High-Speed NETWORK
for Control and Information Systems

HITACHI
Inspire the Next

μΣNETWORK[1]-1000

The system needs for social infrastructure are becoming more and more diverse.
Network systems are now required to support both communication control systems
using real-time data and information systems using high-capacity.
To serve these needs and requirements, Hitachi provides the "μΣNETWORK-1000"
(micro-sigma network 1000) network platform.
μΣNETWORK-1000 is based on general-purpose Ethernet* and ensures high reliability,
high speed and the coexistence of control and information.

High-speed, high capacity, open network

μΣNETWORK-1000 supports TCP/IP and UDP/IP communication with a high-speed
network based on Gigabit Ethernet*.

Coexistence of control and information

μΣNETWORK-1000 supports communications in both control systems and in
information systems, as well as real-time control system applications that are
assigned to the reserved band.
   (1)Control systems: require high reliability and real-time operation
   (2)Information systems: general-purpose Ethernet* communication

High reliability

μΣNETWORK-1000 is equipped with a highly reliable, redundant ring protocol—
developed by Hitachi— overlying its fundamental Ethernet* technology basis.
μΣNETWORK-1000 also ensures its high reliability by a significant number of RAS
(Reliability, Availability and Serviceability) functions developed with Hitachi's over
30 years of experience and know-how in social infrastructure.

■ Components

μΣNETWORK-1000 has two main hardware components: (1) the LANBOX (switch), which connects to the server computer; and (2) NCP-E (module), which connects to the controller. Figure 1 shows these components. The LANBOX has 4 ports of 10Mbps/100Mbps/1Gbps Ethernet* interface, and each port can be used by either a control system or an information system. NCP-E modules connect to the system bus of an R900 (HIACS DCS) controller.

(a) LANBOX

(b) NCP-E

Figure 1: Components of μΣNETWORK-1000

Figure 2 shows the basic system configuration of the μΣNETWORK-1000 using LANBOX and NCP-E.
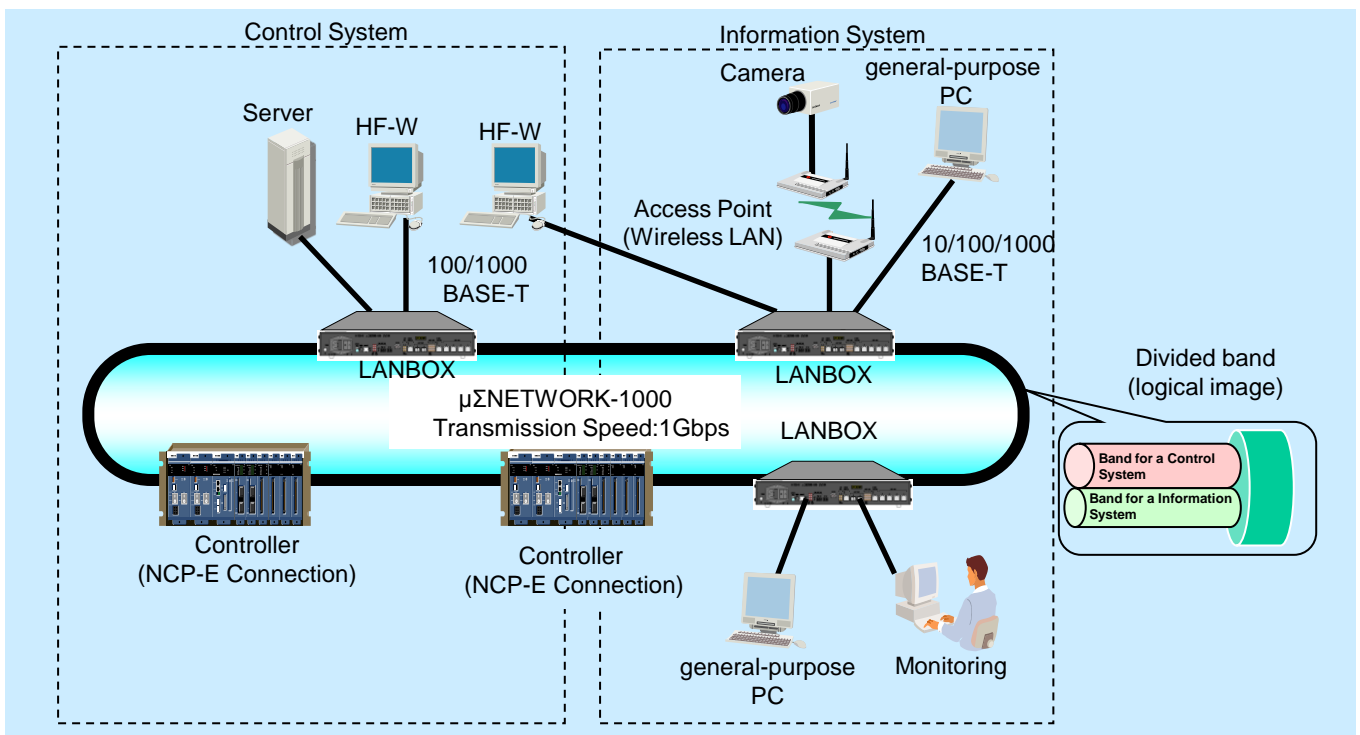

