Plantweb Optics Deployment Best Practices

This white paper covers the best installation practices regarding Plantweb Optics. It is assumed that the reader is familiar with the basic functionality of Plantweb Optics.

It is assumed that the reader is the person tasked with making the installation a success. This document with a definition of what a successful installation looks like and what is accomplished during the rollout.

Plantweb Optics – The Asset Performance Platform for Enabling the Preventative to Predictive Maintenance Digital Transformation

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Plantweb Optics – Asset Performance Platform

Plantweb Optics uses real-time automated data collection from assets within the plant, funneled into diagnostics and analytics platforms to visualize, analyze, and predict performance. With this actionable data, plant service and maintenance workflows integrate with CMMS seamlessly. This platform makes staying on top of asset health in the plant easier than ever before.

Figure 1 - Plantweb Optics Web Client and Phone Application

User Interface Options and Roles

Plantweb Optics is designed for the intermittent daily user – trials with Board Operators indicate that adding more to the role is not a good practice. Board Operators are process focused not asset focused. They tend to look at the world through the control loop perspective, looking at control faceplates versus asset dashboards. Device alert are available to DeltaV Board Operators – feedback from Board Operators is consistent: they want to see an icon on the loop indicating a bad asset. Board Operators do not want a device alert to show up as a unique alarm that must be dealt with. The Emerson implementation accommodated this request – all asset information is shown to board operators through the control loop faceplates. The more important reason why the Operator is not considered a primary Plantweb Optics user is that the Operator is powerless to do anything about the asset. He will most likely call the E&I[1] department. It makes sense to send the asset information to the E&I department directly.

Targeted user roles of Plantweb Optics include Plant Management, Maintenance and Reliability Mangers, Shift Supervisors, HSE personnel and E&I and Reliability staffers.

It is common to have discussion around how Plantweb Optics will be used by these targeted users. Some are not enthusiastic about the introduction of a new interface for Operations[2] or management personnel to look at but don't realize that Plantweb Optics is designed to reduce the number of applications users must interact

[1] Electrical and Instrumentation
[2] "Operations" in this document refers to all folk who are responsible for the day to day operation on the facility.

with on a daily basis and provide a single pane of glass to holistically gather all information related to an asset. This reaction is not uncommon and understood. However, it should be noted that Plantweb Optics is designed very specifically around the intermittent Operations user and delivers key functionality required to move a site from preventative maintenance to predictive maintenance practices. Unique Plantweb Optics functionality includes:

- Collect the asset health from a wide variety number of asset sources
- Present that information in context in an easy to use and understand dashboard
- Connect personnel who share the same asset focus through a digital collaboration platform
- Move traditional workflow practices to fully digital and automated procedures
  And accomplish these functions with a minimal amount of configuration.

Consequently, the most optimal experience in the deployment of Plantweb Optics lies in using the thin client dashboard application (Asset View) and the associated phone application (Plantweb Optics on iOS and Android).

Plantweb Optics Stand-Alone Deployment

Best practice deployment calls for both phone and the thin client application usage. The phone is connected via Wi-Fi or by cellular network – the Plantweb Optics server needs to be deployed on a server that can connect to the internet. Deployment options are discussed later in this document.

