



Claude Fornarino

ILOG Industry Solutions Director

**ILOG : ottimizzazione e
pianificazione**



Vision for Survival *In a Challenging Economy*

Provide Visibility

Make Better Decisions, Faster

Optimize Your Business

IMPACT NOW



ILOG Lines of Business

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 & schedules, enhancing abilities to explore alternatives, understand trade-offs, and respond to changes in business operations

Efficient Supply Chain Management
Optimize 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



Agile and efficient Decision-Support Systems

ILOG BRMS
 Automating Policies

*IF TO require Truck S and Delivery Region is Germany
 THEN Allocate TO to CarrierXX*

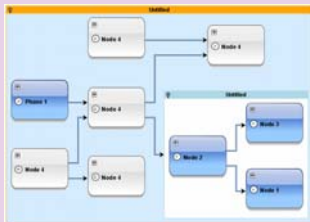
ILOG Optimization

*Minimize Mileage
 Maximize Delivery
 Minimize Delay*

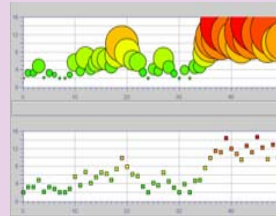
Transactional Data *Capacity Data* **ENTERPRISE DATA** *Inventory Data* *Resources Data*



Dashboards



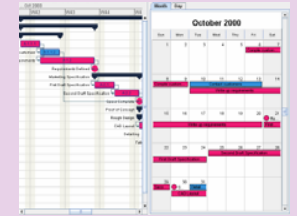
Diagrams



Charts



Maps

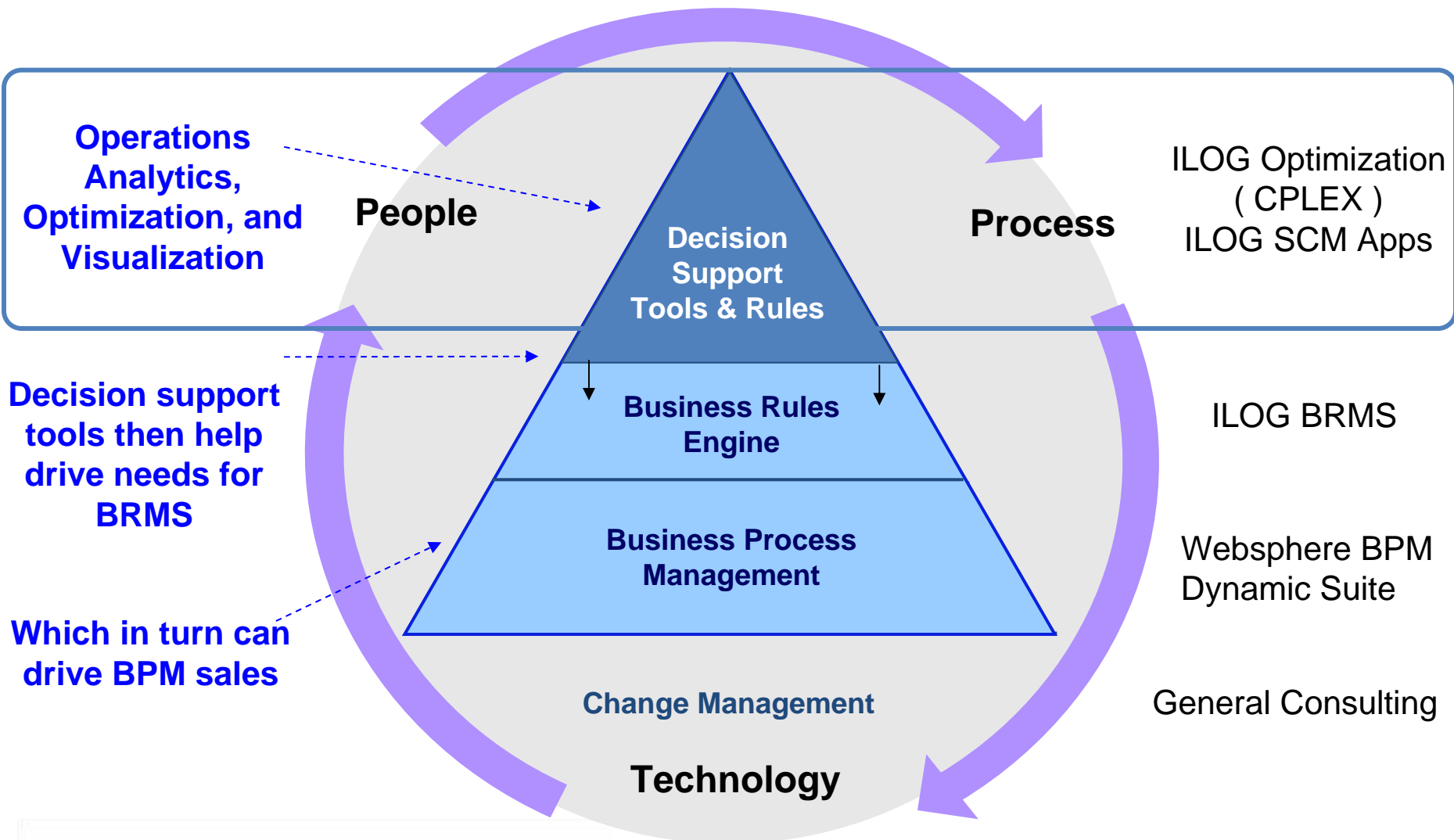


Gantt

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Framework for Collaboration Across ILOG Products



Elevator Pitch

ILOG provides planning and scheduling solutions to Business users to:

- Enhance their SAP/legacy implementations
- Automate business processes
- Generate executable plan
- Support business users making decision on day to day operations.

Customers see savings in production, inventory and transportation cost as well as lean manufacturing and better customer satisfaction.



DANONE

- SAP complementary solution to generate detailed production schedule.
- Improved perfect order fulfillment performance and service levels
 - Reduced inventory and production costs through minimized surpluses and stock-outs, waste, changeover and cleaning times



Developed truck load optimization system. Solution minimized handling costs, maximized truck loads, and improved demand fulfillments by building loads taking into account the production plan as a business constraint. Demand fulfillment is above 99%, yielding customer satisfaction. Vehicle utilization was increased by 2%. Planned line loading reached 80%.

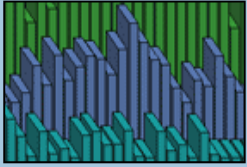
DAIMLER

Developed Integrated Planning Process. Process and reaction time is *one month faster*. Car dealers have *8 additional days* to fill customer orders.

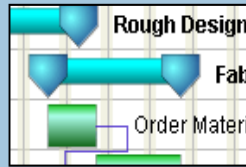


The ILOG Visualization Suite

Charts



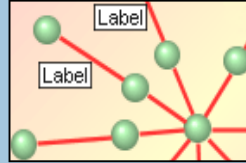
Gantt



Networks



Diagrams



Dashboards



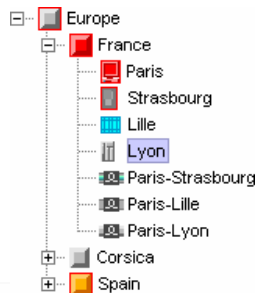
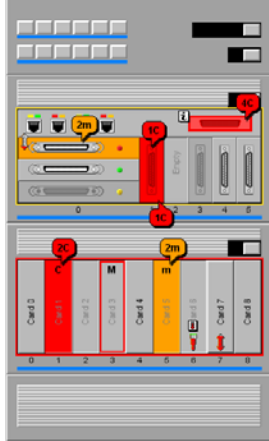
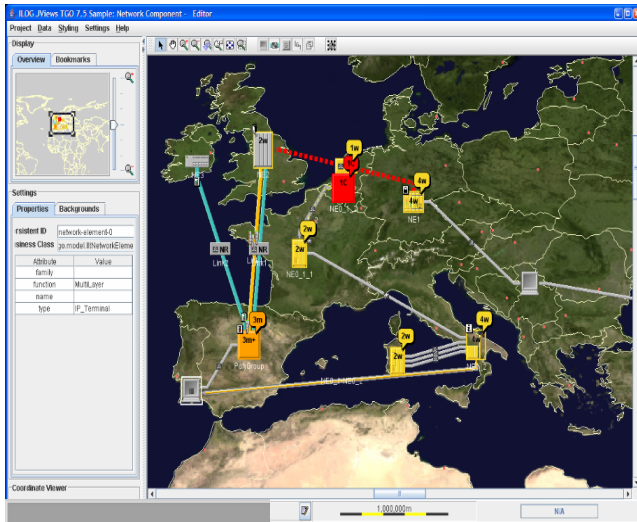
Maps



- ILOG JViews (Java)
 - Diagrammer
 - Graph Layout for Eclipse
 - Telecom Graphic Objects
 - Charts
 - Gantt
 - Maps
 - Maps for Defense
- ILOG Views (C++)
- ILOG for .NET
 - Diagram
 - Gantt
- ILOG Elixir (Flex/Air)



Network Supervision



| Object | Severity | Trend | Ack |
|--------|---------------|-------|-----|
| Mux0 | Cleared | ↓ | ✓ |
| Mux0 | Warning | ↓ | |
| Mux0 | Minor | | ✓ |
| Mux0 | Minor | | |
| Mux1 | Warning | ↓ | |
| Mux1 | Major | → | |
| Mux1 | Warning | → | ✓ |
| Mux1 | Indeterminate | | |
| Mux1 | Major | | |
| Mux1 | Minor | | |
| Mux2 | Critical | → | |
| Mux2 | Minor | | |
| Mux2 | Critical | ↑ | |

- Network Supervision and monitoring
- Goal
 - Provide administrators with an intuitive view of their equipment and quality of service
- ILOG Products
 - ILOG JViews TGO
 - ILOG JViews Diagrammer
 - ILOG Views
- Benefits
 - Pre-built symbols (networks, equipment)
 - Smart network topology displays
 - Real-time updates
 - Desktop and web



