

Enabling the Next Generation of Communications Services with Intelligent OSS/BSS Infrastructure

For many companies, the movement of data is important to their business, but in the communications services industry, the movement of data *is* their business. Business is booming, too—not just because the web has become part of the fabric of our lives at work, at home and on the go, but because telephone and television are quickly becoming just another kind of data delivered over provider networks, as VoIP and IPTV.

The increasing practicality and popularity of social networking, user-contributed content, IPTV and VoIP are fundamentally changing the way people think about information and interactive services. In the past people consumed whatever was made available and promoted through “mass market” channels such as television networks and ad campaigns. Now people are demanding content and services that aren’t just tailored to their tastes, but personalized to let them learn about and interact with their friends, favorite businesses, celebrities, sports teams, stocks, etc.

These shifts are causing communications service providers to perpetually (and quickly) increase the capacity, scalability and manageability and performance of their internal and customer-facing systems. There are three reasons service providers need to evolve their information routing infrastructure to succeed and thrive in the coming years:

- The sheer volume and variety of data they’re being asked to carry,
- The increasing sophistication of services being demanded and delivered
- The increasing operational complexity and risk associated with the both factors

Solace’s innovative technology can help service providers turn these challenges into opportunities by intelligently routing large volumes of information with more predictable performance than software-based solutions, and with better TCO, ease-of-use, manageability and scalability.

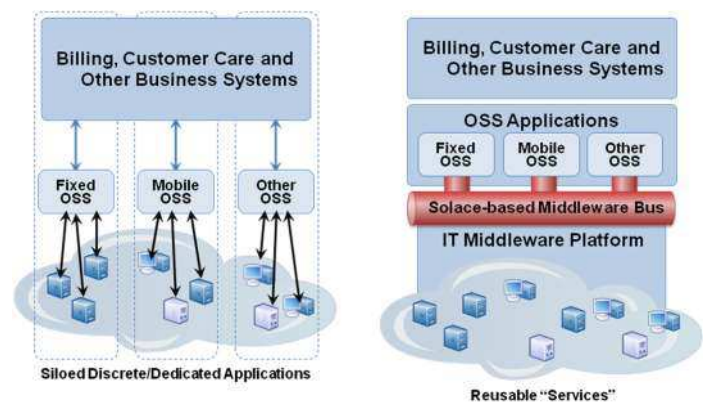


The Need for New OSS/BSS Infrastructure

There are three reasons communications service providers need to evolve their information routing infrastructure to succeed and thrive in the coming years. This section describes how improving the capacity, scalability and manageability of their infrastructure can benefit them in each of these areas, and describes how Solace enables the necessary improvement.

- **Increasing Volume and Variety of Data:** As part of the simultaneous booms of user-provided content (especially video), mobile computing, VoIP and IPTV, service providers are being asked to carry an increasing volume and variety of data. And unlike the old days of carrying telephone calls and serving up static web sites, communications service providers must intelligently direct data and system resources to appropriate users in real-time. Solace utilizes intelligent routing protocols to ensure the immediate delivery of information to many recipients while making efficient use of bandwidth, and requiring little rack space and administration.
- **Increasing Sophistication of Services:** Customers are demanding increasingly rich services that require real-time information, interactivity and personalization, and the ubiquity of social networking can cause demand for services to reach millions of users very quickly. So to attract and retain customers, providers need to be able to quickly deploy lots of new services, and need to be able to provision and personalize them at very high scale. Solace's high capacity, intelligent routing protocols and ability to reformat data on the fly mean service providers can deliver real-time information and interactivity that's customized to each users preferences, privileges and device.
- **Increasing Complexity and Risk:** Service providers deal with many millions of events every day, such as call detail records (CDRs), billing charges, tariff rules, and carrier interconnect fees. Each may make or cost them money, and may be part of a pattern that indicates an emerging problem or opportunity. These events occur in such volume that OSS/BSS systems usually can't keep up, so information is stored to data warehouses for after-the-fact processing. The ability to route and analyze all of the information in real-time can help companies better understand patterns of events as they occur, which can help them provide superior service, reduce costs and optimize the efficiency of their network. Solace can filter, format and forward millions of messages per second to feed complex event processing (CEP) engines a clean stream of relevant events in real-time.