Figure 2: Example of system configuration

■ Features
■ Coexistence of Open networks and Real-time networks

(1)LANBOX is connectable to information system devices such as general-purpose PCs with 10/100/1000BASE-T interface capability.

(2)Communications in a control system and an information system are assigned differently : VLAN separates them into the logical bands and ensures real-time communications in control systems per IEEE 802.1p QoS.

■Cyclic Transmission Function

(1) In cyclic transmissions, each network node * has a common memory as shown in Figure 3. Each network node broadcasts the contents of the sending area of its common memory and copies the data to the target area in the common memory of the other network node.

(2) By this function, a computer or a controller connected to each network node is able to refer to the same data on the common memory at nearly the same time.

(3) The minimum transmission cycle of cyclic transmission is 1ms, and the maximum capacity of the common memory is 1Mbyte**.   * node: LANBOX, NCP-E

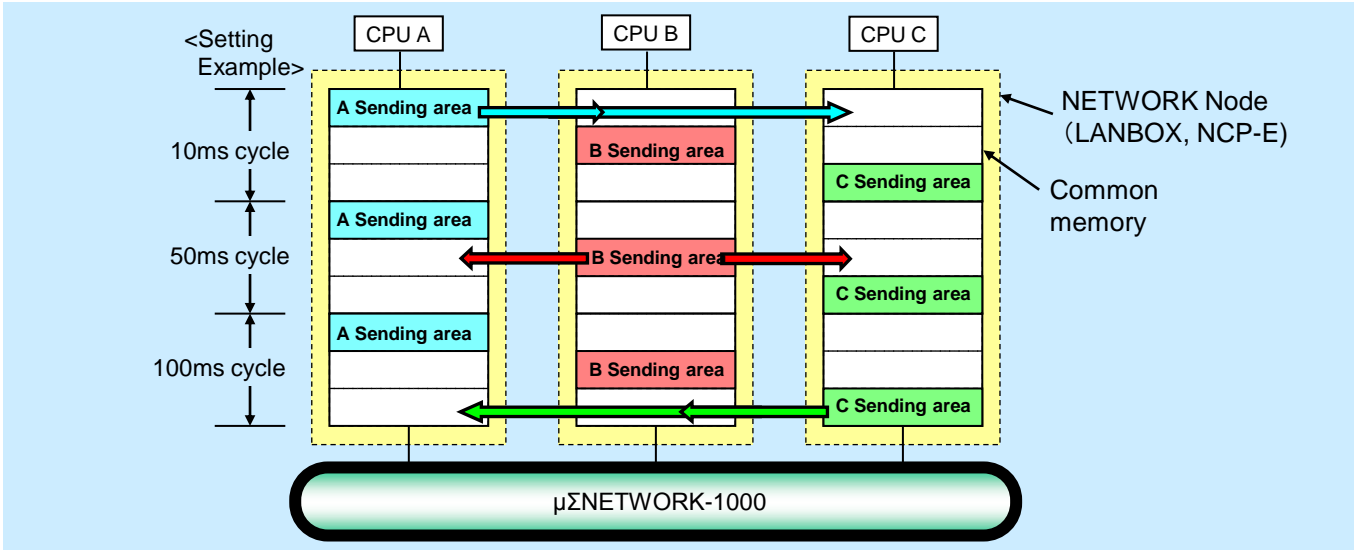**maximum capacity will change depending on the transmission cycle

Figure 3: Concepts of cyclic transmission

■Dual Ring Configuration

(1) μΣNETWORK-1000 operates only on ring based topologies. The following figure shows a basic ring configuration. Each node connects to the ring via two ports. In the normal state, two neighboring nodes of the network become the Blocking State and cut off the connections logically between them to prevent loops which cause transmitted frames to go around forever along the ring network.

