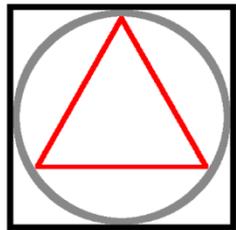


Configurable Kits for xTuple ERP



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BACKGROUND

Background

- “Configurable Kits” is a Client Sponsored Enhancement
 - Client is a manufacturer and reseller of sophisticated lab equipment.
 - Complex selling requirements
 - Many sales are of bundles of related products
 - When purchasing a bundle, clients may choose from a variety of options
 - Customer option choices may be dependent on previous choices made for a bundle, or may preclude other choices the customer might make in any one bundle
 - xTuple ERP had no suitable existing features for this purpose
 - The existing xTuple ERP selling bundle concept was limited to static “shopping list” style kits
 - The depth of configurability would make unreasonable demands on sales reps if the universe of configurations was realized as individual kit items
 - Computers are good at consistently applying complex lists of rules to data, humans not so much... so the system should do this

KEY FEATURES

Key Features

- Kits May be Configurable at Order Time
 - Kit components may be required, chosen from a list of options, or completely optional
 - Quantities of kit components may be variable as a customer choice
 - Optional quantities or components may carry up-charges
- Kits May be Nested
 - The Legacy xTuple kit items only allowed a single level of real component items (“shopping list”)
 - Configurable Kits may be nested into other kits to an arbitrary depth

Key Features

- Extends the Kit Concept to Manufactured and Purchased Item Types
 - These “real” item types may now also represent a bundle of items along with the primary item
- Configurable Kit features replace the Legacy Kit Item functionality when enabled
- Legacy Kit Item features **NOT** supported by Configurable Kits
 - Revision control
 - Component effective/expiry dates

DESIGN CONSIDERATIONS

Design Considerations

- **Replace the Bill of Materials as a means of defining kit components**
 - Avoids adding new fields and concepts for kit support to the BOM
 - Avoids dealing with manufacturing fields and concepts when working with kits
 - Allows manufactured/purchased items to have both a BOM to define their manufacture and be associated with a kit definition to define sales time options & components
- **Reuse transaction processing functionality**
 - Legacy Kit Items copy their BOM defined components into originating transactions in a way that is not dependent on their original BOM definition
 - Configurable Kits, once configured, copy their configured order components into the same records and fields as Legacy Kit Items
 - There are some process changes to originating transactions (e.g. quotes, sales orders) which facilitate getting kits configured for the order, but follow-on transactions (e.g. shipping, invoicing) process both Legacy Kit Items and Configurable Kits the same way
- **Separation of transaction Configurable Kit definitions from master Configurable Kit definitions**
 - Configurable Kit definitions are completely copied to transactions when they are added to orders, not unlike work order materials being captured from BOMs at work order explosion time

Design Considerations

- **User Interface Considerations**
 - The new Configurable Kit forms are progressive entry forms
 - Some fields depend on the values of other fields to define their conditions for validity
 - When this is true, we require the entry of the referenced field prior to enabling the dependent field for data entry
 - Only require data entry when a user has agency to make a choice
 - Earlier user choices in the data entry process, such as when selecting a “Kit Type”, determine whether other fields have systematically well-defined values, or the user has some degree of freedom in setting values
 - When the such values are system defined, the calculable fields should not be available for entry and the values should be provided by the system
 - Accessibility
 - When colors are used to convey information, also include textual references

KIT MAINTENANCE

Kit Maintenance Concepts

- “Configurable Kit” (or simply “Kit”)
 - A Kit is defined by a BOM-like set of records including a Kit Header (Kit Maintenance Form) and Kit Items (Kit Item Maintenance Form)
 - A Kit may be defined for any item of type “Kit”, “Manufactured”, or “Purchased”
 - Use item type “Kit” when the customer is really buying a package of products as a combination; for example, an audio/visual retailer selling “The Complete Home Video Conferencing Bundle”
 - Use either “Manufactured” or “Purchased” when the product has order/shipping time, not manufacture time, options or when the customer intent is to buy a single product, but that product is associated with up-sells, perhaps with special pricing
 - Note that using the correct item type will not only facilitate the transaction (ordering, accounting, logistics), but also capture customer intentions more accurately in the data for later sales analysis
 - A Kit’s component items, or “Kit Items”, may be any regular, salable item including other items defined as Kits; only Kits that would cause a recursive relationship in the definition are disallowed

