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### 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.

<i>General information</i>		
Organization	EisNet TRW (US company)	GEN GEN European Organization
Sector	Intra/Internet Business Information Integration	Engineering Enterprises
Platform	Server on Sun/Solaris	Multiplatform (Java/CORBA-based)
<i>Data Management Framework for Information Sharing/Exchange</i>		
Data Models	Proprietary organization (hierarchy) and model of data sources	Standards such as IEC 61360 (for electronic components); own DTDs
Internal DBMS	InfoWeb (Illustra and Oracle also used under InfoWeb)	Any relational DBs can be used through JDBC
DB access method	Client interfaces provide DB access through HTML, CGI, and Java; InfoWeb also supports ODBC and other data access services	Via GEN Search/Acquisition/Extraction Clients (WWW interfaces and other data loading tools)
High level functions	High-level functions for meta-data generation are provided (e.g. filters, classifiers and feature extractors)	GEN clients and services (through URLs)
Transactions Mgmt.	No information available	No information available
Middleware	InfoWeb middleware layer considers CORBA, HTTP, ODBC and others	Mainly CORBA
External Systems Integration	InfoWeb object server supports integration of legacy databases through C++ class definition of logical DBs	GEN clients and services can be called from company's applications such as CAD systems; local DB information can be retrieved through CGI services
VE Information Access rights	Accounts/passwords are issued for access to local DBs; additional layer of password protection was used for corporate DB access	Based on engineer's access rights (account/password); distinction between company-private and VE-public data
Federated / distributed DB architecture	None	None
<i>Specific VE management functionalities</i>		
VE creation	No information available	Data/metadata can be registered when an enterprise joins the global VE (no information about VE topologies definitions)
VE operation	No information available (data can be dynamically queried and retrieved, but there is no description of special VE operation support)	No information available (search clients can retrieve distributed VE data but no information on specific VE-support operations is provided)
VE dissolution	No information available	No information available
<i>Other characteristics</i>		
Directory Mgmt.	No information available	No information available
Workflow Mgmt.	None	None
Safe Comm. Techniques	Web server firewall (other aspects such as encryption or secured sockets were not required for prototype)	No information available
Internet Data Access	Netscape browser/client interfaces using HTML, CGI, Java applets	GEN Client interfaces are WWW based; XML is used
Main special features	InfoWeb provides some meta-data generation services	Flexible integration of distributed information via Internet

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

<i>General information</i>	<b>NIIP</b>	<b>VEGA</b>
Organization	US industries/government	European ESPRIT project
Sector	Industrial enterprises	Large Scale Engineering
Platform	Multiplatform (CORBA-based)	Multi-platform (CORBA-based)
<i>Data Management Framework for Information Sharing/Exchange</i>		
Data Models	STEP, OMG, others	Mainly STEP data models
Internal DBMS	Implementations of the architecture can use different DBMSs	No information available
DB access method	Several components provide different DB access methods including JDBC, ODBC, ODMG, and SDAI	COAST-based
High level functions	High-level application services are defined for most NIIP components	COAST layer defines high-level data functionalities
Transactions Mgmt.	Object services also include transaction mgmt. services among others	Explicit distributed transactions functions are supported
Middleware	Mainly CORBA	CORBA
External Systems Integration	External system integration supported via wrappers according to OMG model	Application services tier integrates legacy systems; based on CORBA and standardized object services
VE Information Access rights	User ids, passwords, roles, and groups are defined for VE information access	User account/passwords; some parts of enterprise workflows can be hidden
Federated / distributed DB architecture	Some kind of federated DB support is provided for the VE Global Schema; the Mediator component specifies a kind of federated DB mapping language	None
<i>Specific VE management functionalities</i>		
VE creation	VE installation and setup services are defined	No information available
VE operation	Protocols are defined for VE lifecycle and monitoring among others	No information available
VE dissolution	No information available	No information available
<i>Other characteristics</i>		
Directory Mgmt.	NIIP data directory; VE Registry is a meta-directory of VE resource servers	No information available
Workflow Mgmt.	WfMC models used for VE task management	WfMC models for local and global VE management support
Safe Comm. Techniques	On-going work implementing advanced security mechanisms at different levels (e.g. IP, OMG, NIIP)	Mostly based on existing company firewalls
Internet Data Access	Internet services include WWW access, client user interfaces, public forums, mailing lists, etc.	A Web-based presentation layer is provided for end-users
Main special features	One of the most representative VE initiatives; advanced run-time schema mediation approach	Strongly based on IT standards (OMG, CORBA, STEP, Internet)

Table B.2: Evaluation of Object-based infrastructures for VE information management.

