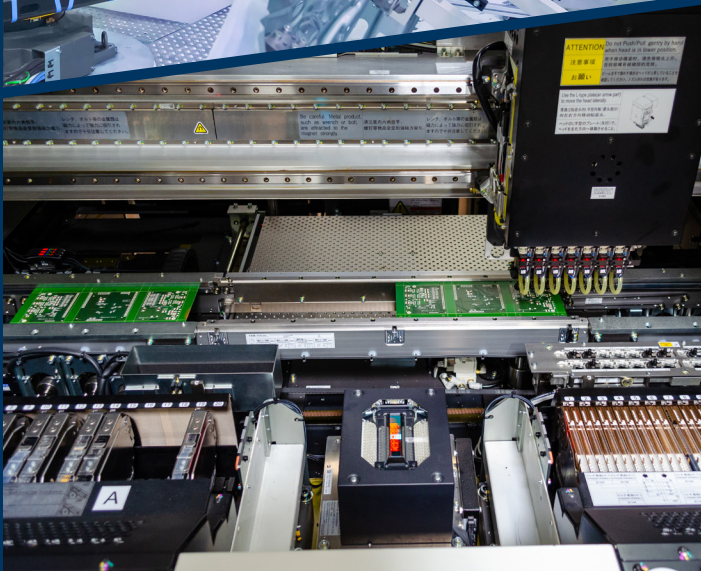# Simplify Machine Integration with Customer's Existing IP & Ethernet Network Infrastructure

**CONTEMPORARY CONTROLS®**

## Executive Summary

Modern machines are comprised of various complex subsystems that communicate via the Internet Protocol (IP) – the backbone of the Internet. The machine builder pre-defines each subsystem IP address and the range of addresses devoted to each machine. This addressing convention may conflict with the addressing policies of the customer potentially jeopardizing a speedy integration of the machine or machines to the plant. This whitepaper examines how an IP router can quickly and effectively integrate these machines to the customer's existing IP infrastructure benefiting both customer and machine builder alike. Additionally, industrial-grade managed, unmanaged, and diagnostic Ethernet switches provide a robust and reliable infrastructure that is beyond par than commercial grade equipment.

## Introduction

The various IP components of the machine are assigned IP addresses and the application controlling these various subsystems is programmed to communicate to these subsystem devices using their IP addresses. A machine builder then ships this tested machine to his customer but the IP addresses being used at the customer's site are most probably different than what was tested at the machine builder's factory. Changing the IP addresses on the machine and modifying the control program to communicate with revised IP addresses to comply with the customer's IP

address requirements adds significant time to the commissioning process and hinders the ability to bring the machine on-line quickly.

## IP Router to the Rescue

The use of an IP router, like Contemporary Controls' EIPR/EIGR, allows the machine's IP addresses to remain unchanged. The IP router consists of two networks, one internal network called LAN and one external network called WAN. The machine is connected to the internal network and the external network is connected to the plant which can be easily changed to comply with the plant's IP requirements. The various machine subsystems are presented as one device to the plant network but can be easily accessed individually by using various features of the IP router like Port Forwarding, Port Range Forwarding and NAT.

> Adding an IP router to the machine provides multiple options that make it easy to integrate the machine to the IP infrastructure of the plant.

## Eliminate IP Address Changes for Machine at Site

The IP router connects two IPv4 subnets together. The built-in Stateful Firewall blocks the traffic originating from the WAN-side port preventing unauthorized access to the machine devices on



**Existing Customer Network**

EIPR          EIGR
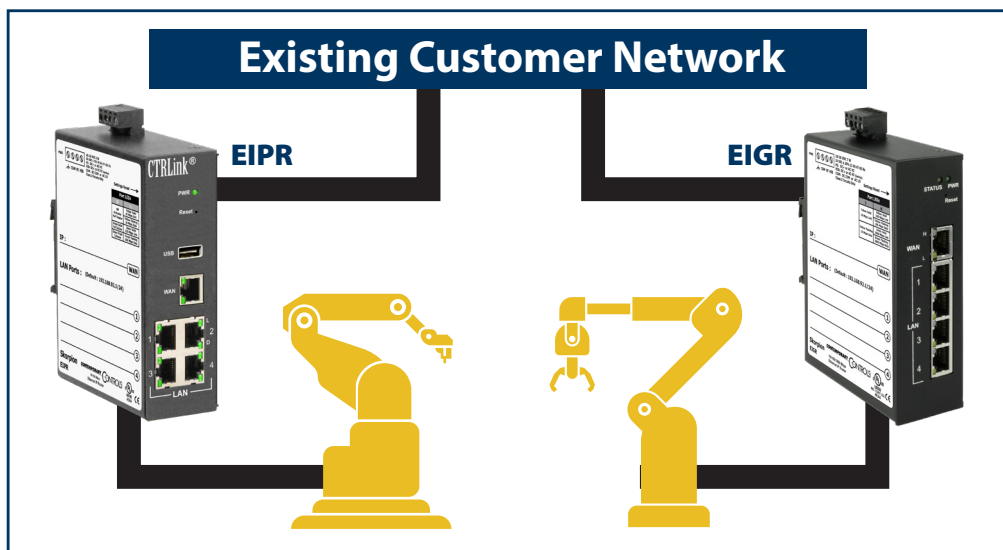
the LAN-side. The router features a 4-port switch on the LAN-side to connect the devices together. Access is granted to the devices through the firewall by enabling Port Forwarding, Port Range Forwarding and/or NAT. **The IP router allows the use of a single IP address on the WAN-side without requesting multiple IP addresses within the machine to be assigned by the customer's IT department.** The same WAN IP address can be used in conjunction with different port number(s) to address the different devices in the machine. Port Forwarding allows the use of a single port and the WAN-side IP address to access a specific port on a LAN-side machine device. Applications requiring a range of continuous IP ports can be accommodated by using the Port Range Forwarding feature of the IP router.

