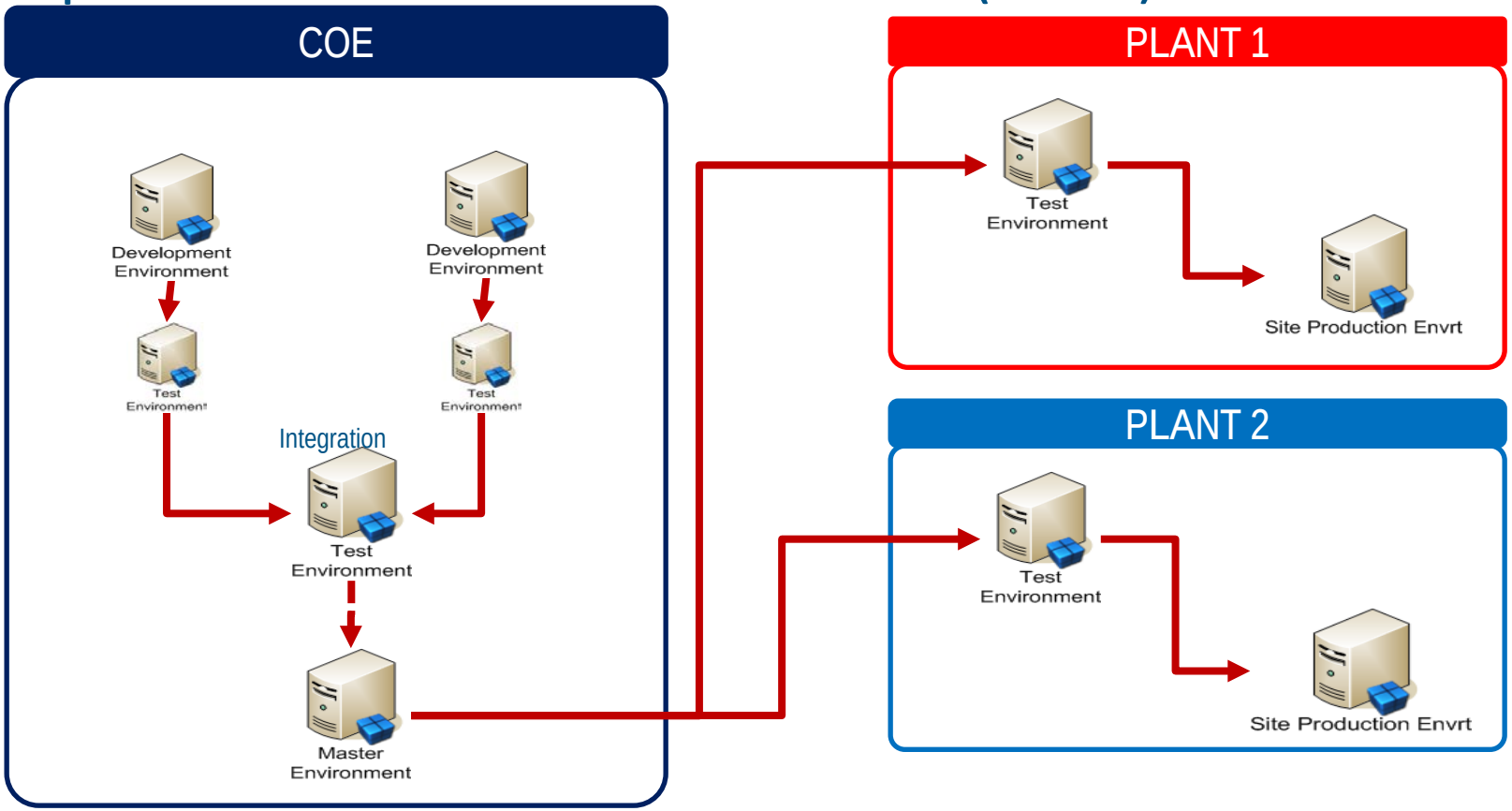
AES VIETNAM

3DEXPERIENCE®

DELMIA Apriso

Infrastructure Topics

Apriso Environments – COE & BU (Plant) levels

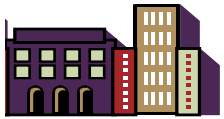


Centralized architecture

APRISO Center Of Operational Excellence

ERP

Central data center



Development instance

Integration instance

Virtual servers

Webserver

Application

Database

Production instance
Physical or Virtualized server

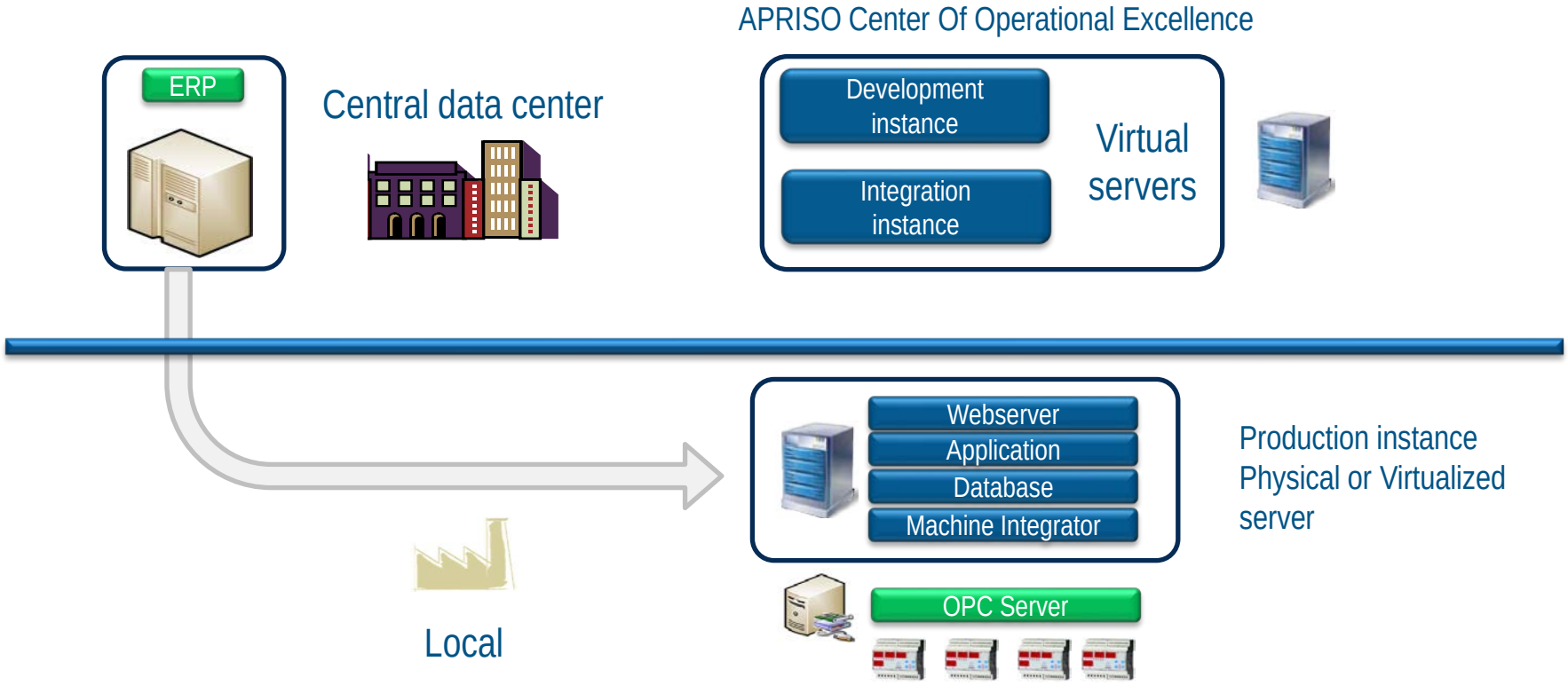
Local

Machine Integrator

OPC Server

Acquisition layer hosted locally on Windows based PC where OPC server is running

Local architecture



Hardware Architecture for APRISO (Production Env)

	Feature	Operating system & infrastructure		Software layer
IT-Room	MES Data	SQL Server 2012 SP3 SQL Server 2014 SP1 Oracle 12c R1	Windows 64-bits Server 2012 R2	APRISO Database server
	Business rules / User context / Process flows	MS-Services	Windows 64-bits Server 2012 R2	APRISO Application server
	Presentation layer	IIS 64-bits .NET 3.5 SP1 and 4.5.2 ASP.NET 3.5 and 4.5	Windows 64-bits Server 2012 R2	APRISO Web Server
Shop floor Operator's Workplace	User Interface APRISO portal	.NET 3.5 SP1 and 4.5.2 IE 11/Edge/Chrome/Firefox Win 8.1/Win Phone 8.1/ iOS/Android (native Apps) Win Mobile 6.1/6.5 or Win CE 6.0	Windows 7 SP1 Enterprise Windows 8.1 Enterprise Windows 10 Enterprise Windows Server 2012 R2	Acquisition Layer APRISO Data acquisition
Shop floor Equipment devices	Supervisors / PLCs Machines / Equipment	OPC-DA / UA RS-232 ASCII		

NOTE: Exact specification mapping can be found in current Install Guide
(Above is based on 2017_InstallGuide.PDF)

