Shared Services and Healthcare Cloud:

A Strategy for Adoption

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What is Shared Services?

Countries and regions are struggling to establish a shared services model

—a means to cost-effectively share the necessary infrastructure for health information exchange—

while creating a collaborative economic model that drives local innovation and accelerates adoption of advanced healthcare usage models.

We will review an HIE/Cloud maturity model in the context of worldwide examples.

Healthcare & Cloud Computing Trends

Care Coordination and Data Sharing for Improved Outcomes

Quality of Life

Proactive health and Wellness

Reduce illness. Promote wellness and empowerment

Home Care

Reduce costly emergency care. Better manage chronic disease.

Residential / Community / Ambulatory Care

Reduce hospital (re) admissions. Manage at home.

Acute Care

Reduce ALOS. Earlier Discharge to Ambulatory environments.

Cost of Care

Highest Quality of Life at the Lowest Possible Cost

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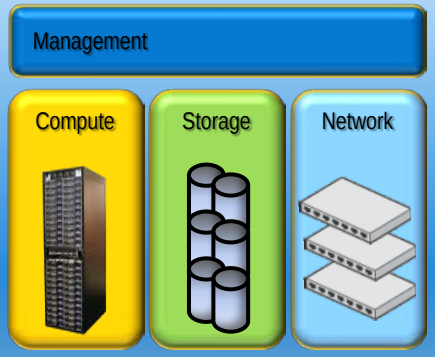
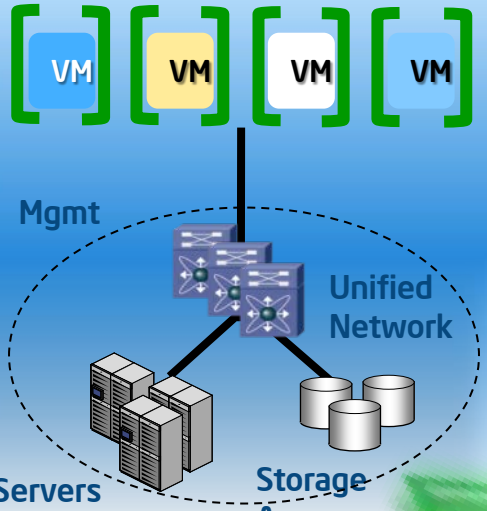
Evolution of the Datacenter

Discrete Datacenter



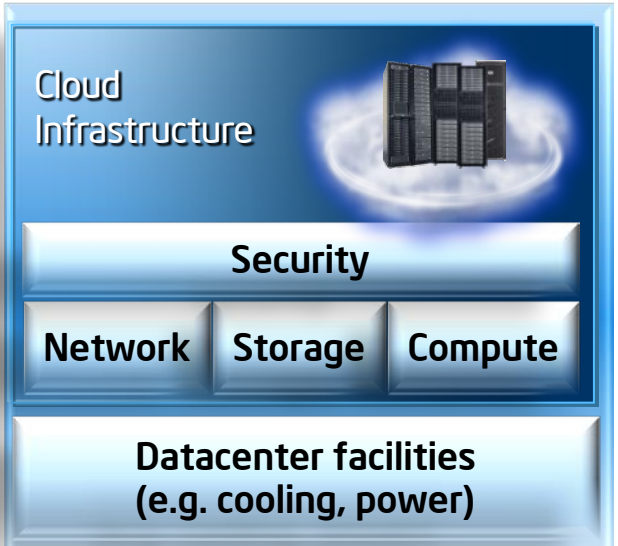
Consolidation
Discrete networks

Virtualized Datacenter



Flexible Management
10G Unified Network

Cloud Datacenter



Efficient and Secure
Open Architecture
Flexible Network

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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]

