

# Stratix 5700 Network Address Translation



## Quick Start



## Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature/>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

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### WARNING



Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

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### IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

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### ATTENTION



Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence

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### SHOCK HAZARD



Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

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### BURN HAZARD



Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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<b>Preface</b>	Introduction . . . . .	3
	<b>Chapter 1</b>	
<b>Configuring and Verifying Network Address Translations</b>	Assumptions . . . . .	7
	Configure NAT in the Stratix 5700 using the Device Manager Web Interface . . . . .	8
	Checking connectivity . . . . .	13
	Statistics . . . . .	14
	Summary . . . . .	16

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**Notes:**

## Introduction

Network Address Translation (NAT) is a technology that provides machine builders and automation engineers with the flexibility to build each of their machines using the same IP addresses, while allowing the machines to communicate with the larger manufacturing environment, requiring a unique IP address. NAT also provides a level of inherent security because end devices can be made available to the larger manufacturing environment only as necessary.

The Stratix 5700 NAT's hardware-based implementation makes it one of the fastest and most scalable solutions available. The Stratix 5700 allows users more flexibility as a switch-based NAT solution and provides built-in resiliency and redundancy protocols.

Imagine a manufacturing plant with 12 injection molding machines. Each molding machine has a ControlLogix system with I/O and an Ethernet module. These 12 machines are identical and from the same Original Equipment Manufacturer (OEM). All of the machines need to be connected on the plant/corporate networks for the HMI and Historian functions.

Without NAT:

- The OEM would need to give 12 unique IP addresses.
- The OEM would need to maintain 12 different ACD files.
- A change to a machine would require 12 changes to be made in the plant or at the OEM.

With NAT:

- Each machine would be configured with the same IP addresses.
- Number of projects to be maintained is reduced to one.

The implementation of NAT in the Stratix 5700 switch is distinct in these ways:

1. One-to-one NAT—the switch uses one-to-one NAT, rather than one-to-many NAT. One-to-one NAT requires that each source address translates to one unique destination address. Unlike one-to-many NAT, multiple source addresses cannot share the same destination address.
2. Layer 2 implementation—the switch's implementation of NAT operates at the Layer 2 (MAC) level. At this level, the switch translates IP addresses and does not act as a router.

This Quick Start will take you through the process of configuring NAT on the Stratix 5700 that will translate private addresses to public addresses on a single VLAN and route to an HMI server on a separate VLAN through a Layer 3 switch.

Assume the manufacturing plant has 12 PC work stations with the 12 new injection mold machines from the Injection OEM. Each machine is identical and has an identical IP address assigned to it. Each machine has a Stratix 5700

NAT switch installed with a PC, a ControlLogix controller and I/O attached to it and everything is running on EtherNet/IP. The plant has created a new central site operations control station with an HMI that will report connectivity status for each station's machine to ensure data collection. Each of the machines should be connected to the overall plant network to allow the HMI server to report connectivity status.

