meinbergOS *2024.12.4*

Release Notes

English

July 18, 2025

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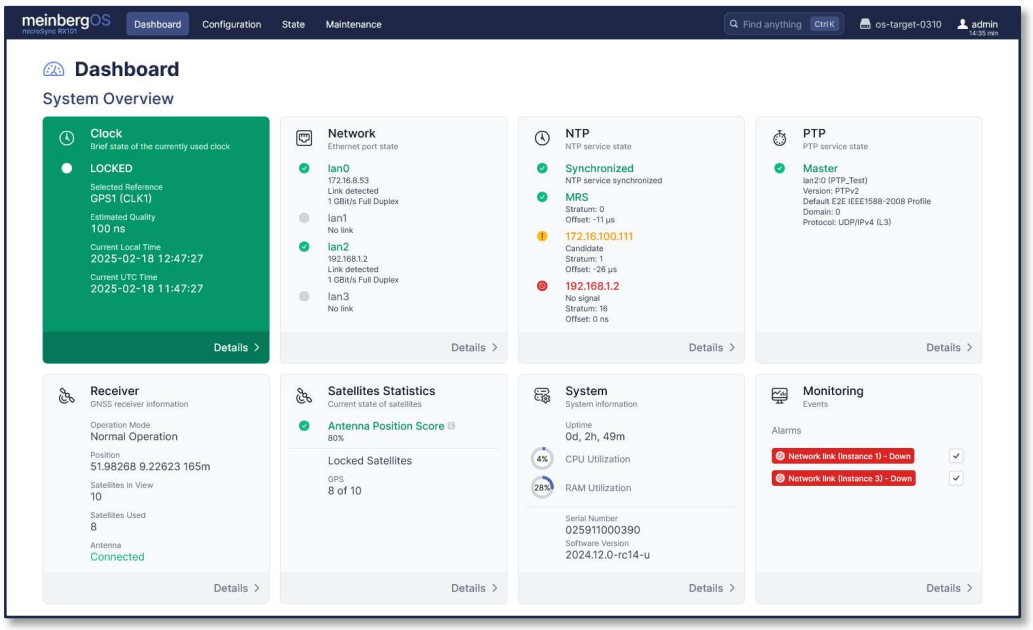
1. Foreword



meinbergOS *2024.12* is a Major Release of the microSync operating system that provides many new features and improvements for the microSync range of systems and their management tools, including a variety of stability and security-related improvements.

This document describes the changes & features introduced in meinbergOS *2024.12*. Features of particular significance are described first, followed by a comprehensive changelog. These Release Notes also include a list of the supported cipher suites and cryptographic algorithms that meinbergOS *2024.12* supports for SSL/TLS and SSH connections.

meinbergOS *2024.12* introduces many new features, including native support for Meinberg's PTP Track Hound monitoring solution, PTPv1 support, and an MMS server for IEC 61850 environments in the power industry.

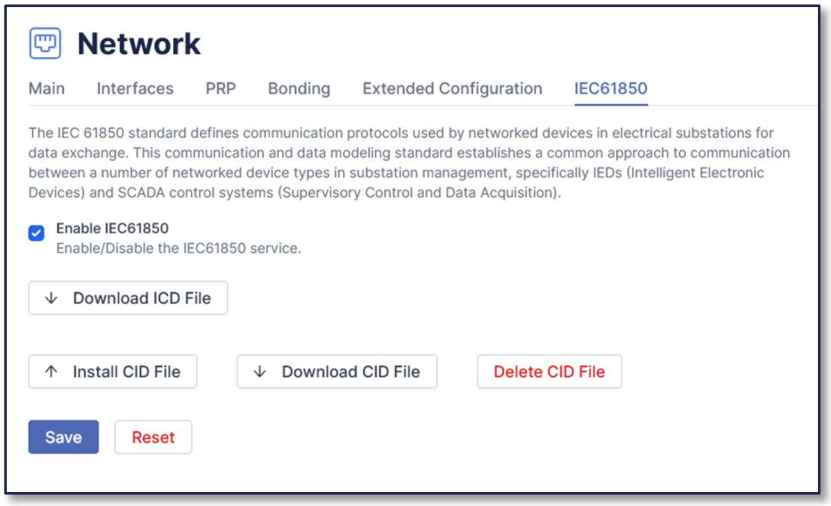
You are encouraged to read these Release Notes carefully before installing this new version, as they contain information that you may need or find helpful to properly install the firmware on your Meinberg system.

2. meinbergOS Patch Releases

2.1. meinbergOS *2024.12.4*

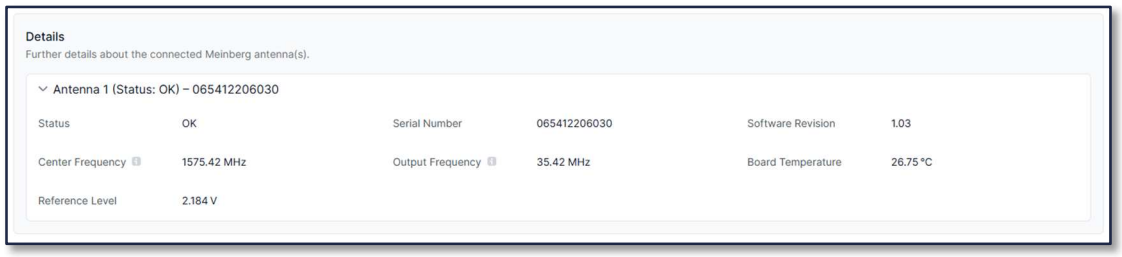
2.1.1. Noteworthy New Features in meinbergOS *2024.12.4*

2.1.1.1. New ICD Download Button on IEC 61850 Configuration Page



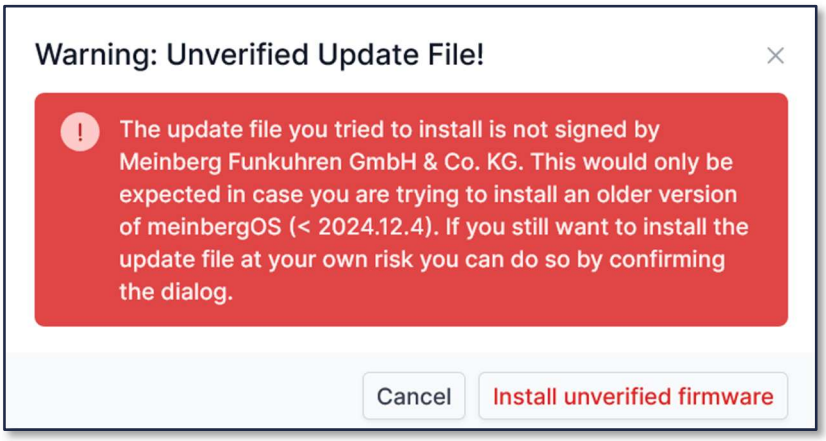
For more intuitive navigation when configuring a microSync for use in an IEC 61850 network, a "**Download ICD File**" has been added to the IEC 61850 **Configuration** page in addition to the button already provided on the corresponding **State** page that allows the ICD file used with a Substation Configuration Tool to be downloaded.

2.1.1.2. Support for mbgARC



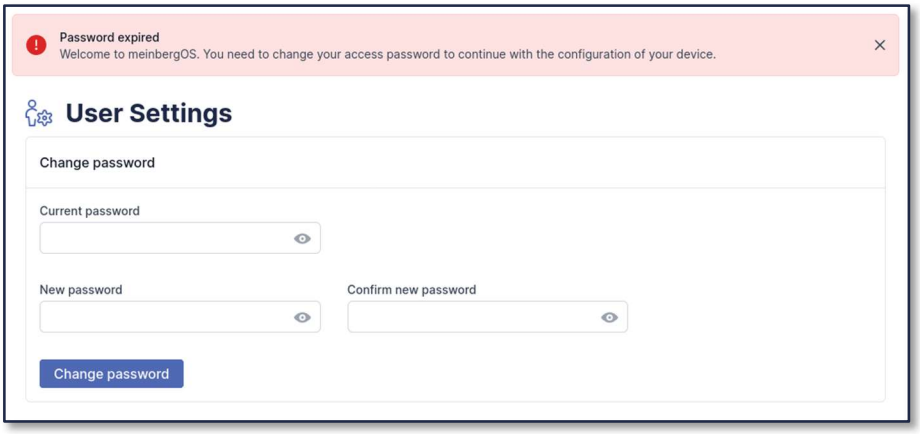
meinbergOS *2024.12.4* introduces support for the new mbgARC intelligent antenna technology introduced in the GPSANTv2 and GNMANTv2 antennas. mbgARC is a bidirectional data link that allows operating and health data for the antenna to be queried directly from the antenna.

2.1.1.3. Support for Signed Firmware Updates



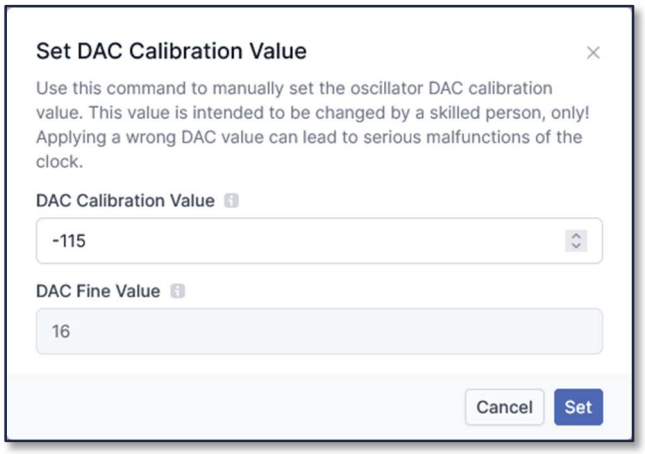
meinbergOS *2024.12.4* introduces support for cryptographically signed firmware updates for improved security. Signed firmware files ensure that tampering or integrity issues are identified before the firmware is installed. Please note that older versions of meinbergOS remain unsigned and will therefore display the above warning message when they are installed; Meinberg recommends only installing signed firmware versions henceforth.

