

SAP R/3<sup>®</sup>

# The Next Generation of SAP R/3 User Interfaces



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# The Next Generation of SAP R/3 User Interfaces

## Summary

“Simple user interface”, “worldwide access”, “new markets”, “electronic commerce”... these catchwords from the Internet environment are resulting in new requirements on SAP and the R/3 System. SAP is responding to these new requirements with two main thrusts:

1. **Internet Session Manager and SAPGUI in Java:** With the implementation of the standard user interface in Java, all R/3 transactions can now be reached through the Web, even on hardware platforms that were not previously supported. Economical NC and NetPC hardware can be used as flexibly as standard business clients, as well as all Java-capable Web browsers.
2. **Internet Application Components (IAC):** SAP opens R/3 to whole new groups of users through the Internet Application Components. Selected business processes, such as purchase orders, who-is-who queries, etc. are offered to all Web users in the Internet/Intranet through a simple, Web-based point-and-click interface. As a result, even occasional users in an Intranet/Internet environment can become R/3 users through the IACs. SAP customers can capture new markets by extending their business processes to the Internet. R/3 makes concepts like product catalogs in the Internet, ordering through the Web, and electronic commerce into reality.

Another important benefit of the new user interfaces for SAP customers: the entire expense for client administration is eliminated. Enormous cost savings are realized because the SAP software is loaded completely from the server, and updates are distributed automatically.

Parallel to the development of the new user interfaces, SAP continues to improve our standard R/3 user interface in the areas of ease-of-use, extended functionality, and simplified administration. New options – such as integrating the display of pictures, graphics, text, and SAP input fields in a single screen – simplify the use of the R/3 System, and increase the enduser productivity. Local processing of user input on the client increases the interactivity of R/3, and enables even better PC-oriented processing with R/3. Based on standard client technologies such as ActiveX and JavaBeans, SAP integrates the new client component framework in both the standard and Java-based GUI. This client component framework, one of a kind among standard software vendors, provides these functions while simultaneously performing their administration. As a result, R/3 customers no longer have to worry about the trade-off between extended functionality and increased administration expense.



From the beginning, SAP has implemented R/3 as a three-tier client/server application. The clear division between database server, application server, and presentation server continues to benefit all R/3 customers whenever new technologies are introduced. Both the Internet applications and the Java-based SAPGUI were implemented without having to change the R/3 applications. As a result, nothing stops existing R/3 customers from immediately taking advantage of new technology.

In implementing the client component framework, SAP relies on our years of experience with distributed software – SAP has always distributed the R/3 application software from database server to the application servers on demand – distributed application processing, minimized network load in the client area, etc. SAP has now linked modern client technology with proven distributed mechanisms to form a forward-looking user interface technology for business applications in the Internet. In particular, the network load aspect plays an ever more decisive role in network-based applications – long response times caused by high network load can render even the best application unusable. We at SAP, with our years of experience with the three-tier architecture of R/3, have an enormous lead in both knowledge and experience. The SAPGUI was designed as a thin client from the very beginning, and always supported the use of WANs. SAP is now utilizing this knowledge in our new developments in the client area.

With SAP's next-generation user interface, endusers are free to select the client of their choice for the various tasks. This freedom to decide and the greatly simplified use of the R/3 System are guarantees for satisfied, highly motivated endusers.

## Introduction

The basic architecture of the R/3 System is a three-tier client/server structure, consisting of:

- ❑ **The database layer:** Stores all data and the R/3 Repository (R/3 programs and R/3 meta information).
- ❑ **The application layer:** All application logic is processed by the application server.
- ❑ **The presentation layer:** SAP pursues a thin client approach. The client provides R/3 users with information and leads them through the interaction.

This design results in a large number of benefits, the most important of which are listed below:

- ❑ **The application content is transparent to the client:** The client does not need to “know” anything about the application or the application logic. It receives the data, values, etc. from the application, displays them on the R/3 screen, and passes the user's input back to the application. Changes and enhancements to the application functionality can be implemented independently of the client software. Compared to a fat client, which also processes application logic, this results in much

greater stability of the client software. Particularly in large installations with a large number of connected users, this results in tremendous savings in administration and software maintenance expense.

- ❑ **During active operations, the client needs only the presentation logic, the screen formatting data, and the minimal additional information required to control and check the user inputs:** Only the information that is actually intended for the user is transported to the client. All other information and data required to execute the application logic is transported to the application server, and therefore does not load the communication network between the client and the application server. This is a further cost-reducing factor in production use, especially when cost-based wide-area networks (WANs) are used to connect remotely installed clients. Customers who have connected their local offices and subsidiaries to a central R/3 installation have learned to appreciate the cost savings that can result. Even analog phone lines can be used to supply employees with up-to-date information from R/3 – with reasonable response times and at reasonable costs.
- ❑ **Within the three-tier architecture of R/3, the presentation layer represents an additional scaling layer:** Depending on the performance of the database server, any number of application servers can be connected; in turn, their performance determines how many clients can be connected. These scaling options enable the R/3 System to be flexibly adapted to rapidly changing customer requirements: as the number of R/3 users increases, the number of application servers can be dynamically increased, and any number of new clients simply connected (depending on the load on the application servers, it might even suffice to “only” increase the number of new clients). This secures your investment in the R/3 System, now and in the future.

Two aspects are particularly important in defining and implementing a client strategy:

- ❑ The needs and requirements of the endusers and operators
- ❑ The technological constraints

Both aspects are dependent on each other, and also necessitate each other to a certain extent. For example, the replacement of mainframe-based systems by client/server systems has resulted in the users' desire for graphically oriented user interfaces. Nowadays, the Internet is starting to influence software users in that they increasingly expect browser-based access to the installed software through worldwide networks.

The main requirements on the user interface for the R/3 System, the standard software product for business process automation, are:

- ❑ Simplicity of use
- ❑ Simple administration
- ❑ Executability on multiple operating systems and hardware platforms, and even hardware independence of the user interface



- Simple access to all the functions of the underlying R/3 application
- User-specific adaptability
- Global access

As mentioned above, these requirements come from different groups of users:

- The endusers who work with R/3
- The operators and customers who run R/3
- The system administrators, who operate, maintain, and monitor the R/3 System

For endusers, in particular, in order to decide on the most suitable client strategy, you have to know whether you are dealing with **professional** – that is, trained users - or **occasional users**, who have practically no knowledge of the underlying application (R/3 in this case). Obviously, the definition of “Ease of use” can vary widely between the two above groups:

- A data entry clerk in the Sales department, who repeatedly enters incoming orders in the system, expects a clearly structured input mask for order entry. They want to quickly enter the order with its various items.
- An Internet user, who occasionally sends an order (in R/3) via the Internet, expects a user interface that is self-explanatory, is navigable with the mouse (point and click), and has an optically attractive interface.

As you can see from just this brief example, a user interface has to be very different for different categories of users, even for the same functionality. This is particularly apparent in the guidelines for the ergonomical design of user interfaces, which are already a requirement in Germany: “User interfaces must be designed appropriately for the user’s skill level”. The Ergonomics Group at SAP is responsible for meeting these requirements, and apply the general requirements to SAP.

