



## **LocaPhone VoIP PBX System**

**Version 1.0**



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## Business Challenge

Your company wants to replace the existing PBX system (telephone system). The new system should have at minimum the same functionality as the existing PBX, should reduce costs, should offer improved communications possibilities to your employees, should be self maintainable by your administration, and thus exceed the former PBX system.

This proposal describes the PBX solution LocaPhone, provided by LocaNet oHG.

LocaPhone is a modern PBX system as a "soft switch" based on Voice-over-IP technology using the freely<sup>1</sup> available OpenSource software Asterisk.

LocaPhone/Asterisk runs on Linux as an operating system.

<sup>1</sup> free means that the software itself is provided without costs, and that the user is free to use and modify it



## Solution Description

### **LocaPhone, based on Asterisk - a quick introduction to Asterisk**

Asterisk is a fully Open Source, hybrid TDM and packet voice PBX platform. Asterisk is provided free of costs as Open Source software, published under GNU General Public License (GPL).

Asterisk is a “soft switch”, a protocol gateway, a media server, and a VoIP gateway.

Asterisk can use both traditional TDM technology and packet voice (Voice over IP, VoIP) protocols. Calls switched on TDM interfaces provide lag-less echo free TDM call quality, while retaining interoperability with VoIP packetized protocols. Asterisk acts as a full featured PBX, supporting virtually all conventional call features on station interfaces, such as CallerID, Call Waiting, Call Forward/Busy, Call Forward/No Answer, Call Forward Variable, different dial tones, Three-way Calling, Supervised Transfer, Unsupervised Transfer, Voicemail, Meet-me or 3<sup>rd</sup> party Conferencing, Least Cost Routing, VoIP gateway, Call Detail Records, Call Center functionality, Interactive Voice Response functionality, integrated Fax server, and more.

### **LocaPhone – the PBX system**

LocaPhone is a software solution using Asterisk and other OpenSource software tools to provide a full featured VoIP PBX system, integrates telephony devices (IP telephones, conference phones, line interfaces) from selected manufacturers, and offers a Web browser-based User- and Admin configuration interface (both in German and English) for telephony functions and easy maintainance.

LocaPhone as an OpenSource software is free from any user- or device-based licensing scheme, and not limited in the amount of telephones, line connections, conference users, functions etc. All PBX features are provided without additional software costs. Additional features, such as some TAPI/CTI functions or e.g. detailed Call Center statistics, may require commercial third party software, depending on the setting used.

LocaPhone uses an existing IP network (LAN, WAN, VPN) to connect phones, servers and traditional telephony connections/lines (via media gateways), and seamlessly integrates with other telephony systems, and with network or server based applications (e.g. CTI with Exchange/Outlook, contact center CRM, web based services etc.).

LocaPhone is both fully modular and scalable. Multiple server nodes can form one unified PBX system in one or more locations (sites), connected by the IP network. Additional line connectivity can be added by using IP trunks to carriers and/or by using additional media gateways. Its flexible software architecture offers a “telephony framework” which can be customized for additional, individual functionality.

Core functions can be provided by deployed clustered server settings or by a simple “one-in-all” server setting.

LocaPhone has built-in fail-save mechanisms for redundancy concepts and improved availability (load balancing).



## **LocaPhone - supported Hardware**

LocaPhone supports a variety of IP phones and hardware interfaces for bringing in telephony channels: analog FXS/FXO ports, ISDN BRI and PRI (E1/T1) ports, GSM connections and others.

These ports are connected with external media gateway boxes to the LocaPhone server by using an existing Ethernet TCP/IP network.

LocaPhone primarily supports IP telephony devices from:

- snom Technology AG 3xx phones
- Polycom SoundPoint, SoundStation, DECT KWS 300/600/6000 devices
- Siemens Enterprise Communications OpenStage 15-80 phones
- Aastra DeTeWe 5xi/67xxi phones, DECT-over-SIP devices

Other IP phones (Grandstream, Thomson, Cisco etc.) can be used with limited functionality.

Telephony TDM channels are connected via SmartNode media gateways from Patton Inalp.

