Success Story

Bringing Real-time Flood Monitoring System to your Fingertips with Milesight IoT Solutions in Austria

A LoRaWAN® Case Report

"The Milesight products provide a very good price-quality ratio and are flexible in their application." ——Hartl Consulting

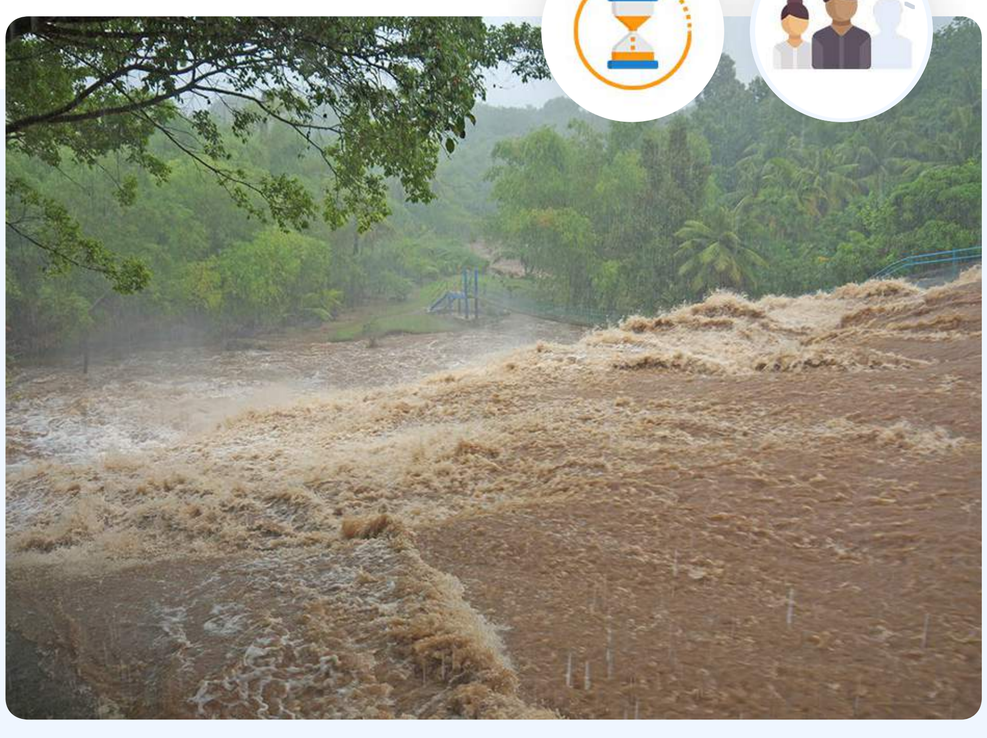
The Situation

Flooding is one of the major disasters occurring in various parts of the world. It wipes out properties, plantations or even takes away lives. A real-time flood monitoring system keeps watch of water and precipitation levels that helps to monitor flood conditions in Austria. The Chorinsky-Klause is a historic dam built across the rivers of the Weißenbach Valley in Austria. It has protected settlements from floods since the early modern. Due to the remote location of the valley, it was difficult for their staffs to maintain it effectively, especially in the cold winter days. In order to optimize efficiency, Hartl Consulting and Milesight came together to bring real-time data monitoring and management solutions for them. With LoRaWAN® (Long Range Wide Area Network) technology involved, data will be collected by our products and reports will be generated based on selected time intervals for users to manage.

Challenges

Limited network coverage in the project area

There is meagre network coverage and a shortage of electricity supply in the project area. Furthermore, it is pricey to set up a thorough wired network solution in remote places and often requires a long period of time to complete.



Time & Labor Consuming

A flood occurs when water overflows from the rivers and lakes or due to heavy rainfall and this situation might happen randomly at any time of the year. Frequent checks and management are necessary to prevent this from happening However, in this case, it was a relatively tough job for staffs to check on a frequent basis, given that Chorinsky-Klause is located in a remote valley in the Austrian Alps with only a small dilapidated road leading to it.

The Solution

Real-time data of water condition can be remotely monitored by utilizing wireless sensors and gateways using LoRaWAN® technology to transmit data to the application level. The well-developed system has demonstrated the applicability of our sensors in monitoring real-time water conditions. The project owners were ultimately thankful to be able to supervise the data of the torrent without much hassle. In the past, it wasn't possible to check the water level of the dam other than heading there manually.

