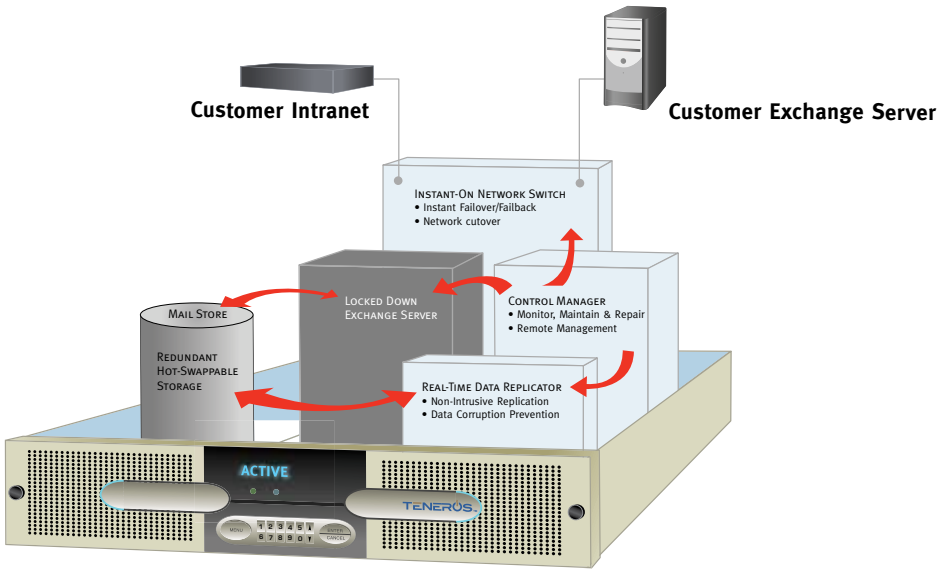
TENEROS™

ON AVAILABLE ACCESSIBLE

The Technology Behind the Teneros Application Continuity Appliance™ for Microsoft® Exchange

The Teneros Application Continuity Appliance (ACA) for Microsoft Exchange is a simple plug-&-go™ appliance packed with powerful technology that assures 24x7 end-user email operation. The key technology components powering the Teneros ACA for Microsoft Exchange are: the Teneros Instant-On Network Switch™, the Teneros Real-Time Data Replicator™, a Locked-Down Microsoft Exchange Server, the Teneros Control Manager, and the Teneros Appliance Platform with built-in hardware component redundancy. This technology drives Teneros Instant-On™ failover and 99.99%-99.999% availability for corporate Exchange users.



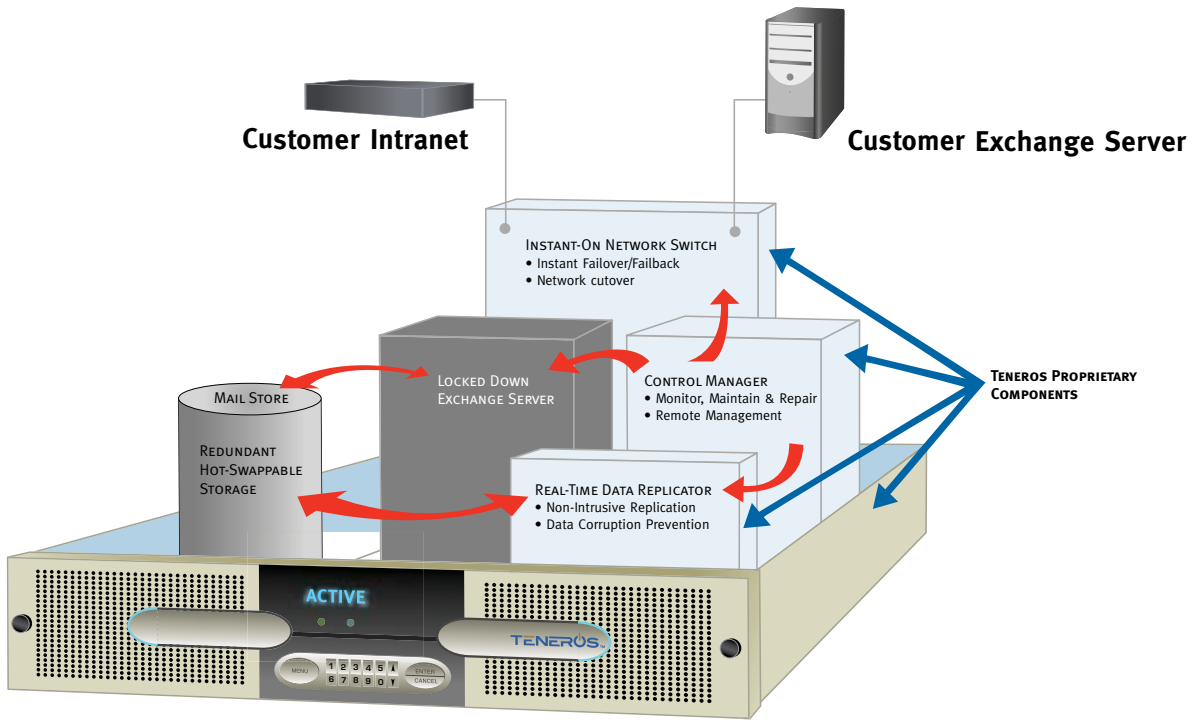
The technology behind the Teneros Application Continuity Appliance

