

STUDY FLOODS INTELLIGENT

MONITORING SYSTEMS

RORS218 PROJECT

www. rors218platform.eu



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The purpose of the study is to identify and present examples of intelligent flood monitoring systems. These are dedicated software and modern and specific flood monitoring equipment and technologies, being a cost-effective and scalable alternative for detecting early flood signs, flood forecasting and monitoring transboundary flood zones.

The main beneficiaries of the study are the smart cities of Timişoara, Zrenjanin and Kikinda, which can use sensor technologies to identify areas where flood risks are highest.

GENERAL PRESENTATION OF THE PHENOMENON

Flooding is mainly a natural phenomenon. Floods can cause injury and loss of life, considerable economic costs, as well as damage to the environment and cultural heritage. Severe flooding has become more frequent in Europe. In recent years, the number of flash floods of medium to large magnitude has increased by at least twice that recorded in the late 1980s. Climate change is an aggravating factor, causing changes in rainfall regimes and weather patterns, rising sea levels and, consequently, more frequent and more severe flooding.

In response to the increased incidence of flooding, the EU adopted *Directive* 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks.

The Court found that, overall, the Floods Directive had positive effects, but that the implementation of flood prevention measures was deficient in terms of the allocation of funds. Member States have started implementing their flood risk management plans, but improvements are needed.

Major future challenges remain in terms of the need for a much greater integration of climate change, flood insurance and land use planning in flood risk management.

Every year, floods lead to the temporary evacuation of a significant number of people, causing material damage and economic losses. However, thanks to the hydrotechnical works currently in place, as well as the operational measures in the field, even greater damages are avoided every year.

Floods usually occur in the spring, when the snow melts, or after heavy rains, but in recent years they have occurred throughout the year and often in successive waves in the same areas.

Changes to the environment caused by human activities, such as excessive urbanization or excessive cutting of forests, economic, industrial, intensive agricultural activities also contribute to the production of more and more frequent floods and with more and more serious consequences.

There are many flood risk management measures (prevention, protection of people and property, preparedness to combat and limit the effects of floods) that we can adopt. The set of public policies (structural and non-structural measures) adopted by the responsible authorities represents Flood Risk Management.

To be able to take measures to prevent and protect against floods, we first need to know how likely they are to occur, where and how extensive these floods could be, and what kind of damage could result.

Through the statistical analysis of floods, supplemented with the analysis of historical hydrometeorological phenomena, specialists determine statistical distributions of flows, including characteristic values relevant for calculations, such as maximum flows with annual exceedance probabilities of 10%, 5%, 2%, 1%, 0.5%, 0.2% or 0.1% for a study area. These probabilities associated with the characteristic flows as well as the extent and depth of the water (sometimes also the speed of the water, if the area is studied by 2D modelling), define the flood hazard.

The combination of flood hazard with vulnerability (the consequences of the respective floods), respectively the potential damage caused to the population,



goods or socio-economic objectives, as well as to the environment, represents the flood risk.

Flood risk is increasing due to the following factors:

- The accentuation of extreme hydrometeorological phenomena as a result of climate change correlated with uncontrolled urban development;
- The regularization of natural rivers and the disconnection of the naturally flooded meadows of the watercourses, which increases the flow speeds and reduces the natural retention of water (reducing the time in which the flood propagates in a sector - faster floods;
- Urbanization and real estate developments in flood hazard areas;
- Land use change excessive deforestation and intensive agricultural practices, urbanization and economic activities reduce water retention capacity (natural drainage) during and after rainfall.

Floods can be divided into several types:

Floods

Torrential rains cause so-called "flash floods". They are characterized by large amounts of precipitation falling in a short period and over a small area. These can be represented by significant runoff from slopes, torrents, streams, flash floods on small rivers with severe local effects, significant increases in flows and levels. Flash floods are some of the strongest negative phenomena that manifest themselves with intensity and which, due to atmospheric instability, are difficult to forecast or have a very short warning time.

River

Flooding can occur when rising water levels cause water to overflow. These are called fluvial or "slow" floods (or floods caused by river overflows) and can be caused by sudden melting of snow or large areas of rain. When the soil cannot fully retain the amount of water resulting from rains in cumulative amounts in two to

three days of more than 100 mm, the resulting runoff accumulates in rivers that emerge from minor riverbeds and exceed the warning levels (threshold levels of attention, flood or hazard).

Underground

When the amounts of water supersaturate the soil, no additional volumes of water can be retained.

The waters remain longer on the surface of the soil, causing flooding through the phenomenon of puddles, phenomena also related to the insufficiency or nonfunctioning of the water drainage/drainage systems.

Pluvial

In cities, where the ground has been covered by construction and concrete, heavy rains can create so-called urban stormwater floods. This happens because the rainwater temporarily exceeds the capacity of the sewage systems, and the accumulated water cannot be absorbed by the soil.

COASTAL

Flooding caused by rising sea levels in coastal areas, which occurs especially during storms and results in inundation of coastal areas during storm surges.

Accidental

Accidental floods occur when accidents occur at hydraulic constructions for flood protection (dikes or dams may fail or malfunction).

WARNING SYSTEM - ALARM

The principles of emergency management are as follows:

- prediction and prevention;
- the priority of protecting and saving human life;



- respecting fundamental human rights and freedoms;
- the assumption of responsibility for the management of emergency situations by public administration authorities;
- cooperation at national, regional and international level with similar bodies and organizations;
- the transparency of the activities carried out for emergency situations, so that they do not lead to the aggravation of the effects produced;
- the continuity and gradualness of emergency management activities, from the level of local public administrative authorities to the level of central public administration authorities, depending on their extent and intensity;
- the operativeness, the active cooperation and the hierarchical subordination of the components of the National System.

During emergency situations or conditions potentially generating emergency situations, measures and actions are undertaken for:

- warning the population, institutions and economic agents in danger zones;
- declaring a state of alert in the event of an imminent threat or occurrence of an emergency;
- the implementation of prevention and protection measures specific to the types of risk and, as the case may be, the decision to evacuate the affected or partially affected area;
- operative intervention with forces and specially constituted means, depending on the situation, to limit and remove the negative effects;
- the granting of emergency aid;
- the establishment of the state of emergency regime, under the conditions provided by the Constitution;
- requesting or granting international assistance;



- granting compensation to natural and legal persons;
- other measures provided by law.

The management of emergency situations generated by dangerous hydrometeorological phenomena resulting in floods, incidents/accidents at hydrotechnical constructions consists in the identification, registration and assessment of the types of risk and their determining factors, notification of the interested parties, warning, alarming, evacuation and sheltering the population, limiting, removing or counteracting the negative effects produced as a result of the risk factors. They are mandatory measures for the central and local authorities responsible for flood risk management in all areas of action: Prevention, Post-event Preparedness, Response, Investigation/Assessment, Recovery/Rehabilitation.

IDENTIFICATION AND PRESENTATION OF SOME EXAMPLES (LATEST SOFTWARE, EQUIPMENT AND TECHNOLOGY) OF INTELLIGENT FLOOD MONITORING SYSTEMS TECHNIQUE AND TECHNOLOGY SPECIFIC TO FLOOD MONITORING

There is an urgent need to improve flood preparedness in response to the intensity and frequency of rainfall events, mainly due to climate change.

Flood early warning systems provide timely data to alert stakeholders and communities exposed to potential floods.

There are a number of ways to set up an automatic flood warning system, but the needs of one system can differ greatly from another. The number of measurement sites, their locations, and the instruments and sensors used at each will vary depending on the nature of the application and the size of the intended

coverage area. If the warning system is intended to serve an entire community, the number of instruments required will depend on the location of nearby waterways in relation to the property and infrastructure. If only a small part of the community is exposed to a prominent stretch of river, for example, a single gauge may be sufficient.

In a single-gauge system, installing a station on the riverbank or on a standing structure such as a pier or bridge abutment will likely give the best results. Measurement instruments can also be embedded in stilling wells or standpipes, facilitating the inclusion of other instruments such as multi-parameter probes equipped with an array of sensors, as well as data loggers and telemetry systems. While radio transmission is the standard telemetry option, satellite and mobile options may be more beneficial for certain applications, depending on its size and location. Almost all telemetry options will provide continuous real-time data to any computer or mobile device, ensuring that the system is running smoothly and any control measures or emergency actions can be implemented immediately if parameter limits are exceeded.

Rain gauge with tipping bucket

Consisting of a funnel and a small container attached to a tilting lever, rain gauges collect a set amount of rainfall before tipping the container, spilling any collected water and transmitting an electrical signal to a data transmitter.

Integrated data recording system

An integrated data logging system is a real-time monitoring station that houses the data logger, telemetry module and power/charge source. Since it is generally cost prohibitive to provide AC power at the monitoring location, integrated solar panels are used to continuously charge the battery for autonomous operation.



Mounting hardware

Data loggers can be mounted directly on the pylon/elbow or on a pole on the bridge, depending on the location and the recommended monitoring plan.

Radar water level sensor

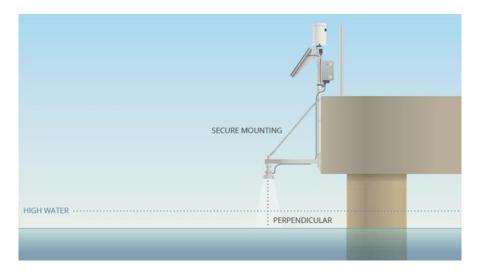
Water level sensors using radar technology offer a non-contact alternative to other level measurement methods such as submersible pressure transducers, enabling monitoring in hard-to-reach places.

Telemetry

Telemetry provides real-time data access, transmitting wireless communications via radio frequencies, but mobile and satellite options are also available.

Live data

Instant access to project data is available 24/7 through a cloud-based data center. Monitoring data can be viewed in real time or as a graph to identify trends. Automated real-time alerts can be sent via text or email when specified parameters exceed predefined limits.





Ensure that data logging and telemetry equipment will be installed sufficiently above the high water level to prevent flooding or otherwise being damaged by high water.

The radar sensor must be mounted directly above the water surface so that the radar beam is perpendicular to the water.

Radar sensors must be securely mounted to prevent vertical movement due to wind or vibration. Any movement can disturb the measurements and lead to vertical alignment errors.

Make sure the radar sensor is mounted high enough to avoid submersion in high water or flooding conditions.

Any potentially exposed sensor cables near the ground should be piped to the data logger box to protect them from animals.

When it comes to developing an automated warning system for flood management, there are many pre-made systems available for purchase, but customizing a system to your specific needs can provide the best results.

Data-driven flood prediction

Have you heard the term 1 in 100-year flood? That means if my house flooded last year, it will not for the next 100 years, right? Not exactly... This is a common misconception. In reality, 1 in 100 annual flood means that experts estimate that the chance in any given year of a flood occurring is 1 percent.

Flood maps show how likely an area is to be flooded. Continuously, the data combined with historical records are used to generate simple flood maps. The better the flow data, the more accurate the estimate. This information provides insight into the level of risk to mitigate property damage and develop new strategies.

As time passes, experts find that these predictions and estimates of floodplains require revisions to reflect reality more accurately, thus influencing development and the need for insurance in the vicinity of communities.

Data-driven decisions like these require real-time meteorological and hydrological measurements.

OTT HydroMet flood monitoring system

OTT HydroMet offers turnkey and customizable solutions to quickly inform if a critical parameter threshold has been exceeded.

The efficient system is composed of:

- advanced data loggers and various telemetry solutions;
- robust water level sensors;
- high precision rain gauges;
- smart weather stations;
- performance room.

The urban flood warning station is a turnkey solution for a real-time flood warning network. This product package is designed to simplify the process of establishing a flood warning network. The station can be modified to measure additional parameters to suit various applications.



The benefits of the system are:

- the possibility of creating a network customized to the requirements;
- possibility of flood risk management;
- the complete solution provides all the necessary equipment to easily install and maintain a new system, while the advanced SUTRON XLink datalogger provides historical data storage, redundancy and expansion for future network development;
- optional upgrades, such as a smart weather sensor or camera, are available to provide additional observations of conditions in the monitored area;
- the ability to quickly notify interested parties about an event;
- the transmission of remote data and alarm notifications directly to stakeholders, which enables preventive measures to be taken to protect citizens and infrastructure from damage;

This system has increased protection against environmental factors, i.e. IP 66.

The temperature range in which the system operates is from -40 °C to 70 °C.

Radar water level sensor VEGAPULS C 23

The VEGAPULS C 23 radar water level sensor from VEGA uses radar pulse technology to measure depth in areas unsuitable for contact-based depth sensors.

VEGAPULS C 23 is a radar sensor for non-contact water level measurement with high precision requirements in all standard applications where a high degree of protection and particularly good signal focusing are required.

It is particularly suitable for level measurement in water treatment, in pumping stations and overflow basins, for flow measurement in narrow channels, for level monitoring in rivers and lakes and for many other environmental applications.

The sensor is suitable for both liquid measurement and use on bulk solids silos or bulk solids containers. The device is designed for connection to data loggers with SDI-12 interface, making it particularly suitable for battery-powered applications that require low power consumption, as well as single-signal and power cable applications for multiple sensors.

The HyQuest Solutions WeatherSens MP Precipitation Sensor provides reliable, maintenance-free precipitation data with an accuracy of 5%.

The MP500 sensor includes the measurement of 5 parameters (W/T/RH/P).

Technical specification: https://www.vega.com/en/products/productcatalog/level/radar/vegapuls-c-23



The NexSens X2 environmental data logger

The NexSens X2 environmental data logger is available in a pole-mounted configuration with cellular modem telemetry and solar charging to keep your data up to date, eliminating the need to routinely visit a measurement site.

The NexSens X2 environmental data logger offers the latest in real-time monitoring technology with wireless communications, large plug-and-play sensor library and ultra-low power consumption. The equipment has Wi-Fi, cellular, satellite and radio telemetry options. Anodized marine aluminum housing for deployment in harsh environments. WQData LIVE web data center for instant data access from any web browser.

The X2 is an all-in-one environmental data logger that can be controlled from any internet browser using a smartphone, tablet or PC. Automatically recognizes sensors and sends data over the web via Wi-Fi, cellular, satellite or radio telemetry. The X2 includes three sensor ports that are compatible with most environmental sensor protocols, including SDI-12, RS-232, and RS-485. All connections are made with a simple threaded connector, and the built-in sensor library automatically makes setup and configuration easy. Data is stored on shared or independent programs.

Power options include SP series solar packs, AC adapter or external 5-16 VDC. Advanced power management combined with ultra-low quiescent and operating currents extend battery life and eliminate the need for multi-battery arrays or large solar charging systems. Intelligent power circuits automatically switch to reserve power when the main source is depleted. The X2 monitors itself while collecting environmental data. Internal temperature, humidity, voltages and currents are constantly recorded. Failure alerts can be automatically sent to a predefined list of contacts.

