State of Vermont
Agency of Human Services –
Medicaid Operations Solutions Procurement

General Systems Design (GSD)

October, 2013

Table of Contents

Key Considerations and Purpose of the GSD

- Questions
  - What “sourcing models”, “hosting options”, and “solution styles” are available for the RFPs?
  - What are the implications of the above for the project’s non-functional requirements (Technical, Implementation, and Performance requirements)?
  - What are the industry trends and best practices around integration of traditional and cloud style application solutions or outsourced business process services?
  - What should be the mandatory NFRs for each of the workstreams?
  - How should the HSE Platform be leveraged by each potential “solution style”?
  - How should Vermont build its integration competency center, integration technology infrastructure, and related integration methods, processes and governance?

- Key Conclusions
  - All procurements will be required to integrate with VT CSB (Cloud Services Broker / Integration Hub infrastructure)
  - NFRs will be developed at different levels of specificity around mandatory items based on the solution being a BPO vs. a heavy leverage of HSE Platform’s COTS Applications or Middleware
  - The ability to develop and deploy a mature Cloud Service Broker / Integration hub infrastructure is critical to the long term success of the HSE Platform

Introduction to the General Systems Design (GSD) for Medicaid Operations Solutions Procurements

Scope of the Medicaid Operations Solutions Procurement

- The solutions will include a modern Medicaid Management Information System which will provide core capabilities (e.g., Claims, Payment, Member and Provider Management, etc.) as well as targeted IT solutions required to support the full scope of the State's Medicaid Operations
- The solutions will include software and ongoing services for service delivery, data provision, and data analysis
- The solutions will support Medicaid funded programs managed and delivered by:
  - Departments of Health – Maternal and Child Health
  - DAIL – Disability and Aging Services
  - Department of Mental Health – Division of Adult Services
  - DVHA – Operations and Clinical Services

Project's Prerequisites and Competing / Parallel Initiatives

- **HSE (Health Services Enterprise) Platform**
  - *Prerequisite* initiative to deliver core business and technical services and components which will be leveraged by the Medicaid Operations Solutions Procurement
  - Competition for technical resources (DII) and management attention
  - Leveragability of State's investment in technologies could be possible
- Vermont Health Connect (the Health Benefit Marketplace – HBM)
  - The VHC project is intended to implement some of the core HSEP technology infrastructure
  - Competition for project resources and management attention to deploy new releases and to address early implementation challenges
- IE (Integrated Eligibility)
  - Introduction of integration requirements
  - Competition for technical resources (DII) and management attention
  - Leveragability of State's investment in technologies could be possible
- Payment Reform
  - Requirements to accommodate new service delivery and payment models
- ICD-10
  - Competition for project resources and management attention
  - Competition for technical resources (DII) to make application changes
  - Operations staff focused on process changes and training

Vermont's Health Services Enterprise (HSE) Platform
Vision

- The Vision for VT HSE is to develop and deploy a technology Solution Pattern that aligns with the future for the State's HHS model of practice – moving from agency-centric to person-centric model of practice
- The HSE will initially focus on –
  - Developing an Enterprise Platform to Support HHS Applications – Service Oriented Architecture (SOA) Enterprise
  - Enabling the deployment of a New Integrated Eligibility solution (Application)
  - Enabling the deployment of a Health Benefit Marketplace solution (Application)
- Key Solution Pattern Components -
  - Application Services Environment for the Integrated Hosting of HHS Applications
  - Common Web Based Gateway Portal – One-Stop-Access
  - Master Data Management including Master Person Index and Identify Management to ensure common understanding and single version of the "truth" across VT's HHS programs
  - Rules Engine for Integrated Benefits Eligibility including Integration with Health Benefit Marketplace
  - Enterprise Service Bus – Harvesting and exchanging data and integrating with the Legacy Systems including integration with Statewide Health Benefit Marketplace
  - Shared Analytics and Business Intelligence infrastructure

Vermont's Health Services Enterprise (HSE)
Core Capabilities

- The Future Functional Capabilities of the HSE Enterprise will include:
  - **Integrated Eligibility** – Capability for Web-based, real-time eligibility determination including robust self service capabilities. Dynamic, flexible, and extensible rules engine that allows for update of eligibility rules without significant effort – focusing first on Medicaid and HIX
  - **Health Benefit Marketplace** – Capability to determine eligibility for Qualified Health Plans and MAGI Medicaid, and enroll applicants in the appropriate benefits
  - **Client Look-up / Search and View Query Results** – Capability to search for client summary and demographic information across programs and services, access to shared information such as identification of program enrollment and current services
  - **Referral Management** – Electronic creation and routing of referrals, acknowledgment and confirmation of referral acceptance, and tracking of referral status, as needed
  - **Collaborative Service Delivery** – Capability for providers to communicate through secure messaging. Improving the coordination, continuity and congruency of services
  - **Shared Analytics (Pushed/Pulled**) – Access to cross-program reports and analytics that will improve decision support capabilities and provide analysis of trends and development of predictive reports. Automated notifications and alerts for users to provide client or population specific information

Mapping of VT HSE Platform Technical Solution Components Aligned to Functional Capabilities

VT HSE Platform Technical Solution Component	VT HSE Platform Functional Capability		
	Integrated Eligibility and VHC	Core MMIS	Care Management
Portal			
Access Control	X	X	X
User Interface	X	X	X
Search	X	X	X
Integration Collaboration and Communications	X		?
Document Management	X	X	X
Enterprise Service Bus			
Data Integration	X	X	X
MDM and EMPI	X	X	X
Consent Management	X	X	X
Security Management	X	X	X
Shared Analytics Infrastructure			
Extract, Transformation, Load Infrastructure (ETL)		X	
Data Warehouse and Data Mart database management systems		X	
Access Tools		X	X
OLAP (Online Analytical Processing) Tools		X	X
Meta Data Management		X	
Data Quality Tools		X	

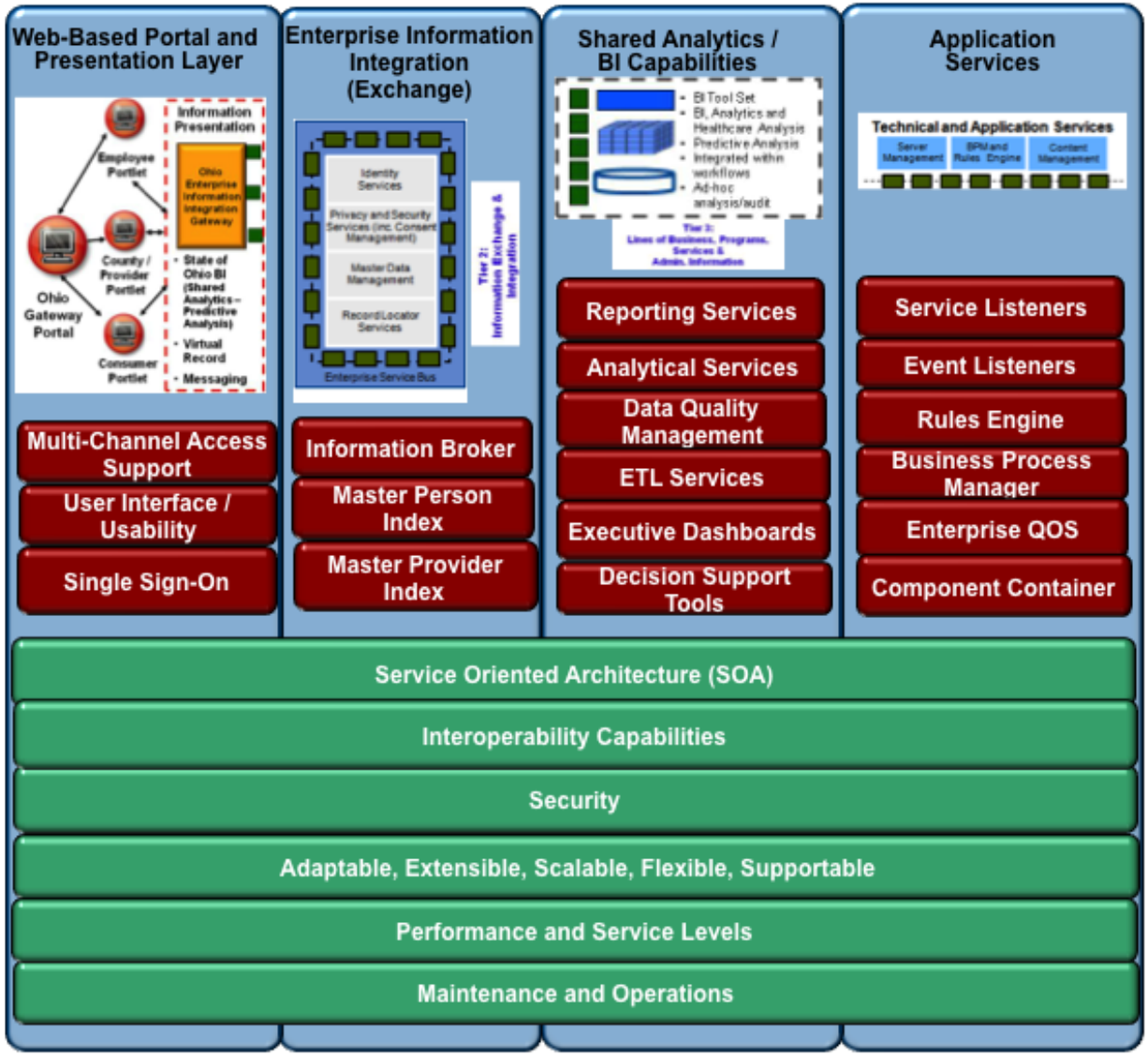
Non-Functional Requirements Development Approach

Process, Critical Success Factors, Methodology and Tools/Templates

The Non-Functional Requirements Development Approach

- Approach to Technical requirements, technology architecture standards and constraints, based on HSE Enterprise Architecture, current VT technology investments and standards
- General System Design (GSD) draft based on what we have learned regarding VT and previous engagements. Today is a half-day GSD workshop to review and refine GSD draft
- Detailed Non-Functional requirements tracing matrix draft will be developed based on the results of the GSD workshop and requirements developed for previous engagements
- Non-functional requirements “orientation “ workshop will be a half day session in which Gartner presents the concept of Non-functional requirements and the high level domains and categories of non-functional requirements. This is an introductory session to enable VT technical SMEs to review and provide suggestions to refine the draft non-functional requirements tracing matrix
- VT gets time to review and provide feedback on the detailed non-functional requirements
- Non-functional requirements finalization session to address questions and comments arising from the detailed requirements
- Gartner will refine the detailed requirements and GSD based on the outcome of the finalization workshop

General Systems Design – Focus Areas



The Requirements Traceability Matrix - Consolidated View of All Requirements

The non-Functional Requirements Traceability Matrix is used by technical teams as input into the overall requirements development process

RFP Req	Requirement Description	Response Code	Proposed Phase	Response Comments
G1.1	The System will provide a user interface that will be simple and consistent throughout all areas and functions of the System.			
G1.2	The System will minimize the number of mouse clicks / user interaction to complete any action.			
G1.3	The System will use a Graphical User Interface (GUI) to help the user navigate to the next logical step in the workflow, or freely navigate to other parts of the System functionality, and then allow the user to return to complete the in-process task.			
G1.4	The System will speak the users' language, with words, phrases and concepts familiar to the user, rather than System-oriented terms.			
G1.5	The System will accommodate diverse populations of users including those with disabilities and limited English proficiency as defined in section 504 of the Rehabilitation Act of 1973			
G1.6	The System will follow real-world Vermont conventions, making information appear in a natural and logical order.			
G1.7	The System will allow the users to easily navigate to a variety of functions available to them without having to move sequentially through excessive menus and screens.			
G1.8	The System will include at minimum the following features and capabilities: a) Drill down and look up functionality to minimize re-entry of information across multiple screens b) Multi-tasking and multiple window capability, including split screens c) Search capabilities to allow retrieval by Provider, Member, procedure code, NDC or others as defined by the State d) Ability to tab and mouse through data fields and screens			
G1.9	The System will support undo and redo, or provide onscreen confirmation/acceptance to the user to confirm a change that is permanent and cannot be "undone".			
G1.10	The System will provide users with a clearly marked "emergency exit" for the instances when a user mistakenly chooses a function and such "emergency exit" must be simple with minimal dialogue.			

Requirements statements indicate **what** the solution will do and how the solution will behave.

These columns provide an opportunity for standardized response from the vendors, including timing for meeting a certain requirement.

Lead Subject Matter Expert (SME)

Expectations

Recommended Role and Approach for Technical SMEs and Thought Leaders

- Key Vermont Technical Subject Matter Experts (SMEs) and thought leaders will be responsible for leading the effort for their constituency in the review, comment and recommendations process in support of validating and finalizing the non-functional requirements for this work stream in support of the development of a Statement of Work or Request for Proposal for a vendor to design, develop and implement the MMIS solutions, with appropriate leveraging of the HSE platform.
- A summary of the process includes –
  - Technical SMEs for the State develop a constituency group and process to review the GSD and detailed non-functional requirements
  - Gartner will provide on-going technical support as requested
  - Technical SMEs will complete the consolidated feedback template
  - Upon receipt of the State's comments and recommendations, Gartner will develop a final draft of the GSD and non-Functional Requirements Tracing Matrix as a key component for a vendor Statement of Work or Request for Proposal

Consolidated Feedback Template

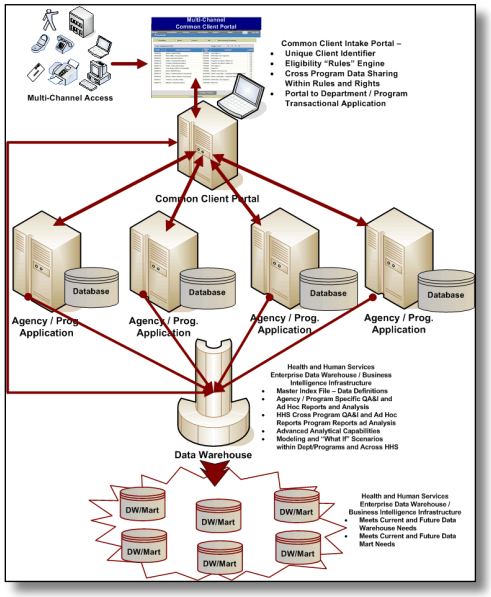
- The Feedback Template ensures that all suggestions and concerns are organized and clustered in a consistent manner and will support the expeditious finalization of the non-Functional Requirements
- It will be important to use the template to provide as much information about the comment, concern or recommendation as possible in the template
- If there are questions that need to be answered or clarifications required during this process they should be brought to the Gartner team (Kevin Chartrand – kevin.chartrand@gartner.com)

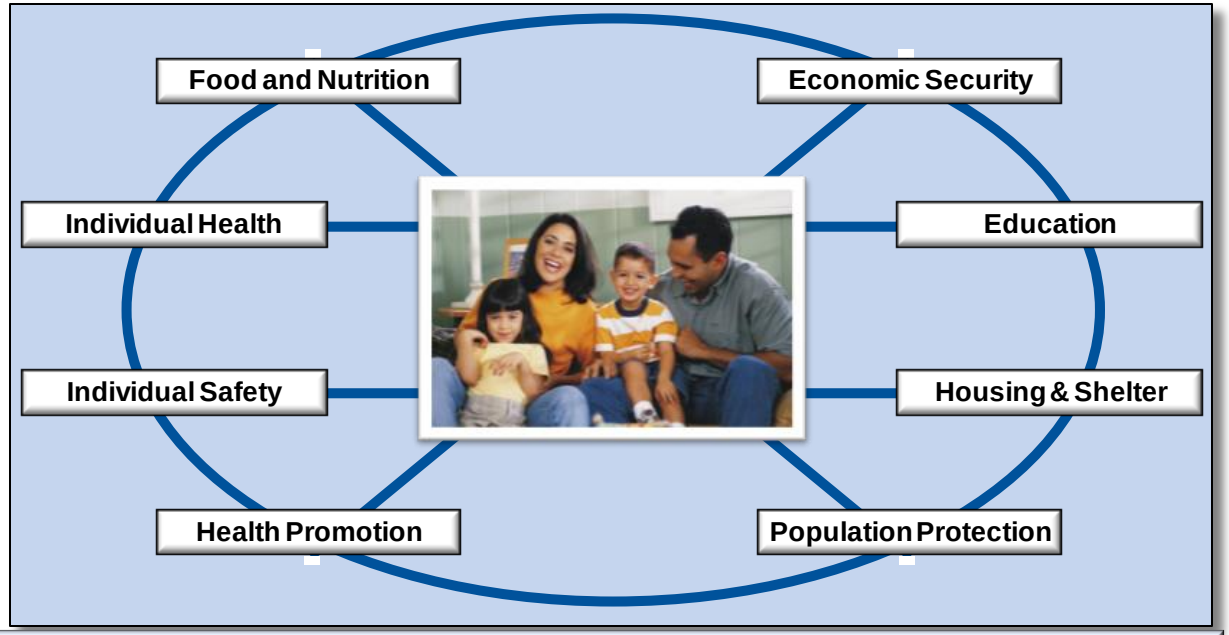
	A	B	C	D	E
1	***Instructions:*** As you review the draft document, please capture your comments using this spreadsheet. Step 1: Enter the relevant page/slide reference Step 2: Enter your suggestion. Each row should only contain one comment. Upon completion, please submit this spreadsheet to Cheryl Burcham				
2	**No.**	**Page Number / Section; Workflow / Use Case Identifier**	**Suggested change (be as specific as possible)**	**Submitter Name**	**Submitter Email Address**
3	*EXAMPLE*	*Use Case5.3; flow 1.c.iv; page 82*	*This reference is not valid for our programs - please remove*	*Kevin Chartrand*	*Kevin.Chartrand@Gartner.com*
4	1				
5	2				
6	3				
7	4				

Industry Trends in Sourcing and Cloud Computing, and Related Best Practices

Person-Centric Approach to HHS Model of Practice

Implications for Modernizing the IT and Process Infrastructure

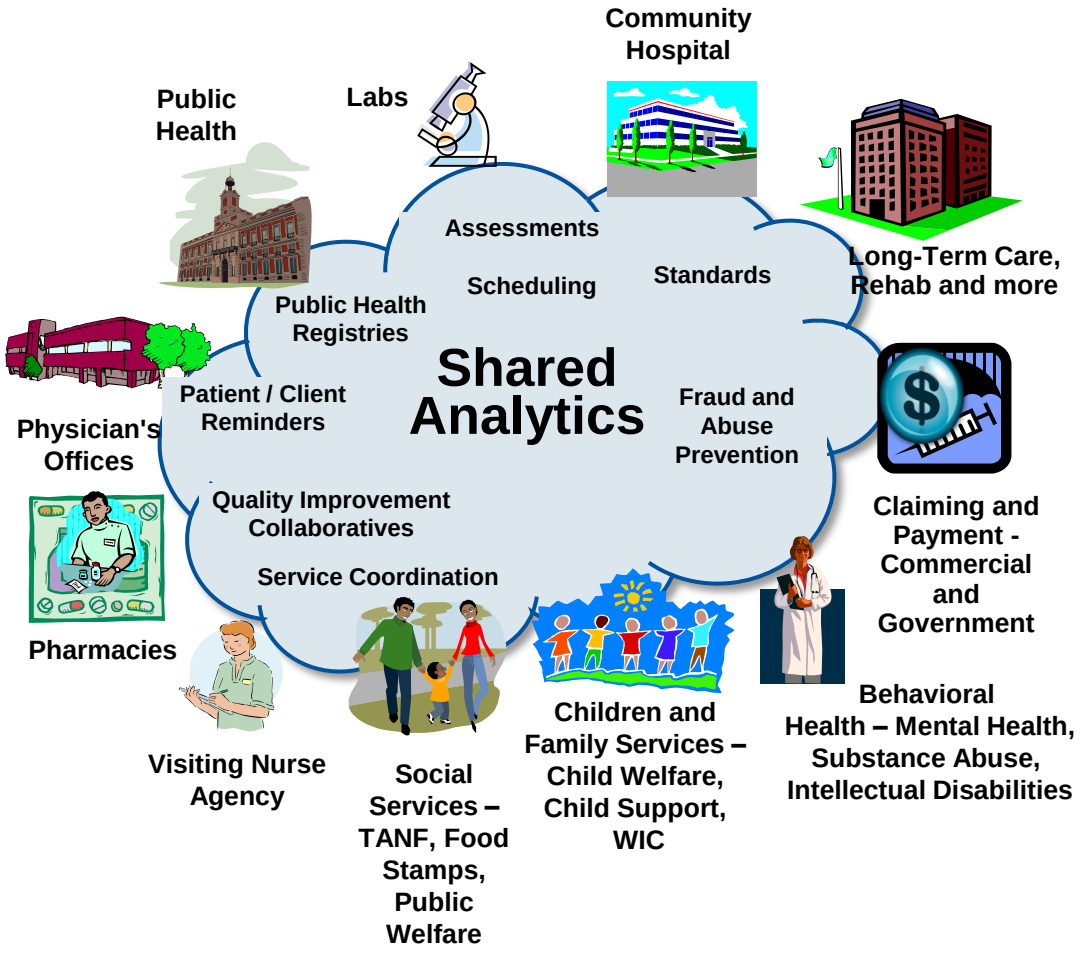




- Leverages Service Oriented Architecture (SOA) and Latest Sourcing Model Best Practices
- Supports Integrated Consumer Access, Eligibility Application and Determination, Service Delivery and Case Management Coordination
- Leverages the capacity of current transactional applications and minimizes need to replace all legacy applications at one time
- Improves both user and consumer's experience
- Provides for Improved Data Quality
- Establish Master Client and Provider Index Capabilities
- Establishes Enterprise Data Warehouse and Business Intelligence standards for governance, data, technology, protocols, interfaces and tools

Integrated HHS Information

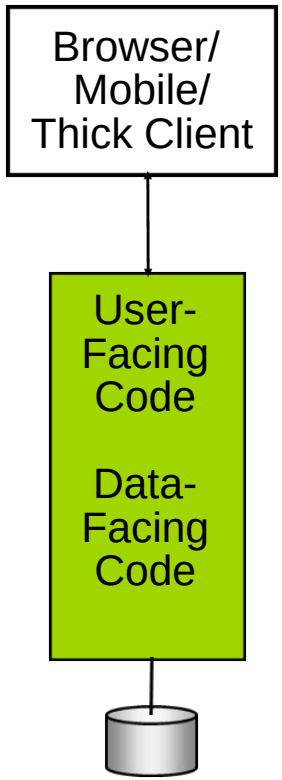
Framework for Enterprise Information Integration Opportunities



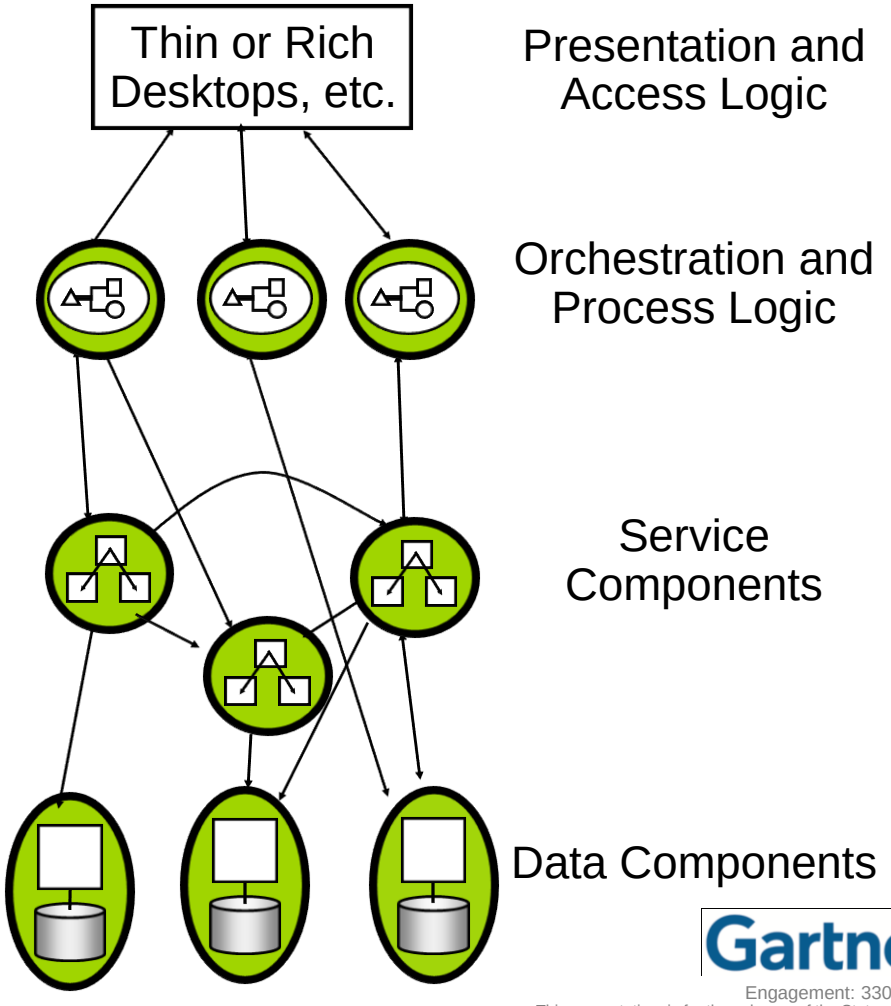
- Internal State Enterprise Service Bus can support the protection and promotion of health and well-being at both the population and client level across all of the State's HHS programs and services
- An internal Enterprise Service Bus, built on national interoperability standards aligned with ONC's HIE initiative strengthens public/private partnerships to produce better outcomes more efficiently
- Shared analytics, with appropriate security and privacy protection controls is vital to improving the quality, outcome and costs of State HHS programs and services

SOA (Service Oriented Architecture) Across Cloud Sourcing Models –
A Better Way to Build, Deliver, or Integrate Applications

Traditional Application On Premise



Modern SOA Application On Premise or in the Cloud



SOA Fundamentals

- SOA is an architectural approach to building systems
- Delivering two major categories of value:
  - Sharing (also called leverage and reuse)
  - Agility (capability to change more rapidly)
- Through two fundamental principles:
  - Interface abstraction
  - Modularization

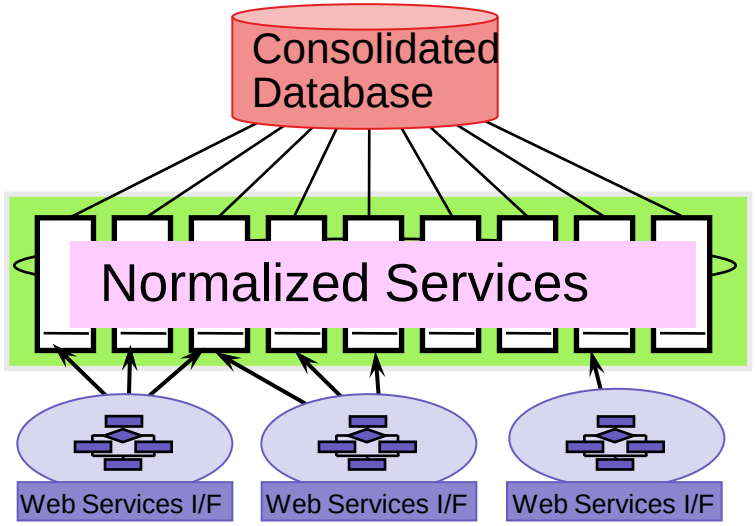
Five Criteria for an SOA Application

1. Modular
2. Distributed
3. Discoverable
4. Swappable
5. Shareable

Service Oriented Architecture

SOA is a set of guidelines, principles and patterns (topological and communications related) for defining a system solution based on loosely coupled software services.

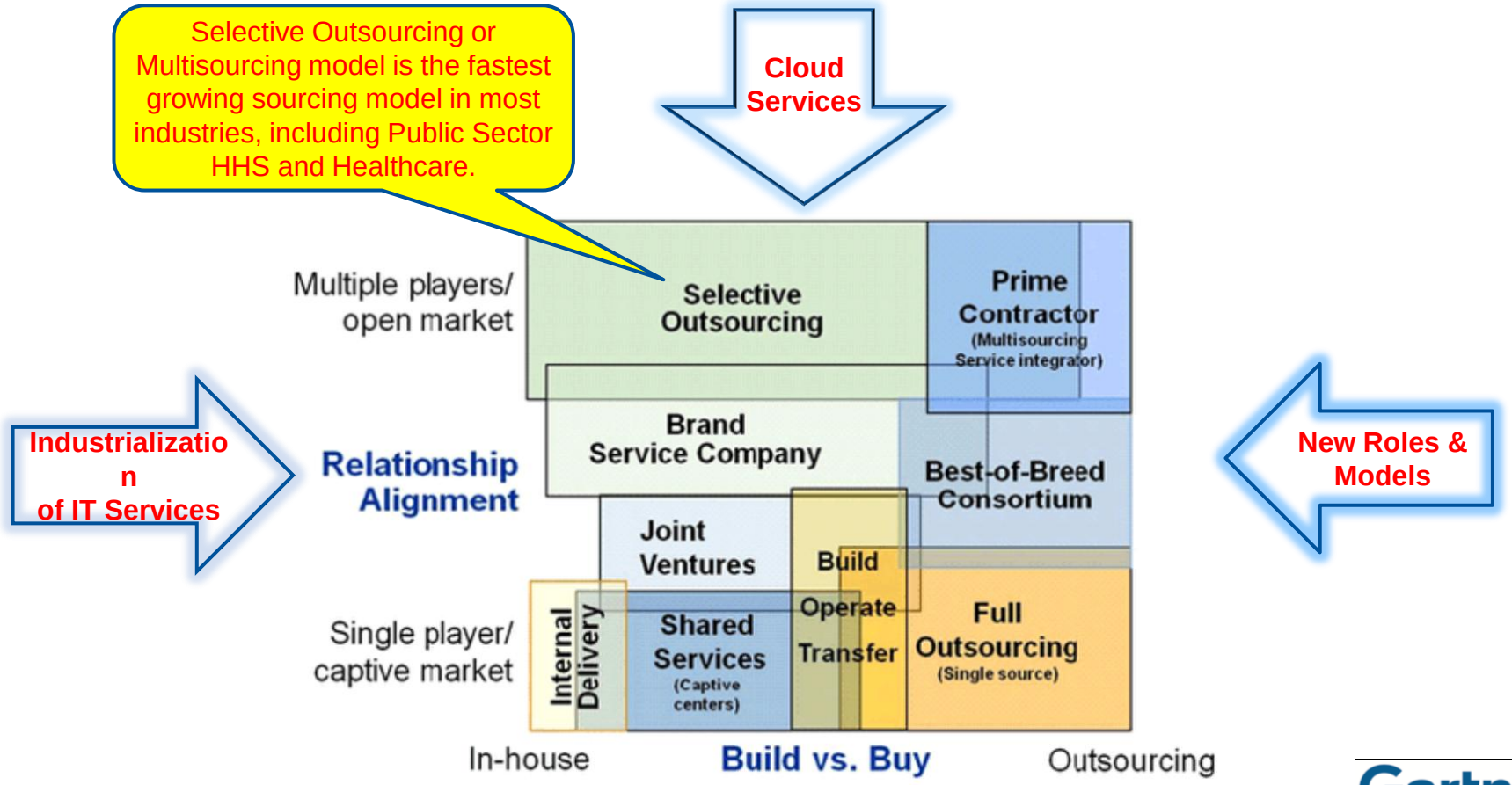
- Services are:
  - **Autonomous** units of the business function
  - **Connected** over distributed network
  - **Contracted** with respect to interface
  - **Coupled** loosely, rather than tightly
  - **Independent** of platform, toolset, methodology or geography
  - **Discoverable** via registry
  - **Standards based** — in the modern incarnation of SOA



- Services are not (just):
  - **Components** — Services are *a type of* component
  - **Objects** — Services are more and less than objects
    - Objects have a state and are designed for fine-grain interaction
    - Services can be composed of objects

Market Drivers For the Nine Most Common Sourcing Models

- There are many ways to implement a sourcing strategy and hybrid models, but only nine major sourcing models are widely used globally. The popularity of Sourcing models are changing based on three key market changes and drivers:



Impact of Cloud Computing and IT Service Industrialization on Government Orgs

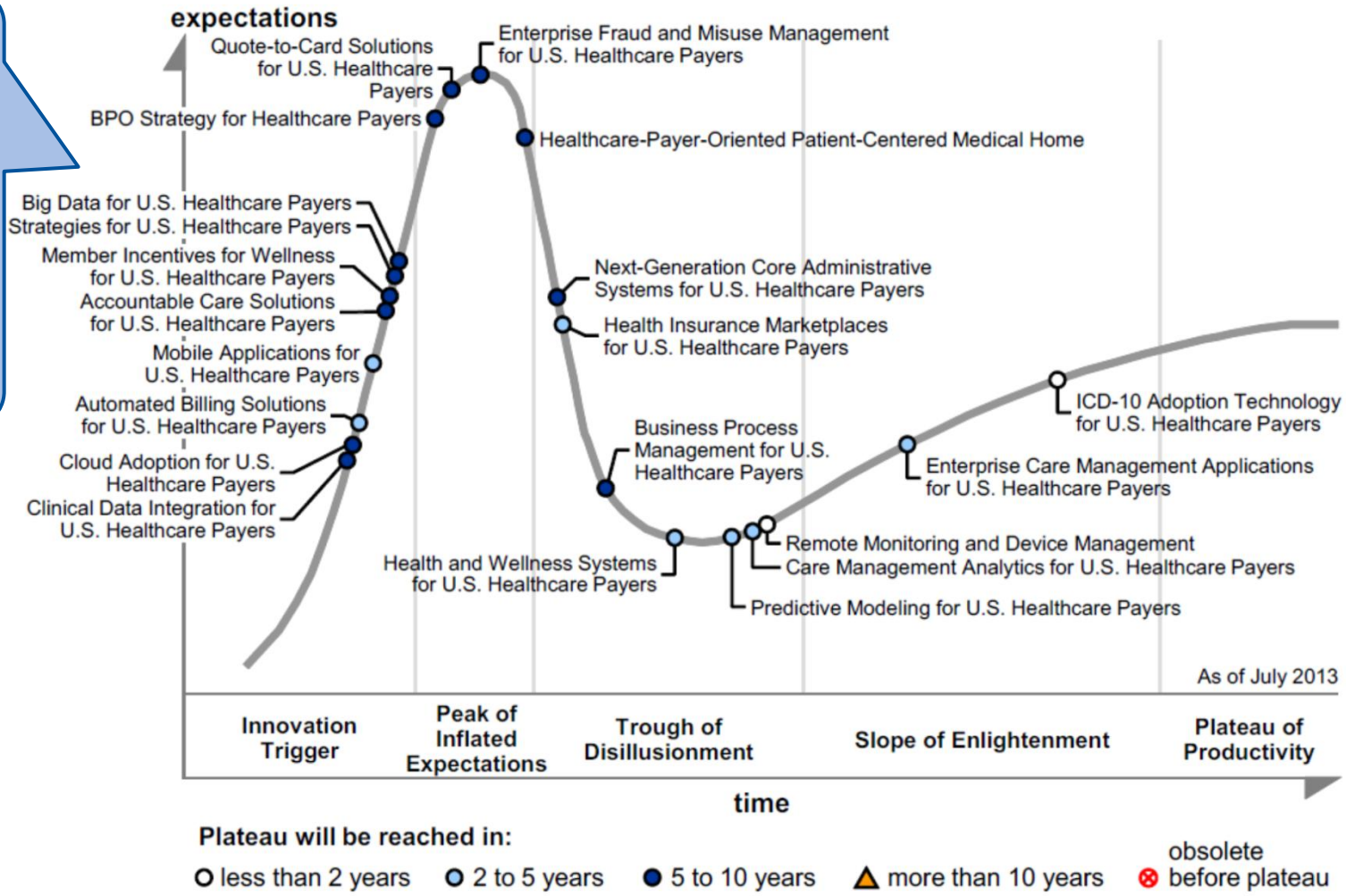
"Cloud Computing" and "IT Service Industrialization" are reinforcing the client organization sourcing models trend toward multisourcing -

- **Cloud Services will:**
  - Favor the growth of sourcing models based on multiple providers, like selective sourcing and prime contractor/service integrators.
  - Reduce the use of sourcing models oriented to a single source, like pure internal delivery, in-house/captive shared services and full outsourcing.
  - Lead to new business models (service aggregators, integrators, brokers, franchisee). This will increase the use of sourcing models like joint ventures or a brand service company
  - Increase the number of managed service providers and make service integration and multisourcing management two of the major challenges for the IT organization; this will lead to new skills and processes in service brokerage.

- **Government Organizations must:**
  - Evaluate their current level of multisourcing management capability and optimize the number of strategic providers.
  - Revisit at least yearly sourcing strategies for business requirement changes and service market changes.
  - Enhance multisourcing management capabilities, before increasing the number of managed providers due to new industrialized services.
  - Be vigilant about vertical/process-specific services emerging — through multi-State shared services, joint ventures or consortia — in HHS sector where there is ongoing significant restructuring.
  - Proactively look at the new service brokerage skills, functions and processes required to manage this "even more multisourced" environment to more quickly and safely evaluate, select, transition and manage multiple service providers.

US Healthcare Payer Hype Cycle 2013

BPO Strategies and Cloud Adoption Becoming prominent issues for US Healthcare Payers!



Source: Gartner (July 2013)

Steps in Developing or Validating the Sourcing Strategy and Options

Multisourcing management capability assessment can inform internal capability development efforts.

Understanding market offerings will help inform the approach to Business Process Service or Application procurement.

