GoldSim: Past, Present, Future

by Ian Miller
Managing Principal, GoldSim Technology Group
Presentation Outline

- Welcome and Introductions
- Conference logistics
- GoldSim Past
- GoldSim Present
- GoldSim Future
- Conference Outline

GoldSim Past, Present, and Future
GoldSim Past: Prehistory


GoldSim Past, Present, and Future

GoldSim Past: RIP and STRIP

- **1990’s:** RIP performance assessment model for DOE, PNC, Enresa:

![Image of GoldSim interface]
GoldSim Past: GoldSim

- 1998 on: All-new modeling platform based on RIP technology. Goals of increased flexibility, user-friendly, transparent, greater range of applications.
GoldSim’s First Release Party: 1999
GoldSim Present

- The team
- How we develop GoldSim
- The business
The GoldSim Technology Group

The GoldSim Technology Group is dedicated to delivering software and services to help people understand complex systems and make better decisions.

- Managing Principal: Ian Miller
- Administration: Carey Beckham
- Consulting services: Charlie Voss
  - Alan Keizur
  - Travis McGrath (honorary)
- S/W Development: Stefan Knopf
  - Eric Dettinger
- Marketing: Scott Kindred
- User support, Manuals: Rick Kossik

GoldSim Past, Present, and Future
The GoldSim Development Process

- ‘Problem Tracker’ database of bugs, features,… (~250 active entries, ~2000 completed)
- Future release versions are named (Ascari, Brabham, Clark…) and given target release dates.
- Bugs that could result in incorrect results are always addressed immediately with a point release.
- New features funded or co-funded by clients have highest priority in the schedule.
- Each task is coded and then tested by the programmers, then re-tested and documented by Rick Kossik, then re-tested as part of the verification prior to each release.
- A full verification involves thousands of tests, and about four person-days.
- We do additional testing of installation process, test it on multiple operating systems, etc.
The GoldSim Business

- The GoldSim Technology Group is a division of Golder Associates Inc.
- Three sources of income:
  - Consulting services
  - Software license sales
  - Contracted software development
- Increased focus in 2002 on software license sales:
  - Revised pricing, packaging, Web site, marketing.
New Name and Look

- Changed name from *GoldSim Consulting Group* to *GoldSim Technology Group*
- New name reflects our focus on selling software, training, and consulting
- New look is more professional and modern
Software Sales

- **GoldSim Pro:** $950
  - Basic GoldSim capabilities

- **Optional modules:**
  - GoldSim CT: $1,000
    - Basic contaminant transport capabilities
  - GoldSim RT: $9,000
    - Radioactive contaminant transport
  - GoldSim DP: $500
    - Up to 5 distributed processors
  - GoldSim DP Plus: $3,000
    - Unlimited distributed processors
Upgrade and Support Program

- Annual membership fee buys free upgrades and support
- 10% discount on all training programs
- Access to GRC resources
- Phone and email support
GoldSim Past, Present, and Future

GoldSim Web Site

Simulation for the Real World

The GoldSim Technology Group, with our GoldSim software suite, is dedicated to helping you understand complex, real-world systems and make better decisions. GoldSim offers the first general-purpose simulation software package to combine power and flexibility with an intuitive, graphical interface.

GoldSim is the ideal simulation tool for the following applications:

- **Strategic Planning**: Evaluate alternative strategies and identify those that offer the greatest potential for success.

- **Portfolio Management**: Determine the optimal portfolio of projects, resources, and/or investments.

- **Program Planning**: Develop project or program plans that provide the highest likelihood of meeting your objectives under budget and on time.

- **Risk Management**: Evaluate risks, and then identify cost-effective preemptive measures and contingency plans that minimize adverse impacts in an uncertain world.

- **Supply Chain Management**: Conceive supply chain systems that provide the efficiency and flexibility you need to thrive in a competitive marketplace.

- **Environmental Modeling**: Utilize GoldSim's unique environmental modeling capabilities to address issues related to ecological and natural resource management, pollution prevention, hazardous waste management, and emission control.

