Network Connection

To operate ***BLADE//runner*** via GUI from your PC, you will need to connect to ***BLADE//runner*** and start a web browser session. The computer may connect either directly to the unit, or (more usually) via a network switch or hub.

Direct

Figure 26 Direct Connection

Networked

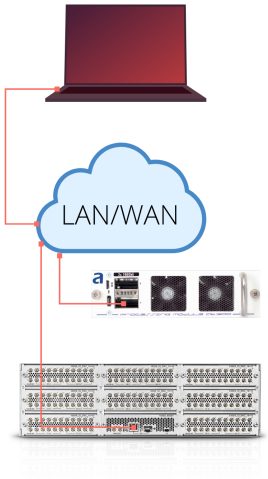

Figure 27 Networked Connection

Outband management control of a AT300 blade can be done by connecting to the front management port of a AT300 or by connecting to the rear management port via central management port of the MGMT module.

Inband management of a AT300 is possible via any 100GE interface. IPv4 or IPv6 are supported.

As each interface is belonging to a separate namespace (behaves like separate own device), IP addresses may be identical on different interfaces.

PC IP Configuration

To establish network communication, you will need to configure the IP settings of your computer's Network Interface card and each ***BLADE//runner*** unit.

Once you have established a connection, you can configure the IP address.

Direct Connection

If your computer is connected directly to ***BLADE//runner*** , then configure your computer's network interface as follows:

- **IP Address** - in the same range as that of the ***BLADE//runner*** network port.

For example, if the ***BLADE//runner*** IP Address is 172.16.1.4, then set your computer IP Address to 172.16.1.100.

- **Subnet Mask** - identical to that of the ***BLADE//runner*** network port (default Subnet Mask = 255.255.0.0).

The screenshots on the next page demonstrate this procedure.

Connection via a Network Switch or Hub

In a networked installation, it is likely that you will be connecting multiple devices and/or computers. Each device on the network requires a unique IP address which may be assigned either dynamically (via DHCP) or statically (Static IP). Please consult your network administrator for details.

> ***BLADE//runner*** supports DHCP (default) and Static IP addresses alternatively.
>
> To change an IP address of ***BLADE//runner*** , connect your computer directly, start a web browser session and **configure the IP address**.

Default addresses:

The rear management and the 100GE ports are set to DHCP.

The USB-C front management port is set to `172.16.2.3`. The port is compatible with USB-C to Ethernet adapters.

Computer Network Interface IP Settings

The following screenshots demonstrate how to configure the IP settings in Windows, Mac OS X and Ubuntu.

