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- [49] Myers AC. JFlow: Practical mostly-static information flow control. In: Proc. of the 26th ACM SIGPLAN-SIGACT Symp. on Principles of Programming Languages. ACM Press, 1999. 228–241. [doi: 10.1145/292540.292561]
- [50] Banerjee A, Naumann DA. Secure information flow and pointer confinement in a Java-like language. In: Proc. of the IEEE Computer Security Foundations Workshop. New York: IEEE, 2002. 253–267.
- [51] Sabelfeld A, Sands D. A per model of secure information flow in sequential programs. Higher-Order and Symbolic Computation, 2001,14(1):59–91. [doi: 10.1023/A:1011553200337]
- [52] Smith G, Volpano D. Secure information flow in a multi-threaded imperative language. In: Proc. of the 25th ACM SIGPLAN-SIGACT Symp. on Principles of Programming Languages. San Francisco: ACM Press, 1998. 355–364.
- [53] Zdancewic S, Zheng L, Nystrom N, Myers AC. Untrusted hosts and confidentiality: Secure program partitioning. ACM SIGOPS Operating Systems Review, 2001,35(5):1–14. [doi: 10.1145/502059.502036]
- [54] Volpano D, Smith G. Eliminating covert flows with minimum typings. In: Proc. of the 10th IEEE Computer Security Foundations Workshop. IEEE, 1997. 156–168. [doi: 10.1109/CSFW.1997.596807]
- [55] Agat J. Transforming out timing leaks. In: Proc. of the 27th ACM SIGPLAN-SIGACT Symp. on Principles of Programming Languages. ACM Press, 2000. 40–53. [doi: 10.1145/325694.325702]
- [56] Volpano D, Smith G. Probabilistic noninterference in a concurrent language. In: Proc. of the 11th IEEE Computer Security Foundations Workshop. New York: IEEE, 1998. 34–43.
- [57] Ørbæk P, Palsberg J. Trust in the  $\lambda$ -calculus. Journal of Functional Programming, 1997,7(06):557–591. [doi: 10.1017/S0956796897002906]
- [58] Dam M, Giambiagi P. Confidentiality for mobile code: The case of a simple payment protocol. In: Proc. of the 13th IEEE Computer Security Foundations Workshop (CSFW-13). IEEE, 2000. 233–244. [doi: 10.1109/CSFW.2000.856940]
- [59] Volpano D, Smith G. Verifying secrets and relative secrecy. In: Proc. of the 27th ACM SIGPLAN-SIGACT Symp. on Principles of Programming Languages. ACM Press, 2000. 268–276. [doi: 10.1145/325694.325729]
- [60] Clark D, Hunt S, Malacaria P. Quantitative analysis of the leakage of confidential data. Electronic Notes in Theoretical Computer Science, 2002,59(3):238–251. [doi: 10.1016/S1571-0661(04)00290-7]
- [61] Wang TL. Research on binary-executable-oriented software vulnerability detection [Ph.D. Thesis]. Beijing: Peking University, 2011 (in Chinese).
- [62] Sun H, Li HP, Zeng QK. Statically detect and run-time check integer-based vulnerabilities with information flow. Ruan Jian Xue Bao/Journal of Software, 2013,24(12):2767–2781 (in Chinese with English abstract). <http://www.jos.org.cn/1000-9825/4385.htm> [doi: 10.3724/SP.J.1001.2013.04385]
- [63] Kemerlis VP, Portokalidis G, Jee K, Keromytis AD. Libdft: Practical dynamic data flow tracking for commodity systems. ACM SIGPLAN Notices, 2012,47(7):121–132. [doi: 10.1145/2365864.2151042]
- [64] Luk CK, Cohn R, Muth R, Klauser A, Lowney G, Hazelwood K. Pin: Building customized program analysis tools with dynamic instrumentation. ACM Sigplan Notices, 2005,40(6):190–200. [doi: 10.1145/1064978.1065034]
- [65] Brumley D, Jager I, Avgerinos T, Schwartz EJ. BAP: A binary analysis platform. In: Proc. of the Computer Aided Verification. Berlin, Heidelberg: Springer-Verlag, 2011. 463–469. [doi: 10.1007/978-3-642-22110-1\_37]
- [66] Song D, Brumley D, Yin H, Caballero J, Jager I, Kang MG, Saxena P. BitBlaze: A new approach to computer security via binary analysis. In: Proc. of the Information Systems Security. Berlin, Heidelberg: Springer-Verlag, 2008. 1–25. [doi: 10.1007/978-3-540-89862-7\_1]
- [67] Kang MG, McCamant S, Poesankam P, Jager I, Kang MG, Saxena P. DTA++: Dynamic taint analysis with targeted control-flow propagation. In: Proc. of the NDSS. San Diego: Internet Society, 2011. 223–231.
