arkona

Quick Start Guide

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Welcome

Welcome to **BLADE//runner** , arkona's software-defined IP Core Routing & Processing Platform.

This documentation is designed for users and technicians, and covers installation and basic operation principles.

For more information and regular product updates, please register at **www.arkonatech.com**.

Marginal Notes

The following symbols are used to draw your attention to:

Points of clarification

Useful tips and short cuts.

Warnings - alert you when an action should always be observed

Recommendations for action

Important Safety Instructions

Please read and observe ALL of the following notes:

- Check all of the hardware devices for transport damage.
- Any devices showing signs of mechanical damage or damage from the spillage of liquids ***MUST NOT*** be connected to the mains supply or disconnected from the mains immediately by pulling out the power lead.
- All devices MUST be grounded by use of grounded main connection.
- All devices MUST be connected to the mains using the three cord power leads supplied with the system. Only supply electrical interfaces with the voltages and signals described in these instructions.
  - CAUTION: For continued protection against risk of fire, replace only with same type and rating of power supply units.
- ***DO NOT*** use the system at extreme temperatures. Proper operation can only be guaranteed between temperatures of 0 C and 35 C and a maximum relative humidity $< 90\%$.
- ***DO NOT*** expose devices to liquids which may drip or splash.
- ***DO NOT*** place objects filled with liquids, such as vases, upon a device.
- Exposure to excessive sound pressure levels can lead to impaired hearing and cause damage to the ear.
- Servicing of components inside a device MUST only be carried out by qualified service personnel according to the following guidelines:
  - Before removing parts of the casing, shields, etc. the device MUST be switched off and disconnected from all mains.
  - Components that carry heavy electrical loads, such as power transistors and resistors, DC/DC converters and FPGAs should NOT be touched until cool to avoid burns.
- Servicing unprotected powered devices may only be carried out by qualified service personnel at their own risk. The following instructions MUST be observed:
  - ***NEVER*** touch bare wires or circuitry.
  - Use insulated tools ONLY.
  - ***DO NOT*** touch metal casings as they can bear high voltages.
  - ***NEVER*** touch cooler parts after removing a blade from the frame
- This equipment has provisions to install Class 1 Laser transceivers that provide optical coupling to communication network, Once a Class 1 laser product is installed, the equipment is a Class 1 Laser Product (Appareil à Laser de Class 1). It emits invisible laser radiation that may lead to eye injury.
  - ***NEVER*** look directly into optical components or optical fiber cables or view directly with optical instruments.
  - Keep optical components closed by protection plugs when unused.
  - For your safety connect all fiber cables first before turning on the equipment.
  - The customer is responsible for selecting and installing the Class 1 laser transceiver and for insuring that the Class 1 AEL (Allowable Emission Limit) per EN/IEC 60825-1, CSA E60825-1, and Code of Federal Regulations 21 CFR 1040 is not exceeded after the laser transceivers have been installed. ***DO NOT*** install laser products whose class rating is greater than 1. Refer to all safety instructions that accompanied the transceiver prior to installation. Only Class 1 laser devices certified for use in the country of installation by the cognizant agency are to be utilized in this product.
- Use only ***BLADE//runner*** processing blades and rear modules or V_matrix processing blades and rear modules with ***BLADE//runner*** frames or V_matrix frames!
- If a slot isn't equipped with a module, it has to be closed with a corresponding blanking/blind plate.

Defective Parts/Modules

- ***BLADE//runner*** contains no user serviceable parts. Therefore ***DO NOT*** open the devices other than to perform the procedures described in this manual. - In the event of a hardware defect, please send the system component to your local service representative together with a detailed description of the fault. We would like to remind you to please check carefully whether the failure is caused by erroneous configuration, operation or connection before sending parts for repair. We recommend contacting our service department before sending parts for repair. - If a slot isn't equipped with a module, it has to be closed with a corresponding blanking/blind plate.

First Aid (in the case of electric shock)

- ***DO NOT*** touch the person or his/her clothing before power is turned off, otherwise you risk sustaining an electric shock yourself. - Separate the person as quickly as possible from the electric power source as follows: - Switch off the equipment. - Unplug or disconnect the mains cable. - Move the person away from the power source by using dry insulating material (such as wood or plastic). - If the person is unconscious: - Check their pulse and reanimate if their respiration is poor. - Lay the body down and turn it to one side. Call for a doctor immediately. - Having sustained an electric shock, ALWAYS consult a doctor.

Electromagnetic Compatibility

This is a class A device. This equipment may cause interference in a residential installation. In this case the user is encouraged to perform appropriate measures to correct the interference.

If a slot isn't equipped with a module, it has to be closed with a corresponding blanking/blind plate to ensure safety, EMI and cooling.

Overview

This chapter provides an overview of ***BLADE//runner*** and its key features:

- **Hardware (Modules)**
- **Basic Frames**
- **Frame Front View**
- **Blade Front Panel**
- **Frame Rear View**
- **Rear IO Modules**
- **Rear IO Modules Overview**

Hardware (Modules)

Basic Frames

FR_1RU	up to two processing and io module slots each
FR_2RU	up to five processing and io module slots each
FR_2RU_LN	up to two processing and io module slots each
FR_3RU	up to eight processing and io module slots each

PSUs

PSU_AC/DC_B1100W (Default)	front psu slots
PSU_AC/DC_B1500W (Optional)	front psu slots
PSU_AC/DC_M1500W (Optional)	front psu slots

Design Front Sets

DF_1RU	for FR_1RU frame
DF_2RU	for FR_2RU and FR_2RU_LN frame
DF_3RU	for FR_3RU frame

Modules

AT300	front processing module slots
IO_BNC_11+11	rear io module slots
IO_BNC_16+16	rear io module slots
IO_BNC_16	rear io module slots
IO_MSC2	rear io module slots
IO_MGMT	rear managment module slot (behind PSUs)

The IO_BNC_11+11 module is no longer manufactured.

Air Guides

Short air guide (Default)	required for FR_2RU_LN frame
Long air guide (Optional)	useable in FR_1RU, FR_2RU and FR_3RU frames

Basic Frames Overview

FR_1RU

Figure 1 FR_1RU Front

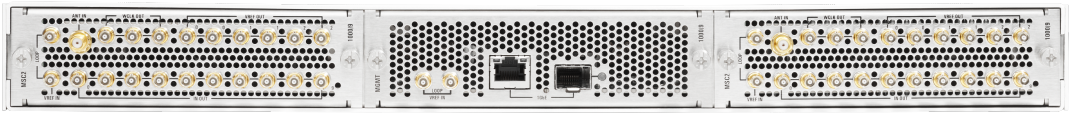

Figure 2 FR_1RU Rear

FR_2RU / FR_2RU_LN

Figure 3 FR_2RU Front

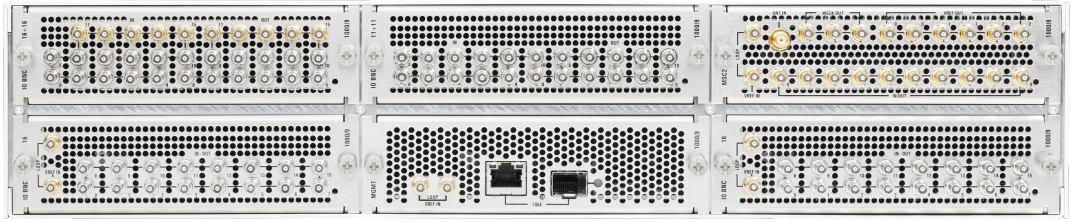

Figure 4 FR_2RU Rear

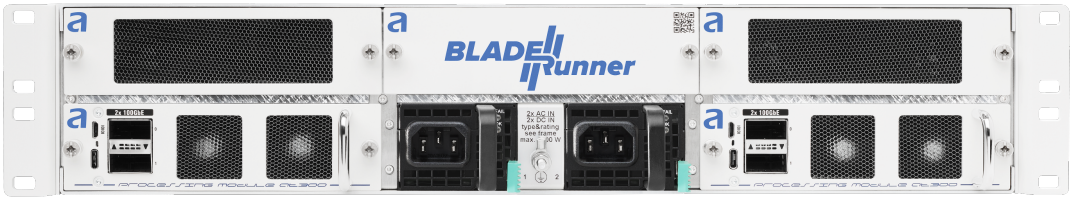

Figure 5 FR_2RU_LN Front[1]

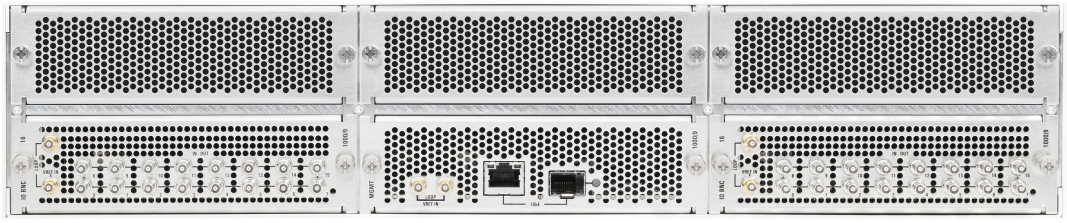

Figure 6 FR_2RU_LN Rear

[1] The low-noise version (FR_2RU_LN) offers up to two processing and io module slots each and has additional fans on the upper level

3RU

Figure 7 3RU Front

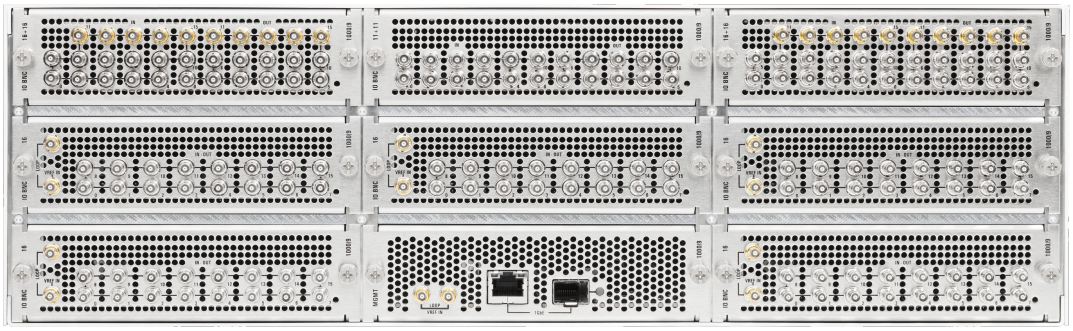

Figure 8 3RU Rear

Frame Front View

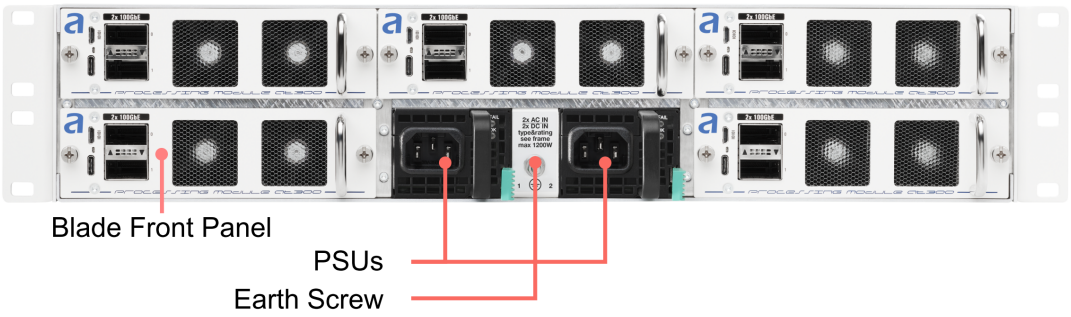

Figure 9 Frame Front View (FR_2RU)

Blade Front Panel	See chapter **Blade Front Panel**
Power Supplies (PSUs)	Redundant Power Supply (2 slots), only one is required for operation (Hot-Swappable)
Earth Screw	For connection to a protective earth

ALWAYS use a grounded power connection to prevent the device from being grounded via other signal connections.

If the device is connected to more than 20 other devices, i.e. more than 20 copper I/O connections, it must be connected to an additional solid protective earth via the earth screw.

Blade Front Panel

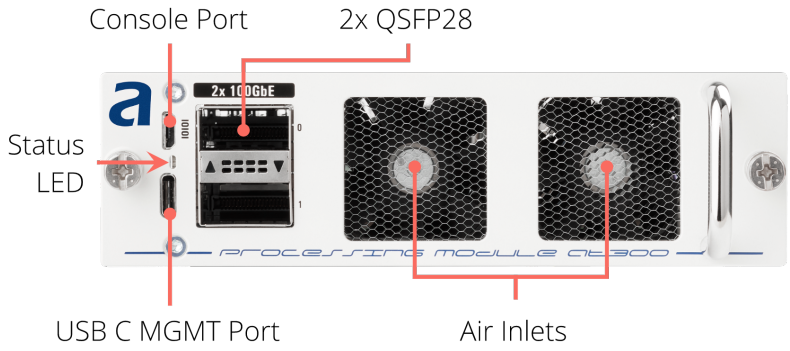

Figure 10 AT300 Front Panel

AT300:

QSFP28

2x 100Gb Ethernet ports. Can operate in redundant or discrete mode.

Activity LED per port with status indication:

Off	No QSFP module present
Green	Port is active
Flashing Green	Port has network traffic
Red	Port is inactive

USB-C MGMT Port

Outband front management port, use a USB-C to RJ45 Ethernet adapter

see **arkona technologies GitHub - IP Setup**

Status LED

Indicates the system status, green/yellow/red; flashing phase PTP synchronized, can be manually set to blue for searching a blade

Console Port

For admin/debug purposes only; also used for neighborhood watching

see **arkona technologies GitHub - Serial Connection**

Air Inlets

Two fans per processing blade, required airflow more than 52cbm/h, airflow direction front to rear

DO NOT block or cover air inlets at the front side and ***DO NOT*** restrict air supply at the front side as to do so will prevent efficient cooling. ***DO NOT*** block or cover air outlet at the rear side and ***DO NOT*** restrict air flow at the rear side.

If a slot isn't equipped with a module, it has to be closed with a corresponding blanking/blind plate to ensure safety, EMI and cooling! Ensure no airflow short between inlet & outlet.

