Microsoft Dynamics® AX 2012

Implementing the Operations Resource Model for Microsoft Dynamics AX 2012 applications

White Paper

This document describes new patterns used for representing resources, resource capabilities, and resource groups as well as new patterns for specifying the resource requirements of operations in a route. It provides details about the new patterns and how to implement and upgrade to them.

Date: January 2011

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Overview

The new operations resource model introduced in Microsoft Dynamics® AX 2012 increases the flexibility and versatility of the application while reducing the amount of master data to maintain. The new model enables the process designer to describe production processes without having to make references to specific machines, tools, or workers in the routes. As a result, the process designer can avoid making scheduling decisions at design time, can model the production environment in Microsoft Dynamics AX as it is laid out on the shop floor, and can handle changes over time. This unified operations resource model integrates resource information across the application and ensures that capacity reservations are respected.

Application developers who are building a new application for Microsoft Dynamics AX 2012, or who are updating existing applications, should be aware of several new concepts and features:

- Only resource groups have fixed locations.

- Over time, resources may be assigned to different resource groups at different locations.

- There may be times when a resource is not assigned to any resource group.

- A resource is only schedulable when assigned to a resource group, and only when the resource group is not marked as a lean work cell.

- Resources of different type and with different capabilities may be assigned to the same resource group at the same time.

- The capacity of a resource group is the sum of the capacity of the resources assigned to the resource group. That is, it has no inherent capacity of its own.

- Capabilities describe what resources are able to do.

- It is typically not known until the operation is scheduled what resource(s) will perform a given operation.

This document does not discuss all of the new resource management and scheduling functionality. Instead, this document focuses on the development patterns and how they are implemented so that the application developer can take full advantage of these new concepts and features.

A comprehensive list of new tables and their replacements can be found in the Appendix, which also contains data model diagrams for the core entities.

Audience

This document targets developers building new applications for Microsoft Dynamics AX 2012 as well as developers updating their existing application code and data.

Terminology

Microsoft Dynamics AX 2012 terms:

Term	Definition
Capability	The ability for a resource to perform a given activity at a specified capability rate (where applicable).
Resource	Anything that is used for the creation, production, or delivery of a good or service beyond the materials consumed in the process. These can be of type Tool, Machine, Human Resource, Location, or Vendor.
Resource group	A group of resources that may or may not have similar capabilities. A resource group typically corresponds to a project team or a physical area on the production floor and must be based on one (and only one) Site.

How to Use this Document

This white paper highlights new patterns used for representing resources and their capabilities, as well as the new patterns for specifying resource requirements on route operations. It provides details about

the new patterns and how to implement them. It also describes existing patterns that are being replaced, and how a developer might update their legacy code.

Changes to the data model

This section describes the changes to the data model that were made to support the operations resource model.

Data model diagrams of table relationships can be found in the Appendix section of this document.

Resource groups

In Microsoft Dynamics AX 2012, the legacy concept of *work center groups* is replaced by the concept of *resource groups*. Beyond serving as a mechanism for organizing work centers into logical groups, work center groups had significance with respect to scheduling because all work centers in a work center group were considered interchangeable. In Microsoft Dynamics AX 2012, a resource group still serves as a vehicle for organizing resources, but the scheduling engine no longer assumes those resources to be interchangeable. Hence, the resource group now can be viewed as representing a physical area where resources are located on the production floor, often delineated by a yellow line on the floor.

Legacy

Both work centers and work center groups previously were stored in the same table (WrkCtrTable). The Boolean field IsGroup would determine whether the record represented a work center or a work center group. A single calendar was assigned to the group and any deviations to this calendar were stored per date in the WrkCtrDateCalendar table.

The work center was associated to a single work center group determined by the WrkCtrGroupId field, and some fields like SiteId were persisted on both the work center and the group and had to be kept in sync.

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Both resources and resource groups are still stored in the WrkCtrTable. However, the field that determines what the record represents is now named IsIndividualResource, and it has the reverse semantics of the previous IsGroup field. Also, some information that previously would have been stored in the WrkCtrTable table but which applies only to resource groups—such as site and production unit—has been separated into the new table, WrkCtrResourceGroup. Any code that previously would have referenced a WrkCtrId of the work center group type now holds a foreign key to the RecId of the WrkCtrResourceGroup table instead.

The calendar information for the resource groups is now stored in a separate table, WrkCtrResourceGroupCalendar, with effective dates. The semantics of this calendar has changed and it no longer defines the group's capacity. Instead, it defines the opening hours of the group when used for operations scheduling. The operation scheduling capacity of the resource group is calculated as the sum of the capacity of each of the resources in the resource group.

Resources are allocated to the group through the resource group membership table, WrkCtrResourceGroupResource. The entries in this table also have effective dates, and this allows the resource to be allocated to multiple resource groups over time. However, a resource may not be a member of more than one resource group at any point in time (although there may also be times when a resource is not a member of any groups).

A resource group can also play the role of a lean work cell by setting the IsWorkCell on the WrkCtrResourceGroup. This will make the scheduling engine ignore both the resource group and any resources allocated to the resource group during scheduling.

Resources

The legacy concept of *work centers* has been enhanced and renamed to *resources* in Microsoft Dynamics AX 2012.