- [68] Clause J, Li W, Orso A. Dytan: A generic dynamic taint analysis framework. In: Proc. of the 2007 Int'l Symp. on Software Testing and Analysis. Portland: ACM, Press, 2007. 196–206. [doi: 10.1145/1273463.1273490]
- [69] Qin F, Wang C, Li Z, Zhou Y, Wu Y. Lift: A low-overhead practical information flow tracking system for detecting security attacks. In: Proc. of the 39th Annual IEEE/ACM Int'l Symp. on Microarchitecture. Orlando: IEEE, 2006. 135–148. [doi: 10.1109/MICRO.2006.29]
- [70] Wang C, Hu S, Kim HS. Stardbt: An efficient multi-platform dynamic binary translation system. In: Proc. of the Advances in Computer Systems Architecture. Berlin, Heidelberg: Springer-Verlag, 2007. 4–15. [doi: 10.1007/978-3-540-74309-5\_3]

- [71] Newsome J, Song D. Dynamic taint analysis for automatic detection, analysis, and signature generation of exploits on commodity software. *Network & Distributed System Security Symp.*, 2005,29(5):720–724.
- [72] Nethercote N, Seward J. Valgrind: A framework for heavyweight dynamic binary instrumentation. *ACM Sigplan Notices*, 2007, 42(6):89–100. [doi: 10.1145/1273442.1250746]
- [73] Schultz D, Liskov B. IFDB: Decentralized information flow control for databases. In: *Proc. of the 8th ACM European Conf. on Computer Systems*. ACM Press, 2013. 43–56. [doi: 10.1145/2465351.2465357]
- [74] Cheng W, Ports DRK, Schultz DA. Abstractions for usable information flow control in Aeolus. In: *Proc. of the USENIX Annual Technical Conf. Berkeley: USENIX*, 2012. 139–151.
- [75] Davis B, Chen H. DBTaint: Cross-Application information flow tracking via databases. *Proc. of the WebApps*, 2010,22(8):2–10.
- [76] Huang YW, Yu F, Hang C. Securing Web application code by static analysis and runtime protection. In: *Proc. of the 13th Int'l Conf. on World Wide Web*. ACM Press, 2004. 40–52. [doi: 10.1145/988672.988679]
- [77] Chlipala A, Impredicative LLC. Static checking of dynamically-varying security policies in database-backed applications. In: *Proc. of the OSDI*. Berkeley: USENIX, 2010. 105–118.
- [78] Corcoran BJ, Swamy N, Hicks M. Cross-Tier, label-based security enforcement for Web applications. In: *Proc. of the 2009 ACM SIGMOD Int'l Conf. on Management of Data*. ACM Press, 2009. 269–282. [doi: 10.1145/1559845.1559875]
- [79] Yoshihama S, Yoshizawa T, Watanabe Y. Dynamic information flow control architecture for Web applications. In: *Proc. of the Computer Security (ESORICS 2007)*. Berlin, Heidelberg: Springer-Verlag, 2007. 267–282. [doi: 10.1007/978-3-540-74835-9\_18]
- [80] Schoepe D, Hedin D, Sabelfeld A. SeLINQ: Tracking information across application-database boundaries. *ACM SIGPLAN Notices*, 2014,49(9):25–38. [doi: 10.1145/2692915.2628151]
- [81] Garvey CE, Papaccio PN. Multilevel data store design. In: *Proc. of the AIAA/ASIS/DODCI 2nd Aerospace Computer Security Conf. San Diego: Internet Society*, 1986. 58–64.
