Network Intrusion Detection and Alert Correlation

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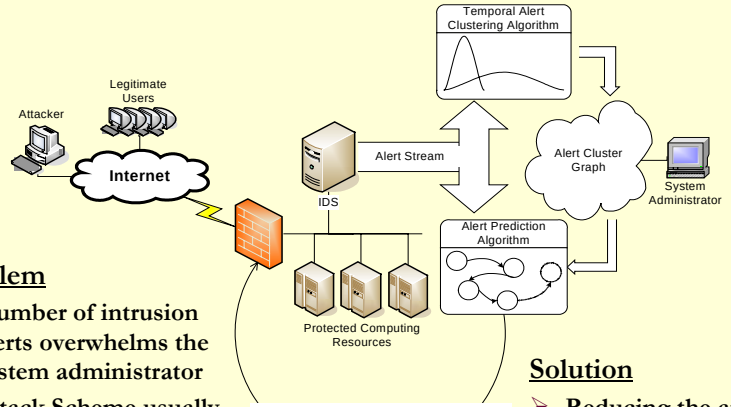
Stop Intrusion Before It Completes



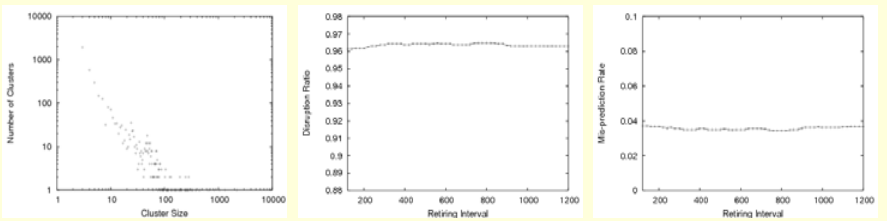
Problem

- Number of intrusion alerts overwhelms the system administrator
- Attack Scheme usually takes multiple steps
- Blocking traffic from source IP would lead to disruption of service because of false positive

Solution

- Reducing the amount of alerts sent to system administrator
- Making predictions for the next step in the attack scheme

Alert Clustering and Prediction for Intrusion Prevention



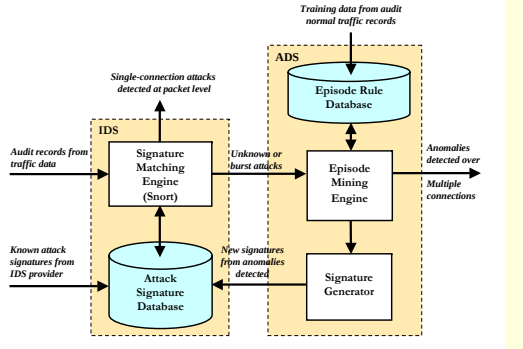
- Based on the inherent temporal relations among intrusion alerts
- Number of alerts is reduced for more than 90%
- Most attack patterns are disrupted with low mis-prediction rates
- Performance insensitive to parameter variations lead to easier implementation

Related Publication:

[1] X. Lou, K. Hwang, and Y. Chen, "Alert Clustering and Prediction Towards Automated Intrusion Response," *Technical Report TR 2005-15, USC Internet and Grid Computing Lab,* August 2005

Collaborative Intrusion Detection with Rule-Based Signature Generation

- Combine *misuse-based IDS* with *Anomaly Detection System* to detect both attacks with and without signatures
- Datamining of *Internet connection episodes* for normal traffic profiling and *automated attack signature generation*



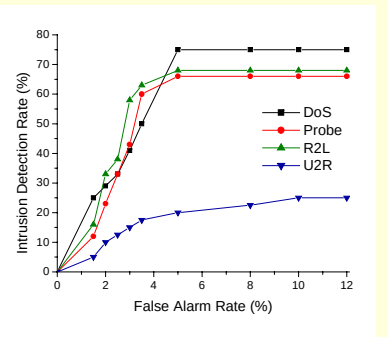
Related Publications:

[1] M. Qin and K. Hwang, "Frequent Episode Rules for Internet Anomaly Detection," *IEEE Int'l Symp. on Network Computing and Applications* (IEEE NCA'04), Cambridge, MA, USA. Sept. 1, 2004.

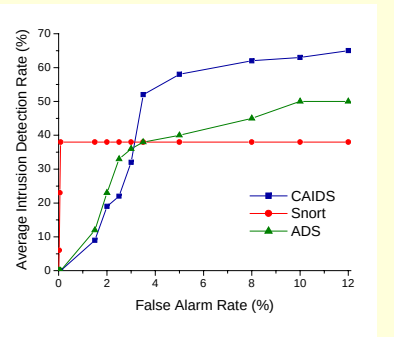
[2] K. Hwang, Y. Chen, and H. Liu, "Defending Distributed Systems Against Malicious Intrusions and Network Anomalies," *IEEE International Workshop on Security in Systems and Networks* (SSN'05), Denver, CO, April 8, 2005.

Performance Evaluation of CAIDS

- The experiment is based on DARPA 1999 Intrusion Detection Evaluation Data Set mixed with real network data from USC
- On the average, the CIDAS outperforms Snort and ADS by 51% and 40% improvement in intrusion detection rate, respectively



ROC curves for four attack classes in using the CIDAS



ROC curves showing the average intrusion detection rates of 3 systems