

Automatically Capturing Data from SCADA to the Maintenance System

11/08/2015 – Alfonso Alhambra Morón – EN-HE-LM



INTRODUCTION

- In order to schedule preventive maintenance for the elevators which grant access to the LHC, the **EN-HE-LM** team controls the meters accounting the number of trips and hours of usage of the machines.

INTRODUCTION

- In order to schedule preventive maintenance for the elevators which grant access to the LHC, the **EN-HE-LM** team controls the meters accounting the number of trips and hours of usage of the machines.
- The meter readings were manually performed on a monthly basis and introduced by hand in the **Infor EAM** maintenance system.

INTRODUCTION

- In order to schedule preventive maintenance for the elevators which grant access to the LHC, the **EN-HE-LM** team controls the meters accounting the number of trips and hours of usage of the machines.
- The meter readings were manually performed on a monthly basis and introduced by hand in the **Infor EAM** maintenance system.
- This method was prone to **errors** due to human errors when reading the meters or typing the values in Infor EAM.

INTRODUCTION

- In order to schedule preventive maintenance for the elevators which grant access to the LHC, the **EN-HE-LM** team controls the meters accounting the number of trips and hours of usage of the machines.
- The meter readings were manually performed on a monthly basis and introduced by hand in the **Infor EAM** maintenance system.
- This method was prone to **errors** due to human errors when reading the meters or typing the values in Infor EAM.
- Furthermore it consumed valuable **resources** in terms of time and effort (physically accessing the meters, writing down the readings, importing them to Infor EAM...)

INTRODUCTION

- In order to schedule preventive maintenance for the elevators which grant access to the LHC, the **EN-HE-LM** team controls the meters accounting the number of trips and hours of usage of the machines.
- The meter readings were manually performed on a monthly basis and introduced by hand in the **Infor EAM** maintenance system.
- This method was prone to **errors** due to human errors when reading the meters or typing the values in Infor EAM.
- Furthermore it consumed valuable **resources** in terms of time and effort (physically accessing the meters, writing down the readings, importing them to Infor EAM...)
- This problem is **common** for other engineering teams also at CERN and automatizing the process would solve all the afore-introduced problems.

INTRODUCTION

- In order to schedule preventive maintenance for the elevators which grant access to the LHC, the **EN-HE-LM** team controls the meters accounting the number of trips and hours of usage of the machines.
- The meter readings were manually performed on a monthly basis and introduced by hand in the **Infor EAM** maintenance system.
- This method was prone to **errors** due to human errors when reading the meters or typing the values in Infor EAM.
- Furthermore it consumed valuable **resources** in terms of time and effort (physically accessing the meters, writing down the readings, importing them to Infor EAM...)
- This problem is **common** for other engineering teams also at CERN and automatizing the process would solve all the afore-introduced problems.
- This is the main motivation behind the **SCADA Bridge Project**.

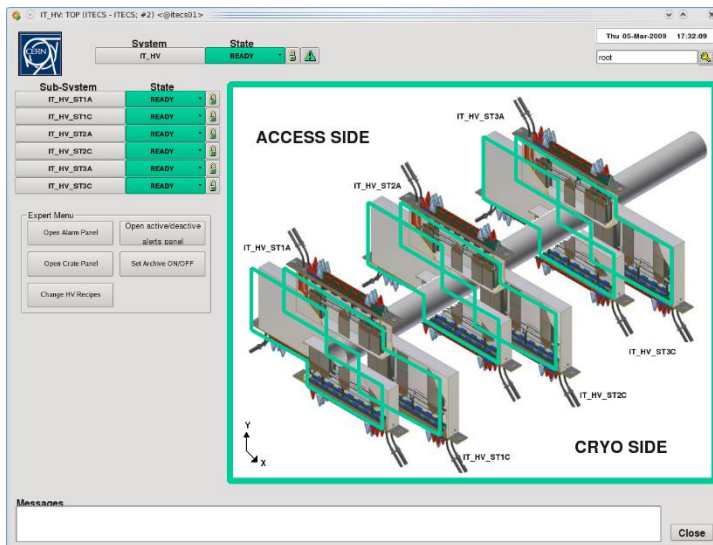
Automatically Capturing Data from SCADA to the Maintenance System

THE CONTEXT AND THE PROBLEM



PVSS II – the SCADA System at CERN

The Supervisory Control and Data Acquisition (**SCADA**) system at CERN is called **PVSS II**. Used since September 2000, it controls from LHC detectors to ancillary systems.



