Curriculum Development Centers Program

Awardee of The Office of the National Coordinator for Health Information Technology

EHR: Hardware and Software

(selected components)

Adapted From ONC Lecture Slides

Installation and Maintenance of Health IT Systems

Elements of a Typical Electronic Health Record System

Lectures a/b

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A New Health System for the 21st Century

- IOM (2001): Six aims for improving health care quality
  1. Safe
  2. Effective
  3. Patient-centered
  4. Timely
  5. Efficient
  6. Equitable

(IOM, 2001)

EHR Hardware – Most Common

- Servers
- Workstations
- Laptops
- Tablets
- PDAs/smartphones
- Flat-panel monitors
- Scanners
- Printers
- Storage and backup
- Shredders
- Medical diagnostic and treatment items

EHR Hardware – Servers

- The server(s) are the “home base” of the core EHR system, with components including:
  - Storage of patient database (index)
  - Real-time, dynamic compilation of patient information from varied sources
  - Modules for parsing user requests
  - User management tools
  - Customization tools

EHR Hardware – Servers

- Picking the right server
  - Consult your IT staff, hardware & EHR vendor(s), and/or consultant to determine the hardware specs required for your organization.
  - Important items to consider include:
    - Reliability
    - Performance
    - Scalability

EHR Hardware – Servers

- Storage requirements depend on EHR/PM application, volume of scanned documents
  - Check with your EHR vendor.
  - Rule of thumb: 5 GB/year/provider

(Kleaveland)

EHR Hardware – Servers

- Purchase considerations
  - Brand
    - e.g. Dell vs. “white box”
  - Operating system (OS)
    - e.g. Windows XP
  - Processors
    - e.g. 2.4 GHz Xeon

EHR Hardware – Servers

- Purchase considerations (cont'd)
  - RAM
    - e.g. 1 GB
  - Hard drive configuration
    - e.g. RAID 5
  - Network card
    - e.g. 1 GB/second
  - Accessories: monitor, keyboard, CD/DVD drive, UPS (Uninterruptible Power Supply)

EHR Hardware – Servers

	Internal	External/Hosted
Cost	Higher initial costs	Monthly fees
Management	Need staff to implement & manage server(s), perform software/hardware maintenance & backup	Dependent on vendor for scheduled maintenance
Power	Capable of utilizing full power of server	Often share resources with other institutions
Connectivity	Control speed & connectivity to server(s)	Remote locations, so connectivity may be shared with other customers, reducing speed

