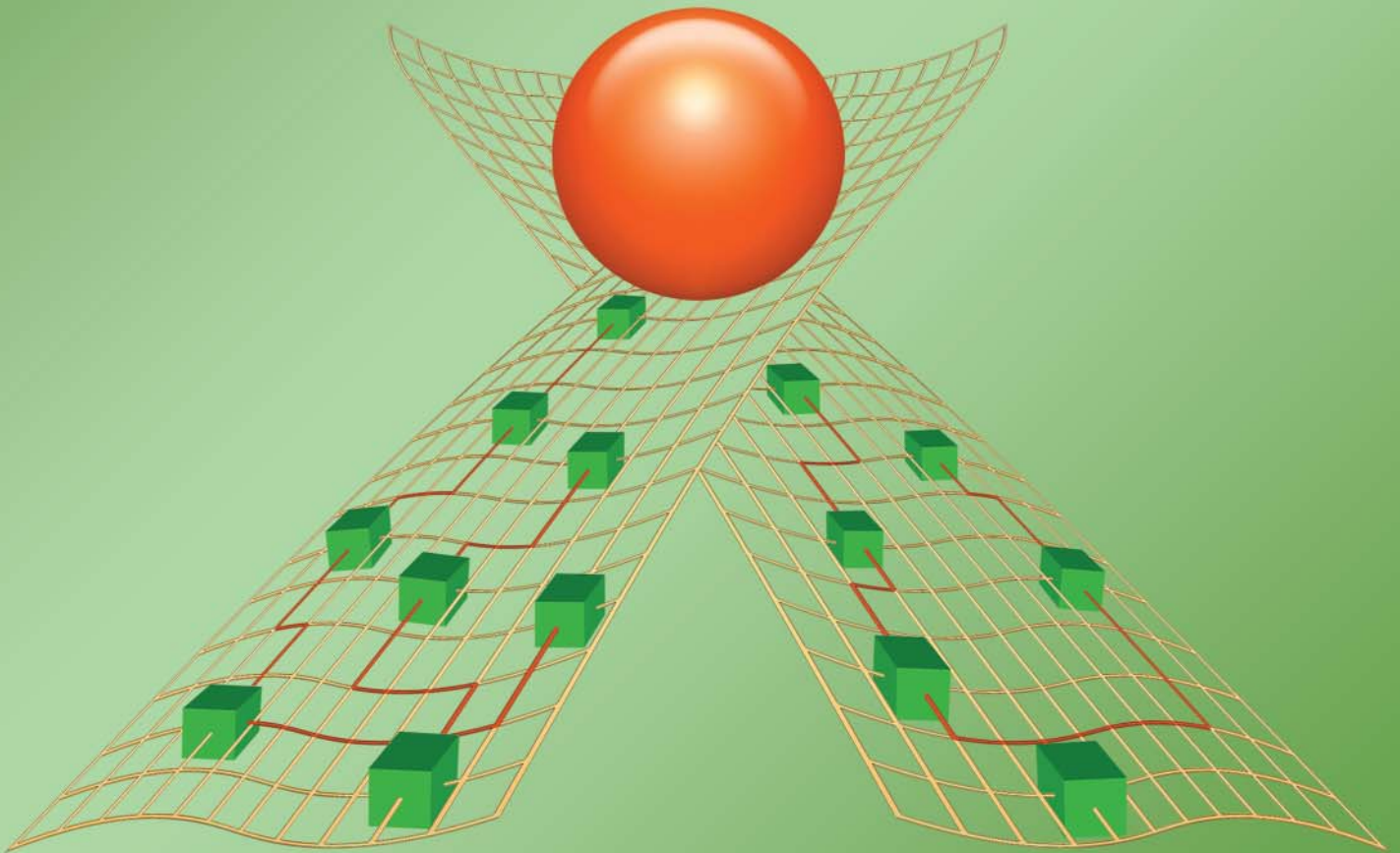


**ReliaSoft**

Presents...



**BlockSim<sup>®</sup> 7**



ReliaSoft



Reliability Office

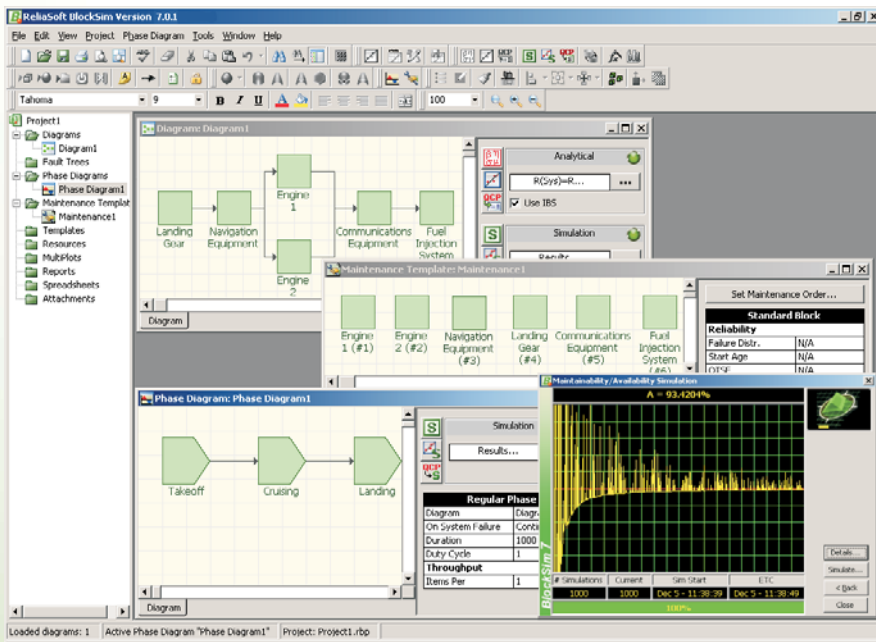


# BlockSim<sup>®</sup> 7

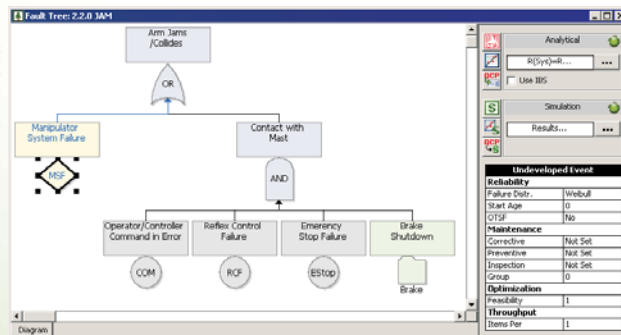
The Ultimate System Visualization and Analysis Tool<sup>SM</sup>



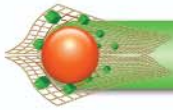
ReliaSoft's **BlockSim** provides a comprehensive and flexible platform to model systems and processes using both reliability block diagram (RBD) and fault tree analysis (FTA) approaches. An extensive array of RBD configurations and FTA gates and events are supported, including advanced capabilities to model complex configurations, load sharing, standby redundancy, phases, duty cycles, and more!



