A&T Seminar 29 Sep 2016

Asset & Maintenance Management at CERN with Infor EAM

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EDMS: **1721874**

Agenda

- **Asset & Maintenance Management**
- Infor EAM – our AMM Platform at CERN
- Infor EAM in Action
- Roadmap & Next steps

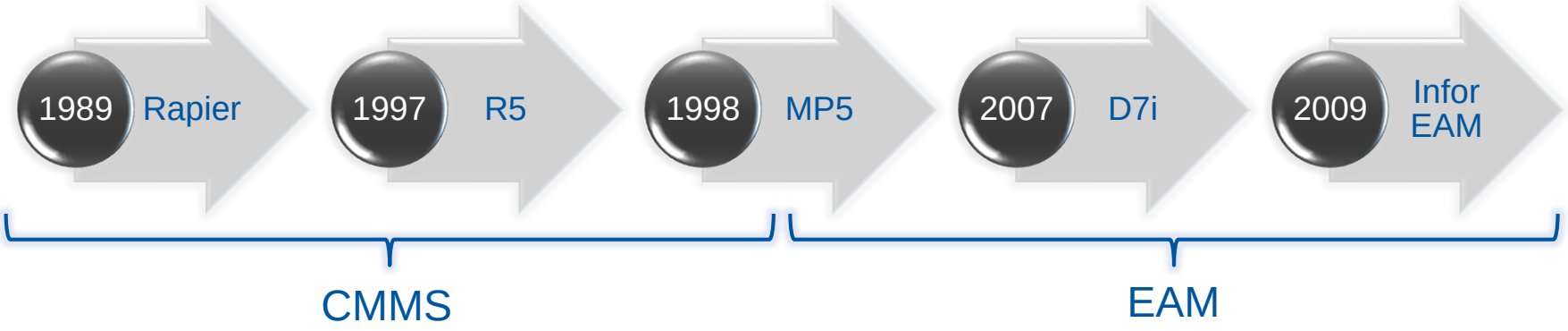
Asset & Maintenance Management

- Asset Management is the coordinated activity of an organisation to realize value from assets.
- An asset is an item, thing or entity that has potential or actual value to an organisation

- Asset management is the systematic approach of deploying, operating, maintaining, upgrading, and disposing of assets cost-effectively.
- Dedicated IT tools are in many cases used to support these efforts.

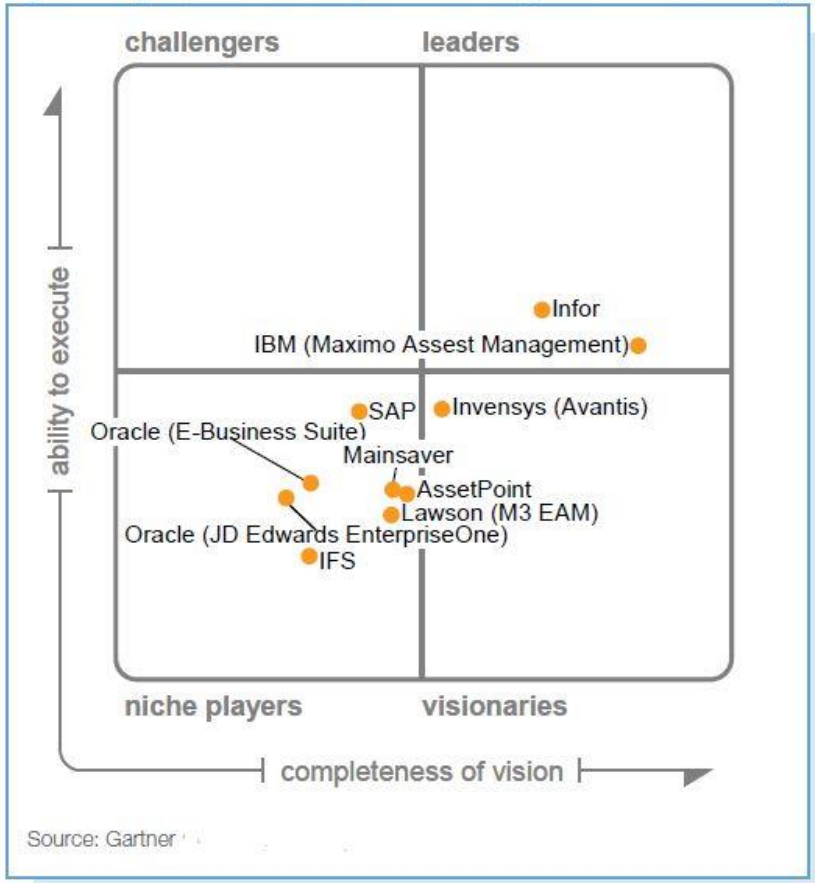
Asset & Maintenance Management

- Computerized Maintenance Management Systems (CMMS) have over time often grown into complete Enterprise Asset Management (EAM) systems.
- A CMMS is essentially about managing the maintenance work necessary to sustain an asset.
- An EAM system manages the asset over its lifecycle to minimise cost and risk while maximising output.



Asset & Maintenance Management

Figure 1. Magic Quadrant for Enterprise Asset Management for Manufacturing



2014

- Infor EAM is still after 20+ years one of the top systems on the market.

2015:

2015 Plant Engineering PRODUCT of the YEAR Grand Award

2016:

PEOPLE'S CHOICE STEVIE® AWARDS

Agenda

- Asset & Maintenance Management
- **Infor EAM – our AMM Platform at CERN**
- Infor EAM in Action
- Roadmap & Next steps

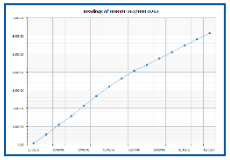
Asset & Maintenance Management

MTF
Manufacturing & Testing

Infor EAM
Enterprise Asset Management

TREC
Radioactive Traceability

BI
Business Intelligence / Reports



PPE
Plant, Property & Equipment

Web Services API
Used for integrating with other applications.

CERN-wide service: Support, Training & Systems

Infor EAM at CERN: In numbers

1.9 M
Equipment

- 960k Assets
- 750k Positions
- 160k Systems

850 k
Documents

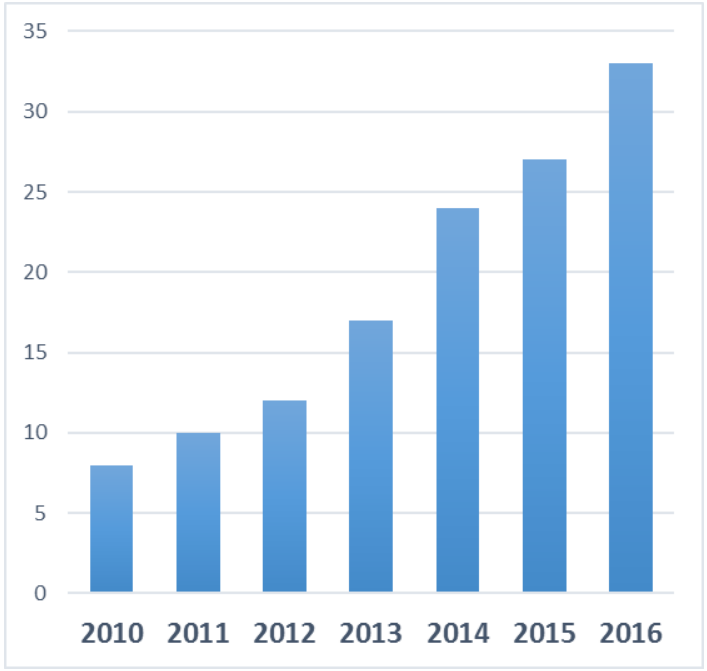
150 k
Work Orders / year

- Average last 10 years
- Peaks: 225k WO/year
- Total: 2.7 M WO

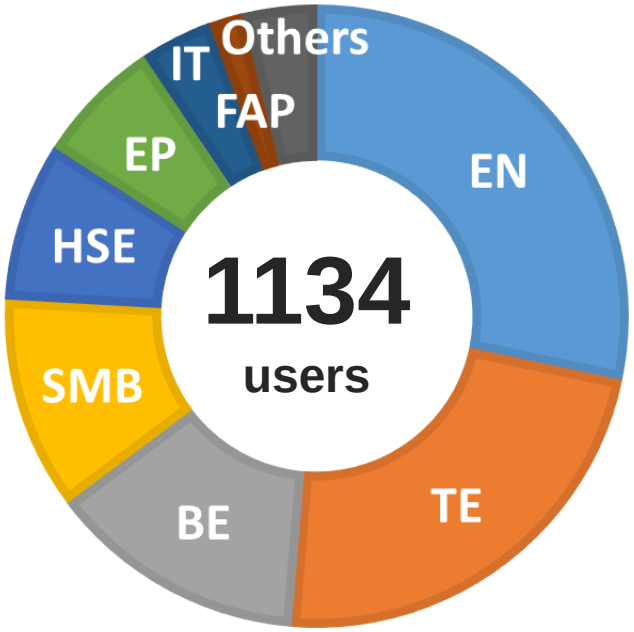
13 M
Tech. parameters

Growing interest in Infor EAM

Groups using / start to use Infor EAM



Users last 12 months



Infor EAM at CERN: Q2 2016

BE	EN	TE	SMB	HSE
BI	ACE	ABT	SC	RP
CO	CV	CRG	SE	SEE
ICS	EL	EPC	SIS	FB
OP	HE	MPE	SMS	
RF	MME	MSC		
	STI	VSC		

IT	EP	FAP	IR
CDA	ATLAS	ACC	ECO
CS	CMX		
CF	DT		
	ESE		

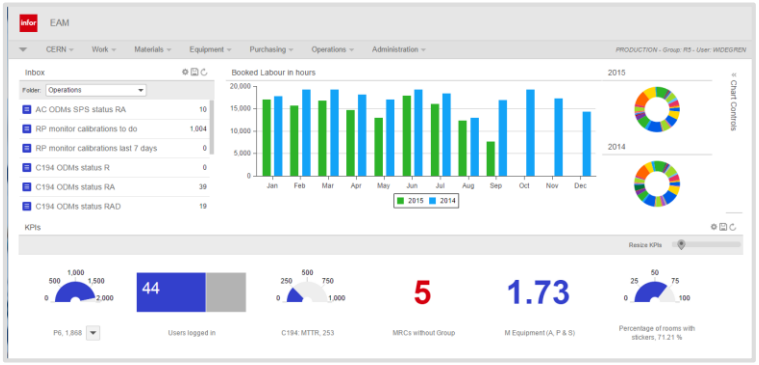
Usage:

