

# Radiology PACS

Department of Radiology and  
Biomedical Imaging UCSF

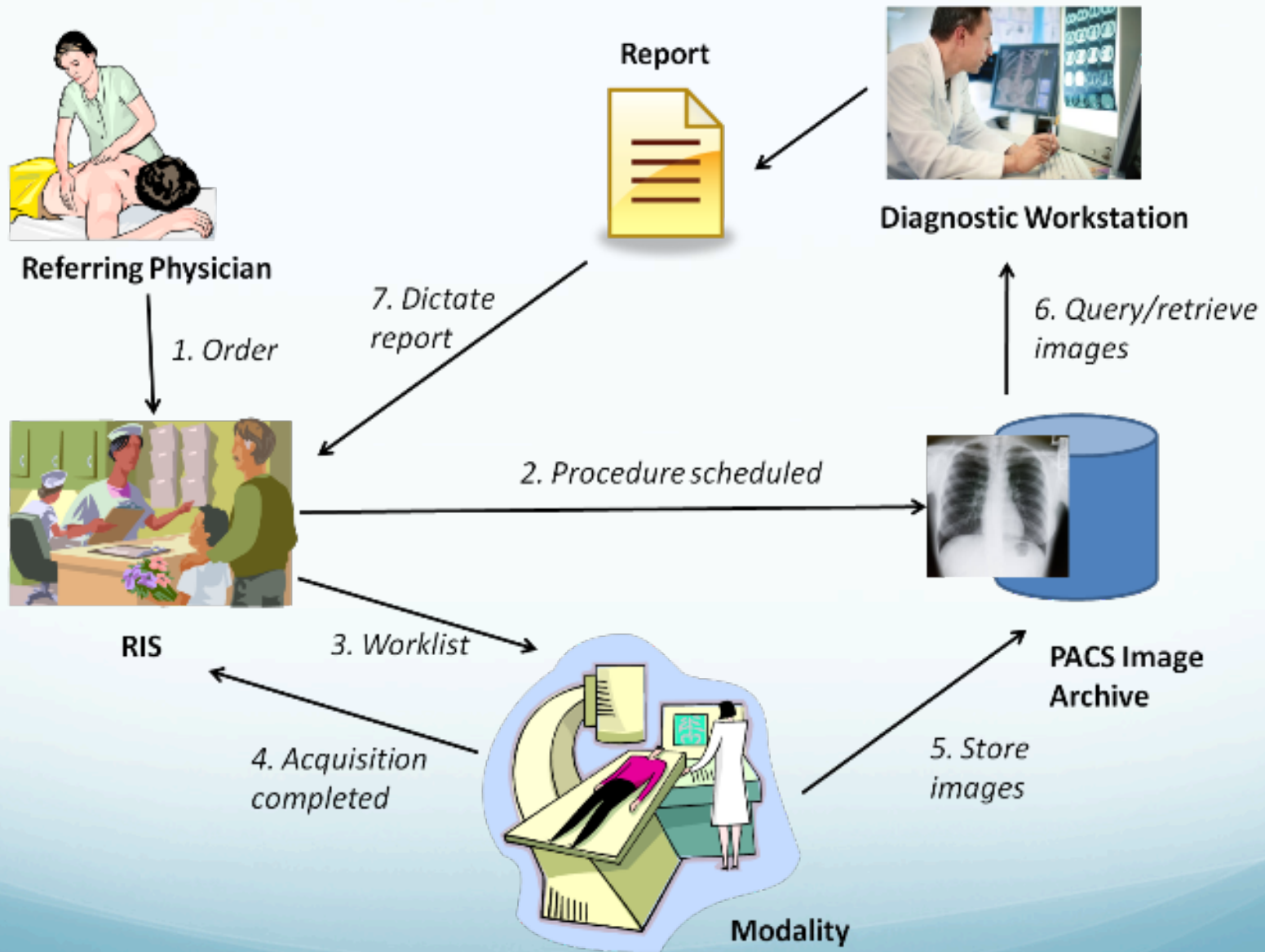
# Outline

- PACS Impact
- PACS Workflow
- PACS Infrastructure
- Collaborations
- Implementation
- Challenges

