MICRO THERMO TECHNOLOGIES DEPLOYMENT TECHNICAL NOTES FOR CUSTOMER IT GROUP

The Micro Thermo MT Alliance Platform is a complete supermarket automation package. It can control all aspects of refrigeration, HVAC, lighting and energy management in a store. Furthermore, Micro Thermo provides corporate tools to monitor and control all your supermarkets to ensure they are operating properly and efficiently.

As an IT ressource you may be involved in LANs, WANs, security, virtual private networks, etc. This document is intended to make you understand all ports and protocols that need to be opened to benefit from all the features of the Platform.

High Level Overview

In each supermarket, multiple electronic control boards are installed near or inside the equipment that is to be controlled. Using sensors and analog or digital outputs, these electronic boards are able to control a specific equipment such as a rooftop unit, compressor rack, or refrigerated display case.

These control boards are all interconnected with a local field bus, allowing them to communicate and exchange information. So it is possible to control a complex system made up of multiple equipment that are physically distributed all over the store. As an IT resource, you do not need to get involved at the control board or field bus level.

However, on that field bus is also connected a data logger device. It provides two main features. It will receive and store data from all the store control boards. Typically a few thousands points are stored every minute for up to 5 years. It can also act as a local user interface for store managers and employees, allowing them to view all store alarms on a floor plan, and allowing changes to be made.

This is where you come into the picture. The data logger has an ethernet port, allowing it to be connected on the local store network, and on the corporate network.

Once on the corporate network, it is possible to take remote control of a specific data logger in a specific store, in order for example to perform detailed diagnostics about equipment failures or fine-tuning a control process in order to reduce energy consumption.

Once on the corporate network, the data logger can also be tied to the corporate tools. Micro Thermo offers a variety of corporate tools. One is called the Enterprise Facility Management Workstation (EFM). It can display all alarms from all the stores on one or more workstation.

Another corporate tool is called Remote Account Management Application (RAM@). It can manage user accounts across all stores, creating, modifying or deleting user accounts in all the data loggers. It supports the concept of corporate users that have access to more than one store, and local store users that can only access a single store.

Another corporate tool is called iCollect. It can pull out specific data points of interest over specific periods from specific sites automatically. This allows a corporation to correlate and compare data points and system behavior from various stores.

Another corporate tool is called Watch. It will automatically produce reports about all changes made by all users in all stores. For example, it is possible to find out who changed setpoints in all stores last week, and when exactly, and from what value to what value.

Another corporate tool is called Validate. It will automatically report all alarm limits in all the stores that are not adhering to the corporate standards for alarm limits.

Another corporate tool is called the Web Energy Logger (WEL) allowing the corporation to compare energy consumption per square foot between stores. It also allows sending corporate load shed commands to a group of stores.

The following paragraphs will explain which ports and protocols must be opened to enable all these features.

Basic Remote Control

This paragraph describes how to take remote control of a specific data logger at a specific site.

The data logger runs the MT Alliance software. The MT Alliance is a single-user Windows Embedded application. Any commercial remote control software that works on Windows Embedded can be deployed (VNC, Carbon Copy, Remote Desktop, pcAnywhere, LogMeIn, etc).

Using a remote control software, a remote user can access the store and the full-featured user interface of the MT Alliance software. In effect, he takes control of the machine. Everything a user can see and do at the data logger workstation can be done remotely.

But how do you manage the remote computers and the remote users?

Typically, the simplest and most secure deployment is to have all access go through a server located at your headquarters. The Server runs Remote Desktop Services (previously known as Windows Terminal Services).

There can be multiple users at the same time. A user connecting to the server will only see its own desktop, and will not be aware that other users are using the server simultaneously. Once the remote control software has been installed on the server and each store, each user that connects can take remote control of a store.

In order to manage access to this server for all possible remote users, you need to provide them with a Virtual Private Network (VPN) or another form of protected and restricted access. Once connected securely, you only need to provide them access to the central server instead of individual access to all the stores.

We use the terminology 'inbound call' to describe a call that is initiated by the server into a specific store where the data logger resides. An 'outbound call' is a call initiated by the data logger inside a store to a destination on the internet. The 'Store X ip' in the tables below represent the IP address of the data logger at store X, as viewed by the server (most likely a NATed address, that is different from the actual local address at the store)

This is an example of the ports/protocols that must be opened between the server and each and every store, in order to allow remote control with pcAnywhere. pcAnywhere uses two ports, a control port and a data port.

The source initiates an inbound call

Source IP	Source Port	Destination IP	Destination Port	Protocols
server ip	1024-5000	store X ip	5631 (ctrl)	tcp & udp
server ip	1024-5000	store X ip	5632 (data)	tcp & udp

There will be a response coming back from the store. You have to make sure that the response can go through as well.

