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!

Use the system models to perform reliability, maintainability, availability, reliability optimization, throughput, resource allocation, life cycle cost and other analyses.

BlockSim has now been completely re-engineered and integrated into the powerful Synthesis Platform®.
Using exact computations or discrete event simulation, BlockSim facilitates a wide variety of analyses for both repairable and non-repairable systems that will be of use to both product designers and asset managers.

**Reliability Block Diagrams and Fault Trees**

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

**Exact Reliability Results and Optimum Allocations**

Using an exclusive algorithm pioneered by ReliaSoft, BlockSim algebraically computes the exact system reliability function for even the most complex systems. Calculated results include Reliability, Probability of Failure, Reliable Life, BX% Life, Mean Life, Failure Rate, pdf plots, Reliability Importance plots and Minimal Cut Sets.

You can also enter cost and achievable reliability improvement information to determine the most cost-effective component reliability allocation strategy to meet a system reliability goal.

**Repairable System Analysis via Discrete Event Simulation**

When you utilize simulation for RAM analysis of repairable systems, the analysis can consider factors such as duty cycles, restoration factors, downtime and cost/availability for repair crews and spare parts. You can also achieve the appropriate model for maintenance scheduling that depends on other components (maintenance groups) and systems that go through different phases during the course of their operation (phase diagrams).

The simulation results can be used for a wide variety of applications, including but not limited to:

- Choosing the most effective maintenance strategy, considering safety, cost and/or availability.
- Determining the optimum preventive maintenance (PM) interval.
- Managing the spare parts inventory, considering factors such as cost, utilization rate, supply bottlenecks, etc.
- Identifying the components that have the biggest impact on availability (downtime).

In addition, BlockSim's Throughput Analysis can be used to identify bottlenecks, optimize resource allocation and otherwise improve the processing efficiency of the system.

Whenever applicable, BlockSim allows you to specify the direct and indirect costs associated with particular maintenance strategies. This yields a wide array of simulation results that are instrumental in performing realistic Life Cycle Cost assessments.

**Why Upgrade to Version 9?** (for details, visit http://BlockSim.ReliaSoft.com/version9.htm)

- Integration into the Synthesis Platform, which allows multiple users throughout the organization to share analysis information between any of ReliaSoft’s Synthesis-enabled analysis tools.
- Multi-thread support and re-optimized code that have resulted in speed increases in excess of 10x.
- Direct integration with RENO. Option to build RBDs or fault trees from system configuration and failure mode data in Xfmea/RCM++/RBI, or from failure rate predictions in Lambda Predict.
- More flexible modeling capabilities, such as state change triggers, new gates for fault trees, success/failure paths in phase diagrams and enhanced cost calculations. New worksheet for performing batch simulation of an RBD, using different input values for each simulation.
- New utilities for calculating the optimum reliability allocation to meet a specified goal, or the optimum interval for preventive maintenance.

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**Built on the Synthesis Platform**

Integration with Weibull++, ALTA, DOE++, RGA, RENO, Lambda Predict, Xfmea, RCM++, RBI, MPC and XFRACAS

**Multiple Languages**

English, French, German, Portuguese, Spanish, Simplified Chinese

**Support**

Extensive resources online and in print. Network of regional offices provide support via phone, e-mail or live chat.
Integration to Empower the Reliability Organization

BlockSim has been integrated into the ground-breaking new Synthesis Platform, which offers practitioners the best of both worlds: analysis tools that are optimized to fully meet the individual user’s needs for a particular set of analysis methods, plus integration into a centralized repository that is shared by users throughout the organization and facilitates integration between analysis tools.

Intelligent Integration Through the New Synthesis Platform — New in Version 9!

The Synthesis Platform offers a unique solution to the challenge of integrating reliability information without sacrificing the power and flexibility of each individual analysis method. Your interaction with each application will be similar to your experience with previous versions — a full-featured tool that has been expertly designed to meet your needs for all aspects of the analysis methodology. And from the overall reliability program perspective, multiple users will now have the ability to share resources between applications and analyses.

