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HPE Shadowbase Support for IBM Db2®

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*HPE Shadowbase is HPE's strategic,
go-forward data replication solution*



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Agenda

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Enhancements to HPE Shadowbase for IBM Db2® Support

HPE Shadowbase IBM Db2 Sample Architectures

- Db2 as a source
 - From Db2 on z/OS IBM Mainframe to HPE NonStop
 - From Db2 on AIX, Linux, or Windows to HPE NonStop
- Db2 as a target
 - From HPE NonStop to Db2 on z/OS IBM Mainframe
 - From HPE NonStop to Db2 on AIX, Linux, or Windows

Current HPE Shadowbase Db2 Requirements

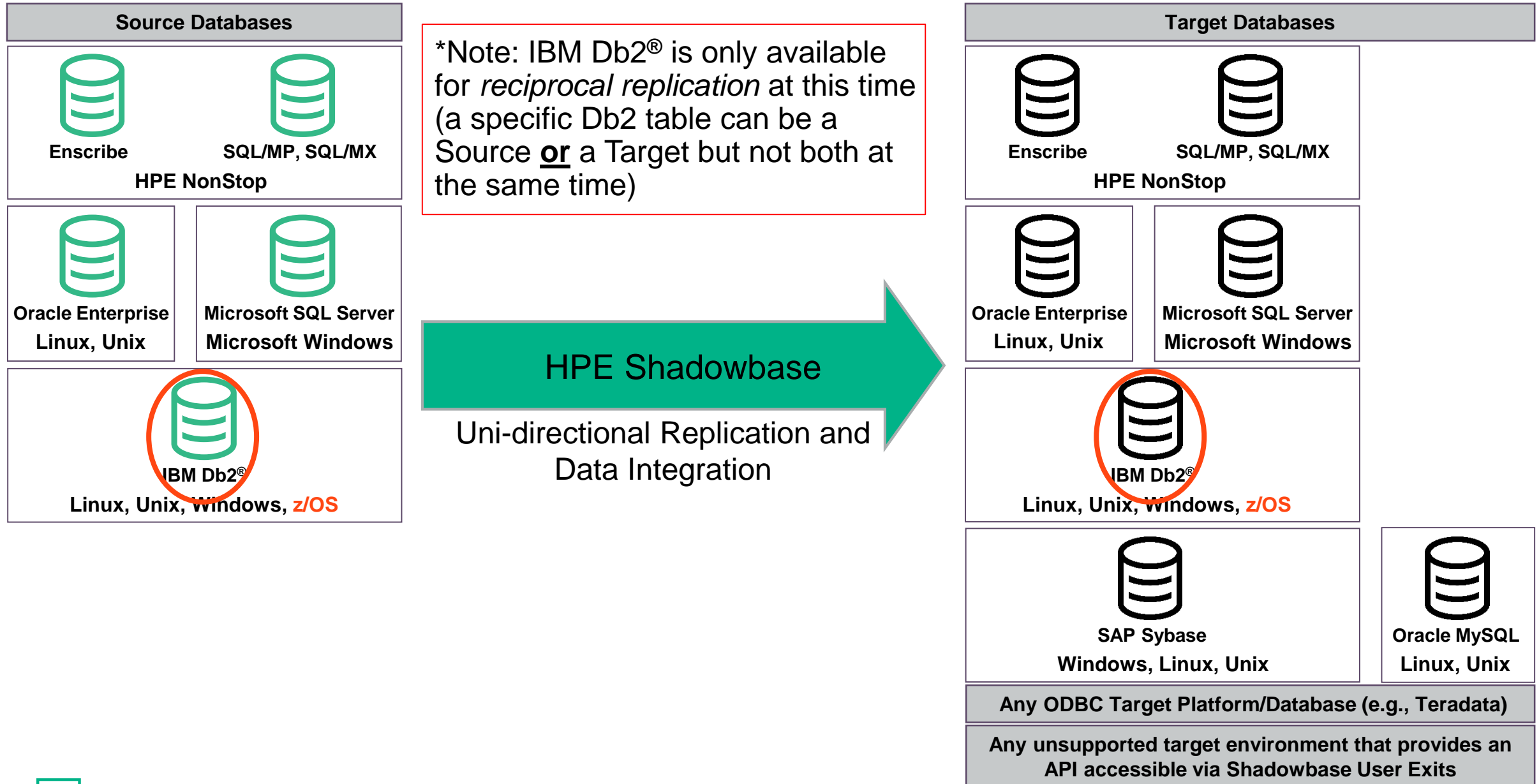
Further Information

Questions? Please ask as we go along...

