DIgSILENT StationWare

Protection Setting Management System

Dr. A. A. Maqrashi

B.Eng, MBA, M.Sc., Ph.D.

www.albanah.com

http://www.albanah.org/ss/showthread.php?701

Implementation of Protection Management System

Extreme Importance of DIgSILENT StationWare

- The complexity of modern protective relays has increased dramatically. It no longer is possible to maintain a paper based documentation of the settings these relays outside in the fields actually have. As being set by the manufacturer software, for each relay a file or set of files in proprietary format contains the settings the relay actually have. As no backup facility is installed, the documentation and integrity of those settings is not guaranteed.
- Furthermore, there is no infrastructure to both quickly find the settings of a certain relay as well as enabling other users to also access this settings data by default.
- It is up to the protective personnel maintaining a repository for protection related files such as documentations, plots or graphs and manuals which also belong to the substation asset. With having no proper infrastructure an appropriate information flow is not possible.
- Without enabling multiple users to quickly access the data requested and without interfacing the repository for accessing the data from other tools or systems like a Power System Simulation Tool a bad workflow and a manual re-entry of settings parameters will be the result.
- The abovementioned situation necessitates the development of a Protection Settings Management System like the DIgSILENT StationWare.

Implementation of Protection Management System

Albanah LLC has Recently completed DIgSILENT StationWare project for Dhofar Power Company [DPC].

DIgSILENT StationWare Key Features

- A central storage system for complete power system protection data.
- User-friendly, full featured substation data management system.
- Web-based secured application that can be accessed by any browser, anywhere, any time.
- Supports Both Oracle and MS SQL Server database.
- Offsite mode enabling users to take the data to site and amend or read it, as required.
- Historic mode to review past data.
- Comprehensive relay type library.
- Range checks and data validation on settings values.
- User-defined workflow sequences for settings management.
- Access rights management for users, functions, and locations.
- Unlimited device lists that can be extended according to the number of devices to be managed.
- Highly flexible software to fit own particular hierarchical requirements.
- Audit Trail enabling deep rooting inside the database to view all changes.
- Flexible Reporting Platform which is extendable according to your requirements.
- Document Management System supporting easy access to relay manuals, test reports or any additional documentation.
- Process type models for different kind of processes, e.g. maintenance, cyclic testing, commissioning, etc.
- Local Support providing all support required including installation, implementation, updates, and training.
- etc.

Implementation of Protection Management System

The Project Implementation consists mainly of two phases.

First Phase :

During this phase all Grid and Primary indoor substations were visited and data was collected for the following equipment:

- Electromechanical Relays.
- Static Relays.
- Digital Relays
- Numerical Relays.
- Power Transformers.
- Auto Voltage Regulators.
- Capacitor Banks and Controllers.
- Battery Chargers.
- Circuit Breakers.
- Current Transformers.
- Voltage Transformers.

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Second Phase :

During this phase all the collected equipment details and relay setting files were modelled by StationWare as per DPC electrical network hierarchy.

- Numerical and Digital relays native setting files were directly populated to StationWare using the excellent converters for a very wide range of relay manufactures which display the relay settings in actual manufacturer's format and well categorized manner.
- Other types of relays (Electromechanical and Static) and other equipment details (CTs, VTs, Power Transformers, Battery Chargers, AVRs, Capacitor Banks and their Controllers, etc) were entered using predefined templates which can be modified later as per client requirement.
- StationWare library was used to upload all the required documents i.e pdfs of SLDs , as built drawings, relay manuals and also relay operating softwares, such as DIGSI, CAP501, Reydisp Evolution, AcSELerator, Agile, MiCOM Studio, WSOS, etc.
- Installation of StationWare and uploading of the completed database were deployed at Dhofar Power Company servers.

