IBM SolutionsConnect 2013

L'IBM TechSoftware nouvelle génération

28, 29 et 30 août

IBM Client Center Paris

#solconnect13

Gestion des garanties (Collateral Management)

Alex Fleischer

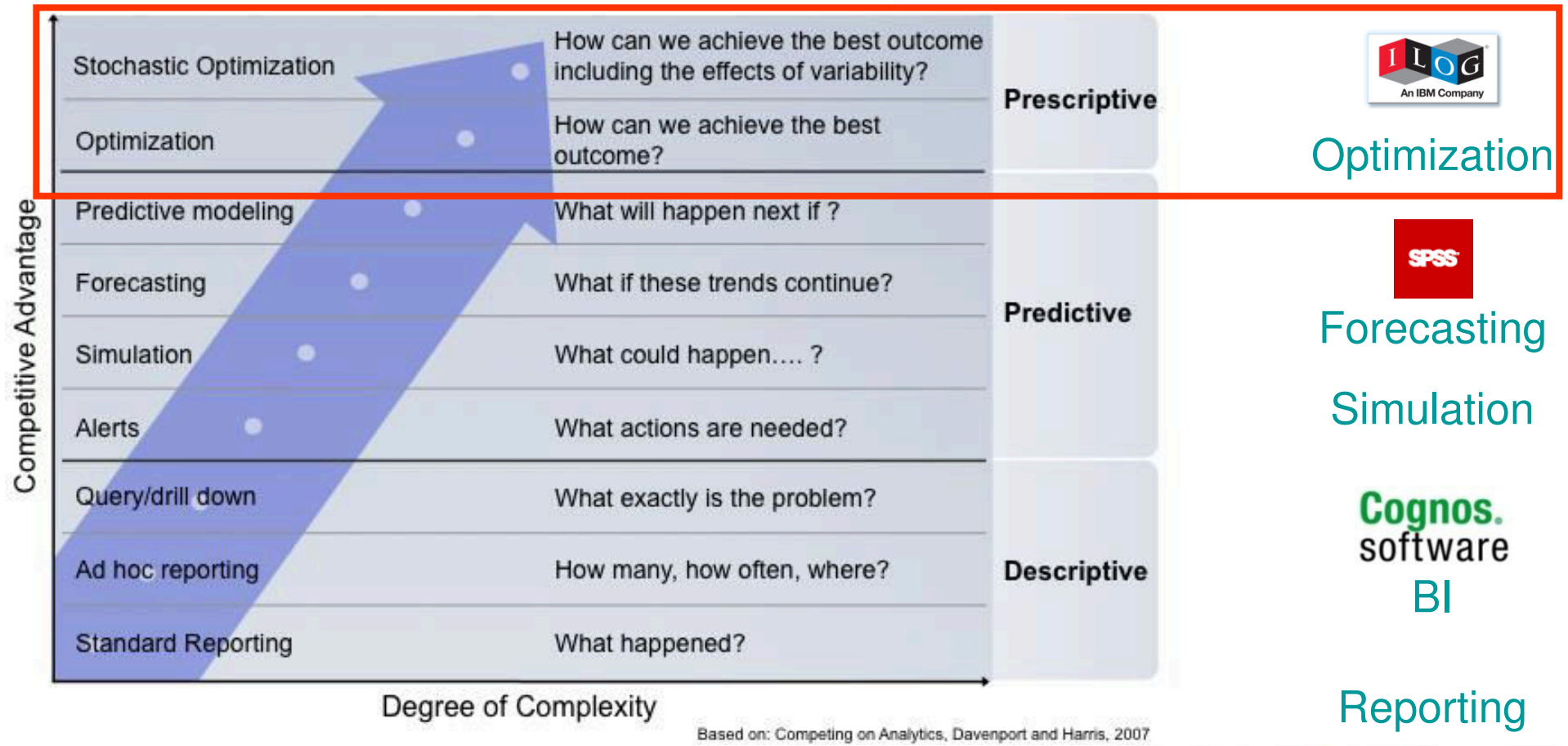
Avant vente Optimisation ILOG Europe

afleischer@fr.ibm.com

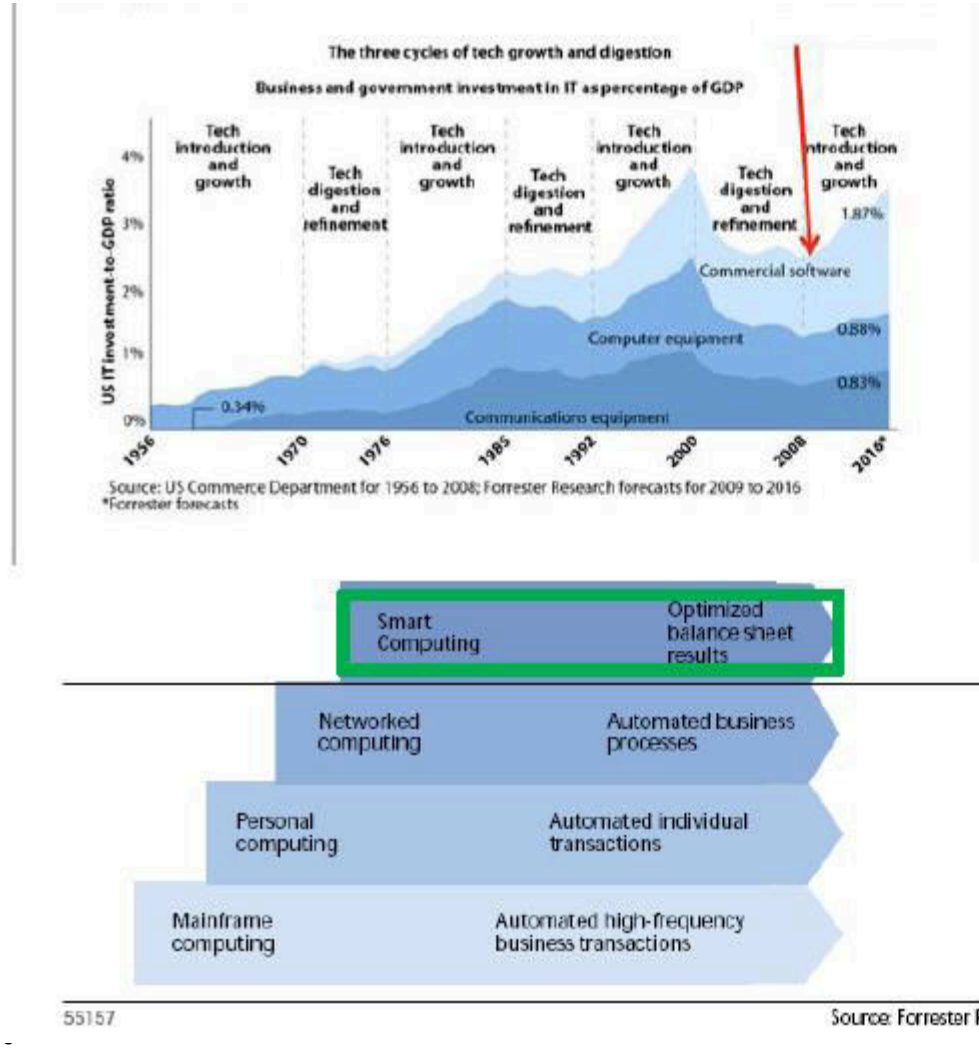
- Context of today's seminar
  - What's ILOG Optimization?
  - How does it work?
  - Recent Optimization developments
- What can it achieve in Finance ? – use cases
  - Collateral Optimization
- Q&A