New technology opens new perspectives for designing user interfaces, but also sets limits. The rapid development of the Internet over the past few years, for example, provided a framework for considering how to give inexperienced users access to R/3. Before the Internet became so popular, the group of potential users was limited to the professional users within closed company networks, simply due to the technological infrastructure. On the other hand, there are many examples of enduser wishes that far exceed the current technology: anyone who expects to find a voice-controlled user interface for the standard software is bound to be disappointed. In this case, linguistic problems set the limits for the technology. In contrast, voice output is already a mature technology that provides an interesting alternative for interaction between the R/3 System and the enduser.

Every development in the client area of R/3 was always geared towards customer requirements and enduser desires. For example, the entire Release 3.1 was designed to meet user requirements for Internet access. But SAP hasn't stopped there – we follow the latest developments in the client area, and integrate them into our client software to make it even easier to use.

This paper provides an overview of the R/3 user interfaces and their particular benefits. It explains SAP's strategy for client design in R/3, and grants a preview of the planned enhancements in the client area of the coming R/3 release.

## Different User Interfaces for Different Users

### SAP's Client Strategy

SAP's client strategy is to provide optimal support to both professional R/3 users and occasional users. SAP provides an enduser environment specially designed to meet the different requirements of each group: The occasional user accesses R/3 with the familiar Web browser, while the professional user interacts with the R/3 System, using an interface appropriate for the business application.

Professional users can even choose between two different user interfaces:

- The **Session Manager**, the multi-system, multi-task work environment
- The **SAPGUI**, the single-system, single-task work environment

The Session Manager is a modern, easy-to-use, universal user interface to the R/3 System. It provides a “multi-system multi-task” work environment for the professional user. A user can use the Session Manager to log on to multiple R/3 systems in parallel – **multi-system** – and open several transaction windows within a session – **multitasking**. In the process, the Session Manager assumes the management of all open sessions and transaction windows, and enables simple navigation between the open sessions and transactions. Furthermore, the Session Manager simplifies working with R/3, because it can be adapted to each user's individual needs. This increases productivity and improves worker motivation.

Direct logon to an R/3 System via the SAPGUI is particularly intended for users who mainly work in one R/3 System and who do not have very powerful client computers. The SAPGUI forms a “single-system single-task” work environment based on a “thin client” approach, while still enabling the user to access all the functions of the R/3 System. The SAPGUI supports parallel work in multiple sessions of the R/3 System by directly starting a second SAPGUI window. In this case, the user simply navigates between the windows on the client desktop. From the enduser perspective, the division

between occasional and professional users is not a strict one. Instead, every user can decide which interface is the best for them based on the specific application function.

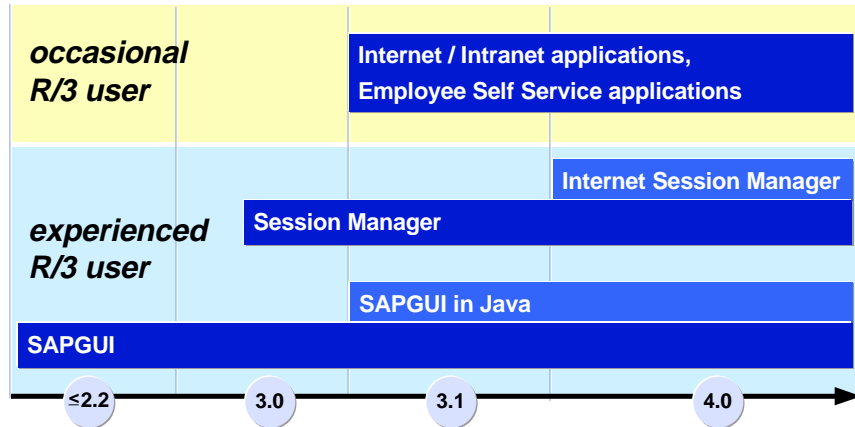


Figure 1: Different Clients for Different User Groups

With the Session Manager and SAPGUI, professional users are provided with a work environment that is powerful, well-organized, and easy to use – but at the same time has such comprehensive functionality that even different versions of a transaction can be implemented. With the availability of a number of different operating system platforms – including Java – the professional user can choose from a complete pallet of access options: direct access with any standard PC platform, NCs, NetPCs, and even access via the Internet using a Java-capable Web browser.

The Internet Application Components use the Internet/Intranet as connection medium and the browser as the work environment for running the applications. The occasional user operates R/3 – like any other Web application – using the familiar Web browser. Access is gained as usual via the Web, simply by entering the proper URL. The IACs are self-explanatory and can be used immediately, without requiring any training whatsoever.

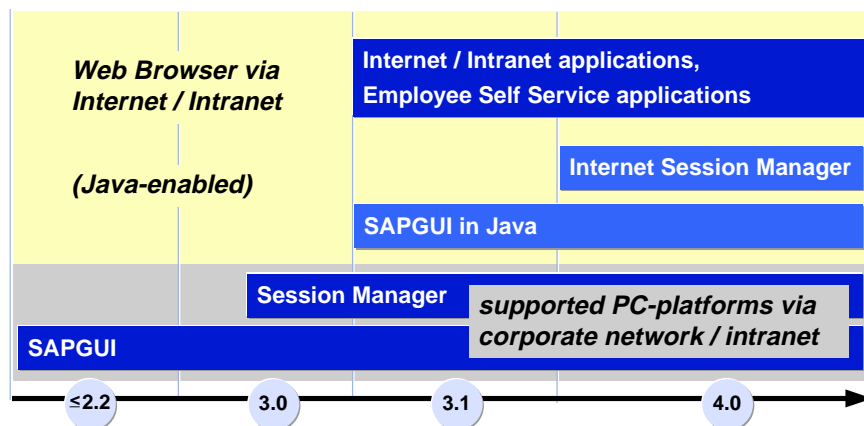


Figure 2: Different Clients for Different Environments

Future developments in the client area will continue in parallel for the two different user groups. SAP will implement additional IACs and further optimize the Internet architecture of the R/3 System. Based on suggestions from our customers, and in response to new Internet developments in the Electronic Commerce area, the number of IACs will continue to grow in future, and fulfill an ever greater portion of the R/3 functionality for occasional users. At the same time, we will continue to enhance the standard interface for R/3. The new client component-enabling technology (CET) will be further integrated into the R/3 applications, continuing to simplify the operation of the R/3 System for the professional user.

