



TrafficDrone: How to start

A step by step guide to your real-time monitoring drone

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Thank you for purchasing the TrafficDrone unit and joining the FLOW family of next-gen traffic analytic intelligence! You have purchased the most powerful and versatile traffic AI available – it is waiting in the box to be unleashed by your creativity.

We wish you an exciting journey towards a smoother and safer traffic of tomorrow. Let the traffic FLOW.

On behalf of the whole DataFromSky team



David Herman, CEO

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Unboxing

First things first - let's check all the bits and pieces that landed on your table. Depending on the selected configuration, you should be able to find the following:

- TrafficDrone processing unit
- How To Start guide
- Wireless keyboard
- Wireless mouse
- Touchscreen 15.6" complete with accessories and cables
- Carrying case for the touchscreen and cables

Optional accessories

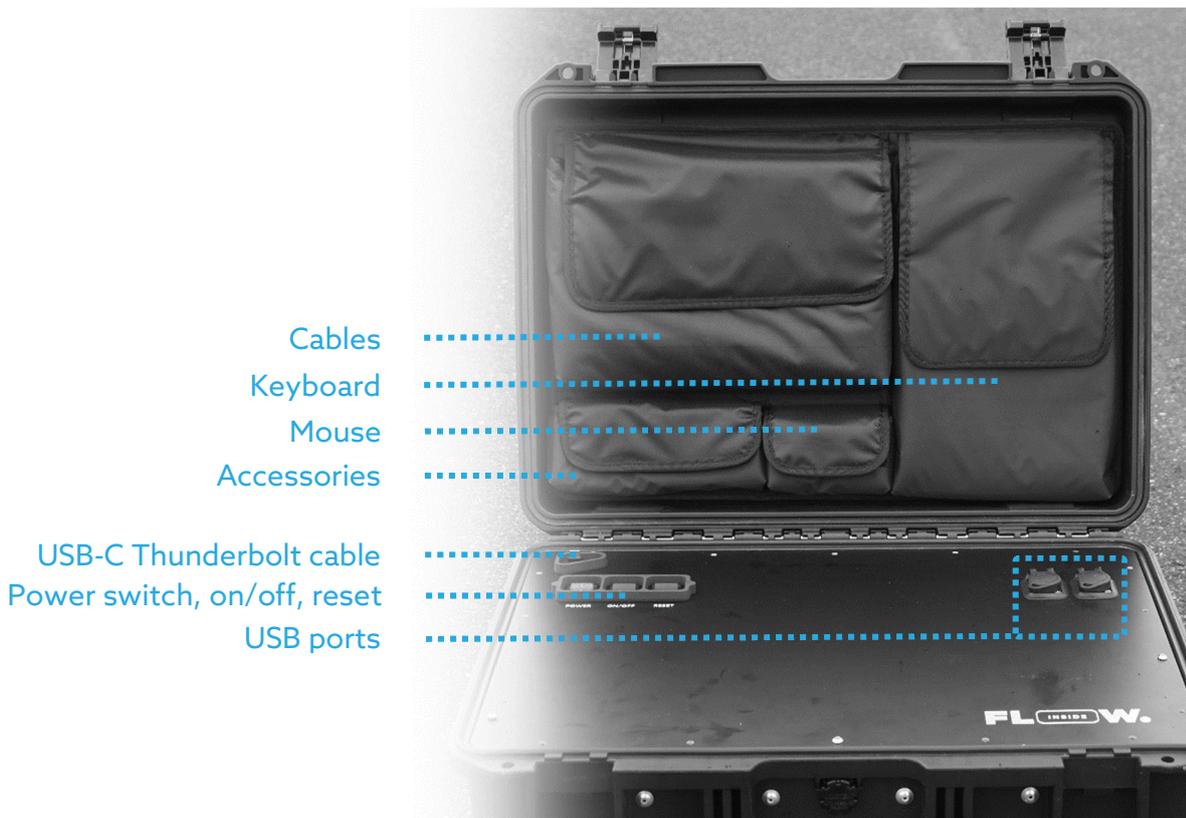
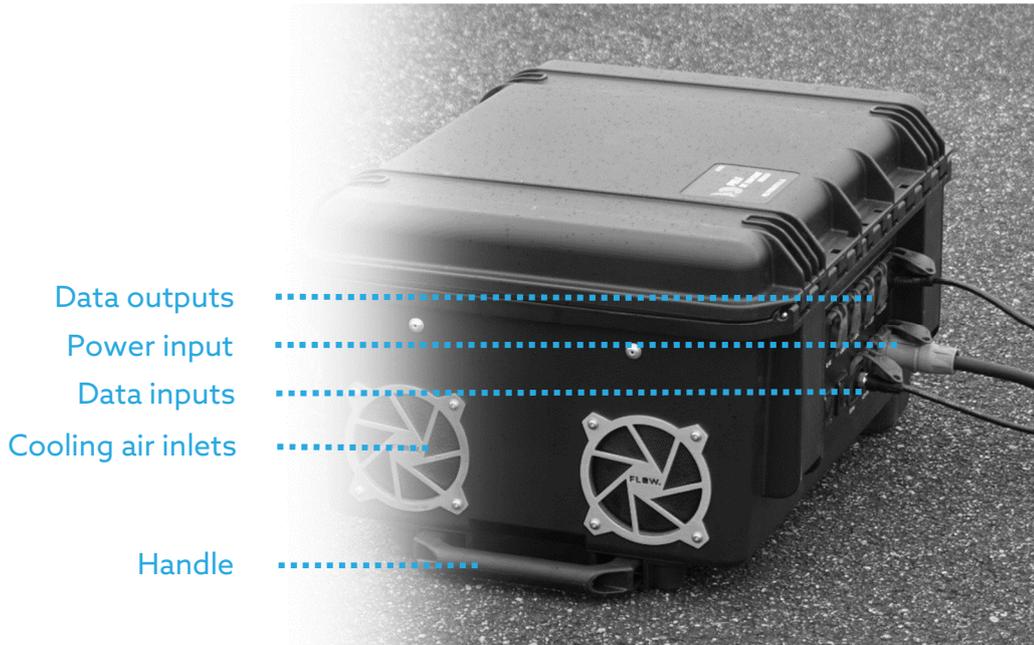
- DJI M210 V2 drone complete with accessories and manuals
- Elistair Ligh-T V4 tethering system complete with accessories and manuals

