Condition-based maintenance via PI System

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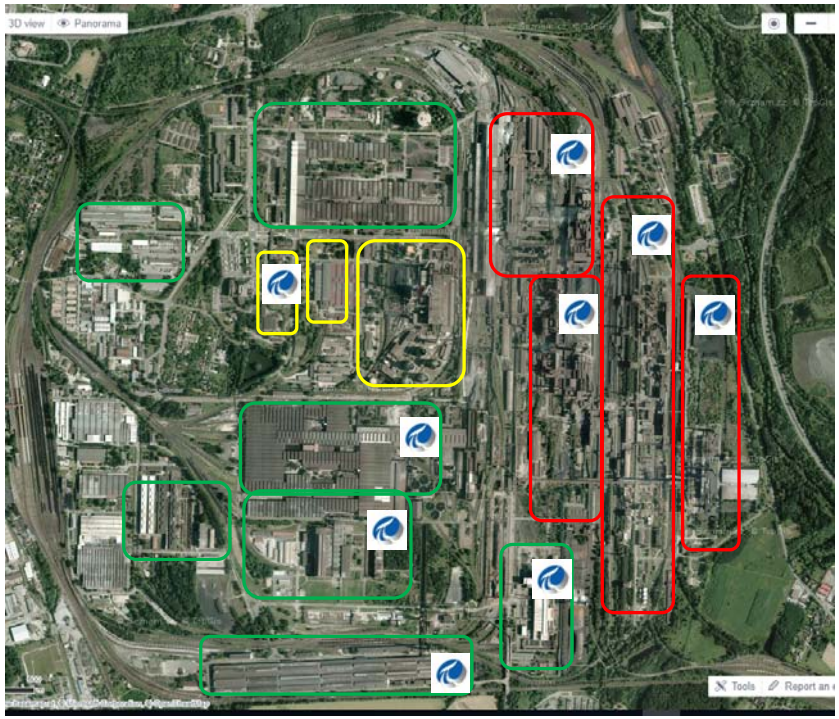
October 2020

LIBERTY Ostrava – complex metallurgical process



Primary

- Coke plant
- Blast furnaces
- Steel plant

Secondary

- WR and HCC mill
- Middle section mill
- Flat products mill
- Cutting lines
- Tubulars
- Foundry
- Road barriers

