Golden 1 Credit Union's Zero Downtime Migration to NonStop x86 with HPE Shadowbase Software

TBC | September 2024 | Sean O'Banion

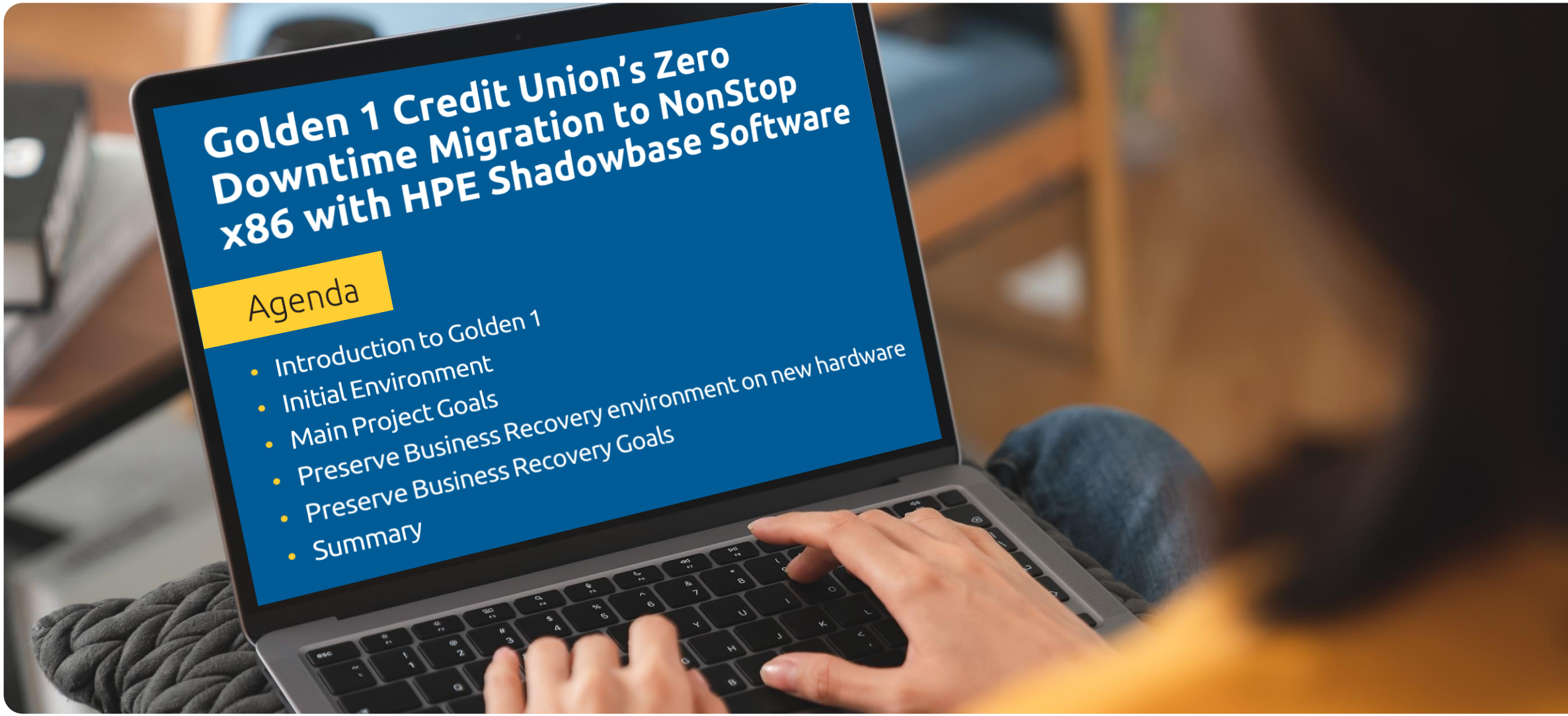
Golden 1 Credit Union

connect

TBC BY THE SEA

CELEBRATING 50 YEARS OF HPE NONSTOP

Golden 1
Credit Union



Introduction to Golden 1 Credit Union

Golden 1 Credit Union

Founded in 1933 in Sacramento

California's leading credit union

Membership is open to all Californians

$21 billion in assets

Over 1 million members

Mission is to deliver exceptional financial services and support to empower our members and communities.

American Banker 2024 Best Credit Unions to Work For

Best-in-State Credit Unions Forbes 2024

Forbes 2024 America's Best-in-State Employers California

The Best Employers for Women Forbes 2024

Great Place To Work. Certified

America's Greatest Workplaces for Women Newsweek

America's Greatest Workplaces 2024 Newsweek

TIME America's Best Companies 2024

Initial Processing Environment

ACI BASE24 Classic™ – issuer only

- ATM/POS transactions, No ATM Driving
- Zelle over NOW Network
- BASE24 current, XPNET needed upgrade

Three Integrity NS2300 systems

- Production (\HQ2) – Sacramento CA Headquarters Data Center
- Production Ready Backup (\RL2) – Sacramento CA Regional Backup Data Center
- Development and DR Production Backup (\DV2) – DR site, Austin Texas

BASE24 running at all 3 Sites – Active in Sacramento one at a time

HPE AutoTMF – in use for audited files

NonStop AutoTMF

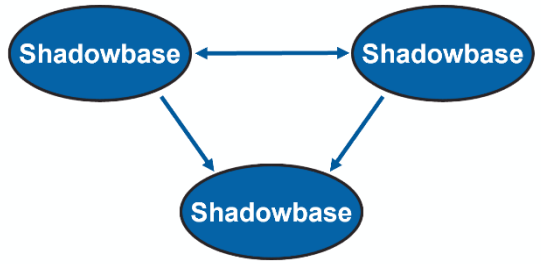
Initial Processing Environment

HPE AutoSync

- In use for non-audited files to both non-production systems

Shadowbase Bidirectional and Unidirectional

- HQ2/RL2 in Sacramento bidirectional for 15 minutes migration of production
- Unidirectional to DV2 in Austin – DR
- Combined environment, one build file



HPE Netbatch

- Running on 3 systems
- Used on inactive systems for utility jobs
- Used 2 schedulers to separate job types

