



Fax Server Cluster Configuration

Low Complexity, "Out of the Box" Clustering for
Reliable and Scalable Enterprise Fax Server Deployment

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Introduction

As increasing number of Softlinx' ReplixFax customers deploy the ReplixFax system to support their enterprise fax messaging needs or high-volume production faxing requirements, it became critical to provision mission-critical fax services with high degree of scalability, reliability and availability without incurring administrative complexity and excessive additional costs. As a result the following questions were raised:

- How well does the ReplixFax system handle increasing and/or fluctuating high volume fax communication workload requirements?
- Can we run the ReplixFax system in a clustered, high availability environment to handle hardware failure or degradation?
- What is the administrative overhead of setting up, maintaining, and recovering fax services in a clustered configuration?

This white paper addresses these issues and describes the ReplixFax fax server clustering configuration.

The advantages of ReplixFax cluster configuration include:

- High availability and failure recovery to provide an uninterrupted fax processing in case of any fax server cluster unit failure(s)
- Increased throughput for fax file conversion and cover page generation using multiple fax server units to process outbound fax jobs.
- Load balancing of outbound fax traffic for even distribution of fax jobs among multiple fax server cluster units (Note: Load balancing requires installation of load balancer(s) on the network.)
- Fax information and files are stored on network attached storage (NAS) location accessible by all fax server cluster units

This white paper is intended for customers who are considering to deploy a ReplixFax server clustering configuration. It provides useful guidelines and practical solutions for "keeping the fax communication alive" without incurring unnecessary costs in extra hardware and administrative complexity in the event of any fax server hardware or software failures.

Note: The ReplixFax Server *Cluster Configuration* is available for the ReplixFax Server version 7.x and above.

ReplixFax System Deployments

The ReplixFax product family provides a mature and robust suite of services, client applications, integration interfaces, and APIs. Depending on the requirements for volume, redundancy, or geographic locations, the ReplixFax system can operate in a variety of configurations to achieve the most efficient interconnection between the end users and available Telco lines, and provides continuous, reliable traffic of inbound and outbound faxes.

These configurations are often organized according to layers or *tiers* of software run by one or more host systems on a network. Examples of software tiers are shown in Table 1. Note that not all of the tiers listed here are likely to be present in the same deployment.

Tier	Function	Examples
Fax Client	User interface	ReplixFax Windows Client Microsoft Outlook Fax Client Lotus Notes Fax Client Java API Client Applications Web browser
Groupware	Collaborative services	Microsoft Exchange Lotus Domino
Web Server	Web session multiplexing	Microsoft IIS Apache
Application Server	Business Logic	WebLogic WebSphere
Fax Server	Fax preparation & routing	ReplixFax Fax Server
Modem Gateway	Hardware interface	ReplixFax IMG
Telco	Fax transmission	

Table 1 - Software Tiers in the ReplixFax System

Each of these software tiers can be assigned to a specific host on a network. In the simplest case all tiers could be assigned to the same physical host. More typically, the software tiers are distributed across multiples hosts, allowing the various stages of fax processing to be overlapped in assembly line fashion. Additional hosts may be assigned via *cluster* or *high availability*

configurations to a tier for the purposes of higher performance and greater redundancy; when one physical host is disabled, the remaining hosts continue to operate for an uninterrupted service.

Client/Server Deployment

In a simple client/server deployment, typical of a small business, ReplixFax software is configured as three logical tiers for the client, fax server, and modem gateway. The Fax Server tier responds to all requests from the Client tier, holds all permanent *state* of the Fax system (i.e. end-user names, DID numbers, preferences), and apportions fax traffic among the available hosts in the Modem Gateway tier. An example of a client/server deployment is shown in Figure 1 below.

