



Thinking SOA: How to Get Your Organization Ready

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Overview

- About BMC
- Quick Review of SOA
- Checklist for SOA readiness
- SOA at Partners Healthcare System
- SOA at Boston Medical Center

Boston Medical Center



- Large academic medical center, Boston University School of Medicine
- 588 beds
- Largest 24-hr Level 1 Trauma Center in New England
- Provided more than \$233 million in free care to uninsured patients
- 29,471 inpatient discharges
- 985,356 outpatient visits
- 12 affiliated community health centers
- \$88M in funded research in 2007, 458 research and services project separate from BU Medical School
- 95% of all clinicians use the electronic medical record
 - 3 EMRs and multiple 'best of breed' applications



SOA means...

Business

a **set of services** that a business wants to expose to their customers and partners, or other portions of the organization

Architecture

an **architectural style** which requires a service provider, requestor and a service description. Consists of a **set of architectural principles**, patterns and criteria which address characteristics such as *modularity, encapsulation, loose coupling, separation of concerns, reuse, and simple or composite implementations*

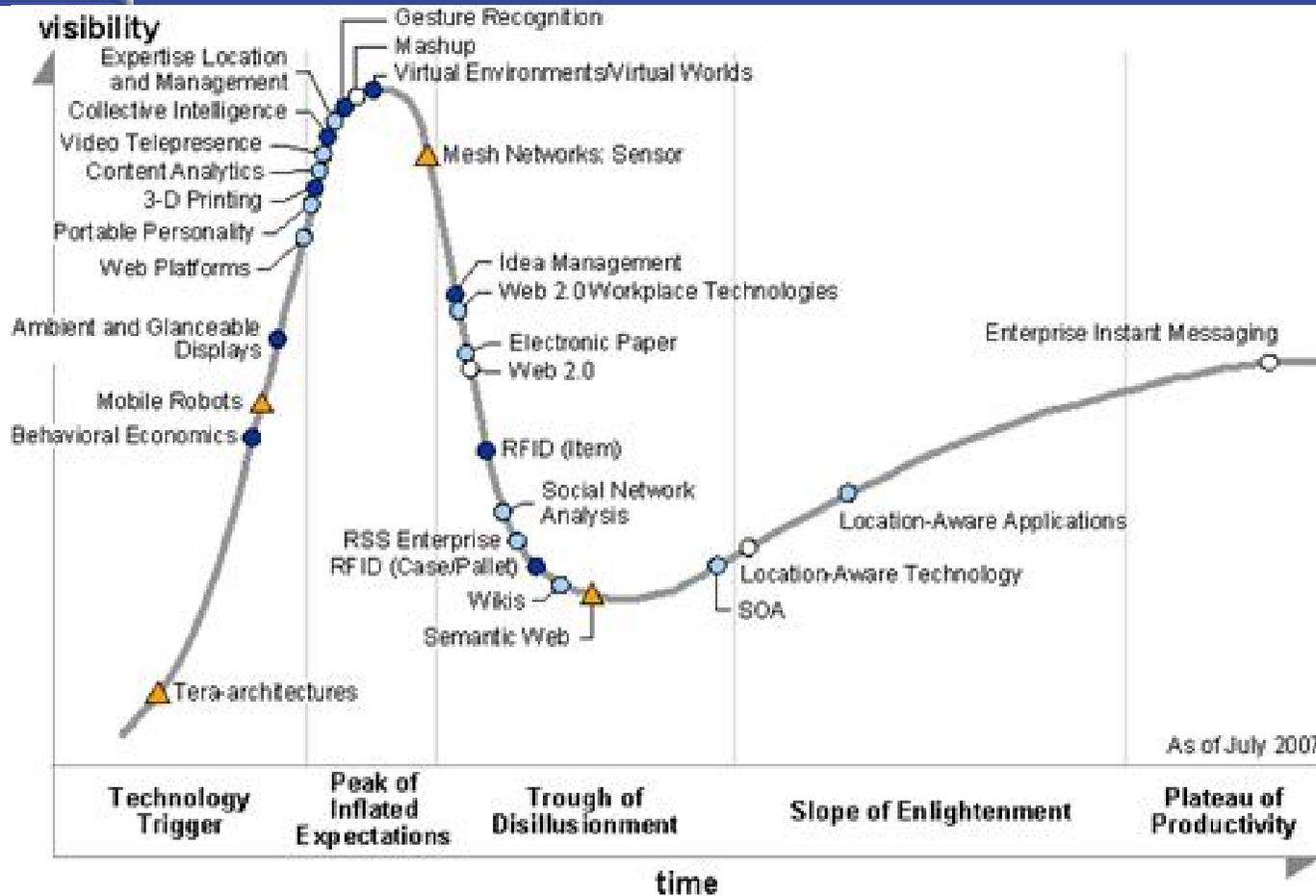
Implementation

a **programming model** complete with standards, tools and technologies such as Web Services

Operations

a **set of agreements** among service requestors and service providers that specify the quality of service and identify key business and IT metrics

SOA Hype



As of July 2007

Years to mainstream adoption:

