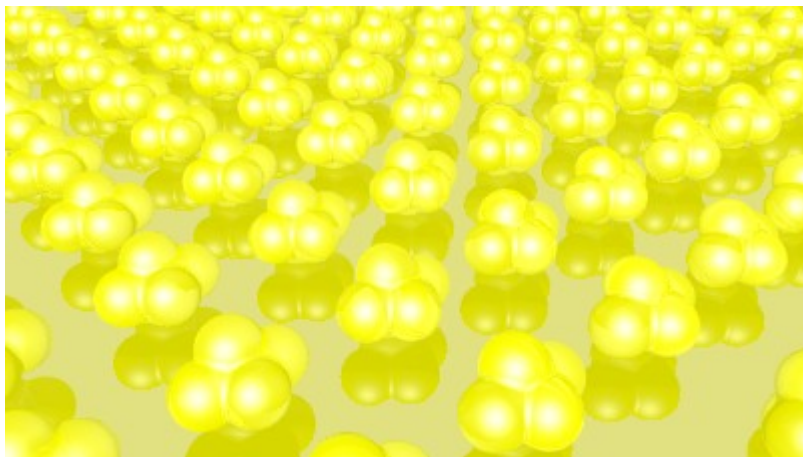


CRP – Capacity Requirement Planning Documentation

May 2007



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Date: 2007-05-18

Project Web Page: <http://crpcapacity.sourceforge.net/>
Project Sourceforge.net: <http://sourceforge.net/projects/crpcapacity/>

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1 Overview

The CRP - Capacity Requirement Planning, shortly “CRP Capacity”, is a solution that is targeted for manufacturing enterprises with discrete production processes and allows the maintenance of resources, tools, products, production plans, and their interdependences. In the present stage, the core of development is focused on data modeling capabilities in order to serve as a master data system for resource and product assignment information.

CRP – Capacity Requirement Planning, envisions a design capable of supporting the decision making process with maximum user-friendliness, interconnectivity, portability, and flexibility. “CRP Capacity” differs from other professional solutions in its development model. “CRP Capacity” is a community enabled fee software project, and will enable large number of people in implementing a solution to manage their operations better, at an affordable cost.

“CRP Capacity” is now in the planning stage with preview releases available regularly.

1.1 Rationale

Central resource and asset master data maintenance helps shorten the times required for modeling and updating of models in several target applications like capacity planning, investment planning, shop floor simulation, sequencing, dispatching, and scheduling. Currently, the project focuses on providing data modeling capabilities to support various applications of the aforementioned types.

While modeling most of state-of-the art applications, resource models have to be either created from scratch or assembled from various distributed information sources. Our intention is to provide a central place for resource modeling with direct data exchange functionalities.

1.2 Features

1.2.1 Data Model Features

- Visual separation of master data and model data

Master Data:

- Plants
- Work Centers
- Product Attributes
- Process Plans
- Operations
- Named Calendars

Model:

- Process Times
- Demands
- Products
- Resources
- Resource Groups
- Resource Group Priorities

1.2.2 UI Features (provided by jMatter)

- Visual style selection
- Integrated user management
- Roles management
- Administrator managed custom class field naming
- Internationalization
- Locking of sensitive commands
- Color coding for required fields
- Class export to CVS
- Element export to XML
- User-defined queries
- User-defined reports
- Choice between absolute dates or named calendars
- Memorization of last user UI layout
- CSS visual styles

1.2.3 Engine Features

[@TODO]

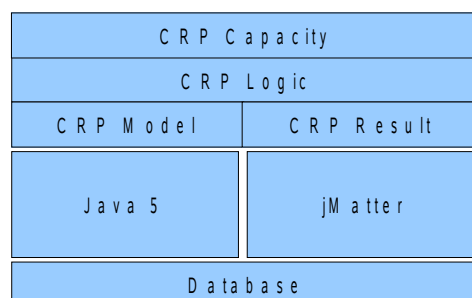
The engine has not yet been implemented. Tentative development with the Frepple – the Free Production Planning Library is work in progress for upcoming releases.

