

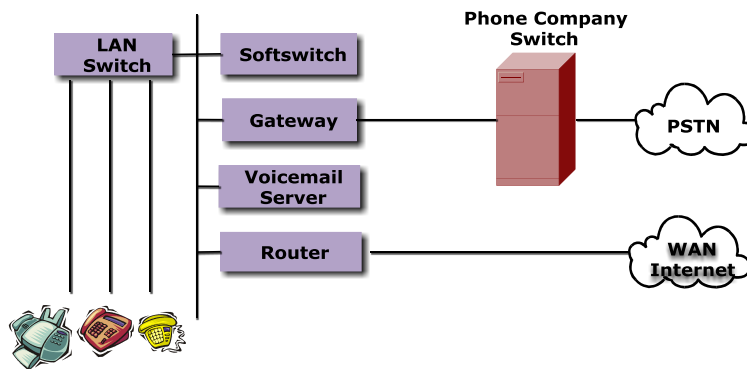
## What is an IP-PBX?

IP-PBXs are rapidly replacing *traditional PBXs* and *key systems*. There are a number of reasons for this trend, but our purpose here is to explain how IP-PBXs work.

### *Requirements*

For an IP-PBX to work, it needs to replace the key functions of a traditional PBX:

- Call control
- Interface with the *Public Switched Telephone Network (PSTN)*
- Support user phones



### *Call Control*

To perform call control, the system must act on signals from the calling phone. This requires specialized call processing software that acts as an automated operator, handling all the tasks a switchboard operator — or a PBX — would handle. The software device tracks and manages call progress, and takes care of the conversion between telephone numbers and the *IP addresses* used on data networks. We will refer to this device as a *softswitch*. Another common name for it is an *IP-PBX*.

### *Interface to the PSTN*

Until the world converts completely to IP, we need a way to communicate between the IP world and the circuit-switched world. *Gateways* accomplish this function, converting signals coming in and out of IP networks to enable communication between the two technologies.

## *User Phones*

While a complete system with a softswitch and gateways can potentially support existing analog handsets, in practice most implementations use IP phones. Phones can be *hardware devices* that plug into the Ethernet network and look just like a normal legacy telephone, or they can be *softphones* that run right on a user's PC.

IP phones actually provide the functionality of a *single user gateway*, converting the analog speech pattern into *digitized voice packets* that are then sent over the IP network.



A Cisco IP Phone

Today's IP phones have *software hooks* built in for customization and are far more flexible than their legacy counterparts. Even the simplest of telephone designs can be extended with applications that reside on the user's PC.

Today's IP phones provide intuitive interfaces with access to application-rich features. They also leverage recent improvements in sound quality to provide a better experience for users and anyone communicating with them.

## *The Complete System*

Now that we have all of our components — a softswitch for call control, gateways to interface with the PSTN, and IP phones for users — let's see how they work during a call:

1. A phone tells the IP-PBX it is off-hook, on-hook, etc.
2. The IP-PBX keeps track of the phone's state, sets up calls, finds routes
3. The IP-PBX converts between telephone numbers and IP addresses
4. Once a call route is established, the IP-PBX gets out of the way so that the path for the voice stream is independent of the IP-PBX
5. If the call is leaving the IP network and being routed to the PSTN, a gateway converts the IP packets into the appropriate format for the PSTN
6. If the call is being sent to another IP device, the call may be managed by multiple IP-PBXs. But when the packets reach the called party's phone, they are converted back into voice.