Architecture

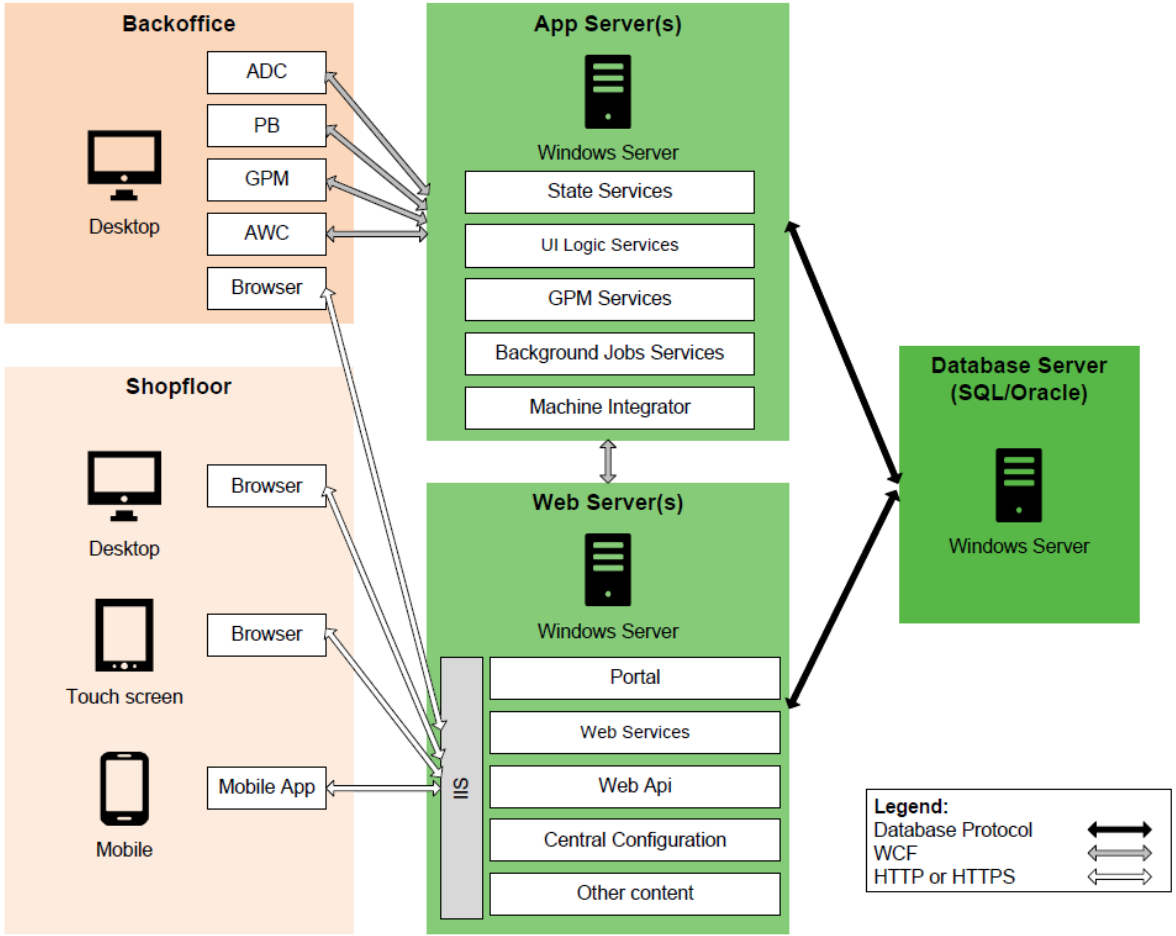
