FUJITSU COMPUTERS
SIEMENS

Hardware Product

RM600 E

Models E40, E42 and E80

RM600 E – server systems for unbeatable performance

The RM600E server generation has been developed to meet the very highest requirements in the UNIX enterprise server class. In design, technology and performance, they set standards in keeping with the overriding importance of information technology infrastructures for the competitiveness of your company. In day-to-day corporate life, RM servers prove their worth not only by virtue of their technical superiority but also because of their cost-effectiveness in operation. This covers long-term considerations of the total cost of ownership (TCO) just as much as the reliability of a long-term development strategy that is based on continuity. Make sure you get the picture - and let yourself be convinced of the performance muscle of a server family that is making its mark not just in the UNIX market.

Investment protection

Thousands of RM server systems prove themselves day in day out, in organizations of all sizes, across all sectors of trade and industry. The benefit for you is system stability based on tried-and-tested technology. By engaging in close dialog with our customers we also receive constant suggestions and ideas arising out of real-world use of the systems, and all this practical experience is fed into further developments at the same time as we integrate innovative technologies. In this process we are constantly guided by the principle of binary compatibility based on the standardized Reliant UNIX

operating system. For you as the customer, this consistency pays in the long term, for your RM server upgrades are also guaranteed in the future. Another bonus is the stability of Siemens, one of the leading IT suppliers operating in the international markets.

Cost-effectiveness

If you compare our performance offering on the basis of cost, we will gladly direct your attention to the outstanding scalability of the RM600 E series. All models are built according to a coherent, modular concept, enabling us to put together tailor-made configurations incorporating precisely those performance features that your company needs today. The bottom line is that you pay only for what you need right now. If your

requirements change, we respond quickly and upgrade your RM600 E systems to match the growth in need, simply by adding further components. There are virtually no limits to your flexibility or ours. Depending on model, for example, main memory can be expanded to a maximum of 24 GB and the number of processors can be increased to 24 with an almost linear rise in performance.

High availability

You can rely on the high availability (HA) of RM600 E systems, anytime and anywhere. Many companies base their decision in favor of our RM servers on this aspect, which is of considerable relevance in view of the importance of trouble-free IT operation.
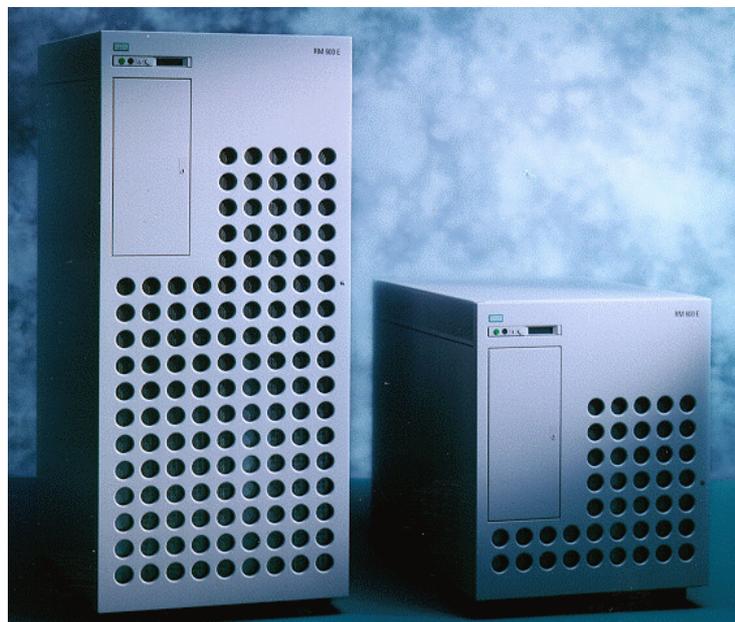
The RM600 E series

The RM600 E server generation satisfies customer requirements in all areas of commercial data processing. The many installations handling online transaction processing (OLTP), data warehousing (DWH) and mission-critical applications (R/3, BAAN) are impressive confirmation of this.

