PRODUCT

innovaphone VoIP products 2010

ANALYSIS

IP telephony solutions from innovaphone

ComConsult Research

ComConsult Research represents the product and technology test laboratory of ComConsult Technologie Information GmbH

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ComConsult Research

Product analysis

innovaphone VoIP products 2010

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Product overview and architecture

Background

In this report and based on the extensive testing in 2007, we have tested the innovaphone IP telephony solution, particularly the new features in software version 8 and integration in Microsoft Unified Messaging.

The innovaphone AG headquarters are based in Sindelfingen. The company provides professional telephone systems entirely based on IP. innovaphone is a privately held medium-sized business, founded in 1997. Currently, innovaphone AG has about 60 employees in six locations. Representative offices also exist in Hanover, Hagen and Berlin, as well as in Italy and Austria.

Figure 1: Weather-proof IP150

The products are distributed exclusively by partners: approximately half of the 150 authorised resellers serves the German market, and the remaining half serves neighbouring European countries. According to the company, more than 2500 technicians have received training on the innovaphone technology in the company's own training centre since 1997.

Figure 2: DECT telephone IP55

The product range incorporates telephone systems, IP telephones, cordless telephones, adapters to connect non-VoIP capable terminals and the appropriate software. The main development emphasis is placed on standard conformity, availability and scalability. Key benefits of the innovaphone solution portfolio include the fact that all telephone systems also have gateway functionality and at the same time have no rotating parts. Furthermore, all solution modules consistently support both SIP and H.323 standards in parallel. The innovaphone solutions can therefore be adapted flexibly to meet customer requirements. This analysis is based on a test environment in the ComConsult Research IT laboratory, which uses the most important infrastructure components and terminals in a realistic environment.

Product range

The product range includes a manageable number of PBXs and terminals which nevertheless still covers the most conceivable scenarios in medium-sized businesses:

- five telephone systems (IP6000, IP2000, IP800, IP305, IP302),
- one DECT base station with integrated PBX (IP1200),
- five IP telephones (IP240, IP230, IP200, IP150, IP110),
- one softphone (Bria)
- four IP adapters ATA (IP28, IP24, IP22, IP21),
- five DECT telephones (IP52, IP54, IP55, IP56, IP64),
- one WLAN telephone (IP72).

The telephone systems mainly differ in the number of ISDN interfaces, the number of analogue ports and the size of the installed memory. The spectrum starts with 1 * BRI on the IP302 and goes on to include 4 * PRI on the IP6000. Positive: The consistent design concept means all systems use the same firmware: operation and user guidance are the same across the board. Furthermore, certain areas of functionality can be easily transferred to other systems, or taken over by other systems if there is a failure (see below for details).

Robust construction

All systems are compactly built - the largest PBX, the IP6000, measures just 210 x 184 x 32 mm and weighs about 1 kg. Despite the small size, which reminds one of a SOHO telephone system, further testing has proven that the innovaphone systems are clearly professional products for business use.

The brushed stainless steel housing is certainly attractive to look at. An optional frame also enables the IP6000 to be installed in a 19” rack.

The systems have no rotating parts (e.g. fans or hard disks) - instead they are equipped with passive cooling elements and flash memory. The integrated CF card slot (type I) fits into this concept, providing memory for voicemail and announcements. The high availability of the hardware is established by the fact that mechanical components have been avoided as far as possible.

Figure 3: The innovaphone flagship, the IP6000

Integrated Gateways

All PBXs also have gateway functionality which means they can be used to connect to the ISDN network. Furthermore, the IP302 has two analogue interfaces, e.g. to connect a fax machine. All PBXs support the standard T.38 (fax over IP). Other non VoIP capable devices can also be used by means of appropriate adapters; such as the IP adapters IP22, IP24 or IP28 which have two, four or eight interfaces, accordingly.

A second Ethernet interface can optionally be used on all innovaphone telephone systems e.g. for IP routing, for a redundant network connection or for connecting to a demilitarised zone (DMZ).

innovaphone operating system

innovaphone has developed and uses its own real-time operating system which has been reduced to essential functions. Therefore, users do not have to worry about security gaps, which are the usual cause of attack on Windows and Linux systems.

The proprietary operating system is also responsible for the quick booting time: measurements in our laboratory proved that on average, the innovaphone system is ready for operation just 10 seconds after being switched on. This is advantageous especially if there has been an error or when rebooting the system after making configuration changes.

The fact that the firmware is identical on all systems also has a positive effect on the amount of training required by administrators.

Scalability

According to innovaphone, one single IP6000 can serve approximately 2,000 subscribers. If this number is exceeded, the gateway functionality should be transferred to another device. This would enable a further 8,000 users to be connected. However, a system of this size should be further cascaded in order to distribute the load. Several primary multiplex connections can thus be distributed amongst other systems, providing additional redundancy.

Using the location concept means that there is basically no limitation to the number of connections in an overall solution. Additional subscribers can be covered by integrating additional hardware.

In addition, and this isn't self-evident, the innovaphone solution can also be scaled downwards. The IP302 enables small branch offices and locations to be integrated economically in larger PBX infrastructures.

Terminals

The terminals are the result of development co-operations with companies such as Kirk, tiptel, swisscom, ascom and Funke+Huster. This diversity however comes at the expense of a uniform terminal design concept. However, in a positive sense, it could be said that innovaphone has sought out the perfect development partner for every operational purpose.

The range of terminals starts with the simple IP110 with its five line display, over the IP200 with alphanumeric keyboard to the IP240 with its seven line display and eight function keys. The IP230 can be extended using a maximum of three extension modules to enable max. 100 function keys. The IP150 is a special case (see Figure 1): It is weather-proof, its special housing protects against vandalism, rendering it suitable for outdoor use.

The IP DECT gateway IP1200 cannot really be classified as a terminal, nevertheless, it is worth being mentioned here as part of a cordless solution. The integrated GAP compatible base station can for example be used by the DECT telephones IP52, IP54, IP55/56 (see figure 2) and IP64. The WLAN telephone IP72 results from a development cooperation with Ascom and provides a real alternative to the DECT solution. The very robust telephone has more than 8 hours talk time and almost 40 hours standby. It supports the standards

IEEE 802.11b/g, enables voice channel encryption according to 802.11i, also providing fundamental quality of service with the Wireless Multimedia Extensions (WMM). innovaphone does not offer its own WLAN infrastructure in the form of 802.11b/g compatible access points (AP). At the moment, access points from Cisco, Aruba, Trapeze and Meru Networks are certified for the IP72.

Protocols and interfaces

SIP and H.323 - A question of features?

All models, from the PBXs to the terminals, support the Session Initiation Protocol (SIP) according to RFC 3261, as well as the ITU-T standard H.323. The degree of support depends, however, on the respective protocol. Standard conformity is an important attribute of innovaphone's products. This together with the fact that H.323 development has been completed, means that slightly more services are provided over H.323 than over SIP.

The benefit of this approach is that it guarantees full interoperability with other standard compliant SIP end points. Consequently, devices from other manufacturers can also be used. At ComConsult Research, several SNOM type 360 terminals worked properly with the innovaphone IP6000 PBX.

A complete list of supported SIP features can be found under http://wiki.innovaphone.com.

Figure 4: The high-end telephone IP240

On a positive note, the firmware makes both protocols available without needing extra flash. Every device can thus use SIP and H.323 at the same time. Multiple registration makes it possible to register to both a H.323 gatekeeper and a SIP registrar to use both services.

Using the SIP protocol, the telephone systems operate as B2BUA (Back to Back User Agent) and thus terminate the signalling path for the SIP terminals concerned. In contrast, the RTP media stream is directly exchanged between the end points for both SIP and H.323. So-called “private networks” are an exception: The PBX can be used as an RTP relay if private networks are configured (Configuration → IP → Settings). This makes it possible to avoid NAT difficulties for the media stream.

SIP over TCP and TLS, SRTP in SIP and H.323 have been supported since software version 7.

QSIG support

Interconnecting PBXs is also enabled using the ETSI standard QSIG. To do this, an IP PBX, e.g. IP800, is connected via ISDN to the existing PBX at both ends of the private network. An existing IP connection is used to establish the link between these two systems. The proprietary protocol used on the PBX side (e.g. CorNet, NQ) and the corresponding features are then tunnelled via QSIG and finally transmitted to the respective party (see Figure 5).

Open interfaces

In addition to Microsoft‘s traditional “Telephony API” (TAPI) for CTI applications and the ISDN interface CAPI for fax, voicemail and unified messaging (UM), there is also a SOAP interface for individual adjustments and extensions. This enables simple integration of IT and TC, enabling implementation of any TC applications. Simple applications can be implemented without delay, such as activating a call diversion over a web site or displaying customer data for an in-coming call.

In contrast, CSTA according to TR/84 is not supported. An additional 3rd party gateway e.g. from ESTOS is needed if the other party requires CSTA (like Microsoft OCS does).

Selecting a telephone directory is organised flexibly. Either the local PBX directory or an external LDAP compatible directory can be integrated. Each directory can be activated or deactivated independently.

ENUM

All models support the ENUM protocol, which ensures ITU-T E.164- addresses are converted to a suitable IETF URI. Calls take place over the IP connection if the subscriber has stored a SIP-URI under his extension number, instead of over the public telephone network (which is usually more expensive).

