Business Process Management with @enterprise

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Groiss Informatics GmbH

1 Introduction

Process orientation enables modern organizations to focus on the value-adding core processes and increase efficiency, transparency, quality and flexibility of the processes. @enterprise is a software platform that supports each step of the business process management life-cycle, see Fig. 1.1.

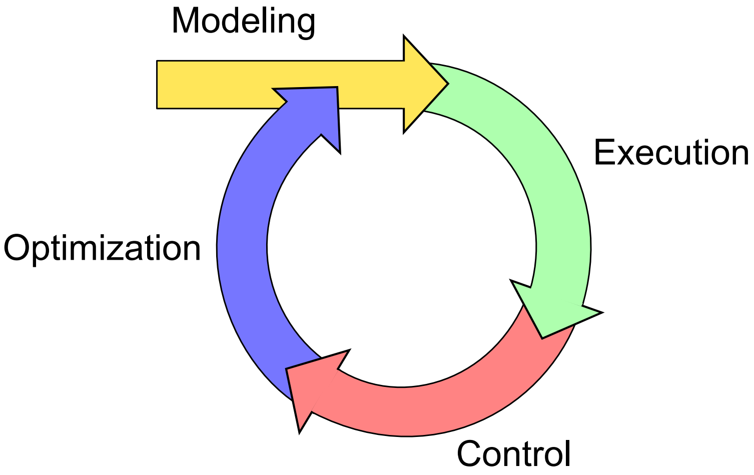


Fig. 1.1: Business process management cycle

The first activity of the cycle is the modeling of the processes, then the process definitions are executed using a workflow engine. This enables stringent monitoring and controlling of the execution with the integrated reporting component in order to gain specific insights enabling continuous process improvement and optimization according to the strategic goals of the organization.

@enterprise is independent of any application domain, customers from diverse sectors have used it for a wide variety of processes:

- ❑ Human resource processes: travel expenses, management of absences, hiring process

❑ Customer relationship management: order management

❑ Administration of educational courses

❑ Production process for books and journals

❑ IT Service Management: dealing with incident and problems and facilitating change management

❑ B2B-workflows

❑ Management of Six Sigma projects

❑ Electronic filing in government (ELAK)

Organizations using @enterprise vary from small companies with a few dozen people to multi-national enterprises with several thousand employees.

In the rest of this paper we give you a brief overview how processes can be defined, executed and analyzed with @enterprise.

2 Process Modeling

The first step to process orientation is the structural modeling of the organization, the process and the data. @enterprise provides modeling tools for each of these aspects.

2.1 Defining the organizational structure

The basic elements of modeling the organization are users and roles and the relationship between them as well as the structuring of the whole corporation as a set of related organizational units.

Organizational units

An organization is usually divided into different organizational units. Modeling this structure is necessary when defining processes that span several such units.

Typically the organizational units are organized in a hierarchical structure.

Roles

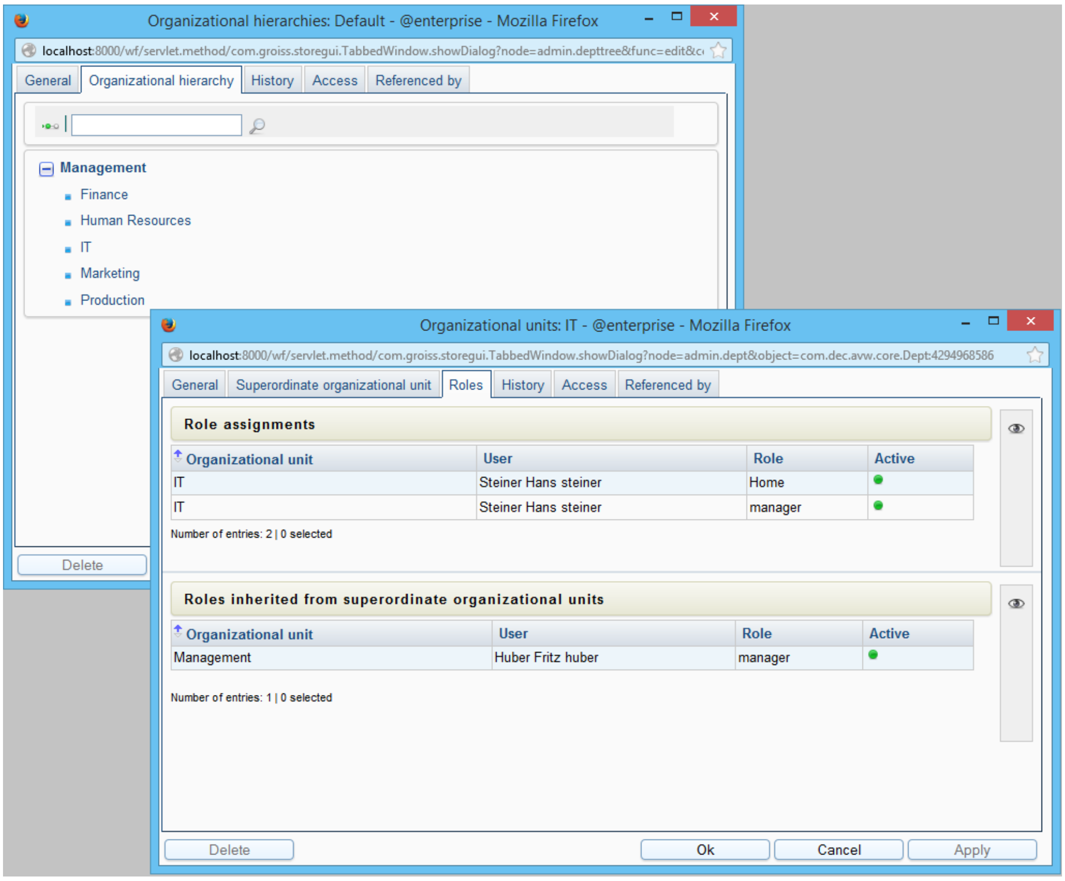
Roles define a function or ability, for example secretary, manager, or Spanish-speaking. Roles can also be used to subsume a set of rights, for example roles like "system administrator" or "department manager" permit to execute some privileged operations.