1.3 Framework

At the current development stage, the framework consists of the following components:

- Java Runtime Environment
- Database Management System
- jMatter Application Framework
- CRP Capacity Application components
 - CRP Model that keeps the master and model data
 - CRP Logic that provides the calculation rules and algorithms

Most of the UI, data modeling, and data base functionality is provided by the jMatter framework. CRP Capacity provides the specific resource modeling objects, classes, and references as well as the business rules to provide results.



[@TODO: Describe framework dependencies]

[@TODO: References to framework components]

1.4 Data Model

Current data model objects/classes overview.

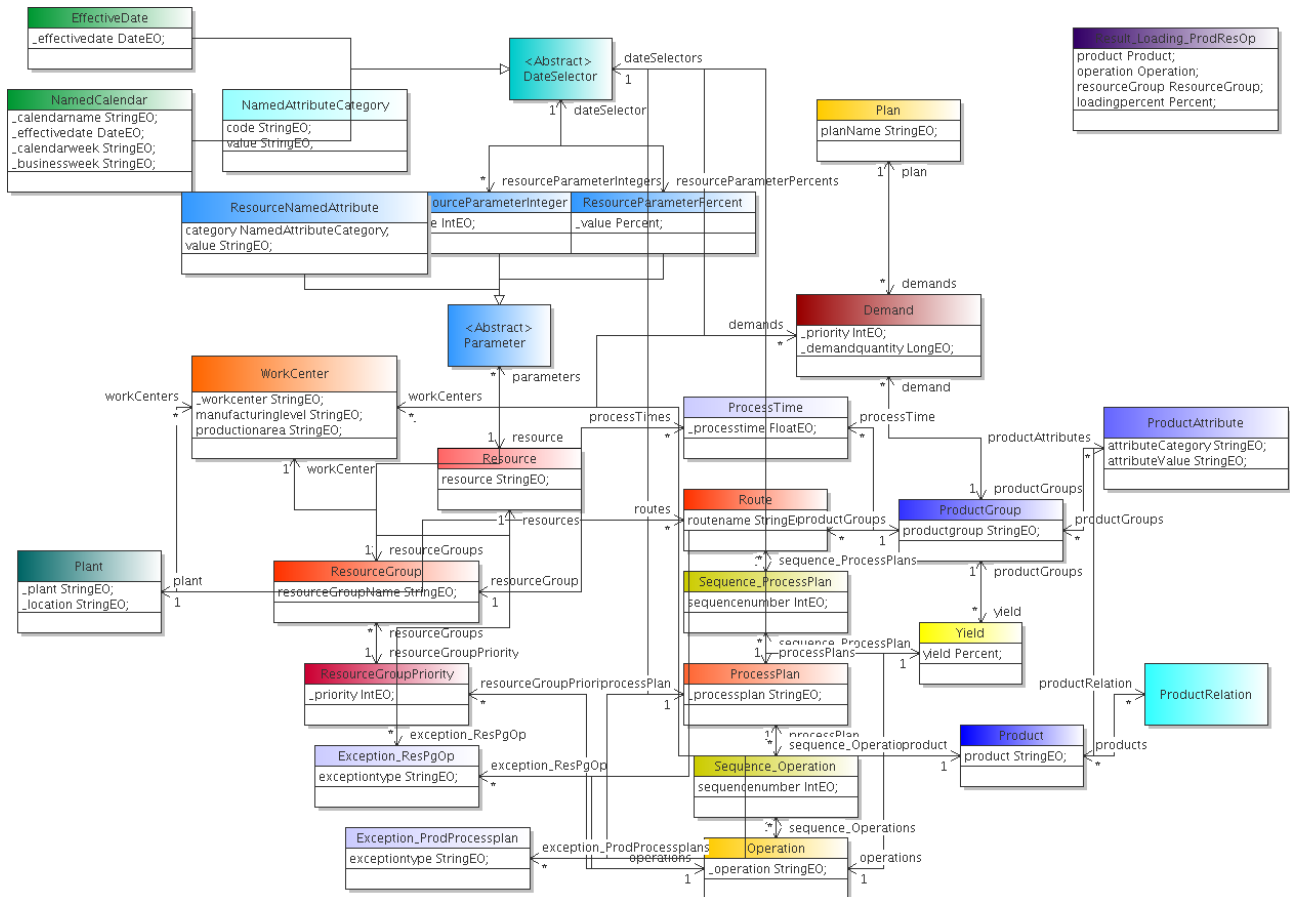


Figure: CRP object and classes model

[@TODO: Description]

