

# Microsoft Connected Health Framework for Health Plans

*A Service Oriented Reference Architecture that enables health plans to accelerate new business opportunities and meet complex and changing business demands*

*Microsoft Corporation*

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For more information on the Connected Health Framework for Health Plans see

<http://msdn2.microsoft.com/en-us/architecture/bb530213.aspx> and

<http://msdn2.microsoft.com/en-us/architecture/bb530326.aspx>

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## Abstract

Microsoft's Connected Health Framework for Health Plans is a free, open, and extensible reference architecture that enables partners and health plans to accelerate new business opportunities and meet complex and changing business demands by reducing the cost and complexities of managing processes and connecting core systems, service channels, new applications, consumers, and business partners. The framework combines Microsoft's comprehensive SOA offering with partner solutions and applications to provide Health Plans with tools, technologies, guidance, and reusable artifacts for building and maintaining SOA solutions. These SOA solutions enable business users to streamline and optimize business processes to increase productivity, drive out costs and complexity, and promote organizational agility.

This paper explores the concepts and components that make Microsoft's Connected Health Framework for Health Plans a simplified and pragmatic approach to service-enabling the critical capabilities health plans need to accelerate new business opportunities and to respond quickly to changing business needs. Following Microsoft's Real World SOA approach, and interoperable by design, the Connected Health Framework extends the life of current application and legacy system investments by connecting people, information, processes, systems, and devices, regardless of the platform or the original programming language. The Connected Health Framework is the next generation platform to support direct-to-consumer connections, delivery of actionable information

within the context of existing workflow and digital lifestyles, and end-to-end collaboration with providers and business partners.

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## Executive Summary

Beyond their core business of underwriting health and paying claims, health plan organizations are under unprecedented pressure to 1) improve the health of their members, 2) improve quality of care and member experience, and 3) control rising medical costs. The challenge that health plans face is that the attainment of these three key goals is underpinned by two core imperatives:

1. **Quickly seize new business opportunities** that create competitive advantage, enable new revenue streams, increase margins, incent and engage consumers to improve their health habits and self-manage their conditions, and support cross-organizational collaborative processes to promote a safer, more effective, and interconnected health care system.
2. **Reduce the cost and complexities** of managing processes and connecting core systems, service channels, consumers and business partners

To execute on these imperatives, the Health Plan's IT organization must establish a standards-based means of integrating diverse systems and applications across a heterogeneous environment. Microsoft's solution to these imperatives begins with Microsoft's Connected Health Framework for Health Plans (CHF). The CHF is a Real World, service oriented architecture (SOA) solution that enables health plans to align their business goals and imperatives with the IT organization. The CHF enables health plan IT organizations to quickly respond to changing business demands by reducing the complexities of managing processes and connecting core systems, service channels, new applications, consumers, and business partners.

Microsoft's CHF takes a different, Real World, approach that quickly unlocks valuable IT resources from existing application silos and makes functionality broadly available to promote business process optimization and organizational agility. The CHF employs SOA design and technology standards that have been proven to reduce application development and maintenance costs by 30 percent or more<sup>1</sup>. For example, Horizon Healthcare was able to reduce overall complexity, increase productivity by over 45% and reduce costs by 50%<sup>2</sup> using Microsoft's platform. Other technology standards and concepts employed by the CHF include web services, Software as a Service (SaaS), Business Process Management (BPM), composite applications, and Web 2.0.

The overall advantages that the CHF provides to Health Plans include:

- Rapid gains in productivity and operational efficiency
- Ecosystem wide collaboration, communication, workflow and compliance
- Simplified identity management
- Microsoft's Consumer Engagement Reference Architecture, a stand-alone companion module to help health plans "go where consumers go" by supporting direct-to-consumer connectivity and personal interactions within the context of the consumer's digital lifestyle, home and devices.

This whitepaper offers guidance and practical next steps for Health Plans to get started quickly by successfully laying the foundation for a service oriented solution environment. It provides guidance and testimony on how SOA enables Health Plan IT organizations to leverage existing IT assets to respond to evolving business demands using a stable and predictable technical infrastructure. The whitepaper outlines Microsoft's recommended Real World "Middle Out" approach for building an SOA. Cases of Health Plan clients that have successfully followed this approach are exemplified throughout. The whitepaper also identifies the core SOA components, architectural patterns, and artifacts available from Microsoft, and Microsoft partners, to help Microsoft health plan customers and partners quickly realize success with the Connected Health Framework for Health Plans.

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<sup>1</sup> Kobiellus, James. "The ROI of SOA", <http://www.networkworld.com/techinsider/2005/101005-roi-of-soa.html>

<sup>2</sup> Microsoft, "Case Study: Horizon Healthcare Services", <http://www.microsoft.com/casestudies/casestudy.aspx?casestudyid=49502>

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## Microsoft's Connected Health Framework for Health Plans

### Business Imperatives for Health Plans

Health Plan executives face the daunting tasks of improving member health, improving the quality of care and member experience, and controlling rising medical costs. This requires them to model and transform their organization into a consumer-centric, collaborative, and knowledge-driven enterprise that is focused on improving the health and experience of the healthcare consumer while holding costs down.

This new consumer-centric and collaborative model brings a completely new set of critical success factors into the board room. Above and beyond maintaining their core business of underwriting health and paying claims, health plan executives must now implement and execute a new portfolio of business and processes that:

- Engage consumers in their health
- Bring new innovative products to market
- Improve the customer and partner experience
- Increase operational productivity and impact of employees
- Incentivize and enable providers to consistently deliver care that's cost-effective and evidence-based.
- Improve access to and leverage of company knowledge assets
- Modernize legacy systems
- Respond faster to changing business demands
- Enter new geographic markets
- Long-run cost reduction
- Better differentiate current product/service offerings from competitors

The ability to execute on this new portfolio of business and processes is hampered by the sprawl of disjointed information that Health Plans have both in tacit, people-driven processes and codified, system-driven processes. Reigning in this information and making it accessible and relevant requires an incremental approach using new technology and architecture. This approach also needs to ensure existing IT assets are leveraged and that there are no large-scale "rip and replace" efforts while enabling new solutions to connect people, information, and processes across their healthcare ecosystem.

### Challenges to Health Plan Success

Along with building the new consumer-centric and collaborative organization, Health Plans must also build a new portfolio of business including new business processes and care processes. Establishing and managing these new processes is impeded by many challenges including:

- A glut of information,
- Disparate and inaccessible legacy systems,
- Lack of integration and interoperability
- Resistance to change

#### **Challenge: A Glut of Information**

The core challenge to Health Plan's success is information, not a lack of it, in fact; information is the organization's fastest growing asset. Health plans however lack the ability to readily access data and present information in a unified view that is relevant to the information's receiver, be it a member, a provider, or another business partner.

**Challenge: Disparate and Inaccessible Legacy Systems**

Standing in the way of establishing new business and care processes are heterogeneous legacy systems. These legacy systems were originally designed to automate structured, machine-to-machine transactions. They were never designed to connect people to information, people to processes, or to other people in the context of their existing digital work styles.

**Challenge: Lack of Integration and Interoperability**

Health Plan IT organizations are challenged by a lack of integration and interoperability among IT assets that span systems, applications and data. The roots of the problem lie in the fact that while legacy and line of business applications typically support rich functionality—whether in claims management, customer service, care management, or sales and marketing — they cannot readily share information with one another, and therefore cannot effectively provide insight into business processes that span cross-functional areas. Many times, to achieve information transfer across disparate and often incompatible systems, whether within or across organizational boundaries, some form of human intervention is necessary.

**Challenge: Resistance to Change**

One of the biggest issues for Health Plans has been the technical deficiencies and challenges presented by their network of providers and business partners. Historically, providers have been resistant to change and reticent to adopt new technology. Therefore, Health Plans must deliver solutions that connect their ecosystem of providers and business partners using minimally-invasive technologies that make adoption a non-issue. In order to do this, they must embrace and leverage proven frameworks, practices, and patterns that allow them to begin to execute more quickly and at reduced costs. Health Plans must become agile organizations that can quickly bring new products to market across a myriad of end user channels that span from mobile devices, to the web, and service representatives.

Given these key challenges, a Health Plan's IT infrastructure and architectural approach becomes a critical path to help drive success and to respond quickly to new business opportunities. In an increasingly competitive marketplace, capitalizing on new business opportunities means moving fast while leveraging existing IT assets. All too often, IT cannot move fast enough or with enough flexibility to compete effectively. What health plans need to compete in this new consumer-centric market is a simple, standards-based means of integrating diverse systems and applications over a heterogeneous set of platforms, access channels, and communication protocols. **Microsoft's Connected Health Framework for Health Plans** (CHF) is a free, open, and extensible reference architecture that enables health plans and solution developers to accelerate new business opportunities and meet complex and changing business demands by reducing the cost and complexities of managing processes and connecting core systems, service channels, new applications, consumers, and business partners. Microsoft's CHF for Health Plans uses a service oriented architecture (SOA) design and provides a set of pre-solved problems within a complete architectural foundation based on a unique "middle out" approach.

**A Real World Solution: Microsoft's Connected Health Framework for Health Plans**

Microsoft's Connected Health Framework for Health Plans is founded on a service oriented architecture that follows Microsoft's *Real World "Middle Out" Approach* and, in conjunction with Microsoft's health plan partners, focuses on the business drivers and process facing health plan executives. Microsoft's Connected Health Framework (CHF) for Health Plans is a simple and pragmatic solution to service-enabling the critical capabilities health plans need to accelerate new business opportunities and respond quickly to changing business needs. Interoperable by design, the Connected Health Framework extends the life of a Health Plan's current application and legacy system investments by connecting people, information, processes, systems, and devices, regardless of the platform or the original programming language. The Connected Health Framework is the next generation solution platform to support direct-to-consumer connections, delivery of actionable information within the context of existing workflow and digital lifestyles, and end-to-end collaboration with providers and trading partners.

### A Different Approach for Health Plan IT Organizations

Microsoft's Connected Health Framework for Health Plans advocates a unique, faster time to value creation approach to enabling a Health Plan's IT organization. Unlike competitive alternatives that may advocate extended, complex and large-scale architectural projects, Microsoft's Connected Health Framework for Health Plans provides multi-channel access, collaboration services, business application integration and standards based technical interoperability in a single and unified platform often with sufficient functionality out of the box. Built into the framework are components that provide a set of pre-solved problems in areas such as .NET/J2EE interoperability, line of business application integration, front-end access, and service enablement. In fact, *a majority of the required functionality for service enablement is available out of the box with Microsoft's tested and proven .NET Framework 3.0 and BizTalk Server 2006.*

While Microsoft's competitors continue to add complex and un-integrated product sets for SOA implementations, Microsoft's single and unified platform approach reduces complexity and accelerates time to value. Using pre-configured components of the reference architecture, a Health Plan IT organization can quickly establish a SOA to quickly demonstrate and prove the value of the Microsoft platform with new business services and business processes.

### Multi-Channel Access and Core Services on a Scalable and Reliable Platform

Figure 1 below illustrates Microsoft's simplified and unified approach that includes (1) a multi-channel presentation layer including device enablement, (2) defined core services for SOA interoperability and (3) a highly scalable and reliable back-end processing layer. The framework includes Microsoft Office System 2007 as one of several options for the service enabled presentation layer to provide end users with a familiar user interface, (using native XML file formats), that can readily consume the exposed services. These services can further be re-used and composed to quickly build end-to-end Office Business Applications (OBA) with minimal to zero programmatic code above the database layer. Message and document interoperability is further enhanced by Microsoft's use of standards that include Web Services Interoperability (WSI), OpenXML, HTTP, and SOAP.

