



B&R

PLC Redundancy



PLC redundancy components

Overview and terms

Goals, definitions and restrictions

Synchronization

Redundant project transfer

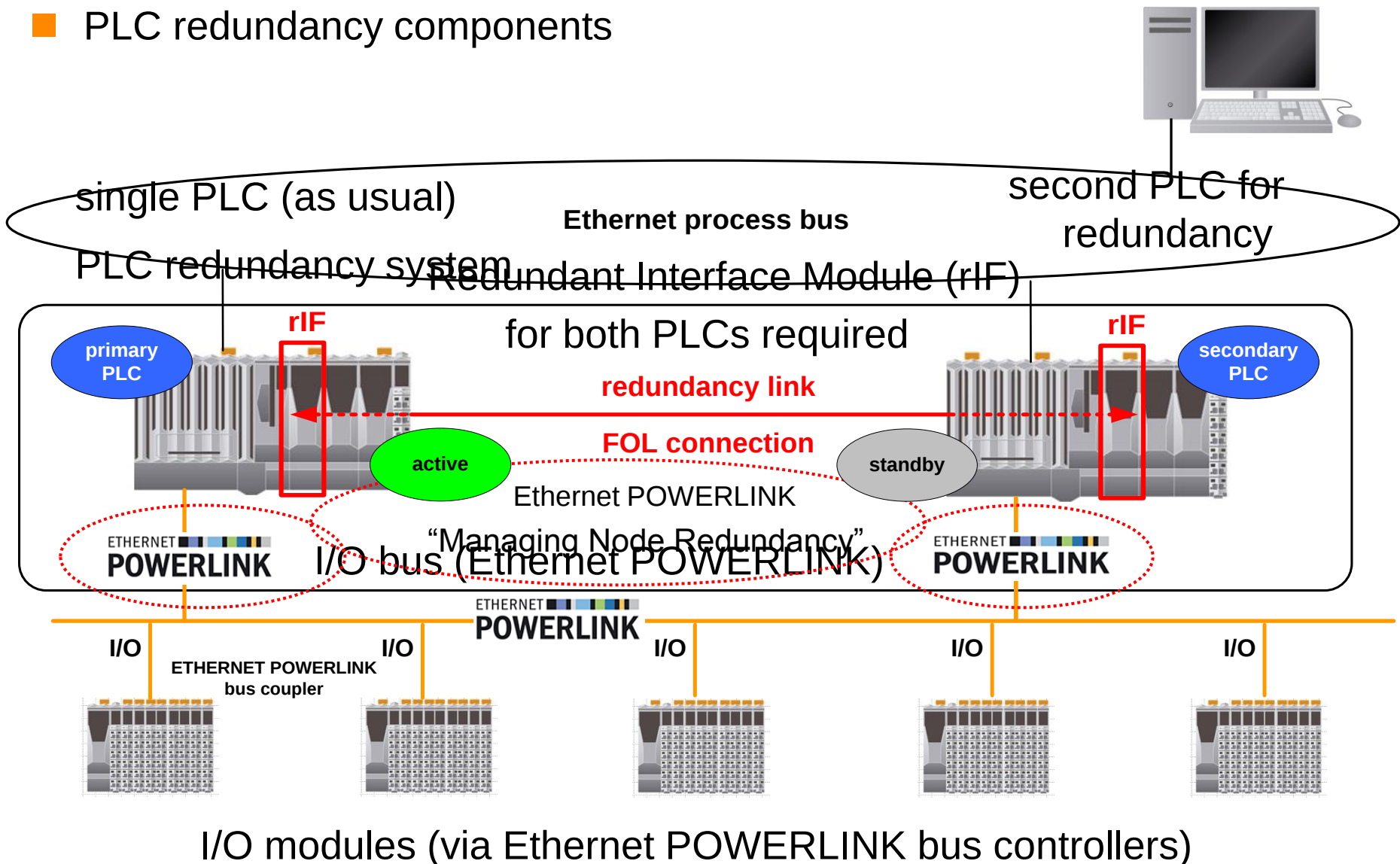
Communication

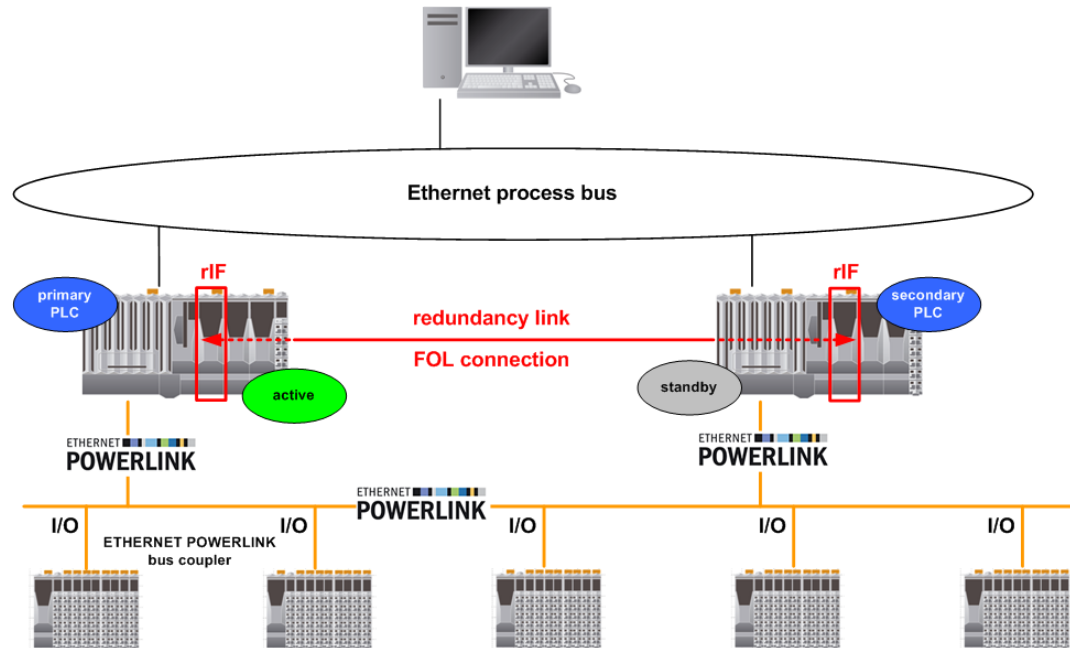