Intense
Medium
Light

Infor EAM at CERN

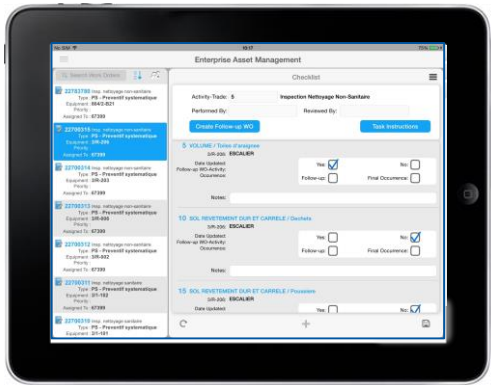
Infor EAM

Full / Expert Web Interface



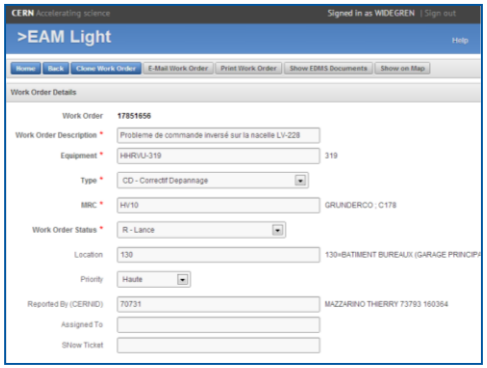
Infor EAM Mobile

Offline Tablet Application



EAM Light

Simplified / Limited Web Interface



Different user profiles – different user interfaces!

Infor EAM at CERN: Offering

Infor EAM
Full / Expert Web Interface

EAM Light
Simplified Web Interface

Infor EAM Mobile
Offline Tablet Application

User Interfaces

Equip. Management
- Technical Characteristics
- Structures & Relations
- Asset Inventory
- Equipment Configuration
- Meter Readings
- Warranty Management
- Linear Equipment
- Operator Checklists
- Financial Depreciation (PPE)
- Costs Management
- Replacement Forecasting
- History Log
- Etc…

Work Management
- Correction Maintenance
- Preventive Maintenance
- Predictive Maintenance
- Resource Management
- Inspections & Checklists
- Deferred Maintenance
- Reliability Calculations
- Scheduling & Load Balancing
- Project Management
- Maintenance Campaigns
- Contract/Rental Management
- Fuel & Energy Management
- Safety Management

Part Management
- Materials Management
- Store Management
- Stock Replenishment
- Store Issues & Returns
- Physical inventory Count
- Goods Receipt & Return
- Associated Material Lists
- Pick lists Generation
- Kit Management
- Material Analysis
- Purchase Order Generation
- Requisition Generation

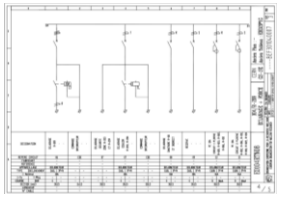
Business Intelligence
- PDF Report Generation
- Interactive Reports
- KPI Calculations
- Dashboards
- Data Warehouse
- Alerts & Warnings
- Filtered Inboxes
- Performance Analysis
- Data mining
- Planning & Forecasting
- Compliance documents

System Integrations
- GIS & CERN Locations
- CCC/TI & Service-Desk
- Layout DB
- TREC & RADOS
- MTF
- SCADA / PVSS
- IMPACT & Planbook
- EDH & AIS Foundation
- BAAN
- ADAMS
- SAILOR
- GESMAR
- EPAK

Document Management
- Leveraging the full EDMS/CDD Functionality & Data
- Equipment Documentation (Specifications, Drawings, Photos,…)
- Work Order Documentation (Reports, Measurements, Photos, Videos,…)
- Parts Documentation (Datasheets, Drawings, Specifications, Photos,…)

Integrating tools and processes

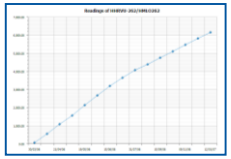
Document Management



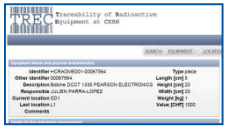
CCC & Service Desk

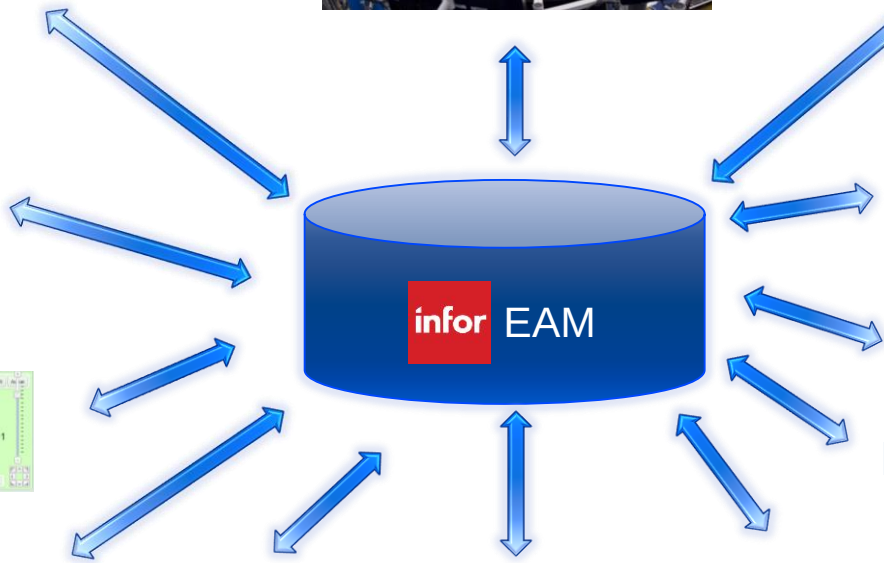
Product Lifecycle Management (PLM)

Reporting tools



Tracing radioactive equip.





GIS

Accelerator Layout DB

Manufacturing & Tests

Planning tools

SCADA

IMPACT

ERP

Contractor's CMMS

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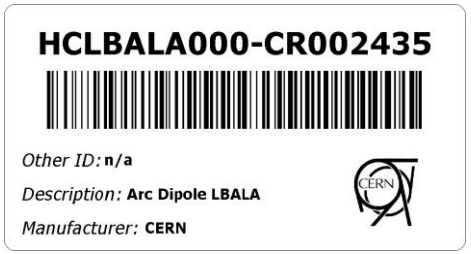
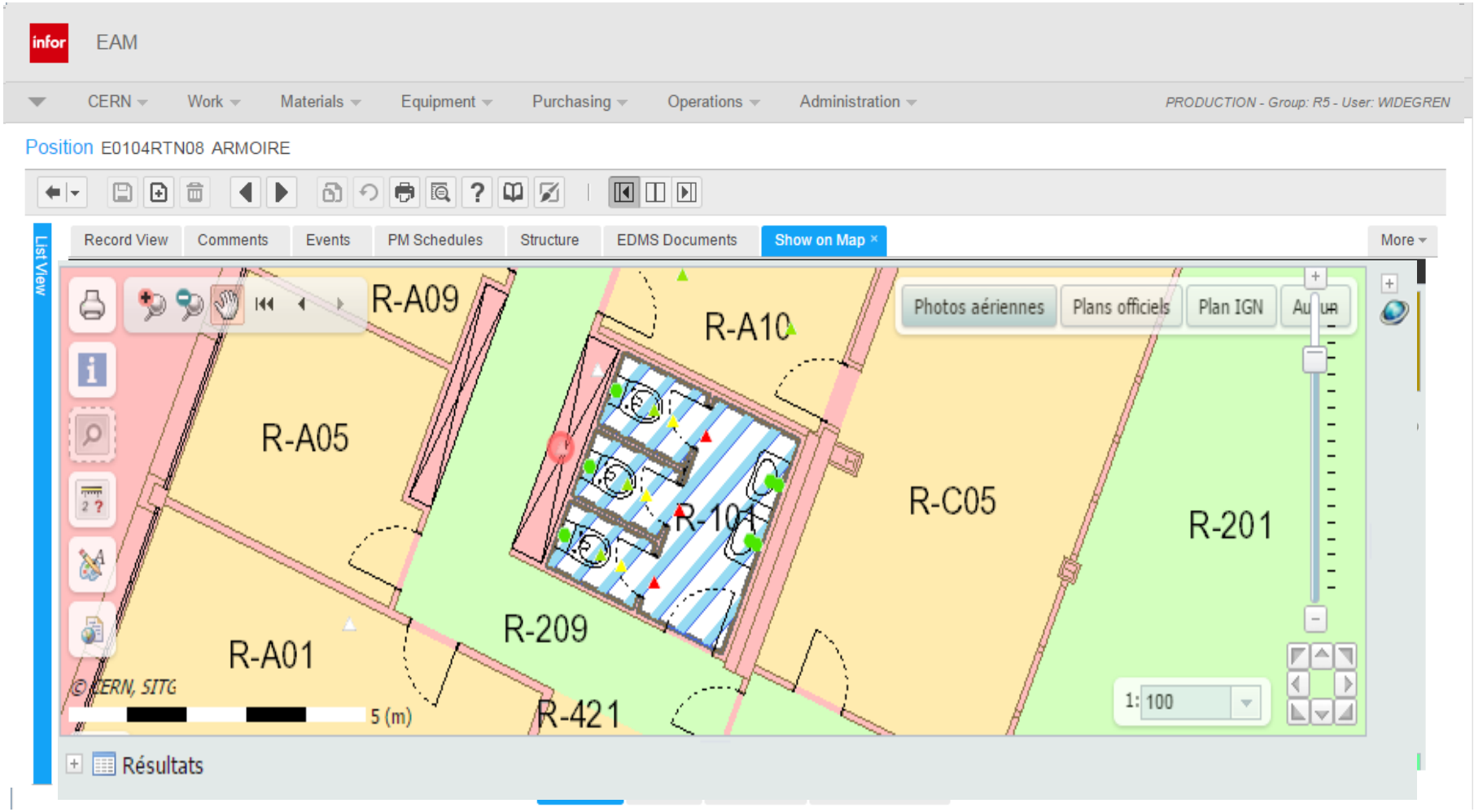
- **Infor EAM in Action**
- Roadmap & Next steps