Using exact computations and/or discrete event simulation, **BlockSim** supports a wide variety of analyses for both repairable and non-repairable systems. This includes reliability, maintainability, availability, reliability optimization, throughput, resource allocation, life cycle cost and other analyses.



# ReliaSoft<sup>®</sup>



BlockSim provides a comprehensive platform for system reliability, maintainability and availability analysis, reliability optimization, system throughput, life cycle cost and related analyses using the exact system reliability function and/or discrete event simulation. BlockSim provides sophisticated and flexible capabilities to model systems and processes using a Reliability Block Diagram (RBD) or Fault Tree Analysis (FTA) approach... or a combination of both!

Reliability Block Diagrams and Fault Trees

Simple drag-and-drop techniques make it easy to build reliability block diagrams and/or fault trees to model the simplest or the most complex systems. All of the traditional RBD configurations and FTA gates and events are supported, along with advanced capabilities to model complex configurations, load sharing, standby redundancy, phases, duty cycles, and more.

Extensive Simulation Options for Repairable System Analysis

BlockSim's sophisticated and realistic simulation engine can be used to generate reliability, maintainability and availability results/plots and also for resource allocation, throughput, life cycle cost and related analyses. Flexible simulation factors include:

- Corrective Maintenance, Preventive Maintenance (PM) and/or Inspection Policies
• Maintenance Durations and Restoration Factors
• Direct and Indirect Maintenance Costs
• Availability of Spare Parts and Maintenance Crews
• Duty Cycles
• Throughput (constant or variable with time)

Results Based on Exact System Reliability Function and/or Simulation

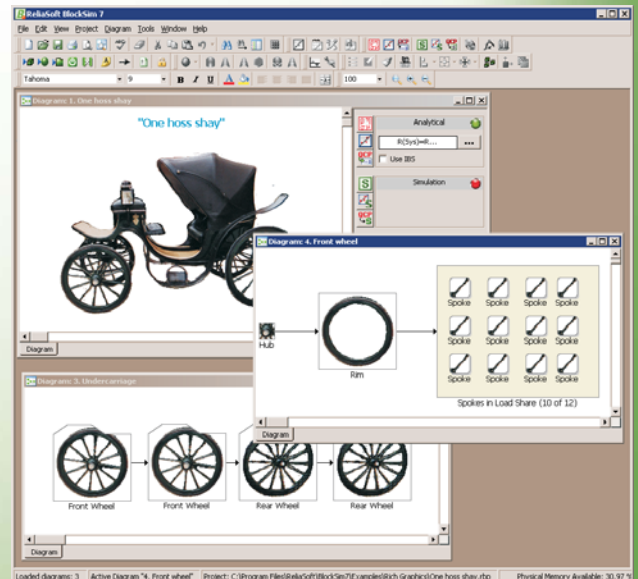
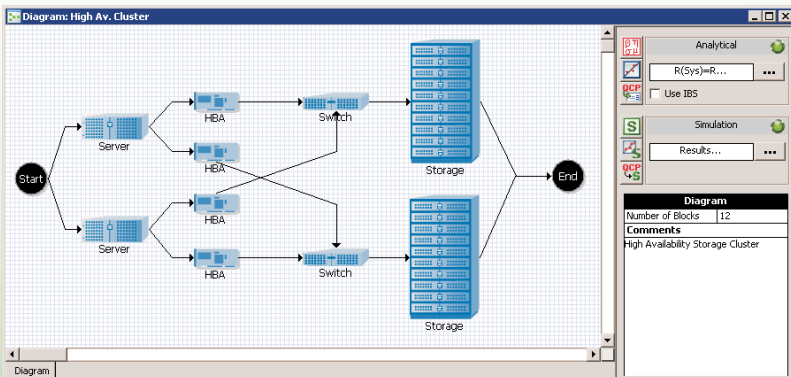
BlockSim provides a wide variety of calculated results and plots for both repairable and non-repairable system analyses. Using an exclusive algorithm pioneered by ReliaSoft, the software algebraically computes the exact system reliability function for even the most complex system. To provide an even larger set of analysis options, this capability is supplemented by a powerful and flexible discrete event simulation engine.

Other Capabilities: Optimum Reliability Allocation, Optimum PM, and more

Additional capabilities that have been built in to this powerful system analysis package include:

- Optimum Reliability Allocation: By leveraging its capability for exact system computations, BlockSim can be used to determine optimum reliability allocation strategies based on your inputs regarding the cost and feasibility to improve each component.
• Optimum Replacement: An easy-to-use utility automatically calculates the optimum Preventive Maintenance time given information about reliability and costs.
• FRED Reports: Graphical reports that help you to use reliability metrics to identify components that may require improvement.
• Custom Analyses: Flexible spreadsheets facilitate your own custom analyses, which may include calculated results automatically inserted via the Function Wizard and customized graphical charts.
• And more...