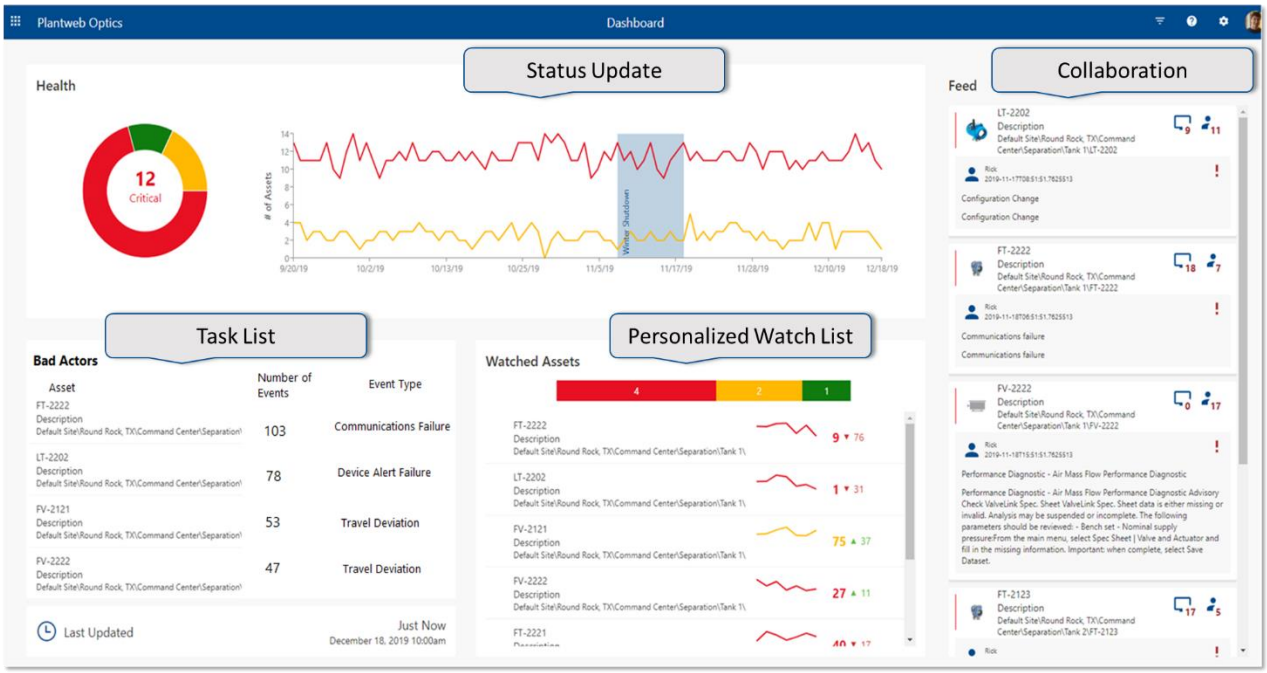

Figure 2 - Screen Capture of Plantweb Optics (v1.6)

The dashboard shows health of the bad actors(s) over time. Also shown are the assets of interest to the user's role and the interactions between users of common responsibility. This dashboard is persona-based and focused around overall asset **health** versus other technology specific applications focused on assert **alerts**. The reason for this focus on asset health versus alerts is because asset alerts can be messy – some alerts are meaningless; others are created so frequently as to be considered spam. In the big picture, one must know what has failed or what is about to fail. And when and how to fix the asset. Plantweb Optics turns alerts into an asset health score so as not to annoy users with meaningless or annoying alerts.

Plantweb Optics provides asset state whereas users' responsibility job is to quantify with criticality how

important an asset is to the process. The combination of those two pieces of information is how users can prioritize their work.

Traditional methods of communication of asset health are not very efficient in that it requires a user to adapt to the product they use like an email or text message or paper board versus the tool adapting to them. Based on user feedback, the best way to do this will be to have an app that gives them a 24x7 visibility and information to the asset health they are responsible for. This way they can have an app that adapts to their workflow versus them adapting to multiple different apps to enable workflow.

The primary users of Plantweb Optics are mobile and not tethered to a fixed workspace like the Board Operators. It makes sense to provide asset information to them – on their desktops and mobile devices as shown in the tablet/phone interface in Figure 3. Users can communicate with other SMEs (Subject Matter Experts) and see the health and diagnostic values over time – extremely useful in understanding asset diagnostics. Much of this information is absent in email and other 3rd party applications – with Plantweb Optics thin client and mobile interfaces, this is available out of box. And it for this reason that we recommend using these interfaces over others. Some users may be supporting multiple sites and may want to know all of their site health in one place. Plantweb Optics mobile enables to do that very efficiently with actionable information at one's fingertips.