Where does Optimization sit in the Business Analytics Spectrum?

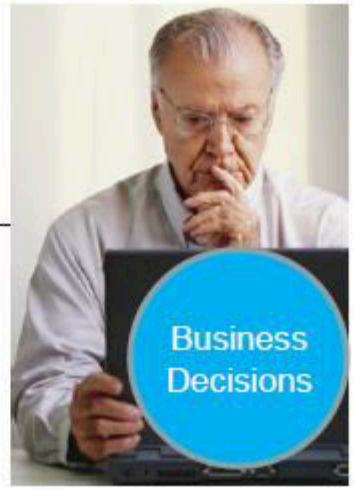
Business Analytics Landscape - ILOG stands for Intelligence Logicielle



IBM SolutionsConnect 2013



Andrew Bartels of Forrester Research says: there have been only three major IT technologies since 1960 (mainframes, PCs, networking), but that **the fourth wave has started**. It is "smart computing" or "optimization".



IBM SolutionsConnect 2013

Successful companies achieve significant savings by using deeper insights from Optimization

€40 mil

Amount a major transportation company reduced operating costs annually through better allocation of rolling stock*.

$240 mil

Amount a central securities depository saved financial institutions in 18 months by faster clearing of securities transactions*.

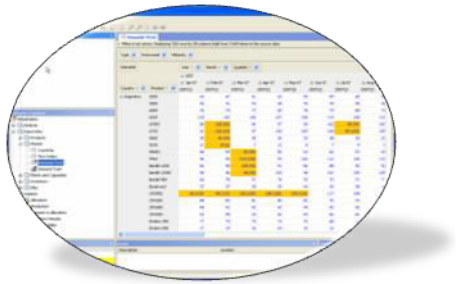
€50 thou

Amount a power system operator reduced daily costs to consumers through better dispatch of generators*.

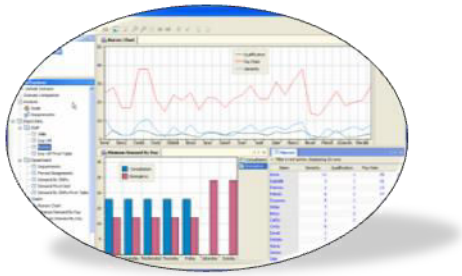
$226 mil

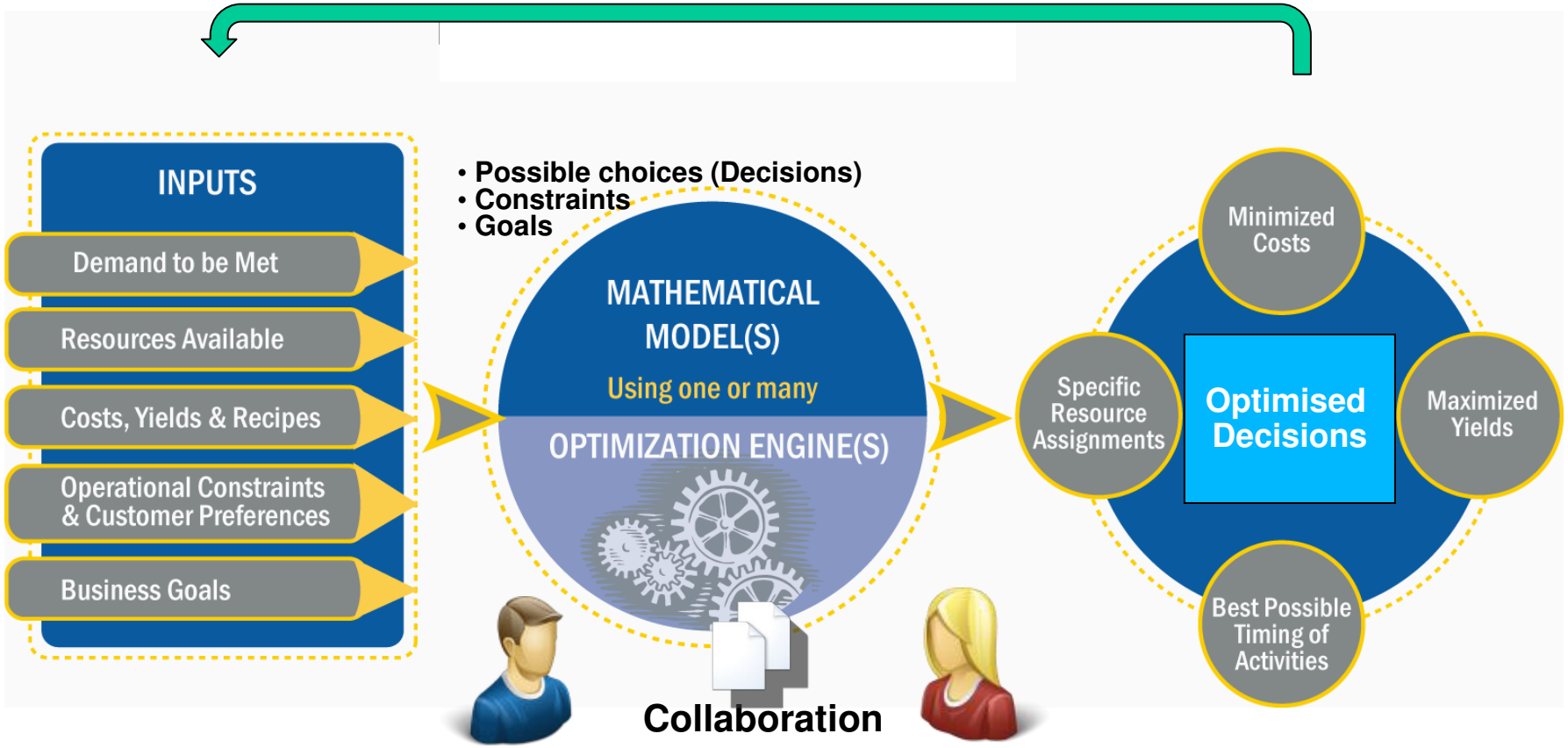
Amount a major hotel chain increased annual revenue by offering the right product to the right customer at the right price.