Users

All process participants are mapped to technical user objects, that contain some standard fields (name, id, password) and contact information. Each user is assigned a set of roles within a subset of the organization structure. This allows for proper automatic routing of processes to competent and entitled individuals.

Substitutions

Defining substitutions is essential to prevent delayed processes in case of absences of employees. @enterprise supports substitutions in the most flexible way: multiple substitutes can be defined; they can be restricted to a specific time span and can cover one, several or all roles of the substituted user.


Organizational hierarchies: Default - @enterprise - Mozilla Firefox
localhost:8000/wf/servlet.method/com.groiss.storegui.TabbedWindow.showDialog?node=admin.depttree&func=edit&c
General
Organizational hierarchy
History
Access
Referenced by
Delete
Organizational units: IT - @enterprise - Mozilla Firefox
localhost:8000/wf/servlet.method/com.groiss.storegui.TabbedWindow.showDialog?node=admin.dept&object=com.dec.avw.core.Dept:4294968586
General
Superordinate organizational unit
Roles
History
Access
Referenced by
Delete
Ok
Cancel
Apply

- Management
  - Finance
  - Human Resources
  - IT
  - Marketing
  - Production

Role assignments

Organizational unit	User	Role	Active
IT	Steiner Hans steiner	Home	●
IT	Steiner Hans steiner	manager	●

Number of entries: 2 | 0 selected

Roles inherited from superordinate organizational units

Organizational unit	User	Role	Active
Management	Huber Fritz huber	manager	●

Number of entries: 1 | 0 selected

Fig. 2.1: Defining the organizational structure

Permissions

The permission system of @enterprise is very sophisticated: Permissions can be assigned to individual users and to roles. Permissions can have different scopes: a single object, the objects of a specific object class, or the objects belonging to an organizational unit. Exceptions can be defined by combining positive and negative permissions: For example a user is entitled to find processes from every organizational unit apart from the accounting department.

Every aspect of the organizational model can be defined using the web-based administration, see Fig. 2.1. Moreover, users, roles, role assignments and the organizational structure can be imported from a directory service (e.g. LDAP).

2.2 Modeling the flow

The graphical process editor (see Fig. 2.2) allows the process designer to model the processes in a standard notation (BPMN) providing all the control structures needed even for the most complex processes consisting of hundreds of steps.

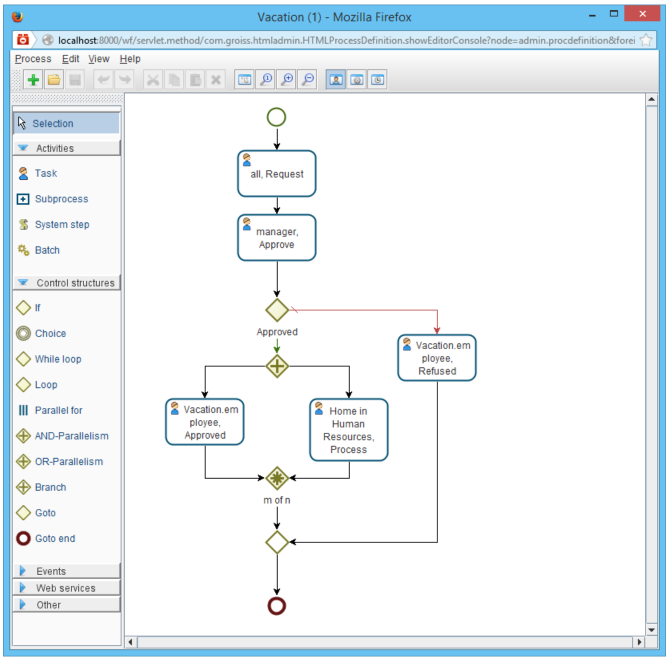

Vacation (1) - Mozilla Firefox
localhost:8000/wf/servlet.method/com.groiss.htmladmin.HTMLProcessDefinition.showEditorConsole?node=admin.procdefinition&forei
Process
Edit
View
Help
Selection
Activities
Task
Subprocess
System step
Batch
Control structures
If
Choice
While loop
Loop
Parallel for
AND-Parallelism
OR-Parallelism
Branch
Goto
Goto end
Events
Web services
Other
all, Request
manager, Approve
Approved
Vacation.employee, Refused
Vacation.employee, Approved
Home in Human Resources, Process
m of n

