

FINAL REPORT

ON

CARRIER SELECTION



24 July 1997

This study has been prepared by ETO on behalf of ECTRA for the Commission of the European Union.

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Content

1. EXECUTIVE SUMMARY	3
2. PRESENTATION OF THE STUDY.....	7
3. THE SCOPE OF THE STUDY	9
4. MECHANISMS FOR CARRIER SELECTION.....	11
4.1 WHAT IS CARRIER SELECTION?	11
4.2 THE NEED FOR CARRIER SELECTION	12
4.3 CARRIER SELECTION AND INTERCONNECTION.....	13
4.4 TECHNICAL ALTERNATIVES FOR CARRIER SELECTION.....	13
4.4.1 Options for single-stage selection.....	13
4.4.2 Two-stage dialling versus single-stage dialling	16
4.4.3 The use of * and # dialling in preselection.....	16
4.5 CARRIER SELECTION MECHANISMS USED IN DIFFERENT COUNTRIES	17
4.5.1 Selection of a carrier network	17
4.5.2 Selection of a switched based reseller	18
4.6 ISSUES RELATED TO THE IMPLEMENTATION OF CARRIER SELECTION.....	18
4.6.1 Technical constraints.....	18
4.6.2 The level of competition in carrier networks	20
4.6.3 Costs of implementing Carrier Selection.....	20
4.6.4 Which Access Network Operators should be required to offer Carrier Selection?	21
4.6.5 Which Carrier Network Operators should have the right to Carrier Selection?.....	22
4.6.6 Customer's choice of preselected carrier	24
4.6.7 Changing the preselected carrier	25
4.6.8 Definition of long-distance calls at a national level.....	26
4.6.9 Should Mobile Operators be obliged to offer Carrier Selection in international calls? ..	27
4.6.10 Billing the customer	28
4.6.11 Carrier Selection from public pay-phones	29
4.6.12 Carrier Prefixes.....	30
4.6.13 European harmonisation.....	34
5. ETO RECOMMENDATIONS FOR CARRIER SELECTION	35
5.1 MECHANISMS FOR CARRIER SELECTION.....	35
5.2 CARRIER SELECTION IN FIXED NETWORKS	36
5.2.1 Which Access Network Operators should be obliged to offer Carrier Selection mechanism?	36
5.2.2 Which Carrier Network Operators should have the right to Carrier Selection?.....	36
5.3 CARRIER SELECTION IN MOBILE NETWORKS	36
5.4 CUSTOMER CHOICE FOR PRESELECTION.....	37
5.5 CHANGING THE PRESELECTED CARRIER.....	37
5.6 DEFINITION OF LONG-DISTANCE CALLS AT THE NATIONAL LEVEL	38
5.7 BILLING	38
5.8 CARRIER SELECTION FROM PUBLIC PAY-PHONES.....	39
5.9 CARRIER PREFIXES.....	40
ANNEXES.....	41
Annex 1 Work requirement on Carrier Selection	43
Annex 2 List of abbreviations	45
Annex 3 Options for Carrier Selection.....	46
Annex 4 Carrier Selection mechanisms used in different countries	47
Annex 5 Competitive environment and Carrier Selection.....	53
Annex 6 Constraints in implementing Carrier Selection	55
Annex 7 Comments from ENF members.....	56
Annex 8 Comments from individual ECTRA countries.....	57

This report has been prepared by Jukka Kanervisto from the ETO with the kind assistance of the experts of ETO, the ECTRA Project Teams on Numbering, Licensing and APRII, ECMA, ETNO, ECTEL, EIIA, ETSI and GSM MoU EIG. It is to be noted, however, that the report does not necessarily reflect the official opinions of the said organisations.

1. EXECUTIVE SUMMARY

From 1st January 1998, most of the EU countries are committed to permitting competition in the whole telecommunications sector and, in particular, in public voice telephony over fixed networks. The success of this policy depends, in part, on the regulatory measures instituted to counterbalance the power of the incumbent telecommunications operator. One of the important issues to be studied is the ease with which customers can select an alternative long-distance carrier.

Carrier selection is a mechanism that permits customers to choose national and/or international long-distance telecommunications carriers. The way in which carrier selection is introduced into public telephone networks will have a significant impact on the speed with which new entrants can obtain a viable market share in different market segments. In a competitive telecommunications environment, there are several access network operators and several carrier network operators. The focus of this study is competition in carrier networks only. The impact of carrier network competition on access network competition is not dealt with in detail.

The results of the ETO study are summarised in the following sections.

Mechanisms for Carrier Selection

There are a number of options for carrier selection. ETO believes that in Europe, where competition in networks is beginning, preselection with call-by-call selection is the best option for users and will lead to the fairest treatment of all telecommunications operators. However, the implementation of preselection is network dependent and may take some time, which may eventually delay the start of competition in carrier networks. In order to follow the competition time schedule (1.1.1998) set by the European Union, an intermediate solution would be default carrier with call-by-call selection, where calls dialled without a carrier prefix will be routed to a default carrier defined by the access network operator.

Carrier selection is a key to long-distance competition on the national level. Due to growing competition within European countries, national carriers may not operate in their home market only. Regarding long-distance calls, international calls in particular, the market area will be the entire European market area in the future rather than different fragmented national market areas. ETO believes that equal and non-discriminatory conditions in the European market area can be created through preselection combined with call-by-call selection.

ETO recommends that:

1. Default carrier defined by an access network operator and call-by-call selection by the user should be implemented in CEPT countries as soon as possible, following the introduction of competition in carrier networks. This option should be seen as an intermediate solution for carrier selection.
2. Preselection with call-by-call selection should be implemented in all CEPT countries as soon as possible, following the introduction of competition in carrier networks. In order to safeguard the benefits of preselection, extension of the carrier selection from default to preselection should be carried out as quickly as possible.

Rights and obligations for Carrier Selection

The large majority of European countries believes that all **access network operators** in fixed networks should be obliged to provide users with the ability to choose long-distance carriers. ETO, therefore, makes this proposal on behalf of ECTRA. This should be confirmed by ECTRA when adopting this report. Countries opposing this proposal should explain their position which will be annexed in this report.

The selection of international carriers in mobile networks is being debated. Some mobile operators do not want to allow subscribers to select an international carrier. In some countries, selection of international carriers from mobile networks has already been implemented. Mobile networks form an access network to international connections as well as fixed access networks. Based on the findings of this report, ETO cannot see the reason why mobile access networks should be treated differently from fixed access networks.

Which **carrier network operators** should have the right to carrier selection and preselection? ETO believes that all carrier network operators and switched based resellers should be able to obtain a carrier prefix to provide their carrier services on a call-by-call basis. With regard to preselection, in the beginning of competition, however, carriers which can provide a full national or international service should be eligible for preselection. The extension of preselection to cover all carriers should be studied in further detail.

ETO recommends that:

3. NRAs should require all fixed access network operators to offer call-by-call selection to carrier network operators, following the end of monopoly on public voice telephony.
4. NRAs should require all fixed access network operators to offer preselection with call-by-call selection as soon as it is technically feasible.
5. All mobile operators should be required to provide users with the possibility to choose their international carrier.

6. All carrier network operators and switched based resellers should be able to obtain carrier prefixes to provide their carrier services on a call-by-call basis.
7. Only those carrier network operators which can provide a full long-distance national service or a full long-distance international service should be entitled to preselection.

Definition of a long-distance call

The split between “local”, “long-distance” and “international” calls seems to be based on historical tariff and network structures and may not be relevant in a competitive environment in the future. International calls are easily defined. Definition of national calls is more difficult. ETO considers it important for long-distance calls - or national calls in general - to be defined in a way that can be understood by users and network operators.

ETO recommends that:

8. Access and carrier network operators in each country should attempt to reach an agreement on the best national definition of “long-distance call”.
9. The NRA should make decide the best definition of “long-distance call” so that it will be binding on subsequent market entrants.

Billing

Billing is a critical matter as it is the key to revenues and to relationships between operators and customers. ETO believes that new entrants should be entitled to choose which billing arrangements are the most suitable for them.

ETO recommends that:

10. NRAs should require the fixed access network operator to allow the carrier network operator to bill the customer directly.
11. The carrier network operator should have the right to require that the access network operator bills its customer.
12. The billing arrangements should be discussed and agreed upon between carrier network operators and access network operators in interconnection negotiations.
13. NRAs should intervene only if negotiations on billing fail.

Carrier prefixes

The optimal length of carrier prefixes results from a number of conflicting pressures - ease of use, number capacity of equipment and available numbering resources. In a fully competitive market, numbering schemes have to enable equal numbering resources for corresponding carriers and resellers. Short codes - in general - are a scarce numbering resource. Short codes (from 1 to 3 digits) allocated for carrier selection conflict with the issues of scarce resource and equal access to numbering resources.

ETO recommends that:

14. NRAs should use four or five digit prefixes for carrier selection, and reserve a five or six digit extension range respectively for future use.

Number range for Carrier Selection

There seems to be a clear demand for a harmonised number range for carrier prefixes on the European level. At the same time, there may exist national and international carriers which will operate only on a national level. ETO believes that two kinds of number ranges are needed, one for national and international carriers operating on a national level and another, harmonised number range for carriers operating in more than one European country.

ETO recommends that:

15. NRAs should reserve a number range for national and international carriers operating on the national level only.
16. Existing number ranges for carrier selection should remain unchanged.
17. ECTRA should determine a harmonised number range for the selection of carriers operating in more than one European country, e.g. from the 10, 11 or 19 number series.
18. In order to safeguard number capacity, carriers which have been allocated codes from national resources and which will be assigned codes from the European resource, should return national codes after a sufficient time of parallel running.

2. PRESENTATION OF THE STUDY

This study on "Carrier Selection" has been prepared by ETO on behalf of ECTRA for the European Commission.

From 1st January 1998 most of the EU countries are committed to allowing competition in the entire telecommunications sector and in particular with regard to public voice telephony over fixed networks. The success of this policy depends, in part, on the regulatory measures instituted to counterbalance the power of the incumbent telecommunications operator. One of the important issues to be studied is the ease with which customers can select an alternative long-distance carrier.

Carrier selection is a mechanism that permits customers to choose national and international long-distance telecommunications carriers. The way in which carrier selection is introduced into public telephone networks will have a significant impact on the speed at which new entrants will be able to obtain a viable market share in different market segments. In a competitive telecommunications environment there are several access network operators and several carrier network operators. This study focuses on competition in carrier networks only.

Carrier selection mechanisms have already been implemented in several countries, for example in the US, Australia, New Zealand, Japan, the UK, Finland, Sweden and Denmark. The aim of this study is to assess the mechanisms used in countries where carrier selection has already been implemented, to observe the lessons learned in these countries and the effects of such mechanisms on new entrants, and finally, to find a solution for Europe which facilitates network and service competition at the European level and with which the problems encountered in other countries can be avoided.

This study is, in principle, a numbering study. However, numbering is only one aspect of carrier selection. Questions such as 1) Which access network operators should be obliged to offer carrier selection, 2) Which carrier network operators should be entitled to provide carrier selection, 3) Should a long-distance call be defined, 4) Should mobile operators be obliged to provide carrier selection, 5) Should access network operators be obliged to bill the customer on behalf of carrier network operators or 6) Should carrier selection be allowed from public telephones, and many other emerging issues are related more to licensing, interconnection or general telecommunications regulation.

The work requirement addressed to ETO (see Annex 1) is as follows:

- 1) to investigate national conditions for public operators as well as for service providers regarding the scope of network services and access to selection codes;
- 2) to investigate carrier selection mechanisms available or planned at the national level in Europe, to refer to mechanisms applied in other countries outside Europe and to work eventually being carried out by ITU;
- 3) to investigate the alternatives for carrier selection on the European level e.g. through a (harmonised) prefix in national numbering spaces, through a pan-European service code;
- 4) to propose a common concept for carrier selection in Europe, on the local, trunk and international level, taking into account the various options for pre-selection;

- 5) to investigate the alternatives for accessing service providers providing simple resale network services on the national and European level;
- 6) to define a common concept on how to access service providers dealing in simple resale services;
- 7) to elaborate on the consequences of the defined common concept for national and European numbering plans and the decisions that are necessary.

