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Managing Microsoft's Exchange Server: More, Better, Faster

A White Paper by Ferris Research

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Executive Summary

Microsoft Exchange Server is a flexible and robust messaging platform. Its email and collaboration features make it a key enterprise application. Because organizations depend on Exchange, IT has to keep it secure and available. Assuring that it is when Exchange is deployed on many servers in multiple locations is challenging. Proactive management with powerful tools is the best way to prevent problems and maintain system performance.

The latest version, *Exchange 2000 Server,* adds little user functionality over Exchange 5.5, but makes big changes in the application infrastructure. In particular, Exchange 2000 uses Microsoft *Windows 2000 Server Active Directory* (*AD*) service. AD eliminates the need for a separate Exchange directory and integrates user management for Exchange and the underlying network operating system. This makes it easier to manage Exchange within a large enterprise, but requires somewhat different tools.

This white paper discusses the tools and tasks needed to manage enterprise-sized Exchange systems in the near future. These systems will typically have both Exchange 5.5 (*E5.5*) and Exchange 2000 (*E2K*) and may be using both Windows 2000 (*Win2K*) and Windows NT 4 (*NT4*) servers. Management activities include:

- Assessing security

- Monitoring availability and performance

- Managing configurations

- Managing information store and directory objects

Microsoft provides basic tools for these activities, but managers of large systems need more comprehensive solutions. The last section of this paper describes products from BindView Corporation that address this need.

An Exchange Primer

Most readers of this paper will be familiar with Exchange, so the first part of this section just summarizes the most important features. See the references for more complete information. The second part presents an overview of administration tasks in the context of the data that describes a running Exchange system.

Quick Review of Exchange 5.5 and 2000

Effective Exchange management requires good understanding of Exchange 5.5 and 2000 (*E5.5* and *E2K* respectively.) You also need a working knowledge of NT4, Win2K and Active Directory (*AD*).

E5.5 and E2K share much of the same core architecture. Both are closely integrated with the host Windows operating system. E5.5 runs on either Windows NT Server version 4.0 or Win2K Server families. E2K runs on Win2K Server/Advanced Server/DataCenter Server. Windows hosts Exchange processes, provides security for databases and users—and for E2K—provides directory services with AD.

Exchange servers store messages that users create or receive in specialized databases, collectively called the *Information Store* (IS). E5.5 has one private store database for user mailboxes and one public store database per server. E2K has a more complex database arrangement using storage groups and multiple message databases.

All versions of E2K support up to four storage groups per server. Exchange runs a separate Win2K process and creates a set of transaction log files for each storage group. E2K Enterprise Server can operate up to five individual mailbox databases—ie, private message stores—within each storage group. These changes make Exchange more scalable. For instance, only a dozen very large E2K servers can provide email to a 100,000-mailbox enterprise. This would require scores of servers running earlier versions of Exchange.

The Enterprise version also supports Win2K Active-Active Clustering, which distributes storage groups and databases from one Exchange Server instance across multiple Windows servers. Each server carries part of the load and if one fails, the others take over processing of databases from the downed unit.

Another change in storage design is a separate .stm (streaming media) file associated with each private message store. Exchange stores MIME attachments from incoming Internet mail and from POP, IMAP and HTTP clients natively in the .stm database. This improves performance for those clients and improves store scalability.

Also, each storage group has one public folder database; so one Exchange Server can host multiple public folder hierarchies.

E5.5 accesses mailbox, public folder, distribution list and permissions through a dedicated directory service, while AD provides that data for E2K. This has several implications. In particular, Windows servers hosting Exchange need not run directory processes and instead use the AD on Win2K Domain Controllers. This reduces directory replication traffic and load on Exchange servers.

AD also changes the notion of a mailbox. Objects—eg, users—in AD may be mailbox-enabled. Such objects are tied to unique Exchange mailboxes. So, unlike earlier versions, each user can have only one mailbox. (Users can still have multiple aliases.)

Other differences include changes in distribution lists and groups, message routing and message transport.

Several Windows services deliver mail and perform other processing for Exchange. Both E5.5 and E2K servers run the following services:

- System Attendant (SA)—monitors other services, builds routing tables and maintains tracking logs.

