



US006157721A

United States Patent [19]

[11] Patent Number: **6,157,721**

Shear et al.

[45] Date of Patent: **Dec. 5, 2000**

[54] **SYSTEMS AND METHODS USING CRYPTOGRAPHY TO PROTECT SECURE COMPUTING ENVIRONMENTS**

4,168,396 9/1979 Best .
4,196,310 4/1980 Forman et al. .

(List continued on next page.)

[75] Inventors: **Victor H. Shear**, Bethesda, Md.; **W. Olin Sibert**, Lexington, Mass.; **David M. Van Wie**, Sunnyvale, Calif.

FOREIGN PATENT DOCUMENTS

9 004 79 12/1984 Belgium .
0 84 441 7/1983 European Pat. Off. .
0128672 12/1984 European Pat. Off. .

(List continued on next page.)

[73] Assignee: **InterTrust Technologies Corp.**, Santa Clara, Calif.

OTHER PUBLICATIONS

[21] Appl. No.: **08/689,754**

Applications Requirements for Innovative Programming; How to Foster (or Cripple) Program Development Opportunities for Interactive Video Programs Delivered on Optical Media; A Challenge for the Introduction of DVD (Digital Video Disc) (Oct. 19–20, 1995, Sheraton Universal Hotel, Universal City CA).

(List continued on next page.)

[22] Filed: **Aug. 12, 1996**

[51] **Int. Cl.**⁷ **H04K 1/00**; H04L 9/00; G06F 11/30

[52] **U.S. Cl.** **380/255**; 380/251; 380/287; 713/155; 713/176; 713/180; 713/182; 713/194

[58] **Field of Search** 380/4, 23, 25, 380/49, 30, 255, 287, 251; 713/150–152, 155, 156, 164–170, 175–182, 189–191, 193, 200, 201, 194

[56] References Cited

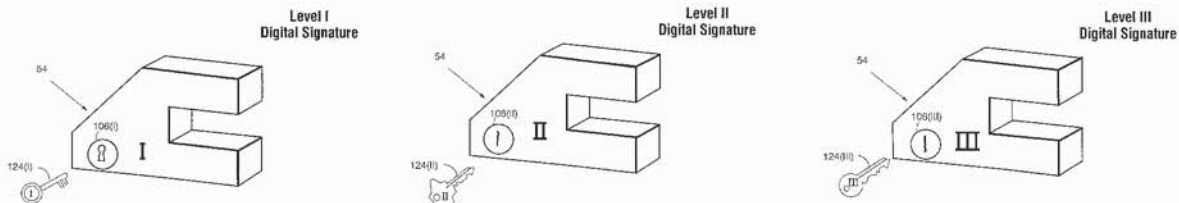
U.S. PATENT DOCUMENTS

- 3,573,747 4/1971 Adams et al. .
- 3,609,697 9/1971 Blevins .
- 3,796,830 3/1974 Smith .
- 3,798,359 3/1974 Feistel .
- 3,798,360 3/1974 Feistel .
- 3,798,605 3/1974 Feistel .
- 3,806,882 4/1974 Clarke .
- 3,829,833 8/1974 Freeny, Jr. .
- 3,906,448 9/1975 Henriques .
- 3,911,397 10/1975 Freeny, Jr. .
- 3,924,065 12/1975 Freeny, Jr. .
- 3,931,504 1/1976 Jacoby .
- 3,946,220 3/1976 Brobeck et al. .
- 3,956,615 5/1976 Anderson et al. .
- 3,958,081 5/1976 Ehrsam et al. .
- 3,970,992 7/1976 Boothroyd et al. .
- 4,048,619 9/1977 Forman, Jr. et al. .
- 4,071,911 1/1978 Mazur .
- 4,112,421 9/1978 Freeny, Jr. .
- 4,120,030 10/1978 Johnstone .
- 4,163,280 7/1979 Mori et al. .