PLC redundancy components



■ PLC redundancy components





PLC redundancy system consists of 2 PLCs

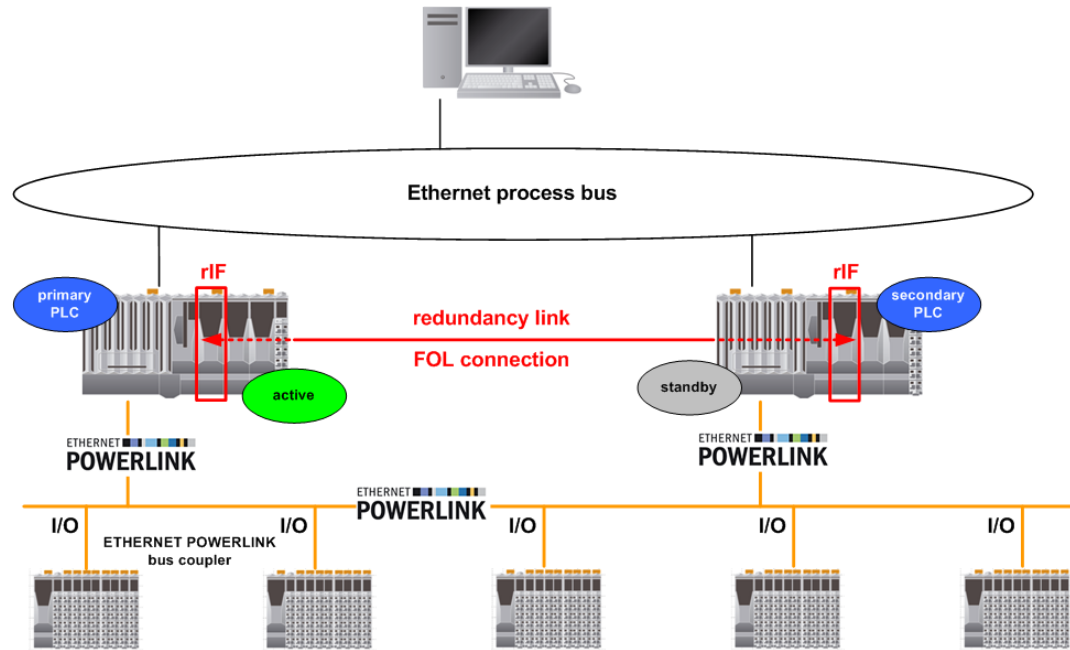
primary PLC (is the preferred active PLC)

secondary PLC (the “backup” PLC)

