

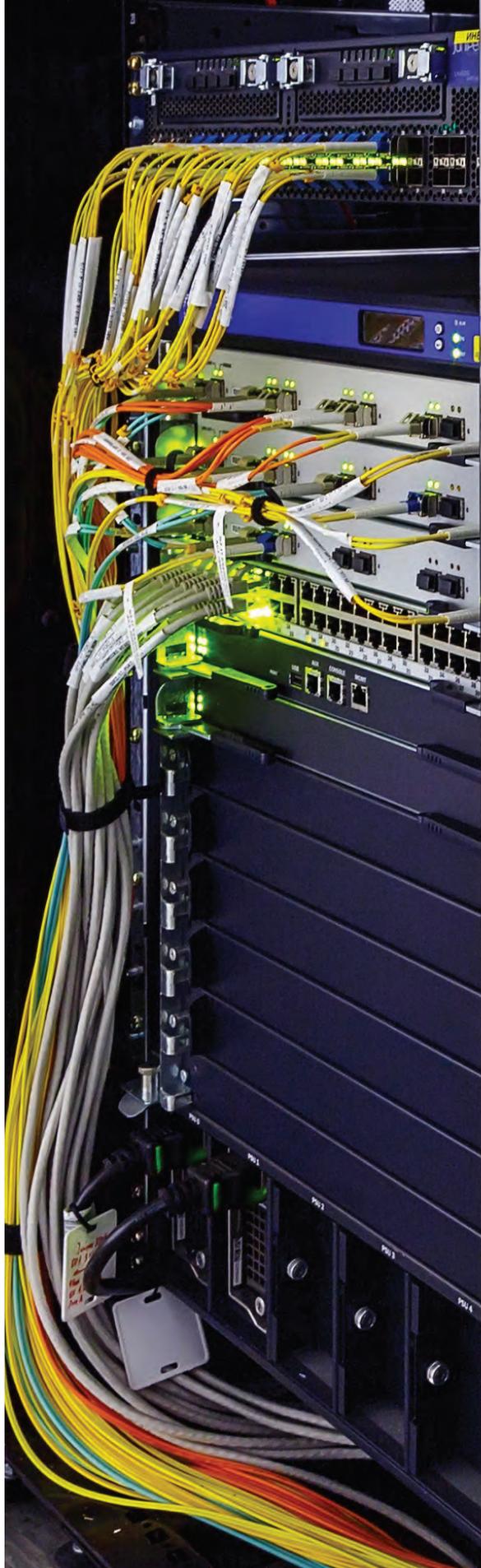
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# BLACK BOX WHITEPAPER: HOW TO CHOOSE BETWEEN MANAGED, UNMANAGED AND WEB- SMART SWITCHES

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LEAVE THE TECH TO US





## FINDING THE RIGHT SWITCH

The three most common typologies of Ethernet switches are unmanaged, managed and web smart. Choosing the right kind depends largely on the size of your network and how much control you need over it.

Managed switches provide configuration possibilities that can modify and manage their operation, which enables greater control and granularity into issue diagnosis. Unmanaged switches do not offer such features. They work on a plug-and-play basis with no interface or the option to modify their operation.

It's important to select an adequate switch for a specific application. In an industrial setting with rugged environments, industrial Ethernet switches will give you the high reliability you need for mission-critical networks.

## WHAT TO CONSIDER WHEN CHOOSING A SWITCH

1. Do I need better control and monitoring over network traffic?
2. Am I looking for a cost-saving solution?
3. Am I planning to deploy services such as wireless LANs or IP telephony in the near future?
4. Do the switches have to stand up to extreme temperatures, vibrations and shocks?
5. What types of data and applications run on the network?
6. Do I need configuration options like VLAN and Quality of Service (QoS)?
7. Do other devices on the network have built-in security functions?

