A POINTBASE WHITE PAPER

PointBase Universal Synchronization

PointBase Universal Synchronization Option: Extending the Reach of Corporate Data

PointBase

Managing data
anywhere on the Net

INTRODUCTION

The PointBase Universal Synchronization Option (UniSync) provides a cornerstone technology for managing data anywhere on the net. UniSync enables developers to distribute application data and code across multiple tiered environments to applications and users located anywhere on the Internet. UniSync integrates with legacy data systems to extend corporate data to new applications and new users, to enable more efficient operations, better service, and new product and service opportunities.

UniSync offers the most comprehensive set of functionality for sharing data among multiple, disparate database systems. When combined with the PointBase database system, UniSync enables an entirely new set of internet-enabled applications that allow developers to leverage enterprise data for improved efficiencies, and increased revenues through new products and services. Examples of applications that benefit from UniSync include solutions for supporting field sales organizations, web-based catalogs, e-commerce servers, and Internet-enabled kiosks.

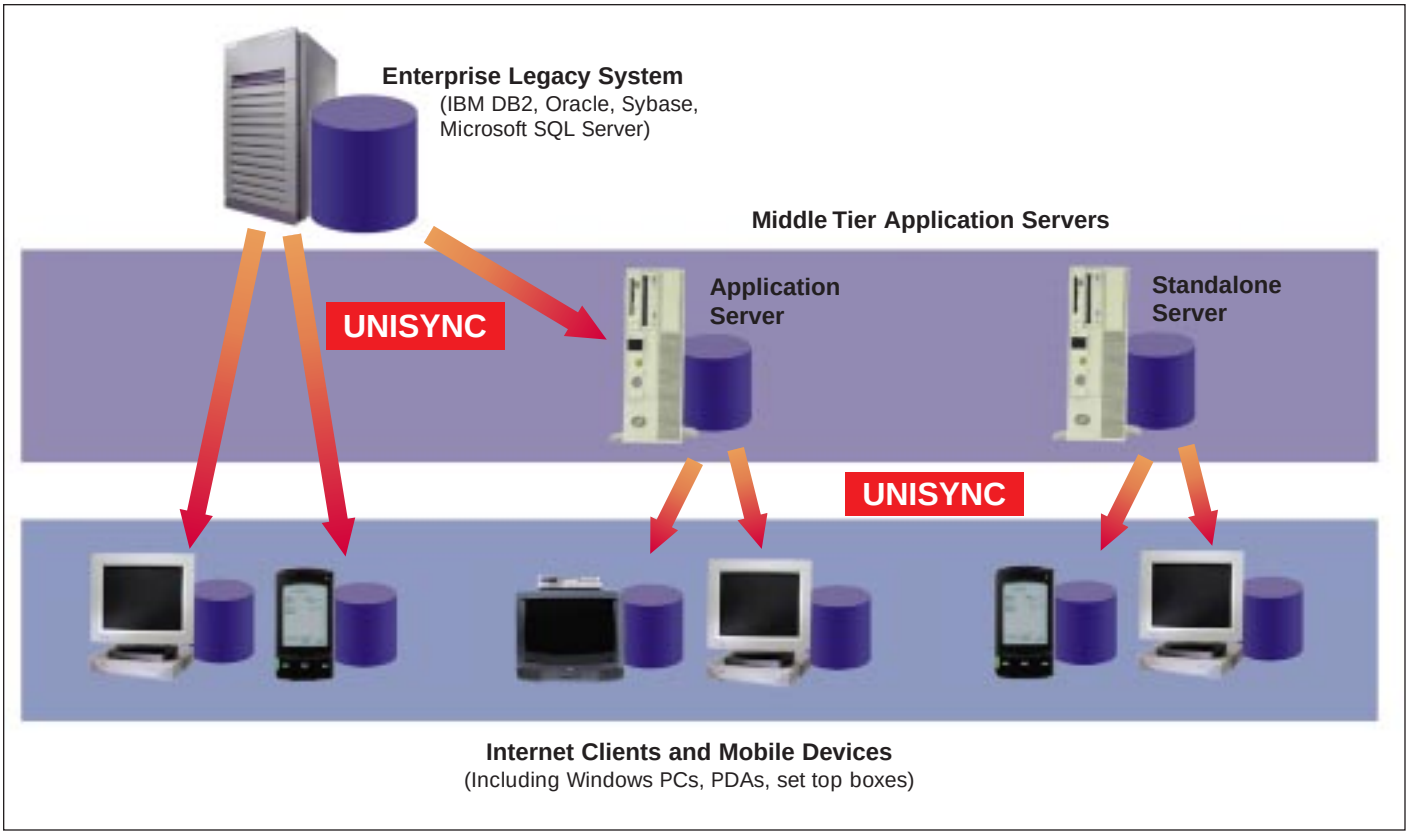


Figure 1: *UniSync provides universal data synchronization between legacy database systems and middle tier servers, Internet clients, and mobile devices.*

PUBLISH/SUBSCRIBE MODEL