Currently, our flood monitoring system makes things expedite to forecast the upcoming floods, to send out warnings and to analyze past events. Users can view real-time synced data of the water conditions, as well as the forecast o directly from the web or via applications. In addition, both gateways can be accessed and reviewed via our 'Device Hub' web/application interfaces, which makes it handier for device management.

Deployment of Monitoring System

Sensors and Gateways in the Project Area

Around the dam there were several sensors installed to measure the water level and to collect data of the weather conditions around the dam. We installed an EM500-UDL Ultrasonic Distance/Level Sensor plus an EM500-SWL Submersible Water Level Sensor next to upstream to measure water level in every 10 minutes interval. Further down near the downstream, locates another EM500-UDL Ultrasonic Distance/Level Sensor to measure data at the same time interval. (see following table, for location see Figure 1 and Figure 2).

Table 1 Overview of the sensors and gateways installed in the project area

Devices	Product Name	Deployment Locations
Sensor01(S01)	 Third Party Weather Station	Chorinskyklause
Sensor02(S02)	 EM500-UDL Ultrasonic Distance/Level Sensor	Chorinskyklause
Sensor03(S03)	 EM500-SWL Submersible Water Level Sensor	Chorinskyklause
Sensor04(S04)	 EM500-UDL Ultrasonic Distance/Level Sensor	1st Bridge at Valley Entrance
Gateway_01	 UG67 LoRaWAN® Gateway	Fire Station in Weißenbach
Gateway_02	 UG85 LoRaWAN® Gateway	Chorinskyklause

*The UG85 LoRaWAN® Gateway has been discontinued. For outdoor LoRaWAN® gateways, the UG67 is recommended or please contact us at iot.sales@milesight.com for more information.

In order to tabulate and allow data transmission, we provided a total of two gateways to cover the entire project area by using our UG67 LoRaWAN® Gateway and UG85 LoRaWAN® Gateway. First, our UG85 LoRaWAN® Gateway was located at the head of the valley, with a small settlement nearby. The UG67 LoRaWAN® Gateway was placed on a small tower of the local fire brigade and connected to the electricity grid. Next, the UG85 Outdoor LoRaWAN® Gateway was located right next to the dam, connected to an existing solar panel with an external GSM-antenna.

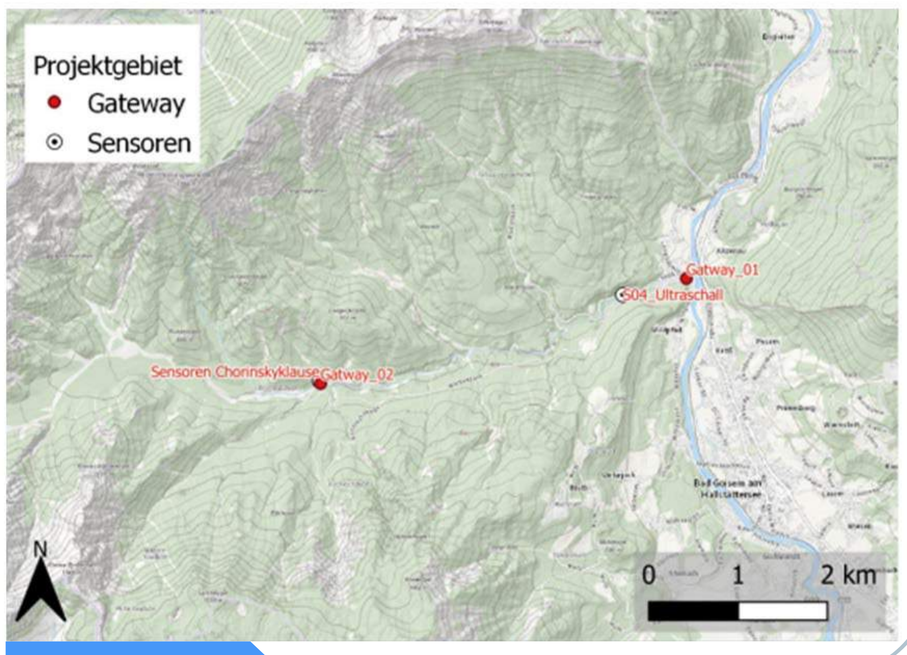


FIGURE 1

Overview of the project area with location of gateways and sensors (as of 21.07.2021). Basemap © basemap.at

FIGURE 2

Map of the monitoring system in the area of the Chorinskyklause (State 21.07.2021).

In the following pictures show some of the sensors and gateways used.

