

Improving the Daily Operation Report with OSIsoft PI System

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Agenda

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- ▶ ONS and a Broad View
- ▶ Energy Sector and a Comparative View
- ▶ Brazilian Electrical System
- ▶ OSI PI Outside Operative Network
- ▶ Daily Operation Report (RDO)
- ▶ Implementation Details
- ▶ Results Obtained / Business Impact
- ▶ Next Steps

Improving the Daily Operation Report with OSIsoft PI System



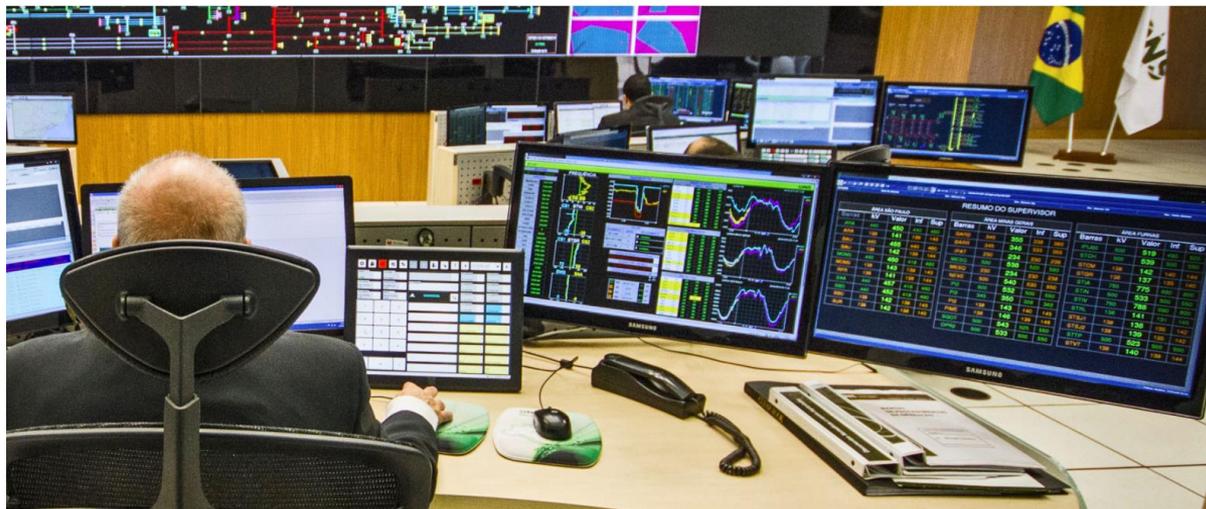
Operador Nacional
do Sistema Elétrico

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.

