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Introduction

Content and Purpose of this Guide

This guide documents security features for firmware version 2.x for Schneider Electric® Network Management Card 4, which enables the devices to function remotely over the network.

This guide documents the following protocols and features, how to select which ones are appropriate for your situation, and how to set up and use them within an overall security system:

- Secure SHell v2 (SSH)
- Transport Layer Security (TLS) v1.0, v1.1, and v1.2
- SNMPv1 and SNMPv3

User Management

Types of User Accounts

The Network Management Card has five basic levels of access:

- A Super User: can use all of the management menus available in the Web interface and all of the commands in the command line interface.
- Administrative User: can use all of the management menus available in the Web interface and all of the commands in the command line interface.
- A Device User: can access the event log and data log (but cannot delete the contents of either log), and can use the device-related menus and commands.
- Network-Only User: can only access information that is not device-related.
- A Read-Only User: can access the event log, data log, and device-related menus, but cannot change configurations, control devices, delete data, delete the content of logs, or use file transfer options.

Note: A Super User is an Administrator account which is persistent and cannot be deleted, but can still be enabled or disabled.
Security

Security Features

Protection of passwords and passphrases
No password or passphrases are stored on the Network Management Card in plain text.

- Passwords are hashed using a one-way hash algorithm.
- Passphrases, which are used for authentication and encryption, are encrypted before they are stored on the Network Management Card.

Summary of access methods
Serial access to the command line interface.

<table>
<thead>
<tr>
<th>Security Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access is by user name, user type, and password</td>
<td>Always enabled.</td>
</tr>
</tbody>
</table>

Remote access to the command line interface

<table>
<thead>
<tr>
<th>Security Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available methods:</td>
<td>For high security, use SSH.</td>
</tr>
<tr>
<td>• User name and password</td>
<td>• Enabling SSH provides encrypted access to the command line interface, to provide additional protection from attempts to intercept, forge, or alter data during transmission.</td>
</tr>
<tr>
<td>• Selectable server port</td>
<td></td>
</tr>
<tr>
<td>• Access protocols that can be enabled or disabled.</td>
<td></td>
</tr>
<tr>
<td>• Secure SHell (SSH)</td>
<td></td>
</tr>
</tbody>
</table>
**SNMPv1 and SNMPv3**

<table>
<thead>
<tr>
<th>Available methods (SNMPv1)*:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Community Name</td>
<td>For both SNMPv1 and SNMPv3, the host name restricts access to the Network Management System (NMS) at that location only, and the NMS IP filters allow access only to the NMSs specified by one of the IP address formats in the following examples:</td>
</tr>
<tr>
<td>• Host Name</td>
<td>• 159.215.12.1: Only the NMS at the IP address 159.215.12.1.</td>
</tr>
<tr>
<td>• Agents that can be enabled or disabled</td>
<td>• 159.215.255.255: Any NMS on the 159.215 segment.</td>
</tr>
<tr>
<td>• Four access communities with read/write/disable capability</td>
<td>• 159.255.255.255: Any NMS on the 159 segment.</td>
</tr>
<tr>
<td></td>
<td>• 0.0.0.0 or 255.255.255.255: Any NMS.</td>
</tr>
</tbody>
</table>

* SNMPv2c is also supported by SNMPv1 and its configuration settings.

**File transfer protocols**

<table>
<thead>
<tr>
<th>Available methods:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• User name and password</td>
<td>With FTP, the user name and password are transmitted as plain text, and files are transferred without encryption. Use SFTP to encrypt the user name and password and the files being transferred, such as firmware updates, configuration files, log files, Transport Layer Security (TLS) certificates, and Secure SHell (SSH) host keys. If you choose SFTP as your file transfer protocol, enable SSH and disable FTP.</td>
</tr>
<tr>
<td>• Selectable server port</td>
<td></td>
</tr>
<tr>
<td>• Access protocols that can be enabled or disabled.</td>
<td></td>
</tr>
<tr>
<td>• Secure FTP (SFTP)</td>
<td></td>
</tr>
</tbody>
</table>