Phase 1 Steps

Assess

1. Set Context and Objectives
2. Assess Service Delivery As-Is
3. Assess Service and Multisourcing Management Capability
4. Evaluate Constraints and Opportunities

Analyze

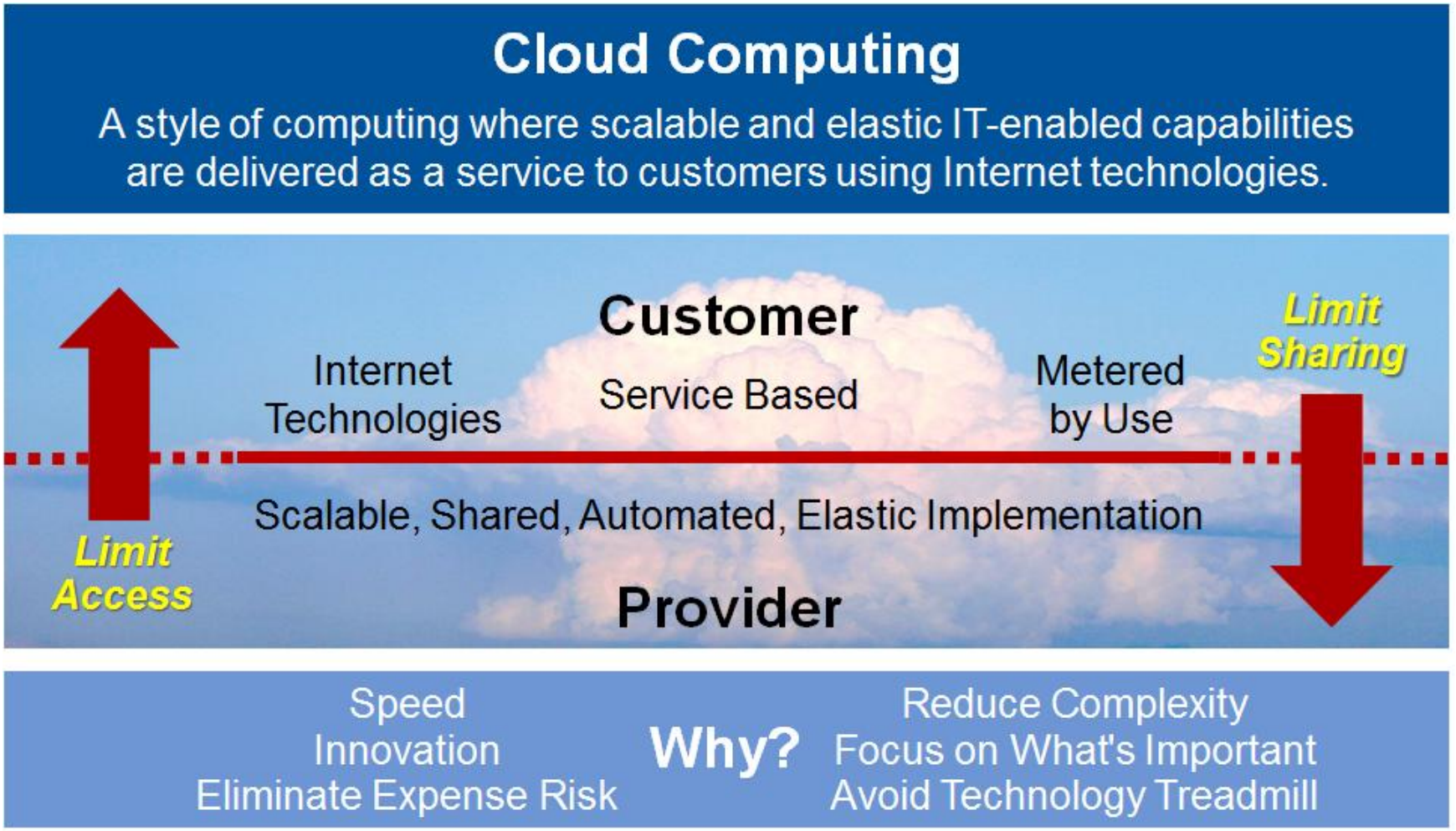
5. Analyze Gaps
6. Analyze External Market
7. Conduct Scenario Planning
8. Analyze Risks

Develop

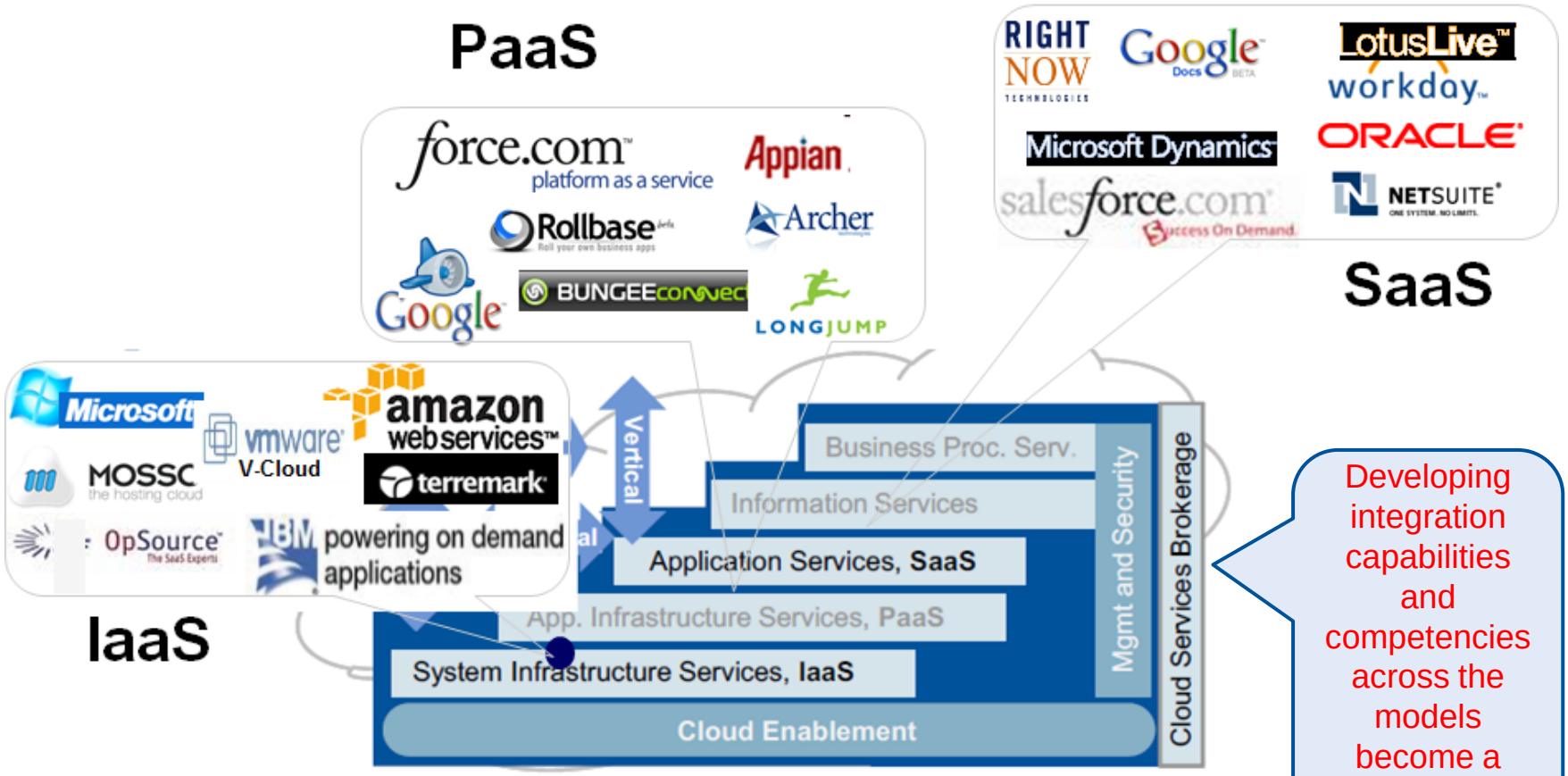
9. Develop Business Case
10. Construct Action Plan

Assess → Analyze → Develop

What is Cloud Computing Anyway?



Basic Layers of Cloud



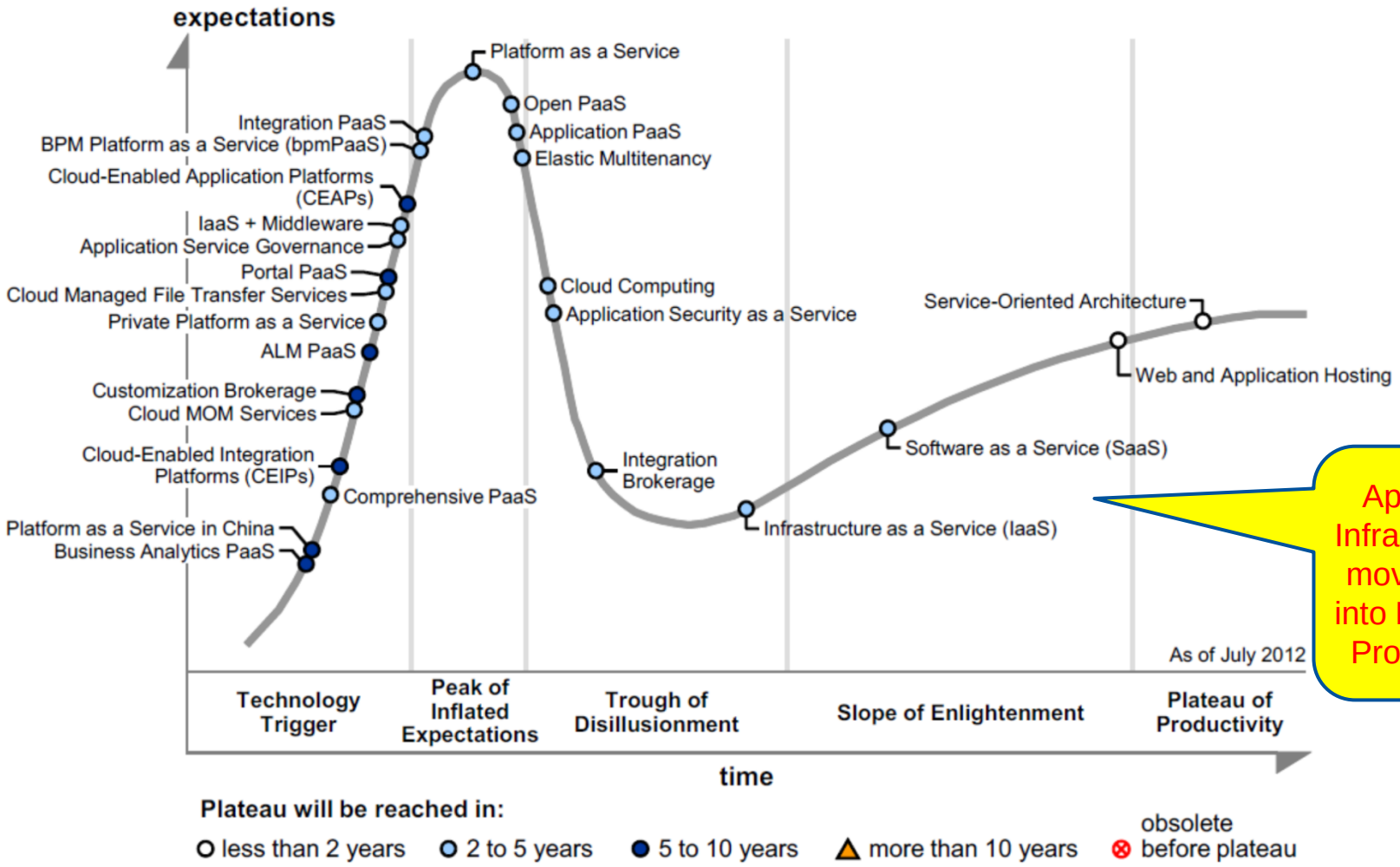
IaaS = infrastructure as a service; PaaS = platform as a service; Proc. = Process; SaaS = software as a service; Serv.

Developing integration capabilities and competencies across the models become a critical success factor.

Definition of Cloud Computing Models and Management Capabilities

- **IaaS** - IaaS is a standardized, highly automated offering where compute resources, complemented by storage and networking capabilities, are owned by a service provider and offered to the customer on demand. The resources are scalable and elastic, operate in near real time and are metered by use. Self-service interfaces are exposed directly to the customer, such as a Web-based UI and an API. The resources may be single- or multitenant, and are hosted either by the service provider off-site, or on-premises in the customer's data center.
- **PaaS** - A platform as a service (PaaS) offering, usually depicted in cloud diagrams between the SaaS layer and the integration as a service (IaaS) layer, is application infrastructure (middleware) services "in the sky." Gartner tracks 15 function-specific types of PaaS, including application, integration and database PaaS. Most of the attention has been on the public renderings of application PaaS like Force.com, while most other forms of PaaS and the private PaaS are only beginning to emerge as subjects of strategic discussion and investment.
- **SaaS** - Software as a service (SaaS) is application software owned, delivered and managed remotely by one or more providers. The provider delivers an application based on a single set of common code and data definitions that is consumed in a one-to-many model by all contracted customers at any time. SaaS is purchased on a pay-for-use basis or as a subscription based on usage metrics.
- **BPaaS** - Gartner defines business process as a service (BPaaS) as the delivery of business process services whose underlying construct is multitenancy (often achieved by leveraging cloud services). Services are often automated, and the required labor pool is shared (so it's not overtly dedicated to a specific client). The pricing models are consumption-based or subscription-based commercial terms that may be gain sharing or outcome based.
- **CSB** - Cloud services brokerage (CSB) is an IT role and business model in which a company or other entity adds value to one or more (public or private) cloud services on behalf of one or more consumers of that service via three primary roles: ***aggregation, integration and customization*** brokerage. A CSB enabler provides technology to implement CSB, and a CSB provider offers combined technology, people and methodologies to implement and manage public or internal cloud-related IT projects.

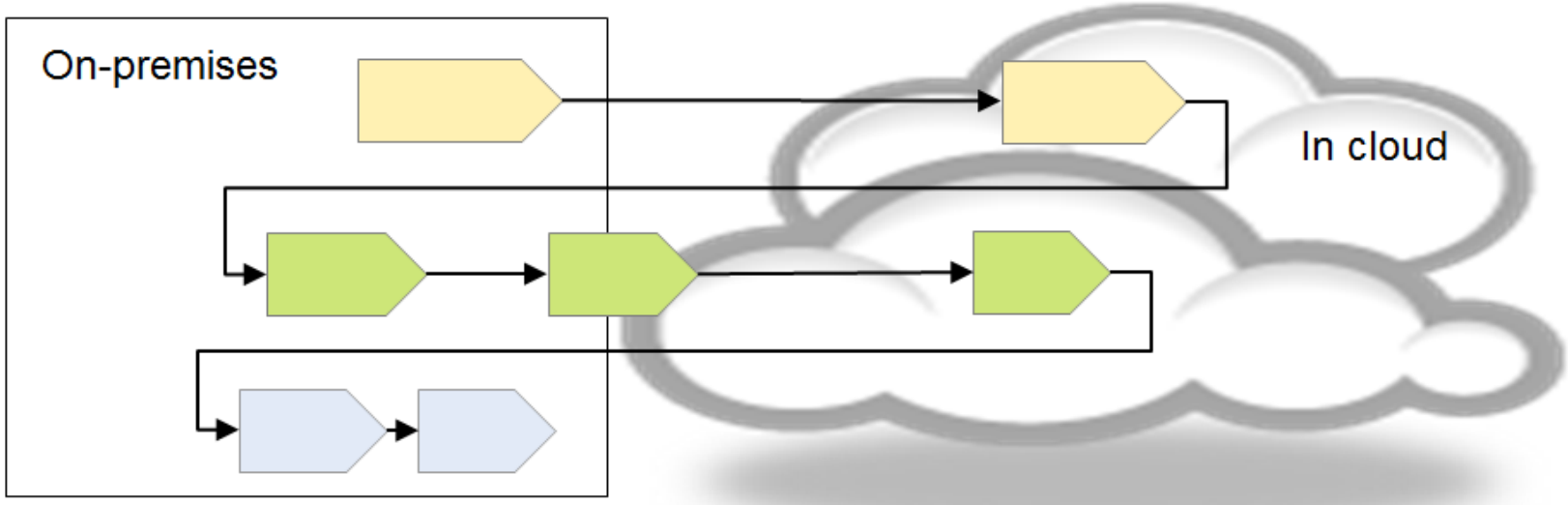
Application Cloud Infrastructure Hype Cycle



App Cloud Infrastructures move rapidly into Plateau of Productivity.

Source: Gartner (July 2012)

Cloud Business Process Services

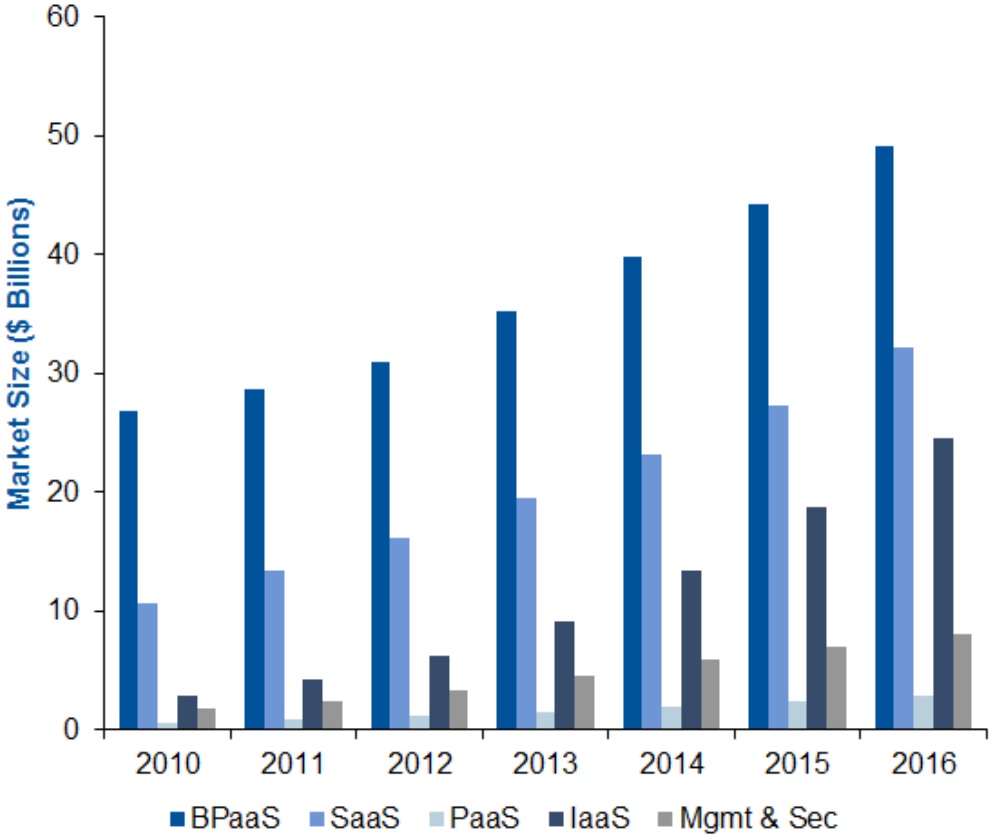


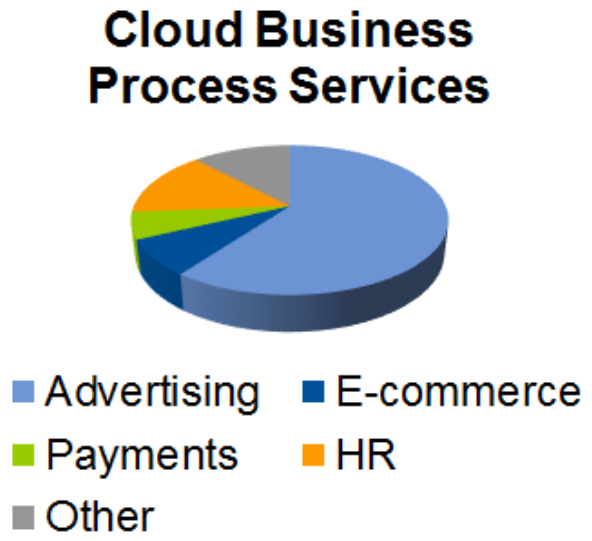
- Cloud attributes:
  - Service based
  - Shared services
  - Scalable and elastic
  - Metered usage
  - Internet technologies

- BPaaS and BPU attributes:
  - Standardized, preconfigured, scalable automated processes
  - Shared or dedicated labor pools
  - Configurable process templates not highly customized processes
  - Consumption, subscription, or outcome driven

Market Trends – Public Cloud Business Process Services Will Grow Rapidly

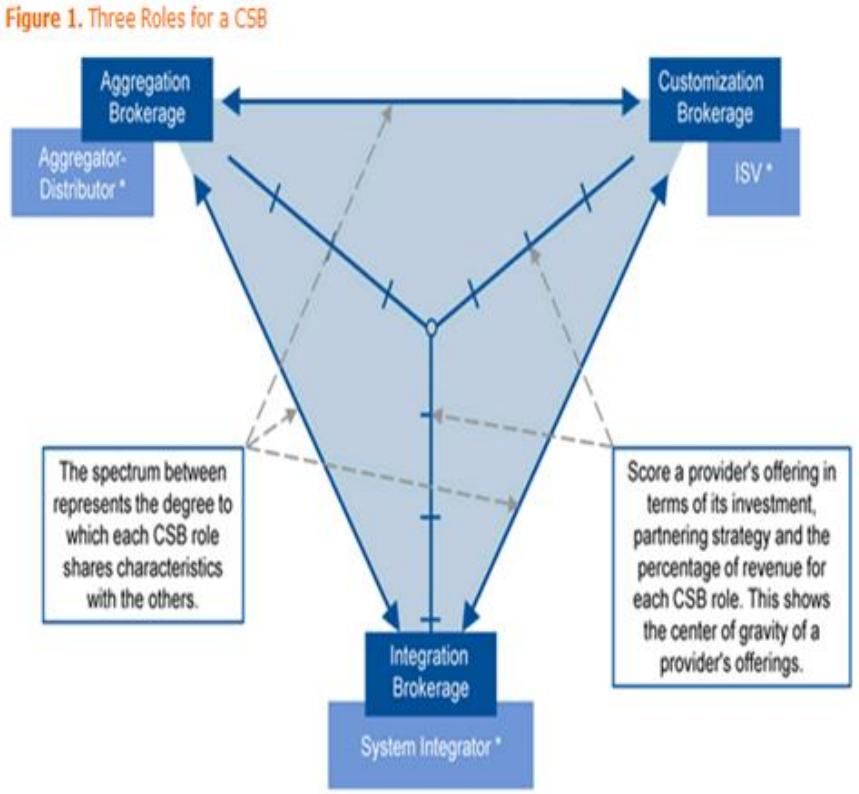
	BPaaS	SaaS	PaaS	IaaS	Mgmt. & Sec
5-year CAGR (2011-2016)	11.3%	19.1%	26.6%	41.8%	26.9%

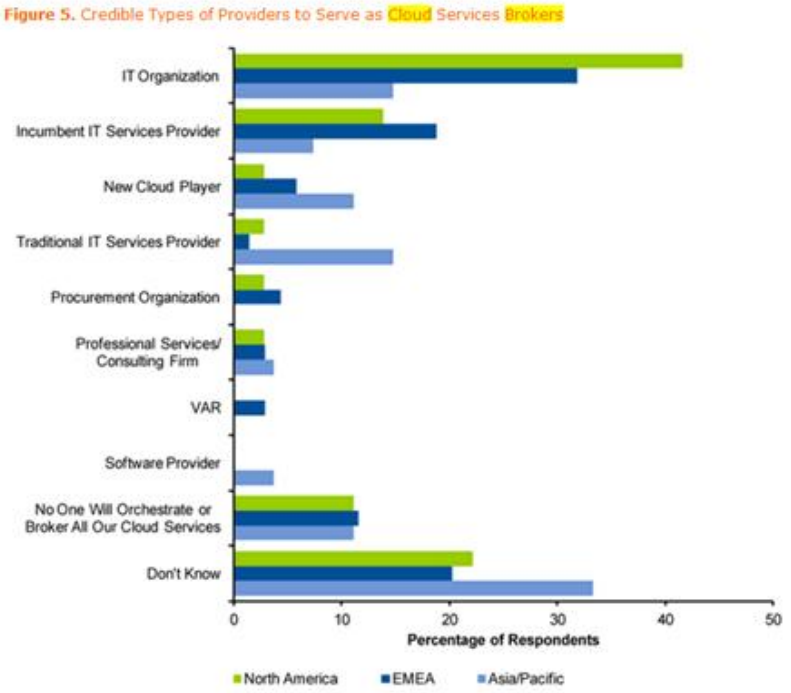




Source: Gartner, "Forecast: Public Cloud Services, Worldwide, 2010-2016, 3Q12 Update," September 2012 (G00238928)
Excluding Cloud Advertising

What Entity Can Provide the “Cloud Services Broker” Services?





Existing IT departments will morph into cloud service brokers, with support from current IT service providers.

Cloud Computing in Government (Circa 2013)

- Government organizations need to continually assess the way they evolve their sourcing strategy and different Cloud deployment options to make sure they get the most out of the new delivery models.

- **Cloud Computing in Government**
  - While interest in cloud computing in government remains high, actual and intended deployments are still very prudent.
  - The value added by a private cloud IaaS implementation over a decently virtualized set of IT resources is not always clear, and economies of scale can be realized only for sufficiently large organizations.
  - There is a difference between government cloud services managed by government organizations and offered by vendors.
  - A smart use of public cloud applications can extend their relevance to areas where privacy and security concerns look insurmountable today.
  - Private Cloud Services in the form of BPU and BPaaS offerings will continue to drive adoption of Cloud Computing in Government.

- **Government IT leadership should:**
  - Continue looking at cloud computing as one out of several sourcing options for IT service delivery.
  - Clearly articulate the business case for building their own private cloud infrastructure, versus limiting themselves to a certain level of virtualization of IT resources or the use of vendor-hosted private clouds.
  - Clearly examine their total cost of ownership of government-run community cloud offerings — where available and not mandated — including the costs of joint governance across multiple government organizations and any relevant track record in shared-service delivery.
  - Build up strengths in cloud security and related disciplines to leverage public cloud applications not only for open data and public-facing websites, but also in areas where personally identifiable information is processed, by adopting appropriate architectural and data segregation approaches.

Cloud Adoption Drivers in Healthcare

- **Cost Savings**
  - Upfront capital costs can often be avoided.
  - Cost savings rely on economies of scale.
  - SaaS solutions have fewer configuration options.

- **Speed**
  - Infrastructure and platform capabilities can often be spun up in minutes or hours.
  - Capabilities can often be taken down just as quickly.
  - SaaS can often be deployed in weeks or months. Incremental functionality can potentially be rolled out quickly and often.

What Are Healthcare Payers Doing in the Cloud?

Care Management, Clinical Decision Support, BI, Predictive Modeling

Campaign Mgmt., Event Tracking, Product Development

Claims Processing, Claims Administration, Adjudication, Appeals and Grievances, and Fraud Tracking

Content Management

Web Services

Mobile Applications

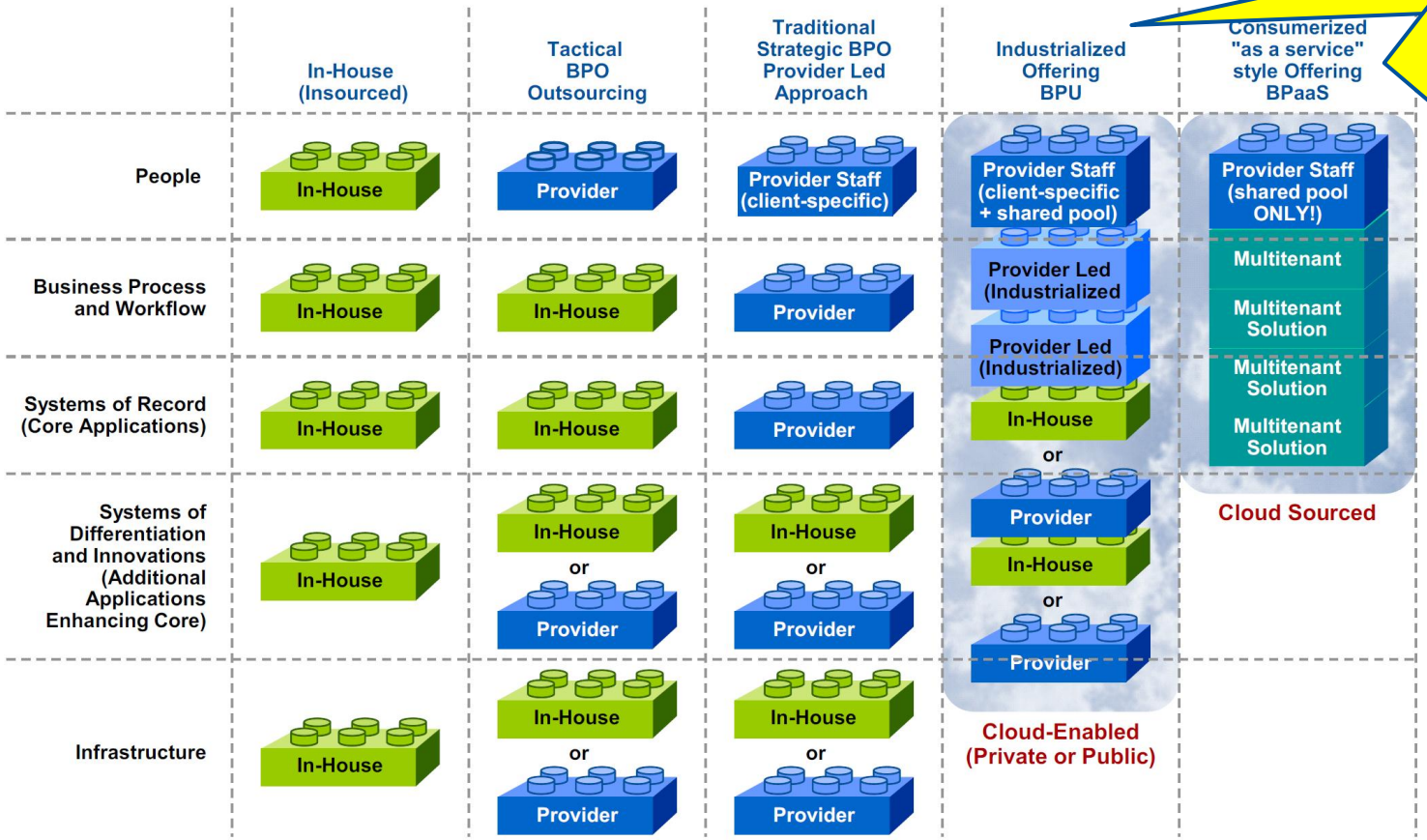
Member Portals

Sales, Quoting, Enrollment, Benefit Mgmt. and Billing

Provider Mgmt. Contract Mgmt.

Analyzing the Business Process Services Sourcing Options

- The Business Process Sourcing Options presents Government organizations with new decisions, risks, and challenges:

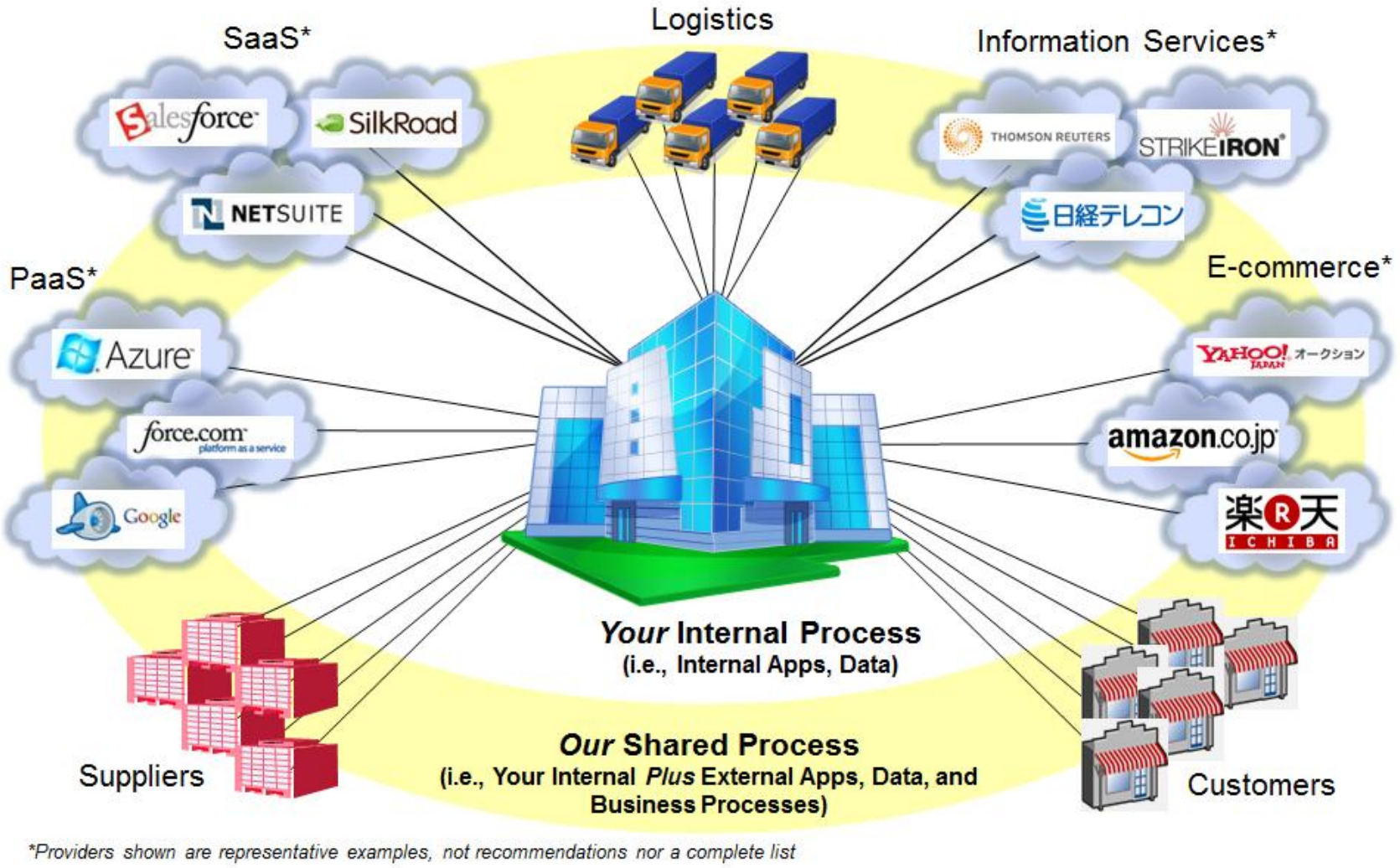


BPO = business process outsourcing; BPU = business process utility; BPaaS = business process as a service

Analyzing the Business Process Services Sourcing Options (cont'd)

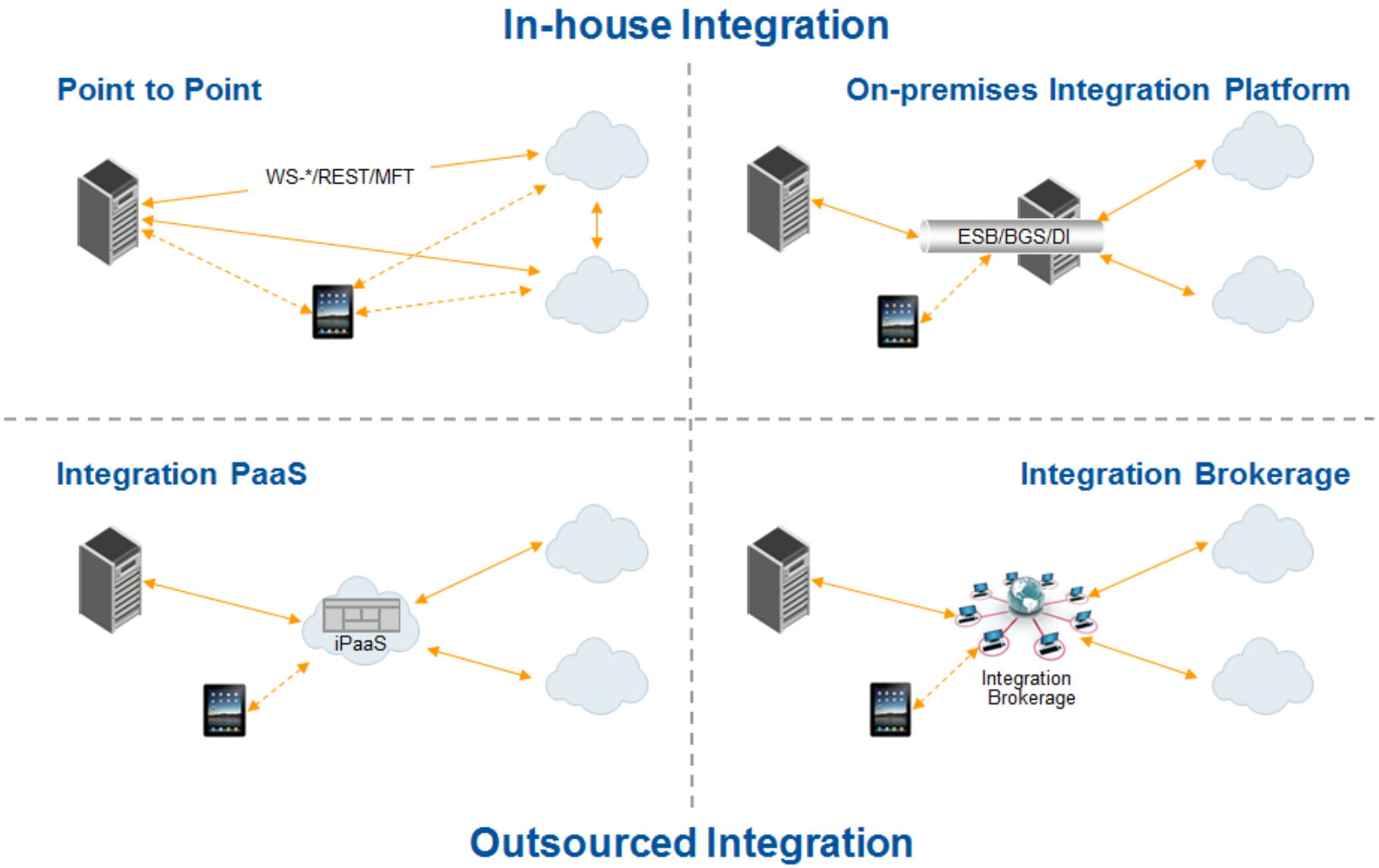
	In-house (insourced) with selective outsourcing	Tactical (single component) outsourcing	Traditional strategic BPO provider-led approach	Business process utility (BPU) — industrialized offering	Business Process as a Services (BPaaS) consumerized offering
Description	In-house team functions as the primary architect and delivery channel for the delivering the business process. May include selective outsourcing for applications and infrastructure.	Dominant manifestation of this model is where enterprise focuses on one (of the five) components depicted below. Most prevalent example is simply outsourcing labor for cross-border arbitrage.	Primary responsibility for delivery is contracted to a vendor. Vendor is primary driver of architecture options.	Vendor has invested in industrialization with a focus on significant decreases in customization, more pre-configured, standardized options. Several waves of utility options have evolved in the market to address a larger, broader set of clients with more leveragable knowledge assets.	Multitenancy achieved for several components. Access is primarily a consumer-driven look and feel. The waves of consumerization designed to address a mass market where volume drives adoption and is the underpinning of profitability.
People	Internal staff.	Focus on labor skills and competencies as primary decision driver.	Service provider staff. Labor pool dedicated to a specific client.	Service provider staff. Mix consisting of: ▪ Labor pool dedicated to specific clients or groupings of client. ▪ Fully shared labor pool for common elements.	Automated as possible. Fully shared labor pool. No dedicated labor for specific clients. Additionally, the service provider staffing model is much less visible to enterprise buyer (may even be an opaque staffing model).
Business Process and Workflow	Internally architected, designed and executed process and workflow. Adoption of business process management principles for internal excellence.	Internal solutions or provider-led. Provider may not necessarily be delivered by BPO vendor providing labor.	Provider-specific. Should be designed for process standards, industry and regulatory compliance.	Industrialized for highly leveraged business process management principles.	Highly automated or business rules based. Predefined process options.