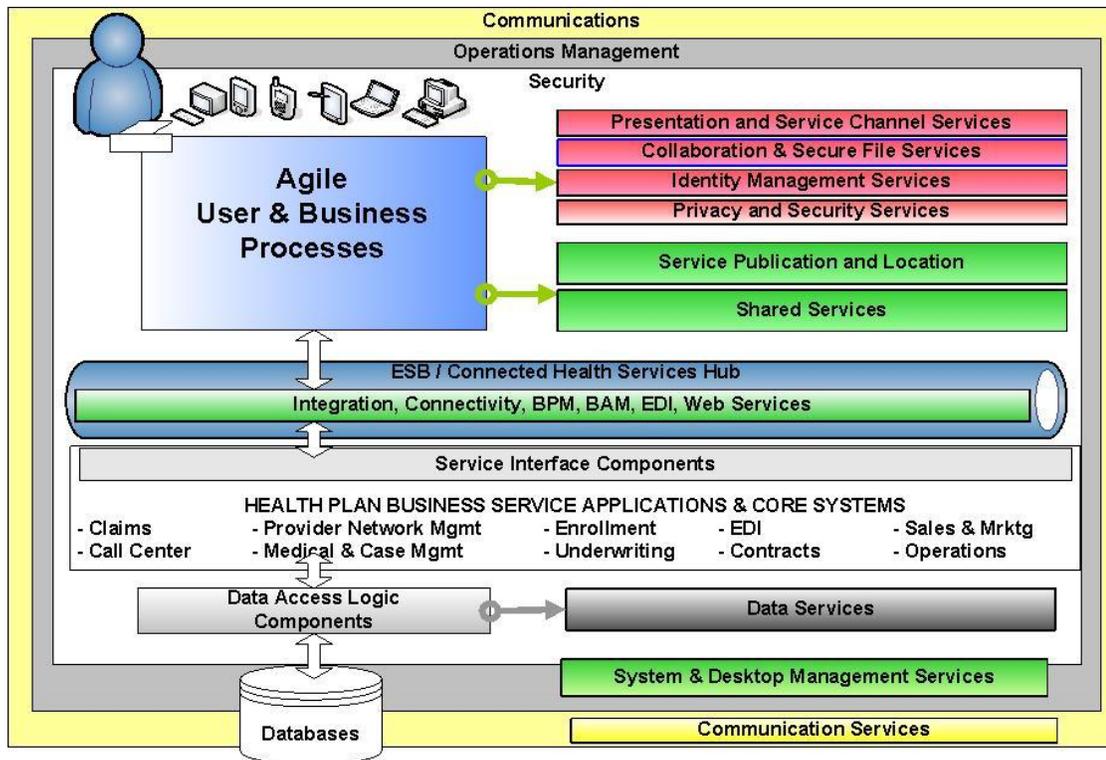
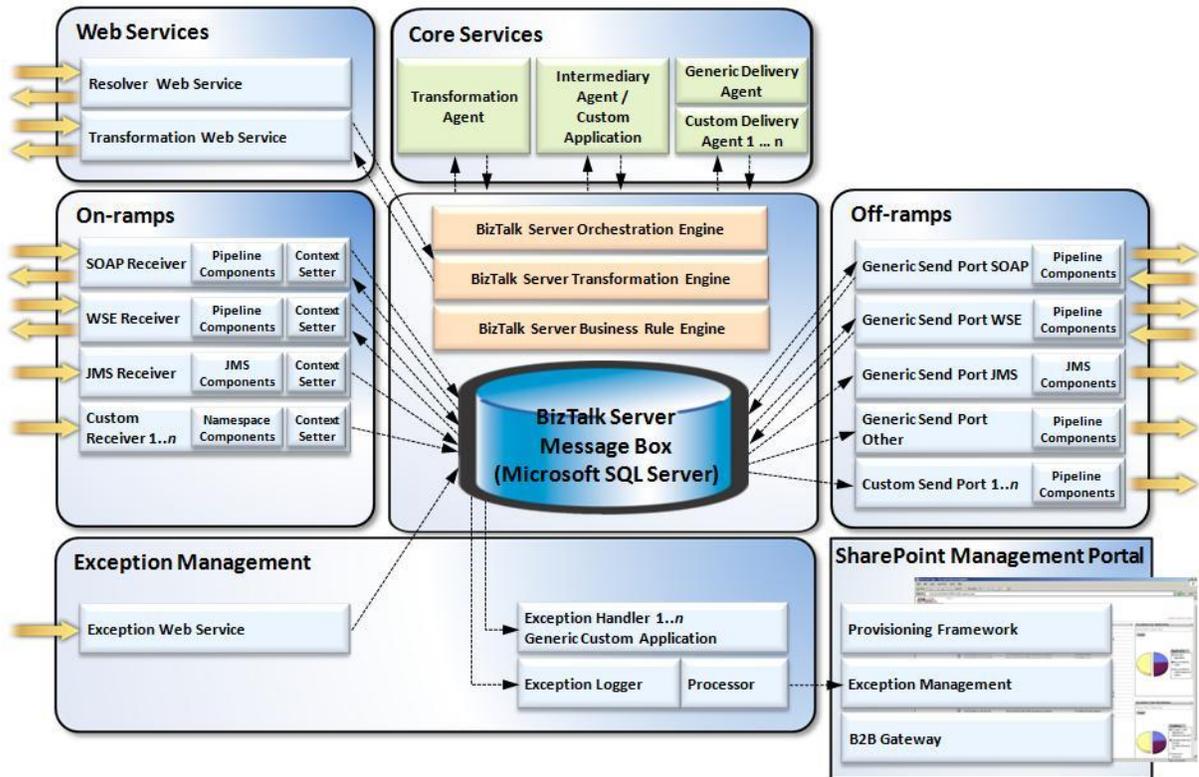


Figure 1 - Microsoft Connected Health Framework for Health Plans

Furthermore, as shown in the architecture diagram in *Figure 2* below, Microsoft's "Enterprise Service Bus Guidance Kit"<sup>3</sup> includes pre-defined components (web services, on ramps, off ramps, and management modules) that readily enable interoperability across both .NET and JAVA environments as well as across heterogeneous messaging standards including JMS, MQSeries and WebSphere. The guidance kit also includes "must have" SOA components for message transformation, message translation, message routing, exception and error handling, business rules, monitoring and administration.



*Figure 2 - Microsoft Enterprise Service Bus Guidance Kit Architecture*

**Flexible Business Integration Architecture for Business Agility**

*Figure 3* below shows how the Connected Health Framework is comprised of two core components that provide an **agile pattern** for business integration and a **stable foundation** for interoperability.

<sup>3</sup> See <http://www.microsoft.com/biztalk/solutions/soa/esb.msp> for detailed ESB Guidance Information

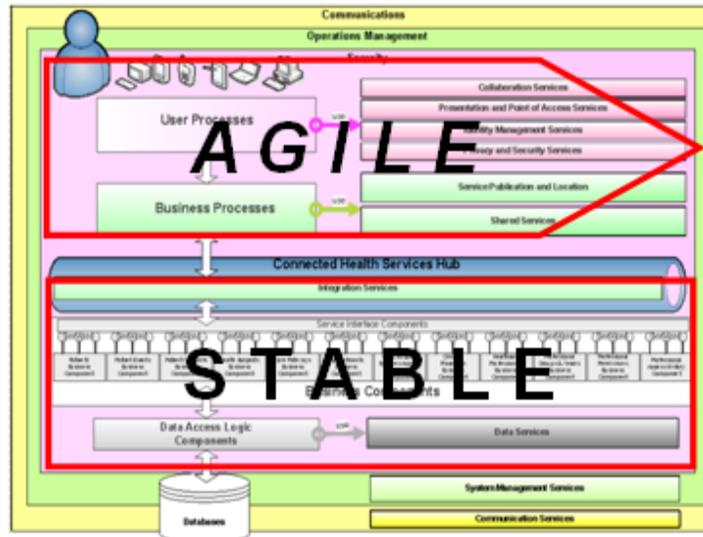


Figure 3 - Agile Processes on a Stable Infrastructure

The business pattern uses SOA design that promotes the achievement of flexible end user process and business application integration and offers a number of “business components” and design patterns from which Health Plan solutions can be developed and deployed. Specifically designed for flexibility and reuse, Microsoft's Connected Health Framework for Health Plans enables organizations to easily integrate systems, data, applications, and processes through the linking of services. Uncomplicated connectivity is achieved by abstracting dependencies away from each application into a Web service (or other brokering service). Applications can then easily be connected to the broker through modular components. And each application can be modified whenever necessary to support flexible and dynamic business processes through platform-independent, standardized interfaces.

### Architecture Design and Technology Standards

In order to maintain and enable simplicity and agility across a heterogeneous environment, the Connected Health Framework relies on architectural designs and technology standards that include SOA, Web Services, Software as a Service (SaaS), Business Process Management (BPM), and the ability to implement composite applications that leverage existing IT assets. These composite applications can also extend into browsers almost anywhere using Microsoft's Silverlight technology and Web 2.0 tools.

#### Service Oriented Architecture (SOA)

Service Oriented Architectures (SOA) provides the design framework to integrate siloed applications so that their functionality can be accessed as services on a network. Most commonly implemented through standards-based, technology-neutral Web Services, SOA breaks down monolithic applications into a suite of services, implementing functionality in a modular fashion.

A SOA approach provides the capability to enable a richer and more seamless user experience from different devices leveraging legacy line of business applications. For example, Horizon (BCBSNJ) used a SOA to instantiate services that allowed members to access self-service processes such as obtaining eligibility status and changing their primary care physician through different channels including a web browser, a voice response system, or a customer service representative. Each of these channels used the same exact set of services and Horizon experienced a measurable increase in data consistency, customer satisfaction, and the self service channels freed up resources to focus on service calls that truly required human intervention.

"Meeting our customers' rising service expectations is our paramount concern and our award-winning Microsoft-based services oriented architecture give us the organizational agility we need to get the job done. Microsoft's standards-based technologies have made it increasingly easier and cost effective for us to integrate our mainframe and UNIX systems for better results."

*Anthony Thomas,  
Chief Technology Officer  
Horizon Blue Cross and Blue Shield*

### **Web Services**

Web Services are the most common way to implement SOA. Web services are applications that use standard transports, encodings, and protocols to exchange information. Web services enable computer systems on any platform to communicate, and are used in a range of application integration scenarios, both within the organization and among trading partners. The Horizon Blue Cross and Blue Shield SOA example detailed above was based on a set of re-usable web services for modern systems and MQSeries for legacy applications. By using Web Services, Horizon was able to expose and re-use business services across the enterprise that led to increased productivity in the development and implementation of additional capabilities while reducing development and maintenance costs.

### **Software as a Service (SaaS)**

Software as a Service (SaaS) is closely related to SOA. Simply put, SaaS can be defined as software deployed as a hosted service and accessed over the Internet. Historically, SaaS as a concept was often associated with the application service providers (ASPs) of the 1990s, but in today's world, SaaS applications are expected to take advantage of the benefits of centralization through a single-instance, multi-tenant architecture. SaaS is also expected to provide a feature-rich experience competitive with comparable on-premise applications. Microsoft considers SaaS to be a strategic component of any customer's SOA strategy.

