RED HAT ENTERPRISE MRG

MESSAGING, REALTIME, GRID

INTRODUCING RED HAT ENTERPRISE MRG

Red Hat Enterprise MRG is next-generation IT infrastructure that makes IT infrastructure 100-fold faster, defines new levels of interoperability and gives customers competitive advantage by running applications and transactions with greater performance and reliability. Red Hat Enterprise MRG integrates messaging, realtime, and grid technologies.

Red Hat Enterprise MRG:

- Provides messaging that is up to 100-fold faster and implements AMQP, the first open messaging standard, for interoperability. Red Hat is a founding member of the AMQP working group.

- Give customers competitive advantage through guaranteed, fast response times.

- Can schedule to local grids, remote grids, and rented cloud infrastructure; and cycle-steal from idle PCs to use all available computing resources. Red Hat has signed a unique partnership with the University of Wisconsin to develop this technology jointly.

By integrating messaging, realtime, and grid technologies, Red Hat Enterprise MRG provides enterprises with a revolutionary foundation for high performance distributed computing for everything from 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 highly optimized for and offers ground-breaking performance on Red Hat Enterprise Linux but also supports other platforms.

BENEFITS

- **Reduced complexity and breakthrough value**
  Red Hat Enterprise MRG provides an integrated platform for high performance distributed computing. Without MRG, enterprises would typically need to build a complicated architecture spanning a number of different products for capabilities like fast messaging, reliable messaging, large-file messaging, deterministic latency, workload scheduling, and scalable virtulization. Furthermore, enterprises have to tie these products together to meet their use cases – usually through custom development. Compounding this difficulty is that many of these products are fundamentally incompatible – requiring deployment in various silos for specialized functionality. Finally, each different product brings with it its own management tools and requirements. As an integrated platform, Red Hat Enterprise MRG vastly simplifies the deployment, management, and architecture of enterprise IT architecture 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 make the difference between a trade and a lost customer. In these environments, consistently fast response times are a huge competitive advantage. MRG Realtime provides the highest levels of predictability for consistent low-latency response times to meet the needs of time-sensitive workloads.
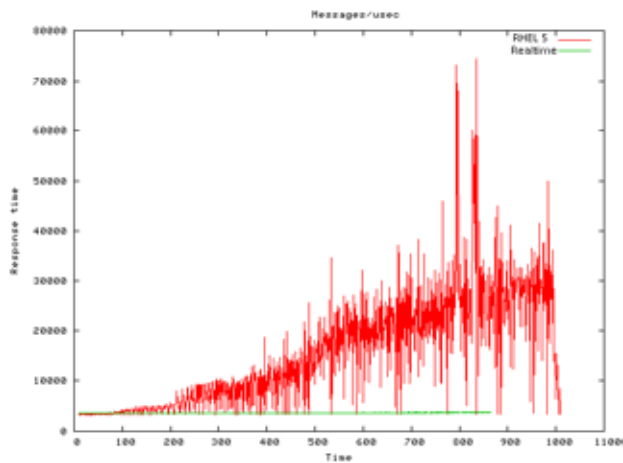
• **Deterministic low-latency messaging**
The combination of realtime and messaging enables
messaging with highly deterministic response times
and reliably low latency.

• **Scalable computing power and resource utilization**
Red Hat Enterprise MRG schedule any workload to
local grids and remote grids, cycle-steal from desktop
workstations, and dynamically provision and schedule
work to cloud-based infrastructure like Amazon EC2.
MRG also supports virtualization to harness any avail-
able resources for various jobs.

• **Messaging-based reliable, low-latency job scheduling**
By leveraging MRG's messaging and realtime com-
ponents, MRG Grid can reliably schedule and execute
jobs in less than a second. This vastly increases the
range of jobs that MRG can meaningfully handle – if
a job scheduler takes several seconds or even min-
utes to schedule a job, then there is no value in hav-
ing that job scheduler run rapid jobs. By providing a
message-based interface for sub-second job schedul-
ing, MRG Grid can handle all workloads, from sub-
second executions to long-running, massively parallel
jobs. Furthermore, by leveraging AMQP, Red Hat
Enterprise MRG provides a cross-platform and cross-
language protocol for submitting jobs from a variety
of environments.

• **Unified management**
Red Hat provides a unified management platform with
a Web-based console, command-line tools, and API's
across the entire MRG platform – greatly simplify-
ing the complexity of managing distributed comput-
ing. Red Hat Enterprise MRG builds its management
capabilities on top of its AMQP-compliant messaging
system. This provides the ability to manage MRG via a
messaging interface across a variety of languages and
platforms. It also enables Red Hat Enterprise MRG's
powerful Web-based management console.