The Future is Multi-Enterprise Process Integration



Providers shown are representative examples, not recommendations nor a complete list

Four Technical Approaches to Integration

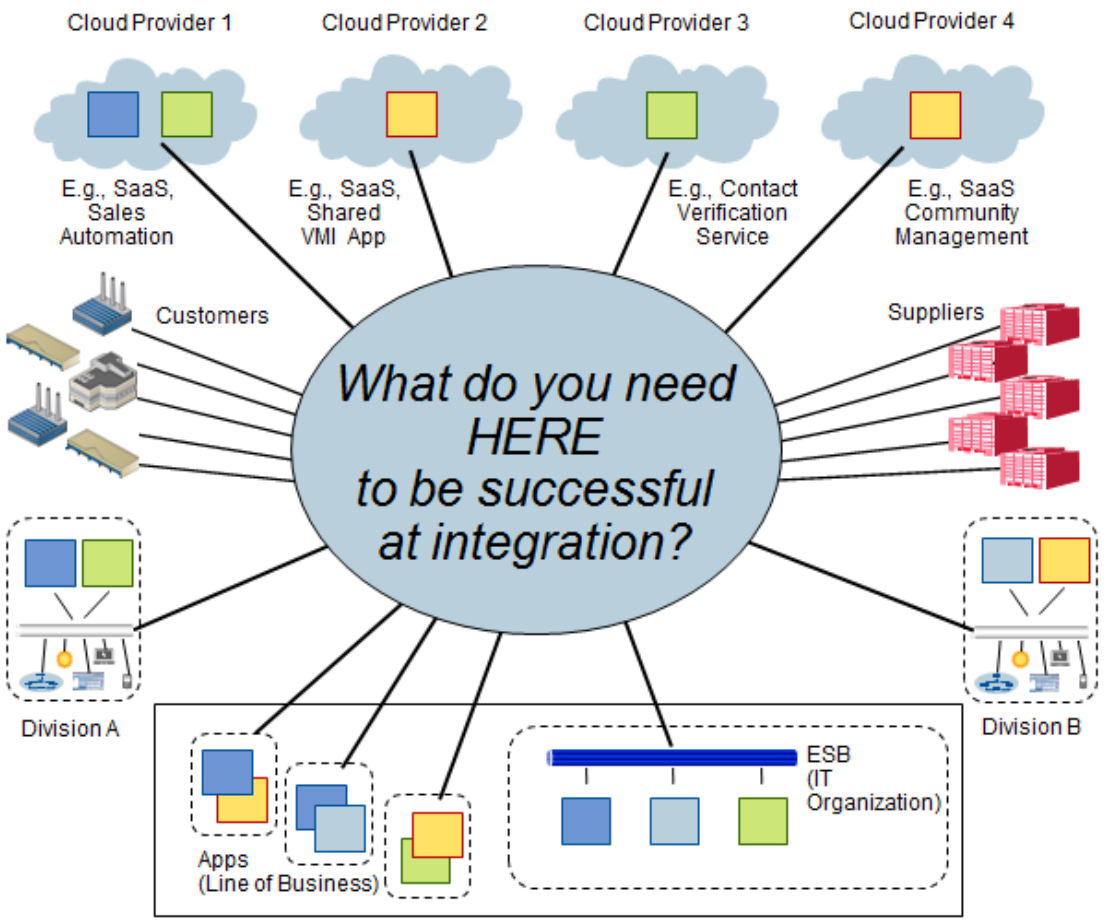


The Integration Challenge Isn't "Cloud Integration" — It's "Everything Integration"

Integration challenges include:

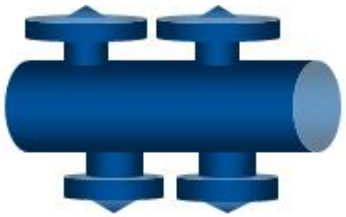
- Synchronizing master data (e.g., customer)
- Complex, multistep business processes
- Frequently adding new applications
- Multi-enterprise composite applications
- Linking SaaS with on-premises SOA services
- API governance across cloud, on-premises apps
- Moving applications from on-premises to cloud, and back again

= *Application or SaaS*

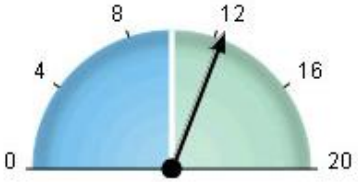


State Shared Hosting Facility

Essential Integration “Survival Skills”



1. **Basic Integration Functional Capabilities:**
   - Messaging technology and adapters (for apps, APIs)
   - Transformation and orchestration
   - Data migration services

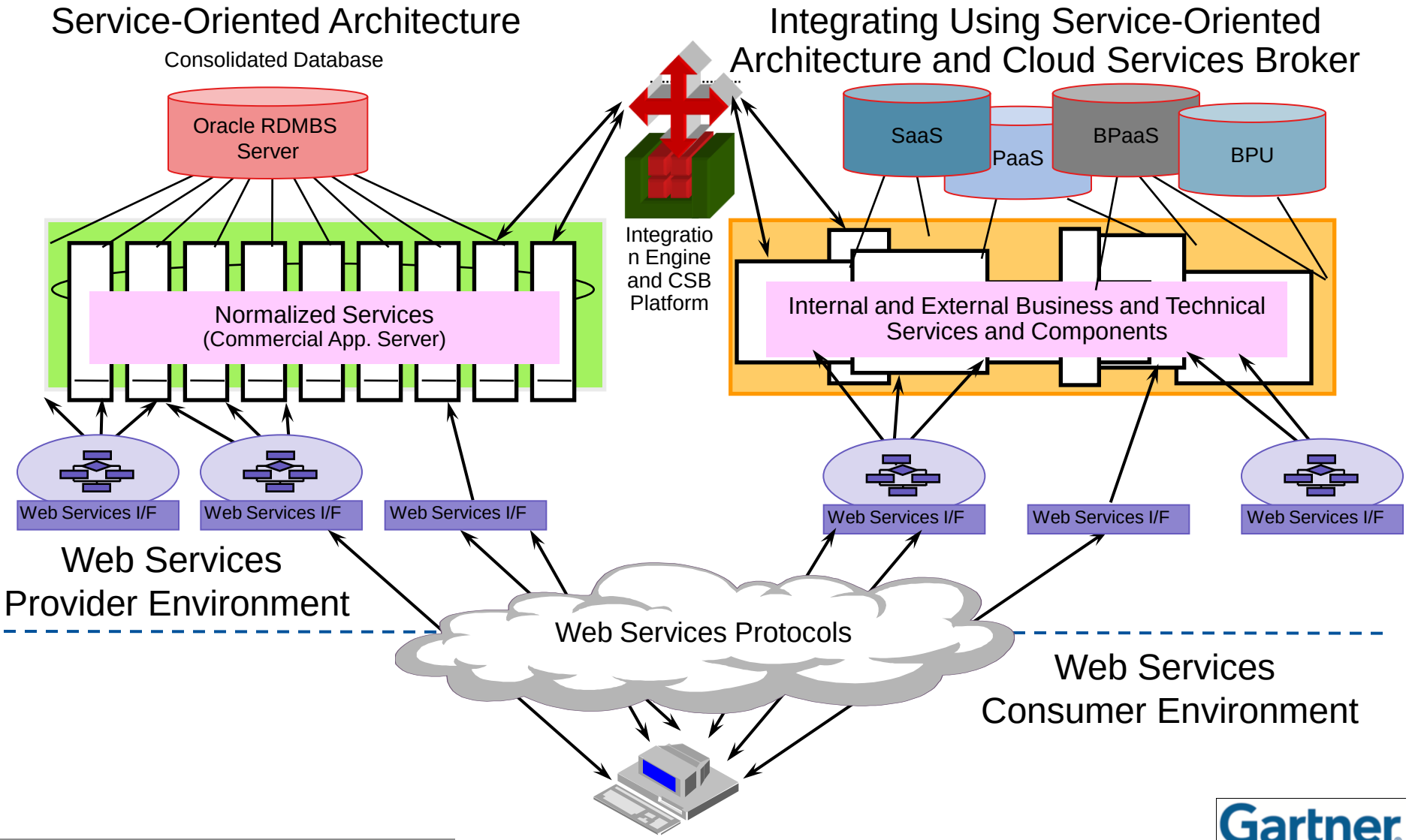


2. **Advanced Functional Capabilities:**
   - Application services governance (policy enforcement)
   - Community management (MDM – internal and external)
   - Situational awareness (BI, BAM, EDA)

3. **Services Disciplines (Internal IT or Service Provider):**
   - Clear, coherent agreements and pricing models
   - Outcome-based project planning, delivery, and support
   - Viable, proven HA/DR capabilities

4. **Proven Integration Maturity (What to Strive for):**
   - G2G and G2B project fulfillment capacity
   - Competencies in A2A, B2B, and cloud integration
   - Skills for Healthcare industry and processes

Implementing Composite Applications Across the On Premise and Private and Public Cloud Infrastructure



Overview of Procurement Strategy

State of Vermont Medicaid Operations Solutions Procurement

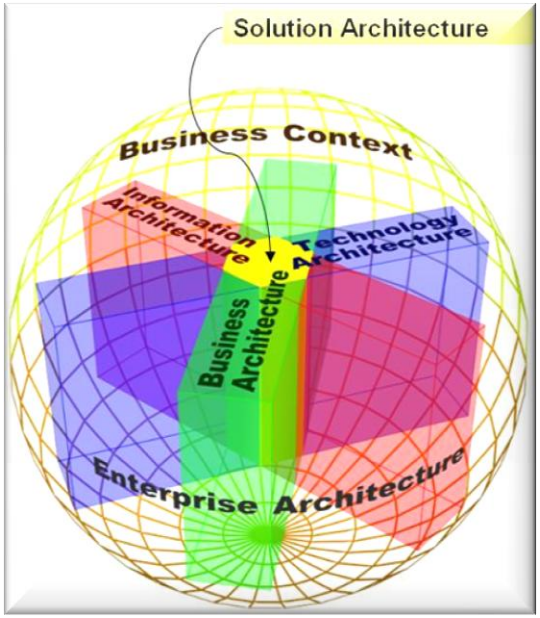
- High priority solutions:
  - Core Medicaid Management Information System (MMIS) including Business Intelligence
  - Pharmacy Benefits Management
  - Care Management
- Each of the solutions include both:
  - A technology component
    - Software
    - Hosting
    - Network interconnectivity within the State, and between the State and external service providers, and other stakeholders
  - A services component
    - Management and delivery of core operations and transaction processing
    - Data sets to provide comparative benchmarks and conduct investigative analytics
    - Expertise and insights regarding operational best practices and retrospective and prospective analysis and planning

Program-Specific and Enterprise Solutions

- The Core MMIS and PBM are program-specific solutions
- MMIS Business Analytics and Reporting – Program-specific or enterprise:
  - There is a broader requirement for analytics across the organization which includes
    - Determining acuity stratification and identifying populations which could benefit from specific programs
    - Assessing utilization and program performance
    - Conducting a broad base of State Medicaid HIT Plan Analytics
    - Other
- Care Management – Program-specific or enterprise:
  - There is a specific program need for Chronic Care Initiative Care Management Solution
  - There is also a general need for Care Management (and Benefit Management) in a range of programs delivered by various organizational units within AHS (e.g. TBI, Management of High-Risk Pregnancies, Pediatric Palliative Care, High Technology Home Care)
- At a high level, the Care Management requirements seem to be similar across programs; the differences relate to -
  - Determining the rules and processes for assessing eligibility or appropriateness for case / care management
  - Managing service definitions
  - Creation and management of care plans
  - Managing external service providers
  - Utilization review and other reporting

Health Services Enterprise Architecture Planning and Principles

Enterprise Architecture Planning Framework



- Main objective of the General Systems Design for the procurement is to identify how the initiative should be influenced by the HSE Architecture and Standards
  - "As Is" HSE Architecture
  - Target State ("To Be") HSE Architecture

- **Business Architecture** - drivers and strategy for the future program/policy framework for the VT's integrated and enterprise approach to health and human services and identifying the implications for enabling IT and developing a functional model of the enterprise from which information and technical architectures can be derived
- **Information Architecture** – identifying the data and information that will be required to anticipate, support and validate key decisions through the life cycle of VT's health and human services programs/services and how that data/information must flow through the State's legacy applications to support the full life cycle of VT's HHS Programs and Services
- **Technology Architecture** – defining the required technology infrastructure and standards (ONC, National HIT Standards, Software/Hardware Standards, etc.) as well as the systems management, operations and security mechanisms that are required to achieve the vision and provide for an sustainable, extensible, adaptable and affordable technical infrastructure for an integrated/enterprise HHS operations and the vision for the VT HSE Platform
- **Solution (Application) Architecture** – defining the required solution pattern, that will be required – such as: common front end one-stop portal; Enterprise Service Bus/enterprise service bus; consolidation / modernization / retirement of legacy applications; enterprise data warehouse/mart and business intelligence tools, etc.

VT HSE Platform Is Driven By A Series of Architecture Principles

Architecture Principles Defined

- "An accepted or professed rule of action or conduct. A general and fundamental truth that may be used in deciding conduct or choice." (dictionary.com v1.1)
- Describes consistent decision-making biases
- Provides logical consistency across multiple areas
- Articulates how to deal with change — drives behavior
- Affects individual decision-making events
- Principles are not Policies
  - Principles — Provide guidance to decision makers
  - Example: Evidence Based Decision Making
  - Policies — Provide specific actionable direction
  - Example: Structured Decision Making in Child Welfare Services
- Principles may (and often do) drive policies, but policies don't drive principles
- *When documented and ratified by business and IT leadership/governance, principles articulate top-level decision-making biases*

Health Services Enterprise Architecture Principles

- **Open Process:** Establish an open and inclusive process for defining the Enterprise Architecture, identifying the needs of the community (providers, payers, government, etc.) and the Business, Information and Technology architecture
- **Accountability and Transparency:** Architecture ownership for governance must be clear. Roles and responsibilities must be delineated unambiguously and shared openly. Defined responsibilities should include: providing input to the decision making process, analyzing alternatives, formulating proposals, making determinations and review and approval
- **Simplicity and Consistency:** Enterprise Architecture governance processes must serve to avoid unnecessary complexity and redundancy in the management of risks and controls across the Enterprise by developing a single, unified approach
- **Broad Participation:** The Agency has identified a need for broad stakeholder representation and involvement in Enterprise Architecture Governance
- **Effectiveness:** Enterprise Architecture that delivers value will have staff assigned for operational support, and adequate levels of investment
- **Aligned and Comprehensive:** The value of Enterprise Architecture will depend in large measure on how well it supports program requirements in all respects

Health Services Enterprise Business Architecture Principles

- **Support the Enterprise Mission and Objectives:** All business processes should be optimized to support overall AHS strategic objectives
- **Focus on User Needs:** Residents, VT HHS State Staff and Trading Partners will be able to use systems that provide content rich and user friendly interfaces via multiple channels and task-appropriate devices aligned with the State's model of practices
- **Enable Data Sharing:** The VT HSE Platform will enable enterprise wide data sharing and also provide flexible data access for Residents and Trading Partners
- **Ensure Privacy and Confidentiality:** The VT HSE Platform will ensure full compliance with all laws and regulations to ensure the privacy and confidentiality of health data
- **Enhance Decision-support:** The VT HSE Platform will provide timely, accurate, and complete decision support information to users through applications and shared services that minimize the labor intensity to enter, access and manipulate data and also anticipate, support and validate key public health and client service activities and decisions
- **Utilize Advanced Data Analytics:** The VT HSE Platform will collect and marshal a wide variety of health data that will be able to be analyzed to create knowledge that informs evidence-based strategies to create actionable results for meeting the needs of Vermont residents
- **Create a Real-Time Integrated Enterprise:** The VT HSE Platform will allow all users to have current and up to the second information regarding all client's interactions with VT's HHS Programs

Health Services Enterprise Information Architecture Principles

- **Manage Information as an Enterprise Asset:** Coordinate the collection, consolidation, and consumption of enterprise information to support strategic initiatives requiring the consistency and dependability of data across multiple business processes
- **Enable Data Sharing via Standards-Based Approach:** VT's HHS Agencies will provide and benefit from consistent and accessible data sharing, internally and externally, using appropriate Health IT standards for naming, messaging, and data exchange
- **Data Governance will be Transparent and Consistent:** The VT HSE Platform will ensure that data governance processes decisions are consistently implemented across the organization to ensure that data integration is as effective as possible
- **Establish a Single Data Source approach to Client and Provider Information:** The VT HSE Platform will use enterprise wide tools to provide reliable and cost effective data sources for the records managed by each Agency and their partners
- **Continuously Improve Data Quality:** Data will be continuously reviewed and there will be a relentless focus on ensuring the highest quality of data content with specified data owners accountable for quality and establishing standards for data stewardship - Addressing data definition, transformation, integrity and quality issues
- **Enforce Data Confidentiality and Legal Requirements:** AHS will ensure that all rules and regulations that govern data collection, storage and use are rigorously applied

Health Services Enterprise Technology Architecture Principles

- **Integrated and Accessible Architecture:** Information captured across the program silos need to be integrated and accessible
  - Leverage data across systems and processes, taking into account security, privacy and confidentiality considerations
  - Maintain consistent definitions and a single authoritative source of record for data
- **Robust Infrastructure Capabilities:** Enhance infrastructure capabilities for standardized approach to health information
  - Need to deploy IT infrastructure for user driven access to and analysis of information
- **Privacy and Security Compliance:** Ensure privacy and security of participant information in accordance with legislative mandates (e.g. HIPAA) and community preferences
  - Improve and enforce the Security standards around IAM (Identity and Access Management).
- **Technology Solutions Aligned to Agency Requirements:** Design technology solutions to accommodate appropriate agency requirements consistent with enterprise architecture and standards while minimizing the number of departmental applications (eliminating duplication and overlap wherever possible)

Health Services Enterprise Solution Architecture Principles

- **Service-Oriented:** The target architecture should consist of a number of services that are compliant with industry standards for service-oriented architecture to facilitate reuse, adaptability and interoperability
- **Interoperability Standards:** Build upon Federal standards and implementation efforts including CDC, NHIST, the ONC HIT Standards Committee and those for the NHIN and comply with emerging national interoperability standards for content exchange, vocabulary/notation and privacy/security
- **Investment Protection:** Provide the ability to integrate with existing public health system platforms and health information exchanges
- **Independence:** Keep architecture skills separate from product and implementation vendors' dependencies to maintain vendor and technology neutrality in the development of architecture
- **Scalable and Extensible:** Provide incremental expansion of functionality over time on a base that is scalable to accommodate additional users and extensible in expanding capabilities to meet future business needs and Federal and State mandates
- **Legacy System Access Through Modernized Interfaces:** Provide the platform, design patterns and disciplines required to facilitate access to the existing application portfolio and data sets leveraging modern interface architecture approaches

Health Services Enterprise Architecture
Key Architectural Components

SOA	• Comprehensive Governance • Sustainable Integration
Identity Management	• Segmented, Integrated Directories • Compliance-driven
Enterprise Content Management	• Shared, Centralized • Generate, Capture, Store, Search, Retrieve Documents and Records • Enterprise Taxonomy
Vermont Enterprise Service Bus	• Clearinghouse for Internal and External Data Exchange • Batch, Near Real-time, and Real-time
Cloud Infrastructure	• Flexible Capacity • Leverages Virtualization • Highly Secured Network Zones
Master Data Management	• Augments VIH • Indexing Approach • Cross Reference for Multiple Applications • Supports ETL, Reporting

Health Services Enterprise Architecture
Key Architectural Assumptions (To Be Validated)

- Cloud First sourcing
- Citizens access all resources through Portal with Multi-Channel and Multi-Device management capabilities
- Customer Service Partners access services through State WAN (e.g. OneGate, Siebel, OBIEE, IDM, Content Management, and others)
- Business Processes will be provided by third parties and transactions will be passed through their systems, for example:
  - Customer Service/Call Center is provided by 3rd Party Maximus
  - Premium Processing is provided by 3rd party Benaissance
  - Pharmacy Benefits will be processed by newly selected 3rd party
- If financial information is needed, PeopleSoft will be utilized
- MDM will be utilized for EMPI (Enterprise Master Person Index)
- User credentials are stored in physically separate IdM directories

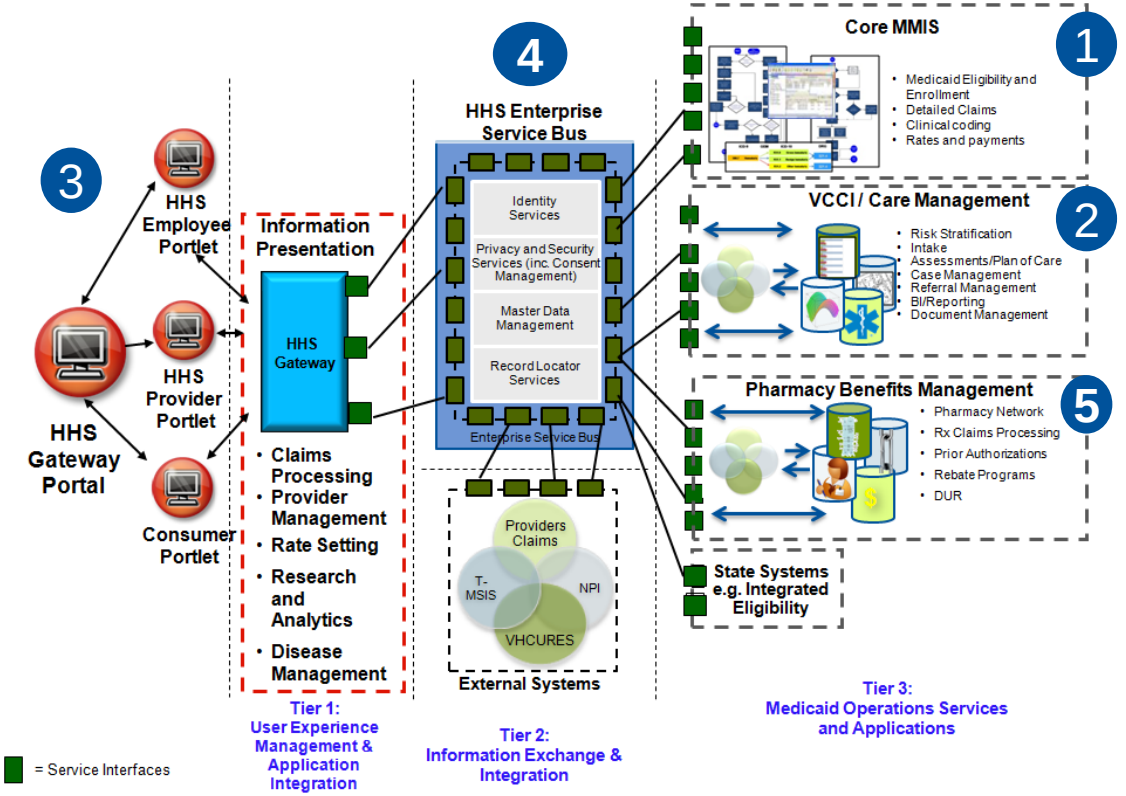
The HSE Platform Architecture and the “Oracle Stack”

HHS Solution Pattern

Appropriate Leveraging of HSE to Achieve A Fully Integrated and Agile HHS Enterprise

- There are **5** key distinct **solution components** that together will deliver the core Medicaid Operations Solutions Procurements and related core **functional capabilities**:

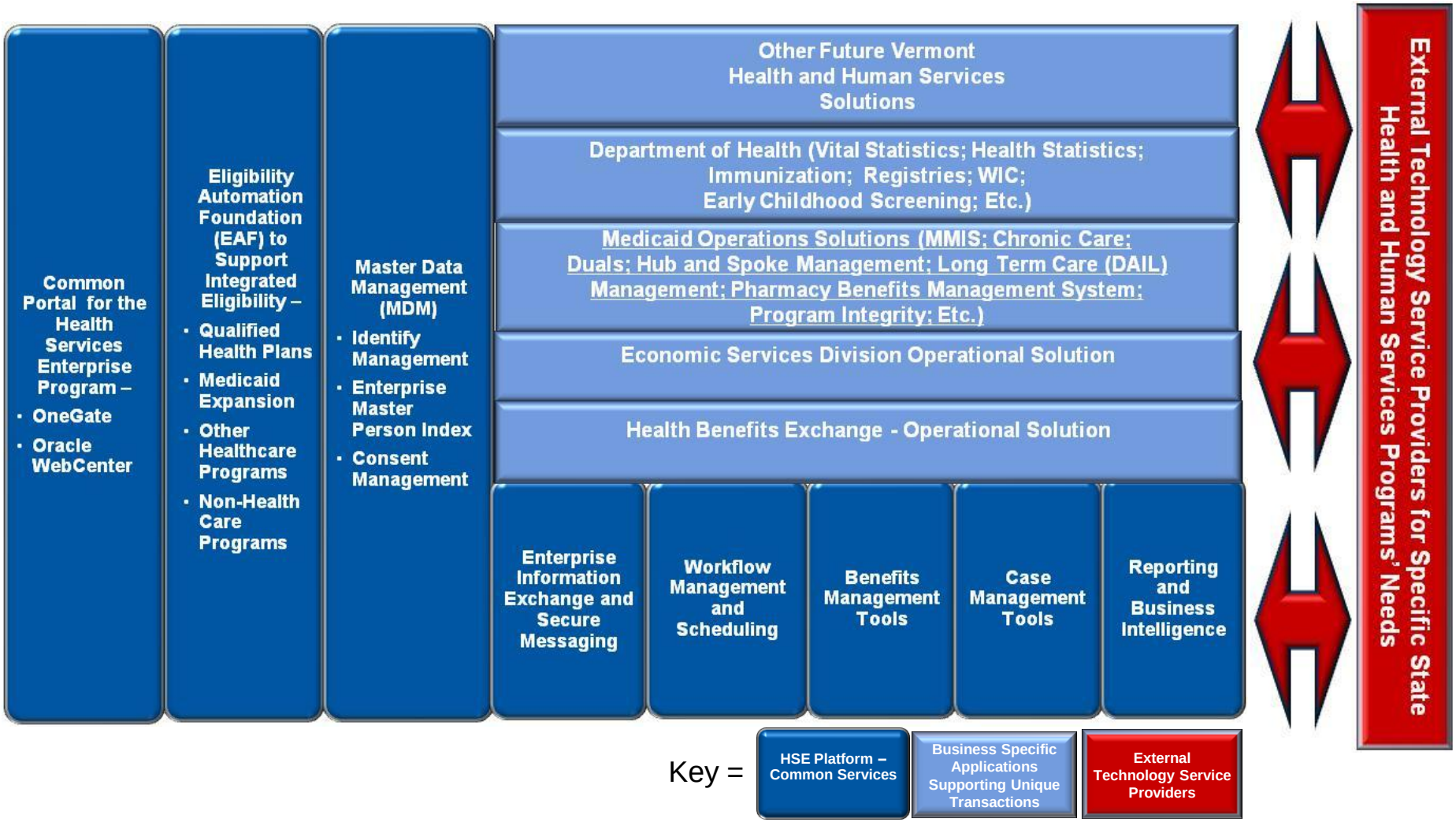
1. **Core MMIS Functionality including BI –** Claims processing system, supporting state and federally funded health care payments including Business Intelligence and Analytics
2. **Care Management Functionality** – Solution to support Chronic Care initiative and other Vermont Enterprise case or care management needs
3. **Portal** – includes User Interface and User Experience Management, Access Control, Collaboration, Communications and Document Search capabilities
4. **HHS Enterprise Service Bus** – Integration of internal and external service components and applications
5. **Pharmacy Benefits Management** – Management of pharmacy benefits eligibility and formularies on a BPO basis



Loosely coupled integration of Service Oriented Architecture (SOA) based solution components essential to supporting the envisioned functional capabilities for Integrated HHS –

- **Integrated Eligibility**
- **Collaborative Service Delivery**
- **Core MMIS and Business Intelligence**
- **Care Management**

HSE Platform
Highest Level Functional Overview

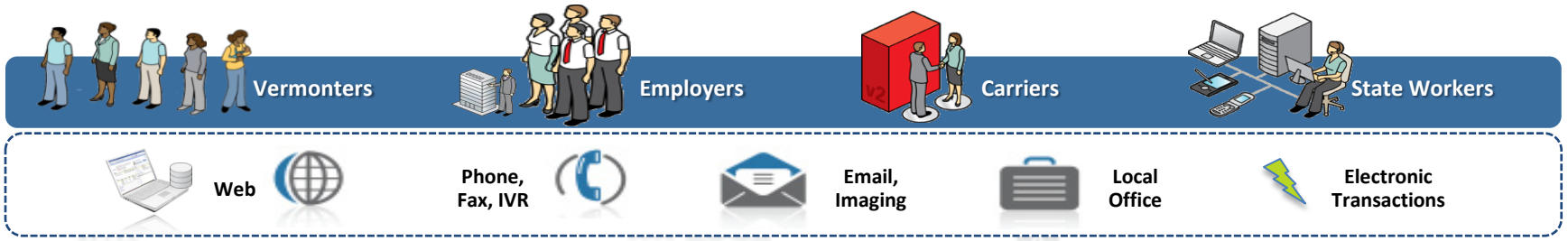


The HSE Platform Architecture and the "Oracle Stack"

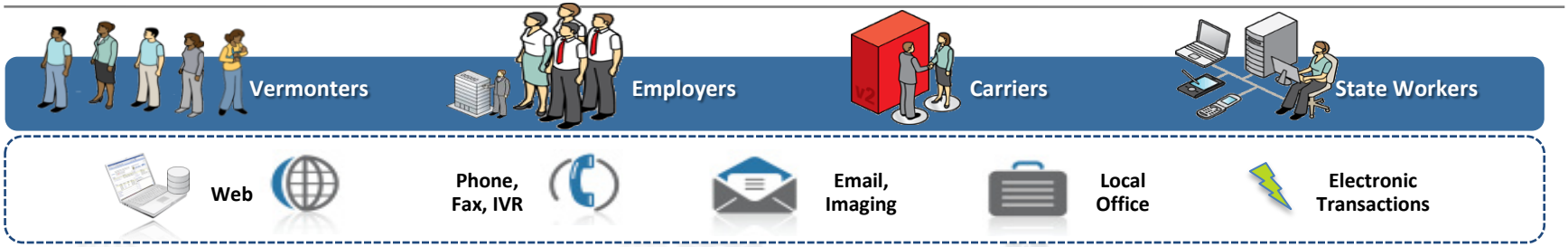
- The HSE Platform and its associated standards take advantage of the extensive stack of Oracle software products AHS licensed in 2011. These include:
  - Oracle Policy Automation
  - Siebel CRM (Public Sector)
  - Oracle Customer Hub (Including Activity Hub and Quality Modules) – previously Siebel UCM
  - Oracle Database EE with RAC and Advanced Security
  - Oracle Identity and Access Management
  - Oracle SOA/Middleware (Application Infrastructure) Including
    - Oracle Service Bus
    - WebLogic (Server and Integration)
    - WebCenter (Portal and Content Management)
    - Business Rules
    - Application Management for Siebel
  - Oracle Business Intelligence EE
  - Oracle Tutor and UPK (User Productivity Kit)
  - GRC (Risk Management)
- And a few other products:
  - HIPAAT for patient consent management
  - LifeRay Portal is being implemented to support OneGate (from Exeter) as part of the VHC system solution

Note: Please refer to Appendix for details regarding HSE Technology Standards Analysis (provided as a separate attachment)

Strategic Application Example – VHC System Business Architecture



Strategic Application Example, Cont'd – Technology & Tools Being Deployed



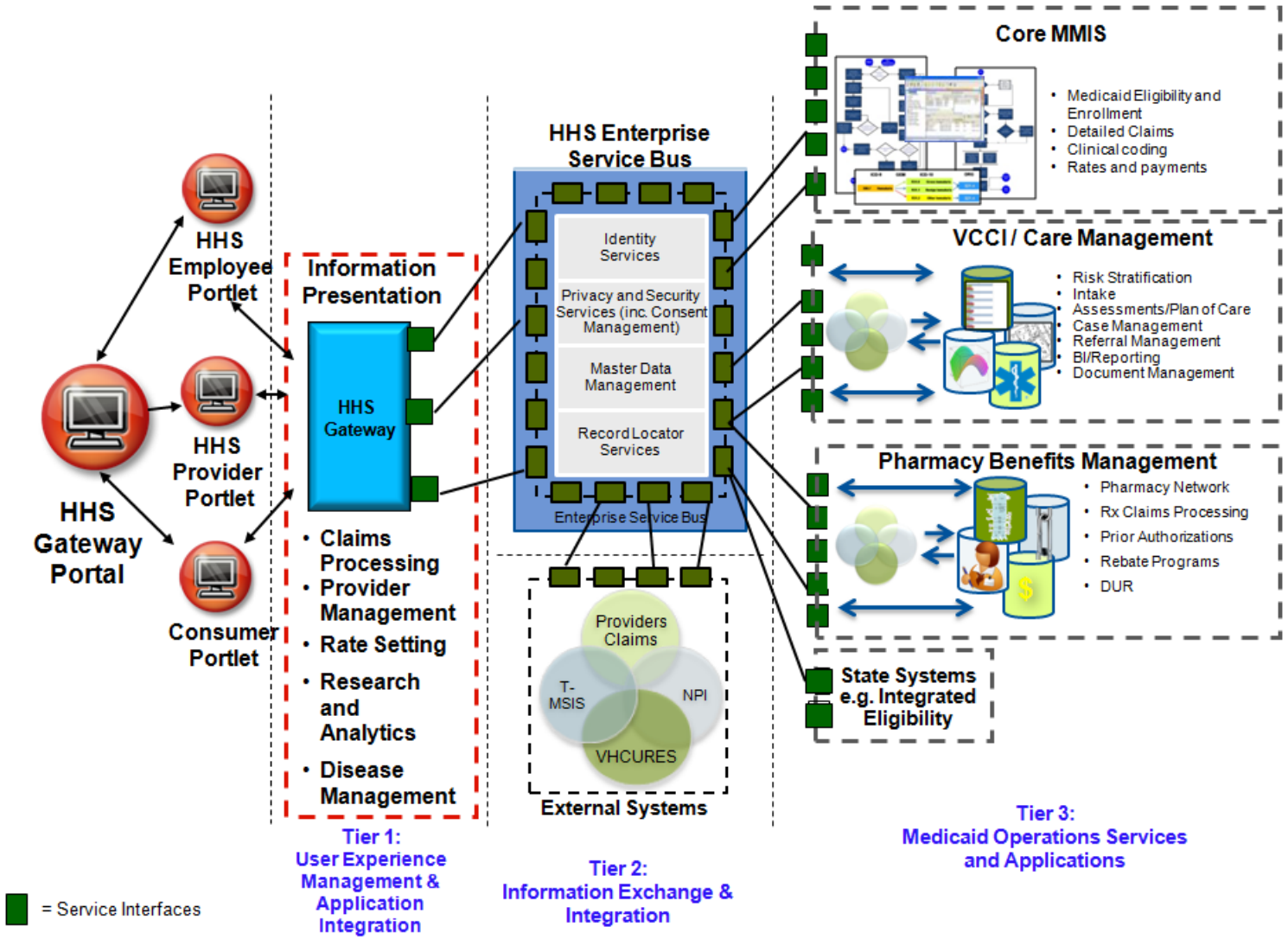
Examples of VT HSE Platform Standards

- Service-Oriented Architecture (SOA) Enterprise Service Bus:
  - ESB support for standard representations including OPA (Oracle Policy Automation), Oracle SOA Suite for Healthcare Integration, Business Process Execution Language (BPEL), XML Process Definition Language (XPDL), Business Process Modeling Language (BPML) and Web Services Flow Language (WSFL)
  - Adapters need to support SOA services using B2B protocols such as Applicability Statement 1 (AS1)/Applicability Statement 2 (AS2), RosettaNet and Electronic Data Interchange for Administration, Commerce and Transportation (EDIFACT)
- Web Services:
  - Web Services Interoperability (WS-I) Organization-compliant implementation of basic Web services standards, including SOAP, WSDL and Universal Description, Discovery and Integration (UDDI), as well as higher-level Web services standards, such as WS-Security.
  - Representational State Transfer (REST): Support for XML-based message processing a well as HTTP, and XHTML.
- Security and Privacy
  - HIPAA EDI Transactions and Security and Privacy Rules
  - NIST 800-53A and NIST 800-53 rev3 Moderate baseline

Examples of VT HSE Platform Standards, Cont'd

- Security and Privacy, Cont'd
  - IRS pub 1075, which points back to NIST 800-53 rev 3
  - NIST 800-53A rev1 guidance (http://csrc.nist.gov/publications/nistpubs/800-53A-rev1/sp800-53A-rev1-final.pdf) and Harmonized Security and Privacy Framework.
  - CMS requirements, which points back to NIST 800-53 rev3 moderate baseline
  - Guidance from CMS including MITA Framework 3.0 and Harmonized Security and Privacy Framework
- Data Exchange for Clinical Data
  - Integrating the Health Enterprise (IHE): Cross-Enterprise Document Sharing (XDS, XDS.b); Cross-Community Access (XCA)
  - Health Level Seven (HL7) Continuity of Care Document (CCD) C32 profile

Drill Down to a Medicaid Operations View of the HSE Platform Integration



Medicaid Procurement Projects' Market Scan

Solution Description – Pharmacy Benefit Management (PBM)

Description

The Pharmacy Benefit Management (PBM) system is the software and services required for the processing and paying prescription drug claims.

Technical Capabilities and Features

- Point of Sale
- Prospective Drug Utilization Review (Pro-DUR)
- Retrospective Drug Utilization Review (Retro DUR)
- Prior Authorizations
- Rate Setting
- Drug Rebate

Service Components

Services include Pharmacy Benefit Management , system operations and support, and pharmacy program operations including call center, prior authorizations, maintaining the Preferred Drug List and Pharmacy Reference File

Solution Description – Pharmacy Benefit Management (PBM) (cont.)

Interaction with Other Solutions	Business Areas Supported
MMIS and IE Analytics	▪ Pharmacy
Contracts and Solutions Replaced	
▪ HP ▪ Catamaran	

Solution Description – Care Management

Description

Care management software supports key processes, including: intake; program design and governance; intervention referral; care management intervention; external data coordination; and reporting, evaluation and change.

Technical Capabilities and Features

- Track patients wellness and health progress over time
- Integration with EHRs
- Outcomes measurement and reports.
- Integrated tools to capture assessments, establish treatment plans, monitor, and track progress.
- Access to treatment protocols and clinical guidelines

Service Components

- Clinical interventions
- Assessment
- Program evaluation

Solution Description – Care Management, Cont'd

Interaction with Other Solutions	Business Areas Supported
EHRs MMIS Integrated Eligibility Analytics Vital Records	▪ Chronic Care ▪ SIM Grant Services ▪ Breast and Cervical Cancer Treatment Program ▪ Disease surveillance

Contracts and Solutions Replaced
▪ APS

Solution Description – Program Integrity (part of Core MMIS)

Description

- A comprehensive set of software and services to support the prevention, detection and investigation of Medicaid fraud, waste and abuse by utilizing data mining and analysis to recoup provider overpayments

Technical Capabilities and Features

- Decision support system
- Production of all essential Surveillance and Utilization Review Subsystem (SURS) reports (e.g., basic practice comparisons and profiling required by CMS)
- Specialized tools and system capabilities uniquely geared for fraud and abuse detection with fraud and abuse detection algorithms and models
- Business intelligence
- Training and assistance for users of the system
- Production of a broad range of statistical data

Service Components

- Support for complex analyses and queries
- Regular updates of benchmark and comparative data
- Ongoing targeted analyses and reporting (e.g. performance reporting, acuity list generation, targets for fraud and abuse investigation)
- System support, maintenance and operations

Solution Description – Program Integrity (part of Core MMIS), Cont'd

Interaction with Other Solutions	Business Areas Supported
▪ Data from IE and MMIS ▪ Provide analytics and reporting data for: ○ Care coordination ○ Financial systems ○ Provider management	▪ Analytics and utilization reporting for program integrity

Contracts and Solutions Replaced
▪ Internal Program Integrity analyses

Solution Description – Core MMIS

Description

A MITA 3.0 compliant and CMS certified claims processing system, supporting state and federally funded health care payments.

Technical Capabilities and Features

- Claims Processing
- Provider Enrollment
- Web-based Portal
- Business Analytics

Service Components

- Fiscal Agent
- Member Management
- Provider Management
- Business Intelligence/Analytics
- Reporting
- Financial Management

Solution Description – Core MMIS (cont.)