---

* SNMPv2c is also supported by SNMPv1 and its configuration settings.
Web Server

<table>
<thead>
<tr>
<th>Security Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available methods:&lt;br&gt;• User name and password&lt;br&gt;• Selectable server port&lt;br&gt;• Web interface access that can be enabled or disabled&lt;br&gt;• Transport Layer Security (TLS)</td>
<td>In basic HTTP authentication mode, the user name and password are transmitted as plain text (with no encoding or encryption). TLS is available on Web browsers supported for use with the Management Card or network-enabled device and on most Web servers. The Web protocol HyperText Transfer Protocol over Secure Sockets Layer (HTTPS) encrypts and decrypts page requests to the Web server and pages returned by the Web server to the user.</td>
</tr>
</tbody>
</table>

Change default user names and passwords immediately

After installation and initial configuration of the Management Card or network-enabled device, immediately change password of the Super User account.

**Note:** You cannot change the user name of the Super User. The Super User password should be changed immediately. It is recommended that the Super User account is disabled, once any additional Administrator accounts are created.

Port assignments

If the FTP server, SSH/SFTP, or the Web server uses a non-standard port, a user must specify the port in the command line or Web address used to access the Management Card or device. A non-standard port number provides an additional level of security. The ports are initially set at the standard “well known ports” for the protocols. To increase security, change the ports to any unused port numbers from 5001 to 32768 for the FTP server and from 5000 to 32768 for the other protocols and servers. (The FTP server uses both the specified port and the port one number lower than the specified port.)

User names, passwords, and community names with SNMPv1

All user names, passwords, and community names for SNMPv1 are transferred over the network as plain text. A user who is capable of monitoring the network traffic can determine the user names and passwords required to log on to the accounts of the command line interface or Web interface of the Management Card or network-enabled device. If your network requires the higher security of the encryption-based options available for the command line interface and Web interface, disable SNMPv1 access or set its access to Read. **(Read access allows you to receive status information and use SNMPv1 traps.)**

SNMPv1 is disabled by default. To check SNMPv1 settings, go to Configuration > Network > SNMPv1 > Access. To disable SNMPv1, clear the Enable SNMPv1 access check box and click Apply.

To set SNMPv1 access to Read, perform the following steps: On the Configuration tab select Network. Select SNMPv1 and then Access Control. For each configured Network Management System (NMS), click the community names and set the Access Type to Read. Select Apply.

Authentication

You can choose security features for the Management Card or network-enabled device that control access by providing basic authentication through user names, passwords, and IP addresses, without using encryption. These basic security features are sufficient for most environments in which sensitive data are not being transferred.
SNMP GETS, SETS, and Traps

For enhanced authentication when you use SNMP to monitor or configure the Management Card or network-enabled device, choose SNMPv3. The authentication passphrase used with SNMPv3 user profiles ensures that a Network Management System (NMS) attempting to communicate with the Management Card or device is the NMS it claims to be, that the message has not been changed during transmission, and that the message was not delayed, copied, and sent again later at an inappropriate time. SNMPv3 is disabled by default.

The Schneider Electric implementation of SNMPv3 allows the use of the SHA-1 or MD5 protocol for authentication.

Web interface and command line interface

To ensure that data and communication between the Management Card or network-enabled device and the client interfaces (the command line interface and the Web interface) cannot be intercepted, you can provide a greater level of security by using one or more of the following encryption-based methods:

- For the Web interface, use the Transport Layer Security (TLS) protocol
- To encrypt user names and passwords for command line interface access, use the Secure SHell (SSH) protocol
- To encrypt user names, passwords, and data for the secure transfer of files, use the Secure FTP (SFTP) protocol.

Note: For more information on encryption-based security, see Encryption.

Encryption

SNMP, GETS, SETS, and Traps

For encrypted communication when you use SNMP to monitor or configure the Management Card or network-enabled device, choose SNMPv3. The privacy passphrase used with SNMPv3 user profiles ensures the privacy of the data (by means of encryption, using the AES or DES encryption algorithm) that an NMS sends to or receives from the Management Card or device.