Specifically for BlockSim, Synthesis gives you the ability to:
- Use models from analyses performed in other Synthesis applications to set the properties for blocks in a BlockSim RBD or fault tree.
- Build RBDs or fault trees in BlockSim from system configuration and failure mode data in Xfmea/RCM++/RBI, or from failure rate predictions in Lambda Predict.
- Use BlockSim simulation diagrams to generate response data for experiment designs in DOE++.
- Work with BlockSim diagrams and RENO flowcharts together in the same analysis project, and use diagram results in flowcharts if desired. (Requires separate licenses.)

Centralized Data Storage and Flexible Permissions

All Synthesis applications offer centralized data storage that allows multiple users to work cooperatively on analysis projects. You can choose which type of database will provide the back-end data storage:
- A Standard Repository is easy to create and maintain without any special IT infrastructure or support, but there are limitations to the amount of data it can store and the number of simultaneous users.
- An Enterprise Repository requires implementation of Microsoft SQL Server® or Oracle®, but it is a more robust platform that can store much more analysis information in the same database and supports access by many more simultaneous users. (Licensing, support and maintenance for SQL Server®/Oracle® are not included with Synthesis.)

When using login security, you will be able to determine which capabilities are available to each individual user. Choose basic predefined security groups or customize the access permissions to meet specific needs.

Messages and Action Tracking

One of the many benefits of having multiple users working from the same centralized data repository is the opportunity to use a common interface for posting messages and tracking completion of assigned actions.

The Synthesis repository can be configured to enable e-mail notifications that serve to alert members of the team when relevant messages or actions are created or updated. You also have the option to send actions to your calendar in Microsoft Outlook®.

Enhanced, Easy-to-Use Interface with Internet Connectivity

All Synthesis applications offer a completely updated user interface with an “Office 2010” look and feel, and many usability enhancements. Some of the most useful include the ability to check-in/check-out portions of the analysis, “restore points” that allow you to restore or roll back to a previous stage in the analysis, and more flexible tools to organize and manage analysis projects. Whenever possible, the new interface takes advantage of an active Internet connection to deliver the most up-to-date announcements, documentation and theoretical resources.
Use RBDs or Fault Trees to Model the System

Reliability Block Diagram (RBD) Configurations

BlockSim’s interface for reliability block diagram (RBD) creation is the most intuitive, flexible and polished in the industry. Easy drag-and-drop techniques allow you to build RBDs for the simplest to the most complex systems.

- Simple Series and Parallel
- Complex: Complex configurations (e.g., for network systems) require a more advanced analytical treatment than a simple combination of series and parallel.
- k-out-of-n: A specified number of paths leading to a node must succeed in order for the system to succeed.
- Load Sharing: Each block supports a percentage of the total load. BlockSim now supports stress-independent distributions for load sharing blocks.
- Standby Redundancy: Standby blocks are available to become active under specified circumstances. BlockSim can model hot, warm or cold standby configurations.
- Mirrored Blocks: Mirrored blocks allow you to put the exact same component in more than one location within the diagram (e.g., to simulate bi-directional paths). BlockSim offers increased modeling flexibility by supporting mirrors across different diagrams.
- Multi Blocks: Save time (and space in the diagram) by using a single block to represent multiple identical components configured in series or parallel.
- Subdiagrams: Link diagrams as components in other diagrams.

We have drastically increased BlockSim’s capability for encapsulation by allowing users to publish an analyzed diagram as a model that can be used in any other Synthesis analysis (e.g., in another BlockSim diagram or in the reliability/maintainability calculations supported by Xfmea or RCM++).

Fault Tree Analysis Configurations — Enhanced in Version 9!