Industrial Supervision

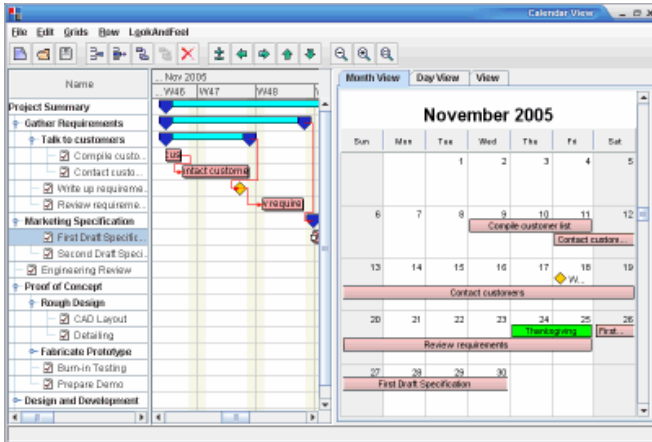
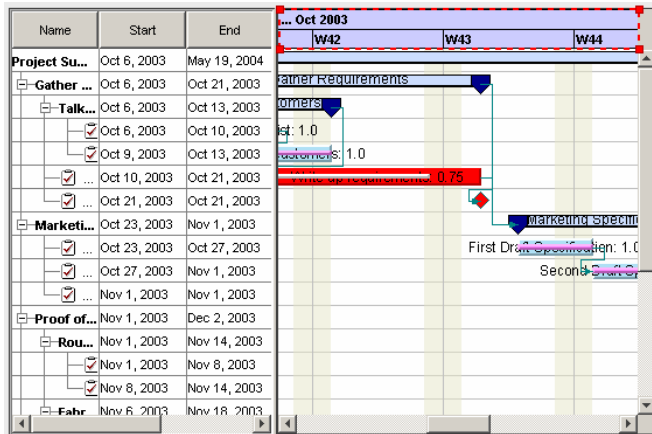


- Goal
 - Real-time supervision of infrastructures (SCADA)
- ILOG Products
 - JViews Diagrammer, Maps & Charts
 - ILOG Views
 - ILOG Diagram for .NET
- Benefits
 - Pre-built symbol and screen editors
 - High performance refreshes
 - Fully customizable

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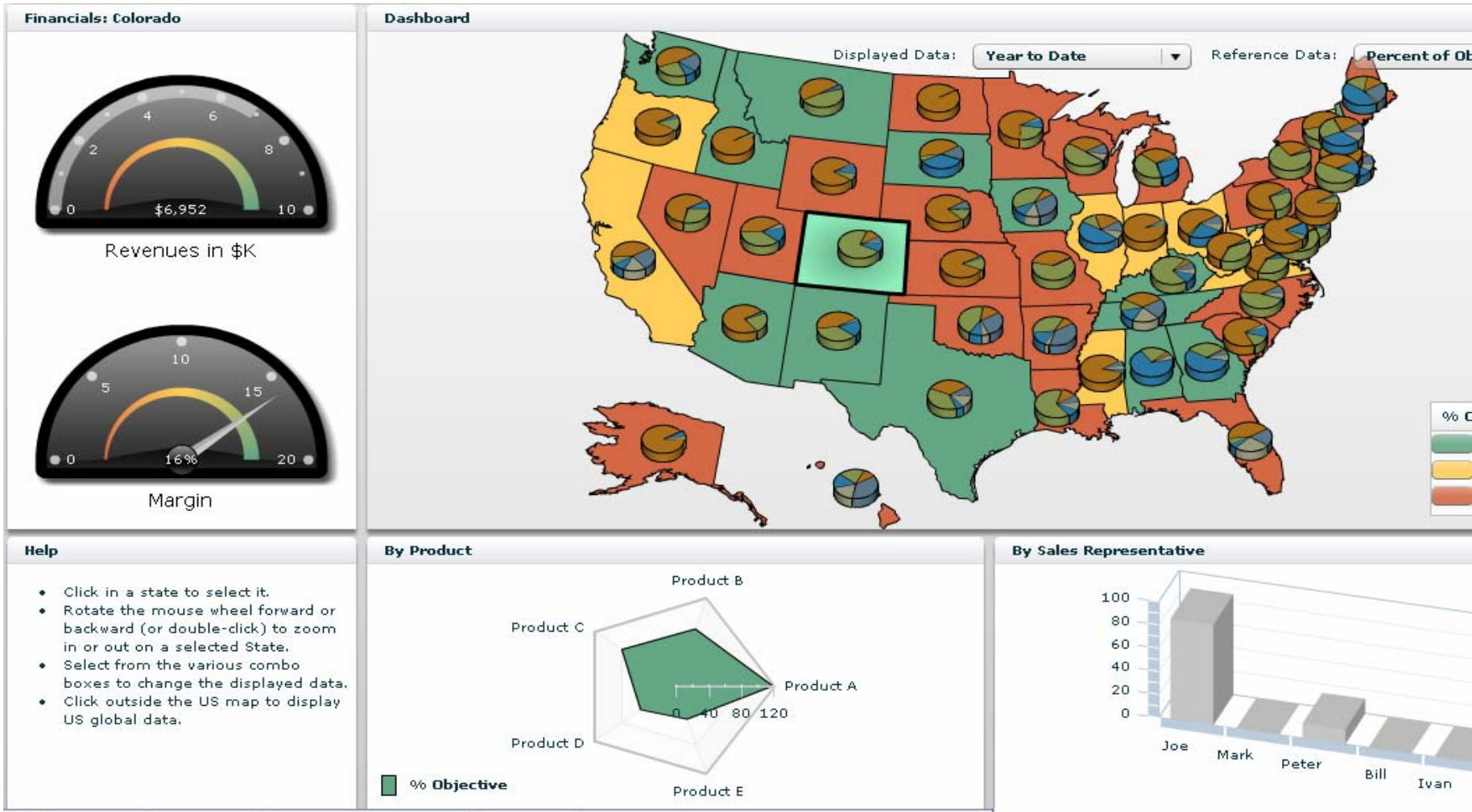
Planning and Scheduling



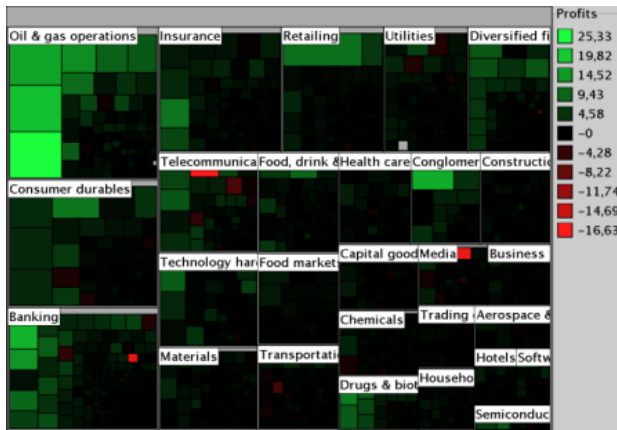
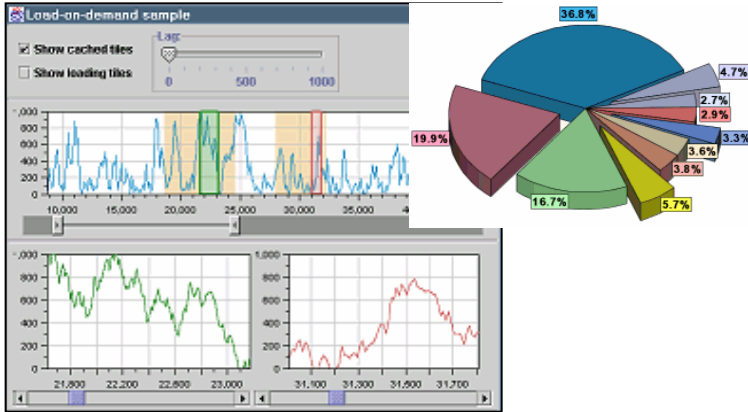
- Goals
 - Visualizing and editing plans, schedules, projects, resource charts
 - Tailored symbols and interactions
- Solutions
 - ILOG JViews Gantt
 - ILOG Gantt for .NET
 - ILOG Elixir
- Benefits
 - Scalability and full customization
 - Desktop and Web



Sales/operations Performance Management



Business Analysis



- Goal
 - Web-based dashboards
 - Intuitive and engaging for business users
- Solutions
 - ILOG JViews Charts & Diagrammer (AJAX)
 - ILOG Elixir (Adobe Flex)
- Benefits
 - Client side animation
 - Dashboard editor
 - Symbol editor



What is Optimization?

Maximize resource efficiency

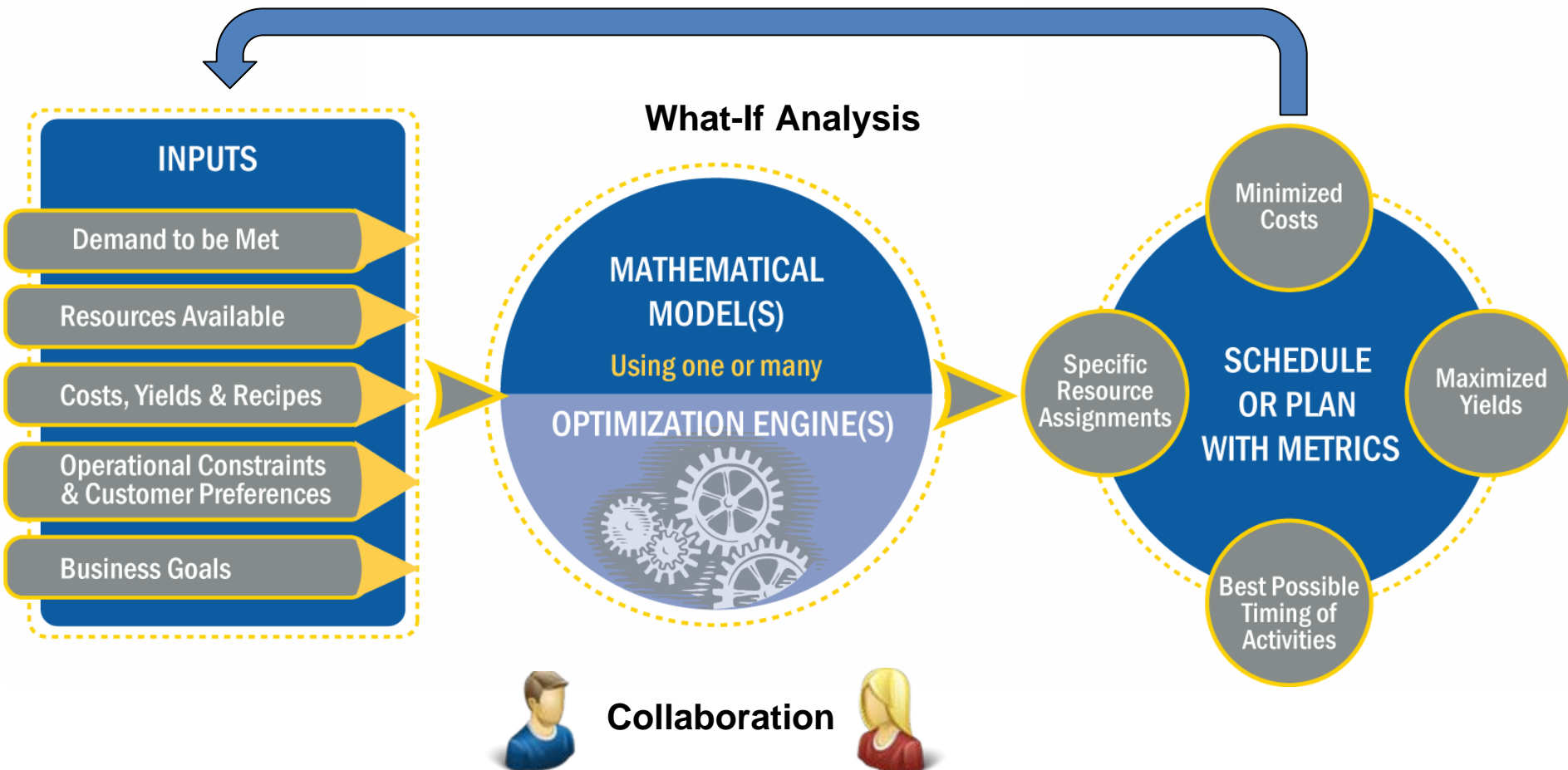
| Resources | Examples of choices to make |
|--------------|----------------------------------|
| Capital | Allocate |
| People | Acquire, schedule, assign, train |
| Time | Allocate |
| Equipment | Acquire, schedule, locate |
| Facilities | Locate, schedule |
| Vehicles | Acquire, route, schedule |
| Raw Material | Acquire, assign |

Used to answer questions starting with *'How many/much?', 'Who?', 'When?', 'Where?', 'Which?'*

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How does optimization support decision making?



