VECTROLINK
TECHNOLOGIES

vMBT-02

Modbus to BACnet Gateway (BACnet/IP & MS/TP)

API Reference

HTTP JSON API for System Integrators

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Confidential — intended for the customer and integrators of this device.

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Chapter 1

Overview & Conventions

Every function available in the vMBT-02's web interface is also available as a JSON HTTP API on the device itself, so you can configure and monitor the gateway from your own tools – a commissioning script that loads the point list of a whole building, a fleet-management system, or a monitoring dashboard – without going through the web UI or Vectrolink Cloud.

The vMBT-02 has two separate interfaces towards other systems:

- **BACnet** (BACnet/IP on UDP 47808, or BACnet MS/TP on one RS-485 channel) is how the building management system (BMS) reads and commands the points. It is described in the *vMBT-02 Specification*, not here.
- **This HTTP JSON API** is how the gateway itself is configured and diagnosed: the BACnet device settings, the RS-485 channels, the Modbus → BACnet point table, live values and counters.

This document is a precise, example-driven reference for the HTTP API: every endpoint, its exact request and response bodies, and the behaviour you need to know about in practice. It does not cover firmware update (OTA), cloud provisioning or superadmin-only maintenance endpoints – those are internal/administrative and out of scope for this document.

1.1 Connecting

All endpoints are served over HTTPS directly by the device, on whatever IP address it has on your network (Ethernet or Wi-Fi). The device uses a self-signed certificate, so your HTTP client or script needs to either trust that specific certificate or disable certificate verification for this host – for example, `curl -k` for quick testing, or your language's HTTP library equivalent for production code.

```
curl -k https://<device-ip>/api/version
```

`GET /api/version` (Section 3.2) is the one endpoint in this API that needs no session token, so it is the right quick check that you can reach the device at all before dealing with authentication (Chapter 2).

1.2 Configuration Changes Take Effect After a Restart

The gateway builds its BACnet objects and its Modbus polling plan once, at start-up. Every endpoint that changes the gateway configuration (Chapters 4 and 5) therefore:

1. validates the request and **saves it to the configuration file** on the device,
2. answers with `"restart_required": true`,

3. keeps running with the *previous* configuration until you call `POST /api/system/restart` (Section 3.3).

Several changes can be saved one after another before a single restart – each save starts from the last saved (not the running) configuration, so a points upload followed by a BACnet settings change both survive. While a restart is pending, the read endpoints (`GET /api/bacnet/config`, `GET /api/points`, `GET /api/points/csv`) return the *saved* configuration and the flag `"restart_pending": true`.

A restart takes about 10 seconds. BACnet clients see the device disappear briefly and reappear with an I-Am broadcast; COV subscriptions are not kept across a restart, so the BMS re-subscribes as it normally does after a device restart.

1.3 Response Envelope

Read-only `GET` endpoints that return data return that data directly as a JSON object or array (or CSV text for `GET /api/points/csv`). Write endpoints respond with a small status object:

```
{"status": "ok", "message": "Saved - restart to apply", "
   restart_required": true}
```

or, on failure:

```
{"status": "error", "message": "<human-readable description>"}
```

Always check the HTTP status code first, then the `status` field if present. Errors detected while reading the request itself (empty or oversized body, broken connection) are answered with a plain-text body instead of JSON.

1.4 HTTP Status Codes

Code	Meaning
200	Success.
400	Bad request – invalid JSON or CSV, a value outside its valid range, or an empty/oversized body. The `message` says which field or which CSV line.
401	No `Authorization` header, or the session token is missing, invalid, or expired.
403	Authenticated, but this account isn't allowed to perform this action (user management, see Chapter 2).
404	Unknown URL, or the referenced resource (user, saved Wi-Fi network) doesn't exist.
500	Internal error on the device (e.g. the configuration file could not be written).

1.5 Field Naming and Types

- All JSON keys are `snake_case`.
- Enumerated point fields (object type, data type, byte order, function code) use short uppercase strings such as `"AV"`, `"F32"` or `"CDAB"`; the complete tables are in Appendix 8.

- BACnet engineering units are the numeric values of the BACnet standard (e.g. `62` = degrees Celsius); a table of the common ones is in Appendix 8.
- `uptime` is in milliseconds; other timestamps are Unix epoch seconds.

> This reference was written directly against the firmware source code, but the API is not formally versioned. If a response includes fields not documented here, ignore unknown fields rather than failing.

Chapter 2

Authentication & Sessions

2.1 Login Flow

1. **Log in** to obtain a session token.
2. **Send the token** on every subsequent request in the `Authorization` header.
3. **Log out** (optional) to invalidate the token early, or just let it expire.

Sessions expire automatically after **1 hour of inactivity**; each successful authenticated request renews the timer. There's no refresh-token mechanism – simply log in again once a request comes back `401`.

2.1.1 POST /api/auth/login

Auth required: none.

```
POST /api/auth/login
Content-Type: application/json

{"username": "user", "password": "user"}
```

Success (200):

```
{"status": "ok", "token": "a1b2c3...64 hex chars", "username": "user"}
```

Errors: 400 (missing username/password), 401 (wrong credentials), 403 (see below).

Optional `access` field. Add `"access": "api"` to the login body if you only want to verify this account has *API access* (rather than *web* access, which is checked by default). This matters because an account can have one without the other – see the `web_access`/`api_access` flags in Section 2.2. If the account lacks the access mode being requested, login fails with `403` even though the password is correct.