THE CONTEXT AND THE PROBLEM

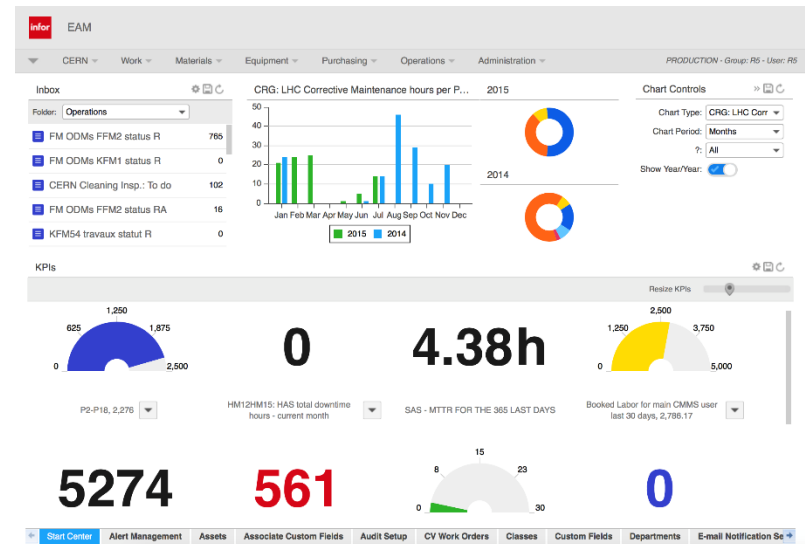
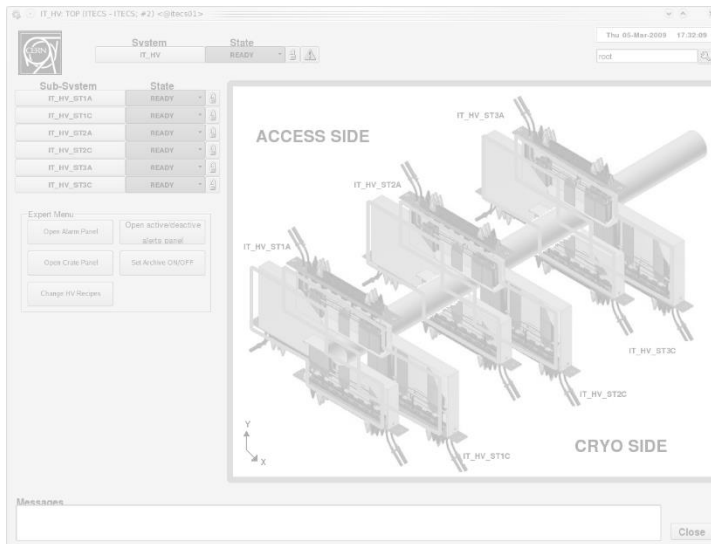


PVSS II – the SCADA System at CERN

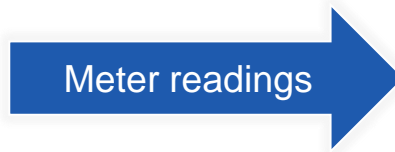
The Supervisory Control and Data Acquisition (**SCADA**) system at CERN is called **PVSS II**. Used since September 2000, it controls from LHC detectors to ancillary systems.

Infor EAM – the CMMS at CERN

The Computerized Maintenance Management System (**CMMS**) at CERN is called **Infor EAM**. Used for more than 25 years, it controls over 1.6 million pieces of equipment all over CERN.



THE CONTEXT AND THE PROBLEM

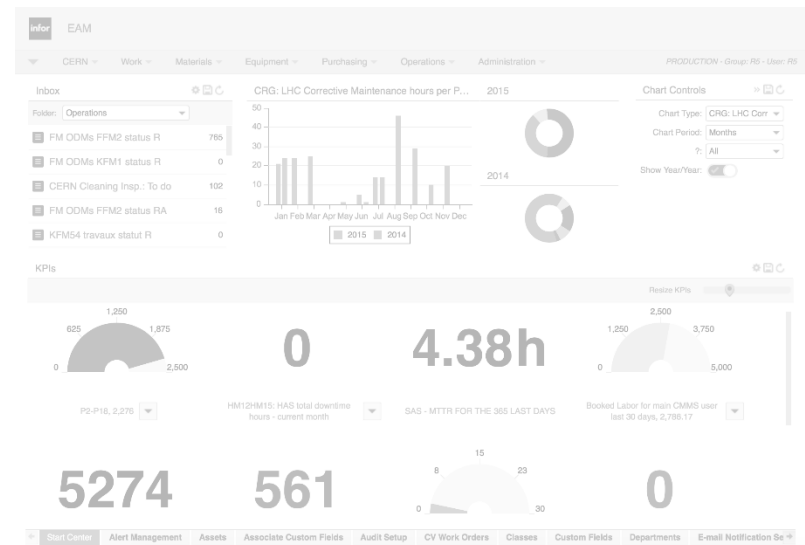
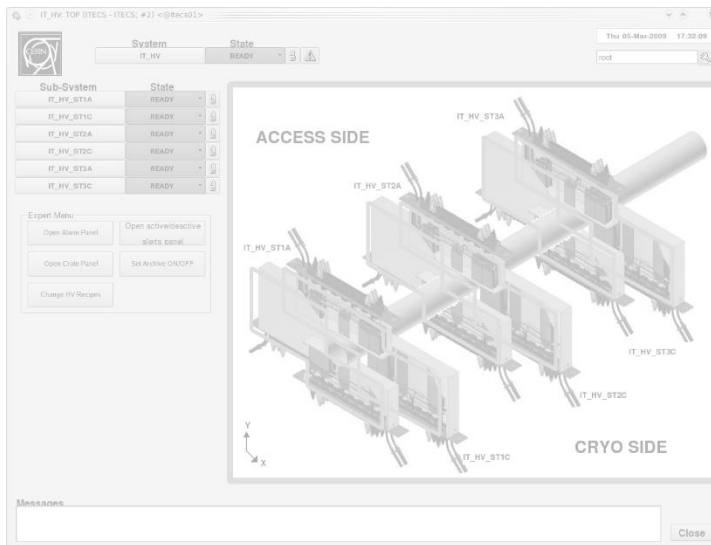


PVSS II – the SCADA System at CERN

The Supervisory Control and Data Acquisition (**SCADA**) system at CERN is called **PVSS II**. Used since September 2000, it controls from LHC detectors to ancillary systems.

Infor EAM – the CMMS at CERN

The Computerized Maintenance Management System (**CMMS**) at CERN is called **Infor EAM**. Used for more than 25 years, it controls over 1.6 million pieces of equipment all over CERN.



