Co-innovating tomorrow™

YOKOGAWA ◆

Integrated Production Control System
CENTUM VP

Co-innovating tomorrow ™

**Through "Process Co-Innovation,"
Yokogawa creates new value with our clients
for a brighter future.**

The CENTUM VP Distributed Control System (DCS) is Yokogawa's most advanced, integrated process control system, providing enhanced productivity and optimization across a wide range of industries. For over forty years, the CENTUM DCS family has evolved to meet and exceed the needs of businesses and will continue to do so as they reinvent themselves through digital transformations and incorporate new technologies such as IoT far into the future.

CENTUM VP

Customer Centric Values

CENTUM VP is a reliable built for safe performance control system that is scalable, flexible, powerful and easy to use.

Efficient Engineering Environment

Automation Design Suite enables users eliminate redundant work, increase engineering efficiency using flexibility of Standardized Modular engineering, maintain data integrity and enable change management through smart engineering. The reduced workflow translates to sustainable, efficient project execution to realize business value.

Intuitive Unified Plant Operations

Operator centric interface for control, safety, asset intelligence integrated with embedded Consolidated Alarm Management System prevents information overload for operators allowing deliver safe, high performance, efficient plant operations for customer satisfaction.
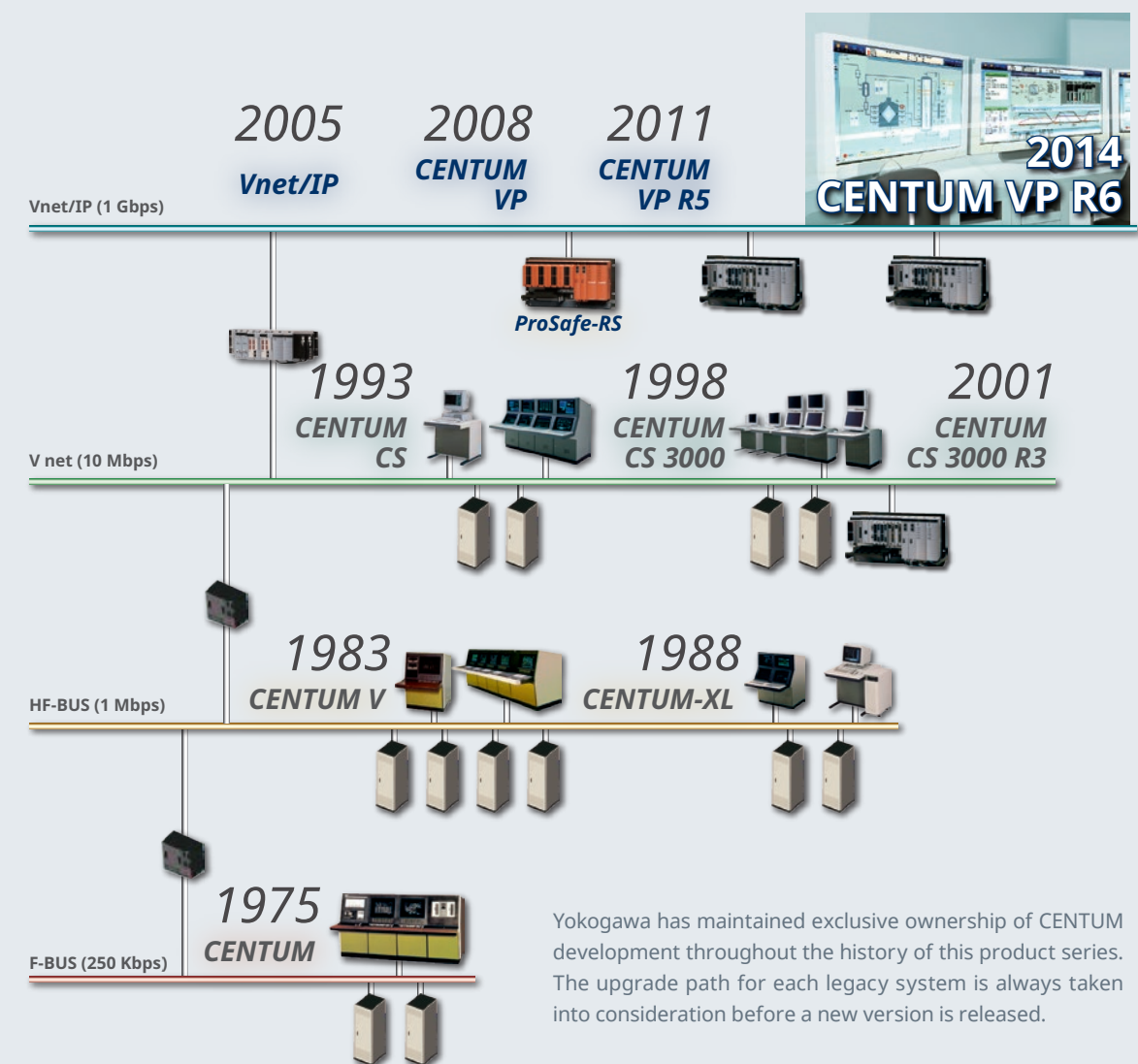
Pragmatic Lifecycle Management Programmes

Yokogawa provide online upgrades, patches, migration, security solutions as lifecycle services. These services involve comprehensive customer collaboration ensuring sustainable return on investment for control system assets. These services are applicable across plant lifecycle.

