Integrating Web Messaging into the Enterprise Middleware Layer

The increasing demand for real-time data has companies seeking to stream information to users at their desks via the web and on the go with mobile apps. Two trends are paving the way:

- **Internet push/streaming technologies:** The web communications approaches and standards known as WebSocket (and Comet and HTTP Streaming before that) enable the bi-directional asynchronous delivery of data to HTTP-connected clients.
- **Application frameworks:** HTML5/JavaScript, Silverlight, and Flash let developers give users a rich user experience within the browser by dynamically updating content through "Rich Internet Applications" that don't require any client-side software. Apple's iOS and Google's Android are proliferating mobile apps that can handle real-time internet-based communication, and mobile frameworks like PhoneGap allow HTML5 apps to run on any mobile device.

Still, companies that want to push real-time data to their users have to deploy web streaming servers and integrate them with the middleware they use to connect applications and information sources within their organization.

New Integrated Approach

With fully integrated support for web messaging, Solace lets companies share real-time information with people and systems over the internet. Example applications include:

- Enterprise: retail brokerages, FX trading, risk position blotters, mobile workforce, logistics and emergency response.
- Consumer: web properties, sports, news, online gambling, online gaming, auctions, chat and social media.

This paper describes the architecture and advantages of Solace's Web Messaging solution, as well as its unprecedented performance. Solace's solution is 50-200 times faster than competitive solutions with latency under 100 microseconds and throughput of 4 million messages per second.

Solace's Hardware Advantage

Solace offers the only solution that unifies real-time communications across LAN, WAN web environments and supports the features and message exchange patterns needed to satisfy all applications.

Solace's solution provides lightweight, efficient, feature rich and easy to use messaging APIs and efficiently transports data through proxies, firewalls and network address translators. Solace message routers provide higher capacity, faster performance and more robustness than any software-based messaging system or internet streaming server.

Advantages and Benefits of Solace's Web Messaging Solution

- **Performance:** Solace can process millions of inbound messages per second, and apply millions of topics and subscriptions to the fanout of up to 4 million messages a second with lower, more consistent latency than software.
- **Scalability**: With support for 200,000 simultaneous client connections, Solace message routers can easily fan messages out to large numbers of subscribers without taxing the internal messaging system at all.
- **Dynamic determination of most efficient transport**: The Solace Web Messaging APIs automatically determine the most efficient transport mode (WebSocket, HTTP Streaming, Comet) that can be supported by the client runtime and any internet intermediaries without any application interactions or impact.
- **Messaging functionality:** Solace supports all of the message exchange patterns and qualities of services used by enterprise applications inside the firewall, like topic-based publish/subscribe with wildcard subscriptions, request/reply, per-client message rate limiting, structured messages, authentication and access controls at the topic and user level.
- **Lightweight, simple APIs:** Solace's easy-to-use RIA APIs have a small footprint and efficient runtime characteristics, which keeps CPU utilization low while providing rich messaging functionality.
- **Manageability:** Solace offers detailed visibility into the real time status of client connections, queue thresholds and events.
- **Security**: A pure hardware datapath translates into serious security because it means Solace message routers are not susceptible to standard internet attacks and software incompatibilities.
- **Peer-to-Peer**: Solace supports client-to-client communications within the Solace message router so clients can have chat one-on-one or group chat sessions with all messaging contained to the Solace message routers in the DMZ.

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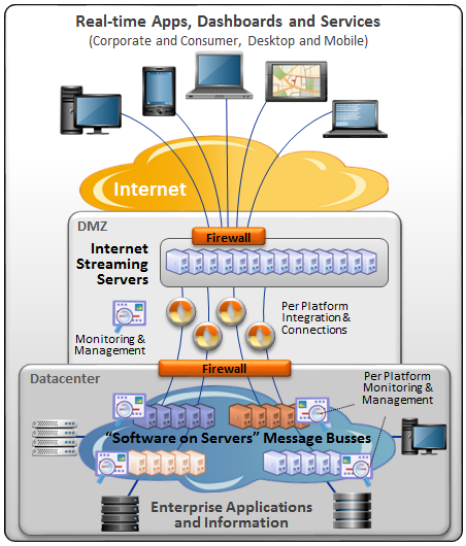
Conventional Web Streaming Solutions

Most internet distribution solutions include the following components, architected as shown in the diagram.



