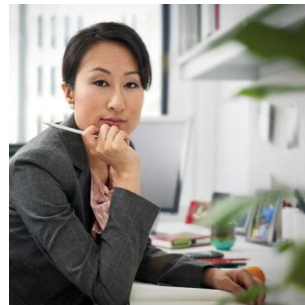
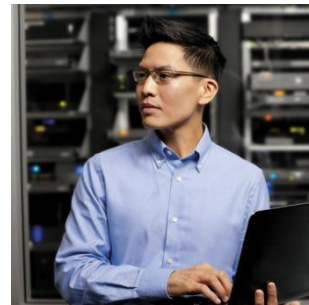
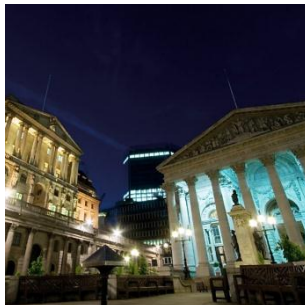


Microsoft® Corporation

Microsoft Industry Reference Architecture for Banking (MIRA-B)

May 2012



Microsoft®

The intended audience of this document includes financial institution CTOs, technical and business architects, consultants, financial services technology vendors and others who are involved in making technology decisions within the banking industry. It assumes the reader is familiar with business and IT operations in the banking industry.

For further information and updates related to MIRA-B, please visit www.microsoft.com/mira-b.

Microsoft welcomes feedback and suggestions related to MIRA-B. Please email us at mira-b@microsoft.com.

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Section I

Foreword

Yoshio Taniguchi, the famous Japanese architect who redesigned the Museum of Modern Art in New York, was quoted as saying: "Architecture is basically a container of something. I hope they will enjoy not so much the teacup, but the tea."¹

Microsoft and its technology partners provide horizontal computing solutions and vertical industry applications to major financial services institutions around the world. As our worldwide financial services team at Microsoft engages customers, partners, and industry analysts around the world we have derived a simple vision. That is: "looking forward, financial institutions must be present in the financial lives of their customers any time, any place, on any device, and across any channel, and deliver value-added services in real-time."

I want to thank our valued customers, partners and analysts who we are privileged to serve on a daily basis. With your continued support we will together redefine the value being realized in the industry as we innovate together in financial services. The by-product of sound architecture is a seamless customer experience. As a result of our banking architecture work, I hope that our banking customers as well as their customers enjoy not so much the teacup, but the tea!

Joseph Pagano
Managing Director, Worldwide Banking & Capital Markets
Microsoft Corporation

Supporting organisations

The following firms have provided endorsement for the MIRA-B framework:



¹ Time magazine, 22 Nov 2004

Section II

Introduction and Executive Summary

The banking industry is experiencing unprecedented change with some even questioning whether it is possible for financial institutions to effectively serve customers, meet new regulatory requirements, and create innovative new business models and solutions while sustaining profitability. Financial institutions are facing competition from non-traditional players; for example, global retailers providing in-store banking services, phone companies providing mobile financial services, P2P payments firms taking increasing share of the lucrative payments market, P2P online lending firms becoming more popular, and personal financial management firms offering aggregation solutions that sit between the customer and the financial institution. Such disintermediation puts the financial institution further away from managing the customer experience across channels.

It is safe to say that with increasing Tier 1 capital requirements, declining margins, and increasing operational costs, economics of the banking business must change. Research from Temenos has shown that banking has the highest IT cost as a percentage of total costs. This research estimates that 14% of costs in banking are IT related compared to a cross industry average of 7% caused by multiple factors including redundant, outdated, and/or siloed applications.² In response, Microsoft sees a number of financial institutions deploying shared resource models, removing silos and consolidating business processes, applications, and data to help bring costs more in line and dramatically impact the cost income ratio. This is a major rationale for the creation of the Banking Industry Architecture Network (BIAN) which Microsoft co-founded in 2008 along with banks such as ING and Credit Suisse. BIAN is focused on creating an industry-standard by defining common business services for banking to simplify integration and reduce technology costs. Although increasing operational efficiency is a good business practice, it only buys time. Innovation which creates differentiated customer experiences at scale must be an equal partner on the agenda.

Reference architectures are an important tool that can help financial institutions modularize and align business and technology assets in a predictable way. By developing business reference architectures, financial institutions are in a position to start rationalizing and assigning role ownership to various banking services which can then be consumed by other areas of the financial institution as needed. Such repeatability and modularity removes redundancy and as a result lowers costs and speeds up the flow of information. It can also result in faster delivery of products to market, reduce operational risk, and improve the ability to listen to customers. Rapid deployments for example, of multi-channel customer facing solutions can help capture new customers and perhaps entire new markets as they emerge.

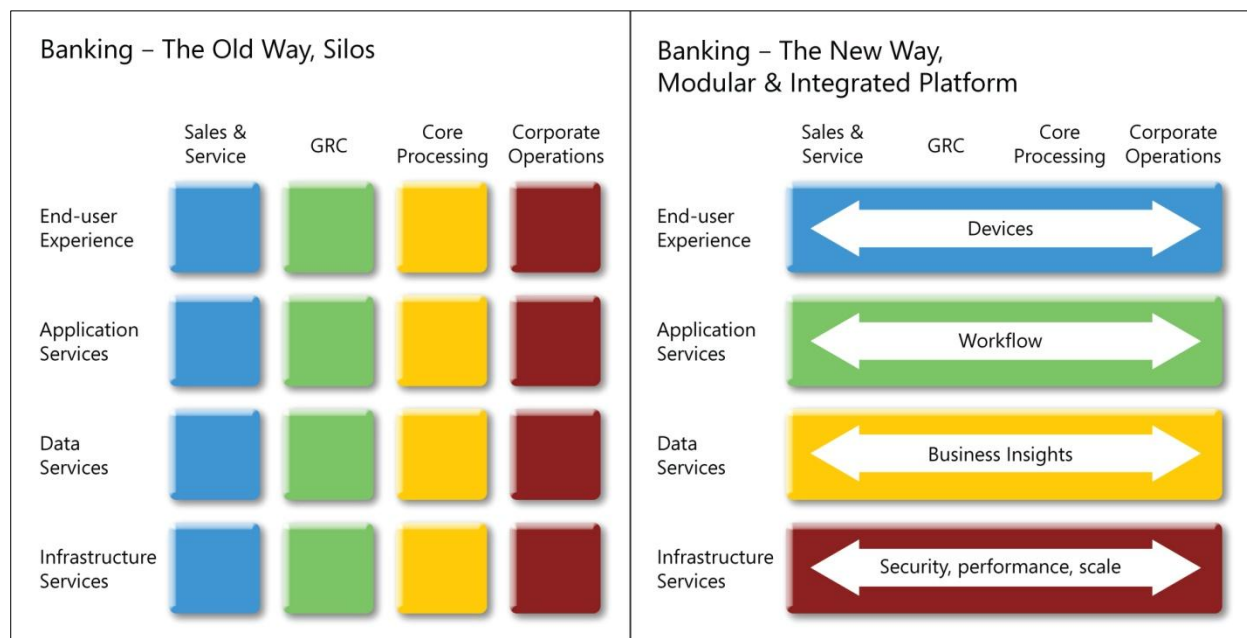
Repeatable architectures allow financial institutions to differentiate their products and services and reuse commodity resources where efficiencies can be gained. Within the context of a common architectural framework this provides new levels of data, application, and business process transparency. Such transparency significantly improves a financial institution's ability to manage risk and understand the needs and wants of its customers.

² Source: Tackling the Productivity Paradox (Temenos White Paper)

Traditional Silos vs. Shared Service Integration Approach

Application, data, and process silos still exist in many banks. This increases the number of moving parts, results in inconsistent customer experiences, and increases operational risk as well as operational costs.

Figure 1: Traditional Silo vs. Shared Service Integration

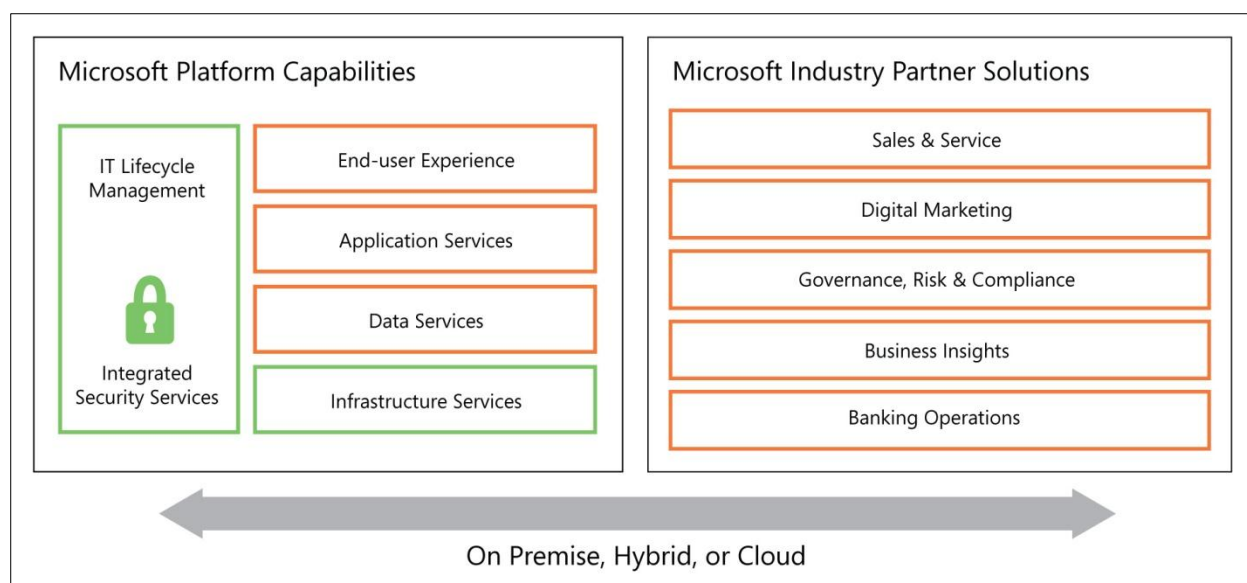


An integrated platform aligned to a holistic architecture view can help break down process, application, and data silos across the bank by fostering a shared services and resource capability. The result can drive cross divisional insights and upsell capabilities, reduce cost and risks, and improve customer satisfaction.

Microsoft Capabilities and Solutions in the Financial Services Industry

Microsoft is uniquely positioned to help financial institutions address industry challenges and opportunities by providing a comprehensive array of mission-critical IT solutions and capabilities which span from the back-office to the front-office, device to the datacenter, on-premise, and in the cloud. Microsoft's technologies are built for mission critical operations and are successfully deployed throughout many of the world's largest financial institutions. These capabilities include highly scalable server and client infrastructure, secure data and application platforms, Big Data and predictive customer analytics, ultra-low latency OS-level support, productivity, CRM/xRM, workflow and collaboration, as well as the connected user experience both on premise and in the cloud. Such capabilities are the foundation for Microsoft and its extensive ecosystem of industry partners in the areas of Sales & Service, Digital Marketing, Governance, Risk, & Compliance, Business Insights and Operations.

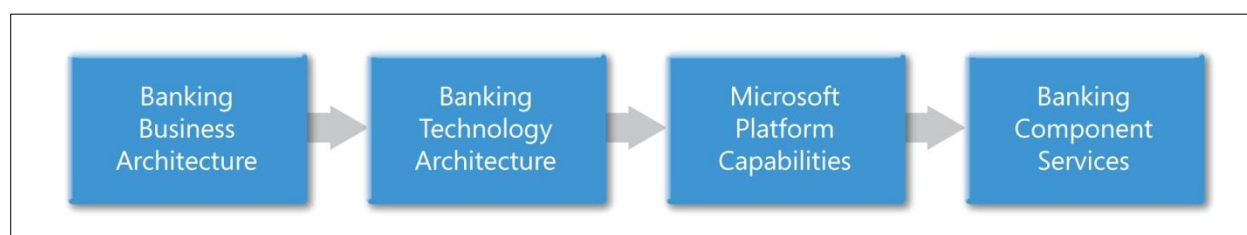
Figure 2: Alignment of Microsoft Platform to Partner Solutions



Microsoft Industry Reference Architecture for Banking (MIRA-B)

The Microsoft Industry Reference Architecture for Banking (MIRA-B) depicts a banking architecture based-on Microsoft's technology platform and services. MIRA-B provides a logical architectural point of view for financial institutions to use for planning purposes. This begins with a business architecture view (aligned to the work of BIAN) of the vertical lines of the banking business and aligns those to a logical banking technology architecture leveraging platform and infrastructure services for on-premise and cloud deployments of banking application services.

Figure 3: MIRA-B Document Flow



Beyond the elements of the MIRA-B reference architecture, Microsoft also recognizes that mission critical solution deployments in financial services require much more than just technical capability. Microsoft advocates that the appropriate process, people and governance around financial services solutions is also vital. This topic is explored in more detail in [Appendix D – Approach to Mission Critical Architectures](#)

Section III

MIRA-B Business View

This section of the architecture presents a technology agnostic, business view of banking operations. This business view is used in this document as a backdrop to highlight Microsoft platform and partner capabilities and how they can be used within a financial institution's technology architecture framework.