How the Teneros Application Continuity Appliance for Microsoft Exchange Works

The Teneros Application Continuity Appliance for Microsoft Exchange plug-&-go installation and setup takes 15 minutes. IP addresses are entered using the intelligent front panel keypad and display. Setup is completed using the Teneros web interface wizard. Upon completion of setup, the **Control Manager** validates the setup information and starts appliance initialization. During initialization the **Real-Time Data Replicator** creates an exact, object-level replica of the Exchange server mail store on the Teneros ACA. The initial replication runs at the rate of 1-2 Gb/hour while it performs a Transaction Integrity Validation on the complete Exchange mail store with no performance degration on the Exchange server. When mail store replication completes, the ACA goes into standby state protecting the Exchange server in the event of failure. During standby the **Real-Time Data Replicator** continuously replicates the ongoing email traffic in real time. Concurrently the **Control Manager**

monitors the Exchange server, checking the status of Exchange services and network ports on the Exchange server, network availability of the Exchange server, and the status of end-user operations such as MAPIlogon. When an Exchange failure occurs, the **Instant-On Network** Switch triggers failover within seconds and the locked-down Exchange server within the ACA provides end-user email service. The end-users have continuous access to all of their email. During failover, the **Instant-On Network Switch** also allows the administrator to repair the Exchange server by connecting to it through a separate IP address. After the Exchange server has been repaired, the administrator initiates failback using either the front panel keypad and display or the Teneros web interface. Upon receipt of a request to failback, the **Control Manager** checks the operational "health" of the Exchange server. If the health check succeeds, the **Real-Time Data Replicator** copies missing mail data back to the Exchange server. This can include mail data generated during failover as well as any other mail data missing on the Exchange server. During the failback process, the Teneros ACA will continue to provide end-user email service. If the Exchange server fails and there is a corrupted or missing backup, the ACA can restore the complete mail store on failback. Upon mail data replication completion, the **Instant-On Network Switch** allows failback transferring end-users in seconds back to the Exchange server for email service. The ACA then returns to standby state. The **Control Manager** reports on the health of the ACA to the Teneros network operations center

"The operation is simple because the technology is powerful"



Proprietary Components in the Teneros Application Continuity Appliance

and checks for software updates. Updates are downloaded and applied to the ACA during customer-defined maintenance windows. If the **Control Manager** detects an error on the ACA, it will repair and rebuild the ACA software without external IT intervention.

The Proprietary Components in the Teneros Application Continuity Appliance (ACA)

Teneros Instant-On Network Switch
To provide high availability, the Teneros Application Continuity Appliance for Microsoft Exchange transparently assumes the network identity, including IP address, of the Exchange server, within seconds of failover. This network transition occurs within seconds of an Exchange server failure to assure end-user email continuity. Other continuity products with software agents that make Exchange IP address modifications or add IP filters to the Exchange server, cannot provide end-user email continuity because they require five to ten minutes to attempt switching the network parameters via software. In addition, a failed Exchange server may not be able to successfully release the network identity using only software agents residing on the Exchange server, resulting in IP conflicts on the network and no email service at all.

The Teneros Instant-On Network Switch guarantees network failover within seconds because it is a proprietary layer 2 through layer 7 GigE network switch. The Instant-On Network Switch allows the ACA to be deployed in line with the Exchange server and switches traffic at GigE speeds supporting all of the common network protocols such as 802.3 AD network aggregation (teaming). Because the ACA is deployed in line with the Exchange server, the ACA passes the layer two network traffic at GigE speeds to the Exchange server with no modification or performance impact. The Instant-On Network Switch also includes a built-in hardware cutover device that transforms the ACA into an Ethernet pass through cable in the unlikely event that the ACA loses power or has a fatal failure.

