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AMMW 2013

An overview of the CERN CMMS

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Agenda

- **Asset Management & Our CMMS**
- Strategic Integrations - Examples
- Targeted User Interfaces
- Conclusions & Questions

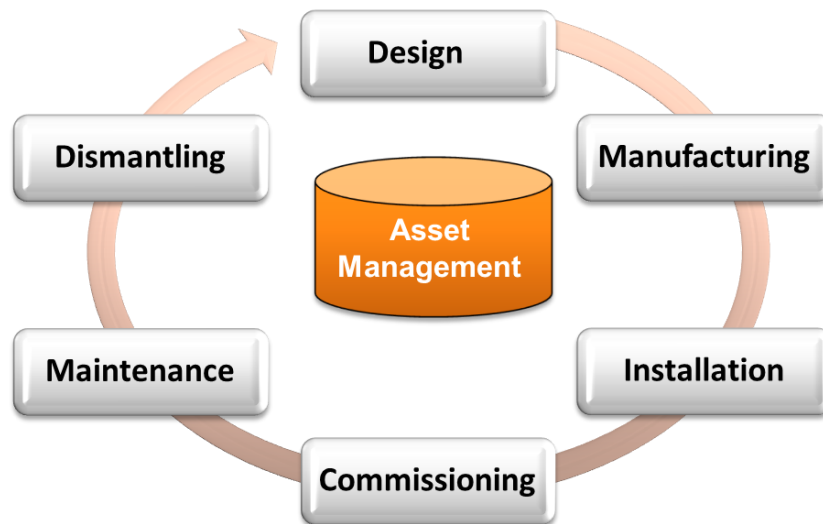
Asset Management at CERN

- CERN owns and operates a considerable number of physical assets representing a significant financial value.
- **Technical infrastructure**
 - Buildings (>700 surface buildings), tunnels, caverns, roads, car parks, electricity, water, cooling and ventilation, access control, machine tools, lifting equipment, etc.
- **Accelerator complex**
 - Supra-conducting magnets, cryogenics, controls equipment, electronics, radiation monitoring, etc.
- **Our CMMS is used throughout the organization to support this wide range of technical disciplines.**



Asset Management at CERN

- Assets at CERN have often a lifecycle exceeding 50 years.
- The long lifecycles combined with turnover of personnel make documentation of both assets and interventions an absolute must.
- Many assets are complex, unique and results of long R&D.
- An inventory of all assets with detailed technical characteristics is essential.