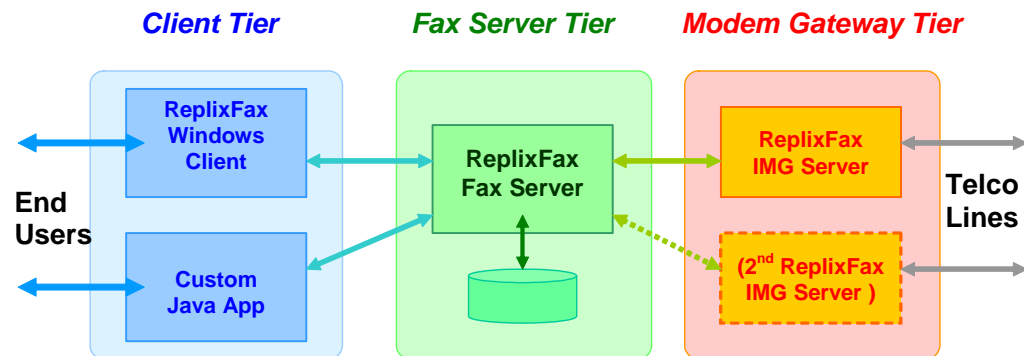


Figure 1 - Software Tiers in a Client/Server Deployment

In a client/server deployment, the fax server maintains a private database of user accounts and fax activity information (i.e. account records for all end users) that constitutes the permanent *state* of the system. As we will see, the notion of state and how it is defined and recovered is particularly important in determinations of system availability and recovery.

In an enterprise environment, additional application service tiers are typically present between the Client tier and the Fax Server tier as part of a broader enterprise network services infrastructure. These architectures support collaboration among multiple groups based on centralized *groupware* servers. In this configuration the ReplixFax software plays the role of an intelligent peripheral, while most mission-critical functions and data are the responsibility of the core groupware services.

Groupware Deployment

For groupware deployments, the Fax server interoperates with a Lotus Domino or Microsoft Exchange server, which in turn supports the end user client interfaces. The fax server tier is typically configured as an intelligent client that polls the groupware server for outgoing email to be converted and sent in fax format. Although user account data is cached in the fax server database, authoritative definitions of this data reside permanently on the groupware tier. The fax server also polls the IMG tier for arriving faxes to be delivered as inbound email attachments. An example groupware deployment is shown in Figure 2 below.

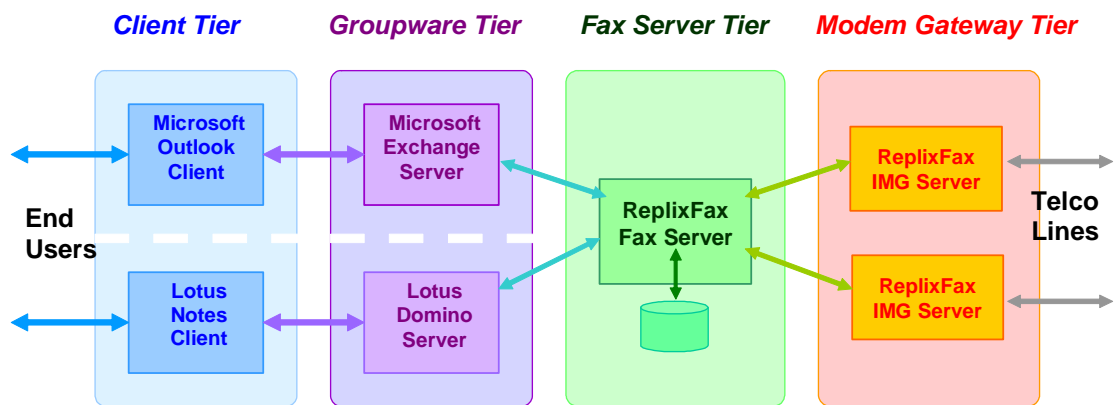


Figure 2 - Replix Deployment with Groupware Tier in an Enterprise

Web Service Deployment

For corporations with significant investment in Web services, the client and groupware functions are elaborated into additional *thinner* tiers of Web service architecture. In J2EE-compliant architecture such as BEA WebLogic or IBM WebSphere, user interface functions are handled by a Web client, while presentation and session management functions are managed by a Web Server tier. Business logic and persistent storage functions are further isolated in their respective Application Server and Database tiers. An example of Web service deployment is shown in Figure 3 – Replix Deployment with Application Server Tier below.