THE CONTEXT AND THE PROBLEM

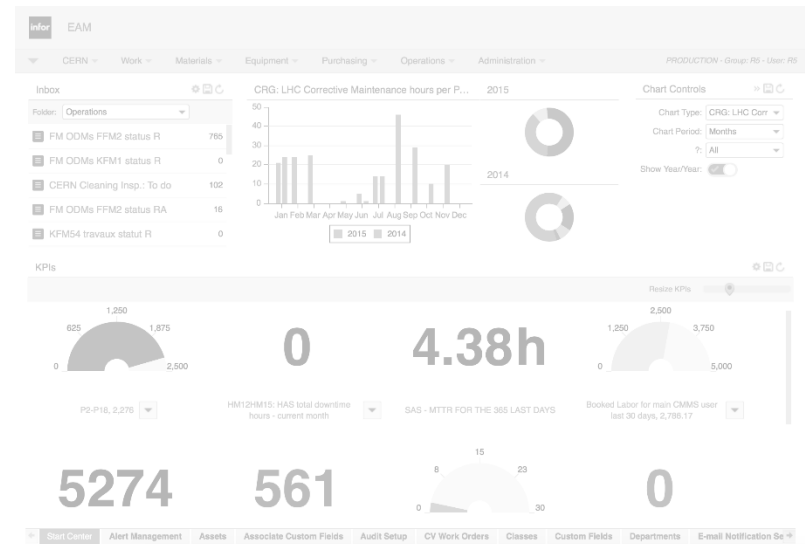
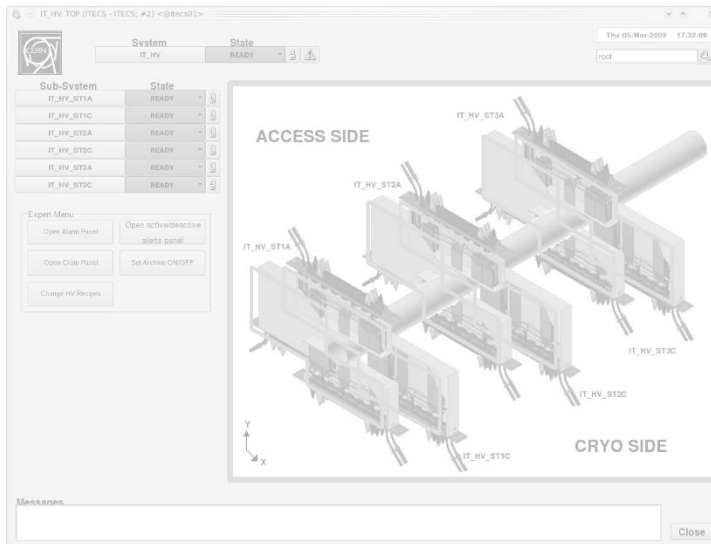


PVSS II – the SCADA System at CERN

The Supervisory Control and Data Acquisition (**SCADA**) system at CERN is called **PVSS II**. Used since September 2000, it controls from LHC detectors to ancillary systems.

