

## COMMUNICATIONS OPTIONS

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### *Conventions*

- Fact vs. Opinion
- No one knows everything
- Application vs. Theory
- Mission critical processes must be fault tolerant or redundant
- UL/ULC requirements must be met
- Systemic approach

### *Fact vs. Opinion*

- A fact is information that can be proved objectively.
- An opinion is information which can not be proved.
- I will always try to distinguish between a fact and an opinion.

### *No one knows everything!*

- I am leading the seminar, but I don't know everything.
- Some of the things presented here may even be incorrect.
- If you question something or there's something that has been missed, please speak up.

### *Application vs. Theory*

- We're in the business of applying our knowledge and skills – not learning knowledge per se.
- Our bosses expect us to make everything work perfectly. They don't care how much we know about technology. They care about what we do with it to make the station run better and more profitably.

### *Mission critical processes...*

- Every mission critical process should be fault tolerant and if not, then at least, redundant.
- A fault tolerant subsystem switches to backup automatically, ideally, without delay.
- Redundant means the backup is available to substitute manually.

### *UL/ULC requirements...*

- Where UL/ULC sets standards, they must be met.

### *Systemic approach...*

- Look at the Central Station environment as a single system.
- Look at communications as an integral part of the Central Station—not as the technologies themselves.

### *What does a Central Station do?*

- A central station is a place that receives information (frequently related to security), processes and acts upon it.
- Acting upon it usually involves notifying someone outside of the station.
- The core technologies that bring in the information, process and send it out are communications technologies.

### *Incoming information...*

- Data
  - Traditional codes (alarms), emails, SMS, faxes
- Voice
  - Calls from users, technicians, responders, authorities and utilities.
- Video
  - Push or pull video clips or real time observation.

### *Services used to get information to and from the Central station...*

- POTS
- ISDN
- Analog DID
- Cellular
- Celemetry
- Proprietary RF
- Internet
- IA (Integrated Access)
- SIP
- PRI

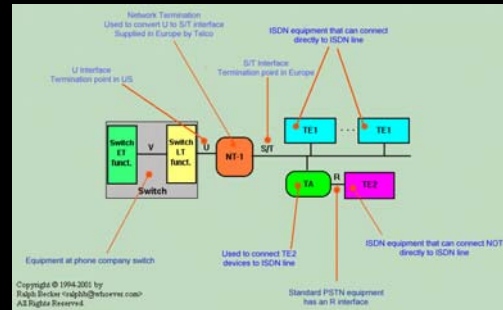
### *POTS*

- **Plain Old Telephone Service**
- A pair of copper wires for each unique telephone line.
- Most common method of receiving alarms and telephone calls.
- Maximum data speed is 56kb (kilobits) per second.

## ISDN

- **Integrated Services Digital Network**, is a system of digital phone connections that allows voice and data to be transmitted simultaneously using end-to-end digital connectivity.
- Contains 2 B channels (each capable of 64kb/sec) and a D channel (control channel)
- Recently displaced by broadband Internet service

## ISDN Graphic



## Analog DID

- A copper pair that sends DNIS and doesn't require a digital card at the customer end.
- Frequently used for elevator monitoring or a small, virtual receiver application where a full blown PRI is cost ineffective.
- Unidirectional, usually inbound only.
- Does not require a Telco interface but does require an equipment interface to 'wink' the central and read DNIS.

## Cellular

- Similar to a POTS line but calls use the cell network for part of the transmission.
- Can be a standalone cell phone in the station (e.g.. required by UL for emergency use) or a transponder in the field to send alarms
- Can be a cell socket—a device that connects to your PBX and behaves as a trunk

## Celemetry

- Uses the 'control' channels of the cellular networks—digital only
- Original purpose to track cell phones coming in and out of tower cell coverage
- Can be used to send alarms, location and access control information from subscriber sites to central stations
- Include GPRS/GSM

## Proprietary RF

- The use of a private radio channel(s) to transmit and receive alarms and communicate between staff.
- Examples of this technology: CRN, AES Intellinet, Seaboard, etc.

