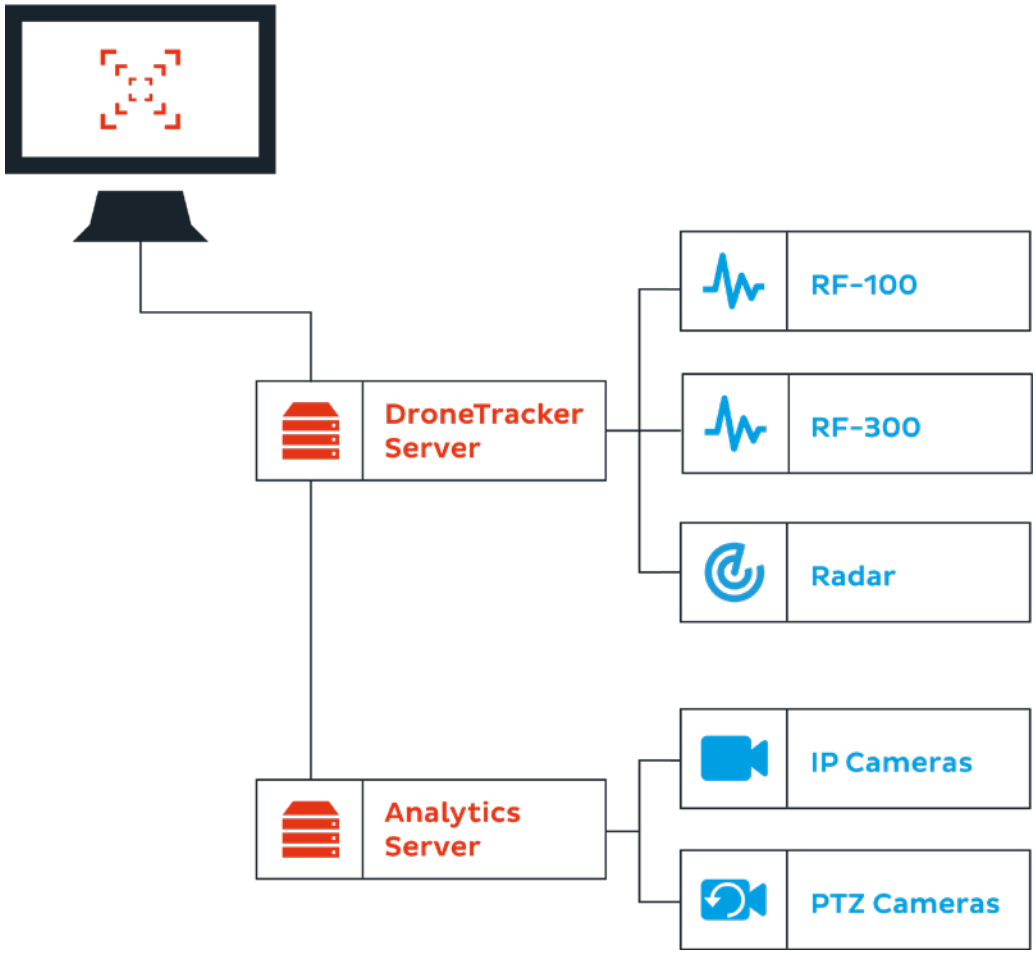
Planning Manual

Deploying DroneTracker System 4.1 on premises



This document gives you a overview of what the requirements for the system are and which steps have to be done to setup the system on premises.

Content

1 List of Network Components

The following components are necessary to setup a DroneTracker System:

- Servers, see requirements here.
- Cables, see requirements here.
- Switches, see requirements here.

2 Server Requirements

An on premises DroneTracker System always needs a DroneTracker Server as a physical or virtual machine.

For a system **with** external IP cameras (static or PTZ), additional to the DroneTracker Server, one or more DroneTracker Analytics Servers are required. The number of Analytic Servers depends on the number and type of cameras and on the used graphic board.

DroneTracker Analytics Servers must be physical machines. The DroneTracker Server may also run on the same machine as the DroneTracker Analytics Servers.

