FORCAM FORCE IIOT
System Requirements

Version 5.11.35

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Content

1   Infrastructure Update and Discontinuation

FORCAM FORCE IIOT	5.10	5.11	Note
Operating System	Windows Server 2012 (R2) Windows Server 2016	**Windows Server 2012 (R2)** **Windows Server 2016** **Windows Server 2019**	
Database	SQL Server 2014 SQL Server 2016 Oracle 11 Oracle 12c	MS SQL Server 2014 **MS SQL Server 2016** **MS SQL Server 2019** Oracle 11 Oracle 12.1 **Oracle 12.2** **Oracle 19c (Enterprise Edition)**	Not supported anymore Not supported anymore Not supported anymore New! (recommended)
Java	Java 8 (Open JDK)	Java 8 (Oracle JDK) **Java 11 (OpenJDK)**	Not supported anymore New! (mandatory)
MongoDB	MongoDB 4.0	MongoDB 4.0 **MongoDB 4.2**	Not supported anymore *Since version FORCAM FORCE IIOT 5.11.27*
Browser	Google Chrome	**Google Chrome** **MS Edge Chromium**	Version from 75.0 Major Version from 81.0 Based on Chromium (Recommended latest version)

2   Technical Requirements

2.1   Minimum Technical Requirements

Architecture required for basic functionality

2-Tier Architecture

Database Server

Application Server
with Data Acquisition
Server

MongoDB Server

If Track and Trace is used,
MongoDB on an additional server
(on premise) is required.
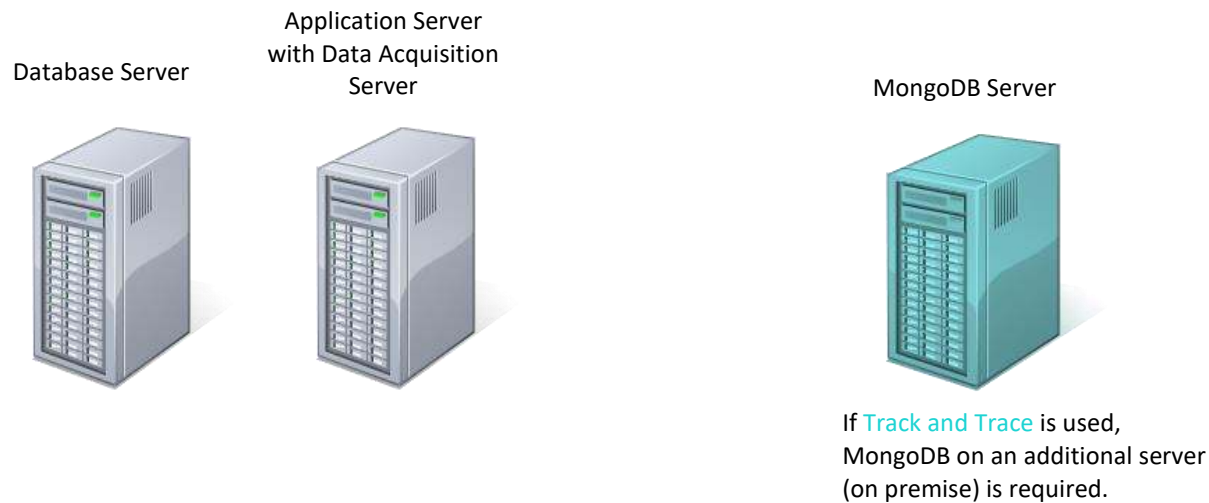
2.2 Recommended Technical Requirements

Architecture required for Productive Use

3-Tier Architecture

Database Server	Application Server	Data Acquisition Server	MongoDB Server	Monitoring Server (Grafana)

It is recommended to run the Data Acquisition Server on premise.

If Track and Trace is used, MongoDB on an additional server (on premise) is required.

If Monitoring/Grafana is used, an additional server (on premise) is required.

2.3 Comparing 2/3-Tier Architecture

Difference between 2-tier and 3-tier architecture:

2-Tier

- Enough for test systems or early pilot phases for projects
- Lower performance due to DCU server running parallel on the application server
- Upgrade to 3-tier recommended after test/pilot
- A MongoDB on additional server (on premise) is required if Track & Trace is used

3-Tier

- Required for productive systems
- Recommended for use with the Edge server
- Provides high performance for timely signal processing
- Physical proximity to machine parks is advantageous depending on number and frequency of signals
- Maintains network security (integrity) for machine parks in case of separated LAN networks (VLAN)
- A MongoDB on additional server (on premise) is required if Track & Trace is used