Interaction with Other Solutions	Business Areas Supported
• HBE • IE • Analytics • Financial • Care/Case Management	▪ Healthcare delivery and payment

Current Applications Replaced
▪ HP MMIS ▪ Member Management (today supported mostly by Maximus for Customer Service)

Overview of the MMIS Market

Pharmacy Benefit Management Solutions and Vendors

Vendor	Notable Features
Catamaran	Meets and exceeds the Modularity Standard by providing published interfaces, a WSDL based API, rules-driven solutions. RxCLAIM®'s SOA-based system architecture allows integration with the MMIS and other systems to Web Services (WSDL), and other transformation services (ESB) in the RxCLAIM® Integration level.
Envision	Envision utilizes SOA in software development and provides a wide range of interoperability standards, including web services.
Goold Health Services	The GHS PBM platform has been developed on an Enterprise Service Bus model. The Service Oriented Architecture (SOA) is used for communication between software applications within the PBM solution. Other COTS products used in the GHS PBM solution include: SAP Business Objects/Business Intelligence/Crystal reports; InterSystems Ensemble; InterSystems DeepSee business inelegance; Microsoft SQL Server; and Microsoft Office.
HP	HP solutions communicate using numerous standards including HIPAA (X12 5010, NCPDP D.0), ePrescribing (NCPDP 8.3), HIE (HL7 Continuity of Care Document - CCD). Available HP HIE, ePrescribe and EDI solutions support NCPDP, HL7 and Nationwide Health Information Network (NwHIN) standards in the larger healthcare ecosystem.

Overview of the MMIS Market

Pharmacy Benefit Management Solutions and Vendors (cont)

Vendor	Notable Features
Magellan Medicaid Administration	MMA has a standard Service Oriented Architecture for integration between our POS/PA systems and external applications. MMA's FirstRx™ core tool utilizes an internal flexible and configurable rules engine. MMA uses industry-standard data exchange tools such as XML and SOAP.
Meridian	MeridianRx' Merlin system has been developed within a web based architecture environment
Optum	Optum's PBM solution is aligned with service oriented architecture-(SOA) design principles and uses open interfaces and exposed application programming interfaces (API); business rules are separated from core programming logic.
Xerox	Xerox uses a true n-tier, Java-based, SOA with multiple layers. The system is built on an Enterprise-ready WebSphere Application Server which can be enabled for full support of SOA, with complete separation of presentation, business processes, business services, technical services and data access services layers.

Overview of the MMIS Market
Care Management Solutions and Vendors

Vendor	Notable Features
APS Healthcare	Several of today's enterprise care management application vendors currently have more than one platform in production. This situation has emerged during the past five to seven years as vendors have sought to modernize legacy client/server applications with more-modern, service-oriented architecture (SOA) techniques.
Audax Health	
Click4Care	
Eliza	
EXL Landa	
Healthwise	
Medecision	
Silverlink Communications	
WebMD	
ZeOmega	

Overview of the MMIS Market
Program Integrity Solutions and Vendors

Vendor	Notable Features
Truven	BI, Analytics, Reporting, Acuity and Outcomes Analysis, Comparative Dataset
Optum	BI, Analytics, Reporting, Acuity and Outcomes Analysis, Comparative Dataset
Xerox	BI, Analytics, Reporting, Acuity and Outcomes Analysis
HMS	Program Integrity, Cost Containment
IBM	BI, Analytics

Overview of the MMIS Market
Core MMIS/Claims Processing Solutions and Vendors

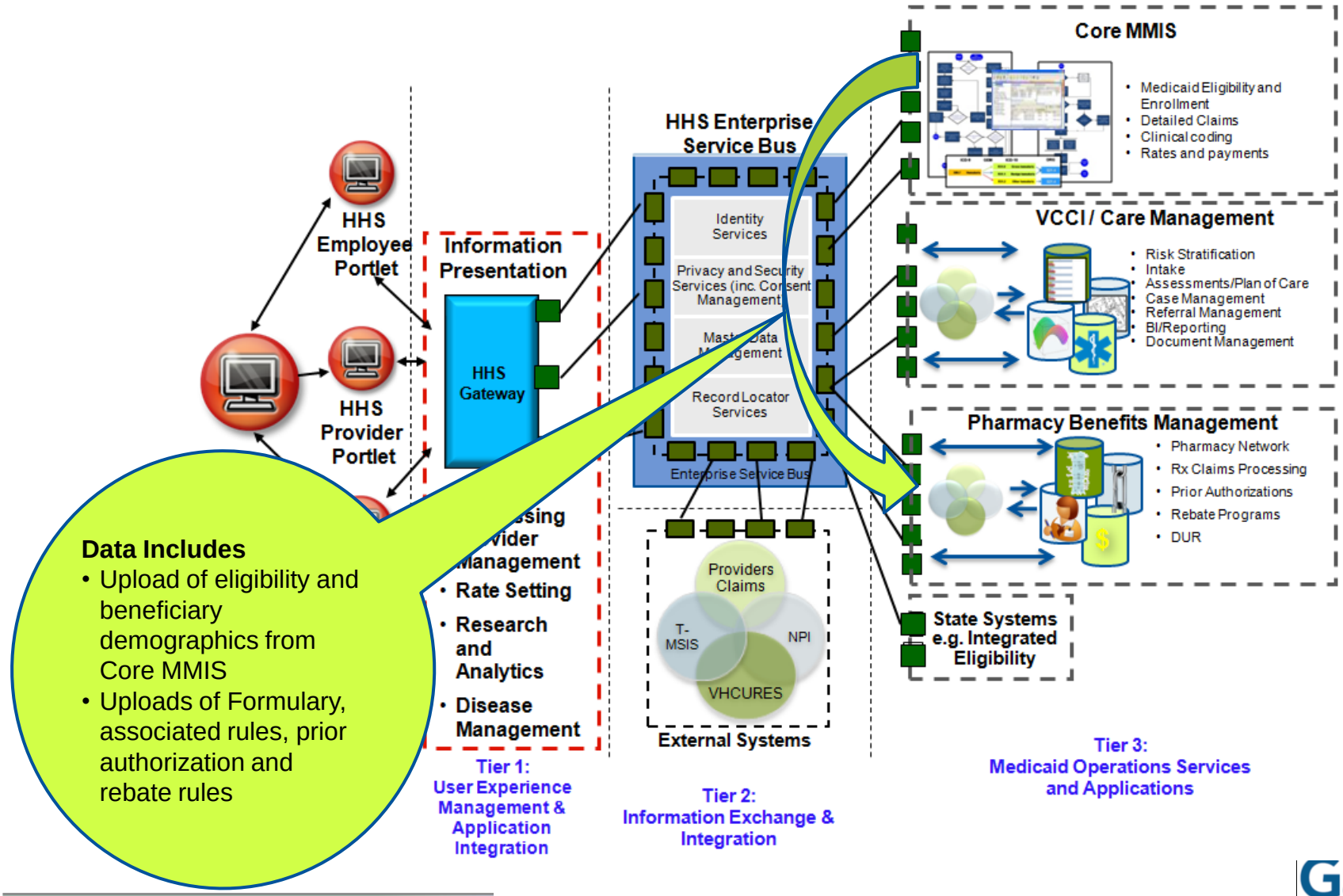
Vendor: Product Name	CMS	Implemented	Fiscal Agent	MITA Aligned	Notable Features
CNSI: eCams	✓	✓	✓	✓	100% web-based Will be acting as FA for LA (with help of Noridian) Partnering with CSC (to be FA) in MD
Molina Medicaid Solutions: Health PAS	✓	✓	✓	✓	Collection of .NET COTS products Web-enabled
ACS State Healthcare: Health Enterprise			✓	✓	Long history of fiscal agent services Several states currently implementing new 'Health Enterprise' system
CSC: TranScend	✓	✓	✓	✓	Use of Content Management System with applications 'Platform as a Service' offering – pay on a usage basis for server in a cloud Multi-Payer System
HP Enterprise Services: Interchange	✓	✓	✓	✓	2 states under new CMS process (WI, MA) Multi-program functions capable of supporting State plans outside of Medicaid Integrated rules engine and robust DSS Application for mobile computing (iPhone)

Overview of the MMIS Market
Core MMIS/Claims Processing Solutions and Vendors (cont.)

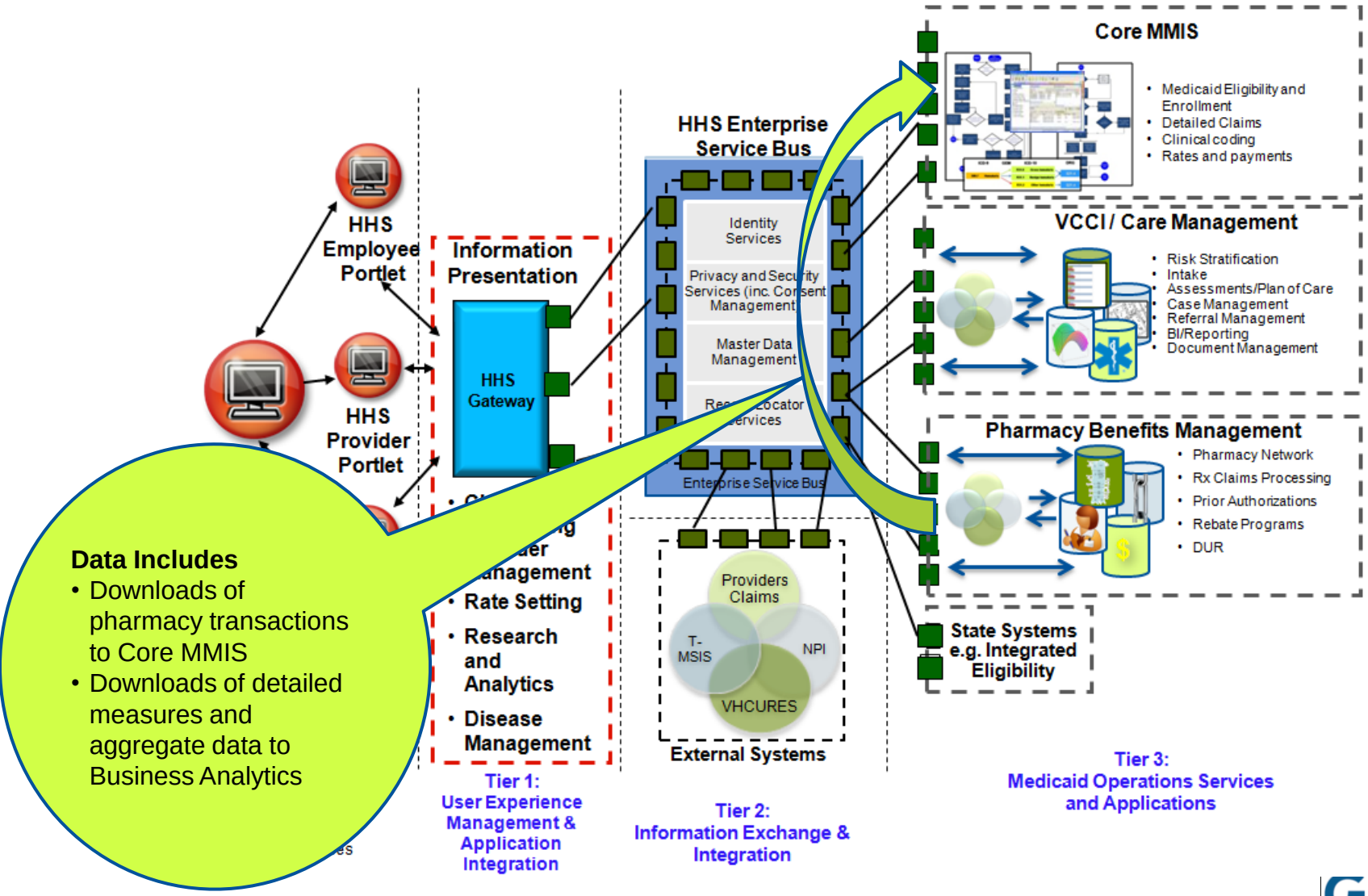
Vendor: Product Name	CMS	Implemented	Fiscal Agent	MITA	Notable Features
Accenture: Accenture Public Health Platform (APHP)				✓	.NET COTS product Web-based system Iowa is first state to award them MMIS contract Member and Provider portal
Noridian Administrative Services: OnBase, EXACT, RapidApp		✓		✓	System integrator and MMIS component vendor; operational services OnBase EDMS: workflow tool EXACT: Provider Management RapidApp: Provider Enrollment EDMS product suite, manufactured by Highland Software
Oracle					Business Analysts have ability to write the rules Partnerships with other vendors but do not have viable MMIS Strong Enterprise Architecture COTS product

Integration Requirements for the Procurement Components

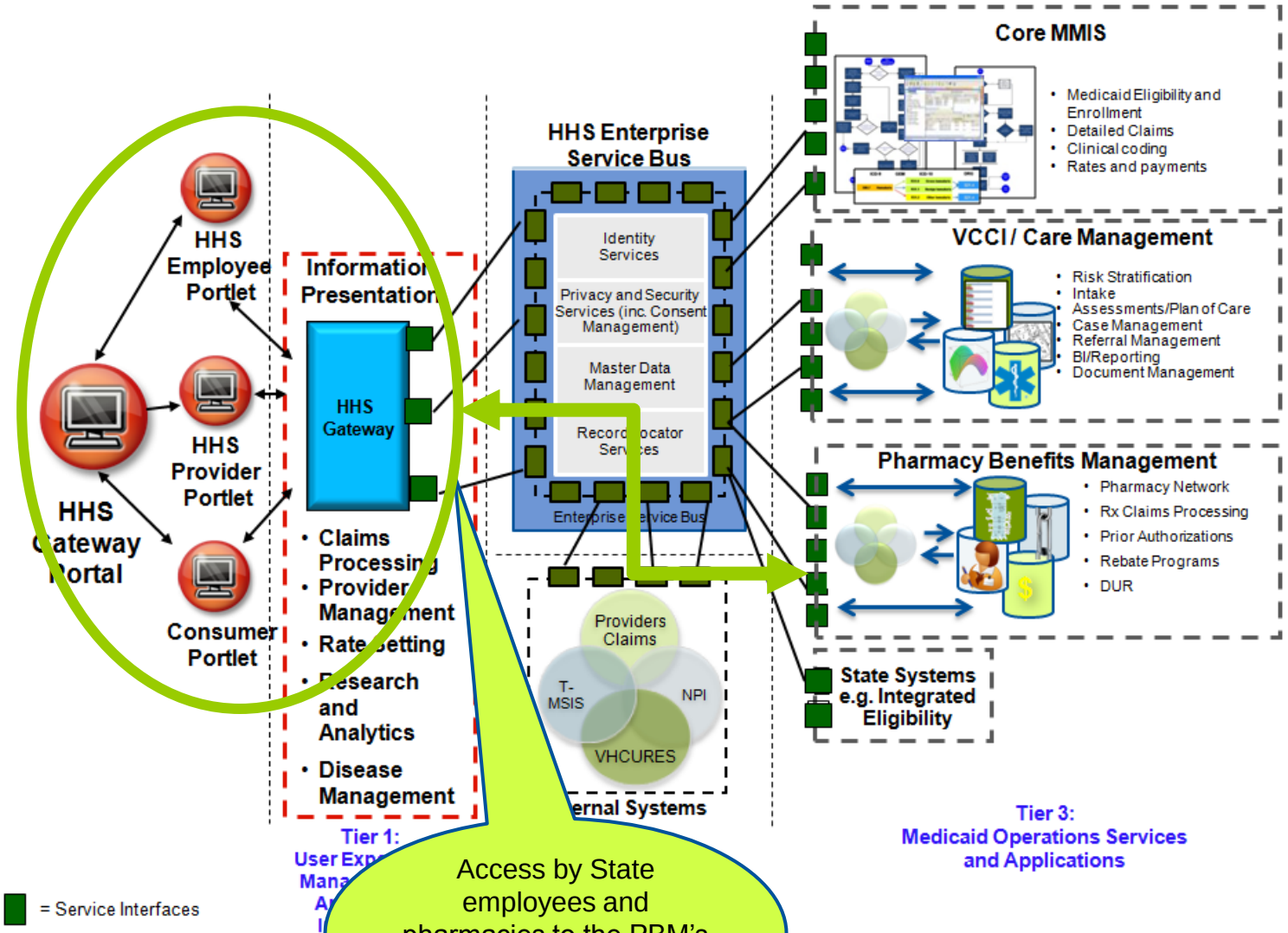
Integration Requirements
Pharmacy Benefits Management



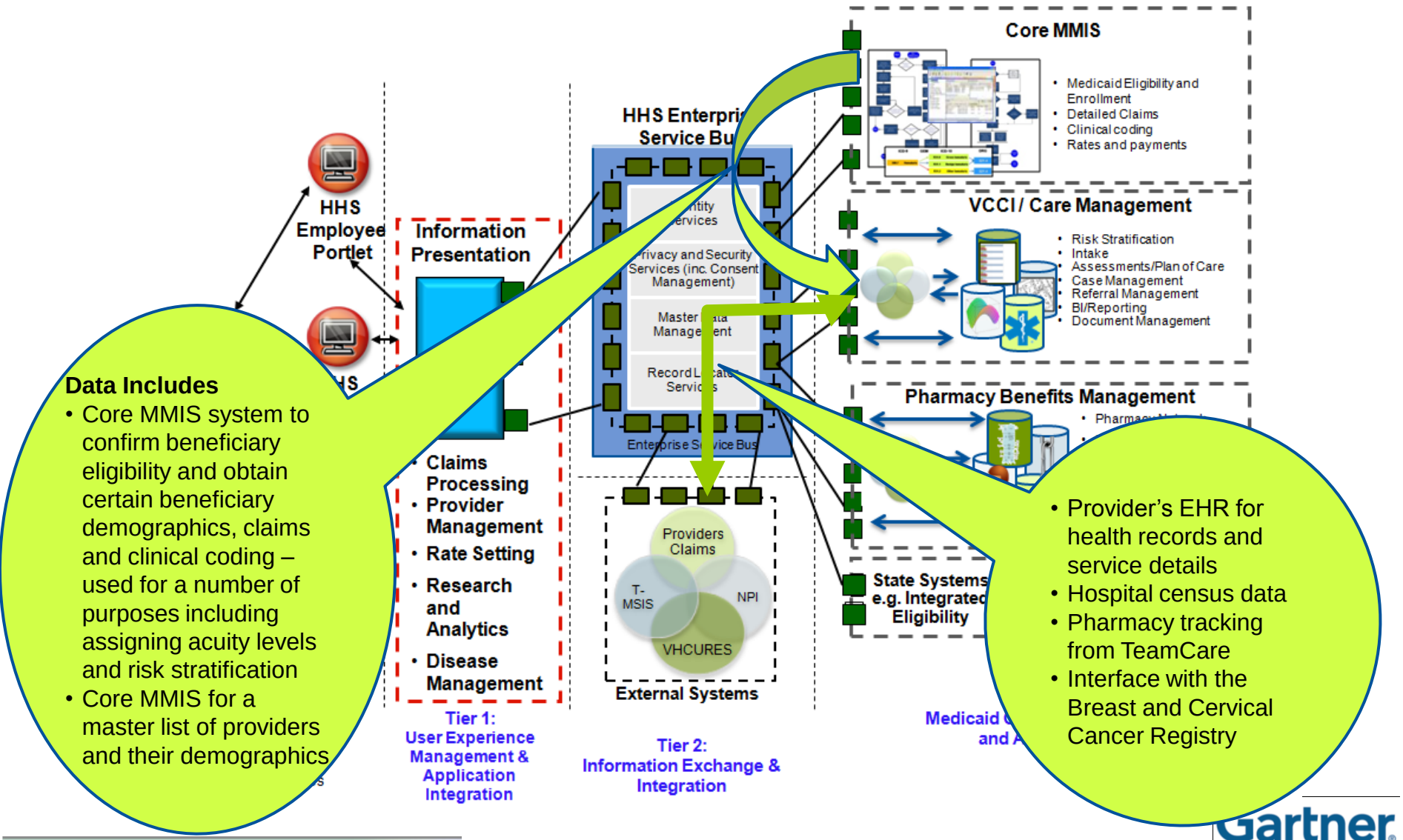
Integration Requirements
Pharmacy Benefits Management (cont'd)



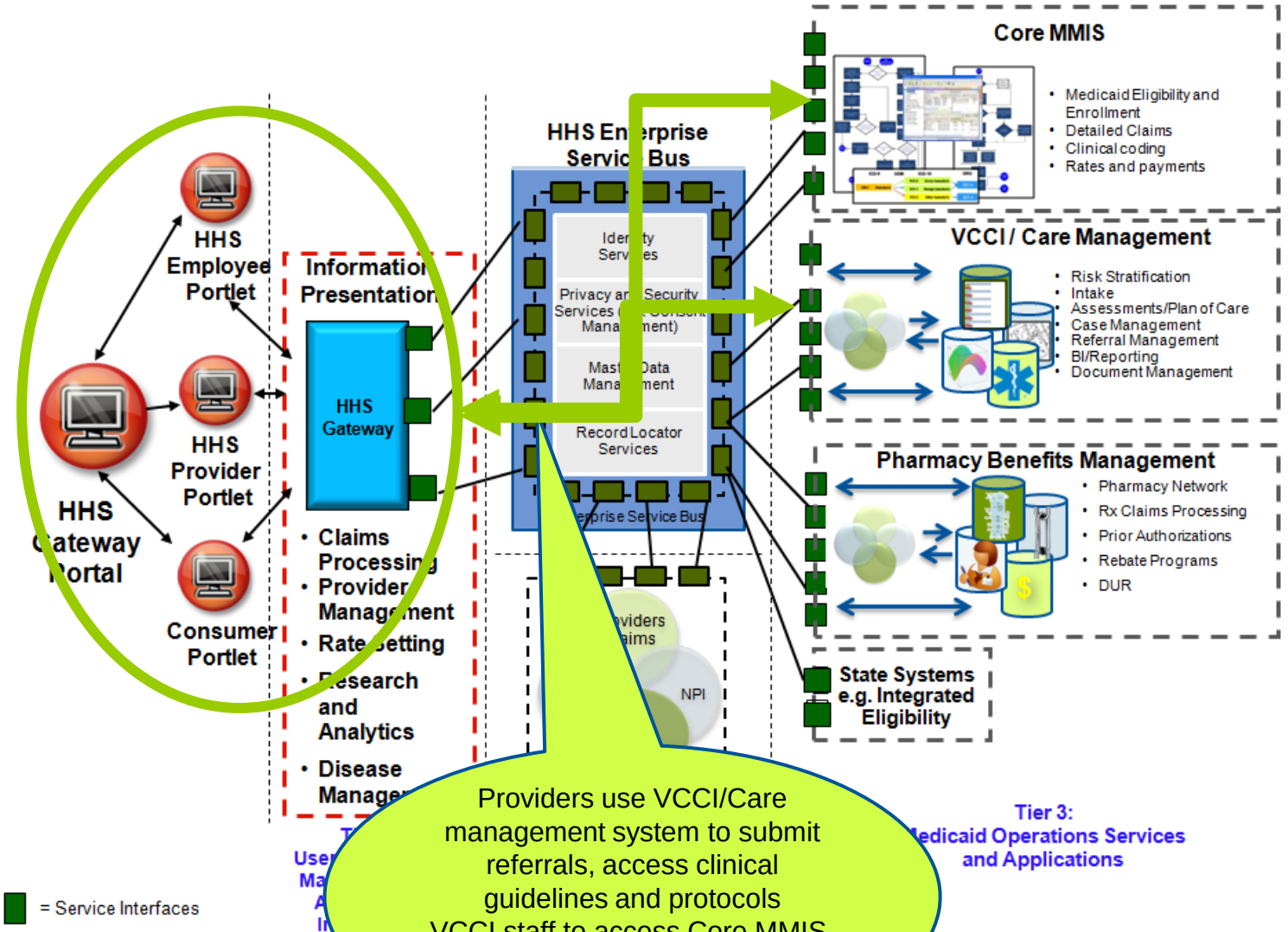
Integration Requirements
Pharmacy Benefits Management (cont'd)



Integration Requirements
Care Management

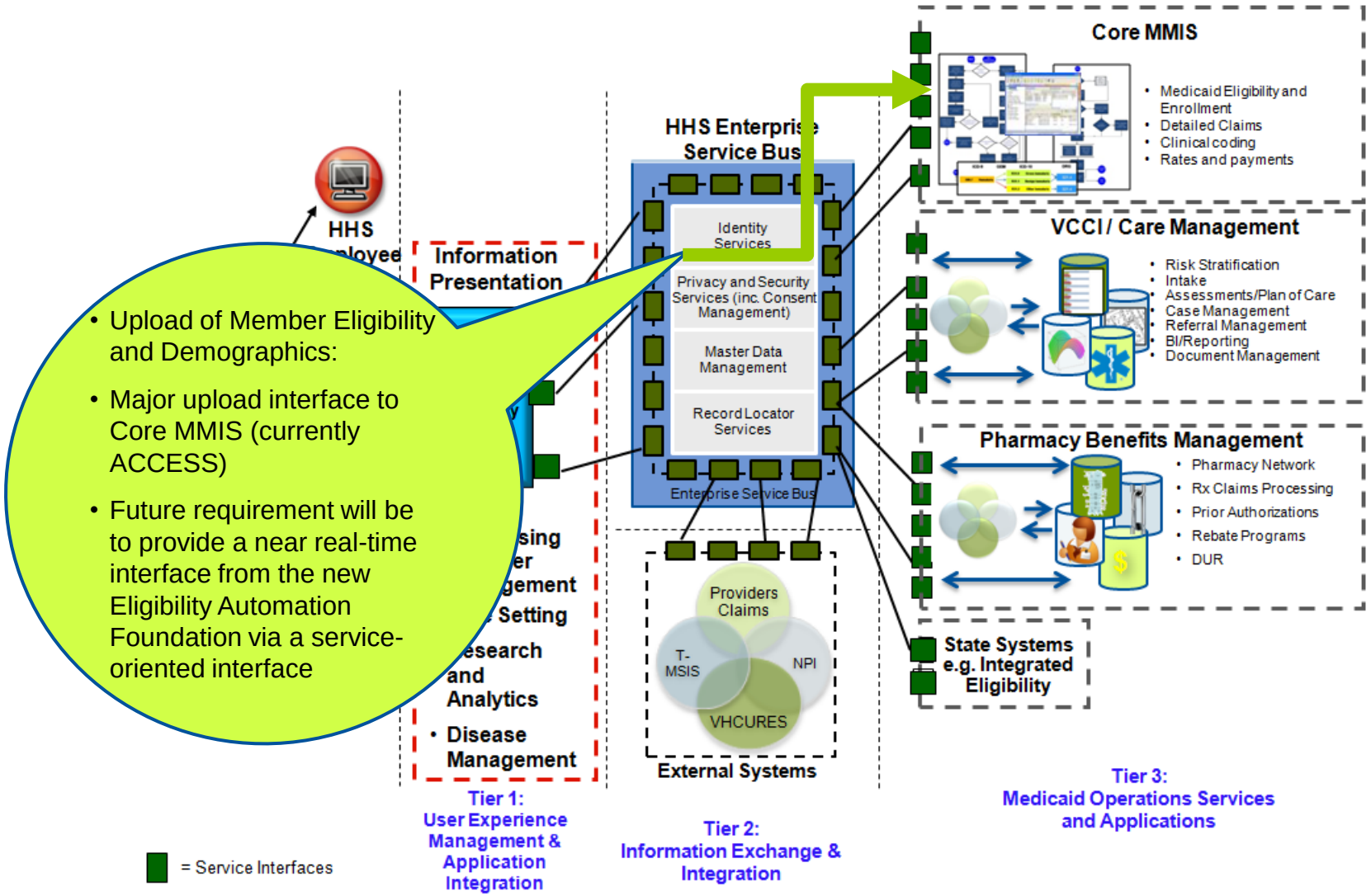


Integration Requirements
Care Management (cont'd)



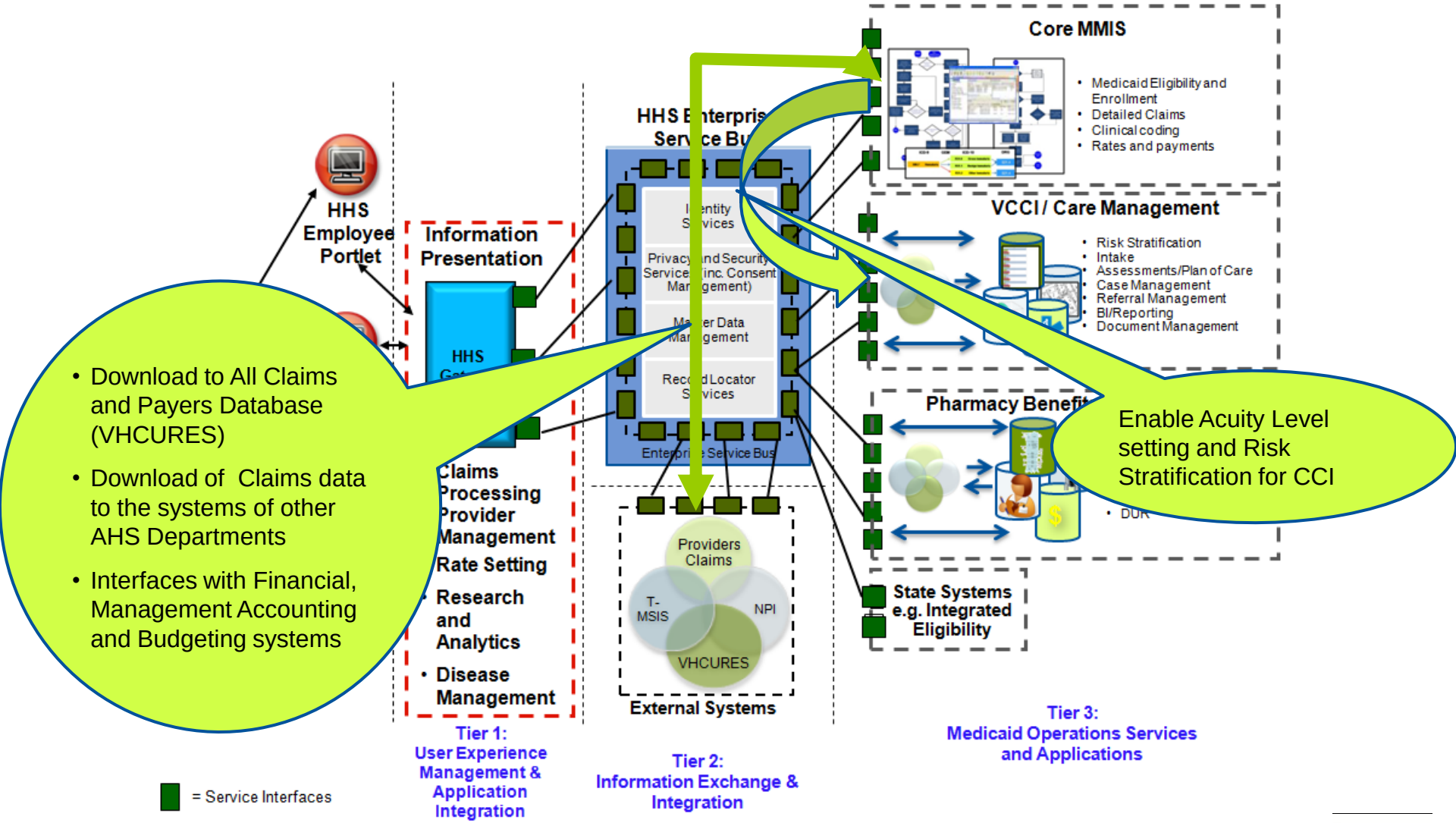
Providers use VCCI/Care management system to submit referrals, access clinical guidelines and protocols
VCCI staff to access Core MMIS, other VT Systems and patient education database

Integration Requirements
Core MMIS



- Upload of Member Eligibility and Demographics:
- Major upload interface to Core MMIS (currently ACCESS)
- Future requirement will be to provide a near real-time interface from the new Eligibility Automation Foundation via a service-oriented interface

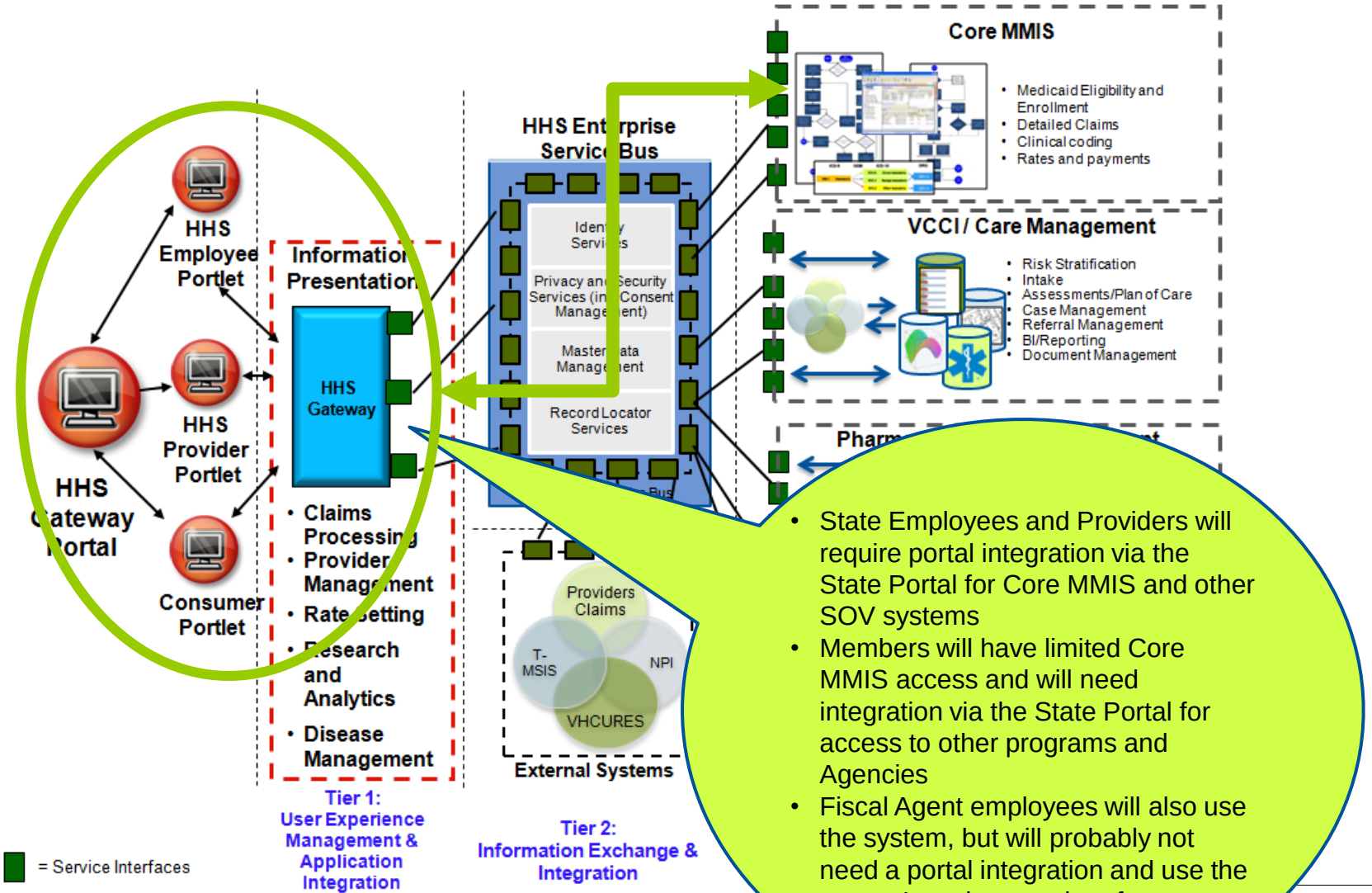
Integration Requirements
Core MMIS (cont'd)



- Download to All Claims and Payers Database (VHCURES)
- Download of Claims data to the systems of other AHS Departments
- Interfaces with Financial, Management Accounting and Budgeting systems

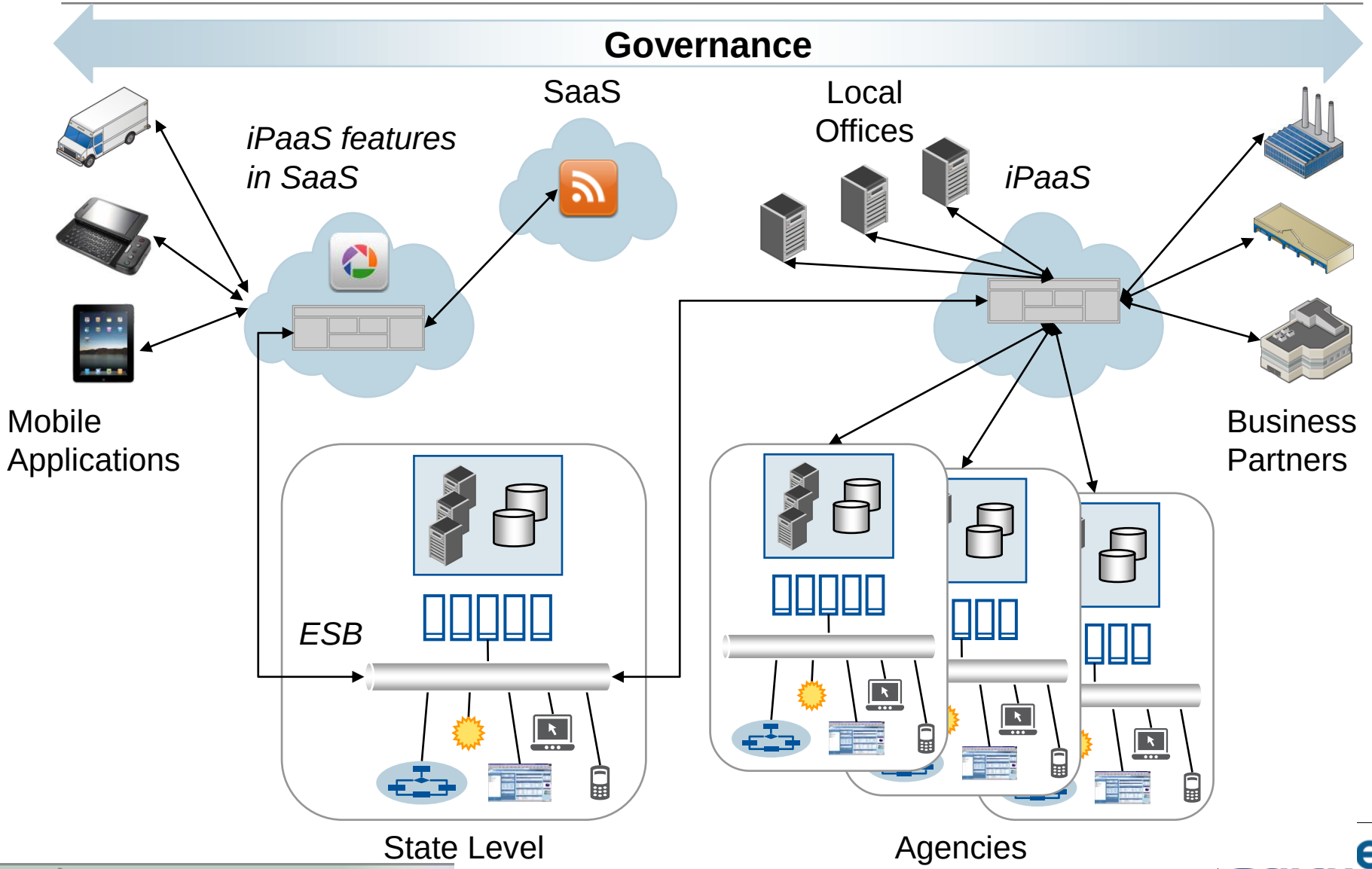
Enable Acuity Level setting and Risk Stratification for CCI