UniSync uses a publish/subscribe model to enable data access and sharing between multiple disparate database systems. The publish/subscribe model supports the concept of a data "publisher" who maintains a master copy of the data. A "subscriber" in turn receives a copy of this data, with occasional updates to ensure that the publisher and subscriber data are consistent.

As an example, consider an application written to support a mobile sales force. The sales representatives require access to the latest customer and pricing information for their sales calls. The sales territories are divided into three different regions: East, Central, and West. In this simple example, the corporate headquarters maintains a central database with all customer and pricing information. The sales representatives, in turn, maintain copies of this information on their mobile clients. UniSync supports an unlimited number of publishers (across one or more databases) and an unlimited number of subscribers to each of those publishers. Within a database, any number of tables may be published, and any number of subscribers may receive privileges to access that information.

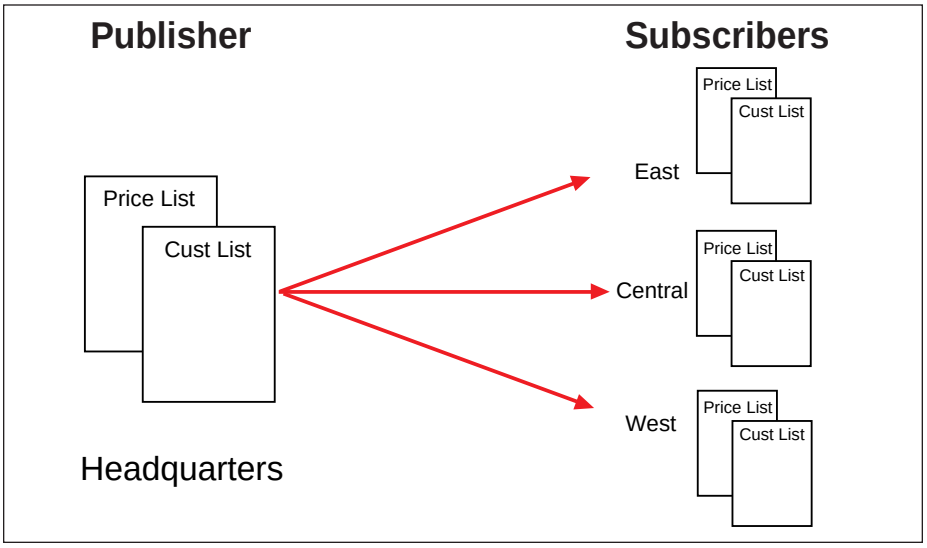


Figure 2: *Simple example of publish/subscribe data synchronization*

The PointBase database allows developers to incorporate an added level of security to their publish and subscribe applications, because with PointBase they may assign a publish or subscribe privilege to any table in the database. Only tables with assigned privileges can synchronize data. This capability provides a developer with an additional level of assurance that secure or sensitive data will synchronize only under strictly managed conditions.

