

Hawkeye

Release 6.0.7

XR2000 User Guide

Notices

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	400-810-0005	8h30 – 17h30
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Hawkeye endpoints definition

An endpoint is called a probe and represents a device inserted at a key juncture in a network for monitoring or collecting performance data about network activity. The test traffic generated conforms to applicable standards. For example, voice traffic contains generated data that conforms to selected codecs with correct packet sizes and packet timings. The Hawkeye endpoint for corporate security generates its test data. Hawkeye does not monitor or analyze corporate private transmitted data. The following Hawkeye endpoints are available:

- Keysight Technologies hardware endpoints: XR3000, XR-E1S, IxProbe, XRPi, and xr2000
- XR software endpoints: XR-VM, XR Docker, PI4 Image, and XR Cloud
- Software endpoints: IOS EP, Android EP, Linux EP, and Windows EP

Hawkeye supports different software endpoints for various platforms. You can download these endpoints from the Keysight Technologies, Inc. web site mentioned in the section on software endpoints.

NOTE

The Real Services testing is only available with XR2000, XR2000 VM (Linux Software), XR Docker, and XRPi endpoints. Use XRPi to perform or monitor wireless network testing.

XR2000

The XR2000 is a low-profile small form factor unit ideal for use as an endpoint. It contains the following components:

- An ultra-low voltage CPU
- Six integrated ethernet ports

NOTE

One of the ethernet ports is PXE-enabled, which allows you to run remote diagnostics and reboot.

It does not contain any fans.



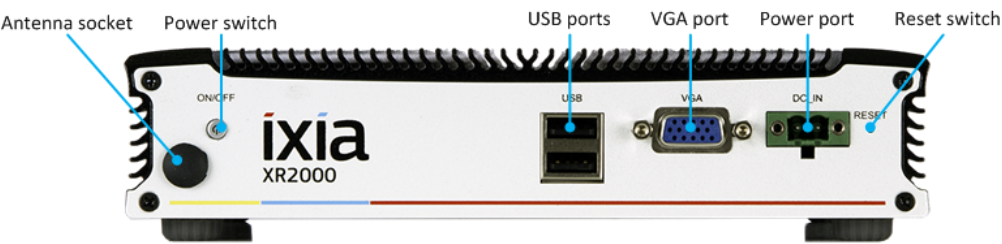
XR2000 Hardware

Package contents

The XR2000 ships with the following components:

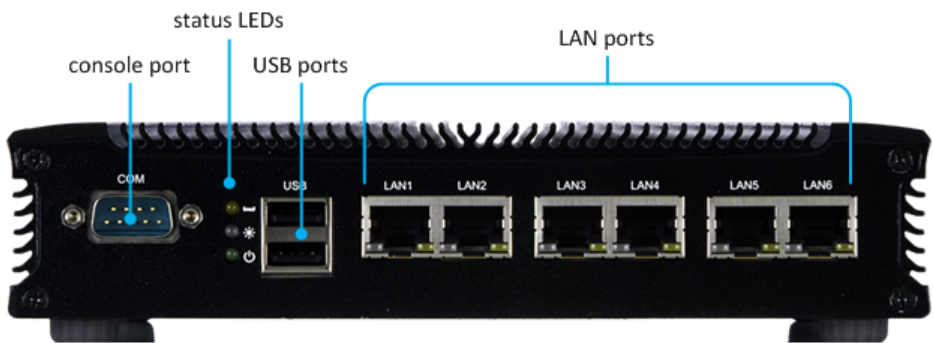
- XR2000 unit
- Dual-voltage (110/220) AC power adapter
- *Quick Start Guide*

Front panel



Component	Description
Antenna socket	Not supported
Power switch / LED	Green indicates that the system is powered on. Red indicates that the system is in standby mode.
USB ports	Not supported
VGA port	Connect this port to a monitor or other display device. The Hawkeye supports QXGA resolution (2048 x 1536 at 75 Hz).
24V DC power socket	Use with the supplied 24V DC power adapter.
Reset switch	Not supported

Rear panel



Component	Description
Console Port (DB-9)	Use this port to connect a suitable rollover cable (Yost cable or Cisco console cable) to configure the Hawkeye, or for diagnostics. Default terminal configuration parameters are 115200 baud, 8 data bits, no parity, 1 stop bit , no flow control. Internally this port is assigned as COM1.