Improved Project Execution and Reduced Cost

N-IO (Network I/O), the next-generation software configurable smart I/O reduces footprint, lowers marshalling costs and allows flexible I/O binding.

N-IO matched with the FieldMate Validator commissioning tool allow significantly faster project completion to reduce costs without quality compromise.

CENTUM History — Over 40 years and still counting

Vnet/IP (1 Gbps)	2005 *Vnet/IP*	2008 *CENTUM VP* — 2011 *CENTUM VP R5* — 2014 **CENTUM VP R6**
	ProSafe-RS	
V net (10 Mbps)	1993 *CENTUM CS*	1998 *CENTUM CS 3000* — 2001 *CENTUM CS 3000 R3*
HF-BUS (1 Mbps)	1983 *CENTUM V*	1988 *CENTUM-XL*
F-BUS (250 Kbps)	1975 *CENTUM*	

Yokogawa has maintained exclusive ownership of CENTUM development throughout the history of this product series. The upgrade path for each legacy system is always taken into consideration before a new version is released.

Yokogawa's Commitment

Yokogawa's system platforms strengthened with decades of market proven execution experience provide the highest quality solutions for secure and optimized process automation management. Yokogawa's global customer centric focus with strong local support reduces users' business risks. Yokogawa provides the lowest total cost of ownership. With a long history of progressive compatibility, Yokogawa is your dependable automation partner.

Operation

True Integration of Production Excellence, Safety Excellence and Asset Excellence

CENTUM VP offers in Operations, Safety and Asset Management Solutions through optimized data management presented using cognitive visual integration for operators. For example, CENTUM VP Human Interface Station (HIS) offers integrated alarm visualization from DCS, Safety Instrumented System (ProSafe-RS) and Yokogawa Plant Resource Manager (PRM) Asset Management System that facilitates seamless operations across multiple control systems.

CENTUM VP HMI for Simplified Operations Through Visual Cognition

Yokogawa's rich experience in process industry with CENTUM is applied to develop an intuitive, human centric designed HMI environment for plant operations. Flexible windows with multi monitor approach offer an adaptable visual platform for diverse plant operator requirements. GUI designed using on human ergonomics makes CENTUM VP HMI environment easy for users. High visibility for data displays, use of colours considering ambient lighting, optimized contrast for visibility. Display configuration combine knowledge from operator experience deliver optimized data on HMI screens. Powerful HMI environment empower operators take timely correct for operation efficiency.

System Message Banner

Latest alarm message display for operators up to date information on process conditions.
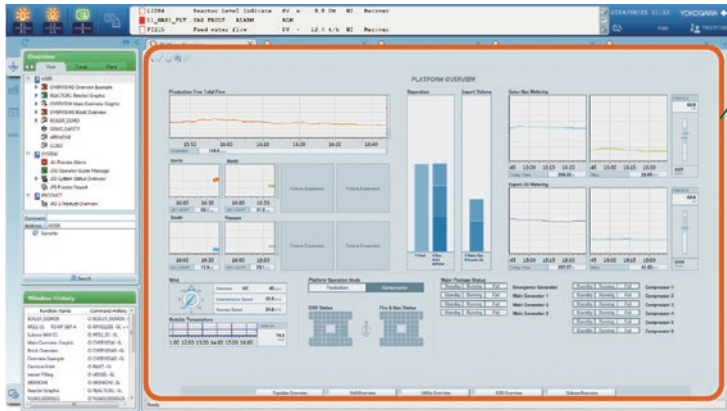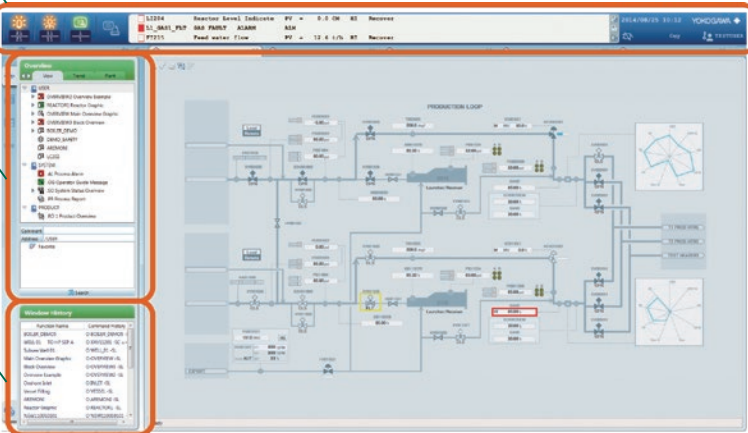
Browser Bar

Contains navigation tools for the operator's convenience, frequently used icons can be grouped in a My Favourites folder.

