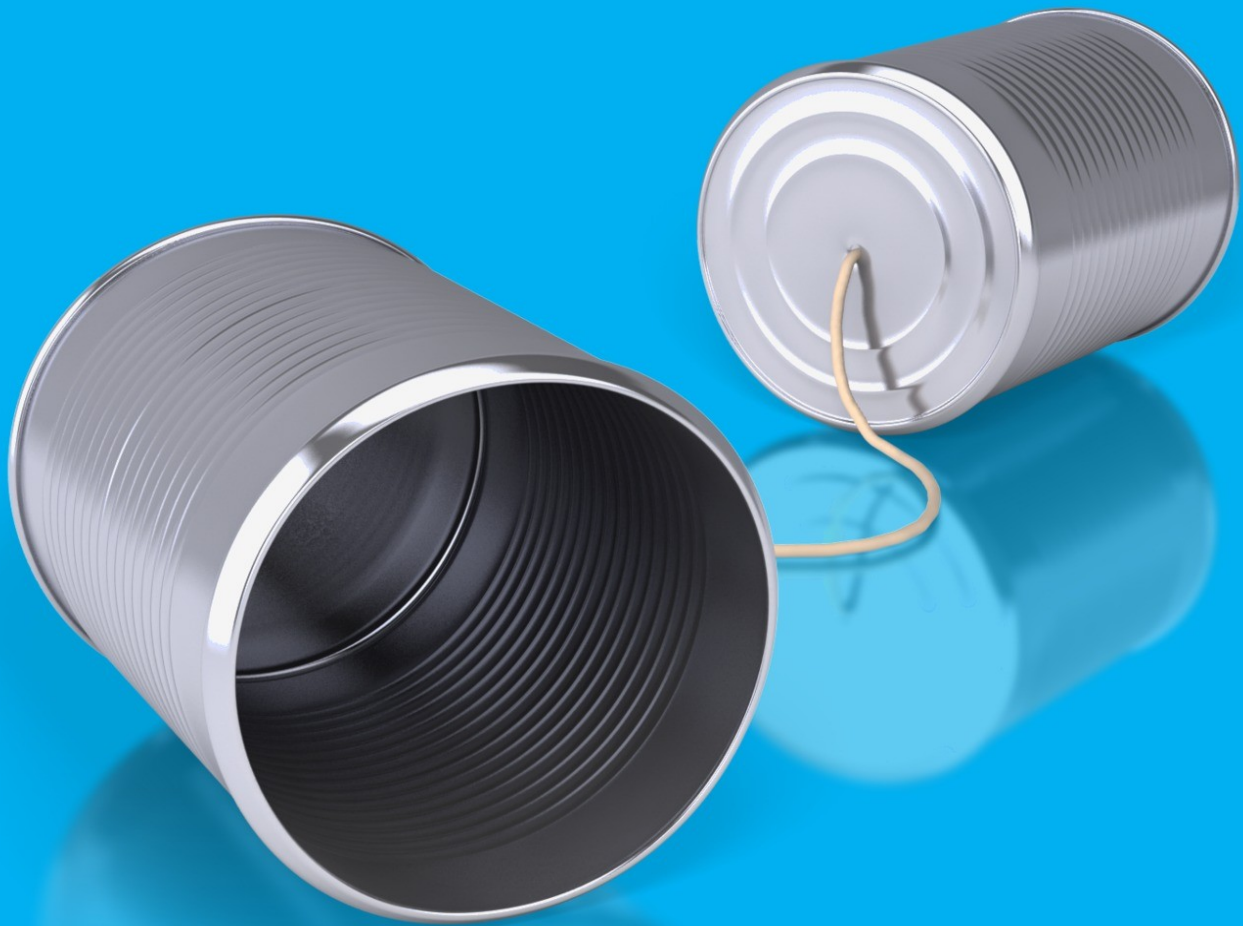




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# An Introduction To Business Phone Systems



A Birchills Telecom Whitepaper  
By David Hill, Chairman of Birchills Telecom

## Introduction

Business phone systems in the UK have evolved over many years. We certainly wouldn't be designing them the way they are if they didn't have to support the changes brought about by 100 years of change and government interference. This means that it is very difficult for new comers who simply want the best phone systems for their money.

You should know that there is a dichotomy between the old legacy systems from the old telephony world and the new VoIP systems that emanate from the new Internet era. This paper aims to let you form a good overview of the position today and it's complications.

It seems to me that the logical way to look at this is from the outside public network down through the phone call carrier and on to the PBX and it's services before looking briefly at the actual phones and the wiring.

There is a video associated with this [whitepaper here](#)

I hope this is helpful.

David Hill

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# An Introduction To Business Phone Systems

## The Network

The first thing that you need to understand with business phone systems is what goes on outside your building. Just how does that telephone call get to you to in the first place? That will be the PSTN.