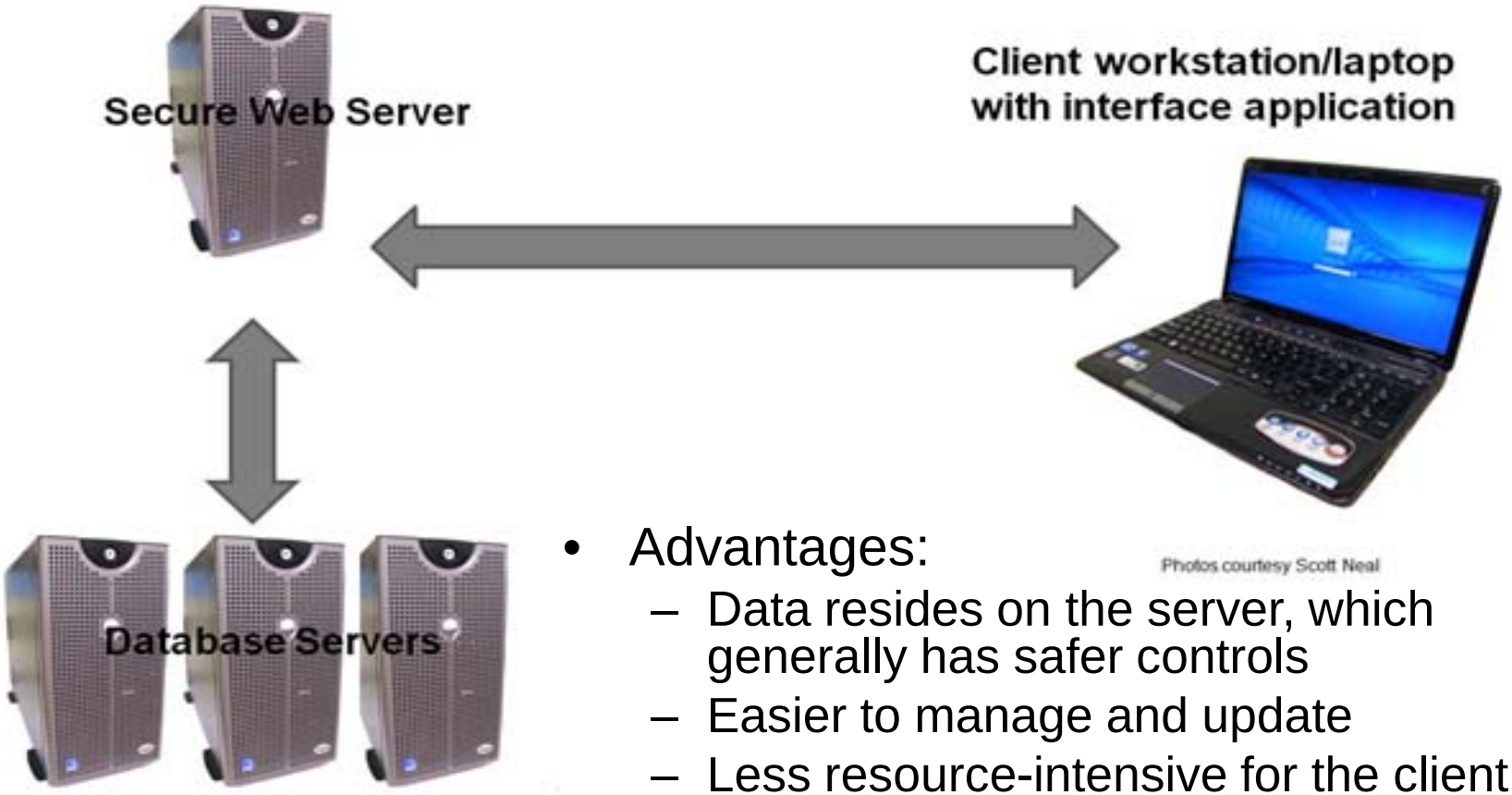
1.1 Table: EHR Hardware-Servers (Neal, 2011)

Client-Server Model

- Most of today's EHR systems are based on the client–server model.
- Software: the collection of programs and related data that contain the instructions for what the computer should do
- Servers: service providers
  - Servers run "server application" software designed to meet client requests.
- Clients: service requesters
  - Client software is designed to "request" information from a server and then present it to the user in an efficient manner.
- A server and client may reside on the same "box" but is generally not recommended..

(Wikipedia, 2010)

Client-Server Model



- Advantages:
  - Data resides on the server, which generally has safer controls
  - Easier to manage and update
  - Less resource-intensive for the client

1.3 Figure: (Neal, 2011)

Network

- Collection of computers and devices connected by communication channels
- Allows users to communicate and share resources with other users
- Important terms
  - Network Medium; Ethernet; Wireless Access Point (WAP); LAN (Local Area Network); WLAN (Wireless Local Area Network); WiFi; WAN (Wide Area Network); Point-to-point or fractional T1; Bandwidth; VPN (Virtual Private Network); Firewall

Local Area Network (LAN)

Server Room(s)

Wireless Connectivity (WLAN)