Version 7 allows you to perform analyses and simulations that are more realistic and more powerful than ever. New features and enhancements include:
New Distributions
- Generalized Gamma
- Gamma
- Logistic
- Loglogistic
- Gumbel
Phase Diagrams
Maintenance Phases
Duty Cycles
Variable Throughput Models
- Linear
- Exponential
- Power
Type I Restoration
Resource Usage Window
Analytical FRED Reports
More Simulation Results

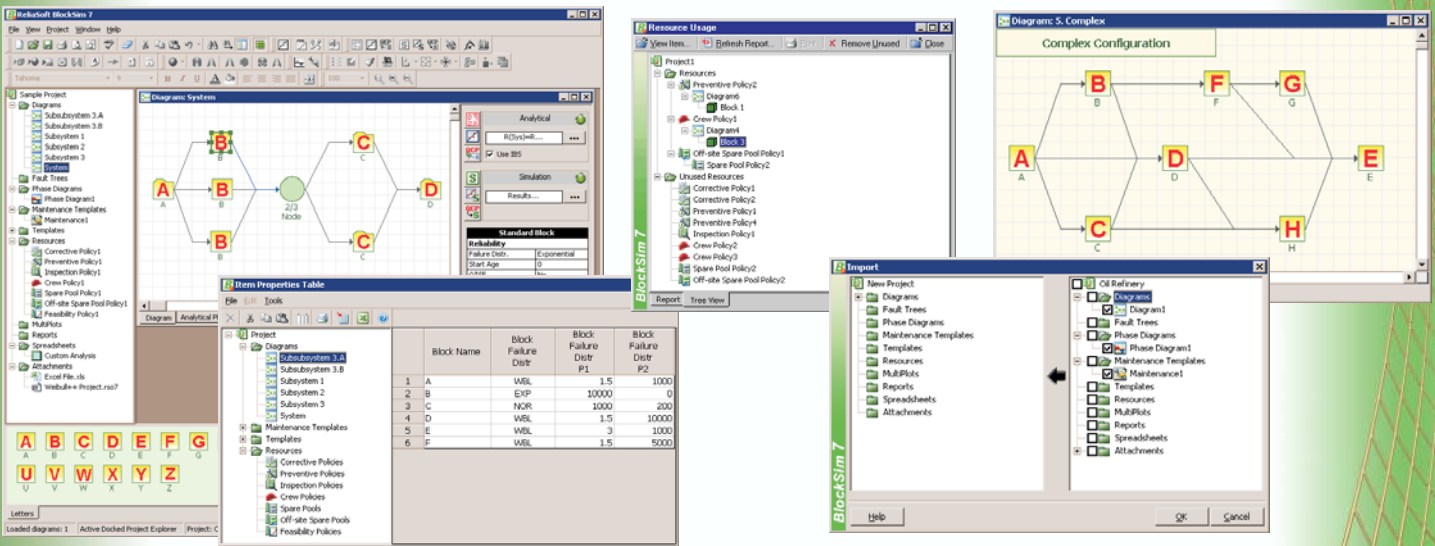


Intuitive interface provides many features to save time, ensure consistency and facilitate data management.

### BlockSim Work Environment

The **BlockSim** interface is an intuitive, flexible and highly integrated work center that uses a hierarchically structured Project Explorer to manage a collection of diagrams, plots, templates, custom analysis spreadsheets and other resources -- all together in a single file. The software incorporates many features designed to save time, ensure consistency and facilitate data management, including:

- **Templates** allow you to create and manage sets of pre-defined blocks that are available to be used in multiple diagrams. Simply drag and drop the template block into any diagram to create a new block with all of the pre-defined characteristics set automatically. This feature can also be used to quickly perform global updates for component properties within your projects.
- **Import and Export Windows** make it easy to transfer selected diagrams, templates, spreadsheets and other resources among projects.
- **Attachments** are available both at the project level and for individual blocks. It's easy to save and edit supplementary files together with any analysis.
- **Item Properties Table** saves you from having to open each block or policy individually by allowing you to view and edit the characteristics via a single interface using a familiar worksheet format.
- **Resource Usage Window** provides an at-a-glance summary of where specific resources are used within a project and makes it easy to remove unused resources, if desired. **New in Version 7!**



Support for all types of RBD configuration...

- Series
- Simple Parallel
- Complex
- k-out-of-n Redundancy
- Standby
- Load Sharing

### Reliability Block Diagram (RBD) Configuration Options

Simple drag-and-drop techniques allow you to build reliability block diagrams for the simplest to the most complex systems. **BlockSim** supports the following reliability-wise configuration types, used individually or in complex combinations.

- **Series and Simple Parallel**
- **Complex:** Complex configurations require a more advanced analytical treatment than a simple combination of series and parallel configurations and may be required for network system, failure modes and other analyses.
- **k-out-of-n Redundancy:** Node blocks can be used to define situations where k out of n paths leading to the node must succeed.
- **Standby:** BlockSim supports the correct analysis of standby configurations, which requires consideration of the component's active and standby distributions as well as the probability of switching from standby to active when needed.
- **Load Sharing:** For load sharing configurations, BlockSim provides life-stress models (derived from the ALTA software) to quantify the effect of the increased load on the operating components when other load sharing components fail.



## Support for All Major Fault Tree Analysis Gates and Events

**BlockSim** supports all of the traditional fault tree analysis gates and event symbols that are applicable to system reliability and related analyses. In addition, the software allows you to expand the modeling capabilities through the introduction of new logic gates to represent load sharing and standby redundancy configurations.

### Fault Trees and/or RBDs in the Same Environment

Your **BlockSim** projects can contain both fault trees and reliability block diagrams, together in the same analysis environment. You can even integrate your fault trees and RBDs in several ways, including:

- Mix and match diagrams by linking a fault tree as a subdiagram to an RBD or vice versa.
- Copy events from a fault tree diagram and paste them as blocks in an RBD.
- Automatically convert any fault tree diagram to a reliability block diagram.

**Fault Trees are now fully integrated with the standard package in Version 7!**

### Innovations to Save Time and Space in Your Diagrams

**BlockSim** incorporates useful innovations to save time and space in your diagrams and also to expand the modeling capabilities. Options include:

- **Subdiagram blocks** can be used in both RBDs and fault trees to link diagrams as components in other diagrams. BlockSim allows unlimited levels of encapsulation, which provides great flexibility to model extremely large and complex systems with subsystems, subsystems and beyond.
- **Multi blocks** can be used to save time and space in the diagram by representing more than one component with a single block in the RBD -- configured in series, parallel or k-out-of-n.
- **Mirrored blocks** can be used to represent the same component in more than one location within an RBD, which can be useful for simulating bi-directional paths and common cause failures.