Historically, lines of business have had their own OSS/BSS infrastructure, forcing overarching functions such as billing, customer care and compliance to pull information from many systems. Solace's solution can form a hardware-based enterprise service bus (ESB) that seamlessly connects a service providers back-office and customer-facing services in real-time. With support for reliable, guaranteed WAN and Web messaging, Solace can meet the needs of all relevant applications, services and users within a datacenter, across the organization, or around the world.



Solace's Next Generation Information Distribution Platform

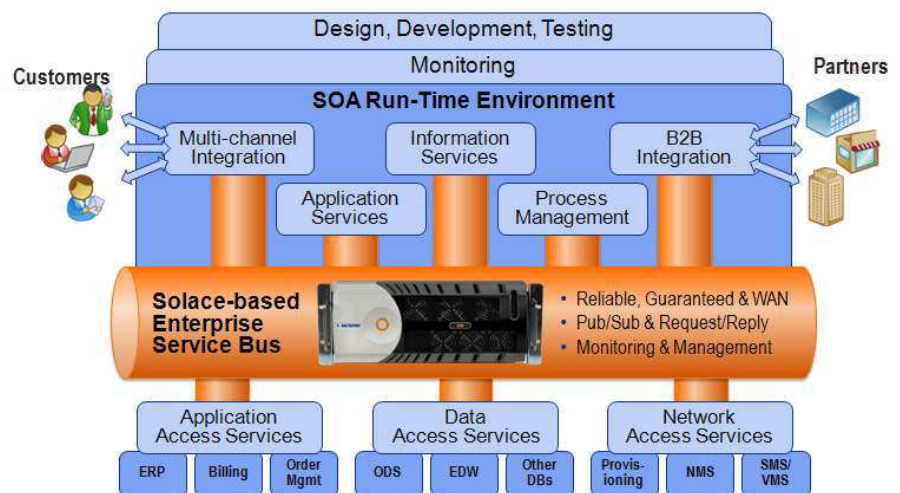
As described above, to support the demand for increasingly rich, personalized and real-time services of all kinds, communication service providers need to do more than just increase the *capacity* of their network, they need to increase its efficiency, adaptability and intelligence.

Solace provides a hardware-based information distribution platform that does all three by filtering, normalizing and routing high-volume traffic like CDRs and traffic load statistics in real time. Solace implements high-speed and persistent messaging coupled with the ability to inspect, route and transform content in real time, and does it all in purpose-built appliances that offer performance 10 to 100 times faster than software-based solutions.

As part of that ESB, Solace's platform can filter, normalize and route events for consumption by complex event processing (CEP) engines that aid in the identification of complex patterns and trends.

Solace's solution lets administrators create and dynamically modify rules in response to changing network and business conditions so each call or data service request can be handled as efficiently as possible.

Solace is advancing the state of the art of routing information with purpose-built hardware much like Cisco revolutionized the routing of raw packets with IP routers and switches.



Benefits

- **Reduce cost and complexity:** The high capacity and shareable nature of Solace's appliances mean Solace can enable device consolidation ranging from 10:1 to 50:1. This reduces capital and operating expenses in the areas of servers and software, as well as power, cooling and connectivity. Solace's appliances also simplify deployment and operation thanks to predictable out-of-the-box behavior, and upgrades that take just minutes because there are no dependencies between applications, messaging software, device drivers and operating systems to deal with.
- **Increased operational agility:** Solace's solution makes it easy to define and update the rules which control content-based routing, so telcos can quickly adapt as new business relationships are formed, network loads change or fraudulent activity is identified.
- **More profitable business operations:** Real-time monitoring of billions of events per day provides much better visibility and control than after-the-fact data warehouse-based reporting. Tracking and of events like CDRs and fraudulent use of resources minimizes costs and improves profitability of voice and data operations.

