Rapid Application Prototyping With GAMS

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www.gams.com

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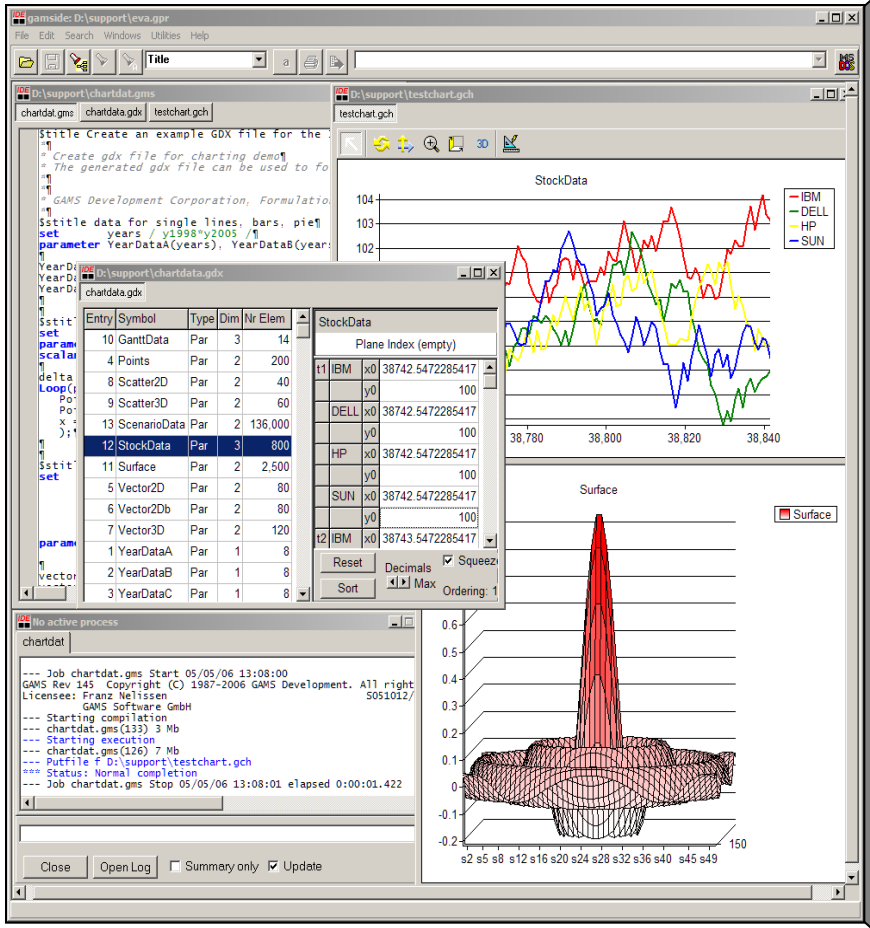
GAMS at a Glance



Algebraic Modeling System

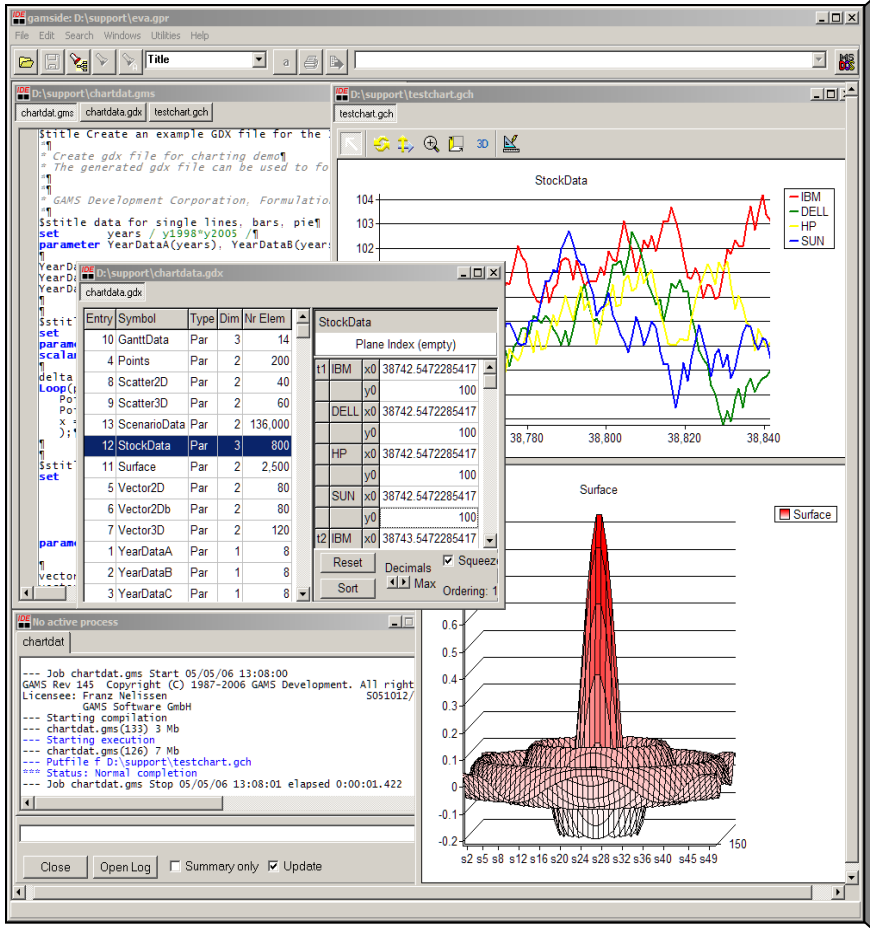
- Facilitates to formulate mathematical optimization problems similar to algebraic notation

