General Guide to Telephony

VoIP Explained

Voice over IP (VoIP) is now {2023} a very mature technology with excellent sound quality, reliability, vast range of features and great customer service providing a very flexible and economic solution for businesses.   Gone are the days of very expensive and proprietary telephony systems that required separate dedicated circuits for voice and data and no longer the need for dedicated support contracts.   Since 1999 businesses have been implementing VoIP and removing the expense of dedicated voice circuits and expensive telephony systems enabling the use of their networks to carry BOTH voice and data.

Traditional analogue methods to relay the voice signal over copper wires and through the Public Switched Telephone Network (PSTN) are very limited in sound quality due to the bandwidth range {range of frequencies = 300Hz to 3500Hz} and **limited to only one conversation** per pair of cables.   Analogue voltages decrease with distance and are subject to noise and interference.

Rather than using the limited analogue signals for voice, by sampling and representing the voice signal as a digital data packet, the voice signal can be sent without degradation, without noise and interference and sent for great distances without the limitation of the analogue PSTN {landlines and ISDN services}.

VoIP sends voice streams as "data packets" across the company networks, private Wide Area Networks (WAN) and the public Internet instead of an analogue phone line or dedicated PBX trunk.   The voice data packets are protected from delay and loss using **Quality of Service (QoS)** which ensures the time sensitive voice packets are given priority over any application or web traffic during any high utilization periods.   Applications and web traffic tends to use Transmission Control Protocol (TCP) which allows for delays and packet loss using retransmission and windowing – most browsers and application users will not notice if the data is delayed or retransmitted causing a 1 second delay.   Voice users however, would notice if the conversation was delayed just 300 milliseconds and/or parts of the conversation lost - this is why QoS is very important to ensure quality on any network with shared or limited bandwidth.

Depending upon the age and manufacture, not all existing business telephony systems are able to support VoIP natively. Some existing telephony systems are able to support VoIP and some require expensive additions…….   ALL existing telephony systems can be integrated into a new VoIP telephony system.

Companies that have several sites have been maintaining separate data and voice circuits between sites.   With VoIP, the company can now use a single data network for voice, data, video and security etc..   International companies can also use their data network to provide great savings sending voice calls between office sites for toll-by-pass, making international calls at the local rate of their international office.

Small companies, home office and domestic users can also benefit from VoIP by using their Internet provider as the network to carry their data and voice traffic.   A simple aDSL domestic line can provide enough bandwidth to support a small business for their data and voice requirements {an average aDSL or basic fibre bandwidth of 15Mbps can support >10 simultaneous telephone calls and data}.   The voice system can be integrated into the SOHO and smart home providing access to automation, security, heating/AC, lighting, entertainment etc.

LEGACY CONNECTIVITY between PSTN {landlines} and voice PBX {telephone systems} have used analogue circuits, old land lines, hybrid, ISDN, BRI, PRI or proprietary circuits dedicated to voice.   These circuits are expensive and are due to be phased out by most telcos in the next two years.   An ISDN PRI service could only handle a maximum call capacity of 30, BRI only 2 and analogue only 1 concurrent call.   Telephone numbers or range of numbers were dedicated to a particular trunk/circuit – no resilience, no redundancy.

VoIP CONNECTIVITY between voice servers, telephones {smart phones, desk phones, softphones, web clients..} uses IP over the existing data networks, private networks and/or the Internet.   A (Session Initiation Protocol) SIP trunk is a virtual trunk between VoIP equipment/devices which uses any IP network to communicate. The SIP trunk can handle as many concurrent calls as permitted by the available bandwidth and connected equipment.   Telephone numbers can be virtual and are not dedicated to a particular trunk, so they can be routed conditionally providing follow-me and fully redundant/resilient services.


VoIP Service Benefits

Driven by cost savings, extensive features, increased productivity, flexibility, portability, mobility, and ease of implementation/use, VoIP systems are now extensively implemented.   However, there are a fast array of methods and options available and a vast amount of miss-information due to the lack of knowledge within some providers.   The main consideration should always balance the cost against the benefits for current and future requirements.

