

# Data Acquisition in a PACS

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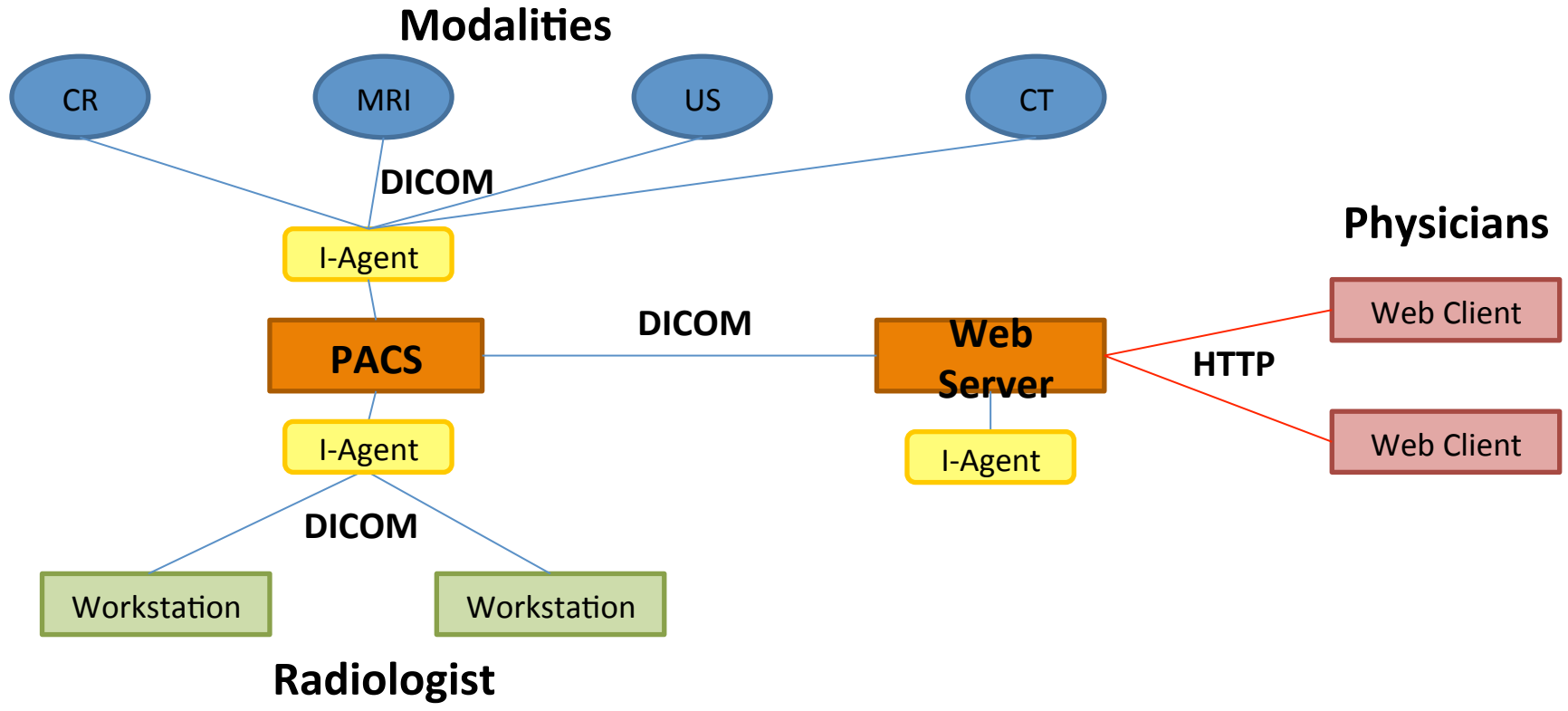
