Multiproject / Multi-user Engineering

SIMATIC PCS 7

Application Description • November 2011

Applications & Tools

Answers for industry.

SIEMENS

Industry Automation and Drive Technologies Service & Support Portal

This article is taken from the Service Portal of Siemens AG, Industry Automation and Drive Technologies. The following link takes you directly to the download page of this document:

http://support.automation.siemens.com/WW/view/en/22258951

If you have any questions about this document, please contact us under the following e-mail address:

online-support.automation@siemens.com

For further information on this topic, you may also actively use our Technical Forum in the Service & Support Portal. Add your questions, suggestions and problems and discuss them in our large forum community:

http://www.automation.siemens.com/WW/forum

SIEMENS

SIMATIC PCS 7

Multiproject / Multi-user Engineering

Application Example

Warranty and Liability

Note

> The application examples are not binding and do not claim to be complete with regard to configuration, equipment or any contingencies. The application examples do not represent customer-specific solutions; they are only intended to provide support for typical applications. You are solely responsible for the correct operation of the described products. These application examples do not relieve you of your responsibility to use sound practices in application, installation, operation and maintenance. When using these application examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these application examples at any time without prior notice. If there are any deviations between the recommendations provided in this application example and other Siemens publications (e.g. catalogs), the contents of the other documents have priority.

We do not accept any liability for the information contained in this document.

Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data etc., described in this Application Example shall be excluded. Such an exclusion shall not apply in the case of mandatory liability, e.g. under the German Product Liability Act ("Produkthaftungsgesetz"), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract ("wesentliche Vertragspflichten"). Damages for a breach of a substantial contractual obligation are, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change in the burden of proof to your detriment.

It is not permissible to transfer or copy these Application Examples or excerpts thereof without express authorization from Siemens Industry Sector.

Preface

This document provides an overview of the different variants and positioning of multiproject and multi-user engineering.

Multiproject engineering provides options for the flexible and performant engineering of plants. For this purpose the automation solution is distributed technologically to several projects. The projects are created within a multiproject on a central engineering station. Apart from the projects it also manages the master data library here which contains all commonly used objects. Individual AS projects of the multiproject are distributed to further engineering stations for decentralized editing.

Figure 1-1
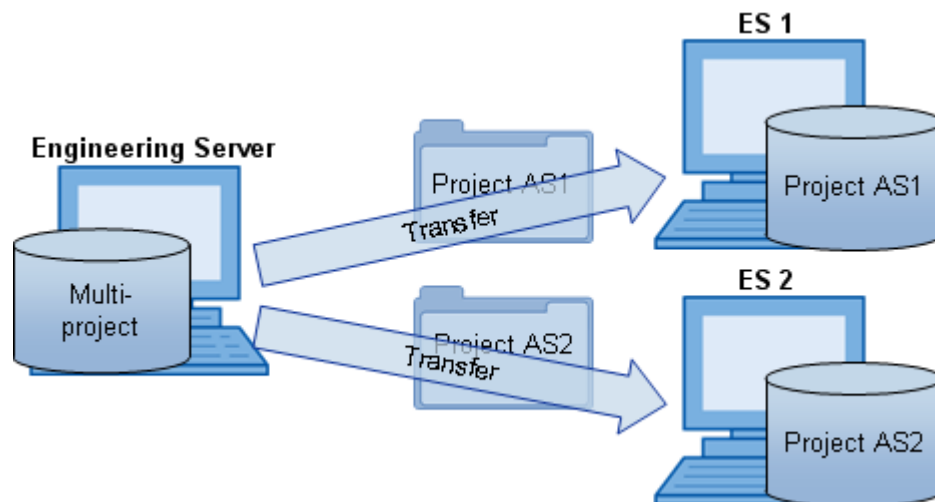
Multi-user engineering additionally provides the option to work at the same user program (CFC/SFC of an AS project) in parallel. The respective project may remain at its storage location then. It is opened and edited from several engineering stations via network at the same time.
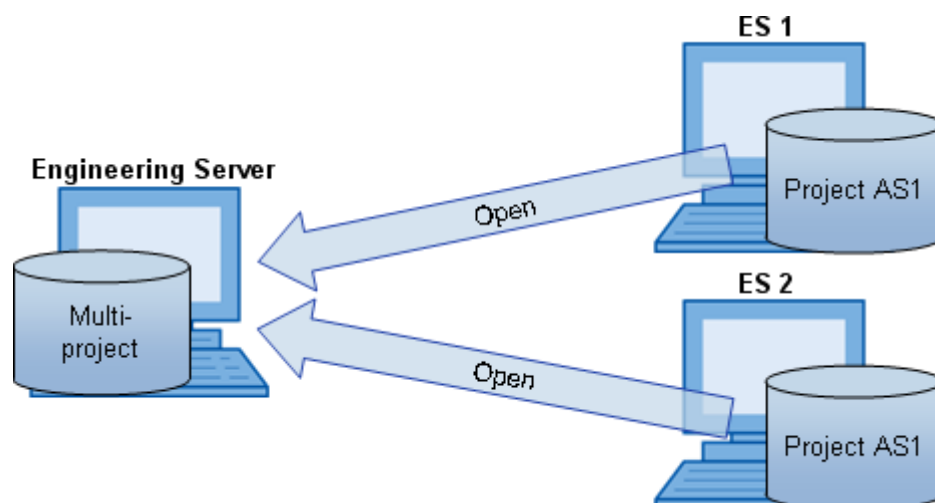
Figure 1-2

Table of Contents

1 Multiproject Engineering

1.1 General information

The multiproject functionality of SIMATIC PCS 7 provides the option of flexible and performant configuration of systems. The main emphasis is placed on parallel and time saving processing of projects which can be managed, divided and merged with system support.

Principle of multiproject

Multiproject is a higher-level structure in the SIMATIC Manager of the central Engineering Server. It comprises all projects of an automation solution with its subordinate objects (automation systems (AS), operator stations (OS), programs, plans, etc.) as well as master data library.

For processing the contained projects they are distributed between decentralized Engineering Stations (ES). The engineering process is optimized using additional memory resources and computer performance. The projects can remain in the multiproject or be separated from it for the duration of processing. The Engineering Server on which the multiproject is filed is a complete engineering station in itself, on which a project or the master data library can be processed.

Figure 1-1
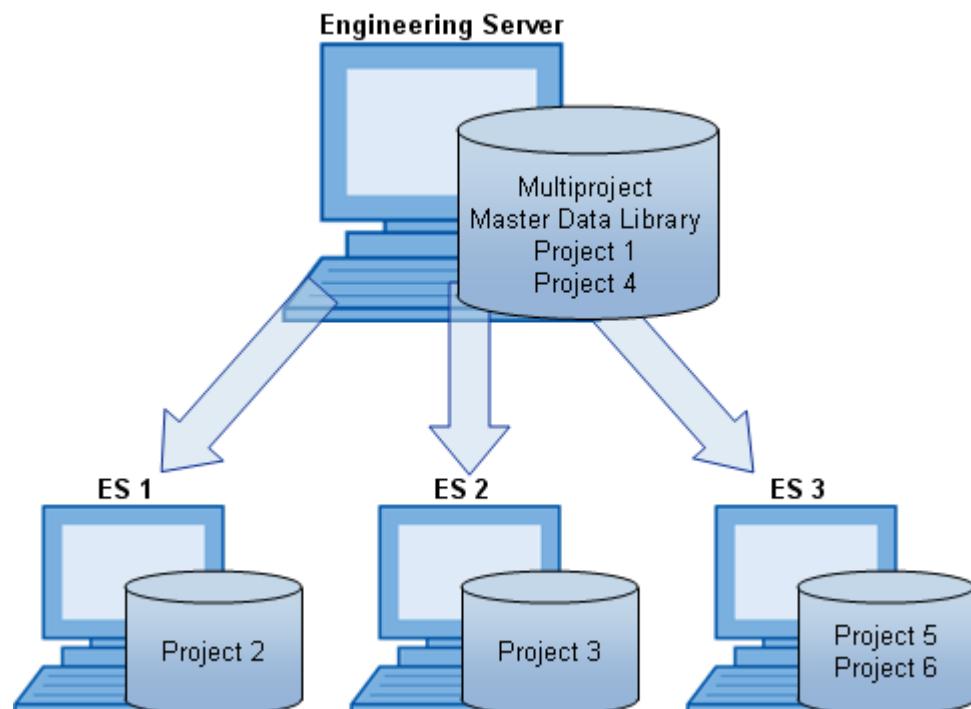
Despite of the decentralized storage, the projects can have interproject relations such as S7 connections.

Advantages of the multiproject

If projects are part of a multiproject, they can be generated in smaller scope and for better overview. Interproject mechanisms ensure that a multiproject can be used as one project.

Examples of such interproject mechanisms are:

- Master data library for central data management of data block types, measuring location types and example solutions for all projects

- Updating the Plant Hierarchy across all projects or for selected projects

- Considering all related AS and OS components in the entire multiproject for the functions "Create/Update block symbols" and "Create/Update diagnostics screen" (for identically named PH)

- Merging subnets and connections with text references of all contained projects

- OS compiling with configuration data of several projects

- Save as (copy of the multiproject with all projects)

- Archiving (zip-archive of the multiproject with all projects)

Note	In the PCS 7 environment it is always recommended to set a multiproject with master data library even if only one project is contained.

1.2 Project structures

The structures of a multiproject are mainly distinguished as project-specific and station-specific setups.

In practice a combination of both variants is often a suitable choice as shown in the following example figure:

Figure 1-2
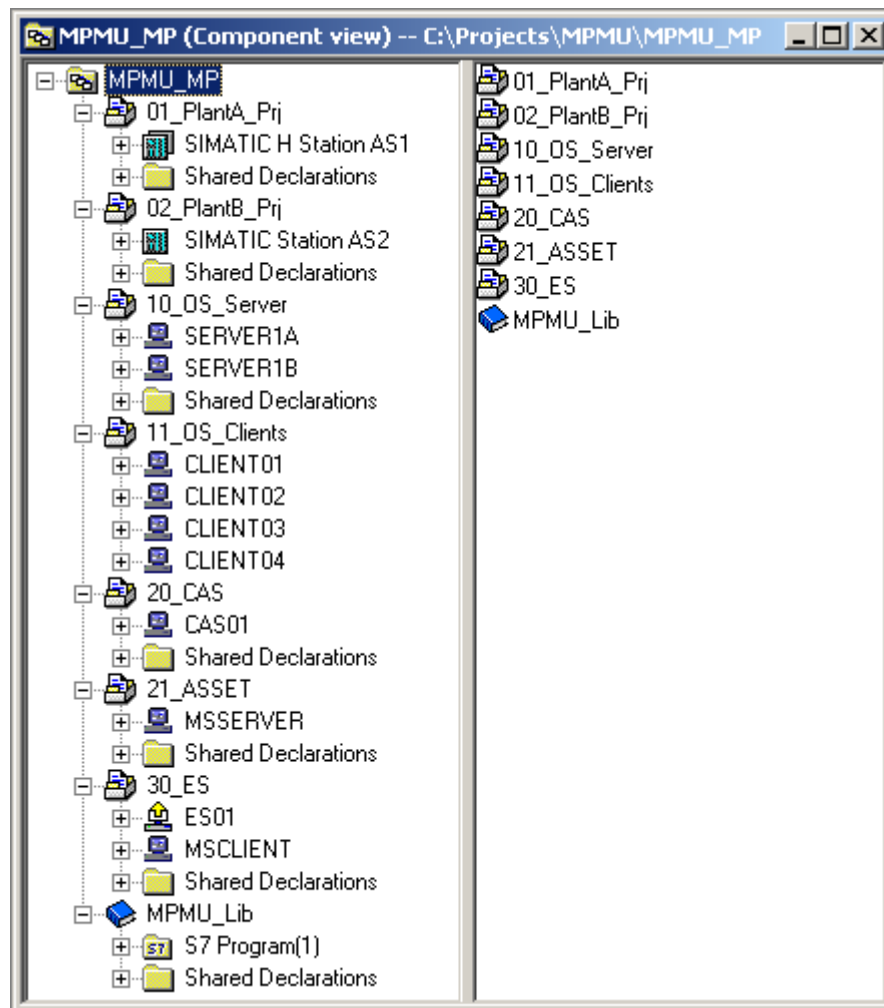
Note	Further information on the creation of a multiproject is available in the document "PCS 7 Compendium Part A - Configuration Guidelines". http://support.automation.siemens.com/WW/view/en/35016996

1.2.1 Boundary conditions

To be able to perform the project work as efficiently as possible later, some preliminary considerations are required.