Planning and Scheduling Processes

| | TYPICAL FREQUENCY | EXAMPLES |
|----------------------------|---|--|
| LONG-TERM PLANNING | <ul style="list-style-type: none"> • Annual • Quarterly • Occasional | <ul style="list-style-type: none"> • Whether to expand a plant or open a new one • How many distribution centers to have • What's the value of additional equipment over time |
| SHORT-TERM PLANNING | <ul style="list-style-type: none"> • Monthly • Weekly | <ul style="list-style-type: none"> • How much should we produce this week • How many shifts should we have • How many resources will we need • Which marketing campaigns will provide the most impact for a set budget |
| DETAILED SCHEDULING | <ul style="list-style-type: none"> • Weekly • Daily • Hourly | <ul style="list-style-type: none"> • Which activity should be done when • Which resource should be assigned when • When can maintenance or any special task be most efficiently scheduled |



Industry Applications

| MANUFACTURING | TRANSPORTATION & LOGISTICS | FINANCIAL SERVICES | UTILITIES, ENERGY & NATURAL RESOURCES | TELECOM | MULTIPLE/ OTHER |
|---|---|---|---|--|---|
| <ul style="list-style-type: none"> • Inventory optimization • Supply chain network design • Production planning • Detailed scheduling • Shipment planning • Truck loading • Maintenance scheduling | <ul style="list-style-type: none"> • Depot/warehouse location • Fleet assignment • Network design • Vehicle & container loading • Vehicle routing & delivery scheduling • Yard, crew, driver & maintenance scheduling • Inventory optimization | <ul style="list-style-type: none"> • Portfolio optimization and rebalancing • Portfolio in-kinding • Trade crossing • Loan pooling • Product/price recommendations | <ul style="list-style-type: none"> • Supply portfolio planning • Power generation scheduling • Distribution planning • Water reservoir management • Mine operations • Timber harvesting | <ul style="list-style-type: none"> • Network capacity planning • Routing • Adaptive network configuration • Antenna and concentrator location • Equipment and service configuration | <ul style="list-style-type: none"> • Workforce scheduling • Advertising scheduling • Marketing campaign optimization • Revenue/Yield management • Appointment & field service scheduling • Combinatorial auctions for procurement |

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The Benefits can be substantial: ROA, OpEx, CapEx, Top Line

Documented ROI

INFORMS Edelman Award Finalists Using ILOG CPLEX

| COMPANY | BUSINESS PROCESS | ROI |
|--------------------------|------------------------|----------------------------------|
| UPS | Air Network Design | \$87m/2yrs + 10% fewer planes |
| Motorola | Procurement Mgmt | \$100-150 mil/year |
| Samsung Electronics | Semiconductor Mfg | 50% reduction in cycle times |
| Continental Airlines | Crew Re-scheduling | \$40 mil in one year |
| AT&T | Network Recovery | 35% reduction spare capacity |
| South African Defense | Force/Equip Planning | \$1.1 bil/year |
| SNCF (French RR) | Scheduling & Pricing | \$1.1 bil/year |
| Grant Mayo van Otterloo | Portfolio Optimization | \$4 mil/year |
| 2 Chilean Forestry firms | Timber Harvesting | \$20 mil/year + 30% fewer trucks |



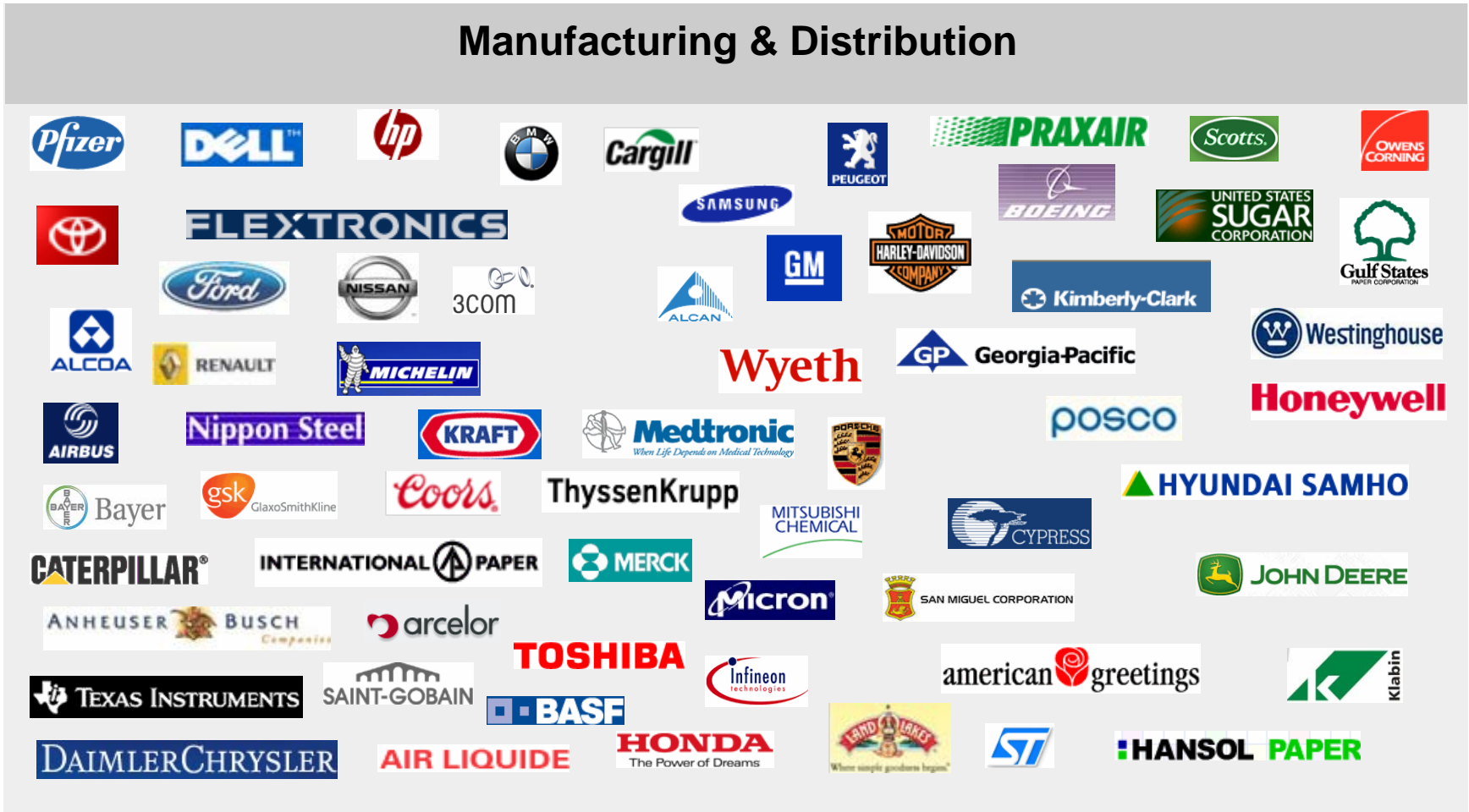
Over 200 of the Global 1000 use ILOG

| Government & Defense | Transportation |
|----------------------|----------------|
| | |



Over 200 of the Global 1000 use ILOG

Manufacturing & Distribution



Over 200 of the Global 1000 use ILOG

| Telecom | Retail | Utilities & Energy |
|---------|--------|--------------------|
| | | |



ILOG provides
Supply Chain Apps
Integrated model and Visualization
Populate with data and run the engine
What if Simulation
Scenario Management and reporting

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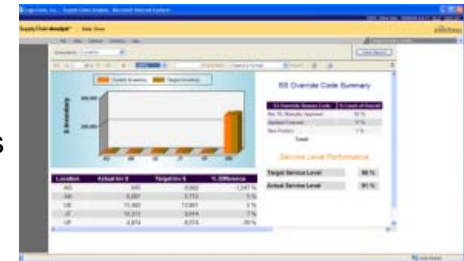
ILOG Supply Chain Applications

SAP Certified
 Integration with SAP Applications



Strategic Supply Chain Planning

- **LogicNet Plus (LNP):** Network design and planning
 - Determine optimal number, location, territories, and size of warehouses, plants, and lines.
 - Determine where products should be made.
 - Optimize Carbon Footprint
- **Inventory Analyst (IA):** Inventory Optimization
 - Determine push/pull locations, buffer locations, postponement, and policy analysis
- **Transportation Analyst (TA):** Transportation Planning
 - Strategic routing for fleet sizing, multi-stops, backhauls, and more.



