



US007296088B1

(12) **United States Patent**  
**Padmanabhan et al.**

(10) **Patent No.:** **US 7,296,088 B1**  
(45) **Date of Patent:** **Nov. 13, 2007**

(54) **SYSTEM AND METHOD FOR DETERMINING THE GEOGRAPHIC LOCATION OF INTERNET HOSTS**

6,981,055 B1 \* 12/2005 Ahuja et al. .... 709/238  
2002/0073231 A1 \* 6/2002 Quarterman et al. .... 709/238  
2002/0078233 A1 \* 6/2002 Biliris et al. .... 709/238  
2003/0095069 A1 \* 5/2003 Stilp ..... 342/465

(75) Inventors: **Venkata N. Padmanabhan**, Bellevue, WA (US); **Lakshminarayanan Subramanian**, El Cerrito, CA (US)

**OTHER PUBLICATIONS**

(73) Assignee: **Microsoft Corporation**, Redmond, WA (US)

U.S. Appl. No. 60/241,776.\*  
U.S. Appl. No. 60/194,761.\*  
Imielinski, T., et al.; "DataSpace: Querying and Monitoring Deeply Networked Collections in Physical Space", IEEE Personal Communications, vol. 7, No. 5, Oct. 2000, p. 4-9.  
David Moore, et al.; "Where in the World is netgeo.caida.org?", [http://www.caida.org/outreach/papers/inet\\_netgeo/](http://www.caida.org/outreach/papers/inet_netgeo/), Viewed Jan. 2, 2001, p. 1-14.  
*Quova: Our Service*, <http://www.quova.com/service.html>, Viewed Jan. 2, 2001, p. 1-3.  
*VisualRoute, Datametrics System Corporation*, <http://www.visualroute.com>, Viewed Jan. 2, 2001, p. 1-2.  
*VisualRoute, Technical Notes-Version 5.0b*, <http://www.visualroute.com/technotes.html>, Viewed Jan. 2, 2001, p. 1-5.

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1127 days.

(21) Appl. No.: **09/849,662**

(22) Filed: **May 4, 2001**

**Related U.S. Application Data**

(60) Provisional application No. 60/249,487, filed on Nov. 17, 2000.

(51) **Int. Cl.**  
**G06F 15/173** (2006.01)  
**G06F 15/16** (2006.01)

(52) **U.S. Cl.** ..... **709/238; 709/239; 709/241**

(58) **Field of Classification Search** ..... None  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,891,761 A \* 1/1990 Gray et al. .... 701/219  
5,515,062 A \* 5/1996 Maine et al. .... 342/457  
6,012,096 A \* 1/2000 Link et al. .... 709/233  
6,356,842 B1 \* 3/2002 Intriligator et al. .... 702/3  
6,684,250 B2 \* 1/2004 Anderson et al. .... 709/225  
6,778,524 B1 \* 8/2004 Augart ..... 370/351  
6,804,624 B2 \* 10/2004 Silverman ..... 702/159  
6,922,417 B2 \* 7/2005 Vanlint ..... 370/503

(Continued)

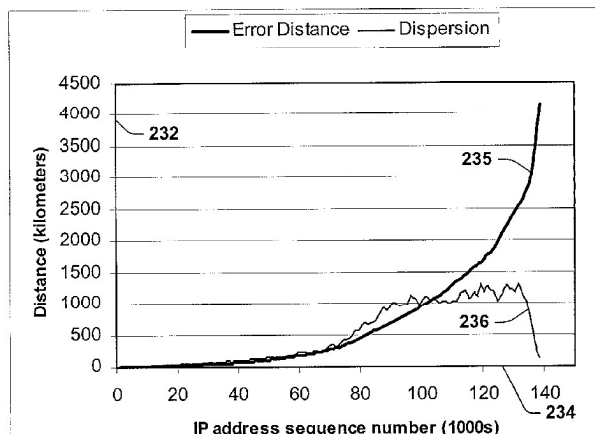
*Primary Examiner*—Nathan J. Flynn  
*Assistant Examiner*—Ashok Patel  
(74) *Attorney, Agent, or Firm*—Amin, Turocy & Calvin, LLP

(57) **ABSTRACT**

A system and methodologies are disclosed for determining the geographic location of an Internet host. A first method infers host location based on the DNS names of the host of interest or other nearby network nodes. A second method employs network delay measurements from geographically distributed locations to triangulate the coordinates of the host. A third method couples partial host-to-location mapping information obtained from one or more sources with BGP or other routing information in order to infer location of the host of interest.

**41 Claims, 13 Drawing Sheets**

230



## OTHER PUBLICATIONS

*AllWhois*, <http://www.allwhois.com/cgi-bin/allwhois4.cgi>, Viewed Nov. 14, 2000, p. 1-2.