1.5 Development Roadmap

The project is currently in the “2 - Pre-Alpha” stage of the development. For comparison, here's a list of project phase classifications from sourceforge.net that is being used for this project:

- 1 – Planning: completed on 2006-11-06
- 2 – Pre-Alpha: current stage, development of data model and functionality
- 3 – Alpha
- 4 – Beta
- 5 – Production / Stable
- 6 – Mature
- 7 – Inactive

2 Installation

2.1 Prerequisites

Required environment:

- Sun Java 2 SE 5.0 JRE (1.5.0_07 or above): <http://java.sun.com/javase/>
- Apache Ant (1.6.5 or above): <http://ant.apache.org/>
- PostgreSQL (8.1.4 or above): <http://www.postgresql.org/>

Other data base management systems are currently untested. However, the framework provides capabilities to support MySQL, Oracle XE, HSQLDB, H2, or any other DBMS that is supported by hibernate ().

2.1.1 Apache Ant

At this point of time you will still require ant to be installed in order to be able export the database schema.

<http://ant.apache.org/>

2.2 Getting The Distribution Files

2.2.1 Local SVN Setup

An SVN repository for this project is not yet set up. Frequent releases with the latest features are provided on the sourceforge.net project page.

Subversion server:

<https://crpcapacity.svn.sourceforge.net>

Path to Repository:

/svnroot/crpcapacity

Checkout using the command:

```
> svn checkout https://crpcapacity.svn.sourceforge.net/svnroot/crpcapacity  
crpcapacity
```

2.2.2 Distribution Download

Please get the files from sourceforge.net project download section:

http://sourceforge.net/project/showfiles.php?group_id=182456

2.3 Building and Installation

Create a directory crp:

```
> mkdir crp
```

Copy and uncompress the distribution file:

```
> cd crp  
> cp ../crp_dist_v0.02_20061126.zip .  
> unzip crp_dist_v0.02_20061126.zip
```

Create a Postgres user “crpadmin”.

Create a Postgres database “crpdb” with “crpadmin” as database owner.
Edit the hibernate.properties file.

Create the database schema:

```
> ant schema-export
```

You should be able to run crp now:

```
> ./run.sh  
or  
> ant run
```

Login with user “admin” and password “admin”.

2.4 Importing Sample Data from CSV

Sample data is provided as csv files in “tools/sampleddata” directory.

Before using the sql statement “import_crpdb.sql”, prefix the paths in the “COPY” statements to where your copy of CRP Capacity is installed.

In Postgres' pgAdminIII you can use the “Execute arbitrary SQL queries” icon, which opens the query tool, to open and execute the query in order to load the sample data, which should be confirmed with “Query returned successfully with no result”.

2.4.1 Step-by-Step Importing to PostgreSQL using pgAdmin III

Preparation:

- In the “tools\sampleddata” folder, open the file “import_crpdb.sql” for editing.
- In the “COPY” statements, prefix the relative path “tools/sampleddata/” with your absolute path to the directory, where crp is installed. The result should be something like [“C:/Userdata/projects/crp/tools/sampleddata/file.csv”](#).
- Save and exit editor.

In pgAdmin3:

- Select the “crpdb” database.
- Open the query tool
- Open the query file “import_crpdb.sql”
- Execute the query

On successful completion you should see a similar statement from the query tool:

```
Query returned successfully: 10 rows affected, 1001 ms execution time.
```

If you run the application again, the data will be available for browsing.

3 Data Modeling

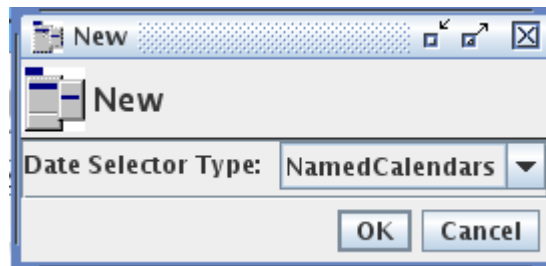
3.1 Effective Date

Effective date for objects that require one can be modeled using an absolute value entry or a named calendar.

