AuthMatrix

Simplified Authorization Testing for Web Applications

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About Me – Mick Ayzenberg

- Security Engineer – 4 years
- Application Security – Web, Mobile, Desktop, SCADA, Embedded
- Specializations – Fuzzing, Crypto-currencies
- Lot of time spent pentesting web for large tech companies

Some Web PenTesting Insights

- Web Security Has Gotten Better
- Proper Design Decisions Prevent Most Issues
  - Patching Schedules
  - Framework/API Selection
- Testing Categories
  - Input Validation
  - Configuration
  - Authorization and Business Logic

Getting Easier to Do Right

- XSS
  - Testing: Fuzz Inputs, Evade Filters
  - Fixing: Encode all Outputs by Default
- SQLi
  - Testing: Fuzz Inputs, Evade Filters
  - Fixing: Parameterized Queries by Default
- CSRF, Authentication, Redirects
  - Testing: Identify them in the application
  - Fixing: Pick a good framework and let it do the work

The Problem

- Critical Bugs are Still Common
- Authorization in web applications and web services is still hard to get right!
  - Hard to develop
  - Hard to test
  - Unique per each application

Auth(n) vs. Auth(z)

- Authentication
  - Login
  - Session Management
- Authorization
  - Permissions
  - Access Controls

OWASP Top 10

OWASP Top 10 – 2013 (New)
A1 – Injection
A2 – Broken Authentication and Session Management
A3 – Cross-Site Scripting (XSS)
A4 – Insecure Direct Object References
A5 – Security Misconfiguration
A6 – Sensitive Data Exposure
A7 – Missing Function Level Access Control
A8 – Cross-Site Request Forgery (CSRF)
A9 – Using Known Vulnerable Components
A10 – Unvalidated Redirects and Forwards

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OWASP Top 10 – Configuration

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- Configuration
  - Patching
  - Easy for Scanners

OWASP Top 10 – Framework

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- Configuration
  - Patching
  - Easy for Scanners
- Framework
  - Standard Testing Methodology
  - App-wide Fix

OWASP Top 10 – Specialized

- Configuration
  - Patching
  - Easy for Scanners
- Framework
  - App-wide Fix
  - Standard Testing Methodology
- Specialized
  - User/Permission Based
  - Unique to Each App

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Authorization Examples

- https://fake.com/GetUserInfo?id=53
- https://fake.com/Admin/ListAllUsers
- https://fake.com/Admin/DeleteUser?id=53

Authorization Example

POST /Admin/DeleteUser HTTP/1.1

Host: fake.com

User-Agent: Mozilla/5.0

Content-Length: 8

id=53

Authorization Challenges

- Harder to fix within the framework
- Testing is time consuming
  - No generic testing conditions
  - Harder to automate
- Hard to repeat tests (regression)
  - Requires custom scripts

Authorization Testing

- Manual Process
  - Enumerate roles
  - Map entire application
  - Authenticate all necessary users
  - Test every combination
    - Run request
    - Observe results
    - Determine if behavior is correct
    - Record results
- Many Opportunities for Human Error

