

Enabling Cloud Architecture for Globally Distributed Applications

The increasingly “on demand” nature of enterprise and consumer services is driving more companies to execute business processes in real-time and give users information in a more real-time, self-service manner. Many of those processes and services involve geographically distributed applications and information sources, so IT groups must find ways to let them efficiently interact and share information in real-time even over long-distance links.

Service providers can use Solace’s hardware to add cloud-based application integration capabilities to their IP/MPLS networks thanks to its very high capacity and support for virtualized multi-tenant deployment.

This paper introduces the architecture and capabilities of Solace’s solution, and describes several use cases where it offers significant value to different kinds of companies.



Business Value

Solace offers proven hardware, software, and processes that enable enterprises and service providers to more cost-effectively deploy and operate private and commercial cloud services.

- **Higher performance:** Solace message routers offer excellent throughput and latency even over long-distance WAN links, having been architected specifically to address the bottlenecks that limit the WAN distribution performance of software running on commodity operating systems and servers.
- **Lower cost and complexity:** By handling message volumes that would otherwise require as many as 10-30 commodity servers, Solace's solution reduces the cost, complexity and datacenter footprint of your data distribution infrastructure.
- **Efficient bandwidth utilization:** Solace uses a variety of network and application optimizations to reduce WAN bandwidth consumption by up to 90%, leading to lower costs, better data synchronization and faster applications.
- **Real-time publish/subscribe:** Solace's solution makes it easy for developers to push information to desktop, mobile and rich internet applications, a powerful technique they can use to create more sophisticated applications and richer user experiences.

Key Capabilities

- **Content aggregation:** Solace message routers ensure that data is sent to all systems responsible for capturing it, meeting the need to instantly archive massive amounts of data so applications can tap into it as events occur or after the fact.
- **Buffering:** Solace message routers queue messages so they can act as a buffer or throttling mechanism that lets the system handle spikes in traffic without any loss of data, and without sizing the entire system to handle peak loads at all times.
- **Alerts:** Today most applications hosted in cloud environments deliver data either using synchronous 'poll-and-response' or by passing responsibility for delivery off to an SMTP or SMS gateway. With the ability to process very large volumes of messages with low latency, Solace message routers let developers easily tap into powerful message routing and queuing capabilities as needed.

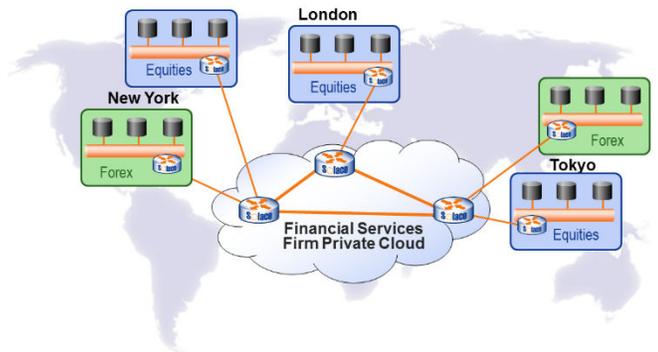
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Use Cases

Capital Markets

Large global banks and other market participants need to update customer profiles, market data, risk information, trade activity, and compliance records as they execute trades and deliver services using increasingly distributed systems. This is mission critical content that needs delivery guaranteed to ensure that the data in each location is always in sync.

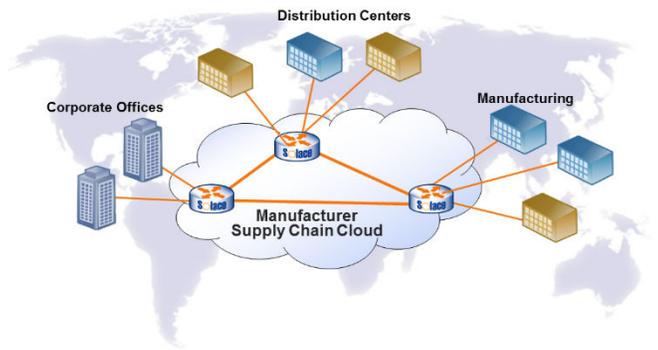
Cloud-based application services can be used to update risk and trade books in real-time, thereby helping banks reduce cross market risk, improve trading profits and protect against oversized losses.