2.1 DroneTracker Server minimum requirements

☐ Exclusive use of the server resources in this OS, physical or virtual machine

☐ 500 GB Hard Disc recommended, divided in System and Recordings:
  - **System**: 50 GB (required)
  - **Recordings**: depending on the number of sensors and system configuration; minimum 50 GB number of recordings severely limited, recommended 450 GB; additional storage for long term archiving

☐ Processor: Dual Core CPU (can be virtualized if exclusive)

☐ Working memory: 8 GB

☐ OS: Ubuntu 16.04 LTS – 64 bit

☐ Deactivated encryption of home directory

2.2 Analytics Server minimum requirements

- ☐ Cuda 10 compatible Nvidia graphics card with Nvidia Pascal microarchitecure or newer (preferably the most recent one like Volta or Turing).
- ☐ Each camera or PTZ may consume up to 1.2 GB of GPU memory on the Analytics Server. For example, a Nvidia RTX 2070 with 8192 MB of VRAM supports up to 6 PTZs and/or cameras.
- ☐ Physical machine, with exclusive use of the server resources in this OS
- ☐ Hard Disc: 500 GB SSD with good I/O, divided in System and Recordings:
  - **System**: 50 GB SSD (required)
  - **Recordings**: depending on the number of sensors and system configuration; minimum 50 GB number of recordings severely limited, recommended 450 GB; additional storage for long term archiving
- ☐ Processor: Intel Xeon E5 CPU with at least 12 Cores; 2,2Ghz and >25MB Cache
- ☐ Working memory: 64 GB
  We recommend distributing the 64 GB of RAM to all available channels, for example 4 x 16 GB multi-channel RAM is better than 1 x 64 GB RAM single-channel.
- ☐ OS: Ubuntu 16.04 LTS (Desktop) – 64 bit, installed **without** secure boot option.
- ☐ Kernel version: from v4.15.0
- ☐ Deactivated encryption of home directory

3 Network Requirements

3.1 General Network Connectivity

Sensors and server must be able to reach each other via a L3 IP Network: Firewall or other Security measures must allow communication between sensors and server. The sensors do not have to communicate directly with each other.

- ☐ IP addresses must be dynamically assigned via DHCP. If sensor and server are in different subnets, DHCP server must send configuration option with IP address of server to sensor (see “Configure Communication Between Server and Sensor”, page 9).
- ☐ The server-sensor-connection does not support NAT traversal.
- ☐ If a virtual machine is used, the network type must be “bridged”.

3.2 RF Sensor connectivity requirements

Ethernet connection with IEEE802.3**at** Power over Ethernet (30 W at PoE Power Sourcing Equipment (PSE) / 25,5 W at powered device). Some Power Sourcing PoE+ Switches might need specific configuration to provide full power.

3.3 Distance

Maximum distance from Ethernet device to next PoE Power Sourcing Equipment (PSE) / PoE switch: **100 m (328 ft), max 70 m (230 ft) recommended.**

3.4 Overview ports

3.4.1 DroneTracker Server

Incoming

Protocol	Service	Function	Port
TCP	SSH	Dedrone Service access	22
TCP	HTTP / HTTPS	Web interface	Configurable Default HTTP: 8080 Default HTTPS:443
TCP	MQTT TLS	Sensor connection	8883
UDP	SNMP	SNMP notifications	Configurable Default: 161
Optional:			
TCP	APT Server	Half-offline update	3142
TCP	Websocket	Sensor connection (optional)	8090

Outgoing

Protocol	Service	Function	Address	Port
TCP	HTTP/HTTPS	Download of updates, communication with cloud	trackerapi.dedrone.com	HTTP: 8080 HTTPS: 443
TCP	HTTP/HTTPS	Check license	license.dedrone.com	HTTP: 8080 HTTPS: 443
TCP	Configurable	Notifications	configurable	configurable
TCP + UDP	DNS	DNS	via DHCP	53
UDP	NTP	Time sync	ntp.dedrone.com	123
UDP	SNMP (traps)	SNMP notifications	configurable	162
TCP	MQTT TLS	Sensor communication		8883
Optional:				
TCP	OpenVPN	Dedrone Service access	supportconnection.dedrone.com	1194

