NETWORK DESIGN FOR SECURITY SYSTEMS

Vigitron Educational Series #1

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Topics

- THE ROLE OF EACH COMPONENT IN A NETWORK
- CHALLENGES FACING IP CCTV SYSTEMS
- PoE SPECIFICATIONS & IMPORTANT FACTORS
- FIBER OPTICS CONSIDERATIONS
- RECORDING AS A NETWORK
- INSTALLATION MADE EASY

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THE ROLE OF EACH COMPONENT IN A NETWORK

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The role of each component in a network

Regardless of Product Specifications, if you cannot transmit data from Point **A** to point **B** nothing else matters.

Recording Devices are also network components

Cables matter

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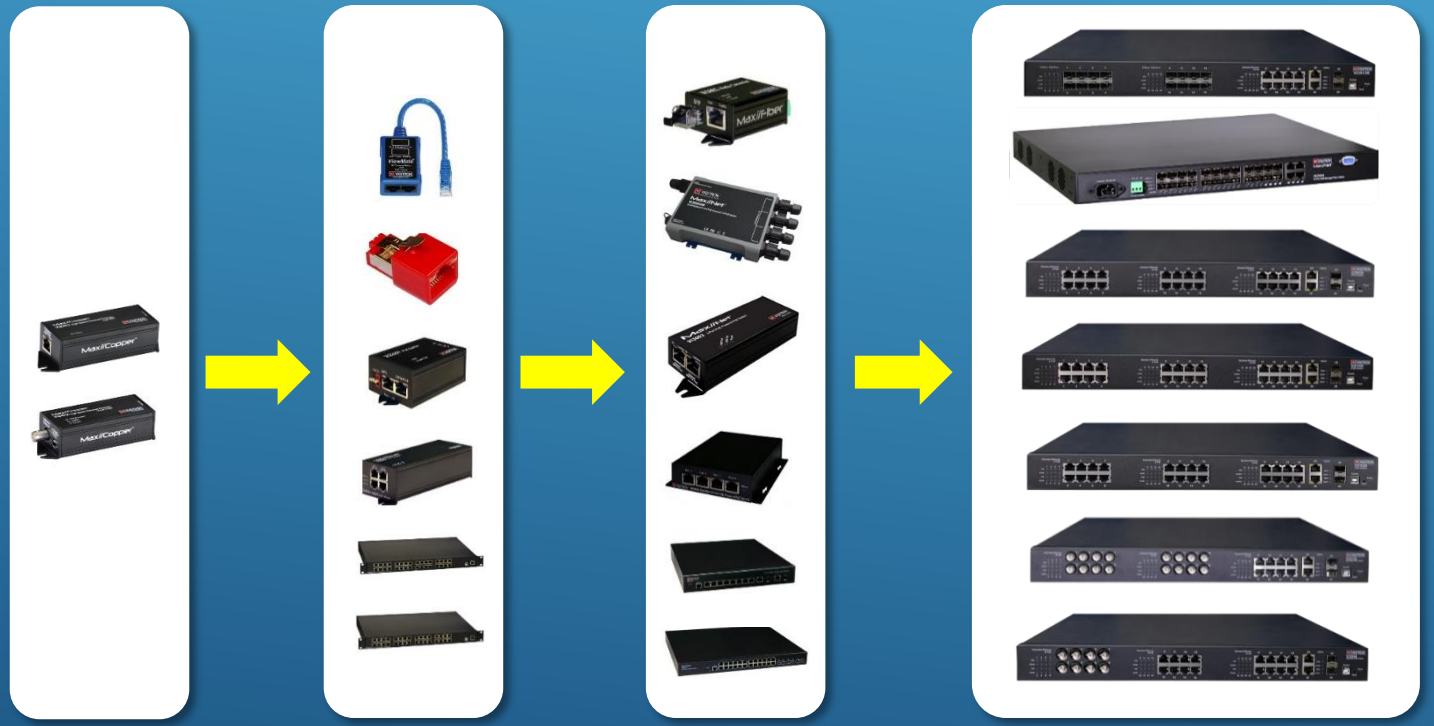
Every part of the system matters

Networks are interactive

All components within the network affect performance of the network itself.



