



Exchange Server 2007 Cluster mit Cluster Continuous Replication (CCR)

Marc Grote

IT Trainer und Consultant

Agenda

- Exchange Server 2007 Grundlagen
- Exchange Server 2007 Serverrollen
- Exchange 2007 Hochverfügbarkeitskonzepte
- Clustergrundlagen
- LCR (Local Continuous Replication)
- SCC (Single Copy Cluster)
- CCR (Cluster Continuous Replication)
- Clusterarten
- Windows Cluster Konfiguration + File Share Witness
- Exchange Cluster Installation
- EXBPA
- Outlook Konfiguration
- Failover + Failback
- Tools

Exchange Server 2007 Grundlagen

- Performance Erweiterungen
- 64 Bit, Pagesize von 4 auf 8 KB
- Active Directory Standort Integration
- Keine Routinggruppen mehr
- Routing basiert auf Active Directory Standorten
- Minimierung des Netzwerk Traffics
- Exchange 2007 routet mit der Anzahl minimaler Hops
- Jede Active Directory Site ist ein Hop
- Recipient Resolution
- Der Bridgehead Server expandiert die Verteilerlisten, führt Active Directory Abfragen durch und löst Empfänger gegen das Active Directory auf.
- Der Bridgehead Server ist "Site Aware" und kommuniziert mit einem DC in der Site
- Message Conversion
- Ein Exchange 2007 Bridgehead Server ist in der Lage eine Nachrichtenkonvertierung basierend auf dem originalen Mailinhalt und dem Zielsystem durchzuführen
- Verfügbarkeit - Der Nachrichtenfluss zwischen mehreren E-Mail Servern und Bridgeheadservern wird automatisch Load Balanced
- Automatisches Failover bei Ausfall eines Bridgeheadservers
- Service Discovery Remote Benutzer nutzen Service Discovery um automatisch einen Server mit der Client Access Server Rolle zu finden, welcher die entsprechenden Dienste anbietet

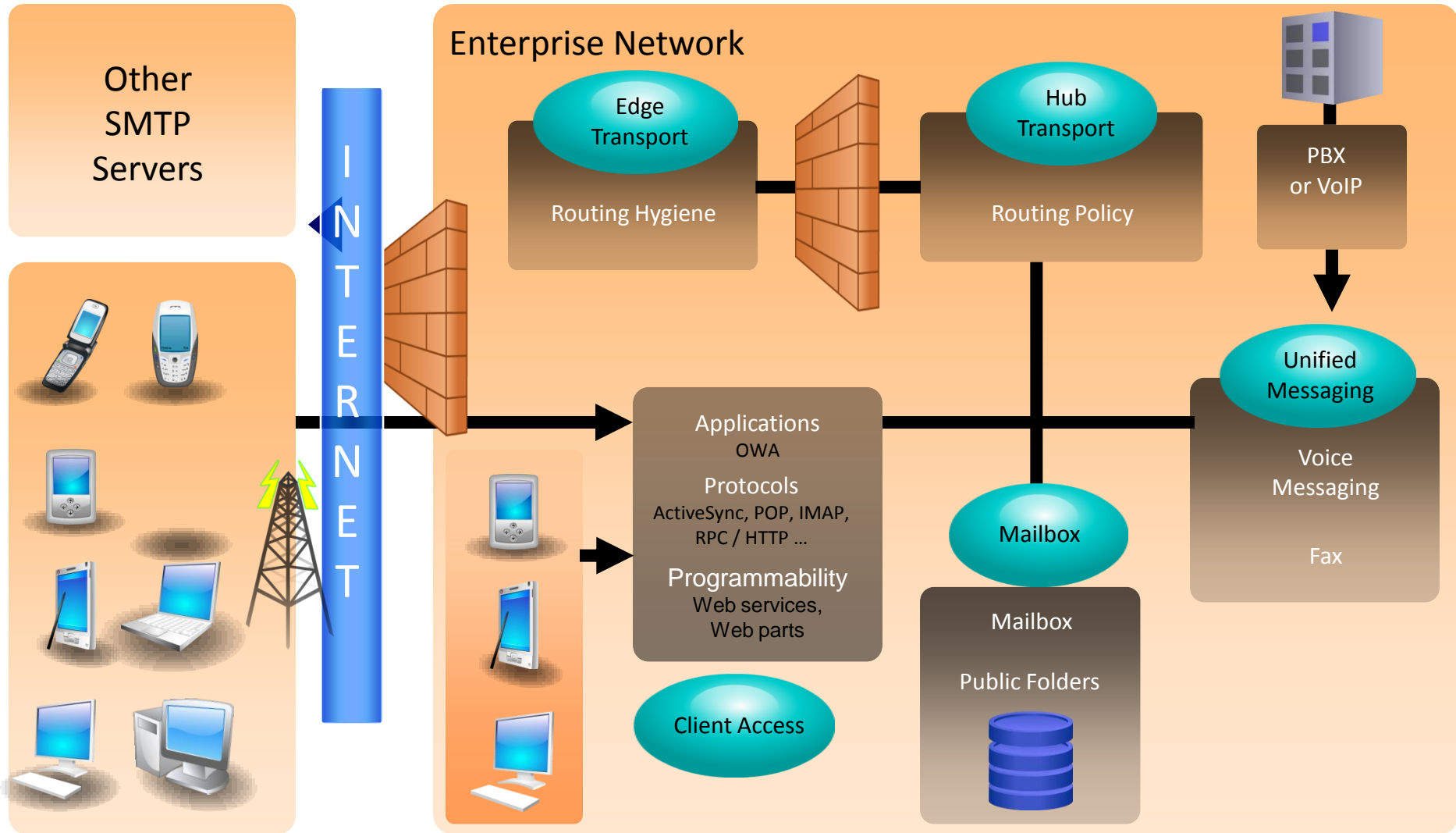
Exchange Server 2007 Grundlagen

- ◆ Rollen basierte Exchange Server Installationen
- ◆ 50 Speichergruppen
- ◆ 50 Datenbanken (maximal pro Server)
- ◆ Pagesize vergrößert von 4 KB auf 8 KB
- ◆ Kommandozeilensupport – “Monad” - PowerShell
- ◆ Keine STM Dateien mehr
- ◆ Maximal 2 Billionen Logfiles
- ◆ 14 Tage “Dumpster”
- ◆ Local Continuous Replication (LCR)
- ◆ Cluster Continuous Replication (CCR)
- ◆ Outlook Voice Access
- ◆ Nur 64 bit (32 Bit zu Testzwecken)
- ◆ Kein Active/Active Cluster
- ◆ Kein OMA mehr
- ◆ Kein NNTP mehr

Exchange Server 2007 Serverrollen

- Mailbox Server
- Client Access Server
- Hub Transport Server
- Unified Messaging Server
- Edge Transport Server

Serverrollen

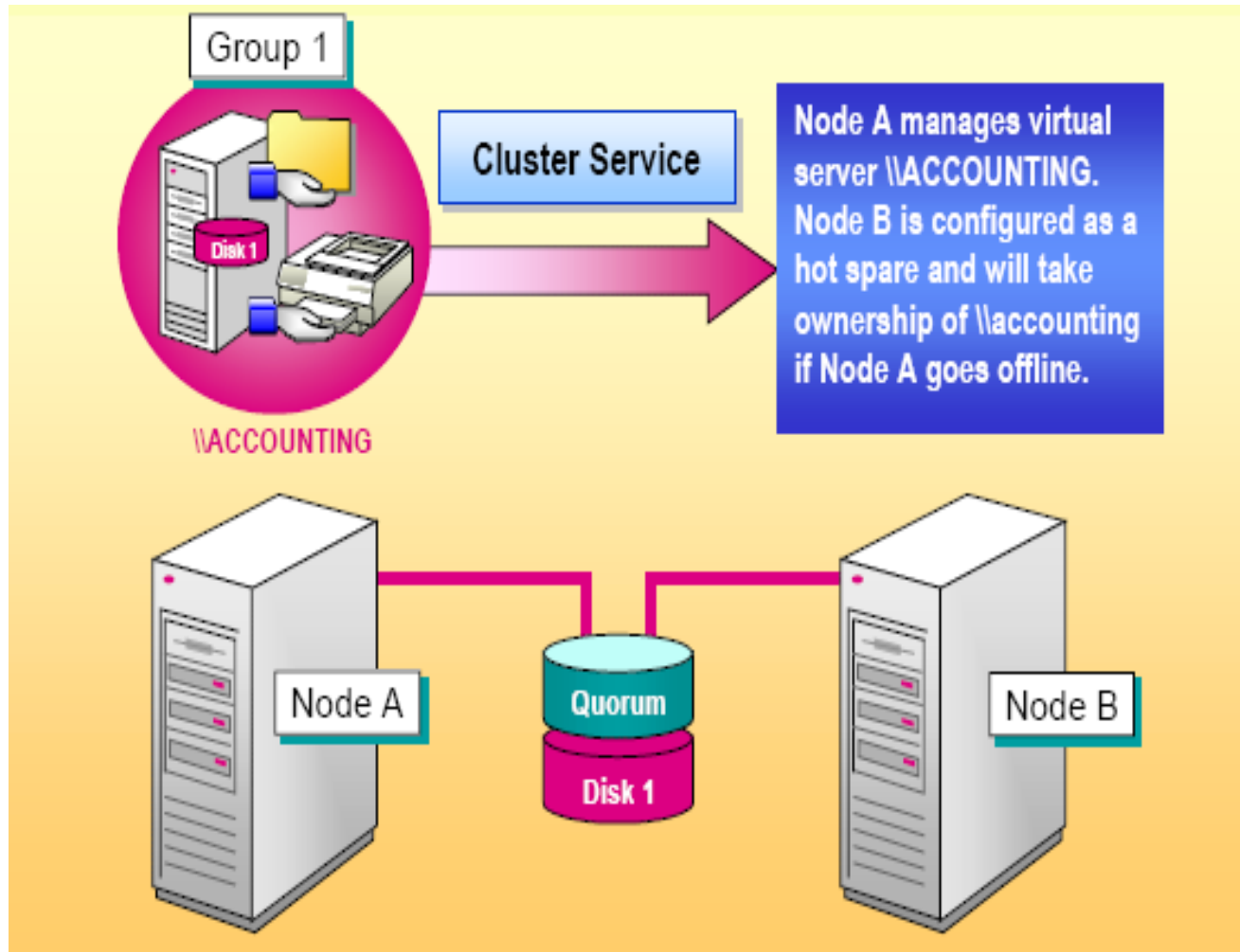


Clustergrundlagen

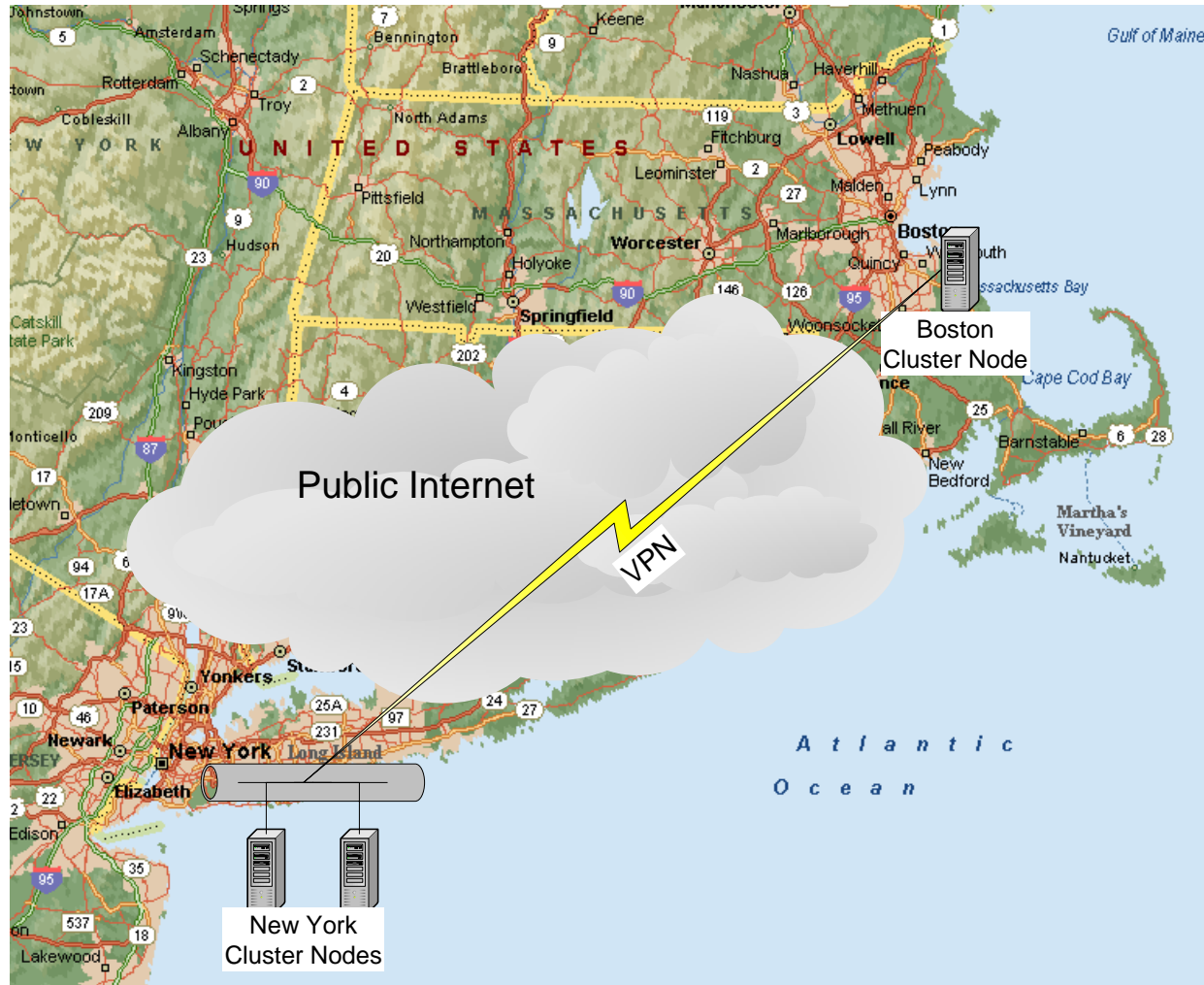
- Ein Cluster, von engl. cluster = Traube, Bündel, Schwarm, genannt, bezeichnet eine Anzahl von vernetzten Computern, die zur parallelen Abarbeitung von zu einer Aufgabe gehörigen Teilaufgaben zur Verfügung stehen. Im Gegensatz zu Parallelrechnern findet die Lastverteilung auf der Ebene einzelner Prozesse statt, die auf einer oder verschiedenen Maschinen des Clusters gestartet werden. Man benötigt also keine parallelisierte Software oder spezielle Betriebssysteme. Alternativ werden Cluster auch zum Steigern der Verfügbarkeit von Systemen genutzt

Quelle: <http://de.wikipedia.org/wiki/Computercluster>

Active / Passive Cluster



Geo Cluster



Anzahl Clusterknoten

Windows Server 2003

- Windows Server 2003 Enterprise und Windows Server 2003 Datacenter unterstützen maximal 8 Clusterknoten
- Keine Clusterunterstützung für Windows Server 2003 Web Edition und Windows Server 2003 Standard

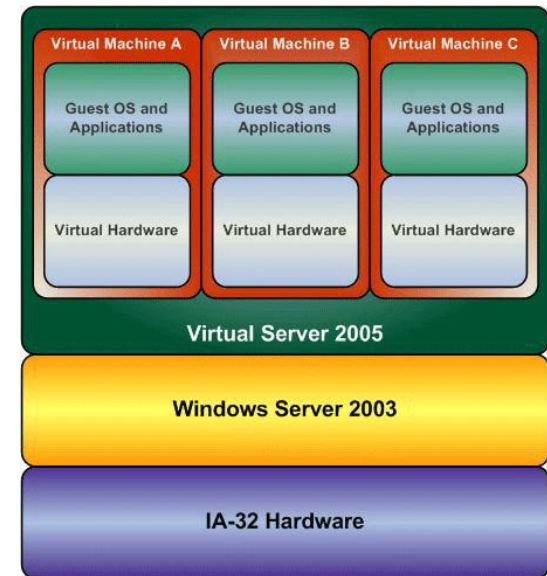
Windows 2000 Server

- Windows 2000 Advanced Server 2 Clusterknoten und Windows 2000 Datacenter Server 4 Clusterknoten
- Keine Clusterunterstützung für Windows 2000 Server Standard

