# Moving from Reactive to Predictive Response Using Internet of Things (IOT)Sensors

SPELL Safety 360 Seminar – July 10, 2024



#### Reactive Maintenance

is also known as corrective maintenance this is the basic building block of a fully formed maintenance strategy. This type of maintenance occurs in response to equipment breakdown or failure, only carried out after performance issues have been detected.



#### Predictive Maintenance

is a proactive approach. The main difference between preventive and predictive maintenance is that predictive maintenance utilizes condition-monitoring equipment to assess the performance of assets through a more real-time, data-driven approach, therefore, identifying the potential for issues before they occur.



#### Preventative Maintenance

is a collection of best practices and averages that zeroes in on an identified interval that gives you the best odds of catching issues before they start. It continues to be practiced because it is highly effective for many organizations.



### Perspective Maintenance

is the asset maintenance strategy that uses machine learning to adjust operating conditions for desired outcomes, as well as intelligently scheduling and planning asset maintenance.

# USING IOT TO YOUR ADVANTAGE



What if you were able to be alerted to Power Failures, Temperature Changes, Humidity Level Changes, Water Leaks, Cold Food Storage operating outside of normal ranges, Moisture in an area there shouldn't be.



All of this and more is possible with an Implementation of IOT sensors.



SPELL JIF has partnered with Travelers Insurance and Monnit to allow members to purchase and deploy sensors to help them in monitoring and proactively or predictively responding to incidents.

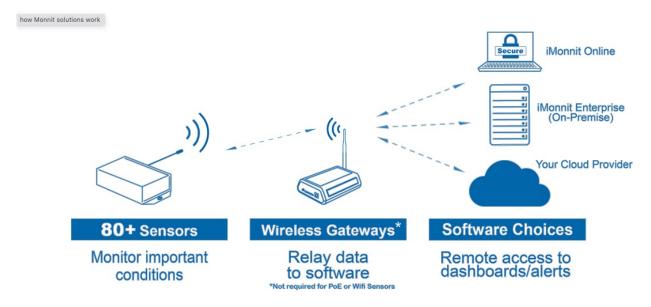


SPELL has the Safety 360 Team available to come out and work with your district in developing this type system.



Water Intrusion, power failures, system failure are all normal events for all schools. Knowing about it right away allows you and your district to manage risk and save time, money and interruption of Instructional and administrative operations.

## How does it work?



The wired gateway connects to your network, all communication with the sensors is sent wirelessly as a 900mhz radio signal. Alerts are delivered to your Monnit portal and via email or SMS to your staff, as you elect.

## Will my technology office allow it?

### Monnit Devices are securely designed to work in your school environment.

### **Proprietary Operating System (OS)**

The EGW4 is a purpose-built embedded gateway with a proprietary operating system and static file system. There is no mechanism supported to add programs or viruses to this device.

#### WIZnet Hardwired TCP/IP Stack

WIZnet hardwired TCP/IP Stack is a chip-level "unattackable" hardware network engine for preventing network attacks such as flooding, spoofing, and injection. The hardware TCP/IP Offload Engine (TOE) technology, implemented as hardwired logic from the Ethernet MAC Layer to the TCP/IP Layer, can protect the IoT system against network attack under an excessive number of flooding packets by discarding flooding packets detected. Additionally, the hardware TOE shows superior performance compared to the software TCP/IP stack solutions. The TOE supports up to eight independent hardware sockets concurrently.

Detailed Gateway Security Brief is available <a href="here">here</a>.



### SPELL JIF Educational Facilities Management Program

#### Travelers Insurance

Welcome to the SPELL JIF Educational Facilities Management Program for Traveler's insured educational partners.

Monnit is pleased to support Traveler's efforts to bring the Internet of Things (IoT) to school districts to best manage their educational facilities

The Program is your key to early and frequent identification of dangerous conditions in your facilities. This proactive approach allows you to swiftly address small issues, preventing them from escalating into major structural and/or operational dilemmas.

The information in the following pages provides suggested internet connected sensors and arrays to address the various needs schools have for deploying the IoT to monitor and prevent loss. Monnit is a leader in the IoT space, with 14 years of service, providing 80+ different sensor types to over 54,000+ customers to monitor a variety of known problems. Monnit believes that by implementing IoT products in your schools, we can help you reduce loss to expensive equipment and inventory and minimize damage to facilities.

This document includes greater details about how and why Monnit provides services to school districts. You may customize purchases to address the issues you wish to address first. That being said, Monnit has provided a starter kit that delivers a good sample of what we offer to address the items discussed in greater detail in the following pages and which are the most pressing for schools to address today.

