
Hardware

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2 Introduction

The type of hardware required will depend on the number of concurrent calls to be made, rather than the total number of extensions.

The type of line interface cards fitted, if any, will depend on the customer's requirements, e.g. how many lines, and of what type are to be fitted.

The rest of the equipment fitted will be decided during the pre-installation inspection and site survey.

3 Considerations When Choosing the Base Server.

3.1 Form Factor

The form factor will be based on the space available in the customer's premises, for instance if they have a server room, or whether the PBX has to share the office with the rest of the company. The form factors available are: -

- Cube – Good small, quiet and cool running choice for a small business, without being too intrusive
- Tower – Some towers can be quite noisy and produce heat.
- Desktop – Similar issues as above. Towers and Desktops should be chosen with care
- Rack mount – Generally noisy and need to be mounted in a rack. Usually more expensive than the above options. These should be chosen for larger installations.

3.2 Processor

A recently purchased machine should be fine for most applications with a processor of 2Ghz or more.

The base operating system is able to handle multiple processors.

64bit processors and motherboards should be avoided, as they have not been fully tested with Asterisk.

3.3 Memory

1Gb for small installations
2Gb for larger 10 to 50 extensions
4Gb for everything else.

3.4 Hard Drives

The entire installation including voicemails etc will happily fit in 5 Gb of hard drive. Most hard drives on the market are in excess of 40 Gb, so the size of hard drive is not really an issue.

CentOS will support most types of hard drive, such as SCSI, SATA and ATA.

3.4.1 Mirroring

Whether hard drive mirroring should be installed will depend on the customer, and the cost to that customer should a hard drive fail, taking down the phone system. On a small installation with maybe 2 analogue lines, in an emergency, normal phones can be plugged into the wall sockets, while a replacement server is sourced.

On larger installations, particularly call centre applications, it can be expensive to lose the phone system, so mirrored hard drives should be used.

There are two types of RAID – Redundant Array of Inexpensive Disks – Hardware and Software.

Usually, hardware raid is much simpler to configure, and to swap disks in and out should there be a failure. However, check the CentOS hardware compatibility list to ensure that the RAID controller will be recognised.

Software RAID has to be configured before installing the PBX during the initial installation of the operating system. RAID cannot easily be implemented when the server is live. Refer to the instructions on building a Software RAID.

4 VOIP Hardware (Server-side)

There are a variety of cards which can be installed into a PBX to suit different line configurations. Note that only one card should be installed into the PBX.

The terminology used is FXO and FXS

FXO is the signalling used to connect to telephone lines

FXS is the signalling used to connect to analogue telephones

Generally speaking, line interface cards should be purchased from Digium or one of their resellers – e.g. <http://www.voiptalk.org/products/voip-hardware.php> in the UK.

The main card types are: -

4.1 TDM400

This card allows the connection of up to 4 analogue lines or up to 4 analogue extensions, or any combination of 4 fxo/fxs ports.

4.2 TDM2400

The TDM2400 allows upto 24 ports in groups of 4. Each module on the card can support 4 fxo or fxs ports. A breakout box will have to be purchased to break the lines out from the card to a box containing 24 terminators.

4.3 ISDN – BRI

ISDN BRI (Basic Rate interface lines) have not been fully tested with the system. The main type is a B410P supporting up to 4 BRI making a total of 8 telephone channels. It may be easier and more reliable to use a VoIP gateway, such as the Mediatrix 4102 BRI VoIP gateway, and configure Asterisk to use this as the trunk.

4.4 ISDN – PRI

ISDN – Primary is for larger installations where 8 to 30 channels are required. This is also known in Europe and UK as an E1. The card can be configured to support T1 (24 Channels in the USA). There are a number of configurations of cards from 1 port giving 30 channels up to 4 port cards giving 120 lines.

Note that this card comes in two versions, 3.3v and 5.5v. Check the server specification carefully to see which PCI card type is required for your hardware.

