From Theory to Reality: Building a Secure Cloud Environment for Diagnostic Imaging

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Intel Corporation
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Healthcare at Intel
Where information and care meet
Agenda

• Intel Secure Healthcare Cloud:
  • Healthcare & Cloud Computing Trends
  • Core Requirements & Design Considerations
  • Strategy for Adoption
  • Technology-Differentiated Services

• Carestream Cloud-Based Diagnostic Imaging:
  • Challenges & Benefits
  • Industry proof points and usage models
  • Architecture & Infrastructure
  • Demo
Evolution of the Datacenter

Discrete Datacenter
- Compute
- Storage
- Network
- Management
- Consolidation
- Discrete networks

Virtualized Datacenter
- Unified Network
- Management
- Servers
- Storage Arrays
- VM
- Efficient and Secure
- Open Architecture
- Flexible Management
- 10G Unified Network

Cloud Datacenter
- Cloud Infrastructure
- Security
- Network
- Storage
- Compute
- Datacenter facilities (e.g. cooling, power)

Efficient and Secure
Open Architecture
Flexible Network
# Cloud Computing Business Drivers

## Business Benefits

<table>
<thead>
<tr>
<th>High-Level IT Strategies and Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></td>
</tr>
<tr>
<td>• Enormous <strong>economies of scale</strong></td>
</tr>
<tr>
<td>• Efficiencies in size; buying power, infrastructure, power consumption</td>
</tr>
<tr>
<td>• Unparalleled <strong>resource utilization</strong></td>
</tr>
<tr>
<td><strong>Agility</strong></td>
</tr>
<tr>
<td>• Improve <strong>provisioning time from days to hours</strong></td>
</tr>
<tr>
<td>• Automate workflows to enable consistency, agility and <strong>elasticity</strong></td>
</tr>
<tr>
<td>• Pay for the resources you actually use</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
</tr>
<tr>
<td>• Deliver high availability for all workloads, regardless of location</td>
</tr>
<tr>
<td>• Protect IP, data and differentiated business processes</td>
</tr>
<tr>
<td>• Provide secure, <strong>broad network access</strong> on authenticated devices</td>
</tr>
<tr>
<td><strong>Services</strong></td>
</tr>
<tr>
<td>• <strong>On demand, self-service portal</strong> to streamline business processes</td>
</tr>
<tr>
<td>• Establish <strong>measured services</strong> for VM utilization, health and usage</td>
</tr>
<tr>
<td>• Apply actual application consumption for IT capacity management</td>
</tr>
</tbody>
</table>

## Healthcare, Utility & Value-Add Services

| **Address scarcity** by effective allocation of resources & expertise |
| **Leverage ecosystem for non-core competencies**, achieve economies of scale |
| **Accelerate standards adoption** through lower barriers to entry |
| **Build the network value model of exchange** |
The Rise of Healthcare “Big Data”

• Diagnostic Imaging
  - Average hospital requires 175TB for images & clinical records. Consumes additional 15 TB annually\(^1\). Data archive for 20+ years.
  - In 2006, primary copy storage for all U.S. imaging = 24 Petabytes (assumes no duplication for RAID, archive, disaster recovery)\(^2\)
  - By 2014, US primary copy storage expected to reach 100 Petabytes\(^2\)

• Genomic Data
  - The Human Genome consists of 3 billion base pairs, unannotated, requires 3 Gb of storage uncompressed\(^3\)
  - In 2007, Baylor College of Medicine required 125 TB, with projected 25-fold increase in storage over the following two year period\(^4\)
  - Digital data projected to reach 35 Zettabytes by 2020, a 44-fold increase from 2009\(^5\)

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\(^1\) John Halamka, CIO, Beth Israel Deaconess, [http://geekdoctor.blogspot.com/](http://geekdoctor.blogspot.com/).
Core Requirements & Design Considerations
Care Coordination Use Case