Virtual Server 2005 R2 Sp1

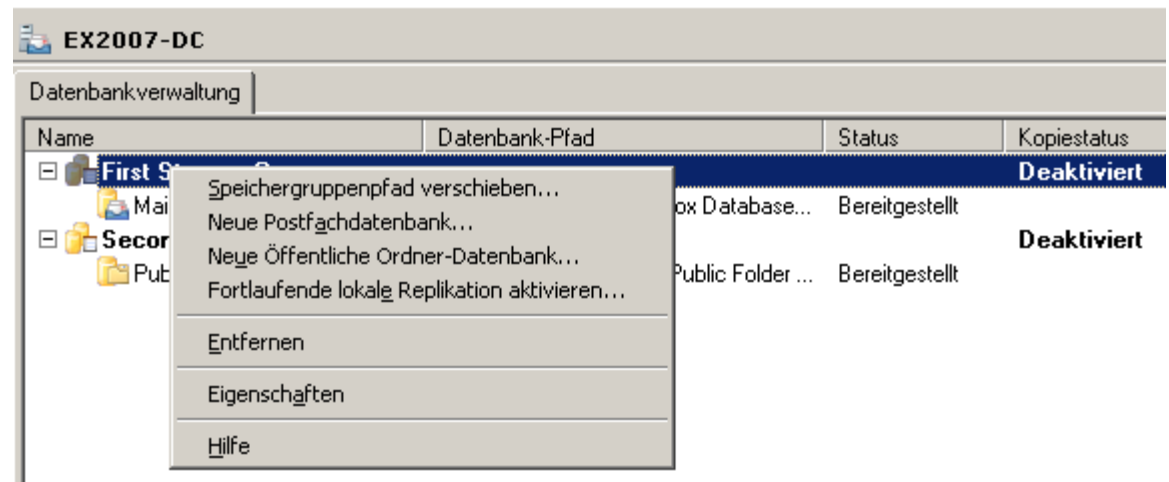
- Kostenlose Virtualisierungssoftware von Microsoft
- Emuliert einen kompletten PC/Server
- Erhältlich als Enterprise Version
- Scriptingfähig
- Ressourcenbegrenzung möglich
- Weboberfläche
- Das Produkt stammt ehemals von Connectix
- Kleiner Bruder ist der Microsoft Virtual PC

- Mitbewerber VMware
 - VMware Workstation
 - VMware Server (kostenlos) – Vergleichbar mit MS Virtual Server
 - VMware ESX Server – Eigenes Betriebssystem / Dateisystem – Enterprise Einsatz

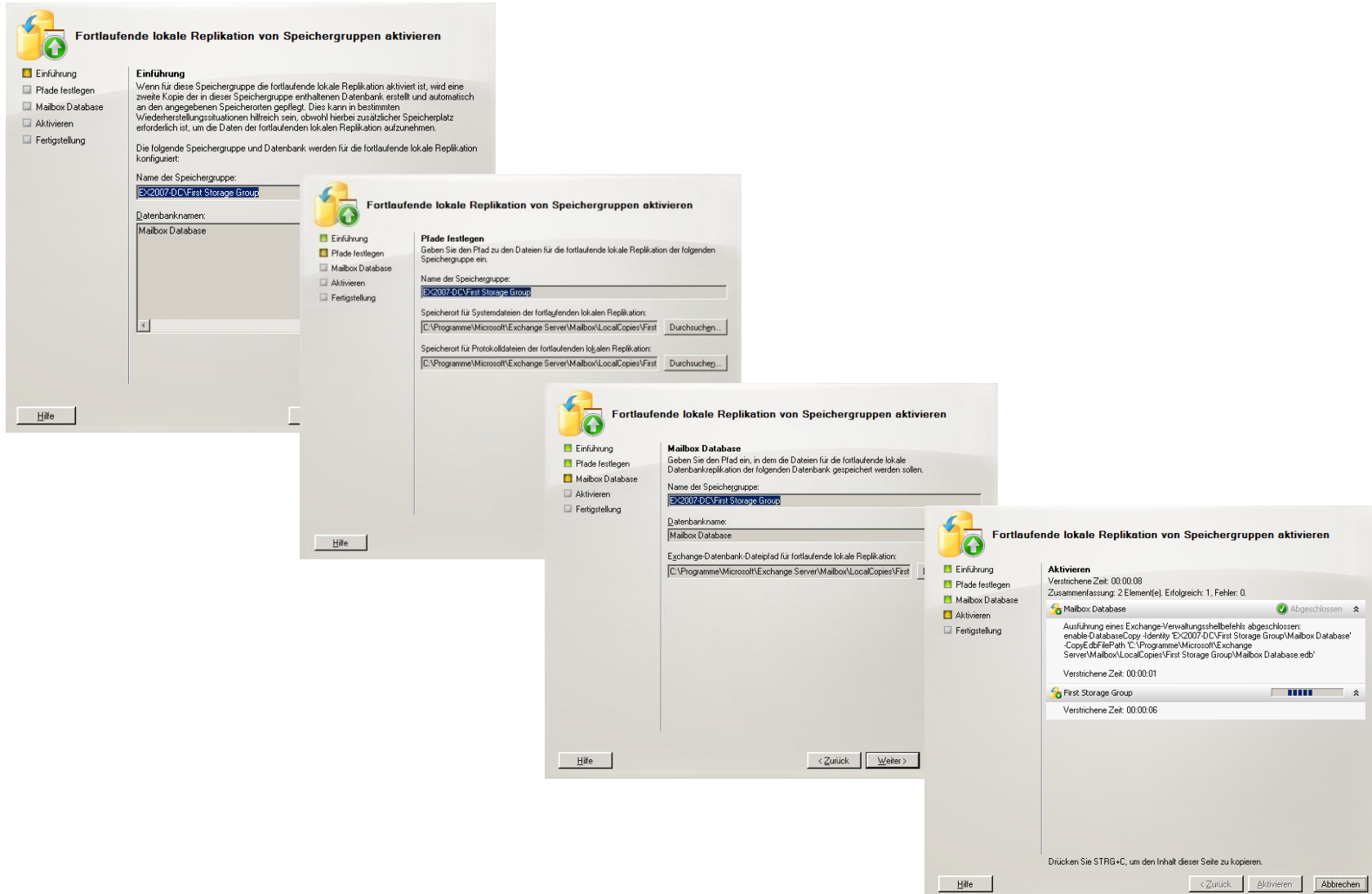


Local Continuous Replication (LCR)

- Lokale Kopie einer Postfach-Datenbank mit Transaktionsreplikation
- Kein Ersatz für ein Backup
- iSCSI, SAN möglich
- Kein LCR für öffentliche Ordner
- Kein UNC Pfad



Local Continuous Replication (LCR)



Fortlaufende lokale Replikation von Speichergruppen aktivieren

Einführung
 Pfad festlegen
 Mailbox Database
 Aktivieren
 Fertigstellung

Wenn für diese Speichergruppe die fortlaufende lokale Replikation aktiviert ist, wird eine zweite Kopie der in dieser Speichergruppe enthaltenen Datenbank erstellt und automatisch an den angegebenen Speicherorten gepflegt. Dies kann in bestimmten Wiederherstellungssituationen hilfreich sein, obwohl hierbei zusätzlicher Speicherplatz erforderlich ist, um die Daten der fortlaufenden lokalen Replikation aufzunehmen.

Die folgende Speichergruppe und Datenbank werden für die fortlaufende lokale Replikation konfiguriert:

Name der Speichergruppe:
 EX2007-DC-First Storage Group

Datenbanknamen:
 Mailbox Database

Fortlaufende lokale Replikation von Speichergruppen aktivieren

Pfad festlegen
 Geben Sie den Pfad zu den Dateien für die fortlaufende lokale Replikation der folgenden Speichergruppe ein.

Name der Speichergruppe:
 EX2007-DC-First Storage Group

Speicherort für Systemdateien der fortlaufenden lokalen Replikation:
 C:\Programme\Microsoft\Exchange Server\Mailbox\LocalCopies\First Durchsuchen...

Speicherort für Protokolldateien der fortlaufenden lokalen Replikation:
 C:\Programme\Microsoft\Exchange Server\Mailbox\LocalCopies\First Durchsuchen...

Fortlaufende lokale Replikation von Speichergruppen aktivieren

Mailbox Database
 Geben Sie den Pfad ein, in dem die Dateien für die fortlaufende lokale Datenbankreplikation der folgenden Datenbank gespeichert werden sollen.

Name der Speichergruppe:
 EX2007-DC-First Storage Group

Datenbankname:
 Mailbox Database

Exchange-Datenbank-Dateipfad für fortlaufende lokale Replikation:
 C:\Programme\Microsoft\Exchange Server\Mailbox\LocalCopies\First

Fortlaufende lokale Replikation von Speichergruppen aktivieren

Aktivieren
 Verstrichene Zeit: 00:00:08
 Zusammenfassung: 2 Element(e) Erfolgreich: 1, Fehler: 0

Mailbox Database Abgeschlossen

Ausführung eines Exchange-Verwaltungsbefehls abgeschlossen:
 enable-DatabaseCopy -Identity 'EX2007-DC-First Storage Group\Mailbox Database'
 -CopyEdbFilePath 'C:\Programme\Microsoft\Exchange Server\Mailbox\LocalCopies\First Storage Group\Mailbox Database.edb'

Verstrichene Zeit: 00:00:01

First Storage Group

Verstrichene Zeit: 00:00:06

Drücken Sie STRG+C, um den Inhalt dieser Seite zu kopieren.

Local Continuous Replication (LCR)

EX2007-DC

Datenbankverwaltung

Name	Datenbank-Pfad	Status	Kopierstatus
First S...	...	Bereitgestellt	Fehlerfrei
Second...	...	Deaktiviert	...

Speichergruppenpfad verschieben...
 Neue Postfachdatenbank...
 Neue Öffentliche Ordner-Datenbank...
 Fortlaufende lokale Replikation deaktivieren
 Fortlaufende lokale Replikation anhalten

Entfernen
 Eigenschaften
 Hilfe

C:\Programme\Microsoft\Exchange Server\Mailbox\First Storage Group

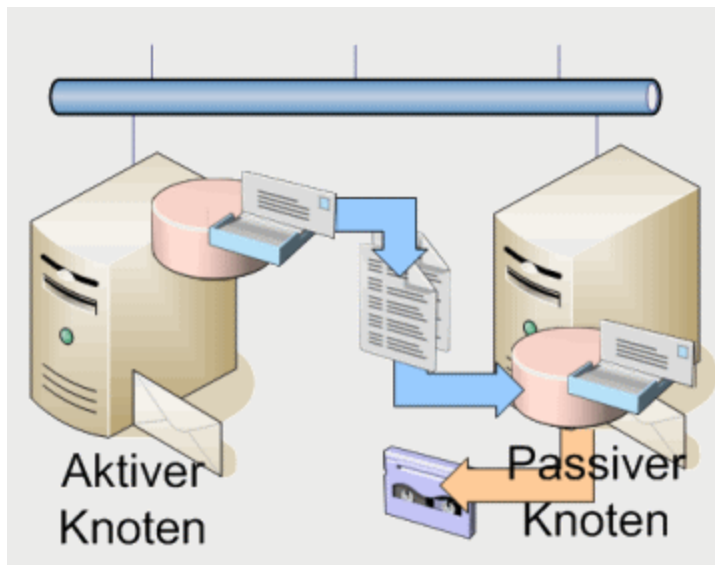
Ordner

- Lokaler Datenträger (C:)
 - Config.Msi
 - Dokumente und Einstellungen
 - ExchangeSetupLogs
 - Inetpub
 - MNSFILESHARE
 - Programme
 - Adobe
 - Common Files
 - ComPlus Applications
 - Exchange Load Generator
 - Exchsrvr
 - Gemeinsame Dateien
 - Internet Explorer
 - Microsoft
 - Exchange Server
 - Bin
 - ClientAccess
 - Logging
 - Mailbox
 - address
 - First Storage Group
 - CatalogData-8af8c711-d17f-481e-9063-0121cf333499-cc6*
 - LocalCopies
 - First Storage Group
 - ignoredLogs
 - inspector
 - MDBTEMP
 - schema
 - Second Storage Group
 - Public
 - Scripts
 - Setup
 - TransportRoles
 - UnifiedMessaging
 - Workitem

Name	Größe	Typ	Geändert am
CatalogData-8af8c711-d17f-...		Dateiordner	20.01.2007 10:28
E00.chk	8 KB	Wiederhergestellte ...	30.01.2007 08:41
E00.log	1.024 KB	Textdokument	30.01.2007 08:41
E0000000F4.log	1.024 KB	Textdokument	20.01.2007 10:38
E0000000F5.log	1.024 KB	Textdokument	20.01.2007 10:40
E0000000F6.log	1.024 KB	Textdokument	20.01.2007 10:40
E0000000F7.log	1.024 KB	Textdokument	20.01.2007 10:47
E0000000F8.log	1.024 KB	Textdokument	20.01.2007 10:47
E0000000F9.log	1.024 KB	Textdokument	20.01.2007 10:52
E0000000FA.log	1.024 KB	Textdokument	20.01.2007 11:03
E0000000FB.log	1.024 KB	Textdokument	20.01.2007 11:03
E0000000FC.log	1.024 KB	Textdokument	20.01.2007 11:09
E0000000FD.log	1.024 KB	Textdokument	20.01.2007 11:25
E0000000FE.log	1.024 KB	Textdokument	20.01.2007 11:40
E0000000FF.log	1.024 KB	Textdokument	20.01.2007 11:55
E00res00001.jrs	1.024 KB	JRS-Datei	16.01.2007 10:37
E00res00002.jrs	1.024 KB	JRS-Datei	16.01.2007 10:37
E00tmp.log	0 KB	Textdokument	30.01.2007 08:41
E00000010A.log	1.024 KB	Textdokument	20.01.2007 14:41
E00000010B.log	1.024 KB	Textdokument	20.01.2007 14:56
E00000010C.log	1.024 KB	Textdokument	20.01.2007 15:11
E00000010D.log	1.024 KB	Textdokument	20.01.2007 15:26
E00000010E.log	1.024 KB	Textdokument	20.01.2007 15:41
E00000010F.log	1.024 KB	Textdokument	20.01.2007 15:56
E00000011A.log	1.024 KB	Textdokument	20.01.2007 18:42
E00000011B.log	1.024 KB	Textdokument	20.01.2007 18:57
E00000011C.log	1.024 KB	Textdokument	20.01.2007 19:12
E00000011D.log	1.024 KB	Textdokument	20.01.2007 19:27
E00000011E.log	1.024 KB	Textdokument	20.01.2007 19:42
E00000011F.log	1.024 KB	Textdokument	20.01.2007 19:57
E00000012A.log	1.024 KB	Textdokument	21.01.2007 22:44
E00000012B.log	1.024 KB	Textdokument	21.01.2007 22:44
E00000012C.log	1.024 KB	Textdokument	22.01.2007 16:13
E00000012D.log	1.024 KB	Textdokument	23.01.2007 13:59
E00000012E.log	1.024 KB	Textdokument	23.01.2007 14:15
E00000012F.log	1.024 KB	Textdokument	23.01.2007 14:30

Single Copy Cluster (SCC)