Frame Rear View

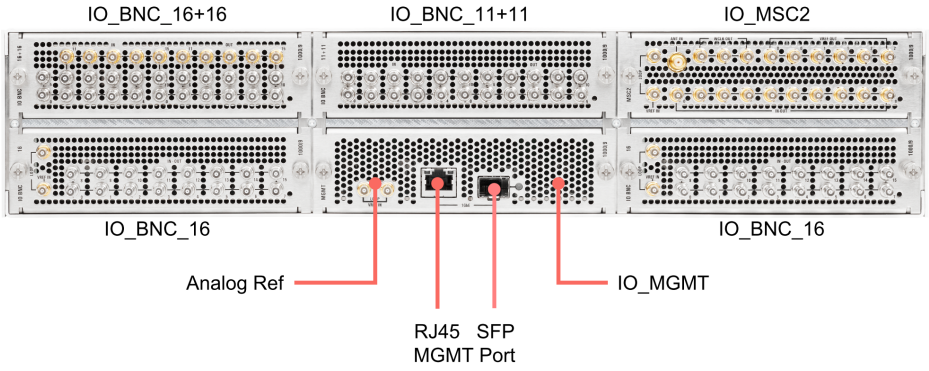

Figure 11 Frame Rear Ports (FR2_RU)

IO_MGMT

MGMT Port: 1x 1GbE out-of-band management port (RJ45 or SFP) which allows access to all processing blades in a frame

Analog Ref: 1x micro-BNC analog video reference input (and 1x micro-BNC loopback) available to all processing blades in a frame (or individually per rear io module if supported, see IO_BNC_16 and IO_MSC2)

IO_BNC_11+11

11x micro-BNC input up to 12G/UHD SDI, 11x micro-BNC output up to 12G/UHD SDI

IO_BNC_16+16

16x micro-BNC input up to 12G/UHD SDI, 16x micro-BNC output up to 12G/UHD SDI

IO_BNC_16

16x micro-BNC bidirectional io's up to 12G/UHD SDI, 1x micro-BNC analog video reference in (and 1x micro-BNC loopback)

IO_MSC2

10x micro-BNC bidirectional io's up to 12G/UHD SDI, 1x micro-BNC analog video reference in (and 1x micro-BNC loopback), 3x dual micro-BNC analog video reference out, 1x SMA GPS antenna input and 3x micro-BNC wordclock out

The micro-BNC io's can be operated in SDI [UHD (12G & 6G), FHD (3G), HD (1.5G), SD (270M)] or MADI mode.

The IO_BNC_11+11 module is no longer manufactured.

Rear IO Modules

IO_BNC_11+11

Note: This module is no longer manufactured.

This rear module has 11 reclocked micro-BNC inputs and 11 reclocked micro-BNC outputs and supports SDI for UHD (12G & 6G), FHD (3G), HD (1.5G), SD (270M) as well as MADI. Up to 2 UHD quad-split inputs are also possible for select ports, please look at **Rear IO Modules Overview**. All outputs are capable of UHD quad-split output and the AT300 will automatically align the four quad-link signals on the output.

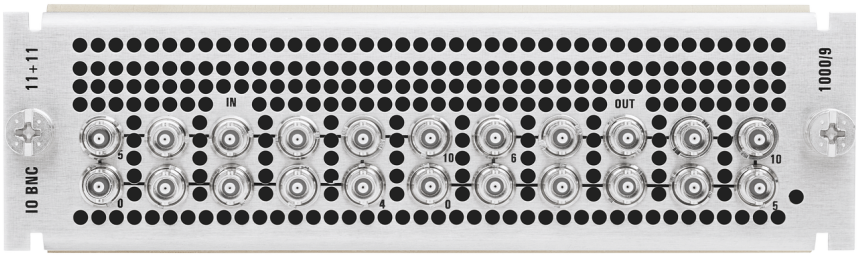

Figure 12 IO_BNC_11+11

IO_BNC_16+16

This rear module has 16 reclocked micro-BNC inputs and 16 reclocked micro-BNC outputs and supports SDI for UHD (12G & 6G), FHD (3G), HD (1.5G), SD (270M) as well as MADI. Up to 4 UHD quad-split inputs are also possible for select ports, please look at **Rear IO Modules Overview**. All outputs are capable of UHD quad-split output and the AT300 will automatically align the four quad-link signals on the output.

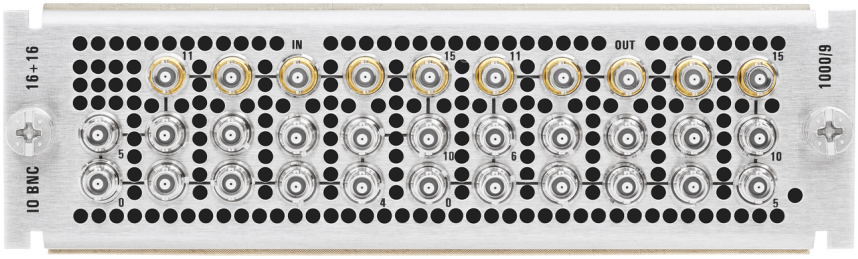

Figure 13 IO_BNC_16+16

IO_BNC_16

This rear module has 16 bi-directional configurable reclocked micro-BNC sockets and supports SDI for UHD (12G & 6G), FHD (3G), HD (1.5G), SD (270M) as well as MADI. Up to 4 UHD quad-split inputs are also possible for select ports, please look at **Rear IO Modules Overview**. All outputs are capable of UHD quad-split output and the AT300 will automatically align the four quad-link signals on the output. It also features an analog video reference port with loopback, which provides an input for Bi-/Tri-level signals for synchronization.

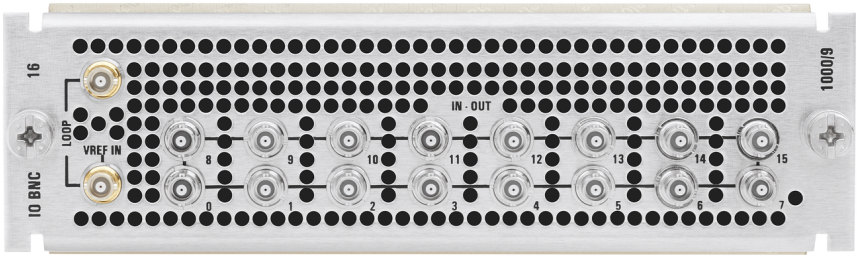

Figure 14 IO BNC 16

IO_MSC2

The IO_MSC2 rear module is specifically designed for the PTP Grandmaster and MasterClock option. It provides 10 bi-directional configurable reclocked micro-BNC sockets and supports SDI for UHD (12G & 6G), FHD (3G), HD (1.5G), SD (270M) as well as MADI. Up to 2 UHD quad-split inputs are also possible for select ports, please look at **Rear IO Modules Overview**. All outputs are capable of UHD quad-split output and the AT300 will automatically align the four quad-link signals on the output. In addition it provides a dedicated GPS/GLONASS antenna input (SMA socket) and 3 micro-BNC word-clock outputs. 6 micro-BNC sockets in 3 groups provide Bi-/Tri-level outputs for up to 3 different timing offsets and standards. It also features an analog video reference port with loopback, which provides an input for Bi-/Tri-level signals for synchronization.

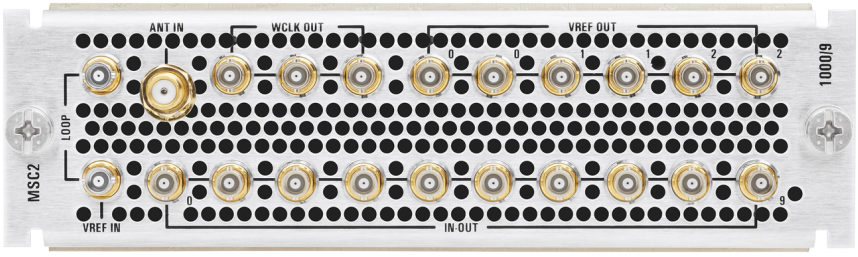

Figure 15 IO_MSC2

IO_MGMT

All frames can optionally be equipped with the IO_MGMT rear module. This provides a 1GbE management port (RJ45 or SFP) that connects to all blades in the frame, simplifying out-of-band control. It also features an analog video reference port with loopback, which provides an input for Bi-/Tri-level signals for synchronization. Mounted in the slot directly behind the front accessible power supplies it connects to all blades in the frame and provides a convenient centralized out-of-band and video reference location.

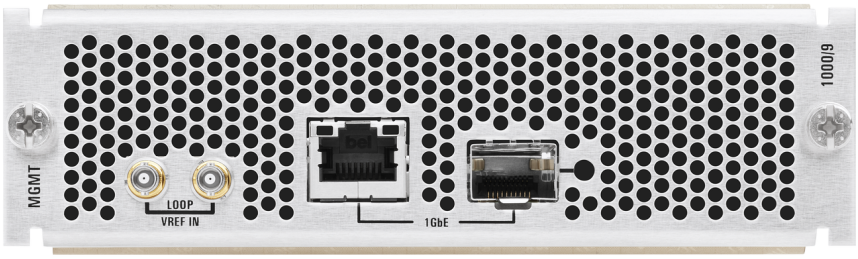

Figure 16 IO_MGMT

In-band control is available on either of the two 100GbE interfaces of each AT300 processing blade.

Rear IO Modules Overview

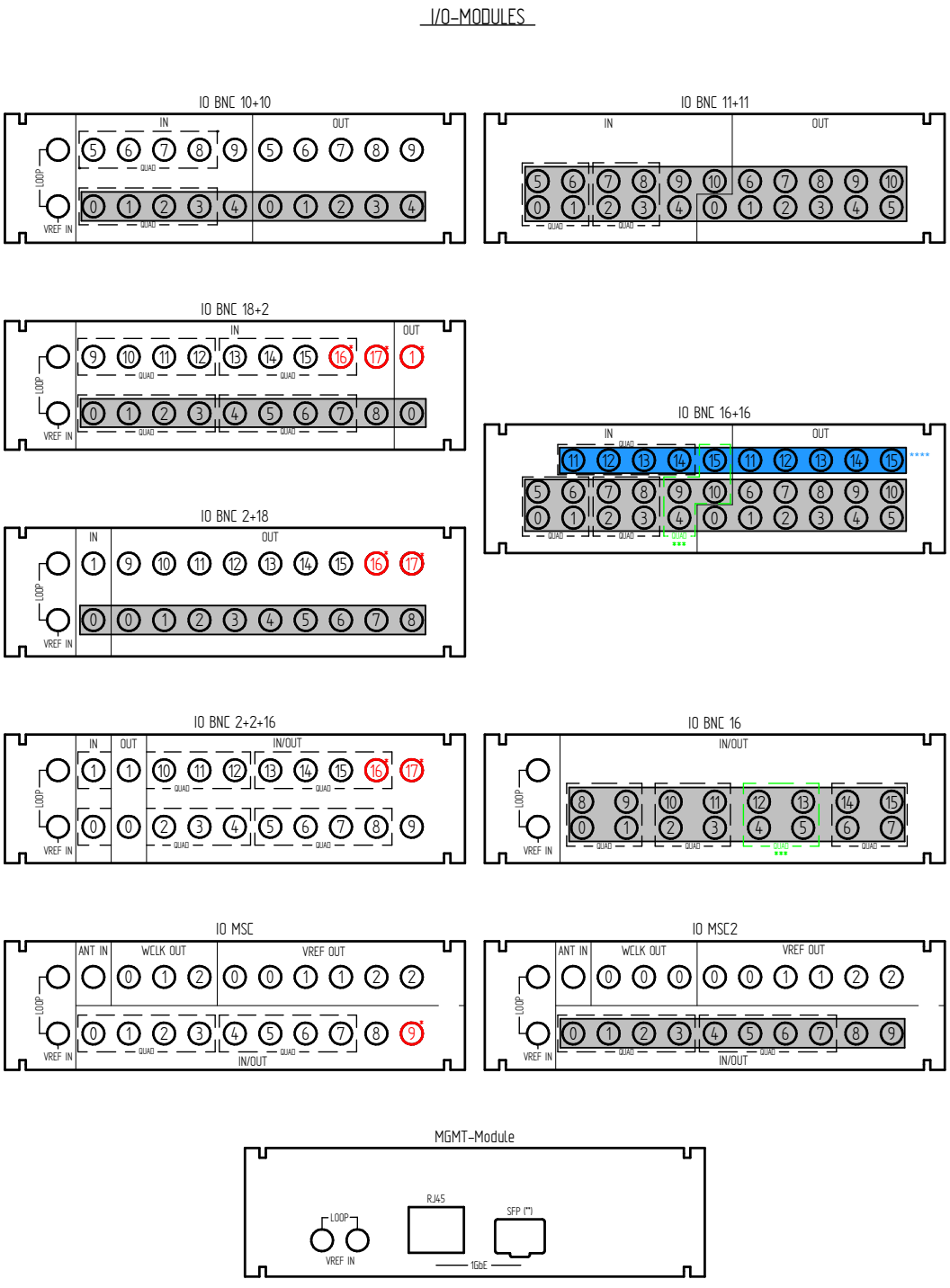

Figure 17 Rear IO Modules Overview

Installation & Configuration

This chapter covers the hardware installation of ***BLADE//runner*** and the configuration of your control computer, network and other settings.

- **Important Notes**
- **Packaging & Shipping**
- **Environmental Data**
- **Computer System Requirements**
- **Installation Checklist**
- **QSFP28 Module Installation**
- **Frame Installation**
- **Blade Installation**
- **Frame Dimensions**
- **Temperature & Cooling Airflow**
- **Grounding & Power**
- **Powering On**
- **Network Connection**
- **PC IP Configuration**
- **Default addresses**
- **Web Browser Control**
- **Troubleshooting the Connection**
- **Software Update**
- **Manual Configuration**
- **Scripted Configuration**
- **Telemetry package**

Important Notes

Weblinks

For the latest infos, news and updates look at our Homepage or GitHub repositories.

Homepape (www.arkonatech.com)

- **Software Releases**
- **Documentation**

GitHub (www.github.com/arkona-technologies)

- **User Guides**
- **IP Setup**
- **Serial Connection**
- **Software Update**

Packaging and Shipping

In case of further shipping or return shipping, please ensure that frames are packed and shipped separately without modules and power supplies, using the original packaging. See the pictures below for example/reference.

The processing, io modules and power supplies must also be packaged and shipped separately, using the original packaging and outer packaging (including shock-absorbing filling material).

For shipping, it is also recommended to place/secure all packaging on pallets.

Figure 18 Frame Packaging

Environmental Data

IP Interfaces

Gigabit Ethernet	1x RJ45 or SFP central rear management port (IO_MGMT); 1x USB-C based Ethernet front management port (per AT300)
2x 100Gb Ethernet IEEE802.3	2x QSFP28 slots (max 5W each) per AT300
Protocols	IPv4/IPv6; IEEE1588 PTPv2 (ordinary clock); IGMPv2&v3/MLD, tagged VLAN, multicast & unicast

USB Interfaces

USB	1x micro-USB serial console port and 1x USB-C port (5V / max 0.9A) per AT300

GPS Antenna Interfaces

GPS	1x SMA socket (3.3V / max 100mA) for GPS antenna input per IO_MSC2

Indicators

2x Power-Status	per power supply unit
1x Module-Status	per AT300
1x QSFP-Status	per QSFP28 per AT300
1x PPS	via serial console port per AT300 (requires special cable)

Management and Monitoring

Protocols	HTTP(S), SNMPv2/3, Syslog, websocket/JSON, RESTful API, NMOS IS-04/IS-05, Ember+
User interface	Embedded HTML5 user interface
Dedicated mgmt. port per module	front management port (USB-C); outband vs. inband management; guaranteed min. bandwidth for inband management/control egress; all parallel
Dedicated mgmt. port per frame	rear management port (RJ45/SFP) through IO_MGMT module

Environmental Specifications

remark: Many of the following values/numbers depend on formats, standards, application modes and also configuration related.

