreme Administrative Court. The appeal path is now shorter but final decision on the applied termination rates can still take years after the complaint. A decision by the Supreme Administrative Court needs high telecommunications expertise and knowledge of costing of telecommunications services.

3 Views related to pricing of call termination

When estimating the impact of termination rates to mobile operators, the traffic originated from mobile subscribers should be studied operator by operator in more detail. Necessary traffic information for this study was not available. Therefore, impact of termination rates to operators has been studied only on a general level.

3.1 Economies of scale

Even a small operational mobile network needs its basic investments to convey a single call. The cost of a call in the mobile network consist of costs of network components (switches, peripheral equipment, base station controllers, base stations and transmission lines), the coverage of network, and the magnitude of traffic going through the network. The network cannot be dimensioned in such a way that the utilization rate would always be 100%. The better is the utilization rate, the cheaper is the unit cost of a call. Correspondingly, the unit cost of a network component serving high traffic is normally lower than the unit cost of network elements serving only limited amount of traffic. The cost of a network is influenced by:

- Coverage of the network
- Structure or configuration of the network
- Ultilization rate
- Traffic volume
- Efficiency of the operator

If we compare two equal networks, cost of a call in the network with higher traffic volume is lower than the cost of a call in the network with lower traffic volume.

If we compare termination costs of two mobile networks with same coverage area, it is likely that the cost of termination is less for the operator with higher market share. Higher market share means higher traffic in principal. If cost-oriented termination rate of the operator with higher market share would be applied to the operator with smaller market

share, it is likely that the termination rate of a smaller operator is under the costs involved. Therefore, reciprocity in termination charges is applicable well only for mobile operators which are comparable in size, coverage area and market share.

If termination rate is calculated based on network costs and traffic, the impact of market share is automatically taken into account with the actual traffic minutes. If termination rate is defined by some other means, the impact of market share should be taken into account separately.

3.2 Efficiency of mobile operators

Basis for the cost-oriented termination rates has been the definition of costs for an efficient operator, not necessarily for the existing operators. For this reason so called bottom-up accounting mechanism has been developed. A network for the bottom-up calculation is a hypothetical network, where network structure has been optimised and the network is constructed with the most cost efficient and new components. The bottom-up model has been basically developed for the calculation of fixed network termination rates, where the threat has been a distortion of termination rates when based on old historical costs and on old fashioned and unreasonable network structure. Application of bottom-up model to mobile network calculations may be questioned. All mobile networks are new and built with modern technology. They have had a pressure of competition from the very beginning. Competitive environment emphasizes the cost efficiency. Author considers the application of bottom-up model in mobile networks irrelevant in principal and if it leads to reciprocal termination rates, in particular.

Ex-ante regulation is asymmetric: It punishes SMP operators with price regulation and supports new entrants entering the market. The more efficient the SMP operator is, the lower its cost-oriented termination rates are. An efficient SMP operator may approach the hypothetical, efficient operator and its cost-oriented termination rate is then the rate of an efficient and competitive operator. Even an efficient operator does not need to sell its services under cost. Cost-oriented pricing scheme allows a reasonable rate of return.

3.3 The share of interconnect traffic from total traffic

Subscription market shares of Mobile Network Operators Sonera, Elisa and Finnet are shown in figure 1. Figures without parenthesis demonstrate market share in mobile subscriptions, figures with parenthesis demonstrate a market share of combined fixed and mobile subscriptions. The share of interconnected traffic from total traffic varies from operator to operator and it is dependent on the market share of operator. With high subscription market share, share of internal (on-net) traffic is higher compared to interconnected traffic. For a mobile operator entering the market, on-net traffic is marginal and most of the traffic is interconnected off-net traffic

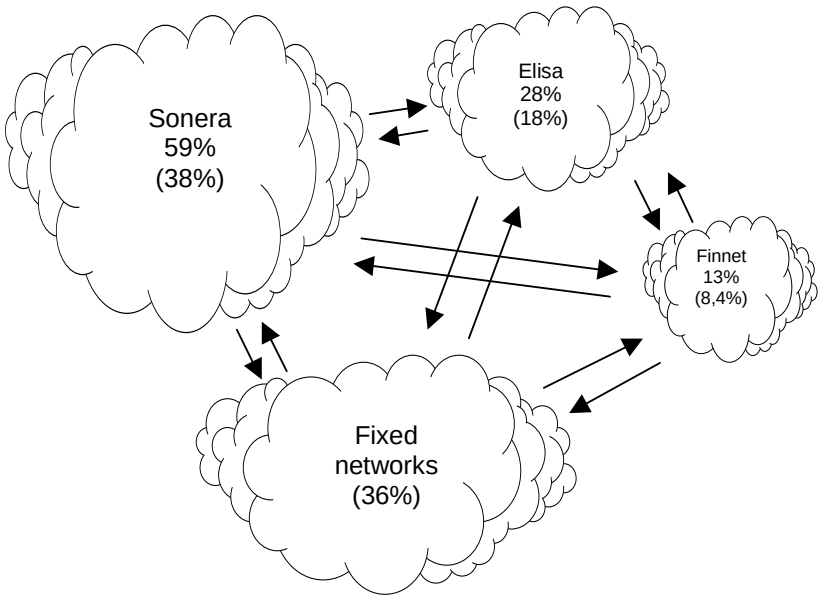


Figure1. LThe market shares of Finnish operators based on subscriptions

The real traffic share of on-net calls and calls going through the point of interconnection (measured in minutes) may differ from the share of subscriptions. On-net call is the most competed call type and operators' offerings are often structured to favour on-net calls.

3.3.1 Traffic between mobile networks

When estimates are based on subscription market shares, Sonera's internal (on-net) traffic would be about 60% and traffic through the point of interconnection about 40% of all mobile traffic. The share of Elisa's internal traffic would be 28% and traffic through the point of interconnection would be over 70%. By Finnet, corresponding figures would be 13% and 87%.

The value of interconnected traffic and the importance of its pricing mechanism is significantly higher to Finnet and Elisa than to Sonera. Correspondingly, the value of on-net traffic is more important to Sonera than to Finnet and Elisa. The smaller the market share the easier it is for the operator to compete with on-net price. This can be seen in the price comparison retail and wholesale prices.

3.3.2 Traffic between fixed and mobile networks

When looking the subscription market shares, the share of Sonera's on-net calls (38%) would be of the same magnitude than calls to fixed networks. Regarding Elisa, traffic to fixed networks would be twice the on-net traffic. Finnet's traffic to fixed network would be more than four times its on-net traffic.

Based on the subscription market shares, 38% of the traffic of fixed networks would be routed to Sonera's mobile network, 18% to Elisa's mobile network and 8,4% to Finnet mobile network. Remaining 36% of traffic is internal on-net traffic of the fixed network.

For fixed networks, the most important interconnection cost factor is Sonera's mobile network termination charge.