actical Inventory Planning

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

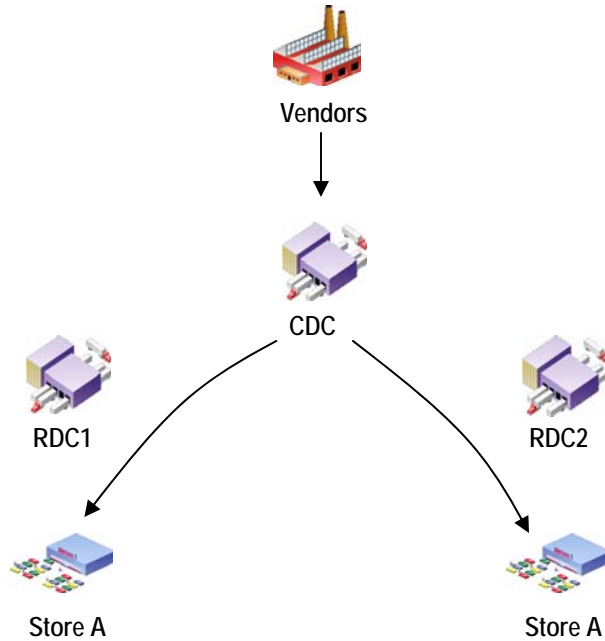


roduction Planning and Detailed Scheduling

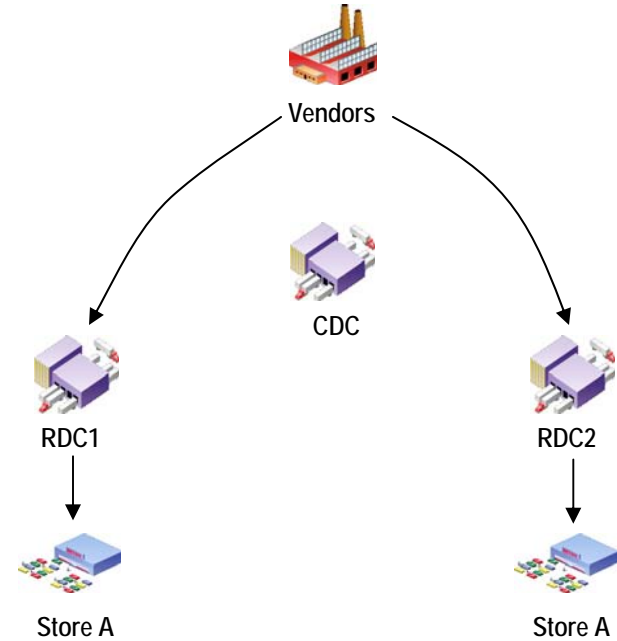
- **Plant PowerOps (PPO):** Production planning and detailed scheduling
 - Planning and detailed finite scheduling for process manufacturing plants



Cost Tradeoff between various stocking strategies



Option 1



Option 2

- Lower SS at DCs in Option 1 based on risk pooling of demand, but higher inventory at stores
 - Less frequent shipments, longer lead-times
 - Higher transit costs from CDC to stores
- Lower SS at stores in Option 2 due to more frequent shipments, shorter lead-times
 - Less risk pooling at RDCs
 - Lower transit costs from RDCs to stores



A few Logic Net Plus references

| | |
|---------------------|--|
| Dow Chemical | <p>a large user base of LogicNet Plus XE, promoted internally the concept of “One Week Model” to address business issues very quickly using LogicNet Plus XE. Dow, who also spoke at our annual symposium, utilizes LogicNet Plus for plant and facility changes, feasibility studies, distribution optimization, mergers & acquisitions and impacts of currency exchange fluctuations on the network.</p> |
| Dupont | <p>a large user base of LogicNet Plus XE, selected LogicNet Plus XE to perform very complex global supply chain production sourcing problems. The particular problems, involving duty & tariff issues, shelf life issues, tax incentives and seasonality, in their supply chain were addressed historically with custom built applications and LogicNet Plus was able to provide the full-functionality required to address all of the issues in a standard format.</p> |
| Lanxess | <p>a \$5B German chemical producer, completed study for North American distribution for all (14) divisions active in North America. Company had recently spun off from parent company and needed to understand how logistics network would be impacted. Identified cost saving totaling 8% of firm’s North American Logistics Spend by identifying synergies between operating units, optimizing warehouse assignments to customer and reducing the number of warehouses.</p> |
| Shell Lubricants | <p>used LogicNet Plus XE in different parts of the world for local distribution optimization studies (Russia, Turkey, Brazil, Australia, South Africa) and production sourcing/capacity planning studies in North America. For the North American production sourcing studies, capturing the raw material procurement costs, transportation costs and distribution costs, LogicNet Plus XE suggested savings opportunities between 6% and 12%.</p> |
| Chemtura | <p>a \$4B specialty chemical manufacturer, completed studies for the plastics additives division in North America, EMEA distribution and Japan distribution. Only within Europe, the team identified savings opportunity between 5% and 8% by optimizing the “port of entries” and properly defining distribution territories out of the regional warehouses.</p> |



Shell Lubricant Downstream

Inventory Optimization using *Inventory Analyst*

Client Overview

- Shell is a global group of energy and petrochemical companies with 104,000 employees in over 110 countries
- Shell helps meet the world's demand for energy in economically, environmentally and socially responsible ways
- Shell's Downstream Lubricants Supply Chain (LSC) has implemented SAP APO (Advanced Planner & Optimiser)
- Along with the APO implementation, an inventory modelling tool (Inventory Analyst by ILOG) was required to help plan inventory at an operational level within the global business units

Team Focus

- Built inventory models by sourcing location – eight across Europe
- Performed detailed analysis at each location to develop recommendations on product classification, replenishment strategies, demand variability, batch sizes and criterion for codes to be stocked or not by location
- Validated the approach to build models and data sources with the local businesses to ensure a long term operational buy-in to the new tool
- Created toolkit to train local planners to update models on a quarterly basis

Business Challenge

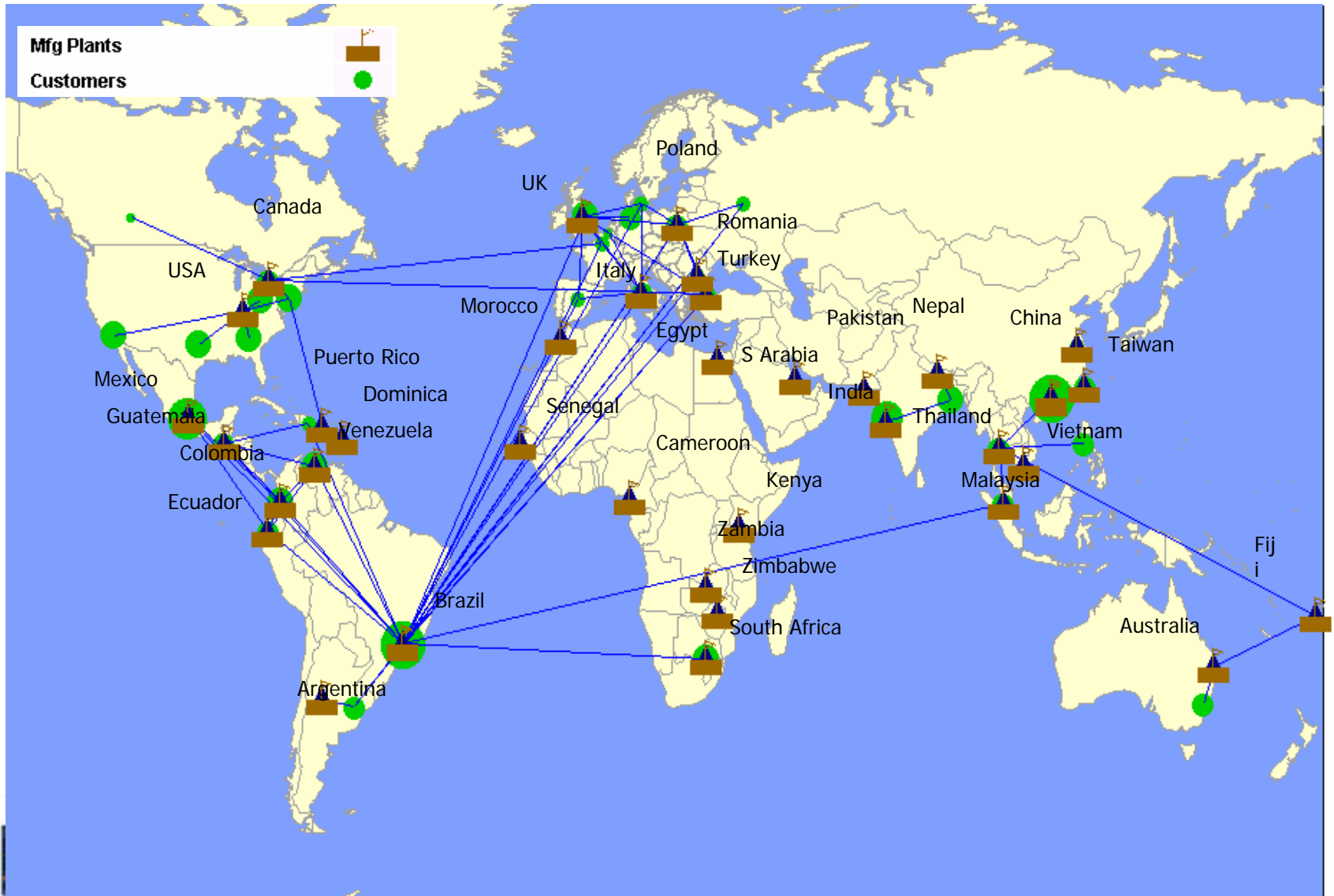
- At the outset of the project, there was no standard approach for inventory management and no clear visibility of inventory targets in place
- Shell asked to carry out inventory modelling for the Lubricants Supply Chain across Europe and determine optimal stock parameters by SKU by location
- These parameters would drive the SAP APO supply plans and ensure that company service targets were met

