# The Configuration Management and Hardening Guide of Moxa's NPort 5000 Series

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**About Moxa**
Moxa is a leading provider of edge connectivity, industrial computing, and network infrastructure solutions for enabling connectivity for the Industrial Internet of Things (IIoT). With over 30 years of industry experience, Moxa has connected more than 71 million devices worldwide and has a distribution and service network that reaches customers in more than 80 countries. Moxa delivers lasting business value by empowering industries with reliable networks and sincere service. Information about Moxa's solutions is available at www.moxa.com.

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# 1. Introduction

This document provides guidelines on how to configure and secure the NPort 5000 Series. You should consider the recommended steps in this document as best practices for security in most applications. It is highly recommended that you review and test the configurations thoroughly before implementing them in your production system to ensure that your application is not negatively impacted.

# 2. General System InformationBasic Information About the Device

| Model | Function | Operating System | Firmware Version |
|---|---|---|---|
| NPort 5000A Series | General purpose | Moxa Operating System | Version 1.6 |
| NPort 5110 | General purpose | Moxa Operating System | Version 2.10 |
| NPort 5130/5150 | General purpose | Moxa Operating System | Version 3.9 |
| NPort 5200 Series | General purpose | Moxa Operating System | Version 2.12 |
| NPort 5400 Series | General purpose | Moxa Operating System | Version 3.14 |
| NPort 5600-DT Series | General purpose | Moxa Operating System | Version 2.8 |
| NPort 5600-DTL Series | General purpose | Moxa Operating System | Version 1.6 |
| NPort 5600-DT Series | General purpose | Moxa Operating System | Version 2.8 |
| NPort 5600-DTL Series | Entry level | Moxa Operating System | Version 1.6 |
| NPort 5600 Series | Rackmount | Moxa Operating System | Version 3.10 |
| NPort 5000AI-M12 Series | Railway | Moxa Operating System | Version 1.5 |
| NPort IA5000 Series | Industrial automation | Moxa Operating System | Version 1.7 |
| NPort IA5000A Series | Industrial automation | Moxa Operating System | Version 1.7 |

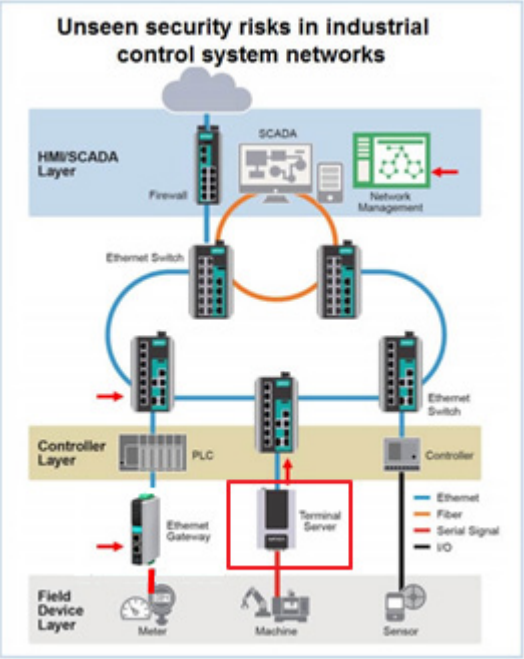
The NPort 5000 Series is a device server specifically designed to allow industrial devices to be directly accessible from the network. Thus, legacy devices can be transformed into Ethernet devices, which then can be monitored and controlled from any network location or even the Internet. Different configurations and features are available for specific applications, such as protocol conversion, Real COM drivers, and TCP operation modes, to name a few. It uses TLS protocols to transmit encrypted serial data over Ethernet.

Moxa Operating System (MOS) is an embedded proprietary operating system, which is only executed in Moxa edge devices. Because the MOS operating system is not freely available, the chances of malware attacks are significantly reduced.

## 2.2. Deployment of the Device

You should deploy the NPort 5000 Series behind a security firewall network that has sufficient security features in place and ensure that networks are safe from internal and external threats.