Window History

Lists previous operational displays for operators to call up previously used graphics windows.

AOG Solution (Advanced Operating Graphics)

AOG is a consulting service to help design PCS (Process Control System) graphics based on human factors and knowledge engineering. AOG provides intuitive situation awareness through ergonomic design, looking at factors such as colour selection, layout, and visual function. Certified consultants conduct a task analysis of plant operations and the result is reflected in the graphics design. The GUIs can enhance safety and productivity by early detection of abnormal situations, quicker decision making, reduction of errors, less-stressed operators, and translating operator skills into explicit knowledge.

Dedicated Operation Keyboard

Optimally allocated function keys, buttons enable operators to call up or switch graphics and control loops by pressing a single key. Two types, a single-loop and an eight loop simultaneous operation keyboards are provided giving users ability to react quickly to process conditions.

Virtualization

Virtualization separates system software operations from physical hardware dependencies, allows software reusability to optimally commission system hardware.
This translates to customer's business centric benefits like smooth migration to new physical hardware with reduced downtime, shorter migration process and system tests time. From maintenance perspective, segregation of hardware and software maintainability are other significant advantages.

Software Suites

CENTUM VP software improve productivity and optimize plant operations.

Solution Alarm Management

Consolidated Alarm Management Function helps customers avoid alarm flooding, maintain safety and environmental targets through proactive incidents detection. This improve operational efficiency under normal conditions, allowing operators avoid micro-management of tedious repetitive tasks to focus on genuine process challenges.
Alarm Management System supports Six Sigma DMAIC (Define, Measure, Analyse, Improve, Control) for alarm management based on the latest EEMUA #191 alarm management guideline. It provides additional useful tools like graphical historical data analysis, automatic alarm reduction, sequence of event management for better alarm management.

Plant Asset Management

PRM (Plant Resource Manager) combines with intelligent field devices to autonomously monitor plant asset conditions remotely. In built diagnostic functions detect early signs of performance deterioration such as valve sticking and impulse line blocking to optimize preventive maintenance plans using accurate instrument failure prediction, thus allowing proactive maintenance.
A wider variety of software suites for automation solutions is available.
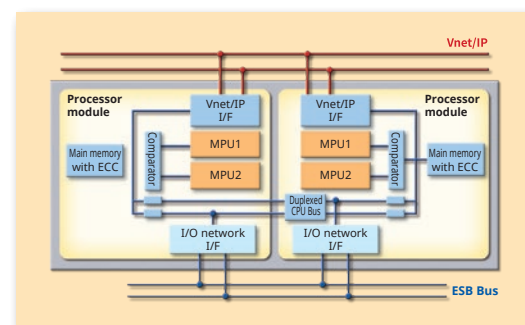
Control

Ensuring the Highest Availability and Reliability

Yokogawa's CENTUM series achieves continuous availability with reliability through a dual-redundant design, online maintenance capability features. FCS processor module, power supply, I/O modules, and I/O networks are all dual redundant. Active and stand-by processor modules work in synchronization: even if a failure occurs, control switches over seamlessly to stand-by module facilitates uninterrupted FCS availability. Failed modules can be replaced online, ensuring that even a hardware failure will not interrupt plant operation.

Designed for Stable Control

The CENTUM series employs a pair & spare architecture that improves process control stability. Each processor module has redundant Main Processing Units (MPU) that simultaneously execute same computations. Their outputs are constantly compared and a bump-less switchover to stand-by processor module is initiated if any anomalies caused by electronic noise or other phenomena are detected. This minimizes any adverse impact on process control due to hardware fault.

The State-of-the-art Field Control Station (FCS)

Yokogawa's performance driven legacy is built imbibing years of quality excellence, customer focus to deliver reliability through quality control system. The CENTUM VP controller features powerful processing capabilities with large application storage capacity, is optimized to full advantage of advanced field digital technology for plants to operate with better efficiency safety and stability.
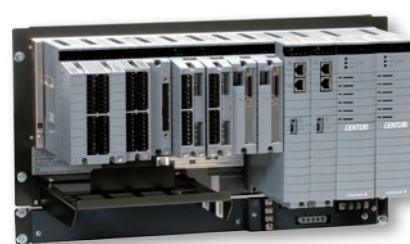
Secured Control Network

Yokogawa's Vnet/IP provides a highly reliable yet open real-time broadband communication network. The open communication does not affect process control data communications or the performance and security aspect of the control communications. Yokogawa system guarantees data updates every second in HIS, regardless of project size or complexity. Both star and ring topologies are supported.

