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Getting the Most Out of OTM Planning

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Objective

• Give a high level summary of the bulk planning process
• Share hands-on experience on some of the most frequently adjusted Planning Parameters
• Describe some of the Itinerary parameters that affect planning
• Describe the Order Release Partition functionality which may give a significant improvement on bulk plan performance
Agenda

- OTM Bulk Plan Process Overview
- Bulk Planning Parameters
- Itinerary Parameters
- Order Release Partition
Bulk Plan Overview

• It’s a **Black Box**!
• Example of business situations that may require special attention to parameters tuning to achieve results and performance objectives:
  • Large number of orders
  • Large number of orders with varying sizes
  • Diversified fleet with vehicles of different capacities
  • Cross docks, pools, complex networks
  • Competing service providers on the route
  • Constraints: location capacity, equipment availability, percent commitment
Bulk Plan Overview

Cost Based Routing (default, exists prior to 6.3)

- “Cost Based Routing” is the only bulk plan method prior to 6.3
- With 6.3 this method still exists (no changes!) but there’s an option to select a new method called “Network Routing”
- Cost Based Routing has some limitations:
  - Only 1 itinerary either multi-stop or multi-leg
  - “Simpler” networks with limitations on the number/configuration of cross docks and pools
Bulk Plan Overview

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Bulk Plan Overview

Network Routing (introduced on 6.3)
Bulk Plan Overview

Network Routing (introduced on 6.3)

• A more robust multi-tier algorithm
• Unifies the multi-leg and pool cross dock paths into one
• Plan across multiple itineraries
• Complex networks: no limitations on number and sequence of cross docks and pools
OTM Planning Parameter Tuning

- OTM optimization process is complex. It's a blend of different solving techniques and algorithms
- Different planning parameters allows adjustments on specific parts of the solving process
- OTM comes “pre-tuned” from factory (DEFAULT parameter set) but usually some adjustments are required according to each customer requirements
- Planning parameter tuning is not a straight forward activity
- A parameter direct influence on bulk plan result is not always “intuitive”, that is, comparing parameter description with result may be challenging
OTM Planning Parameter Tuning

• There’s no exact formula for tuning but planning is essential
• Start tuning activity with a smaller set of orders and then increase gradually
• Modify one parameter at a time, otherwise it becomes difficult to isolate which parameter affected result
• You may need to “retune” parameter X when you modified parameter Y (test according to a “matrix” of parameters)
• It may become necessary to run daily orders on different bulk plans, each bulk plan with a specific parameter set
• Example:
Planning Parameters

Bulk Plan

- **CHECK EQUIPMENT CAPACITY IN REFERENCE UNITS** (Default = FALSE, Alternative = TRUE)
  - Activates ERU (Equipment Reference Unit) capacity constraint during bulk plan. ERU can be used as an unit of measure for equipment group pallet capacity. ERU needs to be defined on the THU, and also on the equipment group.

- **MAX NUM REPLAN** (Default = 0, Alternative = up to 3)
  - Re-plan is typically used when there's a capacity constraint defined. This parameter dictates how many "passes" bulk plan will go through to find the best solution. Capacity constraints examples are carrier capacity, and location capacity.
  - It has a direct impact on performance. Test before if it's really necessary.

  - Used on scenarios where direct delivery and x-dock/deconsolidation pool delivery are alternatives. It tells bulk plan to favor either direct or pool delivery.

- **RERATE ALL SHIPMENTS AFTER BULKPLAN** (Default = FALSE, Alternative = TRUE)
  - Often set as TRUE. For some situations the rerate guarantee a more accurate shipment cost value. One situation it applies is with time-based rates.

- **TRY MULTIPLE EQUIPMENT IF CAPACITY IS IDENTICAL** (Default = FALSE, Alternative = TRUE)
  - Set = TRUE if rate structure allows multiple equipment groups with same capacity
Planning Parameters

**Bulk Plan**

- **USE PRIORITY IN BUNDLING** (Default = FALSE, Alternative = TRUE)
  - Typically used on scenarios where there’s a capacity constraint of any type (location dispatch, carrier equipment, etc) and there’s a need to prioritize some customers or specific orders
- **WEIGHT FOR HIGH PRIORITY** (Default = 100)
  - Relative importance weight given to orders with high priority (priority between 667 and 999)
- **WEIGHT FOR MEDIUM PRIORITY** (Default = 50)
  - Relative importance weight given to orders with medium priority (priority between 334 and 666)
- **WEIGHT FOR LOW PRIORITY** (Default = 1)
  - Relative importance weight given to orders with low priority (priority between 1 and 333)
- **NUMBER OF PRIORITY GROUPS (6.3.1 and later)**
- **MAX NUMBER OF PRIORITIES (6.3.1 and later)**
- Example:
  - NUMBER OF PRIORITY GROUPS = 10
  - MAX NUMBER OF PRIORITIES = 1000
    - Group 1: orders with priorities 0-99
    - Group 2: orders with priorities 100-199
    - Group 10: orders with priorities 900 and over
Planning Parameters

