Uyuni 2026.11

MCP Server Guide



UYUNI

Preface

MCP Server Guide | Uyuni 2026.11

The Uyuni MCP Server connects Model Context Protocol (MCP) clients and AI assistants to the Uyuni API. It provides tools for inspecting systems, assessing patches and CVEs, reviewing scheduled actions, and, when explicitly enabled, changing managed systems.

This guide covers deployment, configuration, client integration, security, available tools, and troubleshooting.

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Chapter 1. Concepts and Architecture

This chapter introduces the components, request flow, deployment models, and capabilities of the Uyuni MCP Server.

The Model Context Protocol (MCP) is an open protocol that allows an AI application to discover and call tools exposed by an external server. The Uyuni MCP Server implements MCP tools that translate structured tool calls into Uyuni HTTP API requests.

The MCP Server integrates with the existing Uyuni authorization model. The authenticated account determines which content is visible and which operations are permitted.

1.1. Components

An MCP integration contains the following components:

MCP host

The AI application in which the user works.

MCP client

The protocol client maintained by the host. It discovers tools, sends tool calls, displays progress and results, and can request user approval.

Uyuni MCP Server

The process that exposes tools over stdio or streamable HTTP and calls the Uyuni API.

Uyuni Server

The managed infrastructure service and authorization boundary.

Identity provider

An optional OAuth 2.0/OpenID Connect provider used for a shared HTTP deployment.

1.2. Request flow

For a read-only request, the flow is:

1. The user asks the AI assistant to retrieve information from Uyuni.
2. The AI assistant selects an MCP tool and supplies structured arguments.
3. The MCP client sends the tool call to the MCP Server.
4. The MCP Server authenticates to Uyuni, calls the corresponding API, and normalizes the response.

5. The MCP client returns the structured result to the AI assistant.

State-changing tools add an approval step when the MCP client supports MCP elicitation. For more information, see Write tool controls.

1.3. Deployment models

Model	Use case	Characteristics
Client-managed stdio	One user or one local AI application	The MCP client starts one server process. Communication remains on stdin and stdout. Uyuni credentials are normally supplied to that process.
Standalone HTTP	A persistent service shared by multiple users or clients	Clients connect to /mcp over streamable HTTP. OAuth is strongly recommended. Production deployments should expose the endpoint only over TLS.

Use client-managed stdio unless the MCP Server must be shared or centrally operated. The smaller network surface and process lifetime make stdio easier to secure.

1.4. Capabilities and limitations

The server exposes MCP tools for systems, updates, CVEs, actions, activation keys, and system groups. Write tools are disabled by default. The server does not expose MCP resources or prompts.

Tool results can be paginated to reduce context usage. For fleet-wide questions, use summary tools first and request detailed update or CVE data only when required.



An AI-generated explanation is not an authoritative record of system state. Review the structured tool result and confirm important changes in the Uyuni Web UI, especially after scheduling updates, rebooting, bootstrapping, or removing systems.

Chapter 2. Installation and Deployment

This chapter describes the requirements and procedures for deploying the Uyuni MCP Server as a client-managed stdio container or a standalone HTTP service.

The MCP Server is available as a container image from the SUSE Container Registry.

2.1. Requirements

Before deployment, ensure that:

- The deployment environment allows outbound HTTPS connections to the Uyuni Server.
- The Uyuni account used by the MCP Server has only the permissions required for the intended tools.
- A supported MCP client is installed.
- The MCP client supports streamable HTTP and OAuth when these features are required.

2.2. Client-managed container with stdio

In this model, the MCP client starts the container and communicates with it over stdio. No host port is published.

1. Create a protected environment file for the server configuration:

```
UYUNI_SERVER=https://server.example.com
UYUNI_USER=mcp-reader
UYUNI_PASS=replace-me
UYUNI_MCP_SSL_VERIFY=true
UYUNI_MCP_WRITE_TOOLS_ENABLED=false
```

   Restrict access to this file because it contains credentials. See Server Configuration for all settings.

2. Configure the MCP client to run:

```
podman run -i --rm \
  --env-file /absolute/path/to/mcp.env \
  registry.suse.com/suse/agentic/mcp/multi-linux-manager:<version>
```

   Replace <version> with a tested release tag. Pin a release tag instead of using latest in a production configuration.

Continue with stdio client configuration.

2.3. Standalone HTTP server

Use HTTP mode when a persistent service must support multiple clients.