For large business, the cost savings can be massive – legacy PBX systems are very expensive to maintain, call costs and provider circuit costs.   Long duration contracts can be integrated into the migration plan to maximize the return on investment and move the company gradually to VoIP, as and when it is economic for the business. Great advantages are gained with the features and flexibility of VoIP which is also a key factor.   Major considerations have to be given to the internal support vs outsourced support and ensure the company is not restricted by the capabilities of the providers.   Companies must also consider the cost to the business during any possible outages and evaluate the options for failover and high availability solutions.

For small business, large cost savings can be made on call costs and removing any expensive telephony circuits. Great advantages are gained with the features and flexibility of VoIP which is also a key factor.   Major considerations have to be given to the internal support vs outsourced support and ensure the company is not restricted by the capabilities of the providers.   Companies must also consider the cost to the business during any possible outages and evaluate the options for failover and high availability solutions.

For domestic and home businesses, the cost savings may not be massive, but the features and flexibility gained by moving to VoIP are usually the driving forces = least cost routing, blacklist and call blocking, route calls to the correct extension or person within the office or home base upon time of day and callerID etc…
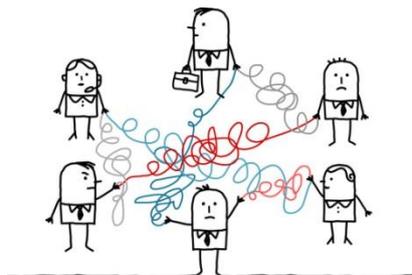
Vast Feature Sets and Flexibility

Large corporation phone system features such as **least cost routing, auto-attendants, ring groups, virtual call center, IVR and agent groups, music-on-hold, follow-me mobility, call blocking/blacklisting, conferencing, video calling, call recording, voicemail unified to email, callerID routing, integration with CRM/database/security/smart home** and **extensive call reporting** options are now available to virtually any sized VoIP system.   The traditional "analogue" PSTN systems are very limited with features and integrations.

As listed above, **the mobility advantage** of being a "digital" system is that you can take your IP phone anywhere and plug into a company network or an Internet connection and use it, providing both portability and flexibility. Allows full flexibility for employees that work from home or away from the main office. Off-site workers are still an extension call away and can answer calls coming into the company's main number. This is not always possible with traditional PSTN telephone services.

High definition sound quality on VoIP calls is now available {depending upon handset/smart phone and bandwidth available} = clear and crisp sound.

Intelligent call routing within most VoIP systems allow for the follow-me mobility and also provide least-cost-routing = the call is routed through the best provider based upon your configured criteria {cost, quality, security}.   Blacklist and call block unwanted callers.   Send calls to the correct extension or person based upon time of day and/or callerID. Also very useful is comprehensive and **detailed call reporting**.

VoIP Topology Decisions

Basically, is the VoIP equipment going to be located at your site or are you going to rent voice services from a provider ? -   **premises VoIP vs hosted/cloud VoIP**

Hosted/Cloud VoIP is a network based VoIP service from a provider = an outsourced model best suited to small business or domestic users that do not require complex feature sets and do not require frequent changes.   Ideal for users that require minimum initial capital investment – usually charged as a monthly fee per extension. Call charges are either bundled in the monthly fee or at a fixed rate. Features and services are limited to the 'off the shelf' nature of the hosted VoIP provider.

Hosted/Cloud VoIP is also referred to as Hosted-PBX, Virtual-PBX, or Cloud-based Communications – any system where the functionality of the phone service is "hosted" as opposed to being on your premises.   Obviously, this means that all your IP phones connect to a server in a data center somewhere via the Internet or via a private connection. This server routes all your incoming and outgoing calls, as well as provides all the features.   The business needs to evaluate the costs should this service become unreachable or the network have an issues which could stop the entire company telephony and isolate the business.   Options include, duplicate systems, duplicate Internet and/or private network connectivity and DR site planning.

Popular with both small business, domestic and small office / home office users that typically require fewer than 10 concurrent calls, less than 20 extensions and want some of the VoIP business features (such as auto-attendants, voicemail system, ring groups, call management, music-on-hold, etc.). Hosted VoIP can be very cost effective depending upon business requirements. The Hosted VoIP pricing starts to converge more when compared to premises VoIP solutions as the number of extensions and feature requirements rise.

Any company that has voice as one of their core business functions would usually find Hosted VoIP too restrictive and/or too expensive.