- Information Store (IS)—places messages in public and private stores and delivers local messages. The IS service contains an implementation of Microsoft's Extensible Storage Engine (ESE). Messages are entered into the databases as transactions. Each one is first written to a transaction log file before committing to the database. This process offers significant performance and fault tolerance features.

- Message Transfer Agent (MTA)—delivers messages between servers in E5.5 and also sends messages from E2K to E5.5 servers in mixed-mode installations.

A number of other services vary between E5.5 and E2K. These include the E5.5 Internet Mail Service (IMS) and various connectors to other mail systems or Exchange sites. Both versions support standard Internet protocols including POP3, IMAP, SMTP, NNTP, LDAP and HTTP (Outlook Web Access). Win2K Internet Information Service (IIS) handles all Internet protocols for E2K, while the IMS runs most of them for E5.5. (IIS is Internet Information Server on Windows NT4 Servers.)

Quick Overview of Exchange Management

Managing Exchange requires that you keep every component, including those described above, healthy. However, this is not enough. End-to-end performance depends on how well these components work together and on overall response of your network. In other words, users see—and care—if you meet your service level agreements. Therefore, you need to monitor the total performance of messaging, server and network systems.

A comprehensive approach breaks ongoing Exchange management into these four activities:

- Assessing security—checking and changing ownership, permissions, delegations, usage, etc on every object in the system; inspecting mailboxes for dangerous attachments.

- Monitoring availability and performance—watching Exchange and Windows processes, queues, event logs and performance counters along with notification when end-to-end messaging performance degrades.

- Managing configurations—documenting settings across the organization and enforcing configuration policies.

- Managing store and directory objects—creating/moving/editing user mailboxes, public folders, security groups, containers, distribution lists, email addresses and permissions on these objects.

Native Exchange and Windows NT/2000 tools can perform most of these tasks reasonably well for a single Exchange server. The main Microsoft-provided tool is called the *Exchange Administrator* in E5.5 and *Exchange System Manager* in E2K. Figure 1 (see next page) shows the E5.5 version.

Other useful programs are the Windows Event Viewer, Services applet, Windows Explorer and Performance Monitor. Some advanced tasks require the registry editor or scripting. Native tools lack full configuration management capabilities, however, and are not powerful or scalable enough for large systems.

Third-party vendors create applications that combine the functions of standard tools. They also perform operations automatically that otherwise would take numerous manual steps. This is particularly helpful for configuration and mailbox management and in controlling multi-site installations.

Figure 1   E5.5 Administrator program
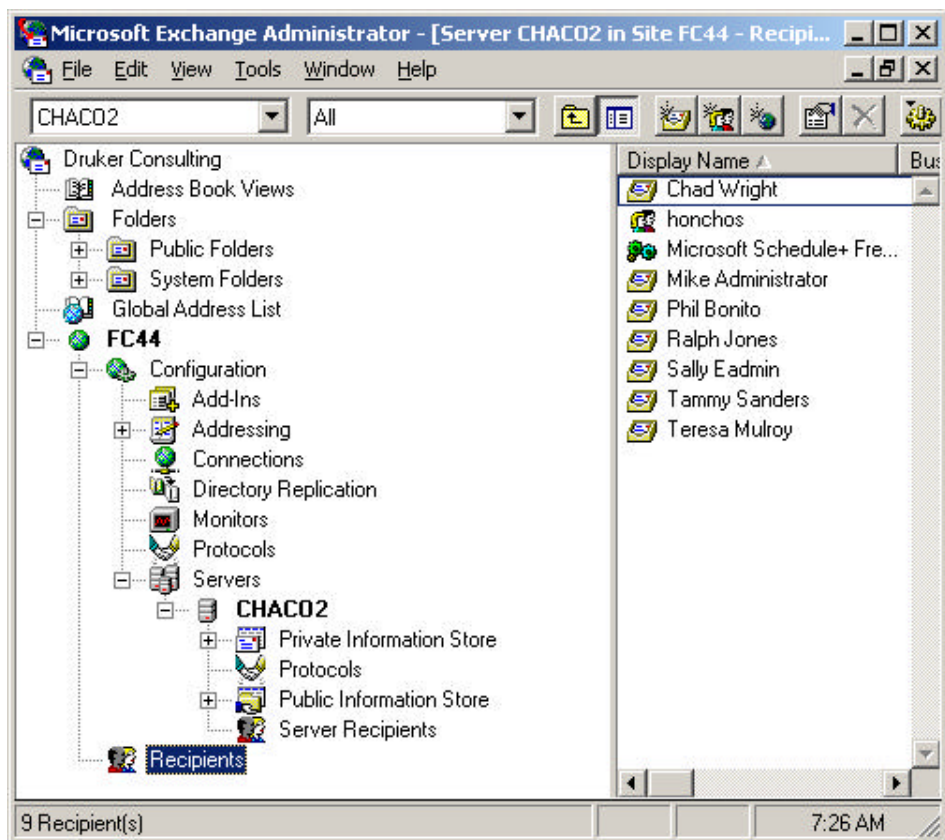
Data Sources for Management