### **Business Process Management (BPM)**

Business Process Management (BPM) is also frequently related to SOA. BPM is a management discipline that combines a process-centric and cross-functional approach to improving how organizations achieve their business goals. A BPM solution provides the tools that help make these processes explicit, as well as the functionality to help business managers control and change both manual and automated workflows. BPM is an IT enabled management discipline that promotes organizational agility and supports the efforts of people to drive process change and rapid innovation. As such, BPM supports the alignment of IT and business activities both within the organization and with business partners and suppliers.

### **Composite Applications**

Composite Applications offer a long-sought-after business nirvana whereby empowered technical business users can stitch together componentized business capabilities. In many ways, composite applications are the business users' equivalent of Web 2.0 and "mash-ups." While there has been a lot of hype around composites, many vendors have been slow to deliver real value in this area. Technologies are emerging, however, that will change this game, and composition will become an increasingly important aspect of constructing business logic. Microsoft's Office System 2007 is a composite application platform. Microsoft's Office Business Application (OBA) strategy, made possible by new platform capabilities in the 2007 Microsoft Office system, enable health plans to bridge the legacy world of structured, transactional processes with the new world of non-routine, unstructured, and people-driven processes. Health plans can realize the "real-world" value and make service orientation mainstream faster and with fewer resources than their competitors by re-using the familiar Microsoft Office and SharePoint® Server environments for accessing services and interacting with business applications to connect them to existing legacy and line-of-business systems.

### **Web 2.0 and Microsoft Silverlight**

Silverlight is a cross-browser, cross-platform plug-in for delivering the next generation of Microsoft .NET-based media experiences and rich interactive applications for the Web. Silverlight enables Rich Internet Application (RIA) development that spans back-end systems to desktop applications to multiple browsers including Apple Macintosh (Mac) powered systems. Silverlight brings together a number of pieces, including WEB 2.0 technologies such as AJAX, that were previously loosely connected or not connected at all. Silverlight's .NET Common Language Runtime will allow developers to program against Silverlight for both Windows and Mac environments using any .NET-supported languages as well as tools such as Visual Studio and Expression Studio. This enables .NET-based applications to be run through browsers almost everywhere. This capability enables health plan's to embrace WEB 2.0 standards while giving them the ability to drive adoption of their new applications by members, providers, and trading partners within their existing browser platforms.

Additional background information and definitions for SOA, Web Services, SaaS, BPM, Composite Applications and OBAs, and Web 2.0 using Silverlight are provided in Appendix B of this document.

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## Advantages to Health Plans

### Rapid Gains in Productivity and Operational Efficiency

The Connected Health Framework for Health Plans builds on Microsoft's Office Business Application (OBA) strategy to enable health plan employees and partners to reuse the familiar and broadly used Microsoft Office and Office SharePoint Server environments. OBAs leverage a Health Plan's investment in the Microsoft platform to extend and optimize new and legacy applications with rich and intuitive forms, reports, spreadsheets and other user-friendly documents. As exemplified in the Premera/Calypto case study discussed below, using OBAs, a Health Plan can easily and quickly build highly flexible, composite applications that enable rapid gains in business user and IT developer productivity along with workflows to optimize operational efficiency.

#### Case Example: Premera/Calypto Claims Payment Accuracy Solution

##### Business Imperative/Opportunity

In 2005, claims payment errors amounted to over \$110 billion dollars industry wide. The average overpayment problem is thought to be 2-4% of paid claims, representing millions of dollars a year for payers and groups. Calypso, a subsidiary of Premera, was recovering about \$100mm annually but realized that due to limited resources and an application that did not scale they were potentially missing between \$75MM and \$250MM of overpaid claims.

##### Challenges

Calypto faced a number of challenges with their previous system that prohibited them from growing their business and optimizing their claims overpayment recovery. Calypso's business growth was constrained as they could not add more clients without adding more highly skilled auditors because of the inherent inefficiencies of the business process. Minor changes requested by the business required involvement of very limited IT resources. In addition, their auditors were spending the majority of their time searching for candidate claims versus auditing claims that met the overpayment criteria. Time was wasted reviewing too many non-overpayment claims and many times, due to a lack of work distribution queues and flows, the same claim may have been reviewed by multiple auditors.

##### Solution (Products)

The solution, as illustrated in the diagram below, to Calypso' challenges was the development and implementation of a workflow driven and disciplined process to claims overpayment discovery, recovery and prevention that would allow Premera (and other clients) to reduce their medical expense and increase profits to the bottom line. The OTB Solutions application coupled with Calypso's expert auditing capabilities, combines cutting edge Microsoft technology and skilled auditors to find millions of dollars in overpayment each year for clients. The SOA based composite application solution was built on Microsoft's Office System 2007, SharePoint Server 2007, BizTalk 2006, and SQL Server 2005. Using the Office System 2007 as a development platform provided OTB Solutions with the ability to compose and configure the application with no programmatic code above the database layer. Key components of the solution include:

- a rules engine to identify probable overpayment of claims
- a scoring engine to prioritize identified claims based on risk, dollar value threshold or other defined requirements
- recovery management and discovery tools to maximize auditor effectiveness

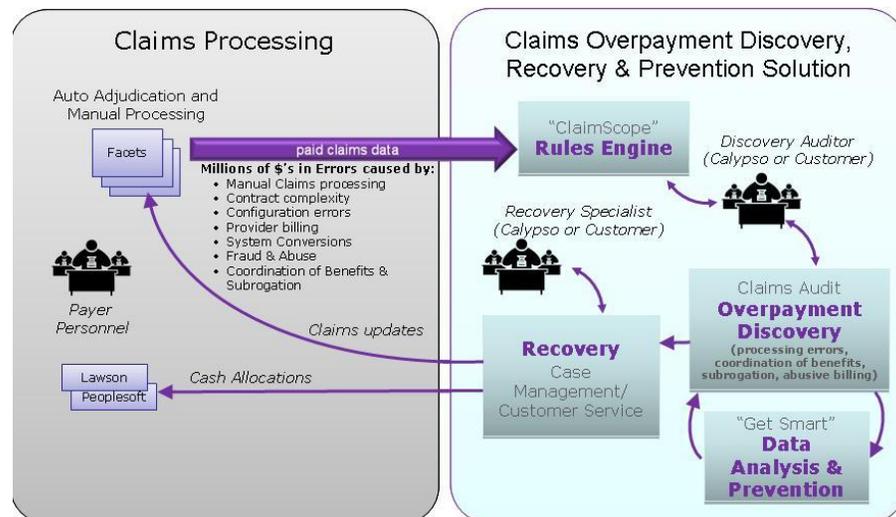


Figure 4 - OTB Claims Accuracy Solution

### Value Proposition and Impact

The OTB Solutions application proved that “Code free” application development is feasible for enterprise class applications. Using built in SharePoint “assets” accelerated development through rapid, iterative prototyping and enabled the team to incorporate many best practices for good application design at no incremental cost. The business users immediately leveraged SharePoint’s extensibility features (such as “my lists”) to enhance the solution. After three months of production, Calypso has observed a substantial gain in their ability to audit more claims, recover more over payments, with less resources.

### CHF Architectural Alignment

The solution exemplifies the use of the Connected Health Framework. Microsoft’s SOA guidance, platform interoperability and integration capabilities allow OTB Solutions to make the solution available as an installed application, as a hosted application, or as Software as a Service. The third option, is the optimal solution, as it allows a health plan to outsource the claims auditing and payment recovery business processes without concerns regarding IT capacity, auditor expertise, and other maintenance and enhancement related issues. In the Software as a Service scenario, OTB Solutions hosts and configures the Claim Payment Accuracy application specific to the client’s requirements. Calypso Healthcare Solutions will then serve as the Outsourcing partner performing all the discovery, recovery and prevention activity.

### Ecosystem Wide Collaboration, Communication, Workflow, and Compliance

Using Microsoft’s Connected Health Framework for Health Plans and the Real World approach for SOA, health plans can quickly implement a SOA infrastructure to service enable existing line of business applications and to extend internal and external collaboration and workflow processes across organizational boundaries. The Connected Health Framework simplifies information access and usage protections that make it easier and less time consuming for employees, partners, and consumers to collaborate and share more information with less risk. This new collaborative model enables health plans to establish new and more customer-centric business processes in tune with the digital lifestyles of consumers and the business processes of providers. This collaborative model allows health plans to “go where consumers live” and “go where providers work” rather than waiting or expecting them to adapt their lifestyles and work styles to the conventional self-service portals that health plans offer today.

**Case Example: Horizon Healthcare Services SOA for Member Self Service**

**Business Imperative/Opportunity**

As a healthcare insurance provider, Horizon Healthcare Services was faced with a constantly changing regulatory environment, shrinking margins, and increasing costs. In order to retain and expand its customer base, Horizon needed to respond quickly to its competitors' offerings, be responsive to customers, and contain costs.

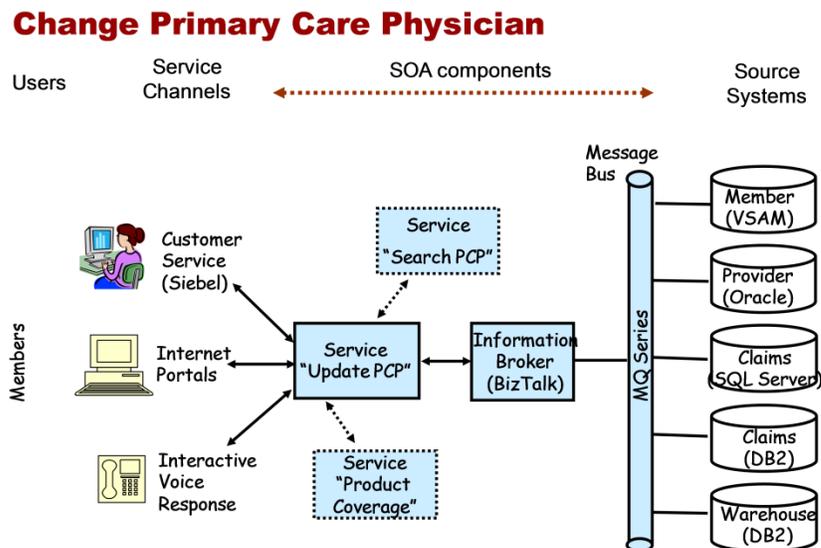
**Challenges**

The main challenge faced by Horizon was that they had had three disparate core systems that were never designed to operate together. The operating platform contained different environments, including IBM mainframes, AIX, and Microsoft® Windows. Member, provider, and customer service representatives were accessing information from different entry points and receiving inconsistent information. Due to the inconsistent information, customer service representatives would have to spend time answering simple transactions such as a benefits eligibility inquiry.

**Solution (Products)**

Horizon implemented a core service-oriented architecture (SOA) system using the business process integration capabilities of .NET framework and BizTalk Server. The SOA Horizon implemented is based on Web services for modern systems and MQSeries for legacy applications. The SOA uses the business process and legacy integration capabilities of BizTalk to provide a unifying access point for client applications into service-enabled systems.