Kit Maintenance Concepts

- **Kit Validity**

- A Kit is considered to be “valid” when:
 - It has defined components (Kit Items)
 - All components are either regular, salable items or other valid Kits
- Only valid Kits are available to be added as a Kit Item of another Kit
- An existing Kit may be made to be invalid by maintaining the definitions of any component that itself is a Kit
 - When a Kit is made invalid (e.g. delete all its Kit Items) that invalidity is propagated up to all parent kits, making them invalid as well
 - Invalid kits and invalidity propagation are expected to be rare
- Only valid Kits may be added to orders

Kit Maintenance Concepts

- **Undefined & Defined Kits**

- Any Kit that has Kit Items added to its definition is considered a “Defined Kit”
- Any item that exists as a Kit but has no defined Kit Items is considered an “Undefined Kit”
- “Is Defined?” shows up in a couple of places to make it clear why a particular item isn’t available for use in certain contexts (ordering)

- **“Incomplete” & “Complete”**

- “Incomplete” and “Complete” are two sides of an order time concept, but there are Kit Maintenance Form options which reference this idea
- Some Kits may be defined in a way that a sales rep must make a choice between various options before the order can be processed further; prior to these choices the Kit Order Item is considered “Incomplete” and “Complete” once all the required choices for the Kit Order Item has been made

Item Form

Item Form (Left):

- Section 1: Item Name
 - * Item Number: BUNDLE
 - Description: bundle kit item
 - Active
- Section 2: Item Details
 - Item Type: Kit
 - * Class Code: FINI-Finished Goods
 - Maximum Desired Cost:
 - * Inventory UOM: EA
 - Pick List Fractional Configured
 - Freight Class:
 - Bar Code:
- Section 3: Item Sold
 - ITEM IS SOLD
 - Product Category: MISCEL-TOP - Miscellaneous
 - List Price:
 - Selling UOM: EA
 - Warranty: 0 Days
 - Wholesale Price:
 - Exclusive
- Section 4: Weight
 - IN OZ
 - Product:
 - Packaging:

Buttons: Save, Cancel, Kit Options...

Item Form (Right):

- Section 1: Item Name
 - * Item Number: BUNDLE
 - Description: bundle kit item
 - Active
- Section 2: Item Details
 - Item Type: Manufactured
 - * Class Code: FINI-Finished Goods
 - Maximum Desired Cost:
 - * Inventory UOM: EA
 - Pick List Fractional Configured
 - Freight Class:
 - Bar Code:
- Section 3: Item Sold
 - ITEM IS SOLD
 - Product Category: MISCEL-TOP - Miscellaneous
 - List Price:
 - Selling UOM: EA
 - Warranty: 0 Days
 - Wholesale Price:
 - Exclusive
- Section 4: Weight
 - IN OZ
 - Product:
 - Packaging:

Buttons: Save, Cancel, Materials..., Kit Options..., Routing..., Workbench...

- Products > Item

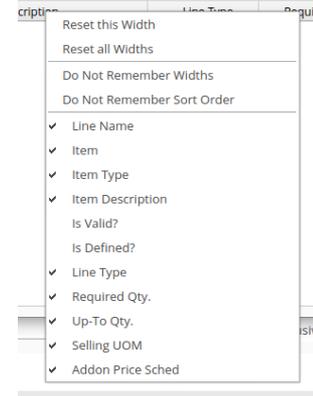
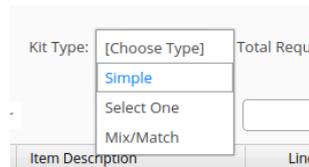
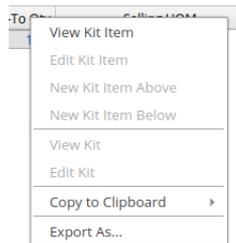
- Item types that sales order time kitting, a new button appears on the Item form, “Kit Options...”
- Only the item types: “Kit”, “Manufactured”, and “Purchased” support defining Kit Options
- This button never appears if the system is not configured to Enable Configurable Kits; Legacy Kit Items use the BOM

