Protecting Against SQLi in Real-Time

Stuart Hancock

stuart.hancock@dbnetworks.com
bob.dewolfe@dbnetworks.com

AGENDA

- SQL injection attacks
  - primary database security focus
- SQL injection detection/prevention
  - current technologies don’t work
- SQL threat assessment technology
  - a new approach

Overview

Web-based attacks: vast majority of data loss

Verizon Business report: 900+ breaches, >900M records lost

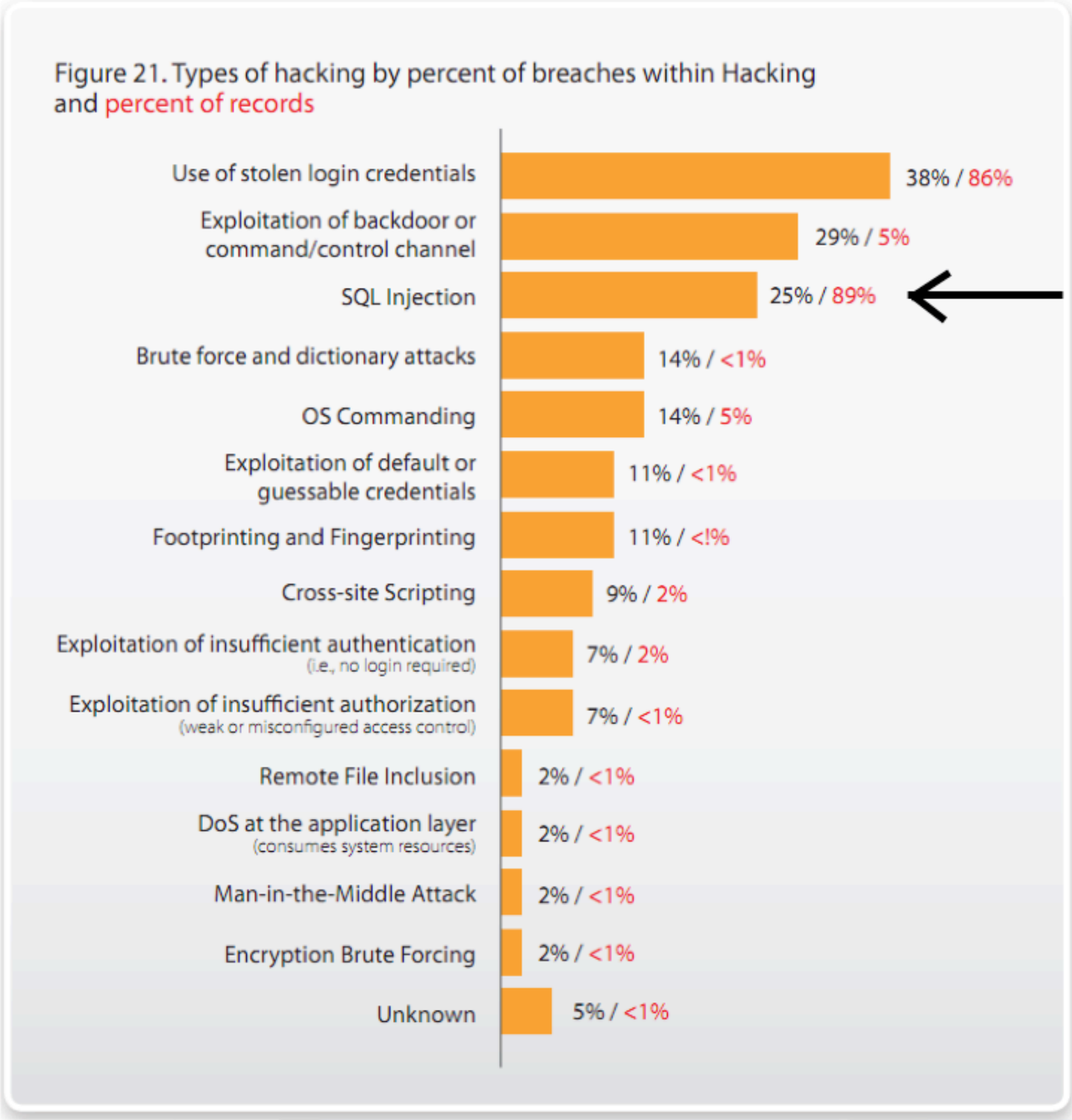
Threat is primarily from the outside

PCI compliance is no panacea

Attacks follow money – Financial, Hospitality, Retail

Overview

- Majority of losses to Web-based attacks
- 2004-2009: 900+ breaches, >900M records lost