Legacy

Work centers were stored in the WrkCtrTable and could be created only in the context of a work center group. During creation, most fields on the work center were defaulted from the group.

A single calendar was assigned to the group and any deviations to this calendar were stored by date in the WrkCtrDateCalendar table.

Microsoft Dynamics AX 2012

Resources are still stored in the WrkCtrTable, but they are now created independently of the resource group. For this reason, it is no longer possible to provide default values for most fields.

The calendar and the production input location of the resource are now stored in the resource group membership table. That is because this information is dependent on the site context, and because the site context for a resource is not known unless it is allocated to a resource group.

Because the allocation of resources to resource groups has effective dates, calendar deviations are made by creating a new assignment of the resource to the same resource group, but using a different calendar for the specified period.

Capabilities

Capabilities are a new concept in Microsoft Dynamics AX 2012. They describe what resources can do. When designing a route, the requirements that resources need to perform the various operations in the route can be expressed as the set of resource capabilities. This allows the allocation of resources to be deferred until production is scheduled.

The functionality provided through capabilities in Microsoft Dynamics AX 2012 is in many ways an enhancement of the functionality provided through task groups in previous releases, because capabilities enable consideration of alternate resources during scheduling.

Microsoft Dynamics AX 2012

Capabilities are stored in the WrkCtrCapability table and are shared across all companies. Unlike task groups in the previous version, which could only contain work centers from a single site, in Microsoft Dynamics AX 2012, resources from multiple sites and even multiple legal entities can have the same capability assigned.

Capabilities can be assigned to resources. The assignments have effective dates and are stored in the WrkCtrCapabilityResource table. A resource can be assigned multiple capabilities at the same date, and for each assignment, it is also possible to set a priority and level (corresponding to the legacy Requirement field).

It is not possible to assign capabilities directly to resource groups. At any point in time, the resource group has the collective set of capabilities provided through the resources that are part of the resource group at that time.

Activities and activity requirements

The Microsoft Dynamics AX scheduling engine is able to create capacity reservations based on requirements from a variety of sources, including production routes and project hour forecasts. In Microsoft Dynamics AX 2012, an entity named *activity* has been introduced to create a common abstraction of the unit of work to be performed by one or more resources.

Legacy

In several places in the system—for example, on a production route operation (ProdRoute table)—it was possible to specify a work center or work center group ID and an alternative task group ID that served as input to the scheduling engine for where to schedule the operation.

Microsoft Dynamics AX 2012

A common Activity (WrkCtrActivity table) has been introduced. This is an abstraction for existing entities like the production route operation. This entity exists in the data model only and so is not directly visible from the user interface. Each of the existing interfaced entities will have a 1:1 relationship with a WrkCtrActivity record through one of the following new tables.

Relationship table (new)	EntityType	Related table
WrkCtrPBATreeRouteOprActivity	PBATreeRouteOpr	PBSTreeRouteOpr
WrkCtrPCRouteOperationActivity	PCRouteOperation	PCTemplateComponent
WrkCtrProdRouteActivity	ProdRoute	ProdRoute
WrkCtrProjForecastEmplActivity	ProjForecastEmpl	ProjForecastEmpl
WrkCtrRouteOprActivity	RouteOpr	RouteOpr

For an activity, the amount of resources needed and the maximum load percentage must be specified. This formerly was defined in the WrkCtrNumOf and WrkCtrLoadPct fields on each of the base entities like ProdRoute. In Microsoft Dynamics AX 2012, however, it is defined in the activity requirement set (WrkCtrActivityRequirementSet) table. Note that, in Microsoft Dynamics AX 2012, there must always be a 1:1 relationship between the set and the activity, even though the data model actually allows a 1:* relationship.

There can be multiple activity requirements for each activity requirement set. In order for a resource to be applicable for an operation, the resource must meet all the requirements. The base table for requirements is WrkCtrActivityRequirement. However, depending on which type of entity is required, the actual requirement is stored in an entity-specific relationship table:

Relationship table (new)	Relationship type	Related table
WrkCtrActivityResourceTypeRequirement	ResourceType	None
WrkCtrActivityResourceRequirement	Resource	WrkCtrTable
WrkCtrActivityResourceGroupRequirement	ResourceGroup	WrkCtrResourceGroup
WrkCtrActivityCapabilityRequirement	Capability	WrkCtrCapability
WrkCtrActivitySkillRequirement	Skill	HcmSkill
WrkCtrActivityCourseRequirement	Course	HrmCourseTable
WrkCtrActivityCertificateRequirement	Certificate	HcmCertificateType
WrkCtrActivityPersonTitleRequirement	PersonTitle	HcmTitle

Microsoft Dynamics AX 2012 allows users to defer selection of resources until scheduling, which can pose a problem for making production order cost estimates. That is because cost estimation takes place before scheduling, but the resource on which costs will be based has not yet been selected. To mitigate this problem, it is now possible to optionally specify a costing resource on the route definition. If a costing resource is not set during route definition, the first applicable resource will be used as the basis for the costing, which might lead to production variances later in the process.

Code patterns

This section describes the code patterns that need to be implemented to use the operations resource model.

Resource group for a resource

In this scenario, you want to write code to identify the resource group to which a resource belongs on a specific date.