All systems management solutions need to get data from the operating system, database, application, etc that they manage. Exchange itself generates a lot of management data during operation. Sources include:

- Public and Private Store databases—including mailbox and public folder attributes

- E5.5 Directory—including object permissions and configurations

- IS transaction logs

- Message tracking logs

- Routing tables

- Message queues

The operating system generates or maintains other important data. These sources include:

- NT4 and Win2K event logs and error codes—application, system, security, DNS and DS

- Filesystem—pathnames, permissions, sizes, etc, of databases, logs and other files

- NT4 and Win2K registry

- Win2K AD

- Network—TCP/IP protocol and network interface configurations and states

- IIS status and logs

- Windows Task Manager—services that are currently running

Another key source, especially to evaluate system loads, is the NT4 or Win2K Performance Monitor. Useful metrics include:

- Processor—processor time, individual process, % utilization

- Memory—available bytes, page faults/sec, paging file usage

- Disk I/O—physical disk time and queue length, logical disk queue length, reads/sec, writes/sec, free megabytes

- Network I/O—bytes total/sec

It is feasible to monitor these data sources on a single Windows server with built-in tools. Larger systems benefit from third-party tools that collect this data from multiple servers and organize it for easy review and comparison.

Main Management Tasks

The day-to-day tasks that Exchange administrators perform fall under these general activities:

- Assessing security
- Monitoring availability and performance
- Managing configuration
- Managing message store and directory objects

The next four sections discuss many of the specific tasks within these areas required to maintain a smooth-running Exchange system.

Assessing Security

Security is leading concern in Exchange management. This is primarily a function of the settings and data associated with user mailboxes and public folders. Investigations should include:

- Uncovering end-users with delegation permissions enabled. Most users should not allow others to send mail on their behalf. Companies need clear policies on how assistants handle mail for others. Permission analysis can help enforce these policies.

- Understanding who can perform mailbox and distribution list administration. E2K allows for delegation of administration duties such as creating/updating/deleting mail-enabled user accounts and distribution lists. It is important to control and manage who has these administrative rights to prevent unauthorized changes and uncontrolled growth of Exchange objects. E5.5 does not provide native delegation of administrative rights. However, third-party tools, such as those from BindView, enable this capability.

- Identifying unneeded mailboxes. Many organizations do not have procedures that ensure unneeded mailboxes are identified and removed. These include mailboxes of users who left the company, mailboxes copied to other servers and test mailboxes. One way to discover these mailboxes is to run reports such as those from BindView that analyze which mailboxes are stale (not accessed recently) or orphaned (no associated active NT user account).

- Gathering statistics on the number of messages delivered from the Internet. Message traffic to and from the Internet affects both capacity planning and security. Some organizations may want to restrict the types of attachments users send to or receive from the Internet.

- Analyzing mailbox and public folder space utilization and usage. Check for rapid changes in these areas and manage them with retention limits and archiving policies.

- Searching mailboxes and public folders for viruses and other inappropriate content or attachment types.

- Reporting on the date that public folders were last accessed. This will uncover whether specific public folders are being used.

- Analyzing who has permissions on files and directories.

