

Technology

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Star Factory - Technology

This Wiki page summarizes all of the standards from Star Factory relating to Technology.

Guidelines for industrial systems and instrumentation design and implementation(#1)

These guidelines are useful for two main reasons:

- To get proper level of security, performance, availability while keeping cost at fair level
- To get installations in line with expectation

To do so, we recommend to:

- Develop project from corporate design documents, use general specification and customize with Particular specification where needed
- Apply best practices and recommendations as shown in these Guidelines/Standards

Complete list of Guidelines [here](#)

Guidelines for control & Safety system maintenance(#2)

While vendors tend to offer extensive but expensive maintenance contracts, selecting the adequate maintenance level is key to maintaining a good performance level while reducing expenses. These guidelines provide a view on the minimum maintenance level recommended to get basic support, update and patches, Antivirus signatures. However, depending on specific business needs, higher system maintenance level can be applied.

These recommendations will ensure availability and performance of the system throughout its lifetime while keeping them properly protected; patched and with reliable antivirus (a key element in this framework)

See guideline [here](#)

IIoT LoRaWAN implementation (#3)

This standard guides the implementation of IIoT LoRaWAN (i.e., an open protocol that enables IoT devices to use LoRa for communication, LoRa being a modulation technique for specific wireless spectrum).

The LoRaWAN technology has been selected to collect information for:

- Enhancing operational performance,
- Following machine health,
- Reducing untimely intervention,
- Increasing proactive maintenance,
- Evaluating the energy consumption.

The implementation requires the use of adequate sensors ([list here](#)), the design of the right architecture with the support of IIOT experts ([see here](#)) and to route the data collected to the relevant application (e.g., MES, Google sheet).

The use of LoRaWAN technology and wireless sensors starts with understanding the infrastructure, benefits and limitations and selecting appropriate applications. A few elements are required to implement the LoRaWAN:

- **Use case Definition** i.e., defining the scope of application and final destination for the data collected as well as clear usage for this data
- **Organization set up** i.e., Choose the local IOT point of contact to coordinate, define needs and actively support the solution in the long run
- **Hardware / Software** i.e., choice of sensors and infrastructure as well as the MES in place (i.e., AspenTek 8.8 minimum or OSIsoft 2018)

The global project requires **~3-6 weeks efforts** with **~4-12 weeks total duration** (project activities [here](#)). In practice, **implementing such technology provides the site** with:

- **Solution design** - a personalized solution and project is designed
- **IoT infrastructure** - a "ready-to-use" operational infrastructure is created (expandable to other use cases)
- **A platform managing IoT devices** is put in place
- **End users are trained** to manage the entire lifecycle of their solution / devices
- **Expert support** is provided

Expose LIMS (laboratory information management system) data into MES (#4)

The purpose of this standard is to explain how to bring laboratory results information / data to production teams at the right time with process data (i.e., Access near real-time lab results, build dashboards, access lab results in a self-service manner).

In other words, this allows to record lab results and product specification (i.e., LabWare and SAP-QM) into the Manufacturing Execution System (i.e., OSIsoft / AspenTech).

Bringing lab results data to production teams requires installing interface software in the MES (tags in the MES) and matching lab results in LIMS with tags in MES. It provides with a few basic functionalities:

- Lab Results linked to MES tags (mapping LW Analysis/Component to MES tag)
- Lab Results linked to MES batches (results integrated into MES batch data)
- Specification Limits for each MES tag (treatable inside the MES)
- SQC Limits for each MES tag (treatable inside the MES - only PI)
- Notifications when Limits are passed (only PI)

This allows to:

- Provide lab results in near **real-time** with process data for **quicker decisions** making
- **Increase quality** through analysis of Quality Control results jointly with process data
- **Increase productivity** by reducing out of specification products early in the process
- Make data available for the **use of Advance Analytics** tools connected to MES (like JMP / Dataiku) for improved optimization

A few elements are required to implement to bring laboratory results information / data to production teams:

- **Data and software** :
 - Medium digital readiness required ([readiness assessment here](#))
 - LabWare or SAP-QM as LIMS in place / MES system in place (OSIsoft/AspenTech)
 - Asset hierarchy in the MES and batch traced in MES (* Required to put lab data into batches)
- **Organization** ([Roles required to deploy LIMS data into MES](#)):
 - Local project manager (also called proxy product owner)
 - Local technical referent on LIMS for maintenance and for extension
 - Local technical referent on MES for maintenance and for extension
- **Compliance and MES prerequisites** :
 - Data compliance requirements identified (EAR/ITAR)
 - Checking MES maturity (i.e., recommended intermediate level at minima (See documents for [PI](#) and [IP21](#))

The typical steps from requesting the service offer to having it installed ranges from **3 to 6 weeks** ([Service request link](#)).