The destination responds to the call

Destination IP	Destination Port	Source IP	Source Port	Protocols
store X ip	5631	server ip	1024-5000	tcp & udp
store X ip	5632	server ip	1024-5000	tcp & udp

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EFM Workstation

Each data logger comes with a windows service called 'Micro Thermo Technologies Core'. The Core links the MT Alliance software with the EFM Workstation. The EFM displays all alarms from all the stores.

With the EFM, it is also possible to:

- Acknowledge alarms
- Get historical data for any given point for up to 7 days
- Change any setpoint on a store
- Send a corporate load shed request to multiple stores in a single request
- Receive the current load shed level of hundreds of stores in real-time
- Ping every store to determine when one is down

The EFM Workstation would be installed on the central server. (The EFM is actually composed of a broker and one or more workstations). The workstations can be on the server, or elsewhere. A server deployment is the simpler to manage.

These are the ports/protocols that must be opened between the server and each and every store, in order to allow EFM Workstations to work properly.

The source initiates an inbound call

Source IP	Source Port	Destination IP	Destination Port	Protocols
server ip	1024-5000	store X ip	50,005	binary/tcp

There will be a response coming back from the store. You have to make sure that the response can go through as well.

The destination responds to the call

Destination IP	Destination Port	Source IP	Source Port	Protocols
store X ip	50,005	server ip	1024-5000	binary/tcp

RAM@, iCollect, Watch, Validate - based on Web Services

Each data logger comes with Microsoft Internet Information Services Server (IIS) for 5 simultaneous users (calls). The IIS is hosting a series of Web Services (the equivalent of a remote function call) which provides access to data, but without a user interface.

This technology in turn allows corporate tools such as RAM@, iCollect, Watch and Validate to invoke these remote functions and pull out data of interest.

On the central server, RAM@, iCollect, Watch and Validate would be installed.

By tapping into the Web Services API that Micro Thermo provides, it is also possible for your IT group to develop your own custom application to access those very same features.

These are the ports/protocols that must be opened between the server and each and every store, in order to allow RAM@, iCollect, Watch and Validate to work properly.

The source initiates an inbound call

Source IP	Source Port	Destination IP	Destination Port	Protocols
server ip	1024-5000	store X ip	50,000	http/tcp

There will be a response coming back from the store. You have to make sure that the response can go through as well.

The destination responds to the call

Destination IP	Destination Port	Source IP	Source Port	Protocols
store X ip	50,000	server ip	1024-5000	http/tcp

WEL

Each data logger can come with a windows service named (MT Alliance to Web) or MTA2WEB. This allows energy data to be sent to a central server located in Micro Thermo Technologies headquarters in Mirabel, Québec, Canada.

Using an internet browser, anyone (with authorisation) from your corporation can access energy related data for all your stores, and can issue a corporate load shed request that will take effect on multiple stores within 2 minutes. Simply by logging into www.mttservicecenter.com

An alternative is to use another control board from Micro Thermo called the Energy Manager. It also comes with its own ethernet port and requires its own IP address in the store network.

This technology differs from all the previous ones in a fundamental way. It is the store that initiates and outbound call to the internet.

These are the ports/protocols that must be opened between each store and the server in Mirabel, in order to allow the WEL to work properly.

The source initiates an outbound call

Source IP	Source Port	Destination IP	Destination Port	Protocols
store X ip or energy manager ip	1024-5000	69.157.211.196 (www.mttservicecenter.com)	50,000	http/tcp

There will be a response coming back from the server in Mirabel. You have to make sure that the response can go through as well.

The destination responds to the call

Destination IP	Destination Port	Source IP	Source Port	Protocols
server	50,000	store X ip or energy manager ip	1024-5000	http/tcp

