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## Whitepaper...

# Network enable the Apex Hera

revision 1.0

The purpose of this whitepaper is to present an inexpensive way of reading-out the measurement and event log from the Apex Hera's memory through a network. This could be a corporate network or even the internet.

## Introduction

The Apex Hera has only a RS-232 serial port for remote monitoring. Therefore, connecting the Apex Hera with a network requires to convert the RS-232 signals and data to a format suitable for a TCP or UDP/IP network. This transformation requires a small converter device called **Serial Device Server**.

A Serial Device Server is a small standalone device with a built-in tiny embedded operating system and all necessary software protocols, such as the TCP/IP stack. It comes equipped with the required hardware interfaces, such as RS-232, RS-422, and RS-485 ports. For use with the Apex Hera, only RS-232 is required. **Both wired and wireless device servers exist.**

Most serial device server manufacturers provide a **real native driver** that works with Windows or other operating systems. This driver establishes a **transparent connection** between the host computer and the serial device server by creating a **virtual local COM port** on the computer. This is a crucial point, since it means that users **do not need** a special communication software for their applications. The driver simply redirects data intended for the serial port to the computer's network card.

In the case of the Apex Hera, reading-out the logs requires a **serial terminal application**, such as HyperTerminal on Windows or Minicom on UNIX-based computers. As the Serial device server's driver will create a virtual serial port, you may continue to use your preferred terminal application. All you will need to do is selecting the virtual serial port in the application settings.

Several manufacturers offer inexpensive serial device server units. For the purpose of this whitepaper, we have used a **Moxa NPort 5110**. As configuration details may vary from one unit to another, we will not go into configuration details but we'll explain you the principal of each operation. For detailed configuration and installation procedures, we invite you to consult the user documentation.

In this document, we will give an overview of how to configure the serial device server, the network infrastructure and the host computer. We will present you both situations: for use over a LAN (corporate network) or WAN (internet). The configuration for use in a standard corporate network is quite simple and does not require advanced networking knowledge, connecting the device over the Internet is a bit more complex. Anyway, **we invite you to prior consult your network administrator before connecting the serial device server to any network.**

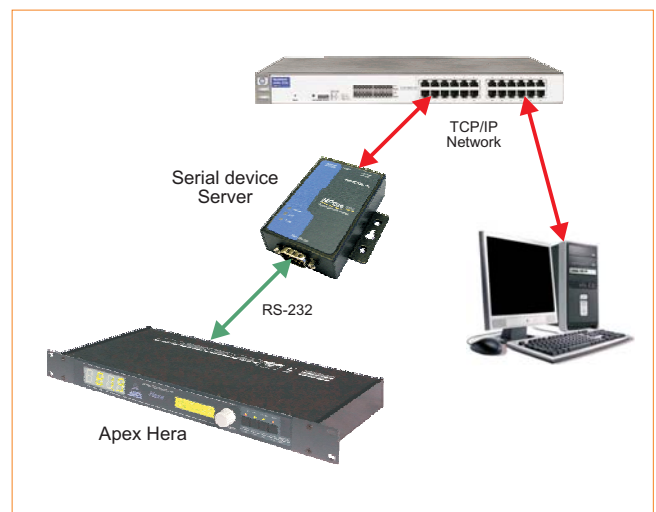
## 1. Installing the device server administration application

Most of the device servers are provided with a Microsoft Windows application that will automatically detect all device servers present in your network and will offer you a user friendly interface to configure them. The installation of this application usually includes the required drivers. For the installation procedure, please refer to the documentation provided with the device server.

## 2. Network set-up

As you know, **each equipment in an IP network requires a unique IP address**, so the first step is to assign an IP address to the serial device server.

There are two ways of assigning an IP address to any equipment, one is called **static** and the other is called **dynamic**. A static IP address is assigned once and will stay assigned for the time the device stays attached to the network. **Each equipment with a static IP address needs to be configured by hand to set their address. Dynamic IP addresses require the presence of DHCP server** which will automatically assign an IP address to all the new equipment added in the network. This dynamic IP address has normally a limited live time. This means that it is perfectly possible that the address you computer or the device server will get today, will be different from the one it get yesterday. This can cause a problem in the case of the serial device server, as the host computer must know at which address he can find the device server. That's why **we recommend to assign a fixed IP address to the device server.**

