

# General Specifications

## Remote Gateway Station (RGS)

## FAST/TOOLS

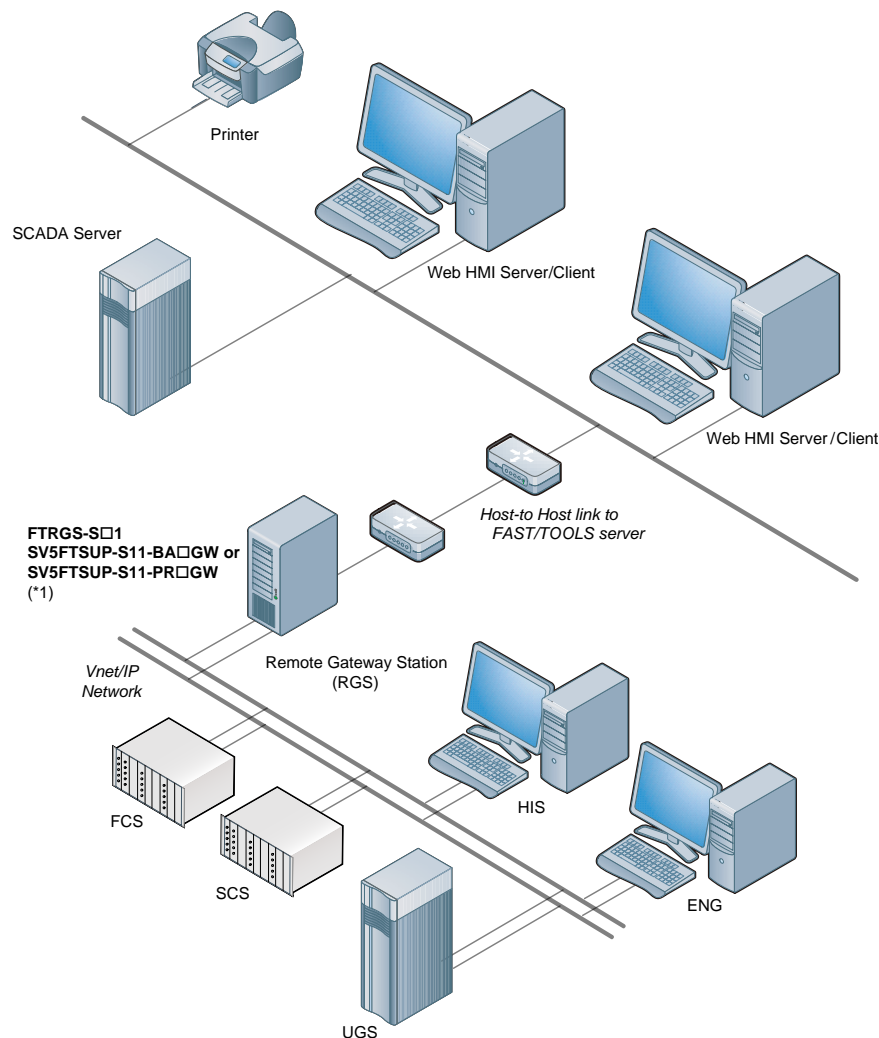
GS 50A01A12-01EN

### ■ GENERAL

The Remote Gateway Station (RGS) facilitates the integration between CENTUM VP and FAST/TOOLS.

RGS delivers an integrated automation solution, which supports a corporate wide automation strategy across multiple domains and geographies. This is achieved by providing access to Vnet/IP and managing the low bandwidth and intermitted communication requirements over remote network infrastructures at the top end from FAST/TOOLS.

Additional functions are provided for communication with CENTUM VP, which allows variable data and function block data to be read/write by FAST/TOOLS.



\*1: □ : S= Single Platform, R= Dual-redundant Platform for Computer

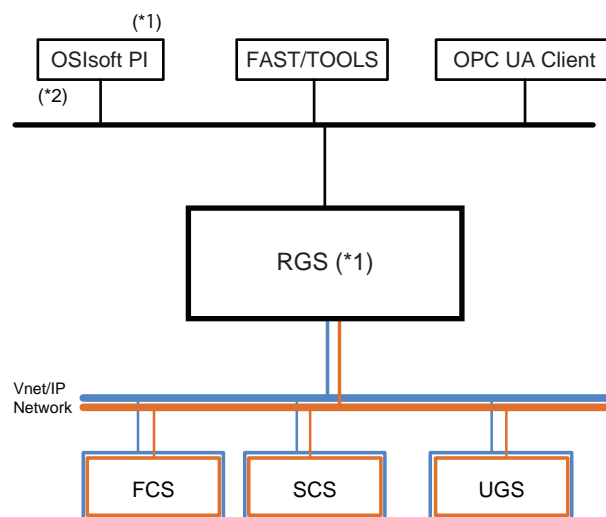
F01E.ai

Figure RGS sample architecture

## ■ CONNECTIVITY

The RGS seamlessly connects to its FAST/TOOLS host system and provides it with read/write access to the underlying Vnet/IP domains and stations, such as FCS, SCS and UGS.

