

# **INTEROPERABILITY BETWEEN AND WITHIN ENTERPRISES**

**Dr. Martin Hofmann  
Bernd Killer**

**Technology Marketing**

**September 1995**



# INTEROPERABILITY BETWEEN AND WITHIN ENTERPRISES

## Greater flexibility and independence for users

Interoperability, defined as seamless interplay between systems and applications of the same or different vendors, is integral to SAP's concepts and actions. By implementing acknowledged standards and norms for interfaces, services, and exchange formats for SAP application systems, we are making it easier for you to flexibly custom-design how your information is managed:

- Open interfaces ensure communication between SAP Systems and with solutions of other vendors.
- Standards for Electronic Data Interchange (EDI) automate exchange of data between SAP and third-party application systems.
- Application Link Enabling (ALE) enables you to loosely couple distributed applications and integrate business processes across multiple systems.
- It is simple to integrate special-purpose subsystems, like for CAD or plant data capture.
- Desktop programs can be linked, like word processors or spreadsheets, to R/3 applications as needed.
- Workflow techniques and electronic mail effectively support automation and control of cross-system work routines.

SAP is thus pursuing a pragmatic strategy geared to maximizing your benefits by enabling side-by-side use of a wide diversity of applications within an integrated environment.

## Loose coupling of distributed applications

With R/3 Release 3.0, SAP is unveiling its landmark ALE (Application Link Enabling) initiative for distributed application systems. ALE opens the way for efficient, secure communication of business information between technically independent systems. Within a coordinated architecture, ALE provides distribution models and technologies for application linking, plus tools for the design and operation of distributed applications.

Frequently requested distribution scenarios are configured as distribution models in Release 3.0, providing a proven business foundation for customized solutions. For example, ALE supports business processes for the distribution of accounting and logistics, sales/invoicing and shipping, local and central profitability analyses, and also central and local sales and operation planning (SOP).

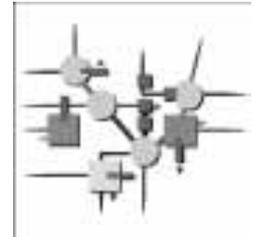
ALE couples autonomous distributed application systems via a configurable distribution model, ensuring the exchange of business information messages, updates of master data, and the coordination of control information. During both the setup and operational phases of distributed application systems, transparency and ease of handling are preserved no matter how comprehensive the scenarios. Distributable process units (inventory management, for example) guarantee data uniformity throughout distribution.

## Basis for consistent business data

SAP offers an open, standard interface for consistent access to business data stored in the R/3 System. Rule-based checks are automatically initiated for processing incoming data. They guarantee the consistency of customers core business data even in case of external updates. Intermediate documents (IDocs) are available for this in the form of data containers that can be extended as needed.

## Exchange of data automated

For cross-enterprise exchange of business data, the key technology of Electronic Data Interchange (EDI) is integrated in the R/3 System. It conveniently and powerfully supports both creation and dispatch as well as receipt and further processing of EDI messages. Workflow techniques trigger follow-up activities, and the range of possibilities extend from fully automated handling all the way to manual manipulation.



ALE technology is based on a business-event-controlled, time-driven exchange of business information messages. Synchronous and asynchronous communication mechanisms (RFCs) provide need-driven integration of applications; linking via a central database is no longer necessary.

The ALE architecture comprises not only application and communication services but also distribution services. This layer takes care of the system or release-based conversion of message contents, with the result that R/2 and external applications can also be integrated.