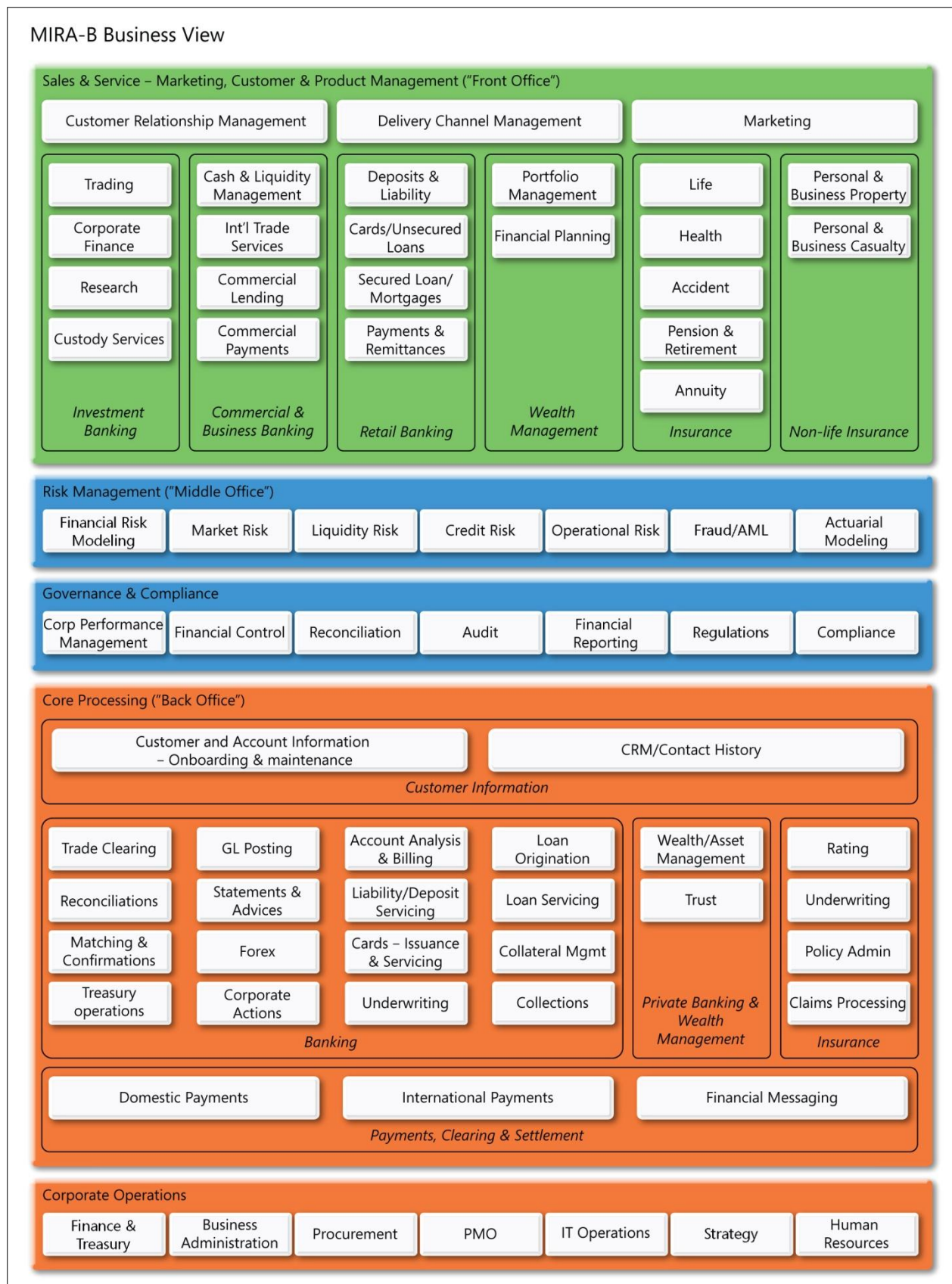
It is vitally important to recognize the interrelation of business operations with technology architecture. The two cannot be considered in isolation; they are very tightly connected. In accordance with the practices set forward by BIAN, Microsoft also recommends that financial institutions first consider a business architecture view of the banking environment. Optimal efficiencies and savings occur when the business processes are transformed and supported by the new technology architecture.

The business architecture maps out a view of banking capabilities and services that will allow for strategic growth. In this it is important to recognize that the nature of banking and the way banking products are delivered has shifted dramatically since the 1980s and early 1990s. In the past products were typically defined by the capabilities of legacy banking systems, with the branch being the service channel. Financial institutions offered services based on what could be processed rather than what customers needed. That has now changed with the ability to deliver banking services through multiple channels and devices; and as a result a plethora of new channels and banking products have been created within any given institution since the late 1990s.

Microsoft recognizes that no two financial institutions are the same in terms of market focus, segmentation, nor the respective deployment of technology. However, the logical diagram in figure 4 shows a layered architecture for a 'Universal Banking' business that covers five main market segments. This is shown for completeness, but few financial institutions in any given market will operate in all five segments.

Market Segment	Description
Investment Banking	This segment services corporations, other financial institutions and governments with raising funds via capital markets. Additional offerings include trading and investment services.
Commercial and Business Banking	These services are offered to larger domestic and multi-national commercial clients and include payments and cash management, trade services, and liquidity management.
Retail Banking	This represents the mainstream consumer banking segment for individuals and small businesses. Typical products are checking (current) accounts and savings, credit and debit cards and consumer loans.
Wealth Management	This represents private banking and wealth management services for high net worth clients. Typical products offered are portfolio management and investment services as well as financial planning and advice.
Life and Annuity Insurance	Products and services would typically include life insurance, accident, health and annuities.
Non-Life Insurance	Non-life insurance products and services would typically include property and casualty, and be offered to consumers and corporations.

Figure 4: MIRA-B Business View



Referring to figure 4, the business architecture of a financial institution is effectively segmented into four groups: Sales and Service, Governance Risk and Compliance (GRC), Core Processing, and Corporate Operations. This refers to products, functions and business services rather than specific processing applications or technology environments. For this reason, delivery channels are not explicitly identified at this level although the function of channel management is.

Business Architecture Strata	Description
Sales, Service, Marketing, and Product Management	This layer defines the products and services offered to customer entities by a financial institution, and is also referred to here as the “front office”, or “order placement” Figure 4 shows how the products are aligned across distinct banking segments and customers. This list includes (but is not limited to): consumers, corporations, public sector departments and agencies, broker/dealers, and other financial institutions. Each customer group will be offered a different suite of products and delivery channels
Risk Management and GRC	Often referred to as the “mid-office,” this layer consists of common business support services for risk management, governance, operational security and compliance. These services have an enterprise focus regardless of industry segment, product offerings and operational processes.
Core Processing	This layer of the business architecture defines operational functions, those essential to the business of financial services. Functions in this segment are not customer-facing. These are business operations areas focused on transaction processing and execution. Some services are vertical specific (such as insurance policy admin and claims processing), whereas others are functionally common across different vertical segments (such as G/L posting and billing) but in reality would likely require separate instantiations. Additional common functions and processing services (such as customer management and payments processing) will support all vertical lines of business.
Corporate Operations	These functions have less to do with the business of banking and are focused on corporate support functions within the organization. As such these services are very horizontal in nature and include the financial institution’s ERP functions, HR, vendor management etc.

By developing business reference architectures, financial institutions are in a position to start rationalizing and assigning role ownership to various banking services which can then be consumed by other areas of the financial institution as needed. This supports the concept of shared services. Shared services are commonly thought of in technical terms (e.g. XML web services), but are just as important in operations functions, processes, and the allocation of resources. Business transformation and technology architecture go hand in hand.

Shared Service Example

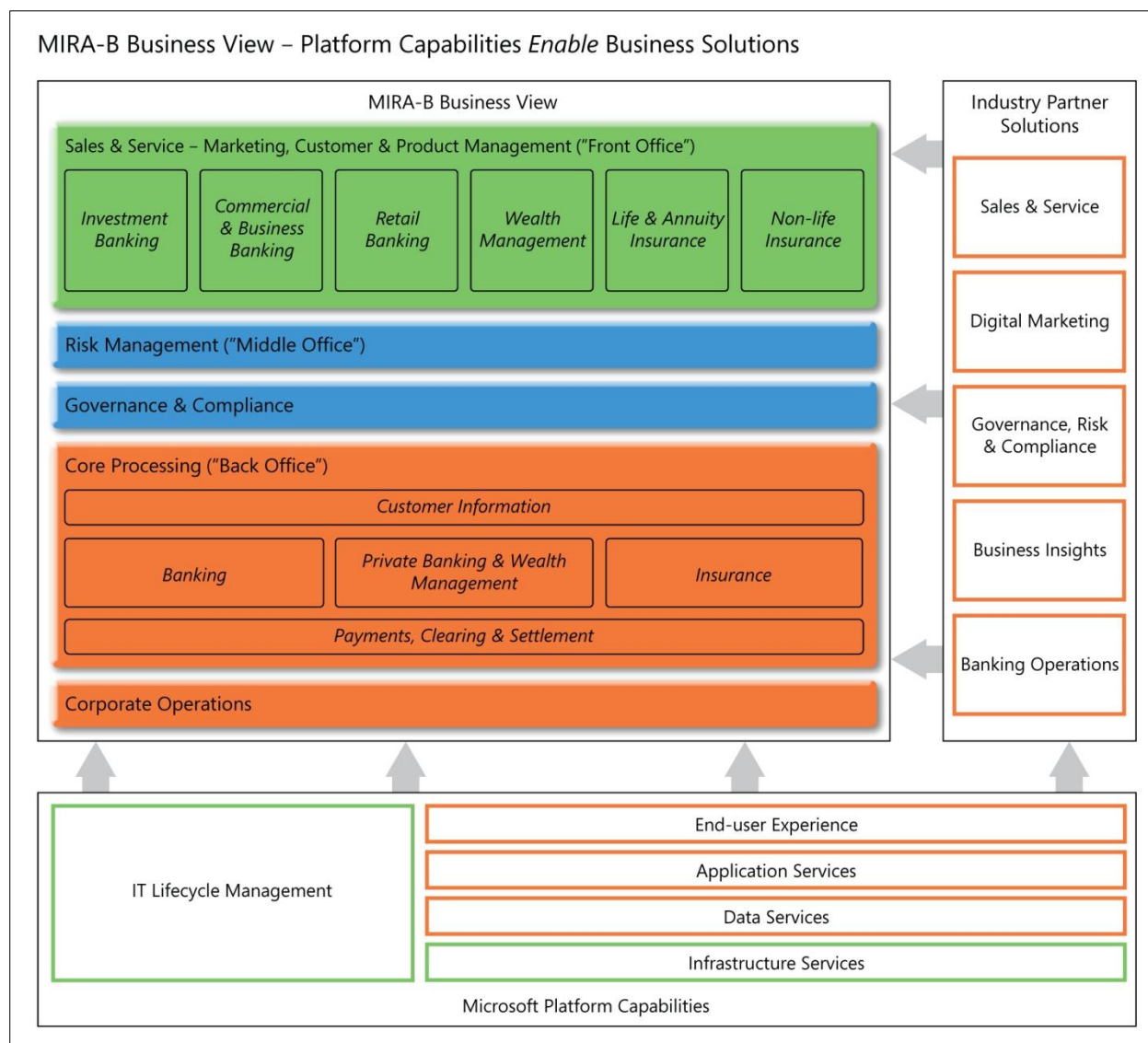
In many countries certain banking transactions must be screened against a government issued list of blocked customers and counterparties. In the USA this is known as the Office of Foreign Assets Control (OFAC) watch list. Business processes to which this screening process applies include deposit account opening, credit card issuing, and high and low value payment processing. In the past multiple applications from various business units would have performed this task, leading to redundancy in processing, and a high chance of inconsistency. By assigning this as a shared service, an enterprise-wide view of screening can be made available to departments (and systems) as needed. As discussed earlier, reaping the benefits requires a service-based approach to business operations and technology.

Alignment of Business View to Solutions and Capabilities

Microsoft and its financial services technology partners offer solutions for the business areas of Sales & Service, GRC, Core Processing and Corporate Services. Every one of these business

solutions is enabled by the Microsoft platform capabilities from systems development to management, data, applications, and user experience. This is illustrated in the following diagram.

Figure 5: Microsoft Capabilities Mapped to Business Solution Areas



This is another area where Microsoft and its partners deliver key differentiation; the ability to provide end to end platform services and business solutions based-on a cost-efficient, highly-integrated Microsoft platform. Microsoft and its partners can deliver mission critical banking operations at scale that provide the optimized customer experience, enhanced insight and collaboration capabilities intended to lower TCO.

Section IV

Technology Forces Driving Architecture

Financial services industry institutions are under significant pressure to modernize due to business and technology drivers. Encumbering these efforts is the fact that many financial institutions are constrained by outdated, inflexible and redundant technology architectures and systems which were built over-time to support silo operations processes and data. Microsoft believes that the majority of technology funding for banking applications is allocated to integration and maintenance therefore leaving little budget or time for innovation and new product development.