Services

- Power station
- Engineering products
- Labs

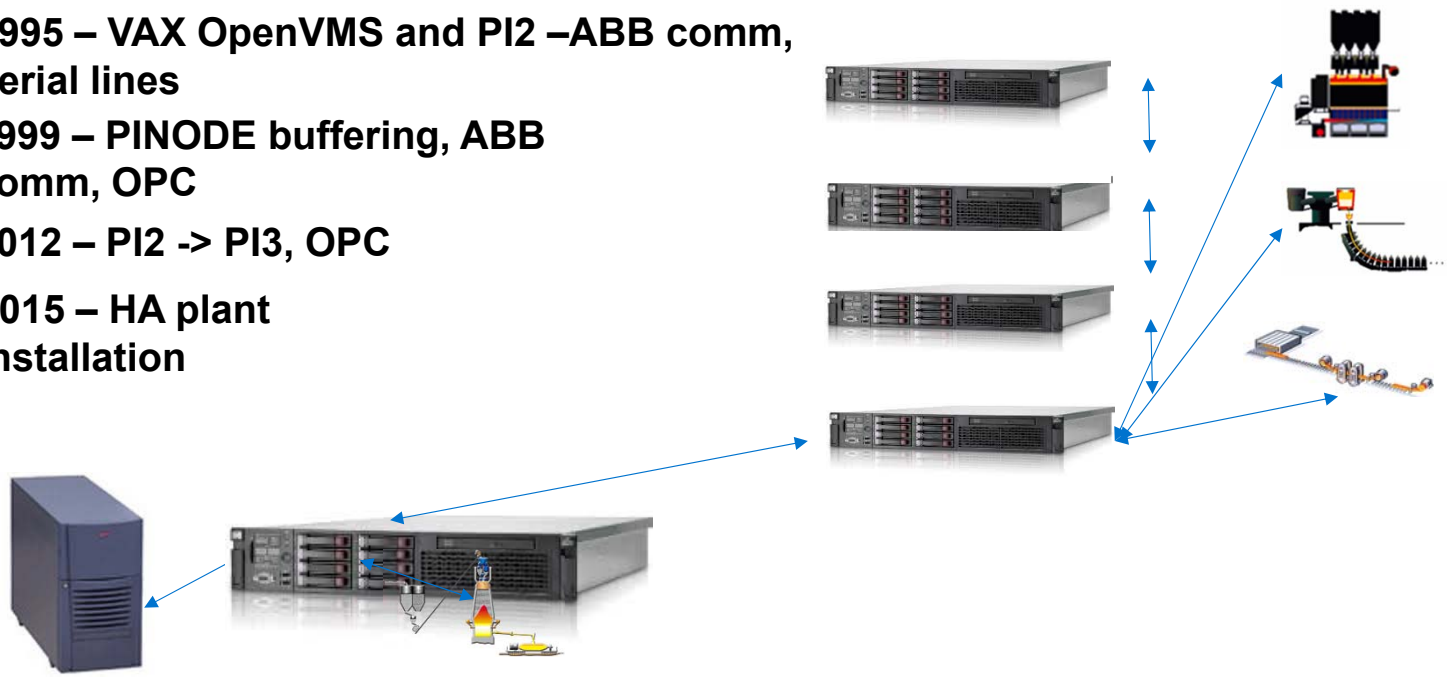
Ostrava‘s PI system history

1995 – VAX OpenVMS and PI2 –ABB comm, serial lines

1999 – PINODE buffering, ABB comm, OPC

2012 – PI2 -> PI3, OPC

2015 – HA plant installation



The communications with other systems (labs, environmental systems) followed described changes