3.4 The ratio of originating and terminating traffic

3.4.1 Between mobile networks

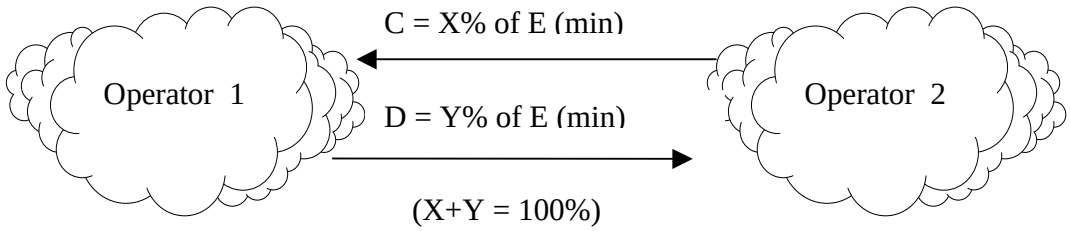
The impact of interconnection charges to interconnected operators depends on the ratio of originating and terminating traffic. The ration depend on the nature of the subscription: In subscriptions targeted to young people and in prepaid subscriptions, the share of incoming traffic can be significantly higher than the share of outgoing traffic. The share depends also on the amount of services in the networks. Service traffic is mostly incoming traffic. When the subscription and service portfolio do not differ significantly between two big mobile operators, their incoming and outgoing traffic is near 50%/50%

3.4.2 Between fixed and mobile networks

No detail traffic information was available regarding traffic minutes between fixed and mobile networks. It is evident that in the existing networks, there are more call minutes from mobile networks to fixed networks than vice a versa. The ratio may even grow with increasing use of systems bypassing the fixed networks when calling from fixed networks to mobile networks.

3.5 Interconnection trade balance

Interconnection trade balance is described by the remainder which is left when interconnection charges paid to the other mobile operator is deducted from revenues gained from call termination, figure 2.



Termination charge
= A (cents/min)

Termination charge
= B (cents/min)

Figure 2. Interconnection trade balance between two operators

Operator 1 trade balance (TB):	TB	= A*C – B*D	Euro cents
		= E*(A*X – B*Y)	Euro cents

where: C = Terminated traffic to Operator 1 network in minutes
D = Originating traffic from Operator 1 in minutes
E = Total traffic (in minutes) between Operator 1 and Operator 2
X = Share of Operator 1 terminating traffic from the total interconnection traffic
Y = Share of Operator 1 originating traffic from the total interconnection traffic

3.5.1 Trade balance between two mobile operators

A mobile operator gets revenues from incoming (terminating) calls and it is obliged to pay for termination charges regarding calls to other mobile operator. The net payment (trade balance) is dependent on 1) the traffic ratio of terminating and originating calls, 2) the difference of termination rates and 3) the level of termination rate.

The trade balance of mobile operator 1 (Euro cents/min) is demonstrated in figures 3, 4 and 5 as a function of termination charge difference of operators 1 and 2. In the figures, the trade balance is calculated in three different values of termination rate of operator 1: 15 cents/min, 10 cents/min and 5 cents/min.

In figure 3, traffic between operator 1 and operator 2 is evenly distributed. Terminating traffic is 50% and originating traffic is 50% of the total traffic. The trade balance is dependent only on the difference of termination rates, not on the absolute value of the termination rate. Therefore, there is only one line visible although the trade balance is calculated with three different values of termination rate: 15, 10 and 5 cents/min.

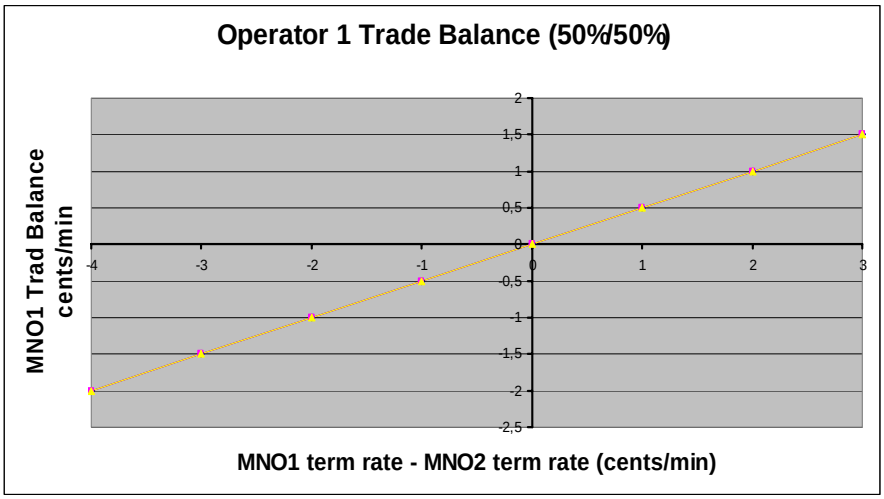


Figure 3. Trade balance of Mobile Operator 1 with incoming/outgoing traffic ratio 50%/50%

In figure 3, the trade balance of mobile operator 1 is -0,5 Euro cents/min if the termination rate of mobile operator 2 is 1 Euro cents/min higher than the termination rate of mobile operator 1. The total payable net rate of mobile operator 1 is (0,5 cents/min) * (sum of incoming and outgoing interconnection traffic of MNO1 and MNO2 in minutes)

The trade balance of MNO1 with the ratio of termination/origination traffic of 45%/55% is presented in figure 4.

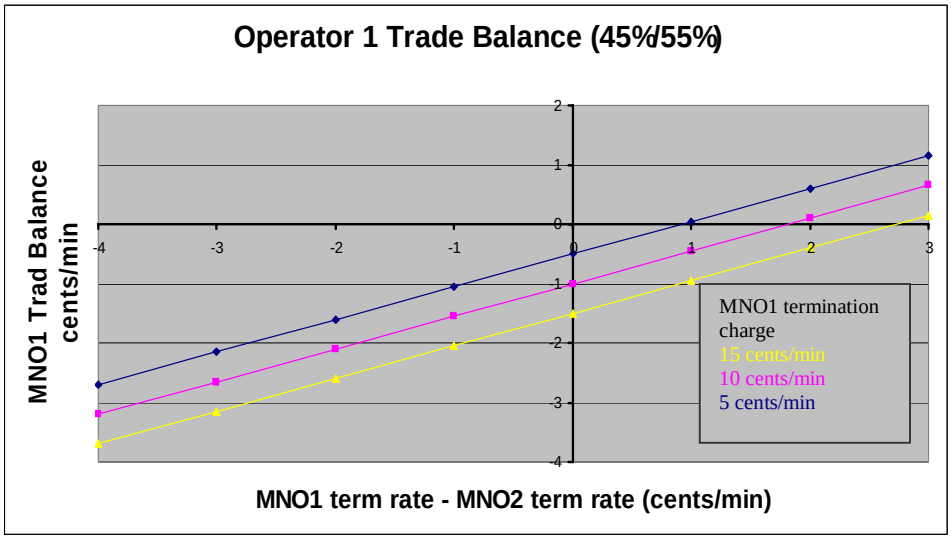


Figure 4. MNO1 trade balance in ratio 45%/55% of incoming and outgoing traffic

If the termination rate of MNO1 would change from 10 cents/min to 5 cents/min,

1) The trade balance of MNO1 would grow 0,5 cents/min if the difference in MNO1 and MNO2 termination rates would be unchanged. (correspondingly, the trade balance of MNO2 would weaken)
2) The trade balance would remain unchanged, if the difference in MNO1 and MNO2 termination rates would increase 1 cent/min

In figure 5, the trade balance of MNO1 is calculated with terminating/originating traffic ratio 55%/45%. The impact of changes in variables is similar to figure 4.