How Does Optimization Work?

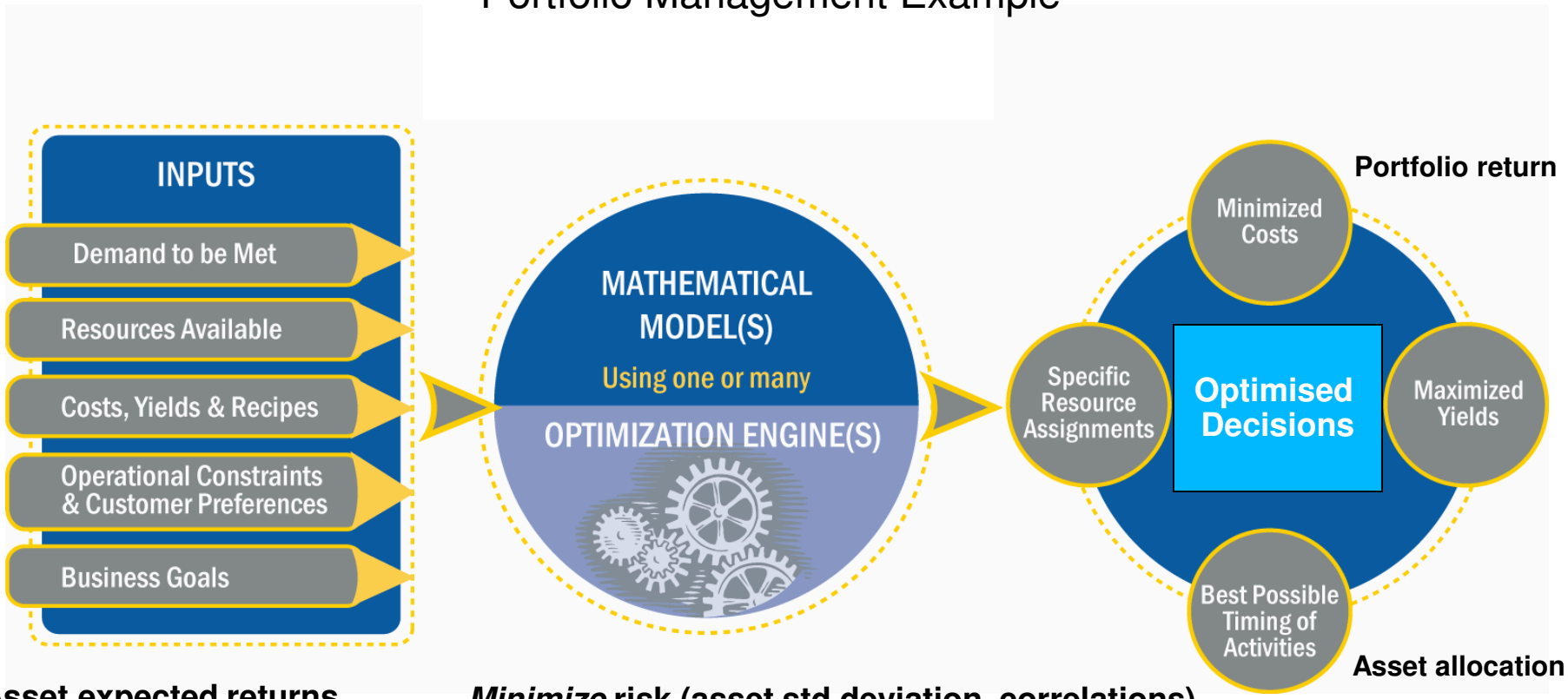


What-If Analysis





Portfolio Management Example



- **Asset expected returns**
- **Asset std deviation of returns**
- **Asset return correlations**

Minimize **risk (asset std deviation, correlations) or CVaR**

Subject to

Sum (asset expected returns) ≥ target

…

Build a custom model

Simple Portfolio Optimization model

```
range float FloatRange = 0.0..Wealth;
float alpha = …;
float Covariance = …;
float Return = …;
dvar float  Allocation[Investments] in FloatRange;  // Investment Level

dexpr float TotalReturn = sum(i in Investments) Return[i]*Allocation[i];
dexpr float TotalVariance = sum(i,j in Investments) Covariance[i][j]*Allocation[i]*Allocation[j];
dexpr float Objective = alpha * TotalReturn – (1 - alpha) (Rho/2)* TotalVariance;

Maximize Objective;
subject to {
// sum of allocations equals amount to be invested
allocate: sum (i in Investments) (Allocation[i])) == Wealth;

}
```