Using a USB adapter and CONNECT software, users can configure the X2 data logger for deployment, view live data, change settings or debug. Optional integrated Wi-Fi, cellular or satellite telemetry modules provide real-time remote communications via the web data center. There, the data is presented on a comprehensive and easy-to-use dashboard. Other features include automatic reports, alarms, push notifications and more.



Technical specification :

https://www.nexsens.com/pdf/X2_datasheet.pdf

WQData LIVE Web Data Center

The WQData LIVE web data center enables 24/7 remote access to collected data from any computer or mobile device, while incorporating instant alarm notifications and trend tracking.

WQData LIVE is a web-based project management service that allows users 24/7 instant access to data collected from remote telemetry systems. Users with NexSens G2, X2 and V2 platforms have the ability to configure and update systems remotely via Wi-Fi, Ethernet, cellular or satellite telemetry. All projects are password protected with multi-level access. Administrators have full access for

remote communication and project modification, while collaborators are limited to viewing and exporting data.

The online database provides the ability to view live readings, set up alerts to notify project staff when data values exceed threshold limits, export data, and more. The project dashboard includes an ESRI Leaflet map view that shows all project sites on a zoomable, scrollable, and draggable map. The bottom of the dashboard includes a project overview, data disclaimer, and project photo. For multi-site projects, each site in a project shows the connected data loggers along with a photo of the site in a convenient view panel.

Clicking on any site within a project displays the most recent data values alongside a graph illustrating a day, week, month or year of data. Within each parameter, users can register to receive email alerts based on a high or low threshold. A rich set of site-specific metadata and diagnostic data is displayed at the bottom for troubleshooting sensor or data logger issues. With this rich set of tools, WQData LIVE simplifies the task of managing an environmental monitoring project.

Technical specification:

https://www.nexsens.com/pdf/WQDataLIVE_datasheet.pdf

Global flood detection and monitoring using social networks

Floods are usually detected and monitored using hydrological models or satellite imagery. However, many flood events remain unreported and the average time lag between the start of a flood and the flood being detected by response organizations is long. More recently, people and organizations have increasingly started to use information from online media (eg Twitter, Facebook, WhatsApp, news articles and blog posts) to monitor flood events.



Data collection and filtering

Twitter data is collected in real time using the Twitter streaming API. GFM uses this data in 12 languages using the keywords as specified in the table:

Language	Keywords
English	flood, floods, flooding, flooded, inundation, inundations,
	inundated
Indonesian	banjir, banjirjkt, bantubanjir
Filipino	baha, babahaha, pagbaha
French	inundation, inundation
German	flut, hochwasser, Überflutung
Italian	floods, inundations, alluvions
Dutch	overflowing
Polish	powódź, powodzie



Serbian	flood, flood, flood, flood
Portuguese	inundation, inundation, inundation, inundation, inundation
Spanish	inundation, inundation, inundation, inundation
Turkish	su taşkın, su dıragını, sel bastı, sel suyu, taşkın oldu, sel
	suyunun

On average, that's about 75,000 flood-related tweets per day. Of course, the number of tweets varies greatly depending on the characteristics of the ongoing flood events. For example, when Hurricane Harvey hit the US, over 600,000 tweets were posted within 24 hours.

Location extraction

To detect enhanced Twitter activity in regions, locations must be attached to tweets. Unfortunately, only approx. 2% of tweets have the user's GPS location at the time of posting. An additional problem with using these GPS locations is that when a major flood event occurs, such as the hurricanes that hit several countries around the Caribbean Sea and the Gulf of Mexico, these events could receive worldwide news coverage. This could lead to increased flood activity in many locations around the world.

Therefore, we created the TAGGS algorithm to find mentions of locations (ie, countries, administrative divisions, cities, towns, and villages) in tweets. This involves roughly two steps:

1) recognition of toponyms;

2) disambiguation of the toponym.

In the first step, the sentence is divided into individual words (unigram) as well as sequences of individual words up to a length of 3 (bigrams and trigrams).

These n-grams are then associated with the nearly comprehensive set of geographic locations (gazetteer) as created using the GeoNames database.

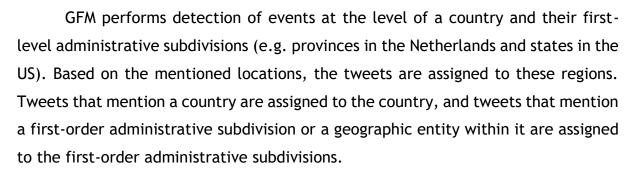
"geonameid": 2655138, "coordinates": [-0.02664, 52.97633 ,
time_zone": "Europe/London",
time_country_geonameid": 2635167,
adm1_geonameid": 2644486,
feature_code": "PPL",
feature_class": "P",
tunon": "eurom" "geonameid": 4930956. -71.05977, 42.35843 ime_zone": "America/New_York", ountry_geonameid": 6252001, dml_geonameid": 6254926, aature_code": "PPLA", iature_class: "P", pe": "town".

Unfortunately, many place names (toponyms) can refer to more than one location (e.g. Boston, UK and Boston, Massachusetts, USA). To disambiguate place names, the algorithm first groups all tweets that mention the same place names within a 24-hour time frame. Then, for all tweets in these groups, additional spatial indicators are analyzed, such as the user's time zone, the user's home city, GPS location, and other location mentions in the text of a tweet. Based on these indicators, the most likely location for all tweets within the group is selected.

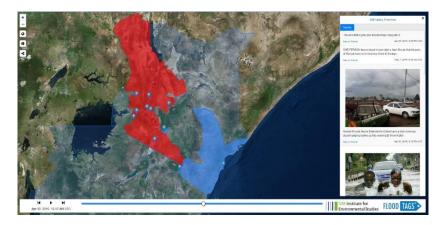
Filtration

Since not all tweets that mention a flood-related keyword are about ongoing flood events and a large number of tweets contain duplicate information, the tweets are subsequently filtered. First, we trained a classification algorithm based on a neural network (BERT) and used it to remove tweets that are not about ongoing floods. We then discard (almost) duplicate information, excluding retweets, tweets by users who have already posted a flood-related tweet in the last 14 days about that region, and tweets where 5 or more consecutive words matched those of one of the previous 100 tweets about a region.

Event detection



Then, burst detection is performed by analyzing the time difference between several consecutive tweets assigned to a region. When the time difference between several consecutive tweets falls below a region-specific threshold, this burst is classified as a flood event. An example of this is for Rift Valley Province in Kenya.



Specialized website: https://www.globalfloodmonitor.org/

Axiomtek, real-time flood monitoring system

Gateways are located in remote areas and connected to sensors, such as sensors used to monitor water levels, soil saturation and rainfall, or to video surveillance cameras. Selecting the right gateway will allow you to collect, connect and analyze field data in a fast, safe and secure way. Axiomtek's gateway devices are the ideal choice for customers who want computing power, data transition speed and robust construction in a single product.



Options based on Intel® Core $^{\mathbb{M}}$ processors and Intel® Celeron® processors, as well as the low-power Intel Atom $^{\mathbb{M}}$ processor are offered for scalability and cost efficiency.

Its rugged, proven construction ensures reliable operation in harsh environments with an extended temperature range of -40° C to 70° C and antivibration up to 2G.

Axiomtek has released a series of robust edge computing systems for AI data processing at the edge. These AI-powered edge systems meet the expectations of real-time, constant, and high-speed processes for running AI and deep learning algorithms.

They have scalable processor options with Intel® Xeon®, Intel® Core M or Intel® Celeron® processors. In addition, they offer rich I/O connectivity, modular design, and application-oriented features. These IP40 rated heavy duty aluminum extrusion systems have wide operating temperatures and vibration resistance suitable for extremely harsh environments.

Specialized site:

<u>https://www.axiomtek.com/Default.aspx?MenuId=Solutions&FunctionId=Sol</u> <u>utionView&ItemId=2656&Title=Real-Time+Flood+Monitoring+System</u>



SensiFlood™

SensiFlood[™] is a complete Internet of Things (IoT) hardware and software platform that includes real-time flood indicators, a wide range of environmental sensing capabilities, powerful cloud-based data storage and analysis, rule-based alerts and easy web/mobile dashboard to use.

The platform allows you to build a cost-effective, low-maintenance and rapidly deployable sensor network that scales from a single location to hundreds of monitored sites in large metropolitan areas or in remote areas.

SensiFlood hardware

The SensiFlood \mathbb{M} EVX2000B-FSN flood sensor is a stand-alone system that can be rapidly deployed for stand-alone environmental monitoring applications. The system can be configured with a variety of sensors and communication options and requires no hardwired power or network connections.

Overview: A powerful environmental monitoring platform.

Water level/step: submersible pressure transducer, ultrasonic without contact or radar.

Internal sensors: GPS, ambient pressure and temperature, battery status.

External sensors: rain gauge, ultrasonic anemometer, high resolution camera.

Sensor Bus: RS-485, SDI-12 and standard voltage/current signals.

Actuator: dry contact closure for actuation of warning signs or gates.

Cellular: LTE-M, Iridium satellite SBD link.

Backup satellite: SBD link via Iridium satellite.

Internal battery: rechargeable Li-Ion, 10W solar panel, full charge < 2 hours, 3 weeks operation without recharging.

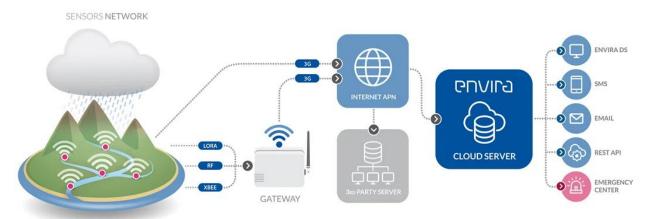
Specialized site:



https://sensiflood.evigia.io/#sensiflood-hardware

ENVIRA IoT's system

The ENVIRA IoT system controls the flow and its behavior in real time, detects possible water courses and alerts about the risk of flooding with real and accurate data. It includes autonomous stations located at strategic points, equipped with a data logger that reads the data captured by the sensors. In addition to water level sensors, sensors for temperature and humidity, turbidity, water speed, capacity, etc. can also be installed.



For each station, a number of determinants can be defined that identify and predict a certain event, with the aim of sending a warning to the control center and to predefined users from the start.

These meters include a radar sensor with a maximum range of 10 to 70 meters. This technology allows independent measurements of environmental conditions and high availability because, thanks to the non-contact monitoring principle, there is an absence of wear and maintenance.

The flexibility of the firmware displayed on the Nanoenvi® stations can integrate the equipment directly with any type of IoT platform or control center, both in the cloud and on - premise, through communication protocols (message

format, communication and transport, M2M networks).) completely adapted to each case.

The Envira DS IoT platform enables the reception, organization and exploitation of data, reporting changes in levels, flows and speed. If the emergency center receives an alert, they will be able to log in immediately and see the status of the waterways.

In addition, although data is sent to the hub at planned intervals, it is possible to determine from the beginning the time interval at which the platform will collect values, unless there is a warning - in which case the communication would be immediate.

The dashboard displays the location of the stations along with their synoptic information. Fast and reliable, the operator can see the overall status of each station in real time. Online stations are shown in green, while non-communicating stations are shown in red.

Those stations in green show the measured flow at each moment: the higher the station is displayed on the dashboard, the higher the river flow.





With the data captured by the stations, the Envira DS platform can generate historical graphs and reports to be exploited later, automatically by intelligent machine learning systems or by knowledgeable and experienced staff specialized in hydrology and environment.

Warning systems

Acquisition and communication electronics continuously monitor the water level and deliver data to the control center at scheduled intervals.

If a preset level or flow is exceeded, it triggers data communication via SMS or email to authorized users.



The solution can be integrated with early flood warning systems (EFWS) of public administrations.

Specialized site:

https://enviraiot.com/flood-monitoring-warning-system/

Global Information System (GIS)

GIS is a computer-based information system that captures, stores, manipulates, analyzes and displays both spatial and non-spatial data to solve complex research, planning and management problems. It is a hardware and software system that performs the above-mentioned activities on information about areas of the Earth.

The four main goals of modern GIS study are:

• General research support;



- Collection, manipulation and use of spatial data in database management;
- Standardization and customization of cartographic production;
- It supports the decision-making process based on spatial data.

Subsystems of GIS

The three main elements of a global information system (GIS) are:

- Hardware components;
- Software;
- Data/Information;
- Population;
- Methods.

Important applications of GIS are:

- Widely used in business, government structures and research, performing environmental analysis, land use planning, tax assessment, utility, location analysis, utility and infrastructure planning;
- GIS is used for real estate analysis, marketing and demographic analysis;
- Wide application in habitat and archaeological analysis.
- Applied in remote sensing, surveying, geodesy, civil engineering, artificial intelligence, operational research.
- Used in natural resource management for locating underground pipes and cables, planning facility maintenance, tracking energy consumption, and balancing loads in power grids.
- Modern GIS applications include address matching, location analysis or site selection, and development of evacuation plans.



RTK GNSS RECEIVERS

More commonly known as RTK GPS Receivers, these GNSS antennas are used for surveying applications as well as GIS surveying and mapping as they can achieve high accuracy.

Generally speaking, GNSS RTK has an accuracy of about 1 - 2 centimeters.

When it comes to determining the location of pipes, cables, infrastructure, roads, buildings and other objects during GPS survey, these GNSS receivers are my best option.

A GNSS RTK antenna is often combined with GPS surveying software to collect points or plot the local coordinate system for the interior of digital terrain models. User data can then be exported or imported.

The two most common configurations that surveyors use are GPS rover sets and GPS rover bases.

Floodwaters have the ability to destroy homes, property and businesses, wreaking havoc on community life. Flooding can happen in minutes, with entire communities inundated in just an hour, and anything that can provide extra time to move valuables and protect assets can be a huge advantage.

An effective flood monitoring system should be based on real-time collection of local data on rainfall, river level and flow.

This can be achieved by arranging the appropriate liquid level sensors and rain gauge sensors.

The operator can remotely understand the water level and rainfall in the monitoring site and set a fixed water level or rainfall alarm value through the data platform. Once the rainfall in the area exceeds the alarm value or the river water level exceeds the set level, an alarm will be triggered and staff will be notified via email and text messages. Staff can analyze and act in time.



TECHNICAL DETAILING AND FINANCIAL ESTIMATION OF INTELLIGENT FLOOD MONITORING SOLUTIONS, THE PROCUREMENT AND OPERATION OF WHICH MAY BE THE OBJECT OF FUTURE PROJECTS OF THE PARTNERS AND DIRECT/INDIRECT BENEFICIARIES OF THE RORS218 PROJECT



1. Automatic rain gauge with GPRS transmission and compatible with the equipment and software installed and functional at the ABA Banat level, with the existing and functional data transmission protocol WKM and HYDRAS 3 net., for rain floods so that a the most accurate forecast in the metropolitan area of Timisoara

It allows real-time measurement of precipitation type (rain, snow, sleet, freezing rain, hail) and intensity, thanks to radar measurement technology.

