Industry Perspective on GIS Integration

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Why Integrate Network Planning Software with GIS?

• **Rapid creation of network planning models**
  Benefit of your GIS data by rapidly generating network planning models out of already existing and well maintained data within the GIS systems

• **Maintaining updated network planning models**
  Improve the network planning process, by keeping your network planning models up to date with the GIS data

• **Centralized Data Management**
  Manage network data in a centralized way

• **Use network calculation engines within your GIS**
  Extend the functionality of your GIS system by equipping it with a calculation engine
Why Integrate Network Planning Software with GIS?

- States are targeting renewable energy to be up to 50% by 2030, or 100% by 2045. Some of that energy is targeted to be achieved via the integration of renewable Distributed Generation to power distribution systems.
- Power Utilities on the other hand, are under the pressure to not only manage the overwhelming amount of DG applications but are mandated to share information with DG developers.
- Limited number of Distribution Planner and limited tools capabilities are complicating processes.
- If non-technical personnel could run a simple DG/load application it would alleviate planners, expedite process, increase DG, States achieve its target. This presentation will highlight a case study where a power flow tool is used as engine to simulate load/DG applications, simple solution display that assist non-technical personnel to reliably/safely and faster assess DG/load integration and the need of system improvement/mitigations.
How can integration assist Power Utilities with massive DG?

• **Use network calculation engines within your GIS**
  Extend the functionality of your GIS system by equipping it with a calculation engine (e.g. Feeder Hosting Capacity Analysis, Voltage Management with DG, FLISR with DG, etc)

• **Maintaining Updated network planning models**
  Improve the network planning process, by keeping your network planning models including the massive DG interconnections

• **Display Feeder Hosting Capacity (color coded)**
  Frequent update of Hosting Capacity Results in the GIS (e.g. Monthly or quarterly)
PSS®SINCAL GIS Integration
Typical system landscape

• Customers
  Distribution and transmission companies

• Typical systems we find at our customers
  ▪ Geographic Information System (GIS)
  ▪ SCADA, EMS/DMS
  ▪ ERP
  ▪ Asset Management
  ▪ Others

• Typical questions
  ▪ How can network planning benefit from the data stored in these systems?
  ▪ How can these systems benefit from the functionality of our network planning systems?
“How can we integrate network analysis with GIS Data?”

In our day to day business we observe following types of GIS Integration projects:

**BASIC:** Data conversion via existing interfaces e.g. an Excel or CIM Interface

**STANDARD:** Off the shelf GIS data conversion interfaces to PSS®SINCAL from widely used GIS Systems

**ADVANCED:** Turn key solutions, creating & maintaining a network analysis model from GIS master data

**ENGINE:** Integration projects where our calculations engines are used within a GIS system

*Under development*
The following types of basic data conversion are widely used:

- **EXCEL interface** that allows to easily map exported data from various sources to the PSS®SINCAL data model.

- **Other standard interfaces like CIM** to import exported CIM data from GIS.
PSS®SINCAL GIS Integration
Data conversion with off-the-shelf GIS Interfaces

You can use various off-the-shelf interfaces to popular GIS Systems, for PSS®SINCAL following standard interfaces are available:

• ESRI Arcmap
• GE Smallworld
• Pitney Bowes MapInfo
• Intergraph G/Technology
• Autodesk AutoCAD MAP

Characteristics include:
• Optimal and intelligent data conversion
• Configurable
• In case of missing data, like loading, it can be completed via EXCEL data
**PSS®SINCAL GIS Integration**  
**Turnkey data interface solutions**

**Characteristics include:**
- Create ready to use and customized analysis models
- Can be mostly operated from within the GIS System
- Collect data from several systems
- Can take care of data mapping
- Create efficient models by intelligent data conversion
- Include some basic model validation
- Complete missing data
- Allow incremental updates of GIS data on existing analysis models

