



## **IP-telephony and Voice over IP**

At least since the ENUM standard is supported by DENIC the now full grown Technology of Internet telephony has all possibilities to conquer the market of Telecommunication. All large providers of telephone services but also of network hardware are already offering their share of products and services in this area of the market.

In order to find an individual and cost efficient solution for an enterprise it is advisory to evaluate the different ways and steps of implementation together with an external service provider. It will not be very long until all telephone systems are fitted to use this technology. It is just important to wait for the right moment in order to avoid needlessly high costs, because currently the hardware of VoIP devices is no cheaper than the traditional telephone arrays.

### **Definitions:**

- The term „Voice over IP“ merely describes the technological basis
- The term „IP telephony“ is used, when the the telephones themselves are already using Voice over IP Technology

## **The advantages of Voice over IP**

- Potentials of reducing costs
- New services that represent considerable value addition in comparison with the traditional telephony

Today nearly every company is operating both a data network and a telephone network independently from each other. By uniting both services the installation of a separate telephone network becomes superfluous. Several different locations only need to be connected with one data conduit that also can be used for telecommunication. Here costs can be particularly reduced since calls into the local network of the far away location can be made at the same costs as from a local call there.

## **New services with VoIP**

Unified messaging: Voice mails, faxes and E.Mails end up in the same Inbox. With the feature "Click-to-Dial" it is possible to make calls out of a web surface or directly from the Outlook contacts, the same way a click on an E-Mail account within a browser opens a new E-Mail. This so called speech/data communication enables a caller to establish a connection directly with the service personnel i.e. of a web shop.

## **Bridging the gap into the fixed telephone network.**

Nowadays the existing fixed telephone networks of various providers are operated alongside data networks that are capable of Voice-over IP. They are connected by Gateways like bridges. These interfaces enable the participants to reach local connections via the internet and vice-versa.

Basically there are several kinds of telephony that partly require Gateways:

- IP-to-fixed network and fixed network-to-IP. In these scenarios there is always a gateway involved that acts as a relay between the IP net and the local net.

- Fixed network to fixed network: Here there is an IP network between two fixed networks, so that local network telephones are used at both ends. Every boundary between the local net and the IP net requires one gateway.
- IP-to-IP: These calls do not require a gateway because a transfer between VoIP and fixed network technology is not needed.

### **VoIP in the business area**

The number of implementations of VoIP solutions in businesses is constantly increasing. A further field of application is the connection of different locations with Voice over IP. One location with a regular telephone array and a separate telecommunication network merely requires an IP-Interface. By now such interfaces are proposed by telephone array producers as an additional module.

IP telephony solutions are increasingly in use in the call centre sector. Features such as the automatic display of customer data sheets on the basis of its respective telephone number are already in use. They are known as “CTI” (Computer Telephony Integration). But with Voice over IP an interface between the telephone and the data net is not required anymore.