The RGS system works always in combination with a FAST/TOOLS system.



F02E.ai

\*1: OSI PI and OPC UA interface are available.

\*2: Supplied from OSIsoft

**Figure Connectivity with RGS**

## ■ COMMUNICATION WITH FCS, SCS AND UGS

The RGS can directly communicate over Vnet/IP to the connected FCS, SCS and UGS stations. The Alarms detection and generation is done by FAST/TOOLS. RGS is not receiving alarm messages from the FCS, SCS and UGS. The annunciation status is controlled by FAST/TOOLS. The communication protocol Vnet/IP is managed by the Vnet/IP driver of EQUIPMENT/FAST.

Note: RGS is not suitable for writing bulk data - such as data from an RTU connected to FAST/TOOLS - into the FCS at a high frequency.

Note: CENTUM-VP Stations( HIS,FCS,SCS,UGS, etc.) can not access data in RGS.

## ■ NUMBER OF RGS SYSTEMS

Multiple Vnet/IP domains can be connected to one (redundant) RGS.

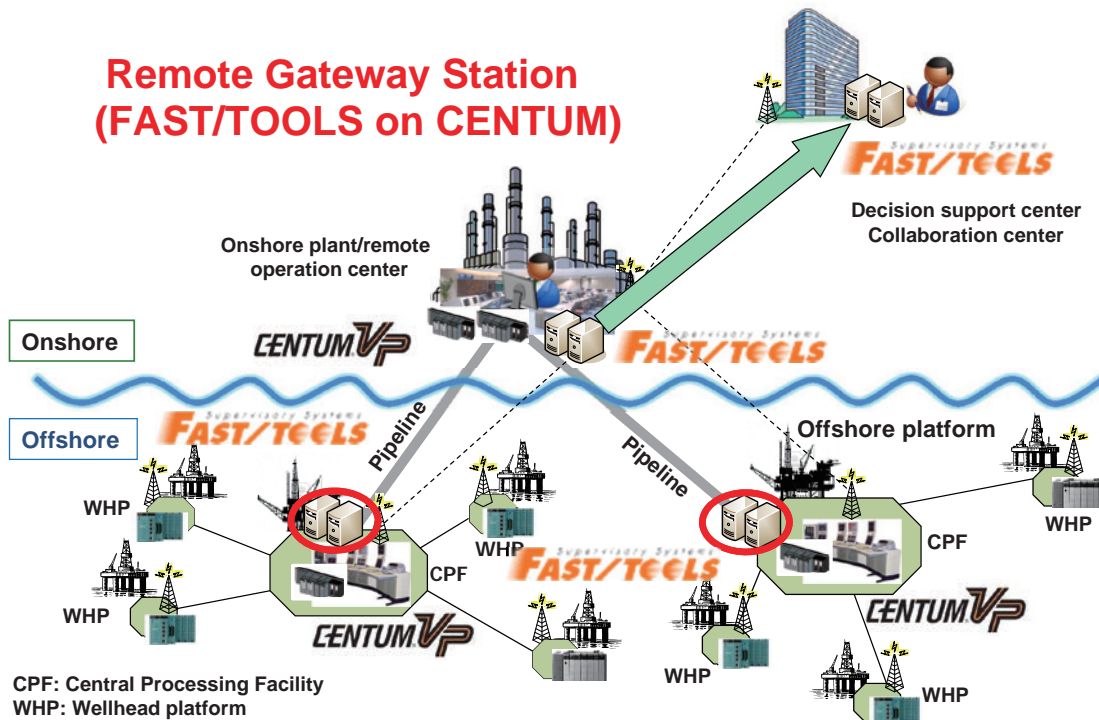
Host-to-Host communication is standard supported with the RGS which allows up to 253 RGS nodes to exist within one integrated FAST/TOOLS system.

Additional FAST/TOOLS nodes (for example Web-HMI Stations and Servers) need to be taken into account to not exceed 4095 nodes in one system.

## ■ INTEGRATED OPERATIONS

The RGS can also be utilized to create an open platform to integrate multiple CENTUM system domains which may be at multiple, geographically dispersed locations into one (local and remote) operations environment. This supports easy to manage delivery of process data and alarms to the users at each automation level (see the figure below). From a process operator who controls the process at the Process level, up to KPIs that are supplied to the financial systems of the corporation at the corporate level.

The FAST/TOOLS host system platform is responsible for gathering the data to be displayed to the user, and processing of the user responses.



F03E.ai

Figure Integrated Operations

In the above figure, three network levels can be identified; the corporate network (Decision support center), the Business Unit network (Onshore plant/remote operation center) and the Process network of the Central Processing Facilities (CPF).

These networks can be one physical network where the sections are separated by routers and firewalls, or these networks can be physically separated. In the latter case, a Business Unit server would need to have two network cards, one that connects the server to the Business Unit network, and one that connects the Business unit server to the corporate network.