Consider a scenario for a table named Table1. In this scenario, Table1 has the fields WrkCtrId and TransDate (transaction date), which you want to use to show the ID of the work center group that the work center belongs to on the transaction date.

In the legacy version of Microsoft Dynamics AX, this could be done by inner joining Table1 to WrkCtrTable on the WrkCtrId field, and then displaying a WrkCtrTable.WrkCtrGroupId field.

In Microsoft Dynamics AX 2012, however, the method of identifying the resource group to which a resource belongs on a particular date depends on assumptions about the data. In the Table1 scenario, those assumptions would be derived from the following questions:

1. Will the WrkCtrId always be that of an individual resource or might it be assigned a resource group identifier?

   If the WrkCtrId can represent only an individual resource, then for performance reasons the view WrkCtrTableIndividualView should be joined with Table1. Otherwise, you must use WrkCtrTableResourceAndGroupView, which is the more expensive in terms of performance. Please note that both of these views are limited to the current company.

2. Must the resource group membership be determined as of the transaction date or as of a fixed date?

   If the resource group membership is needed as of the transaction date, a join between Table1 and the view must be inserted in the **init** method of the view data source like this:

```
qbdsWrkCtrResourceAndGroupView.addRange(fieldnum(WrkCtrResourceAndGroupView,ValidFrom)).value(
        strfmt('(%1.%2 <= %3.%4)',
        WrkCtrResourceAndGroupView _ds.name(),
        fieldstr(WrkCtrResourceAndGroupView,ValidFrom),
        this.query().dataSourceTable(tablenum(Table1)).name(),
        fieldstr(Table1,TransDate)));

qbdsWrkCtrResourceAndGroupView.addRange(fieldnum(WrkCtrResourceAndGroupView,ValidTo)).value(
        strfmt('(%1.%2 >= %3.%4)',
        WrkCtrResourceAndGroupView _ds.name(),
        fieldstr(WrkCtrResourceAndGroupView,ValidTo),
        this.query().dataSourceTable(tablenum(Table1)).name(),
        fieldstr(Table1,TransDate)));
```

   If the current resource group membership is required, then the ranges are simpler:

```
qbdsWrkCtrResourceAndGroupView.addRange(fieldnum(WrkCtrResourceAndGroupView,ValidFrom)).value(
        SysQuery::range(null, _fixedDate));

qbdsWrkCtrResourceAndGroupView.addRange(fieldnum(WrkCtrResourceAndGroupView,ValidTo)).value(
        SysQuery::range(_fixedDate, null));
```

3. Will the resource always be a member of a resource group on the transaction date?

   In many cases, it is known that the resource is a member of a resource group on the transaction date because this is required to be able to determine such things as site membership. In these cases, the view chosen should be inner joined to Table1, otherwise an outer join must be performed (which is more expensive in terms of performance).

Resource lookups

In this scenario, you want to write code to lookup the information about resources.

For fields of type WrkCtrId, the default lookup will only show basic information, such as Resource (the ID), Description, and Type. If additional information like the resource group membership is needed, the lookup method of the data source field or form control can be overridden and the following code added:

```
WrkCtrTable::lookupWrkCtrId(_formControl);
```

This example displays the Resource, Description, Type, Resource group, Site, Production unit, Worker, and Vendor fields. The date-dependent data will be retrieved as of the current system date and both individual resources and resource groups will be included in the list. If needed, the lookup can be filtered to include only resources and resource groups from a specific site, from a specific production unit, or from a specific resource group, and it can be set to include only individual resources and not the groups.

Resources allocated to production routes

In this scenario, you want to write code to look up information about resources that have been allocated to production codes.

Consider a scenario where the field Table1.WrkCtrId is initialized from the ProdRoute.WrkCtrId field.

In Microsoft Dynamics AX 2012, the WrkCtrId field has been removed from the ProdRoute table. It is now replaced by the activity requirements and the costing resource field, WrkCtrIdCost. In this scenario, only a single resource ID or resource group ID is needed, and hence the new method prodRoute.getResource can be used. When using this API, the following parameters must be taken into consideration:

- **boolean _getScheduled**: This parameter determines whether the scheduled resource (or resource group, in the case of operations scheduling) should be retrieved from the capacity reservations. By using this option, the **getResource** method will find something only if the route group of the operation is set to actually reserve capacity.

- **boolean _findCostingResource**: This parameter determines whether the costing resource (if specified) should be used if no scheduled resource or resource group could be found.

- **boolean _findFirstApplicable**: This parameter determines whether the first applicable resource should be used if no scheduled resource or costing resource could be found. A resource is considered an applicable resource if it matches the activity requirements and if it is assigned to a resource group that is not marked as a lean work cell.

- **boolean _findGroupForMultipleResource**: When the production route has been scheduled by using job scheduling and the operation has a requirement for more than one resource, multiple individual job records will be scheduled, each with different resources assigned. In this case, this parameter determines whether to return a) the first scheduled resource or b) the resource group of the first scheduled resource.

- **TransDate _searchFromDate/_searchToDate**: This parameter is the date interval in which to search for applicable resources.

Applicable resources

A resource is considered applicable for an operation on a specific date if both of the following conditions are true on that date:

- The resource matches the activity requirements of the operation.

