



# Notes Domino 8.5



## Domino Attachment and Object Service (DAOS)

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## Top Sheet

- DAOS (Domino Attachment and Object Service) is part of Domino's green computing initiative. It provides the consolidation and storage of attachments for all users of a Domino server.
- DAOS stores common attachments only once (outside the Notes database) and manages reference counts on the shared content. In this way, when an email is sent with an attachment to multiple recipients, one reference of the attachment is stored in DAOS and the recipients get a “small ticket” or pointer to the DAOS store instead of the actual attachment.
- With DAOS, mail file storage is greatly reduced as only one copy of the attachment is stored per server. In addition, since the attachment is outside of the Notes database stores, server performance is greatly enhanced.
- This will be beneficial for all customers who have mail file size issues due to large attachments and who have multiple servers or recipients per server.
- Do your end users send large attachments to a group of users?  
Do you have issues with mail file sizes due to large attachments or multiple attachments?  
Do your customers want to reduce storage costs for Domino mail files?
- Most of the competition uses “shared mail” - a concept where ALL mail is shared and therefore only one “version” of a message is stored. This does not use the “shared mail” concept, and only acts on attachments, thereby reducing corruption and still allowing users to have larger mail files.

## Reduce Storage with DAOS and Domino 8.5

- Storage costs consistently rate as one of the highest components of Domino TCO
- New 8.5 features will help dramatically reduce disk usage, especially overlapping storage – therefore, better TCO!!
  
- Domino Attachment and Object Service (DAOS)
  - Part of Domino's green computing initiative
  - Allows for single instance storage for attachments/objects present in multiple mail files/ applications
  - When combined with other compression features available, yields disk space savings from 40-60%!
  - This represents significant disk space savings, reduced energy consumption and I/O usage along with less network bandwidth consumption and less data to backup

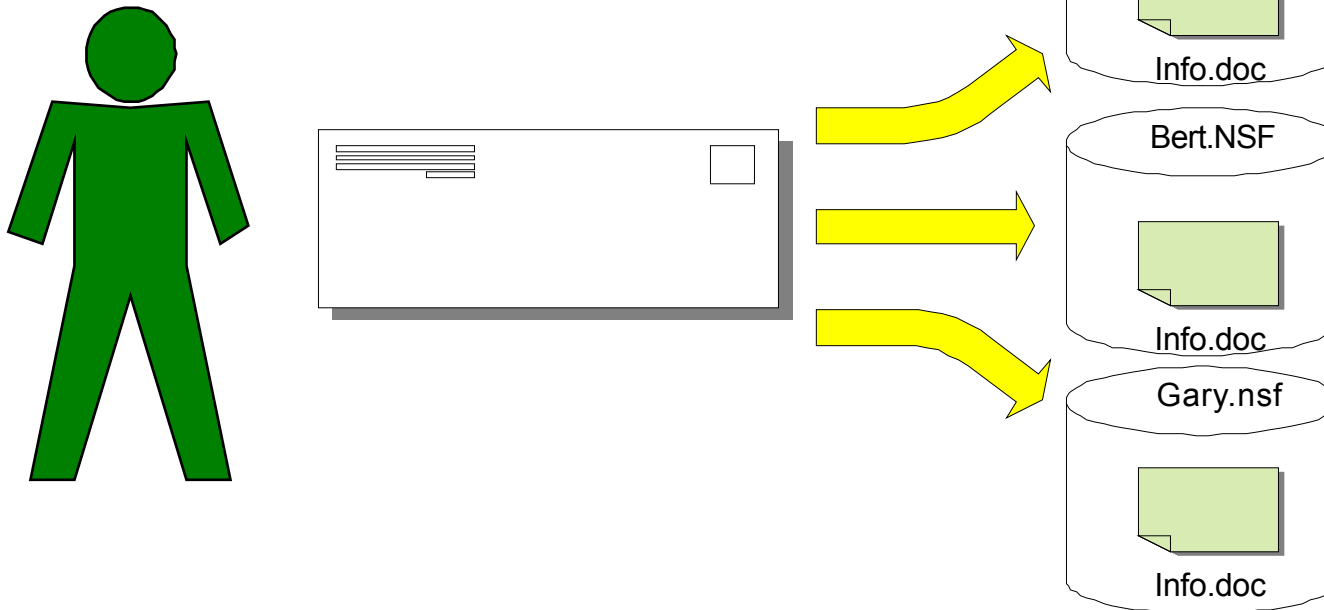
## DAOS Quick Facts

- Domino Attachment and Object Service
- Large Object Store for Domino
  - Does NOT leverage same code as “Shared Mail”
  - Content is stored outside of the Notes database.
  - Consolidate the storage of attachments for all users of a Domino server
  - Common content is stored only once. DAOS manages reference counts on the shared content.
  - Access to DAOS objects is transparent to end-user, Domino server and applications
  - DAOS is transparent to C-API calls, Agents, LotusScript