Equipped with rain sensor with radar technology and adjustable heating. Using a 24 GHz Doppler radar, it measures the velocity of all forms of condensed water. These include rain, freezing rain, hail, snow and sleet. The low energy sensor detects precipitation from the first drop.

Minimum technical characteristics

Electrical parameters

- Power supply 10...28 VDC
- Power consumption without heating 1 VA / 0.4 VA (low power mode)
- Heating power 9 VA

Operating parameters

- Operating temperature range -40...+60 °C
- Operating humidity range 0...95 %
- Protection class IP66
- Survival wind speed 75 m/s

Data transfer

- Interfaces/protocols RS-485 two-wire half-duplex, SDI-12, pulse interface/UMB protocol, Modbus
- Connectable cable minimum 10 m
- Transmission frequency 24 GHz



Precipitation

- Measuring area 9 cm²
- Types of precipitation Rain, snow, sleet, freezing rain, hail, drizzle; No Precipitation (SYNOP 4677)
- Principle of operation Doppler radar
- Accuracy ± 0.16 mm or ± 10 % of measured value for liquid precipitation*
- *) Under laboratory conditions via the Lufft test system: Reference drop simulator with 2.8 mm drop diameter and adjustable intensity between 10 and 200 mm/h.
- Liquid precipitation resolution 0.01 / 0.1 / 0.2 / 0.5 / 1.0 mm (pulse interface)

Measurement domains

- Droplet size 0.3...5.0 mm
- DSD 11 droplet size classes with 0.5mm bandwidth
- Rainfall intensity 0.01...200 mm/h / 0...7.874 inch/h
- Particle speed 0.9...15.5 m/s
- Solid precipitation 5.1...~30 mm

Datalogger, with analog mode, with built-in modern GPRS

- RJ-45 Ethernet communication interface, at least one RS-232 port, at least 2 x pulse/status inputs, at least 2 outputs, configurable analog inputs and outputs, at least 40 monitored channels with the possibility of expansion to 120, TCP/IP HTTP communication, HTTPS, FTP, SMTP, Socket
- Communication paths GSM/GPRS/3G, Ethernet/DSL, fixed line PPP, SSL 3.0 / TLS 1.0 /1.1/1.2 encryption for data transmission, optional integrated modem, GSM/GPRS communication; 3G (UMTS/HSPA+) 900/1800, 850/1900 MHz; 800/850, 900, AWS 1700, 1900, 2100MHz SNTP time synchronization
- Memory capacity of up to 1,100,000 events



Radar type precipitation sensor with 10 ml cable

- Sensor type: rain, snow, sleet, freezing rain, hail; no precipitation; The measuring surface is at least 9 cm2, and the droplet size is 0.3-5.0 mm; DSD minimum 11 droplet size classes with minimum 0.5mm bandwidth, rainfall intensity 0.01-200mm/h, particle velocity 0.9-15.5m/s Solid precipitation 5.1-~30mm
- Accuracy ±0.16 mm or ±10 % of measured value for liquid precipitation, Interfaces RS-485 semi-duplex two-wire, SDI-12,
- UMB pulse interface, Modbus, minimum cable length 10m, power supply 10-28 VDC, Operating temperatures -40...+60 °C and humidity 0-100 % IP66
- 24V/4A power supply.

2. Automatic station with sensors (level and precipitation) type RADAR with back-up to the accumulations in Timiş county with GPRS transmission and compatible with the equipment and software installed and functional at the ABA Banat level, with the existing and functional data transmission protocol WKM and HYDRAS 3 net

Non-contact radar level sensor with pulse radar technology.

It must provide a wide measurement range with a short blanking distance and narrow beam width and connect easily to most data loggers. Extremely low power consumption and ideal for remote or solar powered locations.

Minimum technical characteristics

Water level measurements

• Measuring range - distance to the water surface 0.4 ... 35 m



- Resolution SDI-12 output 0.001 m
- Accuracy (SDI-12) 0.4 ... 2.0 m: ±10 mm;

2.0 ... 30 m: ±3 mm;

30 ... 35 m: ±10 mm

- Average temperature coefficient (-20 ... +40 °C) 0.01 % full scale/10 K
- Accuracy (4 ... 20 mA) ±0.1 % full scale
- Average Temperature Coefficient 10 ppm full scale/°C (at 20°C)
- Measuring time 20 s
- Antenna beam angle (beam width) 12 °
- Power supply 5.4 ... 28 V DC, typ. 12/24 V DC
- Power consumption in active mode (at 12 V) <15 mA
- Power consumption in sleep mode (at 12 V) <0.05 mA
- Interfaces 4 ... 20 mA, SDI-12, RS-485 (SDI-12 protocol)

Material

- ASA housing (UV stabilized ABS)
- Radom (front plate) TFM PTFE
- Mounting bracket 1.4301 (V2A)
 - Lateral axis ±90 °
 - Longitudinal axis ±15 °

Operating temperature -40 ... +60 $^\circ\text{C}$

Storage temperature -40 ... +85 °C

Relative humidity 0 ... 100 %

Protection type IP67 (immersion depth max. 1 m; immersion duration max. 48 h)

EMV limits and radio approvals

• EMV for low power radio devices ETSI EN 301 489-3



- Safety of low voltage devices EN 60950-1
- Radio approval for low power radio devices
- Data loggers specially developed for use in hydrological and meteorological stations. In addition to data logging, data loggers are extremely low power and offer flexible data transfer options over the internet and mobile networks, providing a logging and telemetry solution for every project.
- An integrated web server allows access to the data logger using standard browsers, no additional software is needed.
- Standardized ports and a variety of supported transmission protocols (HTTPS, HTTP, SMTP, FTP) and data formats (including XML) allow easy integration into existing and future systems, thus ensuring a long-term investment.
- Flexible solutions provide connectivity to PLC or process control systems.
- Redundant communication paths ensure full data availability.
- Extremely low power consumption allows extended use in remote locations.
- Each data logger can be individually equipped with input/output modules for a specific application.
- Parallel processing of data from all connected sensors makes short sampling intervals possible.
- The Ethernet interface allows direct web connectivity (netDL 1000) and new IP-based options, such as the use of IP cameras or the coupling of several netDL units.
- Instantaneous values and other information can be read quickly and conveniently at the measuring site with the unit's display.

Communication interfaces

- Ethernet RJ-45 10 Base-T (netDL 1000)
- USB Host and USB Device
- RS-232



Sensor interfaces (standard version)

- SDI-12V 1.3
- RS-485 (SDI-12/Modbus RTU)
- Pulse/status input
- Status/output switch 2

Input/output modules

- Configurable analog inputs
- Configurable, isolated analog inputs
- Configurable analog outputs
- Serial input module for OTT sensors
- Barometric input board
- Measurement channels
- Standard 40
- Optional 120
- IP communication
- Integrated TCP/IP stack HTTP, HTTPS, FTP, SMTP, Socket...
- Communication channels GSM/GPRS/3G, Ethernet/DSL, PPP on fixed line

Integrated Web Server

- Encrypted data transmission HTTPS SSL 3.0 / TLS 1.0 /1.1/1.2
- Integrated modem (optional)
- GSM/GPRS 900/1800, 850/1900 MHz
- GSM/GPRS; 3G (UMTS/HSPA+) 900/1800, 850/1900 MHz; 800/850, 900, AWS 1700, 1900, 2100 MHz
- RTOS operating system with power management for minimal power consumption
- Simple Network Time Protocol (SNTP) time synchronization
- Power supply 9 ... 28 V DC (typ. 12 V DC)



- RAM / NOR / NAND Flash 4 MB / 8 MB / 256 MB
- Data memory
- Capacity up to 1,100,000 values

Display

- Dot matrix graphics 122 x 32 pixels
- LED background lighting
- Jog shuttle control
- 2 x LED status display (variant with integrated modem)

Environment conditions

- Temperature range
- Operation -40 °C ... +70 °C
- Storage -50 °C ... + 85 °C
- Internal modem -30 °C ... +70 °C
- Display (display on) -20 °C ... +70 °C
- Relative humidity 5 ... 95 % (non-condensing)
- ABS housing
- Protection class IP41.

3. Automatic station with sensors (level) type RADAR with back-up on watercourses in Timiş County with GPRS transmission and compatible with the equipment and software installed and functional at the ABA Banat level, with the existing and functional transmission protocol of WKM data and HYDRAS 3 net

Non-contact radar level sensor with pulse radar technology.

It must provide a wide measurement range with a short blanking distance and narrow beam width and connect easily to most data loggers. Extremely low power consumption and ideal for remote or solar powered locations.

Minimum technical characteristics

Water level measurements

- Measuring range distance to the water surface 0.4 ... 35 m
- Resolution SDI-12 output 0.001 m
- Accuracy (SDI-12) 0.4 ... 2.0 m: ±10 mm;

2.0 ... 30 m: ±3 mm;

30 ... 35 m: ±10 mm

- Average temperature coefficient (-20 ... +40 °C) 0.01 % full scale/10 K
- Accuracy (4 ... 20 mA) ±0.1 % full scale
- Average Temperature Coefficient 10 ppm full scale/°C (at 20°C)
- Measuring time 20 s
- Antenna beam angle (beam width) 12 °

Electrical data

• Power supply 5.4 ... 28 V DC, typ. 12/24 V DC



- Power consumption in active mode (at 12 V) <15 mA
- Power consumption in sleep mode (at 12 V) <0.05 mA
- Interfaces 4 ... 20 mA, SDI-12, RS-485 (SDI-12 protocol)

Material

- ASA housing (UV stabilized ABS)
- Radom (front plate) TFM PTFE
- Mounting bracket 1.4301 (V2A)
 - Lateral axis ±90 °
 - Longitudinal axis ±15 °

Operating temperature -40 ... +60 °C

Storage temperature -40 ... +85 °C

Relative humidity 0 ... 100 %

Type of protection

• With horizontal mounting IP67 (immersion depth max. 1 m; immersion duration max. 48 h)

EMV limits and radio approvals

- EMV for low power radio devices ETSI EN 301 489-3
- Safety of low voltage devices EN 60950-1
- Radio approval for low power radio devices* Short Range Device (SRD)

4. High-performance desktop PC for hydrological/hydraulic modeling

Minimum features:



- Minimum processor Intel Core I7-13700K with minimum 16 cores, min 24 threads with a turbo frequency of minimum 5.4 GHz or equivalent
- Motherboard manufactured by the same manufacturer as the computer system. To be part of the subassembly nomenclature of the company producing the computer and to have the operating system manufacturer's logo inscribed (industrially printed)
- Graphics Card Minim Nvidia RTX A2000 6GB GDDR6 Chipset designed by the same manufacturer as the processor Minim Intel W680 Chipset or equivalent
- HDD Minimum 960 GB SSD M.2 NVMe Enterprise
- Maximum RAM memory: 128GB 4 DIMMs (ECC and non-ECC memory support) DDR5
- Installed memory: minimum 32 GB DDR5 4400MHz with minimum 3 free DIMMs
- Communications 1-Gigabit RJ 45 Network Port with Intel Chipset, 1-2.5GbE RJ 45 Network Port with Intel Chipset
- Total expansion slots: (minimum) 1x PCI-e 5.0 x16, 1x PCI-e 5.0 x8, 2x PCI-e 3.0 x4, 1x PCI 5V 32-bit, 3x M.2 slot 4.0 x4 (for storage device PCIe NVMe type support min. 2280) with RAID 0,1,5 support
- Minimum inputs/outputs:
 - Ports on the front panel: 2x USB 3.2 Gen1, 1x USB 3.2 Type-C Gen1, 1x microphone, 1x headphone audio
 - Ports on the back panel: 2x USB 2.0, 3x USB 3.2 Gen 2 Type A, 1x USB 3.2 Gen 2x2 Type C, 1x RJ45, 1x DP 1.4, 1x HDMI, 1x DVI, 7.1 HD Audio Jacks (Line-In, Line- Aut, Center, Surround, 1x SPDIF Out optical port), 1x serial COM header
 - $\circ~$ All ports will be integrated on the motherboard.
- High Definition (HD) Audio, internal speaker
- TOWER type housing, maximum 13.5kg, can optionally be equipped with an intrusion sensor (Chassis Intrusion on board) and with the front panel with a



key that prevents access to the 5.25" bays, minimum 1x 12cm rear Fan (optionally able to install a second 12cm Fan)

- Total number of bays: 2 x 5.25" external included in the configuration, 4 x 3.5" internal disk bays with the possibility of rotating 90 degrees included in the configuration, 4x 2.5" internal disk bays optional
- Min. 8 x SATA III (with RAID 0,1,5,10 support for min. 6 SATA ports)
- Power supply Minimum 660W Power Platinum 80+ Level
- USB optical mouse with scroll
- Keyboard
- Windows 10 Professional license or newer
- Management: Integrated security chip, TPM 2.0; CPU and Memory Voltage Monitoring, CPU Temperature Monitoring, VRM, System and memory

5. Infrared device for detecting infiltrations in the dike

Infrared device with minimum 640x480p sensor resolution, 3.5mm lens, with 256Gb SD card attached, mounting bracket included.

Minimum features:

• Sensor: 640x480p



- Compression: H.265, H.264, max 30fps
- Video Output: CVBS
- Lens: 35mm@F1.0
- Angle: H: 17.2° / V: 13° / D: 22°
- Horizontal rotation: 360° @ 0.025° ~ 120° / sec continuously
- Vertical rotation: -90° ~ 40° @ 0.025° ~ 40° /sec
- Preset accuracy: +/- 0.3°
- Digital image stabilizer, built-in gyro sensor
- Input/output: 1 input / 1 output
- Events: saving files to FTP, sending by email, Notifications by email, etc
- Network: RJ-45 10/100BASE-T
- Video compression: H.265/H.264
- Audio compression: G.711, G.726, AAC-LC
- Smart Codec
- Unicast- 20 users, Multicast
- API Onvif S/G/T, SUNAP
- Operating temperature -40°C ~ +55°C
- Certification: IP66, NEMA4X
- Power supply: 24VAC

Analysis: Direction detection, motion detection, Appearance/Disappearance of objects, Entry/Exit, Virtual line, Audio detection, Temperature change, sound classification, shock detection, Object temperature differentiation.

6. Radar system for the detection of discontinuities in the bodies of dikes, up to 7 m deep

GPR (Ground Penetrating Radar) systems work by sending a small pulse of energy into a material through an antenna.

An integrated computer records the power and time required to return any reflected signals. Subsurface variations will create reflections that are picked up by the system and stored on digital media. These reflections are produced by a variety of materials, such as differences in geological structure and man-made objects such as pipes and wire.

