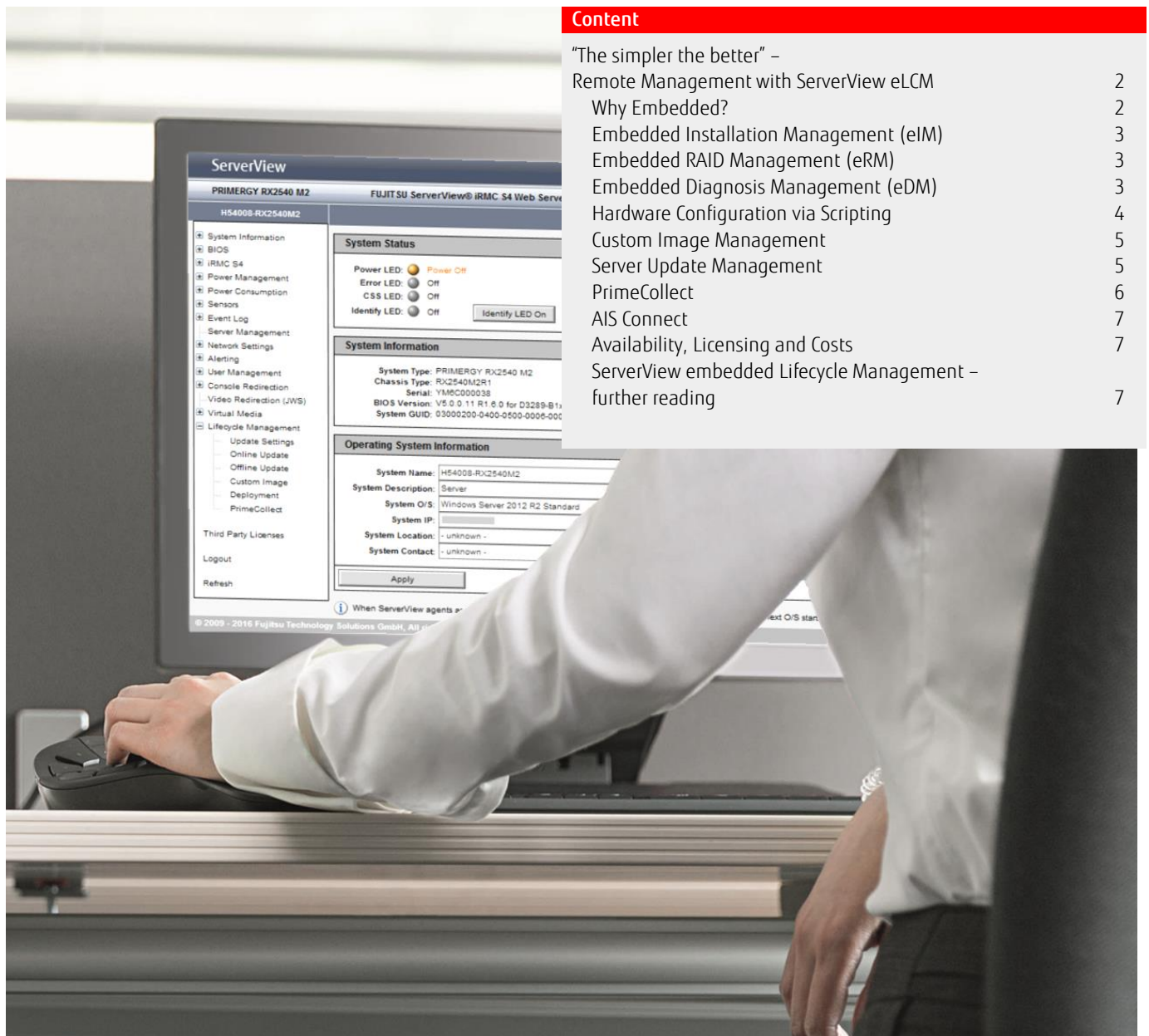


White Paper

FUJITSU Software ServerView® Suite embedded Lifecycle Management

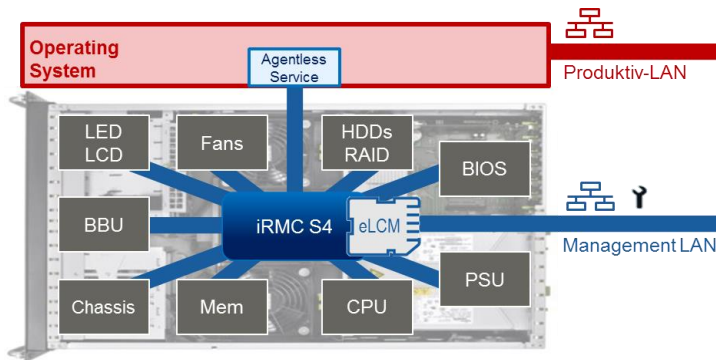
FUJITSU Software ServerView® embedded Lifecycle Management (eLCM) for Fujitsu PRIMERGY servers extensively supports routine, time-consuming management tasks. This White Paper introduces main eLCM functions and describes how administrators benefit from simplified, highly integrated and automated server management.



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“The simpler the better” – Remote Management with ServerView eLCM

Today's server systems perform legions of critical functions they weren't tasked with five or ten years ago. As a result, they are getting ever more complex, and the same goes for the management duties of a typical server administrator. At the same time, users increasingly depend on reliable IT services and infrastructures, and show less tolerance for delays or downtimes. IT departments are thus forced to look for management methods that will allow them to handle the growing complexity with more ease and confidence. One of these methods is called out-of-band management (OOB) and has undergone substantial improvements in the latest edition of Fujitsu's ServerView Suite.



Out-of-band management, also known as lights-out management, uses a dedicated management channel that enables admins to monitor and manage any given server by means of a remote connection. In Fujitsu's PRIMERGY servers, this capability is implemented via the [integrated Remote Management Controller \(iRMC S4\)](#). The iRMC S4 is an autonomous system that resides on a PRIMERGY's system board and comes with its own operating system, web server, Linux file system as well as a separate user management and independent alert management. Moreover, it remains powered on even when its host switches to standby mode, thus giving administrators a chance to do maintenance work whenever they think it is necessary – even after business hours.

The iRMC S4 and its predecessors have been a core component of PRIMERGY servers and the ServerView Suite for more than a decade, and throughout this time its capabilities have constantly expanded. This is also true for the most recent edition of iRMC S4, which has been augmented with a set of important functional enhancements: the controller now comes with an integrated SD card and supports comprehensive lifecycle management from within the system. And since most functionalities required to perform these tasks are integrated ("embedded") into and controlled by the iRMC S4, we subsume them under the term "embedded Lifecycle Management," or eLCM for short.

