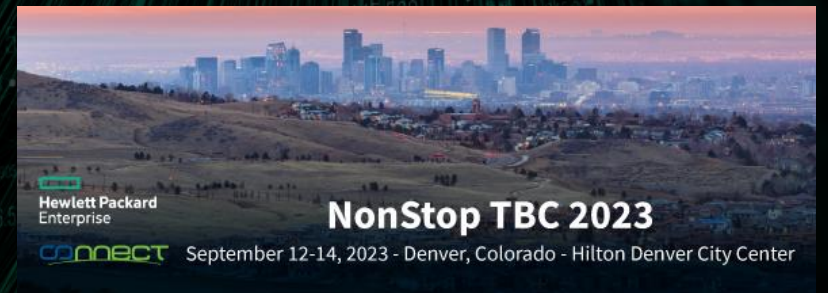


CFP1 - Major UK Bank Migrates its BASE24™ Application to Active/Active for Continuous Availability

Yogesh Teli: AVP, BASE24 Development at Barclays Bank
Drew Bauernschmidt: Product Analyst, Gravic, Inc.

September 2023



Introduction

- **My profile**

- Yogesh Teli, AVP, BASE24™ Development at Barclays Bank
- Chairman and Board Director of ITUG/BITUG
- Extensive experience in payments technology
 - ATM / POS / EftPos / Switches
 - Card systems – debit / credit / smart cards
 - National and international payment systems



- **Disclaimer**

- These are my views and not those of Barclays Bank
- This information is based on my experience on the project over the past few years
- My work for this Active/Active project was based around BASE24 environments
- Other aspects of the Barclays Active/Active project will not be discussed

Agenda

1. About Barclays
2. Project background
3. Proof of concepts (POCs)
4. Implementation
5. Summary and next steps



About Barclays

About Barclays

- Major, diversified global financial institution
- Wide range of products and services
- Barclays UK providing retail banking to UK market, including ATM and POS
- c.20 million customers through Barclays UK
- 87,400 employees worldwide (44,000 in UK)



Reference: <https://home.barclays/content/dam/home-barclays/documents/investor-relations/reports-and-events/annual-reports/2022/AR/Barclays-PLC-Annual-Report-2022.pdf>

HPE NonStop environment

- **Hardware**

- ATM devices: 4,700
- HPE NonStop systems: four servers
 - Production: two NS7s (quad core), six CPUs each
 - Test: one NS3 with four CPUs (dual core) and one NS3 with two CPUs (dual core)

- **Applications**

- BASE24™: six environments
- Transaction Security Services (TSS): three environments
- HPE NonStop Shadowbase: three instances