### Attractive, Customizable Graphical Display

You can fully customize the colors, shapes, sizes, fonts and other graphical properties of the RBDs and fault trees you create. You can print these sophisticated and attractive diagrams directly from **BlockSim** or export/copy the image as an enhanced metafile graphic (\*.emf) that can be used in other reports and presentations.

**Support for traditional fault tree analysis gates and events:**

#### Gates

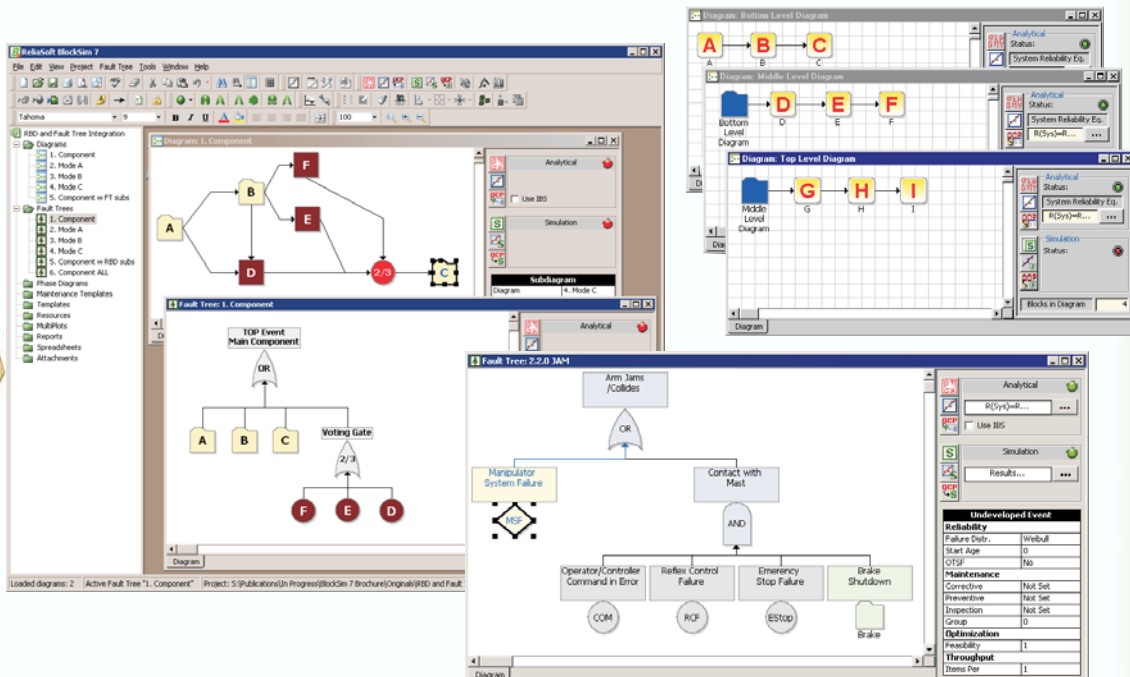
- AND and Priority AND
- OR and Voting OR
- Inhibit
- Sequence Enforcing

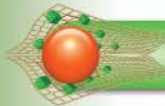
#### Events

- Basic
- Undeveloped
- Trigger
- Resultant
- Conditional

**Plus... new gates for Load Sharing and Standby Redundancy that are available only in BlockSim!**

**Use Subdiagram and Multi blocks to save time and space in diagrams.**





Configurable component properties:

- Reliability
- Maintenance Durations
- Restoration Factors
- Duty Cycle
- Maintenance Costs
- Throughput
- and more...

Resources available to any block in the project:

- Maintenance Policies
- Spare Parts Pools
- Maintenance Crews

Distributions available to define probabilistic values:

- Weibull and Mixed Weibull
- Exponential
- Lognormal
- Normal

New in Version 7!

- Generalized Gamma
- Gamma
- Logistic and Loglogistic
- Gumbel

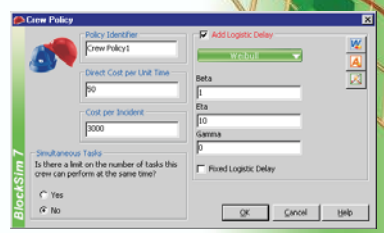
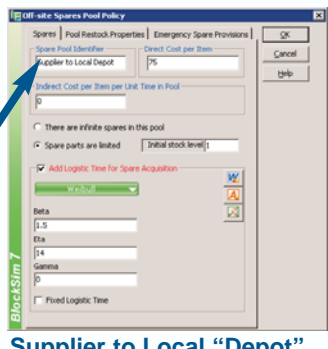
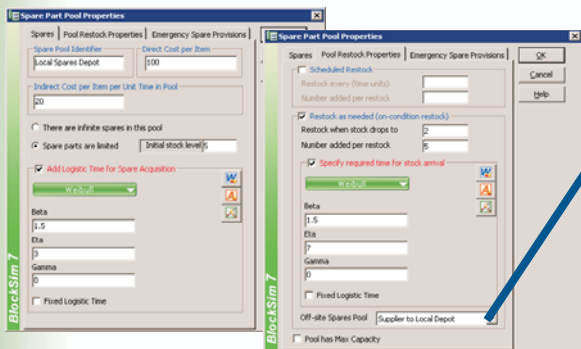
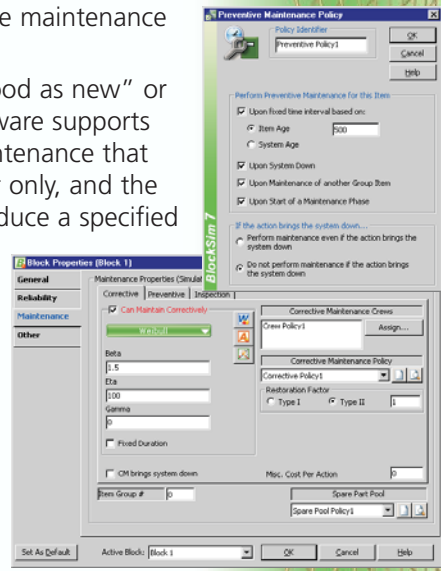
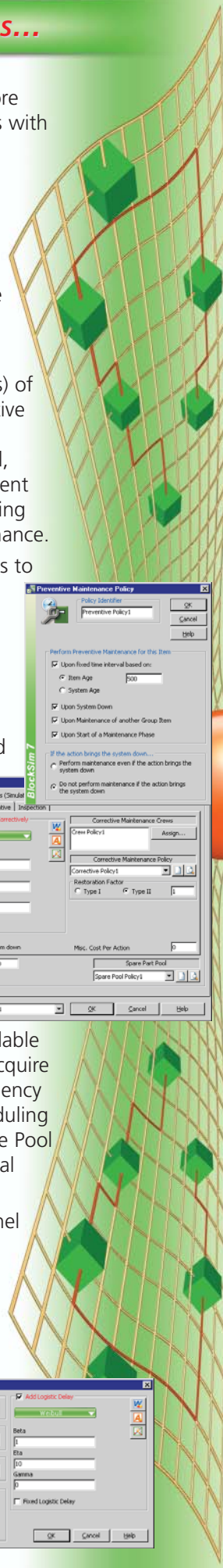
Distribution parameters may be transferred from ReliaSoft's Weibull++ or ALTA (if installed on your computer).