## ■ SYSTEM SPECIFICATION

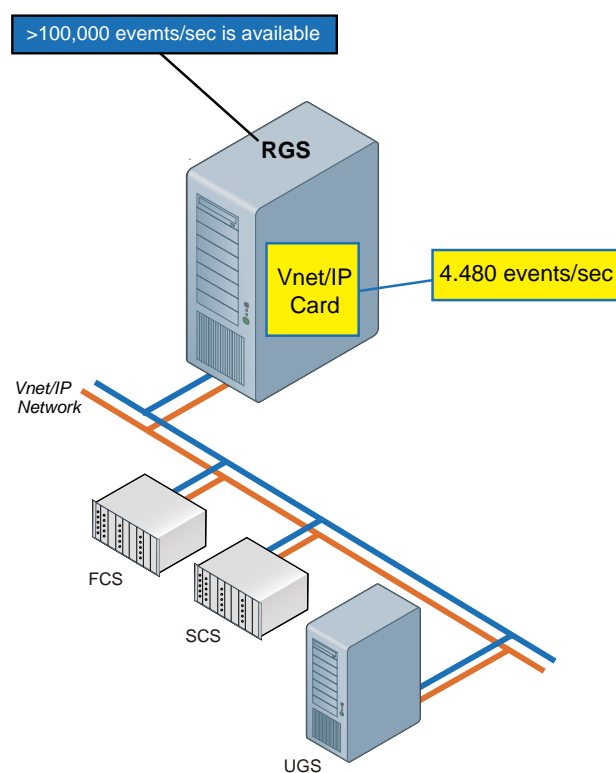
### ● RGS Software Modules

RGS is comprised of function specific software modules (specified in the table below) that connect to the communication data bus BUS/FAST. All RGS modules are event based and submit their events to BUS/ FAST. BUS/ FAST passes these events in a highly secure and reliable manner to modules that are subscribed to these events. The result is a very low CPU-load on any system during normal operations.

Tool name	Description
BUS/FAST	Basic networking support and secure communications
DATABASE/FAST	Real-time database with ISAM based file support and distributed Data Set Services
HISTORY/FAST	History scheduler
ITEM/FAST	Real time item data handling
EQUIPMENT/FAST	Vnet/IP communication
ALARM/FAST	Alarm management and handling
PROCESS/FAST	Sequencing and Calculations
Web-HMI server inclusive one (1) Web-HMI-Client	Engineering

## ■ PERFORMANCE

In RGS a maximum of 512 equipment drivers (EQP's) for the Vnet/IP connection can be defined. Multiple equipment drivers (EQP) can be connected to one FCS, SCS or UGS stations to optimize data throughput and achieve maximum system performance. Each equipment driver (EQP) communicates independent from other equipment drivers (EQP's). In the case of 20 FCSs, each EQP can work at minimum polling speed. So when the total amount of data points is not exceeding 4,480 the polling cycle can be set at 1 second.



**Figure Performance of the RGS**

The maximal throughput of data access depends on the conditions of the project and the application.

## ■ SCANNING FUNCTIONALITY

RGS polls data from the controllers (e.g. FCS, SCS, and UGS). The polling rate can be configured in the Station definition of Vnet/IP. Depending on the chosen polling rate a certain amount of data is polled and passed through to RGS

Note: Depending on the type of the Vnet/IP station, the maximum number of data that each station can handle (e.g. read and write) differs (see the table below). The RGS can be easily tuned so that total communication requests for FCS, SCS, and UGS does not exceed the capability of each station. This tuning is done by modifying the parameter settings of each EQP process.

Station Type	Polling rate (items/sec.)	Remarks
FCS	3,200	AFV10
NFCS	12,800	AFV20 / AFV 30 / AFV40 or later models
UGS	6,400	
SCS	1,280	SSC50 / SSC60

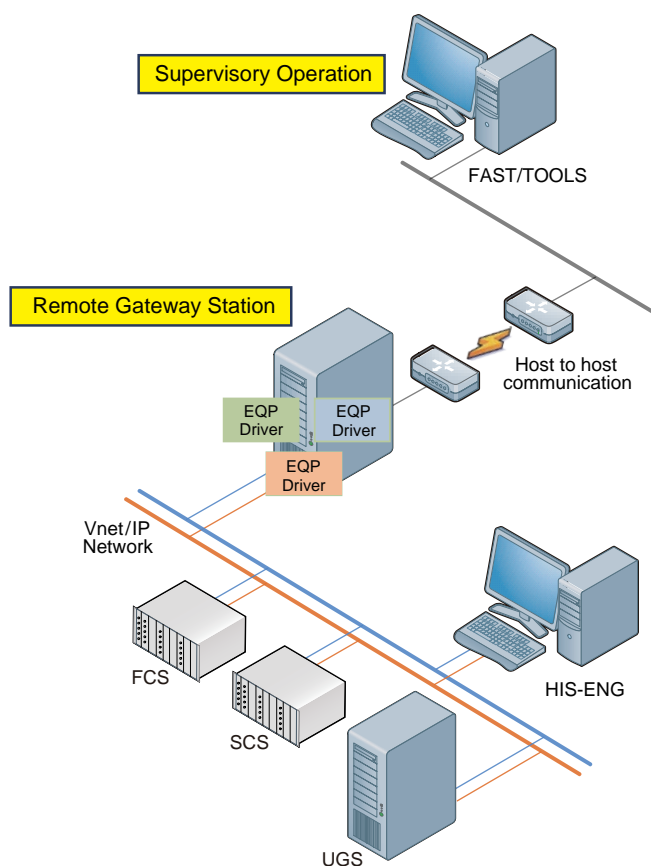
Polling rates are configurable per data type, e.g. PV, MV, SV or on a per tag basis. For instance high critical tags could be scanned every second, medium critical every 2 seconds, low critical every 5 or 10 seconds.