  ➔ Simplified model building

- Provides links to appropriate state-of-the-art external algorithms

  ➔ Efficient solution process

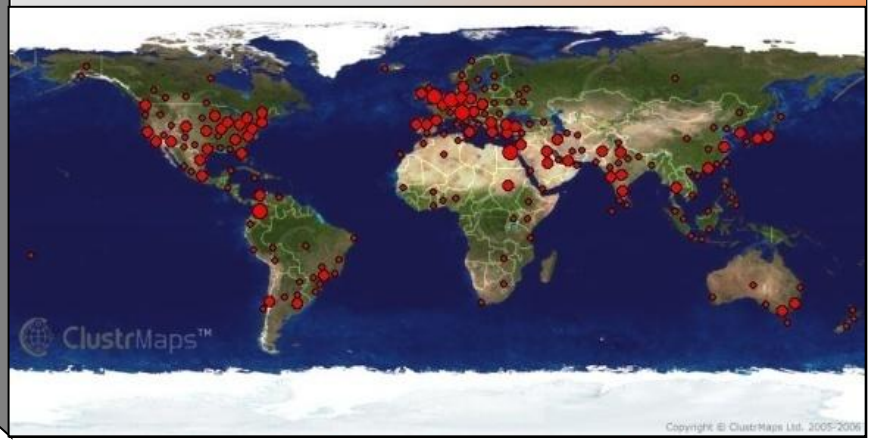
GAMS at a Glance



General **A**lgebraic **M**odeling **S**ystem

- Roots: World Bank, 1976
- Went commercial in 1987
- GAMS Development Corp.
- GAMS Software GmbH

