

ascend

Taking your airline to new heights

IN THE BLACK
A conversation with ...

**Joe Leonard, CEO
and Chairman,
AirTran Airways**

page 59

INSIDE

22

Lufthansa benefits from
close-in re-fleeting

45

Cathay's cargo business
drives revenue

76

Frontier Airlines enlists
strategic partners

Talking Technology With ...

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Open Source in the Enterprise

During the last few years, open-source software has created a revolution in information technology. Commoditization of hardware and software, driven largely by open source, is changing reservations systems and travel distribution in general.

The travel industry has always been at the forefront of e-commerce technology, beginning with the original SABRE computerized reservations system and continuing through to the SabreSonic™ Passenger Solutions. Today, there are several pressures that push for a much greater rate of change, including:

- Revenue issues, as airlines feel the pressure of low-cost competitors and the economic pressure of high oil prices. These effects, coupled with highly variable demand, force airlines to reduce costs and find new ways to increase revenue.
- The Internet, which provides new opportunities and new ways for suppliers and customers to connect with each other. Priceline's "name your price" model is a great example of a new business model.
- Commoditization of computing, which removes barriers to entry in distribution. These reduced costs allow for new brokers that can address niche markets.

What effect has this had on the SabreSonic solutions? Rather than put a Web façade on the existing reservations systems, we're radically rethinking the architecture of the core systems and how we interact with customers and suppliers. Open-source tools and commodity computing are a key part of this strategy.

Open-Source Trends

Linux, Apache, MySQL and others have been the focus lately, but open-source tools have been many years in the making, and there's a long history of Unix developers sharing source

code. While some people think the primary advantage of open-source is that it's available for free, this ignores two other major business advantages:

- Open-source software is built to portable interfaces, avoiding vendor lock in and enables us to choose from a wide variety of hardware. A good example is Advanced Micro Device's new 64-bit Opteron processor — Linux is mature on this platform, and we've had it in production for about a year. However, many "closed" operating systems are yet to be released.
- Open-source software is generally more robust than proprietary systems. Eric S. Raymond, a prominent open-source advocate, summed it up neatly as, "Given enough eyeballs, all bugs are shallow."

Standardization and commoditization mean that the hardware and operating system, and to a lesser degree the database and middleware, are now commodities. There was a time when airlines and other travel companies spent a great deal of time working on network protocols, operating systems and databases. Today, we don't need to work in this space — TCP/IP is ubiquitous. Linux is scalable on many different platforms and open-source databases are gaining traction.

Shopping

The Internet has increased the look-to-book ratio. Shopping brings no revenue to distributors or suppliers, so this software needs to run on the most cost-efficient platform available. So, what do we use for shopping?

In 2000, we partnered with Compaq (now part of Hewlett-Packard) to prototype the Air Travel Shopping Engine, or ATSE. Rather than enhance the mainframe system that we've relied on for many years, it was clear that commodity computing was needed. The resulting system is a hybrid architecture — we use HP's NonStop (formerly Tandem) systems to hold the master database and distribute work. The actual low-fare searches are performed on rack-mounted Linux machines. We have 150 HP servers, each with four AMD Opteron processors, running 64-bit Linux. The NonStop systems broadcast data to a smaller cluster of Itanium-based Linux servers running MySQL. Low-fare search requests are load balanced across this cluster. We've recently rolled out new functionality on this cluster that lets Travelocity return hundreds of low-fare search results for an individual's query.

What does this mean for airlines? The new technology helps airlines realize benefits, including:



“Given enough eyeballs,
all bugs are shallow.”

