White Paper

We make sure

FUJITSU COMPUTERS SIEMENS

Dynamic IT as the Basis of Service-Oriented Architectures (SOAs)

Published March 2007

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Introduction

Lower costs for application development, system integration and application maintenance, accelerated integration of applications, more flexible adaptation of existing applications to future changes in technology and, not least, the ability to develop and market new products and services more quickly – these are just some of the many benefits that companies are expecting from a new approach to application design resulting from the introduction of service-oriented architectures (SOAs).

Service-oriented software design (using web service technology, for example) involves the development of modular, reusable software units that can be distributed across different systems. The resulting flexibility leads, on the one hand, to greater dynamism in the development of new applications. On the other, running software in distributed environments places special demands on the underlying IT infrastructure. IT organizations thus have to deal with the consequences of the new software architecture on their IT infrastructure. Is a traditional IT landscape still able to support a dynamic software landscape adequately?

Experts are in agreement that an infrastructure that is not flexible quickly comes up against its limits, resulting in performance problems. Companies pursuing an SOA strategy should therefore view a service-oriented infrastructure as an important prerequisite. An innovative software infrastructure requires an innovative IT infrastructure. Only then can the full potential of a service-oriented architecture be exploited.

In addition to providing a brief introduction to SOA, this white paper describes the approach of Fujitsu Siemens Computers to the implementation of a service-oriented infrastructure. As part of its Dynamic Data Center strategy, Fujitsu Siemens Computers has developed products, solutions and services for the creation of dynamic IT infrastructures that offer a pragmatic approach to putting in place an SOA. At the same time, these allow companies, even in the short term, to successfully reduce the costs of running their IT infrastructure and increase its flexibility.

Challenges of traditional software design

The problems involved in designing application systems today result from the fact that organizational rules increasingly become integrated in the software over time. This has led to systems with highly interlinked applications that are optimized for a specific business process and therefore work highly efficiently and at extremely high speed. However, it is extremely difficult for them to cope with organizational change. As soon as slight changes are made to the business process, they are rendered useless. Companies therefore have to either make do with the existing application systems or replace them with new ones.

However, this is generally extremely problematic. In environments that have grown organically with many links between systems, a situation inevitably arises in which application systems cannot be replaced just like that. Generally, the only option is to add further application systems whose functionality largely duplicates that of the existing systems. As a result of this increasing complexity, the system as a whole becomes increasingly ineffective and inefficient. Service-oriented architectures have emerged in response to this situation.

Features of a service-oriented software architecture

One of the main design features of an SOA is the separation of the pure functionality, which is provided by a service, from the logic, which combines the various services to form a business process. Ideally, all service modules are largely free of organizational rules. Not until the services are orchestrated (i.e. when the business process is formally described) are the required rules added.

An essential feature of an SOA implementation is the splitting of existing applications between several different service modules. A pool of independent, reusable services emerges, from which more complex services known as composite applications can be formed. To reduce the dependencies between individual services to a minimum, they are only very loosely coupled. This has the advantage that they can be replaced or even completely removed without there being side-effects on other services. It thus becomes significantly easier to adapt or completely redesign business processes. Services are registered and published in a central directory. All the relevant information for the service call can subsequently be obtained from this directory. Another important component of an SOA is the enterprise service bus (ESB), which permits communication between the different services and is also responsible for the transformation of different message formats as well as security aspects.

Although an SOA can be set up on any service-based technology, web services have emerged as the technology platform for implementing an SOA.

