Technology Infrastructure

Research and Advisory Services

Enterprise Management
RESEARCH PAPER

Mutek Solutions
Black Box Flight Recorders for Software

Abstract

Mutek Solutions' Black Box Flight Recorders for Software provide solutions to improve the availability of software applications. They record the activities that lead up to a malfunction, and can then play back in order to identify what is causing the problem. They can operate at the user, system, and code level. The scarcity of professional IT skills, and the increasing requirement for business-critical applications to be available 24x7 means that software quality, and the proactive identification of the root causes of problems, need a focus which hitherto may not have been required. This technology can work out-of-the-box, application software does not have to be changed, and it is completely transparent to runtime applications.

▶ MAXIMISING AVAILABILITY

The ever-increasing growth in e-business, and the complexity of emerging technology, dictates that the management and control of business-critical infrastructures is increasingly difficult. Enterprises have to support their e-business infrastructures in a cost-effective manner. There is a growing shortage of IT professionals to provide this support. Tools are needed to assist enterprises in managing an efficient infrastructure that will ensure the availability and reliability of business-critical systems, and reduce the level of expensive skills required to manage the complexity.

At this time, when there is a global slowdown, enterprises are looking to produce more from their investments and increase their levels of service. It is important that organisations have available to them management tools that are intelligent, and that can assist in the automatic diagnosis of problems.

Mutek Solutions develops and markets software solutions that enable enterprises to improve the availability of business-critical applications. Its Black Box Flight Recorders for software applications record and playback malfunctions in software, and pinpoint the root cause of crashes and other errors in server and desktop applications. They also provide alerts on-line prior to system failures.

Mutek's Black Box Flight Recorder for Software

The Black Box Flight Recorder for Software from Mutek Solutions is a software product that, as its name implies, operates in the same way as an aircraft Black Box Flight Recorder in that it records, and can later play back, every execution that leads up to a failure or crash. It enables the root cause of a failure to be quickly isolated. This enables an enterprise to be proactive in its problem resolution rather than reactive in allowing a problem to become a major crisis. It also avoids the expense of mounting a damage limitation exercise when a failure occurs.

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The Black Box can be incorporated in production environments with a minimal impact on performance. It can be attached to live running processes without the need for any preparation or changes to software, and without any server configuration changes. It provides continuous recording of the last 'x' minutes prior to the problem showing itself. The recording levels can be dynamically configured for individual requirements at user level, system level, and code level, and also for runtime management and control. Mutek builds on the capabilities of the Black Box Flight Recorder by supplying front-end tools to replay recorded failures and assist in identifying the root causes of problems.

The Black Box Flight Recorder for Software can record and send alerts before software failures occur, so that the root cause of software malfunctions in business-critical applications are pinpointed and fixed. They can be configured to identify specific actions and dynamically respond to pre-configured runtime events. Critical tracing data can be automatically set aside at the first sign of trouble to enable errors to be pinpointed:

- **Level 1: User** – All user actions are recorded including keystrokes, mouse movements, mouse clicks, and screen operations. They can then be played back in a controllable video-like environment, illustrating the user's experience, and pinpointing the exact time and action when the problem occurred. All the actions leading up to the problem can be viewed.

- **Level 2: System** – The Black Box at this level looks at application behaviour. It focuses on outside visible events and interactions including: file systems; communications channels; registry access; network connections; processes; Internet server; and database. The system's insight into critical problem indicators enables the quick identification of a large number of software problems. The log pinpoints the root cause of system level problems by highlighting failed actions in red. The scenario can be replayed step by step to illustrate all the actions leading up to the problem.

- **Level 3: Code** – The system records at code level the actual internal operations of programs, down to the individual instruction. The scenario can be replayed and bugs and other internal problems can be pinpointed in the code without the operating environment having to be reproduced.

Client Application Support

Supporting the expanding number of client desktops becomes increasingly complex for the IT support function, faced with a combination of in-house and third-party client applications. The traditional methods of telephone and e-mail interaction between support staff and end-users are notoriously inefficient in resolving problems, with no guarantee of homing in on the root cause. The continuing shortage of IT skills contributes to the problem, as there is often a lack of knowledge of all the factors that can lead to application failure.

The delays in fixing application failures can be very expensive in both loss of business and reduced end-user productivity. When the pressure is on to provide an immediate fix, IT staff quite often utilise convenient workarounds rather than concentrating on the reason for the problem. This kind of application maintenance, without the real knowledge necessary to supply a proper resolution to the failure, invariably stores up future problems.

The Black Box Flight Recorder software is installed on client computers. It can be rapidly downloaded and automatically installed via a Web browser when a problem occurs, or it can be preinstalled with the application software that it supports. When an application failure occurs, Black Box's runtime binary hooking and instrumentation makes it possible to record the live running processes, capturing the problem.

Mission-Critical Application Availability

Mission-critical applications are usually complex, running on global networks that can incorporate thousands of servers, and process many transactions of differing types. This dictates that the identification of all the combination of factors that led to an application failure is virtually impossible. The chances of reproducing all these factors in order identify the cause of the failure is as likely as finding a needle in a haystack.

