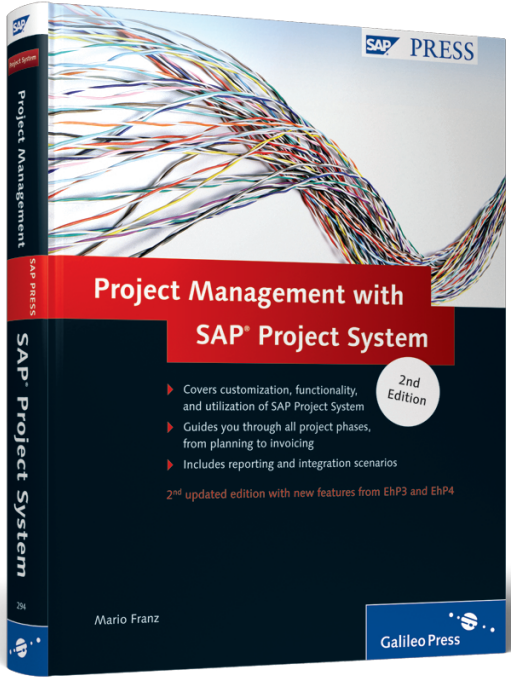
Mario Franz

Project Management with SAP® Project System



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Using project planning, you can preview the time flow, the required resources and materials, and the expected cost and revenues for the individual project parts. Therefore, project planning constitutes an important aspect of project management.

3 Planning Functions

Once you have properly mapped a project using the work breakdown structure (WBS) and the network structure, you can use various SAP Project System functions to plan the dates of the individual work packages, estimate the expected costs and revenues, and provide internal and external resources and materials on schedule before the project starts.

Depending on your requirements, there are planning functions with different levels of detail. For example, within a quotation or approval phase, you can create a preliminary plan of dates and costs with very little effort and add specifications later, if necessary, using other planning functions or additional structures.

In the implementation phase, the planned data is compared with actual data that is posted to the project structures by different business transactions (see Chapter 5, Project Execution Processes). In the processing transactions, particularly in the reporting of SAP Project System, you can therefore make a plan/actual comparison later and then monitor the project earned value.

In this chapter, we'll first discuss the various possibilities of time scheduling in SAP Project System, which is the basis of several other planning activities. Then, we'll explain how to use networks to plan internal and external resources, and material for projects. Lastly, we'll explore the possibilities for planning costs and revenues for your projects in SAP Project System.

3.1 Time Scheduling

The planning of the dates of a project or parts of a project is integral to your project planning. The planning of capacity requirements (see Section 3.2.1, Capacity Planning with Work Centers), for example, requires prior scheduling. The cost planning via Easy Cost Planning (see Section 3.4.4, Easy Cost Planning) or network costing (see Section 3.4.5, Network Costing) is automatically aligned with the planned project dates as well.

Depending on whether you use work breakdown structures or networks for structuring your projects, different functions are available for planning dates. These are discussed separately in Sections 3.1.1, Date Planning with WBS Elements, and 3.1.2, Scheduling with Networks, respectively. If you use both a work breakdown structure and networks, scheduling data can be exchanged between the WBS elements and the activities, which is discussed in Section 3.1.2 as well.

Sets of dates

Regardless of the structures you use for mapping your projects (WBS or network), there are two separate sets of dates available for time scheduling in SAP Project System: *basic dates* and *forecast dates*.[1] You can schedule dates in both sets of dates separately; however, you can also copy dates from one set of dates to the other as often as you like. A third set of dates is available for entering actual dates. Figure 3.1 shows the various sets of dates in the DATES detail screen of a WBS element.

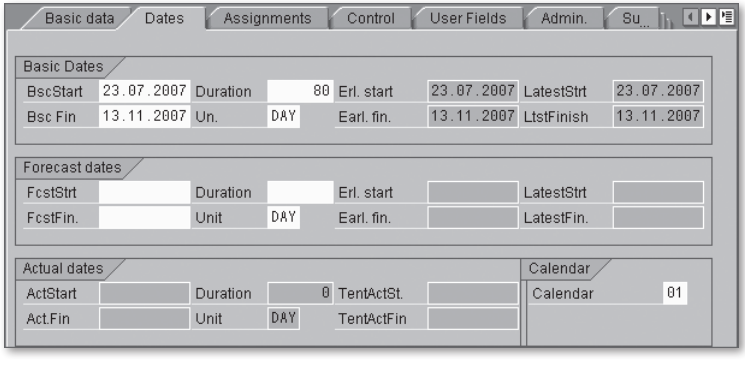

Figure 3.1 Dates Detail Screen of a WBS Element

1 Don't confuse the forecast set of dates with the forecast dates you can enter in the partial confirmation of activities (see Chapter 5, Section 5.3, Confirmations).

The calculation of capacity requirements, the requirement date of material components or, for example, the Easy Cost Planning and the planned costs calculation using network costing are exclusively based on the dates of the basic set of dates.

[«]

Using the forecast set of dates

Typically, the forecast set of dates is used for *baselining*, that is, fixing planned dates at a specific planning stage. To do this, you copy the dates of the basic set of dates into the forecast set of dates. Changes to dates at a later stage are made to the basic set of dates, while the dates in the forecast set of dates unchanged. Therefore, you can always read the current status of time scheduling in the basic set of dates while the forecast set of dates reflects your original time schedule. If you want to maintain several stages of time scheduling, you can use project versions (see Chapter 2, Section 2.9.1, Project Versions).

The presentation of forecast dates depends on the respective transaction. The tabular presentation of structure planning contains, for example, separate tabs for the respective sets of dates (see Chapter 2, Section 2.7.3, Special Maintenance Functions). In Project Builder, the WBS elements detail screen shows all sets of dates, while either the basic set of dates or the forecast set of dates is displayed for networks, depending on the settings. In the project planning board, you determine the field selection and the options for which dates are to be listed or graphically displayed. Figure 3.2 shows the simultaneous presentation of basic and forecast dates in the project planning board.

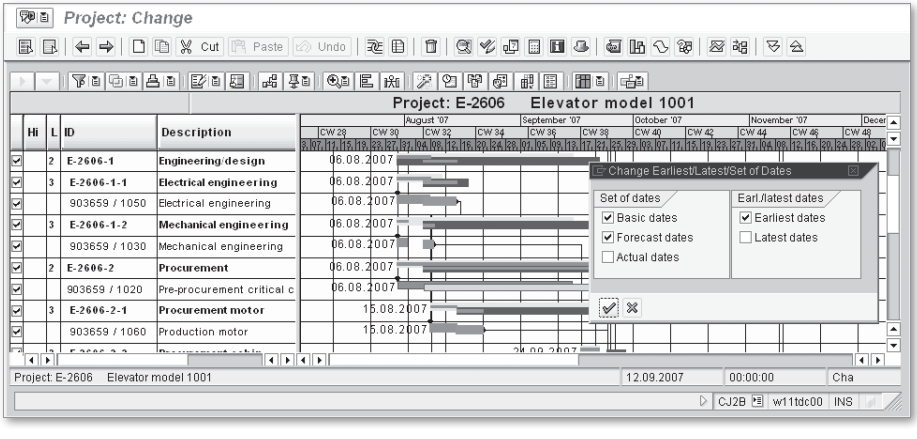

Figure 3.2 Basic and Forecast Dates in the Project Planning Board

3.1.1 Time Scheduling with WBS Elements

When creating a project, you can enter a planned start and end date for the project in the project definition. When you later schedule dates on the WBS elements level, the system notifies you if the WBS element dates are outside of the date range specified in the project definition. If you want, however, start and end dates of the project definition can be adapted to the dates of the WBS elements.

Dates for WBS elements can be scheduled in Project Builder in the WBS elements detail screen, in the project planning board, or via the special maintenance functions, either in a tabular format or, in the project planning board, in a graphical format. Optionally, you can specify both planned start and end dates, or one of the two along with a planned duration for the WBS element. The system then calculates the other date automatically.

Factory calendar

In this time scheduling, the system considers the factory calendar of the WBS element, which distinguishes workdays and non-workdays (holidays, weekends, company holidays, etc.). The entered duration in days, for example, is interpreted as the number of workdays; start or end dates on nonworkdays cause system warnings.[2]

The standard version already contains numerous predefined factory calendars. You can also define your own factory calendars in Customizing using Transaction SCAL. Select the factory calendars separately for every WBS element, or enter them as default values in the project definition or in the project profile.

In addition to the manual maintenance of planned dates for WBS elements, there are various functions that — depending on the transaction — support you in your time scheduling tasks. Using the project planning board as an example, we will explain in detail various time scheduling functions for WBS elements without assigned activities.

Shifting dates

Using the SHIFT DATES function, you can shift the planned dates of individual WBS elements, or of entire subtrees, or of your entire project.

2 In the project planning board, the maintenance and presentation of non-working times are controlled by the non-working time tag in the options or the planning board profile, respectively.

For example, if you select a WBS element and choose the SHIFT SUBTREE function, a dialog box opens in which you can either enter a new start or a new end date, depending on the WBS scheduling parameters (see Section 3.1.2, Scheduling with Networks). The system then shifts both the WBS element and all subordinate WBS elements accordingly.

[!]

Because WBS elements do *not* have relationships, the shifting of WBS elements does *not* automatically cause the planned dates of WBS elements on the same level to be shifted.

Inheriting dates

Using the COPY TOP-DOWN function, you can copy the start and end dates of a WBS element to all hierarchically subordinate WBS elements.[3] Existing planned dates are thereby overwritten.

Projecting dates

Instead of inheriting dates in a top-down fashion, you can, in turn, aggregate dates within the work breakdown structure hierarchy using the EXTRAPOLATE DATES function. Using this function you have to distinguish between bottom-up and strict bottom-up extrapolation.

Bottom-up projecting

If you run the EXTRAPOLATE DATES function for your project and if the OPEN PLANNING or BOTTOM-UP *planning method* has been set, the date ranges of the project definition and of all WBS elements are adapted so that they span the dates of the respective subordinate WBS elements. The date ranges of higher-level objects are therefore extended, if necessary, but not reduced. This means the date range of an object can therefore be larger than that of the subordinate objects.

Figure 3.3 shows an example of the bottom-up projecting of WBS element dates. The dates of the WBS elements ELECTRICAL ENGINEERING and MECHANICAL ENGINEERING have been time-shifted and the dates have been projected to the higher-level ENGINEERING/DESIGN WBS element. The upper time bars (forecast dates) correspond to the dates before; the lower time bars (basic dates) correspond to the dates after the shifting and projecting process.

3 If activities are assigned to the WBS element, the WBS dates can be inherited to these activities as well, if necessary.

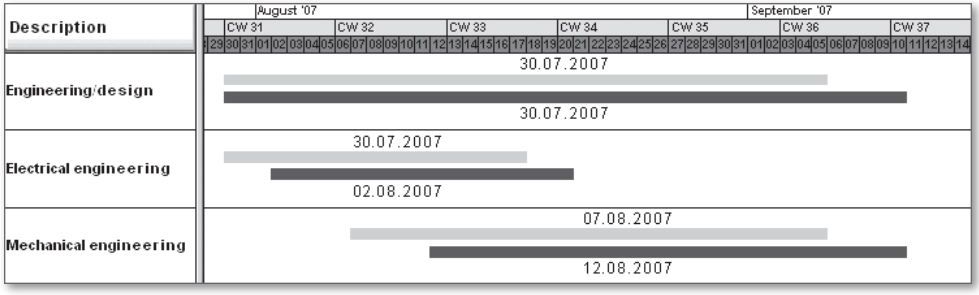

Figure 3.3 Bottom-up Projection

Strict bottom-up projecting

If you execute the EXTRAPOLATE DATES function for a project for which the STRICT BOTTOM-UP planning method has been set, the date ranges of the project definition and of all WBS elements are accurately adapted to the scheduling frameworks of the subordinate WBS elements (see Figure 3.4). The date ranges of higher-level objects are thus both extended and reduced, if necessary.

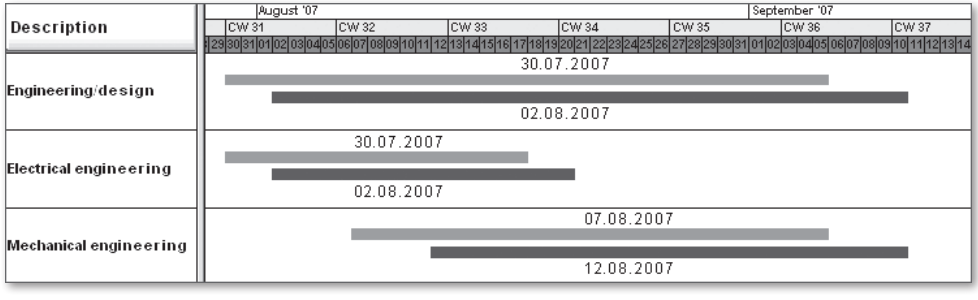

Figure 3.4 Prioritized Bottom-up Projection

Checking dates within project structure

Another function you can implement when time scheduling with WBS elements is the CHECK DATES WITHIN PROJECT STRUCTURE function. The system then highlights WBS elements in color where planned dates of the subordinate WBS elements are outside of the scheduling framework of the WBS element itself. You can therefore avoid hierarchically inconsistent time scheduling for projects.