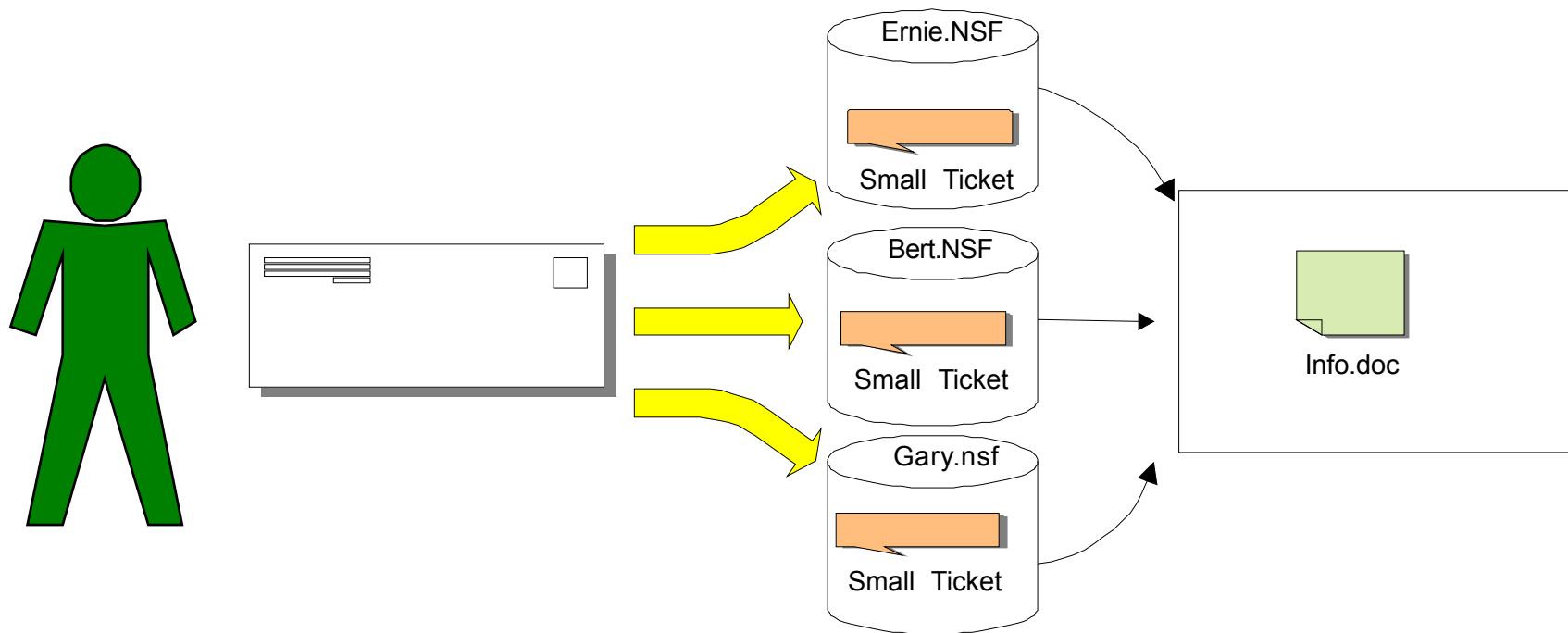
# How Does it Work?

## The old way...

Attachments sent to each user are stored separately in each user's mail file.