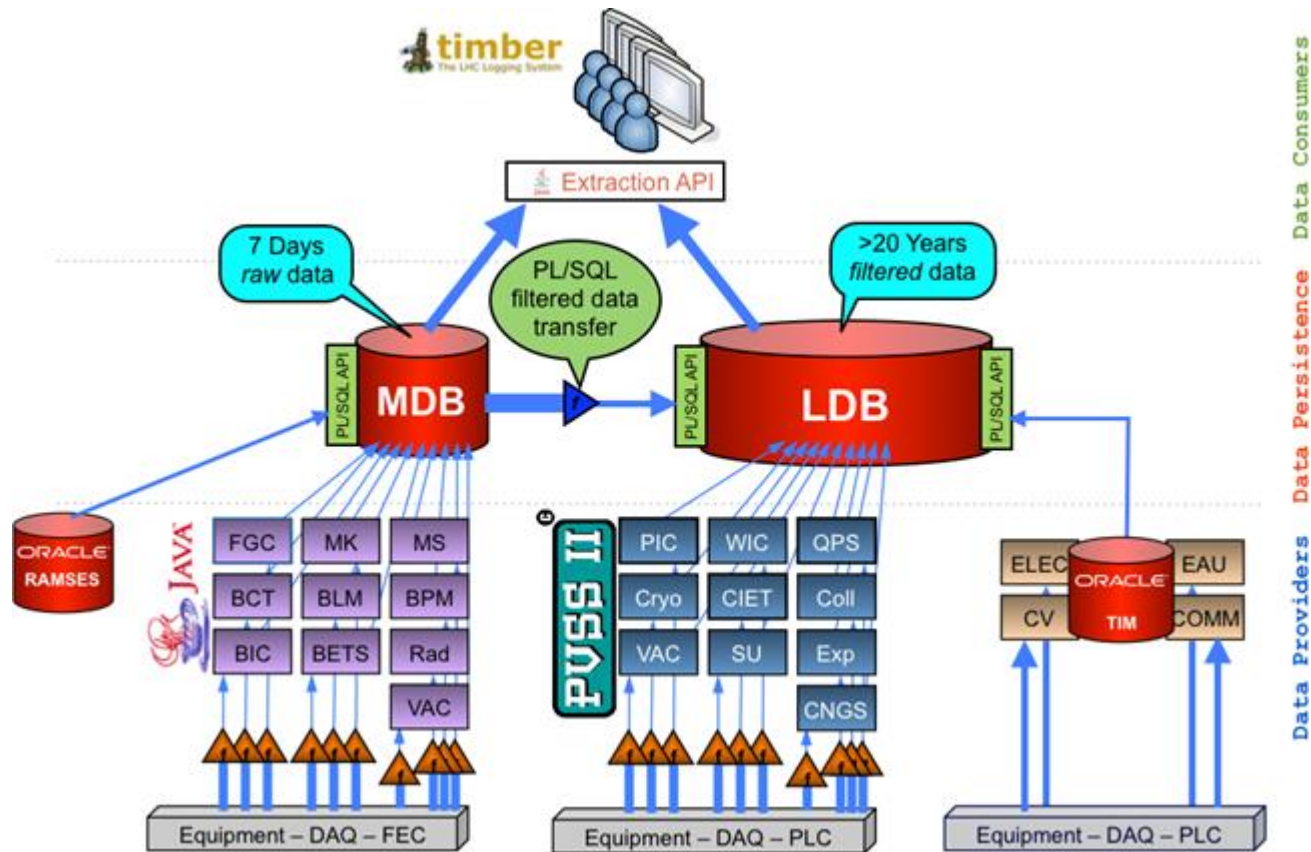
Infor EAM – the CMMS at CERN

The Computerized Maintenance Management System (**CMMS**) at CERN is called **Infor EAM**. Used for more than 25 years, it controls over 1.6 million pieces of equipment all over CERN.



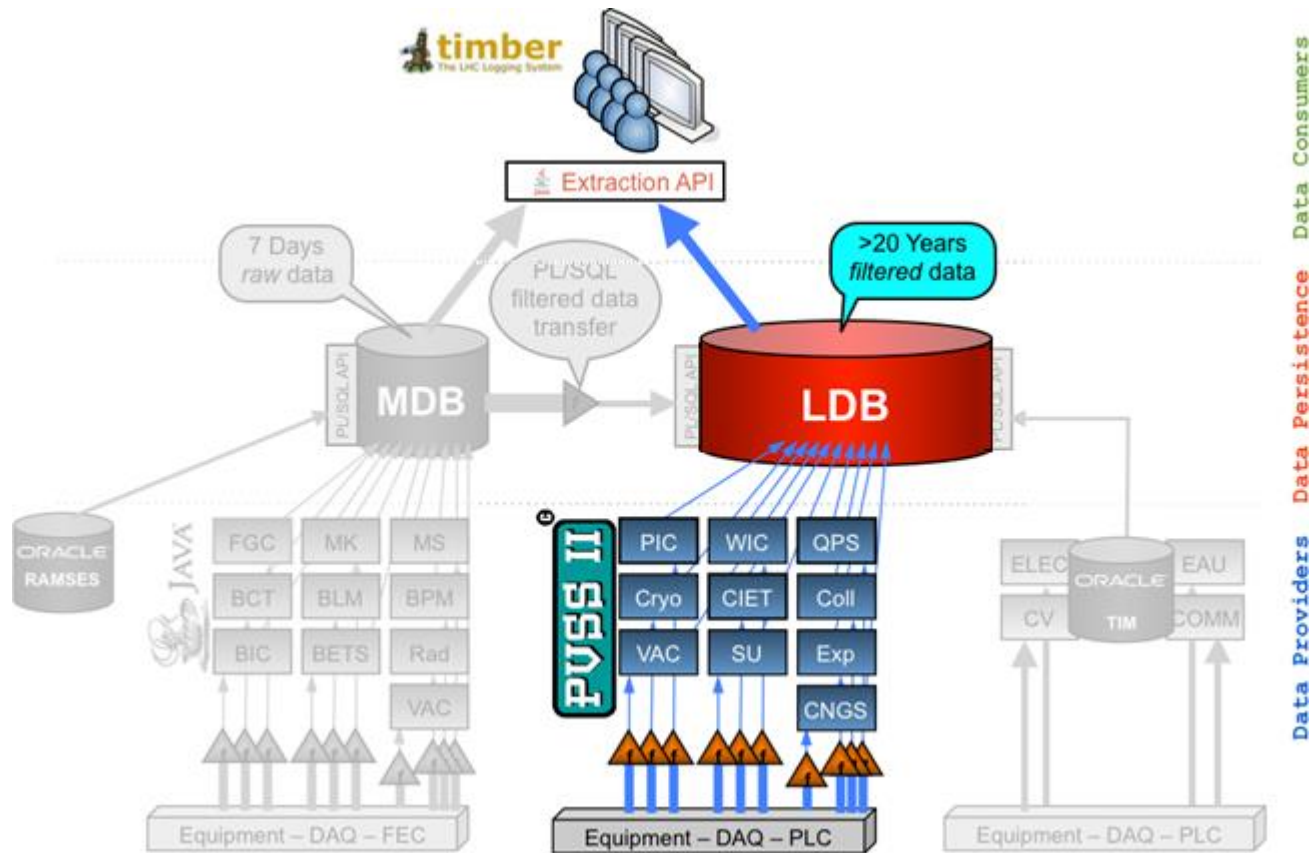
PROPOSED SOLUTION

- **BE-CO-DS** at CERN provides the tool we need in the middle of our data path: **TIMBER**, the **LHC Logging System**.



PROPOSED SOLUTION

- **BE-CO-DS** at CERN provides the tool we need in the middle of our data path: **TIMBER**, the **LHC Logging System**.