As a conclusion, the difference in MNO1 and MNO2 termination rate is more important for the operators than the absolute value of termination rate.

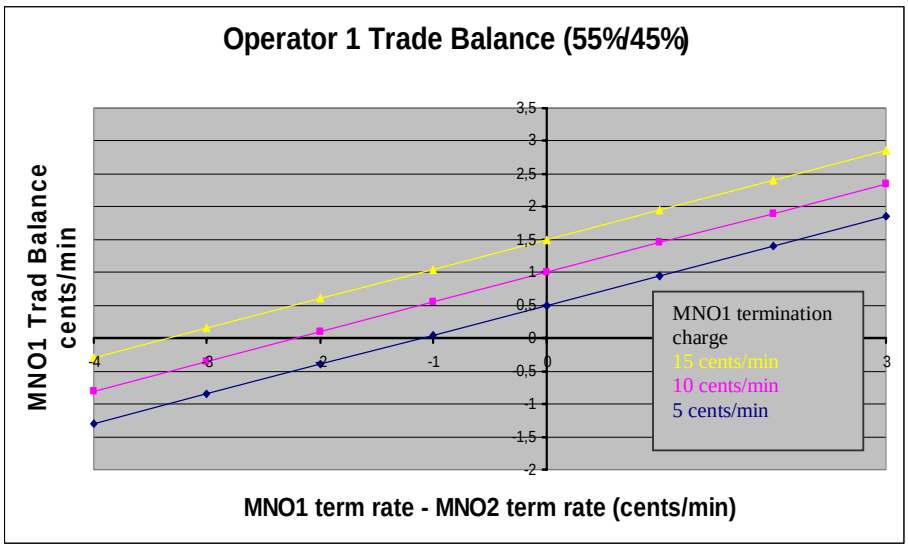


Figure 5. The trade balance of MNO1 with terminating/originating traffic ratio 55%/45%

3.5.2 Trade balance between fixed and mobile networks

The change in the Communications Act in March 2005 will enable fixed network operators to buy mobile termination from mobile network operators and price and sell fixed to mobile calls to their customers. This has not been possible before. The trade balance of traffic between fixed and mobile networks differs significantly from the trade balance between mobile operators. While the difference in termination rates of mobile operators is small, it is significant between mobile and fixed operators: The termination rate of fixed network operators is of magnitude of 2,3 cents/min[6], while in mobile networks it is magnitude of 9 cents/min, about four times the rate of fixed networks. The trade balance of fixed networks is practically always strongly negative.

The trade balance between fixed and mobile networks is presented in figure 6. Trade balance is calculated with three fixed network termination rates: 0 cents/min, 1,6 cents/min and 2,3 cents/min. 1,6 cents/min is estimated termination rate of local networks and 2,3 cents/min includes, in addition to local network termination rate, transit rate which is estimated to be about 0,7 cents/min.

While mobile termination rate is 6-7 cents/min higher than corresponding rate in fixed networks, the trade balance of fixed networks is about -3 cents/min when termination/originating traffic ratio is 55%/45%.

[6] Includes transit link to local networks

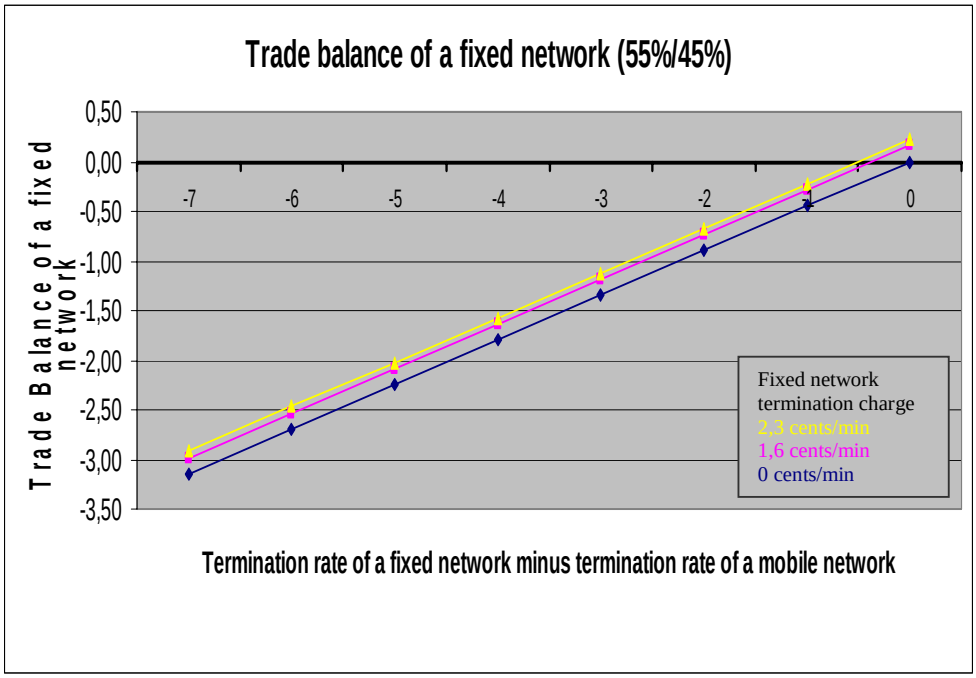


Figure 6. Trade balance of a fixed network with termination/origination traffic ratio of 55%/45%

In figure 6, two cents change in termination rates would result in about one cent change in the trade balance. Because of the high difference in termination rates, fixed network trade balance is more sensitive to changes in mobile termination than in fixed network termination (50% change in mobile termination rate results in bigger change in the trade balance than 50% change in fixed network termination).

4 Pricing alternatives

4.1 Termination rates based on costs

Cost-oriented pricing is a valid solution in theory but very difficult to implement in practise. Cost-based regulation of termination rates has been in force 6 years but it has not led to cost-oriented termination rates in any European countries.

In this report, cost-based pricing has not been discussed but some efforts are made in order to find out alternative pricing mechanisms which could lead to better and easier means to define proper termination rates.

4.2 Competitive pressure to termination rates

Call termination can meet competition only if there is alternative ways to terminate the call. In the following, two alternative ways are studied in more detail.

4.2.1 The use of GSM- gateway in the fixed network

High priced fixed-to-mobile calls have led callers to seek alternative ways to call mobile subscribers. When calling to mobile subscribers, individual callers choose mobile phone instead of fixed line phone. Companies have rationalised this by inserting GSM-gateway equipment in their fixed network PABX. If a caller in a company PABX dials a call to mobile number, GSM-gateway routes the call directly to the mobile network, not via the fixed network, figure 7.