EXAMPLE Hosted VoIP: SOHO (<6 Employees) basic features

If you have a home based or very small office based business (often referred to as SOHO - Small Office / Home Office) with less than 6 people and you do not expect to grow beyond 10 people in the near future, then, depending upon your feature requirements, a SOHO VoIP solution may be sufficient.   SOHO Hosted VoIP providers do not always have the business focused features you may want so considering your requirements up front is vital.   Assumes this example has no requirements for call screening, blacklists, auto routing of calls to correct person in house or SOHO based upon time of day and callerID etc.

A basic SOHO extension with unified voicemail will usually cost < $4 {£4} per month per extension.   ** watch out for emergency service support and any analogue lines you may require for FAX/franking/alarms etc. – these may not be covered by Hosted VoIP

EXAMPLE   Hosted VoIP: Small/Medium (6-100 Employees)

This market has become very competitive and provides quite good feature sets.   In companies where they have very limited technical support staff, it can be ideal to use a hosted VoIP provider.   The contracts can be complex and contain details of features and SLAs to match the business requirements, so they need very careful analysis to ensure the business is getting value for money and has purchased cover for full business telephony resilience.

Contracts for Hosted VoIP for small/medium business with documented features sets, storage of voicemail costs, SLAs and costs for moves/adds/changes will usually cost > $18 {£15} per month per extension.

VCC {Virtual Contact Centers} for agent groups typically cost >$26 {£24} per month per extension.   ** watch out for emergency service support and any analogue lines you may require for FAX/franking/alarms etc. – these may not be covered by Hosted VoIP - AND REMEMBER MOST TELCOS ARE SWITCHING OFF PSTN ANALOGUE SERVICES BY 2025

EXAMPLE   Hosted: Enterprise Business (100+ Employees)

For Enterprise, the main desire for telephony may not be centred on cost, but more on features - Unified Communications = a single platform that combines enterprise features like messaging, presence, conferencing, video and voice can be very appealing. The contracts can be very complex and contain details of features and SLAs to match the business requirements, so they need very careful analysis to ensure the business is getting value for money and has purchased cover for full business telephony resilience.

Contracts for enterprise hosted VoIP can be >$40 {£36} per month per extension.

** watch out for emergency service support and any analogue lines you may require for FAX/franking/alarms etc. – these may not be covered by Hosted VoIP

Premises VoIP is having the voice server within one or more of your sites = more suited to business and domestic users with more complex requirements and/or requirements for frequent changes. Any company that has telephony as one if its core services should consider premises VoIP to enable full control of their telephony environment and not be limited by the provider. Obviously, capital investment is required to implement the premises VoIP system, but maintenance and support is often handled in-house or through a third party VoIP company.

Many companies have invested capital into their own on-premise PBX voice systems and are committed to long support contracts. Often the companies also have multiple dedicated circuits from AT&T, BT, Verizon etc. that are legacy contracts for the voice services. It is possible to upgrade some of the legacy systems to VoIP, allowing the company to utilize Voice over IP technology and reduce monthly costs. Most telcos are phasing out the expensive dedicated circuits used for the legacy voice systems {analogue, ISDN, BRI, PRI} and replacing them with VoIP SIP trunks.

WATCH OUT for the telcos trying to sell their replacement services for ISDN/BR/PRI as they are desperately trying to recoup the vast income they were enjoying from the legacy circuits and PBX systems.

VOICE SERVER COMPARISON

LEGACY PBX	HOSTED/CLOUD VoIP	PREMISES VoIP
Initial cost very high or leased	No initial cost	Initial cost for servers etc
No cost per extension	Cost per extension per month	No cost per extension
Support contracts expensive	Fixed contract	Support in-house or provider
Limited feature set	Fixed feature set	Most flexible feature set
Easy adds/moves/changes	Limited adds/moves/changes	Easy adds/moves/changes
Uses legacy connectivity	Uses Internet connectivity	Uses data and Internet connectivity
	Limited integration	Can integrate with legacy PBX, CRM database and other systems