- Broad academic & commercial user community and network



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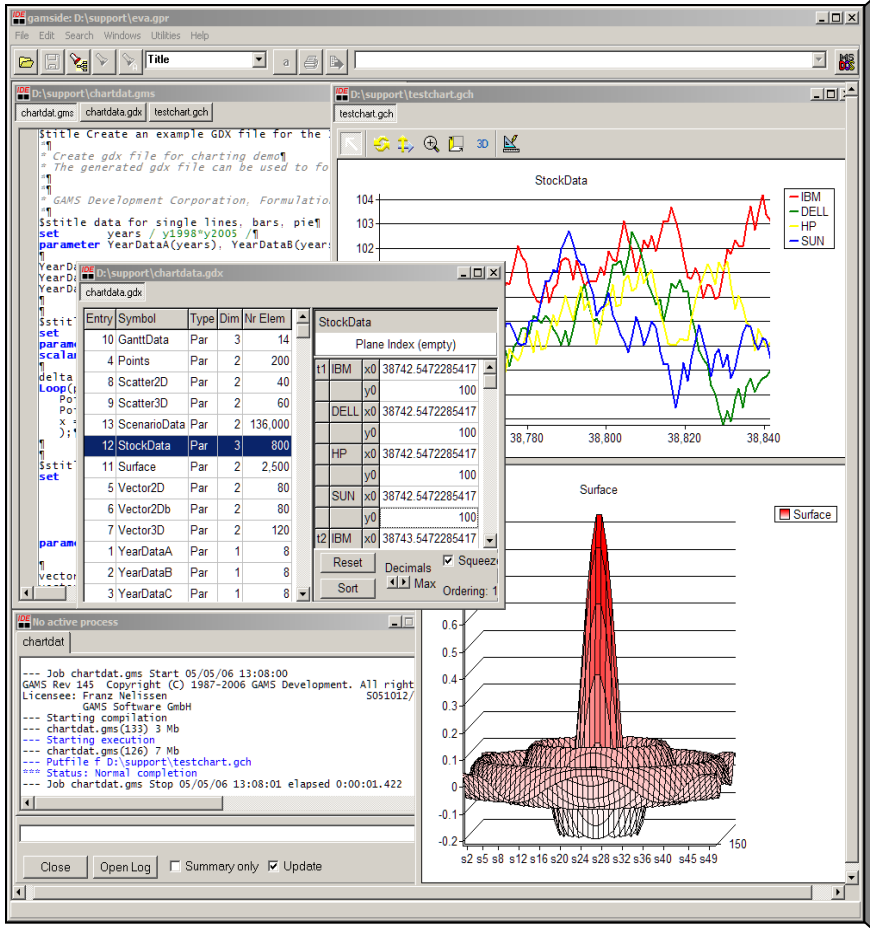
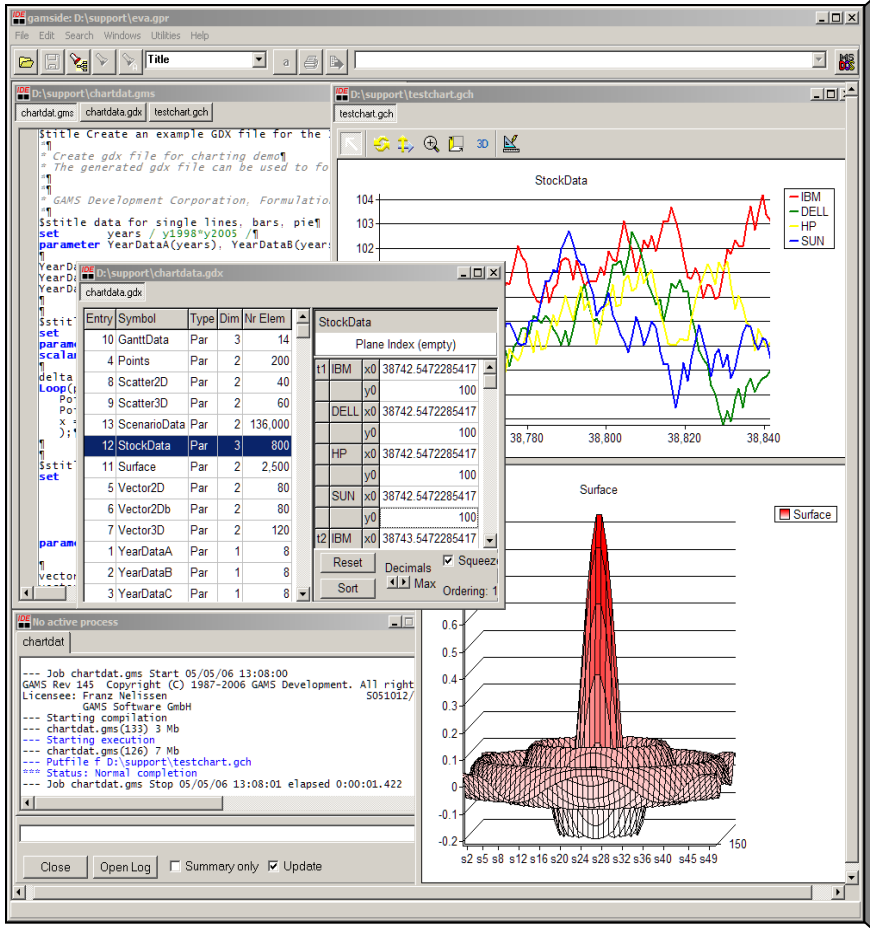
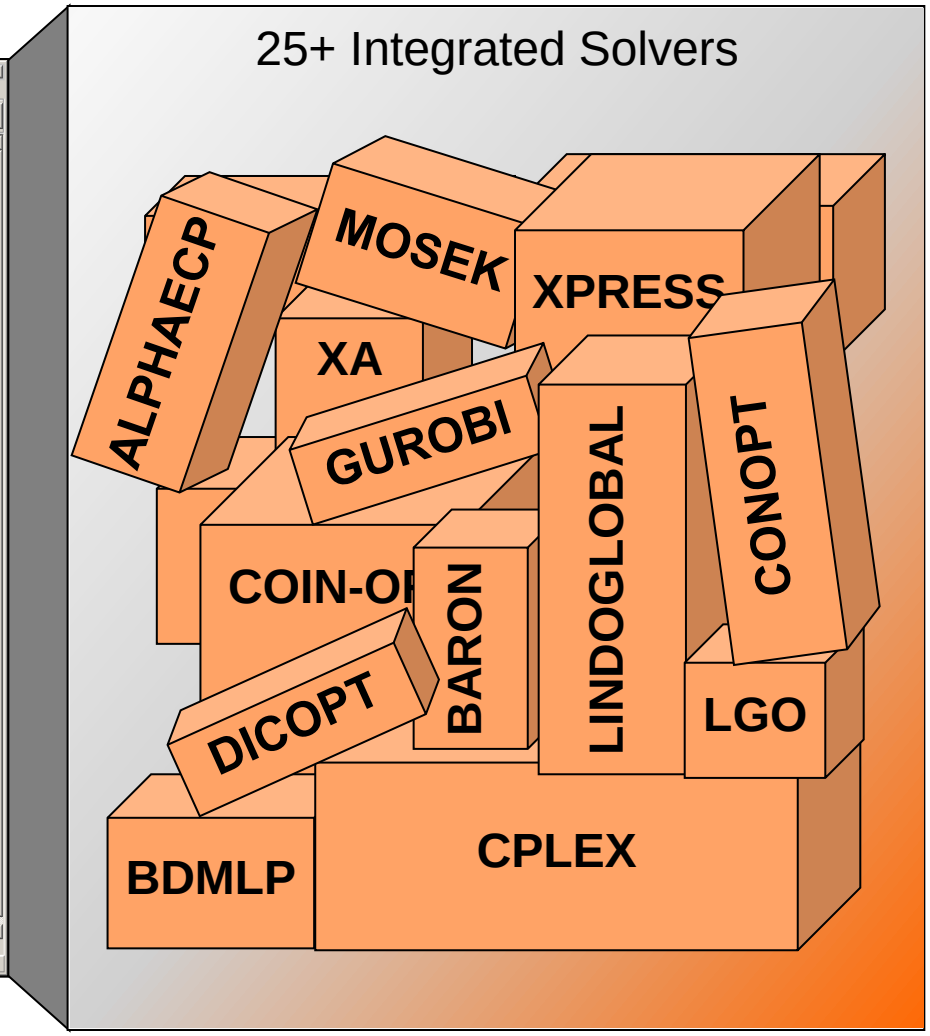


General **A**lgebraic **M**odeling **S**ystem

- Algebraic Modeling Language
- 25+ Integrated Solvers
- 10+ Supported MP classes
- 10+ Supported Platforms
- Connectivity- & Productivity Tools
  - IDE
  - Model Libraries
  - GDX, Interfaces & Tools
  - Grid Computing
  - Benchmarking
  - Compression & Encryption
  - Deployment System
  - …

