

Number portability in Sweden – Administrative process for number portability for fixed public telecommunications services, including the administrative interface and the central reference database – Technical prestudy

Nummerportabilitet i Sverige – Administrativa rutiner för nummerportabilitet för fasta allmänt tillgängliga teletjänster inkluderande administrativa gränssnitt och central referensdatabas – Teknisk förstudie

A technical prestudy on functions and requirements for the reference database, administrative interface and processes supporting number portability for fixed public telecommunications services in Sweden.

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Introduction

The content in this report is equal to Annex B – Considerations, in SS 63 63 91:1999 edition 1, *Number Portability in Sweden – Administrative process for number portability, including the administrative interface and the central reference database*. It was decided to move Annex B into a separate report when producing edition 2 of SS 63 63 91.

The report describes the considerations made concerning the choice of a centralised or distributed reference database. A brief background is also given of the other parts of the specification and of the assumptions liable to have an impact on the operation of the Swedish Number Portability Administrative Centre (SNPAC).

2 References

See SS 63 63 91:1999 edition 1.

3 Terms and definitions

See SS 63 63 91:1999 edition 1.

4 Abbreviations

See SS 63 63 91:1999 edition 1.

5 Considerations

5.1 General

The standard has been produced by a special team under working group AG15, Telecommunications Network Interoperability, which is one of the working groups of ITS, Information Technology Standardization.

Participants in the special team has been:

HiQ Data	Nils Weidstam, Chairman and editor
Global One	Thomas Persson
NPTA	Pamela Davidsson
Tele2	Leif Sunnegårdh
Tele2	Hans Drewitz
Cap Gemini	Dag Samnegård
WorldCom	Tomas Hellberg
Telenordia	Lars Byström
Telia	Stefan Hagbard
Telia Prosoft	Torbjörn Klasa

5.2 General assumptions

The team has worked with a number of main objectives:

1. Follow the work plan ITS 21/15.
2. Reach an agreement without the intervention of authorities.
3. Meet the time lines set by authorities and EU-directives.
4. Give a recommendation concerning the reference database meeting the following requirements:
 - A long term solution
 - Non-discriminatory
 - Possible to operate by third party
 - Open interfaces

- Adaptation to International Recommendations and European Standards.
5. Specify a porting process meeting the following:
- The process must be possible to use both between public telecommunications operators and towards the reference database
 - The process must be applicable both using simplified communication and more advanced programs.
 - The process must allow for different suppliers or system integration houses.
 - Alternative processes in the case no reference database administrator is established.
6. Specify interface protocols:
- No creation of barriers of entry.
 - Possibility to start with a simplified method if others will not be available in time.
 - Alternative solutions to the operators.
 - Automated as well as manual systems.
 - Reference Database Administration working as mediation device

With the above in mind the following considerations have been made.

5.3 Centralised versus distributed reference database

5.3.1 General

Number Portability, when the network solutions All Call Query is used by one or more public telecommunications networks requires access to verified and validated information concerning ported Directory Numbers. To meet the subscribers' requirements on a functioning number portability and minimise the risk for disputes between Public telecommunications operators, a Reference Database for this information is useful.

This Reference Database can be organised in different ways but must meet requirement such as reliability, capacity, maintainability and other main demands. In the following clauses different aspects on centralised versus distributed are treated.

5.3.2 Centralised versus distributed approach

An important issue in the implementation of number portability administration systems would be whether to implement a centralised reference database which would contain information concerning the ported numbers; or go for a distributed approach wherein each public telecommunications operator would be responsible for managing their own number ranges and exchange porting information with other public telecommunications operators as the need occurs.

There are pros and cons to each approach and the following factors would need to be considered before a decision could be made either way:

5.3.3 Regulatory aspects

The database must meet satisfactory requirements on information for Emergency Services Enterprise

This requirement is vital since the latest version of subscriber information (e.g. reference data) in relation to number portability will be in the reference database. It is likely that a centralised concept gives higher reliability and easier access for the concerned authorities.

It must be possible to meet future usage areas

The obvious and first use of the reference database is for the handling of essential information concerning ported Directory Numbers. But it is very likely that other usage areas for a database can be of interest, e.g. Directory Enquiry Service Provider and Numbering Plan Administration. In such a case a centralised database is a preferable.

If the database in the future also is intended to be used for other types of portability relating to e.g. mobile public telecommunications services the centralised approach is likely to be easier. It might not be in the interest of fixed public telecommunications operators to manage numbers for other Portability Domains in a distributed solution.

5.3.4 Commercial aspects

Investments

The upfront cost for a centralised solution would probably be, or seem higher than for a distributed solution. The costs for the distributed could be hard to clarify, since they might be a part of other investments in the operator's Operational Support Systems.