- **Transactions (2022)**

- ATM: 475 million
- POS: 5,500 million

- **Transaction peak (2022)**

- ATM: 60 tps
- POS: 450 tps

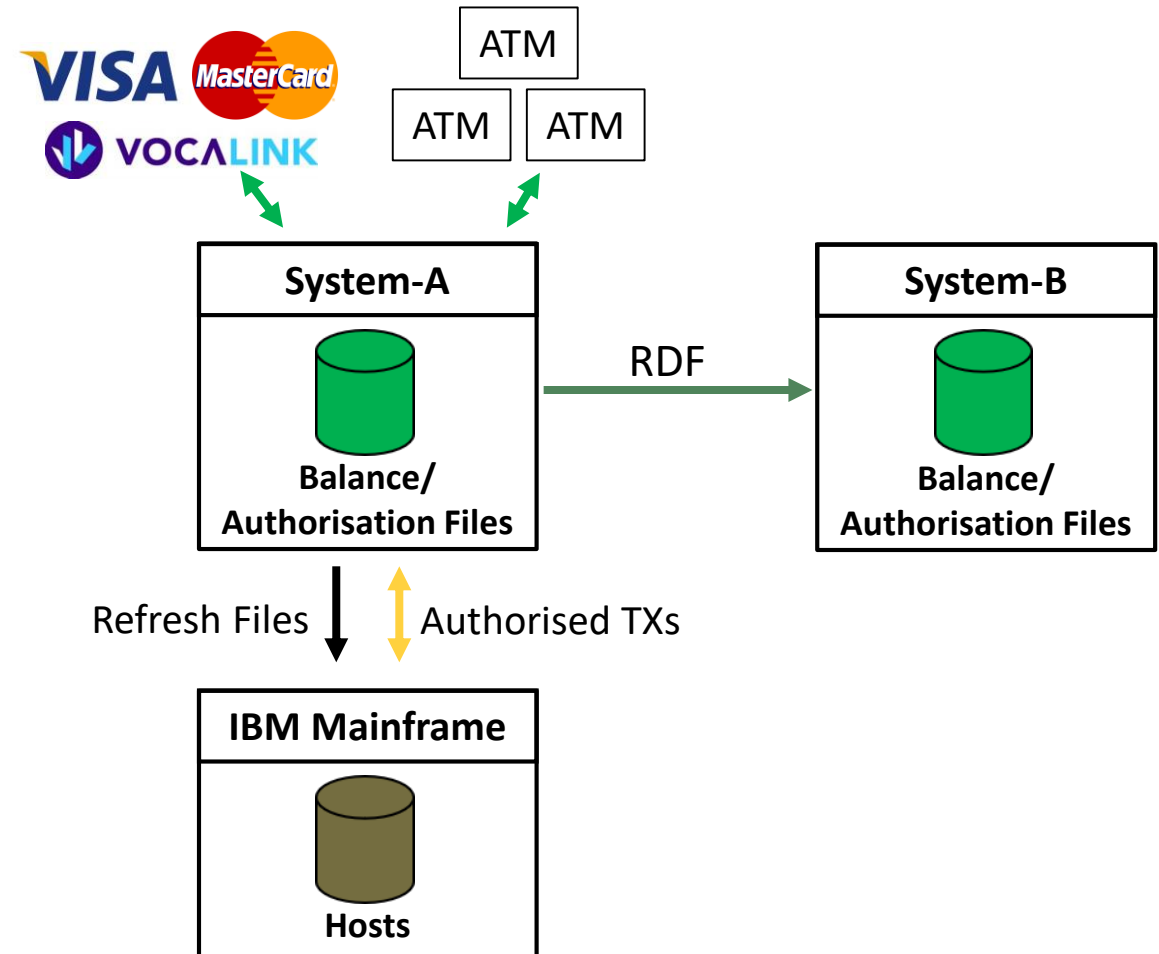


Project Background

Old architecture and need for action

- **Previous environment**

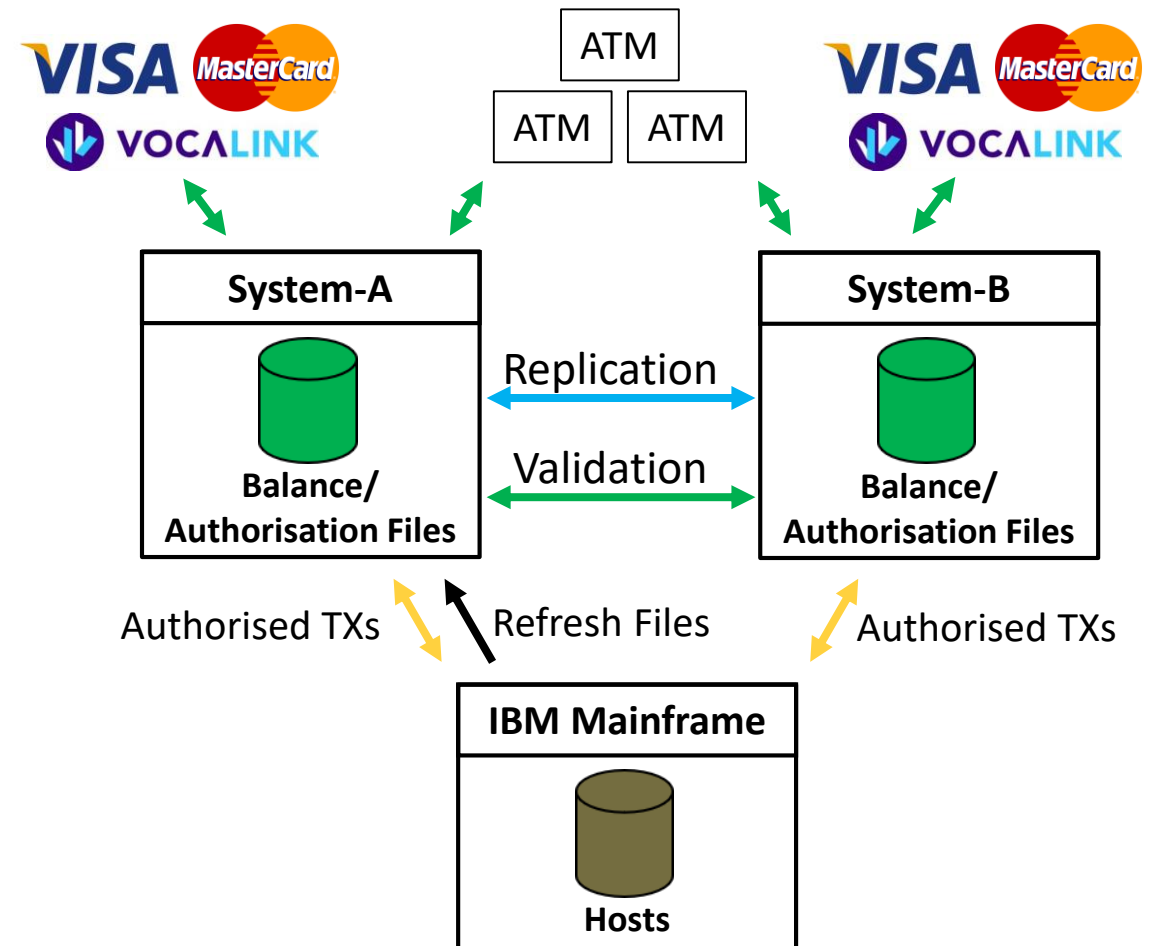
- BASE24™ supporting ATM and POS transactions in Active/Passive architecture
- Regular DR exercises to build confidence which increased system downtime
- Active/Passive architecture using RDF did not provide level of availability desired
- RDF limitations
 - RDF works in uni-directional, Active/Passive mode only and is configured for volume/subvolume-based replication
 - RDF is in “mature” status and will not be enhanced to meet future requirements



New architecture

- **Requirements**

- Active/Active data centre
- Both sites are fully active, but tightly coupled
- Both systems process ATM/POS transactions
- Databases actively accessed
- Full utilization of data assets
- Data collisions may occur but will automatically be resolved
- Faster RTO using bi-directional replication
- Eliminate need for planned downtime



Selecting a solution for the Active/Active architecture

Proof of Concepts (POCs)

- Several POCs undertaken at various times
- Additional steps
 - Upgrade HPE NonStop systems
 - Work with Schemes to become Active/Active
- Considerations
 - Replication speed and reliability
 - Ability to identify types of updates and collision management
 - Ability to resynchronise following a system failure
 - Database creation from existing PROD/DR systems

Timeline

2018	Compare several replication products available in the market
2020	Evaluate and performance test identified replication products
2021/2022	Confirm the chosen product meets the requirements
2022/2023	Design, test, train and implement

Technical evaluation

- **Evaluation scorecard based on key factors were rated**
 - 8 main criteria
 - 29 sub-criteria
- **Other considerations**
 - Corporate relationship
 - Long-term support
 - Knowledgeable staff still at company
 - Future enhancements
 - Sunset or active roadmap?