This study has been carried out by ETO in close co-operation with the ECTRA Project Team on Numbering and the parties represented in the European Numbering Forum (ENF)¹. ETO subcontracted part of this study to OVUM, a UK-based consultancy company. OVUM has studied carrier selection procedures in countries within and outside Europe and has interviewed players from the telecommunications industry both on a national and European level. Ovum has worked in close co-operation with ETO. Several workshops have been arranged with industry participants and regulators in order to identify carrier selection procedures which meet European demands. In order to obtain industry's views on carrier selection procedures, ETO asked the telecommunications industry and regulators for their comments on Ovum's findings. Comments on the first interim report were received from ECMA, ECTEL, ETNO, ETSI NA2NUA, Oftel, Post&Telestyrelsen Sweden, and members of GSM MoU EIG.

The draft final report was sent to the ENF and ECTRA in December 1996 in order to obtain their comments on the report. The most controversial issue - which was the focus of most of the comments - was whether carrier selection should be imposed on all access network operators or only on those having significant market power. ETO received a certain number of comments underlining a strong support for the idea of obliging all access network operators to provide carrier selection. ETO, in order to reflect the ECTRA position, has therefore modified its conclusion in favour of the first option.

ETO tried its best to incorporate these comments in the second version of draft final report. This report was then sent to the ENF for final comments. These comments are annexed to the final report.

The final report, once approved by CEPT/ECTRA, will include any comments individual CEPT/ECTRA members make on these issues in relation to their respective national regimes. The final report of the study shall be delivered to the CEC in July 1997.

¹ The European Numbering Forum (ENF) was established as a Forum for the exchange of information and expertise, for co-ordination and consultation, discussion and common studies on European numbering, addressing and related issues, in accordance with the European Union Council Resolution 92/C318/02 on the promotion of Europe-wide co-operation on numbering of telecommunication services. Currently participating in the ENF are the following organisations (in alphabetical order): the CEC (Commission of the European Communities), ECMA (Standardizing Information and Communication Systems), ECTEL (The European Telecommunications and Professional Electronics Industry), ECTRA (European Committee for Telecommunications Regulatory Affairs), EIIA (European Information Industry Association), ETNO (European Public Telecommunications Network Operators' Association), ETSI (European Telecommunications Standards Institute), GSM MoU EIG (GSM MoU European Interest Group) and INTUG Europe (International Telecommunications Users Group)

3. THE SCOPE OF THE STUDY

This study focuses on 1) selection of voice telephony carriers, 2) carrier selection by using prefixes in front of the number, 3) the use of preselection, where no carrier prefixes are needed and 4) carrier selection by the calling party.

The possibility for carrier selection is often a demand of the party who is paying for the call. Usually this is a calling party. This demand may also stem from the called party in cases where the called party is paying for the call or for part of the call (e.g. in freephone services, shared cost services). Although carrier selection by the called party is important with regard to some services, this study focuses on carrier selection by the calling party. Carrier selection by the called party is not included in the scope of the study.

Carrier selection in services, in IN-based services in particular, has also been omitted from this study. In freephone and other IN based services the price for calling such service is defined beforehand. The location of the IN-database where the call has to be routed to and the location of the destination to which the call has to be re-routed, is not known to the public and thus the caller does not usually know whether the call is a local, long-distance or international call. Therefore, it may be questioned whether carrier selection should be made available for these services or not.

The issue of selection of subsequent carriers is also excluded from the scope of the study. An international call from a calling party to a called party is transferred by several carriers: firstly, the long-distance carrier and the international carrier in the country of origin, secondly, transit carriers in international routes and thirdly, the international carrier and long-distance carrier in the destination country. Theoretically, all carriers could be selected by the caller. However, callers would inevitably not be interested in knowing the routes of international telephone calls, available carriers and their selection codes. Furthermore, selection of subsequent carriers would make selection procedures complicated and user-unfriendly.

Billing the customer is an issue, which is closely related to carrier selection. Carriers may want to bill the customer directly. Billing is a technical issue related to interconnection but also an issue where the interests of different market participants (new entrants, incumbent operators, service providers and customers) may conflict. Billing alternatives and their dependency on the technical solution chosen for carrier selection are considered in this study but the billing procedure itself is outside the scope of this study.

This study focuses on procedures for:

- selection of voice telephony carriers
- carrier selection by using prefixes in front of the number
- the use of preselection, where no carrier prefixes are needed
- carrier selection by the calling party

The study excludes:

- carrier selection by the called party
- selection of a carrier network by a caller for purposes other than long-distance calls (national or international), e.g. for access to a data network or for access to the carrier network's directory enquiry services or IN-based services
- selection of subsequent carrier networks for one call
- technical procedures for billing the customer

4. MECHANISMS FOR CARRIER SELECTION

4.1 What is Carrier Selection?

Carrier selection is a mechanism that permits customers to choose between long-distance telecommunications carriers. The term “long-distance call” is used in this report to denote both national and international long-distance calls.

The caller is directly connected to an *access network*², which delivers the call to a *carrier network*³ for onward carriage. The carrier network may then deliver the call to one of its own customers or hand it over to a separate delivery network. A carrier network may be operated by an *infrastructure operator* (who owns one or more switches and transmission lines) or a *switched based reseller* (who owns one or more switches but leases transmission capacity).

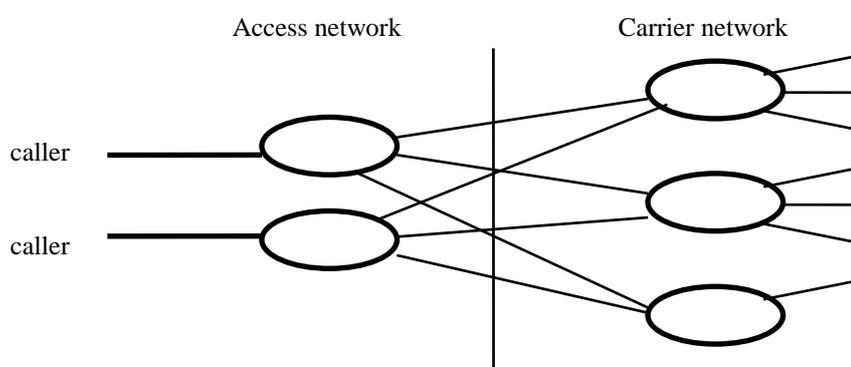


Figure 1. Principles of Carrier Selection

According to ETNO⁴ and OVUM studies⁵, the following alternatives for carrier selection exists (see Annex 3):

1. **Default carrier.** The term default carrier is used when users have no choice of carrier at all and all long-distance calls are routed to the long-distance carrier defined by the access network operator.
2. **Call-by-call selection.** The term call-by-call selection is used when a user has possibility to dial in each call a carrier that he wants to use.
3. **Preselection.** The term preselection is used when a subscriber can preselect his carrier beforehand. In this case, it is not necessary to dial the carrier code. Preselection can be made on a permanent basis either off-line by the access network operator (applicable today) or on-line by the user using a suitable service code procedure for changing the preselected carrier (not applicable today).
4. **Combinations** of alternatives 1,2 and 3.

² Access network (usually understood as a local telephone network) is a network to which the calling subscriber is connected directly, a network consisting of subscriber lines and exchanges providing a user access to telecommunications services.

³ Carrier network (usually understood as a national or international long-distance network) is a network consisting of transmission lines and exchanges providing transmission between access networks, a network to which the customer is not connected directly.

⁴ ETNO Common Position on Carrier Selection, 28 June 1996

⁵ Carrier Selection, Ovum's report to ETO, May 1996

The term **statistical allocation** is also used with regard to carrier selection. In statistical allocation the traffic for users who do not express their preference for preselection is allocated in proportion to the market share of those who do.

The terms “indirect access”, “easy access” and “equal access” are used in this study. Their definition is based on the definition used in the UK, as follows:

Indirect access means the situation where a customer of one network contracts to buy a telecommunication service from an operator to which the customer is not directly connected and where the second operator pays the first operator for the use of that connection.

Easy Access means a method whereby a customer of one network chooses to route long-distance national and international calls via an indirect access network operator by adding a short code prefix to the usual telephone number.

Equal access means a parity in the number of digits dialled to access an indirectly provided service as for the equivalent service provided by the operator to whom the customer is directly connected. This could be achieved either by a customer dialling extra digits for each call made or by customers electing to route calls over a given network for a subsequent period.

4.2 The need for Carrier Selection

The need for competition in telecommunications has been recognised in Europe because of the benefits it brings by reducing prices for customers, increasing the choice and quality of a service, and by making the industry more efficient. All these changes have the effect of giving customers better value for money and of increasing the international competitiveness of European countries.

Historically, monopoly incumbent operators have kept prices in the access network low, partly due to political reasons, and partly as a way of expanding penetration rapidly. In order to subsidise the access network, prices in the long-distance and international markets have been high. As a result, competitors are attracted to enter these markets, rather than the access network market. Incumbents may react by rebalancing prices by reducing the long-distance and international prices and by increasing the access network prices. This in turn may reduce the attractiveness of the carrier networks and make access networks more attractive.

The rebalancing of tariffs will automatically take place after the introduction of competition, as a result of competition. The reduction of any artificial barriers preventing entry onto these markets is therefore critical in encouraging the start of competition, and hence in delivering wider economic benefits to each country. Because of this, the way in which the customers of an incumbent operator can select alternative carriers or alternative access network operators is becoming a key issue of competition.

Conclusions:

19. Competition in telecommunications brings benefits such as lower prices to customers, increases the choice and quality of service and makes the industry more efficient.

20. Historically, local and long-distance tariffs have been unbalanced.
21. The rebalancing of tariffs will automatically take place after the introduction of competition.
22. The way in which the customers of an incumbent operator can select alternative carriers or alternative access network operators is becoming a key issue of competition.

4.3 Carrier Selection and Interconnection

Access network operators who are obliged to provide carrier selection to their customers need to interconnect - in principle - with all carrier networks. This may have some cost implications and technical constraints. Implementation of carrier selection obliges NRAs simultaneously to consider interconnection issues.

4.4 Technical alternatives for Carrier Selection

The alternatives for carrier selection were described in 4.1 as follows: 1) default carrier, 2) call-by-call selection, 3) preselection and 4) combination of previous alternatives. Only call-by-call selection and preselection can be considered as carrier selection. In the default carrier solution the customer can not choose a carrier at all. In this solution a long-distance carrier has been selected by the access network operator.

Preselection is usually done in an administrative way but could also be done on-line, directly by the subscriber.

Call-by-call selection can be made by using single-stage dialling or by using two-stage dialling. Both these alternatives, combined with preselection and default carrier will be discussed in the following pages in more detail.

4.4.1 Options for single-stage selection

Under single-stage dialling the user dials a code to select a carrier network and then dials the subscriber number. To allow customers timely freedom to choose their carrier, call-by-call selection plays an important role in carrier selection. However, call-by-call selection involves dialling extra digits and this procedure, by itself, might be cumbersome and user-unfriendly. Therefore, call-by-call selection combined with other alternatives seems to offer a more practical solution for carrier selection.

The following options are considered the most likely alternatives and they are studied here in more detail:

- Option A) Default carrier and call-by-call selection (overriding the default carrier)
- Option B) Preselection and call-by-call selection (overriding the preselected carrier)
- Option C) Call-by-call selection alone

The advantages and disadvantages mentioned below with regard to each option, are compared to the situation where users have no choice regarding carrier selection at all (= default carrier)

Option A: Default carrier and call-by-call selection

A user can choose a carrier by dialling the access code of the carrier. If no access code is dialled, the call is routed over the carrier network selected by the access network operator.

