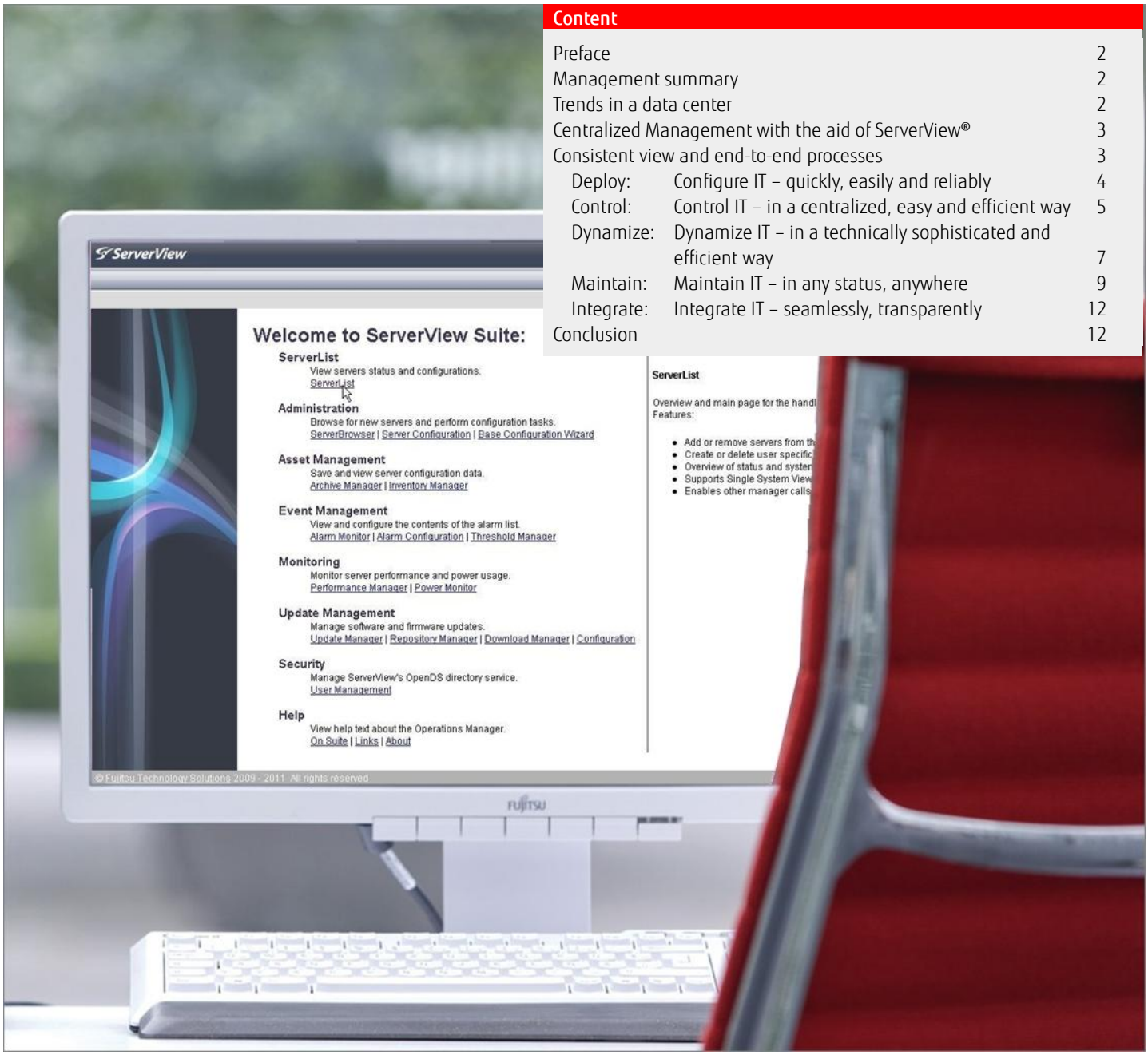
# White Paper
## Fujitsu ServerView® Suite
## Integrated Server Lifecycle Management

The Fujitsu ServerView® Suite offers all the functions required for fail-safe, flexible and automated 24hr operations and improves productivity via intelligent system management solutions. This white paper provides an introduction to the benefits and functionality of the Fujitsu ServerView® Suite.

**Content**





## Preface

This white paper provides an introduction to the benefits and functionality of the Fujitsu ServerView® Suite, the management tool from Fujitsu Technology Solutions used for the administration of industry standard servers. It is aimed at a broad-based readership, who would like to know how - through the use of advanced concepts - modern IT infrastructures can be managed in a **simple, fast, dynamic and above all cost-saving** way. Therefore, the emphasis is initially placed on economic aspects and only then on the technical ones.

## Management summary

Companies today expect considerably more from their IT departments than just the safeguarding of computer operations: Irrespective of the economic situation the pressure to continue to provide services, which are equal to or even better than the previous ones, is on the increase while budgets are frequently stagnating. To ensure that this task does not become insurmountable Fujitsu has been continuously revising ServerView® Suite functionality in order to meet increased demands. The focus is traditionally on those functions, which ensure fail-safe and flexible operation of servers in addition to the constant availability of business-critical data and which also facilitate their consolidation. The focus was recently placed on integrating technologies for the virtualization, dynamization and automation of IT landscapes up to their integration in cross-location and corporation solution concepts, e.g. cloud computing. The Fujitsu ServerView® Suite offers a comprehensive administration covering the overall lifecycle of individual computers as well as entire machine parks and which combines decisive cost benefits with maximum performance and user-friendliness. The resulting progress is shown in detail on the following pages.

## Trends in a data center

The role of corporate IT has undergone a fundamental change since the mid-nineties. Data centers and specialist departments were usually regarded to be just a "necessary evil", but now the integration of e-mail and Internet for internal and external communication and all kinds of work processes means that they have become central units upon which successful business operations greatly depend. This development has recently been accelerated by the introduction of a range of fully web-based services, platforms and distribution models, which have become known as cloud computing and "Software as a Service". IT managers and their employees now face not only a constant increase in the range of traditional tasks, but must also handle the transition to new infrastructure concepts using models that are now completely new and different; in the same way that today's standard models are so different to those used in the pre-Internet era.

Now recognized as an important department within the corporate network, there is an increased obligation to undergo economic cost/benefit analyses - just like other departments - and to provide added value to the company. However, the administration of computer infrastructures is still an increasing cost factor - and will continue to be so for the time being. According to a survey carried out by the market research company IDC last November, IT expenditure worldwide will increase to approx. $US 250 billion by 2013, whereby less than 20% will be invested in hardware (cf. Fig. 1). In fact server management and administration costs is the largest single block, in other words, spending for the regular operation of servers including installation, monitoring, maintenance and integration in existing IT landscapes, and this calculation covers both physical and virtual systems.

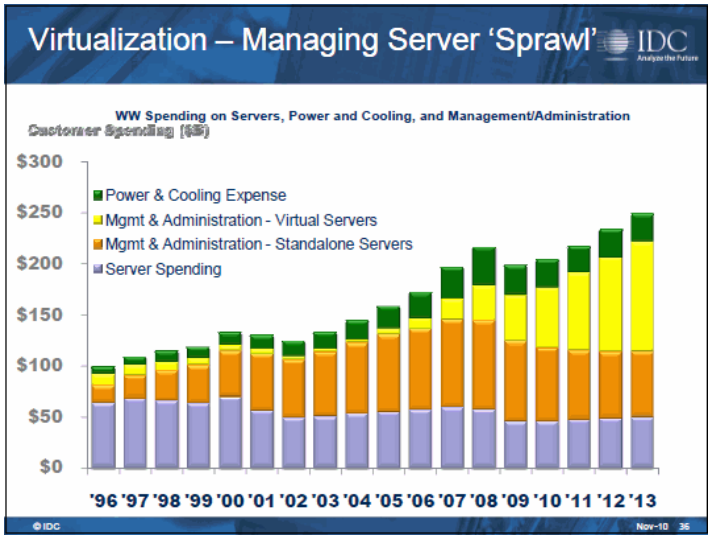



Fig. 1: Development of the worldwide spending for server hardware, power and cooling as well as the management/administration of infrastructures since 1996 (Source: IDC)

Fujitsu reacted to this development early with the introduction of the ServerView® Suite, which is a basic part of all PRIMERGY server models. This management platform has been developed from the outset to consistently control all relevant processes on an end-to-end basis from one central point. Since then the scope of functions has been constantly extended. The traditional key objectives are:

- Secure and automated installation of servers;
- End-to-end status monitoring to ensure as much uninterrupted and energy-efficient server operation as possible;
- Powerful tools and functions to simplify and automate flexible IT operations;
- Powerful tools and functions to avoid downtimes and thus ensure service quality as well as
- Seamless integration of the PRIMERGY servers in enterprise management solutions.