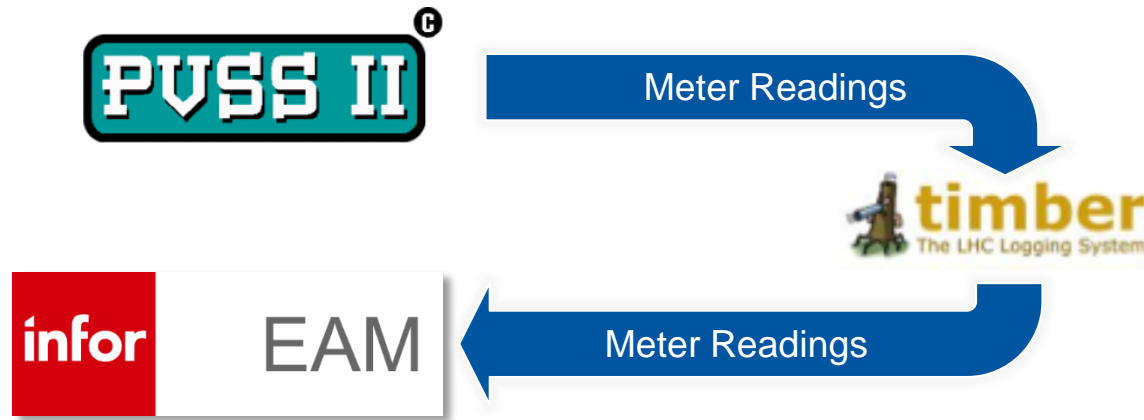


PROPOSED SOLUTION

- **BE-CO-DS** at CERN provides the tool we need in the middle of our data path: **TIMBER**, the **LHC Logging System**.
- **GS-ASE-EDS** at CERN provides the tool we need in the Infor EAM side of our data path: the **Infor EAM Middle Tier Web Services**.

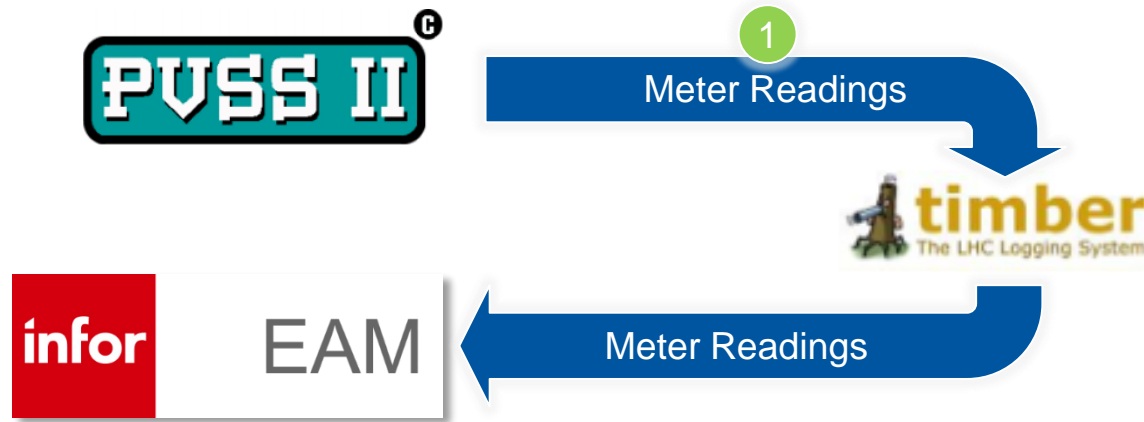
PROPOSED SOLUTION

- **BE-CO-DS** at CERN provides the tool we need in the middle of our data path: **TIMBER**, the **LHC Logging System**.
- **GS-ASE-EDS** at CERN provides the tool we need in the Infor EAM side of our data path: the **Infor EAM Middle Tier Web Services**.



PROPOSED SOLUTION

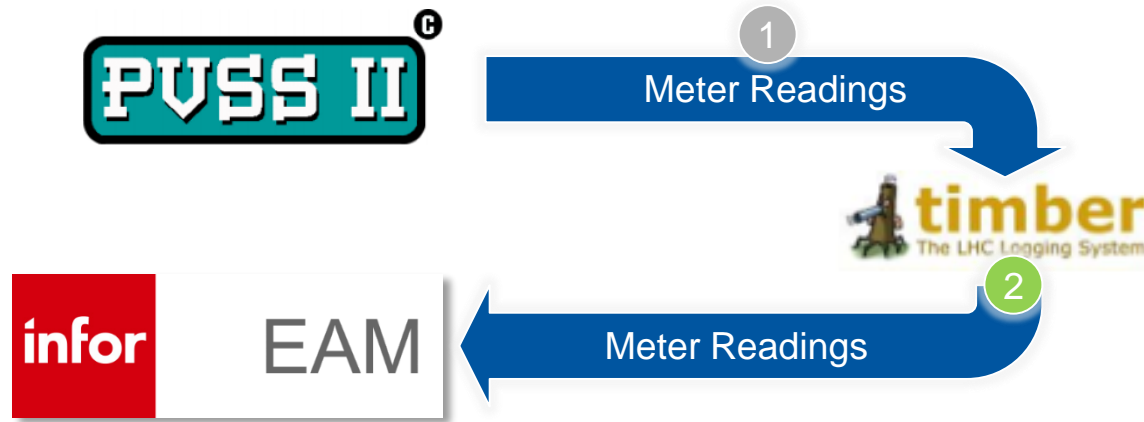
- **BE-CO-DS** at CERN provides the tool we need in the middle of our data path: **TIMBER**, the **LHC Logging System**.
- **GS-ASE-EDS** at CERN provides the tool we need in the Infor EAM side of our data path: the **Infor EAM Middle Tier Web Services**.