Key Capabilities and Attributes

Reliable Messaging

Solace's middleware appliances can enable high-speed information distribution with reliable messaging when speed is more important than a guarantee of delivery, and when the real-time flow of information is only relevant and wanted by subscribers who are currently connected. By handling the routing of messages in purpose-built hardware, the Solace Message Router can deliver millions of messages per second with very low, predictable latency even at rates as high as 10 million messages per second. And Solace's solution helps information flow across networks that consist of different types of devices connected via network links of varying speed by buffering messages and playing them out at a rate each link and recipient can handle.

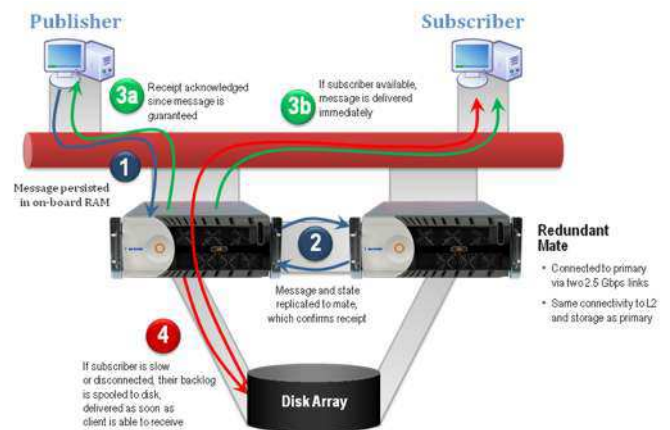
Solace's message processing is embedded in silicon so there's no operating system in the datapath. That means there's no OS interrupts, context switching or data copies between kernel and user space. When messages are received via the I/O card, their topic is passed via high-speed internal fabric to a Topic Routing Blade. That card, which stores up to 10 million subscriptions that can include wildcards, determines the appropriate destinations for each message and directs the I/O card to route them accordingly.

Guaranteed Messaging

In the back office, service providers use MQ-style messaging to pass information and coordinate transactions across applications, and in many scenarios they need a guarantee that every message will successfully delivered in sequence. By guaranteeing delivery in middleware, Solace enables developers to build less complex applications and enables greater performance and scalability.

Solace takes advantage of its appliance form factor to temporarily store messages in high-speed on-board memory until receipt is confirmed. If a recipient is unavailable or unable to keep up with message flow, their messages are persisted to storage until they are ready to receive messages, and then automatically played out without affecting other recipients.

Solace's appliances enable fully failsafe delivery without the performance penalty incurred by software-based solutions, enabling much higher performance and predictability. Solace supports peak throughput of 150,000 messages per second with average latency under 100 microseconds, for 600 byte messages. This low latency is also remarkably consistent even out to the 99.9th percentile.



JMS Messaging

As a JMS broker, Solace's appliance enables over 100,000 messages per second in persistent mode and 10 million messages per second in non-persistent mode. It can even run both simultaneously, with exceptional performance shown here. One Solace message router can do the work of dozens of software-based JMS brokers, reducing architectural complexity and TCO. Client applications connect to Solace appliances just like any other JMS broker, so it's easy for companies to improve performance and reliability by swapping in Solace's solution.

Shareable Infrastructure for Service Deployment

Solace appliances let service providers partition each device into many “Message VPNs” with their own resources, as well as discrete performance and security characteristics. Not only does this reduce TCO, it lets them deploy many services very quickly and easily by enabling them to tap into the power of a single easily-managed and highly scalable platform.

This means service providers can embed the intelligent routing and delivery of information available as a service of their network, so developers can create applications without worrying about how they’ll interact with users and other applications. They simply build the application to perform its intended function and tap into the Solace-based infrastructure for messaging functionality. This reduces time-to-market for new services and keeps application complexity to a minimum.

All of Solace’s features and capabilities are accessible through a single API that’s available for C, C#, Java and JMS. It’s a robust, high performance, full-featured yet low footprint API very similar to the APIs for software-based middleware, so developers can leverage their existing skills. And since the one API is used for all kinds of messaging, companies can repurpose people, tools and templates across all of their messaging initiatives.

