



Serial-to-Ethernet Q&A

When serial devices meet
Ethernet technologies

Serial-to-Ethernet Solutions



Serial Device
Servers



Industrial Serial
Device Servers



Terminal Servers

Overview

When Serial Devices Meet Ethernet Technologies...

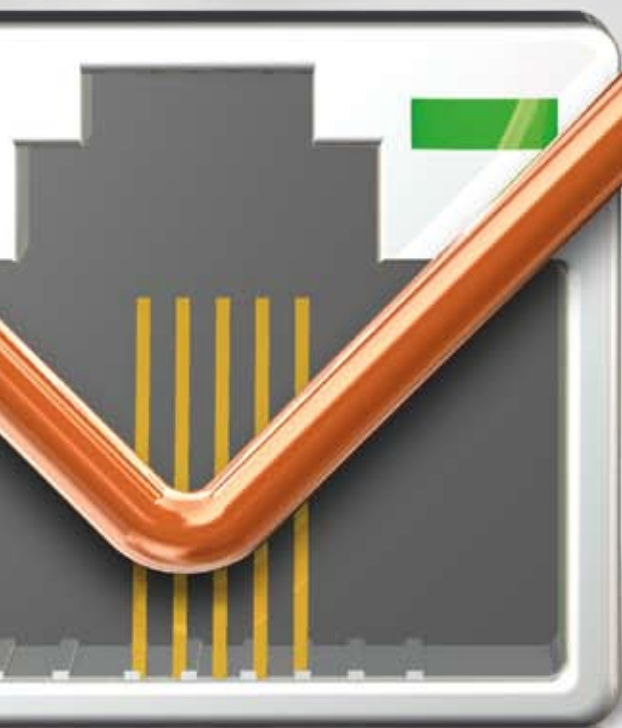
In today's increasingly competitive global environment, leveraging the right technologies and optimizing existing assets is more important than ever for businesses to stay ahead of the competition. In particular, the ability to bring data from all corners of your enterprise onto a common platform for performance measurement, analytics, and even strategic management has helped companies around the world improve productivity and gain an edge over their competitors.

For 20 years, Moxa has led the world in providing serial device servers to connect legacy serial field devices to an Ethernet LAN/WAN. Serial communications based on the RS-232, RS-422, and RS-485 standards have traditionally been used in industrial automation to connect and issue commands to a wide range of serial interface devices from simple barcode readers to sophisticated Computer Numerical Control (CNC) machines. However, the limitations on transmission distance, accessibility, the amount of data transferred at a time, and transmission speed have led to a demand for greater flexibility.

Since the early 90's Ethernet networks have become more prominent in the industrial marketplace, due to their ability to provide fast, secure, and flexible networks. With this shift to Ethernet, a requirement for protocol conversion between serial and Ethernet TCP/IP emerged, and serial-to-Ethernet device servers appeared to bridge this gap. Serial device servers allowed users to retain all of their legacy serial equipment and interface directly with a future-proofed Ethernet network.

As your trusted serial partner, we understand your demands and strive to provide advanced solutions to painlessly connect serial devices to Ethernet networks, and integrate enterprise data for automation. That is why we wrote this "Q&A" to help Network Engineers and Administrators charged with deploying a serial-to-Ethernet network save valuable time. More specifically, the purpose of this "Q&A" is to provide a supplement to The Serial-to-Ethernet Guidebook that has, for over 10 years, provided Product Managers and Sales Personnel working in the communications industry with a general introduction to the terminology and methodology of the serial-to-Ethernet field. By answering some of the most frequently asked questions that are likely to arise, we hope to spare you the trouble of having to reinvent the wheel so you can start enjoying the benefits of network-enabled serial devices even sooner.





Serial-to-Ethernet Q&A

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Part 1

Installation and Configuration

Getting your serial-to-Ethernet network up and running requires more than physically connecting your serial devices, host computer, and serial device servers in a desired topology. This chapter is divided into two sections. First, we will answer questions related to installing and configuring serial-to-Ethernet device servers more quickly. Then, based on specific system requirements, we offer advanced solutions for how to set up your serial-to-Ethernet network.

1-1 Basic Installation

- Initial Installation and Configuration
- Saving Serial Settings
- Future Installations and System Upgrades

1-2 Advanced Installation

- COM Port Expansion
- COM Port Grouping: “Multi-drop” for Ethernet
- Public Networks and Dynamic IP Addresses
- Data Pre-Treatment
- Future-Proof for Network Expansion

Ethernet



Serial

Initial Installation and Configuration

Q : What's the easiest way to install a serial-to-Ethernet device server and configure COM ports for the first time?

A1 : When using a Windows-based host, **NPort Administrator Suite** provides an easy-to-use software utility to configure IP addresses and COM port numbers on serial device servers.

Background

Since each serial device server comes with a default private IP address that is different from the host computer's IP address, you will need to configure the IP addresses for each host computer and serial device server—as well as the relevant COM port numbers on each device server—to have the same network identifier prefix. Traditionally, network engineers would use a web browser to change the host computer's IP address (A) to the device server's default private IP address (B), and then assign the device server an IP address with the same network identifier as the host computer's original IP address (C). After that, you'll need to change the host computer's IP address back the original IP address (A) and consult relevant user's manuals for how to set up virtual serial (COM) ports and how to update serial and Ethernet parameters. For example, you may need to install a virtual serial port driver to configure the COM port numbers on each serial device server.

Problems

- IP addresses and COM port numbers need to be configured manually
- Need to install drivers and keep them up-to-date

Smart Solution

Although you can still use the traditional configuration approach when installing NPort serial device servers, Moxa's NPort Administrator Suite provides an easy-to-use software utility that eliminates the hassles of manual configuration. After setting up your topology, simply open NPort Administrator Suite and click the search button to locate all the NPort serial device servers on the network. Then, double-click on a device server icon to update its serial and Ethernet parameters, or select COM mapping to update the COM port settings.

Benefits

- Graphical user interface that simplifies the installation process and keeps existing host IP settings
- A single utility to deploy up to 1,024 devices at a same time and map virtual serial ports


Smart Tip:

NPort Administrator Suite lets you install, configure, and maintain your serial device servers and networked devices all in one user-friendly software platform.



A2 : When using a Linux or another non-Windows OS, a **3-step configuration wizard** is available for the NPort serial device servers.

Although most the common OS platform running on host computers for serial-to-Ethernet networks is Windows, Linux and other non-Windows operating systems are not unusual in the communications industry and automation networks. Thankfully, an easy-to-use wizard is also available to guide users through 3 simple configuration steps that are necessary to activate the serial-to-Ethernet application. With this speedy configuration tool, a user only needs to spend an average of 30 seconds to complete the NPort settings and enable the application, saving a great amount of time and effort.




Total Solution for Industrial Device Networking

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<ul style="list-style-type: none"> ■ Model - NPort 5150A ■ Name - NP5150A_71 	<ul style="list-style-type: none"> ■ IP - 192.168.127.254 ■ Serial NO. - 71 	<ul style="list-style-type: none"> ■ MAC Address - 00:90:E8:99:31:25 ■ Firmware - 1.0 Build 10022314
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Welcome to NPort web console




Quick Setup

Click 'Quick Setup' to go through three simple steps making your NPort ready to work.



