

Support Note – 645M-4 Cellular Router Port Forwarding

Port Forwarding

Port Forwarding is a method for allowing remote devices to connect to a specific service within a private network. This can be performed over Public Cellular networks to a device with a Private IP address. The ELPRO 645M-4 Cellular Router supports Port Forwarding which allows devices behind the 645M-4 with Private IP addresses to be accessed over the Internet / Cellular Networks. Common applications that Port Forwarding is used in are,

- Monitoring Remote IP cameras,
- Wellhead monitoring,
- Accessing Data Loggers remotely &
- Remote configuration and monitoring of HMI and PLC's

As we know,

- All Ethernet devices have a unique IP address (e.g. 192.168.0.10) assigned to them.
- This IP address identifies the device endpoint address.
- Ethernet devices generally have a range of ports between 1 to 65535, which define or allow access to the different services.

E.g. Port 80 - HTTP (Web Browser), Port 502 - Modbus TCP, Port 23 - Telnet

Network Example - Overview

The following Port Forwarding example will show the configuration required to allow access to an IP Web Camera and a 115E-2 Ethernet I/O connected via a 645M-4 Cellular Router configured with a DDNS name. Configuration will only allow the end devices (Web Cam & 115E-2) to be viewed or interrogated while not allowing access to other network devices that may also be connected to the 645M-4.

Configuration steps for this application are as follows,

IP Camera & 115E-2 I/O

- Assign a Private IP address for LAN connection,
- Assign Gateway IP Address (645M-4 LAN address)
- Define the Ports that the IP camera and 115E-2 services will be using.

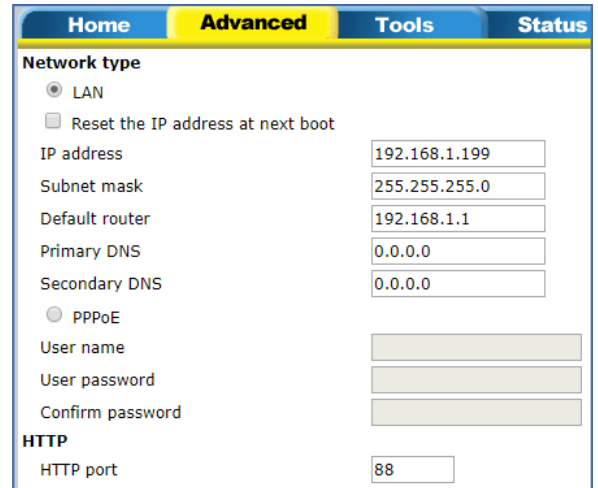
645M-4

- Establish a Cellular Network Connection,
- Enable Port Forwarding,
- Configure a Port Forwarding Rules.

IP Camera Configuration

The configuration of the IP camera requires an IP address to be assigned for the LAN connection and the Gateway IP address. The Gateway IP address will be the physical LAN address of the 645M-4 Modem.

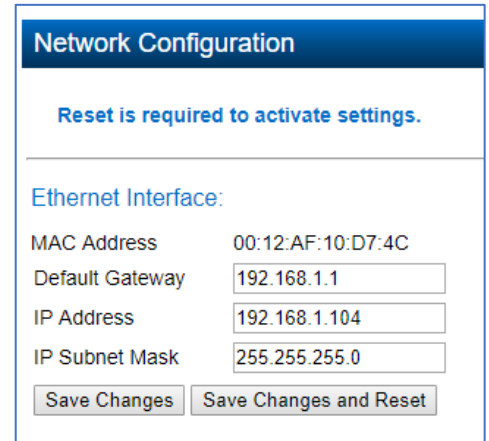
- In this example the IP address of the IP Camera is set to 192.168.1.199
- The Default Gateway (Default Router) is set to the 645M-4 LAN IP address of 192.168.1.1
- The port used for IP Camera connection (in this case Port 88)



IP 115E-2 Configuration

The configuration of the 115E-2 Ethernet I/O requires an IP Address to be assigned to the LAN connection and Gateway IP address. The Gateway IP address will be the physical LAN address of the 645M-4 Modem.