[57] ABSTRACT

Secure computation environments are protected from bogus or rogue load modules, executables and other data elements through use of digital signatures, seals and certificates issued by a verifying authority. A verifying authority—which may be a trusted independent third party—tests the load modules or other executables to verify that their corresponding specifications are accurate and complete, and then digitally signs the load module or other executable based on tamper resistance work factor classification. Secure computation environments with different tamper resistance work factors use different verification digital signature authentication techniques (e.g., different signature algorithms and/or signature verification keys)—allowing one tamper resistance work factor environment to protect itself against load modules from another, different tamper resistance work factor environment. Several dissimilar digital signature algorithms may be used to reduce vulnerability from algorithm compromise, and subsets of multiple digital signatures may be used to reduce the scope of any specific compromise.

41 Claims, 15 Drawing Sheets



U.S. PATENT DOCUMENTS					
			4,757,534	7/1988	Matyas et al. .
			4,768,087	8/1988	Taub et al. .
			4,791,565	12/1988	Dunham et al. .
			4,796,181	1/1989	Wiedemer .
			4,799,156	1/1989	Shavit et al. .
			4,807,288	2/1989	Ugon et al. .
			4,817,140	3/1989	Chandra et al. .
			4,823,264	4/1989	Deming .
			4,827,508	5/1989	Shear .
			4,858,121	8/1989	Barber et al. .
			4,864,494	9/1989	Kobus .
			4,868,877	9/1989	Fischer .
			4,903,296	2/1990	Chandra et al. .
			4,924,378	5/1990	Hershey et al. .
			4,930,073	5/1990	Cina, Jr. 380/23 X
			4,949,187	8/1990	Cohen .
			4,977,594	12/1990	Shear .
			4,999,806	3/1991	Chernow et al. .
			5,001,752	3/1991	Fischer .
			5,005,122	4/1991	Griffin et al. .
			5,005,200	4/1991	Fischer .
			5,010,571	4/1991	Katznelson .
			5,023,907	6/1991	Johnson et al. .
			5,047,928	9/1991	Wiedemer .
			5,048,085	9/1991	Abraham et al. .
			5,050,213	9/1991	Shear .
			5,091,966	2/1992	Bloomberg et al. .
			5,103,392	4/1992	Mori .
			5,103,476	4/1992	Waite et al. .
			5,111,390	5/1992	Ketcham .
			5,119,493	6/1992	Janis et al. .
			5,126,936	6/1992	Champion et al. .
			5,128,525	7/1992	Stearns et al. .
			5,136,643	8/1992	Fischer .
			5,136,646	8/1992	Haber et al. .
			5,136,647	8/1992	Haber et al. .
			5,136,716	8/1992	Harvey et al. .
			5,146,575	9/1992	Nolan, Jr. .
			5,148,481	9/1992	Abraham et al. .
			5,155,680	10/1992	Wiedemer .
			5,168,147	12/1992	Bloomberg .
			5,185,717	2/1993	Mori .
			5,201,046	4/1993	Goldberg et al. .
			5,201,047	4/1993	Maki et al. .
			5,208,748	5/1993	Flores et al. .
			5,214,702	5/1993	Fischer .
			5,216,603	6/1993	Flores et al. .
			5,221,833	6/1993	Hecht .
			5,222,134	6/1993	Waite et al. .
			5,224,160	6/1993	Paulini et al. .
			5,224,163	6/1993	Gasser et al. .
			5,235,642	8/1993	Wobber et al. .
			5,241,671	8/1993	Reed et al. .
			5,245,165	9/1993	Zhang .
			5,247,575	9/1993	Sprague et al. .
			5,260,999	11/1993	Wyman .
			5,263,158	11/1993	Janis .
			5,265,164	11/1993	Matyas et al. .
			5,276,735	1/1994	Boebert et al. .
			5,280,479	1/1994	Mary .
			5,285,494	2/1994	Sprecher et al. .
			5,301,231	4/1994	Abraham et al. .
			5,311,591	5/1994	Fischer .
			5,319,705	6/1994	Halter et al. .
			5,335,169	8/1994	Chong .
			5,337,360	8/1994	Fischer .
			5,341,429	8/1994	Stringer et al. .
			5,343,527	8/1994	Moore .
			5,347,579	9/1994	Blandford .
			5,351,293	9/1994	Michener et al. .
			5,355,474	10/1994	Thuraisingham et al. .
			5,373,440	12/1994	Cohen et al. .