There are 3 scan options for RGS; fast, medium, and slow.  
The following table indicates the default setting typically for actual operation.

Scan Type	Interval	Items	Remarks
Slow	10,000 msec	AOFS, BSET, BSTS, COMMENTS, DL, DIALOGUE, DV, HH, LL, MODE, MSH, MSL, PH, PHASE, PL, SH, SL, UNIT, VL	
Medium	5,000 msec	FV, SV	
Fast	1,000 msec	ALRM, CPV, MV, PV	

Each scan option is user configurable

- Per controller
- Per item (i.e. data point)



F05E.ai

Figure Equipment drivers (EQP) with RGS

## ● Dynamic Scan

Dynamic Scan is added, beside fixed scan (fast, medium, slow) Dynamic scan means: normal scan only once per x seconds, but when items are shown on current graphic display, the scan frequency of those items will be changed to once per second. The Scan frequencies are configurable per EQP.

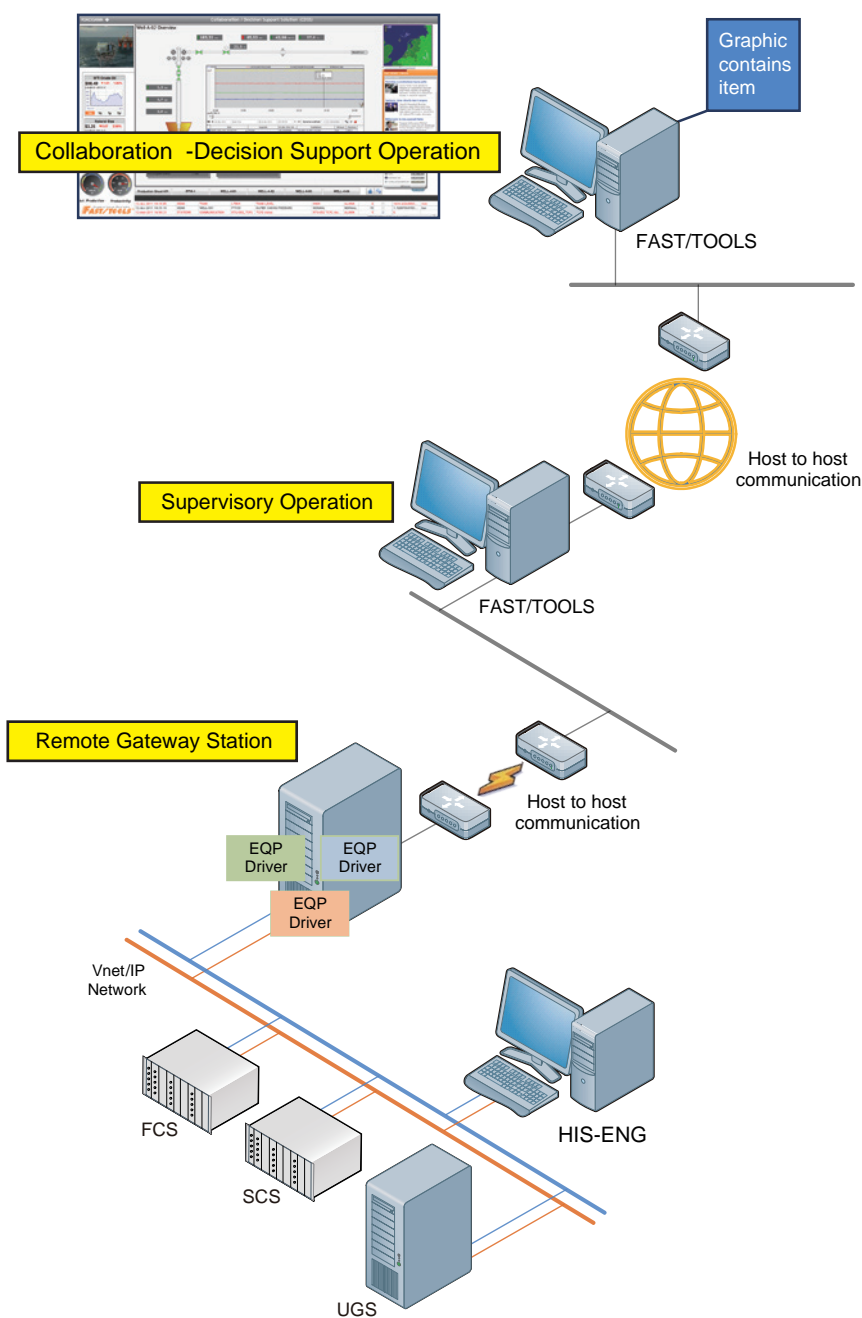
Dynamic scan is typically used for tuning parameters. These values are almost never changing.