Secure SHell (SSH) and Secure FTP (SFTP) for the Command Line Interface

The Secure SHell protocol

SSH provides a secure mechanism to access computer consoles, or shells, remotely. The protocol authenticates the server (in this case, the Management Card or network-enabled device) and encrypts all transmissions between the SSH client and the server.

- SSH is a high-security alternative to Telnet. SSH protects the user name and password, which are the credentials for authentication, from being used by anyone intercepting network traffic.
- To authenticate the SSH server (the Management Card or network-enabled device) to the SSH client, SSH uses a host key unique to the SSH server. The host key is an identification that cannot be falsified, and it prevents an invalid server on the network from obtaining a user name and password by presenting itself as a valid server.

Note: For information on supported SSH client applications, see Secure SHell (SSH).

The Management Card or device supports SSHv2, which provides protection from attempts to intercept, forge, or change data during transmission.
Secure FTP

SFTP is a secure file transfer application that you should use instead of FTP. SFTP uses the SSH protocol as the underlying transport protocol for encryption of user names, passwords, and files.

- When you enable and configure SSH, you automatically enable and configure SFTP. No further configuration of SFTP is needed.
- FTP is disabled by default. FTP settings can be reviewed at Configuration > Network > FTP Server. To disable FTP, clear the Enable check box and click Apply.

Transport Layer Security (TLS) for the Web interface

For secure Web communication, enable Transport Layer Security (TLS) by selecting HTTPS as the protocol mode to use for access to the Web interface of the Management Card or network-enabled device. HyperText Transfer Protocol over Secure Sockets Layer (HTTPS) is a Web protocol that encrypts and decrypts page requests from the user and pages that are returned by the Web server to the user. The Management Card or network-enabled device supports TLS versions 1.0, 1.1 and 1.2. Most browsers let you select the version of TLS to enable.

Note: Secure Socket Layer (SSL) version 3 is not supported.

Note: The Management Card automatically negotiates to use the highest supported protocol or cipher suite that is supported by the Management Card and the client.

Note: When TLS is enabled, your browser displays a small lock icon.

TLS uses a digital certificate to enable the browser to authenticate the server (in this case, the Management Card or device). The browser verifies the following:

- The format of the server certificate is correct.
- The expiration date and time of the server certificate have not passed.
- The DNS name or IP address specified when a user logs on matches the common name in the server certificate.
- The server certificate is signed by a trusted certifying authority. Each major browser manufacturer distributes CA root certificates of the commercial Certificate Authorities in the certificate store (cache) of its browser so that it can compare the signature on the server certificate to the signature on a CA root certificate.

Note: See Creating and Installing Digital Certificates for a summary of how these certificates are used. TLS also uses various algorithms and encryption ciphers to authenticate the server, encrypt data, and ensure the integrity of the data, i.e., that it has not been intercepted and sent by another server.

Note: Web pages that you have recently accessed are saved in the cache of your Web browser and allow you to return to those pages without re-entering your user name and password. Always close your browser session before you leave your computer unattended.

Creating and Installing Digital Certificates

Purpose

For network communication that requires a higher level of security than password encryption, the Web interface of the Management Card or network-enabled device supports the use of digital certificates with the Transport Layer Security (TLS) protocol. Digital certificates can authenticate the Management Card or device (the server) to the Web browser (the TLS client).

Note: You can generate a 1024-bit key or a 2048-bit key - choose a 2048-bit key for increased security.
The sections that follow summarize the two methods of creating, implementing, and using digital certificates to help you determine the most appropriate method for your system.

- Method 1: Use the default certificate auto-generated by the Network Management Card or network-enabled device (2048-bit).
- Method 2: Generate your own certificate. The system uses .pem files and a private key. These can be uploaded separately on the configuration network Web ssl-cert page.

Choosing a Method for your System

Using the Transport Layer Security (TLS) protocol, you can choose any of the following methods for using digital certificates.