Minimum technical characteristics

Control unit

- Number of channels: record data from 1 single frequency antenna or 1 dual frequency antenna
- Data storage 32 GB Flash, 1 GB RAM
- Display Improved 10.4-inch LED display with high internal brightness
- 1024 x 768 active-matrix resolution and 32-bit color
- Internally recorded GPS data
- Display modes Linescan, Linescan plus O-scope, Wiggle trace Full 3D
- 256 color bands are used to represent signal amplitude and polarity
- IP65 environmental rating
- Operating temperature -20°C to 40°C external
- Toughpad
- Data storage 256 GB (SSD)
- 10.1-inch screen, HD with daylight reading, ten-point gloved multi touch + digitizer
- Memory 8 GB DDR3
- Intel® CoreTM i5-7300U vProTM processor, 2.6 GHz to 3.5 GHz with Intel® Turbo Boost Technology, Intel Smart Cache 3MB
- Graphics Intel® HD Graphics 620 video controller (built-in CPU).
- Connectivity Intel® Dual Band Wireless-AC 8265 (IEEE802.11a/b/g/n/ac),
- Bluetooth 4.2 (low energy)



- USB 3.0 ports, HDMI
- Battery life 8 hours (long life battery)
- Weight (not including cover type*) 1.3 kg (3.0 lbs) with optional long-life battery (1.36 kg)
- Windows® 10 Pro 64-bit operating system
- Antenna
 - Central frequency 200 MHz
 - Minimum depth 7 m
 - o Battery life 4 hours
 - o IP65 environmental rating
 - Vibration Mil-STD-810G Method 514.6C Category 9
 - Operating temperature -10°C to 40°C external

Data acquisition

- RADAN® data format (dzt)
- 32-bit output data format
- Scan interval Up to 200 scans/sec
- Number of samples per scan 512, 1024, 2048, 4096, 8192
- Operating modes Continuous (time), Survey Wheel (remote triggered) or Point Mode
- Time range 0-16,000 nanoseconds full scale, user selectable
- Gain: Manual adjustment from -42 to +126 dB
- The number of segments in the gain curve is user selectable from 1 to 8
- Signal-to-noise ratio 171 dB
- Standard real-time filters Infinite Impulse Response (IIR) Low and High Pass, vertical and horizontal
- Advanced real-time functions Surface Position Tracking, Signal Noise Ground Tracking,
- Adaptive background removal, dynamic gain control



- Automatic antenna recognition Automatic recognition of HS antennas to enable maximum compliant transmission rate
- Autonomous internal GPS accuracy 2.5 m (8.2 ft), SBAS 2.0 m
- External Bluetooth GPS
- Wireless range 15 m
- USB I/O, rugged Ethernet, poll wheel and marker input, digital connector
- The system must include Handcart, Control cable length 7m, Li-ion battery 2 pcs, Charger for 2 batteries, Rigid transport case, 2 year warranty, Data processing software.

7. ADCP topo bathymetric sonar (acoustic doppler current profilers) with builtin GPS

The system must at least allow:

- Collect measurements both with the boat in motion and stationery
- RTK network connection within network range
- Using GNSS to calculate the distance between stations for stationary measurements
- Possibility of beam switching (3-beam solution) when one beam shows interference
- Processing *.riv/*.rivr files
- Save data to a computer, external drive or network with file naming option
- Switch between GNSS or built-in magnetic compass for direction

Water velocity profiling

• Profiling radius 0.1-6 m (*1)



- Speed range +/- 5 m/s
- Accuracy 1% +/-0.002 m/s
- Resolution 0.001 m/s
- Number of cells up to 128
- Cell size 2.5-30 cm
- Data output rate 1.0 Hz

Depth Tracking:

- Depth range 0.1-6 m (*1)
- Accuracy (*2) 1% +/- 0.002 m/s
- Resolution 0.001 m/s

Depth measurement:

- Range 0.1-6.5m (*1)
- Accuracy 1% +/-0.005 m

sensors

- Temperature sensor resolution: ±0.01°C
- Accuracy: ±0.5°C
- Compass/Tilt Sensor Range: ±180° Pitch/Roll, 0-360° Heading
- Direction accuracy: ±2°
- Pitch/roll accuracy: ±1°

transducers

- Total number, frequency five, 3.0 MHz
- Beam angle 25°
- Beam width 3°
- bandwidth 25%

Battery



- Input voltage 3.3-4.2 VDC
- Power supply Li-Ion 1x size 18650, 3.7Vdc, 2600mAh
- Battery life 1 x size 18650
- Seven hours of continuous use, typical settings
- Power consumption 1.0 W (average)
- Dimensions 19.2mm x 69.7mm
- Battery life 1 x size 18650: 5 hours of continuous use, typical settings
- Base station 1 x size 18650 14 hours of continuous use, typical settings

Communications

- Bluetooth Low Energy (BLE5) radio protocol
- Range 100m (*3)
- Bluetooth Compliance FCC Part 15, FCC ID: XPYNINAB30
- ISED certification: 8595A-NINAB30

General

- Operating temperature -5° to 45°C
- Storage temperature -20° to 70°C
- Storage with battery temperature (*5) -20 $^{\circ}$ to 45 $^{\circ}\text{C}$
- Waterproof class IP-67
- DGNSS
- Horizontal RMS SBAS (WAAS): <0.3 m
- 2DRMS SBAS (WAAS): <0.6m
- Frequency Multi-frequency, multi-constellation
- Horizontal accuracy (Quality 4) < 0.02 m
- Vertical accuracy (Quality 4) < 0.04 m
- Frequency L1C/A, L2C, Multi-GNSS
- GNS3M Atlas subscription.





8. Drone equipped for topographic LiDAR surveys

Professional drone with vertical takeoff and landing, ready to fly, equipped with battery, charger, remote control, ground control monitor.

The drone must provide long flight duration, have a rigid construction, preferably carbon fiber, and full autonomous GPS RTK EMLID navigation functions.

The drone must be equipped for LiDAR ("light detection and ranging") topographic surveys.

Must include software for data post-processing.

Minimum technical characteristics

- Minimum release year 2023
- Minimum 12-month warranty
- Weight 800 g
- Operating temperature range -20 °C to 60 °C
- Temp. storage -40 °C to 85 °C _ _
- LiDAR system
- Sensor type XT32M2X



- Sensor weight 490 g
- Recording data in the internal memory
- Saving data to a flash card
- Camera connection
- o Built-in IMU
- o Built-in GNSS mode
- o Laser sensor
- o Working range 300 m
- Working flight altitude 200 m
- Sensor accuracy 3-5 cm
- Number of scan beams 32
- $\circ~~360\,^\circ$ horizontal FOV
- Vertical FOV 40.3°
- \circ Horizontal resolution 0.09°
- \circ Vertical resolution 1.3°
- \circ Scan frequency (single reflection) 640000
- Scan frequency (double reflection) 1280000
- Scan frequency (triple reflection) 1920000
- o Refresh rate 5-20 Hz
- o Laser wavelength 905 nm Class 1 protection
- Operating voltage 9 V 36 V Power consumption 10 W
- Ethernet UDP/IP output, 100BASE-TX
- 100 Mbps Ethernet connection
- o GPS/PTP data synchronization
- IP6K7 water resistance
 IMMU
- o IMU weight 35 g
- Operating frequency 200 Hz
- $\circ~$ Direction accuracy (°, 1 σ) 0.07



- Height accuracy (°, 1σ) 0.01
- Rolling accuracy (°, 1σ) 0.01
 GNSS receiver
- o PPK mode
- Number of channels 184
- Frequency 10 Hz
- Data accuracy 3-5 cm
- o GPS L1C/A, L2C
- o GLONASS L10F, L20F
- o BeiDou B1I, B2I
- o Galileo E1B/C, E5b
- o SBAS L1C/A
- QZSS L1C/A, L1S, L2C
- Working without GCP
- $\circ~$ Recommended range to the base station 10 km $\,$

Additional Requirements:

- all accessories necessary for installation and operation will be provided;
- the accessory kit necessary for installation and operation will be provided;
- the technical literature made available by the manufacturer, the quality and warranty certificate, translated into Romanian, will be provided;
- the instructions for using the equipment will be made available, so that the safety and health conditions at work are respected, in accordance with the legislation in force, translated into Romanian;
- the bidder will ensure that the solution provided is complete and that he has considered all the equipment necessary for a turnkey solution;
- warranty minimum 1 year for electronic components; the warranty period starts from the moment of receipt, respectively putting the products into operation; during the warranty period, all spare parts and



authorized interventions will be free of charge; spare parts are all product components, excluding consumables;

- delivery, installation and commissioning will be the subject of a quantitative and qualitative acceptance and will be recorded in an acceptance report;
- any malfunctioning and/or non-compliant product will be repaired/replaced free of charge within 15 working days.
- Software for advanced GNSS data post-processing, image geo-tagging and LIDAR point cloud generation, supports a full range of systems as well as any type of coordinate systems and GEOIDs.
- The software must include the following functionalities:
 - PPK module for post-processing GNSS data and image geotagging
 - LIDAR post-processing to calculate the precise trajectory of LIDAR equipment based on GNSS and IMU data
 - LIDAR Point Cloud Generation to create a high precision georeferenced point cloud
 - Static post-processing, calculates precise point coordinates performs mutual wireframe mesh alignment.
 - Mode to calculate point coordinates in ITRF2014 or any coordinate system.
 - The GNSS data archive allows the download of static rinex data from base stations around the world
 - Coordinate converter.



9. 4x4 van with high clearance for transporting people and material

Minimum features

- Body type SUV
- All-wheel drive, 4x4
- Fuel type petrol/diesel
- Engine Configuration Inline
- Number of cylinders 4
- Cylinder capacity minimum 1300 cm3
- Pollution standard Euro 6
- Approval type WLTP
- Torque minimum 250 Nm
- Power minimum 150 hp
- Number of seats 5
- Ground clearance minimum 18 cm
- Number of gearbox steps 6+1 steps
- Gearbox type manual or automatic

Minimum equipment:

- Height/depth adjustable steering wheel
- Rear-view mirrors electrically adjustable, defrosting and folding
- Central locking with remote control
- Fog lights
- On-board computer
- Spare tire
- 1/3-2/3 folding rear seat
- Rear parking assist



- Video assistance for reverse parking
- Automatic climate control
- Tire pressure monitoring system
- Power steering with variable assistance depending on driving speed
- Power windows front and rear
- Rear window wiper with washer and intermittent operation
- Heated rear sight
- Height-adjustable driver's seat
- Folding sunshades
- 12V sockets, on the central console and in the trunk
- Dashboard with on-board computer
- Warranty minimum 3 years or 100,000 km
- ESP Electronic Trajectory Control
- HSA Hill Start Assist
- ABS+EBD Anti-lock braking system and electronic brake distribution
- Automatic pilot
- Driver and passenger front airbags (disconnectable for passenger)
- Side airbags, front
- Curtain airbags
- Immobilizer
- Alarm system
- Automatic centralized door closing system after starting the car
- Safety belts with two stages of pyrotechnic tensioning, with signaling of the engagement of the belts (for the front seats)
- Safety belts with pyrotechnic tensioning, with signaling of the engagement of the belts (for the rear side seats)
- Headrests with adjustable height, in front
- Individual headrests for each seat of the back seat (3 pcs)
- Start-Stop engine control system (ISG)



- McPherson front suspension, rear multilink with independent arms.

10. Hydrometric self-laboratory 4x4:

4x4 van

Minimum features:

- All-wheel drive, 4x4
- Fuel type diesel
- Engine Configuration Inline
- Number of cylinders 4
- ⁻ Cylindrical capacity maximum 2000 cm ³
- Pollution standard Euro 6
- Approval type WLTP
- Torque minimum 250 Nm
- Power minimum 130 HP
- Number of seats 3
- Ground clearance minimum 18 cm
- Number of gearbox steps 6+1 steps
- Gearbox type manual or automatic

Minimum equipment:

- Height/depth adjustable steering wheel
- Rear-view mirrors electrically adjustable, defrosting and folding
- Central locking with remote control
- Fog lights
- On-board computer
- Spare tire
- Automatic climate control
- Tire pressure monitoring system
- steering



- Power windows
- Height-adjustable driver's seat
- Folding sunshades
- 12V sockets, on the central console and in the trunk
- Dashboard with on-board computer
- Warranty minimum 3 years or 100,000 km
- ESP Electronic Trajectory Control
- HSA Hill Start Assist
- ABS+EBD Anti-lock braking system and electronic brake distribution
- Automatic pilot
- Driver and passenger front airbags (disconnectable for passenger)
- Automatic centralized door closing system after starting the car
- Seat belts
- Headrests with adjustable height.

Electromechanical hydrometric windlass with electronic chronometer with display, windlass-chronometer data transmission cable, ballast weight and winch for measuring water speed and depth on bridges

Minimum features

- Flow speed from 0.025...5 m/s (depending on the type of propeller)
- Lifetime > 1 million switching cycles, max. 9 V DC, solenoid switch, pressure tight up to 30 bar
- Current meter body: stainless steel, corrosion resistant
- Hydrometric aluminum vane
- Stopwatch Z 400 with speed calculation mode
- Bargo individual calibration certificate 0...5m/s
- Shoulder bag for carry
- Winch with 25 ml of cable for lowering and raising the mooring
- Cable for winch with a length of 25 ml



- Double-way crank (raise and lower)
- Winch transport box
- Tail for orienting the mooring in the direction of flow, 1.4 m in 2 pieces
- Tail carrying bag
- Ballast/weight of 25 Kg with bottom contact
- Ballast/weight box
- Crane for handling the whole assembly
- Connecting cable between the winch and the chronometer
- The intermediate piece between the mortise and the weight/ballast
- Morishca C31 paddle oil
- Transport included on the territory of Romania.