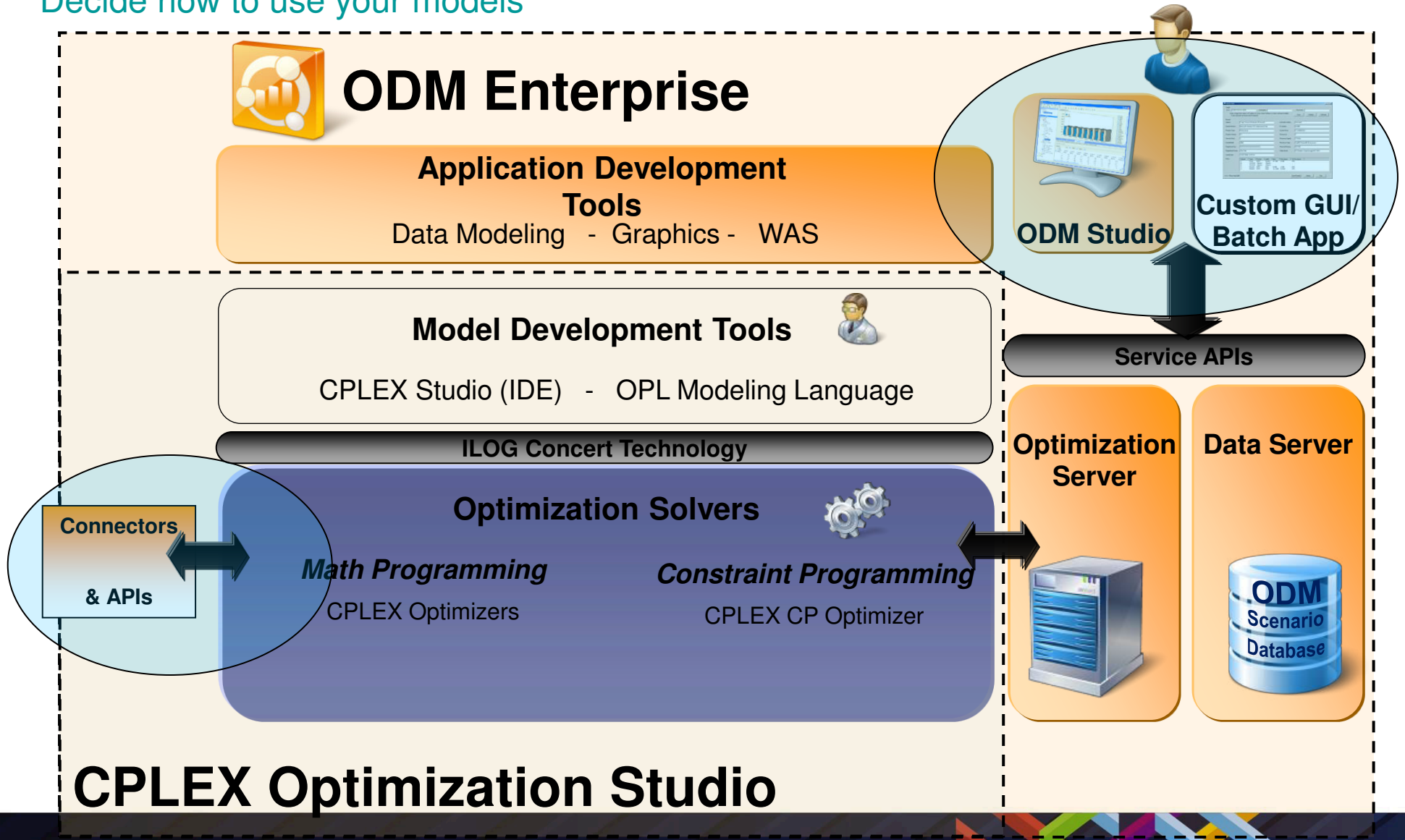
Data

Variables

Objectives

Constraints

Decide how to use your models



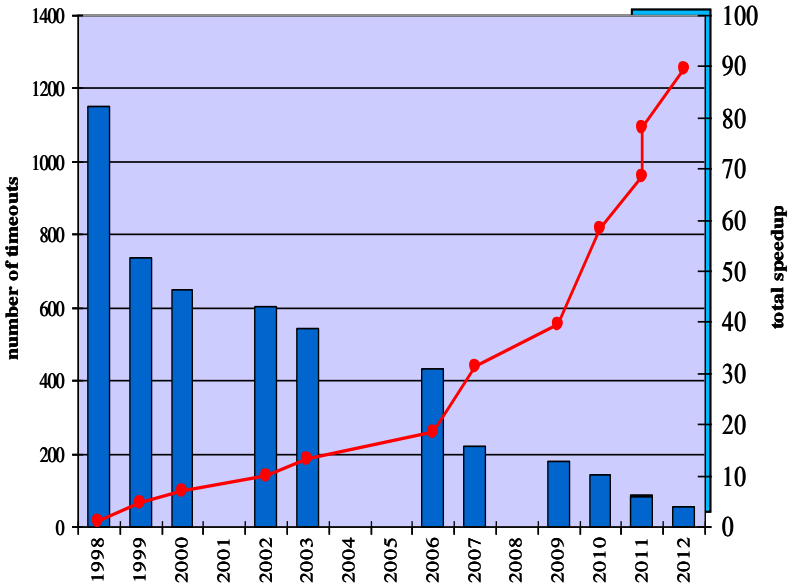
Progress in Linear and Integer Programming (CPLEX engine)

- Since the early 90s
  - Linear Programming
    - Algorithmic: More than 2000 times faster
    - Hardware: Factor 1000
    - **Net: Algorithm * Machine ~ 2 000 000x**
  - Integer Programming
    - Tremendous improvements
    - Still, experimentation can be necessary