When considering how to separate the overall task into subprojects suitably, individual project conditions as well as conditions of the available engineering environment must be taken into account. Here some examples:

- Number of project engineers

- Number of available Engineering Stations (while meeting the PCS 7 ES system requirements)

- Networking the Engineering Stations

- Complexity of the project

- Time duration / configuration effort

Furthermore, certain rules should be followed such as the rules given below:

- Only those project components (AS, OS) required for the respective processing, should be moved to a decentralized ES. The other objects of the multiproject hence remain available for other uses.

- Only whole projects can be moved to a decentralized ES.

The structure of the multiproject can be determined now using these considerations and the background information from the above comparison as a basis.

1.2.2 Station-specific structure

All AS and OS are stored separately in an individual project in the case of the station-specific structure.

Figure 1-3
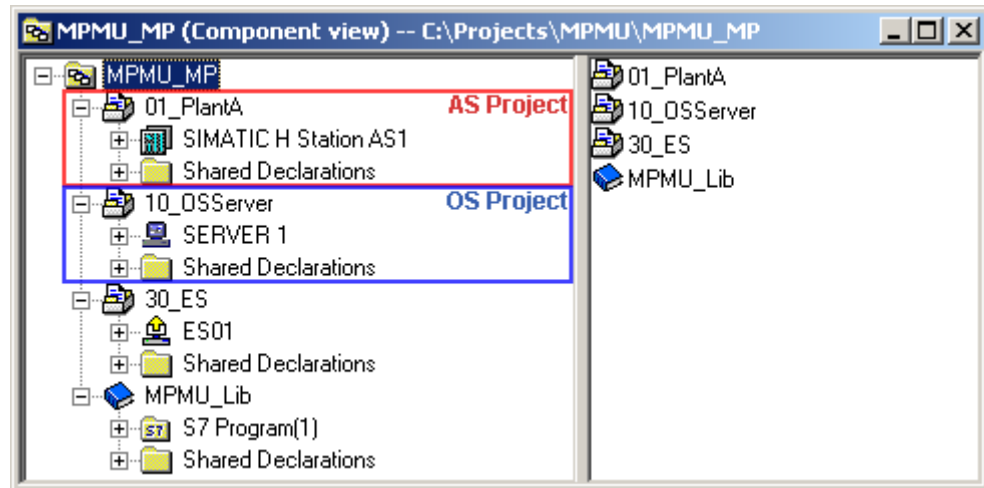
Hence, there are no OS objects (pictures, reports, ...) in the AS project and no AS objects (CFC, SFC, ...) in the OS project.

Figure 1-4

Advantages

- The largest possible division ensures highest flexibility during allocation of the individual projects to the project engineers, and additionally offers the best performance for the processing speed.
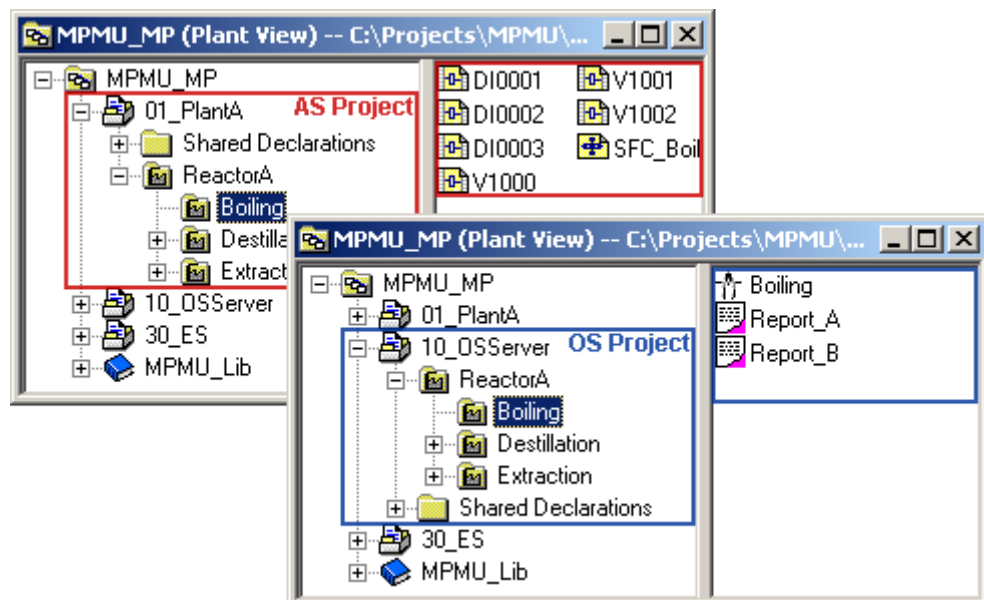
- Engineering Stations can be added or removed during the commissioning process in order to be able to react flexibly to varying staff availability.

Note

- Tests of AS and OS during the configuration process are performed on separate computers (provided that the decentralization took place).

- Changes in the Plant Hierarchies (PH) of projects have to be updated again in the multiproject after the processing.

- It is not possible to copy entire subsystems including the update of the OS objects.

1.2.3 Project-specific structure

Every project of the project-specific structure contains, for instance, one AS and one OS or all AS and OS which a project engineer has to edit.

Figure 1-5
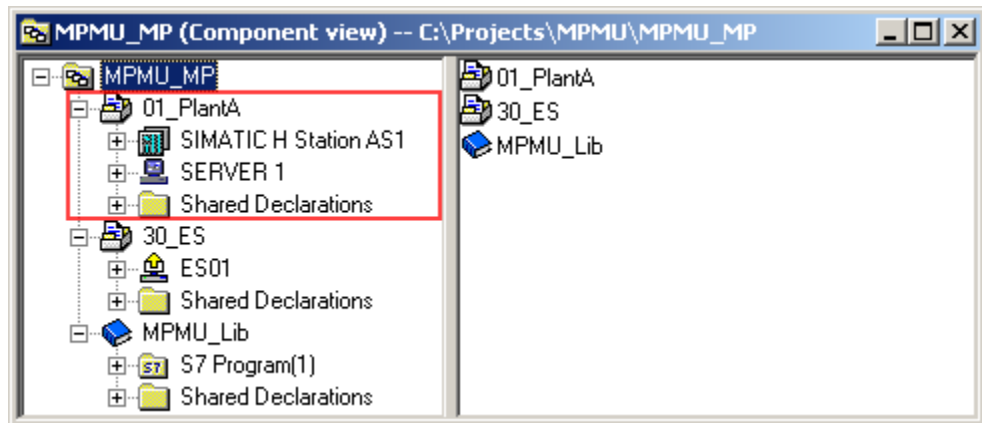
From a technical point of view, the project contains AS objects (CFC, SFC, ...) as well as OS objects (pictures, reports, ...), as illustrated in the figure below.

Figure 1-6
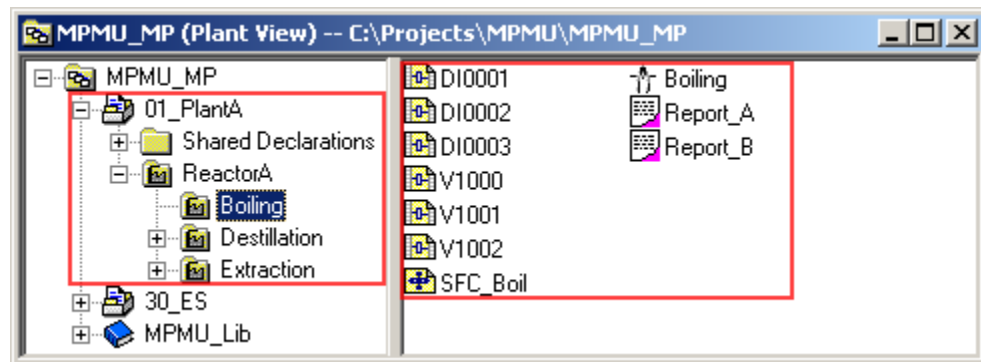
Advantages

- Testing and configuration is possible entirely within the project with AS and OS.

- The work procedure during the project engineering and commissioning is the same.

- Copying entire subsystems is possible including the update of the OS objects.

- There is a uniform view in the Plant Hierarchy which includes AS and OS in a project.

Note

Further division (removing single AS or OS from a project) at a later time requires detailed knowledge of the involved work steps. For that reason the project should be distributed to the largest extent possible from the start.

1.3 Decentralized project division

The decentralized division of projects is a suitable choice for larger project engineering work. The system performance is highest when every project engineer has access to the project parts which are relevant for him locally on his computer.

Figure 1-7
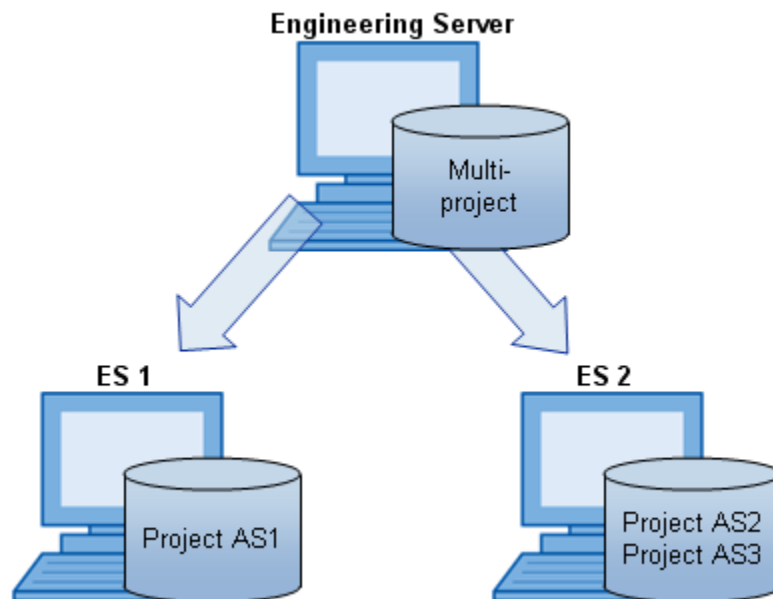
The availability of the communication partners must be explicitly paid attention to especially for interproject activities, such as establishing AS-AS communication or OS compilation.

Decentralized project engineering with and without network interconnection is considered in the following.