3.4.2 Analytics Server

Incoming

Protocol	Service	Function	Port
TCP	Discovery	Sensor discovery	Random Default: 8888
TCP	SSH	Dedrone Service access	22

Outgoing

Protocol	Service	Function	Address	Port
TCP	MQTT TLS	Sensor communication		8883
TCP	RTSP	Real time streaming protocol		configurable default: 554
Optional:				
TCP	OpenVPN	Dedrone Service access	supportconnection.dedrone.com	1194
TCP	Websocket	Fallback for server communication (software version ≤ 2.6.9)	given via discovery or DHCP option	8090
TCP	APT cacher	Half-offline updates		3142

3.4.3 RF Sensor

Incoming

Protocol	Service	Function	Port
TCP	Discovery	Sensor discovery	Random Default: 8888
TCP	SSH	Dedrone Service access	22

Outgoing

Protocol	Service	Function	Address	Port
TCP	MQTT TLS	Sensor communication		8883
TCP	Discovery	External sensor discovery	With ddmt file	8080, 443

Optional:				
TCP	OpenVPN	Dedrone Service access	supportconnection.dedrone.com	1194
TCP	Websocket	Fallback for server communication (software version ≤ 2.6.9)	given via discovery or DHCP option	8090
TCP	APT cacher	Half-offline updates		3142

3.4.4 IP camera and PTZ camera

Incoming

Protocol	Service	Function	Port
TCP	HTTP	Camera management user interface (vendor specific)	Configurable on camera Default: 80

Outgoing

Protocol	Service	Function	Port
TCP	RTSP	Real time streaming protocol	Configurable on camera Default: 554

4 Cable Requirements

Maximum Distance	100 m (328 ft) maximum distance from Ethernet device to next PoE Power Sourcing Equipment (PSE) / PoE switch, **Recommendation**: less than 70 m (230 ft) For longer distances a PoE extender is required
Cable-Type	Cat-6 Cable recommended (For Cat-5e max 50 m (165 ft) distance recommended)
External Cable Diameter	3.5 mm – 7.5 mm
Connector	For a weather resistant connection to the Sensors it is necessary to crimp the supplied environmentally sealed Ethernet connector to the patch cable.

5 PTZ Camera Requirements

☐ The following PTZ cameras are recommended for the DroneTracker System:

- **Axis Q6215-LE**
  - Drone detection range: up to 0.6 mi (1 km)
  - Night view due integrated IR LED up to 1,300 ft (400 m)
  - Zoom: 30x optical
  - Resolution: 1080p
- **Flir HDC1200**
  - Drone detection range day and night: 1.25 mi (2 km), under ideal conditions up to 2.5 mi (4 km)
  - Night view due thermal optic
  - Zoom: 120x optical (with extender), 22x thermal
  - Resolution: 1080p optical, 720p thermal
- Others on request

☐ **PTZ camera is mounted on a leveled horizontal plate** (no tilted foundations).
If the PTZ camera is mounted tilted, the positioning result and camera controls of the PTZ camera won't be accurate either.

☐ **An accurate positioning and alignment of the PTZ camera is a prerequisite for good tracking**.
The configuration of the GPS position and height of the PTZ camera is critical. If the installation and configuration is not accurate, the tracking won't be accurate either.
- Note the GPS position and height of the PTZ camera during the installation.

☐ **An appropriate Analytics Server is installed.**
To operate a PTZ camera in a DroneTracker system an Analytics Server is required. The Analytics Server requirements are documented in chapter 2.2 Analytics Server minimum requirements page 4 and the Online Help of the DroneTracker.

The correct configuration, alignment and calibration of a PTZ camera is described in Dedrone's quick guide "Configure a PTZ camera".

6 IP Camera Requirements

The DroneTracker System supports cameras with the interface **Onvif Profil S**.

Depending of the desired range, a full HD or 4K camera is recommended (note the appropriate Analytics Server requirements).