○ less than 2 years

● 2 to 5 years

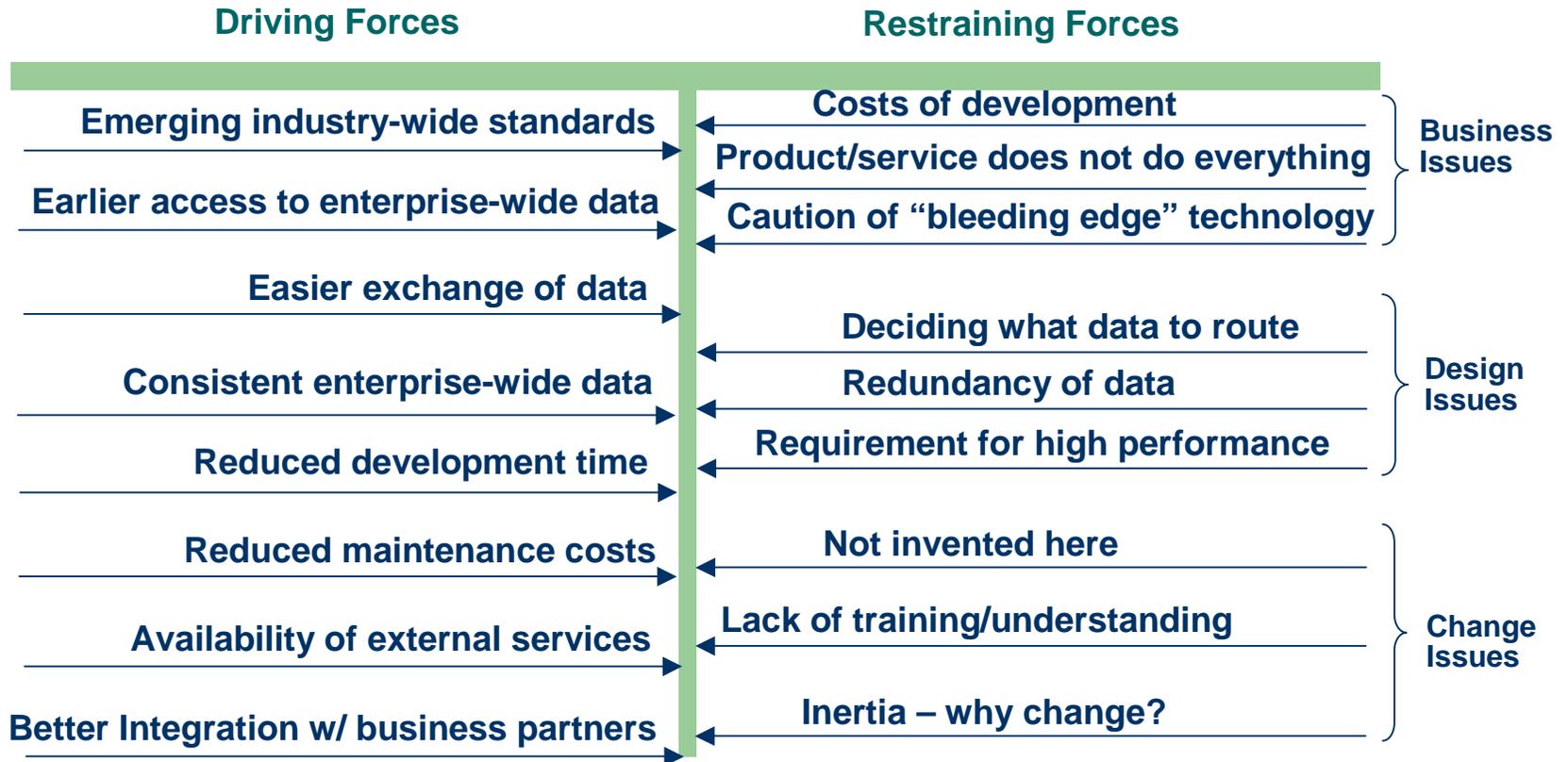
● 5 to 10 years

▲ more than 10 years

⊗ obsolete

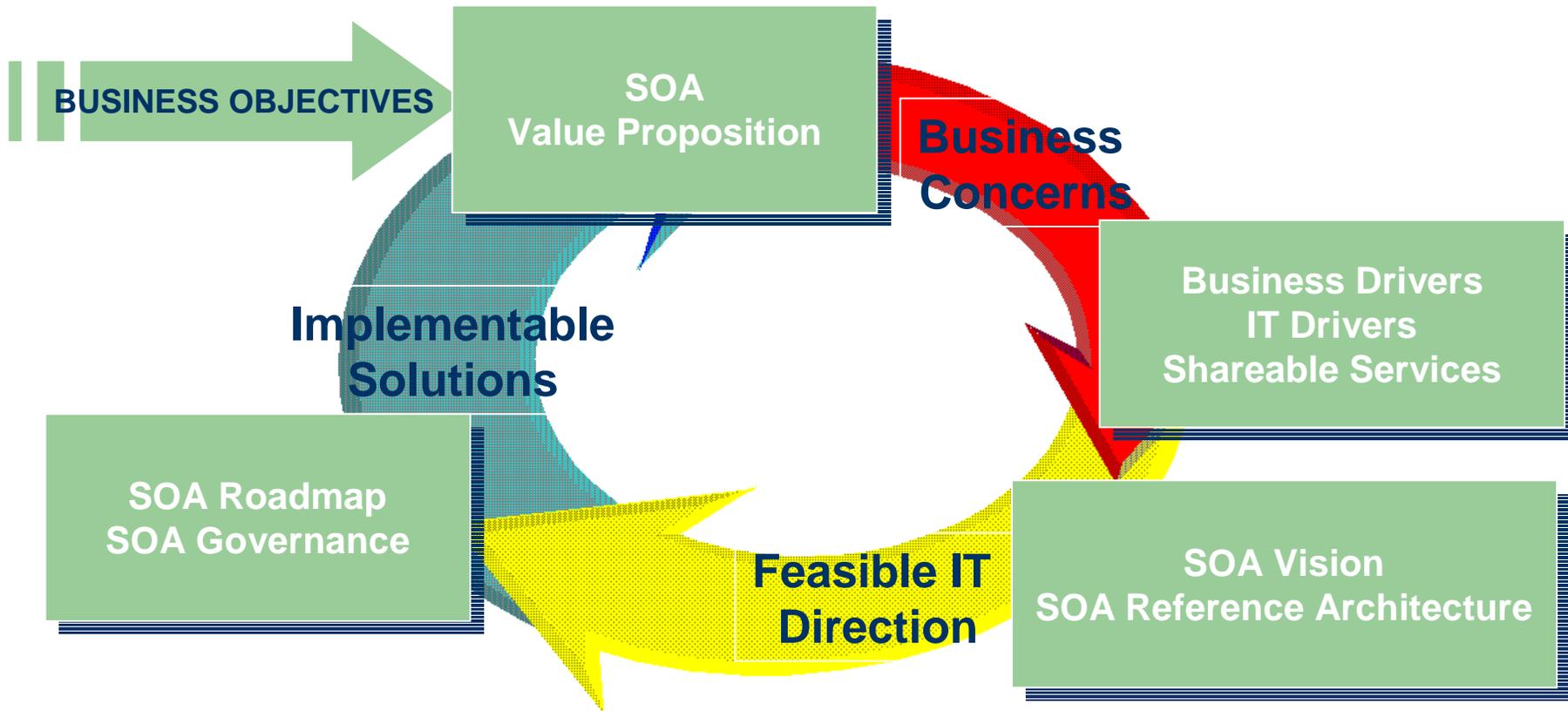
before plateau

Disillusionment: Challenges of Getting to SOA



Source: Web Services and Service-Oriented Architectures, Douglas K. Barry, Morgan Kaufmann Publishers, 2003

Align Business Goals with SOA Strategy



Can I measure my organizational readiness?

- **Lots of SOA Assessment Tools available**
 - IBM, Accenture, Sun, Siemens, Oracle
- **Some on-line tools**
- **Most are consultant engagements**
- **None are truly specific to healthcare**
- **Such an initiative requires support and knowledge...ask around if people know what SOA is...that will give you a sense of how much work it will take to get ready.**

IBM Self-Assessment



The screenshot shows the IBM SOA Self-Assessment web page. The page title is "IBM SOA Self-Assessment". Below the title, there is a section for "Process" with a question: "* 1. What statement best describes your organization's experience in SOA?". The question is followed by four radio button options:

- Organization has no experience in implementing SOA solutions.
- Organization has limited experience in architecture, design or implementing SOA solutions.
- Organization has experience in architecture, design and implementing SOA for two or fewer applications.
- Organization has experience in architecture, design and implementing

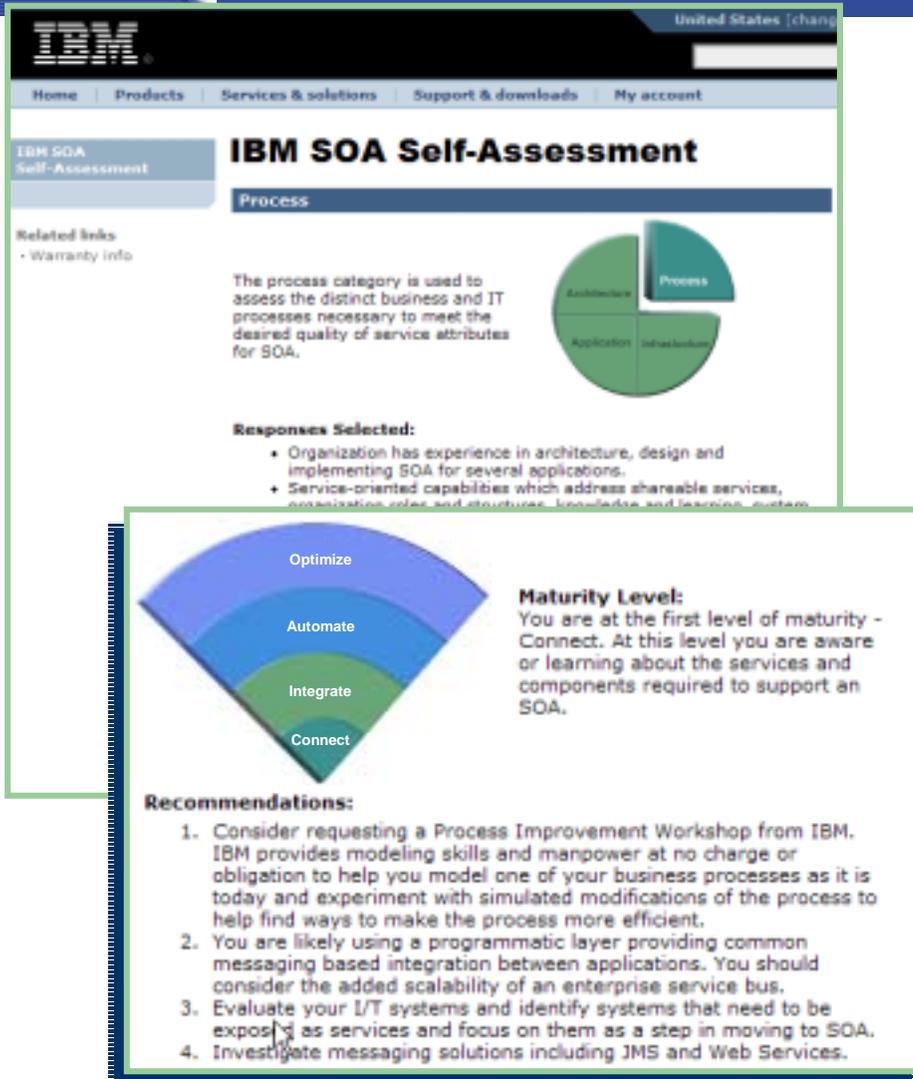
*** 10. Describe your organization's ability to connect applications.**

- Manual re-keying of data and using file transfer technology across applications is common in my organization.
- Connect some applications real-time, but occasionally experience lost or duplicate transactions on occasion.
- Connect applications real-time, and do not have concerns when applications or networks are unavailable; however, problems sometimes arise in audit, problems arise handling large transaction volumes and large message sizes.
- Connect applications real-time without major challenges, but inhibitors are in place which does not allow real-time integration with our extranet or intranet applications.
- Connect applications, real-time, across multiple heterogeneous platforms.