## The new way, using DAOS



## How Does It Work...Details

- Enabled on a server-by-server (Domino instance) basis
- Works on ANY database that resides on an enabled server with database property selected
- When a document is saved (or emailed), Domino sees it as:
  - DddddXXXXXdddddddXXXXXXXXXddddddXXXX where “d” is the body and “X” are the attachments
- DAOS “rewrites” it so that Domino now sees it as:
  - DddddTdddddddTddddddT where “d” is the body and “T” is the small ticket info for DAOS
- DAOS then:
  - puts the attachment in the file system as an .NLO file (one .NLO per attachment)
  - Puts a counter/reference to the .NLO file in the DAOSCatalog.nsf
- When the end-user access the attachment, Domino sees the small ticket item and gets the .NLO file as the attachment

## More Details...

- Requires the 8.5 ODS
- Requires transaction logging
- The .NLO files are in an administrator-defined directory on the file system of the Domino server (or a SAN/NAS)
  - The default location for NLO files is: Domino\Data\DAOS\001\xxxx.nlo
- .NLO files can be encrypted by Domino, but is not required
- Maintains a DAOSCatalog.nsf
  - Keeps track of all counts for an attachment and where the “tickets” for the attachment are referenced
  - Knows every .NLO created on the server and how many references for each
  - Maintains a list of every .NSF file using the attachments
- What about when attachments are modified or copied?
  - DAOS code recognizes when an attachment is updated and stores the new copy as another .NLO file
  - DAOS can also recognize a copied/pasted attachment and references the already existing .NLO

## And More Details...

- What about in a clustered environment?
  - Supports clustering, but each server must have it's own DAOS store
  - Cannot “copy” or backup DAOS store from one server to another
- Access to DAOS objects is transparent to:
  - Other Domino servers (such as clustered servers).
  - Notes applications (such as local mail files).
  - C-API calls, Agents, LotusScript.
- DAOS objects do not reduce the mail file size from the perspective of quotas.
  - “Consolidated attachments” still count against quota and are reported as part of the application's file size.

## DAOS Example

- Email with a 5Mb attachment sent to 12 people on the same mail server
  - With DAOS, only 1 instance of the 5Mb attachment is written to disk and stored
  - A disk space savings of 92%!
    - Less I/O on the Domino server
    - Faster database operations such as compact
  - Prevents “Reply to All” scenario, where an attachment can be sent, and resent again and again...
  
- Email with a 5Mb attachment sent to 12 people, 6 on one server, 6 on another server
  - With DAOS, only 1 instance of the 5Mb attachment is written to disk and stored per server – so only 10Mb in total across both servers
  - Less network bandwidth used (only one copy to send to 2<sup>nd</sup> server)
  - Same savings as above also apply

# Disk Savings – IBM production Mail Servers (approx 20,000 user mail files)

	D03NM118	D01MLC07	D01ML253	D03NM115	D03NM116
MAIL1	31%	24%	29%	30%	29%
BEFORE	50.4	14.3	96.3	111.5	85.9
AFTER	34.6	10.8	68.4	78.5	60.6

Size (MB)

## DAOS Benefits

- **Reduced disk space**
  - Any given DAOS object exists only once on the server
  - Sampling of two different mail servers within IBM had savings of 11-25%
  - The more participating databases, the greater the sharing and savings opportunity
- **Optimized mail routing of attachments**
- **Optimized object copying for any same server copy operations**
- **Compacting databases is faster**
  - 2-7 times faster in our samples
  - Large attachments do not need to be shuffled around to manage space
- **Even greater savings in:**
  - I/O operations – the number of times the disk is accessed during an action (e.g. Saving a document with an attachment)
  - Disk Kilobytes written – the amount of data read and written during an action
  - CPU – the amount of processing required to perform a specific action

## More DAOS Benefits

- **Backup and Restore**
  - DAOS can be backed up incrementally
  - For example:
    - NSF data reduced from 122GB to 3.27GB with DAOS and compression
    - DAOS store 33.7GB can be incrementally backed up
- **Greatest Benefit in using DAOS is in an environment that has:**
  - Databases with large number of attachments
  - Same attachment stored multiple times on a single server
  - Relatively infrequent access to the attachments (each revision is a new file to be stored)
  - Frequent compact and backup operations
- **Least Benefit in using DAOS is in an environment that has**
  - Few attachments
  - Embedded content vs attached content
  - Encrypted attachments (which cannot be consolidated for shared storage)

## Fun extra facts!

- DAOS uses checksums to determine if attachments are the same
- A local replica will get the full attachment – not the “small ticket”
- There are admin tools to restore the catalog and the .NLO files as well as “repack” the database with the attachments
- Don't do an O/S-level copy of a database or the DAOSCatalog OR the .NLO files if using DAOS! (things will break)
- Even web applications can leverage DOAS (but not Quickr)