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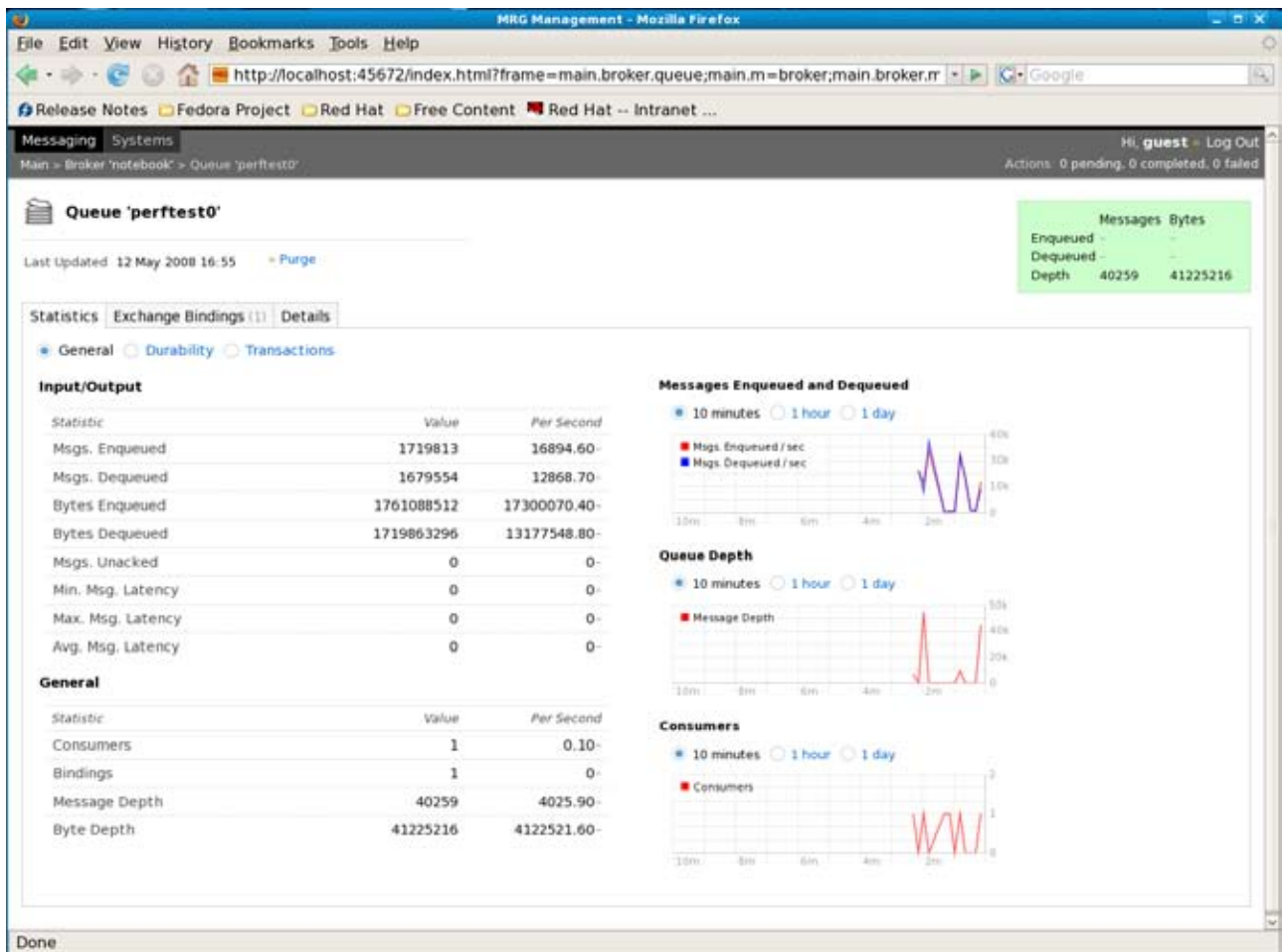
With Red Hat Enterprise MRG, enterprises can gain significant value at the cores of what they do:

- Investment banks can gain competitive advantage by building a more deterministic and lower latency reliable trading platform and also leveraging resources ranging from dedicated grids to dynamically-provisioned cloud-based resources for running Monte Carlo analysis of market conditions

- Governments and the defense industry can create more reliable simulations or control systems and process and disseminate critical information faster

- Telecommunication companies can provide increased reliability, performance, and interoperability for their networks and infrastructure

- Animation studios can render movies more efficiently and complete them sooner with improved workflows

- Oil and gas companies can save precious drilling time by performing seismic analysis with increased speed and efficiency

and so on. In short, Red Hat Enterprise MRG can provide any enterprise with distributed data or computational resources with competitive advantage, greatly simplified complexity, and the flexibility and performance to address peak computational demands by leveraging and integrating the three fundamental technologies of messaging, realtime, and grid.