- 1 PVSS II can be configured by **BE-CO-DS** to log meter updates in the **LHC Logging System**.

PROPOSED SOLUTION

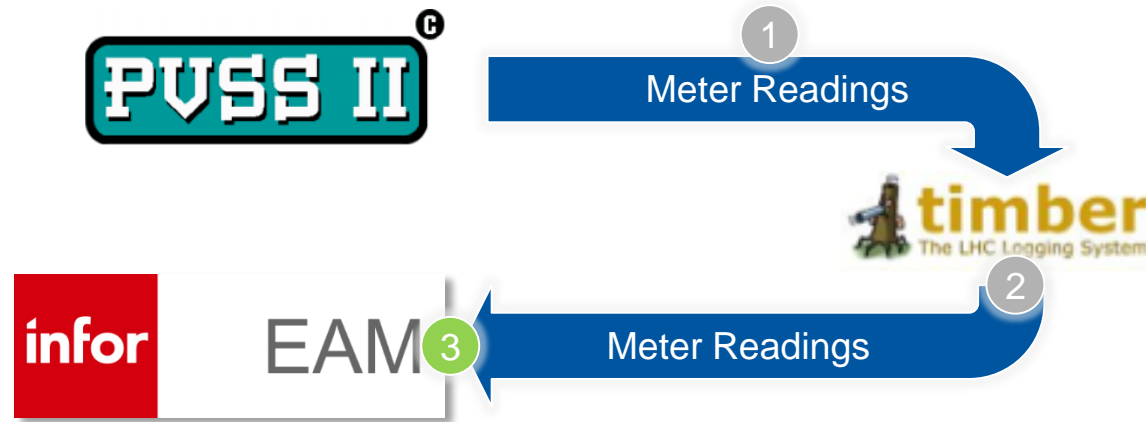
- **BE-CO-DS** at CERN provides the tool we need in the middle of our data path: **TIMBER**, the **LHC Logging System**.
- **GS-ASE-EDS** at CERN provides the tool we need in the Infor EAM side of our data path: the **Infor EAM Middle Tier Web Services**.



- 1 PVSS II can be configured by **BE-CO-DS** to log meter updates in the **LHC Logging System**.
- 2 A **Data Extraction API** can be used by a **Java application** to retrieve logged data from the **LHC Logging System**.

PROPOSED SOLUTION

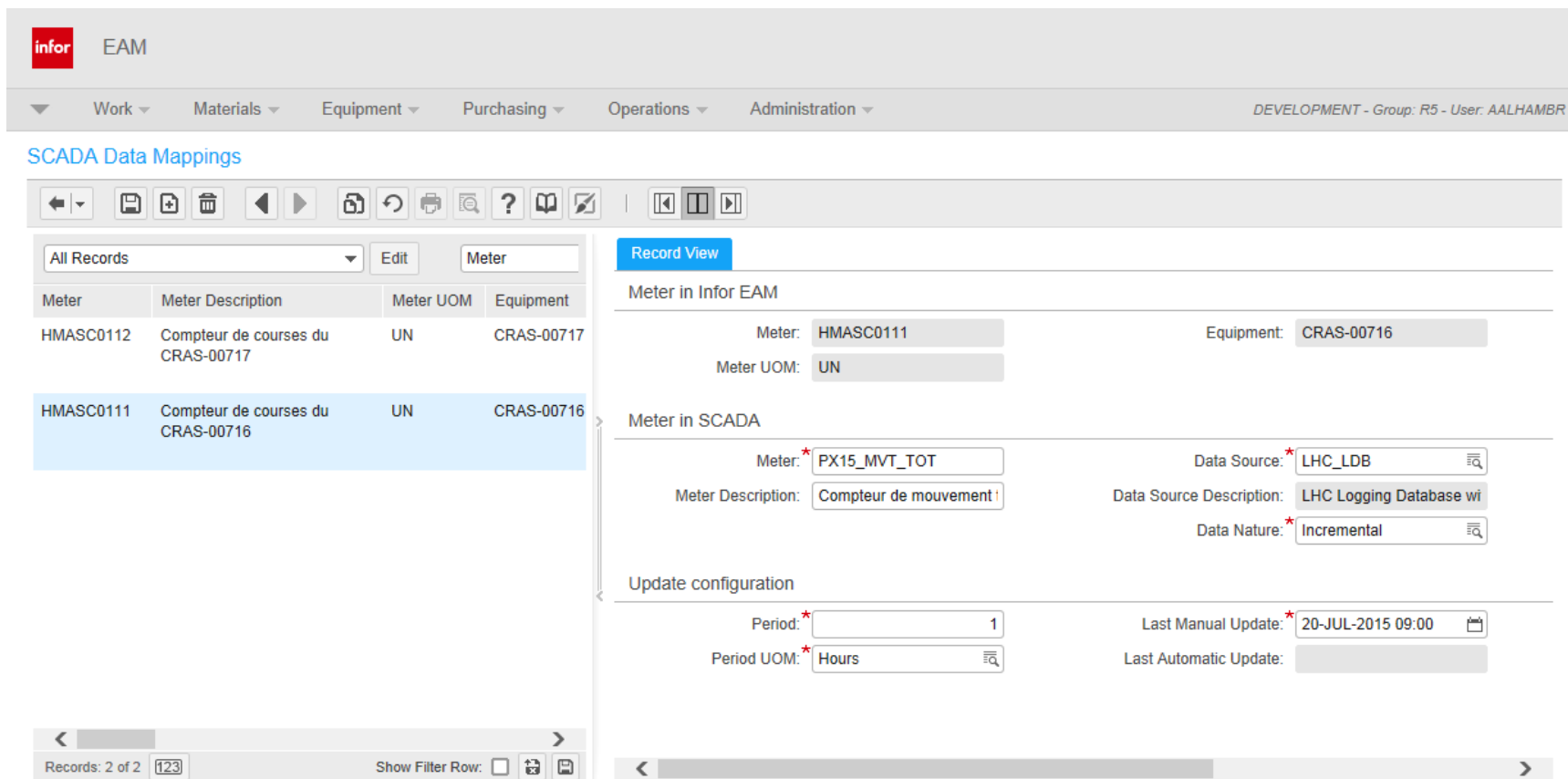
- **BE-CO-DS** at CERN provides the tool we need in the middle of our data path: **TIMBER**, the **LHC Logging System**.
- **GS-ASE-EDS** at CERN provides the tool we need in the Infor EAM side of our data path: the **Infor EAM Middle Tier Web Services**.



