R-Series Failover Appliances

This application brief summarizes strategies for implementing high availability/ failover and outlines the components necessary to implement a redundant/ high availability Asterisk solution using the R-Series appliances from Digium. The R-Series devices handle the physical redirection of PSTN circuits in the event of a catastrophic hardware or software failure. Tightly integrated with monitoring and resource management software, the R-Series can switch PSTN traffic within seconds of a service interruption. A pair of Asterisk-based servers cross-connected through an R-Series appliance can achieve 99.99% availability.

Digium is the creator, sponsor, and innovative force behind Asterisk®, the industry's first and world's most popular open source telephony software. Additionally, Digium provides a variety of VoIP communication solutions that fit the needs of small, medium, and large businesses. Digium's product lines include commercial business phone systems, as well as software, hardware, and other components needed to create powerful custom communications solutions.

Application Summary

When high availability business communication services are required, the R-Series appliances, Asterisk and additional open-source tools can be converged to create a completely redundant and mirrored clustered environment for 24x7 availability. What is high availability (HA)? It can be defined as an approach to communications system design which emphasizes service availability. In true HA systems, core services are available at all times. For users of business communications systems, this would include key PBX services such as inbound and outbound calling, voice mail, automated attendants, call queues and conferencing.

For the Server Administrator, high availability means more than one Asterisk system, a primary and secondary, clustered for the purpose of sensing a failure of the primary. Once a failure of the primary is detected, whether hardware or software, the backup communication server will assume responsibility of all communication services. For true high availability, the backup communications server must restore all services such as voice mail, dial plans, IP addressing and much more intact.

Deployment

The following diagram shows an R-Series failover appliance managing PSTN connections to a pair of mirrored Asterisk Servers. Server A is the primary sever while Server B is a "hot standby" unit.

PSTN

8 Spans

PSTN

USB   USB

PSTN (Standby)

Server A (Pri

Mi /Heartbeat

Server B (Standby)

LAN
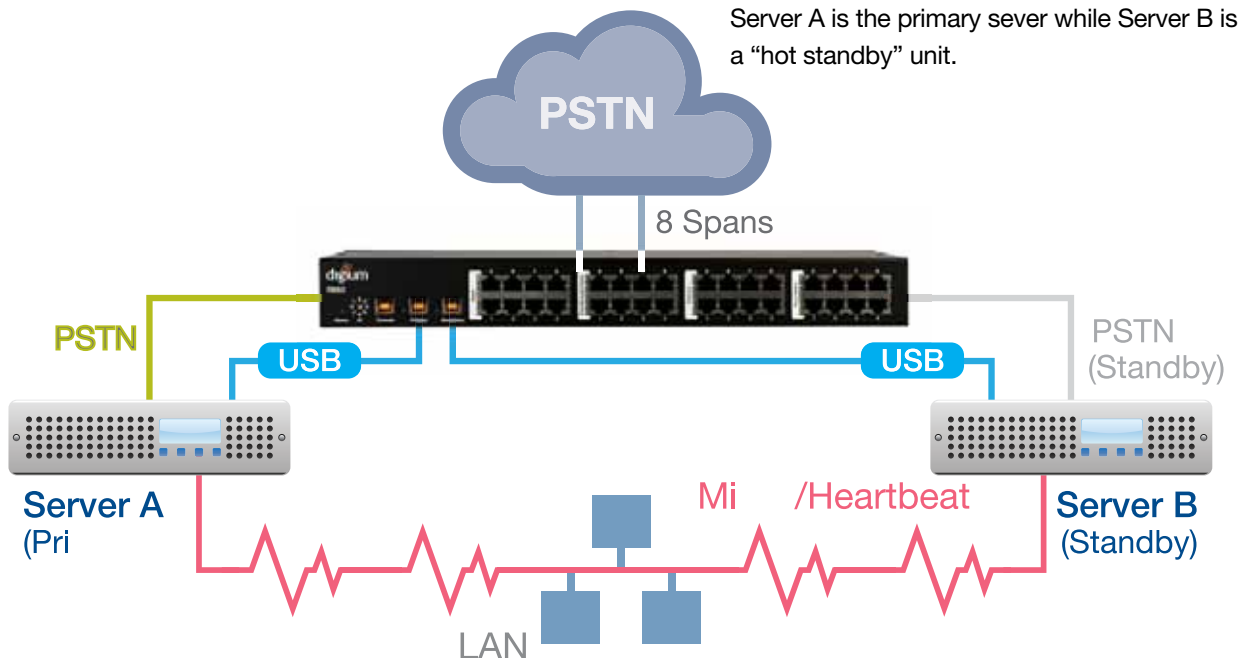
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The two servers are either identical, or sufficiently comparable such that either server can act as the primary at any given time. This scenario describes that happens when a fatal hardware or software failure is experienced on the machine serving as the primary.

