

REAL-TIME VARIABLE EXCHANGE SYSTEM IN A CONCURRENT DESIGN ENVIRONMENT

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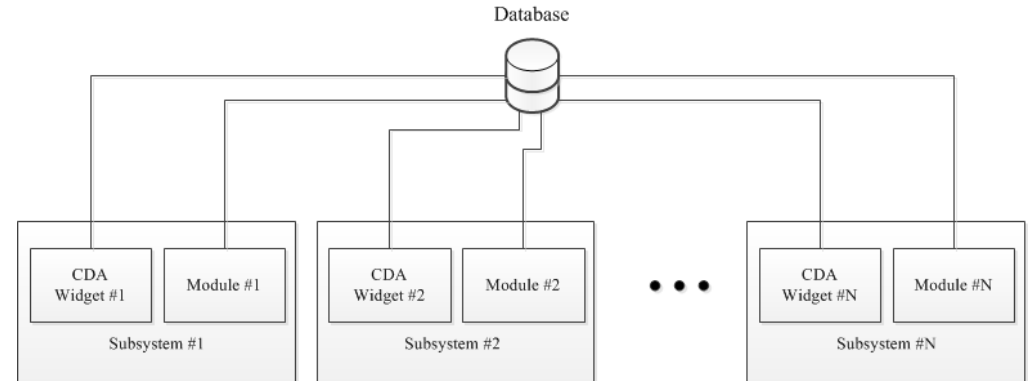
- IDR/UPM is a R&D Institute that belongs to Universidad Politécnica de Madrid
- Master in Space and Satellite Technology: Space Project: Project-Based Learning
- Pre-phase A assessment in scientific instruments (PHI, NOMAD...) and space programs (UPMSat-2)
- Extending the CDF capabilities to other research fields: experimental aerodynamics
- Concurrent engineering as new research field for UPM

Motivation

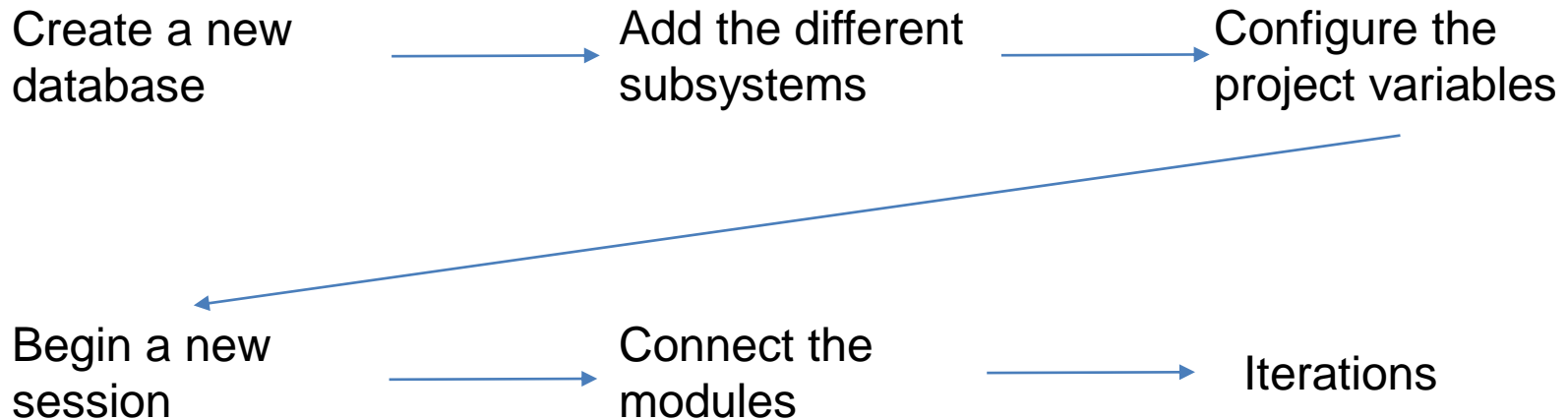
- After testing the SCDT
- Develop a new tool
 - ✓ Flexibility and scalability
 - ✓ Multiplatform
 - ✓ Easy to handle
 - ✓ Open source