# PACS Impact

- Distribution of medical images (X-Ray, CT, MRI, Ultrasound images) for the purposes of:
  - Direct Patient Care
  - Research
  - Teaching
  - Presentations
- Archive of about 4 million studies
- Over 1500 studies arrive daily from imaging devices within UCSF and devices from other medical institutions
- Integrated with RIS, APeX, and surgical navigation devices

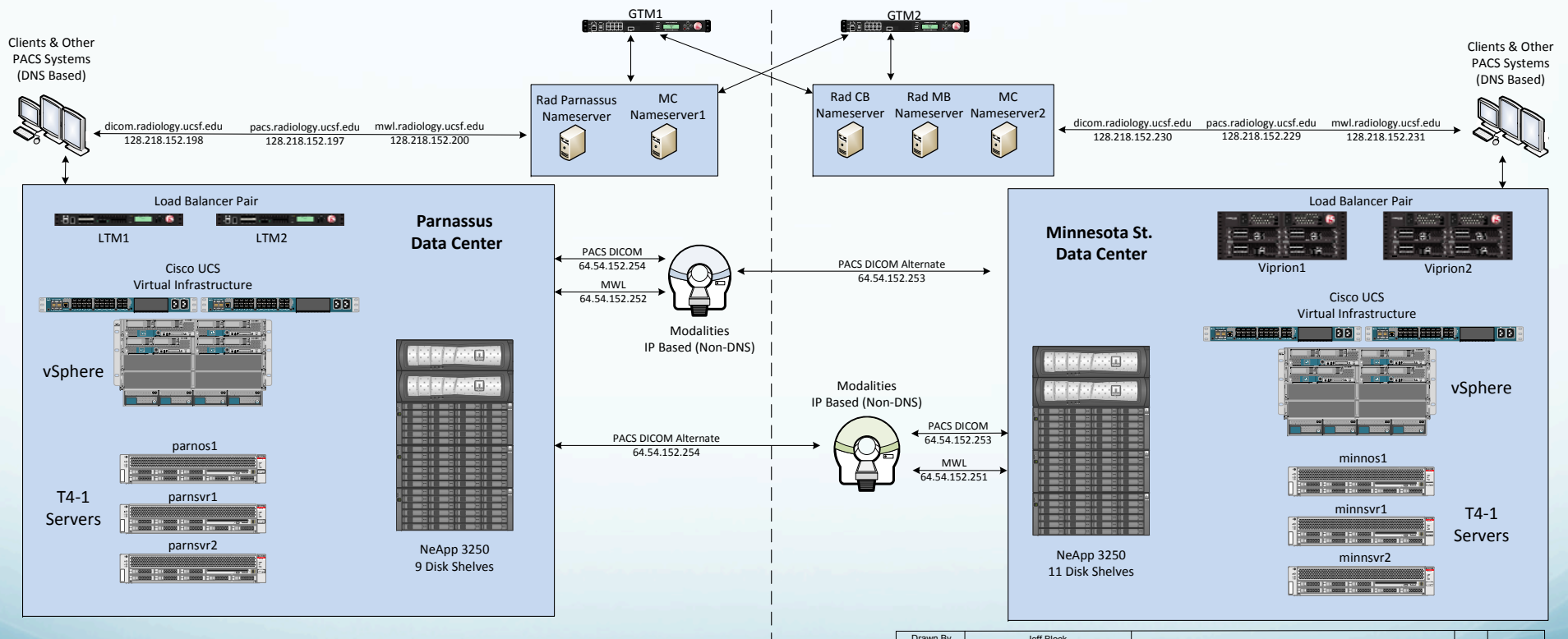
# Basic PACS Workflow



# PACS Workflow Components

- **Application Servers**
  - Front End Application
- **Database Servers**
  - Primary and Backup Oracle DB
- **Connectivity Manager Servers**
  - Interface from Radiology Information System (RIS)
  - Modality Worklist Servers
- **Workflow Manager and Archive Servers**
  - Image Cache and File Services (Short-term and Medium-Term)
- **UCSF Archive**
  - Locally Developed Long Term Archive (~180TB / ~4 Million Studies)
- **IDC**
  - Agfa Long Term Image Archive
  - Database and Image Server Components
- **Full Test Environment**