Vnet/IP

Online Maintenance

Online maintenance function allows FCS applications to be modified without FCS shutdown. User can change logics and parameters without interrupting the process control. This is useful for expansion or modification of the plant online without affecting plant operations.

Wide Variety of Function Blocks

CENTUM VP provides functional blocks for monitoring, control, manipulations, calculations, logic functions, and sequences. Encompassing continuous control, advanced control, complex sequence control and batch control that can be executed in a redundant, secure, and reliable control environment. Process control systems can be flexibly designed, while remaining scalable and modularized, through combination of these control blocks.
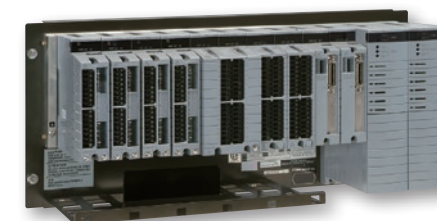
Process Input / Output Module

■ N-IO (Network I/O)

Network I/O (N-IO) enables a single I/O module to handle AI, AO, DI, and DO signals. For each I/O point sigal type is software configurable through appropriate adapter, this prevents delay in the plant installation caused by the change. Adapters serve as signal converters support a wide variety of signal types, offering choice to customer depending on the application. N-IO eliminates need of conventional marshalling saves installation space, reduces project costs. N-IO module can also be used as a remote I/O module by installing it as a remote junction box in the field.

■ N-IO Field Enclosure

N-IO field enclosure is a standard remote cabinet delivered with optimally designed auxiliary equipment including power supply.

■ FIO (Field Network I/O)

A variety of Field Network I/O (FIO) modules are available for each process signal type. The FIO modules can be connected to field devices via a pressure clamp terminal block, dedicated terminal board, or a MIL cable. FIO is the appropriate I/O choice for creating a configuration using a terminal block.

#### ■ RIO System Upgrade I/O

Other available I/O modules include a Remote I/O (RIO) module for I/O signals and an I/O module for RIO system upgrade to upgrade the system in a short time by maximizing existing assets.

Engineering

Yokogawa accelerates plant start-up, ensures sustainable performance

Yokogawa paves way for a new engineering paradigm for the next-generation plant personnel to accelerate plant start up and ensure sustainable performance. Project execution often experience backslide that may involve significant rework, having adverse impact on TCO (Total Cost of Ownership). Yokogawa's engineering prevents these inefficiencies and ensures customers reap all these benefits throughout the project lifecycle.
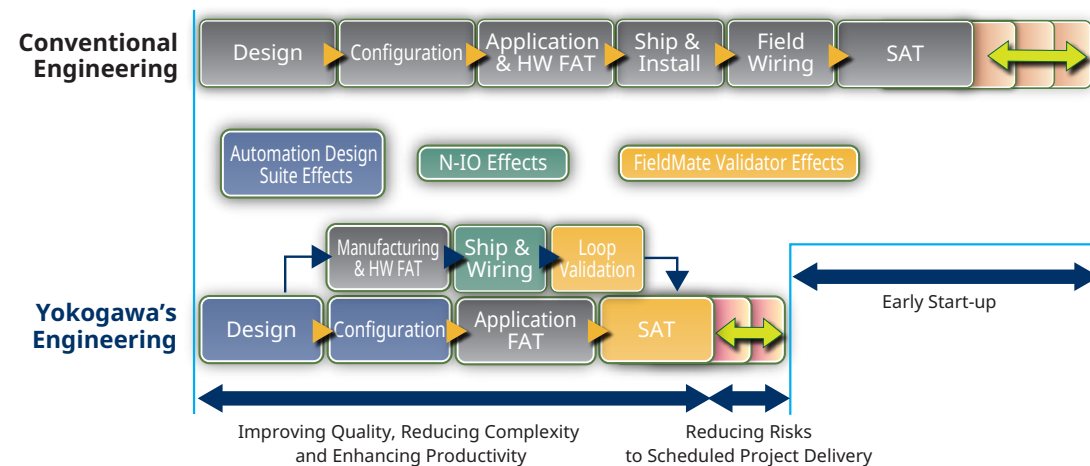
Yokogawa provides smart engineering thanks to three innovative products.
- Automation Design Suite, Yokogawa's engineering environment
- N-IO (The Network I/O), Yokogawa's software configurable smart I/O
- FieldMate Validator, Yokogawa's commissioning tool for N-IO

Flexible I/O Binding – Ensuring Project Execution Excellence

After the DCS is delivered to a site, design changes often occur due to physical restrictions of implementation or unavoidable miscalculations. These changes significantly affect the project schedule. Reduction of project execution time is a pressing challenge. Flexible I/O binding, Yokogawa's improved late I/O binding solution helps overcome these customer challenges.