- **Client APIs:** APIs that run in RIAs in containers such as Microsoft Silverlight, Adobe Flash, Java Virtual Machines (JVMs) or browsers using JavaScript, or running on smartphones and mobile devices. Some provide only a raw "packet pipe" without much messaging functionality, others provide more messaging functionality to the application. All of them enable publishers of data to dynamically connect to client applications through internet intermediaries such as proxies, firewalls, NATs and load balancers.
- **Web Streaming Servers:** Streaming servers that sit in the demilitarized zone (DMZ) and translate between internet streaming protocols and those used by the internal messaging system. They are often implemented in Java which means they have the scalability and performance characteristics common to Java applications, and don't offer true messaging capabilities.
- **Streaming Server-to-Messaging Integration:** Typically, companies need to integrate the streaming server to the back-end messaging system to perform transport and payload conversion, and "helper" functions may also be required in the GUI runtime.
- **Internal Message Buses:** Most messaging products don't support integrated internet streaming, and most internet streaming products don't support the functionality and performance required of internal messaging systems, so deployments today consist of different products for internal application and internet streaming.
- **Management:** The management tools provided to monitor streaming servers varies greatly, but typically little external management is available and the integration with third-party umbrella management, authentication and other systems is left to the user. In any event, certainly the management, security, monitoring mechanisms in the web streaming tier are different from those used by the internal enterprise messaging system.

Disadvantages of Standalone Streaming Servers

- **Performance and scalability:** Software-based streaming servers struggle in use cases that feature lots of inbound messages and require fanout to many subscribers. Functions like payload transformation, per-connection bandwidth management and real-time monitoring degrade performance even further. To perform publish/subscribe fanout in the streaming server, you either need to map external connections back to the internal messaging system (as with JMS), or perform fanout in the streaming server, which means you need to track subscriptions, route messages, etc.—again, requiring developers to build and independently scale their own messaging and gateway functionality.
- **Messaging Functionality:** Web streaming servers act as gateways, and don't offer messaging capabilities such as publish/subscribe, request/reply, user authentication/authorization, and machine independent data types. This means developers must spend their time building messaging functionality into this web streaming layer.
- **Another integration and distribution tier:** A separate web streaming solution must be deployed, integrated with the existing middleware, and folded in to functions such as administration, security, and capacity planning.

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- **Differences in internal and external applications:** Applications inside the firewall will need to use different APIs, semantics and data formats than applications and RIAs connecting over the internet, or at least require additional bindings to the new gateway, including data and semantic translations.

Solace's Approach

Solace offers the only solution that can serve as an internal message bus and seamlessly extend messaging services for internet data streaming, cost-effectively providing ubiquitous reach to applications and users inside the organization and anywhere in the world.

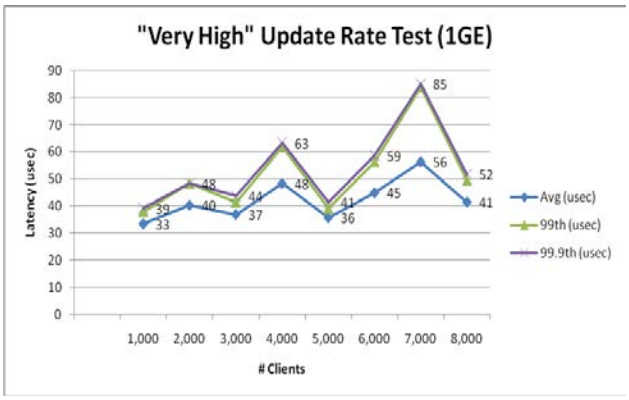
A Solace message router serving internet users is deployed in the DMZ where it accepts incoming connections from clients over the internet on one side, and TCP-based intranet connections with the message bus deployed inside the company's firewall (which could be another Solace message router or third-party messaging software).

As a result, Solace makes messaging over the internet a secure extension of the internal messaging network instead of a custom mix of two disparate technologies. A complete discussion of the value of this architecture is below, but here are a few important notes:

- Solace's routing protocols reduce the number of connections and amount of traffic through the internal firewall because each Solace message router can receive each message once and perform per-client fanout from there, minimizing impact on the internal messaging system.
- Solace message routers provides native access to common LDAP services as well as more sophisticated functions like per-topic access controls.
- Even when deployed exclusively for internet streaming, Solace message routers provides messaging functionality such as publish/subscribe, request/reply, authentication and authorization, per-topic fanout rate control, and monitoring.