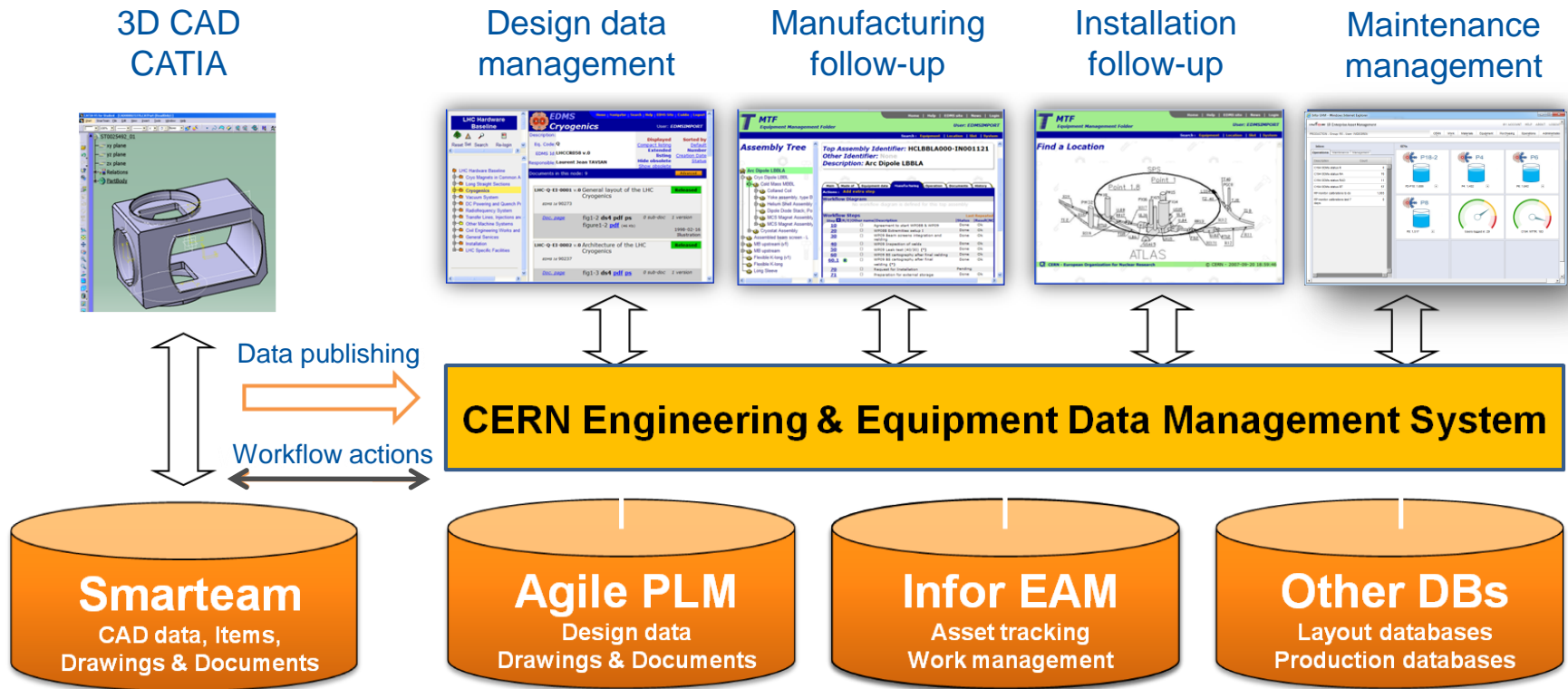
Asset Management at CERN

- **A large part of our maintenance is outsourced**
 - Our very wide range of maintenance activities makes outsourcing the only alternative due to cost and personnel constraints.
- **Outsourced maintenance requires centralized tools for managing knowledge**
 - Essential with single repository for all assets and their history to keep knowledge at CERN.
 - The CMMS is our central repository for assets.
 - Used by both our personnel and external contractors.
 - A common tool brings common methods and ways of working, which in turn brings operational efficiency and significant financial savings.



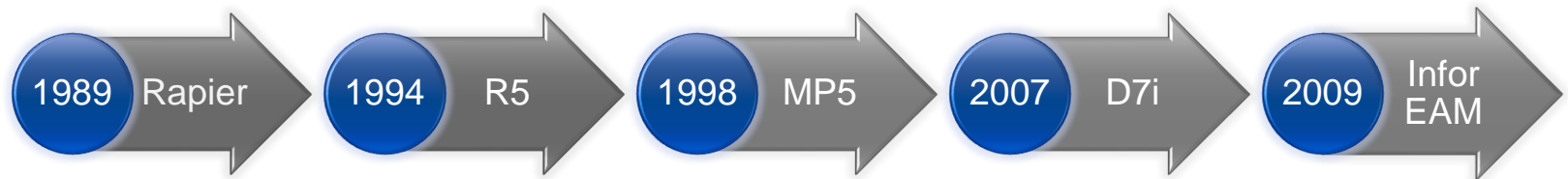
Infor EAM – the CERN CMMS

Infor EAM is integrated in our Engineering Data Management platform



Infor EAM – the CERN CMMS

- Infor EAM has been used at CERN for almost 25 years.
- Infor EAM...
 - is a proven system with a lot of built-in maintenance best practices.
 - is still ranked as one of the top 3 maintenance management systems on the market.
 - provides an open framework for integration with other tools.
 - allows plenty of possibilities to evolve in our usage of the tool since we only use a small percentage of the full functionality.



(Our first Work Orders in the system are from 1971 and were migrated from our previous tool.)

Infor EAM – the CERN CMMS

The screenshot displays the Infor EAM web interface in a Windows Internet Explorer browser window. The page title is "Infor EAM - Windows Internet Explorer". The main header includes the Infor logo and "Enterprise Asset Management", along with navigation links for "MY ACCOUNT", "HELP", "ABOUT", and "LOGOUT". Below the header, the user context is "PRODUCTION - Group: R5 - User: WIDEGREN", and a menu bar contains "CERN", "Work", "Materials", "Equipment", "Purchasing", "Operations", and "Administration".

