

A decorative graphic on the left side of the slide, composed of multiple parallel green lines of varying thicknesses that create a sense of depth and movement, resembling a stylized arrow or a series of overlapping planes.

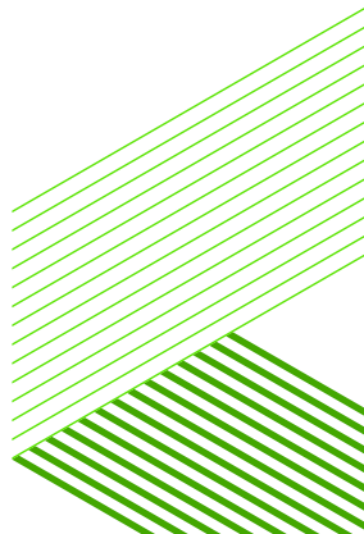
Minimize Unplanned Downtime and Data Loss with OpenEdge

Mike Furgal

Director – Database and Pro2 Services

2018 will be the year where Disaster Recovery is scrutinized higher than years before. In addition to the increased exposure to Natural Disasters, Hacker Attacks are the new disasters that need to be accounted for.

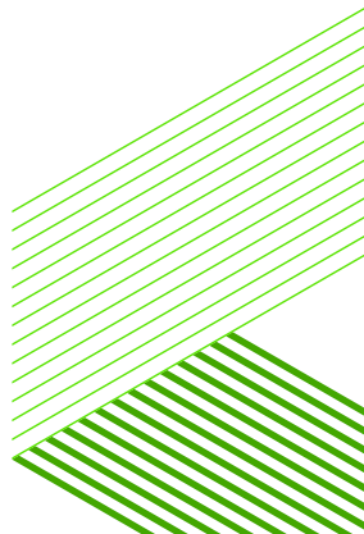
Having a solid Disaster Recovery Plan will be the key to survival



Terms

- Recovery Time Objective (RTO)
 - The targeted duration of time and a service level within which a business process must be restored after a disaster in order to avoid unacceptable consequences associated with a break in business continuity
- Recovery Point Objective (RPO)
 - It is the maximum targeted period in which data might be lost from an IT service due to a major incident.

From Business Continuity Planning



In Simpler Terms

- **Recovery Time Objective (RTO)**
 - How long it takes to recover from a disaster
 - The less time you can be down, the higher the cost of the implementation

- **Recovery Point Objective (RPO)**
 - How much data are you willing to lose
 - The less data you are willing to lose, the higher the cost of the implementation



Rodney

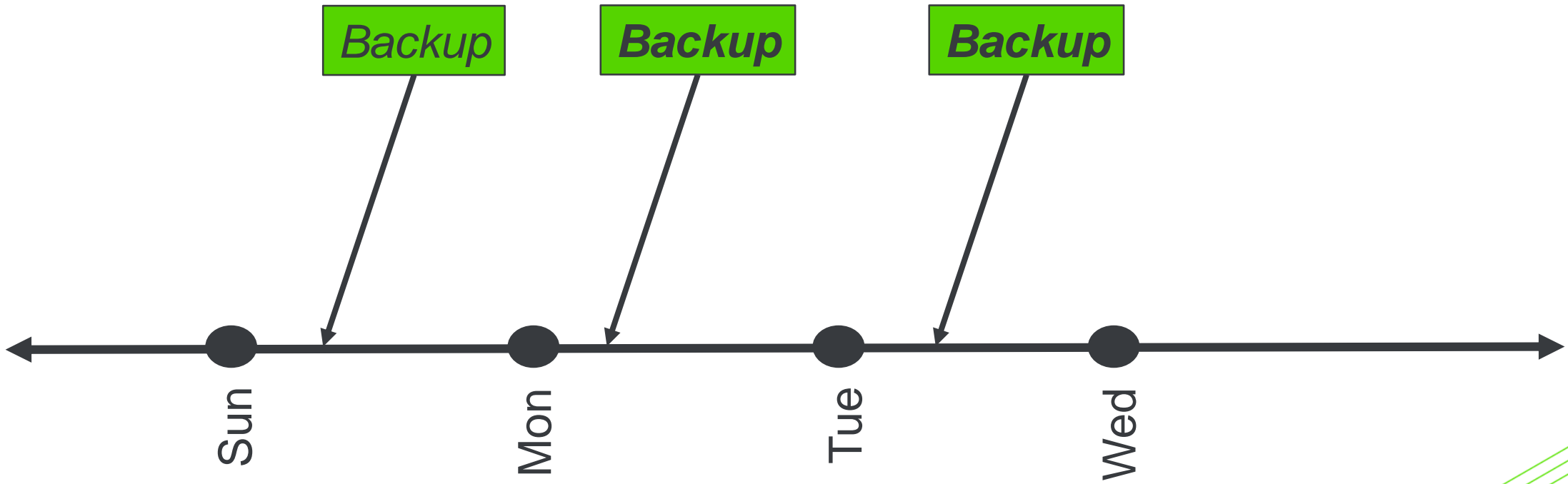
Start with the basics

- Backups
 - Offline
 - Online
 - Full
 - Incremental

When was the last time you tested your backups?

When was the last time you had to restore a backup for a reason?



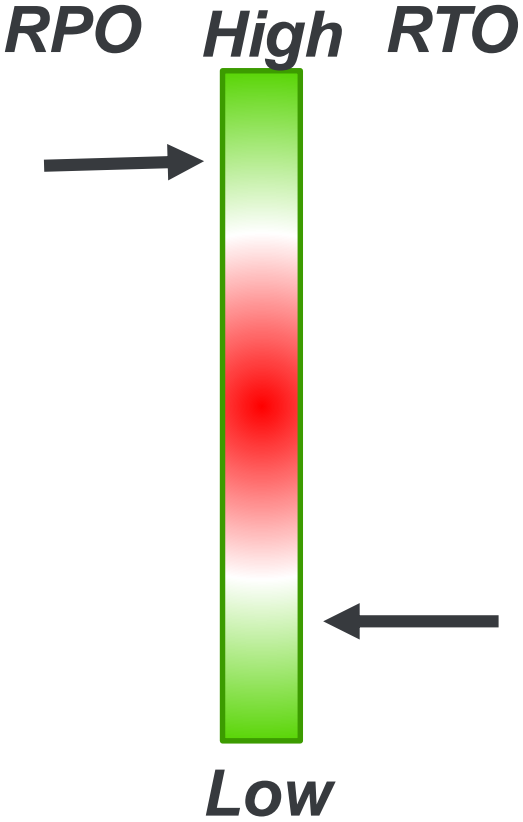


Timeline



Mike

The time to recover is reasonably quick, depending on the database size, so the RTO is low, but the amount of data loss could be a day or more depending on the frequency of backups



