TECHNICAL BRIEF

OneBridge® Mobile Groupware Scalability

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An important consideration for IT professionals when choosing a server-based synchronization solution is that of scalability. Scalability refers to how well the system adapts to increased demands and a greater number of users. Some of these variables might include the number of concurrent synchronization connections, data storage and retrieval requirements, or how the application responds to adding CPU or memory at a later date.

OneBridge Mobile Groupware was designed with scalability in mind. The following architectural features enhance OneBridge scalability:

- Distributed processing and deployment—OneBridge separates the synchronization process from data access using the concept of adapters on both the servers and devices.
- Optimized synchronization process—Processes requests simultaneously to help reduce latency and waiting-for-response time. In addition, no mirror files are required for the synchronization reducing the access time for synchronization.
- Asynchronous communication—Using IOCP (I/O Completion Ports) and other related technologies reduces the threads/processes required for supporting more devices and connections.

OneBridge components

OneBridge runs as a service on Windows NT or Windows 2000/2003, allowing users to synchronize their mobile device. The OneBridge service handles requests from the mobile device, manages security and performs all the data transfers between the mobile device and the data sources.

OneBridge consists of the following components:

- Sync engine—providing the synchronization services between a variety of devices and databases.
- Adapters—serving as access layers for both devices and databases.
- Communication layer—handling the connectivity between the devices and the sync engine and, also between the sync engine and database servers.

Sync engine

The sync engine sends synchronization request messages to OneBridge to synchronize data between a variety of devices and databases. When a sync action is performed, the sync engine coordinates information between the groupware adapter and the mobile adapter. In addition, the sync engine provides conflict resolution between the two adapters.

OneBridge technology is based on a multi-threaded/multi-process architecture that allows the sync engine and the adapters to scale as much as the underlying OS platform allows. With the combination of asynchronous communication between the adapters and sync engine, and modular sync framework, the solution can linearly scale with the incoming connections.

CPU and I/O are typically the bottlenecks that affect scalability. OneBridge overcomes the CPU bottleneck through a distributed processing of sync process and data access. The I/O bottlenecks are resolved, for the most part, using asynchronous communication but are still dependent on the backend database's ability to pump the data (explained separately). By employing distributed processing and using asynchronous communication, OneBridge technology enables a very scalable solution.

Sync adapters

Groupware sync adapters are the link between the OneBridge software and the corporate groupware, such as Microsoft Exchange or Lotus Domino.

Database sync adapters provide a bridge between the database server (DBMS) and the sync engine. OneBridge has one database sync adapter for all available database servers (e.g., Oracle, MS SQL Server, or Advantage Database Server). Server database sync adapters may be deployed in a variety of configurations to meet the company's scalability requirements. For example, the database sync adapters may be installed on a different server than OneBridge to improve throughput. On the mobile device, database sync adapters provide a bridge between the mobile database and the sync engine. OneBridge has one database sync adapter for all available mobile device databases (e.g., Palm PDB, Palm Satellite Forms, Windows CE DB, Windows CE ADOCE).

Communication layer

The OneBridge communication layer handles the connectivity between the devices and the sync engine, as well as between the sync engine and database servers.

Although OneBridge has open connectivity architecture, it uses HTTP or HTTPs to communicate between the sync engine and the adapters on the server and device. It is shipped with a special purpose, lightweight HTTP server but also has a pluggable architecture to plug in to any Web server (such as IIS or Apache) to service the connections. This capability makes connectivity achieve typical Web server scalability.

CONNECTIVITY BETWEEN THE SYNC ENGINE AND ADAPTERS (server and device)

OneBridge supports two types of mobile devices:

- Devices with built-in SyncML clients—Typically, these are mobile phones that have generic SyncML clients on them. These clients are provided by the manufacturer and use HTTP (WSP) for remote connection and OBEX (for Bluetooth and Infrared) for local connection as their transport protocol.
- PDA-class devices that have the OneBridge client installed —These devices communicate using the OneBridge transport layer that uses the HTTP protocol with corporate class end-to-end security, management and application services. The transport layer uses asynchronous communication employing a variety of technology such as IOCP, optimized non-chatty protocols, XML-based data representation and thread pool management to scale to thousands of concurrent connections.

The OneBridge client software is a program that runs on the mobile device, making synchronization possible between OneBridge and the client (the mobile device). Once the client software has been installed and configured, the end user synchronizes their mobile device by tapping the Connect icon on the client. This action establishes a connection with OneBridge and initiates the synchronization.

Data storage and retrieval

OneBridge primarily has two types of storage requirements:

- Configuration data
- Transient data representing data and state information

The sync engine uses a technology that does not require temporary storage of data, so the storage requirements are very minimal. Only configuration information relating to synchronization, file transfer, backup/restore, mobile information, and registry information is stored on OneBridge. This makes it faster to access and easy to scale the sync process.