5,373,561	12/1994	Haber et al. .	5,732,398	3/1998	Tagawa .	
5,390,247	2/1995	Fischer .	5,740,549	4/1998	Reilly et al. .	
5,390,330	2/1995	Talati .	5,745,604	4/1998	Rhoads .	
5,392,220	2/1995	van den Hamer et al. .	5,748,763	5/1998	Rhoads .	
5,392,390	2/1995	Crozier .	5,748,783	5/1998	Rhoads .	
5,394,469	2/1995	Nagel et al. .	5,748,960	5/1998	Fischer .	
5,410,598	4/1995	Shear .	5,754,849	5/1998	Dyer et al. .	
5,412,717	5/1995	Fischer .	5,757,914	5/1998	McManis	380/23
5,418,713	5/1995	Allen .	5,758,152	5/1998	LeTourneau .	
5,421,006	5/1995	Jablon .	5,765,152	6/1998	Erickson .	
5,422,953	6/1995	Fischer .	5,768,426	6/1998	Rhoads .	
5,428,606	6/1995	Moskowitz .	5,774,872	6/1998	Golden et al. .	
5,438,508	8/1995	Wyman .	5,819,263	10/1998	Bromley et al. .	
5,442,645	8/1995	Ugon .	5,842,173	11/1998	Strum et al. .	
5,444,779	8/1995	Daniele .				
5,449,895	9/1995	Hecht et al. .				
5,449,896	9/1995	Hecht et al. .				
5,450,493	9/1995	Maher .	0135422	3/1985	European Pat. Off. .	
5,453,601	9/1995	Rosen .	0180460	5/1986	European Pat. Off. .	
5,453,605	9/1995	Hecht et al. .	0 370 146	11/1988	European Pat. Off. .	
5,455,407	10/1995	Rosen .	0399822A2	11/1990	European Pat. Off. .	
5,455,861	10/1995	Faucher et al. .	0421409A2	4/1991	European Pat. Off. .	
5,455,953	10/1995	Russell .	0 456 386 A2	11/1991	European Pat. Off. .	
5,457,746	10/1995	Dolphin .	0 469 864 A2	2/1992	European Pat. Off. .	
5,458,494	10/1995	Krohn et al. .	0 565 314 A2	10/1993	European Pat. Off. .	
5,463,565	10/1995	Cookson et al. .	0 593 305 A2	4/1994	European Pat. Off. .	
5,473,687	12/1995	Lipscomb et al. .	0 651 554 A1	5/1995	European Pat. Off. .	
5,473,692	12/1995	Davis .	0 668 695 A2	8/1995	European Pat. Off. .	
5,479,509	12/1995	Ugon .	0 695 985 A1	2/1996	European Pat. Off. .	
5,485,622	1/1996	Yamaki .	0 696 798 A1	2/1996	European Pat. Off. .	
5,491,800	2/1996	Goldsmith et al. .	0715243A1	6/1996	European Pat. Off. .	
5,497,479	3/1996	Hornbuckle .	0715244A1	6/1996	European Pat. Off. .	
5,497,491	3/1996	Mitchell et al. .	0715245A1	6/1996	European Pat. Off. .	
5,499,298	3/1996	Narasimhalu et al. .	0715246A1	6/1996	European Pat. Off. .	
5,504,757	4/1996	Cook et al. .	0715247A1	6/1996	European Pat. Off. .	
5,504,818	4/1996	Okano .	0 725 376	8/1996	European Pat. Off. .	
5,504,837	4/1996	Griffith et al. .	0749081A1	12/1996	European Pat. Off. .	
5,508,913	4/1996	Yamamoto et al. .	0 778 513 A2	6/1997	European Pat. Off. .	
5,509,070	4/1996	Schull .	0 795 873 A2	9/1997	European Pat. Off. .	
5,513,261	4/1996	Maher .	3803982A1	1/1990	Germany .	
5,530,235	6/1996	Stefik et al. .	57-726	5/1982	Japan .	
5,530,752	6/1996	Rubin .	62-241061	10/1987	Japan .	
5,533,123	7/1996	Force et al. .	1-068835	3/1989	Japan .	
5,534,975	7/1996	Stefik et al. .	64-68835	3/1989	Japan .	
5,535,322	7/1996	Hecht .	2-242352	9/1990	Japan .	
5,537,526	7/1996	Anderson et al. .	2-247763	10/1990	Japan .	
5,539,735	7/1996	Moskowitz .	2-294855	12/1990	Japan .	
5,539,828	7/1996	Davis .	4-369068	12/1992	Japan .	
5,550,971	8/1996	Brunner et al. .	5-181734	7/1993	Japan .	
5,553,282	9/1996	Parrish et al. .	5-257783	10/1993	Japan .	
5,557,518	9/1996	Rosen .	5-268415	10/1993	Japan .	
5,563,946	10/1996	Cooper et al. .	6-175794	6/1994	Japan .	
5,568,552	10/1996	Davis .	6-215010	8/1994	Japan .	
5,572,673	11/1996	Shurts .	6225059	8/1994	Japan .	
5,592,549	1/1997	Nagel et al. .	7-056794	3/1995	Japan .	
5,606,609	2/1997	Houser et al. .	7-084852	3/1995	Japan .	
5,613,004	3/1997	Cooperman et al. .	7-141138	6/1995	Japan .	
5,621,797	4/1997	Rosen .	7-200317	8/1995	Japan .	
5,629,980	5/1997	Stefik et al. .	7-200492	8/1995	Japan .	
5,633,932	5/1997	Davis et al. .	7-244639	9/1995	Japan .	
5,634,012	5/1997	Stefik et al. .	8-137795	5/1996	Japan .	
5,636,292	6/1997	Rhoads .	8-152990	6/1996	Japan .	
5,638,443	6/1997	Stefik .	8-185298	7/1996	Japan .	
5,638,504	6/1997	Scott et al. .	2136175	9/1984	United Kingdom .	
5,640,546	6/1997	Gopinath et al. .	2264796A	9/1993	United Kingdom .	
5,655,077	8/1997	Jones et al. .	2294348	4/1996	United Kingdom .	
5,687,236	11/1997	Moskowitz et al. .	2295947	6/1996	United Kingdom .	
5,689,587	11/1997	Bender et al. .	WO			
5,692,047	11/1997	McManis .	A8502310	5/1985	WIPO .	
5,692,180	11/1997	Lee .	WO 85/03584	8/1985	WIPO .	
5,710,834	1/1998	Rhoads .	WO 90/02382	3/1990	WIPO .	
5,715,403	2/1998	Stefik .	WO 92/06438	4/1992	WIPO .	
			WO 92/22870	12/1992	WIPO .	