Fig. 2.2: @enteprise Process Editor

The atomic elements of a process definition are:

- ❑ Tasks: interactive steps executed by a person
- ❑ System steps: performed by a script or program or system
- ❑ Subprocesses: calls of other processes
- ❑ Web-service calls

For each task a post-condition, a compensation procedure and several escalation actions can be defined. Each interactive task is assigned to agents via roles or combinations of roles and departments and can flexibly take place at run time based on current process data.

The control structures include everything that is needed for defining algorithms:

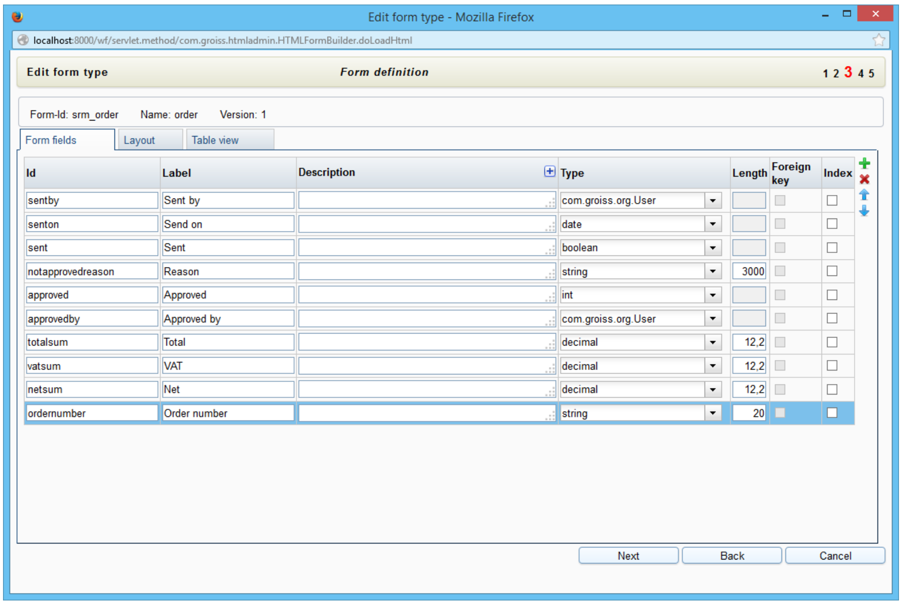
- Sequence
- Branching: if then else, case, choice
- Loops: while, repeat until, loop
- Parallelism: parallel execution of process branches
- Parallel for: parallelism where the number of branches is determined at run-time
- Events and event synchronization

While the modeling on a high level can be done virtually without writing any code, @enterprise provides a full fledged API which allows for every kind of customization and adaptability at a detail level.

Process models and tasks are can be versioned, taking into account the need of process evolution.

2.3 Modeling the data

A forms designer can be used to define the data structures and data entry masks for the process data. The wizard guides you through several steps to define the database structure and the form layout, see Fig. 2.3.



Edit form type - Mozilla Firefox
localhost:8000/wf/servlet.method/com.groiss.htmladmin.HTMLFormBuilder.doLoadHtml
Edit form type
Form definition
1 2 3 4 5

Form-Id: srm_order Name: order Version: 1

Form fields
Layout
Table view

Id	Label	Description	Type	Length	Foreign key	Index
sentby	Sent by		com.groiss.org.User		□	□
senton	Send on		date		□	□
sent	Sent		boolean		□	□
notapprovedreason	Reason		string	3000	□	□
approved	Approved		int		□	□
approvedby	Approved by		com.groiss.org.User		□	□
totalsum	Total		decimal	12,2	□	□
vatsum	VAT		decimal	12,2	□	□
netsum	Net		decimal	12,2	□	□
ordernumber	Order number		string	20	□	□

Fig. 2.3: @enteprise Form Wizard

The layout definition uses the XForms standard from the W3C Consortium. Relations between forms, for example master-detail relations, can be defined, so that arbitrary complex data schemas can be modeled using @enterprise - without writing a single line of code.

3 Process Execution

Once the processes are modeled they can be executed using the @enterprise workflow engine. Different clients, Web-client, Java-client, and mobile client can be used for executing the tasks. More than ten years of continued development resulted in powerful end-user clients that fit for the requirements of the most diverse applications.