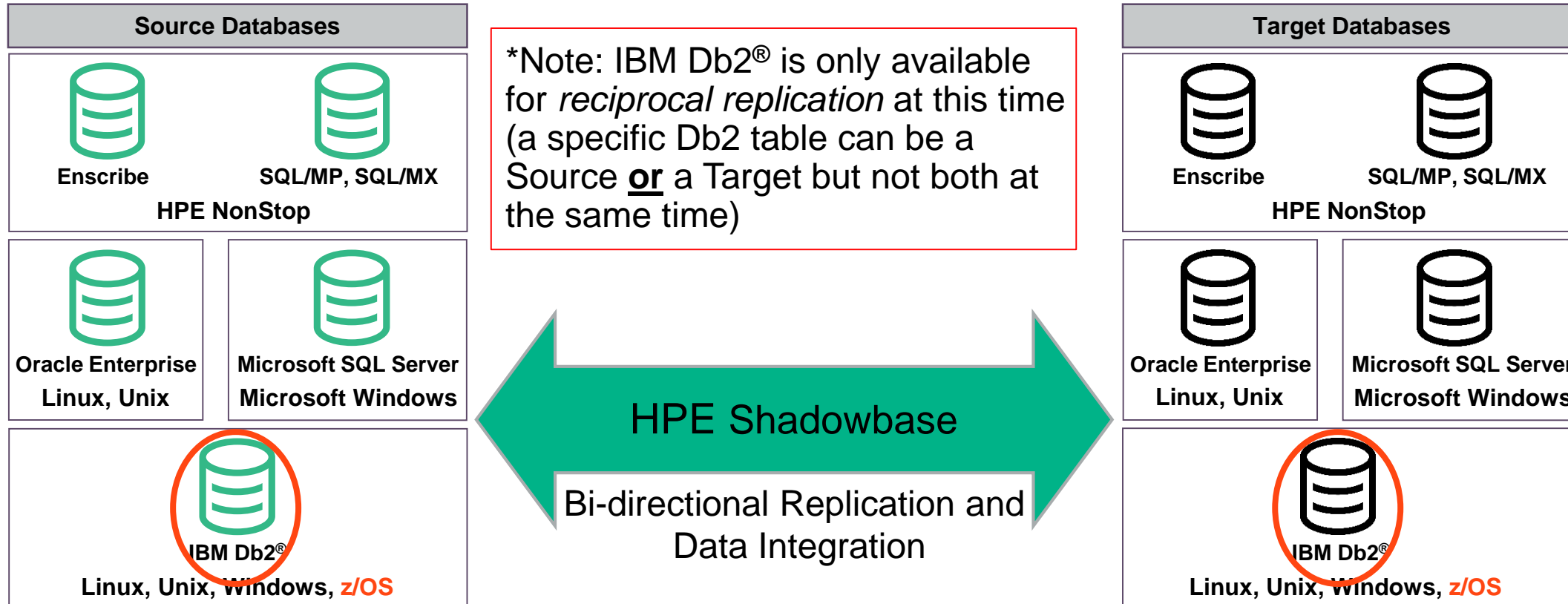


HPE Shadowbase Supported Platforms

Homogeneous & Heterogeneous Uni-directional Data Replication



Homogeneous & Heterogeneous Bi-directional Data Replication



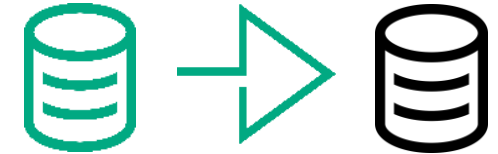


HPE Shadowbase for IBM Db2® Support

Architectural Details

HPE Shadowbase for IBM Db2® Architecture

- HPE Shadowbase provides Uni-directional Db2 replication (from/source or to/target)
- Db2 database can be on any IBM environment/platform
 - AIX, Linux, Windows (ALW), z/OS IBM Mainframe, etc.
- Does not require the installation of any HPE Shadowbase components on the Db2 environment, nor any changes to the application
 - Shadowbase support for Db2 as a source:
 - Uses *IBM Data Event Publisher* (or *Event Publisher*, IDEP) on the source environment to extract the transactional database changes from the Db2 change log and feed them into MQ Series for transport
 - Uses *IBM MQ Series* on the source environment (or data appliance / staging server, depending on the configuration) to deliver the source transactional database changes into HPE Shadowbase
 - Requires a Db2 client connection into the Db2 source database for HPE Shadowbase to extract Db2 table schema information (similar to any other application that accesses the Db2 database)
 - Works with any MQ version supported by IDEP
 - Shadowbase support for Db2 as a target:
 - Requires a Db2 client connection into the Db2 target database
- Hence, HPE Shadowbase supports Db2 both as a source and a target, uni-directionally and reciprocally, on AIX, Linux, Windows, and z/OS platforms





HPE Shadowbase Sample Architectures for IBM Db2®

From Db2 on z/OS IBM Mainframe system to HPE NonStop

HPE Shadowbase Db2® on z/OS replication to NonStop

No HPE Shadowbase components are required/installed on the z/OS environment

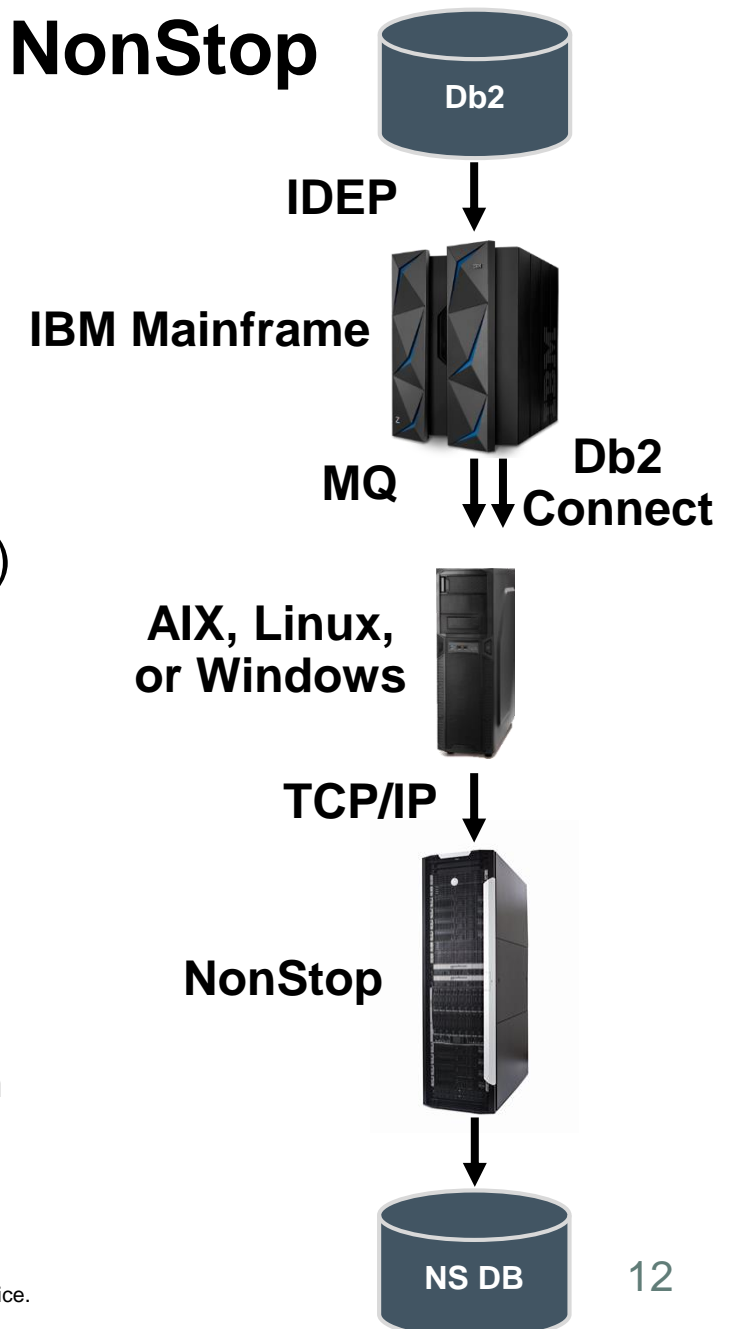
Uses *IBM Data Event Publisher* (IDEP) on z/OS to extract Db2 changes and sends them to MQ Series for transport

Uses *IBM MQ Series* on z/OS to deliver the Db2 changes to the ALW (AIX, Linux, or Windows) system (data appliance / staging server)

Shadowbase runs on the ALW system and receives the MQ changes, then forwards them to the NonStop target using TCP/IP

Shadowbase on the NonStop applies the changes into the target database (Enscribe, SQL/MP, or SQL/MX)