*Akamai, Inc.*; <http://www.akamai.com>, Viewed Nov. 14, 2000, p. 1.

*Akamai Advantage, Inc.*; <http://www.akamai.com/html/aa/index.html>, Viewed Nov. 14, 2000, p. 1.

*Akamai Network, Inc.*; <http://www.akamia.com/html/aa/akne.html>, Viewed Nov. 14, 2000, p. 1-2.

*The CAIDA Web Site*; <http://www.caida.org>, Viewed Nov. 14, 2000, p. 1.

*Topology-CAIDA: Analysis: topology*; <http://www.caida.org/analysis/topology>, Viewed Nov. 14, 2000, p. 1-2.

*Tools-CAIDA: TOOLS*; <http://www.caida.org/tools>, Viewed Nov. 14, 2000, p. 1.

*Education and Outreach-CAIDA: OUTREACH*; <http://www.caida.org/outreach>, Viewed Nov. 14, 2000, p. 1-2.

*NetBoy Suite: Complete Netboy Package of Applications*; <http://www.ndgsoftware.com/~ndgabout/page3.html>, Viewed Nov. 14, 2000, p. 1-3.

*NeoWorx Inc.*, <http://www.neoworx.com>, Viewed Nov. 14, 2000, p. 1-3.

*NeoTrace: Graphical Trace Route Program*; <http://www.neoworx.com/products/neotrace>, Viewed Nov. 14, 2000, p. 1-2.

*"e-Business Without Limits"; Digital Island, Inc.*; <http://www.digitalisland.net/services>, Viewed Nov. 14, 2000, p. 1-2.

*VisualRoute: Mapping the Internet*; <http://www.visualroute.com>, Viewed Nov. 14, 2000, p. 1-2.

*U.S. Census Bureau: United States Department of Commerce*; <http://www.census.gov>, Viewed Nov. 14, 2000, p. 1-2.

Sutton, J.C., et al., "Dynamic Location: An Iconic Model to Synchronize Temporal and Spatial Transportation Data", *Transportation Research Part C (Emerging Technologies)*, vol. 8C, No. 1-6, Feb.-Dec. 2000, p. 37-52.

"A Geographic XML-based Format for the Mobile Environment"; Artem Garmash; Proceedings of the 34th Hawaii International Conference on System Sciences—2001; pp. 1-9.