Managing Equipment



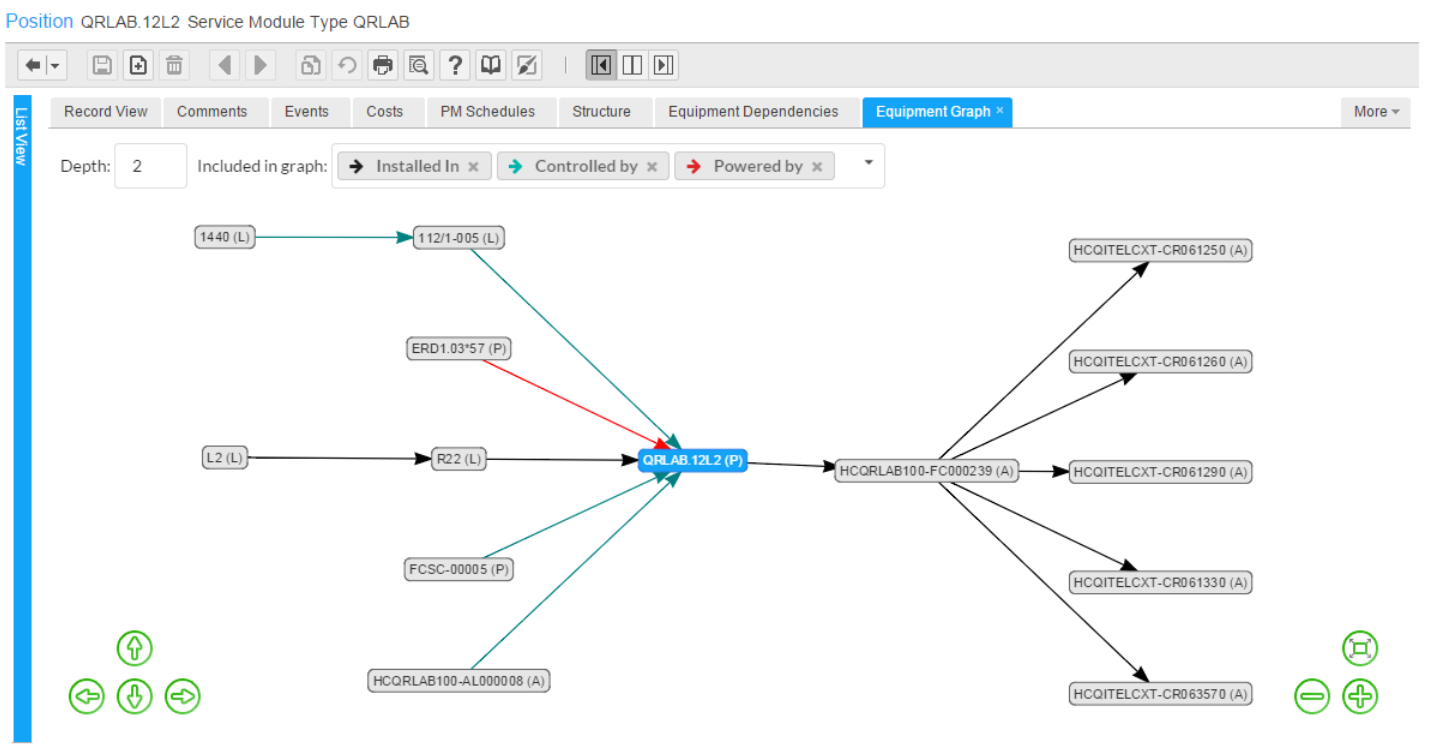
- Identify, track, locate and manage status.
- Associate technical characteristics and measured parameters.
- Link documentation and photos
- Create structures and manage assembly configurations.
- Log meter readings, inspections and comments.
- Access a complete historical record, including location and status changes as well as all maintenance interventions.

Example: Managing Equipment



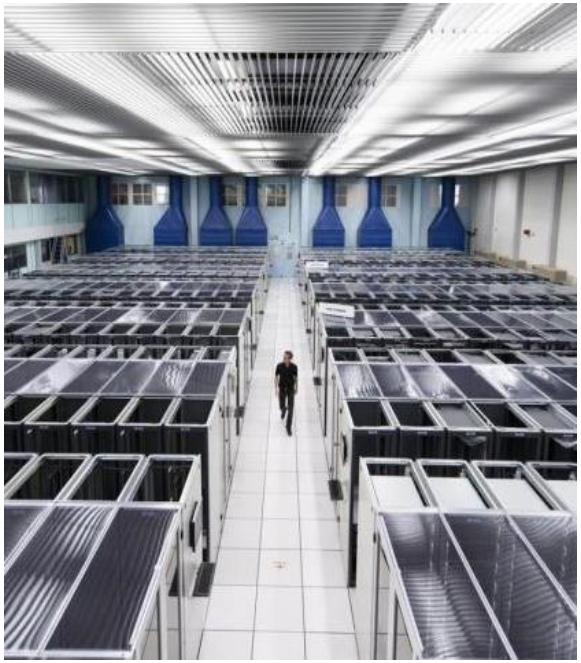
Example: Equipment Dependencies

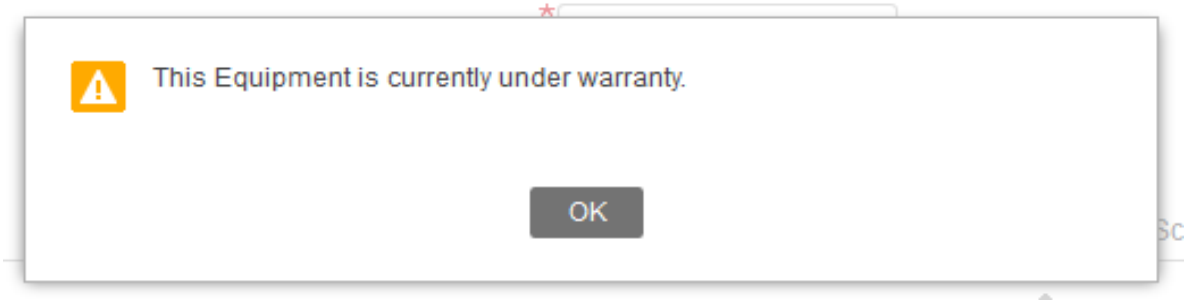
- Possible to model and visualize dependencies between equipment.
- Dependencies can be stored in Infor EAM or in tools like Cabloteque, Layout DB, etc.



Example: Equipment Warranties

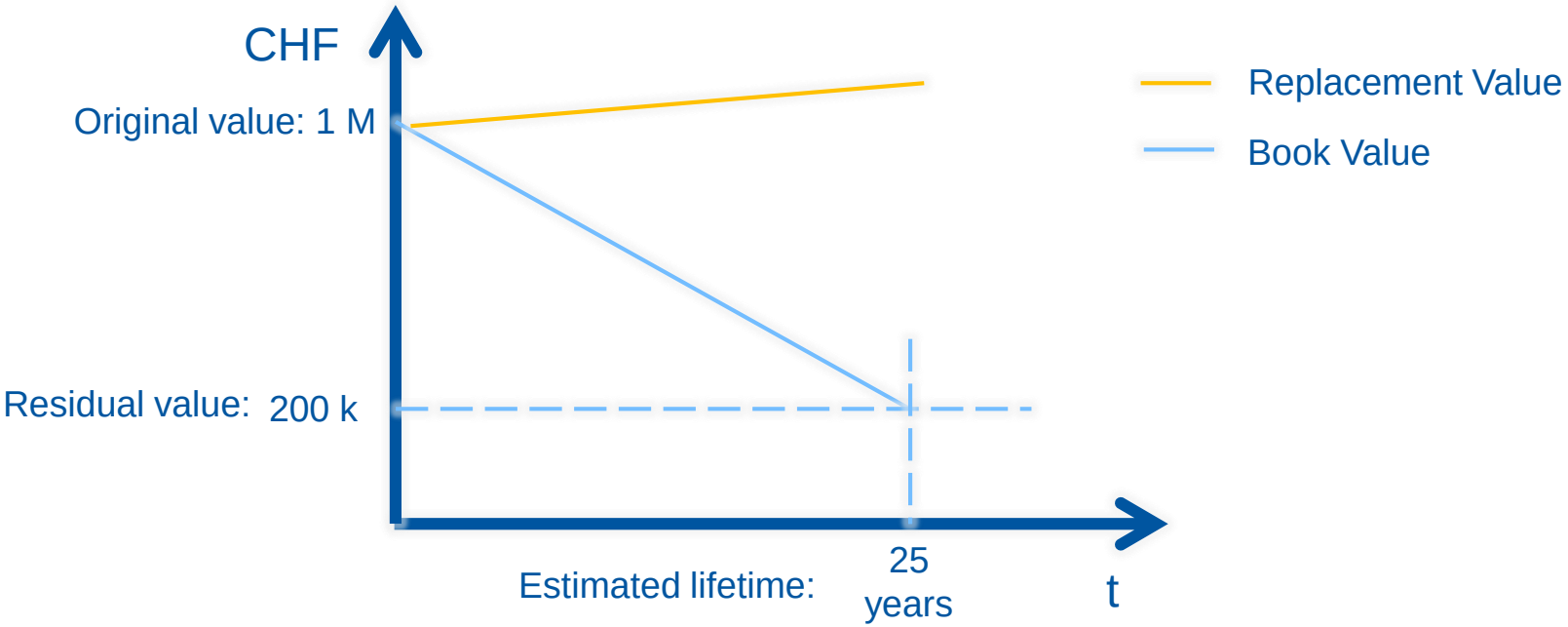
- **Example from our Data Center.**
- All servers are managed in Infor EAM. (20k Assets)
- Lifetime of servers 3-5 years. Warranties normally 3 years.
- Significant savings possible for repairs





Example: Financial Depreciation

- Infor EAM is since 2015 our official Property, Plant & Equipment register for financial depreciation of assets.
- Includes ~30k equipment with an original value of ~12 bn CHF.