- Online diagnostic, co-developed with IBM Global Services SOA Center of Excellence
- Users answer questions about practices in key SOA categories of Process, Architecture, Application, and Infrastructure
- Available at:

<http://www.ibm.com/software/websphere/>

Assessment Results



The screenshot shows the IBM SOA Self-Assessment tool interface. At the top, there is a navigation bar with links for Home, Products, Services & solutions, Support & downloads, and My account. The main heading is "IBM SOA Self-Assessment". Below this, there is a "Process" section with a pie chart showing four categories: Architecture, Process, Application, and Infrastructure. The "Process" category is highlighted. To the right of the pie chart, there is a text box explaining that the process category is used to assess business and IT processes. Below this, there is a "Responses Selected:" section with two bullet points: "Organization has experience in architecture, design and implementing SOA for several applications." and "Service-oriented capabilities which address shareable services, organizational roles and structures, knowledge and learning systems." To the left of this text is a funnel diagram with four levels: Connect (bottom), Integrate, Automate, and Optimize (top). The "Connect" level is highlighted. To the right of the funnel diagram is a "Maturity Level:" section stating: "You are at the first level of maturity - Connect. At this level you are aware or learning about the services and components required to support an SOA." Below this, there is a "Recommendations:" section with four numbered items: 1. Consider requesting a Process Improvement Workshop from IBM. IBM provides modeling skills and manpower at no charge or obligation to help you model one of your business processes as it is today and experiment with simulated modifications of the process to help find ways to make the process more efficient. 2. You are likely using a programmatic layer providing common messaging based integration between applications. You should consider the added scalability of an enterprise service bus. 3. Evaluate your I/T systems and identify systems that need to be exposed as services and focus on them as a step in moving to SOA. 4. Investigate messaging solutions including JMS and Web Services.

- Some level of SOA readiness assessment, but you need an IBM specialist to come out and help with the interpretation.
- Other tools provide similar results
- You can do some up front work to get some sense of 'readiness'

What Do I Need to Get Started?

SOA is not a "rip and replace" strategy; rather, it is a way for enterprises to **leverage existing investments**, manage them better, and become more flexible and aligned with the real **needs of the business**.

Goal / Objectives

Expectations / Roadmap

This **journey** is not facilitated simply by buying a new set of products or adopting new technologies.

Strategy and Oversight

Realizing the value of SOA **requires expertise and governance** from the formal design process through implementation, provisioning, operation, and change - i.e., the entire life cycle.

Drivers

The vital starting point, therefore, is not technology, but rather identifying the **business-specific** services in an organization.

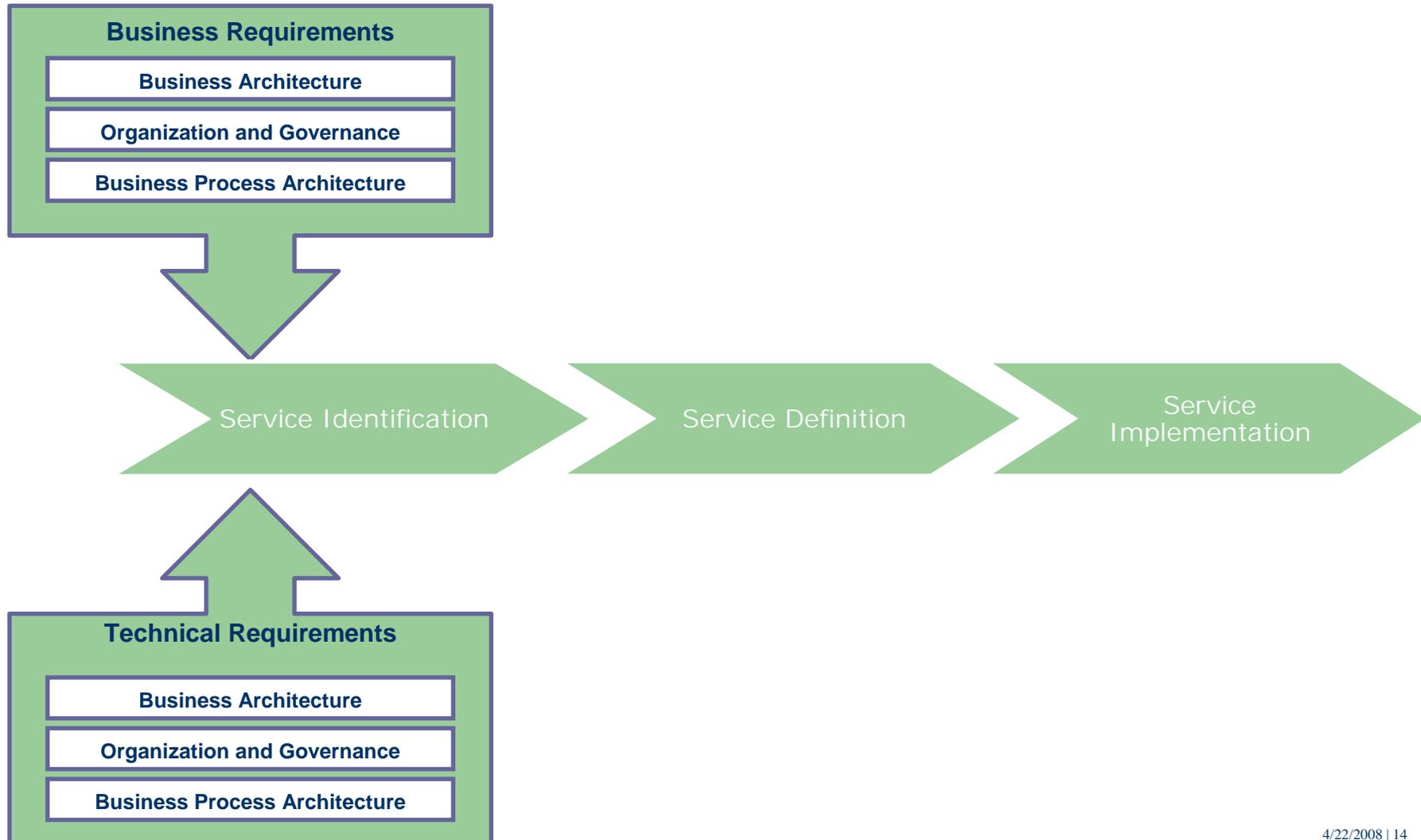
Some things I can do to assess my organizations readiness and/or need for SOA



Drivers: Understand the Reasons for moving towards SOA

- Identify a critical enterprise goal(s)
 - Quality? Safety? Volume?
- Address critical business challenges that impede achievement of that goal
- Analyze *business processes, day to day functions, and/or technologies* that solve these problems but produce redundancies
 - Harvest business process rules
- Objectify these business processes into 'Services' or begin to think of them as such
 - Compose atomic services
- Plan to reduce redundancies that drive business inefficiencies
 - Build for reusability