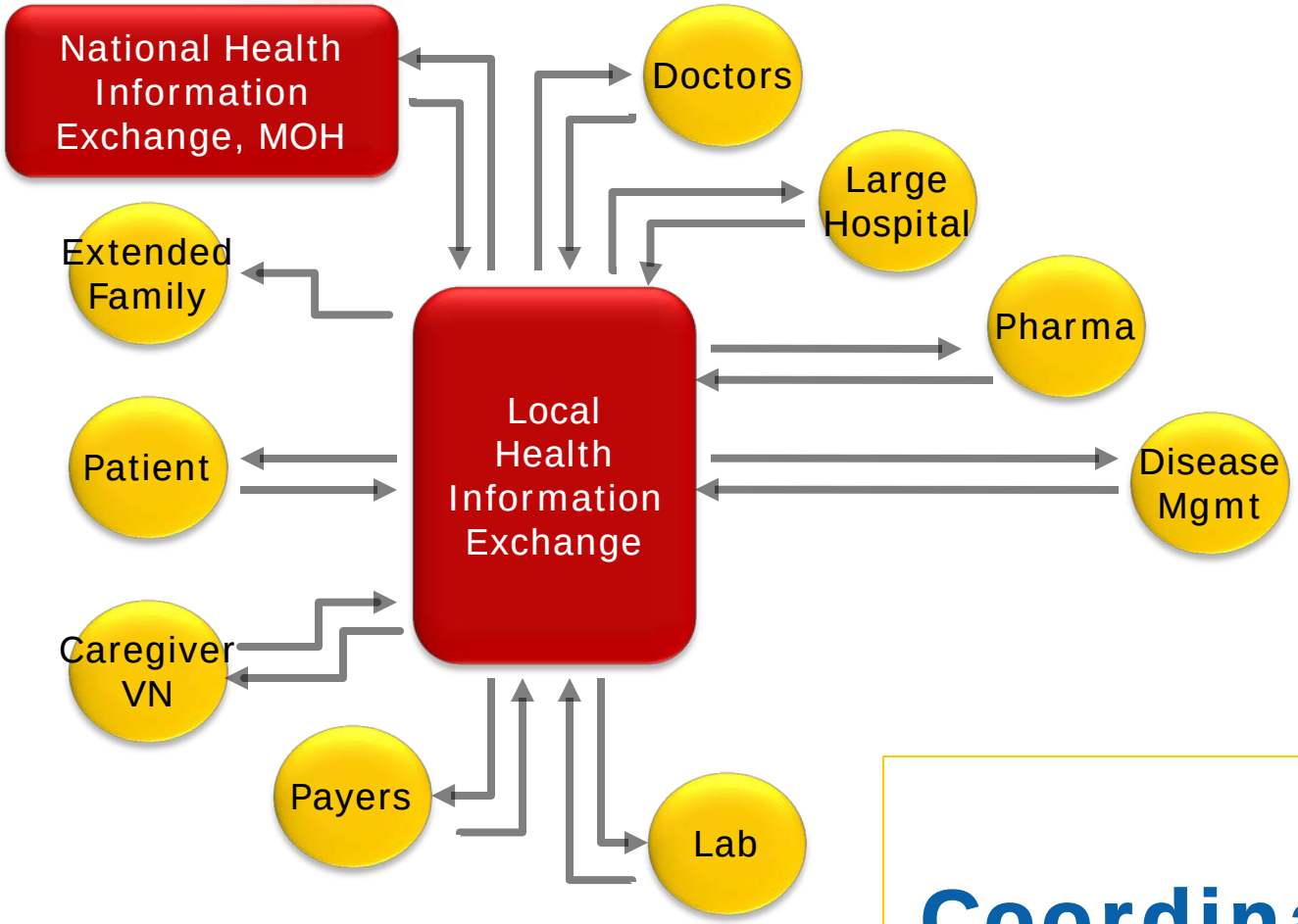
– Data projected to reach 35 Zettabytes by 2020, a 44-fold increase from 2009[5]

[1] John Halamka, CIO, Beth Israel Deaconess, http://geekdoctor.blogspot.com/. [2] "Prepare for Disasters and Tackle Terrabytes When Evaluating Medical Imaging Archiving," ©2008 Frost & Sullivan. [3] Human Genome Project FAQs, http://www.ornl.gov/sci/techresources/Human_Genome/faq/faqs1.shtml. [4] Baylor College of Medicine, Human Genome Sequencing Center, http://www.cwhonors.org/viewCaseStudy.asp?NominationID=340. [5] IDC Digital Universe Study, sponsored by EMC, May 2010