## Internet

- Newest technology for receiving alarms
- VPN
- WAP applications
- Remote access to station via thin client, web browser, Terminal Server
- Can be used to pull PRI over long distances
- Broadband supports near live video

## SIP

- SIP - Session-Initiation Protocol. You may wonder what it has to do with network communications.
- SIP is the call control or signaling protocol that establishes and terminates media sessions. Examples of a media session include voice calls, streamed videos, or audio conferences.
- **A highly-flexible protocol**
- SIP specifies the basic and supplementary services to create, modify, and delete these multimedia sessions or calls. By utilizing SIP, companies like MCI, AT&T, etc., enables customers to use applications regardless of the client's network or access type.

## Authentication

- Authentication Services
- If your network is open to remote access, static passwords are no longer enough to ensure that only authorized users gain entry. People can share passwords or, worse yet, find ways to guess them.
- **Strong Authentication** uses RSA ACE/Server® and patented RSA SecurID® token technology to combine two-factor authentication with a powerful time-based algorithm for identifying users and allowing network access. Only visitors using the personal identification number they've chosen and a complex 60-second token code can get in.
- **Managed PKI for Remote Access** gives you a Public Key Infrastructure and Certificate Authority without the burden of deployment, maintenance, or oversight. You keep control of your security policy, authentication models and certification lifecycle and allow us to do the implementation. A secure solution without the investment of time and staff.

## Firewall

- **Managed Firewall Protection** provides secure Internet access and server data protection without the need to administer the firewall yourself.
- **Enterprise Firewall Protection** for customers that want to manage their own solutions. It enables customers to integrate access control, authentication, address translation, content security, and detailed auditing.
- **Personal Firewall Protection** is a security solution for desktops and individual PCs, ideal for protecting small offices and remote users.

## Integrated Access

- **Combination of voice lines and data**
- XO - a minimum of 6 lines/trunks with a minimum of 14 channels on the T-1 must be utilized
- Flexible to meet individual demands and scalable to grow with your business, Integrated Access is ideally suited for any small or growing company with moderate bandwidth (128 Kbps to 1.024 Mbps) and voice (6\* to 23 lines) requirements

## PRI

- Also referred to as a Digital T1
- The technology of the future—today
- Provides up to 23/24 talk paths, (telephone lines, DSO's)
- Can be inbound or outbound or both
- Inbound identifies itself with DNIS
- For PBX, requires a digital trunk card

## What transports are used by these services?

- Copper
- PTP Microwave
- Cable Modem
- xDSL
- T1/T3 and Optical fiber

## Copper

- Paired copper wire usually provided by the Telco
- Most common transport in stations today

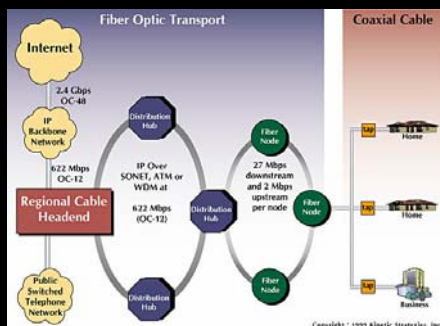
## PTP Microwave

- (Point to Point) A method of moving digital data via RF in the Microwave (mm), band between two points that can see each other (line of site)
- Commonly used for data or Internet connection but can also be used to support a PRI

## Cable

- Can be used for both Internet and telephone services (VoIP)
- Delivers Internet downstream speeds up to 5mb/sec
- Upstream is less
- Speed is not affected by distance from the head end

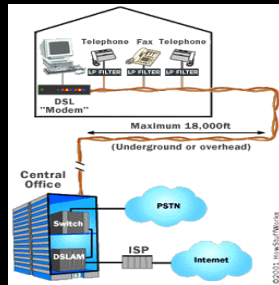
## Cable graphic



## xDSL

- Uses Telco lines (copper pairs)
- Can be used for Internet and telephone services (VoIP)
- Speed varies with the distance from the DSLAM (*Digital Subscriber Line Access Multiplexer*)
- Similar speeds to Cable if close to C.O.
- Most providers use PPOE