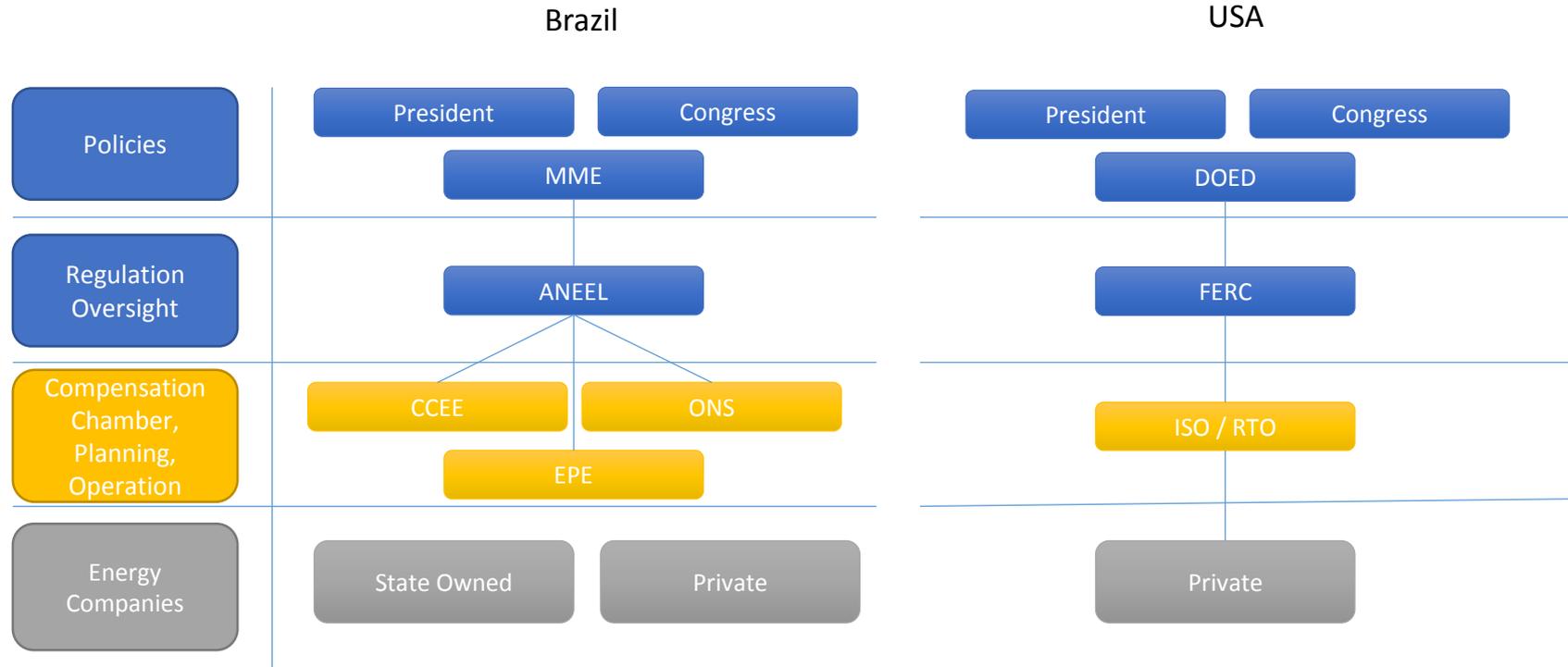


ONS and a Broad View

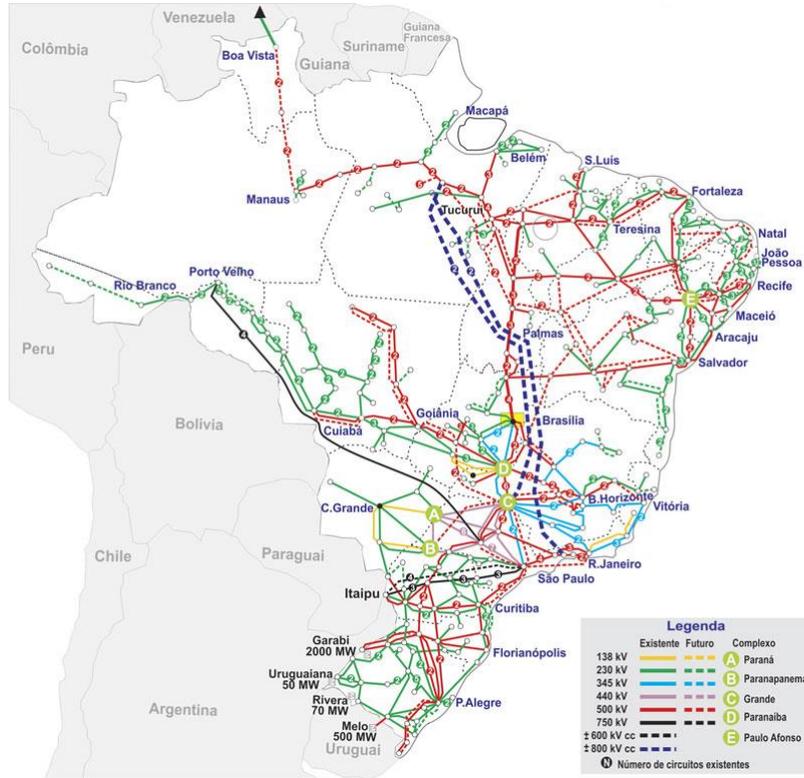
- ▶ Independent System Operator (ISO) of Brazilian Electrical System;
- ▶ Private, non-profit organization founded in 1998;
- ▶ 721 employees, 586 with university degree, 400 engineers;
- ▶ Mission: Operate the National Interconnected System in an integrated manner, with transparency, fairness and neutrality in order to ensure security, continuity and economic efficiency of electricity supply in Brazil;