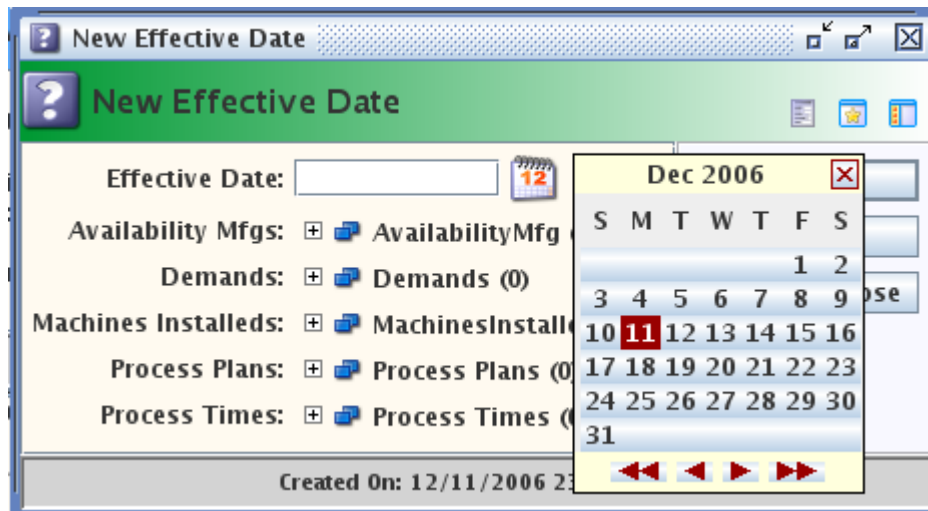
Currently, CRP Capacity supports only US date format, i.e. MM/DD/YYYY or MM/DD/YY.

3.1.1 Absolute Effective Date

When creating an effective date entry a named calendar selection is presented, where a named calendar or an effective date can be provided:

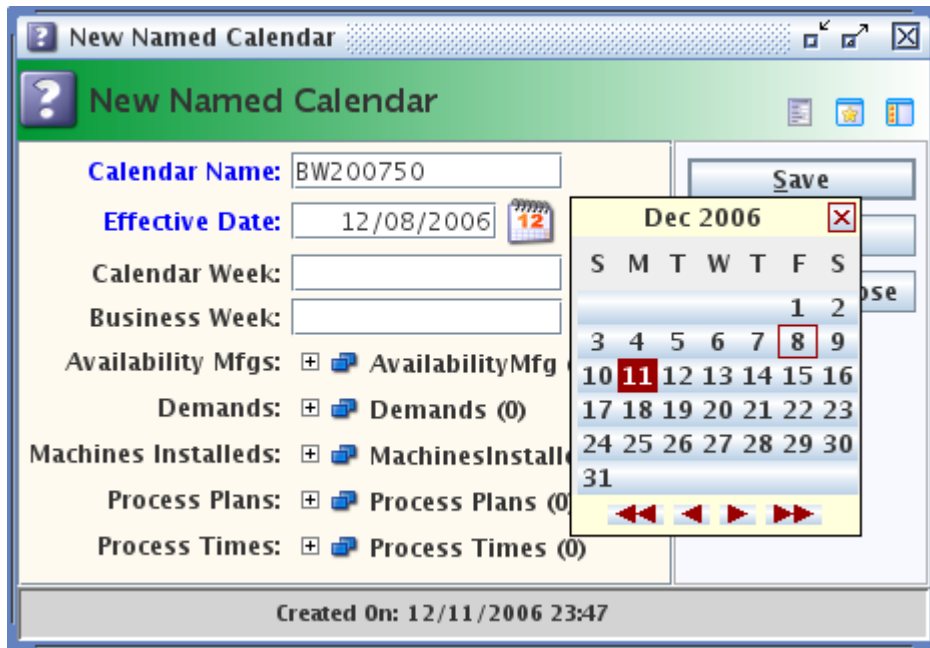


In the case of an absolute effective date entry, the new entry window presents the possibility to enter the date directly or select a date from a calendar, using the calendar icon :



3.1.2 Named Calendar

In the case of a named calendar entry, the new entry window presents the possibility to provide a calendar name and the effective date of the calendar start via a direct field entry or a calendar selection:



The named calendar entry is stored and available for reference in other objects that require an effective date information.

