Network Redundancy

Cable break and outage or misconfiguration of network equipment are frequent causes of failure in the daily automation routine. Searching for errors in the process often proves to be expensive and difficult. In doing so, however, little carelessnesses hide the risk of longer production stoppages and economically relevant outages.

The introduction of redundant real-time networking makes separate cable routes possible. In conjunction with the simultaneous transmission of all data packets on both network lines, single failures on the transmission line no longer have the effect of disrupting communication and therefore automation.

The product „network redundancy" fulfills these qualities precisely by means of a combination of media and communication redundancies.
Even in the case of an error, no data packets to the receiving stations (master or slave) are lost in the process (see Fig. 1). Integrated self-monitoring and diagnostic interfaces draw attention to transmission errors and make finding their location easier.

The network redundancy is optimized for real-time capabilities, compatibility, ruggedness and performance. Conformity with Ethernet standard IEEE 802.3 guarantees the cost-effective networking of more than one hundred redundancy stations[1].

- Switch-over time ≤ 1 PLC cycle
- Real-time network fully Ethernet compatible (IEEE 802.3q)
- Monitoring and diagnostics of errors via SolutionCenter
- Programming interfaces, libraries and system variables for data transmission and communication monitoring in IEC 61131-3
- Prioritized redundancy data transmission makes parallel communication via IP-based protocols possible
- Bandwidth limit integrated
- Connection of terminals via TCP/IP

1) Limit value subject to CPU type, memory available, application size, number of exchangeable variables, network bandwidth available and network and CPU load via non-redundant applications

Item	Item-No.
M-NW-REDU RT	00019828-63

Master CPU A

Network 1

Network 2

Slave Station
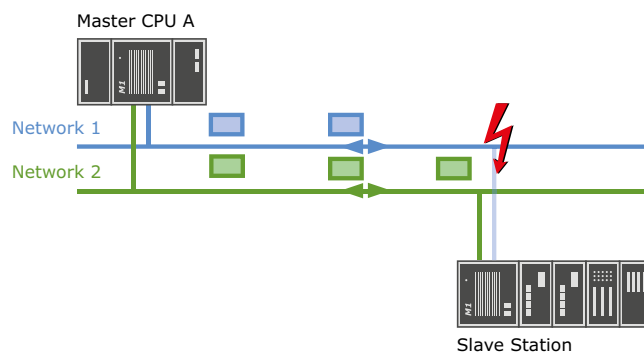
In case of an error, no data packets to the receiving stations are lost.

Network redundancy	
Rationale/Characteristics	
High availability system type	Communication and media redundancy (1oo2 voting integrated)
CPU redundancy	No
Network redundancy	Yes
Switchover	0 ms
Continuous dual-channel ability	Yes
Communication redundancy	Yes
Processing units (recommendation)	Master: M1 standard CPUs of the MPC, MC, MH families or better Slave: M1 standard CPUs of the MX, MPC, MC, MH families or better
I/O peripheral	Via MX CPU all from M1 standard module portfolio
Use of special hardware	No (straight software solution and standard Ethernet)
Topology/Networking	
Protocol basis	Ethernet IEEE 802.3q, Ethertype 0x892D
Communication protocol	bluecom with redundancy enhancement (100% IEEE 802.3q compatible)
Media redundancy	Yes (2-channel, galvanically separated Ethernet networks)
Switches	Industrial standard managed switch (or unmanaged switch with appropriate configuration)
Topologies	Star, bus, ring, mesh
Ring redundancy	Possible via parallel application of MRP, STP and RSTP
Dimension	In compliance with IEEE 802.3 - ≥ 2000 m per network section with fiber optic connection
CPUs spatially separable	Yes (see Dimension)
Time synchronization	Integrated in network protocol
Number of I/O stations	More than 100
Smart substations	Yes, I/O stations can execute local applications for: emergency operation, load separation or local logging
Parallel data traffic	Yes, possible (Ethernet-based protocols and services, e.g. HTTP, FTP, video stream, Modbus, OPC, MMS)

Network redundancy

Interfaces

I/O peripheral	M1 standard module portfolio
Redundancy network	bluecom network variables
Field buses	Gateway function for CAN, Profibus DP, Profinet, Modbus, EtherCAT via application possible
SCADA / control station & PDA	Standard protocols: IEC61850, IEC61400-25, IEC60870-5-104, OPC DA, Modbus TCP/UDP Application development: communication library M1Com and M1Com.NET
IT protocols	See M1 software (FTP, HTTP, SNTP, SMTP, … and security versions)

Configuration/Programming

Configuration	SolutionCenter (support via wizards)
Remote configuration	Yes (Ethernet LAN, Internet)
Network configuration	SolutionCenter (support via wizards)
Programming	M-PLC: IEC 61131-3 (IL, LD, FBD, ST, AS, SFC)
Editor	CoDeSys

Diagnostics/Monitoring

Redundancy status	Yes
Error status	Yes
Diagnostic user interface (API)	Yes, integrated
Statistic user interface (API)	Yes, integrated
Network monitor	SolutionCenter
Network analysis	Yes (by Wireshark plug-in, Wireshark data are generated automatically on the controller)

Performance data

Master cycle time	1 to 1000 ms[1]
I/O cycle time	Minimum 200 µs for non-redundant applications 1 to 1000 ms for redundant applications [1]
I/O frame works	More than 100 stations [1] Number of channels unrestricted ([1], [2]) – typically 400 to 600 channels per station (1/3 analog, 2/3 digital)

Installation

Installation medium	CD ROM or network
Installation tool	SolutionCenter
Upgrading existing systems	Possible via software / new CF card required
License protection	Data CF of the master CPUs is integrated dongle

System prerequisites

Automation equipment	M1 CPUs of the MX200 family or better (minimum 2 Ethernet interfaces onboard)
Network	2x Ethernet 100 MBit/s or Gbit/s, managed switch
Software	MSys / MxCCore / M-BASE V3.80 or higher

1) Limit value subject to CPU type, memory available, application size, number of exchangeable variables, network bandwidth available and network and CPU load via non-redundant applications

2) No program-technical restriction

Order codes		
Item	**Item no.**	**Description**
M-NW-REDU RT	00019828-63	License to operate a network redundancy communication master on one controller CPU. Allows any number of IO stations (slaves) to connect redundantly over the network.