V. N. Padmanabhan, et al., Determining the Geographic Location of Internet Hosts, Nov. 2000, pp. 1-15, MBR—TR—2000-110.

\* cited by examiner

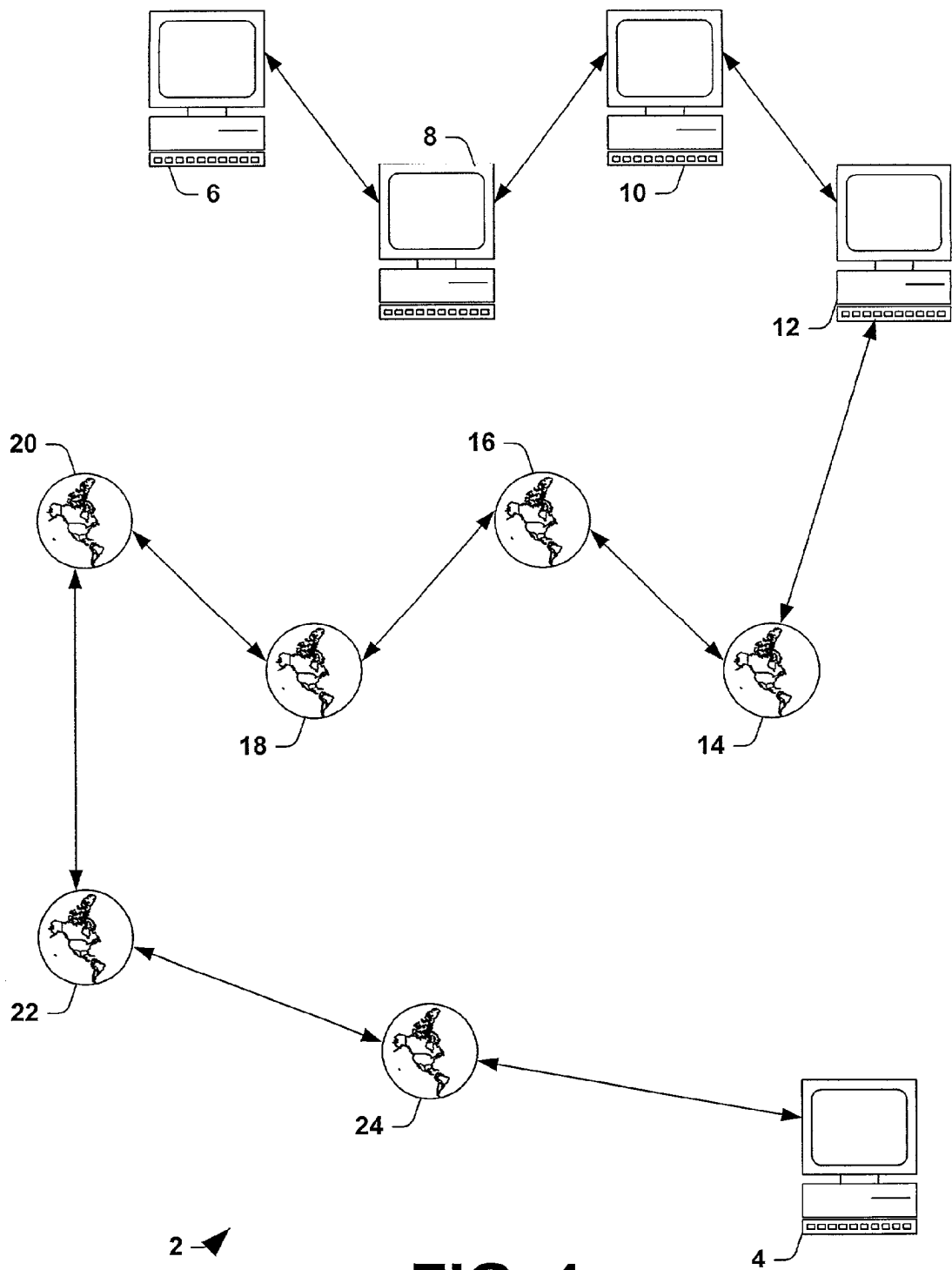