3.1 The user interface

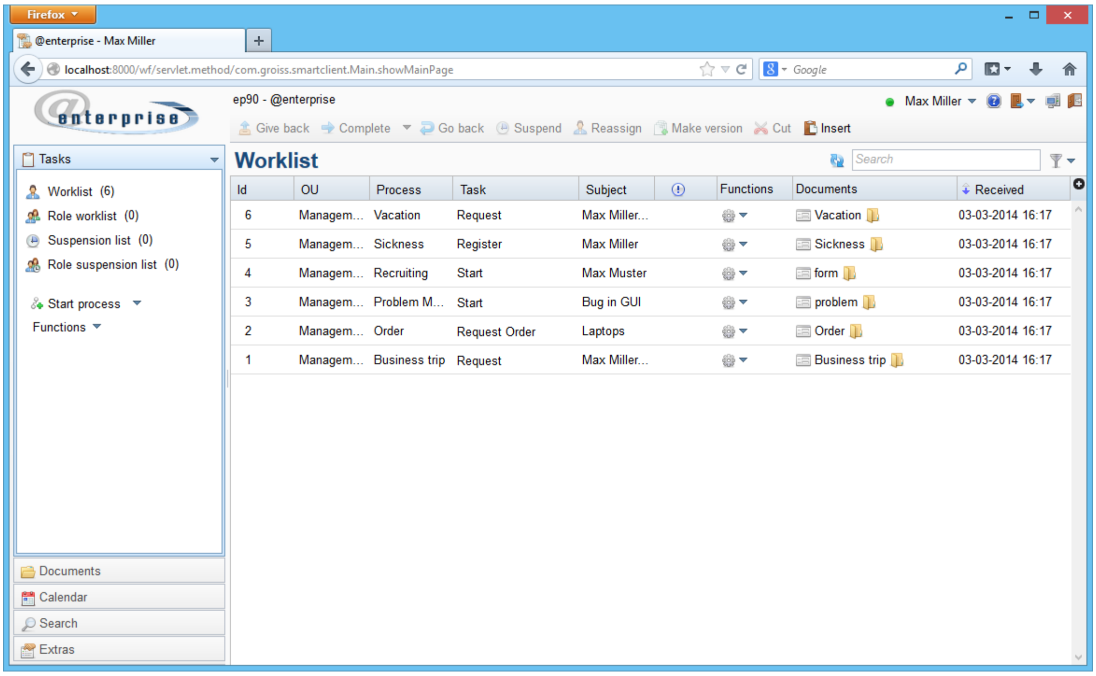
In the workflow client, user see the tasks assigned to them and can modify the workflow data and execute specific workflow functions. Fig. 3.1 shows a screenshot of the Web-client of @enterprise.

The main elements of the navigation panel on the left are:

- Worklists showing the work items assigned to a user herself or to a role assigned to her
- List of startable processes: for creating new process instances
- Application specific functions
- Searchs and reports
- Folders of the integrated document management subsystem
- Calendar
- Settings, Dashboard, and functions for browsing the organization

The main functions accessible from the worklist are:

- Finish: sending the work item to the next step according to the process definition
- Finish and select: as above but additionally select the next agent



Id	OU	Process	Task	Subject	!	Functions	Documents	Received
6	Managem...	Vacation	Request	Max Miller...			Vacation	03-03-2014 16:17
5	Managem...	Sickness	Register	Max Miller			Sickness	03-03-2014 16:17
4	Managem...	Recruiting	Start	Max Muster			form	03-03-2014 16:17
3	Managem...	Problem M...	Start	Bug in GUI			problem	03-03-2014 16:17
2	Managem...	Order	Request Order	Laptops			Order	03-03-2014 16:17
1	Managem...	Business trip	Request	Max Miller...			Business trip	03-03-2014 16:17

Fig. 3.1: @enterprise worklist client

- ❑ Go back: send the process back to a previous step
- ❑ Change agent: select another person and send the work item to her (delegation)
- ❑ Send copy to: send a copy of the work item to another person (information)
- ❑ Give back: If the work item has been addressed to a role (a group of users) and has been taken by a user it can be given back to the role.
- ❑ Suspend: put the work item into the suspension list, it will reappear at the given date.
- ❑ Abort: terminate the process at the current step - a function only accessible to administrators