[Diagram showing integration platform with points for GIS, SCADA EMS/DMS, ERP, Asset Mgmt., and Other, leading to PSS®SINCAL]
PSS®SINCAL GIS Integration
GIS Calculation engine

Connect a network analysis calculation engine to your GIS System

Characteristics
- Analysis directly operated from within the GIS System
- Analysis results are presented directly used in the GIS System
  - e.g. via color coding
- Often used for quick assessments/validations within GIS System
- Enhance GIS functionality
- Easy accessible
- Very quick analysis (seconds) and reporting of the results
- Tailored functionality towards your workflows
GIS Integration
Challenges

General

• Various system landscape and data structures
• Data sources such as GIS, SCADA, billing systems, DG-Management System, etc. are highly customized and modeled differently at each customer
• Rarely a proper network model can be build up from one source system, frequently we will need to fetch data from various systems.
• Systems are often modeled individually, e.g. no proper mapping between GIS and billing system
GIS Integration Challenges

Difference in presentation GIS - NA

<table>
<thead>
<tr>
<th>GIS</th>
<th>PSS*SINCAL</th>
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<tbody>
<tr>
<td>2W Transformer – node type feature</td>
<td>2W Transformer – element with two terminals</td>
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<tr>
<td>3W Transformer – node type feature</td>
<td>3W Transformer – element with three terminals</td>
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<td>Switching element – node type feature</td>
<td>Switching element – setting at terminal level</td>
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<td>Busbar – line type feature</td>
<td>Busbar – node type, despite line representation</td>
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<tr>
<td>Generator, load – node type feature</td>
<td>Generator, load – element with one terminal</td>
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Missing network topology

- No network topology available within GIS
- Based on graphical coordinates of the end-points of network elements (matching within a given tolerance) network topology can be created by advanced interfaces
GIS Integration
Challenges

Missing Substation internals

- Substations are just empty boxes within GIS, missing internal representation
- Smart interfaces can create the inner station details based predefined Station/Voltage/Busbar/Bay hierarchies

“Dense” graphical representation

- At a give GIS map extend/scale – station inner representation is too “dense”
- Smart interface zooms out station internal relative to station center position (i.e. 10x) during conversion to NA
GIS Integration Challenges

Complex graphical representation

- Simplification of inner station structure for NA purposes
- Simplifications of distribution structure (i.e. removing useless connectors)
Case Studies
Case: VSE Slovakia
Implementation of PSS®SINCAL with data integration from GIS

Requirements
• Implementation of new software for long term network planning for HV, MV & LV including data integration from GIS.

Initial Situation
• Well maintained GIS (ESRI - ArcFMUT) system available already integrated with the SAP system.
• Current network planning software had limited functionality and was not integrated with GIS. Network models were created manually. The modeling of a sub region took months.

Methodology
• Review of customers requirements
• Review of available data and systems
• Creation of customized integration concept
Case: VSE Slovakia
Implementation of PSS®SINCAL with data integration from GIS

Technical solution

[Diagram showing data flow from SCADA, GIS DB, SAP PI, SAP IS-U, SAP FI-AA, SAP PM, ETRA, MAXIMO, to Advanced Interface Solution, PSS®SINCAL UPDATER, PSS®SINCAL Ref DB, and TXT help files, MDB, XLS help files.]

[Background graphic of a map or diagram related to the technical solution.]
Case: VSE Slovakia
Implementation of PSS®SINCAL with data integration from GIS

Solution
• Advanced GIS integration solution between ESRI and SINCAL
• GIS Serves as master DB for network analysis and SCADA
• Via the update functionality existing SINCAL models can be updated with actual GIS state.

