MONID

A Temporal Logic Based Framework for Intrusion Detection

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Introduction

What is MONID?

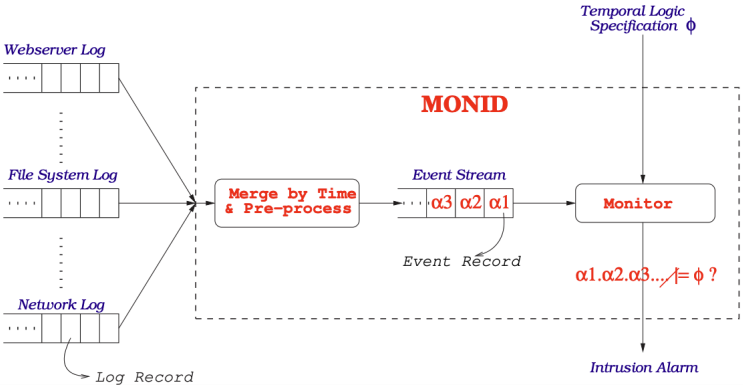
MONID is a prototype which can detect intrusions on a system; in this scenario we are focusing on a *signature-based* approach.

In order:

1. we will use the logic EAGLE to define intrusion patterns using temporal logic formula φ; in this case the monitored formula will be $\psi = \Box(\neg\varphi)$.
2. MONID will create a stream of events $\sigma = \alpha_1, \alpha_2, \ldots$ obtained from a merge of the logs by ascending time order;
3. a monitor will processes each event α_i as it happens and updates the monitored formula ψ to store a relevant summary;
4. an intrusion alarm is triggered if, for any reason, $\alpha_1, \alpha_2 \ldots \not\models \psi$.

What is MONID? (cont'd)

The architecture is the following.



References I

[1] Howard Barringer et al. “EAGLE can do Efficient LTL Monitoring”. In: *Fossacs Ortacas*. 2003.

[2] Howard Barringer et al. “Program monitoring with LTL in EAGLE”. In: *18th International Parallel and Distributed Processing Symposium, 2004. Proceedings*. IEEE. 2004, p. 264.

[3] Howard Barringer et al. “Rule-based runtime verification”. In: *Verification, Model Checking, and Abstract Interpretation: 5th International Conference, VMCAI 2004 Venice, Italy, January 11-13, 2004 Proceedings 5*. Springer. 2004, pp. 44–57.

[4] Wei Gao and Thomas H Morris. “On cyber attacks and signature based intrusion detection for modbus based industrial control systems”. In: *Journal of Digital Forensics, Security and Law* 9.1 (2014), p. 3.

References II

[5] Akash Garg and Prachi Maheshwari. “A hybrid intrusion detection system: A review”. In: *2016 10th International Conference on Intelligent Systems and Control (ISCO)*. IEEE. 2016, pp. 1–5.

[6] VVRPV Jyothsna, Rama Prasad, and K Munivara Prasad. “A review of anomaly based intrusion detection systems”. In: *International Journal of Computer Applications* 28.7 (2011), pp. 26–35.

[7] Urupoj Kanlayasiri, Surasak Sanguanpong, and Wipa Jaratmanachot. “A rule-based approach for port scanning detection”. In: *Proceedings of the 23rd electrical engineering conference, Chiang Mai Thailand*. Citeseer. 2000, pp. 485–488.

References III

[8] John McHugh. “Testing intrusion detection systems: a critique of the 1998 and 1999 darpa intrusion detection system evaluations as performed by lincoln laboratory”. In: *ACM Transactions on Information and System Security (TISSEC)* 3.4 (2000), pp. 262–294.

[9] Prasad Naldurg, Koushik Sen, and Prasanna Thati. “A temporal logic based framework for intrusion detection”. In: *Formal Techniques for Networked and Distributed Systems–FORTE 2004: 24th IFIP WG 6.1 International Conference, Madrid Spain, September 27-30, 2004. Proceedings 24*. Springer. 2004, pp. 359–376.

[10] Krerk Piromsopa and Richard J Enbody. “Buffer-overflow protection: the theory”. In: *2006 IEEE International Conference on Electro/Information Technology*. IEEE. 2006, pp. 454–458.

References IV

[11] Gholam Reza Zargar and Peyman Kabiri. “Identification of effective network features to detect Smurf attacks”. In: *2009 IEEE Student Conference on Research and Development (SCOReD)*. IEEE. 2009, pp. 49–52.

Thanks for the attention