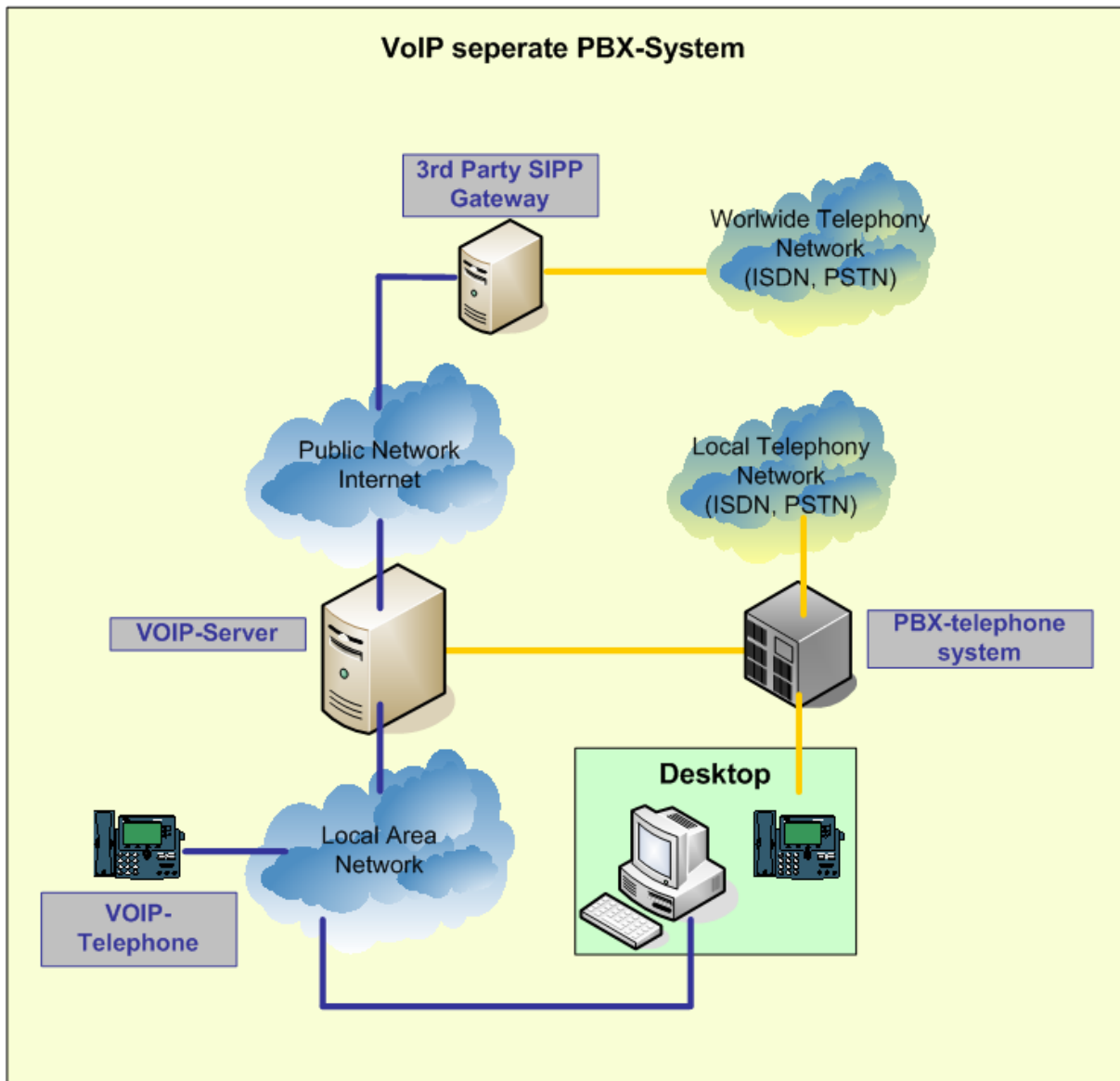
### **The transition from local network to VoIP**

Companies that use a regular telephone array have several different possibilities of implementing Voice over IP:

1. Setup of a new network components which are fitted with the required functions that enable speech services of high quality
2. Telephony services: the implementation of a telecommunication array that is capable of IP telephony, known as IP-PBX (IP-Private Branch Exchange). Alternately regular local net telephone arrays can be used that are enhanced with special IP modules.
3. Establishing of a distributed communication infrastructure. This has the advantage that full flexibility is given in terms of adding features and participants which allows solutions with several hundred thousand participants.

## Example for the integration of a VoIP solution as an extension of the existing telephone array.

The implementation is made on the basis of the leading Open-Source-VoIP software Asterisk. Here the Asterisk environment is implemented as an additional system to the existing telephone array.