1. Emergency Room
2. Radiology
3. Intensive Care
4. Operating Room
5. Neurology

Cloud Vendor Neutral Archive

Client-Aware Cloud Trust Broker

Laptop

Smart Phone

Shared Workstation
## Barriers to Healthcare Cloud Adoption

### Business Concerns

<table>
<thead>
<tr>
<th>Security &amp; Privacy</th>
<th>High-Level IT Areas of Concern</th>
</tr>
</thead>
</table>
| • Must **protect** sensitive information **at rest and in transit**  
• Costs associated with **data breach** are rising  
• Cloud services and virtualization **break traditional perimeter-oriented security techniques**  |  |
| Data Transparency | • Data protection and regulatory compliance require **data transparency**  
• May prevent PHI from being **hosted in another country**  
• May restrict or prohibit **trans-border flow of information**  |
| Auditability & Compliance | • Onsite data centre **audits may be impractical** for cloud providers  
• **SAS 70 Type II/SSAE16 certification**, ISO/IEC 27001  
• **EU Directive 95/46/EC or HIPAA-compliant** cloud providers  |
| Vendor Lock-in | • Service-model dependent  
• Provisioning & automation software built against **proprietary APIs**  
• Cost of entry may be low, **cost of exit may be high**  |
General Deployment Considerations

Availability
- Service Level Agreements, Recovery Time Objective (RTO), Recovery Point Objective (RPO)
- Application Architecture, Fault Tolerance, Network Design
- Business Continuity / Disaster Recovery plans

Network Design
- Network dependency / carrier diversity
- Suitable, geographically-dispersed, failover data centers

Performance
- Workload peak/min sizes & variability, network bandwidth, performance constraints
- Monitoring, Notifications & Alerts
- Start-up costs (cloud on-boarding) & risks of vendor lock-in

Regulatory
- Data Protection Regulations & Locale Constraints
- Data Loss Prevention, Breach Notification
- Independent Attestation

Security
- Defense-in-depth, boundary controller, secure perimeter requirements
- Multi-tenancy risks & benefits, application security, end-to-end security model
- Isolation vs. efficiency (security vs. cost tradeoff)
- Administrative, Physical and Technical Controls

Governance
- Availability of IT expertise, Training & Employee Policy
- Security & Privacy policies, governance
- Risk Assessment & Mitigation
Secure Healthcare Cloud: Strategy for Adoption
What is Secure Healthcare Cloud?

- Strategy for adoption with phased implementation
- Best practices, standards and technologies
- Design principles, deployment considerations, and governance models
- Worldwide program, key learnings, virtualization labs
- Industry alliances including:
  - Intel® Cloud Builders
  - Open Data Center Alliance (ODCA)
  - European Network & Information Security Agency (ENISA)
  - Cloud Security Alliance (CSA)
- Comprehensive set of latest security technologies & solutions covering end-to-end cloud deployment models
- Robust set of ecosystem partners to deliver complete solutions
Secure Healthcare Cloud
Defining Characteristics

Highly Available
- Designed for failure, mitigate risk of data loss, minimize potential for business disruption, tiered service levels, mutually contracted SLAs
- Geo-dispersed data centers, redundant and diverse network carriers
- Failover/load balancing, stress testing for scalability and performance

Highly Secure
- End-to-end security design, assess the risk profile of backend systems, the network, identity assurance levels, and potential endpoint devices
- Multi-Tenancy by design. Designed for breach and other failures, establishing a multi-layer and defense-in-depth approach
- Physical, technical and administrative controls including application security and identity management, encryption at rest and in transit, provisioning, and backup, loss recovery, and secure destruction
- Compliance with international regulations on safe handling of protected information

Highly Transparent
- Data federation services which isolate, secure, enforce sensitive workloads, as well as establish evidence of consistent management practices
- Independent attestation of security profile of underlying hosting environment, evidence of consistent policy and security enforcement
- Compliance with international audit standards
Adopting Secure Healthcare Cloud