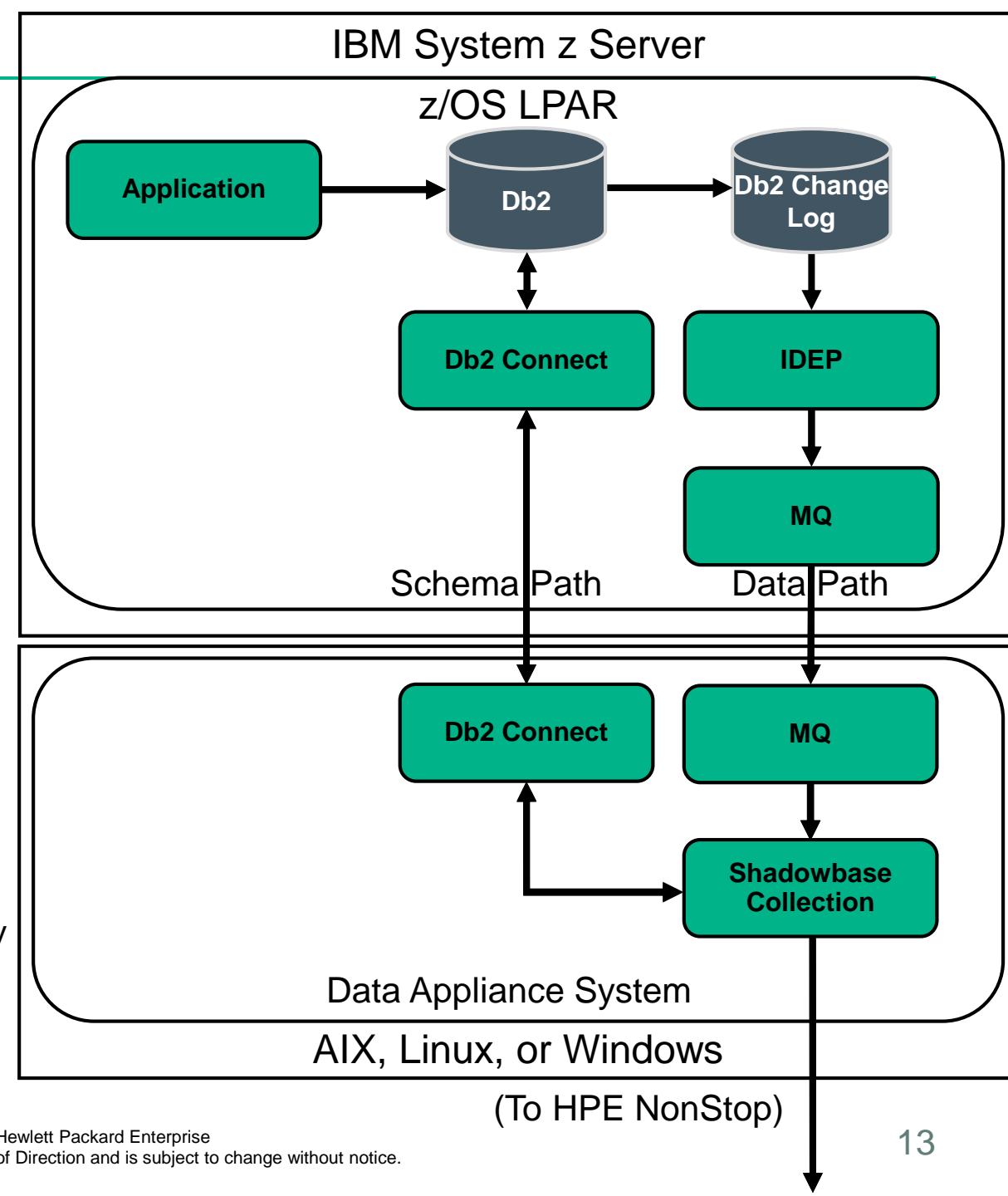
Note: Shadowbase on the ALW system must have a Db2 client connection (Db2 Connect) into the Db2 source database to read the Db2 table schema information



Enhanced IBM Db2® Support

From Db2 on z/OS to HPE NonStop (1)

- This example shows HPE Shadowbase replication from an IBM z/OS mainframe Db2 source database into an HPE NonStop target environment
- When the *Db2* database is on a platform other than AIX, Linux, or Windows (ALW), for example z/OS, HPE Shadowbase runs on an intermediate *Data Appliance / Staging Server System* that has the MQ API and Db2 client access to the database
- The Mainframe Application updates the *Db2 database*
- *Db2* changes are recorded in the *Db2 Change Log*
- Then, IBM Data Event Publisher publishes the *Db2 changes* to an MQ queue located on an intermediate data appliance / staging server (ALW)
- Shadowbase Collection on the intermediate data appliance / staging server (ALW) reads the changes from the MQ queue and forwards them to the *NonStop*
- Shadowbase uses Db2 Connect to retrieve table schema information for tables it has not received/processed previously

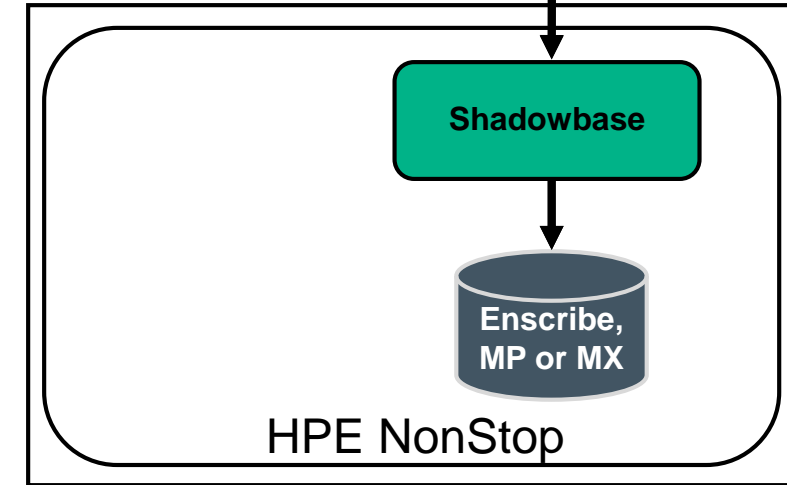


Enhanced IBM Db2® Support

From Db2 on z/OS to HPE NonStop (2)

- Shadowbase on the NonStop receives the changes and applies them into the *NonStop target database*

TCP/IP Connections





HPE Shadowbase Sample Architectures for IBM Db2®

From Db2 on ALW system to HPE NonStop

HPE Shadowbase IBM Db2® on ALW replication to NonStop

Uni-dir IBM Db2 on ALW source replication to HPE NonStop target

Uses *IBM Data Event Publisher* (IDEP) on the ALW (AIX, Linux, or Windows) system to extract the Db2 changes and deliver them to IBM MQ Series for transport