    –Algorithmic controls

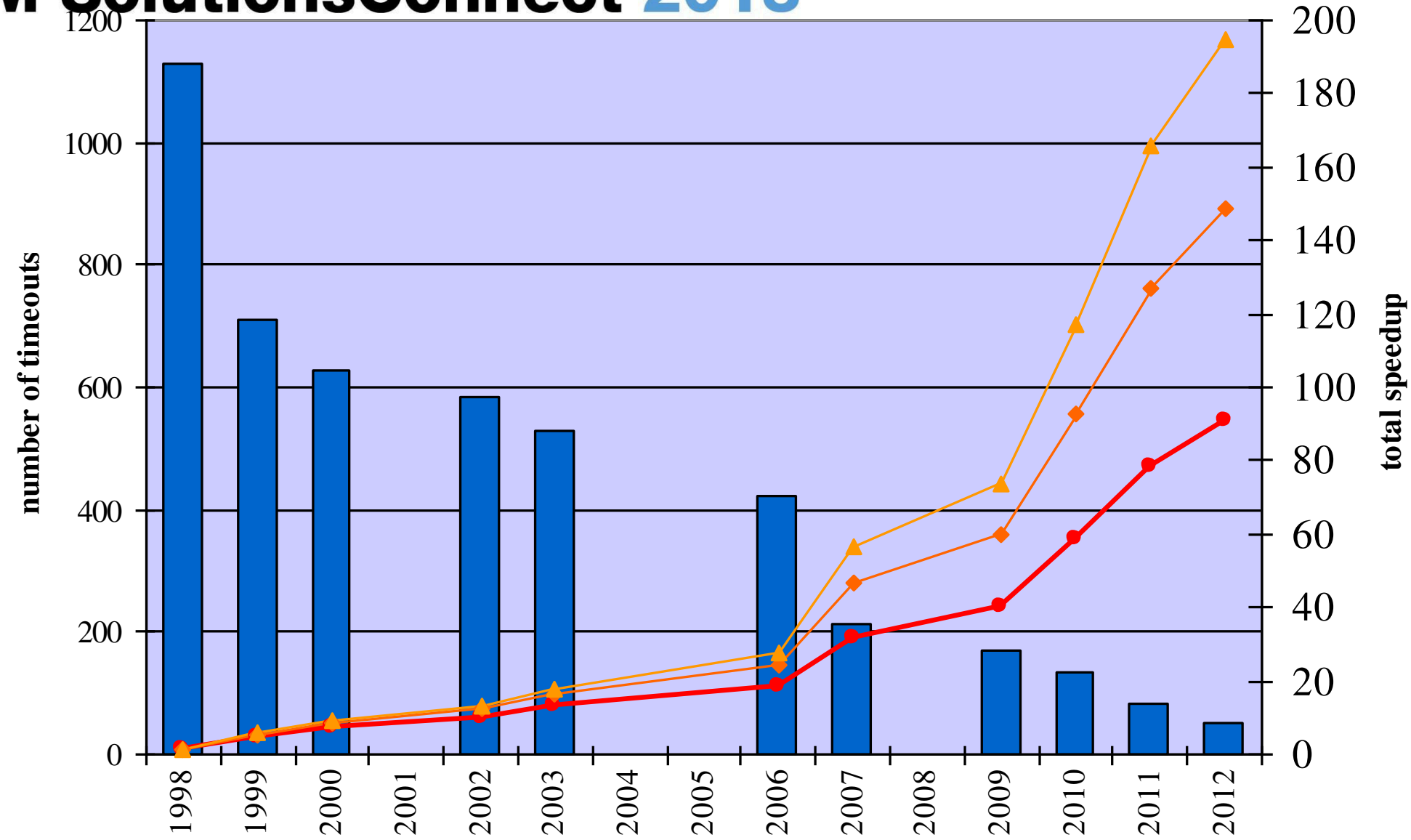
    –User knowledge

    –(Re-)Formulation



Integer Programming
Date: 31 Oct 2012
Testset: 3177 models (1753 in ≥ 10sec, 1515 in ≥ 100sec, 1354 in ≥ 1000sec)
Machine: Intel X5650 @ 2.67GHz, 24 GB RAM, 12 threads (deterministic since CPLEX 11.0)
Timelimit: 10,000 sec