In addition to legacy challenges, the pace of change in technology continuously accelerates, and so the following trends must also be accommodated by the reference architecture:

- **Progression of banking architectures to industry standards and cloud computing**
Microsoft sees the next architecture wave as standardizing banking IT services with an industry view and extending architectures through the use of cloud computing. These are fundamental drivers in banking reference architecture as they enable processes and services to be distributed at an industry level, not just within the walls of a datacenter or confines of a financial institution's network. As financial institutions focus on strategic priorities, an architecture that enables industry standard services and integration of cloud-based services will facilitate the strategic sourcing of business functions. For more information see [Section VII - New Paradigms for Delivering Banking Applications](#).
 - **Development of Industry Standard Service Definitions** – First generation SOA initiatives in the banking industry helped to reduce integration cost and complexity, but the benefits were limited because the resulting services which were defined in each financial institution were essentially “proprietary” instead of aligned with an industry standard. With this approach SOA initiatives have, in essence, been reinvented for each financial institution due to limited best practices for guidance and no standardized integration of packaged solutions.

Microsoft advocates the development of industry-wide architecture standards for banking IT services to promote interoperability and to reduce integration costs across the banking industry. To this end, Microsoft is a founding member and active contributor of two key industry architecture bodies: the Banking Industry Architecture Network (BIAN) and the Interactive eXchange Forum (IFX). In concert, these two standards organizations provide complementary capabilities and roadmap to enable an industry standard banking integration architecture.
 - **Progression to Cloud-based platforms** – The highly automated, self-service, and elastic-scaling characteristics of cloud technology creates unprecedented opportunities for cost savings and efficiency for infrastructure and banking applications. The cloud also enables new business models and access to new market segments or ultra-low margin businesses that may have been cost-prohibitive in the past. However, based-on evolving regulatory and business requirements, financial institutions need the flexibility to leverage different combinations of public cloud,

private cloud, as well traditional datacenter computing services. Microsoft provides financial institutions with an integrated, and growing, set of capabilities that can be developed, deployed, and managed consistently across on-premise and cloud based computing resources to provide flexibility and a compelling TCO.

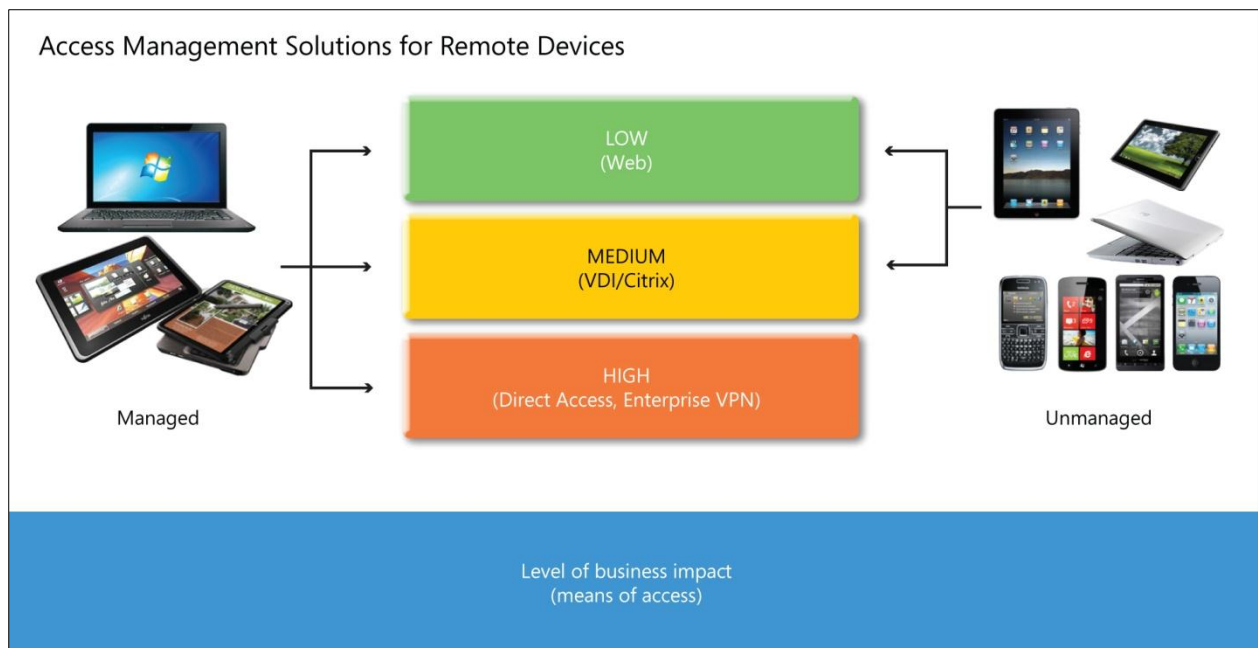
- **Data Explosion – big data, big challenges, and big opportunities**

Financial services is one of the most data-intensive industries. In addition to the retention requirements for application data and the electronic imaging and storage of paper substitutes (billions of checks, for example), financial institutions must deal with and manage data from external sources. Financial institutions also need to see ‘between the applications’ and interpret unstructured and social data to gain advanced operational insights. Huge quantities of data, the disparate applications and systems, latent information delivery and error-prone manual processes impede financial institutions from gaining a holistic view of the business, its risk exposure, and customers. For information regarding Microsoft Big Data solutions, visit online at <http://www.microsoft.com/sqlserver/en/us/solutions-technologies/business-intelligence/big-data-solution.aspx>.

- **The ‘Consumerization’ of IT (CoIT)**

Enterprises have fallen behind in technology innovations compared to consumers who are adopting technology at a record pace, and demanding to use their personal devices in the workplace. With this rapid technology adoption by consumers, new expectations have spread to the enterprise to provide technologies that enable employees to perform their job with a myriad of devices and in a more natural, collaborative working model. This is not easily accomplished since many devices used are for consumers and not designed for the rigors of banking data security requirements. However, Microsoft has cross-platform development tools and productivity applications (e.g. Office, Lync Mobile communicator, SharePoint) as well as capabilities and guidance for supporting CoIT in the banking enterprise with secure Windows devices as well as other, non-Windows consumer devices. For detailed planning information see [Appendix B - Innovative End User Experience](#), or visit Windows Enterprise online at <http://www.microsoft.com/en-us/windows/enterprise/customer-stories/consumerization-of-it.aspx> and download the white paper *Strategies for Embracing Consumerization* at <http://download.microsoft.com/download/E/F/5/EF5F8B95-5E27-4CDB-860F-F982E5B714B0/Strategies%20for%20Embracing%20Consumerization.pdf>.

Figure 6: Access Management Solutions for Remote Devices



- **Expanded and Integrated Platform Capabilities**

This is the foundation that enables collaborative applications to be developed across the widest possible base of users, and supports the development and integration of cloud and on-premise technologies. Microsoft's innovative enterprise platform enables more actionable and collaborative business processes. A key *differentiator is the breadth of capabilities and level of pre-built integration within Microsoft products*. The Microsoft platform has extended capabilities at each layer of the technology stack whether it is for lifecycle management, mission critical OLTP, high-volume integration, enhanced application services including collaboration, productivity, and data insights, or delivering a modern end-user experience across devices. For example; integrated communication and social collaboration, near real-time analytics, integrated security models etc. To compare this to other industries, the automotive industry learned a long time ago that they do not need to build all the parts of a product in order to sell it. In banking, project finance and re-insurance are examples of shared services. In such an environment, integration tools and standards like SWIFT enable integration of shared financial services. To learn more about how Microsoft's capabilities, services and partners are powering banking enterprises worldwide, visit online at www.microsoft.com/financialservices.

As a consequence of these challenges and trends financial institutions need to rethink technology investments to keep up with market pressures.

Section V

Framework for Banking Solutions

Reducing cost and complexity in the banking enterprise and introducing new technology capabilities can be achieved by leveraging Microsoft platform and partner ecosystem. This section will highlight the capabilities and differentiation of the Microsoft platform and highlight how the Microsoft platform “stack” aligns into a Logical Banking Technology Architecture. Sample process scenarios are included to provide examples of how banks can leverage capabilities to improve the customer experience while increasing insights from data and reducing risk and complexity. This section helps align the technology architectures and positions the reader for deeper details of Microsoft platform capabilities which follow in subsequent sections of this document. To see Microsoft products mapped to this diagram, refer to Appendix C.

Figure 7: MIRA-B Logical Technology Architecture

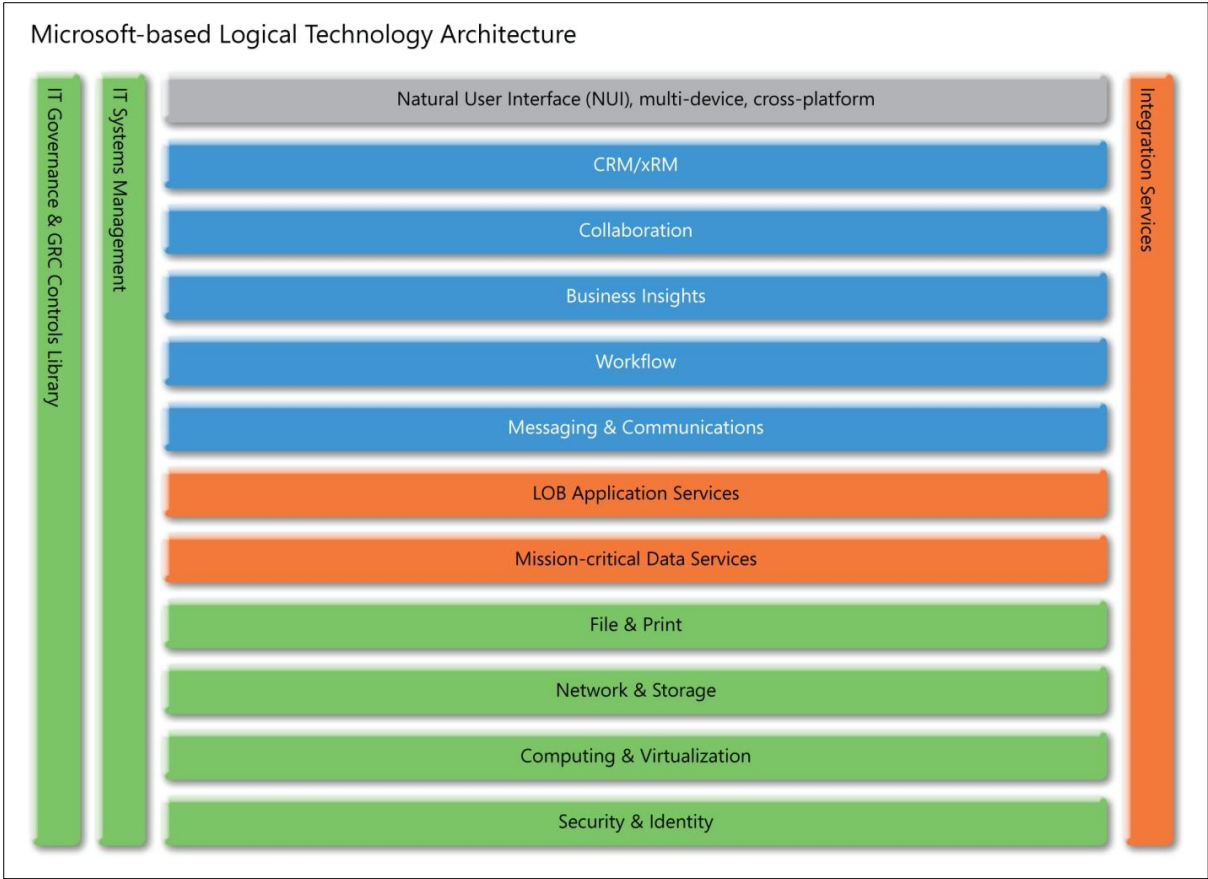
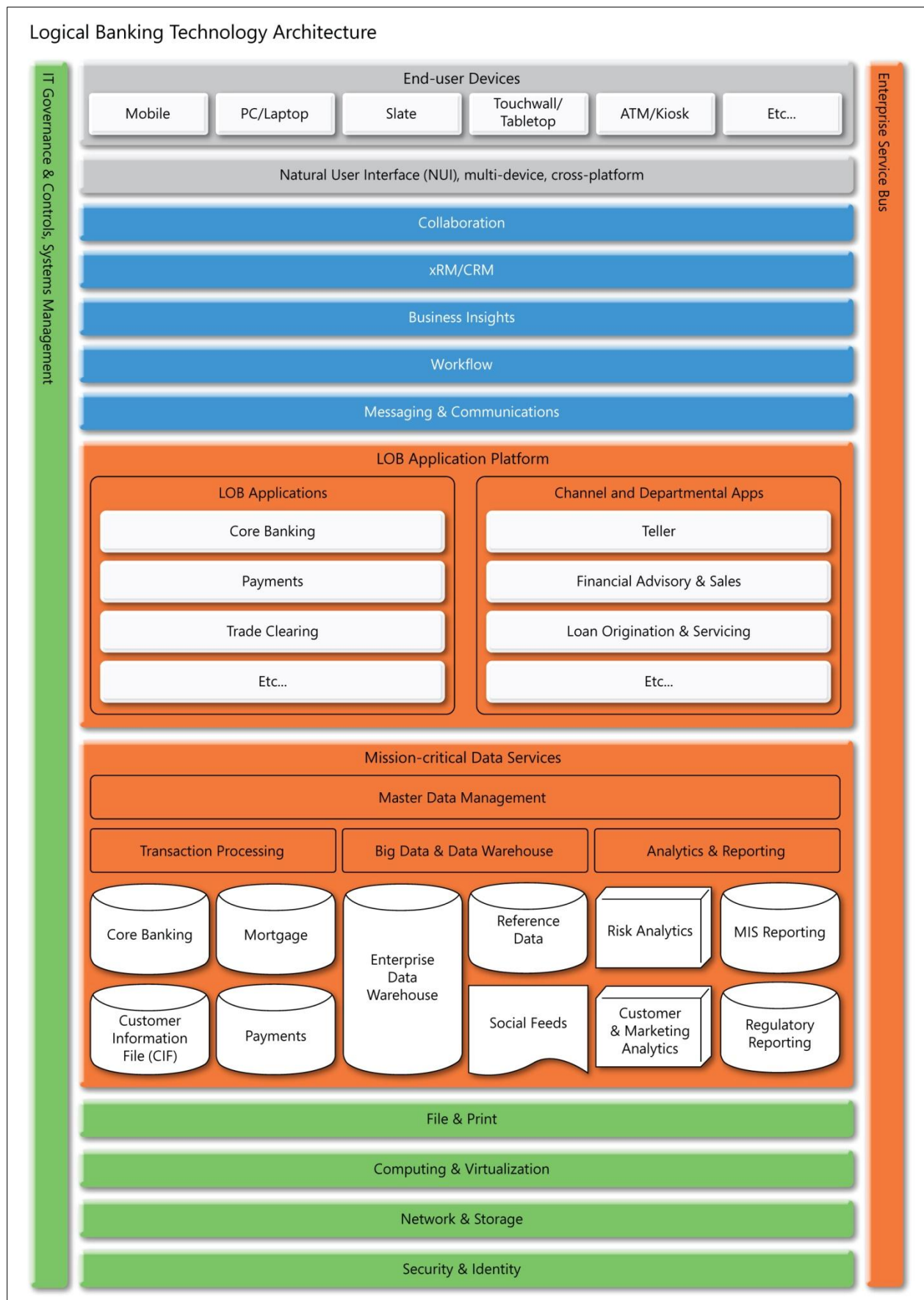