PUBLISH/SUBSCRIBE MODEL

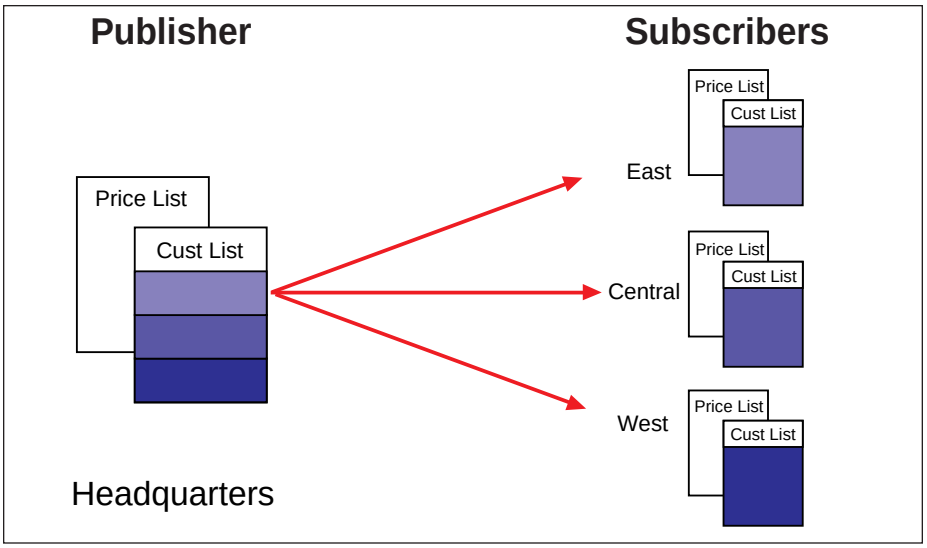


Figure 3: *Publishers can synchronize an entire table or a subset of the table to each subscriber.*

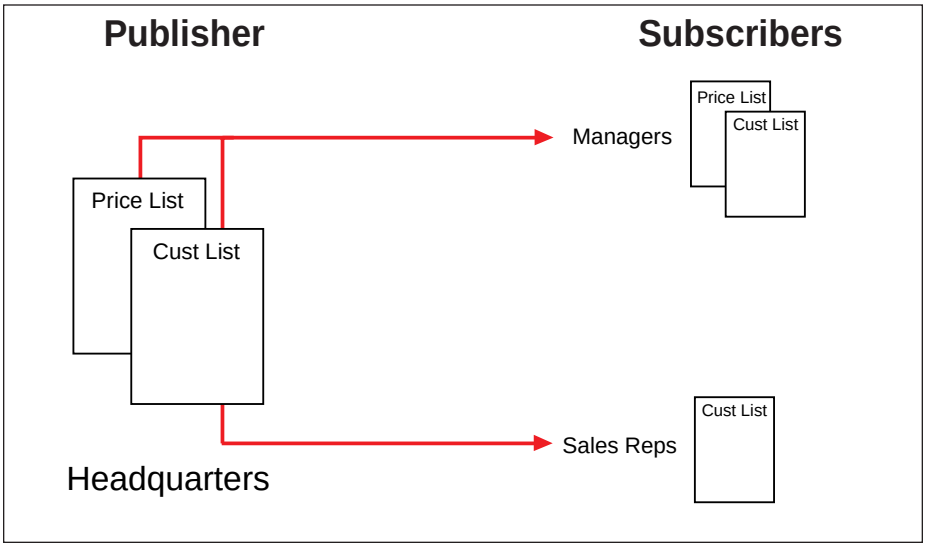


Figure 4: *Subscribers only have access to information that is pertinent to their role or function.*

Publishers

Within a database, publishers can synchronize an entire table of data, or a subset of the table (using any combination of rows and columns in that table). In the mobile sales force example, each of the sales reps only needs information about customers in his or her specific region. In this case, UniSync allows developers to specify which subset of data to publish to sales reps in each of the regions. This capability ensures an efficient means to share data, because UniSync synchronizes only the data that a user needs. UniSync does not consume valuable network bandwidth and system resources to synchronize data that is redundant or irrelevant to a user's application. This feature becomes increasingly important with large data sets and large user populations.

