The DELL.COM Web site is a busy place: on average, it garners 5 million visits each day from 3.2 million unique visitors. Those millions of visitors generate a daily total of over 300 GB of clickstream data—the records of what users click on while browsing the Web. The site hosts content for 82 countries and spans across 81 languages, so it is no surprise that it has a worldwide audience and clickstream total of this magnitude. Until recently, however, there was no way to display this information to a general audience in an engaging format.

EarthWatch, an application that overlays Dell Web traffic onto Google Earth™ images, provides the answer. By displaying where online visits originate, EarthWatch offers an hourly 3D view into the amount of traffic and number of visits generated by each city. It provides a unique view into the engagement level of Dell customers, giving Dell employees, customers, and partners a way to literally see where their customers are and the demand they have for Dell products.

Building a flexible, responsive data display
To build EarthWatch, the Dell eIntelligence team started at the source: the clickstream data. The team used standard internal and external best-of-breed technologies to extract, translate, and display clickstream data. The technologies deployed include Ab Initio extract, transform, load (ETL) software to harvest and load the data; Microsoft® .NET Web services, MaxMind® geolocation data, and Oracle® databases to store and analyze the data; and Google Earth Fusion and Google Earth Server to supply data to the Google Earth Enterprise client software (see Figure 1).

Innovative aspects of the EarthWatch application include the following:

- A .NET Component Object Model (COM) wrapper to monitor, capture, and programmatically handle errors produced by Google Earth
- An error-tracking system using Empirix® monitoring software
- A database-driven flight plan that cruises the world and pops up random sites at various views, angles, tilts, and heights

Dell currently has EarthWatch deployed on six displays in cafeterias, lobbies, and the executive briefing center at the Dell headquarters in Round Rock, Texas, and plans on adding nine more in the future.

Turning clicks into graphics
The Dell Web site presents a significant opportunity for the company to increase its understanding of customer
EarthWatch gives Dell employees, customers, and partners a way to literally see where their customers are and the demand they have for Dell products.”

Dell Web site by geography and engagement level. The Dell operations group uses the framework to overlay service calls, while the Dell manufacturing group shows order shipment information. All this data helps Dell become more proactive and more knowledgeable on where to allocate resources, provide better service, and establish stronger customer ties than was previously possible.

Potential further uses of EarthWatch may include call-center analytics, survey data with real-time examples of quotes, and order fulfillment metrics.

Configuring pop-ups and flight plans
The EarthWatch application communicates asynchronously with a Web service to fetch a sequence of cached XML instructions from an Oracle database. The XML flight plan, with additional instructions, is managed by a custom COM layer that executes these commands on Google Earth using the EARTHLib API. The commands are configurable on the server side and offer many possibilities for practical use, including display of Keyhole Markup Language (KML) features, pop-up balloons, and flights to different camera views. As the flight plan moves to different cities and regions around the world, it can display interesting facts about each city in pop-up balloons (see Figure 2).

Preparing data for Google Earth
Clickstream data forms the backbone of EarthWatch. Each hour, Dell compresses 20 GB of clickstream data from its Web farm. That data is cleansed, loaded into a data warehouse, and sent through an ETL mashup with the MaxMind longitude/latitude database, which converts IP addresses into actual city locations. Dell uses the latest version of Google Earth Fusion, which takes advantage of live link layer capabilities in the fusion layer to create a dynamic pointer to the Dell database. The data is then continually streamed in real time to Google Earth.
Avoiding risk with monitoring touch points

Because the different integration points in the EarthWatch application pose many risks for data to be lost or corrupted—such as Microsoft Windows® OS or Google Earth errors, faulty geographical data, and database, network, or system failures—Dell built an extensive set of monitoring and error-logging functionalities into the system. The application is designed to track Google Earth stability, network availability, database performance, OS management through Microsoft Operations Manager, custom application activity log querying, and more. The COM wrapper can also automatically fix errors, restart Google Earth when needed, and monitor ongoing system health. If EarthWatch exceeds certain defined thresholds, it immediately triggers alerts to notify the appropriate support teams. To help provide zero-error client presentations, the application can also act as a proxy between the HTTP server and the network link-based KML features loaded in the Google Earth client. Acting as a proxy allows EarthWatch to help manage network faults and HTTP errors.

Viewing customer interactions from a new perspective

EarthWatch is an innovative application that takes advantage of the robust, scalable Dell clickstream platform and the powerful display technology of Google Earth to offer a different perspective on how customers interact with the DELL.COM Web site. In the future, Dell may expand EarthWatch to include additional data sources and visualizations such as order volume data and customer comments by city, providing another layer of useful information for customers and partners.

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Figure 2. EarthWatch data displayed in the Google Earth interface