Figure 8: Logical Banking Technology Architecture



- The platform enables integration to other systems through a wide-array of *industry-standard integration* interfaces and techniques. By aligning to industry standards such as ISO, BIAN, and IFX, Microsoft believes the cost and complexity of integrating, managing and maintaining business solutions can be further reduced in the banking industry.
- Robust capabilities in the Microsoft platform are industry leading. The Microsoft platform and partners provide a robust set of *capabilities across the IT lifecycle* – spanning from the mission-critical datacenter to the end-user device both in bank datacenters and the cloud.
- Microsoft's core infrastructure services provide the foundation of *Enterprise IT lifecycle management and computing operations* while the cutting edge application services, business productivity, and data services provide the platform for creating the applications that delivers the *next-generation customer experience*.
- Microsoft products are *highly integrated*, making the value of the holistic platform much more valuable than the individual components. Since most business solutions require multiple capabilities to address a specific challenge, often the integration of these capabilities becomes a key cost and time factor both initially and over the long-term. Microsoft delivers a key differentiator by having the broad set of capabilities it possesses in a highly-integrated platform. This can reduce the matrix of integration points an enterprise needs to implement and maintain, thus freeing up more budget for innovation.
- Microsoft *Mission-critical data platform* can support very-large transaction volumes for the mission critical workloads in banking. The economics of running mission critical processes and transaction are very compelling on the Microsoft platform; which is being used to run stock exchanges such as [DirectEdge](#) in the US, and to replace mainframes for core banking such as in the case of [SDC](#) and in a [growing number of mission critical solutions across the industry](#). The SQL Server 2012 pre-release version was [recently benchmarked with Temenos T24 core banking and HP](#) delivering 11,500 transactions per second on commodity hardware.
- Microsoft is a *leading provider of Data and Business Intelligence platforms* providing a robust, end-to-end data, analytics and collaboration platform. The platform provides Master Data Management (MDM), Data Quality Services (DQS) and pre-defined BI semantic metadata (BISM) which overlay BI capabilities delivered via pre-tuned data warehouse configurations, near real-time analytics delivered through High-Performance technical Computing (HPC) and Complex Event Processing (CEP), and the platform is pre-integrated into the scorecard and collaboration platform (SharePoint) that helps data consumers discover, understand, share and collaborate related to specific data. In addition, a Hadoop distribution and connectors running on Windows and on Windows Azure (public cloud) are on Microsoft's roadmap to effectively analyze Big Data such as social feeds and other sources of big data.

Example scenarios

The following scenarios provide examples how banks can leverage capabilities to improve the customer experience, while increasing insights from data, and reducing risk and complexity. The following scenarios will help to highlight how Microsoft and partner capabilities are leveraged to address next-generation banking scenarios. The first scenario is an enhanced multichannel customer experience and the second scenario exemplifies how Microsoft technologies can help

banks leverage and manage the exploding volume of data produced across the transactional, analytical, and reference data.

Scenario One – Enhancing the Multichannel Customer Experience

Excellent customer service is at the center of growth strategies for banks globally. Banks aspire to improve existing sales and servicing processes and implement new capabilities to be more relevant and accommodating to customers. Significant focus is being placed on providing seamless and immersive experiences across multiple channels while capturing data about the interaction, customer intentions and preferences to be more relevant in customer interactions.

Jane, a homeowner is shopping to refinance her home. She begins her experience online on a slate, moves to a contact center via chat session, and concludes the experience with a loan advisor in a local branch.		
STEP #	Process Description	Capabilities & Microsoft Solution Components
1	Jane is browsing the internet to shop for a refinance on her home to take advantage of the favorable interest rates. She does a search and finds options for mortgages and refinancing. Jane selects a bank whose link is near the top of the search results.	<i>Search Engine Optimization</i> capabilities provided by Web Development tools. Microsoft Web Platform Application Platform Internet Explorer Visual Studio Bing Search
2	Jane clicks the link to a banking site for more information. When she lands on the banking site, she is presented with an advertisement offering a re-finance which is the topic she searched online-for. While she <i>could</i> go directly to this offer, she wants to explore the site and see if she can find more information before applying for the offer	<i>Personalization</i> parameters are derived from online search referral. The parameters are passed to the <i>online portal technology</i> which serves-up the personalized content as part of a seamless online experience. SharePoint for Internet Sites Bing Search
3	With customers like Jane accustomed to searching online, she notices a clearly marked search window on the bank website and uses this to search for re-financing options at the bank.	The website's superior <i>search capabilities</i> help users find the information they seek before abandoning purchases. A superior search experience provides the ability to quickly find results, refine and expand searches, as well as provide feedback on the effectiveness of the searches. FAST Search
4	The customer clicks a link to go to the mortgage homepage and spends a long time on the page. Sensing that a customer could be ready to abandon the purchase, an instant chat is offered to help the customer and avoid abandoning the refinance.	<i>IM Chat, Voice calls, and videoconferencing</i> provided by software-based communications capabilities. Lync/Skype Exchange
5	Jane sees each product contains reviews as well as ratings and comments from other consumers. This is influential in the sale as the "transparency" it provides between the bank and the customer helps build trust with the customer.	<i>Community forums</i> can target any department in the bank. Therefore moderating the banks' community forum requires approval and escalation workflows to properly route requests to many different stakeholders and approvers SharePoint for internet Sites/ ECM
6	The customer decides on a refinance product and begins an online application process. Multiple steps guide the customer through gathering required information for the transaction. The customer reaches a point where she has some documentation to gather and she is delighted to see she can save the application and proceed in any channel when she is	<i>State Management</i> capabilities are required to enable multichannel experiences. Windows Server/Windows Azure or IIS or Dynamics CRM or

	ready.	SQL Server/SQL Azure depending upon requirements
7	Jane's online experience has been great. But she feels better about meeting with an advisor at a branch for such an important purchase. She is able to book times from any channel to meet with an advisor, either via a web conference or in-person.	Appointment scheduling capabilities are provided by CRM/ sales automation and enterprise messaging. Web conferencing capabilities are provided by communication and collaboration software. Dynamics CRM Exchange Outlook
8	Jane books a time to meet an advisor at a local branch via instant messaging with a contact center representative and receives an SMS confirmation. Regardless of channel or different systems in-which data exists, a bank representative can view a 360° profile of the customer, the status of the loan application, select a person in the right location with the right skills, and remind the customer of documentation still needed.	SMS capabilities provided by enterprise messaging. 360° customer profile provided by CRM and Business Intelligence capabilities. Exchange Server Dynamics CRM SQL Server BI platform
9	When Jane visits the branch she notices it appears rich with technology, yet subtle and professional. Touch walls and slate devices are available for customers to explore products and even browse the web. Slate devices and Microsoft's multi-user tabletop computer "Microsoft Surface" are great tools to enable advisors to have engaging interactions with customers.	Software capabilities for branch devices provided by operating system and core infrastructure. Windows Microsoft Surface System Center
10	When Jane meets the lending advisor David, she does not have to explain the application status or the intent of her visit – it is all captured in a CRM platform designed for performing sales, service, and other tracking activities. Jane and David use a Surface computer to compare loan products and perform what-if scenarios. The experience is engaging yet fun where both the customer and the bank employee are viewing and navigating the same screens together.	Software capabilities for branch devices provided by operating system and core infrastructure. Windows Microsoft Surface System Center
11	During the branch appointment, Jane has a question which the loan agent is unsure of the answer. The agent can leverage a variety of tools to save time and avoid a costly call to the helpdesk. This includes the knowledge portal with search capabilities for policy and procedure documentation. It also includes skill-based search capabilities which provide a list of experts and their online availability. The loan agent finds a remote expert who can help immediately and she initiates a web conference so the expert, the customer, and the loan agent can resolve the issue immediately on the first call.	Knowledge portal and search capabilities provided by collaboration portal. Skills based-search capabilities provided by collaboration portal, communication and enterprise messaging. Web Conferencing capabilities provided by software-based communications. SharePoint for Internet Sites Lync Exchange
12	The engaging and seamless experience has led to Jane's decision to proceed with the refinance. Jane is offered to set alerts to contact her if there are any important events like interest rate change, etc. She can be contacted via her preferred channel including being called on her phone using a voice IVR such as Microsoft's cloud-based "Tellme" voice IVR.	Alerting capabilities provided by enterprise messaging. Contact preferences provided within CRM. Automated Voice response provided by Voice IVR. Exchange Dynamics CRM Tellme
END	End of Process Summary – This scenario provides many opportunities for the customer to stop the purchasing process and choose a competitor instead. However, the proper combination of	

	tools can help mitigate customer abandonment at each step by anticipating the needs of the customer and removing complexity and delays in the process. Ultimately the application is processed and the associated transactions are completed.	
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Scenario Two – Optimizing operations and improving insights from data

As we move from batch to real-time process integration in financial services, the requirement for real time analytics and business intelligence becomes more acute. Operations managers need to know about the state of operations regardless of client, transaction type, delivery channel or, for example in the case of payments, settlement method. This is particularly so because clients have higher expectations about the level of service demanded from their banks.

In addition to reliable and timely transaction processing, the data produced from the transaction can be more valuable to the business than merely an official transaction record. The data produced provides key *business insights* for operations, marketing, risk management, etc. however the data is very-large volume, often exists in business silos, is structured and unstructured, and exists inside the bank and on the internet.

Banks realize the ability to discover, trust, combine and analyze data can be a differentiator to their business. They also need to meet increasing regulatory requirements via a holistic view of business exposure and reserves. Whether the goals are to reduce risk or identify revenue potential, it is increasingly difficult and costly to try to leverage the new volumes of data with traditional business intelligence tools and legacy reports. Microsoft brings proven, cutting edge, next-generation BI capabilities that can help banks gain a better view of their business overall, reduce risk, and identify new revenue potential.

The transactions generated by Jane's refinance in Scenario One results in transactions that generate data points throughout the bank's operations areas and systems.		
STEP #	Process Description	Capabilities & Microsoft Solution Components
1	The transactions generated by Jane's refinance in scenario one are mission-critical records which are posted at high-volumes. Because of the importance of the transaction records in the core systems, the systems that hold these records are operated for high-availability, transactional integrity, data security and recoverability.	Technical capabilities for <i>mission-critical operations</i> are provided by data and application platforms as well as core infrastructure and systems management and monitoring. Microsoft SQL Server is built for the rigors of mission-critical operations. However, Microsoft believes that technology capabilities, while very important, are only one piece of supporting mission-critical systems; people, process, policy, governance are also paramount to operations. For more information on Microsoft capabilities in Mission critical operations, refer to Section VI and also Appendix D in this document.