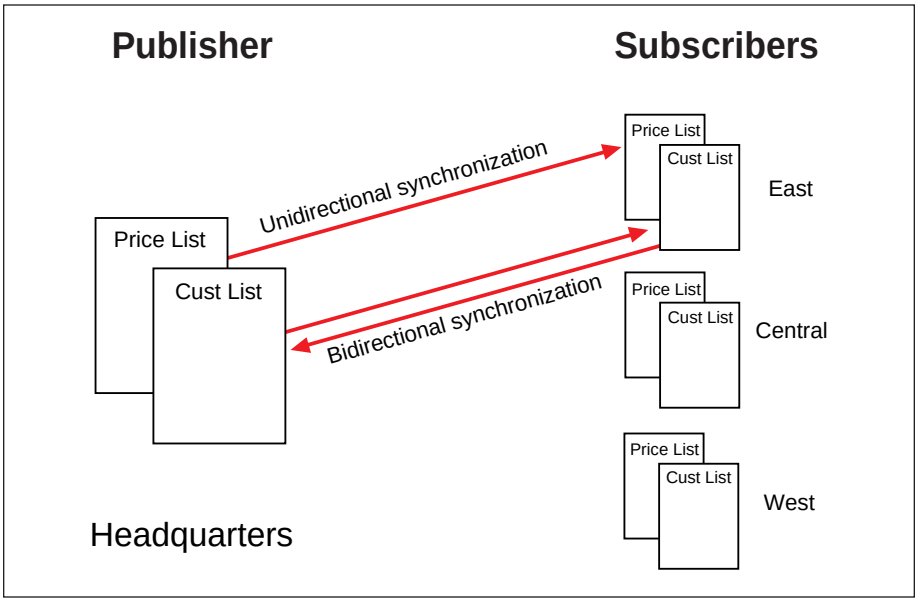
Subscribers

UniSync also allows an additional level of refinement to the publish/subscribe model by supporting "users" and "roles." This capability allows developers to control access to information that is either sensitive or restricted. In other words, a publication may be issued to a pre-defined set of "subscribers" who have the authority to access that information. In the mobile sales force example, managers in the regions may have additional access to information for their regions – information that is not available to the individual sales representatives (such as total sales projections for the region). UniSync provides a way to ensure that each set of users can access only the information that is relevant and appropriate to their roles.

SYNCHRONIZATION TOPOLOGY

UniSync supports a wide variety of network and data management topologies and provides the flexibility to address a range of synchronization requirements among multiple, disparate systems. UniSync allows data sharing in a one-way “broadcast” mode, as well as the ability to share data and updates back and forth between several different systems.

UniSync allows an application to monitor the synchronization connection and transactions through the entire process. If an unexpected interruption or conflict occurs during this process, UniSync notifies the application with the appropriate status and error code. The application can then handle this exception in a number of ways, including rolling back any uncommitted transactions or flagging the transaction for continued processing once the problem is resolved, such as re-establishing a broken connection.



Unidirectional and Bidirectional

Within the publish/subscribe model, databases can serve as a publisher, as a subscriber, or both. This capability is known as bidirectional synchronization. For example, sales representatives want to download the latest customer information from the corporate database, but they may also need to enter changes or additions to customer records based on new orders, changes of address, or new contact information. The sales representatives then need to synchronize these changes back up to the corporate database. In this case the application requires bidirectional synchronization. UniSync supports both unidirectional and bidirectional synchronization.

Hub and Spoke

UniSync also allows developers to support data synchronization among large numbers of users, each of whom maintains a separate copy of the database. Examples include mobile clients, web appliances, and set top boxes. Any number of subscribers may connect to a publisher at any one time to obtain up to date information. UniSync manages the data connection and transmission through the entire synchronization session, assuring that the tasks are processed properly.

Heterogeneous Database Systems

Using DataMirror Transformation Servers, UniSync supports heterogeneous data synchronization between a PointBase database and major third party databases (including Oracle, IBM DB2, Sybase, and Microsoft SQL Server). Each of these systems can serve as a publisher, subscriber, or both for synchronizing data with a PointBase system.