The interface is divided into two main sections: "Inbox" and "KPIs".

Inbox Section: It features three tabs: "Operations" (selected), "Maintenance", and "Management". Below the tabs is a table with the following data:

Description	Count
C194 ODMs status R	2
C194 ODMs status RA	70
C194 ODMs status RAD	11
C194 ODMs status RT	58
RP monitor calibrations to do	1,003
RP monitor calibrations last 7 days	0

KPIs Section: It contains a 2x3 grid of KPI cards. Each card has a CERN logo icon, a title, a visual indicator, and a numerical value with a dropdown arrow.

- P18-2:** Visual indicator: a beaker with blue liquid. Value: P2-P18: 1,699.
- P4:** Visual indicator: a beaker with blue liquid. Value: P4: 1,452.
- P6:** Visual indicator: a beaker with blue liquid. Value: P6: 1,641.
- P8:** Visual indicator: a beaker with blue liquid. Value: P8: 1,515.
- Users logged in:** Visual indicator: a gauge with a needle pointing to 47. Value: Users logged in: 47.
- C194: MTRR:** Visual indicator: a gauge with a needle pointing to 183. Value: C194: MTRR: 183.

At the bottom of each section, there are "Refresh" and "Personalize" buttons.

Infor EAM – the CERN CMMS

- **The main objective is clear;**

Minimize unscheduled accelerator downtime

- **Types of maintenance performed & supported with Infor EAM**

Corrective

- Things break down - even at CERN!

Preventive

- Time based, meter based, mixed, etc.
- Intensive use of PM Schedules (>2600 active)
- Use of PM Plans, PM Work Packages, Campaigns, etc.

Predictive

- Inspection module increasingly used.
- Reliability Centered Maintenance (RCM) starting to be applied notably linked to criticality and risk.
- The Risk & Reliability module currently being configured.

Infor EAM at CERN: In numbers

Objects	
Assets	850,000
Functional Positions	550,000
Number of objects classes	2,000
Properties per object class	8 (average)

Work Orders	
Work orders registered	2,500,000*
Work orders per year (accelerator in operation)	~100,000
Work orders per year (accelerator not in operation)	~150,000
Prev. Maintenance Plans	2,600

Other	
Parts in store	77,000
Linked unique documents	410,000

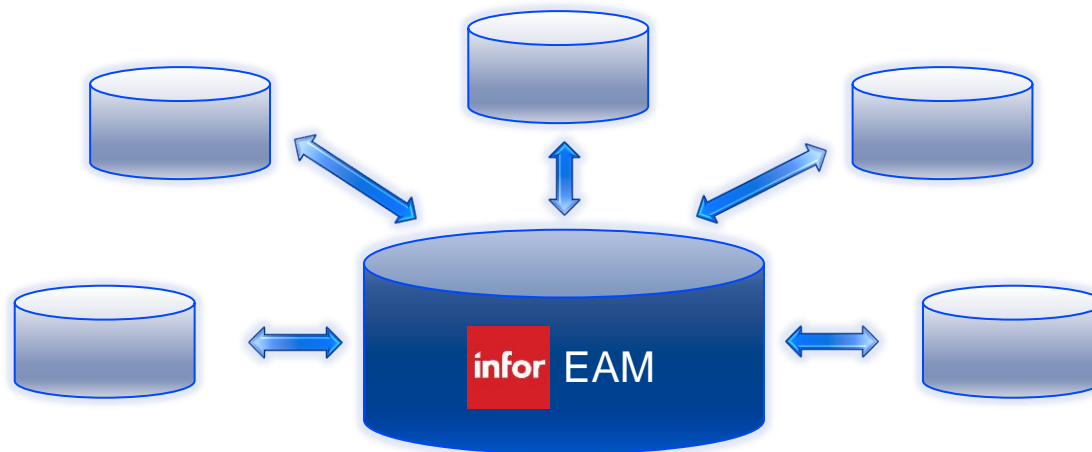
Users	
Users of Infor EAM application	~400
Users of Infor EAM data via other integrated applications	~4,000

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- **Strategic Integrations - Examples**
- Targeted User Interfaces
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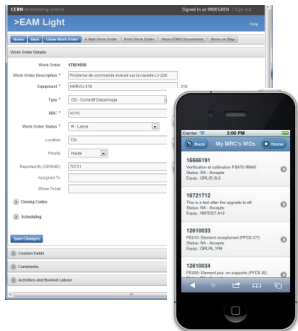
The importance of integrations

- Asset Management plays a central part in most organizations, covering both strategic and operational aspects of the business.
- An Asset Management system can therefore not be treated as a stand-alone issue but also needs to be integrated in the existing infrastructure of information systems.
- At CERN this has not always been the case, but we are currently putting a big effort in integrating and interfacing Infor EAM with all concerned tools and applications.