- Enforcing email-retention-and-size policies. Identify those mailboxes that allow messages to be retained longer than necessary. Administrators need the options to change the storage limits of mailboxes and set warnings if these are exceeded.

Assessing these areas on a regular basis ensures system integrity and eases planning for migrating users to AD in Win2K and, subsequently, to E2K.

Monitoring Availability & Performance

Proactive monitoring of each component and the entire messaging system is essential to maintaining 24x7 availability. Users need rapid and consistent delivery of messages to their own inboxes and other recipients. Exchange managers need tools that systematically measure performance by looking at the underlying components that drive that performance.

It is important to:

- Continually monitor critical Exchange components and processes, such as MTA, system attendant and directory services. Rapid changes indicate problems with Exchange, Win2K Server or the network. Slow changes might mean messaging traffic is growing. Changes in weekly patterns—eg, usage spikes in the middle of the night—might suggest more international message traffic or a security problem.

- Discover high traffic mailboxes and sites. An Exchange site hosting engineering staff may have average message sizes much larger than those of the sales department if engineers are sending CAD drawing as mail attachments. Watching for trends helps capacity planning and in setting mailbox or message size limits.

- Discover individual users whose actions seem to consume excessive disk, server or network resources. This may be a sign of unauthorized use. Sometimes problems with clients or network links manifest themselves this way, too.

- Alert the appropriate Exchange administrator before system performance is affected.

- Assist Exchange Server load balancing to reduce additional costs.

- Monitor Exchange response times and alert support staff when unacceptable.

- Monitor real-time OS events relating to Exchange services.

- Measure message delivery performance.

Managing Configuration

One of the problems with large messaging systems is that they have a lot of pieces: servers, users, public folders, connectors, etc. In most organizations, the number, arrangement and properties of these things change frequently. Since any change can potentially cause a problem, tracking changes and the configuration of the system is important.

Server Configuration

Each Exchange server running on Windows NT or Win2K has thousands of configurable parameters. Many are defaults. The system or Exchange administrator overrides some of them when installing Exchange or making changes. Examples range from database pathnames to the number of information store process threads.

In large systems, several different people or teams may be managing your Exchange, Windows and AD infrastructure. This is even more likely for multinational operations. It can lead to inconsistent settings across the organization, which can affect Exchange stability, performance or security. Therefore, it is important to have tools that document your configuration and track changes.

Keeping this information handy yields several immediate benefits. It aids troubleshooting by letting you see immediately what has changed. A clear picture of your configuration helps plan for—and recover from—disasters. Also, well-organized documentation helps new Exchange administrators come up to speed quickly.

Windows NT or Win2K settings affecting Exchange include:

- Server hardware configurations and parameters—eg, RAID array information, disk partitioning, processor, memory, NIC information

- Windows OS data—versions, service packs, hot fixes and installation details

- TCP/IP protocols and other network configurations, notably DNS

- Versions and installation details of other services and applications

Exchange specific settings include:

- Exchange installation details—versions, service packs, hot fixes

- Exchange database and log file physical disk locations and paths

- Connectors—type and specific settings. (E2K is quite different from E5.5 in this area.)

- Server and site routing

- IS maintenance and index settings

- Service account usernames—and passwords (these should be written down and secured)

User, Mailbox and Public Folder Configuration

To simplify management, most organizations set policies governing Exchange mailbox object and public folder object properties. These properties include:

- Mailbox permissions, ownership and delegations

- Mailbox item retention policy

- Mailbox storage and other size limits

- Deleted item recovery settings

- Public information store characteristics

- Public folder policies—naming standards, authorized modifiers

Organizations also set configuration policies on AD and the E5.5 directory objects. These include:

- User and account information

- Distribution list and group information

- Access permission for all Exchange objects

Managing Configuration with Exchange 5.5 Administrator

Exchange Administrator in E5.5 displays and controls the system configuration. However, it shows this information one server at a time. For example, the Server Mailbox view in figure 2 (see next page) lists mailbox data for users on just one server. If you want to aggregate this data across all sites, you have to open several different windows in Exchange Administrator.

Third-party tools can collect that information into one view or report. They also store the state of your system for later comparisons to discover what has changed.

