

References

1. <http://www.ebay.com>
2. <http://www.paypal.com>
3. <http://www.ipswitch.com/Products/WhatsUp/>
4. <http://www.gnutella.com>
5. <http://freenet.sourceforge.net>
6. <http://www.jxta.org>
7. <http://www.gnunet.org>
8. Arma international. <http://www.arma.org>
9. Bbb dispute resolution. <http://www.dr.bbb.org>
10. e-Government eEurope 2005.
11. i2010 initiative. http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm
12. JSR 219: Foundation Profile 1.1. <http://jcp.org/en/jsr/detail?id=219>
13. kXML. <http://kxml.sourceforge.net>
14. Ltans-charter. URL <http://www.ietf.org/html.charters/>
15. Mobile Information Device Profile. <http://java.sun.com/products/midp/>
16. Statistical office of the european communities. <http://epp.eurostat.ec.europa.eu/>
17. The Legion of the Bouncy Castle. <http://www.bouncycastle.org>
18. The us national archives electronic records archives (era). <http://www.archives.gov/era>
19. 3-D Secure Team: 3-D Secure impementation Guide. Visa Internatitonal Service Association, 1.0.2 edn. (2004)
20. Adar, E., Huberman, B.: Free riding on gnutella (2000). URL citeseer.nj.nec.com/adar00free.html
21. Anantharaman, L., Bao, F.: An efficient and practical peer-to-peer e-payment system (2002). Manuscript
22. Antoniadis, P., Courcoubetis, C.: Market models for P2P content distribution. In: AP2PC'02 (2002)
23. Asokan, N.: Fairness in electronic commerce. Ph.D. thesis, University of Waterloo, Computer Science (1998)
24. Asokan, N., Baum-Waidner, B., Schunter, M., Waidner, M.: Optimistic synchronous multi-party contract signing. Tech. Rep. RZ 3089, IBM Zurich Research Lab (1998)
25. Asokan, N., Janson, P.A., Steiner, M., Waidner, M.: The state of the art in electronic payment systems. *IEEE Computer* **30**(9), 28–35 (1997)
26. Asokan, N., Schunter, M., Waidner, M.: Optimistic protocols for multi-party fair exchange. Tech. Rep. RZ 2892 (# 90840), IBM, Zurich Research Laboratory (1996)
27. Asokan, N., Schunter, M., Waidner, M.: Optimistic protocols for fair exchange. In: Proceedings of the 4th ACM Conference on Computer and Communications Security, pp. 7–17. ACM Press (1997). DOI <http://doi.acm.org/10.1145/266420.266426>