Extenders

Midspans, PSEs, Surge Protections, Meters

Midspans + Extenders, L2+Network Switches, L2 Harden Switches, Fiber Convertors

Fiber Core Switches L2+Midspan+ Extenders Very High PoE Switches

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CHALLENGES FACING IP CCTV SYSTEMS

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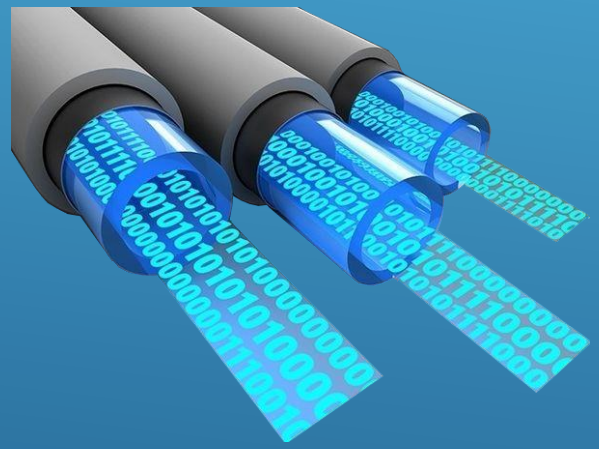
Challenges Facing IP CCTV Systems

Bandwidth:

As resolution of megapixel cameras increase, so does the need for higher packet sizes. As the need for more images per second and dual streaming increases, so does the need for higher transmission bandwidth.



Power:

As camera features such as day/night, auto back focus, LED operation, and PTZ increase the required power increases too.

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PoE SPECIFICATIONS & IMPORTANT FACTORS

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Components of a PoE system

PoE Sourcing Device (PSE)

PoE Switch

Midspan

Up to 100m Cat5/6 UTP Cable

Powered Devices (PD)

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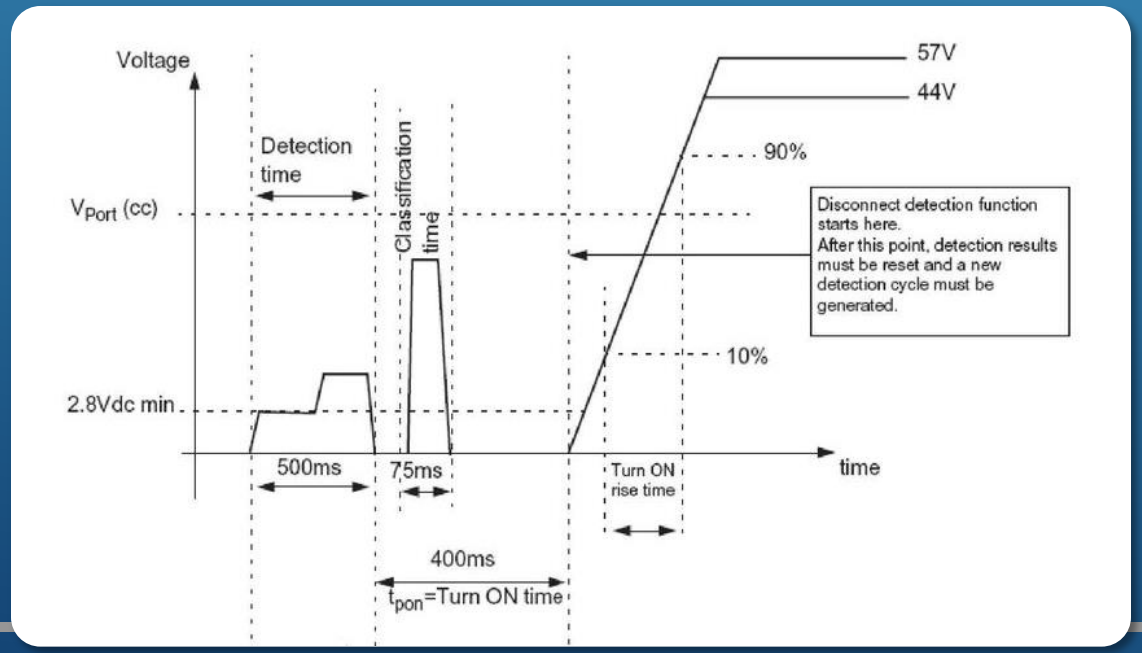
How PoE works?