Example: Financial Depreciation

Replacement Forcasting | Edit

Asset	Description	Replacement Date	Replacement Value
MFHX70-008	SOUDAGE	01-JAN-2016	1,800,000.00
MFHX52-410	FRAISEUSE	01-NOV-2017	680,000.00
MFHX55-405	ALESEUSE	01-JAN-2018	600,000.00
MFHX70-006	SOUDAGE	01-JAN-2018	500,000.00
MFHX70-007	SOUDAGE	01-JAN-2018	1,000,000.00
MFHX52-500	FRAISEUSE	03-MAY-2018	1,578,000.00
MFHX55-407	ALESEUSE	01-JAN-2019	470,000.00
MFHX45-004	ELECTROEROSION	25-MAR-2019	485,000.00
MFHX33-020	MACHINE METROLOGIE	24-NOV-2020	559,000.00
MFHX45-006	ELECTROEROSION	01-APR-2021	400,000.00
MFHX70-018	POTENCE DE SOUDAGE	31-MAY-2021	460,000.00
MFHX47-003	RABOTEUSE	01-JAN-2022	400,000.00

Work Management

Examples of different Work Management functionality used:

Corrective

- Things break down - even at CERN!

Preventive

- Time based, meter based, mixed, etc.
- Intensive use of PM Schedules
- Use of PM Plans, PM Work Packages, Campaigns, etc.

Predictive

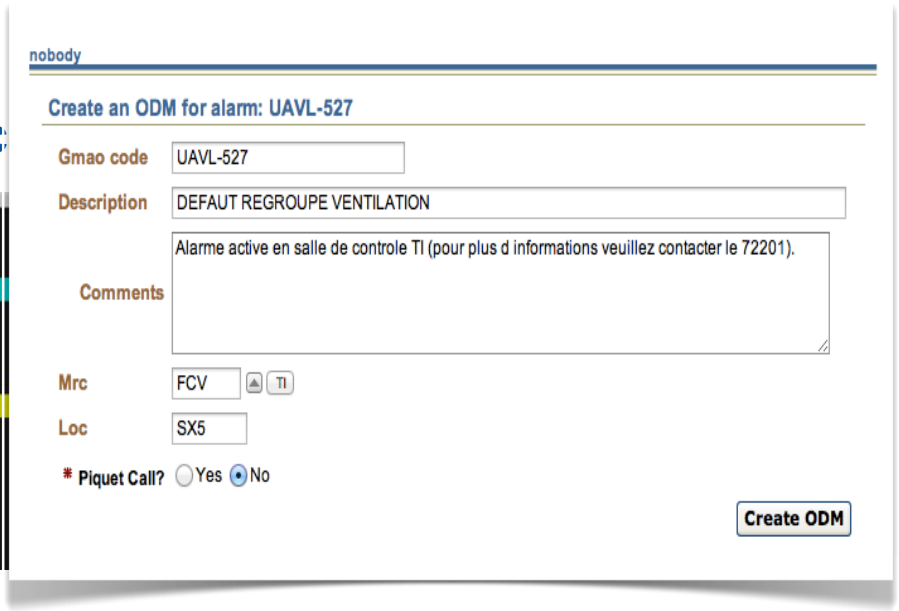
- Checklists increasingly used.
- Reliability Centered Maintenance (RCM) tools available and studied.
- Risk & Reliability module not fully explored.

Example: Corrective Maintenance

- The Technical Infrastructure part of CCC is fully integrated with the Work management module in Infor EAM.
- In case of alarms, the operator can directly decide to create a corrective Work Order in Infor EAM with a simple click.
- Over 10.000 Work Orders created per year.

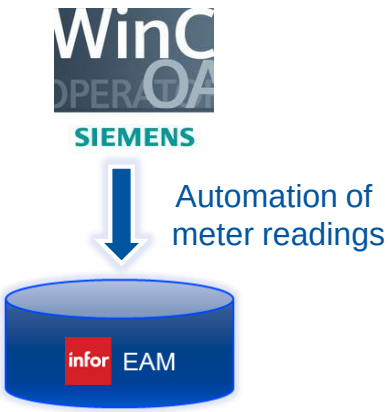
CERN Control Center – Technic

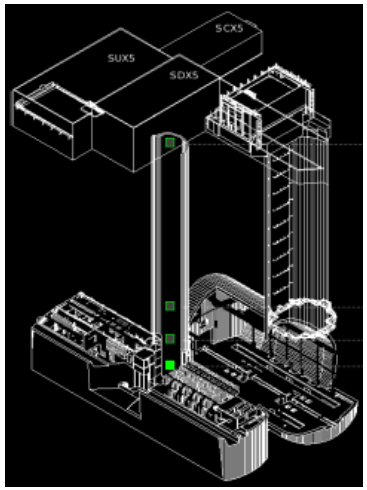
#	Date	Time	Building	Mnemonic	System Name
	26/11	08:08:03	3525	UXC55	EAU_FLUOROCARB_LHC
	1990	–	2280	SU2	THER_VENT_LHC
	03/08	18:21:44	3182	SUX1	EAU_GLACEE_LHC
	05/11	14:03:37	3585	SX5	THER_VENT_LHC
	23/11	18:39:11	3524	USC55	EAU_MIXTE_LHC
	26/11	04:08:25	null	SUX1	THER_VENT_LHC
	N	14:50:25	3580	SU5	THER_VENT_LHC
	N	14:55:45	null	SU5	THER_VENT_LHC
	01/11	16:14:33	3191	SMI2	THER_VENT_LHC
	10/11	11:37:02	2628	UX65	EAU_REJET_LHC
	22/11	09:43:33	3562	SCX5	COMM_TIM_L05
	N	14:50:25	3580	SU5	THER_VENT_LHC
	N	14:50:35	null	SU5	THER_VENT_LHC
	N	14:55:46	3580	SU5	THER_VENT_LHC
	N	14:55:56	3580	SU5	THER_VENT_LHC



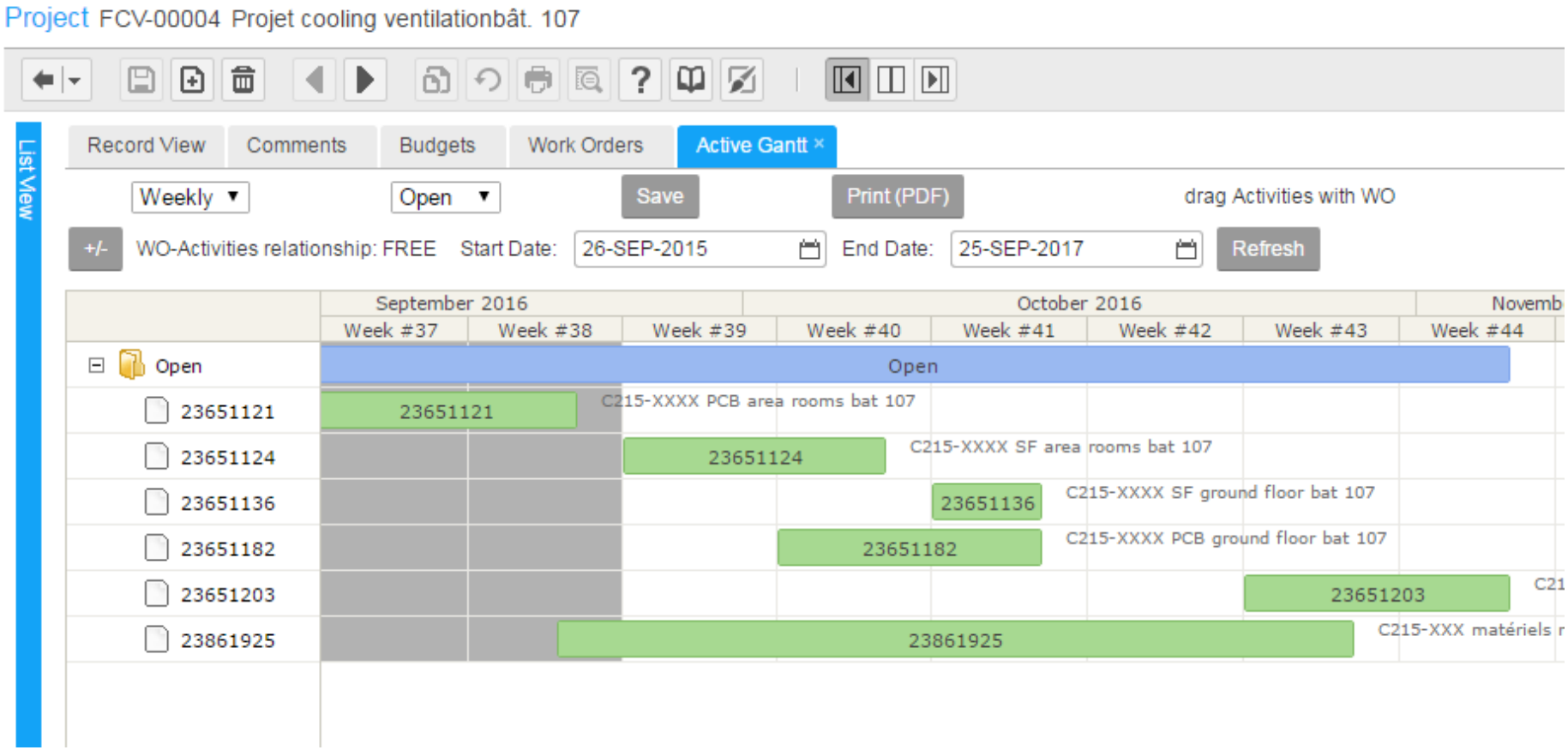
Example: Preventive Maintenance

- Automatic input of meter readings in Infor EAM from WinCC OA via TIMBER.
- Allows more optimised preventive maintenance based on actual equipment usage.
- First examples in EN/HE for LHC lifts where preventive maintenance in some cases could be reduced by 50%.