FOREIGN PATENT DOCUMENTS

WO 93/01550	1/1993	WIPO .
WO 94/01821	1/1994	WIPO .
WO 94/03859	2/1994	WIPO .
WO 94/06103	3/1994	WIPO .
WO 94/16395	7/1994	WIPO .
WO 94/18620	8/1994	WIPO .
WO 94/22266	9/1994	WIPO .
WO 94/27406	11/1994	WIPO .
WO95/14289	5/1995	WIPO .
WO 96/00963	1/1996	WIPO .
WO 96/03835	2/1996	WIPO .
WO 96/05698	2/1996	WIPO .
WO 96/06503	2/1996	WIPO .
WO 96/13013	5/1996	WIPO .
WO 96/21192	7/1996	WIPO .
WO 97/03423	1/1997	WIPO .
WO97/07656	3/1997	WIPO .
WO97/32251	9/1997	WIPO .
WO 97/48203	12/1997	WIPO .

OTHER PUBLICATIONS

- Argent Information Q&A Sheet, <http://www.digital-watermark.com/>, Copyright 1995, The DICE Company, 7 pages.
- Arneke, David, et al., News Release, AT&T, Jan. 9, 1995, AT&T encryption system protects information services, 1 page.
- AT&T Technology*, vol. 9, No. 4, New Products, Systems and Services, pp. 16-19.
- Baggett, Claude, Cable's Emerging Role in the Information Superhighway, Cable Labs, 13 slides.
- Barassi, Theodore Sedgwick, Esq., The Cybernotary: Public Key Registration and Certification and Authentication of International Legal Transactions, 4 pages.
- Barnes, Hugh, memo to Henry LaMuth, subject: George Gilder articles, May 31, 1994.
- Bart, Dan, Comments in the Matter of Public Hearing and Request for Comments on the International Aspects of the National Information Infrastructure, Aug. 12, 1994.
- Baum, Michael, Worldwide Electronic Commerce: Law, Policy and Controls Conference, program details, Nov. 11, 1993.
- Bisbey, II et al., Encapsulation: An Approach to Operating System Security, Oct. 1973, pp. 666-675.
- Blom et al., Encryption Methods in Data Networks, Ericsson Technics, No. 2, 1978, Stockholm, Sweden.
- Bruner, Rick E., PowerAgent, NetBot help advertisers reach Internet shoppers, Aug. 1997 (Document from Internet).
- Cable Television and America's Telecommunications Infrastructure, National Cable Television Association, Apr. 1993.
- Caruso, Technology, Digital Commerce 2 plans for watermarks, which can bind proof of authorship to electronic works, New York Times (Aug. 1995).
- CD ROM, Introducing . . . The Workflow CD-ROM Sampler, Creative Networks, MCIMail: Creative Networks, Inc., Pala Alto, California.
- Choudhury, et al., Copyright Protection for Electronic Publishing over Computer Networks, AT&T Bell.
- Laboratoires, Murray Hill, New Jersey 07974 (Jun. 1994).
- Clark, Tim, Ad service gives cash back, www.news.com, Aug. 4, 1997, 2 pages (Document from Internet).
- Codercard, Spec Sheet—Basic Coder Subsystem, No date given.
- Communications of the ACM, Intelligent Agents, Jul. 1994, vol. 37, No. 7.
- Communications of the ACM, Jun. 1996, vol. 39, No. 6.
- Computer Systems Policy Project (CSSP), Perspectives on the National Information Infrastructure: Ensuring Interoperability (Feb. 1994), February 1994.
