

BOOK

The mainframe as a citizen

of the web

Sustainable application investment

WHITE

Contents

The key points p.04

Introduction p.05

**Integrating mainframe applications:
A perennial issue with
less than convincing results** p.06

- Supporting the interoperability of existing applications: A must p.06
 - Migrating to open systems: One solution of many p.07
 - Retaining applications on the mainframe: A sustainable solution p.09
-

**Making mainframe applications
citizens of the web: A new challenge
for IT system management teams** p.11

- The technical architecture, a key success factor p.11
 - Toward a new and dynamic web interface p.13
-

Conclusion p.18

The key points

Mainframes still host a major number of companies' critical applications.

So, how can these applications be retained at the heart of IT systems and processes?

How can these applications be made to interoperate between themselves and with the entire ecosystem?

Between technical complexity, performances that have frequently been disappointing, lead times and costs that are generally less than encouraging, the integration of mainframe applications has not always been convincing.

Today, however, migrating to an open system is no longer essential. With the help of a resurgence in z/OS and with the advent of the internet as the universal platform for interoperability, retaining applications on a mainframe even appears to be a sustainable route, which is inexpensive and easy to implement.

Whether it is installed on a mainframe (on the basis of dual layer architecture) or remotely on an intermediate server, an integration platform can take various forms, depending on whether you wish to open up a simple web access, update the system's ergonomics or integrate existing applications into a service-oriented architecture (SOA).

*The mainframe
becomes a
citizen of the IT
system"*

Introduction

The role of any IT Department primarily consists of adapting its IT system to a company's particular requirements, as quickly as possible, at an acceptable cost, while minimising the risks. For ten or so years, mainframe applications have put a stop to these kinds of aims; becoming a real thorn in the side of certain IT system management teams. For a number of years, in order to square the circle, it has been necessary to choose between migrating to Unix or Windows, remodelling applications or even, client / server integration; all three solutions representing unwieldy and complex projects.

However, for a few years now, a new path has been opened up by a combination of two factors. Firstly, a resurgence of interest in the z/OS platform, whose price to performance ratio actually comes close to that of systems that are known as «open», above all when you take account of all the direct and indirect cost factors, and whose characteristics in terms of reliability are exactly the same. **In addition, internet technologies are now recognised as a universal solution for guaranteeing interoperability** between systems and applications of all kinds.

When applied to mainframes, internet technologies prove to be sustainable, inexpensive, easy to implement and frequently non-intrusive, and are therefore risk-free. In the same way as other servers, mainframes therefore become citizens of IT systems, in their own right. In more concrete terms, the applications they host will be readily available to new users and modernised from both an ergonomic and functional point of view. They can also be integrated, rapidly and with no risk, into service-oriented architectures. Once there, they communicate as equals with new applications and become standard components of a company's overall IT system. **To sum up, although abandoning the mainframe in the long or short term is still an option, there are now a healthy number of alternatives.**

Integrating mainframe applications: A perennial issue with less than convincing results

Given the constant development of technologies, the integration and adaptation of «inherited» applications has always been a major problem. Depending on their role, their strategic importance and the specific context of each IT system, various solutions have been designed, but the results have not always been satisfactory because of their complexity, lead times, costs, performance or even, ultimately, the coherence of data.

SUPPORTING THE INTEROPERABILITY OF EXISTING APPLICATIONS: A MUST

The true value of an IT system is represented by its existing applications! Whether the hardware platforms and software environments are retained or migrated, the key aim of any strategy is to preserve, enrich and develop these applications, in order to permanently tailor the system to a company's needs.

✓ THE OLDEST APPLICATIONS ARE THE MOST DIFFICULT TO MAINTAIN

Mainframe applications are generally the most critical for a company and are therefore the most difficult to address. They are also based on older technologies such as Cobol or PL/1 as well as CICS or IMS transactional monitors and text mode user interfaces (3270).

Except in extremely rare cases involving the radical reorganization of IT systems, the sustainability of these applications is not only a minimum requirement, but an absolute must!

Since the real challenge is well and truly to **enable them to interoperate with a company's overall IT system**, by improving their ergonomics, by enabling them to communicate with external applications, by opening them up to new users (internal users, clients, partners, etc.).

Sustainability and development can be guaranteed in various, more or less complex, and intrusive ways: migration of applications to open systems, redevelopment while remaining on the mainframe platform, providing existing applications in the form of web services, redesigning the user interface, or even quite simply, creating an internet access.



