- Introductions

- Supply Chain Business Challenges

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- Inventory Optimization

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- Conclusions

- Questions

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ILOG - *Helping clients make smarter decisions*

Powerful Business Rule Management System

Adapt and respond dynamically, automating process-based decisions with business rule management

Advanced Suite of Optimization Tools

Produce the best possible action plans, enhancing abilities to explore alternatives, understand trade-offs, and respond to changes in business operations

Efficient Supply Chain Management

Optimize manufacturing and Supply Chains. Design & planning tools for improved efficiency and productivity

Innovative Visualization Tools

Transform insight into action, enhancing collaboration for smarter role-based business decisions

ILOG
An IBM Company

Today's Supply Chain Challenges

- Global supply chain with long lead times
- Rising customer expectations
- Increase in labor costs in developing countries

The Average Annual Wage Increase between 2003 and 2008

in different Countries

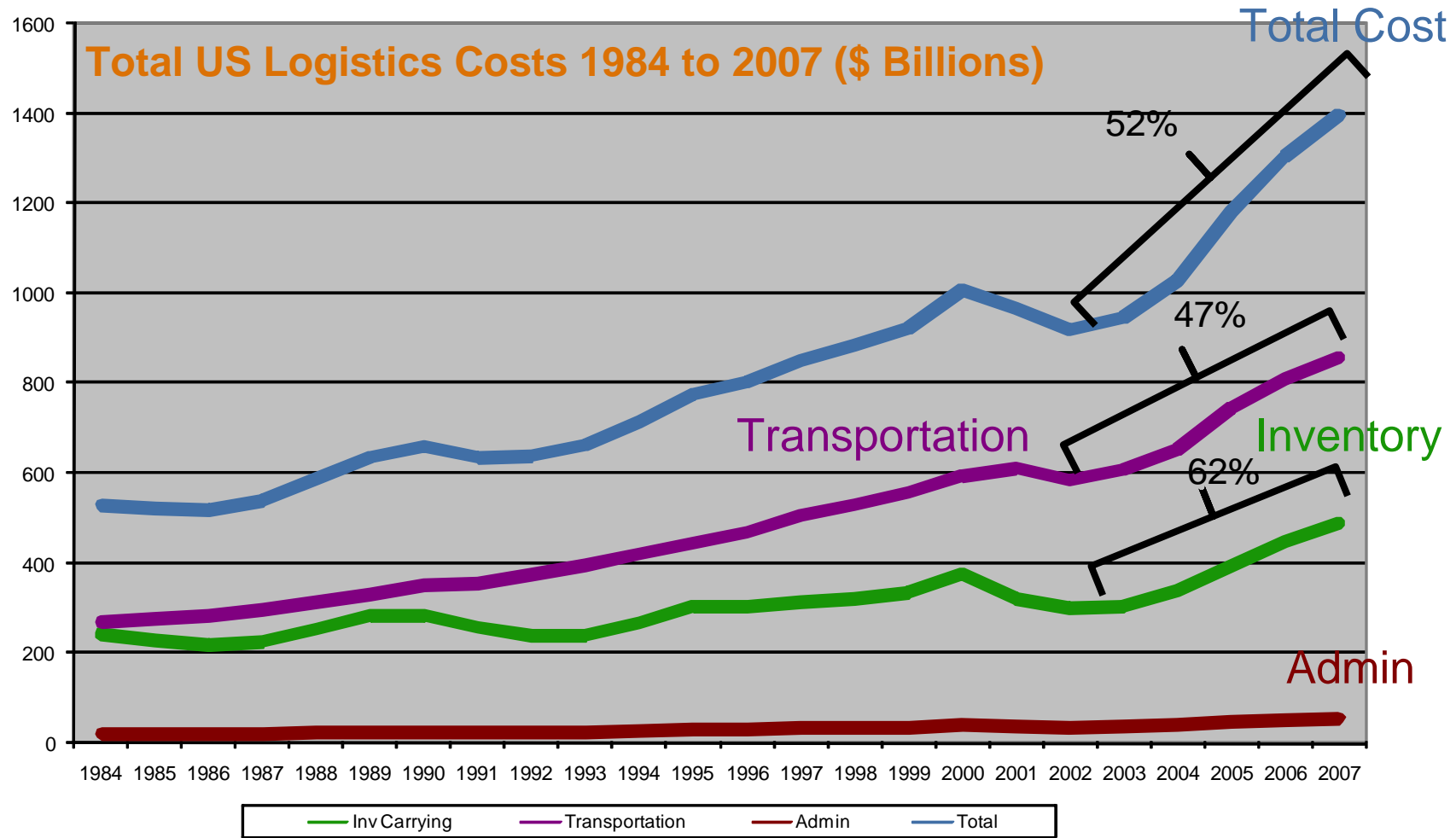| Country	Brazil	China	Malaysia	Mexico	US
Average Annual Wage Increase	21%	19%	8%	5%	3%

Today's Supply Chain Challenges

- Global supply chain with long lead times
- Rising customer expectations
- Increase in labor costs in developing countries
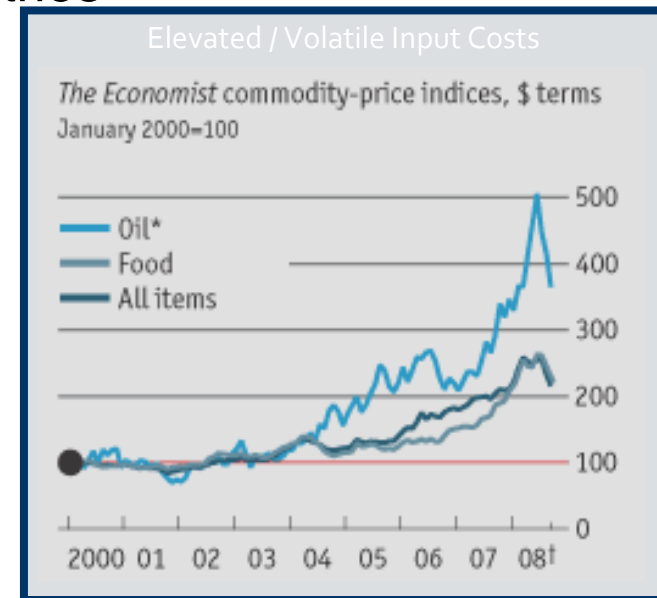- Increase in logistics costs

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Total US Logistics Costs in $MMs

Total US Logistics Costs 1984 to 2007 ($ Billions)

Total Cost

52%

47%

Transportation

Inventory

62%

Admin

Legend: Inv Carrying | Transportation | Admin | Total

X-axis years: 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007

Y-axis: 0 200 400 600 800 1000 1200 1400 1600

Source: 19th Annual Logistics Report

Today's Supply Chain Challenges

- Global supply chain with long lead times
- Rising customer expectations
- Increase in labor costs in developing countries
- Increase in logistics costs
- Importance of sustainability
- Unprecedented volatility

Elevated / Volatile Input Costs

The Economist commodity-price indices, $ terms
January 2000=100

Oil*
Food
All items

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Supply Chain Apps are Top of Mind

Supply Chain Management is key for Business Perforrmance

Figure 1. Top Three Priorities for Supply Chain Investment

"What are the top three priorities for investment in your organization's supply chain management function today?"
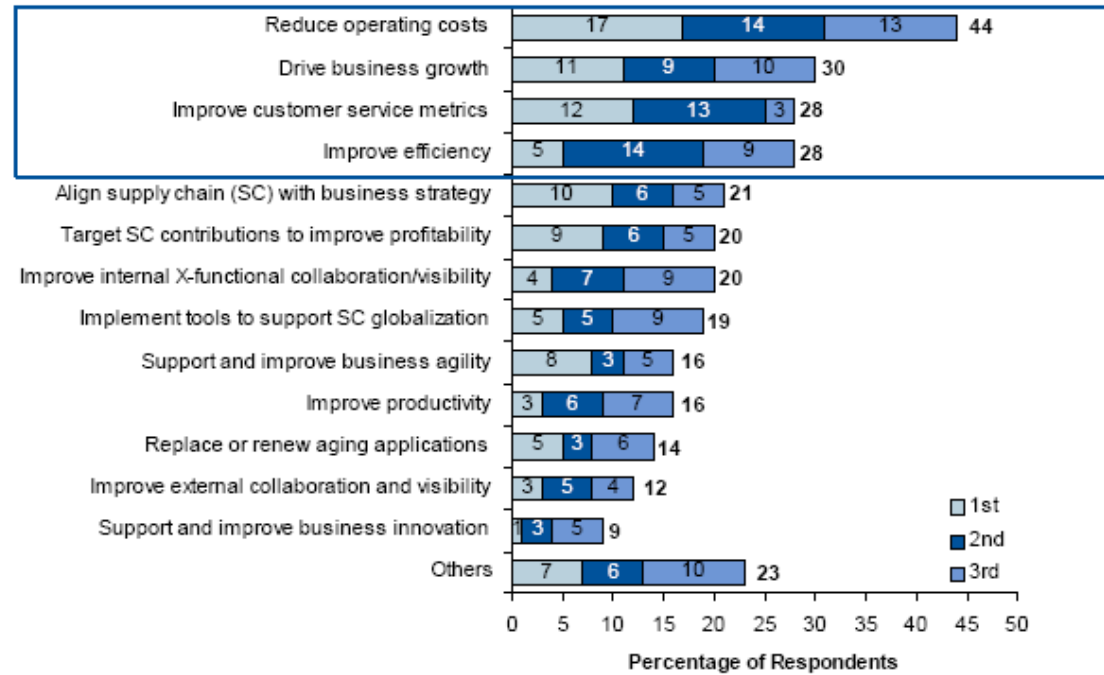
Source: Gartner (December 2008)

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ILOG Supply Chain Applications

- Strategic Supply Chain Planning
  - **Logic Net Plus (LNP):** Network design and planning
    - o Determine optimal number, location, territories, and size of warehouses, plants, and lines.
    - o Determine where products should be made.
    - o Optimize Carbon Footprint
  - **Inventory Analyst (IA)**: Inventory Optimization
    - o Determine push/pull locations, buffer locations, postponement, and policy analysis
  - **Product Flow Optimizer (PFO):**
    - o Determine best flow considering inventory, transportation, and mode
  - **Transportation Analyst (TA)**: Transportation Planning
    - o Strategic routing for fleet sizing, multi-stops, backhauls, and more.