Why Embedded?

IT departments frequently face numerous challenges that further complicate their already demanding tasks. These obstacles are often relatively small: handling a batch of CD/DVD installation media is certainly inconvenient, but not an insurmountable difficulty. In many other cases, however, they are forced to deal with truly substantial problems like the fact that IT infrastructures keep expanding, whereas IT headcount remains stable or even decreases over time. For server admins, this usually means they no longer have physical access to any server to perform hands-on management and maintenance, e.g. to install software, check system health or cure RAID issues and other malfunctions. Under these circumstances, they will find it increasingly hard to do their job with the diligence and accuracy it deserves. By embedding lifecycle management functionalities in the iRMC S4 firmware, Fujitsu enables administrators to control all those processes with just a few mouse clicks in the controller's web interface. More specifically, eLCM covers the following areas and functions:



eLCM Deployment

- embedded Installation Management (eIM)
- embedded RAID Management (eRM)
- embedded Diagnosis Management (eDM)
- Hardware Configuration via scripting

eLCM Image Management

- Custom Image

eLCM Update Management

- Server Update

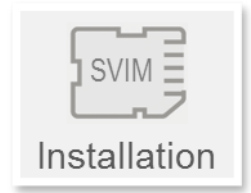
eLCM Health Management

- PrimeCollect
- AIS Connect

All of these functionalities were made available over the course of 2015 and 2016.

Embedded Installation Management (eIM)

As may be easily imagined, the main purpose of this tool is to further simplify and accelerate the initial PRIMERGY setup. Hence, eIM provides an option to run ServerView Installation Manager (SVIM) out of the box, thus freeing admins of the hassle with traditional installation media. All they need to do is launch the iRMC S4 web interface, navigate to the SVIM PE image that's included on the internal SD card, proceed to install the host OS, and configure built-in RAID controllers where necessary. What's more, administrators may also apply this method in case they want to perform server maintenance and/or updates on a productive system. To this end, they only need to download a fresh SVIM image from a download server to the SD card and proceed from there.