— Eric S. Raymond

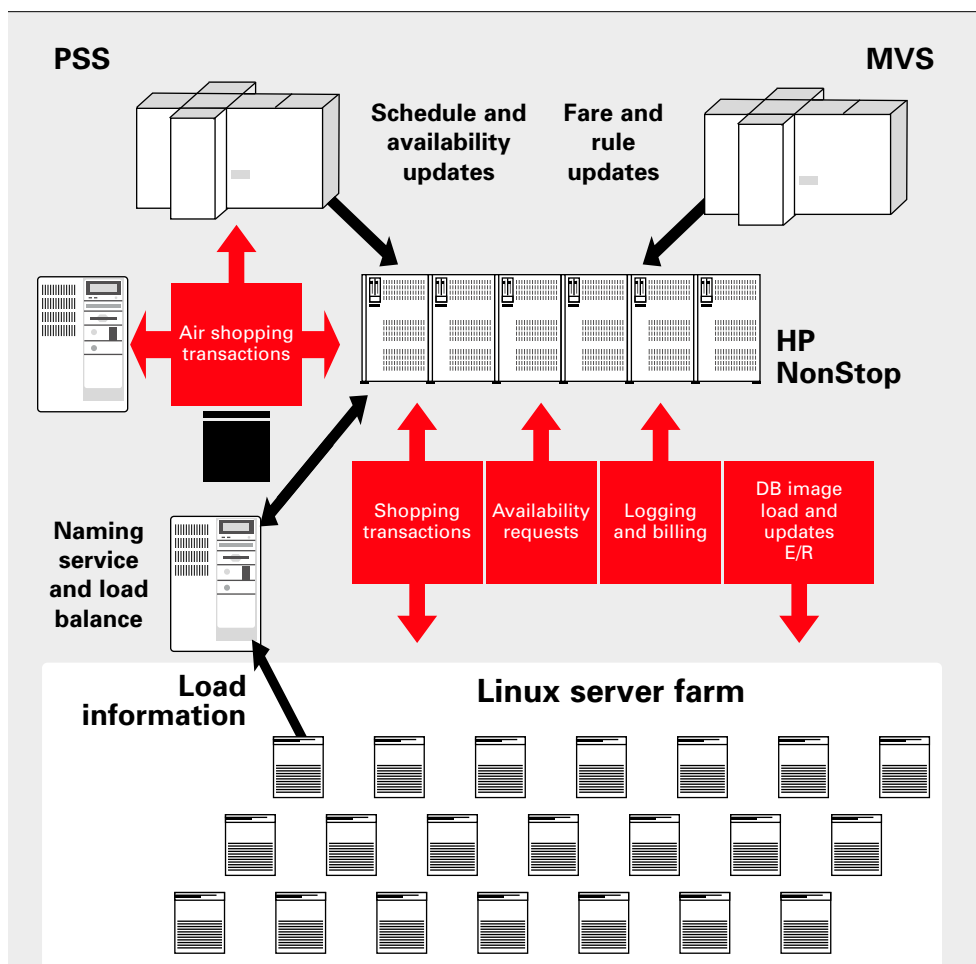
- Displaying hundreds of options means that we can show many options for each of the carriers in a market, even when there are a large number of competitors.
- The NonStop database and real-time replication to Linux means that fare changes are applied instantaneously. Fare changes are loaded much faster than in the legacy main-frame systems, so that responses to a competitor's fare actions are implemented as quickly as possible.

Travelocity is also taking advantage of open systems, replacing its Unix servers with rack-mounted Linux servers. The application is written in Java, using a number of open-source libraries, running on Intel-based servers. These systems are replacing large, proprietary Unix servers, and the new architecture significantly reduces response time.

Finally, in the area of open standards, we've made our functionality accessible via Web services. XML, Java and the Apache XML tools are part of this system, now processing millions of transactions per day. Web services provide a number of important advantages to airlines, including:

- The ability to use off-the-shelf tools to develop client-facing applications, integrating content from multiple companies. Many leading companies on the Internet such as Google and Amazon are now providing their content via Web services. An airline utilizing SabreSonic™ Res will be able to offer its content for other companies to display in their Web sites.
- We will be able to retire proprietary structured protocols so airlines won't be tied to a