Cabling

- Power cable with powerCON NAC3FCA terminal
- Spare powerCON NAC3FCA terminal for custom power cable assembly
- Ethernet cable RJ45 with etherCON NE8MC6-MO terminal
- HDMI video input cable
- SDI video input cable

TrafficDrone video processing unit

The TrafficDrone unit is basically a powerful AI inferencing computer in a rugged Pelican case enclosure. The unit is intended to be directly connected to an UAV ground station. This way it can extract insights based on video stream from the aerial vehicle in real-time, on the spot.



Powering TrafficDroneUnit

The unit is powered by a single 100-230V AC input. The power source shall be capable of delivering 11 A @ 100 V or 5.5 A @ 240 V.

Under typical operating conditions the unit consumes approximately **450W** of power.

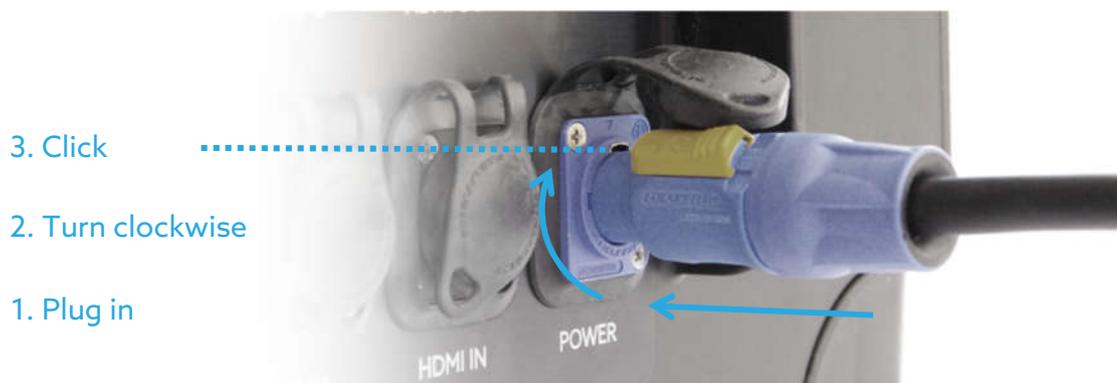
It can be supported by mains electricity, a portable generator or a battery power station.

Attaching the power cord



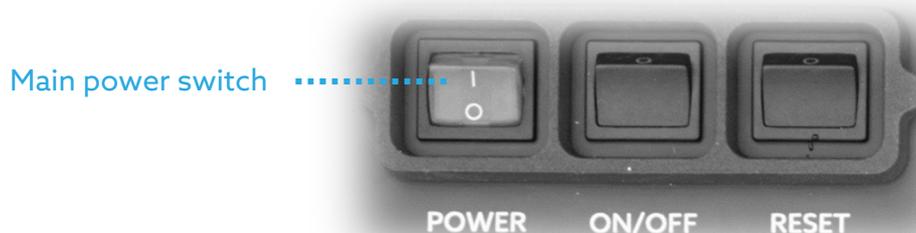
Prior connecting power cable please make sure the main power switch is turned off

The power port features a lockable powerCON terminal for durable and reliable connection. To connect the power cable, insert the powerCON plug into the receptacle placed on back side of the Unit and turn it clockwise until the security latch clicks into its place.



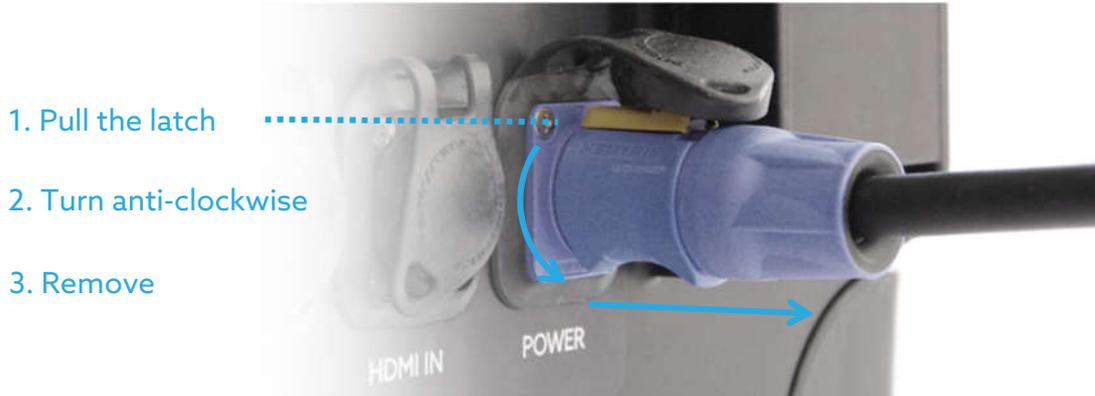
Check that the connection is secure by trying to turn the plug. The connector must not allow any movement or detachment.