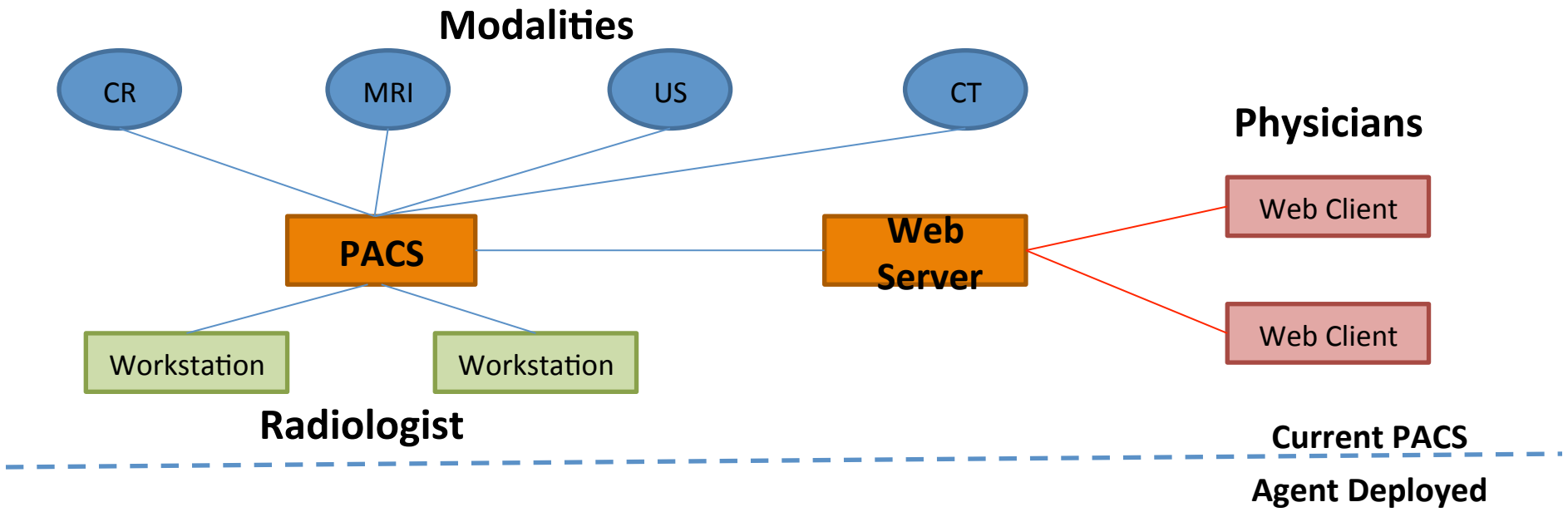
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# Problems about Data Acquisition

