



RED HAT ENTERPRISE MRG

MESSAGING, REALTIME, GRID

INTRODUCING RED HAT ENTERPRISE MRG

Red Hat® Enterprise MRG integrates messaging, real-time, and grid functionality in a unified, high-performance distributed computing platform. Red Hat Enterprise MRG makes IT infrastructure 100 times faster, defines new levels of interoperability, and gives customers a competitive advantage by running applications and transactions with greater efficiency, performance, and reliability.

Red Hat Enterprise MRG:

- Provides faster messaging and implements AMQP, the first open messaging standard for interoperability. Red Hat is a founding member of the AMQP Working Group.
- Gives customers a competitive advantage through guaranteed fast response times.
- Advances customers to high-performance utility computing by scheduling any workload – from sub-second calculations to server applications to high-performance computations – to any computing resource. Workloads can span local grids, remote grids, virtual machines, and cloud infrastructure. They can efficiently cycle-harvest from idle PCs. Red Hat has signed a unique partnership with the University of Wisconsin to continue to develop this technology jointly.

By integrating messaging, realtime, and grid functionality, Red Hat Enterprise MRG provides businesses with a revolutionary foundation for high-performance distributed computing that can be used for everything from service-oriented architecture (SOA) to virtualization to cloud computing to bare-metal, mission-critical applications.

Red Hat Enterprise MRG is a new subscription offering from Red Hat. It is optimized for Red Hat Enterprise Linux,® offering ground-breaking performance on the Red Hat platform, but it also supports other platforms.

BENEFITS

Red Hat Enterprise MRG is a next-generation IT infrastructure that solves significant challenges for today's IT decision-makers.

Here are few examples:

Most – if not all – workloads and environments can benefit from virtualization. But how do you leverage virtualization if:

- You have thousands or tens of thousands of heterogeneous servers running different applications?
- You have high variability or seasonality in your workloads?
- You want to utilize additional resources that aren't in your datacenter?
- You want to treat your datacenter as a computing utility or “internal cloud?”

Distributed applications and architectures require messaging software to distribute data and connect services across a wide variety of computers. But how do you leverage messaging if:

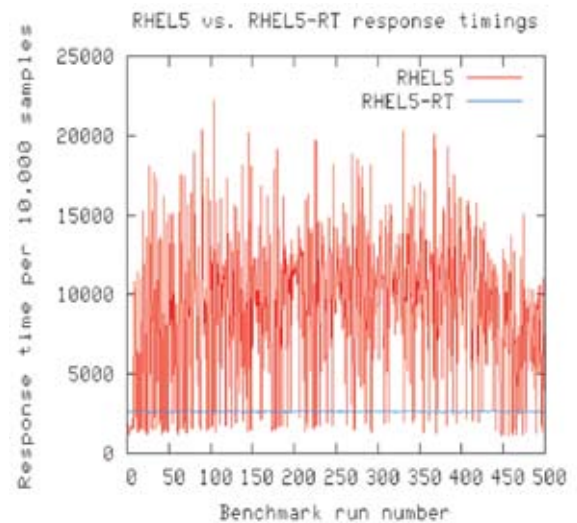
- Messaging software is segmented, complex, and incompatible?
- Messaging software is expensive and proprietary?
- Messaging software does not meet your functional or performance requirements?

Computing is increasingly critical and often provides competitive advantage. But your business must be able to guarantee your software choices will perform reliably and the companies that back them can meet your service level needs.

Red Hat Enterprise MRG solves these issues and others with included benefits like:

- **Reduced complexity and breakthrough value**
Red Hat Enterprise MRG provides an integrated platform for high-performance distributed computing. Before MRG, enterprises would typically need to build a complicated architecture with a number of different products to provide capabilities like fast messaging, reliable messaging, large-file messaging, deterministic latency, workload scheduling, and scalable virtualization. Furthermore, enterprises had to tie these products together to meet their use cases – usually through custom development. This was especially difficult, as many of these products are fundamentally incompatible and require deployment in various silos for specialized functionality. Finally, each different product brings its own management tools and requirements. As an integrated platform, Red Hat Enterprise MRG vastly simplifies the deployment, management, and architecture of enterprise IT while significantly increasing its functionality, performance, and value.
- **Deterministic performance**
For the most time-critical workloads, "close enough" isn't good enough. For instance, in the highly competitive financial services marketplace, milliseconds can make the difference between a trade and a lost customer. In these environments, consistently fast response times are a huge competitive advantage. MRG realtime meets the needs of time-sensitive workloads by providing predictably consistent low-latency response times.
- **Deterministic low-latency messaging**
The combination of realtime and messaging allows for highly deterministic response times and reliably low latency. Furthermore, the AMQP-supported, high-performance optimizations for Red Hat Enterprise Linux with advanced features significantly enhance the value and power of messaging.