2.4 Limitations
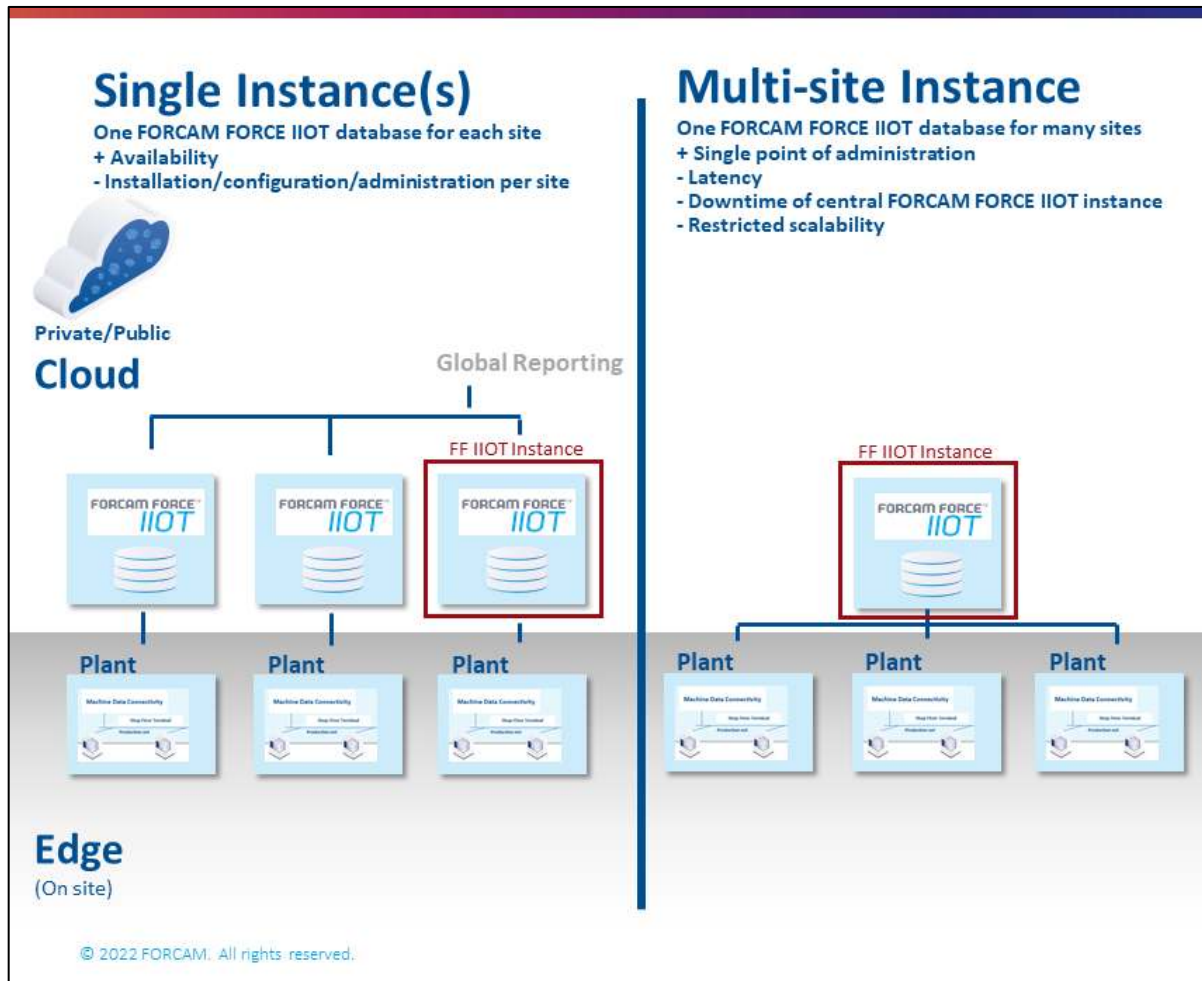
Based on empirical values from various FORCAM FORCE IIOT systems: To ensure a performant operation, the following system limits should not be exceeded.

Limitation for each FORCAM FORCE IIOT instance
(Instance meaning 1 dedicated FORCAM FORCE IIOT server + 1 dedicated database server):

500 workplaces/300.000 events per shift (regular 8 hours)

3 Database Server

3.1 MS SQL Server License

For productive system environments, a Microsoft license for "SQL Server Standard Edition" (minimum) is required. Options:

- License for each Core
  or
- License for at least 1 CAL (Client Access Licenses)

3.2 Overall Server Requirements

- 1 Server (physical or virtualized environment) dedicated only for use with FORCAM FORCE IIOT
- CPU with at least Haswell technology (e.g. Intel Xeon E5) or higher, 4 cores, clocked with > 2 GHz
- 16 GB RAM
- Operating system: Windows Server or Unix, Linux
- Regarding anti-virus software, the recommendations of the OS vendor must be strictly followed, for Microsoft TechNet anti-virus exclusion list (or more up to date)
- Server time zone must be UTC to cover the change to Daylight Saving Time
- Windows-Server user for FORCAM must have extended rights
- User of MS SQL server for FORCAM must also have extended rights (DB owner)