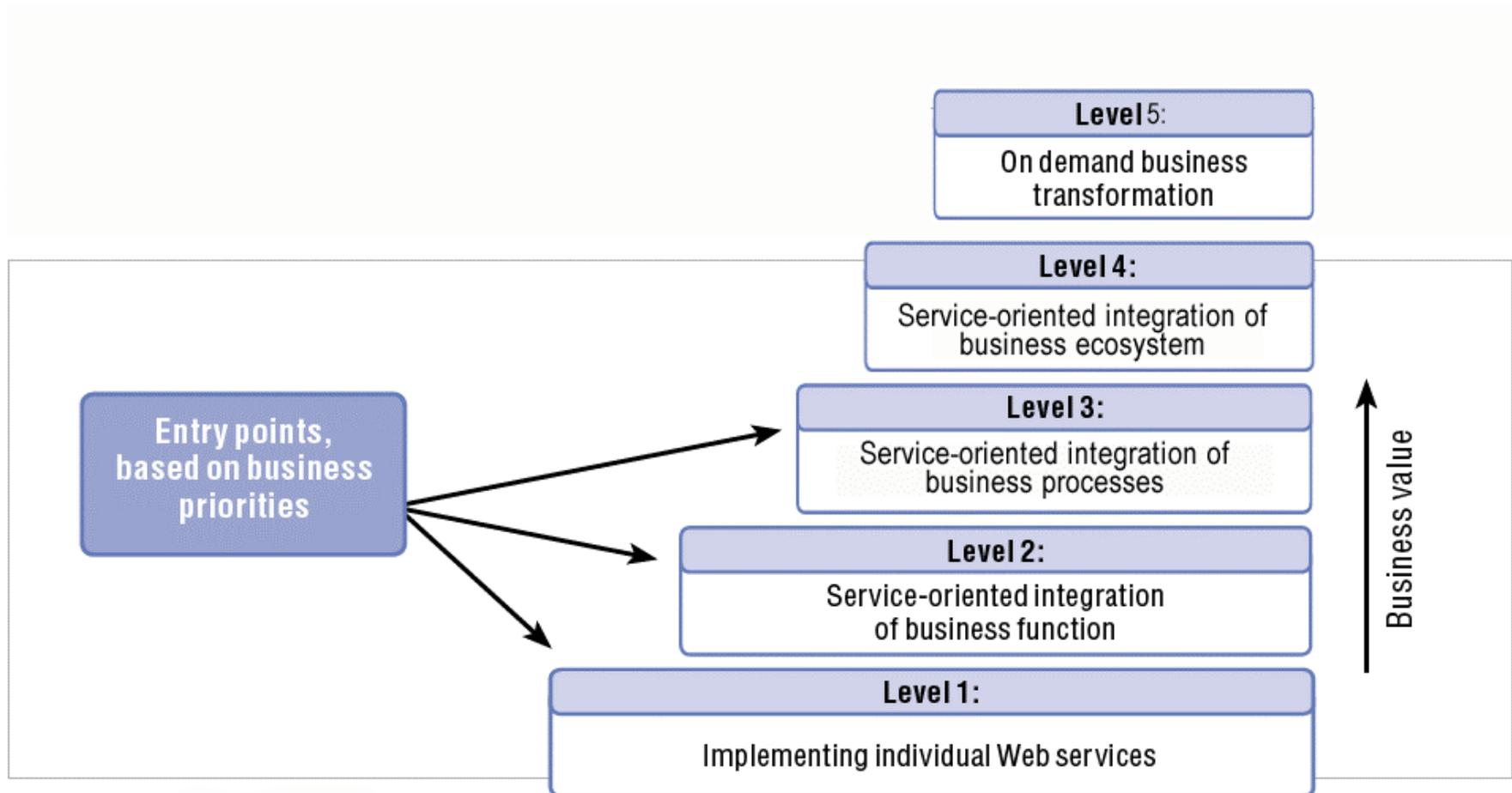
Sifting for Services



Organizational Readiness: Do we have the DNA for SOA?

- **Skill set/Expertise**
 - Architects
 - Producers
- **Infrastructure and Architecture**
 - SDK/Adapters required?
 - Current application set
- **Knowledge Management Processes**
 - Standards for interoperability
- **Change Management Processes**
- **Ecosystem sustainability**
 - Consumers

Draft a Roadmap for SOA adoption Where do you fit in?



Draft a Roadmap: SOA adoption strategy

- Governance development, includes business, clinical, and technology leadership
- Lay out priorities so that units are not competing (without resolution)
- Not Big Bang, but one thing at a time...it's a journey
- Start with one business problem and meticulously chip away at others...they're not hard to find
 - Identifying common denominators across applications and business processes
- Don't forget to address physical infrastructural needs

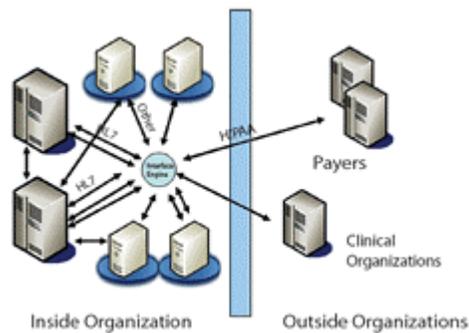


Figure 3

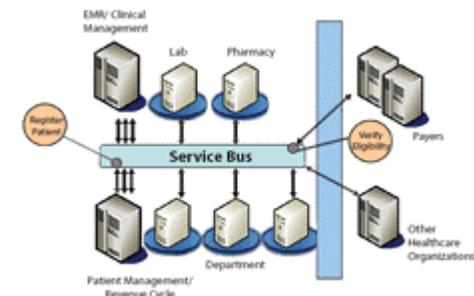


Figure 4

Reference: HMT, May 2007

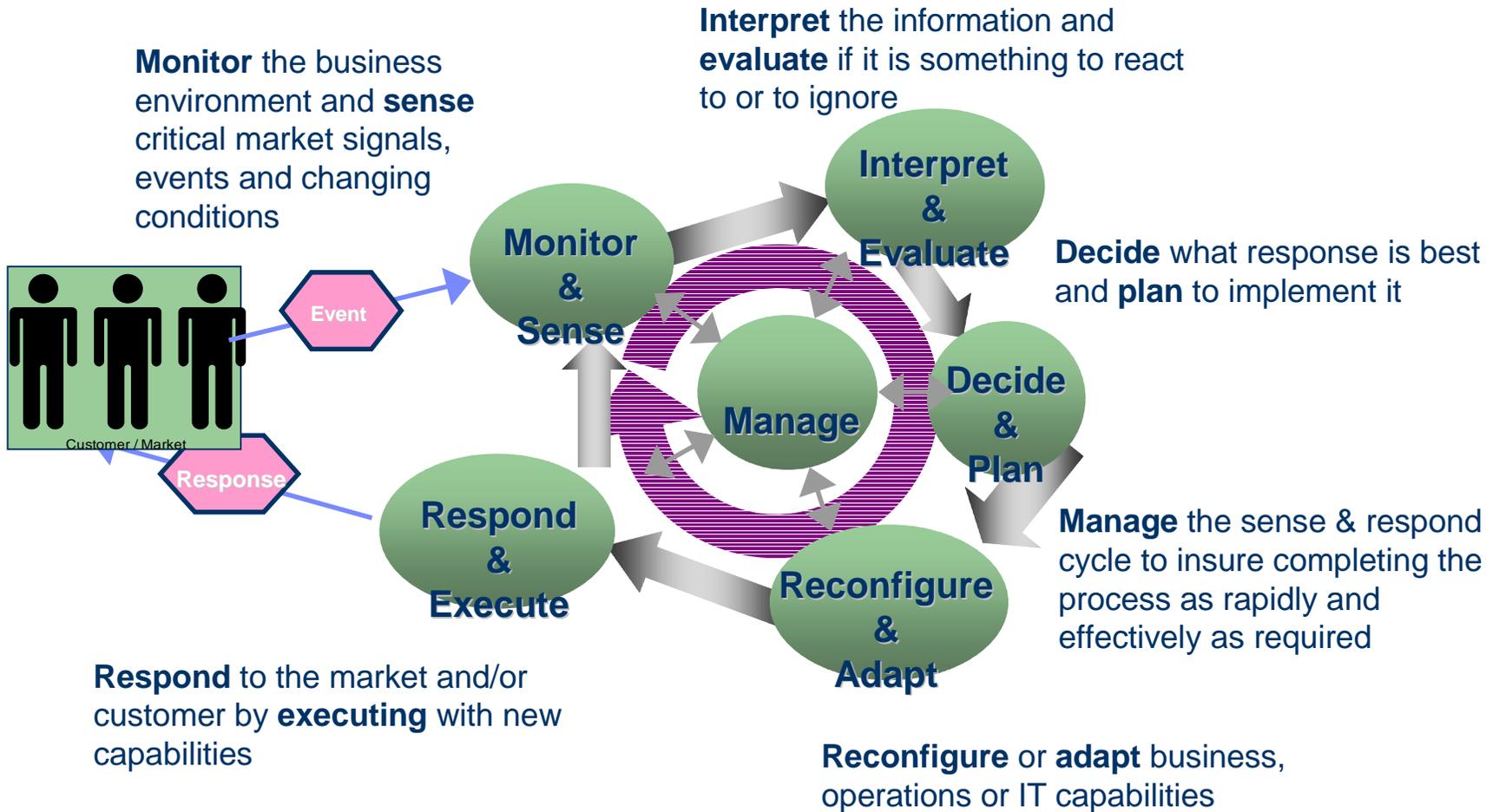
Partners Healthcare Systems

PHS Signature Initiatives:

- *Strengthening clinical management information systems*
- *Enhancing patient safety by reducing medication errors*
- *Maximizing high quality across our system*
- *Expanding disease management for complex and chronic disorders*
- *Improving cost-effectiveness by studying patterns of use*

These Initiatives requires process flexibility.