HDD/Status/Power LEDs	<ul style="list-style-type: none">• HDD: Indicates that the Hawkeye's storage media is functioning normally. At boot time, the LED is on steadily. During data access to or from storage, it blinks. Otherwise, it is off.• Status: Green indicates that the Hawkeye is operating normally. Amber indicates a hardware fault.• Power: On indicates that the system is powered on. Off indicates that the system is powered off.														
USB 2.0 ports	<p>You can connect USB devices such as keyboards to the USB ports.</p> <p>Top: USB0, bottom: USB1</p> <div><div>NOTE</div><div>You should only connect USB devices that have been qualified by Ixia for use with the XR2000. For the list of qualified products, contact your Ixia representative or support@ixiacom.com.</div></div>														
10/100/1000Mbps Ethernet LAN ports	<p>Use these ports to connect the Hawkeye to other ethernet devices.</p> <p>From left to right: LAN1-LAN6</p> <p>LAN1 has Preboot Execution Environment (PXE) capability, so if you access the Hawkeye through this port, you can boot it independently of the installed operating system.</p> <p>LAN LEDs</p> <table><tr><td colspan="2">Left: Connection speed</td></tr><tr><td>Green</td><td>100 Mbps</td></tr><tr><td>Orange</td><td>1000 Mbps</td></tr><tr><td>Off</td><td>10 Mbps</td></tr><tr><td colspan="2">Right: Activity</td></tr><tr><td>On</td><td>port is active</td></tr><tr><td>Blinking</td><td>port is sending or receiving traffic</td></tr></table>	Left: Connection speed		Green	100 Mbps	Orange	1000 Mbps	Off	10 Mbps	Right: Activity		On	port is active	Blinking	port is sending or receiving traffic
Left: Connection speed															
Green	100 Mbps														
Orange	1000 Mbps														
Off	10 Mbps														
Right: Activity															
On	port is active														
Blinking	port is sending or receiving traffic														

System information

Temperature (ambient)	Operating: 0°C ~ 40°C Storage: -20°C ~ 70°C
Humidity (RH), ambient	5 ~ 95 percent, non condensing
Dimensions (WxHxD)	200 mm x 42 mm x 144 mm 7.9" x 1.65" x 5.67"
Weight	1.2 KG
Approvals & Compliance	CE Emission, FCC Class A, RoHS

Configure XR2000

There are four phases to configure and set up XR2000:

- Connect to XR2000
- First-time setup, in which you have to configure an IP address on the XR2000 so that you can access it over a network.
- Web setup, in which you set the XR2000 basic boot-up and runtime configuration. For this phase, you use a web browser to access the XR2000 over your network.
- Register XR2000 with Hawkeye server.

Connect to Hawkeye

For a new XR2000, you need to connect to the XR2000, and then configure its IP addresses so that you can access it over your network.

After you can access it over the network, you can use a web browser to perform more in-depth setup using the web setup. You need to connect directly to the XR2000 to set the IP address. You can do it in the following ways:

- Connect a monitor to the VGA port and a keyboard to the USB port. See, [First time setup through VGA and USB](#).
- Use a console cable to connect a laptop to the console port. See, [First time setup through the console port](#).
- Use an ethernet cable to connect a laptop to one of the LAN ports. See, [First time setup over ethernet](#).

NOTE

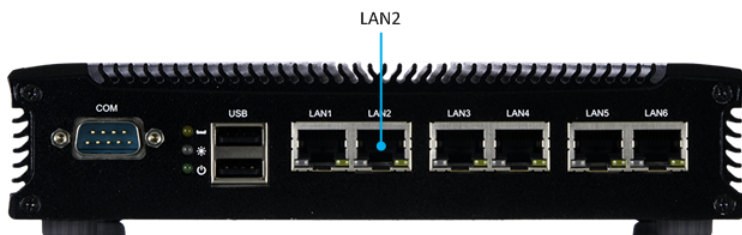
XR2000 supports multiple ethernet ports. Default routes for traffic will be over eth0. If each interface is, however, on a different subnetwork, go to **Preferences > Advanced Options > Set test IP that matches default gateway** and enable the option for Mesh tests a parameter so that when mesh tests are made, traffic will be on the interface that has default gateway defined. On the command line on the XR2000 use the `route -n` command to see which interface has the defined default gateway.

First time setup over ethernet

In the first time setup, you connect to the XR2000, and run a script to configure its name (the probe name). You will need a terminal-type application such as PuTTY.

To perform the first-time setup over ethernet:

1. Make sure that the XR2000 is powered off.
2. Connect one end of an ethernet cable to a computer, and the other end to the LAN2 port on the XR2000.



As shipped from the factory, the XR2000 is configured as follows:

Physical port	Logical port	Address
LAN1	eth0	192.168.1.10 / 255.255.255.0
LAN2	eth1	DHCP

- On the computer, set its IP address so that it is on the same subnet (192.168.1.xxx) as the XR2000. For example, you can set it to **192.168.1.1**.
- Power on the XR2000. At this point, you can do either of two things:
 - Exit the initial setup and move on to the web setup.
 - Run the setup script to configure the permanent IP addressing on the XR2000.