- The resource is assigned to a resource group that is not marked as a lean work cell.

To find the resources that are applicable for an operation, the activity requirement set must first be found. Depending on the need, the activity requirement set then offers two main APIs for finding the applicable resources:

- **applicableResourcesList** will return the IDs of all applicable resources in a simple list.

- **applicableResourcesQuery** will create a query object with the WrkCtrTable as the primary data source.

For both APIs, you must decide whether the output should be the resources that satisfy job scheduling requirements or operation scheduling requirements. (Do not use both options because that would result in too restrictive a search.)

An example of the method's usage can be seen below:

```
query = wrkCtrActivityRequirementSet.applicableResourcesQuery( searchFromDate,
                                                               searchToDate,
                                                               inventSiteId,
                                                               schedMethod == SchedMethod::Detail,
                                                               schedMethod == SchedMethod::Rough);
```

Data upgrade

This section describes upgrades that have been implemented for the core system and issues to take into consideration when creating your own upgrade scripts. Most of the post-upgrade code for the resource model can be found in the **ReleaseUpdateDB60_Prod** class.

Pre-upgrade validations

For resource model changes, a number of pre-upgrade validations will give warnings if data setup is preventing a consistent upgrade to Microsoft Dynamics AX 2012. For customized elements, you should consider whether these validations should be expanded.

Issue	Mitigation
The work center is linked to an employee even though the work center is not of type "human resource." The employee information of the work center will be lost during upgrade.	Change the work center type to "human resource" to avoid having the employee information removed during upgrade.
The site of the work center group and of the associated warehouse must be the same.	Change the warehouse on the work center group.
The work center must be of type "vendor" and must be linked to the same vendor as the group.	Change the type on the work center to "vendor" and assign it to the same vendor that the group has.
The warehouse on the work center differs from the warehouse on the corresponding work center group. All work centers in a work center group must have the same warehouse as the work center group.	Change the warehouse of the work center or the work center group.
The work center must be linked to the same vendor as the group.	Assign the same vendor to the work center that the group has.
The work center is of type "vendor" but is associated to a work center group that is not of type "vendor."	Either change the type on the work center group to "vendor" or change the type of the work center to something other than "vendor".
The work center is linked to a vendor even though the work center is not of type "vendor." The vendor information of the work center will be lost during upgrade.	Change the work center type to "vendor" to avoid having the vendor information removed during upgrade.
The picking location of the work center is invalid. A Warehouse Management System (WMS) location from the warehouse must be associated with the work center group.	Change the picking location on the work center.
The work center is not a member of the task group, even though the task group is used for providing work center alternatives to the work center.	To minimize the number of capabilities created during upgrade, consider adding the work center to the task group.
The work center group is not a member of the task group, even though the task group is used for providing work center alternatives to the work center group.	To minimize the number of capabilities created during upgrade, consider adding the work center group to the task group.

Work centers and work center groups

The primary WrkCtrTable entity still holds both the individual resources and the resource groups, but for each resource group an additional record is inserted into the WrkCtrResourceGroup table. In the legacy system, only a single location and warehouse could be set on the work center group. However, because this is now split into an input and an output location or warehouse, both of the new field pairs will be populated with the same location or warehouse.

For each resource group, a record also is created in the WrkCtrResourceGroupCalendar table, and the calendar is assigned to the group in the date range of {datenull, maxdate}. If any calendar deviations existed for the resource group, then the WrkCtrResourceGroupCalendar record is split into three parts

that differ only on the CalendarId field, with the following date intervals set: {datenull, deviationDate-1}, {deviationDate, deviationDate}, and {deviationDate+1, maxDate}. The splitting is done for each deviation. However, the date intervals are kept as large as possible, so if two deviations have adjacent dates, then only a single split is performed.

Each individual resource is connected to the resource group, also in the date range of {datenull, maxdate}. For resources, the calendar deviations are handled similarly to those of the resource group calendar.

Task groups

Among the pre-upgrade tasks when upgrading from a legacy version of Microsoft Dynamics AX is defining the mapping between the existing task groups and the new capabilities. This must be done because the task groups were company-specific while the capability definitions are shared among the legal entities. This mapping can be done three ways:

- Map task groups having the same ID to the same capability. This consolidates the task groups across all companies.

- Map 1:1 between task groups and capabilities. If two task groups with the same ID exist in two companies, then the TaskGroupId will be suffixed with the company name to ensure uniqueness.

- Same as above, but manually adjust the mappings to merge some of the task groups into one.

The mappings are stored in the table DEL_WrkCtrTaskGroupCapability in the legacy version and then used during the post-upgrade steps in Microsoft Dynamics AX 2012.

In the legacy versions, it was possible to add a work center group to a task group. In the new model, only individual resources can have capabilities. That means all work center group assignments in a task group will be exploded and each of the individual resources in the group will be connected to the capability through the WrkCtrCapabilityResource table.

Operations

A similar upgrade regarding the work centers will be done for the following tables: ProdRoute, RouteOpr, and ProjForecastEmpl.

Each record in these tables will have the costing resource field WrkCtrIdCost defaulted to the value of the legacy WrkCtrId field, which means that if the existing operations are costed again, the result will be the same as previously.