(2) Each node monitors the neighboring segments including the blocking segment at all the time. If any segment of the network is disconnected, it will be back to a normal state within an ultra high-speed recovery time (less than 250ms) by automatically moving the blocking segments to each end of the faulty part thus isolating it.
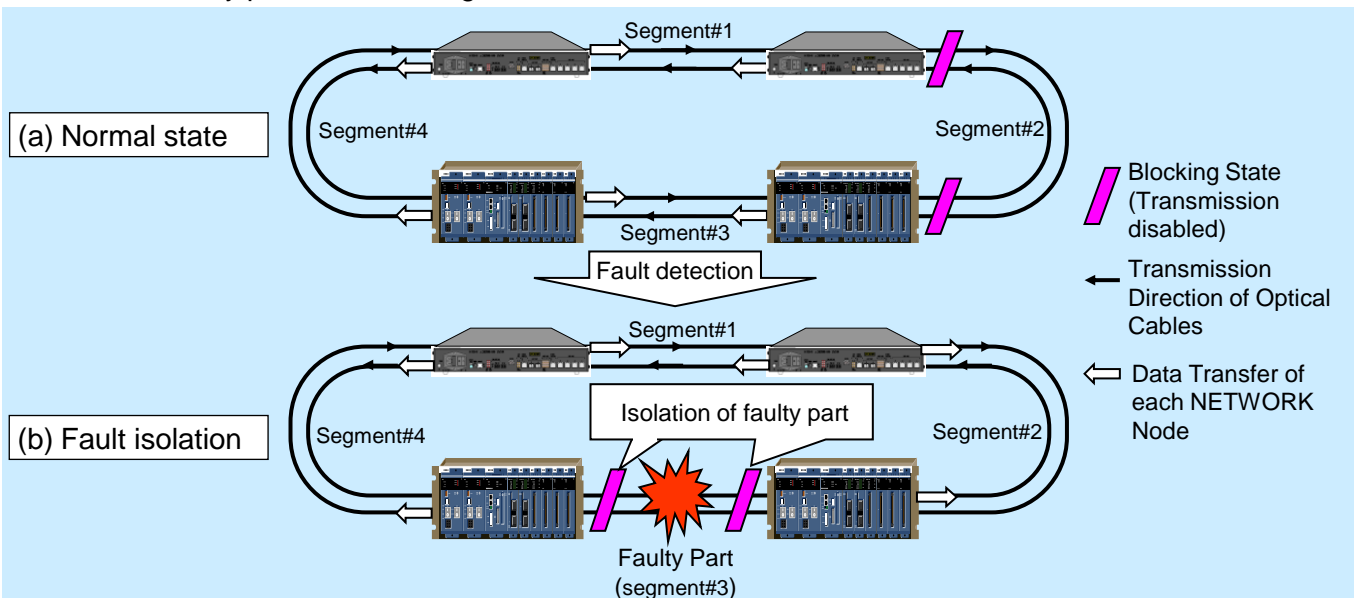
Figure 4: Concepts of dual ring configuration

3

■ Highly Reliable Functions

μΣNETWORK-1000 provides high reliability and availability by supporting the following RAS functions, which perform fault detection and fault isolation and which prevent network faults.

(1)Detection of BER(Bit Error Rate)
Each node monitors BER of its neighboring segment. If BER becomes less than 10^{-10} in the normal state, a faulty segment will be isolated automatically and the network will be back to the normal state

(2)High speed Detection of circuit failures:
Each node monitors its switching hardware every one second.

(3)Disconnect command support:
Maintenance command which disconnects the desired section of the network in order to add and/or remove the network nodes.

■ Main Specifications of μΣNETWORK-1000

Table 1 lists the main specifications of μΣNETWORK-1000.