FIG. 1

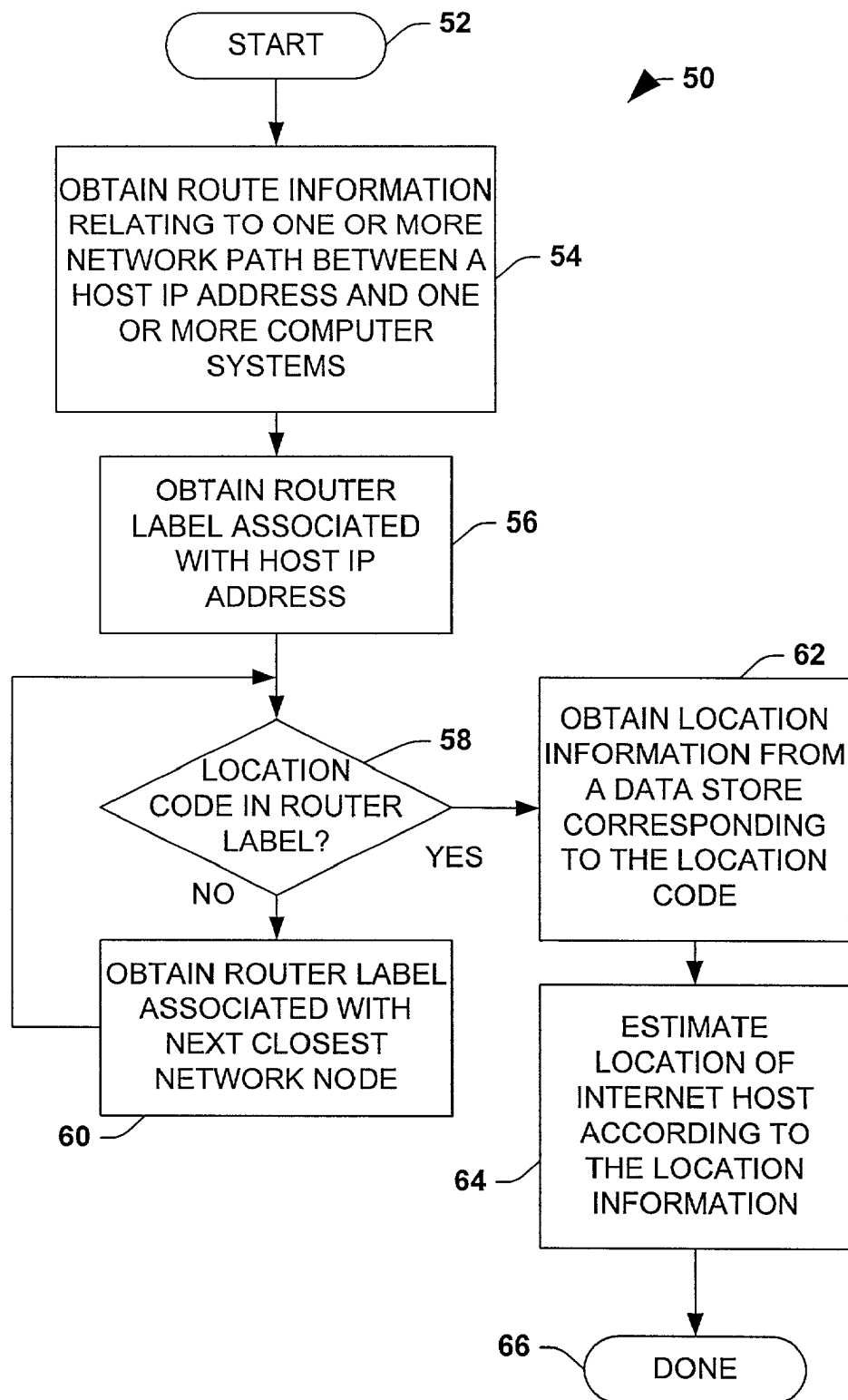


FIG. 2

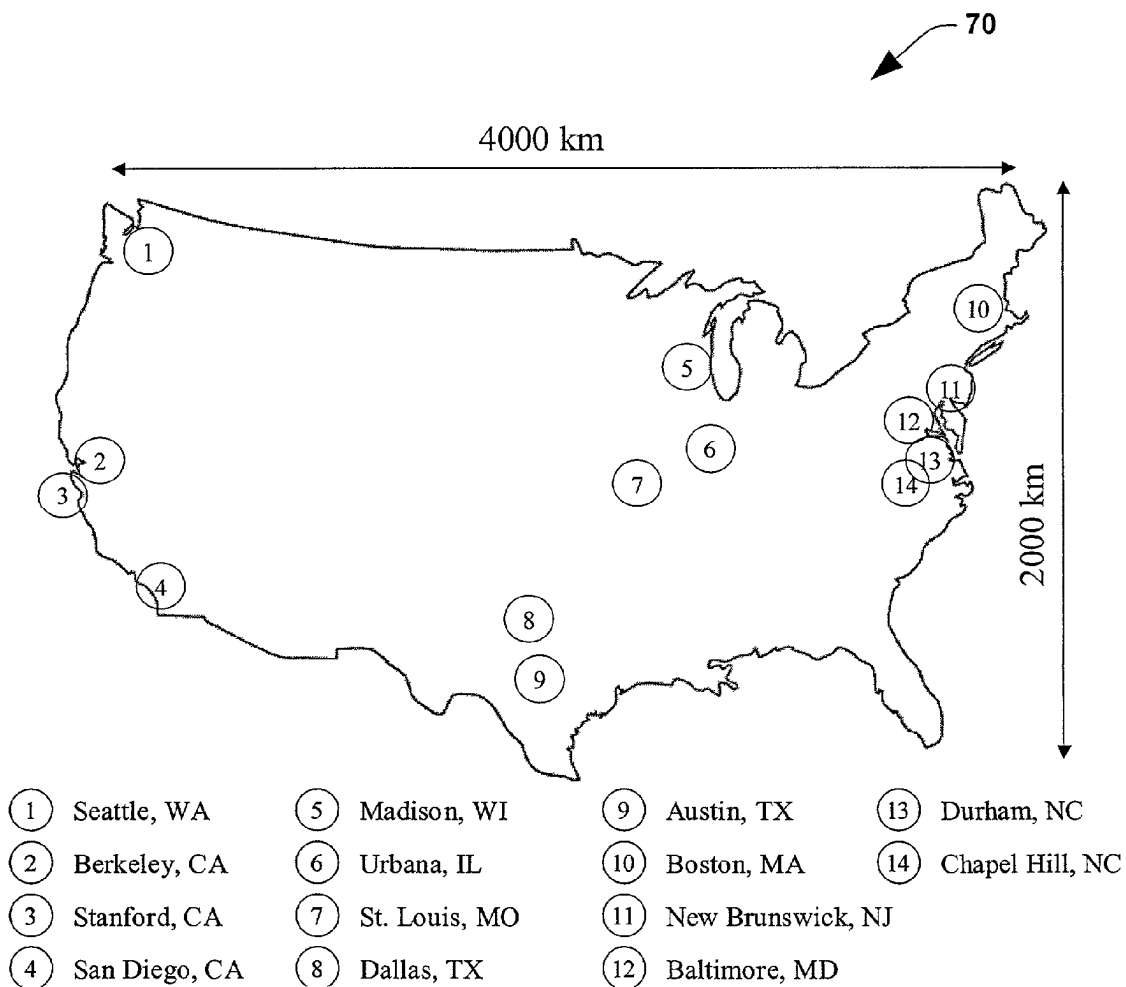


FIG. 3

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.