2.1.1.4. Mandatory Password Change Upon First Use



As of meinbergOS *2024.12.4*, in the interest of security, it is now mandatory for users using the default account credentials provided as part of the factory configuration (User: `admin`, Password: `timeserver`) to change the password when logging into the device for the first time.

2.1.1.5. New Option to Change Oscillator DAC Calibration Values



It is now possible to modify the calibration values of the digital-analog converter of the integrated oscillator via the Web Interface. Note that this is only intended for recovery purposes and should only be used under the instruction of Meinberg Technical Support, as the oscillator of your device has specific calibration values that were measured during production and form the basis of the values to be entered here.

Users are strictly advised not to modify these values without prior consultation with Meinberg Technical Support.

2.1.2. Full Changelog for meinbergOS *2024.12.4*

Web Interface

- "**Download ICD File**" button added to IEC 61850 configuration page
- Renamed LEDs in I/O Ports sections with more distinct designations
- Added option to change oscillator DAC calibration values in Web Interface
- Fixed reactivation of GNSS constellations in systems with GNS receiver when saving page
- Changes to user permissions are now immediately reflected in Web Interface without need to refresh
- Fixed bug where all Web Interface pages visited were read-only after visiting a page where the user only has read-only permissions
- Display of module firmware update availability notification is now persistent regardless of interactions with tabs on **Firmware** page

Web Server

- Added `access.log` file for integrated web server (*nginx*) to diagnostic file

PTP Track Hound

- Fixed bug where remote capture instances were not possible without registered license key despite integrated license being type “Capture”
- Added clean-up of log data generated when PTP Track Hound is enabled for an interface on which no PTP instance is running

User Management

- Force immediate password change on initial login with default credentials
- Login now prohibited for any external user with a username exceeding 31 characters

REST API

- Added endpoint to change oscillator DAC calibration values via REST API

Other System Changes

- Added support for mbgARC bidirectional receiver/antenna data link
- Added support for private-key signed firmware updates
- Added v1.21 firmware update for GPS183/GNS183/GNS183-UC clock modules
- Fixed system crash following deletion of local user accounts
- Fixed output of `uptime` command line tool
- Fixed bug that prevented configuration of serial time string output COM0 on a microSync^{XS}
- Invalid data now cleared correctly from RAM when attempting to upload invalid files as license updates

Component Version Updates

- Updated to Linux Kernel 6.6.96
- Updated MMS Server to 1.74.175
- Updated ICD Generator to 1.2.2

2.2. meinbergOS *2024.12.3*

2.2.1. Full Changelog for meinbergOS *2024.12.3*

PTP

- UTC offset valid flag is now correctly set when synchronizing to a PTP master while Boundary Clock mode is disabled

Web Interface

- "**Download CID File**" button is now disabled if no IEC 61850 CID file exists

User Management

- Fixed reset of bad words list within password rules config after removal of a user account

Other System Changes

- Diagnostics file now features LDAP service debug logfile

Component Version Updates

- Updated to Linux Kernel 6.6.92

2.3. meinbergOS *2024.12.2*

2.3.1. Noteworthy New Features in meinbergOS *2024.12.2*

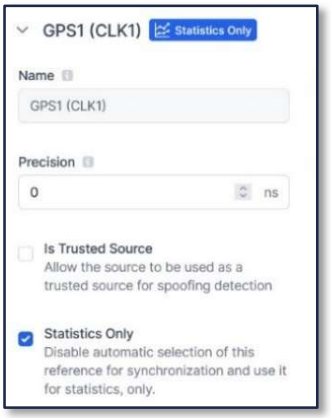
2.3.1.1. Ability to Disable Boundary Clock Mode

This setting is intended for microSync systems operating as boundary clocks with multiple PTP instances.

If enabled, this microSync device will transfer its parent dataset to any other PTP clocks on the system operating as Masters. This allows any downstream Slave clocks to identify the upstream top-level grandmaster of the wider PTP network with its clock ID, clock class, etc.

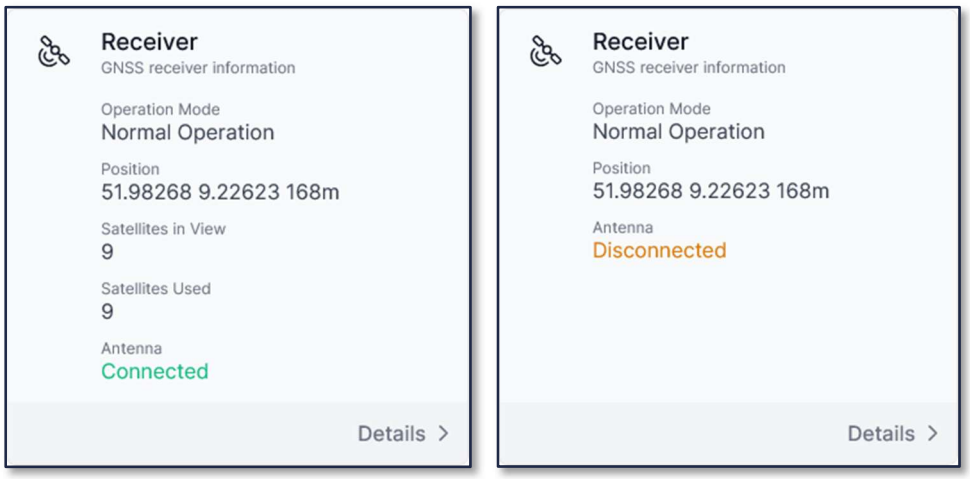
If disabled, this microSync device will transfer its own clock ID, clock class, etc. to slave clocks, identifying itself as the grandmaster of the PTP network.

2.3.1.2. New Indicator Badge for Statistics-Only Reference Sources



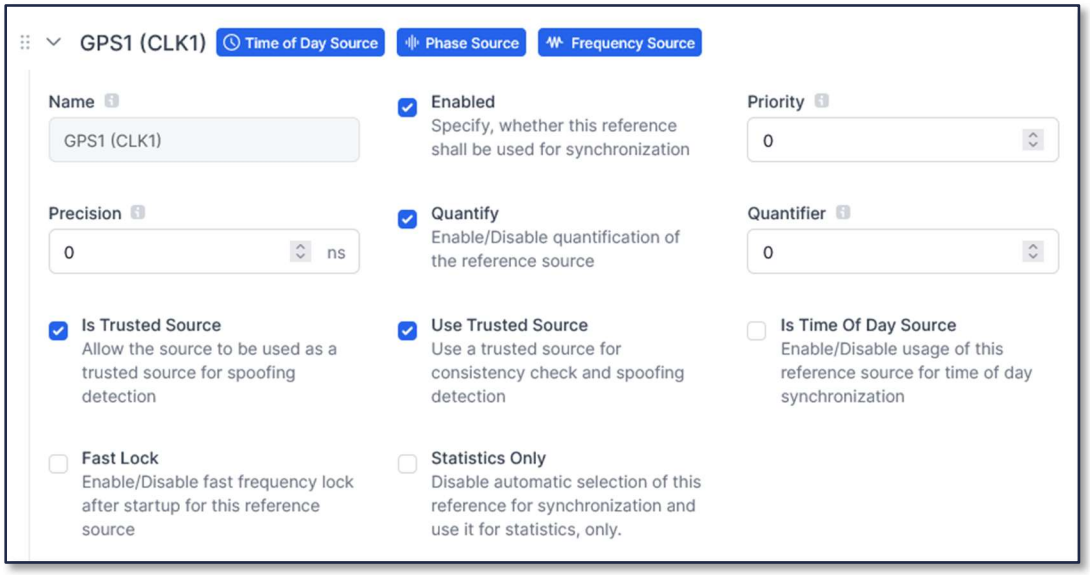
As of meinbergOS *2024.12.2*, reference sources that are exclusively used for statistical analysis (i.e., the checkbox "**Statistics Only**" is enabled) are marked with a blue badge in a similar fashion to the badges introduced in meinbergOS *2024.12.0* (see → **2.5.1.6**).

2.3.1.3. Receiver Tile on Dashboard Simplified to Show Only Relevant Information



The "**Receiver**" tile on the Dashboard has been optimized to only show information that is relevant. Thus, if the GNSS receiver is disconnected and deliberately unused, the "**Satellites in View**" and "**Satellites Used**" entries are hidden. The "**Position**" entry remains displayed as the last known position detected.

2.3.1.4. Fast Lock Support Now Available for Older microSync Systems



The new Fast Lock feature introduced in meinbergOS *2024.12.1* (see → **2.4.1.2**) for microSync systems with GPS183, GNS183, and GNS183-UC reference clocks has now been introduced for microSync systems with the older GPS180, GNS181, and GNS181-UC reference clocks, allowing users of older systems to also benefit from this feature.