28. Asokan, N., Shoup, V., Waidner, M.: Optimistic fair exchange of digital signatures. *IEEE J. Sel. Area. Comm.* **18**(4), 593–610 (2000). URL citeseer.nj.nec.com/asokan98optimistic.html
29. Ateniese, G., de Medeiros, B., Goodrich, M.T.: TRICERT: A distributed certified E-mail scheme. In: *Network and Distributed System Security Symposium Conference Proceedings* (2001)
30. Banks, J., Carson, J., Nelson, B., D.Nicol: *Discrete-event system simulation*. Prentice Hall (2000)
31. Bao, F., Deng, R., Mao, W.: Efficient and practical fair exchange protocols with off-line ttp. In: *IEEE Symposium on Security and Privacy*, pp. 77–85. IEEE (1998)
32. Bao, F., Deng, R., Nguyen, K., Varadharajan, V.: Multi-party fair exchange with an off-line trusted neutral party. In: *Database and Expert Systems Applications, 1999. Proceedings. Tenth International Workshop on*, pp. 858–862 (1999)
33. Bao, F., Deng, R., Zhou, J.: Electronic payment systems with fair on-line verification. In: *IFIP TC11 16th Annual Working Conference on Information Security: Information Security for Global Information Infrastructures*, pp. 451 – 460. IFIP TC11, Kluwer Academic Publishers (2000)
34. Baum-Waidner, B.: Optimistic asynchronous multi-party contract signing with reduced number of rounds. In: F. Orejas, P. Spirakis, J.V. Leeuwen (eds.) *Automata, Languages and Programming*, pp. 898–911. 28th International Colloquium, ICALP 2001, Springer-Verlag (2001)
35. Baum-Waidner, B., Waidner, M.: Optimistic asynchronous multi-party contract signing. Tech. Rep. RZ 3078, IBM Zurich Research Lab (1998)
36. Baum-Waidner, B., Waidner, M.: Round-optimal and abuse-free multi-party contract signing. In: *27th International Colloquium on Automata, Languages and Programming, LNCS*, vol. 1853, pp. 524–535. Springer (2000)
37. Ben-Or, M., Goldreich, O., Micali, S., Rivest, R.: A fair protocol for signing contracts. In: *IEEE Transactions on Information Theory*, vol. 36, pp. 40–46 (1990)
38. Blum, M.: Three applications of the oblivious transfer: Part i: Coin flipping by telephone; part ii: How to exchange secrets; part iii: How to send certified electronic mail. Tech. rep., Department of EECS, University of California (1981)
39. Boly, J.P., Bosselaers, A., Cramer, R., Michelsen, R., Mjolsnes, S.F., Muller, F., Pedersen, T.P., Pfitzmann, B., de Rooij, P., Schoenmakers, B., Schunter, M., Vallee, L., Waidner, M.: The ESPRIT project CAFE - high security digital payment systems. In: *ESORICS*, pp. 217–230 (1994)
40. Bradner, S.: Rfc 2119. key words for use in rfcs to indicate requirement levels (1997)
41. Brannigan, C.: Beyond e-commerce: Expanding the potential of Online Dispute Resolution. *Interaction* **16**(4), 15–17 (2004)
42. Carbonell, M., Onieva, J.A., Lopez, J., Zhou, J.: Timeout estimation using a simulation model for non-repudiation protocols. In: *Fourth International Conference on Computational Science and Its Applications ICCSA, LNCS*, vol. 3043, pp. 903–914. Springer (2004)
43. Chadha, R., Kremer, S., Scedrov, A.: Formal analysis of multi-party contract signing. In: *Proceedings of the 17th IEEE Computer Security Foundations Workshop (CSFW'04)*, pp. 266–279. IEEE Computer Society Press (2004)
44. Cheng, J.S., Wei, V.K.: Defenses against the truncation of computation results of free-roaming agents. In: *Fourth International Conference on Information and Communications Security, LNCS*, vol. 2513, pp. 1–12 (2002)
45. Chiou, G., Chen, W.: Secure broadcasting using the secure lock. *IEEE Transaction on Software Engineering* **15**(8), 929–934 (1989)
46. Damiani, E., Vimercati, S.C.D., Paraboschi, S., Samarati, P., Violante, F.: A reputation-based approach for choosing reliable resources in peer-to-peer networks. In: V. Atluri (ed.) *Computer and Communications Security*, pp. 207–216. ACM (2002)
47. DeMillo, R.A., Merritt, M.: Protocols for data security. *IEEE Computer* **16**, 39–50 (1983)