The PSTN – the public switched telephone network - is basically like the Internet but for telephones - it controls the way that a phone call gets to it's destination. It's the biggest network the planet has ever known and it's been built it step by step for over a hundred years. This has meant that the way it works has had to cope with many technological changes along the way. To understand how it works a bit of history is needed.

The PSTN started with an even older network, the telegraph network. Since that time governments of all countries have decided that it was far too important to leave to private organisations to operate. So up until the last few decades it was all government controlled, which in Britain meant that it was built and controlled by the GPO (General Post Office) and then spun off into British Telecommunications plc. This was privatised in the 1980's and became BT. From the early 1990's on the PSTN has become part of the far wider Information and Communications Network (ICT).

## Openreach

BT would have been a monopoly if just privatised so the government did all it could to encourage healthy competition and began to license other telecoms operators (called Telcos) to compete. As competition has hotted up the government has felt able to leave BT more and more alone to act commercially. The last big change that happened was that BT agreed to spin off into a quasi autonomous organisation the day to day running of the network. It called this organisation Openreach. Openreach has a monopoly on the final connection via the PSTN into the building.

Openreach and BT are now meant to have an arms length relationship which is reported on every year by an independent committee in BT- the Equality of Access Board. BT still has a universal service obligation which means that it has to provide a telephone service to anyone in the UK that wants (and can pay) for it.



## Cable

In the 1980's the idea of cable TV was introduced from America and there was a dash to cable the country with massive expenditure on cable being laid in the street. However the size of the investment together with low levels of take up by householders lead to all of the cable companies getting into financial difficulties resulting in multiple mergers. Eventually today one company, Virgin Media controls all of the cable.

## Mobile Networks

There are now really only 3 mobile networks in the UK. They are Vodafone, EE (now being bought by BT), O2 and Three. There are also about 35 virtual networks who resell the airtime that they have bought off one of the big 3. There are also negotiations between Three and O2. Consolidation is happening in a large way.

Mobile phone providers are trying to attract business phone system traffic but with poor sound quality and variable signal strengths they are finding it difficult.

## Connecting – Making A Call- Analogue

Before the Internet took over the world when you picked up a phone and dialed a number the phone handset sent out a series of clicks or noises that went out over the wires that physically connected to your building to an exchange. These noises then told the exchange where to connect the call to by physically moving cogs and levers – the so called Strowger system.

Your wire became physically connected to another wire which took the phone call on it's way. Eventually this would direct a signal to a bell at the receivers end and the bell would start ringing. If the receiver picked up the handset then a physical connection would be made and you could talk.

Clearly this was monstrously inefficient. As time went on systems were developed to allow multiple phone calls to traverse the same piece of physical cable, called multiplexing systems. Gradually the idea of a physical circuit became replaced by the idea of a virtual circuit but with the same results of a connection from caller to receiver.

As time has progressed further this model is being replaced by VoIP systems where the call is digitised at source and transmitted over the Internet to a gateway where the call can join the PSTN.



## Connecting – Making A Call- Digital VoIP

In the 1990's as the Internet became more and more dominant the idea of VoIP took hold. VoIP stands for Voice Over Internet Protocol. The way it works is that instead of your phone calls going over the PSTN as analogue sounds to be digitised later the call is digitised at your phone. Calls then go out over your broadband to connect with the PSTN at a gateway in the Cloud. From the users point of view all you need is the correct kind of phone, a VoIP phone (also known as an IP phone), broadband and an account with a VoIP provider.

A hosted VoIP phone system takes away all of the phone switches and PBX's and puts them in the Cloud. You simply choose your handsets, they are pre-configured and you plug them into your broadband or network.

The virtual PBX in the Cloud allows you to configure all of the call features, and holds the telephone numbers that relate to all of your handsets. You can have multiple phone numbers associated with a single phone. It performs all of the calling features behind the scenes including recording calls, storing voicemail messages, diverting calls and playing music on hold. Essentially it is the brain, making all the things happen.

## How Do Telephone Lines Work?

All phone systems have to connect to the PSTN and to do that they need telephone lines.

Phone lines come in 4 flavours:

1. The standard or copper phone lines
2. ISDN an obsolescent digital technology which also comes in 2 flavours ISDN 30 for larger installations and ISDN2 for smaller ones
3. Dedicated data lines including leased lines, kilobit etc.
4. And now FTTP fibre to the premises

All phone lines are supplied and administered by Openreach but you are free to use another Telco other than BT. The Telco will then place an order with Openreach and be your point of contact and bill you.

Many Telco's try to get you to sign long term contracts which lock you in. BT for example offers 60 month contracts on ISDN. This way you are locked in for 5 years whilst they are free to increase their prices.



