



Master planning in Dynamics AX 2012

Presenters

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Agenda

- Brief introduction
- Introduction to master planning (Morning)
 - What master planning does
 - Break
 - How master planning ties into other modules
- Lunch (12:00-1:00pm)
- Advanced master planning (Afternoon)
 - Fine-tuning
 - Break
 - Scheduling
- Questions (4:00-5:00pm)



Introduction

- Who am I?
- Who are you?
 - Which version are you on?
 - Which industry you're in?
 - Are you currently using MRP?
 - Which areas of MRP were you hoping to learn more about today?



Plan for today

- Start small
 - Introduce a concept
 - Propose a scenario
 - Walkthrough scenario with my setups
 - Perform scenario on your own in demonstration environments
 - Compare
- **Sure-fire way to successfully implementing MRP**
 - Understand the basic concepts
 - Moved into more advanced areas slowly

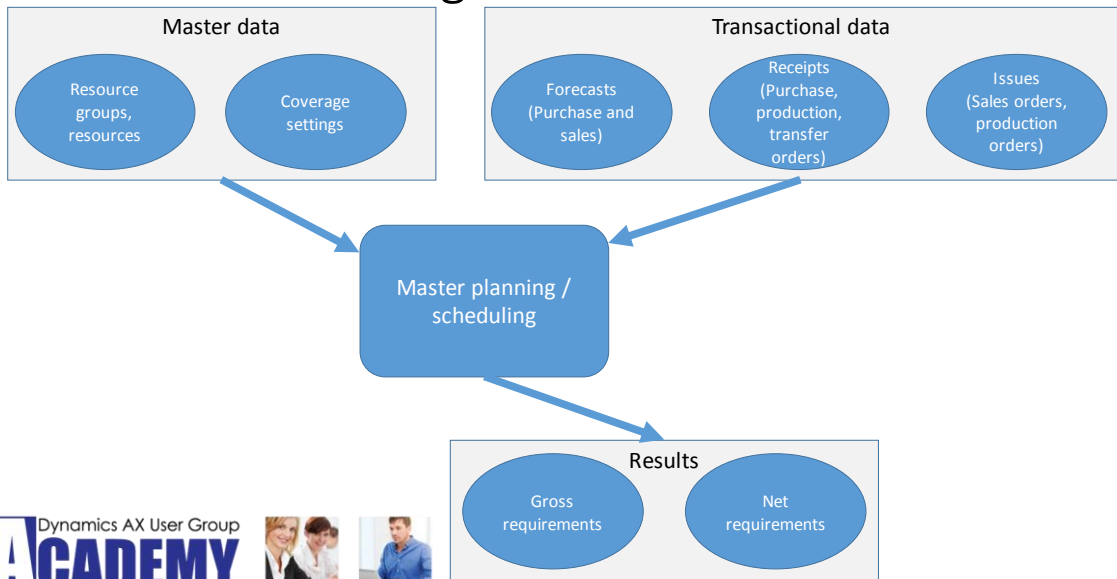


Introduction to master planning

- What is master planning?
 - Planning engine in AX
 - Demand generates planned supply
 - Sales orders
 - Sales forecasts
 - Production / batch orders
 - Safety stock
 - Highly integrated
 - Setups in many modules
 - Inventory and warehouse management, production control, master planning, and organization administration



What feeds MRP engine?



Introduction to master planning, cont.

- MRP generates planned orders
 - Creates a list of “suggestions” from MRP
 - These orders are firmed into actionable orders
 - Could be “approved” by planning department and then firmed by production or purchasing employee
 - Production orders, purchase orders, transfer orders
 - “Pegged supply” shows link between demand and supply



Planned orders

- Master planning → Planned orders
- Master planning → Master planning parameters



Scenario 1

INFO

- Show how demand drives planned supply

TO-DO

- Create a “coffee cup” item
- Add the item to a sales order
- Run local master planning
 - This generates planned supply
- Change quantity and approve planned order
- Re-run master planning
- Firm previously approved planned order



First scenario notes

- Updated a master plan
 - Based strictly on item transactions
 - Sales forecast not used
- “Local” master planning update vs. full update
 - Updates net requirements only for selected item
 - Will not propagate through bills of materials
 - To update ALL requirements, must update the entire plan