48. Dumortier, J., Kelm, S., Nilsson, H., Skouma, G., Eecke, P.V.: The legal and market aspects of electronic signatures. Study for the european comission - dg information society, Interdisciplinary centre for Law & Information Technology, Leuven Universiteit (2003)
49. E-Arbitration-T: Online arbitration: What technology can do for arbitral institutions. Seminar (2003)
50. ElGamal, T.: A public-key cryptosystem and a signature scheme based on discrete logarithms. In: IEEE Transactions on Information Theory, vol. IT-31, pp. 469–472 (1985)
51. Eschenauer, L., Gligor, V.D., Baras, J.: On trust establishment in mobile ad-hoc networks (2002). Submitted for publication 2002
52. EU Information Society: DIRECTIVE 1999/93/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (1999)
53. Even, S., Goldreich, O., Lempel, A.: A randomized protocol for signing contracts. In: Communications of the ACM, vol. 28, pp. 637–647 (1985)
54. Ezhilchelvan, P., Shrivastava, S.: A family of trusted third party based fair-exchange protocols. IEEE T. Depend. Secure. **2**(4), 273–286 (2005)
55. Federal Information, N.B.o.S.: Data encryption standard (des). Tech. Rep. fips-46-3, NIST (1999)
56. Federal Information, N.B.o.S.: Advanced encryption standard (aes). Tech. Rep. fips-197, NIST (2001)
57. Ferrer-Gomila, J.L., Payeras-Capellà, M., Huguet-Rotger, L.: Efficient optimistic n-party contract signing protocol. In: Proceedings of the 4th International Conference on Information Security, pp. 394–407. Springer-Verlag (2001)
58. Ferrer-Gomila, J.L., Payeras-Capellà, M., Huguet-Rotger, L.: A realistic protocol for multi-party certified electronic mail. In: Information Security ISC 2002, LNCS, vol. 2433, pp. 210–219 (2002)
59. Ferrer-Gomila, J.L., Payeras-Capellà, M., Huguet-Rotger, L.: Optimality in asynchronous contract signing protocols. In: 1st International Conference on Trust and Privacy in Digital Business, vol. 3184, pp. 200–208. Springer-Verlag (2004)
60. Franklin, M., Tsudik, G.: Secure group barter: Multi-party fair exchange with semi-trusted neutral parties. In: Proceedings of Financial Cryptography 1998, *Lecture Notes in Computer Science*, vol. 1465, pp. 90–102. Springer (1998)
61. Garay, J.A., MacKenzie, P.D.: Abuse-free multi-party contract signing. In: Proceedings of the 13th International Symposium on Distributed Computing, pp. 151–165. Springer-Verlag (1999)
62. Golle, P., Leyton-Brown, K., Mironov, I.: Incentives for sharing in peer-to-peer networks. In: EC '01: Proceedings of the 3rd ACM conference on Electronic Commerce, pp. 264–267. ACM Press (2001). DOI <http://doi.acm.org/10.1145/501158.501193>
63. Gondrom, T., Brandner, R., Pordesch, U.: Evidence Record Syntax (ERS). RFC 4998 (Proposed Standard) (2007). URL <http://www.ietf.org/rfc/rfc4998.txt>
64. González-Deleito, N.: Trust relationships in exchange protocols. Ph.D. thesis, Faculté des Sciences, Université Libre de Bruxelles (2005)
65. González-Deleito, N., Markowitch, O.: An optimistic multi-party fair exchange protocol with reduced trust requirements. In: Proceedings of the 4th International Conference on Information Security and Cryptology, *Lecture Notes in Computer Science*, vol. 2288, pp. 258–267. Springer-Verlag (2001)
66. González-Deleito, N., Markowitch, O.: Exclusion-freeness in multi-party exchange protocols. In: Lecture Notes in Computer Sciences, pp. 200–209. 5th International Conference on Information Security (ISC 2002), Springer-Verlag (2002)
67. Guillou, L.C., Quisquater, J.: A paradoxical indentity-based signature scheme resulting from zero-knowledge. In: Advances in Cryptology, LNCS, vol. 403, pp. 216–231. Springer (1988)
68. Gürgens, S., Rudolph, C.: Security analysis of (un-) fair non-repudiation protocols. In: Formal Aspects of Security, LNCS, vol. 2629, pp. 99–114. Spinger-Verlag (2002)
69. Haber, S., Kaliski, B., Stornetta, S.: How do digital time-stamps support digital signatures? Cryptobytes Newsletter **1**(3), 14–15 (1995)