Level 1



Daily Backups

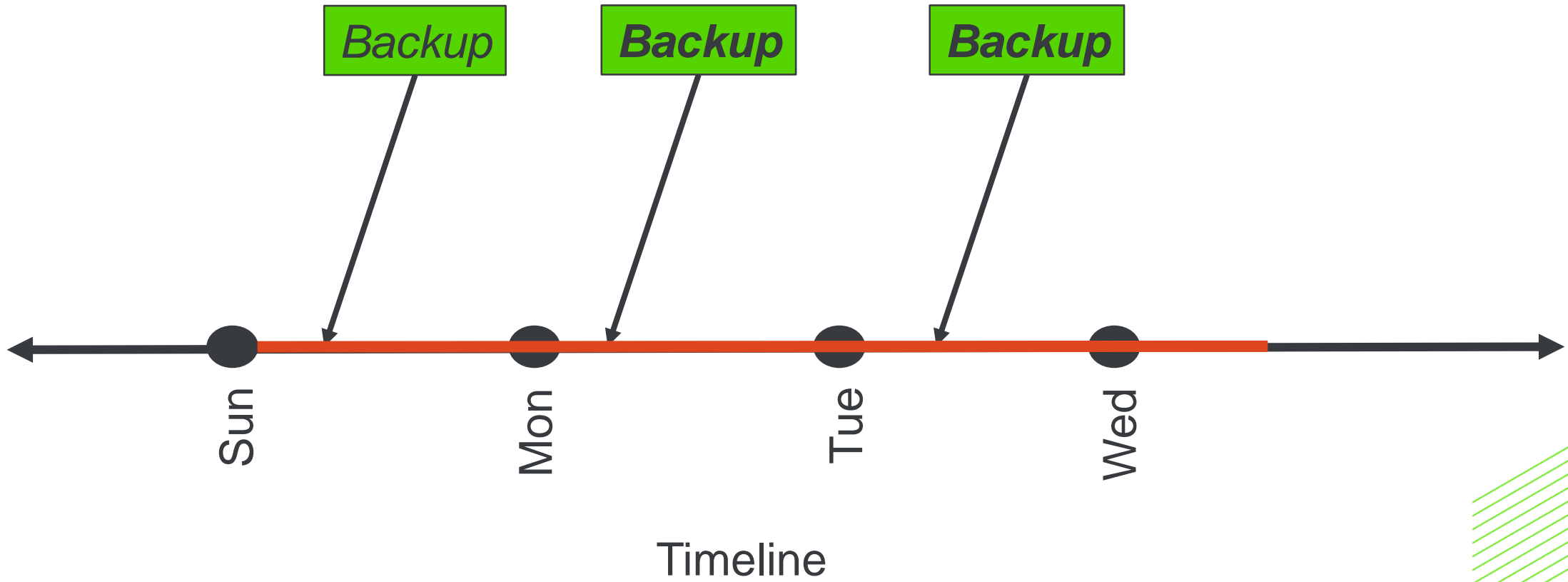


After Imaging

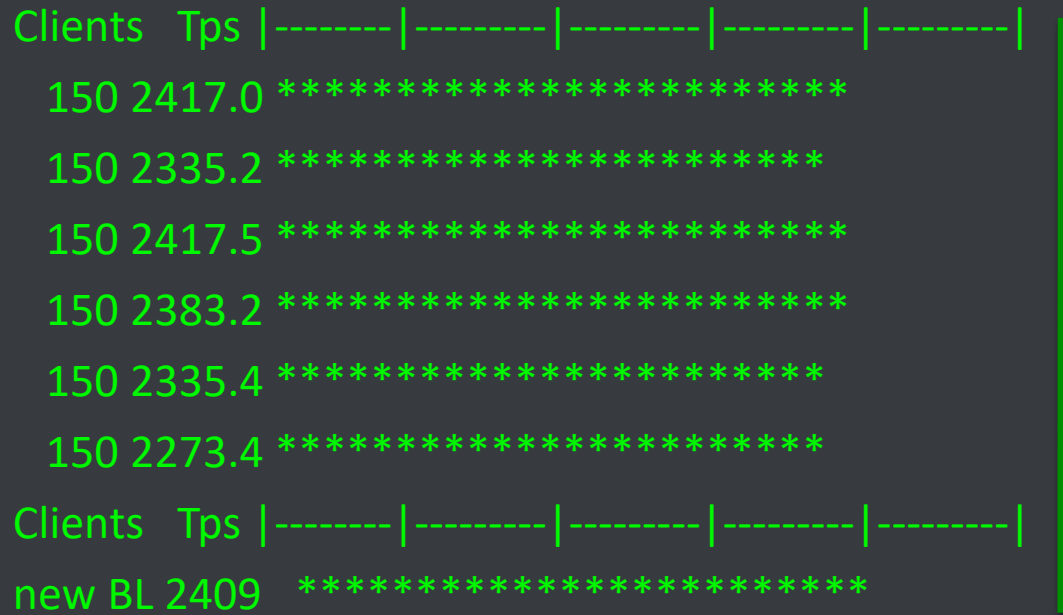
- Enables you to track all the database updates in a “redo” log
- The last good backup plus all the After Image files brings you to the point of the failure
- Simple to Enable
- Simple to Manage
- No performance penalty



After Imaging tracks changes between backups



ATM Benchmark

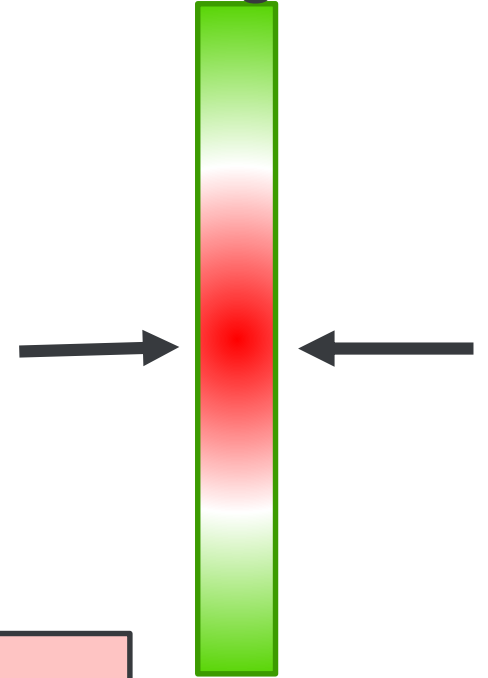


average 2360 tps, 98 %

The performance cost of After Imaging vs no After Imaging

The time to recover is longer since you need to restore the backup and apply AI files.
The amount of potential data loss goes down dramatically, however the risk is still there.

