

Enterprise Operator Edition

Telecommunication Numbering Resource Manager

Imagine ...

- ... a system able to collect, manage and retrieve all your numbering information,
- ... a software component you can integrate into your IT world !

What about ...

- ... up-scaling capabilities only depending on the hardware ?
- ... a flexible application model ?
- ... fully automated data acquisition, distribution and provisioning ?

And last but not least ...

- ... you want to get a product already in operation at reference customer sites ?

With ErgonomiX:DiNoS™ you can get it all !

Handling subscriber numbers, number services, directory numbers, IP-addresses, numbering resources, identifying number types, etc. – daily business for each and every organisation providing telecommunication services. The internal and external workflow of such organisation depends on the way this important key information is handled. But in many organisations this is not done as efficiently as possible.

The ErgonomiX:DiNoS™ Numbering Resource Manager implements Telecommunication Number Management in the most effective way – as a modular, scalable software component.

ErgonomiX:DiNoS™ may be utilised for the administration of all sorts of numbering information including:

- ◆ Subscriber Numbers (Mobile and Fixed Network),
- ◆ Service Numbers,
- ◆ Area Codes, National Destination Codes,
- ◆ Routing Codes (HLRs, Switches, RSUs, SCAs, etc.),
- ◆ Reseller Ranges,
- ◆ Vanity Numbers,
- ◆ Attractive / Unattractive Numbers,
- ◆ Porting Information,
- ◆ Number Block resources, etc.

This covers data about own subscriber numbers as well as foreign numbers, assigned to competitors resources or regulators.

With the ability to implement real flow-through provisioning for number portability, service blocking and service activation purposes, the ErgonomiX product bridges the gap between foreign porting information and your network.

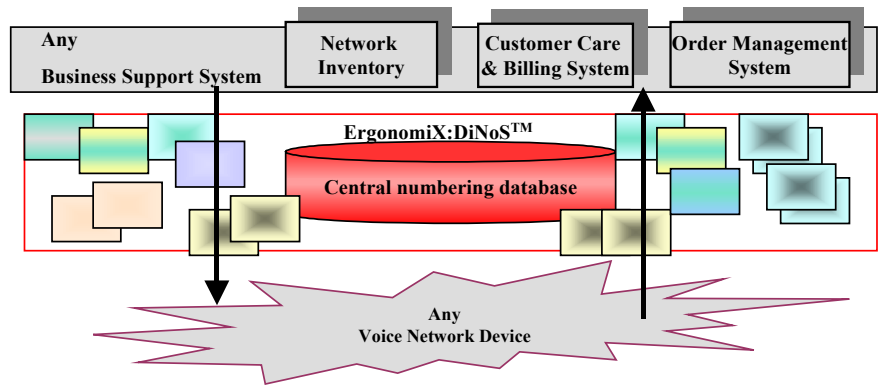
This product provides automation of number management for a de-regulated market !



ErgonomiX
Quality Software

Numbering information in a central database

In today's telecommunication business, numbering information often is distributed among several separate databases. In such an environment, collecting all available information related to a specific number, number block, number range or area code, is its own task. This is not only a problem of cost per subscriber line. Moreover, inefficient management of such information may prevent a network operator from providing an adequate service level to the customer.



Also Numbering resources are expensive in their own special way and customers usually have distinctive relationships to their numbers. In some countries, licensed operators have to buy number blocks at high prices. In most countries an operator has to especially monitor numbering resources. Usually this includes a liability to report to the regulation authority on a regular basis.

The new idea is implementing the management of numbers, numbering resources and related information with a special software component, that is optimised for these purposes. Installing such a centralised **Number Management System** gives the opportunity to have enterprise wide access to one of the most important information pools in a telecommunication organisation.

The ErgonomiX Software System is a leading product for telecommunication number management world-wide. It fulfils all requirements of a network operator to number management, number data exchange, reporting liabilities, etc.

Information Retrieval and Selection Criteria

It is possible to select and search for all information that is stored in the database of the system. Implemented out of the box are selection criteria according to common telecommunication practice. The basic package of the Graphical User Interface (GUI) of ErgonomiX:DiNoS™ already provides many pre-defined queries. Any combination of selection criteria can be used.

The product is able to automatically identify the type of each number and can provide according information, e.g.:

- ◆ if it is an own or a foreign number,
- ◆ to which carrier – or to which own switch – calls are routed,
- ◆ if it is a ported number, and who is the owner of this number or number range,
- ◆ what connection type / service type is associated,
- ◆ the relationships to other numbers (e.g. service, parent service),
- ◆ if the number (range) is related to attractive number rules, etc.

