

## 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 615M-1 3G Modem and Router supports Port Forwarding which allows devices behind the 615M-1 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.
- Each Ethernet device has a number of ports ranging from 1 through to 65535, which define or allow access to different services.

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

## Network Example - Overview

The following example for Port Forwarding will show the required configuration that will provide access to an IP Web Camera connected to a 615M-1 3G Modem and Router. Configuration will only allow the webcam to be viewed and any other device on the network connected the 615M-1 will not be accessible. The example shown below could also be used for connecting to other Ethernet enabled devices.

The configuration steps for this application are as follows,

IP Camera

- Assign a Private IP address for LAN connection,
- Assign Gateway IP Address
- Define Port that IP camera service is using.

615M-1

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

## IP Camera Configuration

The configuration of the IP camera requires IP addresses to be assigned for the LAN connection and the Gateway IP address. The Gateway IP address will be the physical LAN address of the 615M-1 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 615M-1 LAN IP address of 192.168.1.50
- ☒ Port used for IP Camera images is the HTTP Port 80

Home	Advanced	Tools	S
<b>Network type</b>			
<input checked="" type="radio"/> LAN			
<input type="checkbox"/> Reset the IP address at next boot			
IP address	192.168.1.199		
Subnet mask	255.255.255.0		
Default router	192.168.1.50		
Primary DNS	0.0.0.0		
Secondary DNS	0.0.0.0		
<input type="radio"/> PPPoE			
User name			
User password			
Confirm password			
<b>HTTP</b>			
HTTP port	80		

## 615M-1 Modem Configuration

The configuration of the 615M-1 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 192.168.1.50 with the log in user name of admin and password of password.

From the modems webpage menu listing click on Cell Connection,

▶ Unit Status
▶ Cell Connection
▶ LAN Settings
▶ Router
▶ Security
▶ Serial
▶ Diagnostics
▶ I/O Settings
▶ Firmware Update

On the Carrier page shown, the Primary Carrier APN needs to be entered along with User name and Password. The APN, User and Password should be supplied by the SIM Card provider

Cell Connection	Carrier	GSM Settings	CDMA Settings	System Monitor	Dynamic DNS	HELP
<b>Carrier</b>						
Active Carrier		<input checked="" type="radio"/> Primary <input type="radio"/> Secondary				
Primary Carrier		Generic, GSM (Global) ▼				
Secondary Carrier		None ▼				
Auto Connect		<input checked="" type="radio"/> Enable <input type="radio"/> Disable				
<i>If Auto Connect is enabled and the modem fails to connect, the unit will attempt to reconnect 2 times and then one attempt per the following schedule: 1 minute, 2 minutes, 8 minutes and then every 15 minutes until successful.</i>						
<b>Primary Carrier</b>						
Carrier APN		Cellular Provider APN				
User						
Password						
Authentication Protocols		<input checked="" type="radio"/> Auto <input type="radio"/> Use only: <input type="checkbox"/> PAP <input type="checkbox"/> CHAP				
Modem-to-Modem		<input type="radio"/> Enable <input checked="" type="radio"/> Disable				

When the Cellular Carrier details have been entered and saved flowed by reset, check the Unit Status page for PPP Status to Display **UP** and note the PPP IP Address.

PPP	
PPP Status UP	
PPP IP Address	123.209.31.11
PPP Subnet Mask	255.255.255.248
PPP P-t-P	123.209.31.9
Primary DNS	10.4.182.20
Secondary DNS	10.4.81.103

The PPP IP address is the Cellular IP Address that is available to the internet. The PPP IP Address shown is a Public IP Address.

Once the PPP Status is **UP**, select **Router** from the main menu listing on the webpage to set up for the Port forwarding rule to be entered.

By default, Port Forwarding is disabled, so enable the “Port Forwarding Support” and then press **Save**

**Port Forwarding Support**

Port Forwarding  Enable  Disable

After enabling and saving the Port Forwarding Support navigate to the Port Forward Configuration and fill in each field to suit application as shown below.