In addition to the possibility of reusing an effective date via a named calendar, this method offers the advantage for businesses in which the business period (week, month, quarter, or year) starts on a different day than the one defined in your region settings. By referencing named calendars, the effective date is pulled from the calendar entry instead of needing to be defined every time a new object is created.

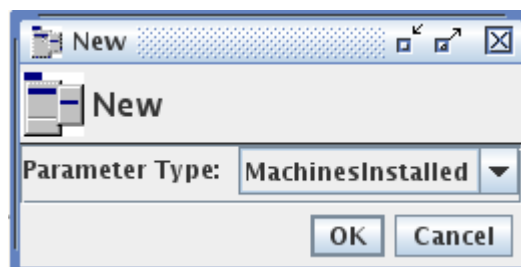
3.2 Resource Modeling

3.2.1 Resource Information

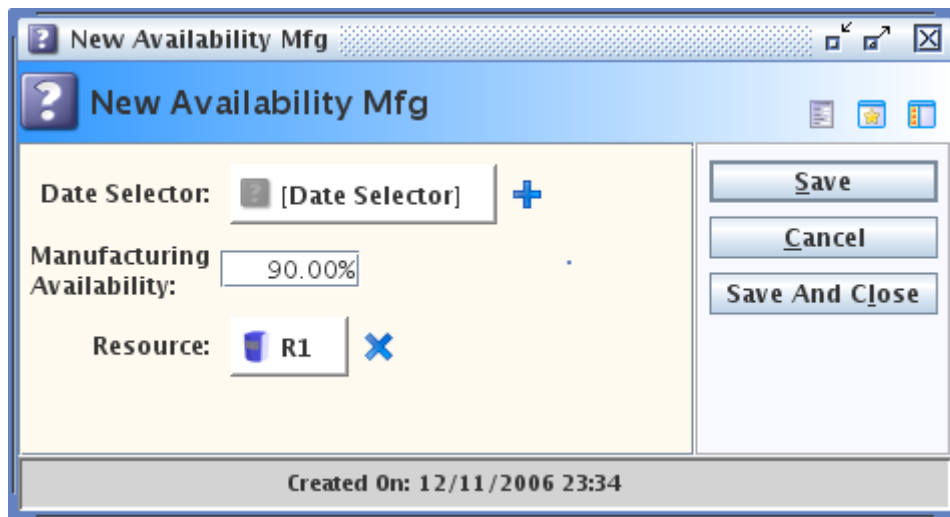
In the “Model” folder, the “Resources” class is designed to enable base resource data Modelling. Resource name is a required field. Further resource information, like work center, manufacturing level, and resource parameters can be defined in this class.

3.2.2 Resource Parameters

When adding new parameters, first a selection window is displayed that allows the creation of a new parameter:

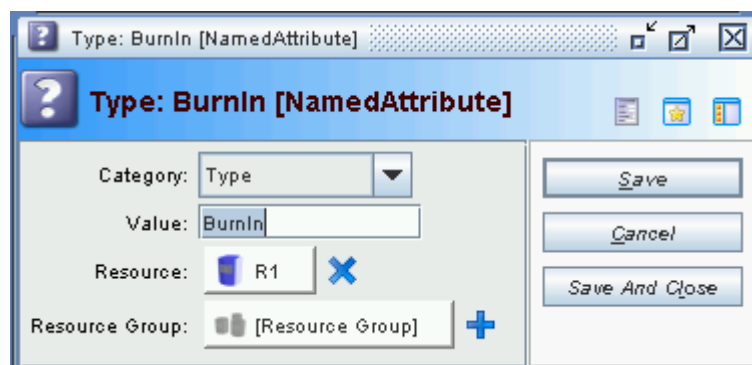


Select a new parameter and provide the required values in the parameter window.



Save and Close the parameter window.

The parameter “NamedAttribute” can be used to further group resources or resource groups according to specific features.



The attribute categories are customizable and are provided in the json file “namedattributecategories.json” in the “resource/data” directory.

3.2.3 Resource Group Priority

Resource group priority definition is done in the “ResourceGroupPriority” class.