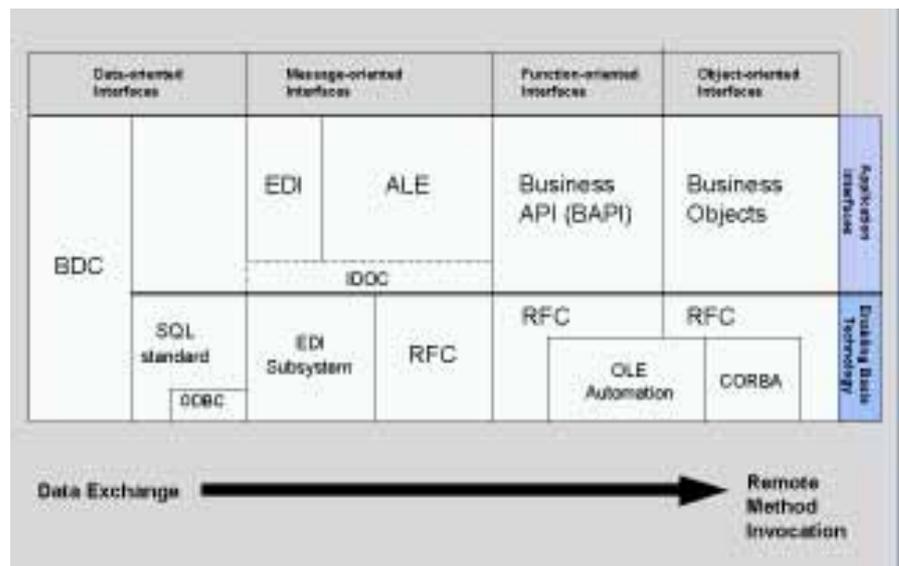


Figure 1: SAP External Interfaces

## Desktop integration

In order to protect their investments, today's modern companies need an open software landscape. Users also want their company's business software to grow together, calling for so-called "personal productivity tools" like word processors, spreadsheets, and PC databases.

Always keen to satisfy user needs, SAP has begun integrating desktop software into a number of R/3 applications. Desktop integration lets end users perform their tasks in an integrated, consistent environment.

For example, we have integrated Microsoft Excel into the XXL List Viewer for more flexible reporting. You can use Excel for costing, project planning and consolidation; Win-Word is available in the Human Resources module and for users of the ABAP/4 Development Workbench to compose online documentation; and mobile users can take

advantage of Microsoft Access to enter travel expenses. SAP-EIS integrates Word and Excel. Other desktop programs, like for applicant administration and calendar management, are also integrated by R/3.

SAP is making sure to use standards and open interfaces. Foremost among them are Object Linking and Embedding (OLE), an industry standard incorporated into Release 3.0 of the R/3 system, and Remote Function Call (RFC), SAP's open programming interface. SAP offers a Desktop Development Kit to support software developers in these areas.

Yet another exciting development is SAP's Intelligent Terminal, which will permit easy linking of supplemental software to SAP business processes via the SAP-GUI. R/3 will also harness standards like ODBC for accessing SQL data.

## Open Applications Integration

The Open Applications Group (OAG) was founded by major software vendors in February of this year with the aim of speedily defining a standard interface for linking different applications within and outside of enterprises. The specifications emerging from this group call for communication based on so-called Business Object Documents, which will enable applications from different vendors to talk to one another. The "proof of concept" event held in Cambridge, Massachusetts on September 12th has already proven the viability of this approach. The Open Applications Group is undertaking three projects to standardize integration among the member vendors' software solutions. Project A - Outside the Enterprise - will specify the integration of enterprise systems with the systems of other enterprises. Project B - Managing within the