**Current**
- **Private Networks**
  - Build/Grow Network of Private Clouds
- **Business Core**
  - Utility
  - Legacy Environments
  - Internal Clients
- **External: Internet**
  - Utility
  - SaaS
    - Scheduling/Triage
    - EHR
    - Care Coordination
    - ePrescribing
    - ePathology
    - Life Sciences – private / academic

**Interim**
- **Private + Limited Public Cloud**
  - Federated Query/Identity
  - Trading Networks
  - Utility + Service
  - Legacy Environments
  - Internal Clients
- **External: Internet**
  - Utility
  - SaaS
    - Claims
    - Processing, Adjudication
    - Disease Registries
    - Knowledge Base
    - Public Health
    - Diagnostic Imaging
    - Quality Reporting

**Future**
- **Ubiquitous Hybrid Health Cloud**
  - Network Effect Drives Innovation
  - Trading Networks
  - Value-Add Data Services
  - Legacy Environments
  - Internal Clients
- **External: Internet**
  - Utility
  - SaaS
    - Clinical Decision Support
    - Disease Mgmt
    - Secondary Use
    - Clinical Trials
    - Translational Medicine

Overcome scarcity by leveraging expertise and capacity in the cloud
Technology-Differentiated Services
Architect for the Cloud Today

**Efficient**
World class energy efficiency

*Refresh with Intel® Xeon® 5600 and Node Manager*

**Secure**
Data protected at rest and in transit

*Intel Trusted Execution and Virtualization Technologies*

**Simplified**
Flexible IA infrastructure and unified networking

*Intel® Xeon® for servers & storage
Deploy 10GbE*

**Open**
Multi-vendor innovation with compatibility of solutions

*Deploy interoperable solutions and support standards*

**Driving Technology Leadership to Enable the Cloud**
Healthcare Big Data Moves to the Cloud

Medical Imaging

10TBs of Diagnostic Images for one type of test
No encryption
No data protection
No Federation
Forklift for capacity

Intel® Xeon® Enables:
Dynamically Available Capacity-scale to the cloud
Added Data Protection & Sophisticated Capabilities
Federated Data Access Across Medical Networks

Efficiency & Scalability
79% Disk Savings

Compression 50% savings
Erasure code 29% savings
Deduplication capabilities savings up to 70%
The cloud provides cost efficient capacity scaling

1 Intel calculations based on industry numbers for compression & erasure code
Ubiquitous Data Protection with Intel® AES New Instructions

1. Secure transactions used pervasively in e-commerce, banking, etc.
2. Full disk encryption software protects data automatically during saving to disk.
3. Most enterprise applications offer options to use encryption to secure information.

Full-disk encryption protects data on hard disks.

Secure transactions on Internet and Intranet.

Application-level encryption for automation and granularity.

Allows broader use of encryption for better protection of sensitive health information.
Carestream Cloud-Based Diagnostic Imaging
(Some of) CIO’s issues with their imaging IT

- Ensure Availability of Patient Data over a Lifetime
- Manage Unpredictable TCO with Unexpected CAPEX
- Enable Physicians Collaboration across Sites & Systems

Time to look for new ways of purchasing Your Imaging IT?
How Do You Care For Your Data?

- Is Your Infrastructure capable of hosting your data securely on-premises? (power redundancy, air/con, security, fire detection & extinction, etc)

- Is Your IT Team adequately skilled and staffed to adapt to ever changing retention and security requirements?

- Is Your Architecture protected against technology obsolescence across the lifetime of data? (software, servers, storage, etc)
Does Your PACS [Archive] Cost You Too Much?

- Continuous **expansion of storage capacities** to absorb the exploding production of imaging data

- **Upfront capital investment** in capacities which stay unused and idle during most of their lifetime

- Unpredictable **Total Cost of Ownership** over the lifetime of data (Investment, Maintenance, Expansion, Migration, Replacement)
Are Your Physicians Able to Share & Collaborate?