Criteria	Prod A	Prod B	Prod C	Comments
DOCUMENTATION				
LEARNABILITY				
COMMUNITY SUPPORT				
USABILITY				
FUNCTIONALITY				
INTEGRATION WITH B24				
PERFORMANCE				
PRICE				

0 - Not Supported
1 - Poor
2 - Fair
3 - Good
4 - Very Good
5 - Excellent

Solution choice: HPE Shadowbase

- **Why HPE Shadowbase was selected**
 - Strong technical evaluation and POC results
 - Excellent long-term relationship with HPE and focus on HPE NonStop systems
 - HPE markets, sells, and supports Shadowbase products
 - Gravic provides very good additional support and professional services
 - HPE is a known entity and an approved vendor, which reduced procurement time
 - No need for new procurement procedure (which would have impacted project timeline)



**Hewlett Packard
Enterprise**



Implementation

Implementation considerations

- **ACI BASE24™**

- BASE24 Dual Site functionality
- Utilize standard (P)TLFs

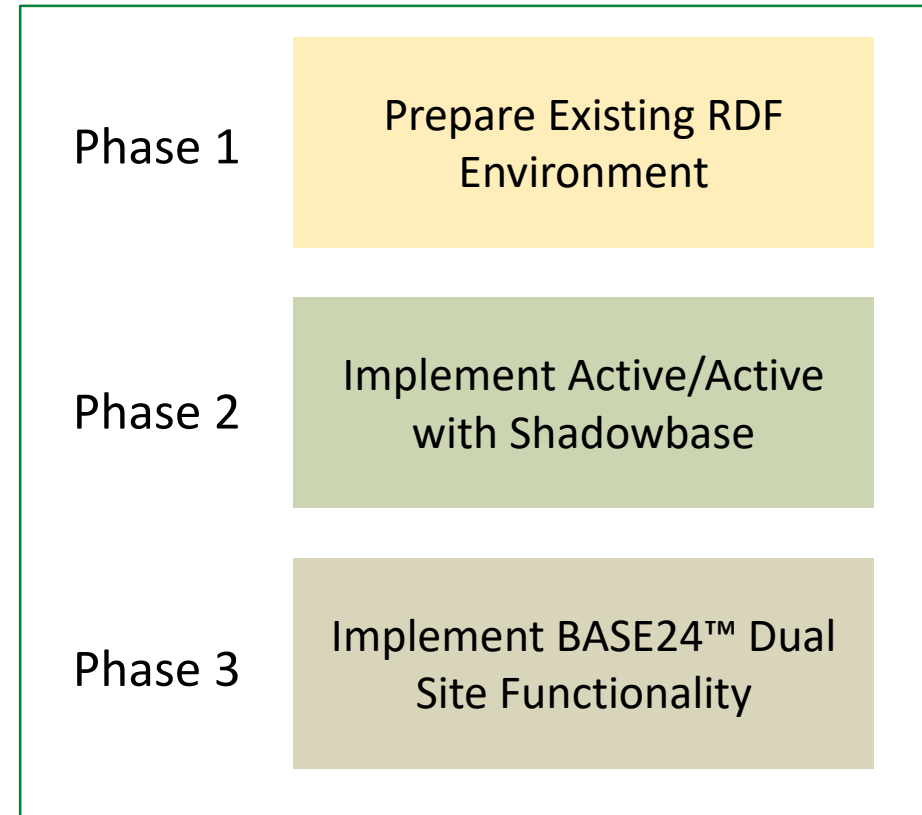
- **HPE Shadowbase**

- Supports key aspects of BASE24 functionality
- Enhanced to enable BASE24 Dual Site functionality
- Works in both uni-directional and bi-directional mode
- File level replication which allows full control of files that need to be replicated
- More complex configuration, but with better management
- Innovative design to create copies of merged (P)TLFs

Implementation approach

- **Testing and implementation time**
 - Phased approach based on number of BASE24™ environments vs Shadowbase instances
 - Migration/testing about 12 months elapsed time
 - Implementation about 4 months elapsed time