Master plan parameters

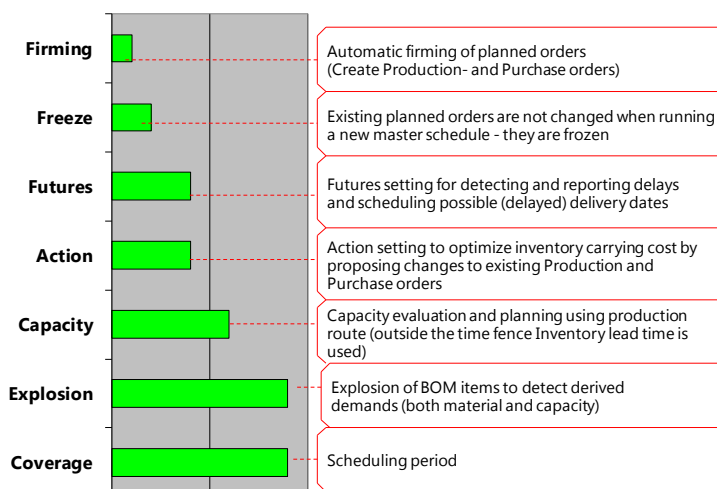
- Master planning → Setup → Plans → Master plans
 - Plan **StaticPlan**

The screenshot shows the 'Identification' form for a 'StaticPlan' master plan. The 'Name' is 'Long term plan'. The 'General' tab is active, showing several sections:

- Setup:** Includes checkboxes for 'Include on-hand inventory' (checked), 'Include inv. transactions' (checked), 'Include sales quotations' (unchecked), 'Probability %' (0), 'Include requests for quotations' (unchecked), 'Include requisitions' (unchecked), and 'Consider shelf life' (unchecked).
- Planned production orders:** Includes 'Scheduling method' (Operations scheduling), 'Finite priority' (unchecked), 'Backward capacity time fence' (0), 'Finite capacity' (checked), 'Finite capacity time fence' (60), 'Bottleneck scheduling' (unchecked), and 'Bottleneck capacity time fence' (0).
- Forecast:** Includes 'Inventory forecast model' (Current), 'Include supply forecast' (unchecked), 'Include demand forecast' (unchecked), and 'Reduction principle' (Transactions - dynamic period).
- Number sequences:** Includes 'Planned order number sequence' (Mat_41) and 'Session number sequence' (Mat_42).



Time fences



Coverage groups

- Items assigned to coverage groups
- 4 “coverage codes”
 - Period
 - Requirement
 - Min/max
 - Manual

Coverage group	Name
Auto	Automatic replenishment of raw material
Monthly	Monthly replenishment
Group	Replenishment per requirement grouping
Manual	Manual coverage group
Req	Replenishment per individual requirement

Coverage group:	Auto
Name:	Automatic replenishment of raw m
Calendar:	Production
General	
Coverage code:	Min/Max, Negative days: 2
Coverage period:	0 Positive days: 100
Coverage time fence:	100
Other	
BOM or formula version requirement:	<input type="checkbox"/>
Route version requirement:	<input type="checkbox"/>
Period template:	
Other	
Action	
Futures	



Scenario 2

INFO

- Multiple sales order lines with the same quantity spread a week apart
- Coverage groups will be changed to demonstrate differences between planned supply results

TO-DO

- Create a “lid” item
- Add the item to a single sales order with multiple lines with different delivery dates
- Update master scheduling on coverage groups with different coverage group settings



Coverage groups (cont.)

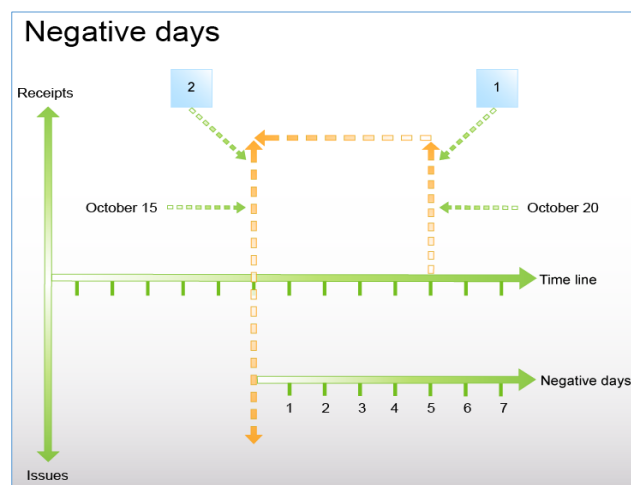
- Settings supersede similar settings on plan