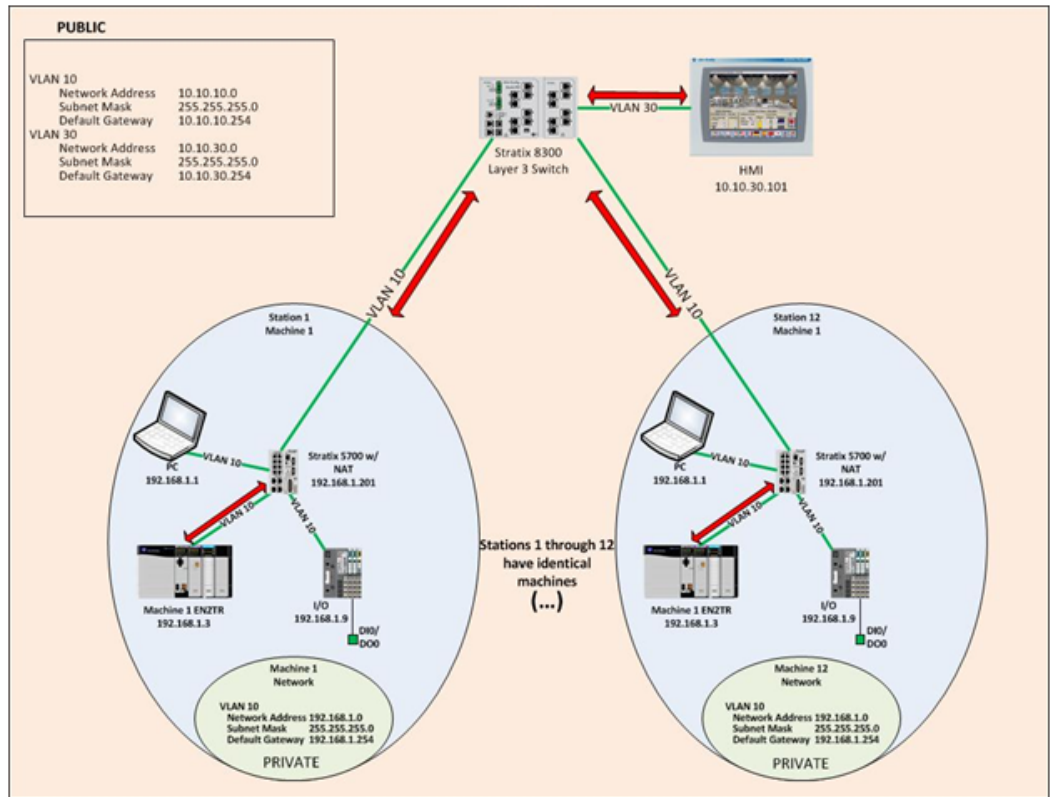
The goal is to:

- Maintain only one Logix program for all 12 machines.
- Not have to reconfigure every device on each machine with new IP addresses.
- Connect to the plant network for data collection.
- Report connectivity status to HMI server.

The problem is that if each machine is identical and connected as is, this causes duplicate IP address errors on our network.

NAT is how we are going to solve this problem. This Quick Start helps you implement NAT on the Stratix 5700 in a manner that gives your PC and your controller a unique address on the Plant network to make communication to the HMI possible.

This Quick Start takes you through the process of configuring NAT on the Stratix 5700 switch to enable devices with existing private IP addresses to be assigned a unique public address. This allows communication from all machines with identical private IP addresses to communicate to an HMI server residing on a different subnet on the plant network. Each machine is assigned a unique public IP address.