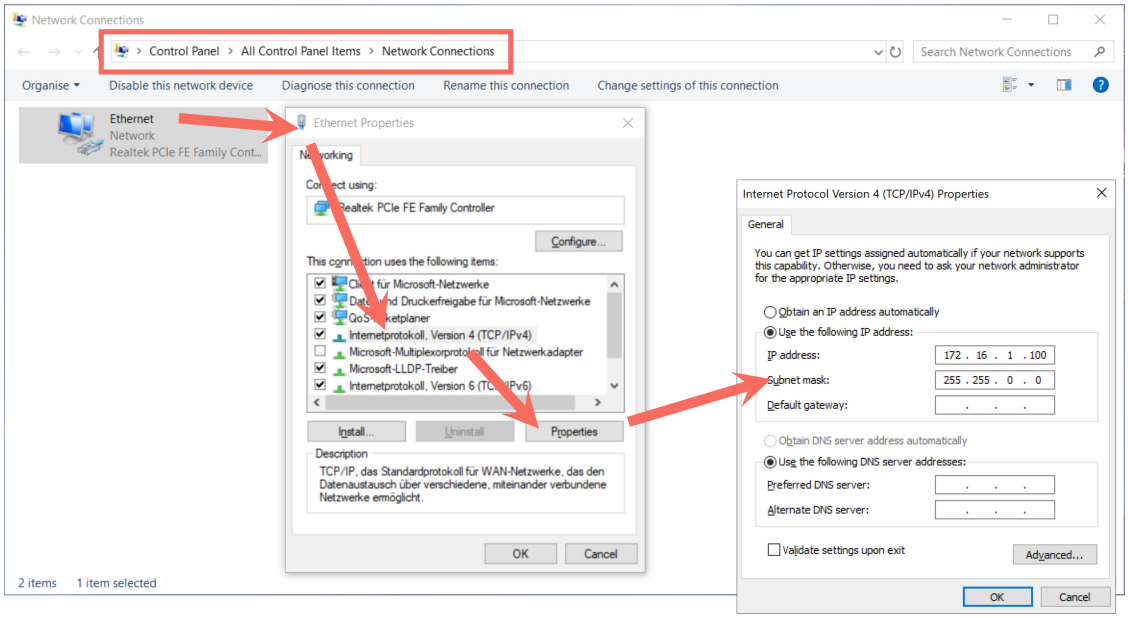

Figure 28 **Windows**: see **www.microsoft.com**

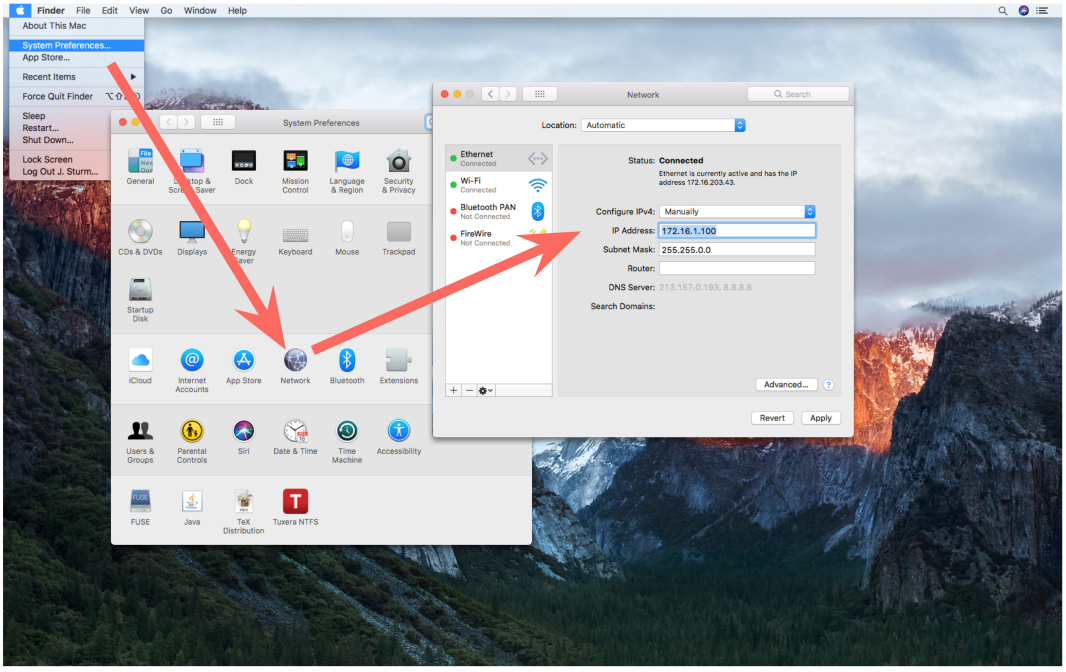

Figure 29 **MAC OS X**: see **www.apple.com**

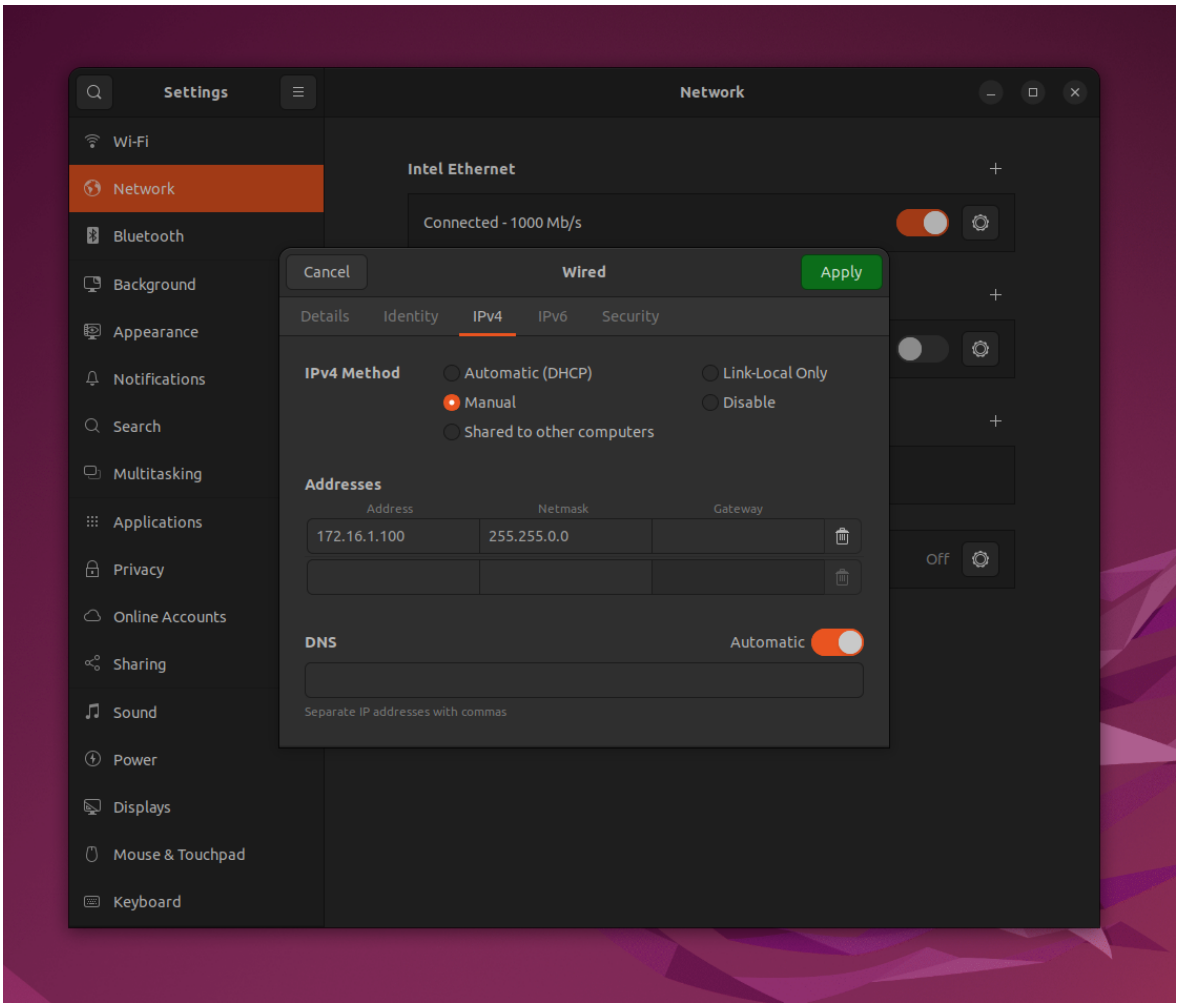

Figure 30 **Ubuntu**: Open Settings -> Network, click the gearwheel button and go to the IPv4 tab

Web Browser Control

Having connected and **configured** the network connection between your computer and ***BLADE//runner*** , you may open a web browser session to control the system's parameters.

See **Starting a Web Browser Session** for details.

Troubleshooting the Connection

If the GUI does not appear, then please check the following:

- **URL Address** - this must match that of the ***BLADE//runner*** system. See **IP configuration**.
- **Physical network connection** - See Network Connection.
- **IP configuration** - if you are connecting via a network switch or hub, then try a direct connection to eliminate the network infrastructure. If the login screen still does not appear, then run a ping test to check your network communication.
- **Firewall** or **Antivirus Software** - some software may interfere with web browser communication. Try disabling your Firewall and/or Antivirus to eliminate them as the cause of the problem.

If the login screen appears, but you are unable to login to ***BLADE//runner*** , then check that the following options are enabled in your Web Browser's settings:

- **Javascript**
- **Websocket**

PING Command

The PING command is a built-in function on Windows, Mac and Linux, that allows you to test whether you have a valid network connection to and from any networked device.

Make sure that your computer is connected to the ***BLADE//runner*** 's network port, and that you have configured the **IP settings** of your computer's Network Interface card. Then run the test:

- On a Windows PC, select `START` -> `Run...` and type **cmd** into the Run window followed by `OK` .

This opens the DOS command prompt window.

Alternatively:

- On a Mac, open the **Terminal** program (found in the **Applications** -> **Utilities** folder).
- Type the following to test the connection:

`ping <ip address of BLADE//runner >`

E.g.: IP is set to 172.16.1.4, then enter: `ping 172.16.1.4`

- Press `ENTER` .

Your computer will now try to establish communication.

- If the ping command fails, then the request will time out, and you will not receive any successful packets.

Check your physical network connections, and also the IP settings on your computer's network interface card.

- If the ping command is successful, then the result will show that the sent packets have been successfully received.

This confirms that the network communication is working. If your browser connection continues to fail, check the URL address and/or disable any Firewall or Antivirus software.

Serial connection with smartphone

If you can't get access to a blade over its ethernet ports and need to show or configure its IP addresses, you can connect through a serial connection using your android smartphone. You can find further information on that **here**.

Next Steps

Having installed the unit and established web browser communication, it is a good idea to check the software revision and, if necessary, perform a **software update**. The latest software revision is available from our **dropbox download page**.

See **Software Update** for details.

Security

SSH Login

You access ***BLADE//runner*** via ssh from your PC as described below.

Default credentials are *user*= `root` and *password*= `fisch`.

Prerequisites:

Linux

Make sure that you have installed a ssh client software like openssh-client. You can check that by opening a terminal and enter `which ssh`. If you get a print like `/usr/bin/ssh` you're ready to go. If you don't get a response, you can install it with `apt install openssh-client`.

Mac

A ssh client is already installed in OS X, so you just need to follow the connection instructions.

Windows

Since Windows 10 1809, a openssh client is preinstalled on the system. If your system is older, you can install a software like **putty** and follow their instructions on how to open a ssh connection.

Open connection

To connect to ***BLADE//runner*** via ssh:

- open a terminal (or in windows a powershell) and
- write: `ssh root@<ip address of your BLADE//runner >`.
  - On a new connection to a formerly unknown host device, you will be asked if you want to accept the new connection.
- On the password prompt, enter `fisch` to open a connection.

Access Control and User Authentication

To restrict which user can perform changes through HTTP or websocket connections to the system state, you can activate access control by creating user accounts.

If no user accounts exist on a machine then access control is disabled.

Supported user roles

The following roles are currently checked:

- read-write Allows modifying most of the system state except network configuration
- net-admin Allows modifying the network configuration like IP addresses

Creating user accounts

To create a user account connect to the machine via SSH or using the serial console and execute the following command:
`vm-adduser USERNAME [ROLE ROLE ...]`

When no roles are set for a user, then that user has read only access

Creating a super user account

It is also possible to create a super user account:
`vm-adduser USERNAME --all`

HTTPS login and default access

Once user accounts exist all access to the machine requires a HTTPS basic auth login (the logged in user is stored in the session).

Accessing ***BLADE//runner*** per browser will prompt a login window. You can logout with the button on the right side of the navigation bar.

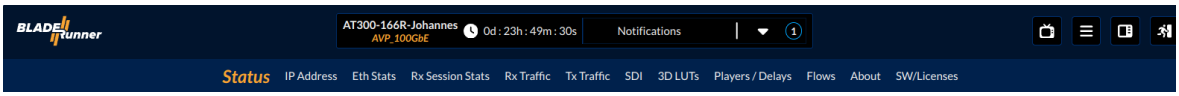

Figure 31 Navigation Bar - Logout

It is possible to allow access without login by enabling a default access:
`vm-adduser --default [ROLE ROLE ...]`

When no roles are specified the default is read only access

Deleting user accounts

To delete an user account or default setting you can use the following command:

```
vm-deluser --default
vm-deluser USERNAME
```

Preventing SSH login using the default Password

Enhance the security of your environment by disabling default SSH login by password authentication

To prevent someone from accessing the machine via SSH using the default password you should disable password based SSH authentication:
`disable_ssh_password.sh`

This tool will update the sshd configuration file to only access public key based authentication (it will warn when no authorized keys are installed). You need to reboot after making this change. Password based login via the serial console will still be possible.