NonStop AutoSYNC

Golden 1 CU's Main Project Goals

Driver behind Nonstop System upgrade project

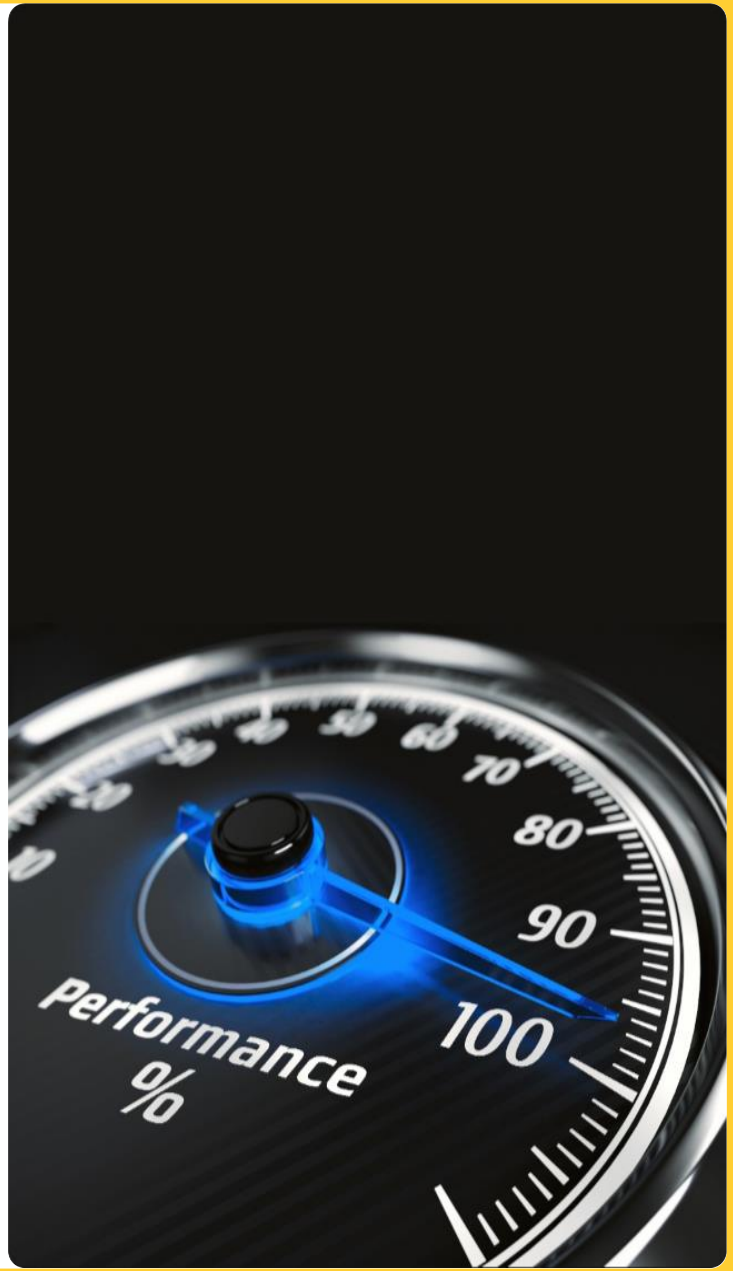
- Retirement of Integrity-based servers
- Stay within Golden 1 5-year hardware Refresh Cycle

Re-architect Data Replication from one environment to two

- Restarting failed replication to the DR site impacted production
- DR site remote connectivity is unreliable
- Uses two build files

Upgrade BASE24 XPNET™ from 3.4 to 4.1

- XPNET 3.4 would be unsupported in 2024



Continue Proven Recovery Environment

3 new Nonstop X86 based NS4 X4 systems

HPE AutoTMF rename features

- Enable auditing for Cardholder (CAF) and Balance (PBF) File Updates
- AutoTMF control enables full refreshes

HPE Shadowbase configuration

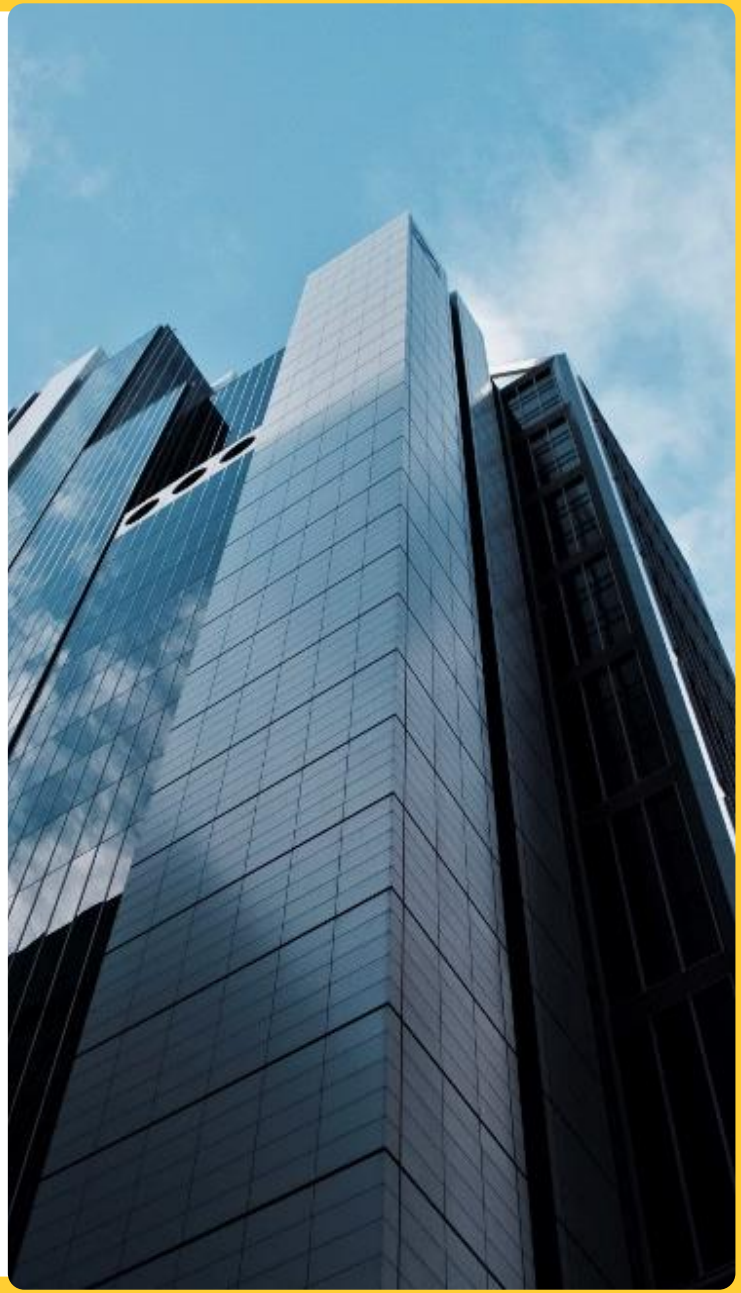
- BASE24™ Assign and Parameter File (L1CONF) Filtering
- BASE24 Users Security File Replication