Export/Import

Click 'Export/Import' to perform configuration backup or recovery.



- Main Menu

- Overview
- Quick Setup
- Export/Import
- Basic Settings
- Network Settings
- Serial Settings
- Operating Settings
- Accessible IP Settings
- Auto Warning Settings
- Upgrade Firmware
- Monitor
- Change Password
- Load Factory Default
- Save/Restart



Watch the demo video to learn more about the NPort 3-step configuration wizard

Choosing the Right Operation Mode

Q : Will migrating to Ethernet require me to reconfigure all my original serial device settings?

A : All NPort series device servers and CN2600 series terminal servers come with multiple serial-to-Ethernet **operation modes** that preserve the original serial communication settings for a wide array of applications.

One of the biggest concerns network engineers have when migrating an existing serial network to Ethernet is having to reconfigure hundreds of serial communication settings and parameters. Using the correct operation mode makes this step easy.

Situation 1

If you want to replace an existing serial adapter card with an NPort serial device server, use **Real COM, Reverse Real COM, Redundant COM, or RFC2217** mode to preserve COM/TTY port communications and settings.

Situation 2

If you want to use Ethernet to extend your RS-232 transmission distance, use **Pair Connection** mode to keep sending DTR, RTS, and DCD hardware signals.

Situation 3

If you want to use TCP/IP socket to communicate with serial devices, use **TCP Server, TCP Client, or UDP** mode to quickly deploy an Ethernet topology and assign the role you want to the NPort device server.

Situation 4

If you want to connect a serial printer over Ethernet, use **Printer** mode to keep existing RAW/LPD settings and preserve original typesetting.

Situation 5

If you want to replace a serial modem with an NPort device server, use **Ethernet Modem** mode to allow the NPort device server to act like a serial modem and follow AT commands.

Situation 6

If you want to add a backup modem, use **PPP** or **SLIP** mode to provide network redundancy to the modem.

Situation 7

If you want to access data on Telnet devices from a remote host, use Telnet or SSH modes to turn your NPort device server into a **Telnet** or **SSH** client.

Situation 8

If you want to provide remote access to serial devices, use **Reverse Telnet** and **Reverse SSH** modes.

Situation 9

If you want to meet Open SSL and RADIUS/TACACS+ specifications for high encryption standards, use **Secure Real COM, Secure TCP Server, or Secure TCP Client** modes.

For detailed operation mode descriptions, please download any NPort user's manual from Moxa's website.

Future Installation and System Upgrades

Q : What if I need to reinstall my device servers? If I upgrade my host computer to the latest hardware and operating system, will the new host be compatible with my serial devices?

A : NPort device servers provide continuous support for new and legacy operating systems, even if the operating system is no longer supported by its vendor!

Background

Although computers generally need to be replaced once every three years, replacing an existing serial-to-Ethernet network's ailing host computer with brand new hardware running the latest operating system may not always be the best idea. Since new drivers on the market usually trail at least one generation behind the latest operating systems available, interoperability issues often arise between the "legacy" device drivers and the newly upgraded operating system. If there is no driver upgrade available for your new OS, you may have no choice but to downgrade your OS to a previous version with a supported driver.

Smart Solution

Moxa is committed to continuous driver/OS availability by providing comprehensive driver and software support for new and existing operating systems available in the industry to ensure seamless interoperability and flexibility of your industrial system platforms. In addition to having a dedicated team committed to developing, testing, and updating drivers for Windows and Linux platforms, Moxa even began supporting new WHQL-certified drivers within 3 months of the release dates of Windows 8.1 and Windows 2012 R2.

See the latest supported operating systems for all NPort series device servers and CN2600 terminal servers



COM Port Expansion

Q : Can I monitor and control more than 256 serial devices at the same time?

A : NPort Windows driver supports **up to 1,024 COM ports** at once.

Background

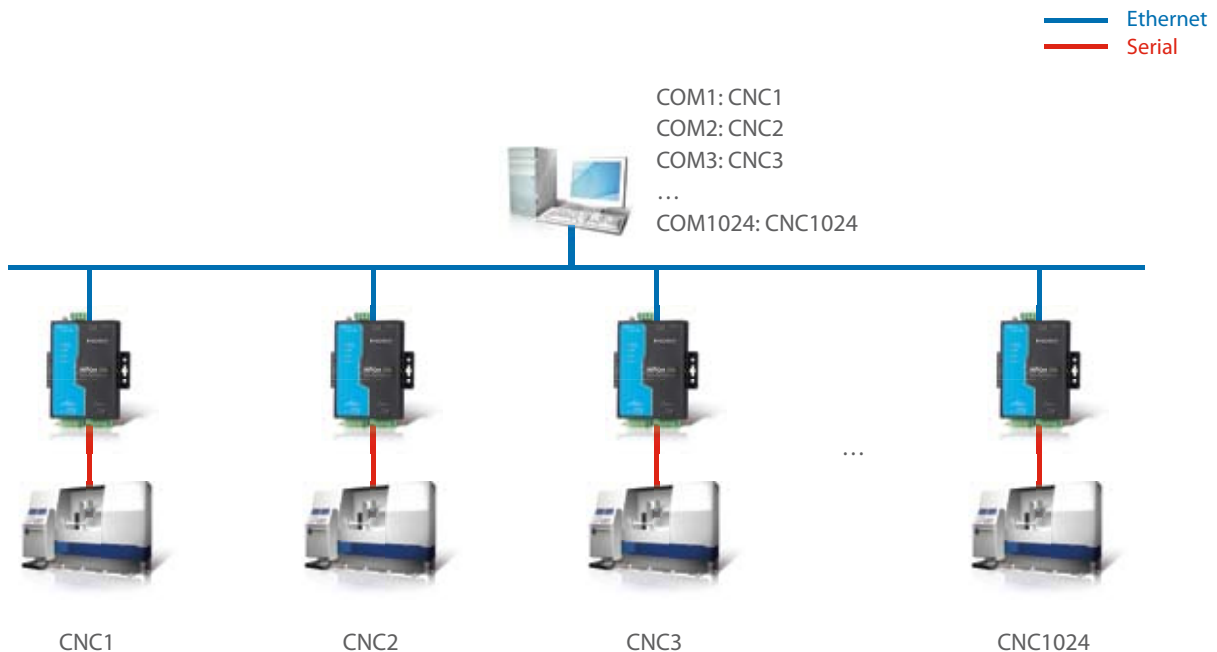
Most Windows drivers only allow each computer to support up to 256 COM ports. Although each COM port needs to be configured one by one, they can all be managed at the same time. As a result, a common way to expand the number of COM ports (and increase the number of serial field devices supported) is to use two or more host computers. However, although using multiple host computers allows you to support and manage more than 256 devices at a time, you will not be able to manage all the COM ports at the same time.

Problems

- Cannot monitor and manage field devices from different hosts at the same time.
- Each additional host computer can only support an additional 256 COM ports that need to be configured one by one.

Smart Solution

Moxa's NPort Windows driver manager can support up to 1,024 COM ports so you only need one host computer to monitor and control all your field devices at the same time.



COM Port Grouping: “Multi-drop” for Ethernet

Q : How can I emulate the multi-drop behavior of serial communication and simultaneously issue the same command to all (or a group of) serial field devices over an Ethernet LAN?