The Austrian domain registration company, nic.at, is a pioneer concerning ENUM, and uses innovaphone PBXs in its offices in Vienna and Salzburg. They use, for example,

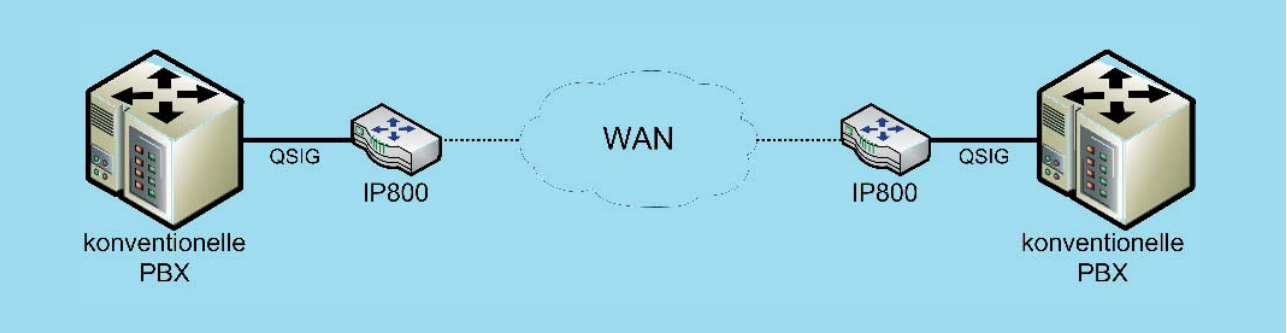

Figure 5: System connection via QSIG

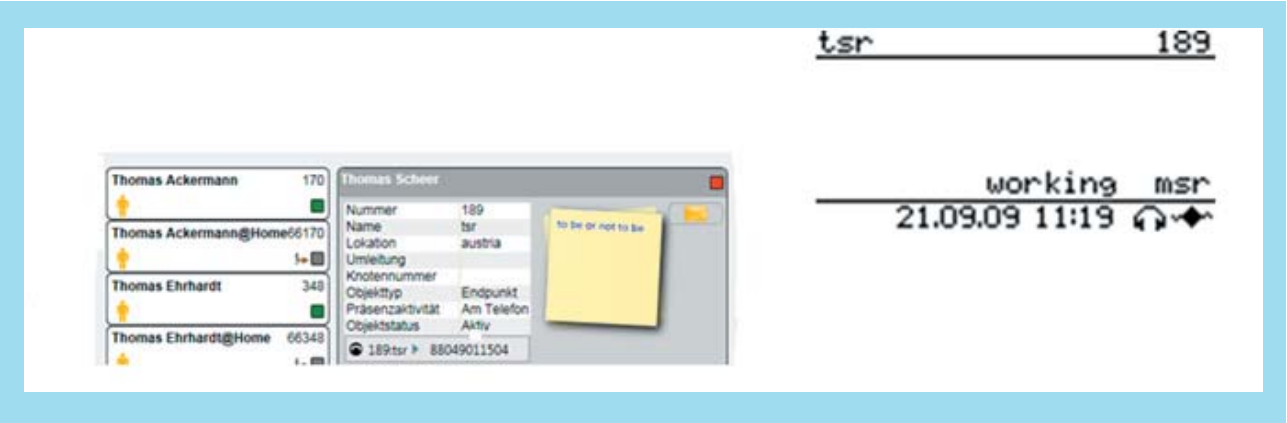

Figure 6: presence information

the IP800, the IP3000 which is no longer available and IP200 terminals.

Presence

The idea of the presence function is to make your current availability visible to other colleagues. For example, you are in a meeting and do not want to be disturbed. You thus change the status on your telephone from "available" to "meeting". Providing the colleagues have subscribed to the status information service, they will receive status changes at the same time on their telephones. With version 8 of its software, innovaphone has now also included this Unified Communication infrastructure in its products. Accordingly, the system provides various presence information possibilities. Five possibilities were selected from a list of 26 various options defined in RFC4480 (busy, away, vacation, lunch and meeting).

However, it is possible to extend or edit this pre-defined list to match your personal working situation. One other presence feature is the "SIP Federation". This is the possibility to exchange status information using presence services outside of your own company. This function is not limited to exchange amongst innovaphone systems, it also supports other manufacturers' presence replication e.g. Microsoft OCS.

Security

Of course, implementing VoIP systems in the network opens up questions concerning security. First of all, IP based telephony is just another application with all the advantages and disadvantages from the world of IP. Encryption is one aspect which has been widely discussed in the media. The necessity of encrypted communication within a company network is a topic which is open to dispute. Experience has however shown that security is required by almost all market participants, but is rarely implemented.

The innovaphone solution is also state-of-the-art in this area. Encrypted protocols SIP over TLS, SRTP and HTTPS as well as H.235 SRTP have been supported ever since SIP over TCP was introduced in version 7.

The implementation of H.323 is also very sophisticated and supports appendix D in H.235, the so-called "Baseline Security Pro-file", which defines authentication and integrity.

Deployment and configuration of the terminals (Roaming Phone Profiles)

As from version 8, telephone user configuration, such as for example, assigning function keys, ringing tones etc. is stored centrally in the PBX. This makes Hot Desking easier: If a user registers on a different telephone, he can still automatically use his individual tele-

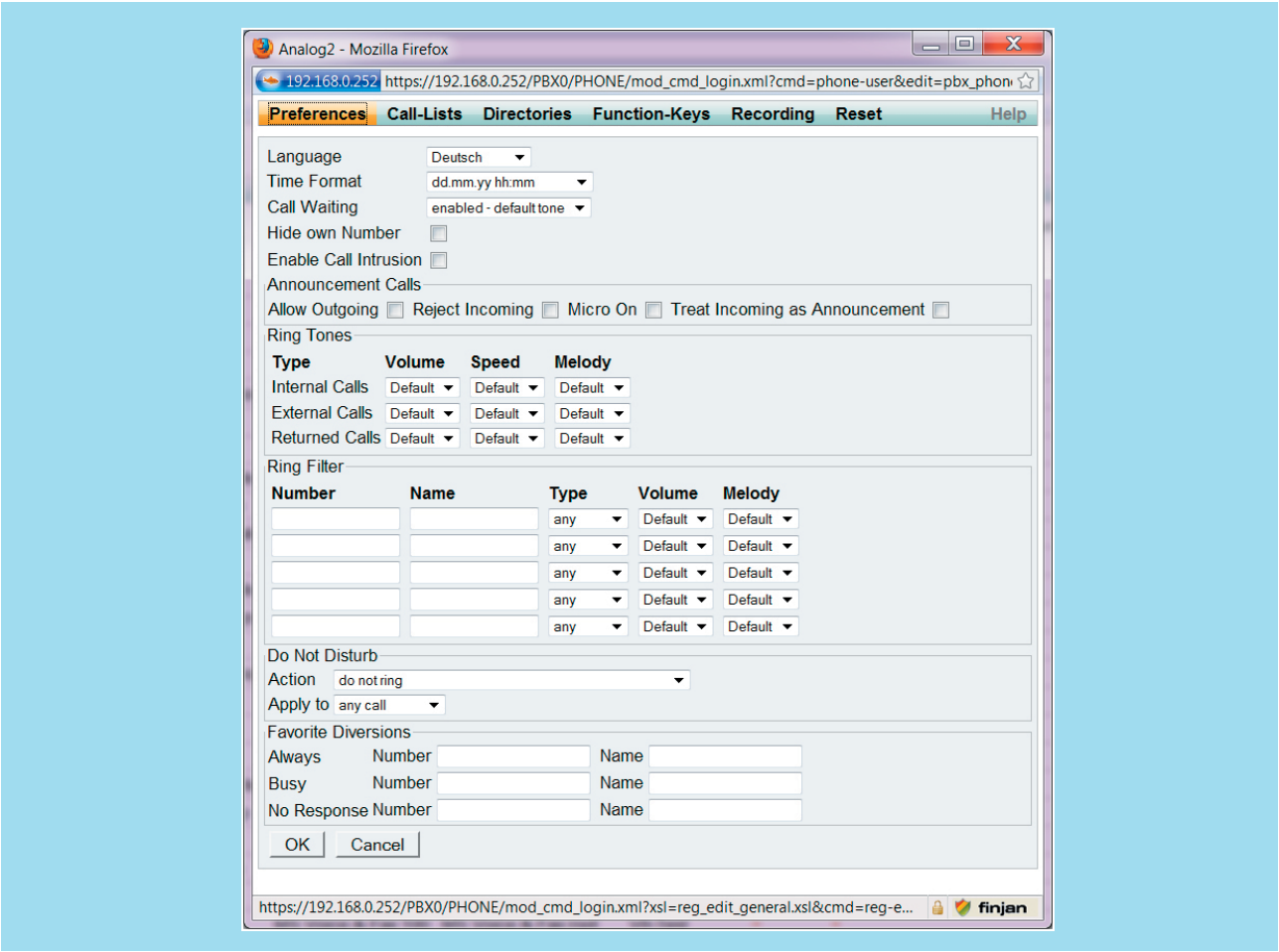

Figure 7: Terminal profile PBX

phone settings. A further aspect is simplifying the administration of a rollout - for example, swapping telephones or setting up standard function keys across the board.

If the feature („Store Phone Config“) is activated in a user‘s PBX settings, all user telephone settings are stored on the PBX.

This includes settings such as language, ringing tones, pre-settings for call diversion, function keys, settings for call lists, directories and recording.

Settings can be done using the telephone’s web interface, but also on the PBX.

During rollout, administrators have the possibility to create configuration templates for various scenarios on the telephones to be installed and to allocate a specific template to each user. A telephone (user) registering to the PBX then obtains the corresponding stored configuration.

If a telephone which was previously a standalone telephone registers, the configuration stored on the telephone is sent to the PBX. The PBX then sends the configuration linked to the templates back to the telephone.