2	The transactions from Jane's branch activity create "events" that initiate actions in near real-time to assess the transaction's validity (for example, anti-fraud measures) and the impact on risk exposure in the lending portfolio.	<i>Near real-time analytics</i> capabilities are provided via Complex Event Processing (CEP) and High-Performance technical Computing (HPC), as well as end-user analytics and certain LOB applications. Microsoft SQL Server StreamInsight (CEP) Microsoft Windows High-Performance Computing Services Microsoft Excel .NET framework
3	The data is also leveraged for extensive business analysis and reporting. Data is provisioned by IT as trusted data "cubes" and analysts consume these on a self-service basis. The data is analyzed directly in Excel's PowerPivot and then built into a dynamic report via Power View and shared with other analysts responsible for risk management.	<i>Multi-dimensional Analytics</i> provided by Data and Business Intelligence solutions. <i>Self-service BI</i> capabilities provided by end-user analytics provided by Data, collaboration and end-user analytical tools. <i>Master Data Management and BI semantic models</i> are provided by data and analytics platform. Microsoft SQL Server BI platform SQL Server Reporting Service including Power View SharePoint
4	For Marketing purposes some internal data is combined with external "big-data" from social feeds to monitor social sentiment related to the bank brand.	<i>Big-data</i> capabilities provided by data and analytics platform. Capabilities include support for <i>Hadoop</i> and <i>associated connectors</i> between Hadoop, Data warehouses, and end-user analytic tools. Microsoft SQL Server Big Data Analytics Microsoft SQL Server Parallel Datawarehouse Microsoft Excel
5	Finally these insights are delivered to business line stakeholders via role-based scorecards and reports. Typical user roles would include: <ul style="list-style-type: none"> • Branch management and performance measurement • Product profitability • Credit and operational risk management • Lending portfolio analysis • Basel III compliance analysis • Marketing analysis for additional cross-sell/up-sell opportunities based on the product selected (e.g.; insurance) 	<i>Scorecards and dynamic reports</i> provided by data, analytics and collaboration platform. This enables the discovery, management, security and distribution of reports and scorecards Microsoft SQL Server SharePoint Microsoft Excel
END	End of Process Summary – Microsoft's Data platform is built for mission-critical operations and facilitates high-availability and high-performance. However, people, process, policy, governance are all critical pillars to mission-critical operations. Traditional BI and Analytics are not feasible for harvesting insights from the massive volumes of data being produced within the banks as well as in the public domain. Microsoft platform provides economic benefits while delivering cutting-edge tools to transform banking into the next-generation operations that will be required for banks to thrive in the new economic models within the banking industry.	

Section VI

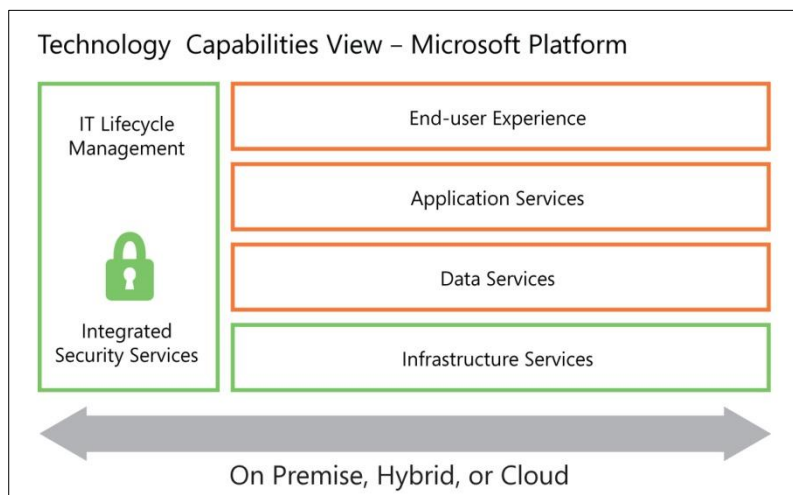
MIRA-B and Microsoft Platform Capabilities

Microsoft provides an industry-leading, highly-integrated, mission-critical technology platform at commoditized pricing. The platform delivers the end-to-end infrastructure, application and data platform, and business productivity capabilities needed to enable a modern, agile banking enterprise. It provides a highly-integrated environment spanning back, middle and front-office operations and can operate on-premises or in public or private cloud. The technology capability view shows the capabilities of the underlying technology platform to support the financial institution's enterprise; from external customer solutions to internal user desktop and collaboration; from security to data management; and from new product development to managing mission critical operations.

Technology Capabilities View of Microsoft Enterprise Platform

The capabilities of Microsoft's software portfolio are both deep and wide. The Technology Capabilities View as shown in Figure 9 is intended to highlight capabilities of the Microsoft platform and serve as a reference in enterprise planning.

Figure 9: Simplified Capabilities View of Microsoft Platform



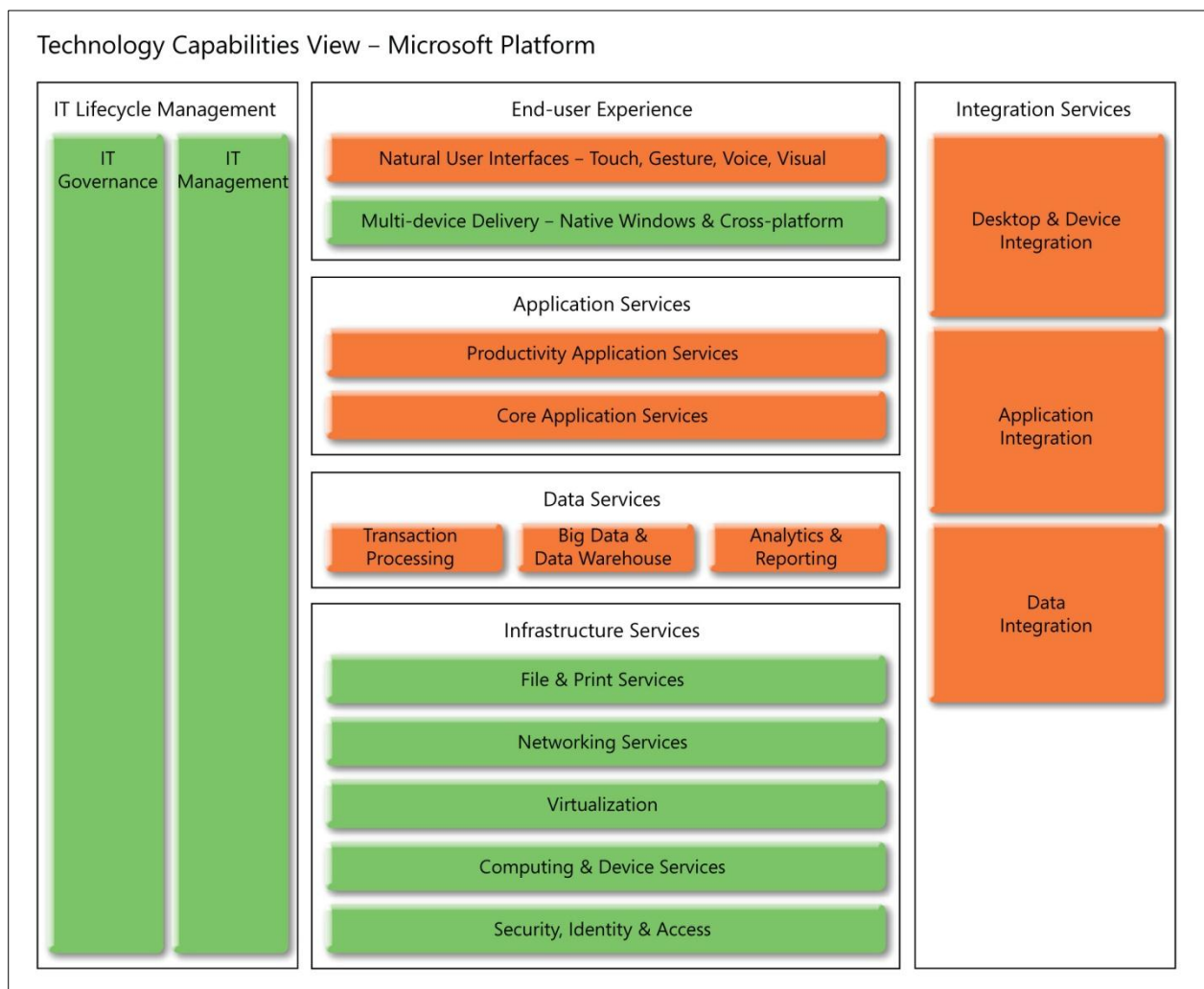
Microsoft platform capabilities span the breadth of the IT lifecycle – Development, Operations Management, Systems Management, Integration, Data Management, Applications, and Business Productivity. It is effectively too large to *list* all of the capabilities into the body of this document, please refer to [Appendix C](#) for detailed capabilities views. These detailed capabilities views can serve as an effective reference for planning and research purposes when financial institutions are planning innovation of their operations.

The combination of highly integrated core infrastructure, application services and business productivity is a significant differentiator of the Microsoft stack. The combination provides a robust

platform designed to enhance the effectiveness of the people, processes and applications by leveraging solutions based-on Microsoft technologies as it is one of the most comprehensive enterprise platforms in the industry. A more detailed view of technology capabilities is shown in the following diagram and is followed by additional layers of detail for the following segments:

- End-user Experience
- Application Services
- Data Services
- Infrastructure Services
- IT Lifecycle Management.

Figure 10: Technology Capabilities View



End User Experience

Consider the following scenarios. A wealth advisor uses a slate device to review the customer profile of her next appointment and research product performance before traveling to the customer's location to provide banking services. A trader uses transparent displays and virtualization to work efficiently while sharing real-time data with other traders. A temporary branch is set-up at a community event with specialized advisors and supervisors available by video conference. A mobile phone provides treasury services for large corporations and banking services to a previously unbanked village. A branch window displays gesture-based, interactive

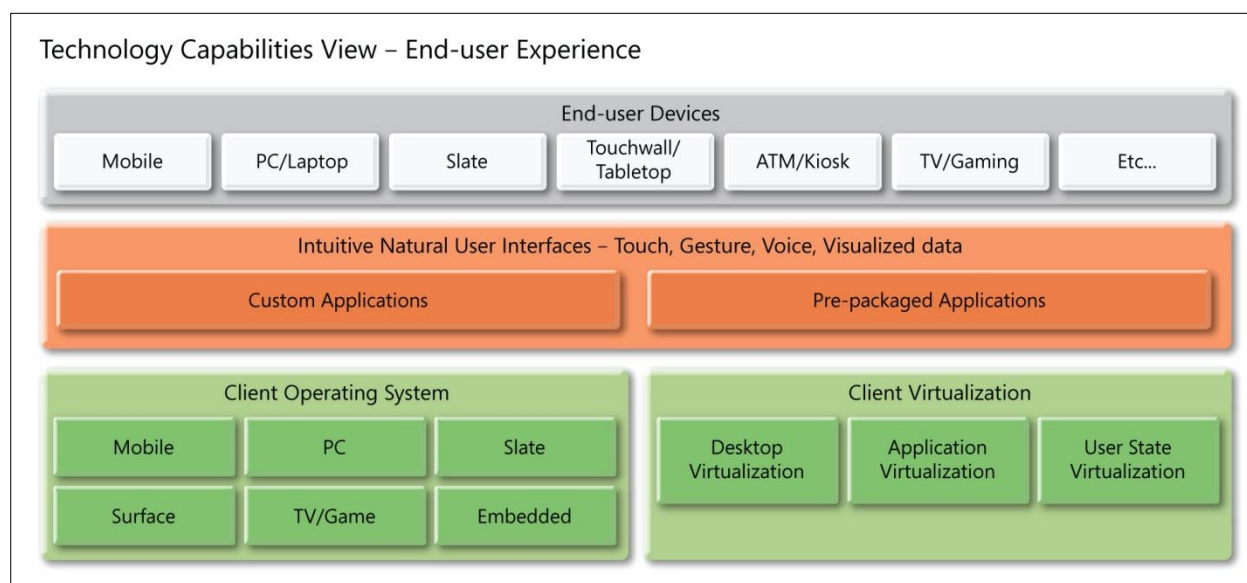
signage. Microsoft has delivered innovative end-user capabilities and applications for years. Microsoft uses its research tools and methodologies to understand and test usage in order to improve user efficiency. The Microsoft platform delivers capabilities to Windows and non-Windows devices with rich end user functionality through a consistent, secure and well-managed infrastructure, allowing financial institutions to explore new access channels and devices, such as the TV and gaming systems to reach customers in any situation. Scenarios like those above are enabled by Microsoft technology and are changing the end-user and customer experience in banking to one that is more interactive, insightful, and collaborative.

Applications deliver expanded functionality including real-time insights, collaboration, communication and social networking capabilities.

New user interfaces are supported including touch, gestures and voice; or pen/stylus support for electronic signature capture.