Reducing the Risks to Scheduled Project Delivery

The flexible I/O binding facilitates simple and convenient I/O binding. This is made possible by software marshalling and the N-IO's universal channels. The type of I/O and the interconnection between the I/O module and the controller can be modified from remote locations which significantly reduces impact of last-minute I/O changes. Moreover, flexible I/O binding achieves early delivery of I/O cabinets to the site, and problems can be found and fixed on-site at a very early stage.

Early Start-up

Flexible I/O binding reduces project duration. After I/O design is fixed, application and hardware engineering can progress concurrently using System Independent Loop Commissioning using Yokogawa's FieldMate Validator, an innovative tool for field testing and validation of N-IO without requiring a deployed system.

Automation Design Suite - Improve Quality, Reduce Complexity, Enhance Productivity

Yokogawa's state of the art engineering environment Automation Design Suite, retains plant engineering history throughout the lifecycle from design – commissioning-operation; ensuring up-to-date plant knowledge with every expansion, hardware and software change and peace of mind to plant managers.

Module Based Engineering

Yokogawa Automation Design Suite adopts a modular approach to automation design and execution, where process loops, alarm design philosophy, graphics and more are deployed as design patterns: downloaded, shared and re-used as standards across the enterprise, saving time and resources.

Yokogawa leverages its long history and vast expertise in process automation, with standardized, industry proven engineering modules available that span a broad range of processes and functions for production, safety and asset excellence.

Management of Change and Resources

The Automation Design Suite is more than the 'As built' specification of process plant... It provides dynamic management of design, investment and project effectiveness by audit, version based engineering changes.

This facilitates effective engineering through ModPacks (Modification Packages) to maintain project schedules by reducing the delays and the engineering impact of late design changes or scope changes. Automation Design Suite also auto-documents and checks inconsistencies in project activity and software resources, removing the pain from project management, and significantly reducing project risk.

Recording Changes Throughout the Plant Lifecycle
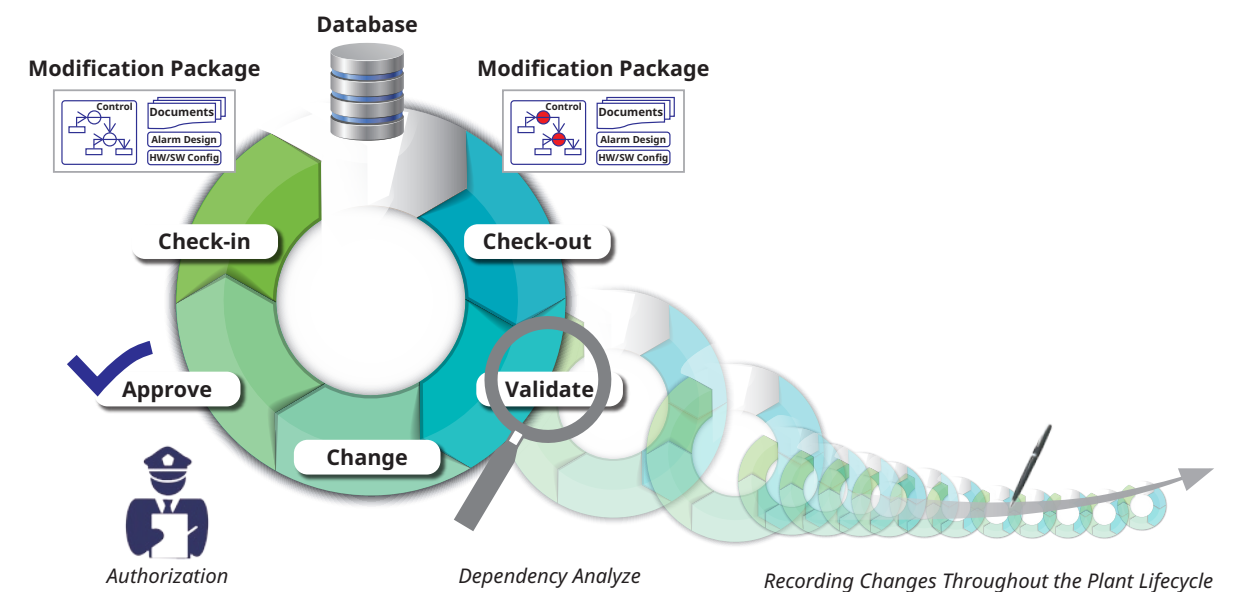
Sustainable Plant

Provide Long-term Functional Maintenance of the Control System

Sustainable Plant is Yokogawa's concept toward long-term stable operation of the control system.