SSL Certificates

To gain access to your machine over a SSL secured connection, you have to install a key and a certificate in its filesystem.

To create and install a self-signed key and certificate with OpenSSL, open a terminal and create a new key and certificate with:

```
openssl ecparam -name prime256v1 -genkey -noout -out key.pem
openssl req -new -x509 -key key.pem -out cert.pem -days 360
```

- Modify the parameters, like key length or expiration time to match your needs. For more information, have a look at the **official openssl documentation**
- The keyfile has to be called “key.pem” and the certificate “cert.pem”
- Copy the files to your machine: `scp key.pem cert.pem root@<ip address of BLADE//runner >/config/httpd/`
- Reboot the machine
- Open a browser session to your machine
  - If a warning about self-signed certificates shows up, you have to add an exception in your browser
  - Chrome / webkit browsers: click on the “advanced” button and then on “proceed to <ip address of ***BLADE//runner*** > (unsafe)”
  - Firefox: click on the “advanced” button and then on “Accept the risk and continue”

Some functions of the landing page are only available on a secured connection (e.g. copy to clipboard)

Operation/Monitoring (Web Browser Control)

This chapter covers the operation of ***BLADE//runner*** from the web browser user interface.

Please check that your computer meets the recommended **system requirements** for web browser control. We are assuming that you have **powered on *BLADE//runner***, and established and configured a network connection between ***BLADE//runner*** and your computer.

Operating Principles

- **Starting a Web Browser Session**
- **Menu Selection & Navigation**

Starting a Web Browser Session

Having connected and configured the network connection between your computer and ***BLADE//runner*** , you may open a web browser session to control the system's parameters.

> You may use any web browser which supports web worker, HTML5 and JSON. Please use the latest revision of your browser for performance requirements.
>
> Web browser applications can be downloaded, free of charge, from the relevant providers.

1.

Open your browser software, and enter the IP address of ***BLADE//runner*** into the URL field.

For example, if the unit is set to the IP address "172.16.1.4" you would type `http://172.16.1.4` and press `Enter` .

The browser connects and the "Landing Page" GUI appears:

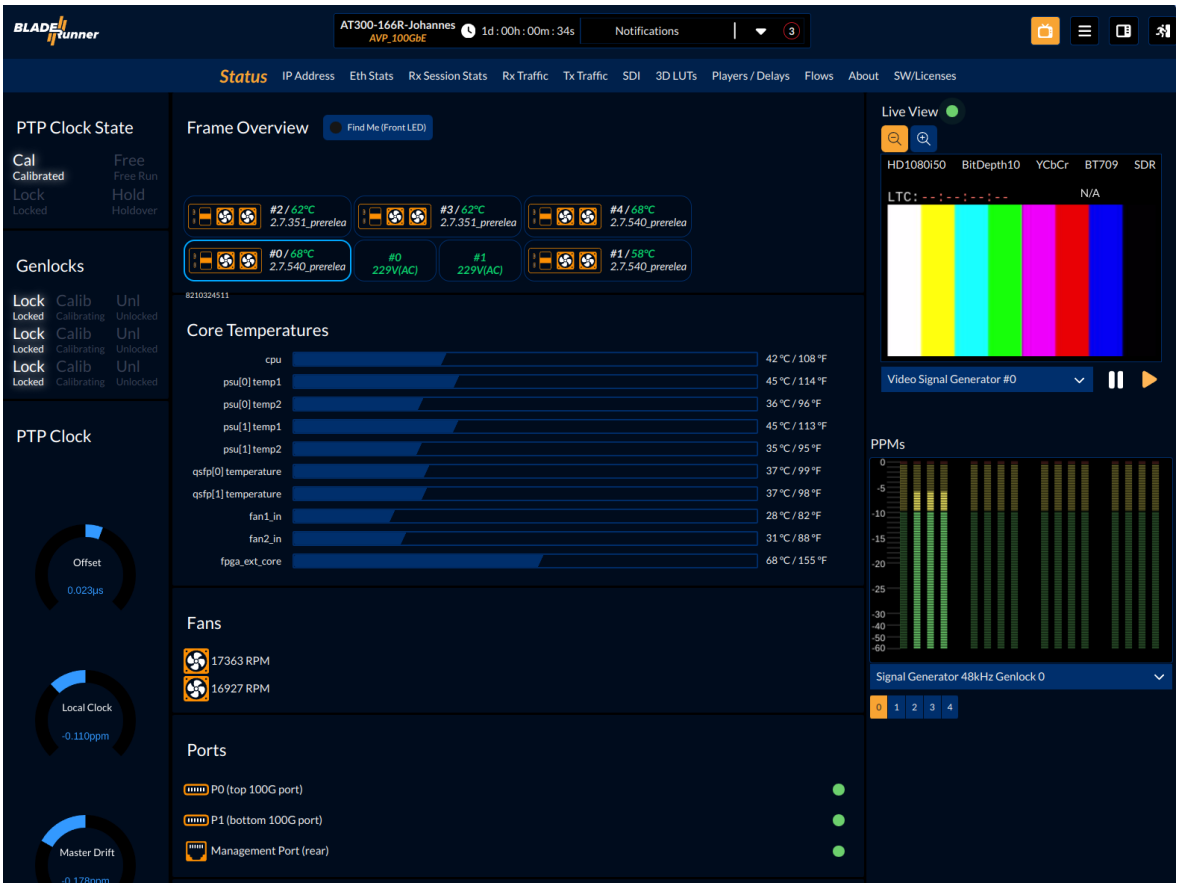

Figure 32 Landing Page

If the page does not appear, please follow the steps described in the chapter Troubleshooting the Browser Connection.

If the browser loses its connection to ***BLADE//runner*** , then click on the browser's `Refresh` button to reconnect - you are returned to the status section. If the refresh does not work, then restart the web browser and troubleshoot the connection.

Menu Selection & Navigation

After accessing the GUI, you are presented with a horizontal navigation bar:

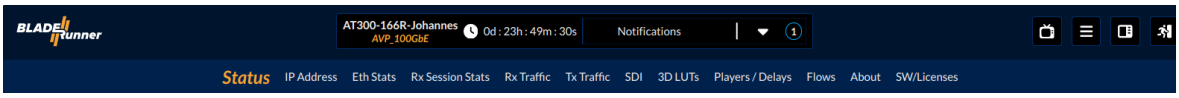

Figure 33 Landing Page - Navigation Bar

Depending on the selected app, there can be a different set of sections available. The persistent sections with their basic functionality are listed below.