Results
• Significant time saving for network modeling and model maintenance. Creating complete models in hours instead of months.
• More precise grid models
• Improved quality of GIS data
• Highly efficient network planning processes
Case: PSS®SINCAL Engine for grid connection assessments
Implementation examples

Requirements
- Basic analysis functionality within the GIS for DG connection assessments
- Effective planning workflow for basic grid connection requests

Initial situation
- Well maintained grid model in GIS & mapping to auxiliary systems

Methodology
- Review of customers requirements
- Review of available data and systems
- Creation of customized integration concept
Case: PSS®SINCAL Engine for DG System Impact Assessments
Implementation examples

Solution
- Customized GIS Add in that uses PSS®SINCAL COM servers to control calculation engines
- Pre Assessment for connection studies, results are shown in GIS with a traffic light representation
- Temporary network model is build up in a virtual PSS®SINCAL DB (in memory) and the results can be directly pulled from memory into the GIS System.

Results
- Customized work flows within GIS
- Pre assessment of situation, without the need to open the network analysis tool
- Network planning can focus on the more complicated cases
- Highly efficient and customized analysis workflows within GIS
Case: PSS®SINCAL Conversion + Automation DG/Load Assessment

Custom GIS Add-In

Insert customer data

Add planned Feed/load data
Case: PSS®SINCAL Conversion + Automation DG/Load Impact Assessment

Select customer connection point in GIS
Case: PSS®SINCAL Conversion + Automation DG/Load Impact Assessment
Case: PSS®SINCAL Conversion + Automation DG/Load Impact Assessment

Select calculation method
Case: PSS®SINCAL Conversion + Automation DG/Load Impact Assessment

Set calculation factors

Starts calculation with SINCAL in the background
Case: PSS®SINCAL Conversion + Automation DG/Load Impact Assessment

Display a simplified result for the selected customer point.
Prints the converted network to a .pdf file
Case: PSS®SINCAL Conversion + Automation DG/Load Impact Assessment

Expert mode allows extended analysis of the results

Detailed calculation results
Case: PSS®SINCAL Conversion + Automation DG/Load Impact Assessment

The PSS®SINCAL model with the calculation results is automatically saved and can be used if further analysis is needed.
Case: European TSO Implementation of GIS

Strategy / Results / Value

- PSS®ODMS model management and integration platform and PSS®E for network analysis
- Interfaces to Asset Management, GIS and Protection Suite
- Customized automation for PSS®ODMS and PSS®E
- Comprehensive CIM-based Model Management facilitates customer workflows
- Data exchange through CIM standards
- Reduced software costs by making use of off-the-shelf software combined with customized program automation

Challenges and Drivers:

- Integrate Model Management and Network Analysis with a Grid Management System
- Existing custom build solution had reached its technical limits
- Support customer workflows
GIS Integration
Siemens PTI offering

- Integration workshops
- Automation training
- Free of charge interfaces (i.e. Excel, CIM)
- Standard GIS Interfaces
- Customized interface and engine solutions
- Partnership with Bentley Systems
- PSS®SINCAL merge application
“How can we keep network models which have been edited in different sources synchronized?”
“How can we keep network models which have been edited in different sources synchronized?”

• Maintaining an up-to-date network model which integrates changes made in both the GIS system and PSS®SINCAL network

Solution
• PSS®SINCAL Merge compares the content of differing PSS®SINCAL models and creates a new updated model
• Result model contains all the changes, deletions and additions from two models that were maintained separately

Benefits
• Highly efficient synchronization of network models from various source systems, like GIS, ERP or other network planning tools
• Flexible parameterization toward individual needs
• Independent easy to use GUI
Thank you for attending the Siemens PTI webinar!
Continue your journey…

Read the article about VSE’s (part of RWE group) implementation of PSS®SINCAL with data integration from GIS (www.tdworld.com/overhead-distribution/distributed-generation-drives-system-planning)

View the Press Release “Siemens and Bentley Systems agree to jointly offer planning and design solutions for utilities” (news.usa.siemens.biz/press-release/energy-management/siemens-and-bentley-systems-agree-jointly-offer-planning-and-design-)

Visit the PSS®SINCAL website (www.siemens.com/pss-sincal)
• Learn more about the main features and benefits of the PSS®SINCAL software

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