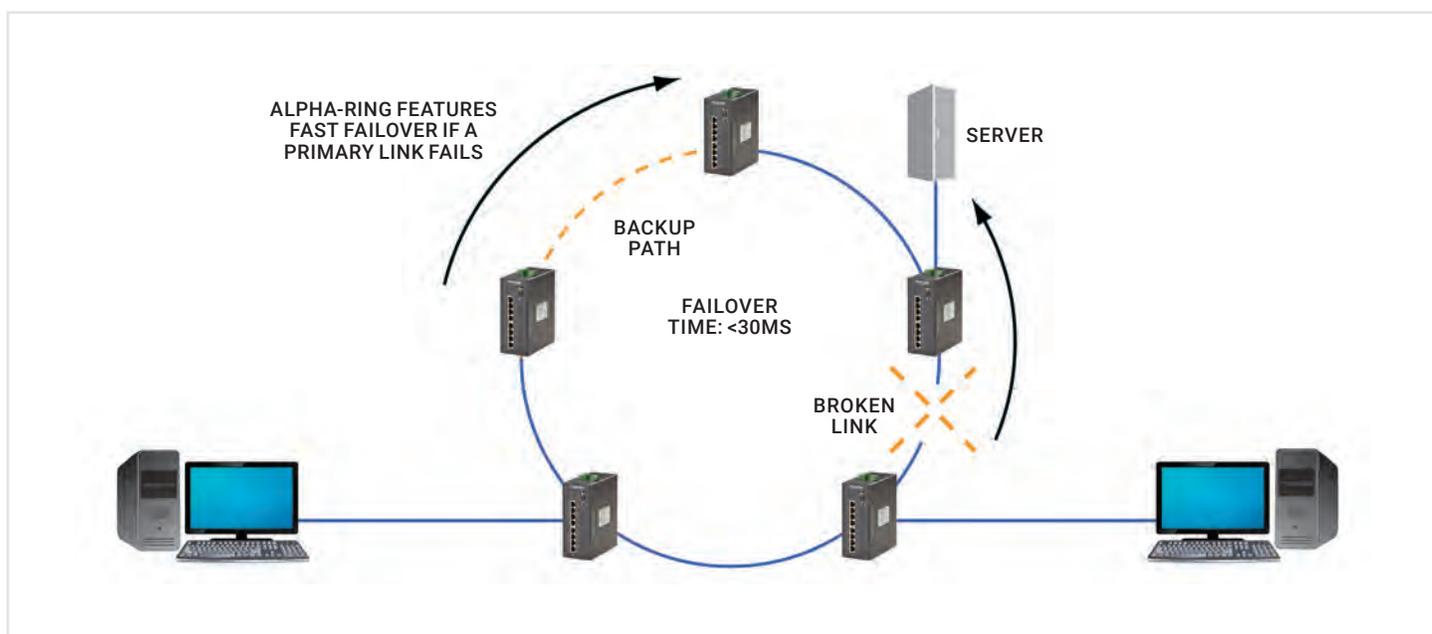
## A VARIETY OF CHOICES MANAGED ETHERNET SWITCHES

Managed switches are oriented toward redundancy. They provide QoS, which can prioritize bandwidth for data subsets. These switches allow prioritization of critical data to ensure appropriate service levels. Managed switches also provide additional protocols like Rapid Spanning Tree Protocol, enabling alternate cabling paths and preventing loop situations, which can cause network malfunctions. A managed switch offers redundancy capabilities to help reduce unplanned downtime. Managed switches also offer powerful features like VLANs, LACP, and all advanced filter and multi-cast algorithms needed today to easily prioritize, partition and organize a reliable high-speed network. With a managed switch, you can change the configuration and segment your network into VLANs to meet your specific networking needs.

### WHEN AND WHERE TO USE

Managed switches are aimed at users that require a response time of milliseconds. They are especially suitable for organizations that need to manage and troubleshoot their network remotely and securely, helping network managers reach optimal network performance and reliability. Managed switches should be used on any network or segment of a network where traffic has to be monitored and controlled. Managed network switches enable complete control of data, bandwidth and traffic control. Some switches come equipped with SFP slots in order to expand a network.

Multi-rate SFP slots allow you to mix and match 100Mbps and 1Gb/s SFP modules for either multi-mode or single mode. If requirements change, it's possible to replace the SFP module and protect your switch investment.