Cloud Computing Business Drivers

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

Common Healthcare Usage Models: Care Coordination



Care Coordination

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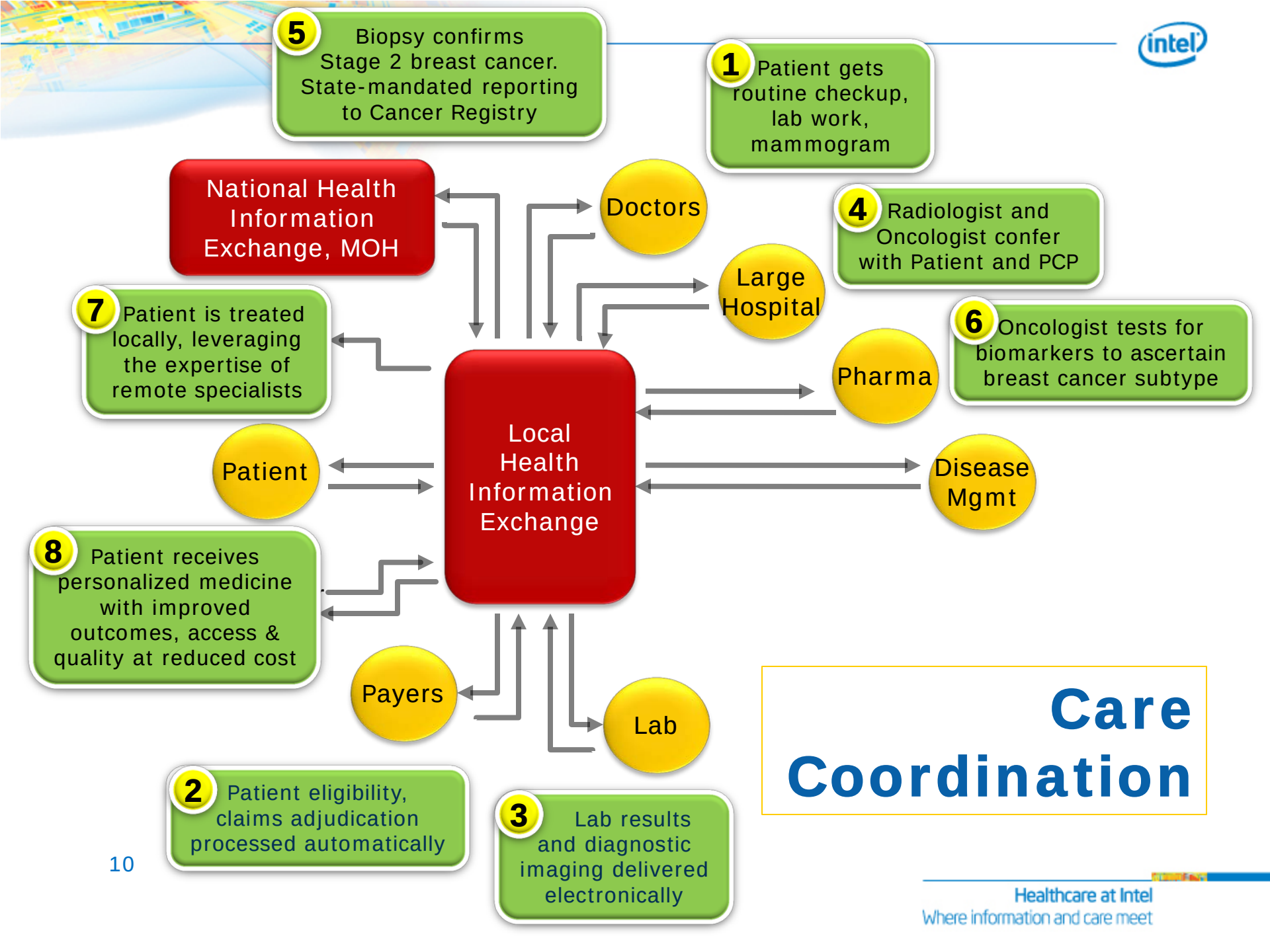

Care Coordination

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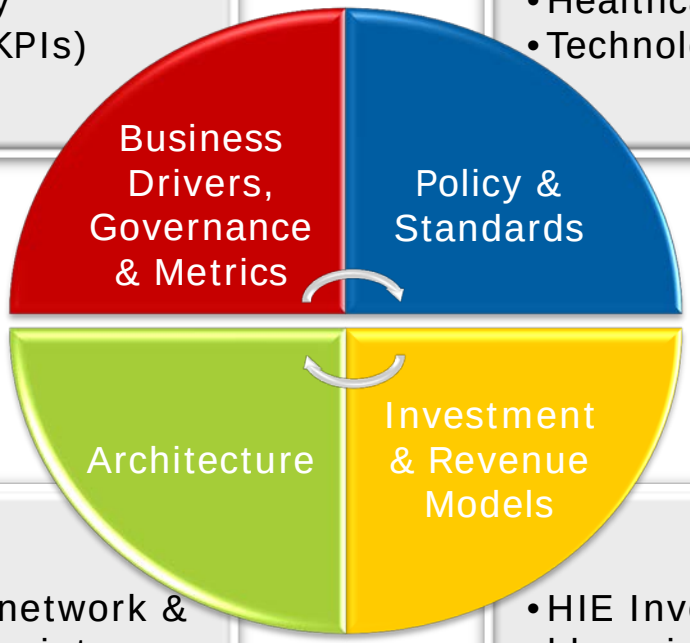
Health Information Exchange Maturity Model

HIE Framework

- Capability Maturity Model
- Data Use and Reciprocal Support Agreement (DURSA)
- Health Quality, Healthcare IT & Architecture Adoption Key Performance Indicators (KPIs)

- Interoperability Standards (healthcare informatics, transport, protocol, privacy & security)
- Privacy, Data Protection Laws/Regs
- Healthcare Reimbursement Policies
- Technology Certification Process



- Business, solution, data, network & security architecture blueprint
- Standard web service methods for healthcare utility services
- Traceability to Key Healthcare Business Capabilities

- HIE Investment tied to architecture blueprint implementation
- Incentives tied to Quality Metrics
- Sustainable revenue based upon subscription and transactional data services & secondary use

HIE Capability Maturity Model

Phase 1

Scheduling & Triage
Summary/Longitudinal Health Record
Care Coordination
ePrescribing, Lab Results, Diagnostic Imaging