- Cunningham, Donna, et al., News Release, AT&T, Jan. 31, 1995, AT&T, VLSI Technology join to improve info high-way security, 3 pages.
- Data Sheet, About the Digital Notary Service, Surety Technologies, Inc., 1994-95, 6 pages.
- Dempsey, et al., *D-Lib Magazine*, Jul./Aug. 1996 The Warwick Metadata Workshop: A Framework for the Deployment of Resource Description, Jul. 15, 1966.
- Denning et al., Data Security, 11 Computing Surveys No. 3, Sep. 1979.
- Diffie, Whitfield and Martin E. Hellman, IEEE Transactions on Information Theory, vol. 22, No. 6, Nov. 1976, New Directions in Cryptography, pp. 644-651.
- Diffie, Whitfield and Martin E. Hellman, Proceedings of the IEEE, vol. 67, No. 3, Mar. 1979, Privacy and Authentication: An Introduction to Cryptography, pp. 397-427.
- Digest of Papers, VLSI: New Architectural Horizons, Feb. 1980, Preventing Software Piracy With Crypto-Microprocessors, Robert M. Best, pp. 466-469.
- DiscStore* (Electronic Publishing Resources 1991).
- Document from Internet, cgi@ncsa.uiuc.edu, CGI Common Gateway Interface, 1 page, 1996.
- DSP56000/DSP56001 Digital Signal Processor User's Manual, Motorola, 1990, pp. 2-2.
- Dusse, Stephen R. and Burton S. Kaliski A Cryptographic Library for the Motorola 56000 in Damgard, I.M., Advances in Cryptology—Proceedings Eurocrypt 90, Springer-Verlag, 1991, pp. 230-244.
- Dyson, Esther, Intellectual Value, *Wired Magazine*, Jul. 1995, pp. 136-141 and 182-184.
- Effector Online vol. 6 No. 6, A Publication of the Electronic Frontier Foundation, 8 pages, Dec. 6, 1993.
- EIA and TIA White Paper on National Information Infrastructure, published by the Electronic Industries Association and the Telecommunications Industry Association, Washington, D.C., no date.
- Electronic Currency Requirements, XIWT (Cross Industry Working Group), no date.
- Electronic Publishing Resources Inc. Protecting Electronically Published Properties Increasing Publishing Profits (Electronic Publishing Resources 1991).
- Firefly Network, Inc., www.fly.com, What is Firefly? Firefly revision: 41.4 Copyright 1995, 1996.
- First CII Honeywell Bull International Symposium on Computer Security and Confidentiality, Jan. 26-28, 1981, Conference Text, pp. 1-21.
- Framework for National Information Infrastructure Services, Draft, U.S. Department of Commerce, Jul. 1994.
- Framework for National Information Infrastructure Services, NIST, Jul. 1994, 12 slides.
- Garcia, D. Linda, testimony before a hearing on science, space and technology, May 26, 1994.
- Gleick, James, "Dead as a Dollar" *The New York Times Magazine*, Jun. 16, 1996, Section 6, pp. 26-30, 35, 42, 50, 54.
- Green paper, Intellectual Property and the National Information Infrastructure, a Preliminary Draft of the Report of the Working Group on Intellectual Property Rights, Jul. 1994.
- Greguras, Fred, Softic Symposium '95, Copyright Clearances and Moral Rights, Nov. 30, 1995 (as updated Dec. 11, 1995), 3 pages.