High Performance Delivered

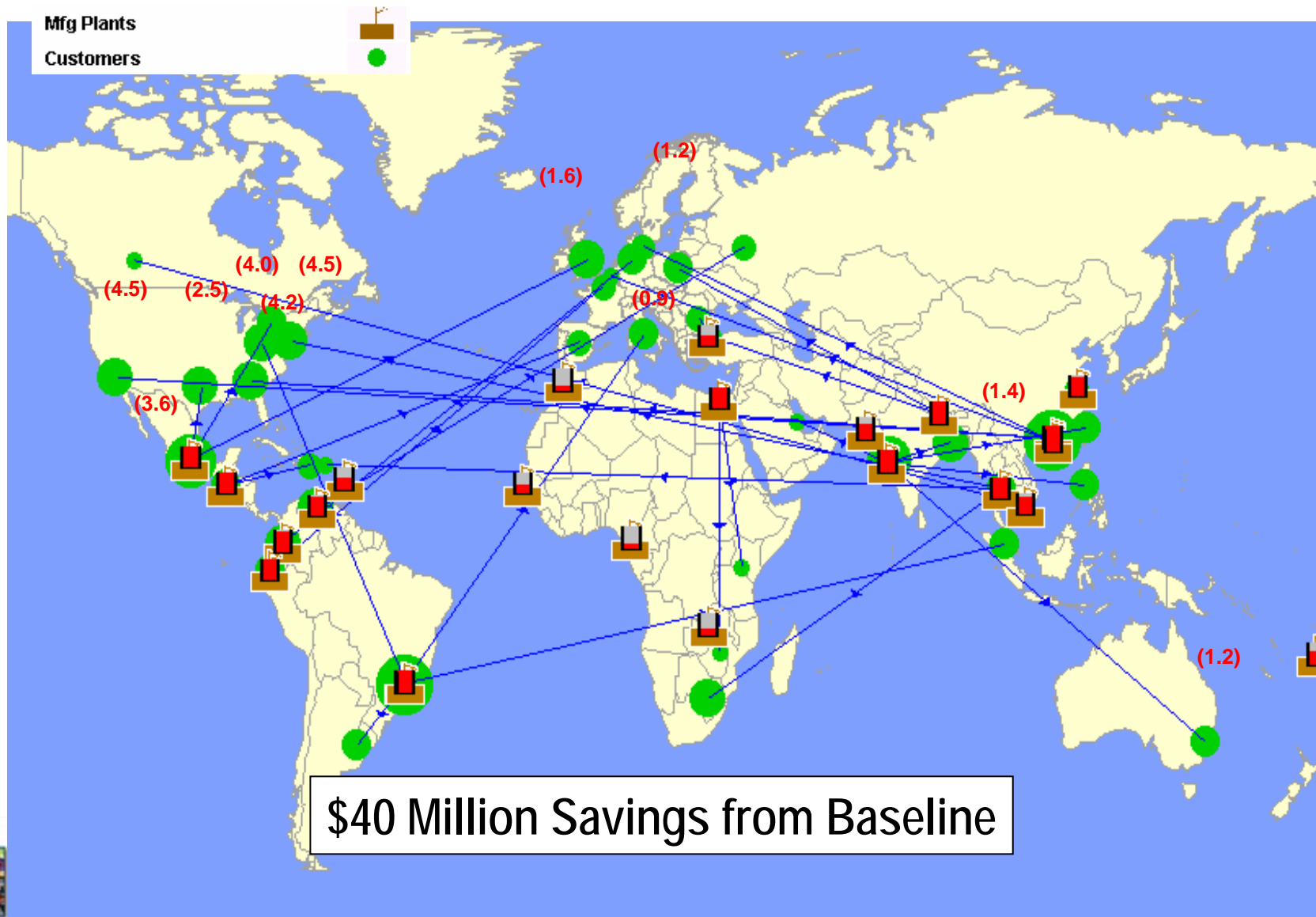
- Delivered an implementation toolkit for any global team wanting to deploy Inventory Analyst
- [Provided immediate visibility of the various supply chains which led to management decisions on portfolio rationalisation, product classification, inventory targets and stock vs. non-stock policy](#)
- [Determined optimum inventory levels by SKU and by location, and along with an implementation plan to achieve these levels](#)
- [Rapidly reduced excess inventory and reduced strain on warehouses; the UK reduced 9% of excess stock in 10 weeks \(500 tons in volume\)](#)
- [Defined and implemented a series of KPIs to track progress](#)



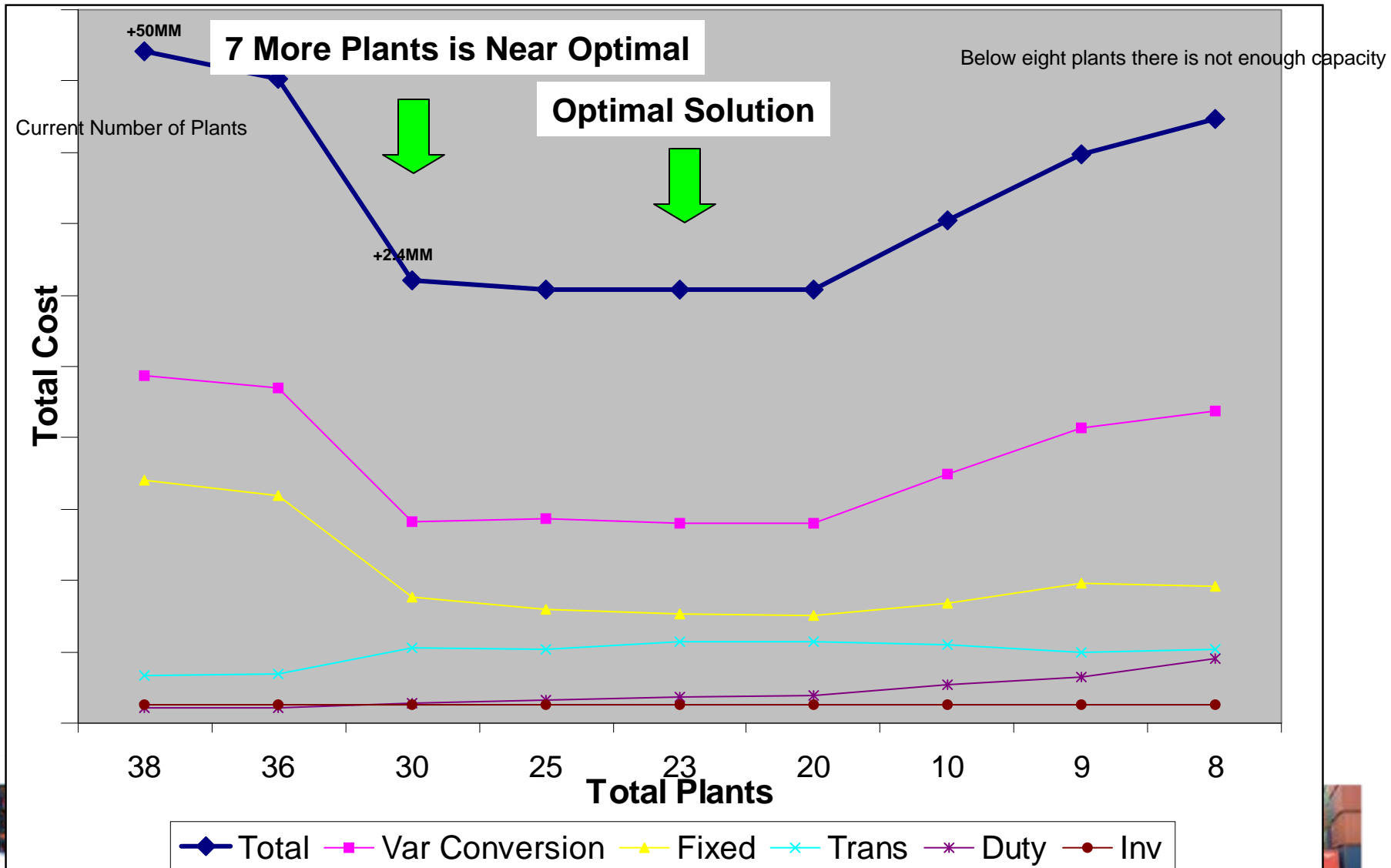
Global CPG Plant Location Study: Baseline



Optimized Network



Trade-Off Curve Between Number of Plants and Costs



Carbon Footprint Analysis with LogicNet Plus

Award-winning application

Data

Provides carbon footprint data on

- Transportation
- Warehouses
- Plants
- Products

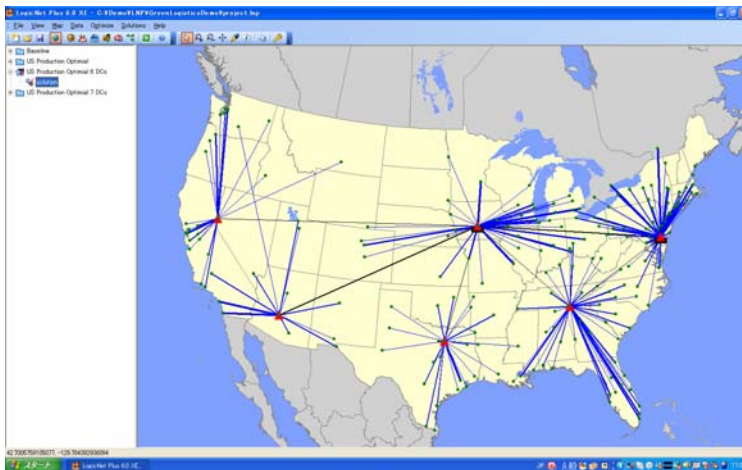
Modeling

End to end supply chain model of carbon footprint

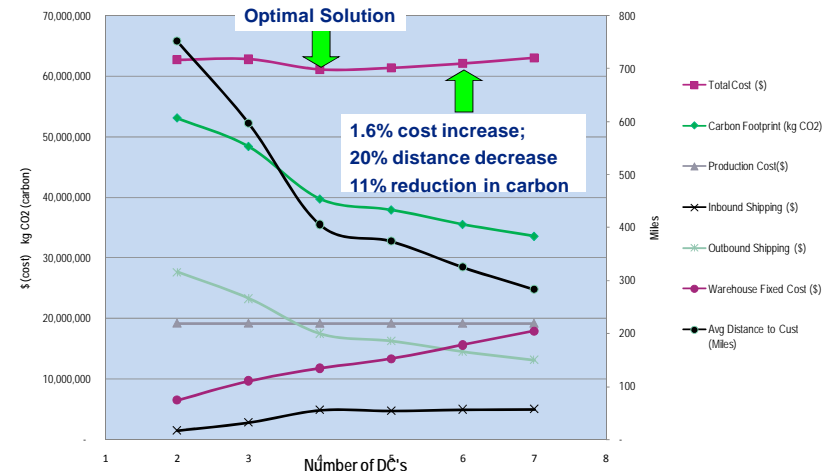
Optimization

- Trade-off between cost, service and carbon emissions
- Cap and trade optimization

Optimized for Cost, Service and Carbon Footprint



Distribution Network with 2-7 DC Locations



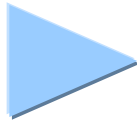
We provide Custom Solution
Meet exact needs
Enhance legacy System and ERP
Adopt your business process

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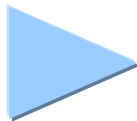
ILOG Value proposition

1. **Drive Operational ROI**



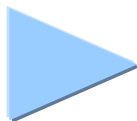
We partner with our customers (both IT and business Users) in order to deliver custom planning and scheduling solutions that **support** business users **on day to day operations**

2. **Complements legacy system**



We leverage your existing information system (SAP, ERP, ...) and extend them with the exact capabilities we specify with you.