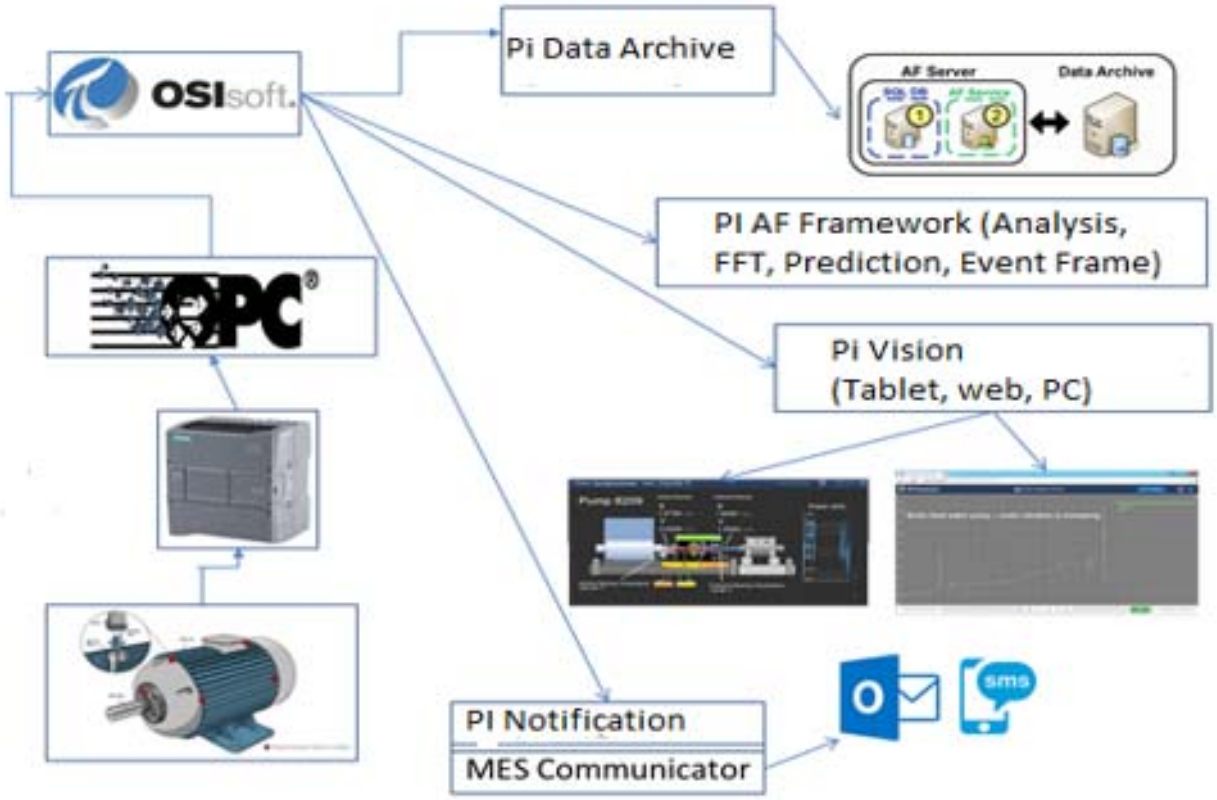
PI and Maintenance

LIBERTY

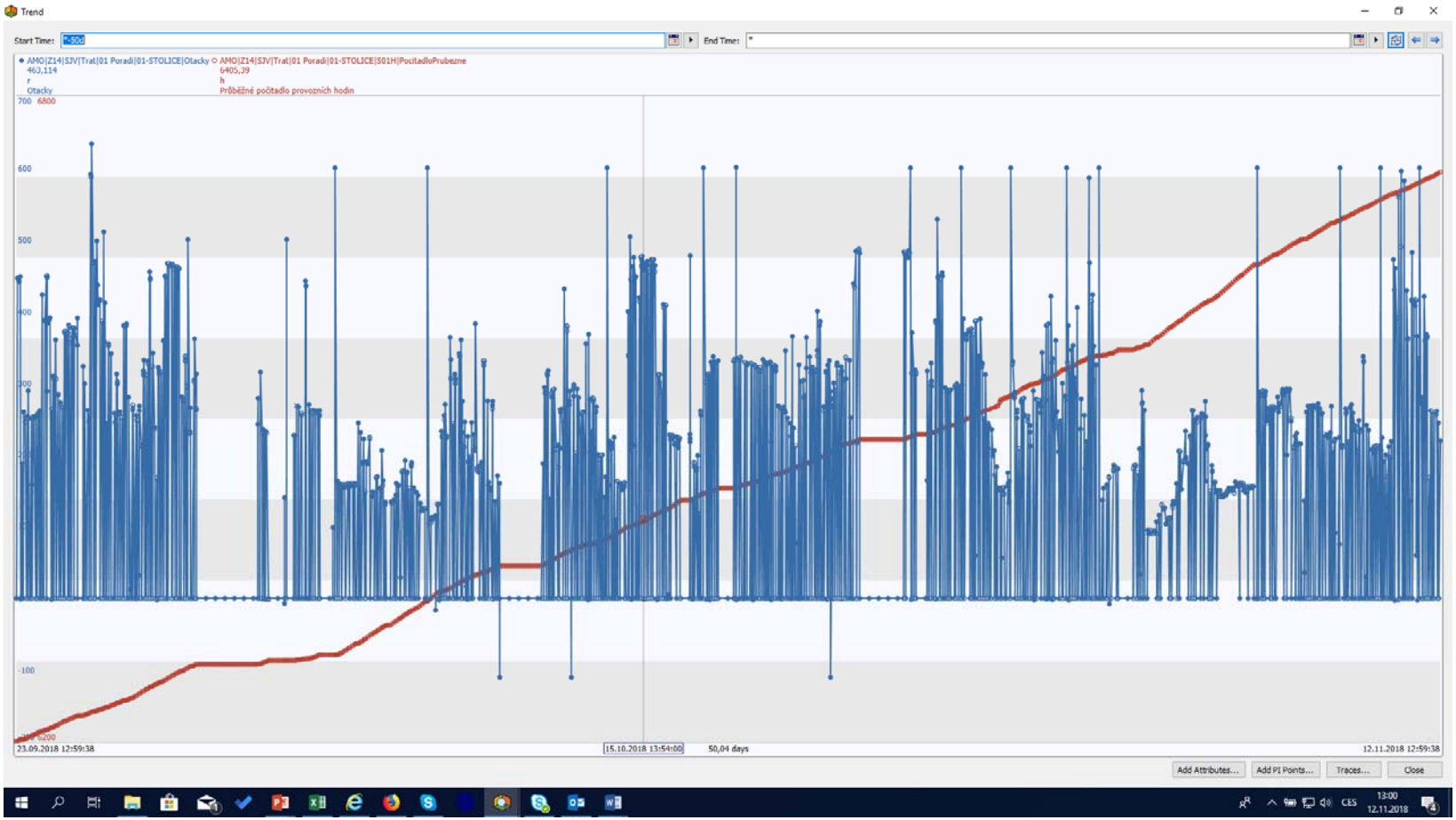
Challenge	Solution	Benefits
• Automatic decision system for CBM	• Internal app develop based on PI System	• FTE saving, avoid mistakes in process, H&S increasing
• Event and alarm system for preventive maintenance	• PI System data and triggers to application	• Avoid loses in production approx 10%
• Predictive maintenance	• Predictive system based on PI System	• Just in progress