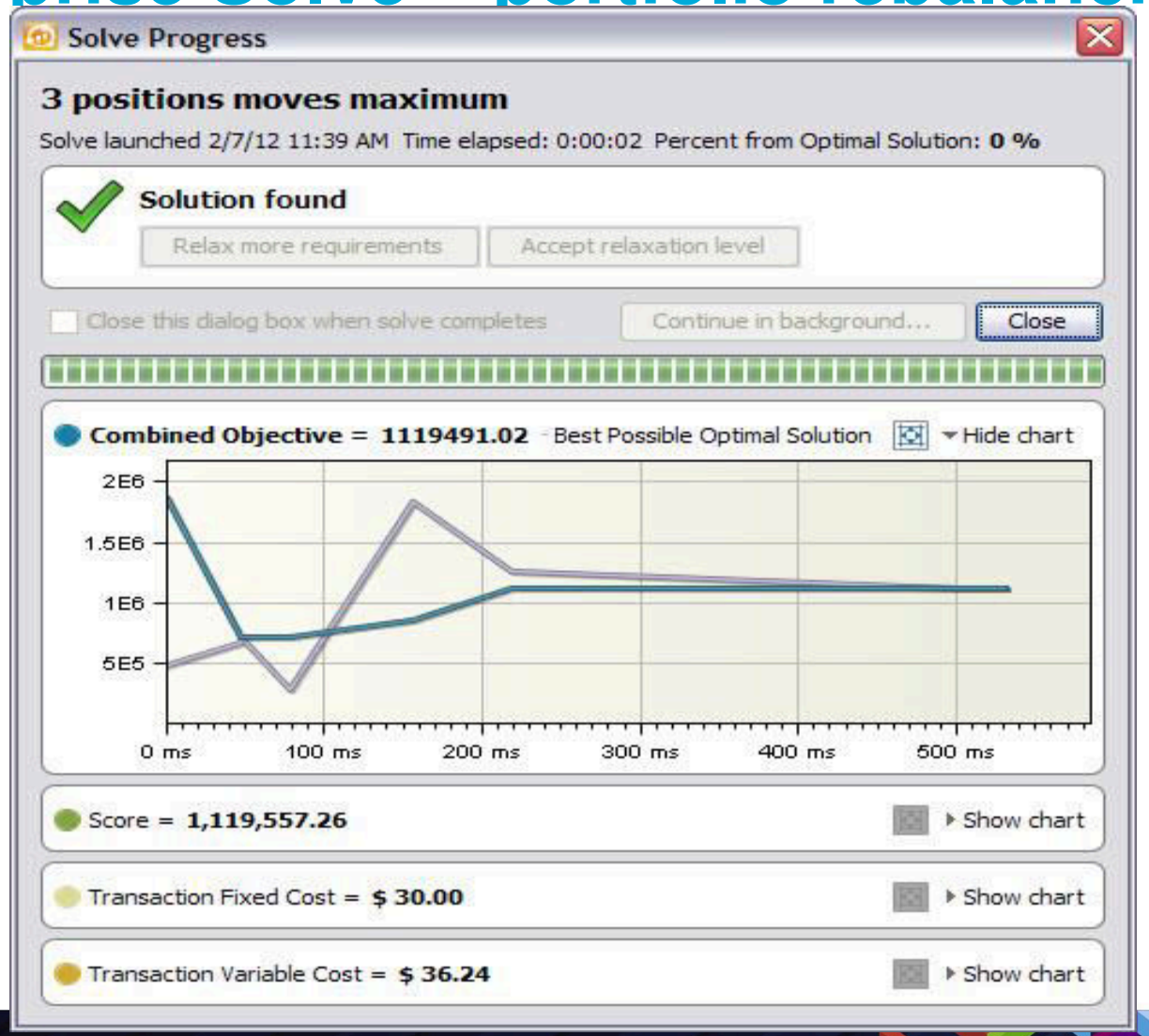
- Benefits
  - Larger, more accurate models
    - Example: Portfolio optimization under uncertainty
  - Optimizing over multiple processes
    - Taking into account more constraints and objectives
  - Real-time, execution level models



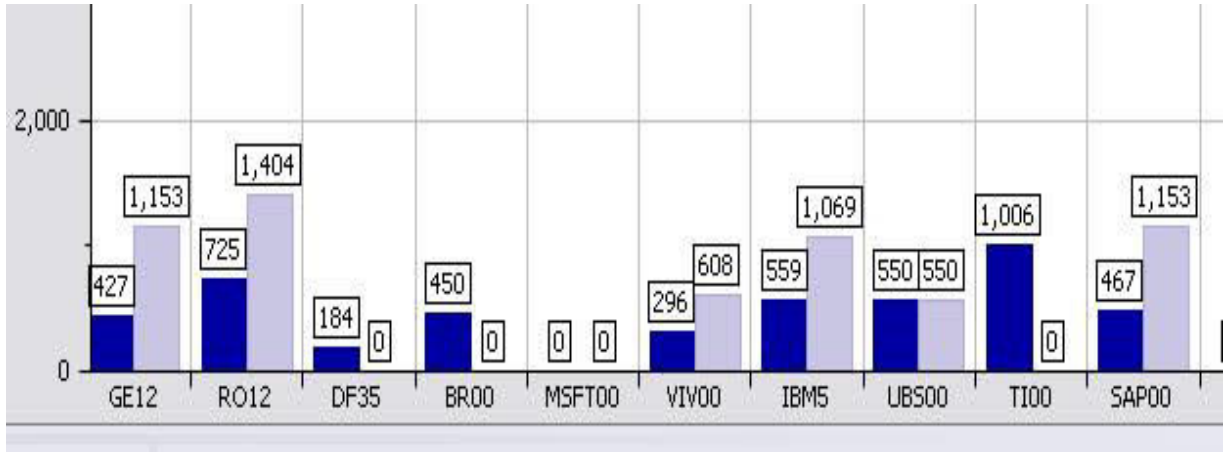
Date: 31 Oct 2012
Machine: Intel Xeon E5-2687W @ 3.10GHz, 24 GB RAM, 12 threads (deterministic since CPLEX 11.0)
Timelimit: 10,000 sec

