HL7 FHIR DevDays 2017

HL7® FHIR®

# Overview over security in FHIR & Security Labels

Grahame Grieve, Health Intersections

Amsterdam, 15-17 November | @fhir_furore | #fhirdevdays17 | www.fhirdevdays.com

# Security Problem Space

- Basic Web Security
- Authentication  / Authorization / Access Control
- Digital Signatures
- Audit Trail / Provenance tracking
- Security Labels

- An insecure system is an unsafe system

# Basic Web Security

- Use a time synchronization protocol
- Use SSL / TLS (almost always)
- Keep your security libraries up to date
- Use CORS correctly (hard)
- No Buffer overflows, XSS, etc
- Narrative Handling

- Recommended: https://www.troyhunt.com/

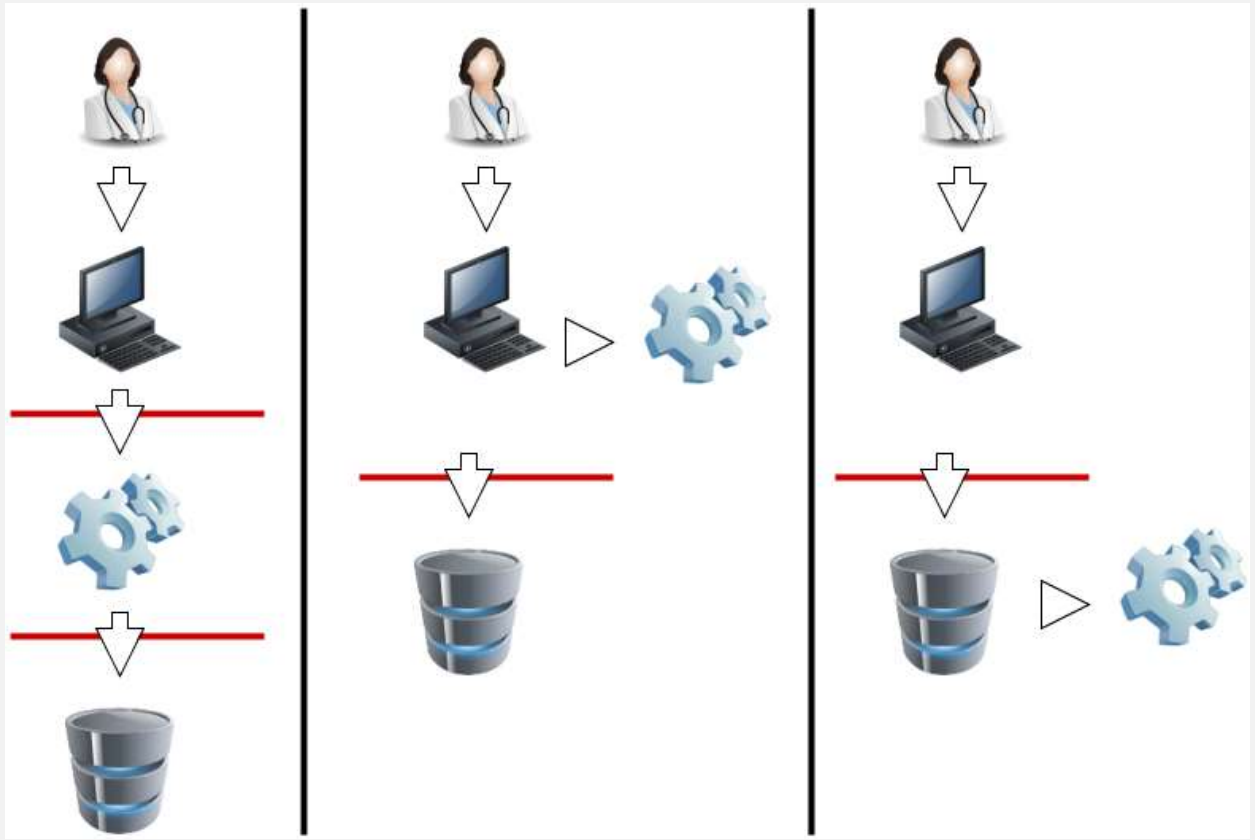
# Content Issues

- Base Content Rules:
  - No DTD references
  - No Active Content in XHTML
- XML: Ignore Processing Instructions
- XHTML:
  - White list external references
  - Don’t leak headers processing external references (images, css, etc)
  - Check media types of attachments

# AuthZ

- Authentication: Who is the user? (and their agent?)
- Authorization: What does the user allow in this context?
- Access Control: Is this request allowed, given
  - The data in the request
  - The user's rights
  - The user's authorization
  - The rules on the underlying data

# Access Control Engine



# OAuth

- Delegating Authorization
- Implicit: Delegating Authentication
  - openID Connect: Make this explicit
- Two layer OAuth (demonstration)
- Smart App Launch (http://hl7.org/fhir/smart-app-launch)
  - A profile on OAuth + openID Connect
  - Should always use this wherever possible for interoperability

# Two Layer OAuth

| OAuth Client | Server (AS/RS) | Resources |
|---|---|---|
| User Application | Health Records Server | What healthcare records should this application get access to |
| Health Records Server | Identity Server | Identification information about the patient |

- Must be possible to map from identity on health records server to Identity server information (this can be established lots of ways)
- Best identity server is a national identity server

# OAuth

- Delegating Authorization
- Implicit: Delegating Authentication
  - openID Connect: Make this explicit
- Two layer OAuth (demonstration)
- Smart App Launch (http://hl7.org/fhir/smart-app-launch)
  - A profile on OAuth + openID Connect
  - Should always use this wherever possible for interoperability