Messaging

- **High Performance Messaging Journal**
  MRG Messaging can achieve sustained durable messaging throughput rates of 500,000 messages per second per LUN on typical hardware, a rate that is up to 100-fold 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 OFED Infiniband Support**
  MRG Messaging offers native OFED Infiniband support. This will enable MRG Messaging to achieve unique throughput/latency ratios not currently found in messaging systems. Red Hat is applying the same types of work it did for achieving maximum theoretical messaging rates for storage to the network.

- **MRG Realtime Optimizations**
  MRG Messaging is optimized to run on MRG's Realtime kernel to provide optimal, deterministic latencies.

- **AMQP Support**
  MRG 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. Red Hat Enterprise MRG 1.0 is compliant with AMQP 0-10, the most current version of AMQP.

- **Flexible Messaging Paradigms**
  MRG 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**
MRG Messaging offers clients in a variety of languages across several platforms, including Java (JMS), C++, Python, .NET, and more. MRG Messaging's <100k scripting clients enable rapid application development with a light-weight tool, while still offering all the performance and transactional power of AMQP.

- **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**
MRG Messaging supports multi-gigabyte messages

- **Clustering and Failover**
MRG Messaging provides clustering and failover to ensure that your applications continue to function if a broker or operating system should crash.

- **Transactions**
MRG 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 delivery of one message fails, delivery of all messages in the group fails.

- **Distributed Management console**
MRG Messaging contains a console for instrumentation (including historical), configuration and the ability to perform management operations through a web interface to a network of deployed machines.

Realtime

- **Highly Deterministic performance**
MRG Realtime dramatically increases the determinism of Red Hat Enterprise Linux. By providing a replacement kernel for Red Hat Enterprise Linux 5.1 and later, MRG Realtime brings new scheduling and performance gains and provides full preemption so that it can respond to any event within 20 microseconds. For applications that cannot tolerate significant deviations in performance, MRG Realtime provides vastly enhanced determinism.

- **Full Application Compatibility with standard Red Hat Enterprise Linux**
MRG Realtime does not modify anything in the userspace 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**
MRG Realtime includes powerful new tools for tuning and tracing the performance of your system for real-time workloads.

Grid

- **Management Tools**
  MRG Grid includes powerful browser-based manage-
  ment tools for managing daemons and machines,
  security, compute jobs, scalability settings, pri-
  orities, and more. MRG also provides sophisticated
  monitoring capabilities.

- **Desktop Cycle-Stealing**
  Desktop Cycle-Stealing allows you to leverage the
  unused capacity of desktops to add processing power
  to your grid.

- **Cloud scheduling**
  MRG Grid enables leveraging computing resources
  at cloud-based environments like Amazon EC2

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

- **Policies**
  MRG Grid enables flexible, customizable policies
  specified by jobs and resources via ClassAds.

- **Virtualization**
  MRG Grid allows submitting of a virtual machine (VM)
  as a user job and supports migration of the VM.

- **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**
  MRG Grid provides sophisticated workflow manage-
  ment capabilities

- **High Availability**
  The Negotiator and Collector, via HAD, and the Schedd,
  via Schedd Fail-over, can have their state replicated to
  allow for graceful fail-over upon service disruption.

- **Disk Space Management**
  Through a multi-protocol storage management sys-
  tem, called NeST, the ability to manage (allocate, free,
  reserve, etc) disk space is exposed 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)**
  MRG Grid provides the ability for a node or set of
  nodes to be claimed by a user in such a way that others
  may use the claimed nodes until the user needs them.

- **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**
  MRG Grid can schedule based on priority

- **Accounting**
  User and group resource utilization is tracked and accessible to administrators.

- **Security**
  MRG Grid includes comprehensive security

- **Parallel Universe**
  MRG Grid provides an extensible framework for running parallel (including MPI) jobs. In this environment, MRG Grid automatically co-allocates compute nodes. Furthermore, MRG Grid provides framework implementation for MPICH1, MPICH2, and LAM.

- **Java Universe**
  MRG Grid provides explicit support of jobs written in Java.

- **Time Scheduling for Job Execution (Cron)**
  MRG Grid allows a job or multiple jobs to be started at specific times, with customizable policy for failures such as missed deadlines.

- **Backfill**
  MRG Grid allows otherwise unused nodes to run jobs provided by BOINC.

- **File Staging**
  In the absence of a shared filesystem, MRG Grid supports automatic file staging (e.g. job input), and online file IO (e.g. file streaming from submit to execute nodes) via Chirp and remote syscalls

- **Dedicated and Undedicated Node Management**
  MRG Grid enables dedicated resources (clusters) to be augmented with otherwise undedicated (desktops) using flexible policies.

- **Master-Worker (MW)**
  MRG Grid provides A C++ framework that enables a single master process to allocate and manage multiple worker processes, which process data based on master specified policies.

- **Condor-C**
  Condor-C enablesjobs in one queue to be moved to another queue.

- **Hawkeye**
  Hawkeye enables automated monitoring of one or more pools.

ADDITIONAL INFORMATION

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