For these for instance, normal scan could be once per 30 minutes, dynamic scan will increase it to every second when the parameter setting display is activated every second.

For dynamic scanning two scan frequencies can be specified:

- A normal scanning frequency
- A special scanning frequency, (when item is shown on a display).

All data is stored on RGS to sync with FT in the event of communication interruption.



F06E.ai

**Figure Dynamic Scan with RGS**

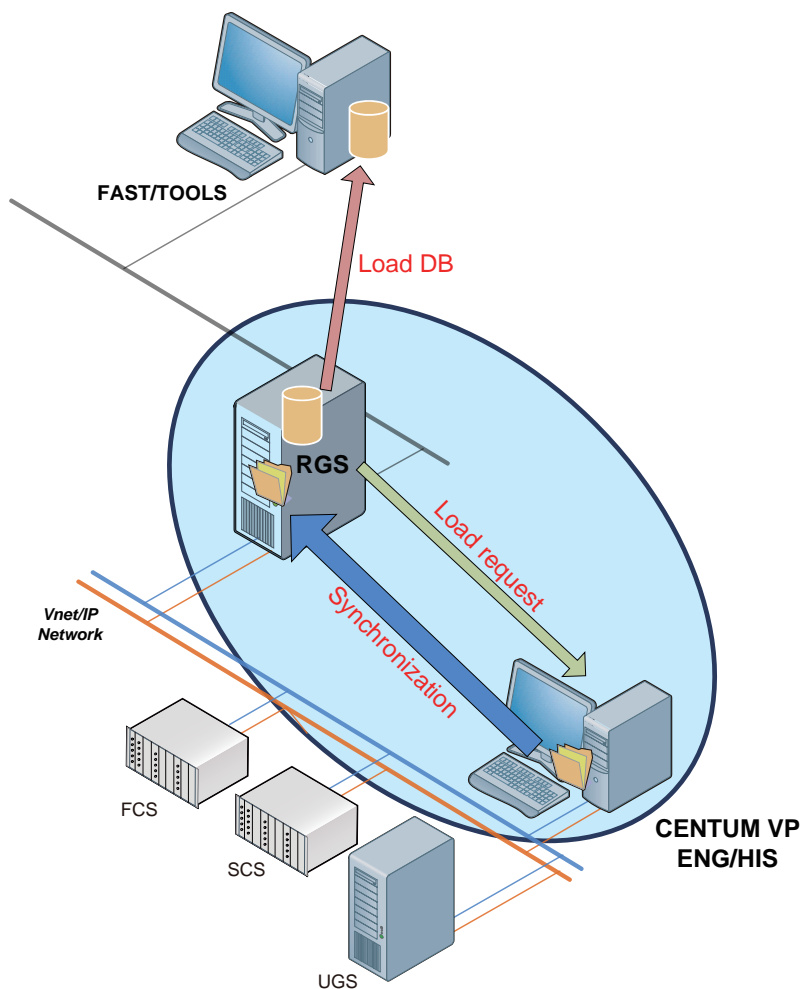
## ■ ENGINEERING

### ● Automatic update function of the RGS

When an engineer makes modifications to a CENTUM DCS system and saves this in the project database on the HIS system these changes and modification are automatic available in the RGS station.

The RGS has a synchronization process which takes care of this functionality.

The FTExchange utility is available for synchronization with a FAST/TOOLS host system. The DB which is loaded into the (remote) FAST/TOOLS host system is generated by this FT-Exchange utility. This DB is then manually copied from RGS to the (remote) FAST/TOOLS host system and automatically generates engineering information in the (remote) FAST/TOOLS host system.



F07E.ai

Figure High Automatic Process update RGS

### ● Communication with FCS, SCS and UGS

The RGS can directly communicate over Vnet/IP to the connected FCS, SCS and UGS stations. The Alarms detection and generation is done by FAST/TOOLS. RGS is not receiving alarm messages from the FCS, SCS and UGS. The annunciation status is controlled by FAST/TOOLS and the communication protocol is Vnet/IP.

## ● Supported Function Blocks

The following tables provide an overview of the functions blocks supported by the RGS. Depending on project requirements specific function blocks can be supported as part of service packs and new releases of RGS software package.