BlockSim’s fault tree analysis interface supports all of the traditional gates and event symbols that are applicable to system reliability and related analyses. In addition, only BlockSim allows you to expand the modeling capabilities with additional logic gates that represent load sharing and standby redundancy configurations. The available event symbols include Basic, Undeveloped, Trigger, Resultant and Conditional, while the supported fault tree diagram gates include:

- AND and OR gates
- NOT, NAND and NOR gates
- Voting gates
- Inhibit gates
- Priority AND and Sequence Enforcing gates
- Load Sharing and Standby gates (exclusively in BlockSim)

Now fault tree diagrams can be configured to display intermediate results at each individual gate (in addition to the results calculated for the top-level gate).

Your BlockSim projects can contain both fault trees and reliability block diagrams together in the same analysis workspace. You can also integrate your fault trees and RBDs by linking a fault tree as a subdiagram to an RBD or vice versa.
ANALYSIS BASED ON EXACT SYSTEM RELIABILITY FUNCTION

BlockSim uses an exclusive algorithm pioneered by ReliaSoft to algebraically compute the exact system reliability function for even the most complex systems. This makes it possible to perform a number of system reliability investigations analytically, without resorting to simulation.

System Reliability Metrics and Plots — Enhanced in Version 9!
You can use the convenient Quick Calculation Pad (QCP) and plot sheets to calculate and visualize key system reliability metrics such as:
- Reliability and probability of failure
- Reliable life (i.e., time for a given reliability)
- BX% life (i.e., time for a given unreliability)
- Mean life
- Failure rate

Quick Calculation Pad with Log of Results — Enhanced in Version 9!
The redesigned Quick Calculation Pad (QCP) provides a “Calculation Log” that works like a paper roll in an adding machine. You can record the results from a series of different calculations and then copy/paste the information as needed.

Minimal Cut Sets
For each analytical diagram, BlockSim identifies the unique combinations of component failure that can cause system failure. These minimal cut sets can be used to understand the structural vulnerability of a system.

FRED Reports and Reliability Importance Measures
BlockSim offers FRED Reports (Failure Reporting, Evaluation and Display), which provide an intuitive graphical presentation of key reliability metrics, with color-coding to identify the ones that may be critical for system improvement.

The software also provides a set of Reliability Importance plots designed to show the relative importance of each component with respect to the overall reliability of a system.

Optimum Reliability Allocation — Enhanced in Version 9!
BlockSim also introduces a new tool dedicated to helping you find the most effective component reliability allocation to meet a system reliability goal. The new centralized utility makes it easier than ever to enter and manage all of the information required to use the innovative cost optimized reliability allocation method that’s still available exclusively in BlockSim. This feature now also supports equal and weighted allocation methods.

Start at the system level and click your way to the component or failure mode level while the software automatically computes the target reliability for each item/mode and transfers it to the next.
Analyze Repairable Systems with Simulation

BlockSim’s simulation engine for reliability, availability, maintainability and supportability (RAMS) analysis of repairable systems is more flexible and realistic than ever. For a new system, you can use simulation results to optimize the design and make projections about how the system may perform in the field. For existing equipment, use the results for maintenance planning, throughput estimates, life cycle cost estimation and more.

Reliability and Maintainability Analysis via Simulation — Enhanced in Version 9!

When you utilize simulation, the analysis can consider:

- The task scheduling logistics (e.g., based on item age, system age, system down, start of maintenance phase, etc.). This includes a new "Virtual Age" option for situations in which the scheduled maintenance task will be performed even if the item has failed.
- The restoration factor that captures the impact of repairs on the future reliability of the component (i.e., as good as new, as bad as old or partial restoration).
- The duty cycles for components that experience a different stress load than the rest of the system (e.g., an item that may run for only 10 minutes out of every hour the system operates, or one that works twice as hard during a particular mission phase).
- The expected downtime associated with corrective or scheduled maintenance (defined either as fixed durations or based on probabilistic distributions).
- The costs and logistical constraints associated with allocating the personnel (repair crews) and materials (spare parts) required to perform maintenance when needed.
- Components that will receive maintenance based on what happens to other components in a specified maintenance group. In the latest version, BlockSim can now model even more complex scenarios, such as maintenance that occurs when another component is restored to operation, or components affected by more than one maintenance group.
- New state change triggers that provide increased flexibility for highly complex dependency scenarios by activating or deactivating a block under certain conditions during the simulation — now trigger actions or respond to a state change (e.g., start, stop, perform maintenance, etc.) from any block and across different diagrams.