The TCO of mainframe platforms may prove to be less than that of distributed architectures"

teristics in terms of reliability and capacity to guarantee availability of the most critical applications.

✓ HARDWARE PLATFORMS: A RENAISSANCE OF Z/OS

Migration to Unix or Windows has for a long time appeared to be the only long-term viable solution, as the mainframe seemed doomed to an inevitable decline. However, today, there is no longer any reason to abandon it, as these machines have adapted to modern technologies. From the processor to the memory, (including disks) the hardware platform is based on identical or very similar foundations to those used in open systems, to such a point that their cost to performance ratio is no longer detrimental.

The TCO (Total Cost of Ownership) for mainframes, including hardware, applications, installations, maintenance and upgrades, may even be less than that of distributed architectures.

A telling fact: a manufacturer is planning to launch a range of z/OS compatible mainframes, based on Intel Itanium processors.

In terms of both the system and its software environment, the mainframe has also been adapted for integration into IP networks and client / server or web architectures. Current mainframes have clearly found a place on the market. At the same time, the zSeries range has retained all its charac-

MIGRATING TO OPEN SYSTEMS: ONE SOLUTION OF MANY

Migration of applications to open systems requires them to be reorganised or their code retained, line by line. Whatever option is chosen, a transition period is required.

✓ COMPLETELY REDESIGNING THE IT SYSTEM

«Big bang» or complete restructuring of an IT system, with migration to Unix or Windows systems, is the choice of a few rare companies. This is actually a question of starting again with an almost completely blank page! Of course, this type of approach can now be mapped out using information system cartography tools or code analysis methods, specifically in order to isolate those existing services that

are relevant to business processes. However, the first step is to develop new applications with new languages (C#, Java or other), implemented in new environments (J2EE or .NET platforms).

This approach is lengthy and expensive and is also accompanied by a major cultural change and, more importantly, a renewal of skills, and even people.

✓ MIGRATING TO OPEN SYSTEMS WITHOUT CHANGING APPLICATIONS

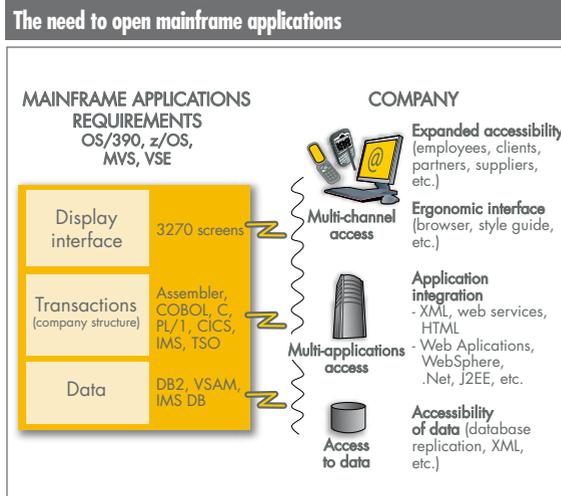
It is perfectly possible to migrate z/OS applications, with iso-functionalities, to Unix or Windows platforms. IBM and several other software publishers actually produce the complete range of software needed: compilers and Cobol operating environments, as well as transactional monitors that are CICS or IMS compatible. Ultimately, the applications run on an Intel platform in exactly the same way as they do with z/OS.

Historically, the reason for this kind of approach was to reduce the operating costs in terms of hardware, for

applications that were unlikely to be significantly developed any further. However, the economic reasons for this are largely unfounded now that the performance to cost ratio for z/OS servers is evidently identical to that for Unix or Windows environments, with all types of workstations.

✓ TRANSFORMING THE MAINFRAME INTO A SAFETY DEPOSIT BOX FOR DATA

Another solution is that of reducing the role of the mainframe to that of a data management unit. In this case, the mainframe either runs solely a DB2 or Oracle engine, or data is accessed via existing transactions. New applications are hosted externally on a Unix or Windows platform. In such cases, multi-application skills are needed and the integration phase becomes far more complex.



✓ GUARANTEEING A SMOOTH TRANSITION

With a few rare exceptions, no company has unilaterally opted for any one of the solutions described above; making the decision to permanently and ruthlessly abandon their mainframe. Even though this is a question of long-term approach, it is necessary to adopt a migration schedule that is spread over five to ten years, generally beginning with the most strategic applications. During the

“A desire to move towards web development and to modernise on-screen displays are the two main reasons that drive companies to migrate their 3270 applications”

transition period, new and old applications should therefore continue to communicate. On the other hand, those that will migrate last must be rapidly modernised, largely in terms of their ergonomics. They should also be available to clients, partners or new users, via the web or intranet, on a one-off or long-term basis.

