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An Interacting Entities Modeling Methodology For Robust Systems Design

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An Interacting Entities Modelling Methodology for Robust Systems Design

OpenCookbook is a web-based requirements and specifications capturing tool supporting a coherent and unified system development methodology based on the Interacting Entities paradigm













- Universality:
 - modelling any type of system, i.e. physical, software, hardware etc. (possibly with heterogeneous parts)
- Scalability:
 - support the development from small to very large and complex systems
- Extensibility:
 - possibility to change and to modify the meta-model (based on system grammar structure of database)







OpenCookbook Principles

- Using natural language for requirements and specifications capturing and architecture definitions
- Separation of concerns, concepts hierarchically decomposed and structured
- Unified repository (database) based on the Systems Grammar
- Using unified workflow for whole system engineering process















OpenCookbook functionality

- System definition through the web
- Possibility of work in local mode on PC
- Organisation of discussion on system requirements, specifications, architecture and work plan
- Queries to project database
- Intuitive interface and easy navigation, using WYSIWYG web-based editors





OpenCookbook functionality

- Generation of project documentation (in html)
- Generation of Task Juggler reports
- Import/export project database
- Implementation of mapping between project levels by hyperlinks.







Precedence tree

- From release or validation task to requirement, precedence tree can be displayed and navigated
- => first step towards "delta-management" for incremental verifcation/validation/ certification







		Task	Start	End	Work	Duration	Completed	Oct 2009 Nov 2009 Dec 2009
<u>Resources</u>		WP 1 Document generator	Thu 2009-10-22	Mon 2009-11-30	46	39	100%	W42 W43 W44 W45 W46 W47 W48 W49 W50 W51 W52 W55
Accounts		T 1 Develop html generator	Thu 2009-10-22	Fri 2009-10-23	4	1.8	100%	
		T 2 Development of pdf generator	Fri 2009-10-30	Fri 2009-11-27	42	28.8	100%	
Reports		WP 3 OpenCookBook Conception Design	Mon 2009-10-26	Fri 2009-11-13	17	18	100%	
eport Name	File	T 4 MetaMetaModel Design	Mon 2009-10-26	Thu 2009-11-12	17	17.8	100%	
SV Reports		T 5 MetaModel Design	Mon 2009-11-02	Fri 2009-11-06	0	4	100%	
Texport Reports		DT 6 Project/Solution Design	Mon 2009-11-09	Wed 2009-11-11	0	2	100%	-
HTML Reports		DT 7 Access Policies Design	Thu 2009-11-12	Fri 2009-11-13	0	1	100%	
Accounting.html	/home/eric/	WP 4 OpenCookBook 2 Alpha: Core Development	Mon 2009-10-26	Thu 2010-01-28	141	94.7	52%	
Calendar.html	/home/eric/	e S WP 2 Metamodel	Fri 2009-10-30	Wed 2009-12-30	- 1	61	100%	
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		DI_17 metamodel xml import/export DT_10 Metamodel Sdites Implement	Mon 2009-12-21	Tue 2009-12-22	0	1	0%	
		JI_18 MetaModel Editor Implementation	wed 2009-12-23	FII 2009-12-25	0	2	0%	
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		DI_19 Node browser	Mon 2010-01-04	Tue 2010-01-05	0	1	0%	
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		D1_23 Collection Filtering/Querying	Mon 2010-01-18	Tue 2010-01-19	0	1	0%	
		DT_24 Relation operations	Wed 2010-01-20	Fri 2010-01-22	0	2	0%	
		DT_25 Solution operations	Mon 2010-01-25	Tue 2010-01-26	0	1	0%	







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Technical info



- Based on Drupal 5.21 Content Management System
- Web server (tested with Apache v. 2.2)
- PHP (tested with 5.3)
- MySQL (tested with 5.0)
- scalability and maintainability issues
- OpenCookBook v1
 - See OpenSpecs
- OpenCookBook v2
 - Wt: compiled web portal in C++
 - Enhanced metamodel







Panel Project is "walking the tree" in project's statespace Requirements -> specifications -> model -> implementation in SW and HW Final model is implementation (model) The larger the statespace the more error prone, more difficult to verify and validate Less is also less for power and cost!



- Changing / increasing requirements
 - Before: only "normal" case: easy (sic)
 - Then: also "test case" (intrusive)
 - Now also: "fault case" => safety & security!
 - Decomposition in entities and interactions
 - (concurrency and communication)
 - Error trapping
 - Fault containment
 - Fault recovery
 - Resource metering (time, memory, bandwidth, power)
 - => additional complexity and system behaviour!





Panel



- But:
 - We program mostly with sequential programming languages as abstraction layers on top of sequential von Neuman CPUs
 - Software doesn't execute hardware!
 - Software must be efficient in translating requirements in specifications
- Hence:
 - Hardware must be efficient to execute specifications!