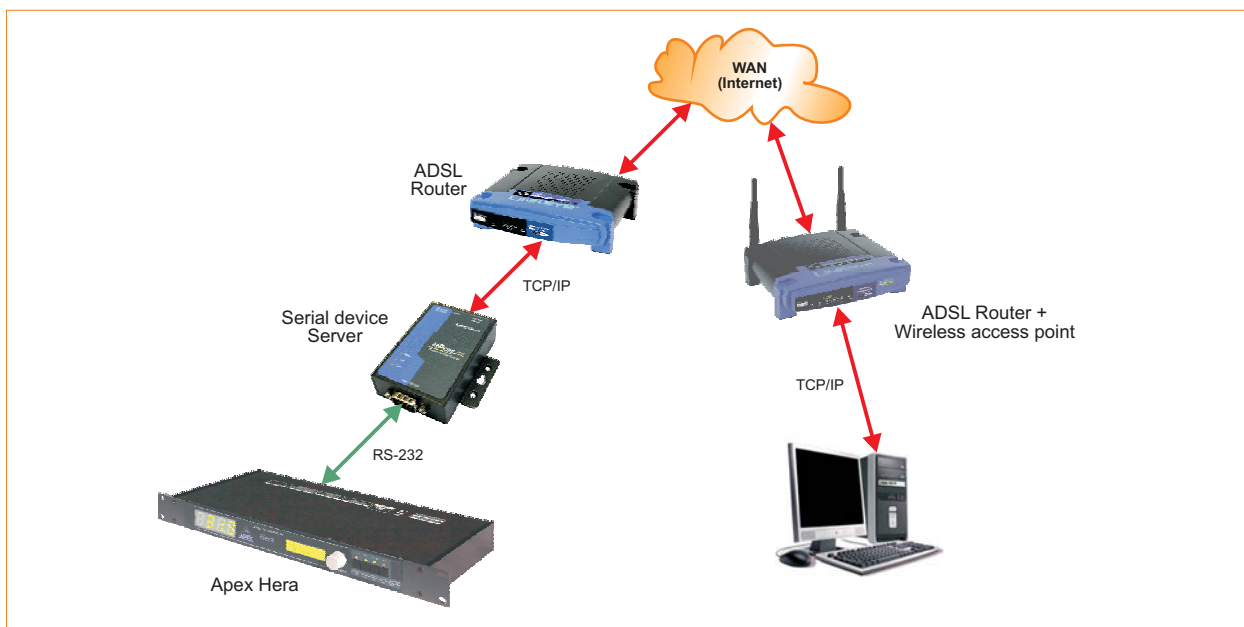


Most of the corporate or home networks have a DHCP server. It can be a software running on a server or a home router. It is possible to mix static and dynamic IP addresses in the same network, and that's usually the case. In fact, the DHCP server is allowed to assign addresses only within a user definable range. So for the case of our device server, you need to choose an address that is not already used and that is outside the DHCP range. **It is preferable to ask the network administrator to give you a fixed IP address for serial device server.** You may also consult the documentation of your home router to know the DHCP address range. Generally, home routers can be simply configured through a built-in web-server.

Once the IP address has been chosen, you need to set up the serial device server to use this address and the subnet mask of your network. From brand to brand, the manner of doing it may differ, but most of the device servers are provided with a Windows application that will automatically detect the device server present in your network and will allow you to configure their network settings. Other manners exist as well, such as a serial console. Some serial device servers also have a built-in web-server, but without knowing its IP address, it is impossible to go to its web page. For details about how to set up the IP address, consult your user manual.

## 2.1. Serial server through a WAN

A Wide Area Network (WAN) is opposed to a Local Area Network (LAN) like a home or corporate network, as it goes through public infrastructure. A WAN may be a leased network or simply the internet. Using a serial device server over a WAN requires a few more steps:



### 2.1.1. Site fixed IP address

An important thing to know is that the site where the device server is installed requires a **fixed IP address on the WAN** or the internet network. The IP addresses over a WAN are also unique, your ISP will assign you one. Generally, for home and small-business, IP addresses on the Internet are assigned using DHCP, so it is not guaranteed that your IP address will stay unchanged. A fixed IP address on the Internet is generally a billable service. Please consult your ISP for that. If for some reason a fixed IP address is not an option, you can try using a service like **Dyndns** ([www.dyndns.org](http://www.dyndns.org)). This free service will provide you a fixed domain-name (e.g. [serialserver.dyndns.org](http://serialserver.dyndns.org)) that is linked to your dynamic IP address. See the Dyndns website for more details.