Status	Live data of PTP, port status, fan speed and temperatures. A live view panel with audio meters. Plus download links for external usage.
IP Address	Overview of ports, defined IP addresses and port statistices. Plus LLDP information.
Eth Stats	Network traffic monitoring page per port
Rx Stats	RTP sessions overview
Rx Traffic	Video and audio receiver monitoring
Tx Traffic	Video and audio transmitter monitoring
SDI	SDI ports overview
3D LUTs	Management of lut definition with cube file upload
Flows (in development)	Assign inputs, outputs and processors like color correction, video mixer etc per drag and drop
About	Overview of general blade information, software changelog, copyright licenses and frame overview with data shared by i^2c
SW/Licenses	Management of licenses and simple **software update**

Status

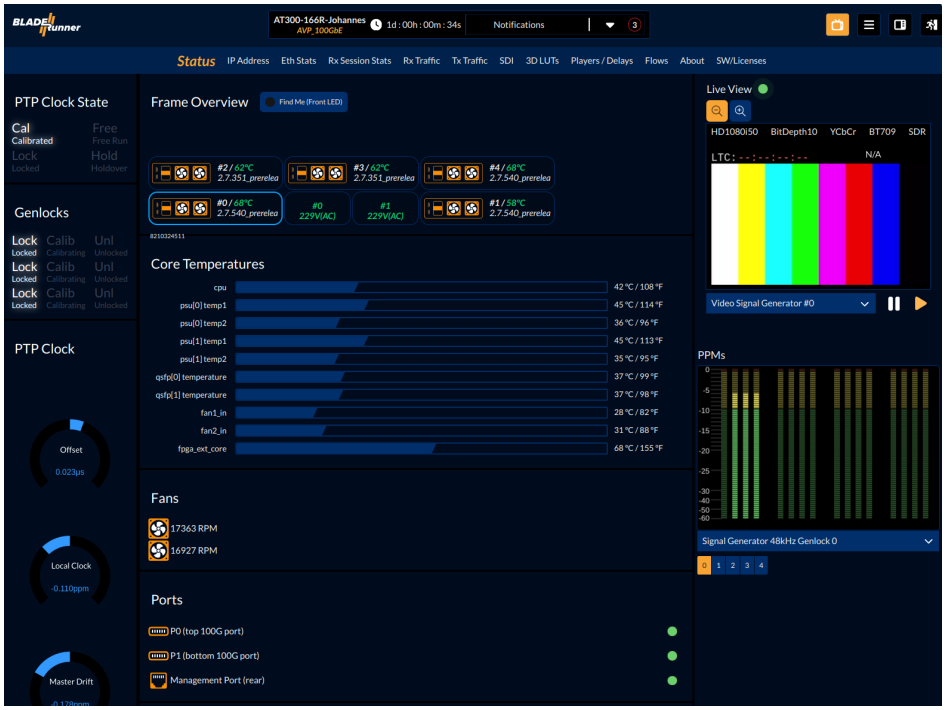

Figure 34 Landing Page - Status Section

In the Status section, you have following elements:

- PTP
  - PTP state
  - Genlock states
  - PTP clock
    - Offset
    - Local clock
    - Drift from master
- Live View
  - Live view monitoring
    - Source selection
    - Play/pause
    - Video standard
    - LTC information
  - Peak meter with source selection
- Temperatures
  - CPU
  - PSU 0 & 1
  - QSFP28 0 & 1
  - Fan intakes
  - FPGA core
- Downloads
  - Nodejs modules vapi, vscript, vutil. For more information, see ***V//api***
  - A vscode workspace template. For more information, see ***V//api***

IP Address

This subsection shows the IP settings of the network interfaces and LLDP neighbourhood information if available.

It also shows the RxPower of the transmitters in dBm and microwatts.

Figure 35 Landing Page - IP Adresses Section

About

This section shows information about installed Software-, Firmware- and FPGA-versions.

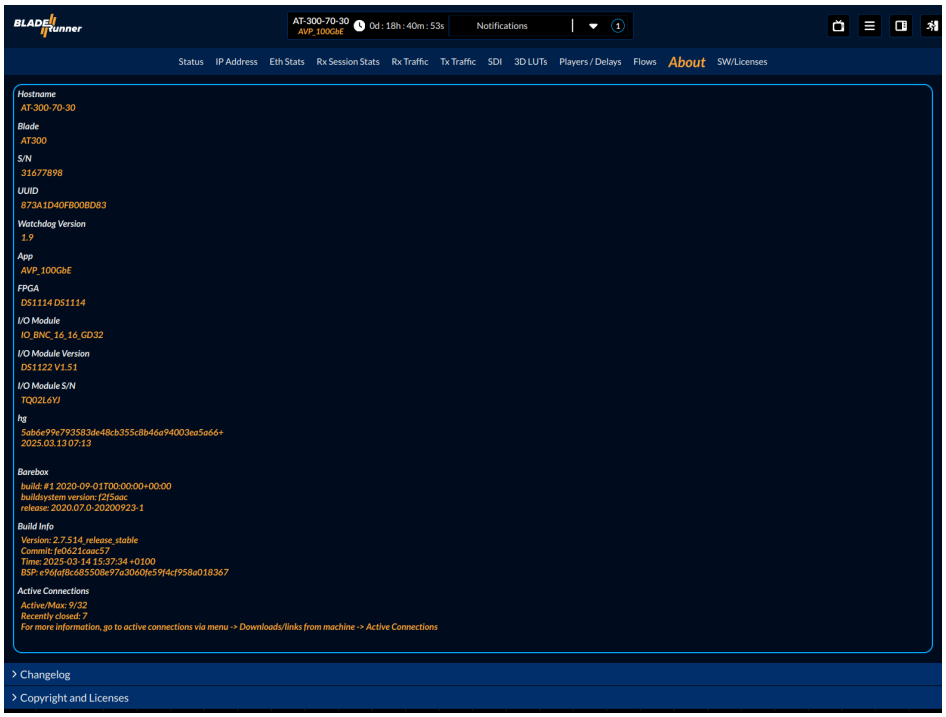

Figure 36 Landing Page - About Section

Advanced Settings

To open the advanced GUI, click the menu button in the navigation bar and the “Open Advanced GUI”:

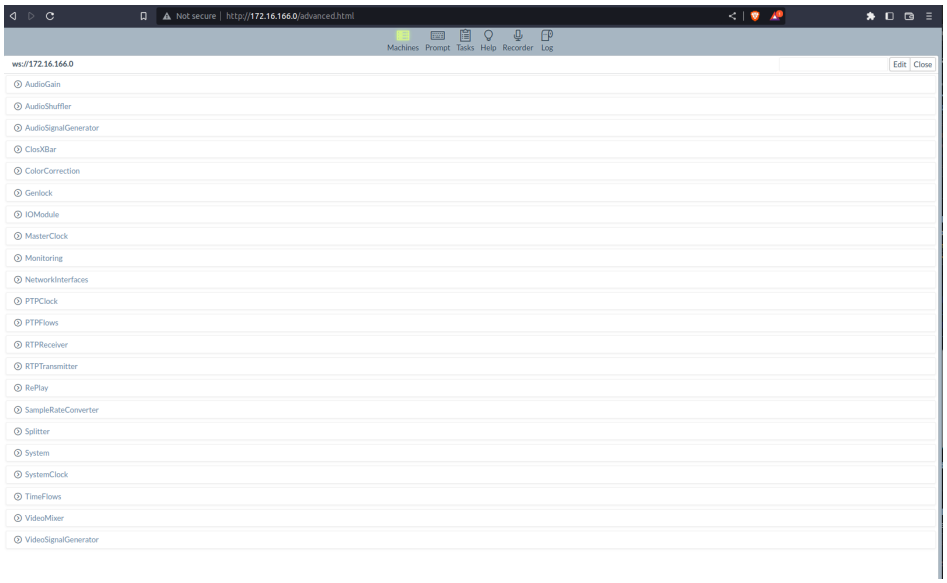

Figure 37 Advanced GUI

For more information about advanced settings menu, get started with the basic configuration chapter and online information.

Manual Configuration

Getting started with basic configuration. To start, open a browser session to ***BLADE//runner***

Defining interfaces

Use the Advanced GUI:

- Click on the menu button
- Click on “Open Advanced GUI”
- Click the “Edit” button in the top right corner
- Click on the “System” row
- Next to “select_fpga”, click on the three dots button and select an application
- Selected vm_app and interface mode is shown in `select_fpga` field
- Type **reboot** into `reboot` field and press `return`-key for execution
- ***BLADE//runner*** reboots and loads specified application

or

Use the GUI menu (available in prerelease/debug versions):

- Click on the menu button
- Hover over the “Select App” dropdown and select an application
- Under “partitions” click on the blue highlighted field to restart your application with the current software or click on another partition field to start your selected application with another software version.