Configurable Number Status

Defining number status names and status identification is a customer domain. Also, number status are often defined by regulation authorities or suppliers of telecommunication networking equipment. Therefore a numbering application must be flexible regarding the presentation and handling of status information.

The ErgonomiX:DiNoS™ product allows to specify customer or country specific names for existing status. Additional customer / country specific status can also be configured.

The implementation of the required status and transaction scheme for numbers, depending on the number or service type can be implemented easily and is part of the services which come with the license price.

Product History

From the beginning of the product design, requirements and recommendations from many organisations active in the telecommunication business – operators, carriers, suppliers and regulators - did influence the general functionality and design of the product. The first release was successfully in life operation January 1st 1998 in Germany. This signifies more than ten years of continuous product development. A lot of functions have been added over the years and today, ErgonomiX is a leading supplier for this type of application.

In the year 1999, ErgonomiX started the international promotion and delivery of the product. From the bottom up, the product is designed for flexibility and adaptation to specific national particularities. Especially the implementation of different national numbering plans was a major design issue. The first project in a foreign country based upon the DiNoS product started in September 1999.

Companies interested in partnership for international marketing should contact ErgonomiX sales department. Several national numbering plans are already supported, additional ones can be configured.

PortClear™ Module

The In-house Clearing-House

The PortClear™ component is an add-on module to the ErgonomiX:DiNoS™ product.

In any communication, that involves several different communication partners, there might be discrepancies or variations. Independent from the type of the interface and the definition of the format and protocol, it can happen, that gathered porting information is divergent. The PortClear™ module helps to resolve these issues effectively and in a timely manner.

The PortClear™ component allows numbering managers and order managers within an organisation to obtain an overview of such discrepancies regarding porting orders and to work them off case by case. The component supports the efficient clarification and clearance of such divergent data either in the own database and / or if the according national interface allows such an action, to clear cases between the loosing and the winning operator automatically.

Only consolidated porting information from an Inter Operator Communication System module is stored in the numbering database as validated information. Depending on the national rules, the porting orders from other network operators or from a national central database are checked against each other and against the own database content.

The introduction of the clearing module gives a numbering manager the opportunity to easily detect the to be cleared cases via GUI, to generate reports for an in-house clearing group or other involved parties (regulation authority or other network operators) and to react in an efficient way.

FlowForce™ Module

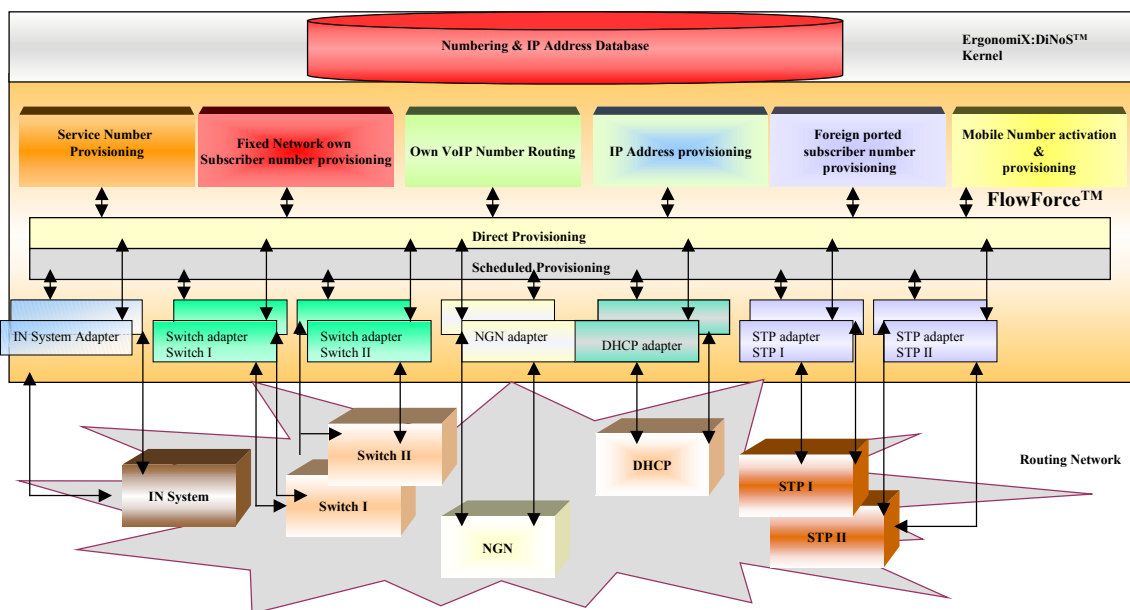
Provisioning of Routing Information to the Network

The FlowForce™ component is an add-on module to the ErgonomiX:DiNoS™ product.