All the protocols between the sync engine and adapters are based on the SyncML protocol. The SyncML data representation protocols are based on XML and the sync engine manages these transient messages by storing them in a database.

OneBridge uses a database abstraction layer to write all the configuration and state information to a database. This layer could be implemented across any database server as it provides a very ODBC-like data navigation functionality. This single point of access to databases makes it easier to isolate the data from the sync process. And by using any dynamic file storage system, it is possible to cluster multiple OneBridge sync servers behind a load balancing server to provide a very scalable solution.

Back-end database server scalability

Scalability of any synchronization server to a certain extent depends on the capability of the backend or source database server such as Exchange or SQL Server to service a high volume of connections with reasonable latency. The OneBridge adapter framework employs the following techniques to maximize the database connectivity and operations:

- Consolidation of all data access across applications (Calendar, Inbox, etc.) to perform them simultaneously, instead of opening up multiple connections.
- Uses HTTP to communicate with the sync engine and uses SyncML packets to service multiple connections from the sync engine.
- like the sync engine, adapters can also be set up inside a load-balancing server to increase scalability.

Lotus Notes scalability

The Notes adapter uses the NOTES API to access the Domino server. Every instance of the Notes client requires approximately 10 MB of memory. So typically, in a server with 2 GB main memory, one can accommodate around 200 concurrent users without any high latency.

Exchange scalability

The Exchange adapter uses no threads of its own. Each connection to the Exchange server will run via the RPC thread pool, which is efficiently optimized for all environments (e.g., scalability and performance). The Exchange adapter uses CDO 1.2 as its interface to access Exchange. CDO 1.2 is tuned for a high-performance server environment. It is thread-safe, it supports multiple code pages for applications that require multiple languages. It supports approximately up to 200 concurrent users per server (limited by concurrent sessions and memory requirements by Microsoft CDO and MAPI.)

Deployment scalability

OneBridge supports a fully distributed model of deployment and processing. A DMZ proxy can be loaded on an existing Windows NT/2000/2003 machine to intercept all OneBridge client traffic and provide authentication prior to allowing the client to synchronize data. Data that is transmitted to/from the client is fully encrypted to the Proxy server. If authentication is successful, then a session is established from the client to the OneBridge, through the OneBridge DMZ Proxy.

OneBridge is designed to allow for thousands of concurrent synchronization connections by distributing the load to other adapters as needed. This is known as a multi-node deployment. Further, OneBridge can work within standard load balancing solutions to provide a high availability and fail-over solution for client connections. OneBridge would also handle all file transfer and device management functions for each mobile device. All data storage for files, mobile database and registry settings would be stored on OneBridge, or on a shared array. This provides for maximum performance by packaging and compressing the data when transmitting to and from the groupware server, and sending it onto the device.

For large deployments, groupware adapters can be placed behind a Layer 4 Switch, which allows them to be closer to the data sources. The Layer 4 Switch will provide for load balancing between groupware adapters, as well as provide a fail-over solution to the groupware adapter server. Each groupware adapter server can handle a couple hundred concurrent sessions, and thousands of sessions each hour. It is also possible to install groupware adapters on the same server as the OneBridge Sync Server engine, depending on the needs of your organization.

Server recommendations for enterprises

OneBridge will hold all of the data for user/group/enterprise file installation on mobile devices, as well as, backup files and registry files for every user and group in the organization. Because of this, OneBridge needs to have adequate data storage space. A shared array to store files for back/restore/installations may also be used to allow a mirrored configuration.

The groupware adapter server will not hold any backup files, installation files, or registry information, and should only be used to provide authentication to the groupware server, and access to the groupware data. Change logs are stored on the groupware server and will require some hard drive space. Therefore, hard drive space can be minimal, but should still be mirrored for fail-over/redundancy.

Hard drive space needs to be considered for each user that will connect and either synchronize data, or use the server as a backup/restore option for their mobile device. Because each organization is different, it is truly difficult to establish this upfront. Things to consider are:

- number of users that will connect to the server
- amount of RAM that these devices will hold
- how many applications and files do you want the users to backup