2.1.2 Using the token

Attach it as a Bearer token on every request:

```
curl -k https://<device-ip>/api/status \
     -H "Authorization: Bearer a1b2c3...64 hex chars"
```

The device also accepts the raw token without the `Bearer` prefix, but sending it with the prefix is the conventional and recommended form.

The `web_access`/`api_access` flags on an account are only checked at *login* time (which mode you request via the `access` field). Once you hold a valid token, it works identically against every endpoint in this document regardless of those flags – they gate *how you can log in*, not what a given session can subsequently call.

2.1.3 POST /api/auth/logout

Auth required: any authenticated session.

```
POST /api/auth/logout
Authorization: Bearer <token>
```

Success (200): `{"status": "ok"}`. Invalidates the token immediately; no request body needed.

2.1.4 GET /api/auth/session

Auth required: any authenticated session. Use this to check whether a token you're holding is still valid, and to find out what the account can do.

```
GET /api/auth/session
Authorization: Bearer <token>
```

Success (200):

```
{
  "status": "ok",
  "authenticated": true,
  "username": "user",
  "is_admin": true,
  "is_superadmin": false
}
```

Expired/invalid (401):

```
{"status": "error", "message": "Invalid or expired session", "
   authenticated": false}
```

2.2 User Accounts

The device ships with a small, fixed set of accounts you can use directly or extend:

Username	Default password	Web access	API access	Notes
superadmin	Not documented here	Yes	Yes	Full control; hidden from GET /api/auth/users entirely; can't be edited/deleted via the API at all. Reserved for Vectrolink support/administrative use – not intended for integrators, and its credentials are out of scope for this reference.
user	user	Yes	Yes	General-purpose account for day-to-day web UI use.
api	api	No	Yes	Meant for integrations – change its password before relying on it.

Change the default passwords before deploying the device. user/user and api/api are well-known defaults – identical on every device of this model until changed, not device-specific.

You can create up to **5 additional managed accounts** beyond these built-in ones (see the X-Max-Managed-Users / X-Managed-Users-Count response headers on GET /api/auth/users to check how many you have left).

Auth required: any authenticated session for all four endpoints below, but what you can actually do depends on whether you're superadmin:

- **Creating/editing a user with is_admin: true requires superadmin.** A non-superadmin caller can still call POST/PUT, but is_admin in the request body is silently ignored and forced to false – this does *not* fail with an error, it just doesn't grant what you asked for. Check the is_admin field in the response of a follow-up GET if you need to confirm what actually landed.
- **Only superadmin can touch the built-in accounts** – superadmin, cloud, user, and api themselves. A non-superadmin session gets 403 Forbidden ("Cannot manage/delete system account") if it tries to PUT/DELETE any of these four usernames. Creating a user with one of these names always fails anyway (they already exist) regardless of caller.
- Anything else – creating, editing, or deleting one of the up to **5 additional managed accounts** – works for any authenticated session, superadmin or not.

In short: any account can manage plain managed users, but only superadmin can grant admin privileges or touch the four built-in accounts. is_admin itself is otherwise informational – shown back to you in GET /api/auth/users/GET /api/auth/session, but nothing else in this API reads it.

2.2.1 GET /api/auth/users

```
GET /api/auth/users
Authorization: Bearer <admin-token>
```

Success (200) – a JSON array, plus two response headers:

```
X-Max-Managed-Users: 5
X-Managed-Users-Count: 2

[
  {
    "username": "user",
    "is_admin": true,
    "web_access": true,
    "api_access": true,
    "manageable": true,
    "created_at": 1720000000
  },
  {
    "username": "api",
    "is_admin": false,
    "web_access": false,
    "api_access": true,
    "manageable": true,
    "created_at": 1720000001
  }
]
```

created_at is a Unix timestamp. The built-in `superadmin` account never appears in this list under any circumstances. `manageable` reflects what *you*, the caller, are allowed to do with that entry: `true` for any of the 5 additional managed accounts, and for the `user`/`api`/`cloud` built-ins only if you're calling as `superadmin` – for a non-superadmin caller, `user` and `api` still appear in the list (unlike `cloud`, which is hidden entirely unless you're `superadmin`) but with `manageable: false`, since `PUT`/`DELETE` against them will 403.

2.2.2 POST /api/auth/users – create a user

```
POST /api/auth/users
Authorization: Bearer <admin-token>
Content-Type: application/json

{
  "username": "integration1",
  "password": "a-strong-password",
  "is_admin": false,
  "web_access": false,
  "api_access": true
}
```

`is_admin` defaults to `false`, `web_access` and `api_access` both default to `true` if omitted. Sending `"is_admin": true` only has an effect if you're calling as `superadmin` – see the note above.

Success (200): `{"status": "ok"}`. **Errors:** 400 (missing username/password, username already taken, or the 5-account managed-user limit reached).

For a pure machine-to-machine integration account with no interactive web login, set `"web_access": false, "api_access": true` as shown above.

2.2.3 PUT /api/auth/users – edit a user

```
PUT /api/auth/users
Authorization: Bearer <admin-token>
Content-Type: application/json

{
  "username": "integration1",
  "is_admin": false,
  "web_access": false,
  "api_access": true,
  "password": "only-set-this-field-to-change-the-password"
}
```

`username`, `is_admin`, `web_access`, and `api_access` are all required in every request (this call replaces the full permission set, it doesn't patch individual fields). `password` is optional – omit it or send an empty string to leave the password unchanged.

Success (200): `{"status": "ok"}`. **Errors:** 400 (missing required fields), 403 (attempting to edit a protected system account you don't have rights to).