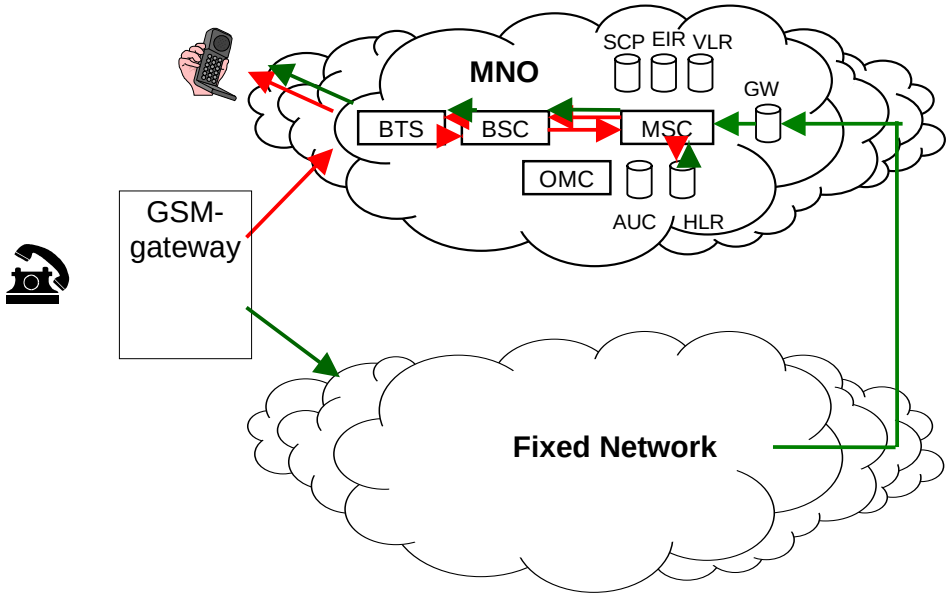


Figure 7. Bypassing the fixed network

Figure 7 demonstrates clearly the pricing paradox. On-net call in the mobile network uses two times the network components compared with a call terminated from the fixed network. In spite of that, on-net retail charge can be even cheaper than mobile termination charge (wholesale charge) collected from the fixed network operator.

GSM-gateway acts in a way an alternative path to the mobile subscriber. It is not a proper competitive solution to call termination hence it is available practically only to business users and only in the fixed networks. For the most of callers it is not an alternative: if traffic via the point of interconnection would cease, for most callers in other networks traffic to mobile networks would cease or would become difficult and cumbersome.

By using GSM-gateway, traffic through the point of interconnection decreases along with termination revenues. This creates pressure to raise prices for call termination or for retail call. When on-net calls are under heavy competitive pressure and termination traffic is a monopoly of the mobile operator, it is likely that raising pressure is targeted to termination rates rather than on-net rates. This would likely lead to increase of termination rates, not decrease as would be the case in normal competitive environment. Therefore, GSM-gateways do not offer a competitive means to call termination.

4.2.2 Mobile Virtual Network Operators

As found out in the report of “MVNO pricing in Finland”, an MVNO can make MNO’s radio access to meet competition, if it succeeds to make simultaneous access contracts with two or more mobile operators, figure 8.

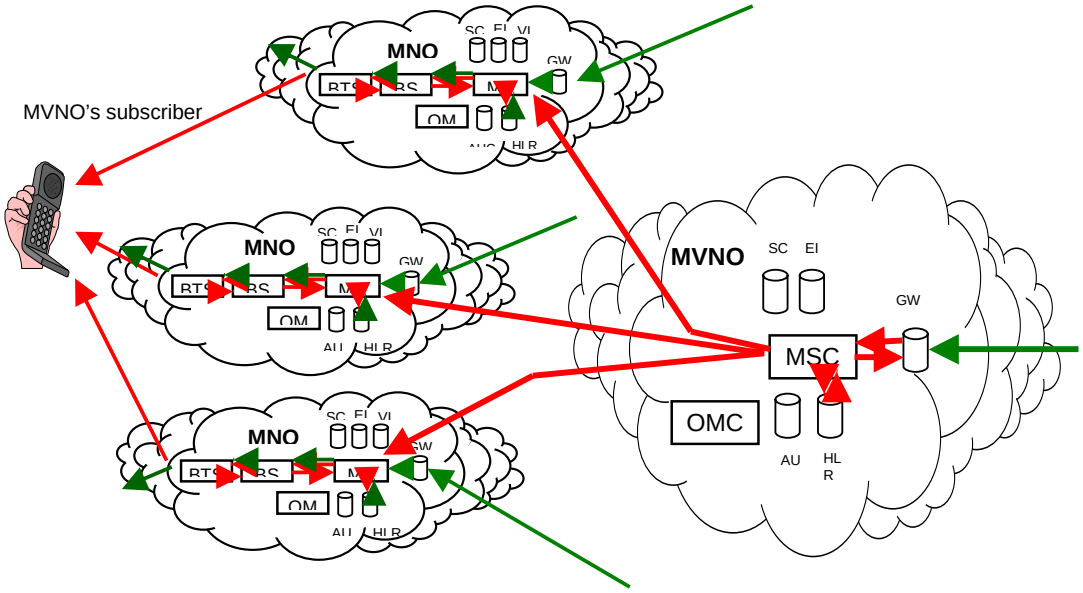


Figure 8. Competition in MNOs radio access

Green arrows in figure 8 demonstrate the normal, regulated termination traffic and red arrows access traffic from MVNO’s switch to the called party. An MVNO could route the traffic via the least cost path. The least cost route will be selected by the MVNO, not by the subscriber. Radio access, although its cost does not significantly differ from termination cost, is not regulated. MNO can sell the radio access to the MVNO in significantly cheaper price compared to its regulated termination rate.

Radio acces is not call termination by definition. Therefore, although radio access can be competed, it may have no impact on termination rates.

4.3 Sender keeps all

In Sender Keeps All (SKA)- mechanism, no interconnection charges are paid. This alternative suppose that traffic in the point of interconnection is evenly distributed, i.e. terminating and originating traffic minutes are equal and termination costs of interconnected networks are equal. SKA-mechanism has been used in some networks due to its simplicity.

Sender keeps all system would free mobile operators to price their off-net and on-net services as they wish. Interconnection price regulation would not be needed. However,

this model would lead to cross subsidy in cases where traffic is not in balance or where interconnection costs of networks differ significantly from each other. In this context it is to be noted that in the Calling Party Pays (CPP) system the caller pays only for outgoing calls. Operators get revenues from other operators also from incoming calls.

Sender keeps all- mechanism does not fit to the existing interconnection environment. It would result in abolition of interconnection charges. Operators having currently negative balance of trade would win (usually big operators) and operators having positive balance of trade would loose (usually small operators). Fixed networks, which have significantly negative balance of trade, would win and all mobile operators would loose because of huge differences in current termination rates between fixed and mobile networks.