## **LocaPhone - supported Protocols and Codecs**

LocaPhone supports different protocols:

- SIP (ETSI)
- H.323 ITU
- IAX (Inter-Asterisk Exchange)
- EURO ISDN S0 (BRI)
- EURO ISDN S2M (PRI)
- FXS (analog telephone port for phone)
- FXO (analog telephone port for line)
- Q.SIG
- DTMF
- others

LocaPhone supports different codecs:

- G.711 A/ $\mu$ -Law
- G.722
- G.723.1
- G.726
- G.729 (requires additional license in some settings)
- GSM
- iLBC
- Linear
- Speex
- T.38 (Fax transmission over IP networks)
- clear-mode (B-channel tunnelling over IP)

LocaPhone provides seamless and transparent translation between all of the above protocols and codecs.



## Solution Benefits

LocaPhone as a software based VoIP system delivers a number of unparalleled advantages.

**Substantial cost reduction** - Combined with IP telephones and media gateway telephony hardware offered by different manufacturers, LocaPhone provides a PBX at a fraction of the price of traditional PBX and key systems, while providing a level of functionality exceeding that of many of the most expensive systems available.

No licensing scheme, no limitations on functions or users, and no proprietary hardware (provided by just one single vendor) is used. Because of its "open" nature LocaPhone eliminates further vendor lock-in and offers a choice to the customer to use the desired or necessary telephony hardware for its setting. It also complements existing PBX systems by avoiding costly replacement of existing PBX investment.

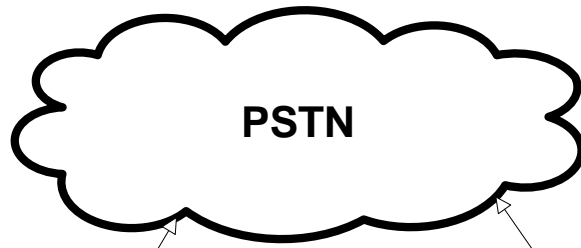
**Control** - LocaPhone allows the user to take control of their phone system, by using different ways of operating their telephony (on a phone, in a web browser, on a mobile phone or smartphone etc).

**Rapid deployment and development** – LocaPhone/Asterisk allows PBX's features such as VoiceMail, Fax server, Interactive Voice Response (IVR) and other applications to be rapidly created, configured and deployed, by using its powerful Web browser interface, or its command line interface (CLI) with scripts for easy configuration and maintainance.

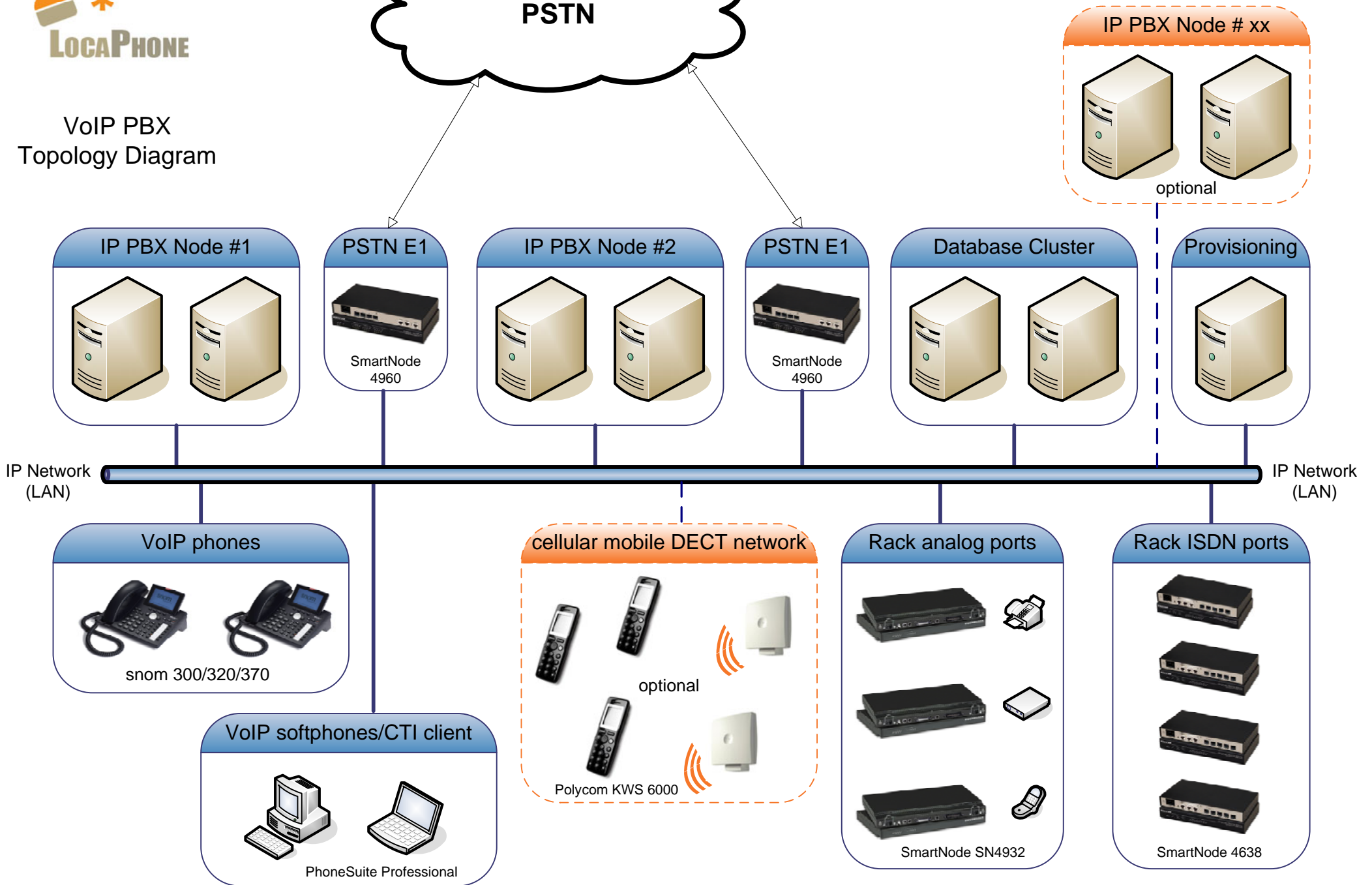
**Customization** - Through its support for internationalization, configuration options, and open source code, every aspect of LocaPhone can be configured or modified. For example, codes for call features can be modified in order to accommodate proprietary protocols, feature menus displayed on IP telephones can be customized to serve individual needs, and individual call flows including voice mail and IVR functions can be set up.