Use HPE Shadowbase Sizzling-Hot-Takeover (SZT)

- Migrate systems within 15 minutes

Project Scope

- **BASE24™ XPNET 3.4 required upgrading to 4.1**
- **No AutoTMF configuration changes**
- **AutoSync upgrade to support NX4 and current replication file sets were reviewed and updated**
- **Upgrade Shadowbase to support NX4**
- **Update CAIL terminal emulation software on Windows desktops and new SSL elliptical key on server**
- **Upgrade Web Viewpoint Enterprise to support NX4**
- **Minor Golden 1 internal network design changes**
- **New Virtual Tape Controllers (VTCs) that were end of life, but retained configuration**



Project Challenges

- **Time constraints – system delivery to go live was initially 3 months, but another higher priority project competed, so it took 5 months**
- **Small Golden 1 technical staff spread across other projects as well**
- **Over 60 Netbatch and stand-alone TACL routines required changes**
- **Support of password requirement changes**
- **All BASE24™ objects required recompilation on X86.**
- **Shadowbase custom User Exit for BASE24 L1CONF had to be recompiled on X86; expectation of later migration to SBMAP scripting solution after an additional Shadowbase upgrade**

Migration Overview

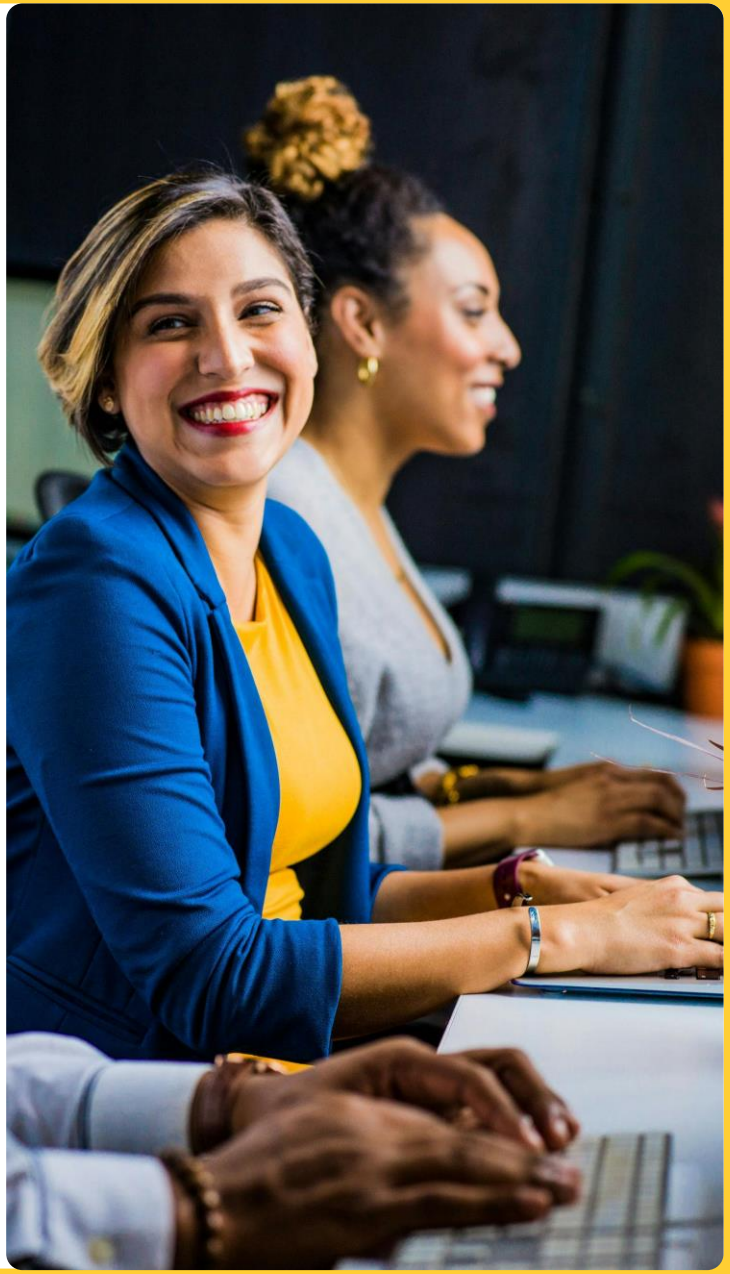
Required seamless cutover for zero-member impact

- Debit transactions had stand-in
- Zelle Operational Rules prohibit stand-in

Requirements included going live at Regional (RL3) and migrating over to the new system at Headquarters (HQ3) and remaining there

The multi-team effort consisted of internal credit union teams and professional services support

- HPE installed the hardware and OS for all 3 systems in HQ, provided system software support, virtual tape controller migration, and cutover support
- Gravic installed the Shadowbase product, and provided configuration, cutover support, and training
- ACI installed BASE24™ on the 3 systems, and was available for cutover