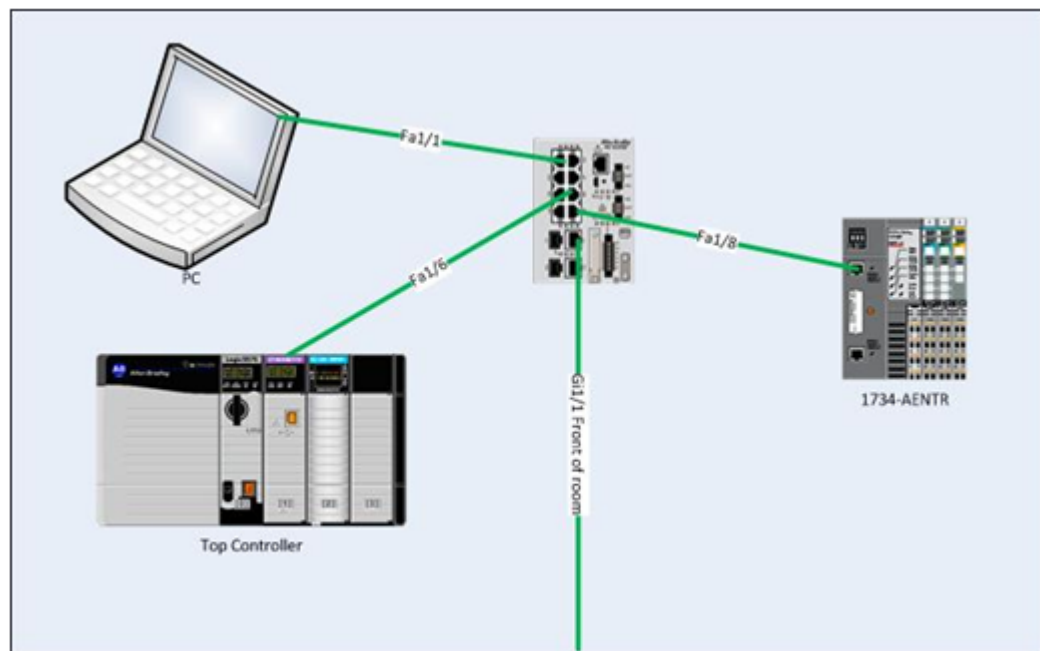


**Notes:**



# Configuring and Verifying Network Address Translations

## Assumptions



This Quick Start operates under the following assumptions:

- The PC is connected to port fa1/1 on the Stratix 5700.
- The 1756-EN2TR is connected to port fa1/6 on the Stratix 5700.
- The 1734-AENTR is connected to port fa1/8 on the Stratix 5700.
- The Gigabit port 1 is connected to the Stratix 8300 (layer 3 switch).
- All devices are configured with the IP addresses shown in the **IP Address** column of the table below.

Device	IP Address	Translated IP Address
PC	192.168.1.1	10.10.10.11
1756-EN2TR	192.168.1.3	10.10.10.101
1734-AENTR	192.168.1.9	N/A

Device	IP Address	Translated IP Address
Stratix 5700	192.168.1.201	N/A
HMI Server	10.10.30.1	N/A
Default Gateway VLAN 10 (Stratix 8300)	10.10.10.254	192.168.1.254

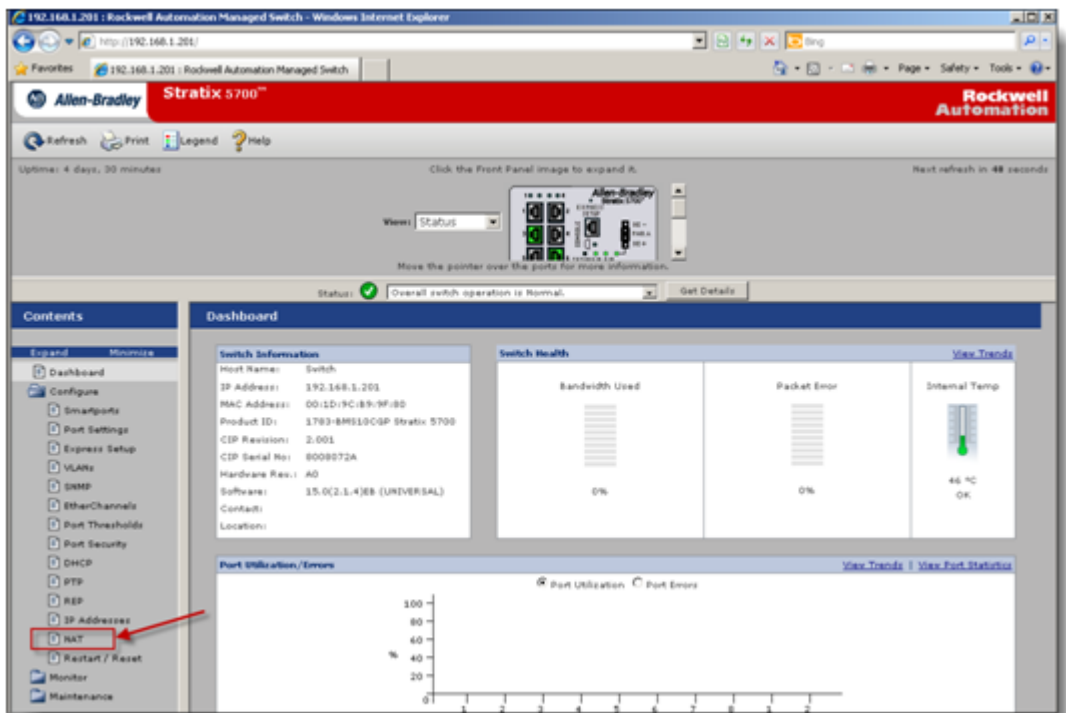
When routing through a layer 3 device; devices on the private subnet need to communicate with devices on the public network using their public address due to the fact a default gateway translation is in place, enabling routing to different subnets. Public devices always use the private device's public translation to communicate with a device on the private network.