## The Professional Work Environment of R/3

### ***Session Manager, the Multi-System, Multi-Task Work Environment***

To “only” consider the ease of use of individual transactions in designing the user interface for R/3 would be a little short-sighted. Other factors also play a decisive role for the optimal usability of a business application like R/3:

- Simple navigation through the transactions
- Individually customized menus
- Personal configuration
- Central access to multiple R/3 installations

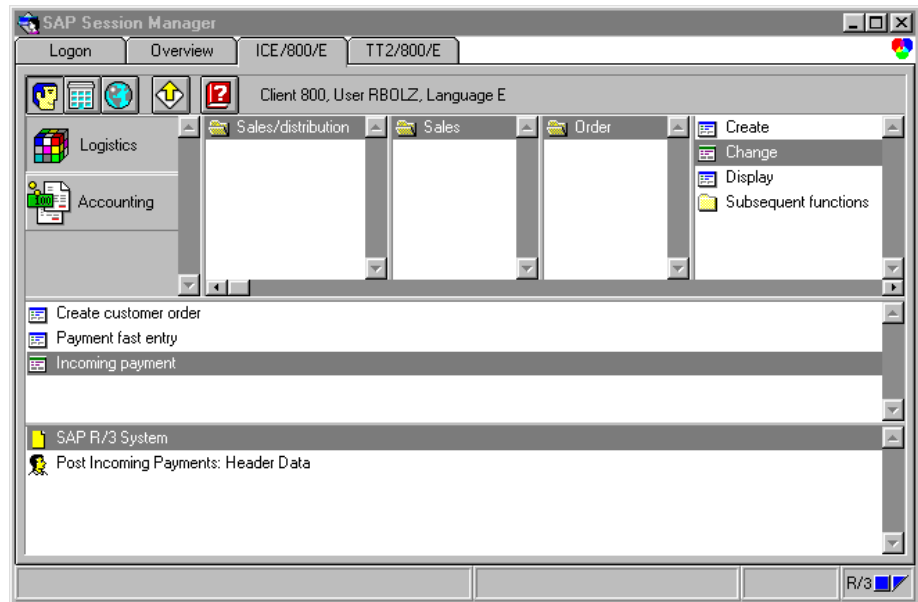
The last item, in particular, will continue to increase in importance: the increasing modularization of the R/3 System means that more and more customers will be running multiple production R/3 systems.

Like the name says, the Session Manager manages a user’s individual sessions in various R/3 systems – hence the term “multi-system”. A “session” is a user logon in a single R/3 System. However, the main emphasis of the Session Manager is to simplify orientation and navigation in R/3. For this purpose, the Session Manager provides each user with a user-specific menu that contains all the transactions (together with the corresponding menu paths) that the user is authorized to perform in the system. Accordingly, the user-specific menu is configured precisely for the respective work center. Users can also configure a personal area, by dragging and dropping frequently used transactions to that section – a technique called “bookmarks” and “favorites” in Web browsers that greatly simplifies navigation through the Web.

Of course, the Session Manager also provides the complete SAP menu and a company-specific menu in addition the user specific menu. The company-specific menu contains only the transactions and menu paths from the applications that are actually used by the company. Customers who use an R/3



System exclusively for human resources management, for example, will only see the menu tree for HR in the company menu. As a result, the complete functionality of the R/3 System is always open to the enduser.



**Figure 3: Session Manager**

The Session Manager takes care of logging on to the R/3 System. From within the Session Manager, a user can log on to any R/3 System for which he/she has a user authorization. Each of the user's open sessions is displayed clearly in the Session Manager. This enables direct navigation from one session to another without having to leave the Session Manager. The logon to the various systems is simplified further by the fact that the Session Manager records the user name (a user can have different user names in different systems) and the last selected settings for language and client for each system. During subsequent logons, the user only needs to enter the password – the other logon fields are already filled.

The Session Manager displays the menus and personal configuration described above for each session (and therefore for each R/3 System). In addition, it lists all the sessions that an enduser has opened. Simple, targeted navigation between sessions is supported here, as well.

It is no coincidence that SAP has introduced the Session Manager as the same time as support for distributed R/3 Systems. When used in a distributed R/3 System environment, the Session Manager attains its full functionality: simple, user-specific operation in several systems from a single user interface.

The Session Manager uses the SAPGUI (see above) to execute the individual transactions. It starts the SAPGUI and calls the initial screen of the chosen transaction. As a result, the actual execution of the individual transactions in the R/3 System is identical in both work environments.

The Session Manager itself is a program from SAP that runs locally on the client. Synchronization of local copies of the various menus and configuration with the configuration in R/3 is performed at pre-defined times set by the user. Through the concept of the local copy on the client, the time required to start the Session Manager is reduced, and menu navigation can be performed locally. Management of the master copy of the menus and configuration in the R/3 System on the other end makes it possible to work on any workstation throughout the globe. When a user starts the Session Manager from a “new” client – one that has not been used previously – the R/3 System automatically copies the user-specific menu and personal configuration to the new client, without requiring any intervention by the enduser or system administrator. Last but not least, this concept also serves to back up the local configuration in case of a system crash, since the R/3 System retains a central copy of this information.

Like any modern PC software product, the Session Manager is based on the latest client technology. As a result, it is only available to date under the latest 32-bit platforms from Microsoft, Windows 95 and Windows NT. With Release 4.0, the Session Manager will also be supported as an Internet Session Manager under Java, and will then run on nearly any platform.

### ***SAPGUI, the Single-System, Single-Task Work Environment***

From the very beginning, the development of R/3 was characterized by the goal of providing professional users with the optimal user interface for running his or her business transactions. For this purpose, SAP developed our own user interface for R/3, the SAPGUI, which sensibly balances the needs of the enduser with the requirements of the operator while fully exploiting the advantages offered by all the latest technology.

- ❑ The SAPGUI provides simple access to all the functions of the R/3 System – including all application transactions, all reports, and the entire pallet of system control and monitoring functions
- ❑ Simple navigation – through to the individual application functions – is enabled through clearly designed menus
- ❑ The use of R/3 is simplified by a rich combination of individual elements – the SAPGUI offers colorized buttons for executing important functions at the touch of a button, short keys to enable keyboard control for the “practiced” professional, various checkboxes to simplify use of the different applications, and comprehensive online help with clear navigation support
- ❑ The SAPGUI supports more than 20 languages, including the double-byte character languages Kanji and Mandarin. This option in particular is an essential prerequisite for running a software product to automate international business processes. However, small and mid-sized companies also benefit from this fact, since nearly every company has an international workforce nowadays. One result: training costs can be reduced significantly when the user interface is available in the enduser’s native tongue



- ❑ Target use of color for highlighting important information and fields in the R/3 screen
- ❑ The SAPGUI runs on all popular platforms, including Microsoft Windows 3.x, Windows for Workgroups, Windows 95, Windows NT, Apple Macintosh, OS/2 Presentation Manager, OSF Motif, and Java.

The SAPGUI is used to log on to the R/3 System – single-system – and presents a transaction window for working in R/3 – single-task. By starting a second SAPGUI – simply by selecting the menu item “New session” – the user can also work in a parallel transaction. Within the same session, a user can run several transactions in parallel in multiple SAPGUI windows. This optimization of personal work processes is particularly effective when individual transactions have long response times, or when long reports are run. As a result, discouraging, unproductive wait times are eliminated.