## APPLICATIONS FOR MANAGED ETHERNET SWITCHES

Ideal applications include cases where large-scale subway systems need to construct lengthy transit lines. Such cases require real-time information between the control rooms and each sub-traffic system for higher reliability and availability. Traffic control operations have to transmit video, voice and data over a single network with high bandwidth availability. This solution is also useful in incidental situations where traffic between locations is interrupted for external malicious or accidental reasons (criminal damage of the traffic control system, etc.), forcing passengers to wait for replacement buses, trams or taxis. The damages can be dramatically reduced if these cables are part of a communication ring system that uses Black Box switches. This type of system could reroute traffic over a backup link within milliseconds. It's possible to provide instantaneous failover when the primary link fails, which helps avoid any communication change due to dropped packets when the primary cable link is physically cut.

### MANAGED ETHERNET SWITCHES ARE IDEAL WHEN YOU NEED:

- A system that allows centralized management of traffic over the metropolitan regions of a city.
- A gigabit fiber optic network that uses Ethernet switches with several nodes spread out over metropolitan regions for both long-distance and high-bandwidth requirements.
- A network connection with fast and expandable redundancy capability to ensure passenger safety and journey reliability in on-board railway communication.
- To transmit data over large areas of a city, enabling you to reach multiple points over long distances.
- To covering traffic surveillance from major intersections and allowing on-site voice communication.

### IN A TRAFFIC MANAGEMENT SETTING, BLACK BOX'S MANAGED SWITCHES ENABLE YOU TO:

- Maintain reliable, secure and effective network availability.
- Self-recover your network within 20 milliseconds in the event of system failure.
- Provide more network resiliency through built-in resilient ring redundancy, allowing for alternate data paths in case the link or node goes down.
- Employ advanced software functions for easy network planning and reliable network management.
- Assist operators with allocating resources, and serve passenger demands during off-peak hours and rush hour.
- Avoid running separate power lines to retrieve video data. Instead, use Power over Ethernet (PoE) to power cameras and other equipment over Ethernet lines.



## MISSION-CRITICAL SETTINGS – MONITORING AND CONTROL

Monitoring is crucial in all mission-critical environments. To make it effective, you may need increased network bandwidth to transmit more videos over your network.

### MANAGED ETHERNET SWITCHES ARE IDEAL FOR SETTINGS LIKE THESE WHEN:

- There is a need for an efficient and reliable security monitoring system that needs to integrate data, video and voice over one network for centralized monitoring management.
- You need to integrate security facilities where power sources are hard to wire.
- It's crucial to have an alarm system for both security and network event purposes.

### IN MISSION-CRITICAL SITUATIONS, BLACK BOX'S MANAGED SWITCHES CAN HELP YOU:

- Ensure that sensors exchange signals over Ethernet that's connected to a control center.
- Transfer input and output signals without extra wiring effort.
- Provide Ethernet network with high bandwidth and long-haul transmission capability for video streaming over office buildings.

## UNMANAGED ETHERNET SWITCHES

Unmanaged switches are plug-and-play devices without the need for a complex setup. These switches allow Ethernet devices to communicate with one another (such as a PC or network printer) by providing a connection to the network and passing information to where it needs to go. They come with a fixed configuration and do not allow any changes to be made. That means there is no need to prioritize the packets. They can be desktop or rack mounted, and are a less expensive option for connectivity switching needs.

One major setback within an industrial setting is that these switches don't support IGMP. They also treat multi-cast traffic in the same fashion as broadcast traffic, which can overwhelm a network when uncontrolled and can also lead to broadcast storms. This feature is particularly important on industrial networks because the protocol Ethernet / IP relies heavily on multi-cast traffic.

## WHEN AND WHERE TO USE

Unmanaged switches are mostly used to connect edge devices on network spurs, or on a small stand-alone network with only a few components. It's suitable for any business network that wants to simplify the installation of wireless access points and IP-based surveillance cameras. They are also applicable for home use, SOHO, small businesses, or to add temporary workgroups to larger networks.

## IS IT POSSIBLE TO CONFIGURE A MANAGED SWITCH AS UNMANAGED?

It is possible to run a managed switch and use it out of the box just like an unmanaged switch. Managed switches can operate with all ports in the default VLAN, allowing it to function the same as an unmanaged switch.