### Configure NAT in the Stratix 5700 using the Device Manager Web Interface

1. Launch Internet Explorer.
2. Type the Stratix 5700 IP address, 192.168.1.201, in the address bar and click **Enter**.

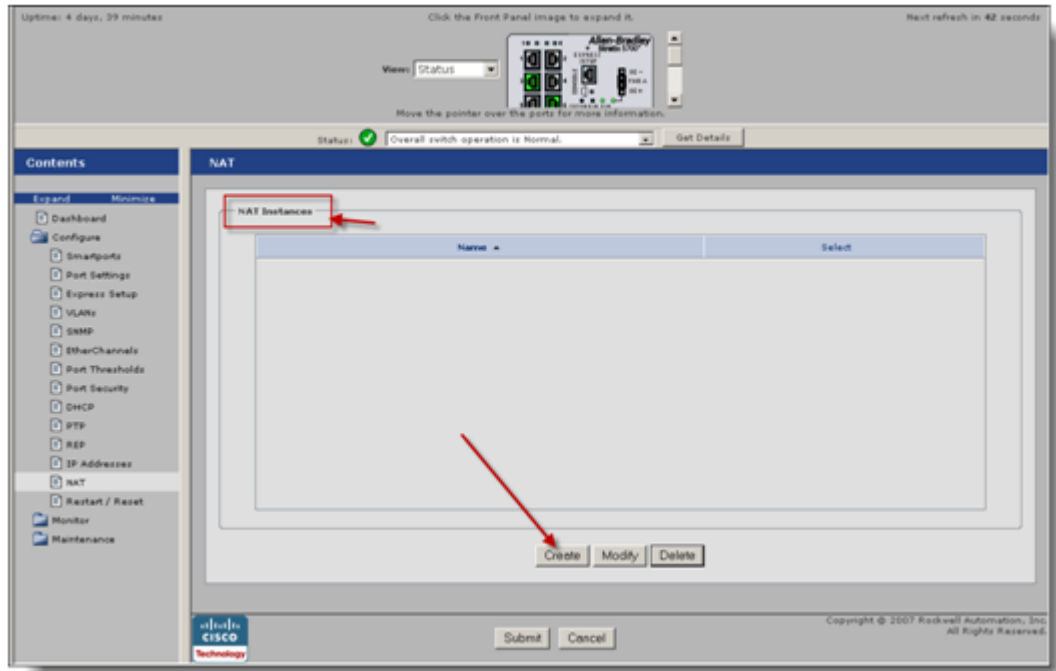


3. Enter the switch name and password.
4. The Stratix 5700 Device Manager opens. In the left pane shown below, expand the **Configure** folder and then click **NAT**.