Game-Changing Performance

In a variety of tests covering different message rates, numbers of connected clients, and network environments, Solace's solution demonstrated much lower and more consistent latency.



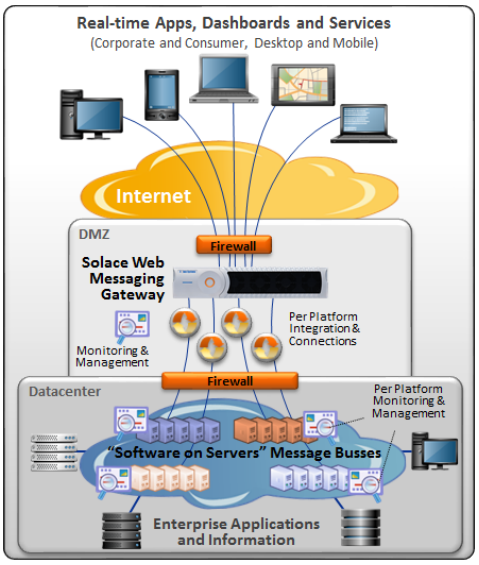
Tests show that Solace's solution introduces nominal latency into the equation and is 50-200 times faster than competitive solutions, with less than 100 microseconds of latency compared to the many *thousands* of microseconds. The results also demonstrate the tight latency distribution of Solace's solution, with low standard deviation all the way to the 99.9th percentile.

The test was run over a 1 GigE network with 20,000 topics, and each message consisting of a 50 Byte payload and 5 Byte topic. Each client was configured with 100 subscriptions, and set to receive messages at a rate of 100 messages per second.

Solace in Context of a Third-Party Messaging Infrastructure

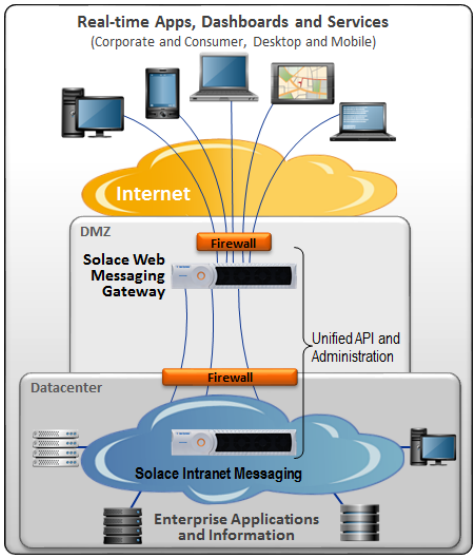
Some companies want to add internet streaming capabilities to their existing internal messaging platform. By handling internet fanout in a single device that can be quickly and easily dropped in to a datacenter and linked with existing messaging systems, Solace message routers make it easy and cost-effective to do so.

In such a deployment, Solace's solution offers high-performance bi-directional web messaging without placing heavy load on the existing message bus. Solace message routers handle fanout to many clients so there's no need for 1:1 mapping of client connections to the message bus, or for complex mappings to fan one message out via many external connections. This reduces the layers of infrastructure for easier management and superior performance and thus also supports direct peer-to-peer communication.



Solace in Context of a Solace Messaging Infrastructure

Solace's solution is even more powerful for companies who also use Solace for messaging inside their datacenters and wide area network, because it serves as an end-to-end strategic solution. By extending internal messaging to include web messaging, companies can have a truly unified messaging platform for all of their information distribution.



Here are some key advantages of this approach:

- Applications connect using one API whether they're running local to the datacenter or over the internet since they're connecting to the same platform. The Solace API determines the most efficient transport.
- A common framework for provisioning, managing, monitoring and securing all messaging components regardless of whether they are used for internal or external message distribution, all without gateways and tiers of infrastructure.
- Simpler and more efficient data distribution since there is no integration between different messaging systems.
- No integration reqiured between the internet gateway of Vendor A and the messaging system of Vendor B. With an all-Solace solution, internet fanout is simply an extension of the existing internal messaging network.

Summary

The rapid development and adoption of real-time, push-based web technologies is driving requirements for many more real-time data applications running within browsers and on mobile devices. Many of these applications have large and unpredictable data volumes, user counts or both putting stress on many software-based web streaming solutions.

Solace offers the only solution that integrates internal and external messaging, supports extremely high rate with very low latency, and offers the turnkey operation of a purpose-built appliance.

To learn more visit solace.com or call +1 613-271-1010.