In order to achieve such objectives, Fujitsu uses technologies which simplify and accelerate the administration of computer networks on a long-term basis. The key terms here are on the one hand virtualization, and on the other hand dynamization and flexibilization as well as automated provision of IT resources. This also includes integration in heterogeneous hardware and operating system landscapes as well as uncomplicated links to cloud computing solutions.

## Centralized Management with the aid of ServerView®

A basic feature of modern computer networks is their constantly growing complexity which is in turn due to the number of applications used: today even small companies usually run a file, print, mail and web server. Small to medium-sized businesses have customer databases with several thousand entries. In larger environments user directories, reservation and ordering systems, invoicing, enterprise resource planning, business intelligence, development and testing environments as well as audio and video streams for internal and external use still frequently run on dedicated physical servers or are accessed from there as and when required. Added to these are the so-called legacy systems in networks that have grown over the years, i.e. applications which have been specially designed to run on specific hardware and/or software platforms that is today considered to be antiquated. And finally the ever-increasing expectations made of the availability of data, applications and systems ensure that infrastructures are designed to be redundant from the outset, which further increases the number of computers and the necessary administration work involved.

Virtualization, i.e. the use of simulated hardware environments, so-called virtual machines (VM), for certain applications pursues two goals in this connection. On the one hand, it enables the number of servers physically required for the operation of these possibly business-critical applications to be limited. Classic examples here would be the merging of various SAP function modules or Oracle database servers, which originally needed their own hardware on a single machine, or the use of materials management systems developed in the nineties but now on current standard hardware. In other words, virtualization increases the utilization of existing servers and simultaneously enables a "cleansing" of the machine park. That is accompanied by a long-term improvement in the energy balance, because the spending for power and ventilation or cooling, space requirements as well as $CO_2$ emissions decrease parallel to the number of systems. Therefore, as the costs decrease, efficiency increases – a consolidation effect occurs (cf. Fig. 2)

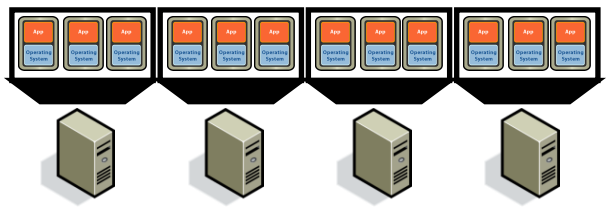


Fig. 2: The operation of several virtual machines on one physical host improves the utilization of the computers and thus enables the server landscape to be consolidated.

This effect can not only be utilized with a view to individual applications or server groups, but also for entire data centers and company networks. This approach first puts all the resources (servers, storage and applications) together in a central pool and then distributes them as required. These opportunities for workflow and IT management process flexibilization and dynamization are at the same time the starting-point for Fujitsu's Dynamic Infrastructures strategy.

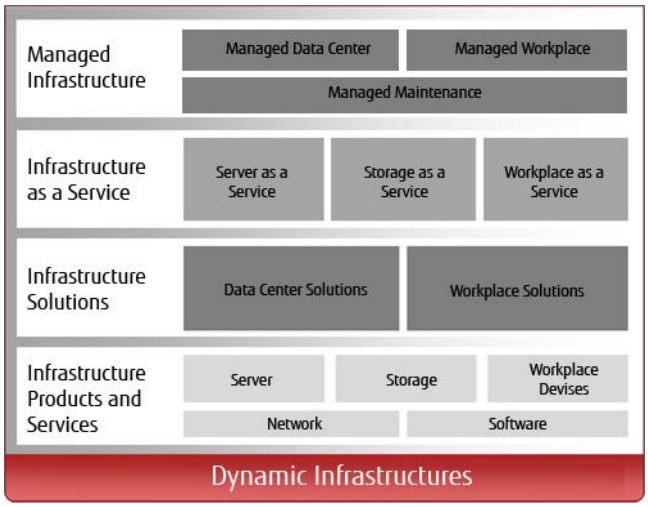


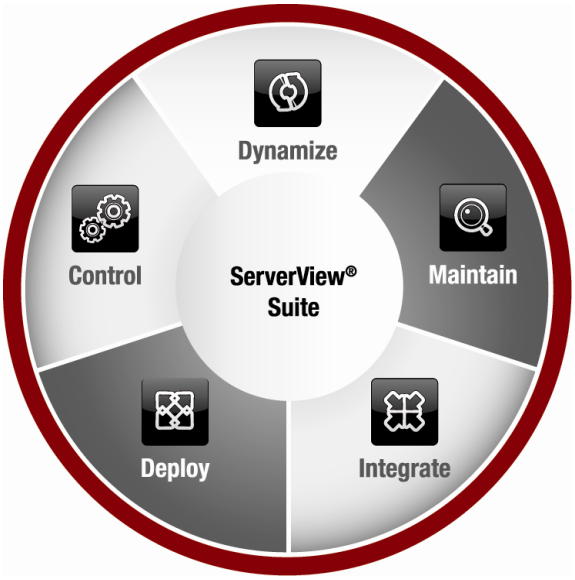

Fig. 3: Dynamic Infrastructures from Fujitsu: An optimally aligned offer

## Consistent view and end-to-end processes

However, the user still has a price to pay for newly gained mobility, savings in hardware procurement and optimized energy levels. Although existing capacities are better used thanks to virtualization and a medium to long-term reduction can even be achieved with them, administrative spending grows compared to conventional infrastructures with their clear-cut allocation of servers and applications. Therefore, companies need a management platform, which combines a consistent view of the IT landscape with comprehensive functions, which are centrally managed from a single point of control.

The Fujitsu ServerView® Suite is one such platform which is also easy to understand and operate. Functionally, it is divided into the **five subsections:** Deploy, Control, Dynamize, Maintain and Integrate: the main features and advantages of which are summarized here. It is designed for use in so-called Open Systems environments, i.e. on industry standard servers which run under the operating systems Windows and Linux (SuSE and Red Hat) or are used as hosts for VMs that use a hypervisor[i] like VMware ESX/ESXi, Citrix Xen Server or Hyper-V.

The Fujitsu ServerView® Suite consists of a combination of mostly free-of-charge server management modules and some chargeable automation modules; an overview is available at the end of this white paper.




## Deploy:
## Configure IT – quickly, easily and reliably

In summary the term Deployment denotes the field of activities of software distribution – from the initial setup / installation of an individual server to the allocation of a reference installation to a large number of servers right through to the cloning of a randomly configured system onto other servers of the same series.
The basic functions required for this purpose are automatic hardware detection, unattended hardware configuration, as well as software installation, including any necessary add-on products and the cloning of individual images. Independent tools are used to perform these tasks, depending on the application scenario, either individually or in combination with each other.

### ServerView® Installation Manager (SV IM)


The **ServerView® Installation Manager (SV IM)**, which provides two alternative methods, is available for the convenient installation of the server operating system on non-preconfigured hardware (so-called bare-metal installation):

- the typical installation, for which a few (typical) configuration parameters can be set, also automatically installs the required ServerView components;
- the user-defined installation, in which a customer-specific configuration of the target system is possible; in addition to the ServerView components it is also possible to integrate add-on software via an installation script.