3. **Rapid, Easy Deployment**



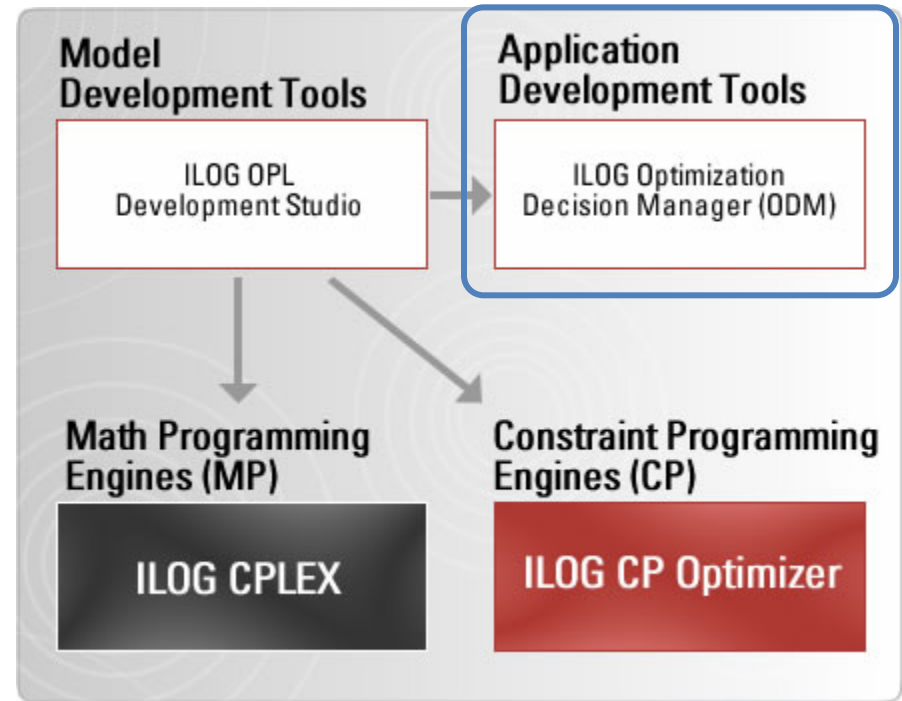
You do not need to adopt the processes of a solution. We adapt to your requirements and we support **your** business process. This approach facilitates greater user acceptance.

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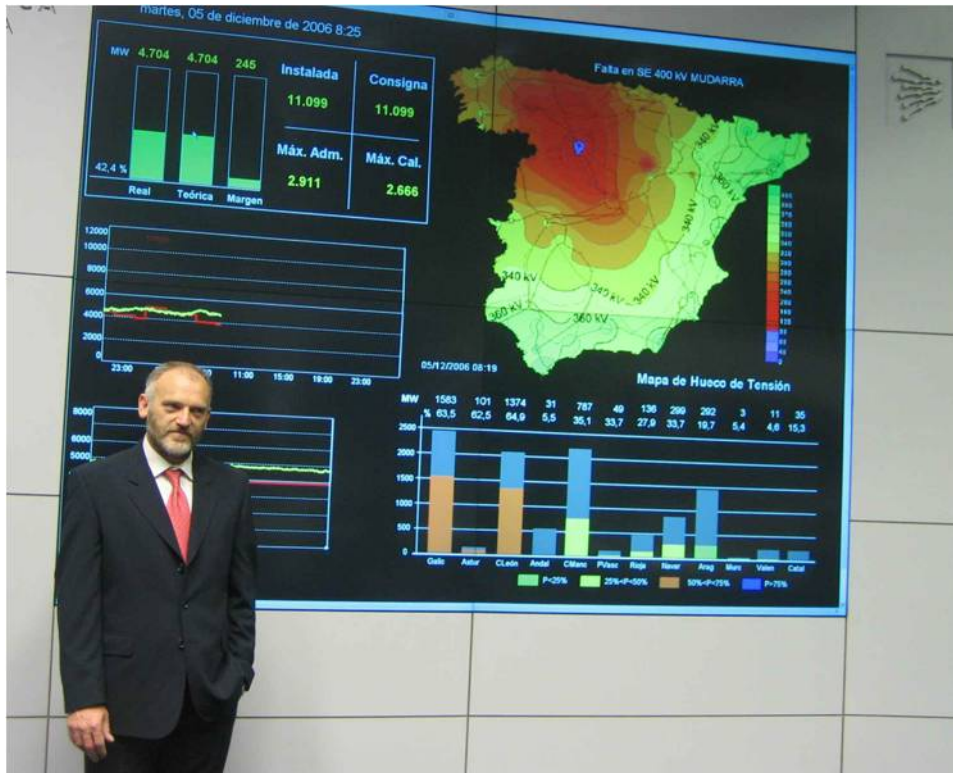
ILOG Optimization Suite

- **Two core engines**
 - ILOG CPLEX
 - ILOG CP Optimizer
- **Two Levels of Productivity Tools**
 - ILOG OPL Development Studio (Optimization Model Development)
 - ILOG ODM (Decision-Support Application Development)



Unit Commitment at REE

Business Problem – Use exact mathematical methods to replace the approximate, heuristic methods Red Eléctrica de España, in charge of managing the Spanish national power grid, had been using for the last 20 years



The methodology applied until now ... was an interactive methodology, which did not guarantee an optimum solution. There were many difficulties in the smaller systems and it was hard to find the most viable solution. Thanks to the new methodology, we have resolved this type of problem.

- Mr. Mustafa Pezicro, REE Project Director



Benefits

- The implementation of OPL/CPLEX and ODM solution has provided great operational advantages to company's managers and engineers
 - “The new tool allows us to simplify all maintenance tasks and any changes made to the model, which in our particular case, are very frequent.”
 - “From a user viewpoint, it has brought greater trust in the solution and a significant reduction in planning time required by users. In parallel with this, from a development and maintenance viewpoint, there has been a significant reduction in associated costs, as well as in the duration of the processes.”

The bottom line:

- REE reduced production costs by between €50,000 and €100,000 per day.
- REE has reduced its carbon emissions by approximately 100,000 tons of CO₂ annually.



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Market Clearing by Energy Market Company

Business Problem – Ensure a reliable source of electricity at the lowest cost for the National Electricity Market of Singapore, first wholesale electricity market liberalized in Asia



- Every half-hour, power companies update their rates for selling electricity to the exchange
- EMC must assemble these rates into a mix of prices and generation schedules that will satisfy consumer demand at the lowest cost possible
- Using ILOG CPLEX, the Market Clearing Engine (MCE) solves the problem within 30 seconds, addressing more than 15,000 constraints and bounds with each trade



Benefits

- Using ILOG CPLEX in the MCE has helped EMC:
 - Consider all possible constraints with each trade
 - Achieve the lowest generation cost for electricity offered to the Singapore wholesale electricity market while considering system security and reliability requirements
 - Improve the performance of the electricity market
 - Reduce the maintenance time for the trading system
- EMC's IT team is more efficient in developing and maintaining the MCE using ILOG Concert Technology



Success ODM - Daimler – S&OP

Context

- **Revamping of the Global Ordering (GO) system**
 - Worldwide application for sales/ marketing/ production
- **Stratégique re-design program planning (SRP)**
 - An extension of GO to support planning process

Objectives

- Build a WW S&OP application
- Run every month for the following next 2 months
- Find an optimal allocation of cars to the markets taking into account plants capacity
- Allocate production capacity to market demands
- Manage globally supply-demand trade-off

Solution

- SOA Architecture based on ILOG ODM entreprise
- WW data visible and editable on one central system
- An optimized allocation
- 0-20 planners using the application in a collaborative mode

benefits

- Higher-level demand forecasting
- Closer planning and execution (2 months in advance)
- Agile and collaborative planning process
- Scenario management



Banking

- Banking and Optimization
 - ATM Cash replenishment
 - Campaign optimization
 - Technician dispatching
 - Workforce management
 - Cash distribution
 - ...

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The Classic Inventory Problem

- Too Much Cash Some Time
- Too Little Cash at Other Times
- Forecast (Timing) Errors
- Data (System) Errors
- Corporate (Politics) Errors



Business Case Synopsis: Top-10 Bank

- Daily Retail Dispensed Nationwide
 - \$ 200 million (+20,000 retail outlets - Branches & ATM's)
- Total Cash in System (Before Optimization)
 - \$ 7 billion
- Optimization Development Goals
 - No change of current replenishment schedules
 - Reduce cash inventory levels (i.e. carrying costs)
 - Reduce replenishment costs (i.e. deliveries)
 - Reduce cross-shipping costs (penalties at Fed)
 - Improve reporting capability (information)
 - “Piggybacking” fixed-charge denomination shipments
 - Must solve quickly (overnight)



Pilot Results After 6 Months

- 58 Vault Pilot
- Reduced cash inventories by 35%*
- Reduced replenishment costs by 55%
- Cross-shipping fees decreased about 63%
- CPLEX runtimes within overnight window (using multi-threading)
- Project rated “Highly Successful” by client’s internal Six Sigma Unit
- Roll-out to entire enterprise this year 😊

* It is an error to attribute all of this to our model alone. Other factors were better forecasting, better operations, better people, and better measurement. Nevertheless, results from the model were most impressive.



Railroad Applications

| High Speed | Conventional Train | Urban/suburban train | Freight conventional | Freight multimodal | Material | Infrastructure |
|---|---|--|---|--|---|---|
| <ul style="list-style-type: none"> • Trip plan | <ul style="list-style-type: none"> • Trip Plan | <ul style="list-style-type: none"> • Schedule • Multimodal interconnection | <ul style="list-style-type: none"> • Vehicle routing & delivery scheduling | <ul style="list-style-type: none"> • Vehicle & container loading | <ul style="list-style-type: none"> • Fleet management | <ul style="list-style-type: none"> • Track allocation |
| <ul style="list-style-type: none"> • Time table optimization | <ul style="list-style-type: none"> • Network + Time table optimization | <ul style="list-style-type: none"> • Time table optimization | <ul style="list-style-type: none"> • Network + Time table optimization | <ul style="list-style-type: none"> • Time table optimization | <ul style="list-style-type: none"> • Workshop organization | <ul style="list-style-type: none"> • Track Maintenance planning |
| <ul style="list-style-type: none"> • Drivers, crew management | <ul style="list-style-type: none"> • yard, crew, driver scheduling | <ul style="list-style-type: none"> • Drivers management | <ul style="list-style-type: none"> • Drivers management | <ul style="list-style-type: none"> • Drivers management | <ul style="list-style-type: none"> • people planning | <ul style="list-style-type: none"> • Resources allocation |
| <ul style="list-style-type: none"> • HS Train management | <ul style="list-style-type: none"> • train + car management | <ul style="list-style-type: none"> • shuttle train management | <ul style="list-style-type: none"> • Fleet assignment + rolling stock management | <ul style="list-style-type: none"> • terminal management | <ul style="list-style-type: none"> • locomotives ,cars, management | <ul style="list-style-type: none"> • Assets management (ie rails,..) |
| <ul style="list-style-type: none"> • Reservation • Back office • yield | <ul style="list-style-type: none"> • Ticketing • Reservation • Back Office | <ul style="list-style-type: none"> • Ticketing (contactless) • Back Office | <ul style="list-style-type: none"> • Back office • Tariff, invoicing | <ul style="list-style-type: none"> • Back office • invoicing | | <ul style="list-style-type: none"> • security management |
| | <ul style="list-style-type: none"> • Rail Station management | | <ul style="list-style-type: none"> • warehouse management | | <ul style="list-style-type: none"> • Preventive maintenance | <ul style="list-style-type: none"> • physical network supervision |
| <ul style="list-style-type: none"> • security management | <ul style="list-style-type: none"> • security management | <ul style="list-style-type: none"> • security management | <ul style="list-style-type: none"> • Derailment prevention | <ul style="list-style-type: none"> • Security management | <ul style="list-style-type: none"> • Security management | <ul style="list-style-type: none"> • Security management |



Netherlands Railways – Allocation of rolling stock

Situation

- 1 million passengers daily, 5000 trains, 390 stations
- Need for an optimal allocation of trains to passenger traffic

Goals

- Build a precise schedule according to traffic requirements
- Optimize to use of trains and the service/availability to passengers
- Manage thousands of constraints, including passenger preferences, seasonal variation in traffic and transport regulations

Solution

- Netherlands Railways have built a solution called TIM (Tool Inzet Matereel) to fully model the company's operations : rail networks, stations and trains as well as the above mentioned constrained. They have used ILOG OPL Development Studio and computed optimal solutions with ILOG CPLEX engine.