### 2.1.2. Gateway address

Transferring data from a LAN (home or corporate network) to a WAN (internet) requires the presence of a **router**. Viewed from the internal network (LAN) the router is also called **gateway**. The rule of the gateway is to re-direct the IP packets from your local network to the wide network. **The serial device server must be aware of the gateway IP address.** The network administrator will provide you the gateway address. For home routers, the gateway address is the IP address of the router itself.

### 2.1.3. Firewall and NAT router configuration

Most network protocols use port numbers to identify sending and receiving applications to and from the same IP address. Without a port number, it would be impossible to have several applications using the network on one computer as the operating system would not know who the packet is intended for. Every serial device server uses multiple ports for different purposes (configuration, broadcast search, firmware update,...). In the case of the **Moxa NPort 5110**, the following table lists all necessary ports:

| Protocol | Port No.   | Purpose   |
|----------|------------|---|
| TCP      | 23         | Telnet  |
| TCP      | 80         | Web Console   |
| TCP      | 4900       | 1. Save settings<br>2. Firmware upgrade   |
| TCP      | 950 (~965) | Data port   |
| TCP      | 966 (~981) | Command port  |
| UDP      | 4800       | 1. Broadcast search/rescan<br>2. Administrator monitor<br>3. Get current settings |

For serial communication, only the **data and command ports** are necessary. All others are used for configuring and monitoring. In a LAN (corporate or home network) there is nothing to worry about. But if you plan to use the NPort through a WAN the necessary TCP and UDP ports should be opened in the **firewall**.

Then, as the NPort will use a private IP address behind your NAT/firewall, you will need to configure your **NAT router** to map the router's public IP address to the NPort's private IP address. Most routers/firewalls support this function, either for a mapping of all the incoming traffic to a so called DMZ, or for mapping based on the port number of the incoming traffic to a so called virtual server.

The examples below show how TCP/UDP port numbers are mapped using a private IP address of 192.168.123.1 for the NPort and a public IP address of 61.x.x.x for the NAT router.

| Protocol | Public IP | Port No.   | Nport private IP | Port No.   |
|----------|-----------|------------|------------------|------------|
| TCP      | 61.x.x.x  | 23         | 192.168.123.1    | 23         |
| TCP      | 61.x.x.x  | 80         | 192.168.123.1    | 80         |
| TCP      | 61.x.x.x  | 4900       | 192.168.123.1    | 4900       |
| TCP      | 61.x.x.x  | 950 (~965) | 192.168.123.1    | 950 (~965) |
| TCP      | 61.x.x.x  | 966 (~981) | 192.168.123.1    | 966 (~981) |
| UDP      | 61.x.x.x  | 4800       | 192.168.123.1    | 4800       |

Details on configuration of both NAT router and firewall are beyond the scope of this whitepaper. Please refer to your network administrator and user documentation.

### 3. Connecting the Apex Hera

You now need to connect the Apex Hera with the serial device server. Caution must be taken with Hera's produced before February 2008: they require a custom cable. It is easy to recognise such device as the RS-232 serial connector on the back panel is a **9-pin D-sub male** connector. The necessary pin layout to build a custom cable can be found in the Hera's user manual. Hera's produced from February 2008 have a **female 9-pin D-Sub connector** instead. With such a model, you can use a standard straight RS-232 male/ female cable.

Both terminal application and serial server device must be configured with proper RS-232 parameters as follows:

Bits per second: 9600  
 Data bits: 8  
 Parity: none  
 Stop bits: 1 bit  
 Flow control: none

## 4. Basic test

In your terminal application, open the virtual serial port corresponding to the serial server driver and hit the 'H' key of your keyboard. The Hera should answer with the command usage as follow:

```
'H' Help:
APEX HERA
Use:
'E' Error/Event List
'M' Measure List
'C' Customer Name
'T' Threshold List
'I' Info
'D' Actual Date/Time
'S' Settings
'H' Help

Please Wait... Ok
```

You're now ready to roll...

## 5. Further information

The Apex Hera's communication protocol may be found in the user manual. This user manual is available for download on our website: [www.apex-audio.be](http://www.apex-audio.be)

For further information on this whitepaper or the Apex products in general, we invite you to write us an e-mail at: [info@apex-audio.be](mailto:info@apex-audio.be)

### 5.1. List of abbreviations

LAN: Local Area Network  
WAN: Wide Area Network  
ISP: Internet Service Provider

### 5.2. Serial device server manufacturers

Moxa [www.moxa.com](http://www.moxa.com)  
Digi [www.digi.com](http://www.digi.com)  
Advantech [www.advantech.com](http://www.advantech.com)  
B&B Electronics [www.bb-elec.com](http://www.bb-elec.com)

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