Integration Requirements
Core MMIS (cont'd)



- State Employees and Providers will require portal integration via the State Portal for Core MMIS and other SOV systems
- Members will have limited Core MMIS access and will need integration via the State Portal for access to other programs and Agencies
- Fiscal Agent employees will also use the system, but will probably not need a portal integration and use the system's native user interface

VT's Integration Architecture Evolves - Hybrid and Distributed



Enterprise Integration and SOA Governance are Critical

Decision	Responsible	Accountable	Consulted	Informed
Which interfaces /services to do?	Enterprise architects, data architects, application developers	Enterprise architects	Application owners, application managers, security experts, database experts	All ICC staff
Which interfaces/services to do first?	Enterprise architects, data architects	Enterprise architects, ICC internal marketing, ICC manager	Application owners, application managers, security experts, database experts	All ICC staff, integration project owner
Is this really a new interface/service, or is it an extension of an existing one?	Enterprise architects, ICC administration, application developers, integration project owner	Enterprise architects, ICC manager	Application developers, security experts, database experts	If a new interface is agreed on, all ICC staff; if not, the owners of the interface that will be extended
Who will pay for the development and maintenance of the interface/service?	Enterprise architects, application developers, application owners, IT budget committee	ICC project sponsor, IT budget committee	Application owners, application managers, security experts, database experts	Application developers, interface owner
Who owns the interface/service?	Enterprise architects, data architects, application developers	Enterprise architects, data architects, application owners	Application owners, application developers, operations, security experts, database experts	All ICC staff

Combined SOA and Integration Competency Center for the HSE Platform

- Vermont Needs to master five high-level categories of technical and operational integration competencies:
  - Basic — Functional integration capabilities. Includes connectivity, adapters, data quality and security, which are primarily related to essential integration "plumbing."
  - Extended — Additional functional integration capabilities that are layered over or used to enhance basic functional integration capabilities. For example, data federation, application services governance and analytics enable IT leaders to drive more value from integration projects
  - Infrastructure — Refers to matters of architecture and technical coherence, in particular, the degree to which the organization shares and/or federates infrastructure across domains.
  - Organizational — Revolves around how IT and lines of business (LOBs) organize to support integration projects and, in particular, to what degree companies have defined a corporate strategy and established a center of excellence (COE) for integration, sometimes called an ICC
  - Sourcing — Focuses on how the organization procures integration functionality in terms of flexibility (e.g., the decision to use software or services) and procurement efficiency (e.g., well-defined, reusable RFPs)
- Recommendation is to combine this with the already identified Service-Oriented Architecture Competency and Governance Process defined in the IE and HESP RFP

Recommendations For “Sourcing Model” and “Solution Style” By Component

Developing NFRs Based on the Sourcing Model and Solution Style

- Based on the available solutions in the marketplace, Gartner will assist VT in defining the NFRs at the appropriate level for each of the required procurements
- In the following slides, Gartner and VT will determine the sourcing model and the most likely solution style based on the information discussed during the workshop today

- Answers to the following three questions will help define the "Solution Style" for each of the Medicaid Operations Solution Procurement components:
  1. **Sourcing Model**: one of the nine most common Gartner models
  2. **Hosting Approach**: e.g. State Data Center, Remote Managed Hosting at CGI, Remote Managed Hosting at Vendor's facilities, Private Cloud at Vendor's facilities, etc.
  3. **HSE Leverage**: one of the five models listed below

- The possible models for leverage of HSE are:
  - *A. Build functionality on HSE Platform using Oracle Siebel CRM PS COTS Application*
  - *B. Build Functionality on HSE Platform using Oracle OBIEE*
  - *C. Build functionality on HSE Platform using Oracle COTS Middleware*
  - *D. Integrate with HSE Enterprise Service Bus and End Use Portal, and leverage as many technical components as possible (e.g. Oracle RDBMS, Oracle IDM, Oracle WebCenter Content, OBIEE etc.)*
  - *E. Integrate with HSE Enterprise Service Bus only*

Anticipating “Solution Style” to Determine Appropriate NFRs for RFP

- Core MMIS – The solution will be integrated via the on premise Cloud Services Broker infrastructure
  - Sourcing Model: Multisourcing
  - Hosting Approach: Remote Managed Hosting at Vendor’s Facilities
  - HSE Leverage: Model D with BI: Model B
- Care Management – Possibility to build on existing HSE Platform solutions such as Siebel or use a BPaaS or SaaS solution that is integrated with the Vermont CSB platform
  - Sourcing Model: Sourced from one or more vendors
  - Hosting Approach: Combination of vendor hosting of Care Management platform (possibly SaaS) integrated with HSE functionality via CGI Remote Managed Hosting
  - HSE Leverage: Model A or D
- Pharmacy Benefit Management – BPO with standard APIs back to Vermont Cloud Services Broker infrastructure, while ensuing compliance with security and performance standards
  - Sourcing Model: Multisourcing
  - Hosting Approach: Remote Managed Hosting at Vendor’s Facilities
  - HSE Leverage: Model D

Anticipating “Solution Style” to Determine Appropriate NFRs for RFP (cont’d)

- Cloud Services Broker – Vermont should ask the vendors to propose the development, deployment, and management of the required processes, resources, and standards to manage all new integration for a period of 2 years past the full deployment
  - Sourcing Model: Multisourcing
  - Hosting Approach: Remote Managed Hosting at CGI Facilities
  - HSE Leverage: Model C

Appendix

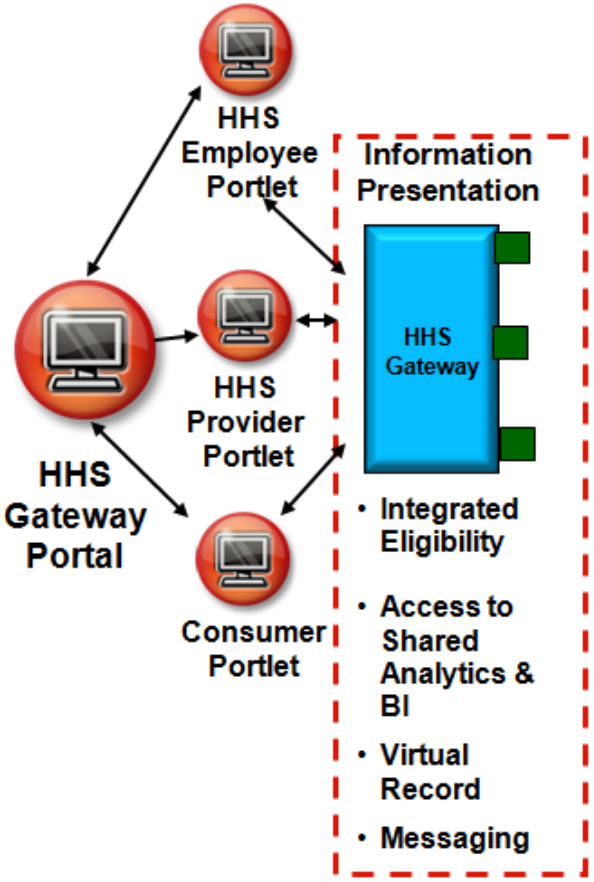
HSE Platform Standards in the Context of Industry Trends

Solution Architecture Components

End User Portal

Technical Requirements Development Approach
User Interface and Portal Technologies

- This section is intended to discuss and develop a comprehensive picture of the platform and technical requirements of the user interface and presentation layer derived from the Solution Pattern:
  - Portal Technical Requirements
    - User Interface requirements, Functional Requirements summary, and identification of relevant Portal functions, services and potential use cases for different types of stakeholders
    - Overview of market offerings and technology capabilities
    - Discussion of Architectural and Design Principles and implications
    - Role within the Solution Architecture



VT HSE Platform - High Level Functional Requirements for Portal Capabilities
Based on Workflows and Use Cases

- User Interface and User Experience Management
  - Unified Access for HHS users of the HSE Platform
  - Client and Provider portals for accessing self-serve capabilities
- Access Control
  - Single Sign On for users
- Integration, Collaboration and Communications
  - Application Access – Access to Integrated Eligibility and Shared Analytics
  - Integration – View Virtual Client Record based on information from various source systems
  - Team Collaboration – Enable shared case notes
  - Workflow Management – Enable the referral management process
  - Correspondence Management – Enable secure messaging between individual providers and groups of providers
- Document Search capability

HSE Platform Portal

What can Portal Technologies do for the VT HSE Platform?

- Portal
  - Horizontal portal – best for G2E (Employee Portal)
  - Can be used effectively for G2C & G2G
- Team Collaboration
  - Team sites, task management, wikis, blogs, discussions and profiles
  - Document library services (version control, document-level security, enforced check-out)
- Application Access
  - Enhanced user experience
  - Streamline and integrate system touch points
- Content Management
  - Federated search
  - Web Content Management, especially for intranets.
- Workflow Management
  - Automate workflows in bureaus and divisions with addition of 3rd party Business Process Management (BPM) functionality
  - Automate knowledge worker workflows within and across Vermont HHS divisions
- Case Management
  - Add Case Management capabilities to public health clinics
- Correspondence Management
  - Manage ad hoc processes around correspondence management

Inside vs. Outside: Difference in Requirements

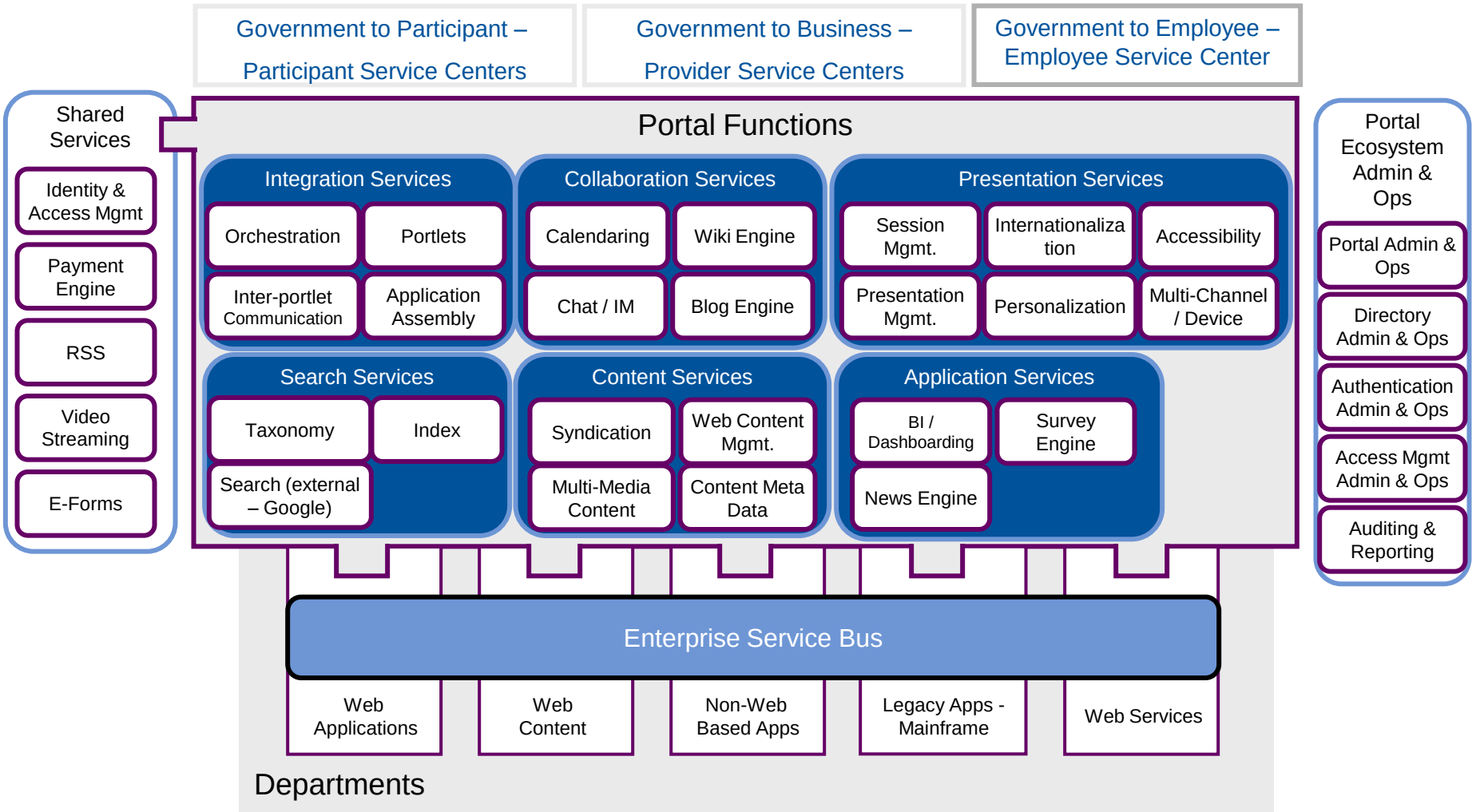
Internal-facing Portal

- Must integrate with Microsoft Office documents
- Must connect to enterprise directory
- Must provide access to core business applications
- Content can be high volume
- Simple personalization by role
- Customization can be deep
- Security is external to package
- Platform compatibility can be important (deal breaker)
- An overall goal: improve staff productivity

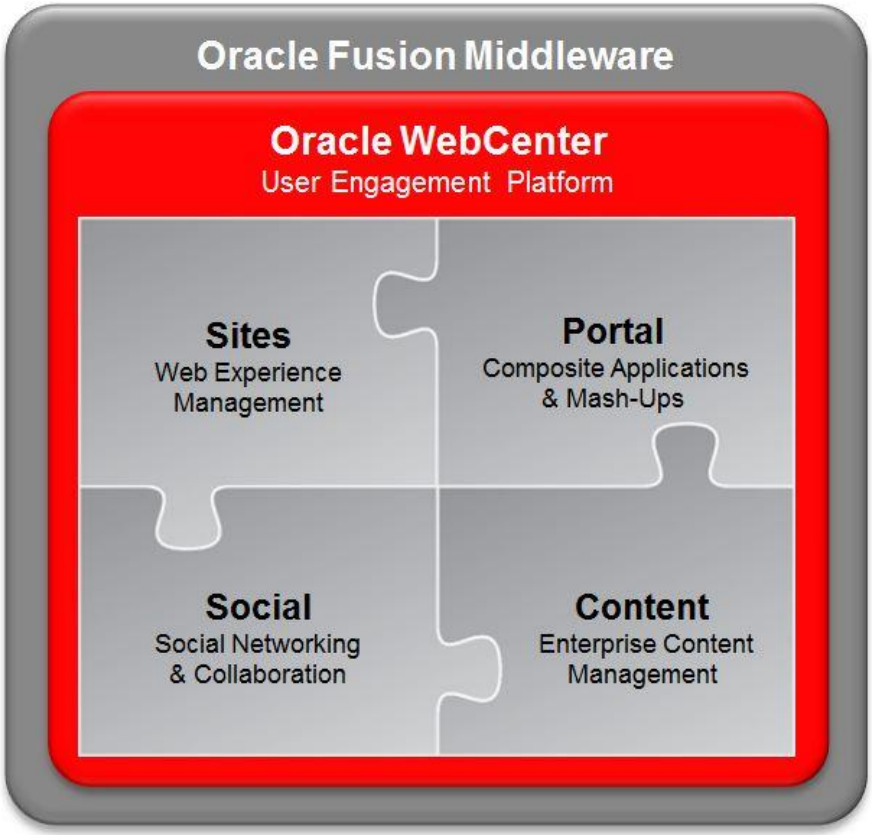
External-facing Portal

- Often stand-alone rather than integrated with back-end systems
- Identity management is often embedded
- Access to business applications may be mediated
- Content must be high quality
- Implicit personalization is key
- Security is embedded, in part
- E-commerce, merchandising, cross-sell and upsell
- E-mail marketing alignment
- Goal: customer retention, service enhancement

Reference Architecture
Portal Functional Domains



Oracle WebCenter – A Vision of Convergence



- Oracle's entry in the UXP game is Oracle WebCenter. WebCenter is the strategic UX framework (they call it a 'user engagement platform') for Oracle and will provide the front-end for the new generation of Oracle Fusion Applications, with initial apps to be delivered in 2011.
- Oracle has a myriad of portal products that they have obtained mostly via acquisitions. One of the concerns expressed by Oracle customers is the six portal products in the Oracle portal portfolio. However, Oracle has been clear that WebCenter is the only strategic offering, and has recently announced a strategy of convergence between the portal products in their portfolio.
- WebCenter features Web, portal, RIA, composition, content, collaboration and social capabilities. WebCenter also features integration with Oracle's mobile offerings.
- WebCenter will be strategic for customers of Oracle applications. However, many other users lean on the Oracle Fusion Middleware (OFM) middleware stack, where the presentation layer is WebCenter.

Horizontal Portal Magic Quadrant

User Interface and Portal Technologies
Oracle WebCenter

Strengths

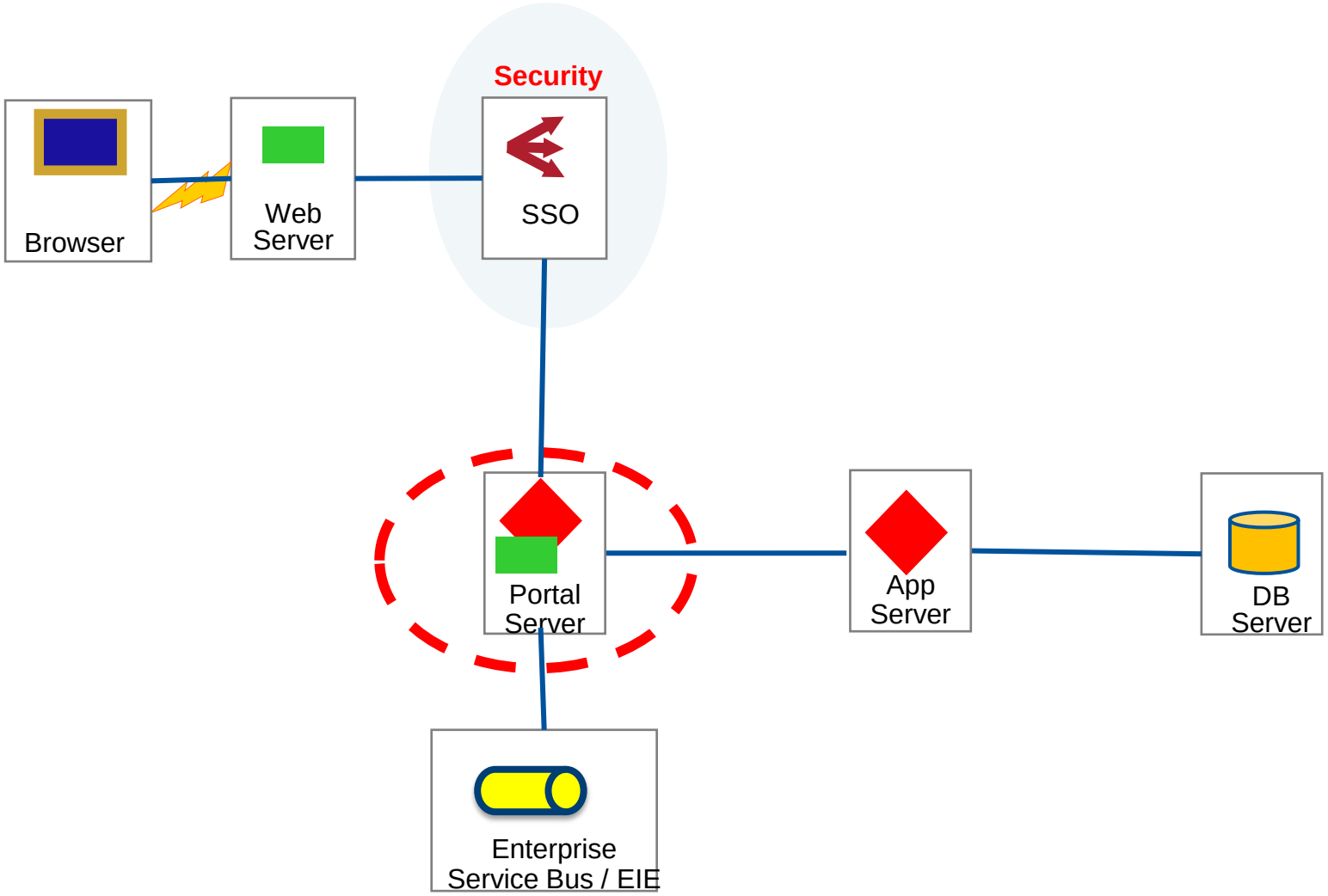
- Oracle WebCenter can leverage more go-to-market angles and appeal to more IT and business audiences than most smaller competitors. In addition to appealing directly to portal requirements, it can leverage its traditional security, database and middleware strengths; its presence in a variety of core business applications (human capital management [HCM], ERP, CRM, supply chain management [SCM], business intelligence [BI]), commonly integrated with portals; its vertical strengths in utilities, retail, healthcare and life sciences; and its acquired heritage supporting customer-facing websites and other content management implementations. Also, Oracle WebCenter provides the UXP for Oracle Fusion applications.
- In recent years, Oracle has made considerable progress in defining, communicating and adhering to a coherent strategy and road map for its portal and UXP customers and prospects. Customers are showing less confusion about the stated path and they are no longer hearing mixed messages from the Oracle organization. This clarity of message is instilling more confidence in Oracle as a strategic provider of portal, content management and related capabilities.
- Oracle is the only one among the large providers to be deemed a Leader in both the Magic Quadrant for Horizontal Portals and the Magic Quadrant for WCM markets. Oracle is also present in the Magic Quadrant for Enterprise Content Management.

Cautions

- Recently, Oracle has placed strong emphasis on Web engagement management (its WebCenter Sites product is chiefly focused on B2C website and digital marketing initiatives) and, by comparison, its message to companies seeking B2E and B2B solutions seems muted. While we've criticized others for not having enough focus on this market opportunity, Oracle may be swinging too far in the other direction. Moreover, although Oracle exhibits leadership in both the portal and WCM markets, the integration between its products is still under way.
- Gartner client activity suggests that a subset of Oracle portal customers, especially those using legacy portal products, are considering moving toward competitive solutions, rather than pursuing the path toward Oracle WebCenter. Concerns cited include cost of development, with some customers required to reskill staff to support WebCenter's somewhat specialized standards and methodologies. While the bulk of the outflow occurred in the year after the acquisition, among BEA AquaLogic User Interaction customers who were committed to the .NET platform, a small, but steady outflow remains.
- Oracle lags behind other Leaders in enterprise collaboration and social initiatives that are often part of a broad portal strategy. The BEA acquisition brought to Oracle some innovative technologies and concepts (based on the Plumtree Software product line) that were unmatched at that time in the market. However, Oracle did not leverage these properties to attain a solid foothold in enterprise social computing. The Oracle Social Network is the latest attempt and it's a fledgling effort and not yet widely adopted. Customers don't typically associate the Oracle brand with social or collaboration capabilities.

Draft “To Be” Enterprise Technology Architecture

Illustrative Portal Pattern with Single Sign On (SSO)



Draft "To Be" Enterprise Technology Architecture

Draft Portal Pattern with Single Sign On (SSO)

Architecture Pattern Description: VT HSE Platform Portal Pattern with SSO		
Architecture	**Sample Architectural Layers**	■ Presentation: Browser ■ Web Server: Oracle WebLogic ■ Portal server: Oracle WebCenter ■ Application server: Oracle WebLogic
	Recommended Technology Standards	■ COTS – Oracle WebCenter
Guidelines	**Solution Component Guidelines**	■ Use Portal pattern to provide application integration at the UI, Personalization and Consistent User Experience ■ Use the Portal pattern to combine multiple disparate Web-Based UIs that need to be combined into a consistent, personalized user experience. The pattern applies equally for G2E, G2C, G2B, and G2G scenarios ■ Portal Server must host the Service implementations to ensure availability and reliability, especially as service reuse and dependencies proliferate.
Use Cases	**Where to Use**	■ Adapt the portal to integrate and aggregate information from multiple cross-enterprise applications, as well as Program tools and applications. ■ G2B (Contracted Providers and Trading Partners), G2E (Employees) and G2C (Consumers)
	Use Cases	■ Client Scheduling, View Alerts and Notifications, Access Application via Self-Service

Assessment of Software Products
Portal Technology

Current HSE Technology Standard: **Oracle WebCenter Portal**

VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and AHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
Oracle WebCenter						
Access Control	High	Medium	High	High	High	Low
User Interface	High	High	High	High	High	
Search	High	High	High	High	High	
Integration Collaboration and Communications	High	High	High	High	High	
Document Management	High	Low	High	High	High	

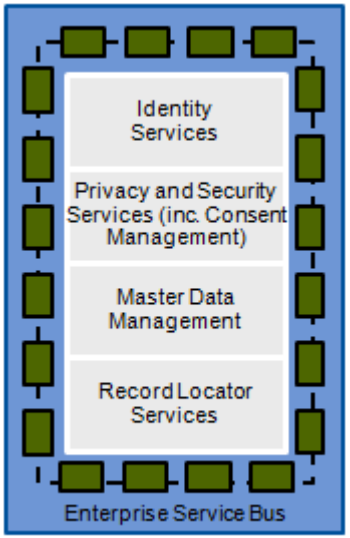
Solution Architecture Components

Enterprise Service Bus

Technical Requirements Development Approach
Enterprise Service Bus Technologies

- Enterprise Service Bus Technical Requirements
  - Review of required integration functionality
  - Discovery Services
    - Integration infrastructure
    - Master Data Management (MDM) and Master Indices (Master Person Index, Master Provider Index)
  - Security Management
  - Consent Management

HHS Enterprise Service Bus



VT HSE Platform Enterprise Service Bus – Discovery Services

- **Data Integration Server**– The data integration server is responsible for message routing, message mapping, data transformation, protocol bridging, orchestration, end to end tracking, and legacy systems' connectivity.
- **EMPI** – Enterprise master person index (EMPI) will link client activity using the minimum necessary data to identify clients/patients positively and helping eliminate duplicate or incorrect client records, using sophisticated technology. The central EMPI application must cross-link the client's identity to the EMPIs used by the local systems
  - "Sound-alike" Search; Probabilistic Record Matching; High Availability; Active and Passive Matching Workflow; Tunable Record Matching; Probabilistic Record Matching should be some of the characteristics of a robust EMPI application
- **Master Provider Directory** – The Master Provider Directory will be used to identify contracted providers who have agreed to the standard terms and conditions for use of the VT HSE Platform in a manner that protects client rights and maximizes data security.
  - The Directory will include information about licensed/certified providers, hospitals, day care centers, community homes, payers, pharmacies, laboratories, etc., such that sending entities have enough information about the receiving entity to make an appropriate determination for data exchange
- **RLS** – The RLS will provide authorized users with pointers to the location of a client's information across network nodes (e.g., the clinical data sources).

VT HSE Platform Enterprise Service Bus – Consent Management

- **Federal Laws** – Certain federal laws and regulations that affect the exchange of health and human services information.
  - Although there should be few instances of conflict among these laws, any conflicting statutes need interpretation to achieve compliance with each regulation.
- **Vermont Law** – Does Vermont have any privacy rules that go beyond the federal requirements and therefore need to be enforced through the VT HSE Platform infrastructure
- **Patient / Client Control** – The system must allow the patient / client to define at a granular level the type and duration of access to any protective information

VT HSE Platform Enterprise Service Bus – Security Management

- **Role-based access and User Provisioning** — Technology component that enables what information a particular user is authorized to access.
  - Users' access rights are usually based on what roles they play in the enterprise and/or what groups they belong to for external entities
- **Authentication of user identities** — Technology component that verifies the identities of those seeking to access client data. Must include strong authentication supported by an appropriate infrastructure for identity and access management.
  - Two factor authentication (something that the user has, such as a smart card, combined with something the user knows, such as a password)
  - Biometric approaches such as fingerprint scanning are even more convenient but not yet reliable enough
- **Logging of activity** — For financial, operational, and legal reasons, the EIE will need to record all activities in a log, which must be searchable to allow administrators to identify any abnormal pattern of activity.
  - Ideally, the EIE would include a capability to monitor activity continually according to a set of pre-defined rules, and to notify administrators when abnormal activity is detected

VT HSE Platform Functional Requirements for Enterprise Exchange Capabilities
Based on To-Be Workflows and Use Cases

- **Discovery Services**
  - Interface to existing systems
    - Real time access to information stored in program specific source systems
  - Master Person and Provider Index
    - Search and identify clients within the VT HSE and across program specific source systems
    - Real time access to client demographics and client records
    - Access to provider directories
  - Record Locator Service
    - Search for client clinical or case documents in VT HSE Platform and program specific source systems

- **Security Management**
  - Role based access control to VT HSE Platform functionality and data
  - Real time validation of user access and authorization to view client records that require consent

- **Consent Management**
  - Tracking of client consent through a consent registry
  - Management of provider access rights within the boundaries of client consent

Discovery Services: Data and Application Integration

Enterprise Service Bus

Data Integration Categories

- Data integration software is essential to an agile enterprise. This type of infrastructure software, can be divided into three categories:

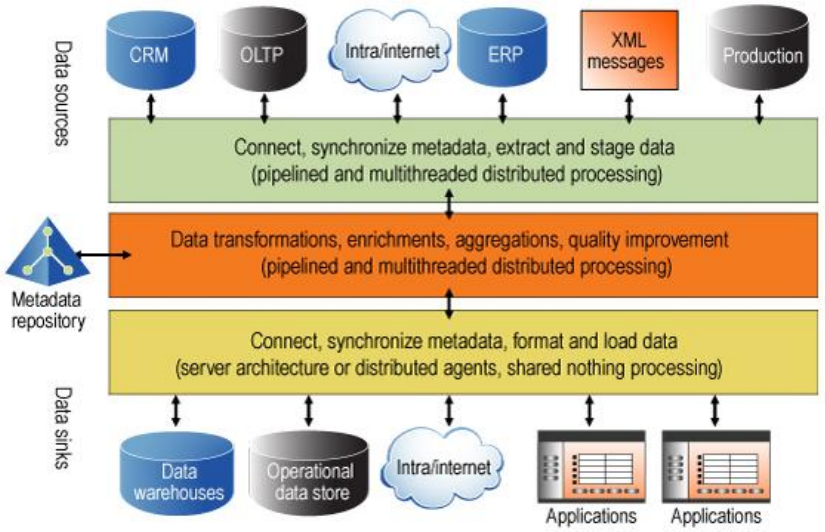
  - **Extract, transform, and load (ETL)** tools that primarily are used to integrate business intelligence data

  - **Enterprise application integration (EAI) and enterprise information integration (EII),** by which applications access different (federated) data stores using a common query language

  - **Data services platforms (DSPs)** that define a layer of data abstraction for integration in a service oriented architecture environment

ETL Tools Functionality

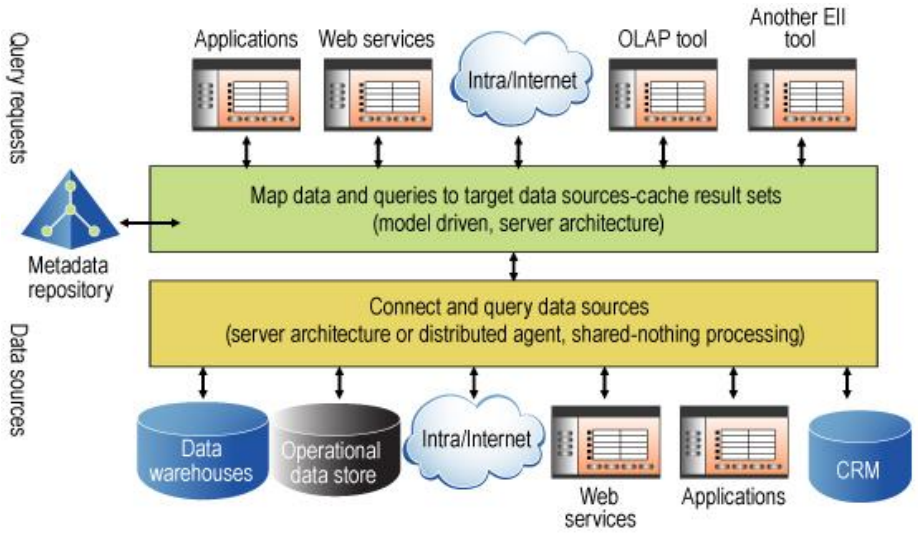
- ETL tools provide support for the following capabilities:
  - All provide facility for run-time data transformations
  - All provide read and write connectivity to multiple databases
  - All provide for automated metadata discovery
  - Most are metadata and model driven with cleanly separated concerns



  - Most offer data profiling (i.e., the number of unique values in a data field), quality (i.e., the error rate in a data field), and enrichment (i.e., additional data like demographical information about customers)
  - Most are used for loading data warehouses and data marts
  - Many use graphs to model transformations
  - Many provide integrated development environments (IDEs), typically Eclipse
  - Some process real-time and batch, just real-time, or just batch
  - Some provide good support for data governance and security policies
  - Some support compliance tasks well; for example, audits, versioning, and traces
  - A few permit ETL metadata to be accessible using O/JDBC

EAI and EII Tools Functionality

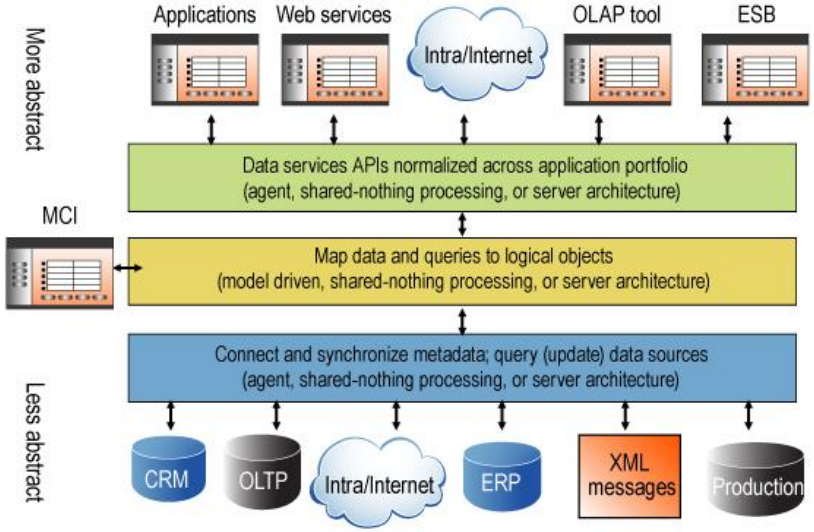
- EAI and EII tools provide the following capabilities:
  - All provide means of mapping data elements into a common element
  - All provide connectivity to query databases, relational, legacy, and XML
  - All provide Web Services Framework (WS-*), Structured Query Language (SQL), and custom data access protocols



  - Most are metadata and model driven with cleanly separated concerns
  - Most provide messaging connectivity; Java Message Service (JMS), IBM Message Queue (MQ), and Microsoft Message Queue (MSMQ)
  - Most provide data transformation and profiling
  - Many uses graphical models to code transformations
  - Many provide integrated development environments (IDEs), often Eclipse
  - Some support data governance and security policies management
  - Some support compliance tasks; for example, audits, versioning, and traces
  - A few permit access to EAI/EII metadata using standard, direct-access protocols (i.e., Open Database Connectivity [ODBC] and Java Database Connectivity [JDBC])

DSP Tools Functionality

- DSP tools provide the following capabilities:
  - All provide connectivity to query databases, relational, legacy, and XML. Services also can be data sources (e.g., web service protocols (WS-*), Representational State Transfer [REST], and Uniform Resource Indicators.
  - All provide mapping of many data elements into a common element
  - All provide capability to define and manage data service APIs using standard protocols, WS-*, and service containers in .NET and Java



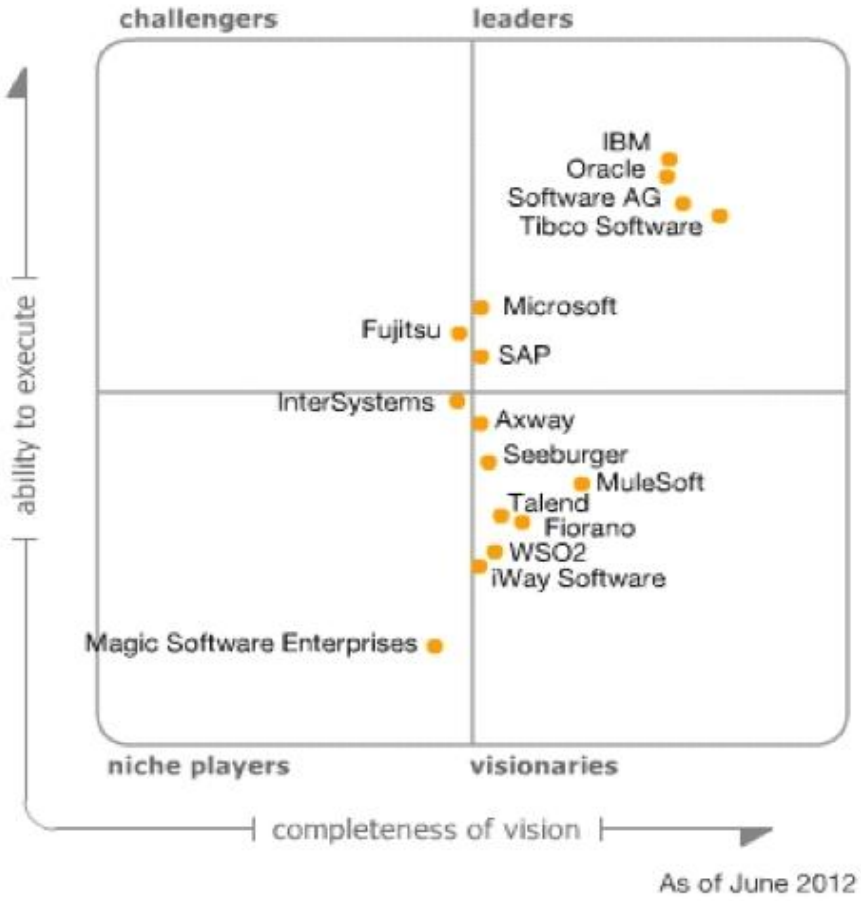
  - DSPs may serve as “mashup platforms” (e.g., use JavaScript with JavaScript Object Notation [JSON]). Illustrative vendors include JackBe, Denodo Technologies, and SAP NetWeaver Visual Composer.
  - Most model transformations using graphs and integrate into Eclipse
  - Most are metadata and model driven with cleanly separated concerns
  - Most provide messaging connectivity, including JMS, IBM MQ, and MSMQ
  - Most provide data transformation and profiling
  - Some support data governance and security policies management
  - Some support compliance tasks; for example, audits, versioning, and traces
  - A few permit access to metadata using O/JDBC

Data Integration Magic Quadrant

Market Scan: Data Integration Tools
External Market Scan – Oracle

- **Strengths**
  - Comprehensive functionality and alignment of offerings: Oracle's unified product development approach for data integration tooling as part of the Oracle Information Management Strategy offers breadth and depth of functionality and aligns to its broader portfolio of data management offerings. ODI provides capabilities for bulk/batch data movement, and Oracle GoldenGate centers on CDC and real-time data delivery. Oracle Data Service Integrator provides data federation/virtualization capabilities. These primary data integration products, along with the message-oriented functionality of Oracle WebLogic Suite, enable the vendor to support each of the major data delivery styles in this market.
  - Diversity of usage scenarios: ODI and Oracle GoldenGate continue to grow in adoption. References using ODI like its ease of use and standardization support of reusable artifacts to improve developers' productivity, aided by knowledge modules and model-driven management of extensible data flows and mapping. These customers also exhibit a mix of use cases and project types, with the vast majority using the tools in support of BI, operational data consistency and data migration. Oracle GoldenGate continues to be cited for its strength in enabling mission-critical data replication and synchronization in heterogeneous data and application environments. Aligning to demand, the 12c release of Oracle's product portfolio sets out to enhance product integration between ODI and Oracle GoldenGate's offerings, optimization of replication workload through in-memory management, and integrated usage of data integration tooling with data quality and MDM capabilities.
  - Wide leverage of application- and data-oriented customer bases: Recognition of Oracle as a comprehensive provider for potential data integration and other data management functionality requirements, such as data quality tools and MDM solutions, is cited as a key point of value for selecting the vendor's tools in this market. Oracle's ability to offer data integration tools in conjunction with broad application- and data-oriented solutions continues to create opportunities for adoption. Oracle leverages its market penetration, global presence and proven viability by cross-selling to its very large application, BI/analytics, DBMS and database appliance customer bases.
- **Cautions**
  - Product migration support: The increasing adoption of ODI as a replacement for OWB, due to OWB's end of life, is raising demand in enterprises for an easier migration path, and the difficulties of tool migration are cited as a significant challenge. In supporting existing usage and a phased migration path, runtime execution of OWB processes through the ODI console is anticipated in the upcoming release of ODI, while Oracle plans to make available a migration toolkit for supporting the migration of OWB artifacts to ODI.
  - Interoperability across products: Customers cited desires for greater metadata management support and simpler ways to achieve interoperability across Oracle's product set, in order to facilitate seamless use of multiple products to achieve a range of data integration functionality. Oracle's road map for increasing interchange capabilities that link data federation/virtualization tooling more closely to the rest of the product set represents an ongoing focus on tightening product interoperability. With the growing interest in virtualized provisioning of data (such as logical data warehouse architectures), requirements to seamlessly operate bulk/batch-style data movements with virtual federation approaches will require increased emphasis, although usage of Oracle's data federation/virtualization offering remains small relative to major competitors in this market.
  - Skills requirements and cost of ownership: A desire for better availability of skilled resources is cited as a challenge, to help address implementations, both in initial setup (particularly for complex projects) and in version upgrades and technical integration with other software in Oracle's product portfolio. Satisfaction with Oracle's pricing method and perception of value relative to cost are reported as relatively low, compared with most of its competitors. Concerns with increased efforts to interoperate multiple products generate perceptions of escalating implementation costs in achieving various required functionality.