Operating temperature Ambient temperature range

FR_1RU	0°C - +35°C / +32°F - +95°F[2]
FR_2RU	
FR_3RU	
FR_2RU_LN	0°C - +40°C / +32°F - +104°F[2]

Storage temperature -20°C - +70°C

Relative humidity < 90% non-condensing

Altitude < 3000m / 9,000ft[3]

Noise emission Measured when fully populated with AT300s at 23°C ambient temperature

FR_1RU	71dB +/- 3dB
FR_2RU	75dB +/- 3dB
FR_3RU	79dB +/- 3dB
FR_2RU_LN	46dB +/- 3dB

Airflow max 76cbm/h per AT300

Safety & EMC CB | CE | NRTL

IEC 62368-1: 2014 | EN IEC 62368-1:2014+A11:2017 | BS EN IEC 62368-1+A11:2020 | DS EN IEC 62368-1:2014 | CSA/UL 62368-1:2014 | J62368-1:2020 | AS/NZS 62368-1:2018

FCC, ISED | KC | VCCI, JEITA

FCC 47 CFR part 15, class A | ICES-003:2020 Issue 7

CISPR 32:2015, class A | VCCI 32-1:2016 | JIS C 61000-3-2:2019 | CISPR 35:2016 | EN 55035:2017 +A11:2020

additionally for IO_MSC2:

FCC, ISED / KC / RCM

FCC part 15, class B / ICES-003:2020 Issue 7, class B

EN 301 489-19 V2.1.1 :2019 / EN 301 489-19 V2.2.3 :2019

[2] prerequisite airflow more than 52cbm/h per AT300

[3] altitude max. operating temperature derating of 1.0°C per 300m/900ft

Power

Connector 2x IEC redundant

Consumption Frame typically under / not more than:

FR_1RU	< 300W
FR_2RU	< 700W
FR_3RU	< 1100W
FR_2RU_LN	< 300W

Consumption AT300 < 130W

per QSFP28 max 5W

Input Voltage

AC Nominal 100 - 240 VAC +/- 10%

AC frequency 50/60Hz +/- 5%

Mechanics

Frame Width 482mm / 19“ gross (incl. rack ears)

Frame Depth 535mm / 21“ net (without design front and excess length screws/handles)

Frame Height 3RU/2RU/1RU

Frame Weight basic frame with blanking/blind plates
(without design front / modules / power supplies)

FR_1RU	4.1kg
FR_2RU	6.5kg
FR_3RU	9.0kg
FR_2RU_LN	6.8kg

Power Supply (Weight) hot swappable, front side

PSU_AC/DC_B1100W	1.1kg
PSU_AC/DC_B1500W	1.2kg
PSU_AC/DC_M1500W	1.4kg

AT300 (Weight) hot swappable, front side, weight 1.2kg

IO Modules (Weight) hot swappable, rear side

IO_BNC_11+11	260g
IO_BNC_16+16	370g
IO_BNC_16	250g
IO_MSC2	320g
IO_MGMT	160g

Ventilation/Airflow airflow direction front to rear

Computer System Requirements

To control parameters you will need an external computer, connected to ***BLADE//runner*** network and running a web browser session or a control system application.

Installation Checklist

To get your system operational, please complete each of the following steps:

- Unpack and check the contents of the shipping boxes, and in the event of any transport damage, contact your local arkona representative.
- Mount the frame and install the power supplies. See **Frame Installation** and **Grounding & Power**.
- Install the processing blades, io and management modules. See **Blade Installation**.
- Insert the QSFP28 transceivers. Please take care not to mix up the transceiver types. See **QSFP28 Module Installation**.
- Connect and turn on the power. See **Grounding & Power**.
- Connect and configure the network connection to your computer.
- Start a **web browser session**.
- Check the software version and, if necessary, **update your unit**.
- Connect the remaining video, audio and reference signals.
- Configure the reference settings for your installation.

The rest of this chapter covers these steps in more detail.

QSFP28 Module Installation

Recommended are optical 100GbE QSFP28 transceivers and/or 100GbE QSFP28 active optical cables (AOC). Supported are transceivers with a electrical interface of **CAUI-4** (**IEEE 802.3bm**) and max 5W per transceiver.

- **CAUI-4** is a 100 Gbit/s 4-lane electrical interface defined in **IEEE 802.3bm** with a nominal signaling rate for each lane of 25.78125 GBd using NRZ modulation.

The customer is responsible for selecting and installing the Class 1 laser transceiver and for insuring that the Class 1 AEL (Allowable Emission Limit) per EN/IEC 60825-1, CSA E60825-1, and Code of Federal Regulations 21 CFR 1040 is not exceeded after the laser transceivers have been installed. ***DO NOT*** install laser products whose class rating is greater than 1. Refer to all safety instructions that accompanied the transceiver prior to installation. Only Class 1 laser devices certified for use in the country of installation by the cognizant agency are to be utilized in this product.

Frame Installation

BLADE//runner can be mounted either in a 19“ equipment rack or on a table top as follows:

- **19“ Rack-Mounting** - fix the rack-mounting brackets to the front of the chassis. Then attach to a standard 19“ equipment rack. Please install a supporting rack mount kit to hold the weight of the unit.

- **Table Top** - the unit should be laid on a flat, horizontal surface.

Plug-in connectors are located at both the front and rear. Therefore, make sure that all connectors are accessible. Especially when used as “Table Top” make sure that the power connectors are easily accessible, so that in an emergency the power supply can be interrupted quickly and easily (or use a suitable power switch/socket in between). For 19“ Rack-Mounting, it’s also recommended to install a master system power switch.

When using 19“ racks with doors please leave enough space for the connectors, cables and air circulation.

Device is foreseen for indoor use in dust-free ambiance and must be mounted horizontally.

DO NOT block or cover air inlets at the front side and ***DO NOT*** restrict air supply at the front side as to do so will prevent efficient cooling. ***DO NOT*** block or cover air outlet at the rear side and ***DO NOT*** restrict air flow at the rear side.

Frame Dimensions

FR_1RU: **Detailed pdf here**

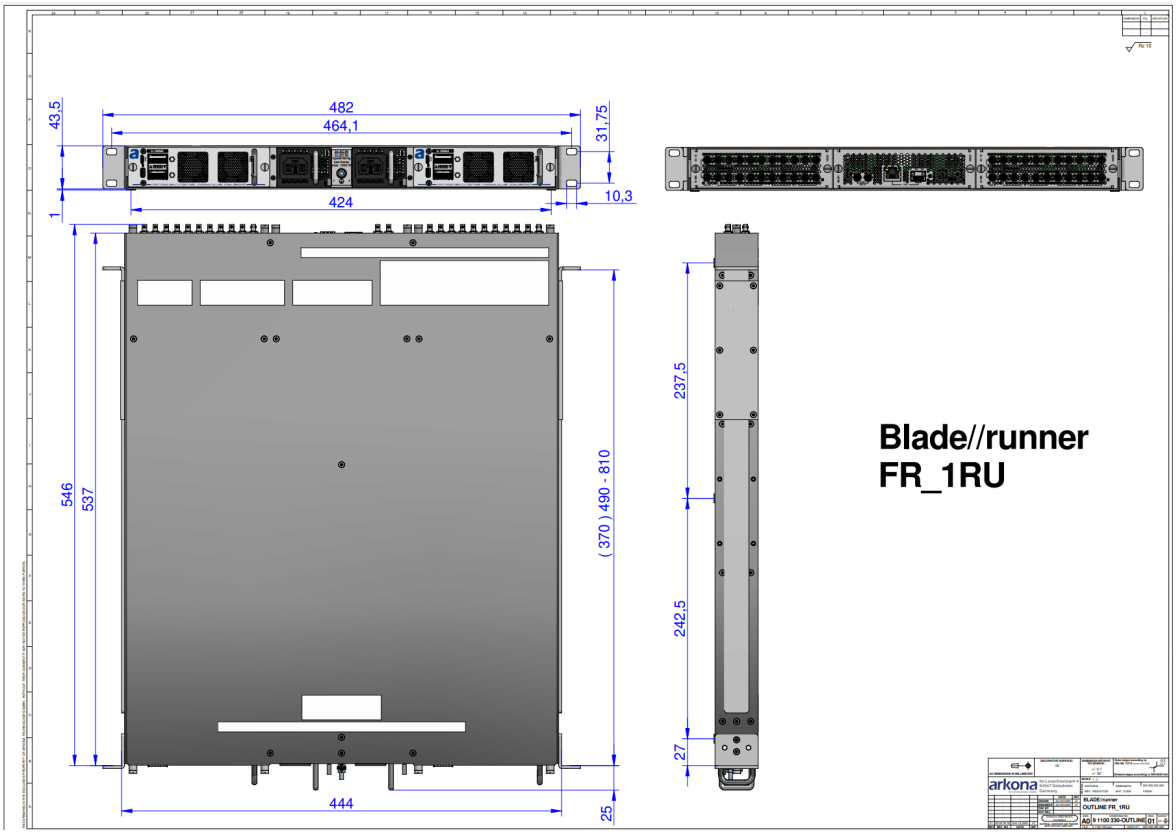

Figure 19 Frame FR_1RU Outline

FR_2RU: **Detailed pdf here**

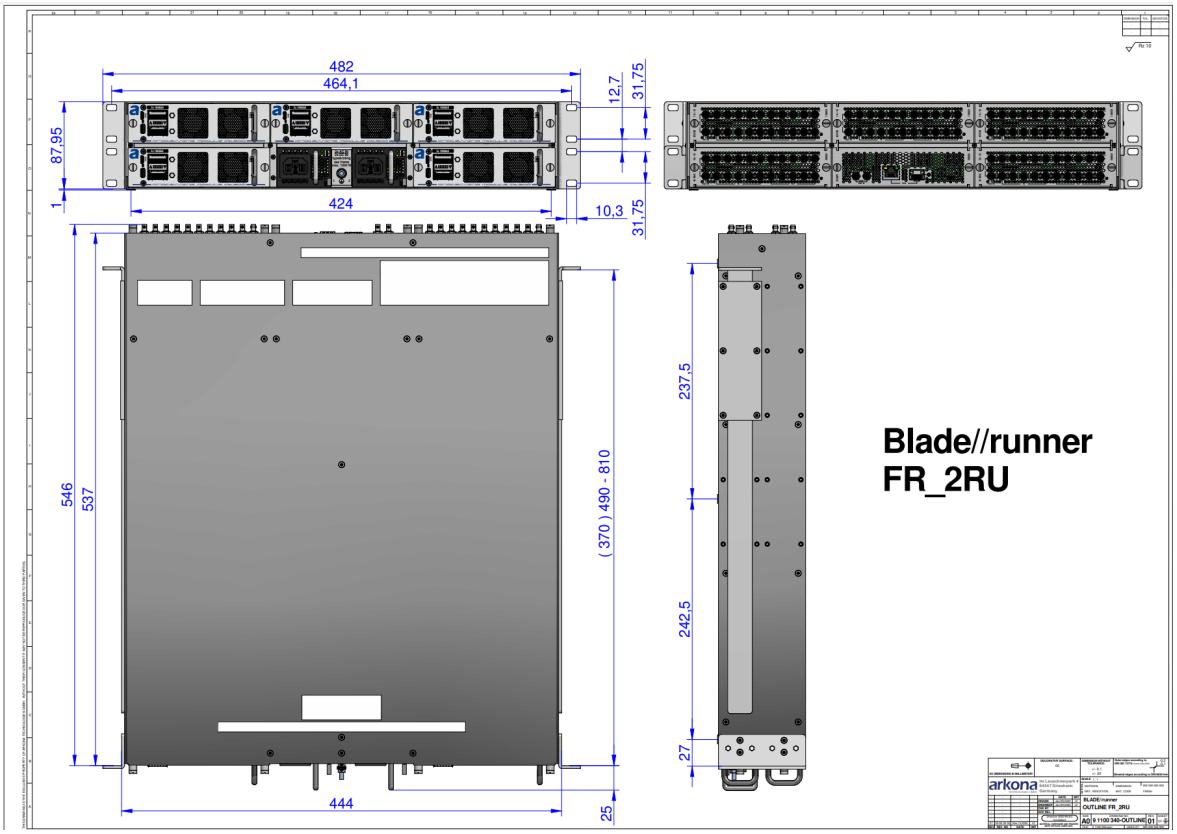

Figure 20 Frame FR_2RU Outline

FR_2RU_LN: **Detailed pdf here**

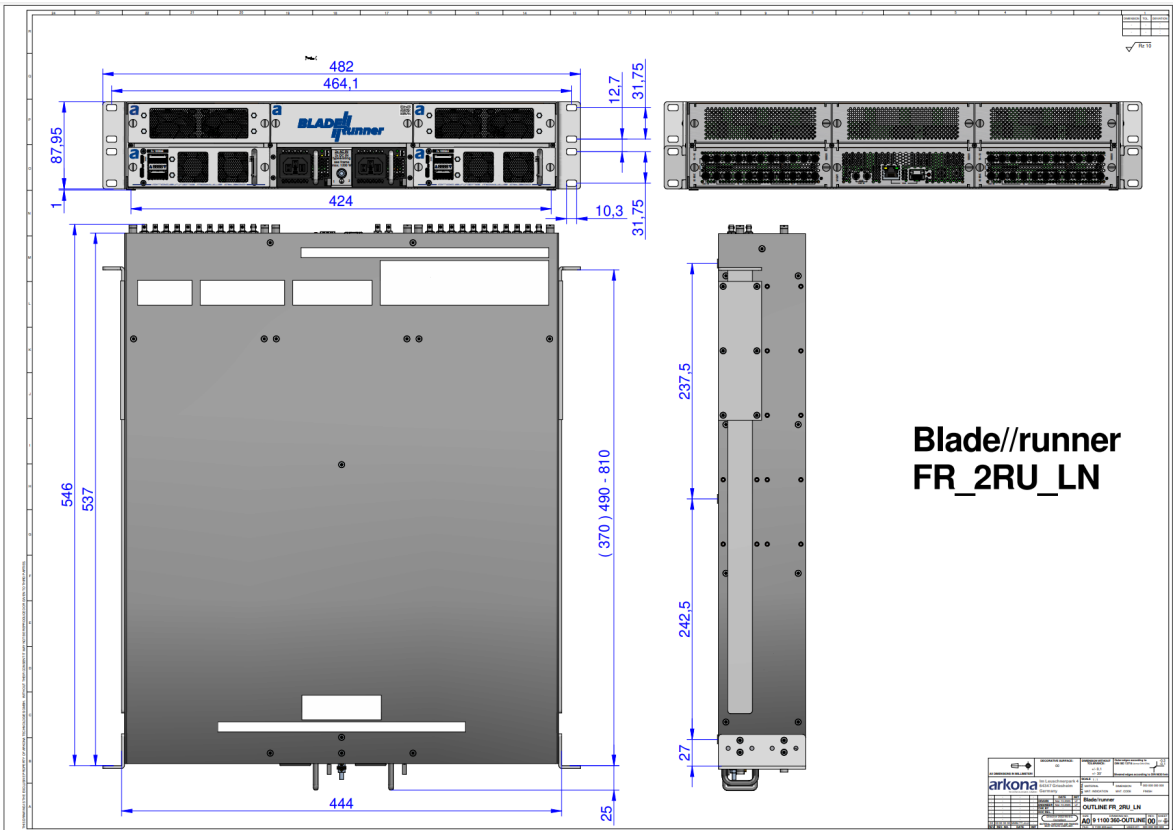

Figure 21 Frame FR_2RU_LN Outline

Only two slots on the bottom row for processing blades and io modules each. Top row slots left & right have fixed mounted additional fan units equipped for low-noise operation.