Technology

The convincing system performance, exceptional scalability and high availability of the RM600 E series is based on its advanced symmetrical multiprocessor (SMP) architecture. This supports dynamic load balancing and parallel processing of applications on multiple processors. It enables up to 24 processors to be interconnected to match individual performance requirements. In the RM600 E series, optimally tuned system configurations, state-of-the-art processor boards and bus systems translate the high processor performance into top-class data throughput rates. The evidence is clear: The RM600 E series offers the flexibility to cope effortlessly with increasing performance requirements.

Technical openness

Integration into existing computer center installations is made easy thanks to the availability of all today's commonest drivers and interfaces. Connection of RAID, FC600 E (Fibre Channel disk subsystem), tape libraries, robot systems and other storage subsystems is possible via Fibre Channel or SCSI with load balancing. Today more than ever, heterogeneous installations including NT servers are deployed in many computer centers with RM servers.

Reliant UNIX

For many years now, the Reliant UNIX operating system has amply demonstrated its power and technical maturity in business-critical applications. UNIX 95 Branding for the current 64-bit version of the Reliant UNIX operating system underlines this standardization strategy for aximum openness, reliability and stability.

High availability

With the RM600 E series, the requisite level of availability can be provided through the installation and combination of different standard components according to your requirements:

- Battery backup unit (BBU), and/or uninterruptible power supply (UPS). The signaling links to the system ensure data consistency and fast database restart following a protracted power failure.
- Redundancy and online replacement (OLR) for fans, system power supply (optional) and mirrored hard disks.

Reliant Cluster Server

The high availability of individual nodes can be raised to a significantly higher level still if they are connected together to form clusters. Depending on application, a failover cluster or parallel database cluster can be chosen. Both solutions are based on a unified hardware concept that supports access by multiple nodes to the mass storage subsystems (disk, RAID, MTC autochanger, etc.). Fibre Channel is generally used to cover greater distances between the nodes and the peripheral devices.

Failover cluster

Failover clusters provide failure monitoring of production computers. If a crashed server is detected, its SCSI / FC peripherals are automatically reconfigured and selected applications are switched to an intact node. The merit of this solution is that it offers fast failover mechanisms in both the front end (client connection) and back end areas. Failover clusters can be expanded to comprise up to 8 nodes.

Parallel database cluster

The "parallel database cluster" solution is the preferred choice in environments where high performance and permanent database availability are of primary importance. Up to 8 systems with up to 192 processors can be configured into a general cluster and then access a shared database simultaneously. Another benefit is increased system availability, as the availability of the database (ORACLE, INFORMIX) is not interrupted if one of the nodes in the cluster goes down.

New performance features

Fibre Channel

Fibre Channel is a development that grew out of the concern with high availability. Basic fault detection mechanisms are an integral part of the specification. To ensure operation can continue even if a connection goes down, Fibre Channel relies on redundancy and multipath technology. The user data is stored in FC600 E cabinets or in RAID systems connected to the server via redundant connections implemented in Fibre Channel technology.

PCI 64-bit subsystem

Using this new technology it is possible to achieve a higher I/O capacity with a 64-bit bus width and higher I/O performance based on a 64-bit EHIOS PCI subsystem. In addition to the new 64-bit FC and Gigabit Ethernet controllers, all 32-bit PCI controllers of the RM600 E series can also be used, such as the new WAN and ISDN communication controllers.

System architecture

RM600 E40,E42 / E80 UNIX SMP servers consist of standardized function units. The 128-bit Synchronous Pipelined Bus (SPbus), which is clocked at 55MHz, forms the backbone of the central unit. The processor boards with their local main memory are directly connected to the SPbus, as also are the Enhanced High-Performance I/O boards (EHIOS) with the PCI subsystems for connecting the I/O controllers. The PCI I/O controllers are used to connect mass storage devices, communications facilities and LAN.