The installation process is typically carried out remotely with the help of the so-called eLCM Profile Management: the administrator picks a suitable installation profile from a pre-defined repository and sends it to the iRMC's remote RESTful API. This profile contains detailed information about the server setup and configuration. As a result, server administrators can not only trigger a largely automated installation process, but may even run it in unattended mode. Alternatively, it's also possible to kick off the eIM process manually in a local setting.

Embedded RAID Management (eRM)

This feature serves as the eLCM equivalent to the well-known ServerView RAID Management function that is distributed via conventional installation media. Contrary to what one might expect, this does not mean users will receive a trimmed-down version; instead, eRM retains the full functionality of the 'classic' version. More specifically, it supports the same number of RAID levels (8 plus JBOD), allows for concatenation and the creation of RAID volumes, and includes numerous advanced functions like online capacity expansion, data migration between RAID types, consistency checks, and copyback. What's more, just like its counterpart eRM permits administration of various RAID controllers and the devices attached to them, regardless of whether they use SCSI, SATA or SAS interfaces. More details are laid out in the [ServerView RAID Manager user guide](#).

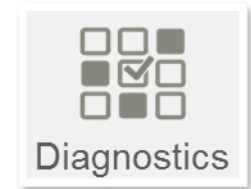


Embedded Diagnosis Management (eDM)

Just like eRM, this function is basically the eLCM edition of a familiar ServerView module, in this case the one that lets users perform online diagnostics while a system is up and running. Put differently, eDM enables sysadmins to carry out performance tests on a variety of hardware components. These tests fall into three broad categories:

- Standard tests emulate moderate system loads and last for about 10 minutes. These tests follow a predefined pattern and help admins determine how well CPUs, memory modules and HDDs fare under these conditions. For CPUs, the load/idle ratio is set to 10%, and the test is carried out on all CPUs inside the server except for the first (CPU0). Standard memory tests eat up 20% of RAM capacity for the fastest subtests (e.g. "Pattern"); here the CPU load is also at 10%. Finally, standard HDD tests help to check sequential read/write speeds for threads with normal priority; the test covers all logical disks except for the system drive and typically requires 50% of the free disk capacity. Because the demands are rather modest, these tests can be executed without affecting other, productive applications.
- By contrast, stress tests simulate high system loads and run for two hours on average. Test parameters will trigger the occurrence of RAM bottlenecks as well as simultaneous execution of high-priority tasks and high HDD throughput. Stress tests can be performed on the same components as standard tests, plus optical disk drives (ODDs). For CPUs, the load/idle ratio is set to 50%, and the test runs on all available CPUs (incl. CPU0) at normal priority. Memory stress tests are identical in terms of CPU usage and thread priority; they involve the full set of seven subtests and require 80% of RAM capacity. Given these conditions, both variants will only work if no other applications are running. HDD and ODD stress tests are less demanding, which means applications may remain active: the HDD stress test includes a so-called butterfly test (synthetic random reads), but is otherwise basically the same as the standard test. ODD stress tests consist of two subsets with the thread priority set to normal; they will last for 15 minutes and may only be performed if a CD/DVD with at least 500 MB capacity is inserted into the drive.
- With custom or user-defined tests, administrators are free to adjust test parameters in accordance with individual PRIMERGY servers. They may thus modify specific test characteristics (e.g. CPU load, memory utilization) for more accurate results that correspond with existing usage scenarios.

For more details, please see the [ServerView Online Diagnostics Manual](#) (PDF).



Hardware Configuration via Scripting

As we have stated in many white papers before, one key objective of the ServerView Suite is to make complex and time-consuming administrative tasks as easy as possible. To achieve this, our developers have constantly reduced the number of processes that require human intervention and replaced them with automated functions instead. The same logic applies with regard to the iRMC S4 and its broad set of capabilities, so providing administrators with a toolset for what could best be described as 'software-based configuration process' was a rather expectable next step.



But how could such a process be realized? In this case, the most obvious answer is also the most rational and practical – by using scripts. With scripts, administrators can create so-called server profiles, that is, a set of configuration parameters that determine how a PRIMERGY server behaves in action. These profiles are stored in a specific repository – the profile store – that resides directly on the iRMC, where they may be remotely activated to be deployed either to a single piece of hardware or a whole group of servers with identical characteristics. In other words, scripts and the resulting profiles help administrators to configure a bunch of managed servers in one single sweep, thus substantially reducing deployment time and efforts as well as maintenance costs.