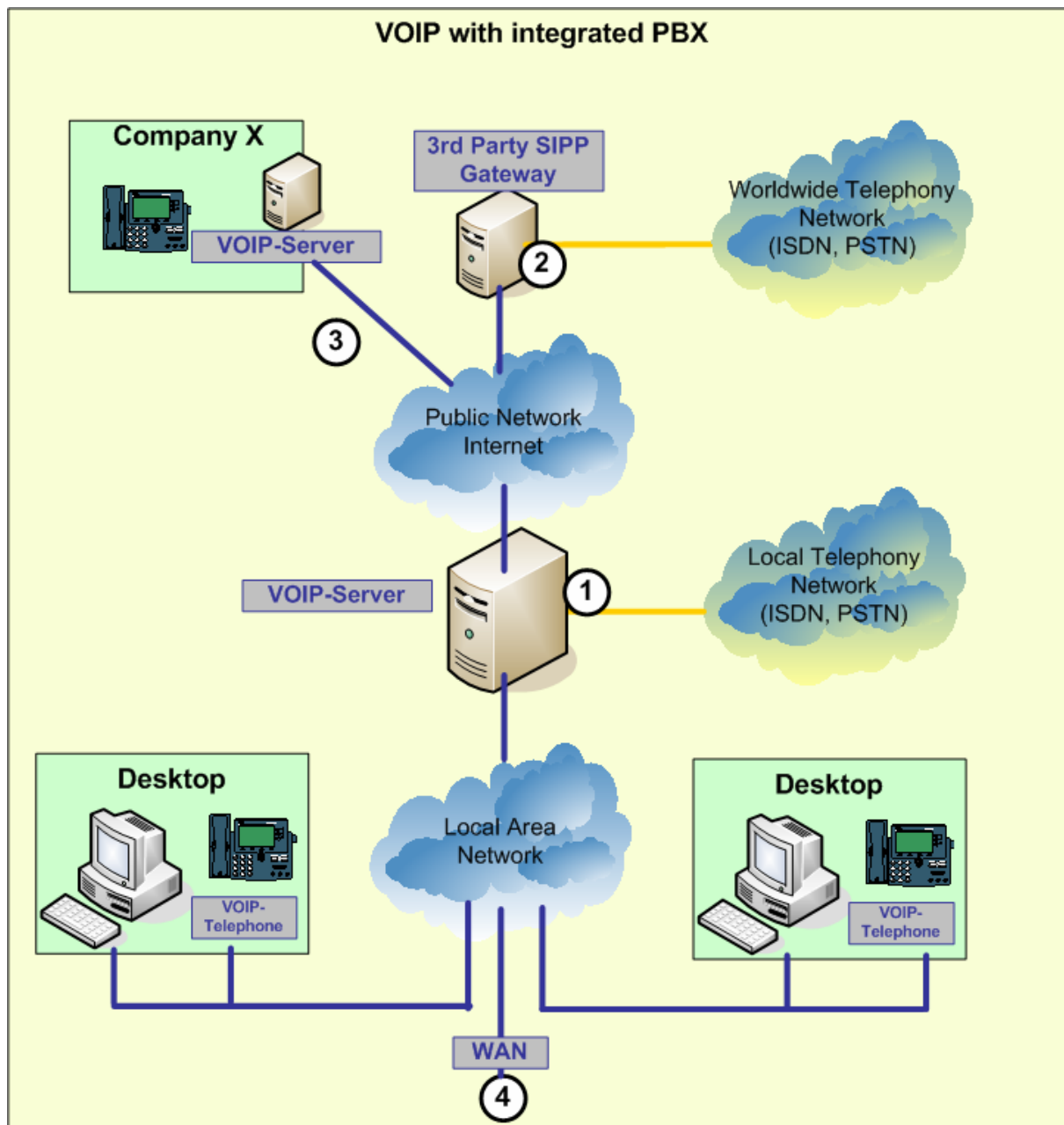


Here the Asterisk software based VoIP Server represents an additional component to the existing telephone array. This offers the possibility to quickly start using the VoIP environment with a minimum of initial investments and to profit from the considerable reduction of costs that ensues. Users with classical telephone arrays must first dial the

extension of the Asterisk server before they can make their call through the existing VoIP networks. This also offers the possibility to transfer the calls that come into the VoIP server onto the corresponding telephones in the array. The different telephones can also be gradually switched to VoIP phones. The solutions can be sized at will, only the hardware must be upgraded in time.

## Example for the integration of a VoIP solution with full PBX functionality.

The implementation is made on the basis of the leading Open-Source-VoIP software Asterisk. Here the Asterisk environment is implemented as full telephone array software.



The Asterisk software based VoIP server represents the central component of this environment. In addition to a network interface card the server is fitted with a Multiport ISDN controller. Principally the Asterisk server should be implemented behind a firewall

in the local network. It is important to know that the SIP protocol requires a relatively high number of ports for outbound connections.

In general this constellation offers four different kinds of connection:

**1. Connection directly through the fixed telephone network:**

This requires a certain number of connections with a local telephone service provider. According to the number and the kind of connections either ISDN controllers can be bundled or Primary multiplex cards can be used.

**2. Connection over the internet through a SIP-Gateway from a third party provider:**

There is a number of Internet/Telephone-gateway providers who offer very attractive conditions for connections into the various telephone networks worldwide. Furthermore several providers in the USA already offer telephony flatrates with two digit fees per month, according to the package chosen.

Es gibt eine Vielzahl von Internet/Telefon-Gateway Anbietern, die zu sehr attraktiven Konditionen Verbindungen in die unterschiedlichen Telefonnetze weltweit offerieren. Außerdem bieten einige Anbieter z.B. in Nordamerika bereits Telefonie-Flatrates, die je nach Paket im zweistelligen Bereich pro Monat liegen.