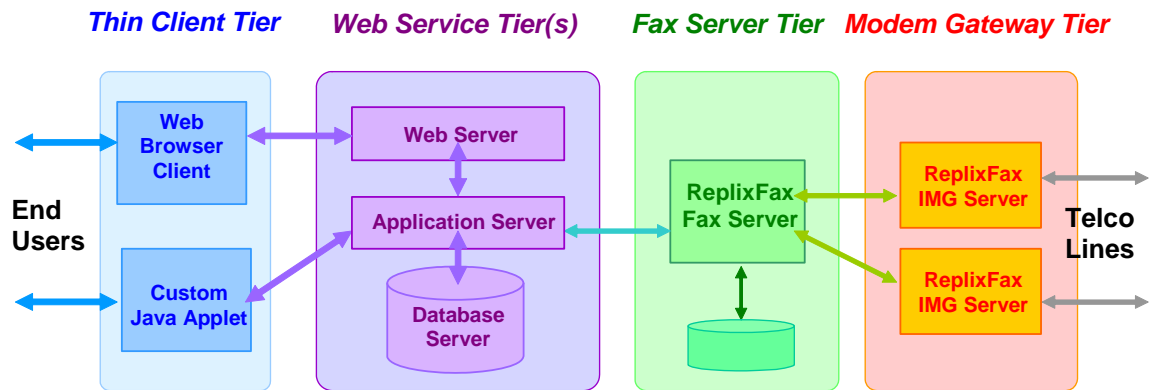


Figure 3 – Replix Deployment with Application Server Tier

In each of the above configurations, the degree of continuous availability to end users depends on the capacity of each tier to detect and recover from failures in its own hardware as well as failures in adjacent tiers.

In a simple client/server configuration, continuous availability may be compromised by the absence of fully redundant hardware in all tiers. Manual replacement and reconfiguration of new hardware may require hours or even days during which fax services remain unavailable. Small business users may opt to deploy backup hosts as live replacements for the Fax Server and Modem Gateway tiers, but typically this is the extent of high availability planning in a small client/server setting.

In an enterprise environment, fully redundant hardware is often mandated by the requirements for maximal availability of various network services: intervals of unplanned outage due to hardware failure should be practically nonexistent, or relegated to statistically remote possibilities of multiple simultaneous failures.

It is easy enough in principle to provide a second host within each tier to take over in the event of a single hardware failure, or even a third host to take over from the first two in the event of an unlikely case of double failure. The real problem for mission-critical applications comes in recovering the data that was in transit when the host failed. In addition any mission critical business fax communication requires a scalable fax server system configuration that will handle increasing and/or fluctuating, high-volume workload requirements in a graceful manner. Fax processing tasks such as fax format conversion takes up a major portion of the fax server cycle, and can quickly become a source of system throughput bottleneck.

The ReplixFax fax server clustering configuration can resolve the bottleneck by providing multiple fax server processing units that can perform fax file conversions in parallel. The ReplixFax fax server clustering also provides high availability of the system since a failure of any fax server processing unit will not bring down the overall system operation, thus providing an *uninterrupted fax communication* in the event of any fax server unit failures.

Overview of the ReplixFax Clustering

ReplixFax Fax Server Clustering Architecture

The ReplixFax fax server cluster consists of multiple fax server units running on Windows servers (see Figure 4). Each fax server acts as an equivalent fax cluster member, or a processing unit. The ReplixFax system supports both MySQL and Oracle databases to store fax database. The fax files and fax database data can be stored on a NAS device or equivalent network storage system. There must be at least two fax server cluster units to implement the ReplixFax fax server clustering, and additional server units can be added by as needed. In the event of any server hardware failures or other unpredictable interruptions, remaining fax servers in the cluster ensure an uninterrupted fax service.