3.3 Specific Database Server Requirements

- SQL Server 2016 or SQL Server 2019 or Oracle 12.2/19c
- HDD Raid Level 1, no striping (for physical devices)
- Best practice: 3 physically separated disks with
  - 100 GB + 1 GB per workplace for data,
  - 100 GB for log space,
  - 100 GB for tempdb and backups

3.4   Recommendations for Memory Space of the SQL Instance

- 1 GB of memory reserved for the operating system
- 1 GB each for every 4 GB of RAM after the initial 4 GB, up to 16 GB of RAM
- 1 GB each for every 8 GB in more than 16 GB of RAM

For example, if you have a 32 GB RAM database server, then memory to be given to the operating system would be as follows:

- 1 GB, the minimum allocation
- + 3 GB, since 16 GB – 4 GB = 12 GB; 12 GB divided by 4 GB (each 4 GB gets 1 GB) is 3 GB
- + 2 GB, as 32 GB – 16 GB = 16 GB; 16 divided by 8 (each 8 GB after 16 GB gets 1 GB) is 2 GB

In total, for a server with 32 GB of RAM, 7 GB will be reserved for the operating system.
The maximum memory allocated to the SQL server should be 25 GB.
For a 64 GB server, 10 GB should be reserved for the operating system and 54 GB should be allocated for the SQL server.

4 Application Server

4.1 Overall Server Requirements

- 1 Server (physical or virtualized environment) dedicated only for use with FORCAM FORCE IIOT (without preceding loadbalancer)
- CPU (e.g. Intel Xeon E5) or higher, clocked with > 2 GHz
  - 4 cores for up to 150 workplaces
  - + 2 cores per additional 100 workplaces
- 32 GB RAM + 50 MB per workplace for a basic setup
  - + 4 GB for fftracing-processing (+ 2 GB for fftracing acquisition)
  - + 2 GB for every additional module (ffdnc, ffscheduler, ffwebservices…)
  - Basic setup includes: ffruntime-ignite, ffruntime, ffworkbench, ffworker, ffnewoffice (Modeller + Visualisation), ffnewoffice-background, DCU/DACQ, FFauth
- Microsoft .NET-Framework version 3.5 must be installed
- Regarding anti-virus software:
  - The recommendations of the OS vendor must be strictly followed, for Microsoft TechNet Anti-Virus exclusion list (or more up to date)
  - The FORCE directory, its subfolders and FORCE Services must be excluded from the AV scan. If this is not possible for security reasons, the scan of this directory must only be performed sporadically at low-operational times, otherwise the performance of the application will be considerably reduced.
- For information regarding required ports, please refer to chapter 10 inside this document.
- Server time zone must be UTC to cover the change to Daylight Saving Time
- Windows-Server user for FORCAM must have administration rights
- In case of using a FORCAM online license, an internet connection to the FORCAM license system is required

4.2 Specific Application Server Requirements

- Read/Write speed must be > 250 MB/sec.
- RAID system (for physical devices), best practice: RAID Level 1
- 1 partition physically separated from the OS containing 250 GB exclusive use for FORCAM FORCE IIOT
- OpenJDK 11 (JDK and JRE), 64 Bit. If 2-tier architecture is being used, please install 32 Bit JDK also.
- Recommended are the browsers Google Chrome and Microsoft Edge with Chromium engine.

5 Data Acquisition Server

5.1 Overall Server Requirements

- 1 Server (physical or virtualized environment) dedicated only for use with FORCAM FORCE IIOT
- CPU (e.g. Intel Xeon E5) or higher, 4 cores, clocked with > 2 GHz
- 12 GB RAM + 0,5 GB RAM per additional DCU[1]
- At least 100 GB of available disk space
- Operating system: Windows Server 2016 or Windows Server 2019
- Regarding anti-virus software:
    - The recommendations of the OS vendor must be strictly followed, for Microsoft TechNet Anti-Virus exclusion list (or more up to date)
    - The FORCE directory, its subfolders and FORCE Services must be excluded from the AV scan. If this is not possible for security reasons, the scan of this directory must only be performed sporadically at low-operational times, otherwise the performance of the application will be considerably reduced.
- For information regarding required ports, please refer to chapter 10 inside this document.
- + 2 GB RAM for fftracing acquisition
- Server time zone must be UTC to cover the change to Daylight Saving Time
- Windows-Server user for FORCAM must have administration rights
- Should be very close to the Shopfloor – No Wireless (WAN) data communication

5.2 Specific Data Acquisition Server Requirements

- Only required for 3-tier architecture
- OpenJDK 11 (JDK), 32 and 64 Bit, latest versions

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[1] Dependent on the load of this server (which depends on the number of configured machines/signals and the DACQ scripts and whether process data shall be collected), it might be necessary to equip the server also with additional compute cores.

