WHITE PAPER

OneBridge®

Scalability and High Availability Overview

SYBASE® iAnywhere®

Your enterprise is a fast-growing, mobile universe with hundreds or even thousands of employees in the field. Your wireless messaging systems are a lifeline. If they go down, your mobile workers go down - losing critical time, energy, profitability, and customer satisfaction. How do you make sure every mobile message goes through?

Scalability and high availability are today's challenges. With an explosion of wireless applications for palmtops, smartphones, laptops, tablets, and PDAs, IT departments are facing security breaches, messaging overload, and a host of scalability and configuration challenges. In global corporations, tens of thousands of mobile workers compete for messaging connectivity. Today's enterprise IT managers not only seek better messaging engines, but scalable performance – a way to ensure that a wireless system can adapt and continue to perform at peak levels despite increased traffic and numbers of users.

Sybase iAnywhere's OneBridge software has been designed with scalability and high availability in mind. This white paper will explain how OneBridge addresses the specific 'pain points' of wireless scalability and availability. You will learn how OneBridge meets the goal of "always available," producing an enterprise messaging system for mobile devices that scales with your enterprise. This paper also provides load balance test results and recommendations for setting up variable OneBridge configurations based on user numbers and sites required and anticipated. You can also read about unique OneBridge features, including two-tier authentication, load balancing, connection frequency, scheduling, and fault tolerance.

ADDRESSING THE 'PAIN POINTS'

Wireless managers need insights and tools to address the challenges of mobile networking. Experience shows that extracting information from legacy systems is a difficult chore, presenting both scalability and availability issues. In addition, managers today face the additional "pain points" of multiple wireless devices and platforms, security and authentication issues, database I/O bottlenecks, network element outages, unpredictable connectivity, and maintenance/access scheduling, especially during periods of peak wireless traffic.

CHALLENGE	SOLUTION
Challenge #1: Scalability limitations of existing interfaces (API) Applications programming interfaces (APIs) to an email system such as Microsoft Exchange or Lotus Notes are not easily scaled. Most APIs or legacy back-end systems were never designed to connect with third-party mobile devices and software. For example, Microsoft Exchange normally supports no more than 500 concurrent instances of a connection. For Lotus Domino, connections range up to a few hundred at one time. Even CRM systems pose scalability challenges to mobile systems.	**Solution #1: Open APIs** Standard, open-system APIs are deployed to enable scalable third-party mobile device access to groupware, corporate databases, and other applications (e.g., Microsoft Exchange, Lotus Domino, Sybase ASE, Oracle, Microsoft SQL Server, SAP, Siebel, among others). OneBridge provides short, sessions-based connection access to optimize the available pool of backend connections. Moreover, the OneBridge adapter framework consolidates all data access across applications (Calendar, Inbox, etc.) to perform them simultaneously instead of opening up multiple connections. Result: maximum messaging availability, minimal number of physical connections required.

CHALLENGE	SOLUTION
Challenge #2: Multiple device types and backend systems Support for multiple mobile device types is critical in the mixed enterprise environments of today. Managers and employees are demanding devices as varied as BlackBerry, Windows Mobile Pocket PC and Smartphone, Palm OS, and Symbian OS, among many others. The sheer volume and variety of devices that need network connectivity pose challenges. Whenever a device connects - whether wireless, wireline, or cradle - the network server may become easily clogged.	**Solution # 2: Multiple device support** OneBridge not only supports the major wireless device types on the market, from Blackberry and Windows Mobile to Symbian, Palm, and OMA Data Sync, but also employs distributed processing across multiple database servers, along with intermittent sessions management with quick log on/log off, to balance traffic effectively and reduce call latency. Network traffic scales and synchronizes using the OneBridge combination of adapters and sync engine components.
Challenge # 3: Authentication User authentication as part of normal security procedures can create wireless messaging bottlenecks, especially when field workers attempt to connect to systems at peak times (i.e., 9 AM on a Monday). Every connection needs to be authenticated. The variety of applications that field workers are using results in the need to authenticate with different systems multiple times. Although some vendors circumvent authentication by providing administrative privileges, this practice raises security concerns.	**Solution #3: Two-tiered authentication** OneBridge utilizes a two-tier authentication system for added security, enabling OneBridge to authenticate users at both the middleware level (OneBridge Sync Server) and also at the backend (i.e., Lotus Domino, Microsoft Exchange or database server.) To manage bottlenecks, OneBridge provides extended sessions management over a specified period of time, typically 8 to 24 hours, to accommodate more users. The two-tier process operates transparently, with a single user sign-on, allowing more users to authenticate and enter the system securely during peak traffic.
Challenge #4: Breaking the database I/O bottleneck Database access I/O can hamper messaging availability because many applications are built to accommodate only so many connections launched from a physical server. CPU and I/O overload can decrease availability and access to backend applications. Although multiple computers, outfitted with adapters or data drivers, can "talk" to a specific backend, technologies are required to remove the I/O bottleneck and scale systems from under 1000 corporate users to tens of thousands as required.	**Solution # 4: Data adapters that 'bust' the I/O bottleneck** Reducing threads/processes required for supporting more devices and connections, OneBridge solves the problem of I/O overload by using distributed processing for synchronization and data access. Multiple computers, outfitted with adapters or data drivers, "talk" to a specific back-end. Each adapter accesses a desired database, removing the I/O bottleneck by spreading out data requests over multiple servers. OneBridge scales with incoming connections. OneBridge uses configurable, redundant clusters of servers and adapters to provide fault tolerance and self-healing network capabilities.