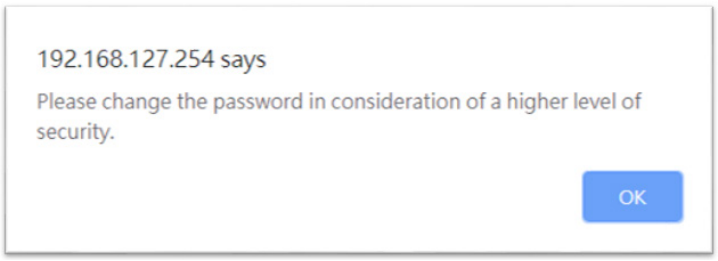
Make sure that the physical protection of the MGate devices and/or the system meets the security needs of your application. Depending on the environment and the threat situation, the form of protection can vary significantly.



# 3. Configuration and Hardening Information

For security reasons, account and password protection is enabled by default, so you must provide the correct account and password to unlock the device before entering the web console of the gateway.

The default account and password are admin and moxa (both in lowercase letters), respectively. Once you are successfully logged in, a pop-up notification will appear to remind you to change the password in order to ensure a higher level of security.



## 3.1. TCP/UDP Port Status

Refer to the table below for all the ports, protocols, and services that are used to communicate between the NPort 5000 Series and other devices.

| Service Name | Option | Default Settings | Type | Port Number | Remark & Description |
|---|---|---|---|---|---|
| Moxa Command (DSCI) | Enable/Disable | Enable | TCP | 14900, 4900 | For Moxa utility communication |
| | | | UDP | 4800 | |
| DNS_wins | Enable | Enable | UDP | 53, 137, 949 | Processing DNS and WINS (Client) data |
| SNMP agent | Enable/Disable | Enable | UDP | 161 | SNMP handling routine |
| HTTP server | Enable/Disable | Disable | TCP | 80 | Web console |
| HTTPS server | Enable/Disable | Enable | TCP | 443 | Secured web console |
| Telnet server | Enable/Disable | Disable | TCP | 23 | Telnet console |
| DHCP client | Enable/Disable | Enable | UDP | 68 | DHCP client needs to acquire the system IP address from the server |
| SNTP | Enable/Disable | Disable | UDP | Random Port | Synchronize the time settings with the time server<br>This function is not available for the 5100/5100A/5200/ 5200A Series. |
| Remote System Log | Enable/Disable | Disable | UDP | Random Port | Send the event log to the remote log server |

| Operation Mode | Option | Default Settings | Type | Port Number | Remark & Description |
|---|---|---|---|---|---|
| Real COM Mode | Enable/Disable | Enable | TCP | 950+ (Serial port No. - 1)<br>966+ (Serial port No. - 1) | |
| RFC2217 Mode | Enable/Disable | Disable | TCP | User-defined (default: 4000+Serial port No.) | Only available in certain models |
| TCP Server Mode | Enable/Disable | Disable | TCP | User-defined (default: 4000+Serial port No.)<br>User-defined (default: 966+Serial port No.) | |

| Operation Mode | Option | Default Settings | Type | Port Number | Remark & Description |
|---|---|---|---|---|---|
| UDP Mode | Enable/Disable | Disable | UDP | User-defined (default: 4000+Serial port No.) | |
| Pair Connection Master Mode | Enable/Disable | Disable | TCP | User-defined (default: 4000+Serial port No.) | Only available in certain models |
| Pair Connection Slave Mode | Enable/Disable | Disable | TCP | User-defined (default: 4000+Serial port No.) | Only available in certain models |
| Ethernet Modem Mode | Enable/Disable | Disable | TCP | User-defined (default: 4000+Serial port No.) | |
| Reverse Telnet Mode | Enable/Disable | Disable | TCP | User-defined (default: 4000+Serial port No.) | |
| Disabled Mode | Enable/Disable | Disable | N/A | N/A | |

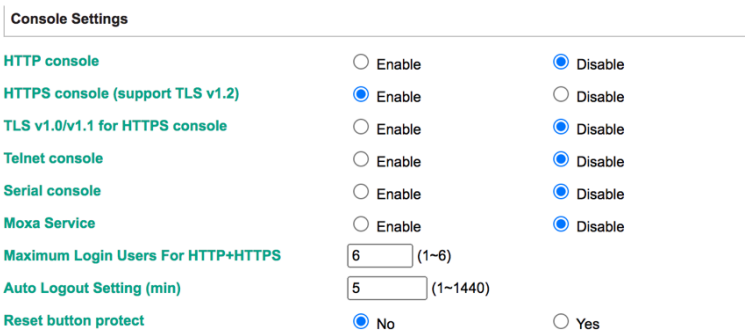
For security reasons, you should consider disabling unused services. After initial setup, use services with stronger security for data communication. Refer to the table below for the suggested settings.