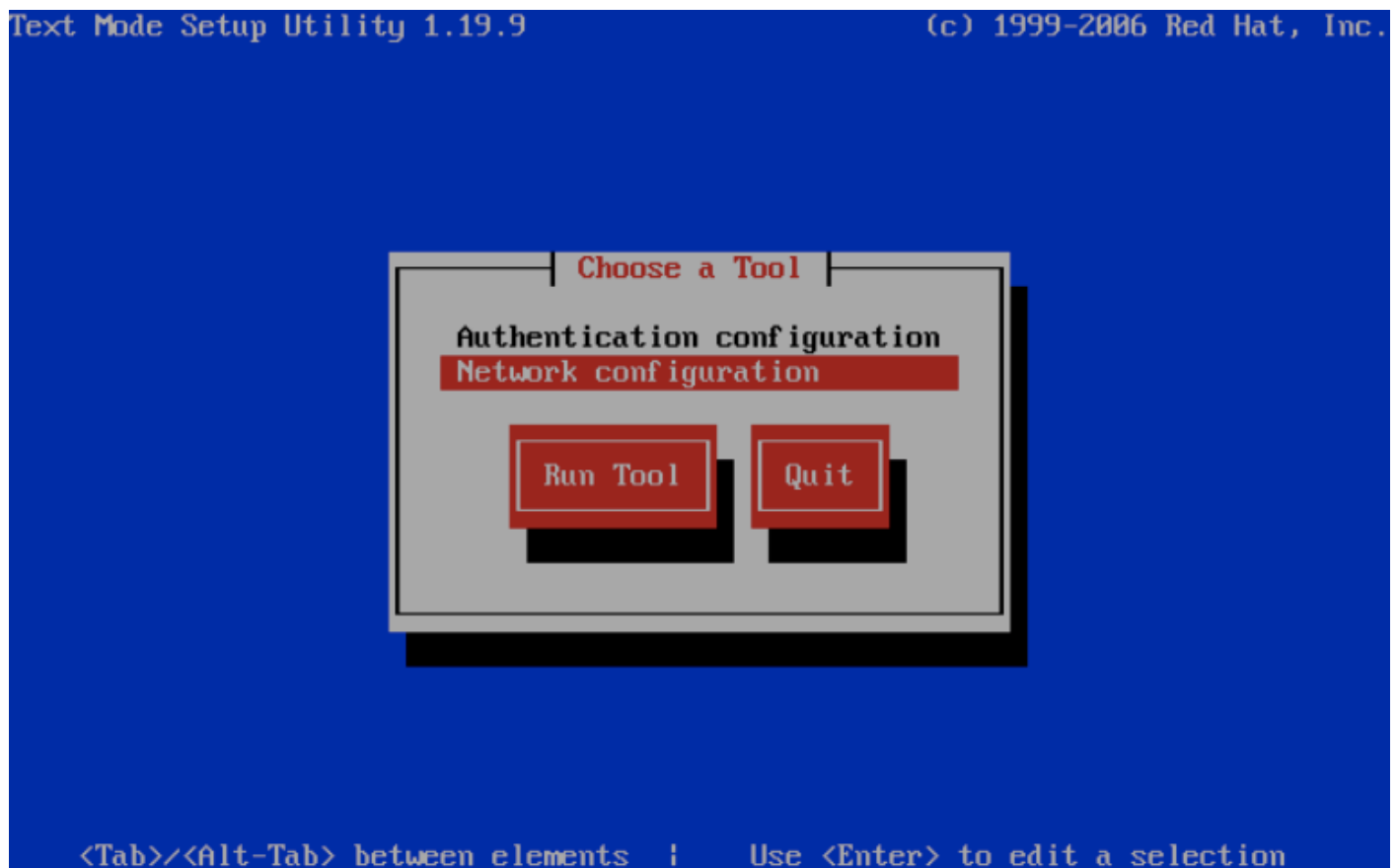
Running the setup scripts

The setup script allows you to quickly configure the IP addressing on the LAN ports. To run the setup script, do the following:

- Connect to the XR2000.
- Type the following command to start the script:

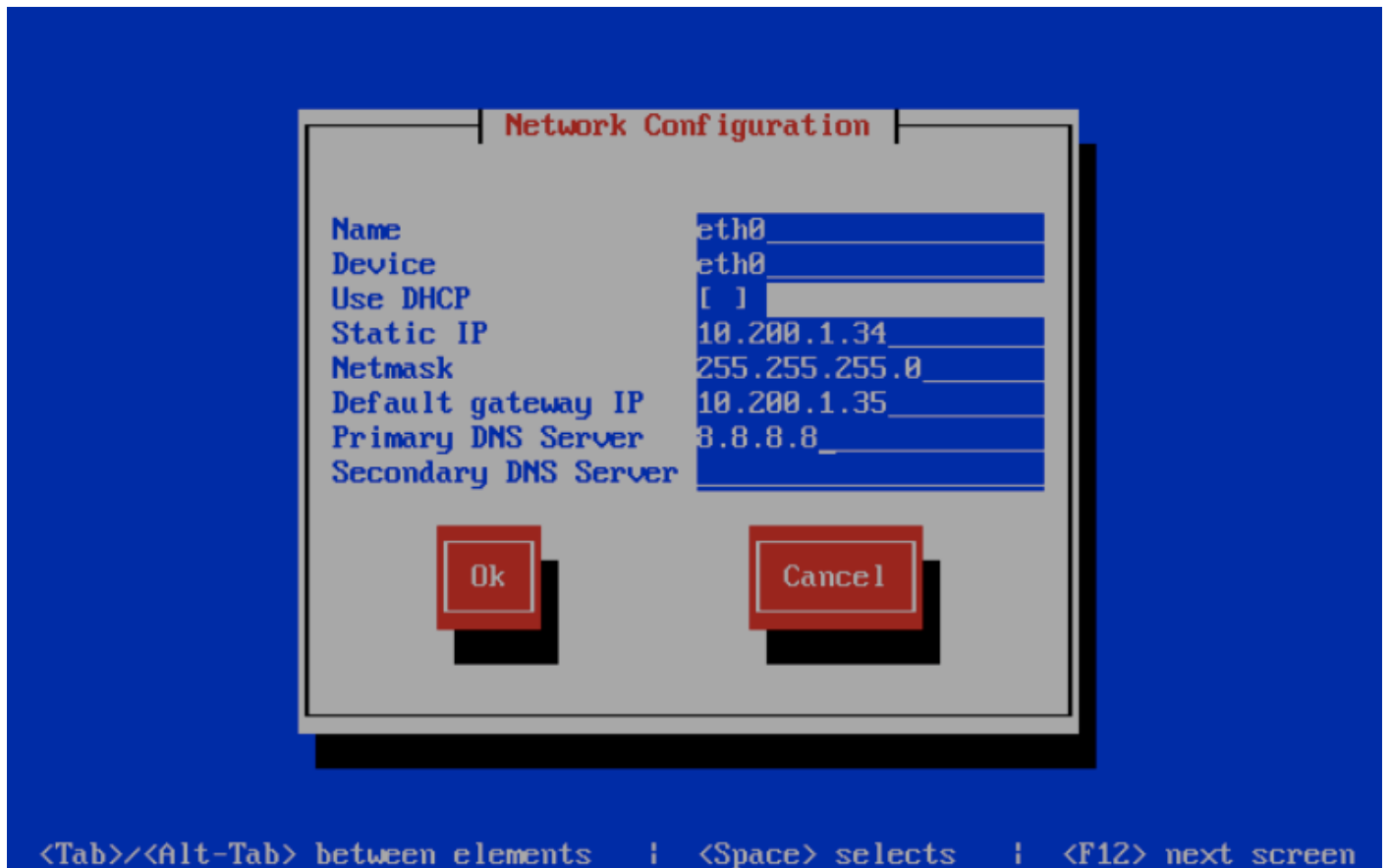
```
setup
```

The **Choose a Tool** window is shown.



- Select **Network configuration**, then choose **Run Tool**.

4. Select **Device configuration**, and then the interface (eth0 or eth1) that you want to configure.
The interface's configuration is displayed.

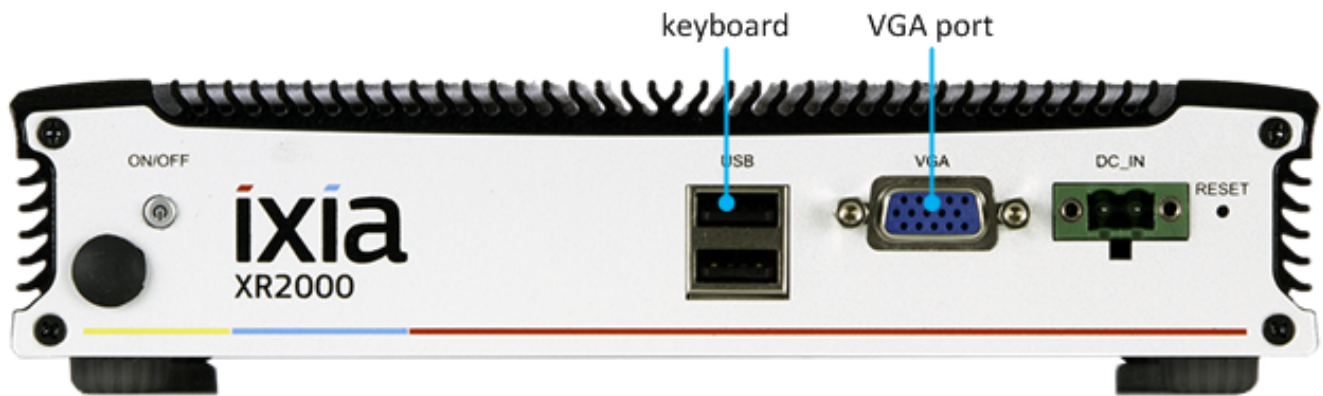


5. Configure the interface settings, then choose **OK** to save the changes.
6. When the script ends, type `exit` to sign off.
If you want to register the XR2000 with a Hawkeye server, continue with [Register with a Hawkeye Server](#).

First time setup through VGA and USB

To perform first-time setup through VGA and USB, do the following:

1. Connect a monitor to the VGA port, and a keyboard to one of the USB ports.



2. Power on the XR2000.
A console window is displayed.
3. Now that you have connected to the XR2000, continue with the setup script.