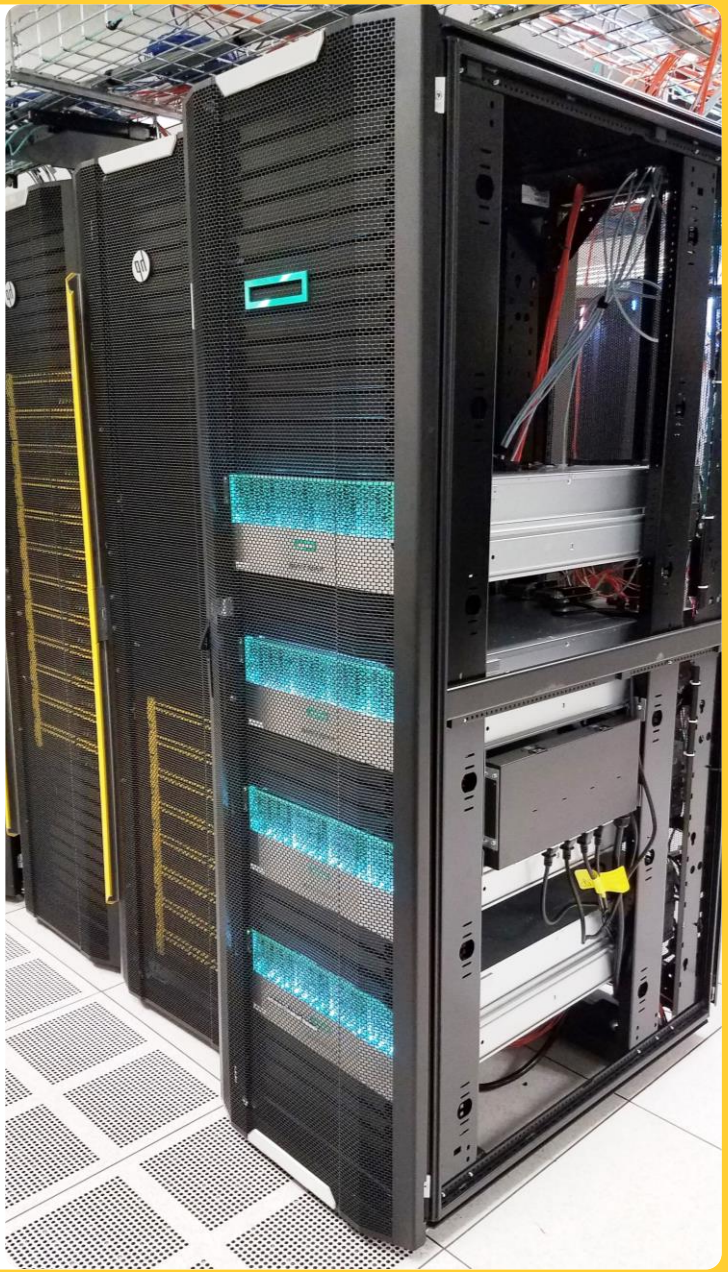


System Configuration – Same to Same

Consistency is the last refuge of the unimaginative.
Oscar Wilde, 1885

Consistency from initial to all new systems was leveraged to simplify replication

- Identical NS4 hardware configuration
- Increased network connections and disk drives
- Most disks are partitioned and encrypted with VLE
- Preserving the same names between old and new systems enabled wildcarding and simplified configuration



System Configuration – Production and FISERV

Interesting production system configuration details

- HQ3 and RL3 use Shadowbase bidirectional replication – active / active “route anywhere”
- The FISERV EPOC and NOW network connections are only enabled by Golden 1 Networking to one NonStop system via Network Address Translation (NAT)
- 3 access (not VLAN) 1GB copper NICs: ZTC0 is for terminals and FTPS file copies; ZTC1 is for FISERV transactions; ZTC2 is on a NPI compliant, non-routing network, used for EXPAND (Shadowbase) and BASE24

I make this explanation for the reason that without it many readers would suppose that all these characters were trying to talk alike and not succeeding.

The Adventures of Huckleberry Finn (Tom Sawyer’s Comrade), Mark Twain, 1885

System Configuration – Test/Dev and DR

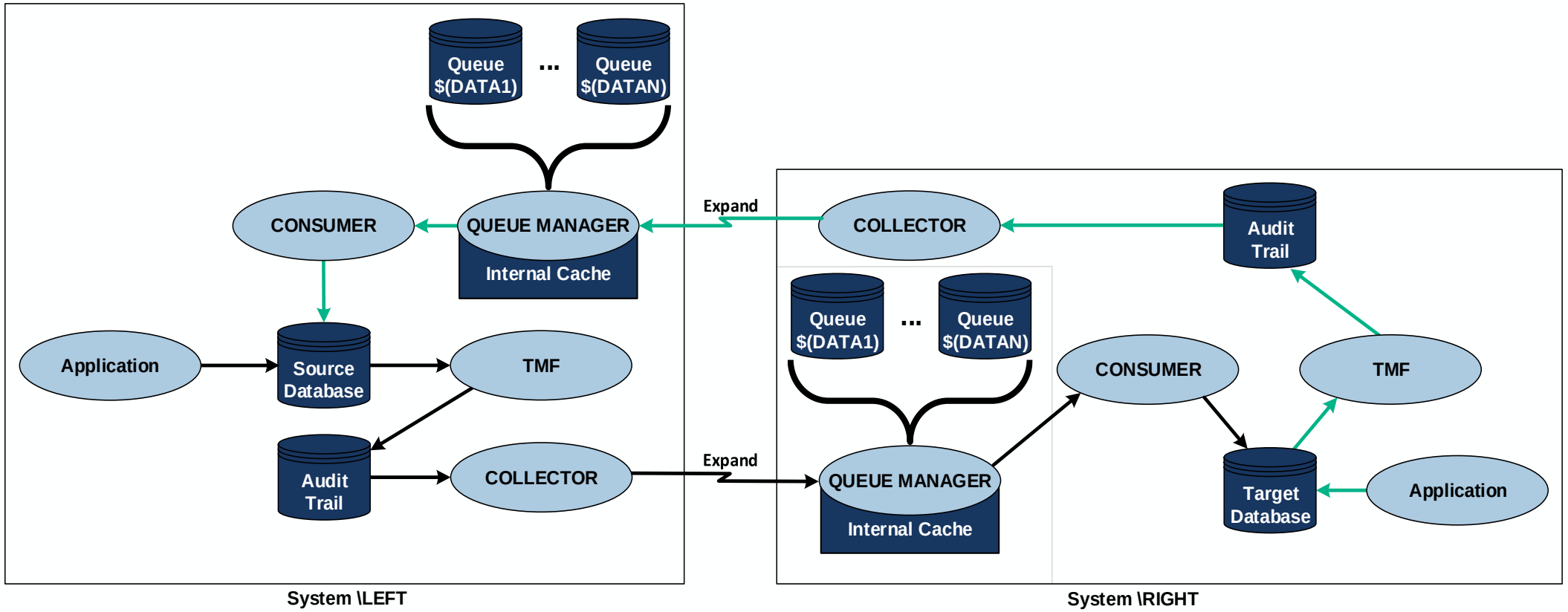
- **Interesting configuration details**
- Testing and development are run on DV3 in Austin, it receives replication from either production system
- The original Shadowbase environment was recreated into two: one bi-directional for Production, and one uni-directional for DR
- TMF Audit Logs were increased from 30 to 100 for a 30-day buffer to restart Shadowbase from Production to DV3

