CARIBCAD PILOT 1 Model

Version: Final
Status: Working version for Pilot 1 team
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I. WED BASED HEURISTIC MODEL

This model is based on the following internal CaribCAF working documents:

- approach to requirements analysis development (appendix 1)
- EGM supplied CAD production requirements analysis (appendix 2)
- TECAM supplied CAD production requirements analysis (appendix 3)

The model was originally developed with the clients input (EGM), then further refined according to the input by TecAm/PUCMM (appendix 3). The web based model proved to be an excellent communication medium for model refinement.

Legend of task/document diagrams:

Open circle:	task that is decomposed in another diagram
Shaded circle	atomic task
Circle in square	task external to this diagram (or task not in scope of definiton)
Square:	document
Plain arrow	produces new or updated document
Dashed arrow	exchanges document without change
Bold arrow	precedence relation between tasks
Curved bold arrow	feedback for incremental improvement until correct
Diamond tail arrow	fires target task under given condition in source task

Use of the heuristic model:
Once the model was stable it was used to:

- refine the document descriptions, e.g. type of text, annotations, CAD components, etc, that is related to all the documents in the following lists
- draw up a schedule (Gantt and Pert charts) and determine critical paths
- find out all the document trails and derive a requirements spec on exchange and sharing technologies that we need to support that
- refine all QA checks in clear predefined procedures
- start modeling the content of the CAD drawings in order to define the QA checks idetail

Downstream choice of WFM tool:
The model was also used to test different candidates and choose the most suitable one for our purposes. An essential requirement of the WFM of choice is that it is able to support the virtual internet connected team.
The main purpose of the description of the work flow through our formalism, glossary and matrices is that we have all information readily available to 'fill' any WFM tool that we chose later on.

Table of Tasks (to be completed):

Task	Related to Tasks				Role	Description
1	start	2			EU	Provide Instruction
2	1	3			EU/DC	Do Performance test
3	2	End			EU/DC	Conduct actual project
1.1	1.2				EU	Prepare initial instruction doc
1.2	1.1	1.3			DC	Comment on Instruction Doc.
1.3	1.2				EU	Revise Instruction Doc.
2.1					EU/DC	Make scan of paper drawing
2.2					DC/EU	Draw elements category 1 until correct
2.3					DC/EU	Draw elements category 2 until correct
2.4					DC/EU	Draw elements category 3 until correct
2.5					DC/EU	Add elements category 4 until correct
2.6					EU	Adjust drawing
2.7					EU/DC	Evaluate test
2.8					EU	Make final instruction/training document
3.0*					EU	Decide outsourcing potential
3.1*					EU/DC	Negotiate contract
3.2					EU	Deliver scans of paper drawings
3.3					DC/EU	Draw all required elements until correct
3.4					EU	Load and adjust in native CAD system
3.5					EU	Make final assessment of DC product
2.1.1					EU	Produce scanned image
2.1.2					DC	Check scanned image
2.2.1					DC	Draw elements
2.2.2					EU	Perform check on elements
2.3.1					DC	Draw elements
2.3.2					EU	Perform check on elements
2.4.1					DC	Draw elements
2.4.2					EU	Perform check on elements
2.5.1					DC	Draw/Add remaining elements
2.5.2					EU	Check elements
2.7.1					EU	Evaluate test and comment on DC evaluation
2.7.2					DC	Evaluate test and comment on EU evaluation
2.7.3					EU	Make final evaluation report, and cons. Instr.
3.2.1					EU	Deliver scans until pass check by DC
3.2.2					DC	Check scans
3.2.3					EU	Provide instruction
3.3.1					DC	Draw elements until correct
3.3.2					EU	Check correctness

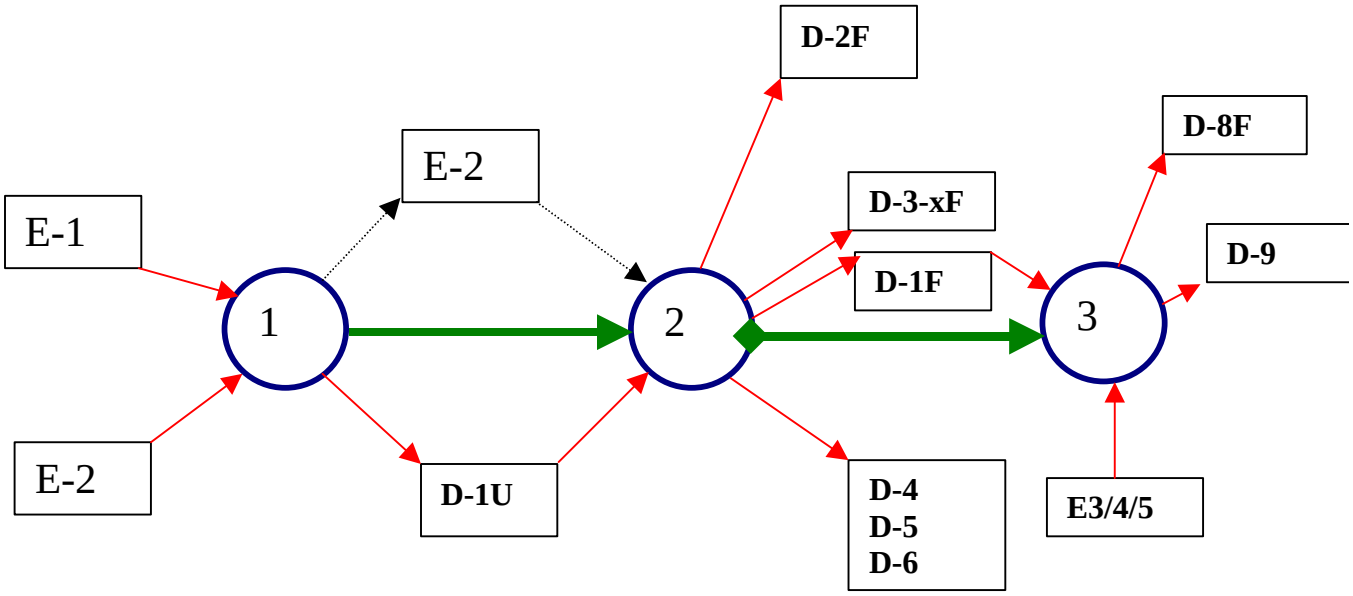
Table of Documents (first original draft):