Digital Ways of Working (DWoW) (#5)

Paper-based and conventional activities within a production department are time consuming and the source of possible errors & omission. It demands a large amount of paper to be used, kept and printed to maintain business continuity and excellent handovers.

Guide to how DWoW initiatives are delivered within the digital acceleration in plants program

(scope is AppSheet, Neptune, Aidap and Google Suite Tools). DWoW are structured along 5 main categories:

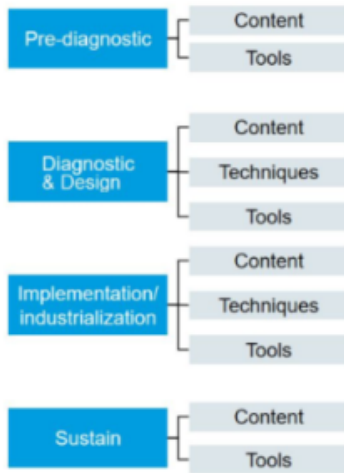
- Tracking performance (live)
- Reviewing performance automatically
- Simplifying way of working
- Optimizing task allocations

- Promoting Safety

Digital Ways of Working allow to:

- Save time in favor to value-added tasks
- Reduce errors & omissions
- Reduce the volume of printed paper & printers
- Create a modern work environment employee boost

DWOW is one of the levers of a Digital Transformation; the DWOW solutions design and deployment requires to **follow some standard steps** and the **Digital Change Agent** (see roles and responsibilities below) is a key actor in those 4 steps ([digital toolkit here](#)).



Roles and responsibilities are clearly defined (see below)

Role	Description	Involved mostly in
Platform owner	The Platform owner is responsible for the ensuring the maintenance and development of a certain application as well the support/funding for its continued operation	Implementation until sustain
Business owner / excellence center	The Business owner/excellence owner are the initiators of the project, final owners of the functional requirements, ensuring the successful implementation within the constraints that are predefined i.e. budgets, timing and scope	Pre-diagnostic until industrialization
Site Key users	Site key users are process engineers control operators or operators. They express their needs, are involved in testing the solution and they can, depending on the solutions, make changes to these solutions themselves (i.e. create Appsheets, dashboards in AIDAP, etc.)	All phases
Data architect	Designs global database architecture, rules, processes and tools to be used in order to store and retrieve data in an effective, secure and optimized way. Leads high-level data strategy. The Data architect is only useful to approve the proposed architecture in the beginning of the project limited to systems outside of industrial IT	Industrialization and sustain
App developer	The developer is in charge of materialising the application in the site context. The developer can drag and drop to create screens or apps and sometimes build code to implementing functional solutions	Implementation until sustain
Digital change agent	To coach site on ME projects (with focus on digital e.g. DWOW), to transfer change management expertise (including toolbox & methodology) to the site teams and to the site Middle management, to create the conditions to reach sustainable results and to create a mindset of continuous improvement Remark: A Digital change agent can also run ME projects into other sites, while belonging to one site organization	All phases
UX/UI developer	Understands the needs of the operators and GBU, ensures its implementation in an interface is in line with the said requirements, guidelines and safety rules in place. Not required for Neptune and AppSheet implementation.	Implementation/industrialization
IT/Enterprise architect	Is responsible for the overall IT architecture consistency. Reviews the use case and approves the IT architecture used. If a new solution is needed, participates in it's selection process. Not required for Neptune and AppSheet implementation.	Diagnostic until Sustain

4 different tools are in the scope of this standard and currently used in Solvay ([delivery model presented page 15](#) ; [Delivery governance page 32](#)):

- AppSheet
- Neptune
- Aspen One
- Google
- Eschbach
- OSIssoft
- Miro

AppSheet(#6)

AppSheet is one of the tools provided by partners within the list of solutions providers described in the standard 6 on Digital Ways of Working (see above). Please refer to the previous standard for contextual elements related to the use of AppSheet.