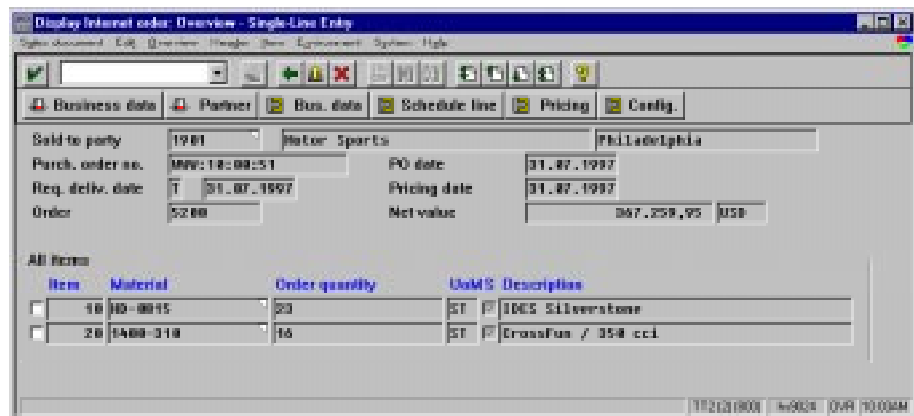


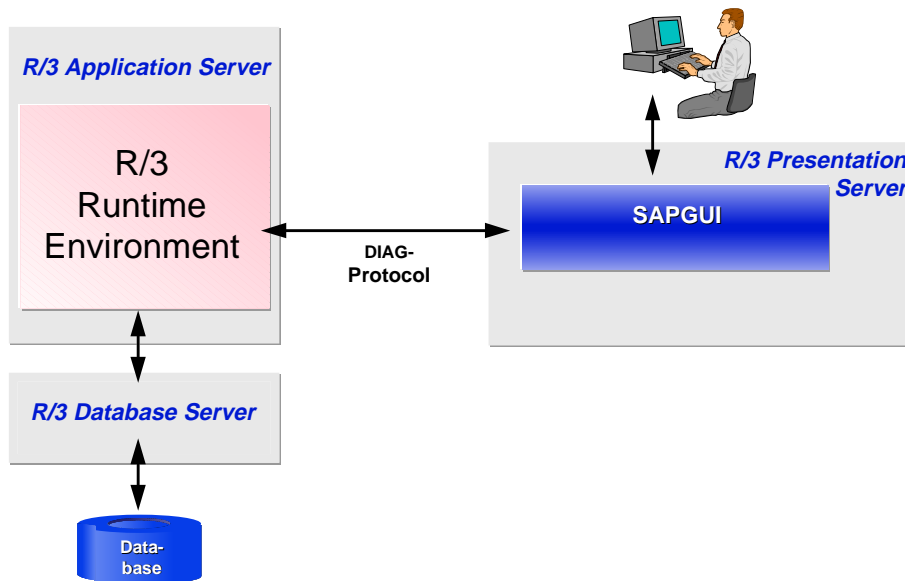
Figure 4: Order Entry in the SAPGUI

The SAPGUI can be configured to the enduser's tastes for language selection, displayed colors, typeface, and font size. This option is only rarely used, since the standard configuration of the SAPGUI is already optimized for the needs of almost all endusers, and the system records the logon language.

The functionality of the SAPGUI is rounded out by the complementary programs SAP Business Graphics and ArchiveLink Viewer. Both are shipped and installed as components of the SAPGUI. The SAP Business Graphics are used by the applications to present tables and their values in graphical form, which simplifies the display. The ArchiveLink Viewer enables the display of scanned original documents for delivery and order transactions, among others.

## **SAPGUI Architecture**

From the beginning, SAP has taken advantage of the three-tier client/server architecture, with database server, application servers, and presentation servers. In the R/3 System, data storage (database server) is separated from the execution of the application logic (application server), which itself is separated from the user interaction (client/presentation server).



**Figure 5: The Architecture of R/3**

SAP has optimized the protocol between the application server and the client to keep the network load as low as possible. Only the data that is required to set up the current screen contents is actually transmitted to the client. As a result, the protocol is also suitable for use in WANs (wide area networks). R/3 customers can economically connect all their local subsidiaries and sales offices to a central R/3 installation, giving everyone access to the latest information.

At this point, we would like to point out that – thanks to this forward-looking architecture concept – SAP was able to make R/3 Internet-capable in an evolutionary, not revolutionary step.

## **Special Features of the Java-Based Session Manager and SAPGUI in Java**

The Internet provides an additional work environment for professional users, and opens new dimensions in flexibility and access freedom. Many companies already expect a Web-based user interface in the near future (according to survey by Forrester Research Inc. taken in September 1996). SAP immediately reacted to these customer requirements, and ported R/3's professional work environment to the Web. With the implementation in Java, the Session Manager and SAPGUI are not only Web-capable, but also platform independent. This reduces the operating costs for an R/3 installa-



tion, since cheap NCs and NetPCs can be used as business clients, saving the complete expense of maintaining the R/3 software on the client. The automatic download of R/3 client software as Java applets eliminates the need to pre-install SAP-specific software components – the result is the zero-administration business client, a significant cost saving factor. Zero administration and reasonably priced clients are decisive factors that minimize your total cost of ownership.

### Internet Session Manager

With Release 4.0 of the R/3 System, the Session Manager will be available in the Internet. The Internet Session Manager will provide the same simple navigation to the R/3 transactions as the standard Session Manager.

At this point, the Internet Session Manager shows another enhancement over the standard Session Manager. It provides users with an additional menu that can be used to access the R/3 Internet applications. This integration of the Internet applications in the standard menu of the R/3 transactions emphasizes once again that the IACs represent a major component of the R/3 client.

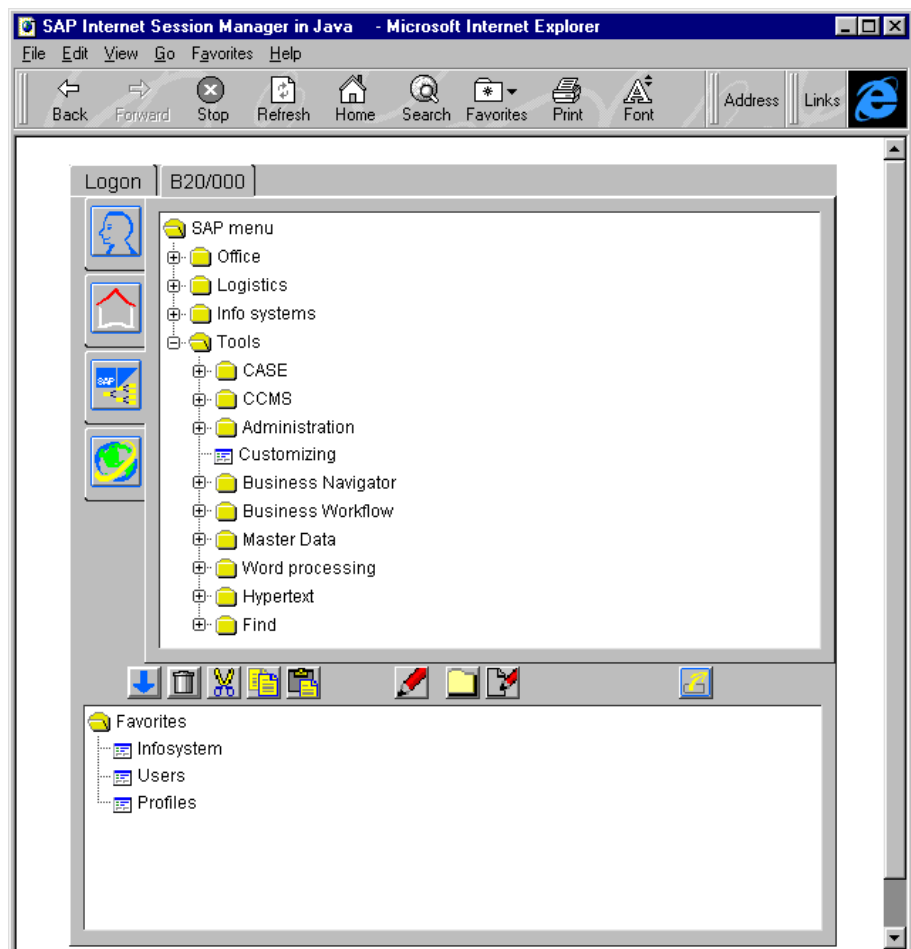
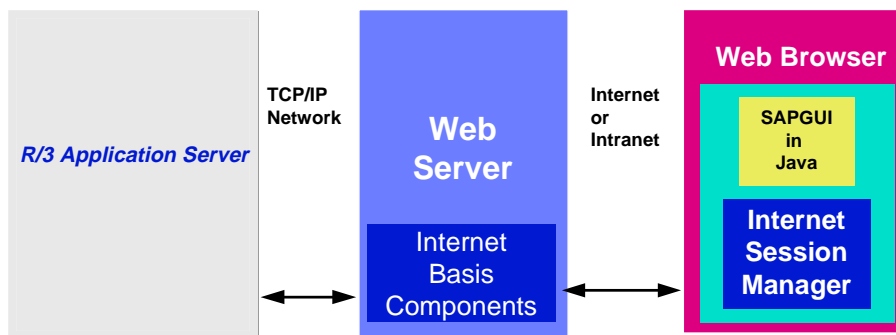