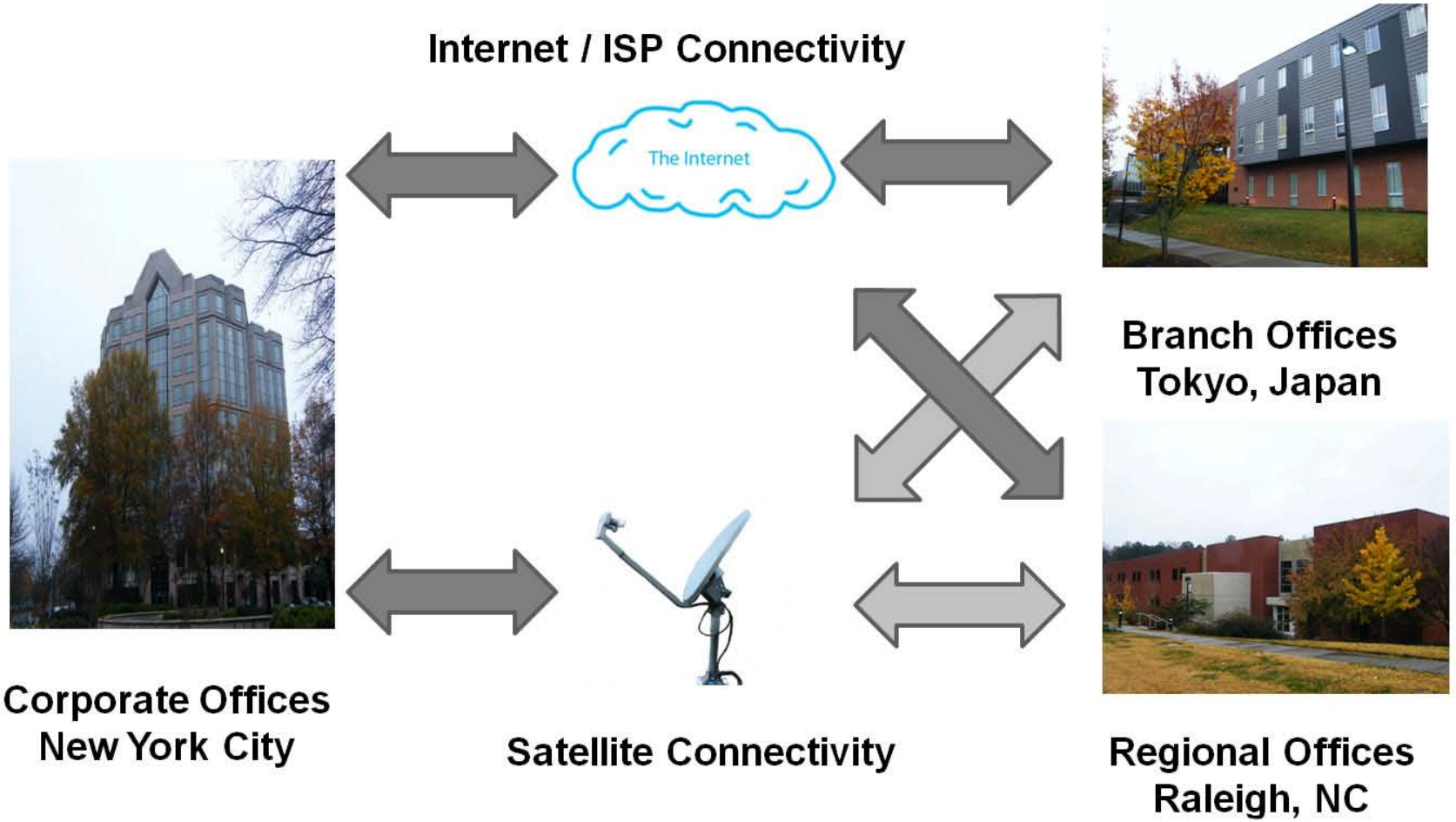
Hard-Wired (Cabled)

Wiring Closet(s)

Local Users (On Premises)