# APPLICATIONS FOR UNMANAGED ETHERNET SWITCHES

## MARITIME – AUTOMATION AND MONITORING

Ideal applications include settings where maritime facilities need to upgrade their power substation control systems. This upgrade is done by adding a new SCADA system, which helps improve customer service through increased automation and monitored operations in power substations that are far away from the harbor. A fiber-based system is perfect for this application because it covers longer transmission distances and provides the high-bandwidth transmission needed to centralize the management and control of all substations, which enables remote monitoring and communication. Choosing unmanaged Ethernet switches is wise when you need to connect hardened video servers that need to operate through extreme temperatures and be immune to interference from electromagnetic fields created by power lines.

### UNMANAGED ETHERNET SWITCHES ARE IDEAL FOR SETTINGS LIKE THESE WHEN:

- Networks require real-time, precise, targeted communication via built-in additional protocols and software tools that enhance determinism and provide stable flow of data.
- There is a need to withstand hot operating temperatures and be immune to interference from the electromagnetic fields.
- It's essential to have a reliable network that requires long-distance transmission capabilities.
- There is a need for remote video surveillance in order to monitor power substations and provide a better way to control all anomalous events.

### BLACK BOX'S UNMANAGED SWITCHES CAN HELP THE MARITIME INDUSTRY:

- Use an existing network that reduces cabling and installation costs.
- Achieve on-demand expansion by adding more devices, including cameras, application / storage servers and other surveillance equipment.
- Reduce noise susceptibility.
- Obtain redundant power inputs that benefit a corporate or industrial network.
- Have reliable remote monitoring functionality and fewer service calls through an Ethernet environment with fiber.
- Get remote access, control and monitoring anywhere, anytime.

## ENERGY – AUTOMATION AND MONITORING

In an energy production setting, electricity production sites frequently face harsh environments that bear extreme temperatures, dust and vibrations. Networking products used in these applications require industrial-grade durability in order to withstand such conditions. In wind power generation, communication between wind turbine towers frequently reaches vast distances, and wind turbines are also prone to electrical interference. Given these circumstances, it is essential for wind farms to use rugged networking devices with long-distance transmission capability for remote monitoring in harsh environments. These devices help prevent unstable transmissions and data loss.

### UNMANAGED ETHERNET SWITCHES ARE IDEAL FOR SETTINGS LIKE THESE WHEN:

- A plug-and-play switch with no configuration is required to provide fiber optic and copper connectivity, as well as PoE.
- Several field site switches need to be connected to a network uplink to provide SCADA systems with communication to network management servers.
- It's essential to integrate data, video and voice endpoints into one network (with enabled queues for traffic prioritization). These endpoints are located in the control room while the remainder are distributed over other offices and manufacturing sites.
- It's practical to connect edge devices on network spurs, or on a small stand-alone network with only a few components.

### IN AN ENERGY PRODUCTION SCENARIO, BLACK BOX'S UNMANAGED SWITCHES CAN HELP YOU:

- Fulfilling the long-haul data transmission to large scale factories, making it easier to configure and support high-speed data transfer between machines or to the central control room.
- Provide long-distance fiber transmission for wind farm networks spread across vast distances.
- Ensure operation in harsh environments or in areas with unstable power supply, especially where there's a need for an event alarm that alerts to power or connection failure.



