



## Fax Server Cluster Configuration

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



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## Introduction

High availability, scalability and reliability are important considerations when selecting an enterprise fax solution to meet critical business communication needs. As more customers depend on the ReplixFax system to handle their mission-critical fax communications, we are often asked the following questions:

- How well does the ReplixFax system handle increasing or fluctuating fax volume workload?
- How does the ReplixFax system ensure uninterrupted fax service in the presence of any hardware or software component failure?
- What is the administrative overhead of setting up, maintaining, and recovering fax services in a clustered fax server configuration environment?

This white paper addresses these questions and explains high availability and scalability features of the ReplixFax fax server cluster configuration.

The advantages of ReplixFax cluster configuration include:

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

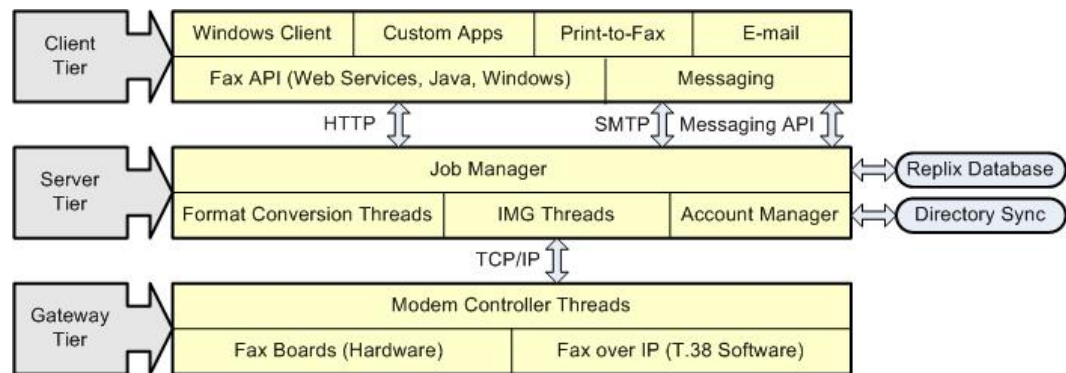
This white paper is intended for customers who plan to deploy a ReplixFax server cluster configuration. It provides useful guidelines and practical solutions for “keeping the fax communication alive” in the event of any hardware or software failure without incurring unnecessary costs in extra hardware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

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, application integration interfaces and comprehensive fax APIs.

The ReplixFax system architecture shown in Figure 1 has layered, or *tiered*, architecture where system components of any layer can be assigned to a specific host on a network. In the simplest case all tiers are assigned to a single physical host machine or a virtual machine (VM). Often, different components of the system are distributed across multiples hosts, or across the network for larger scale deployments.