This module allows the direct provisioning of routing / service activation information to connected network elements within a telecommunication network.

When using the FlowForce™ module, the ErgonomiX:DiNoS™ system becomes a master database for all connected network elements. Responses regarding the success of the provisioning are evaluated and recorded in the products database and the according logs. North-to-South transaction protection is available.

The parallel provisioning of different network elements is possible (e.g. direct provisioning of Switches, IN-Systems, VoIP related devices or SS7 equipment).



Basic features of the FlowForce™ module:

- ⇒ Redundant links to all connected network elements which support the feature.
- ⇒ Support for multiple / different network elements, Element Managers, IN-Systems.
- ⇒ Configurable error toleration in case of exceptional manual intervention directly on a network element.
- ⇒ Pair provisioning and automatic resynchronisation support for redundant network elements.
- ⇒ Link supervision for connections to connected network elements including link status view via GUI.
- ⇒ Dump and Comparison functions in a predefined format for all kinds of network elements.
- ⇒ Administration of communication parameters for the connected network elements and the according provisioning interfaces.
- ⇒ Management of necessary data about associated network elements (such as HLRs, Hosts etc.).

Number Management

The Enterprise Operator Edition works as the central numbering and service oriented number management instance for large or medium sized telecommunication network operators. The product supports all types of numbers and according telecommunication services.

Numbering Resource Management

- ⇒ Administration and support for the **Partitioning of the Range Layout** of switches and RSUs in the own network.
- ⇒ Management of all **Own Number Block Resources** including **Threshold Value Notification** in case a configurable percentage of utilisation is reached.
- ⇒ Support of **Expiration Dates of Number Blocks**.
- ⇒ **Mass Move Functions between Hosts / and or RSUs**.
- ⇒ **Number Block Ownership Change Support** (including Mass Move functions for all ported numbers).
- ⇒ Support of Geographical Number Portability (**GNP**) within the own network.
- ⇒ Support of **Flexible Definition of Attractive Number Rules** (supported definitions are: repeater rules, sequential rules, special vanity support, in several combinations with specification of the alignment and wildcards).

Service Orientation

- ⇒ Support of **Service oriented Handling** of numbering information including the **Management of Services and Parent Services**.
- ⇒ **Mass Data change features** on service level.
- ⇒ **Service Migration** support.
- ⇒ Special **Service Consistency Checks** and according GUI features for **Service Repair** or **Service Migration**.
- ⇒ **Service Types Support** and free definition which service types shall match to the configurable connection types.

Interactive Number Selection

- ⇒ **Number Negotiation, Number Propose** according to the **National Numbering Rules** in combination with the customers **Network Range Layout**.
- ⇒ Support of special **Number Negotiation for "own" Service Numbers** purchased from the regulation authority.
- ⇒ Numbers can be proposed / negotiated matching or not matching to configurable **Attractive Number Rules**.

Fixed Network Support

- ⇒ Support of fixed network number administration and **Provisioning of LNP / SNP Orders for Fixed and Mobile Network Operators**.
- ⇒ **Flexible Partitioning** of the **Network Range Layout** for fixed network subscriber numbers.

- ⇒ Support of fixed network **Subscriber and Service Numbers within one Application**.
- ⇒ Support of **Fixed Network** and **Mobile Network Data within one Application**.

Mobile Network Support

- ⇒ Support of Mobile number administration and **Provisioning of MNP Orders for Fixed and Mobile Network Operators**.
- ⇒ Order management, administration and provisioning of **Service Location Register (MSISDN based / IMSI based)** including Voice Mail Service (**VMS**) and Short Message Service (**SMS**) support for Mobile Network Operators.
- ⇒ **Multiple SIM-Card support for Short Message Services**.
- ⇒ **IMSI & MSISDN Relationship Management**.
- ⇒ Automated **HLR Capacity / Utilisation Ratio Management**
- ⇒ **IMSI / MSISDN Location Register**.
- ⇒ Configuration of **Different HLR Allocation Algorithms** for own Mobile Numbers (e.g. round robin or according percentage rules).

National Numbering Plan

- ⇒ Administration of all **National Short Codes, Service Codes, Mobile Codes, NDCs/ Local Area Codes** with integrated plausibility checks.
- ⇒ **Support of any possible National Numbering Rules**
- ⇒ **Administration of the National Numbering Plan** via GUI.
- ⇒ **Renumbering support** on NDC/LAC or Service Code level as well as for complete renumbering within a country.

Service Blocking Support

- ⇒ Support for all kinds of service blocking for services in the own network. **Blocking** based upon **Called / Calling party, CLIV**.