## Help “Sell” the Benefits

- Development will have a tool that will review all the NSF's for a particular server (R6/R7/R8). It will record information about them and generate actual and predicted sizes of NSF and the amount of data in the DAOS repository after DAOS is run.
- For example: (run on an Iris server)
  - Given the data, the prediction is that there will be approx. 22GB of data in the DAOS repository and 9Gb data in the NSF's – resulting in a savings of almost 44Gb!
  - And..a single 10mb attachment had 40 references, saving 390Mb for that attachment alone!

### Short version:

before:	74.5 Gb NSF
after:	8.4Gb NSF+ 21.8Gb NLO

Total NSF footprint before: 78148550 (Kb)

Total count of NSF's processed: 750

Total count of NLOs after: 127138

Total NLO footprint after: 22862774 (Kb)

Total attachment data extracted: 69299417 (Kb)

Total number of attachments extracted: 410250

Max individual savings: size=10089 (Kb) refs=40

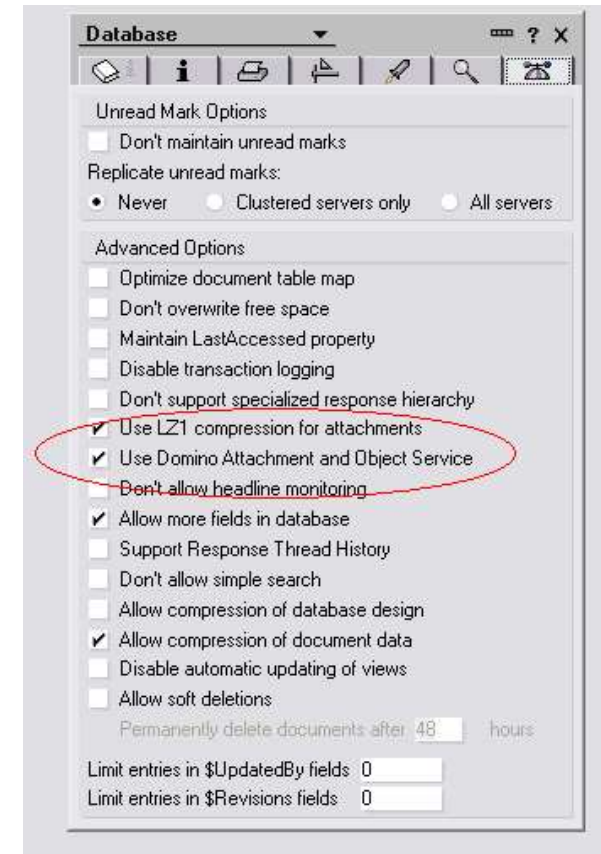
Total NSF footprint after: 8849133 (Kb)

Total footprint before: 78148550 (Kb)

Total footprint after: 31711907 (Kb)

## How Do you Enable It?

- Use of DAOS is optional
  - DAOS service is specific to each Domino server partition – enabled in the server configuration document
  - DAOS only available in Domino 8.5
- Simple to use
  - Participation in DAOS is a per database property setting
  - Compact *database.nsf* –c –daos on
  - Compact *database.nsf* –c –daos off



## For More Information

- IBM Lotus Domino going green: The new Lotus Domino attachment and object service

[http://www.ibm.com/developerworks/lotus/library/domino-green/?S\\_TACT=105AGX54&S\\_CMP%C2%B0717&ca=dnw-928](http://www.ibm.com/developerworks/lotus/library/domino-green/?S_TACT=105AGX54&S_CMP%C2%B0717&ca=dnw-928)

- Dominoblog.com Entries:

- Reduce Storage Costs with Domino 8.5

<http://www.dominoblog.com/dominoblog/dblog.nsf/dx/reduce-storage-costs-with-domino-8.5>

- DAOS – How it works and Security

<http://www.dominoblog.com/dominoblog/dblog.nsf/dx/daos-how-it-works-and-security?opendocument&comments>

- DAOS Part3 – Restores, Admin and Misc Info

<http://www.dominoblog.com/dominoblog/dblog.nsf/dx/daos-part3?opendocument&comments>

- For information on the “Help sell DAOS” tool:

- TBD