This flexibility requires a business integrated sense and respond processes and capabilities into its operations



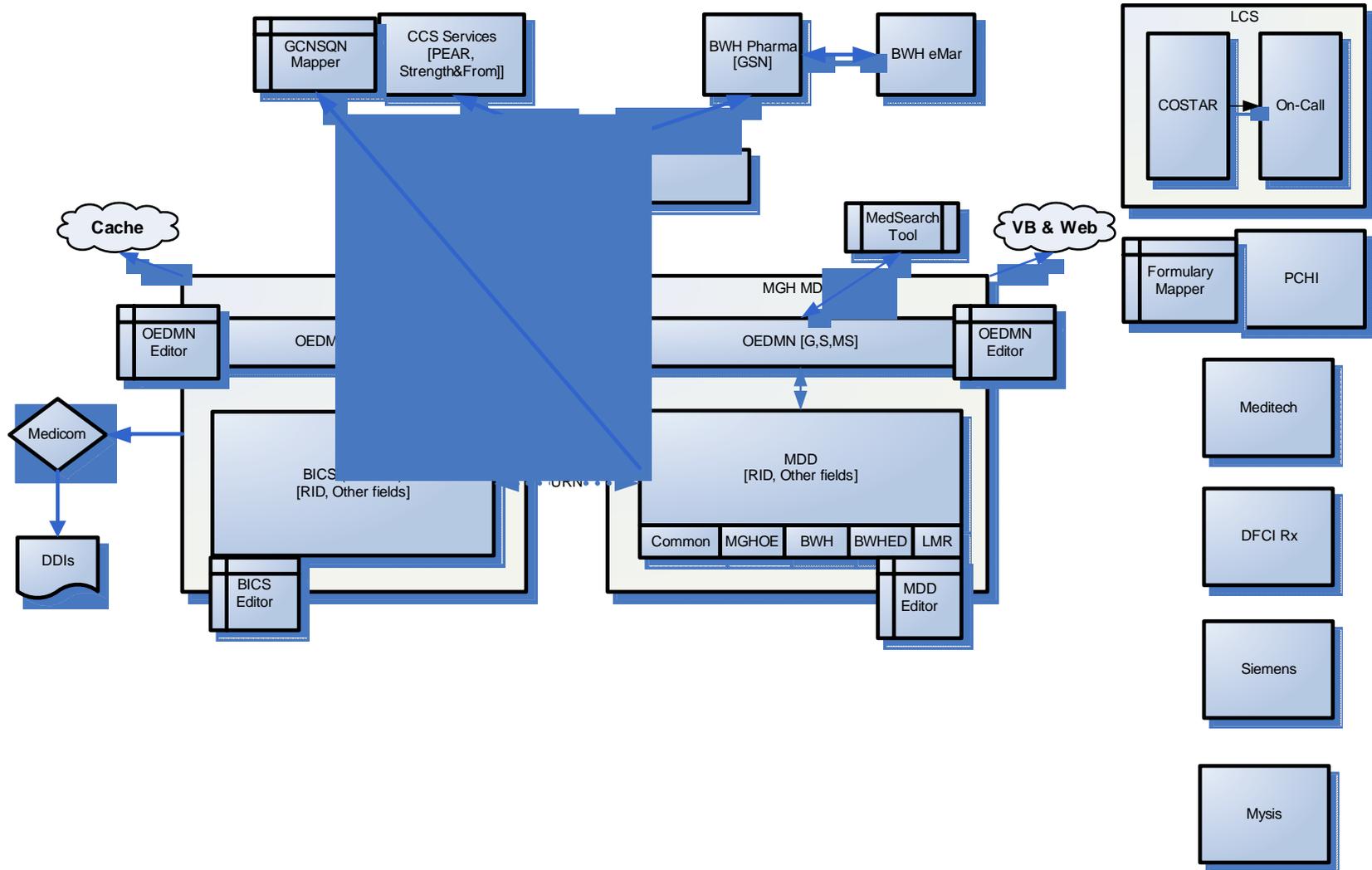
Where we started

- Did not really have a process in place to 'sense' **business needs**, but in-house SMEs identified areas as a starting point.
- Medication services was one area of interest.
- Over a dozen OE systems, various decision support protocols, non-standard rules for alerts, heterogeneous terminologies (in-house and vendor-bought)...etc
- We addressed the foundational knowledge management issues with meds terminology
- Within Meds, we focused on:
 - Medication Reconciliation
 - Drug Classification

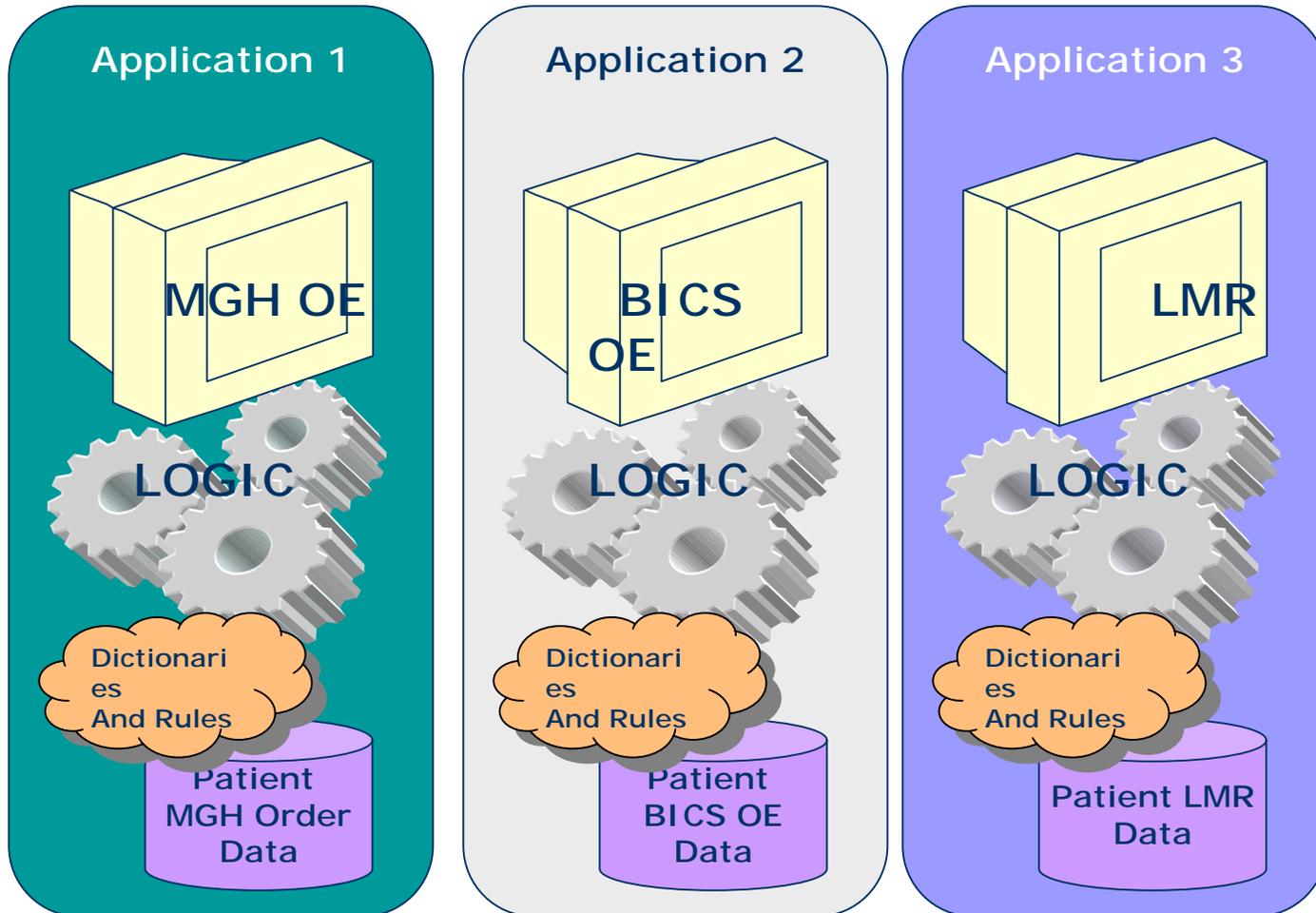
Phased approach

- Reviewed our catalog of services, systems, and knowledge
- Identified that our first order of business was to standardize our medication terminology (knowledge management effort)
- Without a unified knowledge layer, business logic and process development via services will fail