**3. Connection with another company or location through the world wide web.**

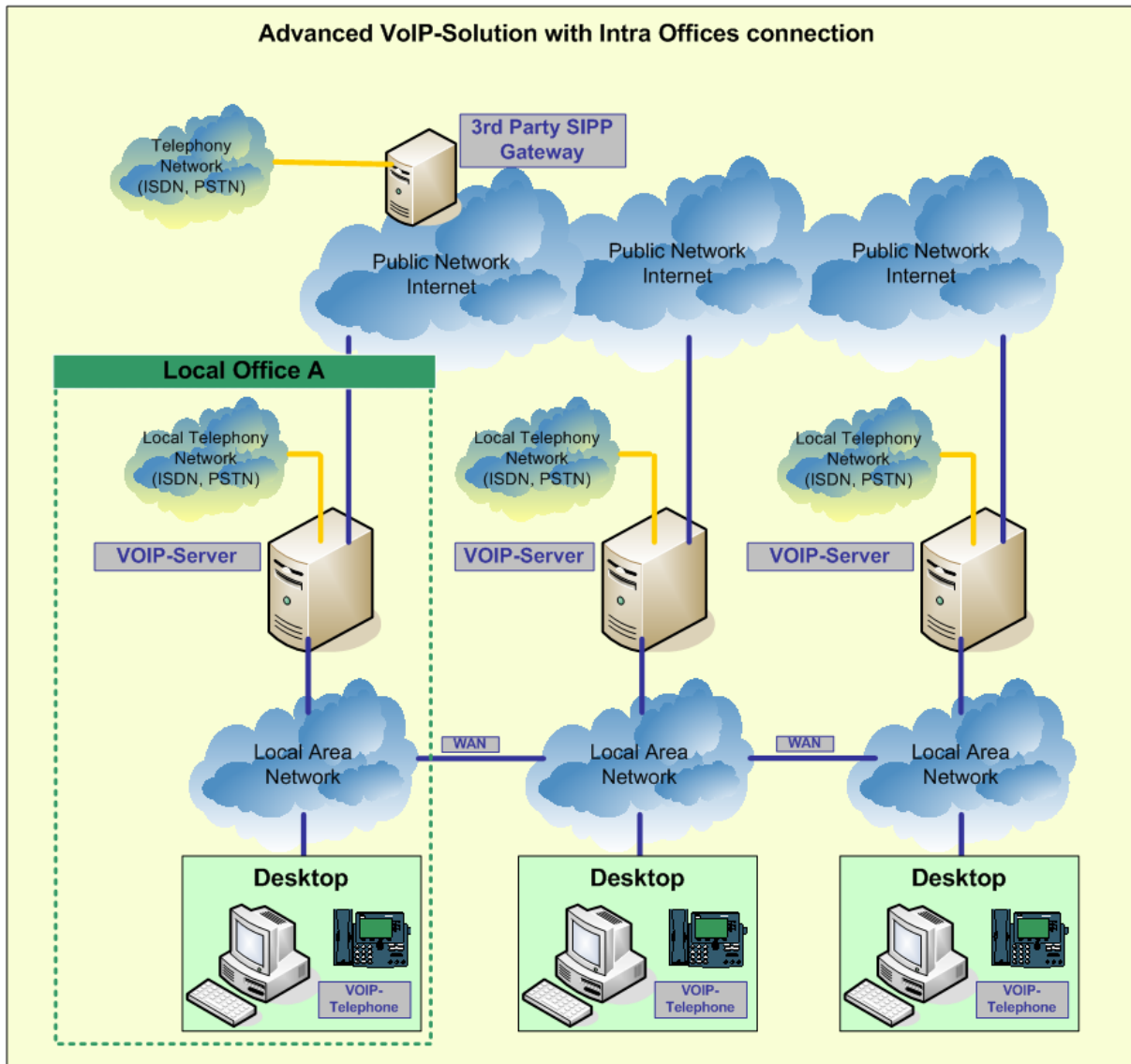
This represents a free connection, but it is required that either the IP-Address of the customer's VoIP-server is known or the customer has prepared the according inscriptions with the DNS-provider (see ENUM or DENIC)

**4. Connection between the different locations of Partner companies**

This connection is made through the in-house Intra-office Network (i.e. WAN). All the VOIP should be made known at all locations. As an example this offers the possibility to establish a telephone connection through the internet or VPN between Hamburg and Shanghai.

## Connection of VoIP solutions of different locations

The following graphic overview shows the constellation of a solution with different locations. In general all locations can make low cost calls through one common third party provider, but it is also possible for every location to have its respective account with a third party provider.



Additional information about ASTERISK:

Die ASTERISK Telephone array comprises the following features:

- ADSI On-Screen Menu System
- Blacklists, Blocking
- Call Detail Records
- Call Forward, Call Monitoring , Call Parking, Call Queuing, Call Recording, Call Retrieval, Call Routing (DID & ANI)
- Call Snooping, Call Transfer, Call Waiting
- Caller ID, Caller ID Blocking, Caller ID on Call Waiting
- Calling Cards
- Conference Bridging
- Database Store / Retrieve, Database Integration
- Dial by Name
- Do Not Disturb
- ENUM
- Local and Remote Call Agents
- Music On Hold, Music On Transfer
- Flexible Mp3-based System
- SMS Messaging
- Spell / Say
- Text-to-Speech (via Festival)
- VoIP Gateways
- Voicemail
- Visual Indicator for Message Waiting, Stutter Dialtone for Message Waiting
- Voicemail to email
- Voicemail Groups
- Web Voicemail Interface
- Computer-Telephony Integration
- Graphical Call Manager

Finally the following graphic overview shows the connection possibilities offered by a solution that uses ASTERISK

