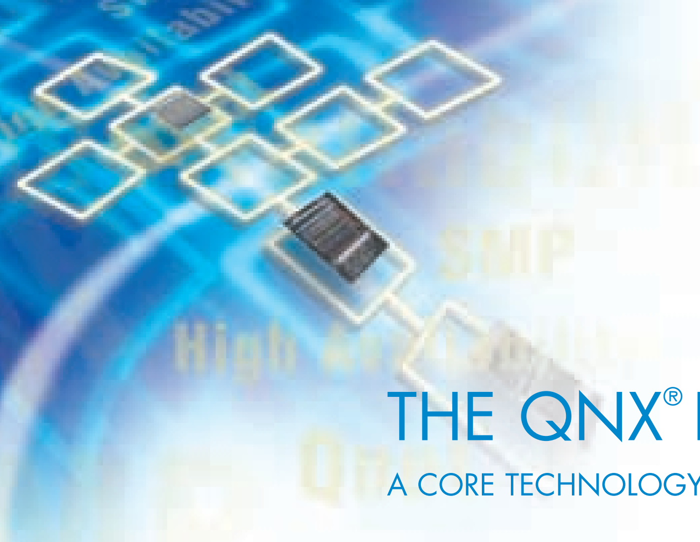


THE QNX® HIGH AVAILABILITY TOOLKIT

A CORE TECHNOLOGY OF THE QNX NETWORKING INFRASTRUCTURE PLATFORM

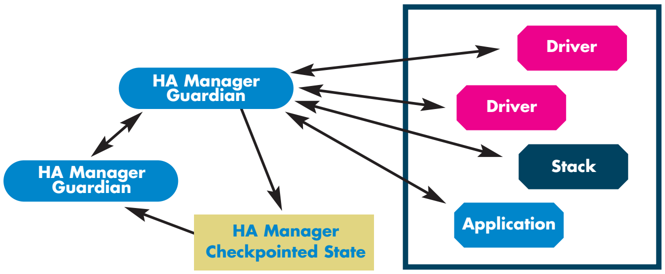
Maximize mean time between failure and reduce mean time to repair with the QNX High Availability Toolkit (HAT). The fully customizable toolkit offers a sophisticated approach to failure detection and recovery, allowing you to detect failures before they escalate to an unrecoverable state, quickly construct custom failure recovery scenarios, and reconnect instantly and transparently to minimize downtime.

Operator error, power outages, and other non-system components are behind half of all system failures. Software faults cause another 40 percent, and hardware problems make up the remainder.[1] Yet most products designed to maximize availability implement hardware-based solutions.

QNX focuses on enabling equipment vendors to improve software availability from the ground up with the QNX realtime operating system, a robust, field-upgradable, memory-protected development platform. The QNX High Availability Toolkit (HAT) lets you take availability to the next level by enabling you to isolate software faults and repair them quickly.

SUPERIOR FAULT-TOLERANCE

A key component of the toolkit, the QNX High Availability (HA) Manager is a resilient, self-monitoring 'smart watchdog' that monitors system services. The HA Manager can immediately and completely reconstruct its own state should it stop abnormally. A mirror process called the Guardian perpetually waits to take over the HA Manager's role should it run into trouble – giving you an extremely fault-tolerant process-monitoring system.



HA MANAGER (HIGH AVAILABILITY MANAGER)

- Highly resilient, self-monitoring manager process
- Heartbeat services to detect component hangs
- Checkpointed High Availability Manager
- Manages recovery on component failure (crashes and hangs)

[1] Source: NIST in IEEE Computer April 1997 and Tandem in IEEE Computer April 1995.

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INSTANT FAULT NOTIFICATION

If the HA Manager detects a certain condition or fault, it instantly and automatically sends an alarm. You can configure system components to respond to alarms according to the specific needs of your application.

LIVENESS DETECTION

Mission-critical performance demands that processes not only exist, but they progress. HAT employs heartbeating to monitor the progress of drivers, system processes, and other components, allowing faults to be detected before they escalate to an unrecoverable state.

CUSTOMIZED FAILURE RECOVERY

HAT lets you construct custom failure-recovery scenarios according to the needs of a particular application. Applications can automatically select failure conditions (events) and specify actions to be performed when these conditions occur (e.g., notification to processes that have subscribed to particular events).

TRANSPARENT RECONNECTION

HAT enables systems to quickly re-establish broken connections in the case of a failed component – so fast, in fact, that the connections won't even know that a failure occurred.

HOT RESTART WITH QNX

The HA Manager controls the automatic restart of individual services – no system reboot required.

For more information, visit **www.qnx.com** or contact your local sales representative.

WHAT'S IN THE HAT?

The QNX High Availability Toolkit consists of the following main components:

High Availability Manager – The HA Manager is a "smart watchdog" – a highly resilient manager process that can monitor your system and perform multi-stage recovery whenever system services or processes fail or no longer respond.

As a self-monitoring manager, the HA Manager is resilient to internal failures. If, for whatever reason, the HA Manager itself is stopped abnormally, it can immediately and completely reconstruct its own state.

HA Manager API – The HA Manager API library gives you a simple mechanism to talk to the HA Manager. This API is implemented as a thread-safe library you can link against.

You use the API to interact with the HA Manager in order to begin monitoring processes and to set up the various conditions (e.g. the death of a server) that will trigger certain recovery actions.

Client recovery library – The client recovery library provides a drop-in enhancement solution for many standard libc I/O operations. The HA library's cover functions provide automatic recovery mechanisms for failed connections that can be recovered from in an HA scenario.

Source code – Full source is included for the following:

- HA Manager and the Guardian processes
- HA Manager API functions
- client covers and convenience functions
- regression test programs
- examples

Examples – You'll find several sample code listings (and source) that illustrate such tasks as restarting, heartbeating, and more. Since the examples deal with some typical fault-recovery scenarios, you can easily tailor this source for your HA applications.

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