Kit Maintenance Form

The Kit Maintenance Form is most often opened from the Item Form > “Kit Options...” button

The screenshot shows the 'Kit Maintenance' window. At the top, there are input fields for 'Item Number' (BUNDLE), 'UOM: EA', 'Kit Type' (Simple), 'Total Required' (3.0000), and 'Total Up-To' (3.0000). Below these are checkboxes for 'Must Save Complete on Quote' and 'Must Save Complete on Sales Order', and buttons for 'Add Item' and 'Remove Items'. The main area is a table with columns: Line Name, Item, Item Type, Item Description, Line Type, Required Qty., Up-To Qty., Selling UOM, and Addon Price Sched. The table contains two rows: a green row for 'A Kit Power Cord' (XO-PC, Kit) and a black row for its component 'CO-B102000' (Regular, BRD,MAIN,P2000). On the right side, there are 'Save', 'Close', 'Move Up', and 'Move Down' buttons.

Line Name	Item	Item Type	Item Description	Line Type	Required Qty.	Up-To Qty.	Selling UOM	Addon Price Sched
A Kit Power Cord	XO-PC	Kit	Select Power Cord	Required	1.00	1.00	EA	
	CO-B102000	Regular	BRD,MAIN,P2000	Required	2.00	2.00	EA	



Green lines in the Kit Item list are items that are themselves Kits; black lines are regular salable items

Kit Maintenance Form

- Kit Maintenance Entry Fields

- Kit Type

- “Simple”
 - Closely resembles the Legacy Kit Item type in functionality
 - A list of required items, each with quantities greater than zero and no optional quantities are allowed
 - Does allow other kits to be added as component items
- “Select One”
 - Defines a kit where all added kit component items represent options available for selection
 - At order time, a sales rep must select exactly one of the available options to add to the order
- “Mix/Match”
 - At order time, kit component items may be configured to be required, optional, or allow optional quantities
 - This is a highly flexible kit type, but also the most nuanced to setup: use sparingly

Kit Maintenance Form

- Kit Maintenance Entry Fields (cont)
 - Total Required
 - Sets the minimum threshold that the sum of the Kit Item quantities in an order must meet
 - Kit Types “Simple” and “Select One” calculate the “Total Required” value automatically, “Mix/Match” Kits allow the user to determine this threshold within the range of optional quantities defined by the Kit Items
 - Total Up-To
 - Sets the maximum threshold that the sum of the Kit Item quantities in an order must not exceed
 - Kit Types “Simple” and “Select One” calculate the “Total Up-To” value automatically, “Mix/Match” Kits allow the user to determine this threshold within the range of optional quantities defined by the Kit Items

Kit Maintenance Form

- Kit Maintenance Entry Fields (cont)
 - Must Save Complete on Quote
 - If checked, the user must “complete” any order items for this Kit prior to saving the quote item
 - If not checked, the user may save a quote item for a Kit and not fully complete it
 - It is expected that incomplete Kits in quotes will be fairly common unless optional quantity upcharges are involved
 - Must Save Complete on Sales Order
 - Same basic idea as Must Save Complete on Quote, but for Sales Orders
 - Not the final check on completeness for Sales Orders, but one directed at forcing a sales rep to fully complete the Kit at the time it is added to the order

Kit Item Maintenance Form

The screenshot shows a software window titled "Kit Item Maintenance". At the top, there are input fields for "KIT: BUNDLE" (with a search icon), "UOM: EA", and "Kit Type: Mix/Match" (with a dropdown arrow). To the right of these fields are buttons for "Close", "Reset", "Save", "Previous", and "Next".

Below this is a section titled "KIT ITEM DEFINITION". It contains an "Item:" field with "XO-PC" and a search icon, "UOM: EA", and the text "Select Power Cord". To the right is a "Line Type:" dropdown menu currently showing "[Choose Type]".

Further down are fields for "Kit Line Name:" (empty), "Selling UOM:" (dropdown with "EA"), "Required Qty:" (input with "0.0000"), and "Up-To Qty:" (input with "0.0000"). Below these is an "Addon List Price Sched.:" field with a dropdown arrow and a gear icon.

At the bottom is an "Extended Description:" label followed by a large empty text area.