• Ever frequent demand to get faster results on-site or on-the-go

• Integrate radiology workflow between disparate legacy imaging systems across multiple distant locations.

• Simple single-point of access to patient’s imaging record across the continuum of care for the community
Now Introducing…

Vue Cloud

LIBERATING TECHNOLOGY.
A New Delivery Model for Software

Cloud-based Services

Ownership → Usage

Do-it-Yourself → Service Level Agreement

Point-to-Point Access → Cloud-based Access
A Portfolio of Innovative Cloud Services

Collaboration-as-a-Service
Rural Clinic

PACS-as-a-Service
Regional Hospital

Teleradiology-as-a-Service
Reading Center

Vue Cloud by Carestream

Archive-as-a-Service
University Hospital

Cloud Portal
Physician’s Office
No change Vendor Neutral Infrastructure

Hospital

Remote Secure Access

Virtual Private Network (VPN)

Cloud Portal

Physician's Office

Remote monitoring 24 X 7

Vue Cloud Platform
Operated by Carestream
In a Tier -3 Data Center

• Active Archive
• Disaster Recovery
• Unlimited retention

Vendor Neutral Infrastructure

Customer's Responsibility

Remote Secure Access Point
(local cache adapted to needs)

DICOM [PACS, modalities]

HL7 [RIS, HIS]

IHE XDS-i [ECG, jpg, mpg pdf]

Local Access (LAN)

Carestream's Responsibility

Local Access
(LAN)

DICOM
(PACS, modalities)

HL7
[RIS, HIS]

IHE XDS-i
[ECG, jpg, mpg pdf]
Behind the Cloud

Hospital

Service Boundary

Remote Secure Access

Cloud Portal

Cloud Services

DMZ

Primary copy

Database Servers

User Mgt

Statistic Reporting

Audit & Security

Proactive Monitoring

Vendor Neutral Infrastructure

No change

DICOM [PACS, modalities]

HL7 [RIS, HIS]

IHE XDS-i [ECG, jpg, mpg pdf]

Local Access (LAN)

Remote monitoring 24 X 7

Service Access Point (local cache adapted to needs)

Virtual Private Network (VPN)

Remote Secure Access Behind the Cloud

Cloud Portal

Application Servers

User Mgt

Statistic Reporting

Audit & Security

Proactive Monitoring

Database Servers

Primary copy

Disaster Recovery copy

DMZ

Vendor Neutral Infrastructure

Customer’s Responsibility

Carestream’s Responsibility

OVERVIEW

CLOUD ARCHIVE

CLOUD PACS

CLOUD COMMUNITY

ARCHITECTURE
Vue Cloud
A Proven Global Platform

More than 1 Petabyte of managed data and over 30,000,000 studies managed at 10 Data Centers

- Tufts Medical Center, Boston
- Long Beach Memorial, CA
- CHR Orleans, France
- Nij Smellighen, Netherlands
- Schwarzer Baer, Hannover
- CMS Tokyo Group
Community Hospital Going Cloud Archive

Long Beach Memorial Medical Center, Long Beach CA

Customer Profile
- Busy 200 bed community Hospital
- Doing over 200,000 Diagnostic Radiology Studies per year
- Needed increased IT infrastructure for medical imaging
- Needed additional IT staff
- Wanted archive solution that was vendor neutral
- Wanted simple yet effective Disaster Recovery

Achievements
- Decided to subscribe to Vue Cloud Archive Service in 2007
- Currently have over 25TB stored in Carestream Cloud
- Currently have approx 1,000,000 studies stored in Carestream Cloud
- All images stored are in a standard DICOM Vendor Neutral Format
Teleradiology Services

Imadis, France

Customer Profile

• 1st Private Teleradiology Service Provider in France
• Delivering on call reading services to independent hospitals, for emergency cases, outside business hours
• Growing rapidly, and therefore need scalable and vendor-neutral infrastructure to connect its clients and radiologists