Planning methods

Using so-called *planning methods*, several of the functions just mentioned can be automatically executed during the saving process, regardless of the processing transaction. The following planning methods are available:

- **Top-down**
  When saving, the system automatically checks the dates within the project structure. If the time scheduling is not consistent, the project cannot be saved. However, no dates are automatically changed.
- **Bottom-up**
  When saving, the system automatically changes the dates of WBS elements and project definition via bottom-up extrapolation.
- **Strict Bottom-up**
  When saving, the system automatically changes the dates of WBS elements and project definition using a strict bottom-up extrapolation.
- **Open Planning**
  The system does not automatically check or change the dates. However, you can manually trigger the CHECK DATES WITHIN PROJECT STRUCTURE or EXTRAPOLATE DATES functions.

You specify the planning method to be used separately for the basic and the forecast set of dates in the project definition. In the project profile, you can store default values for the planning methods of both sets of dates.

If you work with WBS without assigned networks, the *scheduled dates* of WBS elements, i.e., their earliest and latest start and end dates (see Figure 3.1), are only relevant if you use milestones, the dates of which are derived from the WBS element dates. Because the dates of milestones are exclusively derived from the scheduled dates, you must run the WBS SCHEDULING function at least once in this case. For WBS without assigned networks, the WBS scheduling only causes the planned dates to be accepted as scheduled dates.

3.1.2 Scheduling with Networks

While you enter the planned dates of WBS elements manually or via projecting or inheritance, the planned dates of processes are automatically calculated by the system. This determination of the planned dates of networks is called *scheduling*. Depending on the transaction you used to trigger the scheduling, you use *network scheduling*, *overall network scheduling*, or *WBS scheduling*.

In *network scheduling*, only one network is scheduled. All activities of the network are selected and their dates are calculated. If you use *overall network scheduling*, several networks are scheduled at the same time, provided they are linked via relationships or subnetworks. All activities of these networks are then scheduled. In *WBS scheduling*, you select one or more WBS elements, or the entire project, and trigger the scheduling process. The system now selects only those activities for scheduling that are assigned to the selected WBS elements and calculates their dates.

Before we elaborate on more differences between the various scheduling methods, we will first describe the scheduling concept, which is the same for all three methods.

[»] In SAP Project System, the scheduling always takes place both in a forward and backward direction.

Forward scheduling

In *forward scheduling*, the system first determines those activities that — due to their relationships — don't have any predecessors among the selected activities. Beginning with a start date, the system calculates the earliest possible start date for these activities. Depending on the scheduling settings, the start date of forward scheduling can originate from the header of the network or from the assigned WBS elements (WBS determines the dates), or be the current date.

After the earliest start date of these activities has been determined, the system calculates the earliest possible end date of these activities using the scheduling-relevant duration. Then, the system selects the direct successors of these activities and calculates their earliest start and end dates. Each type of relationship (see Section 2.3.1, Structure and Master Data) determines whether the earliest start date must be after the end date of its predecessors (finish-start) or after their start date (start-start), etc.

Earliest dates

The scheduling now goes through all selected activities in a forward direction and calculates their earliest possible start and end dates. Forward scheduling results in the *earliest dates* of activities.

Backward scheduling

In backward scheduling, the system first determines those activities that — due to their relationships — don't have any more successors among the selected activities. Starting from an end date — depending

on the settings of the network header or the assigned WBS elements — the system now calculates the latest possible end date of these activities. Based on the scheduling-relevant duration of the activities, the latest start dates of these activities are then calculated.

Latest dates

The system then goes through the network in a backward direction, following the relationships, and thus successively calculates the latest possible start and end dates for all selected activities, considering their types of relationship and their durations. Backward scheduling determines the *latest dates* of activities.

The earliest start date and the latest end date of the network activities are forwarded to the network header as the *scheduled dates*. In WBS scheduling, the activity dates are also indicated in an aggregated fashion as scheduled dates at the level of the assigned WBS elements.

This logic of forward and backward scheduling requires a number of additional notes regarding the various influencing factors that are relevant to scheduling.

Relationships in scheduling

Without relationships, the result of scheduling in SAP Project System would not be a chronological sequence of the activities. The type of relationship determines how two activities will interact chronologically. If you specified a time interval for a relationship, this will be taken into account during scheduling. This time interval, however, is only interpreted as a minimum time interval, that is, the scheduled time interval between predecessor and successor can be longer than the time interval defined in the relationship.

If the activities selected for scheduling have relationships to activities that are not scheduled at the same time, these relationships are still taken into account. If relationships cannot be met, the system issues warnings that you can analyze in a scheduling log.

Scheduling-relevant duration

The calculation of the scheduling-relevant duration and the consideration of nonworking times depend on the respective activity type; however, for all activity types, the control key of the activities must permit scheduling so that a duration unequal to zero is used during the date calculation.

For internally processed activities, the scheduling-relevant duration — as long as no actual dates have been entered (see Chapter 5, Section 5.1.2, Actual Dates of Activities) — is derived from the value of the NORMAL DURATION field or, if a work center has been stored in the activity, from an appropriate *formula* in the scheduling details of the work center. Typically, however, you will store the standard formula SAP004 in the work center, which references the value of the NORMAL DURATION field in the activity.

The UNIT of the NORMAL DURATION field is relevant as well. For example, if you enter a duration of 24 hours, these hours are interpreted as working hours. If the scheduling-relevant capacity of the work center has an operating time of eight hours per day, this results in a scheduling-relevant duration of three (working) days. If you entered a duration of one day, the system would only use one (working) day as the scheduling-relevant duration.

Non-working times

The scheduling of internally processed activities also considers nonworking times. If you maintained a work center in the activity, the system only uses the working times of the scheduling-relevant capacity of the work center for scheduling. Start and end dates are only scheduled for working days. The differentiation between working and nonworking days originates from a factory calendar that is determined according to the following priority:

1. Factory calendar in the activity
2. Factory calendar in the work center
3. Factory calendar of the plant in the activity

For externally processed activities and service activities, the system, by default, uses the PLANNED DELIVERY TIME as the scheduling-relevant duration without differentiating between working and nonworking days. But, if you want to use a deviating duration for scheduling, you can define a control key with the SCHEDULING EXTERNAL OPERATION indicator and manually enter the scheduling-relevant duration in the NORMAL DURATION field of the INTERNAL tab.

For general costs activities, you can manually specify the scheduling-relevant duration via the NORMAL DURATION field. Using factory calendars in the costs activities, you can restrict scheduling to working days.

Reduction

If necessary, the system can automatically reduce the duration of activities if the scheduled dates are outside of the basic or forecast dates of the network header. The system can therefore automatically adapt the duration of activities to enable the network to be carried out in a given timeframe. This automatic adaptation of activity durations is called *reduction*. By specifying a minimum duration in an activity, you can ensure that a time interval that is required for processing an activity is not further reduced.

Reduction levels

The reduction of the activity durations is performed in several successive stages. In the first stage, for example, the durations could be reduced by 10%. If this reduction is not sufficient, the originally planned durations could be reduced by 15% in a second stage, and so forth. A maximum of six stages could be implemented. After scheduling, you will find the actual number of required *reduction levels* in the network header.

Reduction strategy

For a system to automatically reduce the duration of an activity, you must store a *reduction strategy* in the activity. In the definition of a reduction strategy, for each reduction level, you specify the percentage by which the planned duration of an activity is to be reduced. Figure 3.5 shows an example of the definition of a reduction strategy in the Customizing of SAP Project System.

Finally, you need to specify in the *scheduling parameters* that a reduction is to be carried out. To do this, you specify the maximum number of levels to run through. In addition, you can specify in the scheduling parameters whether all activities that have a reduction strategy are to be reduced or only those that are *time critical*.

Scheduling constraints

Scheduling calculates the planned earliest and latest dates of activities, and the scheduled dates of network headers and WBS elements. The corresponding fields cannot be changed manually.

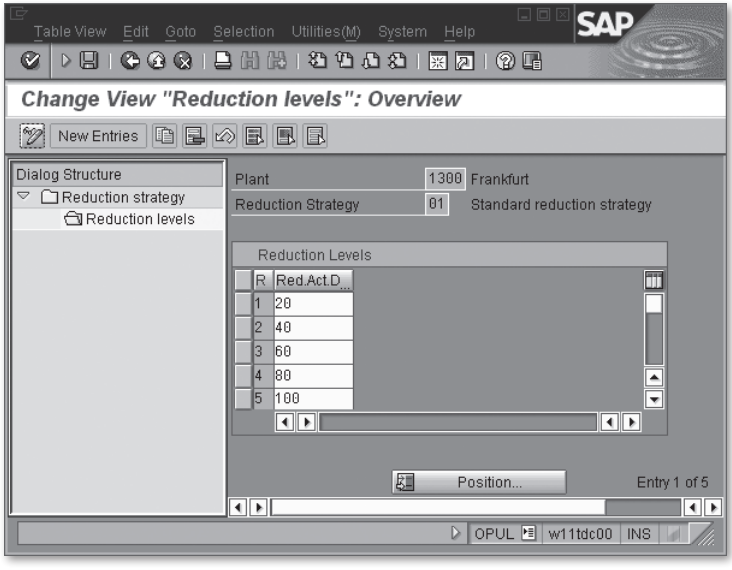

Figure 3.5 Example of a Reduction Strategy

However, you may want to assist in scheduling activities to, for example, define fixed dates or to consider constraints that cause activities to be feasible only within specific periods. To do this, you can specify *scheduling constraints* for activities (see Figure 3.6).

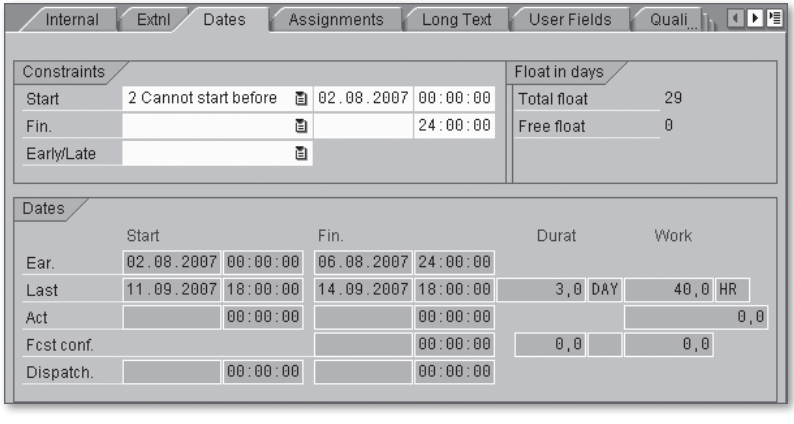

Figure 3.6 Example of a Scheduling Constraint for an Activity

Using scheduling constraints, you can either fix the earliest or latest start or end dates of activities (MUST START/FINISH ON) or restrict them via threshold values (CANNOT START/FINISH BEFORE/NOT LATER). You can manually enter scheduling constraints or graphically determine them in the project planning board, depending on the options or the planning board profile (see Chapter 2, Section 2.7.2, Project Planning Board). In scheduling, the various influencing factors are considered according to the following prioritization:

1. Actual dates (see Chapter 5, Section 5.1.2, Actual Dates of Activities)
2. Scheduling constraints
3. Relationships
4. Start and end dates of the network header or the assigned WBS elements if the work breakdown structure determines dates

Floats

From the scheduled dates of the activities, the system also determines *floats* for each activity, which can be displayed in the detail screen of the activities and the network graphic, or graphically illustrated in the project planning board, respectively. Regarding floats, there is a distinction between a *total float* and a *free float*.

Total float

The *total float* of an activity results from the difference between its latest and earliest dates, and therefore specifies the time interval by which you can shift an activity from its earliest date without exceeding the end date defined in the network header or — if it determines dates — of the assigned WBS element. Activities with a total float smaller than or equal to zero are regarded as *time-critical* and are highlighted in color in the network graphic and the diagram section of the project planning board.[4]

Free float

The *free float* of an activity is the interval by which you can shift the activity from its earliest date without affecting the earliest date of the succeeding activities. For two activities that are linked to each other by a finish-start relationship (without a time interval), the free float of the pre-

4 In the project planning board, you can use the options or even the planning board profile to control the total float starting from which activities are to be highlighted in color.

decessor results, for example, from the difference between the earliest start date of the successor and the earliest end date of the activity itself.

"Flexible" indicator

Free floats typically result from scheduling constraints of succeeding activities, or they occur when there are parallel paths within the network where one path consumes more time than the other (see Figure 3.7). Because you can use the free float to perform activities without affecting subsequent activities with regard to scheduling, you can set the FLEXIBLE indicator for an activity to cause the earliest dates of this activity to be calculated based on the normal duration plus the free float. Consequently, the capacities have more time for performing the activity.