Energy Sector and a Comparative View



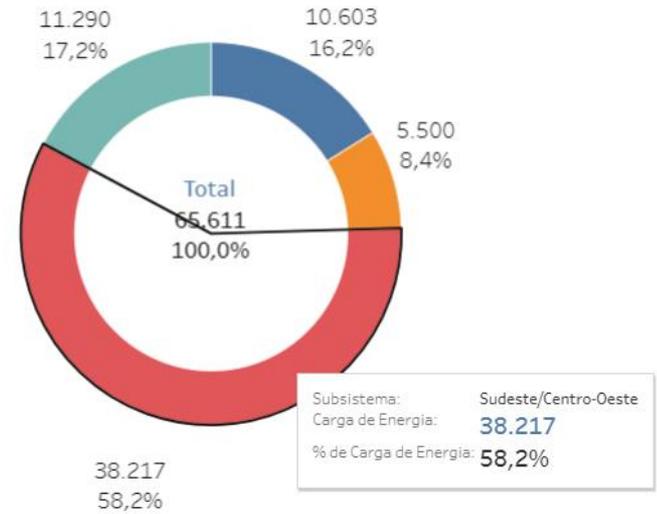
Brazilian Electrical System



- 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

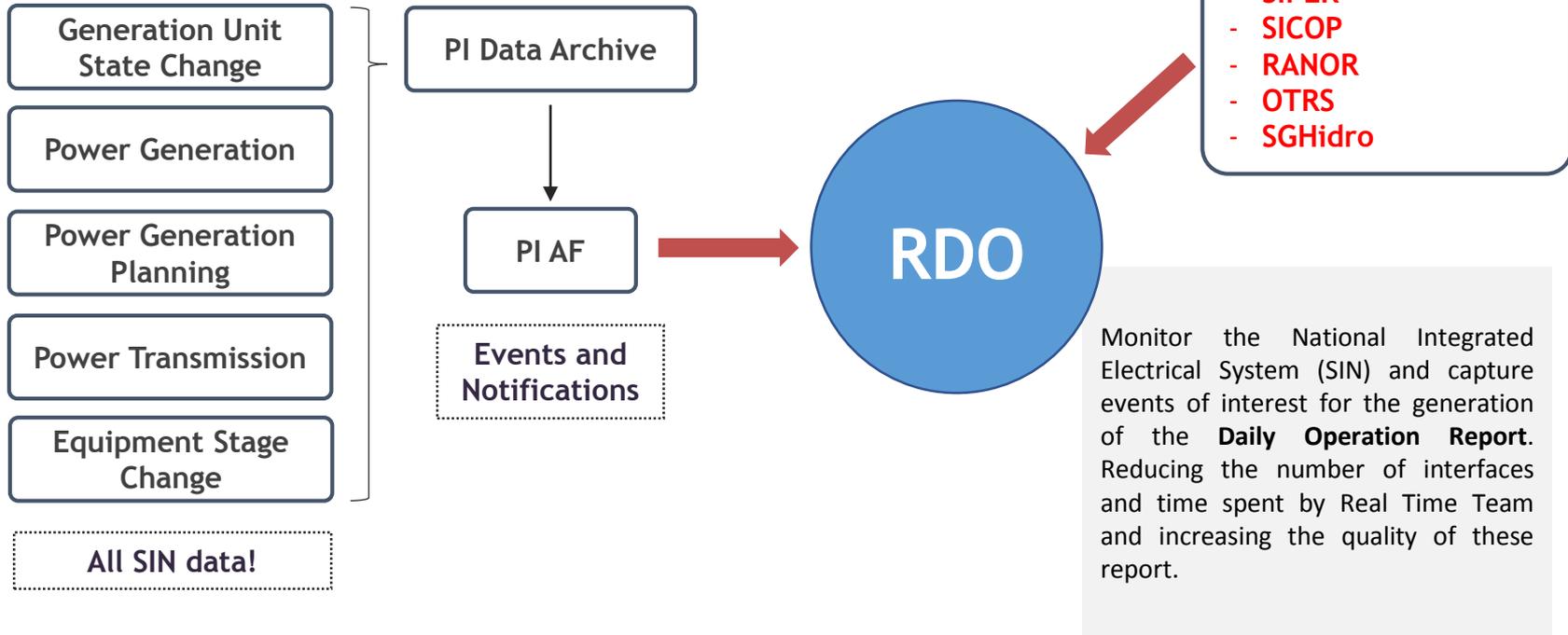
- Interchange and charge calculation system
- Dynamic graphics used in our institutional website are provided by OSIsoft PI System and Tableau data visualization software
- Use of OSIsoft data to produce and train predictive models for forecasting in combination of specialized tools