- In this example the IP address of the 115E-2 Ethernet I/O is set to 192.168.1.104
- The Default Gateway (Default Router) is set to the 645M-4 LAN IP address which is 192.168.1.1
- The port that will be used for the Web page connection, standard HTTP Port is port 80. (The 115E does not allow this to be changed)

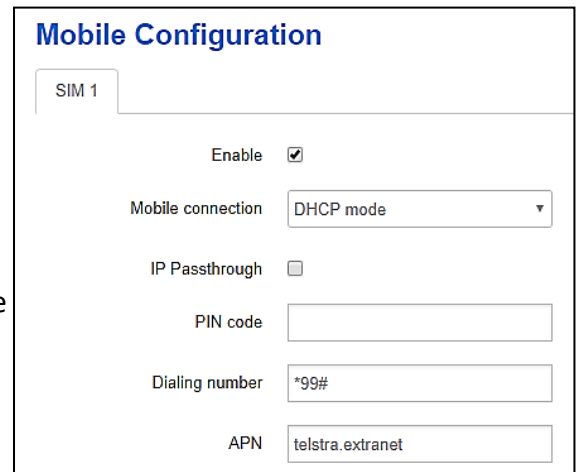


645M-4 Modem Configuration

The configuration of the 645M-4 is performed in 2 stages,

- Establish Cellular Connection
- Setup and configure Port Forwarding rule.

With SIM Card inserted and modem powered up, configuration can be accessed via a web browser using the default IP address of 192.168.1.1 with the log in username of admin and password of admin.



From the modems webpage menu listing click on **Network – Mobile** and enter the APN name that your SIM Card supports for a public IP, in our example we are using “telstra.extranet”.

When the Cellular Carriers details have been entered and the page saved, wait a few minutes and then check the **Status - Overview** page for Cellular Status “**UP**” and note the PPP IP Address.

The IP address under the **Status – Overview – Mobile1** is the Cellular IP Address assigned by the network to allow connection to the internet. The IP Address shown (120.157.82.175) is a Public IP Address.

Mobile 1	
Cellular Status	Up
IP Address	120.157.82.175/255.255.255.224
DNS 1	10.4.130.164
DNS 2	10.4.149.70
Cell Modem	QUECTEL_EC21 (2C7C_0121)
IMEI/ESN	864292040484188

When the Status is **UP**, select **Network – Firewall – Port Forwards** from the webpage menu listing to set up the Port forwarding rules for the connected devices.

By default, Port Forwarding is disabled, so enter a new Port Forward (Enter Name, External Port, Internal IP address and Internal Port) and then press **“Add”**

New port forward:				
Name	Protocol	External port	Internal IP address	Internal port
<input type="text" value="Camera"/>	TCP+UDP	<input type="text" value="88"/>	<input type="text" value="192.168.1.199"/>	<input type="text" value="88"/>
				<input type="button" value="Add"/>

Name – A unique name that will identify the Port Forward Configuration.

Protocol – This is TCP/UDP or both. If unsure select both, typically majority will be TCP.

External Port – This sets the external port number for the incoming request. As the IP Web camera will be accessed via a web browser the Inbound Port will be Port 88 as this is the assigned port number configured for HTTP web access.

Internal IP Address – This is the physical IP address of the IP Web Camera as seen configured in the IP Camera Configuration section above.

Internal Port – This sets the local port number for the connected IP web camera. Note that in the IP Web camera configuration the 3rd step was to determine the required port that is required to access the images from the web camera.

There are a number of other configuration settings that can be configured in the port forward however the above settings are the basic parameters that are needed.