Since its first release, CENTUM has been developed with consideration of compatibility and inheritance, and Yokogawa is making various efforts to achieve long-term stable operation of the entire plant, or a "Sustainable Plant."

● Toward Long-term Stable Operation of the Control System

Yokogawa provides long-term support and sustainability services to ensure the control systems maintain their high level of functionality over the lifecycle of the system and the facility. Yokogawa's lifecycle plans for its control systems provide the lowest cost of ownership for its customers.

● Solutions to Achieve a Sustainable Plant

Yokogawa continuously provides control systems and helps customers maintain and improve the performance of their plants, with the aim to achieve long-term stable operation of the control systems in the plants of customers, as well as meet customers' needs and ensure adaptation to the surrounding environment.

Product	We provide products that enable long-term functional maintenance by developing products, both hardware and software, that ensure functional compatibility and sustainability.
Service	We provide high quality solutions in annual maintenance agreement.

Lifecycle Performance Care Services

Plan & Execute	Maintain	Protect	Analyze	Modernize
Lifecycle Planning	**Basic Maintenance**	**Safety & Security**	**Asset Health Monitoring**	**Technology Refresh**
An optimal Lifecycle Plan for the customer's control systems	Providing prompt solutions and reliable service such as Engineer Dispatch/Bench Repair/etc.	Delivering solutions to ensure plant safety and security, and enhance operational resilience	Prevent unexpected failures by monitoring the condition of the plant	High-quality, seamless upgrading service

Service Foundation

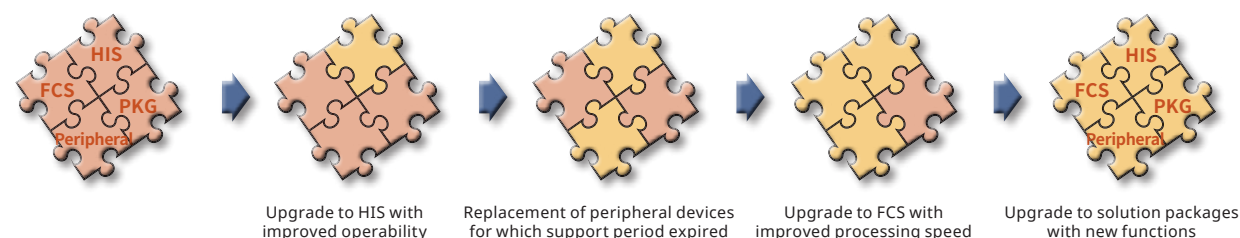| **Secured Remote Solutions**	**Global Service Network**
Secure and controlled access to critical, actionable data at any time and from anywhere	Comprehensive Global Service Network supports you with 24/7 operations

● Long-term Functional Maintenance Image

By updating obsolete components to maintain system functionality, transition can be achieved seamlessly. Maintenance activities can be applied at the same time of shutdown.

Upgrade to HIS with improved operability → Replacement of peripheral devices for which support period expired → Upgrade to FCS with improved processing speed → Upgrade to solution packages with new functions

● Security

We are in a new age of controlling security risks. The spread of malware and a rise in increasingly sophisticated cyber attacks are causing even more serious damage. The threat of cyber-security risks extends beyond information technology systems and into control systems. The use of information technology systems has advanced control systems and helped reduce costs and provide more functions. However, we now need to tackle the associated security risks.

■ Robust Cyber Security

CENTUM VP field control unit has obtained the ISASecure® Embedded Device Security Assurance (EDSA) certification from the ISA Security Compliance Institute (ISCI). The certification was obtained through a process of examination by the CSSC (Control System Security Centre) Certification Laboratory. It certifies that CENTUM VP software is equipped with the relevant cyber security features to be used in the industries such as oil, petrochemical, power and many others. CENTUM VP provides secure configuration for Windows PC/Server. CENTUM VP systems uses Vnet/IP network equipped with built-in features to deal with various security threats such as spoofing, falsification and DoS attacks.

■ Endpoint Security Service

Yokogawa provides an effective security service in response to the customer's requests and operational conditions. USB Port Lock Service, Security Information Service, etc. are available. The Anti-virus software and the white listing software for CENTUM VP are provided by Yokogawa.
Yokogawa verifies the combined operation of the Yokogawa products, antivirus software, and the Microsoft Security Updates.

■ Obtaining Security Certification

CENTUM VP pioneered to obtain the ISA Secure Embedded Device Security Assurance (EDSA) certification that assures security robustness in Japan in 2014.