First time setup through the console port

To perform first-time setup through the console port:

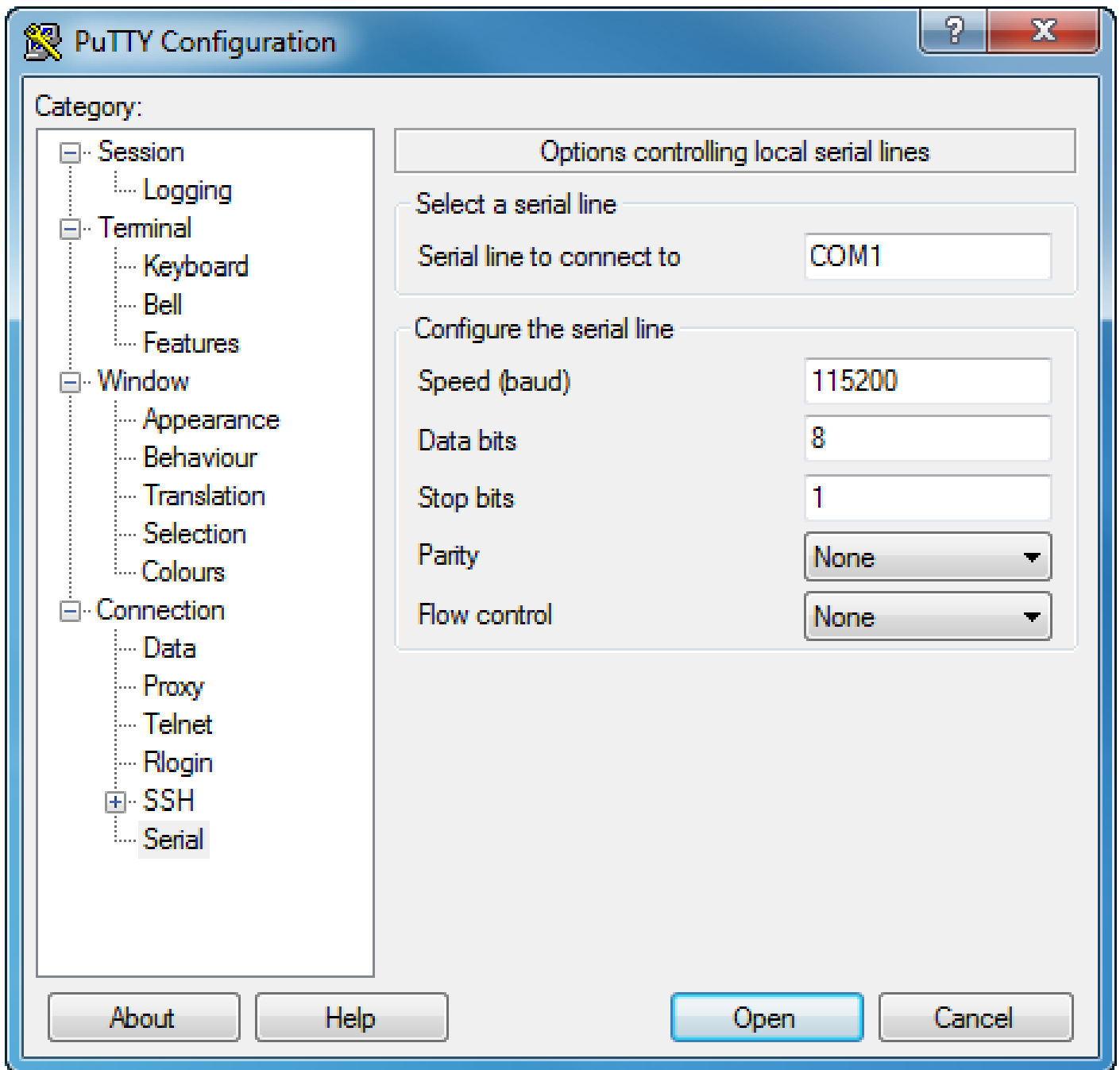
1. Connect a rollover cable or RJ-45 to DB-9 female (Cisco console cable) to the XR2000's console port.



2. Power on the XR2000.
3. On the computer, start a terminal application (such as PuTTY or minicom), and establish a serial connection to the XR2000:

Parameter	Value
Speed	115200
Data bits	8
Stop bits	1

Parity	None
Flow control	None



When a successful connection is established, a terminal window is displayed.

- Now that you have connected to the XR2000, continue with the setup script.

Source-based routing

When using multiple interfaces on the XR2000, it is impossible to configure multiple default gateways because all the interfaces share the same routing table. To customize the interface routing, you can either configure static routes to remote hosts, or use source based routing. Source-based routing allows each interface (physical and logical) to have its own routing table, including default routes.

To configure source-based routing, you use a text editor such as `vi` to edit script files stored on the XR2000. Each logical interface or VLAN ID must have its own script file. Store the scripts in the following folder:

```
/etc/sysconfig/network-scripts
```

Name the scripts according to the logical interface or VLAN ID that they control. For example, to configure `eth0`, you edit the `ifcfg-eth0` script. If a script file for the interface (or combination of VLAN ID and interface) does not already exist, you must create it in the editor.

To configure source-based routing, complete the following steps:

1. Connect to XR2000 by using one of the first time setup methods, and open a console window.
2. Start a text editor, such as `vi`.
3. Set the path to the `/etc/sysconfig/network-scripts` folder, and open the script for the interface that you want to configure.