- Inventory Planning
  - **Inventory Analyst**: Safety Stock setting for ERP
    - o Maintain the correct inventory levels on an on-going basis

- Production Planning and Detailed Scheduling
  - **Plant PowerOps (PPO)**: Production planning and detailed scheduling
    - o Planning and detailed finite scheduling for process manufacturing plants
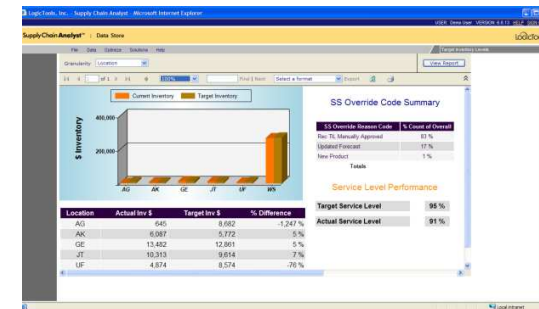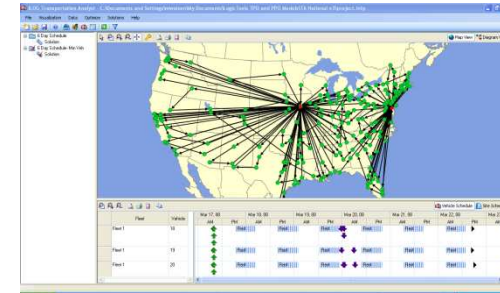
SAP® Certified
Integration with SAP Applications

Manufacturing **Transportation**

Food & Beverage **CPG** **Medical**

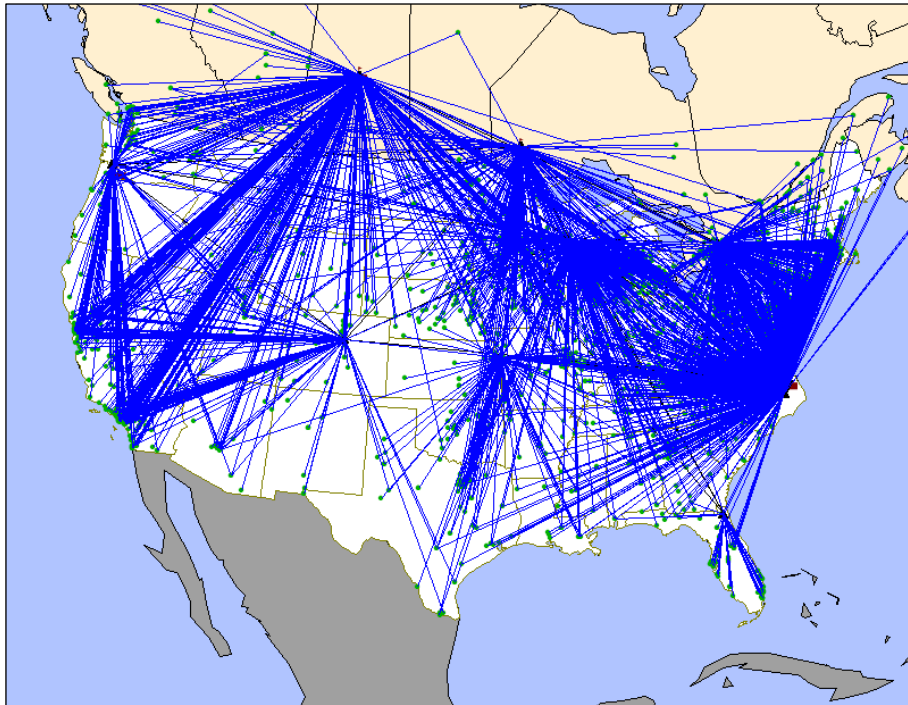**Distribution** **Defense** **Retail** **After-market/Service**

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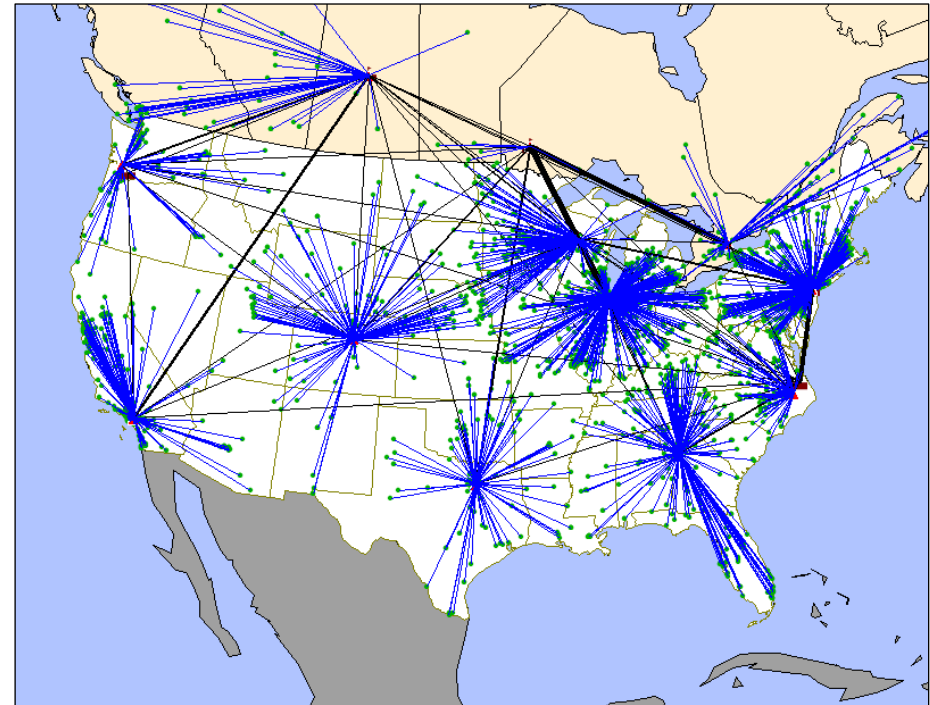
- Conclusions

- Questions

Making the Trade-Off Between Service and Cost

Optimal Network For Cost

Savings: $6 million
Service: 40% next day

Optimal Network For Service

Savings: $3 million
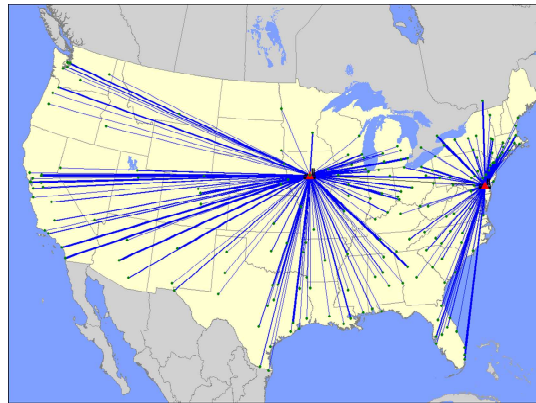Service: 80% next day

Which is Better?

LogicNet Plus XE

- Determines the best number, location, and size of DC's, plants, and lines
- Multi-time period for multi-year or seasonal planning
- Unlimited echelons, unlimited BOM, including multiple recipes and by-products
- Detailed transportation modeling including min/max on lanes for groups of sites
- Detailed sourcing rules for customers and warehouse (single source, dual source, etc)
- Detailed production modeling including lot sizes, overtime, yield, tooling, tanks, and moves
- Currency exchange rates
- Economies of scale, lanes, site grouping, and group single sourcing
- Ability to run sensitivity analysis and efficiently simulate what-ifs
- Carbon Modeling

- Complementary Tools for Follow On Analyst
  - Inventory Analyst for understanding the inventory impact and inventory placement
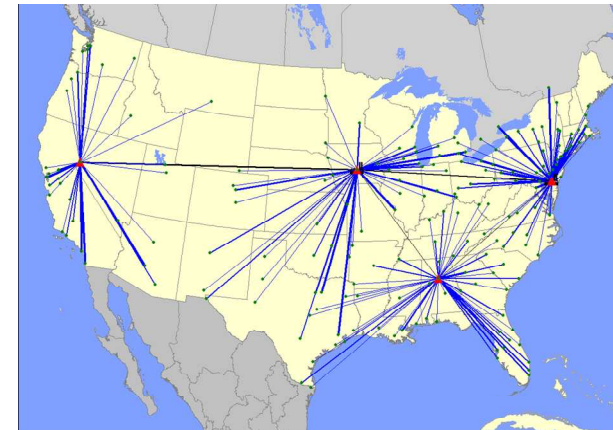 - Transportation Analyst for understanding the details of the routes

