Development and Evaluation of PACS —a Parallel Operation System with Improved Fault-tolerance—

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Research Center for Charged Particle Therapy

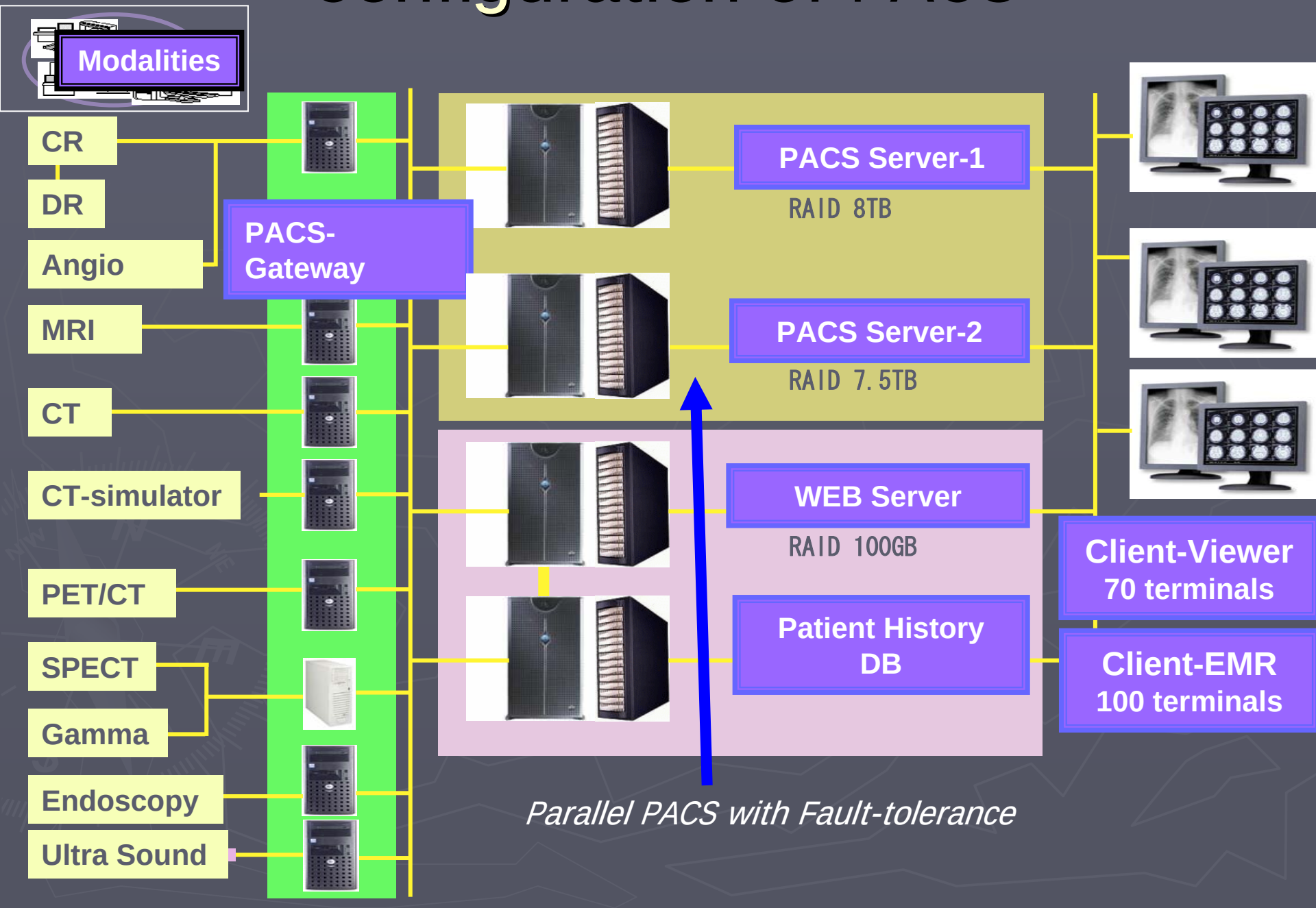
National Institute of Radiological Sciences , JAPAN

- Located at Chiba , JAPAN
- Inpatient: 100 beds
- Outpatients: 70-100 patients/day
- Specialized for a radiation therapy with a Carbon heavy particle