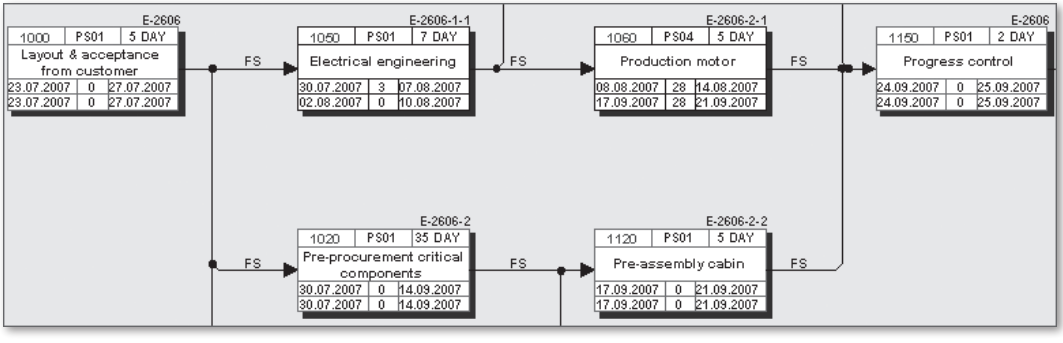

Figure 3.7 Time-critical Activities and Floats in the Network Graphic

Dates of activity elements

You can supplement activities or add more details (see Section 2.3.1, Structure and Master Data) via activity elements. Because activity elements don't have a duration or relationships, they don't affect the scheduling result. Just like activities, however, activity elements have earliest and latest start and end dates. These dates are derived from the scheduled dates of the activity to which the activity elements are assigned and from the time intervals you may have entered in the activity elements.

[»] The planned dates of the activity elements always fall within the activity dates. Scheduling constraints can be defined at an activity level, but not for activity elements.

Dates of activity milestones

For milestones you have assigned to activities, you can either manually enter *fixed dates* or establish a *time reference to the activity*. If you use a time reference, you can use appropriate indicators to specify whether the milestone date is to be taken from the earliest or latest date, and the start or the end date of the activity. Furthermore, you can specify a time interval either in absolute terms (e.g., in a number of days), or in terms of percentage based on the duration of the activity. When using a time reference, every date shift of the activity directly affects the milestone date.

Requirement date of material components

Even if you assign material components to an activity (see Section 3.3.1, Assigning Material Components), you can select between a fixed requirement date for the material and a requirement date that is derived from the start or the end of the activity. The scheduling parameters control whether the date reference should refer to the earliest or the latest date of the activity. If necessary, you can also specify an absolute time interval that is considered when deriving the requirement date from the activity date.

Network Scheduling

In network scheduling, all activities of an individual network are scheduled. Whenever you call the scheduling from the specific maintenance function CN22 or from the Project Builder, provided you have selected a network header or a network activity in the structure tree, you trigger a network scheduling.

Network scheduling parameters

In network scheduling, the scheduling settings are determined from the network scheduling parameters, but can also be temporarily modified. Figure 3.8 shows an example of defining network scheduling parameters.

[«]

Before you can create a network, you must have defined Network Scheduling Parameters for the combination of the plant and the network type of the network header in the Customizing of SAP Project System (Transaction OPU6).

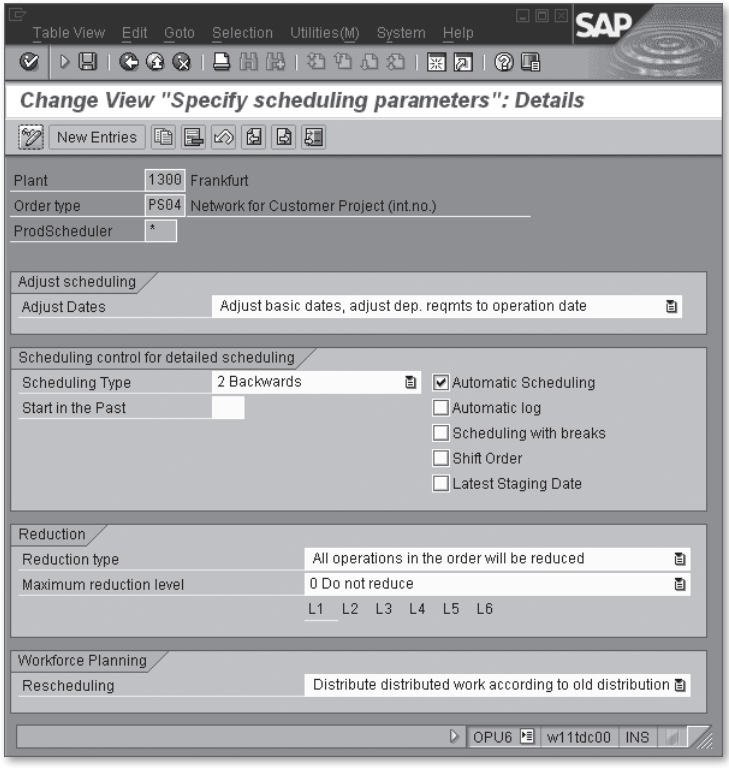

Figure 3.8 Network Scheduling Parameters

Scheduling types

In the scheduling parameters, you first store the SCHEDULING TYPE. This value is displayed at the network header level and can be changed there, if necessary. The following scheduling types are available in SAP Project System:

- **Forward**
  The system first performs a forward and then a backward scheduling. You use this scheduling type if you know the start of the execution, but not its end date.
- **Backward**
  The system first performs a backward and then a forward scheduling. You use this scheduling type if you know the end of the execution (e.g., an agreed delivery date), but not its start date.

- **Current Date**
  Instead of start dates that lie in the past, the system uses the current date for forward scheduling. You can therefore see if the planned period for the execution is still sufficient and which floats may still be available. This also includes both forward and backward scheduling.
- **Only Capacity Requirements**
  The activities use the start and end dates from the network header (or the assigned WBS elements, if they determine dates) as the earliest and latest start and end dates. Relationships or the duration of individual activities are not taken into account in this scheduling type. You can implement this scheduling type if you don't want to specify any details (yet) about the process and duration of individual activities, but want to calculate the capacity requirements for the total runtime (see Section 3.2.1, Capacity Planning with Work Centers).

[«]

In SAP Project System, start and end dates for scheduling can be specified in the network header or the WBS elements to the day only. Scheduling types with a reference to the time of the day can not be implemented in SAP Project System.

"Adjust basic dates" indicator

Using the ADJUST BASIC DATES indicator in the scheduling parameters, you control if the system accepts the scheduled dates at the network header level as basic or forecast dates. For example, if there is a fixed timeframe for the execution, enter the start and end dates manually in the network header and set the DO NOT ADJUST BASIC DATES indicator. Your dates will remain fixed during the scheduling process, and by comparing the scheduled dates, you can determine whether the timeframe is sufficient for the execution.[5]

However, if you only know the start date, for example, and want the system to calculate the end date and to adjust it if changes need to be made at a later stage, select the FORWARDS scheduling type, set the ADJUST BASIC DATES indicator and manually enter a start date in the network header. Based on your start date, the system first calculates the scheduled end of the network, inserts it as the end date, and then performs the backward scheduling based on this date.

5 If the scheduled dates are outside of the predefined dates, the scheduling log issues appropriate warnings.

Start in the Past

The number of days you enter in the START IN THE PAST field in the scheduling parameters controls the handling of start dates that have already passed. If the system determines a start date during scheduling that is further in the past than you permitted in the START IN THE PAST field,[6] the system issues a warning and automatically uses the current date for forward scheduling (this is called *today scheduling*).

Automatic scheduling

By setting the AUTOMATIC SCHEDULING indicator in the scheduling parameters, you cause a scheduling to be performed automatically when the network is saved whenever there has been a scheduling-relevant modification to the network. The indicator is forwarded as a default value to the network header and can be changed there. At the latest, during the implementation phase of a network, it is usually recommended that you remove this indicator from the network header to avoid uncontrolled changes to capacity requirements, purchase requisitions, or reservations of material due to automatic scheduling.

Other indicators in the scheduling parameters control the output of scheduling logs in Transaction CN22, the handling of breaks in the scope of scheduling, the date reference of material components, the consideration of actual dates from partial confirmations (see Chapter 5, Section 5.3, Confirmations), and how later date changes affect a workforce planning (see Section 3.2.2, Workforce Planning).

Overall Network Scheduling

In *overall network scheduling*, all networks or orders that are linked to each other via external relationships or subnetworks are scheduled at the same time. Overall network scheduling is run automatically within the assembly processing (see Section 2.8.7, Assembly Processing) or started from a sales and distribution document. You can trigger overall network scheduling in SAP Project System using Transaction CN24 or CN24N.

During overall network scheduling, the scheduling settings are determined, just like in network scheduling, from the scheduling parameters for the network type.

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6 If you enter 999 in the START IN THE PAST field, the system permits start dates that can be anywhere in the past without performing a today scheduling.

CN24 (Overall network scheduling)

If you use Transaction CN24 for overall network scheduling, first specify the identification of a network and the set of dates for scheduling. Then you can make temporary changes to the scheduling settings, if necessary, or enter new start and end dates for scheduling (see Figure 3.9).

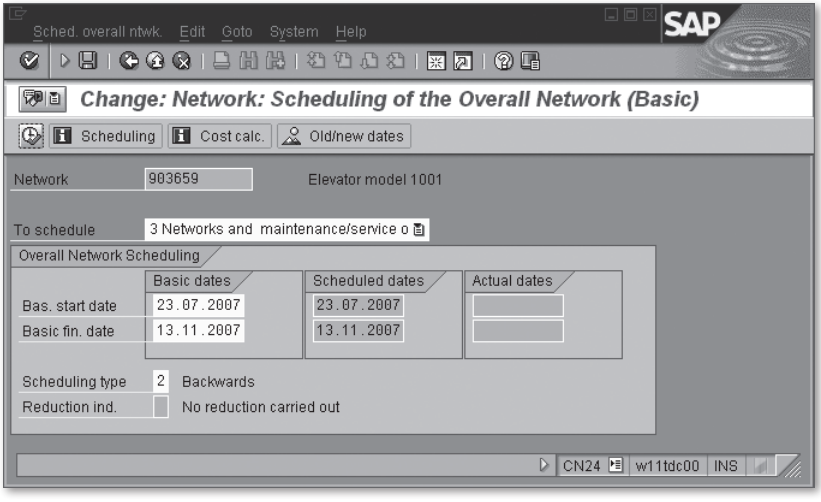

Figure 3.9 Overall Network Scheduling Using Transaction CN24

If you work with maintenance or service orders as assigned subnetworks, you can use the TO SCHEDULE field to determine whether only these orders are to be scheduled, only the networks, or both networks and assigned maintenance or service orders.

After you have performed the scheduling you can use the OLD/NEW DATES function to compare the old dates to the newly calculated dates. Afterward, you can save the date changes of the networks or orders, respectively.

CN24N (Overall network scheduling with selection options)

In contrast to Transaction CN24, OVERALL NETWORK SCHEDULING WITH SELECTION OPTIONS (Transaction CN24N), which is available by default from SAP ECC 5.0, enables you to influence the selection of the networks and subnetworks to be scheduled before the scheduling process (see Figure 3.10) and to also use a monitor for observing the dates of subnetworks.

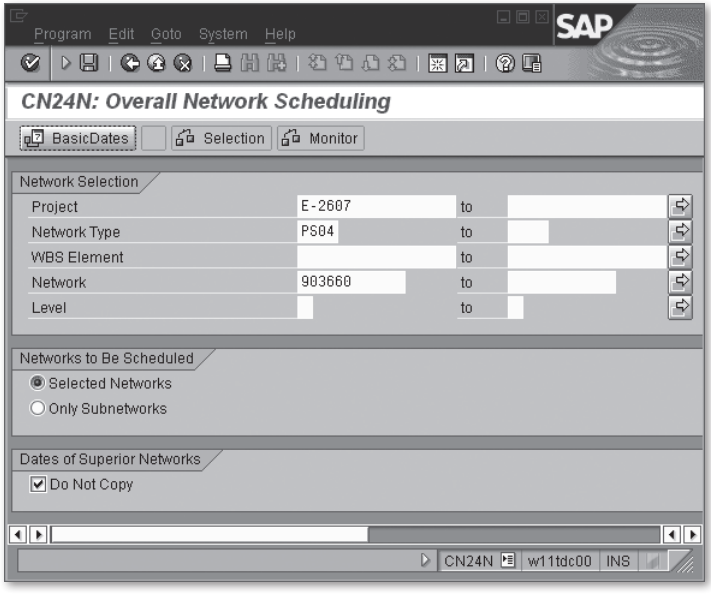

Figure 3.10 Overall Network Scheduling with Selection Options

Subnetwork Monitor

In the SUBNETWORK MONITOR, both data from the selected networks and data from the assigned subnetworks are displayed in a table (see Figure 3.11). You can go to the activity or network header display by clicking on your mouse. In addition, you can enter activity confirmations in the SUBNETWORK MONITOR or call the Project Information System: Structures (see Chapter 7, Section 7.1, Project Information system: Structures). Traffic lights indicate when the dates of the subnetworks are outside of the dates the higher-level activity (CONFLICT) or don't exactly match (UPDATE REQUIRED).

Levels

To use the functions of overall network scheduling with selection options in the Customizing of SAP Project System, you need to define *levels* in addition to the scheduling parameters for the network type, and then manually assign these levels to the network types and number range intervals of the networks and subnetworks. The level definition must reflect the hierarchical arrangement of the networks and subnetworks. The levels serve as selection criteria in Transaction CN24N. A scheduling using Transaction CN24N can span a maximum of two levels.