- How to capture messages in a PACS?
- Who is the users?
- What data is accessed?
- What is the operation on the data?

# How to capture messages in a PACS?

- Network Analyzer Tools, like well-accepted Wireshark?
  - Wireshark is based on WinPcap (Windows), which allows capturing, analyzing and even modifying network packages bypassing the protocol stack, but unable to block or redirect packages to a specified destination (e.g. another application or host). After acquisition the messages, we may change the destination, such as forwarding to common infrastructure for authentication (HIAL).
  - Network analyzer tool can't address our problem.
- Multiple Agents?
  - A proxy server (**Intermediary Agent**) can be deployed to acts as an intermediary between workstations, modalities and PACS servers (Exam Entry Point).
  - Intermediary agents provide exactly the same interface with existing DICOM server entry point, and can be inserted into existing PACS through reconfiguration instead of code level change.



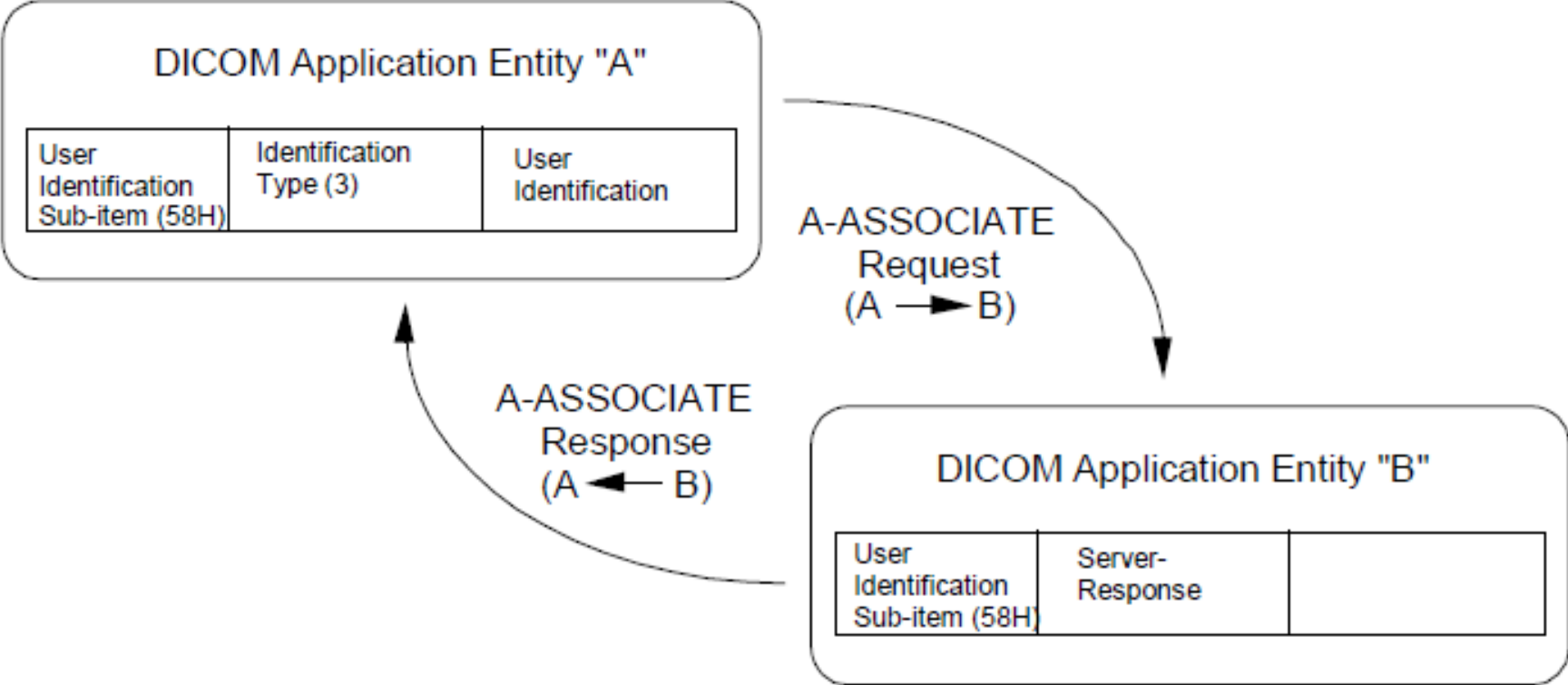
# Who is the users?

- DICOM is based on client-server model. User is authenticated when launching the client application (*e.g. display workstation*), but the authenticated information is not transmitted between client and server (*e.g. PACS Server*).
- A new feature “User Identity Negotiation” (DICOM Part 7, D.3.3.7 ) is added as an optional mechanism to send/receive username, username/password, Kerberos or SAML during DICOM association negotiation.
- The implementation of “User Identity Negotiation” is still rare for PACS. (e.g. dcm4chee supports it but Clear Canvas does not)