PLC states

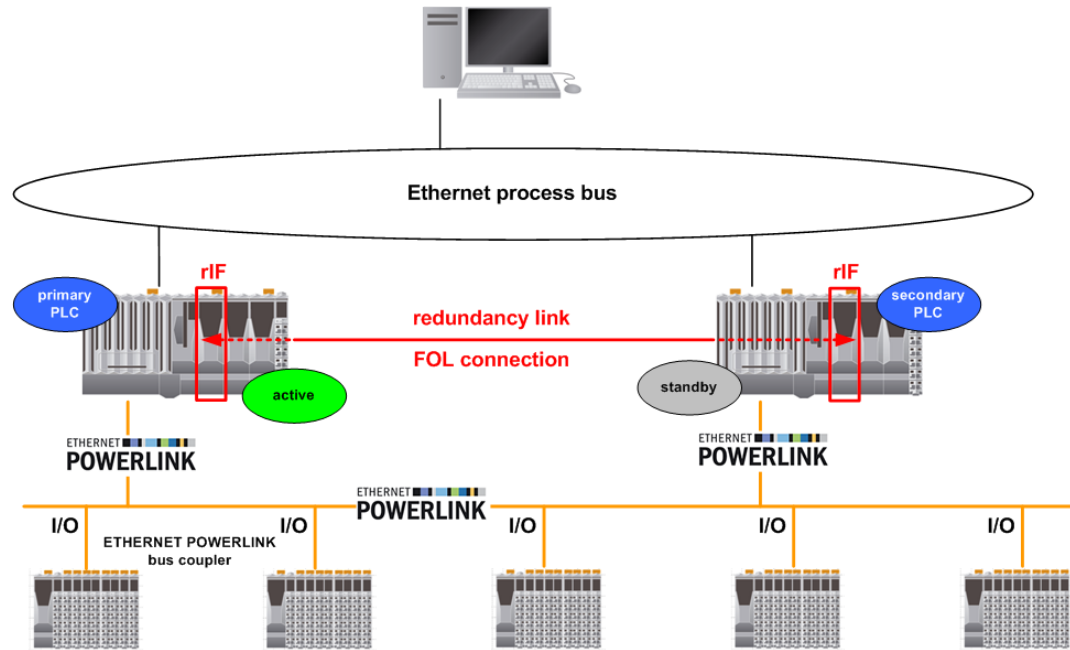
active - active PLC controls the process

inactive – (standby: synchronized with active PLC; is able to take over process control)



Redundancy link

- Communication path between primary and secondary PLC
- Consisting of one redundant interface module (**rIF**) in the primary PLC and one in the secondary PLC
- Synchronization of PLC variables, application data, system data and operating system (AR)
- Fiber optic link connection between primary and secondary PLC (Gigabit Ethernet)



Redundant Interface Module (rIF)

- Interface module with special features for PLC redundancy
- Provides FOL interface for redundancy link (Gigabit Ethernet)
- LED display for redundancy status (PRIMARY, SECONDARY, ACTIVE, STANDBY, RUN, SYNC, ERR, ...)
- Mode switch PRIMARY / SECONDARY
- Toggle button for role switch (active <-> standby)
- Command button for synchronization of application data



Primary goals of PLC redundancy:

- prevention of a single point of failure in the PLC system
- Hot Standby to avoid downtimes for the system in the event of a PLC failure
- process control automatically switches to the partner PLC when a failure is detected

Automatic synchronization of data between primary and secondary PLC via redundancy link

- PLC variables (synchronization takes place in every task class cycle)
- application programs
- system data (timer, Real Time Clock, ...)
- operating system (Automation Runtime)

Automatic synchronization of new PLC units (both primary and secondary) if connected to a running unit (you need new hw modules)

- Easy replacement of broken PLCs (even from untrained personnel)



Identical application on both primary and secondary PLC

- Different applications / projects are not supported

Ethernet POWERLINK or Profibus DP can be used as redundant I/O bus

- Ethernet POWERLINK “Managing Node Redundancy” technology is required
- Ethernet POWERLINK provides general features for PLC redundancy
- Profibus DP realization with netX modules
- Multiple redundant IO Busses are supported