Note	For the actual work steps for shifting the projects refer to the PCS 7 Configuration Manual Engineering System. http://support.automation.siemens.com/WW/view/en/36050990

1.3.1 Division in the network interconnection

If the network is permanently available, project parts can be shifted to distributed Engineering Stations for processing while still remaining in the multiproject.
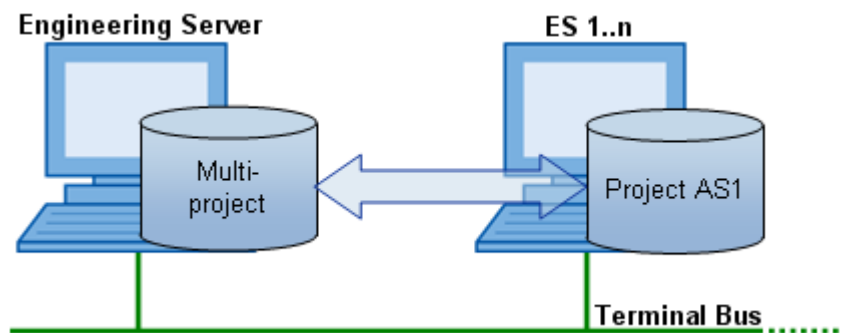
The project engineers can access all components of the multiproject at any time then. Apart from the necessary network connection, all of the PCs managing such components must be switched on and be enabled accordingly.

Figure 1-8

A project is moved via the system function "Save as" with the option that the project which is integrated in the multiproject is replaced by the created copy.

Advantages

- An OS server can be compiled with data from AS stations of other projects at any time.

- All used program parts are stored in the master data library which can be accessed via the network.

- The entire project and all distributed projects can simply be archived on the Engineering Server.

- A project structure which is station-specific to the largest extent and its decentralized division are the most performant configuration option if the network is permanently available.

Note

- If a project should not be available in the network, this may lead to extended delays and waiting times.

- When performing interproject functions, it must be ensured with the project engineers that none of the relevant projects is being worked at during this time. Otherwise inconsistencies could result.

1.3.2 Division without network interconnection

The multiproject functions of SIMATIC PCS 7 are based on the permanent availability of all contained projects. If a contained component is not reached, extended waiting times can result, for example when opening the multiproject or working with NetPro.

If a permanent network connection cannot be guaranteed, the projects should be removed from the multiproject for the duration of the decentralized editing. Possible reasons for this are that not all computers are permanently connected to the network or the projects are edited externally on purpose (e.g. outsourcing to an engineering firm / system integrator).

Figure 1-9
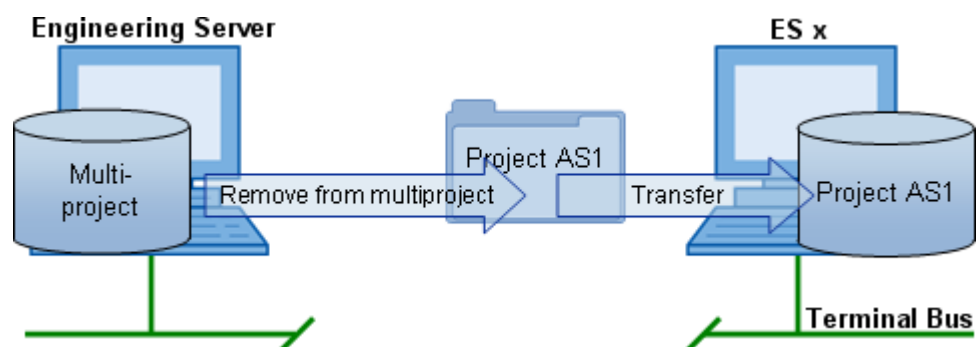
The projects are removed via the system function "Remove from Multiproject". Projects are integrated with the function "Insert into Multiproject".

Advantages

- There are no unexpected delays and waiting times due to missing projects.

- During the distributed processing, the project cannot be accessed by accident (e.g. due to executing interproject functions).

Note

- When working with NetPro, connections which have already been configured can create warning messages due to the missing communication partners. New connections can only be created as unspecified connections via references for the period of project division.

- In order to compile an OS server, all relevant projects (AS projects and corresponding OS project) must be recombined centrally.

- The master data library is not contained in the project. The only blocks which are available are those blocks which have already been used and which are filed in the block folder. To use the functions of the master data library on the decentralized Engineering Stations, it must be managed as local backup.

- The projects must be archived locally.

1.3.3 Dividing the multiproject without network interconnection

With this variant you divide the multiproject including master data library and the project which is to be engineered. The other projects should be removed from the multiproject. This is the preferred method for multiproject engineering.

Figure 1-10

To distribute the multiproject, archive it and shift the created ZIP archive to the decentralized ES with Windows means. After dearchiving remove the projects which are not required from the multiproject and delete them.

When you have edited the project on the decentralized ES, remove it from the multiproject and re-integrate it into the multiproject on the Engineering Server.

Advantages

- The project engineer can access the master data library.

- The import/export assistant (IEA) functions are available.

- During the distributed editing, the project is protected against undesired access on the Engineering Server (e.g. due to executing interproject functions).

Note

- Changes in the master data library may only be made at the Engineering Server. The changes must be made to all decentralized Engineering Stations then.

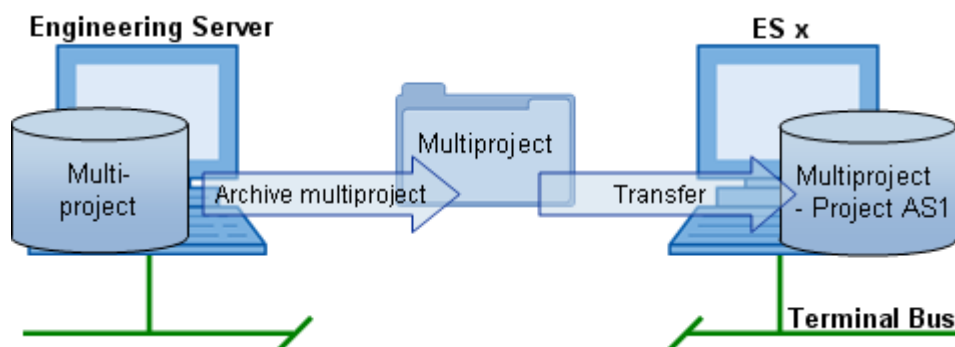- If all projects which are not required were deleted according to the recommendation, connections which have already been configured can create warning messages due to missing communication partners when you work with NetPro. New connections can only be created as unspecified connections via references for the period of project division.

- In order to compile an OS server, all relevant projects (AS projects and corresponding OS projects) must be recombined centrally.

1.4 Shared engineering work step-by-step

General information on interproject activities

The actual processing of the projects is performed decentralized. Interproject data updates and functions on the other hand are always made in the SIMATIC Manager of the central Engineering Server where the multiproject is managed. These tasks may be executed before or after dividing the project, as well as during dividing if the projects have not been removed from the multiproject and are not currently being worked at.

Whether the decentralized projects remain in the multiproject or are removed depends on to what extent a stable network can be guaranteed between the PCs.

Overview of project engineering steps

This is meant to provide an overview of the work processes required within the framework of multiproject engineering. We recommend the following procedure; however, it may vary according to individual conditions and experience. These steps are further described in the following chapters.

Table 1-1

	Activity	Location
1.	Project planning: • Determining the number of project engineers • Determining the available ES • Networking of the ES • Determining the project complexity	
2.	Preparatory project works: • Creating the multiproject • Configuring the SIMATIC stations and the PC stations • Creating and updating the Plant Hierarchy (PH) • Generating interproject networks • Generating interproject connections	Engineering Server
3.	Dividing the projects: • Shifting projects in the network interconnection • Removing projects from the multiproject • Distributing the project including the multiproject	Engineering Server
4.	Decentralized project works	Decentralized ES
5.	Merging the projects: • Shifting projects back into the multiproject • Re-integrating projects into the multiproject	Engineering Server

	Activity	Location
6.	Final project works: • Updating the Plant Hierarchy (PH) • Remerging referenced connections • Checking the interproject consistency • Compiling and loading	Engineering Server

Note	The individual steps are described in detail in the manual "Process Control System PCS 7 Engineering System". http://support.automation.siemens.com/WW/view/en/36050990

1.4.1 Project planning

To be able to perform the project work as efficiently as possible later, some preliminary considerations are required.

When considering how to most suitably separate the overall task into subprojects, individual project conditions as well as conditions of the available engineering environment must be taken into account. Here some examples:

- Number of project engineers

- Number of available Engineering Stations (while meeting the PCS 7 ES system requirements)

- Networking the Engineering Stations

- Complexity of the project

- Time duration of project engineering

Furthermore, certain rules should be followed such as below:

- Only those project components (AS, OS) required for the respective processing, should be moved to a decentralized ES. The other objects of the multiproject hence remain available for other uses.

- Only whole projects can be moved to a decentralized ES.

- A project must generally only be edited by one project engineer at a time.

Determine the multiproject structure by means of these considerations.

1.4 Shared engineering work step-by-step

## 1.4.2 Preparatory project works

Creating new multiproject

The PCS 7 wizard creates a multiproject as well as a subproject whose objects (AS, OS, programs, plans, etc.) are integrated on demand via queries. Additionally, a master data library with the following content is created:

- An S7 program with folders for sources, blocks and plans (component view)

- One folder each for measuring location types and example solutions (Plant Hierarchy)

Start the PCS 7 wizard ("File > 'New project' wizard"). The wizard will prompt you to the multiproject creation with 4 steps.

Figure 1-11
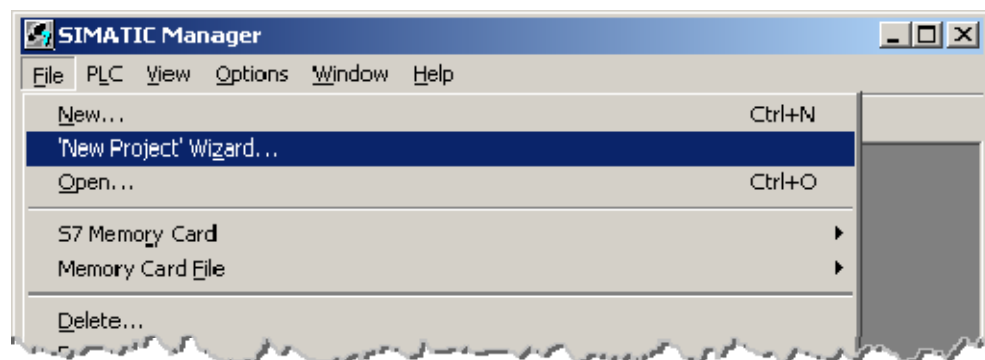
1. Introduction and project preview

2. Configuring automation system
   Here you can select an existing AS of your plant in advance already.

3. Plant Hierarchy and Operator Station
   In this step you determine the number of hierarchy levels and you can also define whether an OS will be created. If you want to create your multiproject as a station-specific multiproject, do not select any PCS 7 OS here.

4. Project name and storage location
   Assign a name to your project in this step and select the directory for filing the multiproject.

Create further projects in the multiproject using the planned structure. For this purpose select the menu option "File > Multiproject > Create in Multiproject...". Alternatively you can copy and customize the project which has been created by the wizard.