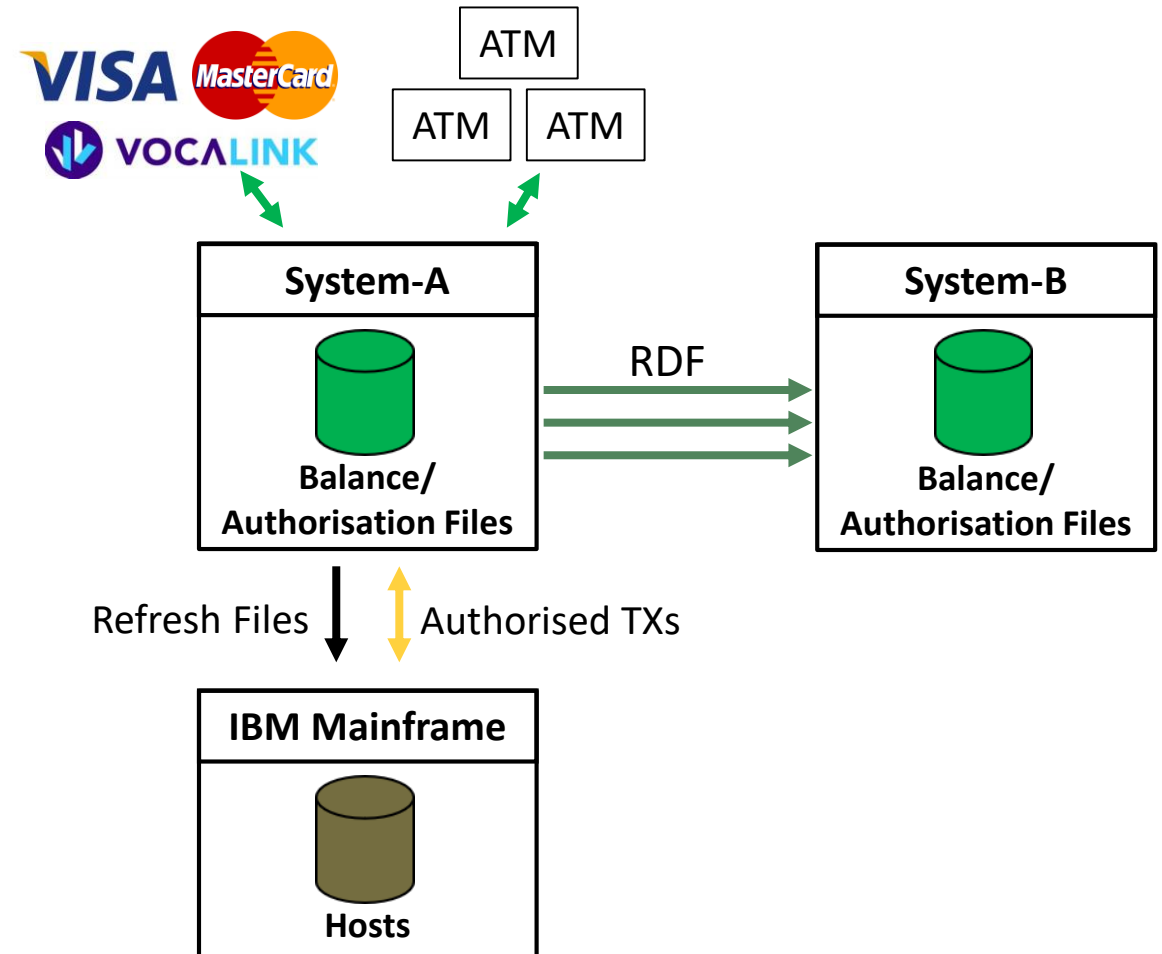
Phased Approach



Migration Phase 1

Beginning state

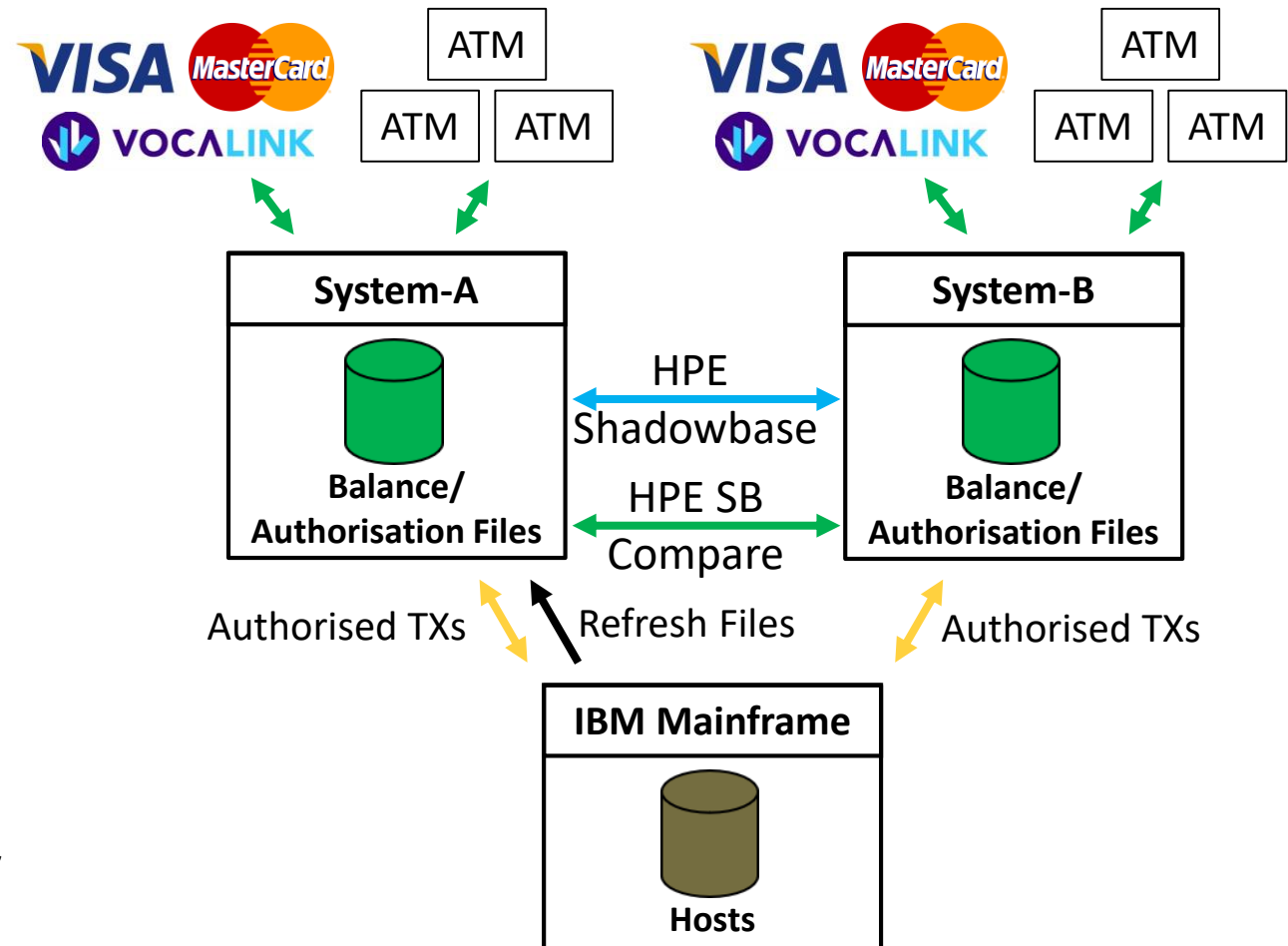
- Activities
 - Modify RDF to allow for a 3-phased Shadowbase replacement
 - Complete Shadowbase training
 - Create Shadowbase BASE24™ environments
 - Run RDF and Shadowbase side-by-side uni-directionally to prove each phase works
 - Replace each RDF phase with Shadowbase uni-directionally