RETAINING APPLICATIONS ON THE MAINFRAME: A SUSTAINABLE SOLUTION

More and more often, the inherent capabilities of mainframes and the wealth of existing applications that they host are influencing the decision to retain them. Applications are sometimes redesigned and sometimes kept as they are, and simply opened up or modernised.

✓ REDESIGNING APPLICATIONS WHILE RETAINING A MAINFRAME

With the notable exception of Microsoft packages, the majority of operating environments, DBMS engines and other ESB buses are available using z/OS, including the WebSphere range from IBM and SQL engines from Oracle and IBM. Even though applications may be redesigned in order to redevelop them using Java, it is perfectly possible to retain a mainframe. This process can prove to be all the more gradual since old and new applications will cohabit on the same platform and can therefore communicate easily, without overloading the network.



✓ DISPLAYING APPLICATIONS IN THE FORM OF WEB SERVICES

An approach that is less intrusive and ultimately equally as suitable consists of displaying existing applications in the form of services that are easily accessible from outside. Either by calling them up via a completely redesigned user interface, or by integrating them into an SOA architecture (Services-oriented architecture) in which old and new applications will be seamlessly combined.

This method can be non-intrusive thanks to an intermediate level that communicates with the applications and is queried like a web service.

It may be even less intrusive, particularly if you wish to redefine the scope of application services that are suitable



for display in the form of web services. Operating more or less automatically, code analysis tools facilitate this task, which goes hand in hand with the organisation of a company's processes.

✓ UPDATING THE ERGONOMY OF APPLICATIONS WITHOUT MODIFYING THEM

According to the market research firm IDC, the desire to move towards web development and updating displays are the two main reasons that drive companies to migrate their 3270 applications. It is nevertheless possible, without altering anything in the environment of these applications, to considerably improve their ergonomics, or to even enhance them functionally. These kinds of improvements will be noticed immediately by users. The structure of new interfaces may be similar to 3270 screens, or, on the other hand, it may be possible to combine several screens, or even to modify the sequence of inputs.

Development may also be gradual, in order to minimise disruption to ongoing operations. There are a large number of tools designed to facilitate just such an approach. However, attention must be paid to their performance and their cost as well as how they guarantee

secure access and how easy they are to deploy, which must be possible without disrupting production. These are all criteria that determine the type of architecture: deployment on the mainframe itself or on an intermediate server. Moreover, the support of Web 2.0 technologies is a major asset, enabling an interface to be designed, with ergonomics that are similar to those of a thick client application.

✓ OPENING UP WEB ACCESS TO MAINFRAME APPLICATIONS

An approach that is even more straightforward than modernising the ergonomics is opening up mainframe applications to the web, using a system that is often known as web-to-host, allowing them to be made accessible to new groups of users, either inside or outside the company. These users may be clients, suppliers or partners. The choice of a web-to-host tool and an ad hoc architecture is once again based on questions of performance, security and ease of implementation. On the other hand, certain products go beyond a simple reproduction of 3270 screens on web pages. Specific parameterisation actually allows ergonomics and presentation to be slightly improved, specifically in order to comply with a company's style guide. Ultimately, there is a certain degree of continuity between simply opening up web access and completely redesigning the ergonomics of an application.

Making mainframe applications citizens of the web: A new challenge for IT system management teams

The spread of web and internet based technologies is now opening up new and extremely interesting ways of implementing solutions for developing and integrating powerful and scaleable mainframe applications. Depending on operational requirements, the technical background and strategic priorities, there are a number of solutions available to companies that enable them to make their mainframe applications independent «citizens» of an IT system that has expanded via the internet to the entire ecosystem. Frequently linked to the choice of technical architecture, these solutions are all characterised by the fact that they are easy to implement as well as by their performance and their return on investment.

THE TECHNICAL ARCHITECTURE, A KEY SUCCESS FACTOR

Two types of architecture, with two or three layers respectively, allow existing applications to be retained in a non-intrusive manner, whether you want to gain access to them via a web interface, redesign the ergonomics or display them in the form of web services. The choice of architecture has major implications for the way in which you perceive the future of these applications and, in a more concrete sense, for the performance, scalability, ease of implementation and cost.