# PACS Infrastructure



Drawn By	Jeff Block	Radiology – IMPAX Dual Data Center Infrastructure	Rev	3/21/14
Unit	Radiology		A	

# PACS Infrastructure Dual Datacenter Design

- Goal: Redundancy and Enhanced Performance
- Minnesota Street
  - UCSF Campus Networks & Firewall
  - UCSF Campus Load Balancers
  - PACS Components
- Parnassus
  - Radiology Networks and Firewall
  - PACS Components

# Collaboration – Radiology IT

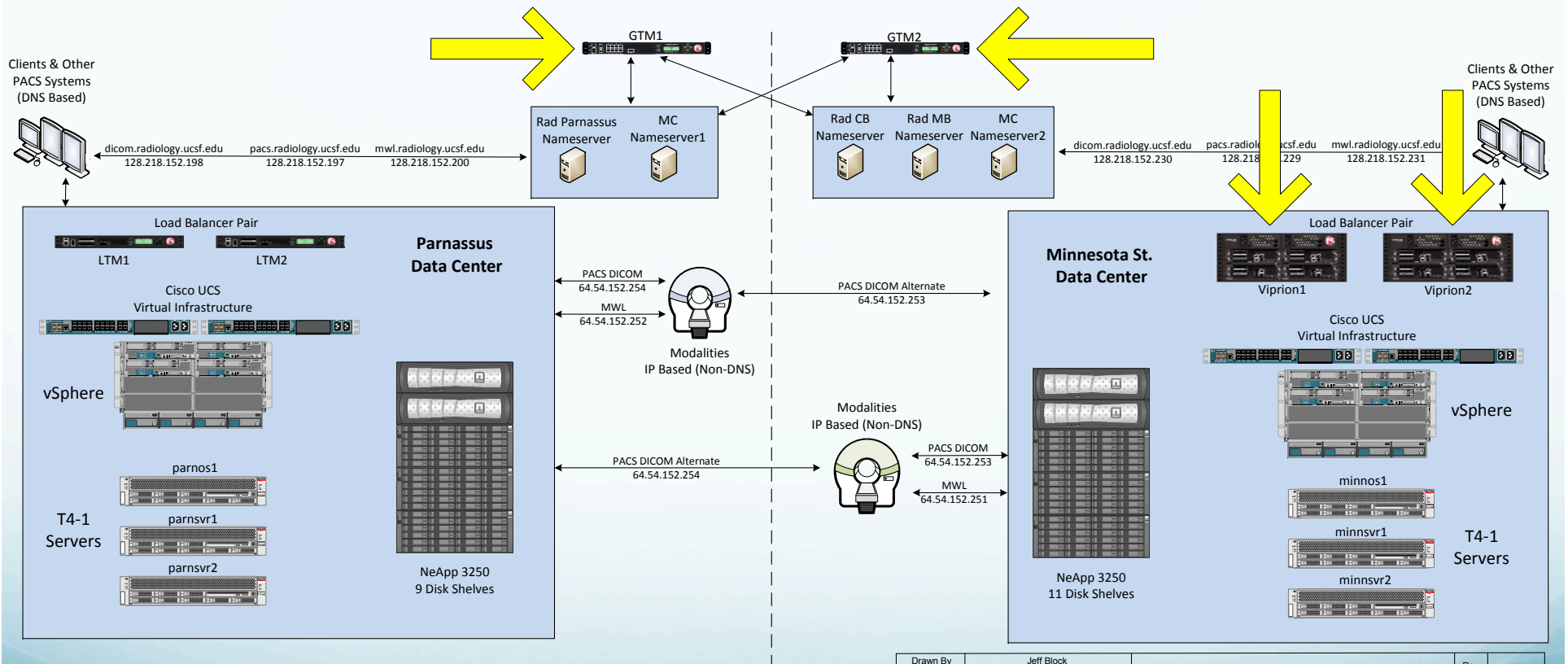
- Radiology PACS Support Group
  - Configuration of ~150 Clinical Devices
  - Configuration / Build / Deployment of ~150 Clinical PACS Workstations
  - Customization of PACS GUI
- Radiology Information Systems (RIS) Support Group
  - RIS Integration
  - Powerscribe 360 Voice Recognition Integration
- Radiology Desktop Support Group
  - Deployment of PACS Workstations
  - Help Desk Support