Miscellaneous

- ⇒ Administration of **Reseller Ranges**.
- ⇒ Administration of **Country Codes**.
- ⇒ **National Language Support** as well as support of multiple languages in a single application instance.
- ⇒ **Management of VoIP Information**.
- ⇒ **Grouping of Numbers** by definition of aliases.
- ⇒ Support of **Open and Closed Numbering**.



Services delivered with the Enterprise Operator Edition:

ErgonomiX, on request, takes the responsibility for the proper individual scaling according to customer needs. The amount of data which can be stored in the database is only hardware dependent – no subscriber limitation.

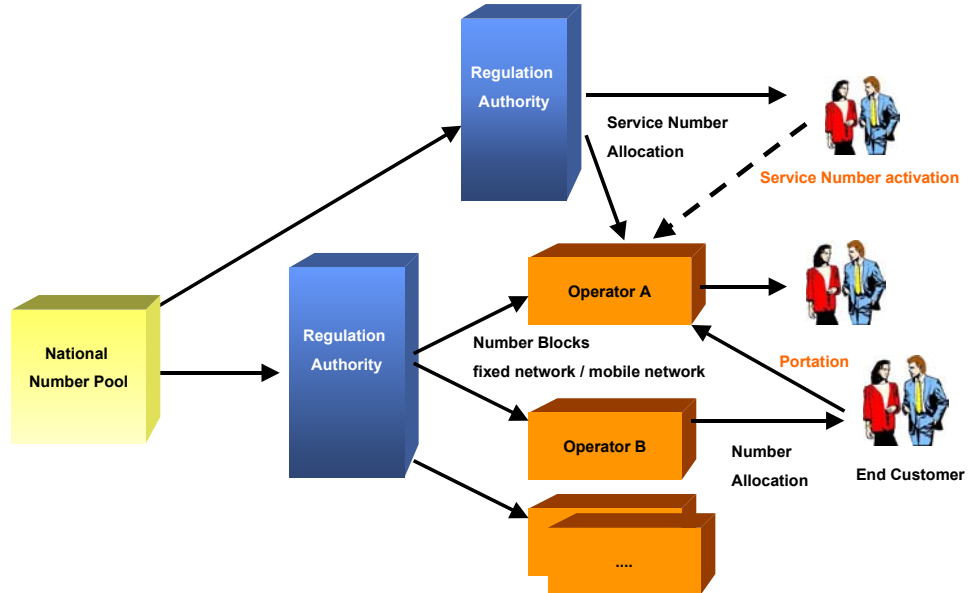
- Customer oriented database optimisation. The types of customer user interactions and the according transaction profile will be investigated and taken into account for further customer specific database optimisations.
- Customised operational concept including backup concept support, if third party products should be used (Third party products not included).
- Support of customer oriented workflow procedures (special cases within an organisation will be identified, specified and according support by the Number Management System will be implemented) is available as additional service.
- Remote monthly / quarterly health check of the system executed by ErgonomiX and provisioning of an according report.
- Customised support of multiple North-bound and South-bound interfaces according to the business needs of the network operator's enterprise is available as an additional service.