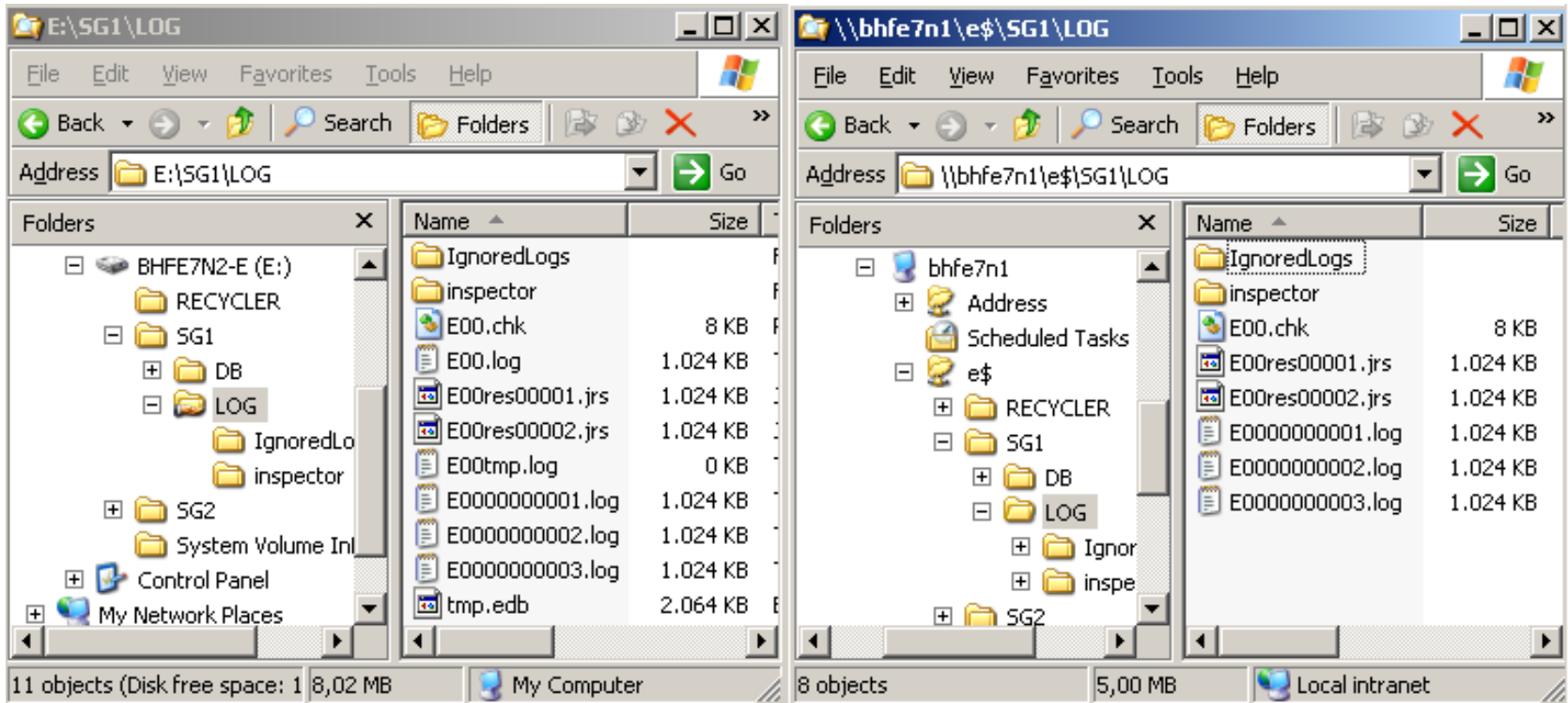
- Kein Active/Active Cluster mehr
- Ausschliesslich Active/Passive
- Prinzip wie bei Exchange 2003



Cluster Continuous Replication

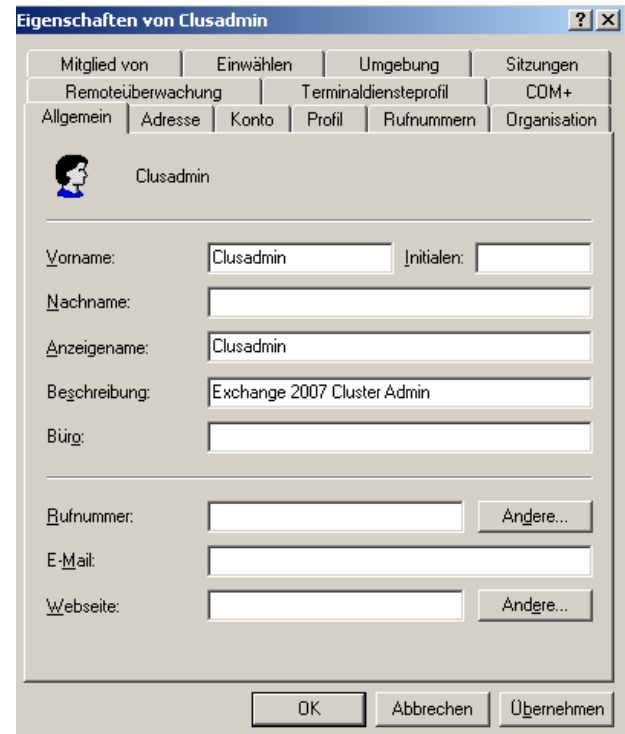
- Kopie einer Exchange Datenbank auf räumlich getrennten Clusterknoten
- Datenbank wird per Transaktionsreplikation repliziert
- Kein Shared Storage (Quorum) notwendig
- Voraussetzung MNS (Majority Node Set)
- Dritter Rechner als Witness (Zeuge) notwendig
- Im K-Fall minimaler Datenverlust möglich

Cluster Continuous Replication



Cluster Account

- Cluster Account anlegen
- Name = Clusadmin
- Vollständige Exchange Berechtigungen
- Lokale Windows Admin Berechtigungen auf den Cluster Knoten
- Kennwort darf nicht ablaufen



The screenshot shows the 'Eigenschaften von Clusadmin' dialog box. The 'Allgemein' tab is selected. The fields are filled as follows:

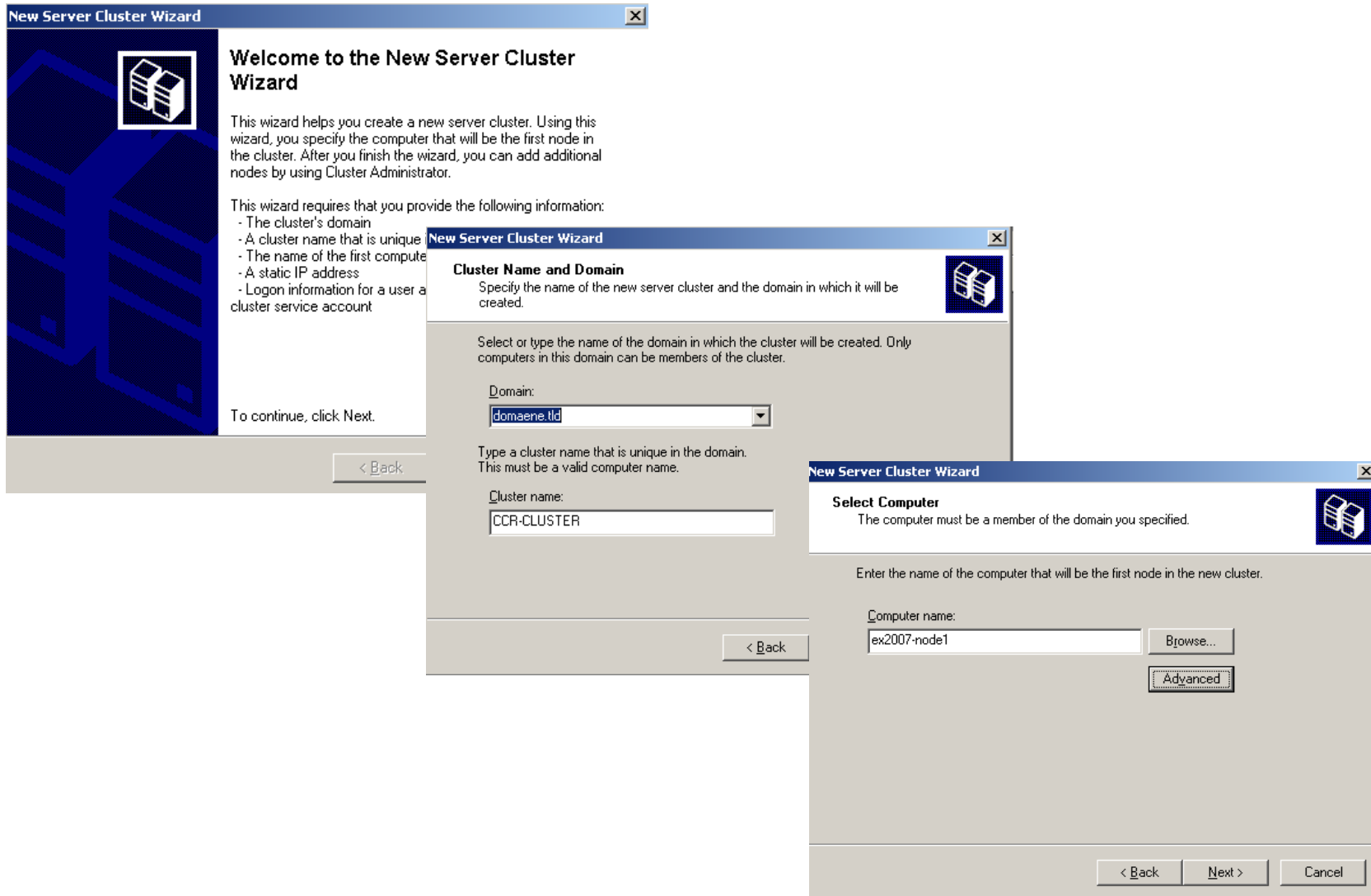
Field	Value
Vorname	Clusadmin
Nachname	
Anzeigename	Clusadmin
Beschreibung	Exchange 2007 Cluster Admin
Bürger	
Rufnummer	
E-Mail	
Webseite	

Buttons at the bottom: OK, Abbrechen, Übernehmen.

Windows Installation (Cluster)

- Windows 2003 SP1 oder R2
- IIS installieren (kein SMTP/NNTP)
- .NET Framework 2.0
- .NET Hotfix 926776
- Powershell
- MMC 3.0

Cluster Installation



The image shows three overlapping windows from the 'New Server Cluster Wizard' in Windows Server. The largest window on the left is the 'Welcome to the New Server Cluster Wizard' screen. It contains an icon of a server rack and the following text: 'Welcome to the New Server Cluster Wizard', 'This wizard helps you create a new server cluster. Using this wizard, you specify the computer that will be the first node in the cluster. After you finish the wizard, you can add additional nodes by using Cluster Administrator.', 'This wizard requires that you provide the following information:', a list of requirements (domain, unique cluster name, first computer name, static IP address, and logon information), and a '< Back' button. The middle window is titled 'Cluster Name and Domain' and asks to specify the domain and cluster name. It has a dropdown for 'Domain' with 'domaene.tld' selected and a text box for 'Cluster name' containing 'CCR-CLUSTER'. It also has a '< Back' button. The smallest window on the right is titled 'Select Computer' and asks for the name of the first node. It has a text box with 'ex2007-node1', a 'Browse...' button, an 'Advanced' button, and 'Back', 'Next >', and 'Cancel' buttons at the bottom.

New Server Cluster Wizard

Welcome to the New Server Cluster Wizard

This wizard helps you create a new server cluster. Using this wizard, you specify the computer that will be the first node in the cluster. After you finish the wizard, you can add additional nodes by using Cluster Administrator.

This wizard requires that you provide the following information:

- The cluster's domain
- A cluster name that is unique in the domain
- The name of the first computer
- A static IP address
- Logon information for a user or a cluster service account

To continue, click Next.

< Back

New Server Cluster Wizard

Cluster Name and Domain

Specify the name of the new server cluster and the domain in which it will be created.

Select or type the name of the domain in which the cluster will be created. Only computers in this domain can be members of the cluster.

Domain:
domaene.tld

Type a cluster name that is unique in the domain. This must be a valid computer name.

Cluster name:
CCR-CLUSTER

< Back

New Server Cluster Wizard

Select Computer

The computer must be a member of the domain you specified.

Enter the name of the computer that will be the first node in the new cluster.

Computer name:
ex2007-node1

Browse...

Advanced

< Back Next > Cancel

Cluster Installation

New Server Cluster Wizard

Analyzing Configuration
Please wait while the wizard determines the cluster configuration.

- ☑ ✓ Checking for existing cluster
- ☑ ✓ Establishing node connection(s)
- ☑ ✓ Checking node feasibility
- ☐ ⚠ Finding common resources on nodes
 - ☑ ✓ ex2007-node1: Collecting managed resources...
 - ☑ ✓ ex2007-node1: The following disks will not be managed by the cluster:
 - ☑ ⚠ ex2007-node1: Could not locate a sharable qu...

Tasks completed.

[View Log...](#)

Click Next to continue. Click Back to change the configurati...

[< Back](#)

New Server Cluster Wizard

IP Address
Enter an IP address that cluster management tools will use to connect to the cluster.

IP Address:

[< Back](#)


New Server Cluster Wizard

Cluster Service Account
Enter login information for the domain account under which the cluster service will be run.

User name:

Password:

Domain:

 This account will be given local administrative rights on all nodes of this cluster to allow for proper operation.

[< Back](#) [Next >](#) [Cancel](#)

Cluster Installation

New Server Cluster Wizard

Proposed Cluster Configuration
Verify that you want to create a cluster with the following configuration.

Cluster name: CCR-CLUSTER.domaene.tld

Cluster IP address: 192.9.200.222\255.255.255.0

Cluster network:
LAN - Private and Public
Intel 21140-Based PCI Fast
Primary Address: 192.9.200.

Cluster service account credentials:
Name: clusadmin
Password: xxxxxxxxxxxxxxxxxxxx

OK Cancel

To create a cluster with this configuration, click Next.

< Back Next >

Cluster Configuration Quorum

Select the resource or resource type that you would like to use for the quorum resource.

Majority Node Set

OK Cancel

New Server Cluster Wizard

Creating the Cluster
Please wait while the cluster is configured.

- Reanalyzing cluster
- Configure cluster services
- Configure resource types
- Configure resources

Tasks completed.

Cluster Administrator - [CCR-CLUSTER (CCR-CLUSTER.domaene.tld)]

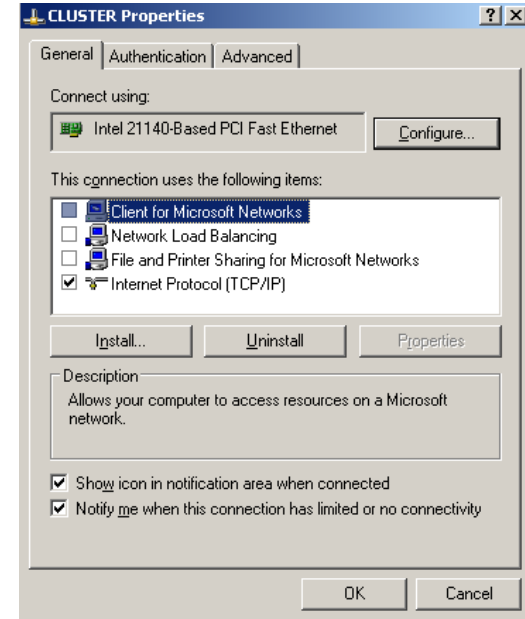
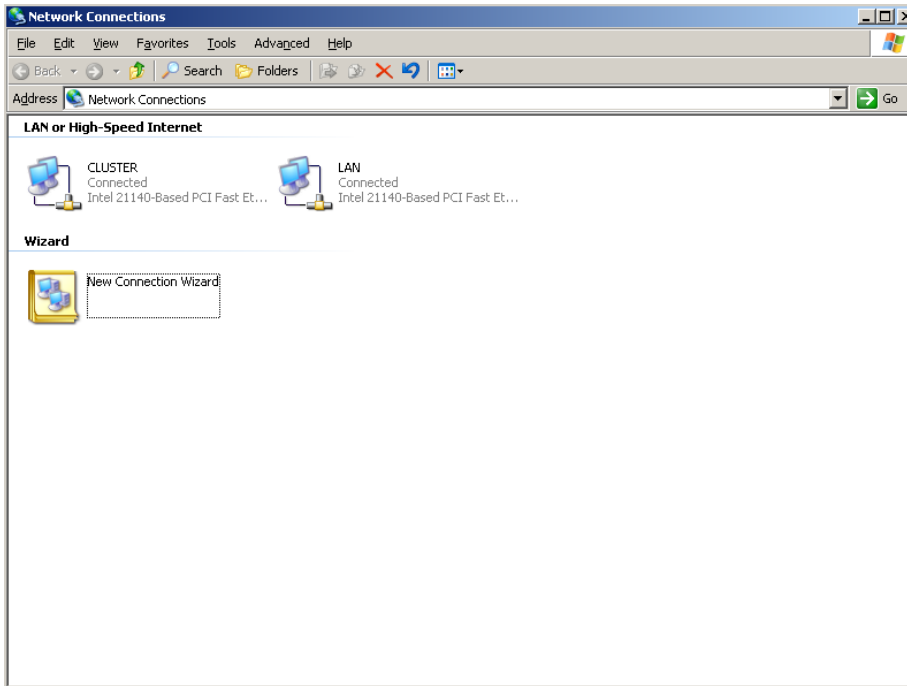
File View Window Help

Name	State
Groups	
Resources	
Cluster Configuration	
EX2007-NODE1	Up

Tree view structure:

- CCR-CLUSTER
 - Groups
 - Cluster Group
 - Resources
 - Cluster Configuration
 - EX2007-NODE1
 - Active Groups
 - Active Resources
 - Network Interfaces

Cluster Netzwerkkonfiguration



NetBIOS over TCP/IP deaktivieren –
LAN NIC in der Reihenfolge nach oben

Cluster Netzwerkkonfiguration

CCR-CLUS Properties

General | Quorum | Network Priority | Security

CCR-CLUS

Networks used for internal cluster communications:

CLUSTER	Move Up
LAN	Move Down

Properties...