ADCP - portable hydrometric and bathymetric measurement system with 5 Doppler 3.0 Mhz beams, internal Li-Ion batteries, Bluetooth, software, smart GNSS antenna, mobile support plate

The system must at least allow:

- Collect measurements both with the boat in motion and stationery
- RTK network connection within network range
- Using GNSS to calculate the distance between stations for stationary measurements
- Possibility of beam switching (3-beam solution) when one beam shows interference
- Processing *.riv/*.rivr files
- Save data to a computer, external drive or network with file naming option
- Switch between GNSS or built-in magnetic compass for direction

Water velocity profiling:

- Profiling radius 0.1-6 m (*1)
- Speed range +/- 5 m/s
- Accuracy 1% +/-0.002 m/s



- Resolution 0.001 m/s
- Number of cells up to 128
- Cell size 2.5-30 cm
- Data output rate 1.0 Hz

Depth Tracking:

- Depth range 0.1-6 m (*1)
- Accuracy (*2) 1% +/- 0.002 m/s
- Resolution 0.001 m/s

Depth measurement:

- Range 0.1-6.5m (*1)
- Accuracy 1% +/-0.005 m

sensors

- Temperature sensor resolution: ±0.01°C
- Accuracy: ±0.5°C
- Compass/Tilt Sensor Range: ±180° Pitch/Roll, 0-360° Heading
- Direction accuracy: $\pm 2^{\circ}$
- Pitch/roll accuracy: ±1°

transducers

- Total number, frequency five, 3.0 MHz
- Beam angle 25°
- Beam width 3°
- bandwidth 25%

Battery

- Input voltage 3.3-4.2 VDC
- Power supply Li-Ion 1x size 18650, 3.7Vdc, 2600mAh
- Battery life 1 x size 18650



- Seven hours of continuous use, typical settings
- Power consumption 1.0 W (average)
- Dimensions 19.2mm x 69.7mm
- Battery life 1 x size 18650: 5 hours of continuous use, typical settings
- Base station 1 x size 18650 14 hours of continuous use, typical settings

Communications

- Bluetooth Low Energy (BLE5) radio protocol
- Range 100m (*3)
- Bluetooth Compliance FCC Part 15, FCC ID: XPYNINAB30
- ISED certification: 8595A-NINAB30

General

- Operating temperature -5° to 45°C
- Storage temperature -20° to 70°C
- Storage with battery temperature (*5) -20° to 45°C
- Waterproof class IP-67
- DGNSS
- Horizontal RMS SBAS (WAAS): <0.3 m
- 2DRMS SBAS (WAAS): <0.6m
- Frequency Multi-frequency, multi-constellation
- Horizontal accuracy (Quality 4) < 0.02 m
- Vertical accuracy (Quality 4) < 0.04 m
- Frequency L1C/A, L2C, Multi-GNSS
- GNS3M Atlas subscription
- Compatible mobile support plate
- GNSS type GPS mode.

Small drone for flying over/reconnaissance of the surrounding area

Minimum features



- Take-off weight (without accessories): 905 g
- Maximum take-off weight min 1100 g
- Maximum climbing speed 5 m/s, 4 m/s with accessories
- Maximum descent speed 3 m/s
- Maximum speed (near sea level, no wind) 72 km/h
- Maximum flight time (no wind) 31 min (at a constant speed of 25 km/h)
- Maximum floating time (no wind) 29 min
- Maximum resistance to wind speed 29-38 km/h
- Maximum angle of inclination 35°
- Maximum angular velocity 200°/s
- Operating temperature range -10°C to 40°C
- GNSS GPS+GLONASS
- Hovering accuracy range

Vertical:

±0.1m (with visual positioning)

±0.5m (with GPS positioning)

Horizontal:

± 0.3 m (with visual positioning)

±1.5m (with GPS positioning)

- Operating frequency 2.400 2.4835 GHz
- Transmit power (EIRP) 2.400 2.4835 GHz, 5.725 5.850 GHz
- Internal storage 24 GB
- M2ED visual camera
 - 1/2.3" CMOS sensor; Effective pixels: 12M
 - \circ Lens FOV: approx. 85°
 - 35mm format equivalent: 24mm
 - Aperture: f/2.8



- o Focus: 0.5m to ∞
- Video ISO Range: 100-12800 (Auto)
- Photo: 100-1600 (auto)
- Maximum image size 4056×3040 (4:3 ; 4056×2280 , 16:9)
- Still shooting modes Single shot
- Burst shooting: 3/5/7 frames
- Interval (2/3/5/7/10/15/20/30/60s)
- 4K Ultra HD Video Recording Modes:
- o 3840×2160 30p
- o 2.7K: 2688×1512 30p
- FHD: 1920×1080 30p
- Maximum video bit rate 100 Mbps
- o JPEG photo
- Video format MP4, MOV (MPEG-4 AVC/H.264)
- o Remote
- \circ Operating frequency 2,400 2,483 GHz; 5.725 5.850 GHz
- Maximum transmission distance (Unobstructed, no interference) 2,400
 2,483 GHz; 5.725 5.850 GHz
- FCC: 10000 m
- o EC: 6000 m
- o SRRC: 6000 m
- o MIC: 6000 m
- Operating temperature range 0 °C to 40 °C
- Transmitter power (EIRP) 2.4 2.4835 GHz
- \circ FCC : ≤26 dBm ; CE : ≤20 dBm ; SRRC : ≤20 dBm MIC : ≤20 dBm
- o 5.725 5.850 GHz
- \circ FCC : ≤26dBm ; CE : ≤14dBm ; SRRC : ≤26dBm
- 3950mAh battery



- Charging time 2 hours 15 min
- Operating current/voltage 1800mA = 3.83V
- Supported mobile device holder thickness: 6.5-8.5mm, maximum length:
 160mm
- RC size folded: 145×80×48 mm (L×W×H)
- Unfolded: 190×115×100 mm (L×W×H)
- Supported USB port types Lightning, Micro USB (Type-B), USB Type-C[™]
- Charger Input 100-240V , 50-60Hz , 1.8A
- Main output: 17.6 V = 3.41 A or 17.0 V = 3.53
- USB: 5V 2A
- Voltage 17.6±0.1V
- Nominal power 60W
- Spotlight M2E
- Dimensions 68x60x41 mm
- Micro-B USB port type
- Operating range 30 m
- Maximum power 26W
- Illumination FOV17°, Max: 11lux @ 30m straight
- APP / Live View
- The mobile app
- Remote Control Live View Quality: 720p@30fps / 1080p@30fps
- Max Live View bit rate 40 Mbps
- Latency 120 130 ms
- Operating systems required ios 10.0 or later Android 5.0 or later

Electronic topometric level with portable telescopic sight 5m

Minimum features

Laser level



- Red laser beam (635 nm), class 2
- Accuracy ± 1.0 mm / 10 m
- Working range 500 m (with sensor) diameter
- Plans generated 1 x horizontal (360 °)
- Head rotation speed 600 rpm
- Power supply 7.4 V (Li-ion, 4000 mAh)
- IP54 resistance class
- Working temperature range -20 $^\circ$ C to + 50 $^\circ$ C
- Weight 3.0 kg
- Use land leveling leveling

It includes

- laser leveler 1 pc
- laser sensor with support 1 pc
- Li-ion batteries 1 set
- charger 1 set
- laser target 1 set
- laser glasses 1 set
- Carrying bag

Mira topography

- Sturdy construction
- Permanent scale marking
- Includes cover and blister
- Length 5 m

Tripod

- Aluminum material
- Quick lock feet



- Weather resistant
- Minimum height of approximately 0.97 m
- Maximum height approximately 1.60 m
- Flat tripod head
- Weight approx. 3 kg

GNSS receiver

- Number of channels: 1408
- GPS: L1C/A/L2P (Y)/L2C/L5
- Glonass: L1, L2
- Galileo: E1, E5a, E5b, E6
- BeiDou: B1I, B2I, B3I, B1C, B2a, B2b
- QZSS: L1, L2, L5, L6
- PPP: B2b-PPP
- SBAS: L1, L5
- RTK:
 - Horizontal: 8 mm + 1 ppm RMS
 - Vertical: 15 mm + 1 ppm RMS
 - Initialization time: <10 s
- PPK
 - Horizontal: 3 mm + 0.5 ppm RMS
 - Vertical: 5 mm + 0.5 ppm RMS
- Wifi 802.11 b/g/n, access point mode
- Bluetooth V 4.2



- Ports 1 x USB Type-C port (external power supply, data download, firmware update) and 1 x UHF antenna port (mother TNC)
- UHF radio
 - Standard Tx/Rx: 410 470 MHz
 - \circ Transmission power: 0.5 W, 1W
 - Protocol: CHC, Transparent, TT450, Satel (5)
 - Link rate: 9,600 bps to 19,200 bps
 - Range: Typical 3 km, up to 8 km with optimal conditions
- Data format
 - o RTCM 2.x
 - RTCM 3.x
 - CMR input / output
 - HCN, HRC
 - RINEX 2.11, 3.02
 - o NMEA 0183 output
 - NTRIP Client,
 - NTRIP Caster
- Memory 8Gb
- Operating temperature: -40°C +65°C
- Protection: IP67 waterproof and dustproof
- Physical shock: can work after a fall from a height of 2m



Level meter with sound and light signal

Contact gauges are used to perform both manual data acquisition (target data measurements) and calibration and control measurements at groundwater level stations using dataloggers.

For measurement, the probe from the heavy-duty tape measure is lowered to the ground water level - and even lower for profile measurements - and can be easily retracted using the crank.

The equipment is specially designed to be used for depth measurements. Working principle: with the help of the crank, the measuring probe at the end of the heavyduty measuring tape is lowered into an observation well or a wellhead well. As soon as the tip of the probe reaches the water level, the probe detects a change in conductivity: a signal will sound and the indicator lamp on the side of the unit will light up. The distance between the reference level and the water surface can now be read on the tape measure.

Characteristics

- Precise operation probe made of high quality material
- Slim design fits into 1" observation wells
- Tape measure with locking and smooth running and drum in sturdy frame
- Convenient handle for easy transport

Applications

- Depth measurements in observation wells, wellhead wells or reservoirs
- Control measurements in pumping tests
- For depths from 15 m to 750 m

Turbidimeter for measuring the turbidity of water in rivers

• Color Display, graphic LCD display; display dimensions 3.9 cm x 6.5 cm



- USB port Built-in micro port for PC connection, portable recharging/powering and direct connection to a USB stick
- Memory > 100,000 data sets

Barometer

- Units: mmHg, inHg, mbar, psi, kPa, atm
- Range: 375 to 825 mmHg;
- Accuracy: ±1.5 mmHg from 0 to 50°C;
- Resolution: 0.1 mmHg
- Recording modes: single point or continuous with auto-stable feature
- Sites and Data IDs: 100 user-defined sites and 100 user-defined data ID tags;
- Site images can be sent to the handheld via proprietary software
- Calibration records: 400 detailed calibration records can be stored and are available for viewing, downloading and printing
- Printing available only through proprietary software
- Rechargeable lithium-ion battery: 48 hours with the handheld only
- Battery recharge time: 9 hours with AC adapter;
- The instrument will also be able to be powered via AC or external power via the USB port
- Operating temperature 0 to 50°C
- Storage temperature 0 to 45°C with battery installed; 0 to 60°C without battery installed
- Degree of protection IP-67
- 3-year warranty on the mobile device
- Cable with 1 port
- Dimensions:

Without depth module: 2.54 cm diameter x 38.18 cm length

With depth module: 2.54 cm diameter x 40.71 cm length



• Temperature sensor

Range: -5 to 70°C;

Accuracy: ±0.2°C;

Resolution: $0.1^{\circ}C$

• Shallow depth sensor

1, 4 and 10 m cables

Range: 0 to 10 m;

Accuracy: ±0.004 m;

Resolution: 0.001 m

• Medium depth sensor

20, 30, 50 and 100 m cables

Range: 0 to 100 m;

Accuracy: ±0.04 m;

Resolution: 0.001 m

2-year warranty on the cable

11. Optimizing the collection of hydrometeorological data from the field through the purchase of desktop PCs and smartphones

Desktop PC

Minimum features:

- Minimum 12th generation Intel i5 processor
- Memory 8 GB RAM DDR4
- 512GB SSD storage
- Intel UHD video graphics card



- Minimum operating system Windows 11 Pro, Microsoft Office
- Minimum 24" full HD monitor

Smartphone

- Smartphone type phone with the following minimum features:
- Dual SIM
- GPS
- Waterproof and dustproof, IP68
- Max weight 200g
- Connectivity: 3G/4G/5G, Wifi, Bluetooth 5.0, NFC, USB type C
- Memory min 8Gb
- Storage capacity min 256Gb
- AMOLED display min 2340x1080p
- Main camera min 12Mp
- Battery min li-ion 4500mA
- Sensors: accelerometer, barometer, gyroscope, fingerprint, proximity sensor, light sensor, gravity sensor





TECHNICAL DETAILING AND FINANCIAL ESTIMATION OF INTELLIGENT COMMUNICATION SOLUTIONS (OBSERVATION AND COORDINATION) FOR FLOOD RISKS PREVENTION, THE ACQUISITION AND OPERATIONAL OF WHICH MAY BE THE OBJECT OF FUTURE PROJECTS OF THE PARTNERS AND DIRECT/INDIRECT BENEFICIARIES OF THE RORS218 PROJECT

A. Coordination room:

a) Video Wall system with controller, user licenses, related accessories

A video wall consisting of 9 monitors in 3x3 format will be installed in the coordination room.

Video wall monitors:

- Screen size 55 inches
- Active display area 1209.63 (H) mm × 680.34 (V) mm
- LED backlight with direct lighting
- Pixel pitch 0.63 mm
- Physical seam 0.88 mm
- Bezel Width 0.44mm (Top/Left), 0.44mm (Bottom/Right)
- Resolution 1920 × 1080 @ 60 Hz (downward compatible)
- Brightness 700 cd/m²



- Viewing angle Horizontal 178°, vertical 178°
- Color depth 10-bit, 1.07B
- Contrast ratio 1100:1
- Response time 8 ms
- 72% NTSC color gamut
- Surface treatment haze 28%, 2 hours
- Interface
 - $\circ~$ Video and audio input VGA \times 1, HDMI \times 1, DVI \times 1, DP \times 1, USB \times 1
- Video and audio
 - HDMI output × 1
 - $\circ~$ Control interface RS232 IN \times 1, RS232 OUT \times 1
- Power
 - Power supply 100 ~ 240 VAC, 50/60 Hz
 - $\circ~$ Power consumption \leq 230, Standby consumption \leq 0.5 W
- Operating temperature 0°C to 40°C
- Operating humidity 10% to 90% RH (non-condensing)
- Clamping vesa 600 (H) mm × 400 (V) mm
- 4K decoder
- It provides HDMI (adaptable to DVI-D) and BNC output interfaces.
- Up to 4K (3840 × 2160 @ 30 Hz) via HDMI output interfaces (only for odd interfaces).
- Decoding up to 8 channels at 24 MP resolution.
- H.265+/H.265, H.264+/H.264, Hik264, MPEG4 and MJPEG video compression.
- PS, RTP, TS, ES, HIK encapsulation formats.
- Three levels of coding: basic, master and high profile.
- G.722, G711A, G726, G711U, MPEG2-L2 and AAC audio compression.
- Two decoding modes: active decoding and passive decoding.