Home office employees

The fact that all devices support the protocols PPPoE (client) and PPTP (client and server) offers interesting options to home office workers. PPPoE provides DSL access to the internet for home office workers, PPTP then ensures a VPN connection to the company. This supports encryption according to MPPE

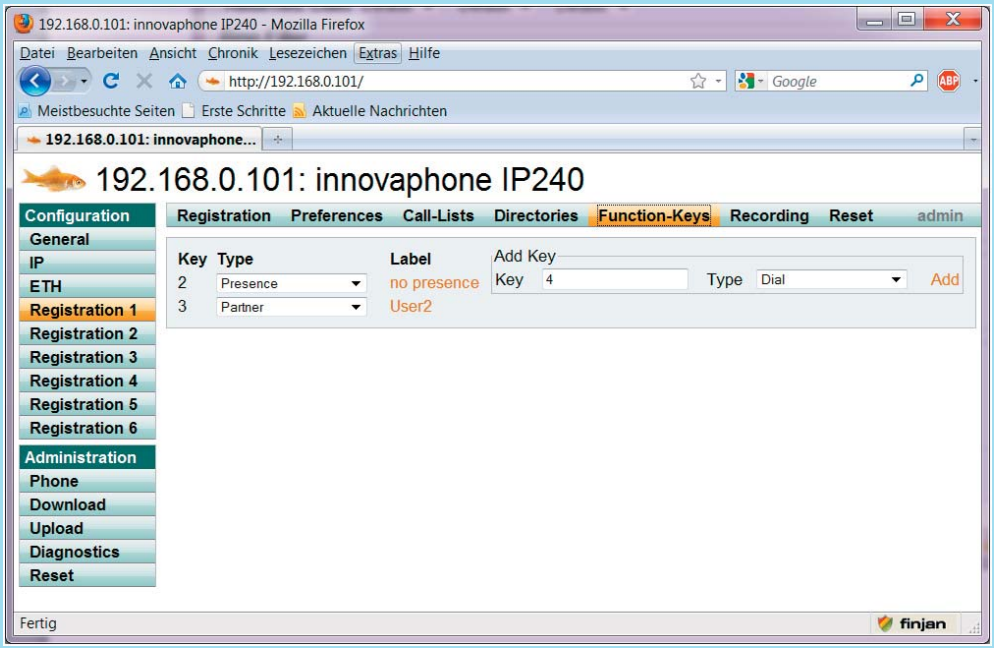

Figure 8: Terminal profile telephone

(RFC 3078) with 40/128bit as well as MS-CHAPv2 authentication. However, there is no IPSec client.

The innovaphone PBXs support up to 32 PPP connections, the terminals support four connections - regardless of whether PPoE or PPTP is used.

It is thus possible to integrate home office employees without needing an additional router with VPN functionality.

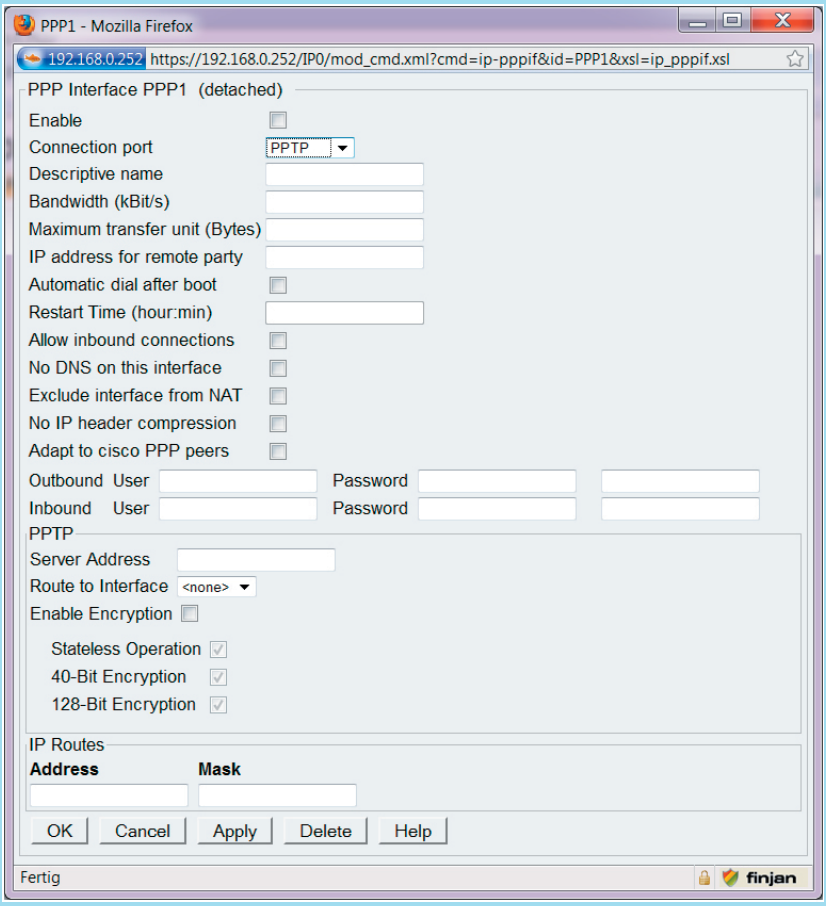

Figure 9: PPTP client configuration

Location concept

Connecting and managing a multitude of different branch offices is a real challenge for TC infrastructure. In this regard, many questions arise concerning central or local administration, open and closed numbering plans as well as cost savings through Least Cost Routing (LCR) and end devices which dial into the company via VPN.

Central administration through replication

The basis of the innovaphone system's location concept is a master-slave relationship between various telephone systems. One telephone system is defined as the master and all others as slaves. An advantage of this master-slave relationship is the realisation of central administration, whereby all user data is replicated onto the appropriate telephone system via LDAP protocol. This so-called "Replicator" is configured on each receiver, i.e. slave, standby or DECT system. This replication provides an additional back up component for the slaves, so that in case of failure the master PBX can take over the malfunctioning slave's tasks. Floating licenses ensure license provisioning.

As the master manages all the user data including the respective location, users have the possibility of changing locations while keeping their personal extension number. During this process, the local PBX simply forwards incoming calls for the subscriber to the master. The master identifies whether the call can be taken locally or needs to be for-warded to another PBX.

Numbering plan

Concerning the numbering plan you have the choice between an open or a closed concept. This allows either the whole company to be equipped with a collective numbering plan or each location to have its own specific, yet complete numbering plan. If the decision is made in favour of a closed numbering plan, prefixes ensure that every subscriber is available, but also that extension numbers can be assigned more than once in different locations.

Least Cost Routing (LCR)

Using internal codes or prefixes also enables manual Least Cost Routing (LCR). This means it is possible to use the appropriate prefix to directly select one of the company's various trunk lines. The subscriber simply has to dial the desired location's prefix, the number for the outside line and the desired telephone number. The call is then processed through the remote trunk line.

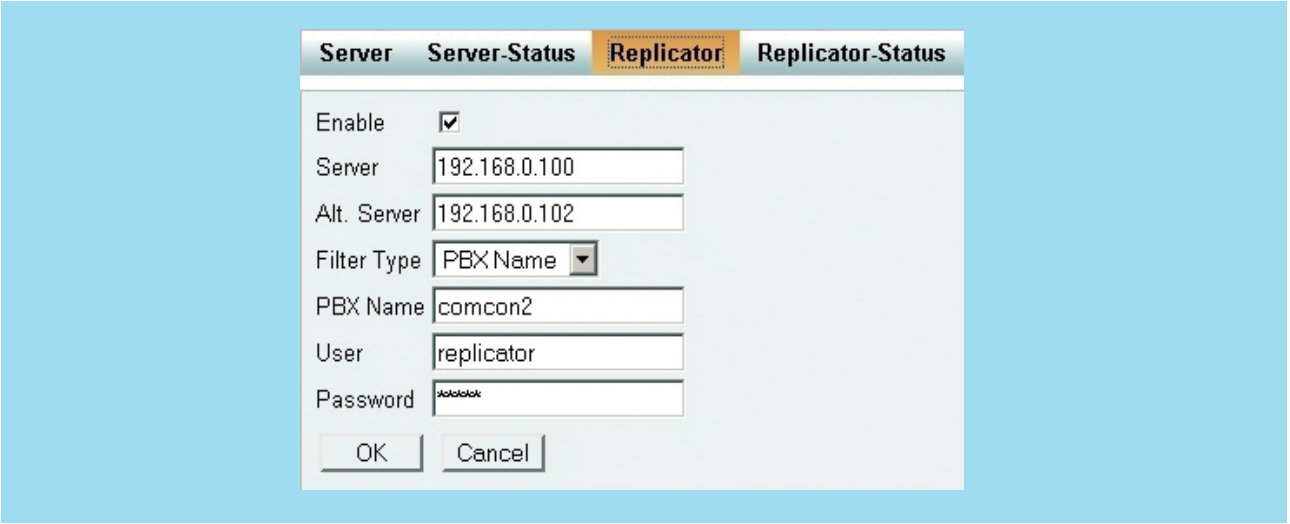

Figure 10: Configuration of a replicator on a slave PBX

Using this remote outside line not only saves costs, as it uses own IP lines as far as possible, but it also provides additional redundancy: Should the local outside line fail or all local lines be busy, then another trunk line can still be used for outgoing calls by selecting a different prefix. However, this always has to be done manually.

Redundancy concept

Reliability is provided on several different levels. On the hardware level, the autarkic hardware, without any moving parts such as hard disks and fans, ensures a robust plat-form for the innovaphone own real time op-erating system. Furthermore, the redundancy concepts described in the following paragraphs are applied.

