CR Reader/PACS
by BMETWiki

What is a CR Reader?

- Computed Radiography (CR) reader is a digital image acquisition and processing unit that uses CR cassette instead of traditional film cassette.

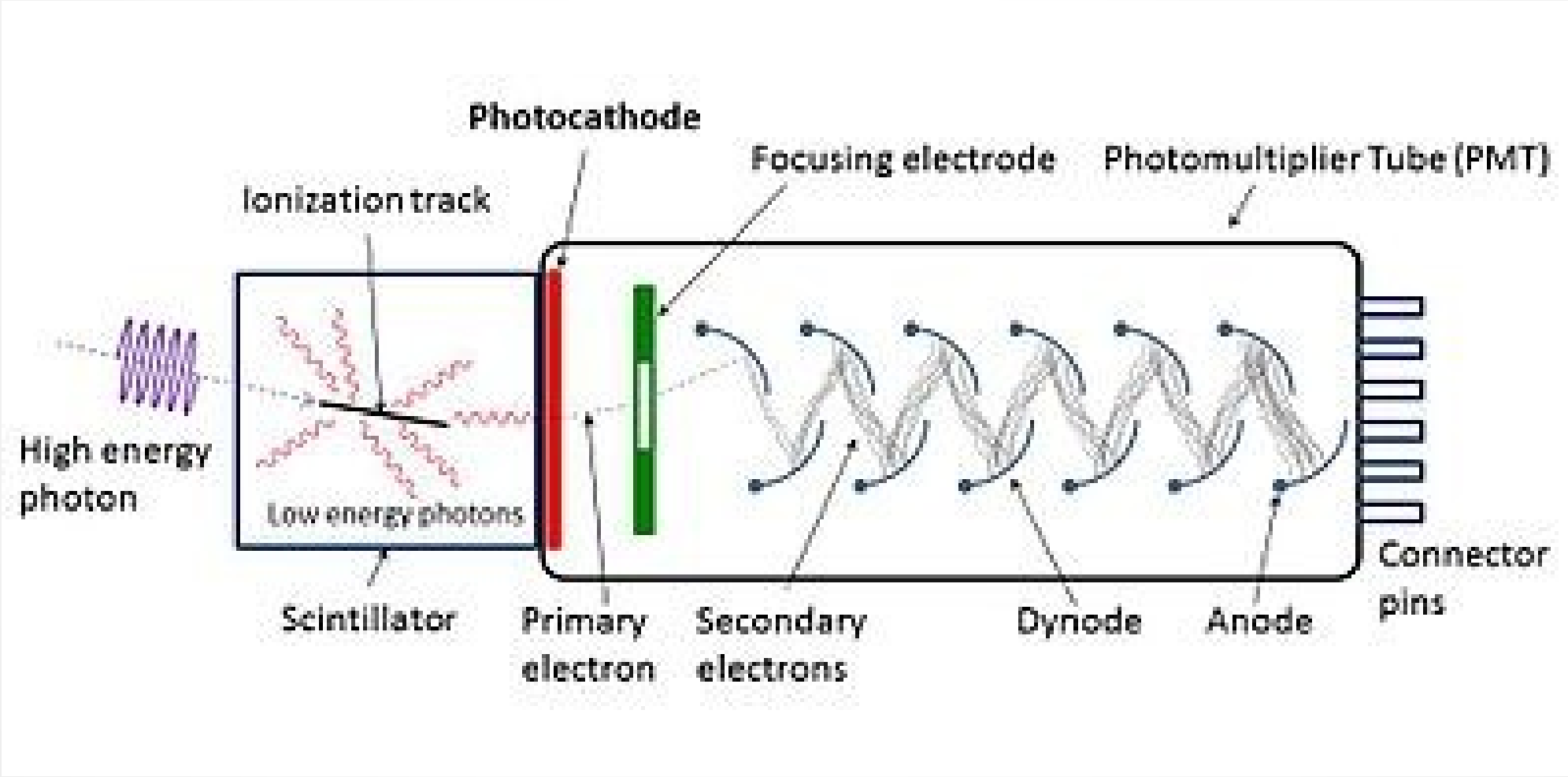
Arguments

- Pros
  - More space efficient than film.
  - Better compatibility with other x-ray modalities (i.e. mammography, U/S, etc...).
  - Least labor intensive.
- Cons
  - Although faster than film its slower than Digital Radiography (DR).
  - No validation of image quality.