2.3.2. Full Changelog for meinbergOS *2024.12.2*

PTP

- Added option to disable or enable Boundary Clock mode
- Fixed support for PTPv1 request intervals below 0 (1/sec)
- Fixed behaviour in Boundary Clock mode when system's own priorities are better than an external Grandmaster
- Fixed system crash when trying to create a Unicast Master and Slave instance on the same virtual interface

Web Interface

- Added indicator badge when a reference source is set to "**Statistics Only**"
- "**Satellites in View**" and "**Satellites Used**" are no longer displayed in the "**Receiver**" tile of the dashboard when no antenna is connected
- Fixed rare freeze when accessing "**Maintenance**" page on microSync Broadcast systems
- Initiation of firmware updates via the header bar are now inhibited if the maximum number of installed firmware versions has been reached
- Module update availability banner notification is now immediately hidden when navigating to another page

Web Server

- Return HTTP code 422 instead of 500 when trying to delete user level currently assigned to a logged-in user

PTP Track Hound

- Fixed service restarts that occur repeatedly when more than approximately 15 instances are detected

User Management

- Fixed LDAP login failures for users with level IDs other than that of the default admin level (ID 100)
- Fixed login counter within user state for active Web/API/microShell sessions

Other System Changes

- Fast Lock feature backported for GPS180, GNS181, and GNS181-UC clock modules

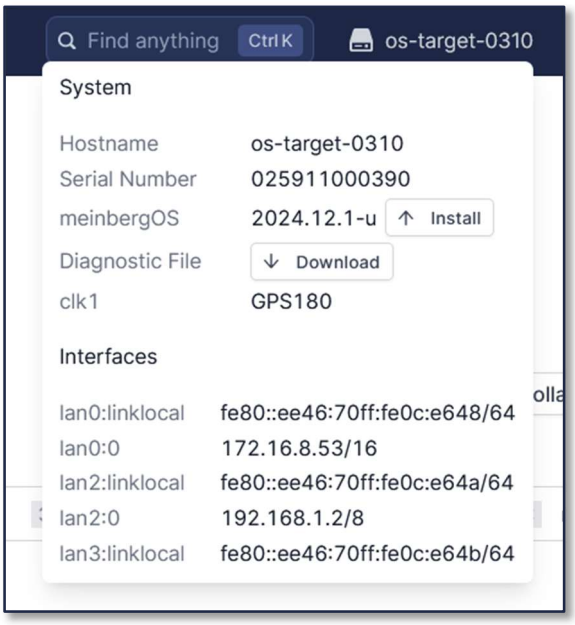
Component Version Updates

- Updated to Linux Kernel 6.6.89
- Updated MMS server to 1.74.173
- Updated ICD Generator to 1.1.2

2.4. meinbergOS *2024.12.1*

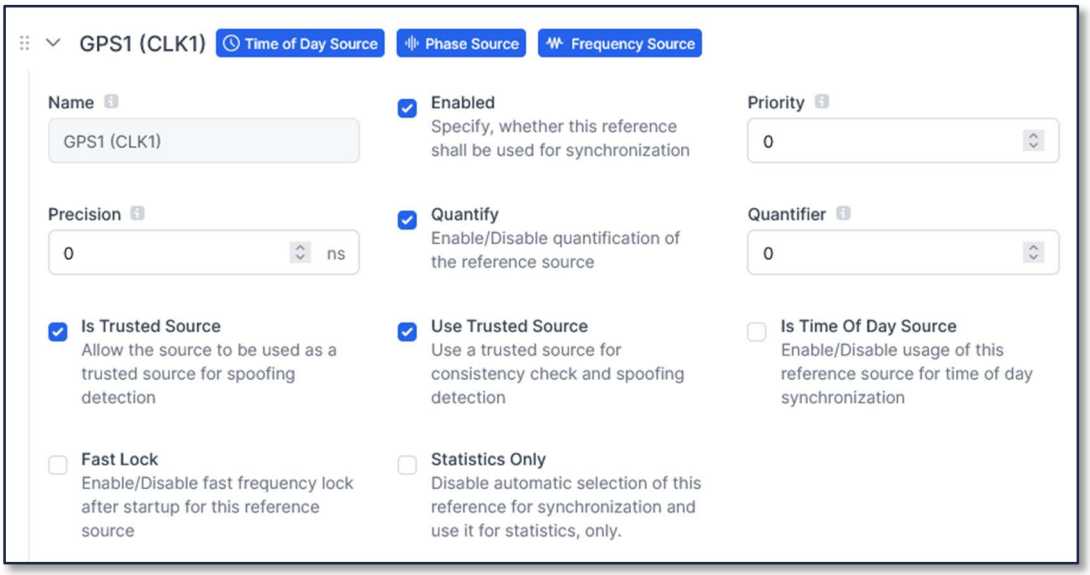
2.4.1. Noteworthy New Features in meinbergOS *2024.12.1*

2.4.1.1. Various New Header Bar Features



meinbergOS *2024.12.1* now provides quick access to a number of key features via the header bar. It introduces direct access to the firmware update prompt (for which you should have the `.ufu` firmware update file to hand), to a download of the current diagnostic file, as well as additional information about bonding interfaces.

2.4.1.2. Support for Fast Lock Feature



meinbergOS *2024.12.1* introduces support for the new **Fast Lock** feature available in the GPS183, GNS183, and GNS183-UC clocks and in future for the GPS180, GNS181, and GNS181-UC clocks.

This feature allows the reference clock to adjust its frequency more rapidly at the expense of some initial time jumps, such that a frequency lock can typically be achieved within 10 to 15 minutes. This behavior only applies to the initial adjustment of the oscillator; once the oscillator has been fully adjusted, the reference clock firmware will revert to the conventional approach of gradual adjustments.

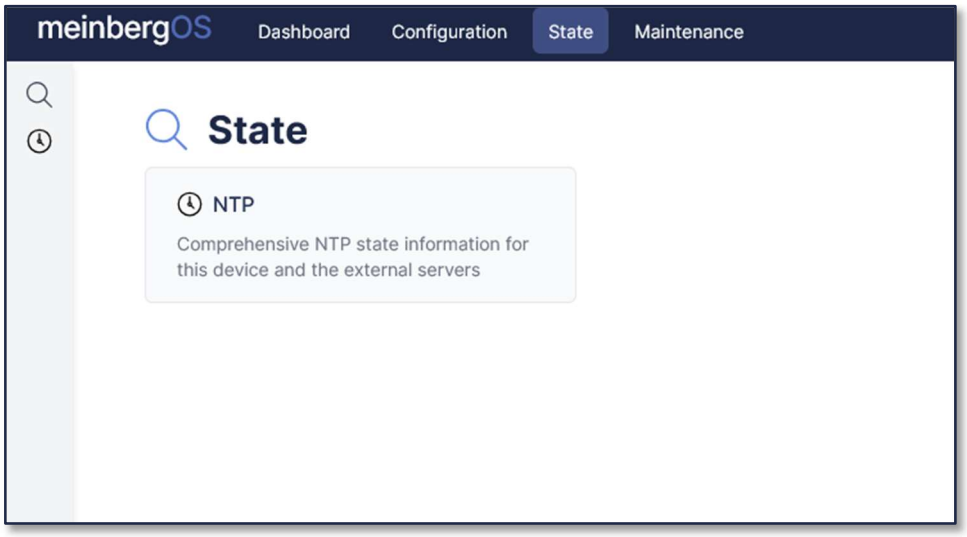
2.4.1.3. Module Firmware Downgradable

As of meinbergOS *2024.12.1*, when downgrading the meinbergOS firmware to an earlier version (i.e., to meinbergOS *2024.12.1* or later), it is possible to downgrade the firmware of integrated modules such as the reference clock to the module firmware integrated into that meinbergOS release.

2.4.1.4. Ability to Perform License Upgrades via the Web Interface

Performance level license upgrades can now be performed via the Web Interface, for example if you require greater PTP capacity or PTPv1 support.

2.4.1.5. Clearer Interface for Accounts with Limited Permissions



With meinbergOS 2024.12.1, the display of pages for users with limited permissions is now a little tidier. Tiles that contain no information or settings that the user has read or write permissions for are now hidden entirely, headings of sub-sections on pages will no longer be displayed if the user lacks any read or write permissions for settings or information under that heading, and configuration fields for which the user lack writes access are now visibly disabled and cannot be edited.

2.4.1.6. Support for AUTOSAR PTP Profile

meinbergOS 2024.12.1 introduces support for the AUTOSAR PTP profile (in slave mode only), as specified by the AUTOSAR Time Synchronization Protocol Specification.