News

- Major GoldSim Upgrade Launched on April 14th
- GoldSim Used to Support Recommendation to the President
GoldSim Past, Present, and Future
GoldSim Past, Present, and Future

Web Site - Services

GoldSim Services - Microsoft Internet Explorer

Home > Services

Services

Providing Complete Solutions.

The GoldSim Technology Group is dedicated to providing complete solutions for our customers. This means that we provide training to customers that want to build models themselves and consulting services to customers that want help building GoldSim models. GoldSim also partners with consulting and software companies that offer industry-specific expertise.

Check out our training programs and our consulting services.

GoldSim Technology Group
Real World Solutions using GoldSim

GoldSim is a general-purpose simulator suitable for modeling just about any system in any industry. Our customers include companies from a broad range of industries and government agencies from all over the world. The common theme in most GoldSim applications is a focus on helping people understand complex systems and make better decisions. In general, GoldSim applications fall into one of these categories of solutions:

**Strategic Planning:** Evaluate alternative strategies and identify those that offer the greatest potential for success.

**Portfolio Management:** Determine the optimal portfolio of projects, resources, and/or investments.

**Program Planning:** Develop program plans that provide the highest likelihood of meeting your objectives under budget and on time.

**Risk Management:** Evaluate risks, and then identify cost-effective pre-emptive measures and contingency plans that minimize adverse impacts in an uncertain world.

**Supply Chain Management:** Conceive supply chain systems that provide the efficiency and flexibility you need to thrive in a competitive marketplace.

**Environmental Modeling:** Utilize GoldSim’s unique environmental modeling capabilities to address issues related to ecological and natural resource management, pollution prevention, hazardous waste management, and environmental restoration.

**Engineered Systems Modeling:** Build integrated models of complex engineered systems to support feasibility analyses, conceptual design, and operations.

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GoldSim Web Site

GoldSim Past, Present, and Future
GoldSim - GoldSim Resource Center (GRC)

Welcome to the GoldSim Resource Center (GRC)

The GoldSim Resource Center (GRC) is your online source for software downloads, the GoldSim Knowledge Base, the GoldSim model library, and GoldSim User Manuals. In addition to these resources, GRC Online is the place to renew your membership in the GoldSim Upgrade and Support Program, activate GoldSim modules, or find information on how to contact GoldSim Product Support.

When you purchase GoldSim software, you receive a one-year membership to the GoldSim Upgrade and Support Program, entitling you to the following:

- Free software upgrades so that you always have the latest version of GoldSim software. This benefit alone can save you hundreds or thousands of dollars per year.
- Phone and email product support for installation and software questions and problems.
- Access to GoldSim Resource Center (GRC Online), which offers a broad range of online support resources, including a model library, knowledge base articles, and the latest versions of the user manuals.
- A 10% discount on all GoldSim training workshops that can save you hundreds of dollars per course.

After the first year, membership in the GoldSim Upgrade and Support Program can be extended with payment of an annual membership fee. If you are already a GoldSim user, visit here to renew your membership. Although users of GoldSim Academic do not receive the initial one-year membership in the GoldSim Upgrade and Support Program, they can always be eligible to join the program at a reduced rate.
Marketing = Customer Service

- How can GoldSim make you more effective?
- How can we better serve your needs?
- We thrive on feedback.
GoldSim Future: New Capabilities

- **Memory optimization:**
  - Time-history results swapped in dynamically
  - External (DLL) processes run separately

- **Replication**

- **A lot more to come…**
Replication

- Replication will allow the GoldSim user to automatically replicate elements or local models over a spatial domain.
- The replicated elements will automatically make interconnections.
- Replication is intended to automate the process of generating spatially-distributed models.
Replication Concepts: Locations

A Location:
- A specific spatial area on a map
- Has local properties (data: geometry, others...)
- Has one or more processes that are simulated using local models
  - The state of each process is represented by outputs of the local models
Replication Concepts: Maps

A Map element in GoldSim has user-defined properties that specify:
- A spatial pattern for replicating local models
- Topological relationships between map locations
- Geometry of the locations
- Local data for each location
Replication Concepts: Template Models