Achievements

• Partnering with Actibase to deliver a teleradiology infrastructure as a service
• Grown from 1 hospital to currently 12 connected to the service in 18 months, all being widely dispersed across France
• Reading Center located in Lyon gets on-call studies automatically pushed from any customer locations
• Planning to connect 3 additional hospitals in coming quarter

http://www.imadis.fr/
Image Exchange Across A Community

Rochester RHIO, New York, US

Customer Profile

- Multiple independent hospitals & private imaging centers members of RHIO covering the Rochester County
- Looking at exchanging patient history available from other institutions to reduce retakes and improve quality of care

Achievements

- Partnering with Axolotl and eHealth Global Technologies to deliver an image exchange infrastructure as a service
- 8 Rochester healthcare institutions connected to the service
  - 35,000 studies collected every month
  - Hosted in CARESTREAM data center in Rochester (Frontier)
  - Meta-data consolidated and images kept on-line for 2 months
  - Radiology studies available on-demand from any institution

http://www.grrhio.org/
National Diagnostic Services

National Radiology System, Scotland

Customer Profile

- 39 hospitals across 16 health boards with legacy IT environment
- 3 millions studies per year, approx 120 TB
- 8,000 users across 2,000 wards
- Limited IT skilled within NSS

Achievements

- Private cloud with PACS/RIS/Archive (4 yrs)
- 2 fully redundant data centers with hot fail-over integrated to National EMPI
- Priors automatically pulled out of the national patient imaging record
- Radiology from multiple hospitals acting as a single department

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Benefits of Vue Cloud Services

**SCALABILITY**
Add and remove data, users, sites, and tools freely as your workload ebbs and flows – without giving up any functionality

**PERFORMANCE**
Your contract defines all the services we will provide, including availability, performance, data restitution and regular reports on usage and activity

**CONTROL**
Carestream follows the precise directions of your designated internal expert – and you always own your data

**PREDICTABILITY**
Predictable total cost of ownership – eliminate unexpected costs from outdated internal support systems

**SECURITY**
Increased quality and security – leave IT to an expert team and redirect your time, money and resources toward core competencies

**RELIABILITY**
24x7x365 proactive monitoring and remote support to provide guaranteed uptime on standardized tested platform
Cloud Delivers Integrated Diagnostics at the Point of Care
### Patient Portal Search Screen