With the release of Version 7, BlockSim's discrete event simulation engine is more sophisticated and realistic than ever. Although you can perform basic simulations with minimal setup, the software also provides tremendous flexibility to define the simulation options to meet your specific needs for reliability, maintainability, throughput, life cycle cost and related analyses.

Maintenance Properties and Policies

By defining individual block properties and "policies" (which can be shared throughout the project), you can model a wide variety of scenarios for repairable system maintenance and operation. In addition to the component reliability, other configurable settings include:

- **Maintenance Policies and System Downing Factors:** Specify which type(s) of maintenance may be performed for a block (Corrective Maintenance, Preventive Maintenance and/or Inspection) and define the conditions under which each maintenance activity may be performed (e.g. upon failure, upon fixed interval, upon system downing event, etc.). You can also specify whether the component continues to operate when the system is down, whether maintenance will bring the system down and whether to bring the system down to perform maintenance.
- **Maintenance Durations:** Specify fixed times or use probabilistic distributions to describe the duration of the corrective maintenance, preventive maintenance and/or inspection activities.
- **Restoration Factors:** Specify whether the item will be "as good as new" or less than 100% restored by the maintenance action. The software supports both the Kijima Type I model, which allows you to define maintenance that reduces a specified portion of the damage since the last repair only, and the Kijima Type II model, where the maintenance is assumed to reduce a specified portion of the total damage to the item. **Enhanced in Version 7!**
- **On-Condition Maintenance Factors:** Specify a Failure Detection Threshold (percentage) or P-F Interval (time) to describe the period in which an oncoming failure can be detected via inspection to trigger PM. **Enhanced in Version 7!**
- **Duty Cycles:** Use this option to define a duty cycle (e.g. a block may operate only X minutes out of every hour that the system operates) or as an acceleration factor (e.g. a block or phase may experience a different stress load than the other blocks or phases). **New in Version 7!**
- **Spare Parts Pools:** Describe the conditions under which spare parts are available or can be obtained. The Spare Pool Policy allows you to specify the time to acquire parts, the ways in which re-stocks may be initiated and the logistics of emergency acquisition. To represent real-world conditions even more accurately for scheduling and resource allocation purposes, this can be combined with an Off-site Spare Pool Policy, which defines similar logic for the entity that supplies parts to your local depot. **Enhanced in Version 7!**
- **Maintenance Crews:** Describe the conditions under which qualified personnel are available to perform maintenance, along with any logistical delays.





### Phase Diagrams and Maintenance Phases **New in Version 7!**

You can use **BlockSim's** intuitive new Phase Diagram Sheets to model systems that go through different phases during the course of their operation. For example, some aircraft components (such as landing gear) operate only during the take-off and landing phases of a mission and others (such as engines) may experience a higher failure rate during these phases due to higher stress. Likewise, a manufacturing plant's production may differ during the day shift and the night shift, and so on.

To model these types of situations, simply create an RBD to describe the system's operation during each phase and use a **Phase Diagram** to describe how the system proceeds through the phases over time. Exclusively in BlockSim, you have the ability to completely change the system configuration and component properties from one phase to another. In addition, the software provides the option to define **Maintenance Phases** to model scenarios in which a system goes directly to maintenance under specified conditions. For example, if a failure occurs on an aircraft during taxiing, it will go directly to maintenance and, once repaired, will start over again from the beginning of the mission -- not from where it was when the failure occurred, as prior RBD analyses were forced to assume. This flexibility provides a tremendous leap forward in the ability to simulate system operation more realistically.

**Use Phase Diagrams for more realistic simulation of systems that go through different operating phases.**

**Use Throughput Analysis to identify bottlenecks, optimize resource allocation and improve processing efficiency.**

### Throughput Analysis

Throughput analysis can be used to identify bottlenecks, optimize resource allocation and otherwise improve the processing efficiency of the system. To utilize **BlockSim's** simulations for such analyses, simply specify the amount of throughput per unit time that a block can process and determine how to allocate throughput from block to block. Options include a weighted allocation based on throughput capacity or an equal allocation across all available paths. You can also define backlog processing characteristics and determine whether throughput will be allocated to failed blocks.