| Service Name | Suggested Settings | Type | Port Number | Security Remark |
|---|---|---|---|---|
| Moxa Command (DSCI) | **Disable** | TCP | 14900, 4900 | Disable service that is not commonly used |
| | | UDP | 4800 | |
| DNS_wins | **Enable** | UDP | 53, 137, 949 | A necessary service to get IP; cannot be disabled |
| SNMP | **Disable** | UDP | 161 | Suggest to manage NPort via HTTPS console |
| HTTP Server | **Disable** | TCP | 80 | Disable the service for HTTP from plain text transmission |
| HTTPS Server | **Enable** | TCP | 443 | Encrypted data channel with trusted certificate for NPort configuration |
| Telnet Server | **Disable** | TCP | 23 | Disable service that is not commonly used |
| DHCP Client | **Disable** | UDP | 67, 68 | Suggest to assign a system IP in static manner |
| SNTP Client | **Disable** | UDP | Random Port | Suggest to use the SNTP server for secure time synchronization |
| Remote System Log | **Enable** | UDP | Random Port | Suggest to have a system log server to store all the logs from all the devices in the network |

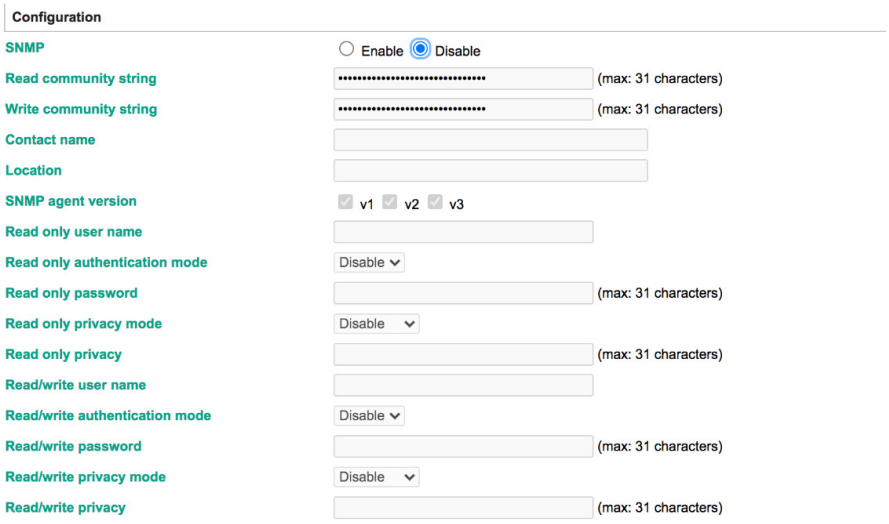
For the console services

| | |
|---|---|
| HTTP | Disable |
| HTTPS | Enable |
| Telnet | Disable |
| Moxa Command | Disable |

To enable or disable these services, log in to the HTTP/HTTPS console and select **Basic Settings → Console Settings**.



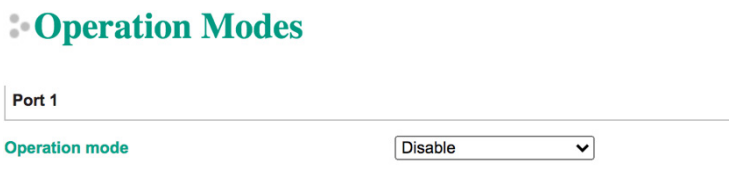

For the SNMP agent service, log in to the HTTP/HTTPS console and select **Administration → SNMP Agent,**. select **Disable** for the SNMP, and select **Disable** for agent service.



To disable the SNTP service server, log in to the HTTP/HTTPS/SSH/Telnet console and select **Basic Settings**, and keep the **Time server** setting empty. This will disable the SNTP service. Then, keep the Time server empty as **Disable** for the SNTP Server.