# Collaboration - ITS

- Datacenter Team
  - Minnesota St. Datacenter
  - Load Balancers (F5 Viprion and GTM)

# Collaboration – Global Traffic Managers and Load Balancers

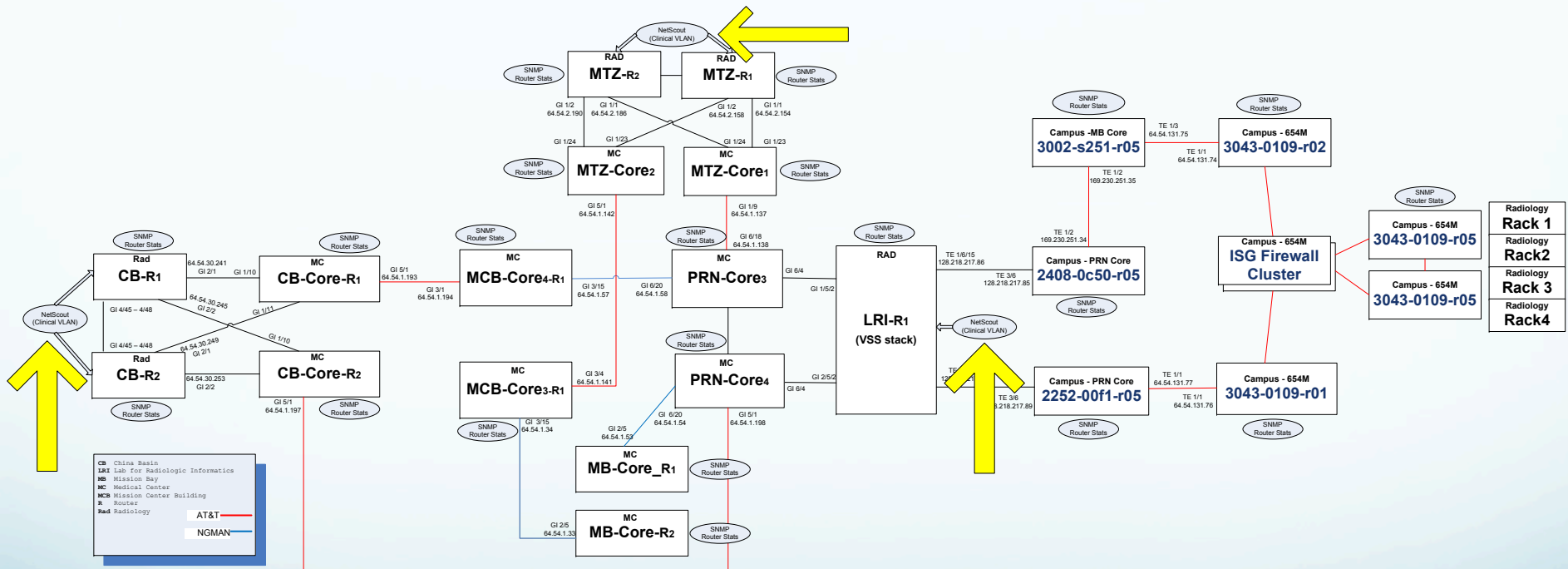


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# Collaboration - ITS

- Datacenter Team
  - Minnesota St. Datacenter
  - Load Balancers (F5 Viprion and GTM)
- Network Team
  - Network Monitoring and Performance – Netscout Probes