Manufacturing

Manufacturers rely on the precise coordination of complex supply chains that need to share customer records, inventory levels, order information and logistics updates between global manufacturing centers and through partner networks.

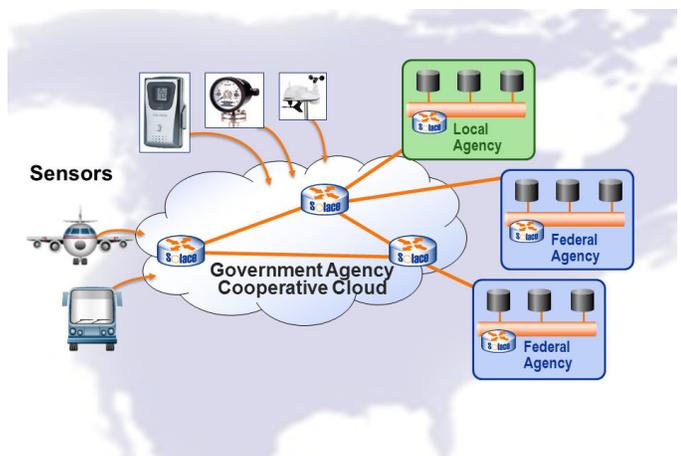
Solace's platform can help manufacturers achieve real-time visibility into their supply chain and distribution channel. This newfound real-time visibility can help them optimize inventories, increase the accuracy of product lifecycle management, reduce manufacturing defects, improve interactions with manufacturing partners and minimized stockouts.



Government Sensor Network

Government agencies rely on large sensor networks to monitor conditions and events that signify developing situations in areas such as air quality, traffic flow, the energy grid, disaster response, military operations and homeland security. These sensor networks generate a massive volume of streaming data that must be intelligently routed and filtered to avoid overwhelming systems and decision makers with readings that are irrelevant to them.

By handling data distribution services in a private cloud, these agencies can more efficiently aggregate and forward data from distributed sensor networks while letting users set rules that filter the stream so they receive only those readings relevant to their area of responsibility and decision making. Reducing the cost and complexity of routing real-time readings from distributed sensor networks can reduce personnel costs, improve resource management and give greater situational awareness.

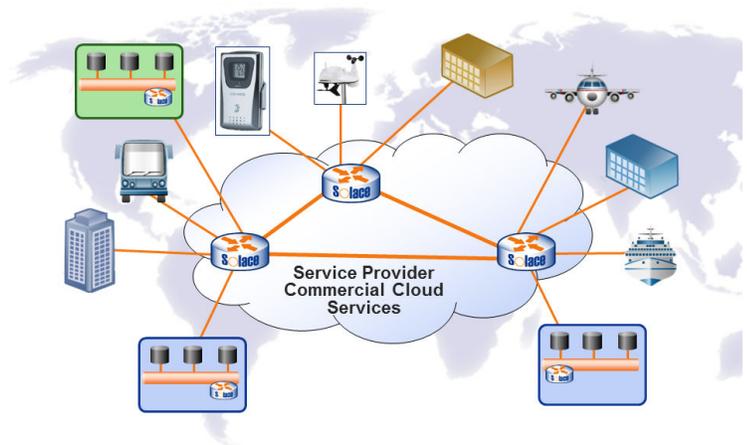


Communications Service Providers

Offering real-time distributed application services as an element of their network lets service providers leverage their operational strengths and existing relationships in the area of WAN connectivity. Solace provides all of the equipment, expertise and management tools to give them confidence in their ability to meet SLAs as they do so.