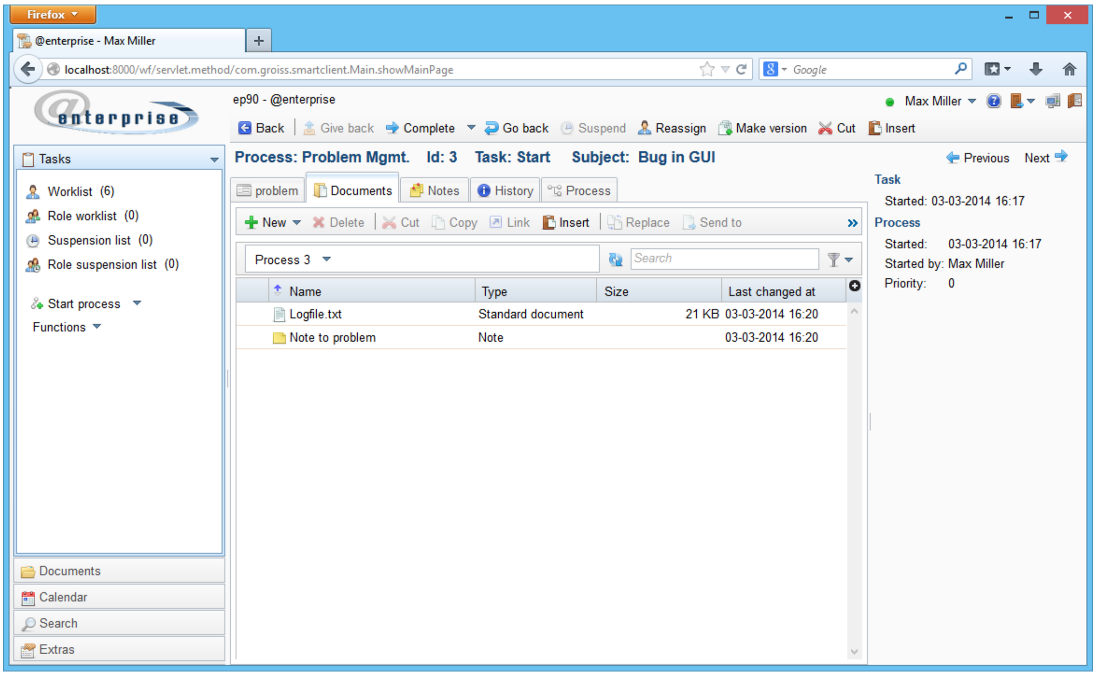
Every action performed in the workflow client is completely documented in the process history. The powerful process search may be used to find process instances and inspect and trace the execution of the individual process steps including the data changes at the level of individual data fields.

The main idea of workflow is to execute processes according in a controlled manner to their definition. But an important feature is also to provide enough run-time flexibility to properly deal with exceptional situations unforeseen at the time of process definition. Some of the above mentioned functions (go back, send copy, give back) provide this flexibility. In @enterprise it is even possible to define ad-hoc processes at run-time and to make ad-hoc modifications (mainly inserting additional steps) to running processes. All those functions are still fully traceable via inspection of the process history.

Apart from these functions the main use of the client is for modifying the process data:

- ❑ Edit forms
- ❑ Manipulate process documents
- ❑ Attach notes
- ❑ Change process metadata like due-date or priority

The document management component is an important part of the system, providing all the necessary document handling functions like versioning, signing, attaching notes and tagging, see Fig. 3.2.



Process: Problem Mgmt. Id: 3 Task: Start Subject: Bug in GUI

Name	Type	Size	Last changed at
Logfile.txt	Standard document	21 KB	03-03-2014 16:20
Note to problem	Note		03-03-2014 16:20

Task
Started: 03-03-2014 16:17
Process
Started: 03-03-2014 16:17
Started by: Max Miller
Priority: 0

Fig. 3.2: Document Management

The process instance acts as a folder in which the process related documents can reside. Documents can also be arranged in a process independent hierarchy to store long term information or master data.

Permissions can be attached to all those documents, to restrict which documents can be viewed or edited by whom.

Document type specific metadata can be defined: For example an invoice may have a recipient, a sender, a receiving date, etc. Full-text search and search in metadata fields eases finding documents and the processes they belong to.

3.2 @enterprise architecture

Fig. 3.3 shows an overview of the architecture of @enterprise.

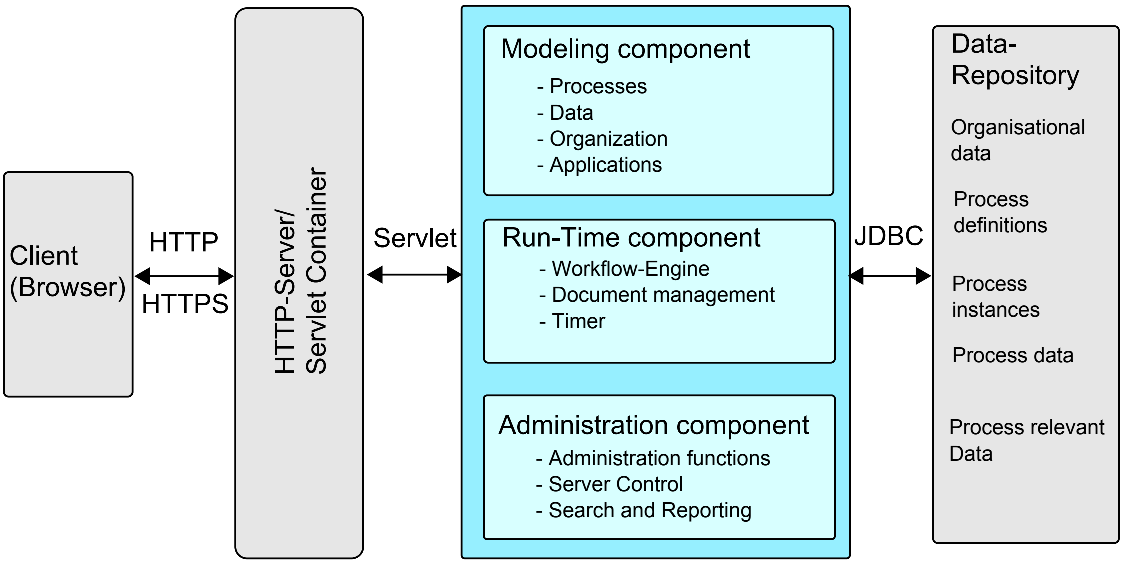


Fig. 3.3: System architecture

From left to right, the system consist of the following components: As client a Web-browser is used, all current browsers are supported (Internet Explorer, Firefox, Chrome, Safari).