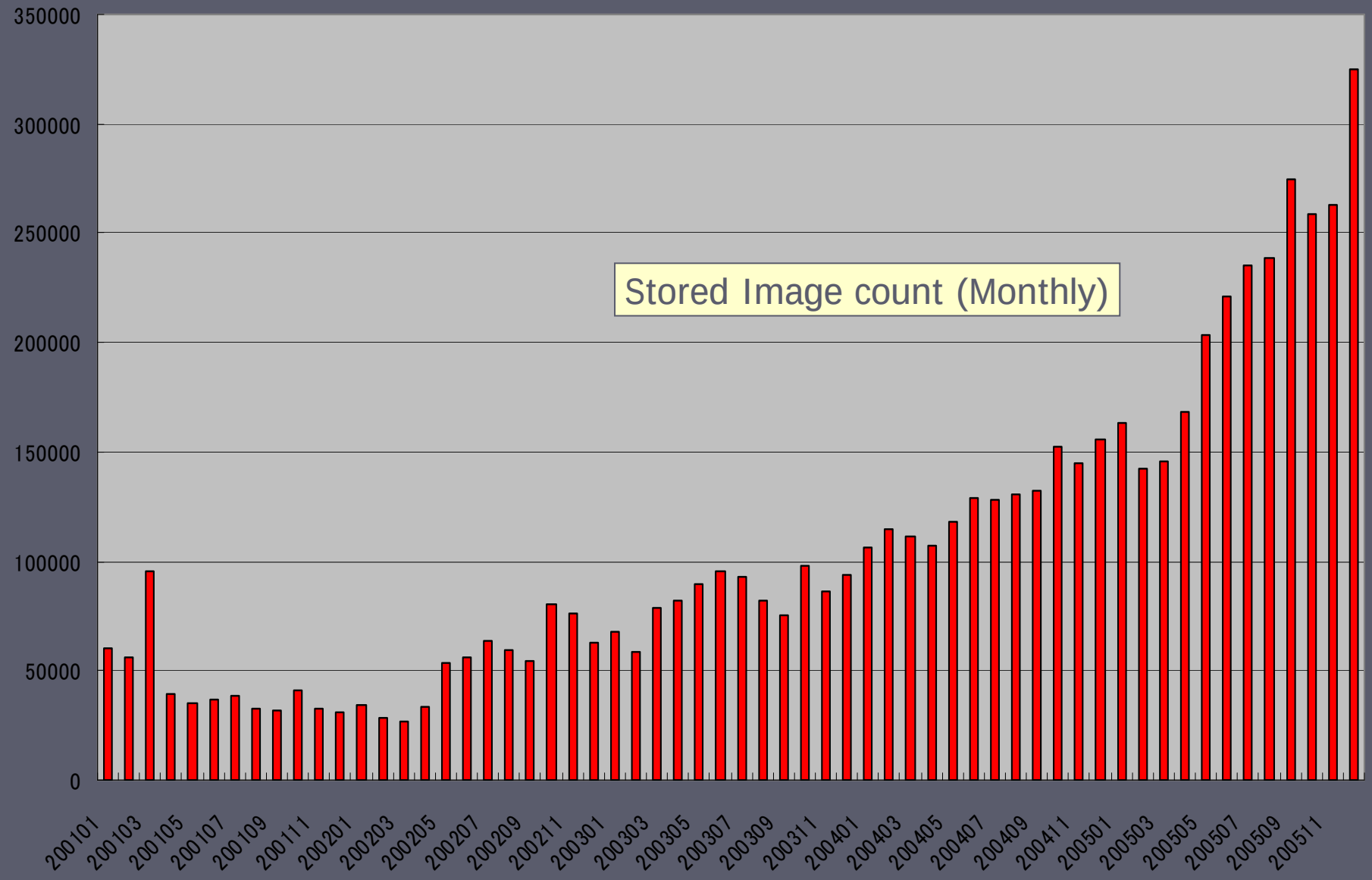
Current Status of PACS

- Modality
  - CT, MRI, CR, DR, Ultra-Sound, endoscope
  - NM (PET, PET/CT, Gamma, SPECT)
- Actual results
  - Number of study : 90 /day
  - Number of image : 20,000 /day（May 2007）
  - Total : 121,000 studies, 12.5 million images
- Topic
  - Archiving DICOM images since 2000
  - Permanent archiving for the long term follow-up
  - All Images are stored on on-line hard disks
  - August 2005: Film-less environment started
  - October 2006: EMR system started