Figure 6: Internet Session Manager

### Architecture of the Internet Session Manager

The Internet Session Manager uses the architecture of the R/3 Internet Application Components. Communication from the Web browser to the R/3 system takes place through the Internet Basis components – also see “Architecture of the Internet Applications”. In R/3, the Internet Session Manager accesses the same structures, configuration, and data as the standard Session Manager. The enduser has the same user-specific menu in both environments, and sees the same personal configuration, without requiring any additional maintenance in R/3.



**Figure 7: Architecture of the Internet Session Manager**

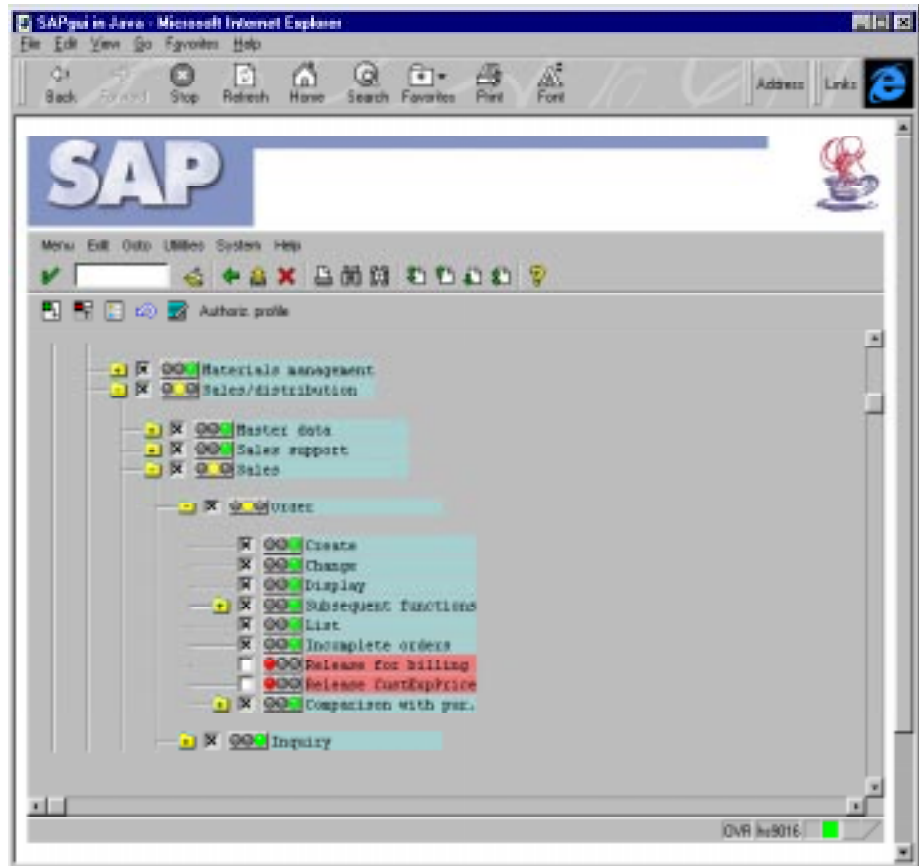
### SAPGUI in Java

With the Java-based SAPGUI, SAP supports yet another platform for the SAPGUI. Professional users have the same look and feel for working with R/3 under Java. Companies can implement the new platform – with the cost savings mentioned above – without having to retrain their employees. The SAPGUI in Java is available from R/3 Release 3.1.

Due to the particularities of Java, not every function available in the standard SAPGUI is currently supported in the Java-based SAPGUI. In particular, the import/export of data to/from the client is not supported (because Java does



not allow access to the client's local hard disk); integration with Office products has not been implemented in the initial version; and SAP Business Graphics are not currently supported due to Java's extremely restrictive security philosophy.

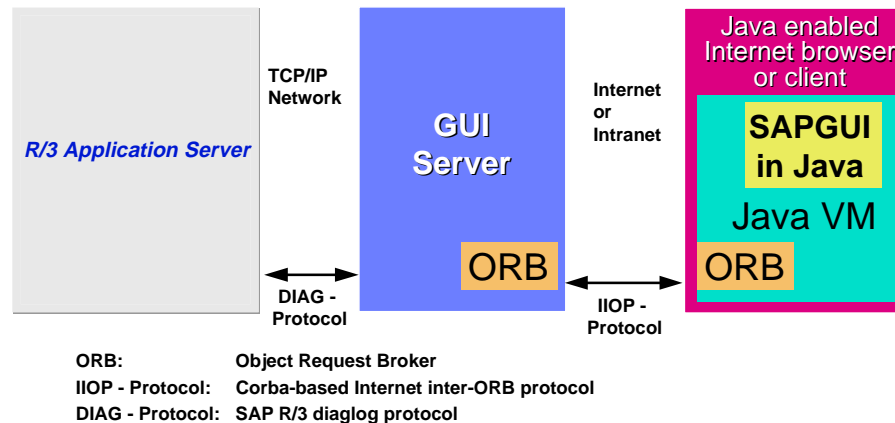


**Figure 8: SAPGUI in Java – The Same Look and Feel for Professional Work with R/3 via Internet**

### *Architecture of the SAPGUI in a Java Installation*

From the perspective of the R/3 application, it makes no difference whether the enduser is running the SAPGUI in Java or the standard SAPGUI – the protocol used for communication between the application and the client is the same. In the case of the SAPGUI in Java, an additional server – the GUI Server – takes care of “translating” the R/3 client protocol into Java. Communications between the GUI Server and the client then take place using the standard CORBA protocol IIOP (Internet Inter-ORB Protocol). From this point, the system uses ORB (Object Request Broker) technology to connect

the client with the GUI Server. In this case, the communication traffic is similar to that of the standard SAPGUI, which is extremely well suited to use via the Internet. Once again, the advantages of SAP's multi-tier architecture and the low-volume design of the R/3 client protocol pay off.