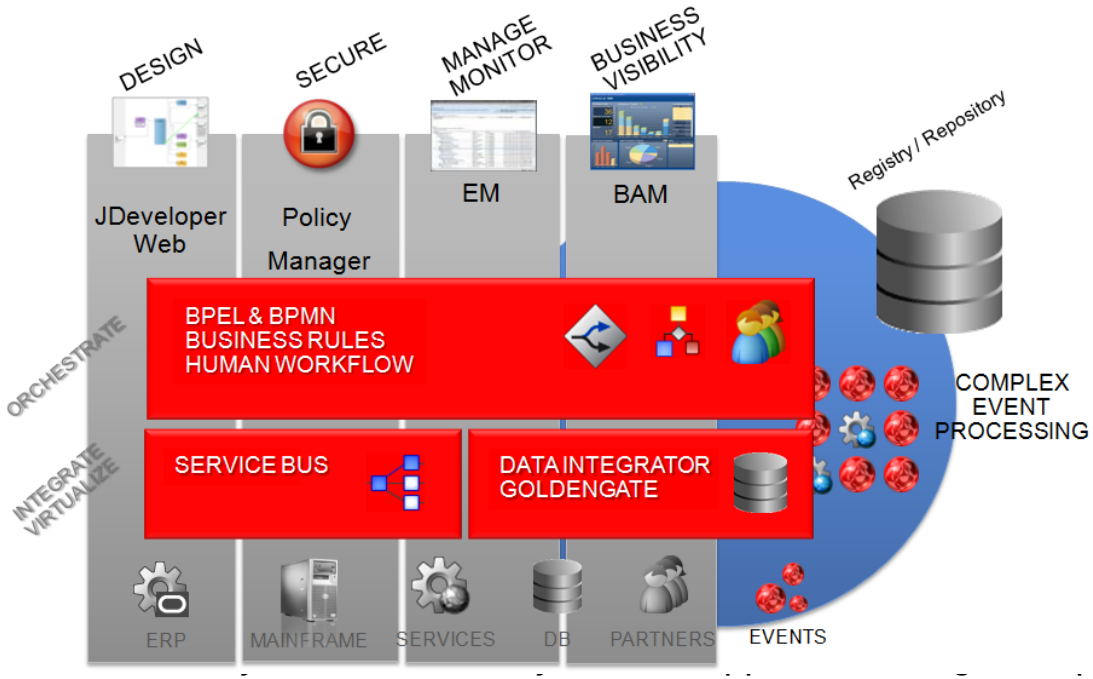
Gartner Magic Quadrant for Application Infrastructure
External Market Scan



Source: Gartner (June 2012)

Market Scan: Application Integration
External Market Scan – Oracle (Oracle Fusion Middleware – OFM)

- The evaluation of Oracle's position in this Magic Quadrant is based on the functionality provided by the OFM 11g family of products, which includes the Oracle SOA Suite



- Other Oracle p ojects include Oracle BPM and Oracle Enterprise Repository for metadata management, as well as Oracle WebLogic Suite (Oracle WebLogic Server, Oracle Coherence, Oracle TopLink, Oracle Web Tier and other components) providing Java EE-based back-end container, in-memory data grid, object-relational mapping and load balancing capabilities.

Market Scan: Application Integration

External Market Scan – Oracle (Oracle Fusion Middleware – OFM) - (cont'd)

- **Strengths**
  - OFM is a large business that positions Oracle as the second-largest application infrastructure middleware vendor in the market, according to Gartner 2011 market share data. The technology is supported by a vast network of partners.
  - OFM provides a comprehensive, integrated (a common development toolset, management environment, metadata services and runtime platform) and feature-rich application infrastructure offering that also provides leading technologies to support systematic application integration requirements, such as those incorporated in the widely adopted Oracle SOA Suite.
  - Oracle's vision for the evolution of OFM addresses key application integration technologies (e.g., Oracle SOA Suite optimization for Exalogic hardware, enhanced mapping [improved XML to non-XML and XML to JSON], MFT and ebXML Messaging Services v.3, Applicability Statement 3 [AS3] and Applicability Statement 4 [AS4] support), emerging requirements (e.g., cloud services integration) and delivery models (public cloud and vertically integrated systems).
  - Synergies with large Oracle Database Management System (DBMS) and packaged application businesses create opportunities for cross-selling OFM technologies to support application integration projects.
- **Cautions**
  - Some large and loyal OFM users, especially those accustomed to BEA Systems' support, report dissatisfaction with Oracle's support.
  - Some Oracle clients are experiencing licensing and pricing issues when upgrading from pre-11g versions of OFM, due to the change in the underlying application server (from Oracle Internet Application Server to Oracle WebLogic Suite) that sometimes results in higher licensing costs.
  - Although the Oracle B2B Integration product (part of Oracle SOA Suite) is a legitimate B2B gateway, it misses key features (supplier scorecard, campaign management and trading-partner self-provisioning) typically supported by leading products. Moreover, the company has no strategic focus on e-commerce B2B integration, and its track record in this market is limited, compared with that of B2B specialists or other application integration middleware providers.

Preliminary Assessment of Software Products
Enterprise Service Bus Technology

Current HSE Technology Standard: **Oracle Service Bus**

VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and AHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
Oracle Service Bus						
Message Routing	High	Medium	High	High	High	Medium
Message Mapping						
Data Transformation						
Standards Support						

Solution Architecture Components

Master Data Management

EMPI and MDM Technologies

- EMPI products are specialized versions of MDM products that focus on the person object. In "Different Approaches or Usage Patterns for MDM and Their Implications," Gartner describes four styles of implementation of MDM systems:
  - **Registry**. Used primarily where master data is created in a distributed fashion and remains fragmented across those systems with a central "indexing" service.
  - **Consolidation**. Used primarily where authoring is distributed, but a "consolidated" physical golden copy is created and stored centrally, then it is used to support business intelligence or data warehousing initiatives
  - **Coexistence**. Used primarily where authoring is distributed, but a physical golden copy is created and stored centrally, followed by publication to subscribing systems. This means that two copies of the golden copy "coexist"
  - **Centralized**. Where a physical golden copy of the master data is authored "centrally," either through workflow or transactional activity, and it is stored and accessed centrally
- In multi-enterprise settings that support cross-enterprise exchange of client data for care giving and quality assessment, ethical and forensic requirements compel the use of the registry approach. Multi-enterprise analytics may solve EMPI issues within centralized data repositories for transactional data and thus would be using the consolidation style

MDM Implementation Styles

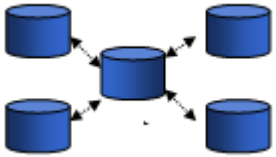
Consolidation

- **Ideal for reporting or analytics that reside in a BI/data warehouse**
- Non intrusive to the business
- BI is the business platform
- Any Industry
- Benefits dependent on success of BI strategy
- No attempt to clean up source data

Registry

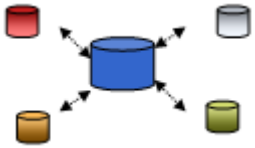
- **Large-scale distributed model**
- Nonintrusive of edge applications
- Emphasis is on remote data and application-to-application integration (lots of real-time network access)
- Distributed governance
- Faster to implement than coexistence and centralized

Coexistence



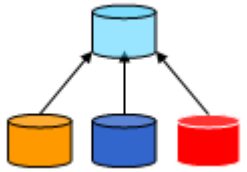
- **Low-control, autonomous environments**
- Largest change to information infrastructure
- Greatest need to mirror data
- Global and local governance
- Greatest risk over control, security
- Focused on shared services

Centralized



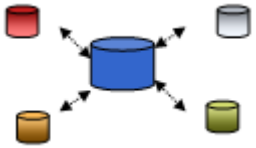
- **High-control, top-down environments**
- Largest change to application infrastructure
- Hugely invasive to the business
- Centralized governance
- Greatest control over access, security
- Focus on common services

MDM Consolidation Style for BI and Reporting



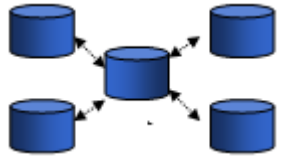
- Data validation based on a “System of Reference” and the source systems remain the author of the master data
- Federation using replication or physical consolidation with unidirectional data flow into the consolidated data set
- Processing occurs in batch or real time with data latency driven by events or batch processing
- Data quality controls in/at the master data repository
- Primary consumer is downstream: BI, Reporting and Dashboards
- Search complexity is relatively light
- Implemented with minimal changes to source systems

Operational MDM – Opposite Ends of the Spectrum



Centralized	Registry
Data validation based on a "**System of Record**" with master data authored by the central hub system	Data validation based on a "**System of Reference**" and the source systems remain the author of the master data
Physical consolidation with batch and real-time change propagation and all master data stored in the hub with inherent bidirectional data flow	Federation and real-time change propagation with the master data actually maintained in the source systems with only linking key held centrally with inherent bidirectional data flow
Processing occurs in both real time and batch with real-time data latency	Processing occurs in real time with data latency driven by events or batch processing in the source systems
Data quality controls at the master data repository	Data quality controls at the master data sources
Primary consumer is upstream: Operational and/or Analytical	Primary consumer is upstream: Operational and/or Analytical
Search is relatively simple	Search is very complex
Significant changes required for all source systems	Implemented with minimal changes to source systems

MDM Coexistence Style



- Really a hybrid of Registry and Centralized styles with validation based on a mixed system of Record and Reference where some master data is authored in the source systems and some in the master data hub
- Federation, physical consolidation and real-time change propagation with some data stored in the hub and some data remaining in the source systems with inherent bidirectional data flow
- Processing occurs in both real time and batch with mixed data latency
- Data quality controls at sources and master data repository
- Primary consumer is upstream: Operational and/or Analytical
- Complexity of searches vary from reasonable to very complex
- High level of complexity and risk with significant changes required for some source systems

Customer Data MDM Magic Quadrant

Market Scan: Customer MDM Tools
External Market Scan – Oracle

- **Strengths**
  - Oracle has a strong MDM portfolio covering multiple data domains and use cases: Oracle has a broad range of MDM assets which organizations can leverage to manage multiple domains and use cases. MDM is strategic for Oracle and it had a total estimated MDM revenue of $221 million in 2011. This represents a growth of 34% from 2010. We estimate that Oracle's 2011 revenue related to MDM of customer data was $103 million (versus $87 million in 2010), with Siebel UCM accounting for $76 million. Siebel UCM can be complemented by other Oracle MDM products, such as Oracle Product Hub, Oracle Supplier Hub, Oracle Site Hub and Oracle Hyperion DRM to enable management of multiple master data domains and use cases.
  - Siebel UCM is still the best selling product in the MDM portfolio: Siebel UCM is still Oracle's best selling solution for MDM of customer data and is the most important offering in Oracle's entire MDM portfolio on the basis of product revenue. It has continuing market momentum and benefits from significant R&D investment. UCM supports Oracle's CX strategy and the industry solution product lines for financial services, telecommunications, media, utilities, large-scale retail and government. UCM appeals to organizations, especially B2C organizations, with long-term strategic commitments to Oracle applications and technology — especially if they have Siebel CRM.
  - Strong momentum, verticalization and proven scalability: Oracle continues its success in selling Siebel UCM, and we estimate that Oracle had 285 UCM customers at the end of 1Q12. Siebel UCM has an impressive number of commitments from blue-chip names across geographies and industries, with particular strength in telecommunications, hi-tech and the public sector, and increasing strength in financial services. Oracle can provide a good number of references and UCM has impressive performance and scalability — including live transactional workloads managing more than 100 million consumers. Oracle has vertical industry variants of Siebel UCM, such as airlines, public sector social services, life sciences, healthcare, higher education and wealth management, either through its own developments or with partners.
  - Comprehensive functionality with increasing support for social CRM: Siebel UCM is a capable product with a comprehensive, prepackaged, verticalized and extensible data model. UCM has good data quality tooling, with Informatica's Data Quality technology as the lead offering. Siebel UCM supports SOAP-based Web services and GoldenGate real-time replication. It leverages the Hyperion DRM technology for hierarchy visualization and management and has embedded rule engine and privacy management functionality. For workflow, Siebel UCM leverages Siebel BPM and can also play a role in business processes built on Oracle BPEL Process Manager. Oracle's Data Governance Manager runs against Siebel UCM, as does MDM Analytics which provides dashboards and reports. As part of Oracle's CX strategy there is increasing integration with social CRM applications, including the companies recently acquired by Oracle (Vitrue and Collective Intellect). We expect the next major release to support the new Siebel UI based on HTML and JavaScript, allowing greater device portability.

Market Scan: Customer MDM Tools
External Market Scan – Oracle (cont'd)

- **Cautions**
  - Multiple solutions for MDM of customer data, including Oracle Fusion MDM: Oracle has three offerings in the market for MDM of customer data; Oracle Fusion MDM, Oracle CDH and Siebel UCM. Oracle is careful to position these differently, but it is a complex situation that can be confusing for prospects and sometimes Oracle makes general claims — such as multidomain and SaaS capability — that don't apply to all products. Although Siebel UCM is currently the lead product, by 2014 Oracle Fusion MDM is likely to have become Oracle's premier MDM product for customer data. Gartner believes that many Siebel UCM customers will never migrate to Oracle Fusion MDM, but those new and existing customers who do want to eventually migrate should mitigate the disruption by leveraging the latest UCM releases which increasingly build on the standard MDM platform and OFM. Oracle's stated strategy is one of coexistence between Siebel UCM and Oracle Fusion MDM.
  - Good party model for customer data, but not designed for multidomain: Siebel UCM is based on a good party model, although Oracle claims that Fusion Customer Hub's party model is better and Siebel UCM does not support "thing" or "place" data to an extent that would allow it to be the basis of a broad multidomain MDM strategy. The Oracle strategy is to provide packaged MDM hubs on a data domain basis, so to achieve support for multiple data domains organizations would have to purchase MDM products based on different technologies and residing in different instances. Also, Siebel UCM is behind the best-in-class products in providing out-of-the box collaborative workflows for authoring data, potentially required for managing business customer data, although Oracle BPM Suite is preintegrated with Siebel UCM for SOA-based business processes. Finally, UCM supports a range of architectural styles, but it lacks sufficient proof points for "virtual" registry-style implementations — where only an index is created and managed.
  - Packaged data model doesn't appeal to everyone and still has some gaps: Siebel UCM comes with a rich prepackaged data model and set of business services. For many organizations, especially those that have Siebel CRM, it is a good fit for their requirements. However, other organizations want a client-driven data model approach and don't feel that UCM provides the level of flexibility that they want. Data Governance Manager provides monitoring and profiling facilities, but like other MDM vendors Oracle still has more work to do in governing master data throughout the life cycle. On the data quality technology front, Oracle will continue to depend on one of its closest MDM competitors, Informatica, until the data quality tooling based on the Datanomic technology matures further. Finally, UCM is not available in a multitenant version for SaaS in the cloud and, although there is increasing convergence with Oracle Fusion MDM, UCM will always be based on a different data model and a range of different technologies including the Siebel Application Server, Siebel Tools and the new Siebel UI.
  - Customer references scored below average in several non-product-related areas: Oracle provided a full set of references for UCM. Oracle's references appear generally happy with UCM's product capabilities. In the online survey, Oracle earned average customer satisfaction scores for understanding the business application of UCM and its clients' vertical industries, for road map visibility and for continuous technology innovation. However, Oracle scored below average for responsiveness to new feature requests and understanding of master data governance. Oracle's references also gave it below-average marks when asked if the pricing structure made it easy to understand, predict and manage the future costs of usage. The product also scored below average for reporting of master data quality metrics. Oracle scored in line with the average for sales support and after-sales care, but below average for organization and process change management support.

Market Scan: Customer MDM Tools
External Market Scan – IBM

IBM is working on integration of the three products in its MDM portfolio (InfoSphere MDM Server, InfoSphere MDM Server for Product Information Management [PIM] and Initiate Master Data Service [MDS]) into a single software stack that includes the key capabilities of each product, together with common UIs, workflow, services and metadata. Subscription and support is an annual flat percentage (approximately 20%) of the license price.

- **Strengths**
  - InfoSphere is part of a portfolio of products that includes BI, performance management, information integration, warehousing and management, content management, and data management, which is an attractive proposition for organizations looking for a wide range of information management functionality from a single, highly viable vendor.
  - In the MDM area, by rationalizing its MDM offerings into a single, more consistent product set with upgrade opportunities, IBM's MDM capabilities become more logical and more leveragable.
- **Cautions**
  - Complexity and inconsistencies within the new InfoSphere MDM product in underlying technologies, UIs and workflows, that result from three separate acquisitions.
  - IBM’s road map includes a single stack with three embedded MDM engines – this will take several years and inconsistencies are likely to be evident.
  - In a customer survey, Initiate MDS scored relatively low with respect to its flexibility in data modeling and internal workflow facilities; MDM Server scored relatively low on understanding master data governance, the transparency of its pricing structure and TCO, for hierarchy management, data quality facilities, monitoring, measurement and reporting facilities of master data quality; and IBM earned relatively low marks for its support of MDM Server, both pre- and post-sales, and the most positive references stressed direct involvement of IBM Labs resources during the initial implementation as a critical success factor.

Choosing an EMPI

- **Enterprise Master Person Index (EMPI)** in health and human services is by no means a commodity. Among products that can "check all the feature boxes," some are far more applicable to the challenges of large populations than others. Organizations looking to buy or replace an EMPI should consider some key information here before establishing a shortlist.

Key Findings

- Gartner client interest in EMPI is growing worldwide. Interest arises equally from government agencies, government-chartered private organizations and private organizations.
- The vast preponderance of EMPI implementations of master data management are done as registries. Because of specialized requirements, clients choose healthcare-specific products, rather than using general MDM tools.
- Probabilistic identity matching is a critical feature in all implementations of EMPI that exceed 200,000 clients; it is desirable for smaller populations.
- Differences in organizational workflow have profound impacts on the cost of implementation and operation, and the quality of the ultimate client matches.

Choosing an EMPI, Cont'd

Key Considerations

- Vermont should consider workflow requirements while picking an EMPI product.
- Vermont should select products and vendors that have demonstrated experience with populations and database sizes comparable to its current and potential future requirements.
- Key flexibility requirements include the ability to add new searchable client demographic keys after implementation and to tune search algorithm parameters for different applications.

Preliminary Assessment of Software Products
Customer Master Data Management / EMPI

Current HSE Technology Standard: **Oracle Siebel UCM**

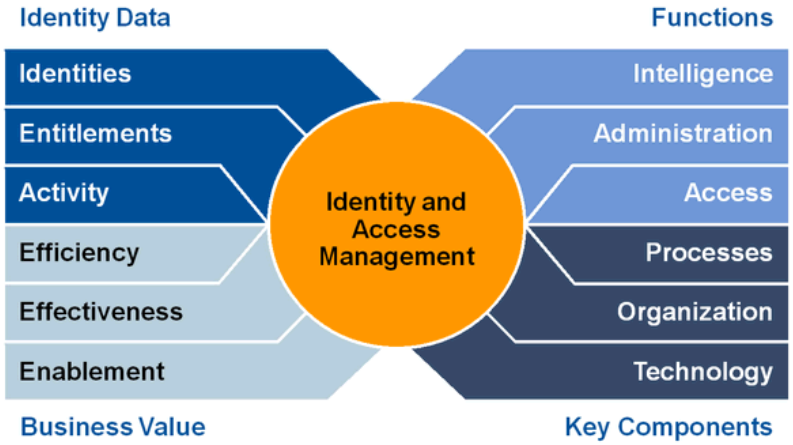
VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and HHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
IBM InfoSphere Initiate						
Intraenterprise EMPI	High	Medium	High	High	High	Low
Probabilistic Record Matching						
Tunable Record Matching						
Configurable Interface Capability						
Siebel UCM (Oracle)						
Intraenterprise EMPI	Medium	High	High	High	High	Low
Probabilistic Record Matching	Medium					
Tunable Record Matching	Medium					
Configurable Interface Capability	High					

Solution Architecture Components

Security Technologies

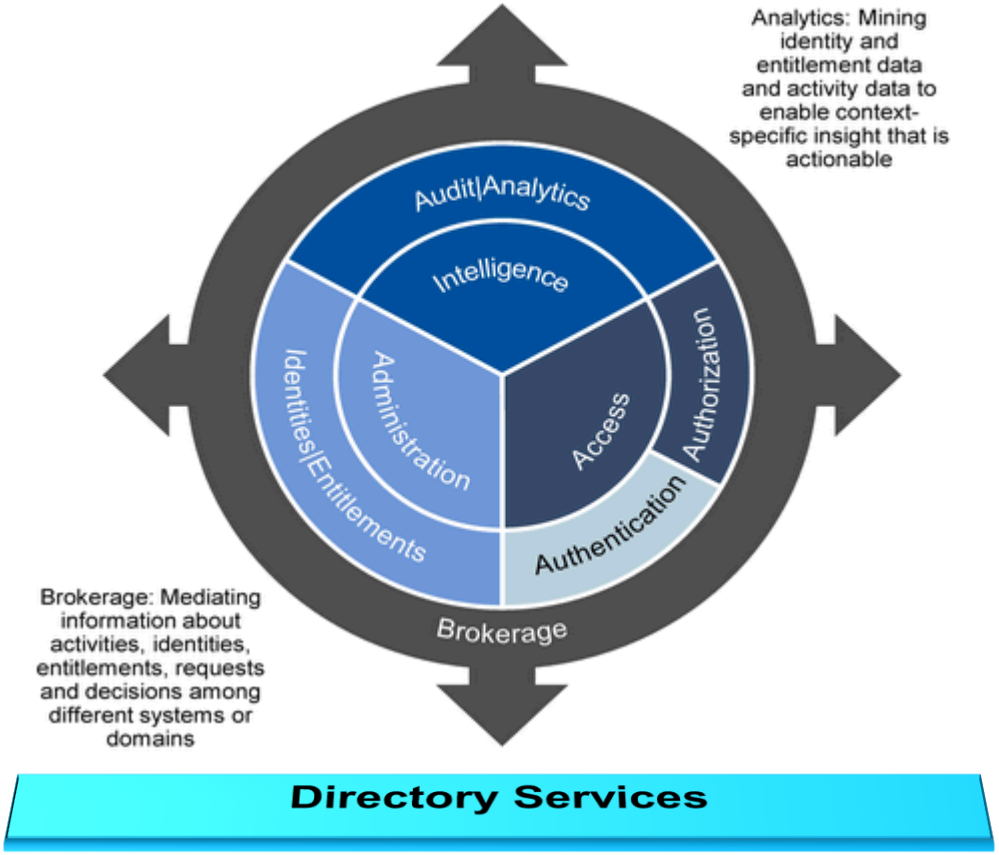
Identity and Access Management Discipline and Supporting Technologies

- Identity and access management (IAM) is the security discipline that enables the right individuals to access the right resources at the right times for the right reasons. This is a crucial undertaking and a key component of the VT HSE Platform which requires both business skills and technical expertise.
- VT can reduce the cost of managing users' identities and entitlements and, more importantly, become more agile in supporting new initiatives. VT IAM leaders and others with responsibility for IAM, information security and risk management should focus on ensuring that IAM technologies truly support the VT HSE Platform needs; meet regulatory and other compliance requirements; consider business processes and organizational impacts; and address other real-world factors that will help to justify IAM spending.



IAM Technology Categories

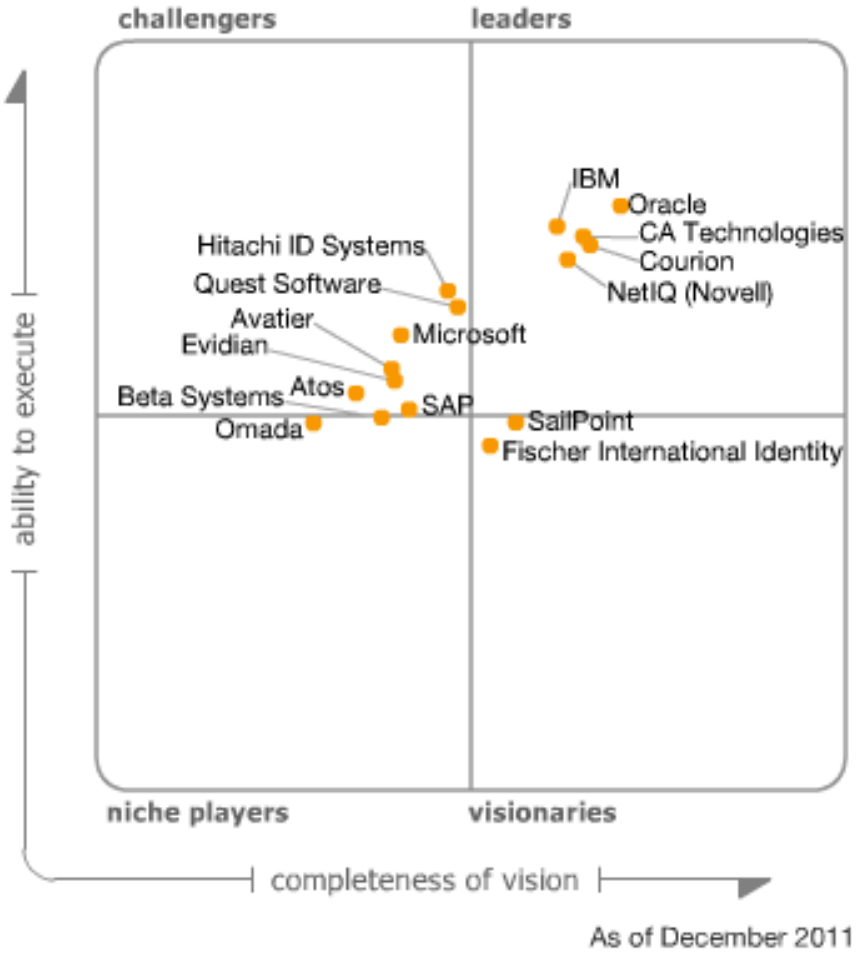
- At a high level, IAM technologies can be grouped into three major categories, according to their primary functional capabilities:
  - Access (combining authentication and authorization)
  - Administration
  - Intelligence (a combination of audit and analytics)
- A fourth category, Directory Services, serves as a fundamental underpinning to support the use of the other three. Directory Services technologies function as repositories for identity, policy and other data, as well as providing a smattering of other functions.



IAM Technology Category Description and Functionality

- The function of the three major functional categories include:
  - **Authentication**: Authentication technologies are deployed to provide real-time corroboration of a person's claimed digital identity (authentication methods), to broker authentication over multiple systems (single sign-on) and to propagate authenticated identities (federation). Authentication methods embrace many different kinds of authentication attributes and mechanisms, sometimes in combination with various physical form factors (for instance, hardware tokens, smart cards or mobile phones). At the time of this writing, passwords are still the most commonly used method of authentication (for more information, see "A Taxonomy of Authentication Methods, Update")
  - **Authorization**: IAM authorization technologies provide access control through enforcement, and are used to determine the specific scope of access to grant to an identity. They provide real-time access policy decisions and enforcement (based on identities, attributes, roles, rules, entitlements and so on). Users should be able to access only what their job functions allow them to access. For instance, if a person is a "manager," then he or she is granted the access necessary to create or edit a performance review; however, if a person is not a manager, then he or she should be able to review only his or her own performance review, and only at a specific stage of the review cycle. Web access management (WAM), externalized authorization management, identity-aware networks and digital rights management tools are examples of authorization technologies
  - **Administration**: IAM administration technologies offer a means of performing identity-related tasks (for instance, adding a user account to a specific system). In general, administration tools provide an automated means of performing identity-related work that would otherwise be performed by a human; examples include tasks such as creating, updating or deleting identities (including credentials and attributes), and administering access policies (rules and entitlements). User provisioning is an IAM (that is, user) administration technology
  - **Intelligence**: Identity and access intelligence (IAI) is essentially business intelligence for IAM. IAI technologies provide the means to collect, analyze, audit, report and support rule-based decision making based on identity and identity-related data. This data helps organizations measure, manage and optimize performance to achieve security efficiency and effectiveness, and to deliver business value

User Administration and Provisioning



Market Scan: Identity and Access Management – Admin and User Provisioning
External Market Scan – Oracle

- Oracle is the leader in this 2011 Magic Quadrant for User Administration/Provisioning. The company continues to execute on a vision of an integrated IAM suite, and has expanded its vision of delivery methods to include cloud-computing-based alternatives in recent announcements. OIM provides a comprehensive feature set for user administration that is available as a stand-alone product or can be integrated with the Oracle Identity and Access Management Suite. Oracle's acquisition of Sun Microsystems in 2010 expanded that suite in terms of components and features, and expanded Oracle's user administration customer base and market opportunity for OIM extensively. As of this writing, many former Sun Identity Manager customers are remaining with Oracle and taking their time to consider alternatives based on Oracle's timeline for user administration support through 2014.
- OIM provides user provisioning, password management and role administration as part of the broader suite that includes IAG, WAM, federation, directory and virtual directory, fraud prevention, authentication, and externalized authorization management. Other IAM-related needs (for example, ESSO and SIEM) are addressed via partnerships. Oracle continues to demonstrate a commitment to improving integration among the products in its IAM portfolio.

Market Scan: Identity and Access Management – Admin and User Provisioning
External Market Scan – Oracle (cont'd)

- **Strengths**
  - Oracle's newest release (Oracle Identity Management 11g) is a competitive differentiator for Oracle because it offers a truly integrated IAM platform that is based on internally developed and externally acquired software. Once integrator training and experience related to the deployment of the 11g increase, it is possible that deployment costs and time frames associated with implementing the 11g generation will be noticeably improved over previous versions.
  - Oracle's access for user administration at all enterprise levels (business to IT) is pervasive and supported through its other product portfolios. The company uses that access for cross-selling opportunities with IAM.
  - Oracle has an extensive set of partners for user administration consulting and system integration, including (but not limited to) Deloitte, Accenture, KPMG, PwC and Wipro, as well as Oracle's consultancy and services in user administration.
- **Cautions**
  - Oracle's SIEM and compliance/audit integration and reporting are less mature than those of competitors IBM Tivoli and NetIQ.
  - Oracle list prices for user administration licensing are significantly higher than most competitors.
  - There continue to be mixed reviews for Oracle integration and deployment experiences, which are attributed to the uneven training and experience of consultants and SIs for the product.

Preliminary Assessment of Software Products
Security Management Platform

Current HSE Technology Standard: **Oracle Identity and Access Management**

VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and HHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
Oracle Identity Manager						
User Provisioning	High	High	High	High	High	High
Identity Administration						
Reporting and Auditing						
Password Management						
Workflow Engine						
Policy Management						

Solution Architecture Components

Privacy and Consent Management

Entitlement / Consent Management Tools

- Consent management is a system, process or set of policies for allowing consumers/clients to determine what information they are willing to permit their various service providers to access. It enables clients to affirm their participation as part of a team that is assessing, planning and delivering services needed and to establish informed consent parameters to determine who will have access to their protected information, for what purpose and under what circumstances. Consent management supports the dynamic creation, management and enforcement privacy and confidentiality requirements
- There are real-world provider use cases, including clinician-asserted rights, purpose-based access (for example, emergency access), patient-determined privacy preferences and consent directives, and flexible policy management. These are based on very simple role definitions and actions that are primarily pushing or requesting data. Players include the Department of Defense, the U.S. Department of Veterans Affairs, the Social Security Administration, MedVirginia and Kaiser Permanente. These implementations are to manage consent interorganizationally, rather than just within a single agency/organization

Consent Management Functional Requirements

- **Consumer Policies Repository** – also called the Policy Information Point (PIP), this repository stores consumer preferences / consent directives
- **Consent Management Service (CMS)** – Also known as the Policy Administration Point (PAP), the CMS is a Web service that enables the creation and administration of organizational and jurisdictional privacy policies, in the form of access rules
- **Consent Validation Service (CVS)** – Also called the Policy Decision Point (PDP), the CVS is a Web service that adjudicates a user's authorization to access a consumer's protected information, based on the rules of the existing privacy policies
- **Consent Enforcement Point** – Also called the Policy Enforcement Point (PEP), it is a point of service application – often an existing clinical application – that enforces consumer consent preferences by allowing or denying access to protected information, in accordance with the decision received from the CVS
- **Audit Service** – a centralized, standards-based repository of audit events that logs all access and attempted access to protected information

Consent Management Non-Functional Requirements

- SOA-based
- Interoperable/vendor agnostic
- Non-disruptive to clinical workflow
- Centralized to consistently enforce policies network-wide
- Enables all applications to support consumer consent
- Accommodates granular directives
- Audits all access to protective information in real time
- Supports break-the-glass/override access
- Provides alert mechanism for privacy breaches
- Flexible

Consent Validation Architecture Using Service Oriented Architecture

1. VT HSE Platform User / Provider requests client's protected information
2. EIE queries the information from the key source(s), e.g. laboratory information system
3. Protected information source provides details (metadata) about the information and in some cases may also supply the requested protected information
4. EIE acts as the gatekeeper and requests the CVS to validate the protective information access, passing in the attributes that are known at the time, including: client/patient ID, provider ID, intended purpose of use, protected information criteria, etc.
5. The CVS uses the given attributes together with a number of other inputs to adjudicate a response of 'Permit,' 'Deny' or 'Permit through override.'
6. In the case of a 'Permit' response, the EIE retrieves the protected information not already present and provides access to the service provider. Otherwise the requesting application will inform the user of the unavailability of the data, or the option to override the restriction, if allowed.