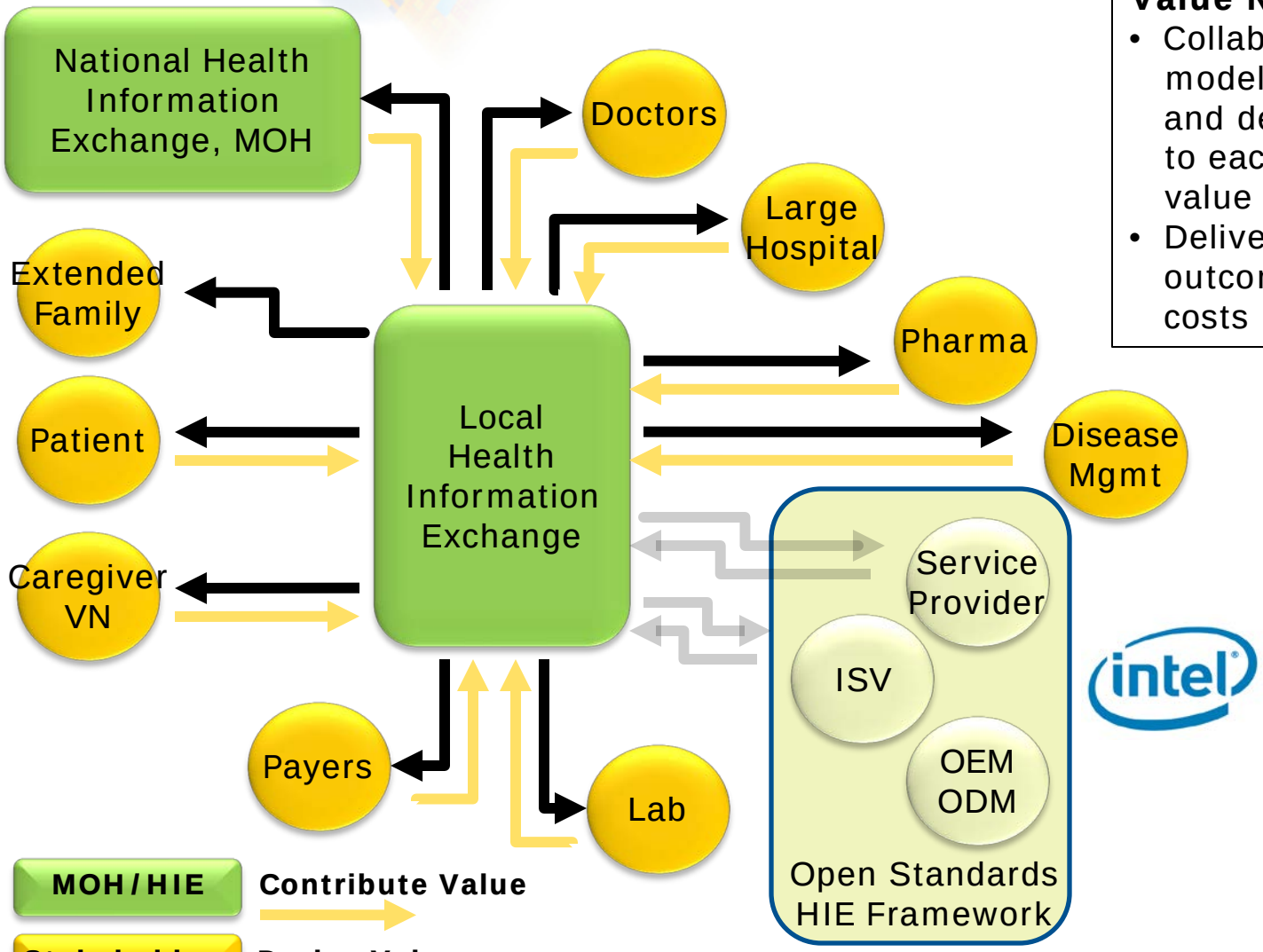
Phase 2

Disease Registries
Clinical Guidelines & Protocols
Chronic Disease Management
Remote Patient Monitoring
Transitions of Care (Discharge, Referrals)

Phase 3

Data Services & Secondary Use
Clinical Decision Support
Public Health & Population Mgmt
Quality Metrics & Reporting
Rural Health & Telemedicine

HIE Collaborative Economic Model



Value Network

- Collaborative economic model shifts revenue and delivers incentives to each according to value derived
- Delivers improved outcomes at reduced costs