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StationWare system setup for Dhofar Power

- Client specific needs
- Location Structure
- Users and User groups (rights management)

Collection and Modelling of existing settings to DPC StationWare database

- Data Collection process
- Downloading the existing settings
- Migration process
- Uniform formatted settings for Dhofar Power's 'relay' and all other substation equipment
- Detailed Relay configuration files

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Live Data Collection from Relays

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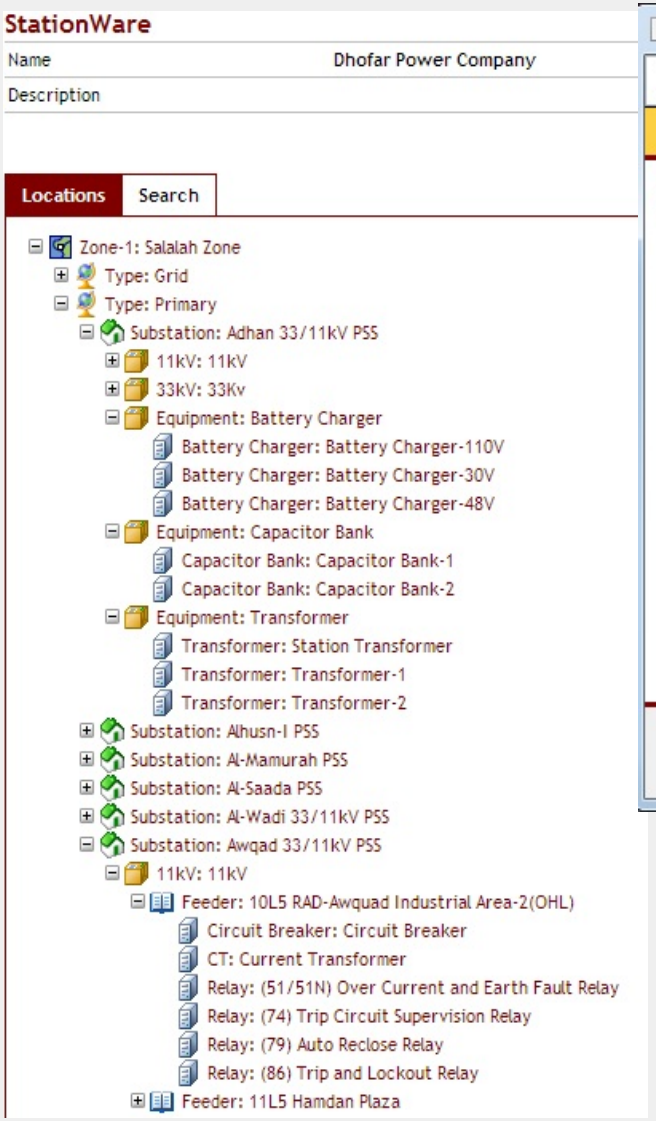
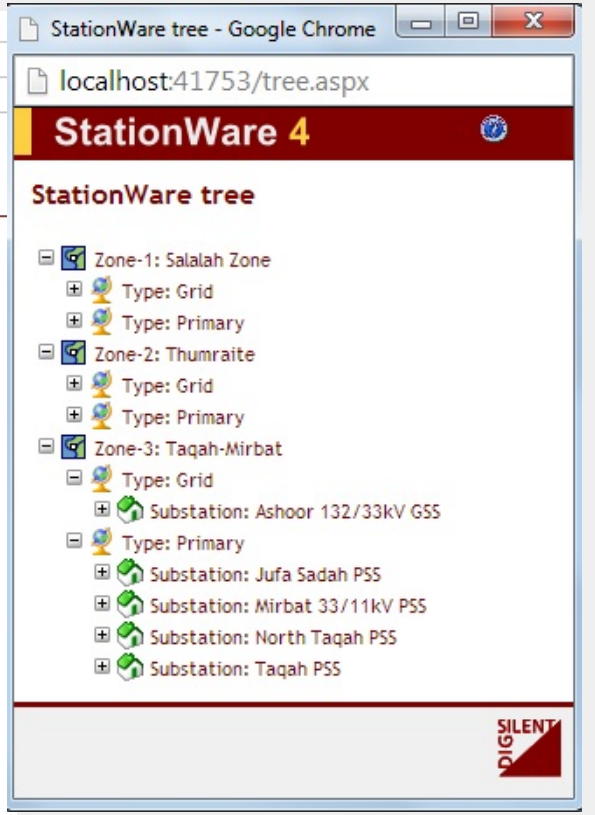
Live Data Collection from Relays

Implementation of Protection Management System

Hierarchical Location Structure

- User-defined location types
- User-defined hierarchy
- Modelling the power system as it is requires a tree type structure where the item depth somewhat has to do with the type, as shown.
- This regional hierarchy is found at the Navigator window or a page showing locations and the location that is currently displayed contains locations inside.