PI and Maintenance – CbM - Lubrication of devices

Realisation of data flow



PI and Maintenance – CBM - Lubrication of devices



Working time calculation

Based of electric current or engine spin the working time is calculated (red line)

PI and Maintenance – CbM - Lubrication of devices

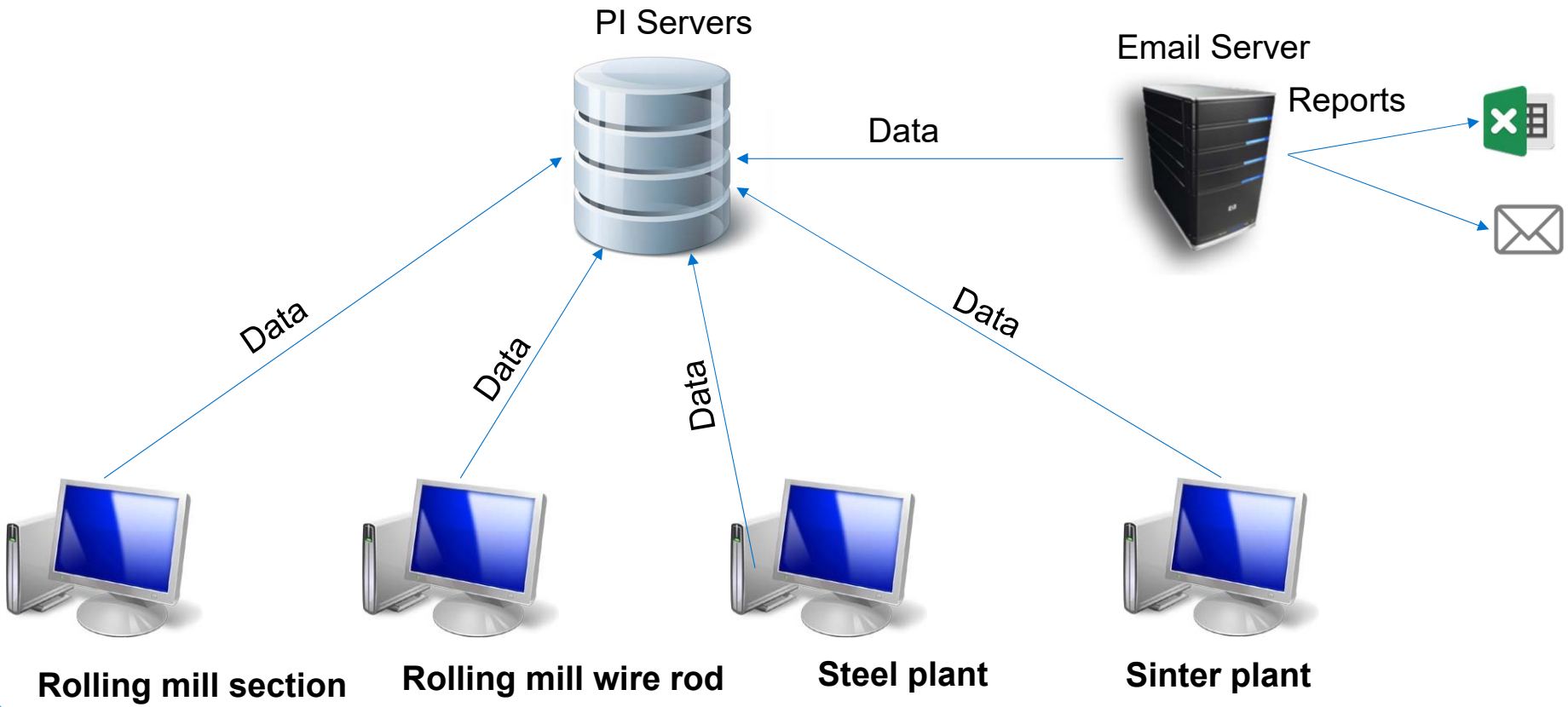
Base data

Working time between lubrication

Total working time

Reset after lubrication

Current architecture



Current situation - description

- All data stored in PI Server databases