Scripts are named according to the interfaces that they configure by using the following naming convention:

```
ifcfg-<logical_interface>.<vlanId>
```

Examples:

- Logical interface: To configure the logical interface `eth0`, edit `ifcfg-eth0`.
- VLAN: To configure the logical interface `eth0`, edit `ifcfg-eth0.25`.

If there is no script file for the interface (or combination of VLAN ID and interface), use the editor to create it.

4. The table below describes the parameters available for the scripts. You can also refer to the examples in this section for examples of how to configure scripts for specific configurations.

Parameter	Description
<code>BOOTPROTO=</code>	Boot-time protocol used to obtain an address for the interface: <code>dhcp</code> = DHCP <code>none</code> = No protocol <code>static</code> = Use static address information configured in this script file Example: <code>BOOTPROTO=dhcp</code>
<code>BROADCAST=</code>	Broadcast IP address Example: <code>BROADCAST=192.168.1.255</code>
<code>DEFROUTE=</code>	Always set <code>DEFROUTE</code> to <code>no</code> , so that the default route in the default routing table will not be used. Example: <code>DEFROUTE=no</code>
<code>DEVICE=</code>	Logical interface that the script configures:

	Logical interface: <code>ethx</code> Example: <code>DEVICE=eth0</code> VLAN interface: <code>ethx.vlanId</code> Example: <code>DEVICE=eth0.25</code>
<code>GATEWAY=</code>	Always set this value to null to exclude the default gateway from the default routing table. Example: <code>GATEWAY=""</code>
<code>HWADDR=</code>	MAC address of the card Example: <code>HWADDR=4C:02:89:00:F3:90</code>
<code>IPADDR=</code>	IP address of the interface (static IP addressing only) Example: <code>HWADDR=4C:02:89:00:F3:90</code>
<code>IPV6INIT=</code>	Enable IPv6 addressing on the interface. Example: <code>IPV6INIT=no</code>
<code>MACADDR=</code>	Specify a value for this parameter only if you want to spoof a MAC address. Example: <code>MACADDR=4C:02:89:00:F3:26</code>
<code>NETMASK=</code>	Network mask for IP address (static IP addressing only) Example: <code>NETMASK=255.255.255.0</code>
<code>NETWORK=</code>	Network address Example: <code>NETWORK=192.168.1.0</code>
<code>NM_CONTROLLED=</code>	Allow or deny changes from the web interface Example: <code>NM_CONTROLLED=yes</code>
<code>ONBOOT=</code>	Activate the interface at boot time Example: <code>ONBOOT=yes</code>
<code>TYPE=</code>	Interface type Example: <code>TYPE=Ethernet</code>
<code>VLAN=</code>	Enable VLAN routing on the interface Example: <code>TYPE=Ethernet</code>

- After configuring and saving the script file, you need to create separate routing tables for each logical interface that need specific default gateways.

To do this, edit the `/etc/iproute2/rt_tables` file, and add as many tables as you need for your configuration. For each new table, you need a table identifier and a table name.

NOTE

You can use any name you want for the tables, but when using VLANs, we recommend you to use the VLAN ID and part of the table name as the table identifier. See the example below, where VLAN 25, 26 and 27 were defined over `eth0`.

Example:

```
# cat rt_tables
#
# reserved values
#
255 local
254 main
253 default
0 unspec
#
# local
#
#1 inr.ruhep
25 vlan25table
26 vlan26table
27 vlan27table
```

6. After you create the tables, you need to add the routes and rules for each table/logical interface. To do this, you create two files in the `etc/sysconfig/network-scripts` folder for each table/logical interface: `route-ethx` and `rule-ethx`.

For example, assume the following:

- VLANs 25, 26 and 27 were created on top of `eth0`.
- The VLAN IPs are: 10.25.0.2, 10.26.0.2, and 10.27.0.2.
- The IPs' corresponding gateways are: 10.25.0.1, 10.26.0.1, and 10.27.0.1.

Under these conditions, the following files must be created:

```
/etc/sysconfig/network-scripts/route-eth0.25
/etc/sysconfig/network-scripts/route-eth0.26
/etc/sysconfig/network-scripts/route-eth0.27
/etc/sysconfig/network-scripts/rule-eth0.25
/etc/sysconfig/network-scripts/rule-eth0.26
/etc/sysconfig/network-scripts/rule-eth0.27
```

The content of `/etc/sysconfig/network-scripts/route-eth0.25` would be:

```
default table vlan25table via 10.25.0.1
```

while the content of `/etc/sysconfig/network-scripts/rule-eth0.25` would be:

```
from 10.25.0.2 table vlan25table
```

The `route-eth0.26`, `route-eth0.27`, `rule-eth0.26`, and `rule-eth0.27` files should have similar content.

7. When you have finished, restart the network service using the `service network restart` command.

Important pointers on using source based routing

- When source-based routing is configured and you want to test the connectivity with a destination, you must use the `-I` switch to specify the source IP that you want to use.