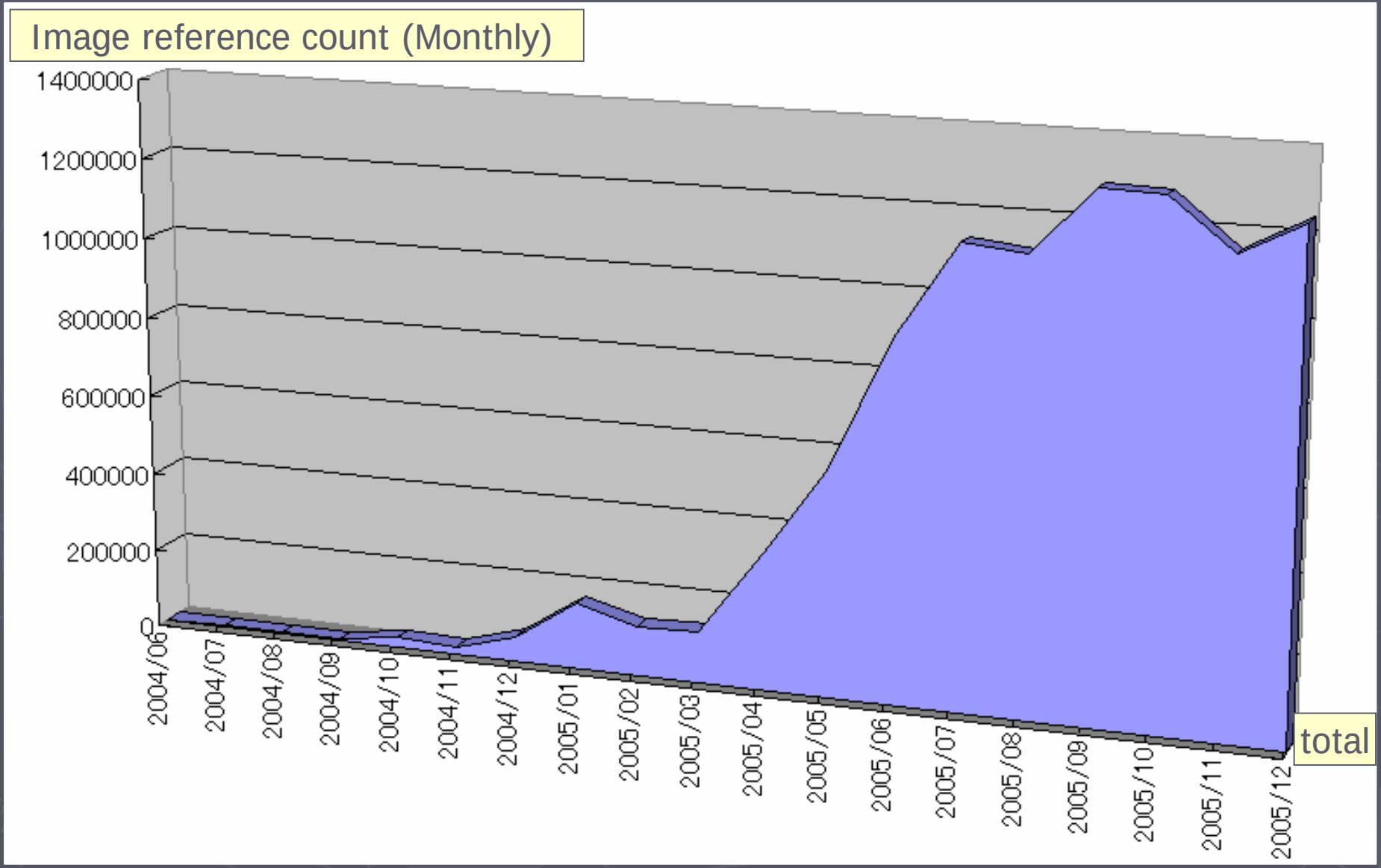
Configuration of PACS



Number of images stored in PACS



Number of Image References



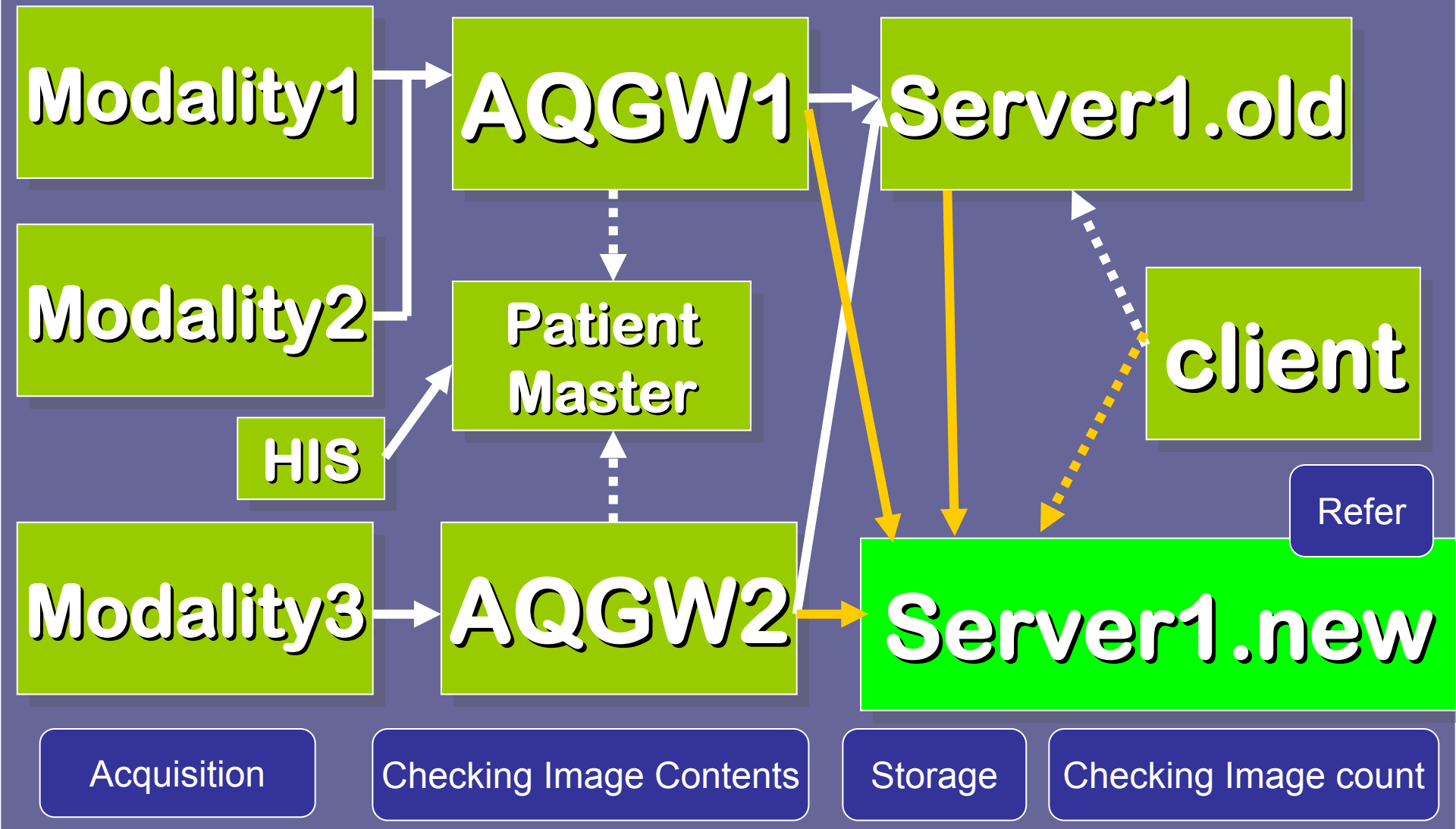
Flow of Image Archive

1) Images were sent from modalities to the AQGW (Acquisition Gateway), an intermediate server.
2) AQGW was to ensure the consistency of patient information of images with that of the master information. If the patient information were matched, images were stored to PACS servers. The images were also remained on AQGW for a week, and then automatically deleted.
3) Physicians could refer the images from the PACS server using the two kinds of viewer applications.