Coverage group:	Group
Name:	Replenishment per requirement.gr
Calendar:	Production
General	
Other	
Planned order	
Requested production status:	Schedule
Firming time fence:	0
Freeze time fence:	0
Explosion time fence:	100
Capacity time fence:	100
Requisition	
Approved requisitions:	0
Forecast plan	
Forecast plan time fence:	100
Reduction key:	
Reduce forecast by:	All transactions
Include intercompany orders:	<input type="checkbox"/>
Safety margin	
Receipt margin:	0
Issue margin:	0
Reorder margin:	0

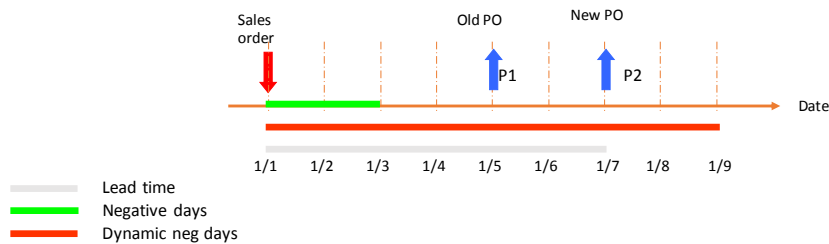


Negative days

- The number of days deemed acceptable to have negative inventory levels
- “Look forward” to see if there’s supply close enough to use
- Without 5 negative days, planned order 2 would result



Dynamic negative days

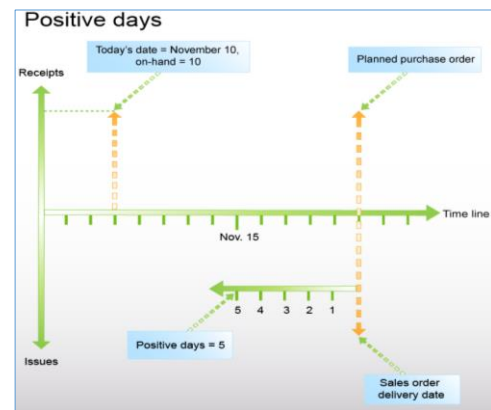


- Adds lead time to negative days
- Enables a more realistic use of negative days
- Enabled in master planning parameters form



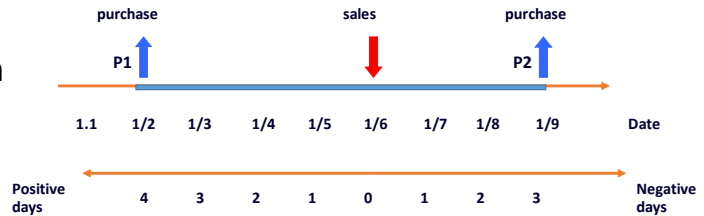
Positive days

- Number of days surplus inventory is acceptable
- Equal to the number of days existing inventory is used before creating new planned supply
- Typically set to same value as coverage time fence



Positive and negative days

- Control how “nervously” the system reacts
- Provide a buffer around the issue date which prevent new orders from generating
- Will reduce action messages as well



Action and future messages

- Action messages
 - Used to enhance proposed plan
- Future message
 - Indicated proposed plan doesn't work
 - Provides more realistic approach based on lead-times and derived requirements
- Both show in “Net requirements” form



Action and future messages (cont.)

- “Net requirements” form with action and future messages

Overview General Action Futures Period										
Update ▾ Inquiries ▾ Sorting ▾										
<input type="checkbox"/>	Reference	Reference	Number	Item number	Requirement date	Req. quantity	Accumulated	Action date	Action quantity	Futures date
	Purchase order		000028	AXUG_0003	6/27/2014	15.00	15.00	⇒	z A ↓	
	Planned purchase o...		003568	AXUG_0003	8/15/2014	10.00	25.00	×	×	×
	Sales order		000748	AXUG_0003	8/15/2014	-25.00				

Action message types

- Increase
- Decrease
- Postpone
- Advance
- Derived actions

Scenario 3

INFO

- A sales order and purchase order will be setup
- Action messages will be created for planned supply and actual purchase order