**Figure 9: Architecture of the SAPGUI in Java**

With an additional layer between the R/3 application server and the SAPGUI, the scalability of the R/3 System is improved further. A single GUI Server can serve multiple users. In the opposite direction, a Java-based SAPGUI can access multiple R/3 installations through the GUI Server. Together, the GUI Server and the Java-based SAPGUI offer the entire functionality of the standard SAPGUI, plus the advantages mentioned above. This includes the fact that every new R/3 application transaction is immediately Java-capable, without SAP or the customer (in the case of proprietary developments) having to write a single new line of coding.

## The R/3 Work Environment for the Occasional (Internet) User

### ***R/3 Internet Applications***

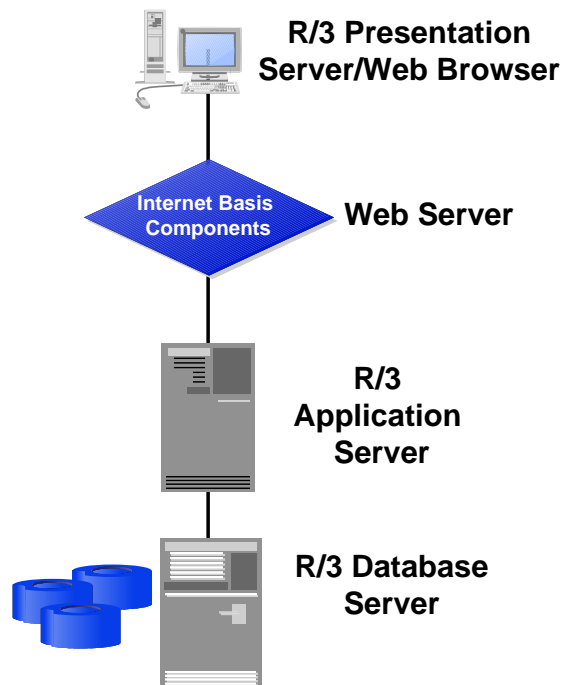
With the growth of the Internet, an infrastructure is available for the first time that connects the separate IT environments of different companies, as well as those of the endusers. In addition to the exchange of information and personal communication, the aspect of trade over the Internet continues to increase in importance. Together with our customers, SAP has examined the different areas and categorized those that require a high degree of integration between R/3 and the Internet. Three areas have been defined:

- ❑ **Business to business:** Extending the supply chain in R/3 to vendors and purchasers through an option of opening specific transactions (via the Internet) to partners of an R/3 customer.
- ❑ **Consumer to business:** The goal here is to integrate the consumer directly in the supply chain. For example, R/3 customers want to enable consumers to order goods directly in R/3.
- ❑ **Intranet:** A third area is represented by an R/3 customer's own employees, who also need direct access to the information in R/3.

The aim of this collaboration between SAP and our customers is to design simple interfaces for Web browsers that enable even unpracticed, occasional users to access R/3. For more information on the individual Internet applications in R/3, please visit SAP's Web site at <http://www.sap.com>.

### Architecture of the R/3 Internet Applications

For the Internet applications, as well, an additional layer is required between the user interface – the Web browser in this case – and the R/3 application server, to convert between R/3 and HTML, the hypertext markup language used in the World Wide Web. This layer is the Internet Basis components, which use the information from R/3 to dynamically generate new Web pages, which a Web server sends to the user's browser.

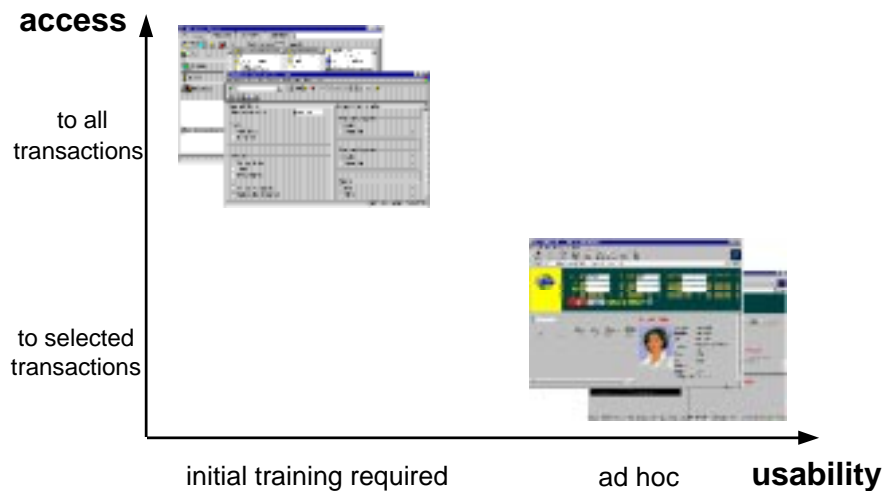


**Figure 10: Architecture of the Internet Applications**

Since standard R/3 transactions are designed for professional users, they hardly represent a suitable interface for the occasional user. Therefore, the implementation of the IACs begins in R/3. An IAC consists mainly of two parts: the flow logic and the structure of the Web page. The flow logic of the Internet application is implemented in R/3; the structure of the Web page is determined independently, in the Internet Basis components. This latter fact enables R/3 customers to design company-specific IACs.

### Future Developments

The comparison of user interfaces for the professional and occasional user emphasizes how SAP positions our different user interfaces. It also shows the direction further developments in the respective user interfaces will take.



**Figure 11: Comparison of User Interfaces for the Professional and Occasional User**

With further development of the IACs (Internet Application Components), more and more applications will be made accessible to the occasional user in the Internet/Intranet. SAP and our customers will investigate the use of Java and VRML to simplify the IACs even further.

To further simplify the use of the professional user interface, SAP is integrating modern client component-enabling technology: ActiveX in the Microsoft environment and JavaBeans in the Java area. The new client component framework provides R/3 applications with entirely new alternatives for presenting information, displaying non-R/3 information in the R/3 client, and controlling interaction with the user – alternatives that will make working with the R/3 System even easier in the future.

Like a Web browser, the frontend for the WWW, in future, the R/3 client will be able to display different information formats in a single screen: pictures next to text fields, graphics next to tables, and even voice output. The multimedia capabilities of the R/3 client open horizons for designing user interfaces that were previously unknown in client/server-based business applications. A particularly important aspect here is the direct access from the R/3 client to non-R/3 information. In the age of the information society and global networking, it is ever more important for applications to open up and exploit the existing information potential for the benefit of the enduser. This information could take the form of current stock prices or exchange rates from the Internet, product information from an external product catalog, and so on.

### The Client Component Framework in R/3 (Available in 4.0)

In Release 4.0, SAP will introduce additional client components to make the client even more user-friendly. Through these client components, some functions that were previously handled exclusively on the application server (in the three-tier R/3 infrastructure) can now be handled by the client. As a result, the user PC is provided with functionality in a thin client that was previously only available in PC applications or applications with a fat client. Examples of such functions are the WYSIWIG (what you see is what you get)



editor, spreadsheet, graphics, and so on. SAP will offer all these functions without sacrificing the thin client concept, with its minimal load on the network between client and application server.

The client components will appear as components of the R/3 screen. Depending on the type of client component, some processing functions will locally on the client. This not only improves ease of use – the client component-enabling technology also significantly enhances the customer-specific configuration of R/3 client: Two client component-specific calls – Set Property and Set Property – can be used for configuration.