In both modes Wizards guide you through the individual configuration steps and check all input for plausibility. As a result, operating errors are effectively avoided before they happen and reliable installation is ensured. The parameters acquired in this way can be saved in a configuration file (e.g. on a file server) and used again later for further installations or as a basis for their modification.

The Installation Manager can be booted locally from the ServerView DVD or from a USB stick, whereby it is also possible to access network resources in this mode if required. The Installation Manager can as an integral part of the Operations Manager be installed on the central management station (CMS), where it can configure and install up to five systems in parallel and unattended on a remote basis via the LAN. In order to rule out any hardware configuration errors it is possible - if requested - to work with real system data by accessing the target hardware.

Servers set up with the Installation Manager stand out for their high availability and reliability; setup, administration and operation only take very little time, and automated remote installation saves above all resources and time.

### ServerView® Deployment Manager (SV DM)

The second deployment tool, the **ServerView® Deployment Manager (SV DM)**, is responsible for classic software cloning. As a professional supplement to the ServerView Suite it requires a separate license. It is always used when dealing with the mass installation or cloning of operating systems and application software; it is also used for the simple regular backup of current server states. Thus its use in large server farms, in which identical quality criteria have to be met by a great many computers, is of particular interest. There are several deployment modes to choose from: image creation with subsequent mass cloning, remote mass installation as well as special image routines to support disaster recovery scenarios. The Deployment Manager has a task management system, which also runs all the modes automatically and on a time-controlled basis.

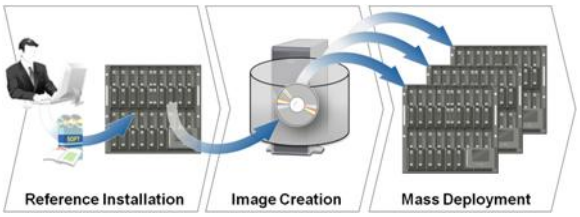



Fig. 4: ServerView Deployment Manager – Concept

Software distribution on the basis of **imaging and cloning** has distinct speed advantages to offer, particularly when installing numerous identical servers, because reference installations can be reproduced very easily and as often as you like. For this purpose, an image of the reference server is created, saved in a repository and then allocated to a compatible server or an entire clone group. Cloning can take place at the same time on all the machines of the clone group, with a special multicast mode effectively reducing the load on the LAN and ensuring a fast rollout. In a typical deployment application of up to 100 systems less than one and a half hours elapse between the start of the reference installation and the end of the cloning[ii].

The basis of **remote mass installation** is formed by the configuration files of the Installation Manager. Prior to their allocation to the respective target systems they are consolidated to form installation groups. The installation then takes place in parallel, also of different configurations, on all servers of the group. As multicast is not possible here in order to reduce the network load, the administrator should limit the number of parallel installations and thus avoid any network overload. Furthermore, crash recovery mode, in which special images that are not suited for cloning are created, enables the recovery of servers after a system crash.

The Fujitsu ServerView® Suite also provides two other tool sets for the deployment of PRIMERGY servers in heterogeneous environments. The **ServerView® Scripting Toolkit** enables simple hardware configuration as well as script-based operating system installation. For this purpose, Fujitsu offers both a Linux and a WindowsPE-based package. In addition to the necessary configuration tools, both also provide example scripts, which can be adapted to suit customer-specific scenarios.

The **ServerView® Integration Pack for Altiris Deployment Solution** enables administrators to integrate new PRIMERGY systems without any additional effort in Symantec's Altiris Deployment Solution (Altiris DS V6.9) as well as HP's Rapid Deployment Pack (RDP).

## Control: Control IT – in a centralized, easy and efficient way

The Control subsection comprises "actual" server management, i.e. the standard tasks that have to be completed as soon as the machines are set up and put into in operation. These include among other things the monitoring of individual systems, including critical hardware components such as processors, main memory, hard disks, etc. and their performance, monitoring and control of energy consumption, analysis of performance and utilization data as well as the updating of the server configuration.

### ServerView® Operations Manager (SV OM)

The **ServerView® Operations Manager** (SV OM), which is currently available in version 5, controls the work stages required for this. The fundamental idea here was also to simplify the tasks as much as possible. As a prerequisite for this the Operations Manager supports the **standardized administration of all physical and virtual servers** in the network with the help of a central tool and one or more CMSs. This enables "control in just a few steps" and at the same time ensures increased system availability.
One of the most important changes compared with the predecessor versions is **role-based user administration**. Together with the security concept of the ServerView Suite it is based on three fundamental concepts:

- Global user administration with the aid of an LDAP directory service (Lightweight Directory Access Protocol);
- Role-based access control (RBAC);
- Single Sign-On (SSO) on the basis of a centralized authentication service (CAS).

Users are saved and administered centrally with the aid of a directory service for all connected CMSs. The directory service supplies all the information required for user authentication and authorization. Either the pre-configured directory service (Sun's OpenDS) of ServerView Operations Manager or a pre-configured directory service that is already in use (e.g. Microsoft Active Directory) can be used as the directory service.

Role-based access control (RBAC) manages access control via a set of defined user roles. The user concept in a standard installation makes provision for **three roles**, to which a **set user name** and **defined access rights** are allocated in each case. These roles are the **administrator**, who has extensive powers of system and, if necessary, network administration, as well as the **operator**, who can access selected functions, and the **monitor**, who can view selected information as an "observer". The graded rights range from read and write access to all resources right through to pure read authorization in order e.g. to check configuration data or the server status. Starting with SV OM version 5.5, additional roles with individual access rights and privileges can be defined to fulfill specific customer needs. RBAC is already implemented in the pre-configured directory service OpenDS; ServerView-specific privileges can be imported in other directory services and the necessary roles then allocated to the users, who are to have the associated privileges.

Support for ServerView Suite when logging in to the individual ServerView components is provided by SSO login. SSO is based on a centralized authentication mechanism, the centralized authentication service (CAS). SSO means that the user only has to prove his identity once. Once successfully authenticated, the user receives access to all ServerView components without the need to login again for any other component.

On the one hand, system and network security is enhanced through the strict allocation of roles and (limited) access rights. And on the other hand, functions such as central authorization and Single Sign-on not only increase ease-of-use, they above all improve the efficiency of server administration – in other words, the new ServerView Operations Manager provides **improved protection and lower TCO** (Total Cost of Ownership).


Fig. 5: Login screen of ServerView Operations Manager

In the Control subsection of ServerView® Suite the ServerView Operations Manager covers the following areas:

- Server Monitoring;
- Performance Management;
- Event Management;
- Power Management;
- Storage Management including RAID Management.

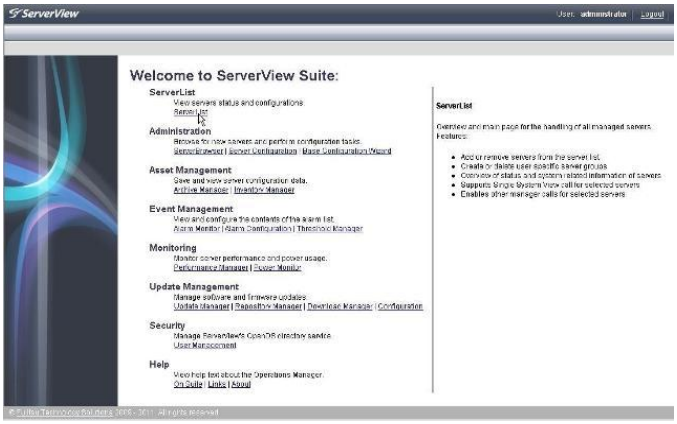



Fig. 6: Home page of ServerView Operations Manager

A well arranged management console that gives administrators a clear overview of the states of physical servers, VM hosts, virtual machines and their respective allocation is used for monitoring and administration. It can be used to perform all the important basic operations (starting / stopping, interrupting / resuming and restarting servers). Furthermore, it shows all the configuration parameters in full, thus creating at the same time the basis for detailed performance monitoring and coherent event management.