VOICE CONNECTIVITY COMPARISON

LEGACY CONNECTIVITY	HOSTED/CLOUD VoIP	PREMISES VoIP
Initial cost very high	Uses existing Internet provision if enough bandwidth	Uses existing data and Internet provision if enough bandwidth
Monthly costs high	May require additional Internet provision	May require additional Internet provision
Fixed number location	Flexible number location	Flexible number location
Limited redundancy	Limited redundancy	Offers greatest redundancy
Limited resilience		
Max 30 concurrent calls per trunk	Concurrent calls limited by contract and bandwidth	Concurrent calls limited only by server and bandwidth

EXAMPLE   Premises VoIP: SOHO Business (<10 Employees)

If you have a home based or very small office based business (often referred to as SOHO - Small Office / Home Office) with less than 10 people, you hope to expand in the future and you have specific feature requirements to suit your business {menu announcements, follow-me, unified voice mail etc.}, a Premises SOHO VoIP solution may right for you as a hosted solution may be too restricted for your business.

A web GUI managed SOHO voice server with full rich VoIP features will usually cost > $500 {£450} for the initial single server implementation. Telephone handsets are available ($30 - $400) - you can also use softphones on your PC/laptop/smartphone at little or no cost ** you will also need enough bandwidth available on an existing Internet provision or a new Internet provision. There are no monthly charges for each extension and you can make moves/adds and changes whenever you want without cost.   You may also want a DID number, geographical or toll-free number provisioned {from as little as $4 {£3} per month}.

Inbound calls are filtered and sent to the correct member of the household/SOHO based upon time of day and callerID.   Blacklists block unwanted callers and unknown callers have to enter their number to be put through to any of your extensions……

Voicemail is unified to users email.   Follow-me service allows you to route calls when and wherever you are.

COMPARE TO HOSTED VoIP   for SOHO   10 extensions -

HOSTED VoIP   >$2880 per year, limited features, limited moves/adds/changes

Will not easily integrate with CRM, smart home, security etc.

Additional extensions increase cost by $24 per month per extension

No knowledge or local support required

PREMISES VoIP <$1400 year 1 (then <$800 per year), full rich features, flexible moves/adds/changes at no cost…

Can be integrated with CRM, smart home, security, entertainment etc.

Add more extensions without cost {to limit of server(s) and bandwidth}

**Local knowledge and/or training required** - included in estimate shown

Scenario 1 A company including 50 local workers that speak to each other on the telephone extensively. However, the company has limited bandwidth that only supports five concurrent calls.
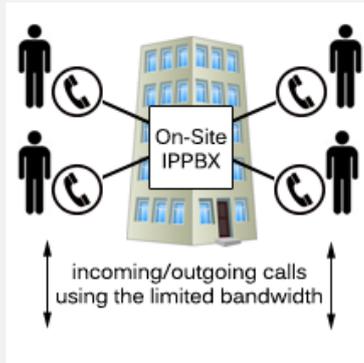
Solution: an on-site system that will route internal calls locally, freeing up the bandwidth to support incoming and outgoing non-local calls.

Scenario 2
A large national provider has branches in many different cities, several of which are in remote locations.
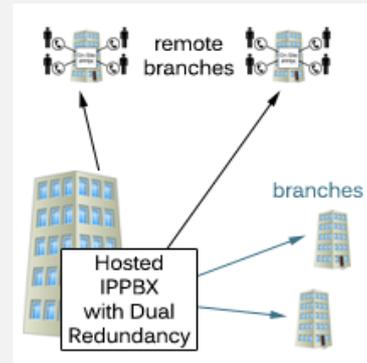
Solution: a large hosted infrastructure with dual location redundancy for the headquarters and many of the branches, in addition to on-site PBXes for the remote locations that do not have bandwidth, preferably with the same software as to provide continuity and minimize training efforts.

Scenario 3 A manufacturing plant of 200 staff members with 100 pre-existing cabled analog handsets already patched. The company does not wish to lose their investment in the 100 handsets and cabling.
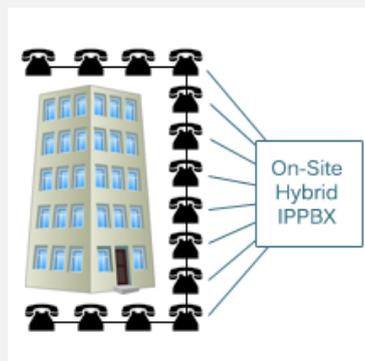
Solution: an on-site hybrid system linking the existing handsets and adding new IP possibilities.

