Hardware Guidelines for Quorum Applications

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Document Summary

Customer:

Document Date/Revision:

Platform Release:

Based on specific customer information and requirements, the NTS (Network Support), BIS (Business Intelligence Support), DBA (Database Administration), and Consulting teams have developed the following general guidelines.

This document provides a high-level overview of the Quorum operational environment for budgeting and planning. It is not intended to be a detailed installation guide. Your project team will review and outline specific requirements, service packs, and patch levels required.

Capacity Requirements (Production Environment)

Please select the product(s) included in the installation:

Products Included	
☐	CAW (Web or Classic)
☐	Contract Management (QCM)
☐	Cost Accounting (QCA)
☐	Core Financials (QCFS)
☐	Division Order and Disbursement (QDOD)
☐	eCalendar
☐	EDI
☐	Geographic Information System (QGIS)
☐	Land System (QLS)
☐	PGAS
☐	Pipeline Transaction Management (QPTM)
☐	Query Module (QQM)
☐	Revenue Accounting (QRA)
☐	Upstream Division Order (QDO)
☐	TIPS

Enter the capacity requirements for each product in the installation:

Upstream Accounting	
AFEs (annual)	
JIB statements (monthly)	
AP invoices (daily)	
Incoming checks/detail lines (monthly)	
Royalty checks/detail lines (monthly)	
Average owners per DOI	
Wells	
Users (total/concurrent)	

TIPS	
Plants	
Wells	
Contracts	
BAs	
Allocations (daily/monthly)	
Users (total/concurrent)	

Land & GIS	
Agreements	
Land edit users	
Land view only	
GIS edit users	
GIS Web users/concurrent	
Brokers	

Transportation	
Number of pipelines	
Number of meters per pipeline	
Number of contracts	
Number of nominations per pipeline	
Daily or monthly processing	
Total/concurrent internal users	
Total/concurrent external users (shippers/customers)	

PGAS	
Meters	
Measurement uploads per day	
PGAS users	

Hardware Guidelines (Production Environment)

Customers may modify the hardware guidelines in this document; however, server specifications should meet or exceed the specifications provided. Failing to meet the server specifications in this document may adversely affect application performance.

Out of scope: These guidelines do not include miscellaneous required equipment, such as network switches, routers, or hardware/software for tape backup requirements.

Assumptions

The guidelines in this document assume the following:

- No applications, processes, or utilities other than those described will run on these servers.
- Customers using a different authentication method have existing Microsoft Active Directory domains that can be used for authentication.
- If applicable, the maximum number of concurrent QQM users is 20.

Infrastructure Diagram (Example)
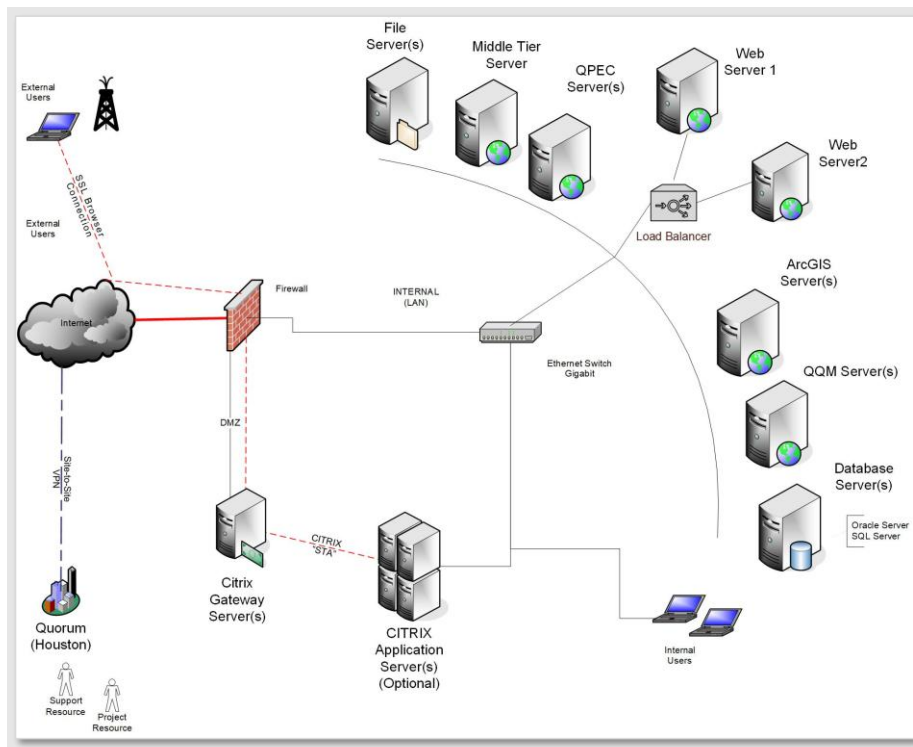
Server Considerations

The servers described in this document are for production environments; capacity and performance should be verified during user acceptance testing. Additional servers for development, testing, and/or ongoing user acceptance testing or training should be provided as needed.