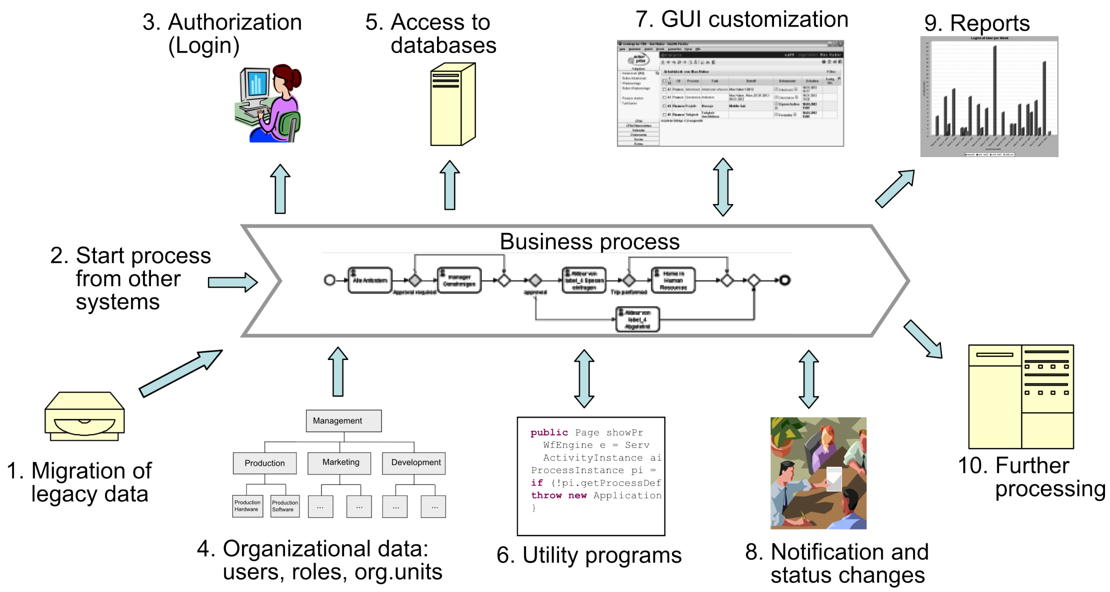
The browser connects to the @enterprise web-server using HTTP for plain or HTTPS for secure communication. The Web-Server can be the built-in web-server or a JEE Application Server like Oracle Application Server or IBM's Websphere. In the latter case, @enterprise itself runs as web-application inside the application server. The main components are the modeling component, the run-time component and the administration component.

For storing persistent data a relational database is accessed via the JDBC (Java Database Connection) interface. We support several database management systems: Oracle, Microsoft SQL*Server, DB2, Postgres, Derby.

A clustered architecture provides increased availability and excellent scalability, where a load balancer routes the browser requests to the server node with the minimal load. The cluster nodes exchange data for cache coherence using fast communication techniques based on reliable multicast protocols. As database, a cluster capable product like Oracle Real Application Cluster can be used.

3.3 Application Integration

Application integration is an important issue in business process management. Fig. 3.4 shows the different integration tasks.



```
public Page showPr
  WfEngine e = Serv
  ActivityInstance ai
ProcessInstance pi =
if (!pi.getProcessDef
throw new Application
}
```

Fig. 3.4: System Integration

@enterprise provides functions, interfaces and APIs to make these integrations as seamless and easy as possible.

1. Legacy data can be imported using an XML or CSV based import utility.

2. Process starts can be initiated via Email reception or Web-Service invocation.

3. The method of authorization can be configured, several implementations exist, including single-sign-on for Windows.

4. Organizational data can be exchanged with LDAP and Active Directory services.
5. Accessing other databases for getting and updating information can be done with Web-Services or using the Java API.
6. Execute utility programs: For setting default values, checking conditions or making some computations during process execution it may by necessary to write small utility functions. In @enterprise Java or Groovy (a script language for rapid prototyping) can be used.
7. @enterprise contains a wizard for customizing the user interface. For each workflow participant the set of functions she needs can be arranged. The appropriate configuration is selected based on the roles assigned to the user.
8. Notification: Inform users that a new work item has arrived. Such notifications can be sent via Email.
9. Creating reports: See section 4.1 for details.
10. Processing the results in another system. Again Web-Services or the API can be used to perform this task.

Reliance on approved and established standards (Web-Services, HTTP, RMI, JEE, LDAP, XML) is a design principle of @enterprise, this eases the task of application integration.

