THE DICOM 2014 Chengdu Workshop

August 25, 2014 Chengdu, China

DICOM℠
Digital Imaging and Communications in Medicine

Keeping It Safe

Securing DICOM

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What is security?

- **Protecting data security (against unauthorized access)**
- **Protecting data integrity (against unauthorized changes)**
- **Protecting data loss (against unauthorized deletions)**
- **Protecting data availability (against denial of service)**

What are the implications if security is compromised?

- **Data corruption and loss**
- **Fraud against those victimized**
- **Civil penalties (fines and lawsuits)**
- **Criminal penalties**
- **Serious harm and death**

What is NOT security?

- **Changing names of parameters, servers or functions to make it harder to guess**
- **Including dangerous functions in a release but not including them in documentation**

Keeping DICOM Safe

Simple workflow

- Modality transmits images to archive
- Radiologist requests images for reading

: Out to cause security issues

DICOM Security Profiles

- **Defined in PS3.15, “Security and System Management Profiles”**
- **Describes methods to mitigate various security concerns**
- **Items in red describe solutions that are used in the industry but not explicity part of the DICOM standard**

DICOM in Transit

Who sees this image?

- The modality, who sends the image
- The archive, who receives the image
- Anyone on the network between

DICOM-TLS

- Transport Level Security encryption (defined in PS3.15 Section B.1)
- Encryption is negotiated as part of TLS
- Traffic encrypted with public certificate and decrypted by private key
- Network VPN tunnels is another mechanism
- DICOMweb can leverage HTTPS (TLS based)

DICOM in Transit

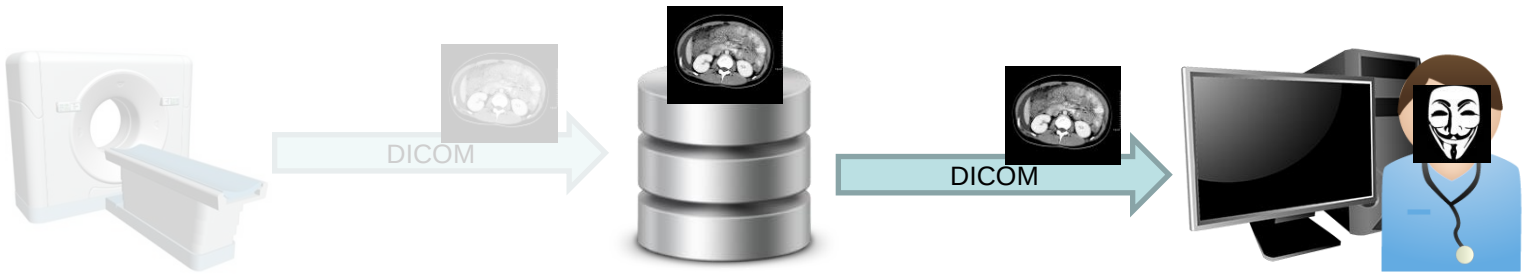
Who are the actors in transmission?

- The modality, who sends the image
- The archive, who receives the image
- Anyone pretending to be these actors

Node Identity

- **DICOM-TLS certificates specifies identifying information about the owner**
- **Verification of certificates are done against a signing authority**
- **AE titles are a less secure alternative**