Concurrent Design Application

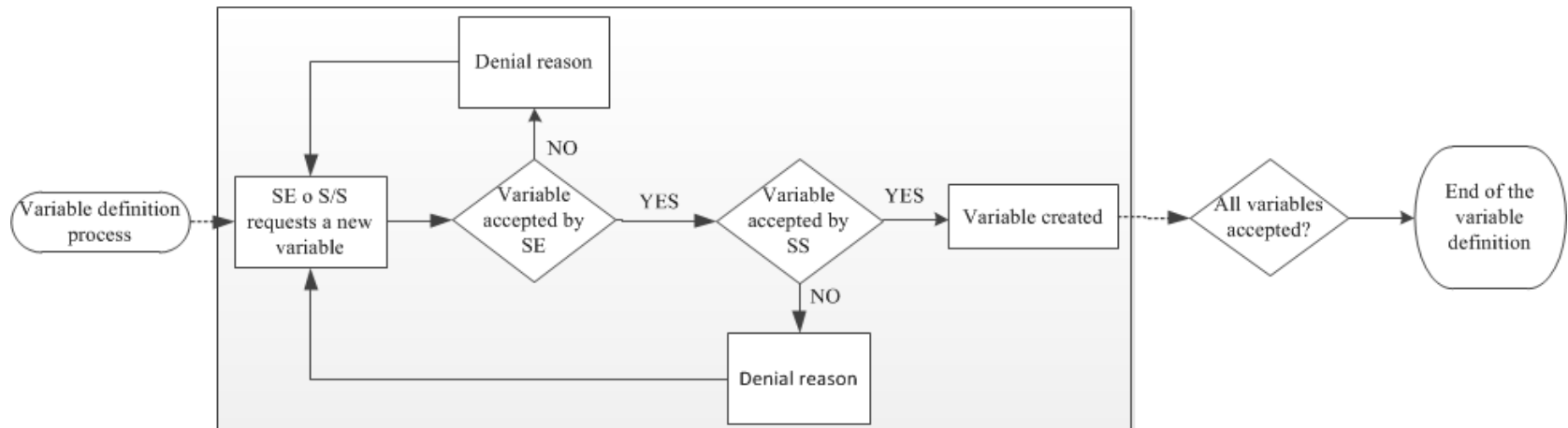
- Python
- Server – client structure
- Easily scalable
- Third-party apps connectivity
- Real-time variable controlling
- Easy and fast to configure new projects
- GUI



Workflow



Variable definition process



Variables

Each variable is identify by an issue and a version

- **The issue:** Major change in the database.
- **The version:** Change in the value of a variable.

Backup the all values

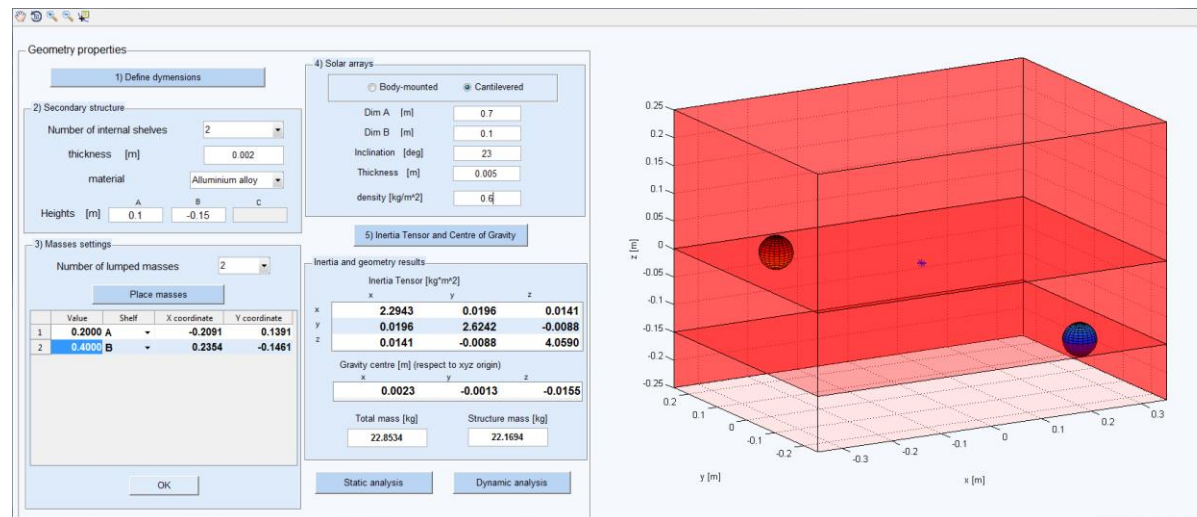
Compare the variables used in the calculation with the latest version present in the DB

Plot the evolution of the variable

Modules

- Each subsystem must use a calculation module
- Any programming language
- Directly connect with the database
- Excel workbook, Matlab program, ESATAN, CATIA,...