For each operation, a new record will be created in the WrkCtrActivty and WrkCtrActivityRequirementSet tables as well as in the related activity table, e.g., WrkCtrProdRouteActivity or WrkCtrRouteOprActivity. A record also will be inserted into the WrkCtrActivityRequirement table, but the type of requirement will depend on which fields had been set on the original record.

- **The WrkCtrId field was set to a specific work center and no task group had been set.**
  A requirement directly for the individual resource will be created.

- **The WrkCtrId field was set to a work center group and no task group had been set.**
  A requirement for the resource group will be created.

- **The WrkCtrId field was set to a specific work center and a task group had been set.**
  In previous versions, setting the task group was a way of specifying alternate resources to the work center. This meant that the work centers that could be used for the operation were the specified work center plus all work centers that were members of the task group. To mimic this behavior in Microsoft Dynamics AX 2012, you must determine whether the resource has the capability of the corresponding task group assigned. If this is the case, then a requirement for the capability will be inserted. However, if the resource does not have the capability assigned, then a new capability must be created to maintain the same number of applicable resources for the operation. The new capability will be named the same as the existing capability, but the name will be suffixed with "_" followed by the resource ID. All members of the existing capability will also be assigned to the new capability, but the additional resource will be included. The requirement of the operation will then point to the new capability.

- **The WrkCtrId field was set to a work center group and a task group had been set.**
  This case will have behavior similar to the preceding case, but with this difference: when checking for capability membership, all the resources in the specified group must possess the capability for it to be applied.

Product builder operations

In the product builder tree route operation PBSTreeRouteOpr table it was possible in the legacy version to define all settings regarding the work center and task group as either a value or a variable. In Microsoft Dynamics AX 2012, the resource requirements must be specific values only. The issue is that it is only possible to get a deterministic upgrade if the source is a fixed value and not a variable. To remedy this, a pre-upgrade task has been introduced in which a fixed value must be provided for all PbaTreeRouteOpr records that previously used a variable field.

Once this has been set, the upgrade will be done the same way as the other operation records following the same algorithm.

Maintaining resource requirements after upgrade

After the upgrade to Microsoft Dynamics AX 2012 is complete, routes will have the same functionality but also the same limitations as before the upgrade where route definitions are tightly coupled to the specific resources or groups. To take full advantage of the benefits of the new model and enable more generic route definitions, it will be necessary to make sure that the system reflects the real-world capabilities, skills, courses, etc., that each resource has. You might also need to adjust the resource group memberships to ensure that the groups actually correspond to the physical shop floor organization.

A new **Maintain Resource Requirements** wizard has been introduced to ease the process of changing the requirements on multiple activities at the same time. Scenarios that the wizard supports include:

- Adding an additional resource requirement. This will typically be used when adding new types of resources to an existing resource group; for example, to make sure that existing operations still can use only resources of type machine even though the group now also contains workers.

- Replacing only the resource requirements that match the search criteria. This can be used when reorganizing capabilities after upgrade.

- Replacing all resource requirements. This can be used if all operations of a certain type have a completely new set of requirements that must be fulfilled, or when switching from using capabilities or specific resource groups. The Maintain Resource Requirements wizard also can be used when replacing resource requirements of type *Capability* or *Resource group* with resource requirements of type *Skill*, *Course*, *Certificate,* or *Title*. The wizard can update requirements for one or more activities at the same time (Routes, Production routes, Product builder routes, Product configuration routes, Hour forecasts). Before the task is executed, it is possible to get a count of how many activities will be affected.

Appendix

Tables

For each of the tables in Microsoft Dynamics AX 2009 that are impacted by the new Operations Resource Model, the following table shows where to find the *equivalent* information in Microsoft Dynamics AX 2012.