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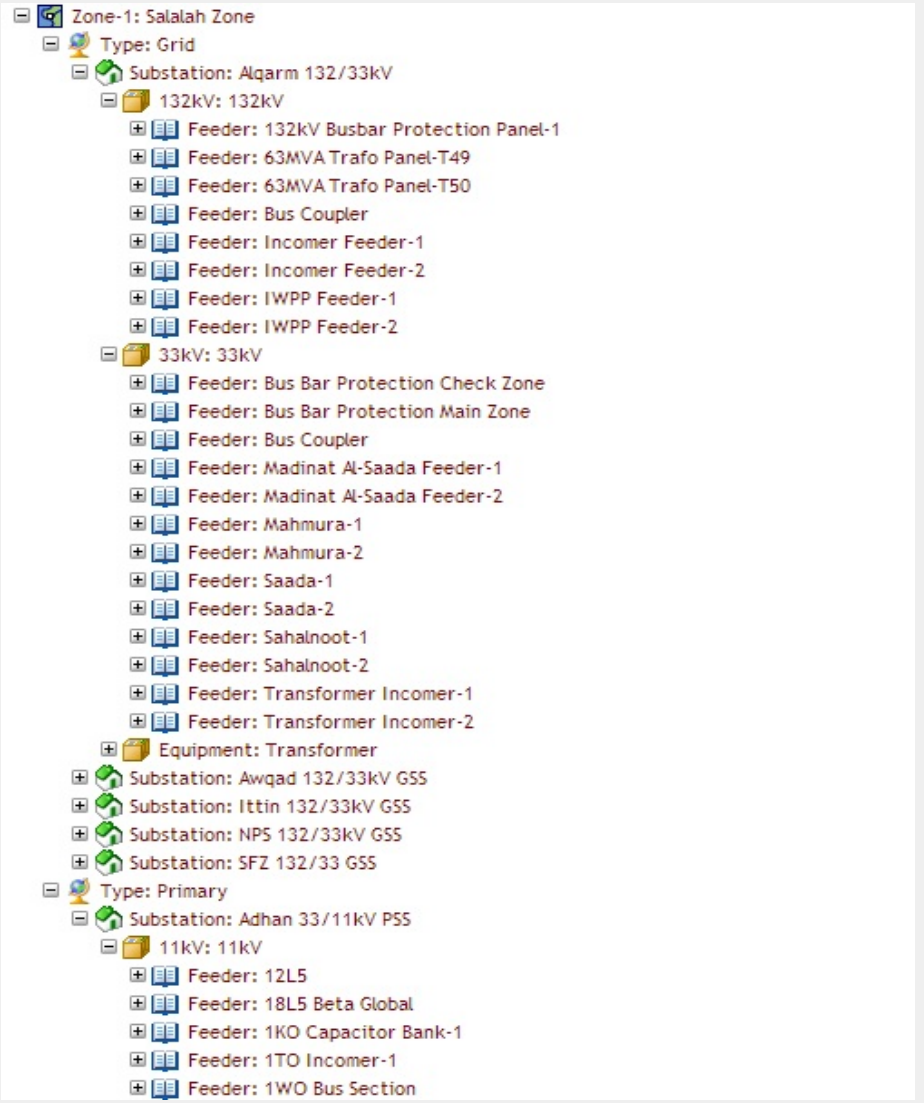
Locations and Zones

• Network was divided into three Zones, including Salalah, Thamrait and Taqa-Mirbat

- All substations per Area
- Transformers
- Capacitor Banks
- Battery Chargers
- Bays per substation
- Feeder Bay
- Incomer Bay
- Bus Coupler
- Bus Section
- Adjusted according to voltage levels, for example 11kV, 33kV and 132kV



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Multi-User Environment

- User accounts
- Access rights management
- Location dependent rights
- Lifecycle dependent rights
- Functional rights
- User administrator
- Template and device manager
- Configuration manager (lifecycle, additional attributes, customized views)

Users and User Groups

- User groups are used to assign location rights and lifecycle/settings rights to users
- Users divided into 3 main groups
- Administrators – Super Administrator Rights
- Settings Engineers – Configuration rights for all locations devices and settings
- Field Technicians– Read only rights for all locations, devices.
- Each user has a username, password and valid email address.