GAMS at a Glance





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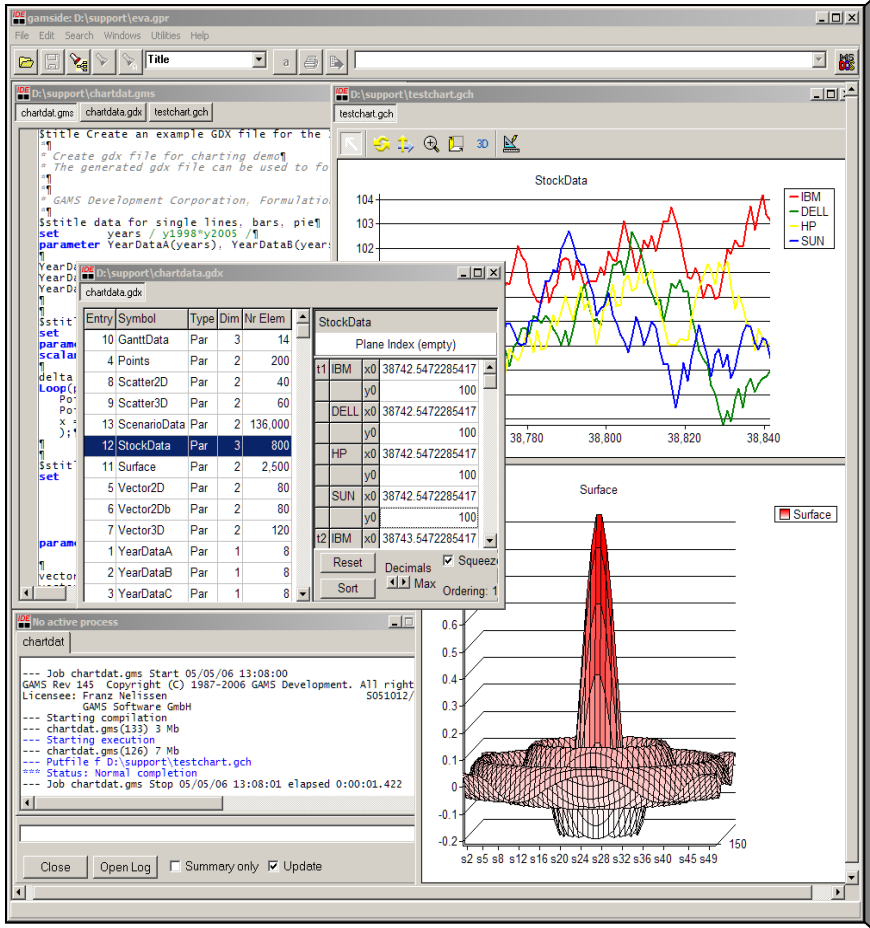