**Dynamic content deployment** - As web servers like Apache allow a developer to deploy dynamic content on the web, such as customer account information, LocaPhone permits such dynamic content deployment over the telephone.

**Flexible dial plan** - LocaPhone's unusually flexible dial plan allows seamless integration of all PBX functionality. Once a call is in a, anything can be done to it. In the same way that an Web server like Apache gives the user fine-grained control over virtually every aspect of its operation (and configuration), the same applies to LocaPhone.



VoIP PBX  
Topology Diagram





## PBX Specifications

### **PBX processors**

The LocaPhone Telephony System (PBX) is provided as a redundant multi-node cluster system on different servers (see topology diagram):

- core servers for users (ca. 200 IP phone users/server)
- data-base server cluster (MySQL database cluster)
- provisioning server (telephone device provisioning)
- web server (Web browser interface for users and administration)

Servers can be installed in one or on different locations/sites.

### **TDM connections (ISDN PRI/E1, ISDN BRI/S0, analog ports)**

The LocaPhone Telephony System (PBX) uses external Media Gateways for TDM connections, e.g.:

- 4-Port ISDN PRI/E1/Q.SIG Media Gateways (SmartNode 4960/4E/120V)
- 4-Port ISDN BRI/S0 Media Gateways (SmartNode 4638)
- 32-Port Analog Media Gateways (SmartNode SN4932/JS)
- other devices from Patton Inalp.

Both server and media gateways are offered as rack-mount devices for cabinet installation. Each device has a 19"/1U form factor. Breakout patch panels for analog ports are provided.

The optional cellular mobile DECT network Polycom KWS 6000 consists of:

- DECT Master Station (up to 4.096 users /256 radio units)
- N x DECT IP Base radio unit (12 channels each)
- N x DECT Handsets (Polycom 40xx/50xx)

Radio coverage can be installed for one or multiple sites, as one single network.

### **Packet connections (SIP)**

The LocaPhone Telephony System (PBX) can be configured to connect to:

- unlimited number of IP phone endpoints (may require additional core servers)
- unlimited number of SIP trunks (carrier PSTN termination, VPN trunks)
- unlimited number of Media Gateways

All devices above are interconnected by a switched Ethernet TCP/IP LAN (L2/L3, QoS optional) provided by the customer. Different installation sites for servers or telephony hardware shall be connected via fully managed MPLS VPN.