Method 1: Use the default certificate auto-generated by the Network Management Card or network-enabled device

TLS is enabled by default. During booting, if no server certificate exists, the Management Card or device generates a default server certificate that is self-signed but that you cannot configure.

Method 1 has the following advantages and disadvantages.

Advantages:
- Before they are transmitted, the user name and password and all data to and from the Management Card or device are encrypted.
- You can use this default server certificate to provide encryption-based security while you are setting up either of the other two digital certificate options, or you can continue to use it for the benefits of encryption that TLS provides.

Disadvantages:
- This method does not include the authentication provided by a CA certificate (a certificate signed by a Certificate Authority). There is no CA Certificate cached in the browser. Therefore, when you log on to the Management Card or device, the browser generates a security alert, indicating that a certificate signed by a trusted authority is not available, and asks if you want to proceed. To avoid this message, you must install the default server certificate into the certificate store (cache) of the browser of each user who needs access to the Management Card or device, and each user must always use the fully qualified domain name of the server when logging on to the Management Card or device.
- The default server certificate has the serial number of the Management Card or device in place of a valid common name (the DNS name or the IP address of the Management Card or device). Therefore, although the Management Card or device can control access to its Web interface by user name, password, and account type (e.g., Super User, Administrator, Device-Only User, or Read-Only User), the browser cannot authenticate which Management Card or device is sending or receiving data.
- The length of the public key (RSA key) that is used for encryption when setting up a TLS session is 2048-bit, by default.

Method 2: Add a valid certificate to the system

Generate a certificate signing request (CSR) file (a .csr file) to send to a Certificate Authority. This can be created using OpenSSL, Certreq.exe or any tool that generates a CSR. The Certificate Authority returns a signed certificate (a .crt file or .cer file typically) based on information you submitted in your request. If this file is not in .pem format, you must covert the file to .pem format. The below OpenSSL command takes a file in .pfc format and converts it to .pem format:

`openssl pkcs12 -in client_ssl.pfx -out client_ssl.pem -clcerts`
For a full list of commands, see the OpenSSL documentation. You can then upload the certificate to the Network Management Card together with its private key.

**Note:** You can also use Method 2 if your company or agency operates its own Certificate Authority. Use your own Certificate Authority in place of a commercial Certificate Authority.

Method 2 has the following advantages and disadvantages.

**Advantages**
Before they are transmitted, the user name and password and all data to and from the Management Card or device are encrypted.

- You have the benefit of authentication by a Certificate Authority that already has a signed root certificate in the certificate cache of the browser. (The CA certificates of commercial Certificate Authorities are distributed as part of the browser software, and a Certificate Authority of your own company or agency has probably already loaded its CA certificate to the browser store of each user’s browser.)
- You choose the length of the **public key** (RSA key) that is used for setting up a TLS session (use 2048-bit which is the default setting, or use 4064-bit to provide complex encryption and a high level of security).
- The server certificate that you upload to the Management Card or device enables TLS to authenticate that data are being received from and sent to the correct Management Card or device. This provides an extra level of security beyond the encryption of the user name, password, and transmitted data.
- The browser matches the digital signature on the server certificate that you uploaded to the Management Card or device with the signature on the CA root certificate that is already in the browser’s certificate cache to provide additional protection from unauthorized access.

**Disadvantages**
Setup requires the extra step of requesting a signed root certificate from a Certificate Authority.

- An external Certificate Authority may charge a fee for providing signed certificates.

**Firewalls**

Although some methods of authentication provide a higher level of security than others, complete protection from security breaches is almost impossible to achieve. Well-configured firewalls are an essential element in an overall security scheme.

**Logs:** The Active Firewall Policy Log lists the most recent firewall events, including the protocol, traffic, action, and rule priority, in reverse chronological order.

**Note:** This log is not persistent and can hold up to 2000 events.

Configuration: Enable or disable the overall firewall functionality.
Active Policy: Select an active policy from the available firewall policies.
Active Rules: Lists the individual rules that are being enforced based on the current active policy.
Create/Edit Policy: Create a new policy or edit an existing one.
Test Policy: Temporarily enforce the rules of a chosen policy.
Command Line Interface Access and Security

Introduction

Users with Super User, Administrator or Device User accounts can access the command line interface through Secure SHell (SSH). (A Super User or Administrator can enable these access methods by selecting the Configuration > Network > Console > Access.) SSH is enabled by default.