> **Note:** *Quorum does not recommend combining production and non-production workloads on the same hardware.*

Backup Infrastructure

Quorum assumes that customers have adequate existing infrastructure to facilitate periodic backups of their environments in a manner that does not adversely impact business operations.

Additional Recommendations

- All Quorum application-related servers should be connected to a gigabit network and reside on the same subnet with no intervening routers or network hops.
- All servers should have a gigabit NIC card and dual power supplies.
- Certain servers specified in this document provide for expansion capabilities when necessary and may not initially be fully populated with CPUs, memory, or disks.
- Secure access to internal Citrix servers (if desired) is available via NetScaler, reverse proxy, or VPN.
- Web servers may be deployed behind a firewall, DMZ, or via reverse proxy.
- For redundancy and high availability, QPEC and Middle-Tier server components can be duplicated.

Advanced Configurations

The guidelines in this document are based on our current understanding of customer environments and requirements; these guidelines make assumptions based on the approach and configuration of Quorum's internal infrastructure.

If customers want to implement other approaches and configurations, Quorum will discuss the implications of these methods based on prior experience with internal and customer environments.

Advanced approaches that merit further discussion include:

- Multiple Active Directory domains
- Server virtualization
- Non-direct attached disk solutions (i.e., SAN or NAS usage)
- Clustered servers

Oracle Database Server

Note: *Should perform as well as or better than direct attached storage.*

Database	
Quantity	1
Server Class	Similar to Dell R740 PowerEdge server
Processor	2 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 8C, 130 W
RAM (low/std/high)	64/128/256 GB 1600 MHz RAM (expandable); optimized preferred
Storage (internal)	2 internal 300GB 15K SAS disk drives (Raid-1) for OS, EXEs 4 internal 600GB 15K SAS disk drives (Raid-5) for database files
Controller	SAS RAID controller (internal)
Media	8x DVD drive (optional)
Operating System	Windows Server 2016 Windows Server 2019 Red Hat Linux 6.x/7.x (64 bit)
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

SQL Database Server

Note: *Should perform as well as or better than direct attached storage.*

Database	
Quantity	1
Server Class	Similar to Dell R740 PowerEdge server
Processor	1 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 8C, 130 W
RAM (low/std/high)	64/128/256 GB 1600 MHz RAM (expandable); optimized preferred
Storage (internal)	2 internal 300GB 15K SAS disk drives (Raid-1) for OS, EXEs 4 internal 600GB 15K SAS disk drives (Raid-5) for database files
Controller	SAS RAID controller with 1024 MB cache (external connectors)
Media	8x DVD drive
Operating System	Windows Server 2016 Windows Server 2019
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

QPEC Application Server

Note: *Can be virtualized.*

Batch and Online Processing and Reporting	
Quantity (low/std/high)	2+ / 4+ / 6+
Server Class	Similar to Dell R640 PowerEdge server
Processor	1 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 8C, 130 W
RAM	64 GB 1600 MHz RAM (expandable); optimized preferred
Storage (internal)	2 internal 146 GB 15K SAS disk drives (Raid-1) for OS, EXEs
Controller	SAS RAID controller (internal)
Media	8x DVD drive (optional)
Operating System	Windows Server 2016 Windows Server 2019
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

ArcGIS Server

Note: *Assumes local caching of "base maps"; less disk space may be needed, depending on map caching options. Can be virtualized.*

Geoprocessing and WebMap Services	
Quantity	1
Server Class	Similar to Dell R640 PowerEdge server
Processor	1 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 8C, 130 W
RAM	24 GB 1600 MHz RAM (expandable); optimized preferred
Storage (internal)	4 internal 300 GB 15K SAS disk drives (Raid-10) for OS, EXEs
Controller	SAS RAID controller (internal)
Media	8x DVD drive (optional)
Operating System	Windows Server 2019 (10.6 and higher)
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

Web Server

> **Note:** *Can be virtualized or externally load-balanced.*

Web Server	
Quantity	2+
Server Class	Similar to Dell R640 PowerEdge server
Processor	1 Intel Xeon Gold 6132 @ 2.60 GHz, 19.25 MB cache, 14C, 140 W
RAM	64 GB 2666 MHz RAM; optimized preferred
Storage (internal)	2 internal 146 GB 15K SAS disk drives (Raid-1) for OS, EXEs
Controller	SAS RAID controller (internal)
Media	8x DVD drive (optional)
Operating System	Windows Server 2016 Windows Server 2019
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