Once the power cable is secured and plugged into a power source, turn on the main power switch on the Unit.



Detaching the power cord

Turn off the main power switch on the unit. Disconnect the power cord from the power source. Then unlock the yellow security latch and turn the powerCON plug counter-clockwise. You are now free to remove the terminal from the receptacle.



Interfacing TrafficDroneUnit

Video input

Apart from power, the TrafficDroneUnit requires only a video signal for successful operation. The signal can be provided by any of these interfaces:

- HDMI Input
- SDI Input
- Network RTSP stream

The HDMI and SDI inputs are designed to be connected directly to the UAV ground station video output. All standard resolutions and formats are supported. However, for best results, FullHD **1080p30 format is recommended.**

The video signal should not include any overlays, composition lines etc. Clean video is desired for best results.

Should overlay-free signal not be available, the affected areas can be omitted by means of "Region of interest - image cropping" function present in FLOW Insights analytics settings.

Video output

The TrafficDroneUnit features three video outputs that can be used for monitoring of the unit:

- 2x HDMI output on the rear panel
- 1x USB-C Thunderbolt cable inside the case

General purpose interfaces

The TrafficDroneUnit features four USB interfaces that can be used for connecting external storage devices, memory card readers or other peripherals

- 2x USB-C
- 2x USB-A

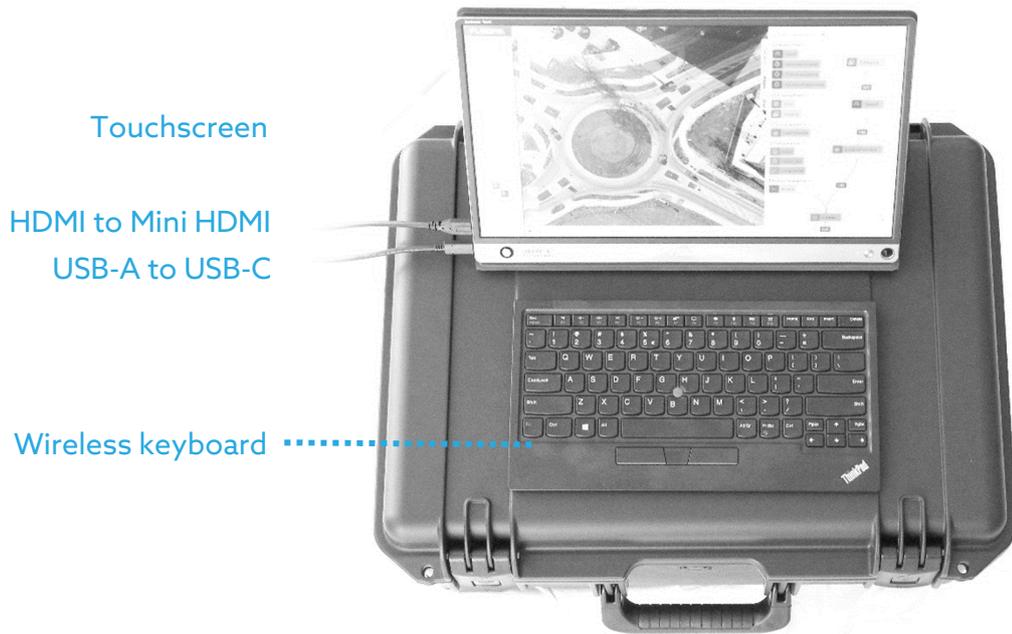
A Gigabit Ethernet interface is available:

- 1x RJ-45 capable of receiving standard RJ45 connectors. The original etherCON enclosure provides additional shielding and mechanical protection.

Configurations

The TrafficDrone Unit is designed to be extremely versatile. It can be deployed in a number of scenarios and configurations. Here are a few typical setups:

1. Remote operation
 - The unit is closed
 - Only power cord, video input and network (either wired or wireless) are connected
 - The unit is controlled remotely by a FLOW Insights application running on a different computer. FLOW Insights for Windows can be downloaded here: http://www.datafromsky.com/download/flow/demokit/FLOW_Demokit.exe
2. Stand-alone configuration with external monitor
 - The unit is closed
 - Network connection is not required
 - External monitor is connected to one of the HDMI outputs on the back side of the unit
 - The unit is controlled by wireless keyboard and mouse. Alternatively, touch interface can be utilized.



3. Stand-alone configuration with internal monitor

- The unit is opened
- Network connection is not required
- Monitor is connected to the internal Thunderbolt port. Monitor is fixed in place by magnetic holder
- The unit is controlled by wireless keyboard and mouse. Alternatively, touch interface can be utilized. Magnetic holder is available for the keyboard.