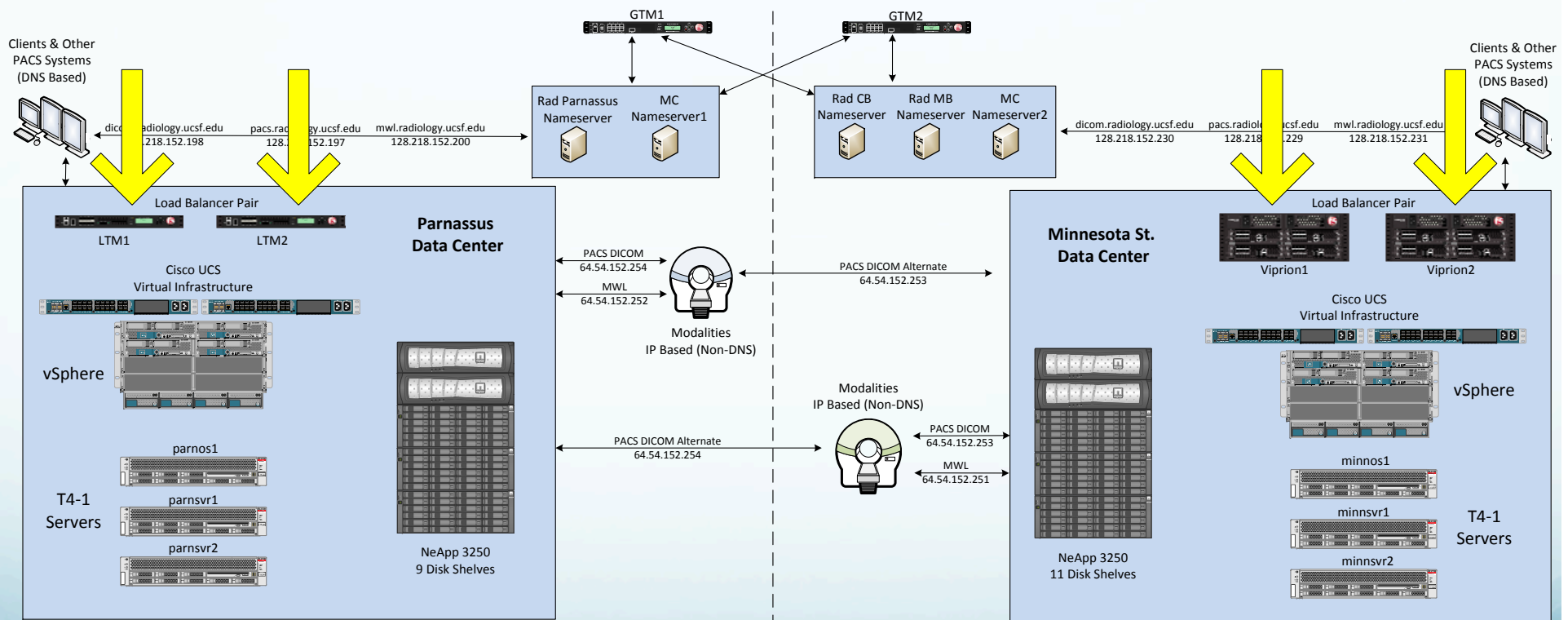
# Collaboration – Netscouts for Network Performance Testing and Statistics



# Collaboration - ITS

- Datacenter Team
  - Minnesota St. Datacenter
  - Load Balancers (F5 Viprion and GTM)
- Network Team
  - Network Monitoring and Performance – Netscout Probes
  - Firewall Policy Access
  - New Firewall Installation with 10G Uplinks
  - Load Balancers and /32 Routes

# Collaboration – Load Balancers and Complex Routing



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# Collaboration - ITS

- Datacenter Team
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  - Load Balancers (F5 Viprion and GTM)
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  - Firewall Policy Access
  - New Firewall Installation with 10G
  - Load Balancers and /32 Routes
- Medical Center IT
  - Active Directory

# Collaboration - Vendors

- Clinical Software / Hardware Vendors
  - AGFA Healthcare – PACS Software
  - NetApp – Storage
  - F5 – Load Balancers
  - imorgon – Ultrasound
  - Nuance Powerscribe 360 – Voice Recognition
  - Philips – iSite
  - TeraRecon – 3D Image Processing



# Implementation

- 2 Year Process
- Not an upgrade, a complete replacement
- Phased Rollout
- Required Zero Downtime
- Patient care was unaffected during go-live

# Challenges

- Design
- Running New and Old Systems Simultaneously
- Load Balancers
  - /32 VIPs and Complex Routing
- Data Migration
- PACS Workstations
  - System Imaging
- First Few Weeks:
  - AD GPO changes
  - Firewall changes

# Acknowledgements

- Radiology IT Teams
- UCSF ITS Teams
  - Data Center
  - Network
  - Medical Center Identity and Access Management
- Vendors
  - AGFA
  - Nuance
  - NetApp
  - F5
  - Philips
  - imorgon
  - TeraRecon