Work Planning & Scheduling



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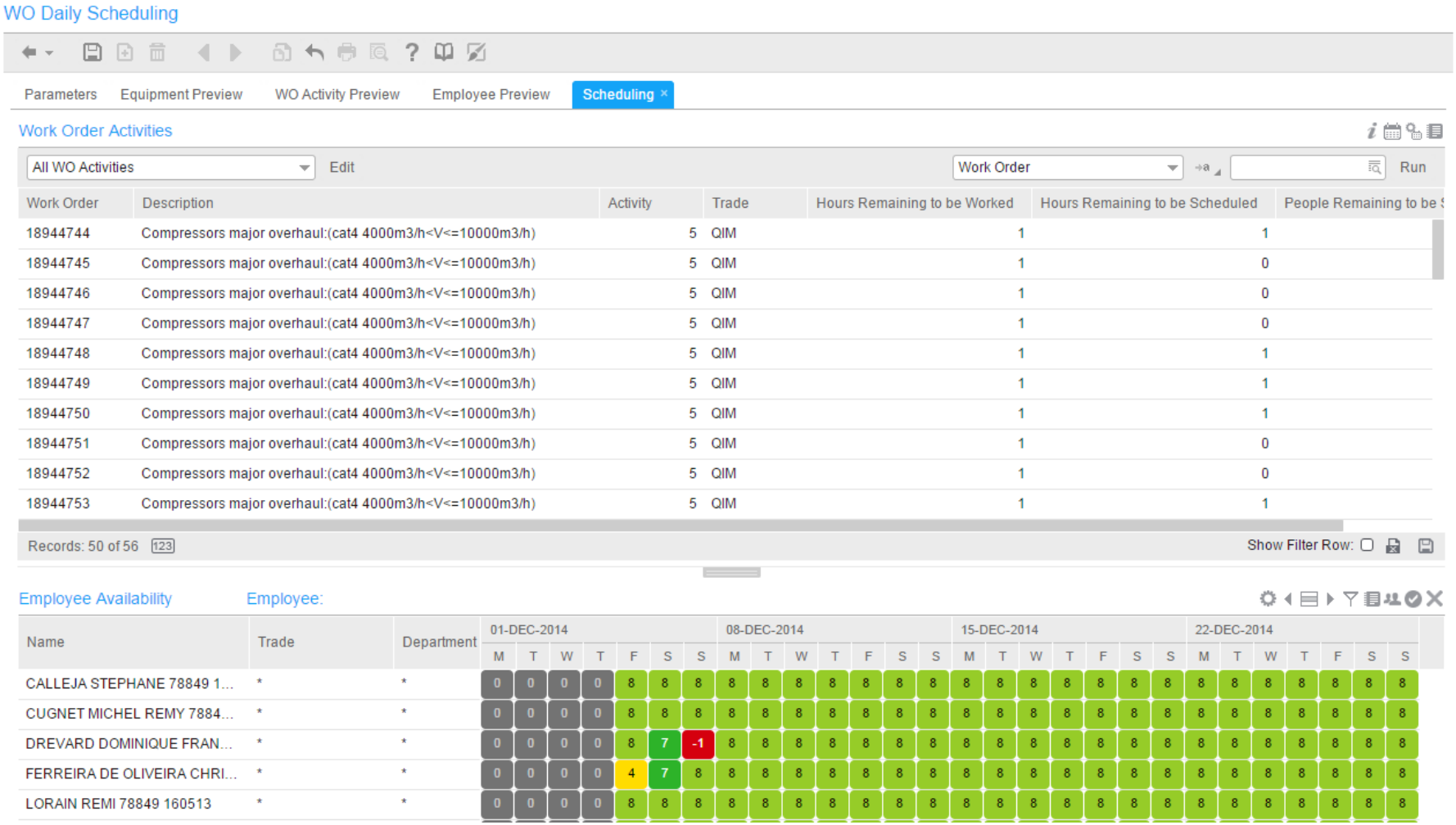
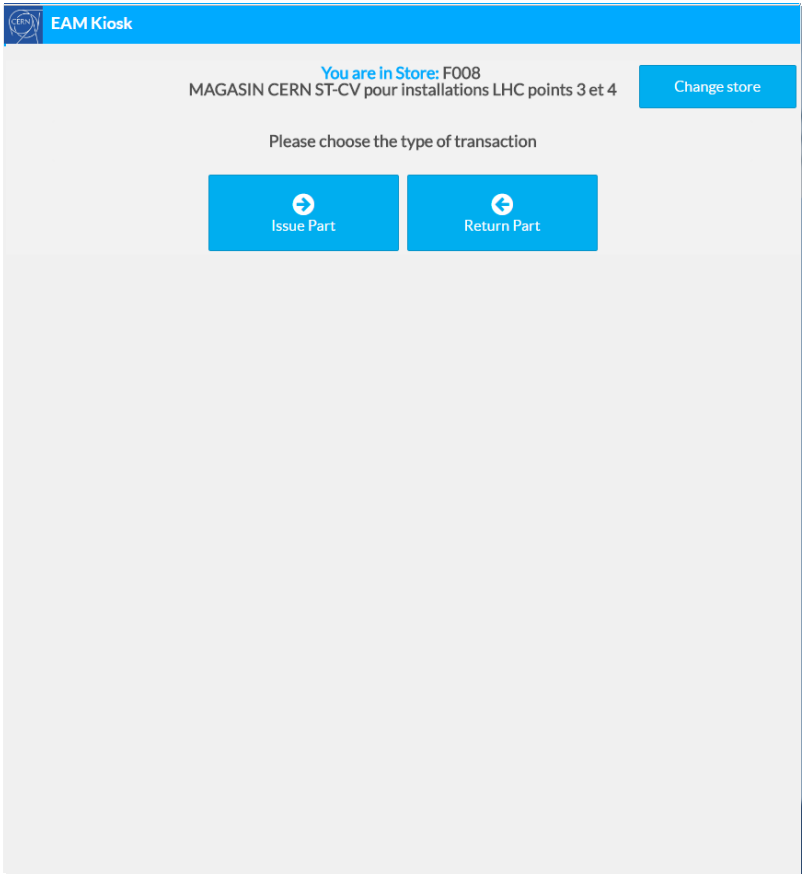


Materials/Part management

- Allows management of parts and materials required for maintenance interventions.
- Allocates materials to Work Orders and generates pick lists.
- Identifies materials that need to be purchased based on existing stock levels, forecasts and current reservations.

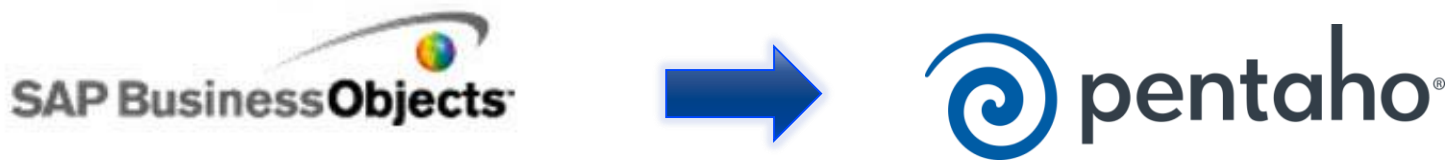
Being tested: Store room kiosk

Self-service kiosk application for quick and easy issue/return of parts in a store room.



Reporting

- Our policy to use the CERN standard reporting platform also for AMM data.
- Ongoing migration from Business Objects to Pentaho, which both are provided by FAP-AIS.
- Pentaho makes use of a data warehouse which speeds up report generation and allows interactive data analysis.
- The target is to complete the migration by end of 2016.



Examples of Reports

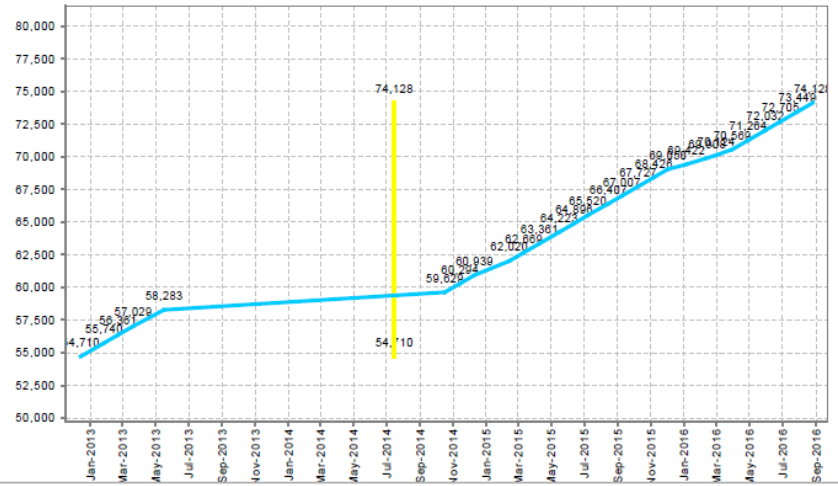
Cryogenics Meter Reading Asset

date extracted on: 12 September 2016 - 17:45:10

399588	2016-08-25 17:00:00.0	679	74,128

Intervention			
PPM Code	PPM Description	PPM Duration	PPM Date
QMCSS-4	Compressors major overhaul:(cat4 4000m3/h<V<=10000m3/h)	1	15-07-2014