- A template model consists of one or more GoldSim elements in a container.
- It defines the properties and behavior of a process at a generic location.
- It has user-defined rules for which map locations it is to be replicated into.
- Multiple template models may be required:
  - Because models at boundaries may have a different structure than internal models.
  - Because different processes may occur in different regions of the map.
  - Because multiple processes may occur at a single location.
Replication Concepts: Connections

- Connections between local models are automatically generated using intelligent rules:
  - A connection may depend on the geometric relation between the locations (e.g. a model on the left side of the map will try to make connections to models on its right side but not on its left side)
  - A connection may depend on the properties of the location at either end
Preview: Top-level View of Model

- Note that the Map element can be viewed in three alternative ways:
  - Template view, Schematic View, Scale View
Replicating the Template Models

- Once the templates are defined, the user presses the ‘Replicate’ button, and GoldSim generates and connects the local models.
- The local models can then be customized if desired, to represent their unique behaviors.
Replication Summary

- Replication is a new GoldSim capability that is under development

- Initial version scheduled for end of May, 2002 (??) will have basic capabilities

- Possible future enhancements include:
  - High-performance numerical algorithms for rapid solution of large transport networks
  - Linkages to GIS systems for geographic modeling
Possible Software Enhancements (1)

- Complete GoldSim’s differentiation between information and material flows:
  - Support different types of material: solids, liquids, money, items…
  - Add logic for calculating flows:
    - By logic rules, and
    - By solving network equations (linear or nonlinear).
  - Add elements for water-network systems: real pipes, open channels, weirs, pumps, reservoir capacity curves, etc.
Possible Software Enhancements (2)

- Develop a new solver algorithm designed to speed up solutions of large Cell-nets, to allow 2-d or 3-d discretization in models.
- Develop the ‘Finance Module’ to simplify and enhance tracking and reporting of costs, revenues, etc. for projects or business ventures.
- Enhance the Replication Module that is currently under development with interfaces to GIS systems, to allow modeling of distributed geographic systems.
- Enhance the Dashboard capability, with more and better controls, some animation capabilities, and better ways to display information and results.
Possible Software Enhancements (3)

- Add an air-transport pathway capability to the contaminant transport module
- Add specialized biosphere elements for crops, animals, milk etc. to simplify exposure modeling
- Add databases with physical/toxicological material properties.
Possible Software Enhancements (4)

- Add decision-analysis capabilities, to calculate utility-functions for one or more stakeholders.
- Add sensitivity-analysis capabilities:
  - Vary one parameter while holding all others at their expected values,
  - Vary one parameter while doing Monte Carlo analyses using the others.
Possible Software Enhancements (5)

- **Add optimization capabilities:**
  - Search for the values of one or more parameters so as to optimize a decision-analysis utility function, while holding all other parameters at their expected values.
  - Optimize within the Monte Carlo environment: optimize based on a performance measure, such as the expected value or 90’th percentile of a utility function.

- **Add Bayesian-updating:** input observations of some variables that are predicted by the model, and have it automatically update the probability distributions of any relevant ‘upstream’ Stochastic elements.
Possible Software Enhancements (6)

- Add one or more alternative icon families for the GoldSim elements.
- Support curved lines for the links between elements.
- Add Internet-server capability so that GoldSim applications can be run over the Internet.
- Add a geochemistry module to solve coupled flow and transport problems.

.... To be continued on Friday morning
Conference Outline

- Thurs am  - Yucca Mountain focus
- Thurs pm  - New application areas
  - Low-level RadWaste
- Friday am - Future development priorities
  - Database use
  - Mining
- Friday pm - High-level Radwaste
  - Other interesting examples
Session Rules

- **20 minutes per session:**
  - 15 minutes presentation
  - 5 minutes discussion

- **Poster presentations:**
  - Thurs. am- Trevor Coleman, WMB
  - Thurs. pm- K. Wakasugi, JNC
First Presentation

  - By Dr. Abraham (Abe) van Luik, DOE