Middle-Tier Server

> **Note:** *Only a single middle tier instance is supported for AP and AFE workflow. Can be virtualized.*

Middle-Tier Server	
Quantity	2+
Server Class	Similar to Dell R640 PowerEdge server
Processor	1 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 8C, 130 W
RAM	64 GB 1600 MHz RAM; optimized preferred
Storage (internal)	2 internal 146 GB 15K SAS disk drives (Raid-1) for OS, EXEs
Controller	SAS RAID controller (internal)
Media	8x DVD drive (optional)
Operating System	Windows Server 2016 Windows Server 2019
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

File Server

> **Note:** *Can be virtualized.*

File Server	
Quantity	1
Server Class	Similar to Dell R640 PowerEdge server
Processor	1 Intel Xeon Gold 5122 3.60 GHz, 16.5 MB cache, 4C, 105 W (expandable)
RAM	24 GB 1600 MHz RAM; optimized preferred
Storage (internal)	2 internal 300 GB 15K SAS disk drives (Raid-1) for OS, EXEs
Controller	SAS RAID controller (internal)
Media	8x DVD drive (optional)
Operating System	Windows Server 2016 Windows Server 2019
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

Typical deployment uses the Windows OS and file share capability to support:

- Network installer, client installer, report templates, import/export folders, document management repository, etc.; and
- Windows services such as QPEC Manager, process services, document management services, and APWF services.

Ultimate disk space is determined by application utilization of this server.

Document attachment functionality can be configured to utilize file share or CMIS capabilities. Depending on the CMIS provider, file upload size should be considered; larger file uploads will impact performance and Web server memory usage.

> **Note:** *Access to approximately 100 GB on a common file share is required for import, export, and report files.*

QQM Server

> **Note:** *Maximum 20 concurrent users.*

QQM Server	
Quantity	1
Server Class	Similar to Dell R640 PowerEdge server
Processor	1 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 4C, 130 W
RAM	24 GB 1600 MHz RAM; optimized preferred
Storage (internal)	2 internal 146 GB 15K SAS disk drives (Raid-1) for OS, EXEs
Controller	SAS RAID controller (internal)
Operating System	Windows Server 2016 (as of BI 4.2 SP3+) Windows Server 2019 (as of BI 4.2 SP7+)
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

Citrix Server

> **Note:** *Per 30 concurrent users. Can be virtualized.*

Citrix Backend Server	
Quantity	1
Server Class	Similar to Dell R640 PowerEdge server
Processor	1 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 8C, 130 W
RAM	24 GB 1600 MHz RAM; optimized preferred
Storage (internal)	2 internal 146 GB 15K SAS disk drives (Raid-1) for OS, EXEs
Controller	SAS RAID controller (internal)
Media	8x DVD drive (optional)
Operating System	Please reference Citrix System Requirements documentation for supported operating systems
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

Citrix Gateway Server

> **Note:** *Can be virtualized.*

Citrix Gateway Server	
Quantity	1
Server Class	Similar to Dell R640 PowerEdge Server
Processor	1 Intel Xeon Gold 6134 @ 3.20 GHz, 24.75 MB cache, 8C, 130 W
RAM	12 GB 1600 MHz RAM optimized preferred
Storage (internal)	2 internal 146 GB 15K SAS disk drives (Raid-1) for OS, EXEs
Controller	SAS RAID controller (internal)
Media	8x DVD drive
Operating System	Please reference Citrix System Requirements documentation for supported operating systems
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

User Desktops

Desktops	
Operating System	(See: Quorum's *Software Prerequisites* documentation)
Processor	2.0 GHz processor
RAM	2 GB**
Disk Space	> 2 GB
Third-Party Software	(See: Quorum's *Software Prerequisites* documentation)

For Esri, ArcGIS Desktop (ArcEditor) will be required for the GIS technicians responsible for creating, editing, and linking GIS polygons. These users will require a machine with additional RAM, processing speed, and disk space.

** Because most users will also be running the operating system and associated Windows application, such as Outlook or Excel, a minimum of 2 GB of RAM is recommended for each user desktop.

Configurations

TLS 1.2

TLS is an important part of the overall security landscape of a runtime environment. It provides security at the transport layer (i.e., the TCP layer) by encrypting communication between two TLS-enabled hosts. Beginning with the QFC 2021.04 release, Quorum's Enterprise product suite now supports TLS 1.2 exclusively.