## MANAGED VS. UNMANAGED SWITCHES – PROS & CONS

	UNMANAGED	MANAGED
<b>PROS</b>	<b>PLUG AND PLAY</b> Auto negotiation takes care of the speed and duplex, while auto uplink takes care of the MDI / MDI-X connection.	<b>PATH REDUNDANCY</b> Incorporate Spanning Tree Protocol, which provides path redundancy in the network, prevents loops, and reduces downtime by allowing one active path at a time between two network devices.
	<b>AFFORDABLE SOLUTION</b> Most cost-effective solution for deployment scenarios requiring only basic layer 2 switching and connectivity when the network traffic is light.	<b>BETTER NETWORK TRAFFIC PRIORITIZATION</b> The QoS feature of a managed switch also allows you to prioritize your network traffic by assigning a higher priority to the critical traffic.
	<b>COMPACT AND SILENT</b> Compact size; easy to position when space is at a premium. Comes with no fan, allowing you to maintain a more peaceful office environment.	<b>INCREASED NETWORK SECURITY LEVELS</b> These switches can be used to insert loops in the network, increasing its security level. They also support multiple VLANs based on requirement.
	<b>GOOD HARDWARE FEATURES</b> Redundant power inputs, extended operating temperatures.	<b>BETTER NETWORK VISUALIZATION AND MAINTENANCE</b> Uses protocols such as SNMP for collecting and organizing information, and also for modifying information to change the device's behavior (able to visualize and maintain an entire network remotely, providing real-time data at every node).
	<b>DESKTOP OR RACK MOUNTED</b>	<b>ACCURATE LAN TRAFFIC CONTROL</b> Allows for certain configuration so segments of network traffic can be monitored and controlled in order to decide who should have access to a network.
	<b>COMMUNICATES WITH ALL DEVICES</b> Switching is made with no Mac addresses; purely passes and filters packets with all devices.	<b>ACCESS TO RELEVANT INFO</b> Bridging table with Mac addresses and port associations Error and packet switching statistics for each port.
<b>IDEAL FOR</b>	<b>SMALLER NETWORKING NEEDS</b> Light to moderate industrial applications Small to medium businesses that have no in-house IT support.	<b>MISSION-CRITICAL APPLICATIONS</b> Organizations with network applications with fast response deal for organizations with network applications that require fast response times and high-bandwidth transmission and data convergence for uplink.
<b>CONS</b>	<b>NO TRAFFIC CONTROL</b> Does not support IGMP and treats multi-cast traffic in the same way as broadcast traffic. This feature is particularly important within industrial networks because the protocol Ethernet / IP relies on multi-cast traffic.	<b>TRAFFIC CONTROL</b> Supports IGMP and allows multicast traffic in a one-to-many application, which prevents data from flooding the switch with broadcast storms and creating saturation issues.
	<b>SUSCEPTIBLE TO LOOPS</b> Doesn't have the bus and port-to-port switching speed to handle high traffic in a timely manner.	<b>MORE EXPENSIVE</b>
	<b>NOT CONFIGURABLE</b> Does not support any configuration interface and options, although it can be locally monitored and configured via LED indicators and DIP switches.	<b>MORE EXPERTISE NEEDED TO OPERATE SWITCH</b> Requires extensive user understanding in order to keep the network functioning as intended.
	<b>LIMITED TOOLS FOR MONITORING NETWORK ACTIVITY / PERFORMANCE</b> No SNMP, QoS, VLAN, link aggregation / trunking.	N/A
	<b>POOR SECURITY FEATURES</b> Low port security can lead to one rogue device causing, issues for more devices.	N/A





## WEB-SMART SWITCHES

Web-managed switches have become a popular option for mid-sized networks that require management. They offer access to switch management features such as port monitoring, link aggregation and VPN through a simple web interface via an embedded web browser. What these switches generally do not have is SNMP management capabilities or a CLI. Web-smart switches are often managed individually rather than in groups. Although the management features found in a Web smart switch are less extensive than those found in a fully managed switch, these switches are becoming smarter with many now offering several features of a fully managed switch.

## APPLICATIONS FOR WEB-SMART SWITCHES

Smart switches come equipped with a practical browser-based management GUI that provides network monitoring, traffic prioritization and VLAN features. These switches handle data, voice and video with control over VLAN segmentation, QoS, and basic SNMP status monitoring. They're also appropriate for networks that require simple network management.

### SMART ETHERNET SWITCHES ARE IDEAL WHEN YOU NEED TO:

- Provide easier manageability, security, QoS and performance to all system operators.
- Configure and manage the switch through a normal web browser.
- Have an access control list that enhances network security, protecting the network by screening traffic from illegal Mac or IP addresses and allowing managed password-protected access to the switch.
- Download firmware or configuration files that offer a sophisticated method of batch operations for multiple switches.
- Have network control from remote locations without trained IT personnel on site.

## INDUSTRIAL ETHERNET SWITCHES

Within industrial settings, you need certain switches to meet different needs. Industrial switches are specially designed for various network connections, including energy distribution in electric substations, as well as monitoring and controlling security camera functions in the field.

Industrial Ethernet switches establish network connectivity between industrial environments and enterprise business applications. These types are targeted for mission-critical applications, and are designed to withstand extreme temperatures and harsh conditions in environments such as factory floors and traffic controls. In demanding settings, a useful characteristic of managed industrial switches is the ability to configure their settings to VLAN mode. This makes it possible to group devices per working department (e.g., IT / Logistics), isolate traffic between these groups so that critical information can flow without delay to the right place, and increase the security level of the network.