A : **COM Grouping** allows you to emulate the multi-drop behavior of legacy serial communication over Ethernet TCP/IP.

Background

Commands on a traditional RS-485 serial network are addressed by an ID that is typically one byte long. Although all nodes on the serial network will receive the command from the network host, only the field devices with matching IDs will actually process the command; all other field devices will ignore the command. This convenient way of grouping serial field devices within a larger network is especially useful in applications where multiple serial field devices need to perform the same action at once (e.g., all the LED signs on the same railway platform need to display the same arrival information for an oncoming train).

But since each physical serial port in a serial-to-Ethernet network is mapped to a virtual COM port number on a device server, each local COM port on the network's host computer usually corresponds to just one virtual COM port number (i.e., serial connection). As a result, the host can only issue commands to just one COM port number at a time or to adjacent COM port numbers within a specified range.

Problems

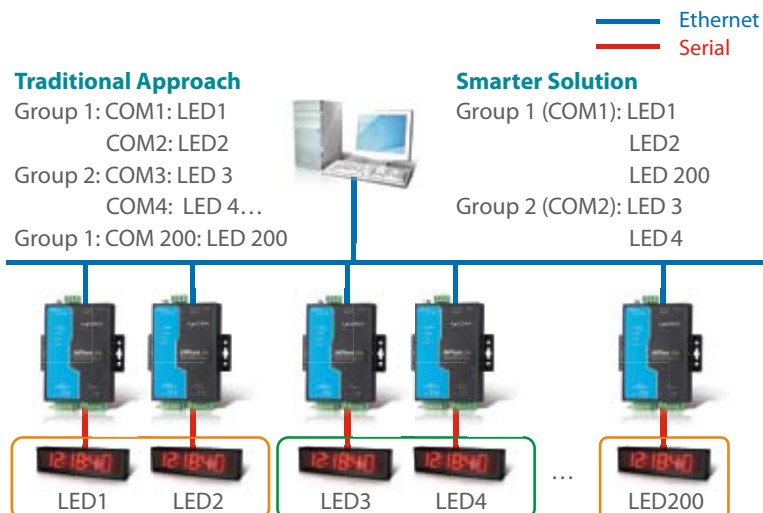
- Host computers can only send commands to 1 COM port at a time.
- When a new field device is added to an existing serial-to-Ethernet network, it can only connect a COM port number that is an adjacent COM port and requires the use of a digital form to manage existing and new serial field devices.

Smart Solution

The “COM Grouping” function is designed to simulate the multi-drop behavior of serial communication over an Ethernet network. COM Grouping allows you to create a COM Group and redirect data from it to several physical COM ports on NPort device servers. With COM Grouping, you will be able to control up to 32 physical serial ports simultaneously by operating only one COM port.

Benefits

- Easily group serial field devices by virtual COM port number.
- Each COM Group can connect up to 32 serial devices.
- Each COM port can read and write different settings.



Public Networks and Dynamic IP Addresses

Q1 : How do I connect serial field devices and device servers in a private LAN to a remote host computer that has a public IP address?

Q2 : How can I connect to a remote serial device located behind a firewall or router?

A : **Reverse Real COM** mode on the NPort 6000 series

Background

All of the serial-to-Ethernet networks we have discussed so far have been on private IP networks with fixed addresses where Real COM mode is used to establish a transparent connection between a host and a serial device by mapping the serial port on the NPort device server to a local COM/TTY port on the host computer. Real COM mode supports up to 8 simultaneous connections that enable multiple hosts to simultaneously collect data from the same serial device. However, Real COM mode will not work when using a private IP address, or in a dynamic IP address environment.

Problems

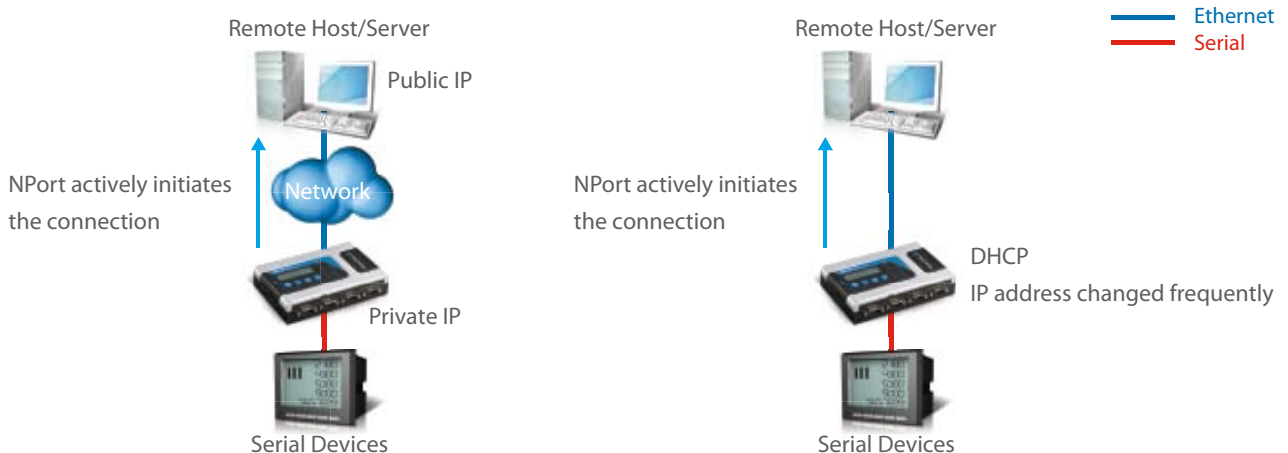
- Remote host/server cannot connect to the NPort when the NPort is on a private network or behind a firewall.
- Remote host/server cannot obtain the NPort's IP address in a dynamic IP address environment (e.g., DHCP).

Smart Solution

Reverse Real COM mode is an innovative operation mode that allows NPort device servers to achieve the same effect as Real COM mode, even if the NPort device server is using a private IP address, or is being used in a dynamic IP address environment. In Reverse Real COM mode, the NPort device server will actively initiate a connection to the remote host/server that is listed in the destination IP field after it boots up.

Benefits

- Connect a private serial-to-Ethernet network to a remote host on a public IP network.
- Connect a remote host or server in a dynamic IP environment.



Situation 1: Private IP address application

Situation 2: Dynamic IP address application

Data Pre-Treatment

Q : How do I ensure the host receives complete serial data from the field serial devices?

A : Advanced **Data Packing** ensures proper framing of messages, eliminating incomplete messages.

Background

When a packet or datagram containing partial serial data arrives at the application charged with processing the data, the application could very well fail. In order to prevent the host from receiving a packet or datagram containing partial serial data, the stream of serial data is packed into a buffer located inside the device server's memory so that data belonging to one serial transmission is sent together as one packet or datagram. However, serial device servers have a limited data buffer storage capacity that may not be large enough for some more advanced applications. Consequently, if a serial data stream exceeds the FIFO size, the host may still end up receiving an incomplete data packet.

Problems

- Limited FIFO size on the device server's UART may still prevent oversized data streams from being transmitted.
- Some serial data streams may have an unknown packet length.