Firewall - Port Forwards - Camera

This page allows you to change advanced properties of the port forwarding entry. In most

Rule is enabled

Name

Protocol

Source zone

- l2tpzone: (empty)
- lan: lan: [IP] [MAC]
- openvpn: (empty)
- pptpzone: (empty)
- vpnzone: (empty)
- wan: wan: [IP] [MAC] ifmobile: [IP]

Source MAC address

Source IP address

Source port

External IP address

External port

Internal zone

- l2tpzone: (empty)
- lan: lan: [IP] [MAC]
- openvpn: (empty)
- pptpzone: (empty)
- vpnzone: (empty)
- wan: wan: [IP] [MAC] ifmobile: [IP]

Internal IP address

Internal port

Enable NAT Loopback

Extra arguments

Example

In this example we are trying to connect to a Remote Camera on 192.168.1.199 at Port 88, also a 115E-Ethernet I/O device web page on Port 80 and polling the 115E-2 Modbus TCP registers using port 502.

You can see we have setup the Port forward as per below, so the appropriate communications get routed to the correct device and port.

Name	Match	Forward to	Enable	Sort	
115E-2	IPv4-TCP, UDP From any host in wan Via any router IP at port 80	IP 192.168.1.113, port 80 in lan	<input checked="" type="checkbox"/>	↑ ↓	Edit Delete
Camera	IPv4-TCP, UDP From any host in wan Via any router IP at port 88	IP 192.168.1.199, port 88 in lan	<input checked="" type="checkbox"/>	↑ ↓	Edit Delete
Modbus 115E	IPv4-TCP, UDP From any host in wan Via any router IP at port 502	IP 192.168.1.113, port 502 in lan	<input checked="" type="checkbox"/>	↑ ↓	Edit Delete

Note: To allow incoming HTTP access (port 80) of the 645M-4 via a cellular connection, you will need to change the default HTTP port from 80 to something like 8080 on the Network / Firewall / Security page otherwise the default Web access will always be routed to the Web based device that we have configured that also uses Port 80, i.e. the 115E-2. This means that whenever we need to connect to the Modem either remotely or Locally (LAN) you will need to use the Address:8080 e.g. Cellular IP address:8080 for Remote or 192.168.1.1:8080 for Local.

General Settings Port Forwards Traffic Rules Source NAT DMZ Security MAC Filter

System Security Configuration

SSH port

SSH access from WAN

Ping from WAN to LAN

Enable telnet

HTTPS Access

HTTPS port

HTTPS access from WAN

HTTP Access

HTTP port

HTTP access from WAN

Remote network

RFC1918 filter

Enable lock account

Dynamic DNS

The Public PPP IP Address assigned by cellular providers can be Fixed or a Dynamic IP address. Dynamic assigned IP addresses will change upon conditions set by the cellular carrier, when this occurs inactivity will occur until the new IP address is known, which typically requires connecting to it locally and viewing the unit status page.

The use of Dynamic DNS which assigns a DNS name to the 645M-4 allows the modem to be accessed regardless of the assigned PPP IP address. There are several providers that offer a free Dynamic DNS service "DDNS". For example, "No-IP.com" or "Dyn.com" are a few that allow users to setup between one and five host names. No-IP is the one we have used in this example.

Dynamic DNS can be configured in the 645M-4 from the **Services – DDNS** Web. Basically, you just need to setup the Provider Details, i.e. "NoIP.com" the Domain Name you wish to use and your Login details. You will need to have setup an account with the Dynamic DNS provider first.

Dynamic DNS
Dynamic DNS allows that your router can be reached with a fixed hostname while having a dynamic IP address.

Details for: **elprotechddnsnet**

Basic Settings | **Advanced Settings** | Timer Settings | Log File Viewer

Enabled

IP address version IPv4-Address
 IPv6-Address

DDNS Service provider [IPv4] NoIP.com

Hostname/Domain elprotech.ddns.net

Username support@elpro.com.au

Password *****

Use HTTP Secure

Testing Port Forward Configuration.

When configuration is complete and if the Dynamic DNS is required and setup, using a PC with an internet



connection open a Web Browser and enter in either the 645M-4 PPP IP address or the Dynamic DNS Host name in the web browser. Because the camera had a specific port configured "port 88", we need to add ":88" to the end of the IP address or DDNS name to access the Cameras web page.