✓ ARCHITECTURE WITH THREE LEVELS AND MORE: A «POTENTIAL NIGHTMARE» OF A MAINFRAME

Implemented over a decade ago, the most classic architecture consists of using an intermediate server to create an interface between

the mainframe, on the one hand, and PCs equipped with navigators or machines hosting new applications, on the other. Running Unix or Windows, the majority of these servers host a 3270 emulation and an HTTP server, as well as a re-formatting tool or communication interface (for example, SOAP/ XML support in the case of web services).

With at least three levels, this topology is suitable for companies that wish to use their mainframe as a «black box» with applications that will not really be required to develop.

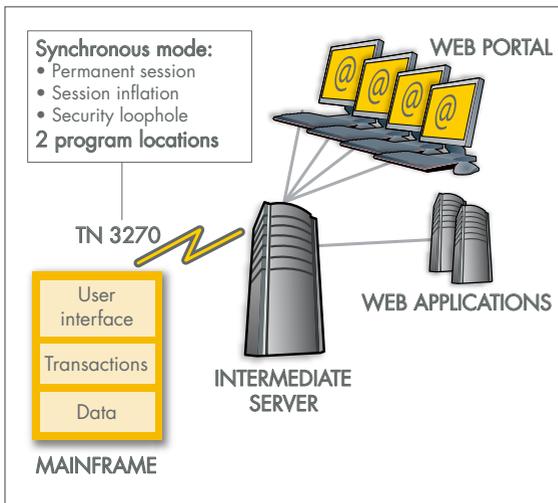
Priority is therefore given to new applications running on Unix or Windows, which only communicate directly with identical systems. In this context, an intermediate server is seen as an advantage.

However, it has its drawbacks: one of these being the addition of a link that represents a potential bottleneck. In physical terms, this is one more machine to be deployed, maintained

and supervised. What is more, communication with the mainframe places an additional load on the network.

At the same time, the majority of market solutions that adopt this architecture manage their emulator via the PC browser, in the form of a plug-in or Java applet, which creates a problem with deployment, updating and, once again, with network capacity. Ultimately, implementation of this architecture requires multi-application skills (mainframe, Unix or Windows and web).

The most widely used architecture for accessing mainframes



✓ DUAL LAYER ARCHITECTURE: THE MAINFRAME AS A CITIZEN OF THE IT SYSTEM

A far simpler architecture consists of installing the integration platform that creates the interface on the mainframe. In this case, the system comprises an HTTP server and a monitor, which communicates with existing applications, usually by simulating end users or experts. The main advantage lies in the capacity of the mainframe and interactivity with applications (data and

transactions) that can continue to be utilised.

In the first place, this choice has philosophical implications, which can be attractive to companies that want to continue developing their existing applications using z/OS, and to therefore retain ad hoc skills. In this case it makes complete sense to entrust the mainframe with hosting a solution that will enable the ergonomics of old applications to be updated or to open them up. With this in mind, this type of mainframe becomes a fully paid-up citizen of the IT system.

Other benefits are much more concrete: on the one hand, supervision and maintenance are completely centralised. In particular in the event of application development, integration and testing are greatly simplified, while, on the other hand, performance is optimised: communication with applications takes place within the machine, without the need for emulators of any kind.

Client workstation browsers or applications installed on Unix or Windows servers communicate directly with the HTTP server, which forms part of the integration platform. The latter generates XML traffic or the corresponding HTML pages, meaning that client workstations do not need either a plug-in or Java applet. Ultimately, performance is improved simply because

the integration platform is optimised for the mainframe, particularly where it is written in z/OS assembler. In the end, the costs of implementation and operation are broadly reduced compared to a multi-tier architecture.

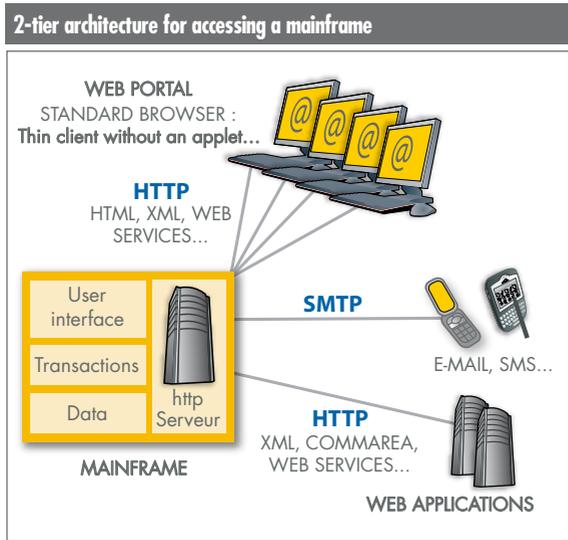
What is more, the latest versions of z/OS now comprise all the functionalities needed to manage access certificates.