Advantages:

- This option is technology-independent and it can - in principle - be implemented in all networks.
- It can be implemented very quickly.
- It is cheap to implement.
- It allows new entrants to focus their marketing strategy on entities they want as their customers.

Disadvantages:

- It is unfair to new carriers. This option favours incumbent operators. Customers wishing to use the incumbent's carrier network do not have to dial extra digits, and so are more likely to use the incumbent. Moreover, customers grow tired of dialling extra digits, or forget them. As a result, calls which should be carried by the new entrant "leak" back to the incumbent operator. Experience in New Zealand indicates that leakage may be as high as 20 to 30% of the new entrant's long-distance traffic.
- It imposes an extra burden on the customer when the code has to be dialled.

Conclusion:

23. **Option A** is not satisfactory because it is not fair to new carriers. However, it permits a competitor to enter the market. It does not maximise effective competition because of the leakage effect. It may be considered a useful initial option until better solutions are introduced.

Option B: Preselection with call-by-call selection

A user can choose a carrier by dialling the access code of the carrier. Subscribers can also preselect their carriers, and calls dialled without the carrier access code will be routed to the preselected carrier. Thus the dialling procedure for local/national/international calls remains the one that users are accustomed to.

Option B differs from option A only in the preselection procedure used. The call-by-call selection is the same in both options. If Option A is implemented first, it will be relatively easy to transfer from Option A to Option B. Preselection can be introduced even on an area to area basis as digitalisation spreads through access networks.

Advantages:

- It is fair to new entrants because the dialling procedure is the same whatever the carrier network used.

- It is simple for customers to use. No extra digits need to be dialled for the preselected carrier.

Disadvantages:

- It is technology-dependent and its implementation - in principle - is economically feasible in digital networks only.
- Implementation of this option is the slowest of the three options. It takes time for the switches to be adapted, and for customers to register their choice.
- There are extra costs in setting up the system.
- There are additional administrative costs each time customers change their pre-selected carrier. (These costs could be reduced later, however, by introducing procedures allowing a change of the preselected carrier on-line by the subscriber).

Conclusion:

24. Despite its disadvantages, **Option B** is good for new entrants and for competition because of its greater fairness. It is simple for customers to understand and use. This option has been implemented in Australia, Finland, New Zealand and the US and will probably be implemented in a number of European countries.

Option C: A call-by-call selection, no default carrier, no preselection:

With this alternative, the carrier access code must be dialled for each call. If no access code is dialled, the call will not be connected.

Advantages:

- The procedure is equal for all carriers.
- It is fair to new entrants.
- It is cheap to implement - the order of the costs are the same as for Option A.

Disadvantages:

- The number length in long-distance calls will be longer than before.
- Calls will fail if the customer does not dial the carrier access codes.
- It clashes with the European Council decision on the international prefix because it omits the use of 00 as an international prefix.

Conclusion:

25. **Option C** clashes with the European Council decision⁶ on international calls because it omits the use of 00 as an international prefix. Furthermore, it is user-unfriendly because the access code has to be dialled for every call. Therefore, under the present circumstances, this option is considered to be an invalid option for the selection of international carriers in EU countries.

⁶ The Council decision on 11 May 1992 "On the introduction of a standard international telephone access code in the Community" (92/264/EEC)

4.4.2 Two-stage dialling versus single-stage dialling

In two-stage dialling the user first dials the access code of a carrier. The access code will typically be a freephone number or a short code. It will give access to the dial tone of the carrier network. Then the user must give a code so that the account can be recognised for billing purposes. The user can then dial the required number.

The single-stage option is clearly preferable to two-stage dialling. It is much easier for the customer to use because fewer digits are involved. Apart from less effort, there are fewer opportunities for errors. Two-stage dialling is open to fraud - it is possible for miscreants to intercept and fraudulently use the authentication code of another person. With single-stage dialling, the authentication is carried out through the calling line identity. The calling line identity cannot be made when the caller is calling from outside his home base. In this case two-stage dialling has to be used when the customer wants to be identified by the carrier (e.g. for billing purposes). The implementation of two-stage dialling is mainly dependent on the carrier network operator and can be left a commercial issue.

The two-stage dialling procedure is already in use in several countries e.g. for calling card services. According to ETSI and ETNO, two-stage dialling can also be used in the call-by-call methods with similar codes described in options A,B and C. Two-stage dialling could be implemented very rapidly.

Conclusions:

26. Single-stage dialling is clearly preferable to two-stage dialling.
27. However, two-stage dialling has to be used outside the customer's home base when the customer wants to be identified by the carrier (e.g. for billing purposes).
28. The implementation of two-stage dialling is mainly dependent on the carrier network operator and can be left a commercial issue.

4.4.3 The use of * and # dialling in preselection

The present methods of activating preselection use administrative procedures. The subscriber has to notify the access network operator of his choice of the preselected carrier and the operator has to program this choice in his network.

Characters * and # in the keypads of Customer Premises could be used for changing - by the subscriber - the preselected carrier. The model proposed by ETNO⁷ would use characters * and # for a temporary preselection in a way similar to on-line subscriber procedures for supplementary services of telephone network. If the user starts the next call with the normal dialling procedure, the previously selected carrier will be the preselected carrier. Dual Tone Multi Frequency (DTMF) dialling is required with this option. According to ETNO, this mechanism can cause problems which are not just technical, e.g. data-protection.

The use of * and # in dialling can be considered as an advanced mechanism for changing preselection. The on-line procedure would lower the administrative costs of operators. It

⁷ ETNO Common Position on Carrier Selection, 28 June 1996

should be studied and standardised. With regard to supplementary services to the public network, ETSI has already reserved service code 09 for carrier selection⁸.

Conclusions:
29. The on-line procedure for changing the preselected carrier would lower the administrative costs of operators. It should be standardised.
30. The use of * and # in dialling can be considered as an advanced mechanism for changing preselection. It should be studied in more detail.

4.5 Carrier Selection mechanisms used in different countries

The carrier selection procedures in use are summarised in the table below. A summary of the country analysis based on Ovum's report and ETO questionnaire can be found in Annex 4.

4.5.1 Selection of a carrier network

Outside Europe (the US, Australia and New Zealand) preselection with call-by-call selection has been used. Australia and New Zealand transferred to preselection with call-by-call selection soon after first implementing default and call-by-call selection.

	National long-distance carriers	International long-distance carriers	Switched based resellers	Years of comp	Market share ⁹ of the incumbent (in fixed network)		
					int	nat	local
Outside Europe							
Australia	Preselection+call-by-call selection		Call-by-call, no preselection. To be studied in the industry forum	5	75	85	100
New Zealand	Preselection+call-by-call selection		Call-by-call, no preselection, codes longer than those for long-distance carriers	5	76		100
the US	Preselection+call-by-call selection		Call-by-call, no preselection	>12		60	<100
In European countries							
Denmark	Default+call-by-call selection		The same as for long-distance carriers	<1			
Finland	Preselection+call-by-call selection	Statistical allocation+call-by-call selection	Call-by-call, no preselection. Codes longer than those for infrastructure operators	3	74	40	<100
	Statistical allocation+call-by-call selection						
Sweden	Default+call-by-call selection	call-by-call only	The same as for long-distance carriers	3,5	82	96	100
The UK	Default+call-by-call selection Default only (Cable TV companies)		The same as for long-distance carriers	12	73	86	95

Table 1. Carrier selection mechanisms used in different countries

In Europe, Finland uses preselection with call-by-call selection for national long-distance calls and statistical allocation and call-by-call selection for international calls. In other

⁸ ETSI Draft pr ETS 300 738, June 1996; Human Factors: Minimum man-machine interface (MMI) to public network based supplementary services

⁹ Figures are only indicative.

European countries default and call-by-call selection have been used. The UK's arrangements have been described as "easy access" requiring the pre-dialling of a short access code. Users are encouraged to use carrier selection with the aid of CPEs, using the memory in telephones, special buttons and "smart boxes" which identify those calls which are appropriate to route via the indirect access operators and automatically add the required digits. The access codes have not proved a barrier to competition. The UK will consider mandating indirect access where an operator exceeds 25% of the relevant market. Sweden and Denmark use default and call-by-call selection and are likely to transfer to preselection with call-by-call selection in the future. Germany and France have also indicated their intention to implement preselection with call-by-call selection in the future.

4.5.2 Selection of a switched based reseller

Carrier selection with regard to switched based resellers is quite a new issue and a straightforward consequence of network competition.

In Australia, switched based service providers are selected on a call-by-call basis. Carrier selection for service providers is under further consideration in the industry forum. In particular, there seems to be a need to extend preselection to include service providers. In New Zealand there are a number of service providers mostly concentrating on international resale. These resellers are selected on a call-by-call basis. The call-by-call arrangements are not entirely equal, since more recent service providers have been allocated four-digit rather than three-digit codes. The reason for this is the lack of available codes.

In most European countries, the access codes of resellers do not differ from the codes of infrastructure operators. In Finland, it is not specially forbidden for resellers to participate in preselection but the resellers do not have the right to require access networks to implement preselection for them. In call-by-call selection their access codes are longer than those of infrastructure carriers for reasons of number capacity.

Conclusions:

31. Most of the countries studied started carrier selection with default and call-by-call selection but transferred soon after or are planning to transfer to preselection with call-by-call selection.
32. The procedures for selecting a switched based reseller differ from country to country. In some countries, the access codes for resellers are as long as the access codes for infrastructure operators. In other countries, they are longer than those for infrastructure operators for capacity reasons. Some countries do not allow resellers to participate in preselection.

4.6 Issues related to the implementation of carrier selection

Some technical constraints exist with regard to the implementation of carrier selection. Also, the benefits and costs of preselection seem to be different in different types of competitive environment and in different types of networks and terminal equipment.

4.6.1 Technical constraints

According to Ovum's report, the current capability of switches and signalling systems presents a short term theoretical constraint to carrier selection. However, in countries where carrier selection has been implemented, no major problems have been identified when the length of a carrier prefix is four or five digits. Problems in carrier selection are mainly related to the number of digits which must be transferred through the network. Problems may become more serious when the length of carrier prefix is to be extended beyond five digits. A more comprehensive list of constraints is enclosed in Annex 6.

Network constraints:

Switches

- Electro-mechanical and analogue switches and switches based on ancient digital technology cannot be used for pre-selection and not all old switches can pass Calling Line Identification (CLI) to another network.
- There is a limit to the number of digits that can be passed through the network. In switches this varies in accordance with the type of switch. Most switches can pass 24 digits and more, but in some cases a limit of 18 or 20 exists.
- Switches also impose constraints on the availability and use of preselection. The number of carriers that can be preselected will be limited but figures of 30-100 are possible.

Signalling systems

- Additional constraints may exist in the signalling systems if the carrier selection parameters have to be carried in the called party number parameter (the maximum size of this in signalling system No.7 is 15 digits).

Mobile networks

- In GSM networks the standard for terminal and radio interface can only handle 20 digits dialled in a single sequence.

Constraints in CPEs

- Most PBXs can accommodate a dialled sequence of 20 digits. The constraints are similar to those identified for public switches.

Other constraints

- Carrier prefixes allocated from a numbering plan are a scarce resource. This problem of scarcity concerns short codes only and can be avoided by extending the length of the carrier prefix.
- Constraints related to interconnection between network operators.

Conclusions:

33. The current capability of switches and signalling systems may present a short-term constraint to carrier selection.
34. However, in countries where carrier selection has been implemented, no major problems have been arisen regarding carrier prefixes of four or five digits.
35. Problems may become more serious when the length of the carrier prefix is extended beyond five digits and the number of preselected carriers surpasses 100.

4.6.2 The level of competition in carrier networks

Today, European countries are in different phases of competition. In some countries, **competition in carrier networks** has been a reality for years and long-distance tariffs have been rebalanced. In some other European countries, competition in carrier networks has only been introduced recently, or competition has not yet started and tariffs are unbalanced. With regard to competition in **access networks**, competition already exists in the UK; in other European countries competition is not fully started yet, although in some countries network operators are already entitled to participate in competition in access networks.