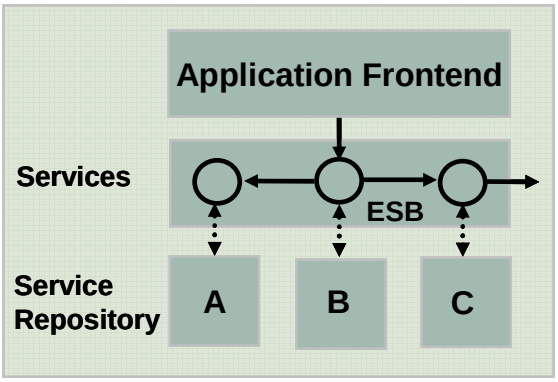

Figure 1: Components of a service-oriented architecture

Benefits of a service-oriented architecture

SOA combines flexibility with efficiency

Independent, reusable and loosely coupled services provide the basis for faster development times and greater flexibility in the configuration and reconfiguration of services as complete business processes. The use of standard-based web services also makes it easier to integrate the services of business partners.

The main benefits resulting from the increased flexibility and speed of software design are that innovative products can be developed more quickly, thus securing a competitive advantage, and that it is possible to respond much more quickly to changes in customer demand, the statutory framework or competition.

However, significant TCO savings are also possible when it comes to internal IT operation as a result of the reduced costs of developing, integrating and maintaining software.

One aspect that should not be forgotten is investment protection for existing applications. These can continue to be used in a service-oriented architecture with the help of web services.

Impact of SOA on the IT infrastructure

A software architecture based on SOA principles can considerably improve the interoperability of the applications in a company, but it cannot provide really agile IT on its own. What is needed is a flexible and dynamic infrastructure, a service-oriented infrastructure (SOI).

Pooling and sharing as an essential common architectural strategy

In principle, a service-oriented infrastructure consists of a combination of physical IT resources using system-related software designed to meet the special requirements of an SOA-based application landscape. Many of the features generally associated with SOA at the software level are found here as well.

Just as a pool of modular, reusable web services that can be flexibly reconfigured is formed in an SOA, the use of physical IT resources is no longer directly tied to a specific purpose in an SOI. In an SOI, IT resources are collected in a resource pool and viewed as replaceable units that can be reorchestrated, as required, to provide the best possible support to a service.

The main difference between the two worlds is the way in which the dynamic provisioning of physical IT resources is handled. If services are reorchestrated in an SOA on account of changed business requirements, it is assumed that the required IT infrastructure is also available. An SOI ensures that this is also actually the case.

The problems of shared services

The effects that SOA design can have on the underlying IT infrastructure can be clearly demonstrated by examining the trend toward access to web services being provided to an increasingly large group of users. Initially developed perhaps only to be used internally within an organization, in the course of changes to the business model, services are now also being made available to partners as well as to a broader public. General access to web services makes it increasingly difficult to predict the extent to which these services will be used. It is thus no longer easy to plan the scale of the IT infrastructure supporting them. There is a risk that if a particular service is overloaded, it will block an entire business process.

The problem gets worse in the case of several business processes sharing an overloaded or even failed service. It is not just one business process that is impaired; all other business processes that use this service are also affected.

The more these services become part of business-critical processes, the greater is the necessity of finding a way of making additional IT resources available to this particular service while avoiding extended downtimes.

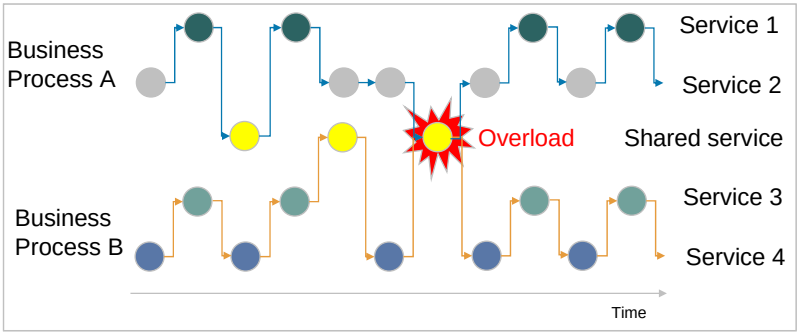

Figure 2: Overloading of a shared service

Support for a flexible and distributed application design

Another particularly attractive aspect of SOAs to companies, which, however, can only be supported inadequately using traditional IT infrastructures, is the flexibility of being able to combine individual services, as required, to form new business processes. The more often general business conditions require the business processes to be adapted, and the more that services that make up an application or an entire business process are distributed across several systems, the greater will be the effort required to supply the individual systems with the required services.