2.2.4 DELETE /api/auth/users

```
DELETE /api/auth/users
Authorization: Bearer <admin-token>
Content-Type: application/json

{"username": "integration1"}
```

Success (200): `{"status": "ok"}`. **Errors:** 400 (missing username), 403 (`"Cannot delete system account"` – protected account), 404 (user not found).

2.2.5 POST /api/auth/password – change a password

Auth required: any authenticated session. There's no separate admin/non-admin distinction on this endpoint – `username` can be any account, not just your own, and any authenticated session can target any account. What actually gates this is `old_password`: the request only succeeds if it matches the *target* account's current password, which is what makes this safe to leave open rather than restricted to `superadmin` like the four endpoints above – proving you already know an account's password is treated as sufficient grounds to change it, regardless of which account you're currently logged in as.

```
POST /api/auth/password
Authorization: Bearer <token>
Content-Type: application/json

{
  "username": "user",
  "old_password": "current-password",
  "new_password": "new-password"
}
```

Success (200): `{"status": "ok"}`. **Errors:** 400 (missing fields), 401 (`old_password` incorrect for the target account).

Chapter 3

Status & System

3.1 GET /api/status

Auth required: any authenticated session.

One call that returns everything a dashboard needs: firmware, uptime, security state, network, the BACnet device summary and the gateway counters. Poll it every few seconds for a status view.

```
GET /api/status
Authorization: Bearer <token>
```

Success (200):


```
{
  "status": "running",
  "version": "0.1.0",
  "build_date": "Nov 12 2026 17:56:20",
  "uptime": 845321,
  "last_reset_reason": "poweron",
  "crash_count": 0,
  "security": {
    "secure_boot": true,
    "flash_encryption": "release",
    "uart_download_disabled": true,
    "jtag_disabled": true
  },
  "wifi_connected": false,
  "wifi_ap": false,
  "wifi_sta": false,
  "wifi_mode": "OFF",
  "wifi_ip": "N/A",
  "eth_connected": true,
  "eth_ip": "192.168.1.74",
  "internet_access": true,
  "device_time": "2026-11-13 09:12:44 UTC",
  "config_timestamp": 0,
  "firmware_update_allowed": true,
  "serial_number": 3381941032,
  "bacnet": {
    "device_instance": 1332008,
    "device_name": "AHU-1 Gateway",
    "datalink": "bip",
    "point_count": 120,
    "max_points": 500,
    "restart_pending": false
  },
```

```
  "modbus": {
    "polls": 48211,
    "poll_errors": 21,
    "writes": 37,
    "write_errors": 0,
    "cycle_ms": 412
  }
}
```

Field	Meaning
`last_reset_reason`	`poweron`, `external_pin`, `software_reset`, `panic`, `interrupt_watchdog`, `task_watchdog`, `other_watchdog`, `brownout`, `sdio` or `unknown`.
`crash_count`	Number of boots that followed a crash (panic, watchdog, brownout).
`security`	What the chip itself enforces, read from its eFuses.
`device_time`	UTC from SNTP, or `"not synced"` without internet access.
`serial_number`	Device serial number as an integer; the label and the web UI show it as 8 hex digits (here `C9945328`).
`bacnet.device_instance`	BACnet Device object instance in use (see Section 4.1.1).
`bacnet.datalink`	`"bip"` (BACnet/IP) or `"mstp"` (BACnet MS/TP).
`bacnet.restart_pending`	A saved configuration is waiting for a restart (Section 1.2).
`modbus.polls`	Modbus read requests sent (one request reads a whole block of neighbouring points).
`modbus.poll_errors`	Of those, requests that failed (timeout, CRC, exception).
`modbus.writes / write_errors`	Modbus writes executed on behalf of the BMS, and the failed ones.
`modbus.cycle_ms`	Duration of the last complete poll of all points.

When the device runs BACnet MS/TP, the response also contains the `mstp` object described in Section 6.1.

`uptime` is in **milliseconds**. `wifi_ip`/`eth_ip` are `"N/A"` when that interface has no address.

3.2 GET /api/version

Auth required: none.

```
GET /api/version
```

Success (200):

```
{"version": "0.1.0", "build_date": "Nov 12 2026 17:56:20"}
```

Use this for a simple "is the device up, and what firmware is it running" check. Everything else needs a session.

3.3 POST /api/system/restart

Auth required: any authenticated session.

Reboots the device – this is how a saved configuration change is applied (Section 1.2).

```
POST /api/system/restart
Authorization: Bearer <token>
```

Success (200):

```
{"status": "ok", "message": "System restarting..."}
```

> The response is sent *before* the device restarts (there is a fixed 500 ms delay to guarantee delivery). Expect the device to be unreachable for about 10 seconds; poll `GET /api/version` until it answers again.

3.4 Configuration backup: GET /api/backup, POST /api/backup

Auth required: any authenticated session.

One JSON file with the whole configuration of the device: BACnet device and datalink settings, RS-485 channels, poll cycle and the point table. The same file format and the same two endpoints exist on every Vectrolink product; a file of another product is refused.

```
GET /api/backup
Authorization: Bearer <token>
```

Success (200): the file, with `Content-Disposition: attachment; filename="vMBT-02_<serial>_config_<date>.json"`:

```
{
  "vectrolink_backup": 1,
  "product": "vMBT-02",
  "firmware": "0.1.0",
  "serial": "C9945328",
  "exported": "2026-11-13T15:20:00Z",
  "config": {
    "bacnet": {"device_instance": 2001, "device_name": "AHU-1 Gateway",
        "datalink": "bip", ...},
    "points_csv": "name,description,enabled,port,slave,..."
  }
}
```

Not part of a backup: passwords and certificates, user accounts, network settings and the update consent – the file may be sent by e-mail, and these belong to the individual device.

```
POST /api/backup
Authorization: Bearer <token>
Content-Type: application/json

<the file as downloaded>
```

The whole file is checked before anything is saved; on an error nothing changes. Keys that are missing in `config` keep the device's current values. The restored configuration is applied after a restart (`POST /api/system/restart`).