In addition, administration of the client will also become easier. Only an ultra-thin client needs to be installed; the R/3 System downloads the other client components as required. New components and modified client components are automatically downloaded from the database, and replace existing client components without requiring any intervention on the administrator's part. This feature of the future R/3 system, in particular, will result in enormous cost savings for R/3 customers, since the ongoing costs for client administration can be reduced to a minimum.

SAP will pave the way to seamless integration with client component enabling in the R/3 client, without these developments negatively affecting user productivity. SAP itself will be implementing various client components – WYSIWIG editor, spreadsheet, graphics, etc. – in parallel developments using JavaBeans and Microsoft's ActiveX technology. Together with development partners, we will also work towards implementing client component-enabling technology on other client platforms.

The simple portability of the client component-enabling technology is supported SAP's approach of providing the individual client components with a "wrapper" that encapsulates the client components. With this method, the R/3 applications do not address the client components directly, but instead through the wrapper interface. This will enable the components to be simply swapped out as necessary.

The new concept of using the client components to partially or completely handle the various screens of the individual dialog steps instead of implementing them all at once also simplifies programming of the client. Clearly defined interfaces between the R/3 client and the respective client component enable the client component to be designed and implemented independently of the rest of the screen structure. Moreover, the client components can be created in most any development environment – such as Visual

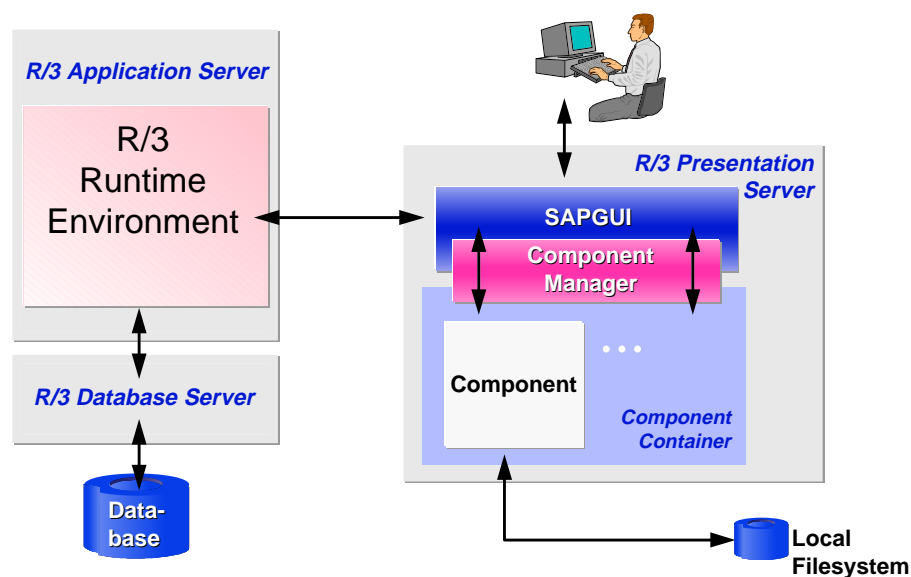
Basic or Visual C++ - completely separate from the ABAP development environment. This opens a new era of flexibility for programming the SAP client:

- ❑ Independent programming teams with different programming skills can implement new functions in parallel
- ❑ State-of-the-art client design environments can be used
- ❑ Client components can be changed without having to change anything in the SAP part of the screen programming

### ***Architecture of the Client Component Framework***

The client component framework consists mainly of three parts:

1. **Component Manager** – For managing the client components and controlling communication between the applications and the client components
2. **SUSE (Self Upgrading Software Environment)** – For automatic installation and update of the client components on the client
3. **Data Provider** – For converting the various data formats



**Figure 12: Component Manager**

The Component Manager is implemented as a component of the R/3 client software. Each client component that is called in the screen of an R/3 application is provided with a component container by the Component Manager. Furthermore, the Component Manager controls all communication between

the client component and the R/3 application, using standard communication methods of client component technology:

- ❑ **Method calls** for controlling the client components from within the R/3 application
- ❑ **Events** for communication between the client components and the application; the client component “publishes” events, and the R/3 application uses the Component Manager to “subscribe” to the events that are relevant.
- ❑ **Get and Set Property** for configuring the characteristics of the client component; this enables transaction-specific and customer-specific configuration of the client components. The same WYSIWIG editor component can be used as a “read-only” editor with restricted functionality (set property “read-only mode”) by one transaction, and as a fully-functional editor (set property “standard editor”) by another transaction. As a result, SAP takes full advantage of the component technology by dynamically adapting components to their call environment. Customers can also use this feature for their own developments, and use the provided client components in their own, customer-specific transactions. This saves costs for all R/3 customers, since a minimal number of client components covers a wide range of presentation functionality. Moreover, the client components can be adapted to the requirements of customer-specific developments.

The client component framework uses the standard SAPGUI protocol (DIAG protocol) of the R/3 System to transmit messages between the R/3 applications on the R/3 application server and the Component Manager and client components on the client. This enables SAP customers to upgrade from R/3 Release 3.x to Release 4.0 and use the new functionality immediately, without having to change their IT or network infrastructure.

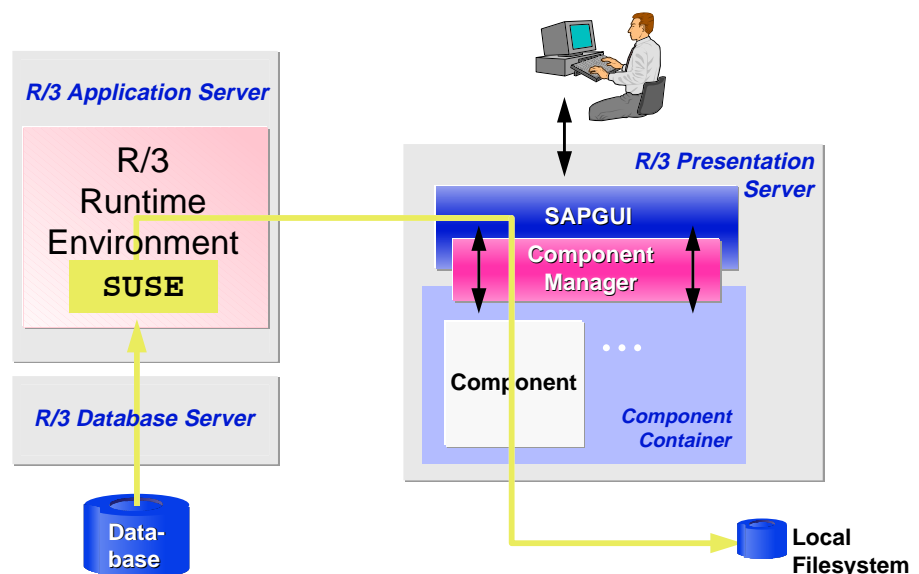
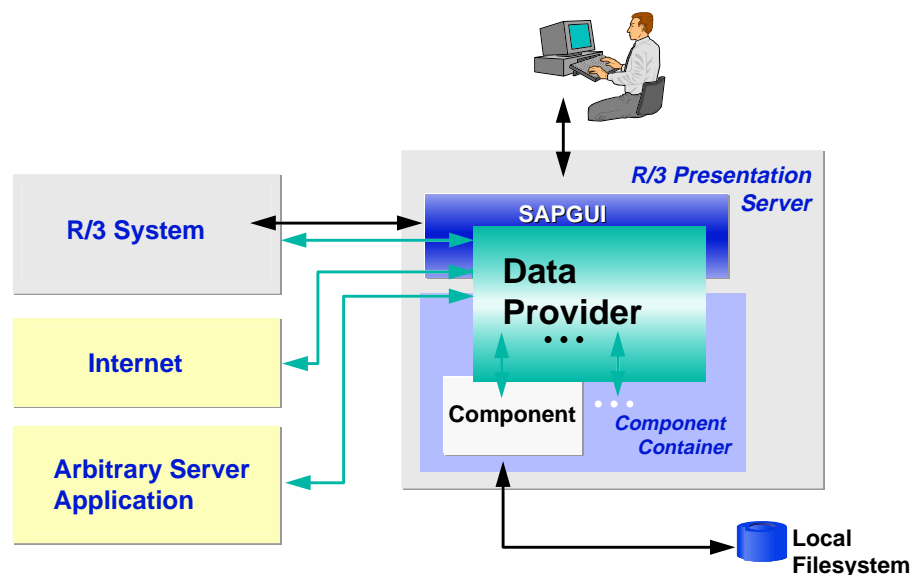