● Migration

Not satisfied with another vendor's control systems? Consider migrating it to CENTUM VP. We have successfully migrated over 350 non-Yokogawa systems so far and the number is steadily growing. To name a few: Bailey INFI90, Foxboro I/A, Emerson RS3/PROVOX/DeltaV, Eurotherm, Hartman & Brown ContronicP, Hitachi, Honeywell TDC2000/TDC3000/PKS, Siemens SIMATIC, Taylor MODCELL, Toshiba, Allen-Bradley PLC.
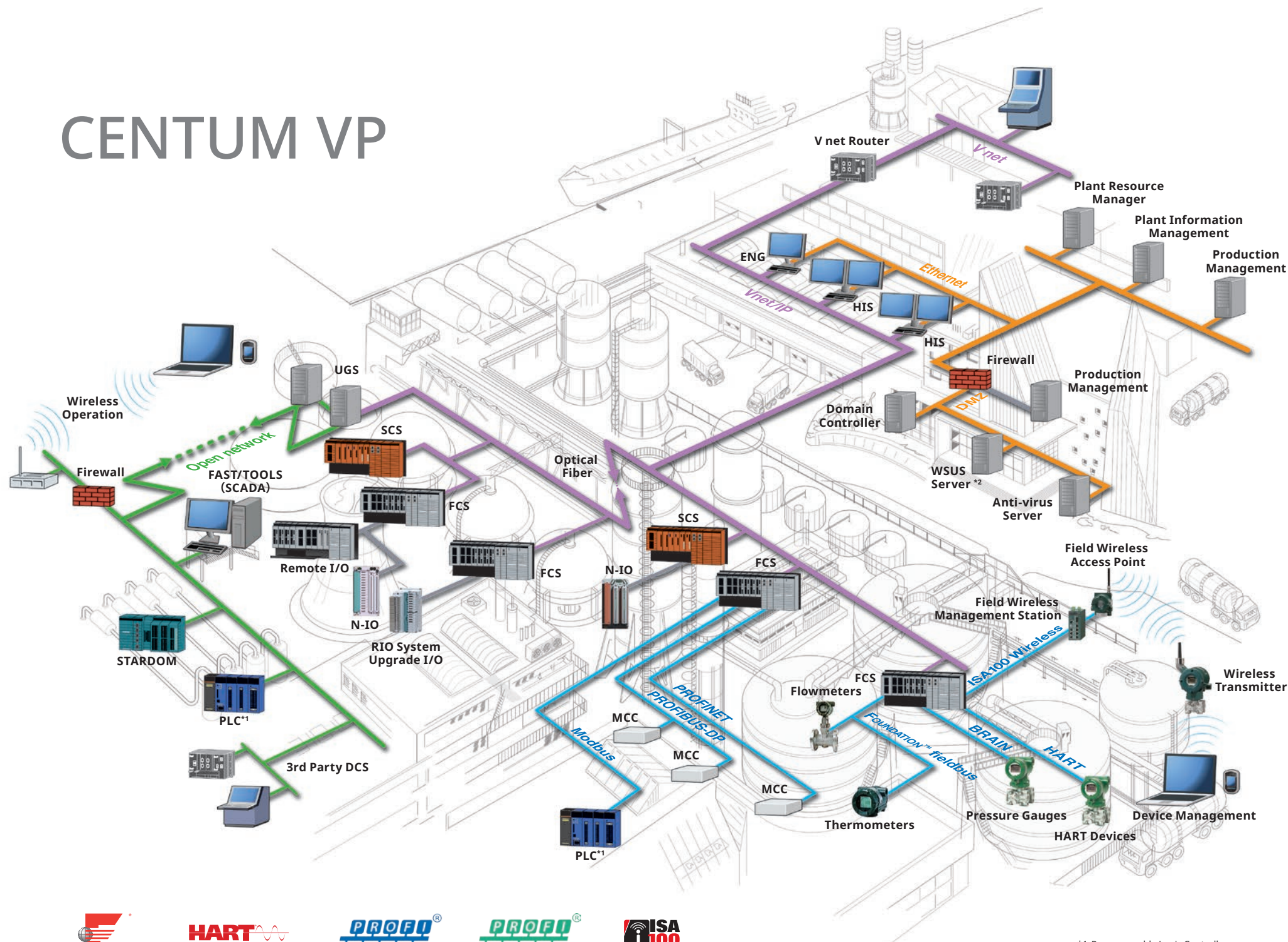
● Upgrading

Upgrade procedure is simple and quick: FCS upgrade is just a mouse click away. All Yokogawa's legacy CENTUM systems can be controlled and monitored from a newer CENTUM system. Via a control network, CENTUM VP can control and monitor operation at a plant relying on CENTUM V, CENTUM-XL, CENTUM CS, or CENTUM CS 3000 system. CENTUM VP can also communicate with both N-IO and traditional FIO. Yokogawa will continue to sell and provide long-term support for both types of I/O. This allows Yokogawa customers to utilize their existing assets wherever possible, thus, Yokogawa offers a cost-effective way to upgrade End User production control systems.