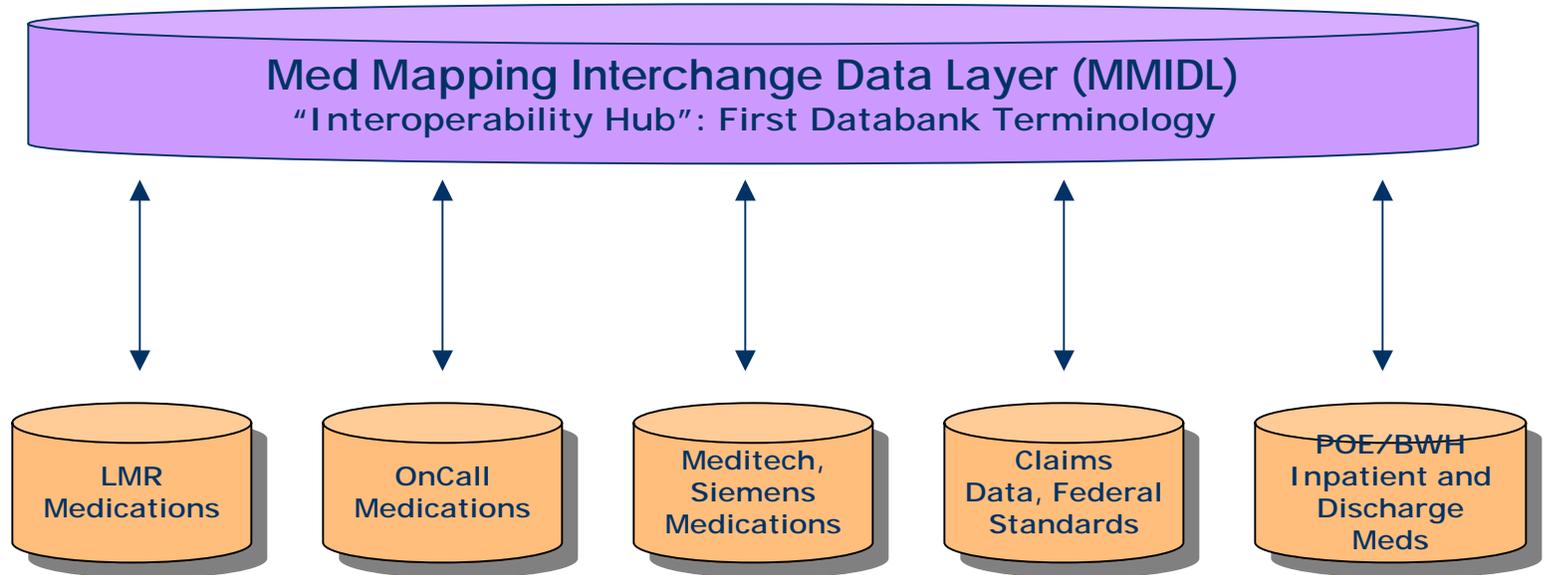
Initial State



Initial State (simplified)

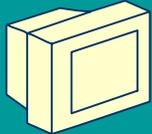


Knowledge Management: Mapping Meds to a Standard

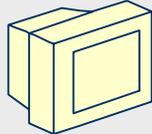


Commercially-Based Unified Medication Knowledge Base and Services Used by Multiple Applications

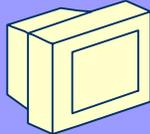
POE-Misys Interface



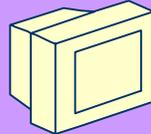
Medication Reconciliation



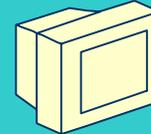
Improved E-Prescribing



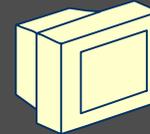
Therapeutic Views



Refined Allergy Alerting



Payor/formular Views



Drug Classification Services

Improved Allergy Services

Med Reconciliation Services

Payor Formulary Services

Medication Mapping Services

MMIDL: Med Mapping Interchange Data Layer
 "Interoperability Hub": FDB Data Import

LMR Medications

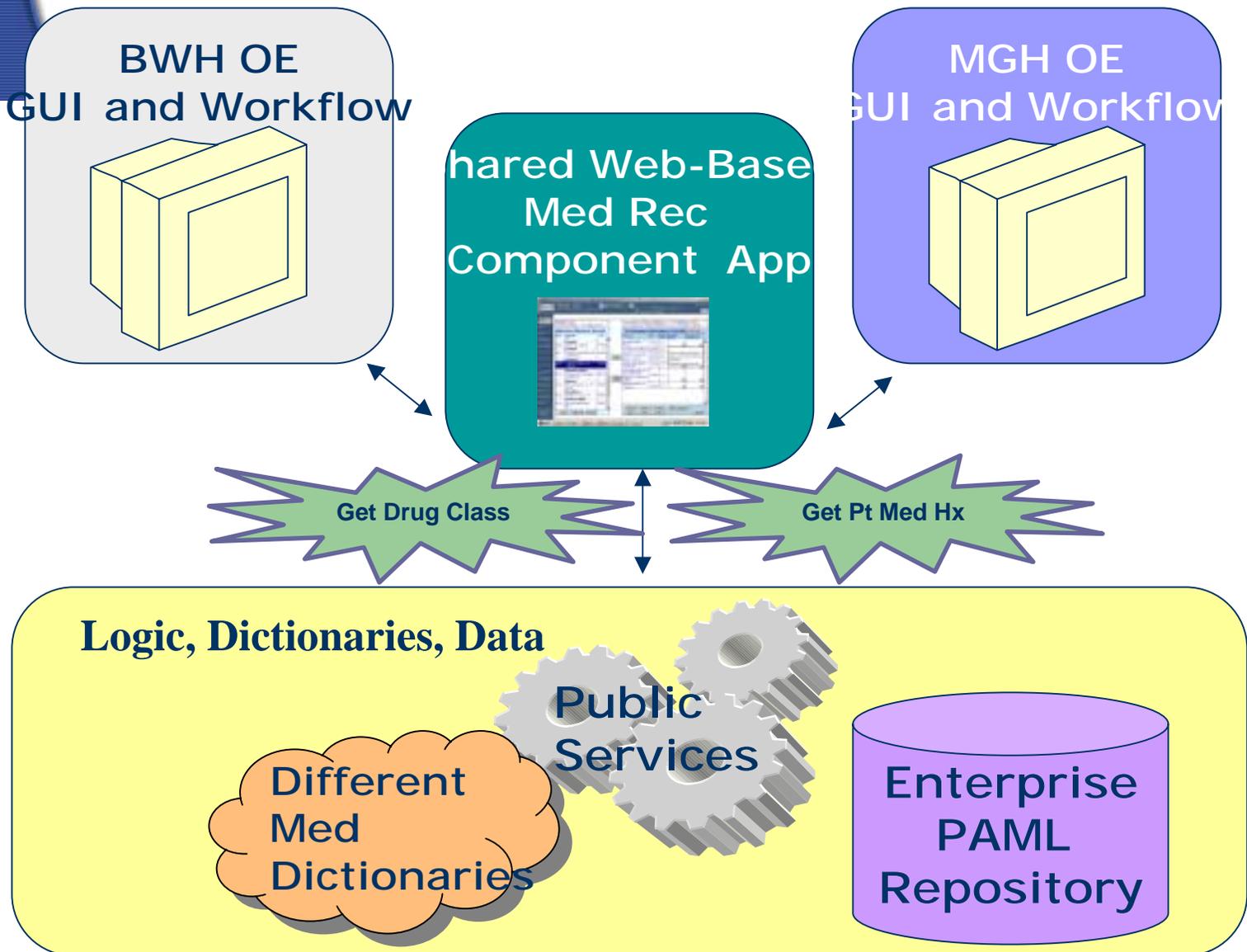
OnCall Medications

Meditech, Siemens Medications

Claims Data, Federal Standards

POE/BWH Inpatient and Discharge Meds

Enterprise Medication Reconciliation Architecture



Medication Reconciliation on the LMR (Ambulatory)

4.3.95 Monday Nov 21, 2005 10:17 AM User: Sandra L. Smith

Select pt **OETEST, LISA** MGH 3861819 59y F MEDICARE PART A B PCP: BLOOM, CLAIRE Pt Details PG