Internal cluster data will only be transmitted over the highest priority available network. Use the Move Up button to raise the priority of a network. Use the Move Down button to lower the priority.

OK

CLUSTER Properties

General

CLUSTER

Name: CLUSTER

Description:

Enable this network for cluster use

This network performs the following role in the cluster:

- Client access only (public network)
- Internal cluster communications only (private network)
- All communications (mixed network)

State: Up
Subnet mask: 255.0.0.0

OK Cancel Apply

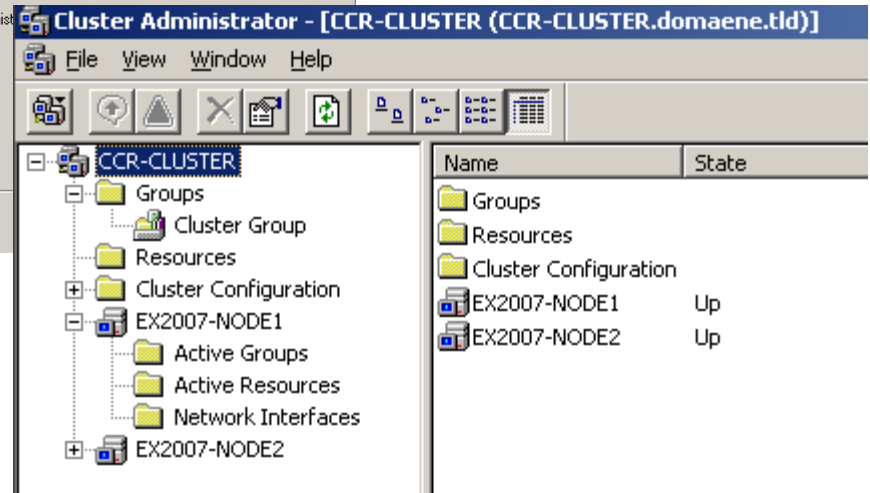
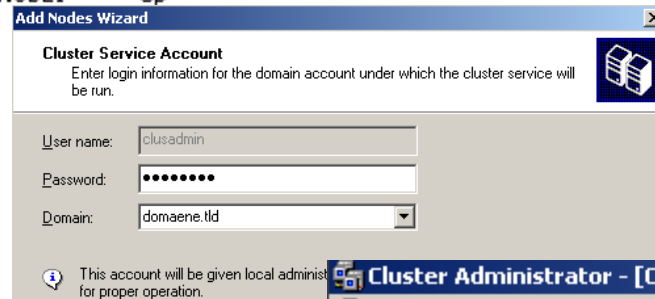
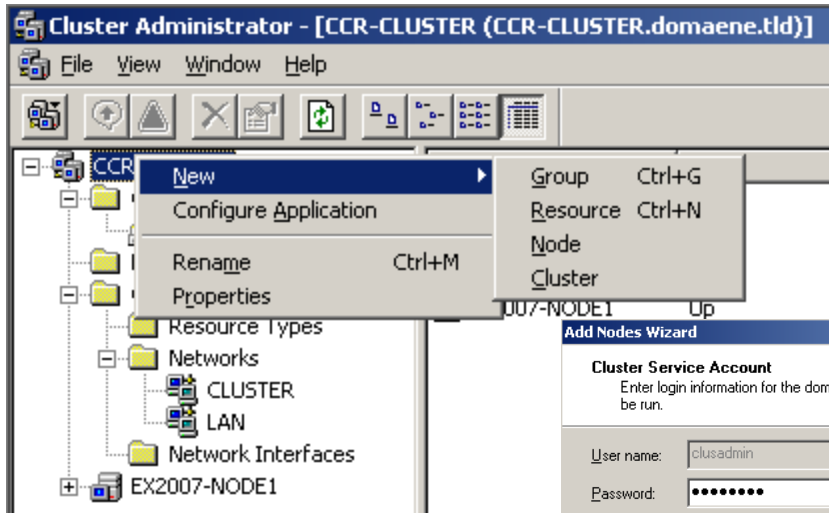
Cluster Administrator - [CCR-CLUSTER (CCR-CLUSTER.d...)]

File View Window Help

- CCR-CLUSTER
 - Groups
 - CCR-CLUSTER1
 - Cluster Group
 - Resources
 - Cluster Configuration
 - Resource Types
 - Networks
 - CLUSTER
 - LAN
 - Network Interfaces
 - EX2007-NODE1
 - EX2007-NODE2

Node	Network	State	Adapter	IP Address
EX2007-...	LAN	Up	Intel 2114...	192.9.200.155
EX2007-...	CLUSTER	Up	Intel 2114...	10.10.10.2
EX2007-...	LAN	Up	Intel 2114...	192.9.200.156
EX2007-...	CLUSTER	Up	Intel 2114...	10.10.10.1

Cluster Installation



Cluster.exe

```

C:\Dokumente und Einstellungen\Administrator.DECUS>cluster /?
Die Syntax dieses Befehls lautet:

CLUSTER /LIST[:Domänenname]

CLUSTER /CHANGEPASS[WORD] /?
CLUSTER /CHANGEPASS[WORD] /HELP
CLUSTER /CLUSTER:Clustername1[,Clustername2[,...]]
        /CHANGEPASS[WORD][:neues Kennwort[,altes Kennwort]] <Optionen>

<Optionen> =
    [/FORCE] [/QUIET] [/SKIPDC] [/TEST] [/VERBOSE] [/UNATTENDED] [/?] [/HELP]

CLUSTER [/CLUSTER:]Clustername <Optionen>

<Optionen> =
    /CREATE [/NODE:Knotenname] [/VERBOSE] [/UNATTENDED] [/MINIMUM]
        /USER:Domäne\Benutzername | Benutzername@Domäne [/PASS[WORD]:Kennwort]
        [/IPADDRESS]:xxx.xxx.xxx.xxx[,xxx.xxx.xxx.xxx,Netzwerkverbindungsname]
    /ADD[NODES][:Knotenname[,Knotenname ...]] [/VERBOSE] [/UNATTENDED]
        [/MINIMUM][[/PASSWORD:Dienstkonto-Kennwort]]

CLUSTER [[/CLUSTER:]Clustername] <Optionen>

<Optionen> =
    /CREATE [/NODE:Knotenname] /WIZARD [/MINIMUM]
        [/USER:Domäne\Benutzername | Benutzername@Domäne] [/PASS[WORD]:Kennwort]
        [/IPADDRESS]:xxx.xxx.xxx.xxx]
    /ADD[NODES][:Knotenname[,Knotenname ...]] /WIZARD [/MINIMUM]
        [/PASSWORD:Dienstkonto-Kennwort]
    /PROPERTIES [<Eigenschaftsliste>]
    /PRIU[PROPERTIES] [<Eigenschaftsliste>]
    /PROPERTIES[:Eigenschaft[,Eigenschaft ...]] /USEDEFAULT]
    /PRIU[PROPERTIES][:Eigenschaft[,Eigenschaft ...]] /USEDEFAULT]
    /RENAME:Clustername
    /QUORUM[RESOURCE]:Ressourcenname [/PATH:Pfad] [/MAXLOGSIZE:Max_Größe_KB]
    /SETFAIL[UREACTIONS][:Knotenname[,Knotenname ...]]
  
```

Cluster Log

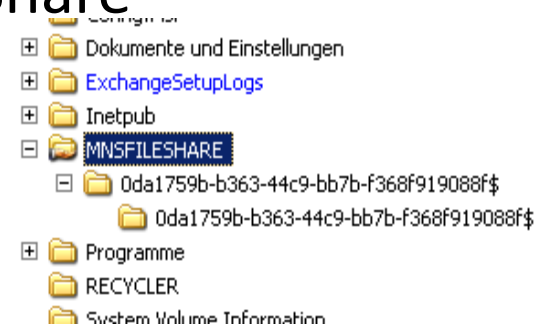
```

C:\Cfgrv.log - Editor
Datei Bearbeiten Format Ansicht ?
2006-02-26 11:27:24.946 [INFO] node2: (null) (hr=00000000, {FDC75680-7DBB-42CA-8003-E4CDB01FF062}, {93C32F99-
2006-02-26 11:27:25.026 [INFO] DECLUS: (null) (hr=00000000, {FDC75680-7DBB-42CA-8003-E4CDB01FF062}, {036BF56
2006-02-26 11:27:25.096 [INFO] node2: Clustertauglichkeit des Knotens wird überprüft... (hr=00000000, {CC5E57
2006-02-26 11:27:25.106 [INFO] node1: Clustertauglichkeit des Knotens wird überprüft... (hr=00000000, {CC5E57
2006-02-26 11:27:25.176 [INFO] node2: (null) (hr=00000000, {CC5E57B1-4520-4672-B4BA-A288EC42946E}, {2F2A800D-
2006-02-26 11:27:25.236 [INFO] node1: (null) (hr=00000000, {CC5E57B1-4520-4672-B4BA-A288EC42946E}, {2F2A800D-
2006-02-26 11:27:25.336 [INFO] node2: Betriebssystemversion auf diesem Knoten wird überprüft... (hr=00000000,
2006-02-26 11:27:25.477 [INFO] node2: Betriebssystemversion auf diesem Knoten wird überprüft... (hr=00000000,
2006-02-26 11:27:25.597 [INFO] node2: Betriebssystemversion auf diesem Knoten wird überprüft... (hr=00000000,
2006-02-26 11:27:25.667 [INFO] node2: Betriebssystemversion auf diesem Knoten wird überprüft... (hr=00000000,
2006-02-26 11:27:26.128 [INFO] node2: (null) (hr=00000000, {CC5E57B1-4520-4672-B4BA-A288EC42946E}, {2F2A800D-
2006-02-26 11:27:26.198 [INFO] node2: Verwaltete Ressourcen werden gesammelt... (hr=00000000, {036BF567-2377-
2006-02-26 11:27:26.298 [INFO] [SRV] The cluster service is not running. Creating a dummy Local Quorum resou
2006-02-26 11:27:26.388 [INFO] node1: Betriebssystemversion auf diesem Knoten wird überprüft... (hr=00000000,
2006-02-26 11:27:26.739 [INFO] node2: Die folgenden Datenträger werden nicht vom Cluster verwaltet: (hr=000000
2006-02-26 11:27:26.799 [INFO] node2: Die folgenden Datenträger werden nicht vom Cluster verwaltet: (hr=000000
2006-02-26 11:27:26.869 [INFO] node2: Der physikalische Datenträger "\\.\PHYSICALDRIVE0" ist kein SCSI-Datent
2006-02-26 11:27:26.919 [INFO] node2: Der physikalische Datenträger "\\.\PHYSICALDRIVE0" ist kein SCSI-Datent
2006-02-26 11:27:26.999 [INFO] node2: Found SCSI disk '\\.\PHYSICALDRIVE1' on Bus '0' and Port '2'; at TID '0
2006-02-26 11:27:27.059 [INFO] node2: Physical disk PHYSICALDRIVE1 has signature 0. (hr=00000000, {05AA0768-5
2006-02-26 11:27:27.510 [WARN] node2: The physical disk '\\.\PHYSICALDRIVE1' does not have any partitions and
2006-02-26 11:27:27.520 [INFO] node1: Betriebssystemversion auf diesem Knoten wird überprüft... (hr=00000000,
2006-02-26 11:27:27.620 [INFO] [SRV] Didn't find the ManagedDisksonSystemBuses value in the registry. (hr = 0x
2006-02-26 11:27:27.840 [WARN] node2: Physical disk 'PHYSICALDRIVE1' is NOT quorum capable. (hr=0x0000001, {05
2006-02-26 11:27:27.920 [INFO] [SRV] The cluster service is not running. Creating a dummy Majority Node Set i
2006-02-26 11:27:28.211 [INFO] node1: (null) (hr=00000000, {CC5E57B1-4520-4672-B4BA-A288EC42946E}, {2F2A800D-
2006-02-26 11:27:28.261 [INFO] node1: Verwaltete Ressourcen werden gesammelt... (hr=00000000, {036BF567-2377-
2006-02-26 11:27:29.222 [INFO] node1: Die folgenden Datenträger werden nicht vom Cluster verwaltet: (hr=000000
2006-02-26 11:27:30.584 [INFO] node1: Der physikalische Datenträger "\\.\PHYSICALDRIVE0" ist kein SCSI-Datent
2006-02-26 11:27:34.800 [INFO] node2: Found IP Address '10.10.10.3' with subnet mask '255.0.0.0'. (hr=00000000
2006-02-26 11:27:34.930 [INFO] node2: Created network adapter 'LAN' (hr=00000000, {05AA0768-5F49-49CD-AFDC-96
2006-02-26 11:27:41.109 [INFO] node2: Found IP Address '192.168.1.3' with subnet mask '255.255.255.0'. (hr=00
2006-02-26 11:27:41.199 [INFO] node2: Created network adapter 'HEARTBEAT' (hr=00000000, {05AA0768-5F49-49CD-A
2006-02-26 11:27:43.973 [INFO] node2: (null) (hr=00000000, {FDC75680-7DBB-42CA-8003-E4CDB01FF062}, {6279EE6C-I
2006-02-26 11:27:44.083 [WARN] node2: [SRV] Enumerating resources. Total Requested:10; Current enum index:0;
2006-02-26 11:27:44.174 [WARN] node2: Local quorum 'is not' the quorum device. (hr=0x0000001, {05AA0768-5F49-4
2006-02-26 11:27:44.354 [INFO] node2: Eine quorumtaugliche Ressource "Lokales quorum" wurde gefunden. (hr=000
2006-02-26 11:27:44.544 [INFO] node2: (null) (hr=00000000, {FDC75680-7DBB-42CA-8003-E4CDB01FF062}, {6279EE6C-I
2006-02-26 11:27:44.664 [INFO] node2: There is not a "friendly name" for the physical disk "PHYSICALDRIVE1".