The economics of each public telecommunications operator maintaining a link to every other possible operator to provide ported number information can be discussed in the distributed scenario. Independent of solution a logical communication link must be established bilaterally since exchange of information directly between the operators is necessary when a number shall be ported. In the centralised solution, all physical links might go over the common infrastructure of the reference database, whereas direct links between the operators are necessary in the distributed scenario.

A distributed database is likely to be cheaper if the number of participating operators is relatively low and stable.

The investment in the centralised case will be more obvious since it requires an outpayment from all of the participating operators, i.e. they have to pay a sum to someone else for the implementation of the centralised reference database. In the distributed case these money would be a part of the normal investments in Operational Support Systems.

In both cases a common infrastructure has to be implemented. This means that there will be outpayments also in the distributed case, but the common infrastructure is a part of the outpayment for the total centralised solution.

Operational costs

The total operational costs for a distributed solution are likely to be higher since no economies of scale can be utilised. Though it is probable that if the number of ported Directory Numbers is low, the basic operational cost for a centralised solution is higher, since equipment and staff might be oversized.

As concerning investments, it is more complicated to distinguish the operational costs relating to a reference database and the common infrastructure in the distributed case. This might lead to a conclusion on which alternative that is most cost-efficient.

Clearing issues

If an independent party shall be responsible for the administration of reference database information, it is obviously much easier with a centralised model.

There are some roles that have to be clarified:

- Clearing House

- An organisation responsible for the clearing of costs in relation to porting a number.
- Management
- The role of supervising the reference database, whether centralised or distributed.
- Operational
- The role of normal, day to day operation of the reference database
- Message handling
- The role of normal, day to day, message flow and exchange.

In the centralised case all four roles could be in the same organisation.

In the distributed case the operational role would have to be on all the operators. The management role would most likely be with one of the operators and the same applies to the clearing house function.

Fault situations

If an argument arises in relation to a fault situation it is probably easier to solve the problem if a centralised reference database is implemented. The reason for this is that it is easier to prove where the problem occurred or to define rules that the centralised database is the reference if a mismatch has occurred.

Level of investment versus system implementation level

A future proof solution will have a higher price tag than one of more short term. For this reason it can be harder to argue for a more long-term oriented solution in the centralised case. The common infrastructure needs to have a certain technology height since that is the vital part of the function.

5.3.5 Competitive aspects

Barriers of entry

In a distributed solution it can easily (with or without purpose) be created barriers of entry for newcomers. The initial public telecommunications operators would establish different procedures and other conditions on how to be incorporated in the distributed system. This can make it complicated for the newcomer and cost the operator considerable sums.

In both cases rules for newcomers have to be decided, possibly by an independent body. Rules to be considered are e.g. on how long time it is allowed to take for a newcomer to become a member of the reference database system.

A preferable solution is a Single Point of Contact, SPOC. This requires some management responsibility that is likely to be more efficient in the centralised case.

It is a requirement that a low cost alternative is available for the newcomer, since the investment otherwise might be disproportionate for a small operator and thus a barrier of entry. The time required to become a member of the reference database system must be short enough not to make it to a delaying factor. The existing operators connected to the reference database must not be charged for the extra costs for the connection of a new operator.

Reliability of information

In a distributed solution the reliability and timeliness of information obtained from competitive public telecommunications operators can be a reason to dispute. In the centralised implementation reliability problems can be discussed with a neutral party.

A centralised database is likely to be considered as more 'impartial'.

5.3.6 Technical aspects

Correct information

Today sophisticated systems for handling of distributed databases exist. Nevertheless it is easier to secure that correct information is in the database if it is centralised, since the number of fault sources are reduced.

The distributed solution is, by nature, more vulnerable to 'mismatching' information.

System management and availability of proven technologies

The system management of a distributed system is much more complicated than for a centralised system. There are technologies available for both centralised and distributed systems. Systems for centralised solutions are more proven.

The handling of information in a distributed environment is likely to be more vulnerable than in a centralised solution.

Fault management

The fault management is very much more complex in a distributed system. Since this is very essential for the relation to the subscribers, it cannot be emphasised enough. The same also applies to auditing in a distributed environment.

Network management and surveillance

A distributed system requires some sort of network management which, in itself, would be as a small 'centralised' kernel of the distributed architecture. A centralised system would get this operational function 'intrinsically'.

The agreements on fault handling and similar situations will cost much more effort in the distributed scenario.

Normal fault handling will be a part of the system, centralised or distributed. In a centralised implementation no mediation is needed.

5.3.7 Security aspects

Protection to unauthorised access

One problem concerning security is the sending of information. This applies both to the centralised and distributed solution.

Another problem concerns the access to the database. With a centralised system the procedures for access and control mechanisms can be more controllable.

5.3.8 Other aspects

Capability of public telecommunications operators for the support of reference databases

The inclination of public telecommunications operators to start venturing out of their core business (telecommunications) so that they can start providing ported numbers via various software protocols thereby getting more into the software arena. This aspect would favour the centralised approach.