<i>General information</i>		
Organization	<b>X-CITTIC</b> European ESPRIT project	<b>PerDiS</b> European ESPRIT project
Sector	Microelectronics Industry	Cooperative engineering
Platform	Windows NT	Unix / Windows NT
<i>Data Management Framework for Information Sharing/Exchange</i>		
Data Models	An Object Model describes the distributed enterprise and its components	Object model (e.g. C++ class instances) and documents (text files)
Internal DBMS	Oracle	None (a local file server is used for data storage)
DB access method	Through CORBA-based data management services	API provides specific functions for mgmt. of shared-memory objects
High level functions	Internal object servers provide different interfaces (static/action/-notification views) with higher-level functions for other X-CITTIC components	No information available; mostly low-level access primitives are described
Transactions Mgmt.	No information available	Support for optimistic and pessimistic transaction models, and explicit data locking
Middleware	CORBA for integration and inter-component communications	None; based on TCP/IP comm. approach (approaches such as CORBA, DCOM, RMI were avoided for the sake of high performance)
External Systems Integration	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	External applications use an API that connects with PerDiS User-Level Library (PULL)
VE Information Access rights	No information available	Groupware-oriented access rights approach based on task/role model; access rights can be assigned at the level of clusters
Federated / distributed DB architecture	None	None
<i>Specific VE management functionalities</i>		
VE creation	No information available	No information available
VE operation	No information available	No information available
VE dissolution	No information available	No information available
<i>Other characteristics</i>		
Directory Mgmt.	No information available	No information available
Workflow Mgmt.	None	None
Safe Comm. Techniques	No information available	Public key schemes for signed data access requests; shared keys for encryption, and combination of the two for message authentication
Internet Data Access	None (addressed as further developments)	Programmers use URLs to refer to object clusters
Main special features	Special support for production planning in a distributed manufacturing environment	Based on efficient, persistent, distributed shared-memory approach

Table B.3: Evaluation of Object-based infrastructures for VE information management (cont.).

<i>General Info.</i>	<b>PRODNET II</b>	<b>MASSVE</b>	<b>FETISH</b>
Organization	European ESPRIT	European KIT/INCO	European 5FP-IST
Sector	Industrial Manufacturing	Manufacturing Scheduling	Tourism Services
Platform	Windows NT	Windows NT	Multi-platform (Java)
<i>Data Management Framework for Information Sharing/Exchange</i>			
Data Models	EDIFACT, STEP, DBP, other models	DBP, other models	DBP, several Tourism Datasets supported
Internal DBMS	Oracle 7.3	Oracle, PEER	Oracle8i
DB access method	Client library of services, ODBC	Client library	JDBC, client library
High level functions	Specific high-level functions for VE creation, monitoring and coordination support	Advanced functions for distributed info. mgmt. regarding VE manufacturing scheduling	High-level information management support functions for VE service interface catalogues
Transactions Mgmt.	Local transaction mechanisms are considered in implementation of high-level functions	Transaction mechanisms support the high-level functionalities for info. mgmt	Information management services are implemented using local transaction facilities
Middleware	RPC	RPC	Jini
External Systems Integration	Interoperable API protocol; online retrieval of external systems information; both push/pull mechanisms supported	API through which information from external systems can be dynamically submitted/extracted	Java/Jini proxies defined for federated tourism services
VE Information Access rights	Definitions of fine-grained VE access rights and visibility levels on local information	Fine-grained access rights at a given node are defined at every other VE members	Access rights on shared VE information are defined at every node of other VE members
Federated / distributed DB architecture	Federated DB architecture as the main approach for sharing and exchange of VE info.	Federated DB concepts provide the base for secured information access among VE nodes	Access to VE service interfaces is managed based on a federated database architecture
<i>Specific VE management functionalities</i>			
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
<i>Other characteristics</i>			
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. Techniques	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.

<i>General information</i>		
Organization	<b>COWORK</b>	<b>LOGSME</b>
Sector	European ESPRIT project	European ESPRIT project
Platform	Mechanical Sector	Food supply chain
	Windows NT	Windows
<i>Data Management Framework for Information Sharing/Exchange</i>		
Data Models	STEP; internal models for product, design process and enterprise competence	EDI and other common message formats are supported and can be flexibly configured
Internal DBMS	Competence mgmt. tool is based on Lotus Notes R5 and supports interfaces to MS SQL Server and MS Access; product manager uses ODBC	Microsoft Access
DB access method	Internet, ODBC (for SCM information)	Gathered data can be made available to the applications as a database view e.g. MS-Access record set
High level functions	Several predefined search criteria can be applied supported by a search wizard	High-level services for specific VE functionalities including inventory stock, forecast, planning, simulation
Transactions Mgmt.	No information available	No information available
Middleware	No information available (only TCP/IP and email mechanisms were mentioned)	Based on standards such as CORBA and DCOMM
External Systems Integration	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	LOG.Info module (composed of a set of DLLs), ensures local and remote connectivity between LOGSME modules and legacy systems
VE Information Access rights	No information available, although the need was identified to protect know-how information and to select public data	No information available
Federated / distributed DB architecture	None	None
<i>Specific VE management functionalities</i>		
VE creation	SCM tool aims at supporting partners search as a pre-step to the VE creation	No information available
VE operation	No information available	No information available
VE dissolution	No information available	No information available
<i>Other characteristics</i>		
Directory Mgmt.	Competency Repository serves as a directory of potential partners	No information available
Workflow Mgmt.	WfMC concepts and models were modified to be applied in the process model	None
Safe Comm. Techniques	Encryption is supported by Lotus Notes; internal data exchange based on e-mail	Security checks are used for data transmissions
Internet Data Access	Internet clients for competence model	External information requests can be submitted via email or HTTP; messages among modules can be sent via FTP, HTTP, and SMTP
Main special features	Support for competency repository and co-design activities in a distributed engineering environment	LOGSME tools are easy, reliable and low-cost modules for SMEs; warehousing is also considered

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