## **IP Telephony devices**

The LocaPhone Telephony System (PBX) will be using the following telephony devices:

- IP phones snom 300, snom 320 and snom 370, with optional keypad extension
- PhoneSuite Professional (softphone, CTI-Client, Windows only)
- DECT Handset Polycom 40xx/50xx

Depending on the special functionality required LocaPhone may be used with alternative telephony devices:

- Polycom SoundPoint range of IP phones
- Siemens OpenStage range of IP phones
- Aastra DeTeWe range of IP Phones

## **IP Telephony devices - Headsets**

Both snom phones and softphones may use the same Plantronics headset, using different cables to connect to either phone or PC.

## **ISDN and analog devices**

The LocaPhone Telephony System (PBX) will provide the following telephony ports, for existing devices to be connected to:

- ISDN BRI/S0-Ports DSS1 protocol (2 B-Channels), for existing services (e.g. RAS, Modems, data transmissions)

The number of ISDN BRI/S0 ports offered is designed for non-blocking ISDN connections. However, the SmartNode 4638 offers 5 ISDN ports each, of which just 4 can be connected to IP. The fifth port can also be used in a "first come, first served" setting, so that if not all devices connected to the ISDN media gateway are used together the number of ISDN media gateways could be reduced.

- analog Ports (FXS, a/b-line), for existing devices (e.g. Fax machines, Conference phones, single DECT Base stations, modems for alarms etc.)

The number of analog ports offered is designed for non-blocking connections, and provide usual analog FXS line connectivity (line voltage, ring current/frequency), and can be individually configured for special services (Fax via T.38 over IP, Intercom, special tone schemes, ring tone sequences, MWI signalling etc.).

## **DECT devices – Base stations and Handsets**

The LocaPhone Telephony System (PBX) will provide as an option a cellular DECT-network infrastructure for site-wide radio coverage. Handsets can roam freely across the installation site with seamless handover. Additional handsets can easily be added to the DECT-network, both from Polycom (special handsets for the network) or other handsets using the DECT GAP-protocol.



## Telephony features

The LocaPhone Telephony System (PBX) provides the basic set of features (as stated in the current specifications sheet), and will provide the following additional features:

- VoiceMail mailboxes for all users
  - o unlimited number of mailboxes
  - o Message Waiting indication by message lamp and text display
  - o individual prompts and recordings per user
  - o unlimited recording time
  - o forwarding voicemails via email
  - o mailbox management on phone and in Web interface
  - o playback of recorded messages on phone, in Web interface, on smartphone
  
- Fax server, for incoming and outgoing fax transmissions
  - o unlimited number of fax boxes and extensions
  - o email to fax, fax to email
  - o fax client software for Windows, MacOS, Linux
  - o individual fax routing
  - o fax queue management by Web interface or fax client
  
- Conference
  - o 3rd party conference via button on phone
  - o unlimited number of conference rooms and conferences
  - o conferences with up to 30 users each
  - o conferences can be created "on the fly"
  - o planned, moderated conferences with email invitations via Web interface (optional)
  
- Roaming user
  - o Users can log off from their phones, and log in on a different phone
  - o all individual phone settings (caller lists, telephone books, ringer settings, volumes, BLF busy lamp field configuration) are provided at the phone on which user logs in
  - o different call diversions configurable if user has logged in/off
  
- Softphones
  - o PBX extensions can be either used with an IP hardware phone, or with a PC client software (softphone)
  - o PhoneSuite softphone for Windows has BLF, CTI features, and offers Exchange/Outlook integration
  - o Softphones provide CLIP (name+number), call transfer, call diversion, mute, conference etc.
  - o softphones can be used with the same headset as an IP hardware phone
  
- CTI functionality
  - o CTI/TAPI functionality is provided by LocaPhone in different ways:
    - Click to dial, by using the Web interface
    - Click to dial, by using the Phonesuite software on Windows
  - o Exchange integration by using the Phonesuite software
  - o Smartphone-Integration for Apple iPhone
  - o API is provided for individual integration of CTI services



## Further Information

LocaPhone Leistungsbeschreibung V.1.7 (German)

LocaPhone Systemverwaltung V.1.7 (German)

<http://www.loca.net/locaphone> (German)

<http://www.asterisk.org>

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