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Carbon Footprint Analysis with LogicNet Plus

Baseline Network

Optimized Network

Network for Cost, Service and Carbon Footprint

Distribution Network with 2-7 DC Locations

Optimal Solution

1.6% cost increase;
20% distance decrease
11% reduction in carbon

Legend:
- Total Cost ($)
- Carbon Footprint (kg CO2)
- Production Cost($)
- Inbound Shipping ($)
- Outbound Shipping ($)
- Warehouse Fixed Cost ($)
- Avg Distance to Cust (Miles)

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THE PEPSI BOTTLING GROUP
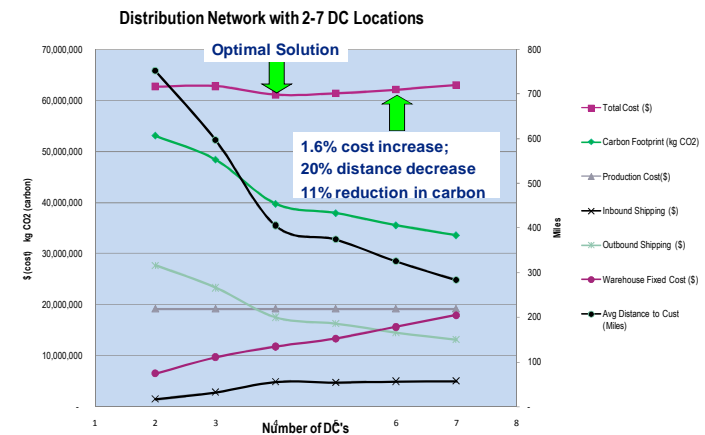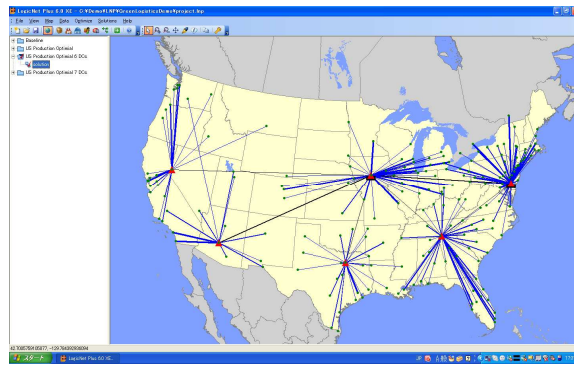
Recent PBG Success Story

Case Study recently published in Consumer Goods Technology Magazine

■ **Challenge:** New demand patterns suddenly left PGB bottle lines operating at capacity and the peak demand outstripping instaneous production capacity

■ **Goal:** Utilize LogicNet Plus XE to create a process which continually improves the production sourcing strategy by minimizing system-wide costs, providing better customer service and creating a competitive advantage

■ **Results:** Their goal was achieved with specific results including:
  - An increase in number of cases available to sell due to reduced out of stocks
  - Reduction in raw material and supplies inventory from $201 to $195 million
  - A 2% decline in the growth of transport miles even as PBG revenue grew
  - Increased in the return on invested capital

"ILOG supply chain applications provided us the means to implement a 21st century supply chain by optimizing inventory, reducing costs and increasing sales" -- Paul Hamilton, VP Global Supply Chain, Logistics and Strategy

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Strategic Transportation Questions Addressed

- Companies need to analyze their transportation network strategy across many dimensions and compare multiple what-if scenarios.

- For a given set of shipments, what are the best routes?
  - Can be used to set budgets
  - To analyze different business rules– different time windows, different rules for service times
- What are the best fixed routes to use?
- What are the opportunities for combining shipments and finding continuous moves?
- Which shipments should use private fleet? Commercial truckload? LTL?
- What should the fleet size be?
- What is the impact of backhauls? How can running inbound and outbound transportation together save additional money?
- After you re-design the supply chain, how does this impact the routes, multi-stops, and transportation operations?
- How do we take advantage of hubs?
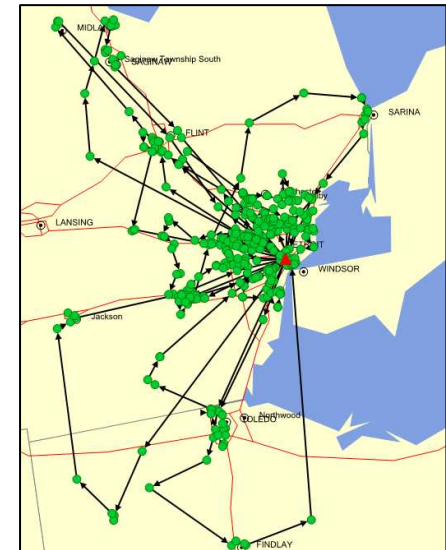
Network Design Solution
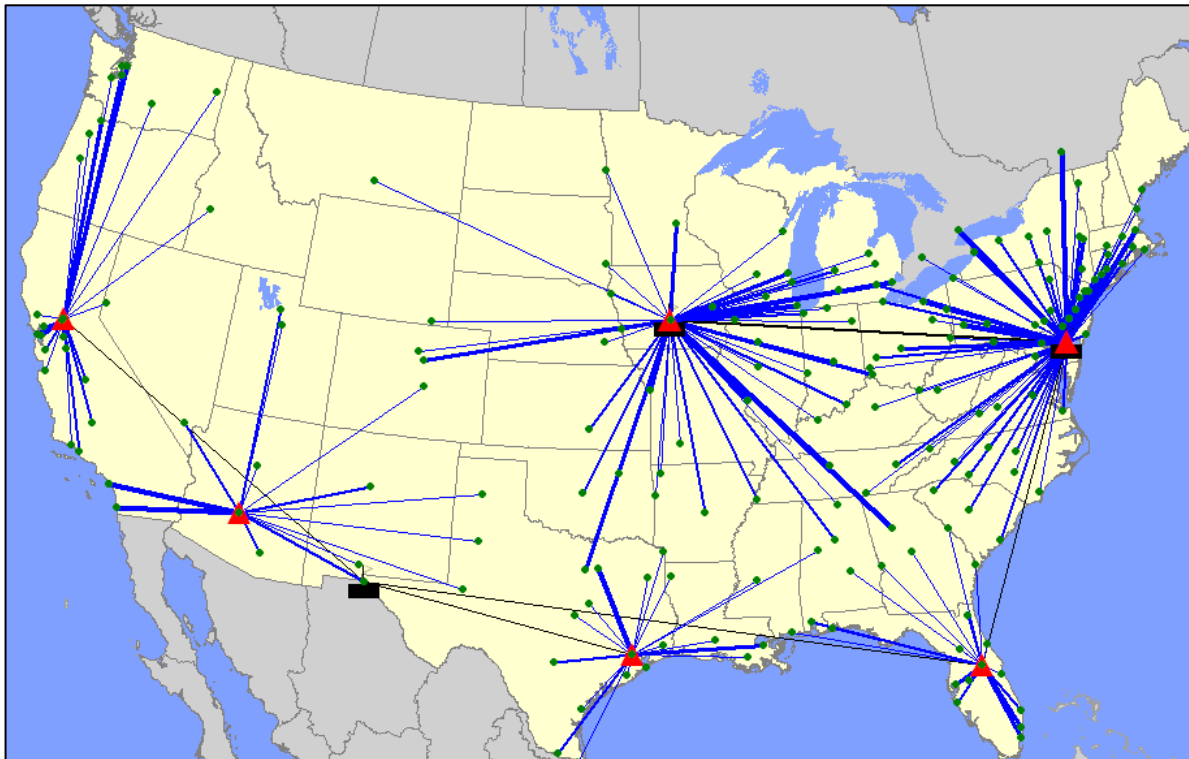
Opens four additional distribution locations:

- Sacramento
- Phoenix
- Houston
- Orlando

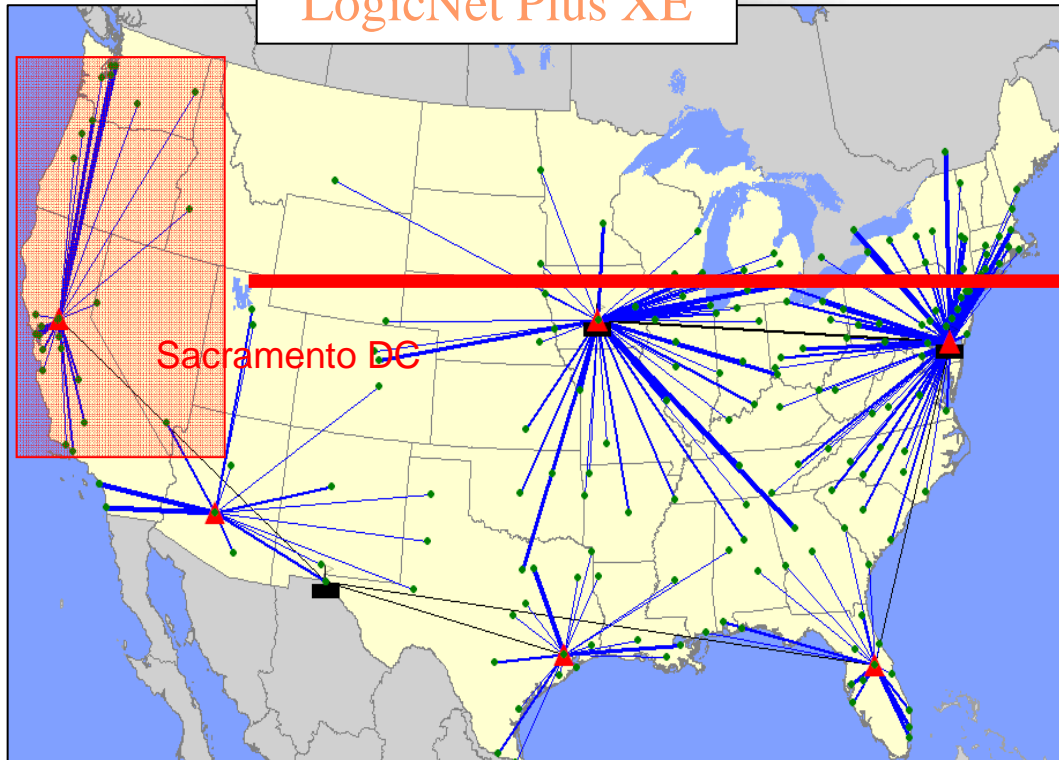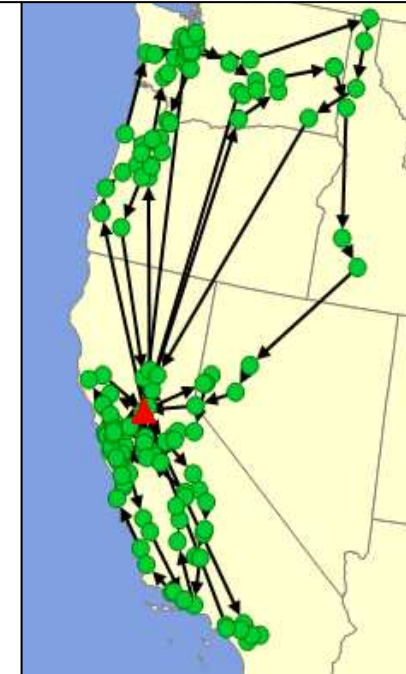Total Cost: $63,000,000   9% Reduction

Average Distance to Customers: 330 miles   56% Reduction
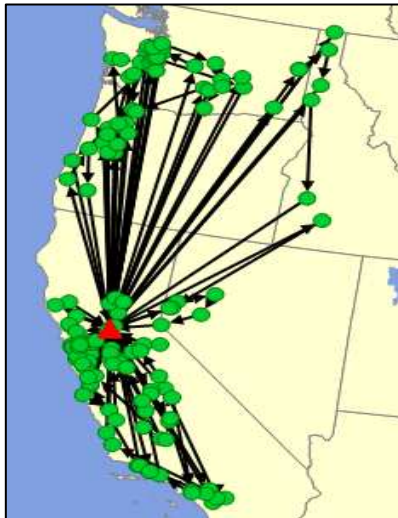
LogicNet Plus XE

Transportation Analyst

Sacramento DC

Annual Snapshot
Total Weight Delivered = 19MM lbs
- Avg. Week 375K lbs
Total Transportation Cost = $1.5MM
- Avg Week $28.6K per week

Typical Week
Total Weight Delivered = 380K lbs
Total Transportation Cost = $29.4K
- Within 3% of LNP Weekly Avg

Shipment Routing Evaluation

Each Customer is promised delivery on a specific day (5 Time Windows)

	Value
Number of Vehicles	21
Total Distance	34,386
Deadhead Distance	11,621
TOTAL COST	$88,301

37% Savings →
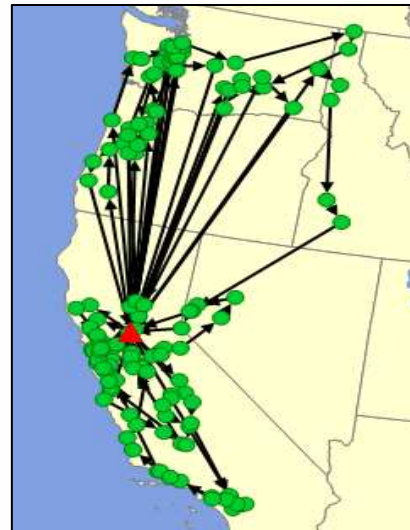
Each customer is promised delivery during a portion of the week (2 Time Windows)

	Value
Number of Vehicles	13
Total Distance	21,320
Deadhead Distance	5,595
TOTAL COST	$55,877

+ 30% Savings →

Deliveries can be made at any point throughout the week (1 Time Window)

	Value
Number of Vehicles	6
Total Distance	11,001
Deadhead Distance	1,489
TOTAL COST	$29,369

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Inventory Optimization: Business Drivers

- Working Capital Reduction
- Service Level Improvement
- Reduce the risk of write-off due to preemption and obsolescence
- Reduce expediting cost
- Overhead cost of inventory (warehouse, insurance, …)

Inventory Analyst   Questions that we answer….

Inventory Questions:
1. How much per SKU?
2. Where?

Objective

1. Maximize Service Level
2. Minimize Inventory Cost

Procurement

Manufacturing

Packaging & Distribution

Customer Service
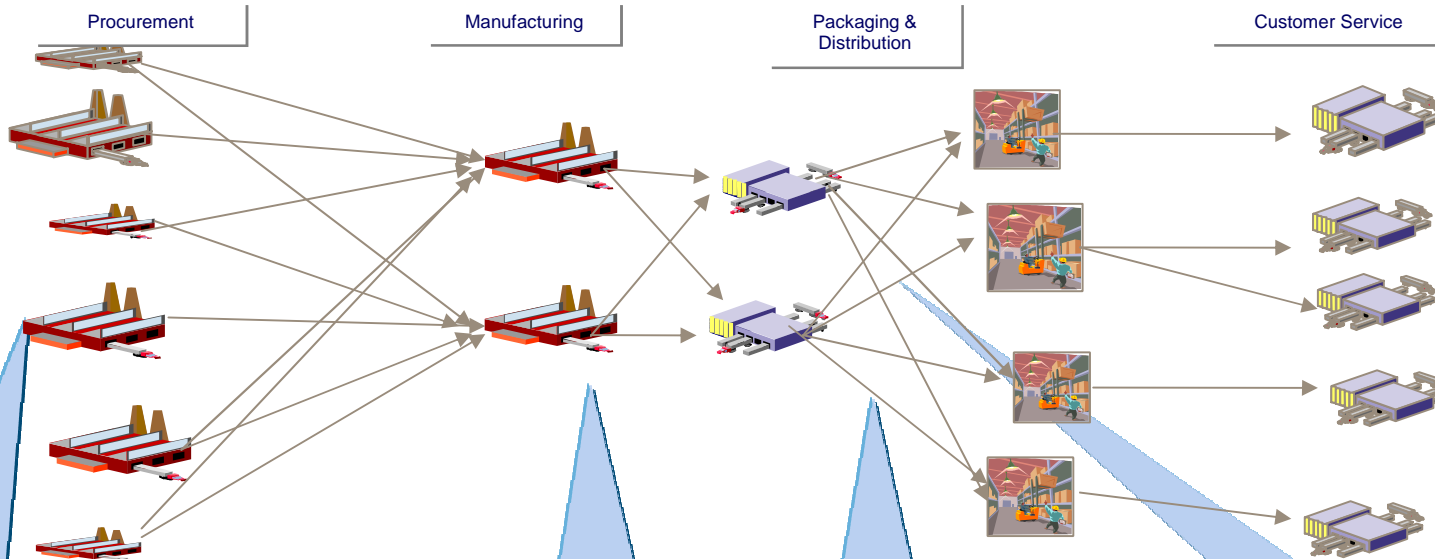
What impact does each supplier have on the entire supply chain?

Which facilities should be make to order or make to stock?

How should shipments and policies be coordinated?

How should I take advantage of centralization to reduce inventory?

Inventory Analyst™ – Multi-Echelon Optimization
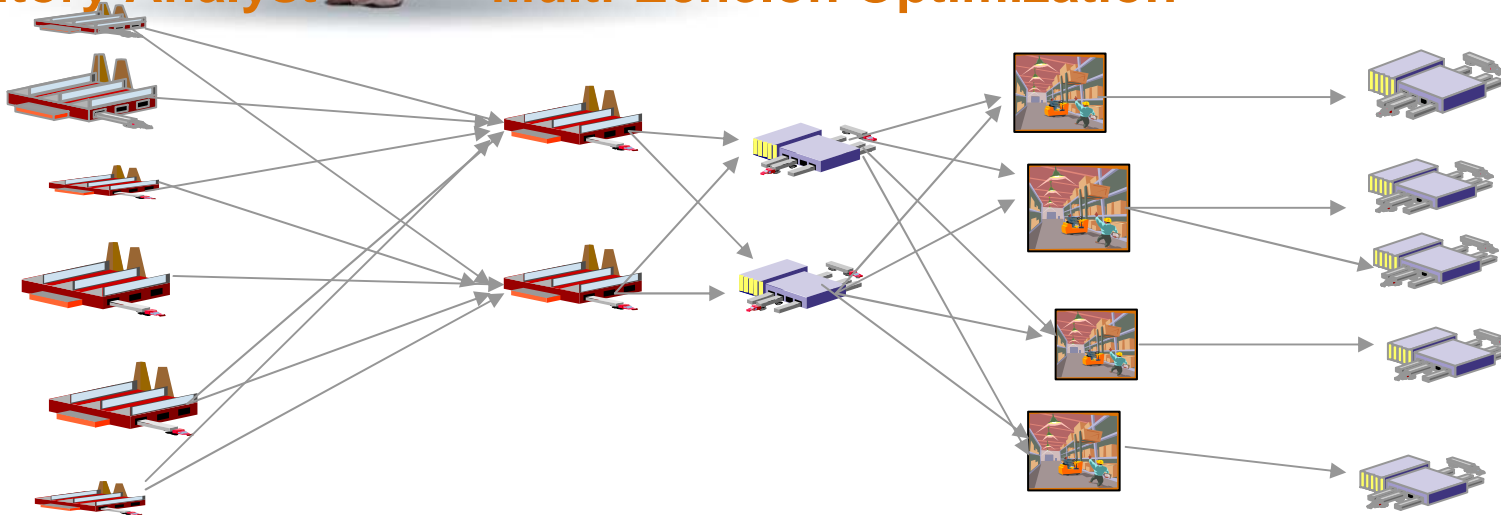
Strategic	**Tactical**
Evaluate supplier sourcing *Postponement strategies* *Make versus Buy* *Transportation decisions* *Central stocking strategies* *Lean Six Sigma initiatives* *VMI, SMI*	▪ *Improve upon rule of thumb or single stage SS calculation* ▪ *Evaluate service level changes and impact on inventory* ▪ *Stratified service levels to customers* ▪ *Feed APS SS targets weekly/monthly/Quarterly*