Doument	Produced in Tasks			Description	Type
	Origin	Amended	Used		
E-1	EU			Native drawing conventions	Text
D-1	1.1	1.2		Drawing instructions	Text
D-1A	1.2			Commented instructions	Text
D-1U/F	1.1	1.3	1.2	Updated instructions until final	Text
E-2	EU			Analog drawings	Anal. Drawing
D-2	2.1.1	2.1.2	2	Scanned test drawings	TIF + Text
D-2A				Commented scans	TIF + Annot
D-2U/F	2.1.1	2.1.2	2	Improved scanned test drawings until final	TIF + Text
D-3-1				CAD test file with elements category 1	CAD
D-3-1A				Commented CAD test file	CAD+text+annot
D-3-1U/F				Updated CAD test file until correct	CAD
D-3-2				CAD test file with elements category 1,2	CAD
D-3-2A				Commented CAD test file	CAD+text+annot
D-3-2U/F				Updated CAD test file until correct	CAD
Etc.				Etc.	
D-3-6				Adjusted CAD test file for internal use	CAD
D-4				EU test report	Text
D-5				DC Test report	Text
D-6				Joint test report	Text+CAD
E-3				Project specs	Text+Drawings
E-4				General conditions	Text
E-5				Analog drawings	
D-7				Scanned drawings	TIF + text
D-7A				Commented scans	TIF +Annot
D-7U/F				Revised scanned test drawings until final	TIF + text+annot
D-8-1				CAD production stage 1	CAD+text
D-8-1A				Commented CAD production stage 1	CAD+text+annot
D-8-1U/F				Updated CAD production stage 1 until final	CSAD +text
D-8-2				CAD production stage 2	CAD+text
Etc.				Etc	….
D-9				Adjusted CAD production files for internal use	Native CAD

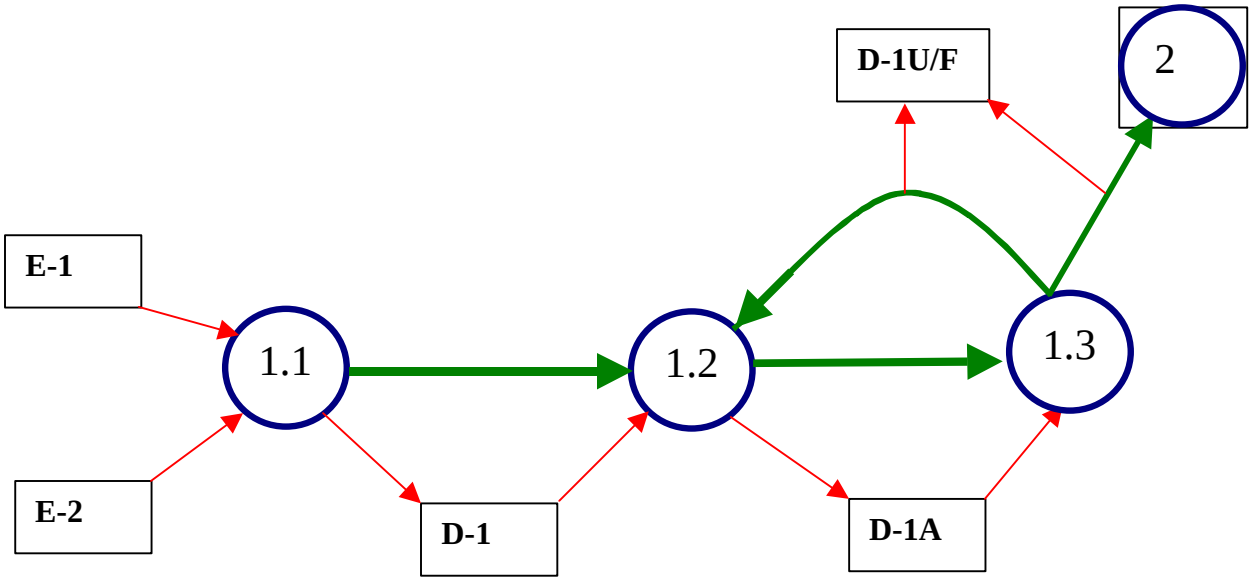
Elaborate descriptions of tasks and documents can be found in appendix 2 and 3

The following explains the model made according to the rules set down in appendix 1.