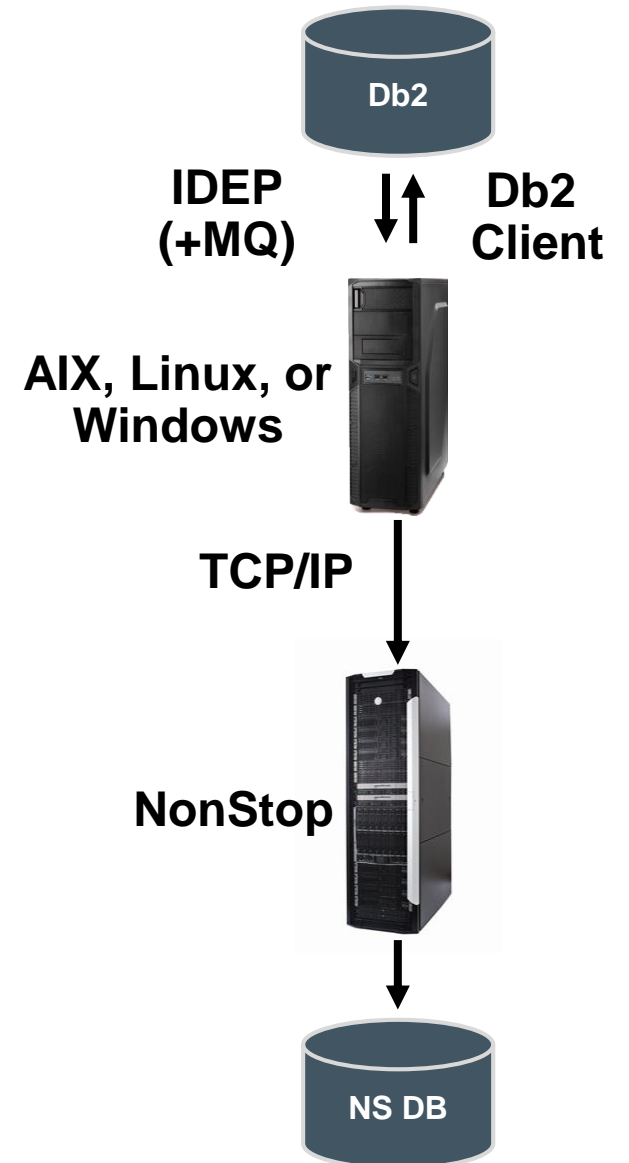
Uses *IBM MQ Series* to deliver the Db2 changes to Shadowbase on the ALW system

Shadowbase on the ALW system uses Db2 Client (ODBC) to read the Db2 Catalog and extract the data schema information

Shadowbase on the ALW system receives the MQ changes, then forwards them to the NonStop target using TCP/IP

Then, Shadowbase on the NonStop applies the changes into the target database (Enscribe, SQL/MP, or SQL/MX)

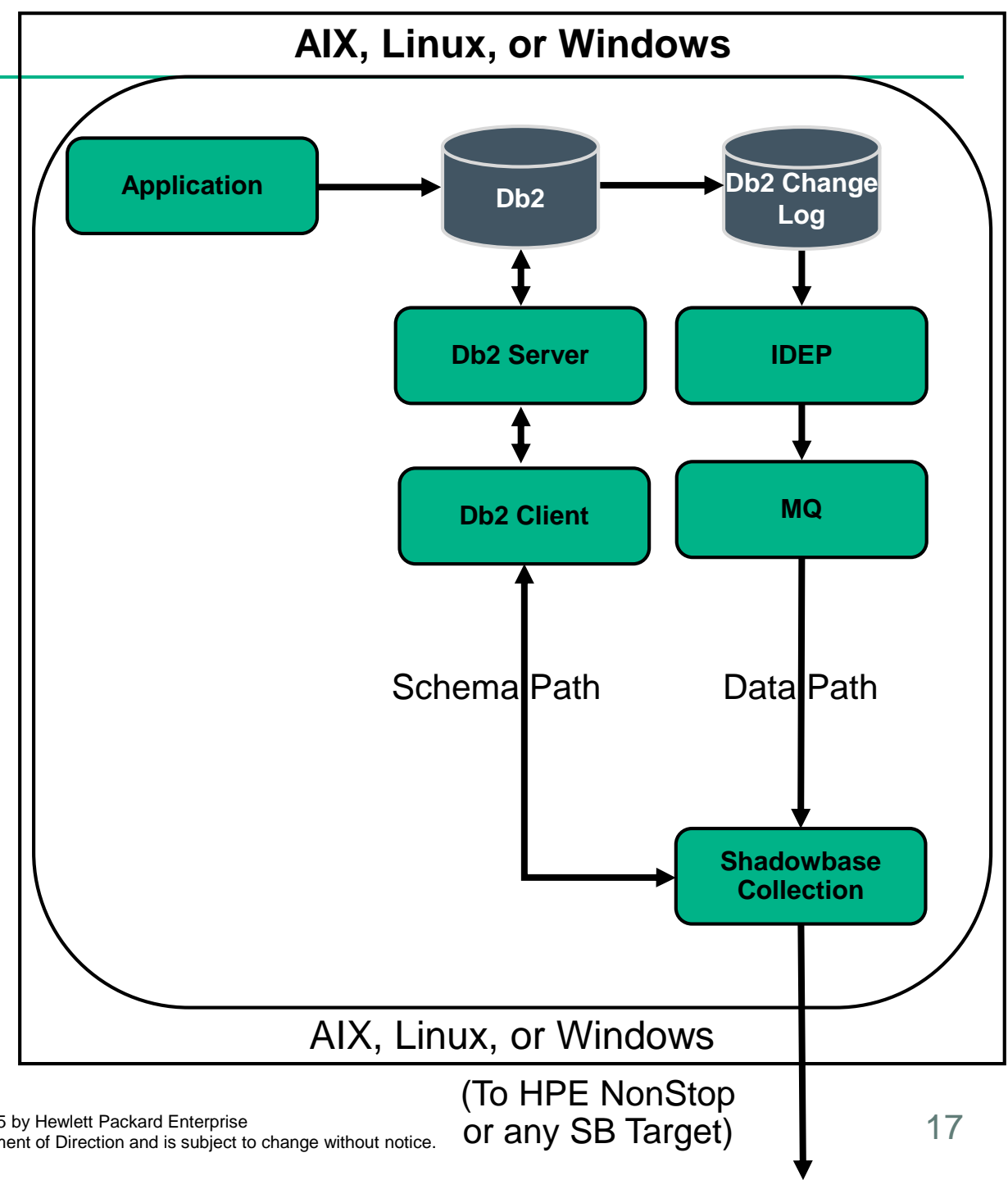
Note: Shadowbase on the ALW system must have a Db2 client connection into the Db2 source database to extract the Db2 table schema information



Enhanced IBM Db2® Support

From Db2 on AIX, Linux, or Windows to HPE NS (1)

- This example shows HPE Shadowbase replication from an AIX, Linux, or Windows source Db2 database into an HPE NonStop target environment
- The Application updates the *Db2* database
- Changes to the *Db2* database are recorded in the *Db2 Change Log*
- Then, IBM Data Event Publisher publishes the Db2 changes to an MQ queue
- MQ delivers the changes and Shadowbase Collection reads the changes from the MQ queue
 - Shadowbase uses Db2 Client to retrieve table schema information for tables it has not received/processed previously
- Shadowbase Collection then forwards the changes to any supported Shadowbase target environment (a NonStop in this example)