To support this dynamic process in the best possible way, you need a central dynamic resource management for the management of all resources that support a business process. This is similar to central SOA service management, which keeps all services in view and is responsible for their orchestration. Dynamic resource management takes care that as many management tasks as possible run automatically. This includes deployment of services, the monitoring of resources, but also actions that are required as a result of failure situations.

Blade server show particularly strength in this area. As a result of their central management architecture, they prove to be an excellent platform for supporting dynamic software architectures.

Dynamic Data Center: a new IT infrastructure for SOA

With its Dynamic Data Center strategy, Fujitsu Siemens Computers meets the demands placed on a service-oriented infrastructure and thus creates the optimum conditions for the operation of the modular software structures that exist in an SOA. Figure 3 shows the fundamental structure of the Dynamic Data Center architecture. The basis is formed by a virtualized IT infrastructure. The virtualization of server, storage and network resources or the application software permits the formation of resource pools that are better suited to the finer granularity of the service modules compared to monolithic applications. The flexibility thus obtained gives IT administrators better control of the utilization and resource management of their systems. Extensive automation of the processes involved in making IT resources available to a service is of particular importance.

Dynamic resource management

Figure 4 shows the basic principle behind an IT infrastructure based on dynamic resource management. A pool of servers linked across a network to a storage system containing both the operating system and the application images is monitored centrally by a control center. The control center automatically intervenes when corrections have to be made to the system. In the event of an error, services can automatically be restarted on another server. It is also possible to respond to changes in the load behavior by using more resources in overload situations and removing resources when there is less load.

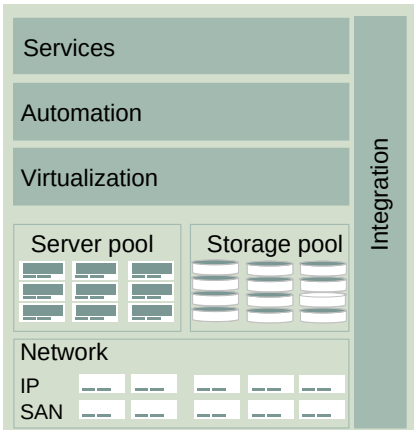

Figure 3: Dynamic Data Center architecture

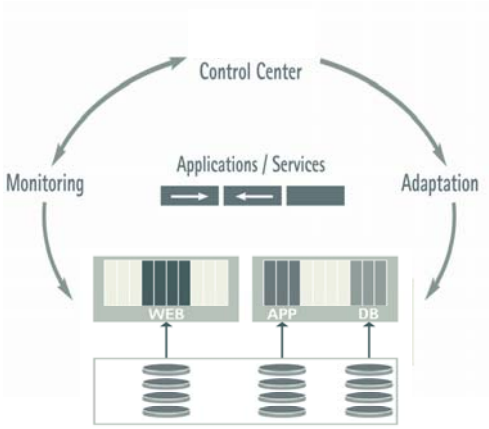

Figure 4: Dynamic resource management

The focus is on the service: integrated service level management

A service-oriented architecture places the focus on the requirements of the services. Services should therefore largely be able to determine which and how many IT resources they require.

In service level management, tools for the monitoring and controlling of services help IT administrators comply with service level agreements. For this purpose, SOA platform-specific products such as Oracle Enterprise Manager Grid Control or Microsoft Operation Manager (MOM) come into operation. In addition to displaying events and reporting for trend analyses, comprehensive monitoring of service-specific performance metrics is offered. The goal is to detect and solve performance problems at an early stage before service level agreements are violated.

But the focus of such products is more on automatic reporting of events. Taking further automatic corrective actions as a result of reported problems is subject to restrictions, however. If rapid adaptation of the IT infrastructure is required to solve a problem, these tools come up against their limits.