Figure 1-12
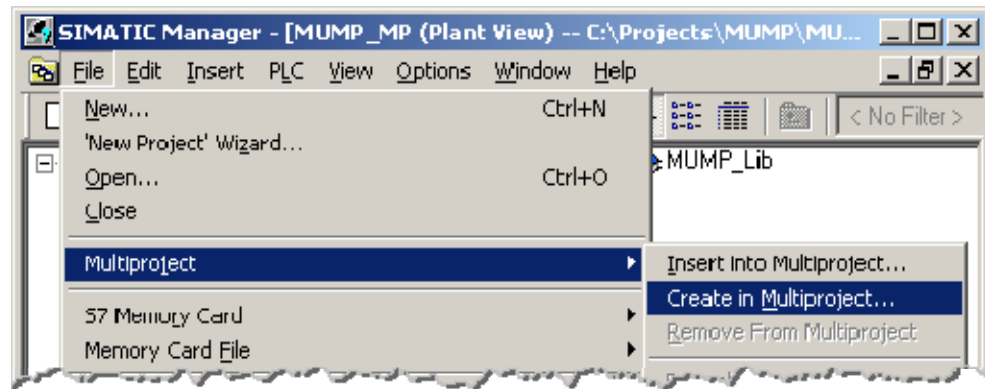
Configuring SIMATIC and PC stations

Configure the individual stations and their network connections according to your project planning and the hardware conditions.

Create the required stations with the menu option "Insert > Station > ..." or use the PCS 7 wizard "Insert > Preconfigured station...".

Figure 1-13
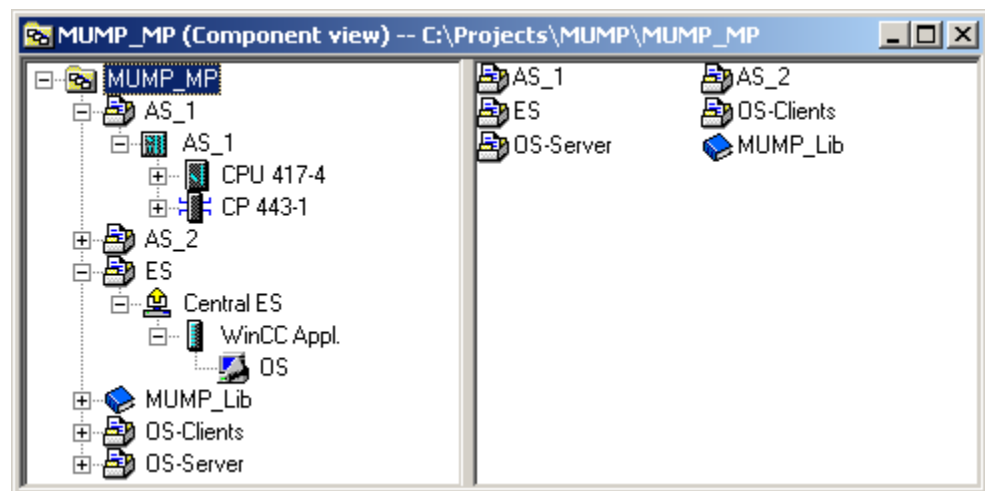
Note	You can also use the PCS 7 wizard to create preconfigured stations for manually created projects. In the case of existing projects start the wizard with the menu option "Insert > Preconfigured station...".

Configuring the Plant Hierarchy

Handling of the Plant Hierarchy in a multiproject will be simplified from version 6.1 of PCS 7. If the folders of the PH are, at least partly, to be created identically in all projects or in individual projects of the multiproject, then this work step is only necessary once in a project. The other projects take on the PH when performing the update.

In the individual projects, hierarchy folders not named identically are created anew and provided with the properties of the template folder. Hierarchy folders of identical name are recognized and will not be created anew, but they also receive the properties of the template folder.

1. Configure the complete Plant Hierarchy in a project.

2. Mark the multiproject and select the menu option "Options > Plant Hierarchy > Update in Multiproject".

Figure 1-14
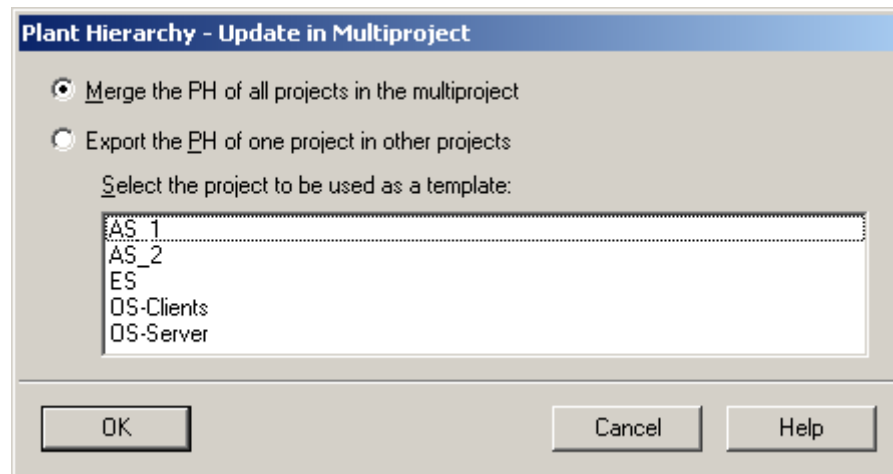
There are two options for updating the Plant Hierarchy:

*   "Merge the PH of all projects in the multiproject"
    The PH will be updated in the entire multiproject.

*   "Export the PH of one project in other projects"
    The PH of a selected project will be updated with the PH of the target projects.

The updated projects have referenced (linked) folders now which are shown in the tree structure with a small arrow. These folders cannot be renamed or deleted. However, depending on the project, plans and/or pictures can be added.

Figure 1-15
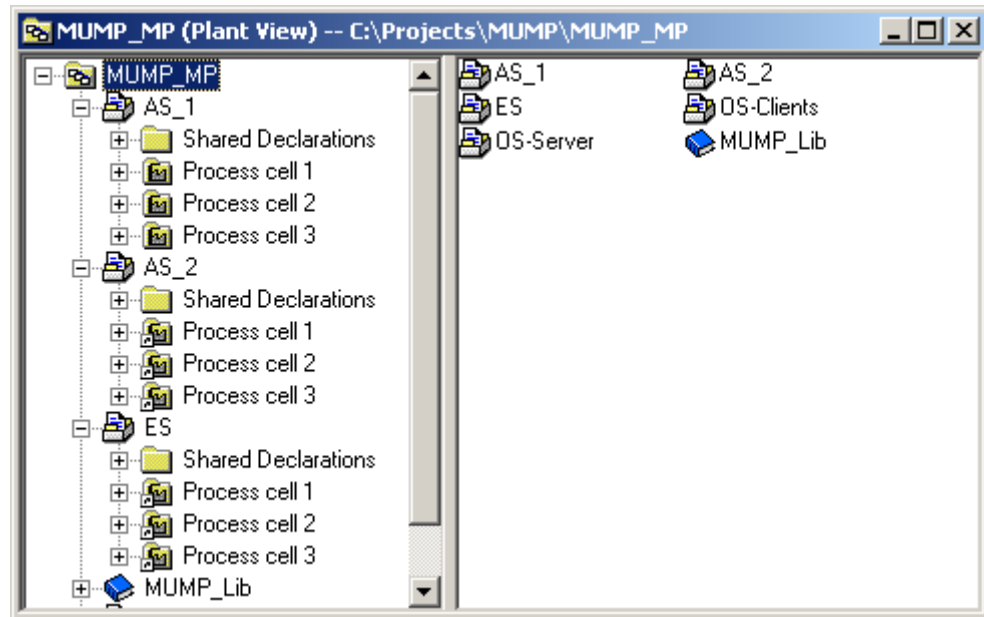
If the Plant Hierarchy of referenced projects shall be changed, the link must be removed prior to that. This is done with the function "Options > Plant Hierarchy > Remove link". You can remove the PH link in the whole multiproject by selecting the multiproject or you can remove it in the project by selecting the respective project.

Generating interproject networks

To ensure that the stations of the individual projects in PCS 7 can communicate with each other, their subnets have to be merged. For this purpose, interproject networks are created in the multiproject.

The dialog for merging subnets is reached via the menu option "File > Multiproject > Adjust Projects..." or from out of NetPro via "Edit > Merge / Unmerge Subnetworks > ...".

1. Select the network type "Industrial Ethernet". Click the "Execute" button.

2. Select those subnets which are to be merged as a global network. With the arrow button "->" (to the right) they are added to the global network.

3. Click "OK" or "Apply" to confirm your settings.

1.4 Shared engineering work step-by-step

Figure 1-16
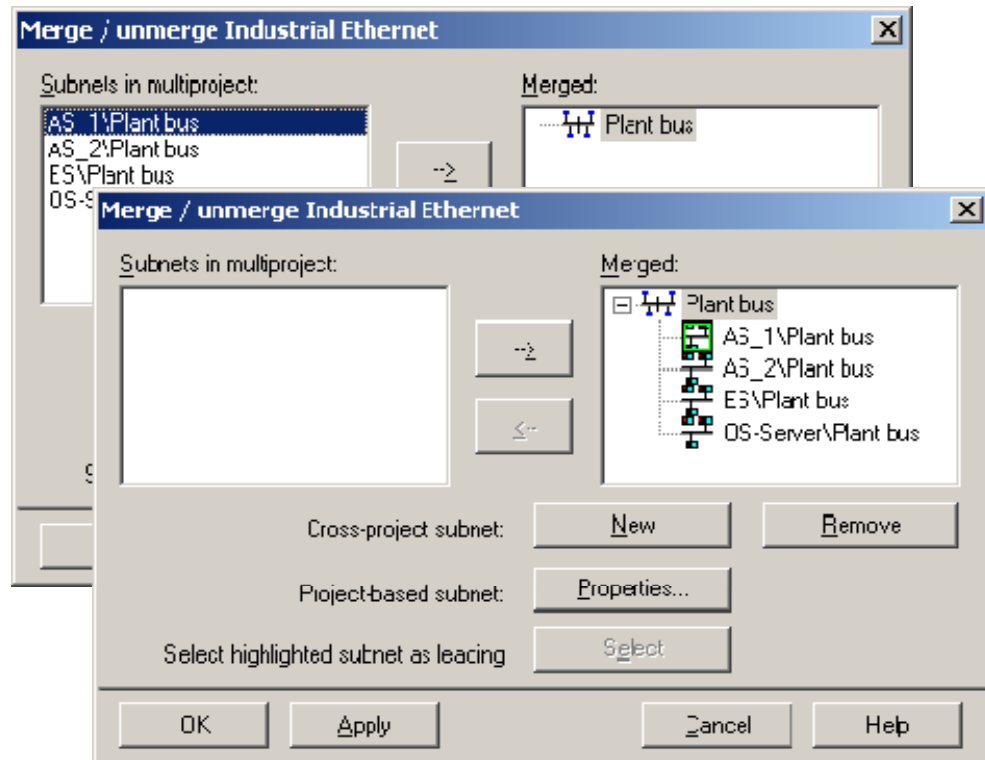
Generating interproject connections

Interproject connections between AS - AS, OS - AS or also ES - AS (in order to test the OS functions on the ES using the OS simulation) can now be generated as usual.

As far as the later decentralized project planning occurs in the multiproject, the connections can also be made after the projects have been divided.

If projects which have been removed from the multiproject shall be edited, it is advisable to generate the known connections in advance already. Unspecified connections can also be added using text references later. The connections can then be closed after remerging the projects on the central Engineering Server.

