Improving the Daily Operation Report with OSIsoft PI System

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Agenda

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- Energy Sector and a Comparative View
- Brazilian Electrical System
- OSI PI Outside Operative Network
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Improving the Daily Operation Report with OSIsoft PI System

COMPANY AND GOAL

ONS is an Independent System Operator that operates and coordinates the Brazilian Electrical System and wanted to improve the Daily Operation Report.

CHALLENGE

Increase the Real Time Team productivity, bringing more security, precision and uniqueness for the records currently made, with emphasis on decision making. Currently certain records are made in more than one application (which are not integrated) to serve more than one process outside the control rooms.
ONS and a Broad View

- Independent System Operator (ISO) of Brazilian Electrical System;

- Private, non-profit organization founded in 1998;

- 721 employees, 586 with university degree, 400 engineers;

- Mission: Operate the National Interconnected System in an integrated manner, with transparency, fairness and neutrality in order to ensure security, continuity and economic efficiency of electricity supply in Brazil;
Energy Sector and a Comparative View

**Brazil**

- **Policies**
  - President
  - Congress
  - MME

- **Regulation Oversight**
  - ANEEL

- **Compensation Chamber, Planning, Operation**
  - CCEE
  - ONS
  - EPE

- **Energy Companies**
  - State Owned
  - Private

**USA**

- **Policies**
  - President
  - Congress
  - DOED

- **Regulation Oversight**
  - FERC

- **Compensation Chamber, Planning, Operation**
  - ISO / RTO

- **Energy Companies**
  - Private
Brazilian Electrical System

• The SIN supplies almost the total electricity consumption of the country. Record demand was 86 GW in Feb’14

• Hydro generation is dominant: about 73%. Hydro Power plants with reservoir, and run of rivers plants.

• Thermal generation is complementary with diversity of fuels: nuclear, coal, natural gas, oil, diesel = about 17%.

• Small share (about 10%) of non-conventional renewable energies: wind, solar and biomass.

• Main transmission grid (≥ 230 kV) with long distance lines.
OSIsoft PI System outside operative network

• Interchange and charge calculation system

• Dynamic graphics used in our institutional website are provided by OSIsoft PI System and Tableau data visualization software

• Use of OSIsoft data to produce and train predictive models for forecasting in combination of specialized tools
Daily Operation Report (RDO)

The RDO project is part of an ONS led program that aims to adopt new solutions to improve the quality of real-time registrations and reduce the effort of control center engineers in performing repetitive services.

At the basis of this effort is the view that an integration of the OSIsoft-PI System through the Asset Framework with internally developed software could give the ONS more records with more assertive information.

These records are used as data for the analysis of failures in the electrical system and in several situations where the momentary view of the event must be taken into account.
Monitor the National Integrated Electrical System (SIN) and capture events of interest for the generation of the Daily Operation Report. Reducing the number of interfaces and time spent by Real Time Team and increasing the quality of these report.
Implementation Details - Actual Scenario

OSIsoft PI System (Data Archive)

SSC
- MUG
- DEGOP

Integration Bus
- SGD

Applications
- RDO
- Triagem
- SGR
- SIPER
- CIOP
- SAMUG

Applications
- SIPER
- SAMUG
- SICOP
- IPDO
- BDO
- SAGIC

Program Scope
Systems to be discontinued
Implementation Details - Future Scenario

OSI PI
- AF
- OSIsoft PI System (Data Archive)

Applications
- RDO
- Triagem
- SGR
- IPDO
- BDO
- SIPER
- SAMUG
- SICOP
- RANOR/OTRS
- SAGIC

Integration Bus
- SGD

Analytics
- Tableau
- Analítico

Program Scope
Implementation Details - Used Tools

- PI Asset Framework;
- Event Frames;
- Analysis;
- Notifications;
- PI-SDK;
- Web API Application;
- Angular 4 Application;
Implementation Details – Data Flow

Real Time Users

Supervision and Control System

ONS Communication

Power Companies Communication

Power Companies
Implementation Details - ONS PI System Architecture

- Largest PI System in Latin America;
- Over 3 million tags;
- Get about 87,000 analogic values and 157,000 digital states;
- Records more than 20,000 measurements per second.
- High availability;
Implementation Details - RDO Architecture

Front End
- Front End 1
  - REST WebAPI + Angular 4
- Front End 2
  - REST WebAPI + Angular 4

Event Service
- Event Server 1
  - REST WebAPI
- Event Server 2
  - REST WebAPI

Report Service
- Report Server 1
  - REST WebAPI
- Report Server 2
  - REST WebAPI

ADC
- ADC
- ADC
- ADC

AF Server
- OSIsoft Infrastructure

Database
- SQL Server
- In-Memory Cache

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Implementation Details – Event Frames / Notifications

- CAG on;
- CAG off;
- CAG operation modality changed;
- Generation Unit On;
- Generation Unit Off;
- Submarket Power Load Deviation;
- Integrated System Power Load Deviation;
- System Frequency High;
- System Frequency Low;
- Power Plant Generation Out of Programmed Range;
- Line Off;
- Busbar Section Off;
- Compensator Off;
- Inverter Off;

Total: 141
Implementation Details – Web Application – Report Search
Implementation Details – Web Application – Add Report
Results Obtained / Business Impact

Events
- 62.80% Automated
- 37.20% Not Automated

Events Effort
- 89.88% Automated
- 10.12% Not Automated
Results Obtained / Business Impact

Report:
- 72.34% (Automated)
- 27.66% (Not Automated)

Report Effort:
- 41.22% (Automated)
- 58.78% (Not Automated)
Next Steps

- Improve the Event/Report Universe;
- Improve the number of automated reports;
- Bring more information to user;
- Integrate with other systems;
# Improving the Daily Operation Report with OSIsoft PI System

## COMPANY AND GOAL
ONS is an Independent System Operator that operates and coordinates the Brazilian Electrical System and wanted to **improve the Daily Operation Report**.

## CHALLENGE
Increase the Real Time Team productivity, bringing more security, precision and uniqueness for the records currently made, with emphasis on decision making. Currently certain records are made in more than one application (which are not integrated) to serve more than one process outside the control rooms.

## SOLUTION
- OSIsoft AF and Web API based Application
  - Development of a Web Application that integrates with PI Event Frames using PI Notifications to receive the daily National Integrated Electrical System occurrences.
  - Development of Web Services to integrate with other Business Areas.

## RESULTS
- **ONS Real Time Team**: reduction of effort to record occurrences
  - 37,20% Events Automated
  - 27,66% Reports automated;
  - 89,88% Events Effort Automated;
  - 58,78 % Reports Effort Automated.
Credits / Project Team

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ONS Control Center Manager

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Questions

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Thank You

Merci
Danke
Gracias
Grazie
Obrigado
감사합니다
谢谢
Спасибо
ありがとう

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