Success (200): `{"status": "ok", "message": "Configuration restored - restart to apply", "restart_required": true}`

Errors (400), for example:

```
{"status": "error", "message": "This backup is from vMBT-02, this
   device is vMBT-02"}
{"status": "error", "message": "Backup format 2 is newer than this
   firmware - update the firmware first"}
{"status": "error", "message": "Not a Vectrolink configuration backup"}
```

3.5 POST /api/system/factory_reset

Auth required: any authenticated session.

Returns the device to its delivery state and restarts – the same as holding the device's button for 10 seconds: network settings, user accounts (passwords back to defaults), crash statistics, the point table and the BACnet/RS-485 settings are erased. The device identity (serial number), its TLS certificate and its Vectrolink Cloud provisioning are kept.

> Export the point table first (`GET /api/points/csv`) if you may need it again.

```
POST /api/system/factory_reset
Authorization: Bearer <token>
```

Success (200): `{"status": "ok", "message": "Factory reset starting - device is restarting..."}`

> After a factory reset the device is back on DHCP with default passwords. Do not call this over a remote or tunneled connection unless someone on site can reach the device afterwards.

3.6 POST /api/system/temp_wifi

Auth required: any authenticated session.

Opens a temporary (10-minute) Wi-Fi window, exactly like a short (`sta`) or double (`ap`) press of the device's button: `"sta"` connects to the saved Wi-Fi networks, `"ap"` opens the device's own service access point.

```
POST /api/system/temp_wifi
Authorization: Bearer <token>
Content-Type: application/json

{"mode": "ap"}
```

Success (200): `{"status": "ok", "message": "Temporary WiFi started for 10 minutes"}`. **Errors:** 400 (`mode` is not `"sta"` or `"ap"`), 500 (Wi-Fi could not be started).

3.7 POST /api/system/firmware_update_allowed

Auth required: any authenticated session.

Turns automatic firmware updates via Vectrolink Cloud on or off for this device (default: on). When off, the device keeps reporting to the update server but does not download or apply any update until the flag is turned back on. Manual firmware upload in the web UI is not affected.

```
POST /api/system/firmware_update_allowed
Authorization: Bearer <token>
Content-Type: application/json

{"allowed": false}
```

Success (200): `{"status": "ok", "firmware_update_allowed": false}`. **Errors:** 400 (missing `allowed`), 500 (`"Failed to update setting"`). The current value is the `firmware_update_allowed` field of `GET /api/status`.

Chapter 4

BACnet & RS-485 Settings

These settings define how the gateway appears on the BACnet network (device instance, name, datalink) and how its two RS-485 channels talk to the Modbus devices. Changes are saved immediately and applied after a restart (Section 1.2).

4.1 GET /api/bacnet/config

Auth required: any authenticated session.

```
GET /api/bacnet/config
Authorization: Bearer <token>
```

Success (200):

```
{
  "device_instance": 0,
  "device_instance_effective": 1332008,
  "device_name": "AHU-1 Gateway",
  "location": "Plant room L2",
  "datalink": "bip",
  "bip_port": 47808,
  "mstp_port": 2,
  "mstp_mac": 10,
  "mstp_max_master": 127,
  "mstp_baud": 38400,
  "poll_period_ms": 1000,
  "ports": [
    {"baud": 9600, "parity": 0, "stop_bits": 1, "timeout_ms": 300},
    {"baud": 9600, "parity": 0, "stop_bits": 1, "timeout_ms": 300}
  ],
  "restart_pending": false
}
```

Field	Meaning
`device_instance`	Configured BACnet Device object instance, 0 = automatic (see below).
`device_instance_effective`	Instance the device is using right now.
`device_name`	BACnet `Object_Name` of the Device object (max 31 characters). Must be unique on the BACnet internetwork.
`location`	BACnet `Location` property (max 31 characters).
`datalink`	`"bip"` = BACnet/IP over Ethernet/Wi-Fi, `"mstp"` = BACnet MS/TP on an RS-485 channel.
`bip_port`	UDP port for BACnet/IP (standard: 47808 = 0xBAC0).
`mstp_port`	RS-485 channel used for MS/TP: 1 or 2. That channel is then not used for Modbus.
`mstp_mac`	MS/TP station address, 0–127, unique on the MS/TP segment.
`mstp_max_master`	Highest master address polled for the token, 1–127. Lower it to the highest MAC actually used on the segment for faster token passing.
`mstp_baud`	MS/TP baud rate: 9600, 19200, 38400, 57600, 76800 or 115200.
`poll_period_ms`	Target duration of one Modbus poll cycle (100–60000). If reading all points takes longer, the next cycle starts immediately.
`ports[0], ports[1]`	Modbus RTU settings of RS-485-1 and RS-485-2.
`ports[].baud`	1200–115200 bit/s.
`ports[].parity`	0 = none, 1 = even, 2 = odd.
`ports[].stop_bits`	1 or 2. Data bits are always 8.
`ports[].timeout_ms`	Modbus response timeout, 50–5000 ms.
`restart_pending`	The values shown are saved but not yet running (Section 1.2).