A typical setup for tether-supported persistent surveillance use case is depicted on the following figure:

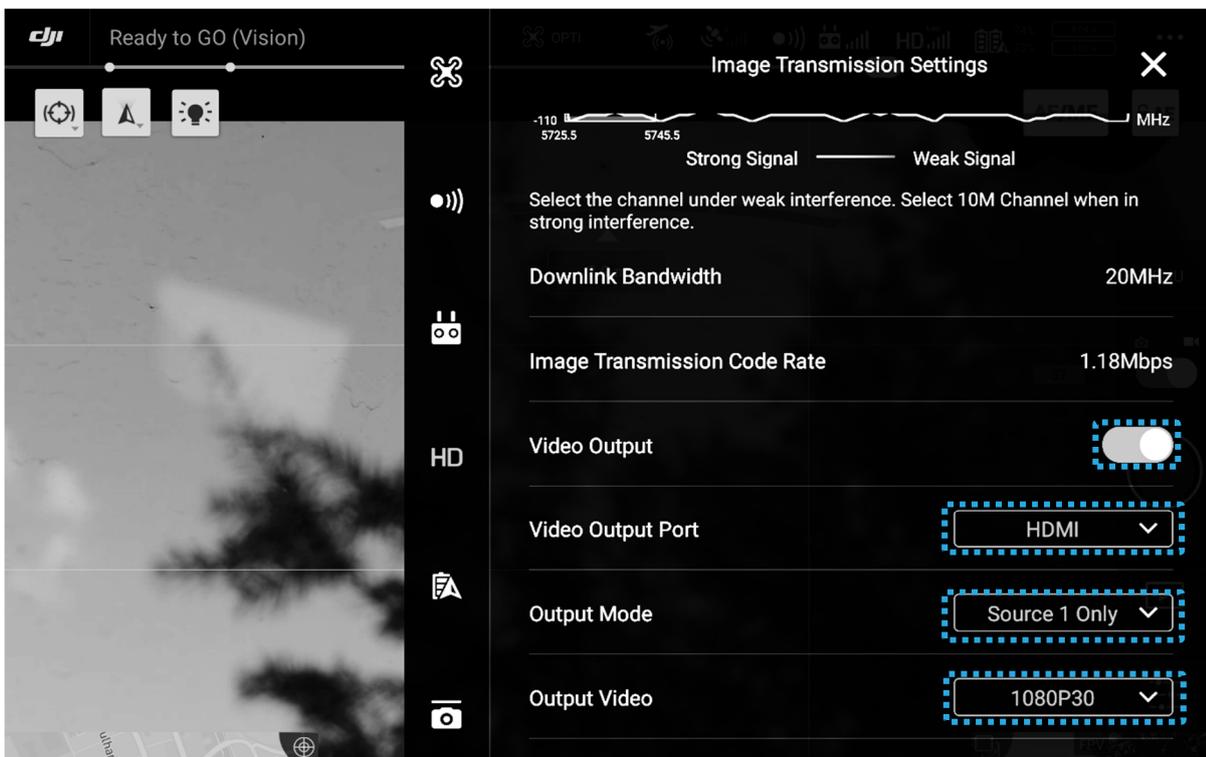


Quick start guide

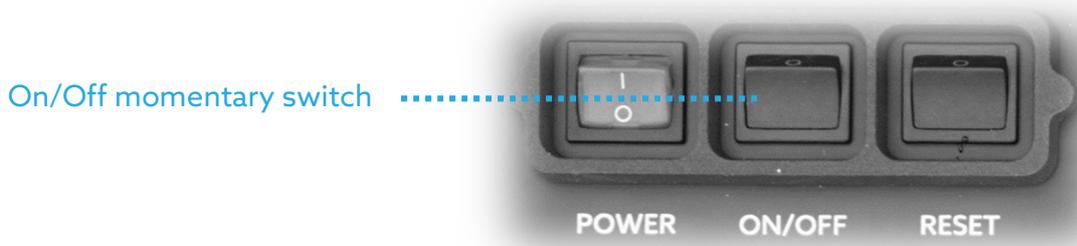
Deployment of the TrafficDroneUnit is very straightforward. Let's demonstrate it on a typical use case.

First, we need to connect the unit to the power source and turn the main power switch on as described above.

Video stream will be fed to the unit via HDMI cable from a DJI CrystalSky/Cendence ground station connected to DJI Matrice M210v2 UAV. We will make sure to set the remote controller to input **clean video signal without overlay** and in appropriate format (**1080p30**):



We are done with the HW setup and ready to start the TrafficDrone processing unit. Let's do it by pressing the On/Off momentary switch:



The unit will come to life after a few moments. It runs on a Debian operating system. We need to **log in to the system** to start using the unit. Since we are interested in standard use of the TrafficDroneUnit, we will take advantage of the user account with the following credentials:

- System login: **flowuser**
- Password: **useruser**



For system administration, updates and root access, please use the administrator account with the following login credentials:

- System login: **flowadmin**
- Password: **adminadmin**



It is recommended to change default passwords in order to increase system security

After successful system login the system starts FLOW Insights interface and connects to the FLOW Block analytics core running on localhost (the TrafficDroneUnit).



The **FLOW Block login** is performed automatically with the following default credentials to provide a straightforward user experience:

- FLOW login: **admin**
- Password: **admin**

When operating TrafficDroneUnit in advanced scenarios with multiple user accounts, please change the admin password. The default login will fail and you will be able to login with desired user account

Easy as that, you are now logged to the FLOW Block running on the TrafficDroneUnit and if there is video signal present at the input, you are already analysing the stream.

