SDD toolkit : ITER CODAC platform for configuration and development

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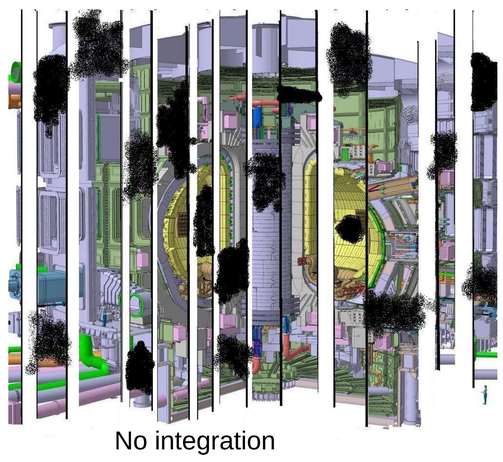
Abstract

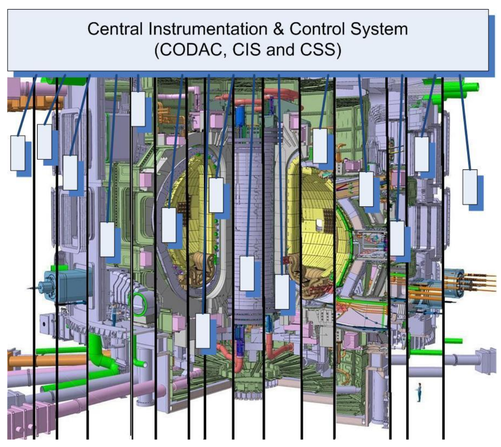
- *ITER will consist of roughly 200 plant system I&Cs (in total millions of variables) delivered in kind which need to be integrated into the ITER control infrastructure. The SDD model has been designed with Hibernate/Spring to provide required information to generate configuration files for CODAC services such as archiving, EPICS, alarm, SDN, basic HMIs, etc. Users enter their configuration data via GUIs based on web application and Eclipse. Snapshots of I&C projects can be dumped to XML. Different levels of validation corresponding to various stages of development have been implemented: it enables verification that I&C projects are compliant with our standards. The development of I&C projects continues with Maven utilities. In 2012, a new Eclipse perspective has been implemented to allow user to develop codes, to start their projects, to develop new HMIs, to retrofit their data in SDD database and to checkout/commit from/to SVN.*

CHALLENGES – SCALE, COMPLEXITY, EVOLUTION

ITER machine will be built by different partners. Standardization is a key criterion for success. To avoid heterogeneous deliverables and interfaces, it is important to set a development framework for I&C designers.



No integration



with integration

PCDH and CODAC Core system have been put in place :

- ❑ Promote standards hardware via catalogue of hardware
- ❑ Clarify interfaces between plant system I&Cs and CODAC (various network PON/SDN/DAN)
- ❑ Common development environment for I&C designers

Technologies

SDD DB, data access, versioning

- ❑ Relational schema based on PostgreSQL database for storing physical, functional and control information
- ❑ Hibernate as an Object Relational Mapping : minimize SQL codes
- ❑ Spring as transaction management layer
- ❑ SVN to keep source code of the I&C project
- ❑ Talend : data migration in case of DB schema change

Translator, Parser, Sync, Maven

- ❑ Plain java command line and API
- ❑ Eclipse plugin to allow integration within Eclipse RCP
- ❑ Apache Velocity for templates
- ❑ ANTLR for retrofitting configuration files
- ❑ JAXB as XML parser
- ❑ Maven : good development framework to hide makefile complexity and push a common structure

GUIs (SDD Editor, SDD webapp, Maven Editor)

- ❑ Eclipse RCP based : rich environment for I&C development, many plugins
- ❑ Web-app based on PrimeFaces and Tomcat : lightweight client and allow remote access
- ❑ Apache POI as Excel handler for mass edition

SDD – Self Description Data

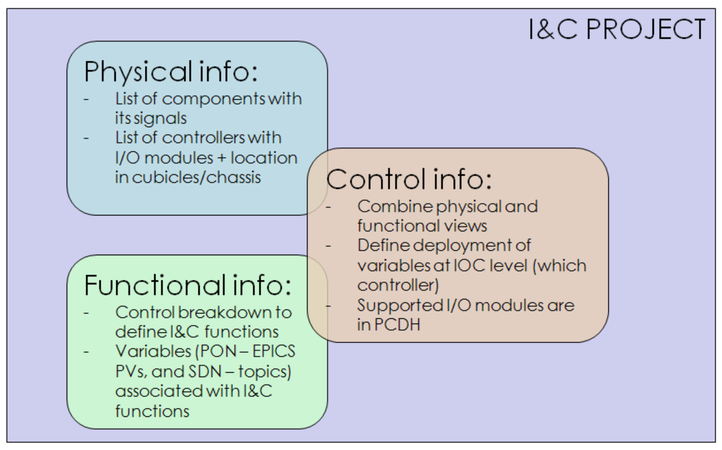
Why?

CODAC Core system includes many packages to ease I&C development. One of them is SDD – an in-house product . The main purposes of SDD are twofold :

- ❑ Ease the configuration management : big systems with a few millions of variables, many thousands of services to configure
- ❑ Promote PCDH/CODAC standards via validation and homogenous structure
- ❑ Simplify the I&C development by minimizing knowledge and expertise of individual tools

What?