4.1.1 Device instance

With `device_instance = 0` the gateway uses the lower 22 bits of its serial number as BACnet Device instance, so every unit leaves the factory with a different instance and can be connected without a collision. Set an explicit instance (1–4194302) to follow the numbering plan of the site.

4.2 POST /api/bacnet/config

Auth required: any authenticated session.

Send only the fields you want to change; the others keep their saved values. Inside `ports` the array index selects the channel, and again only the given fields change.

```
POST /api/bacnet/config
Authorization: Bearer <token>
Content-Type: application/json

{
  "device_instance": 2001,
  "device_name": "AHU-1 Gateway",
  "location": "Plant room L2",
  "datalink": "mstp",
```

```
  "mstp_port": 2,
  "mstp_mac": 12,
  "mstp_max_master": 31,
  "mstp_baud": 38400,
  "ports": [{"baud": 19200, "parity": 1}]
}
```

Success (200):

```
{"status": "ok", "message": "Saved - restart to apply", "
   restart_required": true}
```

Errors (400):

- `{"status": "error", "message": "Invalid JSON"}`
- `{"status": "error", "message": "Invalid value: mstp_mac"}` – the name of the first field outside its range (or `ports.baud`, `ports.parity`, ... for a channel setting). Nothing is saved when any field is invalid.
- Plain-text `Body empty or too large` – the body is limited to 4 KB.

Error (500): `{"status": "error", "message": "Saving failed"}`.

Switching to MS/TP changes how you reach the gateway over BACnet, not over HTTP. The web UI and this API stay on Ethernet/Wi-Fi. With `"datalink": "mstp"` the chosen RS-485 channel carries BACnet only: Modbus points configured on that channel are kept in the table but are not polled (they show a communication failure) until the channel is used for Modbus again.

Chapter 5

Points

A *point* links one value in a Modbus device to one BACnet object of the gateway: for example holding registers 4–5 of slave 3 on RS-485-1, a 32-bit float, become `Analog Input 12 "Supply air temperature"`. The gateway polls the Modbus side and keeps the BACnet object up to date; for writable objects it also passes BMS commands back to the Modbus device.

The gateway holds up to **500 points**. The point table is read as JSON (with live values) and written as CSV – the same file format the web UI uses for import/export and that you can edit in Excel.

5.1 Point Fields

Field	Meaning
`name`	BACnet `Object_Name`, max 31 characters, no double quote.
`description`	Optional BACnet `Description`, max 47 characters.
`enabled`	1 = polled and published as a BACnet object, 0 = not polled and not a BACnet object (the point stays in the table).
`port`	RS-485 channel of the Modbus device: 1 or 2.
`slave`	Modbus slave address, 1–247.
`function`	Modbus area: 1 = coils (FC01), 2 = discrete inputs (FC02), 3 = holding registers (FC03), 4 = input registers (FC04).
`address`	0-based register or bit address (protocol address, not the "40001" notation: holding register 40001 is `address 0`).
`type`	Data type: `U16`, `S16`, `U32`, `S32`, `F32`, `BIT` (Appendix 8).
`order`	Byte order of 32-bit types: `ABCD`, `CDAB`, `BADC`, `DCBA`. Ignored for 16-bit types and bits.
`bit`	For `BIT` on function 3 or 4: which bit (0–15) of the register.
`scale, offset`	BACnet value = raw value × `scale` + `offset`. Writes use the inverse. `scale` must not be 0.
`object`	BACnet object type: `AI`, `AV`, `BI`, `BV`.
`instance`	BACnet object instance, 0–4194302, unique per object type.
`units`	BACnet engineering units (numeric, Appendix 8); 95 = no units.
`cov_increment`	Minimum change of an analog value that triggers a COV notification.
`writable`	1 = the BMS may write the object and the value goes to the Modbus device (AV/BV on function 1 or 3 only).

5.1.1 Rules checked on save

- `BI` and `BV` need type `BIT`; `AI` and `AV` need a numeric type.
- Functions 1 and 2 (coils, discrete inputs) need type `BIT`.
- Only `AV` and `BV` can be writable, and not on functions 2 or 4 (read-only areas).
- No two points may use the same object type and instance.

5.1.2 How writes reach the Modbus device

`AV` and `BV` objects are *commandable*: they have the standard 16-level `Priority_Array`. When the commanded `Present_Value` changes, the gateway writes it to the Modbus device – before its next poll, so normally within a few hundred milliseconds:

Point	Modbus write
BV on a coil (function 1)	FC05 Write Single Coil
BV on a register bit (function 3, `BIT`)	FC03 read, set/clear the bit, FC06 write back
AV, 16-bit type	FC06 Write Single Register
AV, 32-bit type	FC16 Write Multiple Registers (2 registers, configured byte order)

The value read back from the device is kept in `Relinquish_Default`. When the BMS relinquishes all priorities, the object therefore shows the real device value – for example a set-point changed on the device's own panel – and nothing is written to the device.

5.2 GET /api/points

Auth required: any authenticated session.

The whole point table with the latest polled values.

```
GET /api/points
Authorization: Bearer <token>
```

Success (200):

```
{
  "max_points": 500,
  "restart_pending": false,
  "points": [
    {"name": "Supply air temp", "description": "AHU-1 after heat
       recovery",
     "enabled": 1, "port": 1, "slave": 3,
     "function": 3, "address": 4, "type": "F32", "order": "CDAB",
     "bit": 0, "scale": 1, "offset": 0, "object": "AI", "instance": 12,
     "units": 62, "cov_increment": 0.2, "writable": 0,
     "value": 21.4, "valid": true},
    {"name": "Pump run", "description": "", "enabled": 1, "port": 1, "
       slave": 3,
     "function": 1, "address": 0, "type": "BIT", "order": "ABCD",
     "bit": 0, "scale": 1, "offset": 0, "object": "BV", "instance": 1,
     "units": 95, "cov_increment": 0, "writable": 1,
     "value": 1, "valid": true}
  ]
}
```

`value` is the BACnet value (after scale/offset; 0/1 for binary objects), `valid` is `false` when the last Modbus read of that point failed. A float register holding NaN or infinity is returned as `"value": null`.