- [82] Garvey C, Wu A. ASDViews [relational databases]. In: *Proc. of the '88 IEEE Symp. on Security and Privacy*. IEEE, 1988. 85–95. [doi: 10.1109/SECPRI.1988.8100]
- [83] Denning DE, Lunt TF, Schell RR. The SeaView security model. In: *Proc. of the '88 IEEE Symp. on Security and Privacy*. IEEE, 1988. 218–233. [doi: 10.1109/SECPRI.1988.8114]
- [84] Dwyer P, Onuegbe E, Stachour P, Thuraisingham B. Query processing in LDV: A secure database system. In: *Proc. of the 4th IEEE Aerospace Computer Security Applications Conf. IEEE*, 1988. 118–124. [doi: 10.1109/ACSAC.1988.113426]
- [85] McDermott JP, Jajodia S, Sandhu RS. A single-level scheduler for the replicated architecture for multilevel-secure databases. In: *Proc. of the 7th Annual Computer Security Applications Conf. IEEE*, 1991. 2–11. [doi: 10.1109/CSAC.1991.213023]
- [86] ORACLE7 Server Application Developer's Guide. Oracle Corporation, 1992.
- [87] Hasan M, O'Connor JP, Pryzby G. Trusted distributed rubix. *Trusted Distributed Rubix*, 1996,23(1):172–191.
- [88] Hunt GC, Larus JR. Singularity: Rethinking the software stack. *ACM SIGOPS Operating Systems Review*, 2007,41(2):37–49. [doi: 10.1145/1243418.1243424]
- [89] Vogt P, Nentwich F, Jovanovic N. Cross site scripting prevention with dynamic data tainting and static analysis. In: *Proc. of the NDSS*. San Diego: Internet Society, 2007. 76–82.
- [90] Chugh R, Meister JA, Jhala R, Lerner S. Staged information flow for JavaScript. *ACM SIGPLAN Notices*, 2009,44(6):50–62. [doi: 10.1145/1543135.1542483]
- [91] Li Z, Zhang K, Wang XF. Mash-If: Practical information-flow control within client-side mashups. In: *Proc. of the 2010 IEEE/IFIP Int'l Conf. on Dependable Systems and Networks (DSN)*. IEEE, 2010. 251–260. [doi: 10.1109/DSN.2010.5544312]
- [92] De Groef W, Devriese D, Nikiforakis N. FlowFox: A Web browser with flexible and precise information flow control. In: *Proc. of the 2012 ACM Conf. on Computer and Communications Security*. ACM Press, 2012. 748–759. [doi: 10.1145/2382196.2382275]
- [93] Austin TH, Flanagan C. Multiple facets for dynamic information flow. *ACM SIGPLAN Notices*, 2012,47(1):165–178. [doi: 10.1145/2103621.2103677]
- [94] Hedin D, Sabelfeld A. Information-Flow security for a core of JavaScript. In: *Proc. of the 25th IEEE Computer Security Foundations Symp. (CSF)*. IEEE, 2012. 3–18. [doi: 10.1109/CSF.2012.19]
- [95] Just S, Cleary A, Shirley B. Information flow analysis for javascript. In: *Proc. of the 1st ACM SIGPLAN Int'l Workshop on Programming Language and Systems Technologies for Internet Clients*. ACM Press, 2011. 9–18. [doi: 10.1145/2093328.2093331]
- [96] Bichhawat A, Rajani V, Garg D. Information flow control in WebKit's JavaScript bytecode. In: *Proc. of the Principles of Security and Trust*. Berlin, Heidelberg: Springer-Verlag, 2014. 159–178. [doi: 10.1007/978-3-642-54792-8\_9]

- [97] Chinis G, Pratikakis P, Ioannidis S, Athanasopoulos E. Practical information flow for legacy Web applications. In: Proc. of the 8th Workshop on Implementation, Compilation, Optimization of Object-Oriented Languages, Programs and Systems. ACM Press, 2013. 17–28. [doi: 10.1145/2491404.2491410]
- [98] Pappas V, Kemerlis VP, Zavou A, Polychronakis M, Keromytis AD. CloudFence: Data flow tracking as a cloud service. In: Proc. of the Research in Attacks, Intrusions, and Defenses. Berlin, Heidelberg: Springer-Verlag, 2013. 411–431. [doi: 10.1007/978-3-642-41284-4\_21]
- [99] Xie X, Ray I, Adaikkalavan R, Gamble R. Information flow control for stream processing in clouds. In: Proc. of the 18th ACM Symp. on Access Control Models and Technologies. ACM Press, 2013. 89–100. [doi: 10.1145/2462410.2463205]
- [100] Priebe C, Muthukumaran D, O’Keeffe D, Eysers D, Shand B, Kapitza R, Pietzuch P. CloudSafetyNet: Detecting data leakage between cloud tenants. In: Proc. of the 6th Edition of the ACM Workshop on Cloud Computing Security. ACM Press, 2014. 117–128. [doi: 10.1145/2664168.2664174]
- [101] Mundada Y, Ramachandran A, Feamster N. Silverline: Data and network isolation for cloud services. Proc. of HotCloud, 2011, 23(3):342–356.