ErgonomiX

Quality Software

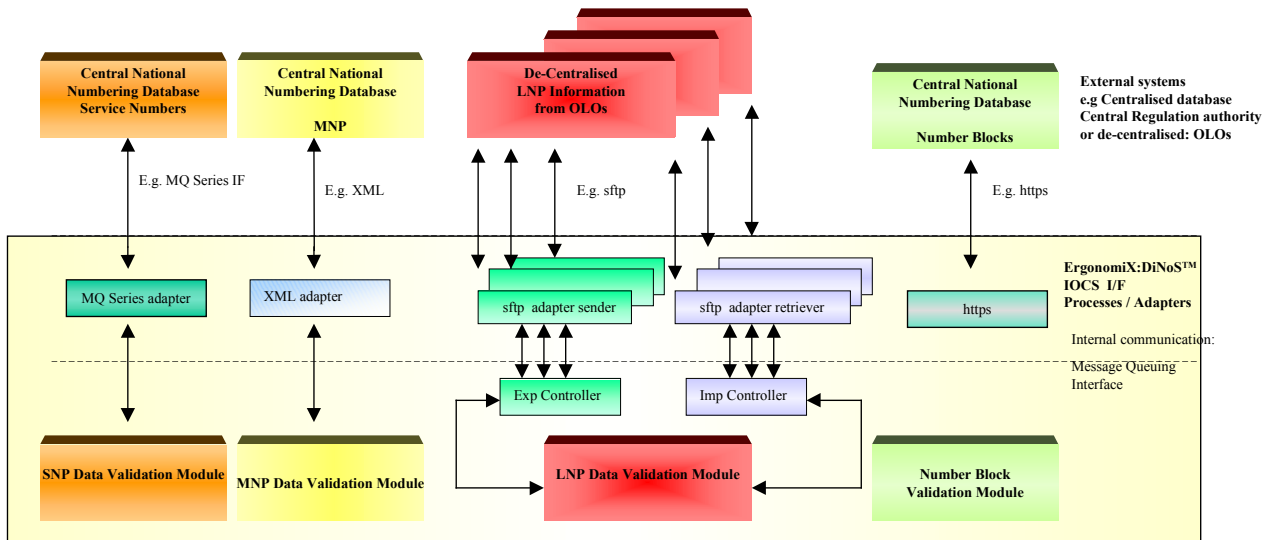
Number Portability

One of the important boosts for efficiency, the ErgonomiX product can provide, is the complete implementation of Number Portability on IT level. The Enterprise Operator Edition supports all types of Number Portability in a single production instance: Local Number Portability (LNP), Geographical Number Portability (GNP), Service Number Portability (SNP) and Mobile Number Portability (MNP). The product comprises all functionality needed for Number Portability implementation in the OSS world and the BSS environment as well.



Implementing Number Portability on IT level

The application collects porting information from the regulation authority, from other licensed operators if required, and from other organisational units in the own enterprise. After complete verification, a routing order is generated and passed on to an according network provisioning system or directly to the network elements. This may be a provisioning software component, an IN system, a Switch, an STP or any other network element on SS7 or IP basis. The application implements a flow-through-provisioning with end-to-end connectivity from a National Number Management Pool System to network routing: Fully automated !



Inter Operator Communication Service (IOCS)

The procedure for the information exchange regarding ported numbers is usually defined by national authorities and differs from country to country. There are two usual high level architectures with the national porting data exchange. One is a centralised solution, where all information regarding ported numbers is held in one database and a network operator has a specific interface to retrieve data and to provide own porting information. The second possibility is a decentralised solution, where the information is passed between operators. Both architectures are supported by the Inter Operator Communication Service module (IOCS) of the ErgonomiX product. A combination of both architectures is also possible and supported.

The support of different exchange interfaces in parallel is a matter of fact. All interfaces, configurations (such as porting windows for porting orders) are independent for each supported number type. Porting exchange interfaces for several countries are already available from stock. The extension of the IOCS component for an additional specific interface is a simple plug-in of a new interface module – the kernel function is already available!

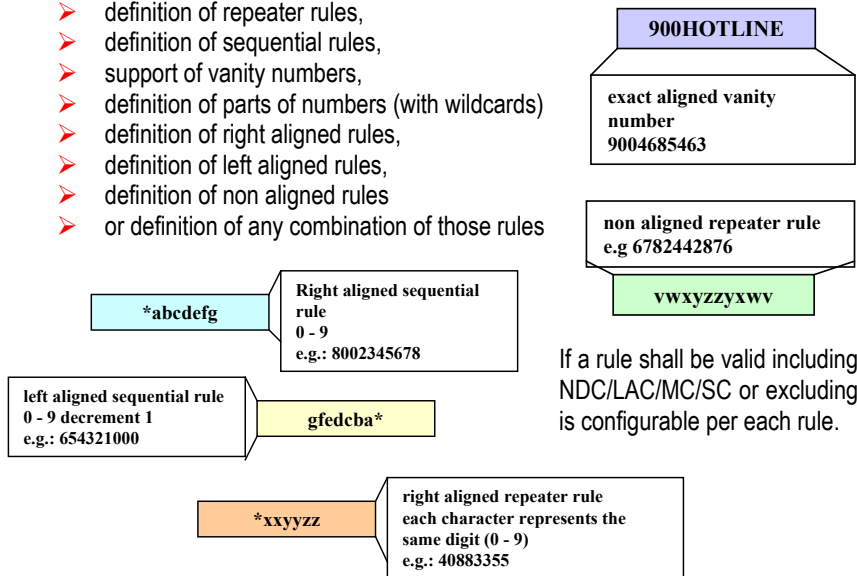
Features – Functions – Add-on modules

Attractive Number Support

An attractive number is a number which is easy to remember, or with a specific economic value, for other reasons. Its allocation may be provided as a gift or as a priced add-on service to an end-customer.