Processor board

A single processor board can accommodate 1-4 R12000/285 MHz processors and up to 4GB of main memory. Processors and main memory can be upgraded in the field.
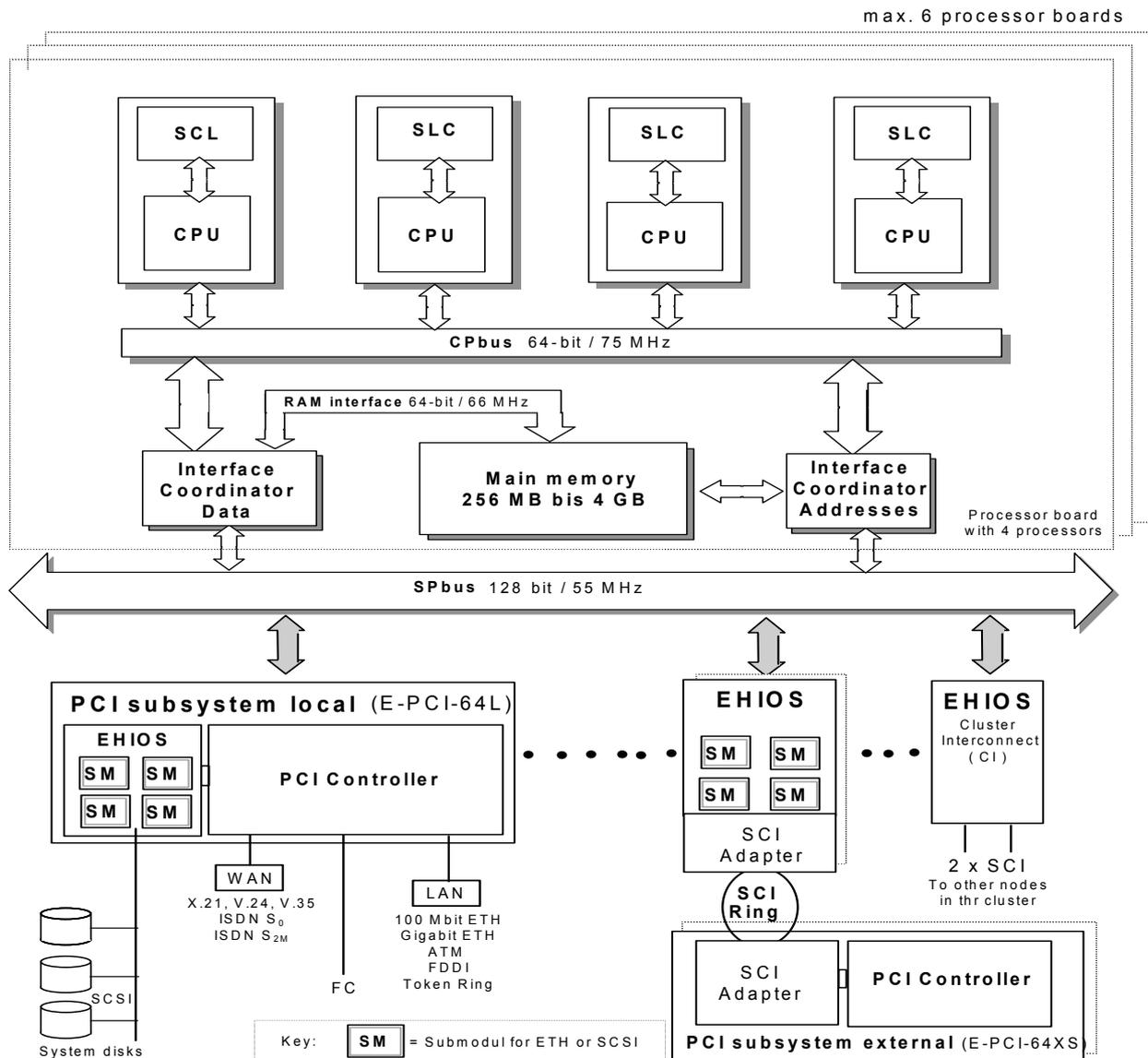
Processor daughterboard