With its Dynamic Data Center strategy, Fujitsu Siemens Computers is pursuing a new approach by integrating the service monitoring tools of leading ISVs with a control center for IT infrastructure resources and thus providing the link between service management and the dynamic resource management of a virtualized IT infrastructure.

All large ISVs today are converting their existing applications to modular web services as part of their SOA strategy. This represents a major investment. Fujitsu Siemens Computers responded to this trend at an early stage, working closely with its partners on the development of service-oriented infrastructures and on integration in their SOA environments. The result is dynamic IT solutions that are able to manage the required infrastructure largely autonomously and thus create added value for the operation of SOA platforms.

Benefits of a service-oriented infrastructure

The Dynamic IT solutions of Fujitsu Siemens Computers contain pretested combinations of all the building blocks required for flexible, service-oriented IT architectures: servers as well as storage subsystems, network technology, middleware and end applications. As well as minimizing the implementation effort and investment risk, we thus offer our customers simply and rapid integration of new hardware components in existing resource pools and a smooth transition to improved cost efficiency and increased flexibility in IT operations.

The use of dynamic IT solutions can reduce the total cost of ownership in important IT areas by 30 or 40 percent or more, while at the same time ensuring consistently high service quality and reducing the required outlay.

- The huge potential for consolidation resulting from the reduced complexity of SAP, Oracle and Microsoft environments and significantly falling administration and maintenance outlay has a positive effect on costs.
- An IT architecture based on resource pools and dynamic resource management offers cost-effective high availability oriented to customers' requirements. Additional complex high-availability and disaster-recovery configurations on the basis of cluster technology only become necessary when an extremely high level of reliability is required.
- Dynamic IT solutions support more flexible adaptation of IT resources to changing business requirements. The use of application-specific metrics in a Dynamic IT solution provides a control center with a more differentiated range of decision-making options when responding to workload situations and thus significantly more efficient workload management. All actions are more appropriate to the requirements of the services. This improves the quality of the services that form a business process with lasting effect.

FlexFrame for SAP from Fujitsu Siemens Computers was the first dynamic infrastructure solution for SAP environments to appear on the market. With **FlexFrame for Oracle** and **Dynamic IT for Microsoft**, as well, Fujitsu Siemens Computers is one of the few vendors to offer service-oriented infrastructures for all the important SOA platforms.

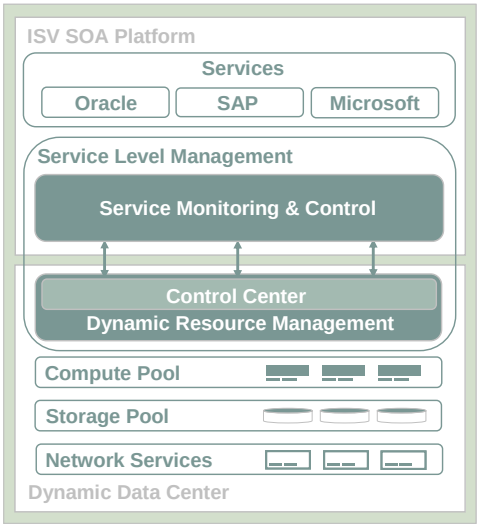

Figure 5: The Dynamic Data Center combines service and resource management

Integration software for SOA: openSEAS

The extraordinary reliability, performance and scalability of mainframes means that they are still the strategic platform on which many companies run their business-critical applications. In the course of the introduction of service-oriented architectures, IT managers are increasingly asking whether and how these applications can be converted to the new SOA world.

The SOA concept allows existing applications to be integrated through the use of special adapters. As a result, not only can companies continue to run their applications within the framework of their existing processes; they also have the option of reusing their core applications in other business processes. The investments they have made in the development of their application landscape are thus secured with long-term effect.

Many customers have a strategy of leaving their business-critical services on the mainframe and transferring all other services for price/performance-related reasons to other server architectures (industry standard servers, for example).