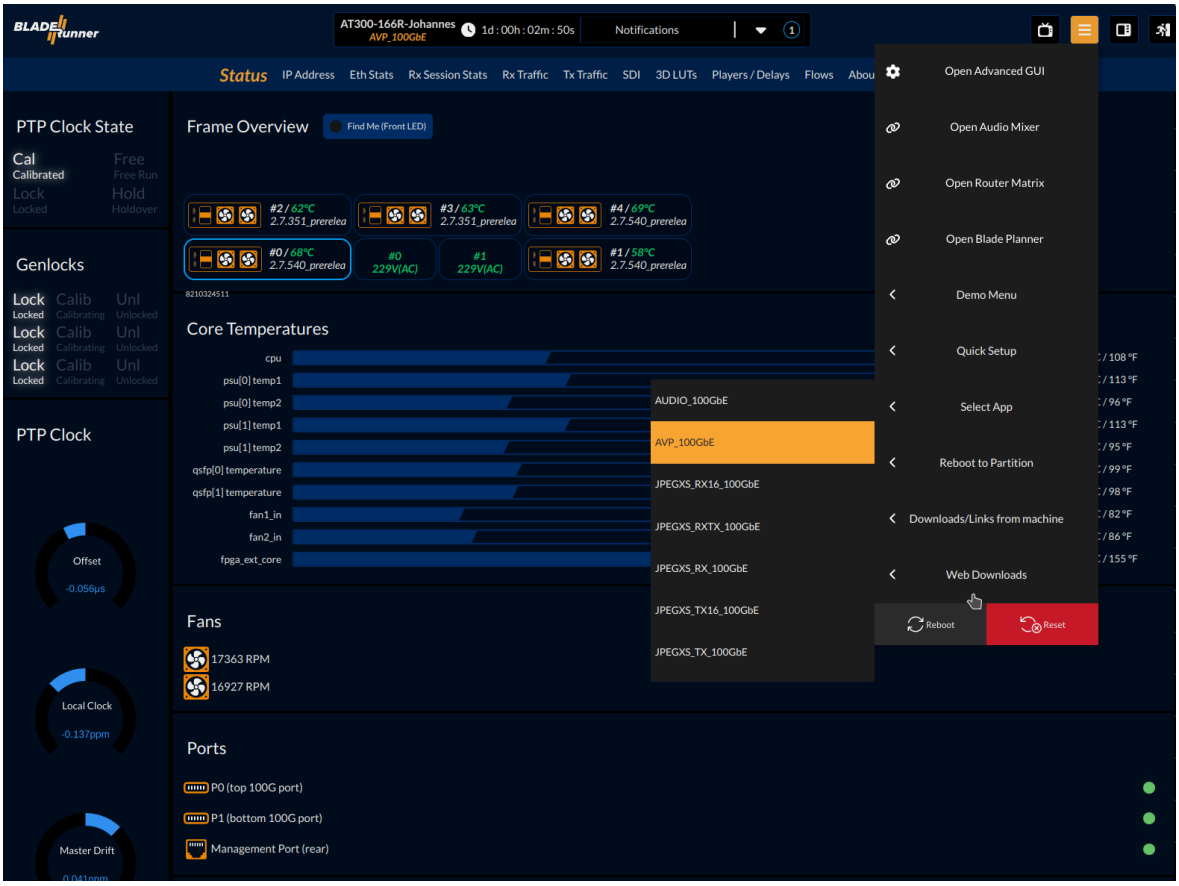

Figure 38 Landing Page - Menu

IP Configuration

As a simple example, if you want to disable DHCP and change the base IP address of port 0 (100GE port) to 172.16.1.4/16, open the advanced GUI and switch into edit mode by clicking the `Edit` button in the top right corner of the advanced GUI page. Then follow the steps:

- Open Network Interfaces
- Open port 0
- Open desired_configuration
- Open base
- Beneath `dhcp` click `false` and open ip_addresses
- In the `ip_address` field, enter *172.16.1.4* and press `Shift+Enter`
- In the `prefix` field, enter *16* and press `Shift+Enter`
- Click `Save interface`
- Reboot ***BLADE//runner***

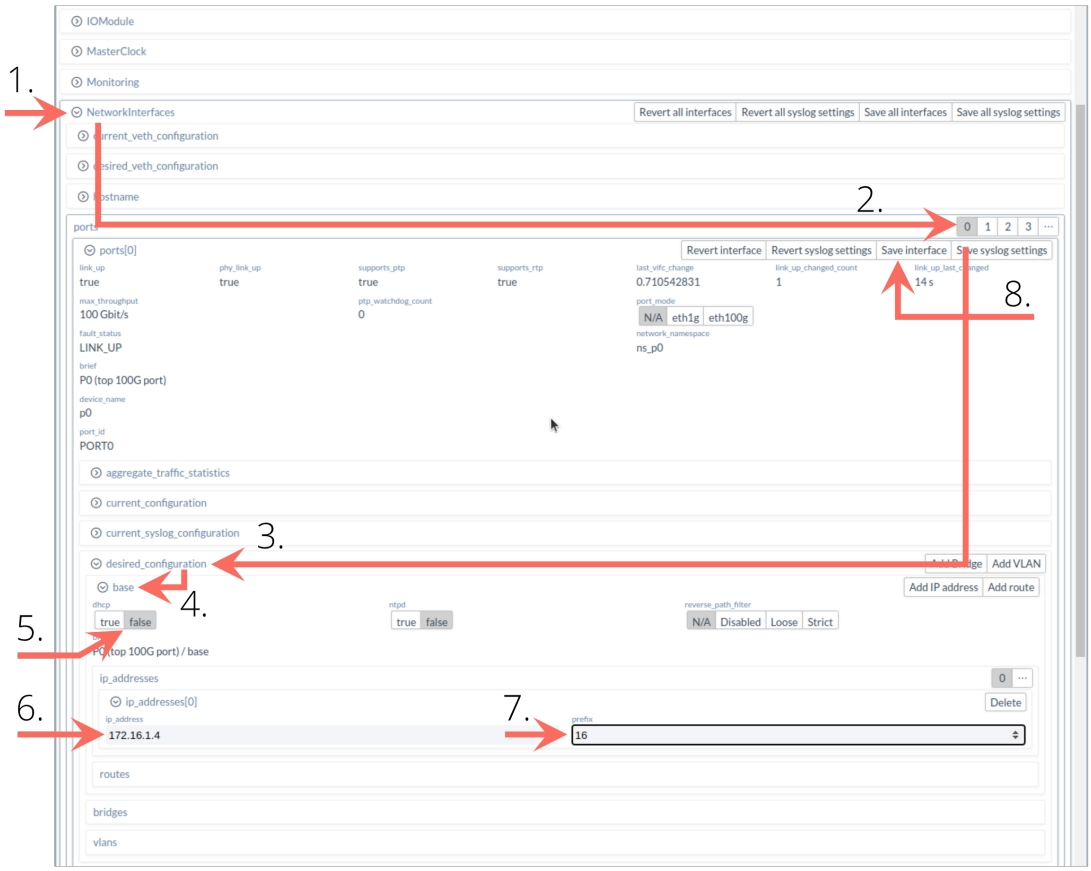

Figure 39 Advanced GUI - Network Interfaces: Change IP address

The embedded Linux system of ***BLADE//runner*** is using the namespace concept. This ensures that each IP interface is completely separated and can be seen as an isolated virtual machine which - for example - allows defining the same IP address settings on all interfaces.

PTP Config

- The ***BLADE//runner*** timing system is based on PTP clock
- PTP clock can be driven by various time sources e.g. PTP flow agents, Analog Reference inputs, RTP receivers recovered clocks, SDI inputs
- Timesources can be combined via TimeFlows for various redundancy schemes
- PTP flow agents (= listeners to PTP GM's) can be created as required for redundancy and other purposes e.g. testing, access to different time sources domain specific etc.
- Redundancy scheme can be path redundancy or path and hardware redundancy or any combination
- PTP flow agents can be setup in unicast/hybrid operation mode or multicast mode and work with different domains
- PTP clock can be operated in "LockToInput" mode or FreeRun (UseInternalOscillator or Disconnect)
- PTP master operation is supported. For GPS antenna input IO_MSC is required.