- [102] Pasquier TFJM, Bacon J, Eysers D. FlowK: Information flow control for the cloud. In: Proc. of the 6th IEEE Int’l Conf. on Cloud Computing Technology and Science (CloudCom). IEEE, 2014. 70–77. [doi: 10.1109/CloudCom.2014.11]
- [103] Pasquier TFJM, Bacon J, Shand B. FlowR: Aspect oriented programming for information flow control in ruby. In: Proc. of the 13th Int’l Conf. on Modularity. ACM Press, 2014. 37–48. [doi: 10.1145/2577080.2577090]
- [104] Ganjali A, Lie D. Auditing cloud management using information flow tracking. In: Proc. of the 7th ACM Workshop on Scalable Trusted Computing. ACM Press, 2012. 79–84. [doi: 10.1145/2382536.2382549]
- [105] Bacon J, Eysers D, Pasquier TF, Singh J, Papagiannis I, Pietzuch P. Information flow control for secure cloud computing. IEEE Trans. on Network and Service Management, 2014, 11(1):76–89. [doi: 10.1109/TNSM.2013.122313.130423]
- [106] Yang Z, Yang M. Leakminer: Detect information leakage on android with static taint analysis. In: Proc. of the 3rd World Congress on Software Engineering (WCSE). IEEE, 2012. 101–104. [doi: 10.1109/WCSE.2012.26]
- [107] Mann C, Starostin A. A framework for static detection of privacy leaks in android applications. In: Proc. of the 27th Annual ACM Symp. on Applied Computing. Sierre: ACM Press, 2012. 1457–1462. [doi: 10.1145/2245276.2232009]
- [108] Gibler C, Crussell J, Erickson J, Chen H. Androidleaks: Automatically detecting potential privacy leaks in android applications on a large scale. In: Proc. of the Trust and Trustworthy Computing. Berlin, Heidelberg: Springer-Verlag, 2012. 291–307. [doi: 10.1007/978-3-642-30921-2\_17]
- [109] Xiao X, Tillmann N, Fahndrich M. User-Aware privacy control via extended static-information-flow analysis. In: Proc. of the 27th IEEE/ACM Int’l Conf. on Automated Software Engineering. Palo Alto: ACM Press, 2012. 80–89. [doi: 10.1145/2351676.2351689]
- [110] Xu R, Saïdi H, Anderson R. Aurasium: Practical policy enforcement for android applications. In: Proc. of the 21st USENIX Security Symp. Bellevue: USENIX, 2012. 32–44.
- [111] Fritz C, Arzt S, Rasthofer S, Bartel A, Klein J, McDaniel P. Highly precise taint analysis for android application. EC SPRIDE Technical Report, TUD-CS-2013-0113, 2013. <http://www.bodden.de/pubs/TUD-CS-2013-0113.pdf>
- [112] Enck W, Gilbert P, Chun BG, Cox LP, Sheth AN. TaintDroid: An information-flow tracking system for realtime privacy monitoring on smartphones. In: Proc. of the OSDI. Berkeley: USENIX Association, 2010. 255–270.
- [113] Yan LK, Yin H. Droidscope: Seamlessly reconstructing the OS and Dalvik semantic views for dynamic Android malware analysis. In: Proc. of the 21st USENIX Security Symp. Bellevue: USENIX, 2012. 135–146.
- [114] Gilbert P, Chun BG, Cox L. Automating privacy testing of smartphone applications. Technical Report, CS-2011-02, Duke University, 2011.
- [115] Akoush S, Carata L, Sohan R. Mrlazy: Lazy runtime label propagation for mapreduce. In: Proc. of the 6th USENIX Workshop on Hot Topics in Cloud Computing (HotCloud 2014). USENIX Association, 2014. 332–345.
- [116] Pasquier TFJM, Singh J, Bacon J. Managing big data with information flow control. SIGARCH Computer Architecture News, 2014, 14(9):721–731.