Examples of Interfaces & Integrations

Lightweight interfaces



Control room & Service Desk



Product Lifecycle Management (PLM)

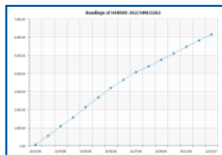


Planning tools

Mobile interfaces



Reporting tools



GIS

Document Management

ERP

Tracing radioactive equip.



Accelerator Layout DB

Manufacturing & Tests



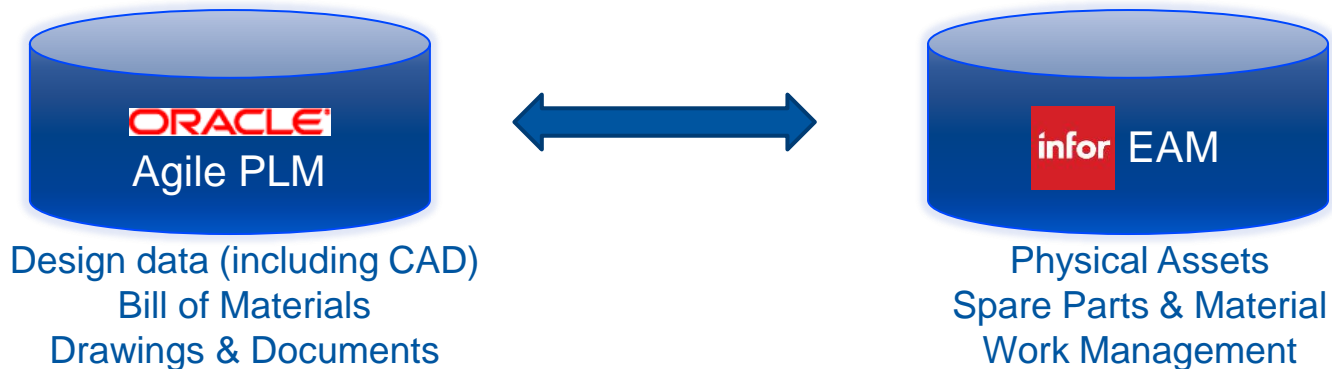
Integration: PLM - EAM

- **Challenge: Full traceability from design to maintenance**

- Many of our complex assets require full traceability from design and manufacturing to installation and maintenance.
- Design reports, manufacturing drawings and test results are for example required to optimize the performance of individual assets.

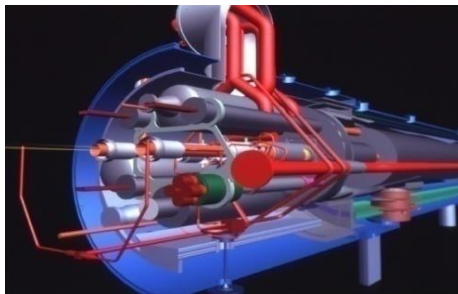
- **Solution: Linking PLM design data to EAM asset data**

- Using each system for what it is best at and originally designed for.
- The design items in our Product Lifecycle Management (PLM) systems are linked and matched with Parts and Assets in Infor EAM.