6 MongoDB (for Track and Trace and Energy Data)

6.1 Overall Server Requirements

- Time zone of the Server must be UTC to cover the change to Daylight Saving Time

6.2 Minimum Server Requirements

- <u>Distribution</u> - MongoDB Community
- *(Customer can choose to have enterprise edition as well, but the purchase of the licence should be done directly from MongoDB. Enterprise edition has advantages as it offers backup tools like OpsManager and has support from MongoDB Inc.)*
- <u>One server</u> for a **three node Replica Set** installation dedicated only for use with FORCAM FORCE IIOT. Each node holding data (i.e. primary and secondary) is installed on a separate drive.
- <u>Storage</u>: SATA SSD (Solid State Disk) – 500 GB per primary and secondary node (to extend depending on expected volume of data)
- <u>RAM:</u> 16 GB per node (to extend depending on expected volume of data); thus, in total 32 GB on the server
- <u>CPU</u> with at least Haswell technology (e.g. Intel Xeon E5) or higher, 4 cores, clocked with > 2 GHz
- <u>Operating System</u>: Windows Server
- **Replication**: In some circumstances (e.g. you have a primary and a secondary, but cost constraints prohibit adding another secondary), you may choose to add a mongod instance to a replica set as an arbiter. An arbiter participates in elections but does not hold data. An arbiter will always be an arbiter whereas a primary may step down and become a secondary and a secondary may become the primary during an election.
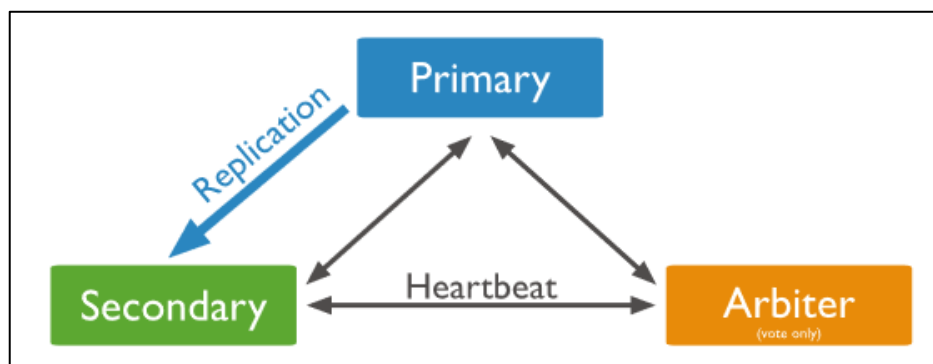
## 6.3   Best Practice Server Requirements

- Distribution - MongoDB Community
- *(Customer can choose to have enterprise edition as well, but the purchase of the licence should be done directly from MongoDB. Enterprise edition has advantages as it offers backup tools like OpsManager and has support from MongoDB Inc.)*
- Two servers for a **three node Replica Set** installation dedicated only for use with FORCAM FORCE IIOT. One server hosts the primary and a secondary node. Each node is installed on a separate drive. On the second server another secondary node is installed. This node can be used for **Backups** without affecting the performance of the FORCE applications.
- *(If the cost is not an issue then the best case is a three-server architecture, where each server hosts one MongoDB instance.)*
- Storage: SATA SSD (Solid State Disk) – 500 GB per node (to extend depending on expected volume of data)
- RAM: 16 GB per node (to extend depending on expected volume of data); thus, each server has 16 GB RAM.
- CPU with at least Haswell technology (e.g. Intel Xeon E5) or higher, 4 cores, clocked with > 2 GHz
- Operating System: Windows Server
- **Replication**: The secondaries replicate the primary's oplog and apply the operations to their data sets such that the secondaries' data sets reflect the primary's data set. If the primary is unavailable, an eligible secondary will hold an election to elect itself the new primary.
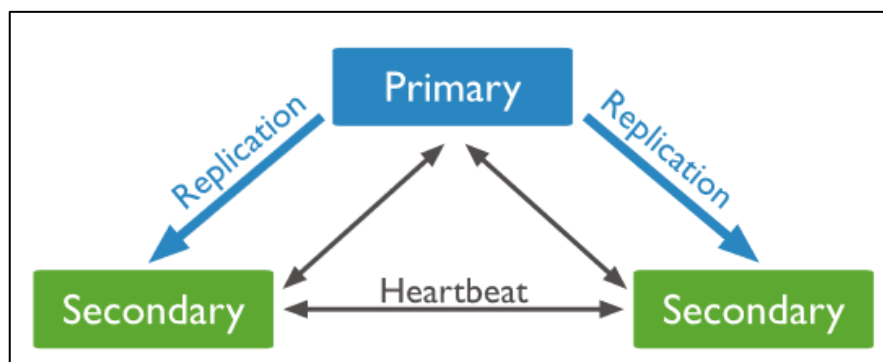
Note: Test and Prod can't run at ONE System