Replication Migration – Initial Shadowbase

Shadowbase configuration choices (1 of 3)

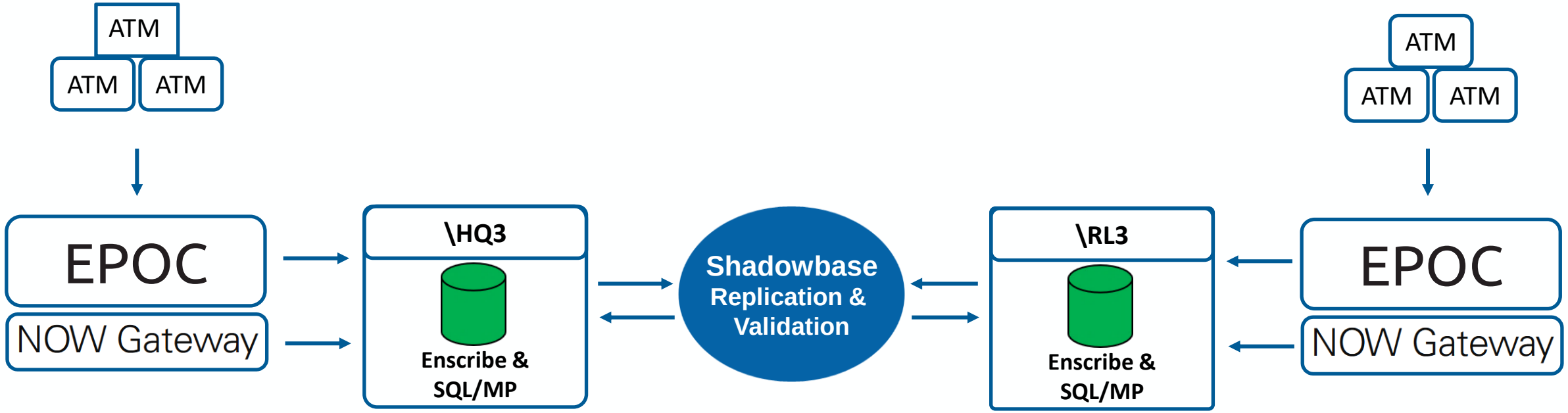
A sympathy in choice.

William Shakespeare, A Midsummer Night's Dream



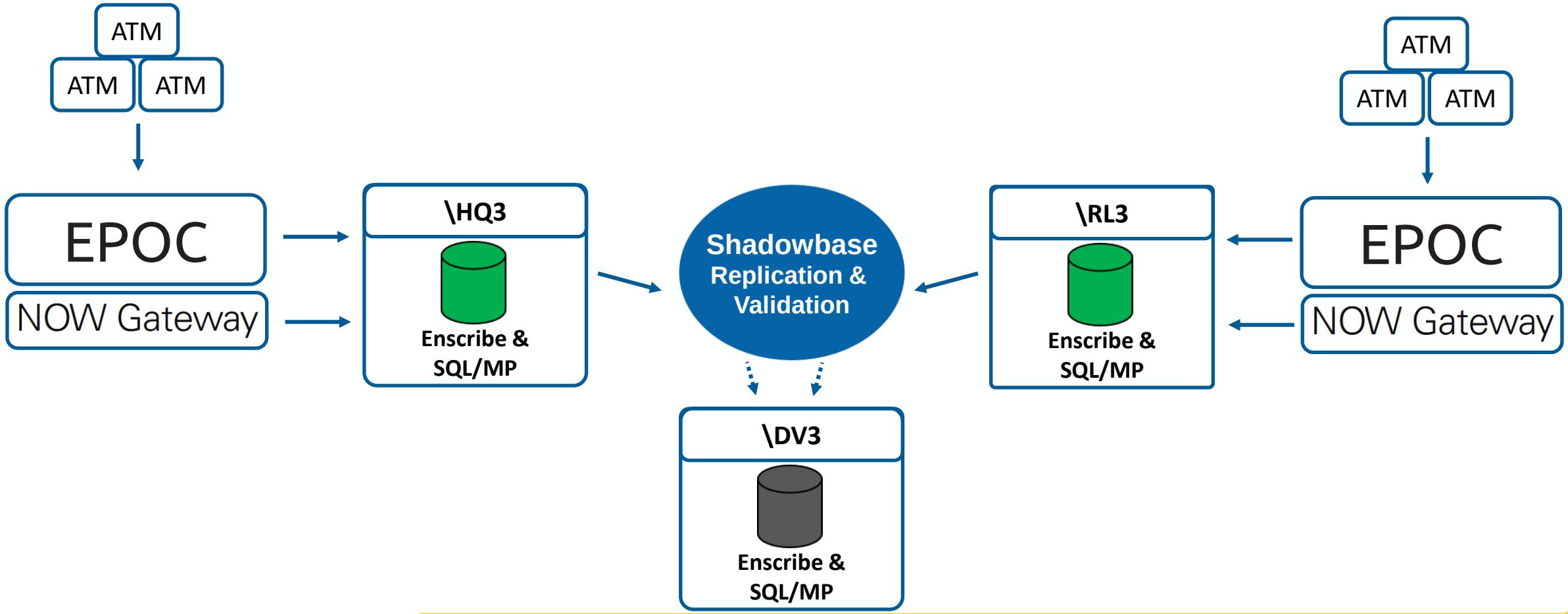
New Business Recovery Environment

Shadowbase Sizzling-Hot-Takeover (SZT) bidirectional replication



New Business Recovery Environment

Unidirectional replication to remote DR standby



Replication Migration – Initial Shadowbase

Shadowbase configuration choices (2 of 3)

- Migration involved 3 new Shadowbase environments:
- We performed an initial Shadowbase data load PAK to UNPAK from HQ2 to a new system, HQ3
- 1 – Then, a uni-directional environment between HQ2 and HQ3 to handle change data
- 2 – Then, bi-directional environment for applying change data between the new Production systems, HQ3 and RL3
- 3 - Lastly, uni-directional environment from HQ3 to DV3

Replication Migration – Initial Shadowbase

Shadowbase configuration choices (3 of 3)

- BASE24™ testing required stopping the HQ2 <-> HQ3 environment to update files as testing progressed
- We tested on production environments, utilizing PAK and UNPAK before and after testing, and restarting replication
- One week before go-live, we stopped testing, did a final update continuing replication from HQ2 <-> HQ3, this helped ensure Old and New systems were up-to-date and accurate