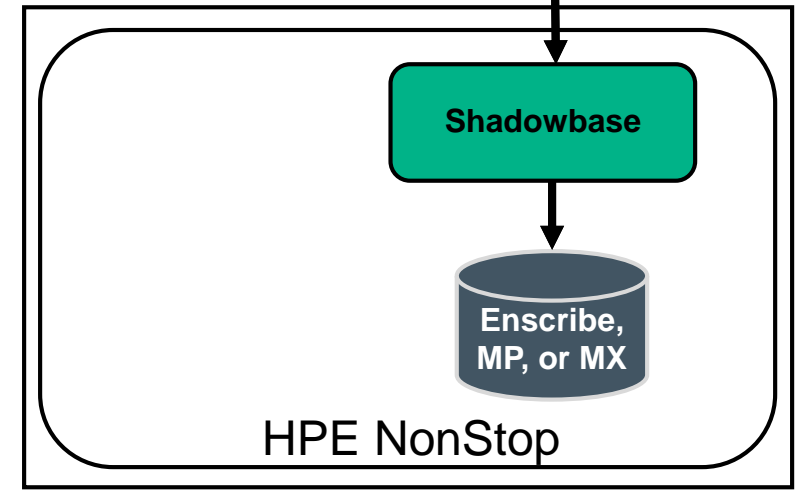


Enhanced IBM Db2® Support

From Db2 on AIX, Linux, or Windows to HPE NS (2)

- Shadowbase on the NonStop receives the changes and applies them into the *NonStop target database*

TCP/IP Connections





HPE Shadowbase Sample Architectures for IBM Db2®

From HPE NonStop to Db2 on z/OS IBM Mainframe system

HPE Shadowbase NonStop replication to IBM Db2® on z/OS

Uni-dir HPE NonStop source replication to IBM Db2 on z/OS target

No HPE Shadowbase components are required/installed on the z/OS environment

Shadowbase on the NonStop extracts TMF database changes (Enscribe, SQL/MP, or SQL/MX)

Then, Shadowbase forwards the changes over TCP/IP to the AIX, Linux, or Windows (ALW) system (data appliance / staging server)

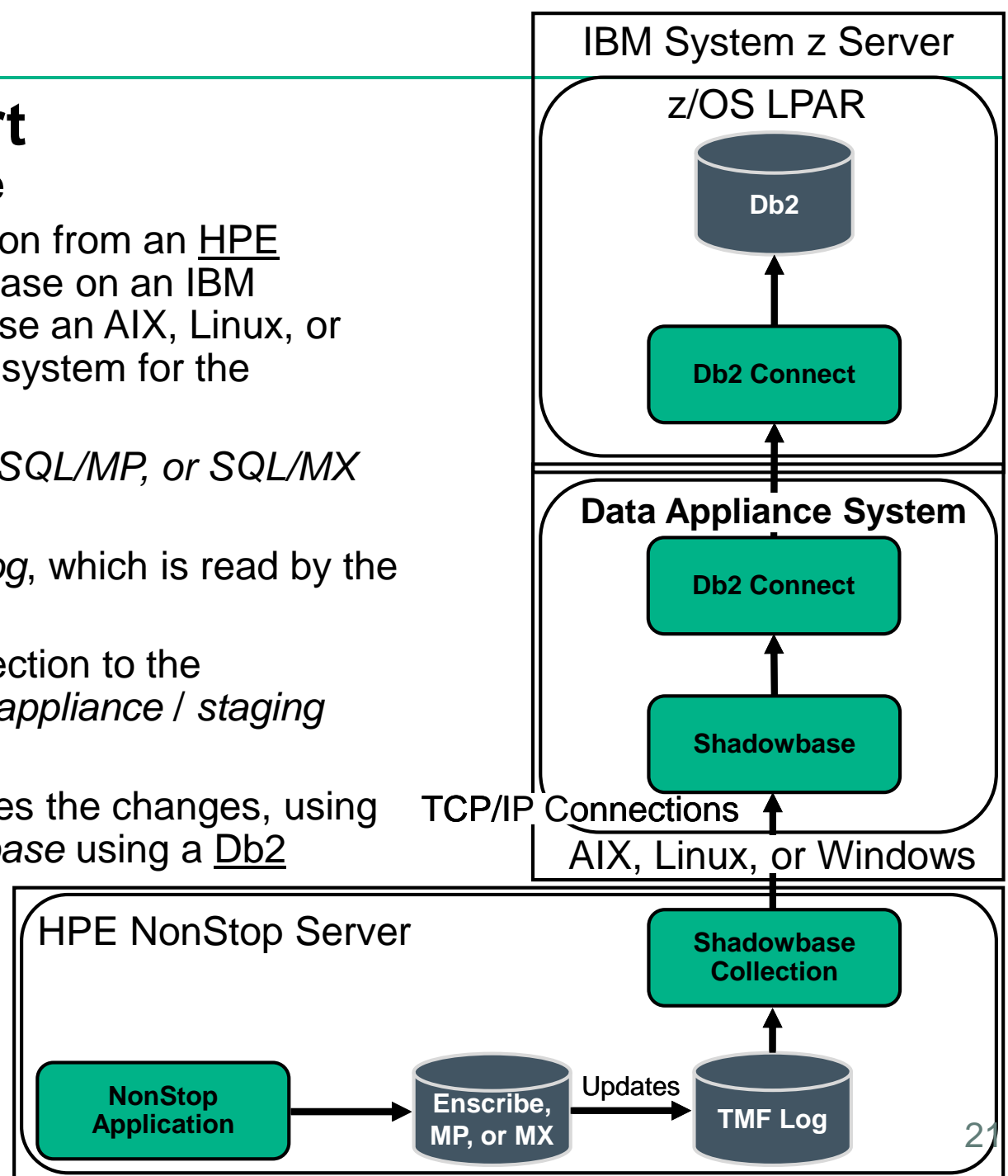
Shadowbase on the ALW system uses a Db2 Client Connection (Db2 Connect) to apply the changes into the Db2 target database on z/OS



Shadowbase IBM Db2® Support

From HPE NonStop to Db2 on IBM Mainframe

- This example shows HPE Shadowbase replication from an HPE NonStop source database to a Db2 target database on an IBM mainframe z/OS environment. Note that it will use an AIX, Linux, or Windows (ALW) data appliance / staging server system for the Shadowbase processes
- NonStop application updates audited *Enscribe*, *SQL/MP*, or *SQL/MX* source tables
- These changes are recorded in the *TMF audit log*, which is read by the Shadowbase Collection software
- The changes are then sent over a TCP/IP connection to the Shadowbase software running on an *ALW data appliance / staging server system*
- Shadowbase software on the ALW system applies the changes, using transaction semantics, into the *Db2 target database* using a Db2 Connect connection