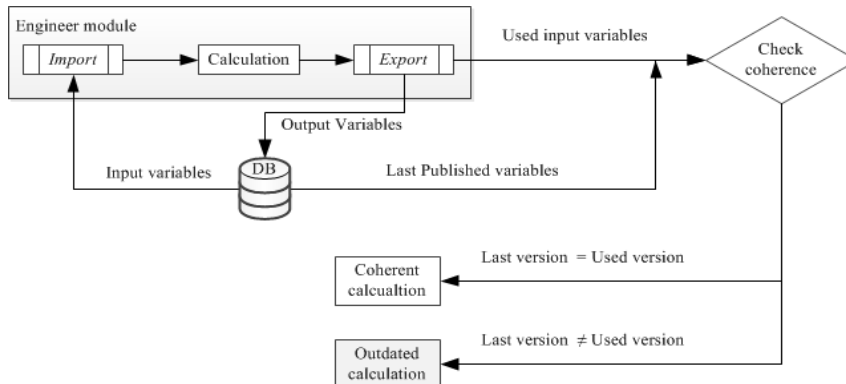
Structure module example (Matlab)



Concurrent session

- Each subsystem can make his own calculation in parallel
- All the subsystems are working with the same issue but the version updates with the variable value
- When one subsystem exports its results to the DB, the issue and version are compared with the variables present in the DB
- As a result of the comparison, the widget alerts if the subsystem is using an old version of the variable

Concurrent session



Concurrent Design Application - Systems Engineer

System Engineer SECESA14

Start | Subsystems | Variable Creation | System Variables | Variable Explorer | System Status | Issue Explorer | Variable Plotter

Input Variables

Variable Name	Source SS	State	Pub. Value	Published Iss/Ver	Used Value	Used Iss/Ver	Units
1. var_01	secesa_01	Consistent	1	5/0	1	5/0	m
2. var_02	secesa_02	Issue mismatch	223.72	5/1	0	0/0	K
3. var_04	secesa_01	Consistent	0.128	5/0	1	5/0	m

Output Variables

Variable Name	Published Value	Published Issue/Version	Units
var_03	12	1/0	m

Refresh Table

Last Update: 18:00:07

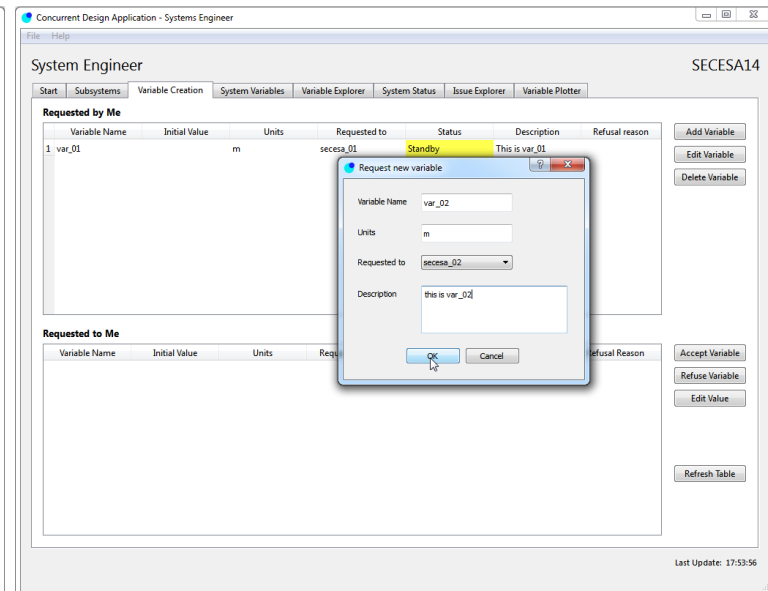
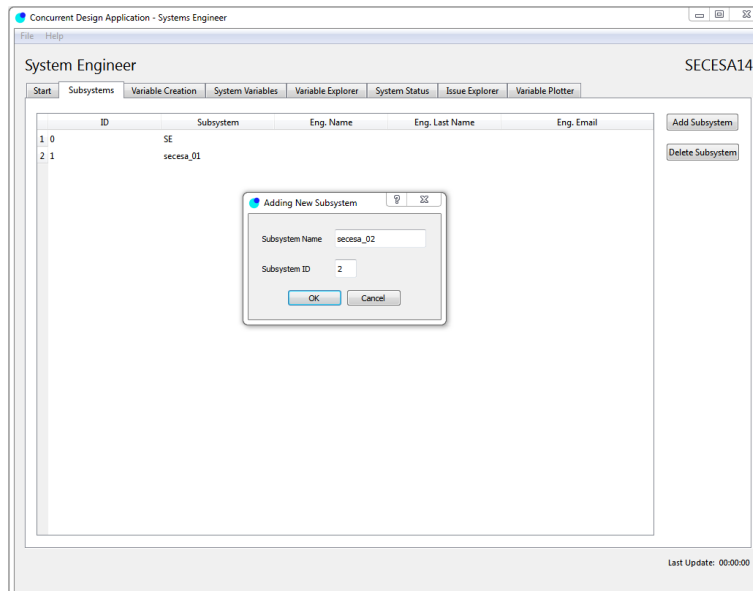
Future work