The Threshold Manager and the Performance Manager are crucial tools for performance monitoring. The **Threshold Manager** constantly monitors the performance of all physical and virtual resources and checks whether these previously defined standard-compliant or individual threshold values (e.g. for CPU and memory utilization) are reached or exceeded. IT departments thus receive fast, accurate information about the current load distribution so as to quickly identify and eliminate any possible bottlenecks. If the threshold values are exceeded, the Threshold Manager also triggers an alarm and shows both performance data and "critical points" in tables or diagrams so that the problems can be eliminated from the CMS directly. This above all increases the availability of central applications and facilitates compliance with Service Level Agreements (SLAs), but it also helps determine the causes for sudden slumps in performance and with them the respective need for optimization.

The same goal is pursued by the **Performance Manager**, which is used for periodic or long-term monitoring of resources and which supplies detailed reports. For example, users receive in this way an overview of recurring workload peaks / maximum values and can initiate counter-measures in good time so as to prevent losses in performance or even system failures.

Reliable information about events and operating states regarding all aspects of the server is provided by the **Event Manager**. This module particularly facilitates the support and maintenance of any connected PRIMERGY servers and storage subsystems. The Event Manager logs all alarms / alerts; comprehensive filter and display options enable the available information to be processed in such a way that fast remedy is possible. In so doing, the tool uses all the proven means of communication (pop-ups, SNMP traps, e-mail, SMS text messages, etc.). Together with the Threshold Manager it also warns against performance problems of physical and virtual servers. The Event Manager also takes the data generated by traps from the Management Information Base (MIB) of third parties so that their systems can also be monitored with the help of ServerView. Therefore, alerts reach the administrators without any delay, at any time and anywhere, which means that faults can be eliminated immediately. The module not only ensures continuous data center and business operations, but also improves the utilization of managed systems – and helps find parameters that can be adjusted, with whose assistance e.g. data throughput and the transfer rate in the network can be improved.

Control of energy consumption is classed as one of the most important points when configuring and operating modern data centers. This has on the one hand economic reasons: In times of fluctuating, but mostly rising electricity prices many companies try to reduce this consumption – for example in production. IT departments as central operating units cannot stop this development; on the contrary they must look for their own ways of realizing savings potential. This pressure is further intensified by the fact that leading industrial nations are aiming for a new energy mix, because the fossil fuels previously used for power generation are running out. On the other hand, ambitious specifications on the part of the US American Environmental Protection Agency (EPA) and the European Commission call for an increase in the energy efficiency of data centers by 20% and 30% respectively in the medium term in order to sustainably decrease among other things $CO_2$ emissions.

The comprehensive **power management functions** of the SV OM help achieve these two targets. They enable power consumption to be flexibly controlled by PRIMERGY servers in different scenarios. And as the power & cooling demands of data centers decrease, so as a result does their potential emission of greenhouse gases. ServerView® Power Management does not just check the current values, it simultaneously enables adaptive consumption management based on threshold values defined by the user.

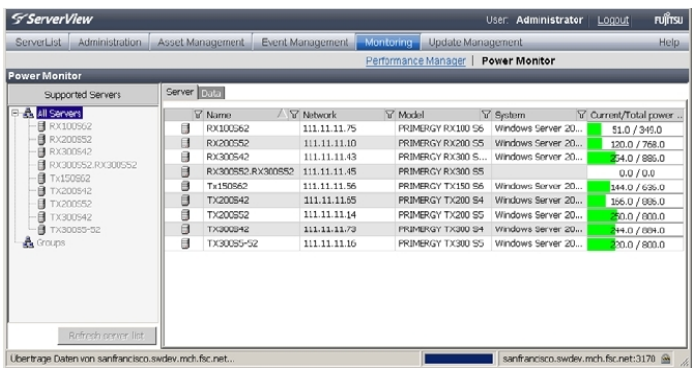



Fig. 7: ServerView Operations Manager: Power Monitoring

The monitoring is assumed by the **iRMC** (integrated Remote Management Controller) which is incorporated in the server; a chip on the motherboard that enables comprehensive remote maintenance of the systems (see below). ServerView® Power Management can be used both for individual machines and in server pools and, in addition to the current consumption values, also supplies the minimum, maximum and average consumption values. Control is effected via the CMS; among other things the administrator can

- define CPU performance in so-called power states depending on the system utilization;
- determine the speeds (clock frequencies) of the memory modules;
- boot and shut down servers on a central basis;
- allocate new power states to CPUs during operation.

All these functions can also be automatically controlled via set timelines. Furthermore, the administrator can stipulate the required energy consumption mode after a system start.

The performance of modern server systems crucially depends – as does corporate data security – on the efficiency of the storage solutions used. For this reason the SV OM also has comprehensive tools for the administration of external storage subsystems and internal RAID arrays. The **Storage Manager** (in short: StorMan), which enables the monitoring and control of directly connected hard disk arrays as well as of network storage systems (e.g. file servers) via the CMS, is responsible for the aforementioned task. As well as other modules the Storage Manager displays the configuration and the current status (utilization, etc.) of the monitored systems; the administration functions support the cross-vendor SMI-S standard and thus enable the standardized administration of different storage platforms, for example the in-house ETERNUS models and PRIMERGY SX Storage Blades, but also those from third-party vendors like NetApp and EMC. On the whole, the integration into central server management reduces administrative work and thus makes a considerable contribution toward cutting costs.

Analog to the Storage Manager, the **ServerView® RAID Manager** forms the basis for the coherent configuration and administration of host-based hardware and software RAID solutions that are made available by various providers for PRIMERGY platforms. The principal objective here was also to resolve the complex task in such a modern and easy way as possible. Consequently, the tool supports the latest RAID and hard disk technologies (incl. integrated controllers, SAS-RAID controllers) as well as all the operating systems and virtualization solutions that have been released for PRIMERGY servers. The RAID Manager constantly monitors the status of the individual subsystems and logs all events (faults, warnings when threshold values are reached), and in so doing hides the details of the manufacturer-specific hardware and firmware implementation in favor of ease of operation. In a similar way to Power Management, numerous remote maintenance options are also available here, e.g. for the configuration of RAID controllers and the administration of logical drives. In comparison to conventional RAID management solutions this once again means noticeably less administrative work – a circumstance that also benefits from the fact that the tool can be easily operated by the web browser.

The user interface of the SV OM also offers direct access to more functions of the ServerView Suite, which are described in the other sections of this white paper.

## Dynamize:
## Dynamize IT – in a technically sophisticated and efficient way

The Dynamize subsection combines a series of special tools and system management tools, which above all permit dynamic and efficient use of physical and virtual resources. On the one hand, they differ from the prevalent tools in SV OM by the fact that they also have comprehensive functions for the automated provision and administration of IT infrastructure resources. And on the other hand, they are chargeable extensions that do not belong to the delivery scope of the PRIMERGY systems. We are talking about the products ServerView® Virtual-IO Manager (SV VIOM), ServerView® Resource Orchestrator Virtual Edition (ROR VE) and ServerView® Resource Orchestrator Cloud Edition (ROR CE).

### ServerView® Virtual-IO Manager (SV VIOM)

The aim of the SV VIOM is to ensure as smooth and efficient as possible communication of the PRIMERGY rack and blade server with clients and storage arrays. For this purpose the module allocates previously defined virtual network addresses to the individual server and also determines via which interfaces they are to establish connection to the LAN or SAN and how they are to be booted. To enable this to work the SV VIOM saves all the specific information about the computers (e.g. MAC addresses and WWNs) in a separate, hardware-independent server profile, which is kept in a central repository outside the server. As a result, individual applications can be started without any further configuration effort by the administrator allocating a specific profile to a rack or blade server and by using the address previously defined for this purpose. Ultimately, the SV VIOM creates a separate domain for server management, thus separating it completely from LAN or SAN management. Any conflicts and overlapping between server, LAN and storage management are ruled out from now on, because through using constant virtual addresses there are no changes in LAN and SAN management.

