Federated Information Management for virtual enterprises
Garita Rodriguez, C.O.

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Appendix B

Comparison of VE Information Management Infrastructures

The tables included in this appendix represent a classification and characterization of several VE projects based on the criteria defined in Chapter 2. Thus, the tables included in this appendix depict the main features and capabilities that are commonly provided by VE information management infrastructures. Conversely, these tables also identify certain features that are not supported by most of the analyzed systems.
<table>
<thead>
<tr>
<th>General information</th>
<th>EisNet</th>
<th>GEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>TRW (US company)</td>
<td>GEN European Organization</td>
</tr>
<tr>
<td>Sector</td>
<td>Intra/Internet Business Information Integration</td>
<td>Engineering Enterprises</td>
</tr>
<tr>
<td>Platform</td>
<td>Server on Sun/Solaris</td>
<td>Multiplatform (Java/CORBA-based)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data Management Framework for Information Sharing/Exchange</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Models</td>
<td>Proprietary organization (hierarchy) and model of data sources</td>
</tr>
<tr>
<td>Internal DBMS</td>
<td>InfoWeb (Illustra and Oracle also used under InfoWeb)</td>
</tr>
<tr>
<td>DB access method</td>
<td>Client interfaces provide DB access through HTML, CGI, and Java; InfoWeb also supports ODBC and other data access services</td>
</tr>
<tr>
<td>High level functions</td>
<td>High-level functions for meta-data generation are provided (e.g. filters, classifiers and feature extractors)</td>
</tr>
<tr>
<td>Transactions Mgmt.</td>
<td>No information available</td>
</tr>
<tr>
<td>Middleware</td>
<td>InfoWeb middleware layer considers CORBA, HTTP, ODBC and others</td>
</tr>
<tr>
<td>External Systems Integration</td>
<td>InfoWeb object server supports integration of legacy databases through C++ class definition of logical DBs</td>
</tr>
<tr>
<td>VE Information Access rights</td>
<td>Accounts/passwords are issued for access to local DBs; additional layer of password protection was used for corporate DB access</td>
</tr>
<tr>
<td>Federated / distributed DB architecture</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific VE management functionalities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VE creation</td>
<td>No information available</td>
</tr>
<tr>
<td>VE operation</td>
<td>No information available (data can be dynamically queried and retrieved, but there is no description of special VE operation support)</td>
</tr>
<tr>
<td>VE dissolution</td>
<td>No information available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Directory Mgmt.</td>
<td>No information available</td>
</tr>
<tr>
<td>Workflow Mgmt.</td>
<td>None</td>
</tr>
<tr>
<td>Safe Comm. Techniques</td>
<td>Web server firewall (other aspects such as encryption or secured sockets were not required for prototype)</td>
</tr>
<tr>
<td>Internet Data Access</td>
<td>Netscape browser/client interfaces using HTML, CGI, Java applets</td>
</tr>
<tr>
<td>Main special features</td>
<td>InfoWeb provides some meta-data generation services</td>
</tr>
</tbody>
</table>

Table B.1: Evaluation of Internet-based infrastructures for VE information management.
### General information

<table>
<thead>
<tr>
<th>Organization</th>
<th>NIII P</th>
<th>VEGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector</td>
<td>Industrial enterprises</td>
<td>Large Scale Engineering</td>
</tr>
<tr>
<td>Platform</td>
<td>Multiplatform (CORBA-based)</td>
<td>Multi-platform (CORBA-based)</td>
</tr>
</tbody>
</table>

### Data Management Framework for Information Sharing/Exchange

<table>
<thead>
<tr>
<th>Data Models</th>
<th>NIII P</th>
<th>VEGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal DBMS</td>
<td>Implementations of the architecture can use different DBMSs</td>
<td>No information available</td>
</tr>
<tr>
<td>DB access method</td>
<td>Several components provide different DB access methods including JDBC, ODBC, ODMG, and SDAI</td>
<td>COAST-based</td>
</tr>
<tr>
<td>High level functions</td>
<td>High-level application services are defined for most NIII P components</td>
<td>COAST layer defines high-level data functionalities</td>
</tr>
<tr>
<td>Transactions Mgmt.</td>
<td>Object services also include transaction mgmt. services among others</td>
<td>Explicit distributed transactions functions are supported</td>
</tr>
</tbody>
</table>

### Middleware

<table>
<thead>
<tr>
<th>NIII P</th>
<th>VEGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Systems Integration</td>
<td>Application services tier integrates legacy systems; based on CORBA and standardized object services</td>
</tr>
<tr>
<td>VE Information Access rights</td>
<td>User account/passwords; some parts of enterprise workflows can be hidden</td>
</tr>
<tr>
<td>Federated / distributed DB architecture</td>
<td>None</td>
</tr>
</tbody>
</table>