## WHEN AND WHERE TO USE

Industrial switches are specifically designed to stand up to extreme temperatures (-40 up to +85°), vibrations and shocks, contributing to a cost-effective, reliable and secure network. These switches give your network new ways to route data if a specific point of your network fails. When using redundancy, the network is able to quickly maintain communication without interruption.

### INDUSTRIAL SWITCHES ARE IDEAL WHEN YOU NEED TO:

- Prepare a reliable network that can manage high speeds.
- Deliver video and other corporate applications to a manufacturing plant floor.
- Maximize availability for distributed control systems without compromising quality, reliability or safety.
- Use the same network to carry both video and voice traffic, as well as data that's used for industrial applications.
- Offer cyber security features to enhance network security at no extra cost.



## PoE IN INDUSTRIAL APPLICATIONS

PoE was originally developed to provide both power and networking capability in areas where it was previously cost prohibitive, or where it was physically impossible to run electrical wiring. PoE switches remotely supply power to devices, removing the restrictions imposed by limited AC outlets. Additionally, if a LAN is protected from power failure by a UPS, the PoE devices connected to your LAN are also protected from power failure.

PoE switches supply power to devices under a vast array of settings, including security surveillance applications, power VoIP phones, backhauling IP camera traffic, and WiFi access-point traffic. These switches use fiber for extended reach in outdoor applications, as well as in distribution warehouses, retail video kiosks, smart signs and retail point-of-information systems.

Within harsh industrial settings, PoE switches simplify the use of devices in hard-to-reach outdoor, and remote areas, saving between \$750-\$1,500 per access point by using PoE technology.

### POE APPLICATIONS AND BENEFITS:

- Save money by eliminating the need to run electrical wiring.
- Use one set of twisted-pair wires for both data and low-wattage appliances.
- Easily move an appliance with minimal disruption.
- If your LAN is protected from power failure by a UPS, the PoE devices connected to your LAN are also protected from power failure.



## APPLICATIONS FOR INDUSTRIAL ETHERNET SWITCHES

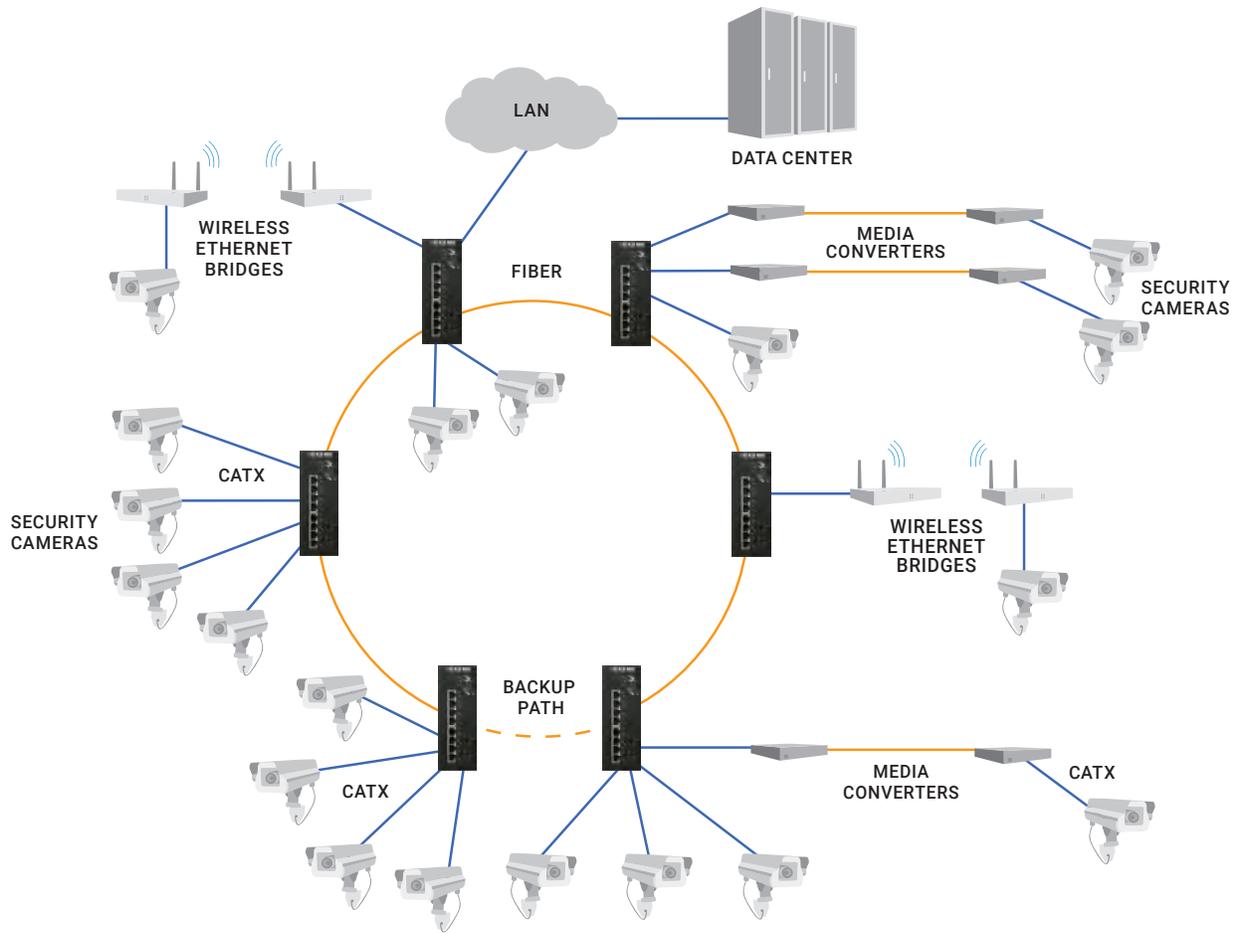
Industrial switches are suitable for any device that's critical to monitoring and securing a network. They're also important wherever redundancy can be implemented to help increase uptime and reliability.