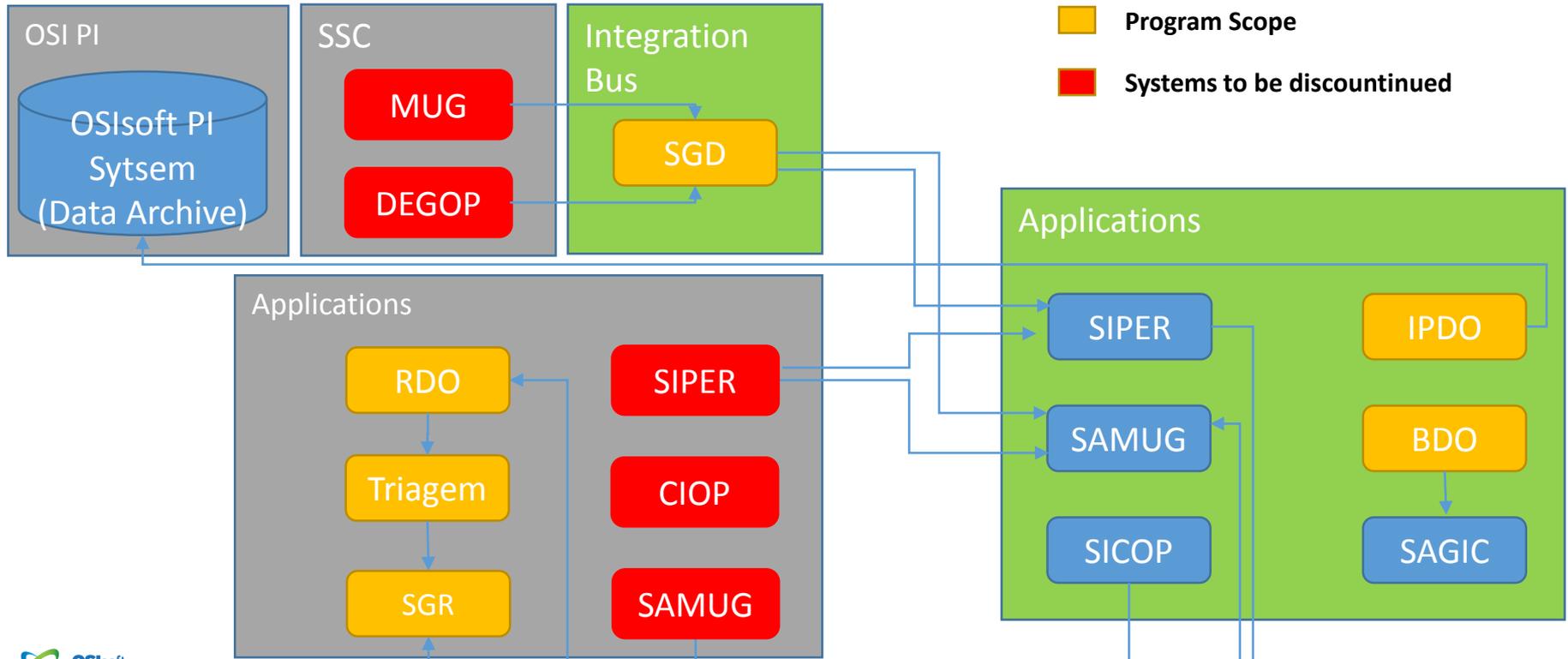
Daily Operation Report (RDO)

- ▶ 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.

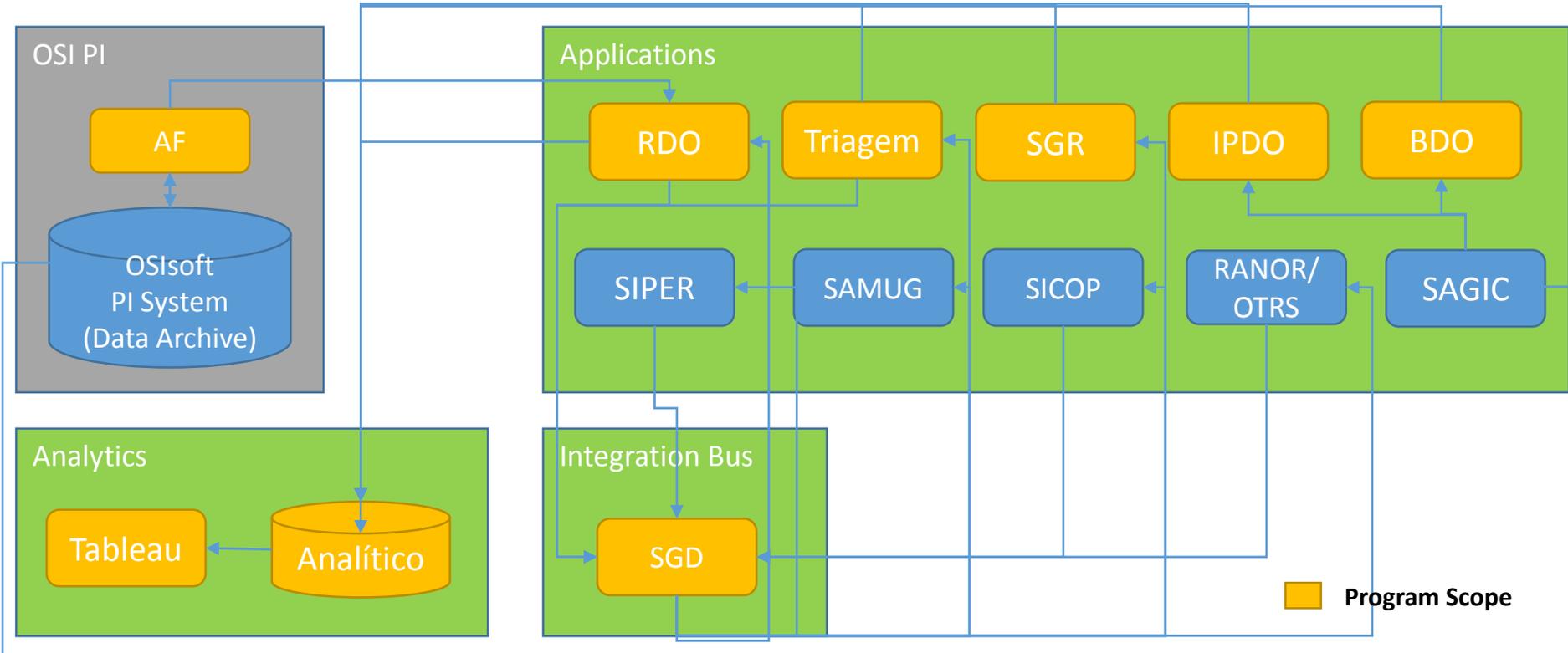
Daily Operation Report (RDO)