The Attractive Number Support of the ErgonomiX application allows the flexible definition of rules for attractive or explicitly unattractive numbers. For the definition of attractive number rules the following functionality is available:

- definition of repeater rules,
- definition of sequential rules,
- support of vanity numbers,
- definition of parts of numbers (with wildcards)
- definition of right aligned rules,
- definition of left aligned rules,
- definition of non aligned rules
- or definition of any combination of those rules



It can be defined by the network operator which rules shall be used to define which numbers are “attractive”. Within the number negotiation function, the interactive number selection, the number proposal process and with number reservation, the specified attractiveness rules are considered.

ErgonomiX:IPAM™ IP Address Manager

The IPAM component is an add-on module to the ErgonomiX:DiNoS™ product. It provides all means for administering large and complex IP address pools. This includes their structures and sub-structures of free, used or sub-licensed IP resources. Own and foreign IP address structures can be managed efficiently and in a timely manner.

With certain telecommunication services, such as VoIP, IP addresses often relate to voice services. Such relationships can be maintained properly with the IPAM module.

Also, because voice networking becomes more and more IP based, an integrated, IP address management software is a necessity for all telecommunication network operators. In addition, with the coming boost of IPv6 IP address utilisation, administration becomes even more difficult, as these addresses are less comprehensive as IPv4 ones. The IPAM module can be used to implement IP address management efficiently for all purposes.

Renumbering Support

If the national numbering plan is changed, all involved own numbers as well as all foreign ported numbers need to be updated. ErgonomiX provides the support of automated Mass-Move functions for all involved numbers in case of Service Code changes, or LAC / NDC changes in the national numbering plan. The renumbering module includes comfortable activation of renumbering via GUI for “smaller” changes and also for a complete renumbering of the national numbering plan. Rules will be configured and stored in separate database tables. GUI functions are available to match a number against the new numbering plan as well as the previous numbering plan. The ErgonomiX application can work as the central renumbering database and reference for all other IT or telecommunication systems of a single network operator or a whole country. Different interfaces and dumps to provide the renumbering information to concerned Network Elements are available.

High Availability

With the non blocking distributed architecture of the software, on according hardware, ErgonomiX can achieve any availability level necessary. ErgonomiX provides different High Availability functions depending on the needs of a network operator. ErgonomiX offers Cold-, Warm- or Hot-Standby configurations for installation on duplex or multiplex hardware.

Clustering set-up according to the business needs and the general architecture of the customers IT can be provided. Several different database update mechanisms are also supported (e.g. Oracle® Multi Master Replication). In a Hot-Standby environment automatic fail-over conditions are configurable according to the customers requirements.

Service Blocking Support on IT-Level

Blocking of allocated services within a telecommunication network is an essential feature for fraud prevention and problem resolution. The ErgonomiX product supports several service blocking administration and provisioning features on IT level. In combination with the FlowForce™ component also a flow through provisioning from the North-bound system towards the responsible network elements is supported for purposes of temporary service blocking. The following service blocking features are supported:

Administration of Black Lists: Service Blocking Support / CLIV. The Blocking is based on calling party numbers and is supported for Single Numbers and Number Ranges.

Multi dimensional Black Lists: Blocking based on Called/Calling Party Numbers. The feature includes an extensive set of blocking types, such as Service Codes (e.g. Free Phone, Call-by-Call, 0700, etc.), Network Operator related (associated with a Service Code), Country Code related, Local Area Code related.

Generic Blocking Administration: Each and every given number or number range can be blocked without any validation towards the national or international numbering plan.

Key Features

Number Management – Services, Status, Porting

- ⇒ Storing all numbers compliant to ITU E.164.
- ⇒ If the national numbering plan is not in all details conformant to ITU E.164, the system is able to operate with such special deviations.
- ⇒ If the national numbering plan changes, only some small adaptations are necessary to support the new numbering plan.
- ⇒ All operations are available for number ranges, too.
- ⇒ Support for all types of Number Portability (LNP, SNP, MNP, GNP)
- ⇒ Management of all own numbers (fixed network / mobile network numbers) related to own numbering resources (e.g. to own number blocks).
- ⇒ Storing all necessary relationships of a subscriber or service number e.g. switch identifier, connection type (ISDN Access, ISDN Multipoint, VoIP, PMX, analogue access), according service type (e.g. ISDN C, ISDN 2 basic, PSTN) addresses of the customer, CUG information, and so on).
- ⇒ Monitoring of own numbering resources.
- ⇒ Management of pre-selected numbers.
- ⇒ Management of imported numbers (ported to own company).
- ⇒ Management of exported own numbers to other network operators (numbers belonging to own numbering resources).
- ⇒ Management of all foreign ported numbers.
- ⇒ Support of any configurable status for numbers (e.g. reserved, suspended, activated, deactivated, cancelled, exported, imported, special status for service numbers, etc.).
- ⇒ Interactive Number Selection support.
- ⇒ Propose and reserve of numbers according to the national numbering plan rules.
- ⇒ Manual clearing options for all kinds of divergent import data (e.g. from electronic interface to other carriers or a central database).
- ⇒ Comfortable investigation options for all types of numbers.
- ⇒ Reservation of numbers from own number blocks.
- ⇒ Support of vanity numbers (allocation or searching a vanity number).
- ⇒ Management of all service numbers published by a central instance (e.g. the regulation authority).
- ⇒ Keeping History of numbers, number ranges, their status and their associations.
- ⇒ Support of Open and Closed Numbering.