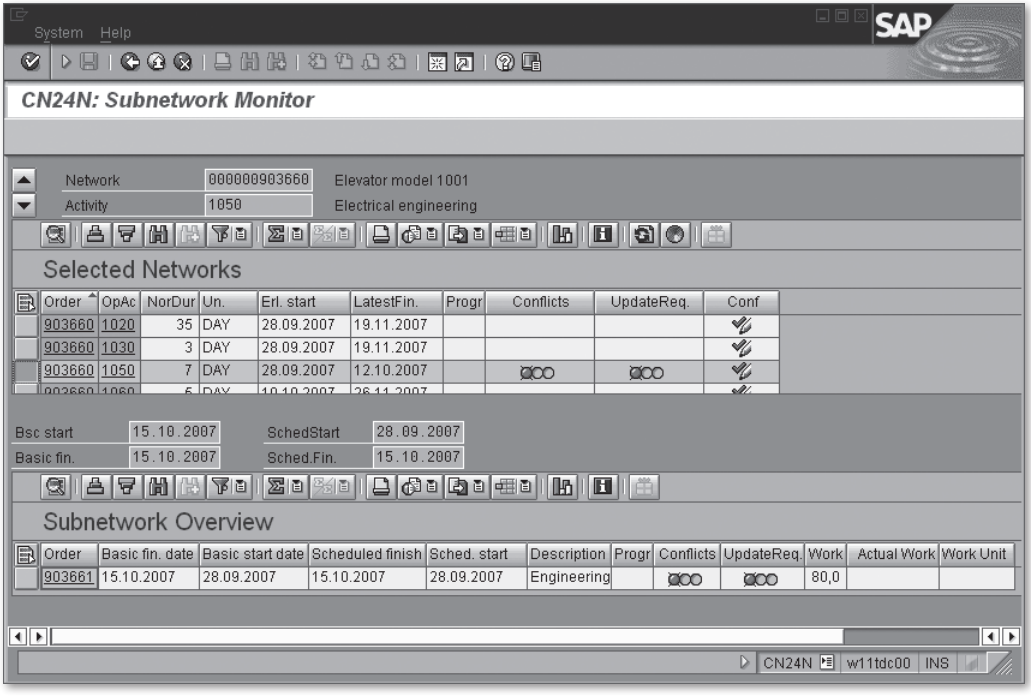

Figure 3.11 Subnetwork Monitor

Transaction CN24N is intended primarily for companies that work with a large number of multilevel subnetwork structures and that don't always want to schedule all networks and subnetworks at the same time when scheduling.

WBS Scheduling

In *WBS scheduling*, the scheduling is started based on one or more WBS elements. In WBS scheduling, activities that are scheduled are assigned to these WBS elements. Therefore, you can schedule individual parts of a project without scheduling all activities of a network. A WBS scheduling can be started in the specific maintenance functions (Transaction CJ20 or CJ02), using PROJECT SCHEDULING (Transaction CJ29), or in the project planning board (Transaction CJ2B). In the Project Builder (Transaction CJ20N), you can perform a WBS scheduling if you've selected the project definition or a WBS element in the structure tree.

Parameters for WBS scheduling

In WBS scheduling, the scheduling settings are determined from the CONTROL PARAMETERS FOR WBS SCHEDULING, but can also be changed temporarily. These control parameters are grouped in a profile that you can define in the Customizing of SAP Project System (see Figure 3.12) and enter in the project profile as a default value for the project definition.

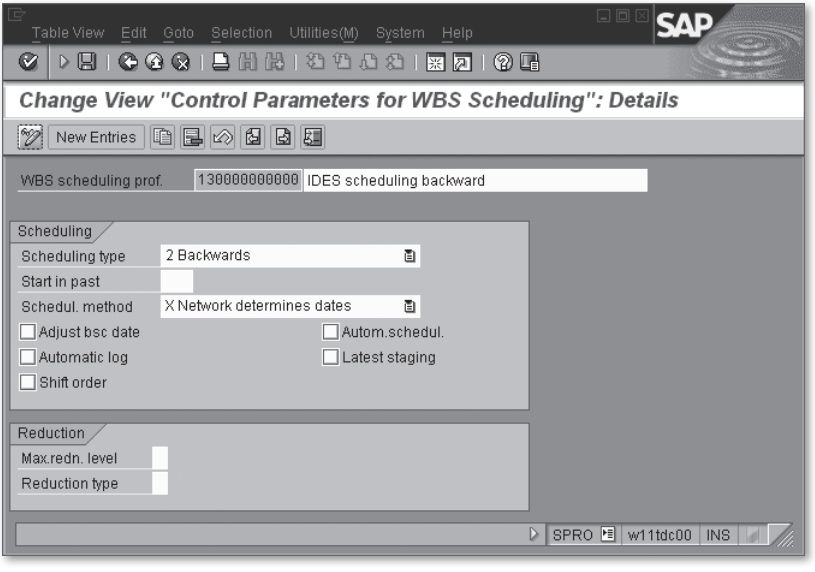

Figure 3.12 Control Parameters for WBS Scheduling

The control parameters for WBS scheduling basically contain the same settings as the parameters of network scheduling, that is, the scheduling type, an indicator for automatically scheduling at saving time, or reduction settings. If you set the ADJUST BASIC DATES in WBS scheduling, not only are the network header dates adapted to the scheduled dates, but the planned dates of the WBS elements are also derived from the scheduled dates of the assigned activities. For that reason, the planned dates of activities and WBS elements can be determined at the same time during a WBS scheduling.

Scheduling method

In addition, the parameters for WBS scheduling include the SCHEDULING METHOD field with the following two options:

- **Network determines dates**
  The network header determines the start and the end date of scheduling.
- **WBS determines dates**
  The planned dates of the WBS element determine the start and end dates for scheduling the assigned activities.

Therefore, the idea of the WBS DETERMINES DATES scheduling method is to first make a manual time schedule at the WBS element level and to then schedule the assigned activities. The scheduling of the activities is then based on the manually planned start and end dates of the WBS elements.

In the time scheduling process using WBS elements and networks, the scheduling parameters controlling the scheduling of the activities and the data exchange with the WBS elements play an important role, and the planning methods controlling the hierarchical exchange of planned dates between WBS elements on different levels. You can define the WBS scheduling parameters in the Customizing and specify them together with the planning methods for your project. Alternatively, you can also use predefined *scheduling scenarios* with WBS elements and networks.

Scheduling scenarios

If you select a scheduling scenario for scheduling a project, all settings are determined via the scheduling scenario. The following scheduling scenarios exist:

- **Bottom-up scenario**
  Based on the basic start date of the network header (which may be anywhere in the past), a forward scheduling and then a backward scheduling are performed. The scheduled dates are used as planned dates at the network header level and the assigned WBS elements. The planned dates of the WBS elements are finally projected in a bottom-up fashion.
- **Top-down scenario**
  In this scenario, you first have to make a manual scheduling at the WBS element level. During this process, the system checks the hierarchical consistency of this time scheduling when scheduling or saving. The scheduling of the assigned activities is based on the planned dates of the WBS elements (which may be anywhere in the past).

In both scheduling scenarios, requirement dates for material are derived from the latest date of activities, and reductions are not performed. The settings of both scheduling scenarios, bottom-up and top-down, are predefined and cannot be changed.

If you want to use one of the two scheduling scenarios, you can store the scenario in the project definition or enter it as a default value in the project profile. However, if you want to use different settings, you need to set the SCHEDULING SCENARIO field to the FREE SCHEDULING value and specify the appropriate settings manually.

Summary

Using scheduling, you can have the system automatically calculate the planned dates of activities and assigned objects, and identify time-critical activities. If the activities are assigned to WBS elements, date information can be exchanged between the activities and the WBS elements. If necessary, you can manually schedule dates at the WBS element level. You are supported by various functions like, for example, the projecting of dates or hierarchical consistency checks.

3.2 Resource Planning

If you mapped a project using only a work breakdown structure, you can plan costs for internal or external resources (see Section 3.4, Planning Costs and Statistical Key Figures) and later assign activity allocations, purchase requisitions, purchase orders, goods receipts, and acceptances, for example, to WBS elements and thereby post the costs of the resource usage to the project (see Chapter 5, Section 5.2, Account Assignment of Documents). A logistic resource planning in the sense of a capacity planning, or an automatic data exchange between the project structure and purchasing documents is only possible in SAP Project System if you also implement networks. A manual cost planning for the required resources and a manual assignment of purchasing documents at the WBS element level are not necessary when using networks. The following sections deal with the functions that are available for planning resources via network activities.

3.2.1 Capacity Planning with Work Centers

When structuring your projects, you use internally processed activities or activity elements for specifying services that will be provided by internal resources, for example, machine or personnel resources. Within scheduling, the system has calculated when these services will be performed; however, the scheduling doesn't verify whether there are sufficient internal resources at the planned date. To make statements about the availability of your resources and thus the feasibility of your projects in terms of capacities, you can use the *capacity requirements planning* in SAP Project System.

Capacity requirements planning

The primary function of capacity requirements planning is to determine capacity requirements and to periodically (e.g., on a weekly or daily basis) compare these requirements with the available capacity using the appropriate reports (see Chapter 7, Section 7.3.3, Capacity Reports). The available capacity is defined using work centers, while the required capacity is derived from the activity data of networks or, for example, production or maintenance orders. If you discover that the capacity requirement is higher than the available capacities during a specific period, you will need to make a *capacity leveling* to get your planning in line with the capacities.

A prerequisite for capacity requirements planning using networks is the usage of work centers. **[«]**

Definition of Work Centers and Available Capacity

Work centers are organizational units in the SAP system that define where an activity can be performed and by whom. If you have already defined work centers for production or maintenance, you can use these work centers in networks as well, provided that this is permitted by the application of the work centers. If you have not yet defined any work centers in the SAP system, or if you want to use separate work centers for projects, you can create new work centers in SAP Project System (Transaction CNR1).

Work center category

When creating a new work center, in addition to the identification and the plant of the work center, you also specify the WORK CENTER CATEGORY

(see Figure 3.13). Among other things, the work center category defines the fields (FIELD SELECTION) and tabs (SCREEN SEQUENCE) to be displayed in the master record of the work center. By default, you can use the 0006 (PROJECT MANAGEMENT) work center category in SAP Project System. If required, you can define additional work center categories (Customizing Transaction OP40).

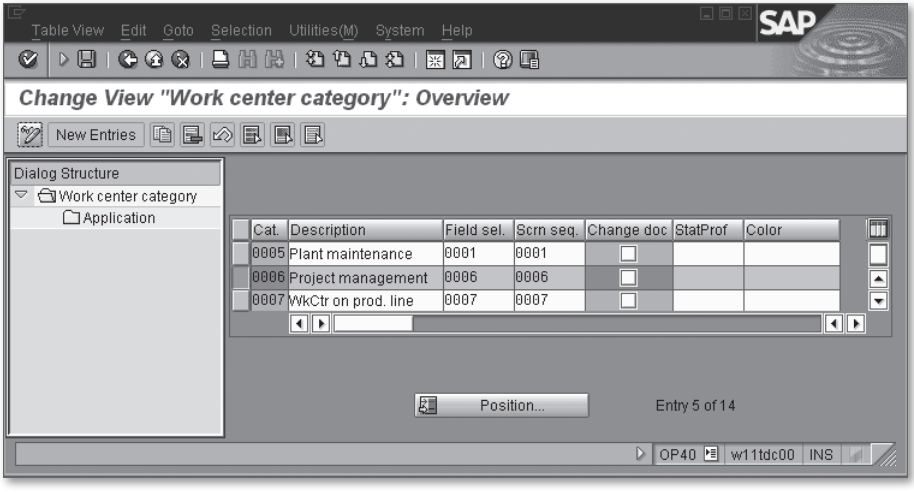

Figure 3.13 Definition of Work Center Categories

Usage The USAGE field in the basic data of the work center determines the task list types and order categories in which the work center can be used. For a work center to be used in standard networks and particularly in operative networks, it must have a usage that is assigned to the task list type 0 (standard network). If the work center is to be exclusively used for networks, you can, for example, enter the application 003 (networks only) in the master record of the work center. If you want, you can use Customizing Transaction OP45 to define your own usages and assign them to the relevant task list types.

Depending on the work center category, you can make a number of settings for the time scheduling (see Section 3.1.2, Scheduling with Networks) and the calculation (see Section 3.4.5, Network Costing) of activi-

ties in the master data. For capacity requirements planning, however, the settings on the CAPACITIES tab are relevant.

Capacity categories

On this tab, you first store one or more CAPACITY CATEGORIES, for example, for persons or machines, and then define the respective available capacity. Capacity categories are defined in Customizing and specify, among other things, whether the available capacity must be defined in time units or in base or volume units, or whether, for example, you can assign persons from Human Resources (HR).

Available capacity

In the simplest case, the definition of an available capacity consists of the specification of a factory calendar for distinguishing working and nonworking days, information about the beginning, the end, and the duration of breaks of a working day, the specification of a capacity utilization rate, and the number of available individual capacities. The rate of capacity utilization describes how much of the daily working time can actually be used for production. The available capacity finally results from the productive operating time of a capacity, multiplied with the number of individual capacities (see Figure 3.14).