Smart Solution

A good data packing function will allow the user to set both a time limit and size of data limit, so that data acquisition is made to match whichever application is being used to process the serial data. Use the NPort's Data Packing function to customize the packet size of your serial data for transmission by packing the data according to the packet length or according to a special character or delimiter in the packet's header or trailer. If the packet length is unknown, or you still want to send incomplete data packets, the Force Transmit function allows you to preset a maximum time interval to wait for a complete serial data stream.



Smart Tip:

Data Packing also lets you receive just the user data (payload) without any control information.

Future-Proof for Network Expansion

Q : Given the limited number of public IP addresses available, is there any way to ensure that I won't run out of IP addresses for my serial-to-Ethernet network in the future?

A : Use solutions that bear the official **IPv6 Ready Logo**, such as the NPort 6000 series terminal servers.

Background

The IPv6 communications protocol was developed by the Internet Engineering Task Force (IETF) in anticipation of the IPv4 address exhaustion problem. IPv6 has become popular for network infrastructure development because it is not only compatible with IPv4 specifications, but also solves the issue of address exhaustion. In some cases, IPv6 is even required for use in government contracts.

Problems

- There may not be enough IPv4 addresses available in the future if you need to expand your network.
- Not all products on the market that claim to be IPv6 compatible comply with all the latest specifications.

Smart Solution

Fortunately, the IPv6 Ready Logo Program has taken the initiative to verify protocol implementation and validate interoperability of IPv6 products by providing IPv6 Ready Logo testing laboratories across the globe. As a result, all products that bear the official IPv6 Ready Logo have been tested and verified to conform to the latest IPv6 specifications. To meet the growing demand for IPv6, NPort serial-to-Ethernet device servers were designed with the latest IPv6 specifications in mind and have been certified by the IPv6 Ready Logo Program.

Benefits

- Full compliance with IPv6 specifications is ensured.
- Enough IP addresses for future network expansion.



Part 2

Ensuring Stability and Reliability

Now that you've successfully installed and configured your serial field devices and device servers over an Ethernet LAN, you'll want to make sure your network continues to provide stable and reliable data communications between each network node. Given the mission-critical nature of industrial networks, even a minor error in data transmission can cost managers time and money. As a result, you'll also need to know how to troubleshoot potential communication issues to maintain high network availability.

In this chapter, we will present some common scenarios that may affect system stability, and assist network administrators in finding the most appropriate solution. More concretely, stable connections in serial-to-Ethernet network architectures are built on the three pillars of host reliability, network reliability, and device reliability. With this framework in mind, the following sections will offer some "Smart Solutions" to help administrators optimize availability in serial-to-Ethernet networks. In addition, we will illustrate how user-friendly device server design can help network administrators troubleshoot more efficiently while keeping the network online and available.

2-1 Host Reliability

- Adding an Automatic Backup Host
- Adding Multiple Backup Hosts

2-2 Network Reliability

- Network Redundancy Using One LAN
- Network Redundancy Using Two LANs

2-3 Device Reliability

- Adding Backup Field Devices
- Avoiding Data Overflow
- Off-Line Data Backup

2-4 Troubleshooting for System Reliability

- For Remote Administrators
- For Field Engineers



Ethernet

Serial

Adding an Automatic Backup Host

Q : How do I add a backup host that can automatically synchronize and take control of my serial-to-Ethernet network?

A : Use the **Maximum Connection** function on supported Moxa device servers to automatically send serial data to up to 8 host computers.

Background

Most serial-to-Ethernet architectures use a single host computer for remote control, leaving the network vulnerable to system-wide disconnections or crashes if that one host computer is not working properly. As a result, a redundant host computer (Host B) is often used to provide host reliability by backing up the data for the primary host computer (Host A). But since this traditional approach to host redundancy requires Host A to manually synchronize with Host B, Host B can only provide limited data redundancy. In addition, Host B can neither read the data on Host A nor take control of the network in place of Host A, leaving the network architecture vulnerable to system-wide crashes.

Problems

- Administrators must manually back up and synchronize host computers
- Backup hosts cannot perform the same tasks as the primary host (e.g., take control of the network)

Smart Solution

The Maximum Connection function on Moxa's NPort serial device servers allows you to designate a primary host to automatically send serial data or commands to up to 8 backup host computers at the same time. Although the primary host can only send the same data or commands to each backup host, each backup host can promptly take over network control when the primary host is not operating properly.

Benefits

- Can designate which computer is the primary host
- Each host receives the same data at the same time (i.e., automatic back up)

Adding Multiple Backup Hosts

Q : But what if I need multiple host computers to control my serial devices?

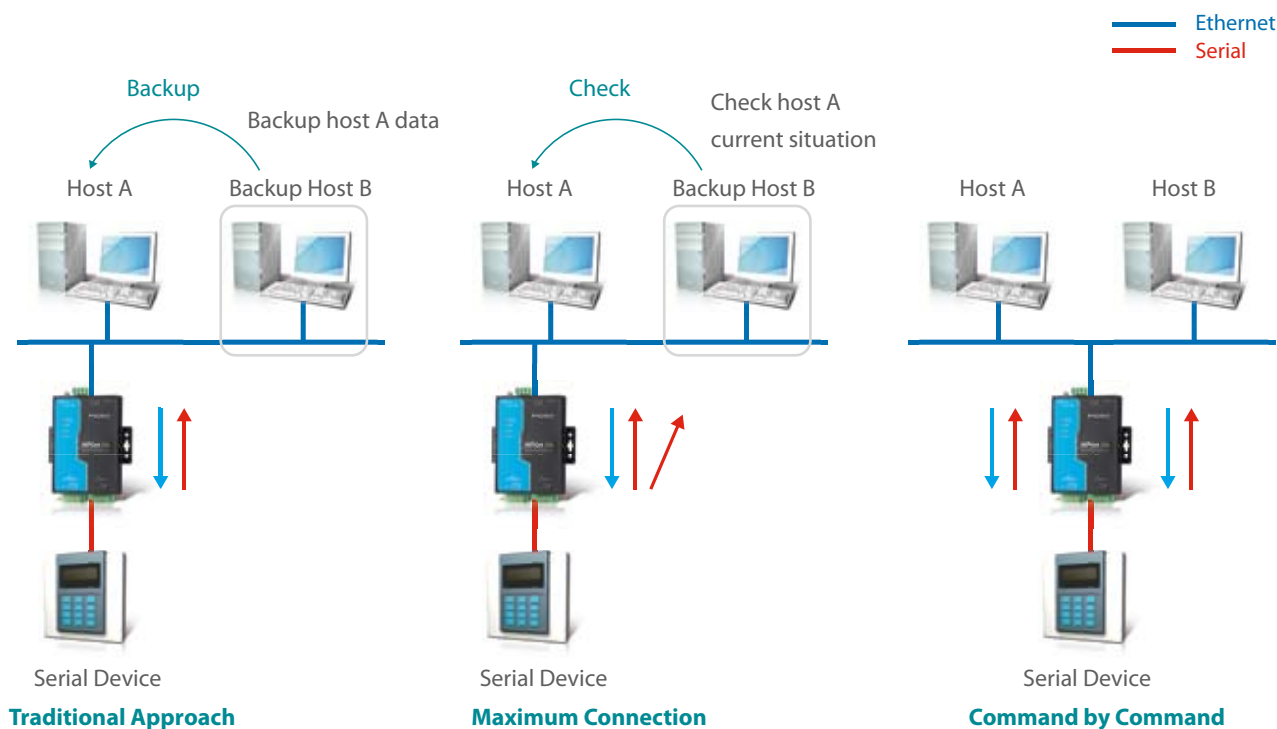
A : Use the **Command by Command** mode on supported serial device servers.