Each processor daughterboard features a MIPS R12000 Risc processor and an onboard second-level cache (SLC) of 8 MB on the E40, E42 model and 8/16 MB on the E80 model. The SLC uses copy-back memory technology and has error correction code (ECC) protection.

ccNUMA architecture

In choosing the ccNUMA architecture (cache-coherent Non-Uniform Memory Access) we are helping to give a major boost to memory access speeds and at the same time significantly increase the data throughput of the overall system:

Performance to delight not just IT specialists but also cost-conscious customers.

RM600 E40, E42 and E80 system architecture:

max. 6 processor boards

SCL	SLC	SLC	SLC
CPU	CPU	CPU	CPU

CPbus 64-bit / 75 MHz

RAM interface 64-bit / 66 MHz

Interface Coordinator Data

Main memory 256 MB bis 4 GB

Interface Coordinator Addresses

Processor board with 4 processors

SPbus 128 bit / 55 MHz

PCI subsystem local (E-PCI-64L)

EHIOS

SM	SM
SM	SM

PCI Controller

EHIOS

SM	SM
SM	SM

SCI Adapter

SCI Ring

EHIOS

Cluster Interconnect (CI)

2 x SCI
To other nodes in thr cluster

WAN

X.21, V.24, V.35
ISDN S_0
ISDN S_{2M}

LAN

100 Mbit ETH
Gigabit ETH
ATM
FDDI
Token Ring

FC

SCSI

System disks

Key: **SM** = Submodul for ETH or SCSI

SCI Adapter

PCI Controller

PCI subsystem external (E-PCI-64XS)

Expandability of RM600 E40, E42 and E80 servers

Components	RM600 models		
System cabinet, expandable with:	**E40**	**E42**	**E80**
Processor board for max. 4 processors (individually pluggable)	1 - 2	1 – 3	1 – 6
Number of processors	1 - 8	2 – 12	2 – 24
Main memory : per processor board per system	256 MB - 4 GB max. 8 GB	2 GB - 4 GB max. 12 GB	1 GB - 4 GB max. 24 GB
1st local PCI subsystem with EHIOS board (basic) with submodule (SM) **PCI subsystem local** **SCI adapter,** optional	2 x V.24 (console, Teleservice) Submodules: 1x8SE, 2x16SE, 1xETH 2 PCI buses per 3x32-bit, 3x64-bit data width 0 – 1 x SCI ring adapter		
EHIOS SCI	Interface for 2 SCI rings for external PCI subsystems		
2nd local PCI subsystem **SCI adapter,** optional	2 PCI buses per 3x32-bit, 3x64-bit and 0 – 1 x SCI ring adapter		
EHIOS CI	2 ports for SCI Cluster Interconnect		
SCSI strings in the system cabinet: 8-bit SE 16-bit SE 16-bit DF	1 x for removable media drives 2 x for system disks 3 x for data disks		
Drive bays for removable media 3½-inch 8-bit SE 5¼-inch 8-bit SE	3 2		
Drive bays for hard disks	11		47
	Some maximum values are mutually exclusive		

Components			
Expansion cabinet, expandable with:	**0 - 4**		**0 – 8**
Hard disk bays **PCI subsystem, external** (per 12 PCI slots)	36 0 - 1		72 0 – 2

Components			
I/O cabinet, expandable with:	**0 - 1**		**0 - 2**
PCI subsystem, external (per 12 PCI slots)	1 - 3		

Components			
FC600 E cabinet	**0 - 4**		**0 – 8**
expandable up to 48 HD drives with:	1-4 disk chassis per 12 drives		