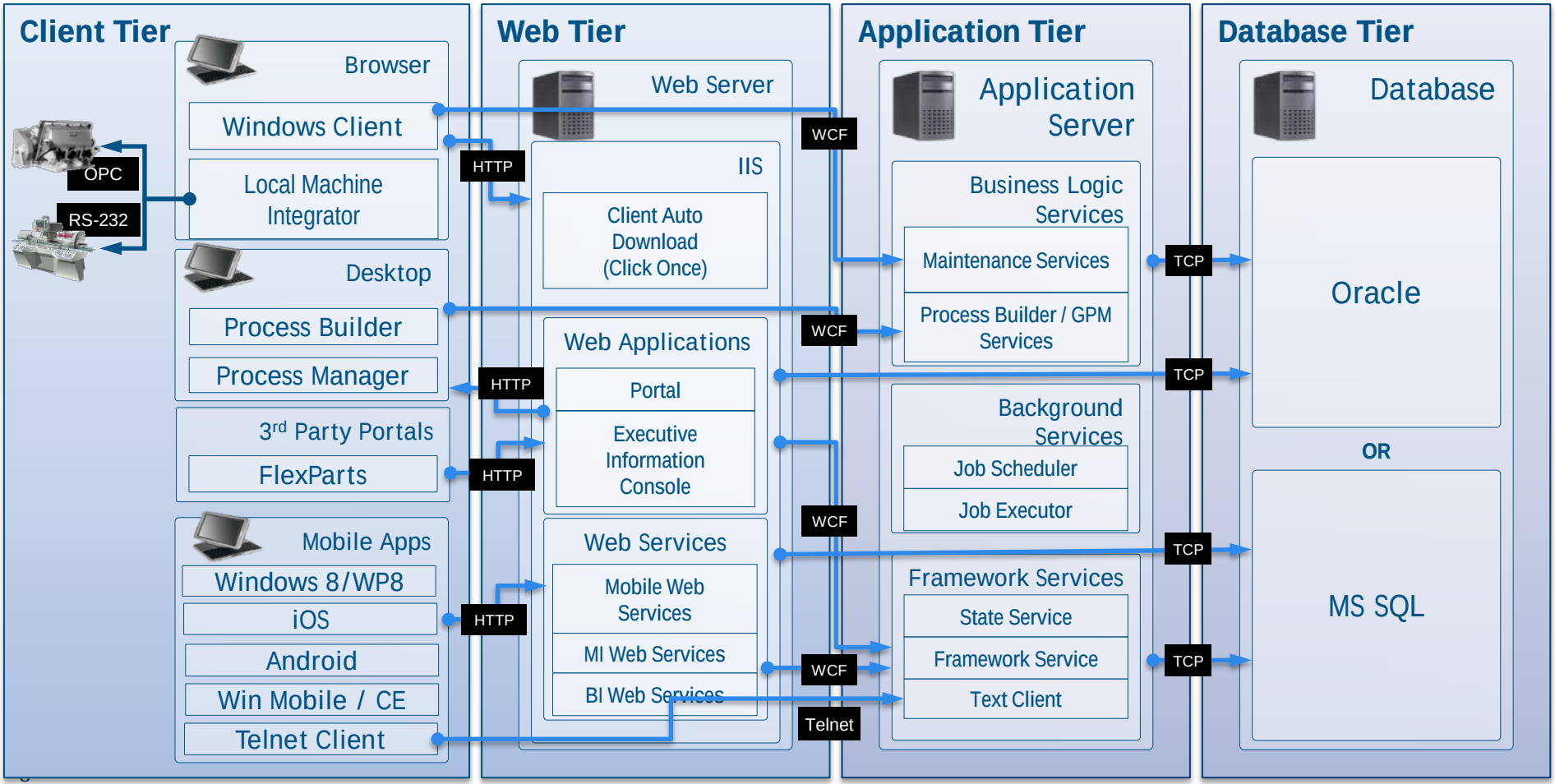