> **"The Teneros Instant-On Network Switch guarantees failover within seconds with a proprietary GigE network switch"**

Real-Time Data Replicator
The Teneros Real-Time Data Replicator performs continuous, real-time synchronization between the Exchange mail store and the ACA mail store. When a mail object is committed on the Exchange server and is visible in the user mailbox, it is copied to the ACA. The Real-Time Data Replicator uses Exchange APIs for mail data replication so it does not require any software agents to be installed on the Exchange server. Replication occurs at the mail object level and not at the disk block, file, or byte level. This is extremely important because object level replication prevents replication of corrupted mail objects from the Exchange server to the ACA. The Real-Time Data Replicator copies all forms of mail data such as email, calendar, contacts, and other end-user mail objects. During failback the Real-Time Data Replicator replicates all missing data back to the Exchange server. This includes the new email generated while the ACA is serving users in failover as well as email data missing on the repaired Exchange server dated prior to the time of failover, thereby preventing data loss in the event of corrupted or missing backups. Object level replication is important because it supports copying data back to the Exchange server even when the mail store database has been defragmented on the Exchange server; a common Exchange server maintenance operation. Other continuity solutions that replicate at the disk block, file, or byte level cannot restore data after defragmentation operations are done on the Exchange server.

Control Manager
The heart of the Teneros ACA is the Control Manager which directs operation of the ACA, monitors the ACA components, manages ACA maintenance and update, and has built-in recovery software to repair the ACA in case of error. The Control Manager operates on an independent hardware processor running a carrier grade version of the Linux operating system. This provides the ACA with "two brains". Should the

locked-down Exchange server within the ACA encounter any problems, the Control Manager can repair and rebuild the ACA system software without external intervention. As the Teneros ACA monitors the "health" of the Exchange server, the Control Manager monitors the "health" of the ACA and will alert the Teneros network operations center if it detects a hardware or software malfunction. The Control Manager contains the logic to maintain the locked-down Exchange server within the ACA with the latest security fixes, patches and upgrades. The Control Manager communicates with the Teneros network operations center securely through an outbound SSL connection on port 443 to download, and apply all ACA software updates.

Teneros Appliance Platform

The Teneros Application Continuity Appliance for Microsoft Exchange is a highly redundant hardware platform. Redundant storage is provided through RAID enabled hot swappable Serial ATA drives. Redundant RAID controllers protect from hardware failures. Dual hot swappable power supplies assure continuous power to the ACA. Dual Xeon processors provide high performance and redundancy for the ACA. The Teneros appliance platform also includes error correcting memory and redundant GigE network intefaces. The platform includes an intelligent front panel with a 48 character display and full numeric keypad and processor. The keypad allows initial input of network configuration information as well as ongoing access to critical alerts and appliance operations.

Other Key Components in the Teneros Application Continuity Appliance

Locked-Down Exchange Server

The Teneros Application Continuity Appliance for Microsoft Exchange contains a fully-licensed Enterprise version of Microsoft Exchange 2003 server running on the standard version of Windows 2003. The Exchange server has been implemented according to the industry recommended expert guidelines from Microsoft. To assure stability and reliability of the Teneros ACA, the Exchange and Windows server configurations within the ACA cannot be accessed or modified by the IT administrator. The ACA Exchange configuration is completely independent of the Exchange infrastructure configuration on the customer network and, as such, does not need to match the configuration of the Exchange server it protects. The ACA replicates and validates only the relevant configuration parameters from the customer Exchange environment thereby preventing accidental or malicious operator error from propagating to the ACA. Other high availability solutions that blindly replicate the Exchange configuration to the secondary server and allow complete administrative access to the secondary Exchange server do not protect administrator Exchange failures due to accidental operator error, which according to analyst data, accounts for approximately 60% of Exchange downtime.

Mail Store

The Teneros Application Continuity Appliance Mail Store resides on a redundant hot-swappable Serial ATA drive array. The integrity of the Mail Store data is maintained by Teneros Transaction Integrity Validation technology which checks for data corruption during both the initial and ongoing data replication processes and prevents replication of corrupted mail data from the Exchange server to the ACA. Data corruption prevention on the ACA Mail Store assures the highest possible success in data restoration to the Exchange server after an Exchange failure.

The Operation is Simple Because the Technology is Powerful

The Teneros Application Continuity Appliance for Microsoft Exchange is the only continuity solution that assures 99.99%-99.999% end-user email availability with data protection, Instant-On failover, and no in-house IT burden at an affordable price.

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