Smart Solution

If you have two or more host computers that need to send data to the serial devices on your network, a Moxa serial device server can be used as an intermediary to simultaneously receive two sets of data and then forward each set of data to the serial devices in two complete sequences. For example, Host A may need to send "abcdef" to the serial devices at the same time that Host B needs to send "123456" to the same serial devices. If both sets of data are sent simultaneously, then the data may be received in a jumbled form, such as "1abc23def456". However, Moxa's Command by Command mode allows the device server to ensure that each set of data is completely sent to the serial devices without interference from another simultaneous data transmission.

Benefits

- No need to synchronize all the host computers together
- Supports multiple primary hosts in the same network



Part 2 Ensuring Stability and Reliability

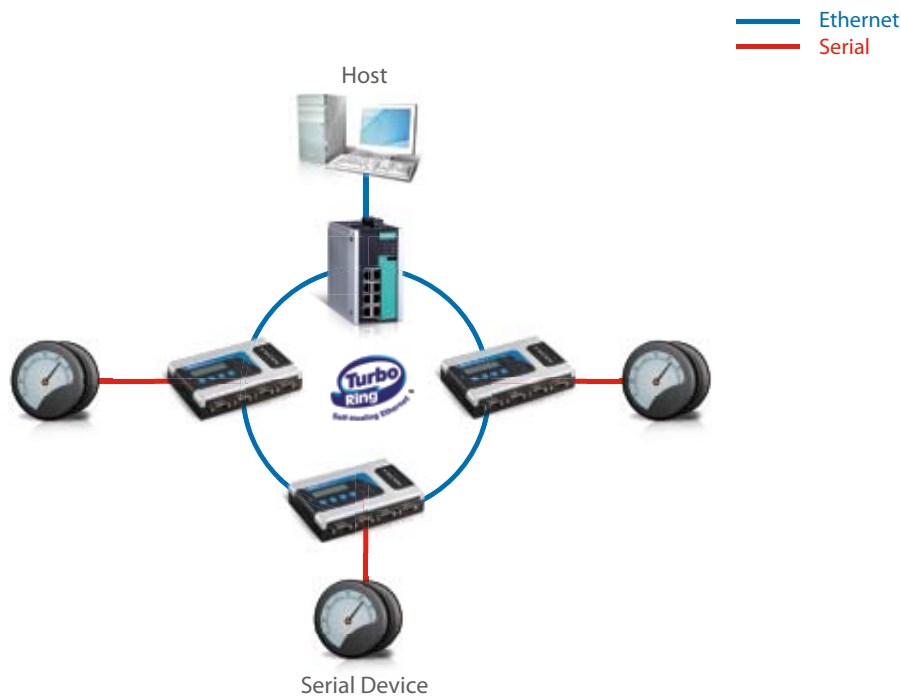
Network Redundancy Using One LAN

Q : How do I ensure non-stop network connectivity?

A : Turbo Ring

Smarter Solution

In the previously discussed network topology, you can also take advantage of Moxa's redundant ring technology—Turbo Ring—to prevent network disruptions and guarantee reliable data transmissions to the proper devices. Generally speaking, one segment of the ring topology will be purposely disconnected in order to prevent switching loops and broadcast storms. However, when an abnormality is detected along the original communication route of the ring topology, the initially disconnected segment will reconnect the device servers through an alternate route. Although network recovery for standard ring topologies can take up to 2 seconds for RSTP, or even 30 to 50 seconds when using STP, Moxa's Turbo Ring can recover your network in less than 100 ms.



Network Redundancy Using Two LANs

Q : How do I ensure network redundancy over two different IP networks?

A : **Redundant COM**

Background

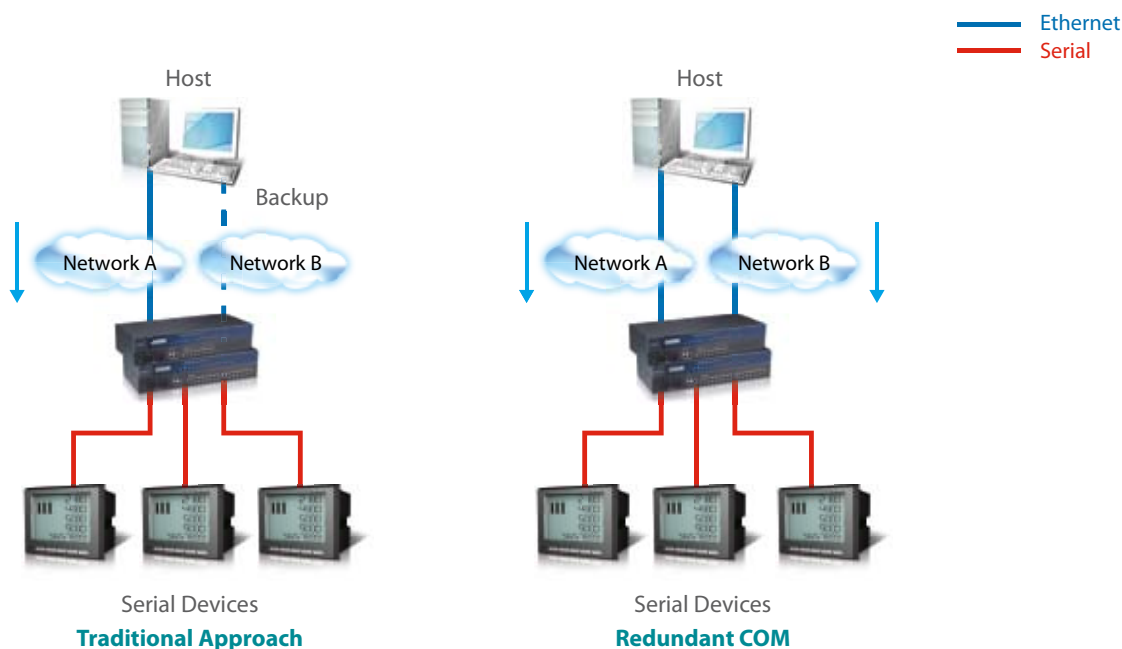
Another way to provide redundancy for your serial-to-Ethernet network is to set up dual LANs (Network A and Network B), each with its own IP address from a different Internet Service Provider (ISP), between the host computer and the serial devices. However, in normal operation, firmware is required to not only detect network abnormalities, but also inform the host computer to switch to the redundant LAN.

Problems

- Relying on firmware to detect network status lengthens the response time
- Connecting two LANs requires additional programming time and effort

Smart Solution

Redundant COM operation mode can be used to set up a redundant LAN between the serial devices connected to the CN2600's serial ports and the host computer. The redundant structure involves using the CN2600's two LAN ports to set up two independent LANs that connect the CN2600 to the host computer. If either of the two LANs fails, the other LAN will continue transmitting packets between the serial devices and the host, with the packets passing through the CN2600. In fact, one of the biggest advantages of the CN2600's Redundant COM mode is that the "switching time" is zero. So besides eliminating programming time and effort, Redundant COM also eliminates response times when switching between LANs.