### Accessible data from FCS/SCS/UGS by RGS

Device	Data type	Description	Access	Tags	Remarks
CENTUM VP FCS	Function Block	Regulatory control block	R/W	Mode, PV, MV, SV, HH, PH, PL, LL	(*1)
		Calculation block	R/W	N/A	(*1)
		Sequence control block	R/W	Mode, PV and SV of switch instrument block	(*1)
		Faceplate block		N/A	
		Unit Instrument and operation		N/A	
		Valve pattern monitor		N/A	
		Offsite block		N/A	
	Software input/output	Internal switch	R/W	N/A	
		Message output	R/W	N/A	
	Process control I/O	Process I/O		N/A	(*2)
		Communication I/O		N/A	(*2)
		Fieldbus I/O		N/A	(*2)
ProSafe-RS	Internal variable	BOOL, DINT, REAL	R	All tags	
	I/O structure	IO_BOOL, IO_REAL	R	All tags	
	Function Block	ECW_B, ECW_I, ECW_R	R/W	All tags	
		ANLGI, ANLG_S	R	ANLG_S	
		VEL	R	N/A	
		ANN	R	All tags	
		SCI_B, SCI_I, SCI_R	R	SCI_B, SCI_R	
		SCO_B, SCI_I, SCI_R	R	SCO_B, SCO_R	
UGS		UGS data types are mapped onto FCS data types			

R: Read only

R/W: Read and Write

\*1: Whether writing is available or not depends on the function block type.

\*2: Writing is available only for output.

Note: Data can not be written to HIS.



**CENTUM function blocks which are automatically synchronized with the RGS database (1/4)**

Device	Function Block	Support	Not Supported	Remarks
CENTUM VP FCS ProSafe-RS UGS	%AN	X		Data with TAG name only
	%SW	X		Data with TAG name only
	ALM-R	X		
	ANLG	X		
	ANN	X		
	AS-H	X		
	AS-L	X		
	AS-M	X		
	ASTM1	X		
	ASTM2	X		
	AVE-C	X		
	AVE-M	X		
	BDA-C	X		
	BDA-L	X		
	BDSET-1C	X		
	BDSET-1L	X		
	BDSET-2C	X		
	BDSET-2L	X		
	BSETU-2	X		
	BSETU-3	X		
	CALCU	X		
	CALCU-C	X		
	CI	X		
	CO	X		
	CTP	X		
	CTS	X		
	DLAY	X		
	DLAY-C	X		
	DSET	X		
	DSET-PVI	X		
	DSW-16	X		
	DSW-16C	X		
	ECW/B	X		
	ECW/I	X		
	FF-AI	X		
	FF-AO	X		
	FF-DI	X		
	FF-DO	X		
	FFSUM	X		
	FOUT	X		
	FUNC-VAR	X		
	GOV_B	X		
	LC64	X		
	LDLAG	X		
	MC-2	X		
	MC-2E	X		
	MC-3	X		

**CENTUM function blocks which are automatically synchronized with the RGS database (2/4)**

Device	Function Block	Support	Not Supported	Remarks
CENTUM VP FCS ProSafe-RS UGS	MC-3E	X		
	MLD	X		
	MLD-PVI	X		
	MLD-SW	X		
	MOB_11	X		
	MOB_21	X		
	MOB_RS	X		
	NOT	X		
	ONOFF	X		
	ONOFF-E	X		
	ONOFF-G	X		
	ONOFF-GE	X		
	PBS10C	X		
	PBS5C	X		
	PD-MR	X		
	PG-L13	X		
	PI_BLEND	X		
	PID	X		
	PID-BSW	X		
	PID-STC	X		
	PID-TP	X		
	PI-HLD	X		
	PTC	X		
	PVI	X		
	PVI-DV	X		
	RATIO	X		
	RL	X		
	RS	X		
	SFCAS	X		
	SFCPB	X		
	SFCSW	X		
	SI-1	X		
	SI-12PE	X		
	SI-1E	X		
	SI-2	X		
	SI-21E	X		
	SI-22E	X		
	SI-22PE	X		
	SI-2E	X		
	SIO-11	X		
	SIO-11E	X		
	SIO-12	X		
	SIO-12E	X		
	SIO-12P	X		
	SIO-21	X		
	SIO-22	X		
	SIO-22P	X		

**CENTUM function blocks which are automatically synchronized with the RGS database (3/4)**

Device	Function Block	Support	Not Supported	Remarks
CENTUM VP FCS ProSafe-RS UGS	SO-1	X		
	SO-1E	X		
	SO-2	X		
	SO-2E	X		
	SPLIT	X		
	SS-DUAL	X		
	SS-H	X		
	SS-L	X		
	SS-M	X		
	ST16	X		
	ST16E	X		
	SW-33	X		
	SW-91	X		
	TM	X		
	USD-CHR	X		
	USD-I16, U16, I32, U32, F32 & F64	X		
	USG-ANNI	X		
	USG-ANNP	X		
	USR-BOOL	X		
	USR-FSMB	X		
	USR-MLDB	X		
	USR-MLPB	X		
	USR-TPCL	X		
	USR-XLMD	X		
	USR-XLMS	X		
	USY-CTR	X		
	USY-US	X		
	VEL	X		
	VELLM	X		
	VLVM	X		
	XCPL	X		
	ADD		X	
	ADL		X	
	AND		X	
	AVE		X	
	BAND		X	
	BNOT		X	
	BOR		X	
	DIV		X	
	EQ		X	
	EXP		X	
	GE		X	
	GT		X	
	INTEG		X	
	LAG		X	
	LD		X	