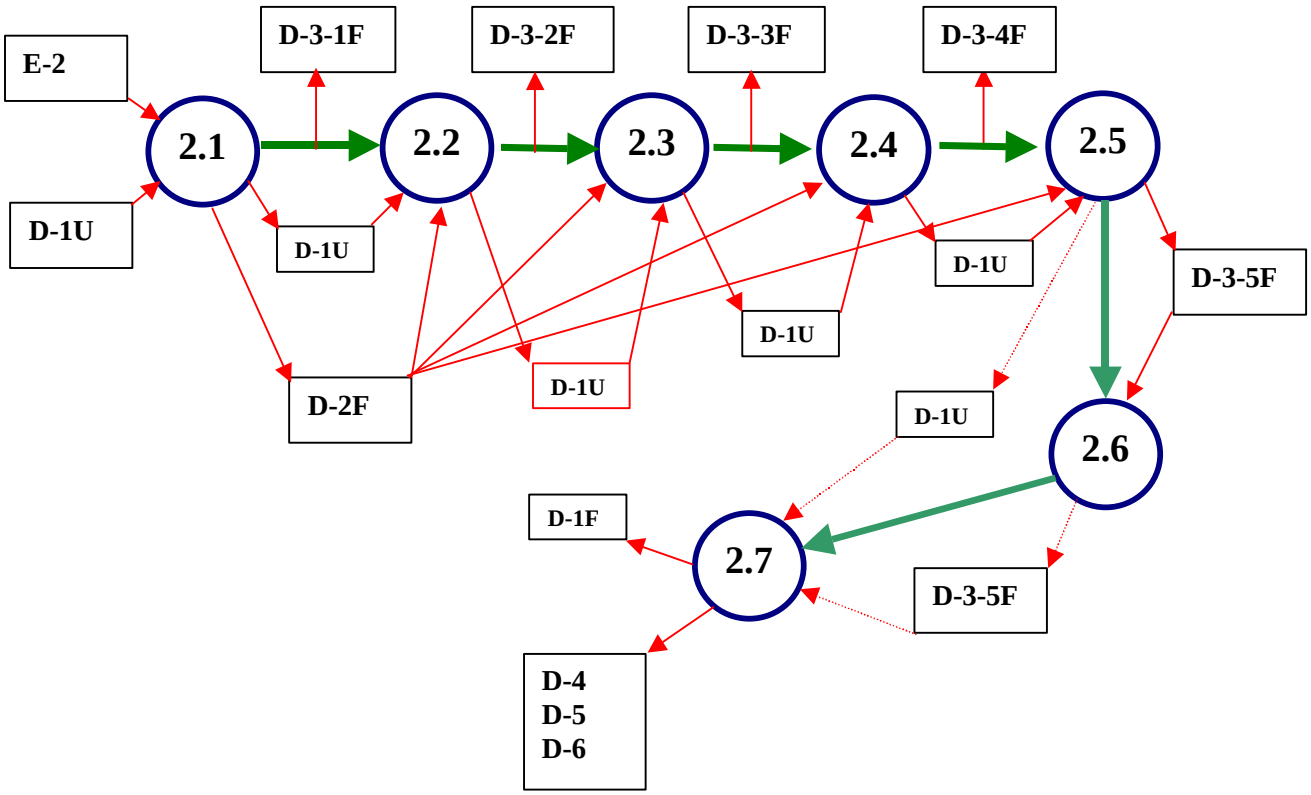
Top level model:



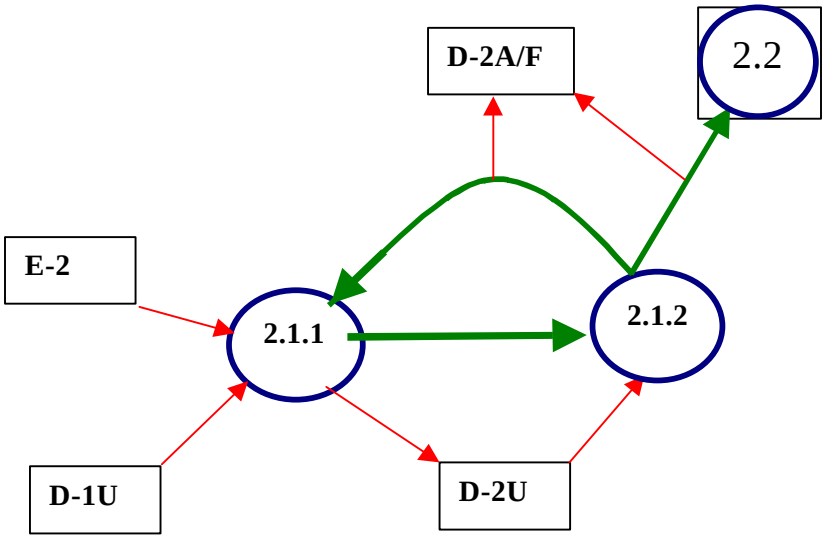
Decomposition of Task 1:



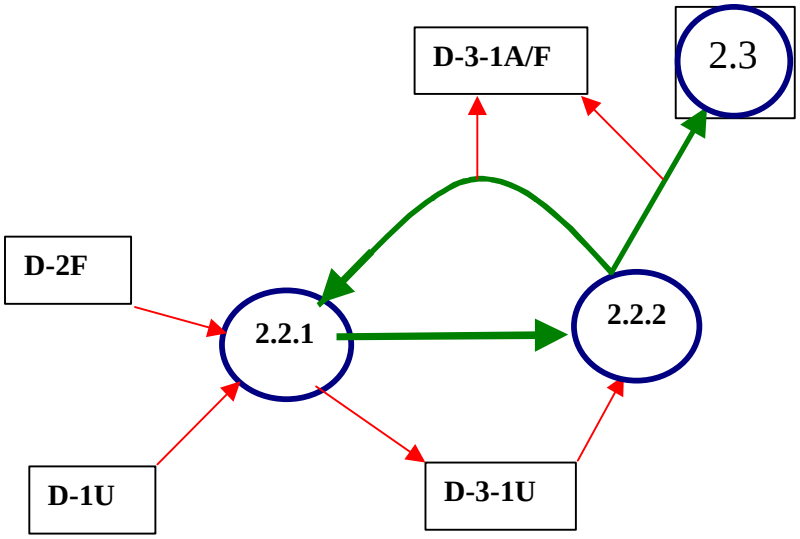
Decomposition (1) of task 2:



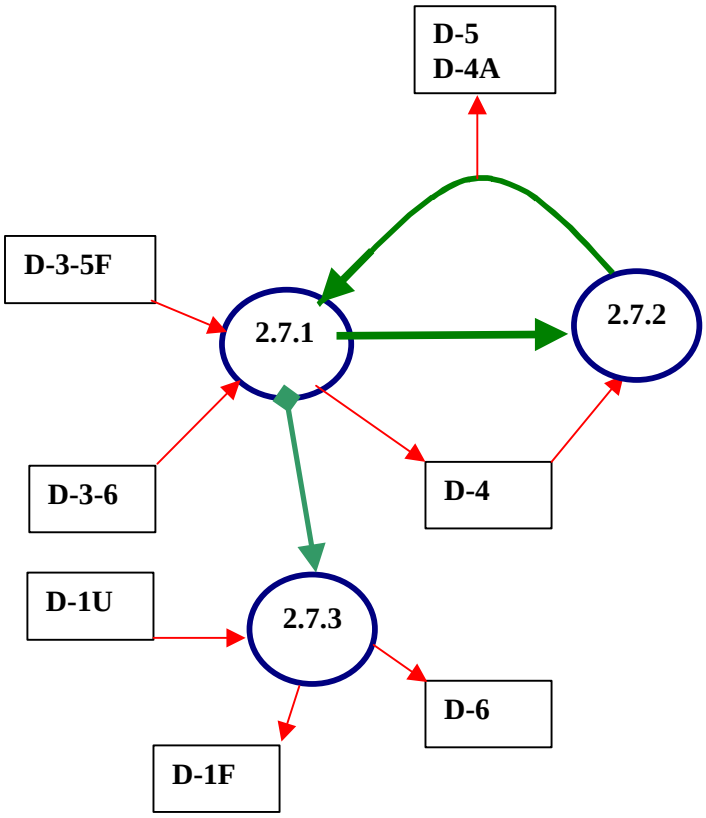
Decomposition level 2 of Task 2.1



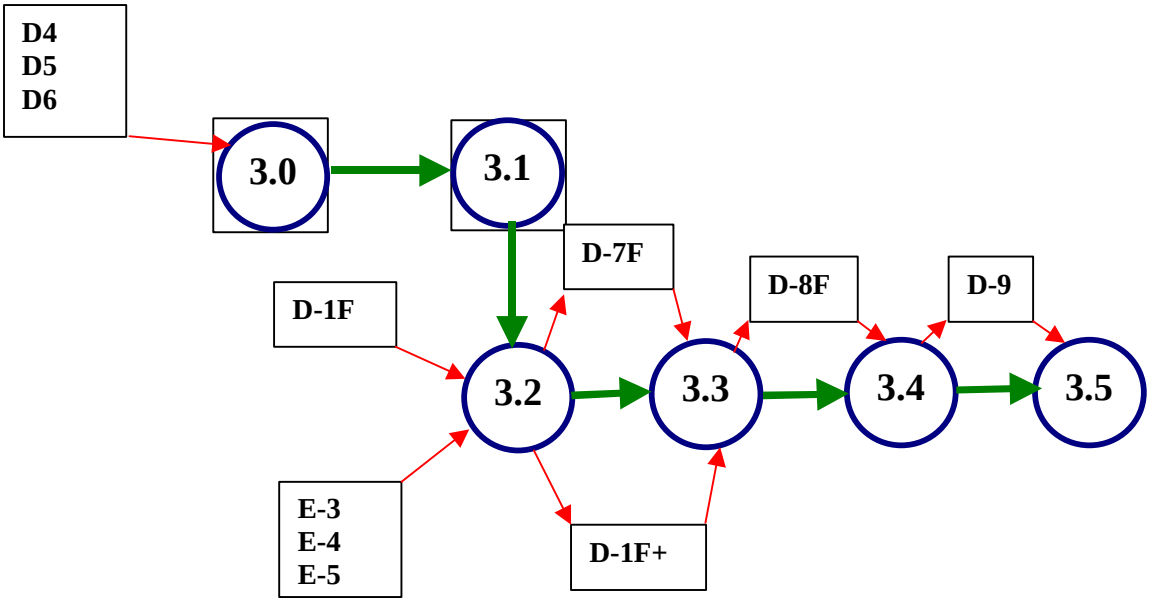
Decomposition level 2 of Task 2.2



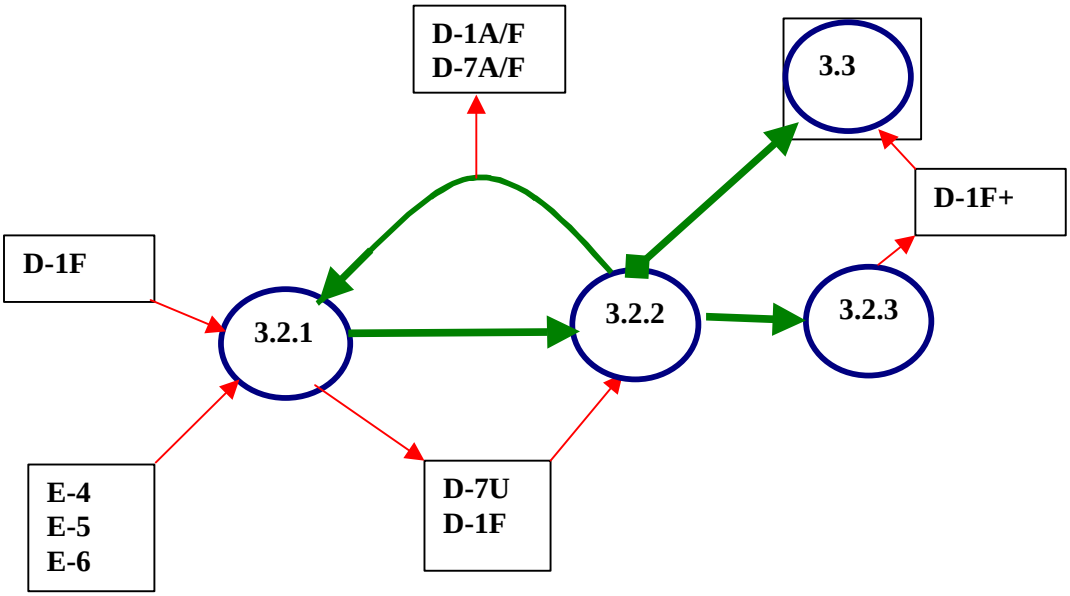
Decomposition level 2 of Task 2.7



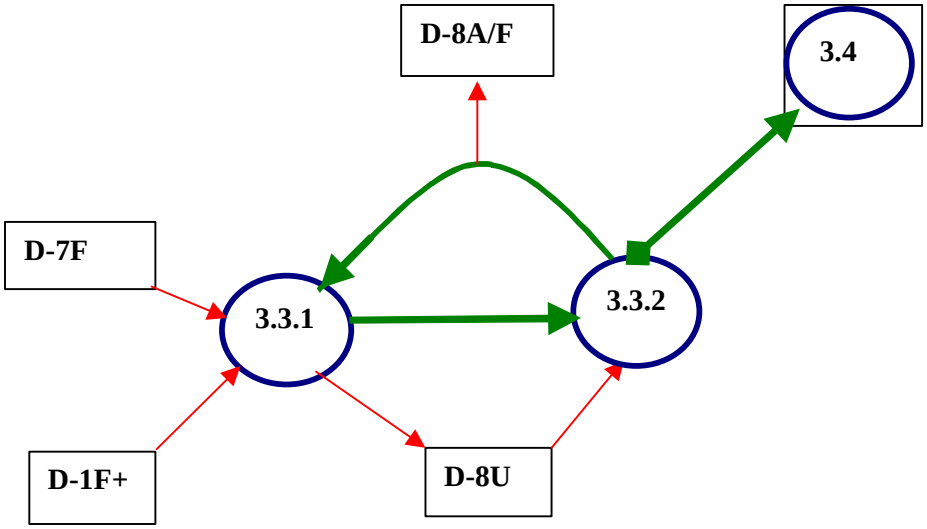
Decomposition of Task 3:



Decomposition level 2 of task 3.2:



Decomposition level 3 of task 3.3

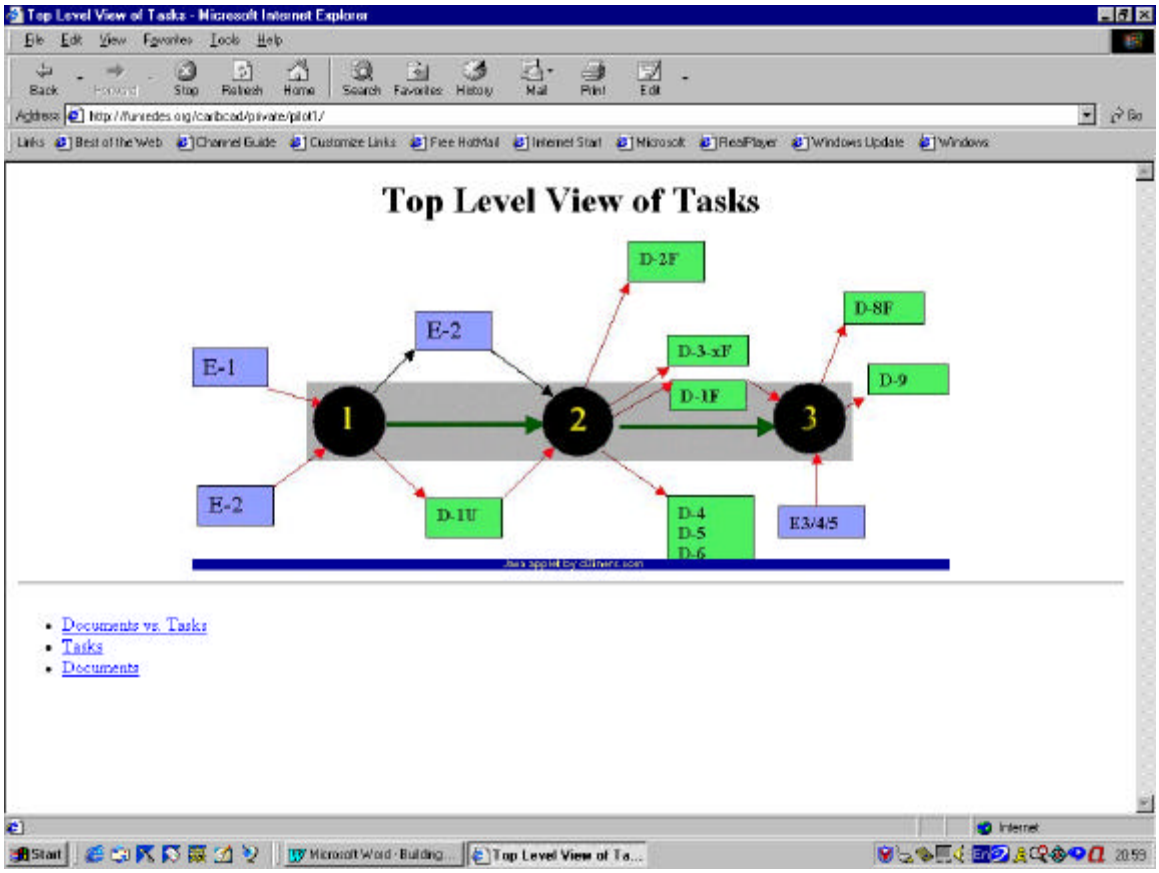


The model was subsequently put on the CaribCAD web site and refined through repeated cycles.

For ‘live ‘inspection of the model we refer to the **Roadmap document (Deliverable D2)**

II. The formal WFM model, using the message based paradigm of Keyflow ™

Based on the web model:



The heuristically defined process was translated into a Workflow that can be remotely managed by the EU client..

Prerequisites:
- Use of the Keyflow Release 3.01 product
- Use of the exchange server of the CaribCAD project

Definition of workflows*:

- A process is a collection of tasks that produce a result.
- A *workflow* is a process definition. A workflow is made up of a series of *steps*. Each step has *prerequisites*, which are conditions that specify when the step should be done.

Steps can be sequential or can execute in parallel. When users execute a workflow, it becomes a *flow*, which can be monitored and changed while running.