- Supports two-way audio via client software.
- Decode output of remote video files.
- It provides VGA and DVI input interfaces.
- It supports window opening, window roaming and window splitting.
- Supports multi-screen control with PC installed with RSC server.
- Receive stream and decode via URL and RTSP from encoding devices.
- Display the decoded video stream on the video wall by directly connecting cameras or by redirecting the media stream.
- Configurable parameters for the width and height of the LED when the LED is connected.
- Regular and irregular virtual screen configurable to display multiple signal sources and escape physical screen restriction.
- Accessible through the thermal network camera, you can view temperature measurement, dynamic fire source detection, vessel detection and VCA information in live view and playback.
- You can enable or disable smart information for the thermal grid camera.
- Port Aggregation Technology (Ethernet Channel).
- Accessible with 2.4 MP DeepinView camera.
- Two-way audio.
- You can configure what the video wall shows when decoding finishes and transmission fails through your web browser and client software.
- Wall mounted bracket
 - Solid steel construction, preventing the screen from bending or twisting
 - Cold Rolled Steel Plate (SPCC)
 - Quick and easy installation
 - VESA 600 mm × 400 mm
 - Surface treatment: electrostatic spraying



b) Operating desk with all-in-one PC

6 offices for operators fully equipped with all-in-one PCs will be installed.

Operating office

- Material Top: Melamine, Chipboard
- Legs Steel
- Frame Steel
- Color- Black
- Feature Adjustable feet, Adjustable height
- Size after assembly
- width: 80 cm
- length: 160 cm
- height: 65-85 cm

Seat

- Folding armrests
- Friction wheels
- Pneumatic lifting mechanism
- Lumbar support
- Tilt mechanism
- Adjustable height
- User weight min 80 kg

Fixed all-in-one workstations with operating systems, Office package licenses and related accessories

- Display 27 inches
- Intel Core i5 processor gen 12 minimum
- RAM memory 16 GB DDR4
- 512GB SSD storage



- Intel Graphics card
- Windows 11 Pro license
- Microsoft Office 2021 Home & Business license

Wireless and Bluetooth operator headset

- Talk time up to 12 hours of talk and up to 15 hours of listening
- Standby time up to 13 days in standby mode
- Bluetooth v4.1 (HSP) 1.2
- Radio class BT class 1
- Advanced Audio Distribution Profile (A2DP) 1.2, AVRCP 1.4
- Sensitivity 94 dB SPL ± 4 dB
- Frequency response 20 Hz 20 kHz
- Impedance 32 ohms
- Speaker size 32 mm
- Battery capacity 360mAh typical / 350mAh minimum
- Rechargeable, non-replaceable lithium-ion polymer battery
- Charging time 1.5 hours
- Microphone Noise cancellation with 2 microphones: 1 uni-directional; 1 MEMSdirectional
- SoundGuard DIGITAL hearing protection: protects against sound levels above 118 dBA; G616 Anti-startle (during calls) detects and eliminates any sudden large increase in signal level;
- Call handling: answer/end, mute, volume up and down
- Desktop application for Windows / Mac
- Android and iOS mobile application
- Model built for UC applications and softphones from various manufacturers
- Certified for Microsoft Skype for Business Open Office



License to use the videoconference platform for a minimum of 100 participants for a minimum of 3 years

- Meeting duration: 24 hours
- Maximum number of participants: 200
- Storage for cloud recordings 10Gb
- MP4 recordings
- Screen sharing
- Unlimited messaging and file sharing
- Search messages, files and users
- Encrypted recordings in the cloud
- End-to-end encryption option
- HIPAA/BAA compliance

c) Data server for virtual machines with rack equipment and user licenses

Minimum technical requirements

- 2U Rackmount Chassis.
- The equipment will contain identification LEDs in the rack (front and rear)
- Front Security Bezel with key to block unauthorized access to discs (access to the power button must not be blocked by the front security panel)
- Platform: Dual Socket
- System to be capable of being configured with min 4x Double Width GPU via nVidia Qualified Server Catalog
- Processor: 2 x Intel Xeon Gold or equivalent, minimum 8-core/16 threads max. 140W, min. 3.2 Ghz, up to 3.6 GHz Turbo Mode, 12 Mb L3 Cache, 10 nm, min. 3x UPI 11.2GT/s supports minimum 6TB memory per processor or higher.
- Chipset Intel C621A or better.
- Memory 256 GB DDR4-3200 installed memory
- At least 8 memory modules of at least 32GB



- Minimum 32 DIMM slots (server must support Intel Persistent Memory for minimum 16 DIMM slots)
- The possibility of using both RDIMM and LRDIMM memory.
- The system must be able to identify the memory type and model as well as their SN
- The system must include at least 4 redundant N+1 hot-plug fans
- The system must be able to support a minimum of 11 PCI-Express 3.0 slots of which at least one is of type xl6 PCIe.
- The system will be configured with a minimum of 3 PCIe slots
- Connectivity
 - Available ports:
 - 2x 1Gbit Base-T OCP 3.0
 - o 2x10Gbit Base-T RJ45
 - Fiber Channel adapter 16Gb PCI-E
 - At least 1x USB 2.0 in the front; min 3x USB 3.0 (of which min. 1x USB 3.0 front).
 - 1x 1 GbE RJ45 management port.
 - $\circ~$ 2x integrated VGA (1x front, 1 rear) no adapters are allowed
 - The system must include an onboard SATA controller with at least 14 ports and RAID Software for rotating HDDs, SSDs
 - The system must include a SAS 12 Gbps and PCIe 3.0 RAID controller that supports the following RAID types: 0/1/10/5/50/6/60. The installed RAID controller will need to contain a minimum of 8GB of memory and SuperCap. The installed RAID controller will need to support both 12G SAS drives and 6G SATA drives.
 - $\circ~$ Installed storage capacity: minimum 4 x 3.84TB SSD SATA hot swap
 - Supported disk types: the system must be able to be configured with a minimum of 20x 3.5" bays (of which min. 16 hot swap bays) or min.
 39x 2.5" bays (of which at least 35 hotswap bays). The system must



support 2.5" SSD SAS and SATA disks. The system must be delivered with a minimum of 25x 2.5" bays hot swap in front

- The system must contain at least two redundant hot plug voltage sources with a minimum of 2000W Platinum Level.
- The sources will be provided with power cables with connectors C13 CI4, 10A, with a minimum length of 1.8 m.
- \circ $\;$ The equipment will be equipped with toolless rails for rack installation.
- Windows Server 2022 Standard Edition software licensed for all cores and 4 virtual machines.
- Security
 - The system must support "Chassis Intrusion Detection" capabilities (on request).
 - The system must have "Secure Boot" capabilities.
- Remote management
 - The management system supports extensive remote management interfaces for various server operation and operation scenarios.
 Supported interfaces include: IPMI, SSH, SNMP, HTTPS, Web GUI, Redfish, RESTful, DCMI, Syslog
 - The system provides accurate and comprehensive hardware fault location capabilities and provides detailed fault causes and management suggestions;
 - The system must offer alert systems: SNMP Trap, e-mail alert, Syslog remote alert in 24x7 mode
 - The system must provide Remote Console KVM access with HTML 5 and Java support
 - The system must support the virtualization of images, USB devices, folders, and local media devices as remote server media devices, simplifying operating system installation, file sharing, and other tasks



- The system must support automatic lock screen capture with the last screen before lock/crash saved and provide a manual screen capture which can quickly capture the screen for easy inspection at scheduled time
- $\circ~$ It supports Dual Flash and Dual Image
- \circ $\;$ The system must benefit from Self-diagnosis and Self-Recovery System $\;$
- The system must have self-diagnosis of processors, memory modules and storage devices
- The system must have firmware update based on secure digital signatures, the unauthorized installation prevention mechanism for third-party firmware
- The system must be able to display information about the local RAID array as well as support the creation of RAID arrays
- Supported operating systems
 - Windows Server 2019
 - RHEL 7.9 and later
 - o SLES 12 and later
 - o Ubuntu 20.04
 - VMware 7.0
- Warranty and support:
 - the solution must be accompanied by warranty and support services covering at least 5 years
 - The bidder will prove the inclusion of warranty and technical support services in the offer, through a confirmation address signed by the equipment manufacturer.
 - Services: the offered solution will be installed at the headquarters of the contracting entity and will include at least the following activities:
 - Physical installation of the equipment in the location provided by the beneficiary; Making the necessary physical connections between



components; Basic configuration and integration of all offered components.

 Any subassemblies and accessories that were not explicitly requested by the beneficiary, but which are necessary during the operationalization of the solution, will be included in the offered solution at the time of its delivery.

d) Virtual platform license for data sharing and certified courses for own personal specialization for implementation

The virtual platform for sharing data and personal specialization courses for a minimum of 100 users, for 3 years, with the following minimum features:

- Allocated storage space: min 250Gb
- Number of pages: 1
- Number of spaces and pages: unlimited
- Macros
- Structured organization of the page tree
- Template library
- Possibility to customize the page
- Application integration
- Management of access rights to pages and virtual spaces
- Archiving and unarchiving pages
- Access session duration management
- Activity audit logs
- Automation 1 project



- Unlimited project boards
- Report
- Customizable workflow

e) Setting up the related network infrastructure and standard equipment of the room

The tenderer must provide full services for the provision of the network infrastructure and the setting up and commissioning of the activity coordination office.

B. Mobile communications hub for cross-border disaster management through information flow and effective monitoring

a) Independent wi-fi/4G digital radio communication system with European coverage with subscription included for 3 years

- Complete Starlink Standard system for constant high-speed Internet access and low latency.
- It can be installed and packed quickly to be moved to another location.
- The system must include both the hardware equipment and the subscription for 36 months.

In addition, we present in the appendix the alternative technical specifications for an independent radio communication system.

b) Fully transportable cell data communications system

VPN router

• Ethernet WAN



- DSL WAN
- SIM card slot
- 3G/4G modem compatibility
- RJ-45 WAN connection type Wireless LAN features
- Dual Wi-Fi band (2.4 GHz/ 5 GHz)
- Wi-Fi 6E standard (802.11ax)
- WLAN data transfer rate (max) 1200 Mbit/s
- Wi-Fi standards: 802.11a, 802.11b, 802.11g, Wi-Fi 4 (802.11n), Wi-Fi 5 (802.11ac), Wi-Fi 6 (802.11ax)

Network

- Ethernet / LAN connection
- Ethernet LAN interface type: Gigabit Ethernet
- Ethernet LAN data transfer rate: 10,100,1000 Mbit/s

Mobile network

• Mobile network type: 4G

Connection

- Ethernet LAN (RJ-45) 5 ports
- USB 2.0 port
- Jack socket DC-input

Management characteristics

• Reset button



- Internal antenna
- Antenna gain level 4 dBi

Built-in processor

- Processor frequency 0.72 MHz
- Number of processor cores 4
- Internal memory 256 Mega bits
- Volatile memory 16 Mega bits
- RAM capacity (Wi-Fi point) 1000 Mega bits
- Input voltage 12 28 V

Dual SIM wireless router

- Minimum processor 650 MHz
- RAM 64MB
- Minimum storage 16 MB Ethernet 10/100
- Built-in 2.4GHz 802.11b/g/n wireless
- Dual-chain
- Chipset QCA9531
- 360° antenna beam width
- Built-in GPS MT3337V with RF connector
- 3.5 dBi LTE antenna
- RS232 serial port
- PoE supported input voltage: 10V 57V
- 8 30 V, microUSB 5 V



- Operating temperature -40°C +50°C tested
- Maximum power consumption 9 W

Access Point

- Ethernet 10/100/1000 minimum 2 ports
- Dual band antennas
 - 2.4 GHz: 3 dBi
 - 5 GHz: 3 dBi
- Wi-Fi 802.11 a/b/g/n/ac
- passive power over Ethernet (48V), 802.3af/803.2at supported
- power supply 48 V, 0.5 A
- Gigabit PoE adapter
- maximum power consumption 9W
- maximum TX power (2.4 GHz, 5 GHz) 22 dBm
- BSSID Up to four per radio, WEP, WPA-PSK, WPA-Enterprise (WPA/WPA2, TKIP/AES),
- Operating Temperature -10 to 70 °C (14 to 158 °F)
- Operating humidity 5 to 95% non-condensing

Level 3 24p switch with PoE

- Ports 24 ports 10/100/1000BASE-T RJ45 auto-MDI/MDI-X
- 2-port 10GBASE-T RJ45 auto-negotiation (from Port-25 to Port-26), support 10G/5G/2.5G/1G/100Mbps data rate
- SFP+ slots 2 10GBASE-SR/LR SFP+ interfaces (Port-27 to Port-28) Compatible with 1000BASE-SX/LX/BX SFP and 2.5G SFP transceiver



- Console 1 x RS232-to-RJ45 serial port (115200, 8, N, 1)
- Reset button
- 2000W Single Power Supply Requirements: AC 100~240V, 50/60Hz, 13A
- Dual 2000W power supplies: AC 100~240V, 50/60Hz, 26A
- Power consumption single PSU: max. 2032 watts/ 6933 BTU
- Dual PSUs in EPS mode: max. 2377 watts/ 8111 BTU
- Fan 2 smart fans
 - LED system
 - Fan Alert 1/2/3 (Red)
 - PoE PWR Alert (Red)
- Ethernet PoE interfaces (Port-1 to Port-24):
 - af/at PoE (orange)
 - bt PoE/UPOE (green)
- Ethernet interfaces (Port-1 to Port-24):
 - 1000 LNK/ACT (green), 10/100 LNK/ACT (orange)
- SFP+ 1/10G interfaces (Port-27 to Port-28):
 - o 1G (green), 10G (orange)
- 10G/5G/2.5G/1G/100M BASE-T Network Cables:
 - o 10G Cat 6A/7
 - o 5G Cat 6/6A/7
 - o 1G/2.5G Cat 5e/6/6A/7
 - 100M Cat 5/5e/6/6A/7



- UTP cable Cat 5/5e/6/6A/7 (maximum 100 meters)
- 10GBASE-LR/SR/BX:
- \circ 50/125µm or 62.5/125µm multimode fiber optic cable, up to 300m
- $\circ~$ Single mode fiber optic cable 9/125µm, up to 60km
- Switch Fabric 128 Gbps/non-blocking
 - Throughput 95.23Mpps@64bytes
 - o 32M bit shared data buffer
 - Flow Control IEEE 802.3x pause frame for full duplex
 - Power via Ethernet
 - PoE Standard 802.3bt PoE++ PSE
 - Compatible with IEEE 802.3af/802.3at PoE PSE
- Power source type PoE 802.3bt
 - PoE output power per port 54V DC
 - o 802.3bt Mode Type 4, Port-1 to Port-24: 90 watts maximum
 - UPoE mode, Port-1 to Port-24: 95 watts maximum
 - End-span mode: 36 watts maximum
 - Medium mode: 36 watts maximum
 - Force mode: 60 watts maximum
 - PoE power budget up to 2280 watts
- PoE management functions
 - PoE extension mode max. 160 to 200 meters
 - Total control of the PoE power budget