In order to specify the resource priority, specify a priority number and assign a resource to the priority class.

3.2.4 Simultaneous Resources

Assignment of resource information is done in the “ResourceGroupPriority” class.

In order to specify a simultaneous resource, create two different resource priority entries with the same priority number. Then, assign both resource priorities to the same operation.

3.2.5 Alternative Resources

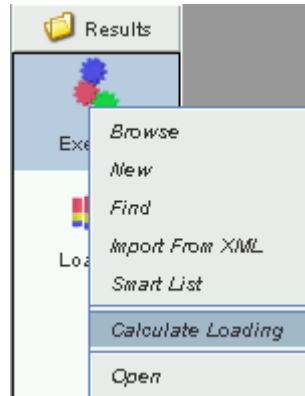
Assignment of resource information is done in the “ResourceGroupPriority” class.

In order to specify an alternative resource, create two different resource priority entries with different priority numbers. Then, assign both resource priorities to the same operation.

4 Business Logic

4.1 The Execution Component

As of the latest release, the “Execute” component offers the “Calculate Loading” command.



This command will search through all existing demands, and calculate the loading for all products on operations and resource groups related to the demand. Missing relations or process times will be ignored in the calculation.

Results of the calculation can be found in the “Loading” component..

The screenshot shows a window titled 'Loading (12)'. Inside, there's a header bar with a search filter set to 'Result_ Res Prod Op's Product'. Below this is a table with five columns: 'Loading', 'Product', 'Operation', 'Resource Group', and 'Loadpercent'. The table contains three rows of data for the product 'BUN BGA X-OVER'.

Loading	Product	Operation	Resource Group	Loadpercent
OVER [in] Solder Paste Deposition [on] StencilPrinter [=] 6.1	BUN BGA X-OVER	Solder Paste Deposition	StencilPrinter	6.10
OVER [in] Automatic Placement [on] PickAndPlaceMachine [=] ...	BUN BGA X-OVER	Automatic Placement	PickAndPlaceMachine	5.95
OVER [in] Reflow Soldering [on] InLineReflowOven [=] 5.95	BUN BGA X-OVER	Reflow Soldering	InLineReflowOven	5.95

5 Customization

5.1 Resource and Resource Group Categories

The contents of the list “resources/data/resourcenamedcategories.json” are initialized on startup in the NamedAttributeCategory class and are available for resources and resource group categorization.

5.2 Customized Product Attribute Categories

The contents of the list “resources/data/productattributecategories.json” are initialized on startup in the ProductAttributeCategory class and are available for product attributes categorization.

5.3 Customizing Default Browsing Mode

Changing the default view for lists to “tableview” is pretty easy. Look at “src/list/CriteriaListEO.java”, line 215:

```
new String[] {"listview", "listtableview", "listiconsview", "omnilistview"});
```

and “src/list/SimpleListEO.java”, line 82:

```
{"listiconsview", "listview", "listtableview", "omnilistview"});
```

The first view listed in this string array is the default used by the given type. So just swapping the order of the items listed will do the trick.

5.4 Custom Style Sheets (CSS)

Some aspects of the user interface can be customized in the file “resources/styles.css”.

5.5 Date Format Customization

The default date display format can be customized via the file “resources/model-metadata.properties”.

The following entry can be added or changed to make this change effective:

```
DateEO.format=yyyy-MM-dd
```

Any or even no format separator can be specified. The day, month, or year order is arbitrary. And the year format can be with four or two digits.

Some examples:

```
# European date format
DateEO.format=dd.MM.yyy
# American with 2 digit year
DateEO.format=MM/dd/yy
# Interational date format
DateEO.format=yyyy-MM-dd
# ISO date format
DateEO.format=yyyyMMdd
```


6 Database Maintenance

[@TODO]

6.1 Schema Upgrades

[@TODO]

6.2 Maintenance of Custom Field Display Names

Custom field names for display are maintained in the table “programminglement”.

Customized field name descriptions are maintained in the table “member”.