```

File Share Witness

- Installation auf Hub Transport Server
- Hotfix auf Cluster Knoten erforderlich
<http://support.microsoft.com/kb/921181> (Reboot)
- Freigabe MNSFILEHSARE (ist wählbar)
- Berechtigungen für Cluster Service Konto Vollzugriff
- Auf einem Clusterknoten:
`cluster.exe res "Majority Node Set" /priv
MNSFileShare=\\HTSERVER\MNSFileShare`
- Test:
`cluster res "Majority Node Set" /priv`



File Share Witness

MNS File Share aktivieren

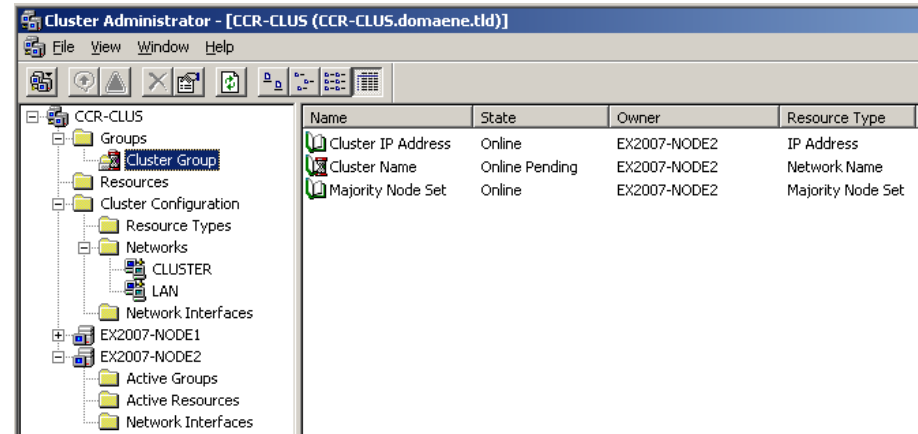
```

C:\Documents and Settings\Administrator.DOMAIN>cluster res "Majority node set"
priv MNSFILESHARE=\\EX2007-DC\MNSFILESHARE

System warning 5024 (0x000013a0).
The properties were stored but not all changes will take effect until the next time the resource is brought online.

C:\Documents and Settings\Administrator.DOMAIN>
    
```

Cluster Gruppe verschieben



The screenshot shows the Cluster Administrator console for a cluster named CCR-CLUS. The left pane shows a tree view where the 'Cluster Group' is selected. The right pane shows a table of resources:

Name	State	Owner	Resource Type
Cluster IP Address	Online	EX2007-NODE2	IP Address
Cluster Name	Online Pending	EX2007-NODE2	Network Name
Majority Node Set	Online	EX2007-NODE2	Majority Node Set

Test ob MNS auf dem richtigen Share liegt

```

C:\Documents and Settings\Administrator.DOMAIN>cluster res "Majority Node set"
priv

Listing private properties for 'Majority Node set':

I Resource      Name                                     Uvalue
-----
S Majority Node set  MNSFileShare                          \\EX2007-DC\MNSFILESHARE
D Majority Node set  MNSFileShareCheckInterval             240 (0xf0)
D Majority Node set  MNSFileShareDelay                      4 (0x4)

C:\Documents and Settings\Administrator.DOMAIN>
    
```

Exchange Cluster Installation

- Windows Server 2003 SP1 oder Windows Server 2003 R2
- IIS 6 ohne NNTP und SMTP
- Powershell
- .NET Framework 2.0
- .NET Framework Update (926776)
- MMC 3.0
- MNS Cluster Update (921181)

Exchange Cluster Installation



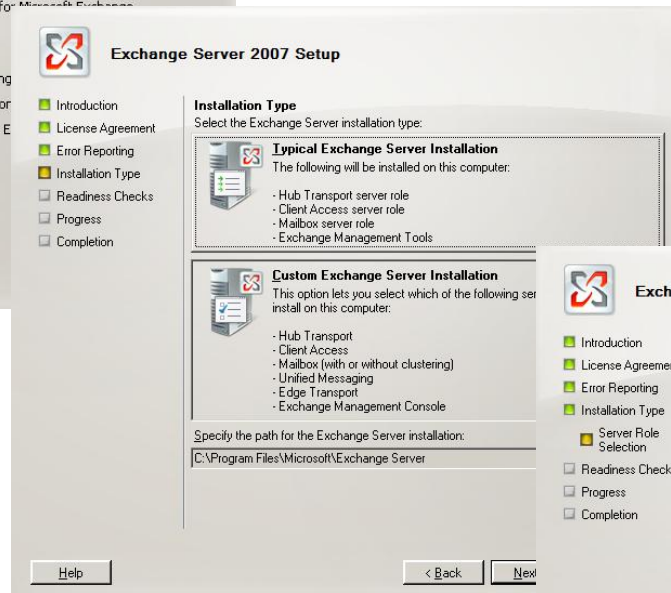
Microsoft Exchange Server enables users to send and receive e-mail, schedule meetings, receive faxes, and receive voice mail.

Microsoft
Exchange Server 2007

Plan
Read about Microsoft Exchange Server 2007

Install
Step 1: Install .NET Framework 2.0 - Installed
Step 2: Install Microsoft Management Console (MMC) - Installed
Step 3: Install Microsoft Windows PowerShell™ - Installed
Step 4: Install Microsoft Exchange
Step 5: Get Critical Updates for Microsoft Exchange

Enhance
Read about Microsoft Exchange
Read about Microsoft Forefront
Install Forefront Security for Exchange Server



Exchange Server 2007 Setup

- Introduction
- License Agreement
- Error Reporting
- Installation Type
- Readiness Checks
- Progress
- Completion

Installation Type
Select the Exchange Server installation type:

Typical Exchange Server Installation
The following will be installed on this computer:

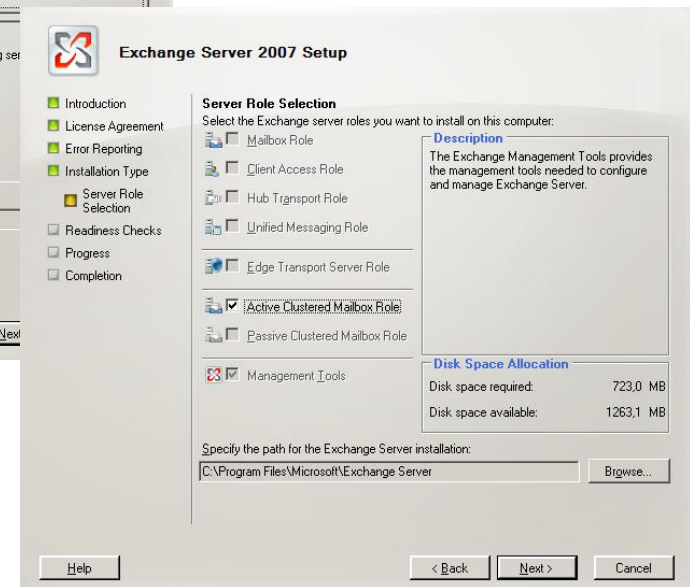
- Hub Transport server role
- Client Access server role
- Mailbox server role
- Exchange Management Tools

Custom Exchange Server Installation
This option lets you select which of the following server roles you want to install on this computer:

- Hub Transport
- Client Access
- Mailbox (with or without clustering)
- Unified Messaging
- Edge Transport
- Exchange Management Console

Specify the path for the Exchange Server installation:
C:\Program Files\Microsoft\Exchange Server

Buttons: Help, < Back, Next >



Exchange Server 2007 Setup

- Introduction
- License Agreement
- Error Reporting
- Installation Type
- Server Role Selection
- Readiness Checks
- Progress
- Completion

Server Role Selection
Select the Exchange server roles you want to install on this computer:

- Mailbox Role
- Client Access Role
- Hub Transport Role
- Unified Messaging Role
- Edge Transport Server Role
- Active Clustered Mailbox Role
- Passive Clustered Mailbox Role
- Management Tools

Description
The Exchange Management Tools provides the management tools needed to configure and manage Exchange Server.

Disk Space Allocation

Disk space required:	723.0 MB
Disk space available:	1263.1 MB

Specify the path for the Exchange Server installation:
C:\Program Files\Microsoft\Exchange Server

Buttons: Help, < Back, Next >, Cancel

Exchange Cluster Installation

Exchange Server 2007 Setup

- Introduction
- License Agreement
- Error Reporting
- Installation Type
 - Server Role Selection
 - Cluster Settings**
- Readiness Checks
- Progress
- Completion

Cluster Settings

Select cluster type:

Cluster Continuous Replication

Cluster continuous replication provides automatic management of node redundancy and uses application-level data replication.

Single Copy Cluster

A single copy cluster provides automatic management of node redundancy and uses shared storage among all nodes.

Specify installation options for this node:

Clustered Mailbox Server Name: CCR-CLUSTER001

Clustered Mailbox Server IP Address: 192.9.200.168

Specify the path for the Clustered Mailbox Server c

C:\Program Files\Microsoft\Exchange Server\Ma

Help < Back

Exchange Server 2007 Setup

- Introduction
- License Agreement
- Error Reporting
- Installation Type
 - Server Role Selection
 - Cluster Settings
- Readiness Checks**
- Progress
- Completion

Readiness Checks

The system and server will be checked to see whether Exchange is ready to be installed.

Elapsed time: 00:00:18

Summary: 2 item(s), 0 succeeded, 0 failed.

Mailbox: Role Prerequisites

Status: Test in progress

Elapsed Time: 00:00:19

Clustered Mailbox: Server Prerequisites

Help

Exchange Server 2007 Setup

- Introduction
- License Agreement
- Error Reporting
- Installation Type
 - Server Role Selection
 - Cluster Settings
- Readiness Checks
- Progress**
- Completion

Progress

Elapsed time: 00:04:03

Summary: 3 item(s), 1 succeeded, 0 failed.

Copy Exchange Files Completed

Elapsed Time: 00:03:32

Mailbox Role

Status: Configuring performance counters

Elapsed Time: 00:00:31

Clustered Mailbox: Server

Help < Back

Exchange Server 2007 Setup

- Introduction
- License Agreement
- Error Reporting
- Installation Type
 - Server Role Selection
 - Cluster Settings
- Readiness Checks
- Progress
- Completion**

Completion

The following server roles have been successfully installed. To close the wizard, click Finish.

Elapsed time: 00:13:21

Successfully installed. No errors.

Copy Exchange Files Completed

Elapsed Time: 00:03:32

Mailbox Role Completed

Elapsed Time: 00:08:11

Clustered Mailbox: Server Completed

Elapsed Time: 00:01:37

Select Ctrl+C to copy the contents of this page.

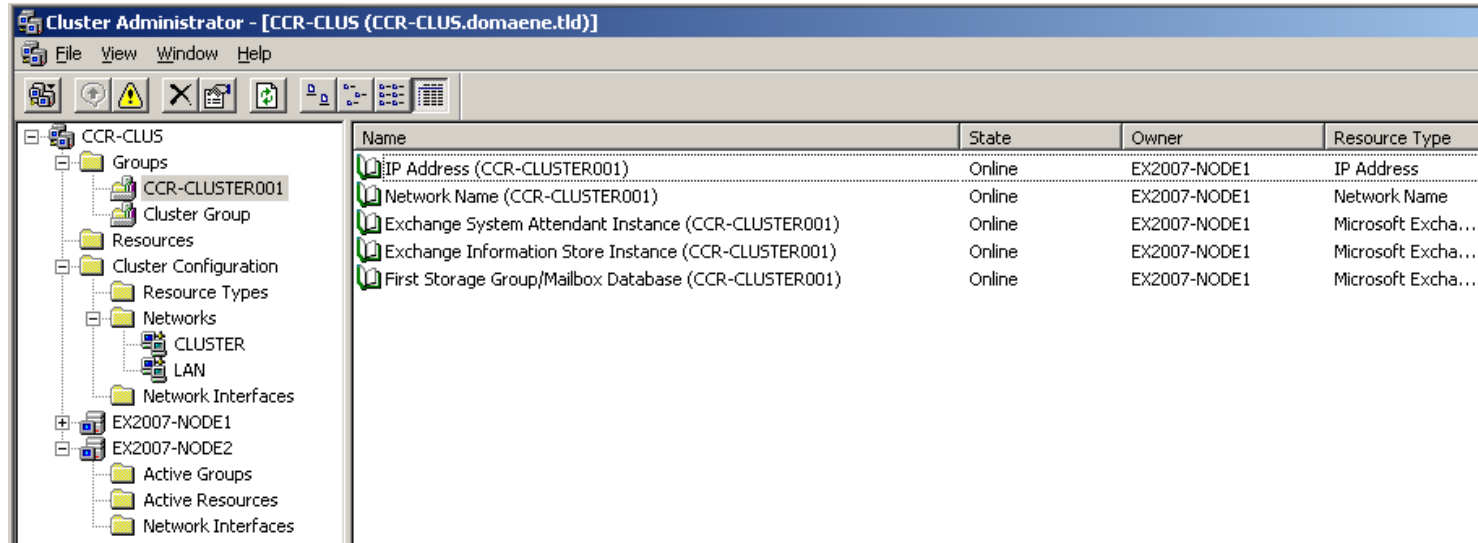
Finalize installation using the Exchange Management Console.

Help < Back Finish Cancel

Exchange Cluster Installation

Cluster Administrator - [CCR-CLUS (CCR-CLUS.domaene.tld)]

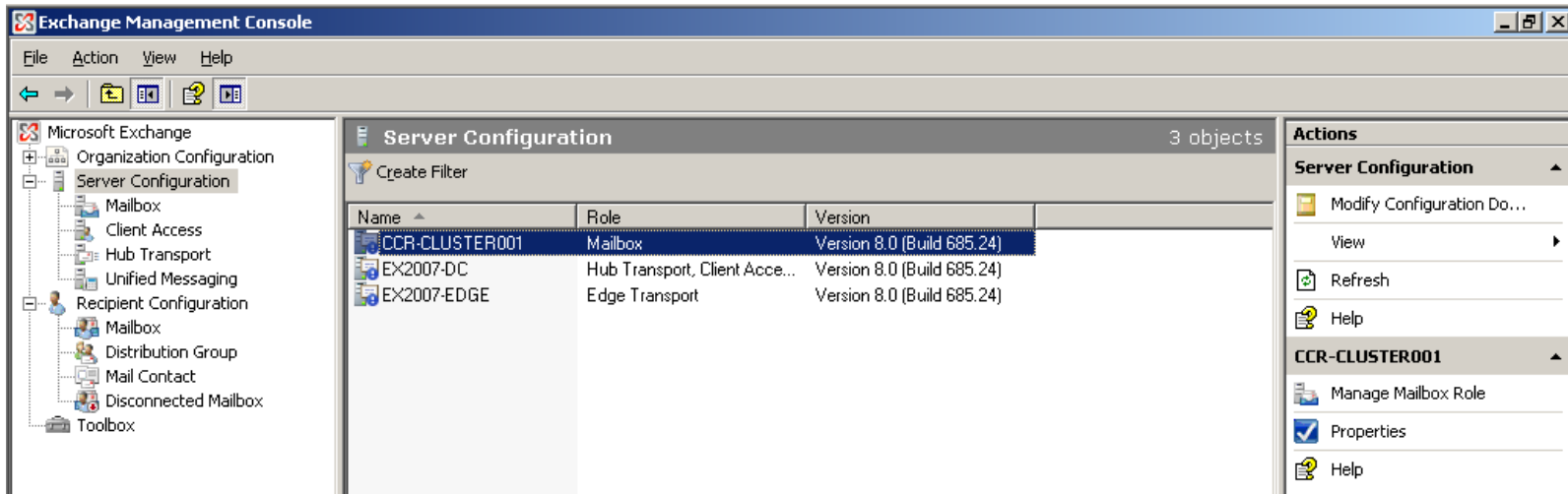
File View Window Help



Name	State	Owner	Resource Type
IP Address (CCR-CLUSTER001)	Online	EX2007-NODE1	IP Address
Network Name (CCR-CLUSTER001)	Online	EX2007-NODE1	Network Name
Exchange System Attendant Instance (CCR-CLUSTER001)	Online	EX2007-NODE1	Microsoft Excha...
Exchange Information Store Instance (CCR-CLUSTER001)	Online	EX2007-NODE1	Microsoft Excha...
First Storage Group/Mailbox Database (CCR-CLUSTER001)	Online	EX2007-NODE1	Microsoft Excha...