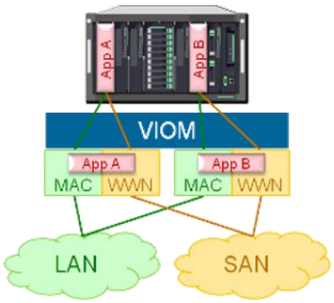



Fig. 8: ServerView Virtual-IO Manager – Concept

Since "role allocation" does not depend on the operating system, problems no longer occur here, either. This means for IT departments that they can do tasks that were previously time-consuming because they were complex and prone to errors far more quickly, as they "just" allocate previously defined configuration parameters, but do not have to define/perform the configuration themselves. The above applies for example for the:

- installation of new rack or blade servers as well as individual server blades ("Plug and Go") as well their integration in existing infrastructures;
- moving of workloads to fresh hardware (or the reallocation of capacities during operation);
- backup and recovery of individual servers;
- configuration of failover solutions to protect against failures;
- maintenance and replacement of servers and network hardware.

## ServerView® Resource Orchestrator Virtual Edition (ROR VE)

### Simplifying day-to-day server management operations of a highly consolidated server infrastructure

For many IT organizations, blade servers combined with virtualization technologies are the IT infrastructure of choice to achieve considerable consolidation benefits. It also is the ideal basis for ensuring more flexible usage of server resources. However, managing all parts of the underlying technology stack of such a highly consolidated server infrastructure presents a looming problem for IT managers. IT administrators have to use a greater number of specialized management tools to manage their daily business. As a result, IT managers are looking for ways to improve the operational efficiency of day-to-day server management operations in mixed physical and virtual IT environments.

With ServerView Resource Orchestrator Virtual Edition, Fujitsu offers a system management tool that delivers standardized management of the consolidated virtual and physical server environment, simplifies server lifecycle management and provides cost-efficient methods for protecting the complete server environment.

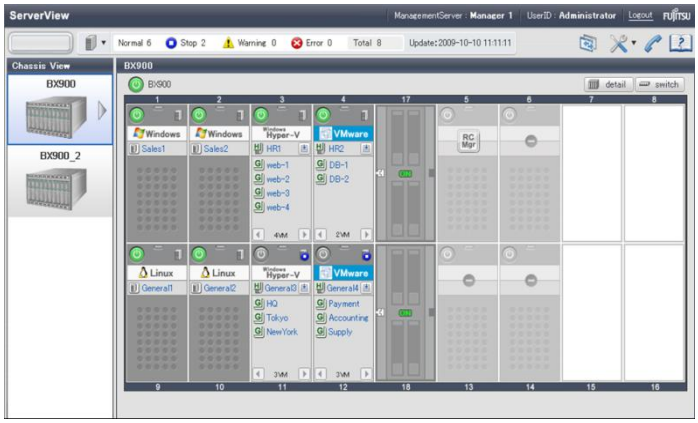



Fig. 9: ServerView Resource Orchestrator Virtual Edition (ROR VE): View of the "BladeViewer"

### Uniform management of physical and virtual servers

No doubt, server virtualization is a key technology in consolidation projects. However, when looking at the current situation in most data centers, a significant number of workloads still runs and will continue to run on physical servers. This means that mixed operation of physical and virtual servers will be a long-term reality in most data centers. Therefore, server management tools must enable optimization across both physical and virtual environments.

The situation is even more critical for IT organizations that use products from more than one hypervisor vendor. Operating a multi-hypervisor environment harbors the risk of becoming trapped in »siloed« virtualized pools. Taking advantage of each hypervisor's management tool also means accepting an even more complex management scenario.

ServerView Resource Orchestrator Virtual Edition brings the management of physical and virtual server environments together under a "single pane of glass". By integrating the administration of physical and virtual servers as much as possible, ServerView Resource Orchestrator Virtual Edition addresses the management challenges in heterogeneous physical and virtual server environments

### Simplified server lifecycle management

Beyond centralized monitoring for effectively managing mixed virtual and physical environments, ServerView Resource Orchestrator Virtual Edition provides integrated lifecycle management, including automated server deployment via server cloning, backup and restore of OS images and basic operations on virtual servers – all from a single intuitive management interface

### Cost-effective server high availability

ServerView Resource Orchestrator Virtual Edition enables cost-efficient N+1 high availability. IT organizations can now protect more servers without paying a premium for dedicated high-availability tools like cluster software. By assigning one or more spare servers to a pool of production servers, it is possible to automatically failover any production servers to the spare server in the event of hardware or operating system failures. Business applications can be resumed without any administrator intervention. Compared to manual recovery processes, server recovery time is reduced significantly, thus resulting in faster responses to server failures. This applies to both physical and virtual server environments.

## ServerView® Resource Orchestrator Cloud Edition (ROR CE)

### Evolve toward more dynamic IT environments

ServerView Resource Orchestrator Cloud Edition delivers all of the functions needed for a more dynamic IT environment and a private cloud infrastructure, front-ended with a self-service provisioning portal to speed delivery of IT infrastructures to end users.

### Build your private cloud infrastructure based on resource pools

The most effective way to organize IT infrastructure resources in a private cloud environment is to build pools of shared resources which can be flexibly allocated to applications. A typical situation in traditional infrastructures with resources directly dedicated to applications arises when new applications are deployed: The IT organization faces the problem of having to manage a growing number of application silos, each with a specific number of resources, which over time leads to a huge sprawl of IT resources. As usage and load conditions for the individual applications change, the systems running those applications happen to be either highly over-provisioned or under-provisioned. It is very difficult, if not impossible, to shift resources from one silo to the other in order to achieve a more balanced usage of existing resources.

ServerView Resource Orchestrator Cloud Edition introduces resource pools to facilitate the sharing of resources between applications. Resources can be flexibly allocated or reallocated to applications on demand, increasing the overall resource utilization. Another positive effect of having a pool architecture is that one or a few systems can stand in for many productive systems, thus delivering a cost-efficient alternative to traditional high-availability solutions

### Automate IT infrastructure provisioning

The key value delivered by ServerView Resource Orchestrator Cloud Edition is the introduction of maximum automation in the provisioning processes executed in back-end data center operations. Provisioning has typically required many administrators, many coordination tasks among administrative domains and many manual operations, which has resulted in long delivery times and user dissatisfaction.

By automating the provisioning processes for server, network and storage resources, the time required for setting up a new server system can be reduced significantly. And there is further potential for streamlining the overall provisioning process, because ServerView Resource Orchestrator Cloud Edition reduces or even eliminates the communication time lag between different administrative domains in large organizations. Automation not only accelerates the provisioning of IT infrastructures, it also handles routine tasks so that IT staff can focus their attention on matters like innovation

**Ready for self-service provisioning**
By combining resource abstraction at the user frontend and the automation of provisioning processes at the data center backend, companies are ready to introduce self-service provisioning. This capability is enabled through a self-service portal, where a catalog of predefined service templates, resources, and service subscription workflows are available. Pending any necessary approvals, these are then dynamically granted upon request.