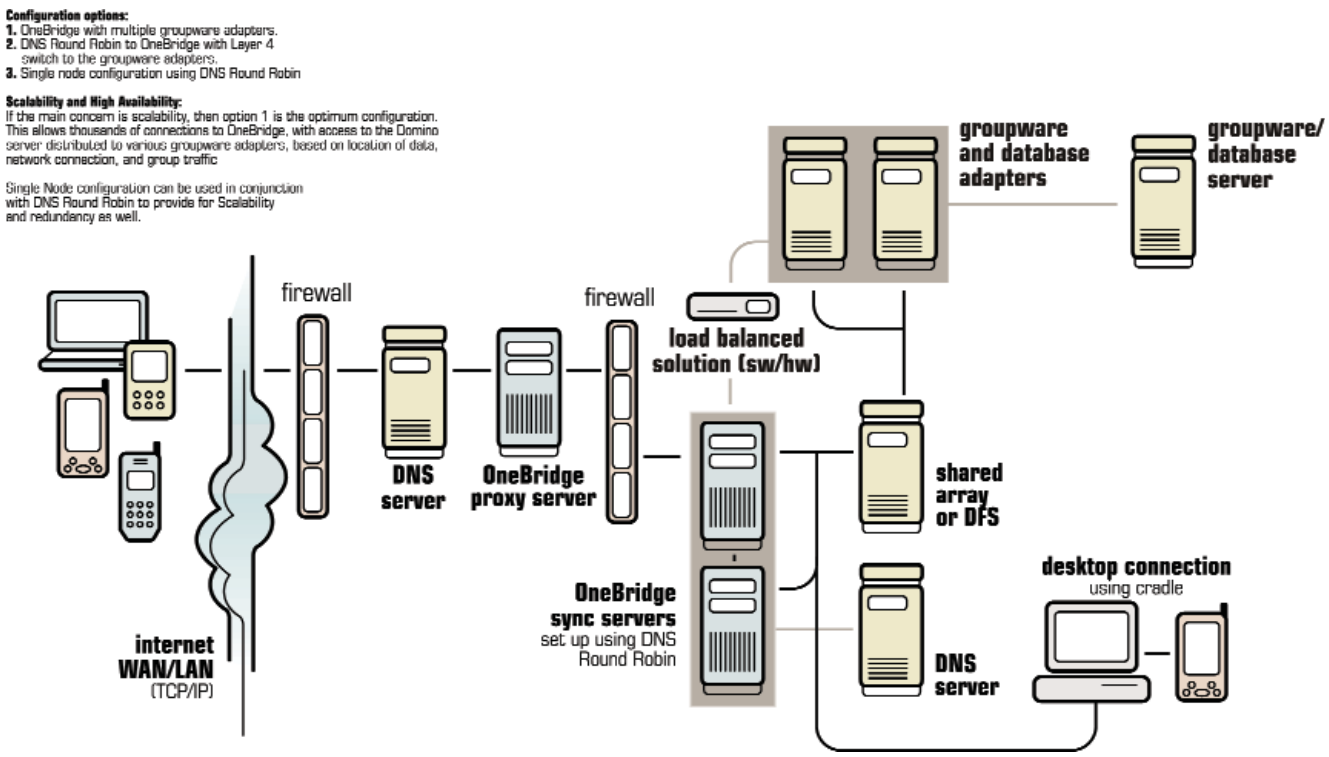
CHALLENGE	SOLUTION
Challenge #5: Unpredictable connectivity The most advanced wireless networks, whether 2.5G or 3G, wireless LANs, WANs, or different flavors of GPRS, 1XRTT, EVDO, among others, are not always available when users need them. Network elements fail or drop out, producing outages. Without effective diagnostics or remote start/stop capabilities, network managers are unable to identify trouble spots quickly or initiate corrective action. Mobile networks scaling to large size require 'big picture' performance statistics to determine active sync times and numbers of users.	**Solution # 5:: Monitoring technology** OneBridge tracks all network components and, when necessary, identifies a "drop out" or failure in a network element, implementing corrective action while notifying authorized personnel of outages. Authorized administrators can log onto a Web-based monitor to perform such tasks as remote start/stop of OneBridge components. OneBridge provides performance statistics on active sync times and current number of users, producing a 'big picture' view of the network as it scales.
Challenge #6: Frequency of connection and schedules An effective network synchronization engine will allocate traffic either by using device polling and/or scheduling algorithms to apportion capacity and transfer files and messages during off-peak hours. Without scheduling, a system can get overloaded during periods of peak traffic. Scheduling and power save features will enable better device performance and battery life while still automatically delivering data.	**Solution #6: Secure connection scheduling** OneBridge features Live Connect, a secure connection mechanism that keeps devices performing at peak levels, providing scheduling of communication between devices and servers. Live Connect can be implemented in various modes (always-on or power-save mode) which improves the scalability of the messaging network by distributing connections at various intervals. The power-save mode improves device performance and battery life while automatically delivering data at a scheduled interval to mobile users.