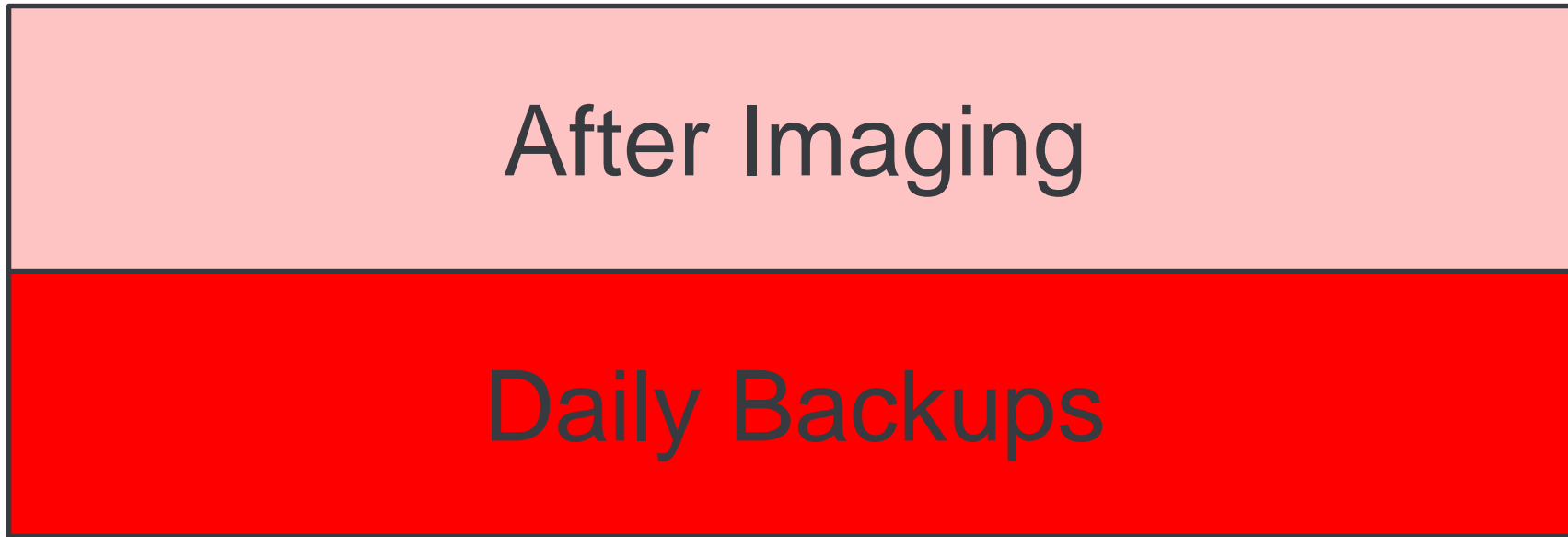
RPO High RTO



Low



Level 2



Things to think about

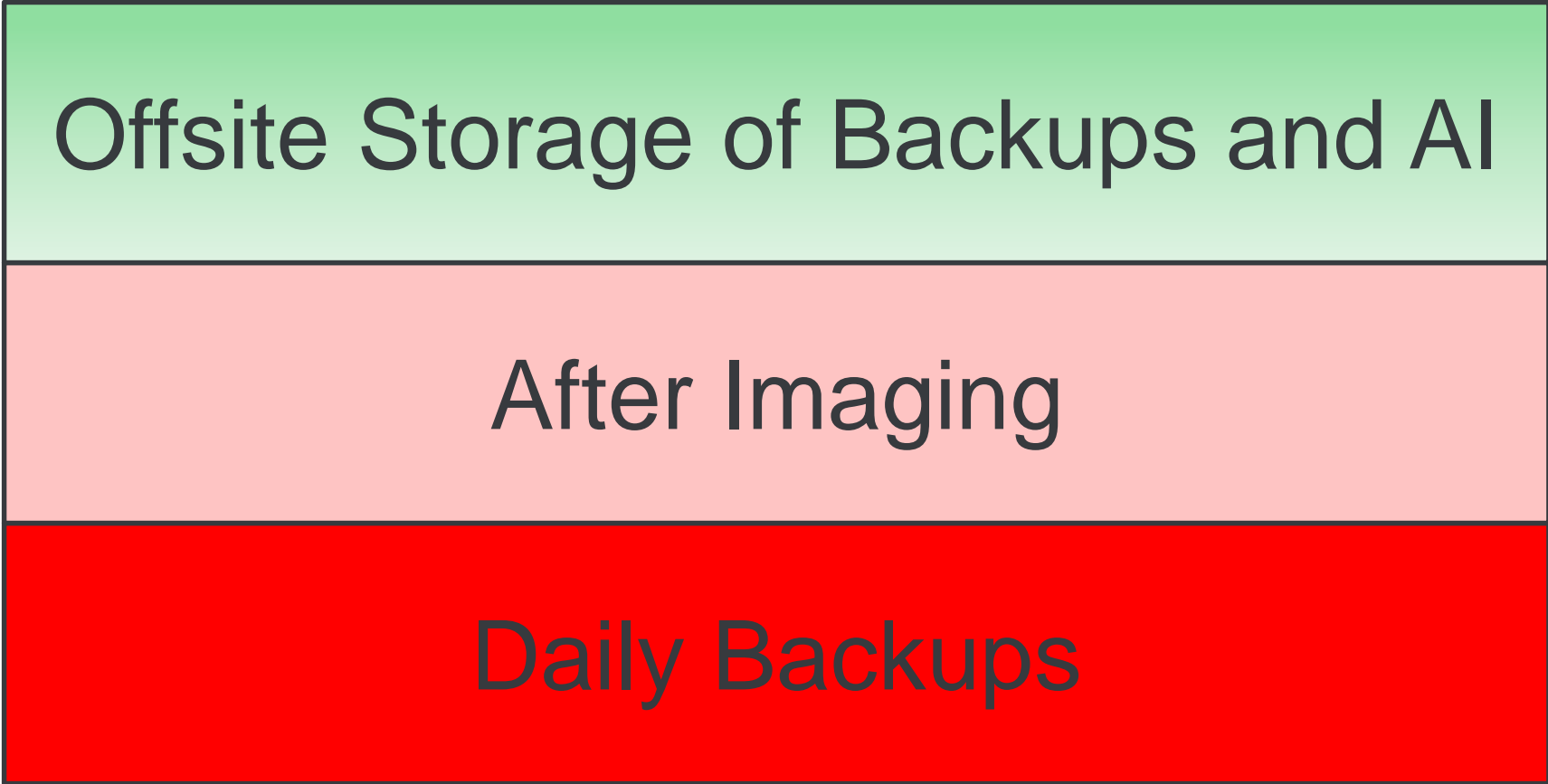
- Where are the backups stored?
- Where are the After Image files stored?
- How often are the AI files switched to move the data from being an active part of the database to being archived data?
- How long do I keep the backups and AI files?



The time to recover is longer since you need to retrieve the files from Iron Mountain or other offsite storage vendor

RPO High *RTC*

Level 3

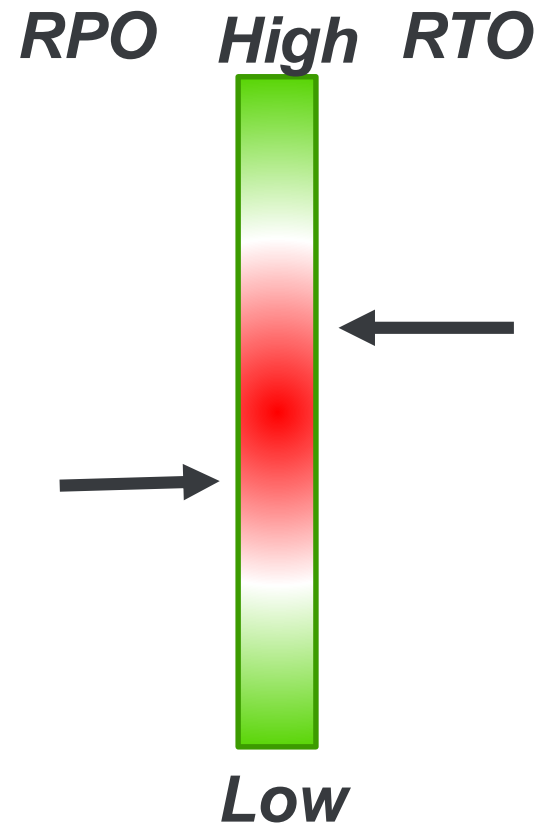


Low

Things to think about

- Where are the backups stored?
- Where are the After Image files stored?
- How often are the AI files switch to move the data from being an active part of the database to being archived data?
- How long do I keep the backups and AI files?
- How long do I keep the files locally?
- How long do I keep the files remote?