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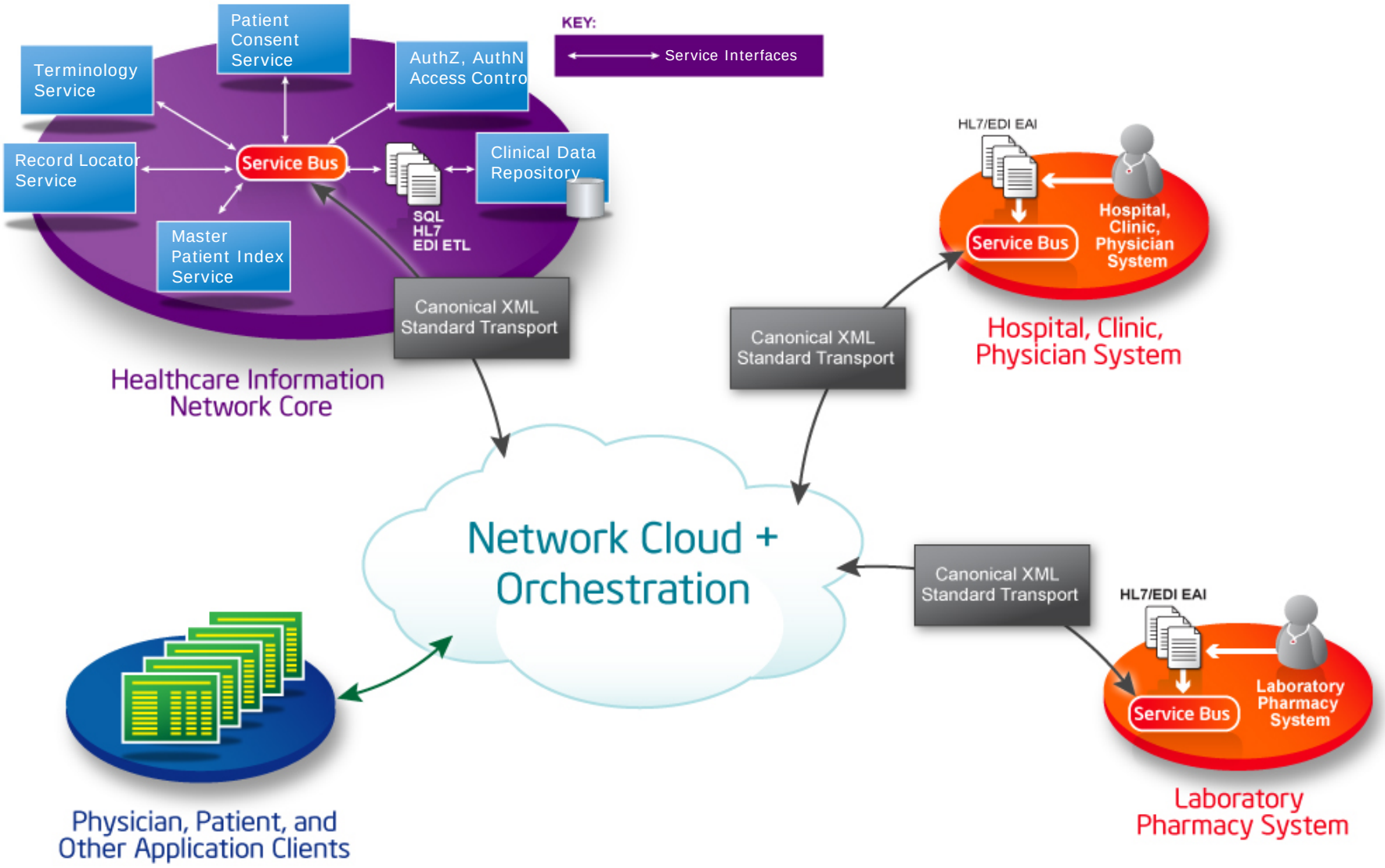
Healthcare Utility Services

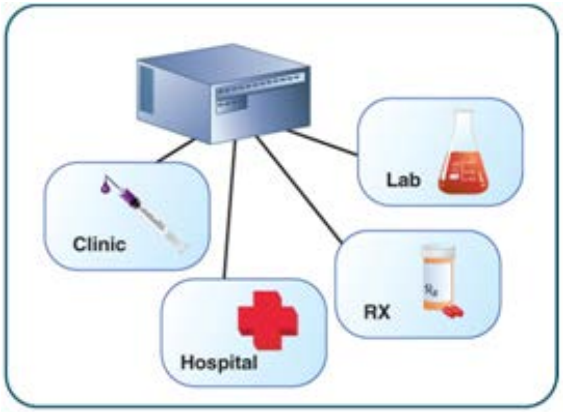
- **Entity Identity Service**
- **Record Locator Service**
- **Controlled Terminology Service**
- **Patient Consent & Authorization Service**
- **Clinical Data Repository**
- **Patient & Clinician Portals**