Procurement and installation

The procurement of a distributed system could lead to conflicts since there is a risk that the public telecommunications operators try to optimise the system choice to existing equipment.

A centralised system would be easier to install. The only impact on the public telecommunications operators would be the adaptation to connect to the interfaces required from this specification.

Matching to general requirements on database for DSP and DQSP

It is probably easier to match a centralised architecture to future business opportunities e.g. offering Directory Enquiry Services.

5.3.9 Recommendations

To be able to recommend a solution, the most important decision factors must be identified. The table under Subclause B.3.10 summarises these.

5.3.10 General

The table below summarises a number of possible main criteria. Depending on what is most important a recommendation could be made.

Item	Centralised	Distributed
Regulatory aspects		
Public undertakings	Easier	More complicated
Rules for newcomers	Less complicated	More complicated
Future usage	Easier	More complicated
Financial aspects		
Initial <i>visible</i> investment	More expensive	Less expensive
<i>Visible</i> operational cost ¹	More costly	Less costly
Clearing house	More synergies	Little synergies
Operational aspects		
SPOC for RefDB issues	Much easier	Complicated
Disputes on information	One 'judge'	Risk for problems
RefDB management	Included	Separate
Information transfer	Same problem	
Technical aspects		
Proven technologies	Established	Fairly new
Security aspects		
Message handling	Same problem	
Database info	More controllable	Less controllable

Table 5.1

5.3.11 Alternatives

- If the main criterion is initial *visible* cost, a distributed approach is recommendable.
- If regulatory aspects are to be met, a centralised approach is more likely to be the best choice.
- If synergies of clearinghouse and management are desirable, a centralised solution is easier.
- If an external organisation shall be responsible for the operation, a centralised solution is probably the only alternative.
- If an independent body were desirable, a centralised solution would be the choice.

¹ Under the assumption that the number of operators is low and the the number of newcomers is low.

- Technical aspects favour the centralised somewhat.
- If 'one stop shopping' shall be used for access to the RefDB, the centralised approach is much easier.

5.3.12 Recommendations

It is not known what capacity requirements that the RefDB must meet since the success of number portability is impossible to foresee. For this reason it is not wise to set the level to low².

It is also very likely that the market³ will require independence in the operation of the RefDB. The experience this far in Sweden emphasises this impression.

It is also very likely that the RefDB will be used for, at least, other portability domains. This leads to the conclusion that even if the initial cost is higher and the system might be oversized, a **Centralised Solution** is **recommendable**.

The operation of the centralised reference database is recommended to be managed by a independent organisation. The reason for this is that an independent organisation is favourable.

This recommendation is not primarily derived from technical factors, but from co-operative and operational aspects.

5.4 Porting process

A special group for administrative processes initially started the work with the description of the porting process. This group produced a specification describing the bilateral communication between operators which is necessary for porting of numbers. It also described how this communication should be structured in messages and the contents of these messages. After the completion of the specification in June 1998, the responsibility was transferred to ITS AG15. It then had to be complemented with procedures for the behaviour of the administrative interface towards the reference database and generally more detailed coding to make it usable as an input to an implementation.

During the latter part of the work a number of key assumptions have been made.

- The porting process shall describe the activities from start of negotiation for a porting between two operators to the final updating of all other operators' Administrative Databases, the NPA, ESE and LEA. It shall also describe back up handling when Administrative Databases have lost information or when a new operator enters the Routing Domain.
- It must be possible to monitor and log the porting process.
- A set of timers must be defined which can be used by the Operators and the Reference Database Administrator for the surveillance of the process.
- The porting process must, as far as possible, support implementation in different environments but still be unambiguous, thus avoiding implementation conflicts.⁴
- The standard assumes additional requirements from the SNPAC for the complete operation of the SNPAC.
- A need to define processes in the absence of a reference database administrator.

² In Sweden geographic numbers are less than 10 millions. It is not likely that more than 5% will be ported the first year.

³ In this context the market means the actors in the portability domain.

⁴ If this is not the case, the porting process in this document could in itself be used as an excuse for delays.

5.5 Interface protocols

The specification of the interface protocols was written with the following main assumptions.

- Open interfaces shall be supported.
- Simplified interface protocols meeting requirements of quick introduction and not creating barriers of entry must be supported.
- More advanced interface protocols and methods meeting requirements on automated procedures must also be supported.
- The existence of forms equivalent to the messages defined by the Swedish Number Portability Administrative Centre is assumed. These forms are to be used by the simplified protocols.
- All communication between the Operators is assumed to pass the Reference Database Administrator. This makes it possible for operators using different interface protocols to communicate over the Reference Database Administrator.
- It is assumed that the Reference Database Administrator supports mediation/protocol conversion between different interface protocols.