70. Horne, B., Pinkas, B., Sander, T.: Escrow services and incentives in peer-to-peer networks. In: Proceedings of the 3rd ACM conference on Electronic Commerce, pp. 85–94. ACM Press (2001). DOI <http://doi.acm.org/10.1145/501158.501168>
71. International, M.: MasterCard SecureCode Merchant Implementation Guide. MasterCard International Incorporated (2004)
72. ISO/IEC: 1st WD 13888-2. Non-repudiation using a symmetric key algorithm. JTC1/SC27/WG2 N83 (1991)
73. ISO/IEC: DIS 10181-4. Information technology - Open systems interconnection - Security frameworks in open systems - Part 4: Non-repudiation (1996)
74. ISO/IEC: 2nd CD 13888-3. Information technology - Security techniques - Non-repudiation - Part 3: Using asymmetric techniques. JTC1/SC27 N1379 (1997)
75. ISO/IEC: 3rd CD 13888-2. Information technology - Security techniques - Non-repudiation - Part 2: Using symmetric encipherment algorithms. JTC1/SC27 N1276 (1998)
76. ISO/IEC: 13888-1. Information technology - Security techniques - Non-repudiation - Part 1: General model. JTC1/SC27 (2004)
77. ITU-T: Information technology - Open Systems Interconnection - The Directory: Overview of concepts, models and services (1997)
78. ITU-T: Security architecture for systems providing end to end communications (2003)
79. ITU-T: Security in Telecommunications and Information Technology (2006)
80. ITU-T X.509: Information technology - Open Systems Interconnection - The Directory: Public-key and attribute certificate frameworks (2000)
81. ITU-T X.813: Information technology - Open Systems Interconnection - Security frameworks for open systems: Non-repudiation framework (1996)
82. Jakobsson, M.: Mini-cash: a minimalistic approach to e-commerce. In: Proceedings of PKC'99, *LNCS*, vol. 1560, pp. 122–135. Springer (1999)
83. Karjoth, G., Asokan, N., Gülcü, C.: Protecting the computation results of free-roaming agents. In: Mobile Agents, *LNCS*, vol. 1477, pp. 195–207 (1998)
84. Karjoth, G., Posegga, J.: Mobile agents and telcos' nightmares. *Tech. Rep.* 55(7/8):29–41, IBM (2000)
85. Ketchpel, S., Garcia-Molina, H.: Distributed commerce transactions. *Tech. rep.*, Stanford University, Computer Science Department (1997)
86. Khill I. and Kim, J., Han, I., Ryou, J.: Multi-party fair exchange protocol using ring architecture model. *Computers & Security* **20**(5), 422–439 (2001)
87. Kremer, S., Markowitch, O.: A multi-party non-repudiation protocol. In: Proceedings of SEC 2000: 15th International Conference on Information Security, pp. 271–280. IFIP World Computer Congress (2000)
88. Kremer, S., Markowitch, O.: Optimistic non-repudiable information exchange. In: J. Biemond, editor, 21st Symp. on Information Theory in the Benelux, pp. 139–146. *Werkge-meenschap Informatie- en Communicatietheorie* (2000)
89. Kremer, S., Markowitch, O.: Fair multi-party non-repudiation protocols. *International Journal of Information Security* **1**(4), 223 – 235 (2003)
90. Kremer, S., Markowitch, O., Zhou, J.: An intensive survey of fair non-repudiation protocols. *Computer Communications* **25**(17), 1606–1621 (2002)
91. Liew, C.C., Ng, W.K., Lim, E.P., Tan, B.S., Ong, K.L.: Non-repudiation in an agent-based electronic commerce system. In: Proceedings of 1999 DEXA International Workshop on Electronic Commerce and Security, pp. 864–868. Florence, Italy (1999)
92. Lindell, Y.: Composition of Secure Multi-Party Protocols. Springer (2003)
93. Lopez, J.: Diseño de una Infraestructura de Notarización para Comercio Electrónico. Ph.D. thesis, E.T.S.I. Informática, Malaga, Spain (2000)
94. Mao, W.: Modern Cryptography: Theory and Practice. Hewlett-Packard Books (2004)
95. Markowitch, O., Gollmann, D., Kremer, S.: On fairness in exchange protocols. In: Springer-Verlag (ed.) 5th International Conference on Information Security and Cryptology, *LNCS*, vol. 2587, pp. 451–464 (2002)