Outside Threats are Primary

- 70% of attacks are external
- 21% of victims were PCI-compliant
- Attacks follow money:
  - Financial – 33%
  - Hospitality – 23%
  - Retail – 15%
  - The rest – vast majority unreported

High Profile Targets Get Attacked

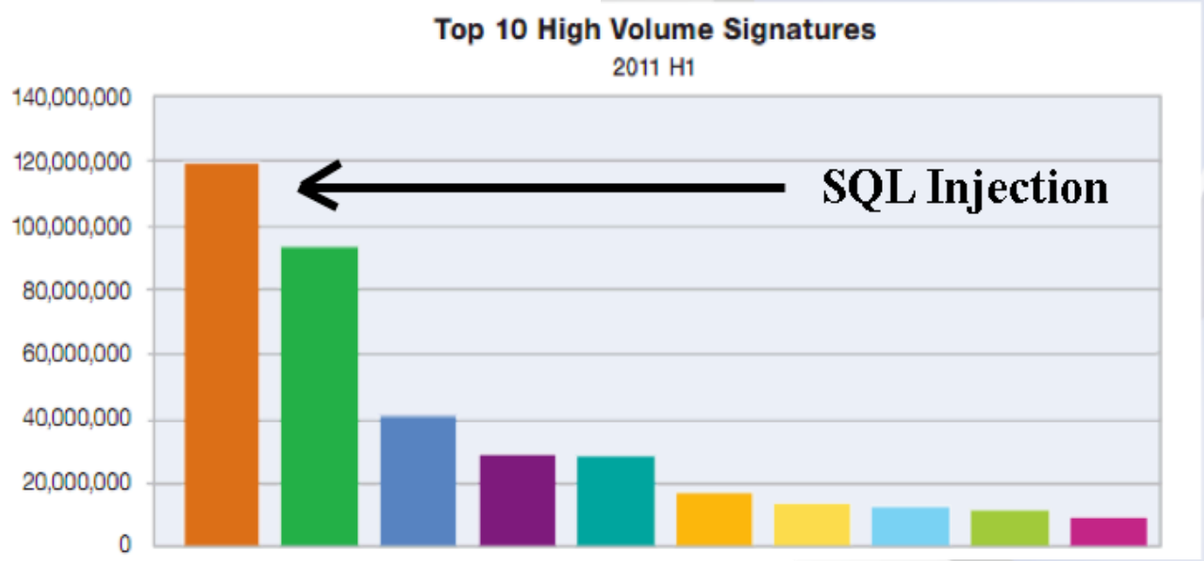
- High profile targets become hacking trophies
  - Stratfor
  - NSA
  - Oklahoma DOC
  - Symantec
  - US Census Bureau
  - United Nations

SQL Injection Attacks

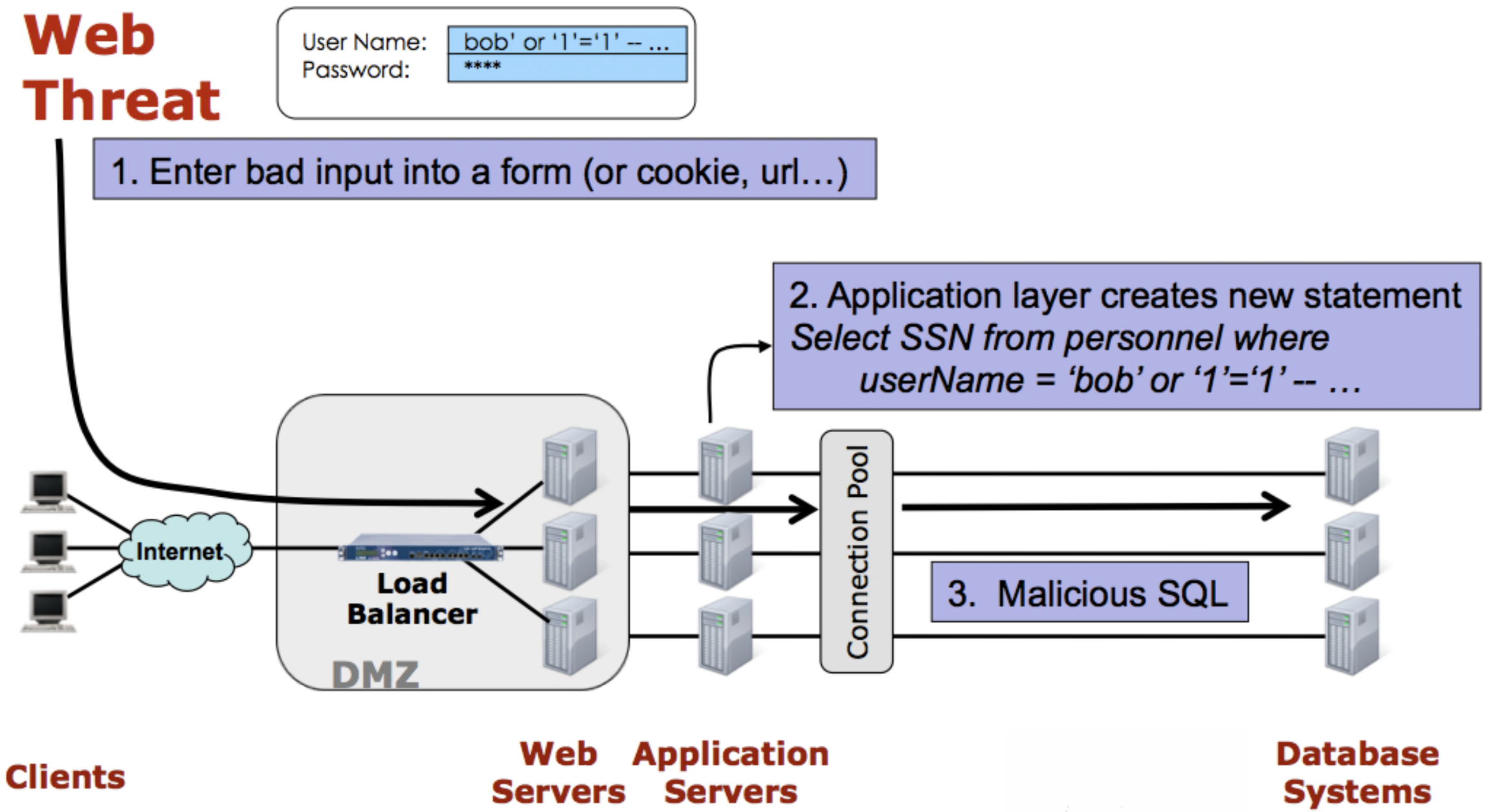
Database attacks result in:

- Leakage of sensitive information
- Destruction of important information
- Defacement of websites
- Distribution of malicious code

SQL Injection remains the preferred method of attack



SQL Injection Scenario



Can we get valuable data?

Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://192.168.28.128/mutillidae/index.php?page=user-info.php

Home Most Visited Smart Bookmarks Getting Started Latest Headlines Southern California C...

Share Browser WebEx

http://192.168.28...age=user-info.php

Core Controls
Home
Register
Login
Logout
Toggle hints
Setup/reset the DB
Show log
Credits

A1 - Cross Site Scripting (XSS)
Add to your blog
View someone's blog
Browser info
Show log

A2 - Injection Flaws (SQL and Command)
Login
User info

View your details

If you do not have an account, Register

Enter your username an password below to view your infromation:

Name:
1' or 1=1 –

Password:

Submit

Results:

Username=admin
Password=adminpass
Signature=Monkey!!!

Username=adrian
Password=somepassword
Signature=Zombie Films Rock!!!

Username=john
Password=monkey
Signature=I like the smell of confunk

Username=ed

Done

Username injected with NO password

Entire Database Dumped

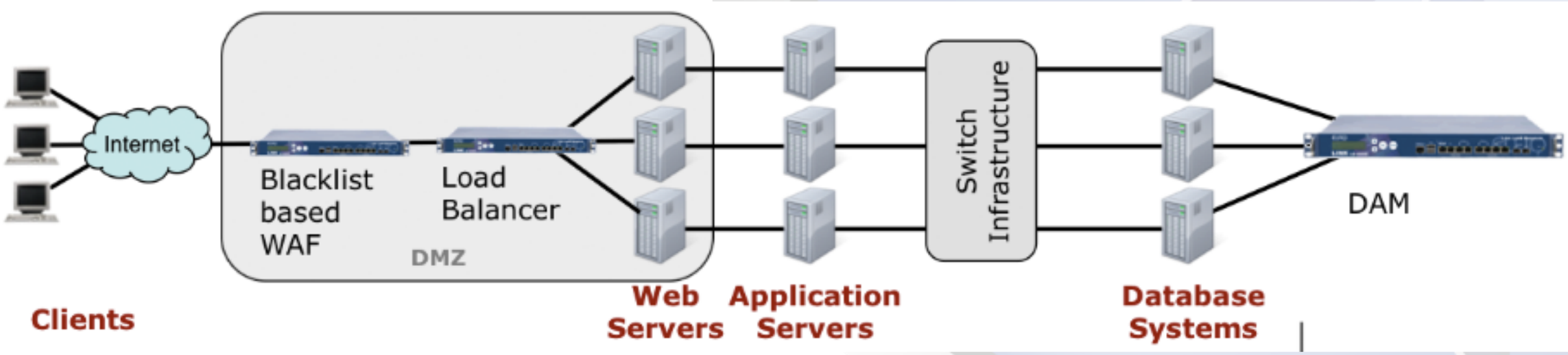
State of the Industry

Current offerings (multi-tiered model):

- Code Review/Scanning
- Pattern Recognition (WL/BL)
- SQL Statement by Statement Training

Problems:

- Good luck with writing perfect code
- Chasing the horse that left the barn
- Very long learning cycle, high false positives



CODE REVIEW

"Software will always have bugs and by extension, security vulnerabilities. A practical goal for a secure software development lifecycle (SDLC) should be to reduce, not necessarily eliminate, the number of vulnerabilities introduced and the severity of those that remain."

- Michael Howard, Microsoft, Senior Security Program Manager

Whitelist/Blacklist, Statement by Statement Learning

- Not effective – horse already left the barn
- Not possible to predict new/unique attacks
- Application and Web Servers are SQL generators
  - Not possible to learn all generated SQL
  - High false positive rate as a result

What's needed:

Adaptive Database Firewall

- Requires full understanding – application/database tiers
- Profiles Web-based applications
- Deep semantic/parametric analysis, all SQL statements
- High sensitivity but low false positive rate
- Lexically new statements assessed for structural attacks
- Short training period
- Continuously refined profiles adapt to application changes

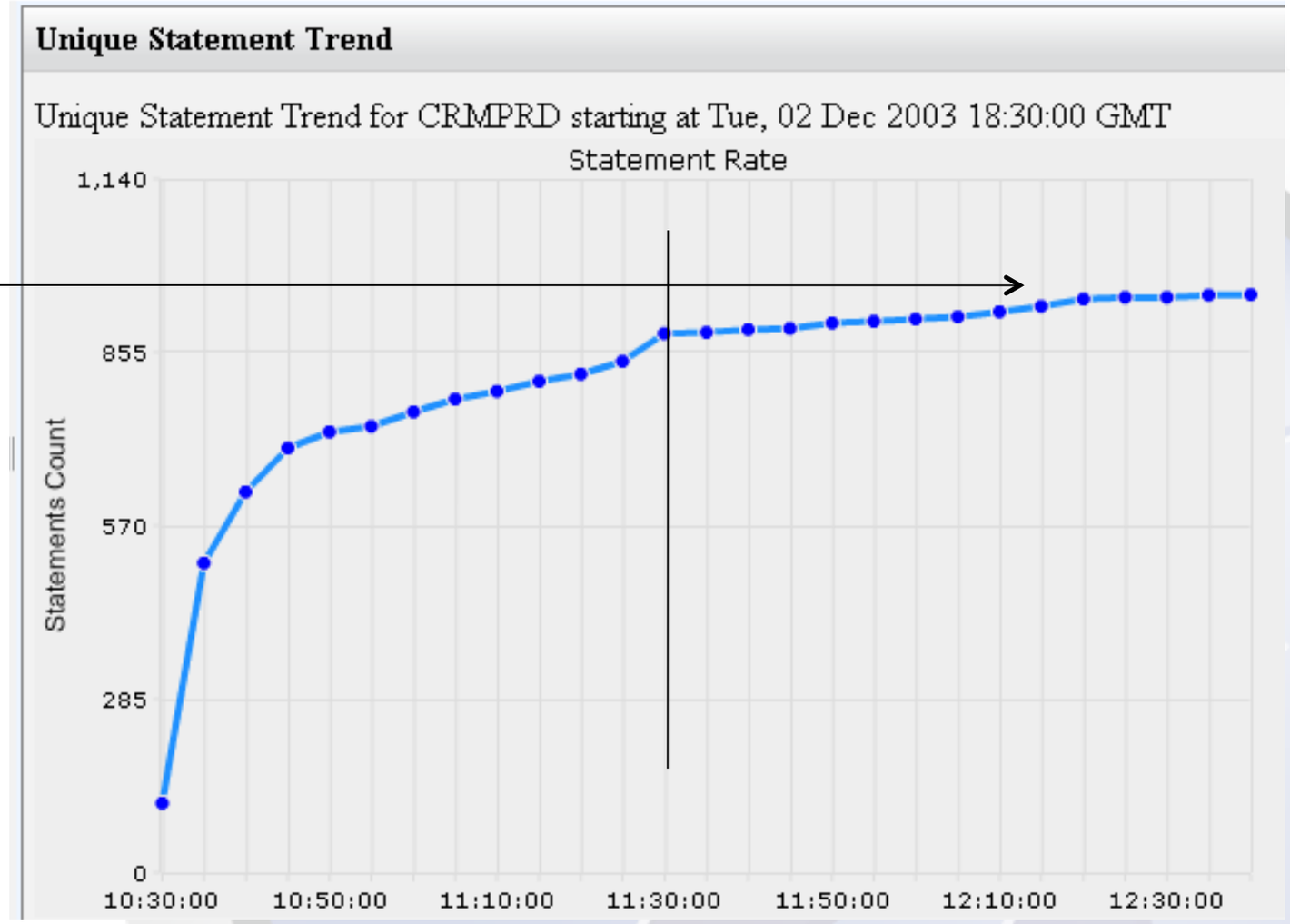
Time to safety

Compared to non-adaptive white-list/black-list technology

- Applications are protected sooner – much sooner
- Less resources consumed to achieve protection
- Application changes less likely during learning cycle
- Protects against new/unique attacks not previously seen
- Capable of monitoring future attack vectors

