INTRUSION DETECTION:

SEPARATING THE HUMAN FROM THE PROGRAM

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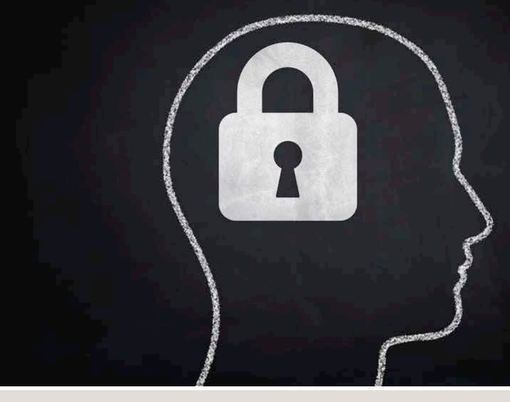


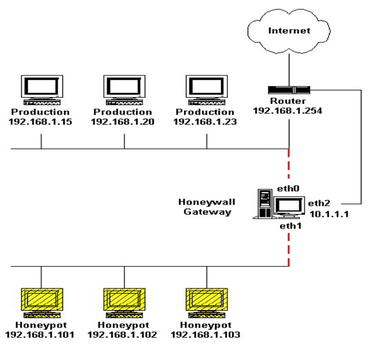
Problem 1: The rise of automated attacks has created a great deal of noise for security personnel to wade through to identify malicious behavior

Problem 2: While many real-time detection tools and log management programs consider time in terms of the repetition of events over a time series, attackers have caught onto this and begun varying the time between their attacks

Research Goal: This project utilized syntactic pattern recognition techniques combined with an analysis of event time difference to discover if there is a statistical way in which to separate human from automated intrusion behavior in a system

Methods

- Honeypots are a type of security architecture set up to gather information on malicious activity



  - Any activity with the honeypot is taken as malicious, as the honeypot runs no authorized services
  - Therefore, honeypots make a perfect testbed for cybersecurity researchers

Adapted (and image taken) from: L. Spitzner, "Know your enemy: Honeynets, what a honeynet is, its value, overview of how it works, and risk/issues involved," *Web May*, 2006.

- Pulled Auth and Snoopy logs from a set of honeypots administered over by the NCSA

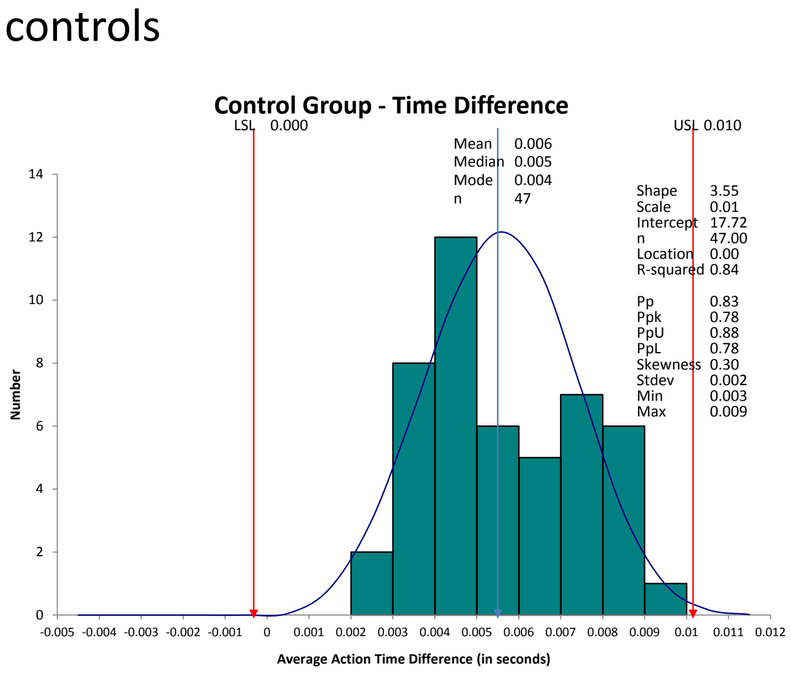
- Organized honeypot log files by time/event/datatype (SID, SSHD, CRON, etc.)