With the middleware suite openSEAS, Fujitsu Siemens Computers offers products that permit rapid and cost-effective integration of applications into SOA environments. The product WebTransactions allows legacy applications to be encapsulated and reused as web services, which then run in composite applications. Web services can be generated automatically from an existing application. The advantage is that the application does not have to be changed or adapted in order to be integrated. The product BeanConnect in the openSEAS suite links legacy systems with modern J2EE application server applications. The connections are bidirectional and can operate with transaction-oriented security.

SOA consulting

In order to offer customers the best possible support in their SOA projects, Fujitsu Siemens Computers works with its regional partners to offer services that cover the entire application and infrastructure landscape and accompany customers through all phases of an SOA project. Fujitsu Siemens Computers contributes its expertise in setting up service-oriented infrastructures, while our partners focus on the application-specific aspects of the design of a service-oriented architecture.

Summary

Hardware concepts that have grown organically over time and are closely tied to particular applications are very unsuitable for supporting dynamic service-oriented software concepts. Only a flexible, service-oriented infrastructure allows the dynamic adaptation of IT resources to constant changes to business processes. Modularity and flexibility through SOA at the software level are supported to optimum effect by virtualization and automation technology at the infrastructure level. This is exactly the approach pursued by Fujitsu Siemens Computers with the Dynamic Data Center strategy.

SOA is taking on an increasingly higher priority on the CIO agenda. Many are convinced that SOA is the architecture of the future. Analysts forecast that SOA concepts will be behind the development of over 50% of all new business-critical applications and business processes in 2007. By 2010 this is expected to rise to over 80%.

Despite this, many companies still do not have a precise idea of how to go about implementing an SOA cost-effectively. The development of a service-oriented infrastructure can be a first step. The immediate benefits in terms of costs and flexibility allow companies to create a solid foundation for a more comprehensive SOA.

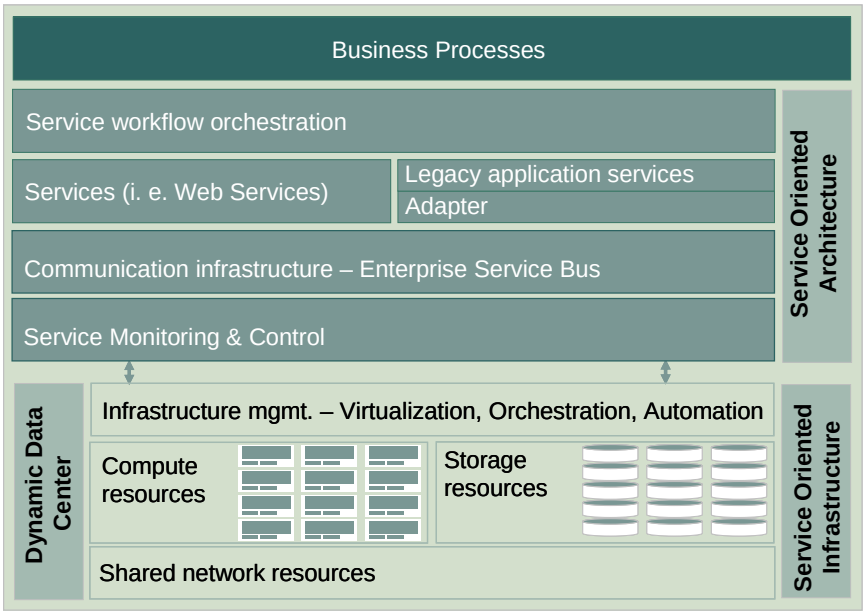

Figure 6: The Dynamic Data Center is Fujitsu Siemens Computers' implementation of a service-oriented infrastructure

Additional information:

- **Service-oriented architectures**
  http://www.fujitsu-siemens.com/it_trends/dynamic_data_center/soa.html
- **Dynamic Data Center**
  http://www.fujitsu-siemens.com/it_trends/dynamic_data_center/index.html
- **FlexFrame for SAP**
  http://www.fujitsu-siemens.com/solutions/it_infrastructure_solutions/sap_infrastructure/index.html
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