Threat Modeling

Action
Create
Read
Update
Delete

Frequency
Always
Sometimes
Never
Not Applicable

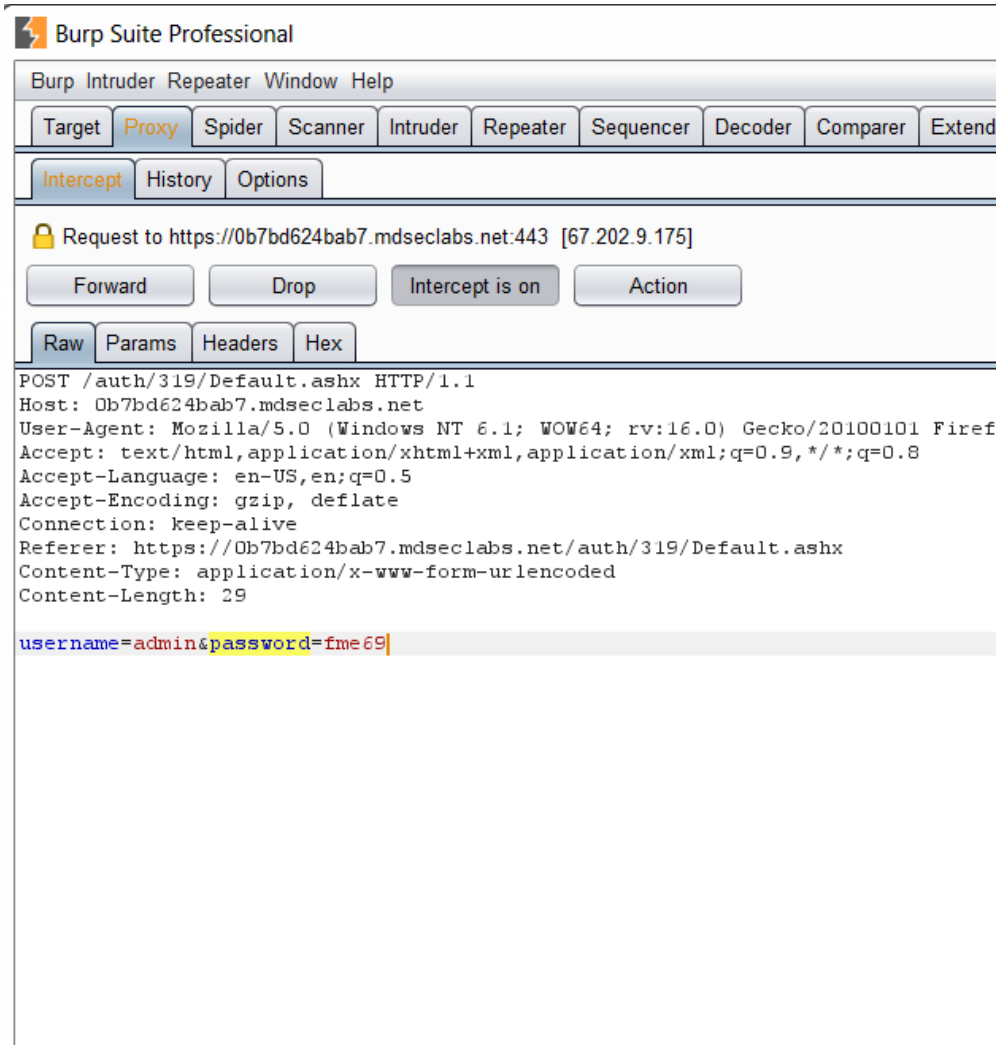
		Role			
Asset	Action	Anonymous	Employee	Manager	Admin
Employee Name	Create	Never	Never	Never	Always
	Read	Never	Sometimes	Always	Never
	Update	Never	Sometimes	Always	Never
	Delete	Never	Never	Never	Always
Employee SSN	Create	Never	Never	Never	Always
	Read	Never	Never	Never	Never
	Update	Never	Sometimes	Never	Never
	Delete	Never	Never	Never	Always
Employee Salary	Create	Never	Never	Never	Always
	Read	Never	Sometimes	Always	Never
	Update	Never	Never	Always	Never
	Delete	Never	Never	Never	Always

AuthMatrix – Design Goals

- Intuitive UI – similar to threat model table
- Manual condition mapping –> Click and Run
- Reduce chances for human error
- Covers 90% of test scenarios
- Reproducible testing
- Make life easier (not harder)

Burp Suite

- Web App Testing Framework
- Commonly used
- Tamper/Request/Proxy individual HTTP messages



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Burp Suite – Extender APIs

- Java, Python, or Ruby
- Features
  - Create new tabs within Burp Suite
  - Send new Requests
  - Modify Requests on the fly
  - Format data types
  - Scan results for specialized vulnerabilities