**Variable Throughput:** A system's throughput may also vary over time. For example, the flow from an oil well may drop over time as the oil reserves are depleted or a manufacturing plant's production may slowly ramp up to full capacity again after shut-down. Version 7 provides a choice of models (linear, exponential or power) to describe a system's time-dependent variable throughput within your simulation. **New in Version 7!**

### Life Cycle Cost Analysis

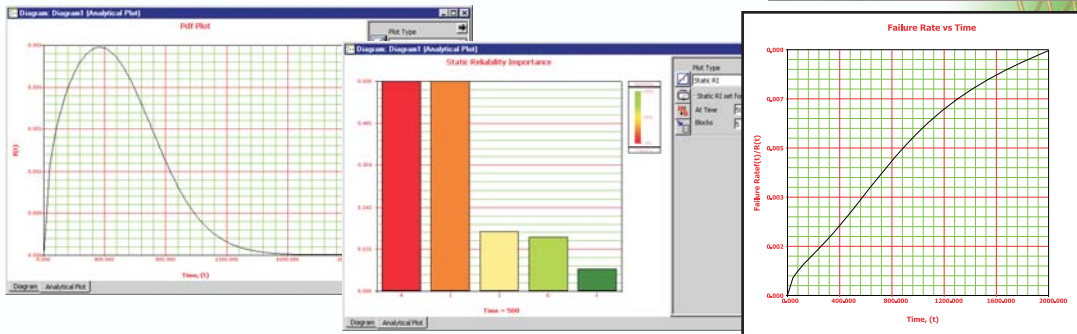
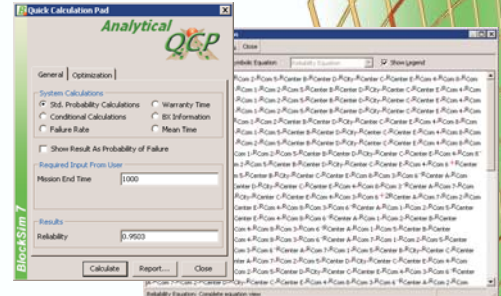
Whenever applicable, **BlockSim** allows you to specify the direct and/or indirect costs associated with the maintenance strategies that you have defined, including costs related to downtime, maintenance crews, spares, etc. This allows you to perform a wide variety of life cycle cost analyses based on simulation results.

Only BlockSim algebraically computes the exact system reliability function.

**Exact Reliability Results and Plots**

Using an exclusive algorithm pioneered by ReliaSoft, **BlockSim** algebraically computes the exact system reliability function for even the most complex system so you can obtain exact system reliability results based on component data. The Analytical Quick Calculation Pad (QCP) provides results at the click of a button while the Analytical Plot Sheet provides a complete array of line, bar and area charts. The software also provides the ability to set individual blocks as "failed" in order to facilitate what-if analyses. Metrics that can be obtained computationally, include:

- Reliability and Probability of Failure
- Failure Rate and MTTF
- Warranty Time and B(X) Life
- Probability Density Function (pdf) plots
- Reliability Importance plots and charts



**Reliability, Maintainability and Availability Results via Simulation**

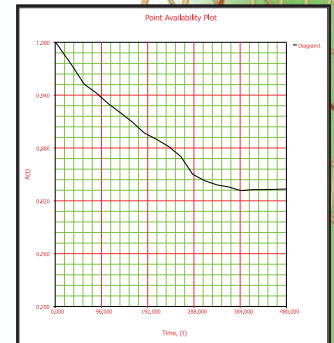
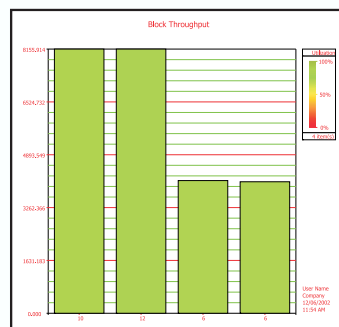
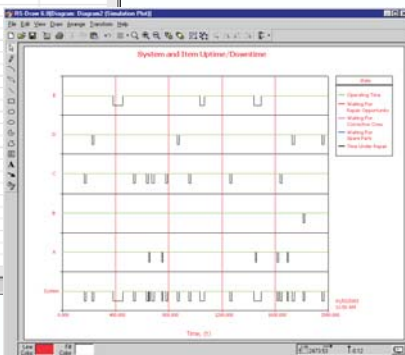
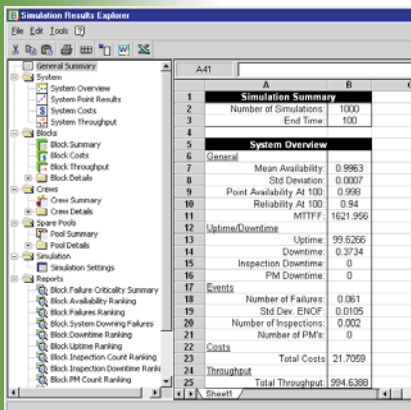
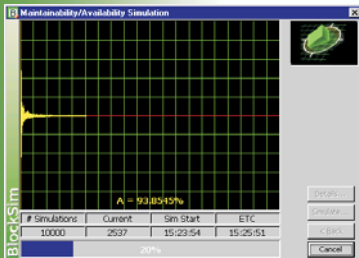
Enhanced in Version 7!

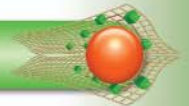
You can use **BlockSim's** powerful discrete event simulation engine to obtain reliability, maintainability, availability, resource usage, life cycle cost, throughput and other results. Simulation results are generated per system and/or per block (as appropriate) and "Point Results" are also available to provide a more detailed picture of the system's operation at specified intervals across the total simulation time. This extensive collection of valuable system information is presented in flexible spreadsheets that support on-the-fly calculations and copy/paste. To enable further analysis and reporting, it's easy to export the data to a BlockSim Spreadsheet (maintained independently within the same project file), ReliaSoft's Weibull++ and/or Microsoft Excel®. The Simulation QCP and Simulation Plot Sheet also provide access to a wide variety of metrics and plots. Some of the available results include:

- Uptime, Downtime, Mean Time to First Failure (MTTFF), Availability, Reliability
- Failure Criticality Index, Downing Event Criticality Index
- Quantities of CMs (failures), PMs and Inspections
- Summaries for Maintenance Crews, Spare Parts and Costs
- Throughput Summaries
- And much more!