Implementation Details - Actual Scenario



Implementation Details - Future Scenario

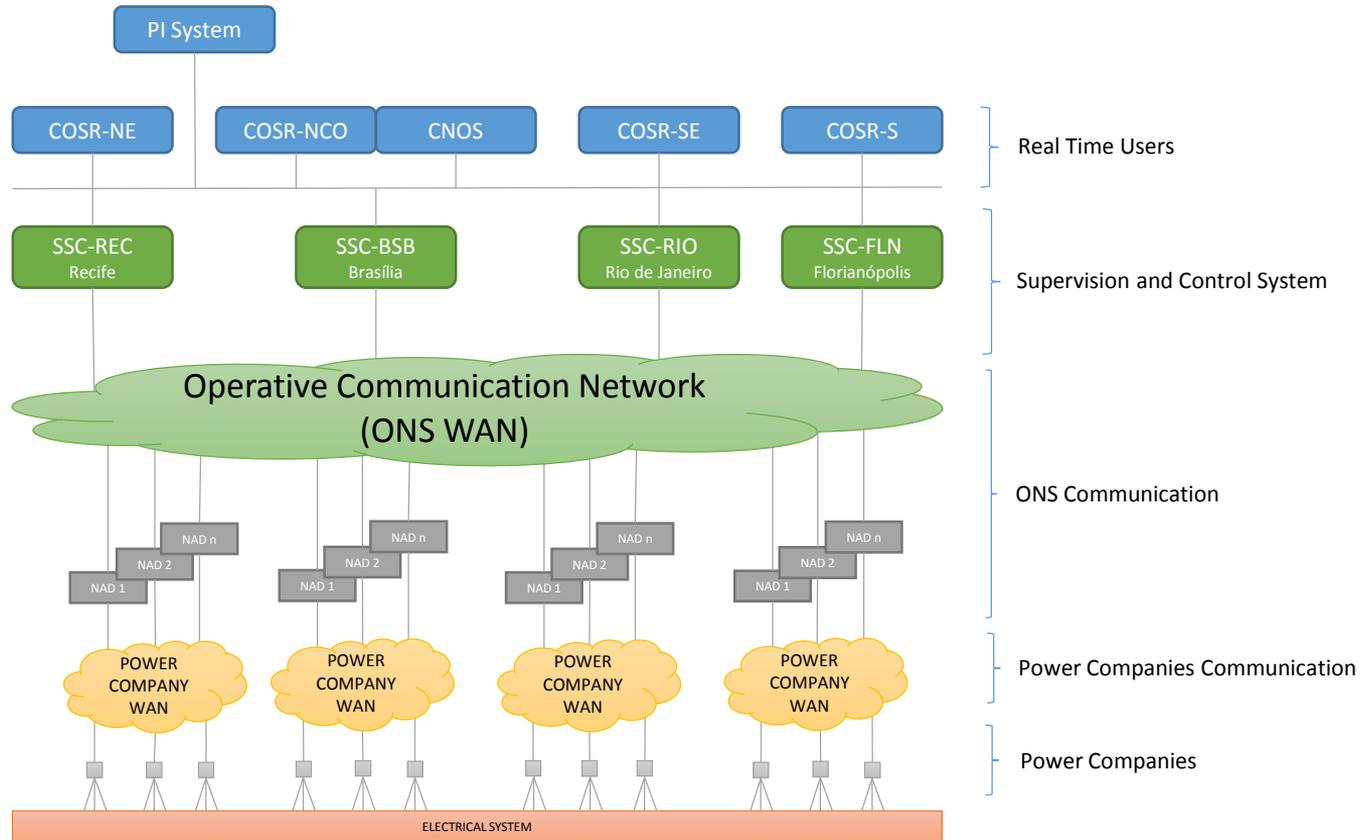


Implementation Details - Used Tools

- ▶ PI Asset Framework;
- ▶ Event Frames;
- ▶ Analysis;
- ▶ Notifications;
- ▶ PI-SDK;
- ▶ Web API Application;
- ▶ Angular 4 Application;