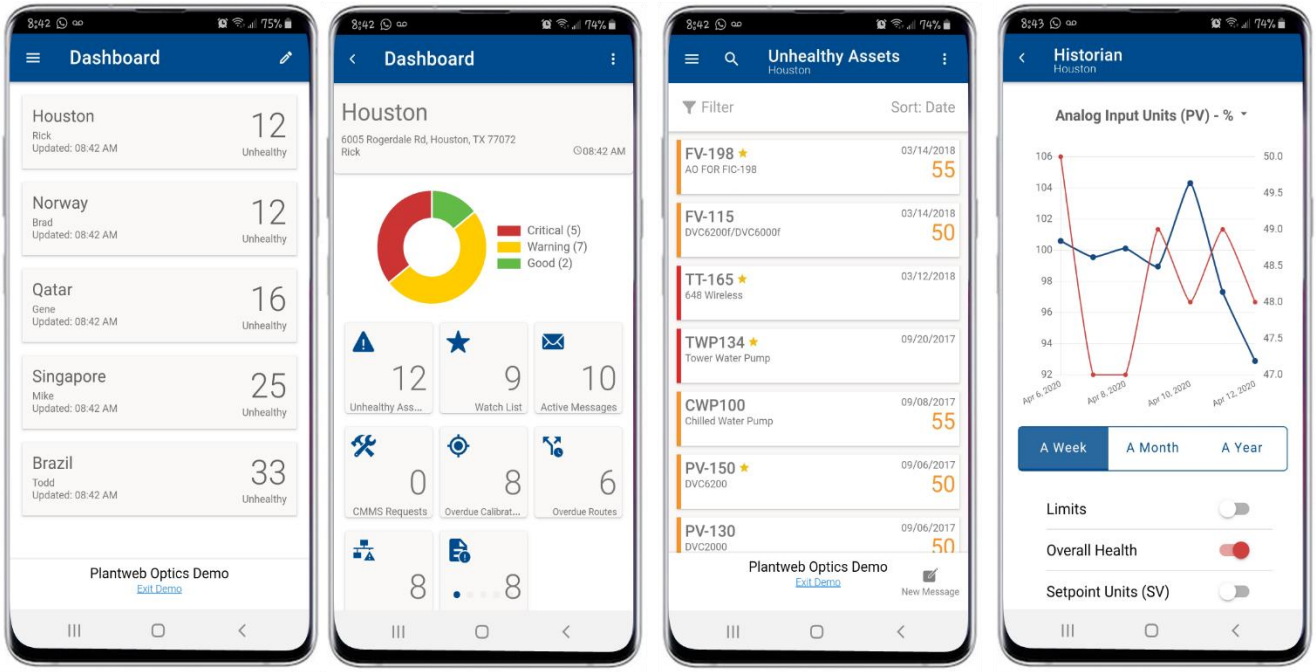

Figure 3 - Screen Captures of Plantweb Optics on phone

A key part of a Plantweb Optics rollout is to introduce these new tools to Operations and to set expectations of their use in day to day activities. The early weeks of a Plantweb Optics roll out will determine where the transition from a preventive to predicative maintenance operation will occur. Plantweb Optics must be used as a daily/hourly tool. Some of the opportunities where Plantweb Optics may be used are discussed below.

Shift Changeover – priority 1

Plantweb Optics should be called up in the meeting room where shift changeover occurs. Any changes from the prior shift should be discussed.

SME Experience – priority 1

All staff participating in the maintenance of certain assets should have the thin client available on their desktops and installed on their mobile devices. We believe that the mobile interface is critical – it allows one to quickly and easily determine the health of assets, whether in the plant, or in a meeting or even when working remotely. All will have a heightened awareness. Also, this interface can be consulted before commencing scheduled work – there is a chance that the asset health is good, and the no-fault-found maintenance or scheduled preventative maintenance tasks can be avoided. Limited maintenance man-hours can be repurposed for more critical tasks.

Finally, the mobile and thin client interfaces facilitate communication between workers and SMEs. And facilitates historical tracking of asset health.

Operations Overview – Priority 2.

It is recommended that there be a permanent overview display where all Operations personnel can access Plantweb Optics. Operators can call up Plantweb Optics to see if a particular asset is heathy.

Using Process Historian as the Primary Interface

Many customers are using an enterprise historian as one of their primary interfaces. We have heard customers ask that asset health be included in Process Historian. It is possible to map all the asset tags into the Process Historian using OPC UA. That way, asset health can be used in the KPI rollups in Process Historian.