OETEST, LISA
3861819 (MGH) 7/12/1986 (19yrs) F

Last saved by: SMITH, SANDRA L. on: 11/21/2005 at: 10:34
Last reviewed by: SMITH, SANDRA L. on: 11/21/2005 at: 08:55

Meds from Electronic Sources

Source	Medication	Date
	Ibuprofen	
OnCall	Ibuprofen po 300mg tid	07/15/05
	Lisinopril	
LMR	Lisinopril PO 5MG TABLET take 1 Tablet(s) QD	10/23/03
	Metoprolol	
OnCall	→Metoprolol (Lopressor) po 50mg bid	08/23/05
	Montelukast Sodium	
OnCall	Montelukast Sodium (Singulair) po 10mg qd	08/23/05
	Naproxen	
OnCall	Naproxen (Naprosyn) po 250 mg bid	07/06/05
	Penicillin Vk	
OnCall	Penicillin Vk 250 mg QD	07/06/05
	Phenelzine Sulfate	
OnCall	Phenelzine Sulfate (Nardil) take	07/06/05

Print Collapse all View Notes

Pre-Admission Medication List (PAML) Reviewed

Medication	Date	Need to check	Medication Details	Planned action on admission
Atorvastatin (Lipitor) 10 mg QD	11/21/05	<input type="checkbox"/>		
Furosemide PO 40 MG QD	11/21/05	<input type="checkbox"/>		
Amiodarone 200 mg QD	11/21/05	<input type="checkbox"/>	Continue at pre-adm Dose/Freq Continue at different Dose/Freq Discontinue Substitute with different med	
Atenolol 25 mg QD	11/21/05	<input type="checkbox"/>		
Doxepin Hcl (Doxepin) PO 25 MG QHS	11/21/05	<input type="checkbox"/>		
Insulin Regular Human SC 3 UNITS BID BEFORE BREAKFAST AND BEFORE SUPPER	11/21/05	<input type="checkbox"/>		
Metoprolol (Lopressor) po 50mg bid	11/21/05	<input type="checkbox"/>		

Add med Modify & Add Remove PAML Comments Sign Print Copy Cancel

Medication Reconciliation on BICS (Inpatient)

4.3.95 Monday Nov 21, 2005 11:51 AM User: Sandra L. Smith

Select pt **OETEST, LISA** MGH 3861819 59y F MEDICARE PART A B PCP: BLOOM, CLAIRE

Discharge Order and Instructions Press F1 for Help

Discharge Medications

Allergies: Penicillins - Rash; Erythromycins - Hepatotoxicity

Sel	Rx	Discharge Medications	Add	AoA	Preadmission Medications	
<input type="checkbox"/>	<input type="checkbox"/>	No Discharge Meds	<input checked="" type="checkbox"/>	CD	Lopressor po 50mg bid	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ATORVASTATIN (LIPITOR) 10 MG PO Daily	←	C	atenolol 25 mg QD	P
<input checked="" type="checkbox"/>	<input type="checkbox"/>	DOXEPIN HCL (DOXEPIN) 25 MG PO Ever	←	C	FUROSEMIDE PO 40 QD	A
<input checked="" type="checkbox"/>	<input type="checkbox"/>	METOPROLOL TARTRATE (LOPRESSOR)	←	C	Lipitor 10 mg QD	M
<input type="checkbox"/>	<input type="checkbox"/>	FUROSEMIDE 20 MG PO Daily	←	D	amiodarone 200 mg QD	L
<input type="checkbox"/>	<input type="checkbox"/>	GLIPIZIDE (GLUCOTROL) 10 MG PO Daily	←	S	DOXEPIN (DOXEPIN HCL) PO 25 QHS	L
<input type="checkbox"/>	<input type="checkbox"/>	INSULIN NPH HUMAN 5 UNITS SC QAM BE	←	CD	INSULIN REGULAR HUMAN SC 3 BID BEFORE	M
<input type="checkbox"/>	<input type="checkbox"/>	PROPRANOLOL HCL (INDERAL) 20 MG P				E
						D
						S

Planned Action on Admission(AoA): D-Discontinued, CD-Continue at diff dose/freq, C-Continued, S-Subst with diff med

Freq: bid PRN

PAML Medication Details

Zoom Add other d'chrg med Print Rx Allergy Print blank non-med Rx Close Cancel

To select a med from the PAML list for inclusion on the discharge list, click Add. The "add med" screen will appear for confirmation of med data; then the med can be added to the discharge list.

The problems we ran into as early adopters

- No Governance, therefore no oversight
- Services weren't discoverable
- No SOA infrastructure (e.g., repository or registry)
 - Discoverability and searchability limitations
- Terminology heterogeneity
- Already producing 'services', and so many thought SOA was just a tag for what we were already doing...chaotic coding
- When we 'chose' our first SOA-based project, it was under the *'if you build it, they will come'* mentality...not truly driven by business
- Many did not because infrastructure was not ready up front and priorities were different...*'we built it, but they didn't have the capacity to even get there OR they wanted to go somewhere else first'*

What we're doing differently at BMC

- Governance is being established up front to address clinical systems
- Engaged Business, Clinical, and Technology leadership
- Knowledge Management team established
- Identified a business problem(s) that matches an enterprise critical goal – value proposition
- Designing for SOA
- Expectation of a long journey