Scenario 4
A small business that employs four home workers, none of whom take responsibility for IT matters.
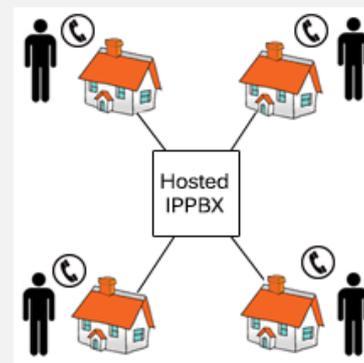
Solution: a hosted solution that gives users communication abilities without any need for maintenance or installation.
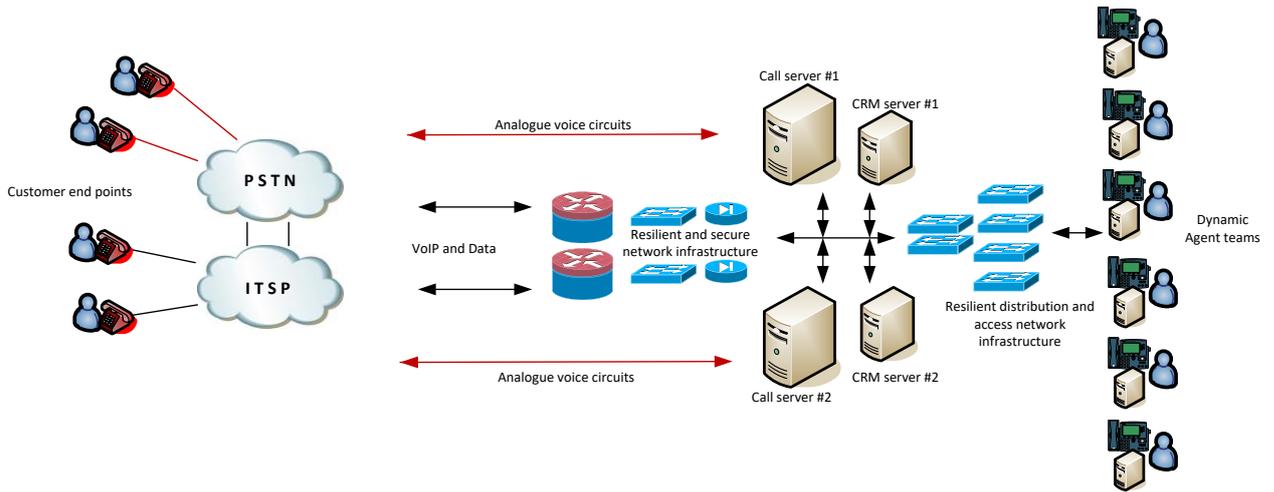
above – typical enterprise VoIP solution

Vast savings can be obtained by moving from proprietary manufactures voice systems to open {manufacturer agnostic} voice systems
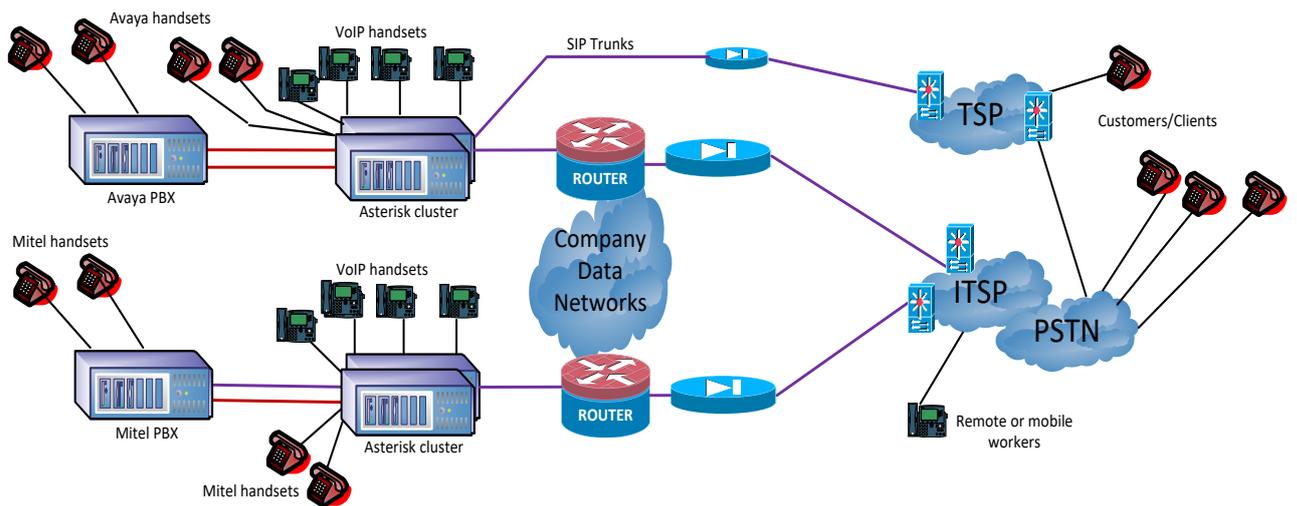
above – typical enterprise migration from legacy PBX