Example Supply Chain

Supplier 1

2 Day Process Time

Supplier 2

Can Re-Order Daily

Mfg Plant

FG WH

Cust

Supplier 3

Frozen Schedules of 10,15, and 15 Days
Some Variability in Supply

Demand = 1,000/wk
Forecast Error 50%
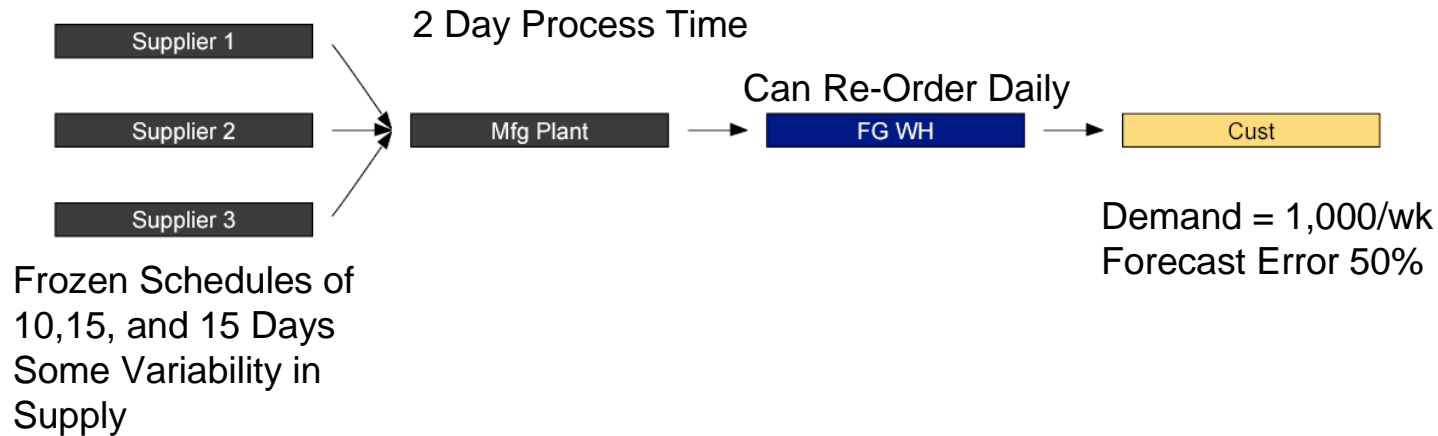
If this company implemented "lean" as was able to remove raw material inventory, it just means that the warehouse finished goods inventory must now account for the supplier frozen schedule and supplier variability.

There is no where else to buffer this. Besides more inventory at the warehouse, the only choices would be to lose sales or make the customers wait.

"Lean" Supply Chain- All Inventory Ends up at the Warehouse

Supplier 1

Supplier 2 → Mfg Plant → FG WH → Cust

Supplier 3

Inv Turns: 11.6
Working Capital: $44K
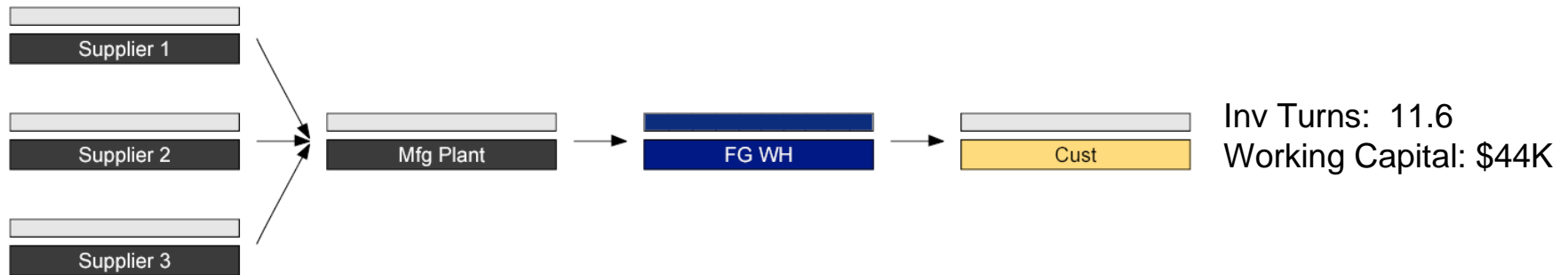
Supply Chain With Appropriate Buffers of Raw and Finished Goods

Supplier 1

Supplier 2 → Mfg Plant → FG WH → Cust

Supplier 3

Inv Turns: 20.8
Working Capital: $25K
(A 43% Reduction)

The plant is buffering the supplier lead time and variability with less expensive components
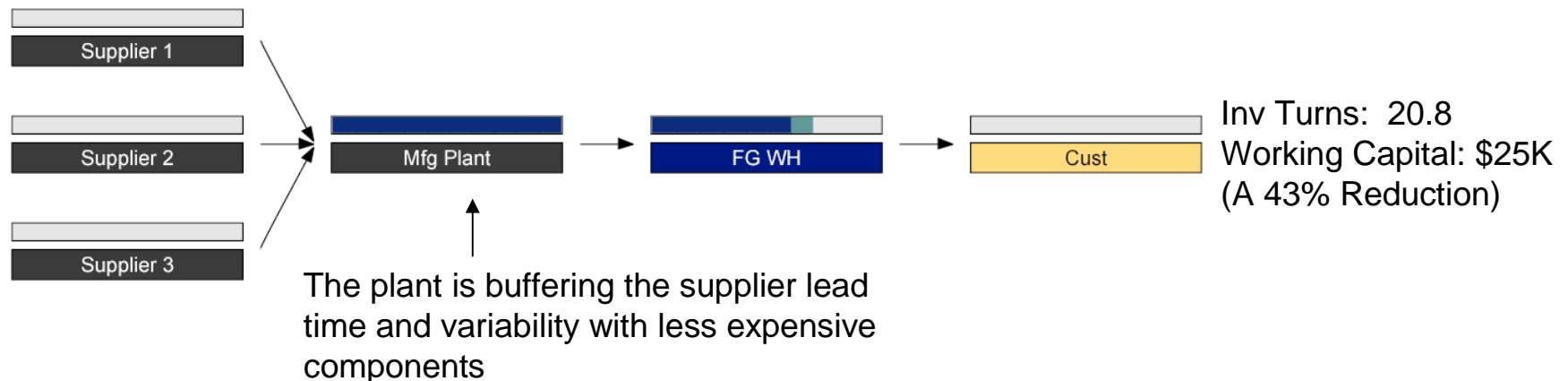
A Better Approach to Lean

③

| Supplier 1 |
| Supplier 2 | → | Mfg Plant | → ② | FG WH | → ④ | Cust |
| Supplier 3 |
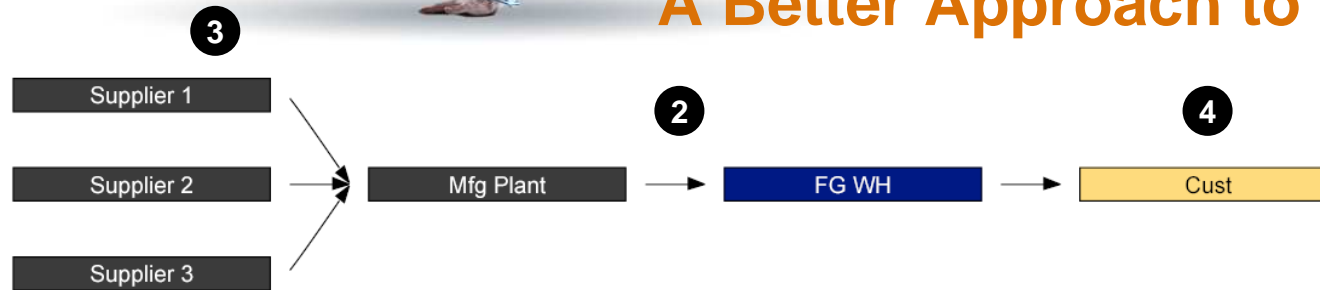
① *Identify the appropriate locations and sizes of buffers*

② **Make plant more flexible, less variable, and responsive to warehouse**

③ **Reduce supplier lead time and variability**

④ **Reduce demand variability**

① **REPEAT: Allow inventory to decrease as you work on 2-4. Review buffer locations**

Inventory reductions come from removing lead times, variability, and inflexible systems. These changes often take time.