Benefits

- Better resource utilization, operating efficiency has increased 5 to 10 % , netting cost savings to 10M€ annually.



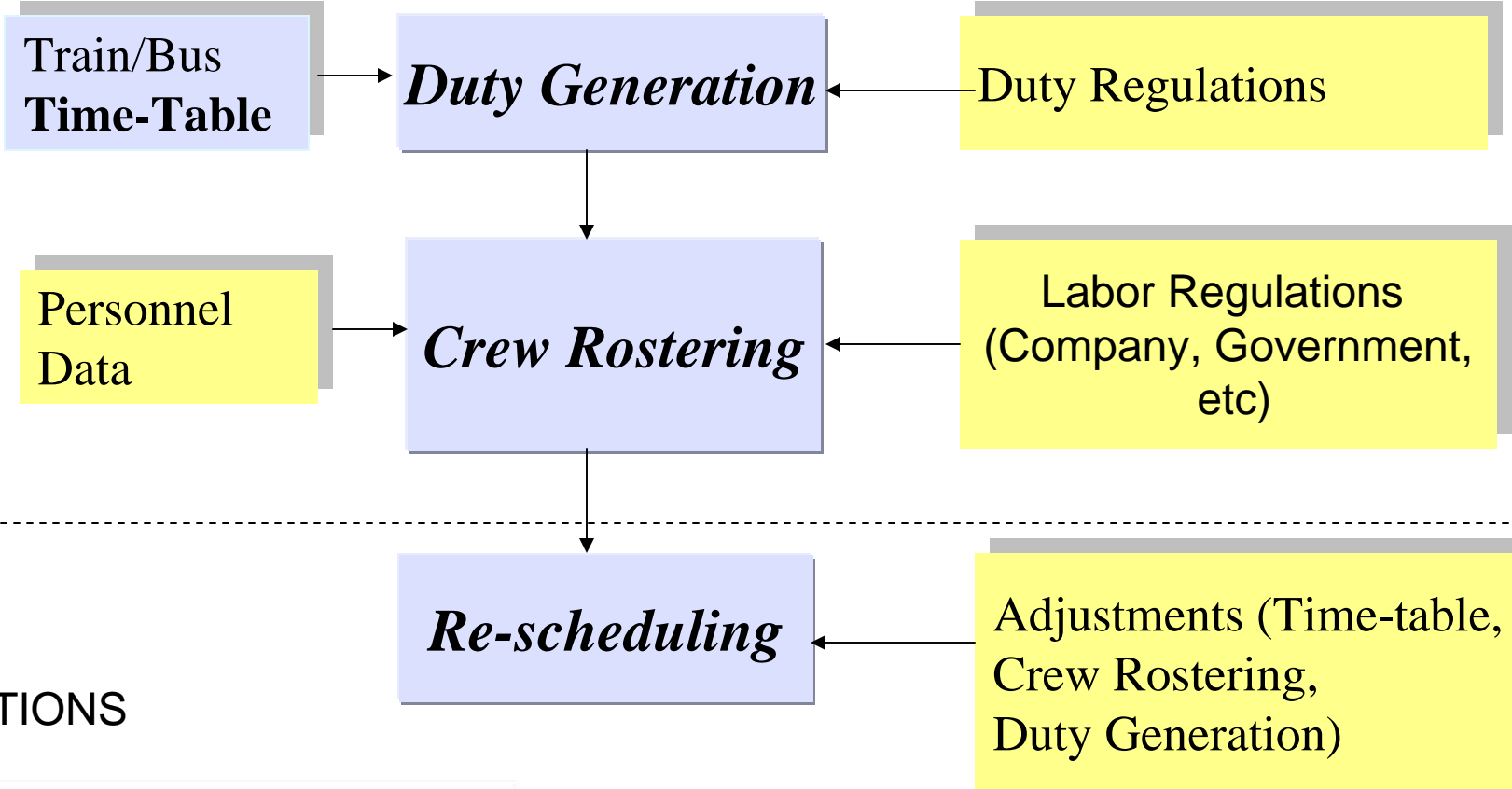
- Business Issue
 - Allocate railcars to customer demands
 - Minimize empty traveled distance
 - Constrained by railcar type, railcar size, railcar status, shipment dates and locations
- Solution
 - Scheduling engine based on ILOG CPLEX
 - Scheduling run every 15'
 - On a 14 days time horizon
 - For 60,000 cars
 - Transport network model
- Benefit:
 - Empty miles reduced by more than 6%



Manpower Planning in Railways/Metro

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Main Modules



- Generation of train driver duties

| 근무 번호 | 승 무 구 간 | | | | | | | | | | 주행 키 로 | | | 근 무 시 간 | | | | | 휴게 시간 | | | |
|-------------|---------|----|-------|----|----|----|----|----|----|-----|--------|------|-------|---------|----|----|-------|-------|----------|----|----|-------|
| | 도기 | 장암 | 도봉 | 수락 | 태릉 | 대공 | 건대 | 청담 | 내방 | 보라매 | 신동 | 천기 | 온수 | 계 | 영업 | 회송 | 계 | 운전 | | 대기 | 감시 | 편승 |
| 출근 19:14 | | | | | | | | | | | 19:14 | 7327 | 19:30 | | | | | | | | | 01:00 |
| 1 | | | 20:59 | | | | | | | | | 7366 | 19:37 | | | | | | | | | |
| | | | 21:08 | | | | | | | | 22:13 | 7395 | | | | | | | | | | |
| | | | | | | | | | | | | 1901 | 05:25 | | | | 00:-1 | 06:00 | 00:-1 | | | |
| | | | | | | | | | | | 05:17 | 7012 | 05:30 | | | | | | | | | |
| | | | | | | | | | | | 05:46 | | | | | | | | | | | |
| 퇴근 08:44 | | | | | | | | | | | 08:12 | 1943 | 08:20 | | | | | | | | | |
| | | | | | | | | | | | 08:44 | 7092 | 08:28 | | | | | | | | | |

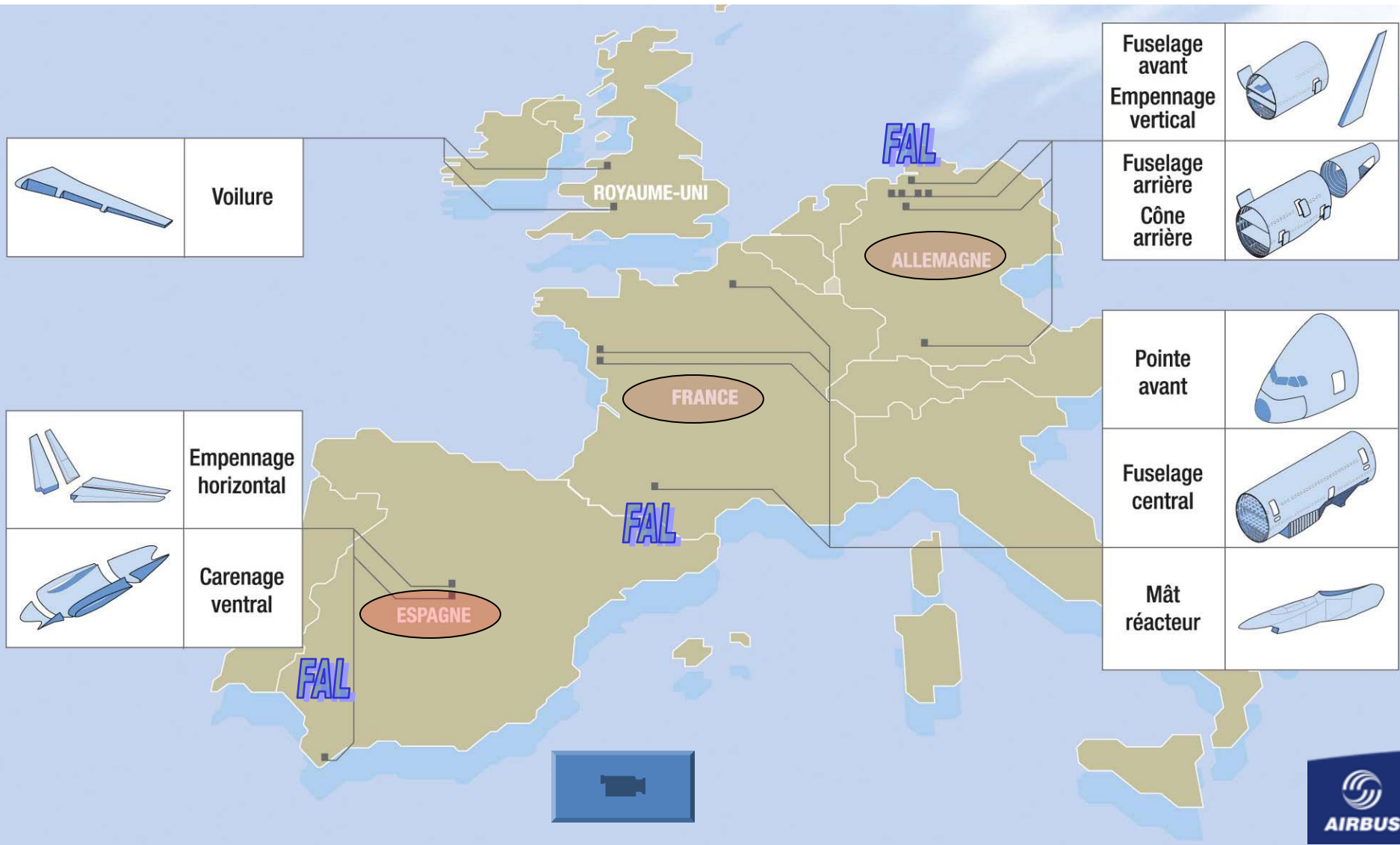
| 근무 번호 | 승 무 구 간 | | | | | | | | | | 주행 키 로 | | | 근 무 시 간 | | | | | 휴게 시간 | | | |
|-------------|---------|----|----|----|----|-------|-------|----|----|-----|--------|------|-------|---------|----|----|-------|-------|----------|----|----|-------|
| | 도기 | 장암 | 도봉 | 수락 | 태릉 | 대공 | 건대 | 청담 | 내방 | 보라매 | 신동 | 천기 | 온수 | 계 | 영업 | 회송 | 계 | 운전 | | 대기 | 감시 | 편승 |
| 출근 17:53 | | | | | | 18:28 | | | | | | 7312 | 17:53 | | | | | | | | | 01:00 |
| 2 | | | | | | | | | | | | 7407 | 22:59 | | | | | | | | | |
| | | | | | | | | | | | | 1903 | 05:33 | | | | 00:-1 | 08:14 | 00:-1 | | | |
| | | | | | | | 06:29 | | | | | 7014 | 05:38 | | | | | | | | | |
| 퇴근 06:29 | | | | | | | | | | | | | | | | | | | | | | |