- Clients - applications in the form of thick clients on user PCs. To start and verify it is necessary to install PI System + to load the user into the PI system. The user can view data, enter data, export reports, monitor Event Frame or PI Vision applications
- User management - we have established user groups based on AD
- Email server - processes data from PI servers, creates text / Excel reports

Current methods

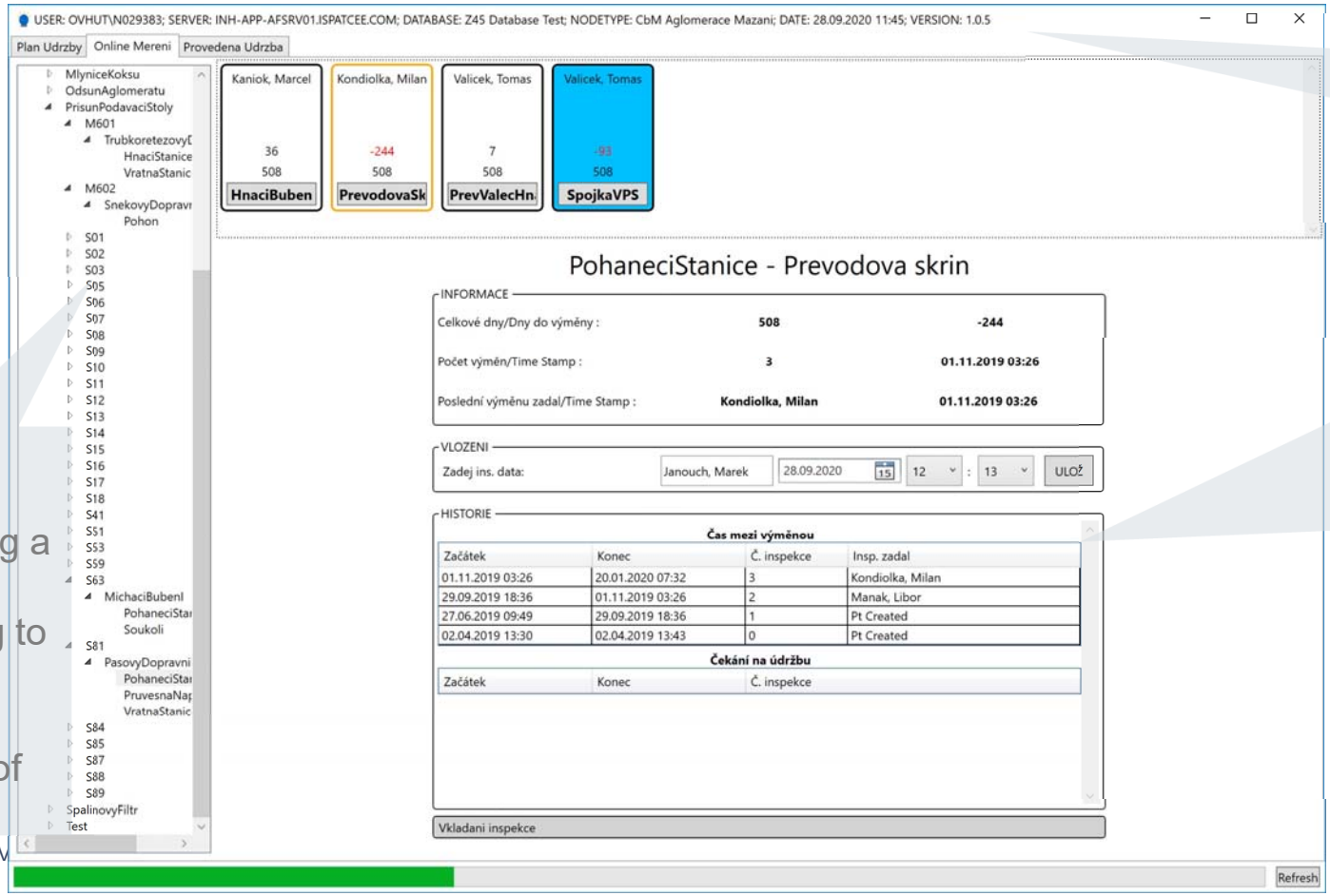
All methods of connecting to programs are from **OSIsoft.AFSDK**.