This allows multiple machines with the same IP addressing scheme to be installed at the site by just changing the IP address of the WAN port of the IP router.

## Keep Same Configuration Across Different Machines

The IP router can provide **Network Address Translation** (NAT) if the customer requires full access to all IP devices in the machine. The router can be configured to translate these external addresses to the internal pre-configured IP addresses on the machine, again eliminating the need to modify the machine IP addresses.

> The IP router allows the use of the same configuration across multiple machines eliminating the need to change IP addresses at site and avoid costly trouble-shooting time.

## Isolating Traffic and Security

The IP router can provide an additional benefit by isolating Multicast and Broadcast traffic generated within the machine from exiting the WAN port. This traffic is normally only required by the IP devices within the machine and would create a filtering

burden to WAN-side devices to eliminate it. Having multiple machines creating more of this unneeded traffic could swamp the plant's network. The IP router can easily keep this traffic contained within the LAN-side. The IP router provides extra security with access control by using the "IP Whitelist" feature where access to the machine is only allowed from the WAN-side devices with specified IP addresses.

## Addressing the "No Gateway" Problem

Though uncommon, it is still possible to have some low-resource IP devices located on the LAN-side that need to communicate to the WAN-side but do not have a provision for setting a gateway address. The IP router can help by providing a masquerade feature thus eliminating the requirement to set a Gateway IP address on these devices.

## Static vs Dynamic IP addressing

Some customer sites do not allow fixed or static IP addresses. Instead they want dynamically assigned addresses. In this situation, an IP router that features a built-in DHCP client requests a DHCP assigned address for its WAN port. IP routers that support hostname function could then be accessed by its hostname instead of its IP  address. This is important with DHCP addressing because IP addresses may change without notice.
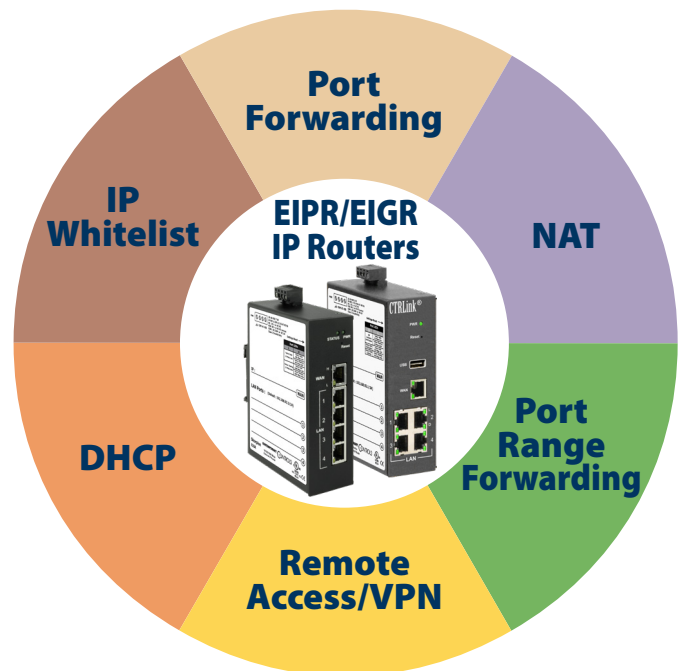
## Quick Diagnostics with Remote Access

The EIPR and EIGR routers also support Virtual Private Network (VPN) functionality. This can be enabled to allow secure remote access to the machine at the site for remote diagnostics and troubleshooting. This allows remote access to the machine over the internet and through the plant network for servicing. This allows the collection of plant data which can be pushed to the cloud for further analysis, process optimization and/or predictive maintenance.