BlockSim’s simulations generate a wide variety of results at the system and component level, such as Uptime/Downtime, Mean Time to First Failure, Availability, Reliability, Number of Failures/PMs/Inspections, Costs, etc.

The Log of Simulations provides the information you need to evaluate the variability in specific simulation results of interest. In the latest version, you can now export these results to Microsoft Excel®.


Every successful organization understands that it is critical to understand the life cycle costs (LCC) associated with their equipment. Whenever applicable, BlockSim allows you to specify both the direct and indirect costs associated with the maintenance strategies that you have defined, including costs related to downtime, maintenance crews, spares, etc. This yields a wide array of simulation results that are instrumental in performing realistic LCC assessments.

In the Synthesis version, we have added the option to enter any cost input as a probabilistic model, if desired. We’ve also increased the modeling flexibility by allowing you to:

- Specify what kinds of crew delays are included in cost calculations and what delays should be ignored.
- Specify costs associated with system failure, including cost per incident and downtime rate.
- Specify system uptime revenue and revenue due to throughput so the simulation is able to calculate opportunity costs.
- View new cost-related simulation results, including system-level costs, the contributions of different kinds of wait times to block costs and the contribution (criticality) of a block’s cost to the total system costs.
**More Simulation Features**

**Reliability Phase Diagrams and Maintenance Phases — Enhanced in Version 9!**

You can use Reliability Phase Diagrams (RPDs) 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, while others (such as engines) may experience a higher failure rate during these phases due to higher stress.

In addition, the software uses Maintenance Phases to model scenarios in which a system goes directly to maintenance under specified conditions. For example, if a failure during the taxi phase sends an aircraft in for maintenance, it will start over from the beginning of the mission once repaired — not from the middle of the taxi phase where it was when the failure occurred, as other RBD analyses have been forced to assume.

Now we have added success/failure paths, for situations where a system proceeds to one phase upon success and a different phase upon failure. BlockSim’s RPDs now also support node blocks and stop blocks.

**Throughput Analysis — Enhanced in Version 9!**

BlockSim’s throughput analysis capabilities can be used to identify bottlenecks, optimize resource allocation and otherwise improve the processing efficiency of the system. The software allows you to determine how the simulation will allocate the processed output (e.g., parts manufactured in an assembly line or volume of oil processed in a pipeline) across the paths defined in the diagram. The software also allows you to specify how the backlog will be processed.

When the throughput varies over time (e.g., if the flow from an oil well drops over time as the reserves are depleted), BlockSim provides a choice of models to describe the time-dependent variability (linear, exponential or power).

**Simulation Worksheets — New in Version 9!**

The new Simulation Worksheets feature allows you to vary values that are used in simulating a BlockSim RBD or RENO flowchart. This enables you to investigate the effect of one or more settings on the simulation results. Two of the most useful applications are the ability to:

- Design an experiment in DOE++ -> simulate the experiment in BlockSim or RENO --> then return to DOE++ and analyze the simulated "response" data.
- Perform batch simulation of an RBD, using different input values for each simulation. For example, this tool makes it easy to run a set of simulations that compare a variety of possible scenarios by altering specific inputs (e.g., cost, reliability, etc.) for each simulation.