Figure 1-17
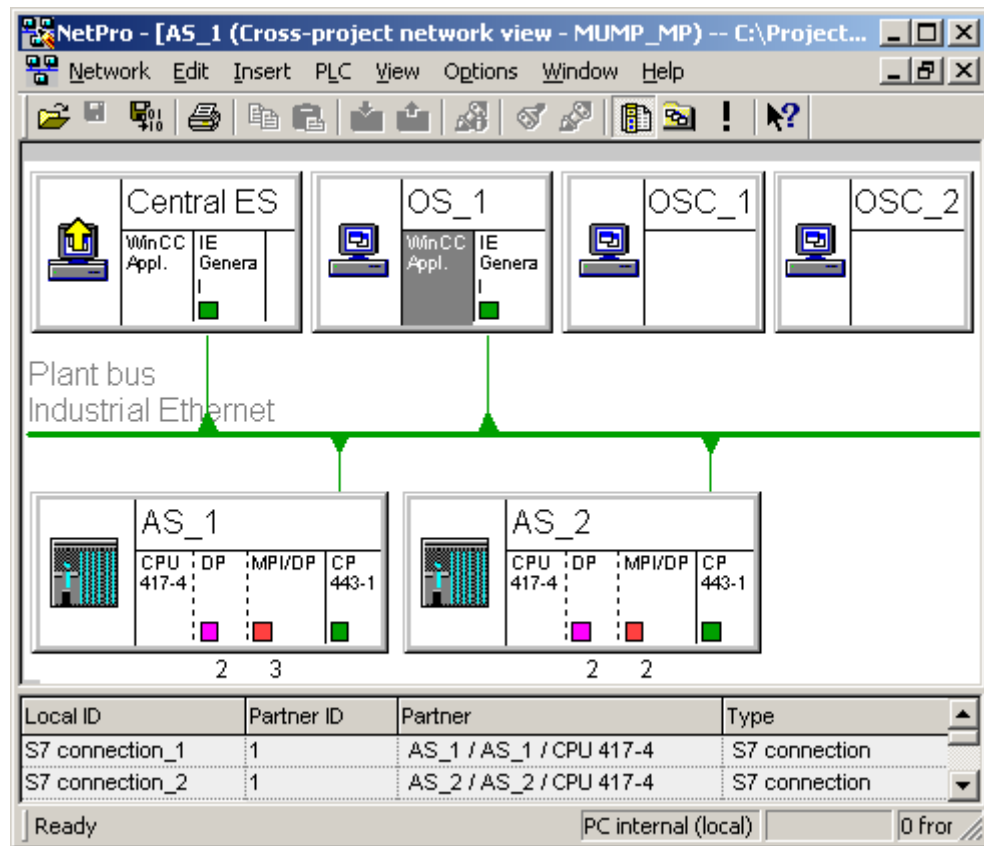
1.4.3 Distributing the projects

Depending on whether the decentralized editing of the projects is to occur in the multiproject with network interconnection, in the multiproject without network interconnection or without multiproject and without network interconnection, three ways of distributing the projects are described below.

However, we recommend using the variant in which you copy and distribute the multiproject.

Distributing a project including multiproject

This option describes how you distribute the multiproject to the decentralized ES. This has the advantage that the project engineer has unrestricted access to the master data library and that he can use the import/export assistant (IEA) for the configuration work.

1.4 Shared engineering work step-by-step

With this variant a copy of the multiproject is distributed. Projects which are not required will be removed from the multiproject on the decentralized ES then. Proceed as follows:

1. Archive the multiproject ("File > Archiving...").

2. Copy or move the archived multiproject to an external data carrier. Unzip the multiproject on the decentralized ES ("File > Retrieve...").

3. Remove from the multiproject all projects which the project engineer does not need ("File > Multiproject > Remove from Multiproject").

4. On the Engineering Server add the removed projects to the multiproject again ("File > Multiproject > Insert into Multiproject...").

Note	The master data library must not be changed on the decentralized ES as it must not be returned into the multiproject of the Engineering Server anymore.
	The master data library should be changed on the Engineering Server by an authorized person only. After changing, it must be distributed to the decentralized ES once again.

Moving a project in the network interconnection

Below, a project is moved within a multiproject from the central Engineering Server via the network to a remote ES. To do this, a copy of the project is generated on the remote PC and integrated into the multiproject. The original is then removed from the multiproject and can physically remain on the hard disk of the central Engineering Server as a backup.

1. Select the project which is to be moved to a decentralized ES, in the SIMATIC Manager.

2. Select the menu command "File > Save as...".

3. Make the following settings in the "Save as" dialog:

   - Set option "Add to multiproject"

   - Select "Current multiproject"

   - Option "Replace current project"

   - Select storage location

4. Save the project with "OK".

Figure 1-18
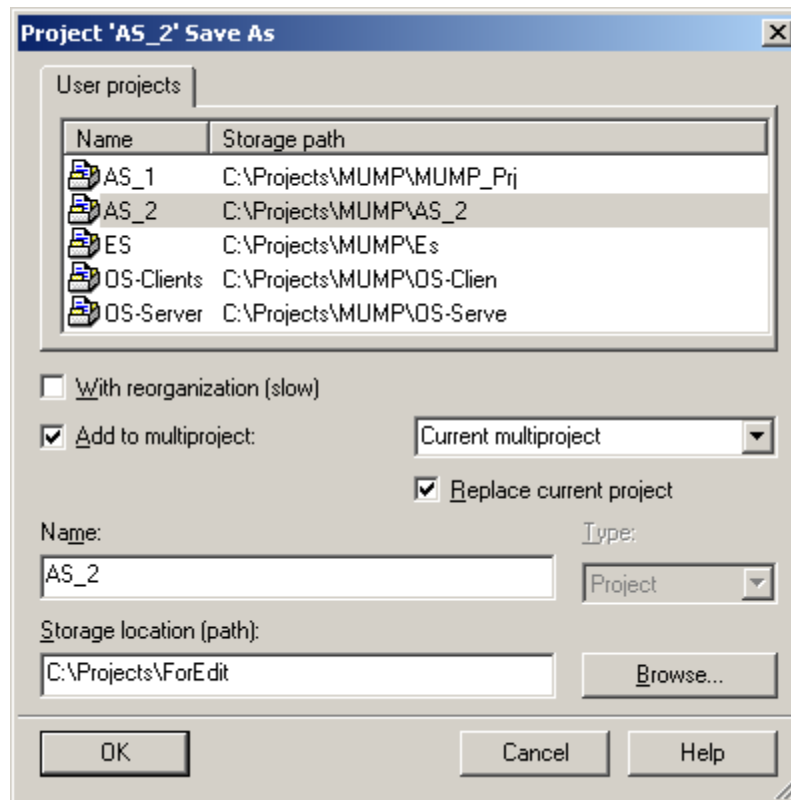
The existing original project was removed from the multiproject and stored on the central Engineering Server. There it can remain as a backup or be deleted. The backup copy can be removed via the menu option "File > Delete..." of the SIMATIC Manager.

Removing a project from the multiproject

A project is completely removed from the multiproject. The removed project can then be moved to an external data storage medium for transport purposes.

1. Select the project to be removed from the multiproject.

2. Select the menu command "File > Multiproject > Remove from Multiproject".

Even if the project was removed from the multiproject, it is still stored as a project in the folder which was created during generation. In order to transfer the project to an external medium, it must be archived.

1. Execute the menu option "File > Archive...".

2. Select the project in the tab "User projects".

3. Start archiving with "OK".

1.4 Shared engineering work step-by-step

After these steps the removed project is located on the drive it was generated on, as a zip-file as well as in original form. Both can remain here as backup or be deleted. The original project can be removed via the menu option "File > Delete...". The zip archive can be deleted, moved or backed up with Windows means.

To allow the project engineer access to the master data library on the decentralized ES, you also have to copy it to the decentralized ES. Changes in the master data library should only be made at the Engineering Server. After that the library has to be distributed to the decentralized ES again.

The master data library can be distributed as follows:

1. Execute the menu option "File > Archive...".

2. Select the master data library of the multiproject on the tab "Libraries". Master data libraries are marked with a blue book icon.

3. Start archiving with "OK".

Figure 1-19
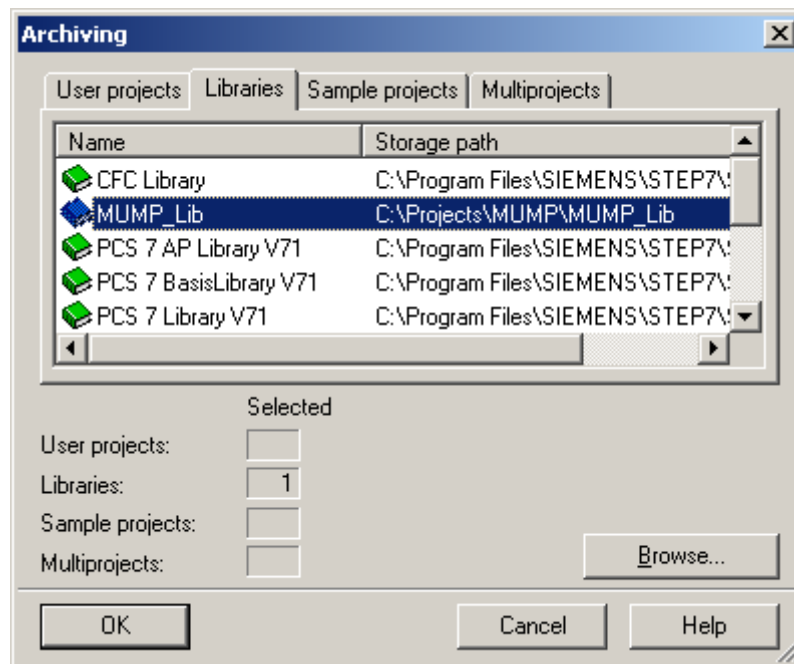
The zip archive of the master data library can be copied to all decentralized Engineering Stations via an external data carrier in the usual way. After unzipping the master data library on the Engineering Stations you can use it just like a normal library.

Note	The SIMATIC Manager provides another functionality for temporary network connections between the Engineering Stations. A selected project can be moved to the remote ES via "File > Multiproject > Remove for editing..." and at the same time be removed from the multiproject. The project is marked in the multiproject as "Project removed for editing" and displayed in gray. On the one hand this saves the deleting process and on the other hand it simplifies the re-integration after the editing process as the original work path was memorized (reducing the administrative work).

1.4.4 Decentralized project works

Editing projects without network interconnection

The following functions are available for the editing of projects on the decentralized ES:

- Non-interproject functions

- Connections to an unknown project
  A text reference is specified for these connections in NetPro. A connection with the same text reference has to be stored at the connection partner. After integrating the connection into the multiproject it can be established with the function "Merge connection".

- Pure editing processes

- Compiling and loading an AS via a fixed parameterized PG/PC interface (e.g. CP1613[ISO])

If the project was distributed without a multiproject, it is only possible to access the master data library if they are copied too. Changes at the master data library should only be made at the Engineering Server by a person who is responsible for this. After changing, it must be distributed to the decentralized ES once again.

Interproject functions or specified relations on the other hand require availability of the partner project.

If you want to download the AS via the interface module "PC internal (local)" from the decentralized EC, you have to perform the following work beforehand:

1. Add to the project a local PC station with a matching CP.

2. Configure the S7 connection between AS and OS.

If you want to test an OS on the decentralized ES in process operation (OS simulation), you have to adapt the computer name in the WinCC Explorer.

1.4 Shared engineering work step-by-step

Note	Before you copy or move the project on the Engineering Server again, you have to undo these changes.

Editing projects in the network interconnection

Decentralized processing of projects of a multiproject corresponds largely to processing several projects on the same Engineering Station, providing there is a permanent and quick network connection. AS compiling and loading or OS compiling are also possible as well as generating interproject connections and the access to the master data library.

