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Agenda

- Research Topic
- High availability concepts
- Virtualization
- XEN Technology
- Design
- Testing XEN & Heartbeat
- Conclusion
Research Topic

To research the possibilities for High Availability (HA) failover mechanisms using the XEN virtualization technology and the requirements necessary for implementation on technical level.
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In Scope:
- XEN and Virtualization technology
- High Availability HA
- Failover Services
- Potential software: DRDB, Heartbeat, LVS, Ultramoney

>> Out Scope
Out of Scope:
- Implementing other VM like UML
- Multi platform tests
- Security flaws of overall designs
- Measurements
- High performance clusters
What is High Availability?

- Minimal service interruption: redundancy

Failover clusters:
- Active-Active: Load balancing: routing
- Active-Passive: each node has backup
- N+1: nodes have one shared backup
- N(ode)+M(standby)
- N+N: Active-Active and N+M
Service Availability

- Controlled outage: reboot, shutdown (UPS, hardware upgrade, software upgrade etc.)

- Uncontrolled failure: network, power, hardware failures, OS failures: application failures, kernel panic, stale processes

>> Requirements HA
Requirements HA

- Redundancy
- Monitoring for a failed node
- Automatic transfer of resource ownership
- Private interconnect (Serial/Ethernet Cable)
- Cluster configuration (Standby/Takeover)
- HA Storage: Distributed, SAN, GFS

>> HA under Linux
HA under Linux

Heartbeat
- Heartbeat Protocol (+SHA1)
- Logical resource manager (LRM)
- Cluster Information Base (CIB)
- Stonith deamon (Single shot in the head)

LVS
- Director
Virtualization
Definition: abstraction of computer resources

a technique for hiding the physical characteristics of computing resources from the way in which other systems, applications, or end users interact with those resources.
Advantages of virtualization

- Transparency – hardware independent
- Efficiency – efficient use of hardware resources
- Flexibility – to move one system to another
- Simplifies application stack – largely removing hardware and drivers from the equation
- Security – providing isolation

>> Disadvantages
Disadvantages of virtualization

- Increased complexity
- CPU and memory overhead

>> Forms of VT
Forms of VT

- Emulation
- Full virtualization or native virtualization
- Para-virtualization
- OS virtualization
- Hardware virtualization
- Application Virtualization

>> XEN Architecture
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- XEN Architecture

X86-Ring protection
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**XEN Architecture**

Source: Xen and the art of virtualization
Advantages XEN
- Open source
- Secure isolation
- High performance HA
- Migration

Disadvantages
- Modify guest OS: or VT Support / SVM support
- Not very mature
1 VM = 1 Service

Shared Datapool

>> Requirements HA Design
Requirements HA Design

- Heartbeat extension which controls XEN
- Resource management system which monitors resources from physical hosts.
- Control STONITH device
- Build in safety measures
- Use HA data pool

>> Procedures Outages
Procedures during:

- **1 Uncontrolled outage**
  - Cold Failover

- **2 Controlled outage**
  - Live Migration!

>> Test environment
Test environment

- **Software:**
  - Ubuntu 6.10, XEN 3, Heartbeat 2, Apache 2.

- **Hardware:**
  - Intel(R) Pentium D CPU 3.00.GHz
  - 2GB Memory
  - DomU 128MB Memory
Scenario 1

Heartbeat communication between physical Node0 and Node1
Service downtime 6-8 sec
Scenario 2

Heartbeat communication between VM01 and physical host node1. Service downtime 6-8 sec
Scenario 3

Heartbeat communication between VM01 and VM02. Service downtime 1-2 sec
Conclusion

- XEN & Heartbeat can be used to realize a flexible, reliable and efficient HA environment.
- Extra functionality needed in cluster manager (Heartbeat)
Heartbeat ADD-ON Requirements:

- Resource management system which monitors resources from physical hosts.
- Heartbeat extension which controls XEN
- Control STONITH device
- Build in safety measures
- Use HA data pool