On the right side of the form, there is a small inset showing a dropdown menu for "Line Type:" with options: "[Choose Type]", "Required", and "Range". Below it, another inset shows "Up-To Qty:" with the option "Range".

The Kit Item Maintenance Form is usually opened from within the Kit Maintenance Form by either double clicking a Kit Item in the list or right clicking a Kit Item and selecting an option from the menu

Kit Item Maintenance Form

- Kit Item Maintenance Entry Fields

- Item

- Establishes the component being add to the Kit
 - May be any regular, salable item or any valid Kit
 - Only Kits which do not introduce a recursive definition are available to the user; recursive Kits do not show in item searches initiated from this field nor can they be added manually

- Line Type

- Defines the behavior of the Kit Item with the Kit
 - For Kit Type “Simple”, this value will be set to “Required” and may not be changed
 - For Kit Type “Select One”, this value will be set to “Select Option” and may not be changed
 - For Kit Type “Mix/Match”, this value will be a choice between “Required” and “Range”
 - “Required”: the Kit Item will be added to the order in the quantity defined in the “Required Qty” field and no optional quantities are allowed
 - “Range”: allows a user to set a quantity to add to the order in the range of the “Required Qty” and the “Up-To Qty” (inclusive). If the “Required Qty” is zero, then the item is entirely optional and not added to the order by default

Kit Item Maintenance Form

- **Kit Item Maintenance Entry Fields (cont)**
 - Kit Line Name
 - Allows users to define a display description for the item in the Kit, principally targeted at document generation
 - If the value is left empty, the Item Description 1 field of the Item will display instead
 - Selling UOM
 - Establishes the UOM of the item as sold in the Kit
 - Required Qty
 - Sets the minimum quantity required to be added to the order
 - Any Kit Item with a Required Qty greater than zero is automatically added to the order at the Required Qty; any Kit Item with a Required Qty of zero is an optional item and it is not added to the order by default
 - Kit Items of Line Type “Required” must have a Required Qty greater than zero
 - Kit Items of Line Type “Select Option” automatically set this value to zero and it may not be changed
 - Kit Items of Line Type “Range” allows the user to assign a value of zero or greater

Kit Item Maintenance Form

- Kit Item Maintenance Entry Fields (cont)

- Up-To Qty

- Sets the maximum quantity of the Kit Item allowed to be added to an order
- Kit Items of Line Type “Required” automatically set this value to be the same as the “Required Qty” value and the user may not change that
- Kit Items of Line Type “Select Option” automatically set this value to 1 and the value may not be changed
- Kit Items of Line Type “Range” allow the user to set a value that is both greater than zero and greater than or equal to the “Required Qty” value

- Addon List Price Sched.

- For Kit Items of Line Types “Select Option” and “Range”, any quantity of the item added to a order that is greater than the “Required Qty” is considered an optional quantity and may be up-charged on the order; the “Required Qty” is always considered to be included in the price of the parent Kit
- The value of this field identifies a specific List Price Schedule to use to set the price per optional unit of this item added to the order
- Note that this is a simple look-up and other pricing schedule resolution mechanisms do not apply
- This field is only available for Kit Items of type “Select Option” and “Range”

Kit Item Maintenance Form

- Kit Item Maintenance Entry Fields (cont)
 - Extended Description
 - An optional alternative extended description for this item as it exists within the Kit
 - Not required
 - Typical uses would be catalog or website descriptions

KIT ORDERING

Kit Ordering Concepts

- **Master Kit Definition vs. Order Kit Definition**
 - The Kit Options definition for Item records is considered the Master Kit Definition, made up of Kit Header and Kit Item records
 - When an Item with Kit Options is added to an order, a copy of the Kit Master Kit Definition is made to an order specific Order Kit Definition, so that the definition of the Kit in the order doesn't change due to on-going Item maintenance
 - The Master Kit Definition is fully copied when the Item is added to an order; the copy does not depend on whether the Kit Items are selected or not
 - The Order Kit Definition can be changed by users with the correct permissions
 - Order Kit Definitions are copied from earlier orders to follow-on orders; for example, a quote Order Kit Definition will be copied into the Sales Order Kit Definition on conversion