In addition to the definition of the standard available capacity, there are several more detailed options for defining available capacities. On the one hand, you can specify time intervals and define a separate available capacity for every interval. Thus, you can map employment relationships depending on the season, for example. On the other hand, you can define SHIFT SEQUENCES in Customizing (Transaction OP4A) and assign them to the capacity category in the work center. Using shift sequences, you can then specify exact break times that can be considered in capacity requirements planning.

Finally, you can also define *individual capacities* and assign them to the capacity category in the work center. Using appropriate reporting settings, you can then also use the aggregated availability of the assigned individual capacities for capacity evaluations instead of the standard offer. For personnel resources, the availability of individual capacities is derived from the planned working time (Infotype 0007) that is maintained for the employees in HR.

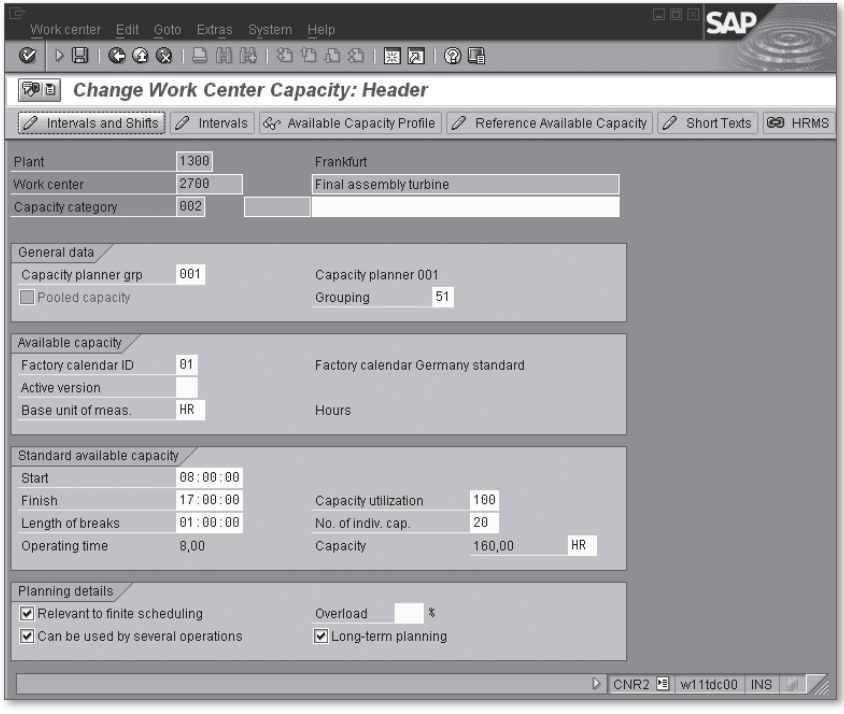

Figure 3.14 Example of a Work Center Capacity

Formula for capacity requirements

After you have defined the available capacity, in the work center enter a formula in the FORMULA REQUIREMENTS INTERNAL PRICING field for the capacity category. The formula determines how the capacity requirements are to be calculated from the activity data. Usually, the standard formula SAP008 is entered here. Figure 3.15 illustrates the definition of this formula. The SAP_07 parameter in the SAP008 formula is linked to the WORK field in activities or activity elements.

In Customizing, however, you can also define your own formulas (Transaction OP21) to consider values of other activity fields as well when calculating capacity requirements.[7] In the work center, you can first test the calculation of capacity requirements using a formula before you save

7 You can also include user fields in formulas. To do this, you must define a separate parameter for the corresponding user field and assign it to the user field in the field key definition. The parameter can then be used in the definition of a formula.

the work center. If you define your own formulas, however, note that the calculation of capacity requirements should always be clearly documented in the reporting.

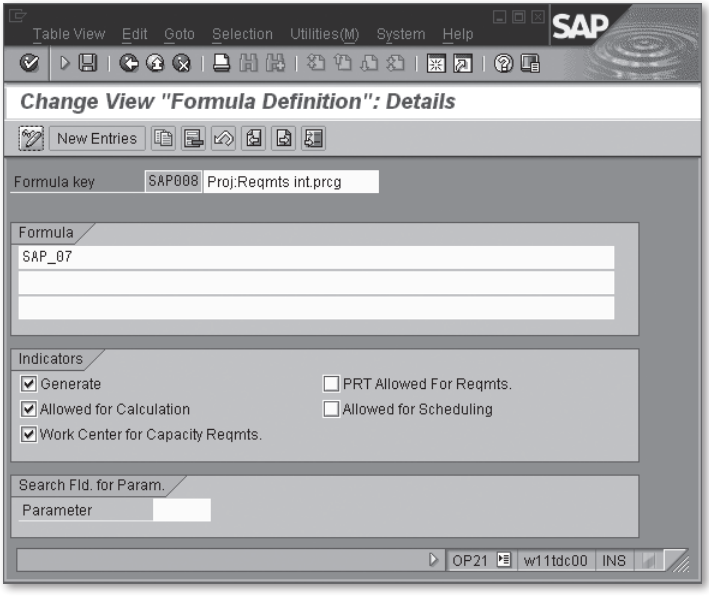

Figure 3.15 Definition of the SAP008 Formula

Distribution key

Using a distribution key in the work center, you can specify how the capacity requirements of an activity are to be distributed across the activity duration. A distribution key consists of a distribution strategy and a distribution function (see Figure 3.16). The distribution function determines — after which percentage of the activity duration — what percent of the entire capacity requirement is needed (see Figure 3.17). Among other things, the distribution strategy determines whether the distribution is to take place via the earliest or the latest dates of the activity (see Figure 3.18). In the standard version, various distribution keys are already defined, such as SAP030 (Equal distribution across the latest dates) or SAP020 (Equal distribution across the earliest dates). If you want, you can also define additional distribution keys, functions, or strategies in the Customizing of SAP Project System.

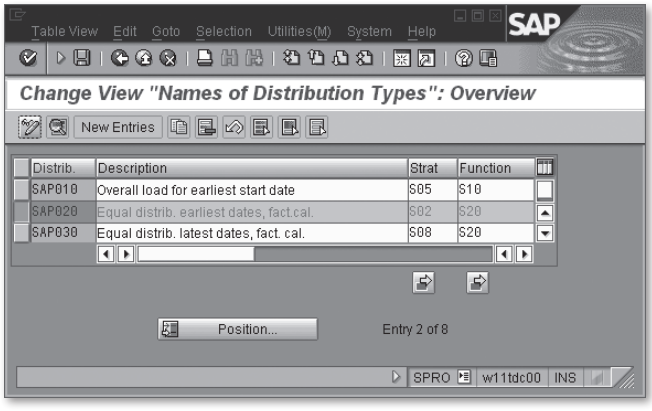

Figure 3.16 Definition of Distribution Keys

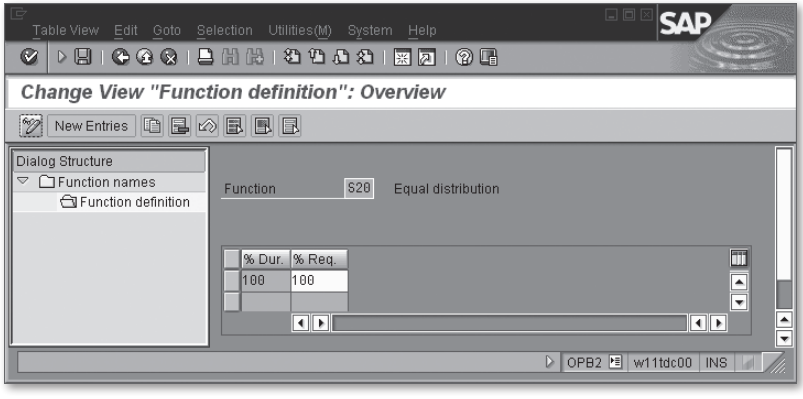

Figure 3.17 Definition of a Distribution Function

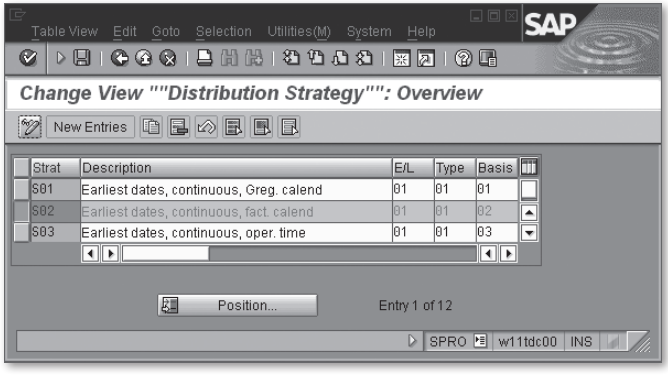

Figure 3.18 Definition of a Distribution Strategy

Prerequisites for Determining Capacity Requirements

To compare the available capacities shown in capacity reports with the corresponding capacities required by your projects, the network must meet various prerequisites:

- The network activities must contain work centers and planned work.
- The control key of the activities must be identified as relevant to the determination of capacity requirements (see Chapter 2, Section 2.3.2, Structure Customizing of the Network).[8]
- The calculation of capacity requirements must be enabled, that is, the CAPACITY REQUIREMENTS indicator must be set in the network header.[9]
- After you have enabled capacity requirements, a scheduling must have been performed.

Also note that a final confirmation or setting the status to TECHNICALLY COMPLETED sets the (remaining) capacity requirement of an activity to zero (0).

Determining the requirements distribution

If you want, you can enter a distribution key in the activities just like you would in a work center. Unless the report you use for the capacity evaluation provides a dedicated distribution key, the system determines the distribution of capacity requirements according to the following strategy:

1. Distribution key of the activity
2. Distribution key of the work center
3. Equal distribution across the latest dates of the activity

After you have created capacity requirements for a network, you can use various reports to compare the capacity requirements of the network plus the requirements of other projects or orders to the corresponding

8 If you want, you can perform your capacity requirements planning for suppliers as well, i.e., using externally processed activities or service activities, if the control key permits this. To do this, you need to define a separate work center with the appropriate required capacities for the supplier, and enter the work center on the Internal tab of the activity.

9 You can remove the CAPACITY REQUIREMENTS indicator from the network header at any time if capacity requirements are no longer required for a network. This may be relevant, for example, if a project is cancelled or stopped during the implementation phase.

available work centers or capacities, respectively. Figure 3.19 shows the capacity overview of the project planning board, which graphically illustrates the available capacities of work centers and the respective total capacity requirement using bars or histograms. Capacity overloads, that is, requirements that exceed the available capacities during a specific period, are highlighted in color. Additional detailed capacity reports are discussed in Section 7.3.3, Capacity Reports.

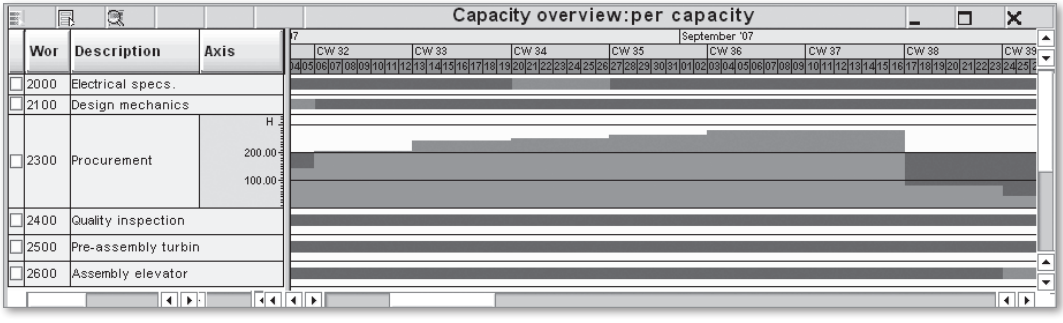

Figure 3.19 Capacity Overview of the Project Planning Board

Planned, remaining, and actual capacity requirements

During the implementation phase of projects, the capacity requirements are adjusted due to the completed work and forecast data from confirmations. Capacity reports therefore distinguish from among three different capacity requirements:

- **Planned Capacity Requirements**
  The capacity requirement resulting from the planned data of the activities.
- **Remaining Capacity Requirements**
  The current capacity requirements resulting from the originally planned requirements, the previously confirmed services, and possibly the forecasted remaining work.
- **Actual Capacity Requirements**
  The service that has actually been used and has already been confirmed.[10]

10 In addition to the relevant settings of the extended capacity reports, it is necessary for an analysis of actual capacity requirements that the relevant work centers determine actual capacity requirements.

3.2.2 Workforce Planning

A work center can consist of several available individual capacities; however, if you perform your capacity requirements planning only at the work center level, you won't be able to specify which individual capacity of the work center will provide the respective service. Therefore, you can't create meaningful capacity evaluations for the individual capacities.

Capacity splits

For some projects, however, you must plan individual capacities — particularly as far as personnel resources are concerned — to avoid an overload of individuals or to consider employees' qualifications when planning the project, for example. To do this, you can distribute the work via capacity splits, that is, split the planned work of an activity into individual capacities. Capacity splits can be individual machines, organizational units, or positions, for example. Usually, however, the SAP Project System performs a *workforce planning*, that is, a distribution with a direct reference to personnel numbers. The work distributed to a person can later be used as a default value for the time data recording using the time sheet Cross-Application Time Sheet (CATS) (see Chapter 5, Section 5.3.3, Cross-Application Time Sheet).