3.4 @enterprise in the cloud

Cloud computing is one of the main trends in current IT as it can reduce IT costs and increase flexibility. @enterprise is well-suited for use in a cloud environment, because it is completely Web-based. Every end-user interaction and almost all administrative tasks can be done via a Web browser.

4 Monitoring and Control

One of the main goals of process management is the complete traceability of the process executions: When has any action in the system taken place, by whom has it been executed and what changes to data have been made.

In @enterprise each of the aspects is fully logged and traceable. Process and document search functions can be used to find processes, see their current state and their progress so far. Using the recorded time stamps further analyses can be done: like comparing target times to real times, to show deadline violations, etc.

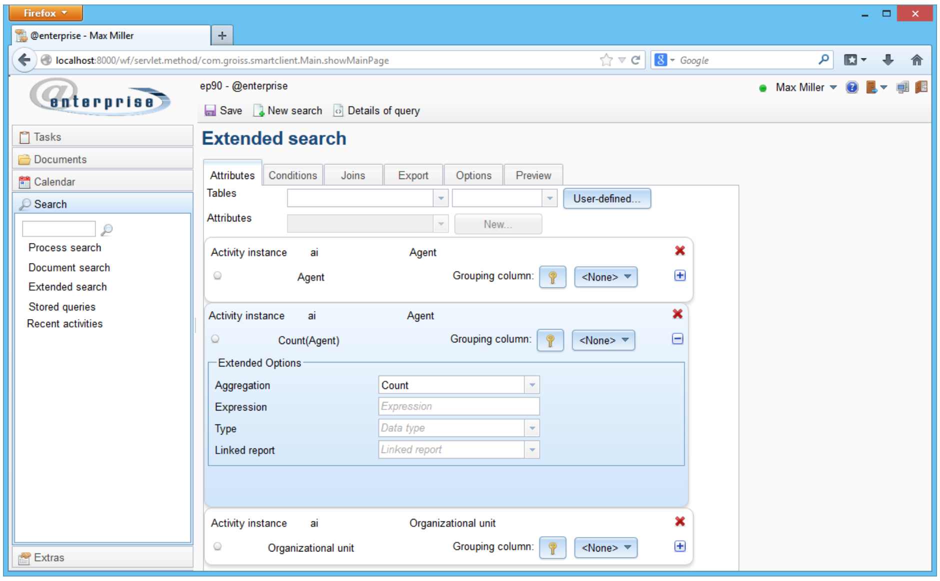
4.1 Reporting

The integrated reporting component can be used to build reports in a wizard like interface, see Fig 4.1.

Reports definitions can be saved and made accessible to a set of users - based on their roles and permissions. The reports can show the data in different formats:

- ❑ HTML table
- ❑ PDF
- ❑ MS Excel
- ❑ various chart formats

Moreover, grouping of reports in the form of specific dashboards (see Fig. 4.2) provides instant and current insight of key indicators.



ep90 - @enterprise

Extended search

- Process search
- Document search
- Extended search
- Stored queries
- Recent activities

Tables

Attributes

Activity instance | ai | Agent
○ Agent | Grouping column: <None>

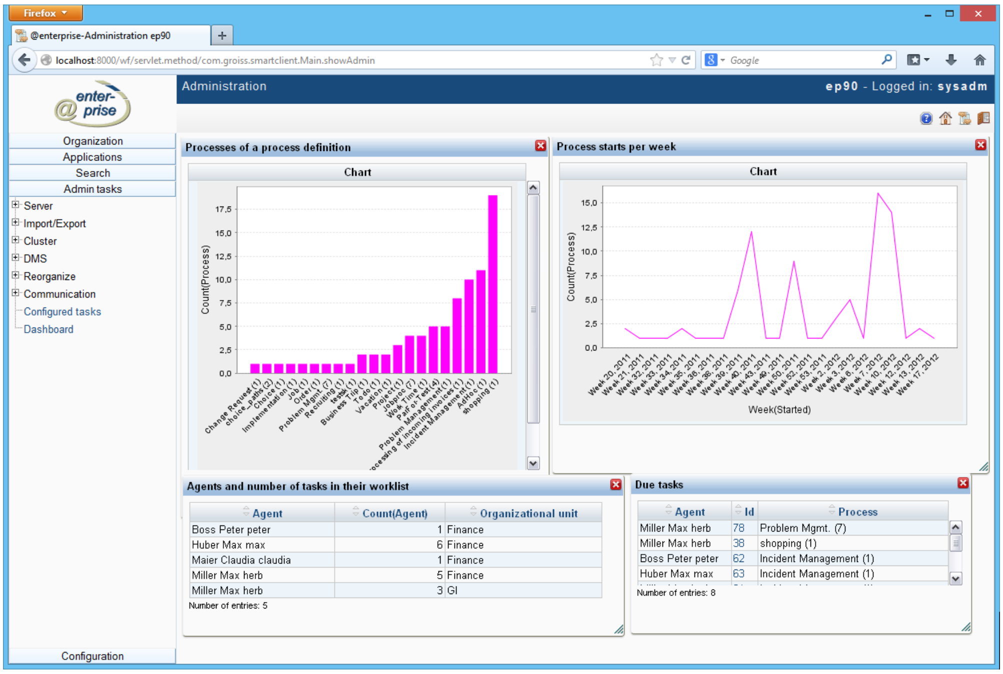
Activity instance | ai | Agent
○ Count(Agent) | Grouping column: <None>