Backing up the multiproject on the Engineering Server also contains the distributed projects. During archiving, the project must not be processed on the decentralized Engineering Stations.

From PCS 7 V6.1 SP1 the option package Version Trail is available in addition. Here, project data, i.e. complete multiprojects, individual projects or libraries can be archived, and the data be provided with a version identification as well as a comment. Furthermore, already versioned project data can be dearchived and reused. Version Trail also takes on the complete management of the version history. This means that for example a once completed version cannot be changed anymore.

1.4.5 Final project works

After merging the decentrally processed projects, the overall project planning can be completed by first time or repeated execution of interproject functions.

Updating the Plant Hierarchy (PH)

If the PH of all projects shall be kept identical, but it was changed during the decentralized processing in a project (e.g. through the adding of a new hierarchy folder), you can update the other projects with this once again.

Mark the multiproject and select the menu option "Options > Plant Hierarchy > Update in Multiproject".
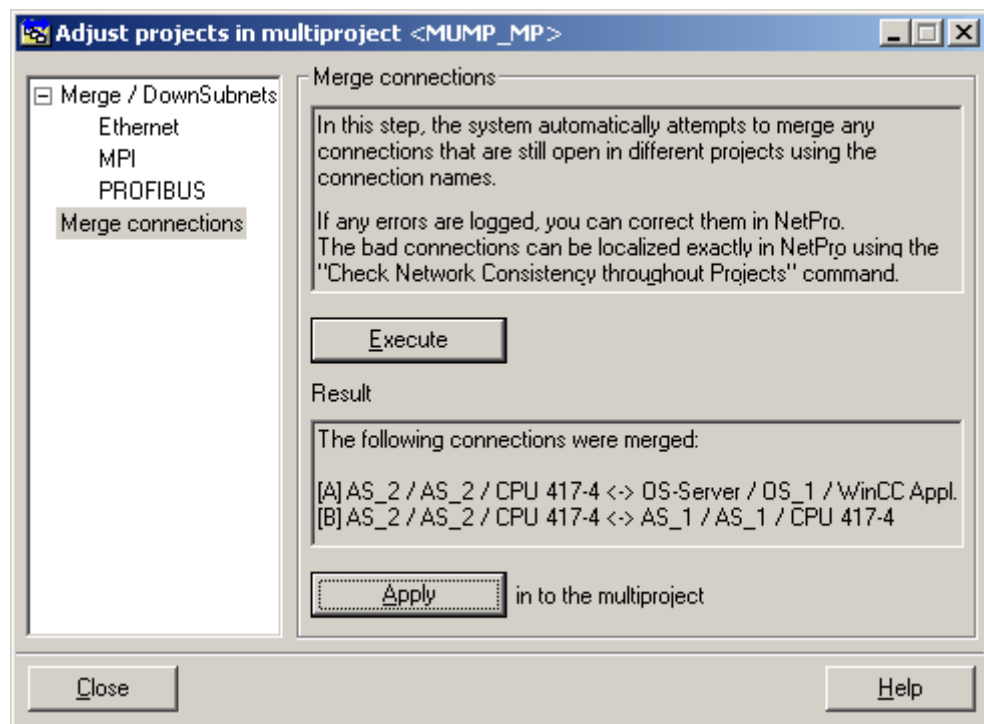
Merging interproject connections

Connections which were created with a text reference on the decentralized Engineering Stations can be closed after integrating the projects into the multiproject on the Engineering Server:

There are two procedures for merging interproject connections.

To merge the interproject connections of all projects in the entire multiproject, proceed as follows:

1. In the SIMATIC Manager select the menu command "File > Multiproject > Update projects...".

2. Mark the entry "Merge connections" in the tree view.

3. Click the "Execute" button. In "Result" all interproject connections are displayed which can be merged.

4. Click the "Apply" button. Thus, all displayed connections are merged.

Figure 1-20

To merge the interproject connections of individual projects, proceed as follows:

1. In the SIMATIC Manager select the project whose connections you want to merge.

2. Start "NetPro".

3. Select the menu command "Edit > Merge connections...".

4. Select the connections which you want to merge and click the "Merge" button.

1.4 Shared engineering work step-by-step

Figure 1-21
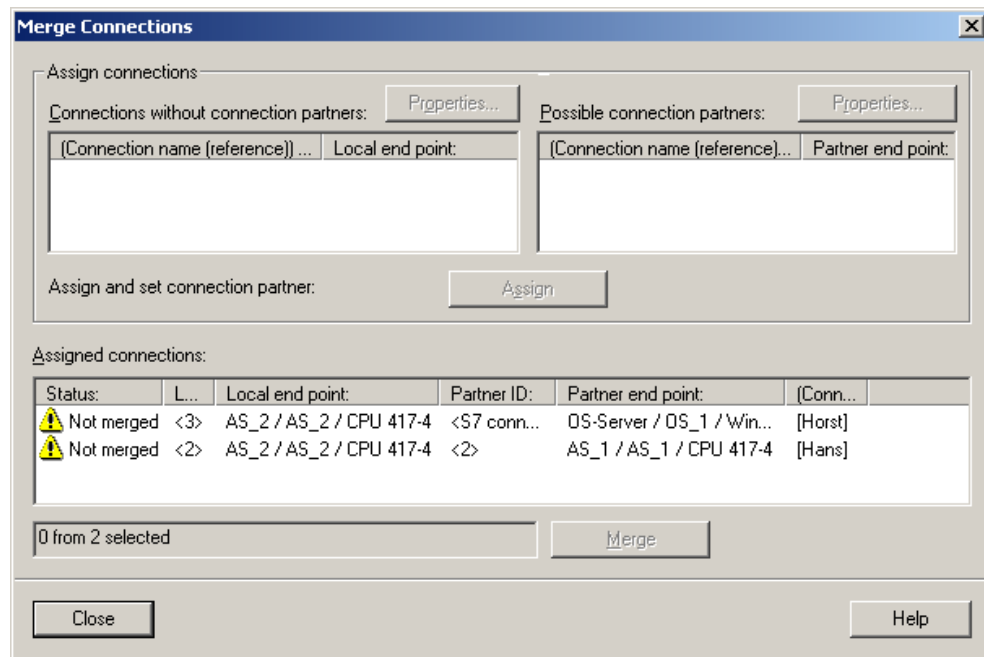
Compiling and loading

Perform the following activities in accordance with the system documentation:

1. Compiling the AS program
   You can skip this step if the program has already been compiled on the decentralized ES.

2. Compiling the OS server with access to the respective AS components

3. Loading the OS server data to the OS clients
   (Must be carried out manually once. Any later changes of the server configuration will be updated automatically on the clients.)

4. Loading all target systems

2 Multi-user Engineering

2.1 Functional mechanisms

In multi-user engineering several project engineers work on the same project regardless of the selected project structure and distribution. The respective project is located on an Engineering Server which is accessed by the individual Engineering Stations via the network. It is not important here whether it is part of a multiproject or has been removed for editing.

Figure 2-1
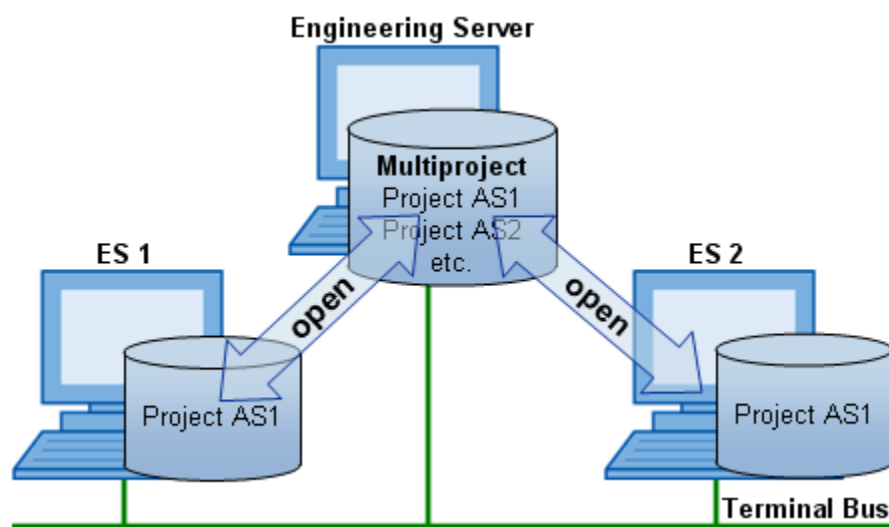
Real multi-user engineering is presently available only for editing CFC/SFC. These objects can be changed by several project engineers in parallel where changes are written directly into the system database. Further information is available in chapter "2.4.1 CFC/SFC".

The following applies generally to all other objects in the PCS 7 project: When these objects are worked on, they are given a status which prevents that the data consistency will be lost. If several users access the same object, e.g. the symbol table, it will be editable only by one user. The other users may open only a write-protected version of the symbol table.

Here it is not important either which way one takes to open an object. The symbol table can be opened, for instance, from the component view, process object view or the menu option of an editor (e.g. SCL Editor). The table will be displayed in the Symbol Editor and edited there as a rule.

2.1 Functional mechanisms

Figure 2-2
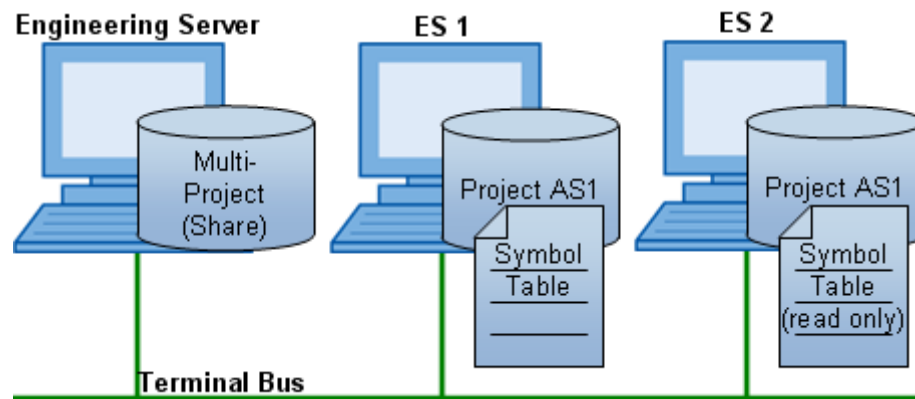
Basically it can be said that all objects can be opened as write-protected versions by all users, whereas they may be edited only by one user. The privilege of saving the changes rests with the user who made a change first. All other users receive the message that the object is already being edited and that they can save their changes only with the function "Save as...". Only after the change was saved by the project engineer, the respective object can be edited by another user again.

If changes were made by another user while an object was displayed, these changes will only be visible when the display is updated (F5).

There will usually be no conflict when different objects are edited in the same project. However, you have to be careful if actions such as AS compiling shall be executed throughout the project. If a user tries to change a CFC chart while the AS program is being compiled, a conflict will occur.

With an OS project the respective editor (WinCC Explorer) will prevent multiple opening of the object. Multi-user engineering is not available for these objects.

2.2 System requirements

Engineering Server

- For performance reasons we recommend using the operating system Windows Server 2003 on the Engineering Server.

- The project engineers of the decentralized Engineering Stations must be given write permissions for the Engineering Server and specifically on the project folder.

Decentralized Engineering Stations

- The decentralized Engineering Stations can use the operating systems Windows XP Professional or Windows Server 2003.