To facilitate scripted configuration and profiles, the iRMC S4 supports three types of APIs: REST (Representational State Transfer), CIM (Common Information Model), and SCCI (ServerView Common Command Interface). In our context, the most efficient interface to use is REST, as it permits that server configuration and profile management be carried out using a web browser and common HTTP(S) methods, which in turn makes it easier to reuse profiles, extend their range or integrate further external resources like Microsoft System Center Operations Manager or Nagios into the configuration process. Moreover, the use of REST ensures that all resources remain uniquely identifiable and addressable, so that they are simple to retrieve, and that communication between a client (management console) and a server occurs only on demand, thus eliminating the need for a permanent connection that only invites cyber-attacks.

The RESTful API enables administrators to send or obtain information about a complete set of configuration details (i.e. a server profile) to or from an iRMC's profile store. More specifically, this type of profile management helps them perform the following tasks:

- Creating server profiles (or sub profiles) inside the profile store
- Retrieving profiles (or sub profiles)
- Applying profiles (or sub profiles) to the iRMC to be executed
- Obtaining session information, including status and log information, for creating and applying profiles
- Controlling profile versions

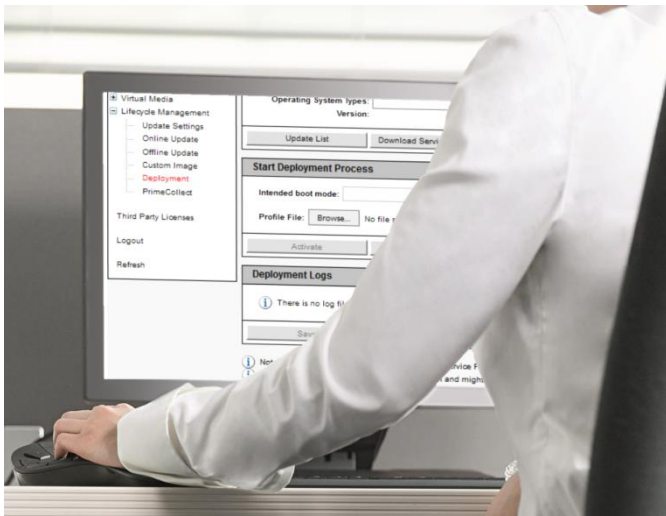
Server profiles are stored as XML or JSON files and comprise various sections, also called sub profiles, namely:

- *SystemConfig* – this section includes all parameters required for iRMC and BIOS configuration in the sub profiles *IrmcConfig* and *BiosConfig*
- *AdapterIrmcConfig* – this section includes the parameters for virtualization configuration as determined by ServerView Virtual-IO Management
- *HWConfigurationIrmc* – this sub profile contains all information required for out-of-band RAID management

Just as the names imply, these sub profiles determine what a server's BIOS and iRMC can do. Administrators who need more comprehensive management options should use the eLCM Service Platform (eLCM SP), an ISO file image that lets them execute eIM, eRM, eDM and Hardware Configuration and can be downloaded or updated from Fujitsu's official repositories [here](#) and [here](#) (to contact these servers, the iRMC must have direct access to the Internet) or from a repository server operated by the customer. With eLCM SP included, administrators have access to the following sub profiles that allow for an unattended deployment process:

- *HWConfiguration* – this section comprises the details of individual servers' RAID and LAN adapter configurations, and
- *OSInstallation* – this section determines which server OS (e.g. Windows Server 2012 R2, Windows Server 2016 etc.) is installed and how it is configured

In order to create a *BiosConfig* sub profile, administrators must first run a BIOS parameter backup: upon request, the managed node initiates a boot to read the parameters of the current BIOS configuration and then saves it in the profile store. Given the central role of BIOS configuration in a server setup, it's only logical that this step should also be automated. For this purpose, administrators have to activate the *Automatic BiosParameter Backup* function on the *Backup/Restoration of BIOS Single Parameter Settings* page. With this function enabled, the parameters of the BIOS configuration will be sent automatically during each boot process. This helps to speed up the *BiosConfig* sub profile creation, but will also slow down the host system boot. Administrators will have to decide whether a faster sub profile creation is worth the tradeoff.



iRMC S4 web user interface – Deployment Manager

Hardware Configuration via Scripting – further reading:

- For more information on using profile management via the RESTful API of the iRMC, please refer to the “iRMC S4 RESTful API” [specification](#).
- For further information on the Service Platform support, please refer to the “eLCM Overview” [user guide](#).
- Detailed information on how to use the CIM and SCCI APIs can be obtained from the “iRMC S4 – Concepts and Interfaces” user guide and the corresponding [manuals](#).