Software Update

To perform a software update you need to have connection to your blade and know its IP address. Per default the network configuration is as enlisted below:

- Front Port 0 (QSFP28 100Gbps)
  - DHCP
- Front Port 1 (QSFP28 100Gbps)
  - DHCP
- Mgmt Port 2 (Central management board on the rear of the frame; RJ45 1Gbps)
  - DHCP
- Front Port 3 (USB-C 1Gbps)
  - 172.16.2.3/16

Accessing your blade

You can access your blade by:

Connecting via Port 0-2 (if IP is unknown, read chapter Network Connection - Get IP information with a smartphone in our Quick Start Guide for information of identifying addresses with your smartphone)

or

Plugging in a USB-C to Ethernet adapter to the front USB-C port and connect to its fixed IP address “172.16.2.3”.

If you connect to the front port with its fixed IP address, don’t forget to adjust the settings of your PC to be in the same subnet. For example, set a fixed IP like “172.16.2.4” with the subnet mask “255.255.0.0”.

Install new software

- Open a browser and go to `http://<IP of your blade>` to open the landing page.
- Click on the `SW/licenses` button in the menu.

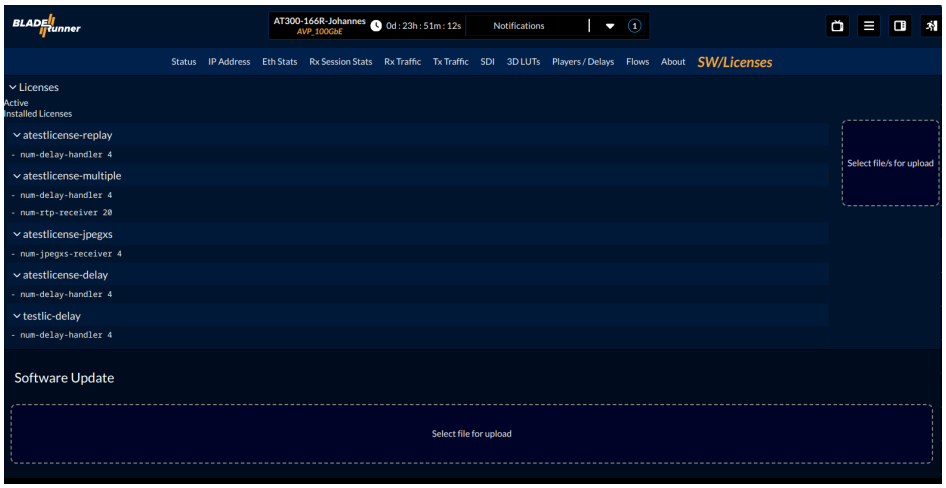

Figure 40 Landing Page - SW/Licenses Section

- Click the big blue field below “Software Update” to select or drag and drop an installer file from your desktop into it to upload the installer file.

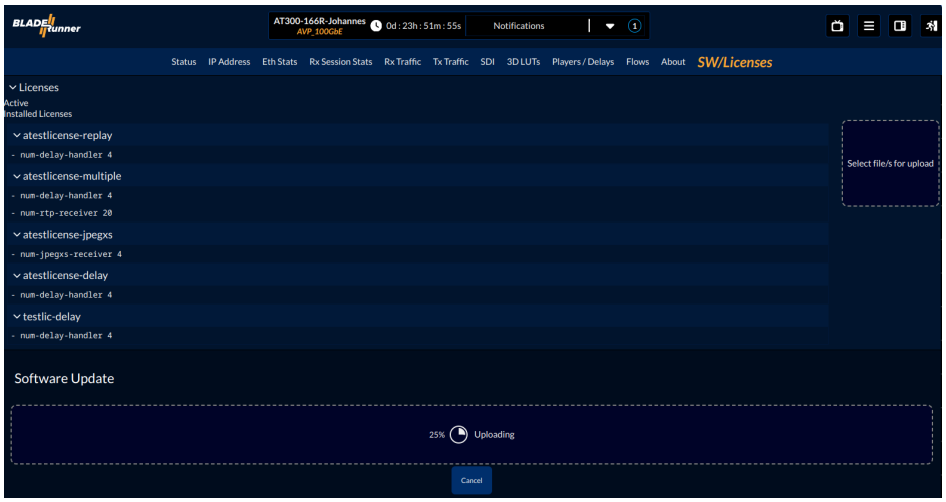

Figure 41 Landing Page - uploading new software

- When the upload has finished, a popup will appear with a download button for a full settings backup of your blade.

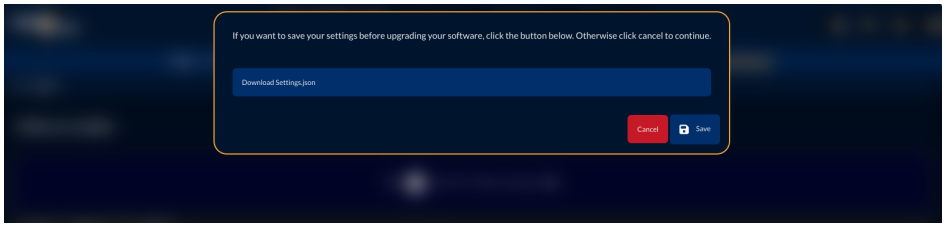

Figure 42 Landing Page - download settings

- Afterwards you can read through the changelogs and start the installation by clicking the green button.

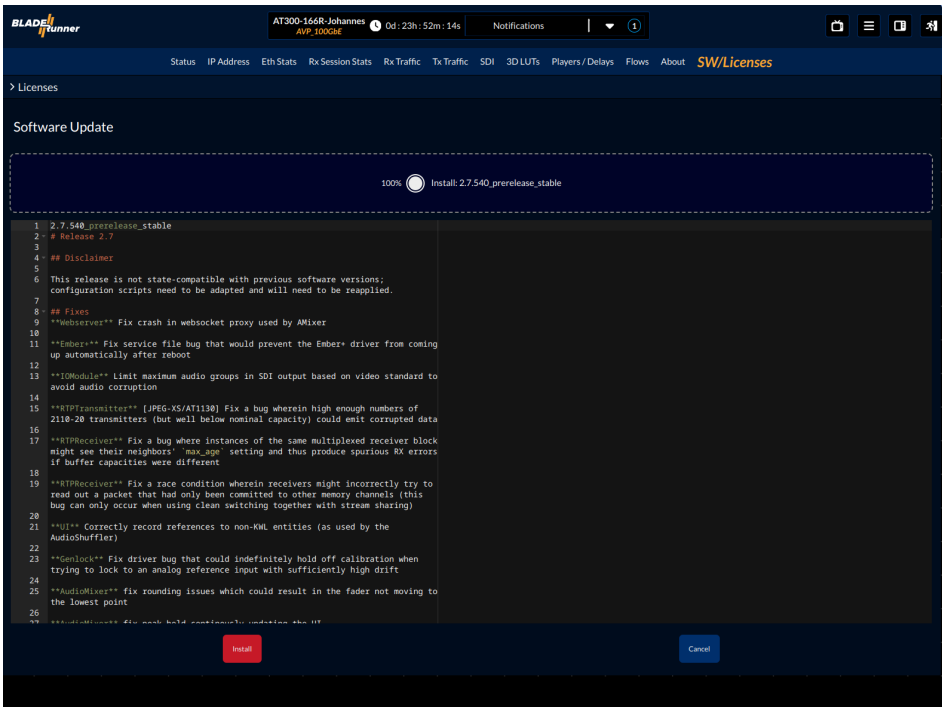

Figure 43 Landing Page - changelog

Notifications

If your browser has a internet connection, the GUI will check for available updates and if so enlist them in the notifications list:

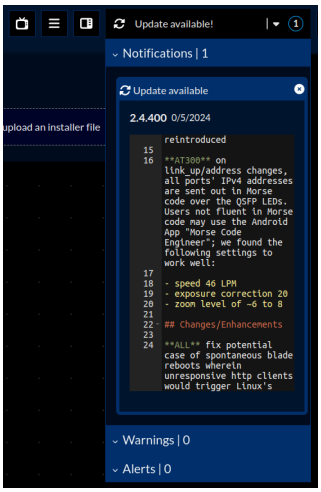

Figure 44 Landing Page - Notifications

Concepts

Get further information for the following topics in the Help Section of the **Advanced Settings Page**:

- API
  - Websocket Native Command Interface
- Timing
  - Fundamental Clocks
  - Time Sources
  - Time Flows
- RTP Receiver
  - Sessions
  - Switching Modes
  - SDP Interpretation
  - Stream Sharing
- WebUI
  - MultiEdit

Tools

Vscript API V//api

For advanced scripting functionalities, you can also download a docker container of the **V//api** package which will provide you with a node.js API to the WebSocket interface of **BLADE//runner** . It relies on the Typescript language and can be used with any Typescript-aware editor, e.g. Visual Studio Code.

