# Willabay Design Environmental Data Monitoring System (EDMS)

## EDMS Product Description

Version 4.2     3/5/2018

### Introduction

The Willabay Design Environmental Data Management System (EDMS) is a fairly unique type of system that utilizes commercially available devices to monitor environmental conditions such as temperature and humidity.

The actual environmental data collection portion of the EDMS system is based on a readily available product from Embedded Data Systems (EDS) in Kentucky. Their Meshnet line of wireless environmental sensors and an associated Meshnet Controller (MN-CTRL) is a very versatile means of collecting environmental data from remote locations over a proprietary wireless interface. Different types of Meshnet sensors are available from EDS but our EDMS application is currently limited to the collection of temperature and humidity data using any of three sensor models as described below. EDS also markets a Meshnet Repeater (MN-RPT-H) that can increase the wireless range of their sensors.

The required EDS devices that are used in this system are shown below.



EDS Meshnet Equipment used in EDMS

The Meshnet Controller (MN-CTRL) requires a direct, hardwired internet connection and a power adaptor that is available from EDS. While many comparable products are Wi-Fi based, we do not believe that is necessary on this concept due to the wireless range of the EDS sensors.

The Willabay Design portion of the EDMS system is a separate device which we call an Environmental Data Interface (EDA) that is also a commercially available programmable device made by Tibbo Technologies in Taiwan. Willabay Design's EDA software application simply collects the data from the MN-CTRL, checks for out of range conditions, and ships the data to a customer's database via the Willabay Design website. The EDA is also capable of sending email alerts when temperature or humidity thresholds are exceeded. Having this capability in the EDA is important since users do not have to log into a server based account to set up their email settings and the Meshnet Controller itself does not send alert messages.

At the present time, there are two equipment options for the EDA. These two options are shown in the figures below.



**Tibbo DS1101 Programmable Controller**          **Tibbo TPS (TPP2L Version) with LCD**

| Device: Tibbo Technologies DS1101 | Device: Tibbo Technologies TPS-TPP2L |
| --- | --- |
| Size:  2.5 " x 3.5 " x 1 " | Size:  4 "x 4 "x 1.5 " |
| Features: Small LCD Screen | Features: Large LCD Screen, Additional Capabilities |

The TPP2L version shown on the right is available with two separate processor alternatives. The newer Generation 2 (G2) device enables us to provide far more functionality in the same enclosure.

Thesetup and  administration of the EDS Controller (MN-CTRL) and its related sensors and repeaters is completely independent of the necessary steps to set up and administer the EDA equipment.

**Background and History**

The Willabay Design Environmental Data Monitoring System (EDMS) was initially conceived as an inexpensive way to monitor low temperatures in condominiums that were vacant for long periods of time during the winter months. While there were many products on the market that could be used by an individual homeowner to keep tabs on the property, we were looking for a means to monitor a large number of condo units in many buildings. Willabay Design had previously worked on a system for a company that needed an inexpensive device that could be attached to a weather station in order to

collect the weather information and transmit it to a remote server. Since weather stations were located anywhere, we thought the concept might work for individual property owners.

Willabay Design did a very thorough search for a company that had existing products that could handle the data collection aspects of what we needed. We were also looking for a company that made their products in the US. We found a small company in Kentucky by the name of Embedded Data Systems (EDS) that had been producing environmental sensors for years. While we were evaluating one of their earlier products, EDS introduced a new wireless system that they called their Meshnet Wireless Sensor System.

Willabay Design selected the EDS Meshnet system as its exclusive environmental data monitoring platform because of the quality of their product and the extensive set of sensor parameters that may be accessed by the Meshnet controller.  EDS also has a good track record with professional agencies such as labs and medical facilities that need a reliable means for monitoring such parameters as temperature, light, air pressure, or humidity

After deciding on the devices that we would use to collect our environmental data, which initially was limited to temperature measurement, we initiated a software development that would use the Tibbo programmable devices for the interface between the Meshnet equipment and a database on a remote server that would be accessed via our website. We had considerable experience working with several different Tibbo devices on previous projects. The device that would support this interface was named an Environmental Data Agent (EDA) because it acted as an agent for a remote server application.

**The current EDA Product in the EDMS System**

The EDA product has evolved to the point where our latest release will support up to 16 sensors using a number of different Meshnet sensor types. These cover temperature only, or both temperature and humidity.  In addition, the EDA now supports the use of EDS repeater devices (MN-RPT-H) that allow sensors to be located in more remote locations such as a nearby building.