**Patient Portal Search (23)**

**Search patient:**

<table>
<thead>
<tr>
<th>Last name</th>
<th>First name</th>
<th>Patient ID</th>
<th>Date of birth</th>
<th>Gender</th>
<th>Last scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamant</td>
<td>Jeff</td>
<td>12346536</td>
<td>1/2/1959 (52 y.o.)</td>
<td>M</td>
<td>7/3/2007 CR Chest</td>
</tr>
<tr>
<td>Doe</td>
<td>Jack</td>
<td>38563823</td>
<td>6/1/1942 (68 y.o.)</td>
<td>M</td>
<td>1/11/2010 XR Pelvis</td>
</tr>
<tr>
<td>Duval</td>
<td>Ken</td>
<td>45646473</td>
<td>1/2/1940 (70 y.o.)</td>
<td>M</td>
<td>14/10/2010 CT Head</td>
</tr>
<tr>
<td>Harrison</td>
<td>George</td>
<td>57646556</td>
<td>1/7/1956 (54 y.o.)</td>
<td>M</td>
<td>9/3/2010 DX Lumber</td>
</tr>
<tr>
<td>Hurt</td>
<td>Jamie</td>
<td>34266985</td>
<td>22/3/1944 (66 y.o.)</td>
<td>M</td>
<td>12/8/2010 MR T-Spine</td>
</tr>
<tr>
<td>Jobs</td>
<td>Christina</td>
<td>57675642</td>
<td>1/7/1964 (46 y.o.)</td>
<td>F</td>
<td>11/10/2010 CR Ankle</td>
</tr>
<tr>
<td>Johnson</td>
<td>Michael</td>
<td>23245577</td>
<td>9/1/1953 (57 y.o.)</td>
<td>M</td>
<td>12/5/2008 CT Pelvis</td>
</tr>
<tr>
<td>Karren</td>
<td>Donna</td>
<td>23764256</td>
<td>1/2/1988 (22 y.o.)</td>
<td>F</td>
<td>9/4/2009 CT Thorax</td>
</tr>
<tr>
<td>Ken</td>
<td>Elinor</td>
<td>12812476</td>
<td>1/2/1927 (83 y.o.)</td>
<td>F</td>
<td>14/10/2010 CR Abdomen</td>
</tr>
<tr>
<td>Ken</td>
<td>Harry</td>
<td>54563429</td>
<td>1/7/1974 (36 y.o.)</td>
<td>M</td>
<td>10/4/2010 DX Chest</td>
</tr>
<tr>
<td>McDonald</td>
<td>Ken</td>
<td>22514575</td>
<td>1/2/1944 (66 y.o.)</td>
<td>M</td>
<td>14/10/2010 CR Chest</td>
</tr>
<tr>
<td>Robertson</td>
<td>Tom</td>
<td>28462747</td>
<td>1/2/1951 (59 y.o.)</td>
<td>M</td>
<td>23/11/2010 MR L-Spine</td>
</tr>
<tr>
<td>Robin</td>
<td>Elinor</td>
<td>34564757</td>
<td>1/7/1934 (76 y.o.)</td>
<td>F</td>
<td>4/7/2010 CR Hand</td>
</tr>
<tr>
<td>Robinson</td>
<td>John</td>
<td>21098254</td>
<td>1/2/1943 (67 y.o.)</td>
<td>M</td>
<td>11/11/2010 CT Chest</td>
</tr>
<tr>
<td>Taylor</td>
<td>Jeff</td>
<td>43578356</td>
<td>1/7/1933 (77 y.o.)</td>
<td>M</td>
<td>23/11/2010 XA Abdomen</td>
</tr>
<tr>
<td>White</td>
<td>Ken</td>
<td>351255</td>
<td>2/1/1931 (79 y.o.)</td>
<td>M</td>
<td>14/10/2010 CT Chest</td>
</tr>
<tr>
<td>Wild</td>
<td>Vanessa</td>
<td>16390535</td>
<td>1/7/1924 (66 y.o.)</td>
<td>F</td>
<td>11/1/2009 CT Chest</td>
</tr>
</tbody>
</table>

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Radiology Report

Patient Name: White Ken
Report Date: 14-Oct-2010 12:17
Patient ID: 351256
Accession No.: 30138169
Patient Birth Date: 02-Jan-1931
Referring Physician: DR. DEMO

Reason For Study: Strong indication for bronchial carcinoma in the right lower lobe in CR thorax

CT Thorax with IV contrast as of 20.05.2005.

Clinical details:
Voluminous mass in the right lower field (conventional X-Ray).

Findings and summary:
Tumorous mass in the dorsal mid lobe, measuring 7.2 * 5.4 cm axially, 6.6 cm longitudinally. The density of this mass is remarkably low (13 HE +/- 6%). Lobulated delineation and finger shaped caudal/ventral protrusions. In addition to an exceptionally

Notes
1/3 Dr. Smith

Purpose: For referring Provider

A call was made to Dr. Lincoln

14.10.10 11:30
Radiology Report

Patient Name: White Ken
Report Date: 14-Oct-2010 12:17
Patient ID: 351256
Accession No.: 30138169
Patient Birth Date: 02-Jan-1931
Referring Physician: DR. DEMO
Reason For Study: Strong indication for bronchial carcinoma in the right lower lobe in CXR thorax

CT Thorax with IV contrast as of 20.06.2005.