4.4 Termination charges tied with retail charges

Based on the structure of the mobile network, the cost of an on-net call is approximately two times the cost of call termination. By tying the termination charge to the retail charge of an on-net call, it would tie call termination to market prices and termination charge would reflect the natural cost of call termination better than current calculated termination cost estimates.

By tying termination to on-net retail prices some problems exist:

1) Termination charges are defined by the network operator and retail charges by the service operator. By tying termination charges to retail charges would entail pricing of services of one operator in accordance with the prices of another operator. This juridical problem would be bypassed by regulation where the Regulator would be given the right to define the level or price cap of call termination, based on the retail prices of the market.

2) To which retail prices termination charge would be tied? 1) to weighted on-net prices of vertically integrated service provider? 2) to weighted on-net prices of all service providers of the MNO? 3) to weighted on-net prices of all mobile service providers in the market?

3) Should termination rate be defined for each mobile operator or be defined as a general minimum, average or maximum rate?

4) How monthly charges would be taken into account in defining retail prices?

5) How the termination rate would be defined in relation to the retail charge? 60% of the retail charge? Maximum the retail charge?

6) How termination rates of individual mobile operators would be defined? By defining the minimum, average of maximum level and let operators agree on the rates within the given limits? Individual rates would be defined in relation to operator market shares?

Tying mechanism listed in point 2 above has significant impacts to mobile operators:

Tying to retail charges of vertically integrated mobile service provider
If the termination rate of a network operator would be tied to retail prices of its vertically integrated service provider, it would lead to intolerable situation of new entrants or small network operators: In order to promote their services, on-net calls may be sold under cost. If a network operator would be obliged to set its termination rate based on under cost retail prices, its termination charges would also be under cost and less than termination charges of bigger operators. In this case, termination charges would not reflect the costs of call termination.

Tying to retail charges of all mobile service providers of the network operator
This alternative could suit to those network operators who have several significant service providers. It would not be successful for network operators having only small number of independent service providers or having no independent services provider at all.

Tying to retail charges of all mobile service providers in the market
If termination rate would be tied to the weighted on-net retail charge of all mobile services providers in the market, the resulting termination rate would reflect the general price level of on-net traffic. Price level were weighted near the on-net retail level of biggest mobile operators and would be less sensitive for promotional price variations of small operators. Changes of retail charges of individual mobile operators would not have a significant impact on the general level of termination charge.

4.5 Termination charges tied with wholesale charges

A service provider, whether it is vertically integrated with the SMP network operator of service provider independent of the network operator, sells its services to end users and purchases network services from the network operator. SMP network operators, which are obliged to separate their accounts, have to separate network services from other services. Network services consist of call origination, call termination and conveyance of on-net calls. Only charges for call termination are regulated, wholesale charges for call origination and on-net calls are not regulated. Unregulated charges are not public and they are not subject to requirements of transparency, non-discrimination and cost orientation. Network operator can price its wholesale services (other than call termination) as they wish and the price does not need to be the same for its own service provider and other service providers.

Tying the termination rate to wholesale services, for example to wholesale price of on-net call, it would entail pricing transparency. Pricing transparency can be made an obligation to SMP operators only. This would need justification based on market failure. Giving an SMP obligation based on the need for price setting of termination rates would be difficult to justify.

Use of wholesale prices for the definition of termination charges could be justified only if wholesale prices are competitive prices. This would entail existence of several and strong service providers that are not tied with ownership to the network operator.

4.6 Releasing termination regulation

4.6.1 Traffic between mobile networks

If a mobile operator raises its termination charges, its revenues increase, its balance of trade increases, if traffic remains unchanged. Higher termination rate is increased cost to its interconnected competitor. This can compensate the increased cost by:

1) Compensation from its own funds
2) Increasing its own retail price
3) Increasing its own termination rate
4) Cutting off originating and/or terminating traffic to/from the mobile operator that increased the termination rate

The two first options are relevant, third is relevant only if termination charges are not regulated. The fourth options may be difficult to implement due to economical and business reasons and when regulations prevent it.

When a mobile operator increases its termination rates, it does not impact to call prices of its own subscribers, its revenues increases and its competitors' costs increase. It is beneficial for a mobile operator to increase its termination rates. Correspondingly, if it is obliged to lower its termination rates, it has no impact to call prices of its own subscribers but its interconnection revenues become lower and interconnection costs of its competitors become lower. It is unprofitable for a mobile operator to decrease its termination rates.

By releasing termination charges between two interconnected operators from regulation, mobile operators would be entitled to negotiate interconnection charges, their level and difference mutually. This could be successful assuming that the mobile operators have equal negotiation power and impact of termination charges to their finance would be comparable. In practise, differences in market shares are significant and the importance of interconnection depends on the size of the operator. Therefore, no equal negotiation power exists and it is likely that possible interconnection agreements would favour market leader on the costs of new entrants. It is the author's view that with current market conditions, releasing of termination pricing regulation is not appropriate. Situation might be different in circumstances where operators are more equal in size and equal negotiation power exists.

4.6.2 Traffic between fixed and mobile networks

Termination rates of mobile operators are from four to five times termination rates of fixed network operators. Therefore, the balance of trade of fixed network operators is

always highly negative. Fixed network operators are always net payers to mobile operators.

If a mobile operator increases its termination rate, its revenues increase and its balance of trade strengthens supposing the traffic will remain unchanged. Increased termination rate is an increased cost factor to fixed network operators. A fixed network operator can compensate increased costs by:

1) Compensation from its own funds
2) Increasing its own retail price
3) Increasing its own termination rate
4) Cutting originating and/or terminating traffic to/from the mobile operator that increased the termination rate

The two first options are relevant, third is not relevant because termination rates of the fixed network are regulated. These cannot be changed for the reason that mobile operator changed its termination rate. The fourth options may be difficult to implement due to economical and business reasons and when regulations prevent it.

While in the mutual trade balance of two mobile operators the difference in termination rates was more significant than the absolute value of termination rate, in the fixed network situation is different.

In mobile networks, difference of termination rates (from one to two cents/min) is about 10-20% of the value of the termination rate (about 9 cents/min). Regarding fixed and mobile networks, the difference of termination rates is about 7 cents/min which is about 80% of mobile termination rate and about four times fixed network termination rate. While in mobile networks termination rate would be possibly decreased by 50% without having major impact to the trade balance, this cannot be done between mobile and fixed network. No common termination rate level exists. Based on the significant differences in termination rates, the trade balance of the fixed network is more sensitive to changes in mobile termination rates than changes in fixed network termination rates. Therefore, the right level of mobile termination is more important to fixed network operators than to mobile operators.

Between fixed and mobile networks, there is no such competitive dependency and no such negotiation power which would lead to a mechanism to define interconnection charges between fixed and mobile operators on equal basis. It is the author’s view that termination rates between fixed and mobile network should be regulated even if regulation would be released regarding interconnection between mobile networks.