Reading Values



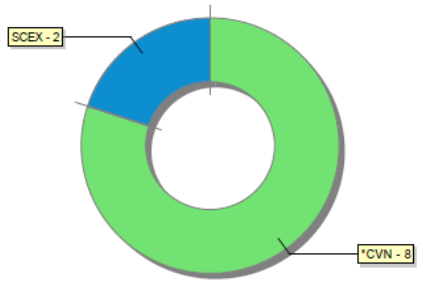
CMMS Service - Pentaho Report interface

Reliability Report

Generated on: 12 September 2016 - 17:44:02

Mean Time Between Causes - (01-01-2011 - 01-01-2016)					
Class	Class Description	Category	Category Description	Objects	Period
FIEC	CARTOUCHE A ECHANGE D'ION	All	-	269	1,826
Closing Code	Closing Code Description			Ocurrences	MTBF (days)
*CVN	VIEILLISSEMENT NORMAL			6	81,866
*CVN	VIEILLISSEMENT NORMAL			2	245,597
SCEX	EXTERNE A L'EQUIPEMENT			2	245,597
	Any cause code			**10**	**49,119**

Number of causes per closing code



Agenda

- Asset & Maintenance Management
- Infor EAM – our AMM Platform at CERN
- Infor EAM in Action
- **Roadmap & Next steps**

Preliminary Roadmap

2016 Q3

- Integrated barcode printing module in Infor EAM and EAM Light
- EAM Self-Service Store Kiosk
- Infor EAM training in CERN Technical Training programme - pilot

2016 Q4

- EAM Light 3.0 (Desktop & Mobile)
- Study of streamlined creation of DAIs in EDH from Infor EAM.
- GIS – EAM integration review

2017 Q1

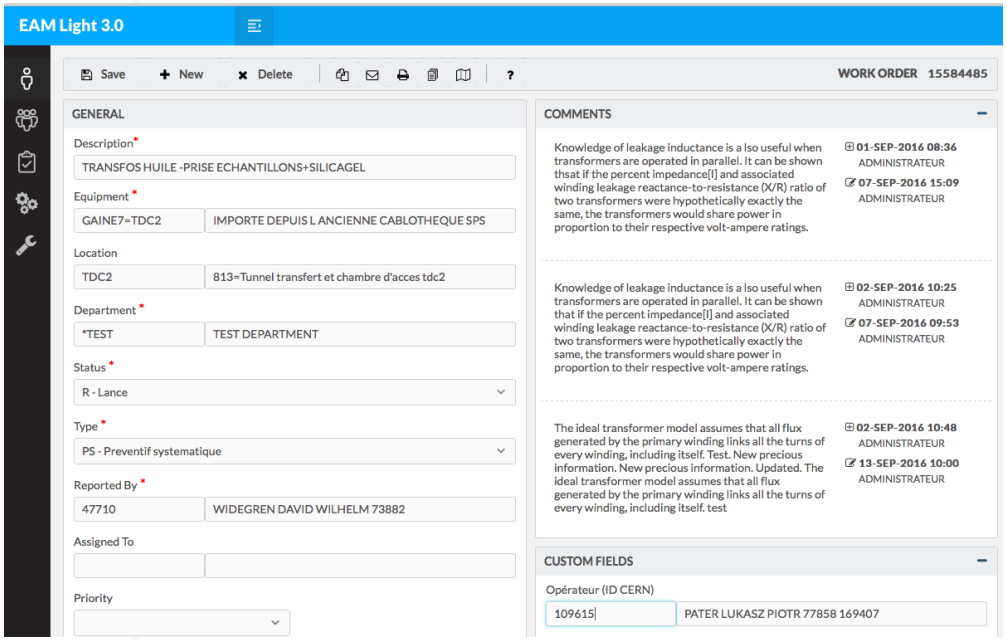
- TREC 3.0 (Desktop & Mobile)
- MTF Functionality in EAM Light
- Visualization and navigation in 2D drawings.

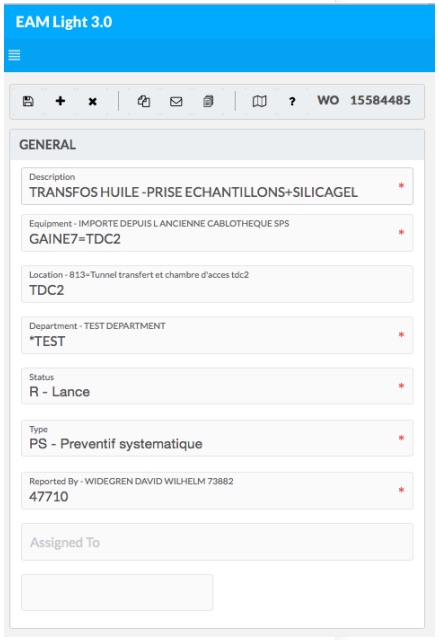
2017 Q2-

- Improved integration between Layout DB and Infor EAM
- Upgrade to Infor EAM 11.3
- Asset & Maintenance Management analytics.
- And more…

Some sneak peaks for 2016…

- Integrated barcode printing from Infor EAM: Q3
- Version 3.0 of EAM Light: Q4





CERN Technical Training

- Maintenance Management
  - 2.5-day course about maintenance management and its main principles for engineers and maintenance managers.
- Pentaho reporting and data analysis
  - Several courses available for both report consumers and report designers.
- **Available soon:** Introduction to Infor EAM
  - 3-day hands-on course covering an overview of the main functionality of Infor EAM for users.
- More trainings to come….

Continuous support

- Weekly / monthly meetings with several equipment groups
  - Coordinating deployment, extended usage or resolving issues.

- CERN Infor EAM user meetings
  - Organized 4-5 times per year with user stories, system news and mini-trainings/refreshers of functionality.
  - Next meeting: 5 Oct 10.00 in 30-7-018.

- CMMS Service Web Pages
  - Documentation, training manuals, links to tools, etc
  - www.cern.ch/cmms-service

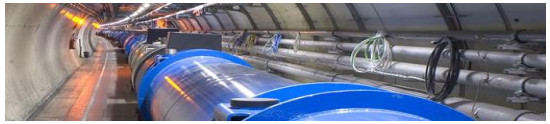
Thanks for your attention!

Questions?

(CMMS.Support@cern.ch)

Extra slides

Analytics for Streamlining AMM



Connected accelerator equipment

Control System Infrastructure

0.5 TB
stored per day

infor EAM

3 M
Work Orders

2 M
Equipment

LHC Logging DB

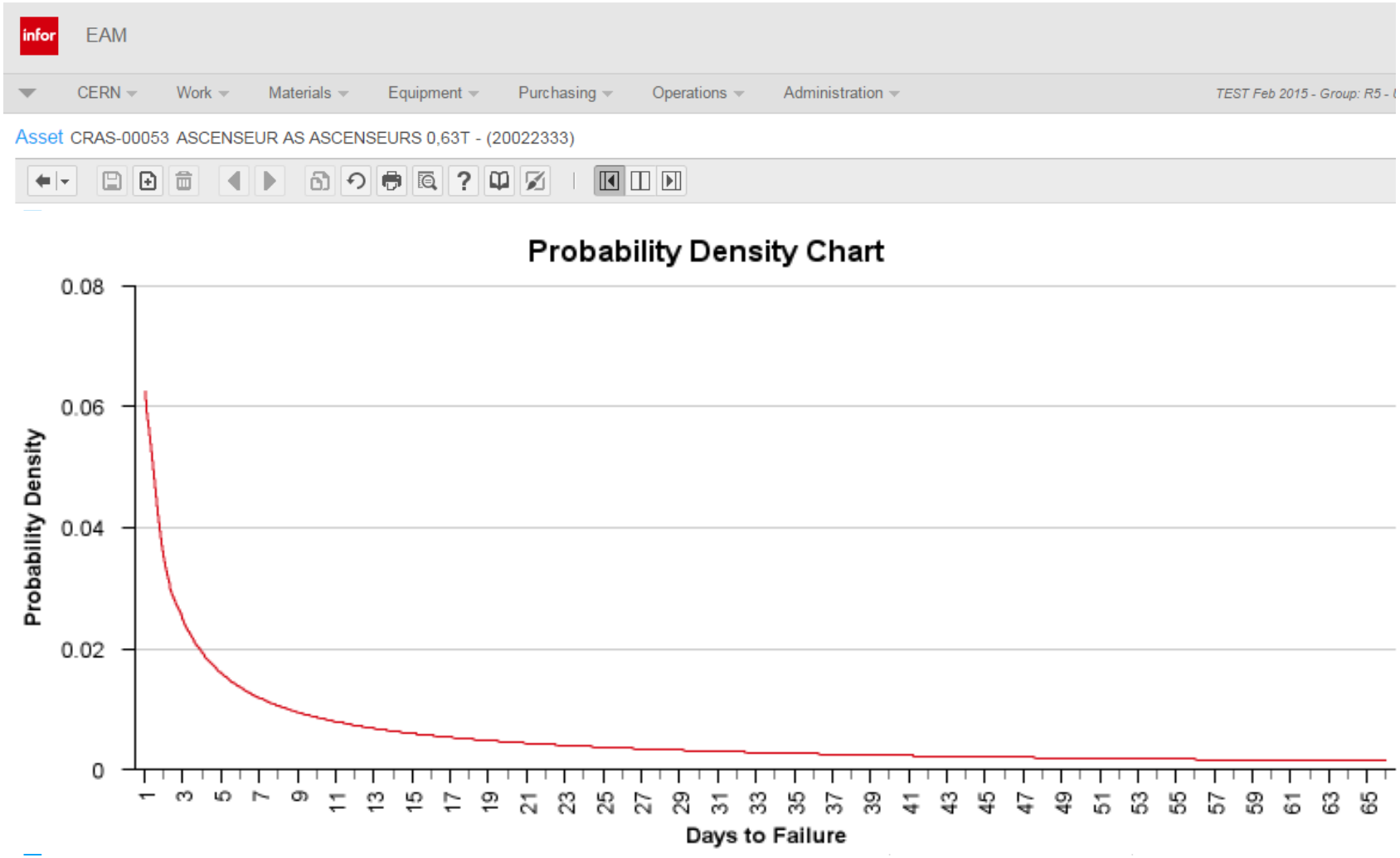
400 TB
stored data

1.4 M
signals

Data Analytics to optimise performance and costs.