FIGURE 3

LoRaWAN® gateway installed at the fire station in Weißenbach in Bad Goisern

FIGURE 4

LoRaWAN® gateway installed at the house next to the Chorinskyklause with an external antenna on the roof

FIGURE 5

Pressure sensor S03 installed at the wall of the dam

FIGURE 6

Ultrasonic sensor S02 mounted at Klausemauer

FIGURE 7

View of the bridge with ultrasonic sensor S04

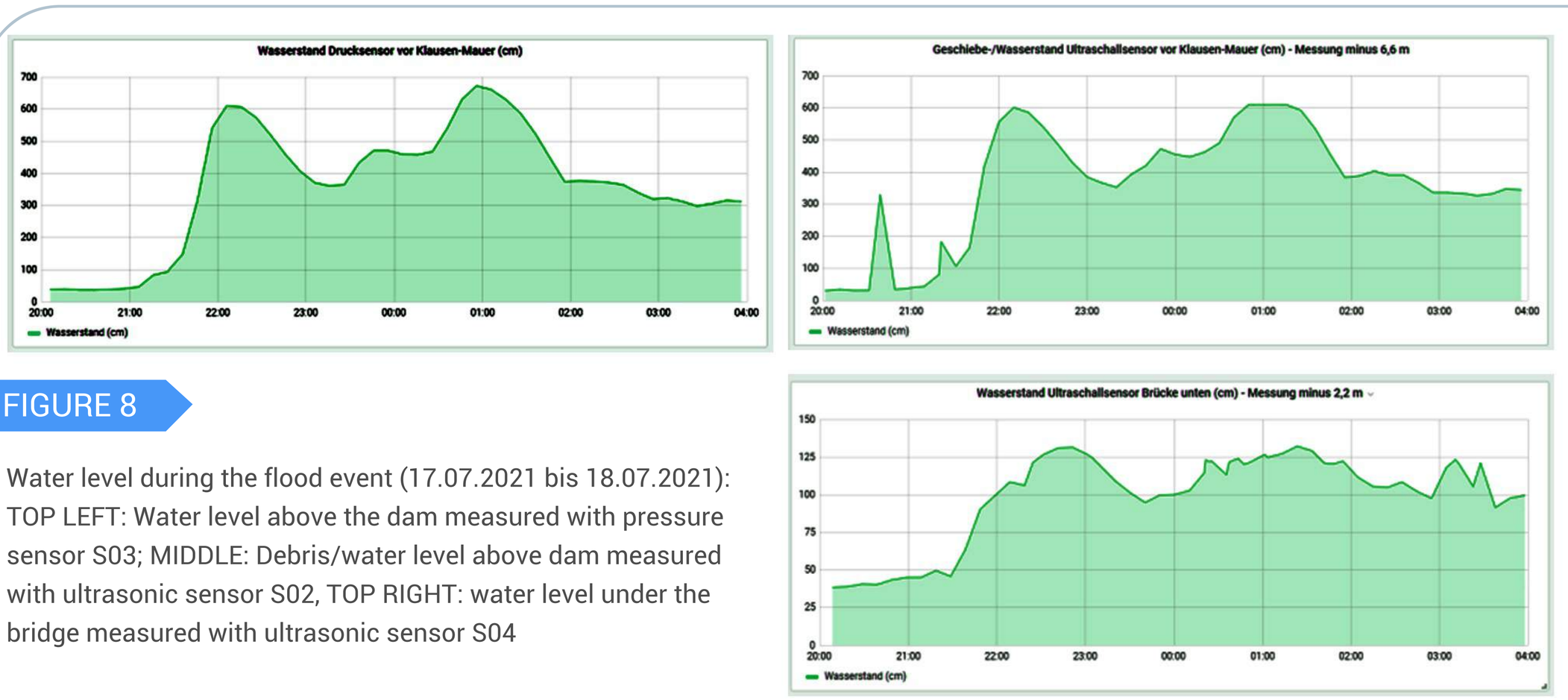


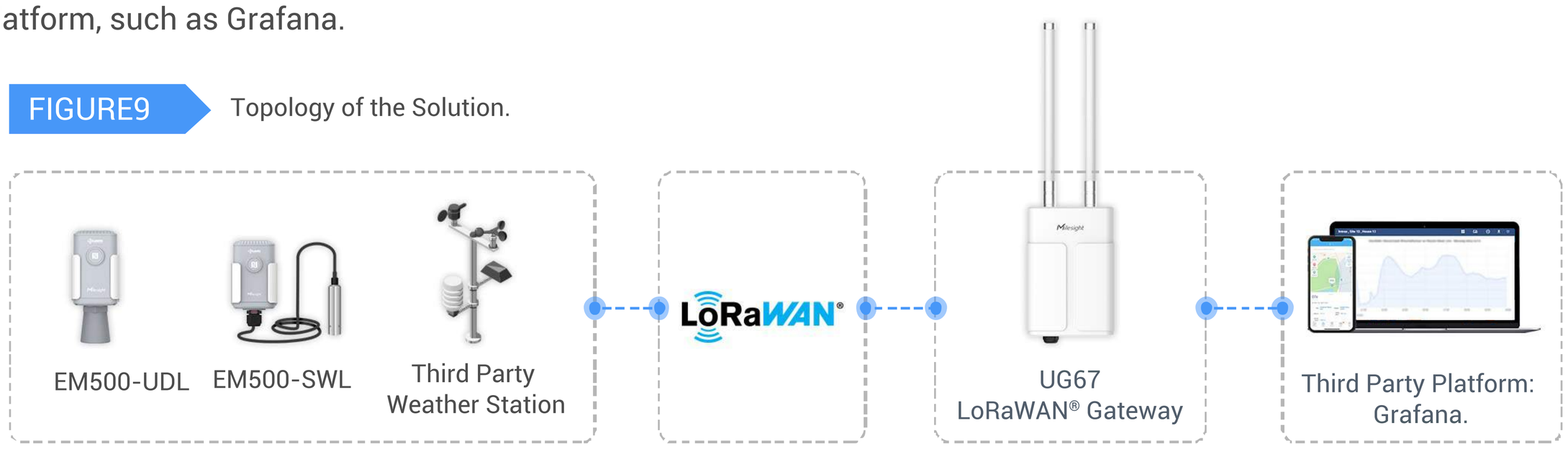
FIGURE 8

Water level during the flood event (17.07.2021 bis 18.07.2021): TOP LEFT: Water level above the dam measured with pressure sensor S03; MIDDLE: Debris/water level above dam measured with ultrasonic sensor S02, TOP RIGHT: water level under the bridge measured with ultrasonic sensor S04

LoRaWAN® Is the Right LPWAN

LoRaWAN® is a radio network which uses the LoRa transmission method to send data over long distances, with very low battery consumption. In order to install such a network, a gateway with an established Internet connection is required. All sensors within the range of this gateway can then send data to the gateway, which forwards this data to an Internet server. In this case, the data will be transmitted to The Things Network (TTN) Server via MQTT to a PostgreSQL database. Afterwards the data can be stored in a database and visualized for the respective purposes in platform, such as Grafana.

FIGURE9 Topology of the Solution.



Low Cost & Lower Power

The great advantage of the system is the high energy efficiency of the sensors. With only one battery charge, many sensors can provide data for several years. The system is very easily expandable and scalable, as a single gateway can communicate with several hundred sensors. Since the system operates in the allocation-free frequency range around 868 MHz, no license costs or SIM cards are necessary.

Robust Long-Range Coverage