Active/passive configuration

All innovaphone telephone systems can be configured as standby systems. Such a passive standby system registers itself on the active system and replicates the database using the LDAP protocol. The passive system does not however accept any registrations from other objects. Should the active telephone system no longer be available and the registration fails, a failover is automatically initiated and the standby system takes over all the tasks including registrations (see Figure 11). In the laboratory, the devices configured with default settings recognised the failure on average within one minute and were registered to the standby system at the latest after a further two minutes. Once the master is back in operation, it takes about one minute until the devices have re-registered and are operating again.

This failover cluster does not use a virtual IP address (VIP), so that accordingly, two IP addresses need to be configured in the clients. Not all SIP terminals are capable of this: For example, only one call server could be configured for the Siemens optiPoint 420 advance S. Consequently, this device was not able to register to the standby telephone system in the laboratory. This was also the case for Cisco's 7960 IP phones. This function is supported by innovaphone terminals.

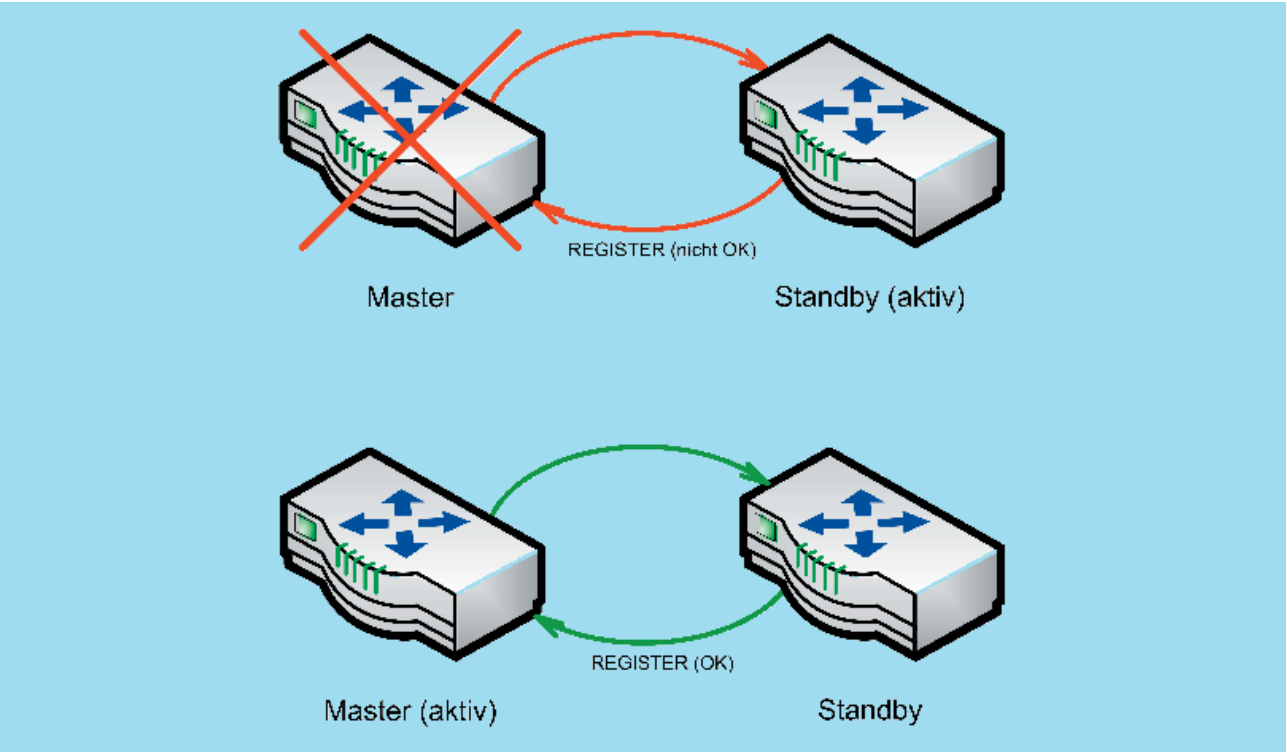

Figure 11: Master/standby configuration

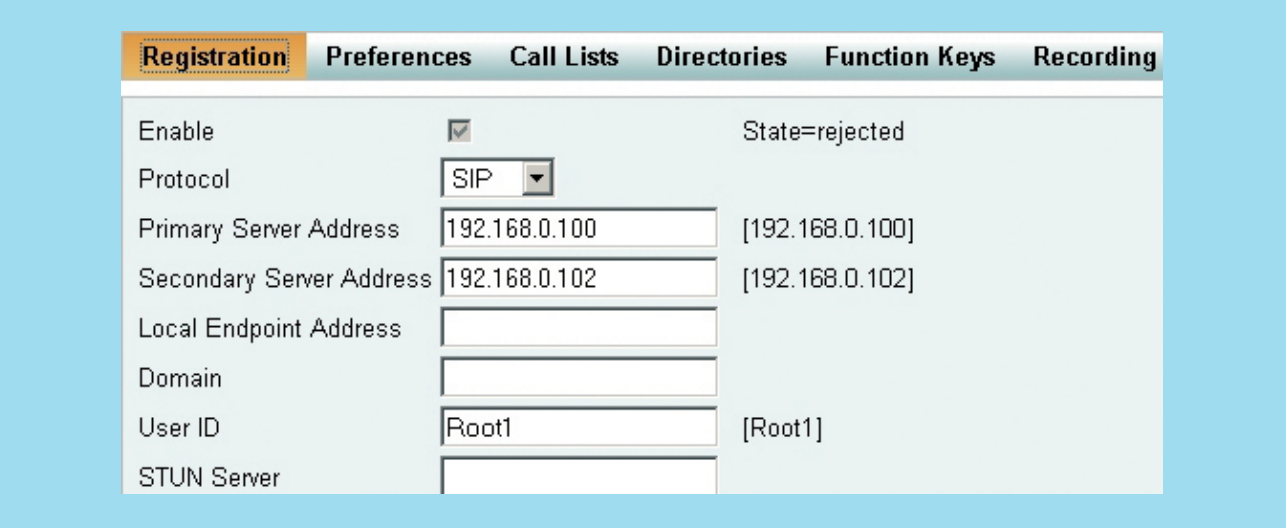

Figure 12: Failed SIP registration when changing-over from standby to normal operation

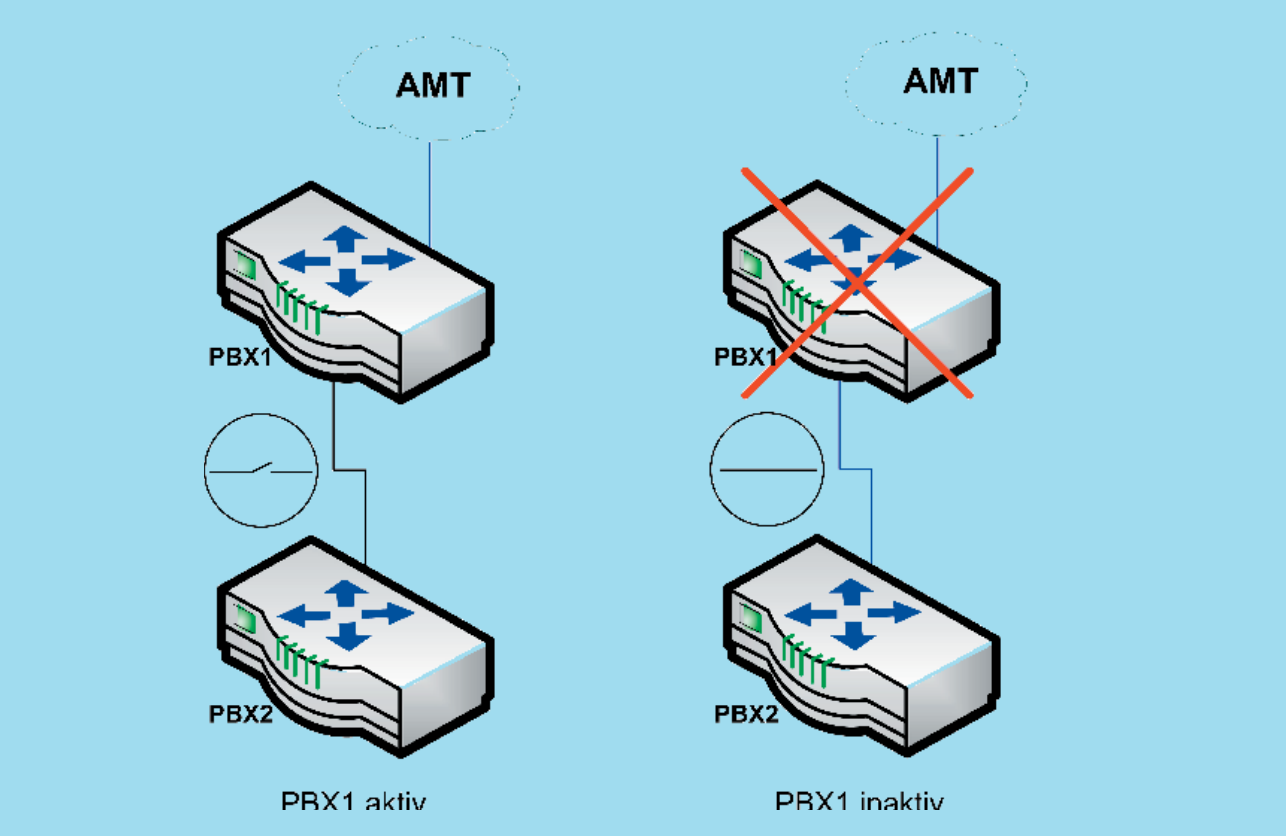

Figure 13: Looping in a trunk line

Relay switch for highly available ISDN trunk connection

The models IP800 and IP6000 are capable of forwarding the ISDN trunk connection (BRI or PRI) to a further PBX, which enables the trunk line to still be available even in case of failure by means of a relay switch. For this purpose, the IP6000 has four PRI and the IP800 four BRI interfaces. Two of these interfaces can be used towards the trunk line and serve thus sixty or four voice channels, respectively. The remaining two interfaces are used to forward onto a system which is preferably identical. An additional failover switch is thus not necessary. This so-called “Power-off loop” system, as shown in figure 13, provides trunk access even if the primary system completely fails.