Figure 13: SUSE – Self-Upgrading Software Environment

Decisive issues for administration of the new client components on the client are how the client components are installed, and what happens when one or more of the client components have to be updated. With SUSE, SAP has fully automated this process, greatly simplifying the administration of the R/3 user interface. During the installation of R/3 4.0, only the client component-enabling technology is installed on the client, not the actual client components. The client components are managed directly from the R/3 database. The first time a specific client component is called, it is automatically installed and registered on the client. The same thing happens when a new version of a client component is installed in the R/3 database. The update process is then fully automatic, and transparent for both enduser and system administrator. Once a client component is installed, it is saved on the client, so it does not have to be downloaded again the next time it is called. SAP also uses standard technology for this service, such as OLE in the Microsoft environment and Java technology in the Java environment.

To ensure backwards compatibility with R/3 Release 4.0 and the R/3 client, SAP will only replace an existing client component when the new version is compatible with the existing version. This ensures that users will always be able to use the latest R/3 client – even to access R/3 Systems from earlier releases.

Of course, customers who use SAPsetup or a separate tool for distributing software can continue to do so to distribute the client components. In this case, the increased effort is rewarded with a reduced network load during ongoing R/3 use – new client components can be distributed to the clients proactively, during times of low network load.



**Figure 14: Data Provider**

Unfortunately, there is still no such thing as a universal data format that every application can interpret and use. Accordingly, the client component framework requires an additional component for converting the various data formats. As a result, SAP has developed the Data Provider, which converts the data from the form in which the data arrives to formats that can be inter-



preted by the client components and vice-versa. The conversion is based on the Internet standard MIME types. For example, the internal R/3 list format is converted to HTML when an application uses the HTML format to display lists. The Data Provider can interpret all MIME-based formats and convert between one another, fully automatically and transparent for the user. New, customer-developed client components can also use the services of the Data Provider.

The Data Provider also makes it possible to display data from non-R/3 applications in the R/3 client. This enables the R/3 client to retrieve data from the Internet through a direct connection.

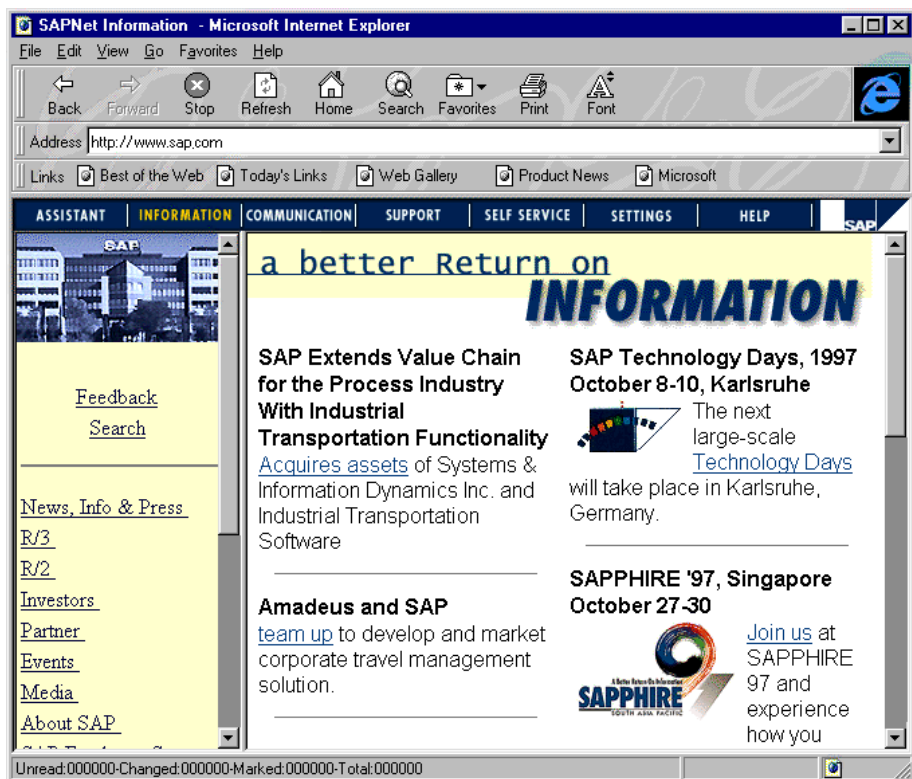


Figure 15: HTML Component in the R/3 Client

## Summary

In implementing the R/3 user interface, SAP has always emphasized the simple operation of the R/3 System. The SAPGUI – the standard R/3 client from the first R/3 releases on– has always used graphical elements, buttons, pull-down menus, and the like. The Session Manager, with its navigation through the R/3 transactions, greatly simplified use of the R/3 System. SAP's own multi-system multi-task user interface provides different menus that are all customized to the individual user's needs, offers a user-specific area for bookmarking frequently used transactions, and enables management of all open tasks even across multiple SAP systems. With the implementation of the SAPGUI in Java, SAP now offers a zero-administration client: The applets are all loaded from the GUI Server, without requiring even one bit of



SAP software to be preinstalled in the browser program. And last but not least: the Internet Application Components, an entirely new interface to the R/3 System for occasional, untrained users, are just another example of the enormous effort SAP has undertaken in order to provide the simplest possible R/3 client environment.

Still, integrating client components in the R/3 environment does not represent a new direction for SAP. SAP has always integrated new technology in our software – and developed our own tools – to simplify the use of R/3. Based on this foundation, and with our years of experience in this area, SAP will continue to integrate client component technology to provide the optimal system interface for our customers.

With our enhancements in the SAPGUI in Release 4.0, SAP is building on the latest technology in the client area. The integration of client components in the SAPGUI makes it possible to wed the advantages of the thin client to the possibilities offered by a fat client, without affecting the strengths that the SAP architecture offers in performance and scalability of the client.

Thanks to the flexible, dynamically adaptable architecture of R/3, SAP can integrate the new client technology in the R/3 System while allowing customers to retain their familiar hardware infrastructure. This evolutionary integration of new technologies, which SAP has already successfully implemented with Internet technology, proves once again how forward-looking and open the basic architecture of the R/3 System truly is.