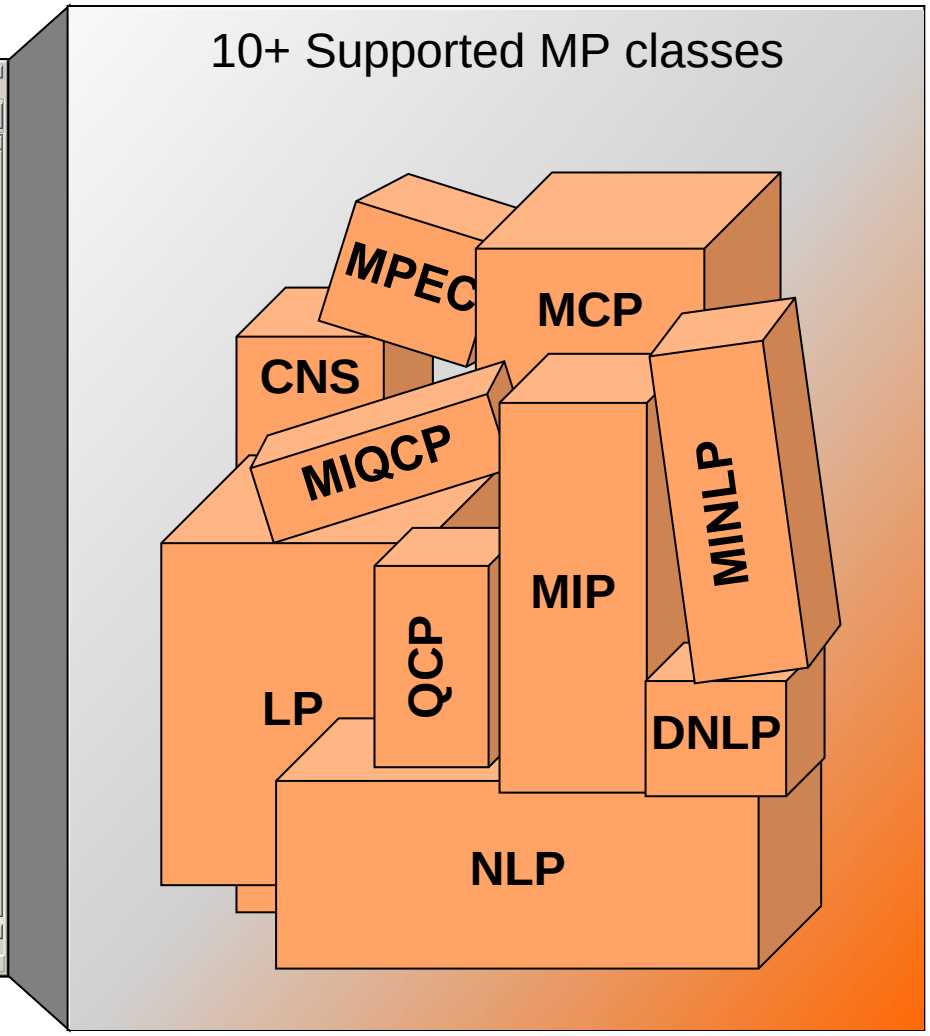

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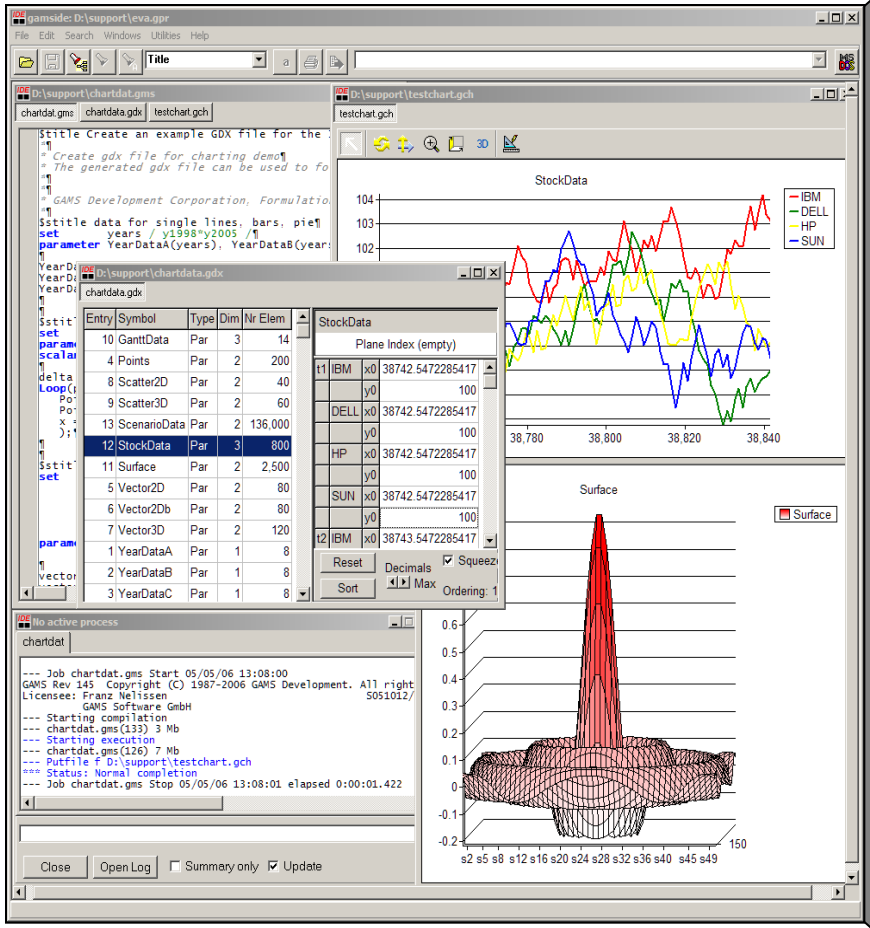