Windows grants access to Exchange Administrator on an all-or-nothing basis. This presents obstacles to distributed administration. Some third-party tools provide role-base administration that grants some access—eg, creating mailboxes—to help desk or departmental personnel.

Figure 2   **E5.5 mailbox window showing mailbox disk space, number of items, and last logon time for users on a single server**
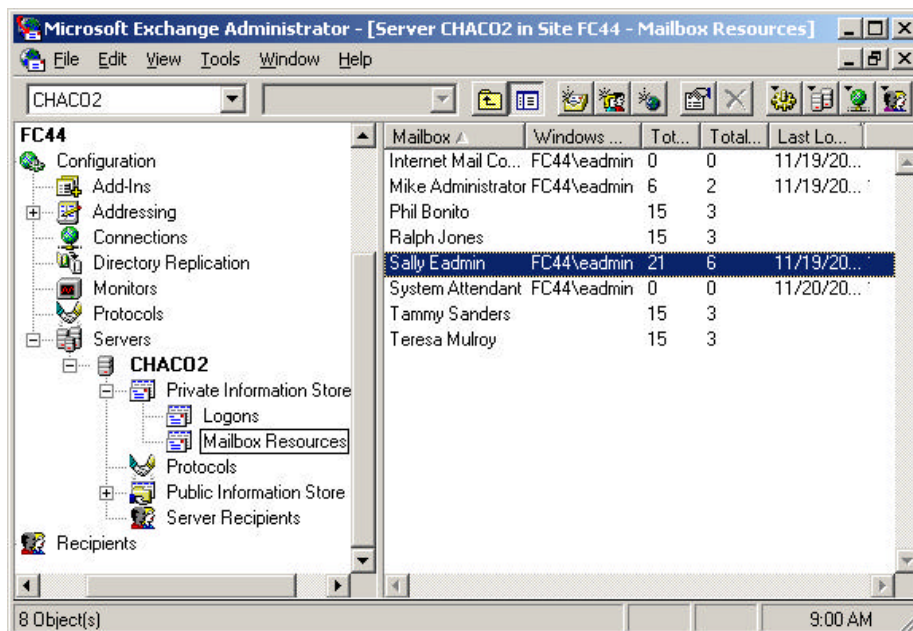
Managing Configuration with E2K System Manager

Win2K Server provides a unified management interface via the *Microsoft Management Console* (MMC). The E2K Exchange System Manager is an MMC snap-in. It is well integrated with other Win2K and AD native tools and offers improved configuration management.

Figure 3 (see next page) shows the Exchange System Manager. The user is viewing similar data to that shown in figure 2 under Exchange Administrator.

AD manages E2K users and groups. The Win2K MMC provides a snap-in for managing them. With Active Directory Connectors (ADC) in place, administrators can manage address books for both E2K and E5.5 users from the Win2K MMC. This is beneficial, but in mixed-mode Exchange organizations, E5.5 server and mailbox management still requires Exchange Administrator. Organizations seeking more unified management consoles have to look to third-party vendors.

Managing Message Store and Directory

Many day-to-day Exchange administration tasks consist of operations on mailboxes, public folders and the E5.5 Directory or AD, including:

- Creating and deleting mailboxes, distribution lists, public folders and containers, along with NT or AD user accounts, groups and organizational units

- Moving mailboxes and distribution lists between Exchange sites, servers or containers

- Modifying mailbox attributes

- Moving, copying or deleting mailbox items

- Moving and copying public folders

- Moving, copying or deleting public folder items

- Modifying public folder attributes

Working with directory objects is also a regular management activity. Typical operations include:

- Adding and removing users from groups and distribution lists

- Adding, modifying and deleting email addresses

- Moving users to new sites or AD organizational units

Figure 3   **E2K mailbox view. The E2K System Manager is an MMC snap-in**
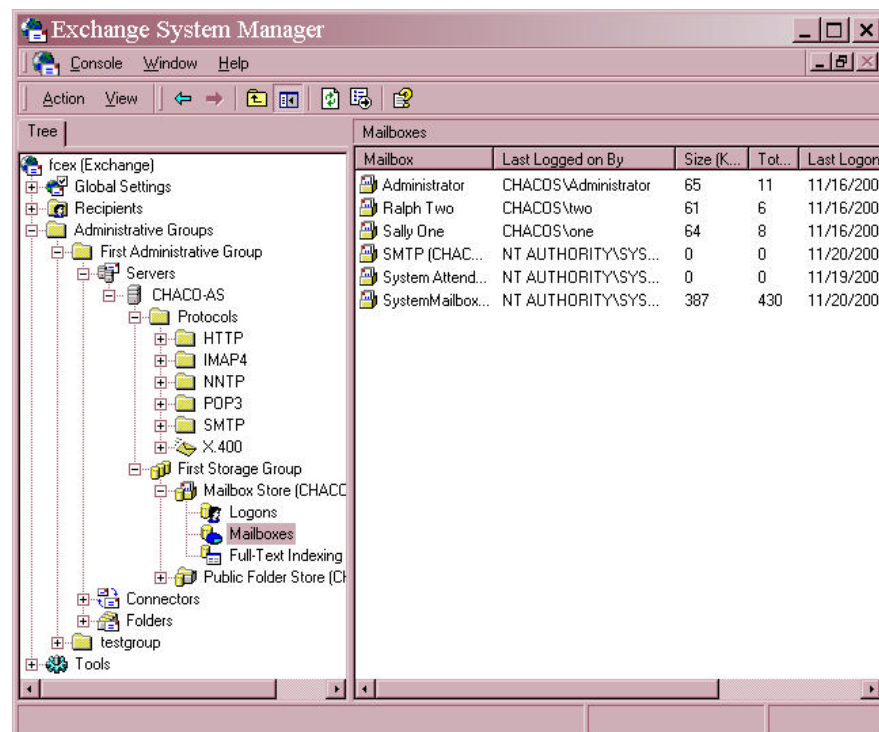
BindView's Offerings

The BindView product families, *bv-Control* and *bv-Admin*, each contain a solution for addressing specific Microsoft Exchange management challenges.

bv-Control is a suite of products for managing system and application security, availability and configuration. There are separate bv-Control products for AD, Windows, UNIX, SAP R/3,and others. bv-Control modules—including bv-Control for Microsoft Exchange—share a user interface called the *BindView RMS Console*. The BindView RMS Console is a MMC snap-in and provides a uniform and extendable platform for BindView's tools.

bv-Admin is a role-based directory management product based on technology BindView acquired when it purchased Entevo in February 2000. When configured with appropriate modules, it provides single-point administration of NT domains, AD, NDS and the E5.5 directory. The product focus is role-based administration of cross-directory objects and directory migration. Since bv-Admin is a cross-platform tool, it has its own user interface; either a management console or web access.

bv-Control for Microsoft Exchange

This product performs three types of operations. It 1) Builds query-generated reports integrating information from Exchange servers across the enterprise; 2) Performs real-time monitoring of Exchange and IIS servers; and 3) Performs certain advanced administrative tasks.

Query-Generated Reports and Charts

As shown in figure 4 (see next page), bv-Control for Microsoft Exchange ships with pre-defined queries that are grouped by function. There are over 100 of these reports included with the product. When run, queries generate a dataset that can be viewed via a simple table called a *grid,* or in report or graph format. The same data can be charted in numerous ways, exported to a spreadsheet or saved for later analysis. A typical query collects data from some type of object—eg, user mailboxes—from across the Exchange organization. It is not limited to a single server or site.