Because the applications are critical to the business, a controlled environment where they can be tested is not possible. The identification, diagnosis, and resolution must be carried out as quickly as possible in the production environment. Many people can be involved in what can be a frantic exercise. The failure generally requires support staff, IT administrators, and application developers to handle it as best they can. Communication between them needs to be accurate and quick, invariably at remote locations.

By their very nature, business-critical applications need to be available, otherwise they are costing the enterprise dearly. The quick restoration of the application service is imperative for the well being of the organisation.

Mutek Solutions' Black Box Flight Recorder can provide a solution that ensures that the availability of business-critical applications is maintained at a maximum level. It creates alerts to IT staff prior to failures occurring so that crises can be avoided. Through its recording of the exact conditions that applied when a malfunction occurred, the root cause or causes can be identified. Application failures can be recovered from quickly and crashes can be anticipated and averted. The Black Box provides out-of-the-box functionality that plugs into existing infrastructures and can support both third-party and custom-built software applications.

Application Development and Quality Assurance

Problems with software can be so complex that they cannot be reproduced in a testing or debugging environment. Sometimes the environment in which the application is running is multi-threaded, running on multiple platforms, with an enormous amount of live data and an unpredictable networking infrastructure. There is no way that these circumstances can be replicated in order to identify a problem.

Mountains of documentation can be produced to aid the developer, but there is no guarantee that the bug can be reproduced. Indeed, some problems finish up never being resolved, even though they are known to occur. Even if the bug can be reproduced, the developer must analyse the problem by tediously reproducing the conditions that create the problem numerous times, each time examining different aspects of the program's actions in the hope of seeing the cause of the error.

The Black Box Flight Recorder for Software Applications records and plays back every aspect of execution of the application, either in its deployed environment or in lab conditions. It is a transparent solution that has a minimal effect on performance with a small footprint. It can also be controlled from remote locations. It can build databases of Black Box data for use in test planning, regression testing, and incident management.

Mutek's Black Box can dramatically improve the quality of software. It can be utilised to streamline the whole testing and debugging process, and resolve software issues that may never be solved through other methods.

AppSight Front-End Interface

The AppSight front-end interface is used for accessing and analysing the data recorded by the system level Black Box. From the Black Box recording, it displays an application's failure as the user experienced it, for the support engineer, software developer, or quality assurance staff. A visual log enables easy identification of the most common application problems including operator error and known bugs. It provides instant access to system configuration information to assist in troubleshooting issues, such as .DLL conflicts, installation problems, hardware, or operating system inconsistencies.

AppSight provides filters in order that specific application behaviours can be investigated. Navigation of the system is user friendly as recordings can be played at full speed, fast-forward, rewind, pause, or step-by-step through application events.

BugTrapper Front-End Interface

The front-end used for accessing and analysing data collected by the code level Black Box is the BugTrapper. Software Developers use BugTrapper to get complete information on an application's execution at code level of function calls, parameters, return values, including line-by-line execution of code. It is able to display the dynamic execution of code, including multi-process applications and multi-threaded behaviours that are not possible in a debugging environment.

BugTrapper allows the user to drill-down to line-by-line execution of code, for the pinpointing of subtle logic errors within functions. A failure scenario can be navigated easily, moving forwards and back through the Black Box recording to examine the detailed code level data. Through the remote control capabilities of BugTrapper, a user can interactively monitor a remote application in real-time. This can be extremely valuable for the troubleshooting of critical server applications in a server environment. Triggers can also be activated from BugTrapper to dynamically control Black Box monitoring, based on runtime events, to set traps for intermittent failures.

Platforms Supported	Mutek Solutions' Black Box supports applications running in 32-bit Windows operating environments including: Win95; Win98; WinNT; and Win2000. It provides system level recording and monitoring of any application programs, independent of programming language. It also supplies code level recording and analysis of any compiled Visual Basic or Visual C++ component, including: executables; DLLs; COM and DCOM components; ISAPI extensions; and filters.
Benefits of Mutek's Solutions	With Black Box Flight Recorders, business-critical application uptime can be maximised, and support costs can be reduced. The root causes of application failures can be pinpointed, and alerts can be sent before failures occur. IT development and support staff efficiency can be improved together with the quality of application software. Butler Group believes that Mutek's solutions provide tools that enable enterprises to maximise their investments in staff and application software, and supply business-critical application availability.

► VENDOR PROFILE

Mutek Solutions was founded in 1996. Its worldwide headquarters are based in Or-Yehuda, a suburb of Tel Aviv, Israel. It markets and supports its products in the United States, Europe, and the rest of the world through its sales offices and distributors. Mutek has expanded dramatically over the past year from 60 people to 120 staff currently, with about 50 based in Israel, 50 in the US, and 20 throughout Europe.

It had a $28million round of financing in February 2001, and its investors include Intel 64 Fund and UBS Capital. Mutek and Sun Microsystems have recently announced a joint development and marketing relationship. Mutek will deliver its Black Box for Server for the Solaris environment. Mutek is also developing versions of its Black Box for Intel Itanium-based applications and servers, under an agreement with Intel Corporation.

Mutek's customers include e-business and traditional blue chip companies in the computer software industry, financial services, telecom and cellular operators, manufacturing and industrial enterprises. For example, Microsoft has standardised on Mutek's solutions across its development, test, and support organisations for both client and server applications.

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