> While a restart is pending (Section 1.2), this endpoint returns the *saved* table, and the `value`/`valid` fields are left out – the running values belong to the old table.

5.3 GET /api/points/values

Auth required: any authenticated session.

Only the live values, in table order – a compact call for frequent polling:

```
GET /api/points/values
Authorization: Bearer <token>
```

Success (200): an array of `[value, valid]` pairs, `valid` as 1/0:

```
[[21.4,1],[1,1],[0,0]]
```

These always belong to the *running* table; match them by position to a `GET /api/points` response taken while no restart was pending.

5.4 GET /api/points/csv – export

Auth required: any authenticated session.

```
GET /api/points/csv
GET /api/points/csv?sep=semicolon
Authorization: Bearer <token>
```

Returns the point table as a CSV file (`text/csv`, UTF-8 with a byte-order mark, `Content-Disposition: attachment; filename="vmbt-02-points.csv"`). With `?sep=semicolon` the separator is `;` and numbers use a decimal comma – the format Excel expects in Polish, German and most other European locales.

```
name,description,enabled,port,slave,function,address,type,order,bit,
   scale,offset,object,instance,units,cov_increment,writable
"Supply air temp","AHU-1 after heat recovery",1,1,3,3,4,F32,CDAB,0,1,0,
   AI,12,62,0.2,0
"Pump run","",1,1,3,1,0,BIT,ABCD,0,1,0,BV,1,95,0,1
```

5.5 POST /api/points/csv – replace the table

Auth required: any authenticated session.

Replaces the *whole* point table with the CSV in the request body (max 128 KB). The table is validated completely before anything is saved: one bad line and nothing changes.

```
POST /api/points/csv
Authorization: Bearer <token>
Content-Type: text/csv

name;object;instance;slave;function;address;type;order;scale;units
"Supply air temp";AI;12;3;3;4;F32;CDAB;1;62
"Room set-point";AV;1;3;3;10;S16;;0,1;62
```

Success (200):

```
{"status": "ok", "message": "2 points saved - restart to apply", "
   restart_required": true}
```

Errors (400), always with the line number of the file:

```
{"status": "error", "message": "line 3: bad type 'FLOAT'"}
{"status": "error", "message": "line 7 (Pump run): FC01/FC02 need type
   BIT"}
{"status": "error", "message": "line 9: AI 12 used twice"}
```

Plain-text `Body empty or too large` for an empty body or one above 128 KB.

5.5.1 CSV format rules

- The first non-empty line is the header. It names the columns, in any order, case-insensitive. `name`, `address`, `object` and `instance` are required; any other column may be left out.
- Missing columns or empty cells take defaults: `enabled 1`, `port 1`, `slave 1`, `function 3`, `type U16` (`BIT` for BI/BV), `order ABCD`, `bit 0`, `scale 1`, `offset 0`, `units 95`, `cov_increment 0`, `writable 0`.
- The separator is taken from the header line: `;` if it contains one, otherwise `,`. With `;`, a decimal comma is accepted (`0,1`).
- Text may be quoted with `"`; a quote inside quoted text is written as `""`. A UTF-8 byte-order mark at the start is ignored.
- Empty lines and lines starting with `#` are ignored. Lines may end with CRLF or LF.
- At most 500 data lines.

A convenient way to commission a site: export the CSV from one gateway, adapt it in Excel (slave addresses, instances, names), and upload it to the next gateway with `POST /api/points/csv` followed by `POST /api/system/restart`.

Chapter 6

Diagnostics

6.1 GET /api/gateway/stats

Auth required: any authenticated session.

Counters of the Modbus side and, when the device runs BACnet MS/TP, of the MS/TP datalink. The same objects are part of `GET /api/status`; this endpoint returns only them, for frequent polling.

```
GET /api/gateway/stats
Authorization: Bearer <token>
```

Success (200) – BACnet/IP:

```
{"modbus": {"polls": 48211, "poll_errors": 21, "writes": 37, "
   write_errors": 0, "cycle_ms": 412}}
```

Success (200) – BACnet MS/TP:

```
{
  "modbus": {"polls": 9120, "poll_errors": 0, "writes": 3, "
     write_errors": 0, "cycle_ms": 655},
  "mstp": {
    "transmit_frames": 120533,
    "receive_valid_frames": 241020,
    "receive_invalid_frames": 2,
    "transmit_pdus": 1840,
    "receive_pdus": 1838,
    "lost_tokens": 0
  }
}
```

All counters count from the last restart. Both variants also contain the `slaves` array described in Section 6.1.1.