## How Do Phone Numbers Work?

As the current system has developed piecemeal with commercial pressure and government interference the phone numbering system (which used to be called STD codes) has failed to keep up. Originally numbers related to the telephone exchange to which the phone system was connected. BT still implements this system. Hosted VoIP providers such as Birchills Telecom can allow any phone numbers on to their system irrespective of actual geography.

The overall numbering scheme is now very difficult to follow and even more difficult to try to work out charging rates. The only things that remain clear are that mobile numbers start with 07 and 01,02, and 03 prefix numbers are charged at landline rates.

Ofcom control and allocate telephone numbers. Generally they allocate blocks of telephone numbers to large Telcos. Until very recently they were free but now Ofcom has started to charge for phone numbers where phone number ranges are limited – especially in London.

The large Telcos make the numbers available to lesser companies but charge for the privilege. Companies are free to charge what they feel they can get away with for phone numbers. So many have invented the idea of gold numbers or platinum numbers where the numbers are repeated or are in other ways memorable. They then charge substantial sums to allocate them to you. Birchills Telecom does not make any distinction between the numbers that we have available and makes no charge for a number.

## Calls and Call Costs

The way call costs are calculated on a landline are the result of a series of government interventions. Originally the sole supplier of calls was British Telecom (BT) and it's predecessors but the government wanted to encourage competition and forced BT to allow other carriers to route calls across it's network. This gave rise to the ability for other carriers to bill for calls across the BT network. This became known as least cost routing. It also became possible to route calls by their destination allowing multiple companies to bill for calls from one number. This ability still exists today using the BT network and this allows some companies to advertise reduced costs without changing anything apart from the company being billed.

The quid pro quo for this increasing competition BT is that it has become increasingly unregulated and free to introduce more and more complex charging mechanisms. As competition has been perceived to increase they have also become free to increase charges as they see fit and have now raised charges year on year for several years.



## Calls and Call Costs (continued)

Part of this freedom to charge what the market will bear has resulted in the introduction of call connection charges which exceed all other elements of the call charge. So when comparing call charge rates it is important not only to compare the per minute rate but also what rounding procedures are applied and what the call set up charge may be. For example BT round up calls to the nearest minute and nearest penny before aggregating the cost. Most legacy phone call suppliers apply a set up charge

Historically the VoIP providers generally offer a simpler tariff structure. So for example Birchills Telecom offers calls with no set up charge and a minimum cost of one tenth of a penny.

BT retail buy their calls from BT wholesale in the same way as their competitors do. Other companies route their calls over part of their own networks and can charge what they feel like. There is no obligation on other companies to allow least cost routing out to other providers.

Mobile companies have very complex charging mechanisms and describing them is beyond the scope of this paper.

## The PBX

Just as actually connecting every phone with a hard wire throughout the circuit became impractical in the PSTN the idea of every phone within a building having an outside circuit was almost immediately impractical and the idea of a PBX or private branch exchange was borne.

PBX's (Private Branch Exchanges) which allow more phone calls to be made than the number of lines you have bought. So if you bought for example a 6x8 PBX you could have 8 extensions and up to 6 lines. If you thought that you would never need to have more than 4 conversations at once then you could buy the PBX and only rent 4 lines. This was a great way of saving cash. Since then PBX's have become cleverer and perform many more functions than minimising the number of outside lines required.



## Traditional PBX

A traditional PBX is a box of electronics that sits somewhere in your building. It takes the incoming lines from the PSTN and connects them to the internal phone circuits within the building.

The internal phone circuits can either be analogue or digital or most PBX's will now allow you to use your internal data wiring.

Today a lot of companies still think this is the way it should work. BT, Panasonic, Avaya and NEC to name but a few. They still sell traditional PBX's which connect into standard phone lines or ISDN lines. I'll call these kind of PBX's traditional PBX's.

Traditional PBX's are expensive and when sold allow Telcos to pay large commissions to the representatives selling them, so a hard sell is always just around the corner.

## Featureline/Centrex

In the 1990's technology had advanced enough so that some of the functions of a PBX could be handled within the exchange and so Featureline was born. Other variants came along from other phone companies which were generically called Centrex system.

The way it worked (and still does) is that you buy special phones which then connect into the exchange. Each phone has it's own line and you can then transfer calls between phones in the same office. In it's day it was great – it avoided you buying a very expensive old fashioned PBX but it's features are very limited and worse, it ties you in to large call costs. The other big problem is that you need a phone line for every phone which means that if you have say 6 phones you have to pay for 6 lines.

## Hosted PBX

With a hosted PBX you plug your phones into the Internet and then pay an extension fee or some other charging structure depending on the VoIP company.