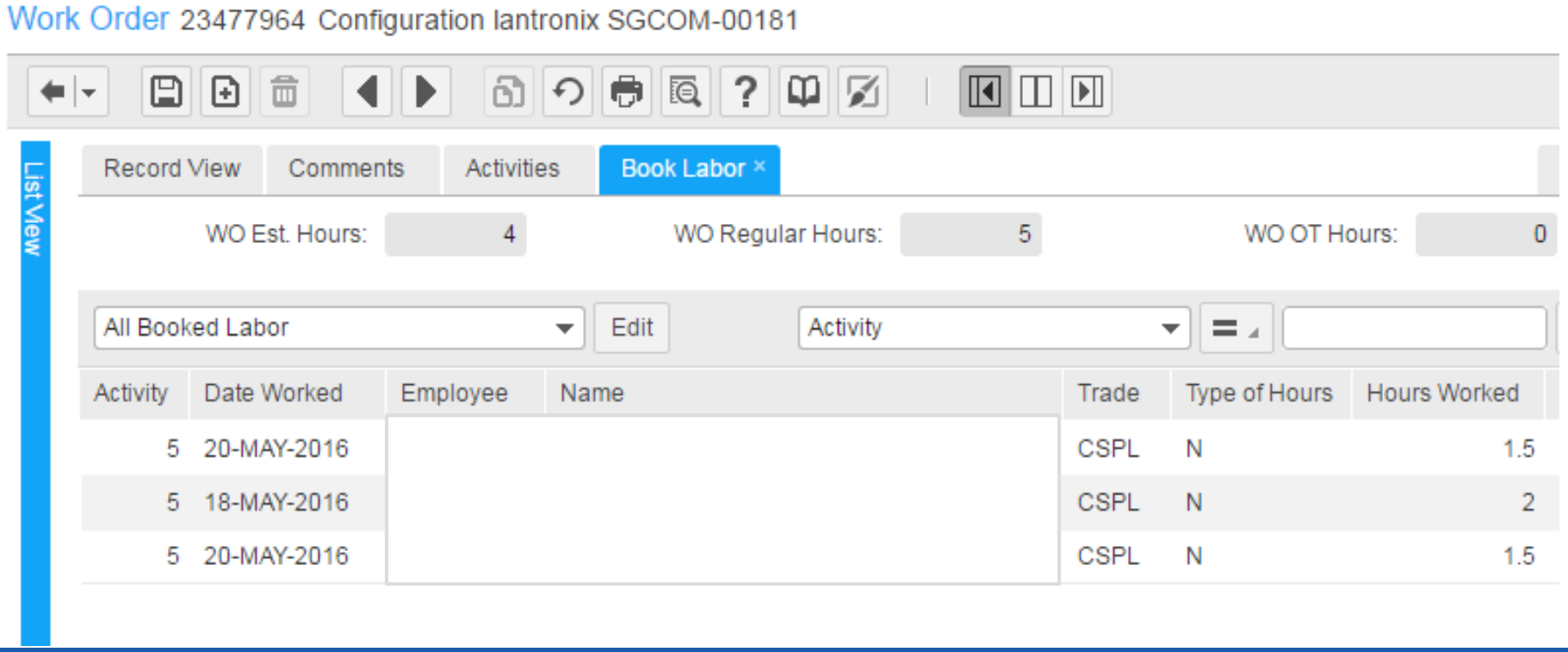
Big opportunity for data analytics to optimise performance and costs.

Reliability Calculations

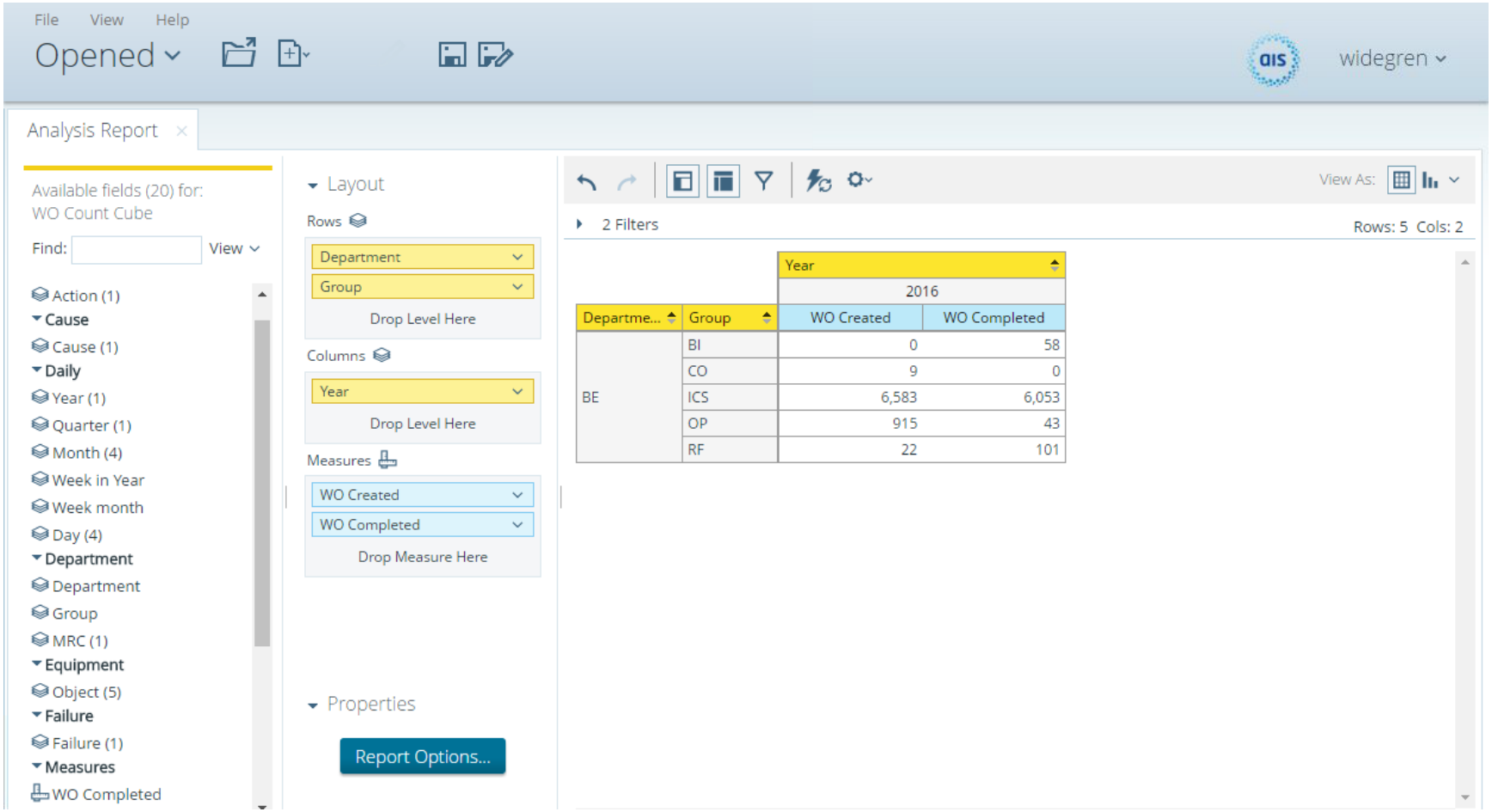


Work Order details

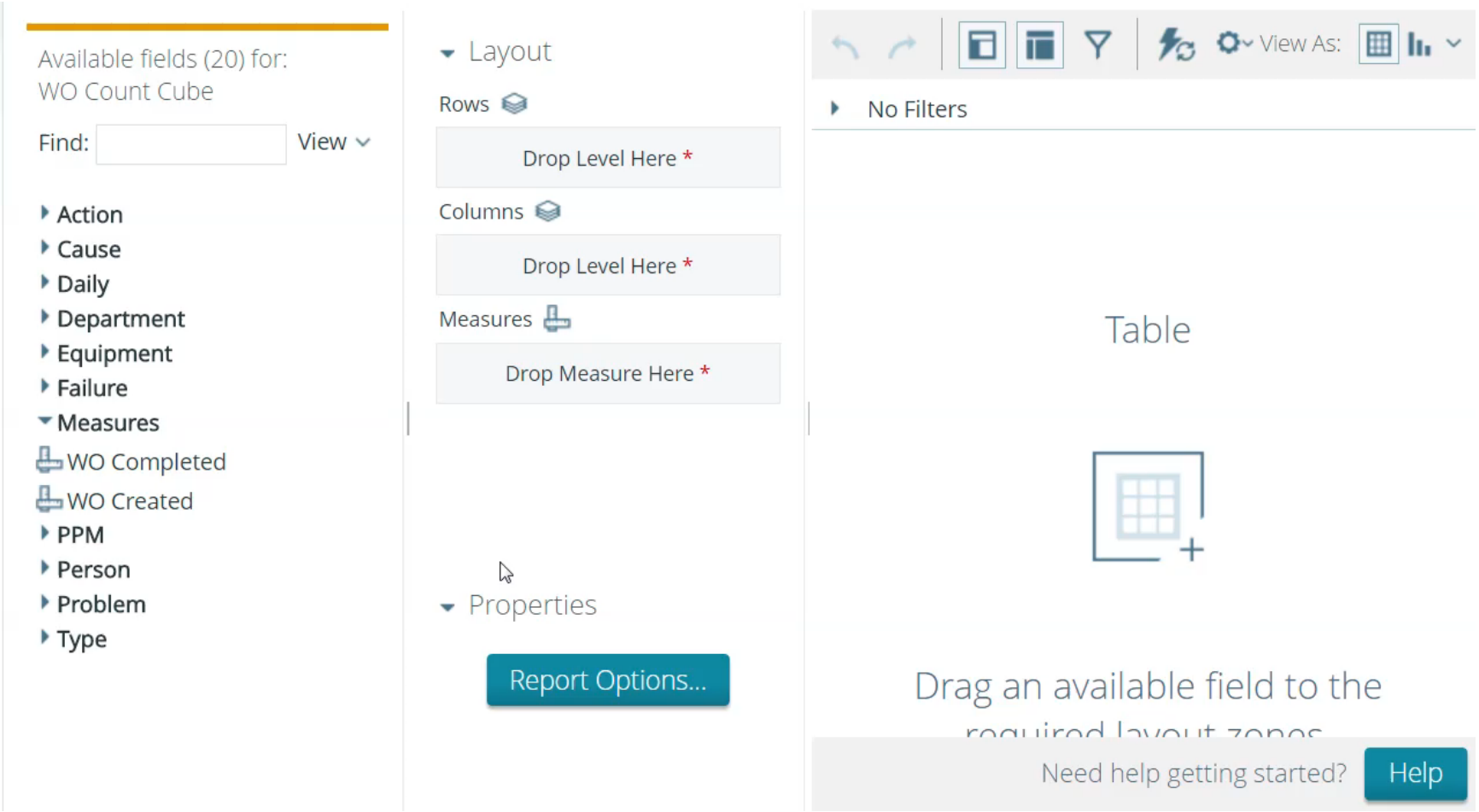
- The actual hours booked on Work Order are often used as the basis for invoicing in case of outsourced maintenance.