Retained Replication Configuration Tuning

Current replication configuration (1 of 2)

Current replication configuration (1 of 2)

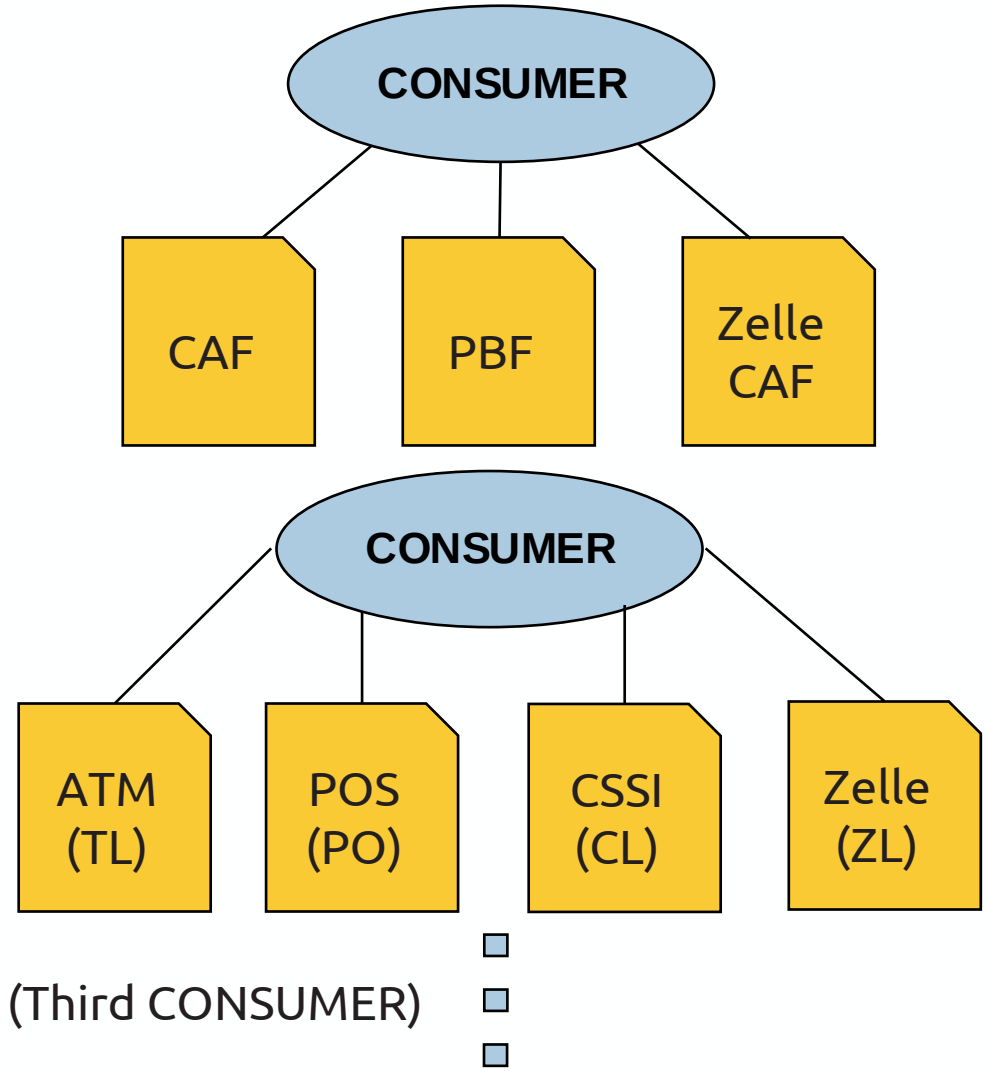
One consumer supports 3 files

- Cardholder Account File (CAF)
- Zelle Cardholder Account File (Zelle CAF)
- Positive Balance File (PBF)

A second consumer supports 4 transaction file types:

- ATM (TL) Transaction Log Files
- POS (PO) Transaction Log Files
- CSSI (CL) Interchange Log Files
- Zelle (ZL) Interchange Log files

The third consumer supports the remaining 50 or so audited files that describe the Golden 1 BASE24™ configuration



Replication Configuration Tuning

Current replication configuration (2 of 2)

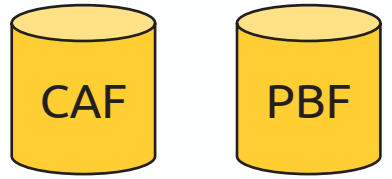
- Initially CAF and PBF files were in the same Consumer as the BASE24™ transaction log files
- When monthly CAF and PBF refresh was run, the Consumer process was saturated, delaying replication
- Now that CAF and PBF files are replicated by their own Shadowbase Consumer, the TLF avoids delaying production replication to log files and replicates CAF & PBF as quickly as possible
- The Zelle CAF is refreshed similarly, but only used by Zelle
- BASE24 Assign/Parameter file (L1CONF) can now be audited, but the records contain the system name; a Gravic-implemented Shadowbase User Exit handles the system naming during replication
- Future goal for the next refresh is to converting the User Exit to a SBMAP script to simplify future upgrades by avoiding recompiling the User Exit during each refresh

Replication Migration – AutoTMF Solution

The Cardholder (CAF) and Balance (PBF) stale data dilemma

system error 80

- The file system rejects rename attempts of audited files with system error 80
- An audit flag cannot be removed on an open file
- BASE24™ renames the CAF or the PBF during a full file refresh
- Golden 1 performs monthly file refreshes to reorganize the partitioned files



AutoTMF overview

- AutoTMF (ATMF) enables applications for TMF without program changes
- Objects are “prepared” to call ATMF I-O routines
- Audited files are monitored, and changes sent as TMF transactions
- As transactions execute, TMF logs all changes into the TMF Audit Trail files
- Shadowbase reads the Audit Trail and replicates to another system

NonStop AutoTMF

Replication Migration – AutoTMF Solution

The Cardholder File (CAF) and Balance File (PBF) stale data solution (1 of 3)

We were able to use the same configuration we had used before, although we added one more cardholder file between migrations

- "Replicaterename" and Generations commands:
  - ADD ATMFF $DATA.PRO1GOLD.CAF, GENERATIONS 3;
  - ADD ATMFF $DATA.PRO1GOLD.CAFO0*, REPLICATERENAME;
- When initially added, BASE24™ opens the standard CAF name as before, then a NEWCAF is created; current CAF is renamed to OLDCAF; CAF is not yet audited, so Rename works; when NEWCAF is renamed to CAF, CAF no longer exists, so AutoTMF renames it to generation file CAFO000; the "Replicaterename" command causes the new CAFO000 to be audited