Rapid Learning

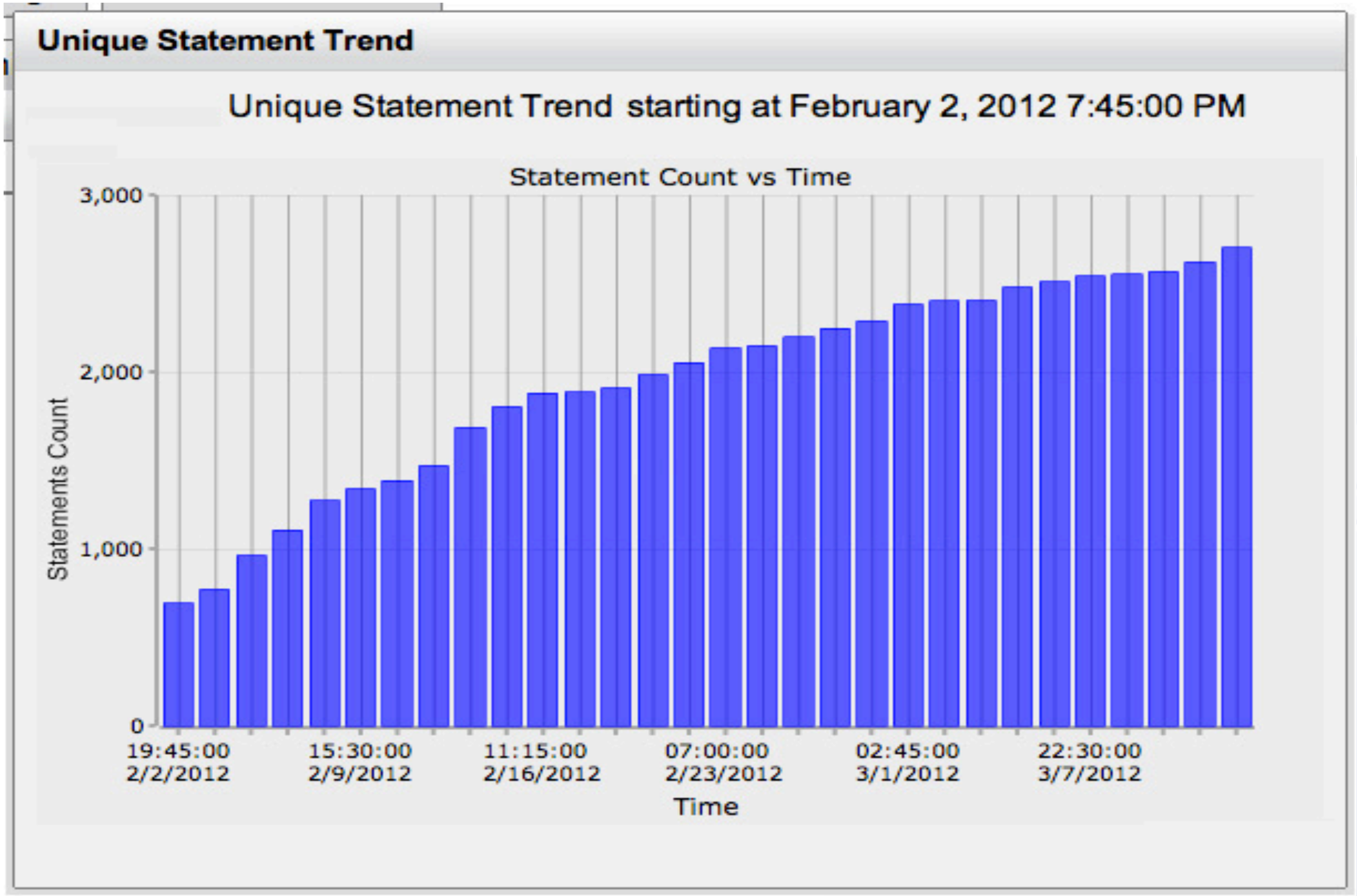
Long tail arrival of new statements



Short learning cycles

- Reduce deployment costs
- keep pace with rapid application changes

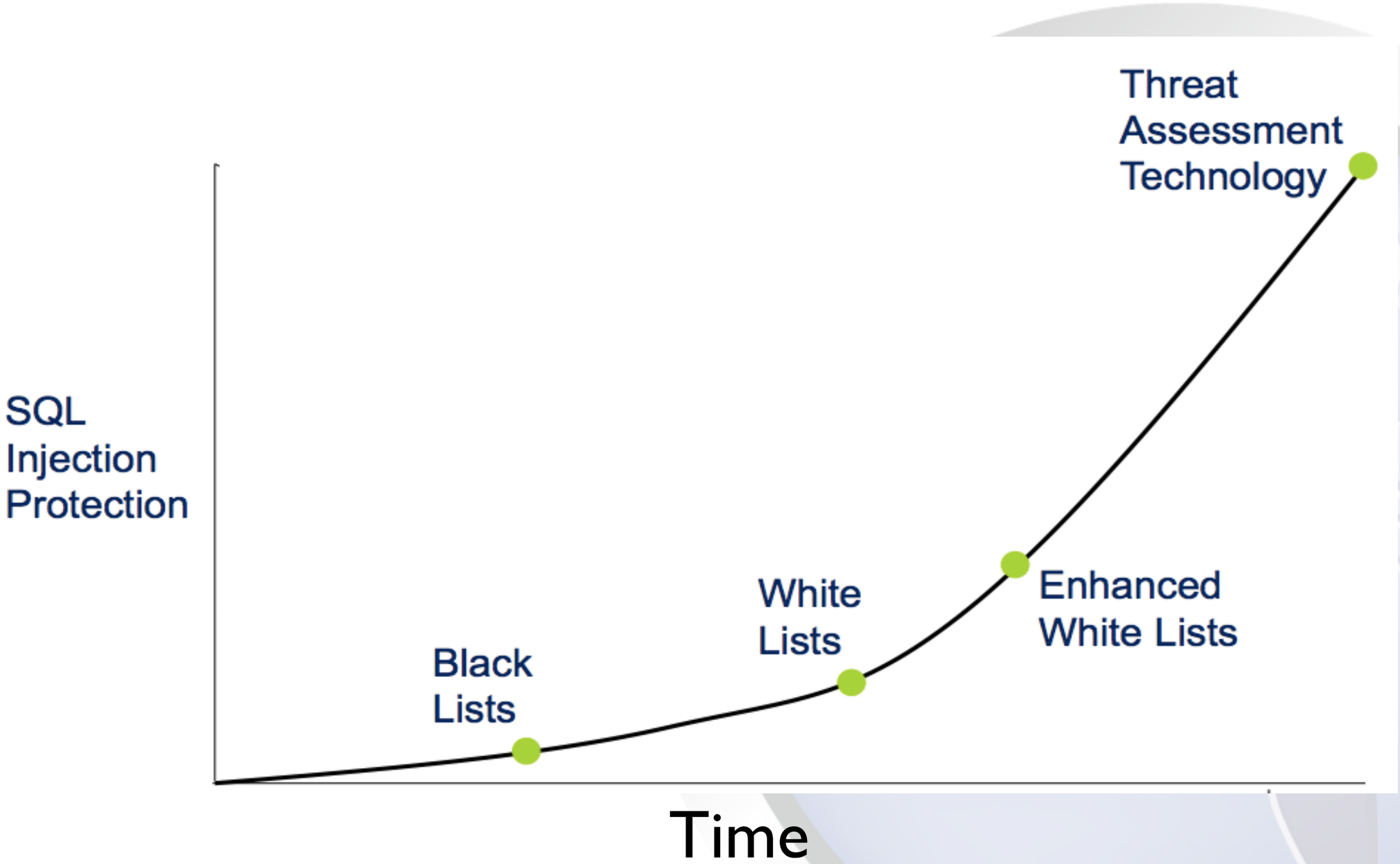
Classic SQL Unique Statement Trend



When an Attack is Detected, one should…

- Alert
  - Create alerts via email, syslog (SIEM), and SNMP
  - Audit logs identify breach - secure, signed logs
- Inform
  - Analytics provide nature and scope of attack
  - Analytics provided to provide efficient review
  - Integration with third party audit/compliance facilities
- Block if desired
  - Database session kill capability terminates attack
  - Web tier integration provides session blocking
  - Blocking presents challenges

Evolution of Database Security



Current Approaches:

- Continue as is, no DB protection
- Development phase – code analysis/improvement
  - Applicable to new code development when possible
  - Too many vulnerabilities, expensive, time-consuming
  - Extensive required testing expensive, delays releases
- Post-breach: Forensics assess scope of damage

  applicable to determine liability, accountability

….or…..

Real-Time Production Phase Protection

- Genuine Protection in Real-Time
- Short learning cycle
- Multi-environment adaptable
- Profiling of each application's database activity
- Drop-in, transparent install
- Passive monitoring
- Multiple heterogeneous databases simultaneously
- Web-tier attack vector correlation

THANK YOU!

Questions?

Stuart Hancock
stuart.hancock@dbnetworks.com
301-788-3192

Bob DeWolfe
bob.dewolfe@dbnetworks.com
978-317-8197