KCCVoIP can design and assist with any migration to ensure the move to VoIP and/or away from expensive manufacturers is phased to suit the business

EXAMPLE SOHO comparison -   Hosted vs Premises VoIP: SOHO (4 domestic + 2 office phones)

SOHO - assuming existing analogue line with aDSL and Internet provision >8Mbps. SOHO and domestic requirements call for call routing based upon time of day and callerID, call blacklist and hacker filters, supply of 4 x DECT wireless telephone handsets for the domestic environment and 2 x office deskphones for the office…. Existing analogue phone provides emergency and power/Internet outage cover.

HOSTED COST ESTIMATE - $ 580 {£580} year 1   then $ 288 {£288} per year

No increase in Internet provision - assumes existing monthly payments unchanged

Hosted VoIP provision for 6 extensions @ $4 {£4} =   < $24 {£24} **per month**

Hosted VoIP service setup charges   < $30 {£30}

Hosted VoIP **service feature charges** (call blacklists, call routing}

Moves, adds and changes **may be chargeable**

Any additional extensions or phones **are chargeable and increase the monthly fee**

Smart phones and/or softphones are **chargeable and increase the monthly fee**

Features and functions will be limited to hosted provider and **may be chargeable**

4 x DECT wireless telephone handset bundle for domestic/roaming use < $180

2 x Office deskphones for office use < $120

PREMISES COST ESTIMATE - $900 {£900} year 1 then $120 {£120} per year

No increase in Internet provision - assumes existing monthly payments unchanged

DID telephone number provisions <$4 {£4} x 2 = $8 {£8} per month

Premises voice server   approx. $500 {£500}

May be costs for configuration of the voice server

4 x DECT wireless telephone handset bundle for domestic/roaming use < $180

2 x Office deskphones for office use < $120

Moves, adds and changes **with no charge**

Extensions can be added **at any time without cost**

Smart phones and/or softophones can be **added without cost**

Additional DID numbers, geographical numbers or toll free numbers can be added

Features and functions are rich and native to the premises server **without cost**

May need support company to assist or train in use of premises system

Support can be contracted, paid ad hoc or on account top-up

Can be fully integrated with business CRM, database, home automation, lightin/heating/AC, security, smart home and entertainment etc.

As shown above the comparison between Hosted and Premises can be very complex, never straight forward and vital to have the full and detailed requirements considered to enable true comparison.

As the amount of extensions increases or the feature requirements and flexibility increases, the Premises VoIP topology becomes more and more economic.

For a limited amount of features and small number of extensions, the Hosted VoIP topology is more economical.

Some companies opt for a hybrid {mixed} environment where they combine some cloud services with on-premises.

Migrating from a proprietary brand such as Cisco, Avaya and Mitel, can save a great deal of money and open up options for the future.

Consider Any Disadvantages

Depending on your company UPS and mains configuration, if there is **a power outage**, **the phones go off**.   For your location, you need to evaluate how often your power goes out and what is the cost to the business during the power outage. Then you can consider the options for UPS.   A company must also consider the legal requirements to provide an emergency telephone for E999/E911/E112 calling.

For a SOHO or domestic implementation, If your **Internet goes down** then the **VoIP phone system is down**. Having two Internet providers on two circuits can be expensive, but removes the single point of failure.