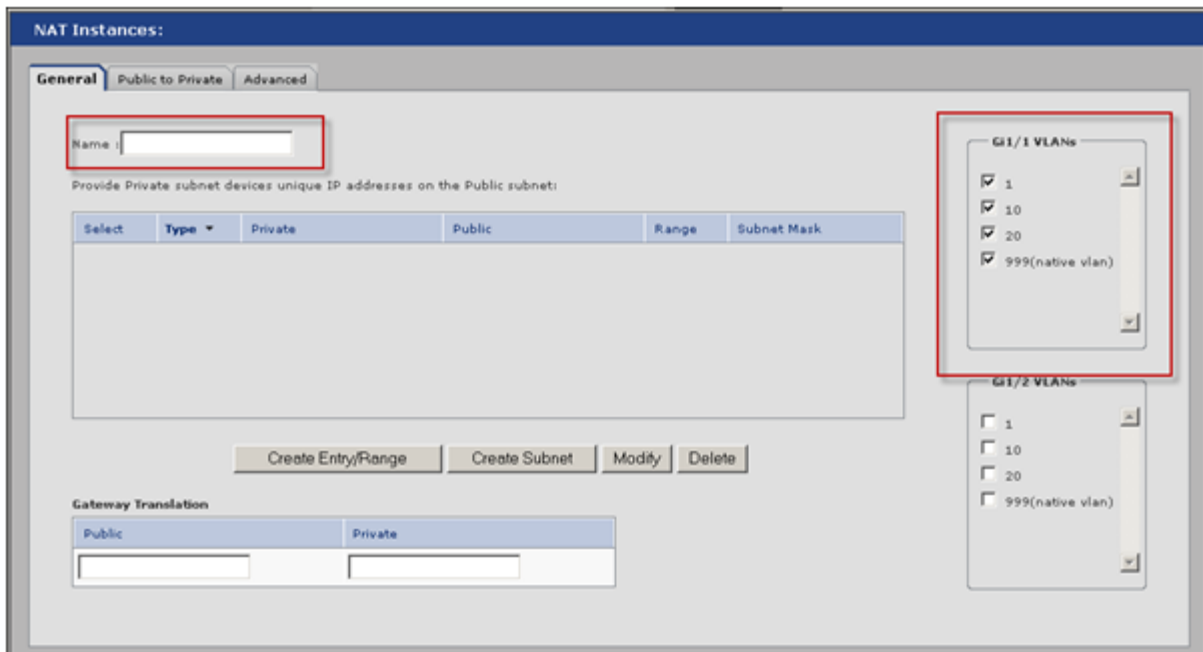


The NAT page opens.

- From the NAT page, shown below, you can configure your NAT Instances.



- Click **Create** to open the NAT Instances window as shown below.



To configure NAT, you create one or more unique NAT instances. In a typical implementation, only one instance is required. A NAT instance contains entries that define each address translation, as well as other configuration parameters.

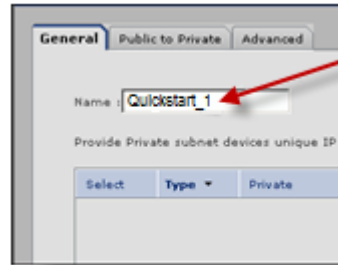
The translations you define depend on whether traffic is routed through a layer 3 switch or router or a layer 2 switch. If traffic is routed through a layer 3 switch or router, you define the following:

- A private-to-public translation for each device on the private subnet that needs to communicate on the public subnet.
- A gateway translation for the layer 3 switch or router.

You do not need to configure NAT for all devices on the private subnet. For example, you can choose to omit some devices from NAT to increase security, decrease traffic on the port, or conserve public address space.

7. Type the name of your NAT instance into the **Name** field.

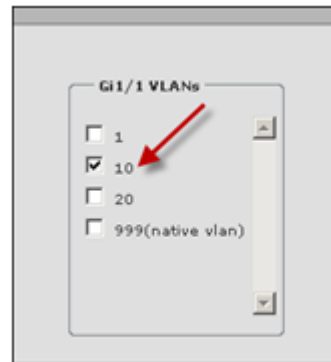
8. Select the interfaces and VLANs to assign to this instance.