Results and plots based on simulation:

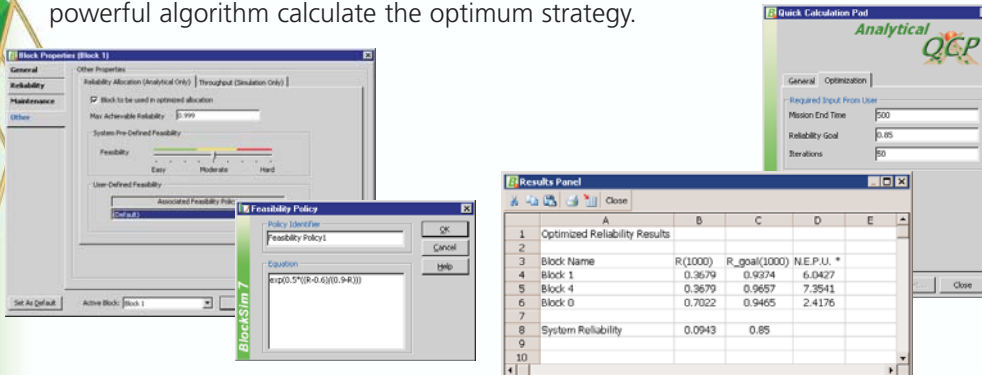
- Uptime / Downtime
- MTTFF
- Availability
- Reliability
- Failure Criticality Index
- Resource Usage
- Cost Summaries
- Throughput Summaries





### Optimum Reliability Allocation

Exclusively in **BlockSim**, you can use the exact system reliability function to determine the most cost-effective component reliability allocation strategy to meet a system reliability goal. Specify the anticipated "cost" of improvement and the maximum achievable reliability for each component and then let the software's powerful algorithm calculate the optimum strategy.

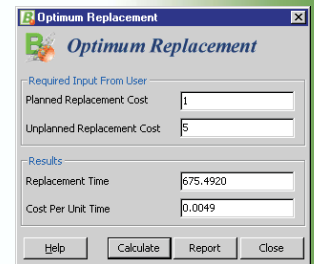


Determine the optimum reliability allocation strategy for a system.

Use the allocation analysis to set component reliability specifications.

### Optimum Replacement Utility

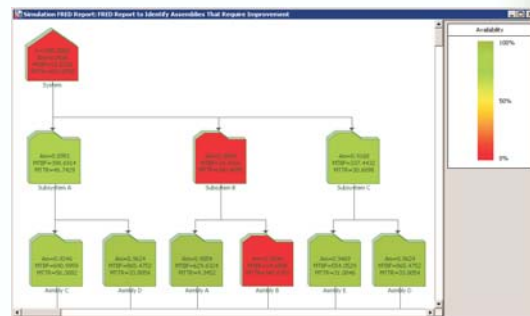
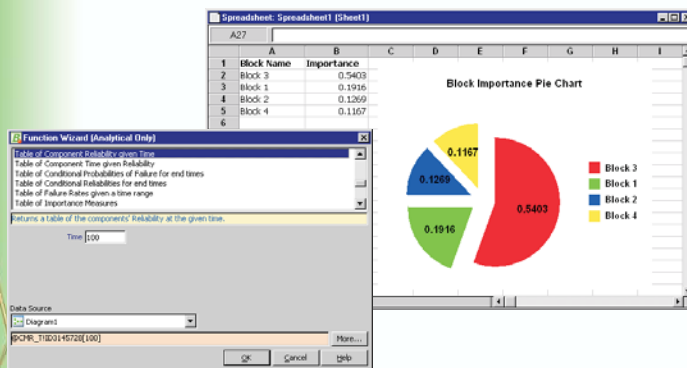
An easy-to-use utility quickly calculates the optimum preventive replacement time for a component based on the reliability characteristics and your inputs for the planned and unplanned replacement costs.



### FRED Reports Enhanced in Version 7!

Failure Reporting Evaluation and Display (FRED) reports provide an intuitive graphical representation of key metrics for a system's assemblies and/or components to help identify the ones that may require improvement. **BlockSim** offers a simulation-based report for repairable systems that considers the Availability, MTBF and MTTR. Now, the software also provides an analytical report, which considers the Reliability and Importance calculated for a specified time and can be used for non-repairable systems.

Calculate the optimum replacement time for a component based on reliability and cost.



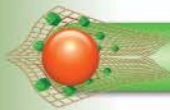
### Flexible Spreadsheets for Custom Analyses and Reports

You can use **BlockSim's** spreadsheets for custom analysis just as you would use an Excel® worksheet, with complete in-cell formula support, cell references and over 140 built-in functions. The Function Wizard can be used to insert selected results from existing analyses and the Chart Wizard generates customized graphical charts.

### Integration with ReliaSoft Software, PRISM® and Excel®

**BlockSim** provides direct integration with ReliaSoft's Weibull++ and/or ALTA software for specifying probabilistic distributions and parameters. The software also reads and writes to an open XML format that can be used for custom data imports and to import system configuration and reliability data from ReliaSoft's Xfmea or RCM++. To facilitate reliability prediction analysis when actual data sets are not available, BlockSim is able to automatically import selected data from the System Reliability Center (SRC) PRISM® software's failure rate database. The software also allows you to automatically export analysis results to Microsoft Excel® or Weibull++ for further analysis. NOTE: Weibull++, ALTA, PRISM®, Xfmea, RCM++ and/or Excel® must be installed and properly licensed on your computer to utilize the integration options described here.

Use FRED reports to identify assemblies or components that require improvement.



Detailed user documentation in printed manual and on-line help, theoretical reference, step-by-step training guide and numerous example projects are provided.

FREE technical support via phone, fax or e-mail.

Training seminars that combine theory and application are also available.

Try a free demonstration copy of BlockSim and decide for yourself!

### Is BlockSim better than the package I am using now?

**ABSOLUTELY.** We invite you to try **BlockSim** and compare it with any other package on the market. Evaluation software is available for download from our Web site at <http://Download.ReliaSoft.com>.

### What are the minimum system requirements?

Windows 2000, NT and XP. 433 MHz Intel Pentium class processor, or an AMD Opteron, AMD Athlon64 or AMD Athlon XP processor, with at least 64MB RAM, SVGA display and at least 80MB of hard disk space.

### What languages are supported?

The **BlockSim** interface is available in English, German, Portuguese and Simplified Chinese. For details and to see if support for additional languages has been added in our most recent release, see <http://www.ReliaSoft.com/multi-language.htm>.

### Is technical support available?

ReliaSoft's software products are renowned for their ease of use and unparalleled after-sale support. We provide **FREE** technical support via phone, fax or e-mail through an established (and growing) network of regional offices and partners/distributors throughout the world. For details, see <http://www.ReliaSoft.com/Support.htm>.

### What other tools are available to help me master the software?

**BlockSim** comes with complete and detailed printed product documentation and on-line help files, a training guide with step-by-step examples, a theoretical textbook and a multitude of example files designed to get you up and running the minute the application is installed.