IBM SolutionsConnect 2013

ILOG ODM Enterprise Solve – portfolio rebalancing



ILOG ODM Enterprise Results



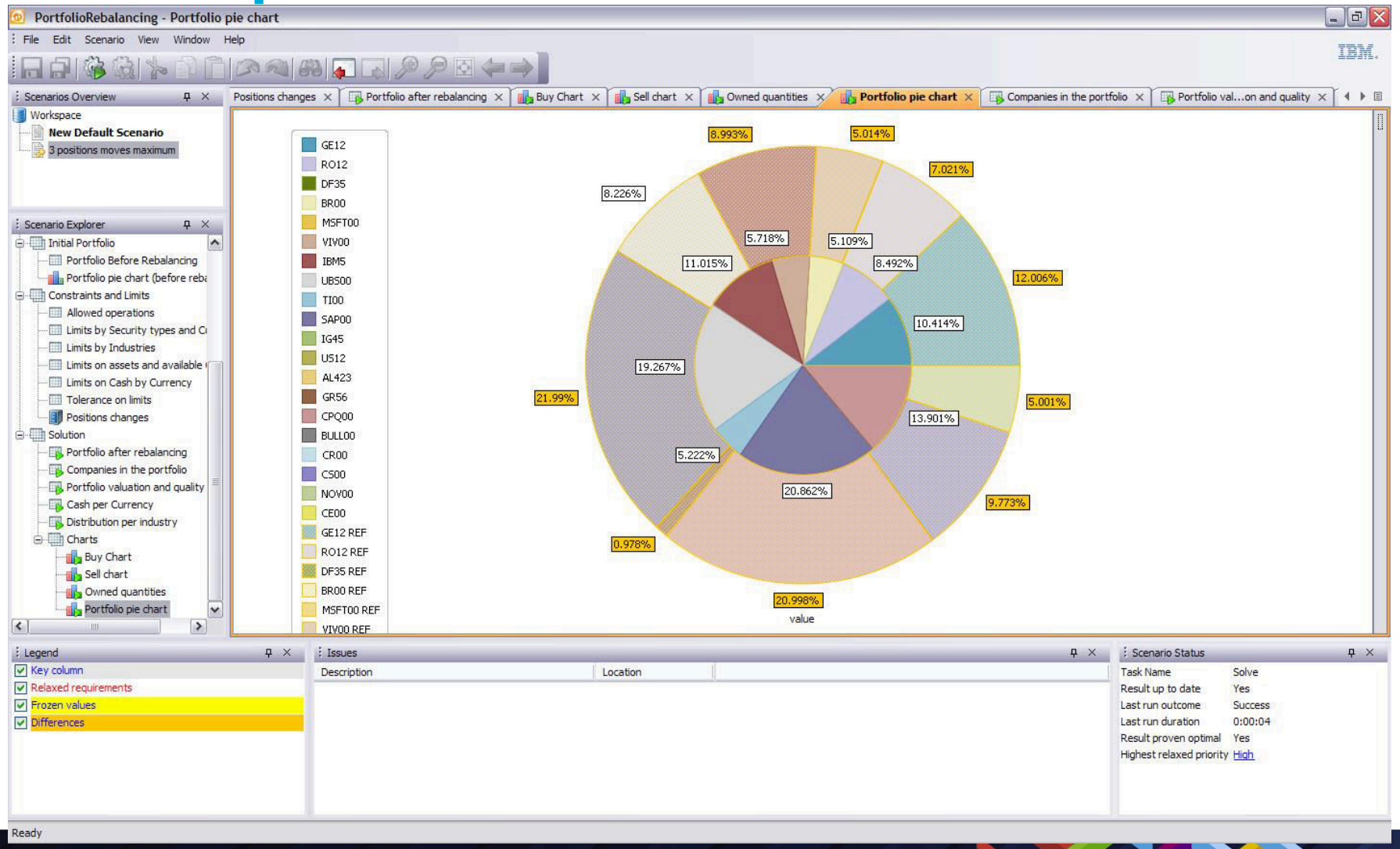
Positions changes | Portfolio after r

Filter is not active. Displaying 19 rows

Company Name	Presence
GeneralElectric	✓
Roche	✓
DeutscheFinance	
Bristol	✓
Microsoft	
Vivendi	✓
IBM	✓
UBS	✓
TexasInstruments	✓
SAP	✓
Infogram	
UStreasury	
Alcatel	
Compaq	✓
Bull	
Cross	
CreditSuisse	
Novartis	
CentralElectric	

IBM SolutionsConnect 2013

ILOG ODM Enterprise Results



Optimization Applications in Finance

Optimization Problems in the Financial Industries

Classic Applications

- Portfolio Optimization
- Trade Matching and Timing
- Asset-Liability Management
- Cash Management

Novel Applications

- Loan Configuration and Lending
- Derivatives Pricing
- Workforce scheduling/dispatch
- Ad scheduling
- Targeted Marketing
- Collateral management
- Trade Settlement - Netting

Changes in the Collateral Management Landscape

- New laws
  - Basel 3
    - Strengthens capital requirements for counterparty credit exposure
  - Dodd-Frank and EMIR
    - Clearing derivatives trades through Central Counterparty Clearing (CCP)
    - Collateral for OTC and Bilateral Swaps
- No free liquidities any more; Customers demand their collateral be segregated
- TABB Group estimates participants will need to find an additional $1.6 trillion to $2.0 trillion in additional collateral to meet the new margin requirements.
- Citigroup and many other major banks say the same.

How to Address these Changes?

- Offsets, Cross-Product, Cross Asset Margining.
- Consolidated View of Firm Collateral
- Collateral Optimization

Collateral Optimization, How Does it Help?

- Collateral can no longer be kept in silos across the different desks.
- A central platform combines and net each counter-party's transactions into one collateral requirement.
- A central platform combines all assets into one central repository for collateral purposes.
- Optimization allocates the available collateral
    - Haircuts
    - Position Limits
    - Asset Type Limits
- During the day, identify trades
- Limit unsecured/treasury funding

Collateral Optimization, What Are the Benefits?

- Centralized control of collateral inventory
- 4.7% reduction in funding costs (5.3 basis points when comparing the effective funding rates)
- Equivalently, a 4.93% increase in leverage with the same assets [1/(1-4.7%)]
- Ability to determine which assets, when purchased in the market, will reduce funding costs the most
- Reduced cash required to facilitate rebalancing

Collateral Optimization, What Are the Rules?

First step
- real time inventory allocation
-

Second step :

same but with the future in mind with rebalancing cost

- Optimizing the CSA

Collateral Optimization, What Are the Rules?

-

'Credit Support Annex'

A credit support annex provides credit protection by setting forth the rules governing the mutual posting of collateral. CSAs are used in documenting collateral arrangements between two parties that trade privately negotiated (over-the-counter) derivative securities. The trade is documented under a standard contract called a master agreement, developed by the International Swaps and Derivatives Association (ISDA). The two parties must sign the ISDA master agreement and execute a credit support annex before they trade derivatives with each other.

Collateral optimization

- Customer
  - A huge European bank
- Problem
  - Minimize the needed collateral to cover positions
  - Take into consideration all possible hair cuts
  - Optimal use and price
  - Avoid sub optimal pledge
- Solution
  - IBM ILOG CPLEX computes the minimal use of available collateral all day long
- Benefits
  - Clients – can do more on the market with less assets, which is key with scarce liquidity
  - The company – differentiation from competitors, reduced cost, grew business

Collateral optimization

- Customer
  - A medium size European bank
- Problem
  - Margin call optimization
  - Balance Sheet Optimization
  - Positions compression
  - IBM ILOG ODME/CPLEX computes the minimal use of available collateral all day long
- Benefits
  - The company can do more with less
  - Better balance sheet

IBM SolutionsConnect 2013

Indeval (Mexican Central Securities Depository)

What if you could raise an entire country's economy through more efficient securities transactions?