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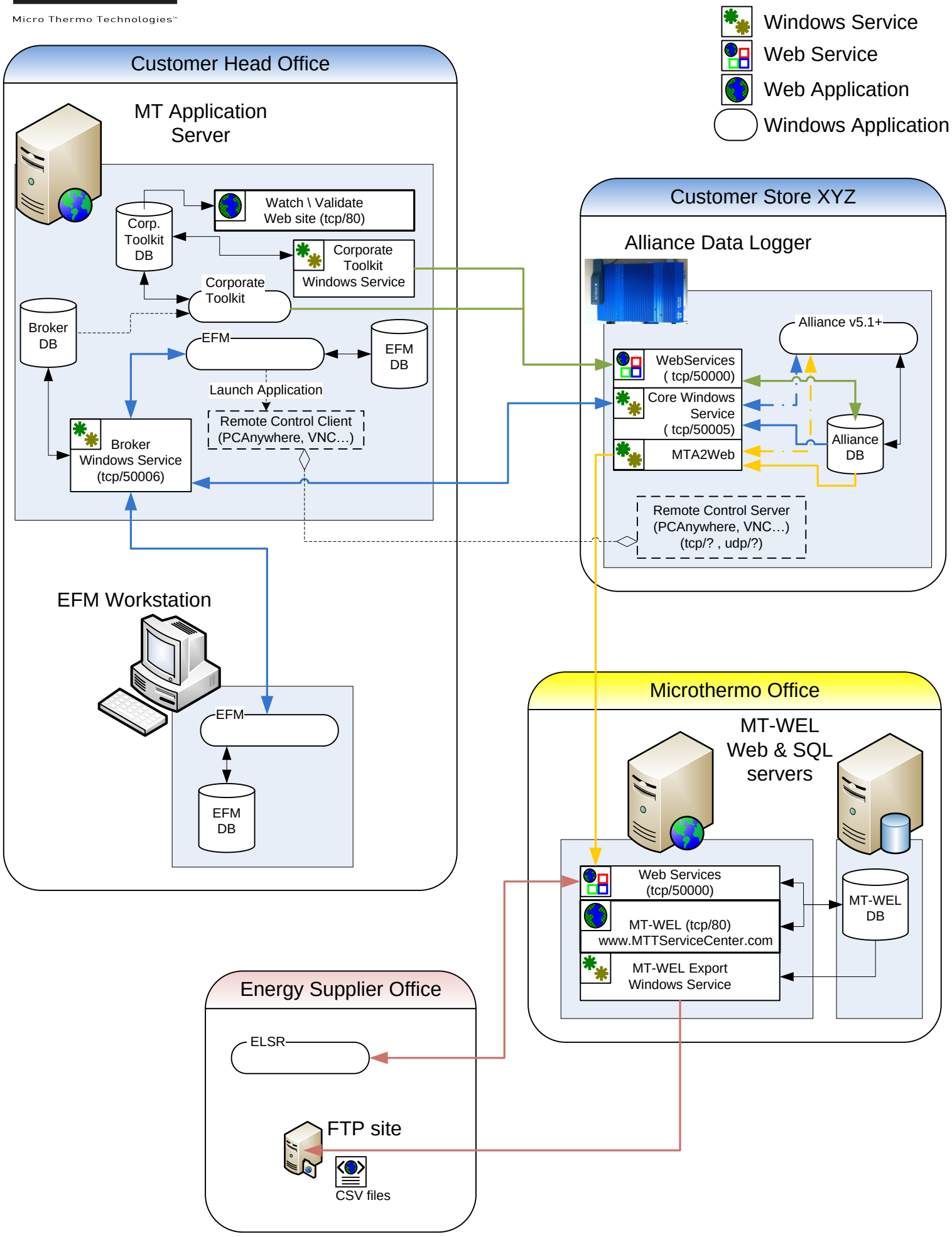
Ver: **1.6** *Date:* **2013-09-05** *By:* E.J.



Requirements

MT Application Server

- OS: Windows Server (32\64 bits) 2003, 2008[1], 2008R2[1]
- Virtualized Environment: VMWare, Hyper-V
- CPU: 1 Xeon CPU Core for < 50 stores, 2 Xeon CPU Core for >= 50 stores
- RAM: 2 GB for < 100 stores, 4 GB for >= 100 stores
- HD: 60GB[2]
- Microsoft .NET Framework 1.1
- Corporate Toolkit Watch \ Validate functionalities[3]: IIS 6/7, .NET Framework 3.5, SQLExpress[4]
- Remote Desktop Services: (optional but recommended). Instead of having multiple EFM Workstation over the network, using RDS allows centralized installation of Micro Thermo software and facilitates user rights usage and configuration. Overall, it reduces management.

[1] On Windows 2008, 2008R2, Core Windows service installed on each store must be version 1.5 or up (Core Windows service version number is independent from Alliance software version). Alliance 7.1+ comes with a Windows 2008 compatible Micro Thermo Core windows service.
[2] May vary, depending if Watch \ Validate functionalities are installed, how many stores are collected and which period of time is kept.
[3] Windows Services installed on each store must be version 7.2 or up (Web services version number is independent from Alliance software version). Alliance 7.0+ comes with a Corporate Toolkit Watch \ Validate compatible web services.
[4] Depending how many stores are collected, which period of time is kept and performance response, it may be required to upgrade to a full licensed Microsoft SQL Server.

EFM Workstation

- OS: XP, Windows 7 (32\64 bits), Windows Server (32\64 bits) 2003, 2008, 2008R2
- Virtualized Environment: VMWare, Hyper-V
- CPU: Any dual core CPU
- RAM: 2 GB for < 100 stores, 4 GB for >= 100 stores
- Microsoft .NET Framework 1.1