HPE Shadowbase Sample Architectures for IBM Db2®

From HPE NonStop to Db2 on ALW system

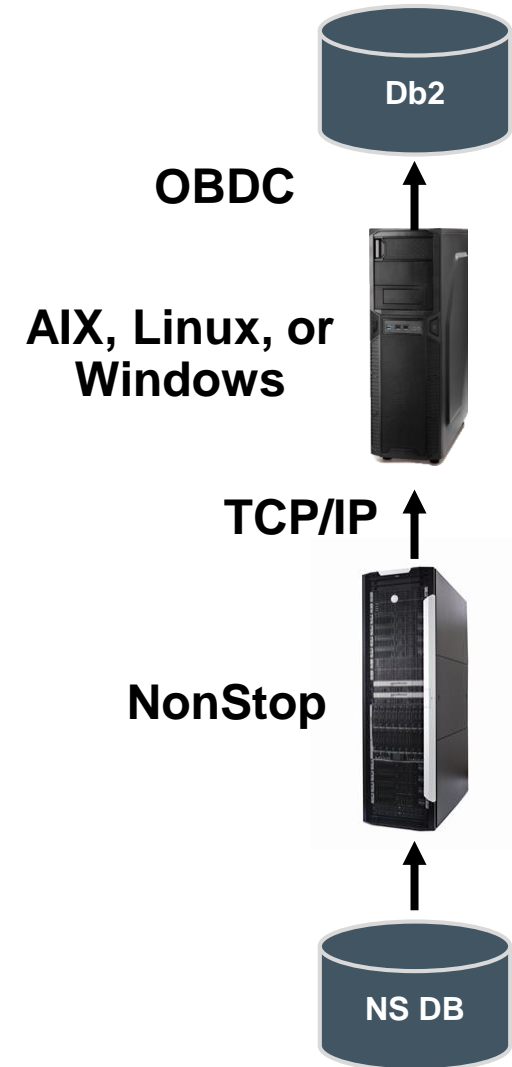
HPE Shadowbase NonStop replication to IBM Db2® on ALW

Uni-dir HPE NonStop source replication to IBM Db2 on ALW target

Shadowbase on the NonStop extracts TMF database changes
(Enscribe, SQL/MP, or SQL/MX)

Then, Shadowbase forwards the changes over TCP/IP to the ALW
(AIX, Linux, or Windows) data appliance / staging server system

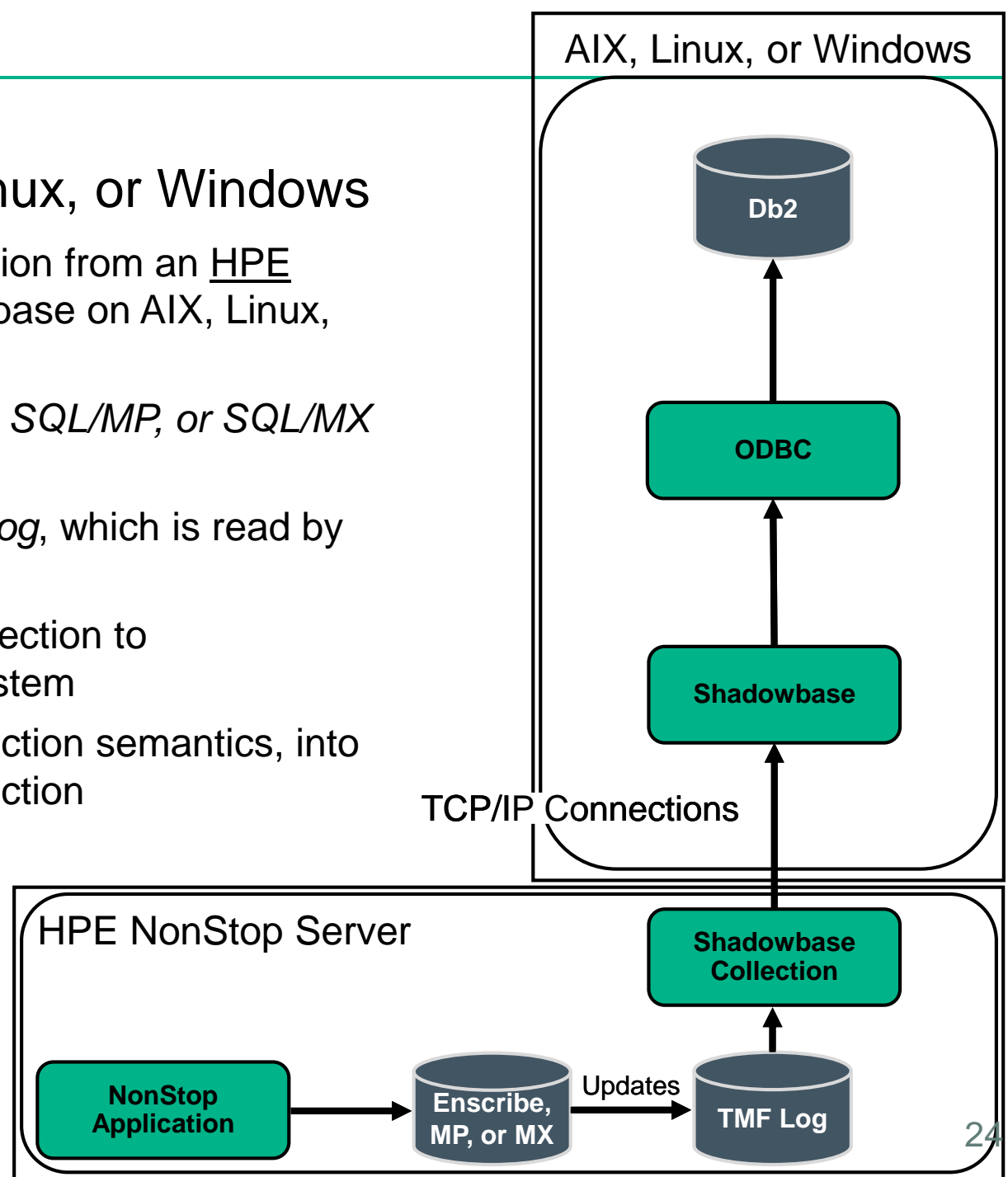
Shadowbase on the ALW system uses an ODBC Client Connection
to apply the changes into the Db2 target database



Enhanced IBM Db2® Support

From HPE NonStop to Db2 on AIX, Linux, or Windows

- This example shows HPE Shadowbase replication from an HPE NonStop source database to a Db2 target database on AIX, Linux, or Windows
- NonStop Application updates audited *Enscribe*, *SQL/MP*, or *SQL/MX* source tables
- These changes are recorded in the *TMF audit log*, which is read by the Shadowbase Collection software
- The changes are then sent over a TCP/IP connection to Shadowbase on the AIX, Linux, or Windows system
- Shadowbase applies the changes, using transaction semantics, into the *Db2 target database* using an ODBC connection