SSH for high-security access. If you use the high security of TLS for the Web interface, use Secure SHell (SSH) for access to the command line interface. SSH encrypts user names, passwords and transmitted data.

To use SSH, you must first configure SSH and have an SSH client program installed on your computer.

Secure SHell (SSH)

SSH is enabled by default. Enabling SSH automatically enables SFTP.

Note: When SSH is enabled and its port is configured, no further configuration is required to use Secure FTP (SFTP). SFTP uses the same configuration as SSH. To use SSH, you must have an SSH client installed. Most Linux and other UNIX® platforms include an SSH client, but Microsoft Windows operating systems do not. SSH clients are available from various vendors.

To configure the options for Secure SHell (SSH):

- On the Configuration tab of the Web interface, select Network on the top menu bar, and select Access under the Console heading.
- Configure the port settings for SSH.

Note: For information on the extra security a non-standard port provides, see Port assignments.

- Select Configuration > Network > Console > SSH Host Key. specify a host key file previously created with OpenSSL.
- If you do not specify a host key file here, if you install an invalid host key, or if you enable SSH with no host key installed, the Management Card or device generates a 2048-bit RSA host key.
- Display the fingerprint of the SSH host key for SSH version 2. Most SSH clients display the fingerprint at the start of a session. Compare the fingerprint displayed by the client to the fingerprint that you recorded from the Web interface or command line interface of the Management Card or device.
Web Interface Access and Security

HTTP and HTTPS (with TLS)

HyperText Transfer Protocol (HTTP) provides access by user name and password, but does not encrypt user names, passwords, and data during transmission. HyperText Transfer Protocol over Secure Sockets Layer (HTTPS) encrypts user names, passwords, and data during transmission, and provides authentication of the Management Card or device by means of digital certificates.

**Note:** See **Creating and Installing Digital Certificates** to choose among the several methods for using digital certificates.

To configure HTTP and HTTPS:

- On the **Configuration** tab, select **Network** on the top menu bar and **Access** under the **Web** tab.
- Enable either HTTP or HTTPS and configure the ports that each of the two protocols will use. Changes take effect the next time you log on. When TLS is activated, your browser displays a small lock icon.

**Note:** For information on the extra security a non-standard port provides, see Port assignments.

- Select: **Configuration > Network > Web > SSL Certificate** to determine whether a server certificate is installed on the Management Card or device.
- In the Web interface, browse to the certificate file and upload it to the Management Card or device.

**Note:** A certificate that the Management Card or device generates has some limitations. See **Method 1: Use the default certificate auto-generated by the Network Management Card or network-enabled device.**

- If a valid digital server certificate is loaded, the **Status** field displays the link **Valid Certificate**. Click the link to display the parameters of the certificate.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| Issued To:         | **Common Name (CN):** The IP Address or DNS name of the Management Card or device. This field controls how you must log on to the Web interface.  
• If an IP address was specified for this field when the certificate was created, use an IP address to log on.  
• If the DNS name was specified for this field when the certificate was created, use the DNS name to log on.  

If you do not use the IP address or DNS name that was specified for the certificate, authentication fails, and you receive an error message asking if you want to continue. For a server certificate generated by default by the Management Card or device, this field displays the serial number of the Management Card or device instead. **Organization (O), Organizational Unit (OU), and Locality, Country:** The name, organizational unit, and location of the organization using the server certificate. For a server certificate generated by default by the Management Card or device, the **Organizational Unit (OU)** field displays "Internally Generated Certificate." **Serial Number:** The serial number of the server certificate. |
| Issued By:         | **Common Name (CN):** The Common Name as specified in the CA root certificate. For a server certificate generated by default by the Management Card or device, this field displays the serial number of the Management Card or device instead.  