For the remote system log server, it depends on your network architecture. We recommend your network administrator to have a Log Server to receive the log messages from the device. In this case, log in to the HTTP/HTTPS/SSH/Telnet console, select **Remote Log Server**, and input the IP address of the Log Server in the **SYSLOG server** field. If your network doesn't have one, keep it empty (disable **Remote System Log Server**).

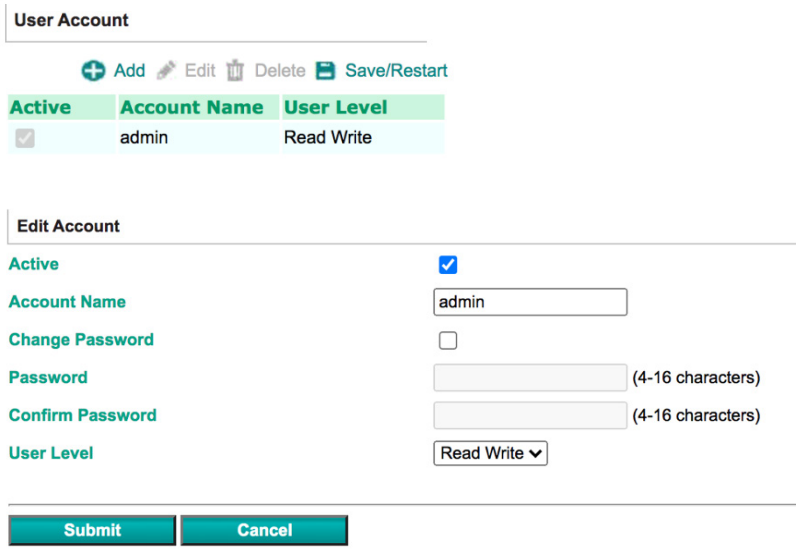

For the operation mode services, it depends on how you bring your serial device to the Ethernet network. For example, if your host PC uses a legacy software to open a COM port to communicate with the serial device, then the NPort will enable the Real COM mode for this application. If you don't want the NPort to provide such a service, log in to the HTTP/HTTPS/SSH/Telnet console, select **Serial Port Settings-> Port # -> Operation Modes**, and then select **Disable**.



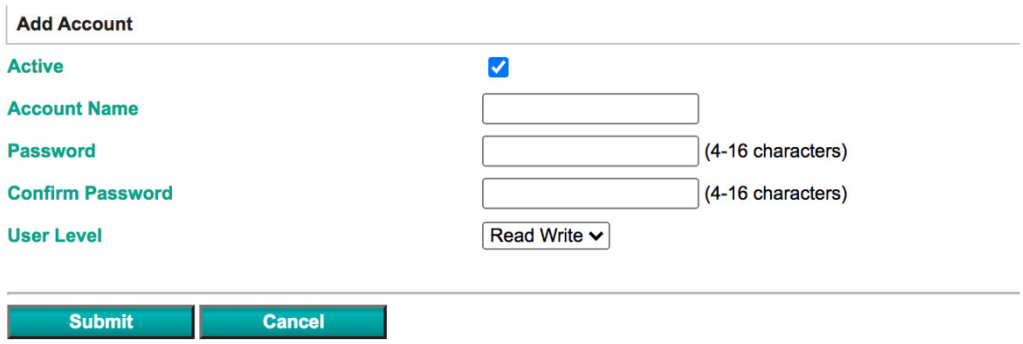

For each instruction above, click the **Submit** button to save your changes, and then restart the NPort 5000 Series so the new settings will take effect.

## 3.2. Account Management

- Through the administration account, admin, log in to NPort 5000 Series and perform configuration settings. To change the default password (moxa), please log in to the HTTP/HTTPS/Telnet console and select **Administration → Account Management → User Account**. Click on the 'admin' account row, and select 'Edit' in the top toolbar. Input the old password in the **Password** field and the new password in **Confirm Password** field (at least 4 characters) to change the password. A screenshot of the GUI for the web console is shown below.