SYNCHRONIZATION FEATURES

UniSync, combined with DataMirror Transformation Servers, incorporates a full set of functionality that allows developers to share data seamlessly between heterogeneous databases. The combination includes features to link disparate networks, systems, databases, and data formats. Plus, UniSync and Transformation Servers provide the ability to automatically resolve conflicts that may arise between synchronized data sets maintained across multiple systems.

Connection Management

UniSync manages database connections at both the publisher and subscriber sites. UniSync maps each database connection with a unique identifier that includes the system name, database name, schema, table, and user. When prompted by an application, UniSync will automatically create a session between any two systems on the network. UniSync also provides the ability to maintain multiple simultaneous connections between a large, distributed population of publishers and subscribers.

Data Movement

UniSync provides ubiquitous "data movement" across the network, between different platforms, and network architectures. UniSync provides a transparent link between a variety of systems and environments, which allows application developers to focus on the application logic for their distributed applications (and not on the complexity of communicating between disparate systems). UniSync will automatically synchronize data using a variety of network topologies and protocols including TCP/IP and HTTP. Developers do not need to write any additional application logic to support synchronization across these disparate environments.

Data Transformation

With Transformation Servers, UniSync provides data transformation between systems that support differing data structures and formats. Different databases can each have unique ways of storing identical information. The Y2K problem provides a good example of how databases store identical data differently. Non Y2K-compliant systems use a two-digit year field (mm/dd/yy), while the compliant systems use a four-digit year field (mm/dd/yyyy). UniSync data transformation will automatically recognize and compensate for these disparities when synchronizing data across database systems. Other examples of UniSync data transformation functionality include support for ASCII/Unicode/EBCDIC, concatenation (automatically combining certain fields), and trimming (automatically shortening certain fields).

Conflict Resolution

UniSync provides the necessary interfaces for resolving errors and conflicts between synchronized data. In many synchronization environments, discrepancies may arise when systems synchronize data after having been disconnected for some period of time. Typically, the system can synchronize most changes without issue. However, in some situations, the application will need to apply some level of business logic to synchronize the data successfully. Consider, for example, that a sales representative enters a $5,000 order from a customer. When he connects to the headquarters database to synchronize this order, the system determines that the customer has already exceeded the credit limit for this account ($4,000). In this case, the business logic might indicate to enter a partial order up to the $4,000 limit, or the application logic might place the entire order on hold for resolution by the credit department. In either case, UniSync provides the ability to identify and flag this discrepancy, with the outcome determined by the application's business logic or by human intervention.

UniSync API

UniSync offers a comprehensive application programming interface (API) that enables developers to provide synchronization functionality as an integral part of their distributed applications. The UniSync API allows developers to deliver true transparent data and application synchronization, shielding the end users from the complexities of configuration and administration. For example, the application developer can integrate a "UniSync" menu command that allows a salesperson to obtain the latest price list and customer information with the click of the mouse. The salesperson does not have to know about the name, location, or schema of the remote database. All of this information is automatically configured as part of the application.

PointBase Console Utility

The PointBase Console provides a simple, graphical way to configure and initiate synchronization sessions between publishers and subscribers. PointBase Console provides a single, integrated tool for developers using the PointBase database. Developers can use the tool to build and test their SQL logic, as well as their synchronization logic. PointBase Console's graphical interface complements the programmatic interface provided with the UniSync API.

SYNCHRONIZATION MODES

UniSync enables a number of synchronization modes tailored to specific application environments. For example, UniSync supports occasionally connected systems, small or large numbers of updates, as well as regular or on-demand synchronization. UniSync provides a flexible architecture to address a range of application characteristics based on: (1) the number of changes applied during a synchronization session, and (2) the periodicity of synchronization sessions.

The number of changes applied during a session will determine whether an application developer would like to apply a full copy refresh or a delta update to the database. With a full copy refresh, all of the data in a subscriber table is deleted and replaced with a new copy from the publisher. By contrast, a delta update applies only the changes required to synchronize the current subscriber table with the publisher table. For instance, by adding or deleting a few rows or updating the data in a number of fields.