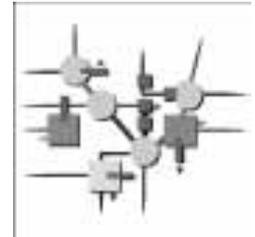


# OPENNESS AND INTER

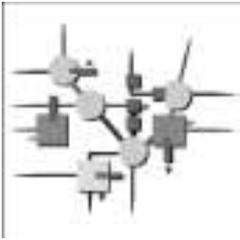
	Compatibility	Customizing	Scalability	Security	Reliability
ALE	<ul style="list-style-type: none"> <li>· SAP guaranteed</li> <li>· Adaptation between different releases</li> </ul>	<ul style="list-style-type: none"> <li>· Customer reference model for distribution</li> <li>· IDOC extensions</li> <li>· Customer exits</li> <li>· Work flow integration</li> </ul>	Data packaging in IDOCs and queuing with RFC's store and forward mechanism	See RFC	<ul style="list-style-type: none"> <li>· Guarantees consistency of application data</li> <li>· See transactional RFC</li> </ul>
EDI	Guaranteed by third-party products for conversion IDOCs into EDI messages (EDIFACT, ANSI X.12, ...)	<ul style="list-style-type: none"> <li>· IDOC extensions</li> <li>· Customer exits</li> </ul>	Result of data packaging in IDOCs and conversion to EDI messages	Responsibility of third-party products	Guarantees consistency of application data
Business Objects (OLE, CORBA)	SAP guaranteed	<ul style="list-style-type: none"> <li>· Customization of methods, attributes and events with delegation</li> <li>· Connection to ALE and workflow defined in object repository</li> <li>· Object repository integrated in R/3 development workbench</li> </ul>	Object request broker which is currently implemented in ABAP	See RFC	Guarantees consistency of application data
BAPI Function Modules	SAP guaranteed	Function module information system (R/3 ABAP/4 DW)	Useful for large data sets	See RFC	Guarantees consistency of application data
BDC	Dependent on screen definition	Creation of batch input sessions is supported by special function modules and programs	Overhead by the simulation of user interface	<ul style="list-style-type: none"> <li>· Can only be triggered by authorized R/3 user</li> <li>· User authorization checks during processing</li> </ul>	<ul style="list-style-type: none"> <li>· Guarantees consistency of application data</li> <li>· Restart possible</li> <li>· Logging of batch input process</li> </ul>
OLE Automation	Server: Based on OLE Automation and RFC API Client: Part of ABAP/4	<ul style="list-style-type: none"> <li>· OLE automation assistant for function browsing and testing</li> <li>· Easy to use OLE Automation interface on top of RFC API</li> </ul>	See RFC	See RFC	See RFC
RFC	SAP standard	<ul style="list-style-type: none"> <li>· RFC interface generator for C and Visual Basic</li> <li>· Integration in R/3 development workbench</li> </ul>	No SAP limit to open connections (configurable)	<ul style="list-style-type: none"> <li>· SAP logon required</li> <li>· Password encoding and table compression</li> </ul>	Transactional RFC: guaranteed delivery, retransmission at communication failure
DB Access	Based on standard SQL interfaces	Use of SAP's tables	Depends on data base	<ul style="list-style-type: none"> <li>· DB logon</li> <li>· No SAP authorization and consistency checks</li> </ul>	DBMS specific locking
Desktop Integration	Based on OLE Automation, RFC API and DDE  Based on external interfaces OLE, CORBA <sup>1</sup> , ...	Easy to use Desktop SDK Integration into the ABAP/4 language	Table viewing and processing components	See RFC	
Open Object Interface			Performance increase through statement caching		