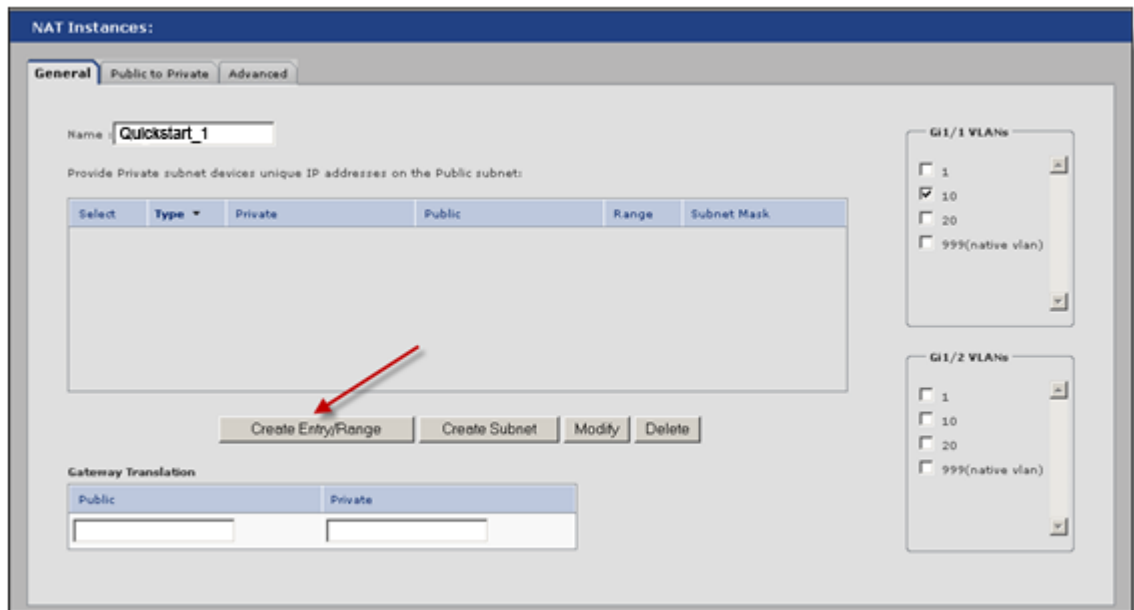
When assigning VLANs to a NAT instance, consider the following:

- NAT supports both trunk ports and access ports.
- NAT does not change VLAN tags. This means both your private and public subnets, while different, need to share the same VLAN to communicate.
- You can assign a maximum of 128 VLANs to one or more instances.
- You can assign the same VLAN to multiple instances as long as the VLAN is associated with different ports. For example, you can assign VLAN 1 to both instance A and instance B as long as VLAN 1 is associated with port Gi1/1 on instance A and port Gi1/2 on instance B.
- By default, each instance is assigned to all VLANs on port Gi1/1 and no instances on port Gi1/2. VLANs associated with a trunk port may or may not be assigned to a NAT instance:
- If a VLAN is assigned to a NAT instance, its traffic is subject to the configuration parameters of the NAT instance.
- If a VLAN is not assigned to a NAT instance, its traffic remains un-translated and is always permitted to pass through the trunk port.

- For this example, use VLAN 10 and interface Gi1/1. Leave VLAN 10 checked and deselect all others.



- From the NAT Instances window, click **Create Entry/Range**.



This example translates a single address. To translate multiple addresses in the private subnet, click **Create Subnet**.

11. Enter **192.168.1.1** in the **Private IP Address** field, type and in the **Public IP Address** field type the public address assigned to the PC.

**Create Entry/Range**

Private IP Address: 192.168.1.1

Public IP Address: 10.10.10.11

Range: 1

Effective Private Range: 192.168.1.1

Effective Public Range: 10.10.10.11

Done Cancel

12. Click **Done**.
13. Repeat steps 9 - 11 to create an entry for the ControlLogix Ethernet card. Machine 1's Ethernet card's private IP address is 192.168.1.3.