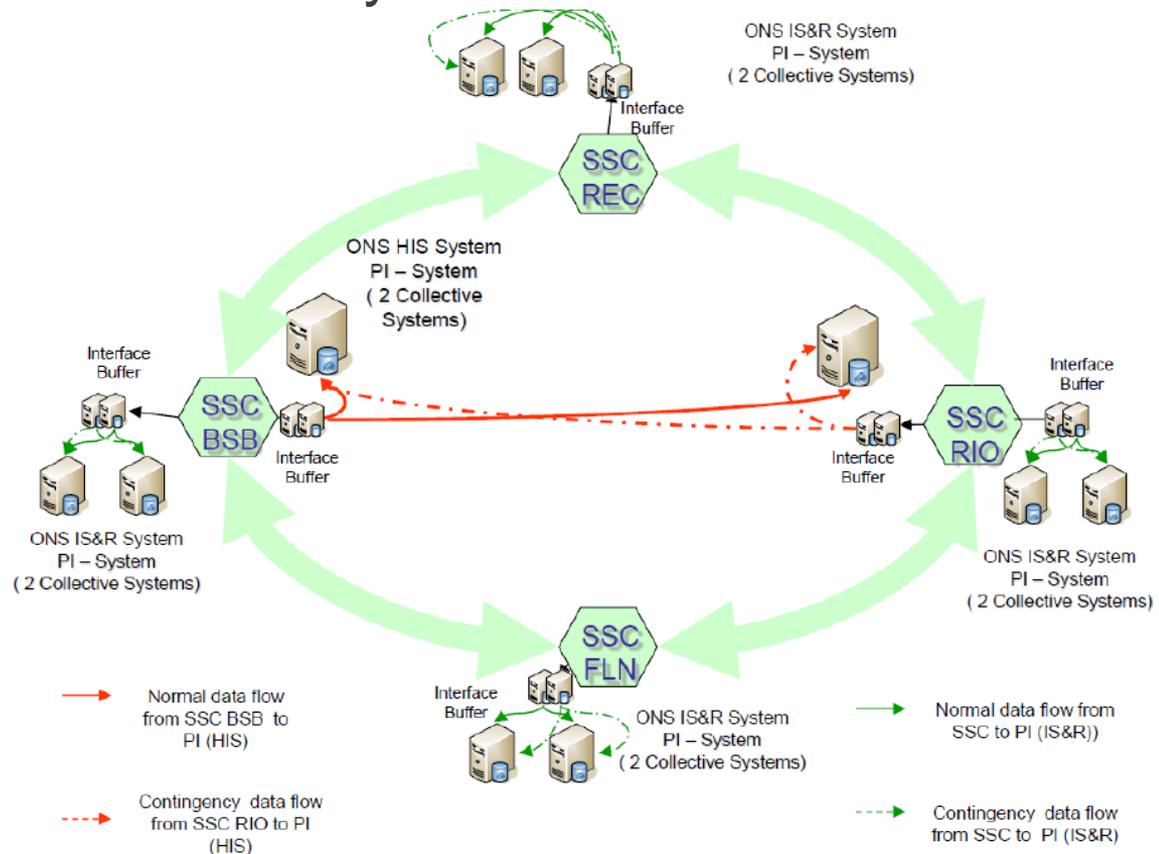


Implementation Details – Data Flow

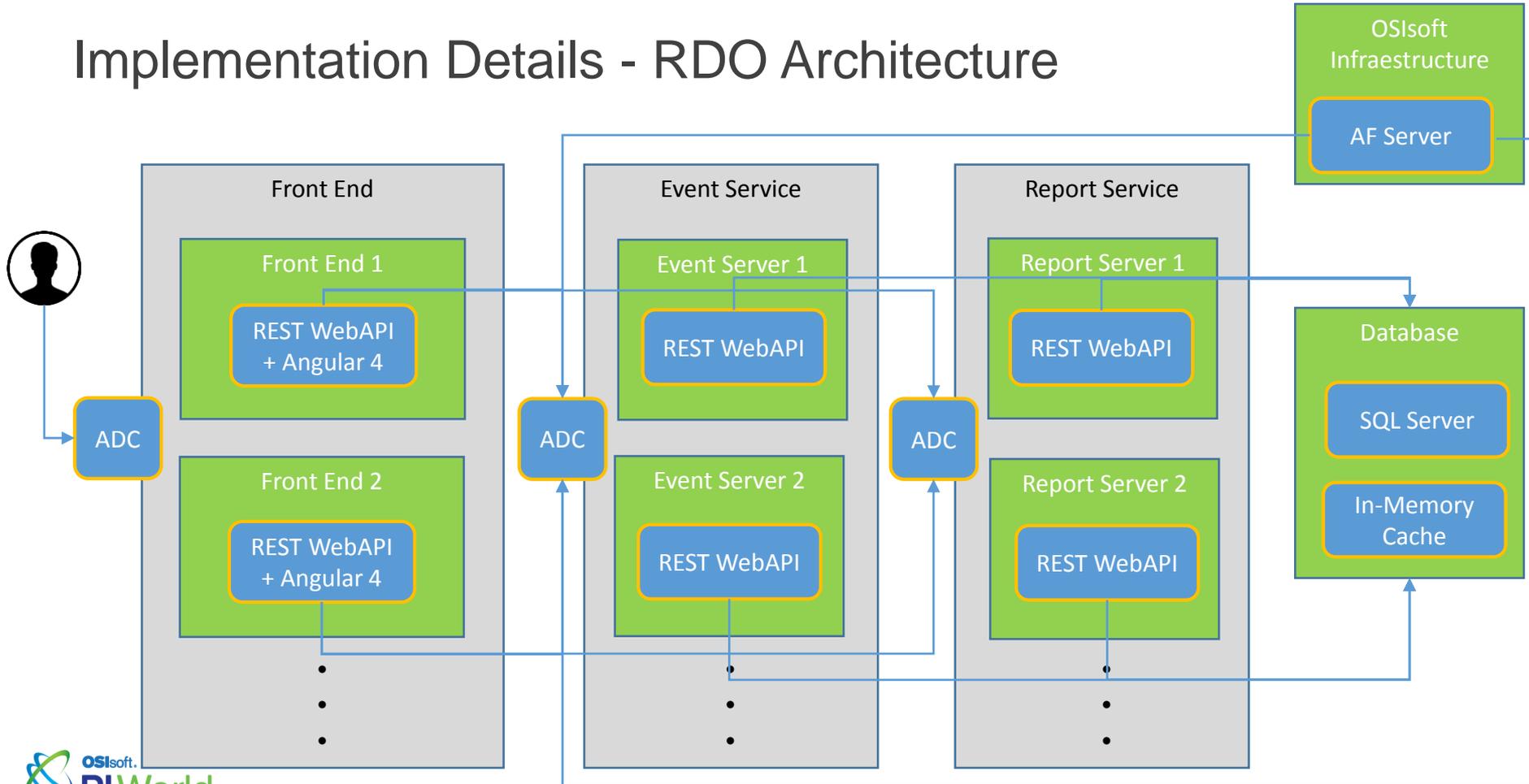


Implementation Details - ONS PI System Architecture

- ▶ 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



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

Registro de Ocorrência + Registro de Ocorrência

Pesquisar Pendentes Todos Padrão

Data Inicio(De) 📅 Data Fim(Até) 📅 Assunto Subassunto

Centro Responsável Tipo de Objeto Família do Objeto Objeto

Empresa Origem Região Unidade Federativa Área Elétrica

Status Descrição Hashtags

Importante

🔄 Limpar 🔍 Pesquisar

✎ AlterarLista 📄 BaixarSelecionados

Tabela Cadastro 🔍

+ <input type="checkbox"/>	Q Status	Filtrar	Q Data Fim	Q Assunto	Q Subassunto	Q Centros	Q Objetos	Q Hashtags	Q Descrição		
+ <input type="checkbox"/>											📄 🗑️ ⋮
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Primeira 1 2 3 4 5 Última

Implementation Details – Web Application – Add Report

Adicionar Registro de Ocorrência ← Voltar ↓ Salvar

↑ Informações Gerais

*Data Inicio(De) → *Data Fim(Até) *Assunto *Subassunto

Status Equipes Regiões Uns. Federativa

Áreas Elétricas Empresas de Origem

Empresas Afetadas Hashtags

Privado

Agente Afetado	Carga Interrompida	Data do Corte
Nenhum agente afetado adicionado		

Carga Total Interrompida

Agente Restabelecido	Carga Restabelecida	Data de Restabelecimento
Nenhum agente restabelecido adicionado		