Components			
BBU cabinet, expandable with:	**0 - 2**		**0 – 4**
Battery set / converter	1 - 4 / 1 – 5		

Components			
Max. disk capacity in TB with 18 GB drives and max. no. of cabinets	6 formatted		18 formatted
Terminal / printer connection	via commercially available terminal servers		
PCI controllers (per PCI subsystem) WAN X.21/V.24/V.35 ISDN S_0 ISDN S_{2M} Fibre Channel 100 MB/s Fast Ethernet 100 Mbit/s Gigabit Ethernet Token Ring SCSI Ultra, 16-bit	0 – 12 0 – 12 0 – 8 0 – 8 0 – 8 0 – 4 0 – 2 0 – 12		
Teleservice	Modem and Tele-X software		
Redundant power supply	Optional		
Console	via V.24 and LAN or Remote Communication Adapter (RCA)		

Technical Data
RM600 E40 / E80

MIPS R12000 processor

Clock speed (MHz)	285
0.35µ technology	
6,100,000 transistors	
Processing width (bits)	64
Floating point unit (FPU)	on chip
Memory management unit (MMU):	on chip
Primary cache	
- Instruction cache (KB)	32
- Data cache (KB)	32
Second-level cache controller	on chip
Second-level cache (MB)	8 (RM600 E40, E42)
	8/16 (RM600 E80)
Cache management	2-way associative
Processor performance (estimated)	
RM600 E80 with 8 MB SLC:	
- for one CPU (SPECint95)	17
Throughput:	
- for 24 CPUs (SPECint_rate95)	3490

(**Note**: 1 MB = 2^{20} bytes, 1KB = 2^{10} bytes)

Processor board

Individually pluggable processors	1 - 4
RAM on board	max. 4 GB
RAM upgrade increments	256 MB

Number of processor boards

RM600 model E40 / E42:	max. 2 / 3
RM600 model E80:	max. 6

Main memory configuration

SDRAM 64 MB in 16-Mbit technology and 256 MB in 64-Mbit technology, multibit error detection and 1-bit error correction (ECC).
Maximum onboard main memory capacity over multiple processor boards with:

RM600 model E40 / E42:	8 GB / 12 GB
RM600 model E80:	24 GB

Hard disks

3½" hard disk drives (16-bit, Fast SCSI-2) in rackmount chassis for direct plugging into system and expansion cabinets:

Hard disk drive [3]	18 GB	36 GB	73 GB
Capacity, formatted (GB)	18	36	73
Speed (rpm)	10.000	10.000	10.000
Average latency time (ms)	3,0	3,0	3,0
Avg. positioning time (ms)	5,3/6,2[2]	5,3/6,2[2]	5,3/6,2[2]
Data transfer rate (MB/s)	20	20	20

[1] with data compression
[2] read/write
[3] 1 MB = 10^6 bytes, 1 GB = 10^9 bytes

MTC drives

MTC drive 8mm	**20/40[1] GB**
- Form factor	5¼" HH
- Storage capacity, formatted (GB)	20/40[1]
- Average data transfer rate (MB/s)	3/6[1]

MTC drive 1/4-inch	**4/8 MB**
- Form factor	5¼" HH
- Storage capacity, formatted (MB)	4/8[1]
- Average recording speed (KB/s)	387

MTC drive 4mm (DAT)	**12/24[1] GB**
- Form factor	3½"(1,6 inch)
- Storage capacity, formatted (GB)	12/24[1]
- Average data transfer rate (KB/s)	1000

MTC drive 4mm (DAT)	**20/40[1] GB**
- Form factor	3½"(1,6 inch)
- Storage capacity, formatted (GB)	20/40[1]
- Average data transfer rate (KB/s)	3000

DVD-ROM Laufwerk

- Formfaktor	5¼" HH
- Speicherkapazität (CD-ROM Datenträger)	≤ 650 MB
- Speicherkapazität (DVD-ROM Datenträger)	≤ 4,3 GB
- Datentransferrate (MB/s)	5 MB/s