ONEBRIDGE ARCHITECTURE

OneBridge meets the scalability and high availability challenges of growing companies. Residing on corporate premises as server-based middleware [see diagram on the next page], OneBridge handles requests from the mobile device, manages security, and performs all data transfers between the mobile device and the data sources to ensure high availability as the system grows.

OneBridge runs as a service on Windows NT, Windows XP, or Windows 2000/2003. OneBridge consists of the following core components:

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



Sync engine

The sync engine sends synchronization request messages to the OneBridge server to synchronize data between a variety of wireless/wireline devices, cradles, and databases. When a sync action is performed, the sync engine coordinates information between the groupware adapter and the mobile adapter, providing any conflict resolution needed between the two adapters. Using a multi-threaded, multi-process architecture, along with asynchronous communications, OneBridge allows the sync engine and adapters to scale as much as the underlying OS platform allows. The modular sync framework can scale linearly with incoming connections.

CPU and I/O are typically the bottlenecks affecting scalability. OneBridge overcomes CPU bottlenecks through a distributed architecture that utilizes multiple adapters to process synchronization sessions and provide data access. Database I/O bottlenecks are resolved for the most part using asynchronous communication.

Multiple and distributable adapters

Groupware sync adapters provide the link between OneBridge software and corporate email systems such as Lotus Domino and Microsoft Exchange. Database sync adapters "bridge" the database server (DBMS) and the sync engine. OneBridge offers a single database sync adapter for all available database servers (e.g., Sybase ASE, Oracle, Microsoft SQL Server, or Advantage Database Server). Server database adapters can be deployed in a variety of configurations to meet a company's scalability needs. For example, the database sync adapters may be installed on a different server than OneBridge to improve throughput. Similarly, on each mobile device, database sync adapters provide a bridge between the mobile database and the sync engine. OneBridge offers a "universal" server-side sync adapter that interfaces with the most common mobile databases (e.g., Palm PDB, Satellite Forms, Windows CE, ADOCE, BlackBerry).

Because of the distributed architecture, administrators can distribute database access to multiple computers, each equipped with an adapter/data driver that can communicate with a specific backend system. In some scalable scenarios, OneBridge sync server will "talk to" multiple adapters in different machines, and each in turn accesses a database. This helps eliminate bottlenecks. For instance, if you have 1,000 users limited to a single server, and then implement 10 different servers running the adapters, your company can then support as many as 10,000 users.

Communication layer

The OneBridge communication layer handles the connectivity between user 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 to comply with corporate security requirements. Use of HTTP helps achieve typical Web server scalability.

ADDITIONAL FEATURES ENHANCING SCALABILITY AND AVAILABILITY

Load balancing

Load balancing of data traffic is achieved in OneBridge by distributing load across multiple servers which process data calls in parallel. This allows thousands of concurrent synchronization connections by distributing the load to other adapters as needed.