2.4.2. Full Changelog for meinbergOS *2024.12.1*

Network

- Fixed problems with fiber connections on port *lan2* or *lan3* when the connected device has link auto-negotiation disabled

NTP

- microSync systems operating as NTP clients can now only be configured with a maximum polling interval of 5 (32 seconds)

PTP

- Added support for AUTOSAR PTP profile (slave-only)

- Fixed transmission of duplicate ATOI TLV in C37.238-2017 profile
- *stepsRemoved* now correctly transmitted as 0 instead of 1 when operating as IEEE 802.1AS Grandmaster

Web Interface

- Firmware installation file prompt can now be accessed directly from the header menu
- Diagnostic file can can now be downloaded directly from the header menu
- Information about bonding interfaces is now directly visible in the header menu
- The clock state on the "**References**" page of the "**State**" tab is now displayed with a color-coded background
- Module firmware can now be downgraded to an older version when activating an older version of meinbergOS (*2024.12.1* or later) containing an older module firmware version
- Performance Level Licenses can now be upgraded via the Web Interface
- Visual representations of network ports on I/O Ports page now depict their link state by means of status LEDs
- User is now prompted to confirm when discarding configuration changes that have not been saved as the start-up configuration
- Fixed issue with Satellites Statistics tiles not automatically updating on Dashboard
- Unsaved configuration changes are now retained while adding users or user levels
- Power supply unit bays with no power supply module insert are no longer listed in the I/O ports drop-down list
- Sections of the Web Interface that are empty by virtue of the user's permissions are now no longer displayed at all
- SNMP MIBs can no longer be downloaded if user does not have appropriate permissions
- Any input fields for which the user has read permissions but lacks write permissions are now disabled
- Fixed UI behavior when leaving the browser tab while installing a firmware update
- Removed text "Serial Interface" from depiction of microSync^{XS} in I/O Ports section
- Reference source sub-sections on the References page are no longer collapsed when the "**Enabled**" checkbox is checked
- Attempting to change the password of an internal system user now returns the correct error code and a meaningful error message

Web Server

- HSTS header is now correctly and consistently set when a 502 Bad Gateway error is returned

Event Monitoring

- Monitoring events are now generated for password validity events such as password warnings or password expiry

User Management

- Added support for transmission of domains containing the `@` delimiter when using Radius, TACACS+, or LDAP authentication

REST API

- Unused property “caCertificates” removed from `/state/modules/clk1/system`

PTP Track Hound

- Fixed application crash when analyzing path trace TLVs in Announce messages

microShell

- The `get` command now accepts the `--state` and `--config` switches to easily acquire the corresponding state or configuration value for a given path
- The `--help` output for the changePassword command now includes usage examples

Other System Changes

- Fast Lock mode is now supported in microSync systems with GPS183, GNS183, and GNS183-UC reference clocks

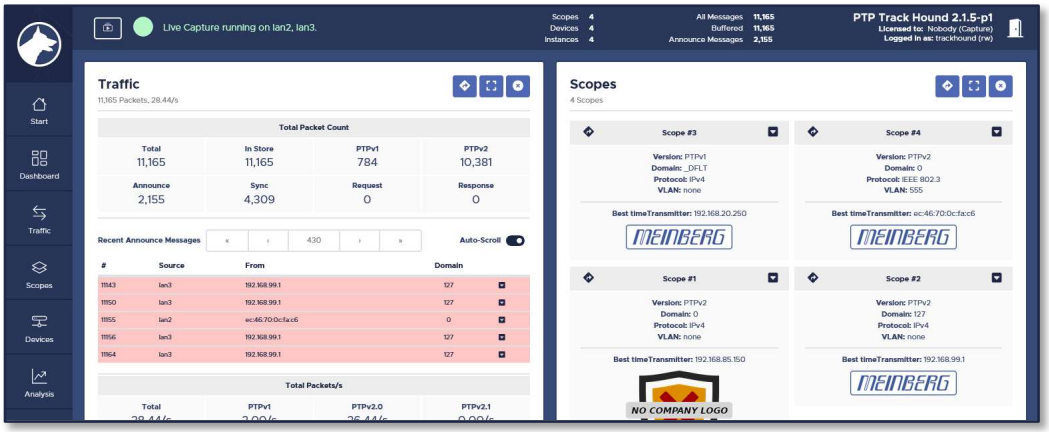
Component Version Updates

- Updated to Linux kernel 6.6.79

2.5. meinbergOS *2024.12.0*

2.5.1. Noteworthy New Features in meinbergOS *2024.12.0*

2.5.1.1. Integrated PTP Track Hound

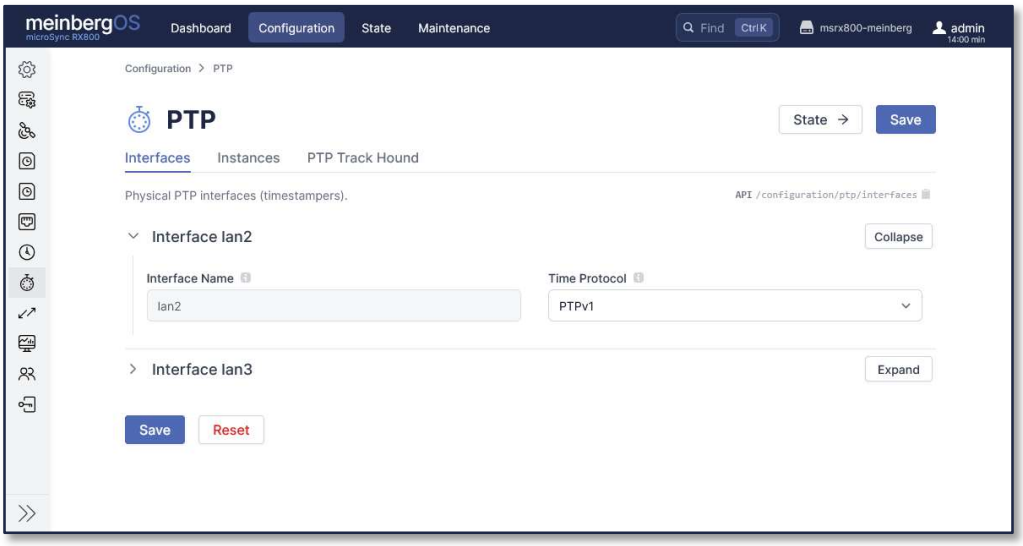


PTP Track Hound is Meinberg's powerful PTP monitoring toolkit that provides a wealth of functions for monitoring PTP clock networks. These functions support both native PTP functions for measuring path delay and asymmetry and acquiring diagnostic data as well as a variety of proprietary extensions integrated in compliance with the IEEE 1588 standard.

meinbergOS *2024.12* now features PTP Track Hound integrated into the firmware, allowing your microSync to operate as a PTP Track Hound monitoring station in its own right. The PTP Track Hound installation in the meinbergOS firmware is included and pre-activated as a Capture license, which means that in addition to evaluating PTP traffic locally via its own PTP-capable network interfaces, it can also forward traffic data to one or several central PTP Track Hound Professional instances for combined analysis. It is also possible to upgrade the license via the meinbergOS Web Interface to a Basic or Professional license to allow the microSync to serve as the central instance in its own right and benefit from additional features such as NetSync Monitor and Capture Time Offsets.

Further information on PTP Track Hound is available at **https://www.ptptrackhound.com**.

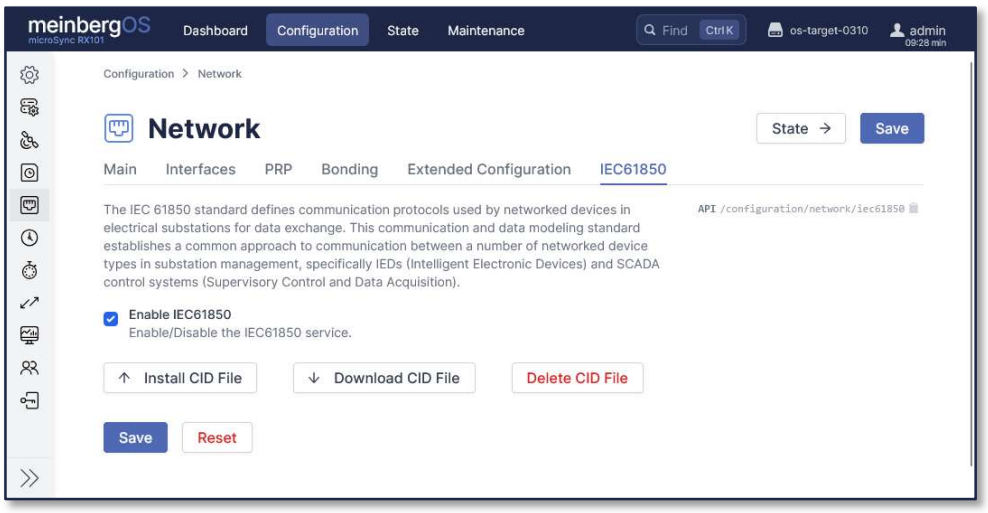
2.5.1.2. Support for PTPv1



meinbergOS *2024.12* marks the introduction of PTPv1 (IEEE 1588-2002) support, providing support for technologies and standards that rely on this particular version of the PTP standard (e.g., Dante) as well as established PTP networks that are built on the legacy IEEE 1588-2002 standard.

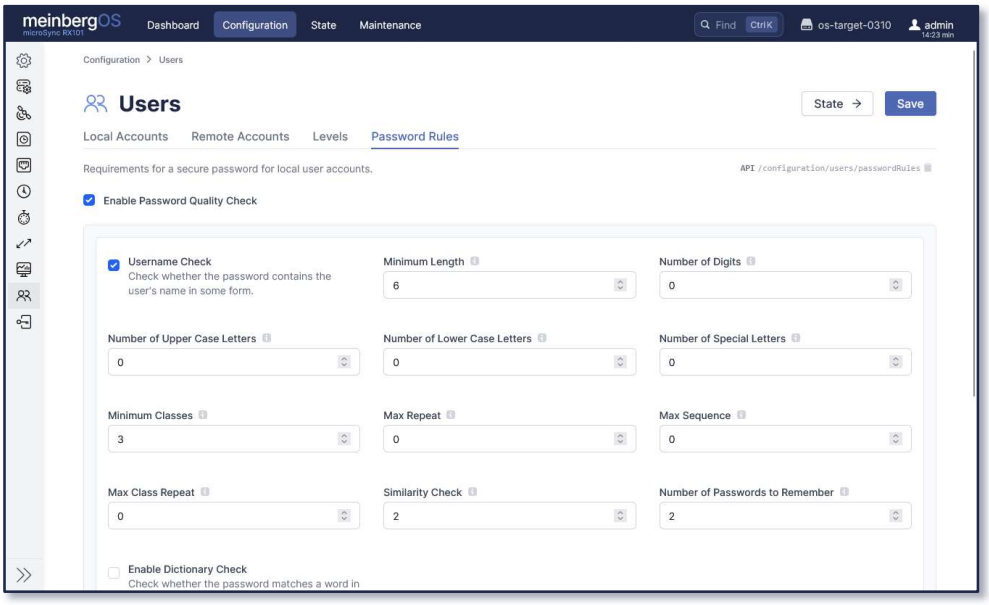
Please note that a **PL-C** license (256 clients) is required for PTPv1 support.