1. Create a protected environment file for the server configuration:

```
UYUNI_SERVER=https://server.example.com
UYUNI_MCP_SSL_VERIFY=true
UYUNI_MCP_WRITE_TOOLS_ENABLED=false
UYUNI_MCP_TRANSPORT=http
UYUNI_MCP_HOST=0.0.0.0
UYUNI_MCP_PORT=8000
UYUNI_MCP_PUBLIC_URL=https://mcp.example.com
UYUNI_AUTH_SERVER=https://idp.example.com/realms/mcp
```

   When UYUNI_AUTH_SERVER is set, the MCP Server uses each client's OAuth token to authenticate to the Uyuni API. In this configuration, UYUNI_USER and UYUNI_PASS are not required.

2. Start the container:

```
podman run --rm \
  --env-file /absolute/path/to/mcp.env \
  -p 8000:8000 \
  registry.suse.com/suse/agentic/mcp/multi-linux-manager:<version>
```

3. Configure TLS termination for https://mcp.example.com and route requests to port 8000.

4. Connect the MCP client to:

```
https://mcp.example.com/mcp
```

The application serves plain HTTP itself. Do not expose it directly to an untrusted network.



If UYUNI_AUTH_SERVER is not set, HTTP requests to the MCP Server are unauthenticated. Only omit authentication for temporary testing on an isolated interface or network.

Complete the OAuth configuration described in OAuth configuration before allowing user access.

Chapter 3. Server Configuration

This chapter describes the environment variables for configuring the Uyuni connection, transport, tools, logging, and system bootstrap.

3.1. Uyuni connection

Variable	Required	Default	Description
UYUNI_SERVER	Yes	-	Base URL of the Uyuni Server. If the scheme is omitted, https is used. A path, query, or fragment is not allowed.
UYUNI_USER	For basic auth	-	Uyuni user name. Use with UYUNI_PASS when UYUNI_AUTH_SERVER is not set.
UYUNI_PASS	For basic auth	-	Password for UYUNI_USER.
UYUNI_MCP_SSL_VERIFY	No	true	Verifies the TLS certificate presented by the Uyuni Server. Values false, 0, and no disable verification.
UYUNI_MCP_TIMEOUT	No	30	HTTP request timeout in seconds. The connection timeout remains 10 seconds.



Do not disable certificate verification in production. Install the issuing CA certificate in the container or host trust store instead.

3.2. Transport and service

Variable	Required	Default	Description
UYUNI_MCP_TRANSPORT	No	stdio	Transport mode. Valid values are stdio and http.
UYUNI_MCP_HOST	HTTP only	127.0.0.1	Address on which the HTTP server listens.
UYUNI_MCP_PORT	HTTP only	8000	Port on which the HTTP server listens.
UYUNI_MCP_PUBLIC_URL	OAuth HTTP deployment	Derived from host and port	External base URL advertised to OAuth-capable clients. Set the client-facing URL, without /mcp.
UYUNI_AUTH_SERVER	Recommended for HTTP	-	OpenID Connect issuer URL. A path is allowed. When omitted, the MCP HTTP endpoint does not authenticate clients.

3.3. Tools and logging

Variable	Required	Default	Description
UYUNI_MCP_WRITE_TOOLS_ENABLED	No	false	Registers tools that modify Uyuni. Values true, 1, and yes enable them.
UYUNI_MCP_LOG_FILE_PATH	No	Console	Path to the server log file.
UYUNI_MCP_LOG_LEVEL	No	INFO	Logging level, for example DEBUG, INFO, WARNING, ERROR, or CRITICAL.



Changing UYUNI_MCP_WRITE_TOOLS_ENABLED requires a process restart because the server registers tools during startup.

3.4. System bootstrap

The add_system tool requires these additional variables:

Variable	Required	Description
UYUNI_SSH_PRIV_KEY	For add_system	Private SSH key used to bootstrap the target. Store the key as one line with each newline represented by the literal \n sequence.
UYUNI_SSH_PRIV_KEY_PASS	No	Passphrase for the private SSH key.



Do not place the key directly in an MCP client configuration that is synchronized or shared. Prefer a protected environment file or a secrets-management system.

3.5. Example read-only configuration

The following example uses basic authentication with UYUNI_USER and UYUNI_PASS.

```
UYUNI_SERVER=https://server.example.com
UYUNI_USER=mcp-reader
UYUNI_PASS=replace-me
UYUNI_MCP_SSL_VERIFY=true
UYUNI_MCP_TIMEOUT=30
UYUNI_MCP_TRANSPORT=stdio
UYUNI_MCP_WRITE_TOOLS_ENABLED=false
UYUNI_MCP_LOG_LEVEL=INFO
```

Chapter 4. MCP Client Configuration

This chapter provides example stdio and HTTP client configurations and explains how to verify the integration.

