



OPS-11: After Imaging - New features, Greater flexibility  
Adam Backman

**OPS-11: After Imaging  
- New features,  
Greater flexibility**

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White Star Software



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**Agenda**

- Basics
- New features
- Implementation
- No Archiver no problem
- Maintenance
- Wrap-up and Questions

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**Basics**

- What is after imaging?
- Why use after imaging?
- How does it work?
- What is the AI archiver?

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**What is after imaging?**

- A journal of transaction data that can be replayed to restore a database to the last completed transaction or a point in time or a specific transaction number.
- Referred to as a redo log.
- Differs from the before image file as space is not reused without interaction.

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**Why use after imaging?**

- Extra layer of protection
- Protections from media loss
- Protection from human error

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**How does it work?**

- All transaction data is written synchronously to the after image journal which can be accessed in a recovery scenario.
- Not automatically enabled
- Recovery not automated

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### How the AI File Works

FOR EACH customer: ← Transaction Begin

UPDATE customer. ← BI Note Written  
← AI Note Written

END. ← Transaction End

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### What does this physically look like on your system

Shared Memory

Database Before Image After Image  
After Image  
After Image

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### After imaging new features (As of 10.1B03)

- Ability to add extents online
- Ability to start AI online
- Ability to archive AI extents
- Ability to move AI archive directory online
- Ability to change AI archive interval online

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### Adding Extents Online

- New Syntax  
`proutil <db> -C addonline [st-file-name]`
- Notes:
  - Use the verify option prior to adding extents online to ensure structure description file is correct
  - Make sure the default permissions for the user are correct prior to adding extents

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### Starting After Imaging Online

- New switch to the probkup utility  
`probkup online <db> <output-file> -enableai`
- Notes:
  - Make sure your AI files are in place
  - Check the permissions on ALL of the AI files before enabling AI
  - Good for the post recovery "Oops I forgot to enable after imaging"

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### What is the AI archiver?

- Daemon started to move after image files on a time-based or fill-based algorithm to a different location and mark the AI extent for reuse.
- This can be started when the database is brought up or online through the probkup utility
- Switching archive locations or the archive interval can be done online as well
- No support for archiving to a second host.

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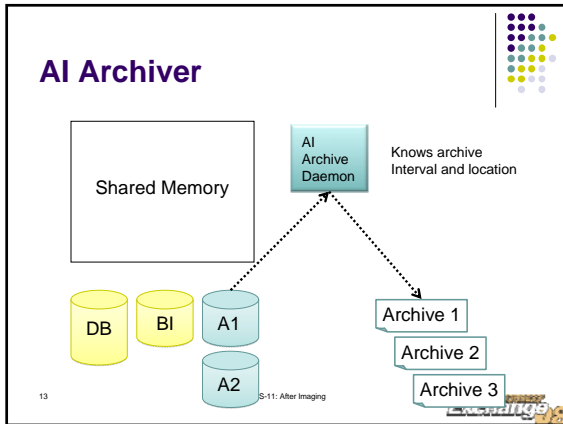
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- ### Implementation
- Creating AI files
    - How many
    - What size
      - Fixed or variable length
    - Location
    - AI archive location
  - Enabling AI
  - Starting the AI archiver
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- ### Creating AI files
- These can be added with the prostrct add or addonline utility depending on your requirements
  - Q: How many AI files to create?
    - A: More than one
    - A2: Everyone will give you a different answer
  - Fixed or Variable length AI extents?
    - Variable - easier to maintain
    - Fixed for ultimate performance
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## After Image File and Archive Locations



- After Image files should reside on a different disk/LUN than any other aspect of the database (db, dn, bn)
- Ideally, the after image archives should reside on yet another disk/LUN but this is not always possible.
- In this case put the archives with the database as this will provide the greatest protection from data loss

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## Archive Timing



- It is of utmost importance to get the archives off the primary system and on to a different system as quickly as possible
- It would be nice if the archive system was very far away
- There are plenty of ways to get these files off site without owning multiple sites (Remote storage via the internet)

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## Enabling AI



- After imaging should be part of every OpenEdge® implementation
- Offline: truncate the before image file, mark the database as backed up then run:

```
rfutil db -C aimage begin
```

- Online: `probkup online db -enableai`

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### Enabling the AI archiver

- The archiver is enabled with the proutil utility or online through the probkup command as is the case with enabling after imaging.

```
proutil db -C enableaiarchiver
```

OR

```
probkup online db -enableaiarchiver -aiarcdir dir  
-aiarcinterval n [-aiarcdircreate]
```

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### Changing the Archive Directory Online

- New Syntax:

```
rfutil <db> -C aiarchiver setarcdir <dir-list>
```

- Directories can be optionally created on the fly as well but I generally don't use this option
- Again watch permissions

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### Changing Archive Interval

- New Syntax:

```
rfutil <db> -aiarchiver setinterval #
```

- Useful for correcting the mistake of minutes versus seconds when first setting up archiving
- Valid range 120 to 86,400 (2 minutes to 1 day)