As shown in *Figure 5* below, the SOA enables Horizon to expose business processes, such as "Change Primary Care Physician", and using Microsoft BizTalk® Server, Horizon can then reuse those processes across the organization. As also depicted in the diagram, the same process can be invoked from multiple channels, thus ensuring data quality and consistency for members in a portal, providers on the phone, or customer service representatives using Siebel.



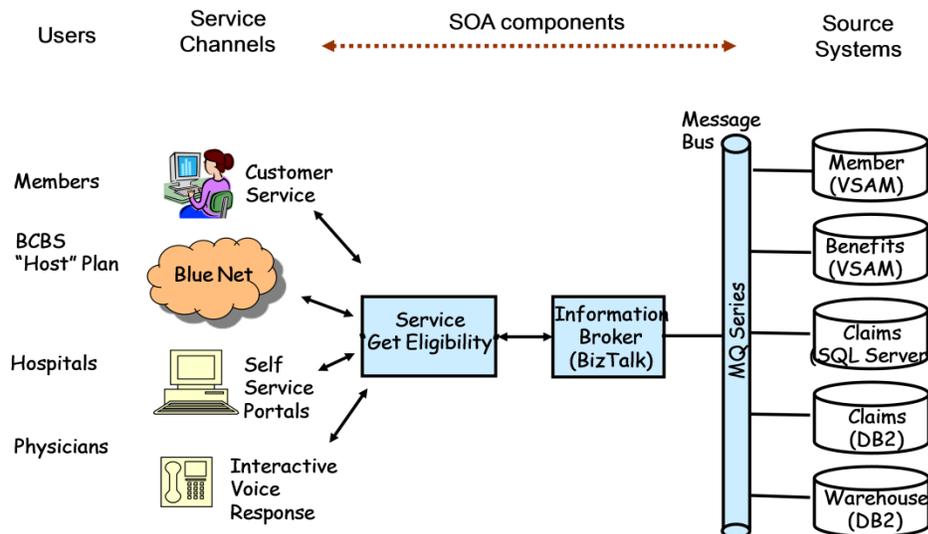
*Figure 5 - Change Primary Care Physician Service on Horizon's SOA*

**Value Proposition and Impact**

Following the "Real World" middle out approach, Horizon experienced a 50% increase in development productivity and reduced costs for development and maintenance by 45%. Horizon was able to identify a few core services that enabled them to prove that the SOA would work in their environment. The initial set of member self services that have been implemented have shown that Horizon has also increased customer satisfaction with increased data quality and consistency, At first glance, the

"Enhanced Eligibility" diagram in *Figure 6* below appears very similar to the "Change Primary Care Physician" diagram above. This is exactly the desired outcome using a real world approach to SOA.

### Enhanced Eligibility



*Figure 6 - Enhanced Eligibility Service on Horizon's SOA*

Horizon's BizTalk-based SOA earned them the 2005 Best Practice Award for Service Oriented Computing by the Technology Managers Forum, in competition with Fortune 1000 companies. Overall, Horizon has been able to expose a set of user and business processes on a stable foundation that can be re-used to instantiate additional processes and solutions. Other benefits include:

- using BizTalk Server in the SOA helped establish collaborative processes and a platform to compete in a consumer-focused market,
- SOA enables new applications to be built on existing architecture and reduces redundancies,
- the SOA approach facilitates Business Process Integration (BPI) by decomposing Horizon's processes and business functions into independent technology components,
- SOA frees IT capital and protects existing assets, while reducing costs versus point-to-point interfaces and allowing components to be reused,
- reduced complexity makes Horizon more agile when responding to market demands and changes to the regulatory environment,
- SOA enables real time transaction processing capability and support for web services, and
- SOA supports HIPAA-mandated data standards.

### CHF Architectural Alignment

The Horizon architecture aligns with the CHF approach for business application integration and platform interoperability. Horizon's development methodology exemplifies Microsoft's Real World "Middle Out" approach for executing SOA. Using this approach, Horizon has measured and shown savings of over 45% and productivity gains of over 50% versus their previous development and deployment methods.

### Case Example: ESB/SOA in Large, Distributed Staff Model HMO

#### Business Imperative/Opportunity

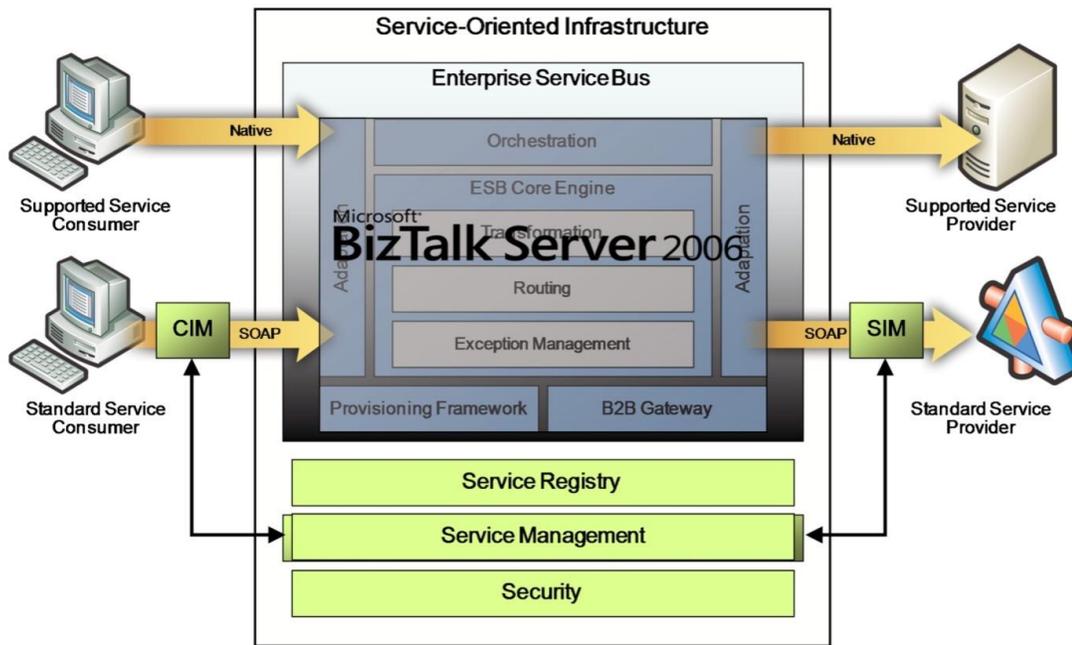
This large staff model HMO needed more flexible and higher quality IT solutions in shorter timeframes. The company was looking to a new IT approach to enable the ability to rapidly respond to business threats and to enter new markets. It was imperative that IT and Business collaborate to define, model, and implement new business processes using a common standard infrastructure to eliminate the need for point-to-point integration.

**Challenges**

The company needed to control IT costs and increase overall productivity. They were also challenged by the need to integrate over 1500 backend systems and with the need to remediate and replace a number of legacy systems.

**Solution (Products)**

The conceptual diagram in *Figure 7* below illustrates the client’s implementation of their Enterprise Service Bus (ESB) to power their SOA. Microsoft’s BizTalk Server is at the core of the ESB. Other core components include two Microsoft ISV partners, Systinet for registry operations and AmberPoint for web services run-time management. Additional agents, web services, and on-ramps and off-ramps, were configured and added as standard components to enable integration and interoperability with J2EE and MQSeries platforms.



*Figure 7 – Microsoft BizTalk Server 2006 in an ESB/SOA*

**Value Proposition and Impact**

The initial pilot was completed in one month. The full cost of software and hardware acquisition was approximately 30% of the competitors’ proposal. Overall, by using Microsoft BizTalk Server as the core ESB, the company substantially reduced product complexity versus competitors. The ESB/SOA configuration also provided the framework and standard methods for integration and interoperability with the existing MQSeries architecture and J2EE environment including JMS messaging.

**CHF Architectural Alignment**

As shown in the CHF alignment diagram in *Figure 8* below, the core components of this client’s ESB/SOA architecture map directly to the CHF components for the services hub, integration and interoperability.

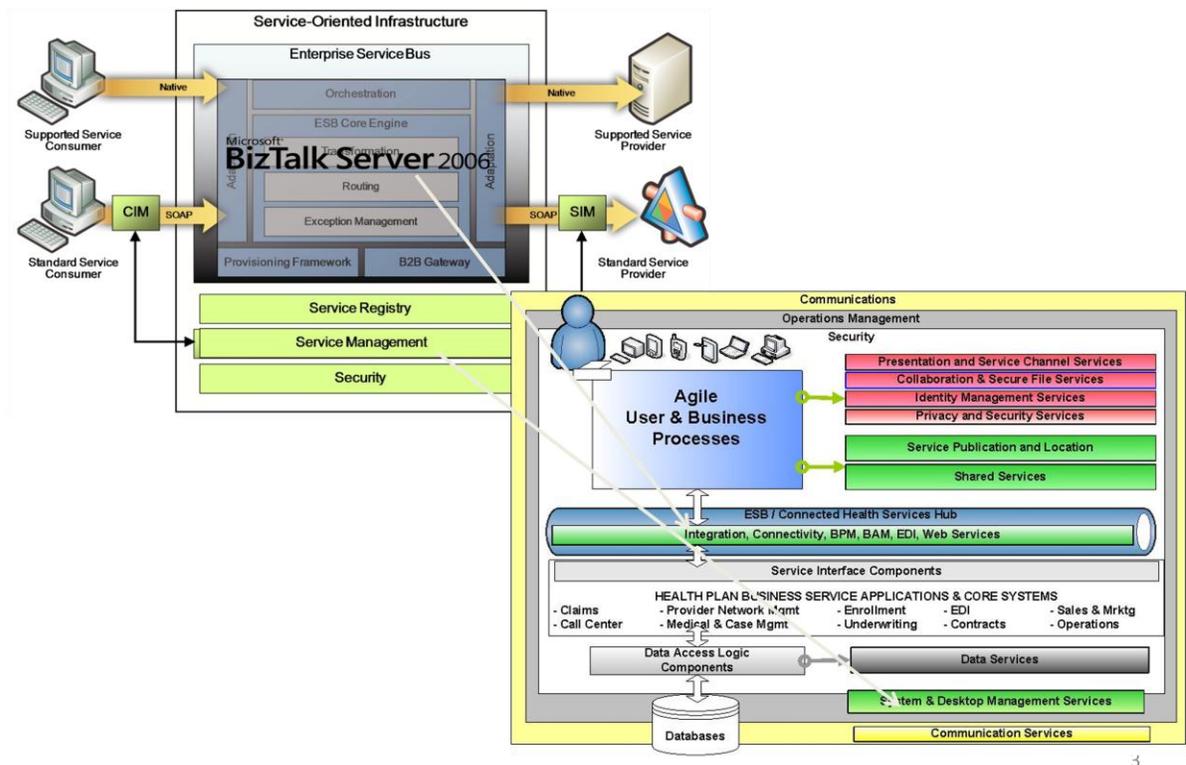


Figure 8 - CHF Alignment

## Simplified Identity Management

A key component to any successful SOA implementation is identity management as defined as the process by which digital claim of identity is established to be valid. Microsoft’s CHF provides multiple methodologies for establishing and using identity throughout the architecture ranging from on ramps to full force identity management solutions to simple, lightweight cross-entity solutions. *Cross entity authentication* (CEA) requires that one entity establish the validity of an identity claim that comes from another entity. CIGNA’s ChoiceLinx division used the CHF CEA capabilities to provide secure, lightweight solution for its customers and partners as detailed below.

