TRANSPOWER

Digital Substation

IEC 61850 Engineering Tools and Project Status

Purpose
Inform and Update

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Looking back on 2023 - Highlights

- OpenSCD core allows distributed architecture – lightweight and functional, allows separation of concerns for design, testing and deployment.
- Approach of abstracting core IEC 61850 SCL into scl-lib or oscd-scl improves testing, separates UI from SCL knowledge and business logic.
- First OpenSCD core distribution based on OpenEnergyTools expected to meet Transpower's needs.
- All key plugins that Transpower requires have been developed and somewhat formally tested in multi-vendor engineering approach with SEL, NR, Siemens and GE devices.
- Omicron developed SLD editor was fun to test and participate in development process. Initial work on diffing quite exciting.
-  The joy of collaboration with the Omicron, OpenEnergyTools and the wider OpenSCD community. 

Looking back on 2023 – What I had hoped for

- We would get 80-90% of OpenSCD migrated to core. We didn't and the time spent discussing approaches and alternatives became controversial and counterproductive
- I would be able to get my subscriber later binding plugin reviewed to provide a foundation for other plugins. Started by Christian but overtaken by other events
- I would have finished writing tests and completing my plugins. Delayed by:
  - Visual tests becoming slow as test coverage increases – need to review approach.
  - Reworking functionality into scl-lib with Jakob as time allows.
  - Time pressures – I am less available since late 2023 for development ☹
- We would have begun more work on 'process automation', IEC 61850-90-30 and BAPs

Roadmaps are just roadmaps

https://github.com/openscd/open-scd/blob/main/ROADMAP.md

Feature ideas for the OpenSCD project. They are currently not prioritized.

- ✔ Add the remaining process elements to the substation editor
- ✔ Edit wizard for `Services` element
- General purpose SCL diffing tool **Groundwork with scl-diff**
- ✔ Finish the Publisher Plugin
- Improve IED Editor user experience
- ✔ Implement a more fully-featured Single Line Diagram editor that can make changes
- Implement Log Control Block manipulation
- Implement Setting Group manipulation
- Implement Role Based Access Control
- Finish the transition to OpenSCD Core
  - Implement the remaining mixins **Mostly via OpenEnergyTools**
  - ✔ Migrate existing plugins
  - Migrate wizard library
- Support older versions of 61850-6, especially edition 1
- Data provenance
- IEC TS 61850 80-1 101 support
- IEC TR 61850 90-2 support (gateway configuration based on SCD)
- IEC TR 61850-90-11 Logic Modelling support
- IEC TS 61850-80-5 Modbus support (still in draft)
- IEC 61850-6-2 (DRAFT) HMI support
- General purpose "Update SCL Element" plugin
- Engineering Workflow Editor **Underway with Transnet BW / SprintEins**
- Graphical network diagram view for Communication section editor

Current State (of https://danyill.github.io/scl-editor/)

❌ Not started 🟡 In progress

✅ Complete 🚧 Blocked

2024 focus!

Component	Concept	Draft	Stable	Comment
Later Binding Subscriber Editor	✅	✅	🟡	Almost ready for v1 release.
Later Binding Manufacturer Specific Plugins (Siemens, SEL and NR)	✅	✅	🟡	`scl-lib` foundation now available, a few tests to write.
Supervision Editor	✅	✅	🟡	`scl-lib` foundation mostly available, the remainder hopefully within a couple of months. Some tests to write.

Current State

❌ Not started 🟡 In progress

✅ Complete 🚧 Blocked

2024 focus!

Component	Concept	Draft	Stable	Comment
Import Templates	✅	✅	🟡	Need tests. `scl-lib` in use.
Import IEDs	✅	✅	🟡	Need tests. `scl-lib` in use. Allows "over-writing IEDs" for ICTs.
Description Editor	✅	✅	❌	Still a prototype.
SLD Editor *(Omicron)*	✅	✅	🟡	Mostly complete. Awaiting 20% tests and refactoring for a v1 release.