## Starter Kit

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Temperature Sensor w/3' Lead	1	\$105.00	\$84.00
Water Detection Puck	1	\$159.00	\$127.20
Ethernet Gateway	1	\$365.00	\$310.25
iMonnit.com License for Six Sensors	1	\$45.00	\$31.50
Total Start Kit Price		\$829.00	\$676.95









## **Humidity Monitoring**

### Facility Monitoring – Humidity Levels in Coastal and High Humidity Regions

Aside from water intrusion, constant, high humidity levels will lead to black mold growth in facilities. Mold remediation can average between \$2.50 - \$30.00 per square foot. Early detection of higher-than-recommended humidity levels using wireless sensors will eliminate the need for remediation services in the future.

Monnit offers humidity sensors that report and alert on humidity and temperature levels inside a building. Not every room requires a humidity sensor. Select rooms with varying "environments" to monitor the building's humidity levels. Track and trend humidity over time and receive alerts if levels are sustained for too long.

Humidity Monitoring								
Sensor Type	Description	Part Number	Qty Needed	Price	Total			
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Annual Software License	Cloud access to iMonnit.com sensor portal	Part number and price are based on the number of sensors deployed at each school location.						

## Water Intrusion

### Facility Monitoring – Early Detection of Water Intrusion and Leaks

Nothing does more damage as quickly as water. There are countless stories of water pipes breaking in schools, causing hundreds of thousands of dollars in damage. It's inconvenient, expensive, and will raise the school district's insurance premiums.

Deploying water detection sensors in areas susceptible to water intrusion can give facility managers a warning when water is detected. Monnit offers a variety of water detection sensors, from a rope that can be extended up to 100 feet for monitoring around foundations or large areas to pucks that can be easily deployed anywhere.

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Sensor Type	Description	Part Number	Qty Needed	Price	Total
Water Rope Sensor	ALTA 900Mhz, Commerical AA Battery, 10' Water Rope Sensor	MNS2-9-W2-WS-WR	1	\$229.00	\$229.00
Water Rope Extension	10' Extension Rope (sensor supports up to 100 feet of rope)	MNA-N-WR-10	1	\$50.00	\$50.00
Water Puck Sensor	Water Detection Puck Sensor (available in white for \$10 more)	MNS2-9-PK-WS-PS	1	\$159.00	\$159.00
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## Cooler and Freezer Monitoring

### School Food Programs – Cooler and Frozen Inventory

Educational budgets are tight, and even more so for food programs. School districts spend anywhere from \$1.25 - \$3.00 per student on food daily, which in some districts amounts to tens of thousands of dollars in inventory.

Read how Llano Independent School District uses Monnit's sensors to remotely monitor cafeteria refrigerators and freezers, preventing cooling failures and saving themselves thousands of dollars. Case Study

Refrigerator and Freezer Monitoring Kit								
Sensor Type	Description	Part Number	Qty Needed	Price	Total			
Leaded Temperature Sensor	ALTA 900Mhz, Commerical AA Battery Temp Sensor w/3' lead	MNS2-9-W2-TS-ST-L03	4	\$105.00	\$420.00			
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## Data Centers, and Data Closet Monitoring

### District Server Rooms / School Data Closets

It's no secret that schools with server hardware and networking equipment must run within the critical temperature and humidity ranges. If these essential measurements rise or drop into dangerous territory—the worst-case scenario is server outages during the school period and unplanned capital expenditures replacing failed hardware.

Deploying a budget-friendly, simple-to-implement temperature/humidity and water detection kit allows the IT manager at the school and district level to quickly determine if the cooling in the rooms and closets is not performing as needed or if water has entered the room.

Data Closet Monitoring Kit								
Sensor Type Humidity/Temperature Sensor	<b>Description</b> ALTA 900Mhz, Commerical AA Battery Humidity Sensor	Part Number MN52-9-W2-HU-RH	Qty Needed 1	Price \$155.00	Total \$155.00			
Water Detect Rope	ALTA 900Mhz, Commerical Water Detection Rope Sensor	MNS2-9-W2-WS-WR	1	\$229.00	\$229.00			
Ethernet Gateway	ALTA 900MHz, Ethernet Gateway	MNG3-9-EGW-CCE	1	\$365.00	\$365.00			
Annual Software License	Cloud access to iMonnit.com sensor portal	Part number and price are based on the number of sensors deployed at each school location.						