FR_3RU: **Detailed pdf here**

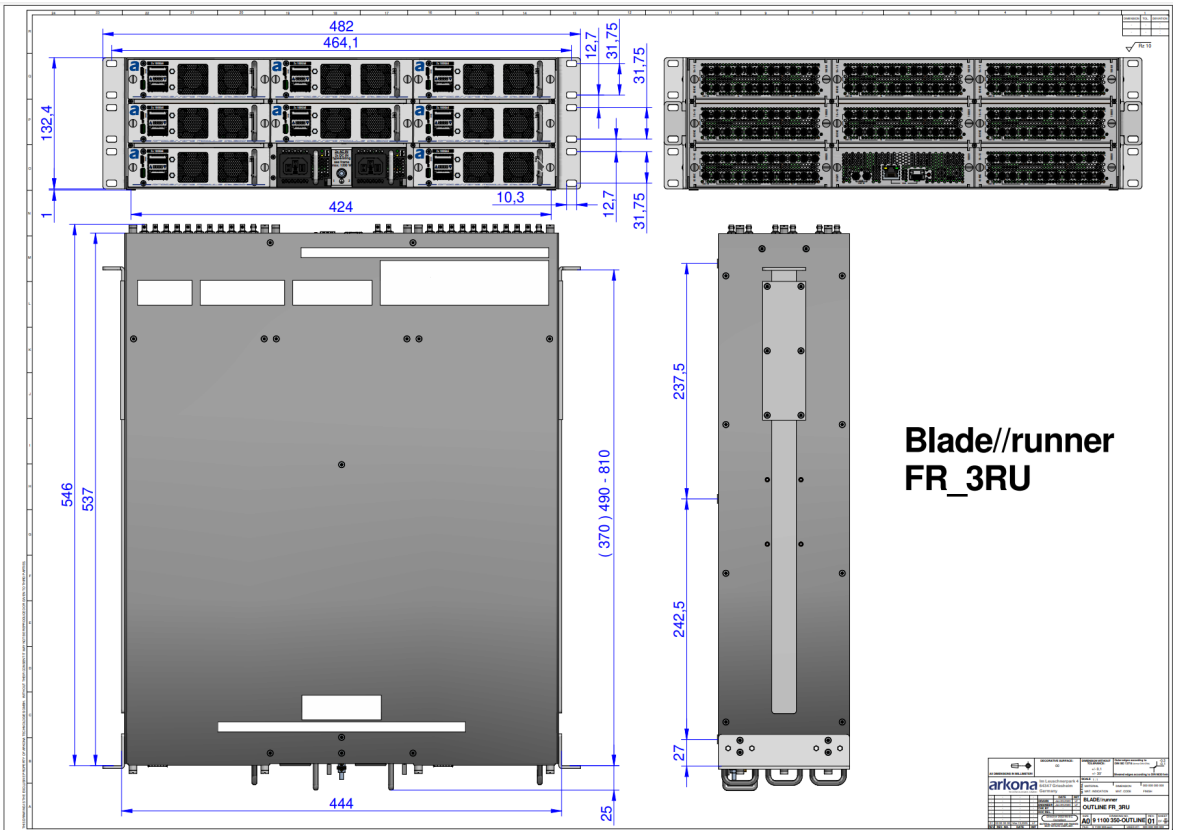

Figure 22 Frame FR_3RU Outline

Blade Installation

BLADE//runner frames are manufactured without EMI stripes in the processing slots (front side). V_matrix frames are manufactured without EMI stripes in processing slots since mid 2022. EMI stripes in processing slots of older V_matrix frames need to be removed before installing AT300 processing blades/modules.

Air Guides

BLADE//runner comes with short air guides; long air guides are optional. Both air guide types have specific use cases:

- **Short air guide (Default)**
  - ***REQUIRED*** in FR_2RU_LN (low-noise) frames. The shorter air guide does not block air supply from the additional fans above the processing blade/module slot.
  - Can be used in FR_1RU, FR_2RU and FR_3RU frames as well.

- **Long air guide (Optional)**
  - For FR_1RU, FR_2RU, FR_3RU frames. Due to the longer guidance, the air reaches higher speeds, resulting in better heat dissipation.

The short air guide is ***REQUIRED*** in FR_2RU_LN (low-noise) frames, ***DO NOT*** use long air guides there!

Temperature and Cooling Airflow

The unit is equipped with two fans per processing blade and ventilation holes on the front and rear. Proper operation is guaranteed between ambient temperatures of 0°C and 35°C and a maximum relative humidity of $< 90\%$ non-condensing.
- required airflow more than 52 cbm/h per processing blade.
- airflow direction front to rear.

DO NOT block or cover air inlets at the front side and ***DO NOT*** restrict air supply at the front side as to do so will prevent efficient cooling. ***DO NOT*** block or cover air outlet at the rear side and ***DO NOT*** restrict air flow at the rear side.

If a slot isn't equipped with a module, it has to be closed with a corresponding blanking/blind plate to ensure safety, EMI and cooling! Ensure no airflow short between inlet & outlet.

Grounding and Power

Figure 23 PSUs and Earth Screw

Grounding

BLADE//runner must be grounded via the 3-pin IEC power connectors of the power supplies and also via the earth screw on the front of the unit.

- **IEC power connectors**: 2x 3-pin IEC power connector of the power supplies, see next chapter **Power**
- **Earth Screw**: 1x for additional connection to a protective earth

The unit must be on the same potential as all other system devices.

ALWAYS use a grounded power connection to prevent the device from being grounded via other signal connections.

If the device is connected to more than 20 other devices, i.e. more than 20 copper I/O connections, it must be connected to an additional solid protective earth via the earth screw.

Power

The device offers two power supplies (for redundancy):

- **Input Voltage**: 2x auto sensing 100-240V AC power supply, 50/60Hz nominal
- **Power Consumption (Typical)**: FR_3RU < 1100W; FR_2RU < 700W; FR_2RU_LN < 300W; FR_1RU < 300W
- **Connection**: 2x IEC 60320 power connectors C13/C14 or C15/C16 (AC), see table below

DEFAULT	**100 – 120VAC (50/60Hz)**		**200 – 240VAC (50/60Hz)**	
Type	**Output Power**	**Input Current**	**Output Power**	**Input Current**
PSU_AC/DC_B1100W Bel Power PFE1100-12-054RA Connector PSU: IEC 60320 C14	100V: 980W 110V: 1010W 120V: 1040W	12A	1080W	6A
Recommended Power Cord/Cable	Connector: IEC 60320 C13 Cable: AWG 16 or 1.5mm² Rated Voltage: min. 125VAC Rated Current: min. 13A		Connector: IEC 60320 C13 Cable: AWG 18/17 or 1.0mm² Rated Voltage: min. 250VAC Rated Current: min. 10A	
Note: IEC 60320 C13/C14 (up to 70°C) International Rating (IEC): up to 250VAC / 10A North America Rating (UL/CSA): up to 125/250VAC / 15A				

OPTIONAL	**100 – 120VAC (50/60Hz)**		**200 – 240VAC (50/60Hz)**	
Type	**Output Power**	**Input Current**	**Output Power**	**Input Current**
PSU_AC/DC_B1500W Bel Power PFE1500-12-054RAC Connector PSU: IEC 60320 C16	100/110V: 1200W 120V: 1260W	13A	1500W	8A
PSU_AC/DC_M1500W muRata D1U54P-W-1500-12-HC3TC Connector PSU: IEC 60320 C16	100V: 1260W 110/120V: 1400W	15A	1500W	8A
Recommended Power Cord/Cable	Connector: IEC 60320 C15 Cable: AWG 14 or 2.5mm² Rated Voltage: min. 125VAC Rated Current: min. 15A		Connector: IEC 60320 C15 Cable: AWG 18/17 or 1.0mm² Rated Voltage: min. 250VAC Rated Current: min. 10A	
Note: IEC 60320 C15/C16 (up to 120°C) International Rating (IEC): up to 250VAC / 10A North America Rating (UL/CSA): up to 125/250VAC / 15A				

Only one supply is required to operate the system. For redundancy, connect both supplies, each to a separate AC mains circuit. This will ensure continued operation if one of the mains circuits fails.

Please observe all of the **Safety Instructions** *BEFORE* connecting power to the unit.

The device MUST be connected to the mains using a proper and certified IEC power cords.

When running with multiple mains supplies, make sure that both circuits lie on the same ground potential. Otherwise, an internal bridge of two ground wires will lead to a ground loop!

ALWAYS use the same power supply type from the same manufacturer in one unit, ***DO NOT*** mix them!

Powering On

BLADE//runner has no on/off power switch, it starts automatically when either power supply is connected to the mains. Please install a master system power switch where applicable or make sure that all power connectors/cords are easy accessible, so that in an emergency the power supply can be interrupted quickly and easily.

With the PSU connected to power, you will hear the fans begin to operate.

The system takes under a minute to boot from power on and loads the latest settings.

Processing Blade/Module Status LED

Indicates the system/operation status; flashing phase PTP synchronized, can be manually set to blue for searching a blade/module.

Off	No power
White	Booting
Green	OK/Normal
Blue	Searching/Identify a processing blade
Yellow	Warning
Red	Alert

PSU 0 and PSU 1 LEDs

PSU_AC/DC_B1100W (Default)	
AC LED	
Off	Power supply is inactive (no mains input or undervoltage)
Green	Power supply is active (OK/Normal)
DC LED	
Off	Power supply is inactive (no mains input or undervoltage)
Green	Power supply is active (OK/Normal)
Yellow or Blinking	Abnormal, please look at power supply datasheet

PSU_AC/DC_B1500W (Optional) **PSU_AC/DC_M1500W (Optional)**	
OK / POWER LED	
Off	Power supply is inactive (no mains input or undervoltage)
Green	Power supply is active (OK/Normal)
Blinking	Power supply is inactive (PSU OFF)
FAIL / FAULT LED	
Off	No fault (OK/Normal)
Amber or Blinking	Abnormal, please look at power supply datasheet

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 24 Direct Connection

Networked

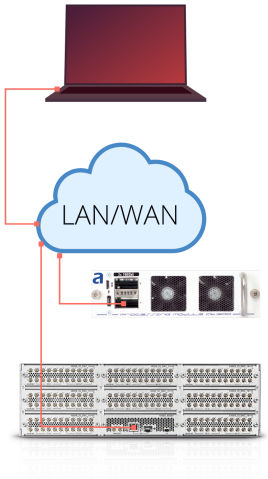

Figure 25 Networked Connection

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 IO_MGMT module.

Inband management of a AT300 is possible via any 100GbE 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 100GbE 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.

> Look at chapter **Serial Connection with a smartphone** for information of identifying addresses with your smartphone or go directly to our arkona github repository **here**.