Timestamp (date)	Timestamp (time)	Event Time Difference (in seconds)	SSHD Number	Event
2015-11-12	11:42:24.172574		19698	Accepted password for root from 130.126.137.23 port 51881 ssh2
2015-11-12	11:42:24.174622	0.002	19698	pam_unix(sshd:session): session opened for user root by (uid=0)
2015-11-12	11:42:24.981013	0.806	19698	Received disconnect from 130.126.137.23: 11: disconnected by user
2015-11-12	11:42:24.981024	0	19698	pam_unix(sshd:session): session closed for user root

- Employed Syntactic Pattern Recognition of events in order to establish patterns

Timestamp (date)	Timestamp (time)	Event Time Difference (in seconds)	SSHD	SSHD Pattern
2015-11-12	11:42:24.172574		19698	
2015-11-12	11:42:24.174622	0.002	19698	
2015-11-12	11:42:24.981013	0.806	19698	
2015-11-12	11:42:24.981024	0	19698	7 8 5 9

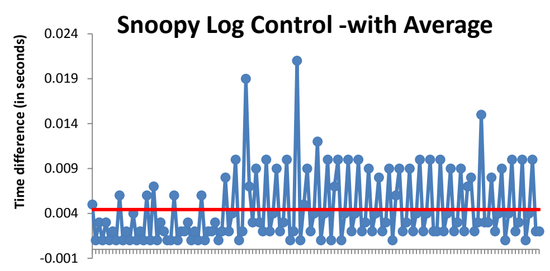
- Pulled CRON (known program) patterns/times/frequency to form controls

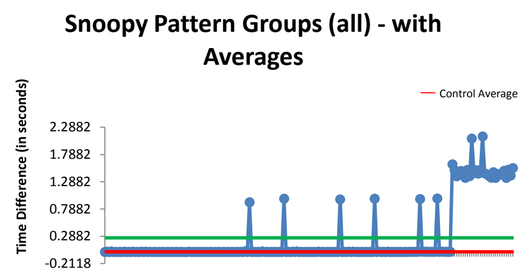


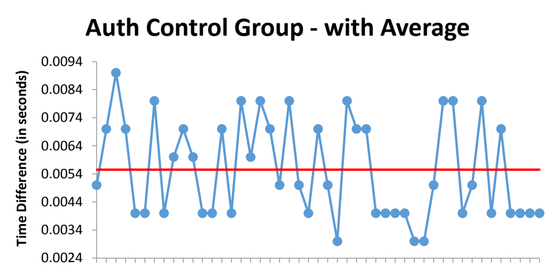
- Compared each pattern-group against controls

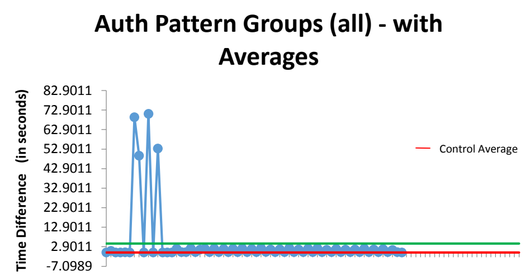
Results

- When comparing event time difference of the pattern-groups (all) against the control, there are several notable events that are statistically different

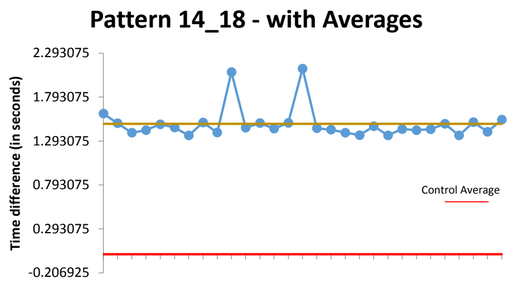


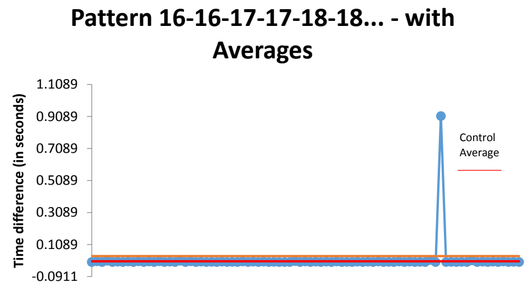






- This becomes even more apparent when you compare the individual pattern-groups against the control mean





Conclusions and Future Research

- More research is needed to find other variables to control for within time difference. (e.g. connection reliability and speed, IP spoofing, etc.)
- More data should be collected to test, in order to conduct a more detailed analysis
- Conduct a more detailed linguistic breakdown of the patterns themselves
- **It seems clear, however, that investigating event time difference between events as an indicator for separating human from automated program behavior in a system should be made a priority**

Acknowledgements

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