How can we get a lower RPO and lower RTO?



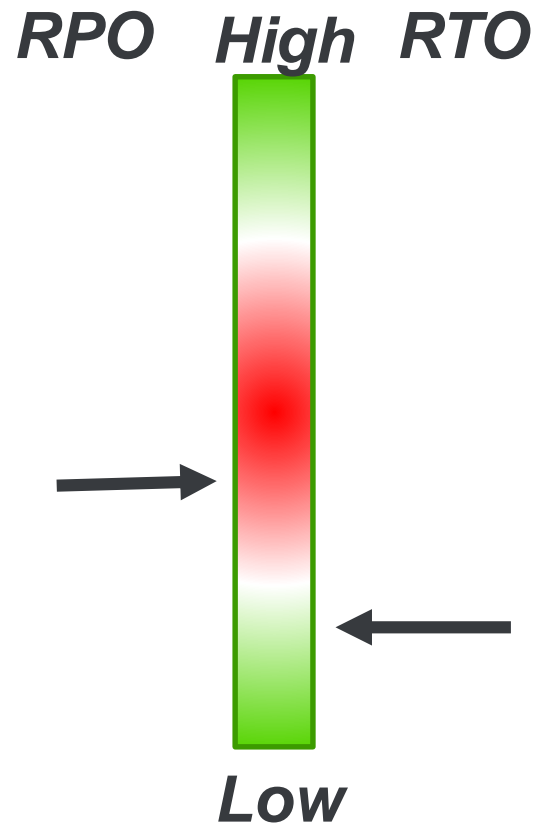
Rodney

Warm Standby Database

- Restore a copy of the database to a different location or machine
- Roll forward the After Image files as they fill up
- Recovery time is reduced to the time it takes to roll forward the last After Image file.



RPO stays the same



Moves the **RTO** Needle



Warm Standby Database

- RPO (data loss) is still possible
 - If the production machine is not available

Database Backups

Archived AI Files

Database

Data Files .d1 .d2dn

Before Image .b1 .b2bn

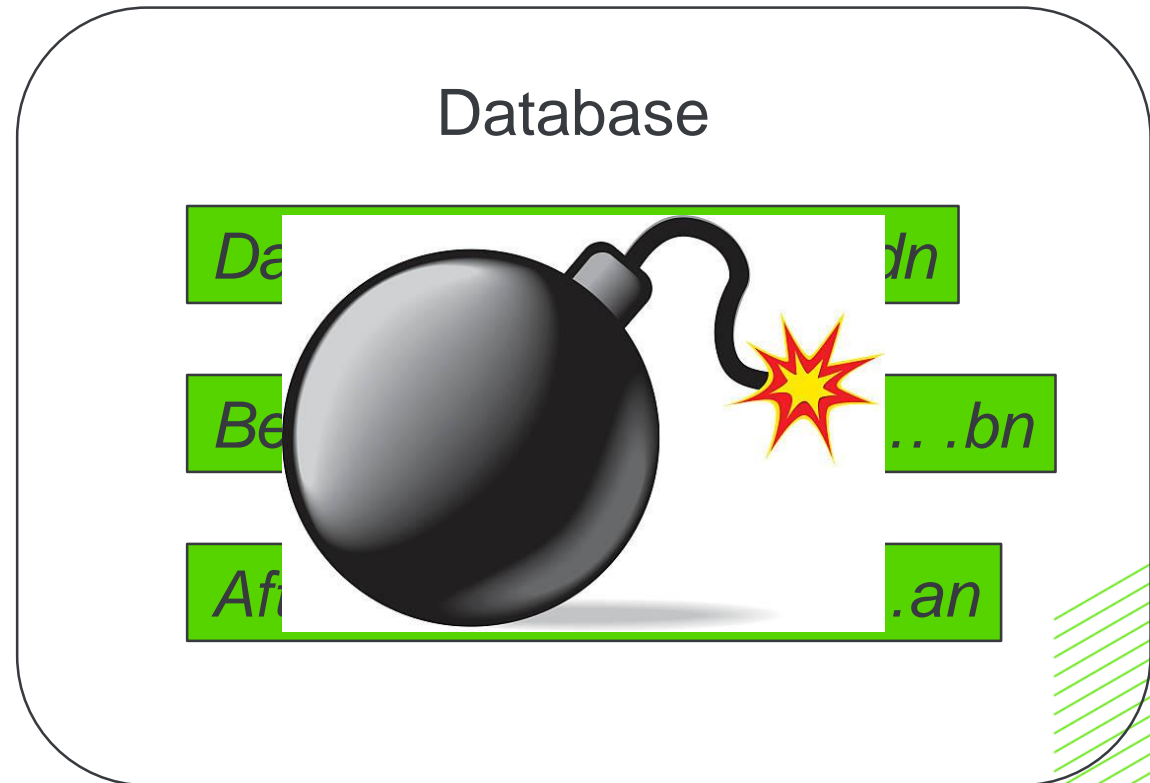
After Image .a1 .a2an

Warm Standby Database

- Have no access to the last live AI data
 - Typical AI switch rates is 15 minutes

Database Backups

Archived AI Files



Warm Standby Database

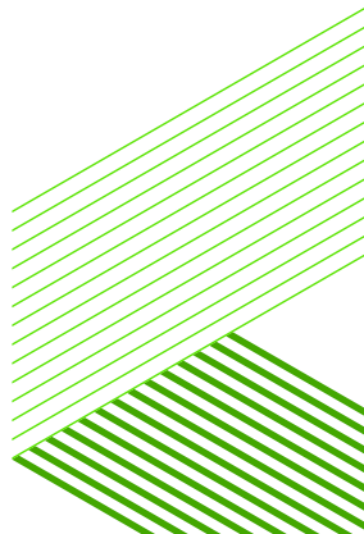
- May not have access to the last live After Image data
 - Typical AI switch rates is 15 minutes
- Needs a Disaster Recovery License to be able to be licensed to do this
- You need to write scripts to keep the warm standby database current by applying the After image files