The Healthcare Services "Network



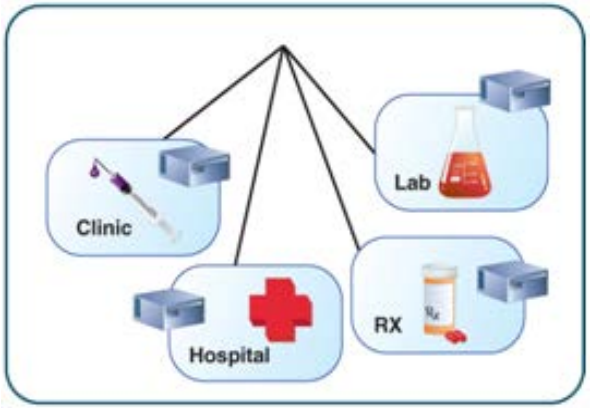
Data Liquidity Across the Region

Centralized



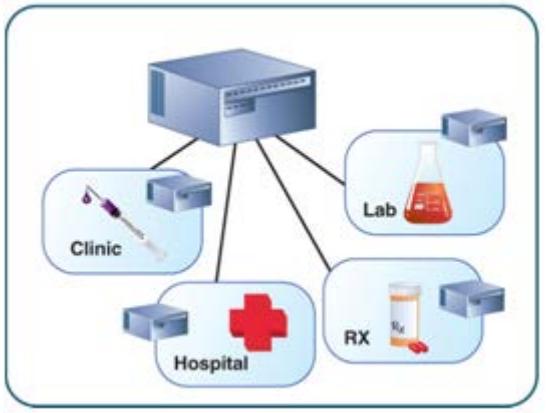
- Optimal sustainable business model; suboptimal for local control
- Optimal for semantic normalization, secondary use of data
- Provides transition path for standards adoption
- Better model for patient consent/auth, privacy and security

Federated



- Optimal for local control; suboptimal for sustainable business model
- No semantic normalization unless all end-points adopt common standards
- Significant burden on end-points to support SLAs
- Inconsistent enforcement of privacy and security

Hybrid



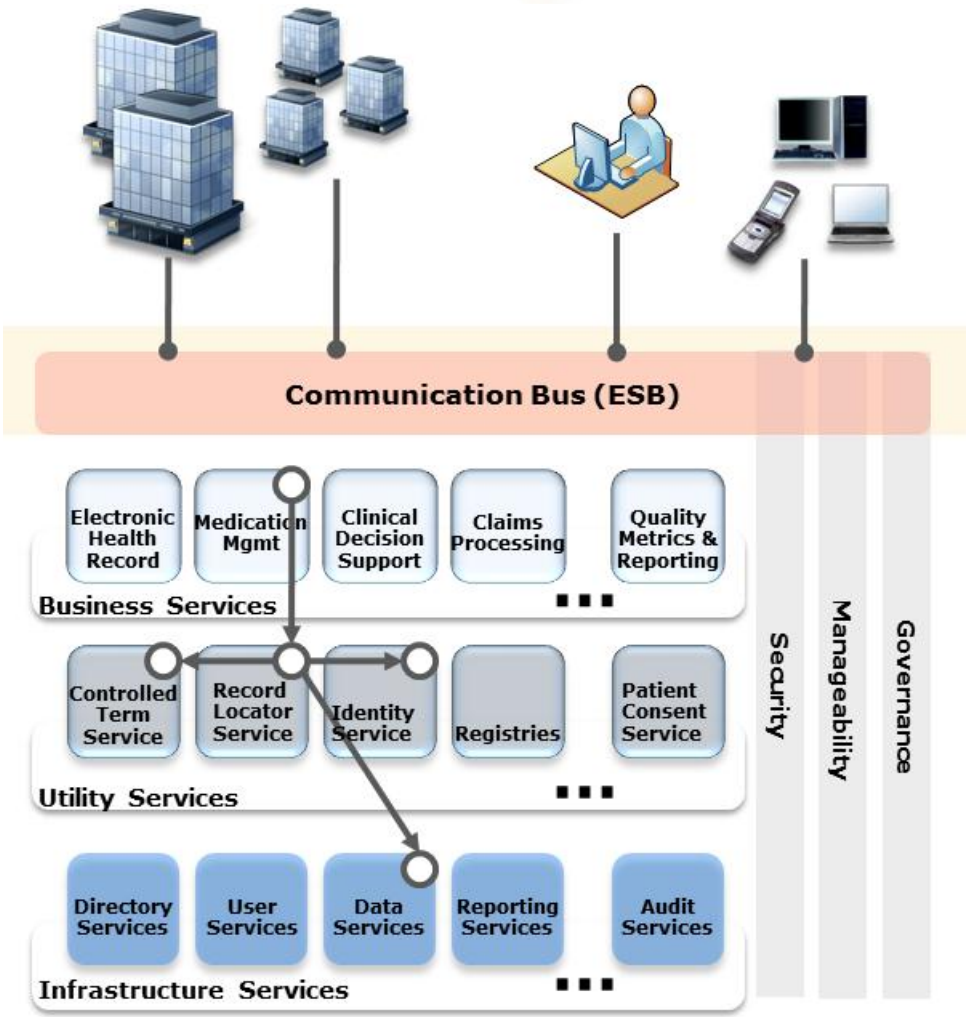
- Compromise to improve performance over Federated
- Same considerations for local control, sustainable business model
- Same considerations for semantic normalization and high availability
- Same considerations for patient consent/auth, privacy and security


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

Healthcare Cloud Service Mediation



Composite Applications

Modular services deliver advanced healthcare capabilities across the compute continuum