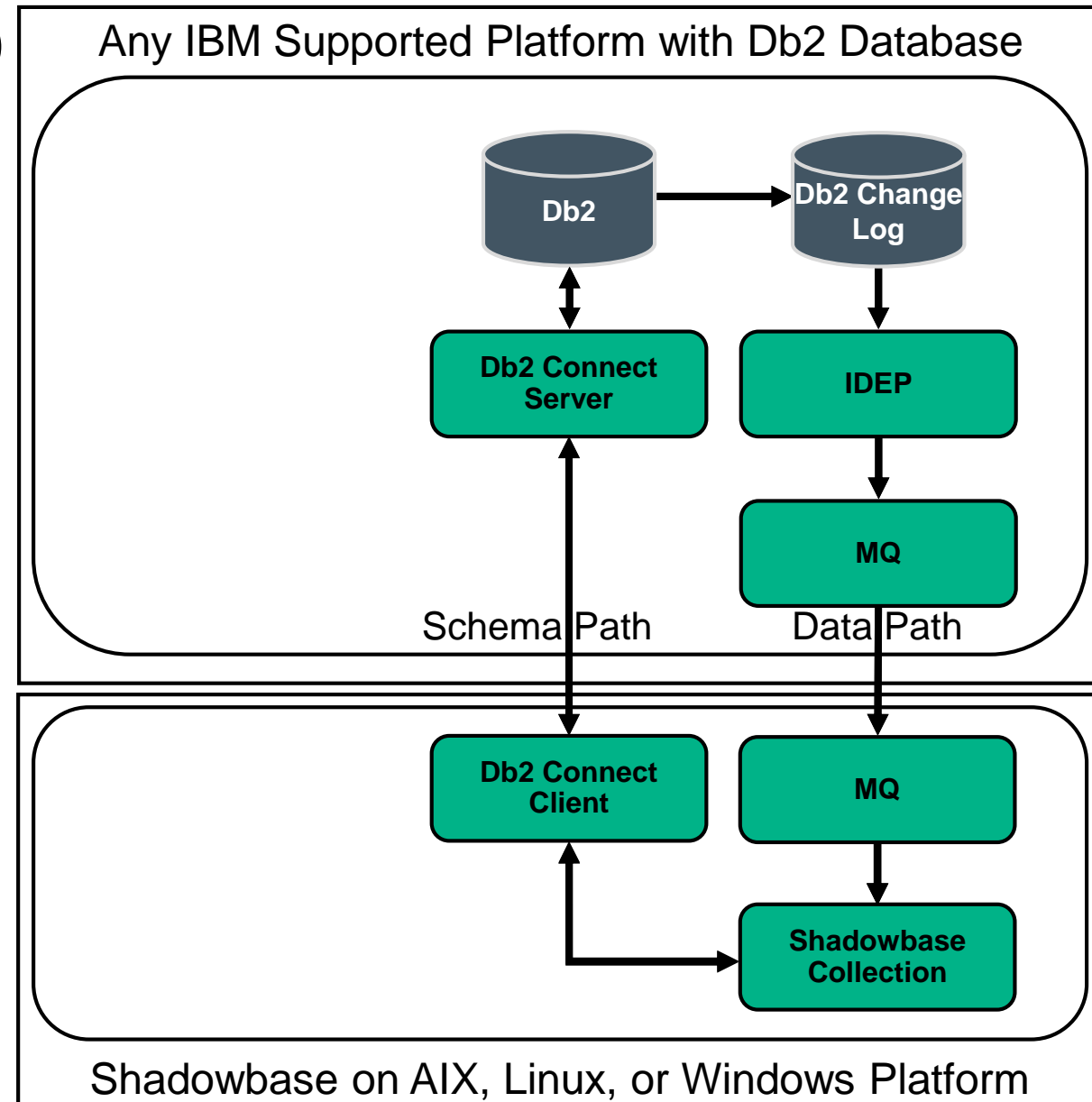


HPE Shadowbase Access into IBM Db2® – A Closer Look

HPE SB Access into IBM Db2® (1)