The following conclusions, drawn from the experiences of Australia, New Zealand and the UK, are based on Ovum's report. The results of Ovum's study are summarised in Annex 5.

Conclusions:

36. After implementation of the default carrier and call-by-call selection solution (option A), calls will leak back to the incumbent operator when tariffs, quality and services have become almost similar and customers are no longer motivated to dial extra digits for a new entrant.
37. In a market where default carrier and call-by-call selection solution (option A) has been in use for a long period of time and where the market environment has become more or less stable, the transfer to preselection with call-by-call selection (option B) may not motivate subscribers to change their carrier and consequently may not have any impact on the market share of present competing operators.
38. Preselection with call-by-call selection (option B) offers an equal solution for carrier selection and it is easy for customers to use.
39. The lack of preselection with call-by-call selection (option B) at the beginning of competition may slow the start of long-distance competition.
40. The advantages of preselection with call-by-call selection (option B) may only be obtained at the birth of competition; there is no evidence that they can successfully be added later.
41. A phased solution (Option A followed by Option B) where default carrier and call-by-call selection is implemented at the very beginning, may offer a customer a mechanism to "test" the new entrant without any commitment with regard to preselection. Shortly after this trial period - before the start of "leakage" effect - preselection with call-by-call selection could give a new entrant the opportunity to offer "commitment" to the customer.

4.6.3 Costs of implementing Carrier Selection

Present studies do not analyse the costs of implementing carrier selection in different networks in detail. The figures presented in public are rough estimates with which it is difficult to conclude the costs related to different types of networks, old or new technology. Furthermore, costs depend on the structure of networks and they may vary from country to country. However, in countries where carrier selection has been implemented with or without

preselection, the costs of implementation have not played such an important role as to provide a reason to delay implementation. In Finland (an almost fully digitalised environment), for example, the implementing of preselection + call-by-call selection required hardly any equipment investments. Most of the costs were due to the new software in the exchanges and the implementation work itself.

No cost/benefit analysis exists on the situation where carrier selection is implemented for the first time. Studies made in the UK reflect the UK market, where indirect access has been implemented for several years, customers have been offered special telephones for carrier selection, tariffs have been more rebalanced and services, quality and call prices have become almost similar. UK studies cannot - as such - be applied to a market where competition is just beginning, tariffs are unbalanced and customers have great expectations from competition.

In a fully digitalised environment, the magnitude of the costs of implementing preselection + call-by-call selection can be estimated to be roughly 1-2% of the overall annual investments of the telecommunications operators involved and far less than 1% of their annual turnover. Although no estimates exist on the direct benefits of preselection, experiences show that introduction of long-distance competition - in general - reduces long-distance tariffs even up to 50%. According to ETNO¹⁰, estimates of the costs of implementing carrier selection do not take into account the implications of new developments (time and costs) needed to adapt the maintenance and customer support systems.

Conclusions:

42. No cost/benefit analysis exists on the situation of carrier selection being implemented for the first time.
43. The implementation cost of preselection + call-by-call selection is roughly estimated to be 1-2% of the annual investments of telecommunications operators involved and far less than 1% of their annual turnover.
44. In countries where carrier selection has been implemented with or without preselection, the costs of implementation have not played such an important role as to provide a reason to delay implementation.

4.6.4 Which Access Network Operators should be required to offer Carrier Selection?

When introducing carrier selection in the network, the question arises as to which type of access network operator should be required to offer carrier selection?

In the beginning of network competition, most of the subscribers are connected to the network of incumbent access network operators. It seems clear that if carrier selection is introduced into the telecommunications network, incumbent operators should be obliged to provide users with the ability to choose long-distance carriers.

¹⁰ ETNO comments to the draft final ETO report on carrier selection, 3 February 1997

The question still remains as to whether new access network operators should be obliged to provide their subscribers with carrier selection mechanism or not. If new entrants in access networks are obliged to provide carrier selection and equal access, what will be the impact of this on local competition? Will it act as a barrier to competition in the access network market? If new entrants are not obliged to offer carrier selection, what will be the impact of this on subscribers of this access network operator? Will they change to another operator offering carrier selection? If incumbent operators are obliged, should other operators also be obliged when they have obtained a significant market power?

Rights and obligations of interconnection are covered in the proposal for the “Interconnection Directive”¹¹. Implementing carrier selection in access networks means interconnection agreements between access network operators and carrier network operators. These may prove expensive for new access network operators and the obligation to provide users with carrier selection could prevent competition in access networks from developing.

According to the Ovum report, the arguments against making new access network operators offer carrier selection are the following: 1) If the new entrants can negotiate bulk deals, they will retain some of the profit being made from long-distance calls. This will improve the viability of their entry into the local access market, and hence speed up this entry; and 2) The new entrant will retain control of the customers, and not share them with the carrier network. This could improve the new entrant’s opportunities for extra revenue and profit.

If new entrants are not obliged to provide carrier selection, it would put the subscribers of new entrants on a different footing from those having the possibility of carrier selection. However, the choice of access network operator rests with the customer. Normal market mechanisms are applicable. If customers are not happy with the service of the access network operator, they can always change the operator. In order to avoid unnecessary churning, customers - when making their subscription - should be informed of whether carrier selection is possible or not.

Comments received in response to previous interim reports (from ECTRA PT on Licensing, ETNO, and a number of countries) show a strong support for obliging all access network operators in fixed networks to provide carrier selection based on the proposals mentioned in this report.

Conclusions:

45. Comments on the previous interim reports show a strong support for obliging all access network operators to provide carrier selection based on the proposals made in this report .

4.6.5 Which Carrier Network Operators should have the right to Carrier Selection?

The questions regarding which carrier network operators should have a right to carrier selection and which carrier network operators should be eligible for preselection mechanisms have to be resolved.

¹¹ Common Position (EC) No 34/96, 18 June 1996, on interconnection in telecommunications with regard to ensuring universal service and interoperability through application of the principles of open network provision (ONP)

The right to call-by-call selection

Access to carrier network on a call-by-call basis can be compared to call-by-call access to telecommunications services in general. ETO believes that all carrier network operators and switched based resellers, as defined in national regulations, should be able to obtain carrier prefixes in order to provide their network services on a call-by-call-basis.

The right to preselection

However, a question such as which carrier network operator should have the right to carrier preselection is more difficult. There are some technical limitations on the number of possible preselected carriers (in some switches up to 100 possible preselected carriers only).

On the one hand, in the beginning customers may find the system very frustrating if they cannot reach all destinations on their preselected carrier. On the other hand, the choice of preselected carrier should be made by the customer itself.

ETO believes that in the beginning of competition, the right to preselection should only be available to those carriers that can provide a "full" long-distance national service or a "full" international service. For long-distance national calls, "full" service means service to all long-distance destinations within the country, including mobile customers. For international calls, the "full" service should be defined by the NRA. However, the provision of "full" service may not present any major obstacles to carriers entering the preselection market because any carrier may fulfil this requirement by using its own infrastructure or by making interconnection agreements with other carriers.

Preselection could later be extended to involve niche carriers as well, if this is found appropriate and feasible. Further studies on this issue are needed.

Conclusions:

46. ETO believes that all carriers operators and switched based resellers should be entitled to obtain a carrier code for call-by-call selection.
47. Carrier network operators that can provide a "full" long-distance national service or a "full" international service should be eligible for pre-selection.
48. For international calls, "full" service should be defined by the NRA.
49. Further studies are needed on extending preselection to cover all carriers.

4.6.6

Customer's choice of preselected carrier

Principles in preselecting a carrier

In preselection, if no carrier prefix is dialled, the call will be routed to the preselected carrier as defined by the subscriber. To make a subscriber decide on the preferred carrier, ballots (in the US and Australia) and marketing campaigns (in Finland and New Zealand) have been used.

Balloting:

advantages:

- ballots give a new entrant considerable publicity and exposure
- they bring potential customers quickly to a point of decision

disadvantages:

- ballots can lead to a surge of customers for the new entrant that exceeds the capacity of its network, thus giving it a poor reputation with regard to quality of service
- the incumbent may lose a substantial proportion of customers overnight, and this could destabilise its short-term finances
- it may lead to a carrier acquiring a large number of low revenue customers who are not profitable for the new entrant
- ballots are expensive to conduct
- it is not equal for new entrants entering the market after balloting

Marketing campaigns:

advantages

- no balloting is needed, subscribers are not forced to make a choice
- it enables new entrants to build up their customer base in line with the growth of their networks
- new entrants can select their target customers according to their policy objectives

disadvantages:

- it gives the incumbent an inbuilt advantage

In preselection, whether based on balloting or marketing campaigns, problems exist - such as, what to do with subscribers who have not expressed their preference of carrier? Some alternatives exist: 1) to ask them to choose a carrier, otherwise calls are allocated between carriers in proportion to those who have chosen (as in the US), 2) calls will be routed to the incumbent operator as before (as in New Zealand) or 3) calls are allocated statistically (as in Finland).

Balloting versus market campaigns

In Europe new operators will be free to enter the market at any time after liberalisation, and it is difficult to see how ballots could be held in this situation. Ballots are also costly to arrange. Balloting seems to result in substantial problems for new entrants, the incumbent and the regulator.

Although marketing campaigns favour the incumbent operator, they allow a smooth transition from a monopoly to a competitive environment. At the same time, they allow new entrants to focus their marketing on customers that they want to "win" or pick up. When implementing preselection, marketing campaigns should be considered as normal means which companies may organise commercially.

Conclusions:

50. Balloting has been used in the US and Australia. Marketing campaigns have been used in Finland and New Zealand.
51. Balloting seems to be costly and to cause substantial problems to new entrants, the incumbent and the regulator.
52. Marketing campaigns provide means for making customers preselect their carrier.

Independent preselection of long-distance and international carriers?

According to the Ovum report, the access network should be capable of allowing independent preselection of long-distance national and international calls. These two call categories offer the greatest opportunity for price reductions through competition and are easy for users to understand. Furthermore, existing prefixes (0 for trunk prefix (in open numbering plans) and 00 for international prefix) offer a suitable means for introducing independent preselection. In Australia, when developing carrier selection procedures, the major requirement is seen to be the separation of long-distance and international preselection.

In most European countries carriers are permitted to provide both national and international long-distance calls to customers. No separate access codes for national and international calls or separate preselection is necessarily needed. However, it would benefit customers if they could preselect national carriers and international carriers separately.

ETO believes that, at the beginning of competition, preselection of one single carrier for both national and international calls should be allowed. However, if national and international long-distance markets are clearly separated in European countries, access networks should be capable of allowing independent preselection of national and international carriers. Users should then be able to register two types of preselection, one for national calls and one for international calls. This should be studied in more detail and implemented in the later phase, if found appropriate.

Conclusions:

53. At the beginning of competition preselection of one single carrier for both national and international calls should be allowed.
54. If national and international long-distance markets are clearly separate in European countries, access networks should be capable of allowing independent preselection of national and international carriers. This should be studied in more detail and implemented in the later phase, if found appropriate.

4.6.7 Changing the preselected carrier

Once customers have preselected their carrier, how can they change that choice? In countries where preselection has been implemented, there is considerable concern over the practice of "slamming". Slamming is a term used to describe any practice that changes a consumer's long-distance carrier without the customer's knowledge or consent. This may be the result of

a sales call from the new carrier where the consequences of the salesman's questions are not clear. The salesman considers having received the customer's permission to change the carrier, although the customer has not given any explicit permission. Slamming takes choices away from customers, often without their knowledge, and distorts the long-distance competitive market by rewarding companies that engage in deceptive and misleading marketing practices. European NRAs should ensure that customers are protected against abuses such as "slamming".

Conclusion:

55. European NRAs should ensure that customers are protected against abuses such as "slamming".

4.6.8 Definition of long-distance calls at a national level

What is a long-distance call?