7   Network

Overall Network Requirements

- 2x 1 Gbit NIC1 per server in failsafe-/load balancing mode
- Database server, application server and Data Acquisition Server connected to Switched LAN (1 Gbit or better)
- Shopfloor network connected with at least 100 Mbit uplink to office network.
- Best practice: Use LAN instead of WLAN to avoid problems with electro-magnetic interferences)
- For use in dedicated environments: optical (fibre) connections to reduce latency

8   Clients

Overall Client Requirements

- Windows 10
- Supported browsers: Google Chrome and Microsoft Edge with Chromium engine
- In general, no Java 11 (JRE) needed due to HTML5 technology.

Exceptions: Use of PDM/DNC, ffscheduler and client-side programs e.g. UDP scanner and printers the "Client-Side Connector" program is needed, which requires an installation of JRE.

9   Additional Third-Party Software

The following software is used during the installation and maintenance of FORCAM FORCE IIOT:

 − BareTail Pro
 − 7-Zip
 − Notepad ++
 − WinMerge
 − SQL Developer

10 Firewall Requirements

10.1 System Architecture
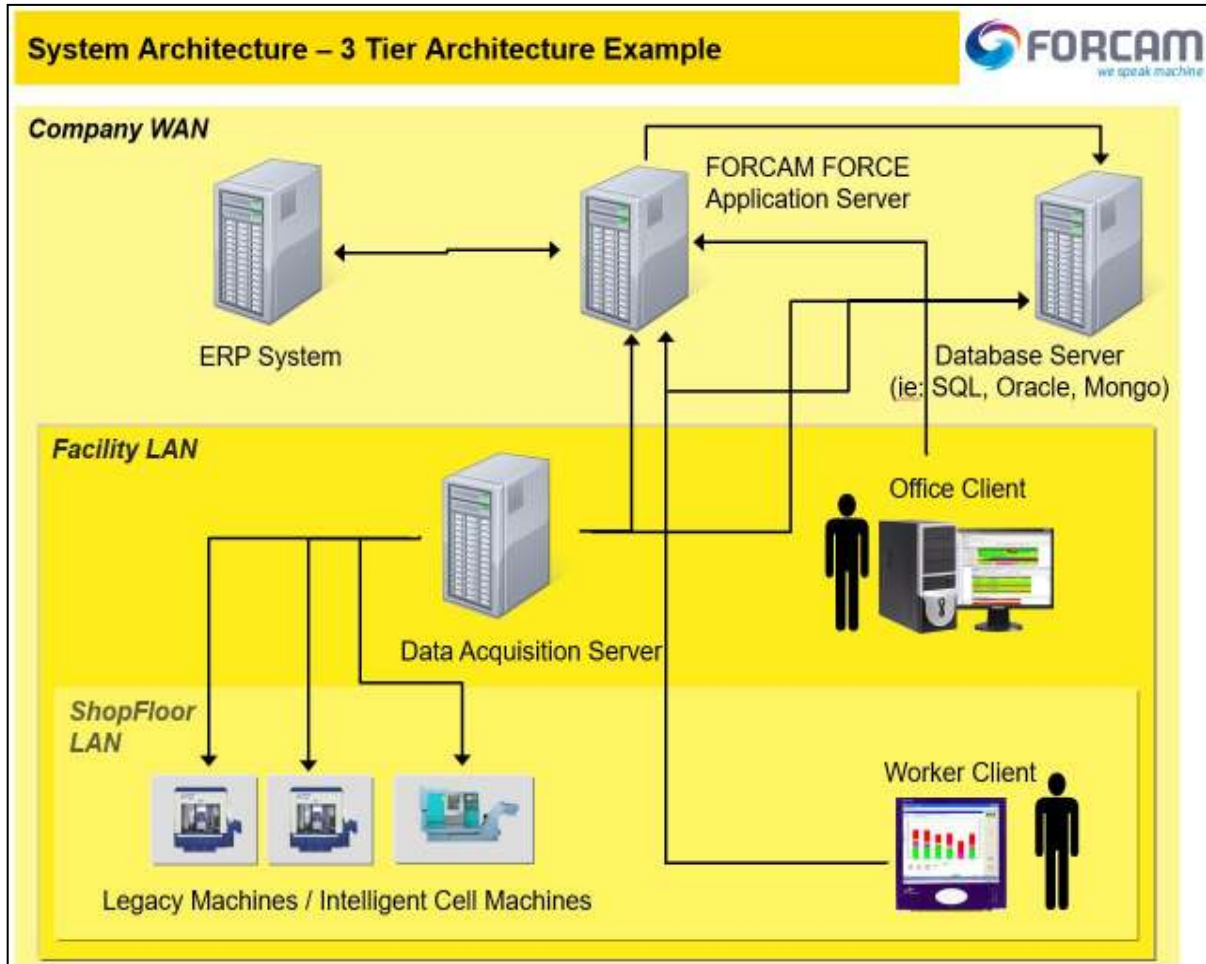
ⓘ All ports requested are to allow return traffic.

⚠ A port scan for the listed ports must be disabled as a port scan can drastically reduce the system performance and may cause serious problems.

10.2 IT Infrastructure Isolation

Source	Description	Destination	Port	Protocol	Comment
Office PCs	Access to FORCAM FORCE IIOT Office Client	Forcam Application Server	19080	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Workbench	Forcam Application Server	15080	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT MDESimulator	Forcam Application Server	16080	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Shopfloor Terminal	Forcam Application Server	11080	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Modeller	Forcam Application Server	20080	TCP	configure in server.xml
	Access to FORCAM FORCE IIOT Detailed Scheduler	Forcam Application Server	21080	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT FFSetup	Forcam Application Server	22080	TCP	configure in server.xml
	Access to FORCAM FORCE IIOT webservices	Forcam Application Server	24080	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Authorization	Forcam Application Server	25080	TCP	Configure in server.xml