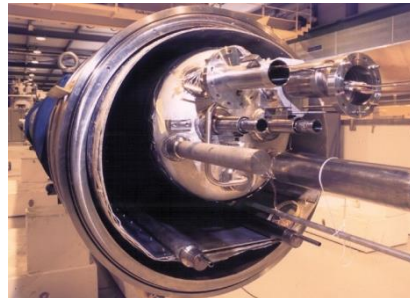


Integration: PLM - EAM

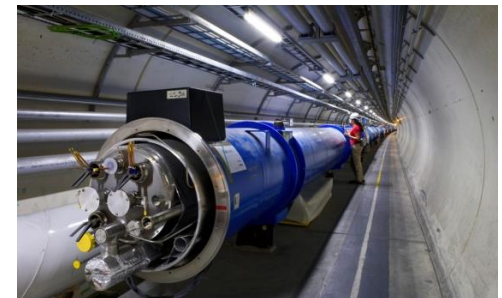
- **Result: Full traceability from design to maintenance**
 - Possible to scan the barcode of a superconducting magnet and access:
 - Detailed information about each manufacturing, testing and installation step.
 - List of Non-Conformities discovered during manufacturing and testing.
 - The precise version of the drawing used to manufacture this asset.
 - The PLM-EAM integration provides complete traceability of assets in the accelerator complex from the cradle to the grave.



Design



Manufacturing & Testing



Operation & Maintenance

Integration: PLM - EAM

Infor EAM - Windows Internet Explorer

INFOR 10 Enterprise Asset Management

START CENTER MY ACCOUNT HELP ABOUT LOGOUT

PRODUCTION - Group: R5 - User: WIDEGREN

CERN Work Materials Equipment Purchasing Operations Administration

Asset: HCLBARA000-IN001013 Arc Dipole LBARA Department: MTF1
Status: Installe et Maintenu

List View Record View Comments Events Costs PM Schedules Structure Inspections & Readings Show on Map EDMS Documents >>

ELECTRICAL INSULATION TESTS AND MEASUREMENTS

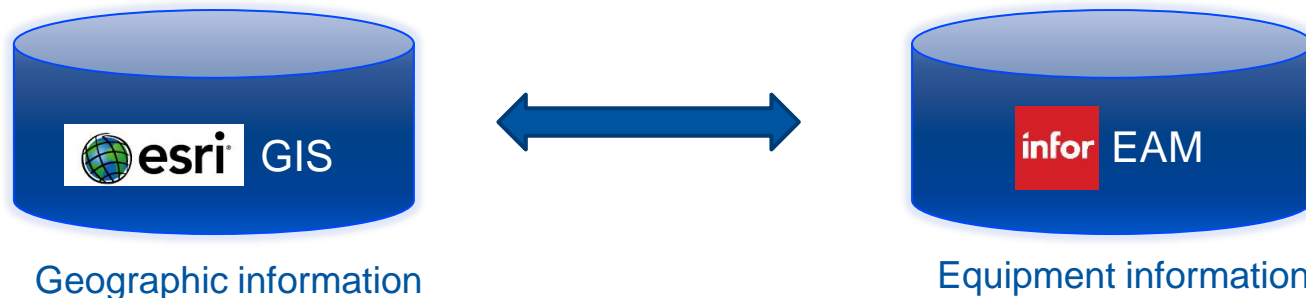
Test type: Insulation strength measured at warm before transportation to the tunnel

Test procedure No		Cryomagnet id.	HCLBAR_000-IN001013	Date of test	02/04/2004
Magnet Temperature	293.00 Kelvin	Test configuration	Main and Auxiliary magnets	Test operator	O. Kalouguine
Bench Name		Rack HV barcode			

Polarity +	Polarity -	Ambient Temp. [K]	Ambient Humidity [%]	Voltage [V]	Duration [mn:s]	Final Current [A]	Resistance [Ω]	Capacitance [F]
Dipole-Quench Heaters	Ground	293	35	613	02:00	4.709E-8	1.302E+10	4.00E-7
Dipole	Quench Heaters - Ground	293	35	537	02:00	6.318E-8	8.504E+9	5.20E-7
Dipole	Ground	293	35	613	02:00	1.197E-8	5.121E+10	3.30E-7
Dipole	All Quench Heaters	293	35	537	02:00	7.384E-8	7.277E+9	3.90E-7
All Quench Heaters	Ground	293	35	613	02:00	8.125E-8	7.545E+9	3.00E-7
Dipole	MCS-MCD Correctors	293	35	258	01:01	5.255E-9	4.900E+10	1.00E-8
MCS-MCD Correctors	Ground	293	35	258	01:01	6.433E-9	4.003E+10	2.00E-8

Integration: GIS - EAM

- **Challenge: Locating assets geographically**
 - Our assets are spread out over a large geographical area.
 - Maintenance personnel must easily be able to locate assets.
- **Solution: Linking GIS information with assets in EAM**
 - Any equipment registered in Infor EAM can be geographically placed on a map in our Geographical Information Systems (GIS).
 - A dedicated GIS portal for maintenance purposes has been created allowing bidirectional links between the two systems.