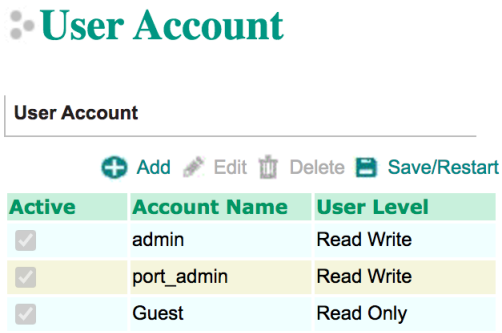

- To add new general users, please log in to the HTTP/HTTPS/Telnet console and select **Administration → Account Management → User Account**. Click **Add** in the top toolbar, then input the Account Name, Password, Confirm Password to add a new user. A snapshot of the GUI for the web console is shown below.




Here, we can also **Delete** users.

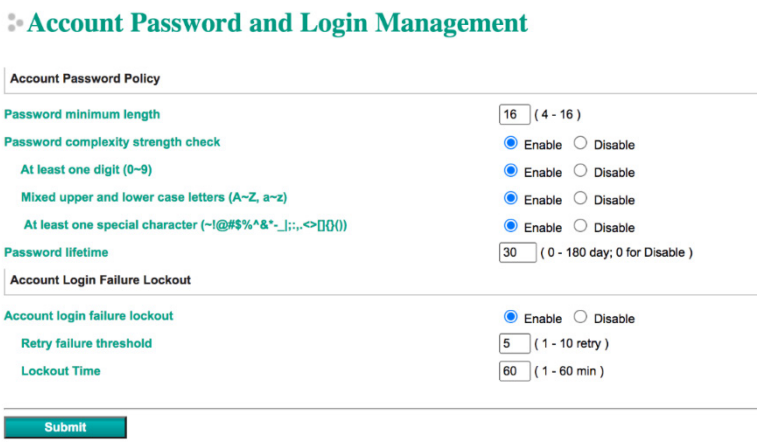
Please note that click **Save/Restart** is performed after any modification.

**Note:** It is suggested to manage the NPort 5000 Series in another "administration level" account instead of using the default "admin" account, as it is commonly used by embedded systems. Once the new administration level account has been created, it is suggested that the original "admin" account be monitored for security reasons to avoid a brute-force attack.



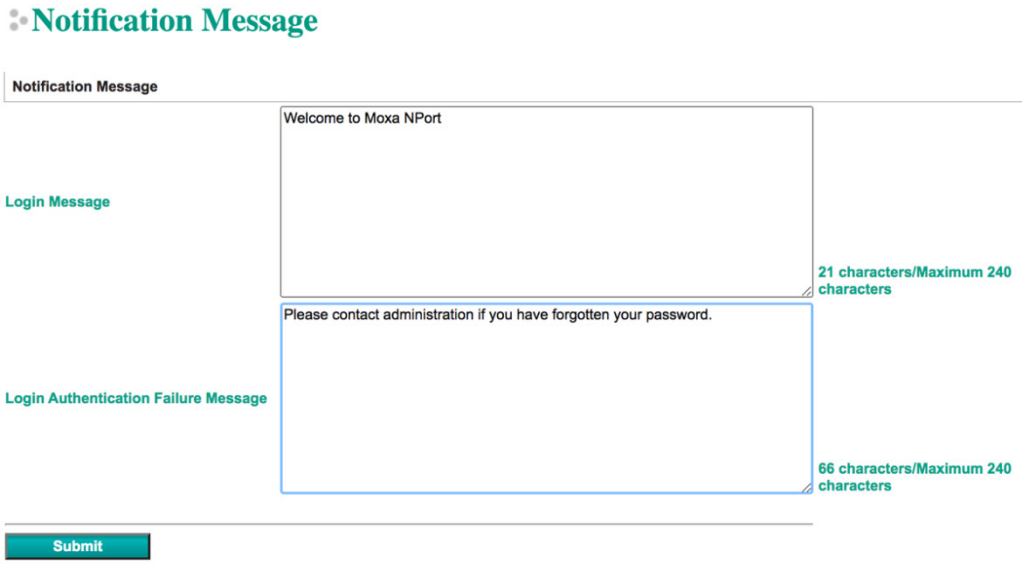

- Considering all security levels, the login password policy and failure lockout can be configured. To configure it, please log in to the HTTP/HTTPS console and select **Administration → Account Management → Password & Login Policy**. Not only can the **Account Password Policy** be configured, but the **Account Login Failure Lockout** can be further enabled to increase the security level of the account management.