2.5.1.3. MMS Server Support for IEC 61850 Environments



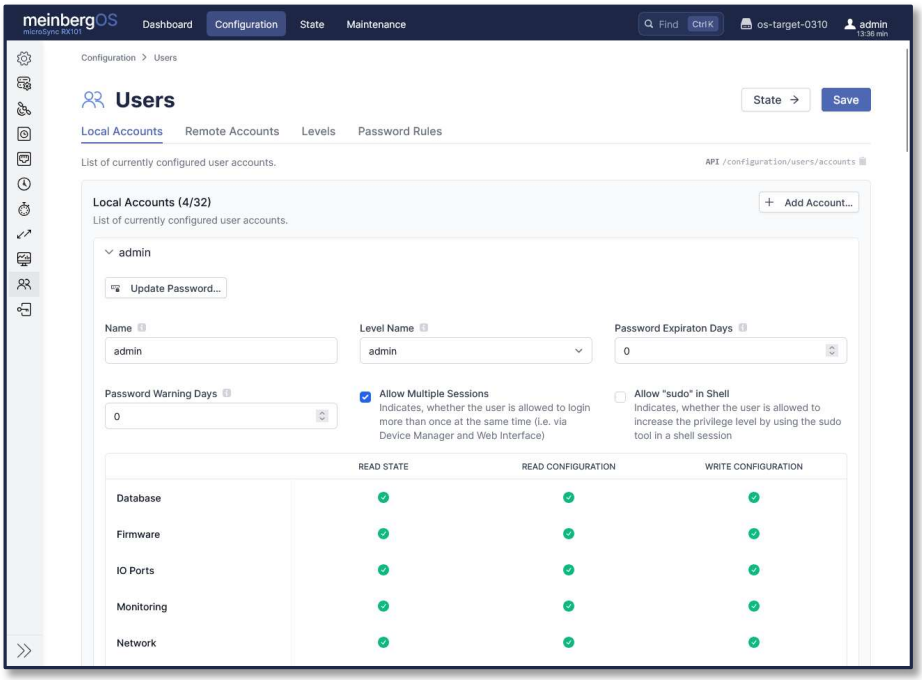
meinbergOS *2024.12* incorporates new MMS server functionality that allows the microSync to communicate directly with other IEC 61850 devices and communicate various aspects of its current operating conditions to SCADA and HMI solutions in power systems.

2.5.1.4. Password Quality Control



Options are now available to establish certain minimum security standards regarding password quality. Administrators may impose requirements regarding minimum password lengths, variety of characters used, and similarity with previous passwords, and can also have passwords verified against a dictionary or list of 'bad words' to ensure that certain easily derived passwords are not used.

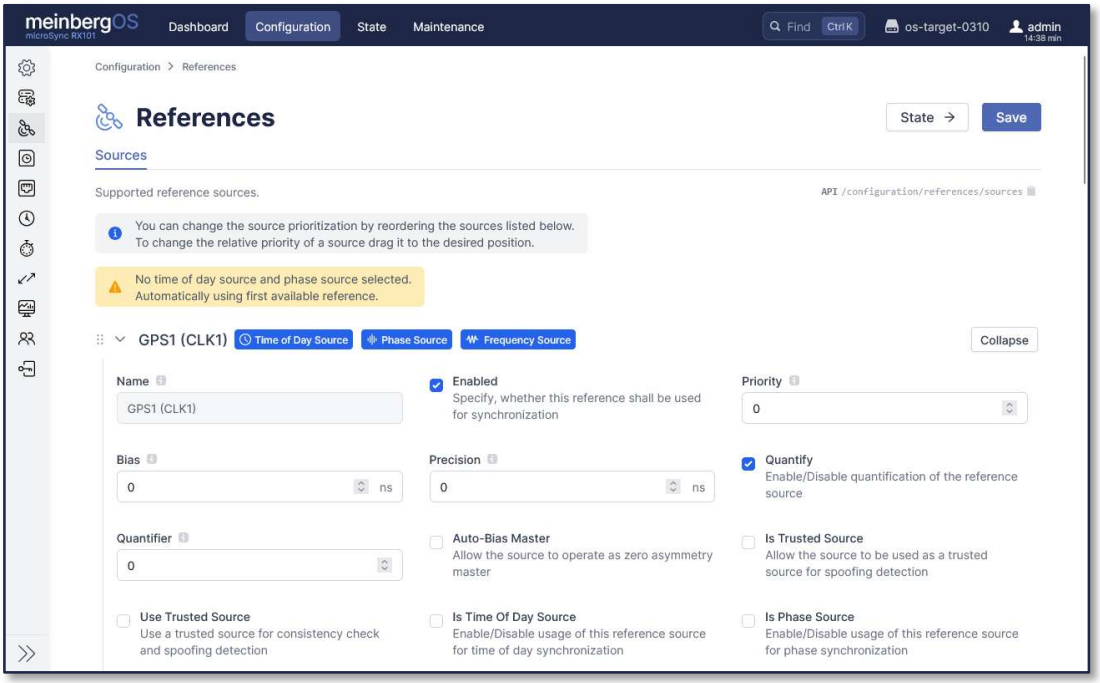
2.5.1.5. New User Permissions Paradigm



meinbergOS *2024.12* introduces a fundamental paradigm shift in how user permissions are managed with a more streamlined and structured approach. Rather than having user accounts be configured and created individually based on a standardized template, this new paradigm permanently binds each user account to a defined user

level. This ensures that any changes to the permissions and accessible channels of a user level are automatically reflected in the user accounts created under that level, allowing for a more disciplined approach to user management in meinbergOS.

2.5.1.6. Clearer Indication of How References are Used

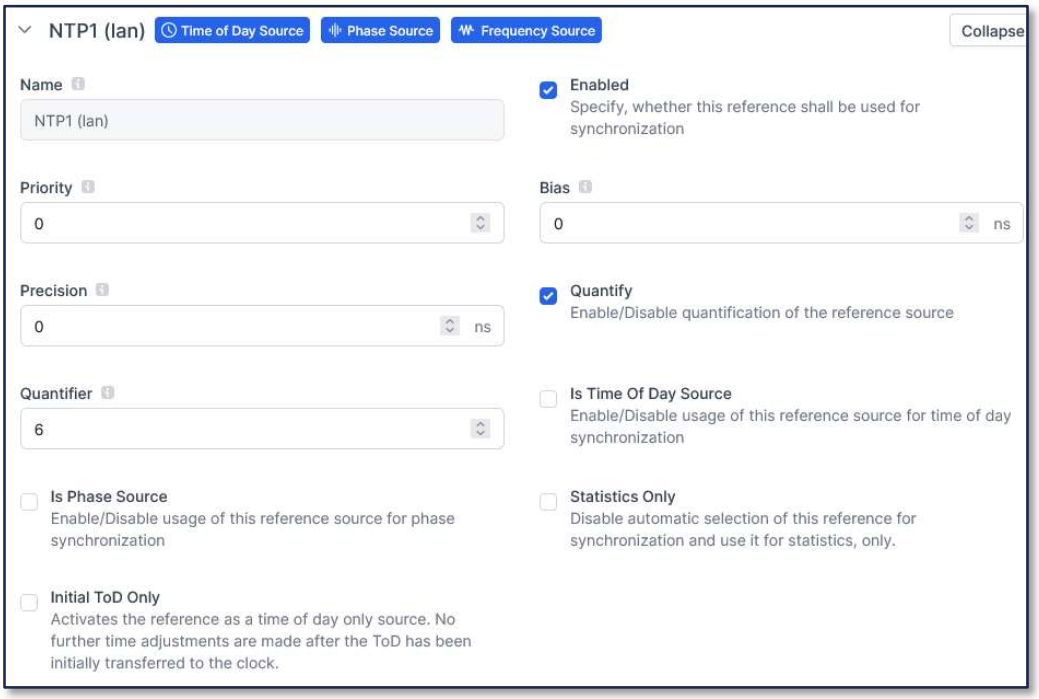


The **References** configuration page has been enhanced to provide more clarity in terms of how each reference signal is used to synchronize the time of day of the microSync's clock and syntonize its oscillator frequency and phase.

Firstly, each reference signal now features badges that indicate if that reference is usable as a time-of-day, phase, and/or frequency source. This can be important as some sources do not support synchronization via all three (for example, a PPS signal can only be used for phase and frequency synchronization).

Secondly, the page now advises you if no reference has been explicitly selected as a time-of-day or phase source, in which case the first reference in the list will be used. This is intended to encourage users to consider modifying the order so that the signals they trust more explicitly can be prioritized for phase-matching and time of day synchronization.