## *xDSL Graphic*



## *T1/T3 and Optical fiber...*

- T1/T3—A digital transmission link with a capacity of 1.544/44 Mbps. Uses two pairs of twisted wires
- OC3, 12, 48, etc.—Optical fiber. Higher capacity
- These are alternatives to Cable and xDSL
- Service, bandwidth and latency can be customized to station's needs
- Dedicated service
- Voice and data can be shared as a service offering

## *Fiber Sonnet Ring*

- A SONET ring is composed of a circle of fiber optic cable and network elements that, when cut or disabled, automatically reroute traffic around the fault to the unbroken side of the loop. Rings can detect, analyze, and restore themselves within 100 milliseconds (ms) of a fiber outage.
- The equivalent of a Sonnet ring can be also be constructed using copper (T1) from a 2<sup>nd</sup> C.O.

## *Fiber Sonnet Ring*



## *Leveraging telephony*

- What are the features and services available from the Telco and what equipment do you use them with to improve the Central Station?
- Are you aware of everything and have you considered what it can do for you?

## *Equipment, Features and Services – older technologies*

- PBX/PABX/Centrex
- Analog DID
- Caller ID
- Caller name display
- CF/RCF/SLR
- Voice Mail
- LAN/WAN

### *PBX/PABX/Centrex*

- Private (Automatic) Branch Exchange
- Private telephone network used within a company
- Incoming calls can be routed without human intervention
- Routing can use DNIS or automated attendant
- With Centrex, switching is done at the C.O.

### *Analog DID*

- Used with a PBX or interface to input/process and output a call based on the number being dialed.
- When a station can't support the costs of a PRI but needs DNIS to route calls or respond differently to calls arriving on a different trunk, this is used.
- Application: Answering elevator emergency phones knowing the address in advance.
- Answering for dealers (3<sup>rd</sup> party) in their company name.

### *Caller ID*

- The Bellcore standard is used in the USA and Canada.
- Commonly used with receivers to double check—account number against last known phone number dialed from
- Some automation software will present the discrepancy as a warning to the operator.

### *Caller name display*

- Used with PBX or interface to input/process and output a call based on the name the owner of the line has listed with the Telco.
- Applications
  - To answer the incoming call with the owner's name.
  - To further track down calls for which the communicator address or name isn't previously known.

### *CF/RCF/SLR*

- Call forwarding/remote call forwarding
- Used to present local presence and/or to reduce long distance charges
- RCF allows you to change the number to be call forwarded to from a remote location
- In Canada, forwarded calls are artificially limited to one at a time
- SLR (Single Line Reach). 10 digit number that routes based on rules provided by you. Because this is a bridging solution there may be incompatibility issues with different terminations.

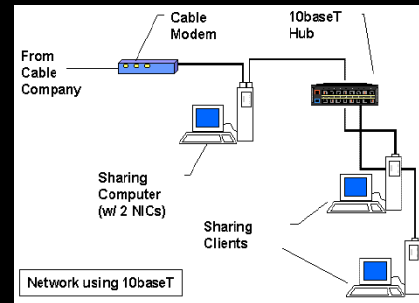
### *Voice Mail/IVR*

- Used with a PBX or interface unit to answer, transfer, direct and record voice calls and faxes.
- Used in conjunction with VLANS, IP phones and/or VoIP devices, a call can be transferred to the other side of the world instantly

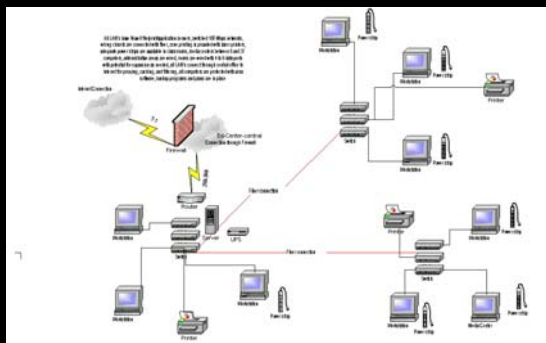
## LAN/WAN

- Local area network/Wide area network
- No medium size or larger station can live without a network. Communications technologies is the glue that connects servers, computers, software and the outside world together, which without this, we are out of business. A WAN consists of 2 or more LAN's.
- The largest WAN is the Internet