In early 2017, we began a major enhancement to our EDA software that would be able to support EDS's newest sensor product; a long range wireless sensor that was similar to their original Meshnet Temperature/Humidity sensor (MN-ENV-TH) but also allowed for a means to connect additional hard-wired temperature probes to the sensor itself. This enabled us to capture up to three additional temperature measurements from locations close to the Meshnet sensor. These could be used for applications such as freezer monitoring. The EDS Meshnet sensor type for this extended sensor is MN-ENV-THX (THX for short).

The limit of 16 devices applies to repeaters as well as sensors thus a network with one repeater can support 15 actual T, TH, or THX sensors.  While our original design forced all of these sensors to be the same type; either all MN-ENV-T or all MN-ENV-TH sensors, we have found a way to drop that restriction on our latest release. The sensor data is collected by the EDS Meshnet controller (MN-CTRL), then captured by our EDA and ultimately transmitted over the internet to a centralized database that is now supported entirely by Willabay Design using forms on the Willabay Design website.

Instead of having each condo owner purchase a home monitoring product individually, and support the product over their own internet access, our EDMS system would allow the sensor devices to be placed in various condo units while the controller devices (the Tibbo based EDA and the EDS MN-CTRL) are located in a common area of the property. This arrangement reduces both the cost and maintenance overhead for all homeowners in the association. The package is particularly useful for second homeowners who do not occupy their condos for months at a time. All of the condo units that are in an assigned network share a database on a remote server that allows them to not only check their unit, but others in the network. The system requires both of the controller devices to be connected to a router or other internet access equipment at a common location.

While this product was originally created for the multi-family residential market, the EDMS system is also applicable to other markets such as greenhouses, grow rooms, storage areas, marinas, or other businesses that need to keep tabs on their environmental conditions. This product description will continue to use the condo market as just one market example.

A typical residential application for the EDMS is shown in the figure below. Five condo units have sensors assigned to monitor the temperature in the units. The units are arranged in two neighborhoods (designated as buildings 10 and 11), each with their own internet access. Any homeowner with access to the network can check the temperature on any of the units in their building or even in any of the other units in the network, assuming that the association has allowed this open access method. This is of major interest to a property manager who wants assurances that there are no problems anywhere on the complex.

The current version of this system should be able to support over 100 sensors in one network assigned over a maximum of 10 neighborhoods (buildings). A very large complex can easily be broken down into several networks. If necessary, the system can easily be configured to monitor multiple locations in each unit (such as furnace or utility rooms) by adding additional sensors.
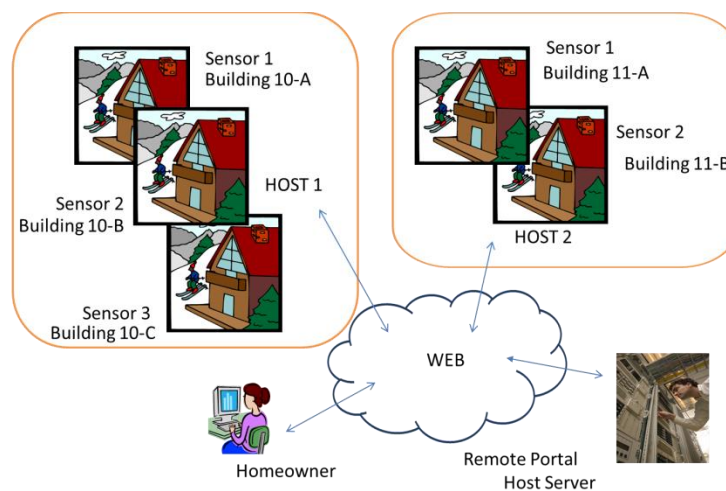


**Typical Network Example Using Ski Condos**

The small (about 3x3 inches) wireless sensors can be placed anywhere in the building that is within range of the EDS MN-CTRL controller unit or a separate repeater device that is within range of the MN-CTRL. The system also supports a way to monitor the state of an external sensor such as a water sensor. Email alerts can be sent if the temperature or humidity at a monitored location drops below an assigned threshold or rises above an assigned threshold. Alerts are also sent if the system detects low battery voltage or an active external sensor trigger. The EDA software is even capable of detecting sensors that are "lost"; those that are no longer responding.

At the present time, The EDA can be either of two types of devices made by Tibbo Technologies in Taiwan. One of these is a Tibbo Technologies DS1101 Programmable Controller. The EDA application is also supported on either generation of Tibbo's TPP2L version of their TPS system. The use of a TPP2L allows for more information to be displayed on a large LCD screen that is available on the TPP2 system. Since the newer, Generation 2, TPP2L is now available at essentially the same price; Willabay Design and Tibbo both recommend that new customers purchase the new G2 version. In fact, support for the new EDS THX sensor's additional attached 1-wire probes or support for more than 8 total sensors and repeaters on one EDA will require a Generation 2 Tibbo device for the EDA. Information on all of Tibbo's devices can be found on their website at http://www.tibbo.com.