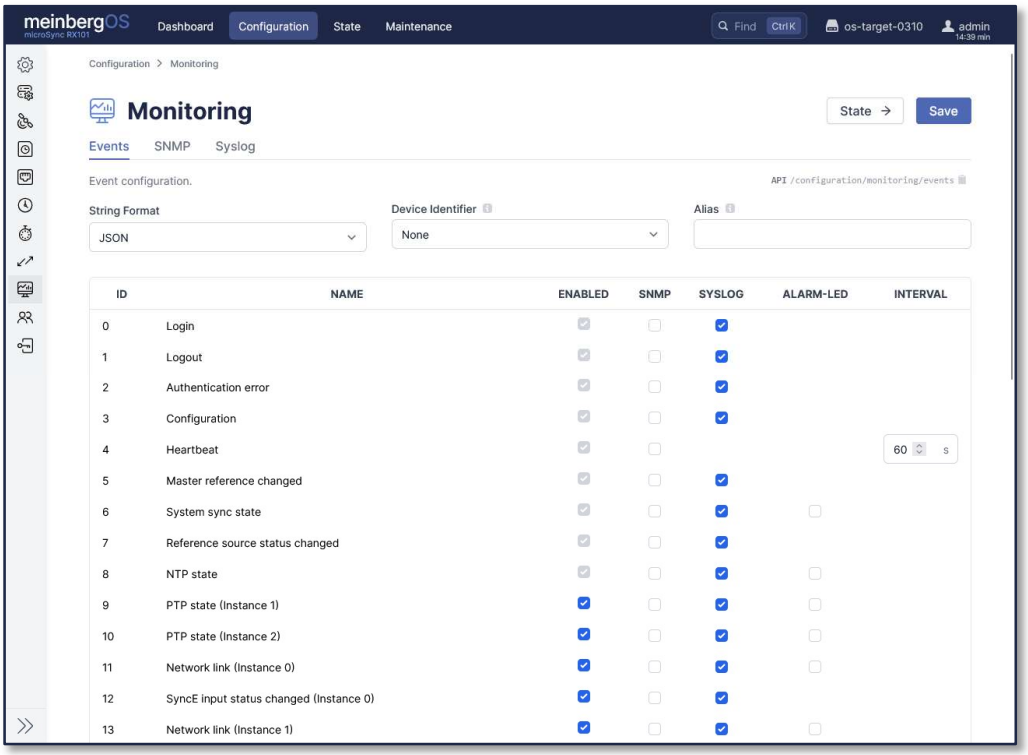
2.5.1.7. NTP Can be Limited to Initial Time-of-Day Synchronization Only



A NTP reference source can be configured as of meinbergOS *2024.12* so that it is only used for the initial time-of-day synchronization. Previously, synchronization based on an exclusive phase/frequency reference or free-running oscillator meant that the time-of-day had to be set manually.

The ability to limit the use of NTP to the initial ToD helps to avoid the need to manually maintain the current time of day, but a resynchronization can be triggered manually if necessary. This can be useful when the microSync is only meant to be syntonized to an external frequency reference or left in a free-run state and simply requires an initial reference time to initialize the clock with.

2.5.1.8. Multiple New Event Types



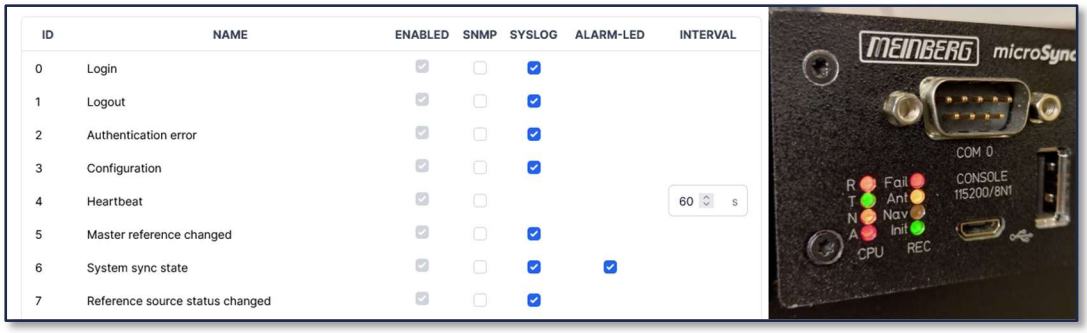
There have been multiple additions to the list of event types that are or can be logged during operation:

- **SyncE input quality changes:** When using Synchronous Ethernet as a frequency reference, any changes reported over the ESMC are logged in the event log for each Ethernet interface.
- **Loss or detection of reference signal:** Previously, only changes in the use of reference signals were logged as events. As of meinbergOS *2024.12*, the loss or detection (or re-detection) of reference signals can be logged as events even before these reference signals are used for synchronization.
- **SSL certificate installation or expiry:** Changes in SSL certificates are now also logged as events, specifically when a new SSL certificate is installed or an existing one expires.

2.5.1.9. Backup of Startup Configuration Directly to Connected USB Device

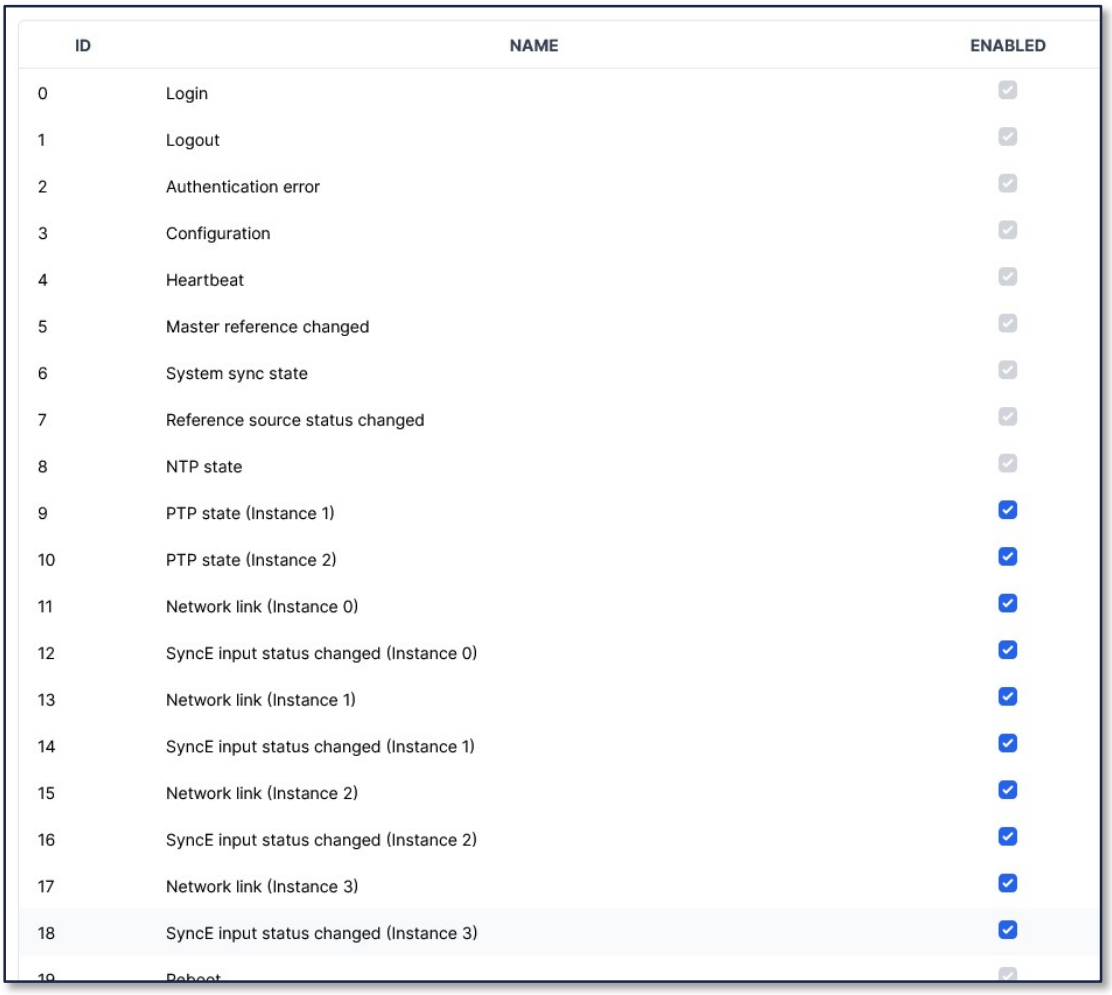
meinbergOS *2024.12* introduces the ability to initiate automatic backups of the startup configuration to an external USB storage medium. A backup is triggered by simply connecting the storage medium to the USB interface, whereupon the configuration file `daemon.cfg` is copied to the USB device. The success or failure of the process is indicated via the "**Alarm**" LED on the microSync itself.

2.5.1.10. Alarm LED on microSync Now Configurable to Signal Defined Events



The alarm LED on a microSync can now be configured via the Web Interface to indicate the occurrence of certain defined key events such as loss of synchronization or power supply failures.