Integration: GIS - EAM

The screenshot displays the CMMS GIS Portal General interface. The browser address bar shows https://gis.cern.ch/gisportal/GIS_CMMS.htm. The page header includes the CERN logo and navigation links for "Patrimony and Site Information Contact", "CERN Geographic Information System > CMMS GIS Portal", "Other GIS Portal", "Video", "PDF", and "Data Catalog".

The main interface is divided into several sections:

- Table des matières:** A sidebar menu with options like "Etages", "Données CERN", "Points d'intérêt", and "Limites administratives".
- Recherche CERN:** A search bar with "Ajout de Données" and "EAM Equipments" sections.
- Map:** An aerial view of a building complex with a floor plan overlay. A vertical "FLOOR" legend on the left shows levels from SKY to S3.
- Interroger:** A popup window displaying details for equipment SFBGL-01178.

The "Interroger" popup window contains the following information:

<input type="checkbox"/> EAM_EQUIPMENT	
<input type="checkbox"/> SFBGL-01178	
CODE	SFBGL-01178
EAM_LINK	https://eam-light.we...
DESCRIPTION	D 03 CUISINNES COTE JURA R-A206 ZS10
STATUS	Installe et Maintenu
MRC	SAS
TYPE	Position fonctionnelle
BATIMENT	866
ETAGE	R
GIS_FEATURE_TYPE	FIR_BOUTON_DECLENCHEMENT_P
GIS_LINK	https://maps.cern.ch...
<input type="checkbox"/> Maintenance Information	
<input type="checkbox"/> 866	
<input type="checkbox"/> Rooms	

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Infor EAM Users at CERN

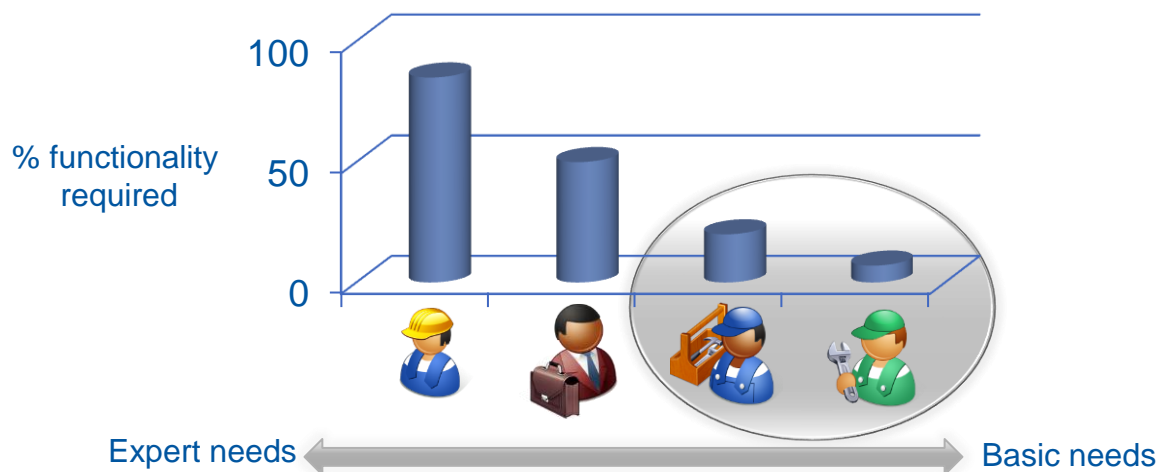
- **Very wide range of user profiles**
 - Maintenance managers
 - Engineers
 - Equipment specialists (often physicists)
 - Maintenance technicians
 - External contractors (technicians + managers)
 - **Training of users is an issue**
 - Different backgrounds and computer skills
 - Turnover of CERN personnel and visiting scientists
 - Turnover of contractors and their personnel.
 - Infor EAM is not difficult to learn but requires training to use efficiently.
 - Many of our users do not use EAM on a daily basis.
- Targeted, simplified and mobile interfaces are used to overcome these challenges for certain precise tasks as a complement to the standard Infor EAM web interface.