# Smart App Launch

- Confidential Client (can keep a secret) – server / secure enclave
- Public Client

- Backend services
  - Not much supported, and not part of STU standard

# Smart App Launch Scopes

- [class]/[type].[mode]

- Class = patient | user | system
- Type = * or a FHIR resource type
- Mode = * | read | write

- Examples: patient/*.read  user/*.* system/Communication.write
- Also: openid profile launch offline_access online_access

# Smart App Launch

| | | | |
|---|---|---|---|
| Clinical Content | Allergies, Medical History, Consultation notes, Care plans, Referrals | ☑ read | ☑ write |
| Recorded Data | Labs, Imaging, Vital signs, device measurements | ☑ read | ☑ write |
| Medications | Prescriptions, Dispenses, Records | ☑ read | ☑ write |
| Appointments | Past & Future appointments / encounters | ☑ read | ☑ write |
| Audit Trail | Record of all changes to all kinds of data | ☑ read | ☑ write |
| Documents | Various documents | ☑ read | ☑ write |
| Financial Records | Various documents | ☑ read | ☑ write |
| Other stuff | Communication records, Supply, Questionnaires, more stuff | ☑ read | ☑ write |

# Alternative Approach

- Instead of Smart Scopes, scopes are URIs that identify Consent resource
- Application identifies the consent resource it wants to work under
- User chooses which consent resource to proceed under
- Server replies with the consent resource that the user chose

- Makes decisions obscure to the interface, but…
- Possibly going to be tested in January connectathon

# Access Control

- The Smart OAuth scopes interact with access control
- Access Control Engine engine:
  - What scopes can a user allow?
  - What operations/data does a user have rights for?
  - What scopes has the user allowed in this context?
  - What other Consents are applicable in this context? (+ jurisdictional rules)

- FHIR does not standardise the access control layer
  - Should we?
  - SCIM for user management – what's the mapping between users and roles?

# AuditEvent and Provenance

AuditEvent

- Record of an event
  - Login/logout
  - RESTful API transaction
  - Higher level event (RWE)
- Typically Create (no update/delete)
- Consider signing the audit trail (blockchain?)

- Provenance
- Information about source of data
- Applies to a set of resources
- W5: Who What When Where Why
- This information is denormalised into resources variably
- Can provide it in an HTTP header
- Can populate the AuditEvent

# Digital Signatures

- Formal Support:
  - Signature Data type
  - Provenance.signature
  - Bundle.signature

# Signature Data Type

| Name | Flags | Card. | Type | Description & Constraints |
|---|---|---|---|---|
| Signature | | | Element | A digital Signature - XML DigSig, JWS, Graphical image of signature, etc.<br>Elements defined in Ancestors: id, extension |
| type | Σ | 1..* | Coding | Indication of the reason the entity signed the object(s)<br>Signature Type Codes (Preferred) |
| when | Σ | 1..1 | instant | When the signature was created |
| who[x] | Σ | 1..1 | | Who signed |
| whoUri | | | uri | |
| whoReference | | | Reference(Practitioner \| RelatedPerson \| Patient \| Device \| Organization) | |
| onBehalfOf[x] | Σ | 0..1 | | The party represented |
| onBehalfOfUri | | | uri | |
| onBehalfOfReference | | | Reference(Practitioner \| RelatedPerson \| Patient \| Device \| Organization) | |
| contentType | Σ | 0..1 | code | The technical format of the signature<br>MimeType (Required) |
| blob | | 0..1 | base64Binary | The actual signature content (XML DigSig. JWS, picture, etc.) |

# Using the Signature Data Type

- Provenance
  - Detached Signature
  - Provenance.target : Reference(Any) 1..*
  - Provenance.signature: a signature across all the resources
  - Canonicalization across multiple resources not specified
- Bundle
  - Enveloped Signature
  - Bundle.signature signs content
  - http://hl7.org/fhir/xml.html#digsig and http://hl7.org/fhir/json.html#canonical

# Challenges with digital signatures

- Signatures on static content (“documents”) are well understood
- Signatures on a RESTful interface are not
  - Changing contents on interface engines
  - Signing packages of resources that can be re-identified

# Security Labels

- Some resources need special handling
  - VIP patients
  - Confidential records
  - Restricted use data (i.e. released for research, not for treatment)
- Sometimes this is implicit in context, or the content of the resource
- Mostly useful to make this explicit on the resource (denormalization)

# Using Labels

```
<Patient xmlns="http://hl7.org/fhir">
  <meta>
    <security>
      <system value="http://hl7.org/fhir/v3/Confidentiality"/>
      <code value="R"/>
      <display value="Restricted"/>
    </security>
  </meta>
...  [snip] ...
</Patient>
```

```
HTTP/1.1 GET fhir/Patient/482735/condition
Content-Type: text/xml
Access-Control-Allow-Origin: *
Last-Modified: Thu, 19 Nov 2013 07:07:32 +1100
ETag: 24
Category: http://hl7.org/fhir/security-label#break-the-glass; scheme="http://hl7.org/fhir/tag/security"; label="Break Th
e Glass"
```

# Core Labels

- Purpose of Use
  - Treatment, research, legal, claims… etc
- Confidentiality Codes
  - Unrestricted → normal → restricted → very restricted
- Delete after use / No Reuse

- All applications are required to know what these labels mean and observe/obey them if relevant
- There are 500+ total labels, and growing….

# Summary

- Security is hard
- Requires clear thinking
- Ongoing development around Authorization and Consent
- Questions…