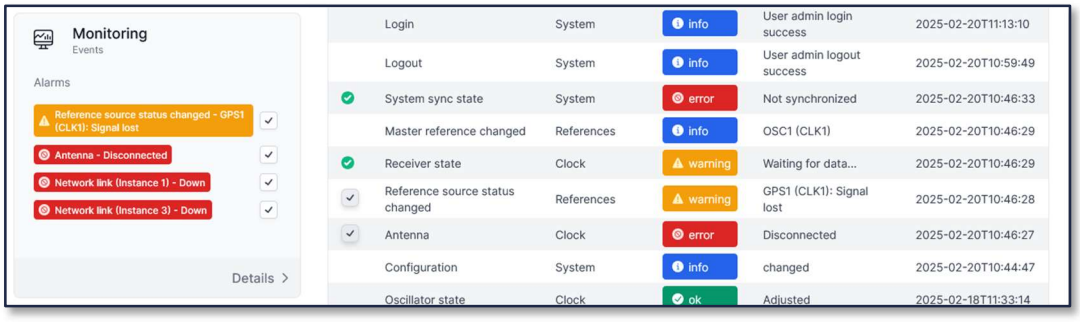
2.5.1.11. New Options to Disable Certain Event Types



ID	NAME	ENABLED
0	Login	☑
1	Logout	☑
2	Authentication error	☑
3	Configuration	☑
4	Heartbeat	☑
5	Master reference changed	☑
6	System sync state	☑
7	Reference source status changed	☑
8	NTP state	☑
9	PTP state (Instance 1)	☑
10	PTP state (Instance 2)	☑
11	Network link (Instance 0)	☑
12	SyncE input status changed (Instance 0)	☑
13	Network link (Instance 1)	☑
14	SyncE input status changed (Instance 1)	☑
15	Network link (Instance 2)	☑
16	SyncE input status changed (Instance 2)	☑
17	Network link (Instance 3)	☑
18	SyncE input status changed (Instance 3)	☑
19	Reboot	☑

As of meinbergOS *2024.12*, it is now possible to disable certain event types, ensuring that predictable events do not trigger unnecessary alerts or log messages. For example, alerts relating to the link state of certain network interfaces can be disabled if those network interfaces are not used or will be frequently connected or disconnected for testing purposes.

2.5.1.12. Acknowledgement System for Monitoring Events



meinbergOS *2024.12* introduces an acknowledgement system for monitored events, specifically for **errors** and **warnings**. In the event of an error or warning arising, the user is prompted to acknowledge the event via the "**Monitoring**" tile on the Dashboard. Once acknowledged, the event disappears and is marked as "acknowledged"

with a green checkmark symbol on the "**State → Monitoring**" page. This allows issues that can be typically problematic but are being worked on or are 'tolerated' to be marked as such in the Web Interface.

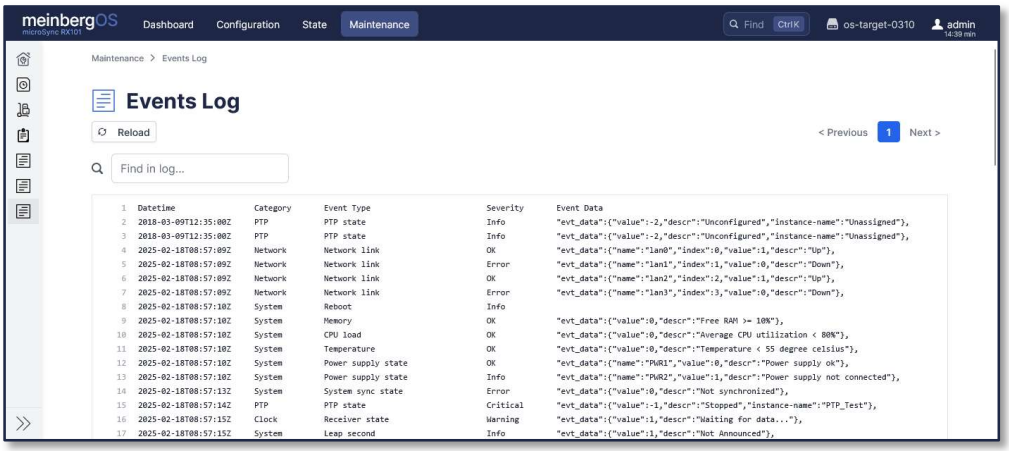
2.5.1.13. Reduced Maximum Number of Concurrently Installed Firmware Releases

The number of concurrently installed firmware releases (including the originally-shipped version, or OSV) has been reduced from five to four.

While Meinberg generally avoids reducing or deprecating functions from its products, we may be compelled to do so in service of more critical interests. The ongoing addition of new features and functions to the firmware of meinbergOS devices means that the space taken up by the firmware itself on the internal microSync storage increases, and with meinbergOS *2024.12*, we have reached a point where we have had to make a hard decision to ensure that we can continue to add useful new features.

In this case, we have chosen to reduce the number of firmware releases that can be concurrently installed to four, as this provides us with the capacity to introduce new features and functions without sacrificing other key features. We believe that four concurrent installations remains fully adequate for regression testing and pre-release testing of new firmware releases, and while Meinberg always encourages users to install the latest version of the firmware, we are of course always ready to provide legacy versions of firmware that end users may be dependent on for certain applications.

2.5.1.14. Overhaul of Log Functionality

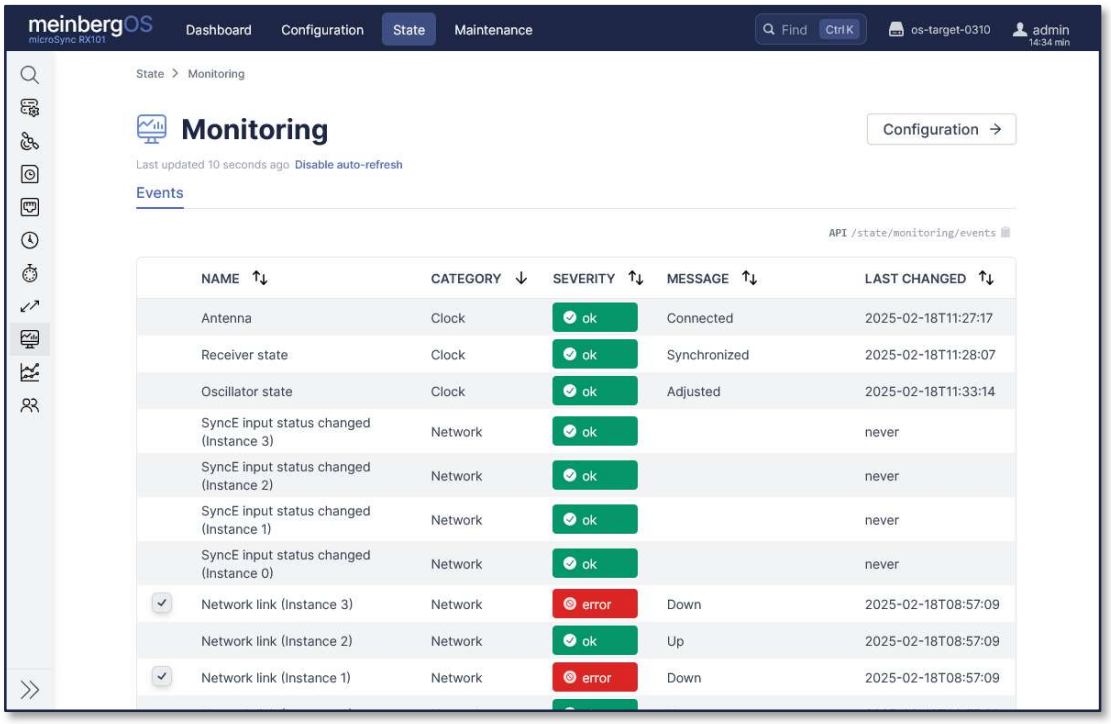


The log functionality has been fundamentally overhauled.

The most important new feature in this respect is the addition of a event log, which logs all monitoring events configured under "**Configuration → Monitoring**" with timestamps, appropriate categories, and severity levels. This log is accessible via the Web Interface under "**Maintenance → Events Log**", can be accessed directly from the Bash shell terminal at `/var/log/events`, or can be also be viewed in the new microShell command-line interface with `show eventLog`.

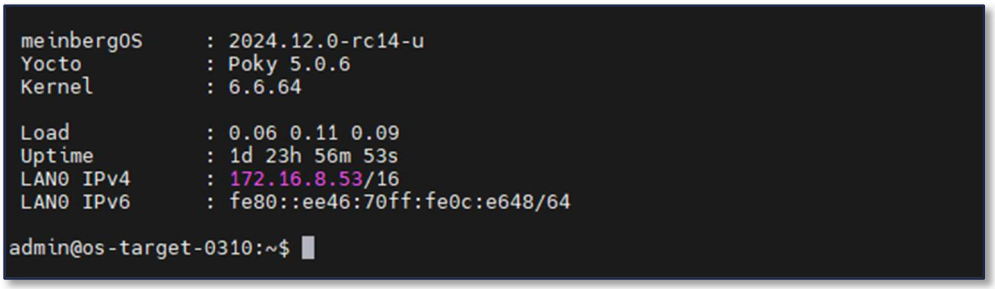
The log pages in the Web Interface now also feature a text box that allows the various logs to be filtered dynamically. This applies to the new "**Events Log**" page as well as the established "**Kernel Log**" and "**System Log**" pages.

2.5.1.15. Categorization of Monitoring Events



Concurrently with the introduction of the new Events Log described in → **Section 2.5.1.14** the new categories for each event type are now also displayed on the State Monitoring page and the page can be sorted by these categories accordingly.