Prerequisites for Workforce Planning

HR master data

A prerequisite for workforce planning is that SAP Project System is provided with various HR master data. This can either be maintained in the system as HR mini–master records, or originate from an HR system. The minimum requirement is HR master data of the Infotypes 0001 (Organizational Assignment) and 0002 (Personal Data). If you want to consider the availability of the person or their qualifications in your planning, you will also need Infotypes 0007 (Planned Working Time) and 0024 (Qualifications). Another later use of the data in the timesheet also requires Infotype 0315 (Default Values Time Sheet).

[«]

Before you can distribute the work of an activity to individuals, you must have already determined the capacity requirements. This means you need at least one work center for workforce planning as well.

The persons to whom you want to distribute the work do not necessarily have to be assigned to that work center. Depending on the system settings, you can use the following personnel for workforce planning:

- Persons who are assigned to the work center of the activity
- Persons of a project organization
- Any personnel resources

Personnel assignment to work centers

There are two ways of assigning personnel to a work center. First, you can assign an organizational unit or an HR work center to the work center and therefore indirectly assign personnel. Second, you can directly assign positions or persons to the work center capacity. The benefit of this option is that you can use the total amount of availabilities of the assigned personnel included in capacity reports as the available capacity of the work center instead of the standard availabilities.

Project organization

Project organization refers to persons, positions, or organizational units that you assign to WBS elements as the default set for a later workforce planning. If you use Transaction CMP2 (Workforce Planning - Selection Project View), the system always first suggests the persons, positions, or organizational units of the project organization for your workforce planning. If you have not assigned a project organization to a WBS element, Transaction CMP2 of the system provides the project organization of the hierarchically superior WBS element for workforce planning. If you only want to store one project organization for the entire project, an assignment at the top project level will suffice. You can assign project organizations to WBS elements in Transaction CMP2, or in all processing transactions for work breakdown structures except Transaction CJ12 (Change WBS Element). Figure 3.20 shows an example of assigning a project organization to a WBS element.

If you want, however, you can plan personnel resources in your workforce planning that are not assigned to the work center or to your project organization. Depending on the transaction you use for workforce planning, however, you must explicitly enable this in the activity or the workforce planning profile.

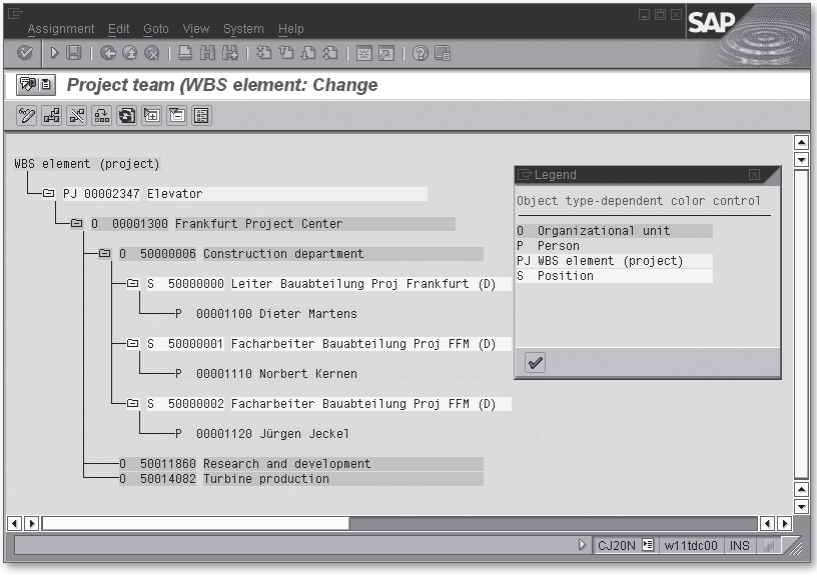

Figure 3.20 Example of a Project Organization

Ranking lists

If you want to take into account the qualifications of the personnel while planning the workforce (e.g., language skills, education, and so on), you can store a requirements profile in the activities that describes the qualifications required for accomplishing an activity. If you also defined the qualifications of the individual personnel resources (Transaction PPPM), the system can create a ranking list during workforce planning listing those persons who are best qualified to meet the requirements of the activity.

Workforce Planning Process

There are different ways to plan a workforce. You can assign persons to an activity on the PERSON ASSIGNMENT tab and specify the date, the planned work, and the permitted duration for every split. The system then automatically distributes the requirements across the specified duration (see Figure 3.21). You can use Transactions CMP2 (Project View) or CMP3 (Work Center View) for distributing your work to persons, positions, or organizational units. You can also manually distribute the work to different days or weeks, for example, or use the graphical or tabular planning board of capacity requirements planning to include capacity splits (see Section 3.2.3, Capacity Leveling). Lastly, you can use the

Open-PS interface (see Chapter 8, Section 8.1, Open PS for Microsoft Project) to export activity data and personnel data to Microsoft Project, to make a resource planning in Microsoft Project, and to reimport it into the SAP system. In contrast to a normal workforce planning, however, an activity element is created for every personnel assignment. An additional option is provided by the *Multi Resource Scheduling* function (MRS). MRS was developed as SAP Custom Development and can be licensed as an Adaptable Custom Solution (ACS). The MRS functionality provides specific expert functions for workforce planning that is needed in the context of service projects, for example.

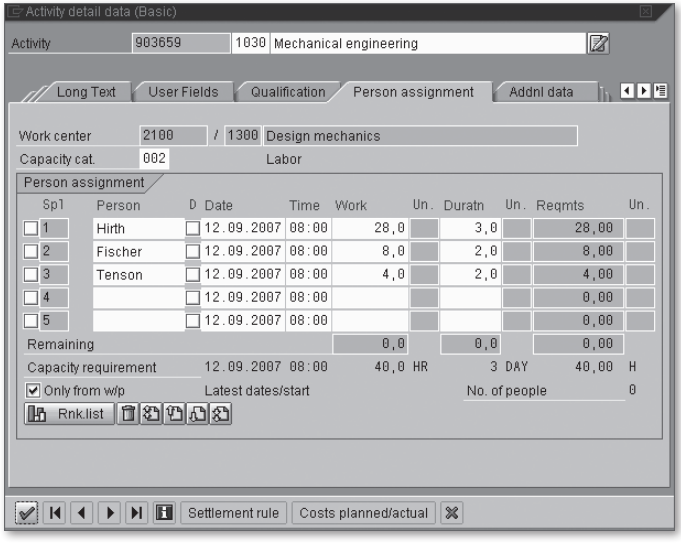

Figure 3.21 Person Assignment Screen of an Internally Processed Activity

Workforce planning profile

To use Transactions CMP2 and CMP3, you first need to define a workforce planning profile in Customizing (Transaction CMPC). Among other things, the profile specifies whether it is permissible to plan resources that don't belong to the work center or to the project organization, and which periods (e.g., days, weeks, or months) are to be used for planning.[11] If you use Transaction CMP9 to evaluate your workforce plan-

11 You can also define mixed period splits to make a day-based planning for the next period, for example, but only a week-based planning for activities that are based more in the future.

ning, you can use the profile to define traffic light functions (*exceptions*) indicating, for example, undistributed work or overloaded employees.

CMP2 (Project View)

In a workforce planning using Transaction CMP2 (Project View), you select the activities for workforce planning by specifying one or more projects, WBS elements, or networks. You receive a list of activities for which there are capacity requirements and then can create an assignment to organizational units, positions, or personnel resources (see Figure 3.22). If there is a project organization, it will be suggested for an assignment; however, you can also use the work center resources and — provided this is permitted by the profile — any other personnel resources.

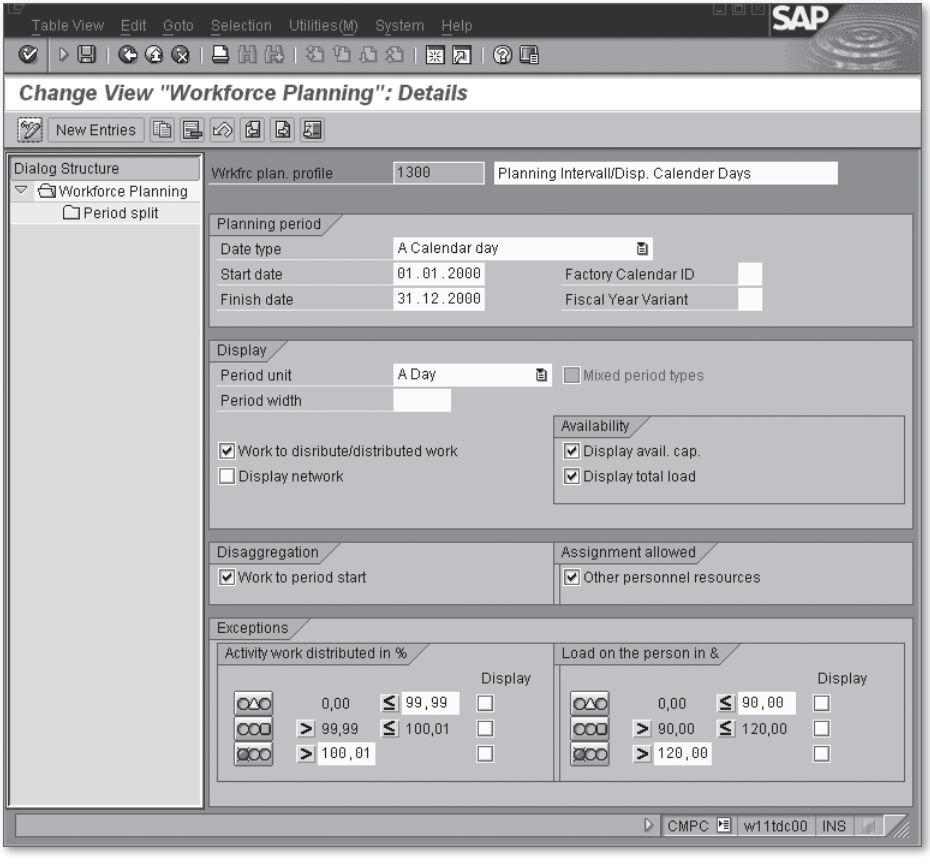

Figure 3.22 Example of a Workforce Planning Profile

However, the assignment of a resource is not sufficient t for workforce planning. In addition, you need to enter the period in which the resource is to accomplish the specified amount of the planned work of the activity. At first, the system only offers the period for distribution that covers the capacity requirements of the activity. If you want, however, you can also use different periods for workforce planning.

You can also display the availability (planned working time) or the total load[12] of the resources for each period. You can also display details of the activities or show the planned distribution of the activities' capacity requirements. Figure 3.23 shows an example of workforce planning using Transaction CMP2.

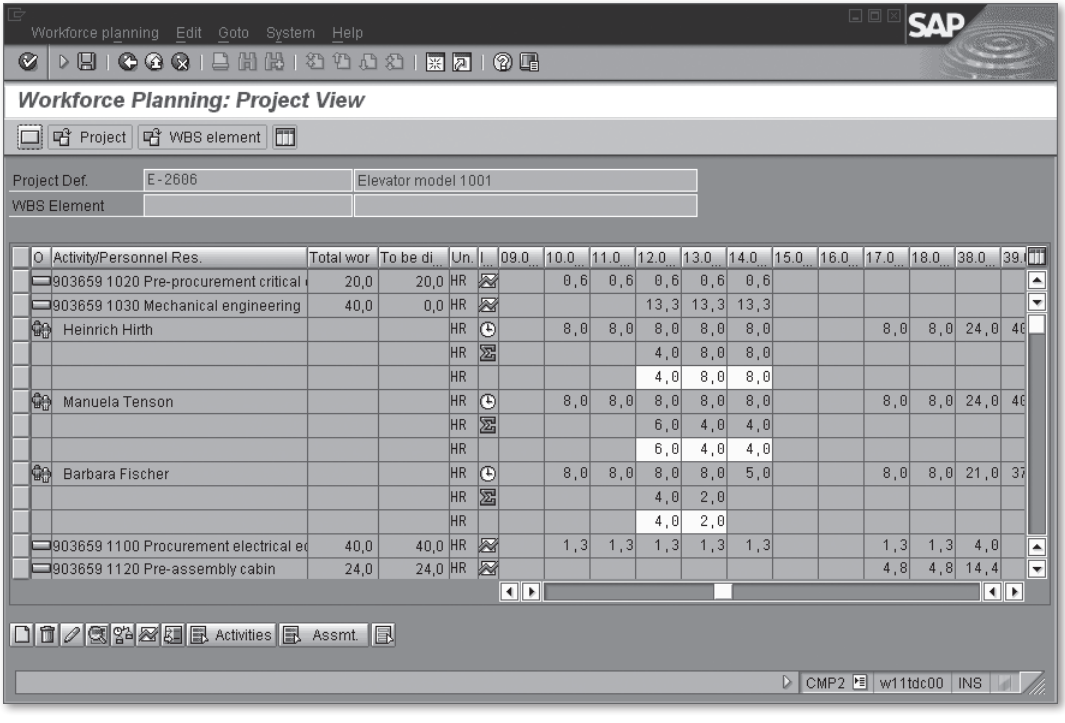

Figure 3.23 Example of Workforce Planning from the Project View

12 The total load shows a resource's total work distribution to network activities for a specific period. Work distributions to other order categories are not taken into account.

