

Predicting Failures using z/OS' Smart Analysis

Soft failures today are abnormal yet allowable behaviors that can slowly lead to the degradation of the z/OS operating system. To help eliminate soft failures, z/OS has developed **Predictive Failure Analysis (PFA)**. PFA is designed to predict if a soft failure will occur sometime in the future and to identify the cause while keeping the base operating system components stateless. PFA is intended to detect abnormal behavior early enough to allow customers to correct the problem before it affects their business. PFA uses remote checks from IBM Health Checker for z/OS [®] to collect data about the installation. Next, PFA uses machine learning to analyze this historical data to identify abnormal behavior. It warns customers by issuing an exception message when a system trend might cause a problem.

Avoiding soft failures

Unlike typical problems or hard failures that have a clear start and a clear cause, soft failures are caused by irregular, but tolerable behavior. Because the cause of the problem is dependent on a certain sequence or combination of events that are unique and infrequent, a solution is often difficult to determine. Multiple nonconforming, but legal actions performed by components on the z/OS image cause most soft failures. By design, most components of z/OS are stateless and are therefore unable to detect soft failures caused by atypical actions.

A classic example is the exhaustion of common storage usage. A low priority, authorized task obtains common storage, but obtains significantly more common storage than usual. Then, a critical authorized system component fails while attempting to obtain a normal amount of common storage. Although the problem occurs in the second critical component, this second component is actually the victim. The first component caused the problem and is considered the villain. Soft failures usually occur in four generic areas:

- Exhaustion of shared resources
- Recurring or recursive failures often caused by damage to critical control structures
- Serialization problems such as classic deadlocks
- Unexpected state transition

z/OS has developed Predictive Failure Analysis (PFA) to help eliminate these soft failures.

Overview of Predictive Failure Analysis

Predictive Failure Analysis (PFA) is designed to predict potential problems with z/OS systems. PFA extends availability by going beyond failure detection to predict problems before they occur. PFA provides this support using remote checks from IBM Health Checker for z/OS to collect data about an installation. It uses the data to compare and model system behavior in the future and identifies when a system trend might cause a problem. PFA uses a z/OS UNIX System Services (z/OS UNIX) file system to manage the historical and problem data that it collects.

PFA creates report output in the following ways:

- In a z/OS UNIX file that stores the list of suspect tasks.
- In an IBM Health Checker for z/OS report that is displayed by z/OS System Display and Search Facility (SDSF) and the message buffer.
- Customers can also set up IBM Health Checker for z/OS to send output to a log stream. After it is set up, they can use the HZSPRINT (Health Check) utility to view PFA check output in the message buffer or in the z/OS log stream.

[®] Health Checker V1 was made available in 2003 and is enhanced for each release of the operating system. The objective of IBM Health Checker for z/OS is to identify potential problems before they impact an installation's availability or, in worst cases, cause outages. It checks the current active z/OS and sysplex settings and definitions for a system and compares the values to those suggested by IBM or defined by you. It is *not* meant to be a diagnostic or monitoring tool, but rather a continuously running preventative that finds potential problems.