MCP configuration formats differ across various clients. Use the examples in this chapter as a template and consult the client documentation for the exact property names and configuration file location.

4.1. Configure a stdio client

The following generic configuration starts a container for each MCP client session:

```
{
  "mcpServers": {
    "mcp-server-uyuni": {
      "command": "podman",
      "args": [
        "run",
        "-i",
        "--rm",
        "--env-file",
        "/absolute/path/to/mcp.env",
        "registry.suse.com/suse/agentic/mcp/multi-linux-manager:<version>"
      ]
    }
  }
}
```

The -i option is required because MCP uses the container's standard input and output. Use an absolute path to the environment file.

4.2. Configure an HTTP client

After deploying the standalone server, configure the client with its streamable HTTP endpoint:

```
{
  "mcpServers": {
    "mcp-server-uyuni": {
      "url": "https://mcp.example.com/mcp",
      "type": "http"
    }
  }
}
```

The client must be able to complete OAuth authorization against the issuer configured with UYUNI_AUTH_SERVER. The exact transport name in a client configuration can be http or streamable-http, depending on the client.

4.3. Verify the integration

Restart the MCP client after changing its configuration. Then make low-risk, read-only requests, for example:

- "List the first five active systems."
- "Find systems with web in the hostname."
- "List the first ten systems that need a reboot."

Confirm that the returned system names and IDs are aligned with the Uyuni Web UI.

4.4. Use tools efficiently

MCP tool output consumes AI context. When explicitly selecting tools, directing an assistant to use a particular tool, or implementing an agent workflow, apply these practices:

- Start with summarize_system_updates or summarize_fleet_updates.
- Use pagination parameters and follow meta.next_offset.
- Set include_cves or include_updates only when details are required.
- Use find_systems_by_name before a tool call when a hostname is ambiguous.
- Ask the assistant to show the target system ID, action ID, or erratum ID before a state-changing call.

Chapter 5. Security

This chapter describes authentication, write-tool controls, deployment hardening, and security considerations for AI-assisted operations.

The MCP Server can query and modify managed infrastructure. Treat it as a privileged administrative interface.

5.1. Security model

The server supports two authentication paths:

Basic Uyuni authentication

In a stdio or trusted deployment, the server logs in with UYUNI_USER and UYUNI_PASS. All MCP clients that use that process receive the permissions of this account.

OAuth bearer token

In an authenticated HTTP deployment, the MCP Server validates the caller's token and forwards it to the Uyuni OIDC login endpoint. Uyuni then maps the token to an existing active user.

Use a dedicated, least-privileged Uyuni account for basic authentication. For a multi-user HTTP deployment, use OAuth so that actions retain individual user identity and permissions.

5.2. OAuth configuration

The MCP Server expects an OpenID Connect issuer. It retrieves signing keys from:

```
<UYUNI_AUTH_SERVER>/protocol/openid-connect/certs
```

Tokens accepted by the MCP Server must:

- Have an issuer that exactly matches UYUNI_AUTH_SERVER.
- Include the mcp-server-uyuni audience.
- Include the mcp:read scope.
- Include the mcp:write scope when write tools are enabled.

Configure the same identity provider on the Uyuni Server in /etc/rhn/rhn.conf:

```
web.oidc.enabled = true
web.oidc.idp.issuer = https://idp.example.com/realms/mcp
```

You can explicitly set the JSON Web Key Set path:

```
web.oidc.idp.jwks_path = /realms/mcp/protocol/openid-connect/certs
```

If the path is not set, Uyuni discovers it from the issuer's /.well-known/openid-configuration document.

The default Uyuni audience and username claim are:

```
web.oidc.jwt.audience = uyuni-server
web.oidc.jwt.username_claim = preferred_username
```

The token forwarded to Uyuni must include:

- The uyuni-server audience, in addition to the mcp-server-uyuni audience.
- A sub claim.
- A configured username claim whose value matches an existing active Uyuni user.

Restart the relevant Uyuni services after changing rhn.conf.

5.3. Write tool controls

State-changing tools are not registered unless UYUNI_MCP_WRITE_TOOLS_ENABLED=true.

When write tools are enabled, the server asks for confirmation before a change if the MCP client advertises the MCP elicitation capability. Clients without elicitation support do not receive this server-side confirmation. Such clients are responsible for their own approval user experience.



Do not rely on elicitation as the only authorization control. Use Uyuni role-based access control permissions, OAuth scopes, network restrictions, and client-side tool approval policies.