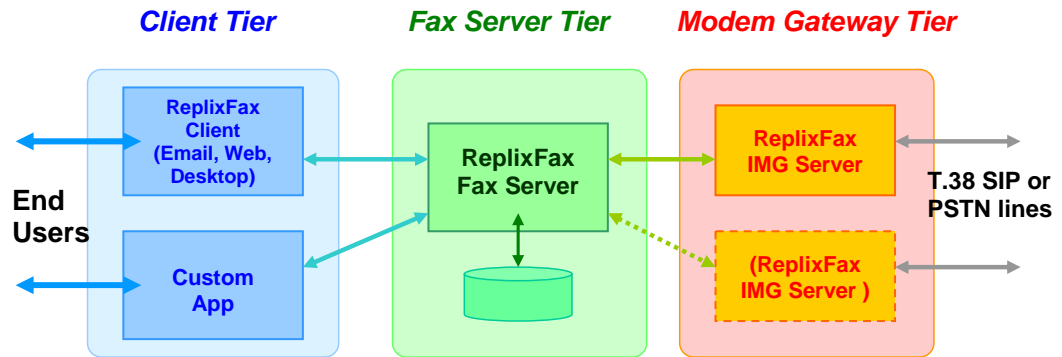


**Figure 1. ReplixFax System Layered Architecture**

## 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 2 below.



**Figure 2. Software Tiers in a Client/Server Deployment**

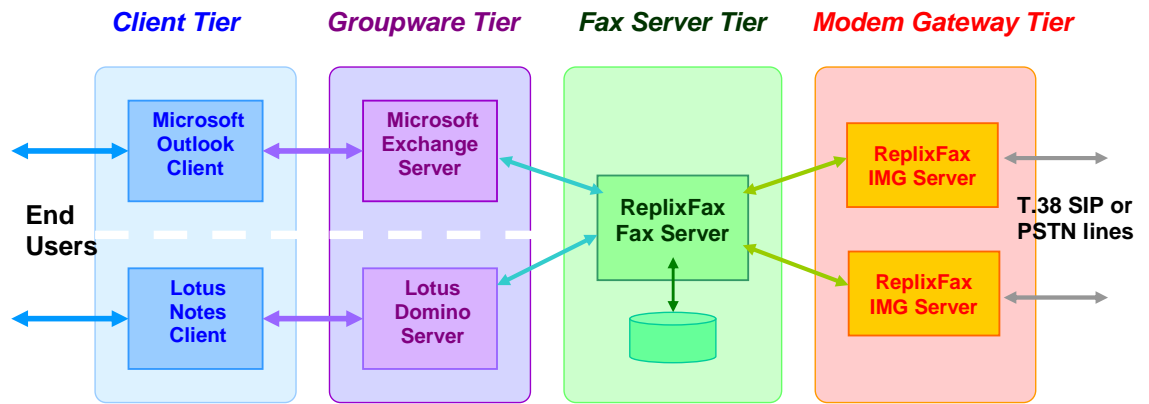
In a client/server deployment, the fax server maintains a private database of user accounts and fax activity information (i.e. account records for all end users) that constitutes the permanent *state* of the system. As we will see, the notion of state and how it is defined and recovered is particularly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

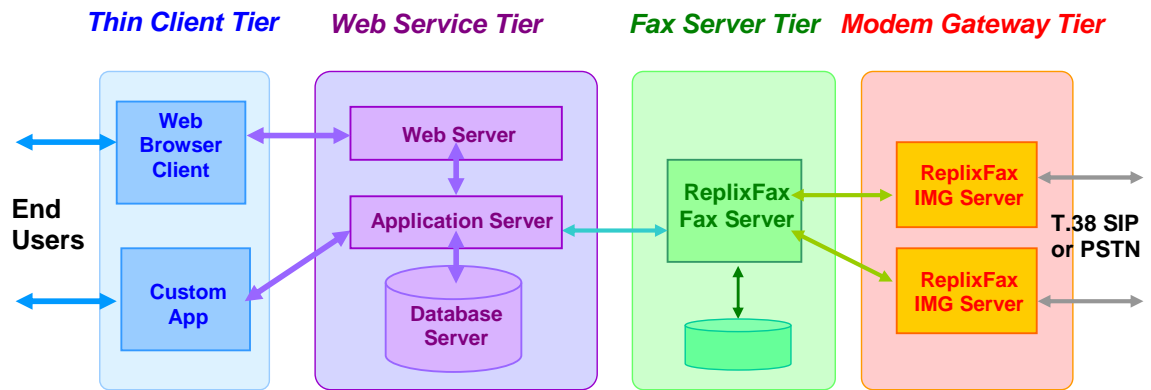
groupware tier. The fax server also polls the IMG tier for arriving faxes to be delivered as inbound email attachments. An example groupware deployment is shown in Figure 3 below.



**Figure 3. 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. 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 4 below.



