Proceedings of the 15th International Conference on Quality and Dependability
Sinaia, Romania, September 14th-16th, 2016
ISSN 1842-3566
Pages 218-224

On the Ensuring the Resilience in Communication Networks

Dorina Luminiţa COPACI, Angelica BACIVAROV
Tribunalul Bucureşti, Bucureşti, România; Laboratorul EUROQUALROM, Universitatea "Politehnica" din Bucureşti, România
lcopaci@yahoo.com, angelica@euroqual.pub.ro

Abstract
In many communication networks the resilience to failures and attacks is becoming an essential requirement. In these networks the cost of failures is significant. In this paper, we present strategies for improve resilience for different types of communication network as well as in P2P overlay networks. The attacks analyzed in this paper are the Denial of Service attacks (DoS) in order to assess the damage that difficult-to-detect which attackers can cause. Our methodology is to study DoS resilience via a new and general class of protocol compliant denial-of-service attacks, which we refer to as JellyFish (JF). In addition to the JF attack, the Black Hole attack is studied, too.

Keywords: Communication networks, Resilience, Models, Malicious attacks, DoS attacks, JellyFish, Black Hole

References:

[1] I. Aad, J.-P. Hubaux and E. Knightly. Impact of Denial of Service Attacks on Ad Hoc Networks, in IEEE Transactions on Networking, 2008.
[2] S. Bohacek, J. Hespanha, J. Lee, C. Lim, and K. Obraczka. TCPPR: TCP for persistent packet reordering. In Proceedings of the 23rd IEEE International Conference on Distributed Computing Systems, May 2003.
[3] Yih-Chun Hu, Adrian Perrig, and David B. Johnson. Ariadne: A secure on-demand routing protocol for ad hoc networks. In Proceedings of the Eighth ACM International Conference on Mobile Computing and Networking (MobiCom 2002), September 2002.
[4] Yih-Chun Hu, David B. Johnson, and Adrian Perrig. SEAD: Secure Efficient Distance Vector Routing for Mobile Wireless Ad Hoc Networks. Ad Hoc Networks, 2003.
[5] Constantin Alin Copaci, Luminiţa Dorina Copaci, "Ensuring the Resilience against Denial of Service Attacks in Ad-hoc Networks", in Proceedings of the 11th IEEE International Conference in Quality and Dependability, Sinaia, sept 2008 pg. 179-186.
[6] Dorina Luminiţa Copaci, Angelica Bacivarov, On Implementation of Resilient Networks. A Case Study, in Asigurarea Calitatii-Quality Assurance, ISSN 1224-5410, Vol. XXII, Issue 85, January-March 2016, pp
[7] P. Elias, A. Feinstein, and C. Shannon. A note on the maximum flow through a network. IEEE Transactions on Information Theory, 2:117-119, December 1956.
[8] G. Ellinas, A. G. Hailemariam, and T. E. Stern. Protection cycles in mesh wdm networks. Selected Areas in Communications, IEEE Journal on, 18(10):1924-1937, Oct 2000.
[9] W. Grover. Mesh-Based Survivable Networks. Options and Strategies for Optical, MPLS, SONET, and ATM Networking. 2004.

[10] A. F. Hansen, A. Kvalbein, T. Cicic, S. Gjessing, and O. Lysne. Resilient routing layers for recovery in packet networks. International Conference on Dependable Systems and Networks DSN 2005. Proceedings, pages 238-247, June-1 July 2005.
[11] T. Klingberg and R. Manfredi. The gnutella protocol specification v0.6. http://rfc-gnutella.sourceforge.net/, 2002.
[12] A. Kvalbein, A. F. Hansen, T. Cicic, S. Gjessing, and O. Lysne. Fast recovery from link failures using resilient routing layers. 10th IEEE Symposium on Computers and Communications, ISCC 2005. Proceedings, pages 554-560, June 2005.
[13] A. Kvalbein, A. F. Hansen, T. Cicic, S. Gjessing, and O. Lysne. Fast ip network recovery using multiple routing configurations. INFOCOM 2006. 25th IEEE International Conference on Computer Communications, pages 1-11, April 2006.
[14] S. Lee, Y. Yu, S. Nelakuditi, Z.-L. Zhang, and C.-N. Chuah. Proactive vs reactive approaches to failure resilient routing. INFOCOM 2004. Twenty-third AnnualJoint Conference of the IEEE Computer and Communications Societies, 1:-186, March 2004.
[15] M. Medard, S. G. Finn, R. A. Barry, and R. G. Gallager. Redundant trees for preplanned recovery in arbitrary vertexredundant or edge-redundant graphs. IEEE/ACM Transactions on Networking, 7(5):641-652, Oct 1999.
[16] J. M. Michael Menth, Andreas Reifert. Self-protecting multipaths - a simple and resource-efficient protection switching mechanism for mpls networks. 3rd IFIP-TC6 Networking Conference (Networking2004 Athens/Greece), 2004.
[17] C. G. Plaxton, R. Rajaraman, and A. W. Richa. Accessing nearby copies of replicated objects in a distributed environment. In ACM Symposium on Parallel Algorithms and Architectures, pages 311-320, 1997.
[18] S. Ratnasamy, P. Francis, M. Handley, R. Karp, and S. Schenker. A scalable content-addressable network. In Conference on Applications, Technologies, Architectures, and Protocols for Computer Communications, pages 161-172, 2001.
[19] E. Rosen, A. Viswanathan, and R. Callon. Multiprotocol label switching architecture, jan 2001.
[20] D. J. Rosenkrantz,S. Goel, S. S. Ravi, J. Gangolly: Structure- Based Resilience Metrics for Service-Oriented Networks, October 11, 2004.
[21] A. Rowstron and P. Druschel. Pastry: Scalable, distributed object location and routing for large-scale peer-to-peer systems. In IFIP/ACM International Conference on Distributed Systems Platforms, pages 329 - 350, November 2001.
[22] I. Stoica, R. Morris, D. Karger, F. Kaashoek, and H. Balakrish-nan. Chord: A Scalable Peer-to-Peer Lookup Service for Internet Aplications. In ACM Applications, Technologies, Architectures, and Protocols for Computer Communication, pages 149 - 160, September 2001.
[23] W. W. Terpstra, J. Kangasharju, C. Leng, and A. P. Buchmann. Bubblestorm: resilient, probabilistic, and exhaustive peer-topeer search. In SIGCOMM Comput. Commun. Rev., 2007.
[24] https://www.tuilmenau.de/fileadmin/public/afs/pub/paper /pik01-09.pdf
[25] D. B. Johnson and D. Maltz, “The dynamic source routing protocol for mobile ad hoc networks (DSR),” 2003, http://www.ietf.org/internet-drafts/draft-ietf-manet-dsr-9.txt.