Custom Image Management

This function mainly serves to download bootable ISO images to the internal SD card. eLCM image management supports two types of images, namely eLCM images provided by Fujitsu or so-called custom images created by IT departments themselves. Images and image updates may be downloaded from various internal or external sources via FTP/FTPS or HTTP/HTTPS channels. Once downloaded, all ISO images show up on the "Custom Image" page of the iRMC S4 web GUI, where admins can activate them either manually or using a timer preset. The image is then mounted as a virtual USB CD/DVD drive, and the system automatically reboots to start from this particular device instead of the standard medium. On PRIMERGY servers that have UEFI Secure Boot and the required keys enabled, it's even possible to boot directly from the SD card.



With a larger selection of ISO images to choose from, eLCM image management gives administrators greater flexibility regarding both the general setup and individual management of PRIMERGY servers.

Server Update Management

To ensure their systems have the latest OS, drivers, firmware, and security features installed, server administrators usually compare the latest information from an update catalog at regular intervals. As a time-consuming routine, this task basically lends itself to being automated, and that's what we try to achieve with eLCM update management.



To carry out eLCM updates, the iRMC S4 automatically downloads the required files from a repository server via its dedicated management LAN port and stores them on the built-in SD card. The repository server can be the official Fujitsu support server or a separate system running the ServerView Repository Server. To further simplify the process, the iRMC can be configured in such a way that it will only download sources that fit with the system it resides on. It thus turns into a partial mirror of the repository server that holds local copies of the matching upgrade catalog, ISO images, and binaries. Some server components can only be updated by the server operating system. To make the corresponding update packages available, the iRMC S4 downloads them, creates corresponding ISO images, and mounts these images as virtual CD-ROM drives.

In this setup, three different update modes are supported: autonomous, online and offline. Each of these modes may either be triggered automatically (e.g. via timer settings) or manually (via the iRMC S4 web GUI). The individual update modes differ in terms of which server components can be updated and whether the server operating system must be running or not:

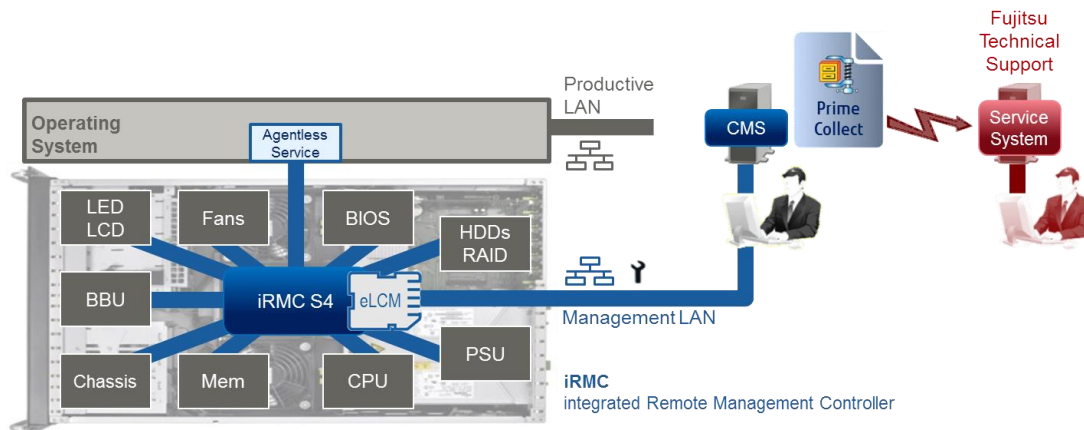
- Autonomous updates will only refresh the iRMC S4 firmware and server BIOS. The iRMC S4 will carry out all necessary operations on its own. Autonomous updates are an integral part of online updates; hence they can't be launched as a separate process; however, they may also be combined with offline updates for a more elaborate procedure.
- Online updates extend the autonomous update capabilities, but require that the ServerView Agentless Service runs on the OS of the system in question. This service provides inventory data for firmware and drivers and installs firmware updates while the server is up and running, i.e. during regular operating hours. On Windows servers, it will also install the necessary component drivers.
- Offline updates are the method of choice if no Agentless Service is running on the managed server or if a server OS is not (yet) supported. As the name indicates, offline updates require that a system or application is allowed a short period of downtime. This method is particularly useful if an admin wants to update the firmware running on components like network or storage controllers.