7 Release Notes

Version 0.07

Release date: 2007-05-18

Release Notes

- Updated to jMatter revision 545 from 2007-05-10
- Changed default browsing mode to table view
- Renamed Product class to ProductGroup
- Renamed Parameter class to ResourceParameter, AvailabilityMfg to ResourcePercentAttribute, MachinesInstalled to ResourceParameterInteger
- Linked ResourceParameter also to ResourceGroup
- Added ResourceNamedAttribute to ResourceParameter
- ResourceNamedAttribute category as AbstractChoice and customizable list in “resources/data/resourcenamedcategories.json”
- Customization of ProductAttribute with a list in “resources/data/productattributecategories.json”
- Added Yield class per operation, product group, and date
- Moved secondary relations to tabs
- Added new class Product
- Added Route class to link several process plans in sequence and to a plant
- Changed ProductGroup relation from ProcessPlan to Route
- Made Operation<>ProcessPlan relation many-to-many
- Date format customization
- Changed ProductAttribute to be a category and value
- New class ProductRelation to model relations between source and target product for product conversions like assembly, or product diversification
- Added preset, coded parameters to ResourceParameterPercent
- Added sequence of process plans in route with the “Sequence_ProcessPlan” class
- Added sequence of operations in process plan with the class “Sequence_Operation”
- Added exception class (Exception_ResPgOp) for product groups on operations and resources and included preliminary preset selection types
- Added exception for products using process plans (class “Exception_ProdProcessplan”) and included preliminary preset selection types
- Moved results classes to new package “crpresult”
- Tentatively included a basic validation component
- Created icons for: ProductGroup, Route, Exception_ProdProcessplan, Exception_ResPgOp, Sequence_ProcessPlan, Sequence_Operation, Yield, Validate, ProductRelation, EffectiveDate, DateSelector, ResourceParameterInteger, ResourceParameterPercent, ResourceNamedAttribute.

Version 0.06

Release date: 2007-05-08

Release Notes

- New folder “Results”
- Added new results class “Result_ResProdOp”
- Automated creation of class entries for relations and calculation of resource group loading per product and operation.
- Changed ProcessTime relation from Resource to ResourceGroup
- Added new package “crplogic” that holds the business logic, and algorithms
- Changed package name from “crp” to “crpmodel”
- Created a new class “Execute” to execute all calculations
- New icons for

- Plan
- Result_ResProdOp
- Execute

Version 0.05

Release date: 2007-04-16

Release Notes

- Updated to jMatter revision 508 from 2007-04-08, with
 - css support for display styles
 - improvements in windows handling
 - removed borders from splash image
- Added plan class for demands
- Joined enterprise, and manufacturing level into work center
- Related demand to work center
- Renamed resource to resource group
- Added resource class
- Renamed resource priority to resource group priority
- Added a new splash image
- Updated sample data (tools/sampleddata/*.csv)
- Updated sql statement (tools/sampleddata/import_crpdb.sql)
- Excel based sample data loader for Postgres (tools/pgloader/CRP_pgLoader.xls)
- Provided UltraViolet model (tools/ultraviolet/crp_umlc.uml)
- Provided source for splash and icon graphics (tools/graphics/)

Version 0.04

Release date: 2007-01-06

Release Notes

- Added resource priority modeling to operations
- The same allows for definition of alternative and simultaneous resources
- Data model and framework documentation part updated
- Added data modeling chapter
- Added development roadmap chapter
- Upgraded product - process plan relation to be many-to-many due to time dependent process plans
- Corrected naming of named calendars and resource priorities in class tab
- Moved resource priority to model class tab
- Temporarily moved operation and product to model class tab
- Added work center class and linked to resource
- Added enterprise class
- Added production area label to manufacturing level, and location label to plant
- Added object icons for enterprise, named calendar
- Extended title naming includes referenced class for resource, work center, manufacturing level, and enterprise
- updated to jMatter revision 307 from 2007-01-03

Version 0.03

Release date: 2006-12-06

Release Notes

- added documentation with overview, installation, and release notes
- added date selector with named calendar or absolute effective date to demands, process times, process plans, installed machines, manufacturing availability
- changed icons for demand, process plan, and plant