We also decided to allow support for some of the base functionality of the EDS THX sensor on a Tibbo DS1101 or TPP2 (G1) platform. These new sensors can be used on these devices but the extended probe aspects of the THX cannot be utilized. The THX device is treated the same way as the MN-ENV-TH. This does allow for longer distances between a location with a THX sensor and the MN-CTRL, even when using a Generation 1 Tibbo based EDA.

The Willabay Design software application, called an Environmental Data Agent (EDA), is easily installed on the Tibbo devices using one of Tibbo's development and installation tools that are free to anyone who has a Tibbo device.

The EDS Meshnet Controller communicates with its wireless sensors using a proprietary protocol. The sensors are battery operated and the batteries will last for two years when configured properly. In the specific case of monitoring individual condos in a condo building, the temperature sensors are placed in each unit and the Meshnet Controller unit is placed anywhere in the building that is within wireless range of each of the sensors in the system. If a sensor is needed at a remote location that is too far away to reach the Meshnet Controller, a Meshnet Repeater can be used to cover the additional distance. A long range THX sensor could also be utilized for this situation.

When configured with 4 or more sensors, an EDMS system is very competitive with other means of monitoring temperature extremes at multiple locations. One of the reasons for this is that the EDS sensors are considerably less expensive than other wireless based sensors on products that can support more than a few sensors. Using today's pricing, an 8 sensor system using a TPP2L(G2) Tibbo platform for the EDA and MN-ENV-T sensors is about $90 per monitored location. This does not include any overhead for any internet equipment that may not already be in place.

The entire system is shown in the figure below.
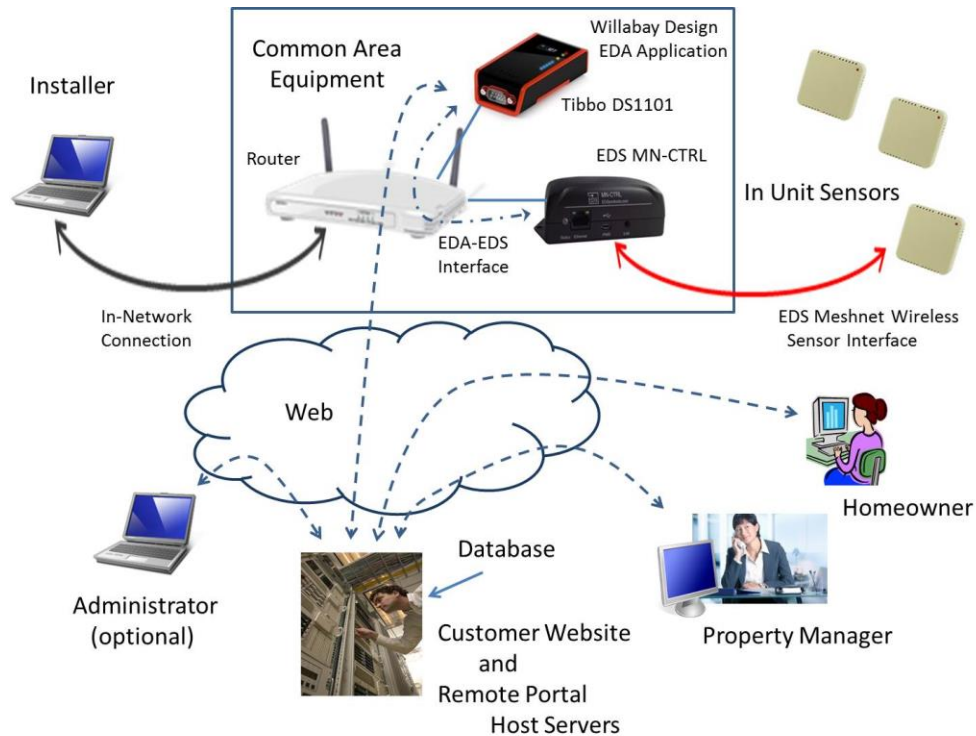


**Environmental Data Monitoring System**

In the figure above, each of the components in the top rectangle is considered common area equipment. The initial configuration of the controllers requires on-site computer access via a laptop or tablet connected to same network. Once the system is configured, the installation computer is no longer required.  The environmental sensors can be placed anywhere within range of the EDS Meshnet Controller (MN-CTRL in the figure above) or a MN Repeater (not shown above) that is communicating with the controller.

The Tibbo DS1101 or TPP2L device can always be placed near the router but the Meshnet Controller has to be centrally located in such a way that it can reach all of its sensors and repeaters. It also has to be connected to the router via an Ethernet cable of any length. Wi-Fi access to the equipment is not supported at this time in order to reduce both the cost and the complexity of configuring the system. This capability would not add much value to the system since the EDS Meshnet sensors are wireless.