Part 2

Ensuring Stability and Reliability

Adding Backup Field Devices

Q : How can I instantly deploy backup serial devices on an existing serial-to-Ethernet network?

A : **COM Grouping**

Background

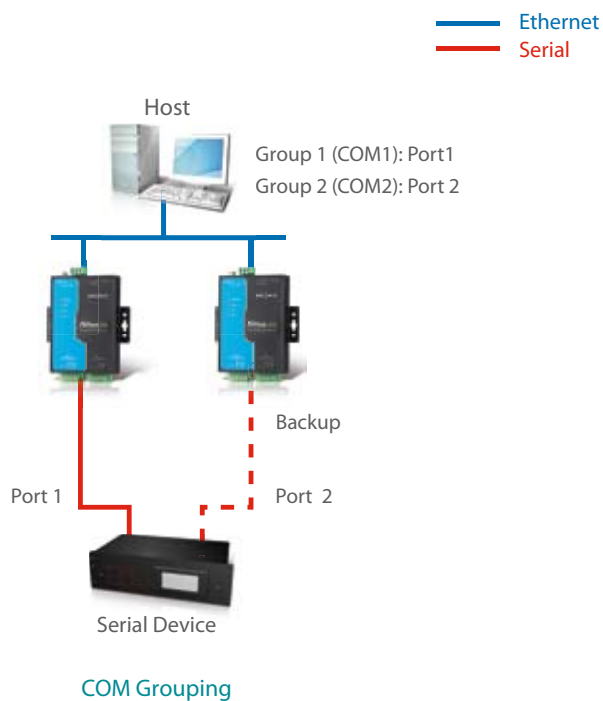
Sometimes, in order to ensure stable operation of the device layer, backup serial devices also need to be deployed. However, for these newly added devices, engineers need to modify the settings of existing software to transmit data simultaneously to both the primary serial devices and the redundant devices.

Problems

- Need to rewrite/reset existing serial communication settings
- Slow deployment for larger networks with many different serial devices

Smart Solution

The COM Grouping function allows you to skip the development time generally required to revise device settings and deploy new backup devices. In other words, you can keep existing settings and flexibly add backup devices to an existing network. For network devices that already have 2 built-in serial ports (e.g., intelligent electronic devices), COM Grouping allows you to create a COM Group for these 2 ports and redirect data from the COM Group to physical COM ports on the NPort device server.



Avoiding Data Overflow

Q : When the data buffer on the device side is not large enough, how do we avoid data overflow?

A : **On-chip software flow control**

Background

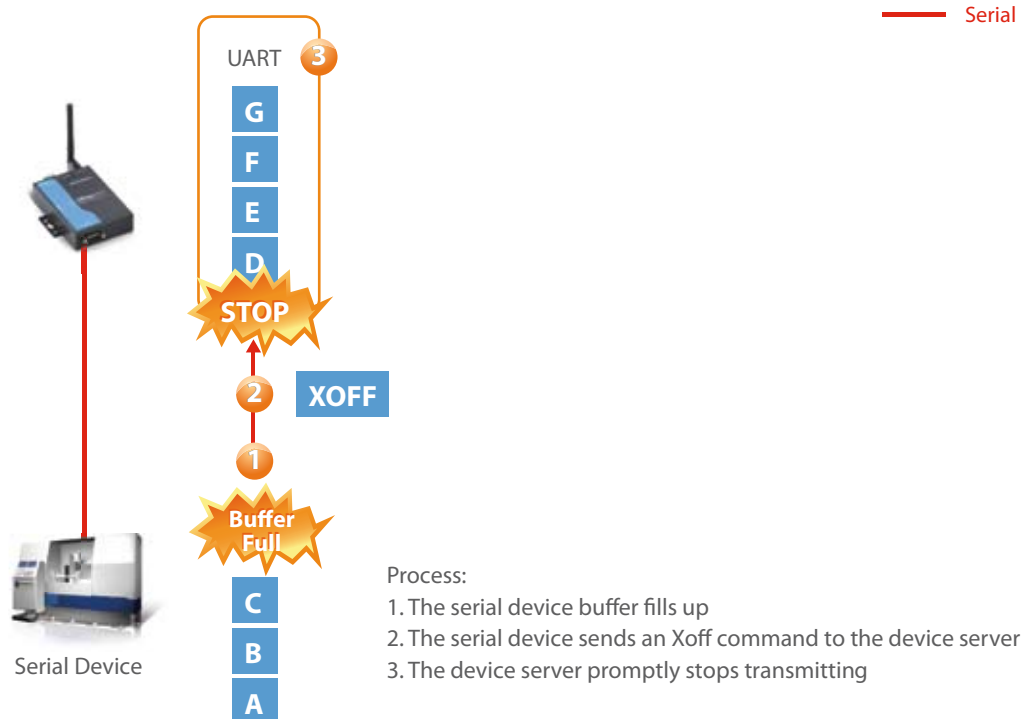
When the data buffer on the serial devices receiving the data is smaller than the data packet being transmitted, the traditional approach has been to use software flow control to manage the size of the data packets being transmitted to the device side. However, by separating the data packet into smaller packets, traditional software flow control runs the risk of losing data if transmission is interrupted before all the data reaches the serial devices.

Problems

- Slow data buffering
- Cannot ensure that 100% of data is received

Smart Solution

By enabling the NPort device server's UART to handle flow control directly, on-chip flow control can overcome the limitations of traditional software flow control. More specifically, on-chip flow control can delineate where a data packet begins and ends to allow sufficient yet efficient lag time for the receiving field devices to process the data.