Office PCs (secured)	Access to FORCAM FORCE IIOT Office Client	Forcam Application Server	19443	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Workbench	Forcam Application Server	15443	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT MDESimulator	Forcam Application Server	16443	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Shopfloor Terminal	Forcam Application Server	11443	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Detailed Scheduler	Forcam Application Server	21443	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT webservices	Forcam Application Server	24443	TCP	Configure in server.xml

Firewall Requirements

Source	Description	Destination	Port	Protocol	Comment
	Access to FORCAM FORCE IIOT Authorization (prefer)	Forcam Application Server	25443	TCP	Configure in server.xml
Application Server	SQL Server database connections	Forcam Database Server	1433	TCP	Database configuration
	Mongo connections	Forcam Mongo Server	27017 or 27024 or 37028	TCP	Configure on Mongo install
	Mongo Apache Drill component	Forcam Mongo Server	2181, 31010	TCP	configure in tool install
	Emailing reports and alerts (AutoReporting)	Company Mail Server	25	TCP	Configure in context.xml
	Access to ActiveMQ	Forcam Application Server	61616	TCP	If separated, not likely
	Access to artifactory	Forcam Application Server	8081	TCP	If separated, not likely
	Ignite	Forcam Application Runtime	48100 to 48500	TCP	Configure in context.xml
	http/remote/runtime/server/port	Forcam Application Runtime	10080	TCP	Configure in context.xml
	rmi/remote/server/port	Forcam Application Runtime	1199	TCP	Configure in context.xml
	rmi/exporter/server/port	Forcam Application Runtime	1299	TCP	Configure in context.xml
	Detailed Scheduler RMI	Forcam Application Server	1998	TCP	Configure in context.xml

10.3 DNC Server Isolation (i.e.: on DCU/DACQ Server)

Source	Description	Destination	Port	Protocol	Comment
DNC Server	SQL Server database connections	Forcam Database Server	1433	TCP	Database configuration
	ActiveMQ	Forcam Application Server	61616	TCP	Activemq configuration
	Ignite	Forcam Application Runtime Ignite	48100, 48500	TCP	Configure in context.xml
	http/remote/runtime/server/port	Forcam Application Runtime	10080	TCP	Configure in context.xml
	rmi/remote/server/port	Forcam Application Runtime	1199	TCP	Configure in context.xml
	rmi/exporter/server/port	Forcam Application Runtime	1299	TCP	Configure in context.xml
	ffdnc Workbench General Configuration	Forcam Application Server	15080-15084	TCP	Configure in workbench
	Machine Access	Machines…	Varies by machine	TCP	See list below
Application Server	ffdnc Java JMX remote access	Forcam DNC Server	8092	TCP	Configure on install
	ffdnc server.xml access	Forcam DNC Server	14005, 14009, 14080, 14443	TCP	Configure in server.xml
	ffdnc Workbench General Configuration	Forcam DNC Server	14080-14084	TCP	Configure in workbench