The split between "local", "long-distance" and "international" calls seems to be based on historical tariff and network structures and may not be relevant in a competitive environment in the future. International calls are easily defined. Definition of national calls is more difficult. Two cases exist: 1) countries where long-distance calls are clearly separated from local calls and 2) countries where no clear separation exists. In the latter case, the incumbent operator may apply long-distance tariffs due to historical reasons, but a new entrant is free to follow its own tariff policy.

In countries where long-distance calls exist, there are a number of options for the definition of long-distance national calls. Such a definition may be based on:

- tariffs
- dialling sequence (for example, all calls starting with a "0")
- the incumbent's network architecture
- artificial areas

It is clear that there is no "optimum" definition and the best solution for each country depends on the weight the incumbent and the new entrants put on the different factors. The definition of long-distance is also a question of user-friendliness: How is long-distance understood by customers? Is the definition of long-distance applicable to all carriers in the same way? Can the long-distance tariffs of different carriers be compared with each other? ETO considers it important for long-distance calls - or national calls in general - to be defined in a way that is understandable to users and to carrier and access network operators.

Telephone networks consist of 1) access networks, to which subscribers are connected directly and 2) carrier networks, which provide transmission between access networks. ETO suggests that access and carrier network operators in each country should attempt to reach an agreement on the best definition of long-distance call. The NRA should have the power to determine the best definition so that it will be binding on subsequent market entrants.

Conclusions:

56. ETO considers it important for long-distance calls - or national calls in general - to be defined in a way that is understandable to users and carrier and access network operators.
57. Access and carrier network operators in each country should attempt to reach an agreement on the best national definition of long-distance call. The NRA should decide the best definition, so that it will be binding on subsequent market entrants.

4.6.9 Should Mobile Operators be obliged to offer Carrier Selection in international calls?

Cellular operators provide one form of access network, and could be included in the carrier selection procedures. However, there are some differences between fixed and mobile networks which make certain distinctions necessary: In a number of European mobile networks there are no tariff differences between local and long-distance mobile calls and no difference between local and long-distance dialling procedures. Cellular networks in Europe have been built as national networks, and do not have the equivalents of local and trunk switches. In these circumstances there seems to be no need to select national long-distance carriers in mobile networks.

However, in countries where tariff differences in fixed network between local and long-distance calls are not significant and no difference between local and long-distance dialling procedures exist, fixed networks are practically comparable with mobile networks. In these circumstances, selection of national carrier may be an issue to be studied in further detail. A user may have several reasons for choosing a carrier. In addition to tariff reasons, other reasons could be quality of service or security, for example.

International calls from mobile phones resemble those initiated from fixed networks. Calls are usually routed from national mobile networks to international connections of fixed networks. Mobile operators do not provide international calls themselves today although they may do it in the future. Call tariffs are often tariffs of fixed networks added with normal mobile tariffs. Questions which need to be answered are: Is there any real difference in accessing international networks from mobile and fixed networks? If fixed access networks are obliged to provide carrier selection in international calls, why should mobile networks be exempt from this obligation? The number of mobile network subscribers is increasing very rapidly; today these are more than 20 million in Europe and this figure is growing rapidly and will soon equal the number of subscribers in fixed networks. Why should these subscribers not be allowed to participate in the international carrier competition?

In mobile networks, three different mechanisms exist for selecting an international carrier: 1) the use of (+) prefix on the keypad, 2) dialling an access code of the selected carrier and 3) a normal dialling without a carrier code, denoting either default or preselected carrier. These three mechanisms could facilitate flexible carrier selection procedures for everybody, including roaming customers. However, some difficulties may exist, for example with regard preselection, and further studies are needed in this area.

There is no cost analysis available to estimate the cost of implementing carrier selection in mobile networks. The implementation of carrier selection in mobile networks may not have any impact on competition between mobile operators. However, as with fixed access

networks, in mobile networks carrier selection in international calls would facilitate competition in international fixed networks. Concerning international calls, competition would bring benefits to customers in the form of price cuts. From the customer's point of view, it is difficult to see reasons for which mobile (access network) operators should be treated differently to access network operators in fixed networks. Some mobile operators do not favour carrier selection from mobile networks. However, selection of international carrier in mobile networks has already been implemented, for example in Finland, and is likely to be implemented in Denmark.

Conclusions:

58. Generally, there seems to be no need to select national long-distance carriers in mobile networks. However, in countries where no tariff differences exist in the fixed network between local and long-distance calls and no differences between local and long-distance dialling procedures exist, fixed networks are practically comparable with mobile networks. In these circumstances, selection of a national carrier may be an issue to be studied in further detail.
59. As regards the selection of international carriers, it is difficult to see reasons to treat mobile (access network) operators differently from access network operators in the fixed network.

4.6.10 Billing the customer

Billing in general is an issue related to interconnection. Only billing issues in single stage dialling are considered below. Two-stage dialling provides carriers with straightforward means for billing the customer.

Billing is fundamental to the commercial success of operators. Three main billing options have been identified with regard to long-distance calls.

- access network bills
- both access network and carrier network bills
- carrier network bills

In addition, there are variants of these options, depending on whether the carrier network requires customers to pre-register with it before it accepts calls from them. Without pre-registration, the carrier network may have difficulty in collecting debts, and is dependent on the access network for billing information.

In cases where carrier networks bill the customer, Calling Line Identification (CLI) is needed and the access network operator has to provide the carrier network operator with the CLI information. CLI is available mainly in modern telephone exchanges and some limitations may exist in old technology. Also some other problem areas may exist. ECMA has pointed out possible problems with regard to Advice of Charge supplementary services¹².

According to ETSI, billing should be studied more thoroughly by ETO in a specific report.

¹² ECMA contribution to ENF: Carrier Selection and Integrity of Advice of Charge Supplementary Services, 14.11.96.

Conclusions:

60. Billing is fundamental to the commercial success of operators.
61. In cases where carrier networks bill the customer, the access network operator has to provide the carrier network operator with the CLI information.
62. CLI is available mainly in modern telephone exchanges. With old technology some limitations may exist in the billing of the customer by the access network operator.
63. Billing should be studied in more detail.

4.6.11 Carrier Selection from public pay-phones

The term 'public pay-phone' is understood differently in different countries. The exact definition of a public pay-phone is unclear - does it depend on who the owner of the public telephone is or on where it is located? What is the border line between public and private pay-phones? Coin- or card-phones are terminal equipment and it is unclear as to what mandatory regulations for carrier selection could apply to owners of terminal equipment. In addition to problems regarding the definition of public pay-phones, some other views on the provision of pay-phone services exist:

1. **Universal service obligation.** The definition of universal service for voice telephony - as proposed today by the Commission of European Union¹³ - states that "the basic telephone service should provide a normal telephone line, directories and directory enquiry services, public pay-telephones and, where appropriate, special services for disabled users and other special groups at affordable prices". The draft ONP VE Directive XIII/96/53 rev 3¹⁴ defines measures for the provision of public telephony services.
2. **Service provision.** The provision of public pay-phone services can be considered a telecommunications service. In addition to access network operators there may be independent service providers which may want to select their access network operators and carrier network operators according to their policy of service provision. Questions which need to be answered are:
 - Should the selection of access networks or carrier networks be left totally to service providers or should temporary users have some say in defining access networks or carrier networks?
 - Should pay-phone services be a totally commercial issue or should there be mandated some service obligations with regard to carrier selection? Defining pay-phones as a commercial service is not necessarily in contradiction with the universal service obligation to guarantee pay-phone services in areas where natural competition is difficult to achieve.

¹³ Guaranteeing affordable access to telephone services in a liberalised environment, DG IV press release, 11 September 1996

¹⁴ Proposal for a European Parliament and Council Directive on the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment.

Pay-phone traffic is marginal compared to total traffic of telecommunications. Pay-phones are used temporarily rather than permanently. Mobile phones are rapidly reducing the use of pay-phones.

1. **New carriers.** The majority of public pay-phones are owned by incumbent access network operators. If the selection of carriers is left only to service providers (e.g. incumbent operators), new carriers cannot participate in national and international calls from pay-phones. In public pay-phones a user cannot make any preselection. The decision on the permanent carrier will always be based on the decision of the service provider (= in most cases the incumbent). Only a call-by-call access could be possible. Pay-phones do not usually include memory functions or “smart boxes” that facilitate dialling the access codes of competing carriers.
2. **Technical problems.** A number of problems are related to carrier selection in public pay-phones. One of them is the problem of billing and charging. The price of calls in public pay-phones usually differ from those of normal subscriber lines. What will be the price of calls for different national and international long-distance operators. Is the cheapest long-distance call on a normal subscriber line also the cheapest from public pay-phone? If free access is allowed from pay-phone to carrier networks, how will public pay-phone operators cover the cost of provision of the line (for example, freephone calls, calling card services).
3. **European harmonisation.** Is carrier selection in public pay-phones an issue which should be discussed at a European level? Can it be considered a national matter or is European harmonisation needed?

From the user’s point of view, it would be advisable to have access from the pay-phone to freephone services and calling card services. Both of them may be considered as telecommunications services rather than actual carrier selection. Both of them are usually tariffed as free of charge for user. The fees for using pay-phones for free of charge services are usually agreed upon in interconnection agreements. Users should also be able to use the common international prefix 00 in public pay-phones.

Conclusions:

64. The term ‘public pay-phone’ is understood differently in different countries. There is no single definition of ‘public pay-phone’.
65. There are a number of problems related to carrier selection from pay-phones.
66. It is not clear whether any action needs to be taken on a European level with regard to carrier selection from pay-phones.
67. From the user’s point of view it would be advisable to have access from the pay-phone to freephone and calling card services. Users should also be able to use the common international prefix 00 in public pay-phones.

4.6.12 Carrier Prefixes

Format of the prefix

To clarify the structure of the carrier prefix, ETNO proposes¹⁵ to divide carrier prefix into two parts: 1) Carrier Access Code (CAC), identifying a sequence of digits which are common to all carriers and 2) Carrier Identification Code (CIC), which identifies an individual carrier. For example, in carrier prefix 10XX digits 10 would denote CAC and XX would denote CIC. This structure would help users identify carrier prefixes and make it easier to distinguish between different carriers. ETNO considers user-friendliness of access codes to be a prerequisite for the harmonious introduction of carrier selection.

Although the existing practices in different countries do not necessarily support the distinction between CAC and CIC, it would help users to remember carrier prefixes.

Length of the prefix

Different lengths of carrier prefixes are used today: In the UK carrier prefixes are three or four digits in length (1XXX), in Denmark four digits (10XX), in Sweden three, four and five digits (007, 008X 0080X, 009), in Finland three and four digits for infrastructure carriers (10X(X), 99X) and for resellers five digits (105XX), in the US seven digits (101XXXX), in Australia four digits (14XX) , in New Zealand three and four digits (05X(X)). Switzerland plans to allocate five digit codes (107 xx and 108 xx)

In deciding the optimal length of access codes, there are a number of conflicting pressures:

- it is necessary to provide an adequate supply of access codes. If this is not done, either the development of competition will be restrained or the system will have to be reorganised
- the convenience of the customer requires short rather than long codes
- the capacity of switches and signalling systems limits the length of access codes

According to Ovum's report, the length of access codes is not likely to exceed six digits in Europe. In practice four or five digit carrier prefixes could facilitate user-friendly numbering procedures and - if used efficiently - provide enough resources for carrier selection. Six digit codes could be reserved for future expansion range. This should be sufficient for likely demand for many years if the access code usage is carefully controlled. The maximum number of digits likely to be dialled in Europe in a single stage is then 23 (15 digits for the international number, and two for the international prefix, plus maximum six for the carrier selection code).

With regard to the length of the carrier prefix, the current digit processing capability of networks presents a constraint to carrier selection. With the majority of switches, 23 digit processing is not a problem. However, some switches exist where processing capacity is

¹⁵ ETNO comments on the ETO report on Carrier Selection, Paris, 3 October 1996

limited to 18 or 20 digits. There is a need to increase the digit processing capability of these switches.