- Guillou, L.: Smart Cards and Conditional Access, pp. 480–490 *Advances in Cryptography, Proceedings of Euro-Crypt 84* (Beth et al, Ed., Springer-Verlag 1985).
- Harman, Harry H., *Modern Factor Analysis*, Third Edition Revised, University of Chicago Press Chicago and London, Third revision published 1976.
- Herzberg, Amir et al., Public Protection of Software, *ACM Transactions on Computer Systems*, vol. 5, No. 4, Nov. 1987, pp. 371–393.
- Hofmann, Jud, Interfacing the NII to User Homes, Electronic Industries Association, Consumer Electronic Bus Committee, 14 slides, no date.
- Holt, Stannie, Start-up promises user confidentiality in Web marketing service, Info World Electric, Aug. 13, 1997 (Document from Internet).
- IBM Technical Disclosure Bulletin, Multimedia Mixed Object Envelopes Supporting a Graduated Fee Scheme via Encryption, vol. 37, No. 03, Mar. 1994, Armonk, NY.
- IBM Technical Disclosure Bulletin, Transformer Rules for Software Distribution Mechanism—Support Products, vol. 37, No. 04B, Arp. 1994, Armonk, NY.
- IISP Break Out Session Report for Group No. 3, Standards Development and Tracking Systems, no date.
- Information Infrastructure Standards Panel: NII 'The Information Superhighway', Nations Bank—HGDeal—ASC X9, 15 pages.
- Invoice? What is an Invoice? *Business Week*, Jun. 10, 1996.
- Jiang, et al, A concept-Based Approach to Retrieval from an Electronic Industrial Directory, *International Journal of Electronic Commerce*, vol. 1, No. 1, Fall 1996, pp. 51–72.
- Jones, Debra, Top Tech Stories, PowerAgent Introduces First Internet 'Infomediary' to Empower and Protect Consumers, Aug. 13, 1997 3 pages (Document from Internet).
- Kelly, Kevin, Whole Earth Review, E-Money, pp. 40–59, Summer 1993.
- Kent, Protecting Externally Supplied Software In Small Computers (MIT/LCS/TR-255 Sep. 1980).
- Kohntopp, M., Sag's durch die Blume, Apr. 1996, marit@schulung.netuse.de.
- Kristol et al., Anonymous Internet Mercantile Protocol, AT&T Bell Laboratories, Murray Hill, New Jersey, Draft: Mar. 17, 1994.
- Lagoze, Carl, *D-Lib Magazine*, Jul./Aug. 1996, The Warwick Framework, A Container Architecture for Diverse Sets of Metadata.
- Lanza, Mike, electronic mail, George Gilder's Fifth Article—Digital Darkhorse—Newspapers, Feb. 21, 1994.
- Levy, Steven, Wired, E-Money, That's What I Want, 10 pages, Dec. 1994.
- Low et al., Anonymous Credit Cards and its Collusion Analysis, AT&T Bell Laboratories, Murray Hill, New Jersey, Oct. 10, 1994.
- Low et al., Anonymous Credit Cards, AT&T Bell Laboratories, Proceedings of the 2nd ACM Conference on Computer and Communications Security, Fairfax, Virginia, Nov. 2–4, 1994.
- Low et al., Document Marking and Identification using both Line and Word Shifting, AT&T Bell Laboratories, Murray Hill, New Jersey, Jul. 29, 1994.
- Maclachlan, Malcolm, PowerAgent Debuts Spam-Free Marketing, *TechWire*, Aug. 13, 1997, 3 pages (Document from Internet).
- Maxemchuk, Electronic Document Distribution, AT&T Bell Laboratories, Murray Hill, New Jersey 07974.