Identifying the location of buffers allows you to minimize the impacts of lead-time and variability giving you time to fix the root of the problem.

Common knowledge…

- We all are aware that if we could:

  - Reduce Forecast Error   =>   Inventory ↓

  - Improve Supplier Performance   =>   Inventory ↓

  - Increase Service Level   =>   Inventory ↑

  - etc.

"Challenge: Very hard to quantify how much increase/decrease, without detailed analysis"

How Leading Companies are Using Inventory Analyst

Strategic

New Product Introductions

- Move away from material cost focus toward a total supply chain cost focus – including inventory
- Design for supply chain

Six Sigma Continuous Improvement Team

- Using with LogicNet Plus to quantify changes to supply chain structures and processes
- SC team acts as liaison to business units

Evaluate Push/Pull Boundaries

- Move away from "push", understand supply chain cost and inventory ramifications

Tactical

SAP R/3 and APO Integration

- Monthly feed to SAP
- IA included in S&OP process
- Work with BW in SAP
- Use IA strategically as well

Complement GSAP rollout

- Feed APO inventory targets
- Phase I Malaysia rollout of SAP

Create TIL – Target Inventory Levels

- Feed multiple ERP systems
- Minimal user interaction with IA
- Exception management flows

Data Process Flow

Inventory Analyst™

Inventory Planners

Data Store

Projected Inventory

Jan Feb Mar Apr May Jun

Recommended Safety Stocks

Exceptions/Alerts

100 90

Inv $
Actual vs. Target

2 to 4 Master Data Tables

Safety Stock Values/ Days of Coverage

Business Analysts

Automated Scenario Creation Wizard uses:
- Master Data
- Configurable Defaults
- Filters
- Data stored in Inventory Analyst™

Scenario 1

Scenario 2

Perform Offline 'What if Analysis' starting with same Master Data

SAP

ORACLE

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How can IA complement APO

- Enhance the safety stock level setting process

- Optimize inventory values across the network

- Standardize and formalize the inventory planning processes that are ad-hoc in many organizations today

- Enable easy what-if scenario analysis

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ILOG Plant PowerOps
Integrated planning and scheduling solution for the batch process industry

- FMCG
  - Fresh dairy
  - Tobacco
  - Chocolate, Candies
  - Biscuits
  - Baby food
  - Beer, Soda
- Pharmaceutical
  - Biotech
  - Pharmaceutical
- Chemicals
  - Consumer chemicals
  - Cosmetics
  - Industrial chemicals

- High demand variability

- Complex manufacturing process

- Focus on performance management
- and cost control

- Product mix changes, new product introduction, phase out

- Complex product quality issues

- **Detailed manufacturing models**

- **Decision support for planners**

- **Performance analysis**

- **Integration in IT landscape**
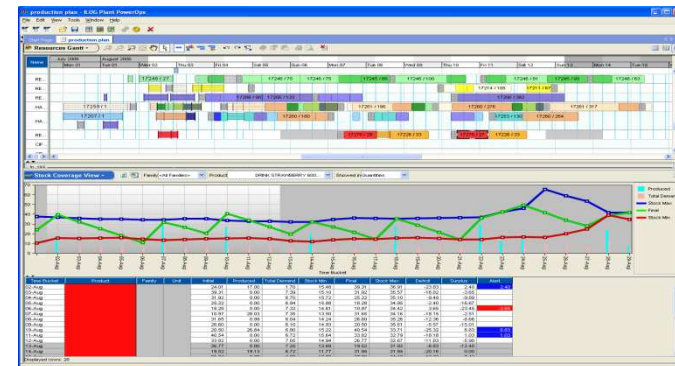
PPO for CPG, Pharmaceutical, Food & Chemicals

Stock and Customer Service Optimization
- Target stock level, Max stock level Min Stock level
- Optimize safety stock and production planning
- Min delivery time and Max delivery time
- Customer required remaining shelf life

Optimized Constrained Planning
- Recipe management
- Optimized automatic selection of alternative recipes (and not only alternative equipment)
- Optimized batch size calculation taking into account production constraints (e.g. equipment capacity)
- Batching policies for traceability

Waste optimization and standard of quality enforced
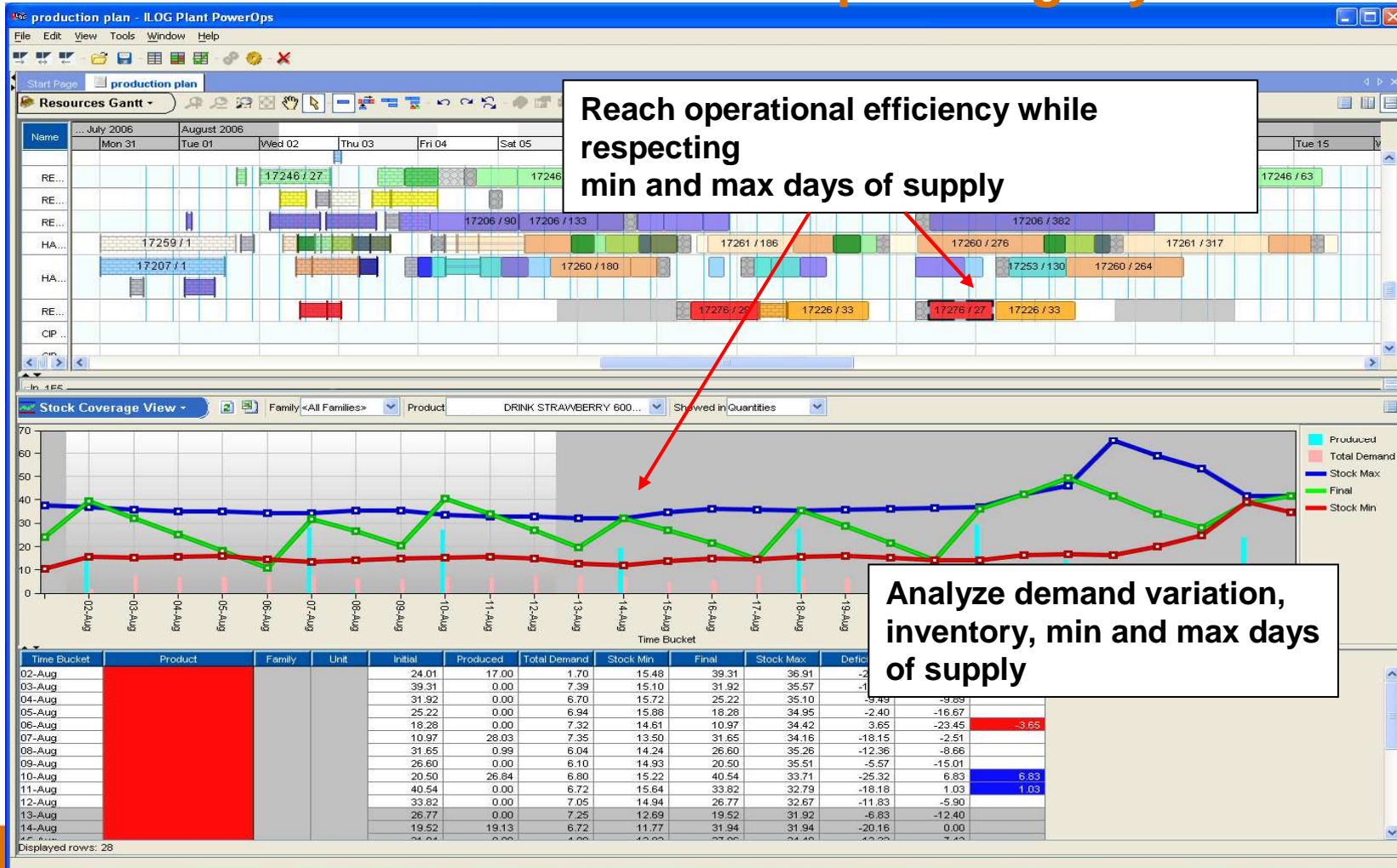- Shelf life and maturation time for raw material, semi finished and finished
- Waste recipes