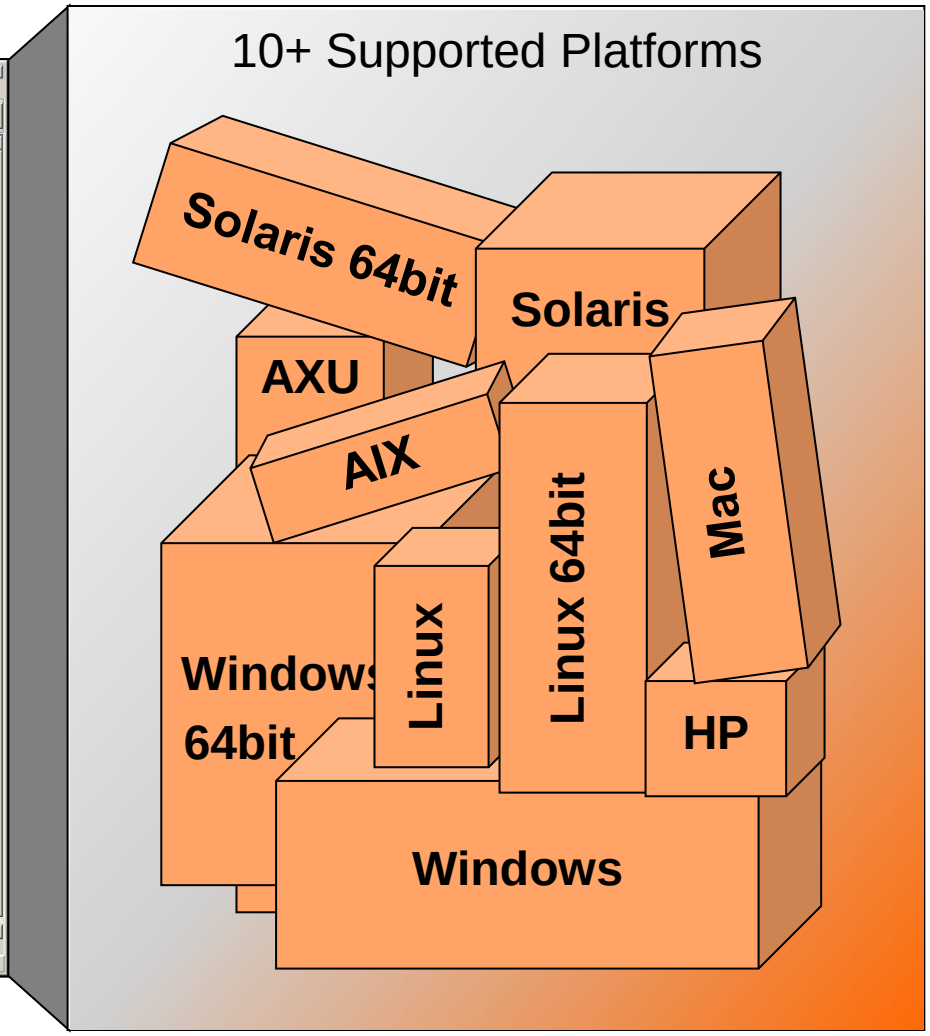

GAMS' Fundamental concepts

- **Platform independence**
- **Open architecture and interfaces to other systems**
- **Balanced mix of declarative and procedural elements**
  - Declaration of Sets, Parameters, Variables, Equations, Models, …
  - Procedural Elements like loops, if-then-else, …
- **Layers of separation**

GAMS' Fundamental concepts

- **Different layers with separation of**
  - model and data
  - model and solution methods
  - model and operating system
  - model and interface

→ Models benefit from

- advancing hardware
- enhanced / new solver technology
- improved / upcoming interfaces to other systems

GAMS 23.6 Beta

- Released yesterday!

www.gams.com/beta

- Chk4Upd
- Python API
- GAMSIDE updates
- XLSDump
- New Solver Libraries (COIN-OR, CPLEX, GUROBI, KNITRO, MOSEK, SCIP, XPRESS)
- New library models (DATALIB, EMPLIB, MODELLIB, TESTLIB)
- Internal reorganization

Basic Sudoku

Address http://www.dailysudoku.com/sudoku/index.shtml

Daily SuDoku

- Home
- Today's SuDoku
- SuDoku Archive
- SuDoku for Kids
- Draw/Play
- Discussion
- FAQ
- Books
- Syndication
- Links
- Email and News
- Contact

Welcome to the Daily SuDoku!

Today's SuDoku is shown on the right. Click the grid to download a printable version of the puzzle. Visit **the archive** for previous daily puzzles and solutions. Play online, print a Sudoku, solve and get hints using the new improved **Draw/Play** function.

But how do I do it?

The object is to insert the numbers in the boxes to satisfy only one condition: each row, column and 3x3 box must contain the digits 1 through 9 exactly once. What could be simpler?

The rules of the new **Monster Sudokus** are exactly the same, but more numbers and letters are needed.

Classic | Monster | Kids | Squiggly

						6		1
			7	3	1			4
5					9			
6			2				1	
		8				4		
	1				5			8
			9					3
7			8	6	3			
9		2						

Daily SuDoku: Thu 2-Nov-2006 very hard

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Christmas Tree Sudoku

Address http://www.dailysudoku.com/sudoku/archive.shtml?year=2005&month=12&day=23&type=seasonal

Daily SuDoku

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Daily Seasonal Sudoku: Fri 23-Dec-2005 [instructions]

	3			2			9	
		1				2		
			7		3			
	7		4		9		2	
	6	2				8	3	
			1		5			
			8		4			
3								5

Christmas tree Sudoku: Fri 23-Dec-2005 very hard

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Samurai Sudoku

Address http://sudoku.top-notch.co.uk/gattai5.asp

Samurai Sudoku

SAMURAI

The classic five merged grid Samurai Sudoku. We have one free puzzle each week and three additional weekly puzzles for registered users. See below for previous puzzles.

We also have a printable blank Gattai-5 grid for those of you who want to print out some copies to work on.

Free Samurai #33 (Easy)

Access key:

To access the premium Samurais, you will need to enter an access key in the box above. The same key will also let you access our Sensei, Shogun, Sumo and Wordoku puzzles and use both the samurai and standard solvers as many times as you like.

To obtain an access key:
Click the "Buy now" button below to use secure PayPal pages to purchase an access key. Each key costs £2.00 and is valid for 14 days. The key will be sent to you by email. We will only use your email address to administer this service, and will not pass your details to any third party.