Kit Ordering Concepts

- “Selected” Kit Item
 - A Kit definition may include both Kit Items that are always added to the order and Kit Items that are optional additions to the order
 - A “Selected” Kit Item is one that has been added to the order either because it was automatically added to the order or because a user explicitly added the option to the order
- “Incomplete” & “Complete”
 - Some Kits may require the user to make a choice between different available options at order time, prior to the Kit being ready for later order processing (e.g. shipping)
 - When a Kit has such options, but the user has not yet made the required choices, the Kit Item is considered “Incomplete”; once the minimum required choices have been made for the order, the Kit Item is considered “Complete”
 - A user may still need to make additional choices related to Kit options that are not required even once the Kit Item reaches the “Completed” state
 - A parent Kit added to an order will be “Incomplete” if any of its Kit Items are also “Incomplete”; the order can only be processed further once the top-level Kit is considered “Complete” in the order

Kit Ordering Concepts

- “Firming”
 - Because Kits may be added to orders in an “Incomplete” state, and also because a “Completed” Kit Item may not be fully configured for the order, we need a way to mark an item as being done and ready for additional order processing
 - We extend the functionality of the existing Sales Order Item “Firmed” state to also indicate that a Kit Order Item is both “Complete” and that the user is done with selecting Kit options
 - An “Incomplete” Kit Order Item may not be “Firmed”
 - A “Firmed” Kit Order Item may not have its selected options or its Order Kit Definition changed
 - A “Firmed” Kit Order Item may be “Unfirmed” so long as no shipping has taken place for the Kit Item and its components
 - Only Sales Orders are subject to Firming; quotes do not have this concept and return authorizations have a related process described next

Kit Ordering Concepts

- “Exploding”
 - Configurable Kits make use of the same functionality that the Legacy Kits use to facilitate follow-on order processing, such as shipping a Sales Order
 - A Kit’s components are “Exploded” into regular order lines as sub-numbered lines of the order item containing the Kit; this has the effect of flattening the nested Kit structure into a simple list of required items
 - If the Kit and its child Kits have components in common, the quantities of those components are summed together and added as a single order item for the item in question
 - Any addon prices are added to the unit price of the main Kit Order Item
 - “Exploding” a Kit does not lose the Order Kit Definition and structure, it only creates new records in the order itself
 - Quote orders are never “Exploded”; sales orders are “Exploded” when the order is “Firmed”; Return Authorizations have right click menu options to “Explode” or “Implode” any Kit Order Items

Kit Ordering Concepts

- Order Item Quantities and Kit Item Quantities
 - The quantities of the individual Kit Items set in a Kit, required and optional, represent the quantities of a single instance of that Kit
 - At the order line level, a user may order multiple quantities of that Kit's specific configuration
 - This means the total quantity of any component that will be ordered is:
*order item quantity * kit item component quantity = total quantity ordered*
 - If a user wants the same Kit but with a different set of options or different quantities of optional quantity items, the user must add the Kit to the order for each different configuration of the Kit desired

Sales Order Form

The screenshot displays the 'Sales Order' form with the following details:

- Order #: 50025, Customer #: SCB KITS TESTING
- Order Date: 10/23/21, Name: Customer Testing Configurable Kits
- Scheduled Date: 10/23/21, Ship To#: [Search]
- Pack Date: 10/23/21, Name: [Search]
- Site: 1WHS, Sale Type: DIRECT-Direct Sales

#	Item	Description	Date	Ordered	Selling UOM	Shipped	Price	Extended	Available QOI
001	BUNDLE	bundle	10/23/21	1.0000	EA		0.00	0.00	0.0000

Buttons on the right side of the form include: New, Edit, Close, Cancel, Delete, Kit Options..., Issue Stock, Issue Line Bal.

Financial summary fields: Subtotal: 0.00, Freight: 0.00, Tax: 0.00, Total: 0.00, Balance: 0.00, Margin: 0.00, Margin %: 0.0000.