Once resources are provisioned, ServerView Resource Orchestrator Cloud Edition offers users multiple options to control and customize a given configuration. Service dashboards provide end users and IT administrators with a consolidated view of the current status and utilization of resources

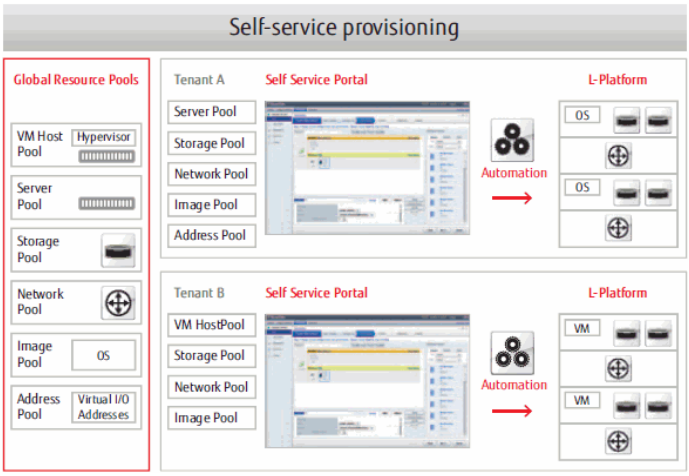



Fig. 10: Automated system provisioning from shared resources for multiple tenants

IT organizations can use the integrated usage metering capability to collect data on how resources are used and who is using them. This information can be used as a foundation for companies that want to implement a charge-back model. At the very least it enables them to report business-critical resource usage

All in all, the modules of the Dynamize subsection do the following:
- They simplify the provisioning of IT resources and their assignment to users, eliminate sources of errors and dramatically reduce the time required for server deployment, maintenance and provisioning – up to 90% for deployment.
- The automatically configured systems have a higher consistency, which minimizes the risk of malfunctions and thus entails longer runtimes and better utilization of the infrastructure.
- The operating costs are reduced as a result of the associated time savings.

## Maintain:
## Maintain IT – in any status, anywhere

Every management platform requires a tool set in order to analyze and maintain the connected systems. Failures of individual components and servers can be quickly eliminated with their assistance. Furthermore, resolute monitoring as well as continuous, controlled and automated updating of the BIOS, firmware, drivers and agents ensures that these are proactively prevented and costly downtimes are also avoided. However, the best precautions cannot prevent unforeseen external events, such as power failures or cable breaks as a result of material fatigue. In these cases the analysis tools help discover and remedy errors quickly and precisely.

In the Fujitsu ServerView® Suite the appropriate tools are consolidated in the **Maintain subsection**, which focuses in total on four task areas:
- Remote Management;
- Update Management;
- Asset Management/Investigation and
- Online Diagnostics and Customer Self Service.

Most of the modules described in this section are part of the scope of delivery of the ServerView Suite. Merely the iRMC Advanced Pack is an exception; the functions it includes are activated for a small surcharge.

### ServerView Remote Management
The remote management functions of ServerView pursue two goals in particular. On the one hand they ensure consistent, integrated monitoring of all PRIMERGY systems; and on the other hand they enable them to be controlled remotely and, if required, directly from the data center – i.e. on a remote basis. In so doing, administrators can not only access functioning servers (in-band control), but also failed servers or servers in stand-by (out-of-band control). The advantage of this construction is obvious: Since many problems can be analyzed and eliminated remotely, the use of specialists onsite is unnecessary, and hence the costs for maintenance and service decrease, which is of particular importance for standard tasks.

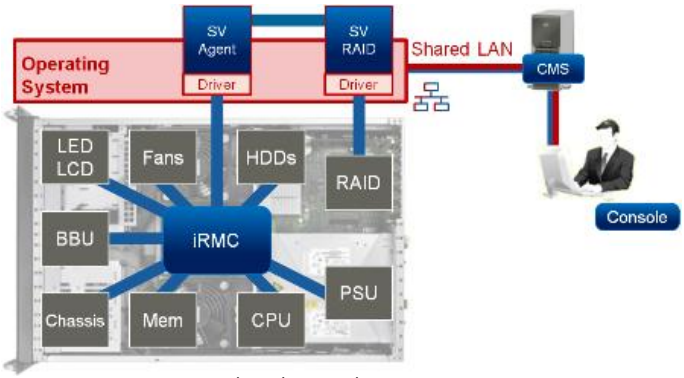



Fig. 11: ServerView in-band control – Concept

As a matter of principle, the remote management function can be controlled in two different ways. In the first version, in-band control, administrators use the **control console of the SV Operations Manager** to access the appropriate tools, with whose help they can intuitively deal with all administrative tasks up to and including power management with no difference to local control becoming

noticeable. In this way, the administrator maintains an overview of the function, utilization and performance values of all systems as well as of server components that are susceptible to wear and tear (main processor, memory modules, hard disks, CMOS batteries and fans). The monitored parameters include among other things CPU frequency, I/O speed, general data throughput, start times of the hard disks, read errors and corrected bit errors, battery voltage as well as temperature and fan speed. Maximum efficiency is ensured by the so-called PDA functionality (Prefailure Detection and Analysis), which can be addressed directly from the SV OM and indicates which of these components are causing problems in the system or should be replaced.

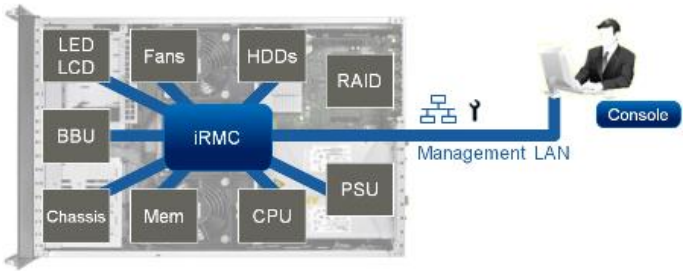



Fig. 12: ServerView out-of-band control – Concept

In addition to the in-band control, most PRIMERGY servers also allow out-of-band control via the **integrated Remote Management Controller** (iRMC), which as an autonomous system is on the motherboard of the server (not for PRIMERGY TX100 and MX130). The iRMC communicates with the management console via the LAN or IP connection, has an own operating system, separate user administration, a web server, separate alarm and event management and is also powered during server standby operation. The internal user database comprises a maximum of 16 users and can be administered either locally/manually or synchronized with existing directory services via LDAP and Secure LDAP. Access is password-protected, all data packets and commands are encrypted using 128-bit SSL if required. Thus a high standard of security is achieved on the whole, which sustainably minimizes risks due to unauthorized accesses.

As with control via SV OM, comprehensive power management functions are available with this iRMC variant; administrators are not just able to switch PRIMERGY servers on and off via GUI, CLI or scripts, they can also control their power draw and thus the power consumption. For this purpose, they define - in a similar way to a notebook - one of three operating states: In the *Minimal Power Consumption* profile the CPU always works with the lowest frequency and voltage, *Best Performance* delegates the selection of both variables to the operating system and *Schedule* permits time-controlled change between the two modes depending on the time and the day of the week. The functions *Power Consumption Limiting* (switching off or limiting the power consumption of a system when a threshold value is reached) and *Power Consumption Budgeting* (control of the power consumption in PRIMERGY blade systems to avoid any overshooting of threshold values) complete the range. Just as important here is the consistent monitoring of the main memory, which supplies reliable data about the status of the DRAM components, which can still be replaced in case of possible failure (Memory Prefailure Analysis).

The chargeable **iRMC expansion package** contains the modules **Advanced Video Redirection (AVR)** and **Remote Storage (RS)**. AVR ensures that administrative tasks can be performed by every workstation in the network, on which a common web browser and Java Runtime Environment run; the ServerView Suite itself need not be installed. Administrators therefore no longer depend on a management station, but can literally do their work at anytime and anywhere. RS provides the managed server with a "virtual" drive, which can be somewhere else in the network and be integrated and used like a local drive, e.g. to boot local servers, to install drivers and programs or to update a BIOS. This also significantly increases flexibility.

## ServerView Update Management

BIOS, firmware, drivers, agents – the majority of the software components installed on a server makes it considerably more difficult for administrators to keep the respective configuration up-to-date. Manually controlled update processes in particular not only cost time, but also entail a high risk of missing something. This is especially true of server groups and data centers, which is why the manual method is out of the question here. On the contrary, the objective must be to update existing configurations with only a few clicks of the mouse so as to ensure as uninterrupted server and data center operations as possible. ServerView Update Management takes its bearings from this specification, and thus relies on **extensive automation**. Merely application software is excluded here, because it is maintained by the respective manufacturer.