**CENTUM function blocks which are automatically synchronized with the RGS database (4/4)**

Device	Function Block	Support	Not Supported	Remarks
CENTUM VP FCS ProSafe-RS UGS	MUL		X	
	OFFD		X	
	OND		X	
	OR		X	
	RAMP		X	
	SQRT		X	
	SRS1-R		X	
	SRS1-S		X	
	SRS2-R		X	
	SRS2-S		X	
	TOFF		X	
	TON		X	
	TPCFL		X	
	WOUT		X	

**■ SYSTEM SUPPORT FUNCTIONS**

RGS is delivered with a complete set of diagnostic tools for every module which allows online monitoring of:

- Configuration settings
- Real-time values of items, communication statistics, process-load
- Time related issues
- Status values
- And other module specific parameters

These diagnostic tools are used to locate suspicious faulty situations in the RGS system and to optimize the performance of the system. Performance optimization can be done by:

- Balancing Vnet/IP network traffic between e.g. a server and workstation in a redundant network
- Preventing queue overflows by adapting queue sizes of RGS processes
- Optimizing scan times of external process variables

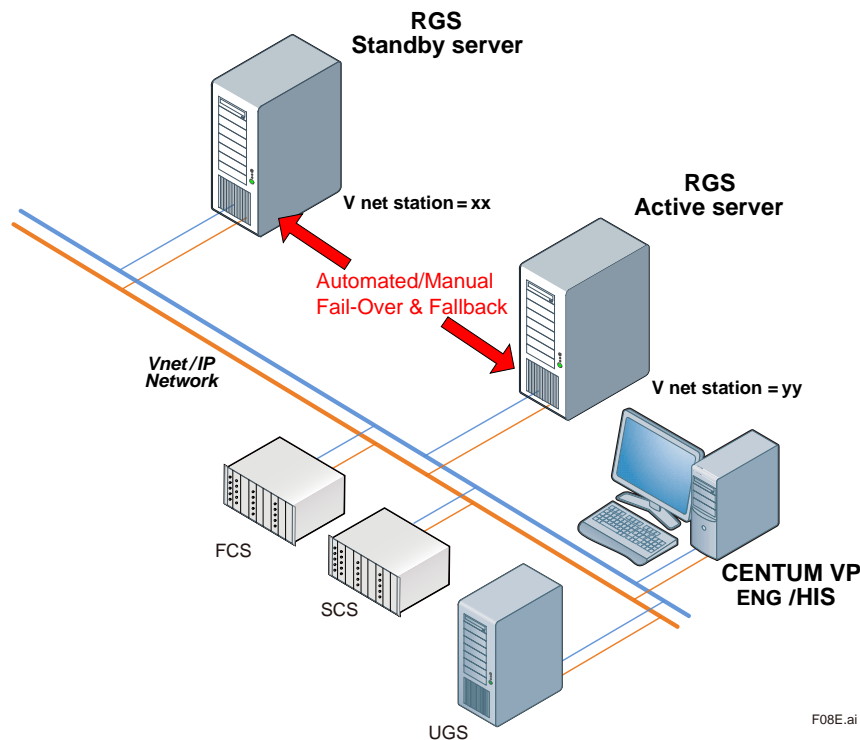
In addition some diagnostic tools allow logging diagnostic data to a file on disk, which can analysed.

## ■ REDUNDANCY

To increase the availability of the RGS it can be made fault tolerant with redundant communication networks. This functionality is the same as embedded for FAST/TOOLS High Availability Computing (HAC).

There are several features available in RGS for building high availability system configurations combined with advanced guidance tools for some typical set-ups.

The High Availability Computing (HAC) software module will take care of handling Dual redundant stations and redundant hard drive configurations (RAID). And with functionalities to manage which station is active and which station is standby and how and when to switchover to the standby station.



Note: Each RGS station in a HAC configuration need to have its own unique station number of Vnet/IP.

**Figure High Availability Computing (HAC)**

The high availability features of RGS are abbreviated to HAC (High Availability Computing). The HAC features are divided into dedicated functional parts, each fulfilling a specific role. The main functions are Watchdog, Active and Hot standby, Island situation, initial status & data synchtonization.