Enable write tools only for a deployment where they are required. For high-risk operations:

- Resolve and verify the target system ID.
- Review the generated arguments before approval.
- Apply changes to a small scope first.
- Verify the resulting scheduled action in the Uyuni Web UI.

Using the remove_system tool is a destructive operation. When cleanup=true, the tool requests forced deletion and cleanup of the system.

5.4. Hardening the deployment

You can harden the MCP Server deployment by applying the following controls:

- Provide TLS termination for HTTP deployments.
- Never expose unauthenticated HTTP mode to an untrusted network.
- Keep UYUNI_MCP_SSL_VERIFY=true.
- Store passwords, OAuth configuration, and SSH private keys in a secrets-management system or protected environment file.
- Pin the MCP Server container to a reviewed release.
- Use INFO or WARNING logging in production and protect log files from unauthorized access.
- Restrict network access from the MCP Server to the required Uyuni and identity-provider endpoints.

5.5. AI and prompt security

An AI assistant can use text from prompts and external content when deciding whether and how to call a tool. This content might contain misleading or malicious instructions. Treat any tool call based on untrusted content as untrusted until you review it.

Configure the MCP host to require explicit approval for state-changing tools. Before approval, verify the tool name, target IDs, update or action IDs, and all arguments. Do not provide secrets in prompts. Do not ask the model to reproduce environment variables, access tokens, passwords, or private keys.

Chapter 6. Tool Reference

This chapter provides a reference to the tools exposed by the Uyuni MCP Server, including their arguments, results, and effects.

The Uyuni MCP Server exposes read-only tools by default. Tools in the state-changing section are available only when UYUNI_MCP_WRITE_TOOLS_ENABLED=true.

Most tools that accept system_identifier support a system name or system ID. If a name is not found or is ambiguous, call find_systems_by_name and use the returned ID.

6.1. Systems and events

Tool	Arguments	Result
list_systems	limit=50, offset=0	Paged active systems. limit is capped at 500.
get_system_details	system_identifier	System ID, name, last boot time, UUID, CPU, network, and installed products.
get_system_event_history	system_identifier, offset=0, limit=10, optional earliest_date	Newest-first event history.
get_system_event_details	system_identifier, event_id	Status, timestamps, result fields, and additional information for one event.
find_systems_by_name	name, limit=50, offset=0	Paged hostname matches.
find_systems_by_ip	ip_address, limit=50, offset=0	Paged systems matching an IP address.
list_systems_needing_reboot	limit=50, offset=0	Paged systems requiring a reboot. limit is capped at 500.

6.2. Updates and CVEs

The supported advisory type values are Security Advisory, Product Enhancement Advisory, and Bug Fix Advisory.

Tool	Arguments	Result
get_system_updates	system_identifier	Compact pending update list and counts. CVE expansion is omitted.
summarize_system_updates	system_identifier, optional advisory_types	Pending and queued update counts without update details.

Tool	Arguments	Result
query_system_updates	system_identifier, limit=25, offset=0, include_cves=false, optional advisory_types	Paged pending updates. A positive limit is capped at 200; a non-positive value returns counts without items.
check_all_systems_for_updates	include_updates=false, include_cves=false, system_limit=25, system_offset=0, updates_per_system=10	Paged systems with pending updates. system_limit is capped at 200.
summarize_fleet_updates	system_limit=25, system_offset=0	Paged systems and update counts without update details. system_limit is capped at 200.
list_systems_needing_update_for_cve	cve_identifier, limit=50, offset=0	Paged systems affected by the specified CVE.
get_unscheduled_errata	system_id	Applicable patches that are not scheduled. system_id must be a numeric string.

6.3. Actions, activation keys, and groups

Tool	Arguments	Result
list_all_scheduled_actions	limit=50, offset=0, optional action_types, optional scheduler	Paged actions after exact-match filtering. limit is capped at 500. The metadata lists observed action types and schedulers for subsequent filters.
list_activation_keys	None	Activation keys available to the current user.
list_system_groups	None	Group ID, name, description, and system count.
list_group_systems	group_name	System IDs and names in the specified group.

6.4. State-changing tools



These tools change managed infrastructure. Review all arguments and the intended targets before approving a call.

Tool	Arguments	Effect
schedule_pending_updates_to_system	system_identifier	Schedules all pending updates for one system.