<sup>1</sup> under construction

# OPERABILITY MATRIX



Integration	Communication Level in 3-tier C/S architecture	Communication Types	Communication Partners	Communication Data	External Interface
Recommended for integration, esp. for secure async. data delivery	Application level	Sync/Async (Sync.: only for RFC requests)	R/3, R/2 and external systems (sender and receiver)	IDOC	RFC API in connection with IDOC message type definition
Useful if EDI interfaces already exist in external application	Application level	Async	R/3, R/2 and external systems (sender and receiver)	EDI document	Third party products for conversion and communication
Useful for access via external object request brokers	Application level	Sync/Async	R/3 (client and server), R/2 and external systems (client)	SAP ABAP/4 Dictionary structures	· OLE and CORBA interfaces <sup>1)</sup> · Direct access via RFC
Focused on synchronous requests	Application level	Sync/Async	R/3 (client and server), R/2 and external systems (client)	SAP ABAP/4 Dictionary structures	RFC API and function module definition
· Supported by all SAP transactions · No event communication	Application level	Data access	All (writer) to R/3 (reader)	Batch input session or internal BDC table	File system → batch input sessions
See RFC	Application level	Sync	Server: External system (client) to R/3 (server), Client: R/3 (server) to external system	See RFC	OLE Automation
Access to customer defined function modules	Application level	Sync/async	R/2 and external systems (client and server)	SAP ABAP/4 Dictionary structures	RFC API
For data read access recommended only	DB level	Data access	External systems (client), R/3 data base (server)	Table contents	DB vendor provided interfaces such as an interface to ODBC
Integration with desktop applications such as WinWord and Excel.	Presentation level	Sync	R/3, external system (client and server)	Tables	OLE Automation (e.g. OCX access), WinWord, Excel
Integration of applications having a component interface	Application level	Sync for OLE Automation	R/3 to OLE Automation server application	Method parameters	OLE Automation



enterprise - focuses on integration between enterprise business applications. Project C - Executing within the enterprise - focuses on the integration of specialized applications and the enterprise business applications. SAP is actively involved in all three OAG projects.

To a particularly great extent, Application Link Enabling underlies these efforts to couple business processes across application boundaries.

SAP is currently the only software vendor that has already introduced processing of incoming and outbound Business Object Documents. After the OAG releases its definitive specifications, SAP will support them directly in the R/3 System.

## Business APIs

SAP supports many corporate routines with the aid of appropriate business objects and business function libraries. External interfaces let you link in supplemental solutions of other vendors. Such interfaces are commonly referred to as Business APIs. SAP will ensure their stability and provide unflagging support for them. The techniques on which the individual interfaces are based range from OLE Automation and Remote Function Call (RFC) to Electronic Data Interchange (EDI) and Intermediate Documents (IDocs).

Customers rightfully expect seamless interplay of business applications and their supplementary components. For their sake, SAP practices quality control by conducting a certification program for the application-specific interfaces in-

involved. The interfaces of some 50 products have already been certified for interaction with SAP R/3. This number is expected to grow rapidly as certification centers are established in the United States and Asia.

The benefits speak for themselves: you select an add-on product from the list of certified vendors and:

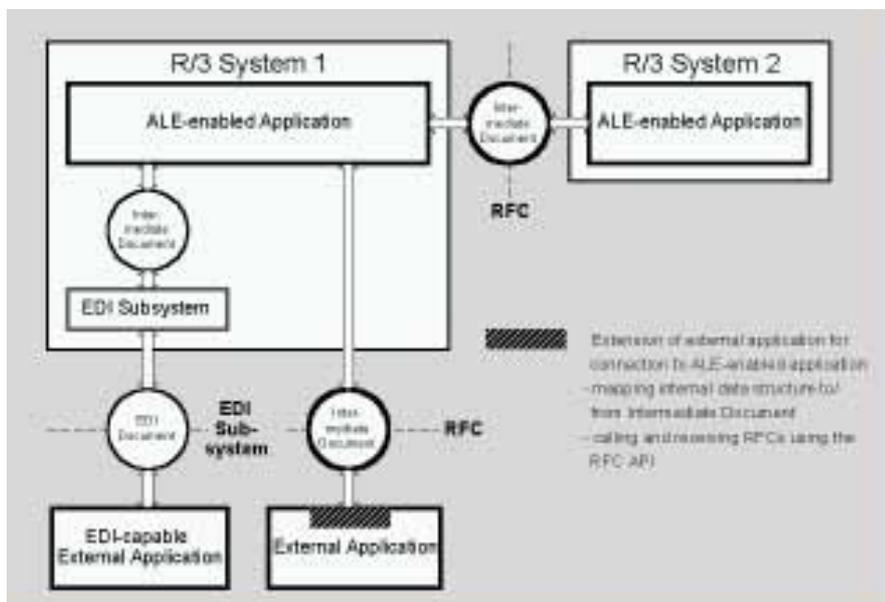
- buy a ready-to-use solution,
- reduce implementation times,
- save money by installing a product that works with the dedicated R/3 interface, and
- invest in a product with a stable interface to our business software.