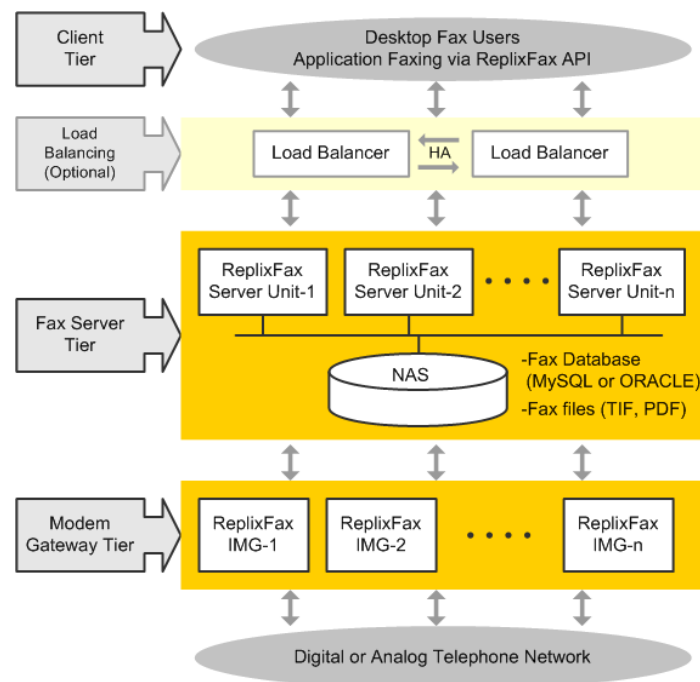


Figure 4 – ReplixFax Clustering Architecture

Load Balancing Layer for Optimized Distribution of Outbound Fax Traffic (optional)

To manage high volume outbound fax workload with optimal performance, you may purchase and configure optional load balancer(s) from third-party vendors. The load balancers evenly distribute outbound fax requests across all fax cluster members to provide highly optimized performance and maximum throughput. The details of cluster techniques for groupware and Web servers are beyond the scope of this paper, and are generally tied to advanced features of the vendor operating system and hardware.

Managing Incoming Faxes

Since the ReplixFax server also supports inbound faxes, a reasonable question arises as to what provisions are necessary to ensure high availability along the inward path from the telco lines to the end user desktop. For the most part, inbound availability is inherent in the configuration of multiple telco lines, redundant modem gateways, and fax servers, and requires no special maintenance of data structures beyond those already supported by the ReplixFax system. In effect, the ReplixFax Fax Server and Modem Gateway Servers already incorporate failure detection and recovery in the polling operations within each server.

Database Access for High Availability Support

To support correct operation of the ReplixFax system high availability server clustering, the ReplixFax system ensures that only one instance of database access on the NAS, or similar network storage equipment, is allowed at any time during its operation. For instance, the ReplixFax system manages MySQL server instance to ensure that only one instance of MySQL Server is active providing access to MySQL database files on the NAS.

Failure and Recovery Scenarios

The following tables describe how the ReplixFax system recovers from failures in each tier of a groupware or Web service architecture.

Outbound Faxes

Failing Tier	Recovery Operation	Notes
Groupware Client Web Client Custom Java App	End user initiated restart/recovery	No redundancy in client tier
Groupware Server	Server recovers state via replication or cluster recovery	Replix queue state is recovered with server
ReplixFax Server	Outbound faxes are moved to alternate Fax server	Duration of failure must exceed timeout interval
Modem Gateway	Outbound faxes are moved to redundant IMG server	Fax server detects failure in main IMG server
Telco	Outbound faxes are re-tried by IMG server	

Table 2 – Outbound Fax Failure/Recovery by Tier

Inbound Faxes

Failing Tier	Recovery Operation	Notes
Telco	Inbound faxes are re-tried by sender	(Assuming failure is detected by sender)
Modem Gateway	Inbound faxes are re-tried by sender	(Assuming failure is detected by sender)
ReplixFax Server	Inbound faxes are forwarded to an alternate Fax server	IMG detects failure in main Fax server
Groupware Server	Server recovers state via replication or cluster recovery	Inbound email boxes are recovered with server
Groupware Client Web client Custom Java App	End user initiated restart/recovery	No redundancy in client tier

Table 3 - Inbound Fax Failure/Recovery by Tier

Summary

This white paper describes a simple, effective approach to provide a reliable and scalable fax communication solution via fax server clustering with multiple fax servers working as equivalent fax processing units. The ReplixFax system clustering leverages multi-tiered enterprise network services architecture of the ReplixFax system. In both groupware and Web service deployments, the configuration and operation of the fax cluster relies on keeping the critical state on the enterprise server tiers continuous and uninterrupted. The fax server cluster offers benefits of high availability, ease of disaster recovery, and improved fax processing throughput.

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