Some notes about this deployment model:

- A Process Historian is built for data repository and works great for process data. When it comes to non-scalar data, collaboration, asset health management, there are a lot of customization that may be required to achieve what is required to support a work flow and that may not be sustainable when changes are made to underlying data.
- One must configure how the asset health is used in Process Historian. Each asset must be mapped point by point (easy but very tedious). Note that the communication requires that OPC UA be used – this might require an OPC DA to OPC UA conversion application for older Process Historian installations.
- Newly deployed assets are not automatically added to Process Historian. This is a manual process which make deployment sustainability more challenging.
- In Plantweb Optics, there is a way to add supporting secondary and diagnostic variables from the field devices. It is not possible to duplicate this with Process Historian.
- Some assets provide files of data for further diagnostics. Examples: DeltaV Loop connector provides a SCV file of lop data; Emerson vibration transmitters provide waveforms. Plantweb Optics also supports the inclusion of asset photos. It is not technically possible to push this data to Process Historian using OPC UA. A web connector must be written to get this information into Process Historian. At the time of this publication, there is no known instance of this implementation.
- There is no way of sending alerts, events, or messages from Plantweb Optics to Process Historian. While health information is more significant, the alert information is valuable in diagnosing asset issues.
- Using Process Historian as a primary interface means that the SME collaboration and sense of community provided by Plantweb Optics is abandoned.
- The Process Historian application requires users to go and look for information as opposed to having this information directed to a specific SME on their mobile devices[3].

[3] It is possible to use a 3rd party Process Historian Snap-On to deliver push information to mobile devices

Using email as the Primary Interface

Some users would rather use email as the primary interface. The benefit is that all users already use email - a new tool is not introduced. Whilst this is an obvious advantage, there are disadvantages to be considered since emails are not designed for better asset health management but as a good collaboration engine.

It is important to understand how Plantweb Optics connects to email. When a message is received, an email is sent to the appropriate user depending on the configuration. The user can choose which emails to get based on the notification priority as shown below.

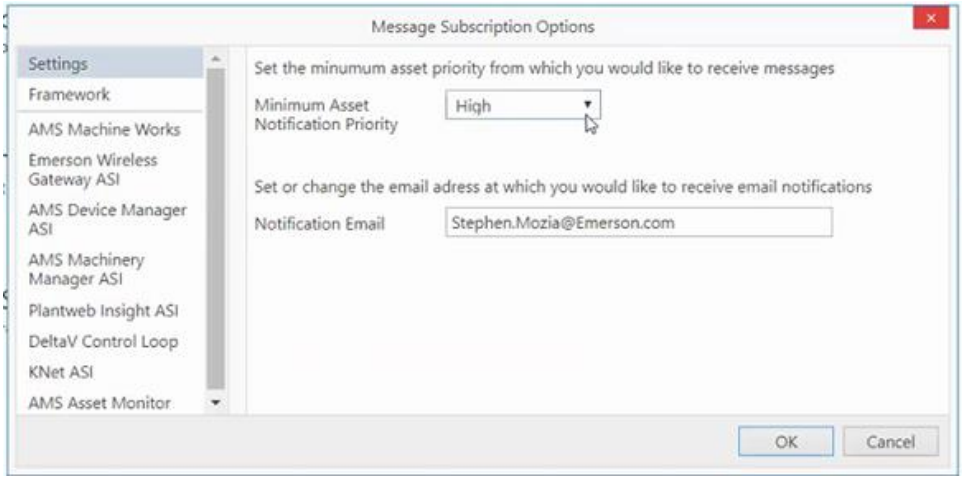

Figure 4 - Configuring Priority of Assets to Receive Messages

One can further tweak the messaging depending on the capabilities of the ASI connector. See the AMS Device Manager example below:

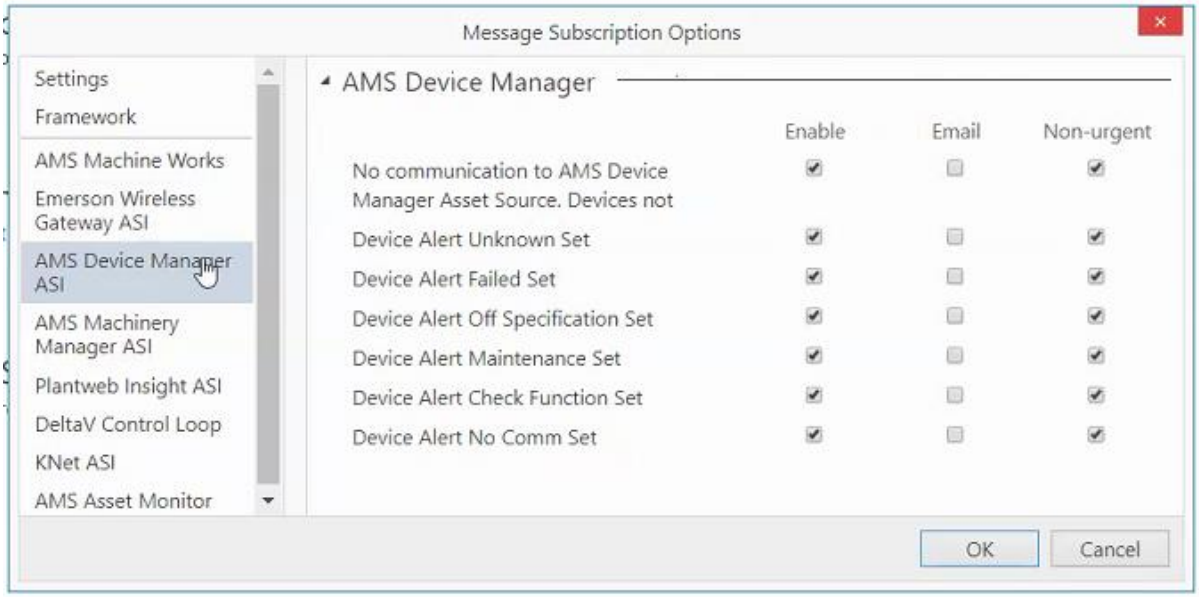

Figure 5 - Message Deliver Configuration Options For AMS Device Manager

Once the email configuration is set, messages received by Plantweb Optics will be sent to the subscribing user. A sample of an email received in email is shown in Figure 5. Comparing Figure 5 and 1, there are major differences.

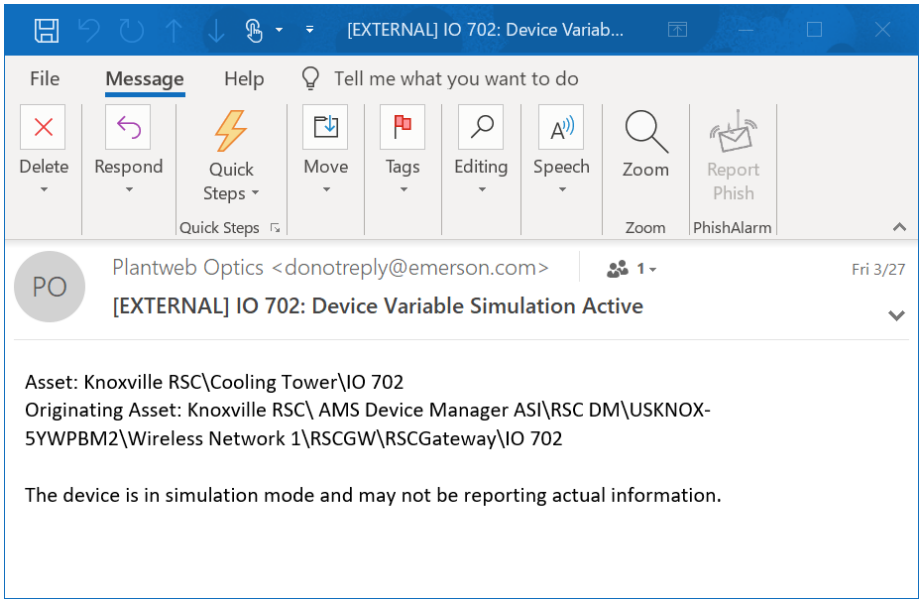

Figure 6 - Plantweb Optics Email Example

Notes regarding this deployment model using email as the only interface include:

- Email users are preconditioned to read and erase emails. Most have fingers hovering over the DELETE button thinking that new emails are, by default SPAM. This may result in information being missed.
- Emails may have other items that are not directly related to asset management and your regular work emails could bury the Plantweb Optics emails.
- Some devices may have alerts generated periodically. A valve may experience stiction due to overtight packing. This will cause a travel alert whenever the valve is moved. This may result in annoying emails that can spam an inbox.
- There is no way for the user to:
    - know the health of the asset from email (asset health is not included in email)
    - have a feeling of the health of a critical asset – once an email message is resent – users may not see any Plantweb Optics emails and assume incorrectly that all assets are good
    - know how many assets are bad – the asset dashboard is not delivered by email – the user cannot answer this question: “how healthy are the safety devices on this unit”
    - create a work notification in CMMS[4] from an email interface; nor to get the status of a work order
    - see context of an asset to understand how a valve might be impacting production or other assets
- There is no asset history available via email.
- Some assets provide files of data for further diagnostics. Examples: DeltaV Loop connector provides a SCV file of lop data; Emerson vibration transmitters provide waveforms. Plantweb Optics also supports the inclusion of asset photos. This information is not transmitted to email.
- Once could partially replace the SME community concept of Plantweb Optics by creating a DL (distribution list) and using email for collaboration. The downside is that there is now asset knowledge in two locations – in the deleted parts of email and in time stamps in Plantweb Optics.

Asset Performance Management Platforms

Some customers have Asset Performance Management applications installed on L4. Some have connected

[4] Computer Maintenance Management System such as SAP PM, Maximo etc

these applications directly to AMS Device Manager by polling the alerts in the AMS Device Manager Device Alert Monitor. The AMS Device Alert Monitor database is SQL based making access easy. However, there are issues with this deployment model:

- **SECURITY:** The connector software is installed on L3 and polls AMS Device Manager which is often installed on L2/L2.5 of the Purdue model. This connector, written before the new-found intense focus on security, requires many firewall ports to be open. Most customers will not permit polling from L3 to L2. Emerson agrees with these objections and recommends against this practice.
- **HEALTH versus ALERTS:** The existing connector delivers AMS Device Manager device alerts to APM. Analytics must be added to APM to create a dashboard like the out of box version by Plantweb Optics.

  To get around these issues, it is recommended that AMS Device Manager reports asset health to Emerson's Plantweb Optics using a secure push mechanism (no polling) and the health of assets be securely transmitted from Plantweb Optics to APM using secure OPC UA.

Others

There are many other software offerings that may want to include asset health in their offerings and dashboards. Emerson discourages connections to the raw asset data (much of it under L3/2 firewalls) and encourage connection to Plantweb Optics which can serve this data to all offerings using OPC UA. Again, the focus is on assets and their health versus the thousands of alerts served up by chatty instruments.

Cloud or not cloud Deployment

Plantweb Optics is typically installed on virtual machines. These virtual machines may be in a customer's private cloud on premises or in an installation hosted by AWS, Azure, Google cloud etc. Regardless of the installation, the installation data is controlled and seen only by the end user – Emerson has no insight into users' asset data.

Some customers have approached Emerson to host their Plantweb Optics instances. Emerson is exploring adding the option for providing Plantweb Optics as a Software-as-a-Service (SaaS). This will allow customer to send their data securely to an Emerson cloud hosted instance of Plantweb Optics which the customer will have access to in order to utilize to the platform. Emerson then will responsible of updating and maintain the customer system. Customer data and IP remain in the hands of customer only.

Summarizing, Plantweb Optics today is designed to be hosted on a server. The users IP remains in full control regardless of whether the Plantweb Optics server is physical, virtual on user premise or virtual in user's offsite virtual server hosted by public cloud hosting vendors.

Where in the Purdue Model is Plantweb Optics Installed?

Plantweb Optics has a flexible architecture that should be implemented in order to be able to have access to the information at accessible levels of your network architecture. Plantweb Optics is typically installed on Virtual Machines on the customer network. Most Plantweb Optics users are L4 users – Plantweb Optics should be installed on this level or on the same level as the enterprise historian.

