

Software Redundancy for S7-300/400



In many applications, relatively slow, undemanding processes continue beyond the changeover time in the event of a fault. "SIMATIC S7 Software Redundancy" can therefore be used for the high-availability control of processes that tolerate a master/standby changeover of the order of a few seconds, i.e. that are not time-critical.

Typical applications are:

- Controlling water works
- Controlling coolant circuits
- Controlling traffic flow
- Monitoring and controlling temperature and levels
- Measured data acquisition

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SIMATIC S7 Software Redundancy

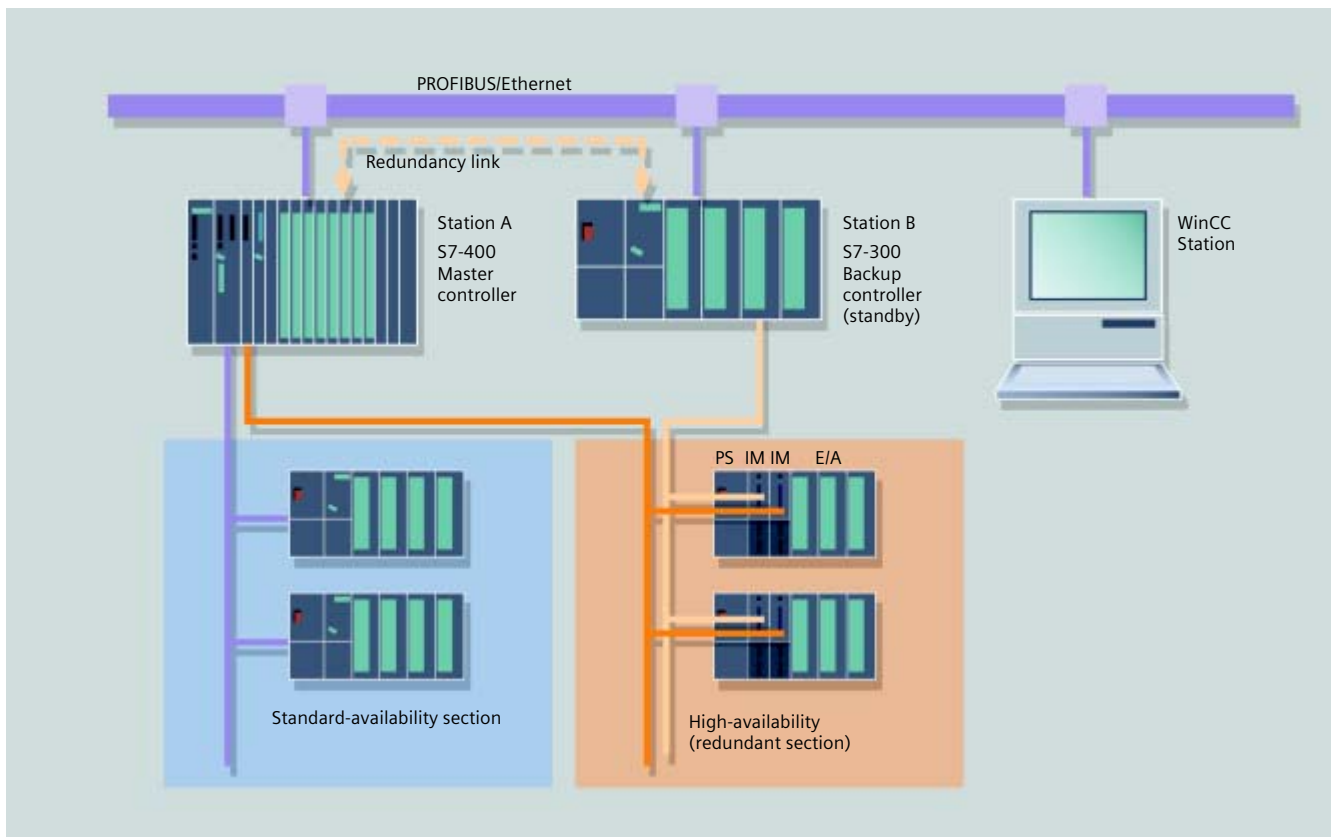
High availability for SIMATIC S7 - implemented with software

Do you want to prevent production down times in the event of a fault and during maintenance work? Using the "SIMATIC S7 Software Redundancy" program package, high-availability control of processes that are critical for production is possible with S7-300 and/or

S7-400 programmable controllers for the first time.