Clinical details:
Voluminous mass in the right lower field (conventional X-ray).

Findings and summary:
Tumorous mass in the dorsal mid lobe, measuring 7.2 * 5.4 cm axially, 6.6 cm longitudinally. The density of this mass is remarkably low (13 HU +/-65).
Lobulated delineation and finger shaped caudal/ventral protrusions. In addition to an eccentrically:

Notes:

Purpose: For referring Provider

A call was made to Dr. Lincoln

14.10.10 11:30
Coming soon: **MyVue**, a Portal for Patients

- Patient completes exam
- Checks out with Imaging Admin
- Patient receives email from hospital staff
- Logs on with info from email
- Patient shares results with specialists
- Patient owns his imaging record, shares on-demand when needed
- Continues with own treatment/care

**Hospital Ownership:**
- Consent Management
- Security / Sharing protocols
- Unlimited expansion
- EHR Patient Portal Services
### Enable Patient Access

- **Disable patient access**
- **Enable patient access**

<table>
<thead>
<tr>
<th>First Name</th>
<th>Email/User Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLAN</td>
<td><a href="mailto:patient@hospital.com">patient@hospital.com</a></td>
</tr>
</tbody>
</table>

- **Last Name**
- **ID no.**

- **Patient consent is signed**

[OK] [Cancel]
Patient Access Enabled

The patient has been granted access to exam data. To view the images and reports, the following credentials should be used:

**Name:**
MARCH ALLAN

**ID no.:**
200332738456

**User Name:**
patient@hospital.com

**Password:**
123456

**Site Address:**
http://10.94.195.75/WebLogin.aspx

OK
Patient Access to Exam Images
Allan March
ID: 200932798456

Dear Mr. March,

You have been granted internet access to your exam data. To be able to view the exam images and report, please click on the link below and use the following credentials:

Username: patient@hospital.com
Password: p

http://10.94.195.75/WebLogin.aspx?token=ee

Alternatively, you can simply scan the QR code below, and view your images on your mobile.

Thank you,

Sarah Davidson
Patient Reports

1/1 REPORTING FIRST REPORTING LAST 3/10/2011

Clinical details:
Prostate cancer with metastases. Patient having received radiation therapy of the sternum and supraventricular area.
Follow-up exam.
State of the bones, lymph nodes, supraventricular region, lung?

Findings:
Supraventricular left there are lymphatic metastases with diffuse borders measuring up to 2.9 cm. In the previous exam, there was only one lymph node measuring 9 mm. Also the intrapulmonary metastases have increased in size: the biggest lesion in the posterior right upper lobe segment measures 3.8 cm. The osteoblastic metastasis in the left part of the seminal mandrible measures 2.3 cm (prior: 1.5 cm). Also additional osteoblastic metastases of the thoracic spine; distinct metastasis in T3, increase in size of the metastasis in T6. Also signs for osteoporosis. Massive progress of the mediastinal lymphatic metastases: a precardial lymph node now measures 3 cm (prior: 1.7 cm).
A congestion of the right kidney with delayed contracting of the right kidney may be observed. New metastases of the left adrenal gland, measuring 2.3 cm in axial diameter.

In summary:
Unfortunately massive increase of the metastases within the organs and lymph nodes. Now congestion of the right kidney with hypoperfusion. An additional abdominal CT is strongly suggested.
Clinical details:
Prostate cancer with metastases. Patient having received radiation therapy of the sternum and supraclavicular area.

Follow-up exam:
State of the bones, lymph nodes, supraclavicular region, lungs?