Exchange Management Console

File Action View Help



Microsoft Exchange

- Organization Configuration
 - Server Configuration
 - Mailbox
 - Client Access
 - Hub Transport
 - Unified Messaging
 - Recipient Configuration
 - Mailbox
 - Distribution Group
 - Mail Contact
 - Disconnected Mailbox
 - Toolbox

Server Configuration 3 objects

Create Filter

Name	Role	Version
CCR-CLUSTER001	Mailbox	Version 8.0 (Build 685.24)
EX2007-DC	Hub Transport, Client Acce...	Version 8.0 (Build 685.24)
EX2007-EDGE	Edge Transport	Version 8.0 (Build 685.24)

Actions

Server Configuration

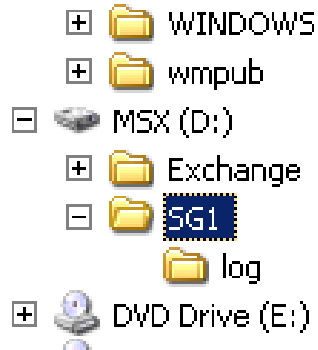
- Modify Configuration Do...
- View
- Refresh
- Help

CCR-CLUSTER001

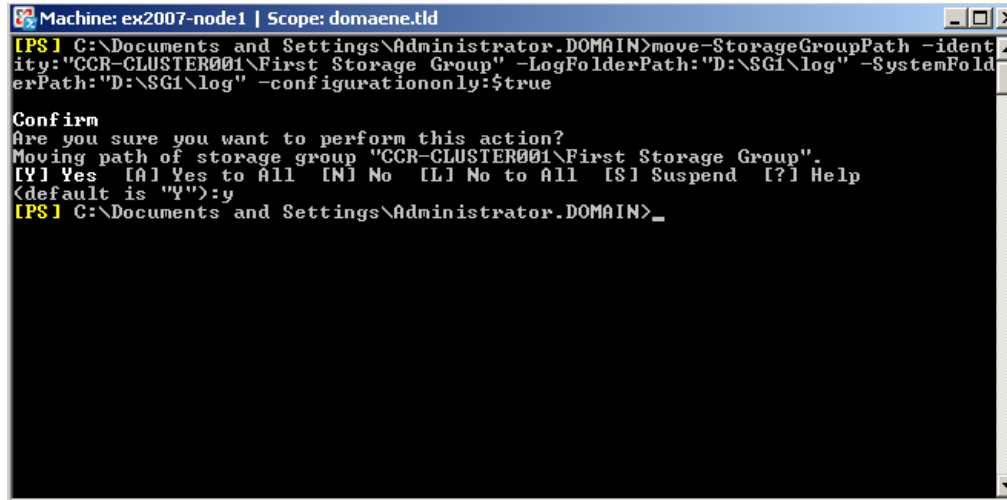
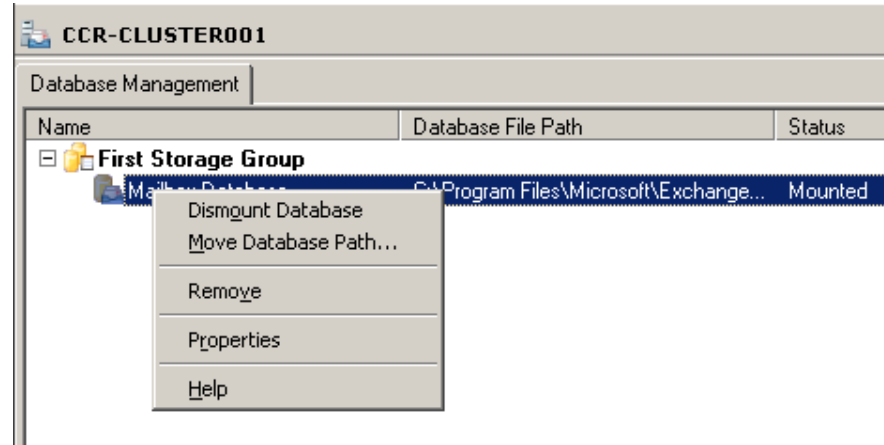
- Manage Mailbox Role
- Properties
- Help

Exchange Cluster Installation

2) Datenbank dismounten

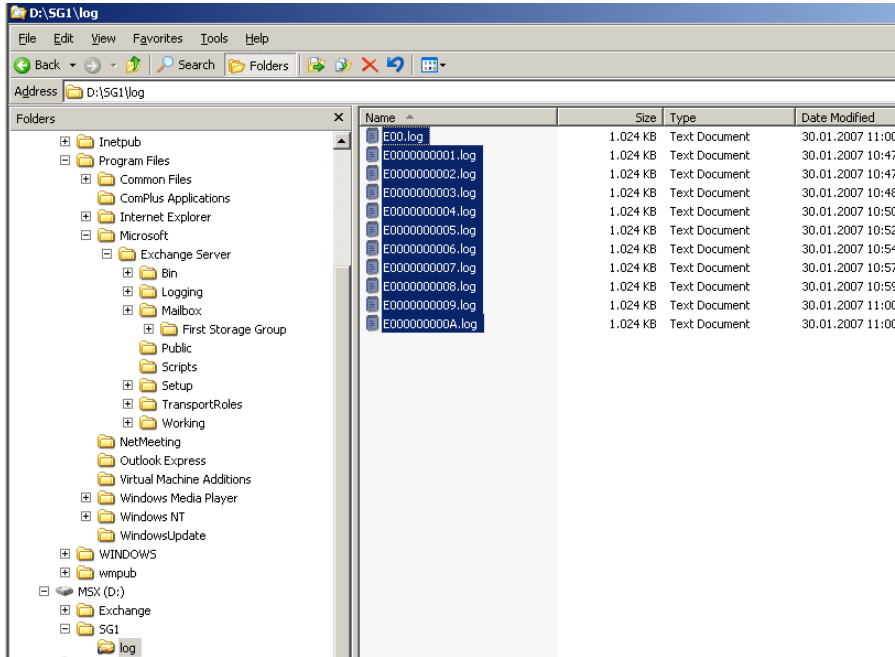


1) Log Verzeichnis vor dem Move

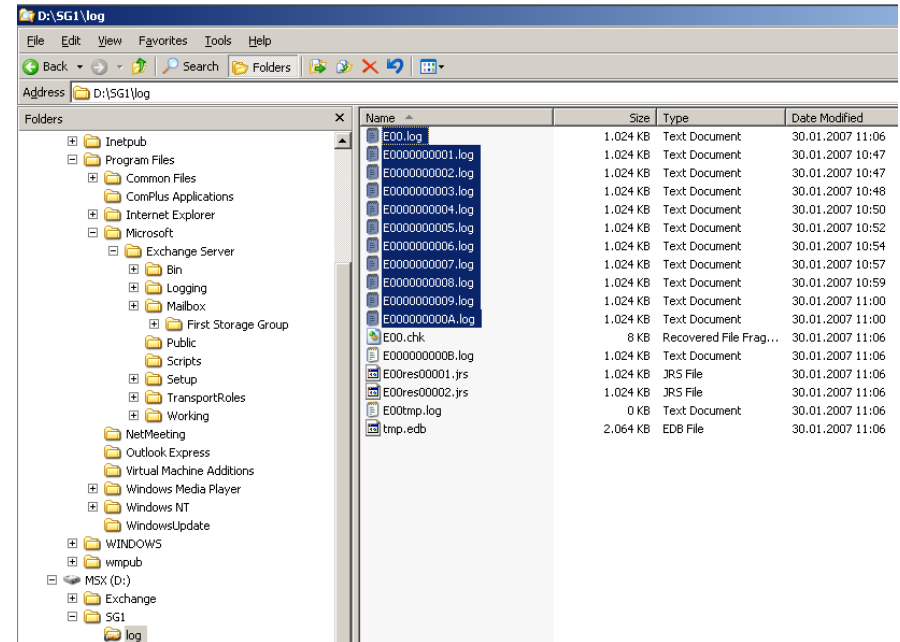


3) Log verschieben

Exchange Cluster Installation



1) Verschieben der Logdateien



2) Datenbank mounten und Ergebnis betrachten

Exchange Cluster Installation



Disk Space Allocation

Disk space required:	723.0 MB
Disk space available:	1283.2 MB

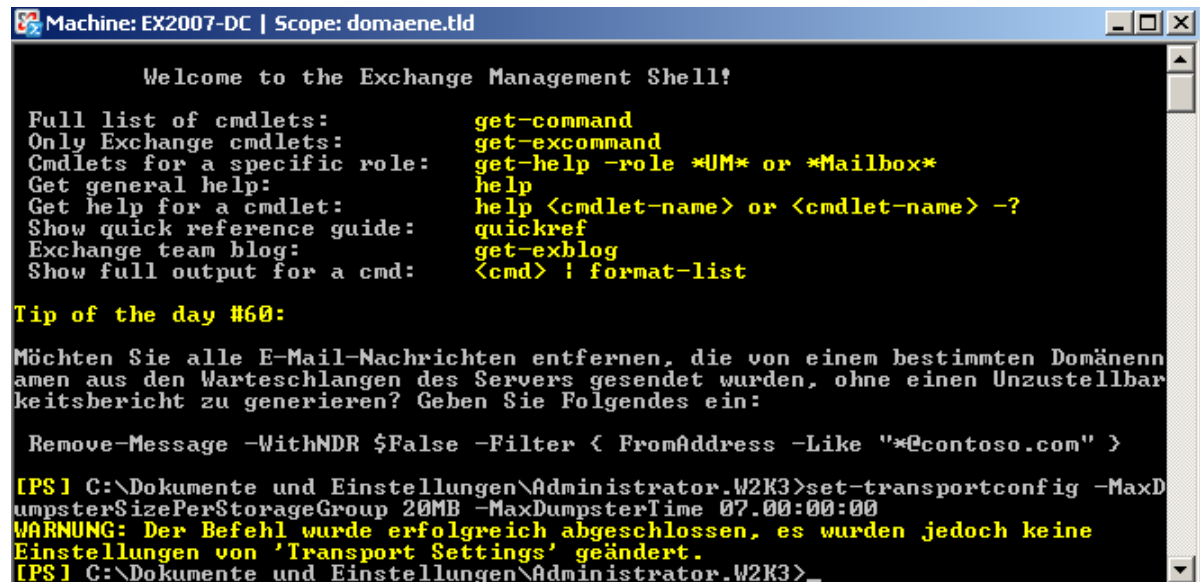
Specify the path for the Exchange Server installation:

Transport Dumpster

- Eine Art Cache Verzeichnis für Transaktionslogdateien
- Bei einem Knotenausfall werden die Logs des Transport Dumpster eingelesen
- Liegen auf einem Hub Transport Server
- Konfiguration des Dumpster mit EMS

Transport Dumpster

- Beispiel: 20 MB Dumpster und 7 Tage Vorhaltezeit
- Dumpstergröße 135-300% der maximalen Nachrichtengröße



```

Machine: EX2007-DC | Scope: domaene.tld

Welcome to the Exchange Management Shell!

Full list of cmdlets:           get-command
Only Exchange cmdlets:        get-excommand
Cmdlets for a specific role:   get-help -role *UM* or *Mailbox*
Get general help:              help
Get help for a cmdlet:         help <cmdlet-name> or <cmdlet-name> -?
Show quick reference guide:    quickref
Exchange team blog:           get-exblog
Show full output for a cmd:    <cmd> ! format-list

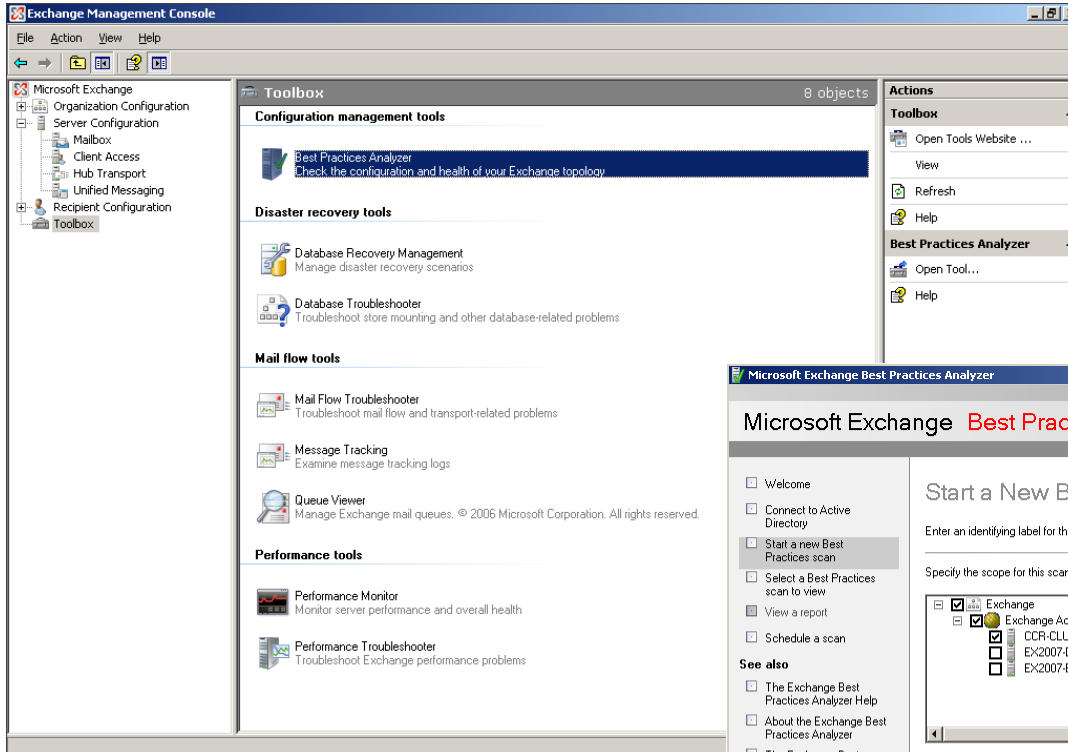
Tip of the day #60:

Möchten Sie alle E-Mail-Nachrichten entfernen, die von einem bestimmten Domännenn
amen aus den Warteschlangen des Servers gesendet wurden, ohne einen Unzustellbar
keitsbericht zu generieren? Geben Sie Folgendes ein:

Remove-Message -WithNDR $False -Filter < FromAddress -Like "*@contoso.com" >

[PS] C:\Dokumente und Einstellungen\Administrator.W2K3>set-transportconfig -MaxD
umpsterSizePerStorageGroup 20MB -MaxDumpsterTime 07.00:00:00
WARNUNG: Der Befehl wurde erfolgreich abgeschlossen, es wurden jedoch keine
Einstellungen von 'Transport Settings' geändert.
[PS] C:\Dokumente und Einstellungen\Administrator.W2K3>
  
```

EXBPA

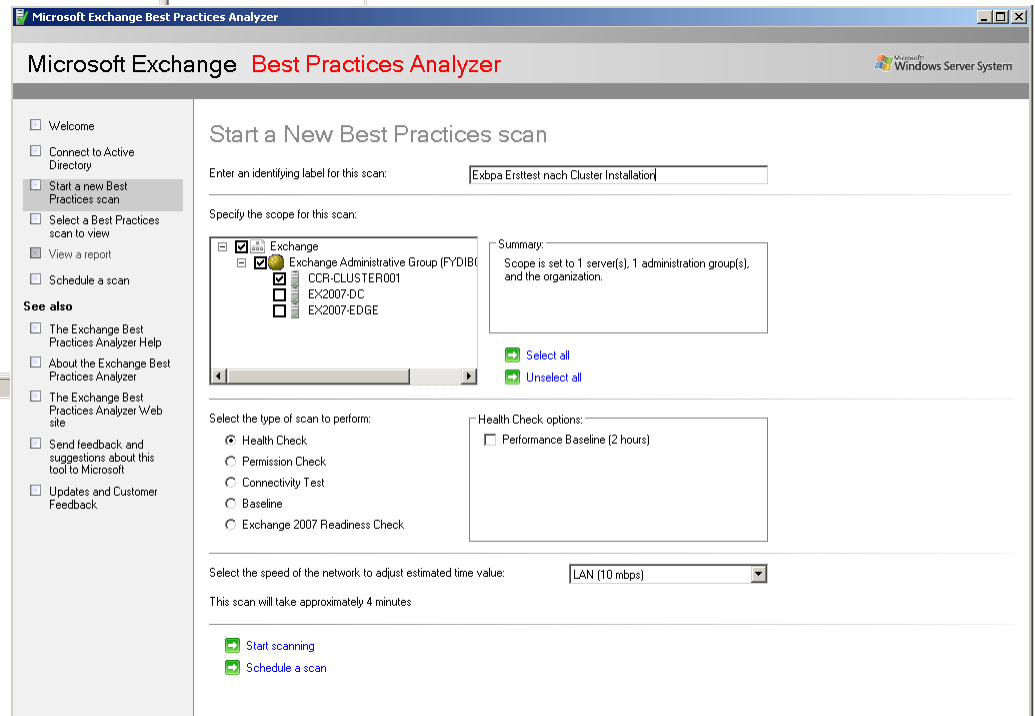


Exchange Management Console

File Action View Help

Microsoft Exchange

- Organization Configuration
 - Server Configuration
 - Mailbox
 - Client Access
 - Hub Transport
 - Unified Messaging
 - Recipient Configuration
 - Toolbox**
 - Configuration management tools** (8 objects)
 - Best Practices Analyzer: Check the configuration and health of your Exchange topology
 - Disaster recovery tools**
 - Database Recovery Management: Manage disaster recovery scenarios
 - Database Troubleshooter: Troubleshoot store mounting and other database-related problems
 - Mail flow tools**
 - Mail Flow Troubleshooter: Troubleshoot mail flow and transport-related problems
 - Message Tracking: Examine message tracking logs
 - Queue Viewer: Manage Exchange mail queues. © 2006 Microsoft Corporation. All rights reserved.
 - Performance tools**
 - Performance Monitor: Monitor server performance and overall health
 - Performance Troubleshooter: Troubleshoot Exchange performance problems



Microsoft Exchange Best Practices Analyzer

Start a New Best Practices scan

Enter an identifying label for this scan:

Specify the scope for this scan:

- Exchange
 - Exchange Administrative Group (FYDIBI)
 - CCR-CLUSTER001
 - EX2007-DC
 - EX2007-EDGE

Summary: Scope is set to 1 server(s), 1 administration group(s), and the organization.