High availability means that systems have a high probability of continuing to operate even when sections of the controller fail due to one or more faults.

The main advantage of this redundant configuration is that standard components of the S7-300 and S7-400 automation systems can be used, so low-cost solutions can be implemented. Another advantage lies in the flexibility of the system, because all S7-400 CPUs and S7-300 CPUs (from CPU 315-2 DP) can be used in any combination.



Software redundancy program package: Example of a configuration with S7-300, S7-400 and WinCC

Master/standby changeover time

To determine the suitability for a specific application, we recommend that the changeover time, i.e. the time during which control of the process is interrupted, is used as a selection criterion. The duration of changeover, which elapses between failure of the master and continuation using the standby controller, is dependent on several factors:

- Communications capability of the CPU used
- Communication medium, type of link used and transmission speed

- Volume of data that is transmitted
- Cause of the fault
- Transmission rate of the PROFIBUS DP system and number of DP slaves

This changeover time is usually of the order of just a few seconds.

I/O interfacing

The enhanced availability provided by the "SIMATIC S7 Software Redundancy" package was developed for single-channel distributed I/O in an ET 200M® with two redundant DP slave interfaces.

The ET 200M distributed I/O station is connected to both PROFIBUS DP lines. In this manner, redundancy can be imple-

mented for the entire process or only an especially critical section of the process (see Figure).

Function

The function modules of the "SIMATIC S7 Software Redundancy" program package that are loaded onto both stations, ensure that in the event of a fault, changeover takes place from one station (master) to the other (standby).

Application Example

Task description: Ventilation for a tunnel

Two fans are used to ventilate a tunnel. Each fan has two speeds that are set in accordance with the measured pollutant concentration. This is measured with two analog sensors. The fans are a central part of the overall system for which high availability is necessary. The user program for controlling the fans is therefore loaded in both stations. The number of vehicles, that travel through the tunnel each day is determined for statistical purposes.

Vehicles entering and leaving the tunnel are detected by means of floor sliders in front of the tunnel. The control program for this section only requires standard S7 availability and is therefore only loaded in station A.

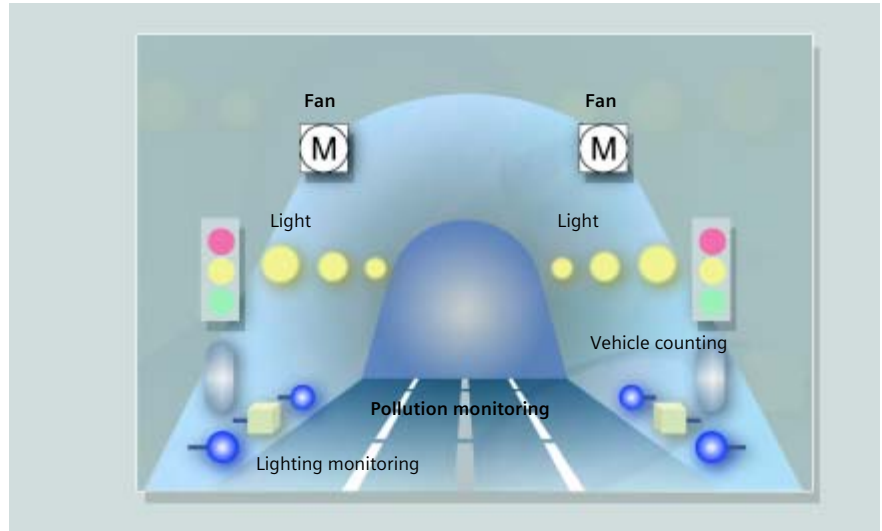
The lighting is monitored through four binary sensors. If the lighting fails, this is reported by means of a binary signal for the respective section. Standard S7 availability is also adequate for the control program for this section, so it is only loaded in station B.