**Technical Advances to Improve Productivity — Enhanced in Version 9!**

All Synthesis applications are now available in both 32-bit and 64-bit versions. In BlockSim, we have also added multi-thread support to take full advantage of the processing power on your computer, and we have re-engineered/re-optimized much of the code so you can now run simulations 10 to 50 times faster.

The Synthesis version also introduces a new Batch Mode feature that improves productivity by allowing you to schedule a series of simulations in advance. For example, you can set the simulations to run overnight and find the results waiting for you when you return to your desk in the morning!
Analysis Flexibility, Plots, Reports and Custom Analyses

Automatic Conversion for Time Values Entered in Different Units — New in Version 9!
All Synthesis applications now allow you to define conversion factors for entering time values in different units. To give just one simple example, you can now define the component failure models in terms of hours but then use the QCP to calculate the system reliability for a year of operation — the software performs the conversion automatically based on the multipliers specified within the repository.

Linked or Attached Files
You can use the links and attachments feature to keep related information from external data files together with the rest of the analysis.

Reuse Reliability/Maintenance Definitions
The universal reliability definition (URD) capabilities in Synthesis make it easier than ever to manage the component reliability and maintenance characteristics required for system analyses. Now you can share the same resources (e.g., failure model, maintenance strategy, availability of repair crew/spare parts, etc.) with all users who have access to the project, and link directly with analyses performed in other Synthesis applications.

For many of the inputs (e.g., duration, cost, etc.), you now have the choice to enter a constant value (e.g., $100) or a probabilistic model (e.g., Normal distribution with Mean = $100 and Std = $16.67).

Plots and Charts to Visualize Analysis Results
BlockSim makes it easy to create a complete array of plots and charts to present your analysis graphically. Depending on diagram type, this can include line charts, bar charts, tableau charts, up/down plots and bubble plots.

The Plot Setup allows you to completely customize the "look and feel" of plot graphics, while the RS Draw metatile graphics editor provides the option to insert text, draw objects or mark particular points on plot graphics.

Overlay Plots (formerly called "MultiPlots") allow you to plot the results from multiple data sets together in the same plot. This can be an effective visual tool for many different purposes, such as comparing different analyses (e.g., Design A vs. Design B) or demonstrating the effects of a design change (e.g., Before vs. After).

You can save your plots in a variety of graphic file formats for use in other documents.

Workbooks and Reports for Custom Analysis — Enhanced in Version 9!
All Synthesis applications offer powerful tools for custom analysis and reporting. If you want to create a custom analysis that integrates results from different diagrams, BlockSim now provides a choice of using an Analysis Workbook (with functionality similar to Microsoft Excel®) or a new Word Report Template (with functionality similar to Microsoft Word®).

Both tools allow you to use the Function Wizard to insert calculated results based on selected analyses.

You also have the option to configure the functions to use generically numbered "data sources" instead of named diagrams. This makes it easy to use the same report template again for different analyses.
FREQUENTLY ASKED QUESTIONS

How can I determine if BlockSim is the right tool for me?
We invite you to try this product and compare it with any comparable package on the market. Download a free demo from our website at [http://Download.ReliaSoft.com](http://Download.ReliaSoft.com).

What are the minimum system requirements?
Both 32-bit and 64-bit versions are available. The supported operating systems are Windows XP (32-bit, SP 3 or higher), Vista (SP 1 or higher), Windows 7 and Windows 8. If you choose to use an enterprise data repository, Microsoft SQL Server® and Oracle® are supported (including the "Express" editions of both). For complete details, see [http://Synthesis.ReliaSoft.com/requirements.htm](http://Synthesis.ReliaSoft.com/requirements.htm).

What languages are supported?
The interface is currently available in English, German, French and Portuguese (with Spanish and Simplified Chinese planned to be added soon). For details and to see if support for additional languages has been added in our most recent release, see [http://www.ReliaSoft.com/languages/](http://www.ReliaSoft.com/languages/).