## LAN Graphic



## WAN Graphic



## Equipment, Features and Services – newer technologies

- PRI
- ANI
- IPX
- IP Phones
- IP Lines
- ROBO
- WLAN
- VLAN

## PRI

- Up to 23 voice/data channels and one control channel
- Can blend or standalone voice/data in any combination of 23 channels
- Use with digital card in a PABX to direct DNIS to extensions, fax machines, receivers
- Use with virtual receivers

## ANI

- The telephone number assigned by the wireless carrier to the cell face or PSAP. Also known as Pseudo-ANI and Emergency Service Routing Digits (ESRD).
- Supplied by PRI to a digital PBX or virtual receiver
- Digital equivalent of Caller ID.
- Used by virtual receiver for AHS—passed on to automation to cross check account #

## IPX

- A (PBX) that supports peer-to-peer connectivity, as well as IP transport and traditional TDM telephony
- The next step for centrals to connect ROBO's together over great distances, sharing one common switch.
- Calls can be recorded, transferred and managed across the country or around the world.
- New vendors: Cisco, 3Com and other companies traditionally thought of as network vendors.

## IP Phones

- Handsets that connect to an IPX over an network (usually Ethernet), connection and without it, wont work.
- Stations that span distance can deploy a SIP based IPX solution, bridged to conventional PBX for an end to end solution with local loops.
- Modern stations and those preparing for the future will be using this technology sooner than later.
- SIP, H3, etc.
- WiMAX coming soon

## IP Lines

- Telephone lines that connect to the closest switch via the Internet (VoIP)
- Vonage, etc.
- Portable
- Have local numbers terminate in the station
- Use to dispatch with local exchanges to remote locations

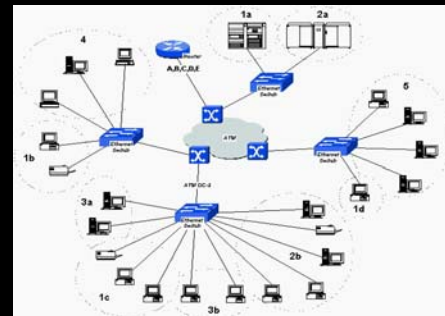
## ROBO

- **Remote Office/Branch Office**
  - Administrative or service facility connected to and communicating with central over IP
- **Branch stations**
  - Call centres that handle alarms from a local region—connected to automation and IPX via the Internet
- **Remote stations**
  - Remote signal processing centres—connected to automation via the Internet

## VLAN

- *Virtual LAN*, a network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a LAN.
- Cornerstone of the RSBS—connecting them to automation and IPX seamlessly, over IP

## VLAN graphic



## *Technologies to manage the station*

- Pagers – Numeric and alphanumeric and voice
- IVR – messaging inter ops – messages for managers – auto notification
- Email
- Blackberries
- SMS

## *Pagers*

- Numeric and Alpha pagers
- Inter operators/operations
- Contact supervisors/managers
- Relay info to dealers (3<sup>rd</sup> party)
- Message users of special conditions
- Limited info.. Numeric extremely limited

## *IVR*

- Integrated Voice Messaging
- Automate messaging to operators/managers/supervisors
- Mailboxes with instructions for situations
- Automatic xmission of pre-recorded messages based on events process monitoring or manual

## *E-mail*

- Most comprehensive method of communications between staff
- Rich detail while being succinct
- Pre-programmed events xmitted in detail tied into wide range of process monitoring
- E.g., Notifications when servers go down, processes go down, switching to backups, to monitor pre-arranged events, track time and attendance, etc.