Workflow fundamentals*

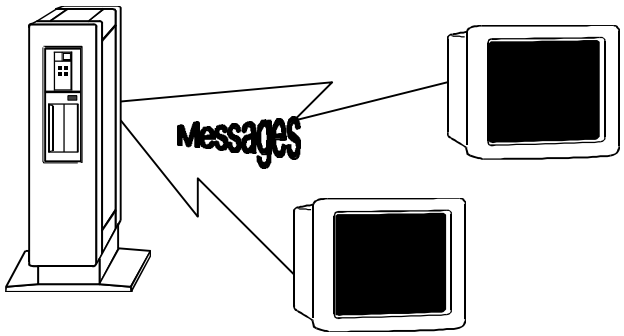
Workflow is the electronic expression of a process or policy. The policy is automatically deployed and contains facilities for monitoring, measuring, improving the processes, and policy implementation. This concept is called "continuous -based workflow applications, like Keyflow, use the existing LAN/WAN/Intranet messaging environment as a platform for the entire workflow system. Keyflow leverages and extends the infrastructure investment in electronic messaging, by bringing users' work to the e-mail in-box. Users can complete their assignments and route them directly from their e-mail client. This approach works because it spans all business applications, as users tend to spend more time in their e-mail than any other specialized application.

The Software

Keyflow Release 3.01 (SP2) by Keyfile Corporation.

Keyflow Architecture*

Keyflow uses a client / server architecture connected by messages. Users run client software to start flows and respond to task messages. In the background, the Keyflow Server sends task messages to users, accepts messages from users, and processes workflows.



* Keyfile Cooperation, White paper "Enabling Custom Workflow Applications for Microsoft Exchange, 1997

Workflow Theory

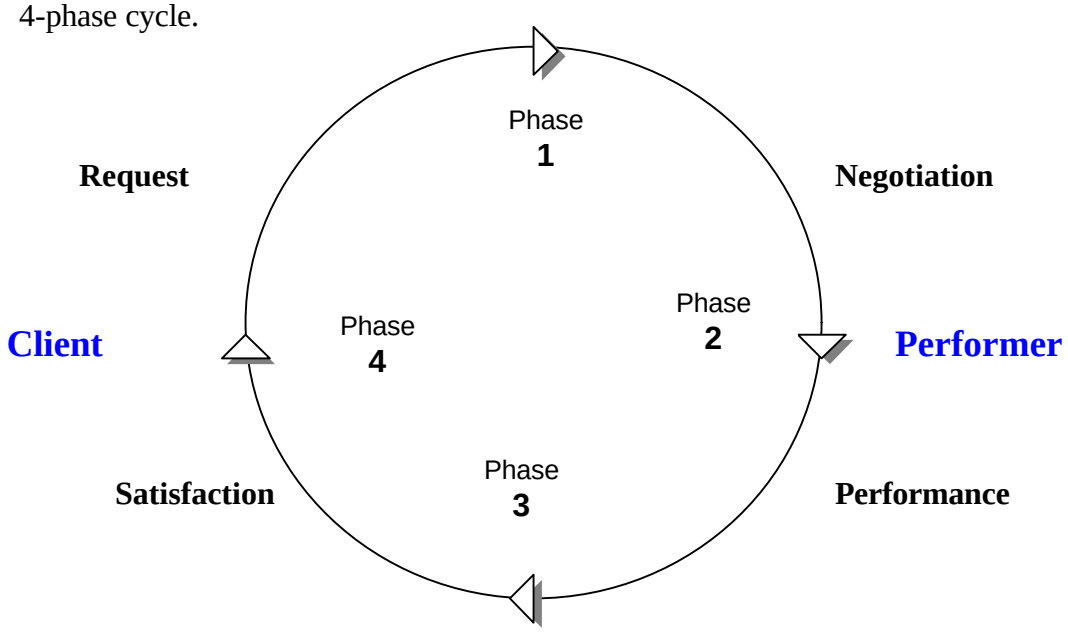
Basic of the flow logic:

A process (e.g. outsourcing of CAD-drawings) can be interpreted as a closed cycle process in which a performer completes actions leading to the 'satisfaction' of a client's request. At any phase, the participants may make requests of others, thus starting secondary cycles. In most cases, the completion of the secondary cycle is the prerequisite to enable forward progress in the primary cycle. The principle generates

a network of connected cycles. Each cycle segment can be further refined, like a fraction, into more cycles.

Basic construction of flow:

A basic workflow cycle connects a client (person making a request or accepting an offer) and a performer (a person making the promise) in a 4-phase cycle.