Field	Meaning
`modbus.polls`	Modbus read requests. Neighbouring points of one slave are read together (up to 125 registers per request), so this grows by the number of blocks per cycle, not the number of points.
`modbus.poll_errors`	Read requests that failed: no answer within `timeout_ms`, CRC error or Modbus exception.
`modbus.writes`	Modbus writes executed for BACnet writes.
`modbus.write_errors`	Of those, the failed ones.
`modbus.cycle_ms`	Duration of the last complete poll of all points.
`mstp.transmit_frames`	MS/TP frames sent (tokens, poll-for-master, data).
`mstp.receive_valid_frames`	Frames received with a correct CRC (from any station on the segment).
`mstp.receive_invalid_frames`	Frames with a CRC or framing error – a rising count points to wiring, termination, biasing or baud-rate problems.
`mstp.transmit_pdus / receive_pdus`	BACnet messages sent / received by this device.
`mstp.lost_tokens`	How often the token was lost and the ring had to be rebuilt. Should stay at 0 on a healthy segment.

6.1.1 Per-device counters

The `slaves` array has one entry per Modbus device (RS-485 channel + slave address) used by the point table, in bus order. Reads and writes for that device are counted together.

```
"slaves": [
  {"port": 1, "slave": 3, "last_ok": true, "requests": 9120, "ok":
     9118,
   "timeouts": 2, "crc_errors": 0, "other_errors": 0,
   "last_ms": 41, "avg_ms": 43, "max_ms": 118},
  {"port": 2, "slave": 7, "last_ok": false, "requests": 300, "ok": 0,
   "timeouts": 300, "crc_errors": 0, "other_errors": 0,
   "last_ms": 0, "avg_ms": 0, "max_ms": 0}
]
```

Field	Meaning
`port, slave`	RS-485 channel and Modbus slave address.
`last_ok`	The last request to this device was answered correctly. `false` = the device does not answer right now.
`requests / ok`	Requests sent (reads and writes) / answered correctly.
`timeouts`	No answer within `timeout_ms`: device off, wrong address, baud rate or wiring.
`crc_errors`	Answer with a wrong checksum: noise, missing termination, two devices with the same address.
`other_errors`	Modbus exception (e.g. register does not exist) or a malformed answer.
`last_ms, avg_ms, max_ms`	Response time of successful requests – from sending the request to a complete answer, including the bus turnaround.

The web interface shows the same table on the dashboard (*Modbus Devices*).

6.2 Point Status

Per point, the communication state is the `valid` field of `GET /api/points` and `GET /api/points/values` (Chapter 5). On the BACnet side the same state is the object's `Reliability` property: `NO_FAULT_DETECTED` while the Modbus reads succeed, `COMMUNICATION_FAILURE` after a failed read, with the `FAULT` flag set in `Status_Flags`. The last good value is kept in `Present_Value`.

6.3 Reading the counters

- **`poll_errors` grows by one per cycle** – one block (one slave) is not answering. Look for points with `valid: false`: they share port and slave.
- **`poll_errors` grows with every request** – the whole channel is silent: wiring, A/B swapped, baud rate or parity, or the devices are not powered.
- **`cycle_ms` is much larger than `poll_period_ms`** – too many slow slaves or many timeouts; lower `timeout_ms` or remove points of devices that are not installed.
- **`write_errors` grows** – the Modbus device rejects writes (read-only register, value out of range); see the device's documentation.

Chapter 7

Network

7.1 GET /api/network

Auth required: any authenticated session for the response in general; `wifi_password` specifically is only populated for the `superadmin` account.

```
GET /api/network
Authorization: Bearer <token>
```

```
{
  "wifi_mode": 2,
  "wifi_ssid": "Factory-Floor-2G",
  "wifi_password": "",
  "wifi_enabled": true,
  "wifi_dhcp_enabled": true,
  "wifi_static_ip": "",
  "wifi_netmask": "",
  "wifi_gateway": "",
  "wifi_dns1": "",
  "wifi_dns2": "",
  "eth_dhcp_enabled": false,
  "eth_static_ip": "192.168.10.111",
  "eth_netmask": "255.255.255.0",
  "eth_gateway": "192.168.10.1",
  "eth_dns1": "8.8.8.8",
  "eth_dns2": ""
}
```

`wifi_mode` is an integer: 0 = AP only, 1 = STA only, 2 = AP+STA. Ethernet has no on/off flag – it's always active; only its IP configuration is here.

> For customer accounts `wifi_password` is always empty (`""`) in this response: the configured Wi-Fi password is write-only through the API. To change it, send the new value with `POST /api/network`.

7.2 POST /api/network

Auth required: any authenticated session.

```
POST /api/network
Authorization: Bearer <token>
Content-Type: application/json

{
  "wifi_mode": 2,
```

```
  "wifi_enabled": true,
  "wifi_ssid": "Factory-Floor-2G",
  "wifi_password": "new-password",
  "wifi_dhcp_enabled": true,
  "eth_dhcp_enabled": false,
  "eth_static_ip": "192.168.10.111",
  "eth_netmask": "255.255.255.0",
  "eth_gateway": "192.168.10.1",
  "eth_dns1": "8.8.8.8"
}
```

Success (200): `{"status": "ok", "message": "Network config saved"}`. **Errors:** 500 (`"Failed to save network config"`).

This call **loads the existing network configuration first** and only overwrites the fields you include – so a partial body (e.g. just `{"eth_static_ip": "..."}`) is safe and won't blank out your Wi-Fi settings. The `saved_networks` list (Section 7.4) is always preserved regardless of what you send here. Two fields default to `true` whenever they're entirely absent from the body, even on an update: `wifi_dhcp_enabled` and `eth_dhcp_enabled`.

Changing network settings (especially `wifi_mode`, static IP settings, or disabling DHCP with an incorrect address) can make the device unreachable at its previous address. Confirm you have another way to reach the device (serial console, or the AP-mode fallback network) before applying a network change you're not certain about, particularly over a remote/tunneled connection.

7.3 GET /api/wifi/scan

Auth required: any authenticated session.