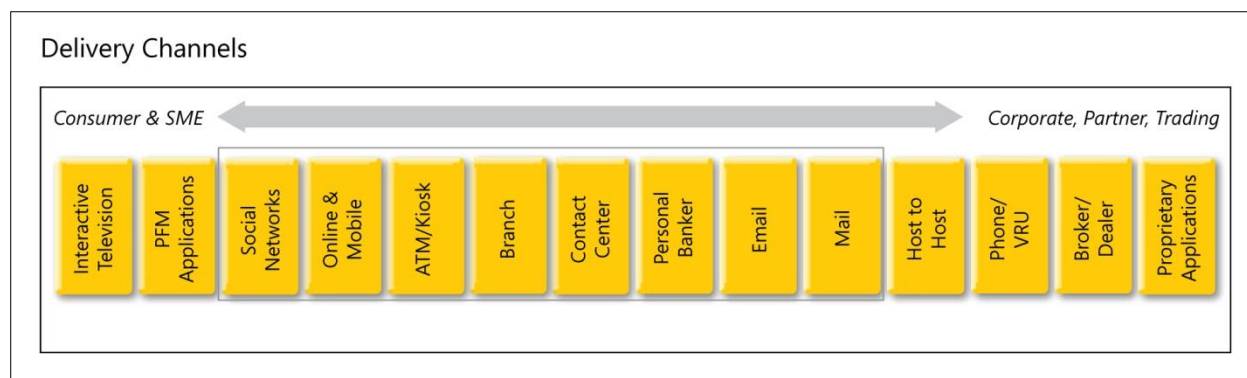
Influxes of consumer-based electronics are finding their way into the enterprise and it has created new challenges which have been referred to as the consumerization of IT (CoIT). Considering the diversity of Windows and non-Windows-based consumer devices, CoIT has introduced new application development, compatibility, security and management challenges to the enterprise.

Figure 11: Technology Capabilities – End-user Experience



When considering the end user experience in the context of customer-facing banking experiences, the Microsoft end-user experience capabilities can be deployed to provide a wide array of innovative channels for delivering online, host-to-host and mobile financial services to retail or commercial customers alike.

Figure 12: Example Delivery Channels



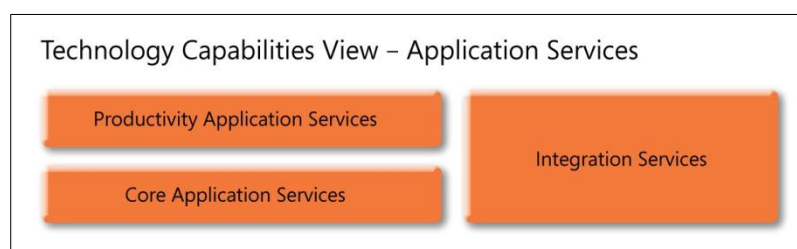
Furthermore, R&D investments in Microsoft's consumer devices such as the Xbox gaming system and Kinect for Windows are now being leveraged by partners to deliver financial services capabilities.

Application Services

Financial institutions' requirements for application services are expanding. Leveraging the application services in the Microsoft platform can reduce time to delivery and provide new capabilities as part of the platform which can be the key to building better business processes within the financial institution. Capabilities such as workflows and alerts for exception management; communications enabled applications that connect customers to remote advisors; embedded data analytics to provide decision support for front line employees, such as next-product suggestions. Finally, location based services help build applications such as ATM locator applications in online and mobile banking applications.

The application services layer within the capabilities view separates application services into three logical categories – *Core Application services*, *Productivity Application services*, and *Integration Services* both on-premise and into the cloud.

Figure 13: Technology Capabilities – Application Services (High Level)



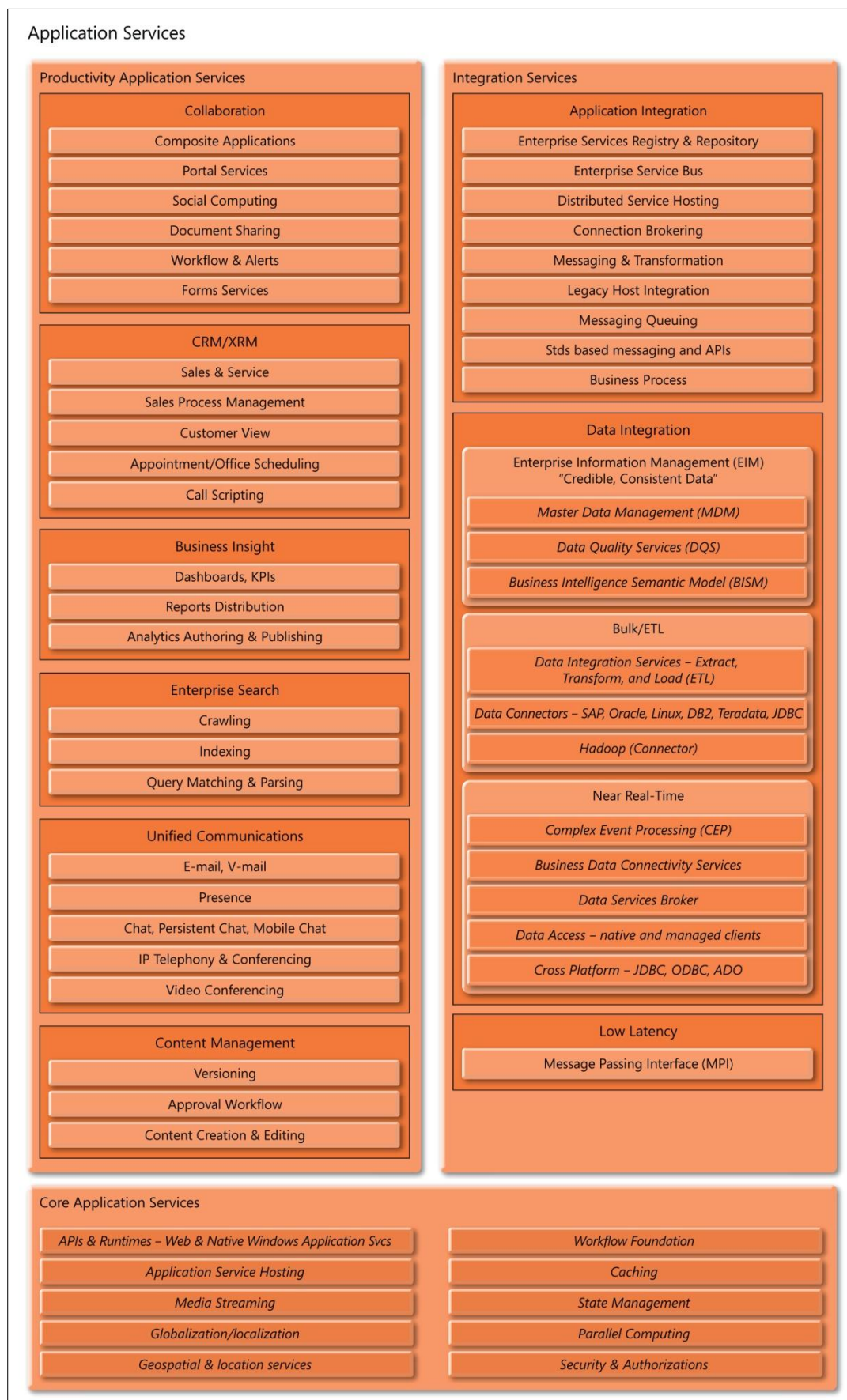
The level of these capabilities in Microsoft's application services is large. The broad functionality in the platform can accelerate time to market for banking applications while providing differentiated functionality to the end-user, whether employee or customer.

- *Core application services* provides the APIs and runtimes to provide low-level application capabilities like caching, state management, parallel programming, media delivery, and location based services. It supports the remainder of the application services layer and provides the foundation for development of business applications on Microsoft's platform.

- The business *productivity application services* layer augments the platform with specialized, higher-order application services. Leveraging these types of highly functional applications services and even the finished software it provides can significantly reduce the development and integration work by leveraging these capabilities as part of the enterprise platform;
 - Collaboration services - enable the composition of applications and processes for delivery to the end user via portals. Enables social networking in the enterprise as well as workflow and alerting
 - CRM and XRM tools and frameworks – track and manage customer information
 - Business insight services - utilize data services and collaboration to deliver interactive visualizations for the best possible insights to the end user. This would include corporate performance management, risk analysis, customer insight and broad operations management functions that replace many traditional reporting methods.
 - Enterprise search - locate and find documents, people and data.
 - Unified communication services - provide the integration of presence, voice, messaging, email and video to the desktop and devices. Instead of 'telephony' being managed separately it is integrated to the end-user experience to support VOIP, instant messaging and video across the desktop and devices.
 - Content management services form an important element of document and records management and regulatory compliance.
- Integration services provide integration capabilities that connect to legacy systems, across platforms and to the cloud. Integration capabilities ranging from low-level data access to low-latency Message Passing Interface (MPI), Complex Event Processing (CEP), message queuing, ETL and SOA processes. It is the area where Enterprise services bus and payments hubs operate. These leverage industry standard interfaces like SWIFT and ISO via Microsoft's BizTalk Server and the Accelerator for SWIFT which connects to payments networks to create a rationalized payment "hub".

Figure 14 breaks these capabilities down into more granular detail which exemplifies the depth and breadth of capabilities in the applications services.

Figure 14: Technology Capabilities - Application Services (Detail View)



Data Services

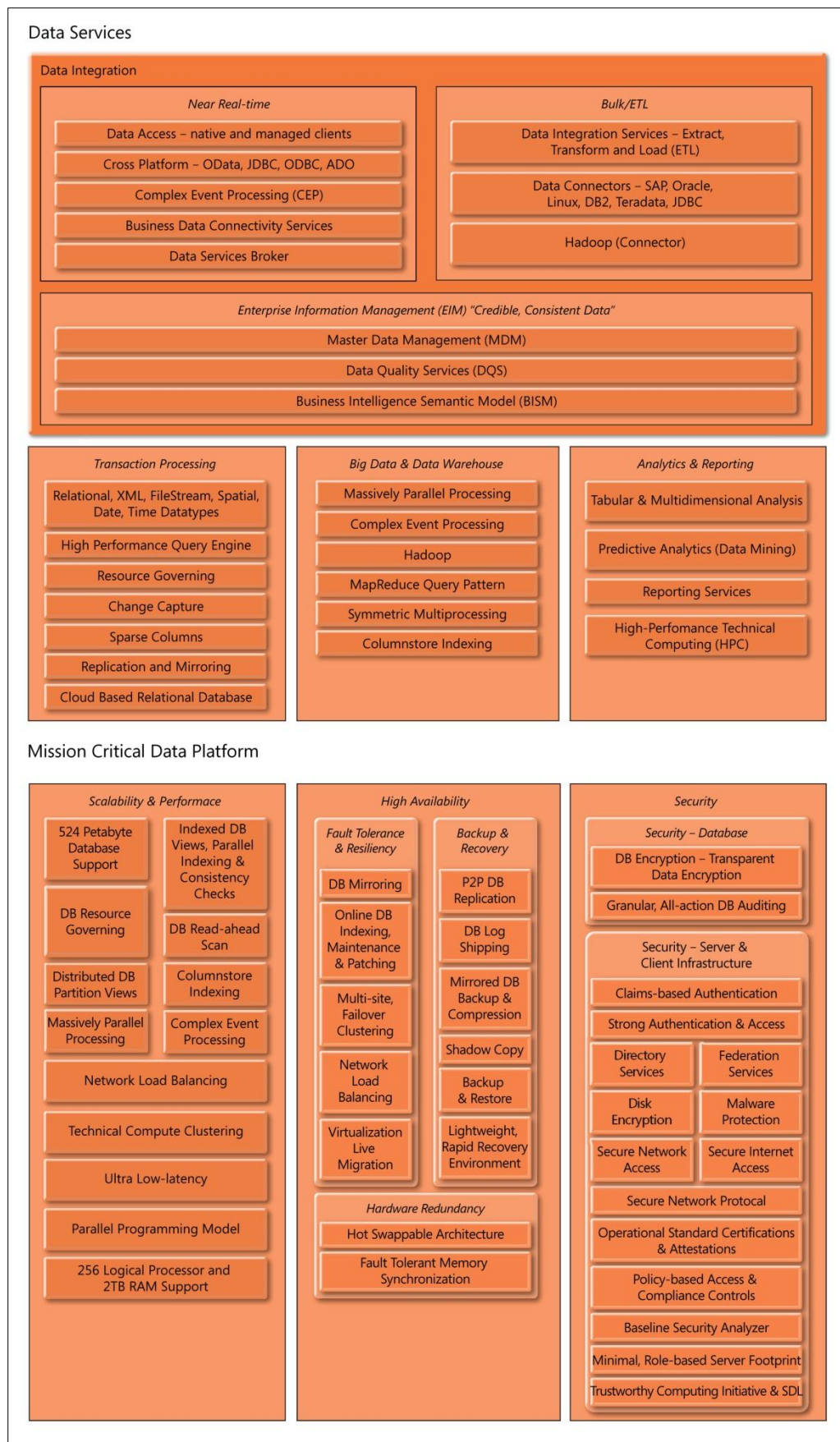
Financial institutions seek to perform more transactions, reliably for less cost while improving the access employees have to insights to help execute on the business strategy. In the context of financial services application architecture, the following are examples of the data services provided; transactional databases of service factories, data warehousing, reference and market data, analytics and reporting.

Figure 15: Technology Capabilities - Data Services (High Level)



The following diagram highlights the breadth of Microsoft's data & BI platform capabilities in the areas of Online Transaction Processing (OLTP), Enterprise Data Warehouse (EDW), Analytics, and Information Delivery. Key capabilities to note for Banking are the extensive mission critical capabilities which are a foundation of the data platform. Some key highlights include high-scale analytics with Massively Parallel Processing (MPP), High Performance Distributed computing (HPC), Complex Event Processing (CEP), column store indexing, horizontal scale-out and cloud-based SQL Azure Data Platform which, for example, is used by Temenos to run T24 Core Banking to support Microfinance in Mexico.