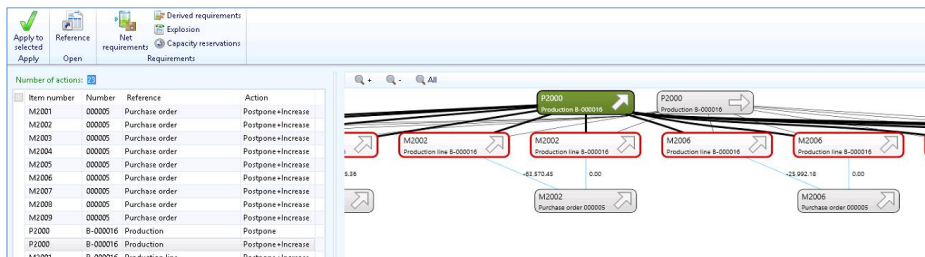
TO-DO

- Create a "label" item
- Create a sales orders
- Create a purchase order to partially satisfy the sales demand, but make it arriving very early
- Act on action messages



Action graph

- See the cascading effects of action messages for production material



Item coverage

- Item specific coverage overwrites coverage group

Overview | General | Lead time | **Min./Max.** | Dimension

(Change planned order type)

Planned order type: Purchase order

Main warehouse: [Field]

Use specific settings

Coverage group: Req

Vendor account: [Field]

Override coverage group settings

Coverage code: Requirement

Coverage period: 1

Coverage time fence: 100

Negative days: 2

Positive days: 100

Override time fences

Firming time fence: 0

Freeze time fence: 0

Explosion time fence: 100

Capacity time fence: 100

Approved requisitions: 0

Min./Max.

Minimum: 0.00

CW minimum: [Field]

Maximum: 0.00

CW maximum: [Field]

Minimum key: [Field]

Maximum key: [Field]

Fulfill minimum: Today's date

Minimum periods: [Field]

Formula priority

Planning Formula: [Field]

Default priority: 99

Current priority: 99

Date changed: [Field]



Min / max keys

- Units can be “Days”, “Months”, or “Years”
- “Fixed” enforces the start of the “Opening date”
 - Otherwise, changes based on when MRP is run
 - Unchecked for yearly strategic MRP run

Overview | General | Lead time | **Min./Max.** | Dimension

Minimum on-hand inventory

From date	Month	Factor	CW minimum	Minimum
1/1/2014	January	18.00		180.00
2/1/2014	February	17.00		170.00
3/1/2014	March	10.00		100.00
4/1/2014	April	10.00		100.00
5/1/2014	May	3.00		30.00
6/1/2014	June	1.00		10.00
7/1/2014	July	1.00		10.00
8/1/2014	August	1.00		10.00
9/1/2014	September	5.00		50.00
10/1/2014	October	7.00		70.00
11/1/2014	November	1.00		10.00
12/1/2014	December	17.00		170.00



Min / max keys (cont.)

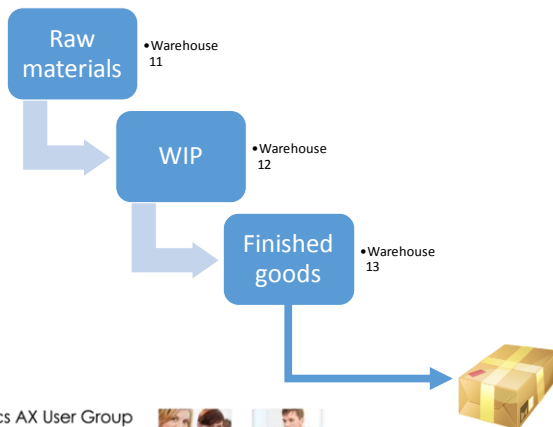
- Transactions look sort of strange
 - Only created when amount on-hand is below minimum
 - In the below example, 30 on-hand satisfies demand through September
 - In September, the minimum on-hand required is 50

Reference	Reference	Number	Item number	Requirement date	Req. quantity	Accumulated	Action date	Action quantity	Futures date
	Planned purchase o...	003596	AXJUG_0004	5/29/2014	30.00	30.00			
	Planned purchase o...	003597	AXJUG_0004	9/1/2014	20.00	50.00			



Warehouses

- Warehouse hierarchy is extremely important



Scenario 4

INFO

- Min levels will be created to drive demand
- Inter-warehouse relationship will be created

TODO

- Create a finished good item for the assembled coffee cup
 - We won't worry about BOMs yet
- Create min levels to generate demand
- Set up a warehouse-to-warehouse relationship
- Update master planning
 - Look at planned transfer orders
 - Examine settings that determine how planned transfer orders behave



Transit warehouse

- Warehouse that material sits in during transfer order processing
- Dictates how long delivery takes between geographical locations

The screenshot shows the 'Transit Warehouse' configuration form in Dynamics AX. It is divided into 'Filter' and 'Overview (General)' sections.