Extended Options

Aggregation	Count
Expression	Expression
Type	Data type
Linked report	Linked report

Activity instance | ai | Organizational unit
○ Organizational unit | Grouping column: <None>

Fig. 4.1: Reporting



Administration | ep90 - Logged in: sysadm

Processes of a process definition

Process starts per week

Agents and number of tasks in their worklist

Agent	Count(Agent)	Organizational unit
Boss Peter peter	1	Finance
Huber Max max	6	Finance
Maier Claudia claudia	1	Finance
Miller Max herb	5	Finance
Miller Max herb	3	GI

Number of entries: 5

Due tasks

Agent	Id	Process
Miller Max herb	78	Problem Mgmt. (7)
Miller Max herb	38	shopping (1)
Boss Peter peter	62	Incident Management (1)
Huber Max max	63	Incident Management (1)

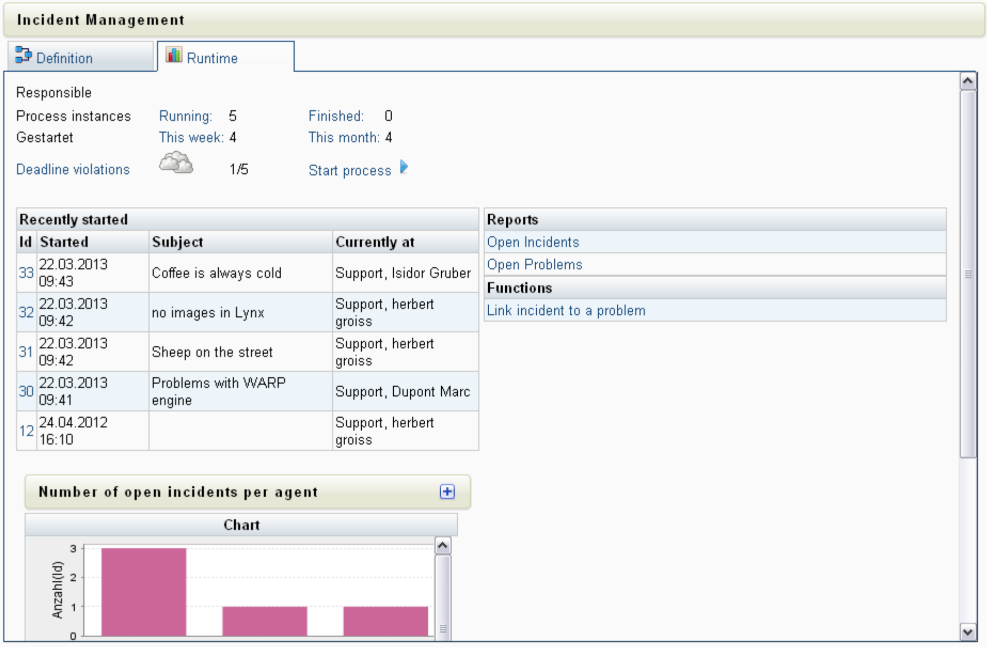
Number of entries: 8

Fig. 4.2: Dashboard

4.2 Process-Cockpit

The combination of the process definitions and the information about process executions can be combined in the so-called Process Cockpit.

This feature gives the management an overview on what's going on to an extend unknown before: Drill-down real-time information from a bird-eye view to the most detailed information about each single process instance.



Incident Management

Definition | Runtime

Responsible

Process instances Running: 5 Finished: 0

Gestartet This week: 4 This month: 4

Deadline violations 1/5 Start process

Recently started			
Id	**Started**	**Subject**	**Currently at**
33	22.03.2013 09:43	Coffee is always cold	Support, Isidor Gruber
32	22.03.2013 09:42	no images in Lynx	Support, herbert groiss
31	22.03.2013 09:42	Sheep on the street	Support, herbert groiss
30	22.03.2013 09:41	Problems with WARP engine	Support, Dupont Marc
12	24.04.2012 16:10		Support, herbert groiss

Reports

- Open Incidents
- Open Problems

Functions

- Link incident to a problem

Number of open incidents per agent

Chart

Fig. 4.3: Process Cockpit

5 Conclusions

@enterprise is a state-of-the-art business process management system supporting the whole business process management lifecyle. The key features are:

❑ modeling every aspect of business processes: the organization, the process flow, and the data structures,

❑ it is platform independent on the server, running on a wide range of server platforms,

❑ platform independent on the client by supporting the main browsers without the need for additional software or plugins on the client,

❑ it supports multiple languages, timezones and other localization aspects (date and number format, character sets, etc.),

❑ easy and fully featured web-based administration,

❑ proved, matured and seasoned through deployment in the context of a lot of projects over more than a decade on the market.