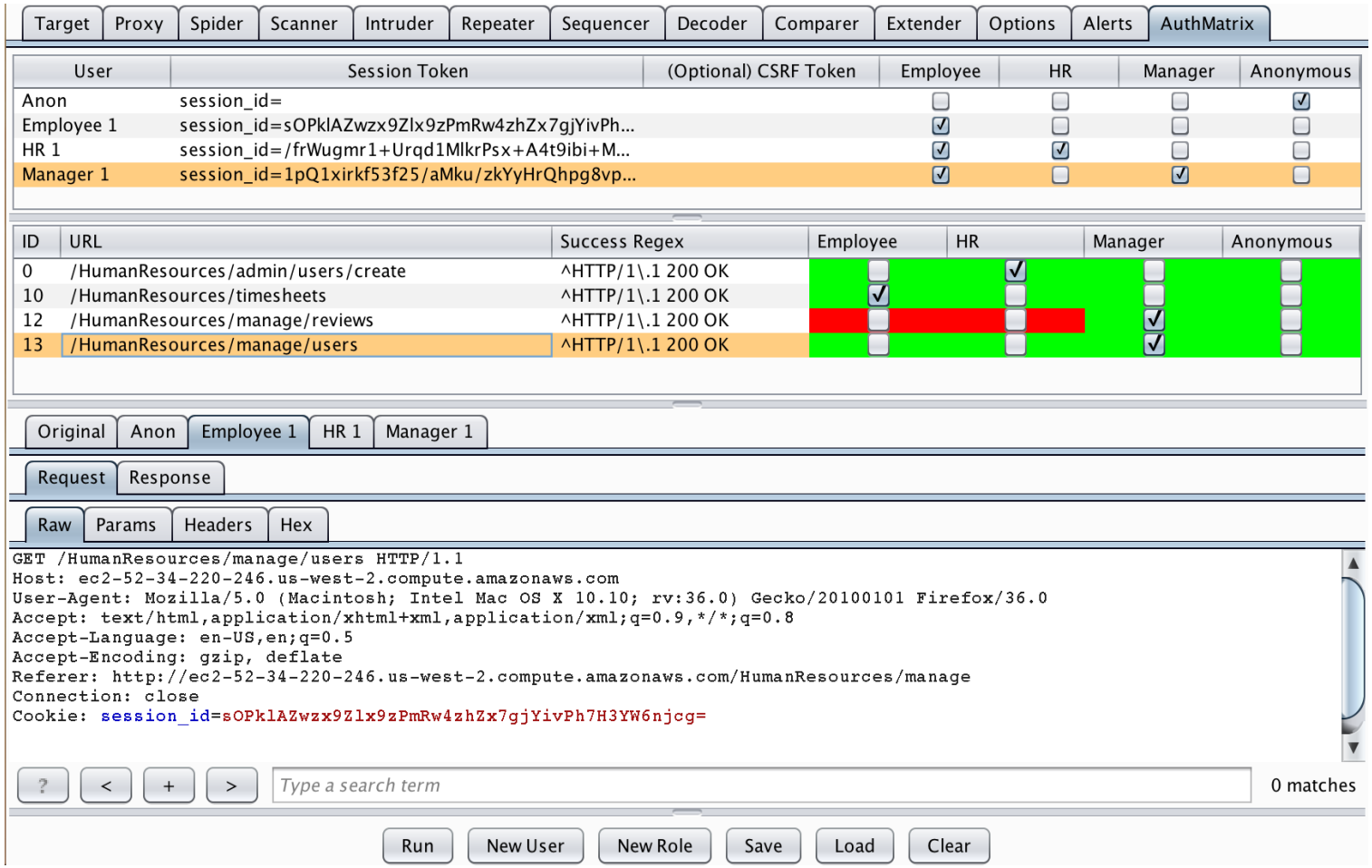
Burp Suite – Extensions

- API Signature headers
- HeartBleed scanning
- Integration with other tools
- Logging and note taking

Burp Suite - BApp Store

- Free extensions
  - Available from within Burp
- Several auth extensions
  - One request at a time
  - Manually review results
  - Confusing UI