CMP3 (Work Center View)

Some companies don't have just one project manager who uses Transaction CMP2 for workforce planning; instead, the persons responsible for specific work centers do this planning. They can use Transaction CMP3 (Work Center View) to distribute work to the resources of their work center (see Figure 3.24). Resources and activities are selected by specifying one or more work centers.

You should note that during workforce planning — from a work center view — all activities that have capacity requirements for the selected work centers in the given period are read, and that the corresponding networks are consequently locked. We therefore recommend that you use Transaction CMP3 to explicitly specify those networks as filters for which you want to distribute work.

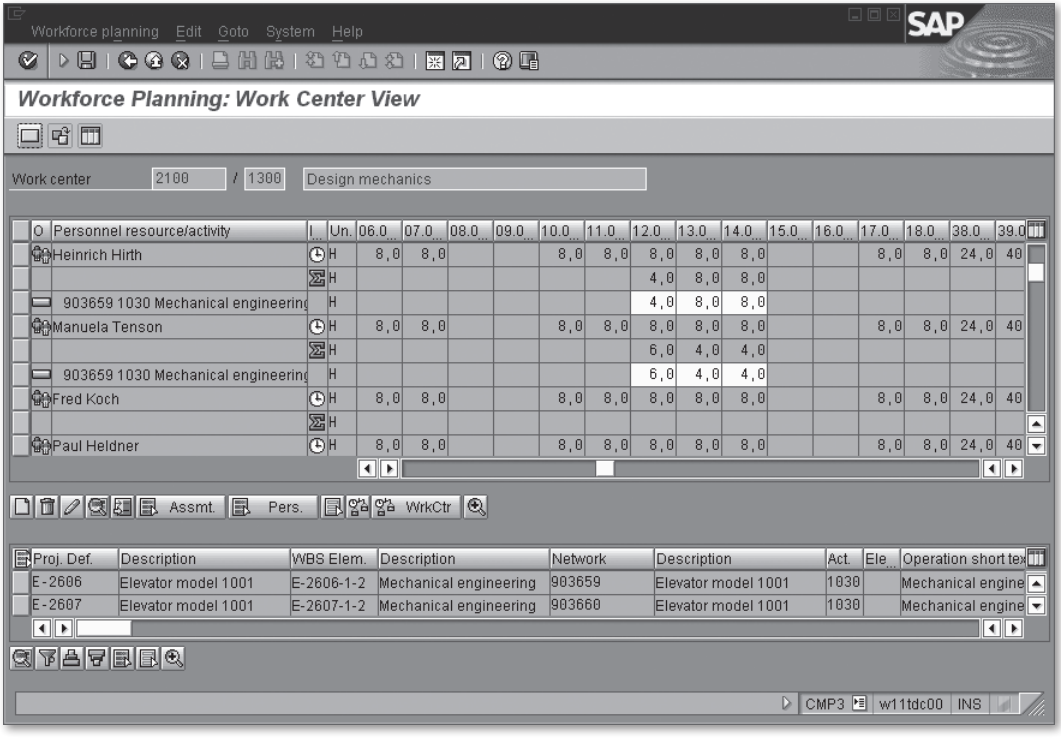

Figure 3.24 Example of Workforce Planning from the Work Center View

CMP9 (Evaluation)

After you have performed a workforce planning, you can evaluate it using the individual capacity reports or Transaction CMP9. In Transaction CMP9, you can use information about projects, work centers, or personnel resources for selecting workforce plannings. In the evaluation, you can use the exceptions defined in the profile to highlight overloaded resources, or activities with work that has not yet been completely distributed (see Figure 3.25).

If activity dates are shifted after a workforce planning has been completed, the RESCHEDULING indicator in the scheduling parameters for the network type (see Section 3.1.2, Scheduling with Networks) decides whether the workforce planning is to be shifted as well, or distributed work outside the new activity dates is to be deleted, for example.

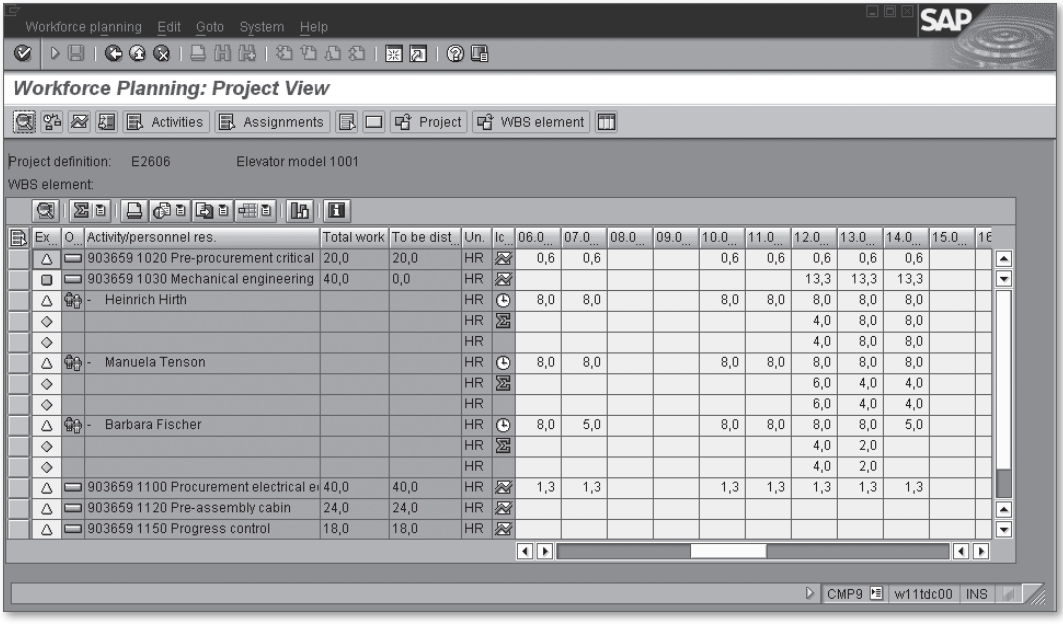

Figure 3.25 Example of an Evaluation of Workforce Planning

3.2.3 Capacity Leveling

Rescheduling

If, during your capacity requirements planning, you find that required resources are overloaded, you will need to adjust your planning. This is called *capacity leveling*. This can be, for example, an adjustment of

the time scheduling, that is, a chronological shifting of activities or increasing their duration. Capacity leveling can also include the creation of new activities or activity elements with additional work centers or resources. If necessary, you can also change the control key of an internally processed activity, and therefore the activity category, to procure the planned work externally (see Sections 3.2.4, External Processing, and 3.2.5, Service).

Capacity planning board

In a stricter sense, however, the term *capacity leveling* refers to the usage of graphical or tabular *capacity planning boards*, that is, specific capacity requirements planning tools for a fixed chronological planning of capacity requirements. These tools are used primarily in production for planning bottleneck work centers, for example, and are rarely used in companies for project planning.

When using a capacity planning board in capacity leveling, you must first select capacities and activities that have requirements for these capacities. Then, you can plan the requirements to be performed by the planned capacity or by a different one. The planning can be done manually, where either you specify the dates for the planning or they are specified automatically (e.g., the earliest or latest dates of an activity).

Scheduled status

Activities, for which you have planned the requirements by using a capacity planning board, automatically obtain the SCHEDULED status. All activity fields that are relevant to capacity requirements planning, like the planned work and duration, the work center, or the activity dates, are locked against being changed due to this status. You can only undo the planning of an activity in a capacity planning board if you shift the activity or change other capacity-relevant data.[13]

You can use capacity planning boards both for capacity leveling of work center capacities and for scheduling individual capacities of the work centers, like personnel resources.

Graphical planning boards

Graphical planning boards (see Figure 3.26) are based on Gantt chart presentations. The graphical area displays the capacity requirements and the periods they cover, and existing scheduled capacity requirements, as

13 If you changed any activity data during scheduling, like the work center or the dates, the original activity data is lost.

individual bars on a time axis. The tabular area shows information about the capacities and the requirements sources. Manual requirement plannings for capacities can be performed via drag and drop. If a capacity would be overloaded due to this planning,[14] you are informed via error messages in a planning log that this planning is not possible.

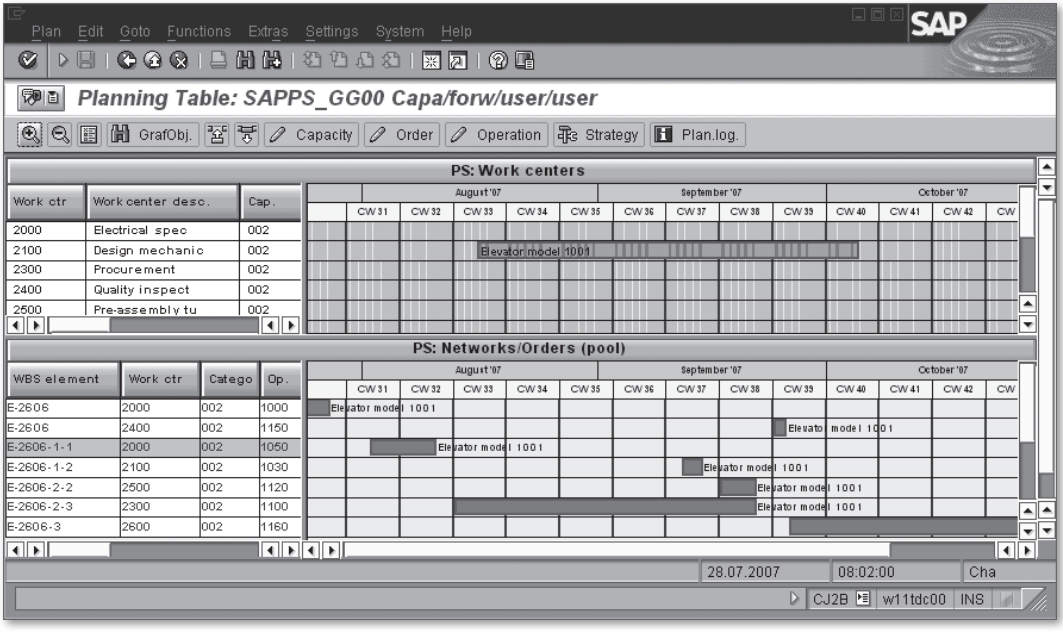

Figure 3.26 Graphical Capacity Planning Board

Tabular planning boards

Tabular planning boards present capacity data and the requirements of activities, and additional data of the requirement sources in a tabular format (see Figure 3.27). In contrast to graphical planning boards, the availabilities of the capacities can be displayed for the respective periods. This enables you to detect whether the capacity will be overloaded even before the planning.

14 When defining available capacities, you can explicitly specify a percentage by which the capacity may be overloaded in plannings.

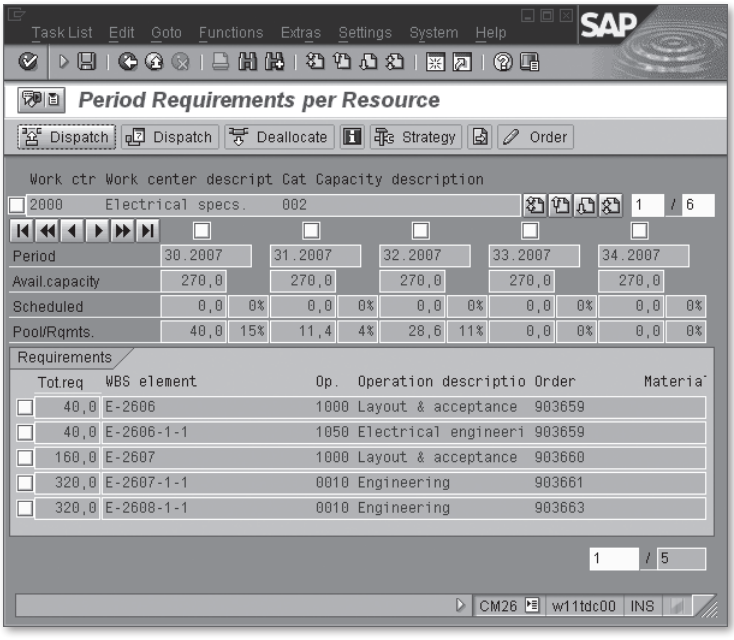

Figure 3.27 Tabular Capacity Planning Board

3.2.4 External Processing

Often, not all services necessary for completing a project can be provided by internal company resources. Using externally processed activities (or external elements, see Chapter 2, Section 2.3.1, Structure and Master Data), you can therefore plan, procure, and monitor services that are to be provided by vendors.

For a manual specification of external activities, you can use describing long texts, documents, or PS texts in SAPscript format, and enter a planned quantity and a unit of measure in an activity. For a cost planning of the external procurement, you can also specify a price per unit, the relevant currency, and a cost element (see Section 3.4.5, Network Costing). To consider the timeframe for the later procurement of the service in the scheduling process, you can store a planned delivery time or duration (see Section 3.1.2, Scheduling with Networks) in the activity. You can also specify a preferred vendor.