  It is suggested to set the password policy at a higher complexity. For example, set the **Password minimum length** at 16, enable all password complexity strength checks, and enable the **Password lifetime** checking mechanism. Also, to avoid a brute-force attack, it's suggested to enable the **Account login failure lockout** feature. A screenshot of the GUI for the web console is shown below.



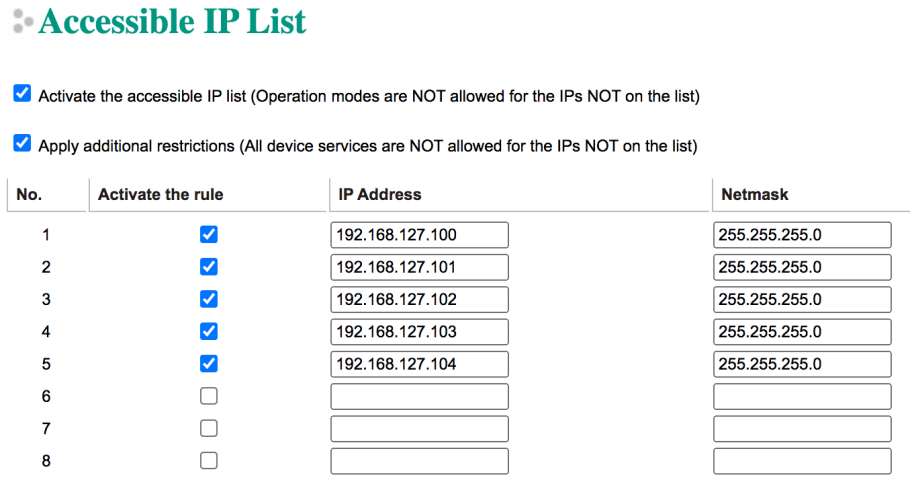

 

- For some system security requirements, an approved warning banner needs to be displayed to all users attempting to access the device. In addition to the warning banner, please log in to the HTTP/HTTPS console and select **Administration → Account Management → Notification Message**. Users can type in the warning message in the **Login Message** field at all access points.




## 3.3. Accessible IP List

- The NPort 5000 Series has a feature that can add or block remote host IP addresses to prevent unauthorized access. That is, if a host's IP address is in the accessible IP table, then the host will be allowed to access the NPort 5000 series. To configure it, please log in to the HTTP/HTTPS console and select Accessible IP List.




You may add a specific address or range of addresses by using a combination of an IP address and a netmask as follows:

**To allow access to a specific IP address:** Enter the IP address in the corresponding field; enter 255.255.255.255 for the netmask.

**To allow access to hosts on a specific subnet:** For both the IP address and netmask, use 0 for the last digit (e.g., "192.168.1.0" and "255.255.255.0").

**To allow access to all IP addresses:** Make sure that the **Enable** checkbox for the Accessible IP List is not checked.

Additional configuration examples are shown in the following table:

| Desired IP Range | IP Address Field | Netmask Field |
|---|---|---|
| Any host | Disable | Enable |
| 192.168.1.120 | 192.168.1.120 | 255.255.255.255 |
| 192.168.1.1 to 192.168.1.254 | 192.168.1.0 | 255.255.255.0 |
| 192.168.1.1 to 192.168.255.254 | 192.168.0.0 | 255.255.0.0 |
| 192.168.1.1 to 192.168.1.126 | 192.168.1.0 | 255.255.255.128 |
| 192.168.1.129 to 192.168.1.254 | 192.168.1.128 | 255.255.255.128 |

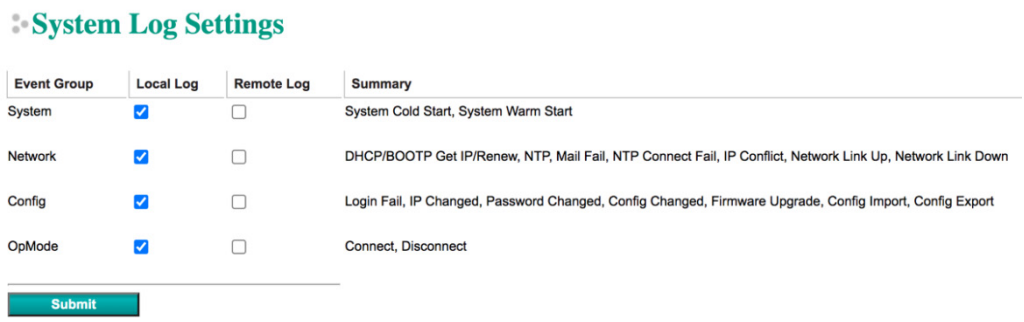
**Warning** Ensure the communication peer is listed in the Accessible IP List for entering the web console.