**Container Optimization (Logic Configuration)**

- Container optimization is the functionality that makes 3D placement of ship units within the equipment. It can give better results however it must be carefully considered due to data requirements and performance impact

- **USE 3D BASED LOAD CONFIGURATION** (Default = FALSE, Alternative = TRUE)
  - This and other algorithms can be activated for Container Optimization. See Help for more details

- **LOAD CONFIG VOLUME THRESHOLD** (Default = 50, Alternative = 0)
  - If set to zero Container Optimization is used for any load size

- **CHECK COMMODITY COMPATIBILITY** (Default = FALSE, Alternative = TRUE)
  - if TRUE then commodity compatibility rules are considered within Container Optimization algorithm

- **CONSIDER CAPACITY LIMITS** (Default = FALSE, Alternative = TRUE)
  - If TRUE then carrier equipment availability constraints are considered during bulk plan
Planning Parameters

**Location Capacity**

- Location capacity is meant to model location dispatch or receiving capacity in number of shipments, weight, etc. It must be carefully considered due to performance impact.

- **CHECK LOCATION CAPACITY** (Default = FALSE, Alternative = TRUE)
  - If TRUE then bulk plan will consider capacity constraint defined at location.

- **LOCATION CAPACITY OPTIMIZER MAX RUNTIME** (Default = 0, meaning there’s no time limit)
  - Sets a time limit for the location capacity algorithm within bulk plan

- **LOCATION CAPACITY OPTIMIZER PERCENTAGE TOLERANCE** (Default = 0)
  - Defines a "tolerance" for final solution compared to defined target

- **LOCATION CAPACITY OPTIMIZER TIME SPAN** (Default = 2H)
  - Defines planning horizon where location capacity will be considered

- **LOCATION CAPACITY OPTIMIZER TIME STEP** (Default = 15M)
  - Time bucket for the location capacity planning. Increasing this parameter may benefit performance.
Planning Parameters

**Multistop (Logic Configuration)**

- Multistop Logic Configuration is frequently adjusted as shipment consolidation is very sensitive to its parameters

- **MULTISTOP COST SAVING CHECK TYPE** (Default = 1, Frequently used alternative = 2)
  - Bulk plan may be very sensitive to this parameter. Worth testing different options.

- **MULTISTOP FAVOR SAME DOWNSTREAM SHIPMENT** (Default = FALSE, Alternative = TRUE)
  - Better results may be obtained modifying this parameter depending on the scenarios.

- **MULTISTOP CONSOLIDATION ALGORITHM TYPE** (Default = 0.CONCURRENT SAVINGS, Frequently used alternative = 1.SEQUENTIAL SAVINGS)
  - Bulk plan may be very sensitive to this parameter. Worth testing different options.

- **MULTISTOP FAVOR SAME SHIP WITH GROUP** (Default = FALSE, Alternative = TRUE)
  - if TRUE then Order Release Ship With Group (SWG) parameter becomes a soft constraint meaning bulk plan will try to plan together as much as possible orders with same SWG. SWG with default parameter (FALSE) is a hard constraint meaning orders with different SWG will never be planned in the same shipment. SWG is not a validated field. It’s typically set with ERP purchase order number, etc.

- **MULTISTOP SAME SHIP WITH GROUP EMPHASIS** (Default = 1000000)
  - When SWG is a soft constraint this parameter tells bulk plan how much weight to give on planning orders with same SWG in the same shipment. Our experience tells this parameter influence is very limited.
Planning Parameters

**Multi-tier**

- **ORDER ROUTING METHOD** (Default = Cost-Based Routing, Alternative = Network Routing)
  - Defines which routing logic will be used; either Cost-based Routing (default) or Network Routing (6.3 or later)

- **NETWORK ROUTING LOGIC CONFIGURATION ID**
  - Define parameters related to the Network Routing algorithm

- **USE DYNAMIC POOL SELECTION** (Default = FALSE)
  - Set this parameter to TRUE when there are overlaps between Deconsolidation Pools coverage regions
Planning Parameters

Order Management

- **MAXIMUM VOLUME PER BUNDLE** (Default = 50000 CUFT)
  - Bulk plan is extremely sensitive to this parameter. Usually don’t touch but it may improve results quality depending on order profile and equipments sizes.
  - Setting Max Volume and Weight per Bundle to ZERO means orders won’t get bundled. It may improve consolidation with an impact on performance but again it needs to be tested for each scenario.

- **MAXIMUM WEIGHT PER BUNDLE** (Default = 50000 LB)
  - Bulk plan is extremely sensitive to this parameter. Usually don’t touch but it may improve results quality depending on order profile and equipments sizes.