- 1 PVSS II can be configured by **BE-CO-DS** to log meter updates in the **LHC Logging System**.
- 2 A **Data Extraction API** can be used by a **Java application** to retrieve logged data from the **LHC Logging System**.
- 3 The **Infor EAM Middle Tier Web Services** can be used to transfer the data to **Infor EAM**.

FINAL PRODUCT

The final solution to allow the final users configure their meters in **Infor EAM** to be automatically updated from **PVSS II** is integrated in the **Infor EAM** extended web interface as a **User Defined Screen**.



infor EAM

Work Materials Equipment Purchasing Operations Administration DEVELOPMENT - Group: R5 - User: AALHAMBR

SCADA Data Mappings

All Records Edit Meter

Meter	Meter Description	Meter UOM	Equipment
HMASC0112	Compteur de courses du CRAS-00717	UN	CRAS-00717
HMASC0111	Compteur de courses du CRAS-00716	UN	CRAS-00716

Record View

Meter in Infor EAM

Meter: HMASC0111 Equipment: CRAS-00716
Meter UOM: UN

Meter in SCADA

Meter: *PX15_MVT_TOT Data Source: *LHC_LDB
Meter Description: Compteur de mouvement ! Data Source Description: LHC Logging Database wi
Data Nature: *Incremental

Update configuration

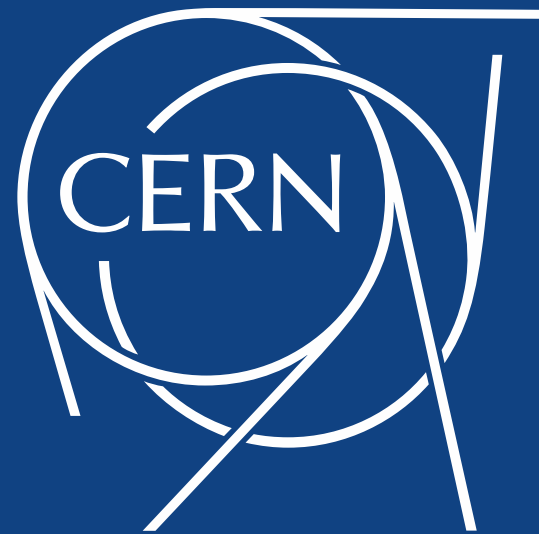
Period: *1 Last Manual Update: *20-JUL-2015 09:00
Period UOM: *Hours Last Automatic Update:

Records: 2 of 2 123 Show Filter Row:

Thank you very much
for your attention 😊

Questions?