First release of PLC redundancy only for latest generation X20 CPUs

- X20CPx5xx (better performance, old chipset discontinued, new AR V4.xx)
- PCI Express support only for latest generation X20 CPUs (necessary for Gigabit Ethernet on rIF module)
- X20 form factor for first version of redundant interface module (rIF)



Support of process bus redundancy (APROL R 4.1)

- 2 Ethernet interfaces and “one” IP address

I/O bus redundancy optional

- Ethernet POWERLINK Network Redundancy HUB can be used (hardware solution)

APROL or Automation Studio used as engineering environment

- additional tool not required
- no additional effort besides configuration for PLC redundancy
- still one (1) PLC to project in Automation Studio for PLC redundancy



PLC redundancy only for SG4

Local I/O not supported

- I/O needs to be connected with Ethernet POWERLINK or Profibus DP

Identical hardware needs to be used for primary and secondary PLC

I/O redundancy not part of PLC redundancy

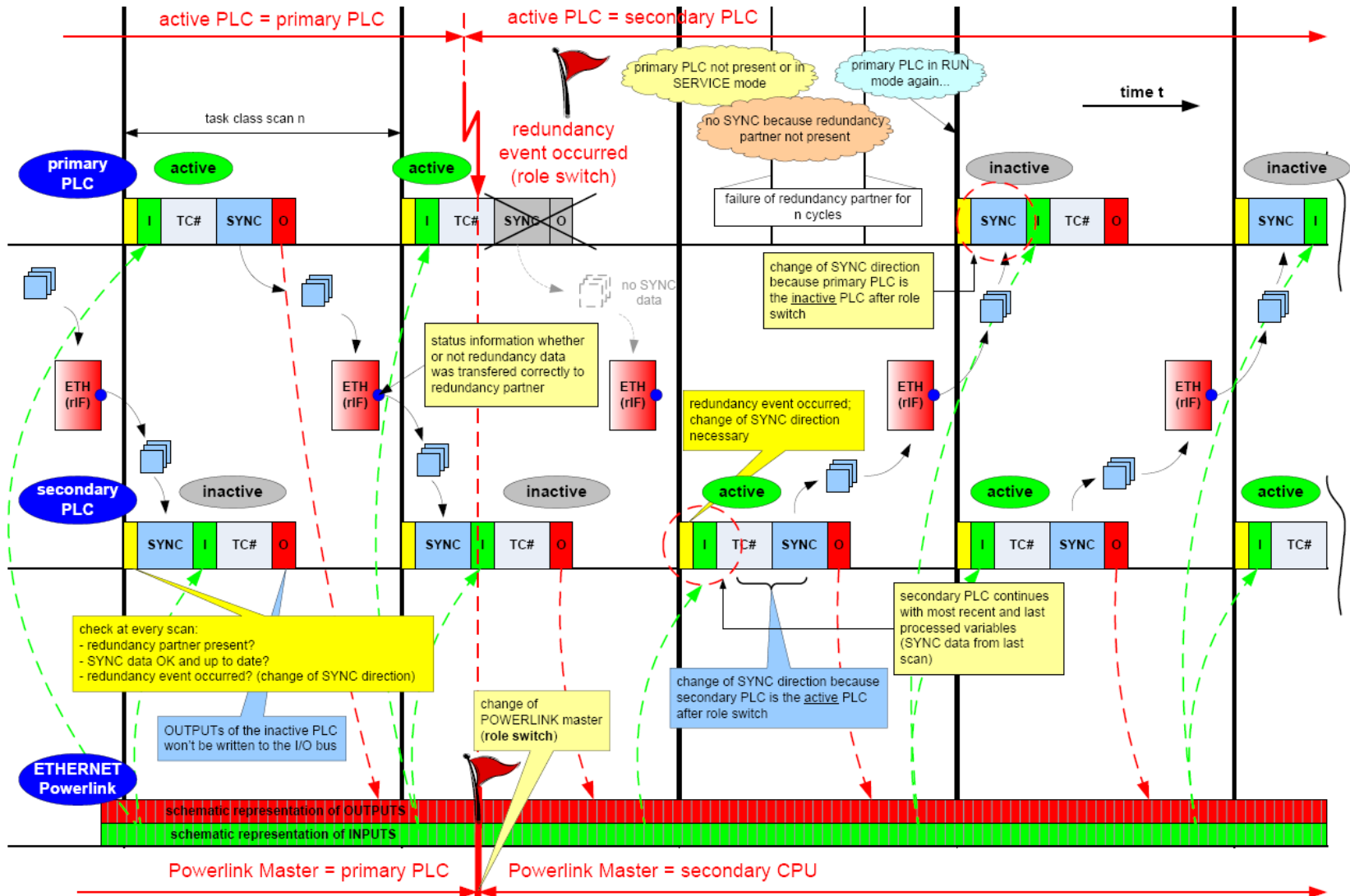
Power supply redundancy not part of PLC redundancy