Touch screen operation

FLOW environment has been conceived with touch screen operation as one of the primary use cases. The user experience is therefore very natural and perhaps even more intuitive compared to using a mouse.

In order to support text input, the system features an on-demand software keyboard that can be evoked by pressing on the following icon:

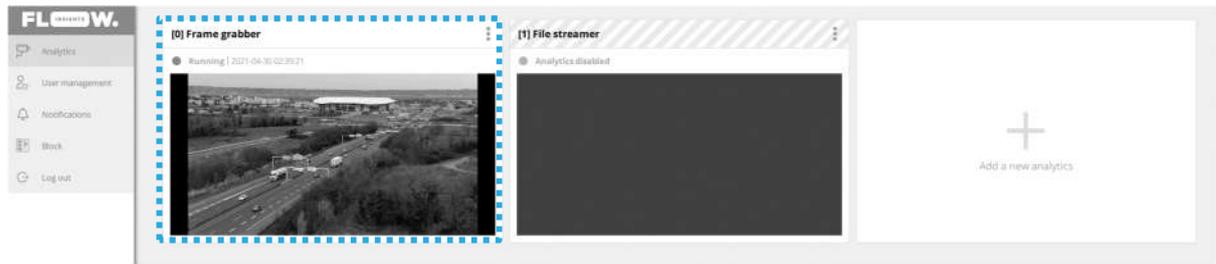


The keyboard can be moved around the screen and closed when no longer needed with dedicated buttons:



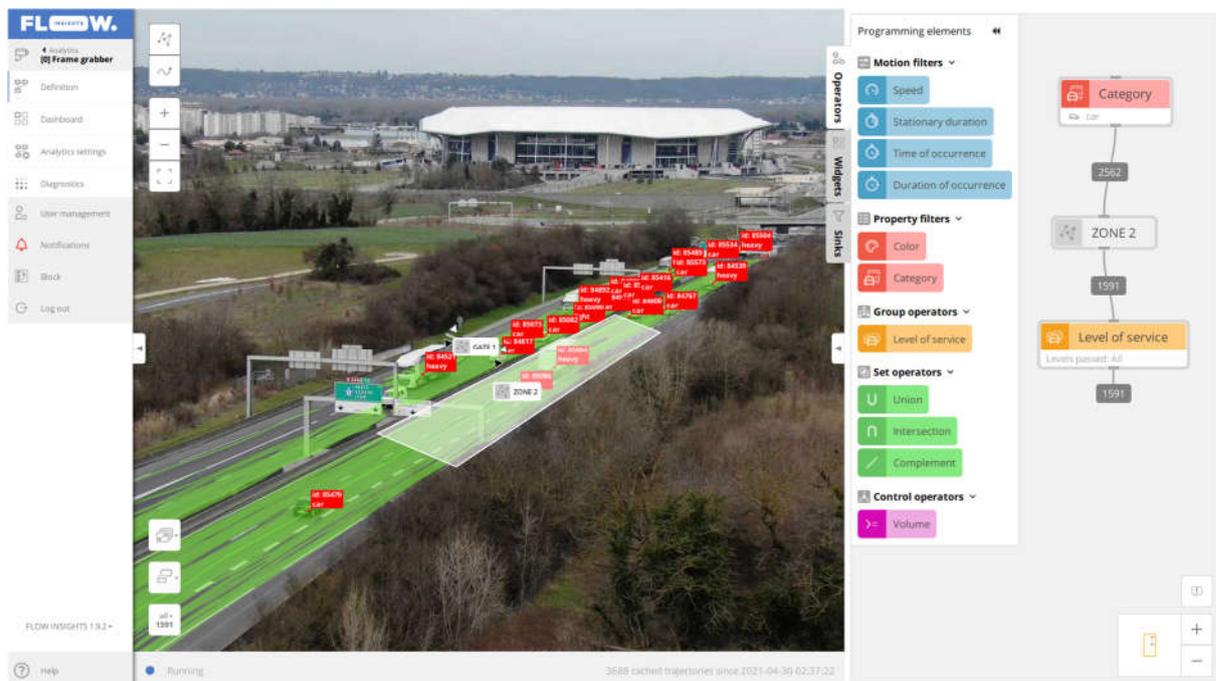
Frame grabber analytics

Let's now enter the analytics based on the HDMI / SDI video input by clicking on the tile:

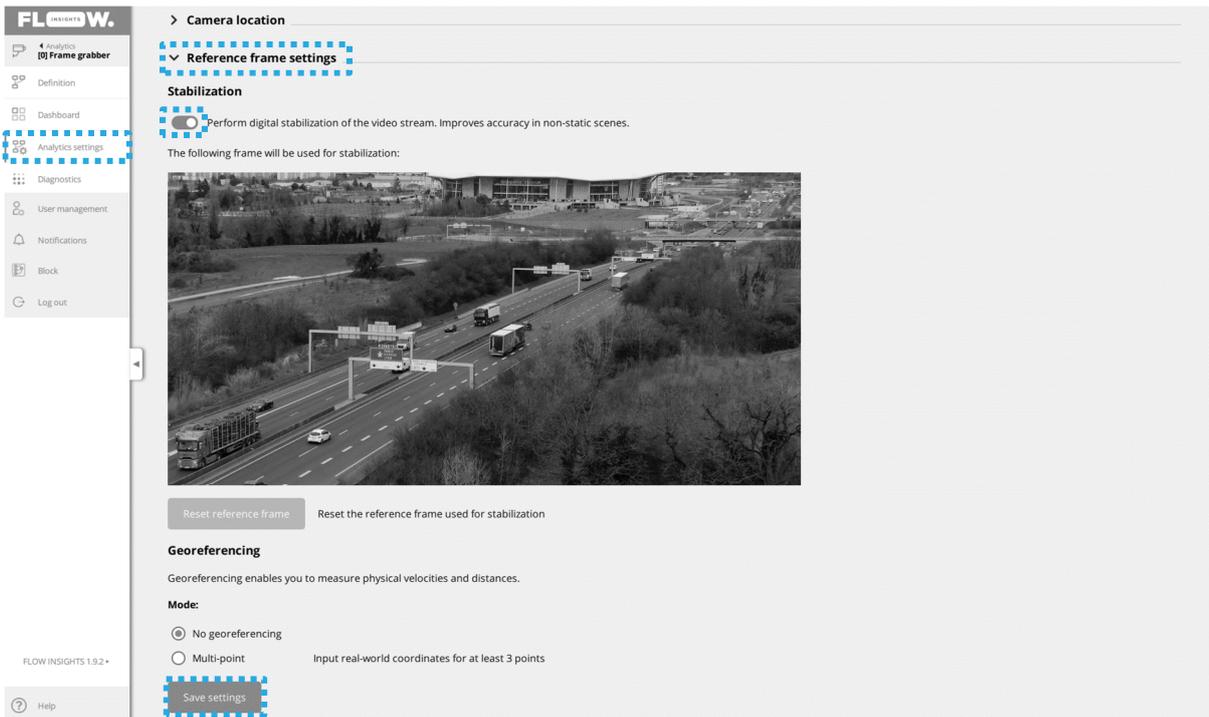


The HDMI and SDI inputs are being switched automatically based on the signal presence. Therefore, if you want to switch from HDMI to SDI, remove the HDMI cable and connect signal to the SDI input.

You are now ready to observe classified targets, see their trajectories and most importantly – filter them according to selected criteria. Design your very own traffic sensor with the intuitive visual programming approach:



For UAV footage, it is often beneficial to enable stabilization of the video input in order to keep the trajectories valid even when the camera view is unstable due to wind gusts or other effects. To take advantage of the video stabilization, visit *analytics settings*:



In the *Reference frame settings*, turn on the stabilization, check the selected reference frame and hit the *Save settings* button.

Image stabilization maintains correct **relative** positions between the targets, trajectories and the source image.

To reference these objects in **absolute** real-world coordinate system, please turn on the multi-point georeferencing option and add at least three ground control points complete with their geodetic coordinates. When the scene has been successfully georeferenced, all velocities, accelerations and other metrics can be acquired in physical units.

Knowledge base

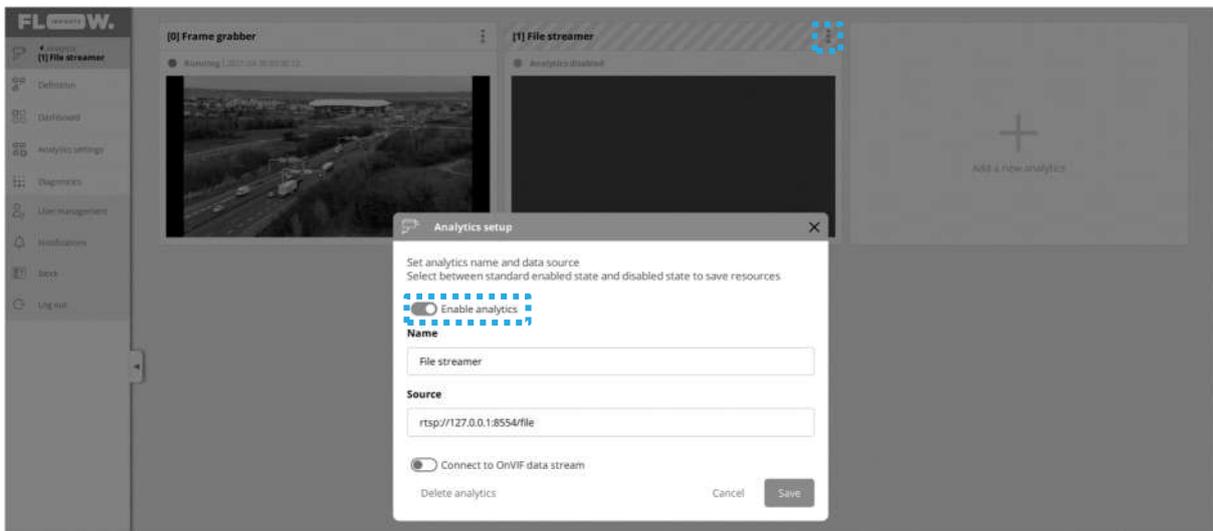
Congratulations – you have successfully started and configured your very first TrafficDroneUnit session. You are ready to enjoy the power of acclaimed DataFromSky traffic analytics in real time. For more information on how to work with FLOW framework complete with tutorials and support, please visit our learning portal here:

<https://intercom.help/datafromsky/en/collections/2019942-datafromsky-flow>

File streamer analytics

Apart from the video signal grabber, the TrafficDroneUnit includes a second default video stream. This source is based on a video file (or more of them) being streamed and consecutively analysed by the FLOW framework. This source is useful for familiarization with the system while no external video source is present. It can also be used for analytic replay of video files that have been captured on board of an UAV and then transferred to the TrafficDroneUnit.