Version 0.02

Release date: 2006-11-26

Release Notes

- object icons for process plan, demand, operation, resource, product attribute, process time, plant
- renamed object AttributeSet to ProductAttribute
- Separated model (resources, demands, process plans) and master data (products, operations, process times, product attributes, manufacturing levels, plants) application folders
- upgraded to new jmatter svn version 171
- separation of license file in posix and windows formatted files
- changed demand type from FloatEo to LongEO
- added consolidated attribute, and manufacturing level title
- removed [Product Attribute] type and other types from title
- distribution with dist/jar and crp source
- included run.sh script; ant still required to create the db schema (schema-export)
- included jmatter build instructions
- included version history
- included basic crp installation instructions

Version 0.01

Release date: 2006-11-18

Release Notes

- New preview version
- Based on jmatter framework v. 20060825
- Basic object model included
- GNU GPL License Version 2 included
- Object icons for product and manufacturing level

8 Services

8.1 Help & Support

Help can be requested on the sourceforge.net project help forum:

http://sourceforge.net/forum/forum.php?forum_id=634486

8.2 Donations

Do you like the idea of community-developed Open Source software and want to support this type of activity for our project?

CRP – Capacity Requirement Planning, envisions a design capable of supporting the decision making process related to production resources in discrete manufacturing environments with maximum user-friendliness, portability, and flexibility. “CRP Capacity” differs from other professional solutions in its development model. “CRP Capacity” is a community enabled open source project, and will enable large number of people in implementing a solution to manage their operations better, at an affordable cost. “CRP Capacity” is now in the planning stage with preview releases available regularly.

By donating money to CRP - Capacity Requirement Planning, you help us to continue to provide a diverse service offering. Through your financial contribution, you can help offset the expense of providing services to this project (power, disk space, backup media, ISP costs), and fund our plans to expand the support to multiple hardware/software platforms and database systems. In addition, it is a strong motivation factor for continuation of the development. A log of our solution improvements is maintained on the SourceForge.net crpcapacity site and the project web site.

Donations are accepted via:

http://sourceforge.net/project/project_donations.php?group_id=182456

<http://crpcapacity.sourceforge.net/>

9 Appendix I – Development Environment

9.1 Linux

Operating System: openSUSE 10.2

Kernel: 2.6.18.2-34-default

jMatter NakedObjects framework SVN revision 545

Sun Java 2 SE 5.0 JDK 1.5.0_08

UltraViolet 0.31 (integrated in jMattter)

PostgreSQL 8.1.4

pgAdmin III 1.6.2 and phpPgAdmin 4.0.1

NetBeans IDE 5.5

9.2 Windows

Windows 2000 Version 5.00.2195 Service Pack 4

jMatter NakedObjects framework SVN revision 545

Sun Java 2 SE 5.0 JDK 1.6.0_01

UltraViolet 0.31 (integrated in jMattter)

PostgreSQL 8.2.4-1

pgAdmin III 1.6.3

NetBeans IDE 5.5

9.3 Setting up the NetBeans Environment

Select “New Project”.

Select “Java Project With Existing Ant Script”.

Select your project's base location. The build script, project name, and project folder will be filled automatically. Go Next. Leave ant targets as is.

Set your jmatter sources and project sources dirs.

In “Java Sources Classpath” include the jmatter lib directory and uncheck “Separate Classpath for Each Source Package Folder”

9.4 Setting up SVN copy

Install an svn client and follow the steps:

- Checkout a repository
- SVN URL: <https://crpcapacity.svn.sourceforge.net/svnroot/crpcapacity>
- Target directory: your local crp-svn path
- Select revision: HEAD
- Checkout

9.5 Upgrading your dependent project from previous jMatter version

Rename your project to a backup folder.

Create a new dependent project.

Edit the resources/hibernate.properties file accordingly and run ant

Copy your resources/images to new project

Copy your doc folder to new project

Copy your sources to new project

Add you classes to src/com/u2d/class-list.xml

Add you classes to src/persistClasses.st

Customize your application name in src/applicationContext.xml

run ant schema-export and ant

10 Appendix II – Related Applications

10.1 Capacity Requirement Planning

Exact Alliance

http://www.exactamerica.com/alliance/capacity_requirements_planning.html

Answer Enterprise ERP

<http://www.answersolutions.com/solutions/manufacturing/crp/>

GNUe

<http://www.gnu.org/software/gnue/project/what.html>

11 Appendix III – GNU Free Documentation License

GNU Free Documentation License

Version 1.2, November 2002

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