✓ SIMPLE OPENING UP OF WEB ACCESS

The accessibility of mainframe applications from a standard workstation via a «universal» channel is the primary requirement of development. In this context, the advent of web technologies presents a real opportunity. In the case of dual layer architecture, web access to applications is simplified, as the platform needs to include both a communication monitor and an HTTP server. In this way, it communicates with the application via a VTAM relay (Virtual Telecommunications Access Method) then converts and formats 3270 traffic destined for a basic web page that is accessible via a secure URL.

When data is entered, a dynamic conversion is performed in the opposite direction. This allows users to see exactly their usual screens, with the identical background colour and characters. It should be noted that any kind of terminal may be used - PC, PDA, mobile phone - so long as they have a web browser. This provides a solution that is perfectly suited to the issue of mobility within a company.

In addition, the page can be slightly modified, for example, in order to personalise the fonts or the background, or even to add images or text. It is possible to grant partial or complete access by managing user profiles. It can even be adapted, depending on the user's language and the corresponding



TOWARD A NEW AND DYNAMIC WEB INTERFACE

Whether it is installed on a mainframe or remotely deployed on an intermediate server, an integration platform for mainframe applications can take various forms, depending on whether it is a question of simply opening up web access, of redesigning the ergonomics or integrating existing applications into a service oriented architecture. However, in all cases, an «intelligent» interface is used in order to perform dynamic conversions. The main criteria when choosing a solution are simplicity, speed of implementation, a reduction in costs, performance and secure access.

font. This is a simple and elegant way of making an application that is designed to be used by several subsidiaries, multi-lingual.

In terms of security, the integration platform should support and organise both mainframe mechanisms (RACF, TSS, ACF2) and those for IP and web environments (filtering by context, secure URLs). It should also take account of printing issues, for example by generating PDF files or triggering a 3287 print out in a browser window, which can then be printed.

Example

Simplified web accessibility:

A major French automotive manufacturer has installed this type of web access.

- The aim is to provide the international commercial networks for two brands of vehicles with access to the group's «legacy» applications via a simple standard client workstation.
- Reasons for the choice: no development, no deterioration in performance, a solution that comprises multi-lingual management including Asian languages.

✓ MODERNISING THE APPLICATION INTERFACE

Beyond simple access to applications, the traditional 3270 interface frequently hinders the use of these applications. Without necessarily redefining functionalities, redesigning browser ergonomics and the appearance of screens is frequently a major objective.

Continuing on from the previous solution, it is possible to go further in improving the ergonomics, even without modifying the browser structure, thereby retaining a 3270 screen for web pages. Using an approach that relates simply to parameterisation, it is possible, for example, to facilitate data entry by adding multiple-choice lists. These can be either permanently integrated into a page or generated by dynamic copies. In the same way, scroll bars, hypertext links, check boxes or calendars for filling in date fields can be added.

This type of formatting only affects the HTML code for the web page and therefore does not require a knowledge of both mainframes and the web. The use of Web 2.0 technologies (Ajax, scripts and JavaScript libraries, REST architecture) enables responsiveness and ergonomics to be improved, specifically by refreshing only those screen areas that need to be refreshed.

Example

Interoperability of applications with gradual improvement of the user interface:

A large financial group wanted to revamp the user interface for one of its key applications.

- The aim was to bring it into line with group standards in terms of the style guide and browser ergonomics.
- Constraint: revamping 3270 screens without modifying the application.
- Solution: integration of each functional 3270 screen into a new web page in accordance with the style guide, and using Ajax technologies to create a real improvement in terms of use (support for data entry, simplified browsing, new generic menu, etc.).

New dynamic web interface using a 3270 screen



Typically, some changes may relate to existing 3270 screens, others to information and help for data entry that have been added. This development work is greatly reduced by the use of open source widget libraries from Yahoo or Google, which are often provided by the publisher of the integration platform.

Ultimately, users will believe they are browsing within a modern dynamic web application, while it is actually their usual application that is providing the data and performing the transactions.

From the point of view of development, this solution has four major advantages: no need for combined knowledge of mainframes and the web, no changes are made to the mainframe application, implementation is quick and the related costs are therefore fully controlled.