- Individual maintenance points are represented by **AF Elements**
- Using PI Analyses, the continuous operating hours in the load range are calculated.
- This data is visualized in several ways by a client application in **C # WPF**.
- User inputs are written as **AF Values** using **Update Values** in the **PI Data Archive** - in our case in both **PI Collective Members**.
- Events used to generate **Event Frames** are defined. Event Frames are triggered by the so-called Stack Trigger. Currently, two Event Frames are available to users:
  - **Time between maintenance** (how long has passed since the last lubrication)
  - **Waiting for maintenance** (is the time when the device had exceeded the maintenance interval) – Event Frames are triggered by the so-called Stack Trigger.

Current methods

- Display of data from Event Frames as reports
- Display of data from Event Frames graphically using PI Vision
- Excel reports and lists are generated from the data
  - Weekly overview
  - Recommended lubrication schedule
  - Warning for non-maintenance
- These reports are regularly emailed to the users responsible for the area

Main page for Sinter plant

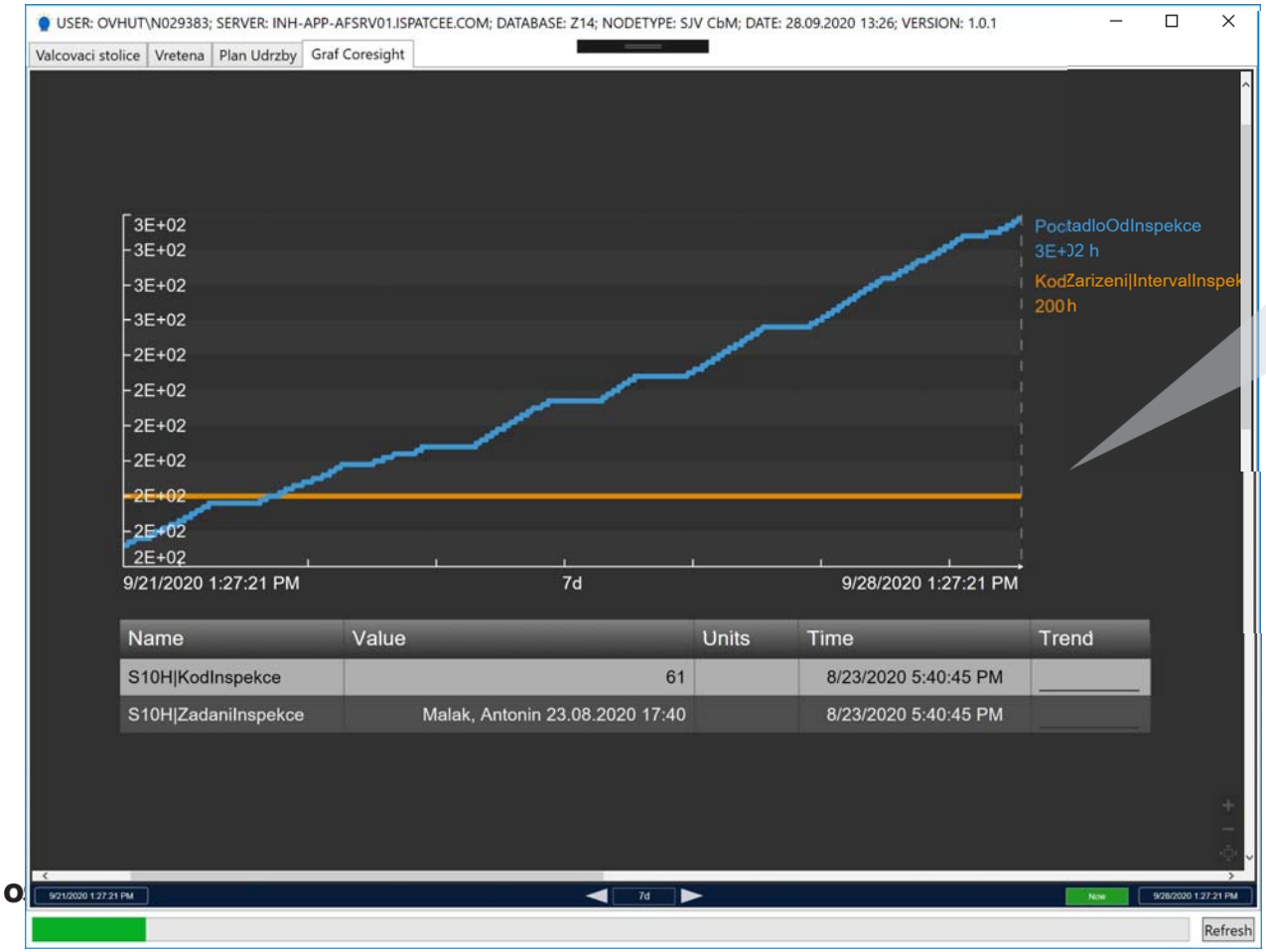


View information about the logged in user, PI server, and dataset.

Displays the detail window of the element. It is possible to insert a maintenance record, look at the maintenance processes in the form of Event Frames.

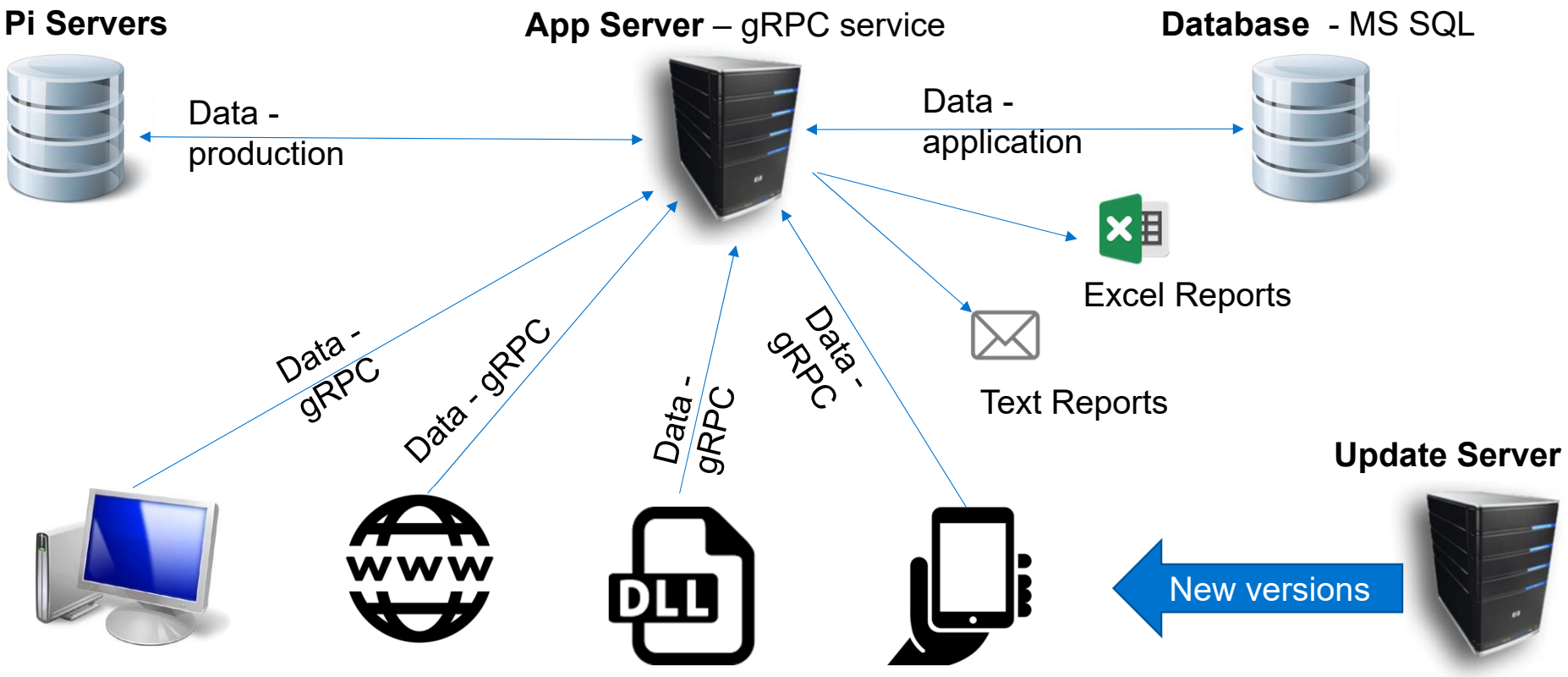
Display of individual elements using a tree structure corresponding to the individual physical arrangement of the line.