DETERMINISTIC PERFORMANCE



- **Scalable and efficient utility computing**
Red Hat Enterprise MRG can schedule any workload (sub-second calculations, server applications, HPC workloads, and more) to any computing resource – even spanning local grids and remote grids, virtual machines, cycle-harvesting from desktop workstations, and dynamically provisioned and scheduled cloud-based infrastructure like Amazon EC2. Enterprises can move toward a utility model of computing where applications are scheduled as jobs across a heterogeneous set of computing resources. The MRG grid scheduler can then automatically optimize utilization, priorities, load, and other key factors.



UNIFIED MANAGEMENT

MRG Management - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://localhost:45672/index.html?frame=main.broker.queue;main.m=broker;main.broker.m

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Messaging Systems Hi, guest - Log Out

Main -> Broker 'notebook' -> Queue 'perftest0' Actions: 0 pending, 0 completed, 0 failed

Queue 'perftest0'

Last Updated: 12 May 2008 16:55 [Purge](#)

| Messages | | Bytes | |
|----------|-------|----------|---|
| Enqueued | - | - | - |
| Dequeued | - | - | - |
| Depth | 40259 | 41225216 | |

Statistics Exchange Bindings (1) Details

General Durability Transactions

Input/Output

| Statistic | Value | Per Second |
|-------------------|------------|-------------|
| Msgs. Enqueued | 1719813 | 16894.60 |
| Msgs. Dequeued | 1679554 | 12868.70 |
| Bytes Enqueued | 1761088512 | 17300070.40 |
| Bytes Dequeued | 1719863296 | 13177548.80 |
| Msgs. Unacked | 0 | 0 |
| Min. Msg. Latency | 0 | 0 |
| Max. Msg. Latency | 0 | 0 |
| Avg. Msg. Latency | 0 | 0 |

General

| Statistic | Value | Per Second |
|---------------|----------|------------|
| Consumers | 1 | 0.10 |
| Bindings | 1 | 0 |
| Message Depth | 40259 | 4025.90 |
| Byte Depth | 41225216 | 4122521.60 |

Messages Enqueued and Dequeued

10 minutes 1 hour 1 day

- **Large-scale virtualization**

Red Hat Enterprise MRG has support for virtualization – and not just Red Hat virtualization, but VMware as well. Red Hat Enterprise MRG provides sophisticated capabilities for managing large-scale virtualization deployments across heterogeneous servers with changing workloads.

- **Unified management**

Red Hat provides unified management with a web-based console, command-line tools, and APIs across the entire platform – greatly simplifying the management of distributed computing. Red Hat Enterprise MRG builds its management capabilities on top of an AMQP-compliant messaging system. This lets you manage MRG via a messaging interface across a variety of languages and platforms. It also allows use of the powerful web-based management console.

FEATURES

Messaging

- **AMQP support**

Messaging implements AMQP, an open and interoperable messaging standard developed by the AMQP Working Group. Red Hat is one of the founding members of the AMQP Working Group and Red Hat Enterprise MRG is compliant with AMQP 0-10, the most current version the standard.

- **Flexible messaging paradigms**

Messaging includes comprehensive support for various messaging paradigms, including store-and-forward, transaction distribution, publish-subscribe, content-based routing, queued file transfer, point-to-point connections among peers, and market data distribution.

- **Multi-language client support**

Messaging offers clients the ability to use a variety of languages across several platforms, including Java (JMS), C++, Python, .NET (WCF), and more. MRG's messaging scripting clients enable rapid application development with a lightweight tool, while still offering all the performance and transactional power of AMQP.

- **High performance**

Messaging can achieve over 6 million OPRA messages per second throughput on an 8-core box using gigabit ethernet.

- **AIO durable messaging journal**

Messaging can achieve sustained durable messaging throughput rates of 500,000 messages per second per LUN on typical hardware, a rate that is orders of magnitude better than previously possible. MRG Messaging achieves these rates through the inclusion of a new AIO journal specifically optimized for persistent messaging storage on Red Hat Enterprise Linux.

- **Native RDMA infiniband support**

Messaging offers native RDMA Infiniband support. This enables MRG Messaging to achieve extremely low end-to-end latencies (in the microsecond range) for reliable messaging.

- **MRG realtime optimizations**

Messaging is optimized to run on MRG's realtime kernel to provide optimal, deterministic latencies and outstanding throughput.

- **Transient and durable messaging**

Durable messaging ensures that messages and queues are restored in the unlikely event of a broker crash or an operating system crash. Transient messaging reduces the processing needed for messages and guarantees delivery as long as the broker continues to run.



- **Large message support**
Messaging supports multi-gigabyte messages.
- **Clustering and failover**
Messaging provides clustering and failover, ensuring that your applications continue to function if a broker or operating system crashes.
- **Federation**
Messaging provides broker federation to enable deployments across multiple geographies.
- **Transactions**
Messaging provides support for messaging transactions, including distributed transaction (XA) support. With transactions, you can ensure that all messages in a group are delivered as a whole—if the delivery of one message fails, then the delivery of all messages in that group fails.
- **Security**
Messaging includes SSL support, role-based access control, SASL authentication, and other security features.
- **Queue semantics**
MRG includes support for queue semantics like ring queues, last value queues, and replay queues.
- **XML**
For XML messages, MRG supports dynamic routing based on XQuery expressions in the messaging broker as well as in-flight message transformation.
- **Distributed management console**
Messaging contains a console for instrumentation (including historical), configuration, and the ability to perform management operations through a web interface to control a network of deployed machines.