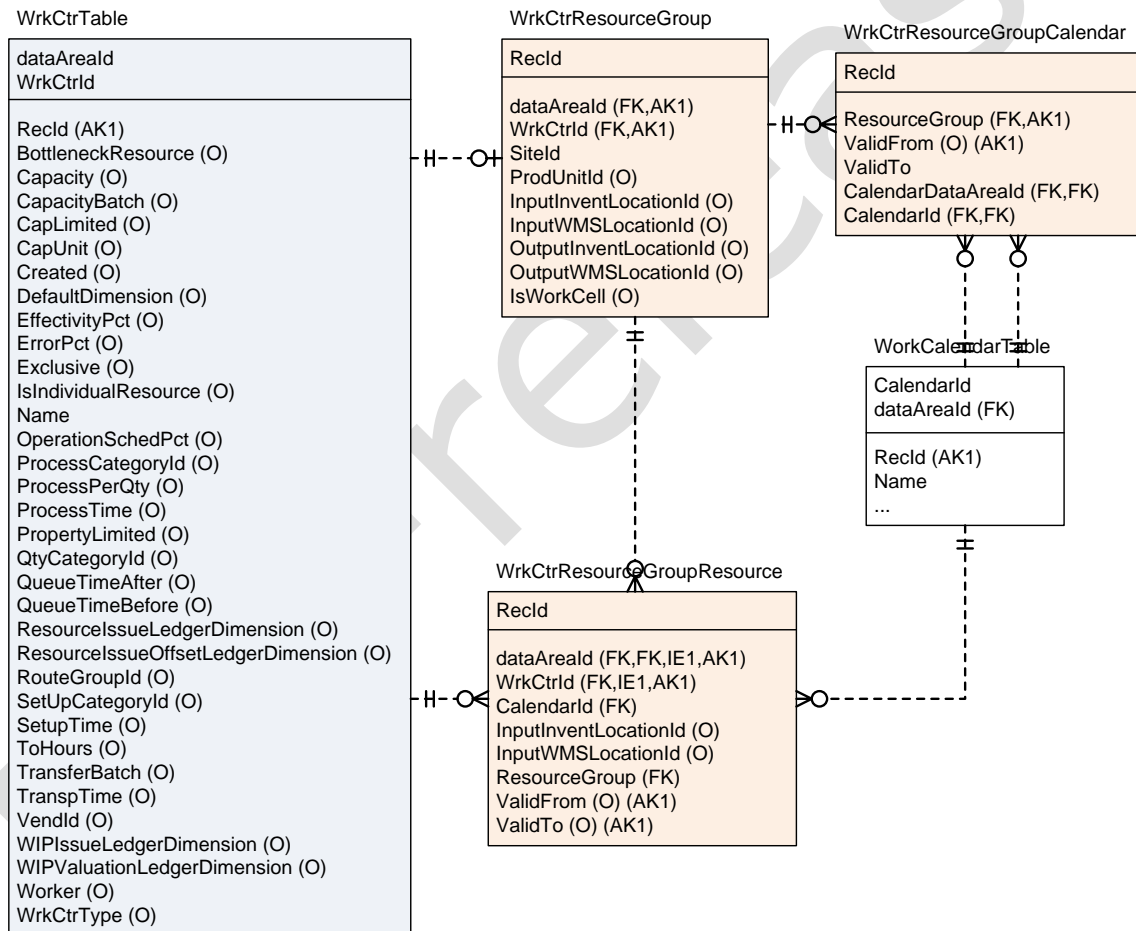| Microsoft Dynamics AX 2009	Microsoft Dynamics AX 2012
WrkCtrTable	WrkCtrTable
	WrkCtrResourceGroup
	WrkCtrResourceGroupResource
	WrkCtrResourceGroupCalendar
WrkCtrDateCalendar	WrkCtrResourceGroupCalendar
	WrkCtrResourceGroupResource
WrkCtrTaskGroup	WrkCtrCapability
WrkCtrTaskGroupLine	WrkCtrCapabilityResource
ProdRoute (WrkCtrId field)	WrkCtrActivityResourceRequirement
RouteOpr (WrkCtrId field)	WrkCtrActivityResourceGroupRequirement
PBATreeRouteOpr (WrkCtrId field)	
ProjForecastEmpl (WrkCtrNum field)	
ProdRoute (WrkCtrTaskDemand, TaskGroupId fields)	WrkCtrActivityCapabilityRequirement
RouteOpr (WrkCtrTaskDemand, TaskGroupId fields)	
PBATreeRouteOpr (WrkCtrTaskDemand, TaskGroupId fields)	
ProjForecastEmpl (SchedTaskDemand, SchedTaskGroupId fields)	
ProdRoute (WrkCtrLoadPct, WrkCtrNumOf fields)	WrkCtrActivityRequirementSet
RouteOpr (WrkCtrLoadPct, WrkCtrNumOf fields)	
PBATreeRouteOpr (WrkCtrLoadPct, WrkCtrNumOf fields)	
ProjForecastEmpl (SchedLoadPct field)	

Data Model Diagrams

In the following diagrams, fields that are not relevant to this white paper have been omitted. Omissions are indicated by ellipses ("…").
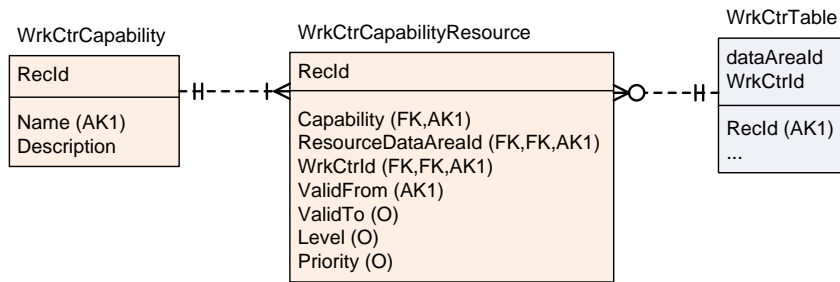
Legend:

☐ Existing table without changes
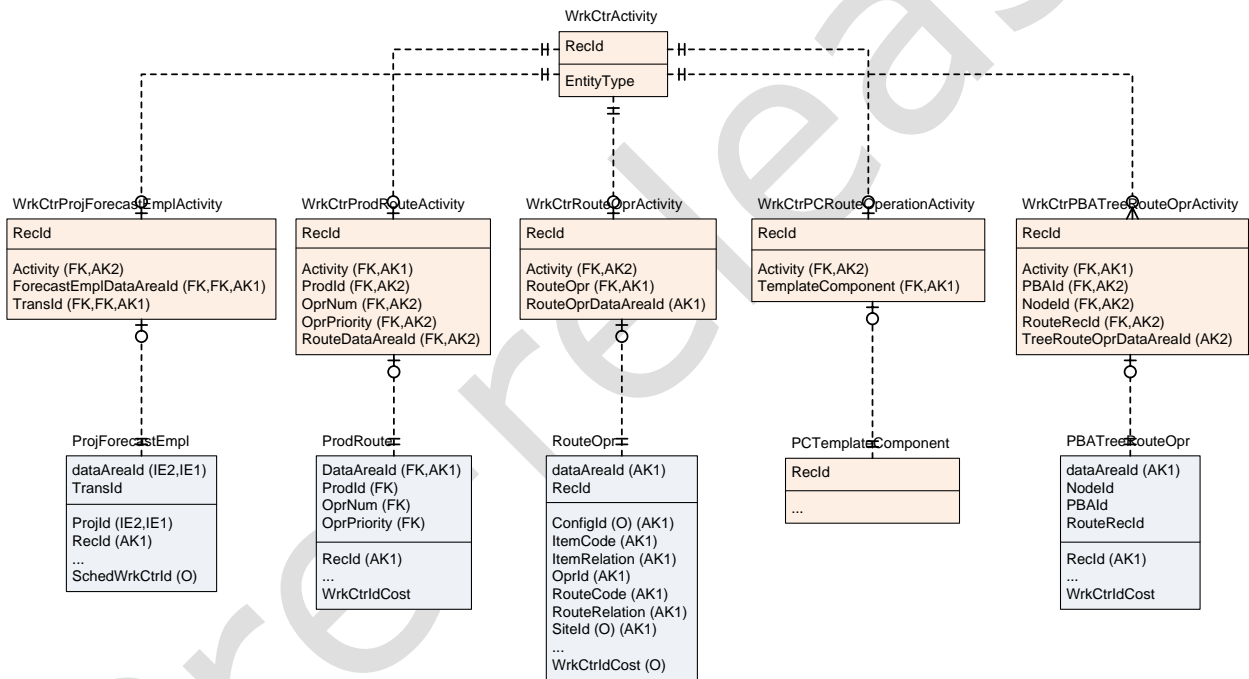
☐ Existing table with changes

☐ New table AX 2012
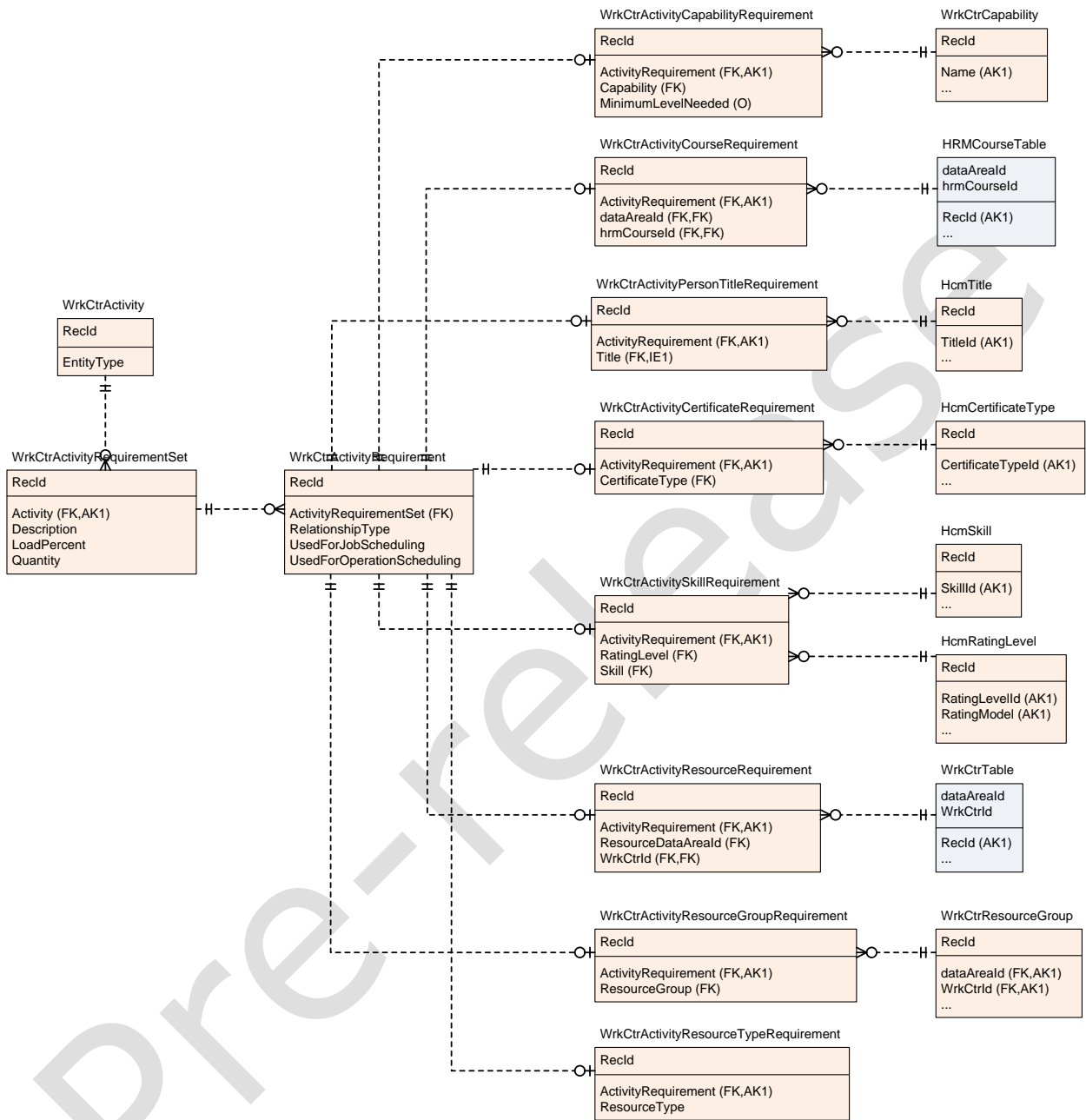
Resource, resource group, and calendar