## 3.4. Logging and Auditing

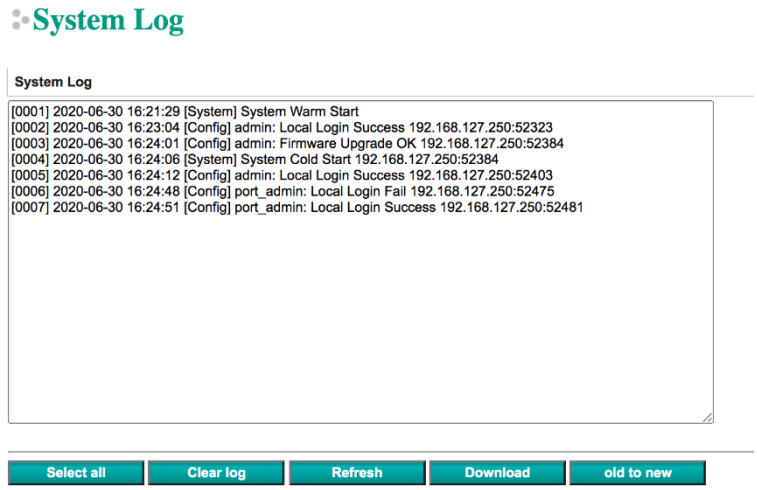
- Please refer to table below for all the events that will be recorded by the NPort 5000 Series

| Event Group | Summary |
|---|---|
| System | System cold start, System warm start |
| Network | DHCP/BOOTP gets IP/renew, NTP connect failed, IP conflict, Network link down |
| Configuration | Login failed, IP changed, Password changed, Firmware upgraded, Certificate imported, Configuration imported or exported, Configuration changed, Clear event logged |
| OpMode | Connect, Disconnect |

- To configure this setting, log in to the HTTP/HTTPS console and select **System Log Settings**. Then, enable the Local Log for recording on the NPort 5000 device and/or **Remote Log** for keeping the records on a server about the network. It is suggested to enable the system log settings to record all important system events in order to monitor any security issue with the device status. A screenshot of the GUI for the web console is shown below.




- To review the above events, log in to HTTP/HTTPS console, select **Monitor → System Log**. A screenshot of the GUI for the web console is shown below.



# 4. Patching/Upgrades

## 4.1. Patch Management Plan

With regard to patch management, Moxa in general releases version enhancement with thorough release notes annually. If any security vulnerability issue is identified, Moxa will release a beta fix within 30 days .

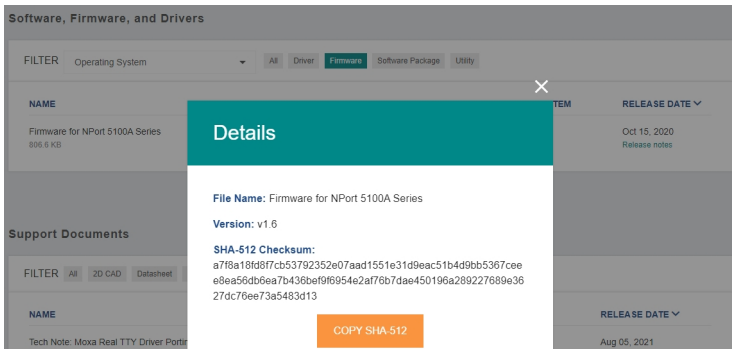
## 4.2. Firmware Upgrades

The process of firmware and/or software upgrade is instructed as below.