96. Markowitch, O., Kremer, S.: A multi-party optimistic non-repudiation protocol. In: Proceedings of 3rd International Conference on Information Security and Cryptology, *LNCS*, vol. 2015, pp. 109–122. Springer-Verlag (2000)
97. Markowitch, O., Roggeman, Y.: Probabilistic non-repudiation without trusted third party. In: Second Workshop on Security in Communication Network 99 (1999). URL citeseer.nj.nec.com/markowitch99probabilistic.html
98. Markowitch, O., Saeednia, S.: Optimistic fair-exchange with transparent signature recovery. In: Proceedings of Financial Cryptography 2001, *LNCS*, vol. 2339, pp. 339–350. Springer-Verlag (2001)
99. Massias, H., Quisquater, J.: Time and cryptography. Tech. rep., Project Timesec Digital Timestamping and the Evaluation of Security Primitives (1997)
100. Maurer, U.: New approaches to digital evidence. In: Proceedings of the IEEE, vol. 92, pp. 933–947. IEEE (2004)
101. Menezes, A.J., Oorschot, P.C.V., Vanstone, S.A.: Handbook of Applied Cryptography, 5 edn. CRC Press (1996)
102. Micali, S.: Simple and fast optimistic protocols for fair electronic exchange. In: Proceedings of the twenty-second annual symposium on Principles of distributed computing, pp. 12–19. ACM Press (2003). DOI <http://doi.acm.org/10.1145/872035.872038>
103. Mills, D.L.: Network time protocol (version 3) specification, implementation and analysis. Tech. Rep. RFC 1305, IETF Working Group (1992)
104. Mullen, T., Wellman, M.: The auction manager: Market middleware for large-scale electronic commerce. In: Proceedings of the 3rd USENIX Workshop on Electronic Commerce, pp. 37–48. Boston, Massachusetts (1998)
105. Onieva, J.A., Zhou, J., Lopez, J.: Practical service charge for P2P content distribution. In: Proceedings of 2003 Fifth International Conference on Information and Communications Security, *LNCS*, vol. 2836, pp. 112 – 123 (2003)
106. Onieva, J.A., Zhou, J., Lopez, J.: Non-repudiation protocols for multiple entities. *Computer Communications* **27**(16), 0140-3664 (2004)
107. Onieva, J.A., Zhou, J., Lopez, J.: Attacking an asynchronous multi-party contract signing protocol. In: Proceedings of 6th International Conference on Cryptology in India, *LNCS*, vol. 3797, pp. 311–321. Springer (2005)
108. Onieva, J.A., Zhou, J., Lopez, J., Carbonell, M.: Agent-mediated non-repudiation protocols. *Electronic Commerce Research and Applications* **3**(2), 1567-4223 (2004)
109. Open Mobile Alliance: DRM Specification, 2 edn. (2006)
110. Pancho-Festin, S., Gollmann, D.: On the formal analyses of the zhou-gollmann non-repudiation protocol. In: Formal Aspects in Security and Trust, pp. 5–15 (2005)
111. Peterson, M.: The coming archive crisis. Tech. rep., Storage Networking Industry Association (SNIA) (2006)
112. Pfitzmann, B., Schunter, M., Waidner, M.: Optimal efficiency of optimistic contract signing. In: Proceedings of the seventeenth annual ACM symposium on Principles of distributed computing, pp. 113–122. ACM Press (1998). DOI <http://doi.acm.org/10.1145/277697.277717>
113. Rajput, W.E.: E-Commerce Systems Architecture and Applications. Artech House (2000)
114. Rivest, R.L., Shamir, A.: Password and micromint: Two simple micropayment schemes. In: Security Protocols Workshop, pp. 69–87 (1996)
115. Robinson, N.: Handbook of Legislative Procedures of Computer and Network Misuse in EU Countries. RAND Europe, Brussels (2003). Study for the European Commission Directorate-General Information Society (2002)
116. Roth, V.: Programming satan’s agents. *Electr. Notes Theor. Comput. Sci.* **63**, 1–16 (2001)
117. Sander, T., Tschudin, C.F.: Protecting mobile agents against malicious hosts. In: Mobile Agents and Security, *LNCS*, vol. 1419, pp. 44–60 (1998)
118. Schneider, S.: Formal analysis of a non-repudiation protocol. In: 11th Computer Security Foundations Workshop (1998)
119. Senate, of Representatives, H.: Public law 107347dec. 17 2002 (2002)