Part 2

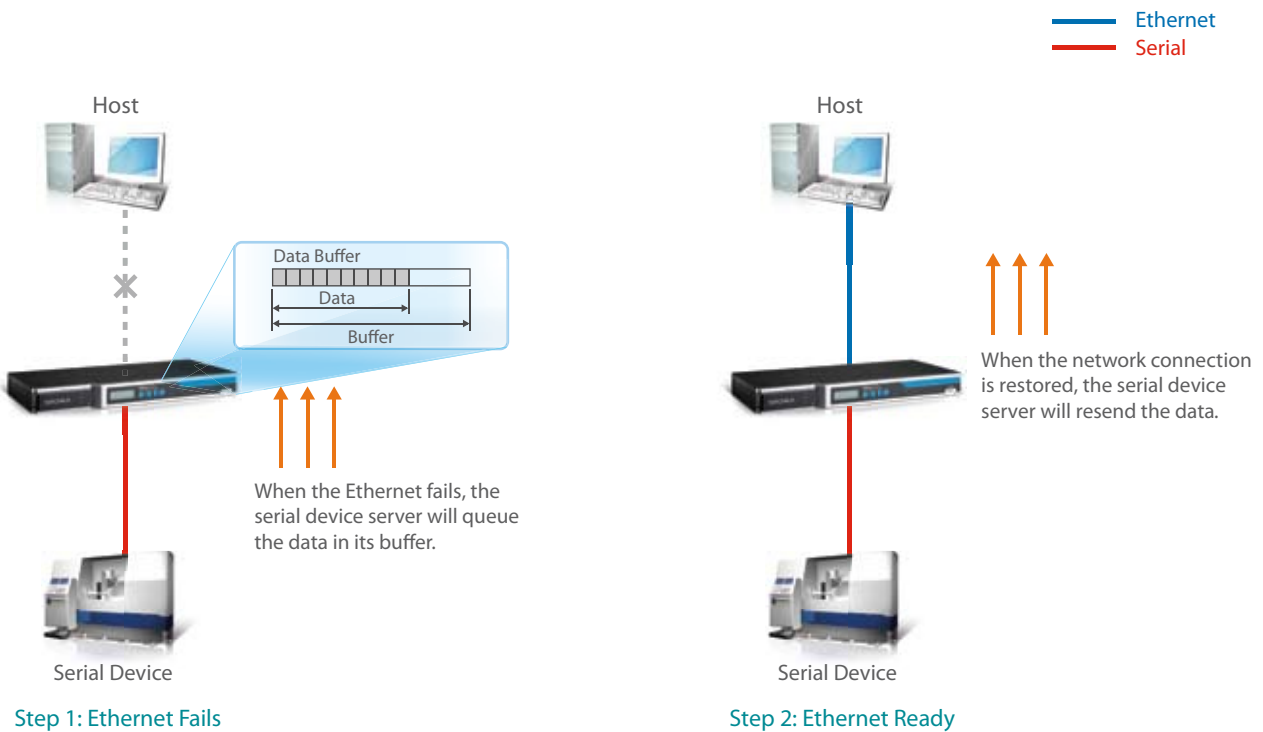
Ensuring Stability and Reliability

Off-Line Data Backup

Q : How can I temporarily store data when the network is disconnected?

A : **Off-line port buffering**

In wired or wireless environments, unexpected factors might cause unstable connections, or even disconnections. Therefore, sometimes you need a way to store data that is being sent or received on a network. When a network is facing trouble, the device servers have enough buffers to temporarily store data, and then resend the data when the network connection is restored. For example, Moxa's serial-to-wireless device server can store an average of 50 minutes at a 9600 baud rate.



Troubleshooting for System Reliability

The following questions and answers seek to help remote administrators and field engineers maintain and troubleshoot a serial-to-Ethernet network more efficiently by matching particular device server features to specific troubleshooting objectives.

For Remote Administrators

Q : How do I monitor real-time and historical data for a serial-to-Ethernet network?

In addition to real-time status reports, network administrators often require data about network conditions preceding an event to improve operational efficiency and perform root cause analysis or other business intelligence applications.

A1 : **Simple Network Management Protocol (SNMP)** provides real-time status reports to remote administrators.

IT administrator converge system information to the existing SNMP management system for real-time network monitoring. In addition, when the following situations occur, IT administrators can receive automatic real-time warnings through SNMP trap and e-mail.

- System restart
- Unauthorized user log-in
- Network settings are revised

A2 : Each NPort device server contains a **Syslog (System Log)** that can be accessed remotely as well as at the field site.

Engineers can access a serial device server's event logs to find system, network, configuration, and operation mode information via the device server itself or a server.

Part 2

Ensuring Stability and Reliability

Troubleshooting for System Reliability

For Field Engineers

Q : What tools are available to help onsite field engineers accelerate troubleshooting?

Engineers dispatched to a field site need to diagnose and troubleshoot network issues in the most efficient manner possible to minimize system downtime.

A1 : Relay outputs support onsite alarms.

To ensure reliable system operation, the serial device servers are connected with alarm devices through relay outputs, and can use sounds or flashing lights to promptly inform onsite engineers that troubleshooting is required.

A2 : LED indicators/LCD displays aid initial troubleshooting.

LED indicators on the serial device servers allow engineers to immediately clarify the following issues:

- Are serial device servers functioning normally?
- Is the Ethernet connected or not?
- Is power being supplied?
- Is the serial port transmitting or receiving data?

In addition, engineers have another option not only to configure some settings, but also monitor the operation status of serial device servers through the LCD (Liquid Crystal Display).

Use WiFi Site Survey Tool to Detect Suitable Access Points

In the past, engineers used computers to detect a suitable AP for serial device servers, but sometimes the detected AP was not reliable. Moxa's NPort W2150A wireless device server supports a site survey tool that bases WiFi AP detection on the serial device server. Engineers can take advantage of the site survey tool to check if there are any WiFi APs on the same channel that can influence connectivity of the serial devices.

Supported Products: NPort W2150A/W2250A series

Part 3

Case Study: Factory Automation

Semiconductor manufacturing is highly precise and incredibly time-intensive, generally requiring many sequences of photolithographic and chemical processing over the course of 6 to 8 weeks. Since even a small mistake due to human error for just one batch of 25 wafers can end up costing millions of dollars, automated fab machines are used to gradually create electronic circuits on the wafers. One of the world's largest semiconductor manufacturers wanted to build a new fab (fabrication plant) to produce integrated circuits (IC chips) on 8-inch wafers. Although the company was already a global leader in producing 6-inch IC chips, the high-stakes nature of semiconductor manufacturing required a completely new fabrication plant to be built to accommodate the new larger wafer size.

System Requirements

- Integrate fab machines and devices running on different serial communication protocols with a remote host for centralized management and control
- Preserve serial communication settings, commands, to be modified for the new fab

Moxa Solution

To avoid disrupting existing fab production processes during system migration and having to rewrite existing commands and programs, Moxa's serial device servers with Real COM mode support the latest operating system drivers and enable interoperability between old and new systems on the production line. In order to support various fab machines that perform different processes and run on different protocols, NPort device servers also provide a rapid response time of under 0.5 seconds. Furthermore, Moxa provides technical modifications with the system firmware to help the semiconductor company design customized quality control tests (e.g., stress tests). Finally, Moxa device servers also provide comprehensive log records for administrators to identify problems and troubleshoot more quickly.

Product Showcase

NPort 5610 series



[Download Serial-to-Ethernet Guidebook](#)

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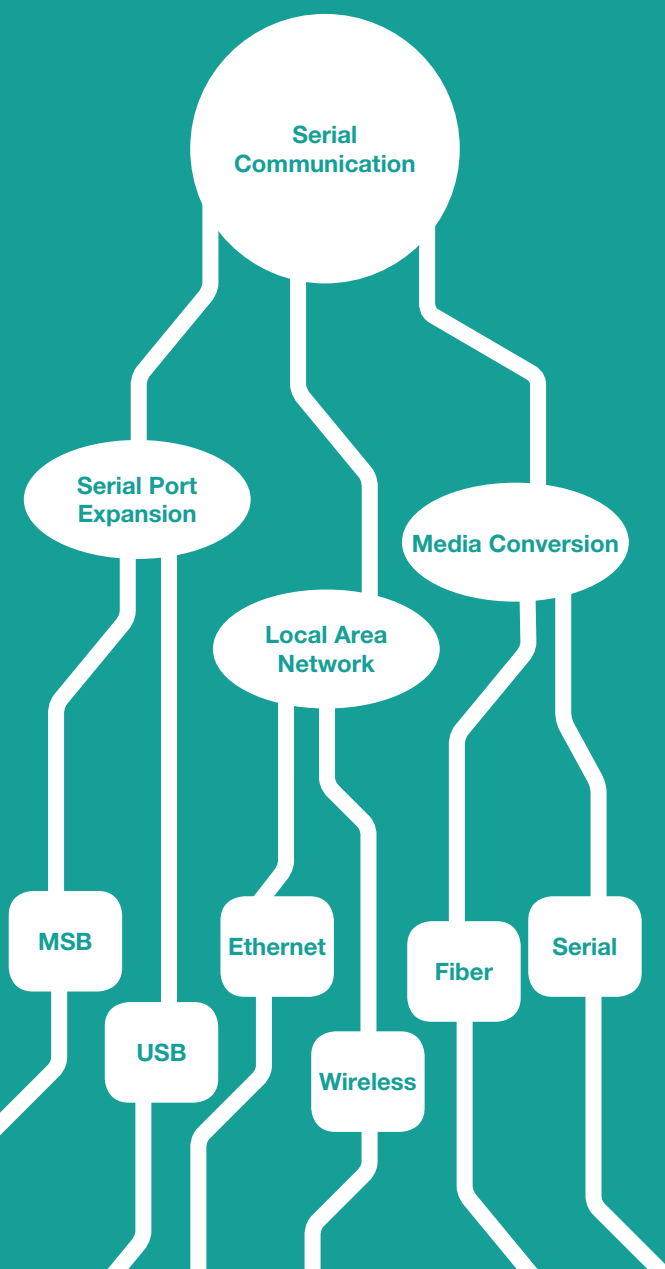
Part 4. Device Server Product Selection Guide