### Case Example: CIGNA’s Cross Entity Consumer and Provider Authentication Solution

#### Business Imperative/Opportunity

With consumers now facing more difficult choices and tradeoffs about their health, care, and finances, health plans, third-party administrators (TPAs), and employers need to make every online experience for the consumer as simple and seamless as possible. Consumers need to be empowered, not more confused. The enrollment process is a great example of how challenging it is today for health plans and TPAs to stitch content, transactions, and technologies together that span multiple sources, partners, and organizational boundaries into a simple and seamless user experience.

#### Challenges

The enrollment process for consumer-driven health plans involves a myriad of more personalized transactions, technologies, and specialized content that needs to come from multiple sources, systems, and partners. Making the consumer experience simple and seamless during the enrollment process requires plans to plug-n-play with whatever user authentication (sign-on) system that each health plan, business partner, and employer has in place today. The problem is that most of the technology installed today at plans, business partners, and employers is complex, proprietary, and rigid. These identity management solutions were never designed to interoperate across multiple systems and

boundaries to the extent that's now required. As a result, SSO implementations today cost too much and take too long.

**Solution (Products)**

Using Microsoft's Connected Health Framework platform (including Windows Server 2003 and the .NET framework), CIGNA's subsidiary Choicelinx figured out how to solve the SSO and cross-entity authentication problem faced by health plans today. Choicelinx made the single sign on process simple and seamless by using a standards-based web service that leveraged off-the-shelf Microsoft technologies to drive out the usual high cost and long delays involved in cross-entity authentication. As depicted in the solution diagram in *Figure 9* below, Choicelinx used industry technical and security standards, including SAML and X509, to enable identity integration between the health plan and its business partners.



*Figure 9 - Choicelinx Cross Entity Authentication Solution*

**Value Proposition and Impact**

Cigna and Choicelinx achieved a number of impressive results including: agility, speed to benefits, and cost savings. With the more agile infrastructure, the solution can adapt to nearly any existing identity management system in place to make the user experience simple and seamless. The benefits of the new solution were realized in weeks versus months and Choicelinx was able to drive out costs and complexity by using a simple standards-based web service and components embedded in Windows Server 2003 OS. Using these embedded components further enables Health Plans, business partners and employers to get more out existing IT investments because they can use what they have in place.

**CHF Architectural Alignment**

The core capabilities required to enable cross-entity authentication and security integration are enabled by the Connected Health Framework's integration and interoperability components including .NET 3.0 and BizTalk Server 2006.

**Reference Architecture Packs for Solution Acceleration**

In addition to the specific examples provided above, Microsoft is committed to providing health plan specific reference architecture packs that provide: 1) detailed solution architectures, 2) solution blueprints, and 3) code samples and/or solution demonstrations. These reference architectures are intended to provide a best practice starting point to apply the Connected Health Framework to real world health plan issues. The first stand-alone module, Microsoft's Consumer Engagement Reference

Architecture (CERA), provides health plans with reference architecture to pro-actively and interactively engage consumers in their health within the context of their existing lifestyle at work, home and on the go.

CERA enables health plans to make it more natural for consumers to make better informed financial and clinical decisions. A CERA based solution also provides members with the ability to use personal technologies to generate new and personalized moments of participation that activate, engage, and re-engage consumers to self-manage their health and conditions. More information on CERA is at <http://msdn2.microsoft.com/en-us/architecture/bb530326.aspx>.

### Case Example: Reference Architecture for Member Advocacy and Wellness Coaching

#### **Business Imperative/Opportunity**

The greatest opportunity for health plans to improve improve the health of their members, improve quality of care, and control rising medical costs lies in engaging members to improve their health behaviors and self-manage their conditions. Health plans need to reach consumers where they live in their digital world while truly engaging them in their health. In addition this engagement needs to leverage current technology investments as well as current consumer engagement channels to provide a comprehensive multi-channel approach to consumer health.

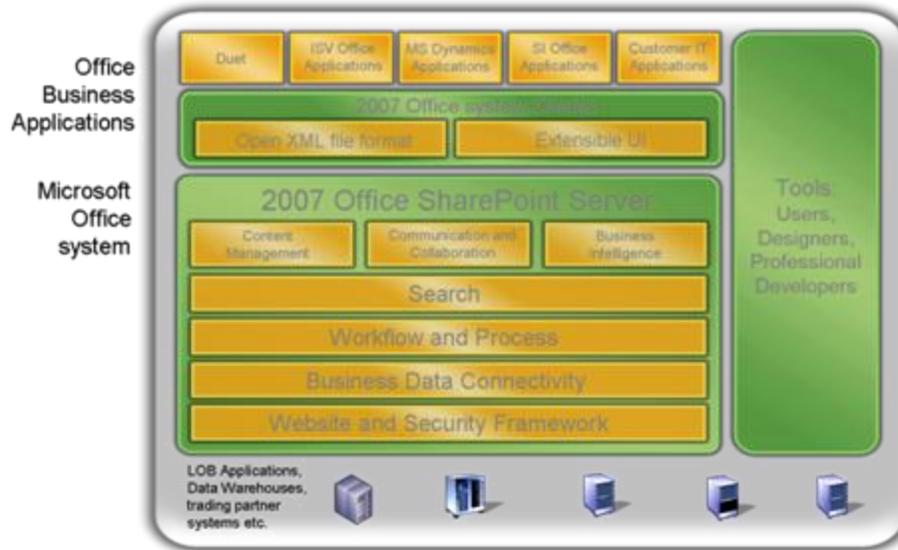
#### **Challenges**

Consumer engagement faces a combination of technology, institutional and motivational issues. Technology needs to both embrace legacy systems as well as to extend these systems in a transparent way combined with health and wellness information across both existing and new engagement channels. In addition health plan organizations must embrace new transparency needs across the organization and its various constituencies. Lastly and most importantly consumers must embrace change and be active participants in the care delivery process.

**Solution (Products)**The Consumer Engagement Reference Architecture (CERA) uses the CHF capabilities to enable plans to pro-actively and interactively engage consumers in their health within the context of their existing lifestyle at work, home and on the go, making it more natural for consumers to make informed financial and clinical decisions and self-manage their risks and conditions. The reference architecture pack is based on the core Office 2007 OBA capabilities combined with direct on ramps to consumer facing email, chat, mobile phone, and portal channels. The core of this solution lies in the OBA platform as detailed below.

#### **The 2007 Office Business Application Platform**

The 2007 Microsoft Office system is such a platform for building composite applications – which are called Office Business Applications. This is shown below in *Figure 10*.



**Figure 10 - Capabilities provided by the 2007 Microsoft Office System to serve as a platform for building composite applications**

At a very high level, some of the technical capabilities of the 2007 Office System are summarized in *Table 1*. Each of these capabilities is a powerful feature when looked at individually - however it is the combination of these different technologies into a single integrated platform that makes it practical. It is the integration of these technologies that enables delivery and deployment of applications without an overwhelming increase in complexity in the overall platform, tooling and architecture.

No	Capability	Description
1	Web site and security framework	A common framework for creating different kinds of sites e.g. team collaboration sites, intranet portals, internet web sites.
2	Open XML file formats	Open formats to represent business documents that can easily be read, transformed and visualized. This enables rich server-side processing of documents in ways that was not possible before. With prior versions of Office, parsing the document using the object model required an instance of the client application.
3	Extensible UI	Server-side portal that can be extended by users from a catalog of web parts and the catalog itself can be extended by solutions providers. Client applications with rich capabilities for extensibility through Visual Studio Tools for Office.
4	Business Data Catalog	A metadata repository to define business entities stored in back-end data stores, to model relationships between entities, and to define actions permissible on entities.
5	Enterprise Search	Surface data from various enterprise sources through search.
6	Workflow	Integration with Workflow Foundation to host workflows that represent people-to-people interactions, and that link user interface elements.
7	Enterprise Content Management	Manage diverse content, with one topology for web, document and records management. Support for document life-cycle management.

No	Capability	Description
8	Business Intelligence	Server-based Excel spreadsheets, plus BI components (dashboards, reports, and web parts) built into the portal and connected to SQL Server Analysis Services.
9	Communication and Collaboration	Support for unified communications integrated into the platform

*Table 1: High level capabilities provided by the 2007 Office System*

The 2007 Microsoft Office system also has in-built server-side support for Workflow Foundation (WF). The WF run-time engine is hosted within MOSS, and itself acts a container for business logic that can be attached to work items and documents in the form of workflows. These workflows may be associated with lists, document libraries, or with particular content types. They are started and completed by user actions, and are managed using WSS task lists. For example, workflow activities create and update task items as required, and users can track workflow progress through history tables. Office client applications (e.g. Word and Excel) are also workflow aware. They can be used for workflow initiation, configuration and completion, and also ad-hoc customization (e.g. forwarding / delegation).

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## Microsoft Connected Health Framework Approach Details

### Approach That Provides A “Middle Out” SOA

SOA provides the design framework to integrate siloed applications so that their functionality can be accessed as services on a network. Most commonly implemented through standards-based, technology-neutral Web Services, SOA breaks down monolithic applications into a suite of services, implementing functionality in a modular fashion. Using a SOA approach, Health Plans can service-enable existing legacy line of business applications to provide a richer and more seamless user experience from different devices.

While a well planned and executed SOA undertaking can help organizations realize greater responsiveness in a changing marketplace, not all service oriented efforts have been successful. Traditionally, two approaches have been commonly pursued for implementing SOA: top-down and bottom-up. In a top-down approach, an overview of the system is first formulated, specifying but not detailing any first-level subsystems. Each subsystem is then refined in yet greater detail until the entire specification is reduced to base elements. The risk with a top-down approach is that it may fail to fully clarify elementary mechanisms or be detailed enough to validate the solution. In a bottom-up approach, the individual base elements of the system are first specified in great detail. These elements are then linked together to form larger subsystems, which then in turn are linked, sometimes in many levels, until a complete top-level system is formed. However, the bottom up approach may result in a tangle of elements and subsystems, developed in isolation, and subject to local optimization as opposed to meeting a global purpose.<sup>4</sup>

Overall, both approaches have risks and pitfalls that can hinder success. Many organizations that have attempted to roll out SOA infrastructure through a top-down approach have discovered that when the infrastructure is finally delivered, it is out of sync with the needs of the business. Likewise, a bottom-up approach can fail as well, because it can lead to a chaotic implementation of services created without regard to organizational goals.

In contrast, **Microsoft takes a different route** and advocates what it calls a “middle out” approach. In this approach, SOA efforts are driven by strategic vision and business needs, and are met through incremental, iterative SOA projects that are designed to deliver on business goals - one business need at a time. The “middle-out” approach is a successful hybrid of the top-down and bottom-up approaches and begins by defining business drivers and strategic vision to set clear direction and priorities. From here, the organization takes multiple iterative steps to develop end-to-end business processes and services. Each iteration quickly delivers a new and dynamic application or service back to the business that is used to create business return. The approach is focused on rapid time-to-value, delivering business results through iterative, incremental steps that facilitate close alignment of IT resources with changing business conditions.

Microsoft has successfully helped customers with their SOA efforts since 1999, when it first announced its Web services model and followed up with the release of the .NET Framework and SOA tools and design approaches built into its application platform. Since then, Microsoft's real world approach has helped organizations of all sizes optimize their business processes and realize greater business agility and faster time to value through use of Microsoft's SOA design principles, best practices, tools and technologies.