Sensors are compatible with industry-standard LoRaWAN® gateways with a range of up to 15 km in rural areas. Especially in the alpine region, the system is suitable to collect data from remote areas where there is no cell phone network coverage, such as in the area of the Chorinskyklause.

The Benefits

Time saving & Cost-efficient

Based on the monitoring system in the Chorinskyklause it could be shown that LoRaWAN® technology is ideally suited to equip and monitor remote areas with sensors.

Our solution saves lots of time wasted by heading back and forth. On top of that, it reduces labor costs, as staffs do not need to make a trip there as often as before for inspection.

Real-Time data collection & Warning alerts

Although there is no telephone or electricity network in the area, it was possible to record water levels and climate data continuously, every 15 minutes, and make the data available online.

In the past, it wasn't possible to check the water level of the dam instantly without heading to the location. In the present, staffs could gather detailed data without too much hassle, and the settlement could be warned of an upcoming flood.

Data-based Insights & Managements

It'll be better to plan for further measures since data acquisition is available and highly efficient to retrieve data for water and precipitation levels, temperature and more. With necessary data recorded by our products, staffs will be able to archive records for t documentation and analyze past events for better management.

With battery runtimes of several years, the maintenance requirements of the sensors are also reduced to a minimum. Since the sensors do not require SIM cards, additional costs and administrative effort can be avoided, especially in systems with many sensors.

Why Milesight

“The Milesight products provide a very good price-quality ratio and are flexible in their application. With a wide range of sensors and gateways we could select the optimal ones for our application. When questions occurred the Milesight service was very fast and helpful."

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