Buy Now

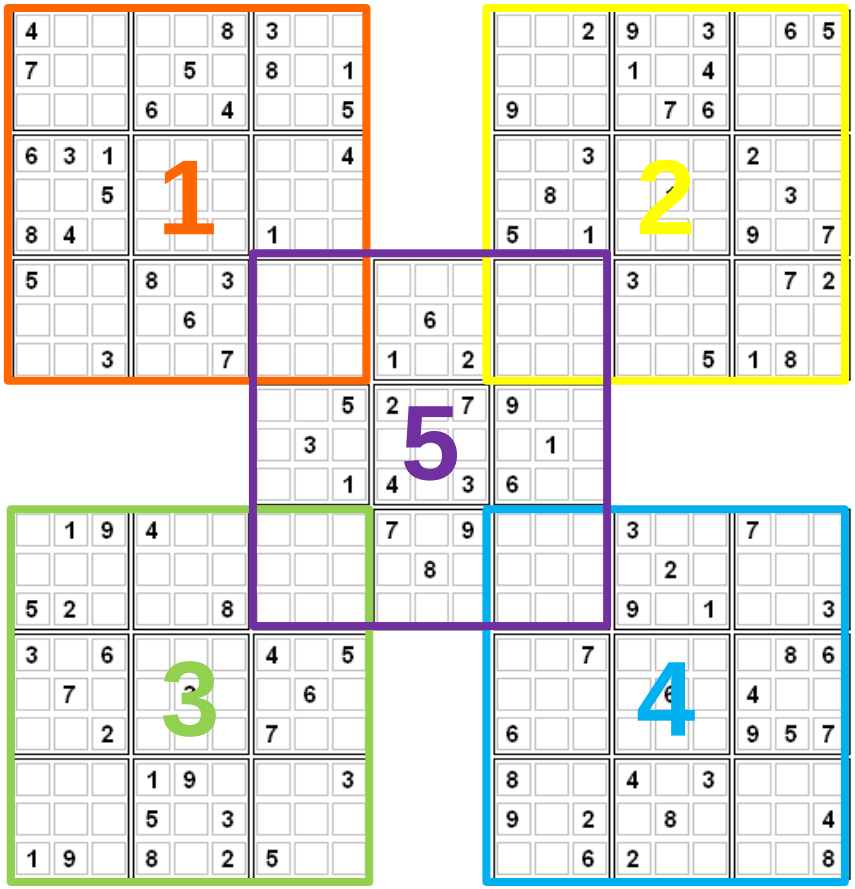
Top Notch Free Samurai #33 (Easy)

Get the solution to this puzzle from our solver.
Registered users can view, save or print this Samurai in Acrobat PDF format.

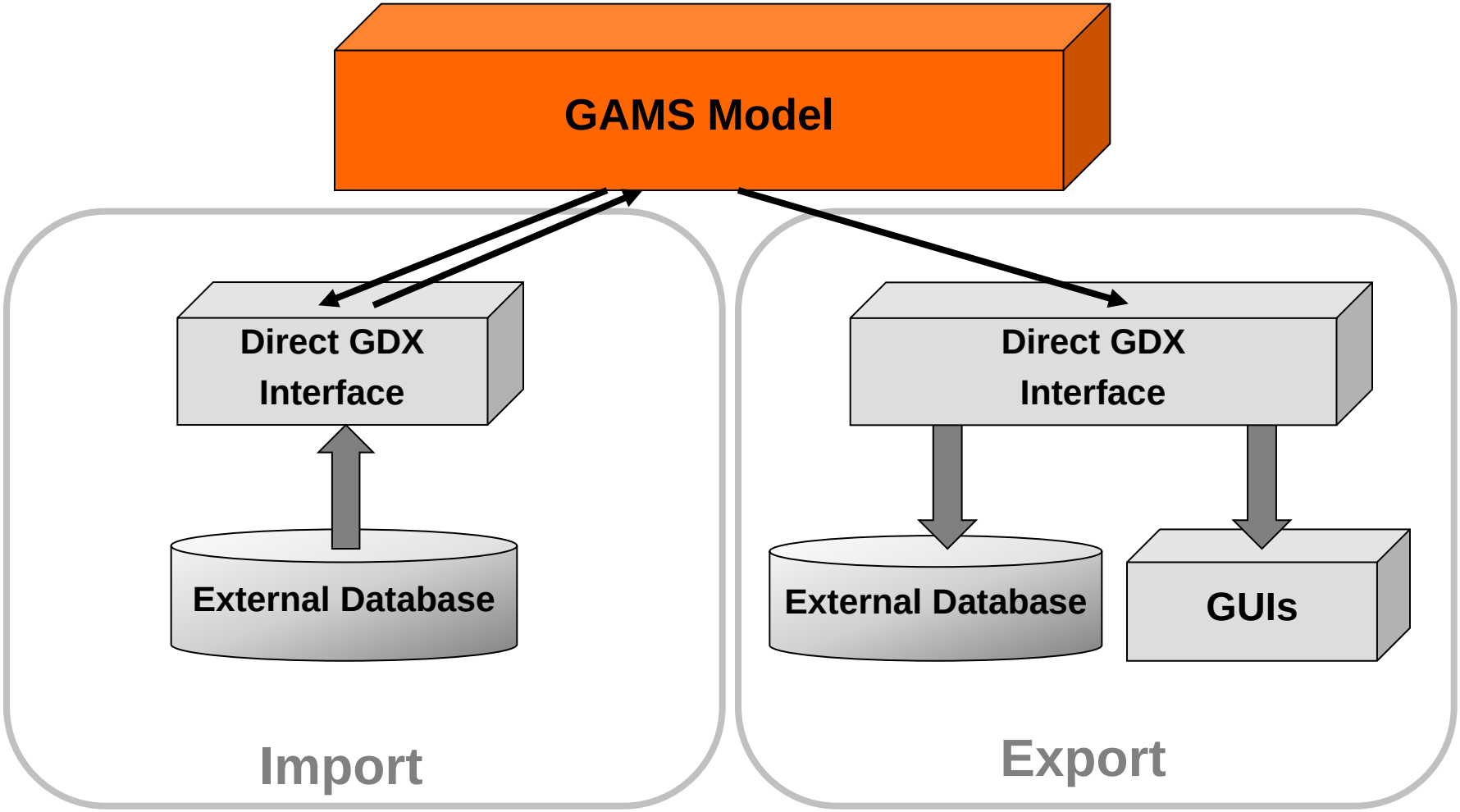
4					8	3							2	9		3		6	5
7				5		8		1						1		4			
			6		4			5				9			7	6			
6	3	1						4					3				2		
		5		4									8		1			3	
8	4					1						5		1			9		7
5			8		3										3				7	2
				6						6										
		3			7				1		2						5	1	8	
								5	2		7	9								
							3						1							
								1	4		3	6								
	1	9	4						7		9				3			7		
										8						2				
5	2				8										9		1			3
3		6				4		5						7					8	6
	7			3			6									6		4		
		2				7						6						9	5	7
			1	9				3				8			4		3			
			5		3							9		2		8				4
1	9		8		2	5								6	2					8