### Approach That Maintains Focus on Business Drivers

Before a developer writes a single line of code, it is critical to identify both specific business drivers of the SOA endeavor and the dependencies between the business and the underlying technologies. Neglecting the business context can result in a project in which SOA infrastructure is pursued for its

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<sup>4</sup> See <http://en.wikipedia.org/wiki/Top-down> for more information on Top-Down versus Bottom-Up approaches

own sake, or where investments are made that do not line up well with the needs and priorities of the business.

### **An Incremental Delivery Approach – Expose, Compose, Consume**

Once the business drivers are defined, the process of implementing the technology can begin. Based upon the clearly defined and prioritized vision, each implementation project is an iterative one of creating (“exposing”) new services, aggregating (“composing”) these services into larger processes, and making the outputs available for use (“consuming”) by the business user.



Figure 11 - The "Middle Out" Approach

#### **Expose**

The expose phase of the SOA approach focuses on which services to create from the underlying applications and data. Service creation can be fine grained (a single service that maps to a single business process, such as ‘insert part number’), or coarse grained (multiple services come together to perform a related set of business functions, such as ‘process purchase order’). The expose phase is also concerned with how the services are implemented. The functionality of underlying IT resources can be made available natively if they already speak Web services, or can be made available as Web services through use of an adapter.

#### **Compose**

Once services are created, they can be combined into more complex services, applications or cross-functional business processes. Because services exist independently of one another as well as from the underlying IT infrastructure, they can be combined and reused with maximum flexibility. And as business processes evolve, business rules and practices can be adjusted without constraint from the limitations of the underlying applications.

#### **Consume**

Once a new application or business process has been created, that functionality is made available for access (consumption) by other IT systems or by end-users. By creating composite applications that consume these services and processes, you deliver to the business new dynamic applications that enable increased productivity and enhanced insight into business performance. Users can consume the composed service through a number of avenues, including web portals, rich clients, Office business applications, and mobile devices.

### **Approach That Provides Faster time to Value for Both Business and IT**

Central to this real-world approach is **time-to-value**. In the health plan industry, time-to-value is a critical value measurement and in the case of SOA, it drives more immediate returns. In the real-world, top-down, big-bang mega approaches seldom succeed. Bottom-up approaches aren’t manageable. Microsoft’s Real World SOA takes a middle-out approach, focusing on immediate business problems and applying IT solutions in incremental steps to deliver near-term business results. By starting small and achieving rapid success around a focused business problem, the focused business solution becomes the basis of broader SOA implementations.

Real World SOA benefits accrue for the organization at two different levels, that of the business user and that of the IT organization. From the business point of view, Real World SOA enables development of a new generation of dynamic applications that:

- **Enhance business decision making.** By aggregating access to business services and information into a set of dynamic, composite business applications, decision makers gain more accurate and more comprehensive information. People, processes and systems spanning multiple departments can more readily be mapped into a single unified view, enabling organizations to better understand the cost tradeoffs they are making in daily business operations. And by providing better information faster, organizations can react more quickly to problems and opportunities as they arise.
- **Improve employee productivity.** By providing streamlined access to systems and information and enabling business process improvement, businesses can drive greater employee productivity. Employees can focus their energies on addressing the important, value-added processes and on collaborative, semi-structured activities, rather than having to conform to the limitations and restrictions of the underlying IT systems. End-users can access information in the form and presentation factor (web, rich client, mobile device) that meets their needs so productivity is enhanced.
- **Forge stronger connections with member and business partners.** The benefits of a Real World SOA extend beyond organizational boundaries. Mergers and acquisitions become more profitable, since it is easier to integrate disparate systems and applications. Integration with business partners and streamlining of supply chain processes are readily attainable goals. Providing more responsive customer service is enabled, as are new customer initiatives, such as one-stop service portals. By making available dynamic applications and business services to external customers and suppliers, not only is richer collaboration is possible, but member/partner satisfaction is increased.
- **Codify business models.** A Real World SOA helps organizations document their business model and use the documented business model to capture changing business dynamics and optimize accordingly.

From the perspective of the IT professional, a "Middle-Out" approach provides the framework through which to simplify the creation and management of integrated systems and applications, and a way to align IT assets with the business model and changing business needs, including:

- **Agility to quickly respond to changing business needs-** Health plan leaders must transform their businesses into ones that are customer-centered, highly collaborative, and knowledge-driven. They need to be capable of turning information into actions that improve member health, quality of care and customer experience, and control rising medical costs.
- **Works with what you have to unlock valuable IT resources** - Legacy claims-based insurance and CRM applications were never designed to support the vast majority of what a customer-centric, highly collaborative, and knowledge-driven health plan actually does: ad hoc, unstructured, collaborative interactions and exception-handling.
- **Enables IT to make existing IT assets** more productive and profitable to the business without the need for custom-coded one-off integration solutions.
- **Faster, more cost-effective composite application development** - Real World SOA enables health plans to develop a new generation of composite applications that provide cross-functional capabilities to the organization irrespective of the underlying platforms and programming languages. Services are uncoupled from their underlying IT infrastructure providing greater flexibility in solution design. Standards-based service design enables IT to create a repository of reusable services that can be combined into higher level services and composite applications as new business needs arise. This lowers the cost of solution development and testing, reduces redundancy, and speeds time to business value. And the use of a single development model and framework simplifies and standardizes application building, testing and maintenance.
- **More manageable and secure applications** - Service oriented solutions provide a common infrastructure (and documentation) for developing secure, monitored, and predictable services.

As business needs change, SOA makes it easier to add in new services and capabilities that map to critical business processes. Because services are accessed rather than the applications themselves, service orientation provides the means for protecting existing IT investments without inhibiting the deployment of new capabilities. And since a strong authentication and authorization model is used for all services—as well as because services exist independently of one another and cannot therefore impact other services—the SOA approach provides greater overall security.

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## Getting Started

Microsoft provides extensive guidance, practices, and patterns for an organization to get started quickly and correctly with their SOA project. The Application Platform Infrastructure Optimization (APIO) and Business Productivity Infrastructure Optimization (BPIO) models help an organization establish the maturity and readiness of their IT and business process infrastructure. The Connected Health Framework for Health Plan is a guide for building SOA based e-health solutions. The “ESB/SOA Guidance Kit” contains a BizTalk 2006 demo with additional code samples and artifacts that can be repurposed to quickly pilot Microsoft’s SOA platform.

If SOA is to become a strategic asset for your organization, it is vital to measure your progress in building an optimized infrastructure. To help chart your journey to improve and develop the state of your capabilities, Microsoft introduces the Application Platform Infrastructure Optimization (APIO) model. This model can be used as a tool to help you assess the maturity of your existing technology platform and identify possible products or solutions to help you reach your desired state.

The APIO model identifies a core set of solution capabilities, which form the basis of any organization’s application platform. One of the strategic core capabilities is the “SOA and Business Process” capability, which is mapped along a maturity continuum. The maturity continuum progresses from a basic infrastructure, where a company’s IT infrastructure may be regarded as more reactive, or a cost center, to a more dynamic environment, where the infrastructure is perceived as a strategic asset that can fuel business growth.

The BPIO model has been developed based on industry best practices with extensive feedback and input from analysts. A key tenant of the BPIO model is to drive dramatic cost savings by moving from an unmanaged environment toward a dynamic environment. The BPIO model enables IT management to move from being highly manual and reactive to highly automated and proactive and processes move from fragmented or non-existent to optimized and repeatable. Overall, following the BPIO, a Health Plan’s ability to use technology to improve its business agility and deliver business value increases as it moves from a basic state up the continuum toward a dynamic state that increasingly empowers information workers and managers and supports new business opportunities.

To encourage the creation of SOA based connected health information solutions and networks that serve a broad range of healthcare needs, Microsoft has developed guidelines for e-health software solutions. These guidelines include the following:

- (1) An overarching set of architecture and design blueprint guides for the Connected Health Framework available at <http://www.microsoft.com/industry/healthcare/connectedframework.aspx>
- (2) The Connected Health Framework for Health Plans available at <http://msdn2.microsoft.com/en-us/architecture/bb530213.aspx>
- (3) The Consumer Engagement Reference Architecture (CERA) Pack available at <http://msdn2.microsoft.com/en-us/architecture/bb530326.aspx>

Additional information can also be obtained by contacting [hlthplan@microsoft.com](mailto:hlthplan@microsoft.com).

## Immediate Next Steps

1. Contact your local Microsoft representative to arrange a detailed briefing on the Microsoft Connected Health Framework for Health Plans
2. Contact Microsoft or one of its partners to evaluate what architecture maturity level your company has reached. The APIO and BPIO models provide questions that span the capabilities and help you identify your organization’s current architecture maturity level.

3. Download and evaluate the Microsoft solution using the ESB/SOA guidance kit. This kit is available by working with Microsoft or a Microsoft certified partner. The evaluation process is free of charge.
4. Download and evaluate the Microsoft BizTalk Services Internet Service Bus (ISB) SDK. The “BizTalk Services” Internet Service Bus (ISB), new technology in the Microsoft platform, hosted on the internet, brings powerful, robust and interoperable foundational capability to applications designers today, complementing the capability available in on-premise deployments of Windows Server, the .NET Framework, and BizTalk Server. The ISB is now available at no charge. Delivered over the network, the ISB complements existing investments in programming skills (C#, PHP, Java™), infrastructure (.NET, XML, BizTalk Server, Web services), and architecture (SOA, loose coupling). Applications designers can now leverage this integrated network-available infrastructure, rather than investing time and resources in designing, building, testing, and operating such infrastructure themselves. This frees applications designers to focus more of their resources on building unique value into their applications. Download the free BizTalk Services SDK and get started today. The SDK can be found at <http://labs.biztalk.net/downloads.aspx>.