For example, to test connectivity from interface IP 10.25.0.2 to destination IP 8.8.8.8, use: `ping 8.8.8.8 -I 10.25.0.2`. If 8.8.8.8 is reachable from the 10.25.0.2 interface, the ping should work. A simple `ping 8.8.8.8` command will not work, even if you have internet connectivity.

- In some cases, you may need to add a default route for the entire system. In this case, you need to add a default route to the default routing table.
To add a default route for the entire system, configure the `GATEWAY` parameter in one of the `ifcfg-ethx` files (if the interface uses a static IP address), or configure `DEFROUTE=yes` if the interface uses DHCP. Also, you can add routes under default routing table, using normal commands, in which you do not need to specify the name of the table.
A PPPoE connection uses the predefined default routing table and will automatically add a default route for the system.
- To display the routes corresponding to a specific table, use the following command `ip route show table <table_name>`.
- To display the routing rules created on the system, use the `ip rule` command. Make sure that there are no duplicate entries for a table.
- Inside the specific routing tables, add as many supplementary routes as you need.
- We recommend source based routing only when multiple gateways are required.
- For routing to specific destinations, use static routes instead.
- If a probe has multiple interfaces, in the Hawkeye GUI you need to add the probe multiple times, using various names, but with the same serial number. Management and test addresses must be configured in various ways, in order to match your testing requirements.

DHCP Example

The following example shows how to configure interface `eth0` for DHCP (script file `ifcfg-eth0`).

Parameter	Description
<code>BOOTPROTO=dhcp</code>	Enable DHCP
<code>HWADDR=4C:02:89:00:F3:90</code>	Replace the MAC value with the actual MAC address of the card.
<code>MACADDR=4C:02:89:00:F3:26</code>	Include this line only if you want to have a spoofed MAC address.
<code>NM_CONTROLLED=yes</code>	Set to <code>no</code> if you do not want to allow changes from the web interface.
<code>TYPE=Ethernet</code>	Set the interface type to ethernet.
<code>IPV6INIT=no</code>	Set to IPv4.
<code>DEVICE=eth0</code>	Interface eth0
<code>DEFROUTE=no</code>	<code>DEFROUTE</code> must be <code>no</code> to keep the default route out of the default routing table.
<code>ONBOOT=yes</code>	Applies on start up.

Static IP Example

The following example shows how to configure interface `eth0` with a static IP address (script file `ifcfg-eth0`).

Parameter	Description
-----------	-------------

BOOTPROTO=static	Enables static IP address.
HWADDR=4C:02:89:00:F3:90	Replace the MAC value with the actual MAC address of the card.
MACADDR=4C:02:89:00:F3:26	Include this line only if you want to have a spoofed MAC address.
NM_CONTROLLED=yes	Set to no, if you do not want to allow changes from the web interface.
TYPE=Ethernet	Set the interface type to ethernet.
IPV6INIT=no	Set to IPv4
DEVICE=eth0	Interface eth0
IPADDR=192.168.1.10	Set to the required IP address (IPv4)
NETMASK=255.255.255.0	Set to the required Netmask.
BROADCAST=192.168.1.255	
NETWORK=192.168.1.0	
GATEWAY=""	Set this parameter to null to keep the default gateway out of the default routing table.
ONBOOT=yes	Applies on start up

VLAN and DHCP Example

The following example shows how to configure VLAN ID 25 on logical interface eth0 for DHCP (script file ifcfg-eth0.25).

Parameter	Description
BOOTPROTO=dhcp	Enables DHCP
HWADDR=4C:02:89:00:F3:90	Replace the MAC value with the actual MAC address of the card.
MACADDR=4C:02:89:00:F3:26	Include this line only if you want to have a spoof MAC address.
NM_CONTROLLED=yes	Set to no if you do not want to allow changes from the web interface.
TYPE=Ethernet	Set the interface type to ethernet.
IPV6INIT=no	Set to IPv4
DEVICE=eth0.25	Set the VLAN ID to 25
DEFROUTE=no	DEFROUTE must be no to keep the default route out of the default routing table.
VLAN=yes	Enables VLAN
ONBOOT=yes	Applies at start up

VLAN with no IP Address Example

The following example shows how to configure a VLAN (ID 25) with no IP address to create a PPPoE connection on top (script file ifcfg-eth0.25).

Parameter	Description
BOOTPROTO=none	Sets no IP address
HWADDR=4C:02:89:00:F3:90	Replace the MAC value with the actual MAC address of the card.
MACADDR=4C:02:89:00:F3:26	Include this line only if you want to have a spoof MAC address.
NM_CONTROLLED=yes	Set to no if you do not want to allow changes from the web interface.
TYPE=Ethernet	Set the interface type to ethernet.
IPV6INIT=no	Set to IPv4
DEVICE=eth0.25	Set the VLAN ID to 25
VLAN=yes	Enables VLAN
ONBOOT=yes	Applies at start up

VLAN with Static IP Example

The following example shows how to configure VLAN ID 25 on eth0 with a static IP address (script file ifcfg-eth0.25).