A detailed account of the costs of each of the EDMS system components can be found in the EDMS Release V4.2 Equipment and Software document; the document that covers the details on what you need and where to get it. That document covers the cost of the equipment at the customer's site but does not include shipping charges, possible third party installation, or the cost any additional equipment

(routers, switches, etc.) that may be needed for internet access. Further savings can be realized when the system components are ordered in bulk quantities.

It is important to note that this system does not track anything other than the environmental data at a given location. A number of other home monitoring or thermostat products also utilize various means to monitor (and track) home occupancy; a very serious and questionable security concern in our opinion.

**The Remote Portal Database**

Another unique aspect of the EDMS system is the means for which customers can access their data from our database that is located on our shared servers. Instead of requiring a subscription or account with Willabay Design to be able to access your data, the information that is captured is simply stored in a shared database that is accessed via our website using several forms provided. This allows customers access their data as if it were on their own remote portal.

Additional forms and scripts are provided as a means for property owners to search their database in order to identify all sensors that may meet a given search criteria. System operators can also integrate some of these scripts into their own websites as additional means for owners to check on their property.

Willabay Design is making the remote server aspect of this system available to our customers free of charge in order to bring the overall cost of the system down to a point where the system is very competitive with other existing environmental monitoring products. A property manager or property owner will only need one customer access code for the server access, no matter how many complexes they own or manage. A very large customer may want to purchase and set up their own database for this system instead of sharing the database with other customers. This option will be available to large customers in the future; once we gain additional experience with large networks. Individual owners who wish to purchase the EDMS product simply need use Willabay Design's online forms to set up a server configuration for their own use. Installation of the EDMS system is fairly simple once the customer's database access is set up.

Our vision is that ultimately, large customers will be able to support and manage their own database using our software. The database itself is a standard MySQL database.  While other EDS Meshnet customers capture and organize their data using software applications that are entirely resident in their servers, we do most of the work in our EDA and just send a portion of the collected data to our website where customers can access their information for free.

**Summary and Additional Comment**

Since this system is comprised of components that are generally available from Tibbo and several US distributers, the only portion of the system that customers need to purchase from Willabay Design is the EDA software application that is loaded on the Tibbo device.  They will then be able to set up access to their database that is resident on Willabay Design's hosting service using the license that comes with their EDA application. The Willabay Design portion of the EDA code is proprietary and will only be sold as a license for use.  Each installation of the EDA software constitutes one license for use. Each of the

hardware components are warranted by the manufacturers and both companies provide extensive documentation on their products.

It should also be noted that individual users can utilize the EDS Meshnet system as a monitor system by itself but the Meshnet system does not support email alerts. By adding the Tibbo based EDA, users gain full access to their data without having to do any custom configuration work at their router. The whole purpose of the EDA application is to act as an agent inside the router's firewall and collect the data that will be sent to the customer's website or a site on a remote server owned by a designated third party.

Willabay Design expects that the EDMS system will potentially be very attractive to alarm system or internet access contractors who can sell the equipment and software as a package to their customers. Property managers may even customize the access to the database access forms and tie this in to their own websites.

While the EDMS system has been used in trial configurations for several years, it is still an evolving product. Willabay Design will eventually partner with other vendors in order to provide additional resources for future development and support of this new system.

ThisV4.2.03 standard release is now available via the Willabay Design website at http://www.willabaydesign.com.

Further information regarding the EDS Meshnet product line can be found on the EDS website at http://www.embeddeddatasystems.com. Any of the EDS products can be purchased online on the EDS site.

Tibbo's web site can be found at http://www.tibbo.com with the specific DS1101 device at http://tibbo.com/products/controllers/ds110x/ds1101.

Information about Tibbs's TPS system can be found at http://tibbo.com/tps.html.

Tibbo's website also has an online outlet from which any of their products can be ordered.

There are now quite a few distributors of Tibbo products in the US. We recommend the MicroController Pros Shop at http://microcontrollershop.com/product_info.php?cPath=385_386&products_id=5264.

Questions and requests for information regarding this product can be directed to Willabay Design at info@willabaydesign.com.


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**Other Documentation**

EDA Product Notes (supplied with the software)

EDMS Setup Guide (available on our website in the EDA Software Product Ordering section)

EDMS System Provisioning and Installation User Guide (available on our website in the EDMS Support section)

EDMS Product Features and Capabilities (on our website)

EDMS/EDA Release 4.2 Equipment and Software(on our website)

EDA Technical Specifications Sheet (on our website)

EDMS FAQS –Typical Questions and Answers (on our website)

Willabay Design Website: http://www.willabaydesign.com