The great benefit of a hosted PBX is that geography ceases to be relevant. Calls can be transferred to and from anywhere for nothing. The hosted PBX can have a massive feature set which can rival even the most expensive traditional PBX.

There is no capital charge for the hosted PBX and it is always up to date.





## PBX Features

Many companies charge for each extra feature they turn on in the PBX. So if you want a simple Auto Attendant (IVR) it's one price and a more complex one it's more. If you would like voicemail it costs more and more again if you'd like it emailing to you. Prepare for a big hike in costs if you'd like to record calls and more again for filing the recordings.

We've detailed below some of the features which you may wish to have or implement on a PBX.

## Transferring Calls

At the heart of any PBX system is the ability to transfer calls from one recipient to another. Traditional PBX's do this quite well provided the recipients are in the same building. However, a hosted PBX can transfer calls to any recipient in any country anywhere for free.

## Reporting Tools

A good PBX should have comprehensive reporting tools you so that can monitor how quickly your organisation is answering calls and look at the overall statistics.

## Rules

A business phone system should allow you to define a very flexible set of rules to be applied based on time or even caller-id. So any of the features below can be used and switched on or off depending upon the rules that you want defined for the system.

## Music or Voice Recordings on Hold

Whenever a caller is on hold a business phone system can allow you to play either music or messages. The messages can tell the caller about features that they may not be aware of or publicise upcoming events. You can choose what messages or music you want to play, subject of course to the usual copyright restrictions.

## Voicemail

A call is directed to voicemail either when the recipient is unavailable or when they choose. A good voicemail system will notify the recipient of the voicemail using email.



## Call Queues

One way to handle inbound calls efficiently and professionally is to use a call queue. A queue is a place where calls are placed on hold until someone is available to take them instead of having a customer get an engaged tone or go to a voicemail system. It can have built in greetings that can give wait time, preset update messages, and music on hold. It also can give information about the queue such as how long someone has been on hold.

## Ring Groups

A single incoming call can ring a group of extensions which ring in unison. This is known as a ring group or a blast group. When the call is answered all extensions cease to ring for that call.

With a hosted system, extensions can be anywhere on the planet. So if you are unable to take a call you can have it transfer seamlessly to a live answering service, where the call is answered by a live person.

## Hunt Groups

An incoming call is directed towards a specific extension and then depending on the state of that extension is either answered by the user or transferred to another extension, queue or IVR.

## Interactive Voice Response IVR (Auto Attendant)

An IVR, or auto attendant, can help improve efficiency by getting the call to the correct person the first time, rather than have to go to one employee and then be handed over to another. It can direct calls to different departments, employee's extensions or to different voicemail boxes.

For example you could configure an IVR so that:

If callers press "1" they will ring the technical support ring group.

If they press "2" they will ring the sales support ring group.

If they press "3" they will ring the sales accounts ring group

or if they continue to hold they will be transferred to the operator



## Handsets

The actual phone handsets which plug into your system can be of several kinds and you can also plug faxes and conference phones in as well.

With a traditional PBX you may well be tied in to the type of proprietary handset that goes with the PBX. Inevitably these will be more expensive than a basic phone. You can often specify that an analogue card is included and then you can plug in normal household phones. The problem with this is that you will lose functionality.

With a Featureline type of system you are again tied to a proprietary handset which is considerably more expensive than a normal one.

With a Hosted VoIP system you can choose from any compatible IP handset. Birchills Telecom for example offer several.

## Plug In Other Devices

You can usually plug faxes and modems into a phone system. With a traditional system you may need to buy an analogue card. With a hosted VoIP system a device called an ATA (Analogue Telephone Adapter) is needed. With Featureline systems you will need to get a separate incoming line.

## Wiring

You can choose to wire phone systems as a separate circuit with their own dedicated wiring. However many modern systems allow you to plug the phones into a standard data network. This is never the case with the Featureline systems which require dedicated wiring.

With VoIP systems you always use either the dedicated data system or plug the phones directly into your router.

## Maintenance Contracts

Traditional PBX phone systems usually come with a maintenance contract costing 10-15% of the cost of the system a year – so over 7- 10 years you double the cost of your system.

A Hosted VoIP system needs no maintenance contract



## Licence Fees And Upgrades

Some phone systems incur licence fees. If you want to add a new phone, not only do you need to add the cost of the phone, plus any line upgrades, plus any hardware upgrades (maybe a new card) you also have to add a new software licence fee.

Birchills Telecoms Hosted VoIP system has no licence fees.

If you want the latest version of the software for a legacy PBX you will often have to pay an upgrade fee.

## Conclusion

I hope this has been a simple and straightforward examination of business phone systems and what they can do and how they work from a completely non technical perspective.

We have lots of other information and guides on our site at [www.Birchills.net](http://www.Birchills.net). I hope to see you there.



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