**Organization (O) and Organizational Unit (OU):** The name and organizational unit of the organization that issued the server certificate. If the server certificate was generated by default by the Management Card or device, this field displays "Internally Generated Certificate." |
| Validity:          | **Issued on:** The date and time at which the certificate was issued. **Expires on:** The date and time at which the certificate expires.                                                                                               |
| Fingerprints       | Each of the two fingerprints is a long string of alphanumeric characters, punctuated by colons. A fingerprint is a unique identifier to further authenticate the server. Record the fingerprints to compare them with the fingerprints contained in the certificate, as displayed in the browser.  

**SHA1 Fingerprint:** A fingerprint created by a Secure Hash Algorithm (SHA-1).  

**MD5 Fingerprint:** A fingerprint created by a Message Digest 5 (MD5) algorithm.  

**Note:** This does not represent the signature hash algorithm used on the certificate. |
Appendix: Security Hardening Checklist

This checklist contains recommended configuration changes to help provide a security hardening profile for Network Management Card-enabled products.

**Upload a custom HTTPS certificate**

Your Network Management Card-enabled device creates an internally-generated HTTPS certification. It is recommended that you create a custom certificate to help strengthen authentication.

**Disable older versions of TLS**

Transport Layer Security (TLS) is a cryptographic protocol that provides communication security over the internet. Ensure that older versions of TLS are disabled on your Network Management Card-enabled device, and use the latest version available.

**Disable FTP**

Disable File Transfer Protocol (FTP) when it is not in use to help harden security on your device. If SSH is enabled, SFTP, which is more secure than FTP, can be used for file transfers.

**Configure SNMPv3 to use AES/SHA**

Configure SNMPv3 to use the most secure algorithms, AES and SHA, to provide encryption and authentication.

**Use custom network ports where applicable**

By using a non-standard port, your device may not be detected by scans looking only for standard ports. This applies to protocols such as HTTPS, SSH, SMTP, Syslog, etc.

**Change the Super User account password**

After installation and initial configuration of your Network Management Card-enabled device, immediately change the default Super User account password.

**Disable Super User account**

Ensure there is at least one Administrator account enabled on your device. Once an Administrator account is configured, it is recommended that the Super User account is disabled. The Administrator account has the same privileges as the Super User account.

**Enable Strong Passwords**

Enable this feature to ensure strong passwords are created. All passwords will be required to be a minimum length and contain special characters to make passwords harder to guess.

**Enable Force Password Change**

Enable this feature to force all passwords to be changed after a user-specified number of days.

**Disable unused network addressing protocols (IPv4/IPv6)**

To help secure your device, disabled unused addressing protocols such as IPv4 and IPv6.

**Disable Ping Response (IPv4)**

IPv4 Ping Response allows your device to respond to network pings. Disable this feature to help make your device undetectable.

**Enable internal firewall with appropriate access rules**

Your Network Management Card-enabled device has an inbuilt firewall that can be used to restrict access to and from your device for various protocols and addresses.
Change the default PowerChute Network Shutdown user name and authentication phrase (if applicable)

If your device supports PowerChute Network Shutdown, upon initial configuration, you are prompted to change the default user name and authentication phrase.
Worldwide Customer Support

Customer support for this or any other product is available at no charge in any of the following ways:

- Visit the Schneider Electric Web site to access documents in the Schneider Electric Knowledge Base and to submit customer support requests.
  - [www.schneider-electric.com](http://www.schneider-electric.com) (Corporate Headquarters)
    Connect to localized Schneider Electric Web sites for specific countries, each of which provides customer support information.
  - [www.schneider-electric.com/support/](http://www.schneider-electric.com/support/)
    Global support searching Schneider Electric Knowledge Base and using e-support.
- Contact the Schneider Electric Customer Support Center by telephone or e-mail.
  - Local, country-specific centers: go to [www.schneider-electric.com > Support > Operations around the world](http://www.schneider-electric.com) for contact information.

For information on how to obtain local customer support, contact the representative or other distributors from whom you purchased your product.