Rolling mill – sections – PI Vision report



Pages displayed in kiosk mode for the rolling mill. It is possible to use the change of the interval of displayed data here.

Future architecture



Future architecture

- The server will also implement business logic for creating emails and attachments in the form of xls, txt. And send them to the appropriate user groups.
- Users will use a range of thin clients - in addition to existing WPF desktop applications, it will also be a client in the form of a website (asp.net), a native mobile application, a dll library for integration into third-party software.
- By defining endpoints using the gRPC protocol, the client application is not dependent on any specific technology or development environment and is faster than Web API
- Update server - will be the only place where current versions of programs (thin clients) will be displayed

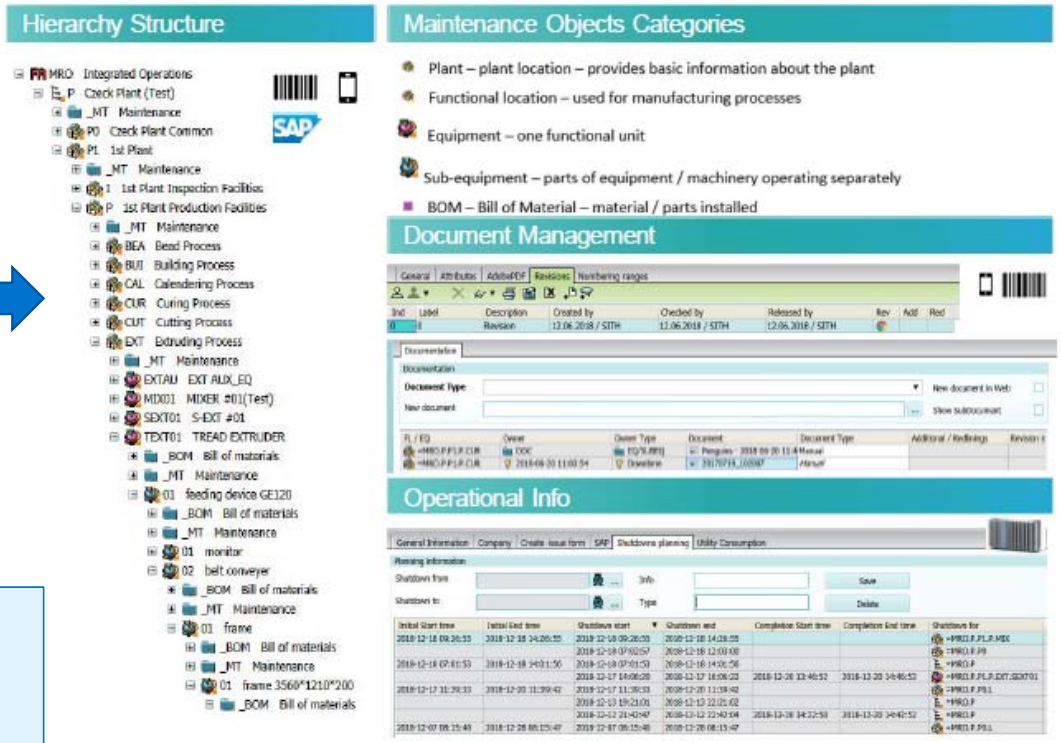
Next steps

Integrate PI System with professional maintenance system contain CMMS, Prediction and Prevention tasks

CAPEX project

Enlarge current benefits as :

FTE saving
Process reliability increasing
Costs savings
Spare parts supplies decreasing



Thank you