**Create Entry/Range**

Private IP Address: 192.168.1.3

Public IP Address: 10.10.10.101

Range: 1

Effective Private Range: 192.168.1.3

Effective Public Range: 10.10.10.101

Done Cancel

14. Define a gateway translation for the layer 3 switch or router as shown below. This example uses a Stratix 8300 at the layer 3 switch.

**Gateway Translation**

Public

Private

The public IP address of the default gateway (Stratix 8300) for VLAN 10 is 10.10.10.254. Type **10.10.10.254** in the **Public** field as shown.

To assign a private address for the default gateway, choose a unique unused address on the private subnet. This example uses 192.168.1.254.

15. Enter **192.168.1.254** in the private field as shown below. Devices in the private subnet will use 192.168.1.254 as their default gateway.

**General** Public to Private Advanced

Name:

Provide Private subnet devices unique IP addresses on the Public subnet:

Select	Type	Private	Public	Range	Subnet Mask
<input type="checkbox"/>	Single	192.168.1.3	10.10.10.101	1	
<input type="checkbox"/>	Single	192.168.1.1	10.10.10.11	1	

Buttons: Create Entry/Range, Create Subnet, Modify, Delete

**Gateway Translation**

Public	Private
<input type="text" value="10.10.10.254"/>	<input type="text" value="192.168.1.254"/>

GI1/1 VLANs:  1,  10,  20,  999(native vlan)

GI1/2 VLANs:  1,  10,  20,  999(native vlan)

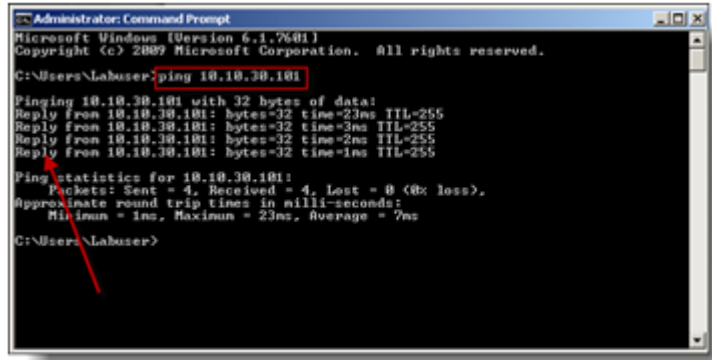
16. Click **Done**.

17. Click **Submit**.

## Checking connectivity

Use the PING utility to check the connection between your PC and the HMI server..

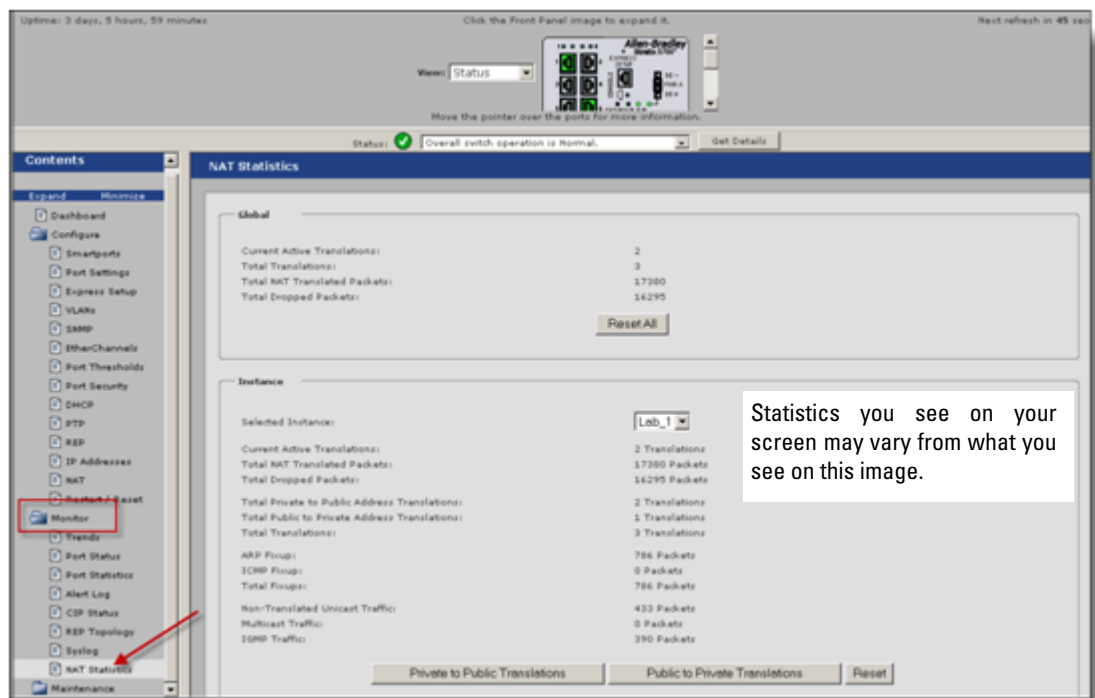
From Windows, launch the **Command Prompt** and enter **ping 10.10.30.101**. 10.10.30.101 is the IP address of the HMI Server. You should receive replies. If not, check your configuration.