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## Additional Resources and Related Whitepapers

See the following resources for further information:

Microsoft in the Health Plan Industry

<http://www.microsoft.com/healthplans>

Horizon Healthcare Services

“Leading Health Insurer Speeds Transactions and Affordably Meets New Business Demands”

<http://www.microsoft.com/casestudies/casestudy.aspx?casestudyid=49502>

Microsoft Health Plans Industry Center

<http://msdn2.microsoft.com/en-us/architecture/bb469958.aspx>

Real Work Service Oriented Architecture Using the Microsoft Platform

<http://www.microsoft.com/biztalk/solutions/soa/whitepaper.msp>

Microsoft Interoperability

<http://www.microsoft.com/interop/>

Enterprise Service Bus (ESB) Guidance

<http://www.microsoft.com/biztalk/solutions/soa/esb.msp>

Application Platform Infrastructure Optimization (APIO)

[http://www.microsoft.com/business/peopleready/appplat/strategic\\_analysis.msp](http://www.microsoft.com/business/peopleready/appplat/strategic_analysis.msp)

APIO Whitepaper "Advance Your Business with IT"

Service Orientation and Its Role in Your Connected Systems Strategy

[http://msdn.microsoft.com/architecture/solutions\\_architecture/service\\_orientation/default.aspx?pull=/library/en-us/dnbda/html/srorientwp.asp](http://msdn.microsoft.com/architecture/solutions_architecture/service_orientation/default.aspx?pull=/library/en-us/dnbda/html/srorientwp.asp)

A Business-Oriented Foundation for Service Orientation

[http://msdn.microsoft.com/architecture/solutions\\_architecture/service\\_orientation/default.aspx?pull=/library/en-us/dnbda/html/ServOrient.asp](http://msdn.microsoft.com/architecture/solutions_architecture/service_orientation/default.aspx?pull=/library/en-us/dnbda/html/ServOrient.asp)

Enabling People-Ready Processes through Business Process Management

<http://www.microsoft.com/biztalk/solutions/bpm/whitepaper.msp>

Software as a Service (SaaS): An Enterprise Perspective

<http://msdn2.microsoft.com/en-us/architecture/aa905332.aspx>

Building Better Business Applications using the 2007 Microsoft Office System

<http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnbda/html/obarapscm.asp>

Patterns & Practices: Web Service Software Factory

<http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnpag2/html/ServiceFactory.asp>

Silverlight FAQ

<http://www.microsoft.com/silverlight/faq.aspx>

Composite Applications: The New Paradigm

<http://msdn2.microsoft.com/en-us/library/bb266335.aspx>

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## Appendix A: SOA Guiding Principles

1. Make sure that you have sound business drivers. When an organization struggles to justify their SOA projects, it is almost always because they are trying to “do SOA” rather than address a business need.
2. Top-down approaches do not work in the real world. Bottom-up approaches are not manageable either. In contrast, organizations that are successful with SOA often adopt a middle-out approach. These organizations all have something in common—they start with clear business challenges and focus on creating business value.
3. Try to avoid subscribing to the “build it and they will come” approach. Some organizations spend 18 to 30 months building a services infrastructure. When they finally reach the service consumption or user-experience layer, they find that the business needs have changed, rendering the investments a waste of time and money. It is often more practical to partition your usage scenarios into small sets and build out the entire scenario top to bottom, from the data through to the application consuming the services. Partitioning functionality in this manner can help you track changing business needs much more effectively.
4. Demonstrate value in rapid iterations. Time-to-value is a critical, healthy metric. The “trust-me” approach is not a healthy model for successfully leveraging SOA.
5. Last, but not least, organizations that have successfully adopted a SOA solution often use a “snowball” approach. How do you build a big snowball? You start with a small snowball. This is probably the most important take-away with respect to leveraging SOA to drive business value.

Following the APIO model can help grow your business through five key areas of investment:

- **Data management.** Increase the performance of your applications with reliable, scalable data infrastructure and management processes.
- **Business intelligence.** Make more informed business decisions by providing data people need in order to make informed decisions at every level of the business.
- **Business process management.** Improve predictability and agility by establishing flexible, repeatable, and connected business and IT processes within a Service Oriented Architecture.
- **Software development.** Respond to business priorities by offering the right level of visibility, collaboration, and control within the software development process.
- **User experience.** Deliver customizable and superior user experiences to drive employee productivity, customer loyalty, and business growth.

Technology can help your business keep pace with changes and meet the challenges of this new world of work by helping your people to:

- Simplify working together.
- Secure and manage content.
- Find information and improve business insight.

Three key solutions form the core of the Microsoft Business Productivity Infrastructure:

- **Unified Communications and Collaboration (UC&C).** Pervasive messaging, workspace, voice, instant messaging, and conferencing capabilities simplify how people work together.
- **Enterprise Content Management (ECM).** Forms, documents, records, and Web content management and search technologies streamline the management of information and processes.
- **Business Intelligence (BI).** Reporting; analysis; scorecards; dashboards; advanced analytics; extraction, transformation, and loading (ETL); data mining; and data warehousing technologies improve business insight and drive business performance.

Supporting UC&C, ECM, and BI is a set of common technologies that simplify and connect the capabilities both for end users and your IT group. These include:

- Workflow
- Search and line-of-business connectivity

- Extensible user interface
- Support for open standards

These technologies help combine UC&C, ECM, and BI into an integrated infrastructure for IT to deploy, provision, and manage. **The question is: Where to start?** How do you assess the gap between where you are and where business needs are driving you? How do you capitalize on existing investments and wisely choose areas for new ones?

For answers, look to the Business Productivity Infrastructure Optimization (BPIO) model. The BPIO model maps an organization's level of infrastructure optimization and provides guidance for optimizing IT infrastructure assets—assisting you to better realize the full value of your IT infrastructure investments while enabling key business solutions.

The BPIO model covers the three capabilities previously described—UC&C, ECM, and BI. These capabilities and the sub-capabilities included in them represent key areas of investment for businesses.

By working with Microsoft and using the APIO model, the BPIO model and the Connected Health Framework for Health Plans as guides, a Health Plan can quickly understand the strategic value and business benefits in moving from the basic level of maturity, where the IT infrastructure is generally considered a cost center, toward a more dynamic approach, where the business value of the IT infrastructure is clearly understood and the IT infrastructure is viewed as a strategic business asset and business facilitator.

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## Appendix B: Component Technologies

Service Oriented Architecture is built into every aspect of the Microsoft technology stack, from the developer tools that build Web services such as .NET, to server products (like BizTalk Server and Microsoft Office SharePoint Server) which further Web service construction by connecting and orchestrating services, and finally to the composite applications that consume Web services (such as web-based applications available via the Intra-, Extra- or Internet, as well as rich client applications developed using Microsoft Office or smart client technologies).

### Building Web Services

Microsoft is committed to providing a rich ecosystem for building and managing connected systems. Microsoft has invested heavily in Web services, building its entire next generation developer platform around Web services with Microsoft .NET.

### Consuming Web Services

In addition to providing a rich developer platform for building Web services, Microsoft has built Web services support into its entire line of product offerings by exposing key product features as Web services. Both Microsoft's products and partner products consume these services to provide end-users with greater connectivity and better user experiences.

### .NET Framework 3.0

For software developers, the .NET Framework is Microsoft's managed code programming model for building applications on the Windows platform. The .NET framework brings into the operating system pre-coded solutions that previously had been individually provided by programming languages and tools from various sources. The .NET Framework provides Web services support that enables .NET developers to develop, discover, debug, deploy, and consume Web services using any of the more than 20 programming languages supported on .NET.

The .NET Framework 3.0, released in 2006, extends the .NET Framework 2.0 application programming interfaces with new technologies for building applications to provide seamless interoperable communications, the ability to model a range of business processes, and to manage identity and create a differentiated user experience. The extended components of the .NET Framework 3.0 for building and leveraging Web services are Windows Communication Foundation (WCF), Windows Workflow Foundation (WF), Windows CardSpace, and Windows Presentation Foundation. In particular, WCF and WF provide very powerful new capabilities for developing web-service enabled, loosely coupled applications:

- **Windows Communication Foundation** is Microsoft's next-generation Web services technology that makes it easier to connect systems and applications within the organization and across geographically distributed sites. It is the first programming model built from the ground up to provide implicit service-oriented application development. WCF takes Web services to the next level by providing developers with a highly productive framework for building secure and reliable Web service applications that interoperate across platforms. Developers can now focus on business logic and leave the underlying plumbing to WCF. In addition to providing a programming model for building Web services, WCF ships with a set of tools and management features that make it easier for IT Professionals to create, deploy, configure, and monitor Web services.
- **Windows Workflow Foundation** is a programming model, engine, and tools for quickly building workflow-enabled applications on Windows. It provides a common framework for building workflows into Windows applications, whether those workflows coordinate interactions among software, people, or both.

### Integrating and Orchestrating Processes

Microsoft provides enabling technologies that support the flexible design, automation, management, and optimization of business processes. Microsoft has invested heavily in a "People Ready Process"

strategy that enables people to drive business results by being empowered to directly impact the critical processes that advance the business (see [www.microsoft.com/bpm](http://www.microsoft.com/bpm) for more information). Two of the key server technologies for orchestration of People Ready Processes are BizTalk Server and Microsoft Office SharePoint Server.

### **BizTalk Server**

Complementary to the .NET Framework 3.0 developer technologies, BizTalk Server is a server product targeted at IT Professionals and Architects that enables customers to integrate systems, employees, and trading partners. With its core architecture based on XML and the .NET Framework, BizTalk Server fully supports all the open standards upon which Web services are built. A BizTalk solution can consume existing Web services and expose business processes (BizTalk orchestrations) as Web services. BizTalk acts as the management layer that orchestrates Web services, controlling the flow and interaction between them and aggregating individual services into a larger composite solution.

BizTalk Server enables integration of applications and systems that are not Web service enabled. Through the use of a broad range of adapters, BizTalk Server can make available the functionality of legacy systems and applications throughout the organization.

BizTalk Server integrates with Microsoft Office SharePoint Server. Together, BizTalk Server and SharePoint make it easier to create end-to-end “people-ready” business process solutions that involve information workers. SharePoint allows information workers to gather and manage business data (through capturing both structured and unstructured data in XML) providing the integral desktop piece of the business process solutions puzzle. BizTalk Server then acts as the central orchestration point for long-running processes that span both systems and humans.

### **Microsoft Office SharePoint Server**

By providing a simple, consistent user experience through familiar client applications, Microsoft Office SharePoint Server 2007 makes human-centric business process initiation, participation, tracking, and reporting easier and more flexible. Designed to help empower users to optimize the way people, content, and processes interact within and across organizations, Office SharePoint Server enables users to take advantage of workflows to automate and gain more visibility into common business activities like document review and approval, issue tracking, and signature collection. Integration with familiar client applications, e-mail, and Web browsers simplifies the user experience. End users can easily define and model their own processes using familiar Microsoft tools.

Office SharePoint Server helps organizations eliminate inefficient manual information management processes. Electronic forms can be used to gather information which can then be easily integrated into line-of-business (LOB) systems, stored in document libraries, used to start workflow processes, or submitted to Web services. This automated approach helps users avoid duplicate efforts and costly errors from manual data entry, and it helps ensure access to accurate, real-time data.

### **Windows Vista**

Windows Vista provides extensive Web services support through WCF, is the next release of the Windows client operating system that makes it easier to build applications that are more secure, reliable, and manageable. Windows Vista enables developers and designers to create user-experience breakthroughs that improve usability and enable greater relevance to the work users do. In particular, Windows Presentation Foundation, the new presentation foundation for Windows Vista, unifies how Windows creates, displays, and manipulates documents, media, and user interface (UI), enabling developers and designers to create differentiated user experiences and individualized branding opportunities for their business customers. Its coverage of all common forms of presentation—UI, media, vector graphics, and documents—represents a degree of unification that is new to the Windows platform.

### **Office System 2007**

Office System 2007 is Microsoft's latest productivity suite for information workers, and includes familiar office tools such as Word and Excel. In addition to this suite of office applications, the Office System

delivers a collection of integrated tools and services that can help developers build business solutions using Web services. Office products also have built-in support for consuming Web services: InfoPath has built-in support for binding to data through Web services, and Visio has built-in support for consuming database-driven Web services, such as Web services exposed by SQL Server's relational database.

Microsoft's 2007 Office System provides a platform for building composite solutions called Office Business Applications (OBAs). Assembled from a company's current collection of information assets, OBAs present LOB functionality in familiar Office products, supporting cross-functional processes and allowing information workers to collaborate. The development of Office Business Applications is made possible by new platform capabilities in the 2007 Microsoft Office system called Office Business Application (OBA) Services. OBA services consist of workflow, search, the Business Data Catalog, a new extensible user interface, Microsoft Office Open XML Formats, and the Web Site and Security Framework. These services can be used to extend Microsoft Office system investments in business intelligence, unified communications and collaboration, and enterprise content management, as well as other business applications by ISVs or corporate developers.