Carga Total Restabelecida

Descrição

Normal Sans Serif **B** *I* U

✓ Eventos Associados

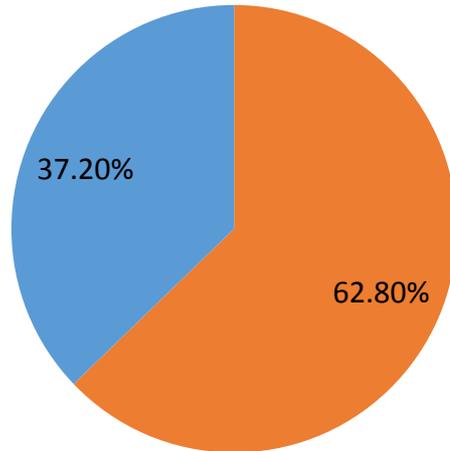
✓ Descrição Término

✓ Anexos

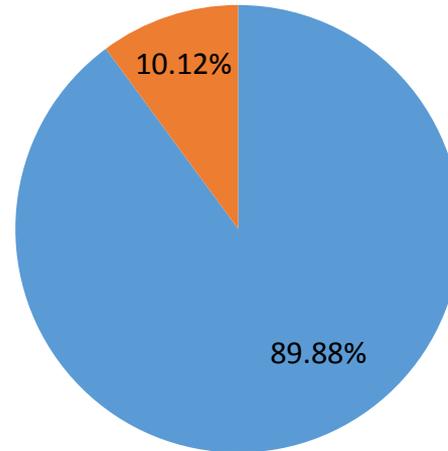
✓ Relacionamentos

Results Obtained / Business Impact

Events



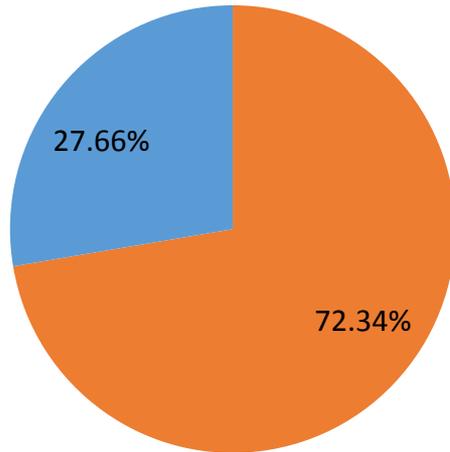
Events Effort



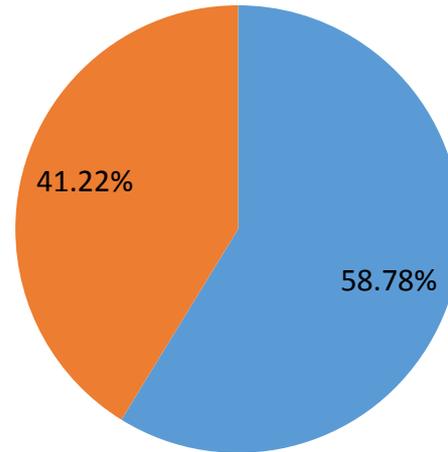
- Automated
- Not Automated

Results Obtained / Business Impact

Report



Report Effort



■ Automated
■ Not Automated

Next Steps

- ▶ Improve the Event/Report Universe;
- ▶ Improve the number of automated reports;
- ▶ Bring more information to user;
- ▶ Integrate with other systems;

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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

Domingos Savio

ONS Control Center Manager

Ylani Freitas

ONS Control Center Manager

Marcia Isabella

ONS Project Development Team Manager

João Batista

Project Manager

Eduardo Primo

IT Project Manager

Erica Motta

IT Project Manager

Frederico Viana

IT Systems Architect

Adriano Elias

OSI PI System Administrator

Fabiano Fernandes

Electrical Engineer

Giovani Montanari

Electrical Engineer

Guilherme Antonine

Electrical Engineer

Lismar Brasil

Electrical Engineer

Marcos Sousa

Electrical Engineer

Cloves Soares

Electrical Engineer

Jeffereson Freire

Electrical Engineer

João Marcelo

Electrical Engineer

Roosevelt Atila

Electrical Engineer

Erotilde Boeno

Electrical Engineer

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Stéfano Bassan
Product Owner

Ledson Germano
Project Architect

Ricardo da Silva
Project Engineer

Bárbara Coelho
Project Engineer

Lucas Guzzo
Project Engineer

Gustavo Rainho
Project Engineer

Felippe Nacif
Project Analyst

Arthur Coelho
Product Analyst

Gabriel Costa
Project Analyst

Daniel Carvalho
Project Analyst

Giovanni Pereira
Project Analyst

Igor Lima
Project Analyst

Fernando Santos
Test Analyst

Questions

Please wait for the **microphone** before asking your questions



State your **name & company**

Please remember to...

Complete the Online Survey for this session



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Control and Automation Engineer

Radix

Merci

谢谢

Спасибо

Danke

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado