Taming the Wild West: Finding Evil with Cloud-Based Analytical Tools

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Outline

- Understanding a research university
- Unique challenges
- Cloud-based analytics
- Results and lessons learned
Understanding a research university: The University of Arizona by the numbers

- More than 41,000 students
- More than 15,000 employees
- More than $2 billion annual operating budget
- More than $625 million in annual research expenditure

- Statewide job and economic impact (2011)
  - Combined from University, Health Network, and Tech Park
  - Contributes $8.3 billion in annual economic impact
  - Creates more than 65,000 direct and indirect jobs
Understanding a research university:
UA “Real World” comparisons

- More than $320 million in credit card sales annually
- Health Network serves 100,000 patients / Level 1 trauma center
- Campus Health serves more than 15,000 patients annually
- Arizona Poison and Drug Information Center
- Power plant generates 30% of electricity; university manages multiple substations including one supporting hospital
- CALEA accredited Police Department with 66 sworn officers and 46 civilian employees, 9-1-1 dispatch
- More than 7,000 residents living in campus housing

Understanding a research university:
Information technology comparisons

- Highly decentralized: 37 IT departments with 900+ staff
- $110 million annual IT expenditure (50/50 central and unit)
- 7,600+ wireless access points on main campus
- More than 100,000 BYOD devices during typical week
- Central IT: ERP, core network + Internet, datacenter colocation and hosting, research supercomputers
- Unit IT: manage thousands of servers with little oversight from central IT or security teams
Understanding a research university:
More like a small city!

Why are universities targeted?*

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<th>Sensitive Enterprise Data</th>
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<td>- Employee data</td>
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<td>- Student records</td>
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<td>- Financial data</td>
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<td>- Recruitment and marketing data</td>
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<th>Research with Potential Economic Value</th>
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<td>- Energy technology</td>
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<td>- Biotechnology, medical, and pharmaceuticals</td>
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<td>- Engineering</td>
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<td>- New materials, such as semi-conductors</td>
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<td>- Information technology</td>
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<tr>
<th>Politically or Commercially Sensitive Information</th>
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<td>- Climate modelling</td>
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<td>- Economic data and projections</td>
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<td>- Live animal research</td>
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<td>- Product development data</td>
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<td>- Information used for expert testimony</td>
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* Adapted from Universities UK. “Cyber security and universities: managing the risk.” November 2013.
Information security challenges

- Decentralized decision making
- Culture focused on idea creation and sharing
- Limited ability to require preventative controls

- High population turnover
- Limited budget and manpower

- And… remember those 37 IT departments?

Why cloud-based analytical tools?

- Needed visibility without burden on local IT staff
- Limited security staff to deploy and maintain local solution
- Needed to ingest and act on variety of log sources

- Began using Threat Analytics Platform in June 2013

- Techniques here could be done with any SIEM and analytics tool
Example 1: VPN sessions using compromised user credentials

Used subsearch function

- Search for all usernames with WiFi authentication events
- Search for matching usernames from VPN authentication events with non-US GeoIP data
- Group by unique username

Results: Identified 10 – 20 compromised accounts/day

Example 2: Open Recursive DNS servers participating in DDoS

Step 1: Identify unusual domains in DNS logs

Search “metaclass” using pivot feature

- Metaclass:DNS combines BIND syslogs and DNS grabbed off wire by BRO network sensors
- Group by domain and sort by highest frequency

Results: Visually identify unusual domains
Example 2: Open Recursive DNS servers participating in DDoS

Step 2: Identify Open DNS Resolvers being queried

- Search "metaclass" DNS
- Search for suspicious domain
- Exclude queries that originate internally
- Group by destination IP

Results: Identify DNS servers being queried from external IPs

Example 3: Employee direct deposit modification from outside Arizona

Used alert rules
- Search Apache logs for POST method and unique URI string
- Group by username
- Rule runs once each minute

Tuning for false positives
- List of domains to exclude

Results: Investigate 3 – 5 accounts per week
Example 4: Compromised accounts accessing Library resources

Needed to identify compromised accounts downloading material

Built off same technique as compromised VPN search

Leverage additional log sources

- WiFi authentication
- VPN authentication
- Web Single Sign On
- EZProxy authorization

Example 4: Compromised accounts accessing Library resources

Built custom parsing for EZProxy logs

- Similar to Apache but slight nuances

Used multiple searches with subsearch function

- Identifies accounts logging in from multiple GeoIP regions
- Filters to highlight EZProxy users tagged in broader search

Results: Investigate 2 – 5 compromised accounts/day

username:(class:[cisco_vpn,jasig_cas,shibboleth_sso,oclc_ezproxy])
AND has:srcipv4
AND has:srccountrycode
not srccountrycode:us
not srccountrycode:mx
not srccountrycode:ca
not action:"authentication_failed"
not action:"ticket_granting_ticket_not_created"
not msg:"authentication: rejected"
AND (class:[jasig_cas,cisco_vpn,shibboleth_sso,oclc_ezproxy]
AND (srccountrycode:us OR srclan:"private ip address lan")
NOT (srclan:10.138.* OR srclan:150.135.114.* OR srclan:150.135.115.*)
not action:"authentication_failed"
not action:"ticket_granting_ticket_not_created"
not msg:"authentication: rejected")

OR (class:cisco_acs AND callid:10.*)

AND class:oclc_ezproxy | groupby username 1000
Questions?

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