## How do I purchase these in NJ?

### **Ordering Process**

Monnit will extend Net 30 terms on purchases for schools and school districts once the following items have been submitted to travelers@monnit.com:

- The top half of the Monnit Credit Application (download from here)
- · Submit credit references sheet
- Provide a tax exemption certificate
- Monnit W9 <u>download</u>

Other items for which the <a href="mailto:travelers@monnit.com">travelers@monnit.com</a> email address should be utilized:

- Inquire about products
- Request estimates
- Send purchase orders
- Anything related to this program

#### Credit Terms Information & Application Please email back to credit@monnit.com along with W-9 Name: Name of Project Mgr Corporate Address: City, State: Ζþ Billing Address: City, State: Zip: D&B #: President Corporation Parent Co: Controller Partnership Federal Tax ID: State of Incorporation: Other: School / School District How many years in business? Credit line requested: Purchasing Agent(s): Name of person purchasing product Phone No Email: Accounts Payable: Name of accounts payable contact. Phone No. Is merchandise for resale? No Mornit Corp., may sharpe your credit out for payments on account, charpes in ecosos of credit limit, or in case of account default without prior written not floation You HasterCard Arrex Shipping Address: City, State: Zφ

Your point of contact will be Nick Mecham, whose team will work to provide what is needed to move forward. Please do so if you need to reach out to him for anything.

Nick Mecham

nickm@monnit.com

T: 801-561-5555 x 908

We look forward to working with you.

## How Do I Start

Reach out the Safety 360 Team. We are available to come out, learn about your facility and your specific issues and help you with a solution or monitoring program.

Link to Request Safety 360 Team Assistance is here.

Link to SPELL Travelers/Monnit IOT Program Information Sheet

Monnit Credit Application



## Monnit ALTA Ethernet Gateway 4 Security Brief

The Monnit ALTA® Ethernet Gateway 4 (EGW4) Ethernet network interface consists of the following:

- 1. Proprietary Operating System
- 2. WIZnet Hardwired TCP/IP Stack
- 3. Configurable Socket Interfaces
- 4. Application-specific Security

All of these modules were selected and designed to meet requirements for IoT Security in today's world.

## **Proprietary Operating System (OS)**

The EGW4 is a purpose-built embedded gateway with a proprietary operating system and static file system. There is no mechanism supported to add programs or viruses to this device.

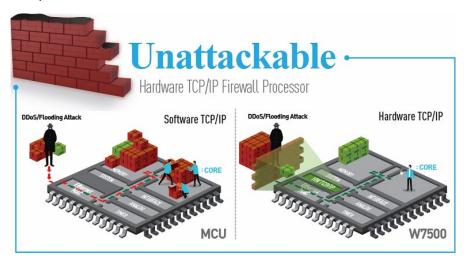
Potential points of attack:

- Device configurations change the behavior of the device.
- The device upgrade mechanism is used to replace code.

Therefore, the gateway interfaces must safeguard how these configurations and code changes occur.

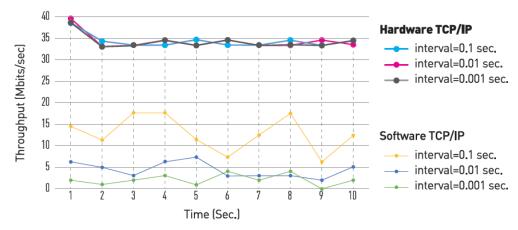
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## Comparison of Network Performance by interval of syn-flood attack (DDoS)



### **Configurable Interfaces**

The Ethernet Gateway has the following interface options available:

- System Socket Interfaces: These IP standard sockets implement the standard DHCP, DNS, and SNTP protocols. These protocols, by design, are outbound-based queries used when the gateway is required to automatically establish/maintain the device IP address, resolve "server names" into networked IP addresses, and query a time server. By default, both DHCP and DNS are used by the gateway. SNTP is disabled by default. Additionally, DHCP and DNS sockets cannot be directly disabled. However, if static IP settings are used for the gateway IP settings and an IP address is used instead of a server name, both interfaces will be effectively inactive.
- 2. Default Server Interface: This enables one intermittent outbound TCP port for server communication. By default, this interface is enabled and set to communicate on outbound TCP port 3000. This interface is primarily responsible for providing time for the gateway. The inbound port associated with an open socket is not fixed (TCP Standard implementation). This socket is activated on demand or on a dedicated poll interval (gateway heartbeat setting). After the dialog concludes, the TCP connection is closed. On "unlocked" versions of the gateway, this interface can be disabled, and no socket-level operations are attempted.
- 3. **Modbus TCP Interface**: This enables one TCP listening socket on a configurable port number. By default, Modbus TCP utilizes the INIA-directed TCP Port 502, and the interface is disabled by default. After this interface is enabled, traffic directed to the configured port number will be sent to the Modbus TCP application for handling.
- 4. SNMP v1 Interface: This enables one UDP listening socket, and up to three UDP Trap sending sockets on configurable port numbers. By default, this interface is disabled and is preconfigured to use the SNMP request port of 161 and SNMP Trap Port of 162 (INIA recommendations). If the interface is enabled, SNMP requests will be received and sent to the SNMP application for handling. If the Trap ports are enabled, the SNMP application can send trap events when they occur.
- 5. **HTTP Interface**: This enables a local webpage viewing for status and configuration. By default, this interface is enabled on INIA TCP port 80. If enabled, all traffic for this interface is directed to the HTTP application. If the interface is disabled, no socket-level operations are allowed.