Figure 1 DELMIA Apriso architecture

Architectural Detail



Deployment approach

- Stand Alone Architecture
  - All APRISO tiers are deployed on single server:
    - Recommended for Quality and Development
    - Possible choice for low size production environment without high availability requirements
- Distributed Architecture – Multiple servers
  - APRISO tiers are deployed on separated servers :
    - Multiple deployment scenarios are available
  - Each of APRISO tiers can be separated from the others

Multi-plant centralized architecture

Pros & cons on HW/SW

- Less servers to install, administrate
- Reduce upgrade operations
- Less RDBMS licenses

- More resources CPU cores, memory
- Single point of failure
- Higher RDBMS license costs
- RDBMS size increasing faster
- Requires to setup archiving at an early project stage
- Less scalability possibilities in case of resources bottleneck (I/O disk)
- Limited timeslots for maintenance

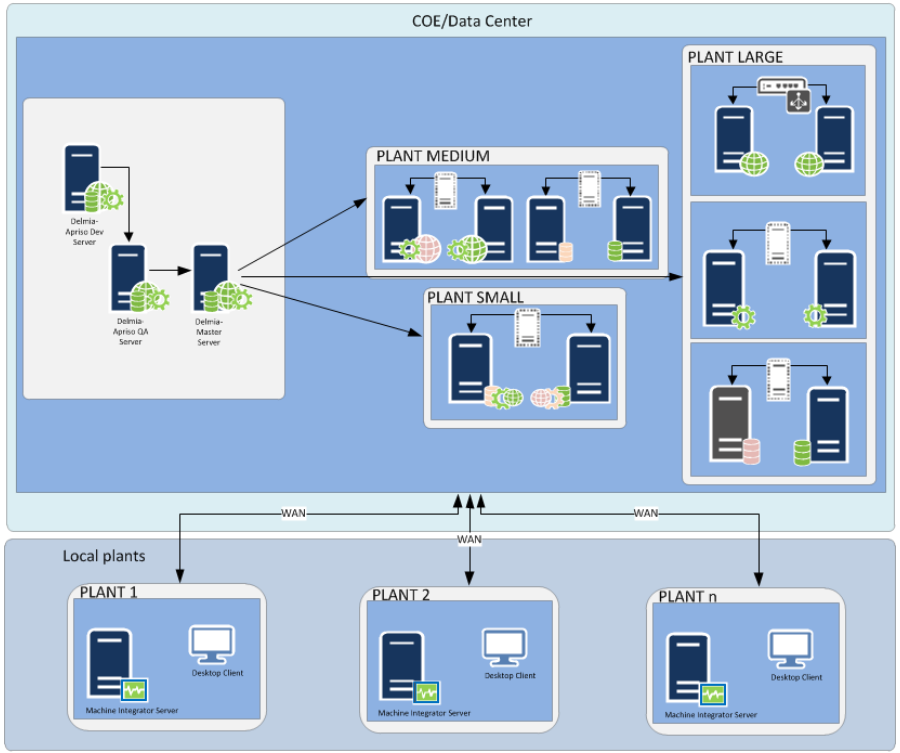
Multi-plant centralized architecture

Pros & cons on Administration

- Single product version
- Single configuration
- Global and common product settings
- One validation
- Enforce the core model concept
- Single Master Data reference

- Doesn't allow to customize product settings per plant
- Can't perform wave upgrades
- ID's of Organizational data must be unique
- Role based access to Maintenance and Monitoring screen must be configured to segregate access at plant level

Example multi-instance centralized architecture



Centralized deployment requirements

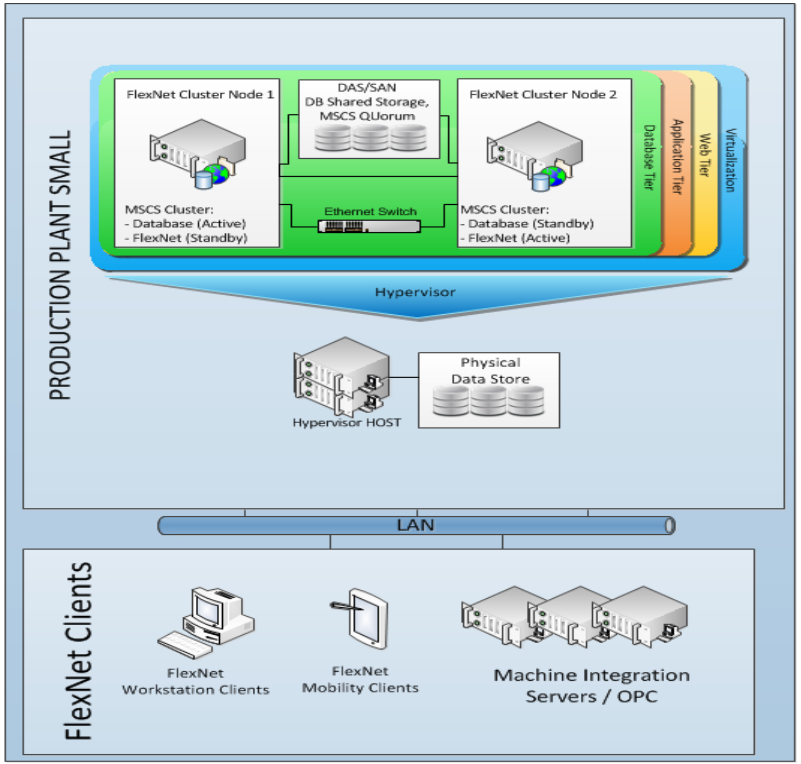
- Minimum single plant network bandwidth: 10Mbps
- Latency
  - < 30ms : perfect
  - 30 - 50ms : correct
  - 50ms : not suitable
- These thresholds are not absolute and should be considered more as generic recommendation