In a load balancing configuration, a TCP/IP connection from a mobile device can be connected through the firewall to a OneBridge Proxy Server. The proxy server has built-in load balancing to distribute the load among all OneBridge sync servers. OneBridge Sync Server can be load balanced to one or more OneBridge groupware or database adapters. Load balancing enables OneBridge to manage a large number of connections — each server is designed to handle 1,000 connections at any one time, and tens of thousands of sessions an hour. This guarantees high availability.

For users who connect wirelessly, calls are directed to a reverse proxy, typically located in a corporate DMZ, which provides added security by circumventing direct wireless connections to the OneBridge sync server inside the secured network. Several different multi-server load balancing configurations and installs are possible, with or without a OneBridge DMZ Proxy installed. Configurations can be scaled in linear fashion to accommodate a thousand users or more per server. Clustered database and sync server configurations also provide fault tolerance so that messaging continues even if network elements experience an outage.

Configuration, data storage, and retrieval

All data associated with device connections are stored on the OneBridge server, or on a shared array. This provides maximum performance by packaging and compressing data when transmitting to and from the groupware server, and sending it to the device. OneBridge primarily has two types of storage requirements:

- Configuration data
- Transient data representing data and state information

Storage requirements for OneBridge sync server are minimal because the sync engine does not require temporary storage of data. Only configuration information relating to synchronization, file transfer, backup/restore, mobile information, and registry information is stored on the OneBridge server. This makes it faster to access and easy to scale the sync process.

The data representation protocols of OneBridge 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 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 scalable solutions.

Database server scalability

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

- Consolidates 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.
- Sets up adapters 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. Typically, in a server with 2GB main memory, OneBridge can accommodate 1,000 Live Connect users without high latency. In order to scale and provide fail-over, enterprises need a load-balanced adapter or server cluster.

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. The Exchange adapter uses CDO 1.2 as its interface to access Exchange. CDO 1.2 is tuned for a high-performance server environment and is thread-safe. It supports multiple code pages for applications requiring multiple languages. The Exchange adapter also supports up to 1,000 Live Connect users per server. In order to scale and provide fail-over, enterprises need a load-balanced adapter or server cluster.

Deployment scalability and fault tolerance

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, providing authentication prior to allowing the client to synchronize data. Data 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 mobile platform through the OneBridge DMZ Proxy. Clustered configurations of OneBridge proxy, sync servers, and database servers provide complete fault tolerance to enterprise users.

Monitoring Service

OneBridge Monitoring Service tracks all the components of deployment and takes remedial actions during outages. The Monitoring Service allows customers to keep tabs on the status of the OneBridge system without having to worry about any unscheduled downtime. An easy configuration wizard 'walks' an IT manager through a OneBridge configuration, setting up threshold values, notification actions and end-to-end tests. A web-based console provides multi-user, role-based access to the OneBridge monitor, showing detailed statistics on the overall health of every OneBridge component. The system tests each OneBridge component to assure operational performance. If the OneBridge Monitor detects an issue, it can take corrective actions automatically ("self-healing" mode) and/or notify personnel. Users with administrative privileges can perform additional tasks such as remote termination or suspension of individual OneBridge components. Additionally, OneBridge collects statistics on average sync times and current active users, etc.

OneBridge Load and Performance Testing Overview

The goal for OneBridge load testing is to anticipate and test typical customer scenarios, finding problems and solutions early. The OneBridge Load Test Lab provides testing for many different scenarios and stress levels. Scenarios involve 1,000+ virtual users and server configurations from a stand-alone sync server, to a fully load-balanced and fail-over environment. Intensive tests are run on each OneBridge release to ensure the best possible functionality, scalability, endurance, and performance.

For load balance test results and recommendations for setting up variable OneBridge configurations based on user numbers and sites required and anticipated, please refer to the specific endurance test results available from your account manager.

CONCLUSION

OneBridge is designed from the ground up to ensure that your workers' mobile messages go through no matter when and where they need them. With a flexible, distributed server architecture, added security and authentication, intelligent monitoring, and database adapters that sync your mobile connections and streamline access to data, OneBridge ensures the industry's highest levels of wireless performance. iAnywhere engineers have optimized and tested OneBridge under the most brutal field conditions, and the systems pass the test. In lab environments as well as customer deployments, OneBridge provides uninterrupted, scalable performance that adapts to your growing wireless universe, no matter where your workers roam.

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