## Robust Industrial Grade Switches for Connectivity

Ethernet continues to evolve as the network of choice for automation systems due to its high speed, familiarity among users, and ability to easily connect to the Internet. Contemporary Controls' CTRLink products are designed for unattended operation in environments not conducive to office-grade equipment. The products provide convenient DIN-rail mounting in control panels, 24VAC/DC power, UL 508, improved EMC compliance and reliability.

With widths as narrow as one inch and a vertical form factor, the switches blend seamlessly with other nearby control equipment. Many jurisdictions require control cabinets to be UL 508 compliant, which is easily complied by the CTRLink Ethernet switches. The switches provide an operating temperature range of 0 to 60°C. With a multitude of options for port count and available copper/fiber connections, the CTRLink switches can easily fit in various industries like industrial automation, transportation, food processing etc.

For simple systems, plug-and-play unmanaged switches provide a cost-effective method for expanding Ethernet networks. For better control over your LAN, managed switches are used which provide advanced functionality like Virtual LANs (VLANs), Redundancy via Rapid Spanning Tree Protocol (RSTP) and Network information via SNMP. For troubleshooting, our diagnostic switches allow a network sniffer to attach to an unused port on a switch and observe all traffic on the network.
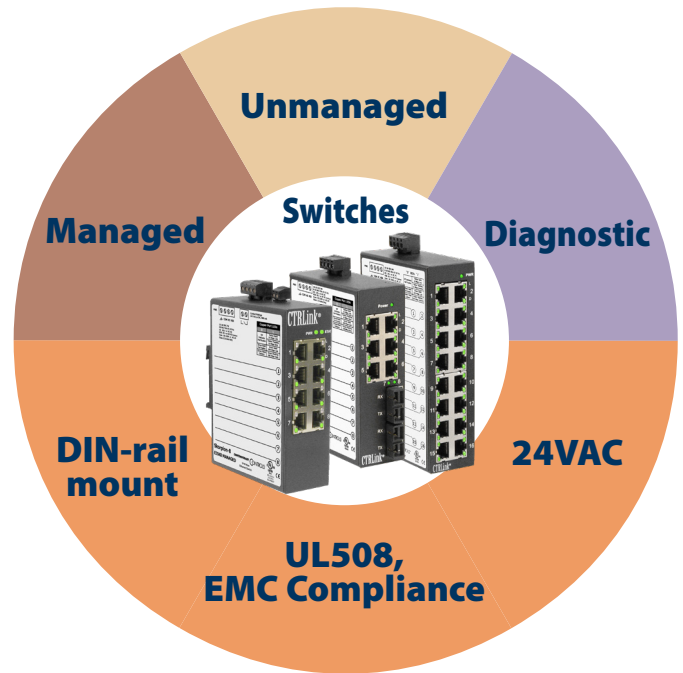


## Conclusion

Network Address Translation and Port Forwarding can be handled by the IP router as a way of translating IP addresses between those required by the customer's IT department and those already assigned to the machine by the machine builder. IP routers save time and reduce the potential for errors during machine installation by eliminating the need to reconfigure the IP addresses in machines or the application software just to comply with IT department's IP address assignment policy. IP routers allow the machine builder to retain the same configuration used during factory acceptance testing when installing at the customer site. IP routers also are used to isolate traffic and for gaining secure access to machines remotely.

Industrial grade Ethernet switches provide high reliability and optimum performance for use in factories and in control cabinets. Various options are available that are sure to satisfy any stringent requirement.

For more information, visit:
**www.ccontrols.com/IPNetwork**

## Glossary

**IP** – Internet protocol. The underlying protocol of the Internet.

**LAN** – Local Area Network. Network of the machine.

**WAN** – Wide Area Network. Network of the plant.

**NAT** – Network Address Translation. Mapping a WAN-side IP address to a LAN-side IP address.

**Port** – Field within the IP packet used to identify the type of IP packet.

**Port Forwarding** – Mapping of a WAN-side port to a LAN-side port.

**IPv4** – Version 4 of the IP protocol has 4-octets of addressing such as 10.0.0.1

**Stateful Firewall** – Access through a router's firewall is based upon the structure of the message.

**Switch** – Ethernet switch which allows for multiple Ethernet connections.

**Multicast** – A message sent to a group of stations.

**Broadcast** – A message sent to all stations.

**Whitelist** – A list of allowed IP addresses gaining access from the WAN-side.

**Static IP address** – Address fixed through configuration.

**Dynamic IP address** – Address assigned by a DHCP server.

**DHCP** – Dynamic Host Configuration Protocol. Protocol used to assign an IP address to a station.

**VPN** – Virtual Private Network. Used for secure access through the Internet.