Redundant power supply using PoE and integrated mains adapter

The power supply is very simple. The telephone systems and terminals can be operated using power over Ethernet (PoE) according to IEEE 802.3af and need a maximum of just 15 watts. Furthermore, all large systems, i.e. IP800 and IP6000 have an integrated 100-240V mains adapter, which can either be used as an alternative to the PoE connection or to create a redundant power supply. The smaller systems can be powered redundantly using external mains adapters.

Scalable distribution

A further option to improve scalability is through outsourcing certain media services. This enables the functions MoH, dial tone and media relay to be distributed amongst various physical systems. In order to further increase these scalability effects, there is also the possibility of inter connecting several PBXs to a logical media service unit.

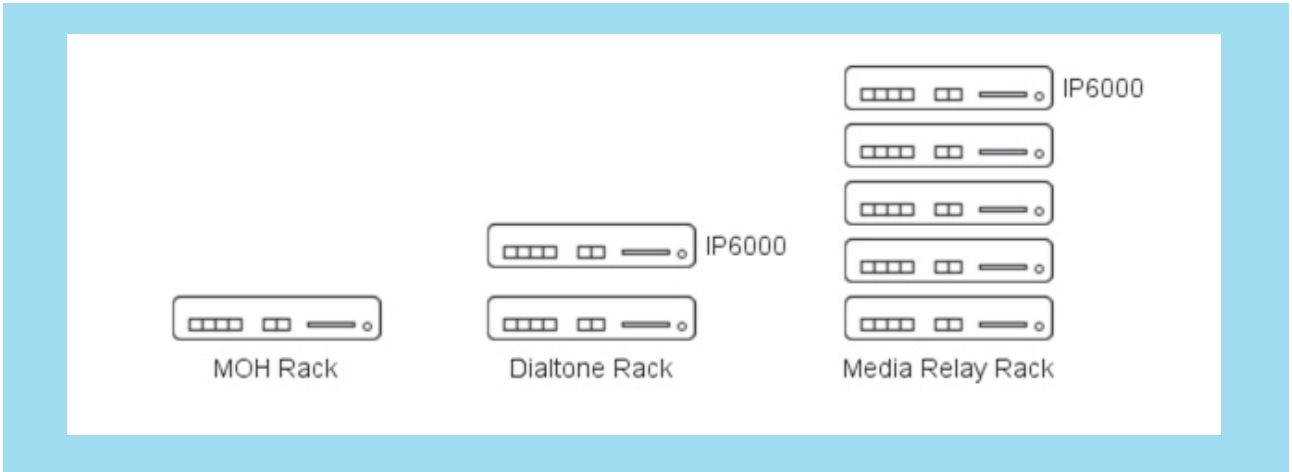

Figure 14: Scalable distribution

Hosted PBX

Multi-client capability

The innovaphone PBX was already able to be used as a Hosted PBX before version 8. However, Version 8 brings a new substantial Hosted PBX feature: the so-called “virtualisation” of PBX systems and an intelligent multi-client capability. Multi-client capability now enables one box to be used to operate various virtual PBXs independently for multiple clients. Virtual PBXs can be added or deleted dynamically whilst the system is running without needing to reboot the hardware. Every single virtual PBX on the hardware base works completely independently and can be managed separately. As the various systems all work autarkic on one box, each client can use his own applications, his own music-on-hold and own announcements.

Licenses are provided using floating licenses from the master PBX. Each virtual TC instance has an LDAP replicator for managing users. The trunk line is provided over the master as a PRI/BRI gateway. There is also the possibility of integrating a SIP provider at this point.

On the customer side, connection takes place either over customer own IP networks, VPN tunnel or over an internet access.

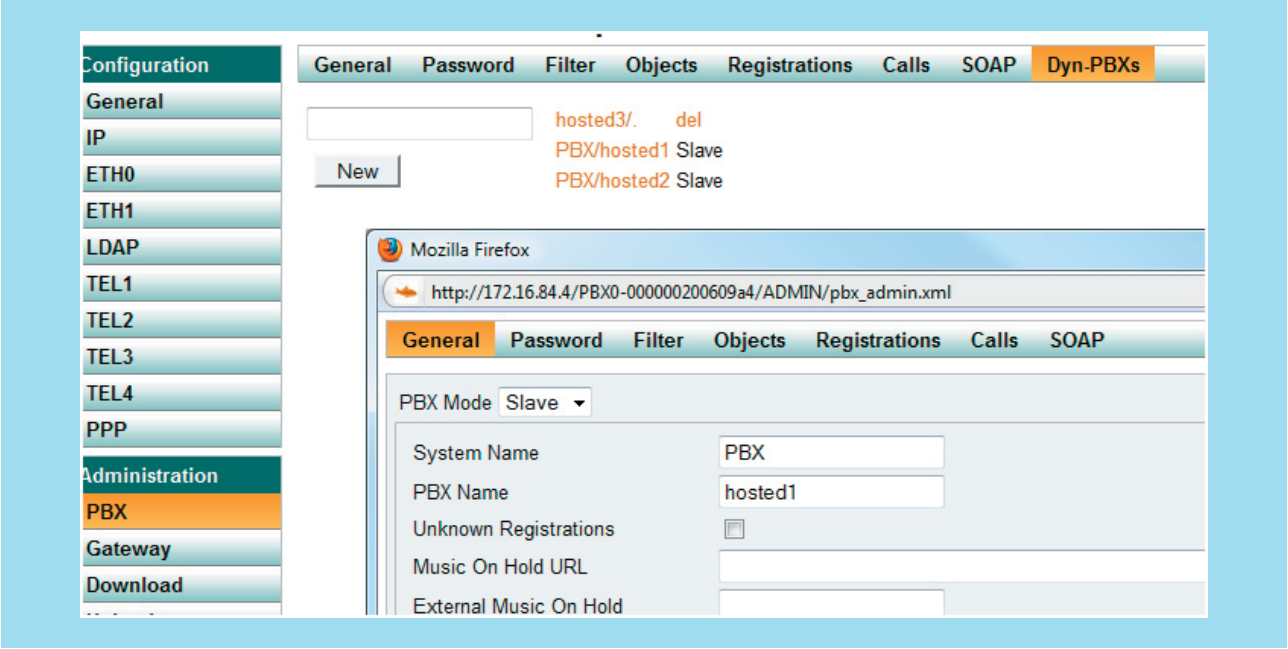

Figure 15: Configuration of virtual PBXs

Mobility

With version 8, the innovaphone PBX has a mobility solution which enables mobile telephones to be integrated into the telephone system. These telephones can be integrated into the PBX as subscribers and can use PBX features. The CTI software also recognises the mobile phone as an internal subscriber.

Mobile integration enables incoming and out-going calls by the mobile phone to the PBX. If the subscriber is called on his company extension number, both his desk telephone and his mobile telephone will ring. Out-going external calls will show the company extension number to the party being called (one number solution).

DTMF features on the PBX can also be used on the mobile phone e.g. call forward, call hold, ending active and picking up held calls, holding active calls and picking up further calls or toggling calls.

A further effect of mobile integration is extended cost control as calls from the mobile phone are always connected through the fixed line network.

An own GSM client is available in order to make the mobile phone into a fully-fledged innovaphone extension.

The GSM client only works together with the innovaphone PBX.