Warm Standby Database

- May not have access to the last live After Image data
 - Typical AI switch rates is 15 minutes
- Needs a Disaster Recovery License to be able to be licensed to do this
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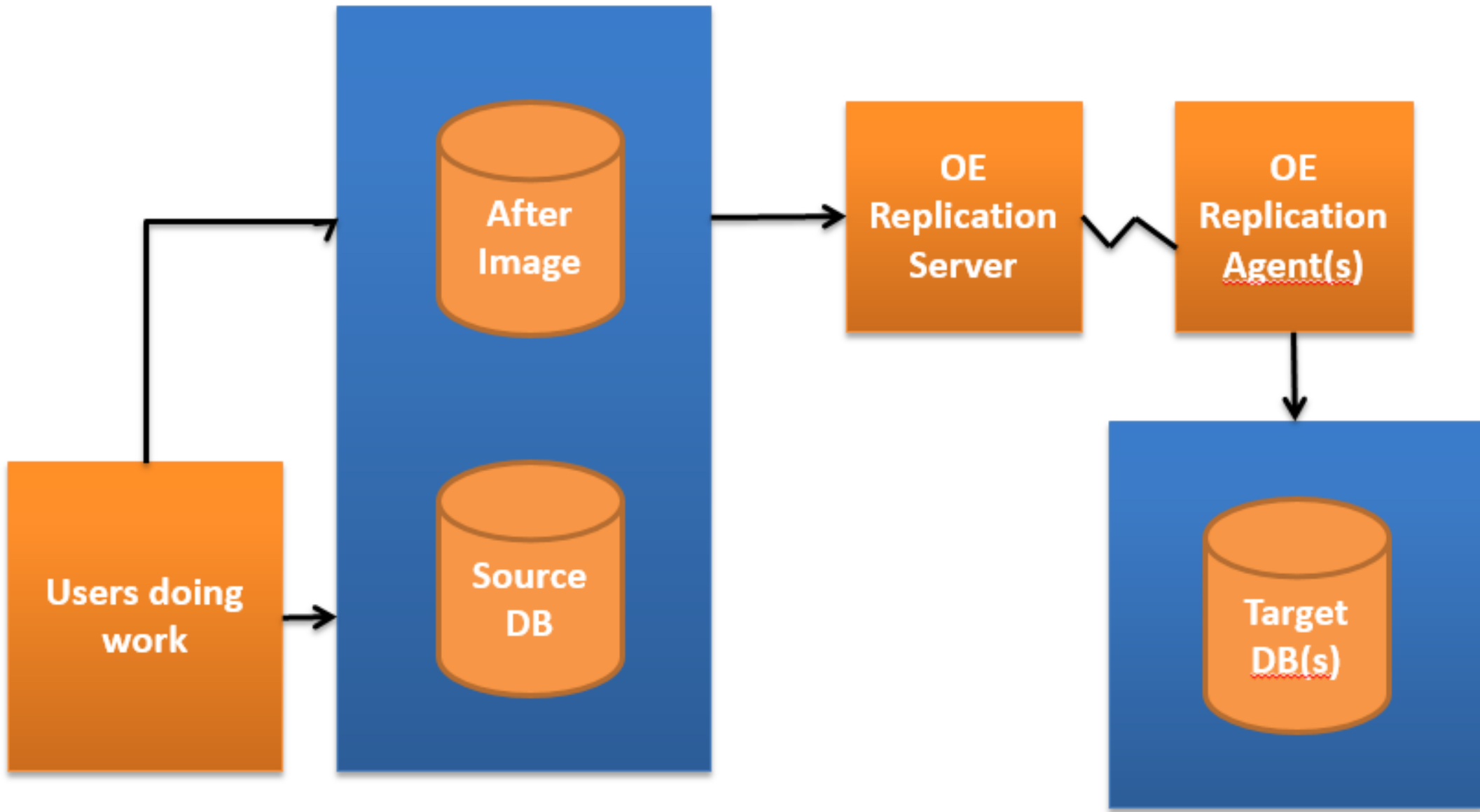
- There must be a better way



OpenEdge Replication

- Real time database replication for Disaster Recovery
 - Includes the Disaster Recovery License
 - No need for scripting
 - Small Performance Penalty
-
- There is now another server to manage
 - More processes to monitor