**Map 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.

**Friendly IP Address** – This is the IP address of “Who can access the Web Camera” IP address 0.0.0.0 is “Anyone on the internet”. If you know the Public IP address of your Internet Connection, then you enter this in here so only anyone from this IP address can access. The “/” can be used to specify the Subnet Mask of the Friendly IP address.

**Inbound 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 80 as this is the assigned port number for HTTP web browsers.

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

**Destination 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.

**Port Forwarding Configuration**

Map Name: Web Camera

Protocol: TCP

Friendly IP Address: 0 . 0 . 0 . 0 /

Inbound Port: 80 (1-65535)

Destination IP Address: 192 . 168 . 1 . 199

Destination Port: 80 (1-65535)

When complete press the Add button to set the Port Forwarding rule in place, once the rule has been applied it can be viewed in the IP Mapping Table screen.

IP Mapping Table						
Map Name	Protocol	Friendly IP Address	Inbound Port	Destination IP Address	Dest. Port	
Web	TCP	0.0.0.0	80	192.168.1.199	80	Delete Entry

## Dynamic DNS

The Public PPP IP Address assigned by cellular providers will be either a Fixed or a Dynamic IP address. Dynamic assigned IP addresses can change upon differing 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 615M-1 allows the modem to be accessed regardless of the assigned PPP IP address. A number of providers offer Dynamic DNS services ("DDNS"). For example, a free service provided by No-IP" allows users to setup between one and five host names on a domain name provided by No-IP. No-IP is the default DNS service.

Dynamic DNS can be configured in the 615M-1 from the Dynamic DNS tab found under the Cell Connections heading. An account will need to be set up with one of the Dynamic DNS providers and details of the account are entered into this section.

Cell Connection	Carrier	GSM Settings	CDMA Settings	System Monitor	Dynamic DNS	HELP
<b>Dynamic DNS</b>						
Dynamic DNS <input checked="" type="radio"/> Enable <input type="radio"/> Disable						
Dynamic DNS Address <input type="text" value="dynupdate.no-ip.com"/>						
Port Number <input type="text" value="8245"/> (1 - 65535)						
User Account <input type="text" value="*****"/>						
User Password <input type="text" value="*****"/>						
Hostname <input type="text" value="elpro615.no-ip.org"/>						
Update Interval <input type="text" value="1"/> (1 - 65535) minutes						
						<input type="button" value="Cancel"/> <input type="button" value="Save"/>

## Testing Port Forward Configuration.

When configuration is complete and if Dynamic DNS is required and setup, using a PC with an internet connection open up a Web Browser and enter in either the 615M-1 PPP IP address or the Dynamic DNS Host name in the web browser. Ports do not need to be entered as HTTP by default is port 80



Accessing IP web camera via 615M-1  
Dynamic DNS address



Accessing IP web camera via 615M-1 PPP  
IP Address

# 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. The Gateway IP address of the device connected to the 615M-1 (IP Web camera in this application) is incorrectly set – The Gateway IP address needs to be set to the IP address of the LAN connection of the 615M-1. By default, this is 192.168.1.50
3. Incorrect Friendly IP address – If not using 0.0.0.0 for the friendly IP address, confirm that the IP address entered is correct. This will be a Public IP address, as a temporary test change to 0.0.0.0.
4. Incorrect Ports configured in the Port Forwarding Configuration – Confirm the ports that will be used for Incoming and port required to access the device connected to the 615M-1

IP Mapping Table						
Map Name	Protocol	Friendly IP Address	Inbound Port	Destination IP Address	Dest. Port	
modbus	TCP	0.0.0.0	502	192.168.1.100	502	Delete Entry
camera	TCP	162.144.12.16	12080	192.168.1.190	80	Delete Entry

Address: 0001      Device Id: 1  
Length: 100      MODBUS Point Type: 03: HOLDING REGISTER

Connection Details

Connect Using: Remote TCP/IP Server

IP Address: 129.209.31.11  
Service Port: 502

IP Mapping Table 1: Modbus –Accessing a Modbus TCP device using Port 502 from Modbus TCP Software.



IP Mapping Table 2: Camera –Accessing a IP Web camera from a fixed internet IP address using Port 12080 from web browser.