120. Shao, M.H., Zhou, J., Wang, G.: On the security of a certified e-mail scheme with temporal authentication. In: Proceedings of 2005 ICCSA Workshop on Internet Communications Security, vol. 3482, pp. 701–710. Springer (2005)
121. Sherif, M.H.: Protocols for Secure Electronic Commerce. CRC Press (2000)
122. Smith, R.E.: Internet Cryptography. Addison-Wesley (1997)
123. Tackén, J., Flake, S., Zoth, C.: Mobile DRM in pervasive networking environments. In: Workshop on Trust and Security in Pervasive Networking, Pervasivetrust 2005, p. N.A. IEEE (2005)
124. Verhoest, P., Hawkins, R., Desruelle, P., Martínez, C., Lopez-Bassols, V., Vickery, G.: Electronic business networks: An assessment of the dynamics of b2b electronic commerce in eleven oecd countries. Tech. rep., IPTS (2003)
125. Wallace, C., Pordesch, U., Brandner, R.: Long-Term Archive Service Requirements. RFC 4810 (Informational) (2007). URL <http://www.ietf.org/rfc/rfc4810.txt>
126. Walpole, R.E., Myers, R.H.: Probabilidad y estadística, Fourth edn. McGraw-Hill (1994)
127. Wang, X., Yu, H.: How to break MD5 and other hash functions. In: R. Cramer (ed.) Advances in Cryptology, *Lecture Notes in Computer Science*, vol. 3494, pp. 19–35. EUROCRYPT, Springer (2005)
128. Yee, B.S.: A sanctuary for mobile agents. In: Secure Internet Programming, pp. 261–273 (1999)
129. Zhou, J.: Non-repudiation in electronic commerce. Computer Security Series. Artech House (2001)
130. Zhou, J.: On the security of a multi-party certified email protocol. In: Information and Communications Security: 6th International Conference, vol. 3269, pp. 40–52 (2004)
131. Zhou, J., Deng, R.: On the validity of digital signatures. ACM SIGCOMM Computer Communication Review **30**(2), 29–34 (2000). DOI <http://doi.acm.org/10.1145/505680.505684>
132. Zhou, J., Gollmann, D.: A fair non-repudiation protocol. In: Proceedings of IEEE Symposium on Security and Privacy, pp. 55–61. IEEE Computer Society Press (1996)
133. Zhou, J., Gollmann, D.: An efficient non-repudiation protocol. In: PCSFW: Proceedings of The 10th Computer Security Foundations Workshop, pp. 126–132. IEEE Computer Society Press (1997). URL citeseer.nj.nec.com/article/zhou97efficient.html
134. Zhou, J., Lam, K.: Undeniable billing in mobile communication. In: Proceedings of the 4th Annual ACM/IEEE International Conference on Mobile Computing and Networking, pp. 284–290 (1998)
135. Zhou, J., Onieva, J.A., Lopez, J.: Optimised multi-party certified email protocols. Information Management & Computer Security Journal **13**(5), 350–366 (2005)
136. Zhou, J., Onieva, J.A., Lopez, J.: A synchronous multi-party contract signing protocol improving lower bound of steps. In: 21st IFIP International Information Security Conference Security and Privacy in Dynamic Environments, *IFIP*, vol. 201, pp. 221–232. IFIP SEC, Springer (2006)