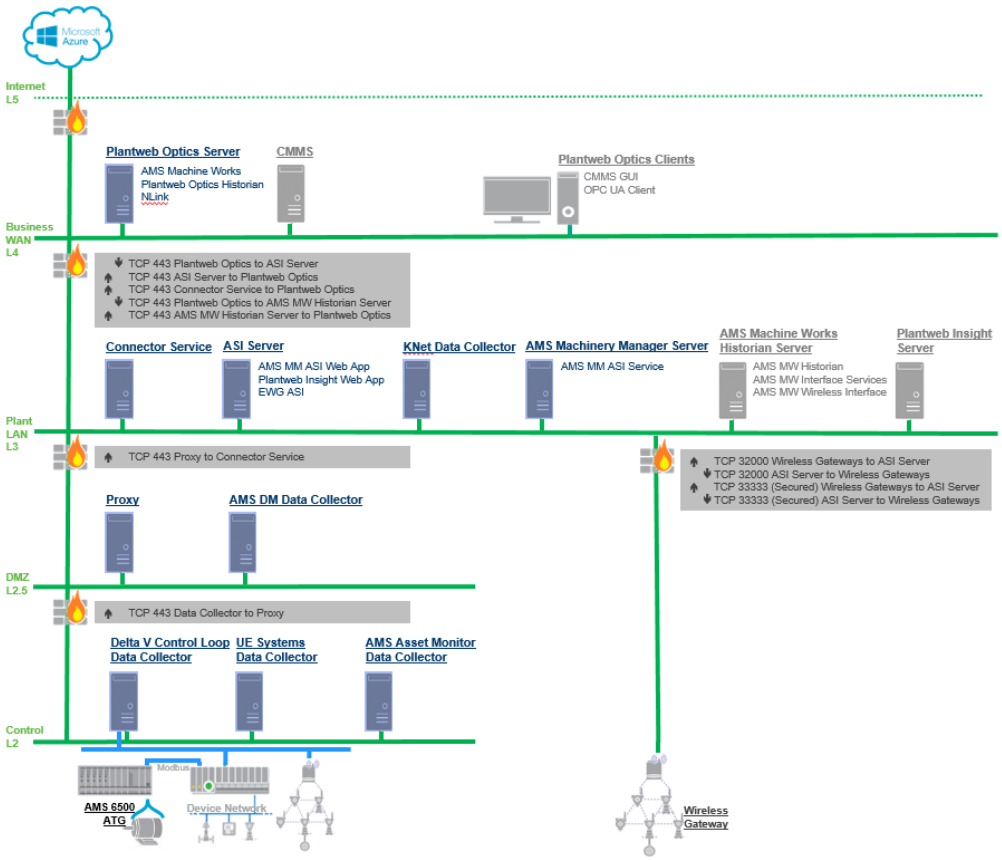

Figure 7 - Architecture showing Plantweb Optics Installed on L4

More information on network considerations is included in the Plantweb Optics Planning Guide.

Potential Obstacles to Success

There are a few potential barriers in the successful deployment of Plantweb Optics. A successful deployment of Plantweb Optics means that the enterprise has moved the reliability practice from preventative to predictive asset management. This means that the organization has changed work practices and now have new work practices in place. There are technical as well as organizational challenges with the latter being the most difficult to overcome. Discussions around these barriers are included below.

Organizational DNA / Inertia

Plantweb Optics has been designed to move users' installations from Preventative Maintenance work practices to Predictive Maintenance. This requires changes in work practices. Some users install Plantweb Optics with the expectation that they will get significant results without thinking and behaving differently. They will be disappointed.

All organizations have inertia that keeps work practices the way they are. There is natural resistance to change. Without an empowered cheerleader who drives change, the results of a Plantweb Optics install will be sub optimal.

The various users should be made aware of the big picture and mission. With this understanding, the various users are more likely to participate in changing the game and working differently.

IT OT[5] Collaboration

Plantweb Optics is generally installed in L4 (Purdue model) and is connected to data sources in L2. There are often numerous firewalls between L4 and L2 with different owners. It is essential that these teams work together in making these connections happen.

Further, there are organizations that are averse to the use of phones. Objections vary from safety to video privacy. Whilst a phone is not a requirement to Plantweb Optics success, it sure helps. There are industrial phones that are available with hazardous area appr ovals, camera or no-camera option, cell or no cell options that can overcome these objections. A no-camera, no-cell Wi-Fi enabled 'phone' is a rugged handheld that can readily be used with Plantweb Optics with few objections.