Replication Migration – AutoTMF Solution

The Cardholder File (CAF) and Balance File (PBF) stale data solution (2 of 3)

REPLICATERENAME requires a "Prepared" FUP (File Utility Program)

- We created a separate location and prepared FUP using AutoTMF I-O library
- We used the BASE24™ L1CONF assign for FUP to point to the "$system.autoprv" location

Current AutoTMF configuration

AutoTMF 2? INFO ATMFF;

AutoTMF FileSet	Attributes
$DATA.PRO1GZEL.CAFGZ0*	RecordTX,ReplicateRename
$DATA.PRO1GZEL.CAFGZEL	Generations 3
$DATA.PRODPBF.PBFGL0*	RecordTX,ReplicateRename
$DATA.PRODPBF.PBFGLD1	Generations 3
$DATA1.PRO1GOLD.CAFGO0*	RecordTX,ReplicateRename
$DATA1.PRO1GOLD.CAFGOLD	Generations 3

Replication Migration – AutoTMF Solution

The Cardholder File (CAF) and Balance File (PBF) stale data solution (3 of 3)

Shadowbase Configuration

==CONSUMER 3 DBS - CAF and PBF

SB_ADD BIDIRDBS DB0285A C3 $DATA1.PRO1GOLD.CAFGO000

SB_ADD BIDIRDBS DB0285B C3 $DATA1.PRO1GOLD.CAFGO001

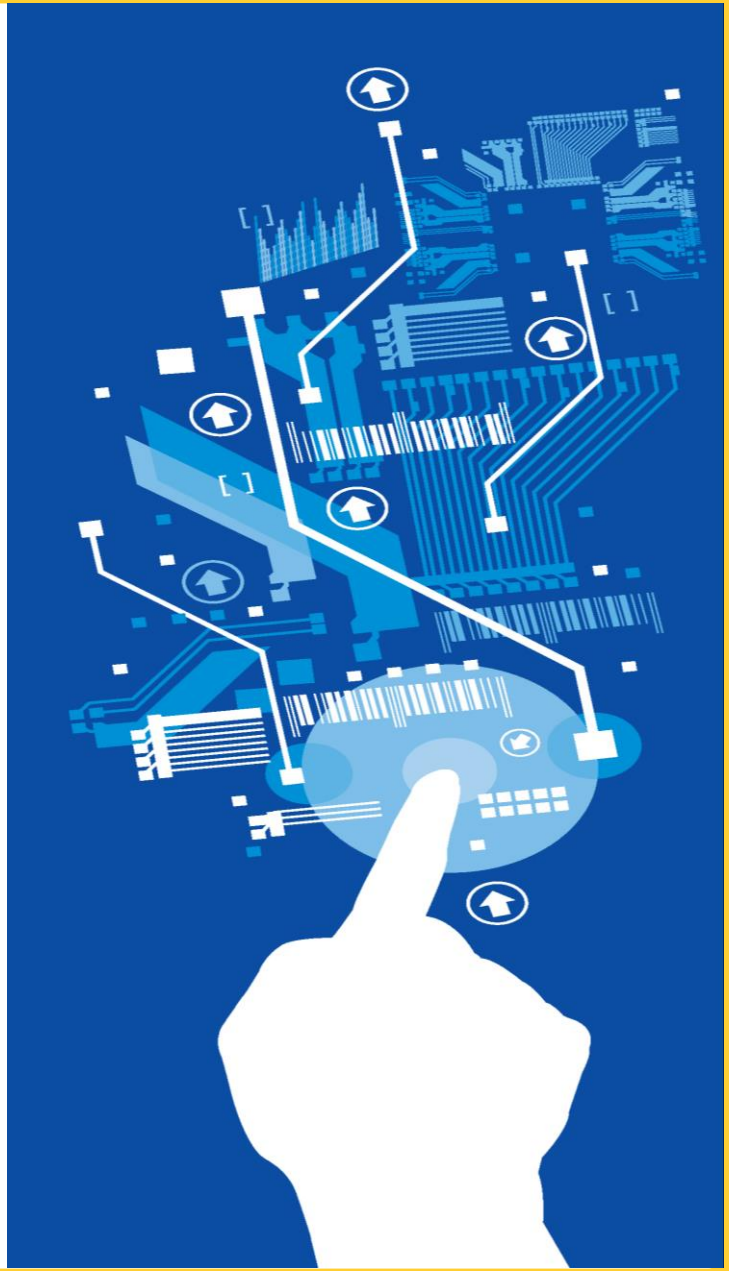
SB_ADD BIDIRDBS DB0285C C3 $DATA1.PRO1GOLD.CAFGO002

==CAF and PBF

SB_ADD DBS_PARAM DB0285A * * * ALLPARTITIONS ON

SB_ADD DBS_PARAM DB0285B * * * ALLPARTITIONS ON

SB_ADD DBS_PARAM DB0285C * * * ALLPARTITIONS ON



Replication Migration – Go Live

Seamless cutover for zero member impact (1 of 2)

At Go Live, 2 migrations were accomplished; the first moved from old to new systems:

- FISERV Card Services (FCS) put the EPOC network (debit) into stand-in
- FCS was logged off of BASE24™ HQ2 for the NOW network (Zelle) (G1 requested Zelle to hold credits) and EPIC
- Shadowbase from HQ2 to HQ3 suspended updates and HQ3 to DV3 was shutdown to flush transactions to completion
- Networking changed the NAT to point FCS to RL3
- RL3 BASE24™ was logged onto FCS EPIC
- Refreshes were completed, core online updates were restarted, then FCS EPOC was taken out of stand-in

Stand-in to Fiserv EPOC was approximately 20 to 30 minutes to complete refreshes and restart online host updates; then we were off the old systems

Is that everyone?

Stephen Strange

What, you wanted more?

Sorcerer Supreme Wong

Avengers Assemble!