Recommended IP cameras:

☐ Axis P1425E (full HD)

☐ Axis P1428E (4K)

7 Radar Requirements

The following radar systems are supported with the DroneTracker System:

- FLIR Ranger R8SS-3D
- Echodyne ECOGUARD

Radar systems are subject to certain legal restrictions and require separate computer hardware. Please contact Dedrone or a Dedrone Partner for the integration of a radar.

8 Steps to Set Up a DroneTracker System

8.1 Set Up the DroneTracker Server

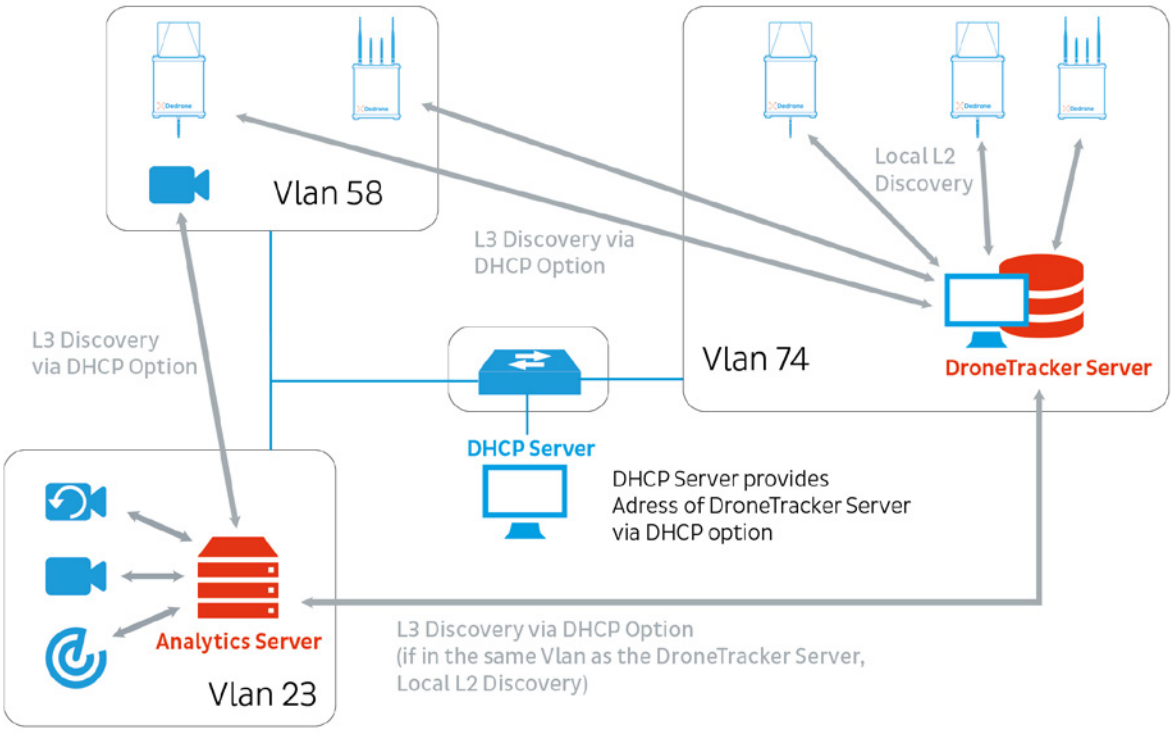
- Get IP for the desired environment.
- Configure the server (follow enclosed Readme).
- Log in to the DroneTracker user interface.
- Upload license key.
- Change login password for the DroneTracker user interface.
- Before a connection between sensor and server can be established, the sensor needs to be configured in the server. The "Add devices" list contains all sensors from which a discovery package was received (discovery mode) OR a connection request was made (DHCP option mode).

8.2 Configure Communication Between Server and Sensor

In a DroneTracker System several sensors connect to a central DroneTracker Server.

The DroneTracker Server and sensors can be on different Layer3/Routed Networks. In this Scenario, which will be common for most enterprise deployments, the sensors need to discover the address of the DroneTracker Server. This discovery happens through a DHCP Option configured on the enterprise DHCP server much like the option provided for IP-Phones to find their call manager.