AMS Device Manager Connector

Some believe that for Plantweb Optics to be of value, every field device must be correctly configured. In recent versions of AMS Device Manager, Emerson has implemented pre-configured alert settings to reduce nuisance alerts out-of-the-box. These settings are also available as "Default" templates that can be applied to existing AMS Device Manager installations. These optimized field device alert settings can be used to ensure little to no configuration effort for a successful Plantweb Optics implementation.

Users are tempted on older installations to spend pre-install time developing device templates and downloading to the field devices. This can be an arduous process that can extend over many months.

Rather, it is recommended that Plantweb Optics be deployed on the AMS Device Manager installation as is (so long as alerts appear in AMS Device Manager Alert Monitor) and realize value immediately. Over time the field installation can be improved.

DCS/PLC Infrastructure

AMS Device Manager in unable to connect to some DCSs and PLCs especially the older variants. Refer to the AMS Device Manager Product Data Sheet on the web site to see if the DCS/PLC under consideration is supported.

Some DCSs/PLCs support non-HART classic I/O cards. It is not possible to determine the health of field devices without HART supported. There is a work-around – for critical devices it is possible to deploy an Emerson Wireless 775 THUM adaptor which enables the device diagnostics to be transmitted wirelessly to AMS Device Manager.

A final barrier in the DCS infrastructure: some DCSs and PLCs require significant CPU to monitor HART signals. When CPUs become overloaded, some users turn off the HART monitoring.

Field Device Infrastructure

In many of the older installations there are devices with proprietary protocols such as DE (Digitally enhanced), Foxcom, Brain and others. None of these protocols are supported by AMS Device Manager. Unfortunately, these field devices must be replaced.

Also, in some of the older installations, there are older field devices that are 4-20mA only. There is no way to get any diagnostics out of these devices. Unfortunately, these field devices must be replaced.

Over the last two decades, almost all smart field have shipped with either FOUNDATION fieldbus or HART. If the installation under consideration is recent, odds are that they digital infrastructure is in place.

Security

Plantweb Optics connects assets to people via wireless or internet. Unfortunately, there are hostile

[5] Operations Technology

organizations that want to hold organizations to ransom or, worse, cause disruptions in plants. Consequently, organizations have taken steps to ensure that their industrial installation are protected.

A small percentage of plants have taken draconian measures and air gapped their systems. They do not have the system connected to L3 in any manner and have stern procedures around the use of USB sticks etc. In these systems, one can use "Asset View" of AMS Device Manager to see a dashboard of field device health. One could add Plantweb Optics to aggregate health of other assets into a single dashboard and to store asset health for a longer period. Unfortunately, the aspect of Plantweb Optics that facilitates changes in work practices is not realized.

A greater percent of customers have implemented data diodes between L2 and L3. Currently there is no way to connect AMS Device Manager on L2 (or L2.5) to Plantweb Optics on L4 via a data diode.

Handhelds

In the earlier part of this document, it states that the best experience with Plantweb Optics should be with the thin client and the phone application.

Some customers do not allow the use of phones in their facility. There may be a variety of reason for this position:

- "phones do not have the right certification for industrial facilities"
- "we do not want inside plant pictures posted on the web"
- "we don't allow people to carry phone with them as they tend to walk when talking and we see this as a safety hazard"

Many are not aware of the new industrial strength phones that are available from several respectable vendors. One such vendor is Pepperl+Fuchs who have a range of industrial devices with a number of options available. Class 1 Div 2 phones are available; these can be ordered with the camera and cell service disabled. Without camera and cell service, the 'phone' is really a Wi-Fi handheld which are acceptable for use in most facilities.

Summary:

Plantweb Optics provides real-time actionable information and insights about abnormal situations to improve operational performance. Also, using machine learning, artificial intelligence, and root-cause analysis you can be predictive when maintaining your plant and intervene before assets are underperforming or require shut down.

Deploying and using Plantweb Optics tools in the right way can help to get success immediately resulting in a quick ROI. Once it is established as part of the workflow, the organization will appreciate the value in terms of uptime, availability, safety and performance.