Realtime

- **Highly deterministic performance**
Realtime dramatically increases the determinism of Red Hat Enterprise Linux. MRG Realtime provides a replacement kernel for Red Hat Enterprise Linux 5, bringing new scheduling and performance gains and providing full pre-emption so that it can respond to any event within 8 microseconds. For applications that cannot tolerate significant deviations in performance, MRG provides vastly enhanced determinism.
- **High-resolution timers**
Realtime includes support for timers with nanosecond accuracy.
- **Optimized gettimeofday()**
Many applications frequently call gettimeofday() operations for things like time-stamping in log files. Realtime includes an optimized gettimeofday() implementation that does not incur a context switch, resulting in significantly improved performance.
- **Full application compatibility with standard Red Hat Enterprise Linux**
Realtime does not modify anything in the user space of Red Hat Enterprise Linux. As such, it preserves full compatibility with applications certified for Red Hat Enterprise Linux. Any application that runs on Red Hat Enterprise Linux will also run on Red Hat Enterprise Linux with a MRG realtime kernel without any modification or recompilation.
- **Performance and tuning tools**
Realtime includes powerful new tools for tuning and tracing the performance of your system for realtime workloads.

Grid

- **Scalable grid scheduler**

The MRG grid scheduler is based on Condor, which powers many of the largest grids in the world and scales beyond tens of thousands of nodes with ease.

- **Virtualization**

The MRG grid allows you to submit a virtual machine (VM) as a user job and supports migration of the VM.

- **Cloud scheduling**

Grid allows you to use computing resources at cloud-based environments like Amazon EC2.

- **Desktop cycle-stealing**

Desktop cycle-stealing allows you to take advantage of the unused capacity of desktop systems to add processing power to your grid.

- **ClassAds**

ClassAds provides a flexible language for policy and meta-data description.

- **Policies**

Grid allows flexible, customizable policies specified by jobs and resources via ClassAds.

- **Low-latency scheduling**

The integration of messaging and grid technology allows job scheduling and response times in the millisecond range. MRG can also be integrated with Microsoft® Excel® to run calculations on a grid.

- **Concurrency limits**

MRG includes the ability to set concurrency limits on jobs. These limits can restrict the instances of licensed software running at one time or control access to scarce resources.

- **Dynamic provisioning**

Grid dynamically adjusts resource slots based on jobs.

- **Federated grids/clusters**

A mechanism known as flocking allows independent pools to use each others' resources, controllable by customizable policies.

- **Multiple standards-based APIs**

A web services interface provides job submission and management functionality. A CLI provides a highly scriptable interface to all functionality, with consistent output.

- **Workflow management**

Grid provides sophisticated workflow management capabilities.

- **High availability**

The Negotiator and Collector, via HAD, and the schedd, via schedd failover, can have their state replicated to allow for graceful failover upon service disruption.

- **Disk space management**

NeST, a multi-protocol storage management system, exposes the ability to manage (allocate, free, reserve, etc.) disk space to a user's jobs.

- **Database support**

All data about jobs and resources can be stored in a database via Quill.

- **Compute on-demand (COD)**

Grid allows a node or set of nodes to be claimed in such a way that others may use the claimed nodes until they are needed.

- **Dynamic pool creation**

Through a technology known as Glide-ins, nodes can be dynamically added to a pool to service user jobs.



- **Priority-based scheduling**
Grid can schedule based on priority.
- **Accounting**
User and group resource utilization is tracked and the information is accessible to administrators.
- **Security**
Grid includes comprehensive security.
- **Parallel universe**
Grid provides an extensible framework for running parallel (including MPI) jobs. In this environment, MRG's grid automatically co-allocates compute nodes. Furthermore, it provides framework implementation for MPICH1, MPICH2, and LAM.
- **Java universe**
Grid provides explicit support of jobs written in Java.
- **Time scheduling for job execution (cron)**
Grid allows a job (or multiple jobs) to be started at specific times, with customizable policy for failures such as missed deadlines.
- **Backfill**
Grid allows otherwise unused nodes to run jobs provided by BOINC.
- **File staging**
In the absence of a shared filesystem, MRG's grid supports automatic file staging (job input) and online file I/O (like file streaming from submit to execute nodes) via Chirp and remote syscalls.
- **Dedicated and undedicated node management**
Grid enables dedicated resources (clusters) to be augmented with otherwise undedicated resources (desktops) using flexible policies.
- **Master-Worker (MW)**
Grid provides a C++ framework that enables a single master process to allocate and manage multiple worker processes. This data is processed based on master specified policies.
- **Condor-C**
Condor-C allows jobs in one queue to be moved to another queue.
- **Management tools**
Grid includes powerful browser-based tools for managing daemons and machines, security, compute jobs, scalability settings, priorities, and more. MRG also provides sophisticated monitoring capabilities.

ADDITIONAL INFORMATION

For additional information on Red Hat Enterprise MRG, visit redhat.com/mrg.



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