Solution

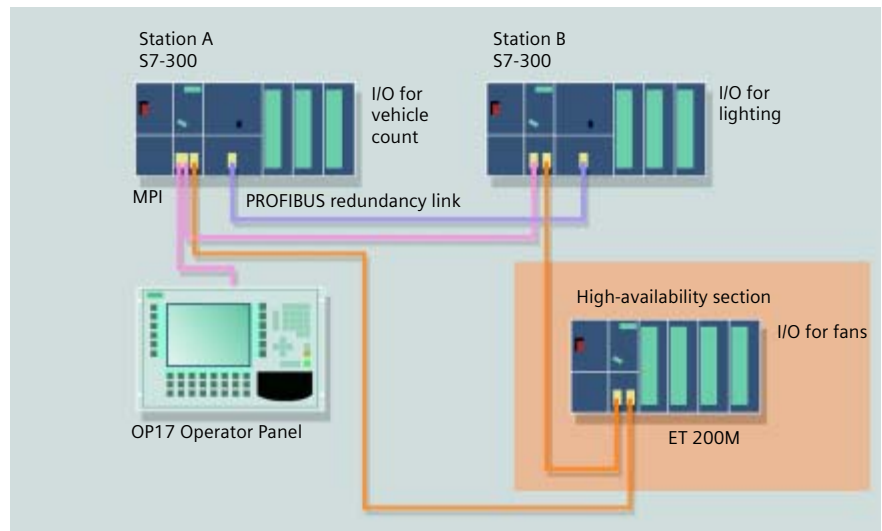
The hardware configuration required for this application example is shown in the diagram.

It comprises two S7-300 stations fitted with the CPU 315-2 DP and an ET 200M DP slave. The IM 153-3 DP interface of the ET 200M is linked on one side to the CPU in station A and on the other to the CPU in station B. Station A and station B are linked to a PROFIBUS network by using a CP 342-5® communication processor.

Master/standby changeover will take place in this configuration in approximately 1.3 seconds.



Layout of a tunnel monitoring system



Configuration example with SIMATIC S7-300

Technical Specifications

SIMATIC S7 Software Redundancy	
Software required	<ul style="list-style-type: none"> STEP® 7 Basic, from Version V4.02 NCM S7 for PROFIBUS for configuring the communication Approx. 10 KB spare memory for FBs in the CPU
Supported hardware	<ul style="list-style-type: none"> CPU 315-2 DP, 316-2DP, 318-2 All S7-400 CPUs Not approved for PCS7
Communication between the CPUs	<ul style="list-style-type: none"> MPI PROFIBUS Industrial Ethernet (Existing communication networks can also be used.)
Modules that can be used in the ET 200M distributed I/O station	<ul style="list-style-type: none"> Redundant IM153-2/-2FO DP slave interface All digital and analog modules for ET 200M FM 350 counter module CP 341
Limitations/boundary conditions	<ul style="list-style-type: none"> One PPOFIBUS DP line is supported IEC counters/timers can only be used CP and FM can only be used in non-redundant section
Programming	<ul style="list-style-type: none"> LAD, FBD, STL, CFC, SCL Each unit is programmed separately Program for high-availability section is identical in both units Program for standard-availability section can be different in each unit
Reasons for changeover	<ul style="list-style-type: none"> Failure of the master (main switch OFF or STOP) Fault in distributed I/O system of the master Manual changeover
Changeover response	<ul style="list-style-type: none"> Outputs are frozen during changeover Following changeover, the new master operates on the basis of the most recently received data
Changeover time	Several seconds, in accordance with the: <ul style="list-style-type: none"> Communication capability of the CPU Communication medium Data volume to be transferred Reason for the fault Baud rate of the PROFIBUS DP network Number of distributed I/O slaves
Type of supply	<ul style="list-style-type: none"> Function modules on CD-ROM Including electronic documentation in 5 languages (G, E, F, S, I) Four loadable application examples A WinCC picture module
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