The periodicity of synchronization sessions can be regularly programmed, or they can occur on an ad-hoc basis. Regularly scheduled sessions typically require a dedicated network connection so that synchronization can occur unattended at set intervals. Programmed synchronization can occur instantaneously (on a second-by-second basis) or at set times (such as hourly, daily, or weekly). For environments that do not have a continuous, dedicated network connection, synchronization occurs on an ad hoc basis. In this case, an application will commonly initiate a synchronization session on demand, once the system has connected to the network.

Batch Refresh

A batch refresh provides applications with an efficient means to transmit large numbers of changes, additions, or deletions to one or more subscriber databases. As part of a batch refresh, UniSync automatically deletes the appropriate data from the subscriber database and replaces the data with a full copy of the table from the publisher database. A batch refresh may be scheduled to occur regularly, at any interval (from minutes to weeks). UniSync will automatically initiate the synchronization session. This synchronization typically assumes that both subscriber and publisher are continuously connected to the network. Data marts commonly use batch refresh to download data regularly from a host transaction system on a daily, weekly, or monthly basis.

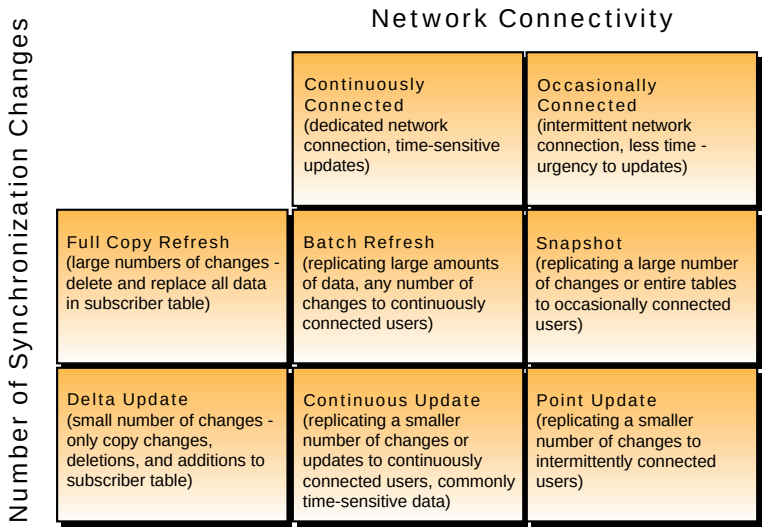


Figure 6: *UniSync modes and application characteristics.*

Snapshot

Snapshots provide an excellent method to transmit large amounts of data to and from systems that are only occasionally connected to the network. When a subscriber or publisher connects to the network, an application directs UniSync to delete all of the data from the subscriber table and transmit a full copy of the updated table from the publisher. Snapshot mode is commonly used for transmitting moderate amounts of data to one or more subscribers on demand. For example, snapshots provide a means for sales representatives to download a new product catalog at any time from the corporate headquarters.

Continuous Update

UniSync also provides the ability to synchronize individual updates on a regularly scheduled basis. These updates typically represent smaller numbers of changes. For instance, a branch office may prefer to update only changes to the employee roster, rather than have to retransmit the entire list of employees. This capability can save valuable network bandwidth and allow updates to occur much more quickly, especially for smaller amounts of changes. Since the updates occur automatically (and unattended), this synchronization mode will most commonly apply to systems with a dedicated network connection.

Point Update

UniSync enables spontaneous updates for subscribers who connect to the Net for the most up to date information. UniSync transmits only the changes made to the subscriber table, which saves network bandwidth and reduces connection time. Updates can occur at any time and at any interval, depending on the nature of the application. A sales representative may need to synchronize customer orders on a daily basis, while a maintenance engineer may connect multiple times a day to diagnose a service problem and order a replacement part as quickly as possible.

CONCLUSION

UniSync from PointBase provides the most comprehensive set of functionality for sharing and synchronizing data across multiple environments and across multiple network tiers. UniSync combines the advantages of bidirectional synchronization, heterogeneous database support, through Transformation Servers, a scalable hub-and-spoke architecture, full synchronization functionality for data movement and transformation, plus comprehensive support for the occasionally connected user. The UniSync technology is an integrated component of the PointBase database and is available as a standard option to both PointBase Mobile and Server Editions.

PointBase

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