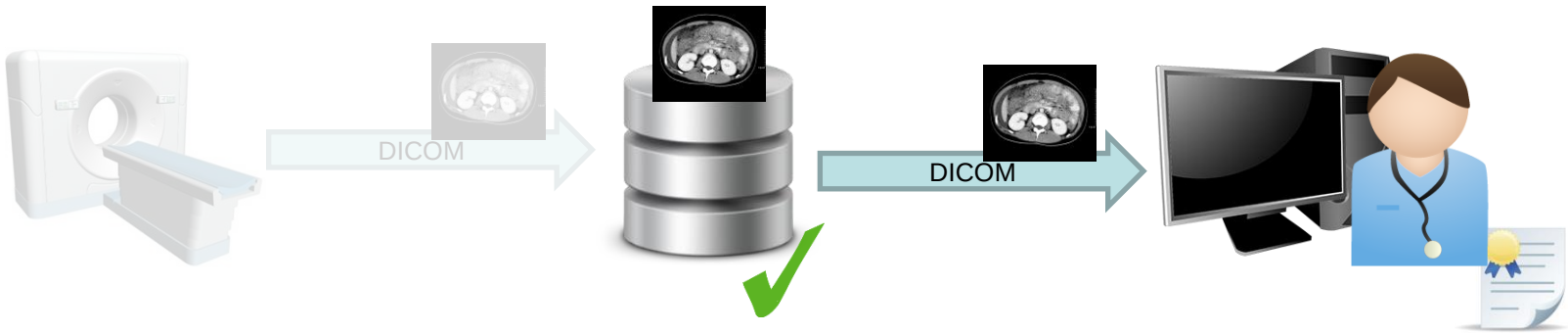
User Authentication



Who can retrieve images?

- Device is validated by DICOM-TLS
- User can retrieve images
- Anyone else using device can, too

User Authentication



- **Defined in PS3.15 B.4-7**
- **Authentication of users can occur via**
  - **Mutual TLS authentication (each side presents certificates)**
  - **Authentication during association negotiation (SAML, Kerberos, etc)**
- **Authenticating users at the application level and making trusted calls to the imaging backend is an alternative approach**

Auditing

- **Described in PS 3.15 Part A.5**
- **User should be known**
- **Events for authentication, query, access, transfer, import/export, and deletion**
- **This is used in the IHE ITI ATNA profile with Radiology option**

DICOM at Rest

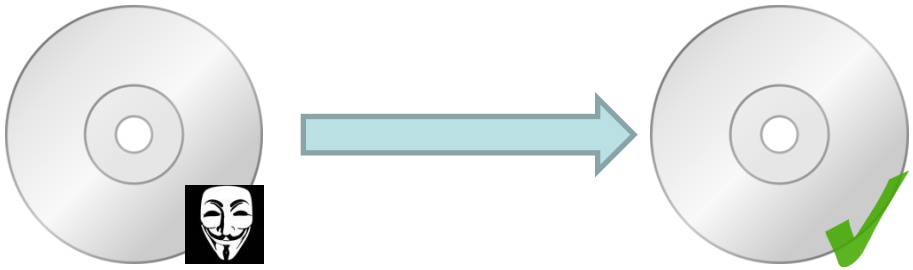
Who ensures the images are genuine as the modality provides them?

- **The archive accomplishes this task**
- **Anyone else who can manipulate the archive**

Digital Signatures

- **DICOM supports digital signatures which provides integrity check and other features**
- **Defined in PS3.15 Section C**
- **Individual fields can also be selectively encrypted**
- **Disk-level encryption can also be used to maintain integrity at rest**

Media Storage



- **Used when DICOM is transmitted via physical media (CD, DVD, USB key)**
- **Guarantees confidentiality, integrity, and media origin**
- **Defined in PS3.15 section D**

Anonymization

- **Anonymization profiles exist to support masking of data for various purposes**
  - **Clinical trials**
  - **Teaching files**
- **Defined in PS3.15 section E**
- **Addresses removal and replacement of DICOM attributes that may reveal protected health information**

DICOM's Stance

- **DICOM enables a very wide variety of authentication and access control policies, but does not mandate them**
- **DICOMweb shares the same position through the use of standard internet technologies**

Suggestions

- ✓ **Use DICOM-TLS and HTTPS for DICOMweb**
- ✓ **Use appropriate authentication and authorization measures**
- ✓ **Use appropriate at-rest encryption mechanisms**
- ✓ **Control access via managed environments, strong identity management, firewalls**
- ✓ **Consider security throughout your project lifecycle, not at the end**

Keep It Safe!

Questions? Thank you!