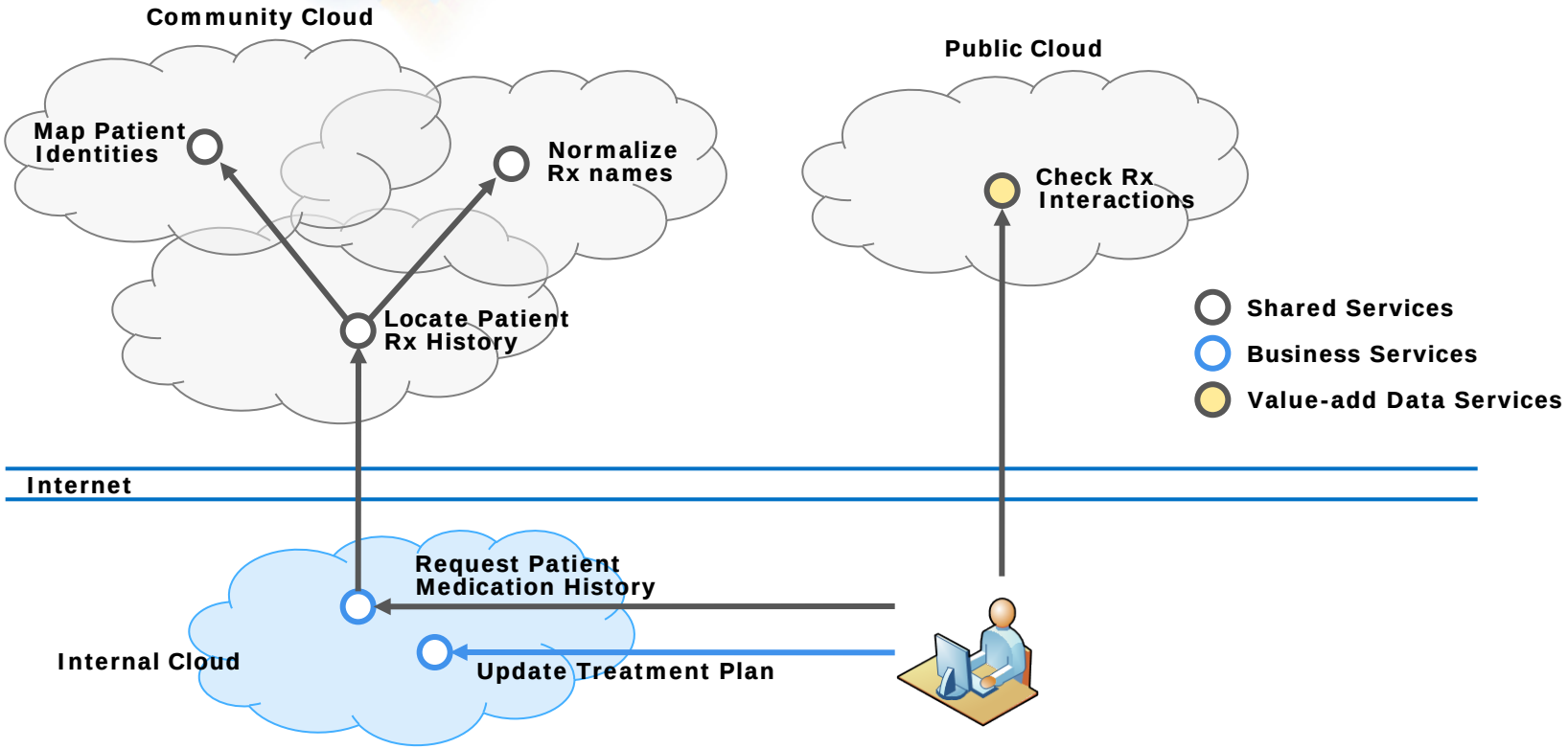
Shared Services

Healthcare utility services provide the necessary foundation to cost-effectively scale-out infrastructure

Rapid Innovation

Deliver value-add data services, improve access to healthcare, create sustainable business models

Cloud Architecture Considerations



Economies of scale demand composite applications, consistent service interfaces, & shared service functionality

Value-add data services, advanced healthcare usage models, and collaborative economic model all depend upon a normalized informatics model

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Community Cloud for Toronto Hospitals

Fourteen hospitals share clinical application & EHR data storage

- Provincial government provides hardware in government data center, recoups investment in compute resources through IaaS
- Mt Sinai recoups administrative and support costs through SaaS

Community Cloud Benefits

- Multi-tenant environments for cross-agency interactions
- Private cloud benefits without cost of private cloud
- Licensing and support economies of scale
- Centralized data, consistent vertical application usage