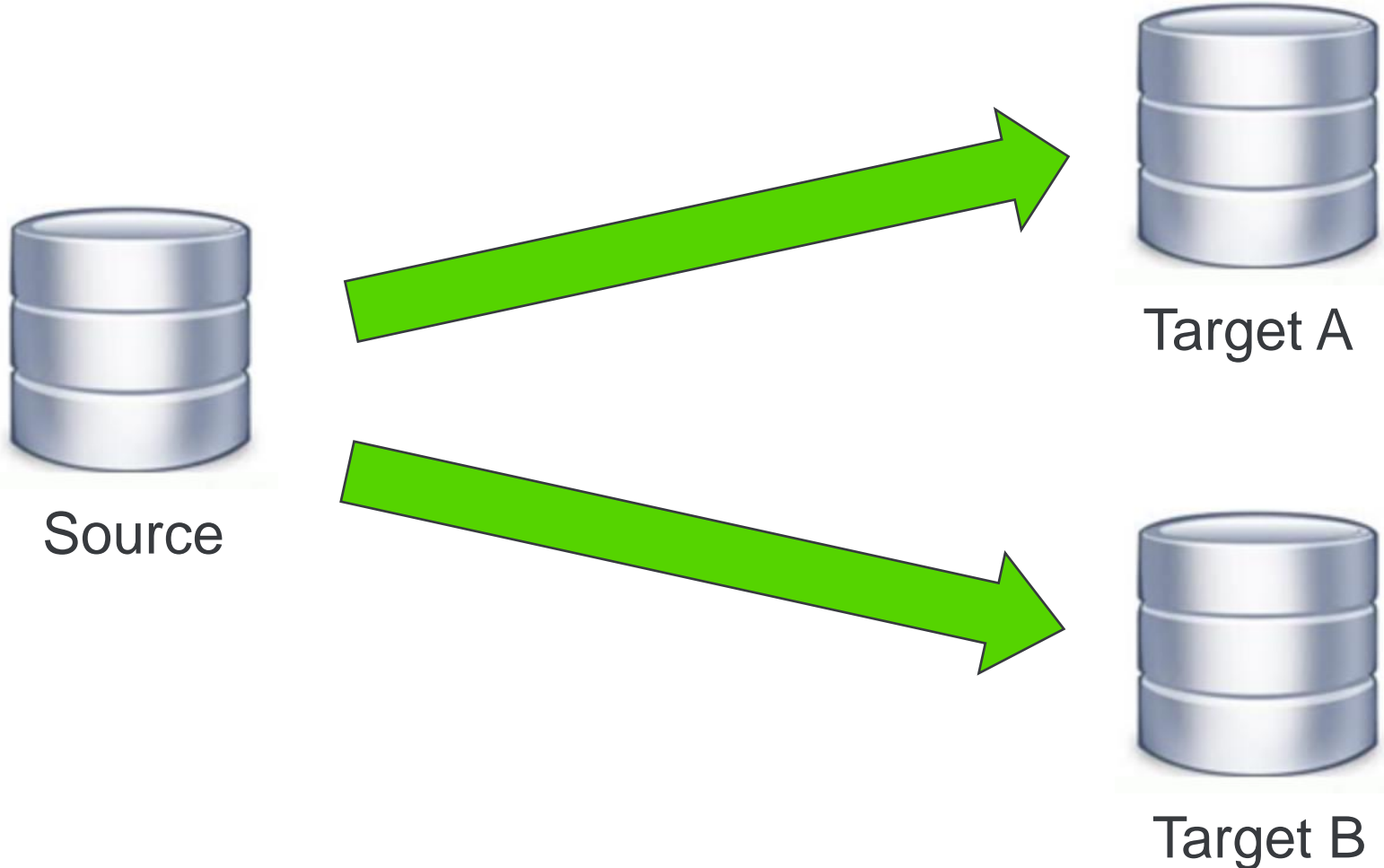


OpenEdge Replication

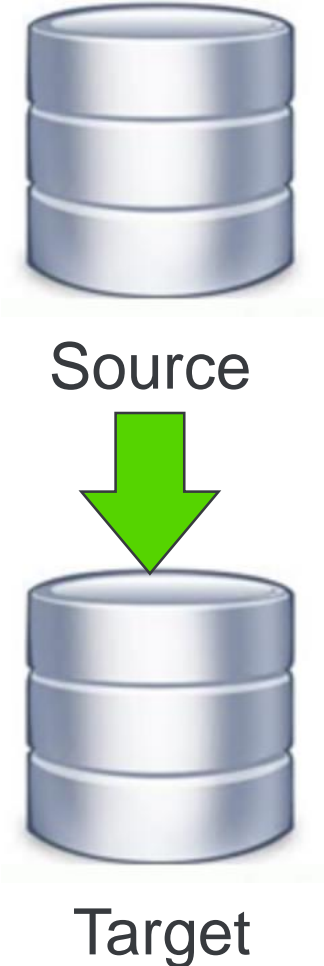
- Many configuration options
- Multiple Target Databases
- Target Databases can be used for reporting
 - Requires OpenEdge Replication Plus
- Can keep a DR target when in a fail-over situation
 - No single point of failure