Areas that SOA can enable

Quality of Care

- CoCare Project

Patient Safety

- Medication Reconciliation
- Allergies
- Immunizations

Continuity of
Care

- Clinical Data Exchange

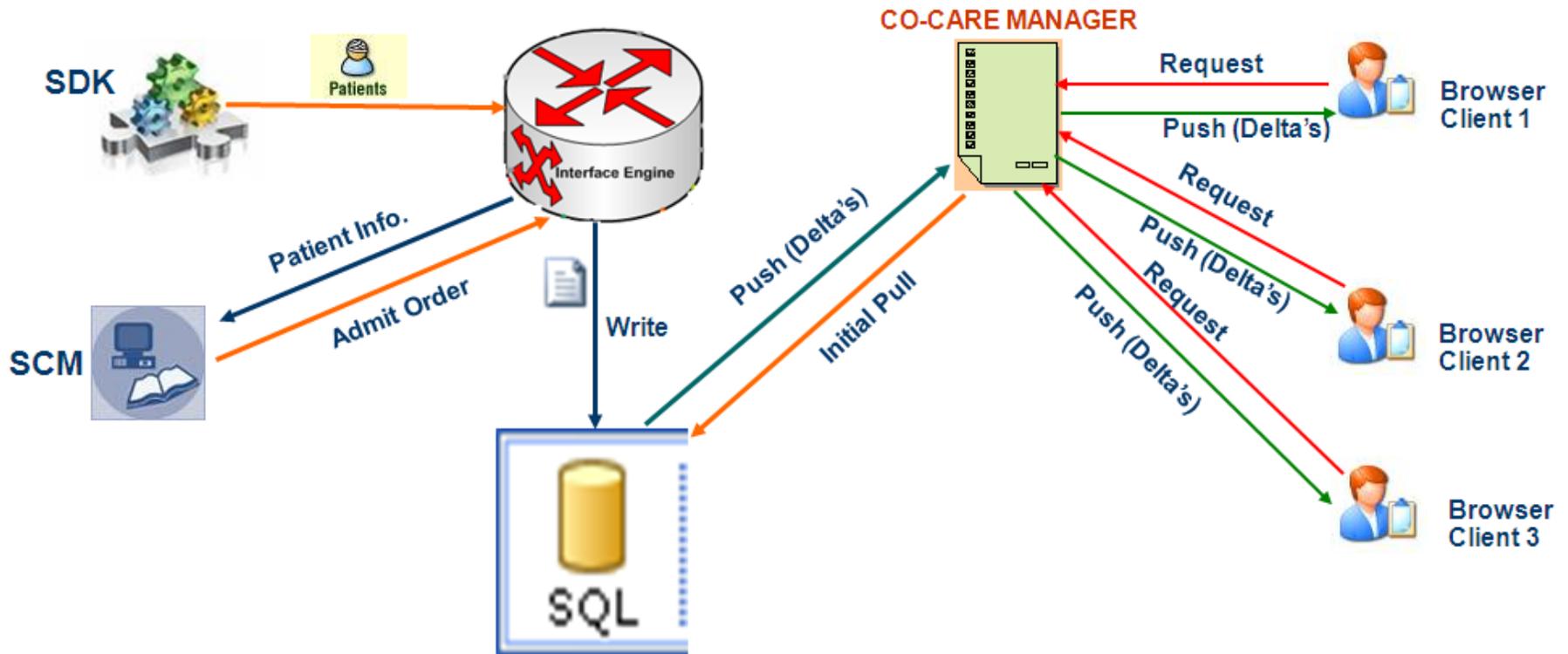
Volume

- eReferrals

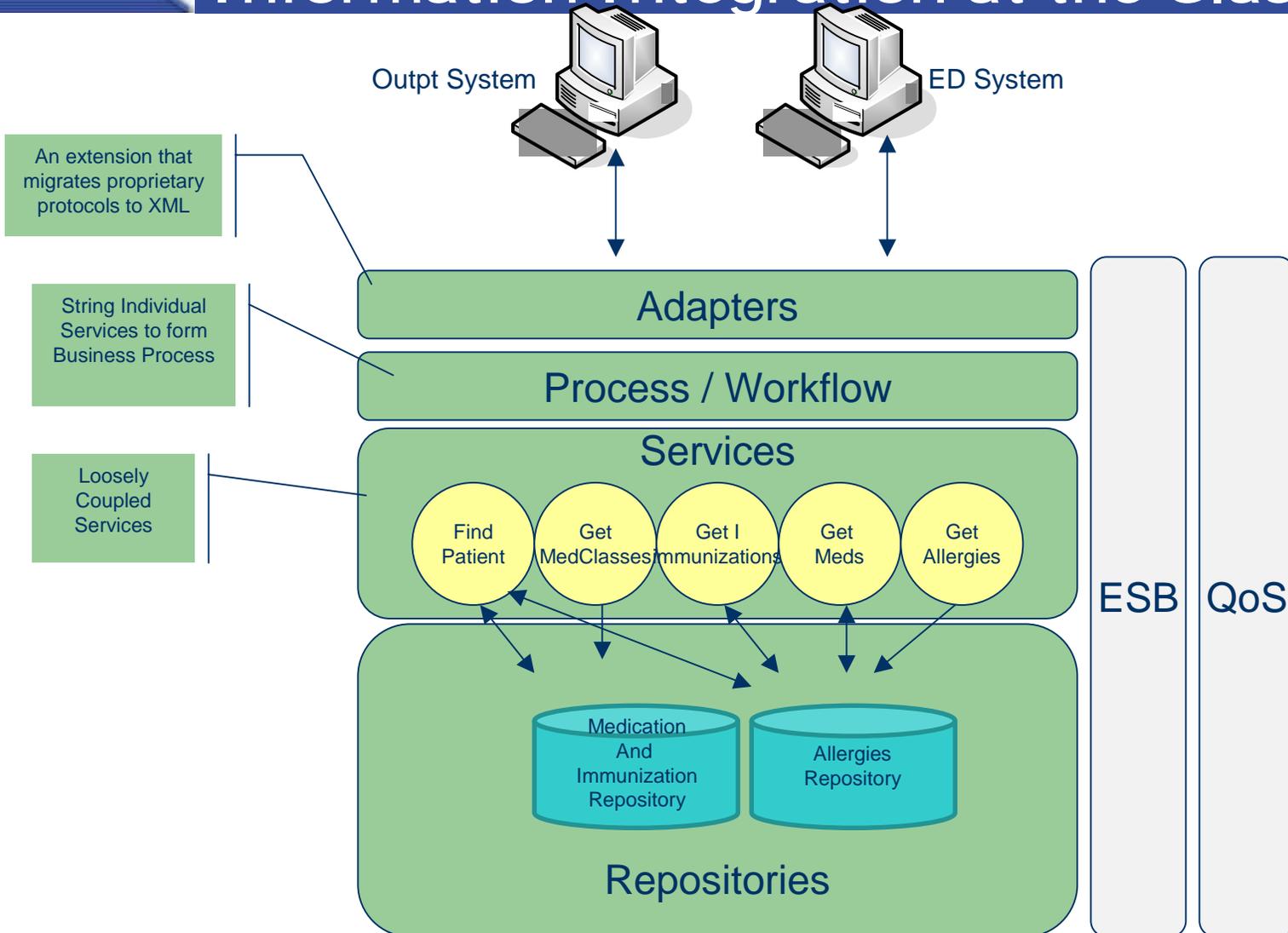
Streamlined IT

- Interface Junkyard

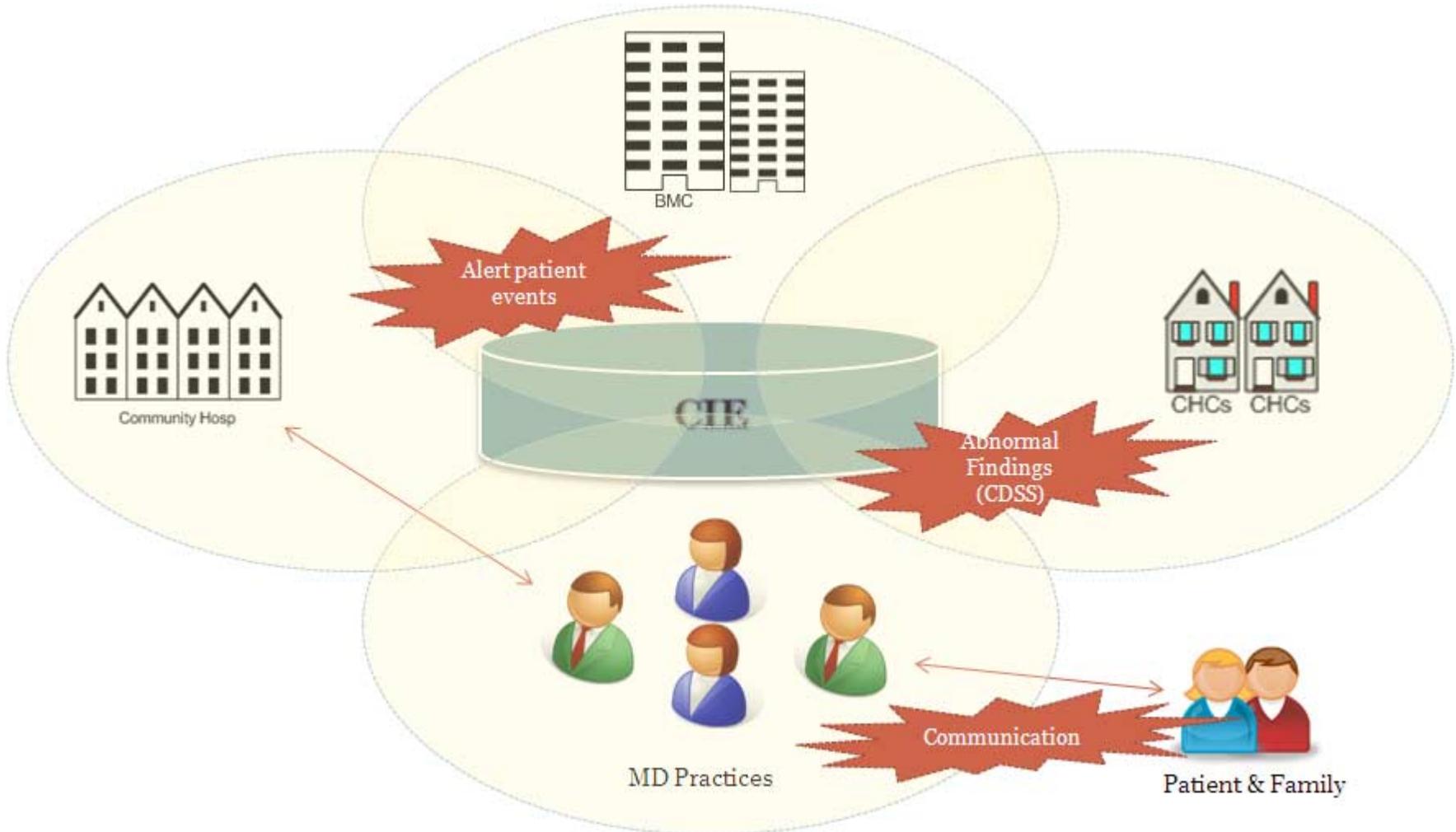
Quality of Care: CoCare



Patient Safety: Information Integration at the Glass



Continuity of Care: Clinical Data Exchange



Summary

- Toolsets are available, but engagement is usually required.
- Up front work by you and your organization can be done.
- Ask for guidance from SOA organizations like SOA consortium.
- **SOA is NOT 'Out of the Box'**
 - HIT Vendors can 'enable' or 'participate', your organization is responsible for executing.
- **Reach out to other institutions to see how they might help you understand how your organization might react to SOA**

Thank You