- 2 separate power supplies for each PLC are recommended

Synchronization primary and secondary PLC



Cyclic synchronization between primary and secondary PLC





Role switch takes place in a few IO bus cycles

Bumpless switching in a few IO bus cycles

Configuration

- Optional synchronization buffer size for each task class
- Declaration of PLC variables for replication
- Engineering support from Automation Studio

Synchronization of application software and operating system

- Configuration options: manual or automatic synchronization



PLC redundancy provides “bumpless” project transfer / software download

Project transfer to standby PLC

- (1) transfer new application to standby PLC
- (2) role switch - standby PLC becomes active with new application
- (3) synchronization of application between active and standby PLC
- (4) transfer finished – new application on both PLCs

Configuration options

- automatic synchronization of application software after timeout
- manual synchronization of application

HW toggle button

Software service

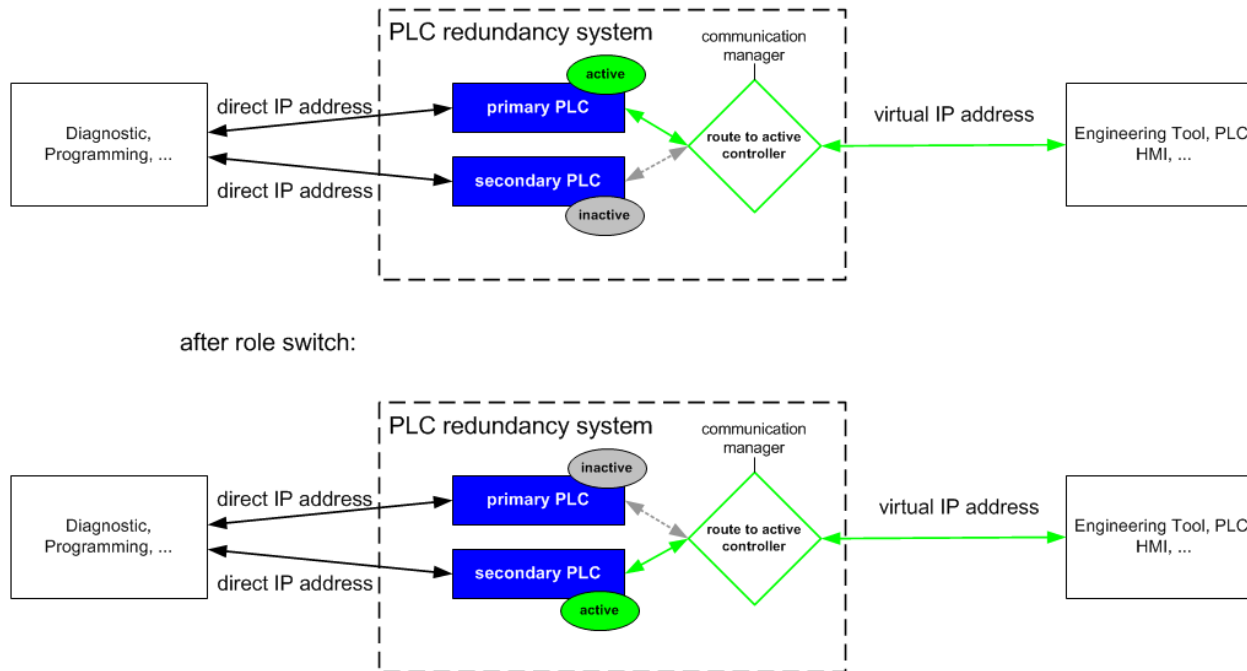
Library function block

“Fall back” mode

- switch back to old application version after transfer



Virtual IP address for redundant system



“virtual” IP communicates with active PLC unit

- no matter which PLC (primary or secondary) is active

Configuration

- Virtual IP address
- IP address primary PLC
- IP address secondary PLC



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