PrimeCollect

This functionality was originally developed to provide admins with detailed system status and error information in case of a server malfunction. To this end, ServerView Agents collect the logging data of a PRIMERGY system in a ZIP archive that is then sent to Fujitsu's support team for detailed analysis. Until now, this process had to be triggered manually whenever a malfunction occurred.



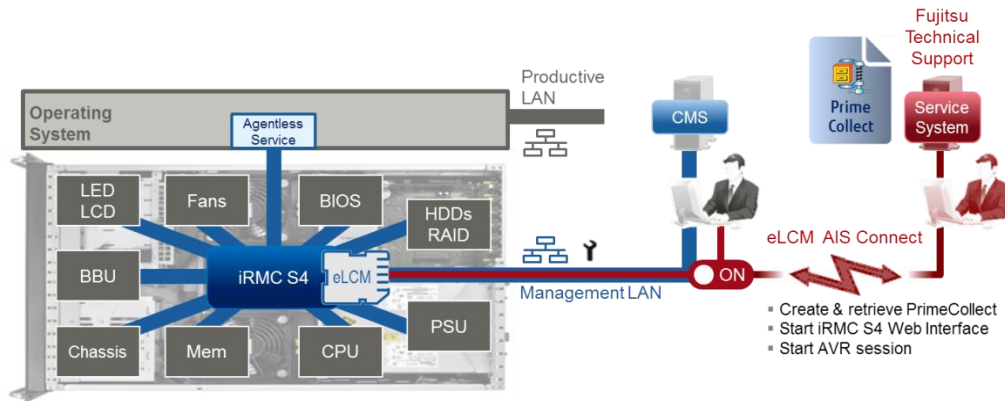
By contrast, eLCM-style PrimeCollect is a lot easier to work with, as it allows for an automated and scheduled creation of the above-mentioned archives. Like the online update function, this requires the ServerView Agentless Service to be running on the managed server. The archives are then stored on the internal SD card. That way, admins can create an 'archive of archives' that helps them retrieve information about previous server issues and repair options. Moreover, PrimeCollect archives may be sent to another server via the iRMC S4 management LAN or Fujitsu's AIS (AutoImmune Systems®) Connect Service.



eLCM PrimeCollect functionality can be configured and started in the PrimeCollect page of the iRMC S4 web interface; all automatically created archives are accessible via the PrimeCollect archives list for further use. For instance, administrators may define a special reference image that will never be overwritten and could serve as a fallback solution in case of an emergency. Likewise, archives may be deleted or stored as regular files.

AIS Connect

The eLCM AIS Connect feature enables “Calling Home” functionalities and allows the Technical Support of Fujitsu to retrieve PrimeCollect archives from the iRMC S4. Fujitsu's AIS (Autolmmune Systems®) Connect Service enables administrators to remotely monitor PRIMERGY servers; in some cases, they may even be controlled with the help of Fujitsu’s Service System, with a service technician managing the workflow.



Availability, Licensing and Costs

eLCM is offered as an optional extension for most PRIMERGY models equipped with iRMC S4. To be eligible for eLCM, these systems must feature an SD card socket as well as a "populated" (loaded) SD card. Licenses are available in two dosage forms and are always purchased together with the SD cards: the eLCM Activation License can be ordered with any new, eLCM-ready PRIMERGY model and will be activated ex works, whereas the eLCM Activation Pack may be ordered for supported systems that are already up and running. Prices vary depending on region.



ServerView embedded Lifecycle Management – further reading

For detailed information, please refer to the

- ServerView [specifications and documentation](#),
- iRMC S4 [data sheet](#), and
- [iRMC S4](#) and [eLCM](#) user manuals.



Contact

Fujitsu Technology Solutions GmbH
Mies-van-der-Rohe-Straße 8
80807 Munich

Website: www.fujitsu.com/fts
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