[Select all](#) [Unselect all](#)

Select the type of scan to perform:

- Health Check
- Permission Check
- Connectivity Test
- Baseline
- Exchange 2007 Readiness Check

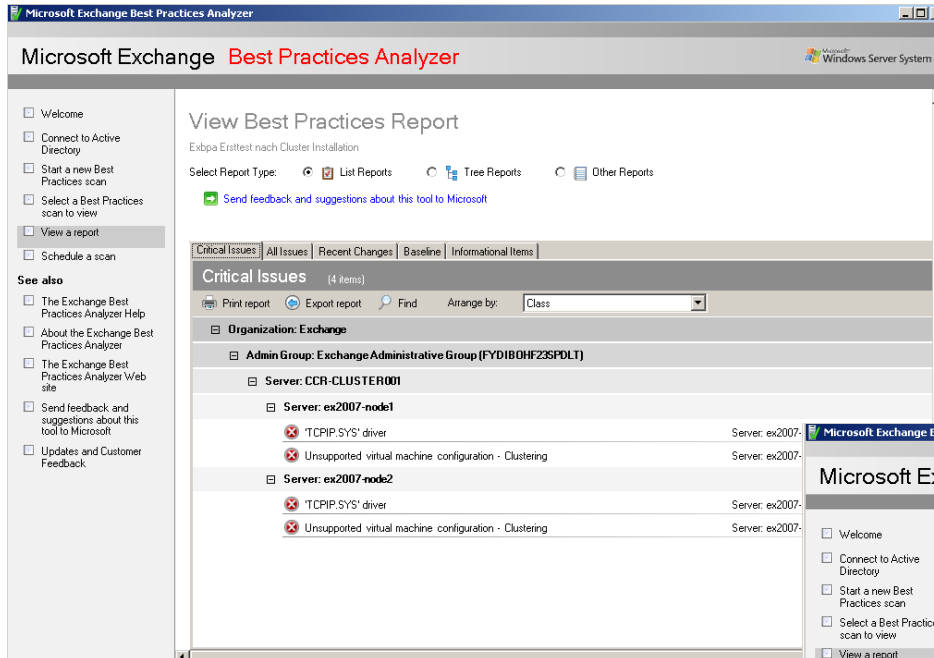
Health Check options: Performance Baseline (2 hours)

Select the speed of the network to adjust estimated time value:

This scan will take approximately 4 minutes

[Start scanning](#) [Schedule a scan](#)

EXBPA



Microsoft Exchange Best Practices Analyzer

View Best Practices Report

Exbpa Ersttest nach Cluster Installation

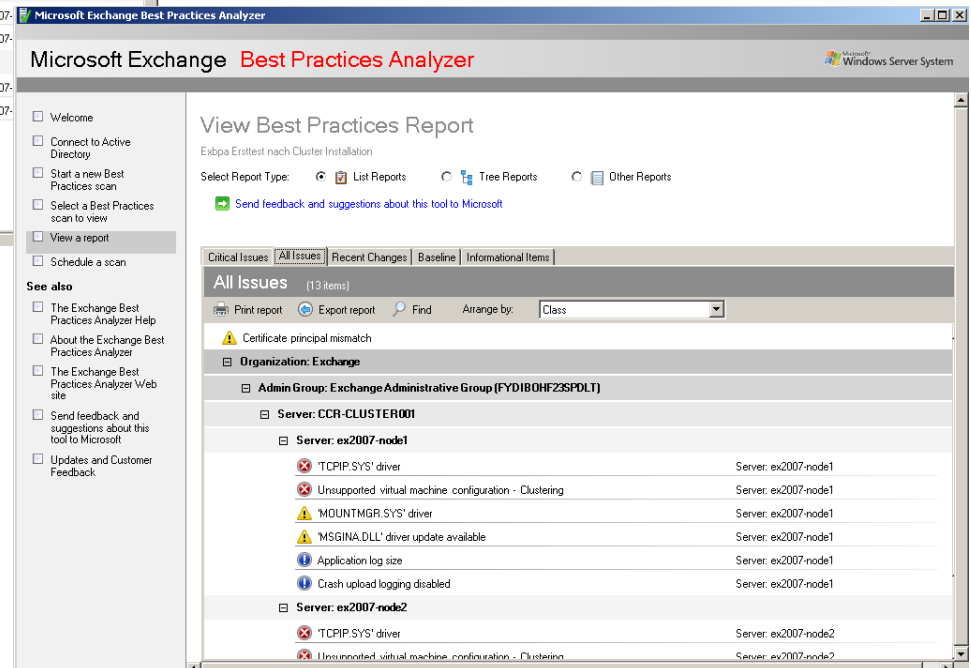
Select Report Type: List Reports Tree Reports Other Reports

[Send feedback and suggestions about this tool to Microsoft](#)

Critical Issues (4 Items)

Print report Export report Find Arrange by: Class

- Organization: Exchange
 - Admin Group: Exchange Administrative Group (FYDIBOHF23SPDLT)
 - Server: CCR-CLUSTER001
 - Server: ex2007-node1
 - TCPIP.SYS' driver Server: ex2007-
 - Unsupported virtual machine configuration - Clustering Server: ex2007-
 - Server: ex2007-node2
 - TCPIP.SYS' driver Server: ex2007-
 - Unsupported virtual machine configuration - Clustering Server: ex2007-



Microsoft Exchange Best Practices Analyzer

View Best Practices Report

Exbpa Ersttest nach Cluster Installation

Select Report Type: List Reports Tree Reports Other Reports

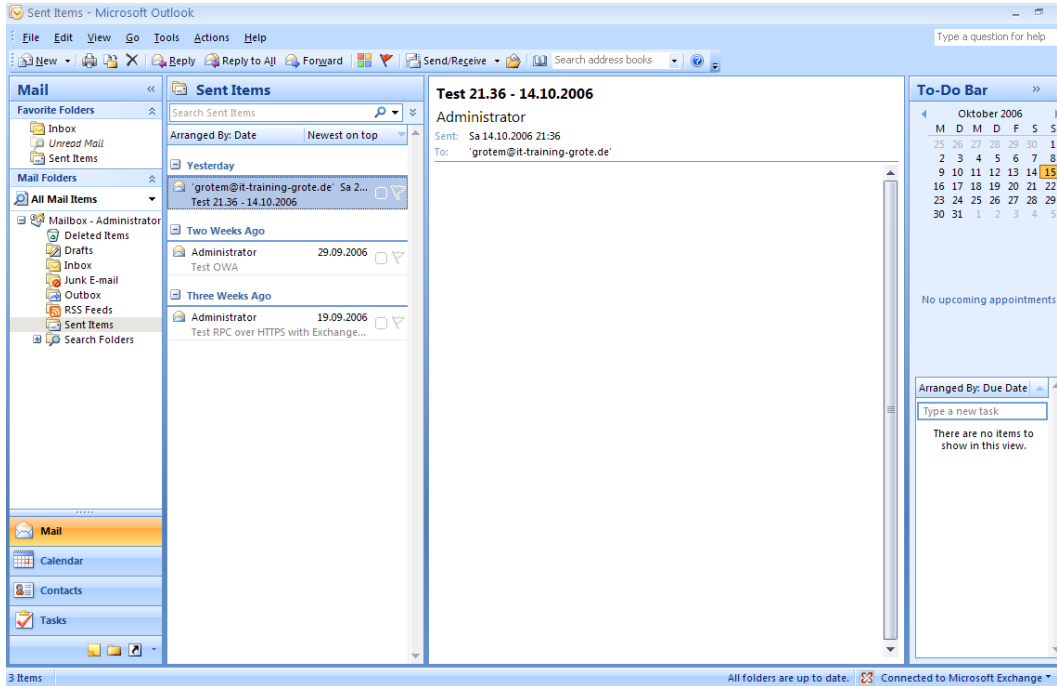
[Send feedback and suggestions about this tool to Microsoft](#)

All Issues (13 Items)

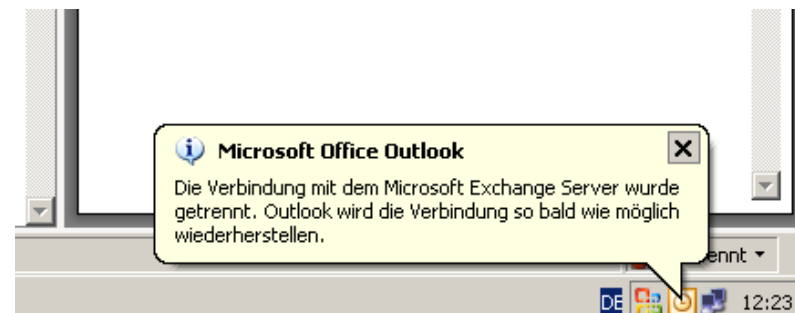
Print report Export report Find Arrange by: Class

- Organization: Exchange
 - Admin Group: Exchange Administrative Group (FYDIBOHF23SPDLT)
 - Server: CCR-CLUSTER001
 - Server: ex2007-node1
 - TCPIP.SYS' driver Server: ex2007-node1
 - Unsupported virtual machine configuration - Clustering Server: ex2007-node1
 - MOUNTMGR.SYS' driver Server: ex2007-node1
 - MSGINA.DLL' driver update available Server: ex2007-node1
 - Application log size Server: ex2007-node1
 - Crash upload logging disabled Server: ex2007-node1
 - Server: ex2007-node2
 - TCPIP.SYS' driver Server: ex2007-node2
 - Unsupported virtual machine configuration - Clustering Server: ex2007-node2

Outlook 2007 Konfiguration



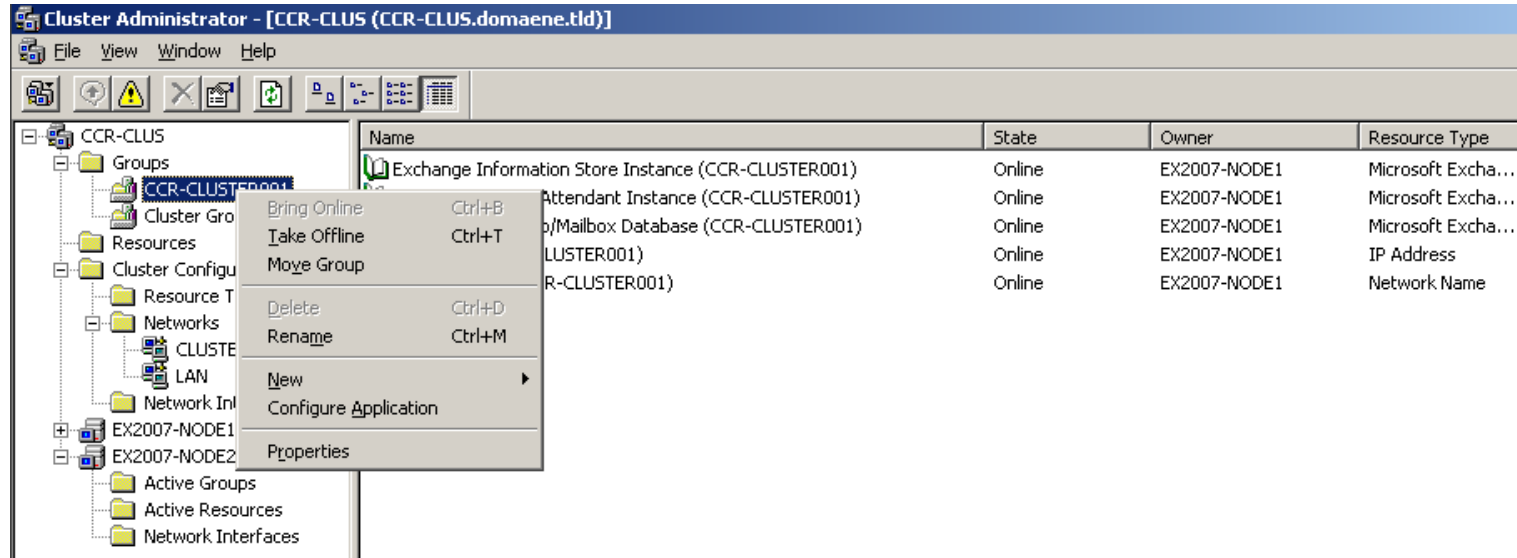
Der Outlook Cache Mode sorgt für minimale Unterbrechung



Failover / Failback

Cluster Administrator - [CCR-CLUS (CCR-CLUS.domaene.tld)]

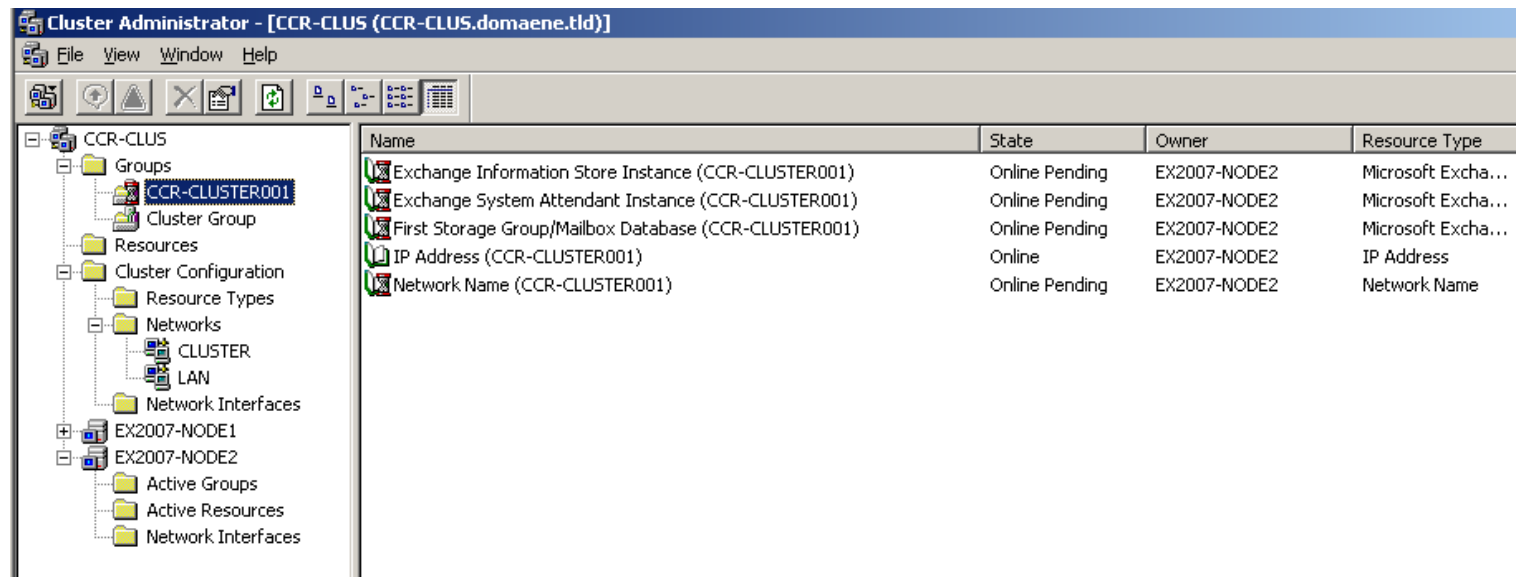
File View Window Help



Name	State	Owner	Resource Type
Exchange Information Store Instance (CCR-CLUSTER001)	Online	EX2007-NODE1	Microsoft Excha...
Exchange System Attendant Instance (CCR-CLUSTER001)	Online	EX2007-NODE1	Microsoft Excha...
First Storage Group/Mailbox Database (CCR-CLUSTER001)	Online	EX2007-NODE1	Microsoft Excha...
IP Address (CCR-CLUSTER001)	Online	EX2007-NODE1	IP Address
Network Name (CCR-CLUSTER001)	Online	EX2007-NODE1	Network Name