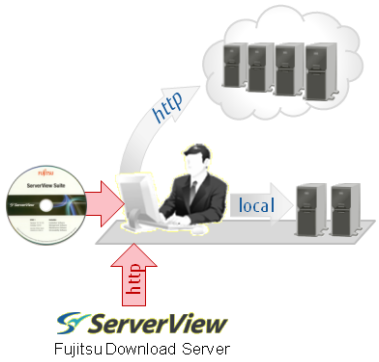



Fig. 13: ServerView Update Management – Concept

Analog to the Deploy subsection, the ServerView Suite also provides two separate tools here, with which the above mentioned components can be updated almost without any intervention on the part of the administrators. The **ServerView Update Manager Express (SV UME)**, which is included as a complete package on the ServerView installation DVD that is supplied with each PRIMERGY system, is used for the local **modification of individual systems**. The update is performed with the aid of self-extracting and self-installing packages, so-called **Autonomous Support Packages (ASPs)** for firmware and BIOS and **PRIMERGY Support Packages (PSPs)** for Windows drivers - with a prior version control and a hardware compatibility check in each case. Assistants support the administrator in such a way that the action is completed in just a few steps. All ASPs and PSPs as well as an ISO image of the installation DVD are also available by download. The update can take place both under a running operating system (Windows, Linux) and by booting the WindowsPE included on the ServerView Suite DVD.

Then again the synchronous updating of a large number of servers can be controlled with the **ServerView Update Manager (SV UM)**. In this case, the software uses a previously created repository in the data center, which is either filled with ASPs and PSPs by download or via the installation DVD. Furthermore, the SV UM can regularly check whether all the configurations are up-to-date and independently propose systems for an update. This makes scheduled, specific remote updates possible, which thanks to the version control and compatibility check meet the same quality requirements as the local version and can for good measure run fully unattended. As in the Deploy subsection the advantages of automated software distribution can also be seen here in the form of immense savings in time and costs, increased flexibility and minimal downtimes.

## ServerView Asset Management

Administration, maintenance, error analyses and any necessary repairs of PRIMERGY servers are made considerably easier if administrators can provide themselves with a complete overview of the appropriate inventory data at any time. Support for the administrator here is provided by asset management, which is also made up of two modules: the ServerView Inventory Manager and the ServerView Archive Manager.

The **Inventory Manager records the details of all connected servers in a structured and precise way**, i.e. their hardware and software configuration as well as any special **dependencies** between operating systems, drivers and firmware. This has several essential advantages: Firstly, all the **relevant information is available at a glance** so that service staff can inform itself comprehensively prior to an intervention and then specifically search for errors. Secondly, the reference to the dependencies ensures that no-one performs any "half-finished" new or re-configurations, **i.e. consistency always remains ensured for any version changes or updates**. Thirdly, all the information can be exported in different data formats and can not only be edited for **various views and reports**, but also sent to the data center or a service provider by **e-mail**.

The **Archive Manager** supplements these functions by **keeping the hardware and software configurations in snapshots**, which the administrator can use for analysis in case of malfunctions.
In this way, it is possible e.g. to compare various archives – i.e. configuration and version statuses – on an individual system or several (identical) servers. External data can also be imported and used for maintenance work. In a nutshell, asset management functions ensure

- central, easy-to-use asset control;
- more stable system configurations;
- quick localization and analysis of errors, fast notification of the IT department or of the service partner, swift repair;
- interoperability with other management systems.

## Online Diagnostics and Customer Self Service

The Maintain subsection is rounded off by a series of additional functions and components, which facilitate the operation and maintenance of PRIMERGY systems in the long term. Together they constitute the Online Diagnostics module. As with all the modules presented in this section, the objective is to increase the **reliability of the PRIMERGY systems and prevent failures**. At the same time a part of these tools empower the users to make any necessary **basic repairs themselves** or to trigger them without having to wait for service staff (Customer Self Service, in short CSS).

In this conjunction, a series of **preventive hardware tests**, which can either be performed according to a previously set **schedule or ad hoc** – and if necessary **in parallel**, play a particularly important role in order to save additional time. The following are controlled: **processors, main memory, hard disks and optical drives**, whereby the administrator can either use **predefined standard and stress tests**, which only take a short time and generate little system load, or resort to **more comprehensive tests**. If the values determined do not comply with the specifications, the affected components can be replaced in good time before a server fails, namely as and when required even without having to shut it down. Of course, these tests can also be used to analyze causes for malfunctions that have already occurred.

To further simplify replacement PRIMERGY systems are equipped with a series of **LED indicators** in the factory, which help **localize a fault** and at the same time inform the user whether **the necessary steps can be performed autonomously**. The LEDs work in three steps: an amber-colored light at the front shows whether an error exists, a yellow one whether the user has to become active. Other displays are optionally available for servers of the RX and TX series. An LCD attached to the front of the server with 2 x 20 characters, the so-called Local Service Display (LSD), shows error messages and status information. Using the 4-way keypad the user can navigate through a range of information pages, which contain exact details about the operating status, type of error and the necessary repair stages. Alternatively, the Local Service Panel (LSP) is used, which monitors CPU, main memory, hard disks, batteries, fans as well as any additional network cards, NMI connections and the UPS system; it also shows whether operation voltage and server temperature are correct.


Fig. 14: Local Service Panel (LSP; above) and Local Service Display (LSD; below)

Thirdly, light diodes on the system board, which are directly next to the monitored component, are used. In this way, the user sees whether a system is working perfectly or not, and also which hardware has to be re-ordered in case of an emergency and whether a service engineer is needed for the replacement or whether the user can take care of this case alone – as in the case of the hard disks and memory modules. Furthermore, the additional components enable online access to the spare parts list. Ultimately, the combination of easy-to-use diagnostic tools and a self-evident self-service concept improves the reliability of the PRIMERGY systems; and shorter downtimes as well as lower service costs contribute toward economical IT operations.

## Integrate:
## Integrate IT – seamlessly, transparently

Consistent IT infrastructures, which use standardized hardware and software platforms, are the exception rather than the rule in operational everyday life. This also applies on a broad front 30 years after the introduction of computer systems. IT departments are thus regularly faced by the highly demanding task of attuning the components of their heterogeneous networks in such a way that they work without any frictional losses. Since overlapping, contradictions and errors can easily occur, which for their part imply system failures, system integration is quite rightly considered as a kind of ultimate discipline; and the less the user notices such problems, the better the rating of IT departments. Therefore, special administrators or teams are often responsible for individual platforms, which they maintain with a great deal of time and effort. The fact that this pushes up the operating costs and thus the TCO is easy to understand – and likewise that a trend toward platform-neutral solutions that can be deployed throughout the company, which enables coherent **Enterprise IT Management (EITM)** and similar administration of data centers, has asserted itself in the past few years.


To get these problems under control the Fujitsu ServerView® Suite also has a series of so-called **integration packs**, which facilitate the "embedding" of Fujitsu hardware in existing heterogeneous environments in the long term. Apart from Fujitsu's internal EITM solution, **ManageNow®**, which is described in detail elsewhere, ServerView can be easily integrated in existing Enterprise-IT-Management systems. Support is currently provided for the following platforms:

- CA Unicenter and CA Spectrum;
- Microsoft's System Center product family (SMS, SCCM, MOM and SCOM);
- the Open-Source suite Nagios;
- HP Network Node Manager and HP Operations Manager;
- IBM Tivoli Management Environment (TME) 10 Framework T/EC and IBM Tivoli NetView;
- BMC ProactiveNet Performance Management (earlier known as PATROL).

Additional modules enable docking with hardware-specific management platforms, such as HP Systems Insight Manager (SIM) and IBM Director. In all these scenarios ManageNow® provides a **central control console for all PRIMERGY systems**, which can in turn be adapted to **higher-level administrative solutions in a seamless and transparent way**. In this way, existing management solutions can be retained, they are merely supplemented by a PRIMERGY component; and nothing has to change in proven IT management processes, either.

In addition to technical and organizational advantages, it also has tangible economical advantages: For example, training and migration spending is contained from the very outset, the costs for implementing PRIMERGY systems can in comparison with conventional methods be reduced by up to 65%, and savings of up to 40% are possible for "pure" operating costs. Therefore, users receive a solution with optimal functionality with maximum investment protection and minimal expenditure – and come one big step closer to the goal of "economical IT".