- Micro Card—Micro Card Technologies, Inc., Dallas, Texas, No date given.
- Milbrandt, E., Stenography Info and Archive, 1996.
- Mori, Ryoichi and Masaji Kawahara, The Transactions of the EIEICE, V, Superdistribution: The Concept and the Architecture, E73 (Jul. 1990), No. 7, Tokyo, Japan.
- Mossberg, Walter S., Personal Technology, Threats to Privacy On-Line Become More Worrysome, *Wall Street Journal*, Oct. 24, 1996.
- Negroponte, Electronic Word of Mouth, *Wired* Oct. 1996, p. 218.
- Negroponte, Nicholas, Telecommunications, Some Thoughts on Likely and expected Communications scenarios: A Rebuttal, pp. 41–42, Jan. 1993.
- Neumann, et al., A Provably Secure Operating System: The System, Its Applications, and Proofs, Computer Science Laboratory Report CSL-116, Second Edition, SRI International (May 1980).
- News Release, Premenos Announces Templar 2.0—Next Generation Software for Secure Internet EDI, webmaster@templar.net, 1 page, Jan. 17, 1996.
- News Release, The Document Company Xerox, Xerox Announces Software Kit for Creating Working Documents with Dataglyphs, Nov. 6, 1995, Minneapolis, MN, 13 pages.
- News Release, The White House, Office of the President, Background on the Administration's Telecommunications Policy Reform Initiative, Jan. 11, 1994.
- NII, Architecture Requirements, XIWT, no date.
- Open System Environment Architectural Framework for National Information Infrastructure Services and Standards, in Support of National Class Distributed Systems, Distributed System Engineering Program Sponsor Group, Draft 1.0, Aug. 5, 1994.
- Pelton, Dr. Joseph N., Telecommunications, Why Nicholas Negroponte is Wrong About the Future of Telecommunications, pp. 35–40, Jan. 1993.
- Portland Software's ZipLock, Internet information, Copyright Portland Software 1996–1997, 12 pages.
- PowerAgent Inc., Proper Use of Consumer Information on the Internet White Paper, Jun. 1997, Document from Internet, 9 pages (Document from Internet).
- PowerAgent Press Releases, What the Experts are Reporting on PowerAgent, Aug. 13, 1997, 6 pages (Document from Internet).
- PowerAgent Press Releases, What the Experts are Reporting on PowerAgent, Aug. 4, 1997, 5 pages (Document from Internet).
- PowerAgent Press Releases, What the Experts are Reporting on PowerAgent, Aug. 13, 1997, 3 pages (Document from Internet).
- Premenos Corp. White Paper: The Future of Electronic Commerce, A Supplement to Midrange Systems, Internet webmaster@premenos.com, 4 pages.
- Press Release, National Semiconductor and EPR Partner For Information Metering/Data Security Cards (Mar. 4, 1994).
- Rankine, G., Thomas—A Complete Single-Chip RSA Device, *Advances in Cryptography, Proceedings of Crypto 86*, pp. 480–487 (A.M. Odlyzko Ed., Springer-Verlag 1987).
- Reilly, Arthur K., Standards committee T1—Telecommunications, Input to the 'International Telecommunications Hearings,' Panel 1: Component Technologies of the NII/GII, no date.
- Resnick, et al., Recommender Systems, *Communications of the ACM*, vol. 40, No. 3, Mar. 1997, pp. 56–80.

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.