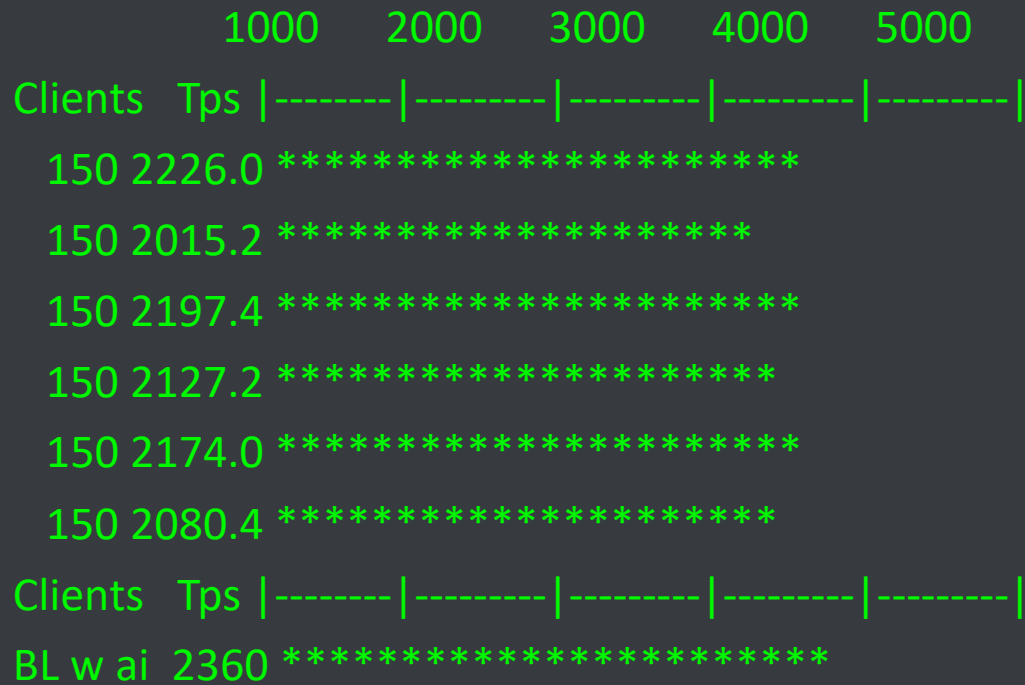
OpenEdge Replication – 2 Targets



OpenEdge Replication – 2 Target Failover



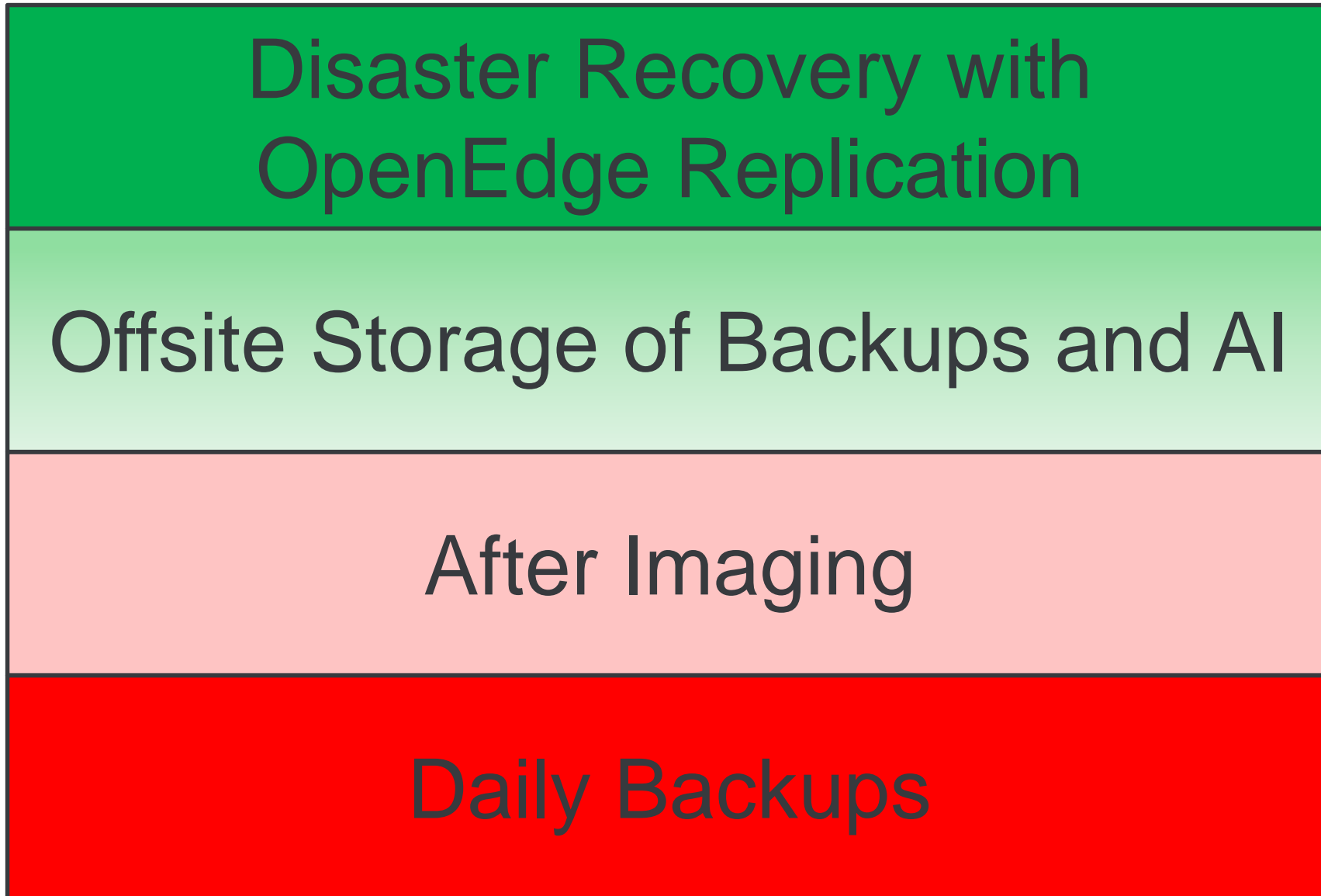
ATM Benchmark



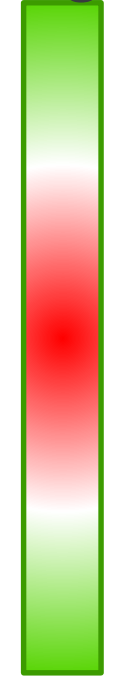
average is 2136 tps or 91%

The performance cost of OE Replication – 9%

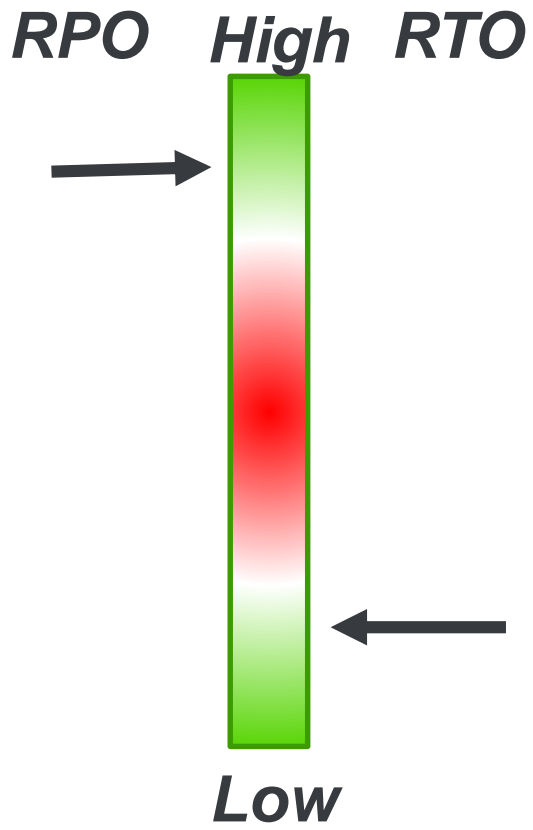
Level 4



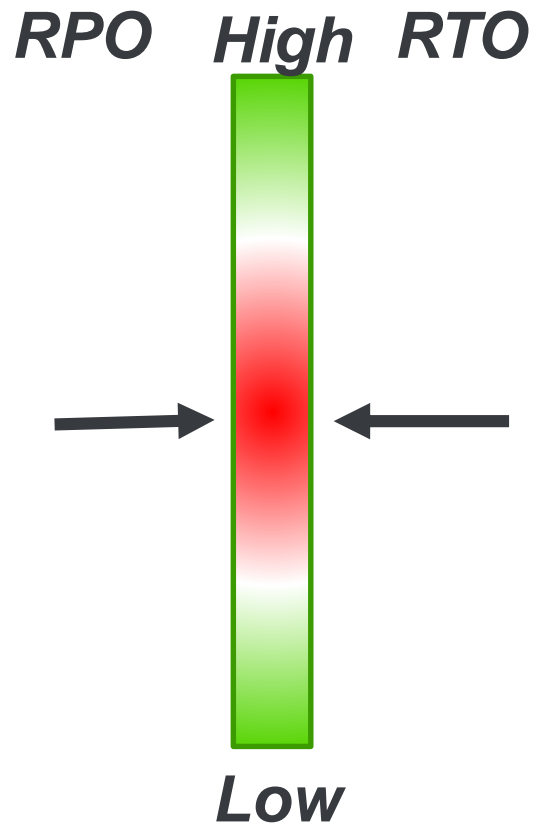
RPO High RTC



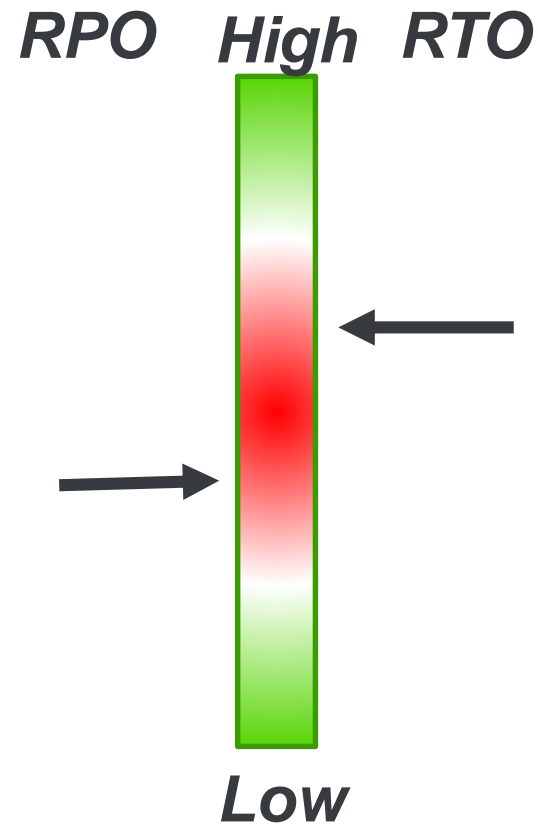
Mike



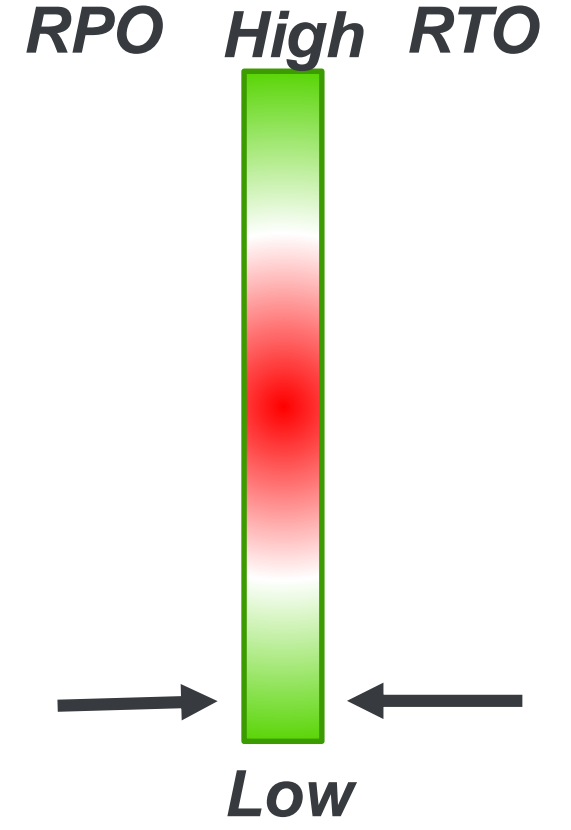
Daily Backups



After Imaging



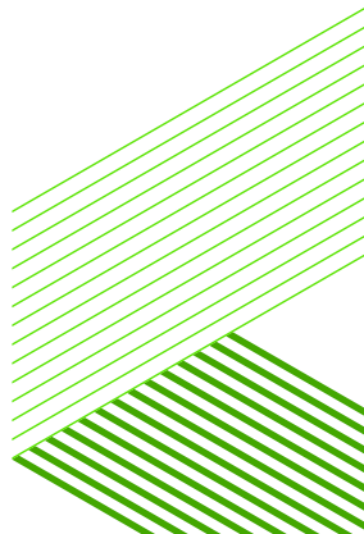
Offsite storage



OE Replication

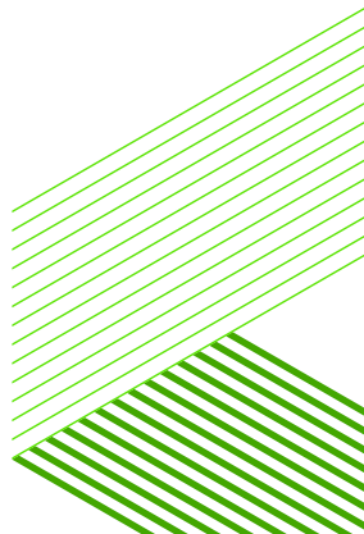
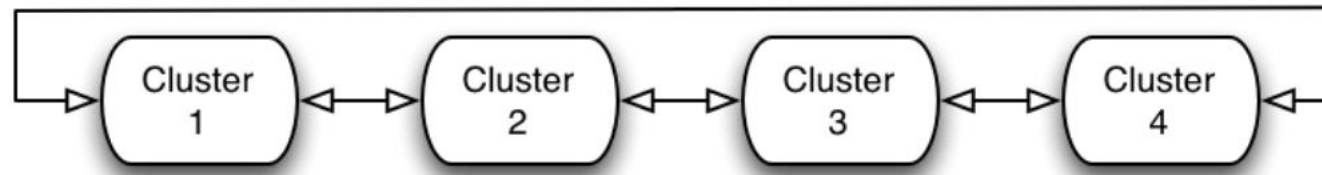
Replication Technologies

- OpenEdge Pro2 Replication
 - Replicates to a MSSQL, Oracle, or OpenEdge database for Reporting
 - NOT FOR DR
- SAN Based Replication Technologies
 - EMC SRDF is tested and supported
 - Others *may* work
 - Must Adhere to the Write Ahead Logging protocol



Write Ahead Logging

- Allows Crash Recovery to work
- 3 Phases of Crash Recovery
 - Before Image Cluster Fix up
 - Physical Redo
 - Transaction Undo
- Before Image Cluster Fix up
 - Rebuilds the Before Image Cluster Ring



Write Ahead Logging

■ Physical Redo

- Each DB block has a version number
- A Before Image Note describes a change to a block
 - Find block 1234 change the name “Mike” to “Bob”, change the version from 10 to 11
- Redo make sure all the block version are up to date
- For each note in the Before Image file
 - Find the DB block
 - If the Block version is higher then the one this note describes then skip it
 - If the Block version matches this note, then redo the work and change the Block version



Write Ahead Logging

■ Transaction Undo

- For each OPEN transaction read the Before Image file backwards looking for notes for this transaction
- Read the block. If the note for Block 1234, version 11, then create a new note changing the Block 1234 from version 11 to 12 and apply the change
 - The new note describes the undo action: Name “Bob” to “Mike”
 - This makes Crash Recovery Recoverable
- What happens if Block 1234 has version 14, and our note says it knows about version 11?
 - Write Ahead Logging Protocol was not enforced.



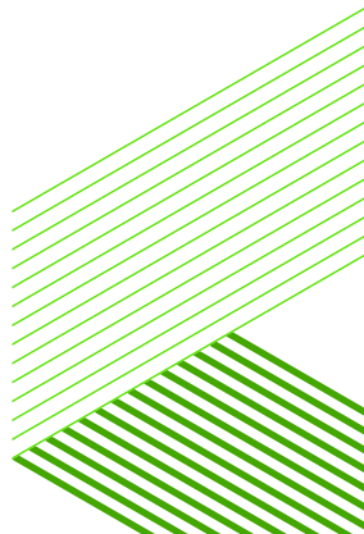
Replication Technologies

- EMC SRDF is supported
- Others may seem to work. BEWARE