Figure 16: Technology Services – Data Services (Detailed View)



Online Transaction Processing (OLTP) – Financial institutions’ core operations depend upon reliable transaction processing and can face adverse consequences from outages or unreliable processing. However, because these services are commoditized they must be delivered at scale with the best TCO possible. Microsoft Windows and SQL Server provide mission-critical scale, performance and reliability for OLTP workloads.

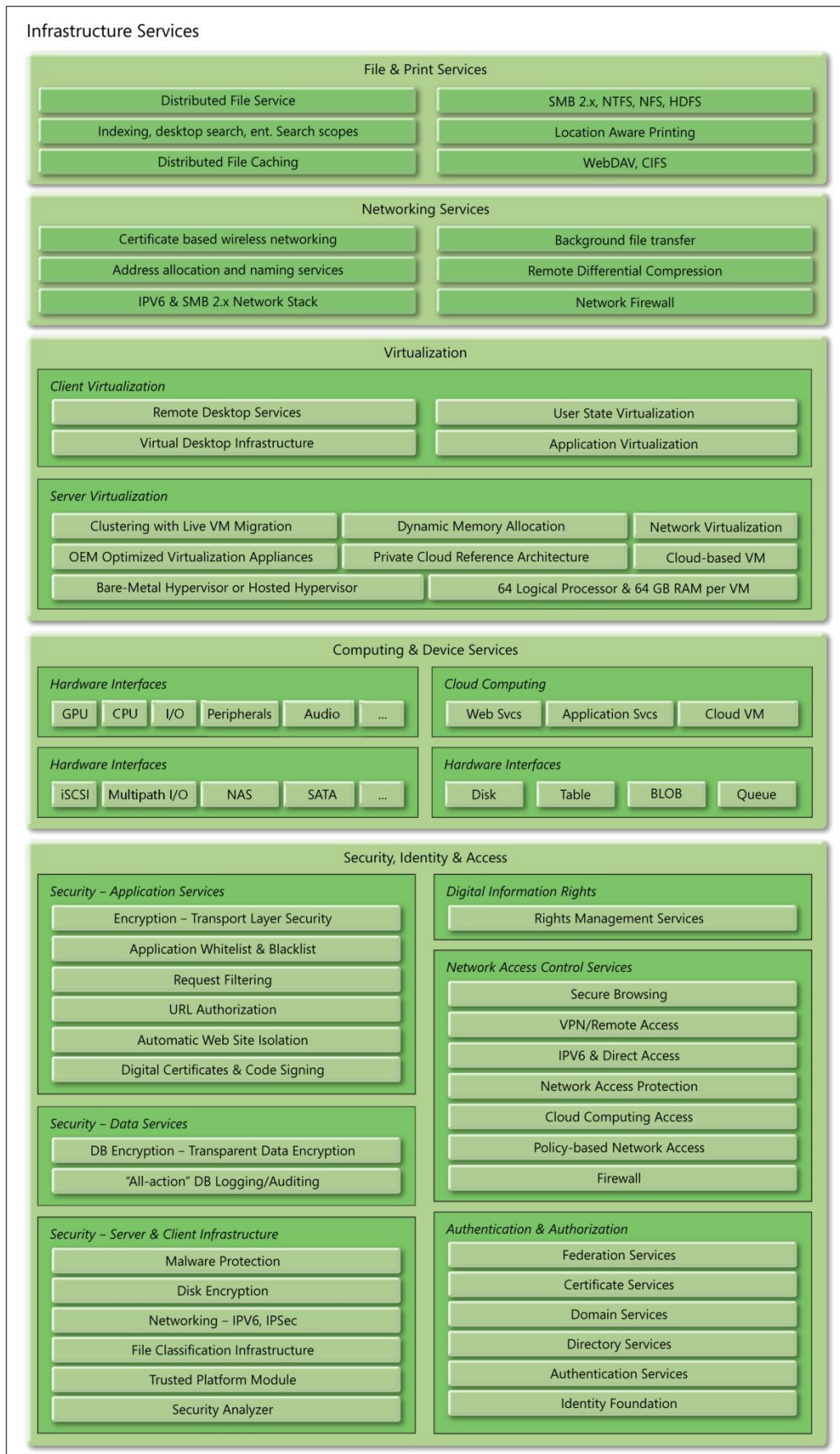
OLTP Example: Temenos, an alliance gold partner providing industry leading core banking solutions, takes advantage of the SQL platform to run their core banking suite T24. In partnership, Temenos and Microsoft have optimized T24 for the Microsoft Windows and SQL platform. Public benchmarks are available demonstrating performance and near linear scalability for models up to 25 million accounts. For more information, refer to www.temenos.com.

Insight and Analytics – The demand for information in banking is surging in many areas including historical analysis, performance budgeting, business performance analytics, executive dashboards, marketing and sales automation, product innovation, customer profitability, regulatory compliance and risk management. There are so many sources of data and so many people that need access to analytics, the delivery paradigms for information and decision support must change. The Microsoft platform strategy for addressing big data is to support massive scale in the back-end for OLTP and Data Analytics and support new delivery paradigms like self-service and near real-time analytics in the front-end. An example of this can be found in the Appendix A.

Infrastructure Services

Infrastructure Services provide networking, identity management and access, core computing services via on-premise, virtualized, or cloud-based infrastructure. This layer is the foundation providing core services to the other layers of the architecture; such as data interaction, scale and security, application and productivity services, etc. As with other elements of the Microsoft platform, this layer is built with security and integrity as essential considerations. Figure 17 below breaks these services into more granular services that enable capabilities such as server and desktop virtualization and server applications and workloads.

Figure 17: Technology Services – Infrastructure Services (Detail View)



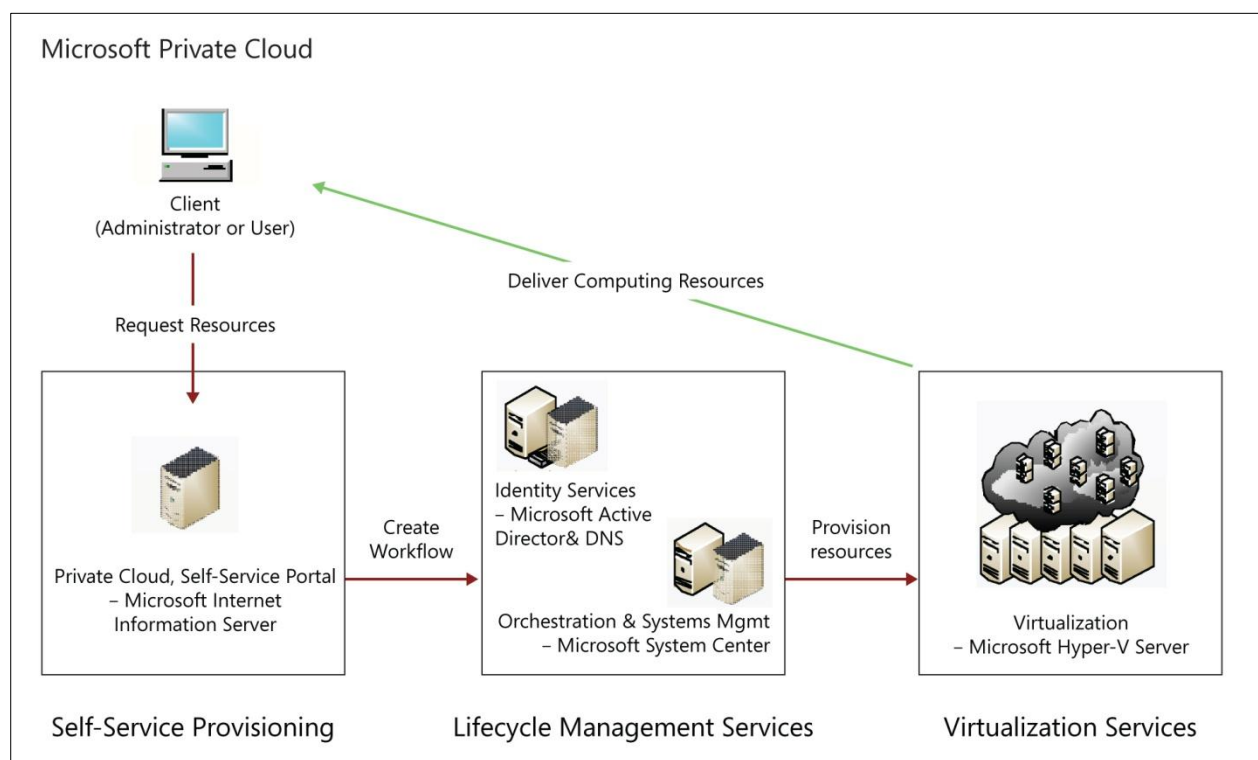
Infrastructure Services – Deployment Scenarios

Scenario One; Private, Public, and/or Hybrid Cloud

A highly topical infrastructure service requirement is the ability to extend computing to the cloud. Financial institutions are very interested in cloud computing because of the opportunities they bring for innovation and cost. There is a particular interest by financial institutions to implement private cloud in their datacenters, due to data privacy and other business factors which prevent certain uses of public cloud resources today. The goal that is achieved with private cloud deployments is efficiency and cost savings via a highly elastic, highly automated and self-service computing environment. The Infrastructure Services layer lays the foundation for private cloud by providing a highly virtualized and automated private cloud implementation in the financial institution's datacenter.

The foundation is built on Microsoft Hyper-v which provides virtualization services within Microsoft's platform. The Lifecycle Management layer of the architecture provides highly automated operations and includes self-service provisioning through a service-portal in order to realize the potential cost savings of the private cloud model. To help with the journey to cloud, Microsoft has a number of professional services offerings, SI partners, and architectural guidance (<http://www.microsoft.com/en-us/server-cloud/private-cloud/hyperv-cloud-deployment.aspx>) specializing in Private cloud implementations.

Figure 18: Private Cloud configuration with the Microsoft platform



Microsoft Reference Architecture for Private Cloud –

<http://social.technet.microsoft.com/wiki/contents/articles/3819.reference-architecture-for-private-cloud.aspx>

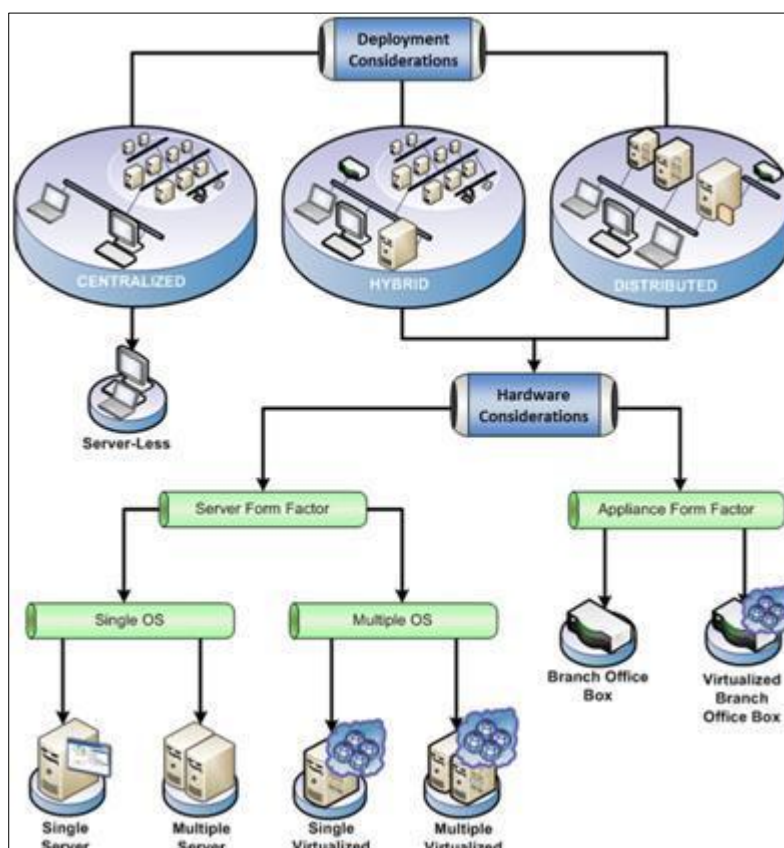
Scenario Two: Branch Renewal

As another usage example, this layer provides key capabilities to enable branch renewal in the wave of branch modernization that is occurring. It provides computing services in centralized,

distributed and hybrid branch topologies and provides the services needed to run technology for the branch including specialty banking peripheral support, file, print, network access and compression services, and security/encryption. Microsoft provides the infrastructure and systems management to deliver a secure, efficient, and agile branch infrastructure that enables financial institutions to deliver enhanced customer service at lower TCO. There are many choices needed for renewing branch infrastructures – depending upon the bandwidth, costs, employees and customer volumes, etc. Microsoft provides specific planning and design tools for your branch infrastructure called “Branch Office Infrastructure Solutions v3.0”

<http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=22199>. It helps the architect understand the depth of services available in the infrastructure and what considerations one must make when planning branch modernization.