- The **PSE** sends a **Detection** (Discovery) Pulse the **PD**.
- The **PD** places specific resistor on line to acknowledge that it is a valid PoE device.
- Non “802.3af” **PSE**s send a **Classification** pulse to know how much power the **PD** needs.
- The **PD** places specific resistor on line to let the **PSE** know how much power it needs.
- The **PSE** provides requested power level to **PD**. If the voltage at **PD** is lower than expected the **PD** does not start.
- The **PSE** continuously monitors the current to the **PD**. If it exceeds the requested power level, **PSE** shuts down power.
- If PoE disconnected the **PSE,** depending on programing, sends **Detection** pulses until the whole cycle starts and power is restated.



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PoE Standards: IEEE802.3af, IEEE802.3at, IEEE802.3at

IEEE Standard	802.3af	802.3at	802.3bt*	802.3bt*
Type	Type 1	Type 2	Type 3	Type 4
Status	Released	Released	Draft	Draft
Maximum number of energized pairs	2 Mode A (Endspan) Mode B (Midspan)	2	4	4
Maximum DC current per pair	350 mA	600 mA	600 mA	960 mA
Maximum power provided by the Power Sourcing Device (PSE)	15.4 W (Class 0) 4.0 W (Class 1) 7.0 W (Class 2) 15.4 W (Class 3)	15.4 W (Class 0) 4.0 W (Class 1) 7.0 W (Class 2) 15.4 W (Class 3) 30.0 W (Class 4)	45.0 W (Class 5) 60.0 W (Class 6)	45.0 W (Class 5) 60.0 W (Class 6) 75.0 W (Class 7) 90.0 W (Class 8)
Minimum power required at the Powered Device (PD)	12.95 W (Class 0) 3.84 W (Class 1) 6.49 W (Class 2) 12.95 W (Class 3)	12.95 W (Class 0) 3.84 W (Class 1) 6.49 W (Class 2) 12.95 W (Class 3) 25.5 W (Class 4)	40.0 W (Class 5) 51.0 W (Class 6)	40.0 W (Class 5) 51.0 W (Class 6) 62.0 W (Class 7) 71.3 W (Class 8)
PSE Output Voltage	44 - 57 VDC	50 - 57 VDC	50 - 57 VDC	52 - 57 VDC
PD Input Voltage	37 - 57 VDC	42.5 - 57 VDC	42.5 - 57 VDC	41.1 - 57 VDC

* **PoE Compatibility**

Even though the 802.3bt standard has not released yet but there are several PoE ICs and devices are available that some use 2-PSE/2-PD configuration and some 2-PSE/2-PD configuration. When choosing a higher than 30W PoE solution we should note the differences.

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The Effect of Cabling on PoE

As cable distance increases

Cable resistance increases

Voltage and available power at the camera end decreases

30W

15.4W

IEEE802.3at

25.5W

The Source/Load power difference is due to cable loss.

IEEE802.3af

12.95W

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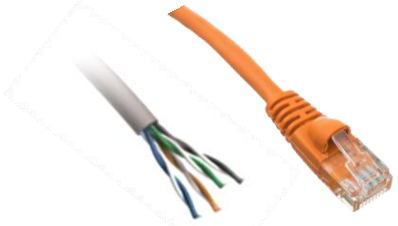
Do Different Cables yield Different Results?



CAT 5E/6
(4 PAIR)

COAX

FIBER

18-2
(2 –WIRE)

Different cables within the same type yield different results.