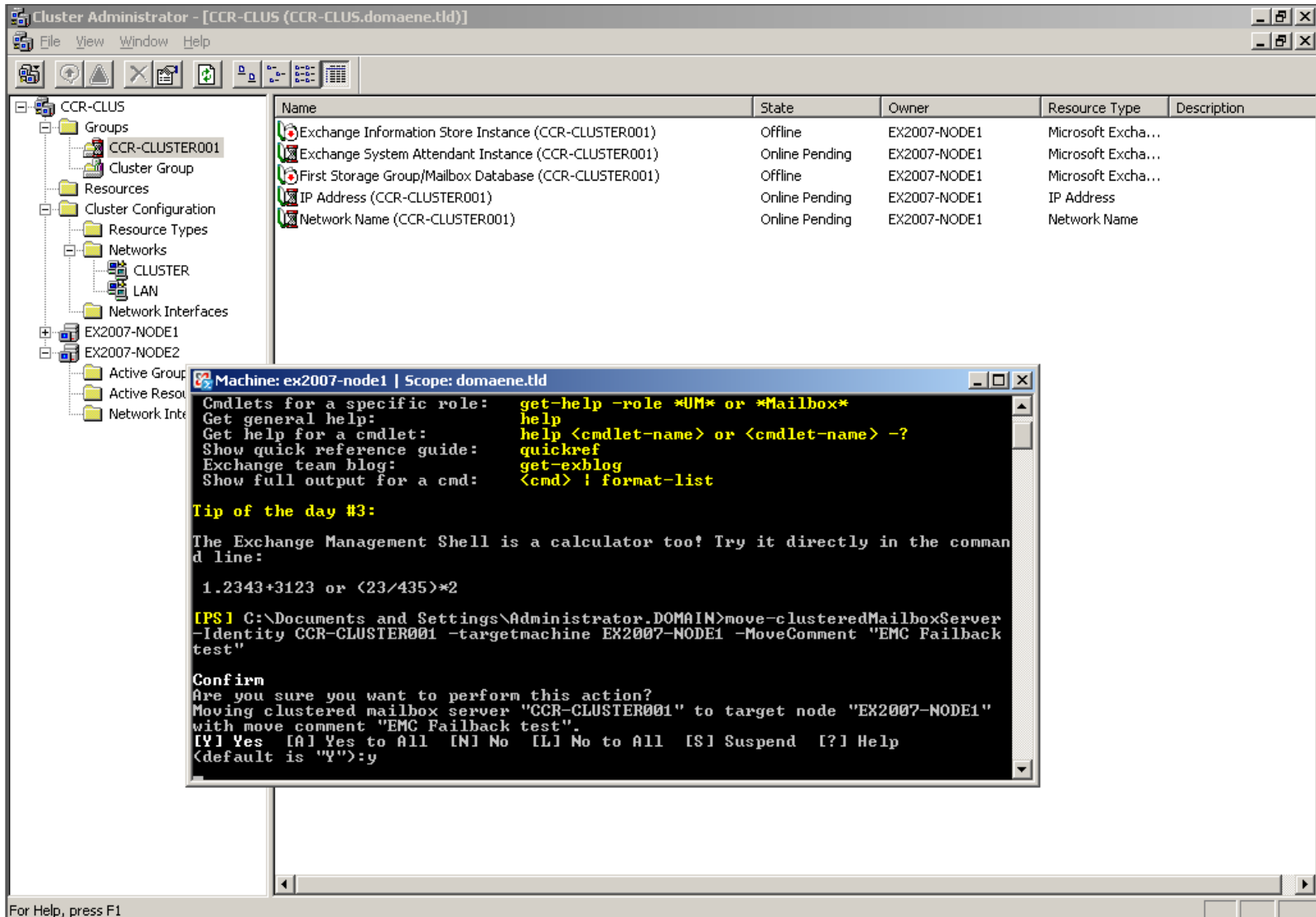
Cluster Administrator - [CCR-CLUS (CCR-CLUS.domaene.tld)]

File View Window Help



Name	State	Owner	Resource Type
Exchange Information Store Instance (CCR-CLUSTER001)	Online Pending	EX2007-NODE2	Microsoft Excha...
Exchange System Attendant Instance (CCR-CLUSTER001)	Online Pending	EX2007-NODE2	Microsoft Excha...
First Storage Group/Mailbox Database (CCR-CLUSTER001)	Online Pending	EX2007-NODE2	Microsoft Excha...
IP Address (CCR-CLUSTER001)	Online	EX2007-NODE2	IP Address
Network Name (CCR-CLUSTER001)	Online Pending	EX2007-NODE2	Network Name

Failover / Failback



The screenshot shows the Cluster Administrator interface for a cluster named CCR-CLUS. The left pane shows the cluster hierarchy, including Groups, Resources, and Network Interfaces. The right pane displays a table of resources and their states.

Name	State	Owner	Resource Type	Description
Exchange Information Store Instance (CCR-CLUSTER001)	Offline	EX2007-NODE1	Microsoft Excha...	
Exchange System Attendant Instance (CCR-CLUSTER001)	Online Pending	EX2007-NODE1	Microsoft Excha...	
First Storage Group/Mailbox Database (CCR-CLUSTER001)	Offline	EX2007-NODE1	Microsoft Excha...	
IP Address (CCR-CLUSTER001)	Online Pending	EX2007-NODE1	IP Address	
Network Name (CCR-CLUSTER001)	Online Pending	EX2007-NODE1	Network Name	

Overlaid on the interface is a command prompt window titled "Machine: ex2007-node1 | Scope: domaene.tld". The window shows the following text:

```

Cmdlets for a specific role:  get-help -role *UM* or *Mailbox*
Get general help:            help
Get help for a cmdlet:       help <cmdlet-name> or <cmdlet-name> -?
Show quick reference guide:  quickref
Exchange team blog:         get-exblog
Show full output for a cmd:  <cmd> ! format-list

Tip of the day #3:

The Exchange Management Shell is a calculator too! Try it directly in the command line:

1.2343+3123 or (23/435)*2

[PS] C:\Documents and Settings\Administrator.DOMAIN>move-clusteredMailboxServer -Identity CCR-CLUSTER001 -targetmachine EX2007-NODE1 -MoveComment "EMC Failback test"

Confirm
Are you sure you want to perform this action?
Moving clustered mailbox server "CCR-CLUSTER001" to target node "EX2007-NODE1" with move comment "EMC Failback test".
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help
<default is "Y">:y
  
```

At the bottom left of the Cluster Administrator window, it says "For Help, press F1".

Exchange Cluster entfernen

```
Machine: ex2007-node1 | Scope: domaene.tld
[PS] C:\Documents and Settings\Administrator.DOMAIN>get-clusteredmailboxserverstatus

Identity                : CCR-CLUSTER1
ClusteredMailboxServerName : CCR-CLUSTER1.domaene.tld
State                    : Online
OperationalMachines      : {EX2007-NODE1 <Active, Quorum Owner>, EX2007-NODE2}
FailedResources          : {}
IsValid                  : True
ObjectState              : Unchanged
```

Clustered Mailbox Owner bestimmen

```
Command Prompt
[PS] C:\Documents and Settings\Administrator.DOMAIN>
C:\Program Files\Microsoft\Exchange Server\Bin>setup /removeCMS /CMSName:CCR-Cluster1

Welcome to Microsoft Exchange Server 2007 Unattended Setup

Preparing Exchange Setup

The following server roles will be removed
  Clustered Mailbox Server

Performing Microsoft Exchange Server Prerequisite Check
  Clustered Mailbox Role Checks ..... COMPLETED

Configuring Microsoft Exchange Server
  Clustered Mailbox Server .....
C:\Program Files\Microsoft\Exchange Server\Bin>
```

CMS entfernen

Passive Node
entfernen

```
Command Prompt - setup /mode:uninstall
C:\Program Files\Microsoft\Exchange Server\Bin>setup /mode:uninstall

Welcome to Microsoft Exchange Server 2007 Unattended Setup

Preparing Exchange Setup

The following server roles will be removed
  Mailbox Role
  Management Tools

Performing Microsoft Exchange Server Prerequisite Check
  Mailbox Role Checks ..... COMPLETED

Configuring Microsoft Exchange Server
  Mailbox Server Role ..... 7%
```

Exchange Cluster entfernen - II

```

c:\Program Files\Microsoft\Exchange Server\Bin>setup /mode:uninstall

Welcome to Microsoft Exchange Server 2007 Unattended Setup

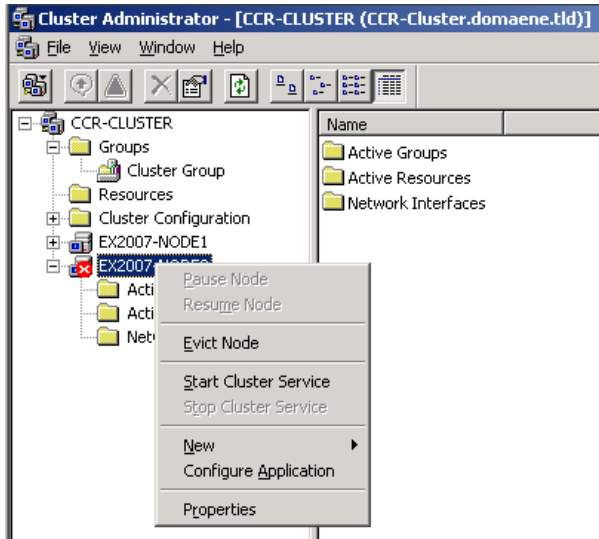
Preparing Exchange Setup

The following server roles will be removed
Mailbox Role
Management Tools

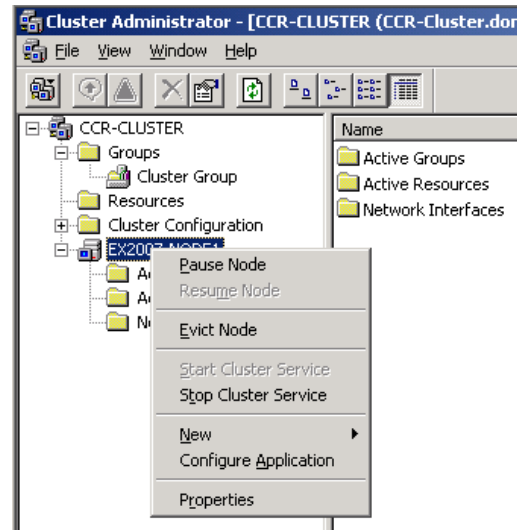
Performing Microsoft Exchange Server Prerequisite Check

Mailbox Role Checks ..... COMPLETED

Configuring Microsoft Exchange Server
Mailbox Server Role ..... 7%
  
```

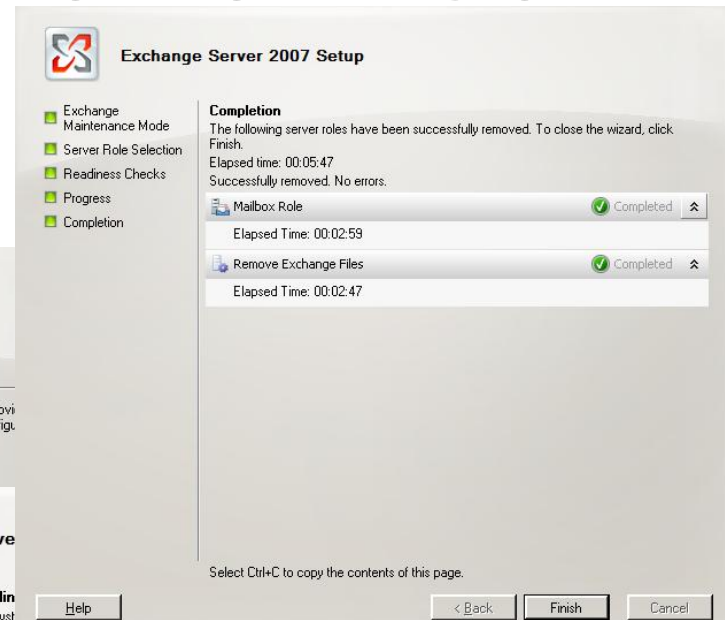
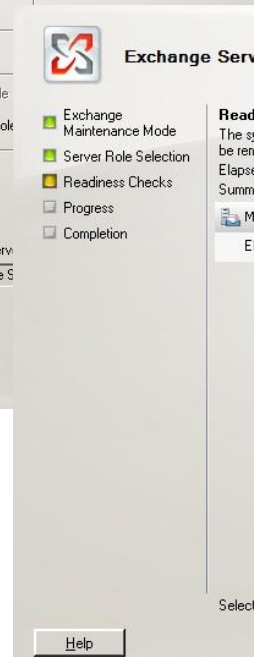
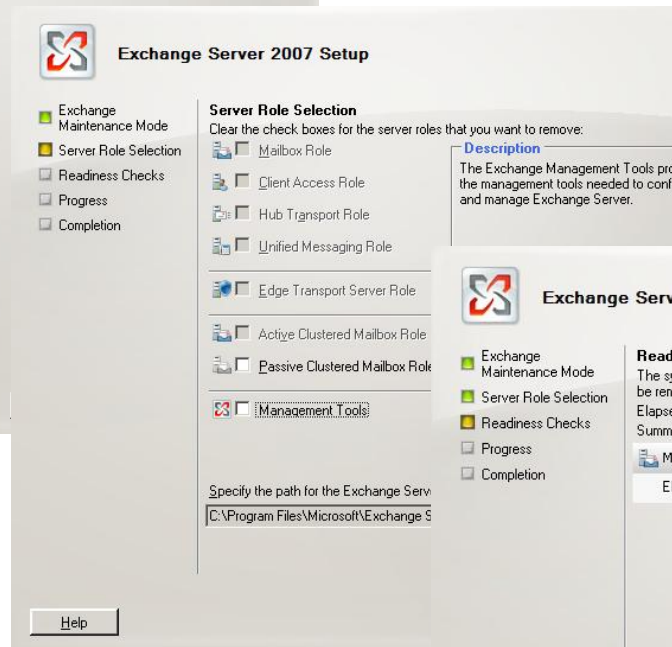
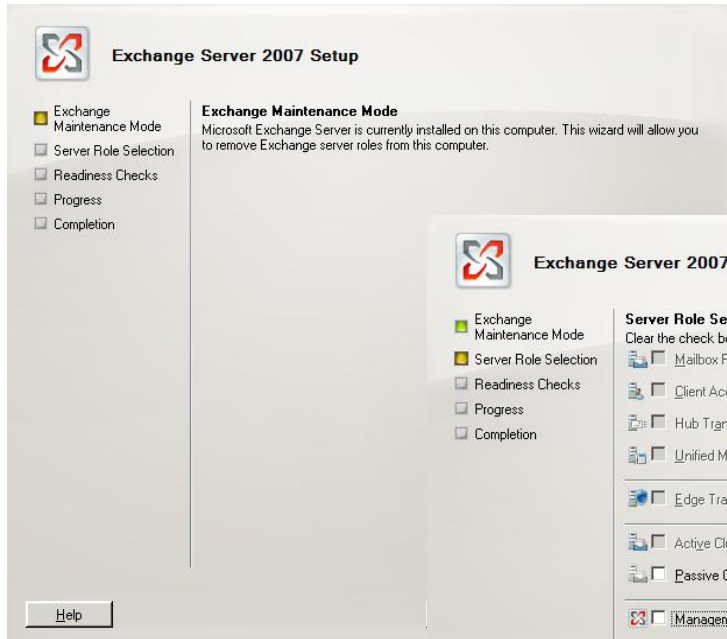


Passive Node
entfernen



Last Node
entfernen

Exchange Cluster entfernen - GUI



Vor der Deinstallation des aktiven Cluster Knoten müssen alle Mailboxen verschoben oder deaktiviert werden

Links

- <http://nw-america.com>
- <http://www.microsoft.com/windowsserver2003/community/centers/clustering/default.aspx>
- <http://www.microsoft.com/windowsserver2003/technologies/clustering/default.aspx>
- <http://msexchangeteam.com/archive/2006/08/09/428642.aspx>
- <http://www.msexchange.org/tutorials/Installing-Configuring-Testing-Exchange-2007-Cluster-Continuous-Replication-Based-Mailbox-Server-Part1.html>
- <http://support.microsoft.com/default.aspx?scid=kb;en-us;887827>
- <http://support.microsoft.com/default.aspx?scid=kb;en-us;895981>
- <http://support.microsoft.com/default.aspx?scid=kb;en-us;818665>
- <http://www.microsoft.com/downloads/details.aspx?FamilyID=96f76ed7-9634-4300-9159-89638f4b4ef7&DisplayLang=en>
- <http://www.microsoft.com/technet/prodtechnol/virtualserver/deploy/cvs2005.aspx>
- <http://www.exchange-mail.org/articles/VMware%20clustering%201.0.pdf>

Fragen



Das Ende

- Vielen Dank für Ihre Aufmerksamkeit

A business card for Marc Grote, an IT-Trainer & Consultant. The card has a blue and orange color scheme. The top left features the 'IT TRAINING-GROTE SCHULUNG & CONSULTING' logo. The middle left section has a white background with the word 'CONTACT' in orange, handwritten-style text, with a large orange arrow pointing to the right. Below this is a faint fingerprint graphic. The right side of the card is dark blue with white text providing contact information.

The logo for IT Training-Grote Schulung & Consulting, featuring a stylized orange 'IT' icon to the left of the text 'TRAINING-GROTE' in a bold, sans-serif font, with 'SCHULUNG & CONSULTING' in a smaller font below it.

CONTACT →

MARC GROTE
IT-TRAINER & CONSULANT

HALTENHOFFSTR. 229
30419 HANNOVER-HERRENHAUSEN

MOBIL: 0176 / 233 802 79

E-MAIL: GROTEM@IT-TRAINING-GROTE.DE
WEBSITE: WWW.IT-TRAINING-GROTE.DE