### Specific VE management functionalities

<table>
<thead>
<tr>
<th>NIII P</th>
<th>VEGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>VE creation</td>
<td>VE installation and setup services are defined</td>
</tr>
<tr>
<td>VE operation</td>
<td>Protocols are defined for VE lifecycle and monitoring among others</td>
</tr>
<tr>
<td>VE dissolution</td>
<td>No information available</td>
</tr>
</tbody>
</table>

### Other characteristics

<table>
<thead>
<tr>
<th>NIII P</th>
<th>VEGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directory Mgmt.</td>
<td>NIII P data directory; VE Registry is a meta-directory of VE resource servers</td>
</tr>
<tr>
<td>Workflow Mgmt.</td>
<td>WfMC models used for VE task management</td>
</tr>
<tr>
<td>Safe Comm. Techniques</td>
<td>On-going work implementing advanced security mechanisms at different levels (e.g., IP, OMG, NIII P)</td>
</tr>
<tr>
<td>Internet Data Access</td>
<td>Internet services include WWW access, client user interfaces, public forums, mailing lists, etc.</td>
</tr>
<tr>
<td>Main special features</td>
<td>One of the most representative VE initiatives; advanced run-time schema mediation approach</td>
</tr>
</tbody>
</table>

Table B.2: Evaluation of Object-based infrastructures for VE information management.
<table>
<thead>
<tr>
<th>General Information</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>European ESPRIT project</td>
<td>European ESPRIT project</td>
</tr>
<tr>
<td>Sector</td>
<td>Microelectronics Industry</td>
<td>Cooperative engineering</td>
</tr>
<tr>
<td>Platform</td>
<td>Windows NT</td>
<td>Unix / Windows NT</td>
</tr>
</tbody>
</table>

### Data Management Framework for Information Sharing/Exchange

<table>
<thead>
<tr>
<th>Data Models</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>An Object Model describes the distributed enterprise and its components</td>
<td>Object model (e.g. C++ class instances) and documents (text files)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal DBMS</th>
<th>Oracle</th>
<th>None (a local file server is used for data storage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB access method</td>
<td>Through CORBA-based data management services</td>
<td>API provides specific functions for mgmt. of shared-memory objects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High level functions</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Internal object servers provide different interfaces (static/action/notification views) with higher-level functions for other X-CITTIC components</td>
<td>No information available; mostly low-level access primitives are described</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transactions Mgmt.</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No information available</td>
<td>Support for optimistic and pessimistic transaction models, and explicit data locking</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Middleware</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>CORBA for integration and inter-component communications</td>
<td>None; based on TCP/IP comm. approach (approaches such as CORBA, DCOM, RMI were avoided for the sake of high performance)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Systems Integration</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>The info. mgmt. module makes connection to local relational DBs of external systems; Interfaces for external systems such as ERP and MES have been implemented</td>
<td>External applications use an API that connects with PerDis User-Level Library (PULL)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VE Information Access rights</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No information available</td>
<td>Groupware-oriented access rights approach based on task/role model; access rights can be assigned at the level of clusters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Federated / distributed DB architecture</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

### Specific VE management functionalities

<table>
<thead>
<tr>
<th>VE creation</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No information available</td>
<td>No information available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VE operation</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No information available</td>
<td>No information available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VE dissolution</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No information available</td>
<td>No information available</td>
</tr>
</tbody>
</table>

### Other characteristics

<table>
<thead>
<tr>
<th>Directory Mgmt.</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No information available</td>
<td>No information available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workflow Mgmt.</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Safe Comm. Techniques</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No information available</td>
<td>Public key schemes for signed data access requests; shared keys for encryption, and combination of the two for message authentication</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internet Data Access</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>None (addressed as further developments)</td>
<td>Programmers use URLs to refer to object clusters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Main special features</th>
<th>X-CITTIC</th>
<th>PerDis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Special support for production planning in a distributed manufacturing environment</td>
<td>Based on efficient, persistent, distributed shared-memory approach</td>
</tr>
</tbody>
</table>

Table B.3: Evaluation of Object-based infrastructures for VE information management (cont.).
<table>
<thead>
<tr>
<th>General Info.</th>
<th>PRODNET II</th>
<th>MASSYVE</th>
<th>FETISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>European ESPRIT</td>
<td>European KIT/INCO</td>
<td>European 5FP-IST</td>
</tr>
<tr>
<td>Sector</td>
<td>Industrial Manufacturing</td>
<td>Manufacturing Scheduling</td>
<td>Tourism Services</td>
</tr>
<tr>
<td>Platform</td>
<td>Windows NT</td>
<td>Windows NT</td>
<td>Multi-platform (Java)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data Management Framework for Information Sharing/Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Models</strong></td>
</tr>
<tr>
<td><strong>Internal DBMS</strong></td>
</tr>
<tr>
<td><strong>DB access method</strong></td>
</tr>
<tr>
<td><strong>High level functions</strong></td>
</tr>
<tr>
<td><strong>Transactions Mgmt.</strong></td>
</tr>
<tr>
<td><strong>Middleware</strong></td>
</tr>
<tr>
<td><strong>External Systems Integration</strong></td>
</tr>
<tr>
<td><strong>VE Information Access rights</strong></td>
</tr>
<tr>
<td><strong>Federated / distributed DB architecture</strong></td>
</tr>
</tbody>
</table>