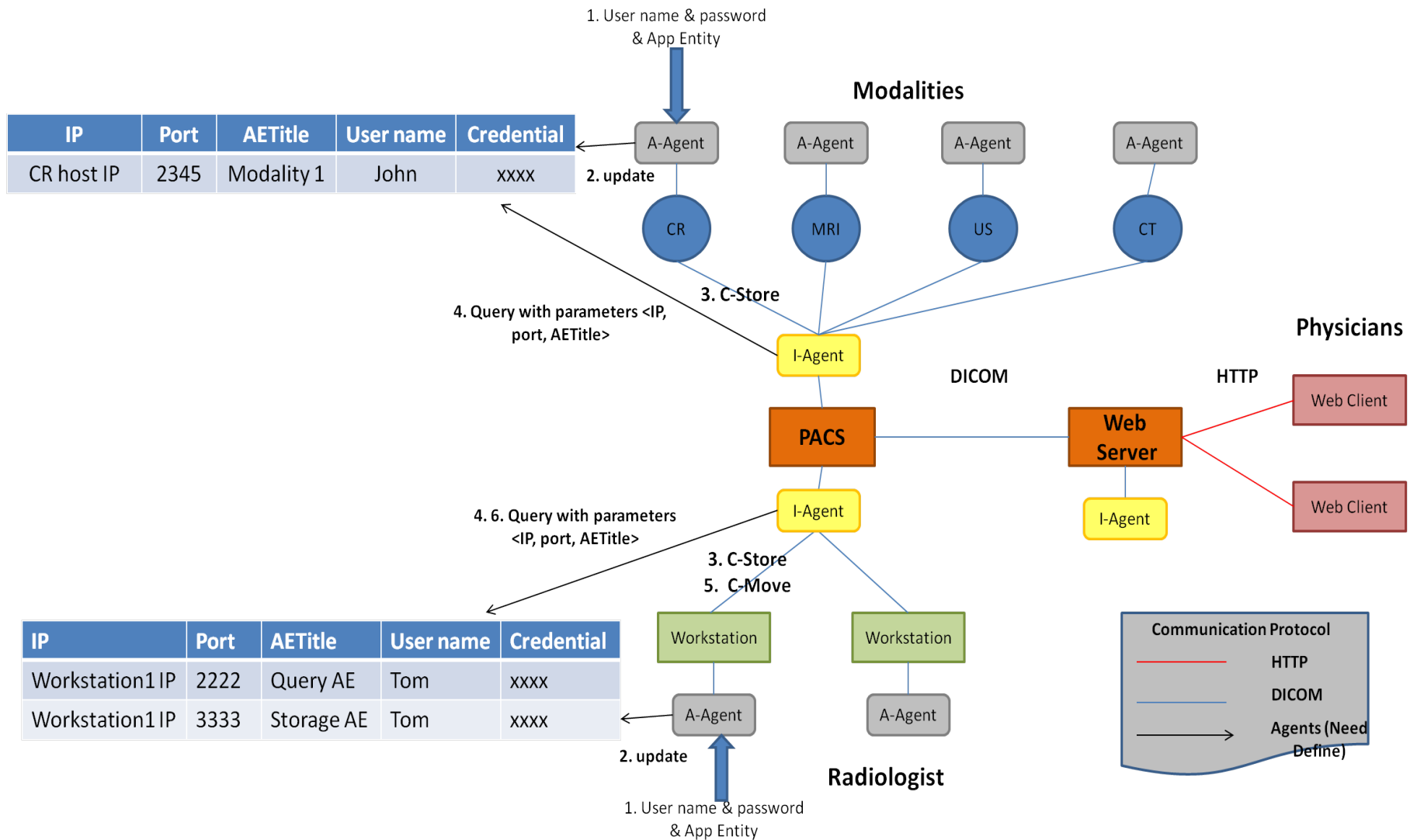
# Who is the users?

- “**Client Authentication Agent**” is pre-installed software on each modality and workstation.
- When user wants to launch modality or workstation application (SCU), he has to input user name and password through agent’s guide, and then agent will transmit such information to server application (SCP) on behalf of client. There are two options for user identity:
  - Agent captures DICOM A-ASSOCIATE request sent by SCU, and then inserts user identity items into the DICOM message.
  - Agent also caches a list of authenticated users, with one record in the form of <user identity, AETitle, IP, port, credential>, representing all applications running on the host, and update them to intermediary agent positively or passively. Consequently, intermediary agent knows who is the user through checking the list by the key <AETitle, IP, port>. When the user logoff application, client authentication agent should capture such event and contact intermediary agent to delete such entity.

# Option1- User Identity Negotiation



# Option2- Client Authentication Agent





# What data is accessed?

- The accessed data can be extracted from DICOM message directly.

Table 2: Attributes extracted from DICOM message

Message Field	Tag (Group, Element)	Value	Description
Group Length	(0000, 0000)	128	The even number of bytes from the end of (0000, 0000) value field to the end of the C-Find-Rq message.
Affected SOP Class UID	(0000, 0002)	1.2.840.10008. 5.1.4.1.2.1.1	Contains the SOP UID for this C-FIND query root.
Command Field	(0000, 0100)	0020	DICOM C-Find-Rq command
Message ID	(0000, 0110)	9527	Unique numerical ID for this message
Priority	(0000, 0070)	0000	0000 (for medium priority) 0001 (for high priority) 0002 (for low priority)
Data Set Type	(0000, 0800)	non-0101	0101 means data set is empty.
Query Parameter	(0008, 0052)	STUDY	Defines level or hierarchy search, can be ("PATIENT", "STUDY", "SERIES", "IMAGE")
Query Parameter	(0010, 0020)	12345	Patient ID
Query Parameter	(0008, 0020)	20130101- 20130201	Study Date: range matching between two dates in YYMMDD format.

# What is the operation on the data?

- The operation can be extracted from DICOM message directly.

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