Specific Batch Process Industry features
- Resource connections (pipe lines, conveyors, …)
- Variable machine efficiency
- Time constrained activities
- Tanks, buffers and silos
- Cleaning In Place (CIP) optimization
- Changeover and Cleaning Procedures
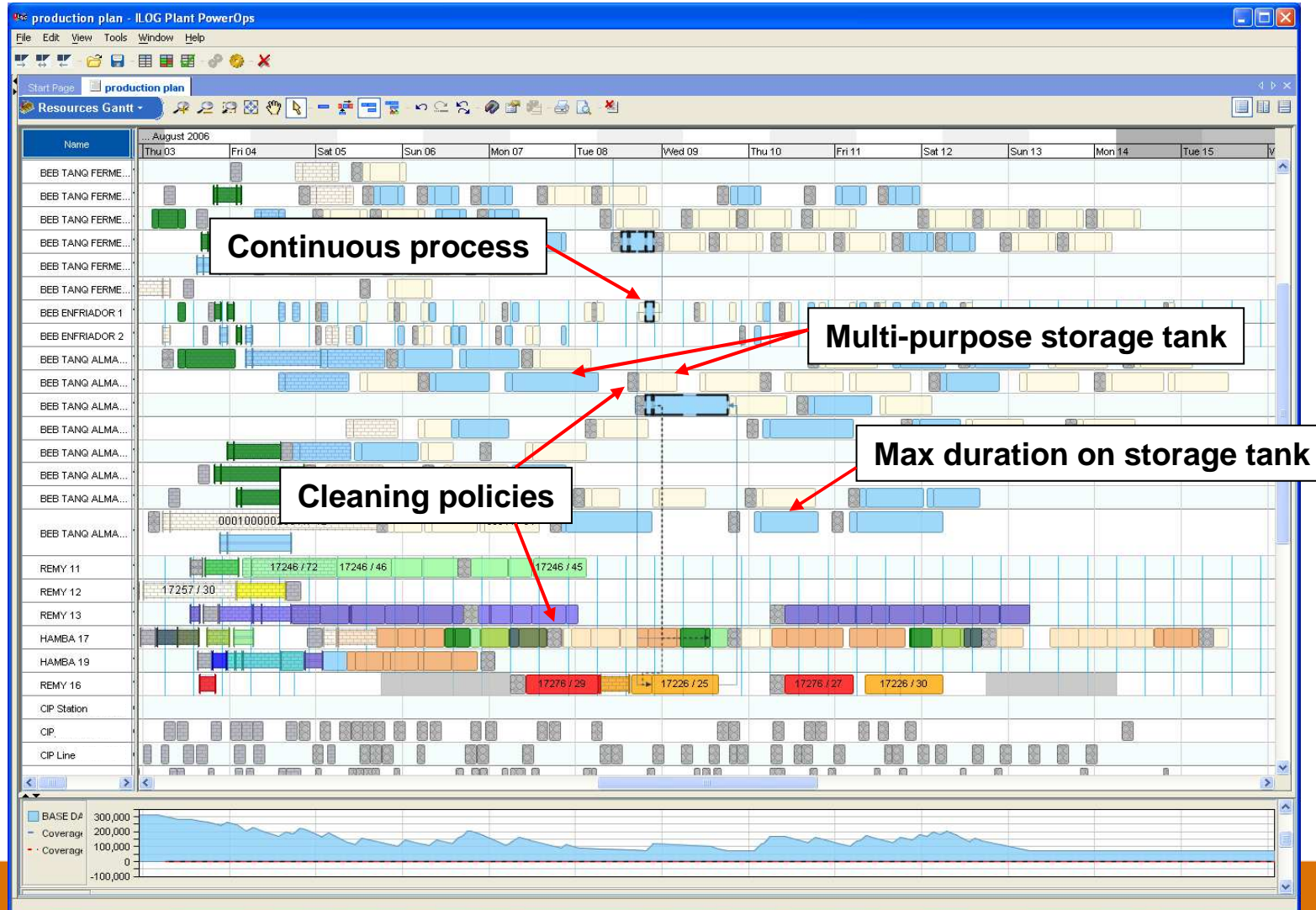- Co-products and by-products

Managing plant floor constraints

Continuous process

Multi-purpose storage tank

Max duration on storage tank

Cleaning policies

Optimal tradeoff between Supply Chain and Manufacturing goals

KPI Comparison Panel				✕
KPIs	Initial	Standard	SupplyChain	Factory
Inventory Excess (t)	1,136.65	513.81	453.78	579.74
Inventory Deficit (t)	22,021.54	17,768.21	16,049.80	19,003.19
Daily Inventory Excess Incidents	60.00	35.00	32.00	41.00
Daily Inventory Deficit Incidents	195.00	179.00	170.00	177.00
Operational Efficiency (%)	62.92	63.18	63.28	63.72
Operational Utilization (%)	73.91	86.48	90.75	83.92
Average Cycle Time (h)	50.71	45.55	41.10	47.31
Total Cleaning Time (h)	134.65	178.65	192.92	164.65
Total Setup Time (h)	0.00	0.00	0.00	0.00
Average Compactness (%)	99.87	98.64	94.93	97.48
White Mass Waste Cost ($)	0.00	0.00	0.00	0.00
Fruit Change Waste Cost ($)	0.00	0.00	0.00	0.00
Packaging Change Waste Cost ($)	0.00	0.00	0.00	0.00
Max Direct Labor (people)	0.00	0.00	0.00	0.00
Manpower (man.hours)	0.00	0.00	0.00	0.00

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Scenario - 1

customers orders → ERP ← Demand Planning

Net demands

other plants requirements

PPO planning

← scheduled material arrivals, released orders

MRP (SAP) → proposed purchasing orders

service levels →

PPO Model

Constraints

Objectives

Visibility

→ suggest scheduled process orders

min-max stock →

Planning

Production

optimization strategies →

PPO scheduling

released process orders

WIP

Inventory

Resources Status

Production Control and Monitoring
(MES or ERP)

Plant

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Scenario - 2

customers orders

ERP

Demand Planning

Net demands

other plants
requirements

PPO
Model

Integrated
Planning &
Scheduling

*Shared
Constraints and
Objectives*

service levels

min-max stock

optimization
strategies

scheduled material
arrivals, released
orders

suggest scheduled
process orders

MRP
(SAP)

proposed
purchasing
orders

Planning

Production

released process

orders

WIP

Inventory

Resources Status

Production Control and Monitoring
(MES or ERP)

Plant
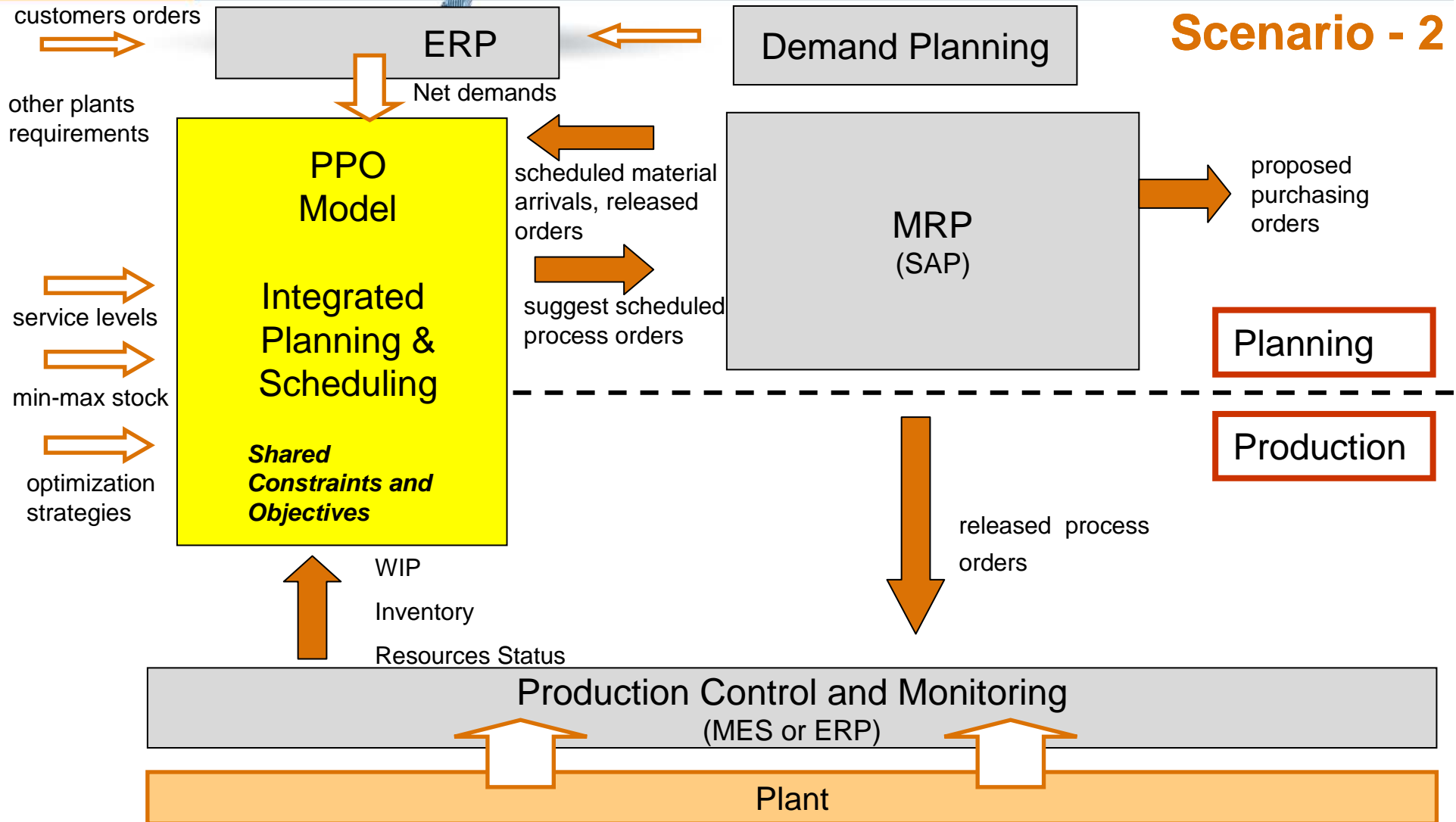
Excellence in Factory Planning & Scheduling means…