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Detailed Relay Import

- StationWare has the capability to import the relay configuration files from selected manufacturers and selected models
- Manual creation of relays and import of settings
- Manual creation of transformer, capacitor bank, battery charger, etc
- In the instances where relay configuration files were available, it was imported into StationWare
- Actual relay configuration files stored at device level on 'Settings Documents in StationWare'

End Result

- Central protection settings management
- Audit trail available – Who changed what and when
- Security of settings
- Import/Export relay configuration files
- Import/Export settings to PowerFactory
- Fault and Test reports upload available

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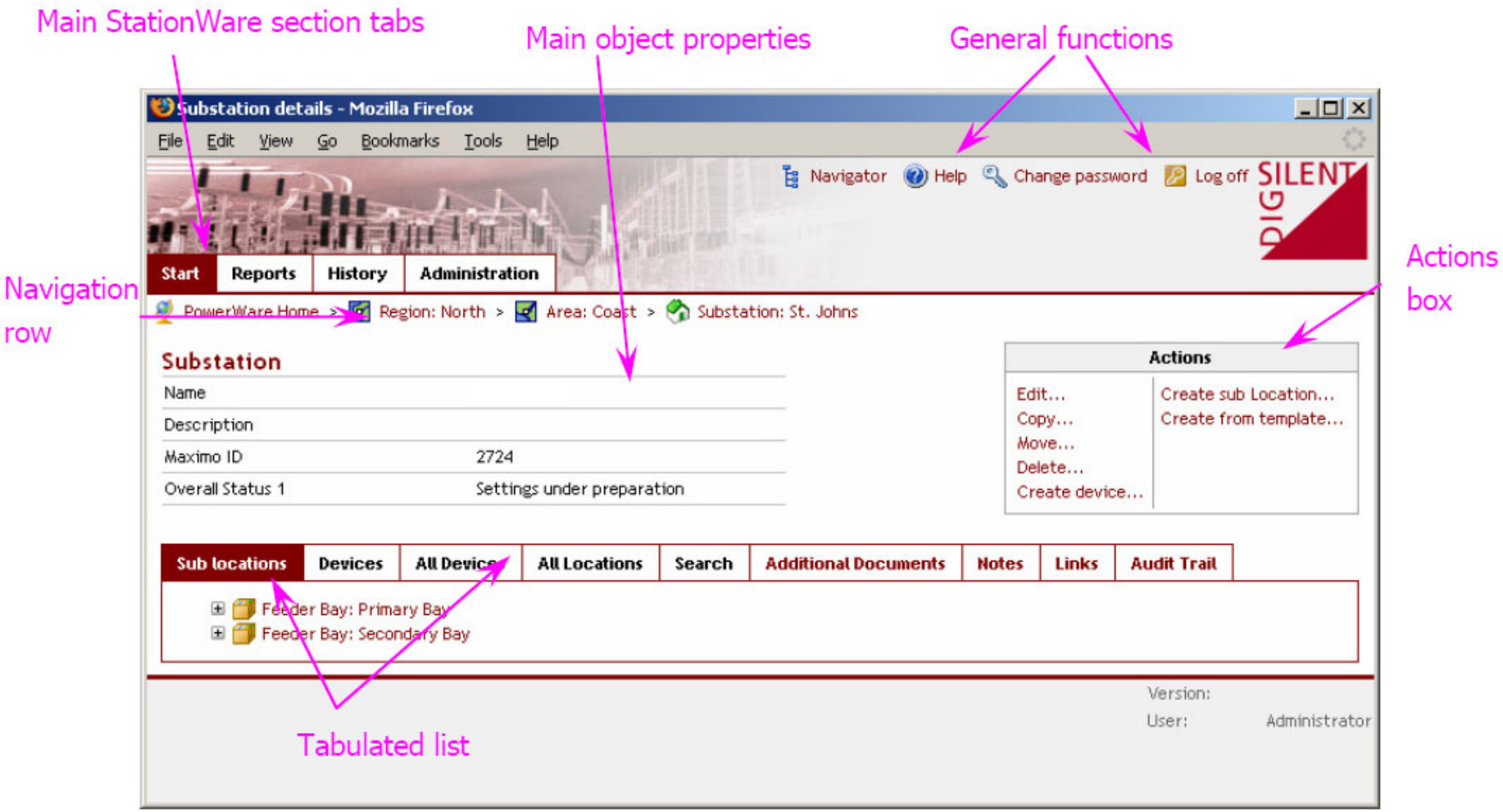
StationWare Settings Display