It used to be acceptable to have a small number of analogue phone lines as a back-up for Internet and/or power outages, but with PSTN switch off, ALL of the landlines and analogue devices {old phones, alarms, FAX, franking machines, monitoring circuits, backup and emergency lines etc.} now need to be voip connected.   This can be achieved either by upgrade, replacement or by installing an ATA {analogue telephone adapter} to allow an analogue device to connect to digital voip networks.

Medium/large and enterprise business will typically have multiple network devices connecting multiple WAN circuits and multiple Internet provisions to ensure 99.999% availability for all of the data and voice services.

If you install just one server as your only voice server, what steps do you need take to ensure backups and resilience – do you need to consider high availability servers and/or backup systems ?

Selecting the Best Telephony for a Business

KCCVoIP are not tied to any manufacturer or provider and therefore provide an unbiased service to assist with the choices, design, implementation, training and support of VoIP systems.

Making an uninformed choice can be costly, time consuming, and a painful experience for the business.

A few hours consultation can save you and/or your company a great deal of time and money.   The more details and better understanding you have of your business requirements, the easier it will be to select the most cost effective solution for your telephony.

Start with a checklist that helps define the current and future requirements for telephony and details any existing equipment.

As a general rule – for basic VoIP services, it is more cost effective to use hosted/cloud providers for a site with less than 60 extensions/users and use onsite equipment for any site with more complex needs or more than 60 extensions/users.

Business Telephony Checklist Example

Quantity and site locations   {now and future - helps decide Hosted vs Premises and costing}

Quantity of extension   {now and future - helps decide Hosted vs Premises and costing - quantify the extensions for each site + remote requirements}

Estimated concurrent calls peak for each site {now and future - helps cost trunks and/or data/Internet bandwidth and voice server(s) sizing}

Dialing requirements {now and future - outbound vs inbound, countries to dial, toll free numbers, toll-by-pass, call recording, roaming, follow-me mobility etc…}

Features required   {list every required feature, nice to have and not required}

Existing telephony   {helps cost any integration and migration}

Existing telephony circuits   {technology details and contract end dates, helps cost any integration and migration}

Existing analogue circuits   {helps decide what provisions are required for emergency dialing, + requirements for FAX/franking/alarm/security equipment etc}

Existing networks   {helps plan bandwidth requirements}

Existing Internet provision   {helps plan bandwidth requirements}

Existing telephone numbering   {existing number may need to be ported to alternate VoIP providers + list any future requirements such as 0800/1800 toll free, geographical numbers and analogue requirements for FAX/Franking/Alarms etc}

Existing support staff   {level of expertise on various manufacturer and generic systems -   very useful to decide if you could manage your own system in-house}

Agent and ACD requirements {quantify agent groups and call flows}

Security levels {any PCI compliance issues - detail CDE and encryption needs}

Required application integration {CRM and database systems etc.}

Existing Support and maintenance contracts {time to fix and SLAs}

Home and Home-Office Telephony Checklist Example

Quantity and site locations   {now and future - helps decide Hosted vs Premises and costing}

Quantity of extension   {now and future - helps decide Hosted vs Premises and costing - quantify the extensions for each site + remote requirements}

Estimated concurrent calls peak for each site {now and future - helps cost trunks and/or data/Internet bandwidth and voice server(s) sizing}

Dialing requirements {now and future - outbound vs inbound, countries to dial, toll free numbers, toll-by-pass, call recording, roaming, follow-me mobility etc…}

Features required   {list every required feature, nice to have and not required}

Existing telephony   {helps cost any integration and migration}

Existing telephony circuits   {technology details and contract end dates, helps cost any integration and migration}

Existing analogue circuits   {helps decide what provisions are required for emergency dialing, + requirements for FAX/franking/alarm/security equipment etc}

Existing Internet provision   {helps plan bandwidth requirements}

Existing telephone numbering   {existing number may need to be ported to alternate VoIP providers + list any future requirements such as 0800/1800 toll free, geographical numbers and analogue requirements for FAX/Franking/Alarms etc}

Required application integration {CRM and database systems etc.}

for unbiased advice
www.kccvoip.com

We can provide a detailed report to show you how to save money on your telephony

Make sure you are ready for the PSTN switch off