- Overtemperature threshold alarm
- PoE usage threshold alarm
- o IP interfaces Max. 128 VLAN interfaces
- Routing Table Max. 128 routing entries
- IPv4 routing protocols OSPFv2
- o IPv4 hardware static routing
- IPv6 hardware static routing
- Layer 2 management functions
- $\circ~$ Auto-negotiation 10/100/1000Mbps full and half duplex mode selection
- Disable/enable flow control
- Port link capacity control
- Port Status Displays each port's speed duplex mode, connection status, flow control status,
- o self-negotiation state, trunk state
- Port Mirroring TX/RX/Both
- Multi-in-1 monitor
 - VLAN 802.1Q tagged VLAN
 - Q-in-Q tunnel
 - Private VLAN Edge (PVE)
 - MAC based VLAN
 - Protocol-based VLAN
 - Voice VLAN
- MVR (multicast VLAN registration)



- Up to 4K VLAN groups, from 4095 VLAN IDs
- Link Aggregation IEEE 802.3ad LACP/static trunk
- Supports 3 trunk groups with 4 ports per trunk group
- Spanning Tree Protocol IEEE 802.1D Spanning Tree Protocol (STP)
- IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
- IGMP snooping IPv4 IGMP snooping (v1/v2/v3)
- Support for IPv4 IGMP polling mode
- Supports 255 IGMP groups
- MLD Snooping IPv6 MLD (v1/v2) Snooping,
- Support for IPv6 MLD query mode
- Supports 255 MLD groups
- \circ QoS based on traffic classification, strict priority and WRR
- 8-level priority for switching:
- The port numbers
- 802.1p priority
- 802.1Q VLAN tag
- DSCP/ToS field in IP packet
- IP-based ACL/MAC-based ACL access control list

ACL based on:

- o mac address
- IP address



- o Ethertype
- Protocol type
- o VLAN ID
- o DSCP
- 802.1p priority
- o Up to 256 entries
- o Bandwidth control
- Input: 100Kbps~1000Mbps
- Output: 100Kbps~1000Mbps
- \circ RING ERPS support, complies with ITU-T G.8032
- Recovery time < 10ms with 3 drives
- Recovery time < 50 ms with 16 drives
- Console basic management interfaces
- o **Telnet**
- web browser
- SNMP v1, v2c
- Secure management interfaces SSHv2, TLSv1.2, SSL, SNMP v3
- o SNMP MIBs RFC 1213 MIB-II
- o RFC 1493 Bridge MIB
- RFC 1643 Ethernet MIB
- o RFC 2863 Interface MIB
- o RFC 2665 ether-like MIB



- RFC 2819 RMON MIB (Groups 1, 2, 3 and 9)
- o RFC 2737 Entity MIB
- RFC 2618 RADIUS Client MIB
- o RFC 2863 IF-MIB
- o RFC 2933 IGMP-STD-MIB
- RFC 3411 SNMP-Frameworks-MIB
- o RFC 4292 IP Forwarding MIB

NAS type data storage support

- Compatible storage drive interfaces SATA, Serial ATA II -, Serial ATA III
- Supported storage disk capacity 2.5,3.5"
- RAID levels 0, 1, 5, 6, 10, 50, 60, JBOD
- Hot-swap type drive bays
- Supported file systems FAT32, HFS+, NTFS, exFAT, ext3, ext4
- Number of storage disks supported 4
- Supported storage disk types HDD & SSD
- Scan for bad drives
- Processor
 - Processor frequency 1.7 GHz
 - Number of processor cores 4
- Memory
 - Internal memory type DDR3
 - Memory clock speed 1600 MHz



- o Maximum supported RAM memory 8 Giga Bits
- Memory slots 1
- o Internal memory 8 Giga Bits
- Volatile memory 512 Mega bytes
- Network
 - Ethernet / LAN connection
 - o Ethernet LAN data transfer rate 10,100,1000 Mbit/s
 - DHCP client
 - DHCP server
 - o iSCSI support
 - Wake-on-LAN ready
 - Supported network protocols TCP/IP, IPv4, IPv6, CIFS/SMB, AFP v3.3, NFS v3, FTP, FTPS, SFTP, TFTP, HTTP(S), Telnet, SSH, iSCSI, SNMP, SMTP, SMSC
- Connection
 - USB ports 3.2 Gen min 1 (3.1 Gen 1) Type-A min 4
 - SFP+ fiber optic connector
 - Ethernet LAN (RJ-45) min 2
 - \circ The number of fans min 3
 - Fan diameter 4 cm
 - LED indicators: HDD, LAN, Status
- Back-up function
- Cloud backup features, iSCSI LUN



- bell
- Noise level 20.3 dB
- Web-based management
- Supported security algorithm 256-bit AES
- List of supported browsers for this product: Apple Safari 7 browser, Google Chrome, Microsoft Internet Explorer 10, Mozilla Firefox
- Access Control List (ACL)
- Reset button
- On/off switch
- Universal Plug and Play (UPnP)
- Software
 - Supported Windows operating systems: Windows 10 Education, Windows 10 Education x64, Windows 10 Enterprise, Windows 10 Enterprise x64, Windows 10 Home, Windows 10 Home x64, Windows 10 IOT Core, Windows 10 Pro, Windows 10 Pro x64, Windows 7, Windows 7 Enterprise, Windows 7 Enterprise x64, Windows 7 Home Basic, Windows 7 Home Basic x64, Windows 7 Home Premium, Windows 7 Home Premium x64, Windows 7 Professional, Windows 7 Professional x64, Windows 7 Starter, Windows 7 Starter x64, Windows 7 Ultimate, Windows 7 Ultimate x64, Windows 8, Windows 8 Enterprise, Windows 8 Enterprise x64, Windows 8 Pro, Windows 8 Pro x64, Windows 8 x64
 - Support Linux operating systems
 - Supported Mac operating systems: Mac OS X 10.10 Yosemite, Mac OS X 10.11 El Capitan, Mac OS X 10.12 Sierra, Mac OS X 10.13 High Sierra,

Mac OS X 10.14 Mojave, Mac OS X 10.7 Lion, Mac OS X 10.8 Mountain Lion, Mac OS X 10.9 Mavericks

- Supported server operating systems: Windows Server 2003, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2
- Energy management
 - Power source location: built-in
 - Power Supply Unit (PSU) Capacity: 100W
 - Power consumption (HDD standby): 12.42 W
 - Input AC voltage: 100 240 V
 - AC input frequency: 50 60 Hz
 - Fan voltage: 12 V
 - \circ Operating temperature range (TT) 0 40 °C
 - Operating relative humidity range 5 95%

Full radiolink/wi-max subscriber

Complete telecommunications system using WiMax with subscription included for 3 years

- Internet access with speed 6-15Mbps download, 2-5Mpbs upload
- Standard: IEEE 802.16e-2005 (WiMAX) Wave 2
- Integrated Omni Antenna (2dBi)
- Frequency 3.3GHz 3.6GHz
- Adaptive modulation DL: QPSK, 16QAM, 64QAM, UL: QPSK, 16QAM, 64QAM
- Channel width 5, 7, 10MHz
- Compatibility: Wi-Fi: NA; USB: Windows/Mac OSX/Linux



- Supports: DNS, NAT, DHCP, VPN, Firewall
- Communication protocols: SNMP v2c, TR069, OMA-DM
- Local management: Web browser access, CLI, Telnet
- 1 USB 2.0, WiFi AP 802.11b/g
- temperature 0°C 50°C
- External antenna for use in fixed points in weak signal areas
- Fixed IP address

Rackable UPS

- Power 2200 VA/1320 W
- Battery-AC transfer time less than 4ms
- 4 x IEC C13 sockets with protection
- Weight 16.5 kg
- Nominal input voltage 230 VAC
- Accepted input voltage range 165-290 VAC
- Nominal output voltage 230 VAC
- Communication port RS232 / HID USB / RJ45/RJ11
- Frequency 50-60 Hz (self-detection)
- Noise level below 50 dB
- Sealed and leak-proof battery type
- Dimensions 400 x 438 x 88 mm 2U
- Compatible battery PW9123
- Operating temperature from 0 to 40°C



- LCD display charge level, battery level, battery mode, AC mode, bypass mode, fault indicators
- Operating humidity between 0 and 90% (without condensation)
- specifications 12V 9Ah x 2

media-converters

- SC optical connector
- Number of fibers 1 pc
- Transmission distance 20 km single-mode optical fiber
- Compatible standards IEEE 802.3, IEEE 802.3u
- LAN port 1 pc. (RJ-45. UTP/STP)
- Communication speed 10/100 Mbps
- Optical output wavelength 1550 / 1310 nm
- MDI/MDI-X auto detection
- Auto detection of transfer speed
- Bidirectional transmission through a single optical fiber
- The LEDs indicate the operating status of the equipment
- Multiplied technology in the WDM optical wavelength range (Tx 1550nm / Rx 1310nm)
- Power supply 5 V DC / 2 A (power supply in the set)
- Working temperature 0 °C ... 50 °C



Mobile equipment rack with patchpanel and power bar

- Professional version
- Size: 12U
- Material: 10 mm plywood
- Front and top split cover
- 7 butterfly latches
- 4 folding handles
- 8 rounded corners
- Fully removable service door with 2 butterfly latches
- 3-way rack rail
- Stabilization rail
- 4 swivel castors of 100 mm of which 2 with brakes
- Length of upper shelf rail: 445 mm
- Usable length of top shelf rail: 445mm
- Installation depth of upper rack rail: 655 mm
- Distance from rack rail to cover: 95mm
- Front support rail length: 580 mm
- Usable length of the front rack rail: 550 mm
- Rack front rail installation depth: 475 mm
- External dimensions (W x D x H) without wheels: $555 \times 815 \times 615$ mm
- External dimensions (L x W x H) with wheels fitted: $555 \times 940 \times 615$ mm
- Weight: 31 kg



c) Transportable generating set with external operation

- Insulation class H
- Number of phases 3 + zero
- Automatic voltage regulator
- Voltage regulation range 1.0% (at constant load)
- Voltage regulator model R220
- Degree of protection IP 23
- Cos phi 0.8
- Phone influence factor 50
- Total harmonic content LL/LN 4.0%
- Radio interference aligned with European Standard EN61000-6
- Apparent electrical power 18 kVA intervention / 16.5 kVA production
- Active electrical power 14.4 kW intervention / 13.2 kW production
- Voltage 400 V
- Frequency 50 Hz
- Cos phi 0.8
- The alternator is designed to operate in normal environmental conditions and is equipped with:
- 32A four-pole circuit breaker with an overload trip coil and short-circuit protection, which is mounted in a housing located on the genset chassis.
- Cooling system
 - Centrifugal water pump,



- o Thermostat,
- Radiator mounted on the engine,
- o Fan,
- Caterpillar Coolant,
- Coolant easy emptying device (flexible connection, tap, plug).
- Resistance to heating
- Coolant preheater 1000 W / 230V with resistance and thermostat.
- The electrical system
 - Starting battery: 12 V,
 - Electric starter: 12 V,
 - Alternator: 65A,
 - Battery rectifier: 5A.
- Exhaust system
 - Expansion compensator in stainless steel,
 - Industrial type muffler for noise reduction,
 - Maximum Back Pressure: 10.2 kPa,
 - Exhaust gas flow rate: 3.2 m3/min,
 - Exhaust gas temperature: 413 °C
- Lubrication system
 - Oil filter,
 - Total oil capacity 10.6 I,
 - Oil pan 8.9 I,



- o crankcase breather,
- o oil dipstick,
- Easy oil drain device (flexible connection, tap, plug)
- Air system
 - Air filter with clogging indicator,
 - Combustion air flow rate: 1.5 m/min,
 - Maximum combustion air restriction: 3.0 kPa,
 - Cooling air flow through the radiator: 33.0 m3/min
 - External cooling air flow restriction: 125 Pa
- Fuel system
 - Fuel tank: 55 l
 - o Fuel filter
 - Flexible connections for the flow and return fuel circuit
 - Recommended fuel: Diesel class A2 or BSEN590
 - Fuel drain plug
 - Security tools
 - o oil pressure probe,
 - Coolant temperature probe,
 - RPM probe
- Location
 - o Vibration dampers between the genset and the chassis
 - Steel chassis with built-in fuel tank



d) Hardened laptop for field network administration

- Designed to withstand drops, vibrations or shocks
- The entry points of the laptop are equipped with mechanical doors with top
 protection to prevent water or dust from entering, the keyboard with RGB
 lighting is waterproof, and the IP52 class seal protects the device against dust
 and water.
- Thanks to the heat management system it must allow resistance to high temperatures without problems.
- Intel i5 processor manufacturer
- Processor model 6300U
- Nominal frequency 2.4 GHz
- Turbo Boost frequency 3 GHz
- Cache 3072 KB
- Intel® HD Graphics 520 integrated graphics processor
- Diagonal display 14 inches
- Full HD display format
- 1920 x 1080 resolution
- Memory capacity 8 GB
- DDR4 memory type
- SSD storage type
- Video Card Type Integrated
- Intel HD video chipset



e) Ultraportable workstations with operating system user licenses and Office plus package with wireless/Bluetooth telephone operator headset

- Manufacturer Apple processor manufacture minimum 2022
- Processor type M1
- Apple M1 processor model
- ARM architecture
- Number of cores 8
- 5 nm processor technology
- Diagonal display 13.3 inches
- Display format WQXGA
- IPS display technology
- Brightness 400 nits
- 2560 x 1600 resolution
- Memory capacity 8 GB
- Integrated memory 8192 MB
- SSD capacity 256 GB
- Video Card Type Integrated
- HD WEB camera
- Stereo audio speakers
- Three microphones
- Ports



- o 2 x Thunderbolt v3
- 1 x Audio Out/Microphone
- Wireless 802.11 ac
- Bluetooth version 5.0
- Mac OS operating system
- Weight 1.29 Kg
- Dimensions (W x H x D) 304.1 x 212.4 x 0.41 16.1 mm
- TouchID security
- Material Aluminum
- Accessories included Adapter 30W
- Battery life 18 h
- Fingerprint reader
- Carrying backpack with reinforcements and rain cover

f) Satellite terminal

- Max dimensions 145 mm x 55 mm x 30 mm
- Max weight 270 g
- Operating temperature from -10°C to +55°C
- Battery life
 - standby time: up to 30 hours
 - talk time: up to 4 hours
- 200 character illuminated graphic display



- Volume, signal and battery power meters
- Weatherproof illuminated keyboard
- Integrated speaker
- Quick login to voicemail
- Two-way SMS and short email
- Preprogrammable international access code (00 or +)
- Mailbox for voice, numeric and text messages, selectable ringtones and alerts (8 options)
- Internal phonebook with minimum 100 entries, with capacity for multiple phone numbers, email addresses and notes
- SIM card directory with a minimum capacity of 155 entries
- Call history records received, missed and dialed calls, user-configurable call timers to manage costs
- Keypad lock and PIN lock for added security

g) Smartphone-type hardened GSM terminals

- Data 3G, 4G (LTE), 5G, Dual SIM
- Nano SIM
- Max dimensions 90 x 25 x 180 mm
- Max weight 485 g
- Protection: waterproof/dustproof/shockproof
- Minimum Android 11 operating system
- IPS screen