Figure 16: Mobility Integration – In-coming call

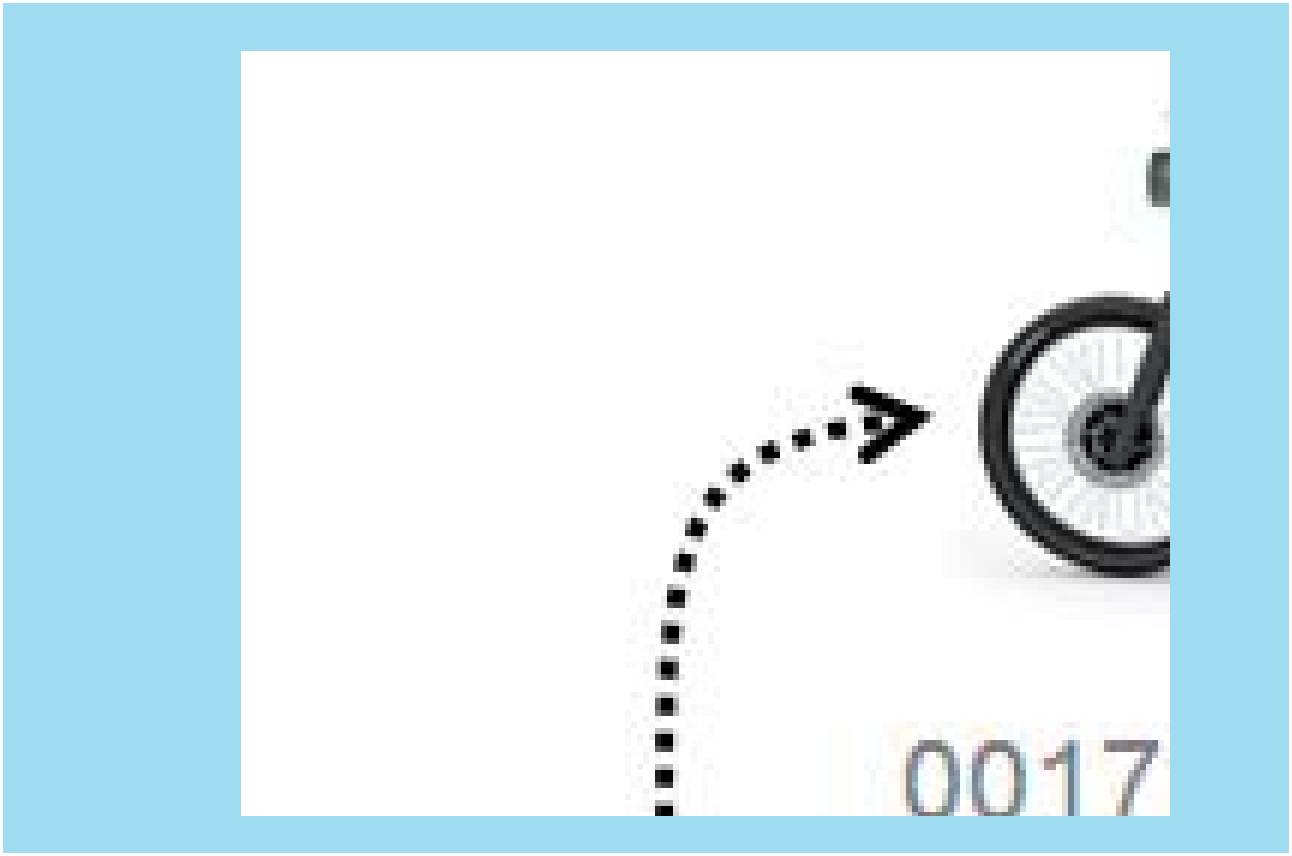

Figure 17: Mobility Integration – Outgoing call

It is initially available for Windows Mobile and Symbian 60, and will also be available later for iPhone and Blackberry.

The client only works if a mobility and a GSM license are registered to the PBX. For the PBX, a mobility object first needs to be generated and the mobile phone has to be stored with its telephone number. For in-coming calls, forking is then generated to the desktop terminal and to the employee's mobile phone.

For outgoing calls, the client signals the number to be dialled to the PBX. The PBX then sets up a call to the selected destination number. In doing so, the party being called only sees the employee's extension number and the mobile phone number remains hidden.

OCS integration through ‘Dual Forking’

The PBX now also supports ‘Dual Forking’. Multiple numbers can be stored for one and the same user in addition to his extension number – no matter whether the numbers are internal or external to the PBX.

Dual Forking is needed to ensure reasonable integration in the Microsoft OCS, as this is the only way a call is signalled to the OCS client as well as to the telephone.

In addition to the OCS number, other numbers can of course also be integrated. For example, mobile phone numbers or external numbers such as analogue telephone numbers in a home office.

If the extension number is called, then all other devices or clients whose numbers have been stored, ring at the same time.

Full integration of the OC soft client into the innovaphone PBX is thus guaranteed due to ‘Dual Forking’.

This means that the functions dual forking, CSTA over the gateway and TSIP are supported when using OCS with the innovaphone PBX. Therefore:

- PBS status information is displayed in the OCS client
- OCS as CTI user interface for innovaphone IP phones
- Connection of UM functions from the Microsoft Exchange

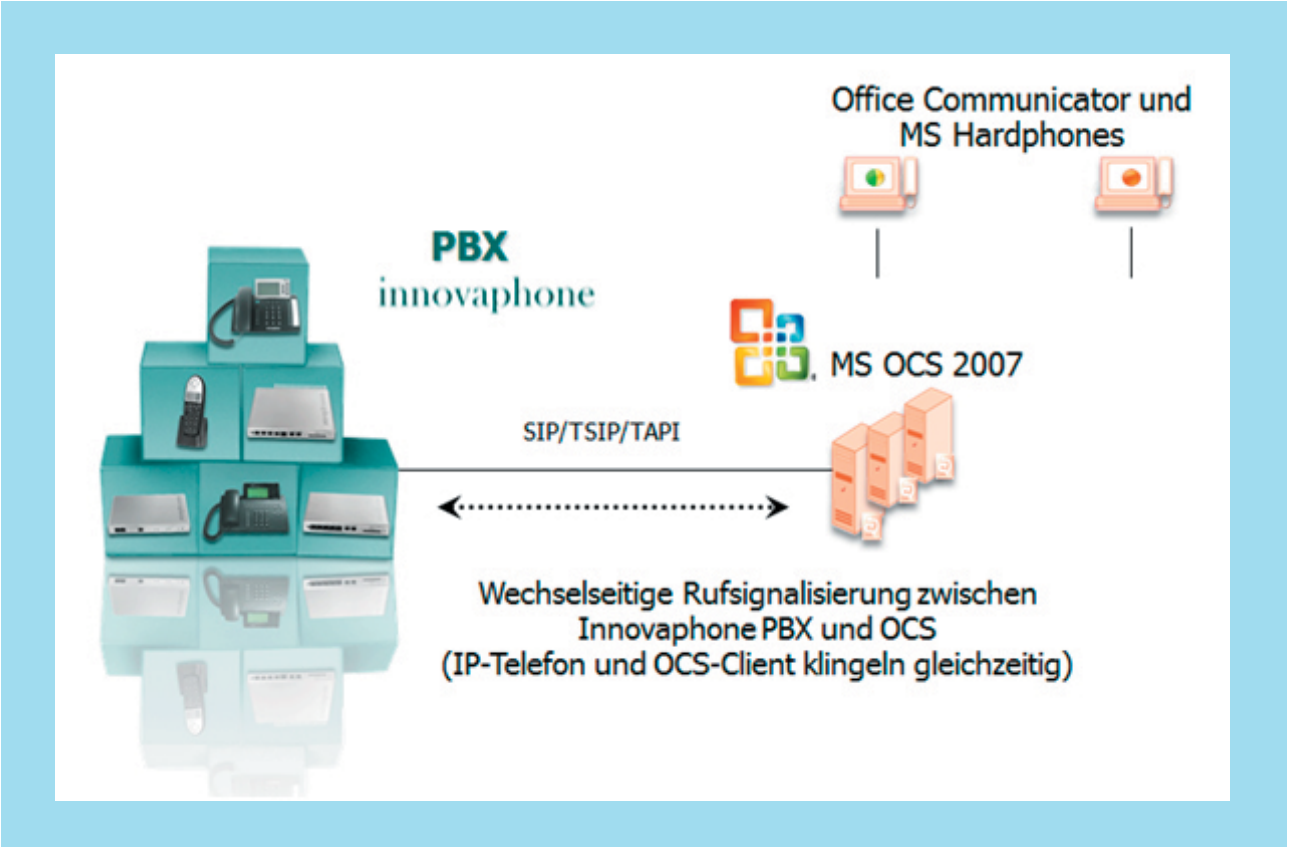

Figure 18: Microsoft OCS Integration

Practical installation in the ComConsult Laboratory

Concept

A lab environment was set up in the ComConsult laboratory in order to test the new functions, as mentioned above. Two characteristics were picked out as examples for the lab project: on the one hand, the new presence functionality and on the other hand, integration of the Microsoft Exchange 2007 as a UM service.

Lab set-up

The telephone system IP302 served as the basis for the setup. The firmware used was the version “8.00 hotfix1”. The IP55 and IP240 models were used as terminals. A few SNOM 360 terminals were added for interoperability testing. All models were powered using a PoE capable switch. The IP302 also had the role of a DHCP server and ISDN gateway for the break-out into the public telephone network. The DECT telephone IP55 was registered to the relevant DECT station IP1200. A Microsoft server 2008 was used as the domain controller in order to show the connection to the Microsoft Unified Messaging solution, as well as Exchange 2007 on a Microsoft Hyper-V platform.

Commissioning and administration

After the device was commissioned, all the steps were carried out using the web based management interface. There were no restrictions in selecting a browser; in addition to the obligatory Internet Explorer support, Mozilla Firefox is also supported (tested with Version 3.6). The system is compatible and easy to service due to the fact that no Java-Applets and other browser plug-ins have been used.