4.7 Other alternatives

4.7.1 Segment pricing

Termination charges are charges which operators pay to each other and they are not visible to callers. If termination charge would be visible to caller, it would make caller

aware on how call price is divided between operators and what is the level of call termination compared with call origination and with on-net call. It is questionable, however, how much visibility of termination charge would impact on price level of termination charge. Segment pricing is used today in calls from fixed to mobile networks and in traffic to different services. Expanding the practise to all calls would probably blur the pricing scheme more than termination rate transparency would benefit it. Issue is not discussed here in further detail.

4.7.2 Expansion of cost calculation obligations

One alternative to verify correctness of the level of termination rates would be to calculate costs of call origination and costs of on-net calls. Regulator would then be able to compare the cost of call termination to costs of call origination and costs of on-net calls. If the cost of call termination differs significantly from the cost of call origination or cost of an on-net call from combined costs of call origination and call termination, mobile network operator would be requested to justify the differences. Cost calculations would be made only for the regulator. They would be needed for the definition of wholesale pricing of other than call termination services unless these services are not defined as obligations of SMP operators.

These options were small improvement to current cost calculation model, where cost calculation obligation is only for call termination. Cost calculation requirement for other than call termination services would cross-check cost of call termination in relation to cost of call origination and cost of on-net call. Option would increase the work load of both operators and regulators. Resulting calculations would still be independent of market prices and inaccuracy of parameter estimates in the calculations would still cause price distortion comparable to current model. Option would not guarantee adequacy of difference between retail and wholesale prices.

5 Alternatives in the context of EU regulation

Article 13 of Access directive[7], regulates interconnection pricing. According to Article 13 (Price control and cost accounting obligations):

> *1. A national regulatory authority may, in accordance with the provisions of Article 8, impose **obligations relating to cost recovery and price controls**, including obligations for cost orientation of prices and obligations concerning cost accounting systems, for the provision of specific types of interconnection and/or access, in situations where a market analysis indicates that a lack of effective competition means that the operator concerned might sustain prices at an excessively high level, or apply a price squeeze, to the detriment of end-users. National regulatory authorities shall take into account the investment made by the operator and allow him a reasonable rate of return on adequate capital employed, taking into account the risks involved.*
>
> *2. National regulatory authorities shall ensure that any **cost recovery mechanism or pricing methodology** that is mandated serves to promote efficiency and sustainable*

[7] Euroopan Parlamentin ja Neuvoston Direktiivi 2002/19/EY, Sähköisten viestintäverkkojen ja niiden liitännäistoimintojen käyttöoikeuksistaa ja yhteenliittämisestä (käyttöoikeusdirektiivi) 7.3.2002

> *competition and maximise consumer benefits. In this regard national regulatory authorities may also take account of prices available in comparable competitive markets.*
>
> *3. Where an operator has an obligation regarding the cost orientation of its prices, the burden of proof that charges are derived from costs including a reasonable rate of return on investment shall lie with the operator concerned. For the purpose of calculating the cost of efficient provision of services, national regulatory authorities may use cost accounting methods independent of those used by the undertaking. National regulatory authorities may require an operator to provide full justification for its prices, and may, where appropriate, require prices to be adjusted.*
>
> *4. National regulatory authorities shall ensure that, where implementation of a cost accounting system is mandated in order to support price controls, a description of the cost accounting system is made publicly available, showing at least the main categories under which costs are grouped and the rules used for the allocation of costs. Compliance with the cost accounting system shall be verified by a qualified independent body. A statement concerning compliance shall be published annually.*
>
> ***(bolded and underlined words made by the author)***

According to paragraph 1, a national regulatory authority may, in accordance with the provisions of Article 8, impose obligations relating to cost recovery and price control. Current cost-oriented pricing seems clearly be in accordance with cost recovery obligations. To what extent other pricing alternatives included in this report (sender keeps all, tying with resale prices, tying with wholesale prices) belong under Article 13 of the Access Directive, may be debated. It is author's view that tying of termination rate to the retail or wholesale price of on-net calls reflects better real termination costs than current cost calculation mechanisms.

According to paragraph 2, "national regulatory authorities shall ensure that any cost recovery mechanism or pricing methodology that is mandated serves to promote efficiency and sustainable competition and maximise consumer benefits. In this regard national regulatory authorities may also take account of prices available in comparable competitive markets". When interpreting the wording, one could also claim that current cost calculation mechanism does not promote competition due to difficulties in its implementation and it would, therefore, be in conflict with the Directive. According to wordings in paragraph 2, also other than cost recovery mechanisms may exist.

According to recital 20 of the Access Directive,

> *Price control may be necessary when market analysis in a particular market reveals inefficient competition. The regulatory intervention may be relatively light, such as an obligation that prices for carrier selection are reasonable as laid down in Directive 97/33/EC, or much heavier such as an obligation that prices are cost-oriented to provide full justification for those prices where competition is not sufficiently strong to prevent excessive pricing.* ***In particular, operators with significant market power should avoid a price squeeze whereby the difference between their retail prices and the interconnection prices charged to competitors who provide similar retail services is not adequate to ensure sustainable competition.*** *When a national regulatory authority calculates costs incurred in establishing a service mandated under this Directive, it is*

> *appropriate to allow a reasonable return on the capital employed including appropriate labour and building costs, with the value of capital adjusted where necessary to reflect the current valuation of assets and efficiency of operations. The method of cost recovery should be appropriate to the circumstances taking account of the need to promote efficiency and sustainable competition and maximise consumer benefits.*
>
> ***(bolded wording made by the author)***

" In particular, operators with significant market power should avoid a price squeeze whereby the difference between their retail prices and the interconnection prices charged to competitors who provide similar retail services is not adequate to ensure sustainable competition". According to recital 20, the difference between retail prices and wholesale interconnection prices is one of the criteria to ensure sustainable competition. If this difference is used to define appropriate termination rate, it should not be in conflict with the Directive.

In conclusion, Article 13 in the Access Directive does not define cost orientation as the only means to control termination charges. Procedure, where termination charge is defined based on retail charges should not be in conflict with the objectives of the Access Directive.

6 Conclusions

Alternatives for cost-oriented termination charges

In this report, other alternatives than cost-oriented pricing have been investigated in order to find a reasonable charge level of call termination. Examples of those alternatives are inter alia:

- Competitive pricing of call termination
- Sender Keeps All mechanism
- Termination charges calculated from on-net retail prices
- Termination charges calculated from on-net wholesale prices
- Releasing mobile-to-mobile traffic from regulation
- Releasing fixed-to-mobile traffic from regulation
- Making termination charges visible to callers

From these alternatives, only tying termination charges to on-net retail charges offers a means to the current cost-oriented pricing. From other alternatives:

- Competitive pricing of call termination is impossible in practise
- Sender Keeps All mechanism is not suitable in circumstances where Input/Output relation of interconnection differs from ratio 50%/50%. Furthermore, it would result in a significant change in the trade balance of current operators.
- If termination charges were calculated from unregulated on-net wholesale charges, it would turn wholesale charges transparent and presumably SMP obligation for other than call termination. In order to get wholesale prices into reasonable level, it would entail several strong service providers / MVNOs which were not owned or influenced by network operators.