## Conclusion

The work of IT departments and data centers with their typical combination of a growing variety of tasks, increasing quality requirements and sinking budgets has become increasingly difficult in the past few years. Companies should therefore provide their employees with the technical equipment, with which they can sensibly fulfill their roles and efficiently provide the expected services. As a leading IT infrastructure provider, Fujitsu Technology Solutions provides in PRIMERGY ServerView® Suite an end-to-end server management platform that precisely enables this.

The core task of the Fujitsu ServerView® Suite is to ensure fail-safe, flexible and dynamic operation of server resources in data centers. This is why many tasks have been automated as far as possible in order to relieve IT departments from routine tasks and give them the freedom for their actual job – to develop new applications and services. This applies for example for the unattended setup of server systems with the aid of the Installation Manager, the unattended installation of server farms with the Deployment Manager or the integrated central administration of PRIMERGY blade systems. At the same time, many work stages have been simplified to such an extent that even less experienced personnel can perform them at once – for example in the fields of system diagnostics and maintenance. The sophisticated features ensure maximum availability and thus a consistently high performance as well as fail-safety for the managed server infrastructure. The clear-cut structure and ease-of-use of the suite ensure together with the advanced degree of automation that configuration errors do not as far as possible occur – which in turn increases the security of the IT landscape. Comprehensive virtualization functions increase the efficiency and round off the image together with an extensive package of integration modules.

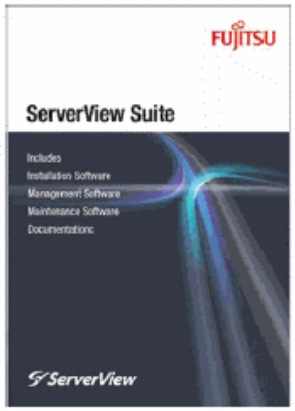
ServerView

# ServerView
## INTEGRATED SERVER LIFECYCLE MANAGEMENT

FUJITSU

| Deploy<br>Fast, easy, reliable | Control<br>Centralized, easy, efficient | Dynamize<br>Simple, sophisticated, efficient | Maintain<br>In any state, at any place | Integrate<br>Seamless, manage uniformly |
|---|---|---|---|---|
| **Server Setup Installation**<br>✓ SV Installation Manager<br>✓ SV Scripting Toolkit | **Server Monitoring**<br>✓ SV Operations Manager<br>✓ SV System Monitor<br>✓ SV Event Management | **Private Cloud Infrastructures**<br>◆ SV Resource Orchestrator Cloud Edition (ROR CE) | **Remote Management**<br>◆/✓ SV Remote Management<br>– iRMC S2 / iRMC S3<br>– Management Blades | **Uniformed Management**<br>◆/✓ SV Integration<br>◆ – Fujitsu ManageNow® solutions<br>✓ – Microsoft SMS and SCCM<br>✓ – Microsoft MOM and SCOM<br>✓ – Microsoft SCE<br>✓ – Nagios<br>✓ – Icinga<br>✓ – HP Network Node Manager<br>✓ – HP Operations Manager<br>✓ – HP Systems Insight Manager<br>✓ – IBM Tivoli T/EC<br>✓ – IBM Tivoli NetView<br>✓ – CA Unicenter<br>✓ – CA Spectrum<br>◆ – BMC Patrol |
| **Mass Deployment**<br>◆ SV Deployment Manager<br>✓ Integration Pack for Altiris Deployment Server | **Performance Management**<br>✓ SV Performance Manager<br>✓ SV Threshold Manager | **Consolidated Server Infrastructures**<br>◆ SV Resource Orchestrator Virtual Edition (ROR VE) | **Update Management**<br>✓ SV Update Manager / Express<br>✓ SV Download Manager<br>✓ SV Repository Manager | |
| | **Power Management**<br>✓ SV Power Monitor<br>✓ SV Power Consumption Manager | **I/O Management**<br>◆ SV Virtual-IO Manager | **Investigation**<br>✓ SV Asset Management<br>– Inventory Manager<br>– Archive Manager<br>✓ SV PrimeCollect | |
| | **Storage Management**<br>✓ SV RAID Manager<br>✓ SV Storage Manager | | **Inspection**<br>✓ SV Online Diagnostics<br>◆ SV Customer Self Service<br>– Local Service Panel<br>– Local Service Display | |

✓ = standard / free of charge, ◆ = optional





**MORE INFORMATION ON PRIMERGY SERVERVIEW SUITE:**
www.fujitsu.com/fts/products/computing/servers/primergy/management/

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## List of abbreviations

| | |
|---|---|
| ASP | Autonomous Support Package |
| AVR | Advanced Video Redirection |
| BIOS | Basic Input/Output System |
| CAS | Centralized Authentication Service |
| CLI | Command Line Interface |
| CMOS | Complementary Metal Oxide Semiconductor |
| CMS | Central Management Station |
| CPU | Central Processing Unit |
| CSS | Customer Self Service |
| DRAM | Dynamic Random Access Memory |
| DVD | Digital Versatile Disk |
| EITM | Enterprise IT Management |
| E-Mail | Electronic Mail |
| EPA | Environmental Protection Agency, USA |
| GUI | Graphical User Interface |
| HA | High Availability |
| I/O | Input / Output |
| IP | Internet Protocol |
| iRMC | integrated Remote Management Controller |
| ISO | International Organization for Standardization |
| IT | Information Technology |
| LAN | Local Area Network |
| LCD | Liquid Crystal Display |
| LDAP | Lightweight Directory Access Protocol |
| LED | Light Emitting Diode |
| LSD | Local Service Display |
| LSP | Local Service Panel |
| MAC | Media Access Control (address) |
| MIB | Management Information Base |
| NMI | Non Maskable Interrupt |
| PDA | Prefailure Detection and Analysis |
| PSP | PRIMERGY Support Package |
| PSU | Power Supply Unit |
| RAID | Redundant Array of Independent Disks |
| RAM | Random Access Memory |
| RBAC | Role Based Access Control |
| ROR VE | ServerView Resource Orchestrator Virtual Edition |
| ROR CE | ServerView Resource Orchestrator Cloud Edition |
| RS | Remote Storage |
| SAN | Storage Area Network |
| SAS | Serial Attached SCSI |
| SCSI | Small Computer System Interface |
| SLA | Service Level Agreement |
| SMI-S | Storage Management Initiative – Specification |
| SMS | Short Message Service |
| SNMP | Simple Network Management Protocol |
| SSL | Secure Sockets Layer |
| SSO | Single Sign On |
| SV | ServerView |
| SVS | ServerView Suite |
| SV DM | ServerView Deployment Manager |
| SV IM | ServerView Installation Manager |
| SV OM | ServerView Operations Manager |
| SV UM | ServerView Update Manager |
| SV UME | ServerView Update Manager Express |
| SV VIOM | ServerView Virtual-IO Manager |
| TCO | Total Cost of Ownership |
| UPS | Uninterruptible Power Supply |
| VLAN | Virtual Local Area Network |
| VM | Virtual Machine |
| VMM | Virtual Machine Monitor |
| WWN | World Wide Name |

## Further information

- Fujitsu ServerView Suite in the Internet:
  http://www.fujitsu.com/fts/serverview
- User manuals:
  http://manuals.ts.fujitsu.com/files/html/primergy/svs-sitemap/sitemap_emea_en/index.html
- Software download:
  http://support.ts.fujitsu.com/prim_supportcd/SVSSoftware/start.html
- Repeat orders of the current ServerView DVD media sets:
  - Order number for individual orders: U15000-C289
  - Order number for an annual subscription: U15000-C176

[i] A software layer, which communicates between the hardware of a server and the VMs running on it, i.e. enables the parallel operation of various operating systems and applications, is referred to as a hypervisor (or Virtual Machine Monitor/VMM).

[ii] Depending on the performance and speed of the LAN.

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