To automatically create purchase requisitions from the activity data later, you must also store a purchasing organization, a purchasing group, and the material group of the external activity in the activity. This organizational data, and the cost element, currency, and unit of measure, can be entered in the network profile (Transaction OPUU) as default values (see Chapter 2, Section 2.3.2, Structure Customizing of the Network).

Purchasing info records, outline agreements

Instead of manually entering specifications of the external activity, a price, a planned delivery time, the material group, and so forth in the activity, as described previously, you can also refer to *purchasing info records* or *outline agreements* from purchasing. If you store an info record for external processing or an outline agreement in an externally processed activity, the activity automatically uses all necessary purchasing data from these purchasing information sources. This data — except for the quantity — can no longer be changed manually in the activity.

Automatic creation of purchase requisitions

From the activity data, the system can automatically display a purchase requisition. Depending on the setting of the RES./PURC. REQ. field, this can be done even before the activity is released (IMMEDIATELY), automatically by setting the RELEASED (FROM RELEASE) status, or at a later stage. For the last option, first set the indicator to the NEVER value, and then change the setting to IMMEDIATELY later. The value of the RES./PURC. REQ. can be preset via the network profile.

The purchase requisition is automatically filled with all data relevant to the purchase. The system uses the latest end date of the activity as a delivery date in the purchase requisition. You can use a customer enhancement to influence the creation of a purchase requisition from the activity data. If relevant data in the activity is changed, the purchase requisition is adapted automatically. A manual change of the quantity, the material group, and the purchasing group taken from the activity is not possible in the purchase requisition.

Displaying purchase requisitions

From an externally processed activity, you can go to the display of the created purchase requisition at any time. In addition, the Purchase Requisitions for Project report is available in SAP Project System, for example, which enables you to analyze purchase requisitions of one or more

projects in a tabular form at the same time (see Figure 3.28).[15] You can also use the ProMan (see Chapter 5, Section 5.5.3, ProMan) to evaluate quantity or date information of purchase requisitions, for example, and to highlight deviations from your planning using traffic lights.

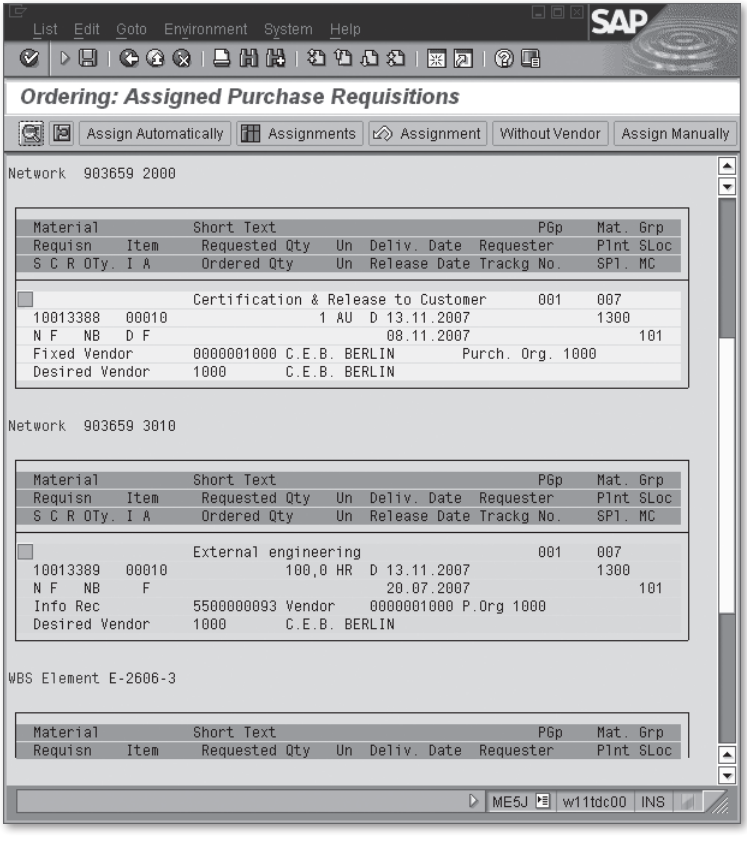

Figure 3.28 Tabular Presentation of Purchase Requisitions for a Project

Vendor selection

The automatically created purchase requisitions are also visible in purchasing and can be further processed by a responsible purchaser. Unless you referred to a purchasing info record or an outline agreement in the activity, the purchaser also selects the vendor. In purchasing, this can

15 From the Purchase Requisitions for Project report, you can also assign vendors or create orders, if necessary; however, these activities are usually handled by Purchasing.

be achieved, for example, via a bidding process or an automatic source determination.

Commitments

If a vendor has been selected and assigned to the purchase requisition, the data of the purchase requisition can be transferred to a purchase order. The purchase order authorizes the vendor to offer the services ordered for your project, provided that external activities can later be documented via goods or invoice receipts.

All purchasing documents are assigned to the activity so that not only can you analyze the planned costs, but the commitments according to the purchase requisition and purchase order, and the actual costs of the external service performed for the activity or the network, respectively. The purchasing process and the corresponding value flows are discussed in detail in Chapter 5, Project Execution Processes.

Document type and account assignment category

In the Customizing section of SAP Project System (Transaction OPTT, see Figure 3.29), you define the *document type* for networks, which is to be used for creating the purchase requisition, and in the ACCT. ASSGMT. GEN. field, you specify the *account assignment category* that controls the value flows of the purchase requisition and all subsequent purchasing documents. These settings are consistently implemented for all networks, regardless of the plant or network type.

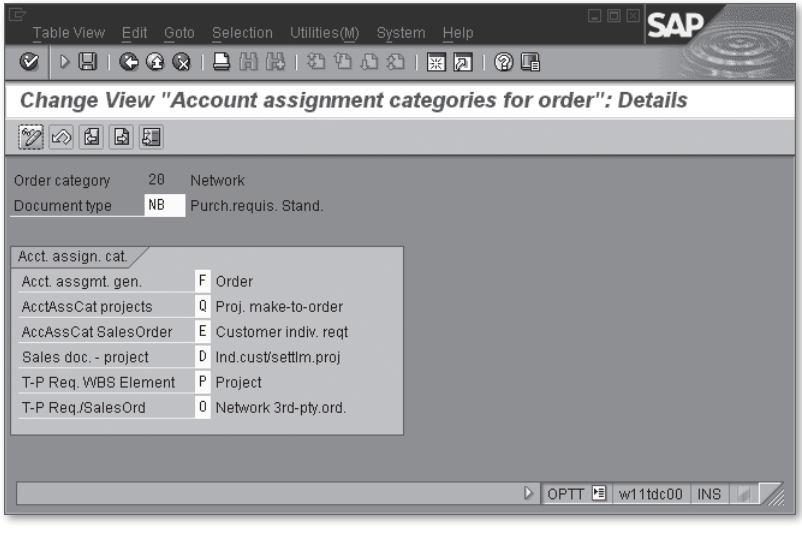

Figure 3.29 Determination of the Account Assignment Categories for Networks

In Network Type Parameters (Transaction OPUV), you can specify per plant and network type whether a separate purchase requisition is to be created for every externally processed activity (and every service operation and every purchased part [see Section 3.3.1, Assigning Material Components]), or whether only one purchase requisition is to be created per network, with one item for every external procurement (collective purchase requisition).

As of EhP 3, you can decide how to best summarize purchase order-relevant items within a project, even across different networks, if necessary. To do that, you must activate the same grouping indicator in the PR coll indic. field for all externally processed activities and service activities, and for every purchased part you want to aggregate. Grouping indicators have to be defined in the project definition in advance

External purchasing systems

If you're implementing an external purchasing system, you can specify for combinations of purchasing and material groups that purchase requisitions are transferred directly to the external purchasing system and that any further purchasing processes are performed there. You can also use a customer enhancement to determine criteria for selecting the purchase requisitions to be transferred.

3.2.5 Service

If your company's purchasing department also supports the procurement of services using service specifications and acceptances of services performed, SAP Project System provides service activities and service activity elements for planning and procuring such services. Similar to externally processed activities, services to be provided by external vendors are planned using service activities by specifying purchasing info records or outline agreements, if necessary. For service activities, purchase requisitions can then be created from activity data as well, and purchasing processes can therefore be triggered automatically.

Service specifications

Contrary to an externally processed activity that you simply use to plan and procure an individual external activity, you can use a service operation to plan several vendor services in one step and specify additional information about services that cannot yet be defined in detail. When creating a service operation, the system prompts you to create *service specifications* (see Figure 3.30).

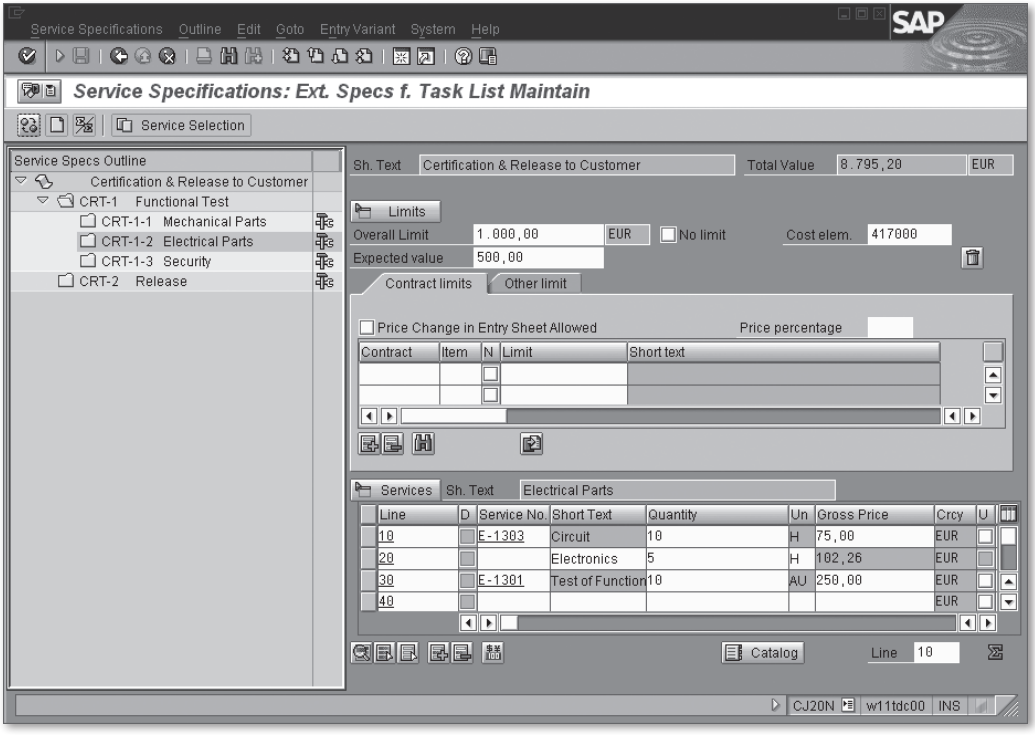

Figure 3.30 Example of Service Specifications

In service specifications, you can create a list of planned services in a hierarchical structure, if necessary. To do this, you can use *service master records* from purchasing that might already store various data of a service. Using the purchasing condition technique, prices for service master records can then be automatically determined and used for calculating the activity. You can also select services from other service specifications, for example, from existing purchasing documents or other networks or purchase orders, and copy them into your service specifications.

Model service specifications and standard service catalogs

In purchasing, *model service specifications* can be defined that can then serve as a template for creating service specifications in the network activity. In some branches, it is common practice to specify services using standardized text modules. In purchasing, this can be mapped via *standard service catalogs*. If you refer to a standard service catalog in your service specifications, you can then plan services by selecting individual text modules.

Catalogs

As of SAP ECC Release 5.0, you can also call intranet or external Internet catalogs from service specifications to select services from these catalogs, and transfer them to the service specifications. This is implemented via the Open Catalog Interface (OCI) (see Section 3.3.1, Assigning Material Components).

Unplanned services

Frequently, not all services can be planned in detail before a project starts, because the required services may depend on the course of the project, for example. In addition to planned services, you can also specify information about unplanned services in the service specifications. To calculate a service operation, you can store an expected value for unplanned services in the service specifications. This value and the total value of planned services add up to the planned costs of the activity.

Limit of values

In addition, you can limit the value of unplanned services by entering a limit of values in the service specifications. If the vendor later provides services that you didn't explicitly specify in the service specifications, the value of this unplanned service is checked against the limit of values. If the value of the unplanned services exceeds the specified limit, the entered services cannot be saved.

External services management

Another difference between externally processed activities and service activities can be found in further purchasing management. At first, a vendor selection and the purchase order implementation take place for a purchase requisition of a service operation in purchasing as well. While, depending on the account assignment category, a goods receipt can be posted to document services for externally processed activities, service activities always require a service entry and an acceptance of services performed. More purchasing management details for service activities are discussed in Chapter 5, Section 5.4.2, Service.

Purchase requisitions due to service activities use the same document type and the same account assignment category as externally processed activities (Transaction OPTT). Depending on the material and purchasing group of the purchase requisition, a transfer to an external purchasing system can be performed as well. In the network profile (Transaction OPUU), you can store default values for service operations in the activity, which cover the cost type of the planned services, the material and purchasing group, and the unit of measure.

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