Coax has no fixed standard for IP/PoE

Single pair wire specifications are very different from 24/2 to 18/2

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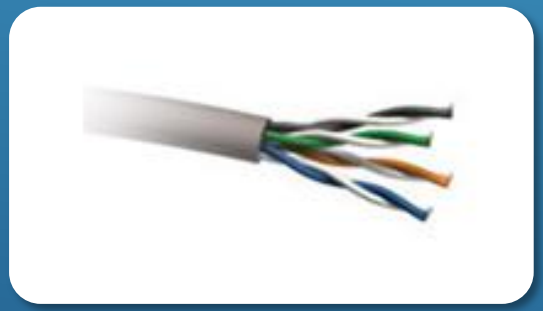
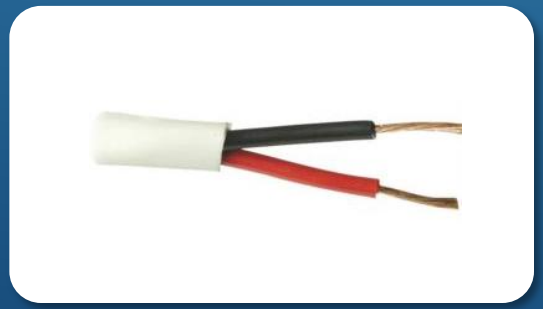
Cat5e/6 UTP Cables vs. single pair wires



Cat5e/6

- Bandwidth up to 1G/10G
- Uses 2 pairs for Class 0-4 and 4 pairs for PoE>30W
- Can handle up to 95 watts if A & B pairs are used
- Can Transmit IP Video and PoE up to 3,000 feet (Using Vigitron Solutions)
- High noise cancelling capability



Single Pair

- Bandwidth Limited to only 10Mbps
- PoE depends on thickness of wire
- IP Video transmission limited to approximately 1700 feet
- Susceptible to noise

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Cabling Resistance

The higher the Gauge or AWG, the smaller the diameter and the higher the resistance is.

Size		Diameter		Resistance @ 77°F	
AWG	Metric mm^2	inch	mm	ohm/1000'	ohm/km
24	0.205	0.0232	0.590	26.1823	85.900
22	0.326	0.0293	0.744	16.4592	54.000
20	0.518	0.0369	0.938	10.3632	34.000
18	0.823	0.0465	1.182	6.5227	21.400

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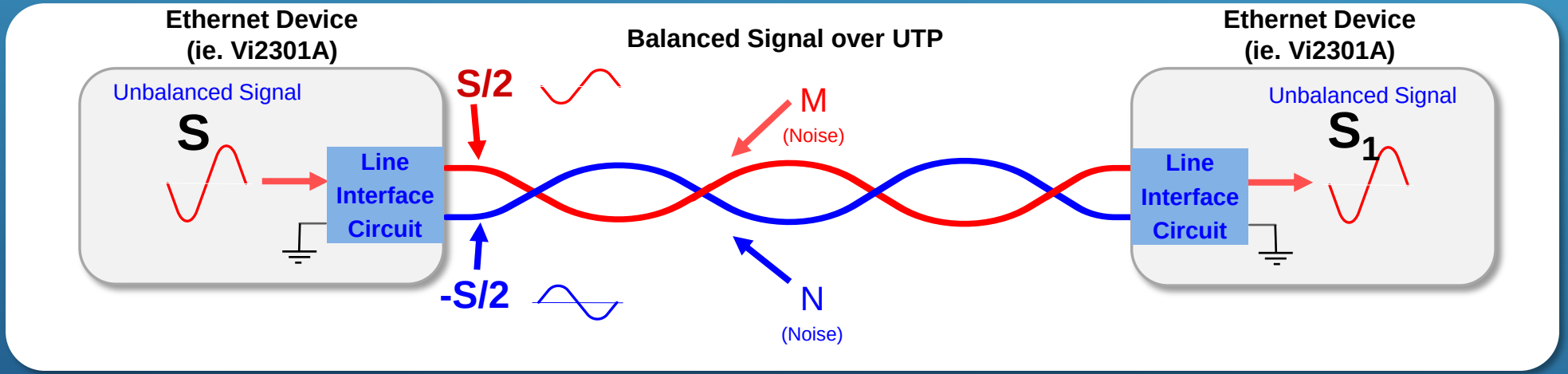
Twisted Pairs can eliminate noise & interference



$S_1 = (S/2+M) - (-S/2+N) = S + (M-N)$

Noise is minimal when **M** is similar to **N**.