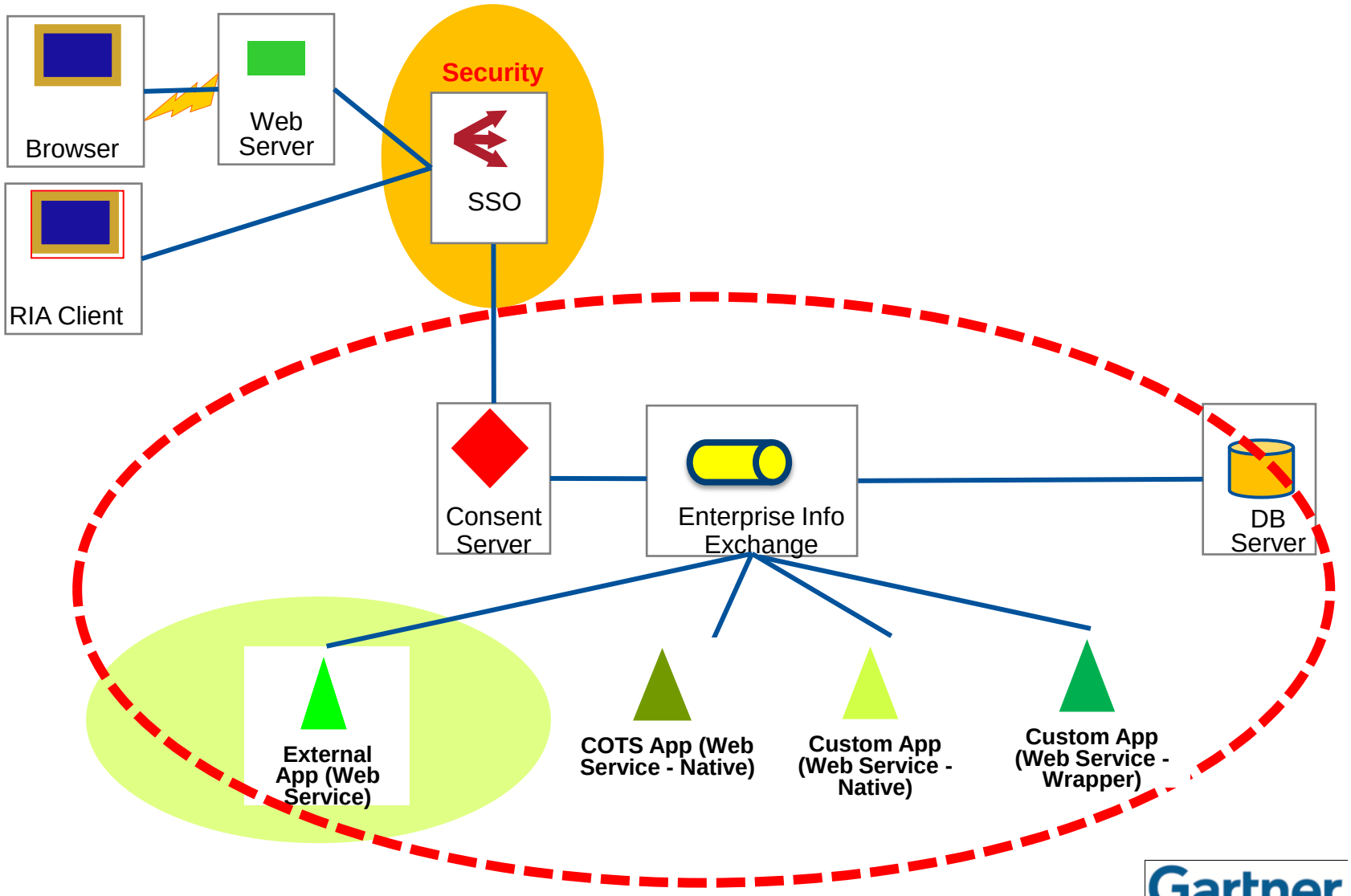
Consent Management Tools

Business Impact / Opportunity:

- Role-based access controls typically permit users to access protective information available to their roles, even when such access is unnecessary or inappropriate
- VT should capture consumer preferences using suitable automated consent management tools, and apply those preferences statewide
- Failure of an Enterprise Service Bus to implement consent management could lead to failure

- Selected Short List Vendors: HIPAAT; Jericho Systems; You Take Control

Draft “To Be” Enterprise Technology Architecture
Application Integration Pattern – Enterprise Service Bus



“To Be” Enterprise Technology Architecture

Enterprise Service Bus Pattern with Integration Suite, MDM, and Security

Architecture Pattern Description: Integration Pattern with Enterprise HIE		
Architecture	**Sample Architectural Layers**	■ Data Integration Server: Data Services Platform ■ MDM Server: Coexistence model of centralized and distributed ■ Consent Management: SOA Based Framework ■ Identity and Access Management: Service Based
	Recommended Technology Standards	■ Data Integration Server: ODI and OWB ■ Application Integration Services: OFM ■ MDM Server: IBM InfoSphere Standard (Initiate) or Siebel UCM ■ Identity and Access Management: OIM ■ Consent Management: HIPAAT and Jericho Systems
Guidelines	**Solution Component Guidelines**	■ Use the Web Service Implementation pattern for quality of service (QOS), process centric, business services that require security, reliability, and/or orchestration via robust middleware ■ Search performance and accuracy was a key driver in the choice of MDM ■ Consent Management will be at a granular level, allowing for full client control over the details of protective information shared or not, with whom for what period of time
Use Cases	**Where to Use**	■ Functionality that must be shared from COTS products (i.e., without native service support) should use Wrapper services as described in the Web Service Implementation pattern. Additionally, the ESB / Integration Suite typically provides pre-built adaptors that wrap many vendor APIs ■ For packaged applications that require file transfers (no native or wrapped service options) VT will use MFT ■ All external services to use the ESB / Integration suite for integration
	Use Cases	■ All Use Cases

Preliminary Assessment of Software Products
Consent Management Platform

Current HSE Technology Standard: **HIPAAT Consent Management**

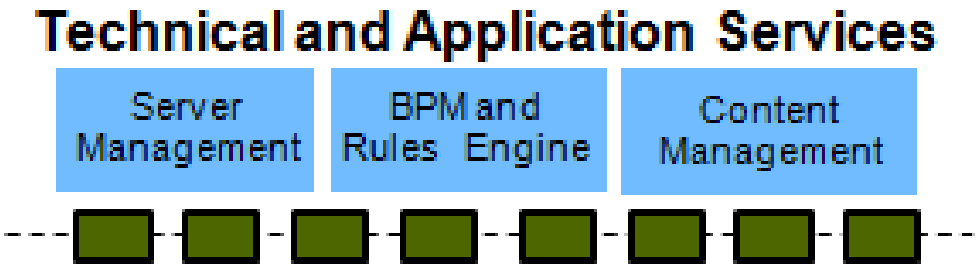
VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and AHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
HIPAAT						
Policy Repository	High	High	High	High	Med	Low
Policy Administration						
Consent Validation						
Policy Enforcement						
Audit Services						

Solution Architecture Components

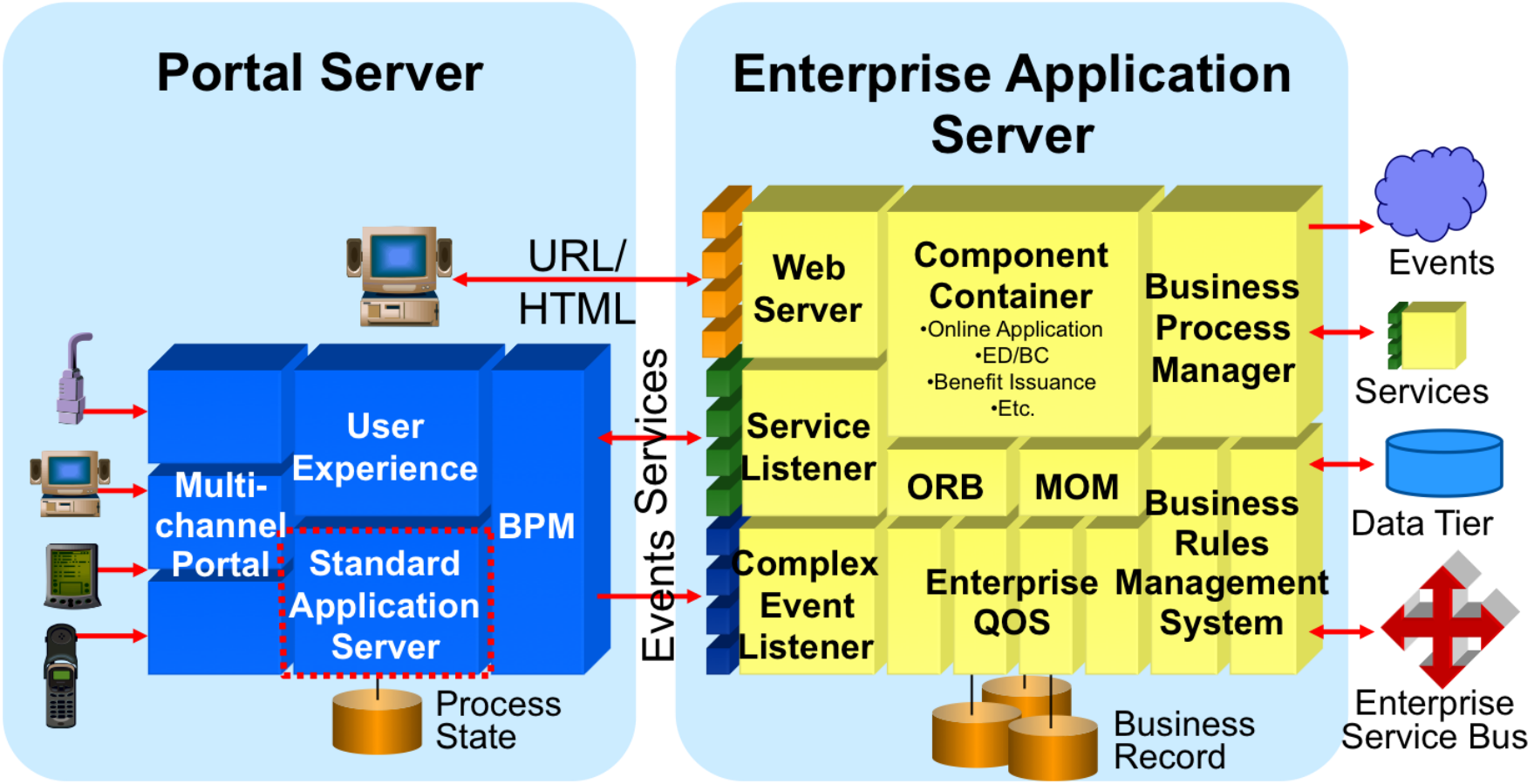
Application Server

Technical Requirements Development Approach
Technical and Application Services

- Technical and Application Services - Technical Requirements
  - Server Management Services – Enterprise Application Server environment
  - Business Process Management Suite
  - Business Rules Management System
  - Enterprise Content Management



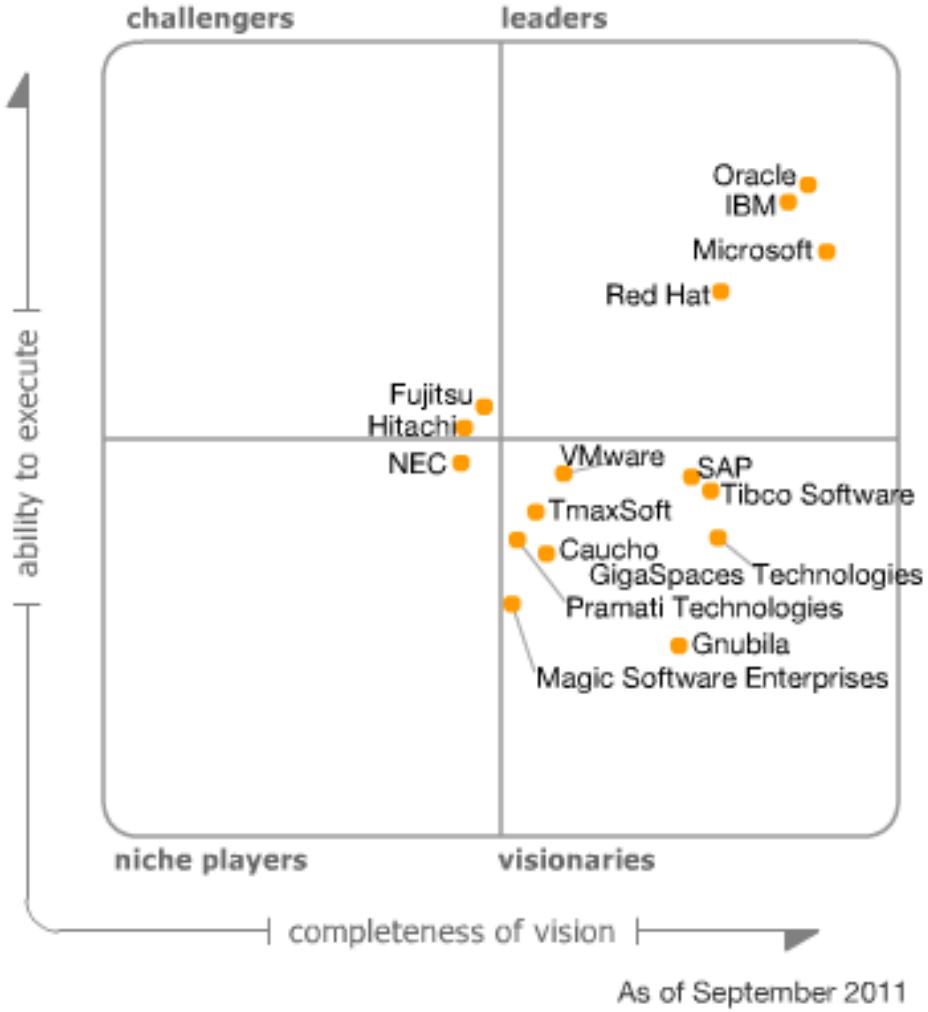
Enterprise Application Server
Target Platform for Integrated Eligibility Services and Functionality



BPM = Business Process Manager

MOM = Message Oriented Middleware
QOS = Quality of Service
ORB = Object Request Broker

Enterprise Application Server Magic Quadrant



Market Scan: Enterprise Application Servers
Oracle WebLogic

Oracle WebLogic Suite includes the Oracle Coherence in-memory data grid, the Oracle TopLink object-relational mapping tool, the JRockit and HotSpot JVMs, the Oracle Virtual Assembly Builder for packaging of software appliances, Oracle Web Tier (a Web reverse proxy),development tools (Oracle JDeveloper, Oracle Enterprise Pack for Eclipse and NetBeans) and Oracle Enterprise Manager for administration and management.

Strengths

- Oracle has a large and loyal relational database management system (RDBMS) installed base, embeds the Oracle WebLogic Suite in a large number of Oracle Fusion Middleware components and with multiple Oracle's packaged applications products. This favors adoption, especially in vertical industries like telecom, financial services and government, where Oracle traditionally had a strong and loyal installed base, in part deriving from its numerous acquisitions, including that of BEA Systems.
- The Oracle WebLogic Server family is very mature, proven, widely adopted (tens of thousands of users) and largely supported by third-party solutions. It also includes capabilities to support mobile devices, in-memory data grids, low-latency messaging and other features; this makes it an attractive option for organizations looking for a safe, mainstream EAS product also able to target advanced requirements.
- Oracle's aggressive and focused marketing and sales strategies targeting the integrated Oracle WebLogic Server portfolio, in combination with the Oracle Exalogic Elastic Cloud integrated system, support the offering's penetration into a wide range of usage scenarios, spanning from deployment of packaged applications in midsize organizations to complex, large-scale business-critical Web applications.

Cautions

- Oracle's ever-growing technology portfolio raises concerns among its largest customers about the company's excessive influence on their IT strategy. Therefore, these users may look to balance their IT investments using the offerings of Oracle's competitors. This could potentially threaten Oracle's EAS installed base, which is technically relatively easy to replace, given its compliance with the most relevant industry standards, like Java EE.
- Oracle's policy to support Oracle IAS user migration to Oracle WebLogic Server in some cases requires a significant investment in software license upgrades, in addition to the application conversion costs. This, coupled with a general perception of Oracle charging high and growing costs, makes migration to closed and open-source alternatives appealing for budget constrained organizations.
- Oracle Exalogic Elastic Cloud current limitations (e.g., lack of support for virtualization, likely to be available by YE11/1Q12) and the small number of real-life, production deployments to date, could hinder the adoption of the Oracle WebLogic offering for the most demanding private cloud deployments.

Assessment of Software Products
Enterprise Application Server Platforms

Current HSE Technology Standard: **Oracle WebLogic Application Server**

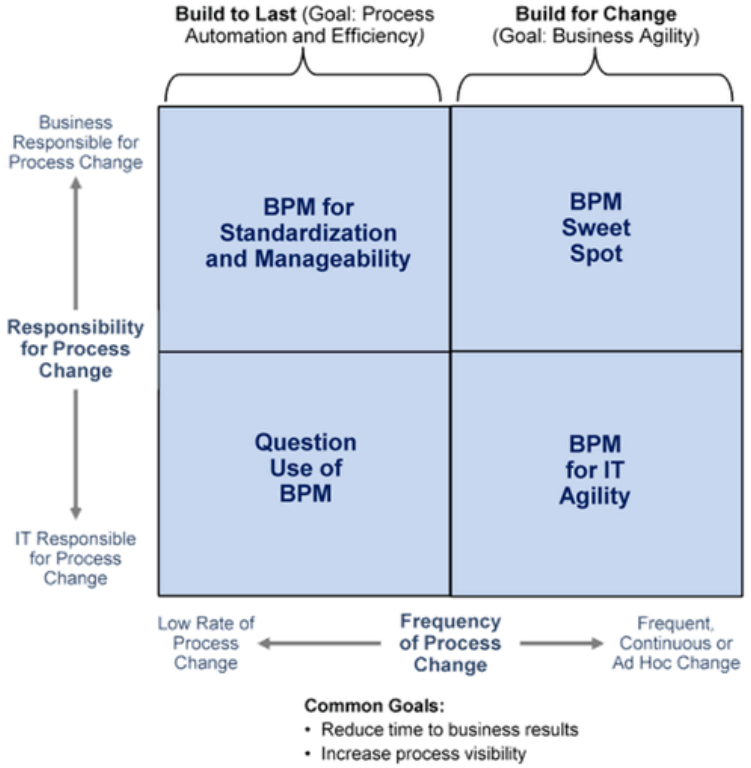
OHHSEE Technical Solution Component	Level of Functional Requirements Coverage	Alignment with State and HHS Technology Standards	Alignment with OHT Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with HHS Staff Skills and Operational Capabilities
Oracle WebLogic						
SOA Support	High	High	High	High	High	Low
EDA Support						
Programming Model						
Product Architecture						
Administration & Management						
Standards Support						

Solution Architecture Components

Business Process Management Suite

Business Process Management

Definition	Tenets	Attributes
BPM is a management discipline that treats processes as assets …	**Visibility**	• Explicit business process models. • Into the flow and status of work. • To all process participants. • All phases of process life cycle. • Into metrics and true business performance.
… that directly contribute to enterprise performance …	**Accountability**	• Business leaders own process change, not IT. • Eliminate cross-functional responsibility gaps. • Clear line of sight for metrics and outcomes.
… by driving operational excellence and agility.	**Adaptability**	• At the pace of business, versus IT delivery cycles. • "Build to change" mentality. • Continuous process improvement.



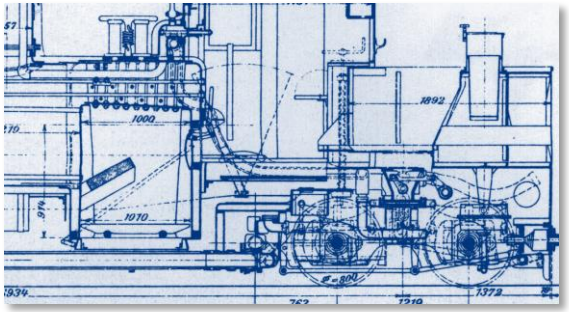
Examples of BPM-Enabling Technologies

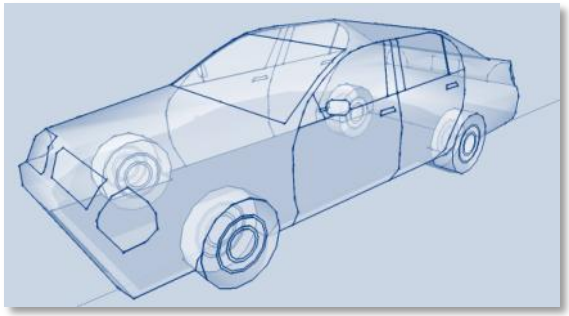
Definition: *A BPM-enabling technology (BPMT) is one that makes one or more aspects of a process explicit via abstract models.*

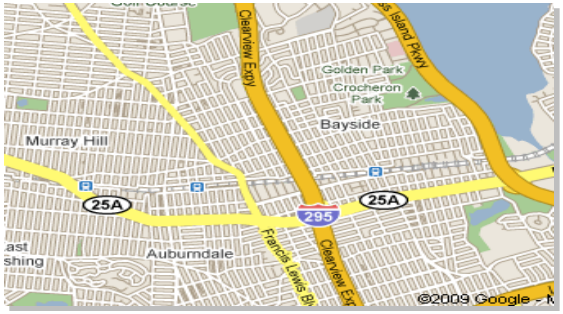
Explicit models are easily understood and readily changed.

Abstract models are independent of (separate from) their implementation.

Examples: *Business Process Analysis tools (BPA), Business Activity Monitoring tools (BAM), Business Process Management Suites (BPMS) and Business Rule Engines (BRE)*



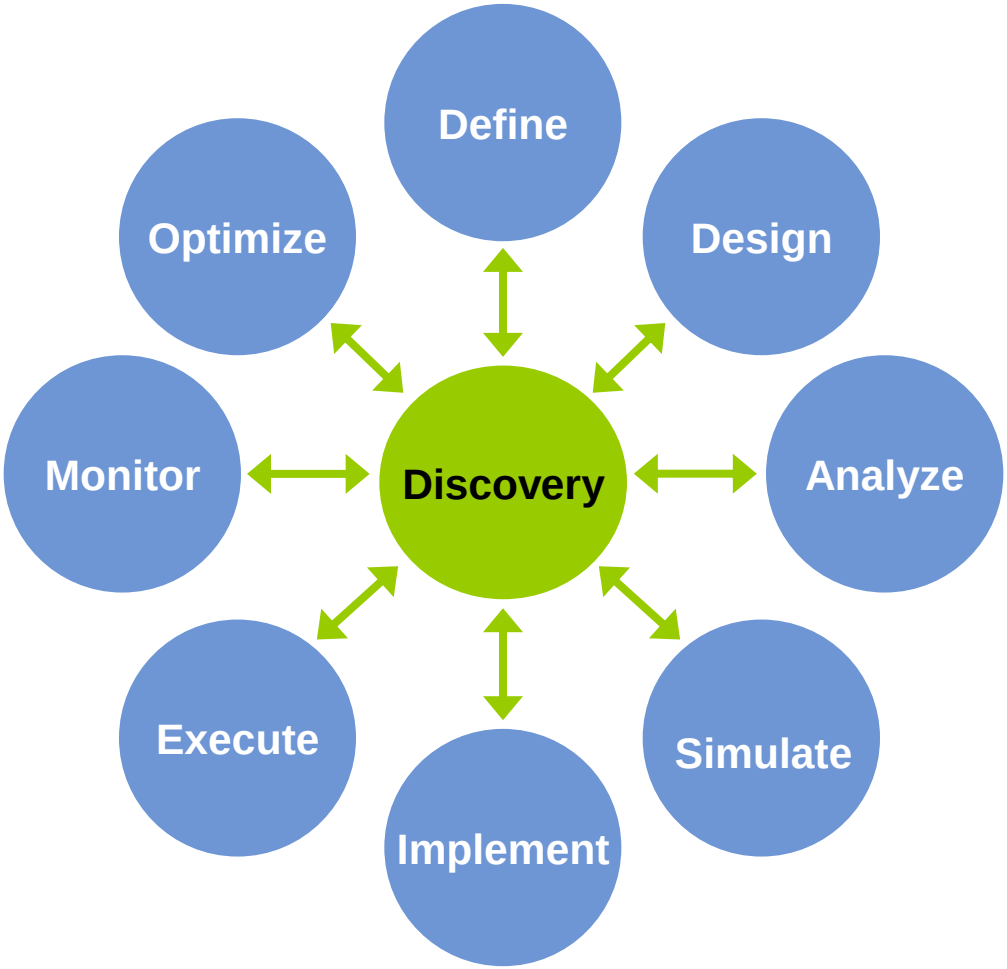




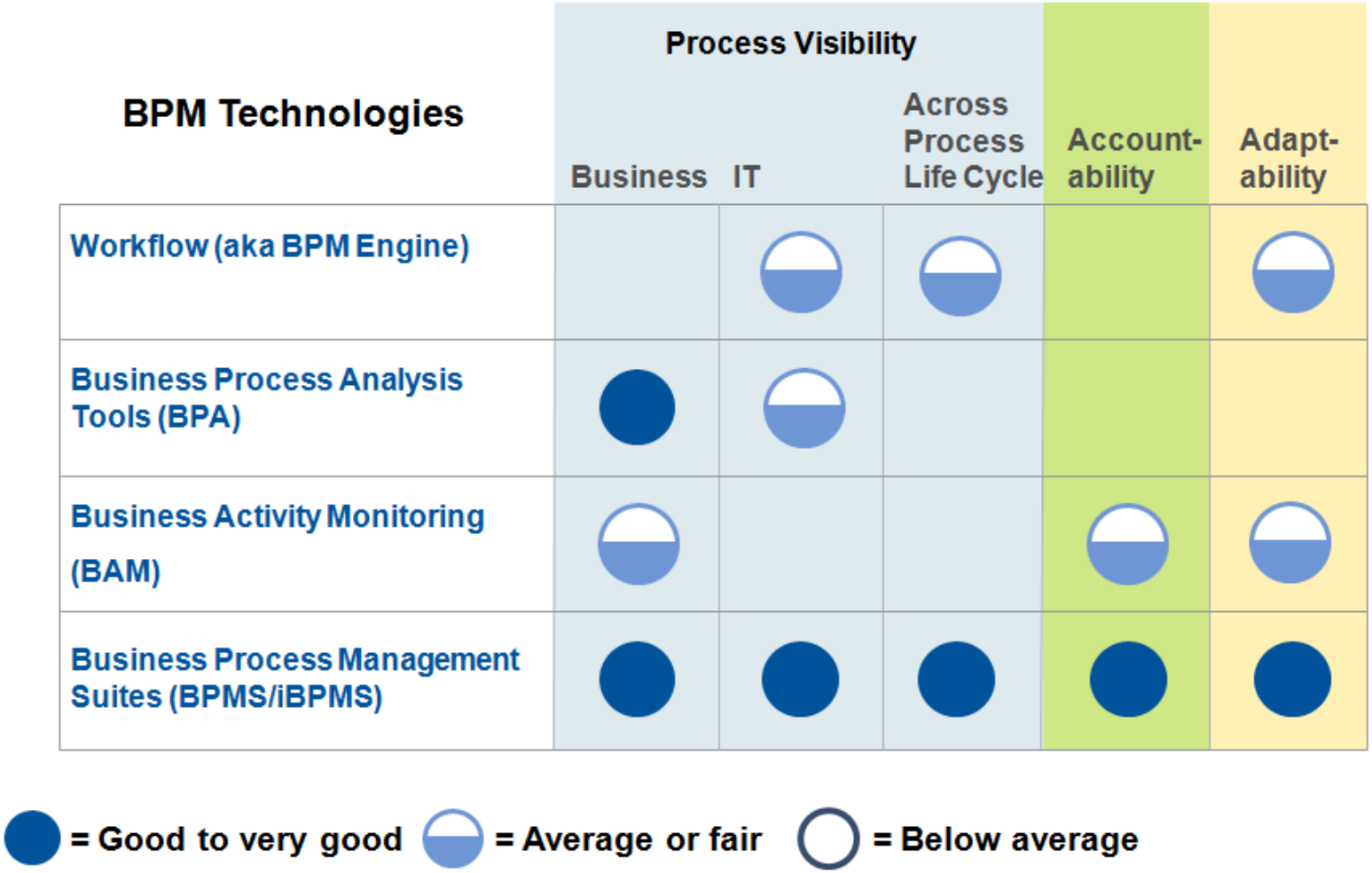
Map Image by: MRSC — licensed under the CC 2.0 license

The Process of Process Management

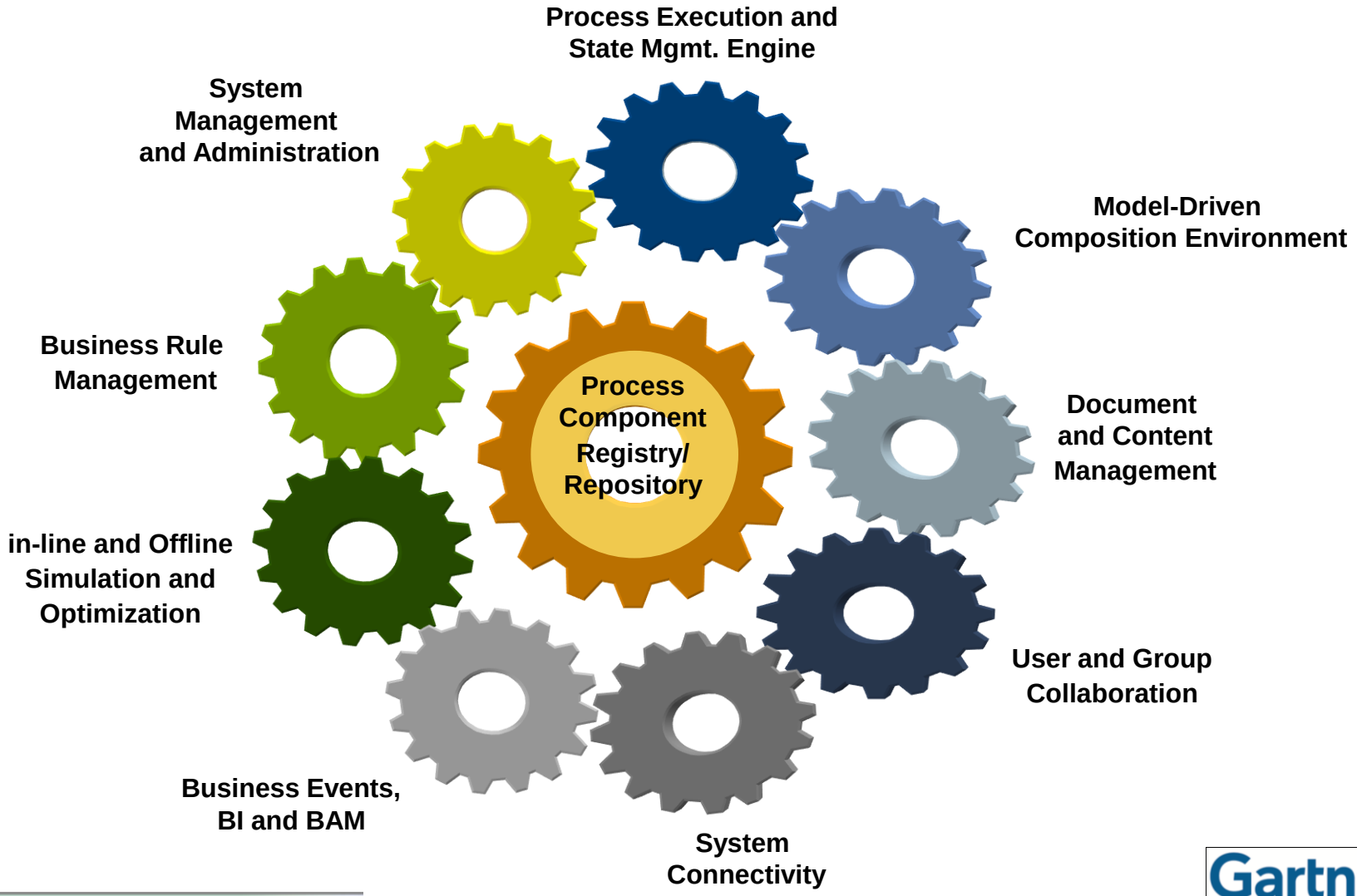
- Is a cycle of Continuous Process Improvement (CPI).
- CPI drives business agility — the ability of an enterprise to sense and respond effectively and efficiently to market dynamics.
- An integrated suite of BPM tools can make this cycle fluid (seamless) and enable business and IT roles to collaborate on a "build to change" approach to applications.



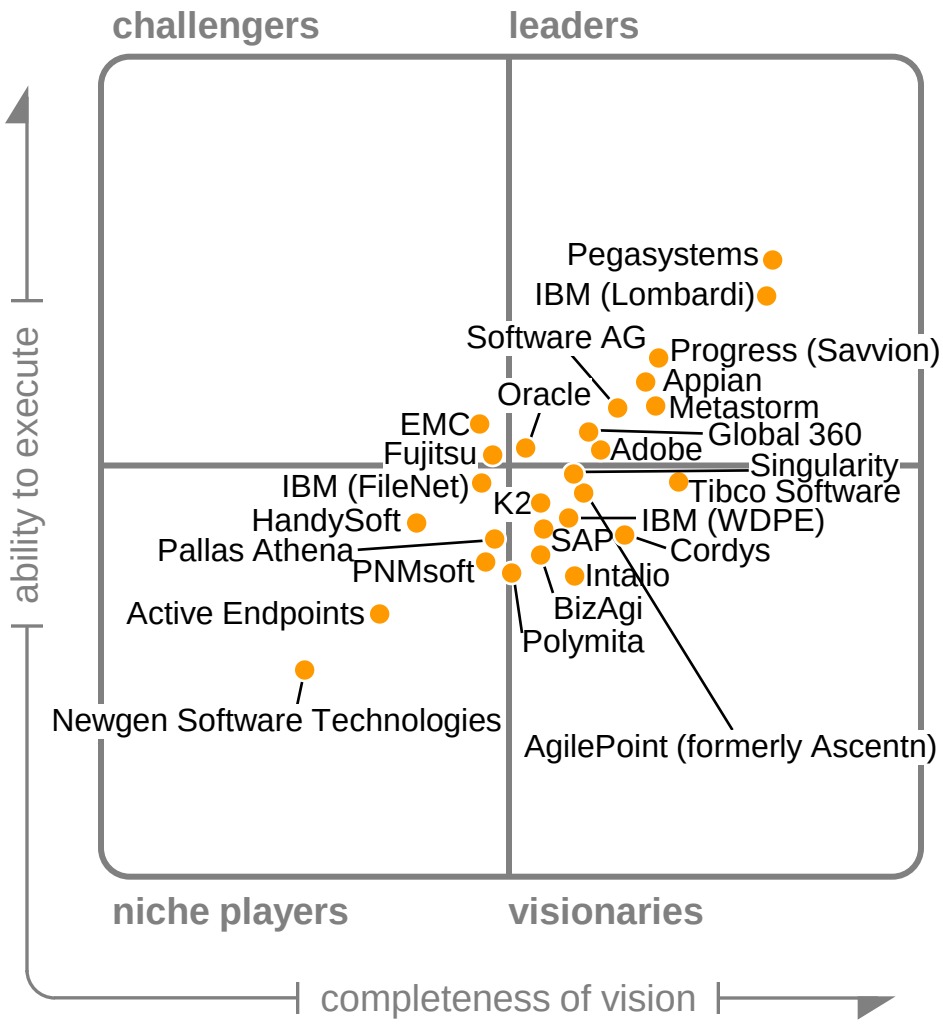
How Well do Technologies Address the BPM Key Tenets?



BPM Suites



Business Process Management Suite



As of October 2010

Market Scan: Business Process Management Suite
Oracle BPM Suite 11g

- **Strengths**
  - Oracle has delivered an integrated and agile BPMS that will serve well as a process platform for Oracle applications, as well as for BPM efforts, from now on.
  - Oracle BPM Suite 11g has the ability to leverage newly integrated capabilities, including complex events, business rules and optimization capabilities. This release rationalizes duplicate functionality that Oracle had as a result of acquisitions and unifies them into an SCA-compliant platform.
  - Oracle has delivered the 11g platform in a SaaS model as well.
  - Oracle 11g is BPMN-2.0-compliant for organizations that find this important.
  - The new SCA editor with the BPM Studio provides a nice architectural perspective on the BPMN implementation model.
- **Cautions**
  - In Gartner's opinion, the UI looks like an Oracle application in execution mode.
  - The transition from Oracle BPM Suite 10gR3 to 11g is a major product revision. Existing Fuego Software and BEA customers have a multistep migration: They must migrate to 10gR3 first and then wait for new 11g releases to get functionality comparable to what they have today.
  - Oracle BPM Suite 11g is the first release of Oracle's new unified architecture. In Gartner's opinion, it is Step 1 on a new product development road map that will bring many more refinements.

Preliminary Assessment of Software Products
Business Process Management Suite

Current HSE Technology Standard: **Oracle BPM 11g Suite**

VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and HHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
Oracle BPM Suite 11g						
Model-Driven Composition	High	High	High	High	High	High
Content Management	High	High	High	High	High	High
Collaboration	High	High	High	High	High	High
Integration/Interfaces	High	High	High	High	High	High
Business Monitoring	High	High	High	High	High	High
Rule management	High	High	High	High	High	High

Solution Architecture Components

Business Rules Management System

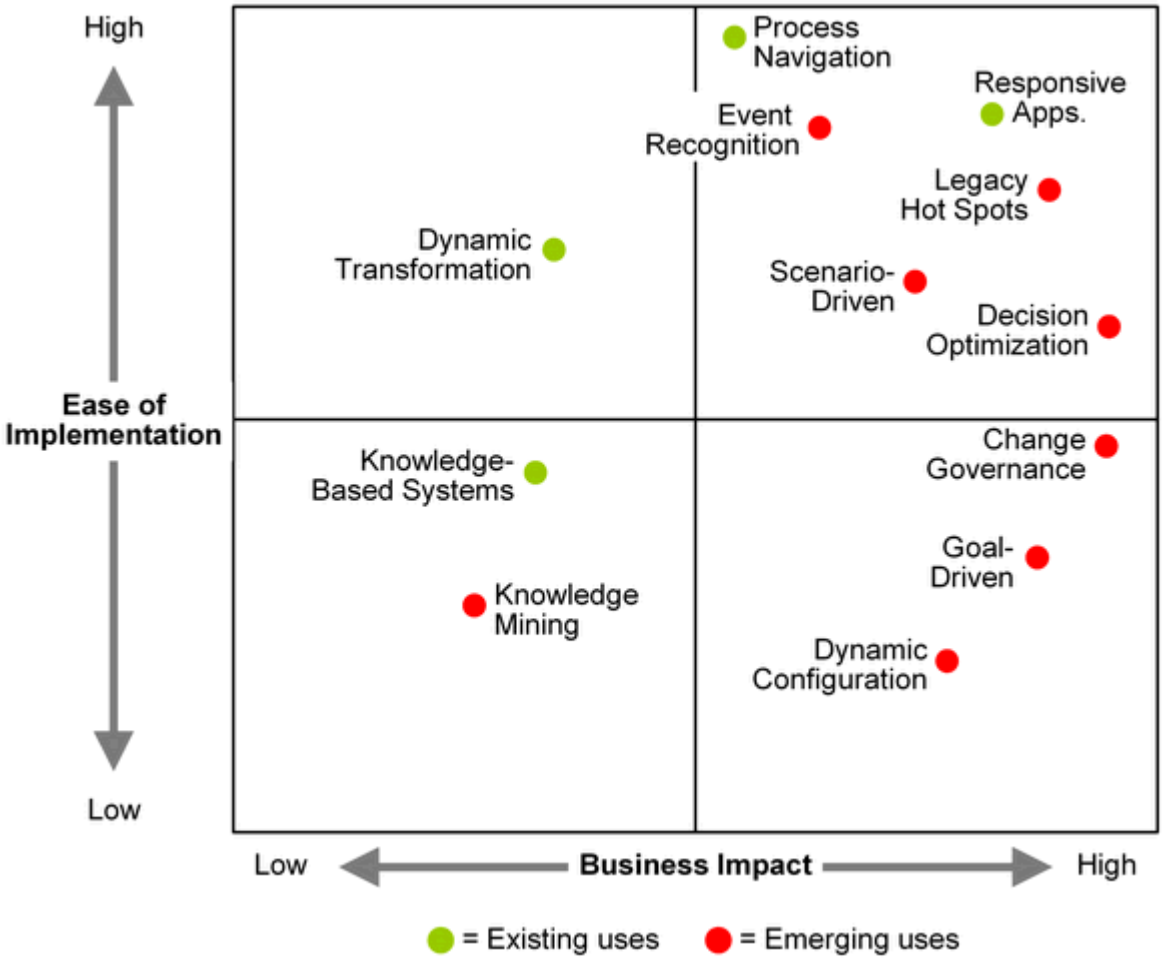
Business Rules Management Systems (BRMS) Products and Market

- Organizations like Ohio HHS are challenged to improve their agility and respond more quickly to business events — as well as make and manage quick application and process changes needed to support this agility. Adding more BRM can help meet this challenge by enabling the business to react faster and helping ensure that implemented rule changes are rolled out quickly with proper governance. BRM can add more intelligence to processes and applications, giving business professionals more direct control over these processes and applications, and helping them to be more proactive.
- Following a recent period of consolidation during which many platform/application vendors made BRM acquisitions to gain the agility needed to support better decision making — the business rule market has experienced a recent upswing in growth and attention. Driving this upward trend are recent ease-of-use improvements in business rule technologies, and increased needs for more dynamic processes and applications.
- When differentiating the vendors in this market, it is important to understand the difference between business rule engines and BRMSs. A business rule engine allows for immediate rule changes by leveraging explicit rules and late binding, but a rule engine alone does not help to manage rules — only to execute them. A BRMS requires a rule repository and rule management tools. The analysis of the 11 vendors provided below concentrates on the independent BRMSs that focus heavily on business rules and their management. It is not an exhaustive list of BRM offerings on the market, and it is subject to change.