Computer Network Interface IP Settings

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

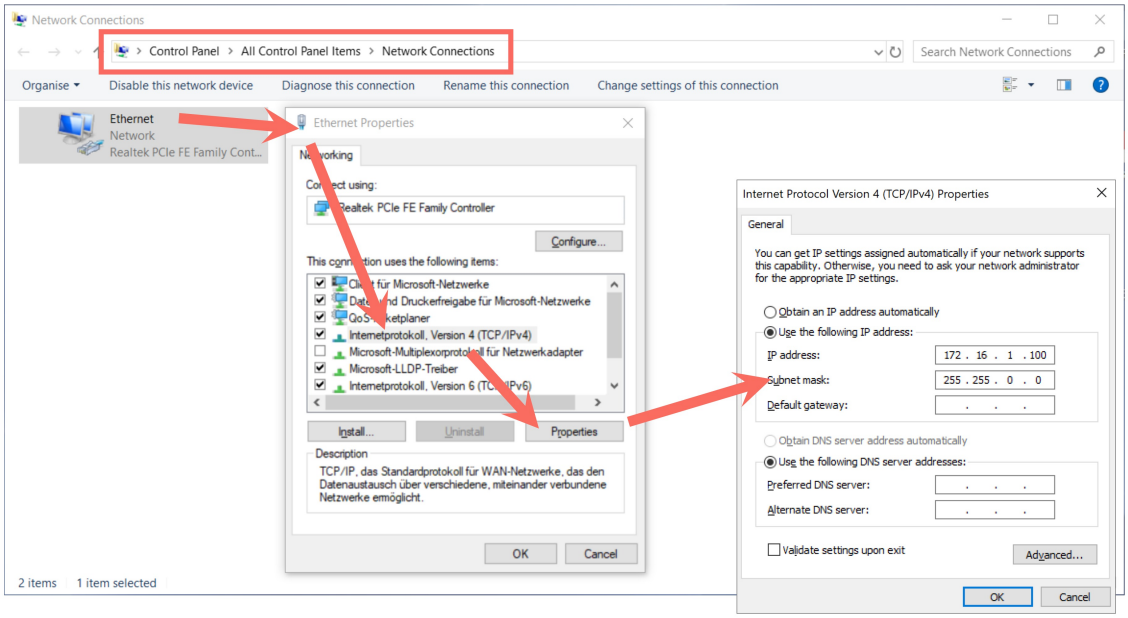

Figure 26 **Windows**: see **www.microsoft.com**

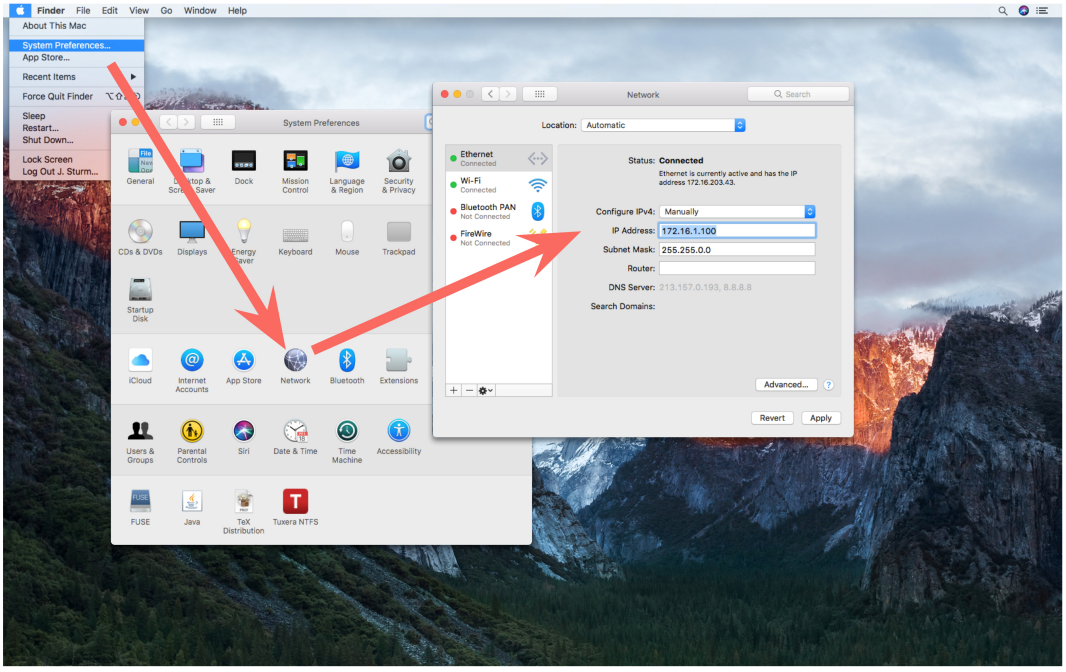

Figure 27 **MAC OS X**: see **www.apple.com**

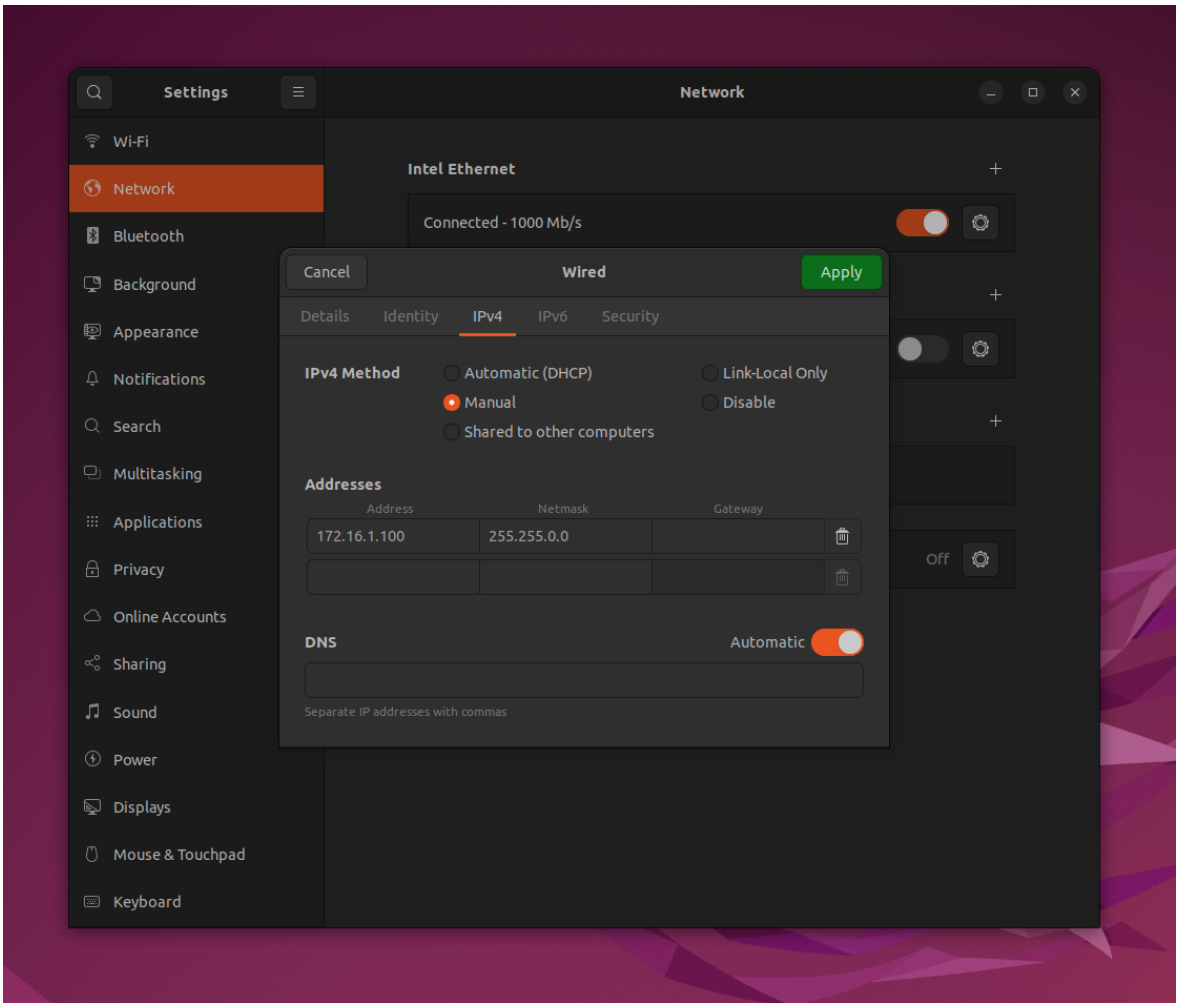

Figure 28 **Ubuntu**: Open Settings -> Network, click the gearwheel button and go to the IPv4 tab

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 a 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.

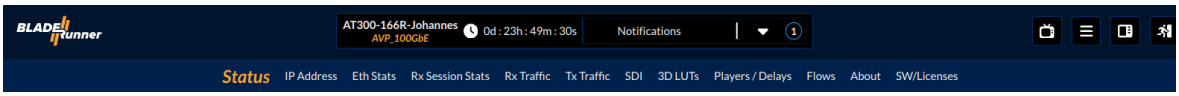

Figure 29 Navigation Bar - Logout

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**
- **Manual Configuration**
- **Software Update**

Operating Principles

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:

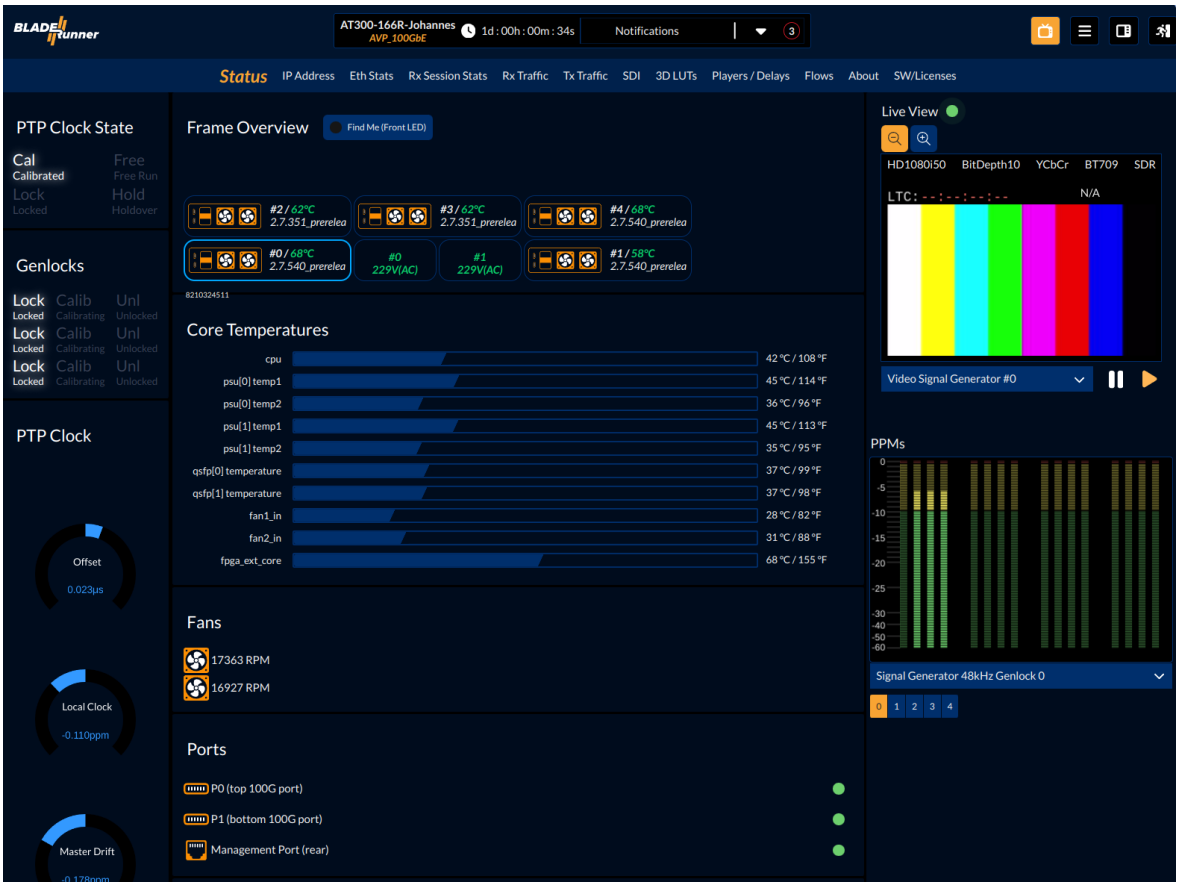

Figure 30 Landing Page

If the page does not appear, please follow the steps described in the chapter **Troubleshooting the 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:

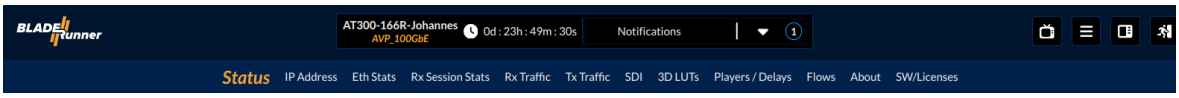

Figure 31 Landing Page - Navigation Bar

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

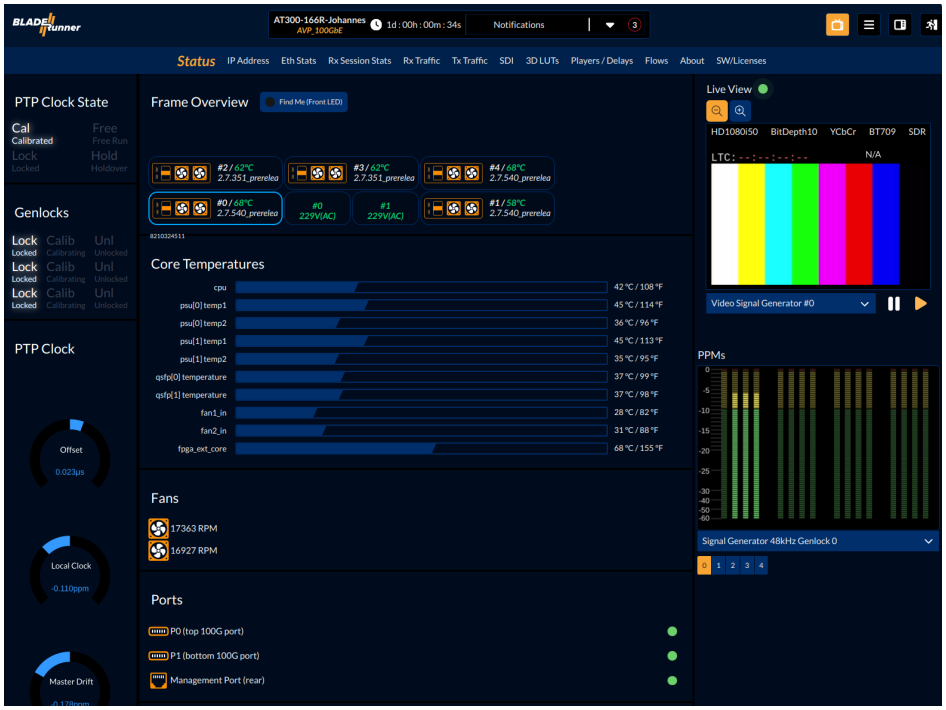

Figure 32 Landing Page - Status Section

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 33 Landing Page - IP Adresses Section

About

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

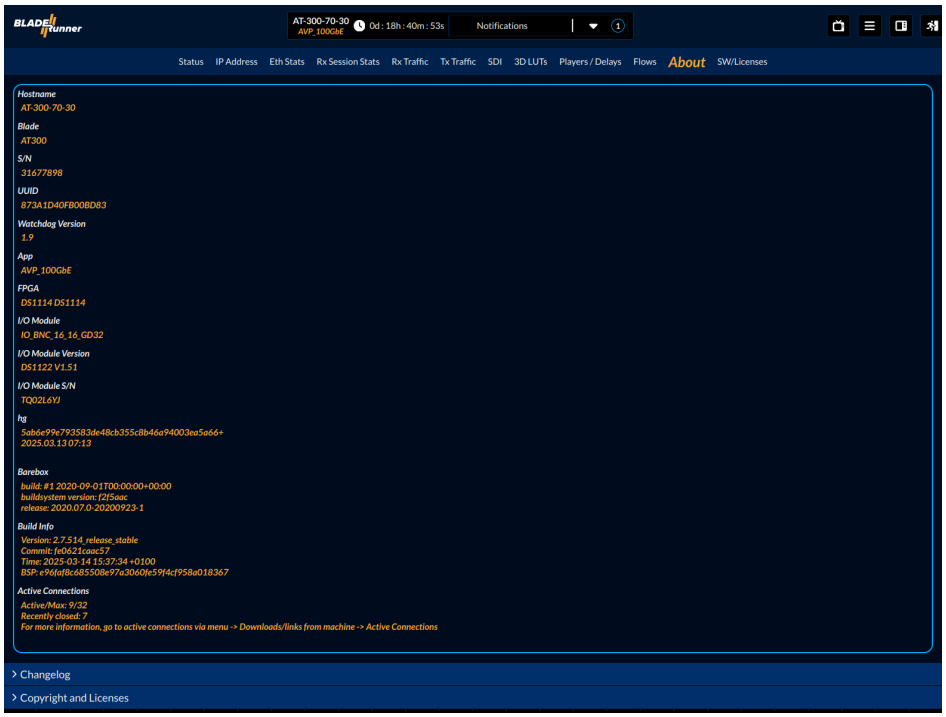

Figure 34 Landing Page - About Section

Advanced Settings

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

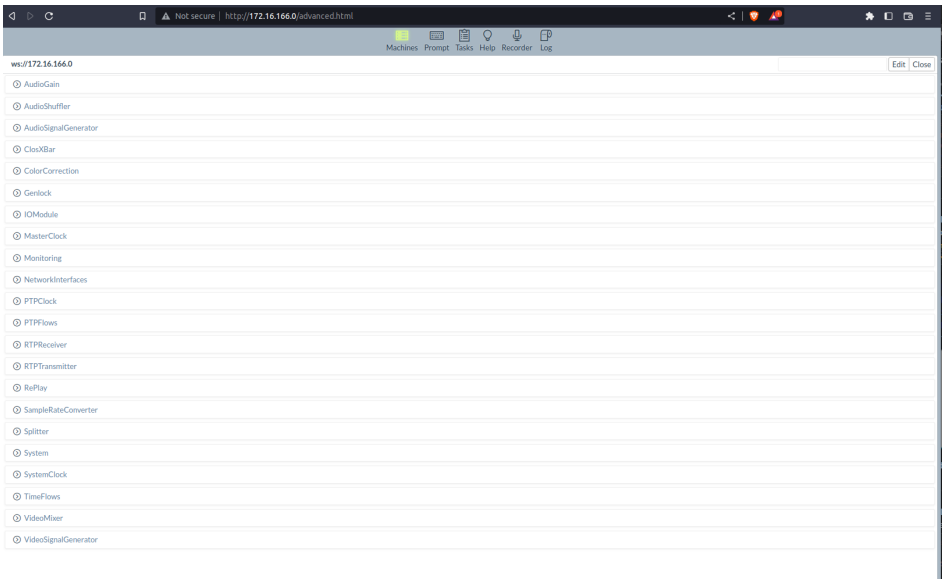

Figure 35 Advanced GUI

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.