ReliaSoft's training seminars provide instruction in reliability engineering principles and theory as well as the ReliaSoft software tools designed to put that theory into practice. Courses on **BlockSim** and System Analysis are available in both public and on-site venues. For details, see <http://Seminars.ReliaSoft.com>.

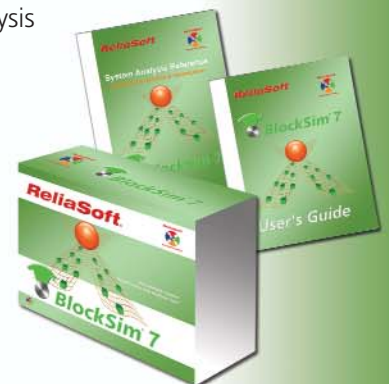
### How much does it cost, how do I order, and when will it arrive?

License and pricing information is available at <http://BlockSim.ReliaSoft.com>. To order, use our Web store, print-ready order form or contact the ReliaSoft office nearest you (see Worldwide Directory at <http://www.ReliaSoft.com/internat.htm>). We will process your order on the same business day that we receive it, with shipment via an express courier (2nd Day or International service). If requested and depending on your location, domestic orders can be shipped with Overnight service for delivery by the next business day. We also offer the option of immediate software downloads via the Web.

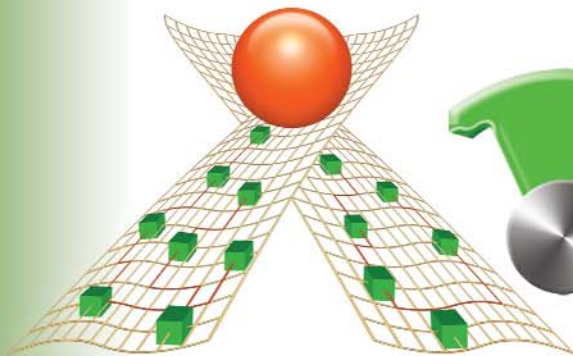
### What other reliability software is available from ReliaSoft?

ReliaSoft's reliability analysis software products have become the industry standard for complete reliability analysis and are used worldwide by most manufacturers with an active quality/reliability engineering program. Complete product details are available on the Web at <http://www.ReliaSoft.com>.

- **Weibull++** for life data analysis
- **ALTA** for quantitative accelerated life testing (QALT) data analysis
- **RGA** for reliability growth analysis
- **RENO** for visual stochastic event simulation and risk analysis
- **Xfmea** for FMEA / FMECA analysis
- **RCM++** for reliability centered maintenance (RCM) analysis
- **MPC** for MSG-3 aircraft systems and powerplant analysis
- **Lambda Predict** for standards based reliability prediction
- **XFRACAS** for FRACA/FRACAS activities



# ReliaSoft®



## BlockSim® 7



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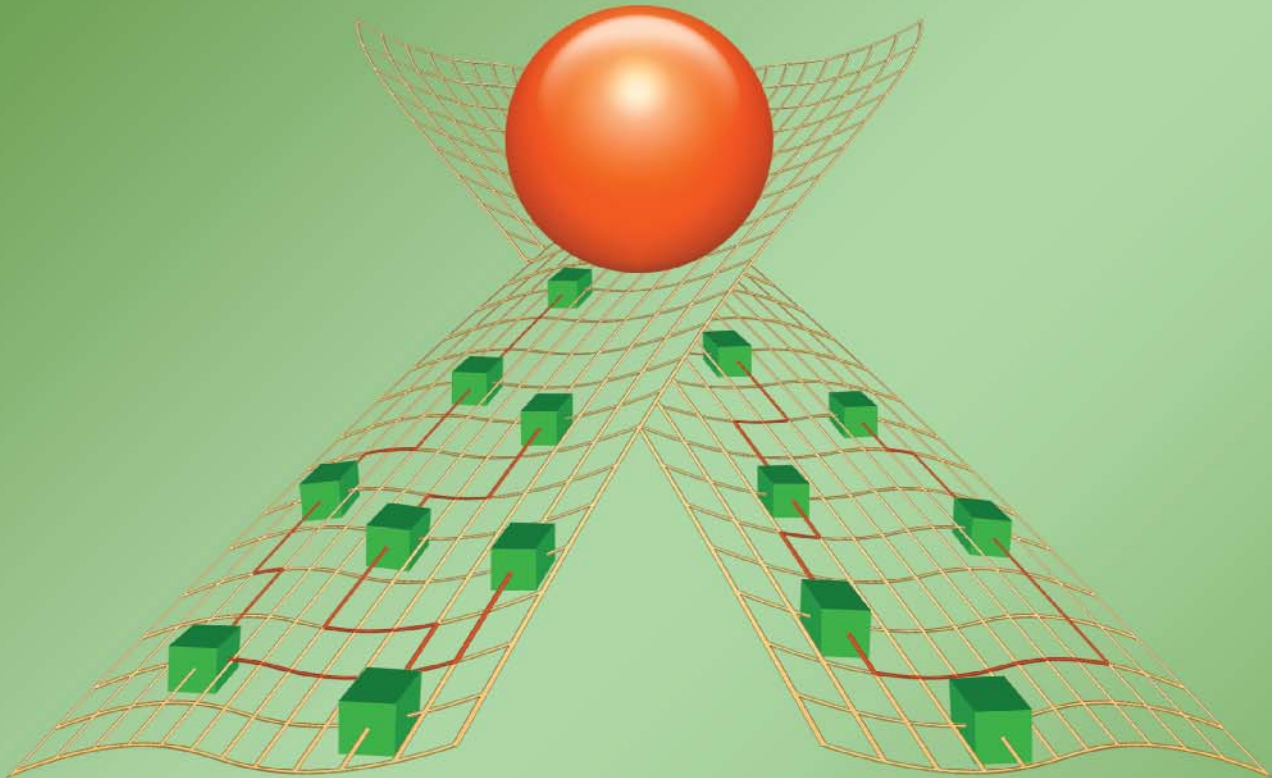
Or consult our Worldwide Directory at <http://www.Reliasoft.com/internat.htm>  
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