The version of **V//script** contained within this Docker image is similarly structured, but backwards-incompatible and not yet supported by the Web UI's recording functionality. It is, however, robust enough for production use, and offers major correctness and productivity improvements over the previous version. Early adopters are thus encouraged to use this image as their starting point for new developments.

The advantages of this approach will quickly become apparent in a TypeScript-aware editor, as TypeScript will not allow you to misspell `p_t_p_flows` or `agents`, nor will it allow you to read a keyword named `stat` or `stote`. It will also know that the variable `state` can only hold one of the 5 fixed strings "Inactive", "Listening", "Passive", "Slave" or "Master" and make sure that this invariant is respected in all further operations.

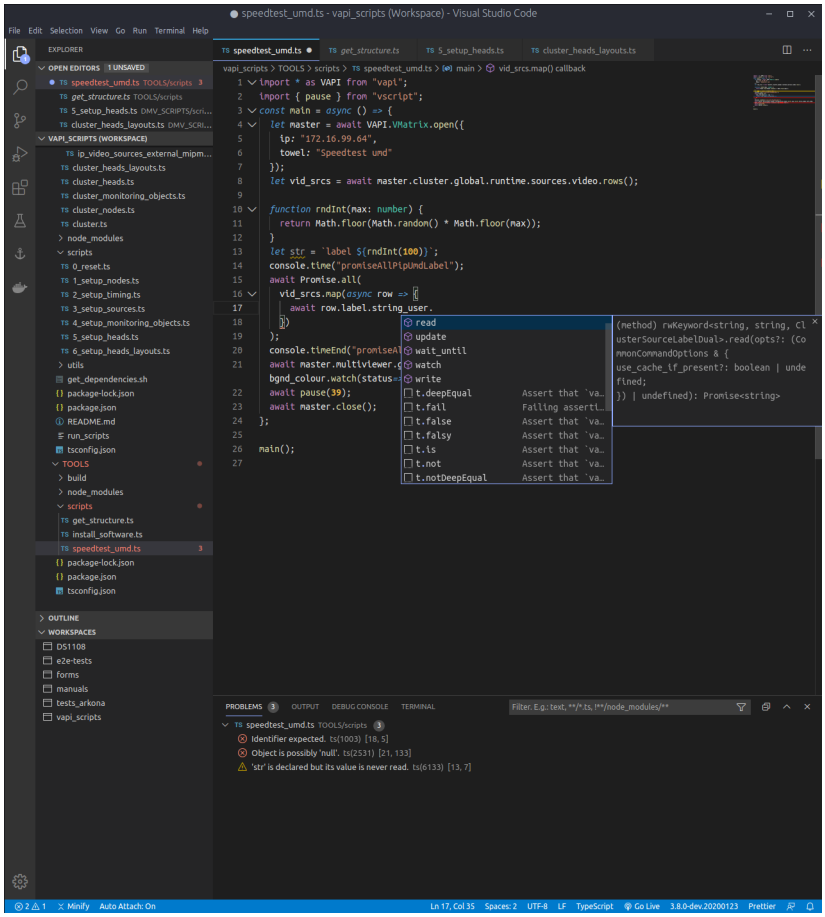

Figure 45 API integrated with Visual Studio Code - showing possible functionality suggestions

Please go to the **Docker Hub** for further information and instructions.

Set up a workspace with VAPI and VSCode

For a coding / scripting environment, linux is recommended.

Linux/Unix

The following description is for a ubuntu based distro, it may differ for other operating systems.

1.

Download the .deb installer for VSCode from **code.visualstudio.com** (or for more advanced users, download the floss project codium from **vscodium.com**)

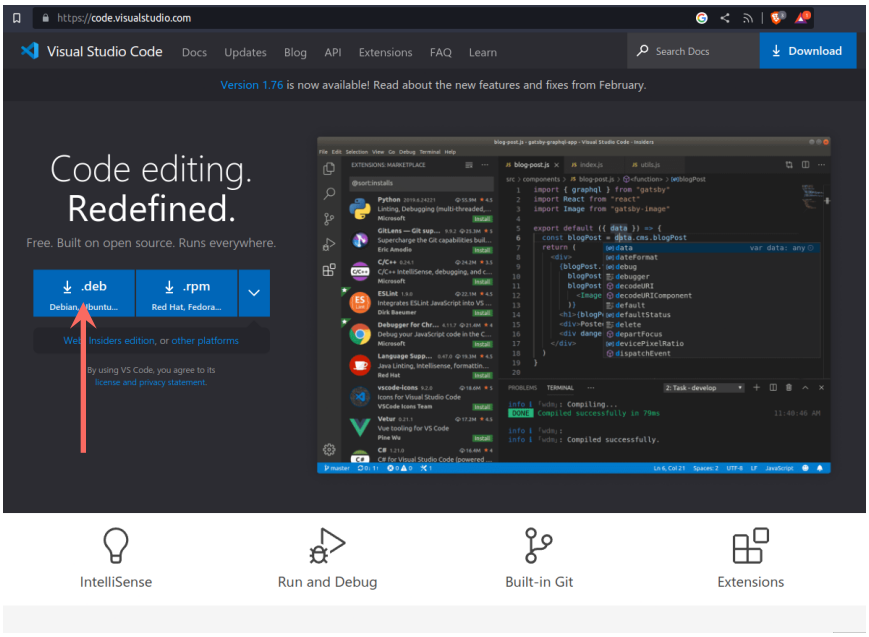

Figure 46 Download Visual Studio Code

2.

Install the package by opening the .deb installer and following the instructions

- if you prefer the terminal, install with `dpkg -i <.deb installer file>`

3.

Open the landing page of a AT300 in your browser and download the workspace template package linked in the “web downloads” element

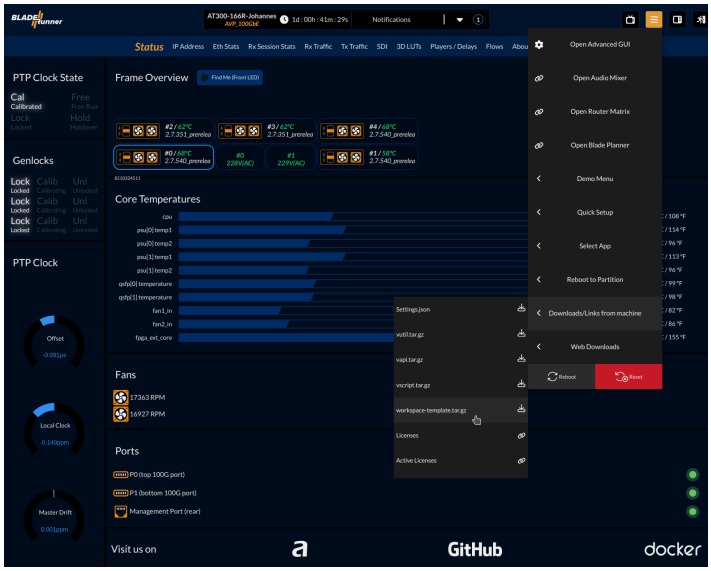

Figure 47 Download workspace template

4.