- Release of mobile-to-mobile traffic from regulation might be possible if interconnected mobile operators would have similar negotiation power and if mobile termination charges could be different from fixed to mobile termination charges. In the Finnish market, no countervailing negotiation power exists and the current regulation makes termination charges independent of the origination network.
- Regulation between fixed and mobile network cannot be released because of the fact that no such mechanism exists that would result in a sufficient negotiation power between fixed and mobile networks in order to define termination charges based on the proper competitive environment

Trade Balance of Interconnected Mobile Network Operators
The trade balance of two interconnected operators is calculated by subtracting the outbound termination costs from inbound termination revenues. The analysis of mobile operators trade balance demonstrates that the difference between the termination rates is more important to the interconnected operators than the absolute level of termination charge. In fact, the termination rate of the Finnish mobile operators could be made in half without any change in the trade balance if, at the same time, mutual difference of their termination charges would be slightly changed.

Termination charges based on on-net retail charges
Termination charge could be tied with mobile-to-mobile on-net charge in several alternative ways. However, in order to tie termination rates to retail rates, the regulator needs legal power.

In this report, an alternative for cost-oriented termination rate is presented. Termination rate would be defined in relation to mobile-to-mobile on-net rate as follows: 1) An average on-net rate would be defined by on-net retail call rate of all mobile service providers, weighted by subscriptions. 2) This average “national” on-net retail rate would be as a basis for the definition of a “national” termination rate. 3) “National” cap termination rate would equal to the “national” on-net retail rate. Termination rate of any mobile network operator could not exceed this cap rate. 4) Termination rates of individual operators would be lower than the cap rate, in counter relation to their subscription market share. Therefore, the termination rate of Sonera would be the lowest (as having biggest market share) and the termination rate of Finnet would be the highest (as having the lowest market share). Termination rate of Elisa would be between the two operators. In defining the termination rate, the share of the market share is justified because of the economies of scale. Economies of scale are automatically taken into account in the current cost calculations of individual operators.

The proposed solution has the following positive influences:

- termination rates would be tied with public retail market prices and system would be strictly transparent
- the development of termination rate would automatically follow the development of market

- proposed solution would not request operator specific cost calculations. Instead of cost calculation, individual public retail rates would be investigated and "national" average rate calculated. The work load of operators in defining termination costs would cease and the work load of the regulator would decrease significantly
- proposed solution would lead to termination rates near to rates corresponding their costs (below the rate of an on-net call)
- proposed solution would decrease the cross subsidy to mobile operators paid by the fixed network subscribers
- proposed solution would not impact to the current interconnect trade balance of mobile operators
- court procedures would decrease significantly or deceased, depending on the way how unambiguously the calculation mechanisms could be defined

The proposed solution is illogical in a way: wholesale rates would be defined by the retail rates. It is to be noted, however, that mobile operator can define the retail rate without knowing or without publishing its wholesale rate. Therefore, wholesale rate does not necessarily exist, if it is not made public by regulations. With calculations based on costs of call conveyance, the definition of termination cost has not been successful. By the proposed solution, the wholesale rate would still be based on calculations and would not reflect the real cost of call termination. However, termination rate that is based on the retail rate would better reflect the natural relation between wholesale and retail rates, the matter that is taken as a criterion in the Access Directive, whereby the difference between retail prices and the interconnection prices charged to competitors who provide similar retail services should be adequate to ensure sustainable competition.

Cost calculation of all wholesale services

In order to verify the competency of currently calculated termination rates, also cost calculations of call origination and on-net calls would be needed. Having cost calculations of call origination and on-net calls, regulators would be able to compare costs of call termination to call origination and on-net calls. If cost of call termination would significantly differ from costs of call origination or cost of on-net call differs significantly from combined cost of call origination and call termination, operators would be requested to justify reasons for the difference. Verification would be made only for the regulator in order to verify the right level of termination. It would not be used for pricing of call origination and on-net services, if these services are not defined under obligation of SMP operators.

This alternative would be a slight improvement to the current cost calculation mechanism where cost orientation obligation is applied only for call termination. It would demonstrate the level of termination cost compared with the level of cost of call origination and to the level of cost of on-net call. Solution would increase the work load of both operators and the regulator. The cost of call termination would still be independent of market prices and the inaccuracy of calculation parameters would still be subject to pricing distortion. It would not still clarify the adequate difference between wholesale and retail rates.

Glossary

Acronyms used in the Report:

AUC	Authentication Centre
BSC	Base Station Controller
BTS	Base Transceiver Station
EIR	Equipment Identity Register
GW MSC	Gate Way Mobile Switching Centre
HLR	Home Location Register
IRG	Independent Regulators Group
MNO	Mobile Network Operator
MSC	Mobile Switching Centre
MVNO	Mobile Virtual Network Operator
OMC	Operations and Maintenance Centre
SCP	Service Control Point
SKA	Sender Keeps All
SMP	Significant Market Power
VLR	Visitor Location Register

Charging of Mobile services in Finland, 11/2004

Sonera 11/2004	Install	Monthly	**Mob-to-fixed**	*Fixe termin*	*Sonera's share*	**To other mobiles**	*Term. Elisa*	*Sonera's share*	**On-net call**	*Sonera's*	*Sonera's*	From fixed network		*Sonera's*	*Sonera's*
Prices VAT excl	Euro	Euro	**cents/min**	*cents/min 5)*	*cents/min*	**cents/min**	*cents/min*	*cents/min*	**cents/min**	*term.*	*share of access*	Peak	Off-peak	*own term.*	*service share*
One	3,3689	3,27	10,66	2,3	8,36	10,66	10	0,66	10,66	9	1,66	19,7	13,1	9	4,1-10,7
Max	3,3689	5,73	7,30	2,3	5,00	7,30	10	-2,70	7,30	9	-1,70	19,7	13,1	9	4,1-10,7
Mini	3,3689	1,63	13,93	2,3	11,63	13,93	10	3,93	13,93	9	4,93	19,7	13,1	9	4,1-10,7
			9,84	2,3	7,54	9,84	10	-0,16	9,84	9	0,84	19,7	13,1	9	4,1-10,7
Classic Duo	3,3689	2,87	12,30	2,3	10,00	12,30	10	2,30	8,20	9	-0,80	19,7	13,1	9	4,1-10,7
Privat Duo	3,3689	3,00	12,30	2,3	10,00	12,30	10	2,30	12,30	9	3,30	19,7	13,1	9	4,1-10,7
			8,20	2,3	5,90	8,20	10	-1,80	8,20	9	-0,80	19,7	13,1	9	4,1-10,7
Zeroforty	3,3689	8,19	10,66	2,3	8,36	10,66	10	0,66	10,66	9	1,66	19,7	13,1	9	4,1-10,7