Photomultiplier Tube (PMT)

- A PMT is a vacuum tube that detects light from a dim blue light source through the use of photoemmission and to produce enough electrons to generate a current signal.
- Primarily, a PMT converts blue light into an electrical signal. Down the road, the electrical signal is then converted into a pixel by the processing circuit board.

PMT artwork


Photocathode
Focusing electrode
Photomultiplier Tube (PMT)
Ionization track
High energy photon
Low energy photons
Scintillator
Primary electron
Secondary electrons
Dynode
Anode
Connector pins

CR cassette

- After x-rays pass through patient by means of attenuation then those x-rays interacts with a Phosphor plate within the cassette converting x-rays to visible light.
- Speed film which is measured by thickness of Phosphor materiel determines radiation exposure for an acceptable image.

CR cassette artwork

How to insert the cassette into CR Reader:

Remember is mnemonic...

“The wheels on the bus go down.”

The **blue** circles are the wheels on the bus

TWAIN

- An open-source communications protocol and application program interface between digital imaging devices and its software.
- TWAIN requires the “date source” drivers.
- Unofficial acronym is **T**echnology **W**ithout **A**n **I**nteresting **N**ame (TWAIN).

DICOM

- Acronym is Digital Imaging and Communications in Medicine (DICOM).
- DICOM is a standard of communication protocols. Protocols are rules governing communication between devices or applications (e.g Http, FTP, TCP/IP).
- DICOM communication must have these three variables to work:
  - Application Entity (AE) title—defines DICOM item that will send or receive data.
  - Port Number – Default port is 104
  - IP Address – Network address

Service level use

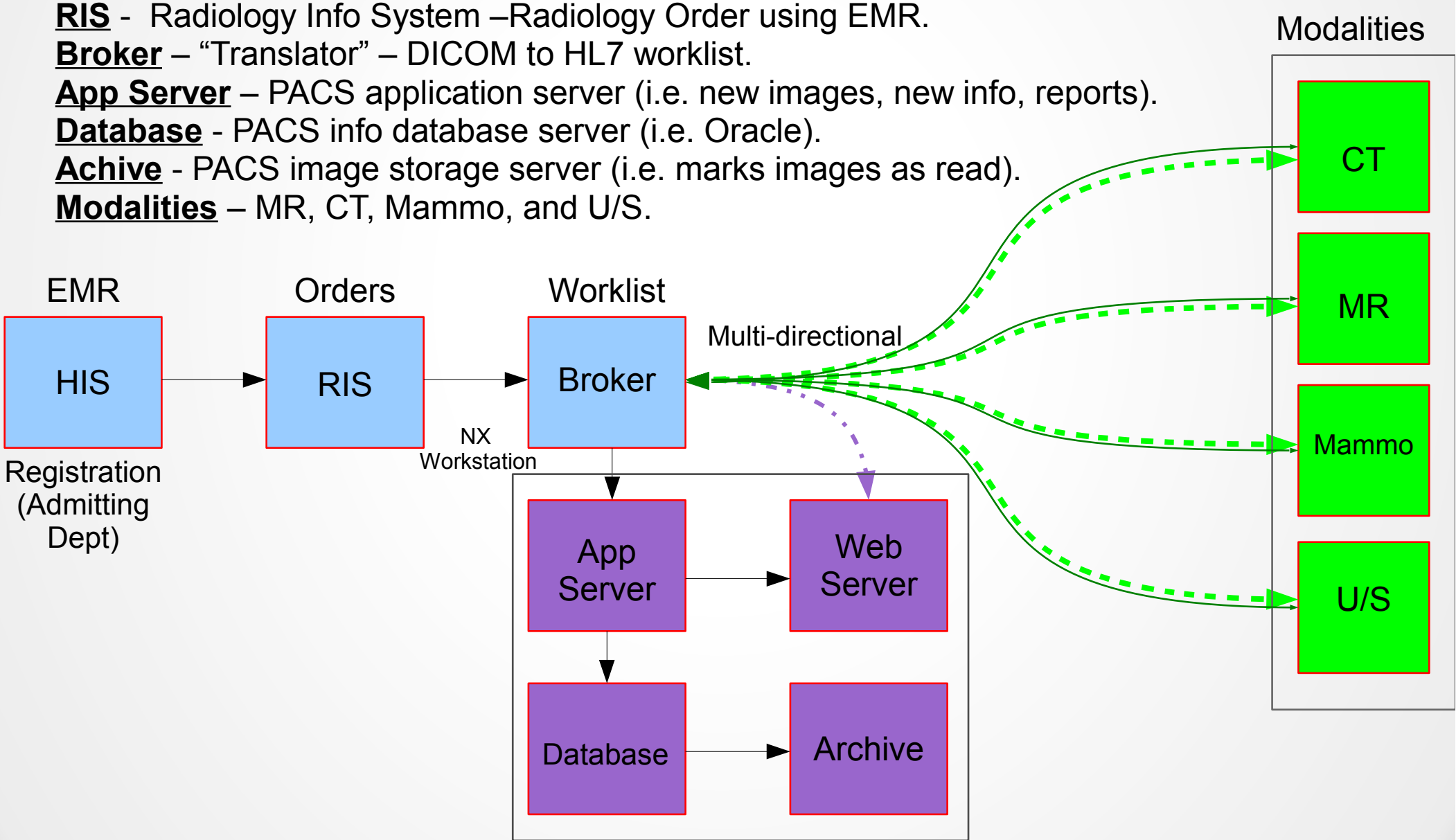
- Has service-level requirements which requires the following items to operate:
  - Serial dongle to prevent software piracy
  - Software license agreement
  - MAC Address