Migration Phase 2

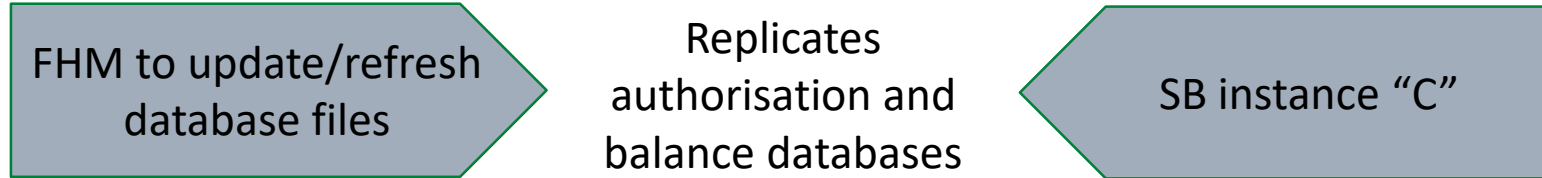
Current state

- Activities
 - Implement Shadowbase A/A partitioned architecture
 - Implement Merged and Exact TLF processes
 - Create three Shadowbase instances per system
 - Utilise six BASE24™ environments per system
 - Work on interchanges to ensure all support A/A
 - Reconfigure device connectivity
 - Reconfigure IBM Mainframe connectivity