Extra Slides



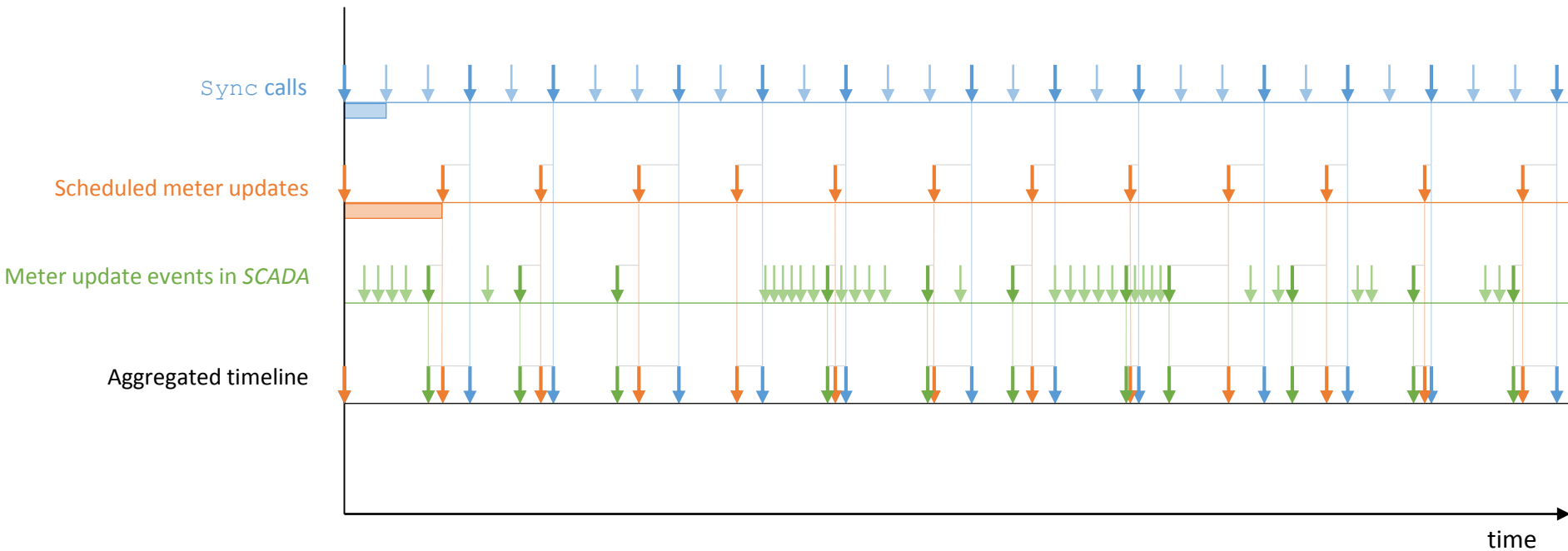
TEAMS

- **EN-HE-LM: Engineering – Handling Engineering – Lift Maintenance**
<http://en.web.cern.ch/en-he-group>
- **BE-CO-DS: Beam – Controls – Data Services**
<https://espace.cern.ch/be-dep/CO/DS/default.aspx>
- **GS-ASE-EDS: General Services – Access, Safety and Engineering tools – Engineering Databases and Systems**
<http://gs-dep.web.cern.ch/en/content/gs-ase>
- **GS-ASE-EPS: General Services – Access, Safety and Engineering tools – Engineering Process Support**
<http://gs-dep.web.cern.ch/en/content/gs-ase>

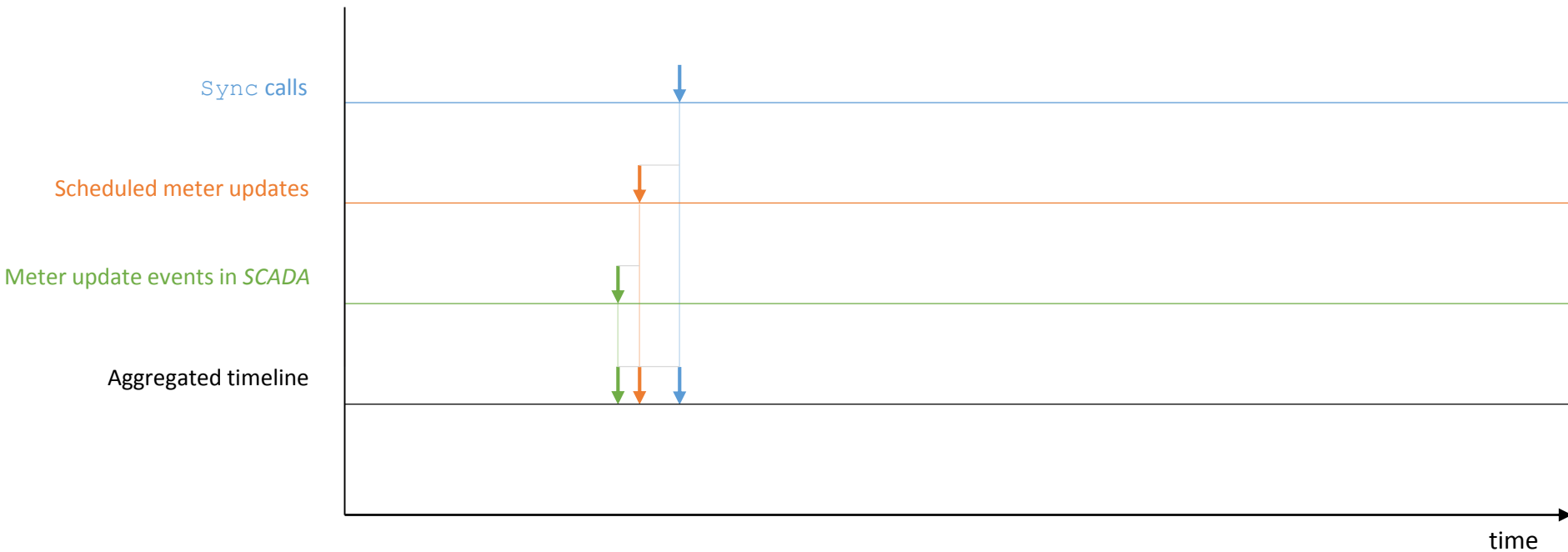
THE BACKEND

- The core of the final solution is a self-contained **Java Web Application** which runs on an independent **Apache Tomcat 7** container.
- This application provides a **sync** method intended to be invoked every 5 minutes by a **robust external periodic events generator** such as the Oracle DBMS which manages all the **Infor EAM** data.
- Every time the **sync** method is called, this Java application performs the following actions:
 1. It uses the **Infor EAM Middle Tier Web Services** to fetch the mapping information, provided by the users through the front end, for all the meters whose readings need to be updated.
 2. It uses the **Data Extraction API** to retrieve from **TIMBER** logged data from **PVSS II**.
 3. It uses the **Infor EAM Middle Tier Web Services** to update the meters using the retrieved data.

THE TIMING MODEL



THE TIMING MODEL



FEATURES OF THE FINAL PRODUCT

The final product has been designed with 4 main objectives in mind:

- **Usability:** The user interface minimizes the amount of information needed to be provided in order to setup a meter to be auto-updated.
- **Flexibility:** The tool has been designed to flexibly support different types of data nature or different data source settings.
- **Robustness:** The tool has been carefully developed to recover from runtime errors whenever possible, notify of failures and always preserve a consistent state of the meter data in Infor EAM.
- **Extensibility:** The system architecture has been carefully designed to allow future extensions like different data sources in the future.