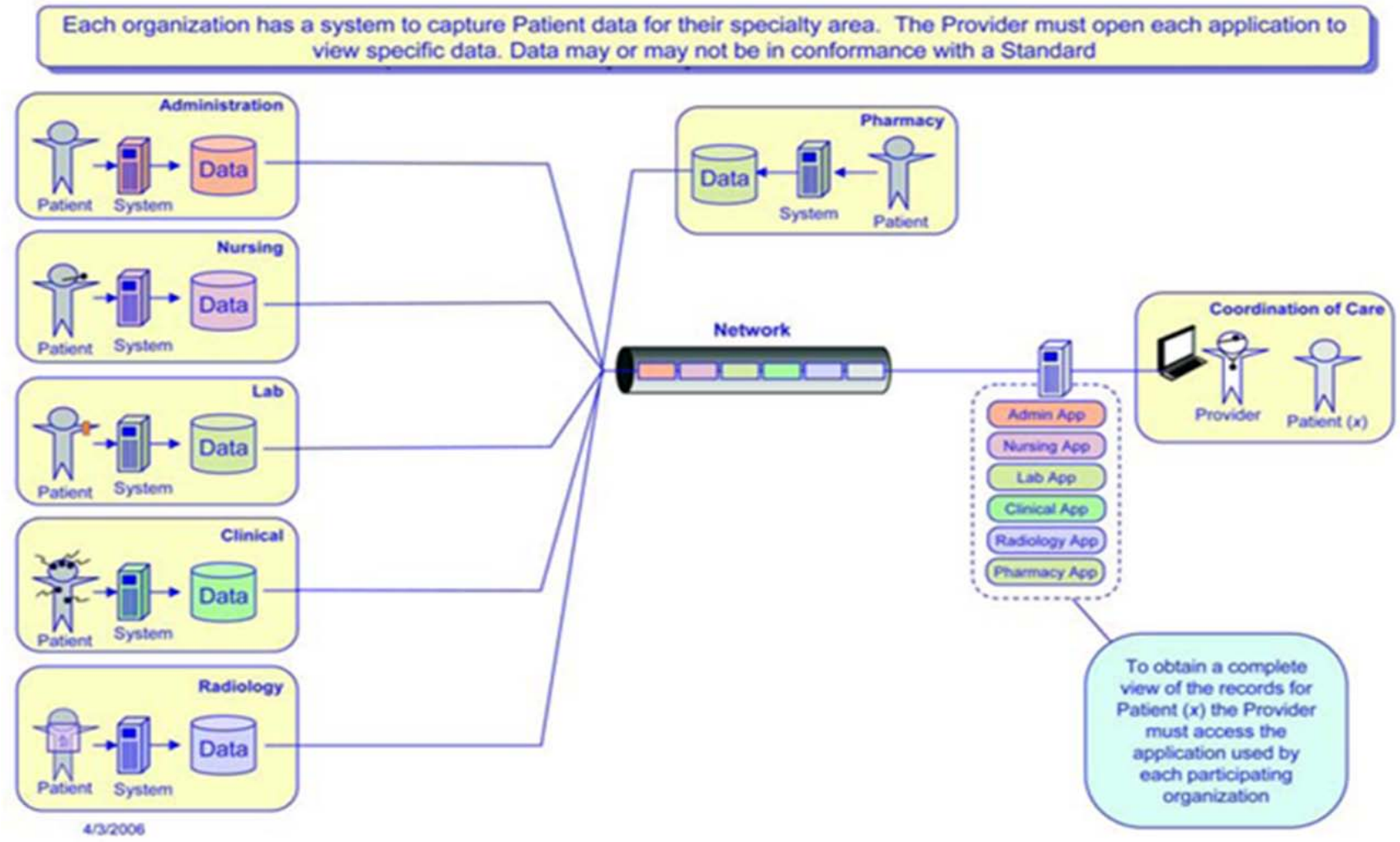
(Neal, 2011)

Wide Area Network (WAN)