AppSheet has **3 main objectives** :

- Reduce paperworks

- Spread digital mindset in our plants
- Data available everywhere in the plant

The tool does so by:

- **Creating mobile apps** reading/updating your Google Sheets
- Adding features to your help **leveraging an expertise** team to help you
- Deploying the app to any hardware for operators (smartphone, tablet or pc)

This features allows team on the site to:

- Reduce paperworks
- Send alerts and notifications
- Take pictures and scan QR-code in the field
- Fast development using user-friendly templates
- Send numerical values into the MES tags
- No big connectivity investment: it works offline

A few elements are required to implement to bring laboratory results information / data to production teams:

- **Data and software** :
 - Ensure that data recorded do not have to be compliant with Dual Use Goods Regulations
 - Ensure back up for critical data (e.g., production / quality)
- **Organization** (local):
 - Project manager to ensure change management and use of the apps and the creation of a backup plan
 - AppSheet key-user to oversee the apps created at the site and insure knowledge transfer (“train the trainers”)
 - AppSheet developers to develop the required apps
- **Hardware** - Mobile devices (Smartphones, Tablets) and the hardware necessary to run the app must be bought following the procedure at this [link](#)
- **Connectivity** - Ensure that there is minimal coverage of wireless connectivity to allow synchronization of data (shopfloor WiFi or LTE connection facilitates adoption)
 - App can run offline in the workshop

The global project requires **~1-3 days of effort** with **~1 week total duration** . In practice, **implementing such technology provides the site** with:

- AppSheet training
- Self-Service of AppSheet library
- Expert support

Infrastructure assessment (#7)

This standard aims at Identifying gaps and areas of improvement of a site in order to ensure IT performance in accordance with the business requirements. This assessment requires filling out a questionnaire completed by the visit of an expert on the site.

Private APN service (#8)

Introduction

Private APN service is an alternative solution to allow quick implementation of remote connections in factory areas not covered from wifi solvay without infrastructure investments. This allows connection from Data mobile devices via the wireless “Mobile Operators” network (3G/4G).

This Solution gives a good flexibility to access Solvay applications in plants from Smart Devices without installing a costly physical infrastructure (LAN switches, WiFi). The main features of such solution are list below, **it provides** :

- A connexion from any device (tablets, smartphone, barcode readers,)from everywhere with 3G/4G connectivity to all applications declared
- A Secure Virtual Wireless private Solvay Network

More details on what is an APN service [here](#)

Main advantages are:

- A cheaper solution in comparison with important implementation cost of infrastructure
- A fast realization of new solution in new site (through Helix ServiceONE platform)

Submission request and activation

Submission request can be done through Solvay One under IT Foundation > Telecom Connectivity > Private APN Solutions

see [here](#) for further details (walk through)

Private APN activation requires the following steps:

- Check the presence of the OBS coverage (3G/4G) in the Solvay’s site partner 3G/4G coverage (Private APN Site Coordinator)
- Define the list of Applications that have to be accessed and send list to mobility team (Private APN Site Coordinator)

- Open Solvay Firewall / Organize OBS security service / define SIM list / send SIM to the the site / test the access (Global Telecom Mobility Team / Private APN Coordinator)
- Receive SIM / Configure Device with Private APN settings + MDM + AE_COBO + send to Mobility team device IMEI to allow data traffic (Wisdom Team / MDM Team /Private APN Coordinator)

More information on activation [here](#)

More detailed guide for installation [here](#)

Main requirements

- Connectivity
 - Private APN networks require the 3G / 4G coverage provided by the network of Mobile Carriers partner of Orange Business Network.
 - This 3G /4G coverage has to be present in all the Solvay's factory areas where we plan to have remote connection
 - The list of the current Country's carriers is [available here](#)
- Hardware - Android devices (Android Enterprise installed) are eligible for Private APN solution (Tablets, Smartphone, Bar Code readers with 3G /4G interface)
- Organization - Need for an IS site coordinator, an Private APN contributor and Service One process / request defined

MES upgrade policy(#9)

Introduction

This standard describes how MES (i.e.Manufacturing Execution Systems, a set of Servers, Network assets and Applications to collect, record and use Industrial Process data) systems are managed and explains the process to upgrade such systems.

MES Management

MES System design is done by Digital & Technology (DT) organized into Platform teams (Intelligent Asset, Hybrid & Cloud, Enterprise Architecture, Information Security & Compliance) and Manufacturing Operations Product manager

MES Systems roll-out is done by DT Platforms (i.e., Intelligent Asset for MES applications and Hybrid & Cloud for infra assets (servers and networks))

MES systems Administration and support is done by DT platform

more on MES management [here](#)

Policy server upgrade guidelines

Why?

The hosting infrastructure is getting too old (assets, Operating Systems)

The application version is no longer supported by the vendor

There is a need to use some features not available in the installed version

Who?