Interactive Analysis Reports



Interactive Analysis Reports



More detailed planning

AMM Service Overview Planning 2016-2017

2016 Q1

Task name	Deliverables	EDMS Ref.	Client	Est. time	Status
EAM Web Services Hub migrated to JBoss	Migration of the CERN EAM Web Services Hub from Tomcat to JBoss to increase flexibility and long-term maintainability of the system.		EN/ACE	***	Done
Quick EDMS document creation in EAM	A one-click creation of EDMS documents of the type report and with a generic description in Infor EAM as well as in EAM Light.	1368713	EN/EL EN/HE	**	Done
Implementation of Department Security	Allow to manage access rights on data and not just on functions, as done today. For each MRC or Department it is possible to indicate who should be able to read and/or update the information. Management of users is done via e-groups that synchronize with EAM.	1284364	EN/ACE	***	Done
CERN EAM Upload Utility 1.3	Extended functionality to also cover equipment dependencies, part substitutes, checklist definitions, PM schedules as well as Project & Budget information for Work Orders.		TE/CRG EN/EL EN/CV IT/CF FAP/ACC	***	Done
PPE register for 2015 completed	Completion and handover of the PPE register for 2015 to FAP/ACC for achieving and integration in CERN's financial statement for 2015.		FAP/ACC	***	Done

2016 Q2

Task name	Deliverables	EDMS Ref.	Client	Est. time	Status
ISRAM migrated to TREC/Infor EAM	Implementation of ISRAM functionality in TREC which replaces the use of ISRAM at CERN. Migration of all ISRAM data to TREC.		HSE/RP	***	Done
Infor EAM System Upgrade to version 11.2	Upgrade to 11.2 includes many new features such as asset scheduling and reservations, case management, key management, self-service kiosks and several new features needed for the PPE project.	1698836	EN/ACE	***	Done
Roll-out of Department Security functionality	Rollout and configuration of the access rights management on a group by group basis.	1284364	EN/ACE	***	On-going
TREC Versions 2.8 & 2.9	Additional functionality for waste management and containers (2.8) as well as improvements to the workflow and user interface (2.9).		HSE/RP	***	Done
Pilot: Contract Management functionality completely configured in production	Configuration of contract management module to automate and streamline invoice generation for the new CRG contractor starting 1 July 2016. Price lists with validity dates loaded into Infor EAM.		TE/CRG	***	On-going
VTL to Infor EAM migration	Replacement and migration of the Vacuum Tracking Log tool to Infor EAM. Configuration of workflows, attributes and migration of legacy data as well as user trainings.		TE/VSC	***	Done
WIC to Infor EAM migration	Migration of all assets previously managed in the Warm Interlock Controller application are to Infor EAM. Configuration of system and migration of legacy data and equipment dependencies. User training.		TE/MPE	***	Done
Roadmap for EAM Light 3.0 project	Overall planning of the EAM Light 3.0 Project which includes a migration and merge of technologies between EAM Light, TREC and MTF.	1687953	EN/ACE	*	Done

2016 Q3

Task name	Deliverables	EDMS Ref.	Client	Est. time	Status
E-pool functionality for rental and calibration of electronics in production	Configuration of Infor EAM to handle repairs and calibrations of electronics equipment rented out by e-pool. Integration with BAAN for all commercial aspects of the rental.		EP/ESE	***	Done
Integrated barcode printing module in Infor EAM and EAM Light	Allowing individuals as well as batch printing of barcodes for assets, positions, systems and parts from inside Infor EAM and EAM Light. This will eventually replace the current use of external barcode printing software packages such as Codesoft. Based on EAM Light 3.0 platform.		BE, EN, TE, SMB, HSE, IT & EP	***	On-going
EAM Self-Service Store Kiosk	Upgrade to 11.2 includes many new features such as asset scheduling and reservations, case management, key management, self-service kiosks and several new features needed for the PPE project.		BE, EN, TE, SMB, IT & EP	***	On-going
EAM Logbook pilot	Investigate possibility to replace existing logbooks with the new case management functionality made available in Infor EAM version 11.2.		TE/CRG	***	On-going
Infor EAM training in CERN Technical Training programme	Introduction of Infor EAM training modules in the standard CERN Technical Training programme. A 2-day standard Infor EAM outsourced course will be complemented with a half-day CERN specific course. Training on CERN data with partly modified course material.		BE, EN, TE, SMB, HSE, IT & EP	***	On-going
IT network equipment in production	Asset tracking and work management for CERN network equipment for the IT/CS group. Strong interest from other equipment groups to link equipment dependencies to these equipment since many depend on the network.		IT/CS	***	On-going
Outsourcing of TREC hardware support	Outsourcing of all hardware support for the TREC self-service kiosks as well as barcode printing tasks and the gradual replacing aging equipment.		EN/ACE	***	On-going

2016 Q4

Task name	Deliverables	EDMS Ref.	Client	Est. time	Status
EAM Light 3.0	The new EAM Light 3.0 will replace the current APEX based EAM Light version that has become difficult to maintain. The first version of EAM Light 3.0 will contain all current functionality plus the possibility update equipment and equipment properties. The new EAM Light platform would be shared between EAM Light, TREC and MTF allowing better use of resources in the team and more agile developments/ extensions.		BE, EN, TE, SMB, HSE, IT & EP	***	On-going
Feasibility study of sever cluster solution for Infor EAM	Following the recent support for server clusters in Infor EAM, we should investigate how this could be implemented at CERN in order to provide an infrastructure with more redundancy and stability. This would also be the first step towards zero-downtime upgrades of the system.		EN/ACE	***	
VSC Store management roll-out	The VSC group has started to use the EAM store room capabilities for spare parts but needs to scale upand roll-out this usage within the group. A large number of parts are currently managed with the PACT tool proposed by the (now closed) MFO. This task includes system configuration as well as training.		TE/VSC	***	
Mobile checklists for Access Control & Alarm System equipment	The AC and AS section would like to start using checklists on mobile devices for their preventive maintenance activities. Corresponding system configuration and user training would need to be provided.		BE/CS	**	
Identification of use cases for asset & maintenance management analytics	With a large amount of data that has been captured about our equipment both in EAM but also in the Logging DB, we would be able to start providing more advanced analytics and insights. By combining EAM equipment data (manufacturing tests and details, maintenance history, costs, criticality rankings, etc) with operational data from Logging DB, new information, trends and conclusions could be found. Identifications of use cases to be found, where first requests have come from TE/MSC.		BE, EN, TE, SMB, HSE, IT & EP	***	
GIS – EAM integration review	In order to scale-up the usage of the GIS-EAM integration the current setup needs to be reviewed. Today's solution with manually created views with data exchanged between the two systems is not scalable and too time-consuming. Alterative solutions need to be found where notably the standard integration proposed by ESRI and Infor should be more thoroughly investigated and tested.		EN/ACE SMB/SE	***	
Study of streamlined/automatic generation of Purchase Orders in EDH from Infor EAM.	If managing Parts in Infor EAM it is possible to generate Purchase Orders on-demand or when whenever the re-order level has been reached. This Purchase Order has currently to be re-typed as a DAI in EDH. This transfer of information should be streamlined/automated. For standard parts, a pre-requirement for this is to match/pair Parts references between Infor EAM and BAAN.	934246	BE, EN, TE, SMB, & IT	***	On-going
Detailed roadmap for MTF migration to EAM Light	A detailed roadmap for the merge of MTF and its functionality into Infor EAM and EAM Light would need to be carried out in order to be able to deliver the MTF functionality in EAM Light during the fist quarter of 2017.		EN/ACE	***	
Mobile solution for physical inventory	Following the deprecated solution for Windows Mobile 6, a new mobile solution has to be found for performing physical inventory in store rooms.		EN/CV EN/HE TE/VSC TE/CRG	***	

2017 Q1

Task name	Deliverables	EDMS Ref.	Client	Est. time	Status
MSC Store management pilot	The TE/MSC group has a large number of stores that currently either are managed with a legacy MS Access application or with the PACT tool proposed by the now closed MFO. A pilot with Infor EAM has been requested and would need to be configured and setup up.		TE/MSC	***	
MTF functionality available in EAM Light	The functionality currently proposed by MTF should be reviewed and merged into the EAM Light interface to reduce the number of (overlapping) user interfaces and applications for our users. It will also simply the long-term maintenance of the MTF functionality.			***	
TREC 3.0	A new version of TREC will be delivered fully based on the new EAM Light framework. This would make all EAM applications more coherent for users and easier to maintain for the AMM service.			***	

2017 Q2

Task name	Deliverables	EDMS Ref.	Client	Est. time	Status
Upgrade to Infor EAM 11.3	The new version of Infor EAM will be released in Jan/Feb 2017 and an upgrade to the next version is planned to June 2017.			***	
Integration with the Accelerator Fault Tracking system	The Accelerator Fault Tracking system is logging information about high-level faults in the accelerator complex – mostly associated to a global system such as "Cryogenics". These high-level fault will have to be linked to the more detailed information about the precise fault/break-down logged and managed by the corresponding equipment group in Infor EAM.			***	