Creating trust in a community cloud

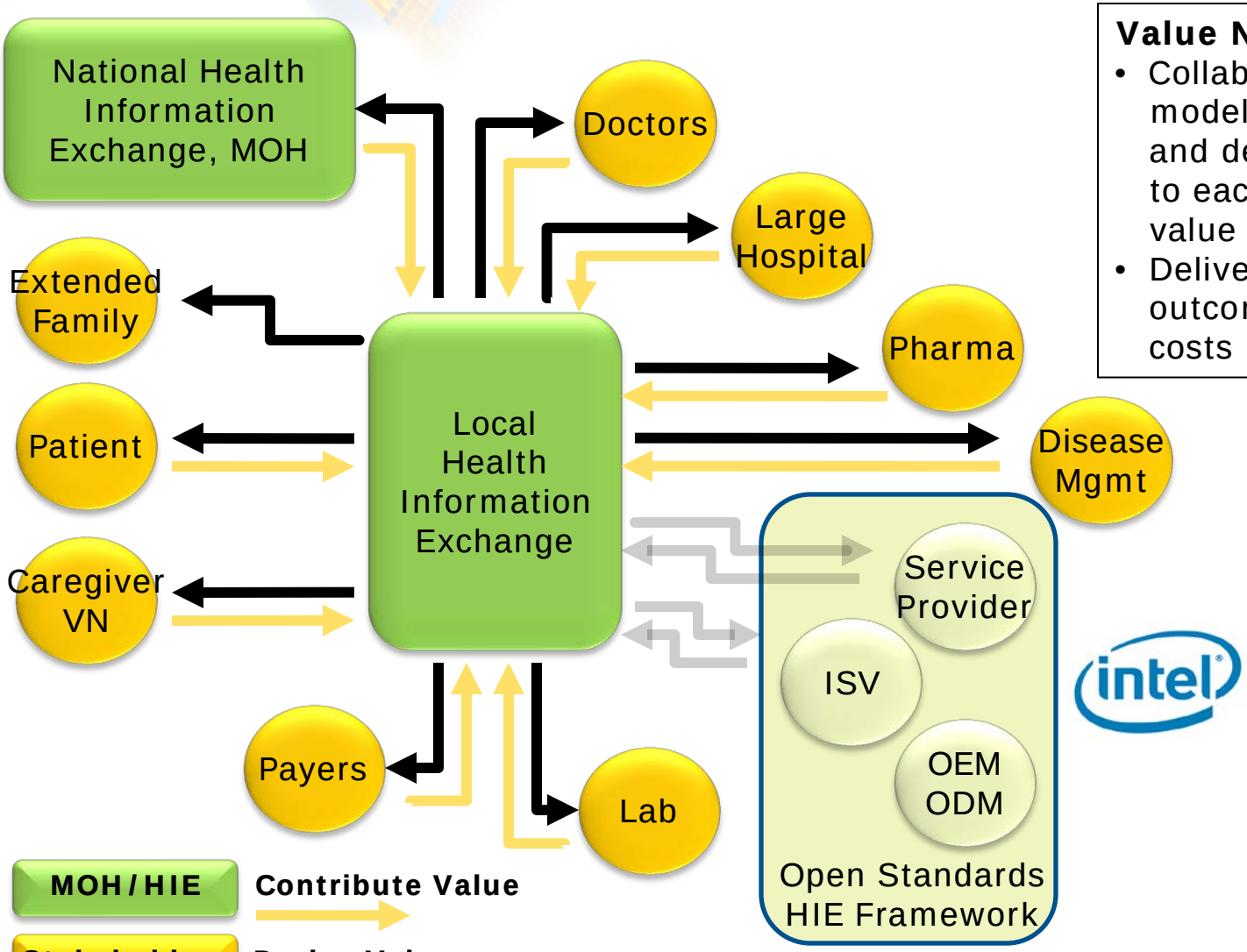
- Privacy, security & data use agreements
- Mutual support and Service Level Agreements
- Must possess some degree of shared goals/objectives ('political will')

Source: "A healthcare community cloud takes shape", SearchCIO.com, 21 Dec 2010

Service Models Deliver Real Sustainability

intel Health

Collaborative Economic Model



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Institute of Medicine

Rapid Learning Health System

- Data of all types is contributed, analyzed, and disseminated in a **continuous feedback loop that integrates research and care**
- Such a system provides the gateway to 21st century medicine—**personalized, predictive, preemptive, and participatory**—where the patient and his/her particular **genetic and clinical characteristics** are at the center of all activity, playing a key role in both **research and self-management of health**

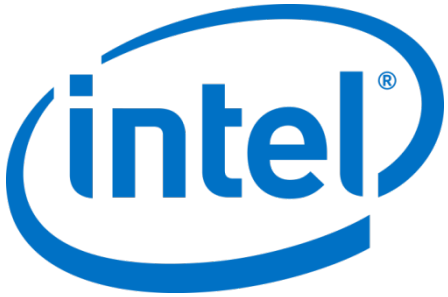
Source: The Learning Healthcare System. Workshop Summary, March 2007 (http://www.iom.edu/Reports/2007/The-Learning-Healthcare-System-Workshop-Summary.aspx)

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:

- Healthcare Blogs – Intel® Healthcare IT Professionals
- Industry Alliances
  - Intel® Cloud Builders
  - Open Data Center Alliance (ODCA)
  - Cloud Security Alliance (CSA)
  - European Network and Information Security Agency (ENISA)
- Whitepapers
  - CARESTREAM* Increasing the Scalability of Medical Imaging Solutions
  - GNAX Health* Protecting Healthcare Data in the Cloud
  - 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 Animation
  - Healthcare Storage Animation
  - Peake Healthcare*, Johns Hopkins*, VMware* Medical Imaging Cloud



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