Filter:

- Shipping point:** Type: Warehouse, Warehouse: 12
- Receiving point:** Type: Warehouse, Warehouse: (empty), ZIP/postal code: (empty), County: (empty), State/province: (empty), Country/region: (empty)

Overview (General):

Shipping warehouse	Country/region	State	County	ZIP/postal code	Receiving warehouse	Transport days
12				5	11	5

Below the table are 'Add' and 'Remove' buttons.

Mode of delivery	Description	Transport days	Default
10	Track	5	<input type="checkbox"/>
20	Air	1	<input type="checkbox"/>



Forecasts

- Types
 - Demand – user-generated
 - Supply – user-generated, used rarely
 - Inventory – system-generated, based on Demand and Supply forecasts
- Models
 - Used to create for the forecast plans
 - Can include multiple sub-models



Forecast lines

- Can be manually entered through “Inventory and warehouse management” → “Periodic” → “Forecast” → “Entry” → “Items”
- Click “Demand forecast” button to open form

Model	Date	Customer account	Customer group	Item allocation key	Sales quantity	Unit	Amount	Currency	CW quantity	CW unit
Current	1/15/2013				400.00	ea	194,800.00	USD		
CurrentF	2/15/2013				397.00	ea	187,800.00	USD		
CurrentF	3/15/2013				396.00	ea	187,300.00	USD		
CurrentF	4/15/2013				381.00	ea	181,840.00	USD		
CurrentF	5/15/2013				396.00	ea	195,200.00	USD		
CurrentF	6/15/2013				391.00	ea	187,600.00	USD		
CurrentF	7/15/2013				391.00	ea	187,600.00	USD		
CurrentF	8/15/2013				396.00	ea	190,120.00	USD		
CurrentF	9/15/2013				400.00	ea	195,800.00	USD		
CurrentF	10/15/2013				400.00	ea	201,600.00	USD		
CurrentF	11/15/2013				410.00	ea	207,900.00	USD		

Allocation Method: None | Per: | Unit: | Day: | Period type: | End: | Create lines

Exploded

Date * Sales quantity Unit CW quantity CW unit Amount Currency



Forecast lines (cont.)

- Item allocation keys
 - Also known as “product family”
 - Can be forecasted against
 - Maintained in “Inventory and warehouse management” → “Setup” → “Forecast” → “Item allocation keys”
 - Don’t need the same item

Item number	Configuration	Size	Color	Style	Percent
C0001			Black		25.00
C0001			White		25.00
C0002					50.00



Forecast lines (cont.)

- Forecast lines can be allocated
- Types
 - None – lines must be manually entered for each date
 - Period – lines can be allocated over a given period
 - Select the unit to determine the period length
 - Key – can be used for seasonal items
- Reduction principle
 - Found on the master plan
 - Can be set to a key or reduction by sales / purchase orders
 - Can also select whether to reduce based on all transactions or just orders



Scenario 5

INFO

- Sales forecast will create demand
- Sales orders will consume this demand

TODO

- Create a sales forecast for an item
- Run master scheduling
 - Note new forecast lines
 - Note how sales orders reduce the forecast



Planned production orders

- Same philosophy as planned purchase orders
- Look at active BOM that meets requirement
 - Must have active BOM, or no derived requirements will be created – just the planned production order
- Cycles through multiple levels of BOM to generate requirements

BOM	Name	Site	From date	To date	From qty.	Active	Approved by	Approved
1000	Coffee cup assembly	1			1.00	✓	80004	✓

Item number	Configuration	Site	Color	Style	Warehouse	Resource consumption	Quantity	Per cent	Unit	Configuration group	Item type	Product no.
AXUL001					12	<input type="checkbox"/>	1,000		1	ea		Coffee cup
AXUL002					12	<input type="checkbox"/>	1,000		1	ea		Cup
AXUL003					12	<input type="checkbox"/>	1,000		1	ea		Label
AXUL004					12	<input type="checkbox"/>	1,000		1	ea		Thermal st.