Steve Rogers

Avengers: Endgame, Marvel Studios, 2019

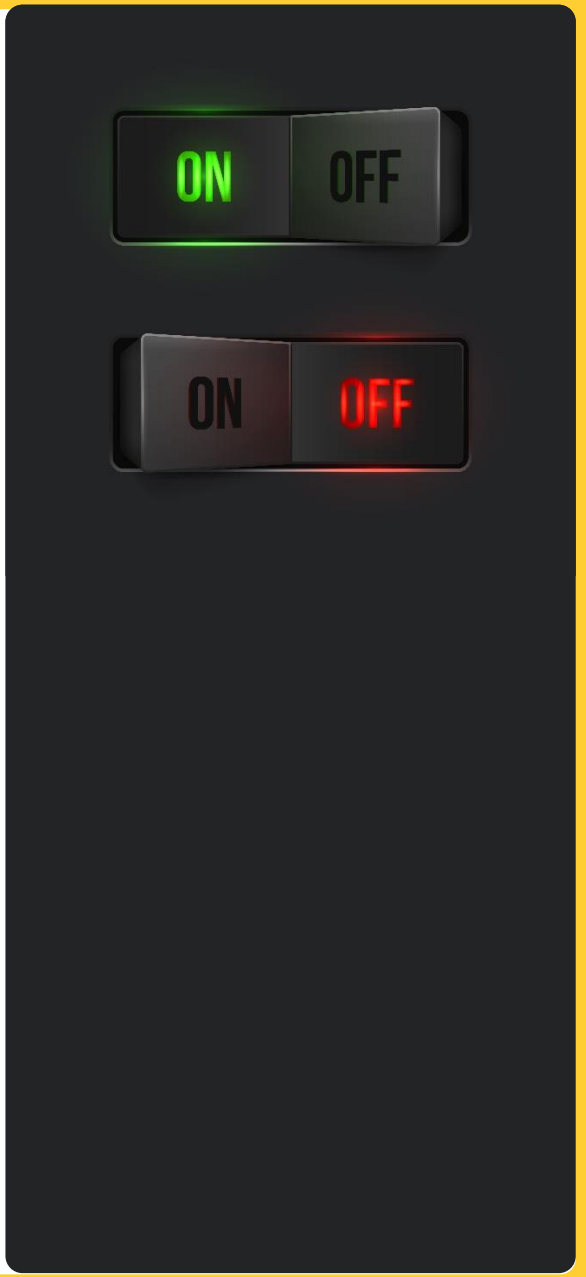
Replication Migration – Go Live

Seamless cutover for “Zero” member impact (2 of 2)

With RL3 BASE24™ in production, Shadowbase bidirectional replication was updating HQ3, and after about an hour on RL3, we migrated to HQ3

- FCS EPOC went back into stand-in for Golden 1
- RL3 BASE24 was logged off of EPOC.
- Shadowbase from RL3 to HQ3 suspended updates to flush transactions to completion
- Networking changed the NAT to point FCS to HQ3
- HQ3 BASE24 was logged onto FCS EPOC and onto FCS NOW for Zelle
- Refreshes were completed, core online updates were restarted, then FCS EPOC was taken out of stand-in and Zelle released holding credits
- Shadowbase resumed updates from RL3 to HQ3 (but no transactions to replicate) and HQ3 to DV3 started where it was shutdown to catchup from the beginning of migration from HQ2.

Migration from RL3 to HQ3 was about 10 minutes



Summary

Problem

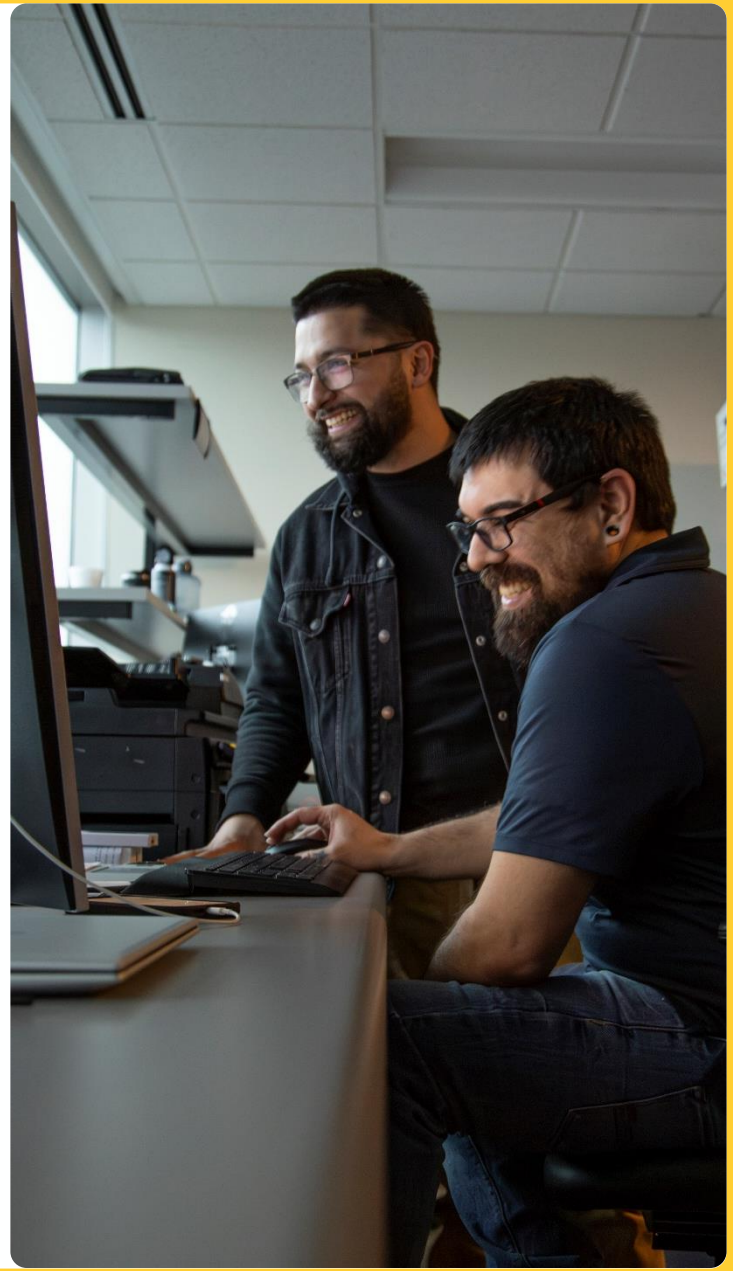
- Support of Integrity servers was ending
- Replaced with X86 servers

Solution

- Migrate to supported servers

Outcome

- Continue a failover of less than 15 minutes
- Member transactions are protected
- 3 systems are fully protected



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