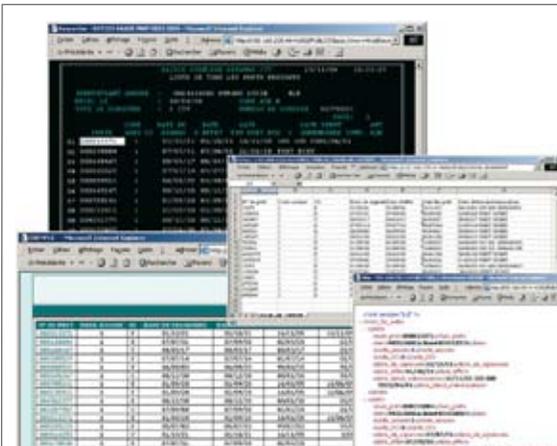
✓ MODERNISING THE APPLICATION INTERFACE AND FUNCTIONAL IMPROVEMENTS

For certain projects, modernising applications may also result, in addition to redesigning the interface front-end, in functional and browser-related development. In these cases, it becomes a question of moving away from the structure of 3270 screens in order to recreate a new web application based on data and transactions from the mainframe application.

Thanks to the flexibility provided by XML, mainframe applications and Unix / Windows can evolve independently of each other"

By combining reformatting techniques and the functionalities of the integration platform, which communicates with mainframe applications, it is possible to go as far as completely redesigning the ergonomics of an application. The initial sequence of screens can therefore be completely masked, in terms of both display zones and data entry fields. This means that nothing stands in the way of combining in a single web page, fields or information that have previously been spread over several screens, or conversely, dividing a single 3270 screen over several web pages. A redesign of the ergonomics may also be accompanied by functional improvements, such as the addition of data from other applications or the formatting of data in the form of dynamic tables. Finally, it is possible to retrieve

Example of retrieving data from a central application in various formats: HTML, Excel, xml



data resulting from a query in Excel or PDF format.

The application is therefore able to continue to evolve and the user interface is created solely on the basis of HTML pages.

✓ INTEGRATING MAINFRAME APPLICATIONS INTO WOA ARCHITECTURE

The need to develop mainframe applications can ultimately be expressed as the pure and simple dynamic integration of host data and transactions into new applications.

For a long time, the integration of mainframe application services into new J2EE or .NET type applications has been carried out using relatively rigid client / server mechanisms that were complicated to implement. These have been, for example, program to program communication protocols (such as APPC), asynchronous middleware (such as MQ Series) and EAI or ETL tools. By allowing loose coupling and standardised access to services and data, service oriented architectures (or SOAs), have changed the situation.

The whole issue is then how **to display existing applications, and particularly transactional services, in the form of web services, using an inter-application interface.** Now universal, the combination of HTTP and XML



is all that is needed to build this type of complete and flexible interface. The distributed software components are integrated into a web oriented architecture, or WOA, a streamlined version of an SOA, which for its part uses a more restrictive protocol (SOAP).

In more concrete terms, HTTP and XML enable files to be exchanged, for example between one mainframe application and another, running Unix. The role of the integration platform, in this case, is to translate the traditional Commarea fields of the mainframe application into XML; these are usually read by simulating an expert user. Simple parameterisation enables these fields to be matched with those of the Unix application. Thanks to the flexibility provided by XML, the mainframe and Unix / Windows applications can develop independently of each other, without the interface that connects them being redesigned.

Conclusion

Thanks to the use of the various technologies and architectures outlined in this white paper, IT management teams now have at their disposal, interoperability solutions that are tailored to their needs, from the most basic access to the most sophisticated integration. What is more, the global cost of these solutions, as well as their simplicity and the speed with which they can be implemented, are now opening up new possibilities for modernising and integrating mainframe applications.

Ultimately, based on standard mainframe and web technologies, these solutions, which are genuinely scalable, enable «inherited» applications to become citizens of a company's entire IT system. These applications are therefore able to form an integral part of the Information System and no longer put a stop to either its development or its necessary adaptation to meet new business requirements. ■

ABOUT SYSPERTEC



For many years, SysperTec has been providing IBM's major clients with solutions in terms of interoperability and different types of connections. These architectures, which are used by hundreds of clients, support access, scalability and integration of applications and data from a central site, making them citizens of the web.

To find out more about SysperTec's solutions please visit:

www.syspertec.com

To find out more about SysperTec visit:

<http://www.syspertec.com>

Registered office
SysperTec communication
196, Bureaux de la Colline
92213 SAINT CLOUD cedex
France
Tel: +33 (0)1 46 02 60 42
Fax: +33 (0)1 46 02 59 98