Is the Synthesis Platform a separate product to buy and install?
No. The platform is integrated directly into each product (Synthesis Application). It is automatically installed and configured during the installation process.

Do I have to buy a different version for single-user vs. enterprise deployments?
No. All Synthesis Applications are designed to adapt automatically to single-user, multi-user and/or enterprise configurations based on what type of repository you are connected to. Each application can be used as an enterprise version when connected to a Microsoft SQL Server® or Oracle® database, or act as a single-user or simple multi-user version when connected to a standard repository.

What type of technical support is available?
Having the best and most advanced solution on the market is only part of the package; our unparalleled after-sale support completes it. We provide good old-fashioned "pick up the phone and talk to a real engineer at ReliaSoft" support. No seemingly endless phone menus and incessant elevator music on hold. Our growing network of regional offices is waiting to answer your questions personally via phone, e-mail or live chat. Software-related technical support is completely FREE for registered end users with Single User Licenses. For other license types, support is available with an active maintenance agreement. For details, visit [http://Support.ReliaSoft.com](http://Support.ReliaSoft.com).

What resources are available to help me master the software?
BlockSim offers complete and detailed online help files, a quick start guide with step-by-step examples, a theoretical eTextbook and a multitude of example files designed to get you up and running the minute the application is installed. In addition, 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. For details, see [http://Seminars.ReliaSoft.com](http://Seminars.ReliaSoft.com).

How do I order the software and when will it arrive?
We provide a variety of license options to meet your particular needs, and we also offer competitively priced multi-product suites. For Single User Licenses, use our secure web store, print-ready order form or contact the ReliaSoft office nearest you. For any other licensing option, including Network or Unlimited User licensing, please contact ReliaSoft to receive a quotation.

Generally, orders received by your local office before 2 p.m. are processed on the same business day. Otherwise, orders are processed the next business day. Both eDelivery and Box Delivery are available — you have the option to download the product from the website or to have a disk and printed materials shipped to you 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. For details, see [http://www.ReliaSoft.com/order/](http://www.ReliaSoft.com/order/).
ReliaSoft Corporation is the global leader in reliability engineering software, training and services that combine the latest theoretical advances with essential tools for the practitioner in the field. We are dedicated to meeting the reliability, quality and maintenance planning needs of product manufacturers and equipment operators worldwide.

**SOFTWARE**

Acclaimed for their ease of use, analytical power and unparalleled technical support, ReliaSoft’s software facilitates a comprehensive set of reliability-related analysis techniques. The Synthesis Platform® facilitates intelligent integration between analysis tools.

- **Weibull++**  
  Life data analysis
- **RCCM++**  
  Reliability centered maintenance analysis
- **ALTA**  
  Accelerated life testing data analysis
- **RBI**  
  Risk based inspection analysis
- **DOE++**  
  Experiment design and analysis
- **MPC**  
  MSG-3 aircraft systems and powerplant analysis
- **RGA**  
  Reliability growth analysis
- **XFRACAS**  
  Web-based FRACAS and related activities
- **BlockSim**  
  System analysis using block diagrams or fault trees
- **RENO**  
  Visual stochastic event simulation and risk analysis
- **Orion eAPI**  
  Web-based asset performance management
- **APREDICT**  
  Standards based reliability prediction
- **Enterprise Portal**  
  Web-based Synthesis Portal
- **XFMEA**  
  FMEA/FMECA and related analyses
- **Synthesis API**  
  Application Programming Interfaces (APIs)

**EDUCATION**

ReliaSoft offers an extensive curriculum of reliability training courses that provide thorough coverage of the underlying principles and theory as well as the applicable software. The complete course list and calendar of upcoming public seminars are published on the web.

**CONSULTING**

ReliaSoft’s expert reliability consulting services team offers a uniquely powerful combination of industry insight, unparalleled subject mastery and, most important of all, direct access to all of ReliaSoft’s global resources, expertise and contacts.

www.ReliaSoft.com