Tool	Arguments	Effect
schedule_specific_update	system_identifier, errata_id	Schedules one patch for one system.
add_system	host, optional activation_key, ssh_port=22, ssh_user=root, proxy_id, salt_ssh=false	Bootstraps and registers a system over SSH. Requires UYUNI_SSH_PRIV_KEY. If the client supports elicitation, a missing activation key can be requested interactively.
remove_system	system_identifier, cleanup=true	Removes a system. cleanup=true requests forced deletion and cleanup; false requests no cleanup.
schedule_system_reboot	system_identifier	Schedules an immediate reboot.
cancel_action	action_id	Cancels the specified scheduled action.
create_system_group	name, optional description	Creates a system group.
add_systems_to_group	group_name, system_identifiers	Adds the specified systems to a group.
remove_systems_from_group	group_name, system_identifiers	Removes the specified systems from a group.

The add_system API can continue processing after the MCP Server request timeout. When the tool reports that the addition process has started, check the system list later rather than immediately repeating the call.

6.5. Pagination controls

Tools that can return large result sets support pagination with limit and offset arguments. Paginated responses include a meta object that describes the current page and provides next_offset when more results are available. Pagination limits response size, reduces latency, and lowers AI context usage.

Chapter 7. Troubleshooting

This chapter describes common problems that can occur when configuring or operating the Uyuni MCP Server and provides guidance for resolving them.

Start troubleshooting with a read-only tool such as list_systems. Set UYUNI_MCP_LOG_LEVEL=DEBUG temporarily when the default log level does not provide enough information. Debug logs can contain sensitive operational data; protect and remove them according to your logging policy.

7.1. Startup problems

Message or symptom	Resolution
Missing required environment variables: UYUNI_SERVER	Set UYUNI_SERVER in the environment visible to the MCP Server process. For a client-managed container, verify the absolute path supplied to --env-file.
UYUNI_SERVER must use http or https and include a host	Use a URL such as https://server.example.com.
UYUNI_SERVER must not include a path	Remove paths such as /rhn and use only the server base URL.
UYUNI_MCP_TRANSPORT must be either 'stdio' or 'http'	Set the value to exactly stdio or http.
The stdio server disconnects immediately	Run the configured command in a terminal and inspect stderr. Verify the image tag, environment-file path, -i container option, and Uyuni URL.
The HTTP client receives a connection error	Verify the bind address, published port, external route, and that the client URL ends in /mcp.

7.2. Authentication and authorization

Message or symptom	Resolution
HTTP 401 or 403 during Uyuni login	For basic authentication, verify UYUNI_USER, UYUNI_PASS, account status, and permissions. For OAuth, verify issuer, audiences, scopes, username claim, and the matching active Uyuni user.
OAuth discovery or token validation fails	Ensure UYUNI_MCP_PUBLIC_URL is the externally reachable HTTPS base URL. Confirm that UYUNI_AUTH_SERVER exactly matches the token iss claim and that its signing-key endpoint is reachable by the MCP Server.

Message or symptom	Resolution
MCP authentication succeeds but Uyuni OIDC login fails	Ensure the token includes both mcp-server-uyuni and uyuni-server audiences, includes sub, and contains the configured username claim.
A read tool is available but a write tool is missing	Set UYUNI_MCP_WRITE_TOOLS_ENABLED=true and restart the MCP Server. In OAuth mode, obtain a token with both mcp:read and mcp:write.
The user can call a tool but the operation is denied	Grant only the required Uyuni permissions to the user. MCP availability does not override Uyuni authorization.

7.3. Connectivity and certificates

A network error or timeout indicates that the MCP Server could not complete a request to Uyuni.

1. Resolve UYUNI_SERVER from the MCP Server host or container.
2. Verify TCP and TLS connectivity to the configured port.
3. Confirm that proxies and firewalls allow the connection.
4. Verify that the server certificate is valid for the configured hostname and that its CA is trusted.
5. Increase UYUNI_MCP_TIMEOUT only after checking server and network health.

Do not use UYUNI_MCP_SSL_VERIFY=false as a permanent certificate fix.

7.4. Tool-call problems

Message or symptom	Resolution
A system name is not found or resolves ambiguously	Call find_systems_by_name and pass the numeric system_id to the next tool.
Invalid system_id ... Provide system_id as a numeric string	The get_unscheduled_errata tool does not accept a hostname. Supply the system ID as digits.
You need to provide an activation key	The MCP client does not support elicitation. Pass activation_key explicitly to add_system.
UYUNI_SSH_PRIV_KEY environment variable is not set	Set the complete private key with literal \n separators in the MCP Server environment and restart the process.
System addition reports that the process started	The bootstrap request exceeded the request timeout but can still be running on Uyuni. Check the system list and server logs before retrying.

Message or symptom	Resolution
An operation returns Operation cancelled	The elicitation request was declined, cancelled, or not explicitly approved. Review the arguments and invoke the tool again only if the change is intended.

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