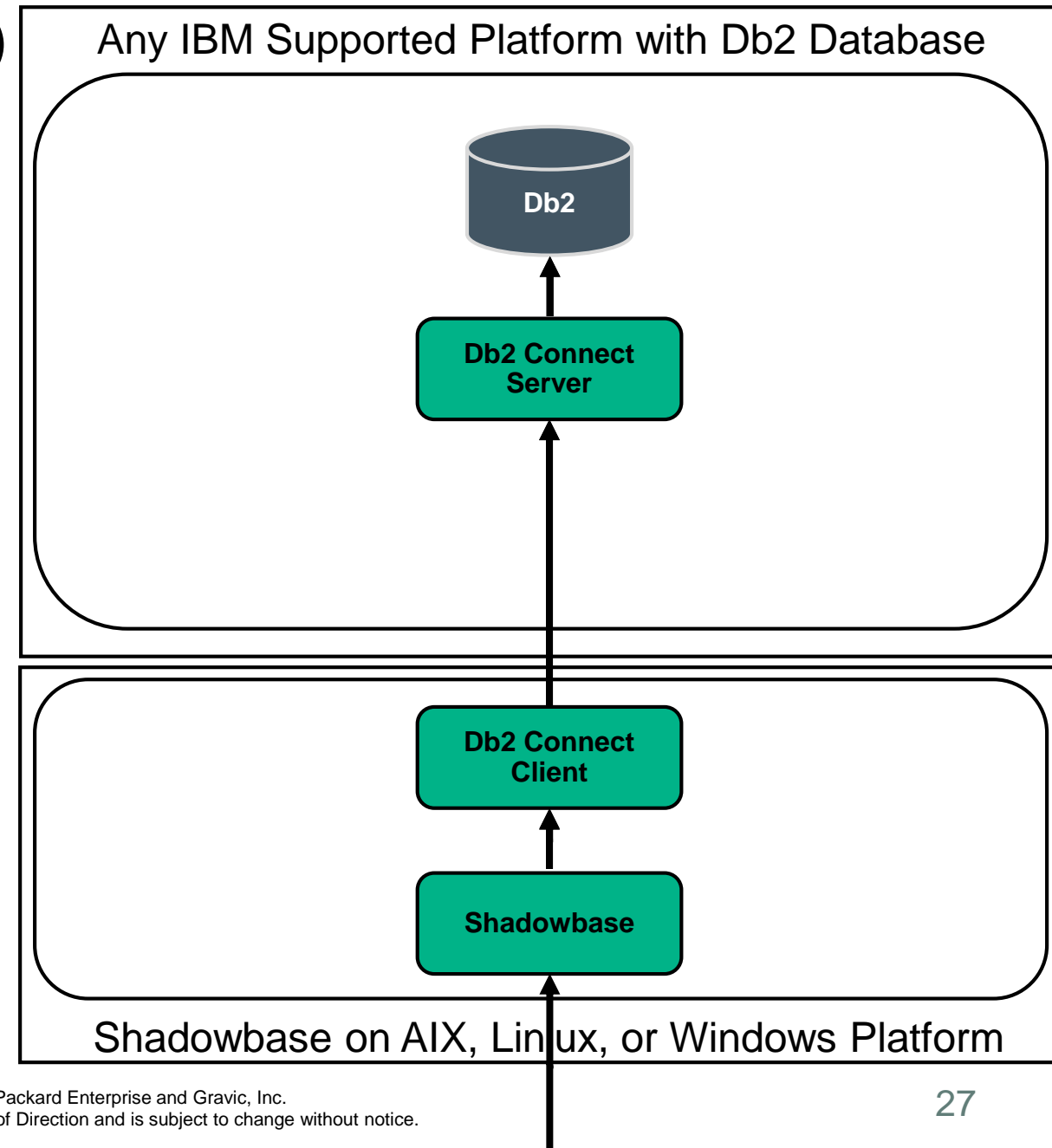
As a Replication Source

- The Db2 database (along with IDEP and MQ) can reside on any platform that IBM supports
- IDEP extracts the Db2 database changes (from the Db2 Journal), and uses MQ to deliver the changes to Shadowbase
- Shadowbase uses the Db2 Connect Client Library (z/OS) or Db2 Client (e.g. ODBC) to read the Db2 catalog to retrieve the table schema information for the tables being replicated
- Shadowbase must run on an AIX, Linux, or Windows platform that has access to MQ and the Db2 Connect (or ODBC) Client Library



HPE SB Access into IBM Db2® (2) As a Replication Target

- The Db2 database can reside on any platform that IBM supports
- Shadowbase uses the Db2 Connect Client (z/OS) or Db2 client (e.g., ODBC) to write the replicated events into the Db2 database
- Shadowbase must run on an AIX, Linux, or Windows (ALW) platform that has access to the Db2 Connect Client (z/OS) or Db2 Client (e.g., ODBC) Library
- The ALW platform can be viewed as a data appliance / staging server system



HPE SB Access into IBM Db2® (3)

FAQs

- Can Shadowbase run on the SAME platform as the Db2 database?
 - Yes, if that platform is an AIX, Linux, or Windows (ALW) platform
 - No, otherwise
- Can Shadowbase run on a z/OS mainframe environment?
 - At this time, Shadowbase has **not** been ported to run directly on z/OS
- Are there any plans to port Shadowbase to run on a z/OS mainframe environment?
 - Not at this time
- Can Shadowbase running on a NonStop directly write to or read from Db2?
 - The Db2 Connect Client Library is not available on the NonStop
 - Therefore, Shadowbase must run on a platform where the Db2 Connect Library is available
 - At this time, this means that Shadowbase must run on an ALW platform
- **Note:** The current HPE Shadowbase architecture for replicating to Db2 on a z/OS environment, or replicating from Db2 on a z/OS environment, does not require the installation of **any** Shadowbase components on the z/OS environment.



HPE SB Access into IBM Db2® (4)

FAQs

- For NonStop and Db2 (on z/OS) replication, how and where is ASCII / EBCDIC translation performed?
 - When replicating Db2 from z/OS to NonStop, the IDEP and MQ configurations provide translation capabilities. For example, IDEP knows the Db2 schema data types, and can translate the data appropriately when configured to use the correct code/map pages
 - When replicating from NonStop to Db2 on z/OS, the client/server ODBC interface supports similar translation when configured to use the correct code/map pages
- How are the Db2 SQL datatypes translated to and from the NonStop Enscribe DDL field definitions or NonStop SQL schema columns (e.g., for a BASE24 PBF table/file)?
 - The rules for data mapping must be defined to HPE Shadowbase (using either the SBMAP data translation facility or SB User Exits) so that SB will map the fields and columns appropriately, for example performing all necessary data translation



HPE SB Access into IBM Db2® (5)

FAQs

- For supporting a “partial refresh” style of replication, how are individual transactions replicated from Db2 to NonStop?
 - IDEP performs the transactional extract from the Db2 Journal to get the individual insert, update, and delete operations, and then uses MQ for delivery to HPE SB
 - HPE SB then uses TCP/IP to send the data to the NonStop, where the transactional inserts, updates, and deletes are performed into the target file/table
- For supporting a “full refresh” style of replication, how is the Db2 table replicated (copied) from Db2 to NonStop?
 - Method will depend on the size of the Db2 source table
 - One method performs transactional updates (no-op updates) to pass all data through the Db2 Journal (may be too slow for large Db2 tables)
 - Another method performs a Db2 table COPY with logging or other mechanism to pass the data into MQ
 - Db2 data can also be unloaded into a flat file and then SFTP'd, pausing replication before the unload takes place, however that would require Shadowbase to perform extra work (e.g., ASCII/EBCDIC translation)

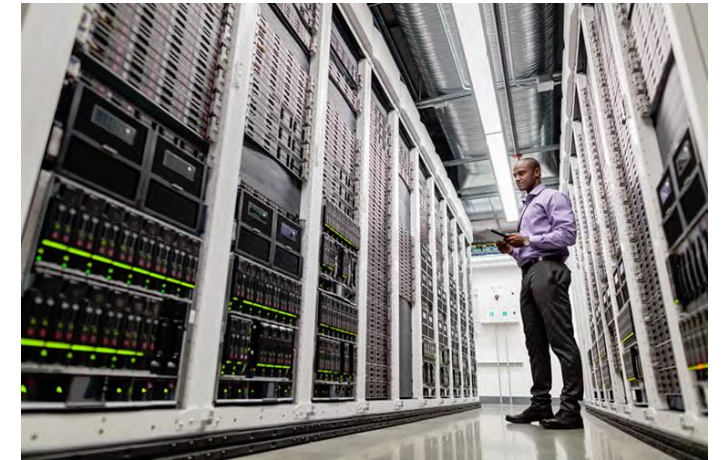




Current HPE Shadowbase Requirements for IBM Db2®

Current HPE Shadowbase Requirements for IBM Db2®

- Support for uni-directional and reciprocal replication only (no bi-directional support yet)
 - A Db2 table can be either a source or a target but not both at the same time
- For Db2 source replication
 - Shadowbase uses IBM Data Event Publisher (IDEP) to extract the Db2 database changes from the Db2 journal and then uses IBM MQ to deliver the changes to Shadowbase
 - Shadowbase also needs access to the Db2 catalog through a Db2 Connect connection (z/OS) or a Db2 Client (ODBC) to read the Db2 SQL table schema information
 - Hence, Shadowbase must run on an AIX, Linux, or Windows platform
- For Db2 target replication
 - Shadowbase must run on either an AIX, Linux, or Windows platform
 - Shadowbase will use Db2 Connect (z/OS) or Db2 Client (ODBC) to apply the changes into the Db2 target database (target database can be local or remote)



Thank you

Questions?

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data replication solution*