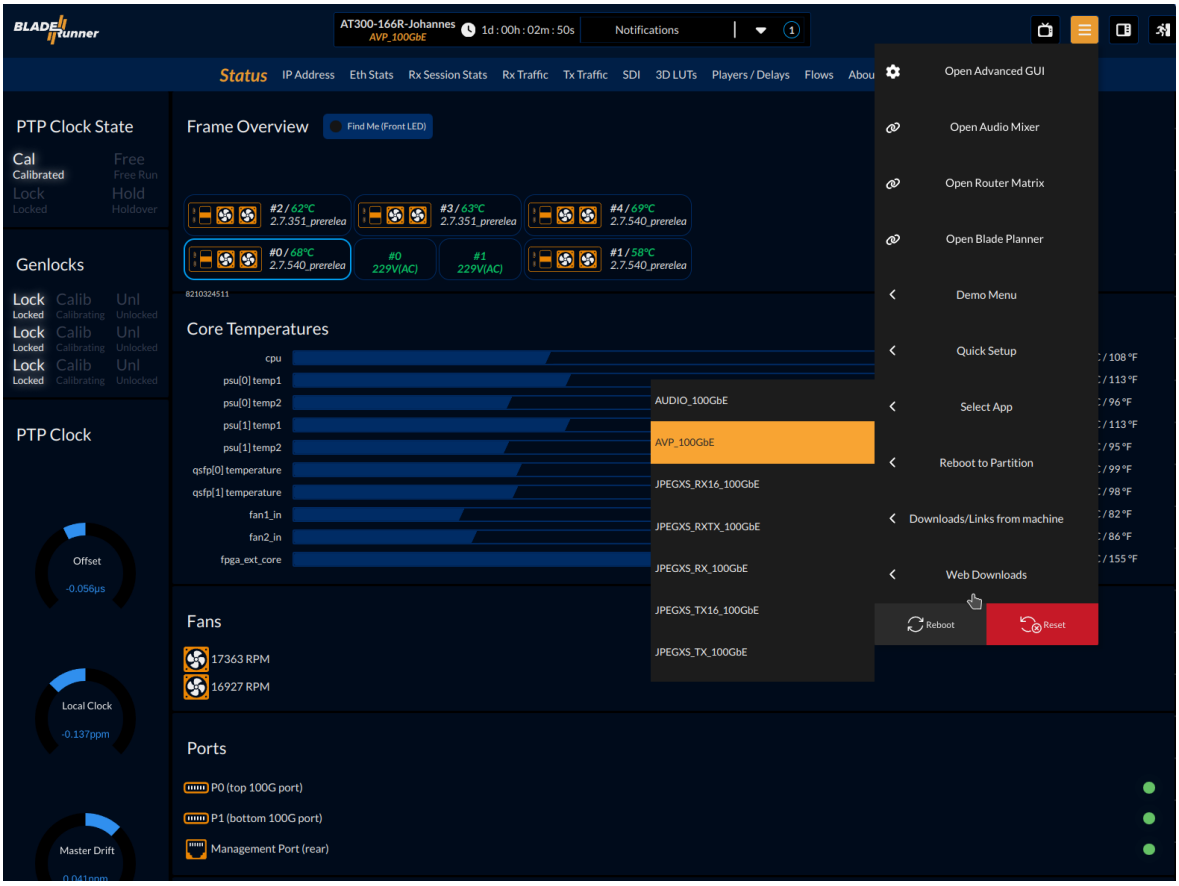

Figure 36 Landing Page - Menu

IP Configuration

As a simple example, if you want to disable DHCP and change the base IP address of port 0 (100GbE 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***

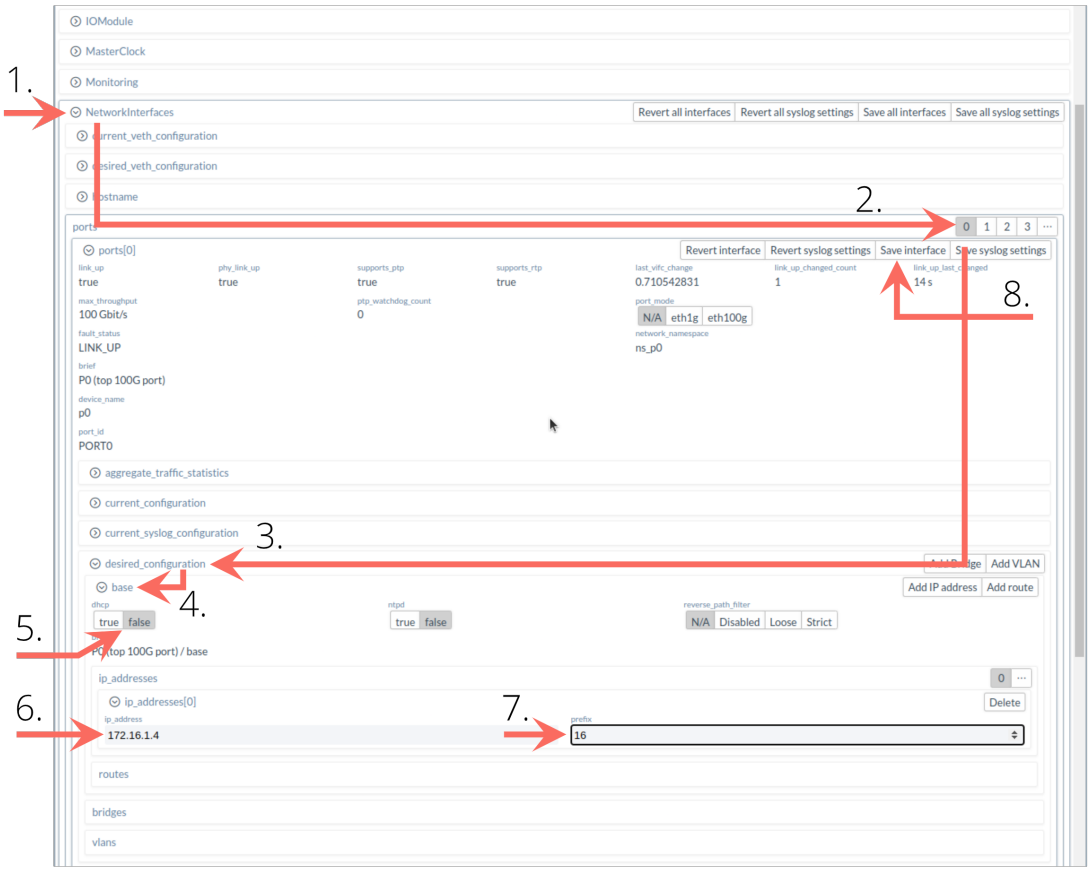

Figure 37 Advanced GUI - Network Interfaces: Change IP address

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, look at chapter **Serial Connection with a smartphone** or go directly to our arkona github repository **here** 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.

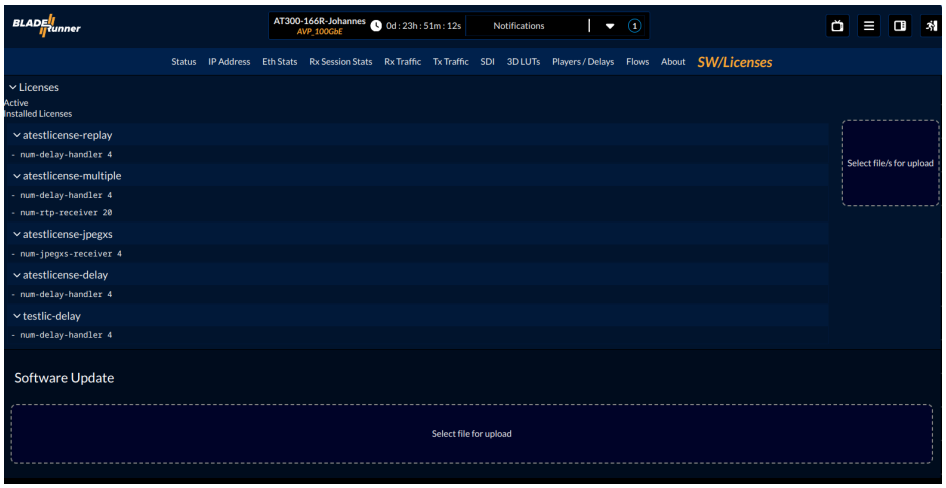

Figure 38 Landing Page - SW/Licenses Section

- 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.

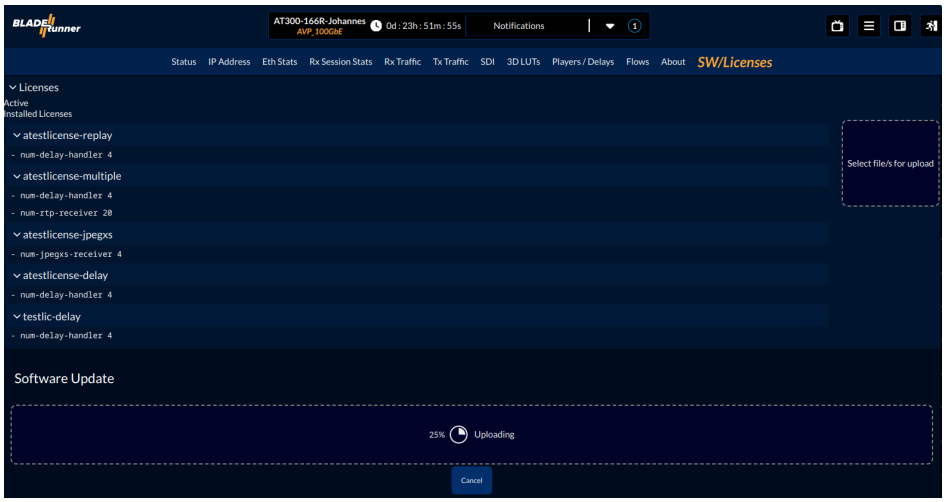

Figure 39 Landing Page - uploading new software

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

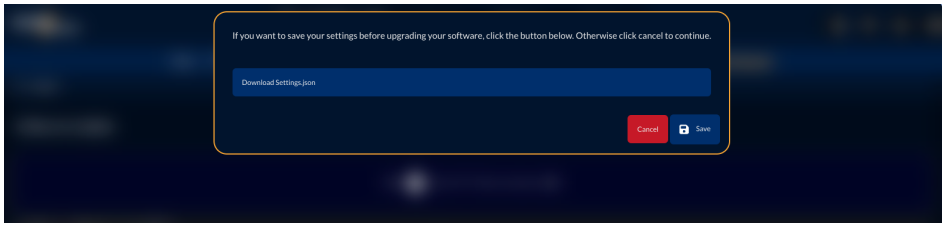

Figure 40 Landing Page - download settings

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

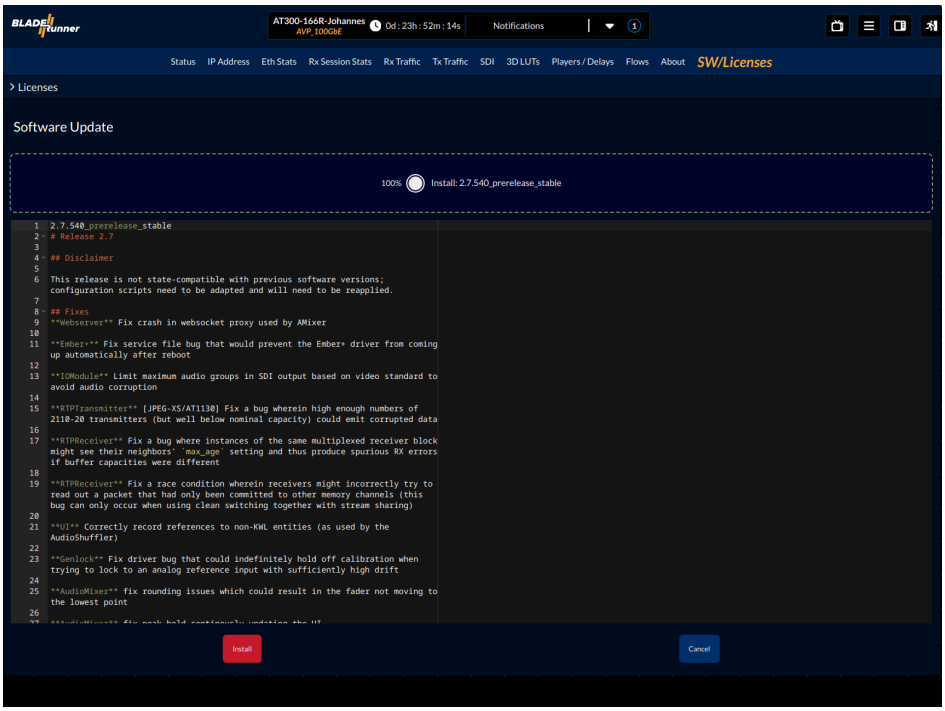

Figure 41 Landing Page - changelog

Notifications

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

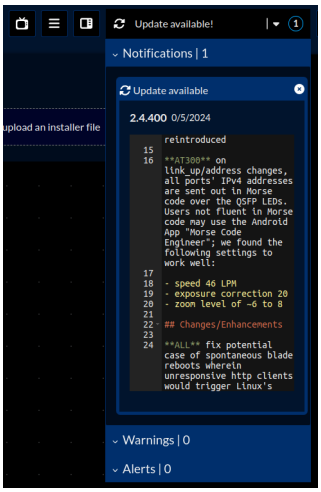

Figure 42 Landing Page - Notifications

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.