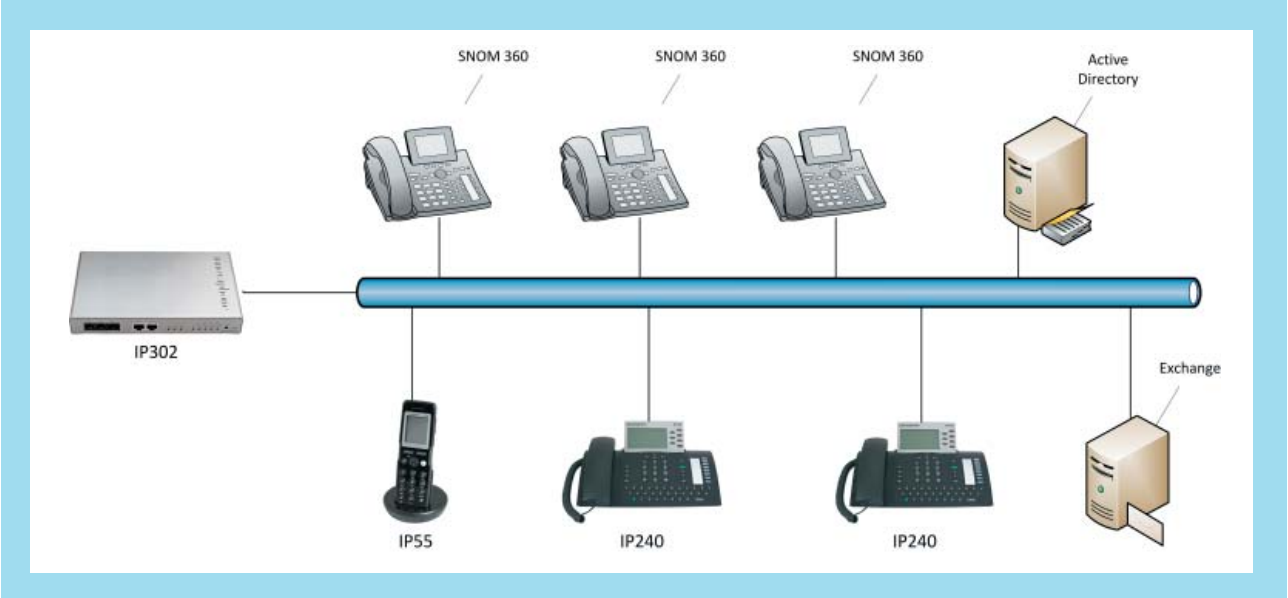

Figure 19: Lab set-up

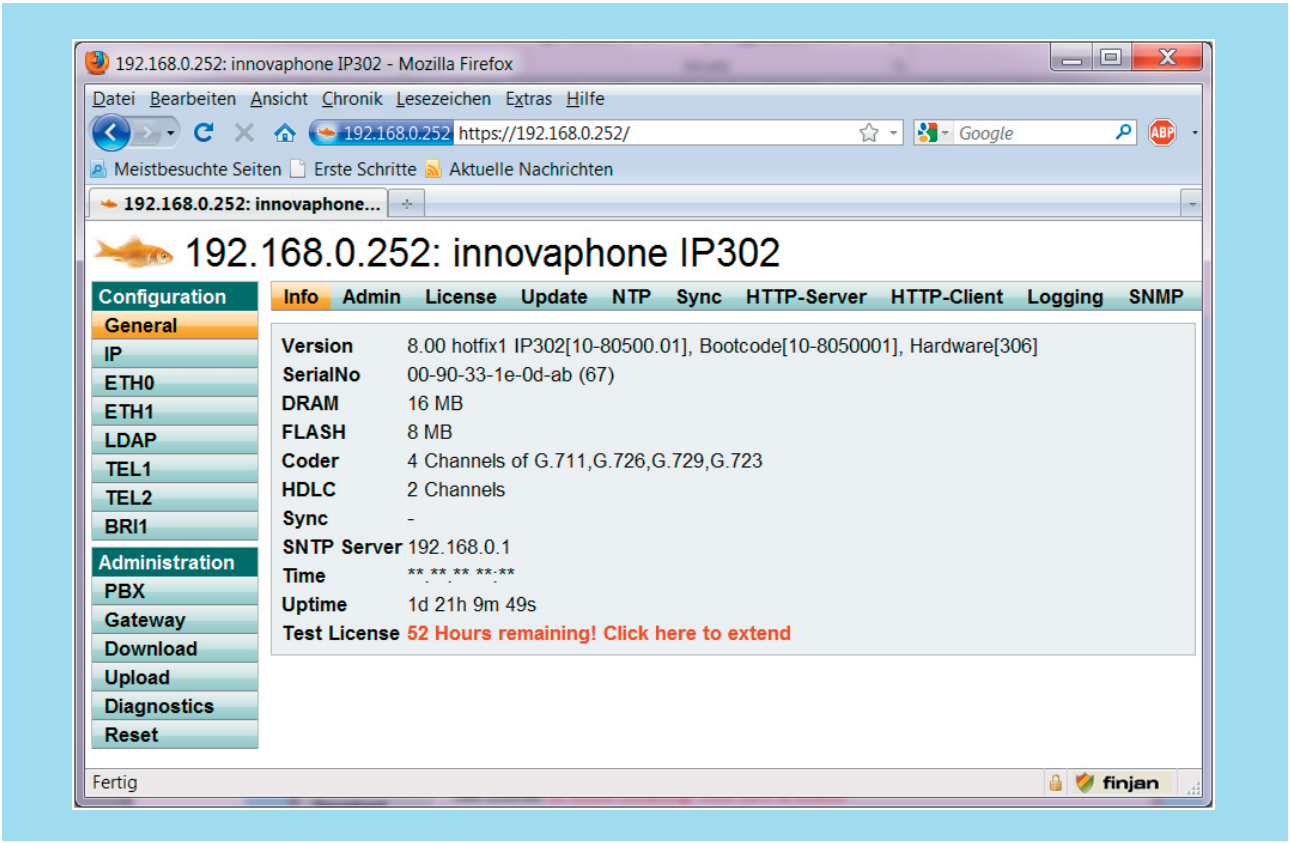

Figure 20: Web based administration: overview of IP302

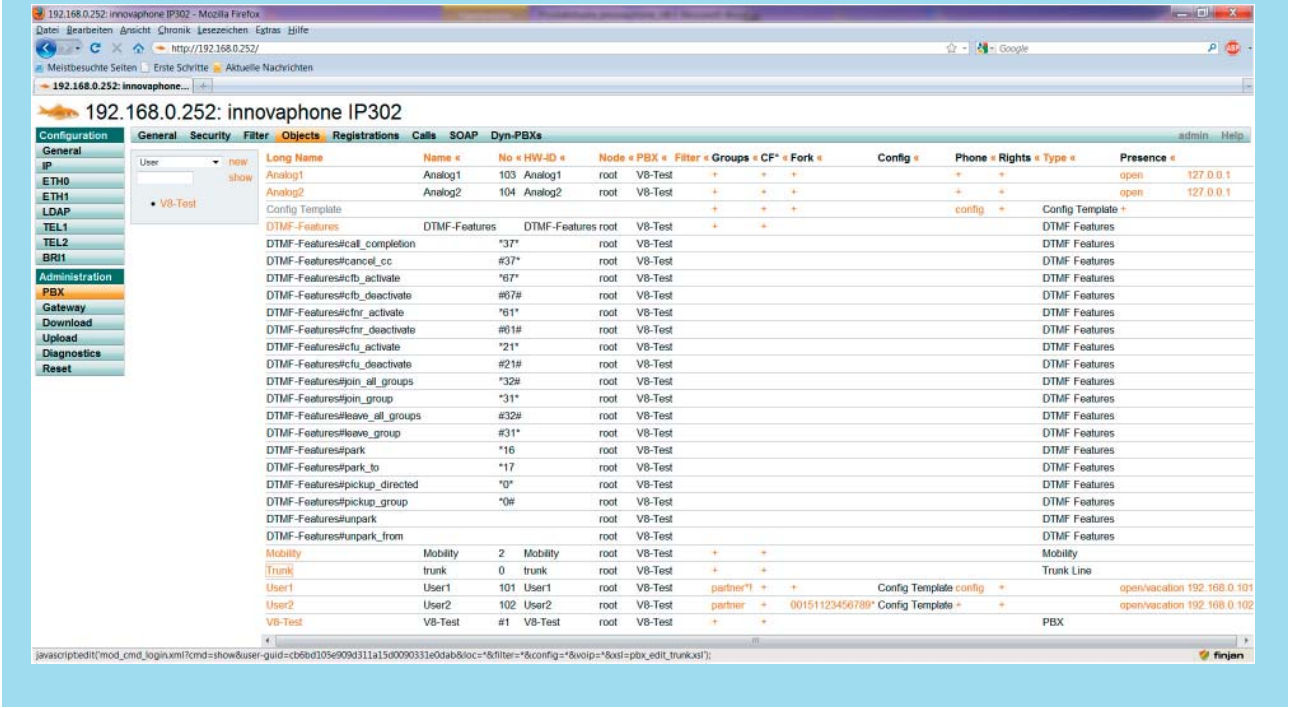

Figure 21: Configured objects for the laboratory set-up

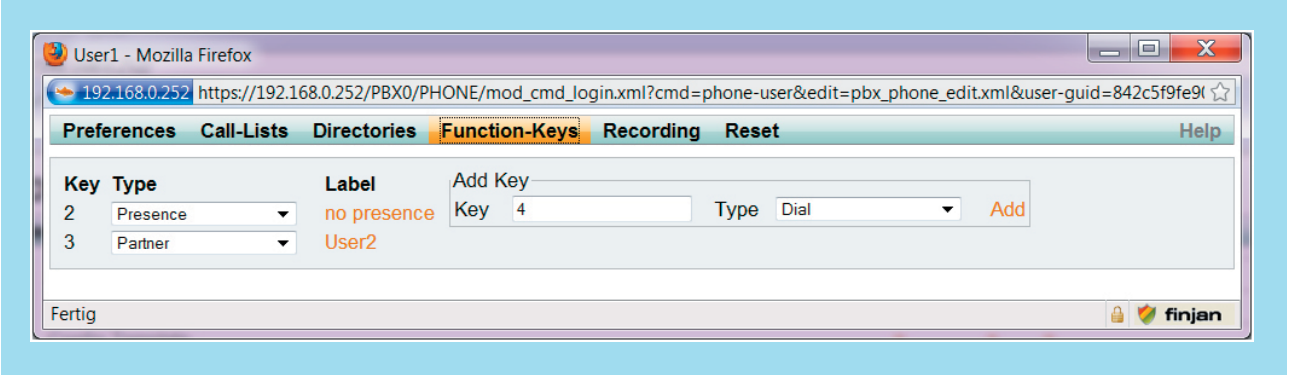

Figure 22: Setting up function keys

Another positive fact is that the web interface is clearly structured and thus gives a good overview. Figure 20 shows a screenshot of the overview page on the web interface. This is also the case for the telephone system, for the DECT base station and for the terminals. There is no need to familiarise oneself with other administration user interfaces.

All user data is listed centrally under objects. Other users, gateways, DECT systems, trunk connections and features are also defined over corresponding objects. Figure 21 shows the table of objects, resulting from the lab setup.