The Sales Order Form adds a new “Kit Options...” button and a “Kit Options” right click menu option to the “Line Items” order items list

The Sales Order Item Form adds a new “Kit Options...” button

Kit Configuration Form

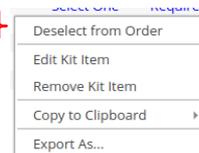
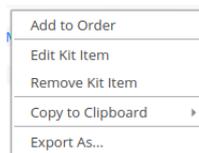
Kit Item Colors:

- Black: Not Selected to the order
- Blue: Selected to the order and is Complete
- Red: Selected to the order and is Not Complete
(the light blue item is just the list selection)

Most fields are not entry fields, just informational and based on the current list selection



Right clicking a Kit Item that is itself a kit, allows a user to alter the Kit Order Definition, if the user has permission to do so



Right clicking a Kit Item that is optional allows the user to add (Select) that item to the order, or deselect it

Kit Configuration Form

- **Kit Configuration Entry Fields**

- Require All Items are Complete to Save

- When checked, the Kit Configuration and Order Item may not be saved until the all Selected and Incomplete Kit Items have been Completed
- The starting state of the checkbox is setup on the Kit Maintenance Form
- A user with the appropriate permissions may override this checkbox

- Firm Sales Order Item if Top Level Kit is Complete

- This is a convenience function to automatically Firm the sales order item if the top-level Kit Item is complete (which means the entire Kit is complete in the order); the Firming happens on form close
- This field may only be changed if the user has the correct permission for firming orders

- Quantity Ordered

- The number of units that are ordered
- For Kit Line Types of “Required” and “Select Option” this value is set automatically and may not be changed
- For Kit Line Types of “Range” the value may be changed by the user to any value between the “Required Qty” and “Up-To Qty” (inclusive)

Kit Configuration Form

- Kit Configuration Entry Fields (cont)
 - Addon Unit Price
 - If the Kit Item has optional quantities (quantities above the “Required Qty”) and the user has the correct price override permission, the user may override the Addon Price Schedule based price
 - Show Order Items Only
 - When checked, only those Kit Items that have been Selected to the order will display in the Kit Item list; if unchecked all Order Kit Definition records are displayed
 - By default, Kits that are not Firmed/Exploded enter the Kit Configuration Form with this checkbox unchecked; Firmed/Exploded orders default this checkbox to be checked
 - This setting only effects the immediate display of the data in the form only

CONFIGURATION & PRIVILEGES

Configurations

- Setup > Products > Enable Configurable Kits
 - Checking gives warning to the user that the action is not reversible
 - If accepted, the system will convert any existing BOM based Legacy Kit Items into Configurable Kits and will enable the Configurable Kits processing throughout the system

The screenshot shows the 'Setup' window for 'Products'. The 'Module' is set to 'Products'. The left sidebar shows a tree view with 'Configure' expanded, and 'Products' selected. The main area displays the 'Products' configuration options. The 'Enable Configurable Kits' checkbox is checked and highlighted with a red arrow. Other options include 'Enable Transforms', 'Enable Revision Control', 'Post Item Changes to the Change Log', 'Allow Inactive Items to be Added to BOMs', 'Allow deletion of Items from Bill of Material', 'Start Item Search when no results found', 'Enforce Unique Item Bar Codes', 'Set Sold Items as Exclusive', 'Default Cost Element for Freight', 'W/O Material Issue Method', 'WORK CENTER ROUTINGS', 'TRACK MACHINE OVERHEAD', 'as Machine Overhead', 'with General Overhead', 'Enable Breeder Bills of Materials', and 'Change BOM/Routing Active Revision to Substitute when activating a Pending Revision'. The bottom right corner has 'Apply', 'Cancel', and 'Save' buttons.

Configurations

- Setup > Inventory > Shipping and Receiving > Kit Components Inherit COS from Kit Parent
 - This setting exists as part of the Legacy Kits functionality, but is also respected by the Configurable Kits functionality

Privileges

- **Sales Module Privileges**
 - OverrideSaveKitCompleteQuote
 - Allows a user to override the kit defined setting to require quotes to be fully configured at quote save time
 - OverrideSaveKitCompleteSalesOrder
 - Allows a user to override the kit define setting to require quotes to be fully configured at sales order save time
 - ModifySalesKitsInOrders
 - Grants a user the ability to modify the kit definition of an order item
 - OverridePrice
 - Allows a user to change addon pricing at order time
 - FirmSalesOrder
 - Allows a user to set the “Firm Sales Order Item if Top Level Kit is Complete” checkbox for the order