- **Improved operational efficiency & throughput**
  - Do more with less Equipment, Manpower, Inventory, WIP, Safety Stocks and Buffers, Energy
- **Improved fulfillment and on time delivery**
  - Optimal tradeoff between production efficiency (e.g. campaigns optimization), inventory costs and customer service
- **Better management of regulatory compliance**
  - Quality regulations managed as constraints in planning and scheduling
- **Reduced waste**
  - Reduced product waste in products with shelf life constraints
- **Better synchronization**
  - Between upstream and downstream processes and resources
  - Between production, quality control, maintenance and internal logistics
  - Between execution and demand sensing
- **Demand driven manufacturing**
  - The higher the variability of demand, the greater the need for manufacturing scheduling systems to be closely coupled with other planning systems.
  - Integrated planning and scheduling, Dynamic Safety Stock
- **Reduce planning and scheduling cycle time**
  - Enables to make decisions more often, thus based on better information
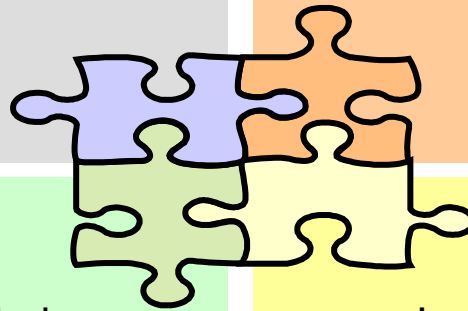 - Ease of use is critical

Key benefits for Danone De Mexico

Information System

- Full SAP integration
- Modeling of both finished and semi-finished products
- Repeatable core-model

User

- Very good user acceptance
- Easy to learn, easy to use
- Decision support system for planners with plan editing capabilities

Organization

- Manufacturing and Supply Chain are using the same tool
- Daily (weekly before) planning
  - Improve reactivity
- Detailed planning delivered to manufacturing

Process

- Improve
  - Operation Efficiency/Utilization
  - Service level
  - Inventory corridor
- Deliver executable Plan
  - Finished products & white mass
  - Cleaning & changeovers
- Planning and scheduling integrated

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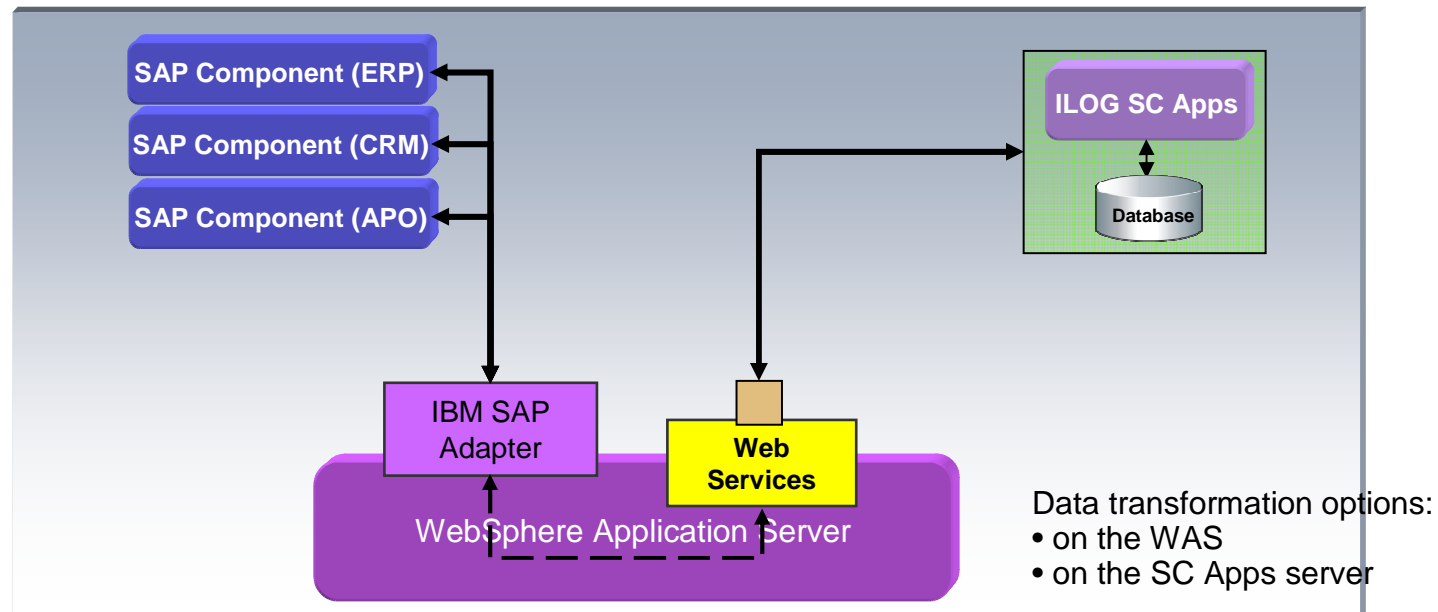
- Conclusions

- Questions

SCM Complements SAP's White Spaces
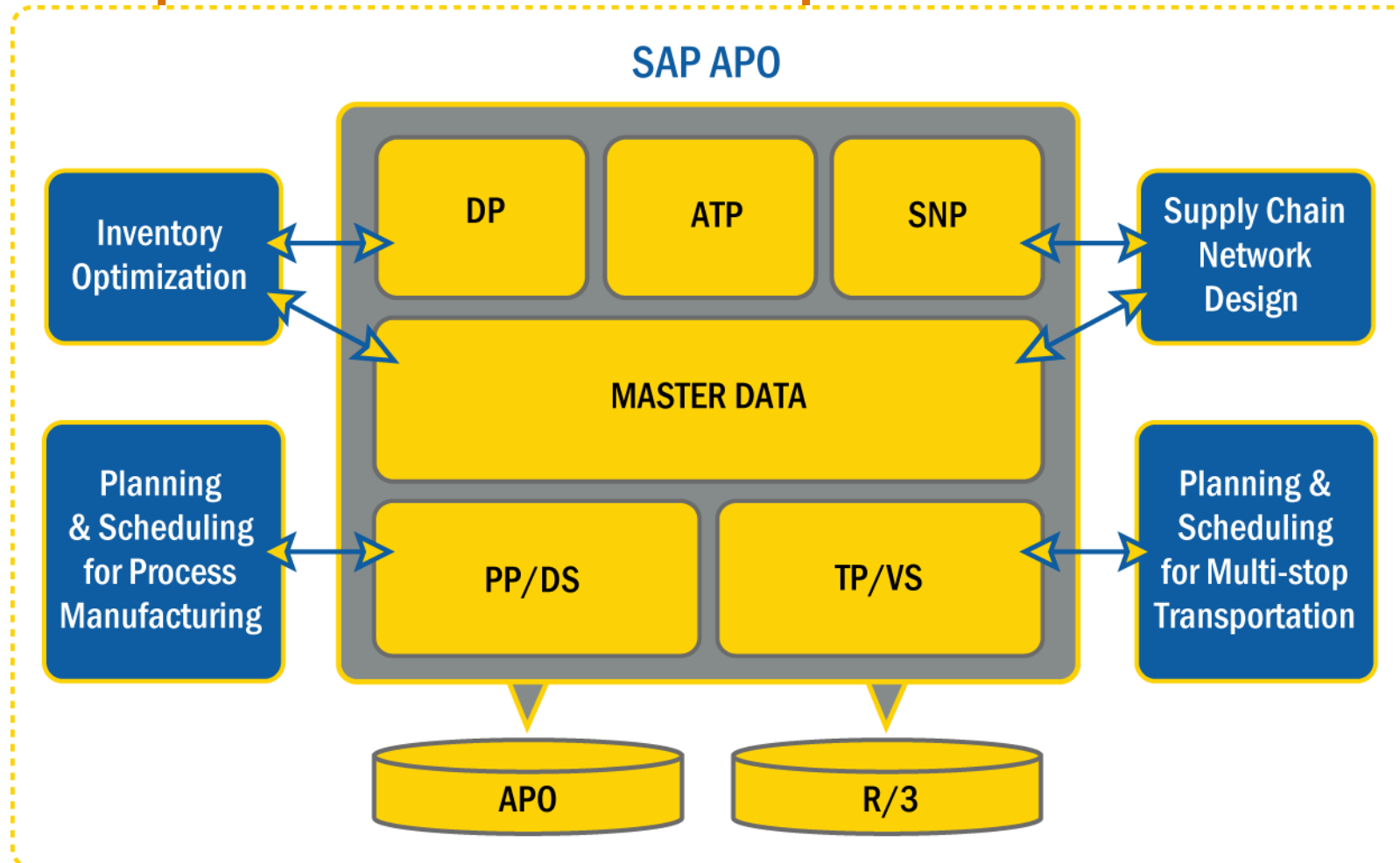
Integration with SAP

- IBM WebSphere SAP adapter is a leading SAP integration solution in the marketplace

  - Limited custom development
  - Reduced implementation cost and risk
  - Migration to different versions of SAP is greatly facilitated
  - Highly scalable open solution for future enhancements
  - The same technology is available for Oracle and other legacy systems

Conclusion

Our Focus: Addressing Supply Chain and Manufacturing pain points

- Cost pressure
  - Optimizing network: LogicNet Plus is the leading solution
  - Fuel Efficiency: Transportation Analyst
  - Production planning and scheduling: Plant PowerOps

- Tax Optimization
  - Tax efficient supply chain: LogicNet Plus will soon include tax optimization

- Capital efficiency
  - Reducing inventory – Inventory Analyst

- Pressure to have a flexible Supply Chain strategy
  - LogicNet Plus to identify the appropriate level of flexibility

- Pressure to become more green
  - LogicNet Plus and Transportation Analyst Carbon emission optimization
  - LogicNet Plus will soon include carbon credits in the objective function

Questions ?