- **New revenue opportunities:** Message routers enable a networking platform that can be the basis for new, high-margin cloud services.
- **Strategic positioning with customers:** Providing unique data services in the cloud can help service providers embed themselves in their enterprise customer's business.
- **Performance and scale:** Solace message routers move data analysis and manipulation into hardware with multi-tenant, virtualized infrastructure thereby lowering operating expenses.
- **Familiar operation:** Solace message routers are a robust, turnkey hardware platform with deployment, administration and management similar to traditional IP networking equipment.
- **WAN bandwidth upsell:** Making real-time application services available as an elastic service will accelerate the rate at which enterprises can adopt real-time processing, driving demand for increased WAN bandwidth over time.

Providing application services in the cloud positions the service provider as a trusted business partner actively involved in both the customers' network and information distribution strategy, paving the way for future cloud-based offerings such as middleware on demand, data archiving, compliance, and distributed database synchronization.



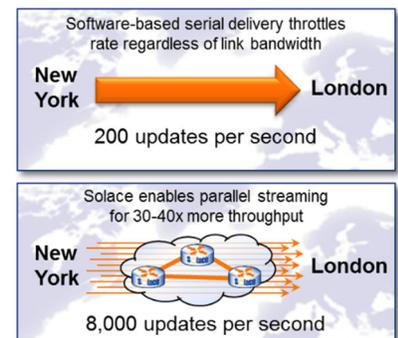
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Technical Overview

Solace message routers leverage network processors, FPGAs, and other high-speed hardware technology to manage the millions of subscriptions and topics that drive the routing of information between distributed heterogeneous applications. Solace delivers information across LANs and WANs utilizing a variety of qualities of service such as reliable and guaranteed delivery. Here are some of the key needs and how Solace meets them.

Global Distribution over Wide Area Networks

Solace's solution can distribute real-time data over long-distance WAN links with much lower, more consistent latency than traditional software-based solutions. In independent testing, customers have seen Solace improve the rate of updates between applications from just a few hundred per second to many thousand per second. By offering that level of performance Solace enables companies to implement private clouds that make geographically distributed systems work together as part of real-time business processes and give users self-service access to the information they need.



Intelligent Filtering and Routing

Most cloud solutions waste network resources by treating WAN and LANs the same. Solace's solution handles each message individually and only sends copies over the WAN when a system on the other end needs that specific piece of information.

High Rate Delivery with Built-in Buffering

Solace can route 450,000 messages per second ensuring delivery to every recipient. If some recipients are unavailable or the WAN is down, Solace buffers messages in on-board non-volatile memory and plays them out as soon as the recipient is able to receive them. This minimizes the disruption caused by application outages and WAN issues.

Streaming Compression

Solace's solution performs streaming gzip compression in hardware, reducing data volume by as much as 90%, to offer high throughput with low latency.

Client-Specific Flow Control

Solace message routers support custom flow control for recipients who don't need every update in a high-speed message flow but do need to make sure they are always receiving the latest information. Common use cases include streaming market data to human traders and rate limiting FX updates.

TCP Optimizations

Solace message routers perform TCP protocol termination and have been optimized for data delivery over high long haul cloud links with the following features:

- **Window scaling:** Scaling TCP windows allows more data to be transmitted over each connection before the window closes.
- **Support for parallel TCP connections:** Solace hashes flows across connections to preserve sequence while increasing throughput.
- **Aggressive start-up and slow back-off:** Long-life TCP connections should spend their time in congestion avoidance rather than slow start. Parameters are tuned so that any errors ensure the affected TCP sessions slowly back-off from congestion and quickly move back towards the maximum available bandwidth.

Management and Monitoring

Solace provides per-connection status information and statistics you can't get from messaging software, such as TCP round trip time, number of fast and slow retransmits (which indicates congestion in the sending direction), number of packets received out of order (which indicates congestion in the receiving direction), and messages rates.

Summary

Whether powering a private cloud for any enterprise or being used by service providers to offer cloud-based services, Solace message routers tie together globally distributed applications and information far more efficiently than software on servers. Solace has been deployed as the basis of private and commercial cloud services for customers in financial services, internet services, government, telecom, transportation and logistics.

To learn more visit
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