**Specific VE management functionalities**

| **VE creation** | Specific high-level functions for loading and instantiation of VE topology, partner profile, and supervision clauses info. | Data about new VEs can be dynamically loaded | VE enterprises can also be instantiated through specific information management functionalities |
| **VE operation** | Specific support for VE operation based on VE topology (use of VE ids and VE member ids as parameters) | Specific functions for VE scheduling are supported based on the VE topology | VE operation support functions include retrieval of service proxies available in a given VE |
| **VE dissolution** | No | No | No |

**Other characteristics**

| Directory Mgmt. | No | No | Catalogues for services interface definitions |
| Workflow Mgmt. | Federated query processing and info. pulling mechanisms are modeled as workflow plans | Workflows are used to retrieve info. from existing manufacturing and scheduling systems | Value-added services are seen as workflow plans for which info. mgmt. functions are provided |
| Safe Comm. Technologies | Sophisticated encryption, digital signature, multi-comm. protocols support (via PCI) | Encryption, digital signature, and several communication protocols can be supported | Not defined yet |
| Internet Data Access | No (future extensions) | No | Java, Jini, and XML technologies are used |
| Main special features | Use of a VE-tailored federated DB approach | Based on multi-agent architecture | Extensive use of Java/Jini |

Table B.4: Evaluation of Federated Database infrastructures for VE information Management.
**Comparison of VE Information Management Infrastructures**

<table>
<thead>
<tr>
<th><strong>General information</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>European ESPRIT project</td>
<td>European ESPRIT project</td>
</tr>
<tr>
<td>Sector</td>
<td>Mechanical Sector</td>
<td>Food supply chain</td>
</tr>
<tr>
<td>Platform</td>
<td>Windows NT</td>
<td>Windows</td>
</tr>
</tbody>
</table>

**Data Management Framework for Information Sharing/Exchange**

<table>
<thead>
<tr>
<th><strong>Data Models</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP</td>
<td>Internal models for product, design process and enterprise competence</td>
<td>EDI and other common message formats are supported and can be flexibly configured</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Internal DBMS</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence mgmt. tool is based on Lotus Notes R5 and supports interfaces to MS SQL Server and MS Access; product manager uses ODBC</td>
<td>Microsoft Access</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DB access method</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet, ODBC (for SCM information)</td>
<td>Gathered data can be made available to the applications as a database view e.g. MS-Access record set</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>High level functions</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Several predefined search criteria can be applied supported by a search wizard</td>
<td>High-level services for specific VE functionalities including inventory stock, forecast, planning, simulation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Transactions Mgmt.</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No information available</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Middleware</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No information available (only TCP/IP and email mechanisms were mentioned)</td>
<td>Based on standards such as CORBA and DCOMM</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>External Systems Integration</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence model tool allows external software modules to index and link repository contents; Product Manager can integrate with CAD tools; users can store some query results as database files</td>
<td>LOG.Info module (composed of a set of DLLs), ensures local and remote connectivity between LOGSME modules and legacy systems</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VE Information Access rights</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No information available, although the need was identified to protect know-how information and to select public data</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Federated / distributed DB architecture</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

**Specific VE management functionalities**

<table>
<thead>
<tr>
<th><strong>VE creation</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SCM tool aims at supporting partners search as a pre-step to the VE creation</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VE operation</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No information available</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VE dissolution</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No information available</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

**Other characteristics**

<table>
<thead>
<tr>
<th><strong>Directory Mgmt.</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Competency Repository serves as a directory of potential partners</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Workflow Mgmt.</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>WFMC concepts and models were modified to be applied in the process model</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Safe Comm. Techniques</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Encryption is supported by Lotus Notes; internal data exchange based on e-mail</td>
<td>Security checks are used for data transmissions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Internet Data Access</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet clients for competence model</td>
<td>External information requests can be submitted via email or HTTP; messages among modules can be sent via FTP, HTTP, and SMTP</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Main special features</strong></th>
<th><strong>COWORK</strong></th>
<th><strong>LOGSME</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Support for competency repository and co-design activities in a distributed engineering environment</td>
<td>LOGSME tools are easy, reliable and low-cost modules for SMEs; warehousing is also considered</td>
<td></td>
</tr>
</tbody>
</table>

Table B.5: Evaluation of Message-passing infrastructures for VE information management.