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FIBER OPTICS CONSIDERATIONS

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Fiber Optics Design Parameters

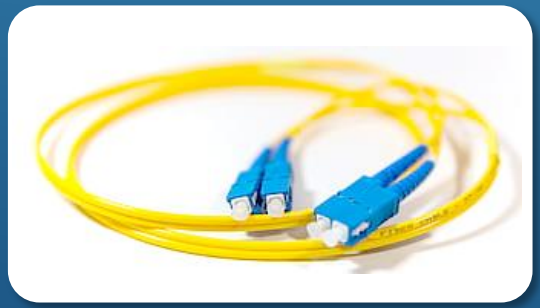
Matching SFPs

- The only standard the MSA (Multi-Source Agreement) which only applies to the physical interface.
- SPFs must match on both ends of the cable
- The ability of the switch to read bandwidth and the DDMI (Discovery and Dependency Mapping) is dependent upon the switch and SFP firmware

Warning: Since there are no standards for interfacing, if a switch does not recognize the transmitting frequency it will not recognize the SFP.

Possible Solutions

- Fix the port speed
- Run the port speed in auto
- Use a 1G SFP



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RECORDING AS A NETWORK

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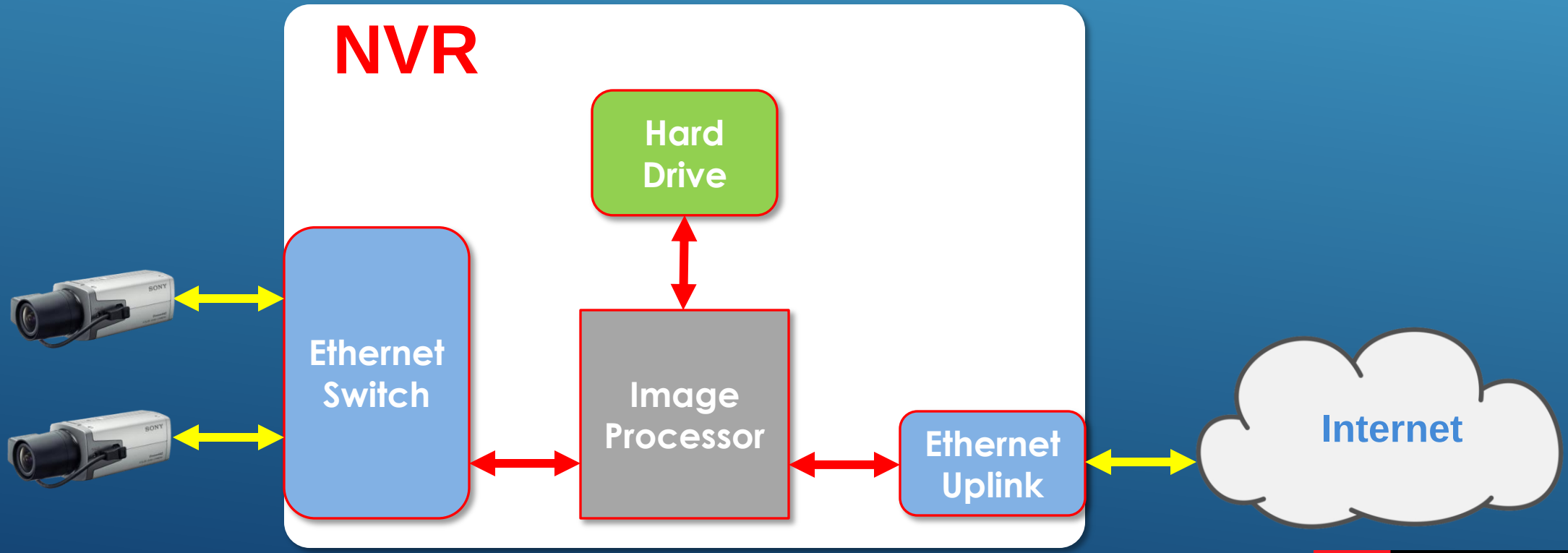
Recording Devices have their own internal Network Bandwith limitation



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INSTALLATION MADE EASY

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What Questions to Ask When Designing An Infrastructure?

Background: Each design is unique. There is no cookie cutter approach to designing an infrastructure. Each design will require knowing the following information:

Cameras: What is the manufacturer and model number

Number of cameras routed to a single network switch (IDF- Intermediate Distribution Frame) If different cameras are going to the same location you need to know the manufacturer and model numbers for all the cameras routed to a single location

Cable: Type of Cable:

- **Coax:** RG6, RG11, RG59
- **UTP:** Cat5e or 6
- **Single pair:** 18/2, 20/2, 22/2, 24/2
- **Fiber:** single mode (9/1.25), multimode (62.5/1.25 or 50/1.25)

Cable Length: Longest cable distance to a single point.