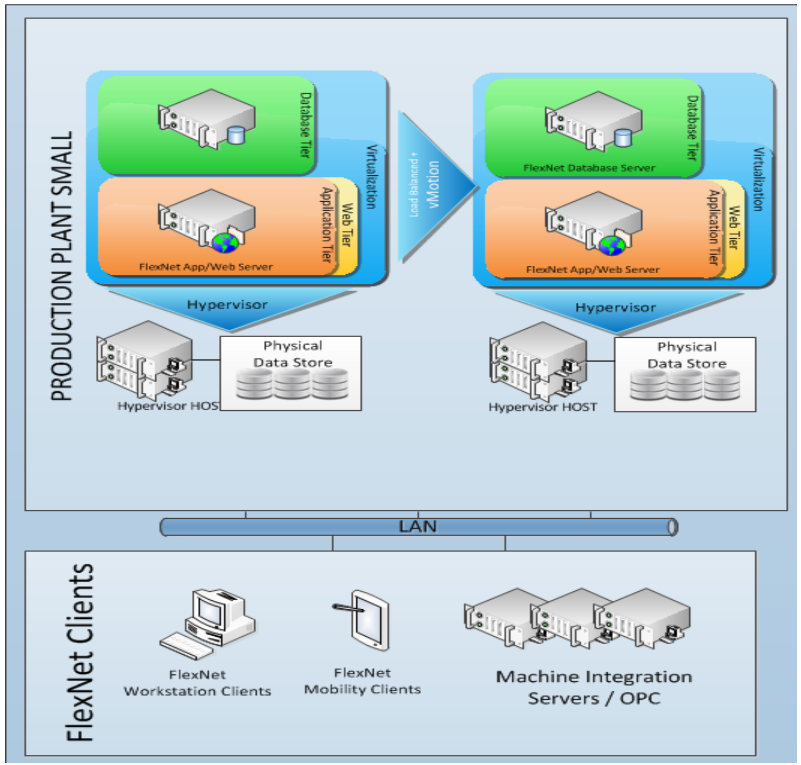
Example Hardware Sizing

Scenario names	Apriso maximum concurrent HTTP clients	Apriso Business Integrator: Interfaces processed Per second (no mapping on Apriso server)		Apriso Estimate Hardware			
		Incoming	Outgoing	Server role	No. of server	HW type	HW spec
Small Plant	60	0.23	0.66	Single server hosting all tiers	1	Virtual machine	4 cores 8 GB RAM 100 GB storage 1x 1 Gbps NIC
Medium Plant	200	0.58	1.76	Database server	1	Virtual machine	8 cores 16-32 GB RAM 100 GB storage (local) 1x 1Gbps NIC 200-400 GB DB store
				Apriso Application / Web servers	1-2	Virtual machine	4-6 cores 8-16 GB RAM 100 GB storage (local) 1x 1Gbps NIC
Large Plant	450	1.15	3.27	Application / database cluster node	2	Physical server	12 cores 48 GB RAM 2x 100GB (local) 2x 1Gbps NIC 800 GB DB shared store
				Network Load Balancing Web nodes	2	Physical server	4 cores 8 GB RAM 2x 100GB (local) 2x 1Gbps NIC