Parameter	Description
BOOTPROTO=static	Enables the static IP address.
HWADDR=4C:02:89:00:F3:90	Replace the MAC value with the actual MAC address of the card.
MACADDR=4C:02:89:00:F3:26	Include this line only if you want to have a spoof MAC address.
NM_CONTROLLED=yes	Set to no if you do not want to allow changes from the web interface.
TYPE=Ethernet	Set the interface type to ethernet.
IPV6INIT=no	Set to IPv4
DEVICE=eth0.25	Set the VLAN ID to 25
IPADDR=192.168.1.10	Set to the required IP address (IPv4).
NETMASK=255.255.255.0	Set to the required netmask.
BROADCAST=192.168.1.255	
NETWORK=192.168.1.0	
GATEWAY=""	Set this parameter to null to keep the default gateway out of the default routing table.

Register with Hawkeye server

Automatic endpoint

Keysight includes a script that allows XR2000 to automatically register itself with an Hawkeye server. If you do not want to do this, you can move on to the web setup. Later you can run the script or use the web interface to configure auto-registration.

To automatically register with Hawkeye server, do the following:

1. Connect to XR2000.
2. Type the following command to start the script:

```
xr2000_configure
```

3. When the script prompts you, enter the following:

- A name for the probe. You can use letters, numbers, and hyphens (-) in the name. The name will be used by Hawkeye to set the hostname, and it is displayed as the probe name.
- The host name or IP address of the Hawkeye server (public IP if in cloud).

NOTE

The name cannot contain spaces.

4. If you want to configure the advanced features of XR2000, continue with the web setup process.

Upgrade XR2000

Following instructions are valid for XR2000 and XR2000_vm probes.

Overview of XR2000 upgrade

XR2000 needs the following upgrades:

- Update operating system so that security levels are maintained.
- Update Ixia software on the endpoint for manual probes.
- Apply Ixia software patch.

Following instructions are valid for XR2000 and XR2000_vm endpoints.

NOTE

Any XR2000 upgrade to latest Hawkeye server release, where the XR2000 is on a version prior to 9.x, we recommend to first update the operating system and then perform manual upgrade.

Register with Hawkeye Server

When an automatic endpoint is connected to the Hawkeye server, Hawkeye server will automatically upgrade the endpoint to the required software version. You can confirm this from the Hawkeye server web UI in the **Auto Probe Management** page. Select the endpoint, to display the details of the endpoint including the version.

Upgrade XR2000 from internet without Hawkeye server

To upgrade manual endpoints from internet, do the following:

1. When the XR2000 has internet connectivity, connect to XR2000 with SSH.
2. Run:

```
cd /tmp
wget https://ixiapublic.s3.amazonaws.com/hawkeye/xr2000_upgrade.tar.gz
tar zxvf xr2000_upgrade.tar.gz
cd xr2000_upgrade
./ixia_chariotprobe_install.sh
cd ..
rm -rf xr2000_upgrade
rm -rf xr2000_upgrade.tar.gz
```

3. If the XR2000 does not have internet connectivity copy the file at the https://ixiapublic.s3.amazonaws.com/hawkeye/xr2000_upgrade.tar.gz location, copy on USB drive to XR2000 and place in /tmp folder. Then run the procedure:

```
tar zxvf xr2000_upgrade.tar.gz
cd xr2000_upgrade
./ixia_chariotprobe_install.sh
cd ..
rm -rf xr2000_upgrade
rm -rf xr2000_upgrade.tar.gz
```

NOTE

A reboot after upgrade is necessary.

Upgrade operating system

You must be connected to internet to upgrade operating system. You cannot upgrade operating system without accessing public servers.

IMPORTANT

Do not upgrade your operating system. The packages are constantly being upgraded and may not function with a specific version of the Hawkeye Server. If the operating system upgrade is required, please contact Keysight Customer Support for assistance as it is preferred to update only required packages.

1. To perform upgrade, sign in as root and type in:

```
yum update -y
yum clean all
```

2. To keep compatibility with the bittorrent test type in Hawkeye, the following library needs to be downgraded after yum upgrade:

```
yum downgrade libtorrent -y
```

Linux Quick Reference

This section lists some standard Linux commands that you may find helpful with the XR2000.

NOTE

After capturing data, you can use the web interface remote tools **Upload** and **Download** to load the .enc file and open it with Wireshark on a windows PC.

Command	Descriptions
netstat	Displays generic network statistics of the host. If you include the <code>-an</code> and <code>-rn</code> arguments, <code>netstat</code> displays the routing table and the application ports open on the XR2000, as well as their respective output. With no arguments, <code>netstat</code> displays the active connections and the used sockets.
passwd	Changes the password for the current user.
route	Displays routing table information.
ifconfig	Displays the IP address and netmask associated with each Ethernet port. Also displays details/counts of packets/bytes of traffic on each port.
route	Displays the routing table information.

tcpdump P	Displays the packets on an interface.	
	To use for a specific interface:	<code>tcpdump -i eth0</code>
	To use with no ssh port:	<code>tcpdump -i eth0 not port 22</code>
	To export the command output to a file:	<code>tcpdump -i eth0 not port 22 -w /tmp/mycapture.enc</code>

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