- [117] Singh J, Pasquier TFJM, Bacon J. Securing tags to control information flows within the Internet of Things. In: Proc. of the 2015 Int’l Conf. on Recent Advances in Internet of Things (RIoT). IEEE, 2015. 1–6. [doi: 10.1109/RIOT.2015.7104903]
- [118] Portokalidis G, Homburg P, Anagnostakis K. Paranoid android: Versatile protection for smartphones. In: Proc. of the 26th Annual Computer Security Applications Conf. ACM Press, 2010. 347–356. [doi: 10.1145/1920261.1920313]



- [119] Chen S, Kozuch M, Strigkos T, Falsafi B, Gibbons PB, Mowry TC, Vlachos E. Flexible hardware acceleration for instruction-grain program monitoring. *ACM SIGARCH Computer Architecture News*, 2008,36(3):377–388. [doi: 10.1145/1394608.1382153]
- [120] Ruwase O, Gibbons PB, Mowry TC, Ramachandran V, Chen S, Kozuch M, Ryan M. Parallelizing dynamic information flow tracking. In: *Proc. of the 20th Annual Symp. on Parallelism in Algorithms and Architectures*. ACM Press, 2008. 35–45. [doi: 10.1145/1378533.1378538]
- [121] Chow J, Garfinkel T, Chen PM. Decoupling dynamic program analysis from execution in virtual environments. In: *Proc. of the USENIX 2008 Annual Technical Conf. on Annual Technical Conf.* Berkeley: USENIX Association, 2008. 1–14.
- [122] Jee K, Kemerlis VP, Keromytis AD. ShadowReplica: Efficient parallelization of dynamic data flow tracking. In: *Proc. of the 2013 ACM SIGSAC Conf. on Computer & Communications Security*. ACM Press, 2013. 235–246. [doi: 10.1145/2508859.2516704]
- [123] Jee K, Portokalidis G, Kemerlis VP, Ghosh S, August DI, Keromytis AD. A general approach for efficiently accelerating software-based dynamic data flow tracking on commodity hardware. In: *Proc. of the 19th NDSS*. San Diego: Internet Society, 2012. 324–335.
- [124] Chang W, Streiff B, Lin C. Efficient and extensible security enforcement using dynamic data flow analysis. In: *Proc. of the 15th ACM Conf. on Computer and Communications Security*. Alexandria: ACM Press, 2008. 39–50. [doi: 10.1145/1455770.1455778]
- [125] Portokalidis G, Bos H. Eudaemon: Involuntary and on-demand emulation against zero-day exploits. In: *Proc. of the 2008 EuroSys*. 2008. 287–299. [doi: 10.1145/1352592.1352622]
- [126] Saxena P, Sekar R, Puranik V. Efficient fine-grained binary instrumentation with applications to taint-tracking. In: *Proc. of the 6th CGO*. ACM Press, 2008. 74–83. [doi: 10.1145/1356058.1356069]
- [127] Kim HC, Keromytis AD. On the deployment of dynamic taint analysis for application communities. *IEICE Trans. on Information & Systems*, 2009,92(3):548–551.

#### 附中文参考文献:

- [12] 姚剑波.基于句法分析的安全信息流[博士学位论文].贵州:贵州大学,2006.
- [20] 赵保华,陈波,陆超.概率信息流安全属性分析.计算机学报,2006,29(8):1447–145.
- [21] 李超,殷丽华,郭云川.基于 ptSPA 的概率时间信息流安全属性分析.计算机研究与发展,2011,48(8):1370–1380.
- [39] 单智勇,石文昌.STBAC:一种新的操作系统访问控制模型.计算机研究与发展,2008,45(5):758–764.
- [40] 杨智,殷丽华,段泳毅,吴金字,金舒原,郭莉.基于广义污点传播模型的操作系统访问控制.软件学报,2012,23(6):1602–1619. <http://www.jos.org.cn/1000-9825/4083.htm> [doi: 10.3724/SP.J.1001.2012.04083]
- [61] 王铁磊.面向二进程序的漏洞挖掘关键技术研究[博士学位论文].北京:北京大学,2011.
- [62] 孙浩,李会朋,曾庆凯.基于信息流的整数漏洞插装和验证.软件学报,2013,24(12):2767–2781. <http://www.jos.org.cn/1000-9825/4385.htm> [doi: 10.3724/SP.J.1001.2013.04385]



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