A private securities depository organization in Mexico implements a customized solution to reconcile and complete trading operations faster and more efficiently.

The need

Indeval was looking for a solution to **process security transactions in real time, rather than on a daily basis**, to provide the best service to the Mexican Stock Exchange and be more cost effective for trading partners.

S.D. INDEVAL
Instituto para el Depósito de Valores

Solution Components

- IBM ILOG CPLEX Optimization Studio
- IBM System p5 running AIX

Business Results

- **Real time reconciliation and completion of trading operations** for more than **USD$250 B in average, every day**
- **Reduced liquidity** requirements for trading partners **by 52 percent**
- **Increased the volume** of operations **by 26 percent**
- **Reduced the costs of each trading transaction** for electronic trading facilities, the Stock Exchange and trading brokers
- **Enhanced Mexico's risk status among analysts**

"By building a unique technology solution for our securities services, we now better serve the Mexican Financial Community and trading partners. We are very proud that this solution has played a key role in helping elevate the economy of Mexico."
Jaime Villaseñor
Chief Risk Officer, INDEVAL

A Large Central Bank in Europe

IBM ILOG Optimization on z/OS as a core technology for a night settlement module

Business Results

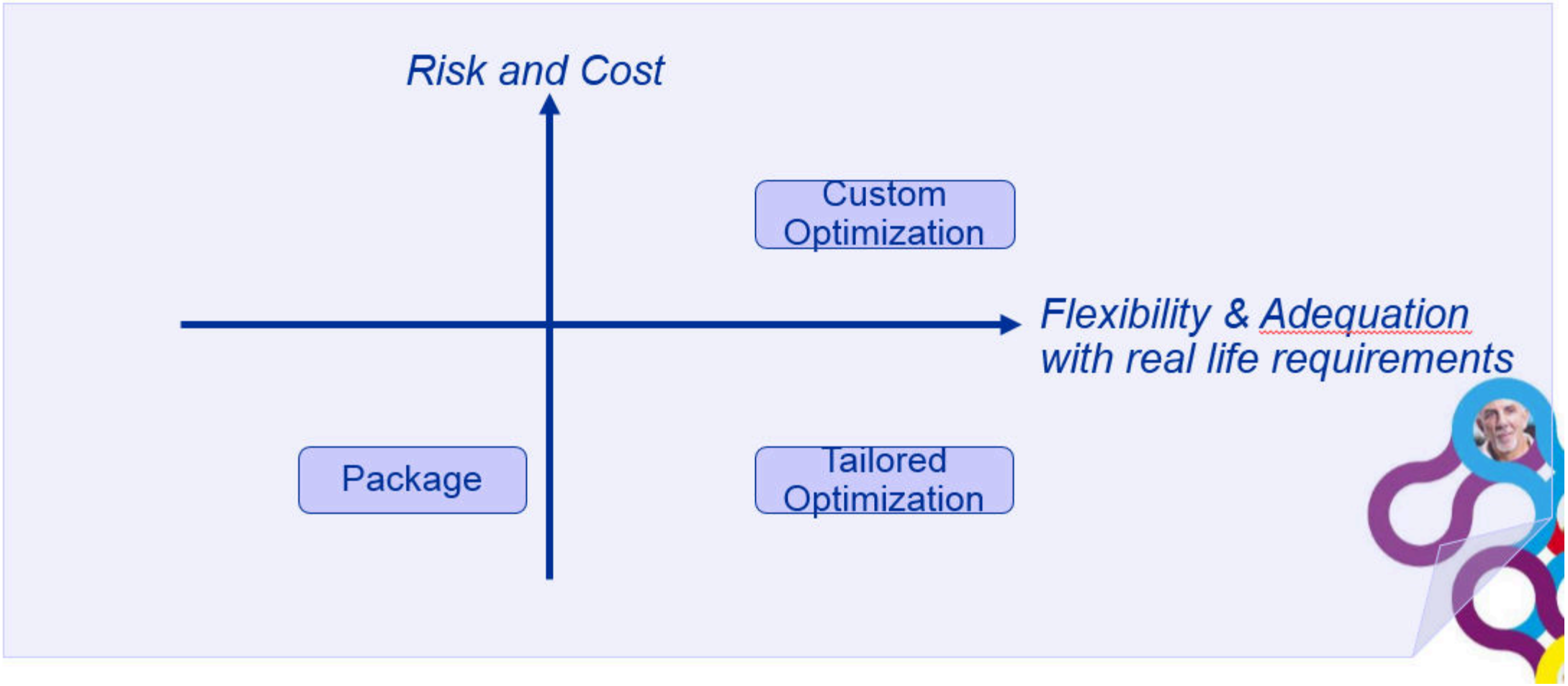
– Settling more trades at lower cost will increase liquidity and capital flow.

– Using IBM Optimization will allow the bank to respond more quickly to new constraints as legislation and customer behavior changes.

– The optimized settlement system should free up hundreds of millions of euro worth of collateral used to back up trades.

Solution Components

- IBM ILOG CPLEX on z/OS
- IBM Labs, Lab services and Research involved


Risk and Cost
Custom Optimization
Flexibility & Adequation with real life requirements
Package
Tailored Optimization

Dealing with some objections for not using optimization here

- But then how to answer WHY ?
  - Break symmetries to have one and only one possible solution
  - Use optimization to configure the optimal set of rules
- If the main concern is fairness
  - Use random before solve
- Back and stress testing
  - Optimization allows back and stress testing thru simulation and what if analysis
- Even if the result is not used
  - The gap measures the cost of not using the optimal solution

Optimization is Everywhere but finance provides the biggest return on investment for ilog optimization