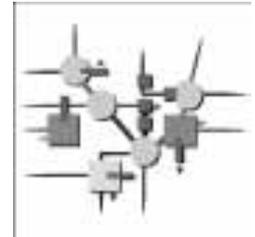
Links to our business APIs are being certified in the following areas: ALE converters, bar code readers, computer-aided design software, database backup tools, EDI subsystems, electronic catalogs, export form systems, geographical information systems, imaging systems, laboratory information management systems, mobile data recording, optical archives, plant data management, process control systems, sales tax systems, shop floor control systems, time and attendance systems, and warehouse control systems.

## Business objects

Object technology is being steadily introduced to the R/3 System for integration between R/3 applications, external systems, and desktop applications. Business data and functions are encapsulated in objects.

Figure 2: ALE messages can also be sent via an EDI subsystem to EDI-capable application.





Objects can be defined based on object types and managed in the Business Object Repository. From the Enterprise Data Model business objects are derived by assigning data models. Each data model describes the internal structure of a business object. Besides business objects, also technical objects like texts, graphics, etc. can be stored in the Business Object Repository.

SAP's object model is geared to the COM (Microsoft OLE 2.0) and CORBA standards (OMG). An RFC Dynamic Invocation Interface permits access to attributes and methods of the objects types defined in the Business Object Repository. An OLE Automation server based on this RFC interface enables PC applications to use business objects similarly to other desktop objects.

The objects possess a standard interface to SAP Business Workflow. Pressing forward in the same vein, R/3 will make it possible to connect external systems using standard object interfaces like OLE Automation or CORBA to establish links.

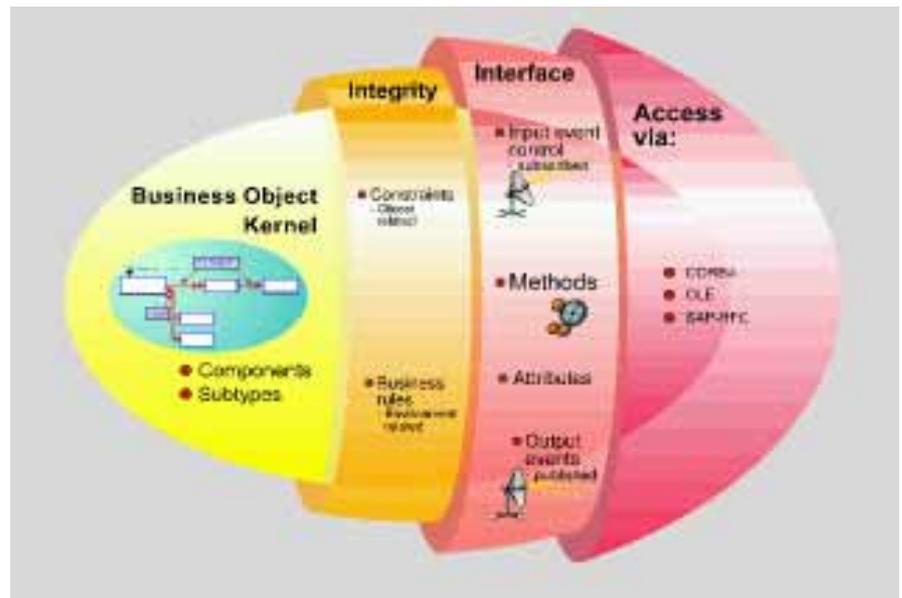


Figure 3: SAP's Business Object