The current recommendation for Enterprise products is to enable TLS 1.2 and disable all older TLS protocols (TLS 1.1, TLS 1.0, and SSL 3.0) for all servers that make up the runtime environment (Web, Middle-Tier, QPEC, Database, etc.).

Port Configuration

With services installed across servers, communication ports between servers must be enabled for services to communicate. The following traffic flow options will need to be allowed, depending on which ports are set at the time of installation or other infrastructure configuration:

From	To	Port(s)
Web	Middle Tier (MT)	Ports range configured for Broker service and MT service
Web	API Host (MT)	Ports range configured for Broker service and API Host service
Web	Middle Tier (MT)	135, DTC ports range
Web	Open ID identity (if applicable)	SSL (443)
Web	Pendo CDN	SSL (443)
QPEC	Middle Tier (MT)	Ports range configured for Broker service and MT service
QPEC	Middle Tier (MT)	135, DTC ports range
QPEC	File share	139, 145
API Host (MT)	Oracle DB/SQL Server	Oracle listener (1521)/customer-defined
Middle Tier (MT)	Oracle DB/SQL Server	Oracle listener (1521)/customer-defined
Middle Tier (MT)	Oracle DB & SQL Server	135, DTC ports range
Middle Tier (MT)	File share	139, 145
Middle Tier (MT)	CMIS Document Management	SSL (443)
Middle Tier (MT)	RabbitMQ (Integration Platform)	9200, 5672
Citrix	Web	HTTP (80) and/or HTTPS (443)
Citrix	Middle Tier (MT)	Ports range configured for Broker service and MT service

Ports will need to be configured in order to send Application Insights to the cloud-hosted repository. Please refer to Microsoft's *IP Addresses Used by Azure Monitor* documentation to enable communication between Application Insights and the receiving log repository.

Pendo

For Pendo to be enabled correctly, customers may need to whitelist the following Pendo domains:

- app.pendo.io
- pendo-io-static.storage.googleapis.com
- cdn.pendo.io
- pendo-static-SUB_ID.storage.googleapis.com
- data.pendo.io

Database Engines

SQL Server 2019 (Standard Edition 2 or Enterprise Edition)

The Enterprise edition supports additional features (such as unlimited CPU cores and memory, free disaster recovery replicas, and automated tuning), but it is not required for running Quorum applications. Customers should review their internal expansion needs before making a final purchase decision.

Collation:

- **Integration Platform:** SQL_Latin1_General_CP1_CI_AS
- **All other Enterprise products:** Latin1_General_BIN

Note: Quorum recommends compressing table and index pages to reduce database size. This feature is available in both Standard and Enterprise editions.

Oracle 19c

Enterprise editions support advanced features (such as DBA functionality and tools), but they are not required for running Quorum applications. Customers should review their internal needs before making a final purchase decision.

Note: Customers are encouraged to contact Oracle Support to acquire any recommended patches for their operating systems. This release includes extended support from Oracle.

Database requirements:

- **Character set:** WE8MSWIN1252
- **National character set:** AL16UTF16
- **DB block size:** 16k (16,384)

Performance considerations:

Quorum recommends gathering statistics on a regular basis to ensure optimal query execution and improve performance. For additional details, refer to Oracle's *Gathering Optimizer Statistics* documentation.

A sample command for statistics gathering is available below:

```
BEGIN
  DBMS_STATS.GATHER_FIXED_OBJECTS_STATS;
  DBMS_STATS.GATHER_DICTIONARY_STATS(ESTIMATE_PERCENT
 => 100, CASCADE => TRUE, METHOD_OPT => 'FOR ALL COLUMNS SIZE
AUTO');
  DBMS_STATS.GATHER_DATABASE_STATS(ESTIMATE_PERCENT
=> 100, CASCADE => TRUE, METHOD_OPT => 'FOR ALL COLUMNS SIZE AUTO');
END;
/

BEGIN
  DBMS_STATS.GATHER_SYSTEM_STATS(GATHERING_MODE => 'INTERVAL', INTERVAL => 60);
END;
/
```

The following database parameters should be set for optimal performance:

Products	Parameter	Value
All	optimizer_adaptive_reporting_only	TRUE
All	optimizer_dynamic_sampling	0
Land only	cursor_sharing	FORCE
Land only	_complex_view_merging	FALSE

quorum
software

Software Requirements

Please refer to Quorum's *Software Prerequisites* documentation for additional information.

Commented [MH1]: @Rebecca Stoll - This links to another document on the sharepoint site. (365_v17_Prerequesite_Setup. We should update this link to the latest when finalizing this document.

Commented [MH2R1]: Update: Nix the link, but still call out the other doc as a reference point.