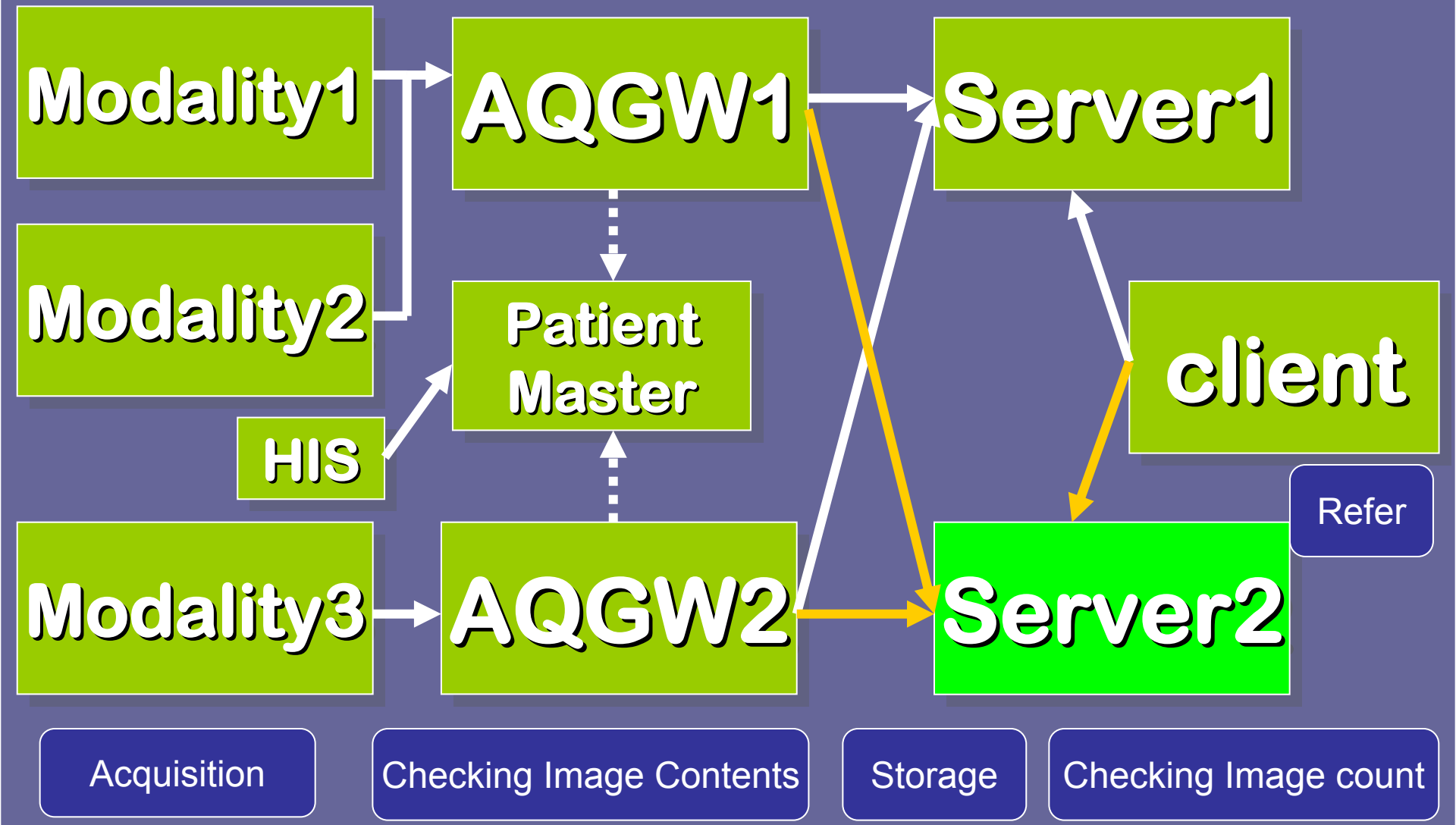
Transfer Procedure

1) When the PACS-1 server was started up, the server was used only for viewing images which was transferred from the former PACS server. DICOM C-STORE was used to transfer image data from transfer source to transfer destination.
2) When the PACS-2 server was started up, DICOM Q/R（Query and Retrieve） from transfer destination to transfer source was used for transfer image data in order to maintain a parallel operation with the PACS-1 server.
3) Then AQGW had also extended function to send multiple servers on the network in parallel.

Outline of PACS （During a shift）



Outline of PACS (Goal)



Results and Future Issues

- The system migration was finished without problems such as long discontinuation of services or data deficiency.
- Users can select the viewer applications on their demand.
- As future issues
  - PACS-1:For effective disk management, a reversible image compression may be applied to image store.
  - PACS-2: User authentication may be ensured for correct audit trail.

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