In order to access the analytics, we need to enable it by clicking on the options button, entering *Setup analytics* and enabling the analytics:



Please note that TrafficDroneUnit can process one video stream at a time. However, multiple analytics can be defined. You therefore need to enable the analytics that you are interested in. All other analytics are disabled automatically.

The file streamer reads the following directory and streams all video files present in it sequentially: **/Data/StreamVid**.

A few sample traffic recordings are placed in **/Data/TestVid** folder. You can simply copy them to the **/Data/StreamVid** directory to make them streamed and analysed.



Custom video files can be transferred from external storage connected to one of the TrafficDroneUnit USB ports by:

- Pressing the Windows button on the keyboard
- Typing *Files* and selecting the *Files* icon
- Transferring the files with *Files* or any other file manager

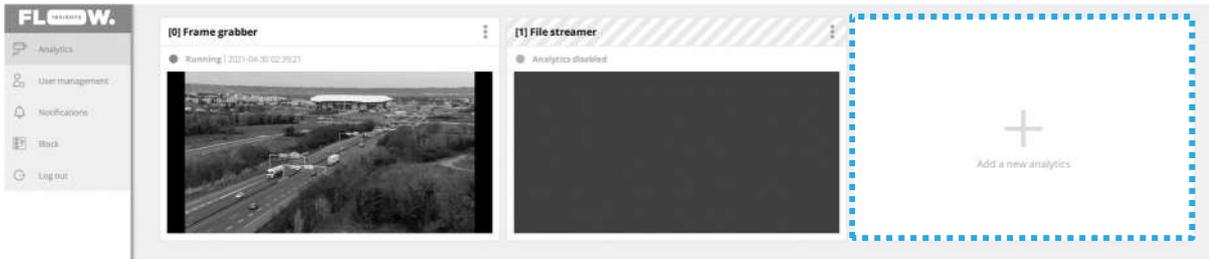
Alternatively, the recordings and other files can be transferred via network by a SFTP client.

Configuration and processing of the analytics based on file streamer is identical to the process valid for live video stream.

Optional RTSP stream

Apart from the frame grabber and file streamer, you can connect TrafficDroneUnit to any RTSP stream available on the network (e.g. provided by an IP camera) and enjoy the real-time intelligence extracted from the stream.

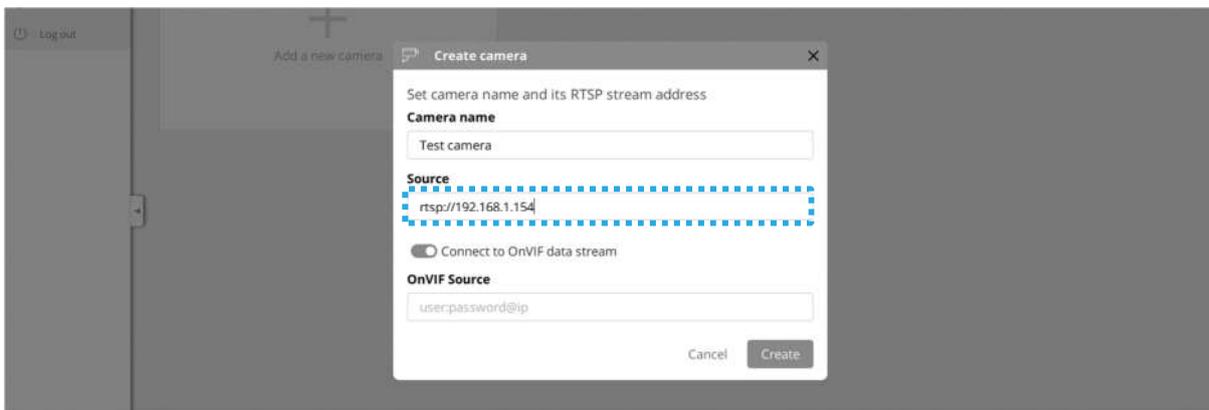
When connected to the TrafficDroneUnit with FLOW Insights, you need to add another analytics:



The camera video source stream address and optional OnVIF source address are formatted in the following way:

- Video source: **rtsp://user:password@ip:port/path/file**
- OnVIF source: **user:password@ip**

The required information is source specific and can be usually found in the camera user manual or in the web interface of the IP camera.



The frame grabber and file streamer analytics are based on RTSP streams as well. The only difference is that these streams are generated directly by the TrafficDroneUnit. The addresses for these two default streams are:



- Frame grabber: **rtsp://127.0.0.1:8554/grabber**
- File streamer: **rtsp://127.0.0.1:8554/file**

You can use these RTSP addresses if you accidentally delete your default analytics – for example.

Remote access

Apart from the default self-contained operation, the TrafficDroneUnit can be controlled remotely over the network from any computer.

You can access the field unit from a central control room and configure the analytics exactly as desired. The team in the field takes care of the UAV flight mission, while the analytics can be completely controlled from a command centre.

To achieve this, a FLOW Insights application needs to be installed on the computer that will be accessing the TrafficDroneUnit.