Can be requested by Site, Product manager or DT platforms

Will be performed by DT platforms

What?

Only Current version is eligible for installation

May require hardware upgrade

Existing data will be preserved

When and where?

Whenever necessary (usually each system is upgraded every 5 years)

Usually done for one site but can be global as well

more on MES upgrade [here](#)

List of recommended applications (#10)

Many industrial related applications exist with some of these either overlapping with each other or in the process being decommissioned. It is therefore crucial to focus our energy using the group standard to ensure some level of harmonization as well as sustainability, LT support, and savings.

In order to do so, the recommended solutions have been mapped for each critical industrial process.

Guidelines for dashboarding construction in digital applications (#11)

This standard describes the applications available in the Solvay environnement in order to develop dashboards to visualize / analyze industrial data.

As there is no ONE size fits all dashboarding applications, the choice of the right application depends on the type of industrial data in scope. For instance, when **no real-time** display of data is required, generic tools like Tableau can be leveraged. However for **real-time data**, either specific industrial tool like PI Vision, Aspenone (and SeeQ in test) are recommended.

Guidelines for IT/OT scope clarification (#12)

Computers, networks, softwares are widely used in companies, to provide office automation as well as for production purposes. As constraints & priorities are significantly different depending on use, organization guidelines also need to be different. It is therefore crucial to clarify roles, responsibilities, priorities and accountabilities to ensure organization efficiency.

This standard clarifies 3 elements based on functionalities, priorities and architecture:

- **IT:** Office Automation, company management tools, data storage and associated infrastructure
- **OT:** Production Automation, Production data collection and short term storage
- **IT/OT:** aspects related to OT but managed/hosted on IT infrastructure like MES, Cybersecurity

This leads to concrete **impacts** :

- As priorities and responsibilities are clear, gaps, lack of accountability, and lack of focus are avoided
- Create an interface helping to have efficient collaboration, interaction and data transfer between IT and OT

Guidelines for Wireless Technology Selection in process facilities (#13)

In the context of field instrumentation deployment within Solvay it is key to understand what wireless instruments are used for (for what type of information). Moreover, it is also crucial to understand what technology can be used to avoid risk of mis-use and potential associated incidents/accidents.

These guidelines help users in their decisions when it comes to wireless technology selection. More specifically, a guide in relation with IIOT based on LoRaWan standards has been elaborated, describing where it can be used and where it cannot.

This leads to concrete **impacts** :

- Selection of the right technology for the targeted purpose
- Limit risk linked to miss-used technology
 - By improving availability
 - Ensuring high safety standards

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Playbook

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- [DWO \(#5\)](#)

Key Documents

- [Infrastructure assessment \(#1\)](#)
- [Detailed roles & responsibilities \(#3\)](#)
- [LoRaWan Gateways Introduction \(#3\)](#)
- [Roles to deploy LIMS data into MES \(#4\)](#)
- [Technical presentation Aspen IP21 \(#4\)](#)
- [Technical presentations OSIsoft PI\(#4\)](#)
- [AppSheet use charter \(#6\)](#)
- [Example of infrastructure assessment \(#7\)](#)

- List of local Support / Coordinator (#8)
- MES Upgrade Policy (#9)
- List of existing dashboards (#11)
- IT / OT / IT-OT Modernization (#12)
- IA&E /Intel Asset pltfm meeting 20-01-2022 (#12)
- IT-OT foundations (#12)
- IIoT Architecture Final (#12)

Guidelines

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- Clear guidance on how to maintain the solution (#3)
- IIoT LoRaWAN Brainstorming idea (#3)
- LoRaWAN Gateways starting guide (#3)
- Situation Gateways (#3)
- Guide on P-APN/Fluid (#8)

Use Cases

- Jemeppe use case (#3)
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Standards

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- APN Service (#8)
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- Wireless Technology Selection (#13)

Key contact

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- Fabio Zattarin (#8)
- JM Pierotti (#9)
- Jeremy Fry (#10)
- Antoine Roy (#11)
- Maximilien Simons (#12, #13)

Key trainings

- IIoT LoRaWAN Awareness training (#3)
- Training offer, courses and webinars (MES portal)(#4)
- AppSheet Online training (#6)

Linked pages

- Support (MES portal)(#4)
- MES user community (#4)
- Freshdesk support (#6)
- AppSheet Wiki (#6)
- Solvay App Catalog (#6)
- Digital community (#6)

- [Telecommunications Portal \(#8\)](#)