The administrator has extensive documentation to help setup (English), as well as a wiki which is also linked over the internal help function. The address is *http://wiki.innovaphone.com*.

Implementation

In accordance with the task, initially two IP240 terminals were configured for the presence service. On the telephone, keys were defined to set the status and to show subscriber status.

No changes were made to the existing 6 basic settings for the presence settings (busy, vacation, lunch, away, meeting, none)

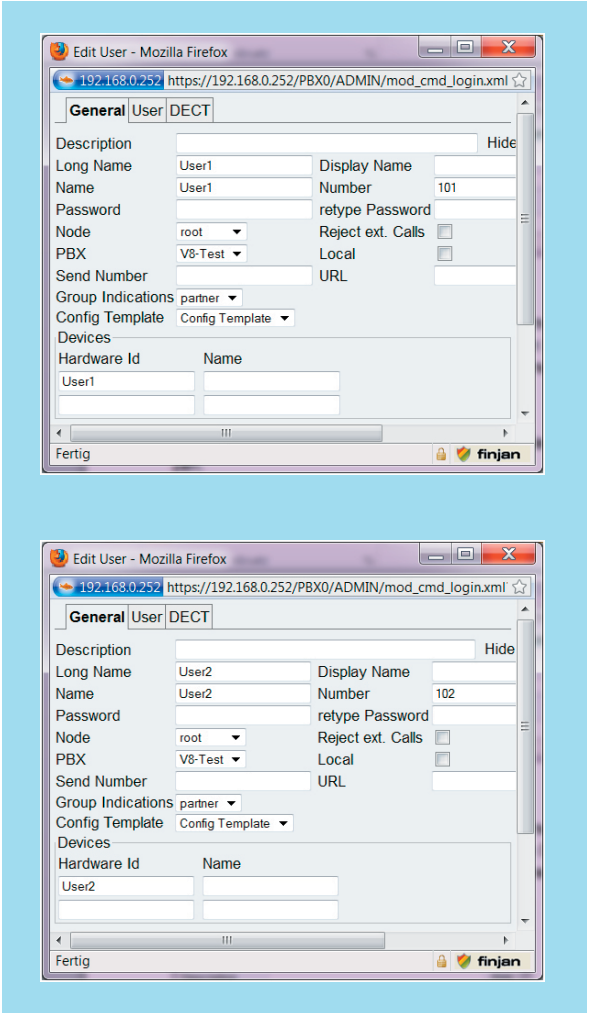

Figure 23: Group member configuration

Presence configurations were also made on the PBX for the subscribers concerned. This means, that a group was set-up for the users concerned, who are entitled to exchange status information. Within a group there are two situations dependent on whether you want to receive just passive status information or actively publicise own presence information.

After this, the telephones had to be re-booted in order to implement the configuration changes. The telephone settings (function key, status key) could all be managed centrally from the PBX's web interface.

The second task included setting-up Microsoft Exchange 2007 as a unified messaging and fax server solution. This option was taken into consideration as Exchange is already established in many companies as an email service. In order to implement this, it was necessary to make some configuration changes to the innovaphone devices. Initially a local gateway object was generated which could answer calls if the subscriber was busy or not answering.

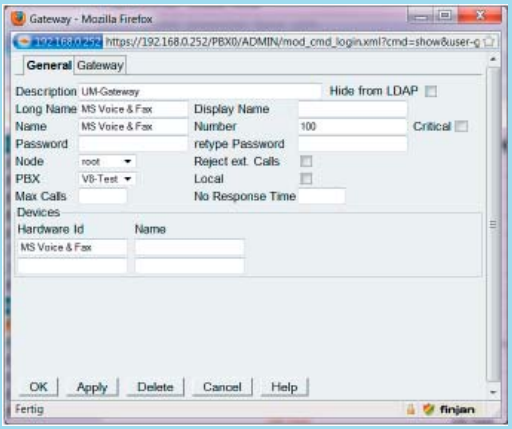

Figure 24: Local gateway voicemail set-up

In addition to this local destination, a real destination also has to be set up. To do this it was necessary to leave the PBX object environment to reach the gateway area.

It was important to set TSIP as the connection protocol to signal to the exchange and to support fax using T.38.

Figure 25: Call Routing

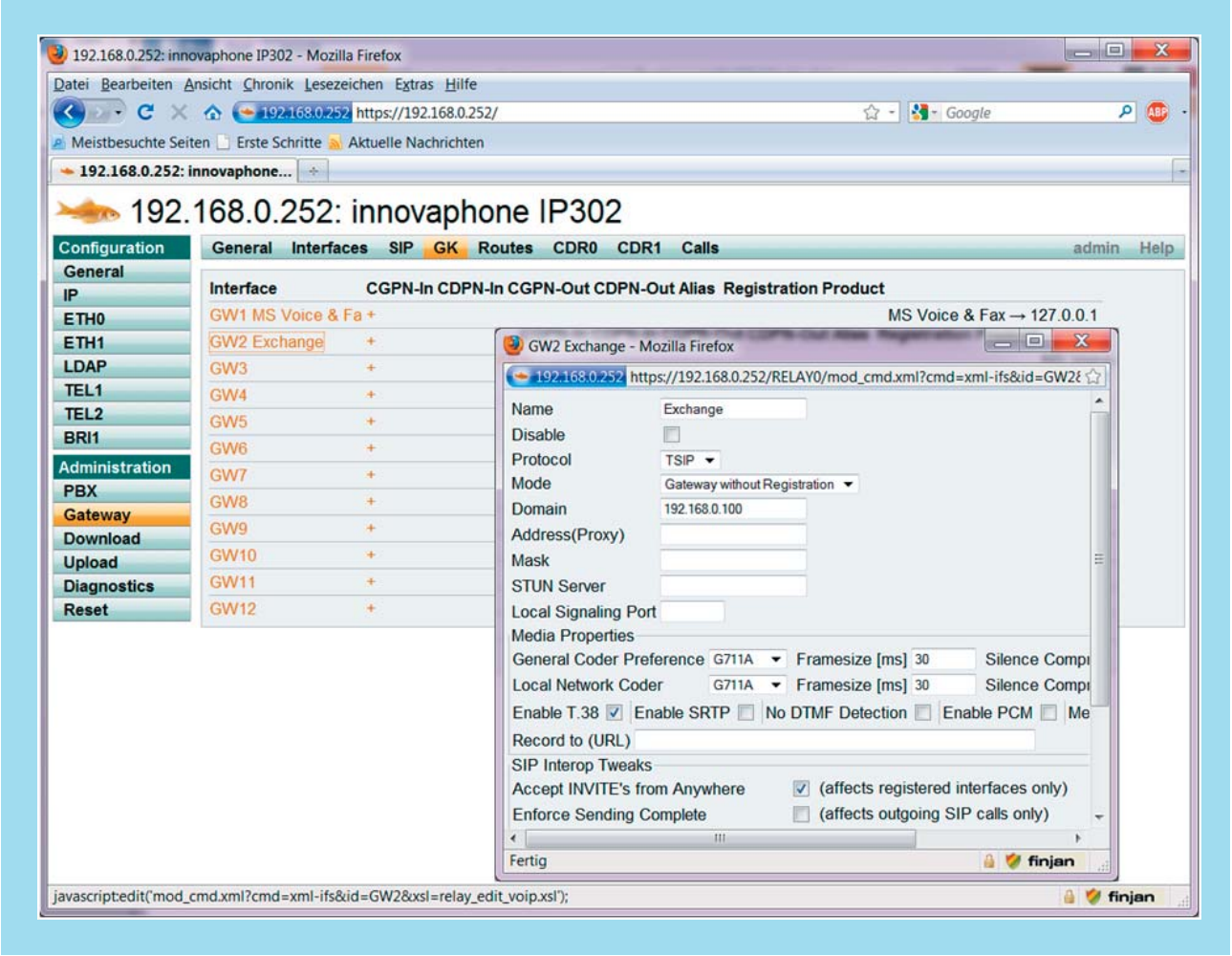

Figure 26: Setting up an exchange as gateway destination

Providing relevant call routers between the PBX and UM system was the last step to a successful setup.

Interworking between the Exchange and the innovaphone PBX is realised over SIP/QSIG.

Conclusion

The innovaphone solution leaves a positive overall impression. The products are technically satisfying. The positive overall result includes both the hardware and the software. This impression is rounded off by the high quality of documentation, which is also provided in an up-to-date wiki.

The weak points in the innovaphone solution are the heterogeneous product lines concerning the terminals. The following points should be noted:

- No colour or high definition displays. Function keys cannot be labelled over the LCD display.

However, according to information by innovaphone, a new terminal product line will be presented in 2011 which should remedy these weaknesses.

The possibility of operating both SIP and H.323 terminals in parallel is considered to be very good.

The positive aspects can be outlined as follows:

+ Consistent use of open standards: SIP, H.323, LDAP, etc.,
+ Convincing hardware architecture for the telephone system: It is robust and contains no rotating parts such as fans or hard disks.
+ PoE supply on all devices with the option of redundant power supply using additional mains adapters.
+ All telephone systems are also gateways to PSTN via ISDN.
+ Unified and well structured web interface
+ All important SIP security features such as SIP/TLS and SRTP are supported
+ High scalability thanks to flexible location concept
+ ENUM support
+ Central administration
+ Presence service
+ Mobility solution for mobile telephone connection
+ Simple integration of MS Exchange as UM service

Another key benefit of the innovaphone system is the integration of simple variations of voicemail and interactive voice response (IVR) in the factory settings. However, these were not tested in detail within the scope of this study. Moreover, innovaphone solutions can also be extended functionally using a wide range of partner products.

Overall, innovaphone has a very interesting solution for medium sized companies and companies with a widely distributed branch network.

Table of figures

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