Index

Symbols

1-N MPNR application 47

A

AAA 73
abuse-free 44
Access Control 9
acronyms, list of xv
active attack 56
active-time limit 41
adjudicator, arbitrator 22
agent 74
anonymity 133, 146
asymmetric encryption 55
asynchronous protocol 53
asynchronous timeliness 39, 44
Authentication 9
Availability 10

B

billing 135

C

CA 22
CEMBS 123
certified email 12, 52, 109
collision resistance 55
collusion 50
communication channel 53
concurrent self-composition 46
conditional timeliness 51
confidentiality 38, 146
Content Distribution 145

Content Provider 133
contract signing 12

D

data 5
Confidentiality 9
Integrity 10
delivery agent *see* intermediary
digital certificate 19, 20
digital declaration 20
digital note 147
digital right object 132
digital rights 135
digital signature 19, 20, 22, 24, 55
Dimensions
Security Dimensions 8
dispute 7, 10
dispute resolution 22, 25, 139
DRM 133

E

e-commerce 3
e-government 4
effectiveness 26
efficiency 25, 39, 50, 63
electronic coins 147
Electronic Notary 22
EOD 18
EOO 18
EOR 18
EOS 18
event-oriented simulation 89
evidence 7, 9, 19
generation 23
storage 24

transfer 23
 verification 24
 exclusion-freeness 42

F

fair
 non-repudiation protocol 23, 25
 fair exchange 11
 fairness 21, 25, 37, 38, 146
 formal methods 175

G

generatable item 41
 group encryption 72

H

hash chain 138
 hash function 55
 homomorphic encryption 158

I

identity 19, 22, 146
 electronic document 175
 intermediary 18, 52, 135

K

Kolmogorov-Smirnov 99

L

label 55
 Layers
 Security Layers 8
 legal framework 22, 29

M

many-to-many application 36
 many-to-one application 36
 Mobile Agents 131
 free roaming 157
 sandbox 157
 MPCS 43, 52
 MPNR 35
 multi-party certified email 48
 multi-party contract signing 43, 119
 multi-party fair exchange 37, 42
 multi-party non-repudiation 35

N

non-malleability 55
 Non-repudiation 9
 non-repudiation 147
 non-repudiation protocol 12
 notification system 60
 NRD 18
 NRO 18, 134
 NRR 18, 134
 NRS 18

O

oblivious transfer 119
 one-way resilient channel 53
 optimistic MPCS 43
 optimistic multi-party fair exchange 40

P

P2P 145
 parallel self-composition 46
 passive attack 56
 payment systems
 cash-like 147
 check-like 147
 on-line verification 147
 pre-paid 147
 Planes
 Security Planes 8
 policy 11, 22, 25, 26, 39, 153
 post office 110
 preimage resistance 55
 Privacy 10
 protocols 4, 8, 10
 gradual exchange 21, 119
 HTTPS 15
 IPSec 15
 Kerberos 15
 optimistic 26, 110
 PGP 15
 probabilistic 21, 119
 SET 15
 SOCKS 15
 SSL 14
 TCP/IP 10

R

recovery protocol 41
 revocable item 41
 Rights Issuer 133
 round 53

S

secure envelope 19, 24
selective receipt 51
self-composition 46
Server-Supported Signatures 138
step 53
symbols, list of xv
symmetric encryption 54
synchronous protocol 53, 120
synchronous timeliness 39

T

threat model 56
threshold protocol 46
timeliness 26, 39, 51, 69, 111, 146
truncation attack 132
Trusted Personal Device 132
TSA 19, 22
TTP 11, 17, 19, 20
 in-line 21
 off-line 21

 on-line 21

TTP's transparency 51, 68, 120

TTP's verifiability 51

U

universal composition 46
unlinkability 146
untraceability 146

V

verifiable encryption 120
virtual private network 15
VPN 73

W

WTLS 143

X

XML 5, 116

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