Demo: Mapping data (map1)

- We solve the Samurai as 5 basic puzzles, with linking constraints for the overlapping cells
- Requires mapping 21x21 Samurai puzzle into 5 separate 9x9 puzzles



GAMS in Control



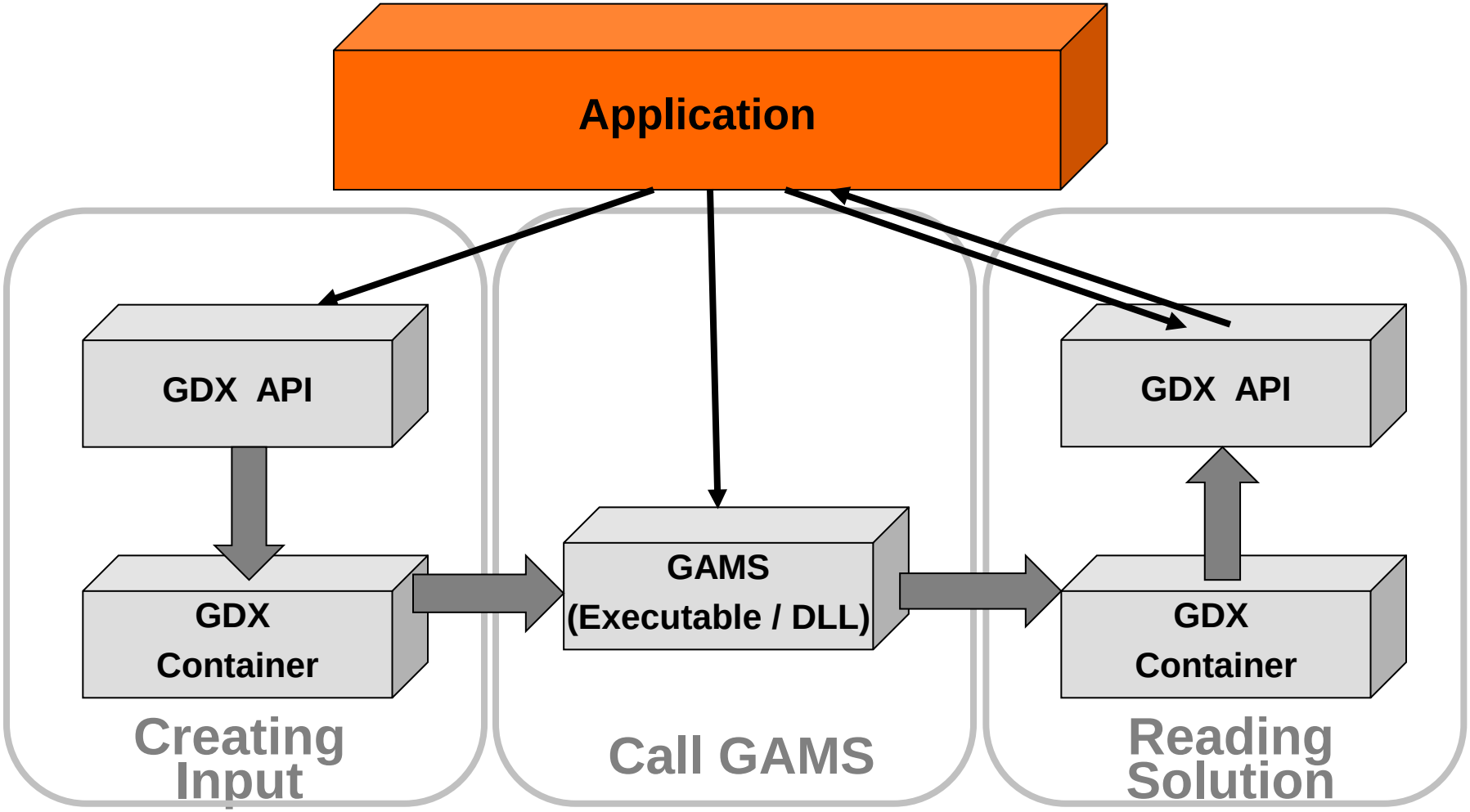
Calling GAMS from an Application

Creating Input for GAMS Model
Callout to a GAMS Process/Executable
Reading Output from GAMS Model

- Works from basically every environment
  - Web application (server side)
  - Application Builder
    - Oracle, Eclipse, .NET, …
    - Regular Programming language C++, Java, VB, …
  - MS Office Application / VBA

- Integrates with existing user IT infrastructure

Application in Control



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