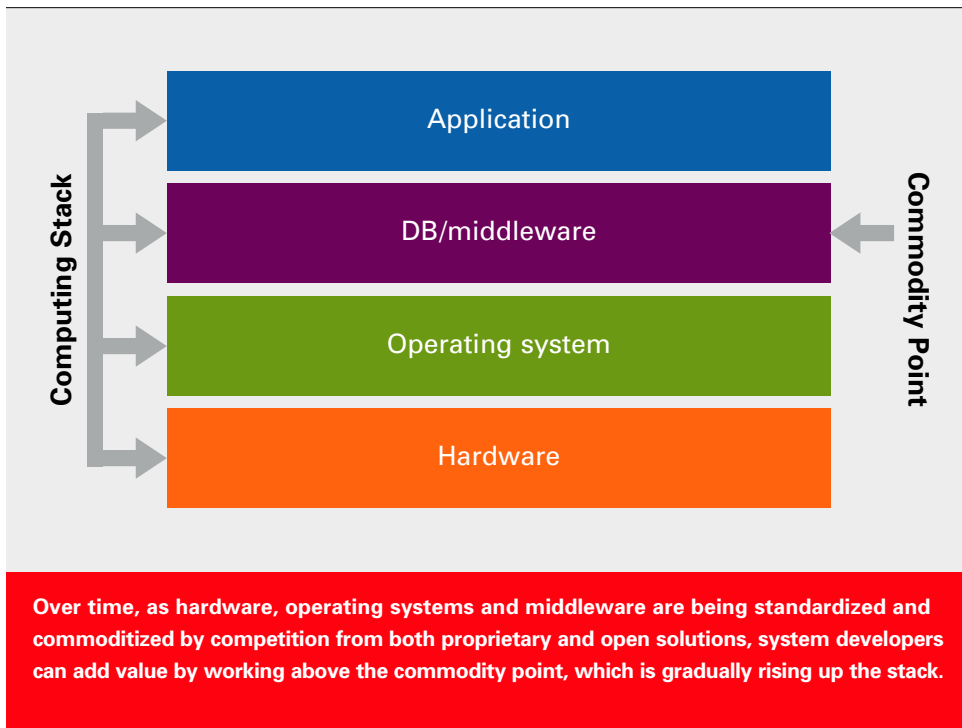
Air Travel Shopping Engine



The Air Travel Shopping Engine runs on a cluster of 140 four-way Opteron servers from Hewlett-Packard. Fares, schedule and availability data are replicated in real time, flowing through a master database running on HP NonStop servers.



Above the Commodity Point



specific system. Private networks and specialized hardware are not required to use Web services, also reducing cost and time to market.

A Customer Focus

In the previous “Talking Technology” column, Barry Smith, chief scientist for Sabre Holdings, discussed customer choice models that enable airlines to model the true demand for a product. These models will also allow systems to tailor offers to specific customers and customer segments, requiring a lot of computing power. In addition, open-source tools drive down the cost of incremental computing power and incremental storage. This means we can now

capture and keep individual transactions, process this data to build statistical models of customer behavior and, perhaps most importantly, we can use these models in real time. We can harness this computing power with models and business rules engines to tailor the displays to specific points of sale.

What does this mean in concrete terms? This year we began limited testing of a new system that can tailor screens to individual agency requests and gather model customer preferences in real time. Additionally, we can gather real-time display information and generate alerts, letting airlines know how their service is being seen by the marketplace. This new system moves control of the terminals off the

mainframe and onto a cluster of Linux servers, using a flexible rules engine to dynamically create offers. We can imagine many scenarios, and we will test several, including:

- Cross-sell of additional products, such as hotel, car and insurance — We’ve previously done this on Web sites, but can now bring this to all points of sale. We could create new opportunities, such as selling meals or issuing vouchers for special services at the airport.
- Dynamic pricing and availability, which enables the system to “correct” inconsistencies in pricing — For example, if low-fare searches show that a carrier has the lowest fare in a market and has the only non-stop service, we can generate alerts in real time or even modify what is displayed. The rules to do this are flexible and can be modified online.

We’re not limited to products that are displayed in traditional reservations systems today because the new system is written in Java and can call external Web services from a number of partners. We’re effectively treating our traditional global distribution system as another content source.

The Future of Distribution Technology

New technology makes distribution systems more relevant and enables us to leverage commoditization and open systems to create new value to suppliers and customers. We believe that future distribution systems will bear little resemblance to the current mainframe systems; they’ll take a much more customer-centric focus, allowing suppliers to better understand what drives demand and give them the tools to respond to demand in real time. This is not just a vision of the future. We’re currently rolling out components and moving very quickly in this direction. **E**

+count it up

28 million — Number of passengers a year on average handled by Toronto Pearson International Airport, Canada’s busiest airport, which is projected to grow to 50 million by 2020. In preparation for the additional traffic,

the airport is building a new multilevel parking garage, which will have 12,600 spaces upon completion and is part of a US\$3.3 billion terminal development project initiated to enhance customer service and convenience.

80 — Percentage of all global available seat kilometers for the top 100 airlines that flow through at least one system within the Sabre® AirFlite™ Planning and Scheduling Suite.