Floppy disk drive

- Form factor	3.5"
- Storage capacity, formatted (MB)	1.44
- Data transfer rate (Kbit/s)	500

Installation Data

Cabinet type	System cabinet E40/E42	E80	Expansion cabinet 36 drives	72drives	I/O cabinet	BBU cabinet
Electrical specifications						
AC power input (V)	208 - 240	208 - 240	208 - 240	208 - 240	208 - 240	208 - 240
Power input tolerance (%)	+6 / -10	+6 / -10	+6 / -10	+6 / -10	+6 / -10	+6 / 10
Rated frequency (Hz)	47 - 63	47 - 63	47 - 63	47 - 63	47 - 63	47 - 63
Power consumption (VA)	970	2 x 1390	810	2 x 810	510	1950 **)
Effective power (W)	966*)	2 x 1390 *)	810 *)	2 x 810 *)	325 *)	1156 *) **)
Rated current (A)	5	2 x 7	4	2 x 4	3	10 **)
Mechanical specifications						
Hx	750x	1.380x	750x	1.380x	750x	750x
WxD (mm)	600x800	600x800	600x800	600x800	600x800	600x800
Weight (kg) ***)	205	330	230	330	170	404

*) in maximum configuration   **) only when charging BBU   ***) in maximum configuration

AC power connection

Cabinet type: E40, E42 system cabinet, 36-drive expansion cabinet and I/O cabinet:

230 V (Europe):	single-phase, standard power cable (national variant), circuit breaker: 16A slow-acting, power-off switch with redundant power supply: 2nd power supply unit on separate power circuit
120/208 V (North America):	2-phase connection (L6-20P), 2-phase per power supply unit, power-off switch, circuit breaker: 16A slow-acting, with redundant power supply: 2nd power supply unit on separate power circuit

Cabinet type: E80 system cabinet and 72-drive expansion cabinet with power distributor:

230 V (Europe):	3-phase connection (star), 3x16A CEE connectors, 1 phase per power supply unit (L1+N, L2+N, L3+N), circuit breaker per phase: 16A slow-acting / power-off switch
120/208 V (North America):	2-phase connection (L6-30P), 2-phase per power supply unit, each power supply unit with separate X+Y phase-phase connection, circuit breaker per phase: 30A / power-off switch

Service and maintenance area

front: 1000 mm   back: 800 mm

Environmental conditions (valid for all cabinets)

Operation	Class 3K2 to EN 60721-3-3	**Transportation**	Class 2K2 to EN 60721-3-2
Temperature (°C)	15 - 32	Temperature (°C)	-25 to +60
Rel. humidity (%)	10 - 75	Rel. humidity	max. 75% at 30 °C
Altitude above sea level	3000 m	Altitude above sea level	12,000 m

Mechanical conditions (valid for all cabinets)

Operation	Class 3M2 to EN 60721-3-3	**Transportation**	Class 2M1 to EN 60721-3-2
Mech. active subst.	Class 3S2 to EN 721-3-3	Mech. active subst.	Class 2S1 to EN 721-3-2
Chem. active subst.	Class 3C2 to EN 60721-3-3	Chem. active subst.	Class 2C2 to EN 60721-3-2

Compliance with standards (valid for all cabinets)

Safety	**EMC specifications**	**Noise level** (per cabinet to ISO 9296; in operation)	
Product class B	EN 55022-B	Noise output level	L_{WAd}: 7.1 B
EN 60950	EN 500082 T1	Workplace-related noise output level for	
UL 1950	FCC Class A (USA)	cabinet type: E40, E42, 36-drive, I/O	L_{pAm}: 51 dB
CSA 22.2 No. 950	C 108.8 Class A (Canada)	cabinet type: E80, 72-drive	L_{pAm}: 54 dB
Certifications: UL / cUL listed, CCA certificate, conformity declaration (CE)			

Company stamp