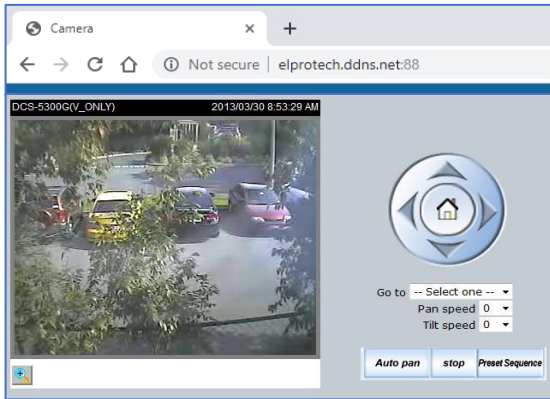
Also, if you typed in the DDNS address without a port number (default webpage port is 80) you will be directed to the 115E-2 I/O web page because we configured the port forward to this IP address for traffic on Port "80". As we are using Modbus, we needed to add in a port forward for this Modbus TCP port 502.

Diagnosing Port Forwarding Connections

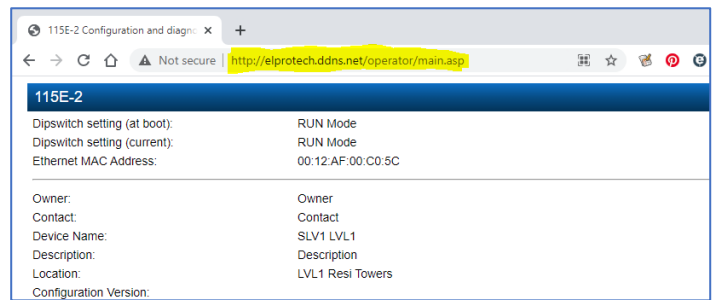
If you find that the port forward configuration is not working from the initial setup, the four main common problems are.

1. PPP Status is down – This typically is either antenna connection or Carrier APN not set correctly.
2. If the Gateway IP address of the device connected to the 645M-4, i.e. the Web Cam or 115E-2 is incorrectly set. The Gateway IP address generally will be an IP address the device will send traffic to if it does not know where to send it to and would normally be set to the LAN IP Address of the 645M-4.
3. Incorrect Ports configured in the Port Forwarding – Confirm that the ports that will be used for Incoming messages are the correct ports required to access the device connected to the 645M-4

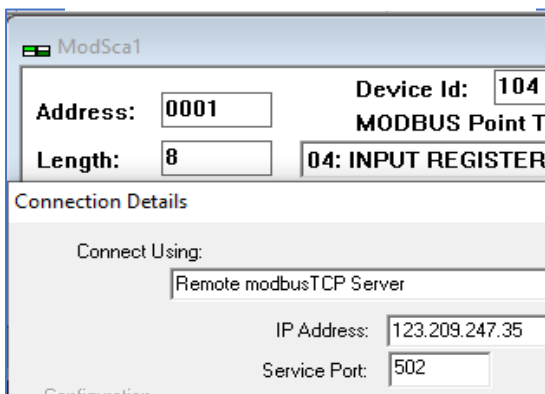
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Camera	IPv4-TCP, UDP From any host in wan Via any router IP at port 88	IP 192.168.1.199, port 88 in lan	<input checked="" type="checkbox"/>	<input type="button" value="↑"/> <input type="button" value="↓"/> <input type="button" value="Edit"/> <input type="button" value="Delete"/>
Modbus 115E	IPv4-TCP, UDP From any host in wan Via any router IP at port 502	IP 192.168.1.113, port 502 in lan	<input checked="" type="checkbox"/>	<input type="button" value="↑"/> <input type="button" value="↓"/> <input type="button" value="Edit"/> <input type="button" value="Delete"/>



Entry 1: Camera – Accessing the web camera from the DDNS name and Port 88



Entry 2: 115E-2 – Accessing the Modules Web interface via the DDNS name and Port 80



Entry 3: Modbus – Accessing the 115E-2 Modbus registers via the IP address and Port 502

Amendment Register:

Issue No.	Date	Details of Amendment
1.0	9/08/19	Draft Issue
1.1	4/2/2021	Minor amendments and add HTTP Access Port 8080