Defining Business Rules Engine and Its Role Within the Enterprise

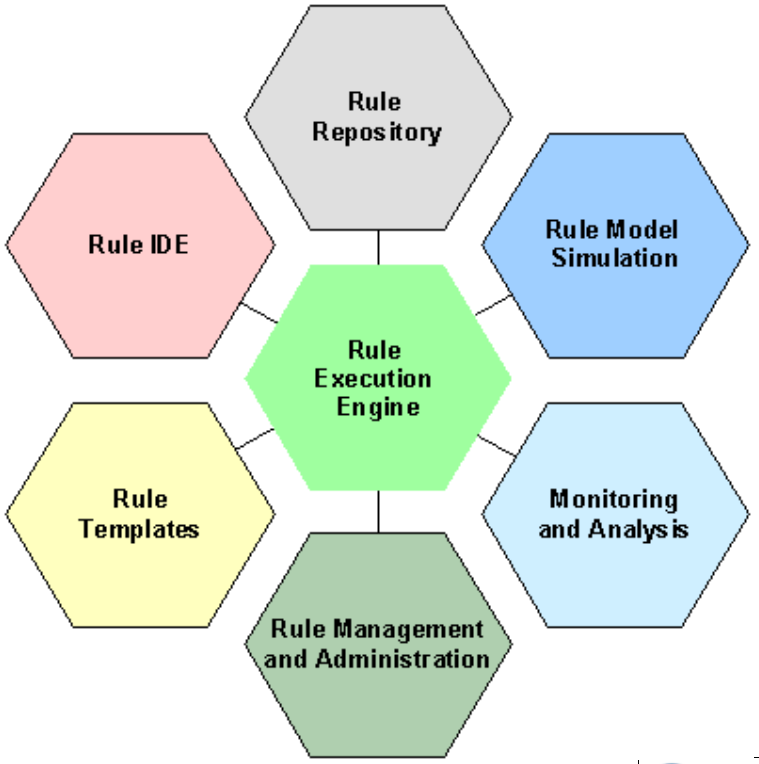
- A Business Rules Engine (BRE) is a specific collection of design-time and runtime software that enables an enterprise to explicitly define, analyze, execute, audit and maintain a wide variety of business logic, collectively referred to as "rules." A BRE enables IT and/or business staff to define rules using decision trees, decision tables, pseudo-natural language, programming-like code or other representation techniques. Unlike traditional application development approaches, a BRE isolates the rule representation from the executing business logic — providing for explicit rule management. A BRE provides features to analyze rules for rule conflicts, rule consistency and other quality issues. A BRE enables auditing of the rule execution path and firing order, and a BRE provides a rule repository and related features to maintain and enhance the rule base.
- A BRE may simply provide rule externalization capabilities (separating rules from programming code), or it may provide higher-level rule-processing capabilities, such as inferencing (forward chaining, goal-directed backward chaining), case-based reasoning and advanced heuristics. Many BRE vendors are increasing their business rule management technologies and ecosystems and are creating comprehensive business rule management systems (BRMSs) that add capabilities to the basic BRE technology. BREs are used in a variety of industries, but the common theme is applying a BRE to decisions that need automated assistance (for example, underwriting) where the rules are volatile enough or important enough (for example, eligibility or compliance) to require flexible platforms for managing and changing the rules as explicit software assets.

Top BRMS Use Cases



BRMS Selection Criteria

- Business rule representation and coverage
- Ease of use in operation/development and administration
- Performance and scalability
- Rule management features for the execution engine
- Third-party integration support
- Advanced inference features
- Vertical/horizontal template support
- Rule repository
- Pricing models



Market Scan: Business Rules Management Systems
External Market Scan – Oracle

- The Australian company RuleBurst (known as SoftLaw until 2005) acquired U.S.-based Haley in late 2007 and was itself then acquired by Oracle in early 2009. Oracle has multiple rule capabilities, but only one is currently sold independently: Oracle Policy Automation (OPA), previously known as RuleBurst. Oracle Business Process Management Suite 11g has a capable embedded rule engine called Oracle Business Rules (OBR), but it is not sold independently as of this writing.
- **Strengths - OPA 10.3:**
  - Proven high-volume capacity with larger rule bases
  - Significant intellectual property in the public sector, with large-scale references
  - Strong pseudo-natural-language approach to rule representation
- **Strengths - OBR 11g**
  - Proven high-volume capacity with larger rule bases
  - Multiple rule development environments (one for deep programming and one for nontechnical users)
  - Strong leverage in a service-oriented architecture (SOA) context

Assessment of Software Products
BRMS Platforms

Current HSE Technology Standard: **Oracle Policy Automaion**

VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and HHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
Oracle PA						
Ease of use	High	High	High	High	High	High
Performance and Scalability	High	High	High	High	High	High
Integration support	High	High	High	High	High	High
Inference features	High	High	High	High	High	High
Rule development env.	High	High	High	High	High	High
Rule repository	High	High	High	High	High	High

Solution Architecture Components

Enterprise Content Management

Enterprise Content Management - The Four Worlds of ECM

Transactional Content Management

Capture and control of static content: imaged forms, contracts, HR employment applications, tax filings, etc.

Infrastructure Content Management

Federated search, metadata strategies, and interoperability between content and records management systems are critical. Consider information infrastructures and hybrid content architectures with BCS, ECM and SaaS combined.

Social Content Management

Library services; document collaboration; use of blogs, wikis, workflow automation with alerts, calendaring and task tracking; browser or portal viewing; markup; annotation; and version control.

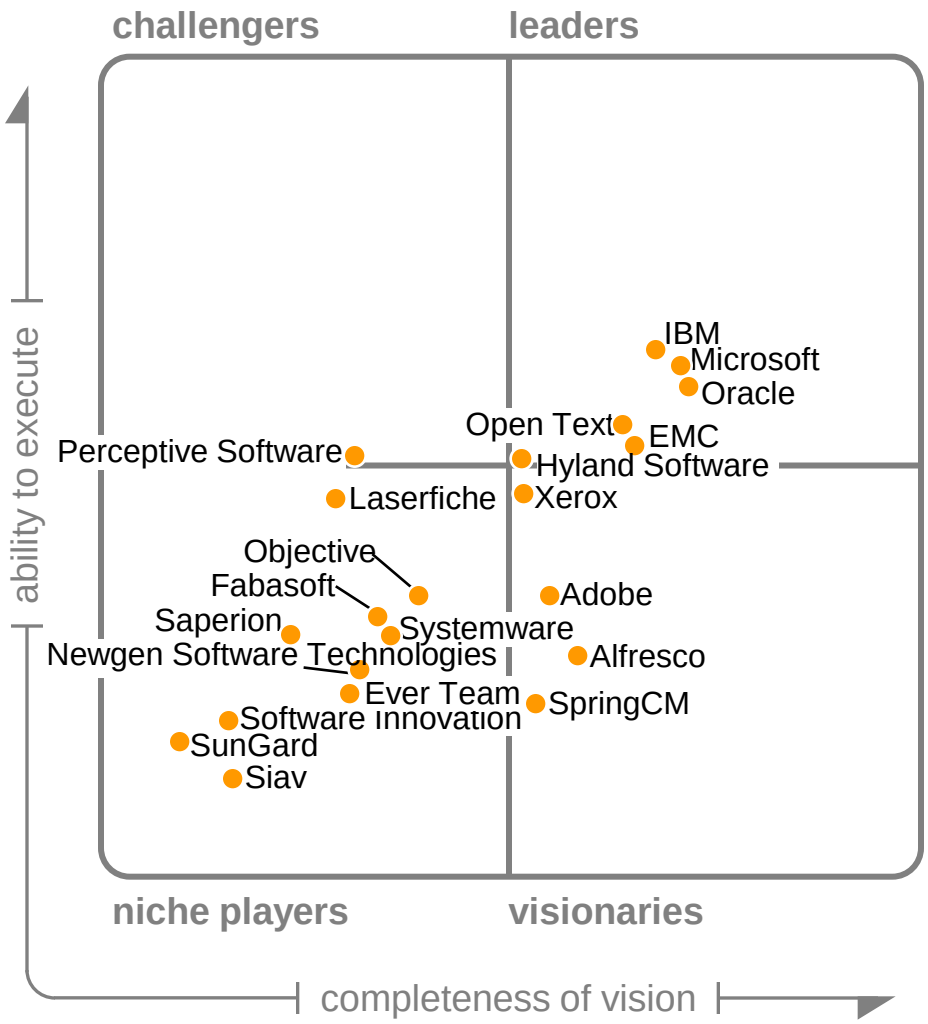
Online Channel Optimization

Web channel technology set, including WCM, DAM, portals, Web analytics, e-forms, social media and CRM.

What ECM provides

1. Improving operational efficiencies
2. Providing more efficient information sharing
3. Improving the quality of decision making
4. Reducing costs
5. Ensuring compliance, transparency and proper reporting

Magic Quadrant for ECM



As of October 2011

Market Scan: Enterprise Content Management
Oracle WebCenter

- Strengths
  - Oracle WebCenter Content is a well integrated content management suite that provides a broad set of content management functionality. It addresses the integrated content management needs that are driven by infrastructure requirements as well as the line of business.
  - Integration of Oracle WebCenter with Oracle's software stack — including the rest of the WebCenter portfolio and out-of-box integrations with Oracle E-Business Suite, PeopleSoft and Siebel — provides substantial benefits to Oracle customers, much as Microsoft SharePoint provides value through integration with Office and Outlook.
  - The size and capabilities of Oracle's sales force, product development and support organizations provide it with significant opportunities to continue growing its content management business and increase its market share.
- Cautions
  - Oracle must provide tighter integration of its Web 2.0 and collaboration capabilities with Oracle Social Network, which was recently introduced at Oracle OpenWorld.
  - Mid-market customers often find Oracle ECM too expensive for their content management applications due to software and services costs.
  - Oracle needs to provide a stronger story of ECM and BPM "fusion" as enterprises look for better business processes for their content-centric applications.

Market Scan: Enterprise Content Management
Hyland OnBase

- **Strengths**
  - Hyland continues to demonstrate a focus on customer satisfaction and brings a clearly articulated set of content management solutions to the market.
  - Hyland's appeal to the mid-market is partly due to its moderate cost for deployment and its strength in integration with other core players, such as Epic in the healthcare arena.
  - Hyland has expanded its software as a service (SaaS)-based offering, OnBase OnLine, and has invested in its international data centers to accommodate increased demand from EMEA and Asia/Pacific.
- **Cautions**
  - Hyland must continue to build out richer vertical solutions as well as an aligned partner ecosystem with strong domain expertise in these areas.
  - Hyland itself remains a midsize organization with a more limited international footprint than the other ECM Leaders. As such, it may not be suitable for the most demanding scalability requirements of some Global 2000 enterprises and federal government agencies of comparable size with geographically distributed deployments.
  - Hyland's functional capabilities focus primarily on transactional content management. Clients with a focus on social content management or online channel optimization will need to supplement OnBase with partner offerings.

Draft “To Be” Enterprise Technology Architecture
Draft Application Platform and BRMS Pattern

Architecture Pattern Description: OHHSEE Application Server and BRMS Pattern		
Architectu	**Sample Architectural Layers**	■ Application server: Enterprise Class J2EE platform ■ BRMS: Full rules management platform with design and run time binding
	Recommended Technology Standards	■ COTS – IBM WebSphere and JRules, Consider other J2EE Rules Management System to conduct a proof of concept for interoperability with CRIS-E
Guideline	**Solution Component Guidelines**	■ Use Application Server pattern to build systematic application services
Use Cases	**Where to Use**	■ Use with mission critical enterprise-wide applications with high availability, manageability and scalability requirements
	Use Cases	■ Integrated Eligibility

Assessment of Software Products
Enterprise Content Management

Current HSE Technology Standard: **Oracle WebCenter Content**

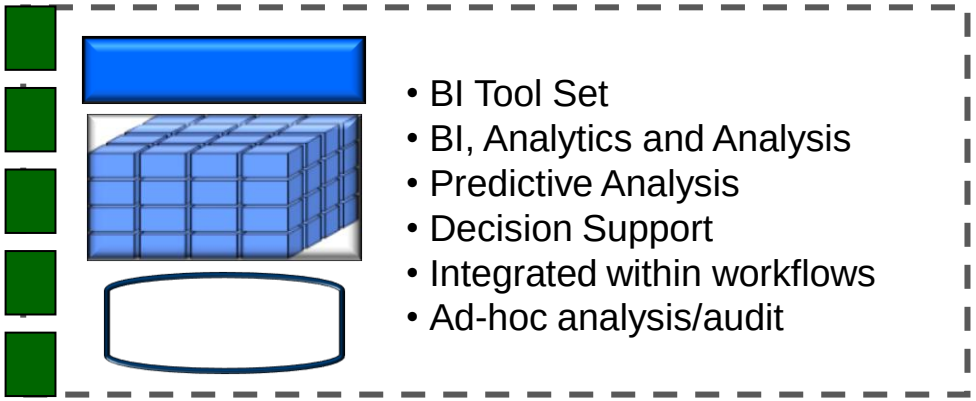
VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become State and HHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
Oracle ECM						
Ease of use	High	Medium	High	High	High	Low
Workflow	High					
Image Capture	High					
Document Management	High					
Web Content Management	High					
Oracle Integration	High					

Solution Architecture Components

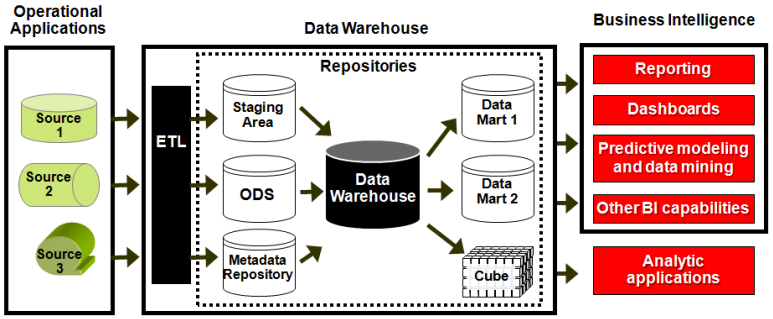
Business Intelligence and Shared Analytics

Technical Requirements Development Approach

- Shared Analytics Technical Requirements
  - BI Platform and ETL Requirements
  - Analytics and Data Mining Requirements
  - Classes of End Users and Relevant Tools
  - Data Quality Management and Audit Approach
  - Overview of market offerings and technology capabilities
  - Role within the Solution Architecture



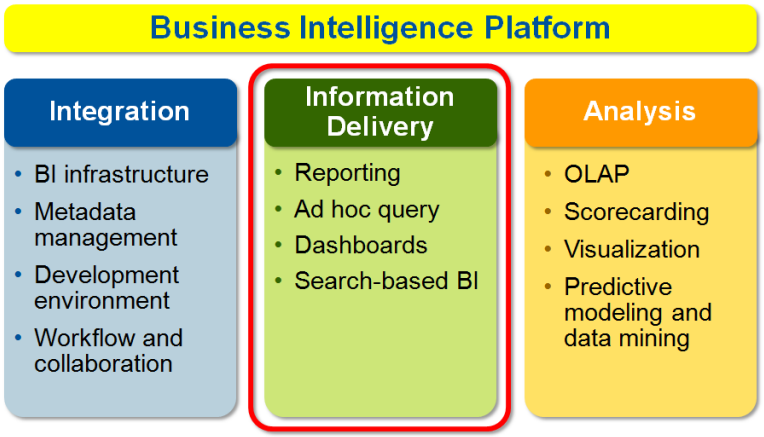
Traditional BI Structures
External Market Scan



Business intelligence is purpose-driven and delivers capabilities to end users by exploiting a range of technologies and capabilities, such as ***data integration***, ***metadata management***, ***operational data stores***, ***data warehouses***, ***data marts, preloaded analytic cubes and business process management***. *You cannot successfully deliver BI to end users without at least some of these underlying technologies and capabilities.*

- Operational applications are where the day-to-day work of the organization is done. Most contain application-specific databases.
- Generally, the data warehouse infrastructure is divided into three larger areas focused on ***data acquisition***, ***repositories*** and ***end-user access optimization***. Each of these areas has multiple components.
- Data warehouses are moving away from being passive, offline, after-the-fact reporting structures that are disconnected from business processes. They are gradually becoming structures that are deeply embedded in business processes, leveraged for real-time decision making and collaboration, and directly interactive with operational systems.
- The BI infrastructure is divided into functional applications that deliver specific decision-making, measurement, management and optimization capabilities to business end users. As with any asset, the information assets will typically be used by a variety of other business applications in the organization.

BI Platform Capabilities
External Market Scan



- BI platforms enable users to build applications that help organizations learn and understand their business. Gartner defines a BI platform as a software platform that delivers the 12 capabilities listed in this slide. These capabilities are organized into three categories of functionality: integration, information delivery and analysis. Information delivery is the core focus of most BI projects today, but we see an increasing need to focus more on analysis to discover new insights as well as focus on integration to implement those insights
- Integration is what makes a set of BI tools into a platform. There are four BI platform capabilities within the integration category: infrastructure, metadata, development, and workflow and collaboration.

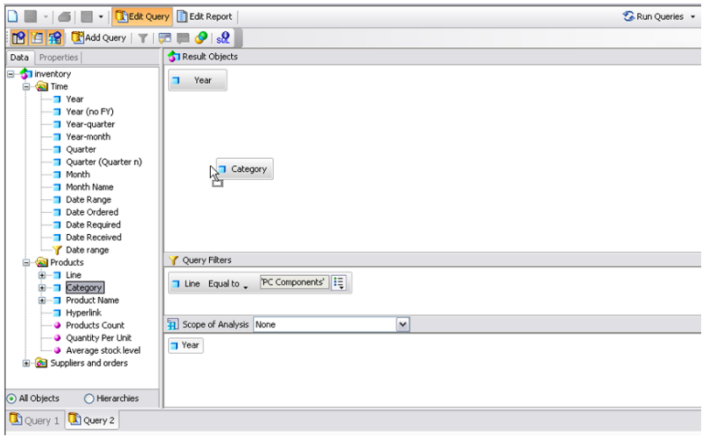
BI Capabilities – Information Delivery
External Market Scan

Reporting

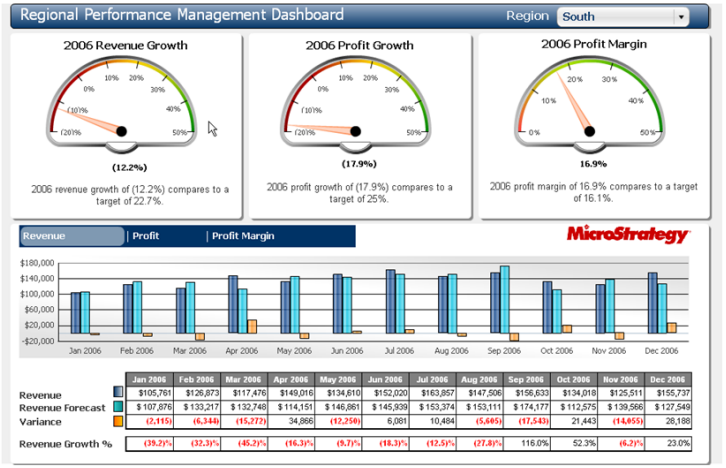
Revenue Growth for France

Revenue		France				Central Europe	Sales Territory
		2004	2005	2006	% Growth	% Growth	% Growth
Camping Equipment	Cooking Gear	$125,516.26	$116,733.50	$147,198.48	26.10%	20.30%	25.15%
	Sleeping Bags	$290,767.50	$275,282.52	$310,203.60	12.69%	14.05%	21.79%
	Packs	$431,071.22	$427,499.48	$497,624.98	16.40%	16.03%	23.13%
	Tents	$683,882.82	$661,319.26	$809,391.72	22.39%	14.06%	19.86%
	Lanterns	$271,296.92	$250,133.14	$288,022.38	15.15%	11.68%	17.75%
	Camping Equipment	**$1,802,534.72**	**$1,730,967.90**	**$2,052,441.16**	**18.57%**	**14.53%**	**20.71%**
Golf Equipment	Irons	$166,643.98	$232,007.04	$212,859.18	-8.25%	-5.99%	11.74%
	Putters	$50,940.44	$70,509.90	$66,185.02	-6.13%	-11.65%	7.50%
	Woods	$274,651.14	$379,567.72	$363,065.56	-4.35%	-0.50%	13.54%
	Golf Accessories	$15,766.26	$23,807.34	$21,825.10	-8.33%	-7.12%	0.92%
	Golf Equipment	**$508,001.82**	**$705,892.00**	**$663,934.86**	**-5.94%**	**-3.54%**	**11.96%**
Mountaineering Equipment	Climbing Accessories	$0.00	$97,473.96	$133,150.90	36.60%	15.53%	15.58%
	Tools	$0.00	$123,172.52	$178,540.72	44.95%	14.59%	17.73%
	Rope	$0.00	$281,037.78	$390,477.30	38.94%	15.02%	16.42%
	Safety	$0.00	$41,201.58	$58,402.34	41.75%	15.18%	17.27%
	Mountaineering Equipment	**$0.00**	**$542,885.84**	**$760,571.26**	**40.10%**	**15.02%**	**16.66%**

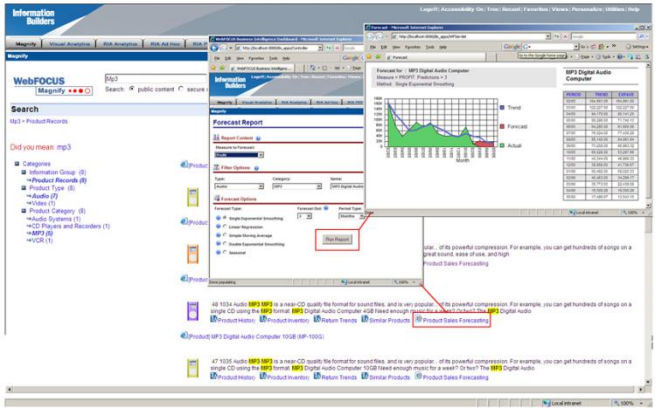
Ad Hoc Query



Dashboards



Search-Based BI

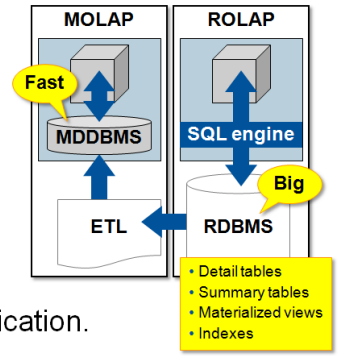


BI Capabilities – Analytical Processing
External Market Scan

Online Analytical Processing

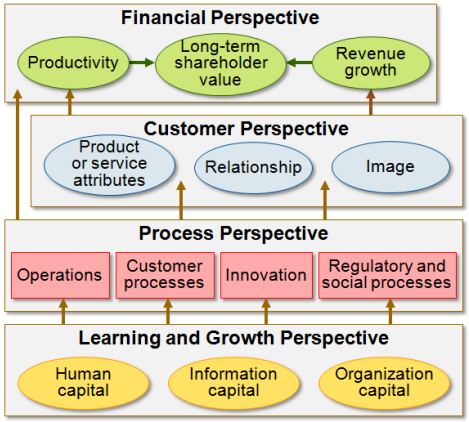
- MDX decouples front-end OLAP viewers from back-end engines.
- In-memory calculations striking up storage debates that were "put to bed" by hybrid OLAP.
- Traditionally just for business analysts, OLAP now required in widely deployed BI application.

Underlying OLAP Storage Constructs



MDDBMS = multidimensional database management system; MOLAP = multidimensional OLAP; RDBMS = relational database management system; ROLAP = relational OLAP.

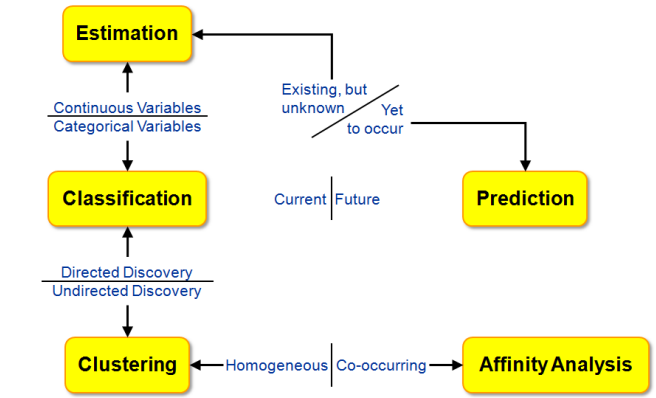
Scorecards: Strategy Maps Are Key



Benefits:

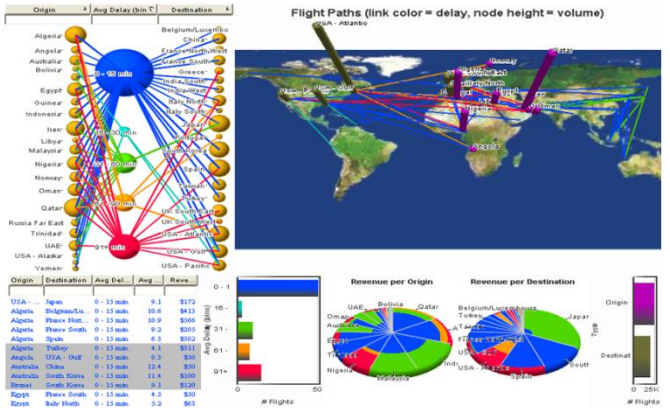
- Links KPIs as a collaboration tool.
- Links intangible assets to tangible outcomes.
- Identifies gap or fit for the large amount of data and reports.
- Creates leading indicators.

The Different Purposes of Predictive Modeling and Data Mining



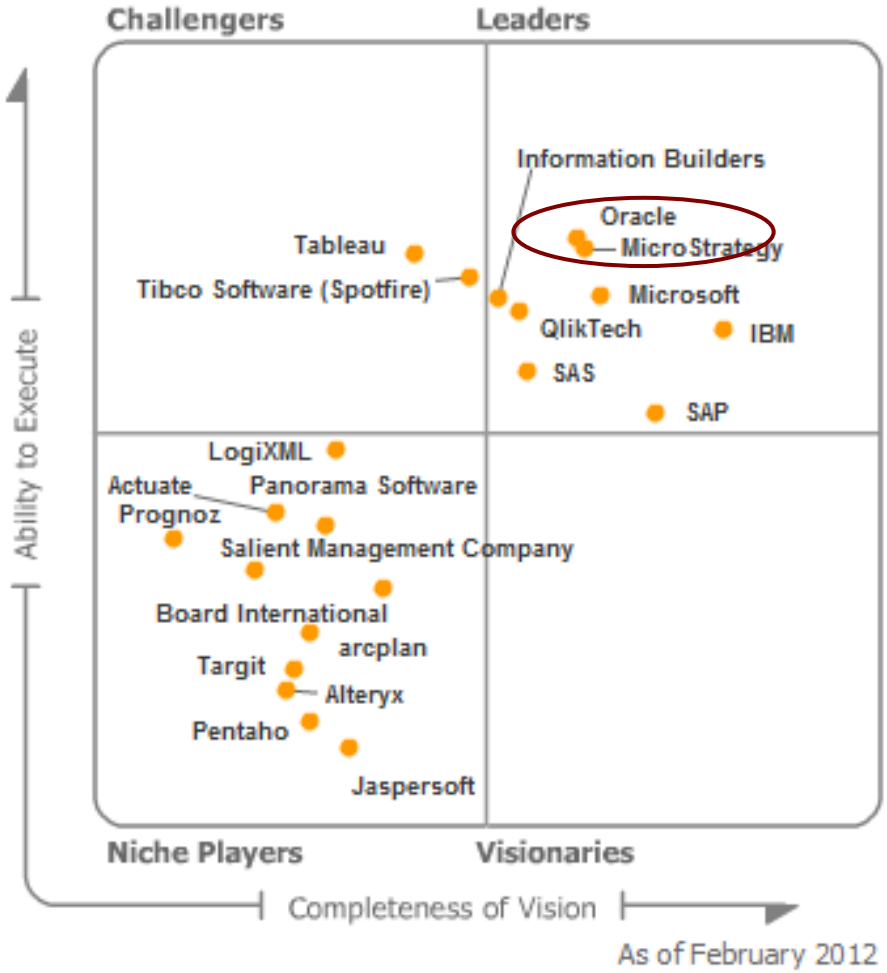
Note: These distinctions may vary slightly depending upon specific definitions.

Interactive Visualization



Source: Advizor Solutions

Gartner Magic Quadrant for Business Intelligence Platforms
External Market Scan



Market Scan: BI Tools
External Market Scan – Oracle

- **Strengths**
  - Oracle is deployed most broadly (in respect of global deployment) of any vendor in this Magic Quadrant and it is considered the BI standard for nearly 70% of firms surveyed. References select Oracle primarily for functionality, enterprise application integration, and data access capabilities.
  - Acquisition of Endeca, a search-based provider of e-commerce and analytic capabilities is considered to be a forward looking acquisition and will have significant impact on the company's analytics future. Relatively low numbers of existing references access hybrid data types using OBIEE.
  - The integrated hardware/software analytics solution features a package of OBIEE with new in-memory (Oracle Exalytics In-Memory Machine) capabilities for improved performance, optimized Oracle Essbase to support the range of traditional BI (reporting, dashboards and analysis), and dynamic planning, what-if and scenario analysis, as well as interactive visualization and data discovery capabilities.
  - Customer indicated that they valued the products' ability to support large numbers of users. Like other megavendors, the product road map plays an important role in the evaluation process.
- **Cautions**
  - References rate OBIEE as difficult to implement and OBIEE was rated as having lower than average ease of use (both developer and end users) scores.
  - The company has been slow to respond to the data discovery trend. However, some functions are now available in the Exalytics In-Memory Machine, and the Endeca acquisition will add more capabilities in this important area.
  - Product functionality evaluation scores and customer support/product quality issue remain below average again this year. In fact, both support and product quality were also noted as issues that blocked further deployments within customer organizations
  - Oracle customers use the product mostly for static report viewing, parameterized reporting and scorecard capabilities, leading to below average user complexity ratings..
  - More than 10% of survey respondents indicate that they plan to discontinue, or are evaluating a discontinuation of, software use in the next three years — a relatively high response rate given responses from the prior year. This is above the average for all vendors in this research.

Data Quality Management Tools Market

- The data quality tools market comprises vendors that offer stand-alone software products to address the core functional requirements of the data quality discipline:
  - **Profiling**. The analysis of data to capture statistics (metadata) that provide insight into the quality of the data and help to identify data quality issues
  - **Parsing and standardization**. The decomposition of text fields into component parts and the formatting of values into consistent layouts based on industry standards, local standards (for example, postal authority standards for address data), user-defined business rules and knowledge bases of values and patterns
  - **Generalized "cleansing."** The modification of data values to meet domain restrictions, integrity constraints or other business rules that define when the quality of data is sufficient for the organization
  - **Matching**. Identifying, linking or merging related entries within or across sets of data
  - **Monitoring**. Deploying controls to ensure that data continues to conform to business rules that define data quality for the organization
  - **Enrichment**. Enhancing the value of internally held data by appending related attributes from external sources (for example, consumer demographic attributes or geographic descriptors)

Data Quality Management Tools Market, Cont'd

- In addition, these products provide a range of related functional capabilities that are not unique to this market but which are required to execute many of the data quality core functions, or for specific data quality applications:
  - **Connectivity/adapters.** The ability to interact with a range of different data structure types
  - **Subject-area-specific support**. Standardization capabilities for specific data subject areas
  - **International support**. The relevance for data quality operations on a global basis
  - **Metadata management**. The ability to capture, reconcile and interoperate metadata related to the data quality process
  - **Configuration environment**. Capabilities for creating, managing and deploying data quality rules
  - **Operations and administration**. Facilities for supporting, managing and controlling data quality processes
  - **Workflow/data quality process support**. Processes and user interfaces for various data quality roles, such as data stewards
  - **Service enablement**. Service-oriented characteristics and support for service-oriented architecture (SOA) deployments

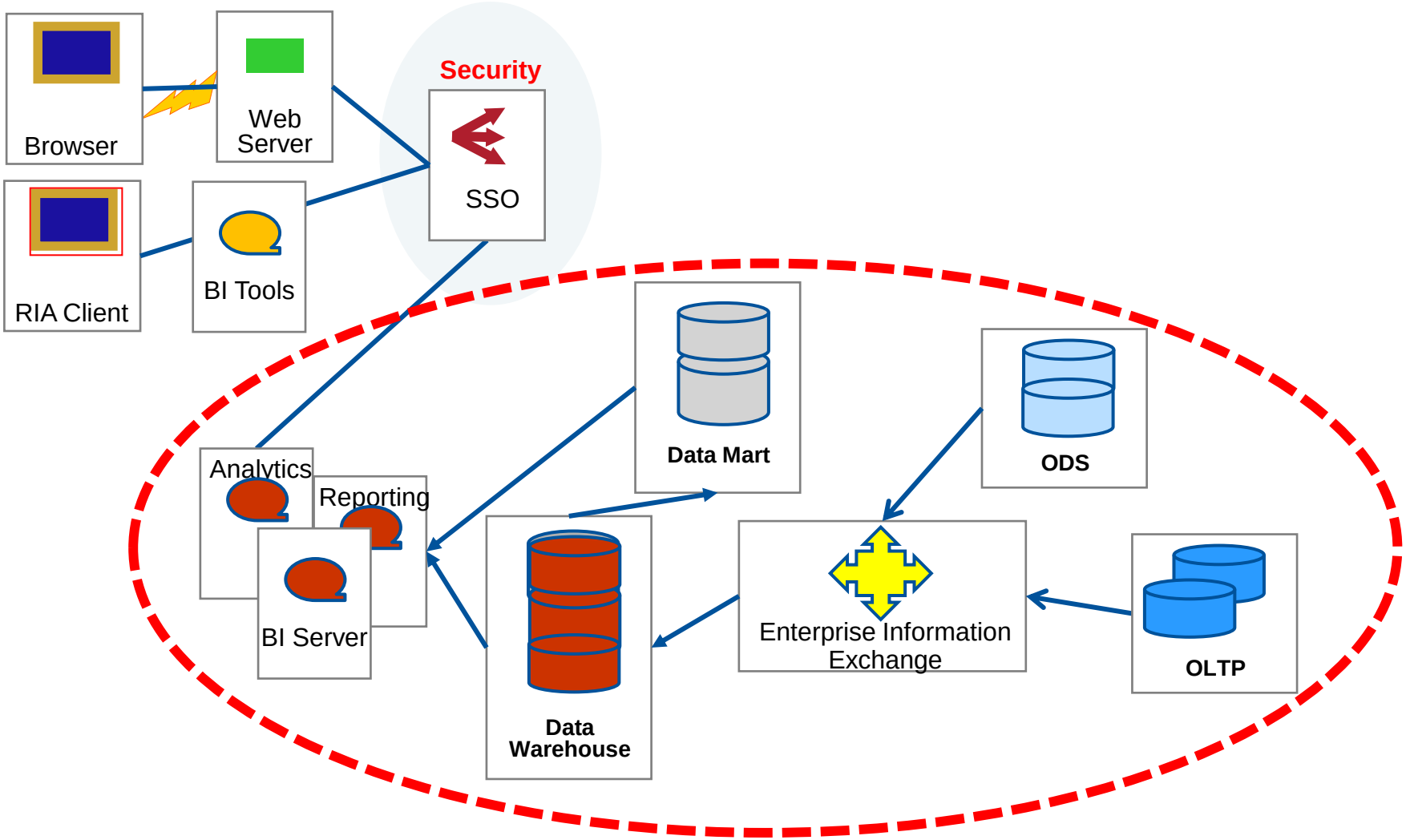
Gartner Magic Quadrant for Data Quality Technologies
External Market Scan

Market Scan: Data Quality Management Tools
External Market Scan – Oracle Enterprise Data Quality (Datanomics)

- **Strengths**
  - Oracle is a new entrant on this year's Magic Quadrant, as it acquired U.K.-based data quality tools vendor Datanomic, thereby fulfilling the inclusion criteria for this report. Oracle's existing data quality tool was only targeted product data domain (Old: Silver Creek). With acquisition of Datanomic, a small but established vendor in the European data quality tools market, Oracle now can provide profiling, cleansing and matching for multiple data domains, from product data to party data, such as customer, supplier or employee.
  - Datanomic and its Java and SOA-based architecture fit well into the Oracle family of data management products, and give Oracle the required data quality technology to handle customer data, support for watchlists, sanctions and politically exposed persons.
  - All of Oracle's data quality technology will be bundled with the Oracle Data Integration stack and integrated with its MDM hubs. The new product family is Oracle Enterprise Data Quality, while the existing Oracle Data Quality (ODQ) refers to the Trillium Software OEM product. Products from both PDQ and Datanomic will be aligned with the current product set, enabling synergies in the data management portfolio, and also following the market trend to synchronize data integration, data quality and MDM products.
- **Cautions**
  - Various products (e.g. PDQ and Datanomics) will only be "interoperable" for the foreseeable future, with Web services connectivity in between platforms. Although dn:Directora (Datanomics) is built on an SOA, customer references describe the product as hard to integrate into other environments, and hardly any references report using the product outside customer/party data domains and address cleansing, which increases the risk of a siloed approach to the various data quality products. This will potentially cause friction in a data quality initiative if it needs to span both product data and party data, and may increase the necessary implementation efforts.
  - Oracle customers using one of the vendor's data quality tools partners, in particular Trillium Software, are likely to see a rapid cooling-off period of Oracle's interest in its data quality OEM alliances.
  - Despite the Web services capabilities of the combined Oracle data quality products, neither PDQ nor Datanomic dn:Director are offered as a cloud-based data quality solution. In fact, a SaaS model is not even on the short-term road map. Almost all customer references indicate that they installed Datanomic's products on-premises

Draft “To Be” Enterprise Technology Architecture

Sample Data Analytics Pattern with Enterprise HIE



“To Be” Enterprise Technology Architecture
BI/Shared Analytics Pattern

Architecture Pattern Description: Sample Data Analytics Pattern with Integration Broker		
Architecture	**Sample Architectural Layers**	■ BI Server/Data Mart: Oracle 11G ■ Analytic Server: Oracle Business Intelligence Server (old: Siebel Analytic Server) ■ Reporting server: Oracle Business Intelligence Server ■ ETL Tool: OWB (Oracle Warehouse Builder) and ODI (Oracle Data Integration) ■ Integration Broker: GoldenGate (Oracle) and ODSI (Data Service Integrator) ■ Operational Data Store: Oracle Database Enterprise Edition ■ Statistical Analysis / Predictive Modeling: TBD (Discussion required) ■ Data Quality Management: Oracle Enterprise Data Quality (?)
	Recommended Technology Standards	■ Oracle Business Intelligence Enterprise Edition , MS Excel, SAS, Oracle Enterprise Data Quality
Guidelines	**Solution Component Guidelines**	■ Data quality management must be adapted which includes profiling, standardization / parsing, cleansing, matching, monitoring, and enrichment. Most modern data quality tools provide these capabilities to improve and enhance data. ■ Data consistency must be adapted to reconcile data aggregated from multiple sources to ensure information is free of collisions and is unambiguous
Use Cases	**Where to Use**	■ Data Warehouses should be used sparingly to support efficient analytic processing, historical reporting, dashboards, multidimensional analysis, and ad hoc queries across all Vermont HS subject areas. ■ Data Marts should be used to support more granular analysis and decision support against specific subject areas. Data Marts should be a subset of information from the Data Warehouse (dependent).
	Use Cases	■ Alerts and Notifications, Management Reporting

Assessment of Software Products
BI Platforms

Current HSE Technology Standard: **Oracle BI Enterprise Edition**

VT HSE Platform Technical Solution Component	Level of Functional Requirements Coverage	Potential to become the State and AHS Technology Standards	Alignment with Strategic Goals	Alignment with Architecture Principles	Platform and Vendor Viability	Alignment with Staff Skills and Operational Capabilities
Oracle						
ETL	High	High	High	High	High	Low
DW DBMS Scalability	High					
Access Tools (Accessibility of the Data)	High					
OLAP Tools	High					
Meta Data Management	High					
Data Quality Tools	Medium					

Contacts

Frank Petrus
Senior Managing Partner
Health and Human Services Practice
Gartner Consulting
Telephone: +1 617 851 6800
Frank.Petrus@gartner.com

Martin Geffen
Vice President
Gartner Consulting
Telephone: +1 416 822 5168
Martin.Geffen@gartner.com