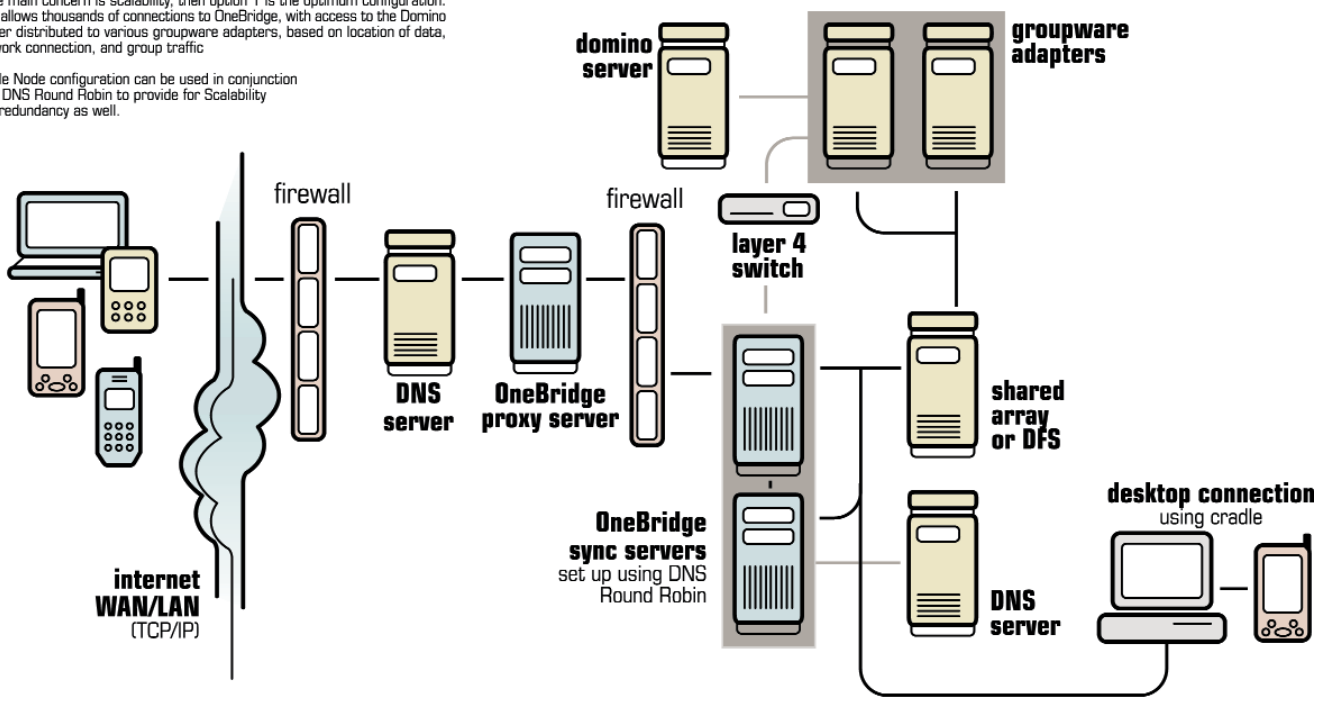
In general, the amount of data that a device will store (32MB) multiplied by the total number of users (2000). The organization should consider around 60-70 GB of hard drive space. This can be limited by reducing the amount of data being backed up, and what is actually stored on the server.

The following diagram describes the architecture in detail and provides information about the different components that need to be installed, and where they would be placed in regards to your DMZ, Layer 4 Switch and groupware servers.

Configuration options:
1. OneBridge with multiple groupware adapters.
2. DNS Round Robin to OneBridge with Layer 4 switch to the groupware adapters.
3. Single node configuration using DNS Round Robin

Scalability and High Availability:
If the main concern is scalability, then option 1 is the optimum configuration. This allows thousands of connections to OneBridge, with access to the Domino server distributed to various groupware adapters, based on location of data, network connection, and group traffic

Single Node configuration can be used in conjunction with DNS Round Robin to provide for Scalability and redundancy as well.



SPECIFICATIONS

Hardware required

- Pentium 4 Processor of 2 GHz or higher—server class machine with two or more processors will enhance performance. Should support industry standards for hard drive redundancy/fail-over.
- 512 MB RAM Minimum—recommend 512 MB for 100-250 users, 1 GB for 250-500 users, 2 GB for 500-1000 users
- Recommend overall Data Storage capacity of 60 GB or greater, 7200 RPM minimum disk speed, and a RAID class disk array.
- TCP/IP LAN connection. 100 MB connection between server and adapters recommended

Server platform support

- Windows NT Server 4.0 with Service Pack 6a or later
- Windows 2000 Server with Service Pack 2
- Windows 2003 Server

Mobile device platform*

- Palm OS platform 3.5 or later
- Microsoft Windows Mobile 2002/2003 (Pocket PC, and Smartphones OS platforms)
- Windows CE Handheld PC 3.0
- SyncML 1.0.1 and 1.1.1 clients
- Symbian OS 6 and 7
- RIM 2.1
- Microsoft Windows-based clients

Groupware support

- Microsoft Exchange 5.5/2000/2003
- Lotus Domino R5/5.5 & R6/6.5 & R7 (includes custom Notes database support)
- Optional database support accessible via ADO (OLE DB), ODBC or custom SDK

Refer to the OneBridge Mobile Data Suite data sheet for more information.

* Assumes no more than 10% concurrency rate.

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