2.5.1.16. Useful Information Displayed when Connecting to Terminal Shell

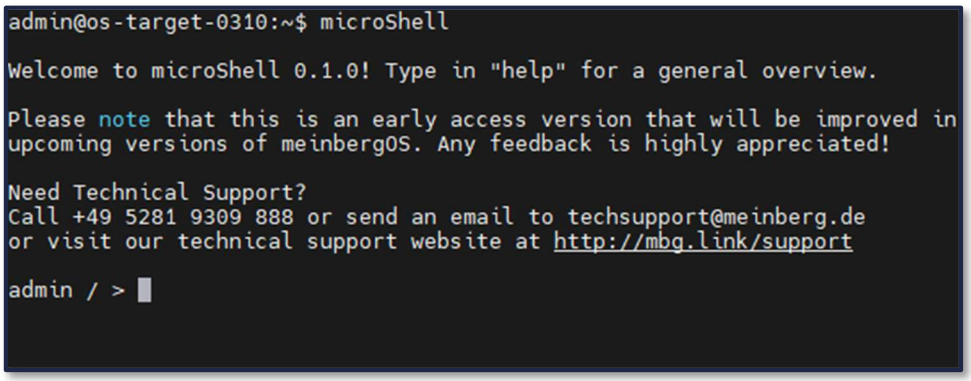


When logging into the microSync via a terminal connection (serial, SSH), the terminal will display a new MOTD (Message of the Day) containing some useful basic information such as the current firmware version and the current IP address for network connections.

2.5.1.17. Easier Navigation Between Corresponding Configuration & State Pages

Selecting the "**Configuration**" or "**State**" button on any "**Configuration**" or "**State**" page to navigate to the matching page now brings you directly to the corresponding tab on the corresponding subpage, allowing you to more efficiently review the impact of any configuration changes you have made or review the relevant configuration behind any state information you may wish to investigate further.

2.5.1.18. Pre-Release Version of Command-Line Environment "microShell"



meinbergOS *2024.12* includes a 'preview' build of the new CLI tool microShell, that will allow every function and parameter to be managed and monitored via a command line interface over an SSH or serial terminal connection. Alongside the REST API, this will provide an additional avenue for scripting and automation for power users.

Please note that this feature is considered to be in an alpha state right now and is not intended to be used in productive applications. However, Meinberg welcomes any and all feedback from your experimentation and testing of this exciting new feature.

2.5.1.19. Web Interface Rebuilt for Improved Performance

The Web Interface has now been rebuilt entirely as a single-page application. This eliminates the necessity for page refreshes, vastly improving the consistency, feel, and performance of the Web Interface experience.

2.5.1.20. Installation of SSL/TLS Certificates with Encrypted Private Keys now Disallowed

meinbergOS *2024.12* resolves the issue whereby installing an SSL/TLS certificate with an encrypted private key would result in system errors caused by a crash in a background process. This problem has been resolved by disallowing the upload of encrypted private keys; the private key must first be decrypted with the appropriate passphrase before it is uploaded.

2.5.2. Full Changelog for meinbergOS *2024.12.0*

NTP

- Added option to limit use of NTP as reference source to initial time-of-day synchronization upon system start only

PTP

- Added support for PTPv1 (PL-C required)
- Added integrated PTP Track Hound instance with traffic capture on ports lan2 and lan3

Web Interface

- Added buttons to the Configuration and State pages to allow direct navigation to corresponding page in the other section (Configuration to State, or vice versa)
- Added filter text input to log pages to allow logs to be filtered
- Removed recommendation of Meinberg Device Manager version as the use of Meinberg Device Manager for microSync systems is considered deprecated
- Fixed bug where formatting of certain error messages was inconsistent
- Added information on time-of-day, phase, and frequency support for individual reference sources to References configuration page

Event Monitoring

- Implemented auditable log and categorization for monitored events
- Added options to completely disable certain events
- Added acknowledgement system for error and warning type events
- Added options to use “Alarm” LED as visible indicator on device for defined events
- Added event for SyncE ESMC input quality changes
- Added event for reference source availability changes
- Added events for SSL/TLS certificate expiry and installation

User Management

- Implemented password control options for enforcing user-defined minimum password security requirements
- Redesigned user management so that users are assigned exclusively to defined user levels with permission profiles rather than possessing individual permissions
- Fixed exploit that allowed user account names to be changed to a name that is already in use or is reserved for internal system users
- Fixed exploit that allowed user level IDs to be changed to an ID that is already in use or is reserved for internal system user groups

REST API

- Fixed crash when submitting disallowed PUT request pertaining to properties within `/startup`
- Fixed return code on POST requests to LDAP commands (start/stop/restart) if LDAP is disabled

Other System Changes

- Added MMS server support for IEC 61850 environments
- Added support for triggering automated configuration backups to USB storage media upon connection of storage medium
- Added basic JSON validity check before attempting to restore a backup configuration file
- Reduced maximum number of concurrently installed firmware versions to four
- Disallowed installation of SSL/TLS certificates with encrypted private keys

Command Line

- Added early-access version of command-line shell tool (microShell v0.1.0)
- Added message-of-the-day containing useful device information in terminal when logging in via SSH/serial

Component Version Updates

- Updated to Linux kernel 6.6.64

3. Cipher Lists

To be able to establish an **SSL/TLS connection** once your device is updated, your browser must support at least one of the listed TLS 1.2 and TLS 1.3 cipher suites under meinbergOS *2024.12*:

TLS 1.2	ECDHE-RSA-CHACHA20-POLY1305
	ECDHE-RSA-AES256-GCM-SHA384
	ECDHE-RSA-AES128-GCM-SHA256
TLS 1.3	TLS_CHACHA20_POLY1305_SHA256
	TLS_AES_256_GCM_SHA384
	TLS_AES_128_GCM_SHA256

To be able to establish an **SSH connection** once your device is updated, your SSH client must support at least one of each of the cryptographic algorithms listed below (i.e., SSH cipher, key exchange algorithm, host key algorithm, message authentication code).

Ciphers	chacha20-poly1305@openssh.com
	aes256-gcm@openssh.com
	aes128-gcm@openssh.com
	aes256-ctr
	aes128-ctr
Key Exchange Algorithms	curve25519-sha256
	curve25519-sha256@libssh.org
	ecdh-sha2-nistp512
	ecdh-sha2-nistp384
	ecdh-sha2-nistp256
	diffie-hellman-group16-sha512
	diffie-hellman-group14-sha256
	kex-strict-s-v00@openssh.com
	kexguess2@matt.ucc.asn.au
Host Key Algorithms	ssh-ed25519
	ecdsa-sha2-nistp521
	rsa-sha2-256
MACs	hmac-sha2-512
	hmac-sha2-256

4. meinbergOS *2024.12* Component Versions

meinbergOS *2024.12* comprises several software components, some of which are provided by third parties. The most important first-party and third-party software packages included in meinbergOS *2024.12* are listed below alongside their version numbers in each patch release. A comparison with the previous meinbergOS patch release *2024.05.7* is also provided.

Component changes are marked in **bold and underlined**.

4.1. Third-Party Components

	Application	Version 2024.05.7	Version 2024.12.0	Version 2024.12.1	Version 2024.12.2	Version 2024.12.3	Version 2024.12.4
Operating System Kernel	Linux kernel	6.1.99	**6.6.64**	**6.6.79**	**6.6.89**	**6.6.92**	**6.6.96**
File/Shell Utilities	GNU coreutils	9.0	**9.6**	**9.4**	9.4	9.4	9.4
SSL/TLS Cryptography	OpenSSL	3.0.13	**3.2.3**	3.2.3	**3.2.4**	3.2.4	3.2.4
SSH Server/Client	Dropbear	2022.83	2022.83	2022.83	2022.83	2022.83	2022.83
SSH Protocol Library	libssh	0.9.6	**0.10.6**	0.10.6	0.10.6	0.10.6	0.10.6
NTP Server/Client	NTP	4.2.8p17	4.2.8p17	4.2.8p17	4.2.8p17	4.2.8p17	4.2.8p17
Python Interpreter	Python	3.10.13	**3.12.6**	**3.12.8**	**3.12.9**	3.12.9	3.12.9
Unix Standard Utilities	BusyBox	1.35.0	**1.36.1**	1.36.1	1.36.1	1.36.1	1.36.1
Web Server	nginx	1.24.0	1.24.0	1.24.0	1.24.0	1.24.0	1.24.0
SNMP	Net-SNMP	5.9.3	**5.9.4.pre2**	5.9.4.pre2	5.9.4.pre2	5.9.4.pre2	5.9.4.pre2
DHCP Client	dhcpcd	9.4.1	**10.0.6**	10.0.6	10.0.6	10.0.6	10.0.6
Text Editor*	GNU nano	6.2	**7.2**	7.2	7.2	7.2	7.2
LDAP Implementation	OpenLDAP	20516	**20607**	20607	20607	20607	20607
File Viewer	less	*Version in BusyBox 1.35.0*	**643***	643*	643*	643*	643*
USB Utilities	usbutils	014	**017**	017	017	017	017

* Greenwood Software version of *less*

4.2. First-Party Components

	Application	Version 2024.05.7	Version 2024.12.0	Version 2024.12.1	Version 2024.12.2	Version 2024.12.3	Version 2024.12.4
meinbergOS Daemon	microd	2024.05.7	**2024.12.0**	**2024.12.1**	**2024.12.2**	**2024.12.3**	**2024.12.4**
CLI environment	microShell	n/a	**0.1.0**	**0.2.0**	0.2.0	0.2.0	0.2.0
Firmware Management Tool	fwmgmt	0.2.0	**0.3.0**	0.3.0	0.3.0	0.3.0	0.3.0
PTP Stack	syn1588	1.16	1.16	**1.17**	1.17	1.17	1.17
PTP Monitoring Service	PTP Track Hound	n/a	**2.1.5-p1**	**2.1.5-p2**	**2.1.5-p3**	2.1.5-p3	**2.1.5-p5**
IEC 61850 MMS Server	mmsync	n/a	**1.74.171**	1.74.171	**1.74.173**	1.74.173	**1.74.175**
IEC 61850 ICD Generator	generate_msync_icd	n/a	**1.1.0**	1.1.0	**1.1.2**	1.1.2	**1.2.2**