- The same PCS 7 version must be installed on all Engineering Stations with the same options as on the Engineering Server.

- The ES licenses can be installed locally (license type "Single"), or free licenses are used which are accessed via network (license type "Floating"). The floating licenses can be located on the Engineering Server or on an additional license server. The RT licenses which are required for testing OS functions must be installed locally.

Networking

- For loading the AS or for testing OS functions the Engineering Stations which can be used for this must be connected directly with the plant bus. (Routing through the Engineering Server is not possible.)

- A stable network connection must exist between the involved Engineering Stations.

Note	Working via network increases the potential hazards for a smooth workflow. If the network connection should fail during a writing process, long waiting times and inconsistencies in data management may occur.

2.3 Overview of project engineering steps

Generally, the first project engineering steps, such as creating the multiproject, must be carried out on the Engineering Server.

By working via the network the risks of data inconsistencies may increase. A stable network connection is mandatory between the Engineering Stations in the multi-user operation.

Generally we recommend performing interproject functions on the Engineering Server where the project or the multiproject is managed.

- Creating and updating the Plant Hierarchy (PH)

- Managing the master data library

- Remerging subnets and connections

- Creating and updating the block icons

- Compiling and loading all contained components (AS, OS, ...)

The following procedure is recommended, however, it may vary according to individual conditions and experience.

Table 2-1

	Activity	Location
1.	Preparatory project works: • Configuring the network release for the project folder • Creating the multiproject • Configuring the SIMATIC stations and the PC stations • Creating and updating the Plant Hierarchy (PH) • Generating interproject networks • Generating interproject connections • Filling the master data library (parameterized function blocks, measuring location types, ...)	ES server
2.	Parallel project editing • Parallel opening of the project via network release • Editing process objects	Decentralized ES
3.	Final project works: • Updating the Plant Hierarchy (PH) • Remerging interproject connections • Checking the interproject consistency • Compiling and loading	ES server

Note	When interproject functions are to be executed, the project engineers must be informed because they must not work on the projects during that time. The individual steps are described in detail in the PCS 7 Configuration Manual "Engineering System".
	Further information on the creation of a multiproject is available in the document "PCS 7 Compendium Part A - Configuration Guidelines". http://support.automation.siemens.com/WW/view/en/35016996

2.4　　Working in parallel

The multiproject, or individual projects of the multiproject, is opened via network access on several Engineering Stations when working in parallel in the multi-user mode. The Engineering Server on which the project is located may also be used as a host.

Access scenarios / peculiarities

The following cases are distinguished for editing objects:

- Editing objects of different stations

- Editing different objects of one and the same station

- Editing one and the same object of one and the same station

No inconsistencies should occur when working in different stations.

The probability of inconsistencies is also small if different objects of one and the same station are worked on. However, conflicts may not be circumvented entirely because, for instance, all CFC charts access common resources, such as symbol tables, run sequence etc.

If several project engineers work on the same object though, mutual interferences may occur. For instance, if two project engineers access one and the same input mask in a CFC chart at the same time, the action of the project engineer will be carried out who presses "Apply" or finishes the dialog with "OK" last.

Note	If several project engineers work on the same object, the view should be refreshed more frequently (F5). This ensures that the actual current state is displayed.

This mode of operation should generally be avoided. Simultaneous access to the same resources should be restricted to short actions, for instance, the parameterization of the same I/Os of a certain block type. The project engineers should talk and coordinate long reading or writing actions.

Conflict handling

A typical conflict situation is, for instance, a parallel change on the same object. Here, the user is privileged to save the change as a rule who was first to make the change. All other users will usually get a message that the object is write-protected or that it is being used by another process.

Figure 2-3
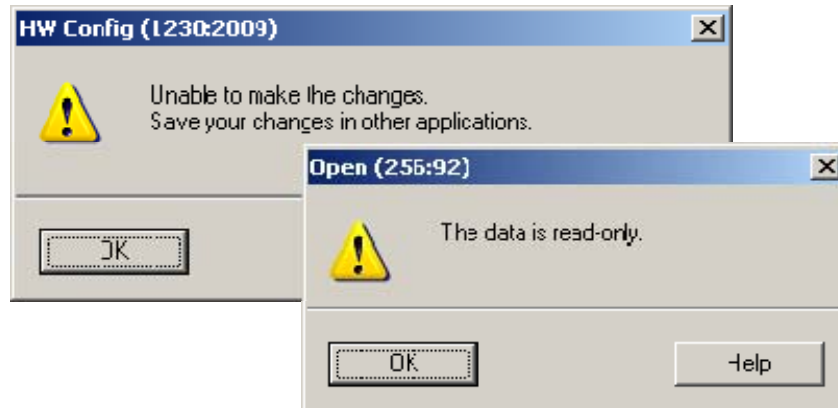
Parallel opening (reading) of objects or of its properties will normally not result in any conflict and can be executed by all users.

2.4.1 CFC/SFC

Prioritizing the actions

The individual transactions are assigned different priorities:

Table 2-2

Action type	Prio	Examples
Short reading	3	• Opening charts • Opening run sequence • Opening dialog fields
Short writing	2	• Instancing, parameterizing • Closing dialog fields with OK
Long reading (with resource use)	1	• AS-OS data transfer (OS compilation) • Creating chart reference data

Action type	Prio	Examples
Long writing (with resource use)	1	• Optimizing the run sequence • Compiling and loading (AS and OS) • Updating or cleaning up type import and block types • Updating the global declarations • Creating module drivers • Reading back • Creating block icons • Creating diagnostic screens • Updating PH in the multiproject • Import / export functions of the IEA and of the process object view • Import / export functions of ES objects of the VCM

Signaling conflicts

The same chart (CFC or SFC) can theoretically be edited by several project engineers at the same time. However, only one user at a time may access the database for writing actions. If an action cannot be executed, a message like this will be displayed:

Figure 2-4
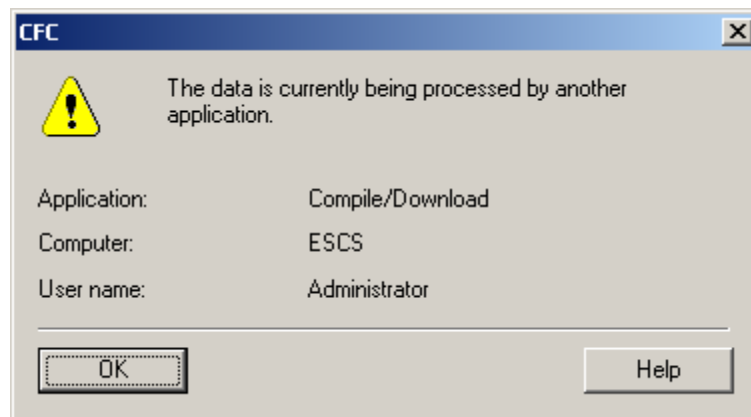
Such conflicts are very rare due to the shortness of the time which is required for writing into the database.

Note	Warnings will appear only in the case of conflict (no notification when opening an already opened CFC / SFC chart). The project engineers should generally coordinate their actions when editing the same CFC / SFC charts. Agreement among the project engineers as to what change should be saved will be required in the case of conflict at the latest.

ATTENTION	**Special care should be taken when you load the automation system. Make sure that actually all work on the AS program has been completed. Otherwise, semi-finished compiled intermediate states could be loaded into the AS which might cause dangerous situations.**

Typical conflict situations within CFC and SFC are, for instance:

- Cutting connections

- Parameterization of blocks

- Locating blocks

- Defining steps / transitions

Note	The operation will be denied in the case of access conflicts outside the CFC/SFC (no multi-user-conform message). Simultaneous work in the SIMATIC Manager is not supported outside the PCS 7 ES.

Conflict dealing in accordance with the priority of the action

As a matter of principle, the higher-priority action will always be executed in the case of access conflict. The lower-priority action is aborted in this case.

- Prio 3 (short reading actions)
  If further short reading actions are carried out in parallel, no conflicts are to be expected.
  If a short or long writing action is carried out in parallel, access conflicts may occur, i.e. the short reading action will be aborted.

- Prio 2 (short writing action)
  If a short or long writing action is carried out in parallel, access conflicts may occur for the action which has been started later.

- Prio 1 (long reading or writing actions)
  Long reading or writing actions will be executed without any access conflict if upon the start of such actions no access conflict occurs immediately due to, for instance, a parallel reading or writing action. (as to exceptions refer to the reference below)

2.4 Working in parallel

If parallel actions have the same priority the action which has been started first will be carried out.

Note	For further information about how the system responds to conflicts refer to the PCS 7 Function Manual "CFC for SIMATIC S7", chapter 6 "Multi-User Engineering" under the heading "Notes relating to system behavior".

You will find information on:

- Conflicts due to access to the same resources outside the CFC
- Conflicts when using the test mode

Locking mechanisms

Every transaction has an ID and is protected via it (allocated), i.e., further writing actions made to the same location in the database will be blocked.

Note	The actions on the individual program units are allocated line by line in the process object view (table layout).

2.4.2 Process object view

When working in the process object view changes are written directly into the database, i.e. dialogs for confirming the change will not be displayed. If several ES are being worked on in the process object view in parallel, the changes made by other users will only become visible after the view has been refreshed.

A conflict of access to the parameters of an object in the process object view will only occur if these parameters are written into the database by different ES at the same time. A message will appear then that the process is being used by another application already. The message also contains the information what user blocks the process on which computer.

Figure 2-5
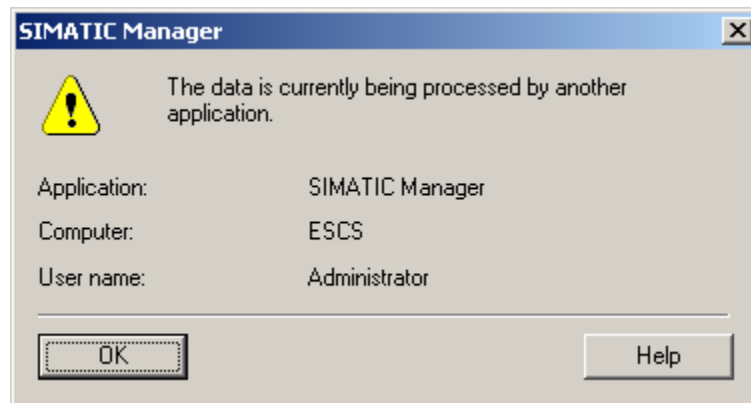
Your own changes will be lost in this case and the changes of the displayed user
will be written into the database. Upon updating the display (F5) the inputs of the
other user will be displayed in the process object view then.