Conclusions:

- 68. Four or five digit carrier prefixes could facilitate user-friendly numbering procedures and provide enough resources for carrier selection if used efficiently.
- 69. Five and six digit codes could be reserved for a future extension range.
- 70. The digit processing capacity of networks should be extended to allow transfer of 23 digits.

Different access codes for national and international carriers?

Do access codes of international carriers need to be separated from access codes for national long-distance carriers? Incumbent operators are almost always both national and international long-distance operators and would benefit from having only one access code for both services for call-by-call selection. Also, new entrants are often authorised to provide national and international connections. In Sweden, Denmark and the UK the same code is used both for national and international calls. In Finland carrier prefixes are different for international and national calls. In the Finnish model the carrier prefix of an international carrier is a combined carrier prefix and international prefix. An additional international prefix is not needed. So far, market demand for separating long-distance national and long-distance international carrier prefixes has not been ascertained.

Conclusion:

- 71. So far, no market demand for separating carrier prefixes for long-distance national and long-distance international calls has been ascertained.

Number ranges for access codes

So far, carrier prefixes have been allocated by NRAs to carriers operating in the country. However, due to the introduction of competition at a European level there seems to be a growing demand for harmonisation of European prefixes to allow those carriers which operate in several European countries to be recognised through one single access code in every country. ETNO proposes¹⁶ that the harmonisation of carrier prefixes at the European level should be considered as quickly as possible taking into account the time-scales for implementation of carrier selection.

It seems clear that a need for two kinds of number ranges exists:

- a need for a number range for national and international carriers that offer their services only in the home country and

¹⁶ ETNO comments on the ETO report on Carrier Selection, Paris, 3 October 1996

- a need for a number range for carriers that offer their services in several European countries. These “trans-European carriers” would benefit from a common, single access code which is common in every European country

In several European countries, number ranges for carrier selection prefixes have already been defined. Changing these number ranges would be difficult, especially when justification for that kind of change has not been identified. However, a new harmonised number range should be established to respond to the need for harmonised codes for trans-European carriers. In single-stage dialling the use of an ETNS for such a purpose is excluded because of the length of the code. The only solution seems to be the use of a harmonised number range from national resources.

Based on the different studies carried out by Ovum and ETO, the 10X number range has already been used or is planned to be used for carrier selection in several countries. Numbers from 11X range had been proposed by CEPT in 1976 for use as harmonised European numbers and this number range has already been reserved for European use in some countries. Studies made by Eurescom for ETNO identify also number range 19X as one possible number range for harmonisation. Number ranges 10X, 11X and 19X could offer the easiest harmonised number space for assigning prefixes for trans-European carriers and their applicability should be studied in more detail. Human factors should be considered. With regard to the use of 11X resources, the possibility of misdialling to 112 must be taken into account.

Carrier prefixes should be assigned in compliance with the numbering conventions to be established at a national level for national numbers and at a European level for harmonised European numbers. Carriers should be free to choose whether they wish to apply for access code from national resources or from harmonised European resources. However, in order to save number capacity, carriers should get access codes only from one resource, e.g. carriers which get their access code from harmonised European resources do not need access codes from national resources. When assigned resources from harmonised European resources, possible carrier access codes from national resources should be withdrawn after a period of parallel running.

Conclusions:

72. Two kinds of number range for carrier selection are needed: One for the numbering of national and international carriers operating in the home country and the other for the numbering of international carriers that provide their services in several European countries.
73. The definition of a number range for national and international carriers operating in a home country is a national matter.
74. A number range for international carriers operating in several countries should be defined by ECTRA.
75. 10X, 11X and 19X ranges could offer the easiest harmonised number space for the numbering of carrier prefixes for trans-European carriers, and their applicability should be studied in more detail.

4.6.13 European harmonisation

In the European telecommunications market, equal and non-discriminatory access to carriers plays an important role. Non-equal access predicated in carrier selection conditions, may unbalance the commercial conditions of European players. With unbalanced conditions it may happen that the operator of a country able to compete with equal access in the home market is not able to compete under the same conditions in the neighbouring country where no equal access exists and where conditions favour the incumbent operator.

In response to ETO report, several opinions were expressed on the implementation of preselection in Europe ^{17·18·19}. ETO points out that if harmonised conditions cannot be achieved, the issue of how to achieve fair and equal competition in European countries remains unsolved.

Conclusions:

76. In the European telecommunications market, reciprocity and symmetry play an important role.
77. Non-harmonised carrier selection conditions may unbalance the commercial conditions of European players.
78. ETO points out that if harmonised conditions cannot be achieved, the problem of how to achieve fair and equal competition in European countries remains unsolved.

¹⁷ ETNO recommends that the introduction of preselection should be harmonised and synchronised throughout Europe in order to avoid biased competition under the following conditions: if the benefits are proved and when the technical barriers are removed in European countries.

¹⁸ Ofitel considers that the implementation of equal access in the present circumstances would have disbenefits to UK market. Implementation of equal access throughout Europe would put the UK in a difficult position.

¹⁹ ECTEL recommends the rapid harmonisation of dialling procedures for carrier selection and, as far as is possible, the harmonisation of carrier access codes for international carriers.

5. ETO RECOMMENDATIONS FOR CARRIER SELECTION

In this chapter recommendations for carrier selection in CEPT countries are made.

5.1 Mechanisms for Carrier Selection

There are a number of options for carrier selection. ETO believes that in Europe, where network competition will be introduced, preselection with call-by-call selection is the best option for customers and will lead to the fairest treatment of all telecommunications operators. However, implementation of preselection with call-by-call selection is network dependent and the implementation work may take some time and eventually delay the opening of the market to competition. In order to follow the competition time schedule (1.1.1998) set by the European Union, an intermediate solution for carrier selection - default carrier + call-by-call selection (Option A) - should be implemented.

Due to growing competition within European countries, national carriers no longer operate in the home market only. They are extending their operations to other countries within and outside Europe. Words such as "alliances" and "globalisation" are commonly heard in today's telecommunications market. In the future, the long-distance market area (for national and international calls) will be the European or global market area rather than different fragmented national market areas. In order to guarantee equal conditions for carriers in the European market area, ETO believes that equal and non-discriminatory conditions can be achieved through preselection with call-by-call selection.

ETO recommends that:

79. Default carrier defined by an access network operator and call-by-call selection by a user should be implemented in CEPT countries as soon as possible following the introduction of competition in carrier networks. This option should be seen as an intermediate solution for carrier selection.
80. Preselection with call-by-call selection should be implemented in all CEPT countries as soon as possible following the introduction of competition in carrier networks. In order to safeguard the benefits of preselection, extension of the carrier selection from default to preselection should be carried out as quickly as possible.
81. At the beginning of competition, the preselection of one single carrier for both national and international calls should be allowed.
82. The implementation of two-stage dialling for call-by-call selection is dependent mainly on the carrier network operator and should be left a commercial issue.

5.2

Carrier Selection in fixed networks

5.2.1 Which Access Network Operators should be obliged to offer Carrier Selection mechanism?

When introducing competition in a monopoly environment, in the early stages all customers are connected to the access network of an incumbent operator. It seems clear that incumbent operators should be obliged to provide users with the ability to choose long-distance carriers.

Comments received on previous interim reports (from ECTRA PT on Licensing, ETNO, a number of individual countries) show a strong support for obliging all access network operators to provide carrier selection.

ETO recommends that:

83. NRAs should require all fixed access network operators to offer call-by-call selection to carrier network operators, following the end of monopoly on public voice telephony.
84. NRAs should require all fixed access network operators to offer preselection with call-by-call selection as soon as it is technically feasible.

5.2.2 Which Carrier Network Operators should have the right to Carrier Selection?

The issue of which carrier network operators should have the right to carrier selection and preselection may give rise to considerable debate. ETO believes that all carrier network operators should be able to obtain a carrier prefix to provide their carrier services on a call-by-call basis. However, with regard to preselection, only those carriers which can provide a full national or international service should be eligible for preselection.

ETO recommends that:

85. All carrier network operators and switched based resellers should be able to obtain a carrier prefix to provide their carrier services on a call-by-call basis.
86. Only those carrier network operators which can provide a full long-distance national service or a full long-distance international service should be entitled to preselection.
87. For long-distance international calls the full service should be defined by the NRA.
88. Further studies are needed on extending the right for preselection to cover all carriers.

5.3 Carrier Selection in mobile networks

International calls from mobile networks are routed from national mobile networks to the international connections of fixed networks because mobile networks do not provide international calls themselves. Mobile networks are access networks to international calls in a way similar to fixed access networks. Mobile customers should be able to choose their international carrier in the same way as they do in the fixed network. For international calls, competition would bring benefits to mobile customers in the form of price cuts. The volume of these calls is increasing rapidly and they are becoming an important component of telecommunications expenditure.

ETO recommends that:

89. All mobile operators should be required to provide users with the possibility to choose their international carrier.

5.4 Customer choice for preselection

When implementing preselection some countries have organised ballots to enable customers to choose their preselected carrier. Balloting is one possible means for customers to choose their carrier. The other alternative is that, at the beginning, when customers have not expressed their carrier preference, calls dialled without the carrier prefix will be routed to the incumbent operator. New entrants can build up their marketing campaigns in accordance with their customer policy. In this way, balloting can be avoided and the market will be changed smoothly, according to the activities of new entrants.

ETO does not believe that, in an efficient telecommunications industry, balloting is in the best interest of new entrants. A more appropriate procedure would be that new entrants build up their customers through marketing campaigns.

ETO believes that:

90. Ballots on the choice of preselected carrier are costly and cause substantial problems to new entrants, the incumbents and the regulator.
91. Marketing campaigns should be considered for the choice of preselection by customers.

5.5 Changing the preselected carrier

In countries where preselection has been implemented, there has been considerable concern over the practice of "slamming". Slamming is a term used to describe any practice that changes a customer's long-distance carrier without the customer's knowledge or consent. This practice should be prevented in Europe.

ETO recommends that:

92. NRAs should ensure that customers are protected against abuses such as “slamming”.

5.6 Definition of long-distance calls at the national level

Considerable disputes can occur between operators over the definition of “long-distance call”. ETO considers it important for long-distance calls - or national calls in general - to be defined in a way that can be understood by users and network operators. Circumstances vary from country to country and ETO suggests that access and carrier network operators in each country should attempt to reach an agreement on the best definition of long-distance call. The NRA should have the power to determine the best definition, so that it will be binding on subsequent market entrants.

ETO recommends that:

93. Access and carrier network operators in each country should attempt to reach an agreement on the best national definition of “long-distance call”.
94. The NRA should decide the best definition of “long-distance call”, so that it will be binding on subsequent market entrants.

5.7 Billing

Billing is an issue related to interconnection. In addition to network operators, it also concerns service providers, service subscribers and users. Billing may come to be user-unfriendly if a caller receives two or three bills for one call. Billing may also lead to legal and technical problems between operators.

However, billing is a critical matter as it is the key to revenues and to the relationship between operators and customers. ETO believes that new entrants should be entitled to choose which billing arrangements are most suitable for them. The billing arrangements should be discussed and agreed upon between carrier network operators and access network operators in the interconnection negotiations. NRAs should intervene only if these negotiations fail.

ETO recommends that:

95. NRAs should require the fixed access network operator to allow carrier network operators to bill the customer directly.

96. The carrier network operators should have the right to require that the access network operator bills its customer.
97. The billing arrangements should be discussed and agreed upon between carrier network operators and access network operators in interconnection negotiations.
98. NRAs should intervene only if negotiations on billing fail.

5.8 Carrier Selection from public pay-phones

The term public 'pay-phone' is understood differently in different countries. A lot of technical problems are related to carrier selection from public pay-phones, for example the issue of charging between service providers, access network operators and carrier network operators. No justification has been found for the harmonising of carrier selection procedures from pay-phones at a European level.

However, it would be convenient for users to have access from pay-phones to free of charge services (e.g. freephone and calling card services). The fees for using pay-phones for these services should be agreed upon during negotiations between service providers and network operators.