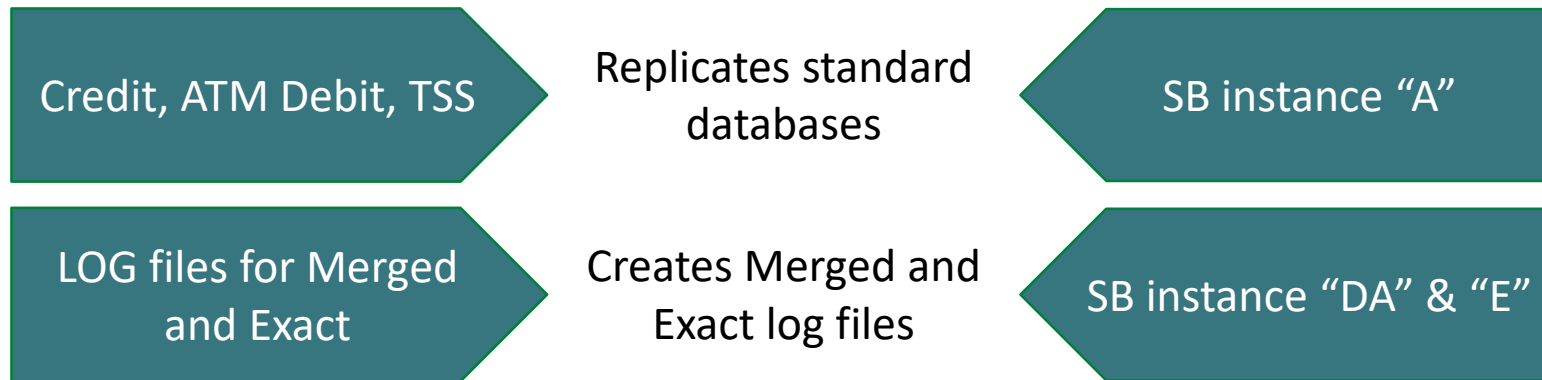


BASE24™ environments vs. Shadowbase instances

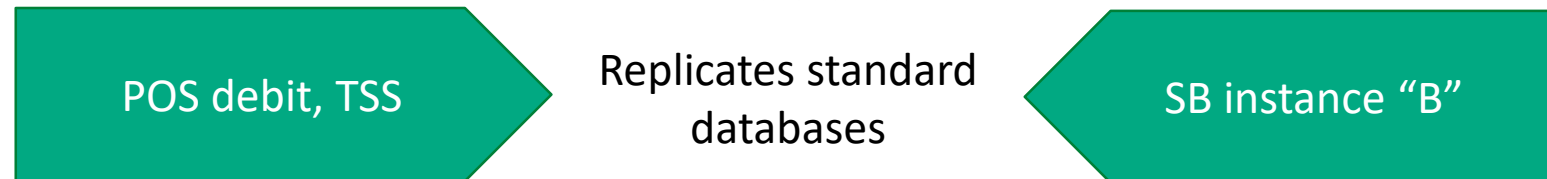
Phase 1



Phase 2



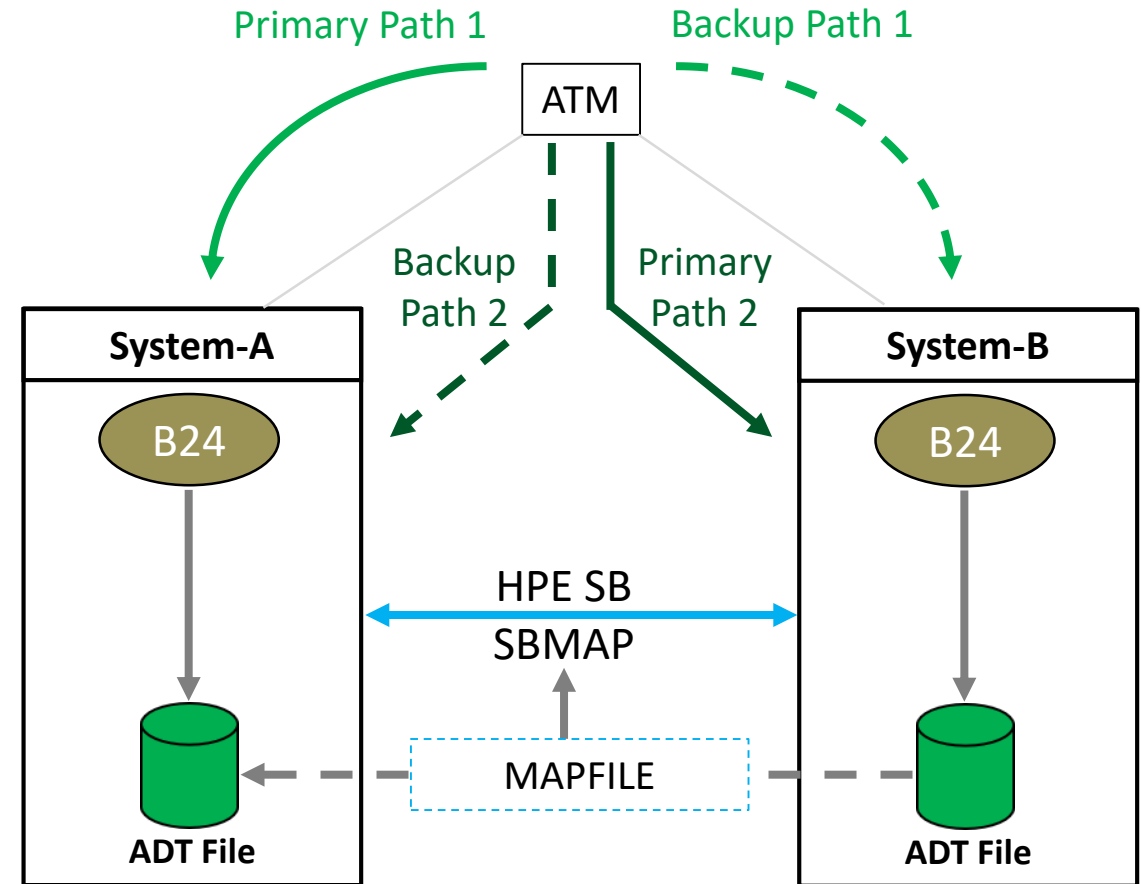
Phase 3



Migration Phase 2

New state

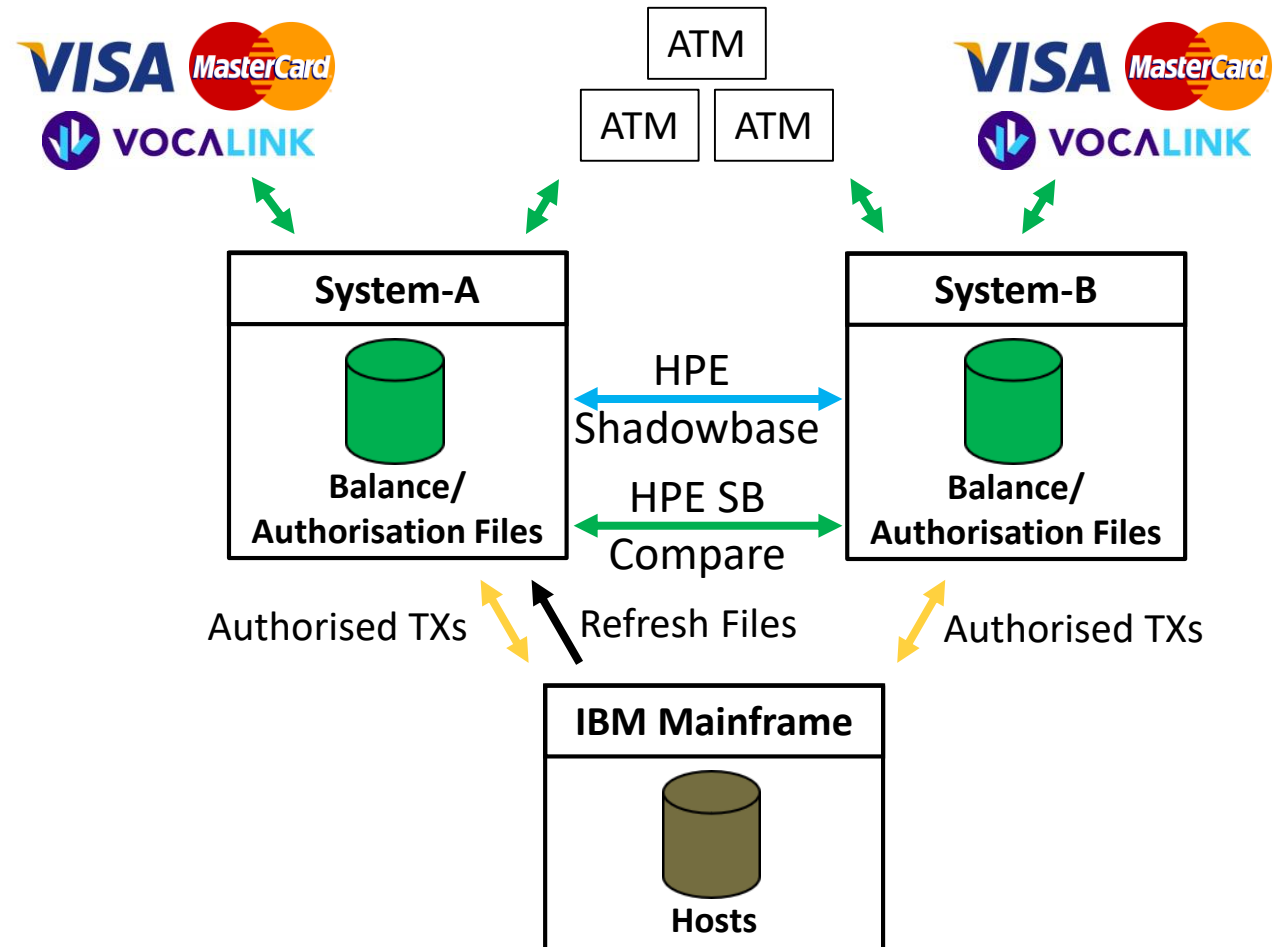
- Activities
 - Utilising BASE24™ Dual Site functionality
 - Implementing Shadowbase Dual Site functionality
 - Reconfiguring device connectivity
- HPE Shadowbase Data Mapping Facility (SBMAP)
 - SBMAP scripting vs. writing User Exits
 - Saved time
 - Reduced costs



Migration Phase 3

Final state

- Activities
 - Utilise BASE24™ Dual Site functionality
 - Implement Shadowbase Dual Site functionality
 - Configure Shadowbase data collision resolution logic
 - Reconfigure device connectivity
- Target implementation date
 - Future 😊



Summary and next steps

Summary

Technical objectives met:

- ✓ Active/Active data centre
- ✓ Both sites are fully active, but tightly coupled