	Serial Device Servers		Industrial Device Servers			Terminal Servers		Switch / Serial Device Servers	Wireless Device Servers
Model Name	NPort 5100 NPort 5200 NPort 5400 NPort 5600 NPort 5600-8-DT NPort 5600-8-DTL	NPort 5100A NPort P5150A NPort 5200A	NPort IA5150 NPort IA5250	NPort IA5150A NPort IA5250A NPort IA5450A	NPort 5150AI-M12 NPort 5250AI-M12 NPort 5450AI-M12	NPort 6150 NPort 6250 NPort 6450 NPort 6610 NPort 6650	CN2610 CN2650	NPort S8455 NPort S8458	NPort W2150A NPort W2250A
Basic Installation									
NPort administrator suite	•	•	•	•	•				
3-step configuration wizard		•		•	•				•
Advanced Installation									
Windows driver supports up to 1,024 ports	•	•	•	•	•	•	•	•	•
COM grouping	•	•	•	•	•				
Reverse Real COM						•			
Serial data packing	•	•	•	•	•	•	•	•	•
IPv6						•			
Host Reliability									
Maximum connection	•	•	•	•	•	•	•	•	•
Command by Command Mode						•			
Network Reliability									
Turbo Ring						•		•	
Redundant COM							•		
Device Reliability									
On-chip software flow control	•	•	•	•	•	•	•	•	•
Off-line port buffering						•	•		•
Troubleshooting for System Reliability									
SNMP/SMTP	•	•	•	•	•	•	•	•	•
Syslog/System Log						•	•		
Relay			•	•		•		•	
LED	•	•	•	•	•	•	•	•	•
LCD	For 4 ports or more				For 4 ports or more	•			
Site survey tool									•

Part 5

Serial Expansion Roadmap

Several asynchronous serial interfaces, including RS-232, RS-422, RS-485, CANbus, and PROFIBUS, are currently in use to connect various types of devices, such as sensors, card readers, meters, and PLCs. However, the limitations of serial communications, such as distance, accessibility, the amount of data transferred at any one time, and speed, have led to a demand for solutions that provide a more flexible means of communicating. Although this book concentrates on products and applications that require access to RS-232, RS-422, and RS-485 interface devices via an Ethernet connection, we hope the following serial expansion “roadmap” will help you select the most appropriate solution(s) for expanding the capabilities of your legacy serial devices.



Serial Port Expansion

If you need to expand the number of serial port connections (i.e., COM ports) for your host computer, the solutions available will depend on whether you are using a desktop computer or a notebook computer.

MSB: If you're using a desktop computer as your host, then you can choose either a **multiport serial board** or **USB hub**.

USB: If you're using a notebook computer, then you will need to use a **USB hub** to expand the number of COM port connections for serial field devices.

Local Area Network

If your objective is to remotely control multiple serial field devices, then you'll need to choose an appropriate LAN architecture for connecting your field devices.

Ethernet: If you have an existing Ethernet backbone or want to deploy a new Ethernet LAN, then you will need to use a **serial device server** or an **embedded serial device server** to network-enable your legacy serial field devices for the TCP/IP platform.

Wireless: If you cannot use a wired network to remotely control your serial field devices, then you can use a **wireless device server** or an **embedded serial device server** to enable IEEE 802.11a/b/g wireless communications for your serial field devices.

Media Conversion

If you want to extend the data transmission distance, or transmit data between two different communication standards or protocols, then you will need to use a media converter.

Fiber: If you only want to extend your serial communication distance, then you will need to use a **serial-to-fiber media converter**. Compared to traditional copper wires used in legacy serial data transmissions, fiber cables support a much greater transmission distance.

Serial: If you want to convert between different serial communication standards, such as from RS-232 to RS-485, then you will need to use a **serial-to-serial media converter**.



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Moxa is a leading manufacturer of industrial networking, computing, and automation solutions. With over 25 years of industry experience, Moxa has connected more than 30 million devices worldwide and has a distribution and service network that reaches customers in more than 70 countries. Moxa delivers lasting business value by empowering industry with reliable networks and sincere service for automation systems.

Moxa Sales and Marketing Headquarters

Moxa Corporate Plaza
601 Valencia Ave., Suite 200
Brea, CA 92823, U.S.A.
Toll Free: 1-888-669-2872
Tel: +1-714-528-6777
Fax: +1-714-528-6778
usa@moxa.com

Moxa Design and Engineering Headquarters

Fl. 4, No. 135, Lane 235, Baoqiao Rd.
Xindian Dist., New Taipei City,
Taiwan, R.O.C.
Tel: +886-2-8919-1230
Fax: +886-2-8919-1231
info@moxa.com

The Americas Moxa Americas

Toll Free: 1-888-MOXA-USA
Tel: +1-714-528-6777
Fax: +1-714-528-6778
usa@moxa.com

Moxa Brazil

Tel: +55-11-2495-3555
Fax: +55-11-2495-6555
brazil@moxa.com

Europe Moxa Germany

Tel: +49-89-3700-399-0
Fax: +49-89-3700-399-99
europe@moxa.com

Moxa France

Tel: +33-1-30-85-41-80
Fax: +33-1-30-47-35-91
france@moxa.com

Moxa UK

Tel: +44-1844-355-601
Fax: +44-1844-353-553
uk@moxa.com

Asia-Pacific Moxa Taiwan

Tel: +886-2-8919-1230
Fax: +886-2-8919-1231
asia@moxa.com

Moxa India

Tel: +91-80-4172-9088
Fax: +91-80-4132-1045
india@moxa.com

Moxa Russia

Tel: +7(495)287-09-29
Fax: +7(495)269-09-29
russia@moxa.com

China Moxa Shanghai

Tel: +86-21-5258-9955
Fax: +86-21-5258-5505
china@moxa.com

Moxa Beijing

Tel: +86-10-6872-3959/61
Fax: +86-10-6872-3958
china@moxa.com

Moxa Shenzhen

Tel: +86-755-8368-4084/94
Fax: +86-755-8368-4148
china@moxa.com