- Diagonal minimum 6.5"
- Minimum resolution 1600 x 720 px
- Minimum processor Octa Core processor frequency (GHz) minimum 2.2 GHz
- Memory Storage minimum 128GB
- RAM memory minimum 8GB
- microSD card slot
- Bluetooth v5.0 minimum
- Wi-Fi 802.11 a/b/g/n/ac
- GPS
- USB Type-C
- NFC
- Main camera minimum 48 MP
- Secondary camera minimum 8 MP
- Sensors: accelerometer, gyroscope, fingerprint, compass, proximity sensor, light sensor
- Battery 15000 mAh

h) Fixed GSM terminal with gain antenna

- 2.8" TFT color screen, resolution 320 × 240 pixels
- 2G: GSM 900/1800 MHz
- 3G: WCDMA 900/1200 MHz
- 4G: VoLTE LTE FDD / TDD



- Dual band WIFI 2.4G/5G
- WIFI hotspot (802.11 b/g/n) and WAN port
- Omnidirectional Wi-Fi antenna
- Bluetooth, GPS, WAP
- Headset 3.5mm jack
- Android operating system
- Automatic System Update (Firmware Over-the-Air)
- Radio, Alarm clock, Calculator, Calendar, SMS management
- Power supply: mains charger (1A) miniUSB + built-in 1000 mAh Li-Ion battery

i) Metal transport crates

- 10 mm black coated plywood material
- Front and top split cover
- Minimum of 4 butterfly latches
- 2 folding handles
- 8 corner protectors
- Service door with butterfly lock
- Usable length of the upper shelf rail of at least 340 mm
- Distance from rack rail to shelf minimum 45 m
- Usable front rack rail length minimum 175mm (with built-in stabilization) / 260mm (without built-in stabilization)
- Installation depth of front rack rail minimum 485 mm



- Shelf dimensions 510 x 280 mm
- External dimensions (W x H x D): 580 x 430 x 635 mm
- Weight: minimum 21 kg

C. Fixed shortwave dispatch station

- Fixed short wave reception station
- Working distance min 10m
- Frequency in the range of 3-30Mhz
- Minimum 10 channels
- Includes radio station and antenna.

In addition, we present in the appendix the technical specifications for an ultra-shortwave Radio Bus Station, 4x4 chassis.

APPENDICES: Financial estimate and Technical Annexes

Note: Prices are valid on the date of the offer. Depending on market developments, they may be subject to change until the date of purchase. In the specifications above, any mention of a trade name, brand, brand, model, manufacturer, standards, etc., is used for descriptive purposes and must be considered as always accompanied by the mention "or equivalent".



Technical Annex Technical specifications

Radio station and 4x4 chassis

- Bullbar, thresholds, 4x4 traction , 5 seats, 12v towing hook for original trailer
- radio station for example Motorola DP4601e digital professional portable radio station, containing Antenna for Motorola DP4601e radio station, Mains charger for Motorola DP4601e radio station, Battery for Motorola DP4601e radio station, Cable + programming software;
- Luggage box on the towing hook (with approved V20 plate, min 360l, minimum load 60 kg, foldable, anti-theft system, side access, <u>https://www.emag.ro/cutieportbagaj-pe-carligul-de-remorcare-towbox-v2</u> grit2x000c/pd/D6KGK7BBM/?ref=ps&emag_click_id=36644edaf79be54e3c074a8de0 4feaa4&utm_source=recenzee.ro_affiliate_FXCH&utm_medium=profitshare&utm_ campaign=profitshare_FXCH&utm_content=link;https://www.autolux.ro/cutieportbagaj-auto-cu-catch-on-the-hook_de-towing-towbox-v2-black-edition-paut2x000n-3/;
- Ceiling luggage box minimum 180 cm long or maximum adapted to the car model, with approved transverse mounting bars, min 350 l, load min 65 kg, gray: <u>https://www.provelo.ro/produs/cutie-portbagaj-auto/thule-auto-trunk-box/thule-motion-xt-sport-titan-glossy-trunk-box/</u>; <u>https://www.provelo.ro/produs/bare-auto-transversale/bare-transversale-thule/bare-auto-transversale-thule-wingbar-edge-negru-black-fpng/;</u>



SERVER x86				
TECHNICAL CHARACTERISTICS	PARAMETERS			
Processor:	Type: Intel Xeon or equivalent configuration in terms of performance			
	Frequency: 1.8 – 3.4 GHz			
	Cache: 15 - 30 MB			
	Number of cores per processor: 4 - 10 cores/processor			
	Number of processors supported: 2 <or> 4</or>			
	Number of processors installed: 1 <or> 2</or>			
Memory:	Installed memory: 128 <or> 256 GB DDR4 ECC</or>			
Storage capacity:	Usable capacity after RAID configuration			
	Interface type: SAS <or> SATA</or>			
	HDD bay type: hot-plug			
Internal RAID controller:	Cache memory: <the be="" filled="" in="" parameter="" will=""></the>			
	Data backup battery support, battery included			
Format	Rack-able 19 inches			





External RAID controller: <if considered<="" not="" th=""><th></th><th></th></if>		
necessary this technical feature can be		
excluded>	Ports: 2 <or> 4 SAS/SATA ports</or>	
	Cache memory: <the be="" filled="" in="" parameter="" will=""></the>	
	Battery: The system must be equipped with a back-up battery for the cache memory	
Error identification:	LCD or LED display for signaling global errors	
Slots:	2 PCI-Express x4 slots	
	1 PCI-Express x16 slot	
Integrated ports:	2 USB 2.0 ports	
	1 serial port	
	1 VGA port	
	2 RJ45 ports	
Optical drive:	included 2 pcs. 7200RPM, min. 16TB, min. 256 mem. cache	
Power source:	At least 2 sources with capacity according to the manufacturer's technical sheet	
	Redundancy: Yes, hotplug capability	
	Voltage: support for 220VAC / 50Hz	
Fans:	2 hotplug fans, redundant configuration	
Ethernet interfaces:	2 <or> 4 10/100/1000/10000 Mbps Ethernet interfaces integrated on the motherboard</or>	





Operating system:	License Server win. 2019 retail	
Supported operating systems:	Microsoft Windows Server, Red Hat Enterprise Linux, ESXi hypervisor, Microsoft Hyper-V	
Accessory	12U rack with patch panel with 12V fan, removable walls, mounted power bar, min. 1 equipment tray included	
	rack mount kit	
Guarantee	at least 3 years	
	NETWORK ATTACHED STORAGE	
TECHNICAL CHARACTERISTICS	PARAMETERS	
Processor	Туре	Multicore
	No. cores	2 <or> 4</or>
Memory	Memory type	DDR4
	Capacity (GB)	4 <or> 8</or>
storage	Discs included	Yes, 2 pcs included. 5200RPM, min. 6TB, min. 256MB cache
	Disc type	SSD <or> HDD</or>
	No. discs included	4 <or> 8</or>
	Disc capacity	4 <or> 8</or>
	Interface	SATA <or> M2</or>
Ports	1 x RJ 45 <or> 2 x RJ45 <or> 4 x RJ45</or></or>	
	1 x USB 3.0 <or> 2 x USB 3.0</or>	
RAID support	0 <and or=""> 1 <and or=""> 5 <and or=""> 6 <and or=""> 10 <and or=""> JBOD</and></and></and></and></and>	



Fans	2 <or> 4</or>	
Supported operating system	Windows <and or=""> Linux <and or=""> Mac OS</and></and>	
Network protocols	FTP <and or=""> SSH <and or=""> SNMP <and or=""> NFS <and or=""> TCP/IP <and or=""> Telnet <and or=""> ISCSI <and or=""> AFP <and or=""> VPN <and or=""> SMB <and or=""> HTTP <and or=""> HTTPS</and></and></and></and></and></and></and></and></and></and></and>	
Format	rack	
Accessory	Power cable AC 220 V 50 Hz CEE 7/7	
	19 inch rack mount kit	
Guarantee	at least 2 years	



Minimum technical specifications

Independent radio communication system

- 1 Complete digital repeater with external antennas and fixing system
- 2 Portable terminals

3 UPS rackable management. Ready for the rack model , min. 4 outputs, rackable, min 2500 VA, 0.5 m cables included

- 4 Rigid transportable rack 12 U
- 5 Transportable telescopic / pneumatic mast
- 6 Auxiliary power supply generator with batteries and photovoltaic panel
- 7 Fixed or mobile station
- 8 Transport box minimum 5 terminals with multiple charger 2 pcs.

Annex

Financial offer (native)





Oferta

Nr. 112 /28.04.2023

Beneficiar: ADIVEST SRL

Nr.	Denumire	Cantitate	Pret unitar EUR		Valoare EUR	
1	Pluviometre automate cu transmisie GPRS și compatibile cu echipamentul si cu soft ul instalat si funcțional la nivelul A.B.A. Banat, cu protocolul existent si funcțional de transmisie de date WKM si HYDRAS 3 net	10	€	10,736.40	€	107,364.00
2	Stații automate cu senzori (nivel si precipitații) tip RADAR cu back-up cu transmisie GPRS și compatibile cu echipamentul si cu soft ul instalat si funcțional la nivelul A.B.A. Banat, cu protocolul existent si funcțional de transmisie de date WKM si HYDRAS 3 net	35	€	15,171.72	€	531,010.20
з	Stații automate cu senzori (nivel) tip RADAR cu back-up,transmisie GPRS și compatibile cu echipamentul si cu soft ul instalat si funcțional la nivelul A.B.A. Banat, cu protocolul existent si funcțional de transmisie de date WKM si HYDRAS 3net	14	€	12,348.24	€	172,875.36
4	Desktop PC performant (stație de lucru) destinat modelarii hidrologice/hidraulice	2	€	3,505.20	€	7,010.40
5	Dispozitive infraroșu pentru detectarea infiltrațiilor in dig	1	€	14,504.40	€	14,504.40
6	Sisteme radar pentru detectarea discontinuităților in corpurile digurilor, pana la 7 m adâncime	1	€	16,303.35	€	16,303.35
7	Sonar topobatimetric ADCP (acoustic doppler current profilers) cu GPS incorporat	1	€	53,475.00	€	53,475.00
8	Drona echipata pentru ridicari topografice LIDAR	1	€	71,622.00	€	71,622.00
9	Autoutilitara 4x4 cu garda inalta pentru transport persoane si material	1	€	33,405.60	€	33,405.60
10	Autolaborator hidrometric 4x4	3	€	57,686.76	€	173,060.28
11	Morișcă hidrometrică electromecanică cu cronocontor electronic cu display, cablu transmisie date morișcă-cronocontor, greutate lest si troliu pentru masurarea de pe poduri a vitezei si adancimii apei	3	€	37,560.84	€	112,682.52
12	ADCP – sistem RS5 de masuratori hidrometrice si batimetrice portabil cu 5 fascicule Doppler 3.0 Mhz, acumulatori interni Li-Ion, Bluetooth, software RSQ Windows for real time, antena GNSS smart, Sontek Hydroboard II-Micro	3	€	53,475.00	€	160,425.00
13	Drona de mici dimensiuni pentru survolarea/recunoașterea zonei inconjuratoare	3	€	2,744.82	€	8,234.46
14	Nivelă topometrică electronică cu miră (stadie) telescopică portabilă 5m	3	€	975.61	€	2,926.83
15	Receptor GNSS-RTK	3	€	5,670.73	€	17,012.20
16	Nivelmetru cu semnal sonor si luminos Solinst Model 201 (ruleta pentru masurarea adancimii apei)	3	€	826.62	€	2,479.86
17	Turbidimetru pentru masurarea turbiditatii apei din rauri	3	€	6,234.40	€	18,703.21
18	Desktop PC	4	€	1,488.00	€	5,952.00
19	mobile de tip smartphone la fiecare centru de colectare	90	€	589.02	€	53,012.20
20	Sistem Video Wall cu controller, licențe de utilizare, accesorii aferente	1	€	33,866.58	€	33,866.58



21	Pupitre operator	6	€	297.91	€	1,787.46
22	Stații de lucru fixe de tip all-in-one cu sisteme de operare, licențe pachet Office și accesoriile aferente	6	€	1,863.00	€	11,178.00
23	Cască operator telefonic wireless și Bluetooth	6	€	145.32	€	871.90
24	Licență de utilizare platformă videoconferință pentru minim 100 de participanți pentru minim 3 ani	1	€	96.76	€	96.76
25	Server de date pentru mașini virtuale cu rack de echipamente și licențe de utilizare	1	€	64,860.00	€	64,860.00
26	Licență platformă virtuală de partajare date și cursuri certificate de specializare personal propriu pentru implementare;	1	€	9,118.54	€	9,118.54
	Sistem independent de comunicații radio digitale wi-fi/4G cu acoperire europeană	1	€	11,824.80	€	11,824.80
27	Router VPN	1	€	494.98	€	494.98
28	Router wireless dual SIM	2	€	321.44	€	642.88
29	Access Point	1	€	154.27	€	154.27
30	Switch nivel 3 24p cu PoE	2	€	1,739.02	€	3,478.05
31	Suport stocare date tip NAS	1	€	790.79	€	790.79
32	Abonat complet radiolink/wi-max	1	€	634.80	€	634.80
33	UPS rackabil	1	€	341.77	€	341.77
34	Media-convertoare – 2 perechi	2	€	74.15	€	148.29
35	Rack mobil echipamente cu patchpanel și bară de alimentare	1	€	563.36	€	563.36
36	Grup electrogen transportabil cu funcționare exterioară	1	€	16,932.60	€	16,932.60
37	Laptop rigidizat pentru administrare rețele din teren	1	€	4,278.00	€	4,278.00
38	Stații de lucru ultraportabile cu licențe de utilizare sistem de operare și pachet Office cu cască operator telefonic wireless/Bluetooth	1	€	2,760.00	€	2,760.00
39	Terminal satelitar	2	€	2,033.35	€	4,066.71
40	Terminale GSM rigidizate de tip smarthphone	6	€	375.63	€	2,253.78
41	Terminal GSM fix cu antenă de câștig	1	€	97.56	€	97.56
42	Lăzi metalice de transport	1	€	403.39	€	403.39
43	Stație fixă dispecerat unde scurte	1	€	103.90	€	103.90
	TOTAL (EXCLUSIV TVA) - EUR -				€	1,733,808.02
TVA - EUR -				€	329,423.52	
TOTAL GENERAL - EUR -				€	2,063,231.55	

Intocmit: NEXT MAINTENANCE SRL Ing. Ana Purcaroiu



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