- ✓ Both systems process transactions
- ✓ Databases actively accessed
- ✓ Full utilisation of data assets
- ✓ Data collisions may occur but will automatically be resolved
- ✓ Faster RTO using bi-directional replication
- ✓ Eliminate need for planned downtime

Business outcomes met:

- ✓ Continuous availability: Active/Active payments engine
- ✓ Utilises full infrastructure
- ✓ Better resiliency: improved recovery service
- ✓ Increased capability
- ✓ Improved technical solution

Next steps:

- Implement Shadowbase full active/active architecture
- Reconfigure device connectivity

HPE Shadowbase perspective

One product, many solutions



Business Continuity



Data Integration



Zero Downtime Migration (ZDM)



Essentials Bundle



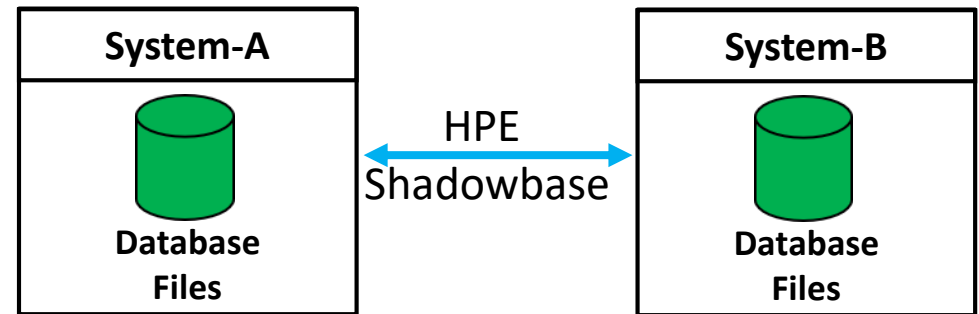
Compare & Repair



Application Integration

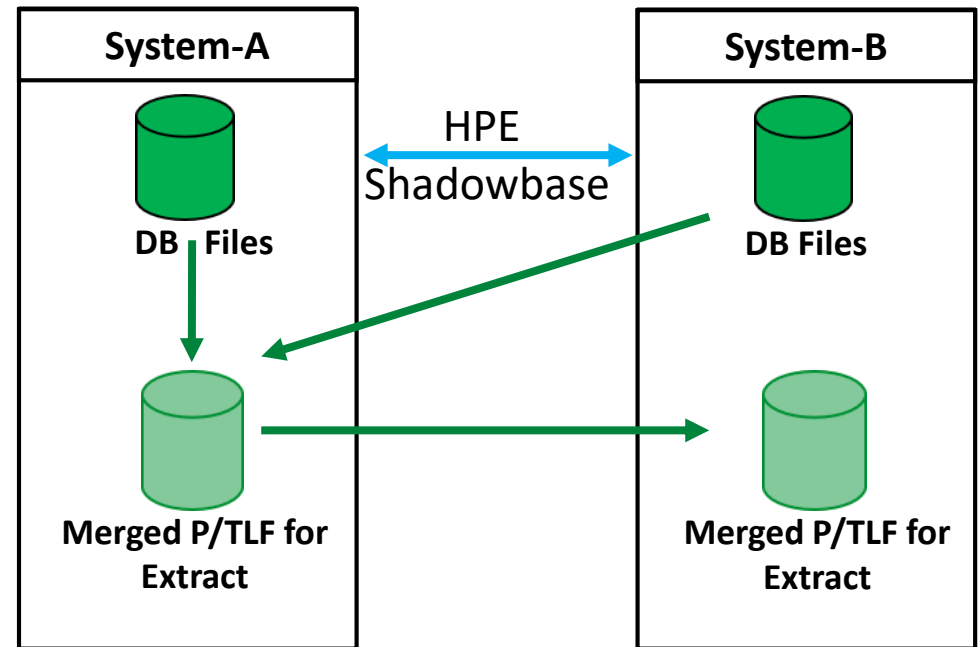
HPE Shadowbase bi-directional replication for Active/Active applications