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## Appendix C: Technology Standards Background

### Enter SOA

Service Oriented Architecture provides the design framework to integrate siloed applications so that their functionality can be accessed as services on a network. Most commonly implemented through standards-based, technology-neutral Web Services, SOA breaks down monolithic applications into a suite of services, implementing functionality in a modular fashion.

What exactly is a service? A service is an independent piece of functionality that can be discovered on the network, and that describes both what it can do and how it can be interacted with. From the business perspective, a service performs a specific task; as such, it can map onto a business process as simple as inputting or outputting a field of data such as 'customer ID'; alternatively services can be aggregated into a composite application that provides a higher-order service as complex as 'fill customer order', a process that end to end spans multiple business applications.

The service oriented approach allows the creation of services and composite applications that exist independent of the underlying technologies. Rather than requiring that all data and logic reside on a single computer, the service model facilitates access and consumption of IT resources over the network. Since services are designed to be standalone, autonomous, and loosely coupled, they can be readily combined and recombined into composite applications according to the changing needs of the organization. Composite (also known as dynamic) applications are what enable a businesses to improve and automate manual tasks, to realize a consistent view of customers and trading partners, and to orchestrate business processes that comply with internal mandates and external regulations. The net result is that organizations adopting service orientation can create and reuse services and applications as business needs evolve, and are thereby able to gain the agility necessary for superior marketplace performance.

### Web Services

Using a SOA-based design approach does not require Web services; however, as previously mentioned, Web services is the most common way to implement SOA. Web services are applications that use standard transports, encodings, and protocols to exchange information. Web services enable computer systems on any platform to communicate, and are used in a range of application integration scenarios, both within the organization and among trading partners.

Web services are based on a core set of communication standards, including XML for representing data, the Simple Object Access Protocol (SOAP) for data exchange, and the Web Services Description Language (WSDL) to describe the capabilities of a Web service. Additional specifications, collectively referred to as the WS-\* architecture, define functionality for Web services discovery, eventing, attachments, security, reliable messaging, transactions, and management.

Microsoft first announced this Web services model in September 1999, and in so doing initiated a wave of innovation that has fundamentally changed the application architecture landscape. Beginning with version 1.0 of the .NET Framework, Microsoft investments in tools together with the intrinsic support for Web services in the Windows platform have helped make Service Orientation mainstream. Shortly thereafter, Microsoft worked with IBM to develop the Web services Interoperability Organization (WS-I) which promotes interoperability across platforms, operating systems and programming languages. Now grown to nearly 150 member companies, WS-I has created Web services that address critical areas such as interoperability, security, and the reliability of messaging.

### Enter SaaS

Another concept closely related to SOA is the notion of Software as a Service (or SaaS). Simply put, SaaS can be defined as "software deployed as a hosted service and accessed over the Internet."

SaaS as a concept is often associated with the application service providers (ASPs) of the 1990s, which provided "shrink-wrap" applications to business users over the Internet. These early attempts at Internet-delivered software had more in common with traditional on-premise applications than with modern SaaS applications in some ways, such as licensing and architecture. Because these applications were originally built as single-tenant applications, their ability to share data and processes with other applications was limited, and they tended to offer few economic benefits over their locally installed counterparts.

Today, SaaS applications are expected to take advantage of the benefits of centralization through a single-instance, multi-tenant architecture, and to provide a feature-rich experience competitive with comparable on-premise applications. A typical SaaS application is offered either directly by the vendor or by an intermediary party called an aggregator, which bundles SaaS offerings from different vendors and offers them as part of a unified application platform.

In contrast to the one-time licensing model commonly used for on-premise software, SaaS application access is frequently sold using a subscription model, with customers paying an ongoing fee to use the application. Fee structures vary from application to application; some providers charge a flat rate for unlimited access to some or all of the application's features, while others charge varying rates that are based on usage.

SaaS also embraces a foundation of service orientation. For the purpose of this whitepaper, we will refer broadly to SOA as encompassing both on-premise and hosted services "in the cloud". We consider SaaS to be a strategic component of any customer's SOA strategy.

### **Enter BPM**

The topic of Business Process Management (BPM) is also frequently related to SOA. BPM is a management discipline that combines a process-centric and cross-functional approach to improving how organizations achieve their business goals. A BPM solution provides the tools that help make these processes explicit, as well as the functionality to help business managers control and change both manual and automated workflows.

Business process management has its origins in total quality management and business process reengineering. While it adds to these a technological framework, it is more than just the combination of these disciplines. BPM is an IT enabled management discipline that promotes organizational agility and supports the efforts of people to drive process change and rapid innovation. As such, BPM supports the alignment of IT and business activities both within the organization and with business partners and suppliers.

Business processes may be structured or unstructured, depending on the extent to which the underlying steps are fixed and therefore automated or changeable and generally executed by people or people interacting with systems. People are a critical part of nearly every business processes – they drive the solutions and insight that advances a business, so the goal should be to empower them to create new innovation and be more productive (and not to "re-engineer" people out of the process).

While BPM can be pursued separately from SOA initiatives, the ability to quickly and flexibly define new business processes is made much easier if you also have exposed your system IT resources in a service oriented manner. For the purpose of this whitepaper, we will refer to the composition and monitoring of business processes as a key part of developing a SOA strategy.

### **Composite Applications**

Composite applications offer a long-sought-after business nirvana whereby empowered technical business users can stitch together componentized business capabilities. In many ways, composite applications are the business users' equivalent of Web 2.0 and "mash-ups." While there has been a lot of hype around composites, many vendors have been slow to deliver real value in this area. Technologies are emerging, however, that will change this game, and composition will become an

increasingly important aspect of constructing business logic. In this article, we'll discuss some of the fundamentals and advantages of using composite applications for today's business challenges.

Compos-ability is a paradigm shift in computing from brittle, monolithic, developer-centric applications solving one particular problem, to agile, contextual, user-driven applications to support particular business processes. As with the shift to service orientation, this will require not only refactoring existing code, but also rethinking new code. It will also require new infrastructure to host the applications. The Microsoft 2007 Office System, especially with the inclusion of SharePoint server support and support of Workflow, is a first step toward these applications. In the future, the trend will continue so that users can effectively configure and control their own work environment, passing data seamlessly among applications, and perhaps across enterprise boundaries, to complete their tasks. Much still needs to be done to accomplish this vision, but spurred on by user expectations from advances in Web technology, it will be hard to turn back now.

**Web 2.0 and Silverlight**

Silverlight is Microsoft's cross-browser, cross-platform plug-in for delivering the next generation of .NET-based media experiences and rich interactive applications (RIAs) for the Web. Silverlight offers a flexible programming model that supports AJAX, Visual Basic .NET, C#, Python, and Ruby and integrates with existing Web applications. Silverlight media capabilities include fast, cost-effective delivery of high-quality audio and video to all major browsers including Mozilla Firefox, Apple Safari, and Windows Internet Explorer running on Mac OS or Microsoft Windows. By using Microsoft Expression Studio and Microsoft Visual Studio, designers and developers can collaborate more effectively using the skills they have today to light up the Web of tomorrow.

Key benefits of Silverlight include:

Compelling cross-platform user experiences	Flexible Programming Model with Collaboration Tools	High-quality media, low-cost delivery	Connected to data, servers, and services
<p>Deliver media experiences and rich interactive applications (RIA) for the Web that incorporate video, animation, interactivity, and stunning user interfaces (UIs).</p> <p>Seamless, fast installation for users, thanks to a small, on-demand, easy-to-install plug-in that is under 2 megabyte (MB) in size and works with all leading browsers</p> <p>Consistent experiences on Windows and on Mac OS without any additional installation requirements.</p> <p>Create richer, more compelling Web experiences that take greater advantage of the client for increased performance.</p> <p>Stunning vector-based graphics, media, text,</p>	<p>- Based on the Microsoft .NET Framework, Silverlight enables developers and designers to easily use existing skills and tools to deliver media experiences and RIAs for the Web.</p> <p>Choice of programming languages such as AJAX, Visual Basic .NET, C#, Python, and Ruby offers developers and designers the flexibility to use their existing skills without the need to learn a new language.</p> <p>Simple integration with existing Web technologies and assets means Silverlight works with any back-end Web platform or technology. No "rip and replace" required. Silverlight integrates with your existing infrastructure and applications, including Apache and PHP, as well</p>	<p>Unified media format scales from high definition (HD) to mobile with Windows Media Video (WMV), the Microsoft implementation of the Society of Motion Picture and Television Engineers (SMPTE) VC-1 video standard, as well as support for Windows Media Audio (WMA) and MP3 audio.</p> <p>Add vector-based graphics and overlays to media with support for integration of graphics that scale to any size and broadcast-style overlays for tickers and closed captioning.</p> <p>Flexible ad-insertion solutions with video and animation including the ability to deliver fluid, broadcast-style video or animated advertisements without any loss of visual</p>	<p>Create mash-ups by incorporating data and services from anywhere on the Web by using Silverlight support for LINQ and LINQ-to-XML. Access data with common protocols like JSON, RSS, POX, and REST.</p> <p>Increase discoverability of RIA content that can be indexed and searched, thanks to the Silverlight text-based XAML format.</p> <p>Rapidly scale Silverlight applications by using SilverlightTM Streaming by Windows Live</p>

Compelling cross-platform user experiences	Flexible Programming Model with Collaboration Tools	High-quality media, low-cost delivery	Connected to data, servers, and services
<p>animation, and overlays enable seamless integration of graphics and effects into any existing Web application.</p> <p>Enhance existing standards/AJAX-based applications with richer graphics and media and improve their performance and capabilities by using Silverlight.</p>	<p>as with JavaScript and XHTML on the client.</p> <p>Role-specific tools for both designers and developers that take advantage of Web standards and the breadth of the Microsoft .NET-connected software features.</p> <p>Designers will like that Expression Studio creates interactive UIs and media rich experiences, prepares media for encoding and distribution, and creates World Wide Web Consortium (W3C) standards-compliant sites by using modern XHTML, XML, XSLT, CSS, and Microsoft ASP.NET.</p> <p>Developers will use Visual Studio for development of client and server code with full Microsoft IntelliSense, powerful debugging, rich language support, and more.</p> <p>Consistent presentation model using XAML, the declarative presentation language used in Windows Vista applications. Controls, visual designs, media, and other elements can be presented with full design fidelity in both Silverlight and Windows-based applications.</p> <p>Dramatically improved performance for AJAX-enabled Web sites with the power, performance, and flexibility of Silverlight and .NET-connected software.</p>	<p>fidelity or motion quality.</p> <p>Lower-cost media streaming with Emmy Award-winning Windows Media technologies that can significantly lower the cost of streaming delivery with the flexibility to work with existing Windows Media streaming deployments. Even further cost reductions are possible with the upcoming Microsoft Internet Information Services (IIS) Media Pack for Windows Server Code Name "Longhorn."</p> <p>Broad ecosystem of media tools, servers, and solutions compatible with the Windows Media operating system.</p> <p>Powerful encoding tools for live and on-demand publishing of media experiences with Expression Media Encoder, including hardware-accelerated encoding of WMV and VC-1 at up to 15 times the performance of software alone when paired with a Tarari Encoder Accelerator board (based on Tarari internal tests).</p>	