10.4 Tracing Acquisition Server Isolation (i.e. on DCU/DACQ Server)

Source	Description	Destination	Port	Protocol	Comment
Tracing Server	SQL Server database connections	Forcam Database Server	1433	TCP	database configuration
	Mongo DB	Forcam Mongo Database Server	27017 or 27024 or 37028	TCP	configure in context.xml
	ActiveMQ	Forcam Application Server	61616	TCP	ActiveMQ configuration
	Artifactory	Forcam Artifactory	8081	TCP	configure in context.xml
	Ignite	Forcam Application Runtime Ignite	48100, 48506, 48507	TCP	configure in context.xml
	http/remote/runtime/server/port	Forcam Application Runtime	10080	TCP	configure in context.xml
	influxdb/db/port	Influx DB Server	25086	TCP	configure in context.xml
	Emailing	Company Mail Server	25	TCP	configure in context.xml
	Machine Access	Machines…	Varies by machine	TCP	See list below. Is this needed?

Firewall Requirements

Source	Description	Destination	Port	Protocol	Comment
Application Server	ffacquisition Java JMX remote access	Forcam Tracing Server	18091	TCP	configure on install
	ffacquisition server.xml access	Forcam Tracing Server	17005, 17009, 17080, 17443	TCP	configure in server.xml
	ffprocessing Java JMX remote access	Forcam Tracing Server	18095	TCP	configure on install
	ffprocessng server.xml access	Forcam Tracing Server	18005, 18009, 18080, 18443	TCP	configure in server.xml

10.5 Data Acquisition Server (DCU/DACQ) Isolation

Source	Description	Destination	Port	Protocol	Comment
Data Acquisition Server	SQL Server database connections	Forcam Database Server	1433	TCP	Database configuration
	ActiveMQ	Forcam Application Server	61616	TCP	Activemq configuration
	http/remote/runtime/server/port	Forcam Application Runtime	10080	TCP	Configure in server.xml/javis.ini
	rmi/remote/server/port	Forcam Application Runtime	1199	TCP	Configure in context.xml
	rmi/exporter/server/port	Forcam Application Runtime	1299	TCP	Configure in context.xml
	Internal DACQ to DCU on server	Forcam Data Acquisition Server	8765	TCP	Only if separate services
	Remote Restart of DACQ-scripting	Forcam Data Acquisition Server	8775	TCP	

10.6 Shopfloor Isolation

Source	Description	Destination	Port	Protocol	Comment
Shopfloor Terminals	Access to FORCAM FORCE IIOT Shopfloor Terminal	Forcam Application Server	11080	TCP	Configure in server.xml
	Access to FORCAM FORCE IIOT Shopfloor Terminal	Forcam Application Server	11443	TCP	Configure in server.xml
Data Acquisition Server	Allen Bradley/Rockwell (EtherNet/IP™, new)	Machines with …	44818	TCP/UDP	
	Allen Bradley/Rockwell (PLC5E, SLC5/05, old)	Machines with …	2222	TCP/UDP	
	Allen Bradley/Rockwell (Peer to Peer)	Machines with …	4000	TCP/UDP	
	Fanuc FOCAS 1&2 / Ethernet	Machines with …	8193	TCP	Configure on controller
	Fanuc CIMPLICITY i CELL	Machines with …	8192	UDP	
	Fanuc FOCAS2/Ethernet	Machines with …	8195	UDP	
	Fanue Unsolicited Message Server	Machines with …	8196	TCP	
	Heidenhain (for newer controls, TNC640)	Machines with …	19003	TCP	
	Heidenhain (for older controls, iTNC530)	Machines with …	19000	TCP	
	Heidenhain (NFS)	Machines with …	111	TCP	
	Heidenhain (SMB)	Machines with …	445	TCP	
	Heidenhain (default)	Machines with …	5000	TCP	
	Heidenhain (LSV2, for serial COM)	Machines with …	9000	TCP	
	IBH-Link S5++ (IBHNet, read/write)	Machines with …	2002	TCP	
	IBH-Link S5++ (Programming Unit - PU)	Machines with …	10010	TCP	
	IBH-Link S5/S7 RFC1006	Machines with …	102	TCP	
	IBH-Link S7 Standard	Machines with …	1099	TCP	
	IBH-Link S7++ (Search for IBHLink device)	Machines with …	25383, 25384	UDP	
	Makino MML	Machines with …	8193 or 11212	TCP	