- Business Issue
 - Each traffic incident may delay multiple trains and take hours to recover
 - Traffic close to network capacity needs efficient scheduling and re-scheduling capabilities
- Solution
 - Re-scheduling engine based on ILOG Solver
 - Minimizing total delays
 - With rail specific constraints
 - With rail specific heuristics
 - Dispatcher oriented graphical interface
- Benefits
 - Total delay reduced by 30% to 50%
 - Computation time from 1 to few minutes

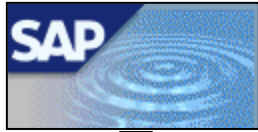


Airbus Final Assembly Lines



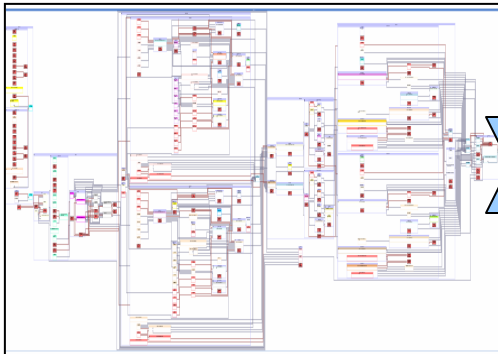
AVL2 – The 3-step process

Step 1 Modeling



Real Time

AVL2



Step 2 Detailed planning



Real Time

AVL2

| Nom | jeu. sept. 04, 08 | | | | | |
|--------------|-------------------|----|-----|-----|-----|------|
| | ... 16 | 20 | 0 | 4 | 8 | 12 |
| F10-MONTF1 1 | 0 | 3 | 6,7 | 7,2 | 7,7 | 11,2 |
| F10-MONTF1 2 | | | | | | |
| F10-MONTF1 3 | | | | | | |
| F10-MONTF1 4 | | | | | | |
| F10-MONTF1 5 | | | | | | |
| F10-MONTF1 6 | | | | | | |
| F10-MONTF1 7 | | | | | | |

Step 3 Monitoring



Real Time

AVL2

| Nom | jeu. sept. 04, 2008 | | | | | | ven. sept. 05, 2008 | | | | | | | | | | | | | | | | | | |
|---------------|---------------------|----|----|----|----|----|---------------------|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|---|
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 1 |
| F10-MONTF1 3 | 14,7 | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 4 | | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 5 | | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 6 | | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 8 | | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 9 | | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 10 | | | | | | | | | | | | | | | | | | | | | | | | | |
| F10-MONTF1 11 | | | | | | | | | | | | | | | | | | | | | | | | | |

Simulation DB

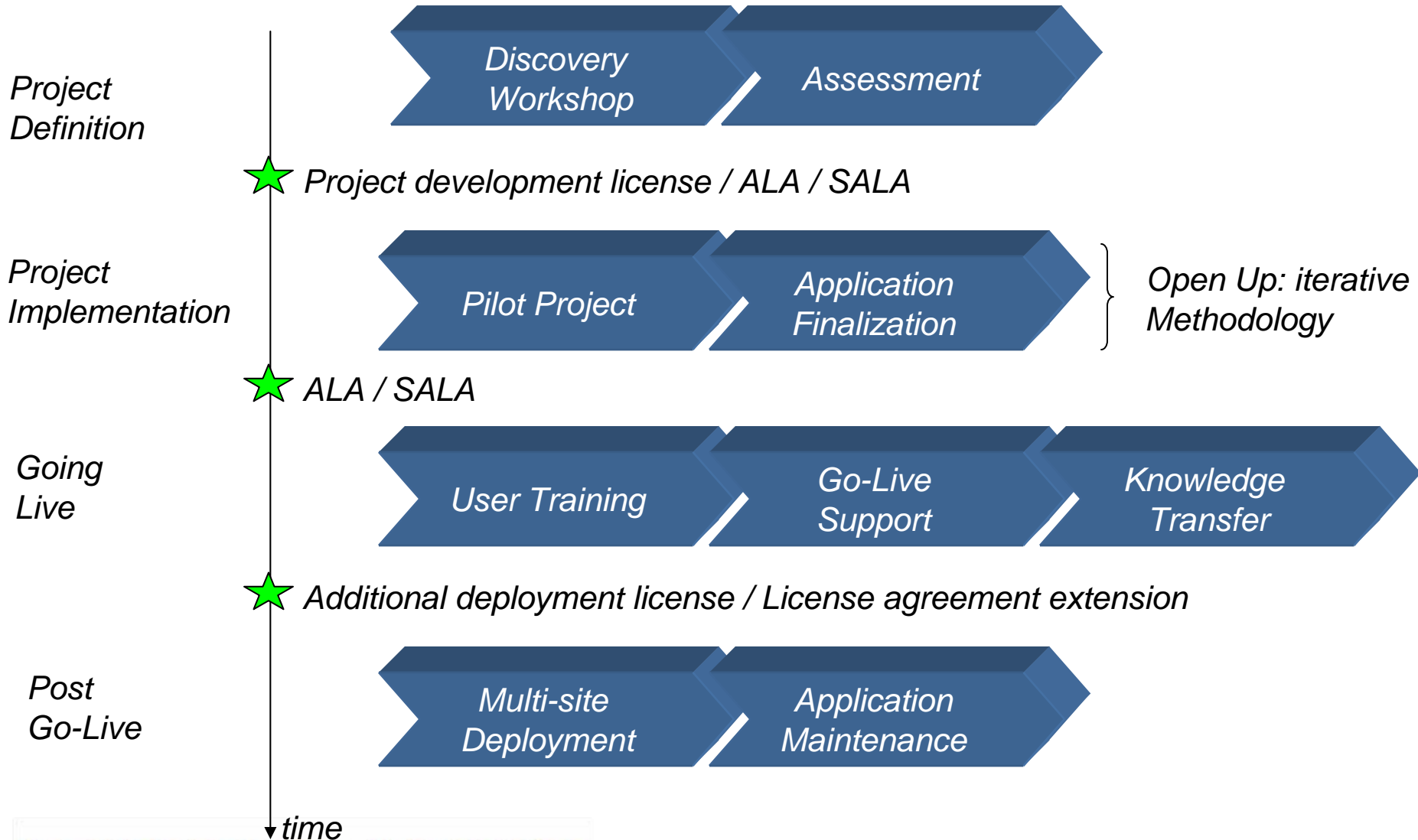


- Advanced Graphics
 - Tree, Pert, Gantt, Table, Editors, etc.
 - View, highlight, navigate, edit
- Scheduling
 - Plan computation
 - Master plan instantiation
 - Critical path computation
- Monitoring and rescheduling
 - Alarm management
- Fully integrated with SAP

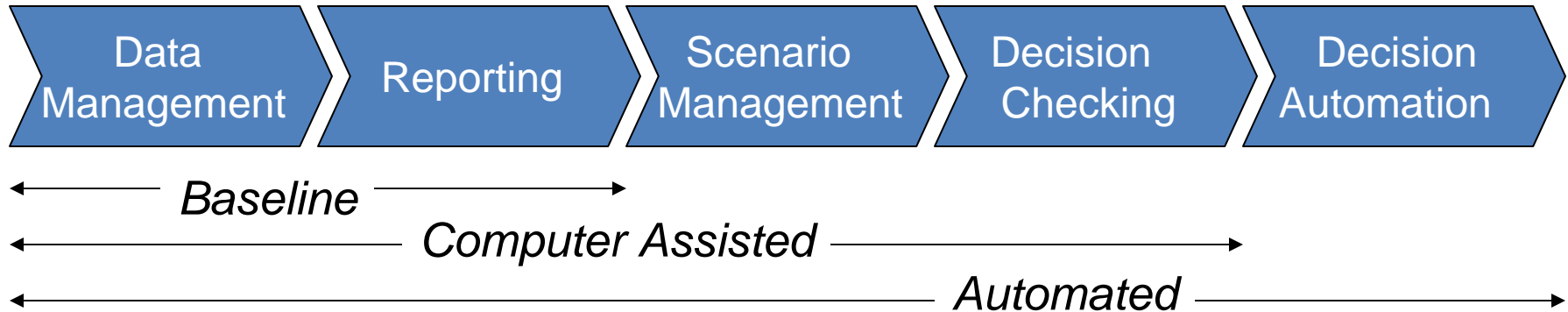
- Support **production rate increase**
- Saving
 - Better personnel & asset utilization
 - Avoid late delivery penalties
 - Better integration of remaining works
- Free up team leader for more operational tasks
- Knowledge/know-how management and capitalization

Optimization Wanted!

Processes and steps



Iterative Application Development Process



Modular Offer

- Baseline
 - Data Management layer + Optional [Reporting]
- Computer Assisted
 - Baseline + Optional [Scenario Management] + Decision checking
- Automated
 - Computer Assisted + Decision automation



Data
Management

Reporting

Scenario
Management

Decision
Checking

Decision
Automation

- Core Model : Data modeling « real » world
 - Master/transactional/plan/KPI data
- Load/Save data from source
- Support building realistic dataset
- Check data consistency/integrity
- View/understand/analyze data
 - User friendly visualization/navigation
- Edit Data
 - Master/transactional/plan/kpi data

IMPACT NOW



Thank You



IMPACT NOW