Findings:
Supraclavicular left there are lymphatic metastases with diffuse borders, measuring up to 2 cm. In the previous exam, there was only one lymph node measuring 3 mm. Also the intradural metastases have increased in size, the largest lesion in the posterior part of the upper lobe segment measures 3 cm. The osteolytic metastasis in the left part of the sternum measures 3.5 cm (posterior 1.5 cm). Also additional osteolytic metastases of the thoracic spine, distinct metastasis T3, increase in size of the metastasis T6. Also signs for osteoblastosis. Massive progress of the mediastinal lymphatic metastases; a paracervical lymph node now measures 3 cm (posterior 1.7 cm).

A congestion of the right kidney with delayed contrasting of the right kidney may be observed. New metastasis of the left adrenal gland, measuring 2.5 cm in axial diameter.

In summary:
Unfortunately, massive increase of the metastases within the organs and lymph nodes. New congestion of the right kidney with hypoperfusion. An additional abdominal CT is strongly suggested.
Access Exam Images of Allan March
ID: 200932798456

Dear Dr. Jane Doe,

Allan March has invited you to view his radiology exam images and report.
To access Mr. March's exam data, please click on the link below:

http://10.84.1.95.75/WebLogin.aspx?token=bb

You can also simply scan the QR code below and view the images on your mobile.

Thank you,
The Chicago Hospital Team
A New Way to Purchase and Deliver Your Imaging IT!

More on www.carestream.com/cloud
Summary

• Overcome scarcity by leveraging expertise and capacity in the cloud
• Focus on innovation, rely on the ecosystem for services outside your core competency
• Adopt standards and best practices leveraging worldwide models
Additional Sources of Information:

- Intel® Cloud Builders
- Open Data Center Alliance (ODCA)
- Cloud Security Alliance (CSA)
- European Network and Information Security Agency (ENISA)
- Healthcare Blogs – Intel® Healthcare IT Professionals
- Whitepapers
  - CARESTREAM* Increasing the Scalability of Medical Imaging Solutions
  - Secure Healthcare Cloud (TXT whitepaper)
  - VMware® and Intel® 10GbE Best Practices
  - Securing the Enterprise with Intel® AES-NI
  - Enhanced Cloud Security with HyTrust* & VMware*
  - Taking Control of the Cloud for your Enterprise
  - Unified Networking with Cisco® Virtualized Multi-Tenant Data Center*
- Videos
  - Cloud Security: Built from the Ground Up
  - Trusted Execution Technology
  - Virtualization Demo/Animation
  - CARESTREAM* SuperPACS™ architecture at Clalit Health Services
Intel Technologies

- **Intel® Virtualization Technology (Intel® VT)** – Provides flexibility and maximum system utilization by consolidating multiple environments into a single server, workstation, or PC.

- **Intel® vPro™ Technology** – Designed specifically for the needs of business, notebooks and desktops with Intel® vPro™ technology have security and manageability built right into the chip.

- **Intel® Trusted Execution Technology (Intel® TXT)** – Protect confidentiality and integrity of business data against software-based attacks.

- **Intel® Anti-Theft Technology (Intel® AT)** – Providing the option to activate hardware-based client-side intelligence to secure the PC and its data in the event the notebook is lost or stolen.

- **Intel® AES New Instructions (Intel® AES-NI)** – The Advanced Encryption Standard (AES) algorithm is now widely used across the software ecosystem to protect network traffic, personal data, and corporate IT infrastructures.

- **Intel® Identity Protection Technology (Intel® IPT)** – Two-factor authentication directly into the processors of select 2nd generation Intel® Core™ processor-based PCs.

- **Intel® Cloud Access 360** – Protection Enterprise Access to Cloud and Protecting Enterprise Applications in the Cloud.


- **McAfee Cloud Security Platform** – Consistent security policies, reporting, and threat intelligence across all cloud traffic—now available from a single platform.

- **Intel® Scale-out Storage** – Tackle your data center’s challenges with enterprise storage solutions powered by the world’s most advanced multi-core architecture.


- **Intel Unified Networking** – Unified Networking enables cost-effective connectivity to the LAN and the SAN on the same Ethernet fabric.