ETO recommends that:

99. Carrier selection from public pay-phones should be a national matter.
100. NRAs should require access network operators and public pay-phone service providers to offer free of charge access from public pay-phones with DTMF keypad to free of charge services (e.g. freephone services, calling card services). The fees for using pay-phones for these services should be agreed upon during negotiations between service providers and network operators.
101. The use of international prefix 00 should be applicable to pay-phones.

5.9

Carrier Prefixes

Length of the prefix

The optimum length of carrier prefixes depends on a number of conflicting factors - the ease of use, the numbering capacity of the equipment involved, and available numbering resources.

ETO recommends that:

102. NRAs should use four or five digit prefixes for carrier selection, and reserve five or six digit extension range respectively for future use.

Number range for Carrier Selection

There seems to be a clear demand for a harmonised number range for carrier prefixes on a European level. At the same time, carriers may exist which will operate on a national level only. Two kinds of number range are needed: one unharmonised number range for national and international carriers operating on a national level and another harmonised number range for carriers operating in more than one European country.

ETO recommends that:

103. NRAs should reserve a number range for national and international carriers operating in their countries.
104. Existing number ranges for carrier selection should remain unchanged.
105. ECTRA should determine a harmonised number range for the selection of carriers operating in more than one European country.
106. In order to safeguard number capacity, carriers which have been allocated codes from national resources and which will be assigned codes from the European resource, should return national codes after a sufficient time of parallel running.

ANNEXES

Annex 1

Work requirement on Carrier Selection

1. Subject: Carrier Selection

2. Purpose

The work requirement covers the work that the European Telecommunications Office (ETO) will conduct on behalf of ECTRA for the European Commission in the area of numbering of telecommunications services. This annex defines the terms of reference for a study on the subject of carrier selection. The main objective of the study is to identify the problems and to propose a convergence strategy towards common procedures for carrier selection.

3. Justification

In view of the liberalisation of infrastructures and telecommunications services in the European Union by 1 January 1998 and the creation of trans-European networks, a study on the possibilities for carrier selection in Europe, both on national level and on pan-European level, urgently needs to be carried out.

On a national level, the licensing conditions and configurations of the networks influence the procedures for carrier selection. At the same time different European countries may encounter network competition on different levels in the network where the procedures for carrier selection are taken into account in different ways. In addition to this, simple resale of network services may become common occurrence and new procedures may be required to access the service providers.

On the European level, the question is how to access trans-European carriers with single pan-European access codes.

The different issues and problems emerging with the introduction of carrier selection at different levels of the networks should be investigated and a convergence strategy towards common procedures should be defined. All this will directly contribute to ensuring fair competition and user-friendly dialling arrangements for the European customer.

4. Work requirement

- (1) to investigate national conditions for public operators as well as for service providers regarding the scope of network services and access to selection codes;
- (2) to investigate carrier selection mechanisms available or planned at the national level in Europe, to refer to mechanisms applied in other countries outside Europe and to work eventually being carried out by ITU;
- (3) to investigate the alternatives for carrier selection on the European level e.g. through a (harmonised) prefix in national numbering spaces, through a pan-European service code;
- (4) to propose a common concept for carrier selection in Europe, on the local, trunk and international level, taking into account the various options for pre-selection;
- (5) to investigate the alternatives for accessing service providers providing simple resale network services on national and European level;
- (6) to define a common concept on how to access service providers dealing in simple resale services;
- (7) to elaborate on the consequences of the defined common concept for national and European numbering plans and the decisions that are necessary.

5. Execution

The work on these issues shall be carried out in close co-operation with the CEC, the ECTRA PT on Numbering and the European Numbering Forum (ENF). The final report shall be delivered to the CEC not later than 1 August 1996²⁰.

6. Deliverables

One interim report and one final report shall be delivered.

The first interim report shall be delivered during the course of the work. The first interim report containing the different aspects related to points 1, 2 and 5. The first interim report will be delivered around 1 February 1996.

The draft final report contains findings and proposals. The draft final report shall be delivered to ECTRA and ENF for comments around 1 May 1996.

The final report shall contain the findings and proposals, as approved by CEPT/ECTRA and will include any comments that individual CEPT/ECTRA members have on these issues with regards to their respective national regimes. The final report shall be delivered to the CEC not later than 1 August 1996.

All reports shall be made available in draft form one month before a liaison meeting between the CEC and ETO, where results will be discussed and approval may be given for their release.

The Commission shall receive three copies of the interim report, while the approved final report shall be made available in 15 bound copies, one unbound copy and one copy on floppy disk in Microsoft Office format. Graphics shall be made available on separate hard copies.

7. Manpower

This work is expected to be accomplished within 11 man-months at expert level, including subcontracting.

8. Subcontracting

A significant part of the work, up to seven man-months, may be contracted to subcontractors for the execution of parts of this contract.

²⁰ Dates apply if the work order is signed in October 1995

Annex 2 List of abbreviations

CC	Country Code
CEC	The Commission of the European Communities
CEPT	European Conference of Postal and Telecommunications Administrations
CERP	European Committee on Postal Regulation
CLI	Calling Line Identification
CN	Corporate Network
DTMF	Dual Tone Multi Frequency
ECMA	Standardizing Information and Communication Systems
ECTEL	The European Telecommunications and Professional Electronic Industry
ECTRA	European Committee for Telecommunications Regulatory Affairs
ECTRA PTN	ECTRA Project Team on Numbering
ECTUA	European Council of Telecommunications Users Association
EIG	European Interest Group
EIIA	European Information Industry Association
ENF	European Numbering Forum
ERC	European Radiocommunications Committee
ETNO	European Public Telecommunications Network Operators' Association
ETNS	European Telephony Numbering Space
ETO	European Telecommunications Office
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
ETSI STC NA2	ETSI Sub Technical Committee Network Aspects 2
EU	European Union
GSM	Global System for Mobile Communications
IN	Intelligent Network
INTUG	International Telecommunications Users Group
ISDN	Integrated Services Digital Network
ITU	International Telecommunication Union
ITU-T	Telecommunication Standardization Sector of ITU
MoU	Memorandum of Understanding
NANP	North American Numbering Plan
NDC	National Destination Code
NMT	Nordic Mobile Telephone
NRA	National Regulatory Authority
N(S)N	National (Significant) Number
OFTEL	Office of Telecommunications (UK)
SAC	Service Access Code
SN	Subscriber Number
SPC	Stored Program Control
VPN	Virtual Private Network

Annex 3 Options for Carrier Selection

Options for carrier selection are described in table 1.

Carrier selection not available	Carrier selection available			
Default carrier defined by the access network operator	Call-by-call selection	Preselection		
	Single-stage dialling	Two-stage dialling	Programmed by the Access Network Operator	Programmed by the customer

Table 1. Carrier selection alternatives

Two main alternatives exist:

1. The customer cannot select a carrier. The call, national or international, will be routed to the carrier defined by the access network operator (Default carrier)
2. The customer can select a carrier. Again two alternatives exist:
 - call-by-call selection, in which a customer dials the access code of the carrier he wishes to select.
 - preselection, where the customer has chosen the carrier permanently beforehand and all calls which are dialled without a carrier prefix are routed to the preselected carrier.

These alternatives are not exclusive. It is always possible to combine these alternatives. For example:

- Default carrier and call-by-call selection
- Preselection with call-by-call selection

Call-by-call-selection can be:

- obligatory (access code has to be added in all calls)
- non-obligatory (if access code is not dialled, the call will be routed to “default” or “preselected carrier”)
- single-stage dialling (carrier prefix and the normal dialling procedure)
- two-stage dialling (carrier prefix, then authentication code, and the normal dialling procedure)

Preselection can be:

- programmed by the Access Network Operator, following the order of the subscriber
- programmed by the customer itself

Annex 4 Carrier Selection mechanisms used in different countries

According to the OVUM report²¹ the following carrier selection mechanisms are used:

Countries outside Europe

Australia

In Australia, carrier selection using **default + call-by-call selection** was installed in the very beginning of competition but **preselection + call-by-call selection** is now being introduced area by area across Australia. Balloting is used to force customers to select their preferred carrier. Overall, preselection + call-by-call selection has the support of just about the entire industry in Australia.

New Zealand

In New Zealand, carrier selection using **default + call-by-call selection** was installed in the very beginning of competition. The present system using **preselection + call-by-call selection** was introduced progressively during 1993 and 1994. Customers remained the incumbent's customers by default. The onus is on the new entrant to sign up customers to its services.

US

In the US, all Local Exchange Carriers (LECs) must provide a choice to their customers for long-distance and international traffic. On taking up a service, a new customer must preselect a long-distance carrier. This choice can be overridden on a call-by-call basis by using an access code. If no access code is used, the call will be routed by the preselected carrier (**preselection + call-by-call selection**). AT&T's share of the toll revenues fell from nearly 90% in 1984 to 54% as of the second quarter 1996²².

In European countries

Carrier selection procedures have been implemented in Denmark, Finland, Sweden and the UK. These countries have implemented their carrier selection procedures according to their national demands. These procedures differ from country to country.

Denmark

In Denmark, all carriers have been allocated four digit codes, 10XX. If a customer wants to dial a competitive carrier, he has to dial the four digit code of that carrier. If no carrier code is dialled by the caller, the call is routed by the access network operator. (**default + call-by-call selection**). Denmark is likely to implement **preselection + call-by-call selection** in the future.

Finland

In Finland, public carriers have been allocated three or four digit codes. Carrier selection is different for national and international calls. **For national calls**, if no code is dialled, the call is routed to the preselected carrier (**preselection + call-by-call selection**). The traffic for subscribers who have not expressed their preference in preselection, is routed in proportion to the market share of those who have done so (**statistical allocation + call-by-call selection**). **For international calls**, if a customer wants to dial a competitive carrier, he has to dial the three digit code of that carrier. If a European harmonised international prefix 00 is dialled,

²¹ Ovum's report to ETO on "Carrier selection", May 1996

²² FCC Report on long-distance market, 27 September 1996.

the call will be routed to one of the carriers, following the market share of international carriers (**statistical allocation + call-by-call selection**).

Equal access (call-by-call selection + preselection) has been implemented in long-distance calls since the very beginning of competition, in 1993. The incumbent operator Telecom Finland has today only 40% market share of the long-distance market. In Finland, preselection has not yet been made available for international calls and the incumbent operator still has a 74% market share of the international market.

Resellers have five digit access codes and they are not allowed to participate in the preselection procedure, nor are they considered when sharing the traffic in statistical allocation (call-by-call selection).

Sweden

In Sweden, current carrier selection mechanisms offer a temporary solution. They are different for national and international calls. For **international** calls, Sweden currently uses call-by-call access with an integrated international prefix and carrier selection code (**call-by-call selection**). For **national** calls Swedish customers use an access code for new entrants but not for the incumbent (**default + call-by-call selection**). Access codes are the same as in international calls. Sweden is likely to opt for **preselection + call-by-call selection** in the future.

In Sweden, the new entrant believes that the existence of different carrier selection mechanisms in national and international calls is one of the reasons that it has only a four per cent market share in national calls (default + call-by-call selection) compared with its 18% share of the international market (call-by-call selection).

United Kingdom

In the UK, four access mechanisms are in use: 1) an access code 1XXX is dialled before the national or international number to select the carrier; this system is particularly used by resellers. No code is needed for the directly connected operator (**default + call-by-call selection**); 2) the use of a "smart box" to inject the access number before the call process. (**default + call-by-call selection with the aid of a terminal equipment**); 3) special arrangement in the Hull area, where the customer has to select either BT (default) or Mercury by dialling a two-digit code 4) interconnection agreements between cable-TV companies and carriers (**default without call-by-call selection**).

In the UK, users are encouraged to opt for carrier selection with the aid of CPEs, using the memory in telephones, special buttons and "smart boxes" to achieve least cost routing. The access codes have not proved a barrier to competition as some carriers provide "smart boxes" which identify those calls which are appropriate for routing via the indirect access operator and automatically add the required number.