- Technology that are known not to work with running databases
 - Zerto
 - VMWare VMotion
 - VMWare Snapshots
 - Veeam



It's not just the data

- Other things to consider
 - Application Files
 - Printers
 - Users Accounts
 - Users Files
 - etc



Best Practice

- Use OpenEdge Replication for Database Replication
- Use SAN based replication for all other data

/database
/bi
/ai



/database
/bi
/ai

/aisave
/bbackup
/app
/home



/aisave
/bbackup
/app
/home



Test and Re-Test

- A fail-over test needs to be run periodically
 - Annually
 - Anytime there is an application change
 - Anytime there is an environmental change
- There is no need to have a solid DR plan if there is no guarantee that it works.



Rodney



Looking Ahead – Continuous Operations



Continuous Operations Vision

**There is no reason for your
ABL application to ever stop
running**



OpenEdge 12 – Continuous Operations



Keep the system running 24x7x365

Many **companies need to achieve 5 9's of availability** in order to meet business requirements

Cloud and mobile, particularly with **self-service initiatives, are driving the desire for continuous operations**

Inability to meet uptime SLAs can impact partner perception by end users, or worse, **cause them to pay penalties**

Continuous Operations Overview



- Resiliency to Failure
 - If a serious software error occurs, the application responds appropriately
 - If the OpenEdge database fails, the system automatically and transparently transitions to a backup system (and can transparently transition back)
 - If PAS for OpenEdge fails, new Server instances are created automatically
 - Users continue operating the application without direct knowledge of any failure
- Online Maintenance
 - Various operations (e.g. database) and overall system settings are accomplished/modified while the system is up and running
 - Whenever possible, the system self-monitors and self-maintains itself
- Online Business Logic and Database Schema Changes
 - There is no need to bring the system down to update the business logic or schema, including updates to the OpenEdge infrastructure itself



Summary

- Application Availability is Critical
- Plan for the Unexpected
- Gain Confidence by Testing
- OpenEdge Continues to Deliver
 - Helping with unplanned downtime
 - Eliminating the need for planned downtime