Figure 4 **bv-Control for Microsoft Exchange showing pre-defined mailbox management queries**
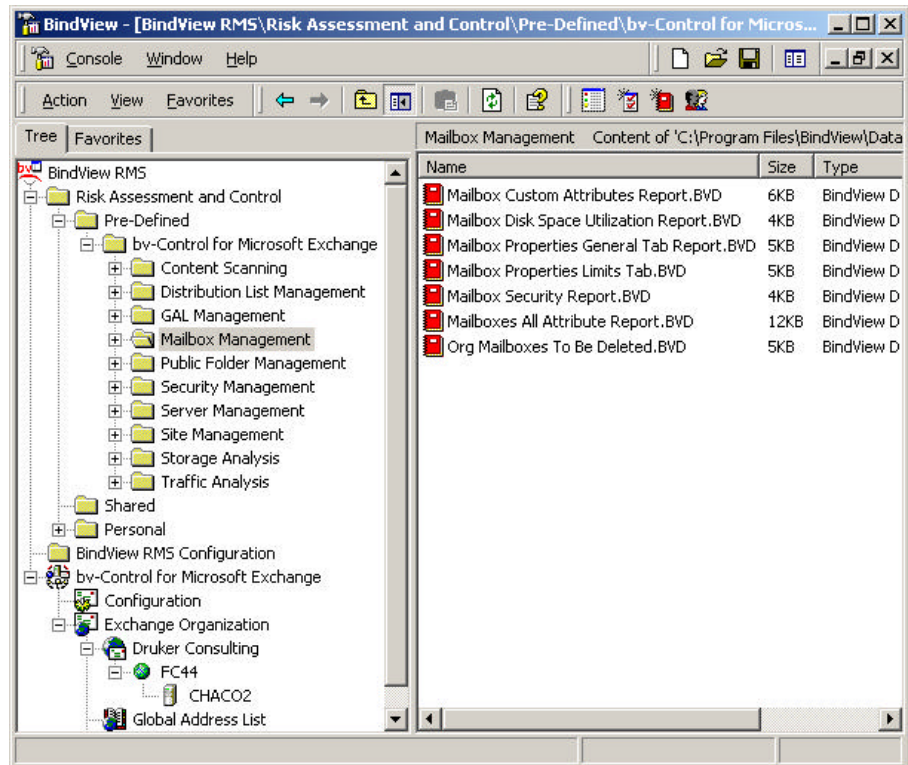
The right-hand pane in the figure window lists the packaged queries for mailbox management. Each query generates a report of related mailbox properties. A right-click pulls up an interface called the *Query Builder* that lets the user include additional fields, filter on field values or sort the results.

Real-Time Monitoring

Administrators can also monitor Exchange servers across the enterprise with bv-Control. Windows services run on the network to collect data from Exchange servers and relay it to a central engine called the *Event Database Server* (EDBS). Note that bv-Control does not require agents on monitored servers, so there is no performance penalty for this multi-tiered architecture.

The EDBS provides event data to the RMS Console, sends alerts and stores alert data in a Microsoft SQL Server database. This maintains a historical record for later analysis and comparison.

Scripts—written in VBScript—determine what is monitored and the alert levels for each server. The product ships with about 80 pre-defined scripts. It also provides a *Script Generation Wizard* to create custom solutions. This provides great flexibility without the burden of manual programming.

The services collect data from a variety of sources. These include:

- Windows Performance Monitor counters
- Event logs
- Services
- Exchange client log-on and server delivery times

Mailbox and Public Folder Administration

Moving users between E5.5 sites has been a problematic operation. Without bv-Control, moving mailboxes requires the following steps:

- Create a mailbox on the new server
- EXMerge data from the old mailbox to a .pst file
- Move the .pst file to the new server
- EXMerge the .pst file to the new mailbox on the new server
- Delete the .pst from the server
- Notify the user that the mailbox has been moved
- Delete the mailbox on the old server

bv-Control makes it a drag-and-drop operation. The product also makes quick work of making distribution lists of all users on a single server and creating server aliases.

bv-Control also includes *ActiveAdmin*. This adds two types of functionality: 1) Copy/move/delete messages listed in reports; and 2) Modify mailbox public folder attributes from within reports. ActiveAdmin can modify values for over 50 different attributes including message size limits, user demographics and public folder custom attributes.

This is how it works. An administrator prepares a query and runs it to get a report, as usual. If the results suggest an attribute change or action on a message, the administrator can do that directly in bv-Control by selecting the specific result and changing its value.

bv-Admin for Microsoft Exchange

bv-Admin's main value in a mixed-mode E2K/E5.5 environment is single-point and distributed management of directory objects. *Active Directory Connector* (ADC), which comes with E2K, keeps AD and E5.5 directories in sync, but does not provide full management of E5.5 users and mailboxes from within AD.