Source	Description	Destination	Port	Protocol	Comment
	MCIS-RPC	Machines with …	3010	TCP	Host port
	MCIS-RPC	Machines with …	3011	TCP	Machine (listening) port
	MOXA telnet communication	Machines with …	23	TCP	
	MOXA Web UI	Machines with …	80	TCP	
	MOXA Data port	Machines with …	950-965	TCP	
	MOXA Command port (for transferring data)	Machines with …	966-981	TCP	
	MOXA Data port (for transferring data)	Machines with …	4001	TCP	
	MOXA Broadcast search	Machines with …	4800	UDP	
	MOXA Firmware Upgrade	Machines with …	4900	TCP	
	MQTT.fx server	Machines with …	2783	TCP	
	MQTT (default)	Machines with …	1883, 1885	TCP	
	MQTT (SSL/TLS)	Machines with …	8883	TCP	
	MTConnect Agent	Machines with …	5000, custom	TCP	Configurable
	MTConnect Adapter	Machines with …	7878	TCP	Configurable
	Okuma THINC Listening	Machines with …	8888	TCP	
	Omron (FINS)	Machines with …	9600	UDP	
	OPC DA (Binary/DCOM, read)	Machines with …	5000	TCP	
	OPC DA (Binary/DCOM, write)	Machines with …	6000	TCP	
	OPC DA-XML	Machines with …	80	TCP	
	OPC DA-XML (HTTPS)	Machines with …	443	TCP	
	OPC UA (SOAP-XML)	Machines with …	80	TCP	
	OPC UA (SOAP-XML, HTTPS)	Machines with …	443	TCP	
	OPC UA (Binary)	Machines with …	4840, 4843	TCP	
	OPC UA (Binary, DataFEED OPC)	Machines with …	4980	TCP	
	OPC UA (SOAP-XML, KEPServerEX)	Machines with …	49320	TCP	
	OPC-Server (DCOM, Service Contr. Manager)	Machines with …	135	TCP	

Firewall Requirements

Source	Description	Destination	Port	Protocol	Comment
	Siemens Control with CP (IPS7Link/RFC1006)	Machines with …	102	TCP	
	Siemens MCIS-RPC (RPC, Host)	Machines with …	13010	TCP	
	Siemens MCIS-RPC (RPC, Machine)	Machines with …	3011	TCP	
	Simatic S7 IPS7LNK	Machines with …	502, 2000	TCP	
	WAGO http access	Machines with …	80	TCP	WAGO configuration page
	WAGO https access	Machines with …	443	TCP	WAGO configuration page
	WAGO CodeSys Software	Machines with …	2455	TCP	
	WAGO Controller - FORCAM I/O-Box	Machines with …	3002	UDP	
	WAGO (Modbus, polling/send)	Machines with …	502	UDP/TCP	

10.7 External Access

Source	Description	Destination	Port	Protocol	Comment
External access	Access for: 1. Customer system for support 2. Customer access GUIs 3. Cloud environment	Forcam Application Server	80, 443, 1998, 3389, custom, 10080, 10443, 11080, 11443, 15080, 15443, 16080, 16443, 19080, 19443, 21080, 21443, 24080, 24443, 25080, 25443	TCP	Customer defined Access Runtime Worker Client Workbench MDESimulator Office Client Scheduler Webservices Authentication
		Forcam Database Server	80, 443, custom		Customer defined Access
		Forcam Data Acquisition Server	80, 443, custom		Customer defined Access
ERP System	ERP "Download" interface	Forcam Application Runtime	10080	TCP	Configure in server.xml
	ERP secured "Download" interface	Forcam Application Runtime	10443	TCP	Configure in server.xml
	ERP "Upload" interface from Application Server	ERP - System	8002	TCP	Configurable

10.8 Single Sign-on

⚠ LDAP naming schema configuration does not support multi-site.

Source	Description	Destination	Port	Protocol	Comment
SSO external access		LDAP Server	Custom	TCP	Configure on LDAP server
Forcam Application Server		LDAP Server	HTTP=389, HTTPS=636	TCP	Configure on LDAP server
LDAP Server		Forcam Application Server	15009, 19009	TCP	Configure on LDAP server

11   Document History

Version	Date	Name	Change
7	2022-03-10	Sandro Veiga Perez A. Skultety N. Löffler	− Added MongoDB 4.2 to column 5.11 in ch.1 − Added ch.3.1 MS SQL Server License − Added time zone, Windows Server and SQL Server info to ch.3.2, 4.1, 5.1
8	2022-06-23	Sandro Veiga Perez A. Skultety N. Löffler	Update for FORCAM FORCE IIOT version 5.11.32: − Updated the infrastructure table in ch.1 for MongoDB and Browser − Added ch.2.4 "Limitations" − Added extended rights for user of MS SQL Server to ch.3.2 − Added location distance to ch.5.1 − Added Windows Server as operating system in ch.6.2 and 6.3 − Updated the list of additional third-party software in ch.9
9	2022-09-05	Sandro Veiga Perez A. Skultety N. Löffler	Update for FORCAM FORCE IIOT version 5.11.35: − Extended ch.3.1 for required licenses