Triggers a live Wi-Fi scan (blocking – this call takes a few seconds) and returns nearby access points.

```
GET /api/wifi/scan
Authorization: Bearer <token>
```

```
[
  {"ssid": "Factory-Floor-2G", "rssi": -52, "auth": 3, "channel": 6},
  {"ssid": "Guest-WiFi", "rssi": -71, "auth": 0, "channel": 11}
]
```

`rssi` is signal strength in dBm (higher/less negative is stronger). `auth` is the raw ESP-IDF `wifi_auth_mode_t` value (0 = open, 3 = WPA2-PSK, etc.) – this reference doesn't reproduce the full ESP-IDF enum; treat `0` as open and any non-zero value as secured if you don't need the exact scheme. Up to 20 access points are returned.

7.4 Saved Wi-Fi Networks

The device can remember up to **5 Wi-Fi networks** with a priority order, independent of the single active `wifi_ssid`/`wifi_password` pair in `GET /api/network`.

7.4.1 GET /api/wifi/networks

```
GET /api/wifi/networks
Authorization: Bearer <token>
```

```
[
  {"ssid": "Factory-Floor-2G", "priority": 0},
  {"ssid": "Backup-Router", "priority": 1}
]
```

Unlike `GET /api/network`, saved networks' passwords are **not** included in this response – only `ssid` and `priority` (0 = highest priority). An item's position in the array is its index, used by the delete call below.

7.4.2 POST /api/wifi/networks – add

```
POST /api/wifi/networks
Authorization: Bearer <token>
Content-Type: application/json

{"ssid": "Backup-Router", "password": "backup-password", "priority": 1}
```

`password` defaults to an empty string (open network) if omitted; `priority` defaults to `0`.

Success (200): `{"status": "ok"}`. **Errors:** 400 (missing `ssid`), 500 with `{"status": "error", "error": "Maximum networks reached"}` once you already have 5 saved, or `{"status": "error", "error": "Failed to add network"}` on any other failure.

Note the error key here is `error`, not `message` – inconsistent with most other endpoints in this document (see Chapter 1's general envelope note). Check for either key defensively if you centralize error handling across endpoints.

7.4.3 DELETE /api/wifi/networks/{index}

```
DELETE /api/wifi/networks/1
Authorization: Bearer <token>
```

The index is part of the URL path, not the body. **Success (200):** `{"status": "ok"}`. **Errors:** 500 (`"Failed to remove network"` – out-of-range index).

Chapter 8

Enum Reference

8.1 object – BACnet object type

Value	BACnet object	Use
AI	Analog Input	Measured values (temperature, energy, power, ...). Read-only for the BMS.
AV	Analog Value	Set-points and parameters. Commandable (priority array) when `writable`.
BI	Binary Input	States and alarms. Read-only for the BMS.
BV	Binary Value	On/off commands. Commandable (priority array) when `writable`.

8.2 type – Modbus data type

Value	Registers	Meaning
U16	1	Unsigned 16-bit, 0–65535.
S16	1	Signed 16-bit (two's complement), −32768–32767.
U32	2	Unsigned 32-bit, byte order per `order`.
S32	2	Signed 32-bit, byte order per `order`.
F32	2	IEEE 754 single-precision float, byte order per `order`.
BIT	1 bit	A coil or discrete input (functions 1, 2), or bit `bit` of a register (functions 3, 4).

8.3 order – byte order of 32-bit values

The 32-bit value is written as bytes `A B C D`, `A` being the most significant. The order says how these bytes arrive in the two registers `R0` (lower address) and `R1`:

Value	R0 R1	Typical use
ABCD	AB CD	Big-endian, the Modbus standard (most meters).
CDAB	CD AB	Word swap – low word first (common for floats in PLCs and some meters).
BADC	BA DC	Byte swap within each register.
DCBA	DC BA	Little-endian.

Example: the float 1500.5 is `0x44BB9000`. With `ABCD` the device sends `R0=0x44BB, R1=0x9000`; with `CDAB` it sends `R0=0x9000, R1=0x44BB`. If a value looks absurd (e.g. 10^{-38} or 10^{30}), try the other orders.

8.4 function – Modbus area

Value	Read with	Writes (writable AV/BV)
1	FC01 Read Coils	FC05 Write Single Coil
2	FC02 Read Discrete Inputs	read-only
3	FC03 Read Holding Registers	FC06 / FC16; register bit: FC03 + FC06
4	FC04 Read Input Registers	read-only

8.5 units – BACnet engineering units (common values)

Any value of the BACnet `BACnetEngineeringUnits` enumeration is accepted; the web UI offers these:

Value	Unit	Value	Unit	Value	Unit
95	no units	47	W	53	Pa
62	°C	48	kW	54	kPa
64	°F	18	Wh	55	bar
29	%RH	19	kWh	135	m^3/h
98	%	146	MWh	87	l/s
5	V	8	VA	88	l/min
6	kV	9	kVA	136	l/h
124	mV	11	var	80	m^3
3	A	12	kvar	82	l
2	mA	15	power factor	104	rpm
27	Hz	96	ppm	37	lx
74	m/s	39	kg	73 / 72 / 71	s / min / h

8.6 datalink

Value	Meaning
bip	BACnet/IP (Annex J) over Ethernet or Wi-Fi, UDP port `bip_port`.
mstp	BACnet MS/TP master node on RS-485 channel `mstp_port`.

8.7 parity

0 = none, 1 = even, 2 = odd.

8.8 wifi_mode

0 = access point only, 1 = station only, 2 = access point + station (see Chapter 7).