**Figure 4. 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 or extra virtual machine (VM) hosts are often mandated by the requirements for maximal availability of various network services: intervals of unplanned outage due to any system component 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



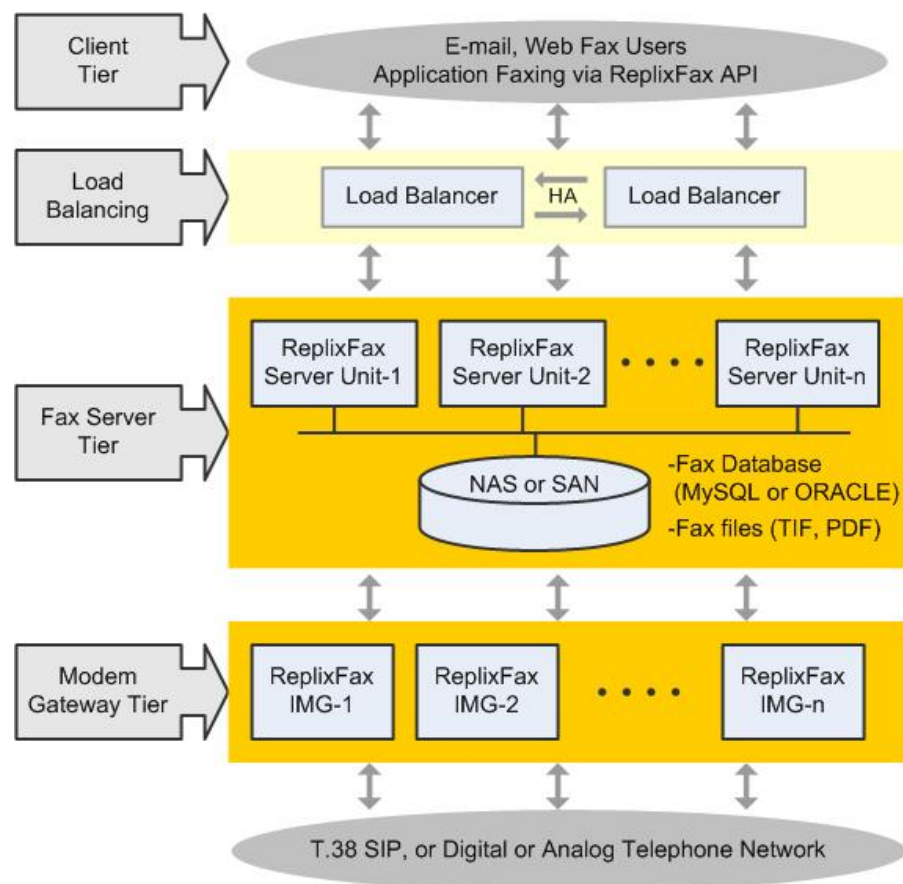
configuration that is capable of handling increasing and/or fluctuating, high-volume workload requirements in a graceful manner. Fax processing tasks such as fax format conversion takes up a major portion of the fax server cycle, and can quickly become a source of system throughput bottleneck.

The ReplixFax fax server cluster 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 Fax Server Cluster

## ReplixFax Fax Server Cluster Architecture

The ReplixFax fax server cluster consists of two or more fax server and modem gateway units. Additional server or gateway units can be added without interrupting the live operation. In the event of any server hardware or VM host failures, remaining fax servers in the cluster ensure an uninterrupted fax service.



**Figure 5. ReplixFax Cluster Architecture**

The ReplixFax system supports both MySQL and Oracle databases to store fax data. The fax files and fax database data can be stored on a NAS device or equivalent network storage system.

## Load Balancing Layer for Optimized Distribution of Outbound Fax Traffic

Load balancers are used to manage outbound fax workload with optimal performance. Dual redundancy configuration is recommended for high availability. The load balancers evenly distribute outbound fax requests across all fax server cluster units to provide highly optimized performance and maximum throughput.

## 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
Email Client Web Client Custom 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
T.38 SIP or Phone Lines	Outbound faxes are re-tried by IMG server	

**Table 1. Outbound Fax Failure/Recovery by Tier**

### Inbound Faxes

Failing Tier	Recovery Operation	Notes
T.38 SIP or Phone Lines	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	Inbound email boxes are recovered with server

	recovery	
Email Client Web client Custom App	End user initiated restart/recovery	No redundancy in client tier

**Table 2. 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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Softlinx, Inc.

100 Riverpark Drive

North Reading, MA 01864

Phone: +1.978.881.0560

Fax: +1.978.664.0181

[www.softlinx.com](http://www.softlinx.com)

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