5 Hardware – Installation

5.1 Network

A network used for VoIP will very quickly make any faults in the network very apparent. Consideration should be given as to whether VoIP will share bandwidth with existing traffic, or whether it should be given its own cabling system. This should only be required in heavy traffic environments.

If the choice is made to share the bandwidth, then the network should be switched, and planned for VoIP.

Note that many cheaper switches run at the speed of the slowest device attached to the switch. Therefore if the network is a gigabit network, then plugging in a 100baseT phone may bring the whole network down to 100Mb/sec.

5.2 Power

Power should be provided through a UPS – uninterruptible power supply. This will help to make the server run smoothly, and may increase the voice quality, as well as providing power backup in the event of a power outage. A UPS sufficient to run the system for 20 to 30 minutes should be ample. Power outages are rarely longer than this.

5.3 POE Switch

One of the issues with office environments is that if the office has not been designed from the ground up with sufficient power points, it may be difficult to source power at each individual desk.

The solution to this is to use a POE (Power over Ethernet) switch which will deliver 12 or 48 volts to each location. The power output of the switch must match the input power of the phones.

If a POE switch is employed and it is attached to the UPS, then the phones will remain in operation during any power outages as the phones will get their power via the Cat5 cabling, which is what many companies have come to expect.

5.4 Broadband

If the PBX is to be attached to a VSP (VoIP Service Provider) or external extensions are to be provided, then thought must be given to providing a second dedicated broadband line used solely for VoIP. Ideally, this extra line should have a fixed IP address to make maintenance and configuration easier.

If the broadband is to be shared with data, then some sort of quality of service (QoS) router must be purchased.

Although the system has firewalls enabled on it, and is currently regarded as secure, the system should be put behind a firewall. If SIP is to be used on external extensions, then a SIP aware firewall should be used.

Note that a standard UK ADSL is usually 256Kb/s upstream speed, which is good for about 2 or 3 concurrent VoIP calls depending on the CODEC used.

5.5 VoIP Gateways

In many offices, it is sometimes found that the telephone lines are physically dispersed. VoIP gateways, which take in an analogue or ISDN line on one side and convert to SIP on the network, may be used to avoid running extension telephone wires to the back of the server.

5.6 Premicells

Premicells are mobile phones fitted with a SIM card, but lack a keypad or a screen. These can be plugged straight into an analogue port of the PBX, and configured as a trunk to take advantage of cheaper calls when calling from mobile to mobile.

5.7 ATA

Analogue Terminal Adapters take a SIP input, and convert it to analogue, so that an analogue phone or fax may be plugged in anywhere on the network. Note that when using SIP and an ATA, an uncompressed CODEC must be used such as alaw or ulaw.

6 Redundancy

Much is made of having redundant servers that will immediately take over should the system fail. However there are problems associated with a fully redundant system, such as where the lines come into the building, dual power supplies, generator, clustering etc. A cost benefit analysis must be made to see what level of redundancy is required.

Usually the most effective method is hot standby system, if redundancy is required. This is a machine which is configured in exactly the same way as the main PBX with the same hardware. If server number one fails, then the lines are simply moved across to the new server and configured with an appropriate IP address. Thus downtime can be limited to less than 5 minutes.

This methodology has the advantage of being able to test dial-plans and IVR menus on a non-production server.

7 Conclusion

The computer used for the installation will depend on the customer's requirements, and particularly how many calls are likely to be made at any one time.

There is a variety of hardware that can be used with the system in a variety of configurations.

It is extremely important that a proper site survey be done before providing the customer with a quote. The site survey should cover, but not limited to, the following areas: -

- Location and type of each telephone line
- Location and numbers of phones
- Power for phones and equipment
- The state of the network and traffic loadings
- Location and quantity of network cabling
- Broadband, Router and firewall
- Maximum concurrent calls
- Cost benefit of redundant hot swap server.
- Customer expectations.

When building the customers system, it is good practice to build the system on the bench, with all the phone properly configured and tested, so that time spent of the customers premises is kept to a minimum, which helps to give an air of professionalism.