The bv-Admin product line provides most of the missing functionality. Key features include:

- Creating/updating/deleting mailboxes and distribution lists concurrent with Windows NT and AD users and groups

- Creating/updating/deleting public folders and permissions

- Setting mailbox and distribution list, storage and size limits

- Setting other mailbox and user properties at the same time

- Controlling E5.5 directory container, object properties and permissions

- Establishing administrative roles in E5.5 and E2K and delegating them to the appropriate staff

The latest version of bv-Admin fully supports E2K and includes:

- Integrated management of mixed-mode E2K/E5.5 users and groups.

- Find-and-fix from within reports. This helps distribute routine user and group maintenance to the help desk or down to the department or workgroup level.

- Role-based delegation. This helps distribute routine user and group maintenance to the help desk or down to the department or workgroup level.

Figure 5 (see next page) shows how bv-Admin performs role-based delegation by assigning access rights to a specific role. In this figure, the "Mailbox Administrator" has read access to all Exchange objects and read, write, delete, create, modify native permission and read native permissions access to mailbox objects.

Figure 5 **bv-Admin for Microsoft Exchange role management. The role of mailbox administrator is being granted rights to Exchange mailbox objects.**
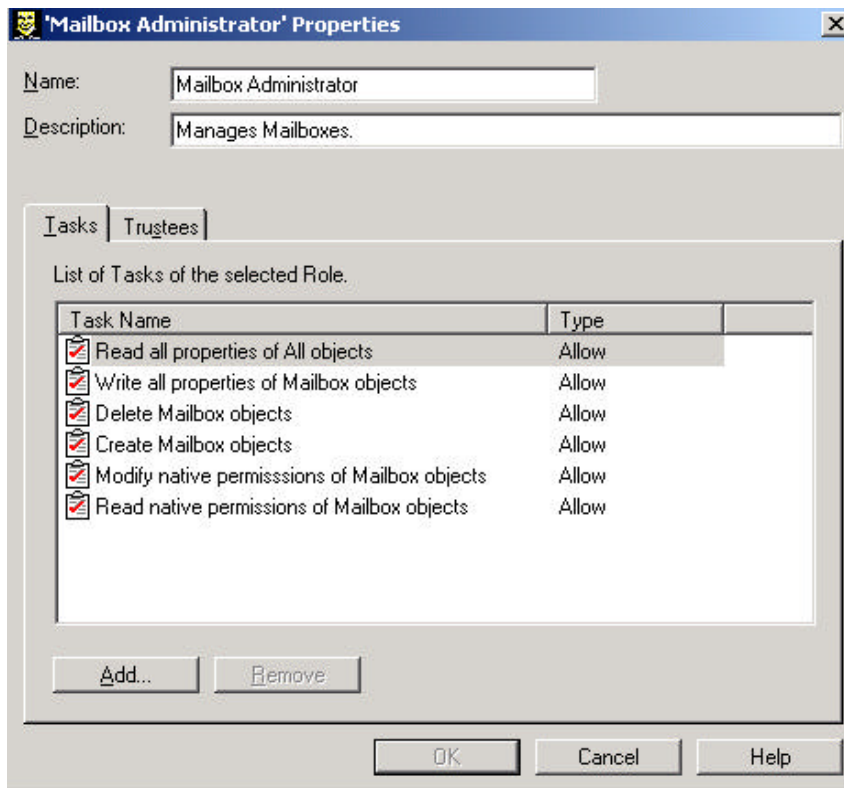
Summary

BindView's Exchange products together help ensure messaging systems meet the business objectives of security, availability, user functionality and cost effectiveness. Differentiators include:

- bv-Control's MMC interface, which provides tight integration with other Microsoft and third-party management tools, such Diskeeper

- An agent-less architecture, which requires no agents on monitored servers, makes installation simpler and ensures no performance overhead for Exchange

- bv-Control's script wizard, which makes it easy to add custom queries and generate custom reports

- bv-Control's Active Admin, which lets administrators change mailbox and public folder properties from within reports, as well as copy/move/delete capabilities for messages with specific contents

- bv-Admin's web console, which provides remote administration of users in both E5.5 and E2K systems

- bv-Admin's cross-directory capability, which enables integrated user administration of E2K/5.5 and Win2K/NT

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