Number Management – Permanent Data

- ⇒ Management of own number blocks and all number blocks of other local carriers. Automatic acquisition and exchange of number block information published by the regulation authority.
- ⇒ Support of Number Block Ownership Change including automatic Mass Changes for all ported numbers belonging to a block.
- ⇒ Management of all local area codes, automated load of area code data including corresponding rules (e.g. the allowed length of an analogue subscriber number, the rules for ISDN-subscriber numbers related to a specific area code, etc.).
- ⇒ Management of all service codes and mobile codes and corresponding plausibility rules (e.g. shared cost-numbers, free-phone numbers, information services, etc.).
- ⇒ Administration of data related to other network operators (contact addresses, fax, e-mail, contact-person, routing short-codes, information for establishing connection to other carrier's databases, etc.).

Processing of Routing

- ⇒ Processing of routing information for provisioning purposes. Feature available for ported numbers and own numbers.
- ⇒ Routing provisioning based upon area code, switch ID, trunk ID or interconnect partner ID.
- ⇒ Routing orders can be exported / sent at configurable times.
- ⇒ Simple configuration of the specific porting times and several porting-windows.

- ⇒ Automatic, electronic transfer of routing orders to an IN-system, a service provisioning system or directly to a network element.
- ⇒ Data Distribution configuration based on service type or number range (rules / algorithms for the determination of information distribution can be customised).

User Access Management

- ⇒ User management on application level.
- ⇒ Definition of different user groups with different access rights (e.g. Order Manager, Application Manager, System Administrator, ...).
- ⇒ Group Management and User Management support in combination with Subdivision Access Control functions
- ⇒ Authorisation configuration separately for each menu, window, button (e.g. new, change, delete, export, etc.).

Number Data Exchange

- ⇒ Porting data acquisition facility (from other carriers or from a central database).
- ⇒ Number block allocation data exchange facility.
- ⇒ Porting notification facility (to other carriers or to a central database).
- ⇒ Service activation notification facility.

Attractive Numbers

- ⇒ Administration of flexible rules for attractive and unattractive numbers.
- ⇒ Numbers or numbers in ranges in states free or allocated can be identified regarding their attractiveness.
- ⇒ Attractive numbers can be proposed and negotiated.
- ⇒ Attractive / unattractive numbers can be excluded from standard propose function.

Logging / Tracing

- ⇒ Recording of interface activity.
- ⇒ User logs for all user operations which effect the database (insert, update, delete operations).
- ⇒ System logs for all system activity.
- ⇒ Logs the provisioning activity in case of electronic provisioning.
- ⇒ Data Exchange Status View for all external interfaces.
- ⇒ Integrated message catalogue for log, trace or alarm messages (e.g. incorrect configuration of the system, user errors, protocol information, interface activities, etc) in any language of your choice.
- ⇒ Integrated Application level tracing for analysis, performance measurement, etc.