Components:
- PSTN connection (analog or digital lines)
- R-Series R800 or R850 unit
- Server A
- Server B

Preconditions:
- This example uses the R850 appliance and digital (T1) PSTN service
- Server A and Server B are running the software configuration described below
- Server A is acting as the primary node
  - Asterisk is running on Server A
  - The R-Series unit has the T1(s) routed to Server A
  - VoIP traffic is directed to an IP address bound to Server A
- Server B is acting as a standby node for Server A

Trigger
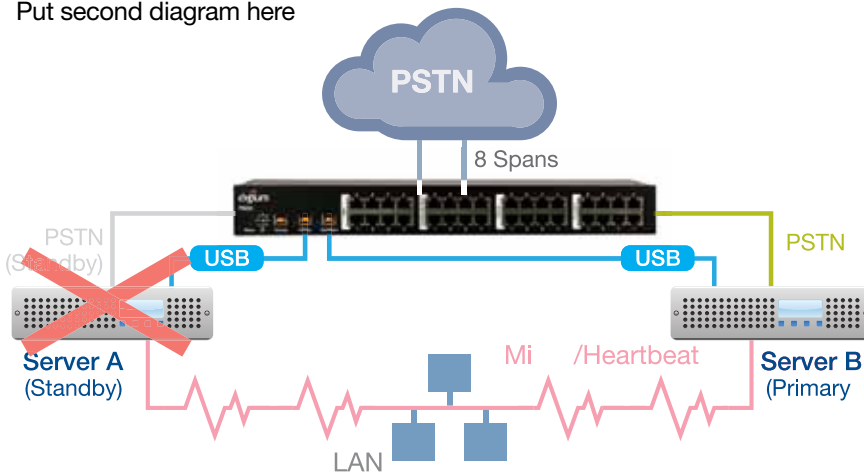- Server A experiences a fatal software hardware failure

General Flow
- The host software on Server B detects that Server A has left the cluster
- The host software on Server B instructs the R-Series unit to direct the T1(s) to Server B
- The host software on Server B activates the floating IP address locally
- The host software on Server B starts Asterisk
- Server A comes back online and rejoins the cluster as a standby for Server B

Software Configuration
The software used for this method of automatic failover includes Pacemaker, Corosync, and DRBD. A brief description of each of these components is listed below.

- **Pacemaker** is a "resource manager" for clusters (including clusters with just two nodes as outlined in this example). The resource manager takes care of starting and stopping services on the nodes (computers) in the cluster. Think of Pacemaker as the director — it tells the other parts of the system what to do.

"Pacemaker is an Open Source, High Availability resource manager suitable for both small and large clusters. Hardware and application failures can result in prolonged downtime and impact your bottom line. In the event of a failure, resource managers like Pacemaker automatically initiate recovery and make sure your application is available from one of the remaining machines in the cluster. Your users may never even know there was a problem."

www.clusterlabs.org

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In the event of a hardware of software failure on the primary server, the standby server will resume communications with all services (voice mail, IVR, etc.) intact.

- **Corosync** is the messaging system that lets all the nodes in the cluster reliably communicate with each other. In this example, Corosync sends system delivers status (health) messages from one node to the other.

- **DRBD – DRBD** is a Linux utility that synchronizes data between file systems on different computers. It works much like RAID-1 — it mirrors the data on the drives — but over the LAN rather than on the same system. In this example DRBD is used to keep configuration data

> "DRBD refers to block devices designed as a building block to form high availability (HA) clusters. This is done by mirroring a whole block device via an assigned network. DRBD can be understood as network-based RAID-1."
>
> *www.drbd.org*

Failure Detection

Pacemaker manages resources in a cluster. A resource agent (RA) is a utility used by Pacemaker to take care of the details of managing a resource. For our purposes, Pacemaker is managing resources in a two-node cluster. Pacemaker will be configured to periodically poll the resource agent in charge of the Asterisk process. One of the required interfaces of a resource agent is to be able to return the status of the resource.

The cluster messaging layer, Corosync, is in charge of determining cluster membership. If it loses contact with another node for any reason, it will decide that it has failed and failover will be initiated by notifying the R-Series appliance to redirect the PSTN services.

For detailed step-by-step configuration, please view the R-Series manual at **http://docs.digium.com/R800F/r-series-manual.pdf**

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