### MAJOR APPLICATIONS INCLUDE:

- Marine
- Mining
- Security / Surveillance providers – Backhaul IP camera video, alarms
- Utilities and SCADA / M2M – Automated communication
- Eliminating truck rolls
- Oil / Gas – Control and monitoring of wells and transmission lines
- Building automation – Remote control and monitoring of buildings with HVAC systems
- Water waste / Water management – Control and monitoring of water waste to ensure public safety
- Defense (military vehicles / ships) – Securing communication in harsh environments
- Rail and intelligent transportation systems: train stations, ticketing machines, parking systems
- Factory automation for controlling machinery, PLCs, motor drives, sensors, counters, inspection cameras and packaging equipment
- Power utility substations (plant engineering)
- Explosive environments
- Tariffed carrier field facilities
- Security and surveillance (industrial video surveillance systems with PoE)



## INDUSTRIAL NETWORK SETUP IN AN ALPHA-RING FOR REDUNDANCY



<b>MOUNTING OPTIONS</b>	DIN rail, panel
<b>ENVIRONMENT</b>	Harsh environments, including factories, oil / gas fields, military vehicles / ships, HVAC controls, security and surveillance, and more
<b>OPERATING TEMP.</b>	Extended
<b>COOLING</b>	Convection cooling with limited ingress points
<b>POWER</b>	DC input for safety inside the panel
<b>PACKAGING</b>	Designed to withstand high shock and vibrations

Major sectors of the economy are undergoing a transformation driven by new requirements around production and factory automation, traffic management, data analytics and machine-to-machine communication. On top of that, the uptime of a network is sensitive to the quality of an Ethernet Switch. It's important to choose a switch that can reach the far ends of your network.

From the edges of your commercial network to harsh, difficult environments, you'll find the right switch at Black Box. Choose from a wide selection of managed and unmanaged switches with options include standalone, rackmount and hardened

enclosures, port counts, bandwidth, L2 / L3 capabilities, PoE and cabling media. Black Box's industrial switches offer advanced filters and multi-cast algorithms to help you achieve a reliable high-speed network.

Our switches are easy to install. But if you need assistance, our specialized technical support staff can give you free advice on individually optimized applications. Learn more about our Tech Support Center at [BLACKBOX.COM/EN-US/SUPPORT/BLACK-BOX-PRODUCTS](https://BLACKBOX.COM/EN-US/SUPPORT/BLACK-BOX-PRODUCTS).