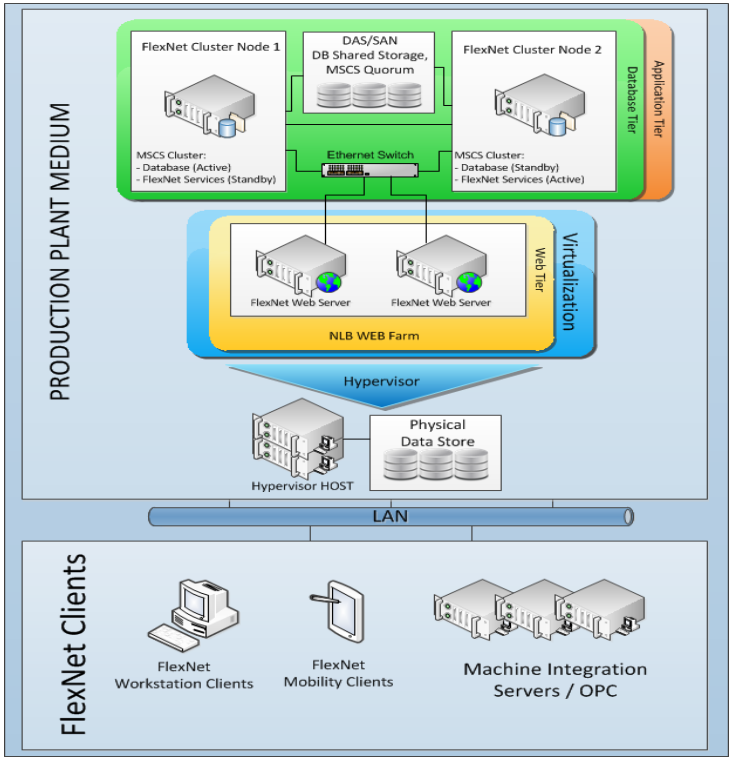
Please see slide notes

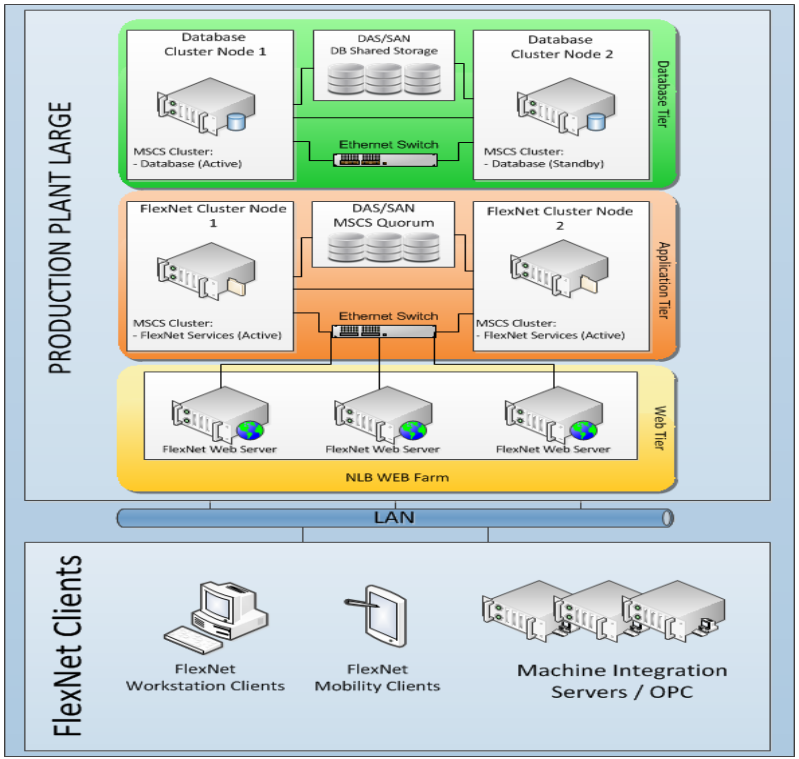
Plant small – example architecture





Plant medium & Large – example architecture





Scalability approach in Apriso

Capacity planning goes 1st.

Apriso capacity planning phase (infrastructure sizing) is a must for most of the implementations to provide estimations of minimal hardware requirements for production systems.

"Scale UP" capable tiers and HW resources

- Database tier: CPU, RAM, IO
- Application tier: CPU
- Web tier: CPU, RAM

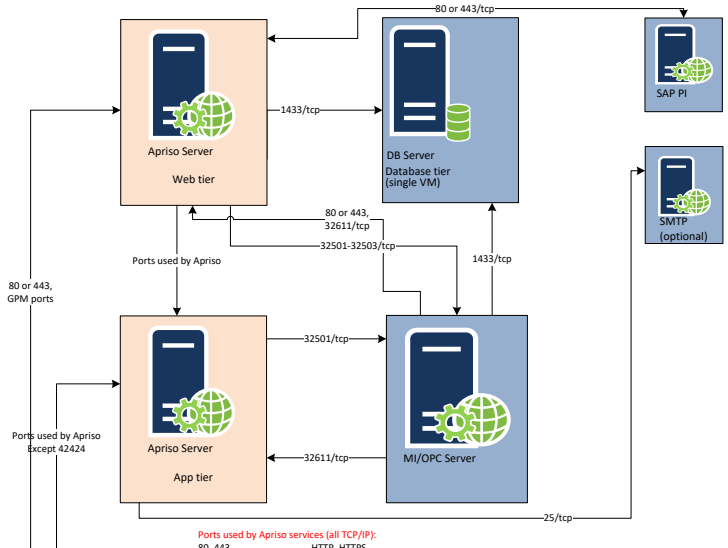
"Scale OUT" capable tiers

- Database tier: Vertical data distribution (operational data store with reporting data store),
  - Always-On Readable Replica on MS SQL
  - RAC with LB on Oracle RDBMS
- Application tier: Multiplication and physical distribution of mission critical Apriso services (e.g. load split of with multiple Job executors and Machine integrators)
- Web tier: Multiplication of WEB servers with Load Balancing - WEB Farm (Load Balancing). ASP State data storage distribution (e.g. ASP State Database)

Example of network requirements

	LARGE	MEDIUM	SMALL
Number of concurrent users	140	75	25
Peak number of synchronous and asynchronous standard operations executed in Apriso per minute	150	75	20
Daily XML messages sent from ERP to Apriso	~1000	~1000	~1000
Daily XML messages sent from Apriso to ERP	~20000	~20000	~20000
MI point reads per hour	300K	100K	50K
Network prerequisites (Bandwidth/Latency)	40-60Mbps <50ms RTT	16-24Mbps <50ms RTT	12-16Mbps <50ms RTT

Network Flows Between Apriso Servers



Ports used by Apriso services (all TCP/IP):

80, 443	HTTP, HTTPS
42424	ASP.NET state service used for ASP session management (service on Apriso app server).
32600,32601	Framework service for Win UI applets
32603,32610	Process Builder services
32602,32604	Maintenance services used by M&MS and Cockpit Win UI applets
32606,32608	Apriso State service used by all apps for keeping state
32709, 32710	
32809, 32810	Global Process Manager services
32605, 32607	Scheduler services used by Job scheduler and Job Scheduler UI applets
32611, 32612	Job Executor service used for remote Job execution

Apriso services use WCF over TCP/IP.