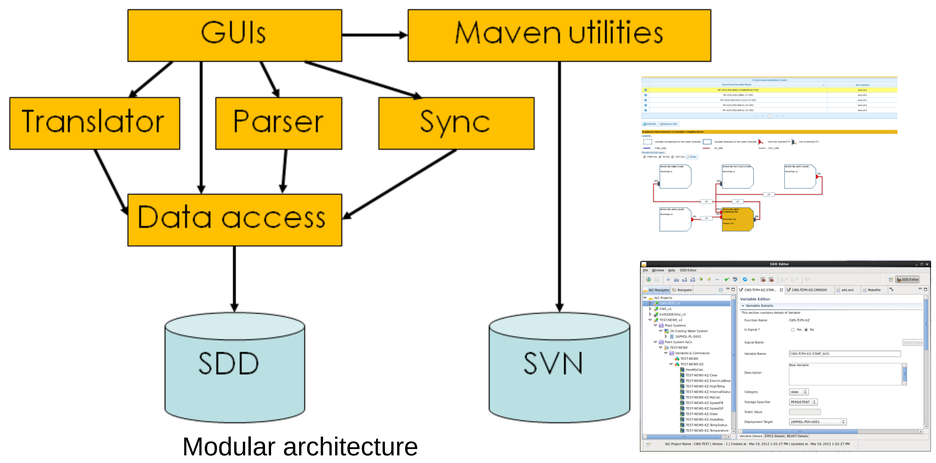
It describes the static configuration of the system. It consists of three views.



SDD model : 3 different views

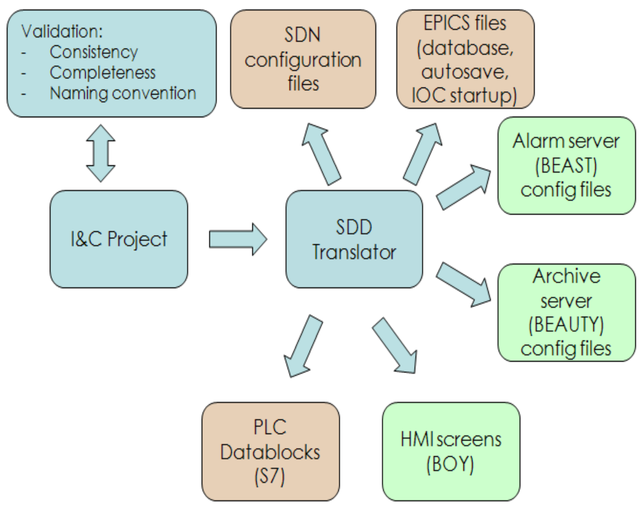
How?

SDD toolkit is a layered architecture, consisting of many modules



Modular architecture

Heterogeneous environment



Data validation to ensure consistent data configuration

Different services to configure:

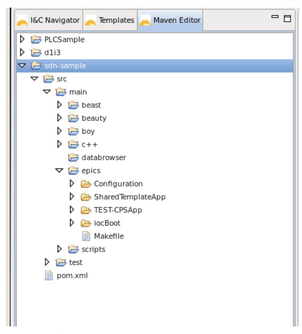
- ❑ EPICS applications and IOCs
- ❑ SDN applications
- ❑ Alarm, archive configuration
- ❑ Test HMIs screens
- ❑ PLC files

Color code:

- SDD Toolkit
- CODAC services
- Controllers

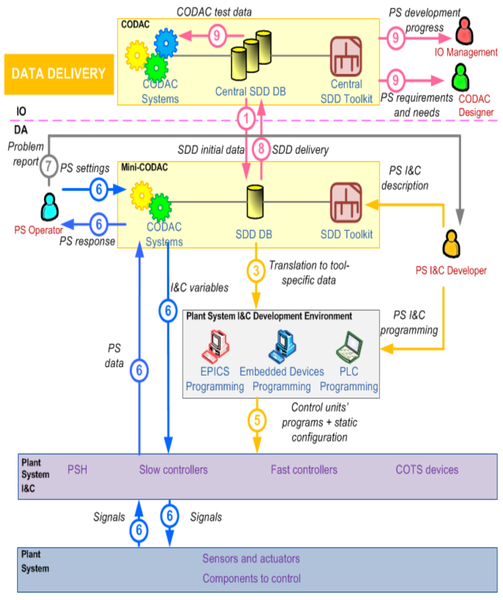
SDD Lifecycle

Standard structure for I&C project



Central SDD DB

- ❑ Allows ITER to check status of I&C projects
- ❑ Allows data sharing
- ❑ Allows static data to be updated
- ❑ Final repository for all I&C deliverables



CONCLUSIONS AND FUTURE WORK

The development of SDD toolkit started three years ago from scratch. Now the SDD toolkit is becoming more stable and a mature product.
Current development is now mainly focused on the support for remote execution especially when dealing with fast controllers. We are also working on improving the validations based on users' feedback . We also concentrate efforts on improving the central SDD architecture by making the architecture more robust, developing REST APIs .

REFERENCES

[1] PCDH http://www.iter.org/org/team/chd/cid/codac/plantcontrolhandbook [2] F. Di Maio et al, , the ITER software distribution for I&C, this conference. [3] EPICS Control System, http://www.aps.anl.gov/epics/