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**No archiver no problem**

- If for some reason you do not want to run the archiver you can still archive AI files while the database is online.
- Check the number of full extents
- Switch extents `rfutil db -C aimage new`
- Find the last full extent `rfutil db -C aimage full`
- Repeat for the number of full extents
- Example: [www.wss.com](http://www.wss.com)

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**Maintenance**

- Monitoring your AI files
- Archive log naming
- Backing up AI archive files
- Cleaning up AI archive files

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**Monitoring After Image Files**

- From the command line:  
`rfutil <db> -C aimage extent list`
- It is a little tricky with VSTs but you can use ProTop (free download: [wss.com](http://wss.com))
- With the archiver active you should not have more than one full extent

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### Archive Log Naming

- This is not changeable (it should be)
  - Date and time
  - Simple sequence
  - Sequence tied to backup
- Current naming convention is:  
<arc-dir>/<db>.backup-seq.ai-seq.extent-name
- Easily managed as the sequence number of the extent is in the name as well as the time which helps in recovery situations

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### Backing up Archives

- This is NOT included in the Progress® backup
- Archives should be backed up to a separate backup media to protect against media failure
- It is recommended to move archives to a second machine throughout the day

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### Cleaning Up Archives

- The archiver will retain archives forever which eventually will cause a problem with disk space
- How much to keep is dependant on your business
- Create an automated process to clean up archives after a period of time (days)
- I would recommend keeping at least 7 days of archives online

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### Cleaning up Archives - Unix/Linux



- The find command is very useful for this task

```
# Archive Cleaner  
# Should be run from cron daily  
ARCDIR=your-archive-directory  
KEEPDAYS=30  
Find $ARCDIR -mtime $KEEPDAYS -exec rm {} \ 2>&1 > /dev/null
```

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### Cleaning up Archive - Windows



- The best way to cleanup files uses a file from the windows resource kit (free)
- The file you are looking for is forfiles.exe in %WINDOWS%\system32

```
REM ** Archive cleanup batch file  
REM ** Have this run as a scheduled task  
Set ARCDIR=your-archive-directory  
Set KEEPDAYS=30  
forfiles /P %ARCDIR% /m *.a* /D %KEEPDAYS% /C "CMD /C del /q @FILE"  
REM OR  
forfiles -p%ARCDIR% -m *.a* -d%KEEPDAYS% -c"CMD /C del /q @FILE"
```

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### Using AI archives to recover



- It is quite easy
- Take the second archive after your backup and every subsequent archive to get to current
- Why not the first?

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**Why Not Apply The First?**

- The backup process causes an after image file switch
- The "busy" extent will be marked a "full"
- The full extent will be archived and it's timestamp will be post the backup time
- That after image information will already be in the database
- Will not cause a big issue it will just give you a message saying it is looking for a different AI file

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**Recovery Process Overview**

- Get everyone off the system
- Backup what you have now (test it too)
  - Database (even just parts)
  - AI files
  - AI Archives
- Delete broken database
- Restore most recent backup
- Apply after image archives

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**Extending archiver usefulness**

- Off site archiving
- Log-based replication to backup machine

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**Off Site Archiving**

- This will increase the number of disasters you can recovery from
- This will decrease the potential data loss
- Getting it off the machine is a good minimum
- Getting it to an off site location soon after archive is the goal

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**Disaster scenarios**

- Floods 
- Fire 

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**Log-Based Replication**

- With the archiver you will need to deal with the awkward naming convention used by OpenEdge
- I would recommend creating a sub-directory under your archive directory for applied archives
- Have a process looking for archives
- When found take archives and apply to a second database (best if on a remote host)

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### Log-Based Replication

- The second database cannot be updated as subsequent replication will fail
- Good for backups as it eliminates backup I/O operations on the production system (use -norecover option with probkup)
- A third copy could be created from this to provide for reporting. Take the "midnight" copy of the database to provide a day-old source for reports

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### Wrap-up

- All OpenEdge systems should use after imaging to further protect your data
- There are no more excuses
  - AI can be enabled online
  - AI archiver can be enabled online
- Cleanup of archives is a manual process but is easily automated
- Use the archives to keep a backup copy of your database current

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### QUESTIONS?



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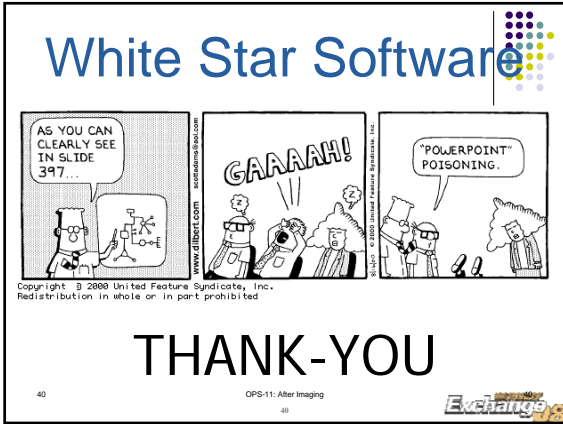
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