Table 1: μΣNETWORK-1000 System specifications

No.	Item	Sub-Item	Description
1	NETWORK Main Line Specifications	NETWORK Configuration	Dual Ring
		Transmission Speed	1 Gbps（1000BASE-SX,LX, BX)
		Cable Type	・Multi-Mode Optical Fiber (MMF)　GI-50/125μm ・Single Mode Optical Fiber (SMF) SM-10/125 μm
		Node to node distance	・1000BASE-SX (MMF) : Max. 550m ・1000BASE-LX (SMF) : Max. 10km ・1000BASE-LH (SMF) : Max. 40km ・1000BASE-BX (SMF, 1-core optical fiber) : Max. 40km
		Total Loop Length	Max. 100km (using cyclic transmission) 　　　500km (NOT using cyclic transmission)
		Connector	LC Connector
		Max. numbers of connection nodes	128 Units
2	Specifications of LANBOX Branch Line	Transmission Speed	10Mbps /100Mbps/1Gbps (10/100/1000BASE-T)
		Cable Types	Twist pair line cat5e: Max. 100m
		Connector	RJ-45 modular jack
		Numbers of Ports	4 ports
3	Communication Specifications	Functions in Control System	・ TCP,UDP/IP Communication ・ Transaction Code Communication ・ Cyclic Communication 　　　NETWORK Cycle: 1ms～1000ms 　　　Capacity of Cyclic Communication: Max. 1MByte ・ Remote CPU Control NETWORK
		Functions in Information System	・TCP,UDP/IP communication

■Basic Configuration

The µΣNETWORK-1000 system is composed of the following equipment and module.

(1) LANBOX

Equipment (switch) connecting computers or Ethernet devices to a µΣNETWORK-1000 network.

Table 2: LANBOX hardware specifications

No.	Item	Description
1	Model	H-7628-51: 1000BASE-SX(MMF) x 2 ports H-7628-52: 1000BASE-LX(SMF) x 2 ports H-7626-53: 1000BASE-LH(SMF) x 2 ports H-7628-54: Port-A 1000BASE-SX(MMF) 　　　　　　　Port-B 1000BASE-LH(SMF) H-7628-55: Port-A 1000BASE-LH(SMF) 　　　　　　　Port-B 1000BASE-SX(MMF) H-7628-56: Port-A 1000BASE-LX(SMF) 　　　　　　　Port-B 1000BASE-LH(SMF) H-7628-57: Port-A 1000BASE-LH(SMF) 　　　　　　　Port-B 1000BASE-LX(SMF) H-7628-58: Port-A 1000BASE-BX-U(SMF) 　　　　　　　Port-B 1000BASE-BX-D(SMF)
2	Power	AC 100V-240V 50/60 Hz or DC 100V-110V
3	I/F for Branch Line	10/100/1000BASE-T x 4port (RJ-45 modular jack) Each port is set and allocated to a Control system or to an Information system. The 10Mbps connection cannot use cyclic transmission.
4	Connection Devices	Port for a Control system: RS90/200 series, HF-W, CF-1000 Port for an Information system: General-purpose Ethernet devices
5	Maintainability	Front-access Maintenance (All display parts and cable connectors are arranged in the front.)

5

(2) NCP-E

Module for controller connection to a μΣNETWORK-1000 network

<div style="background:#cfe7f5">

Table 3: NCP-E hardware specifications

No.	Item	Description	
1	Model	・LNC600 (for R900) LPU650/1 (for R600CH) LJN020(for R800C)	: 1000BASE-SX(MMF) × 2port
		・LNC601 (for R900) LPU652/3 (R600CH) LJN021(for R800C)	: 1000BASE-LX(SMF) × 2port
		・LNC602 (for R900) LPU654/6 (for R600CH) LJN002 (for R800C)	: Port-A 1000BASE-SX(MMF) Port-B 1000BASE-LX(SMF)
		・LNC603 (for R900) LPU655/7 (for R600CH) LJN003 (for R800C)	: Port-A 1000BASE-LX(SMF) Port-B 1000BASE-SX(MMF)
		(*)1000BASE-LH is available	
2	Connection Bus	R900 controller system bus R800C controller system bus	
3	Application Setting	Set connection application (Control system or Information system) with front switch	

</div>

These equipment and modules in this document are for Hitachi's system use only.