The incumbent operator, BT still has the bulk of the fixed telecommunications market, with 95% of the local market, 86% of the long-distance market, and 73% of the international market.

The carrier selection procedures in use are summarised in the table below:

	National long-distance carriers	International long-distance carriers	Switched based resellers	Years of comp	Market share ²³ of the incumbent (in fixed network)		
					int	nat	local
Outside Europe							
Australia	Preselection+call-by-call selection		Call-by-call, no preselection. To be studied in the industry forum	5	75	85	100
New Zealand	Preselection+call-by-call selection		Call-by-call, no preselection, codes longer than those for long-distance carriers	5	76		100
the US	Preselection+call-by-call selection		Call-by-call, no preselection	>12		54	<100
European countries							
Denmark	Default+call-by-call selection		The same as for long-distance carriers	<1			
Finland	Preselection+call-by-call selection Statistical allocation+call-by-call selection	Statistical allocation+call-by-call selection	Call-by-call, no preselection. Codes longer than those for infrastructure operators	3	74	40	<100
Sweden	Default+call-by-call selection	call-by-call only	The same as for long-distance carriers	3,5	82	96	100
UK	Default+call-by-call selection Default only (Cable TV companies)		The same as for long-distance carriers	12	73	86	95

Table 1. Carrier selection procedures in different countries

²³ Figures are only indicative.

QUESTIONNAIRE FOR CARRIER SELECTION
ETO 15 May 1997

	Carrier selection				
Country	Constraints in CS	When removed	CS-code available 1.1.1998	equal length	equal quality
Albania					
Austria	call-by-call: preselection:				
Belgium	call-by-call: no decisions yet; tech.constraints may not delay the start of comp. preselection: as above		no decisions yet		
Bosnia Herzegovina					
Bulgaria					
Croatia					
Czech Republic					
Cyprus					
Denmark	call-by-call: no, 99% yes, 1% in analog. net Preselection: not known	1998	10XX ²⁴	yes, until now	yes
Estonia					
Finland	call-by-call: no preselection: no	-	10X(XX) 99X(XX)	No ²⁵	yes
France	call-by-call: no preselection: no	-	2,4,5,7,8,9 value 0 is for preselection. in the future, 4 digit codes for all operators	1 digit = full coverage 4 digits = not full coverage	yes
Germany	call-by-call: constraints not foreseen preselection: constraints not foreseen		lottery in 10 June 97 010xy (118xy for directory)	yes, so far	yes
Greece	call-by-call: competition by 2000 preselection:	By 2000	Not yet decided	Will be	Will be
Hungary					
Iceland					

²⁴ It is foreseen that 100 codes may not be enough

²⁵ resellers have longer codes than carriers

	Carrier selection				
Country	Constraints in CS	When removed	CS-code available 1.1.1998	equal length	equal quality
Ireland	call-by-call: number change to be made; competition by 2000 preselection: not discussed	by 2000 when competition starts	seeking for 10XX(X), 4 or 5 digits codes	Will be	Will be
Italy	call-by-call: preselection:				
Latvia					
Luxembourg	call-by-call: preselection:				
Lichtenstein					
Lithuania					
The former Yugoslav Republic of Macedonia					
Malta					
Moldova					
Monaco					
The Netherlands	call-by-call: no constraint preselection: constraints with regard old techn and adaptation of software	under discuss. 1999-2000?	16XY	only for new entrants	only for new entrants
Norway	call-by-call: too early to say: preselection: too early to say		no decisions yet		
Poland					
Portugal	call-by-call: competition in 2000 no constr. 1999 preselection:		not yet decided 1 series planned	Will be	Will be
Romania					
Russia					
San Marino					
Slovak Republic					
Slovenia					
Spain	call-by-call: yes: - CLI and - number length preselection: not known	1998	Not yet decided, under discussion		

	Carrier selection				
Country	Constraints in CS	When removed	CS-code available 1.1.1998	equal length	equal quality
Sweden	call-by-call: no, 96% yes, 4% preselection: no, 96% yes, 4%	1998	007, 009 008X 0080X ²⁶ New range to be planned	no	yes
Switzerland	call-by-call: no preselection: costly, switches, support systems	- under consider	proposal. 10XXX	yes	yes
Turkey					
Ukraine					
United Kingdom	call-by-call: no preselection: not offered		1XXX ²⁷ mostly 12XX 13XX 14XX 16XX 18XX	mostly 4 digits	yes
Vatican City					

²⁶ It is foreseen that total capacity of 100 codes is enough

²⁷ operators without significant marketshare are not obliged to provide carrier selection

Annex 5 Competitive environment and Carrier Selection

In the UK

According to Ovum's study for ETO²⁸, the UK has now had ten years of competition and, as a result, many of the customers who would have benefited from equal access have already switched to Mercury or Energis, the main competitors of BT. Moreover, customers of the local loop providers, (especially cable companies) are having their choice made for them, and so are unlikely to gain much further benefit from equal access. Over the last few years, long-distance prices have dropped considerably as a result of competition and re-balancing, and the scope for further price reductions (and hence benefits attributable to equal access), is limited. The introduction of equal access in the European liberalisation programme would place the UK in a difficult position.

Nera, in association with Smith System Engineering, was commissioned by OfTel to undertake a cost-benefit analysis of the introduction of equal access in the UK by BT and any other local operators who have, or can in future be expected to have, a market share in excess of 25%. Costs and benefits were estimated when transferring from the present situation (default + call-by-call selection) to equal access (preselection + call-by-call selection). The study concluded that there is no conclusive evidence to prove that, in the UK at this present time, equal access (as defined for the analysis) has benefits that exceed its costs. OFTEL is of the opinion that implementation of equal access would result in a net disbenefit to the telecommunications industry and would work against the development of competition in local loop.

The Nera report concerns the UK market only where indirect access has been implemented for several years, customers have been offered special telephones for carrier selection, tariffs have been rebalanced and services, quality and call prices have become almost similar. The UK studies cannot - as such - be applied to a market where competition is just beginning, tariffs are unbalanced and customers have great expectations from competition.

In other European countries

Unlike the situation in the UK, other European countries are just starting to introduce carrier selection. Some countries are starting with default solution but intend to transfer to preselection + call-by-call selection as soon as it is technically possible. Preselection with call-by-call selection has been implemented in Finland only.

In Australia

In Australia, a duopoly (Optus, Telstra) will exist until 30 June 1997. Optus started with default + call-by-call selection ("Dial 1 access") and wished to move to equal access preselection with balloting of all customers in the area in question. Balloting is typically arranged six to nine months after the introduction of "Dial 1 access". Customers who do not vote remain in Telstra. The two main carriers and Austel believe that equal access with preselection has been more advantageous to Australia than the interim Dial 1 arrangement. The benefits of equal access preselection to Dial 1 arrangement are seen as follows:

- it offers better utilisation of numbering space (refer to one digit access code)
- it is able to support more carriers and service providers
- it is easier for callers to use
- there will be no leakage of calls back to incumbent
- Optus argues that equal access with preselection in general and ballots in particular enables new entrants to get "a foot in the door" and also results in increasing "brand awareness"

²⁸ Ovum's report to ETO on "Carrier selection", May 1996

The disadvantages of equal access preselection has been seen as 1) additional costs of setting-up and managing preferential routing systems, 2) costs of organising customer ballots and 3) risks of uneconomic customer churn and “slamming”.

Overall, equal access preselection has the support of just about the entire industry in Australia. Austel sees the whole process as being a great success. While equal access preselection may not have greatly increased the extent of competition in Australia in the short term, and balloting may have been unduly expensive, it has paved the way for effective and sustainable competition between multiple carriers.

In Australia, a working group has been set up to study carrier selection mechanisms 1) for service providers, particularly with regard to extending preselection to include service providers, 2) for new carriers entering the market after 97 and 3) multiple carrier selection mechanisms. The major requirement is seen to be for the separation of long-distance and international preselection.

New Zealand

The example of New Zealand is interesting. According to Ovum's study, from a dynamic efficiency point of view, the lack of preselection (called non-code access) at the start of the competitive market, has hampered competition in New Zealand. The new entrant, Clear, which from the very beginning was able to use call-by-call selection only, estimates that 20-25% of the long-distance and international revenue from its registered subscribers “leaked” back to the incumbent. In addition, it believes that the need to pre-register with Clear, coupled with the knowledge that call-by-call insertion of an additional three digit was required, acted as a significant barrier to switching from incumbent to Clear. Clear believes that it was a mistake to start competition in this way for the following reasons:

- By the time equal access preselection was available “people had gone to sleep”. In other words customers were no longer motivated to try a new carrier, partly because prices and services had become more similar, and partly because there was no longer the chance to take advantage of people's willingness to try something new. The advantages of non-code access are perhaps only to be found at the birth of competition; they cannot be added in later.
- The equal access preselection, when it did come, included no mechanism to force customers to make a choice between Clear and the incumbent. Clear has found it almost impossible to persuade customers who use it on a call-by-call basis, to sign up for Clear on a permanent basis. Despite extensive efforts, only 35% of its customers have now selected Clear as their carrier of choice. Since non-code access was made available, Clear's market share has hardly increased at all.

Clear believes that it would have been better to start competition with equal access preselection or to have forced people to make a choice of carriers through call-by-call equal access (along the lines adopted in Australia). However, it is wary of full equal access preselection because of the high costs of balloting, and its apparent lack of impact.

Based on the experiences obtained from the UK, Australia and New Zealand, the following conclusions can be drawn:

- In a market where default + call-by-call selection has been in use for a long period of time and where the market environment is stable, the implementation of preselection + call-by-call selection may not motivate subscribers to change their carrier and, consequently, may not have any impact on the market share of new entrants.
- The advantages of preselection + call-by-call selection may only be obtained at the birth of competition; they cannot be added in later.
- The lack of preselection at the beginning of competition may slow the start of competition.

Annex 6 Constraints in implementing Carrier Selection

The following main constraints with regard to carrier selection have been found:

Network constraints

- network constraints in the number of digits that can be carried in a single sequence, and hence in the length of access codes that can be used for carrier selection
- the ability of switches to provide Calling Line Identity (CLI) numbers and hence the adequacy of billing information from the access network to the carrier network
- the number of preselected carriers the switches can accommodate
- the number analysed in the international telephone network is restricted to seven digits. Information in subsequent digits cannot be used for service or network identification in the originating exchange. In these cases a solution using the signalling network is required
- in the signalling system the protocol field carrying the called party address is limited to 15 digits
- individual preselection is not available for electromechanical exchanges. These switches cannot provide CLI either. Subscriber preselection is expensive to implement in analogue SPC exchanges
- Dual Tone Multi Frequency (DTMF) dialling is usually only available in modern exchanges
- potential constraints in the support systems

Constraints in Customer Premises Equipment (CPE)

- to store and transmit a string of digits, and hence the length of access codes that can be used in a single stage carrier selection
- Dual Tone Multi Frequency (DTMF) dialling is usually only available in part of the terminal equipment

Constraints of numbering resources

- when using access codes, these codes reserve capacity from SN resources of the numbering plan

Electromechanical and analogue SPC exchanges and exchanges based on ancient digital technology are the most serious technical barriers to carrier selection, particularly with regard to individual preselection. However, networks in western Europe are being digitalised very quickly, which makes implementation of preselection easier.

The maximum number of digits that can be passed in the network varies according to the type of switch. Additional constraints lie in the signalling system used, and their capability to handle long numbers. According to ETSI, the maximum number of digits in the signalling system No.7 is 15 digits.

According to Ovum, the current capability of switches and signalling systems present a theoretical short term constraint to carrier selection. The problems may become more serious when the length of carrier access code is extended beyond four digits. It seems that the European variations of AT&T and GPT switches will experience some problems in implementing carrier selection with preselection. There is a need for AT&T and GPT to increase the digit processing capability of their switches and for an increase in the digit capacity of the signalling systems.

Annex 7 **Comments from ENF members**

Annex 8 Comments from individual ECTRA countries