System Architecture

Scalable and Interoperable Architecture

CENTUM VP

Diagram labels:
- V net Router
- V net
- Plant Resource Manager
- Plant Information Management
- ENG
- Ethernet
- Production Management
- Vnet/IP
- HIS
- HIS
- HIS
- Firewall
- UGS
- Wireless Operation
- Domain Controller
- Production Management
- Open network
- SCS
- DMZ
- Firewall
- FAST/TOOLS (SCADA)
- Optical Fiber
- WSUS Server *2
- Anti-virus Server
- FCS
- SCS
- Remote I/O
- FCS
- N-IO
- FCS
- Field Wireless Access Point
- N-IO
- Field Wireless Management Station
- RIO System Upgrade I/O
- STARDOM
- PLC*1
- ISA100 Wireless
- Wireless Transmitter
- PROFINET
- PROFIBUS-DP
- FCS Flowmeters
- 3rd Party DCS
- Modbus
- MCC
- FOUNDATION fieldbus
- BRAIN
- HART
- MCC
- MCC
- Pressure Gauges
- Device Management
- Thermometers
- HART Devices
- PLC*1

Logos: FOUNDATION, HART COMMUNICATION PROTOCOL, PROFIBUS, PROFINET, ISA100 WIRELESS

*1: Programmable Logic Controller
*2: Windows Server Update Services

Human Interface Station (HIS)
Windows based operating system, commercial-off-the-shelf PC hardware, and optional specialized operator keyboard for a large variety of operator consoles.

Engineering Station (ENG)
With the same PC features mentioned above, this includes a comprehensive engineering package for all the CENTUM VP components and applications.

Field Control Station (FCS)
100% Yokogawa manufactured. This is the core of CENTUM VP's high availability/reliability, continuing the CENTUM heritage.

UGS/GSGW
Unified Gateway Station (UGS) serves as a gateway to interface CENTUM VP with STARDOM or the third-party subsystems. Generic Subsystem Gateway (GSGW) is a controller for operating and monitoring subsystems connected to CENTUM VP.

Bus Converter (BCV)
Interface hardware that connects multiple control network domains. It also connects previous CENTUM series systems to CENTUM VP.

Control Network (Vnet/IP)
Vnet/IP, an IEEE802.3 Ethernet compliant redundant network operating at 1 Gbps, incorporates Yokogawa's technology, achieving deterministic, reliable, and secure communications.

Digital Fieldnetworks
CENTUM VP supports FOUNDATION™ fieldbus, HART, PROFINET, PROFIBUS-DP, DeviceNet, Modbus, Modbus/TCP, and EtherNet/IP.

Safety Control Station (SCS) - ProSafe-RS
This is Yokogawa's TÜV SIL3 certified premier safety instrumented system. It incorporates Yokogawa's own Pair & Spare and Vnet/IP technologies and offers unprecedented synergy with CENTUM VP.

Network-based Control System - STARDOM
Yokogawa's intelligent-hybrid remote telecommunication controllers are ideal for the oil and gas upstream market. They can be seamlessly integrated, via the UGS, to CENTUM VP.

Operational Excellence Software Suite
A software suite for the Windows platform that supports plant operations and maintenance improvement, such as plant safety, plant asset management, production management, and optimization.

YOKOGAWA ELECTRIC CORPORATION
World Headquarters
9-32, Nakacho 2-chome, Musashino-shi, Tokyo 180-8750, Japan
http://www.yokogawa.com/

YOKOGAWA CORPORATION OF AMERICA
12530 West Airport Blvd, Sugar Land, Texas 77478, USA
http://www.yokogawa.com/us/

YOKOGAWA EUROPE B.V.
Euroweg 2, 3825 HD Amersfoort, The Netherlands
http://www.yokogawa.com/eu/

YOKOGAWA ENGINEERING ASIA PTE. LTD.
5 Bedok South Road, Singapore 469270, Singapore
http://www.yokogawa.com/sg/

YOKOGAWA CHINA CO., LTD.
3F TowerD Cartelo Crocodile Building,
No.568 West Tianshan Road, Shanghai 200335, China
http://www.yokogawa.com/cn/

YOKOGAWA MIDDLE EAST & AFRICA B.S.C.(c)
P.O. Box 10070, Manama,
Building 577, Road 2516, Busaiteen 225, Muharraq, Bahrain
http://www.yokogawa.com/bh/

Visit our website at:

https://www.yokogawa.com/solutions/products-platforms/control-system/distributed-control-systems-dcs/centum-vp/

Represented by:

Printed in Japan, 907(KP) [Ed : 04/b]

YOKOGAWA ♦ *Co-innovating tomorrow* ™