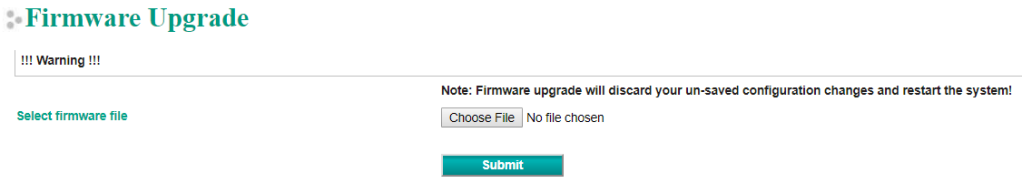
- We will release the latest firmware and software along with its released notes on our official website. The links listed below are for specified items for the NPort 5000 Series.

| NPort Series | URL |
|---|---|
| 5100A | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5100a-series#resources |
| 5100 | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5100-series#resources |
| 5200A | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5200a-series#resources |
| 5200 | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5200-series#resources |
| 5400 | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5400-series#resources |
| 5600 | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5600-series#resources |
| 5600-DT | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5600-dt-series#resources |
| 5600-DTL | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5600-dtl-series#resources |
| IA5000A | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/industrial-device-servers/nport-ia5000a-series#resources |
| IA5000 | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/industrial-device-servers/nport-ia5000-series#resources |
| 5000AI-M12 | https://www.moxa.com/en/products/industrial-edge-connectivity/serial-device-servers/general-device-servers/nport-5000ai-m12-series#resources |

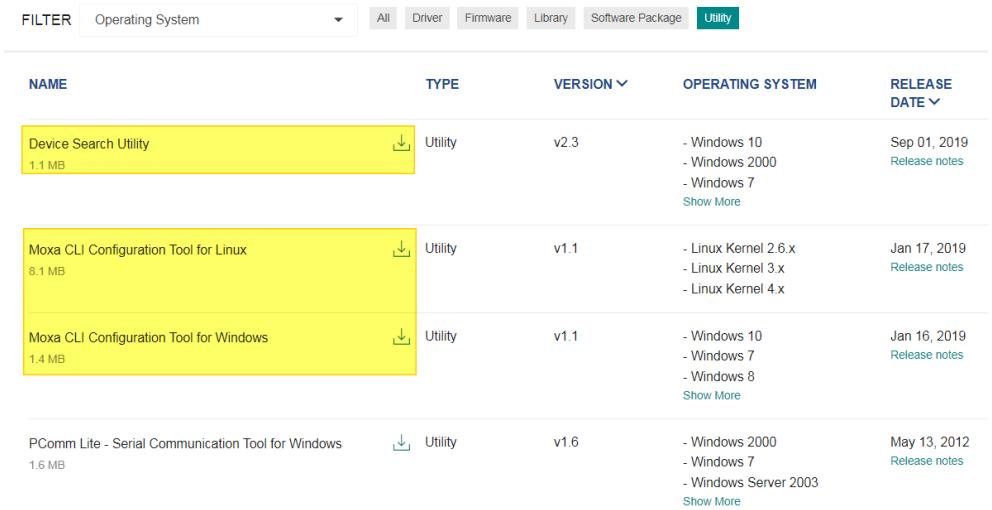
- Moxa's website provides the SHA-512 hash value for you to double-check if the firmware is identical to the one on the website.




- When a user wants to upgrade the firmware of the NPort 5000 Series, please download the firmware from the website first. Then log in to HTTP/HTTPS console and select **Upgrade Firmware**. Click the **Choose File** button to select the proper firmware and click **Submit** to upgrade the firmware.




- If a user wants to upgrade the firmware of the NPort 6000 Series with multiple units , please download the utility Device Search Utility (DSU) or MXconfig for a GUI interface, or the Moxa CLI Configuration Tool for a CLI interface to preform the mass deployment.



| | | | | |
|---|---|---|---|---|
| MXconfig<br>118.1 MB | Software Package | v2.6 | - Windows 10<br>- Windows 7<br>- Windows 8<br>Show More | May 29, 2020<br>Release notes |

# 5. Security Information and Vulnerability Feedback

As the adoption of the Industrial IoT (IIoT) continues to grow rapidly, security has become one of the top priorities. The Moxa Cyber Security Response Team (CSRT) is taking a proactive approach to protect our products from security vulnerabilities and help our customers better manage security risks.

Please follow the updated Moxa security information from the link below:

https://www.moxa.com/en/support/product-support/security-advisory