Current State

❌ Not started ✅ Complete 🟡 In progress 🚧 Blocked

2024 focus!

Component	Concept	Draft	Stable	Comment
Versioning	✅	🟡	❌	Manage `Header` element. Simple in principle but not progressed.
Diff/Merge *(Omicron)*	✅	❌	❌	Critical to ongoing management of digital substations. Prototyping of core functions done in `@openenergytoosl/scl-diff`
Device Mappings *(Omicron)*	🟡	❌	❌	Budget and time may not extend this far 😢 IEC 61850-90-30 *very* complicated. Good approach (!?)

2024 focus!

2024 focus! (funding dependent)

maybe....

Current State (somewhat Transpower specific)

❌ Not started ⬤ In progress

✅ Complete 🚧 Blocked

2024 focus!

Component	Concept	Draft	Stable	Comment
Multicast Traffic	✅	✅	⬤	Very specific to Transpower however key enabler for communications configuration.
Network Design Information	✅	✅	✅	Provides declarative subscription information, used in network switch configuration.
Cisco Switch Configuration	✅	✅	⬤	Needs further development and tests.

Current State

❌ Not started ⭕ In progress

✅ Complete 🚧 Blocked

2024 focus!

Component	Concept	Draft	Stable	Comment
Distribution and Deployment *(based on OpenEnergyTools)*	✅	✅	❌	Need Electron app with installer for airgapped installation.

Not really but producing a basic Electron app appears to work quite well with existing scl-editor

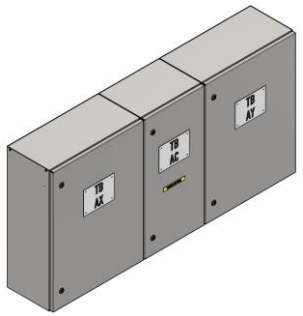
Hopes for 2024

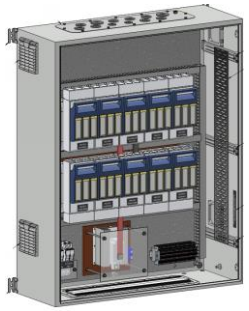
- Ensure OpenSCD validator stable on memory constrained machines (this)
- Show versioning in distribution (this)
- Have Electron app for distribution release
- Have plan/requirements for integrating extensions into distribution and release/publishing process
- Improve core editing API (edit titles/squashed edits)
- Allow multi-file/renaming in core
- Resolve web component “lock-step” issues
- Look into maintenance agreement for Transpower’s distribution
- Enhance subscriber-later-binding for DOs (only DAs supported now)
- *Increased utility involvement in testing/developing/using OpenSCD*

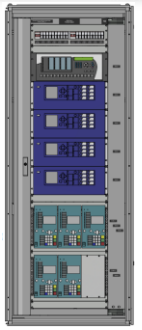
Brief Project Update

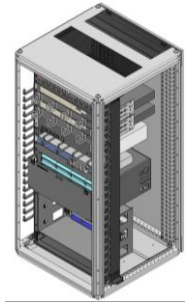
- Most configuration templates are 80-90% complete. Last 20% is the hardest.
- Testing packages using Omicron RelaySimTest under development.
- Control room preliminary design complete, detailed design underway.
- Secondary design/panels 95% complete.
- Outdoor junction box and cabling/fibre design 95% complete – built in lab for testing
- Looking to first digital substation. Engaging company around idea of:
  - Prebuilding control and facilities room and ODJBs
  - Making site-specific modifications as projects require
  - Rolling “substation level secondary” systems from stock and just adjust one or two models for typical green-field substation configurations
- Likely project will need to extend from July 2024 to October 2024 – hoping first site committed soon, most customer projects haven’t signed up yet, possibly a site rebuild.

3D model of portable control room and panels









Questions & Discussion