Planned production orders (cont.)

- Settings in coverage groups
 - Explosion time fence
 - Requested production status

Other	
Planned order	
Requested production status:	Scheduled
Firming time fence:	0
Freeze time fence:	0
Explosion time fence:	100
Capacity time fence:	100



Scenario 6

INFO

- A BOM (000110) has already been created and is available for use
 - Composed of one cup, one lid, one label, and one sleeve
- Use minimums to drive demand and see

TODO

- Attach BOM to finished good item (DEMO-0005)
- Indicate item should generate planned production order
- Update full master plan and examine results



Scenario 7

INFO

- Resources and resource groups set to infinite capacity

TODO

- Assign route to item (Route 000085 can be used)
- Manually create planned production orders that overlap
- Look at reserved capacity
 - Note how capacity is overbooked for certain days



Scheduling

- Resources / resource groups
- Capacity
 - Infinite vs. finite
 - Past the time fence, AX uses inventory lead time for production orders
 - Route is necessary to calculate time requirements on a resource
- Bottleneck scheduling



Master plan parameters (scheduling)

- Scheduling setups

Identification

Plan:
 Name:

General

Setup

Include on-hand inventory:
 Include into transactions:
 Include sales quotations:
 Probability %:
 Include requests for quotations:
 Include requisitions:
 Consider shelf life:

Planned production orders

Scheduling method:
 Finite property:
 Backward capacity time fence:
 Finite capacity:
 Finite capacity time fence:
 Bottleneck scheduling:
 Bottleneck capacity time fence:

Forecast

Inventory forecast model:
 Include supply forecast:
 Include demand forecast:
 Reduction principle:

Number sequences

Planned order number sequence:
 Session number sequence:



Resources

- Resources drive capacity
 - Example – Assembler
- Resource groups are groups of resources
 - Example – Assembly pool
- Operation can be assigned to either
- Capacity can be set as finite or infinite



Resources (cont.)

- Resources can have capabilities assigned
 - These can route capacity reservation to a particular resource
 - Example – high temperature furnace vs. low temperature furnace
 - Both might be resources in the same group
 - Either might be satisfactory for certain operations
 - Sometimes, though operations might need a high temperature furnace

The screenshot shows the 'Resource' form for 'Polishing worker 1'. The form includes fields for 'Type' (main resources), 'Operation' (102), 'Ledger', and 'Financial dimensions'. The 'Capabilities' section is expanded, showing a table with columns for 'Capabl...', 'Description', 'Expirat...', 'Le...', and 'Prior...'. The table contains two rows: 'Cabinet production' with 'None' in the 'Expirat...' and 'Le...' columns, and 'Polishing' with 'None' in the 'Expirat...' and 'Le...' columns. The 'Polishing' row has '0.00' in the 'Prior...' column. Below the table, there is a note: 'Select View = All to view and/or manage all assignments, including those that are not currently effective'.



Routes

- Determine how long something takes to make
- Indicate how this time should be accounted for
- Indicate which resources should be used to complete them
 - For the example route
 - 1 hour per piece
 - Using the 1110 resource group (speaker assembly)



Bottleneck scheduling

- Scheduling based on most constrained resource
- Can be set on a resource / resource group
 - Although routes exist for other work centers, only the bottleneck resource constrains the scheduling
 - All other work centers should use infinite capacity



Scenario 8

- **INFO**
- Use same planned orders from Scenario 7
- **TODO**
- Enable finite capacity on 1210, 1211, and 1212
- Manually reschedule each planned production order
 - Backward from scheduling date
 - Use the same scheduling dates – we're trying to overschedule a resource



Scheduling

- “Production control” → “Periodic” → “Scheduling”
- Doesn’t include planned orders
- Can be run to firm up actual production orders in short term



Intercompany master planning

- Two ways this can be accomplished
 - Automatic – requires firming fence to be enabled in demand company
 - Semi-manual – requires intervention after other company MRP runs
- Can trace results in pegging



Tracing

- Through explosion
- Through Performance Monitor
 - Makes large files



Questions?

- Anything we didn't discuss?
- Any areas that we want to re-examine?
- jake@horsepeaks.com