Capability

WrkCtrCapability

RecId
Name (AK1)
Description

WrkCtrCapabilityResource

RecId
Capability (FK,AK1)
ResourceDataAreaId (FK,FK,AK1)
WrkCtrId (FK,FK,AK1)
ValidFrom (AK1)
ValidTo (O)
Level (O)
Priority (O)

WrkCtrTable

dataAreaId
WrkCtrId
RecId (AK1)
...

Activity

WrkCtrActivity

RecId
EntityType

WrkCtrProjForecastEmplActivity

RecId
Activity (FK,AK2)
ForecastEmplDataAreaId (FK,FK,AK1)
TransId (FK,FK,AK1)

WrkCtrProdRouteActivity

RecId
Activity (FK,AK1)
ProdId (FK,AK2)
OprNum (FK,AK2)
OprPriority (FK,AK2)
RouteDataAreaId (FK,AK2)

WrkCtrRouteOprActivity

RecId
Activity (FK,AK2)
RouteOpr (FK,AK1)
RouteOprDataAreaId (AK1)

WrkCtrPCRouteOperationActivity

RecId
Activity (FK,AK2)
TemplateComponent (FK,AK1)

WrkCtrPBATreeRouteOprActivity

RecId
Activity (FK,AK1)
PBAId (FK,AK2)
NodeId (FK,AK2)
RouteRecId (FK,AK2)
TreeRouteOprDataAreaId (AK2)

ProjForecastEmpl

dataAreaId (IE2,IE1)
TransId
ProjId (IE2,IE1)
RecId (AK1)
...
SchedWrkCtrId (O)

ProdRoute

DataAreaId (FK,AK1)
ProdId (FK)
OprNum (FK)
OprPriority (FK)
RecId (AK1)
...
WrkCtrIdCost

RouteOpr

dataAreaId (AK1)
RecId
ConfigId (O) (AK1)
ItemCode (AK1)
ItemRelation (AK1)
OprId (AK1)
RouteCode (AK1)
RouteRelation (AK1)
SiteId (O) (AK1)
...
WrkCtrIdCost (O)

PCTemplateComponent

RecId
...

PBATreeRouteOpr

dataAreaId (AK1)
NodeId
PBAId
RouteRecId
RecId (AK1)
...
WrkCtrIdCost

Activity requirements

WrkCtrActivityCapabilityRequirement
RecId
ActivityRequirement (FK,AK1)
Capability (FK)
MinimumLevelNeeded (O)

WrkCtrCapability
RecId
Name (AK1)
...

WrkCtrActivityCourseRequirement
RecId
ActivityRequirement (FK,AK1)
dataAreaId (FK,FK)
hrmCourseId (FK,FK)

HRMCourseTable
dataAreaId
hrmCourseId
RecId (AK1)
...

WrkCtrActivityPersonTitleRequirement
RecId
ActivityRequirement (FK,AK1)
Title (FK,IE1)

HcmTitle
RecId
TitleId (AK1)
...

WrkCtrActivityCertificateRequirement
RecId
ActivityRequirement (FK,AK1)
CertificateType (FK)

HcmCertificateType
RecId
CertificateTypeId (AK1)
...

WrkCtrActivity
RecId
EntityType

WrkCtrActivityRequirementSet
RecId
Activity (FK,AK1)
Description
LoadPercent
Quantity

WrkCtrActivityRequirement
RecId
ActivityRequirementSet (FK)
RelationshipType
UsedForJobScheduling
UsedForOperationScheduling

WrkCtrActivitySkillRequirement
RecId
ActivityRequirement (FK,AK1)
RatingLevel (FK)
Skill (FK)

HcmSkill
RecId
SkillId (AK1)
...

HcmRatingLevel
RecId
RatingLevelId (AK1)
RatingModel (AK1)
...

WrkCtrActivityResourceRequirement
RecId
ActivityRequirement (FK,AK1)
ResourceDataAreaId (FK)
WrkCtrId (FK,FK)

WrkCtrTable
dataAreaId
WrkCtrId
RecId (AK1)
...

WrkCtrActivityResourceGroupRequirement
RecId
ActivityRequirement (FK,AK1)
ResourceGroup (FK)

WrkCtrResourceGroup
RecId
dataAreaId (FK,AK1)
WrkCtrId (FK,AK1)
...

WrkCtrActivityResourceTypeRequirement
RecId
ActivityRequirement (FK,AK1)
ResourceType

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