Architected for Flexibility and Scalability

Solace’s appliances have proven their performance and robustness in some of the most demanding computing environments around, from Wall Street to the U.S. Department of Homeland Security. Each appliance can accommodate a number of PCIe cards that perform functions such as protocol termination, message routing, and guaranteed delivery. This lets service providers configure them to meet their exact needs, and expand both capacity and functionality within that footprint.

Solace appliances automatically propagate subscriptions and share information about network availability so they can identify the shortest possible path for each message. This means the capacity and/or functionality of a system can very easily be increased by simply deploying additional Solace devices, without worrying about provisioning servers, installing and software, and load balancing.

Unified Monitoring and Management

Solace gives service providers a comprehensive set of per-client statistics that can’t be achieved with software in real time without a significant performance penalty, and many of which can’t be collected at all in multicast environments.

At the TCP layer Solace provides data about round trip time, bytes sent and received, queue depths, number of retransmits, and number of packets received out of order. At the messaging layer Solace provides real-time and high water mark data about queue depths, messages transmitted and received per second, and messages discarded due to queue depth problems. This can help service providers quickly identify the root cause of situations whether they’re caused by some problem with the network itself or a specific client.

Solace’s solution can be managed using a command line interface (CLI) or Solace’s GUI element manager called SolAdmin. Information and alerts can be sent to management systems using Syslog and SNMPv2 or v3 for events such as hardware faults, threshold crossing conditions and client application activity. A management API called SEMP (Solace Element Management Protocol) lets service providers integrate the management of Solace’s solution into their existing custom framework.

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CEP Pre-Processing

Complex event processing (CEP) software helps service providers recognize and respond to situations as they arise by analyzing streams of data and identifying patterns of events that signify emerging problems, risks and opportunities.

Even the most powerful CEP software struggles with the amount of information flowing across large communications networks, but Solace's platform can help by filtering out meaningless data and routing only relevant information to any number of CEP engines. Solace can and even normalize the data stream by transforming messages into each engine's desired format. Either way, Solace's solution can dramatically increase the effectiveness of CEP solutions by feeding them a cleaner stream of data to process.

This reduces the cost of CEP infrastructure by reducing the footprint of CEP engines and the hardware it takes to run them. It also enables new uses of CEP by letting engines tap into information streams that are too voluminous for them to process today, enabling new uses that are impractical today.

WAN Optimization

The amount of data traversing the globe via wide area networks (WANs) is surging, in many cases beyond the capacity of existing systems which causes slowdowns and unpredictability. Adding bandwidth is an effective (if expensive) solution, but only gets you so far before latency and application behavior create diminishing returns. With the ability to route and delivery 150,000 messages a second over WAN links, Solace's appliances can be used as the foundation of a sophisticated multi-datacenter information distribution system. Solace's solution optimizes bandwidth utilization by only sending messages across the WAN when an application on the other side needs it, and by performing streaming compression on a per-client basis and between appliances.

Security

Since Solace's solution handles message distribution via discrete TCP connections, the platform can be made much more secure than multicast environments. Administrators must be authenticated using username/password in order to gain management access to the message router, thereby preventing unauthorized access and changes. Client applications are authenticated to access the message router via a username/password. Solace supports an on-board authentication database, or integration with Radius and LDAP. Publisher and subscriber access control lists (ACLs) determine what each application is allowed to send and receive, and IP layer ACLs restrict which IP address and subnet they can connect from. Finally, adherence to Nessus prevents denial of service attacks.

Summary

To capitalize on the burgeoning volume and variety of data being consumed and generated by an increasing number of fixed and mobile devices, communications service providers need to improve the performance, robustness and scalability of their network and OSS/BSS infrastructure.

Solace's solution meets that need by providing a platform that can support all kinds of information filtration, routing and distribution in a compact appliance that features low TCO and unparalleled performance thanks to an innovative pure hardware approach.

To learn more visit
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