- Modeled after well-known NonStop products, like Pathway
- No intercept library, so can be upgraded while application keeps running
- Bi-directional mode ensures files on both systems are kept in sync
- Ensures that replicated changes are not replicated back
- Bi-directional replication uses the same core components
- Highly customizable to meet customer requirements



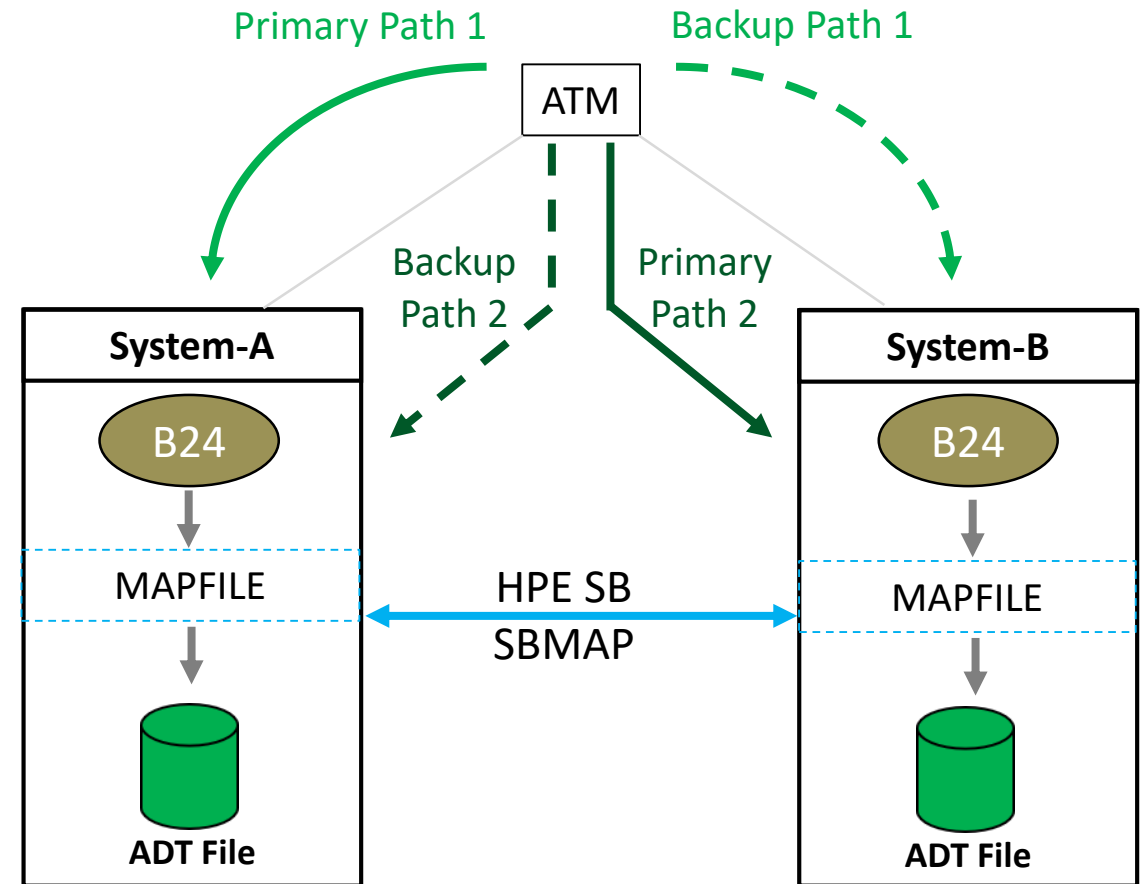
HPE Shadowbase settlement and extract processing

- Unique settlement and extract processing requirements
- General database files kept in sync
- Log files (P/TLF) needed to be merged from both systems and replicated back to meet:
 - The requirement to run multiple extracts on the NonStop
 - The ability to run on either node
 - The ability to resume from last point on either node regardless of place of last extract



Current progress: HPE Shadowbase Mapping Facility (SBMAP)

- SBMAP scripting vs. writing User Exits
 - An SQL-like scripting facility for transforming large data sets
 - Alters field based on the system where the transaction originated
- Additional features
 - Add, Drop, Rename Columns, and Apply Event Filtering
 - Reference and Utilize External Tables
 - Replicate Before and After Image Values
 - Supports Parallelism



Keys to success

Close collaboration across multiple teams at Barclays, Gravic, and HPE

- Open exchange of ideas and approaches
- Thorough testing performed independently
- Open discussions of any issues uncovered during testing and all proposed solutions



Thank You

Questions?