Highly Available Systems: Concepts and Practice
Two-Day Seminar

Seminar Description

This one-day seminar describes how highly available systems with annual downtimes measured in minutes or seconds can be implemented. The secret to high availability is fast failover to a redundant backup system.

An introduction to basic availability concepts leads to methods for implementing highly available systems. Fundamental to all highly available systems is data replication to a remote site. Various data replication techniques are studied, and commercially available data replication engines are described.

Highly available architectures that support a wide range of availability characteristics are presented. They include active/active systems that can provide uptimes measured in centuries by recovering from a fault in seconds.

Several case studies demonstrate successful implementations. Sprinkled throughout the seminar are many "never again" educational stories of disastrous failures of critical systems.

We will tailor the content of the seminar to meet your needs and interests.

Seminar Objectives

Attendees can expect to learn the following:

- Real examples of what can go wrong.
- Basic availability concepts
- The impact of redundancy on availability

- The use of data replication for database synchronization
- Data replication products
- How RPO and RTO is affected by the choice of data-replication technique
- Highly available architectures
- Active/active systems
- Eliminating planned downtime
- Real-life examples of highly available systems in practice

Prerequisites

Familiarity with transaction-processing systems and knowledge of simple algebra is recommended.

Instructor Biography

Dr. Bill Highleyman brings more than 40 years' experience in the design and implementation of mission-critical computer systems to his position as Chairman of The Sombers Group. Dr. Highleyman, a graduate of Rensselaer Polytechnic Institute and MIT, earned his doctorate degree in electrical engineering from Polytechnic University. He has published extensively on availability, performance, testing, and middleware issues. He is the author of "Performance Analysis of Transaction Processing Systems," published by Prentice-Hall, and is coauthor of the three-volume series, "Breaking the Availability Barrier." Dr. Highleyman holds several patents and publishes the free monthly Availability Digest available at www.availabilitydigest.com.

Highly Available Systems: Concepts and Practice
Day 1

9:00 – 10:30: Concepts in Availability

Continuous availability versus high
    availability
MTR, MTBF, Availability, and their
relationship
The 9s game – Measuring availability as
    9s
Recovery Time Objective (RTO) and
    Recovery Point Objective (RPO)
The impact of redundancy on availability
Calculating availability
    Node failures
    Effects of failover times and faults
Active/active systems – an introduction
    Comparison to clusters

10:30 – 10:45: Break

10:45 – 12:15: Data Replication

Synchronizing database copies with
    data replication
Asynchronous replication:
    Replication latency
    Data loss following a node failure
    Data-collision detection and
        resolution
Synchronous replication:
    Application latency
    Network deadlocks
The importance of redundant, reliable
    networks
Replication does not eliminate backups

12:15 – 1:15: Lunch

1:15 – 2:45: Data Replication Engines

The replication engine check list
Asynchronous replication engines
    Shadowbase
    Goldengate
    IBM Global Mirror
    Sybase, SQL Server, MySQL
Synchronous replication engines
    Shadowbase Plus SR
    IBM Parallel Sysplex
    IBM Metro Mirror
SAN Replication
    Grow your own

2:45 – 3:00: Break

3:00 – 4:30: Highly Available Architectures

Fault-tolerant systems (single node)
    HP NonStop
    Stratus
Active/standby systems:
    Magnetic tape
    Virtual tape
Active/passive systems:
    Unidirectional async replication
    Unidirectional synchronous replication
Active/active systems:
    Bidirectional async replication
    Bidirectional synchronous replication
Eliminating planned downtime
Fast failover
    User redirection
    Transaction redirection
Other advantages of active/active
systems

Highly Available Systems: Concepts and Practice
Day 2

9:00 – 10:30 Cloud Computing

What is the cloud?
Advantages of the cloud
Public clouds
Private clouds
Hybrid clouds
Notable cloud failures
   Amazon Web Services
   Google Apps
   Windows Azure
   Salesforce.com
Cloud SLAs
Connecting to the cloud
   Internet reliability
The compute utility
The appropriate role of the cloud

10:30 – 10:45: Break

10:45 – 12:15 Cyber Attacks

Types of cyber attacks
   Spear phishing
   Trojans
   Worms
   Viruses
   Key loggers
   Spyware
   Ransomware
Mobile device threats
Distributed Denial of Service (DDoS)
   The biggest threat to availability
   Botnets
   Types of DDoS attacks
   Recent examples
   Mitigation

12:15 – 1:15: Lunch

1:15 – 2:45 Never Agains

Examples of massive system failures
   Human error
   Failed upgrades
   Failover faults
   Internet
   Intranet
   Environmental
Lessons learned

2:45 – 3:00: Break

3:00 – 4:30 Active/Active Systems in Action

Case studies
   Financial
   Communications
   Control systems
   Other case studies