PoE Source: Manufacturer and Model number

Important Warning!

Never Design a System without studying all the component specifications.

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Benefits of Vigitron's Design Center

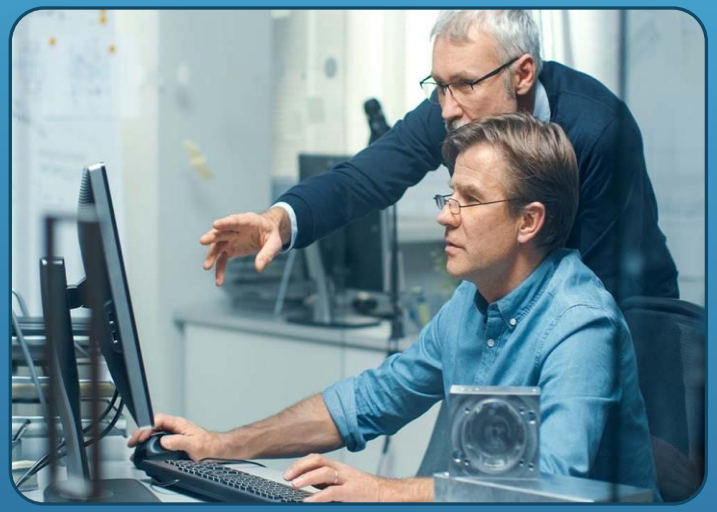
Design Services: Saves Dealers time and money, and reduces the potential for costly after sales service calls by developing networking with Vigitron's engineering staff.

Vigitron's certification and IP camera inter-operability testing provides the bases for our Design Services staffed by expert system engineers. By providing only basic system component information, our system design team will provide the most cost effective and reliable infrastructure solutions meeting specific installation requirements.

Installers and distributors' staff can access the Design Center directly on the website at:

http://www.vigitron.com/IP_CCTV_Design_Assistance.aspx

or by emailing question to support@vigitron.com.



VIGITRON DESIGN SERVICES ARE FREE AND WITHOUT OBLIGATION

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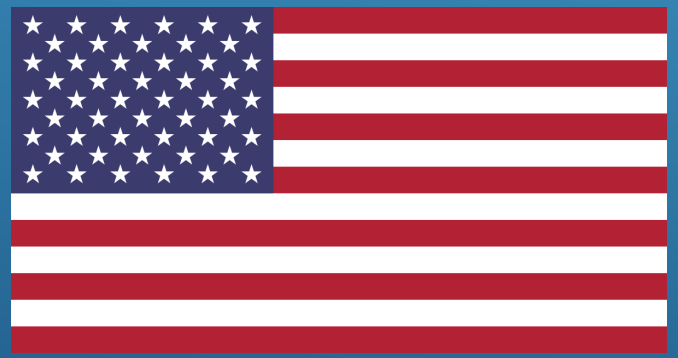
Vigitron Advantages

Over 200 IP/PoE Products covering every network category with the ability to provide complete network solutions

- MANAGED POE SWITCHES
- MANAGED FIBER SWITCHES
- HARDENED POE SWITCHES
- UTP ETHERNET EXTENDERS
- COAX ETHERNET EXTENDERS
- POE MIDSPANS
- POE SPLITTERS
- DROP & INSERTS
- FIBER OPTICS MEDIA CONVERTERS
- REPEATERS
- IP67 NETWORKING PRODUCTS
- ACCESSORIES
- ANALOG VIDEO TRANSMISSION

Products are designed, tested and quality controlled in the United States with local design and service support from skilled network engineers.



The industry's longest Lifetime warranty with complete protection for a full 3 years in even after a product goes end of life.

+ 3 Years

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THANK YOU!

CONTACT VIGITRON

Phone: +1 (858) 484-5209

Email: support@vigitron.com

Website: www.vigitron.com

Design Center: www.vigitron.com/IP_CCTV_Design_Assistance.aspx

White Papers & Application Notes: www.vigitron.com/WhitePapers.aspx

Contact: Neil Heller
nheller@vigitron.com
+1 (714) 305-7044