### **Application-specific Security Features**

- Default Server Application: This communicates utilizing EncryptRF© and the proprietary Monnit Server (MSVR) protocol. This security suite enables the gateway to form a secure communications link between an authorized server and the gateway. This secure link is authorized to perform gateway configurations. Additionally, gateway updates are only permitted across this secure link, and the gateway verifies the integrity of the new code before completing the updates.
- Modbus TCP Application: This enables Modbus TCP register read-access to collect gateway status and current sensor data. No write access is supported.
- SNMP v1 Application: This enables SNMP OID read-access to collect gateway status and current sensor data. No write-access is supported. If SNMP traps are enabled, the application will initiate qualified Trap events when they occur.
- HTTP Application: This uses the following "access configurations" to control access to this interface:
  - "Read-Only" Interface will process all HTTP GET requests. This enables the viewing of gateway status and current configurations. However, HTTP POST messages will be ignored, and a read-only warning will be delivered to the caller. This removes this interface's ability to change the operation of the gateway.
  - "5-Minute Access" For five minutes after a boot event or the pressing of the Gateway Utility button, the gateway will accept HTTP POST messages. This enables configuration changes during this time.
  - "30-Minute Access" For 30 minutes after a boot event or the pressing of the Gateway Utility button, the gateway will accept HTTP POST messages. This enables configuration changes during this time.
  - "Unlimited Access" This interface will always accept HTTP POST messages. No security limit here.

#### Default Enabled Interface Summary:

- DHCP (UDP Port 67) Standard implementation
- DNS (UDP Port 53) Standard implementation
- Default Server (TCP Outbound Port 3000) secured by EncryptRf©, Propriatary MSVR Protocol
- HTTP (TCP Inbound Port 80) Default as "read-only"



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#### Please email back to <a href="mailto:credit@monnit.com">credit@monnit.com</a> along with W-9 Name: Name of Project Mgr Phone: Corporate Address: City, State: Zip: Billing Address: City, State: President D&B #: Corporation ( ( ) Federal Tax ID: State of Incorporation: Type of business: Number of Employees: Sole Proprietor ( ) How many years in business? Other: School / School District Credit line requested: Purchasing Agent(s): Name of person purchasing product Email Accounts Payable: Name of accounts payable contact Phone No: Email Are purchase orders required? Is merchandise for resale? No Monnit Corp. may charge your credit card for payments on account, charges in excess of credit limit, or in case of account default without prior written notification Visa MasterCard Amex

City, State:

Zip:

**Credit Terms Information & Application** 

Your point of contact will be Nick Mecham, whose team will work to provide what is needed to move forward. Please do so if you need to reach out to him for anything.

Shipping Address:

Nick Mecham
<a href="mailto:nickm@monnit.com">nickm@monnit.com</a>
T: 201 FG1 FFFF x 200

T: 801-561-5555 x 908

We look forward to working with you.



Thank you for requesting an application of credit with Monnit Corporation.

Please fill out the attached Credit Terms Information & Application form and email it back to your Sales Representative along with a copy of your W-9. You will hear back from the Accounting Department shortly.



3400 S. West Temple Salt Lake City, UT 84115 Tel.: 801-561-5555 Fax: 801-561-5575

# Credit Terms Information & Application Please email back to credit@monnit.com along with W-9

Name:	Phone: Fax:		Fax:							
Corporate Address:		City, State:					Zip:			
Billing Address:		City, State:					Zip:			
						ı				
President:	D&B #:					Corpo	ration		(	)
Parent Co:	Controller:					Partne	rship		(	)
Federal Tax ID:	State of Incorporatio	n:				LLC			(	)
Type of business:	Number of Employe	es:				Sole P	roprietor		(	)
How many years in business?	Credit line requested	d:	\$		ı	Other:				
Purchasing Agent(s):	Phone No:				En	nail:				
Accounts Payable:	Phone No:				En	nail:				
Are purchase orders required?			Is merch	nandise f	or resa	ale?				
Monnit Corp. may charge your credit card for payment	ts on account, charges in e	xcess of c	credit limit, or in	case of acc	count de	efault with	out prior writter	n notification		
Visa MasterCard Amex Card #				Expiration:	/		Card Verification	on Code:		
Shipping Address:		City, S	tate:					<u>Zip:</u>		
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Signature of Authorized Agent / Cardholder	Т	itle				-	D	ate		