Basic functionality for basic needs

Challenge: Non-expert users need quick and mobile access to data

- All personnel (internal & external) intervening on CERN equipment should be able to report work done electronically – no retyping by secretaries.
- Many technicians only need to do basic updates of Work Orders.
- A large percentage of our (potential) users use Infor EAM on an occasional basis.
- Turnover of personnel and contractors at CERN increases need of training.



Basic functionality for basic needs

Solution : Simplified web and mobile interfaces

- A simplified web interface for basic and frequently performed operations.
- The goal is not replace the use of the standard Infor EAM web interface but to provide a simple and mobile alternative – especially in the field.

The screenshot displays the CERN EAM Light web interface. At the top, it shows the CERN logo and the text "Accelerating science". The user is signed in as "WIDEGREN" and can click "Sign out". The main header is ">EAM Light" with a "Help" link. Below the header is a navigation bar with buttons for "Home", "Back", "Clone Work Order", "E-Mail Work Order", "Print Work Order", "Show EDMS Documents", and "Show on Map". The main content area is titled "Work Order Details" and contains a form with the following fields:

Work Order	17851656
Work Order Description *	<input type="text" value="Probleme de commande inversé sur la nacelle LV-228"/>
Equipment *	<input type="text" value="HHRVU-319"/> 319
Type *	<input type="text" value="CD - Correctif Depannage"/>
MRC *	<input type="text" value="HV10"/> GRUNDERCO ; C178
Work Order Status *	<input type="text" value="R - Lance"/>
Location	<input type="text" value="130"/> 130=BATIMENT BUREAUX (GARAGE PRINCIPA
Priority	<input type="text" value="Haute"/>
Reported By (CERNID)	<input type="text" value="70731"/> MAZZARINO THIERRY 73793 160364
Assigned To	<input type="text"/>

Basic functionality for basic needs

Result: Quick access to basic data from any web-enabled device

- Easy access to Work Orders assigned to user – limited training.
- Simple to update basic information directly in the field using a tablet – increased reactivity and improved data quality.



The tablet screen shows a web application interface with the following sections:

- Comments
- Activities and Booked Labour
- Inspections

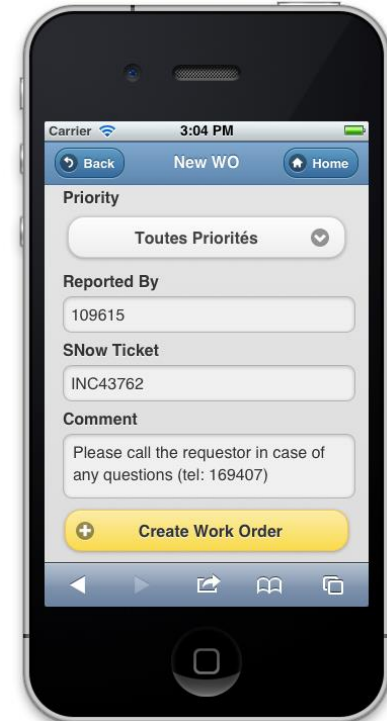
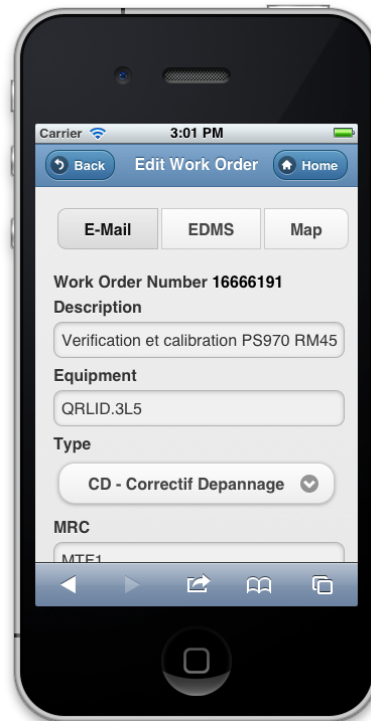
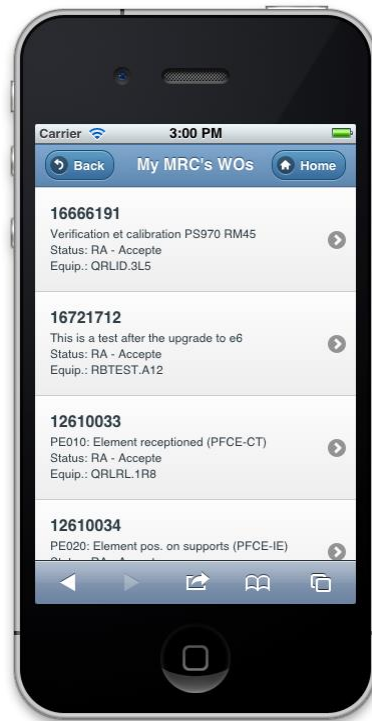
Equipment Code	Point	Aspect	Value	Finding
865/1-101	Volume [VOLLU]	Aeration / Desodorisation [KS20]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Volume [VOLLU]	Toiles d'araignee [KS50]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Sol - Revetement dur et carrelé [SOLC]	Poussiere [KS35]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Sol - Revetement dur et carrelé [SOLC]	Salissures [KS40]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Sol - Revetement dur et carrelé [SOLC]	Traces de lavage [KS55]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Murs-cloisons-plinthes [MCP]	Poussiere [KS35]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Murs-cloisons-plinthes [MCP]	Salissures [KS40]	<input type="radio"/> Ok <input checked="" type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Murs-cloisons-plinthes [MCP]	Traces de lavage [KS55]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Huissieres-chassis-grilles < 2.50 m [HUIS]	Poussiere [KS35]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Huissieres-chassis-grilles < 2.50 m [HUIS]	Salissures [KS40]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Huissieres-chassis-grilles < 2.50 m [HUIS]	Traces de lavage [KS55]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Lavabo/Robinetterie [LAV]	Aspect [KS05]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Lavabo/Robinetterie [LAV]	Desinfection [KS15]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Lavabo/Robinetterie [LAV]	Detartrage [KS25]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	
865/1-101	Lavabo/Robinetterie [LAV]	Salissures [KS40]	<input checked="" type="radio"/> Ok <input type="radio"/> Not Ok <input type="radio"/> N/A	

Save Changes

Basic functionality for basic needs

Bonus: A smartphone-friendly version of the web pages

- Accessible from any smartphone (iOS, Android, Windows, etc.)
- “Automatic” formatting of web pages done with the free tool jQuery Mobile.



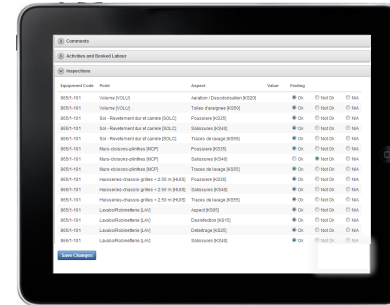
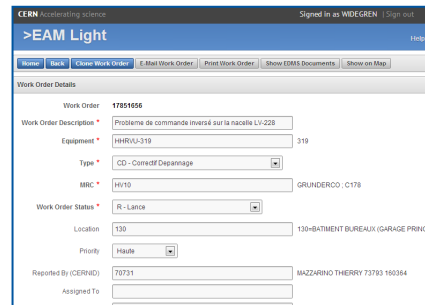
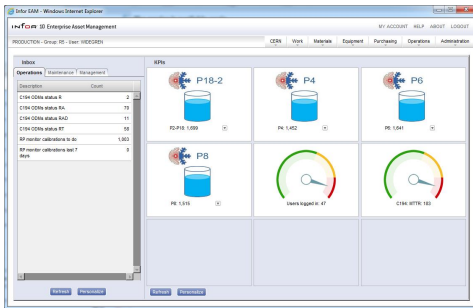
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Conclusions

- CERN has been using Infor EAM for almost 25 years and we are in the process of extending the use of it even further.
- A CMMS on its own can only help increasing your efficiency to a certain level. To go further you need to integrate it in your existing information system infrastructure.
- In our environment, simplified and targeted user interfaces for certain user profiles have greatly increased productivity and lowered training costs.
- To use a commercial CMMS in a scientific research environment is possible and allows us to benefit from industrial best practices.





Thanks for your attention! Questions?

Email: david.widegren@cern.ch





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