Extract the workspace-template.tar.gz file by double-clicking

- or in the terminal with: `tar -xf workspace-template.tar.gz`

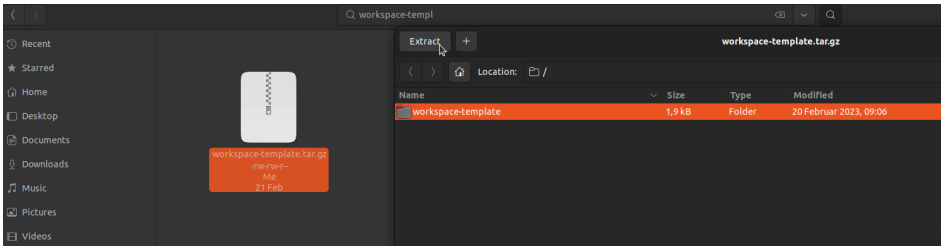

Figure 48 Extract workspace template

5.

Open VSCode and go to the menu: `File -> Open Folder` and select the extracted workspace template folder

6.

If you don’t have nodejs installed yet,

- Enter `apt-get install nodejs npm`
- For easy nodejs version management, you can install tools like “nvm” or “n”
- For “n”, enter `sudo npm i -g n`. For more information, go to **npmjs.com: n**
  - Now you can easily install nodejs versions. To get the latest lts version, enter: `n lts`
- For more information, go to **linuxize.com: how to install nodejs on ubuntu**

7.

Follow further instructions in **this video**

Windows

1.

Download and install the installer for VSCode from **code.visualstudio.com** (or for more advanced users, download the floss project codium from **vscodium.com**)

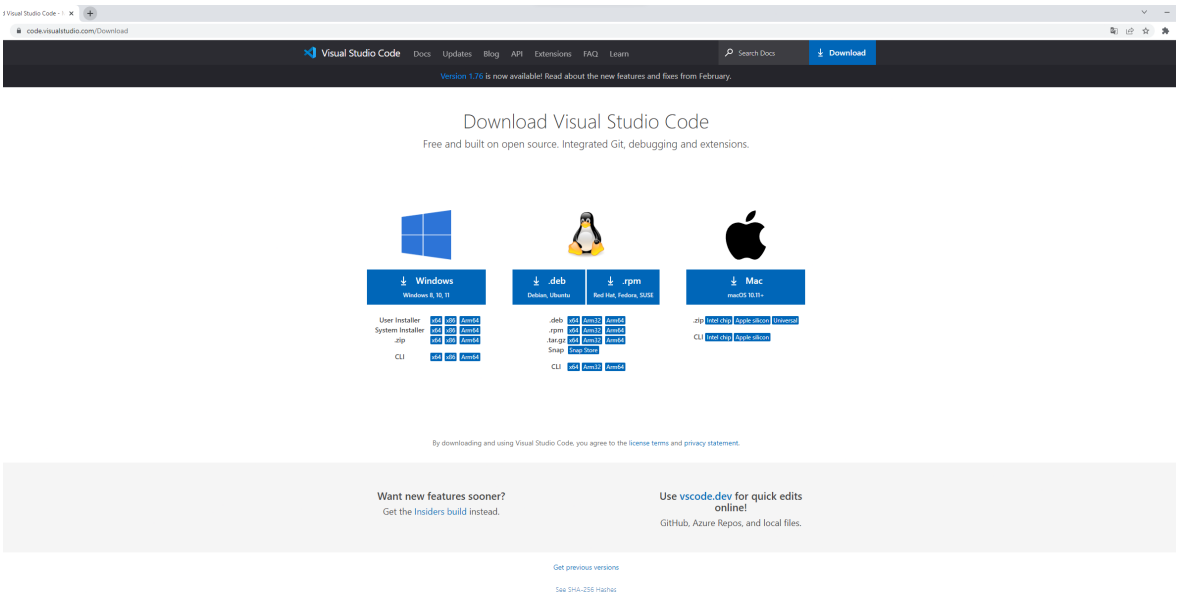

Figure 49 Download Visual Studio Code

2.

Open the landing page of a AT300 in your browser and download the workspace template package linked in the “web downloads” element

3.

Extract the workspace-template.tar.gz with a software like winrar or 7zip

4.

Open VSCode and go to the menu: `File -> Open Folder` and select the extracted workspace template folder

6.

If you don’t have nodejs installed yet, download and install it from **nodejs.org**

7.

Follow further instructions in **this video**

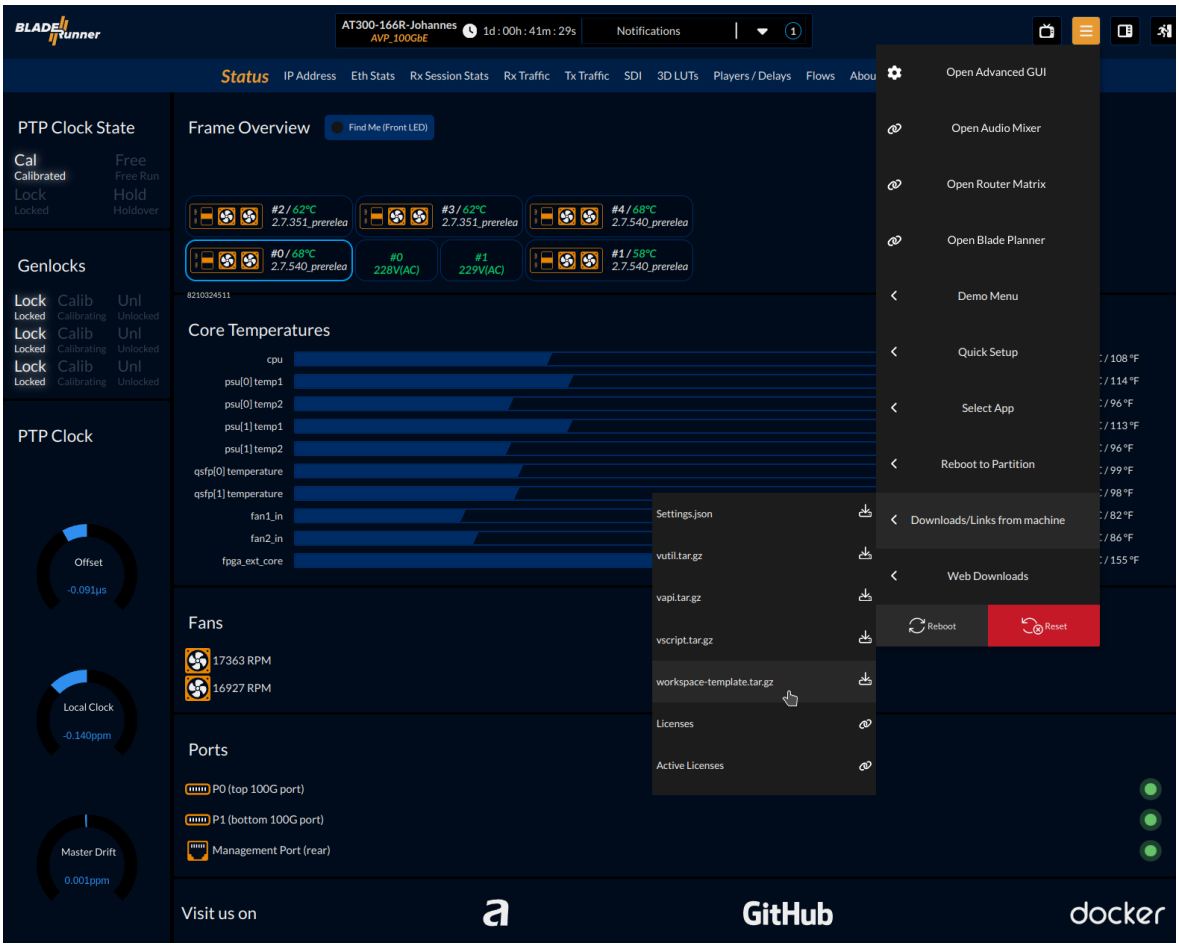

Figure 50 Download workspace template