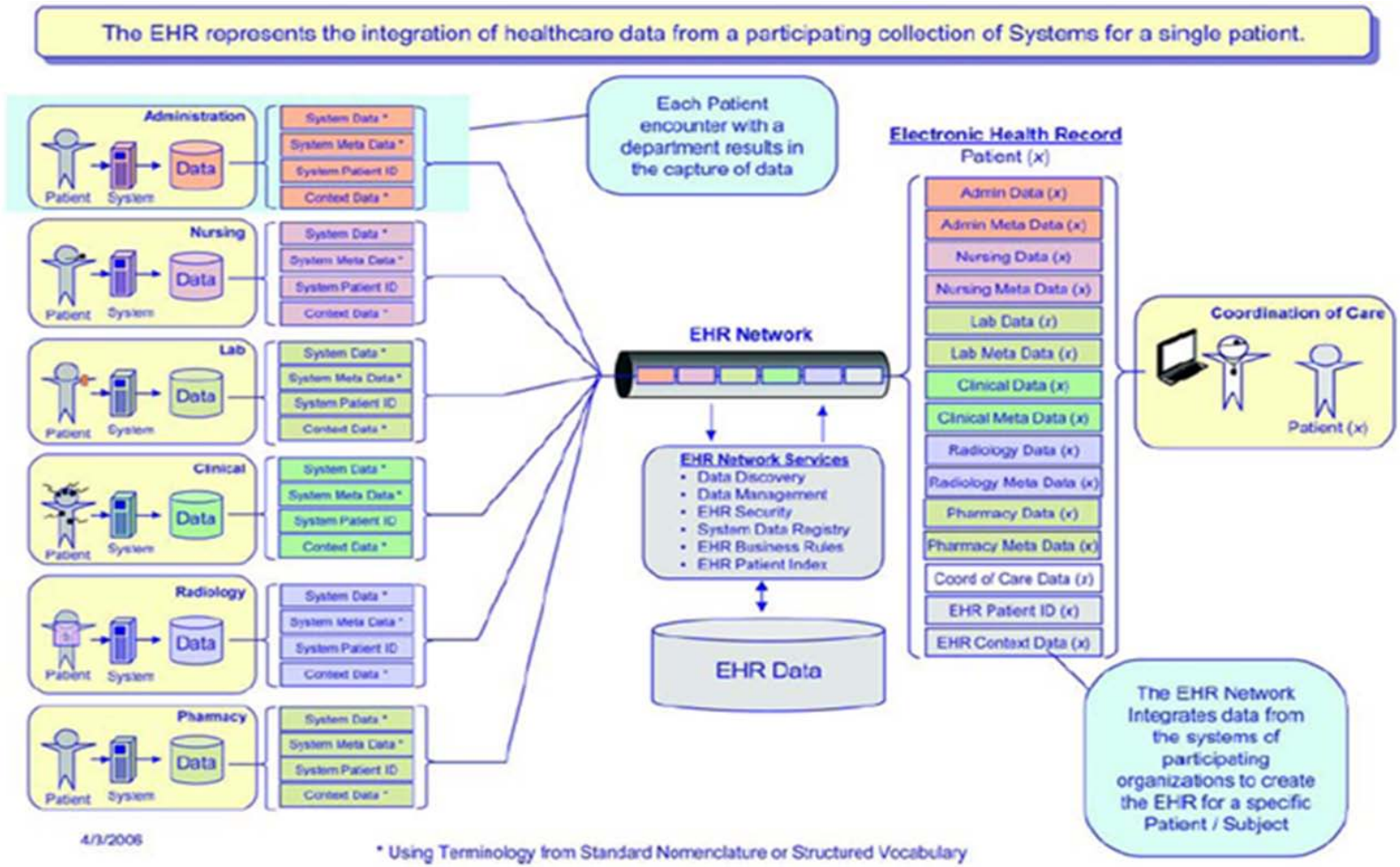
(Neal, 2011)

Software Elements – Pre-EHR



1.1 Figure: (MITRE, 2006)

Software Elements – Post-EHR



1.2 Figure: (MITRE, 2006)