Between browser based clients and Portal server only HTTP ports (80 or 443 if HTTPs) are required.

Please see additional details in 2017_InstallGuide.pdf

Virtualization

Dassault Systemes makes extensive use of VMware and MS Hyper-V during the development process of DELMIA Apriso updates, as well as within internal IT and support organizations to create and test various Windows environments for compatibility and other purposes. Dassault Systemes is not aware of any specific issues with DELMIA Apriso Software Products and VMware or MS Hyper-V

Product	Running on
FlexNet 9.4.2	VMware ESX 3.0
FlexNet 9.5/MPI 2.1	VMware ESX 4.0
FlexNet 9.6/MPI 2.1 or 3.0	VMware ESXi 5.1+
	MS Hyper-V version that comes with the supported Windows Server version
Apriso 9.7/MPI 4.0	VMware ESXi 5.1+
	MS Hyper-V version that comes with the supported Windows Server version
DELMIA Apriso 2016	VMware ESXi 5.1+
	MS Hyper-V version that comes with the supported Windows Server version

Dassault Systemes offers Performance Tuning services to help with this analysis, and highly recommends the implementation of these services prior to undertaking any potential VMware or MS Hyper-V virtualization deployment

All versions and configurations of applications and operating systems running under VMware or MS Hyper-V must comply with the versions specified by DELMIA Apriso support.

Cloud

IaaS is supported

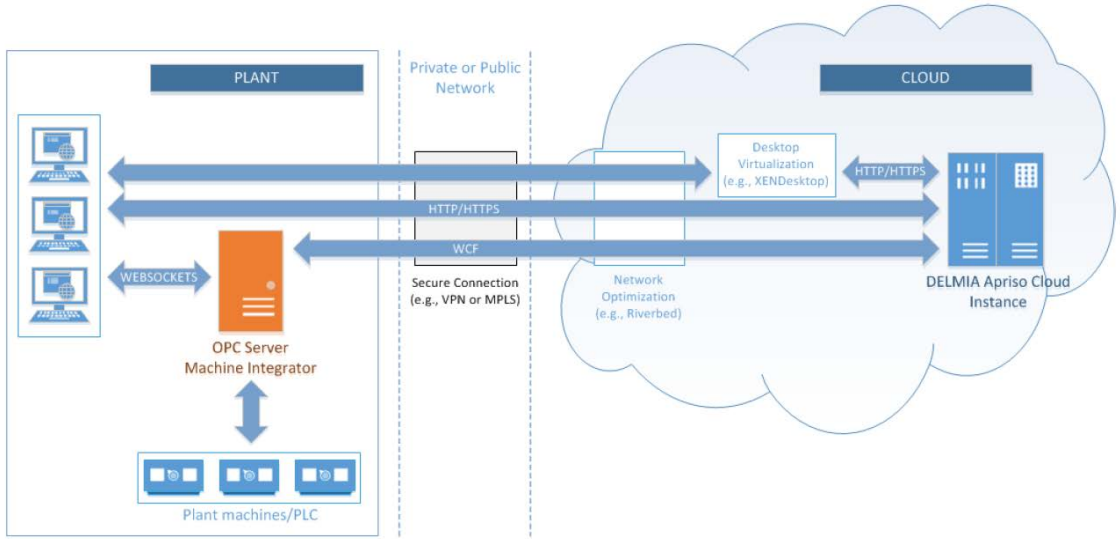
Name	Consumer	Provided Cloud Service	Service Provider Responsibilities
Software as a Service (SaaS)	End user	▶ Ready-to-use application	▶ Application availability and performance
Platform as a Service (PaaS)	Application owner	▶ Environment to run the application code ▶ Storage ▶ Other Cloud services	▶ Environment availability and performance
Infrastructure as a Service (IaaS)	Application owner or IT	▶ Virtual server ▶ Storage	▶ Virtual server availability ▶ Provisioning time

DELMIA Apriso 2016 supports the Infrastructure as a Service (IaaS) model. The IaaS infrastructure can be provided by any 3rd party vendor that supports VMWare or Hyper-V virtualization

Cloud

In the example the Application Server, Web Server, and Database Server are located in a private cloud. Additionally, the entire communication is performed over a secured channel.

Depending on network capabilities, additional solutions, such as Desktop Virtualization and Network Optimization, can be used in order to improve service efficiency and user experience.



It is possible to use one DELMIA Apriso Cloud instance for multiple plants, usually one DELMIA Apriso instance is used for one plant.

AES VIETNAM

DELMIA

DASSAULT SYSTEMES | The 3DEXPERIENCE® Company