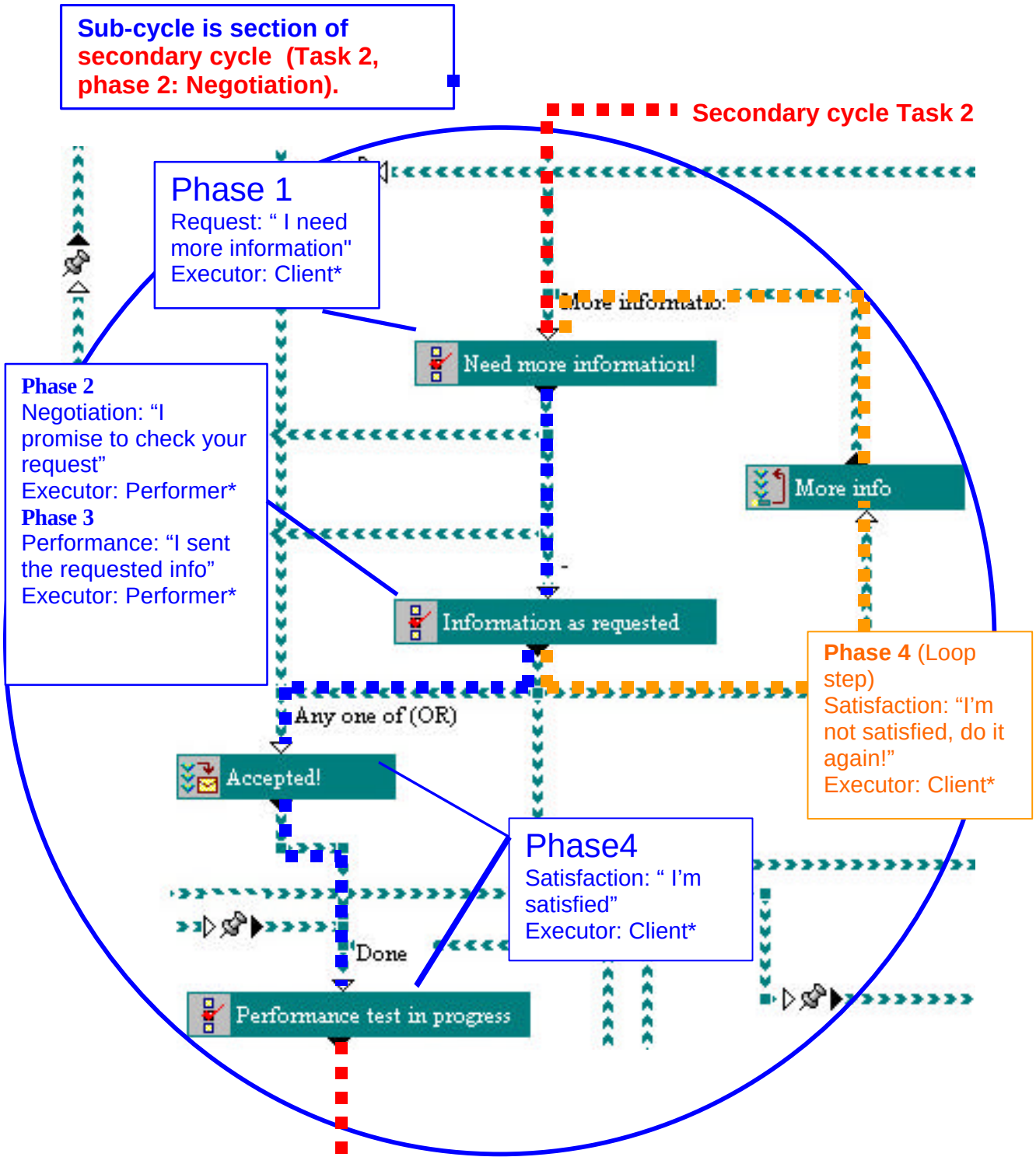
*Phase **1***	Client:	I request
*Phase **2***	Performer:	I promise
*Phase **3***	Performer:	I am done
*Phase **4***	Client:	I am satisfied or I am unsatisfied ==> repeat cycle or quite process

The cycle moves toward completion as participants (client, performer) conduct actions (e.g. send response)

Explanation of exemplary flow-section (Section Task 2)

Primary cycle: Outsource CAD-drawings
Secondary cycle: Task 1 (Provide instruction and information about the project and the project approach)
Task 2 (Do the performance test)
Task 3 (Conduct the actual outsourcing)

***** *Note: Client in sub-cycle is Performer in secondary cycle (Task2), Performer in sub-cycle is Client in secondary cycle (Task2)*



Requirements for proper execution:

- The workflow process is well-understood by both client and performer.
- The process (primary cycle) can be broken down into tasks (secondary cycles).
- Secondary tasks can be can be further decomposed into sub-cycles and definite steps.
- The workflow participants (recipients) can be identified and addressed in their specific role in each step.

The Process Simulation

Approach

- The pilot1 model was divided into 3 independent tasks.
- For each task a flow template was developed.
- A simulation to test the flows was run between different 'client (students before the actual workers were exposed to the flows
- After finishing one task, the next task was started manually.

Task Description

- Task1: Provide instruction and information about the project and the project approach
- Task2: Do the performance test
- Task3: Conduct the actual project

Flow Templates

Appendix IV contains the flow-templates of TASK1, TASK2 and TASK3.

Necessity of simulation:

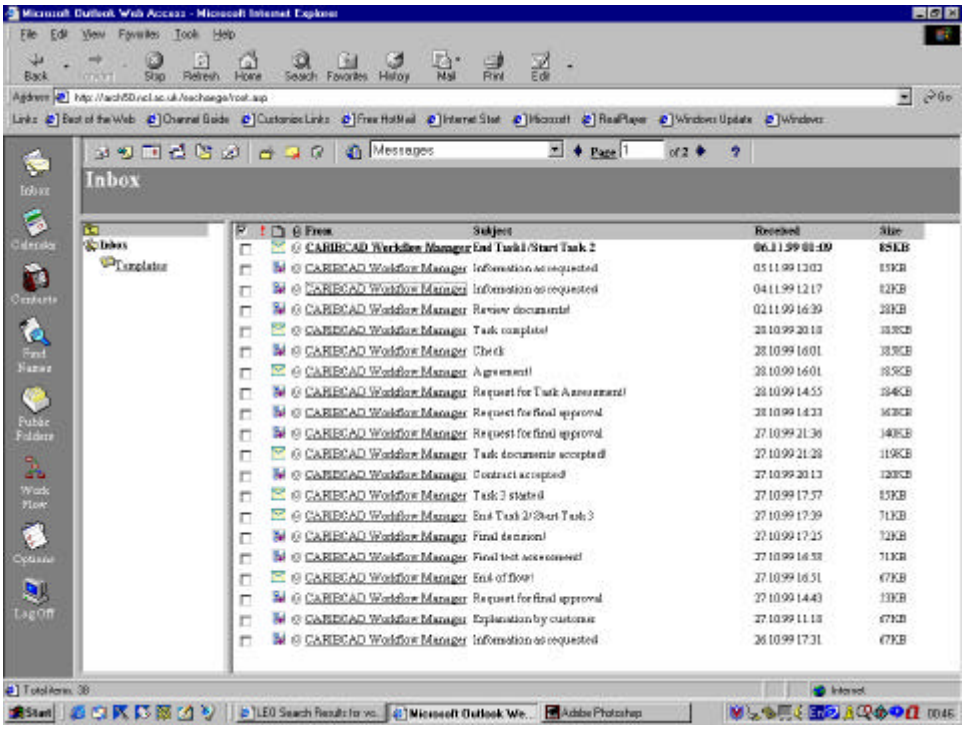
- To test if the workflow process will execute.
- To test if all flow-cycles are linked in the correct way.
- To test if the model of the workflow is complete (all primary and secondary cycles have been identified and addressed).
- To find redundancies within the process
- To test if the flow delivers the anticipated results.
- To find out if the flow-instructions are clear and definite.
- To see if the flow represents the "real work process".