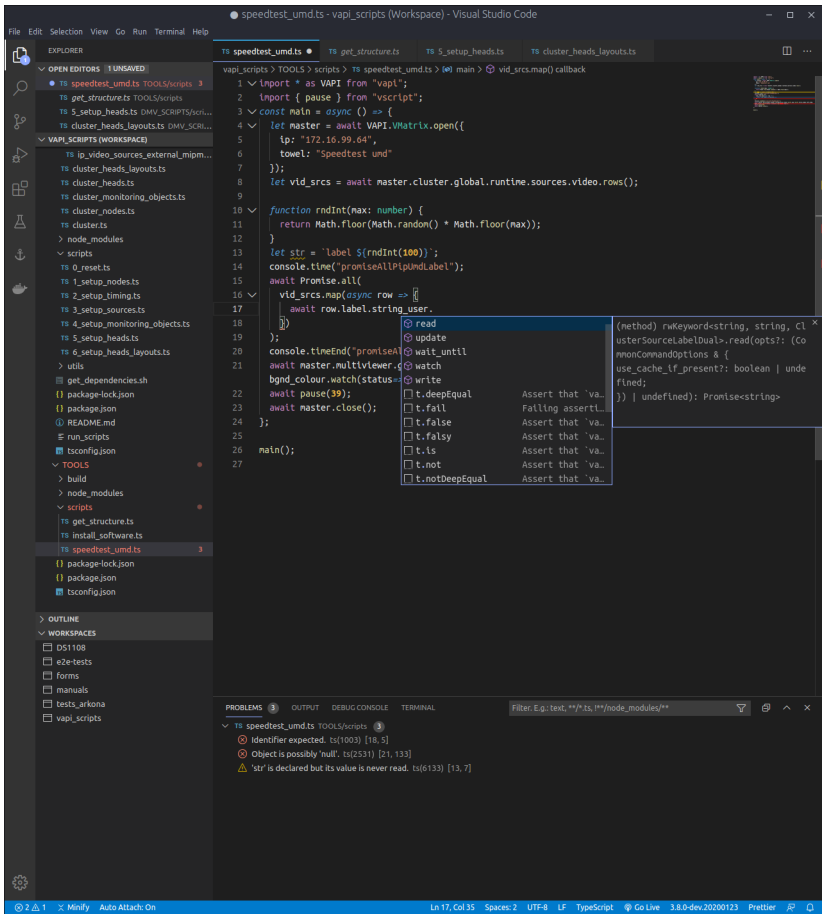

Figure 43 API integrated with Visual Studio Code - showing possible functionality suggestions

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**)

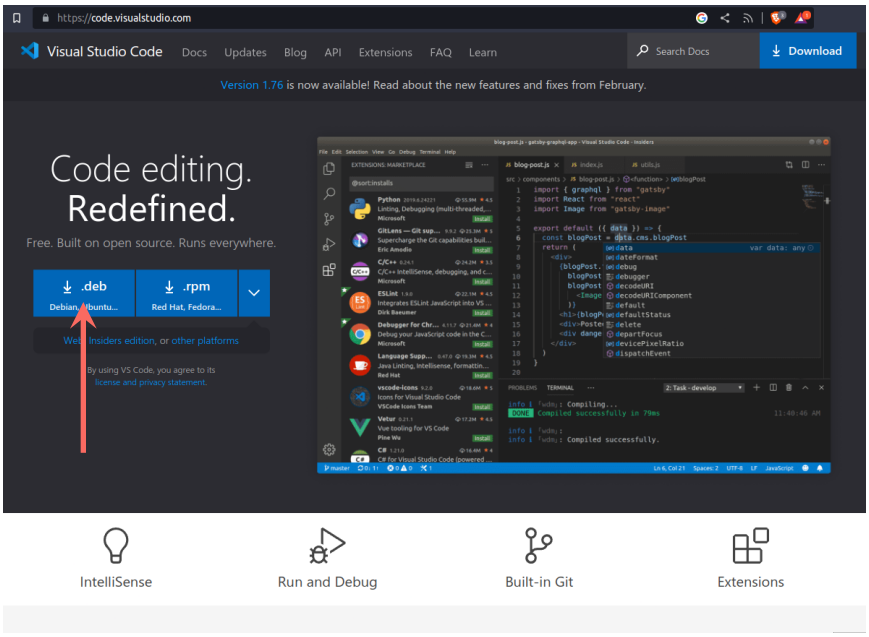

Figure 44 Download Visual Studio Code

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

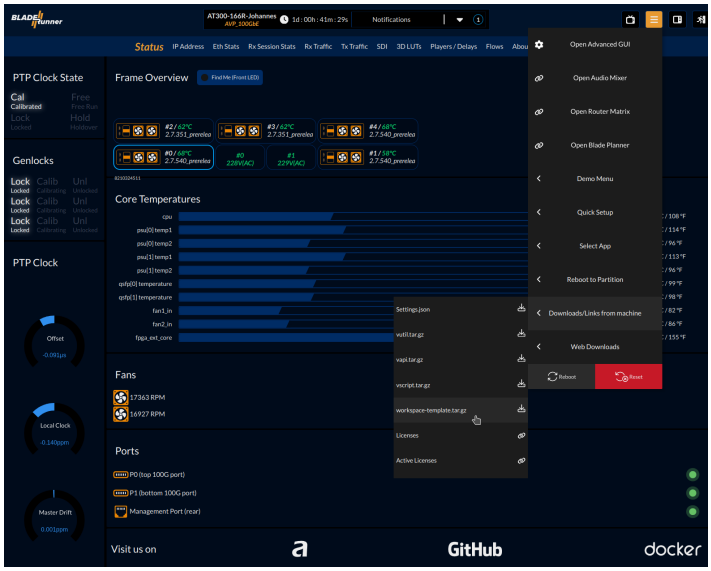

Figure 45 Download workspace template

4.

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

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

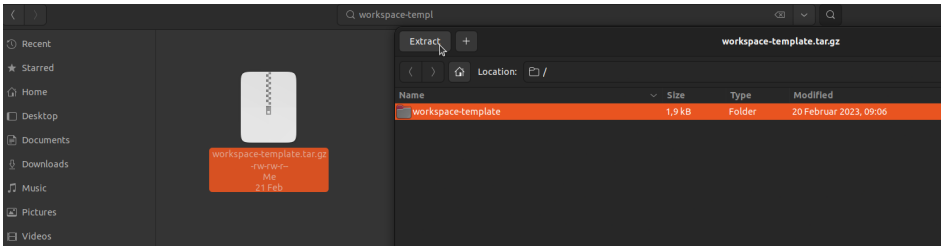

Figure 46 Extract workspace template

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**)

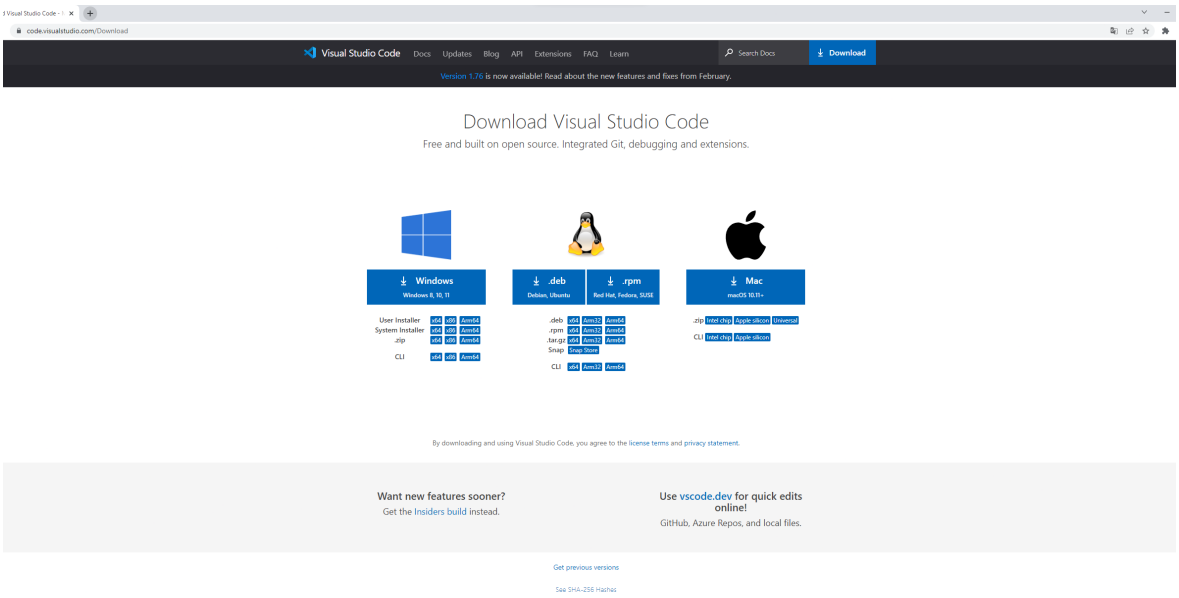

Figure 47 Download Visual Studio Code

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**

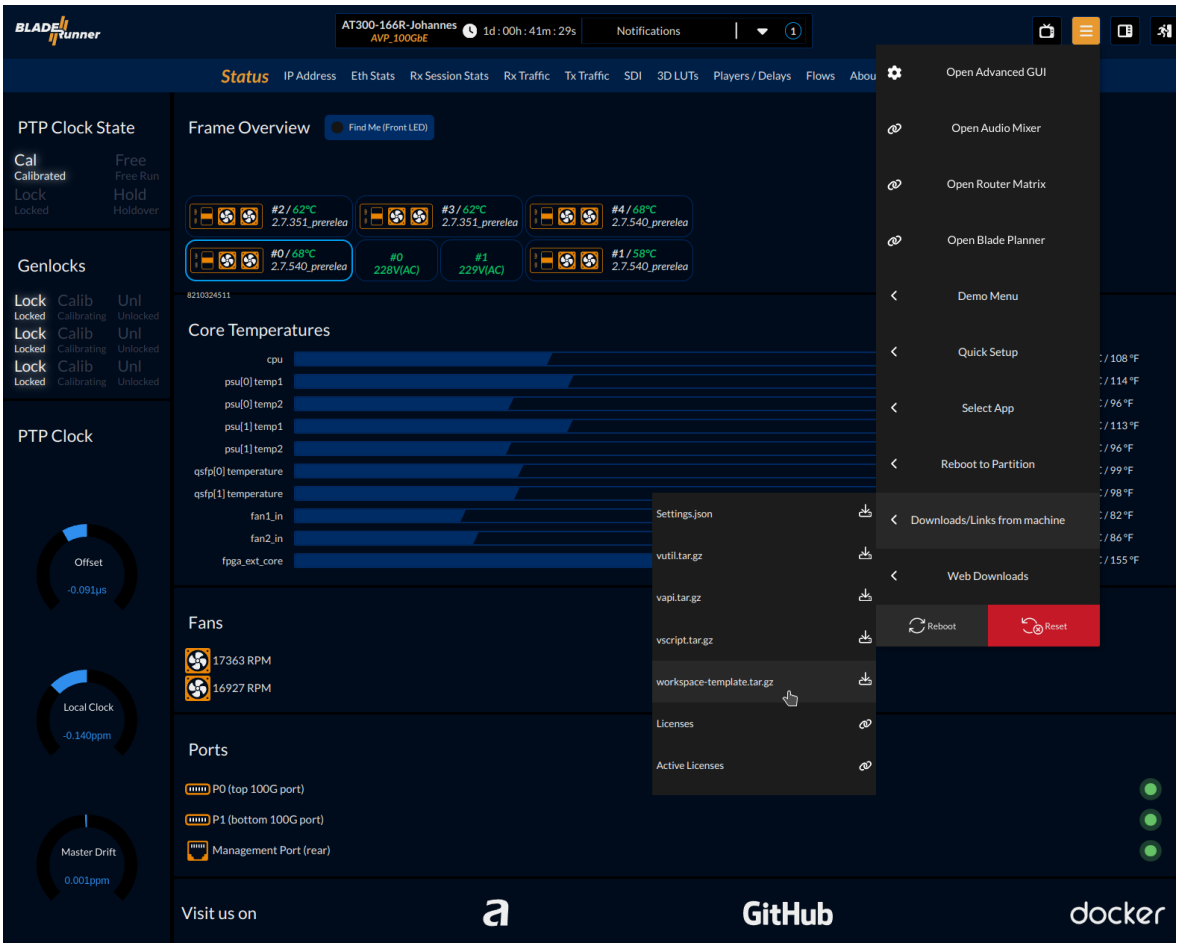

Figure 48 Download workspace template

Monitoring

Telemetry package

V//telemetry

What is this?

This image allows you to monitor all operational parameters exposed by the arkona ***BLADE//runner*** , and stream the results to an influxDB database for further analysis or interactive visual inspection.

Where do I get it from?

To download the docker image, please install **docker-ce and docker-compose** first and pull the image with the docker command: `docker pull arkonatechnologies/vtelemetry2` . If you want to use podman, pull the image from the docker.io hub : `podman pull docker.io/arkonatechnologies/vtelemetry2` .

How do I set it up?

There are two ways of setup, manually or with an existing template. For a fresh start, beginning with our template is the recommended way as it will handle some necessary setup steps on its own. For more information on the templates, jump to **"I do not have a preexisting setup, but would like to try this anyway"**

Manually

The container is configured by environment variables defined on container start as shown in the example below:

```
docker run -d \
      -e MACHINES=172.16.4.10,172.16.4.20,172.16.4.30 \
      -e BLACKLIST='\.audio\.signals,\.output\.signals,\.user_labels,
\.monitoring_objects\.audio,software_update,audio_source_slices,peak_meter' \
      -e WHITELIST='p_t_p,genlock,system' \
      -e INFLUX_API=2 \
      -e DB_HOST=192.168.1.23 \
      -e DB_PORT=8086 \
      -e DB_USER=user \
      -e DB_PASSWORD=password \
      -e DB_ORG=myorganization \
      -e DB_BUCKET=main_db \
      -e DB_NAME=main_db \
      -e DB_TOKEN='<token created in influxDB>' \
      -e VERBOSITY=1 \
    arkonatechnologies/vtelemetry2
```

Machines

Decide on the list of machines you wish to monitor and enter their respective IP addresses. For example, if you wish to monitor three ***BLADE//runner*** blades running at `172.16.4.10` , `172.16.4.20` , `172.16.4.30` , the environment variable should look like:
`-e MACHINES=172.16.4.10,172.16.4.20,172.16.4.30`

Every machine may be monitored through any of its IP addresses (i.e., whether you choose to use a management port or one of the 100GbE ports is irrelevant). Should you have requested multiple

connections to the same blade by mistake, ***V//telemetry*** will tell you about the offending IP address(-es) and exit.

Whitelist / Blacklist

To monitor everything ***BLADE//runner*** has to offer, you may simply omit the **BLACKLIST** and **WHITELIST** variables. However, this will likely log large amounts of irrelevant information such as peak meter levels, and thus place an unnecessarily high burden on your database server.

To only monitor those parts of the state you are actually interested in, set **BLACKLIST** to a list of comma-separated regular expressions (using JavaScript syntax). Those will be matched against every keyword's entire path `<keyword_list>.<keyword_name>`, and anything that matches will be ignored. For most use cases, the following is a good default to begin with:

```
-e BLACKLIST='\.audio\.signals,\.output\.signals,\.user_labels,
\.monitoring_objects\.audio,software_update,audio_source_slices,peak_meter'
```

You may also use **WHITELIST** to re-include state parts that had previously been excluded by **BLACKLIST**. For example, the easiest way to log everything under **PTP** and **Genlock** but nothing else would be to set `BLACKLIST=.*` (i.e., skip everything) and `WHITELIST=p_t_p,genlock`.

I wish to use this with a preexisting influxdb/Grafana setup

Fill in all fields starting with **DB_** according to your particular influxdb setup. For example, if you wish to log to a database named **main_db** on an influxdb server at IP address **192.168.1.23**, using the default port of **8086**, username **user** and password **password**, the config file should now look as follows:

```
docker run -d \
      -e MACHINES=172.16.4.10,172.16.4.20,172.16.4.30 \
      -e BLACKLIST='\.audio\.signals,\.output\.signals,\.user_labels,
\.monitoring_objects\.audio,software_update,audio_source_slices,peak_meter' \
      -e WHITELIST='p_t_p,genlock,system' \
      -e INFLUX_API=2 \
      -e DB_HOST=192.168.1.23 \
      -e DB_PORT=8086 \
      -e DB_USER=user \
      -e DB_PASSWORD=password \
      -e DB_ORG=myorganization \
      -e DB_BUCKET=main_db \
      -e DB_NAME=main_db \
      -e DB_TOKEN='<token created in influxDB>' \
      -e VERBOSITY=1 \
    arkonatechnologies/vtelemetry2
```

InfluxDB v1.8 support

The vtelemetry package can also still be used with influxDB v1.8. Just change following variables:

- Change `INFLUX_API=2` to `INFLUX_API=1`
- No need for `DB_BUCKET=<bucket name>`
- No need for `DB_TOKEN=<influx token>`

I do not have a preexisting setup, but would like to try this anyway

To get your feet wet with an example setup of influxdb, grafana and vtelemetry, you either need to install the **docker engine** or podman with podman-compose first.