### Watch-dog

A "watch-dog" feature runs on each of the servers in a redundancy cluster. The Watchdog takes a number of critical inputs relating to the health of the 'active' system and of the 'hot standby' system. It decides whether the system is sufficiently healthy to carry on and take the least intrusive course of action to recover from any failure, or last whether the redundant server should be brought online. The Watchdog takes the following inputs as a basis for determining the health of the system:

- Current RGS System health
- Current state of the network connection to the hot standby server
- Availability of network devices
- Results of custom scripts

The watchdog can support the following configurations:

- Up to 4 network interfaces
- Up to 20 IP device checks
- Provision for periodic checks using custom scripts as input to the health check

**Data Synchronization**

Data is being synchronized permanently using integrity updates (initial full synchronization at start-up) and then by exception. To allow for a good startup of the standby server it is essential that this server is up to date with the most recent information from the active server. This means that critical databases, files and folders are to be synchronized from the active server to the standby server. This is an automatic process between Active and Standby servers with necessary logs in case of any database synchronization problems.

**■ TIME SYNCHRONIZATION**

The RGS system is acting as slave and is time synchronized using the Vnet/IP sync function. In case of a redundant RGS system the time of both the active and standby RGS systems are synchronized using the Vnet/IP sync function.

**■ OPERATING ENVIRONMENT**

RGS is supported on the server platforms as defined below. For each platform, the required operating system.

Platform	Operating System
Microsoft	Windows 10 Enterprise 2016 LTSC (64-bit) Windows 10 IoT Enterprise 2016 LTSC (64-bit) Windows 7 Professional SP1 (64-bit) Windows Server 2016 (64-bit) Windows Server 2019 (64-bit)

Note: When you use Dual-redundant Platform for computer the support OS is Windows Server 2016 only.

Note: When you use Vnet/IP driver the support OS is different by driver version. Contact Yokogawa for more details.

**■ SYSTEM REQUIREMENTS**

The specified hardware is a minimum recommendation for optimal software performance. Furthermore it should be taken into account that additional non RGS applications may require additional resources.

The RGS station works with CENTUM VP R5.01.20 or later.

**● RGS Station**

Items	Specifications
CPU	Microsoft Intel © Core™ i7, 3.40 GHz or better.
RAM	At least 8 GB
Hard Disk	1TB (7200 rpm) At least 300 Mbytes of free space is required for the software.
Ethernet adapter	An Ethernet adapter that is supported by the operating system is required at installation. Please note that for HAC (High Availability Computing) a dedicated network adapter is preferred.
DVD-ROM Drive	A DVD-ROM drive that is supported by the operating system is required.

**● Vnet/IP card**

Model	Description
VI702	Vnet/IP Interface Card

**■ NOTICE FOR THIRD-PARTY PRODUCTS**

RGS is software that makes the most of commercial off-the-shelf (COTS) software, so third-party products meeting the specifications required by RGS are myriad. The pieces of software described in the General Specifications and User's Manuals of RGS, will operate correctly to the extent of the specifications.

Yokogawa has conducted combination tests on third party products that many want to use with RGS. These tests may also be performed on new third-party products as required. Nevertheless, these tests simply check the basic operations in combination with RGS and are not intended to assure correct operations. The most recent results of these tests will be available to those who have concluded a support contract.

## ■ MODELS AND SUFFIX CODES

Each RGS in the integrated system has to be licensed with a RGS node license.

### Windows RGS Package

		Description
<b>Model</b>	FTRGS	FAST/TOOLS Microsoft Windows RGS Package
<b>Suffix Codes</b>	-S	Software license
	S	for Single Platform
	R	for Dual-redundant Platform
	1	Always 1
<b>Option Code</b>	/UA	OPC UA Server

Note: For a redundant RGS configuration twice the package must be ordered.

Note: FAST/TOOLS Support Contract (SV5FTSUP) must be ordered with the RGS package.

Note: Need to order in combination with a FAST/TOOLS licenses

Note: WebHMI is limit to only the Engineering module

### FAST/TOOLS Support Contract

		Description
<b>Model</b>	SV5FTSUP	Support contract for FAST/TOOLS license
<b>Suffix Codes</b>	-S	Software license
	1	Always 1
	1	Always 1
	-BASGW	FTRGS-SS1 (Basic)
	-BARGW	FTRGS-SR1 (Basic)
	-PRSGW	FTRGS-SS1 (Professional)
	-PRRGW	FTRGS-SR1 (Professional)

Note: The annual support contract provides product support on the standard FAST/TOOLS product for faults/bug fixes. The support contract includes office hour e-mail support. Application support and remote support will be provided on request.

Note: All software licenses will be sold with a support contract to the end-user. This support contract will become effective as soon as the license is purchased. This also applies to upgrade licenses.

Note: There are following two types of SV5FTSUP.

Basic

- Minor Release upgrade: Free of Charge
- Major Release upgrade: 40 % of current transefer/list price

Professional

- Minor Release upgrade: Free of Charge
- Major Release upgrade: Free of Charge

## ■ ORDERING INFORMATION

Specify the model and suffix codes.

## ■ TRADEMARK ACKNOWLEDGMENT

The names of corporations, organizations, products and logos herein are either registered trademarks or trademarks of Yokogawa Electric Corporation and their respective holders.