Conditions for *'ideal'* simulation:

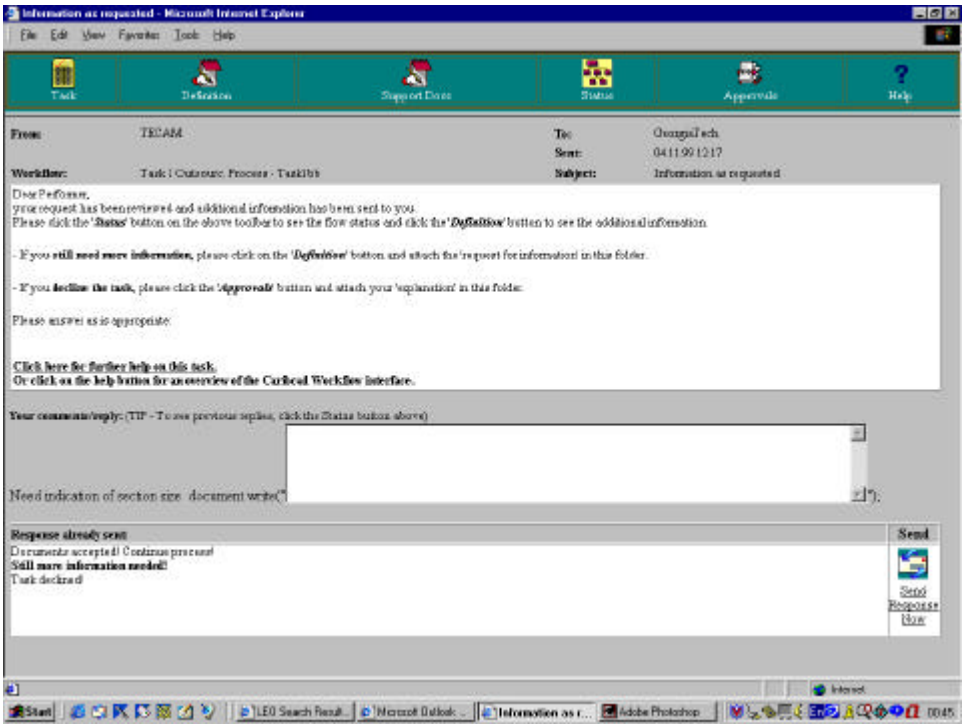
- Simulation participants have similar or same knowledge and capabilities than 'real players'→ no extra insight knowledge.
- Conditions of simulation represent exactly the conditions of the real process.
- There is no interference from outside the simulation process.
- Each participant acts as in 'reality'.

It was obviously hard, if not impossible t fullfil all of these requirements.

The Web Interface



Screenshot of the Web-Interface of the User-Inbox



Screenshot of the Message-Interface in the User-Inbox

Results of the Simulation

- All three flows (Task1, Task2, Task3) were tested through simulation leading to incremental improvements
- The multi-lingual, multi-time zone, mulit-cultural and multi-social approach of Caribcad made it difficult to coordinate the workflow.
- Due to the technical (web-interface), availability and communicational problems (multi-lingual), the simulation took more time than expected.
- Failure to follow the specified flow rules endangered the success of the flow.
- As several flows ran at the same time, keeping track of the incoming messages in the User-Inbox was difficult (Keyflow problem).
- 'Big attachments' could slow down the network-connection drastically. Speed changes or short interruptions of the network-connection may result in data loss (especially true for the regular modem dial-up network connections in the DC).
- Due to technical problems with the Web-Interface (performer), regular email was used to keep the flow partner informed. The flow software itself doesn't support a reaction to any unforeseen problem (technical, availability or communicational).

Conclusions with respect to the adequacy of the workflow paradigm:

- The flow-instructions (wording) *have to be* simple, clear and unambiguous; this proved to be a major reason to conduct simulations before the deployment of the flows.
- The Web-Interface *has to* provide all necessary information in a simple, clear and an non-misleading form.
- The flow *has to* provide a possibility to correct wrong/erroneous answers. This is especially important for long flows with many prerequisites.
- The control of the flow *has to* stay with the client; restarting at any point of the flow should be possible.
- The possibility to cancel the flow (by the client or the performer) *has to be* ensured all the time.
- All the participants *have to* follow and obey the 'rules of the flow' all the time.

- A separate subfolder for each flow *should be* considered.
- Slow or unreliable network-connections *should be* avoided.
- Unchanged attachments *should be* made easier to recognize from the list
- In case of a technical problem a ‘emergency notification’ system *should be* specified, either within the flow software or in the rules of the flow.
- The automatic notification system in the regular Mail-Inbox *should always be ɒn’*. It speeds up the flow progress (reduce timeouts), and avoids confusion if different persons access the same mailbox to inspect new tasks.
- The used software *should be* compatible between all participants of the flow.

Assessment of the software:

The software was useful to support the paradigm. It also served to identify and find redundancies and weak points within the workflow model.
The software tool is sufficient to model the typical client-performer outsource flows, but still needs some development to fulfill all the requirements of a complex flow model. Flow templates tend to get very complex and hard to transfer between different members of a development team.

Appendix I: Approach to requirements analysis

Internal working document.
Available from private member section of CaribCAD web site

Appendix II: CAD production requirements analysis in EGM

Internal working document.
Available from private member section of CaribCAD web site

Appendix III: CAD production Requirements analysis in TECAM

Internal working document.
Available from private member section of CaribCAD web site

Appendix IV: PILOT 1 models

Inspect the attached print outs or (for a full inspection of the models) connect to the Exchange server using Outlook and the Keflow client software. (The procedure is described in the Roadmap annex).