2.4.3 Hardware components and connections

Hardware

On principle, it is possible to have the hardware components (AS, OS, connections, other stations, ...) configured and edited by several users. If a hardware object is edited and opened with the respective editor (HW Config, NetPro), this object is blocked against changes of other users. These users can open the object only as a write-protected version.
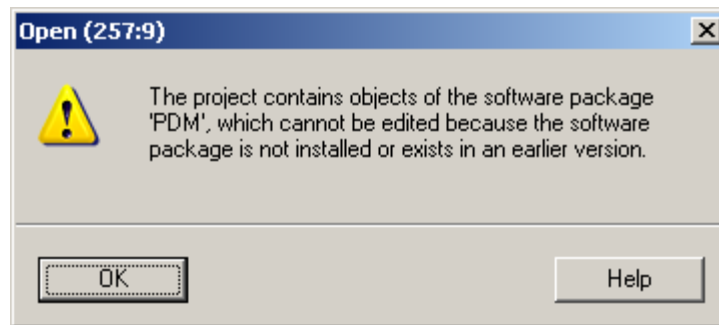
Figure 2-6
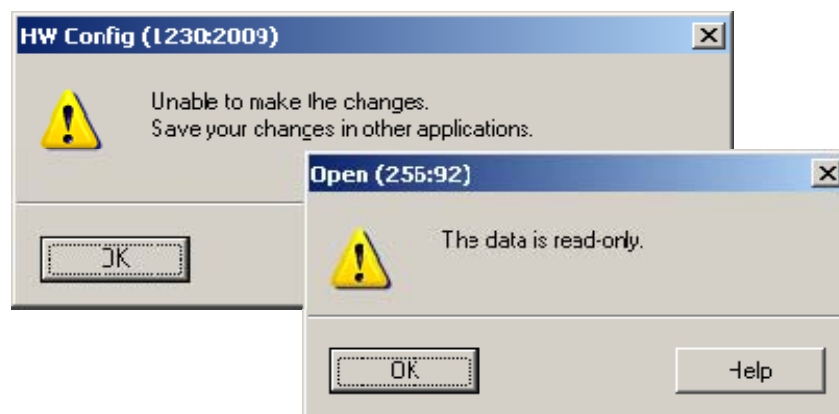
Note We recommend making the complete hardware configuration on the Engineering Server.

**Process Device Manager (SIMATIC PDM)**

In order to parameterize a field device with PDM, a device configuration file must be installed on the ES. If the project is loaded on an ES with configured PDM device without an installed device configuration file, a note appears informing about the missing software when HW Config is opened. HW Config can be opened only for reading access then. Changes in HW Config cannot be saved.

Figure 2-7

Field devices which were configured with the Process Device Manager can only be opened by one user at a time for editing. Other users can open the device configuration only for reading access then.

Figure 2-8
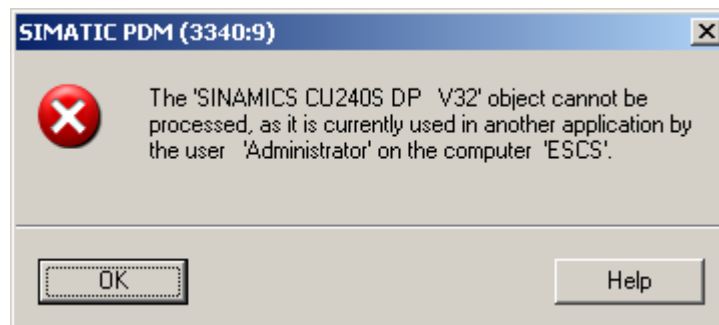
| ATTENTION	**When editing PDM devices on different ES there is the risk of data inconsistency.**
	We recommend editing the PDM field devices as a rule only from one ES (e.g. the Engineering Server) since SIMATIC PDM saves the configuration data of the field devices only locally. Editing the device configuration on another ES requires a manual update of the configuration data with the import/export function or via an explicit reading-in of the data. After an import of the configuration data an upload or download of the data should be carried out to ensure that no different configuration status will be reported later.

2.4.4 Other ES components

Generally, the user who made a change to objects in the PCS 7 project first can save the change. This applies to the objects specified below. As long as the change has not been saved, all other users have only reading access to the object. This is indicated by a respective message.

- Connections

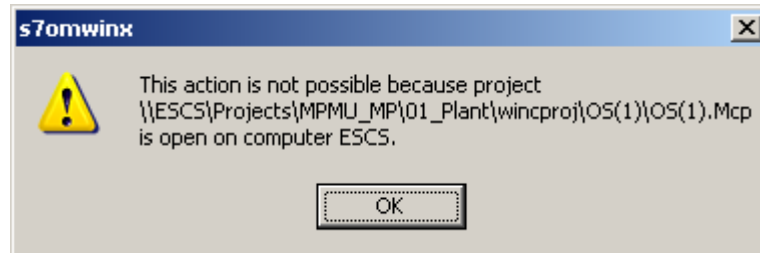- Sources (STL, SCL, LAD, FBD)

- Blocks

- Symbol table

Figure 2-9
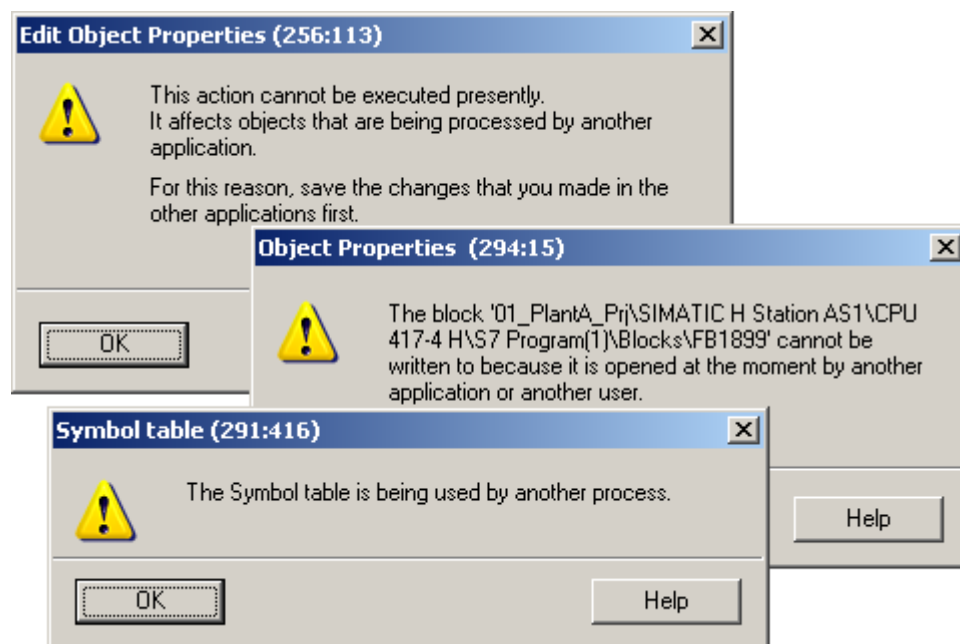
2.4.5 OS project

WinCC Explorer prevents that the OS project is opened in parallel. The project can be opened only once at a time as a rule. WinCC Explorer cannot be used in the multi-user operation. When you attempt to open the OS project once again, the following message appears:

Figure 2-10

The OS pictures are an exception. They can be opened out of the Graphics Designer from another project. However, only one user has the right to edit the picture. Other users have only write-protected access to the picture.

Figure 2-11
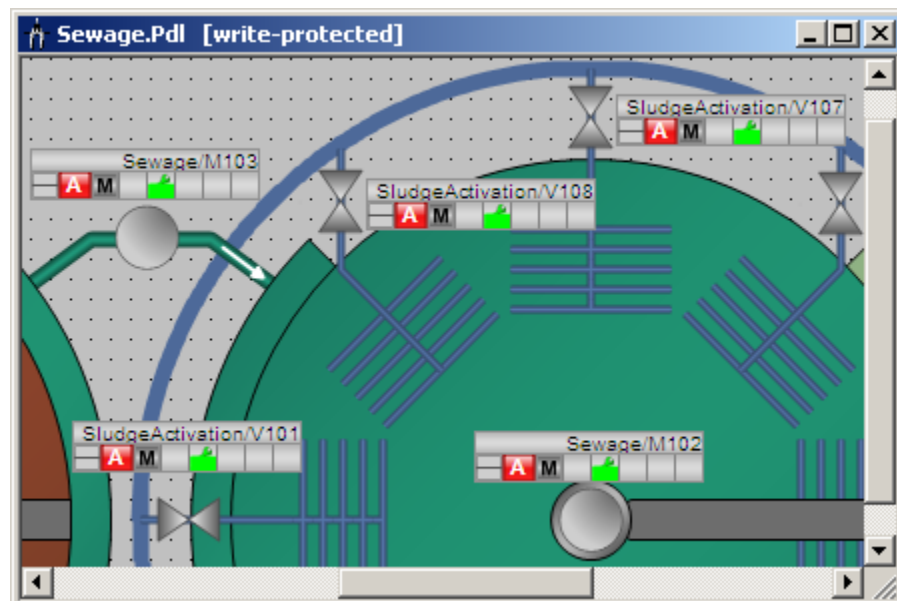
2.4.6 Compiling and loading objects

Options

In PCS 7 you can start the functions for compiling and loading from different editors. There are differences in the function scope. The following table provides an overview of the options for compilation and loading of PCS 7 components:

Table 2-3

Editor	Function
HW Config	Compiling and loading the hardware configuration
NetPro	Compiling and loading the network and connection configuration and hardware configurations
CFC and SFC	Compiling and loading the AS program
SIMATIC Manager	Compiling and loading individual or all objects of a multiproject

Compiling and loading stations individually

As a rule, different AS/OS can be compiled on different ES. However, conflicts may occur when compiling different OS if the OS visualize the process of the same AS. It is not possible to compile the same AS/OS on different ES simultaneously. A conflict will occur.

Figure 2-12
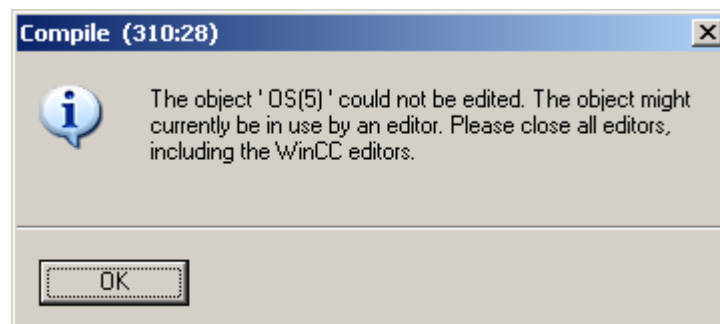
Compiling and loading objects (Make)

You can compile and load all objects, connections and programs of a multiproject with the dialog "Compiling and loading objects".

| Note | We recommend compiling and loading all objects always from the Engineering Server. Coordinate your work with the other project engineers as a rule. The multiproject or the integrated projects must not be opened on all ES as otherwise a conflict will occur and the overall compilation will be aborted. |

3 References

3.1 Internet links

The following list is by no means complete and only provides a selection of appropriate sources.

Table 3-1

	Topic	Title
\1\	Reference to this entry	http://support.automation.siemens.com/WW/view/en/22258951
\2\	Siemens I IA/DT Customer Support	http://support.automation.siemens.com
\3\	Entry: PCS 7 Compendium Part A – Configuration Guidelines	http://support.automation.siemens.com/WW/view/en/35016996
\4\	Manual: PCS 7 Engineering System (V7.1)	http://support.automation.siemens.com/WW/view/en/36050990
\5\	Manual: PCS 7 CFC for SIMATIC S7	http://support.automation.siemens.com/WW/view/en/27002752

3.2 Bibliographic references

The following list is by no means complete and only provides a selection of appropriate sources.

Table 3-2

	Topic	Title
/1/	STEP7	Automating with STEP7 in STL and SCL Hans Berger Publicis MCD Verlag ISBN 3-89578-113-4
/2/	CFC for SIMATIC S7	Chapter 6 "Multi-user Engineering"

4 List of Revisions

Table 4-1

Version	Date	Revisions
V1.0	12.09.2007	First edition on the DVD PCS 7 V7.0 SP1
V2.0	05.11.2009	Layout adaptation to Applications & Tools Design
V3.0	30.11.2011	Multi-user-Engineering for CFC/SFC extended by additional ES / OS components