## *SMS*

- Simple Messaging Services
- Very succinct – short (160 bytes) messages
- Valuable for sending short notification messages
- Very fast.. <2 seconds from source to destination from within a network
- Integration with station systems currently requires a 'socket' connection via a wireless carrier

## *Blackberries, Blueberries and others*

- Most efficient, thorough and comprehensive way for staff to maintain contact with each other and the station.
- Superb for automated and remote monitoring of processes
- Unified form of messaging to keep everyone up to date effortlessly
- Remote control through WAP interface
- Gateways can back up

### *Communications cost analysis*

- Communications is the 2<sup>nd</sup> largest expense for the modern station (labor is the 1<sup>st</sup>)
- Stations deal with life/safety issues
- Communications cost is an important consideration but not at the expense of life safety

### *Reasons for leaving copper?*

- Allows leveraging of communications channels
- Can combine voice, receivers and data (internet)
- Only option if copper is limited
- Based on DNIS

### *What's to use?*

- Integrated Access
- PRI
- Depends on what you need to do now and in the future?

### *Costs*

- 23 Channels of PRI – approx \$600/mo
- DID's vary from 10 cents to 25 cents
- In Canada, a PRI is approx \$850
- DID's vary from \$.05 to \$2.50
- Analog lines – approx \$35/mo with required services

### *Costs*

- How many voice lines do you have? Need?
- How many receiver lines do you have? Need?
- Are you 3<sup>rd</sup> party? You need private lines for dealers. Want to answer in the dealer's name. You need a PRI.

### *Costs*

- With a PRI, you do NOT need a virtual receiver but you will probably want to use one
- You can direct specific DNIS to specific channels – allowing you to run in non-virtual mode
- You can send caller ID in DTMF or FSK

## Costs

- Using DNIS (DID's) for voice and for virtual receiving requires special equipment
- PABX requires a T1 card or use an interface (e.g.. Atlas 550 most commonly used)
- With IA in the US, some carriers will provide the interface for you, (e.g.. XO)

## Costs

- \$7500 for a T1 card for a modern PABX.
- You're a station – you need 2 of everything
- An Atlas 550 costs \$3500. You need 2.
- What if your PRI goes down, you need 2.
- Does your PRI route through the same conduit. Is it amplified? (More than 18,000 ft from the CO). Are you provisioned with separate conduits and isolated amplifiers? If not, you could lose it all.

## Costs

- Radionics 6600 and SG III most popular Virtual receivers. Both UL listed.
- Major differences. SGIII is fault tolerant. R6600 is not.
- SGIII has AHS. R6600 does not (yet)
- For 23 lines, the SGIII costs \$30K. The R6600 costs \$10K.
- Both require an interface like an Atlas 550 (2 for redundancy) or a fault tolerant switch (e.g.. Avaya)

## Costs

- Copper lines for voice and for receivers are independent. Normal fails are one at a time.
- T1/PRI – they all fail at once
- Copper is simple to troubleshoot. T1/PRI is not, (compression, timing, framing, etc)
- Unless you have a lot of lines, lightly loaded, going virtual may not bring you a lot of savings.

## Costs

- PRI has many advantages
- Dedicated 10 digit numbers for everything. Receiver groups, individuals within your company.
- Ideal for IVR – auto routing to voice boxes and fax
- Provide dealers with their own lines without cost

## Costs

- AHS reduces line costs if used properly
- Presents correct handshake immediately
- Can block runaways
- Can mix mutually exclusive handshake requirements on a single line (not recommended)
- Lowers your costs

### *Costs*

- If you're not big enough to support 2 PRI's (remember – you need redundancy) for receivers, consider sharing voice and receivers on the same PRI
- Getting 100% caller ID (ANI) is also valuable
- Choosing the right provider you can get ANI – even from private and blocked calls.

### *Costs*

- Example – change to PRI in 2004.
- 102 dialer lines and 34 voice lines
- Converted to 4 PRI's, 92 channels
- Monthly costs didn't change much.. Still around \$4K/mo
- Additional dealer receiver and voice lines are not \$30 now. Future growth is where the savings are realized.

### *Advantages in example*

- All calls – voice and dialer – 100% xmit ANI now – less than 77% xmitted before
- Voice lines are now interchangeable.. 46 voice channels total – significantly more than before
- NONE – not a single busy signal for a dialer. Measurable from the station side now.

### *The Future of Station communications*

- All phone services use the public Internet
- PBX becomes IPX
- Local 911 available to all stations via IP tandems
- Stations will push premise pop's via IP-E 911