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StationWare Settings Display

Settings

Name	Transformer Details
Description	
Device type	TRANSFORMER
Device Usage	
Firmware	
Status	Planning
Last change	10/5/2013 12:22:34 AM [Administrator]
Voltage Level [kV]	0
GlobalNote	

Actions		
Edit...	Export...	[Report] Settings compare...
Change status...	Import...	[Report] Settings views...
Copy...	[Report] Simple settings report...	[Report] Simple settings report...
Delete...	[Report] Settings changes...	
Compare to another device...	[Report] Settings compare...	

Main Settings | Additional documents | Notes | Links | Audit trail

Attribute	Description	Value	Range	Unit	Assigned
GENERAL SETTINGS					
Manufacturer	Manufacturer	HACKBRIGE HEWITTIC AND EASUN LIMITED		40 Character	☑
Serial Number	Serial Number	38955		40 Character	☑
Year of manufacture	Year of manufacture	2001		40 Character	☑
kVA	Rated Power	10000		kVA	☑
V1	Rated Voltage H.V	33000		V	☑
V2	Rated Voltage L.V	11500		V	☑
A1	Rated Current H.V	206.07		A	☑
A2	Rated Current L.V	602.33		A	☑
Z	Impedance	8.05		%	☑
W1	No Load Loss	NA		W	☑

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StationWare Settings Display

Settings

Name	Settings
Description	
Device type	CAPACITOR_BANK
Device Usage	
Firmware	
Status	Planning
Last change	10/5/2013 12:14:25 AM [Administrator]
Voltage Level [kV]	0
GlobalNote	

Actions		
Edit...	Export...	[Report] Settings compare...
Change status...	Import...	[Report] Settings views...
Copy...	[Report] Simple settings report...	[Report] Simple settings report...
Delete...	[Report] Settings changes...	
Compare to another device...	[Report] Settings compare...	

Main Settings | Additional documents | Notes | Links | Audit trail

Attribute	Description	Value	Range	Unit	Assigned
GENERAL SETTINGS					
Manufacturer	Manufacturer	Power Economy		40 Character	☑
Serial Number	Serial Number	PEME/1112/07		40 Character	☑
Year of manufacture	Year of manufacture	2002		40 Character	☑
Rated Output	Rated Output	3		MVAR	☑
Stages	Stages	3			☑
Step Size	Step Size	1		MVAR	☑
V	Rated Voltage	11500		V	☑
Phases	Phases	3			☑
F	Frequency	50		Hz	☑
Insulation	Insulation Level	28kVrms/75kVp			☑
CONTROLLER SETTINGS					
Manufacturer	Manufacturer	MICROELECTRICA SCIENTIFICA		40 Character	☑

For More Details :

We can be contacted by Post :

Albanah LLC
P.O. Box 485, P.C. 122, SEEB, OMAN
Email : web@albanah.com
Office : +968 24152433
Fax : +968 24152434
Mobile : +968 99326658
Web Contact : http://www.albanah.org/ss/sendmessage.php

We are located in Knowledge Oasis Muscat.

Best wishes from Albanah Team