The following setup has been tested on ubuntu 22.04 and ubuntu on wsl (linux on windows). The docker-compose file has been successfully tested with:

- **docker** (v23) with docker compose (v2)
- **podman** (v4.4.4) and **podman-compose** (v1.0.6)

This example serves as a quick start to get telemetry up and running, you are free to modify configuration for your needs.

We offer two quick templates for you:

A small stack with vtelemetry, grafana and a influxDB version 1 **here**, containing:

- an influxDB1 container

- a grafana container

- a vtelemetry container

It has no further dependencies than having a docker or podman installation running

It can be started with the docker compose command.

Or a bigger stack with vtelemetry, grafana, influxDB version 2, loki and rsyslog **here**, containing:

- an influxDB2 container

- a grafana container

- a vtelemetry container

- a loki container

- a promtail container

- a setup script

In addition to docker/podman, this template requires the apt package manager or a preexisting rsyslog installation.

The setup script in this template will try to install and configure rsyslog on the host machine. Afterwards it goes through the necessary steps to set the container stack up. InfluxDB2 uses generated tokens for authorization, the script will run the database container first and create a token. This read-write token will be shown in the output and also written to the .env file in the folder. In the last step the environment variables in the .env file will be used to set all containers up. Including data connections in grafana.

If the prerequisites are fulfilled, you only have to set variables in the .env file (especially IPs of blades) and start the script.

Follow the readme on the page you're choosing to install the stack on your host.

or

if you want to just handle the compose file yourself, download the docker-compose file from **here**, edit it and start the stack using the following command (non-rootless installation may need to be started with sudo!):

```
docker compose -f docker-compose.yml up
```

- Go to your InfluxDB in a browser instance: `http://localhost:8086`
- **Create a token** which needs read and write permissions for your database **main_db**.
- Copy the token and enter in the docker-compose file in the **DB_TOKEN** entry for the vtelemetry container.
- Restart the docker compose setup with `docker compose -f docker-compose.yml up -d`. Vtelemetry should now be able to send data to influxDB. The `-d` argument starts containers in the background. You can check your running containers with `docker ps`
- Navigate to `http://localhost:3000` using a browser of your choice. You should be presented with the following login screen:

Figure 49 Grafana Login Screen

- Enter username `test`, password `test` and click on `Log In`.
- Now, add your InfluxDB as a data source (see **grafana reference**)
- In the settings screen, fill in the following fields:

HTTP

- URL: `http://localhost:8086`

Custom HTTP Headers -> Add Header

- Header: `Authorization`
- Value: `Token <your InfluxDB token>`

InfluxDB Details

- Database=`bladerunner`
- User=`influxdbuser`
- Password=`influxdbpassword`
- Click `Save & Test` and make sure Grafana tells you that the data source is working.

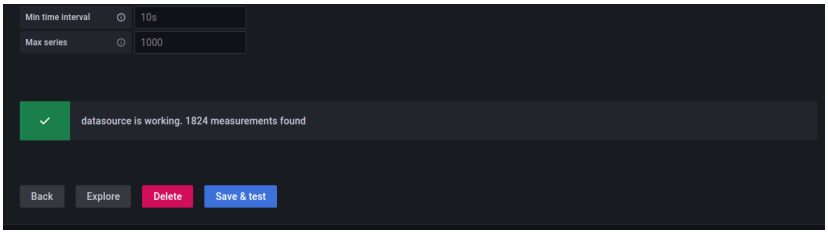

Figure 50 Database check on save

- Click on `Explore` in the left toolbar (compass icon).
- Click on the `measurements` button, you should now see a popup menu with a wealth of items to choose from.

- Enter `system` and set `field` to `temperature.cpu`.
- Group the resulting data by IP address and set the displayed measurement interval to at least 15 minutes (in the top right corner of the screen). If only one blade had been monitored, something like the following might show up:

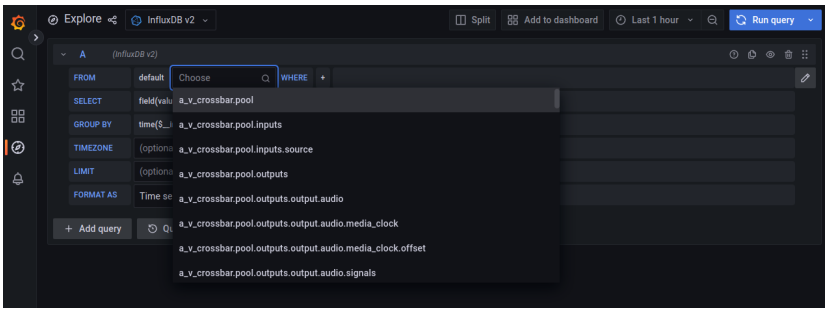

Figure 51 Grafana Explore - Measurements Dropdown

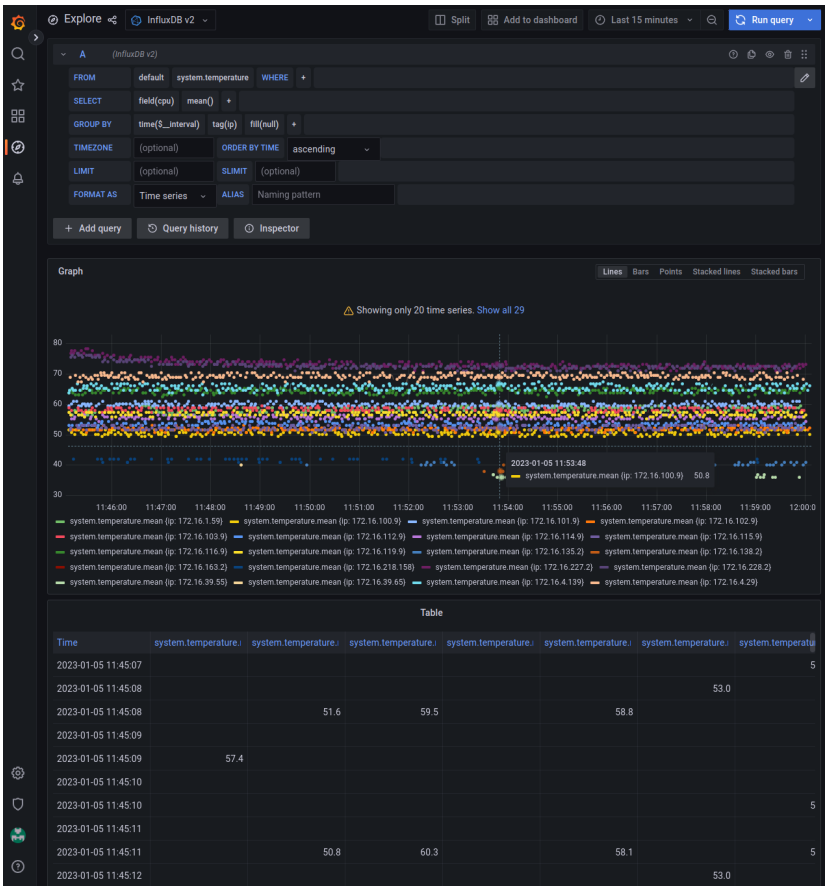

Figure 52 Grafana Explore - Query

Where do I go from here?

Play around with the `Explore` section and maybe set up a few dashboards. If you like what you see, you may now wish to consult the official `influxdb` documentation on how to set up a properly configured server. At the very least, please make sure to set up a **retention policy** as `influxdb` will otherwise keep inflating its database until your storage medium signals surrender.

Hardware requirements

The hardware requirements for vtelemetry depend on the setup of vtelemetry, especially the number of blades and the list of keywords being monitored. Including keywords that are by default excluded by the blacklist, like peak meters, will result in huge data loads with questionable purpose.

It furthermore depends on how long the data has to be stored, 7d of data (default configuration) of ~45 blades results in ~1TB of data. There are possibilities in the database to reduce that load by downsample older data, like adding a recursing task with something like the following:

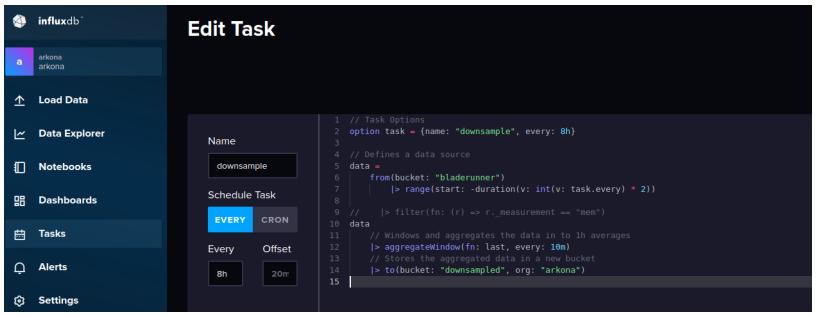

Figure 53 Downsampling data in influxDB

```
// Task Options
option task = {name: "downsample", every: 8h}

// Defines a data source
data =
    from(bucket: "bladerunner")
        |> range(start: -duration(v: int(v: task.every) * 2))

//    |> filter(fn: (r) => r._measurement == "mem")
data
    // Windows and aggregates the data in to 1h averages
    |> aggregateWindow(fn: last, every: 10m)
    // Stores the aggregated data in a new bucket
    |> to(bucket: "downsampled", org: "influxdborg")
```

Also, querying the data in a non-wasteful way is often more important than further optimizing the collection process. Unspecific queries for a long time period can result in request timeouts or even an unresponsive PC. Best way to do queries is to be as specific as possible. This is even more important when there's not plenty of RAM in which the database usually caches data.

For detailed information, always consider reading through the documentation of **InfluxDB**.

TL;DR

As a **very rough** recommendation there are two scenarios:

- Small installations like up to 8 blades with the default configuration can be monitored by a mid range PC, roughly: `{ cpu: i5/Ryzen 5, ram: 16GB RAM, disk: SSD }`.
- Bigger installations like up to ~40 blades or more* with the default configuration can be monitored by a higher range PC `(i7/i9/Ryzen 5/Ryzen 7, 64GB RAM, SSD raid)`. It scales better with more cores/threads than pure clock speed. 64GB of RAM are not needed, but 32GB could be right at the edge without any in-mem handling for the database, and therefore not recommended for that scenario.

*Not having the possibility to test telemetry with more blades than being installed in our lab, the numbers are to be handled with caution. The lab has around 45 blades running, all being monitored on one server (32 core EPYC, 192GB RAM, SSD raid), data stored for 7d plus downsampled data for a year,plus some other data and services with a load of 30GB RAM used, 140GB RAM cached for influx, 30% CPU in average.

Caveats

Even with a lot of optimizations, the huge amount of data being written to the database in very short time periods could lead to problems if multiple data batches want to to write at the exact same time to the database. To resolve issues like that, consider looking for a database clustering or other optimizations.

Techdata and Appendices

- **IPGR Datasheet (available online)**
- **Declaration of Conformity**
- **SNMP MIB file for *BLADE//runner* (available online)**

IPGR Datasheet

IPGR Datasheet (available online)

SNMP MIB File

SNMP MIB file for ***BLADE//runner*** (available online)

Declaration of Conformity

arkona TECHNOLOGIES GMBH

Supplier's Declaration of Conformity

in accordance with ISO/IEC 17050-1

The undersigned authority declares that the product(s) listed below

Product Type:	Audio/video information and communication technology equipment / Multimedia equipment
Product Name:	AT300, IO_MSC2
Product Options:	All

Conforms with the requirements of following documents:

Safety:	EN 62368-1:2014 + A11: 2017, AS/NZS 62368.1:2018

Electro Magnetic Compatibility (EMC):

EN 55032:2015 + A11: 2020
EN 55024:2010 + A1: 2015
EN 55035:2017 + A11: 2020
EN 61000-3-2:2014

Restriction of Hazardous Substances (RoHS):

EN 63000:2018

RF:

EN 303413 V1.1.1: 2017/06

This product complies with the requirements of the European Union Directives:

2014/35/EU	Low Voltage Directive
2014/30/EU	EMC Directive
2012/19/EU	Waste Electrical and Electronic Equipment (WEEE) Directive
2011/65/EU	Restriction of Hazardous Substances (RoHS) Directive

Additional Information:
This equipment complies with all the requirements for the CE Mark.
Operating conditions and use according to the operating instructions/data sheet are prerequisites.

December 10th, 2021
Date

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arkona TECHNOLOGIES GMBH

Supplier's Declaration of Conformity

in accordance with ISO/IEC 17050-1

The undersigned authority declares that the product(s) listed below

Product Type:	Audio/video information and communication technology equipment / Multimedia equipment
Product Name:	IO_BNC_16+16, IO_BNC_11+11, IO_BNC_16, IO_MGMT
Product Options:	All

Conforms with the requirements of following documents:

Safety: EN 62368-1:2014 + A11: 2017, AS/NZS 62368.1:2018

Electro Magnetic Compatibility (EMC):

EN 55032:2015 + A11: 2020
EN 55024:2010 + A1: 2015
EN 55035:2017 + A11: 2020
EN 61000-3-2:2014

Restriction of Hazardous Substances (RoHS):

EN 63000:2018

RF:

EN 303413 V1.1.1: 2017/06

This product complies with the requirements of the European Union Directives:

2014/35/EU	Low Voltage Directive
2014/30/EU	EMC Directive
2012/19/EU	Waste Electrical and Electronic Equipment (WEEE) Directive
2011/65/EU	Restriction of Hazardous Substances (RoHS) Directive

Additional Information:
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Operating conditions and use according to the operating instructions/data sheet are prerequisites.

December 21st, 2023
Date

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Supplier's Declaration of Conformity

in accordance with ISO/IEC 17050-1

The undersigned authority declares that the product(s) listed below

Product Type:	Audio/video information and communication technology equipment / Multimedia equipment
Product Name:	FR_3RU, FR_2RU, FR_1RU, FR_2RU_LN
Product Options:	All

Conforms with the requirements of following documents:

Safety:	EN 62368-1:2014 + A11: 2017, AS/NZS 62368.1:2018

Electro Magnetic Compatibility (EMC):

EN 55032:2015 + A11: 2020
EN 55024:2010 + A1: 2015
EN 55035:2017 + A11: 2020
EN 61000-3-2:2014

Restriction of Hazardous Substances (RoHS):

EN 63000:2018

RF:

EN 303413 V1.1.1: 2017/06

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2014/30/EU	EMC Directive
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December 22nd, 2023
Date

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