- **MIN BUNDLING TIME WINDOW AFTER CURRENT TIME** (Default = 0)
  - Fixed time to be added to current server time where shipment planned start time may begin

- **PLAN ORDERS WITH DATE EMPHASIS PAST** (Default = FALSE, Alternative = TRUE)
  - If TRUE order release date constraints are “relaxed” so orders will probably not fail due to time constraint. Typically used for test (old set of orders) or troubleshooting.

- **ORDER WINDOW TIME SPAN** (Default = 30 D)
  - May need to increase if dealing with long lead time transportations (e.g. ocean)
Planning Parameters

Rates

• ALLOW DUPLICATE RATES BY CARRIER (Default = 0, Alternative = 1, 2, 3)
  • If there are competing rates for same route or geographically overlapping rates then try changing this parameter. When set to 3 the most geographically specific rate will be chosen (only works for rates related to the same rate offering)

• RATING ENGINE STORES DETAILED COST INFORMATION (Default = FALSE, Alternative = TRUE)
  • Usually set to TRUE. If TRUE Bulk Plan will store more detailed cost info on shipment financial tab. Analyze performance impact.
Planning Parameters

Service Provider Assignment

• **PLAN SHIPMENTS WITH CARRIER COMMITMENT** (Default = FALSE, Alternative = TRUE)
  • if TRUE then carrier percent commitment definitions are considered during bulk plan. Percent commitment allows setting a shipment percentage distribution among competing carriers on a specific route.
  • Also it’s recommended to set to TRUE when carrier capacity limits is setup. Even though carrier capacity limits may work without this parameter, our experience shows better results may be obtained for certain scenarios.

• **CARRIER RESOURCE REASSIGNMENT TYPE** (Default = 0, Alternative = 1)
  • When carrier capacity limits are defined then set = 1 (If re-assign fails, do re-plan) for best results.

• **MODE PROFILE FOR CARRIER COMMITMENT** (Default = TL)
  • if carrier percent commitment functionality is used you may need to change this parameter if commitment also applies to other transport modes
Planning Parameters

**Service Time**

- **COMPUTE SHIPMENT TIME WINDOW** (Default = FALSE, Alternative = TRUE)
  - If TRUE bulk plan calculates shipment latest feasible start time
- **HOLD AS LATE AS POSSIBLE** (Default = FALSE, Alternative = TRUE)
  - Instead of planning orders as early as possible (default behavior) bulk plan will set shipment start time backwards according to order release late delivery date
- **MINIMIZE WAIT TIME IN SERVICE TIME CALCULATION** (Default = FALSE, Alternative = TRUE)
  - If set to TRUE shipment depart date/time from pickup location will be calculated backwards according to planned delivery time therefore minimizing driver wait time at delivery locations
Planning Parameters

**Shipment Planning**

- **RATE ALL EQUIPMENT GROUPS IN SHIPMENT BUILDING** (Default = FALSE, Alternative = TRUE)
  - When this parameter is true, the logic rates all equipment groups in order to pick the cheapest, and not necessarily the best fit (best fit meaning better utilization)
Itinerary Parameters

• Itinerary parameters are strictly observed by the planning process

• **MULTI-STOP ITINERARY** (Default = FALSE, Alternative = TRUE)
  • Allows multi-stop shipments

• **DECONSERVATION POOL** (Default = FALSE, Alternative = TRUE)
  • Set TRUE if using Deconsolidation Pool

• **DESTINATION BUNDLE PREFERRED** (Default = FALSE, Alternative = TRUE)
  • Set TRUE if using Crossdock

• **MAX DISTANCE BETWEEN DELIVERIES, MAX RADIUS BETWEEN DELIVERIES, MAX RADIUS PERCENT FOR DELIVERIES**
  • These parameters establish different distance limits for the deliveries of a multistop shipment. All parameters defined must be observed simultaneously

• **MINIMUM TL WEIGHT** (Default = null)
  • If setup with any value then it establishes a weight threshold: below the threshold the order bundle is sent through the deconsolidation pool; above it’s sent directly (direct delivery)
Order Release Partition

- Order Releases can be setup with a parameter called Partition ID
- Partition ID must be created before being assigned to an Order Release
- It can dramatically reduce total bulk plan time
- Each partition runs independently on a different thread
- No order consolidation occurs between orders on different threads
- Orders without Partition ID are planned after all partitions were already processed
- CAVEAT: as we may have several partitions running in parallel some global constraints may not be considered correctly:
  - Carrier capacity
  - Location capacity
  - Carrier percent commitment
Bulk Plan Performance

- Bulk Plan run time and number of orders

**Example 1**

- Linear (Series1)
  - $y = 0.0792x + 3.4595$
  - $R^2 = 0.7102$

**Example 2**

- Linear (Series1)
  - $y = 0.0458x + 3.5689$
  - $R^2 = 0.5714$
Questions?