AuthMatrix - DEMO



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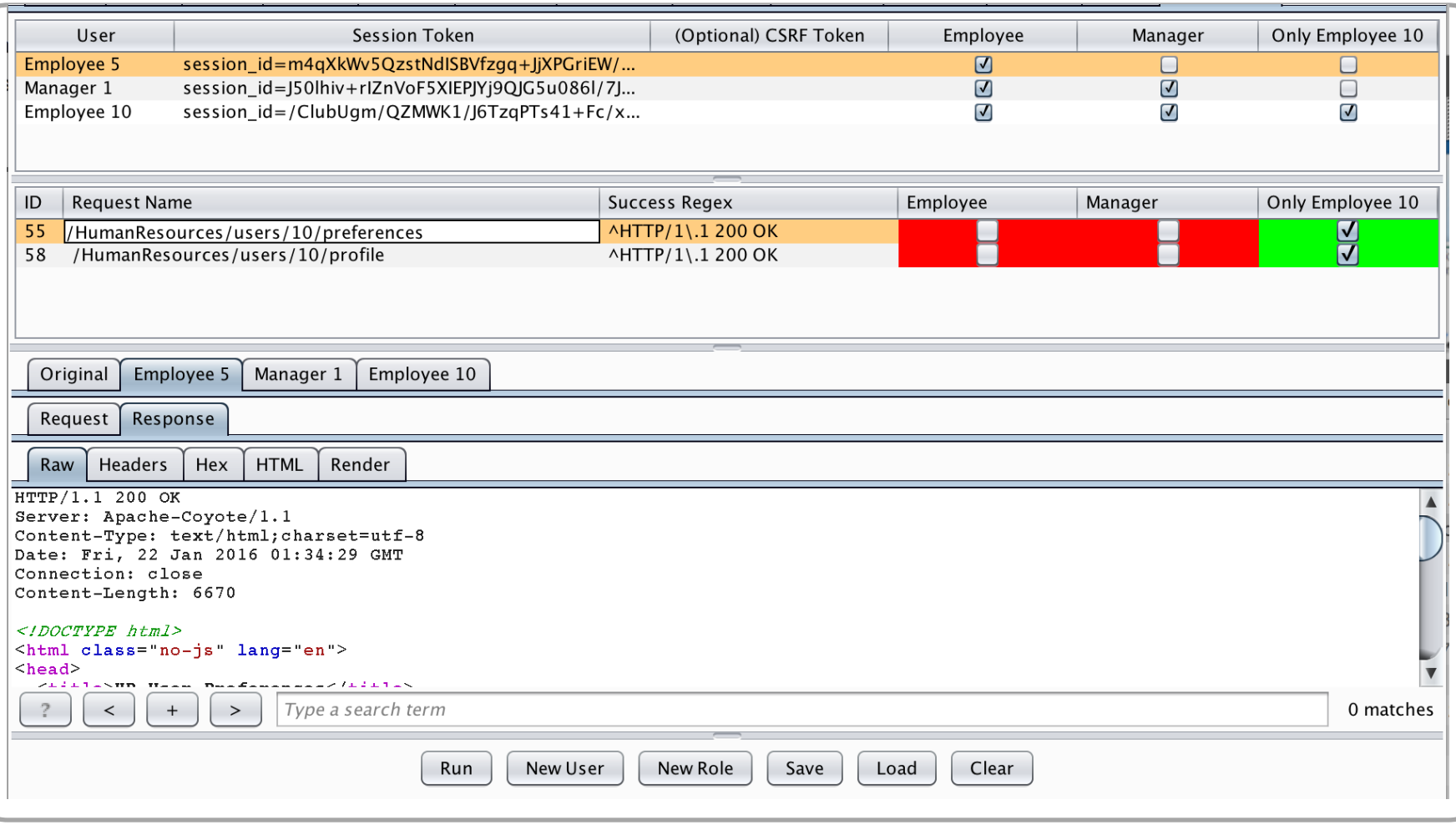
Revised Methodology

- Explore target application
- Add all functionality endpoints to AuthMatrix
- Define Roles and Users
- Fill out matrix tables
- Define success conditions (regex)
- Generate Session Tokens
- Run Save and Repeat

Usage Tips/Tricks

- Session token can be Header or Cookie
  - **Sessionid=abcd**
  - **Sessionid: abcd**
- Don’t load untrusted configs
- Parameters matter in authorization as well

A4 - Insecure Direct Object Reference



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Current Limitations

- Only static CSRF tokens supported currently
- No support for multiple session tokens
- Success detection requires regex
- Web service signature support
  - Though can often be coupled with other extensions
- Permission Exceptions
  - “Admins can, Managers can, but Admin-Managers can not.”

Whats Next?

- Open sourced soon…
  - https://github.com/SecurityInnovation/AuthMatrix
- Explore Burp session management integration
  - Macros to renew session tokens automatically
  - Macros to update CSRF tokens
- Submission to BApp Store for free download

QUESTIONS?

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