- Continue developing
- Distribute the software via Github or similar
- Applying a method for finding the fastest way to update the modules
- New connector for software that not accepts SQL syntax

Requirements

- MySQL
- Coffee

Screenshots



Screenshots

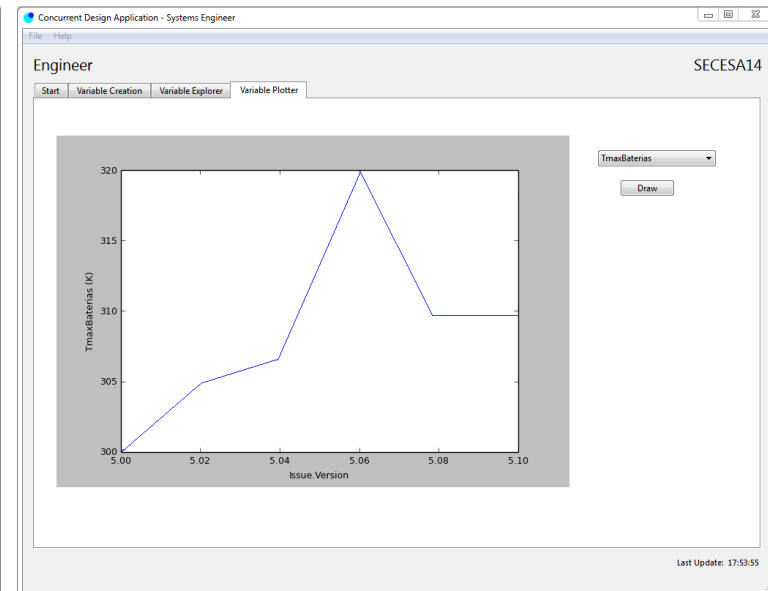
Concurrent Design Application - Systems Engineer

System Engineer cdf_02

Start Subsystems Variable Creation System Variables Variable Explorer System Status Issue Explorer Variable Plotter

Variable Name	Source SS	Destination SS	State	Pub. Value	Published Iss/Ver	Used Value	Used Iss/Ver	Units
1 DisipacionMaxi...	potencia	termico	Consistent	50	5/0	50	5/0	W
2 TminBaterias	termico	SE	Issue mismatch	275.98	5/1	0	0/0	K
3 TmaxBaterias	termico	SE	Issue mismatch	318.09	5/1	0	0/0	K
4 WidthCube	SE	termico	Consistent	1	5/0	1	5/0	m
5 TminGiroscopo	termico	SE	Issue mismatch	223.72	5/1	0	0/0	K
6 LenghtCube	SE	termico	Consistent	1	5/0	1	5/0	m
7 TmaxMagneto...	termico	SE	Issue mismatch	290.11	5/1	0	0/0	K
8 TmaxGiroscopos	termico	SE	Issue mismatch	291.08	5/1	0	0/0	K
9 TmaxElectronica	termico	SE	Issue mismatch	296.08	5/1	0	0/0	K
10 HeightCube	SE	termico	Consistent	1	5/0	1	5/0	m
11 TminElectronica	termico	SE	Issue mismatch	249.57	5/1	0	0/0	K
12 TminMagnetop...	termico	SE	Issue mismatch	223.72	5/1	0	0/0	K
13 SheetsNumber	SE	termico	Consistent	2	5/0	2	5/0	NA
14 MasaBateria	potencia	termico	Consistent	0.128	5/0	0.128	5/0	Kg
15 AreaBateria	potencia	termico	Consistent	0.225	5/0	0.225	5/0	m^2

Last Update: 12:33:19





Thank you!!