To download most recent version of FLOW Demokit for Windows, please visit http://www.datafromsky.com/download/flow/demokit/FLOW_Demokit.exe

After starting the FLOW Insights application, select the option for connecting to a FLOW unit.



The FLOW Demokit includes Demo datasets that can be used for familiarization with the environment without a need for actually running video analysis in real time. Therefore, the Demokit can be run on any computer and is ideal for training and evaluation purposes. At the same time, it can connect to any operational FLOW unit and control its operation in real-time.

Now we need to input a valid **IP address** of the TrafficDroneUnit:



At this point, login credentials for the FLOW block running on the TrafficDroneUnit need to be entered. The default values for admin account are as follows:

- FLOW login: **admin**
- Password: **admin**

Success! You are now in full control of the FLOW Block running on the TrafficDroneUnit and can control it exactly in the same way as if you were sitting in front of the Unit.



In more comprehensive scenarios, multiple user accounts can be defined by the administrator. Different user roles can be assigned to user accounts. The roles can be defined per analytics, allowing for advanced access control. Following roles are available:

- Administrator - Full control of the FLOW Block including user accounts
 - Analyst - new analytics creation, analytic tree definition etc.
 - Viewer - no edit rights
-

Integration

TrafficDroneUnit is capable of extracting insights from any aerial video stream in real time, right on the spot. That alone is valuable, however to take full advantage of the extracted intelligence, multiple integration options are available:

- REST API
- UDP API
- Webhooks
- Direct control of GPIO pins

Please consult the knowledge base in order to integrate TrafficDroneUnit into your ecosystem. Do not hesitate to contact us in order to consult other integration options if needed.

Remote support

TrafficDroneUnit does not connect to any external networks automatically. If remote support is required, the unit needs to be connected to a DataFromSky service VPN:

- Run Terminal (press the Windows key on the keyboard, type `terminal` and hit the Terminal icon)
- In Terminal, do the following:
- `support.sh`
- Confirm with password
- Check that ping to 10.202.0.1 is returning valid results



Your network needs to be configured correctly in order to pass remote support communication: allow **UDP** connections to **flow.datafromsky.com:31231**

Camera framing

Camera positioning and framing are defining parameters for video stream quality which is the main driving factor of AI traffic analytics accuracy. Therefore, we do recommend to pay appropriate attention to fine-tuning the acquisition geometry. Here are a few points to consider:

- Camera image center should be ideally identical with Region of Interest center
- There should be sufficient padding between the image borders and the Region of Interest (ROI)
- Incidence angle between the camera lens axis and the ground plane normal should be ideally 0-45 degrees in order to avoid reflections and dynamic occlusions. Top-down view (incidence angle 0°) allows for maximum accuracy.
- The objects in ROI should be fully visible; at least 70 % of the object area should be visible to achieve high accuracy (be aware of dynamic/static occlusions)
- Do not capture the sky - the sun can have negative impact on video analysis (tilt the camera down if necessary)
- If possible, orient the camera perpendicular to the traffic flow or aligned with the flow, in the direction of travel - this helps avoiding reflections from vehicle lights in night scenes.



Region of Interest

Specifications

Part number TD-U-01

Power supply

Voltage: 100 V - 240 V
Current: 11 A - 5.5 A
Frequency: 50 Hz - 60 Hz
Weight: 16kg

Hardware

CPU: 1x AMD Ryzen 7 3800X
GPU: 1x nVidia RTX 2080Ti 11GB
RAM: 4x 16GB DDR4 3600MHz CL17
Storage: 2x 500GB SSD NVMe M.2

Interfaces

Inputs: 1x Power terminal powerCON Neutrik NAC3MPA
1x HDMI 2.0a
1x SDI 10-bit SD/HD/Ultra HD (BNC)
Outputs: 1x RJ45 etherCON Neutrik NE8FDY-C6-B
2x HDMI
2x USB-A 3.0
2x USB-C 3.1 gen 1
1x USB-C 3.1 gen 2 Thunderbolt 3 cable
Wireless 1x WiFi adapter - IEEE 802.11b/g/n 2.4 GHz, IEEE 802.11a/n/ac 5 GHz

Environmental conditions

Operating temperature	5°C to 40°C
Storage temperature	-20°C to 45°C
Relative humidity	15% to 90% non-condensing (30%/hr max gradient)
Shock resistance - operation	80G (half-sine shock pulses of 2 ms)
Shock resistance - storage	300G (non-repetitive half-sine shock pulse of 2 ms)

Video input

SD Video Standards
525i59.94 NTSC, 625i50 PAL

HD Video Standards
720p50, 720p59.94, 720p60
1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60
1080PsF23.98, 1080PsF24, 1080PsF25, 1080PsF29.97, 1080PsF30
1080i50, 1080i59.94, 1080i60

2K Video Standards (SDI ONLY)

2K DCI 23.98p, 2K DCI 24p, 2K DCI 25p

Ultra HD Video Standards

2160p23.98, 2160p24, 2160p25, 2160p29.97, 2160p30

4K DCI Video Standards

4K DCI 23.98p, 4K DCI 24p, 4K DCI 25p.

SDI Compliance

SMPTE 259M, SMPTE 292M, SMPTE 296M, SMPTE 372M, SMPTE 425M, SMPTE 2081, ITU-R BT.656 and ITU-R BT.601.

Video output

Maximum 7680x4320@60Hz

3x Multi-view

DataFromSky contact information

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