Elisa 11/2004	Install	Monthly	**Mob-to-fixed**	*Fixe termin*	*Elisa's share*	**To other mobiles**	*Term. Sonera*	*Elisa's share*	**On-net call**	*Elisa's*	*Elisa's*	From fixed network		*Elisa's*	*Elisa's*
Prices VAT excl	Euro	Euro	**cents/min**	*cents/min 5)*	*cents/min*	**cents/min**	*cents/min*	*cents/min*	**cents/min**	*term.*	*share of access*	Peak	Off-peak	*own term.*	*service share*
Tandem	6,47	4,00	21,31	2,3	19,01	21,31	9	12,31	9,84	10	-0,16	21,3	13,9	10	3,9-11,3
			9,84	2,3	7,54	13,93	9	4,93	9,84	10	-0,16	21,3	13,9	10	3,9-11,3
Tandem Aina	6,47	2,73	13,93	2,3	11,63	13,93	9	4,93	13,93	10	3,93	21,3	13,9	10	3,9-11,3
Tandem Aina Plus	6,47	3,24	9,84	2,3	7,54	9,84	9	0,84	9,84	10	-0,16	21,3	13,9	10	3,9-11,3
Tandem Aina Tekst	6,47	4,06	12,70	2,3	10,40	12,70	9	3,70	12,70	10	2,70	21,3	13,9	10	3,9-11,3
Tandem Aina Yö	6,47	2,73	13,93	2,3	11,63	13,93	9	4,93	13,93	10	3,93	21,3	13,9	10	3,9-11,3
			13,93	2,3	11,63	13,93	9	4,93	0,00	10	-10,00	21,3	13,9	10	3,9-11,3
Eturinki	6,47	4,06	12,30	2,3	10,00	12,30	9	3,30	12,30	10	2,30	21,3	13,9	10	3,9-11,3
			8,20	2,3	5,90	8,20	9	-0,80	8,20	10	-1,80	21,3	13,9	10	3,9-11,3
Tandem Aina Pro	6,47	5,00	8,93	2,3	6,63	8,93	9	-0,07	8,93	10	-1,07	21,3	13,9	10	3,9-11,3

DNA 11/2004	Install	Monthly	**Mob-to-fixed**	*Fixe termin*	*DNA's share*	**To other mobiles**	*Term. Sonera*	*DNA's share*	**On-net call**	Finnet	DNA:n	From fixed network		*Finnet's*	*DNA's*
Prices VAT excl	Euro	Euro	**cents/min**	*cents/min 5)*	*cents/min*	**cents/min**	*cents/min*	*cents/min*	**cents/min**	term.	*share of access*	Peak	Off-peak	*own term.*	*service share*
Yritysliittymä	2,4	4,0	9,84	2,3	7,54	13,93	9	4,93	9,84	11	-1,16	21,3	13,9	11,0	2,9-10,3
Koti GSM 1	2,4	6,5	10,66	2,3	8,36	10,66	9	1,66	5,74	11	-5,26	21,3	13,9	11,0	2,9-10,3
Onni	2,4	0,6	5,66	2,3	3,36	5,66	9	-3,34	5,66	11	-5,34	21,3	13,9	11,0	2,9-10,3
Helmi	2,4	2,4	7,38	2,3	5,08	7,38	9	-1,62	1,64	11	-9,36	21,3	13,9	11,0	2,9-10,3
Vakio S	2,4	0,0	14,75	2,3	12,45	14,75	9	5,75	14,75	11	3,75	21,3	13,9	11,0	2,9-10,3
Vakio M	2,4	3,2	9,84	2,3	7,54	9,84	9	0,84	9,84	11	-1,16	21,3	13,9	11,0	2,9-10,3
Vakio L	2,4	6,5	8,61	2,3	6,31	8,61	9	-0,39	8,61	11	-2,39	21,3	13,9	11,0	2,9-10,3
Prepaid	0,00	0,00	13,11	2,3	10,81	13,11	9	4,11	13,11	11	2,11	21,3	13,9	11,0	2,9-10,3

Saunalahti 11/04	Install	Monthly	**Mob-to-fixed**	*Fixe termin*	*Saunalahti share*	**To other mobiles**	*Term. Elisa*	*Saunalahti share*	**On-net call**	*Saunal*	*Saunal*	From fixed network		*Sonera's*	*Saunal*
Prices VAT excl	Euro	Euro	**cents/min**	*cents/min 5)*	*cents/min*	**cents/min**	*cents/min*	*cents/min*	**cents/min**	*term.*	*share of access*	Peak	Off-peak	*term*	*service share*
Tasahalpa	0,00	0,00	6,5	2,3	4,2	6,5	10	-3,5	6,5	9	-2,5	21,5	13,6	9	4,6-12,5
Simppeli	0,00	0,77	7,7	2,3	5,4	7,7	10	-2,3	7,7	9	-1,3	21,5	13,6	9	4,6-12,5
Sopuhinta	0,00	4,02	9,0	2,3	6,7	9,0	10	-1,0	9,0	9	0,0	21,5	13,6	9	4,6-12,5
			4,9	2,3	2,6	4,9	10	-5,1	4,9	9	-4,1	21,5	13,6	9	4,6-12,5
Saunalahtelainen	0,00	4,02	12,3	2,3	10,0	12,3	10	2,3	3,3	9	-5,7	21,5	13,6	9	4,6-12,5
Saunalahti GSM	7,38	0,00	11,4	2,3	9,1	11,4	10	1,4	11,4	9	2,4	21,5	13,6	9	4,6-12,5
Saunalahti Lanka	0,00	2,42	8,2	2,3	5,9	8,1	10	-1,9	8,2	9	-0,8	21,5	13,6	9	4,6-12,5
			+0,82 / min						+0,82 / min			21,5	13,6	9	4,6-12,5
Paketti Plus 1)	0,00	16,31	8,1	2,3	5,8	8,1	10	-1,9	8,1	9	-0,9	21,5	13,6	9	4,6-12,5
Tekstari 2)	0,00	7,38	10,6	2,3	8,3	10,6	10	0,6	10,6	9	1,6	21,5	13,6	9	4,6-12,5
Saunal GSM plus	0,00	4,88	8,6	2,3	6,3	8,6	10	-1,4	8,6	9	-0,4	21,5	13,6	9	4,6-12,5
Puhu hyvää	7,38	0,00	11,4	2,3	9,1	11,4	10	1,4	6,5	9	-2,5	21,5	13,6	9	4,6-12,5
YritysGSM plus 3)	0	0	7,4	2,3	5,1	7,4	10	-2,6	5,3	9	-3,7	21,5	13,6	9	4,6-12,5
Prepaid 4)	8,20	0,00	8,2	2,3	5,9	8,2	10	-1,8	8,2	9	-0,8	21,5	13,6	9	4,6-12,5

1) includes 450 call minutes to all national GSM and fixed subscriptions
2) includes 1000 SMSs/month to all mobile subscriptions
3) prices without VAT; minimum charge 3,5 Euros/month
4) Starter kit of 10 Euros includes call minutes of value 10 Euros
5) Estimate (max): Transit 0,7cents/min + local termination 1,6 senttiä/min

VAT = 1,22