Broker

- The Broker is a software and hardware device that accepts HL7 messages from the RIS then translates, or maps, the data to produce DICOM messages for transmission to the PACS.
- Rad Tech work flow requires patient and exam information from the RIS to flow to the modality (i.e. MR, CT, Mammo, U/S).
- The broker provides DICOM Modality Worklist (DMWL) for the Rad Techs daily “work to do”.

PACS Work Flow

HIS – Hospital Info System – Patient registration using EMR.
RIS - Radiology Info System –Radiology Order using EMR.
Broker – "Translator" – DICOM to HL7 worklist.
App Server – PACS application server (i.e. new images, new info, reports).
Database - PACS info database server (i.e. Oracle).
Achive - PACS image storage server (i.e. marks images as read).
Modalities – MR, CT, Mammo, and U/S.



AE Title

- To ensure successful image delivery, the AE title is case sensitive.
- Rule of thumb: create an AT title based on device location and use all CAPs and noseperators (no spaces) .
- Good—TINA12345
- Bad—tina 12345

Software utilities

- **Bing**—same as “ping.” verifies network connectivity.
- **arp -a** – display MAC address
- **Echo** – checks IP, AE title, and port number. This is a basic "is everything working OK" service - sometimes referred to as "DICOM Ping".
- **gpedt.msc**—group policy (i.e. security, password length, etc...) editor
- **ipconfig/all** – lists ip address

Preventive maintenance (PM)

- Recommend PMs:
  - Verify no artifact (i.e. white lines are dust while black lines are missing data).
  - Cassettes are cleaned weekly.
  - Erase cassette after every 10 uses.
  - Clean Phosphor plate with anti static wipes.
  - Check suction rollers (i.e. re-position at 45 degree angle).
  - Check workstation duplex settings (i.e. digitizer and network switch is 100 half duplex).
  - Clean optics with wire brush.
  - Verify routing table (.cpf).
  - Verify shading calibration (.sdh).
  - Check error logs.

References

- http://dicom.nema.org
- http://www.twain.org

Questions