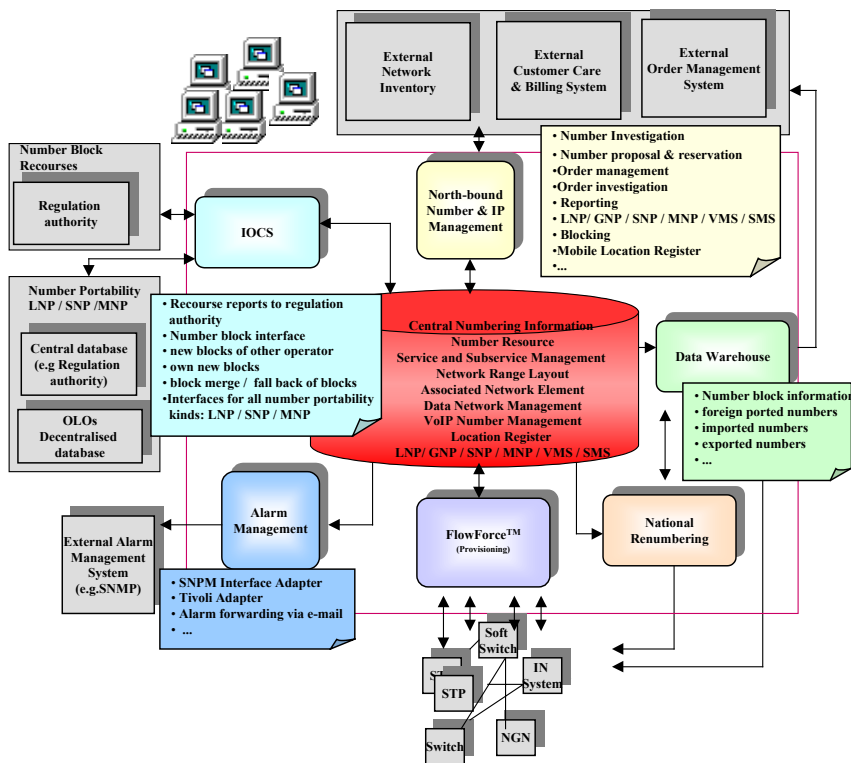
Alarm Management

- ⇒ Includes a complete Alarm Management module.
- ⇒ Simple individual configuration of the severity per alarm.
- ⇒ All steps of alarm handling will be recorded in the user log.
- ⇒ Query facility for alarm log (e.g. all fatal errors of today, all information of yesterday, of specific date).
- ⇒ Alarm management platform adapter.
- ⇒ E-mail interface, SNMP interface for alarm notification.

Miscellaneous

- ⇒ Renumbering support for service numbers changes, LAC /NDC changes or complete renumbering in a country.
- ⇒ On-line help for every application window.
- ⇒ Export of application data for statistics purposes.
- ⇒ Automated acquisition of order data via Batch Processor.
- ⇒ Easy configuration of system parameters in central system parameter file.
- ⇒ National Language Support included.
- ⇒ Support for mobile networks as well as fixed networks in one single product.
- ⇒ Disk Mirroring, Clustering, Cold, Warm or Hot Stand-by configuration (Duplex) for high availability.

Interfaces



North-bound Interfaces

- ◆ HTML/Web Client providing access through all standard web browsers
- ◆ Asynchronous Messaging Interface
- ◆ Asynchronous / Synchronous RPC Interface. Fast, flexible RPC Client
- ◆ Automatic Routing Provisioning interface
- ◆ CORBA interface / XML interface can be plugged in
- ◆ Batch (File) Interface (order acquisition, number status query, permanent data load)

South-bound Interfaces

- ◆ Routing Provisioning Interface (electronic flow through provisioning), implementation / configuration of individual routing algorithms possible

IOCS Interfaces

- ◆ IOCS Interface for exchange of porting information (centralised and de-centralised systems are supported)
- ◆ Central Porting Database Interface (e.g. to a national numbering database)
- ◆ Interface to other carrier databases (in case this is supported for the respective country)

Miscellaneous Interfaces

- ◆ Data Extractor (file based for integration with CDR-Mediation, Billing, Customer Management, Data Warehouse, etc.)
- ◆ Data Warehouse Interface (separate database for integration with CDR-Mediation, Billing, Customer Management etc.)
- ◆ National Renumbering Interface
- ◆ Reporting Interface
- ◆ Alarm Escalation Interface (e.g. e-mail, Fax, SNMP)
- ◆ Direct Database Access Interface (selected SQL-tables and views)
- ◆ Easy adding of additional customer specific interfaces because of modular design.

Availability

ErgonomiX:DiNoS™ Release 5.5 is generally available since December 2007, Release 6.0 is generally available since June 2008. If the standard DiNoS workflow is used, customers may start managing numbering information more efficiently a few weeks after ordering ! Adaptation to the national numbering plan and to the customer's specific workflow is not included in the DiNoS Enterprise Package but is usually offered on customer's request at a reasonable fixed price. If the customer already designed a corresponding workflow such a project phase may be completed within a few months including a formal system test phase. In addition, ErgonomiX offers consulting services for workflow specification in the area of number management and number portability.

Database

DiNoS utilises the Oracle® RDBMS product for database purposes. The product already supports Oracle® 9i, 10g and 11g. A database abstraction layer shields the application code from specific database access code. By exchanging this layer, the adaptation to different database products is possible.

Operating Systems

The DiNoS product is available for all important UNIX®-based operating systems.

HP-UX®	>= 11i
IBM AIX®	>= 5L
Linux Novell SuSE	>= SLES 10
Sun Solaris®	Solaris 9, Solaris 10

Contact

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Product Partner Information

This information was handed over by