## Statistics

Statistics for NAT on the Stratix 5700 provide the ability to “drill down” into the configuration. This allows the user to see a global view both for operation and loading, then drill down into specific instances to see a detailed analysis of traffic for troubleshooting purposes.

1. In the Device Manager Web interface open the **Monitor** folder in the left hand pane and click **NAT Statistics**. Use the NAT Statistics display to view statistics related to the instances as well as statistics related to the public-to-private and private-to-public translations. You can also reset the statistics.





2. Click **Private to Public Translations**. Notice that these are your private devices that need to communicate to the public network.

Private ▼	Public	Subnet	Total Number of Packets	Number of Packets(Past 90Sec)
192.168.1.3	10.10.10.101		352	352
192.168.1.1	10.10.10.11		14	14

Statistics you see on your screen may vary from what you see on this image.

Done

3. Click **Done**.
4. Click **Public to Private Translations**. This is your public device (default gateway) that needs a private address assigned to it.
5. Click **Done**.

Public ▼	Private	Subnet	Total Number of Packets	Number of Packets(Past 90Sec)
10.10.10.254	192.168.1.254		13	2

Statistics you see on your screen may vary from what you see on this image.

Done

The Stratix 5700 management interface can be associated with a VLAN that is or is not assigned to a NAT instance:

- If its associated VLAN is assigned to a NAT instance, the management interface resides on the private subnet by default. To manage the switch from the private subnet, no additional configuration is required. To manage the switch from the public subnet, you must configure a private-to-public translation.
- If its associated VLAN is not assigned to a NAT instance, the management interface's traffic remains un-translated and is always permitted to pass through the port. In this case the management addresses need to be unique for each switch.

## Summary

In this Quick Start, 12 identical machines with identical IP addresses all needed to communicate to the HMI server on the Plant network without having to reassign new IP addresses to each machine while maintaining only one Logix program for the 12 controllers instead of one each. The solution was to implement Network Address Translation (NAT) on the Stratix 5700 switch to translate the identical private addresses to unique public addresses and still have only one program to maintain.

The important thing to remember is what IP address to use and when. If a HMI server on the public side needs to communicate with a controller on a machine residing on the private side, the server needs to use its public address, which we assigned on the 10.10.10.x subnet.

Configuring a gateway translation, as we did in this Quick Start because we had a layer 3 device on our network, allowed communication from the private network to a device on the public network (HMI server) using its public address.



# Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://www.rockwellautomation.com/support/>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/support/>.

## Installation Assistance

If you experience an anomaly within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the <a href="#">Worldwide Locator</a> at <a href="http://www.rockwellautomation.com/support/americas/phone_en.html">http://www.rockwellautomation.com/support/americas/phone_en.html</a> , or contact your local Rockwell Automation representative.

## New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

## Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at <http://www.rockwellautomation.com/literature/>.

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