If the DroneTracker Server and the sensors are on the same Layer2 Network (aka Vlan) there is a Layer2-discovery method available as well.

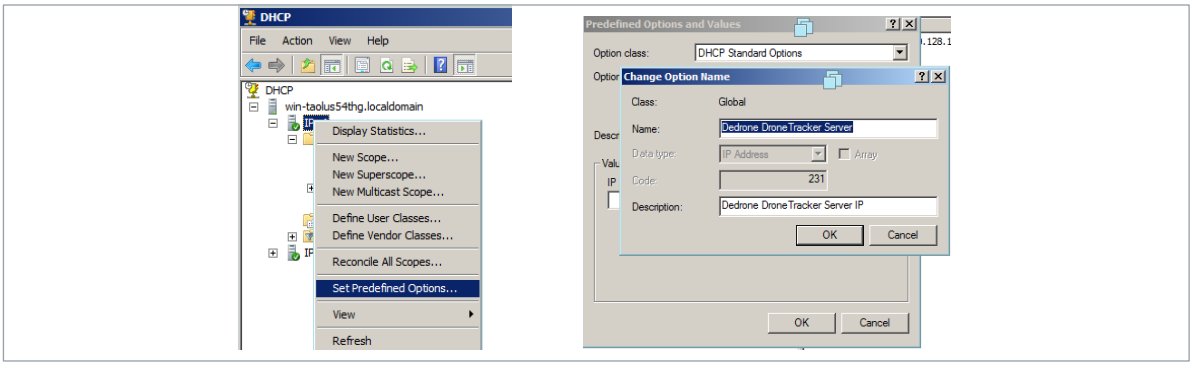


Network Communication in a DroneTracker System

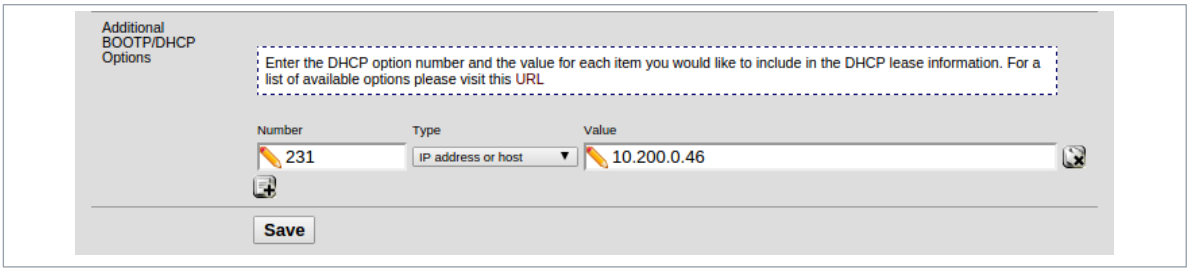
8.2.1 Forced Connection via DHCP Option

If the DroneTracker Server receives DHCP option 231 containing an IP address, the sensors will try to connect to a server instance on this IP address listening on port 8000. You can use DHCP option 232 as unsigned 16-bit integer to change the port.

If the connection to the specified server fails after 10 tries, the sensors will fall back to discovery mode for some seconds before they try to connect to the specified IP address again.



Windows 2008 DHCP Server



FreeBSD PfSense

After adding the DHCP option to your DHCP server, please make sure the DroneTracker renews or acquires a new DHCP lease. The safest way to ensure this is to reboot the DroneTracker.

8.2.2 UDP Broadcast Discovery

If DHCP option 231 is unset, the sensors will send UDP broadcast packets on port 9876 to their broadcast address as configured via DHCP. These packages publish a TCP port (default 8888, random if occupied) where the sensor is reachable for connection requests. The server will answer discovery packages for which it has a paired sensor on that port. The sensor then connects to the server that first answered the discovery package.

8.3 Install and Connect Sensors to the Network (see Installation Manual)

8.4 Add Sensors in the UI (Site Configuration and Map Editor)

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