Figure 19: Source BOIS v3.0 – Depicting high level branch infrastructure deployment



Lifecycle Management

IT Lifecycle Management involves the management of IT planning, operations and delivery. Governance plays a huge role in Financial Services since there are many operational requirements to comply with, and managing compliance of the systems supporting the business can be a daunting. Microsoft provides GRC compliance libraries and controls to help insure the system are running in a compliant and dependable fashion.

Microsoft enables low cost operations through highly automated management processes. These are key capabilities to enable private cloud services since the management and system orchestration within our management platform, System Center, is responsible for the enabling the

self-service provisioning and dynamic scaling properties that make the private cloud so compelling to financial institutions. The lifecycle management layer also provides endpoint protection and encryption management to protect systems from data loss or production interruptions and alleviates some of the hassles with cross-platform data protection through its ability to manage devices across technology platforms.

Trustworthy Computing and Security Development Lifecycle

The Microsoft platform is developed based on Microsoft's Trustworthy Computing initiative which includes the Microsoft Security Development Lifecycle plan to guide the development and implementation of secure software. The Microsoft portfolio is built with these guidelines and has returned positive results in maintaining security in the platform. For example, SQL Server had no critical vulnerabilities in 2010 . The SDL artifacts are available for use in the banking enterprise for governance and management of development and IT operations of business applications. Information regarding the SDL visit online at www.microsoft.com/twc.

Technology Capabilities View – Microsoft Azure Platform

Microsoft's development and management tools address cloud scenarios, on premise and hybrid scenarios within the same suite of tools.

When looking at the Azure Public Cloud Platform and at our Private Cloud guidance, there is focus on connectivity, development, and management across cloud and datacenter. It also has core capabilities that are well aligned with on premise capabilities. The following graphic depicts cloud capabilities for each layer of the Microsoft platform.

Figure 20: End-to-End Capabilities – Cloud Platform



Section VII

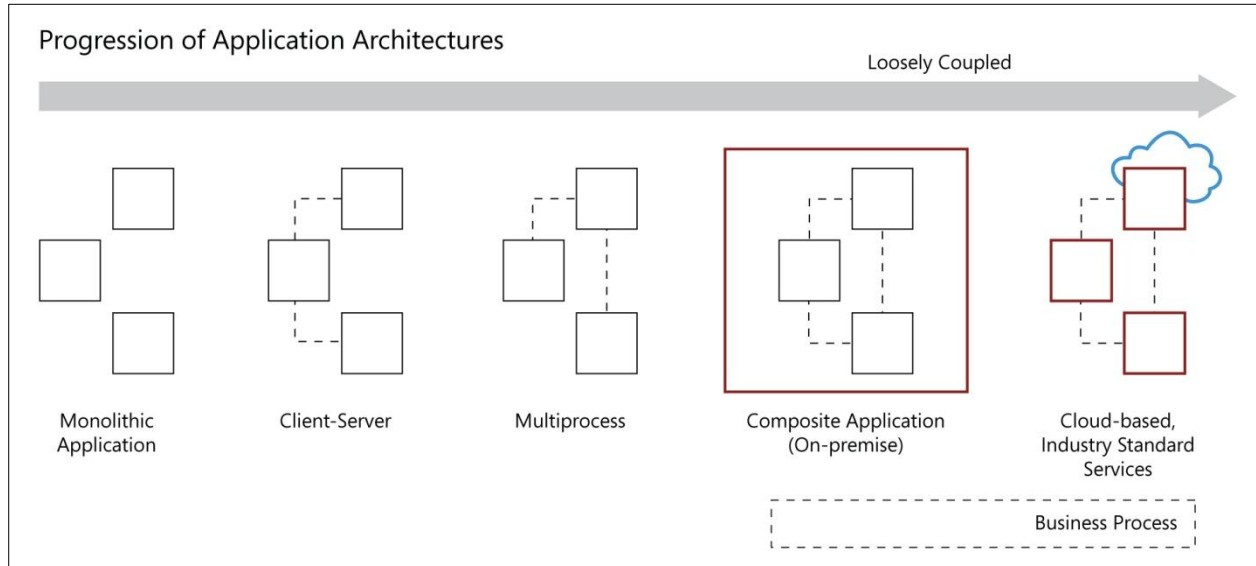
New Paradigms for Delivering Banking Applications

Microsoft sees the next architecture wave as standardizing the banking services with an industry-view and extending component-based architectures to leverage cloud computing. These are fundamental drivers in banking reference architecture as they enable processes and services to be distributed at an industry level, not just within the walls of a datacenter or confines of a financial institution's network. As financial institutions focus on strategic priorities, an architecture that enables industry standard services and cloud-based integrated business and technology services will facilitate the strategic sourcing of business functions.

Industry Standardization of Banking Services

When considering reference architectures, financial institutions must also consider the timeline and progression of application architectures since the 1970s and 1980s. Over time the industry has seen a progression from monolithic applications deployed on mainframes, through client-server in the 1990s, to more composite applications on-premise; and now leveraging the scale of the cloud.

Figure 21: Progression of Application Architectures



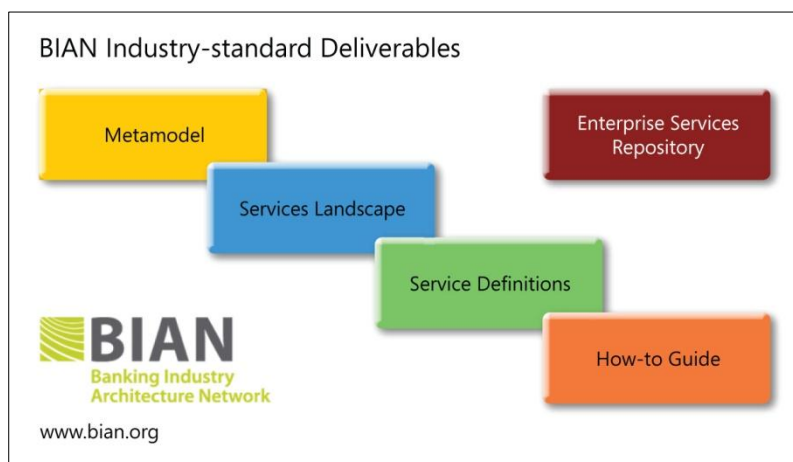
Banking solutions delivered as componentized sets of business services have now become commonplace within the application vendor community and in-house development (as depicted by the red box in figure 21). However, the definitions of these services are *not standardized* across industry vendors and financial institutions.

When tackled in isolation, initiatives to transform the Financial Services enterprise to componentized services can prove to be daunting to undertake, challenging to complete and provide less than optimal reuse across the enterprise or the banking industry. This is where

collaborative efforts from BIAN and IFX can add value to enabling standardized services within the banking enterprise.

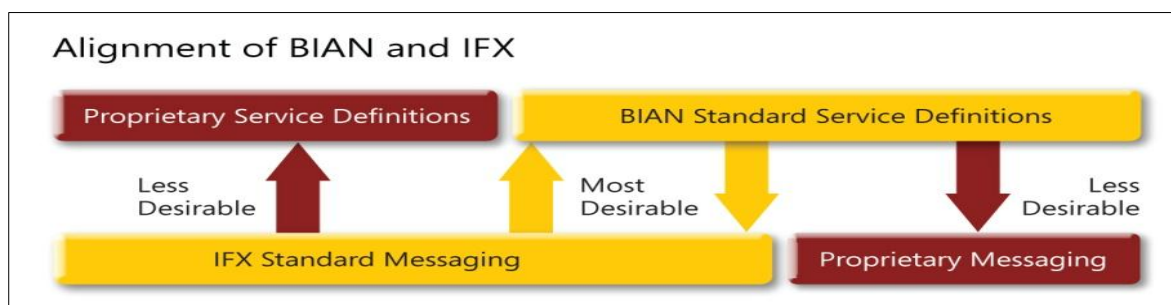
- BIAN (whose membership includes major global financial institutions, software vendors and solution integrators) is focused-on the standardization of Service Oriented Architectures across the banking industry. BIAN is in the iterative process of defining common, industry-standard banking services at a business semantics level and creating guidance for the implementation of these services in the banking enterprise. An example of the current BIAN Service Landscape (version 1.5) can be found in Appendix G. Please also refer to www.bian.org for future versions of BIAN architecture documents and a full list of members.

Figure 22: BIAN Industry Deliverables



- Microsoft also collaborates closely with Interactive eXchange Forum (IFX). IFX is an open, interoperable financial messaging standard for defining financial message payloads. IFX message specification and object oriented design makes it well-suited to be leveraged in a web-service. IFX is designed for SOA but the IFX Forum mission does not focus on *defining* standardized services. Conversely, BIAN does not define low-level financial messaging. This makes IFX messaging and BIAN's Service Definitions a good complement to each other. The diagram below gives a simplistic example of that complement of the two standards. Please also refer to www.ifxforum.org for more information related to IFX and the IFX Forum.

Figure 23: Alignment of BIAN and IFX

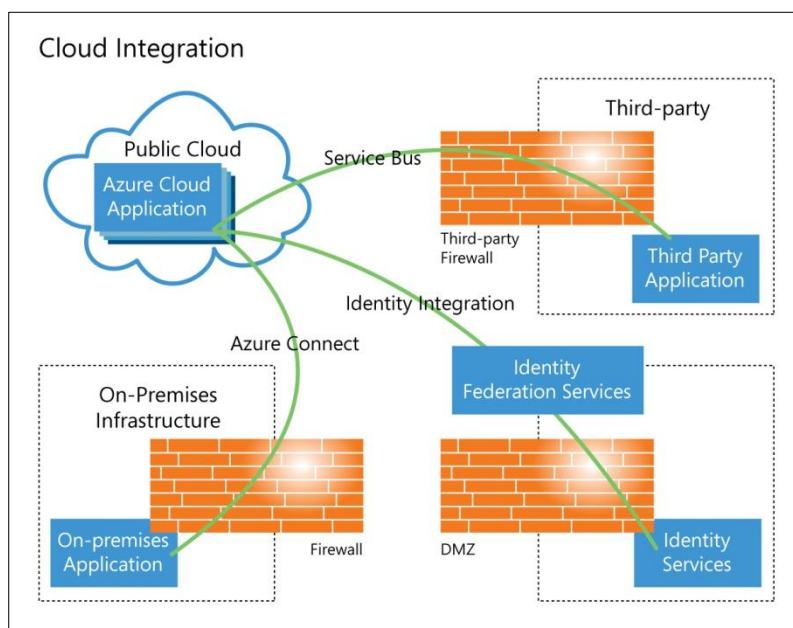


MIRA-B complements the value proposition of industry architecture bodies and extends those elements to a reference architecture based on and deployed with Microsoft technology.

Extending Application Architectures to the Cloud

Cloud computing, and the ability to efficiently access cloud resources is now as important as application composition and SOA for improving time to market and reach, while reducing cost of operations. As we move into the future, the industry will provide more and more specialized services which are designed to be integrated into a financial institution's business processes as application 'building blocks'. This componentized approach can enable more 'application composition' in lieu of every bank building redundant and often commoditized capabilities. Cloud computing and Services Oriented Architecture (SOA) will play an increasingly important role since many of these services will run in the cloud and financial services institutions will leverage SOA patterns as a primary mechanism to interact with these services. As depicted below, Microsoft's platform provides cloud-based computing, application, data and virtualization services for Public cloud. For connecting them together, Microsoft Windows and Azure provides the ability to quickly and securely integrate public cloud resources into the enterprise including service bus and secure, IPSec networking (via Windows Azure Connect, Service Bus Relay) and Federated Claims-based Identity (via Active Directory).

Figure 24: Sample Cloud Integration Model




An architecture designed for leveraging cloud services enables more flexibility for financial institutions to leverage business solutions and services that are built in-house as well as making it easier to leverage an ISV or SI solutions as well.

As with other computing models, adoption of cloud computing is not an all or nothing proposition. To benefit from cloud computing, financial institutions can take an *incremental* approach to adoption as is suitable for that institution. Cloud adoption will ultimately span a range of scenarios from development and testing to production tier-1 applications and will leverage a broad set of capabilities ranging from highly automated, elastic private cloud infrastructures

(provided by Windows and System Center) to public, multi-tenant cloud platforms (such as Windows Azure). For example, many benefits can be gained for development, test and/or production but it does not have to be all projects at once. The same goes for adopting cloud capabilities – all capabilities and data storage need-not be migrated to the public cloud at-once. For example customer data can be left on premises but cloud computing power can be used for analytics and high performance computing or perhaps leverage the simplified connectivity and caching capabilities in the cloud for connecting systems together. There are many different strategies that can be used for migration to the cloud. Microsoft provides many options to help you in the cloud journey including partners, professional services, as well as great self-service resources at Azure.com and MSDN.com. Additionally books such as *To the Cloud: Cloud Powering an Enterprise* by authors Pankaj Arora, Raj Biyani, and Dave Salil provide references and high-level process guide for cloud migration. http://www.tothecloudguide.com/the_book.aspx

MIRA-B – Developing a Services View of Architecture

A critical challenge for financial institutions is integrating new channels, applications, data flows and operational processes into the traditional back office. Financial institutions must recognize that the driving forces of the product development and delivery channels versus the back office are very different, and the reference architecture must accommodate this reality.

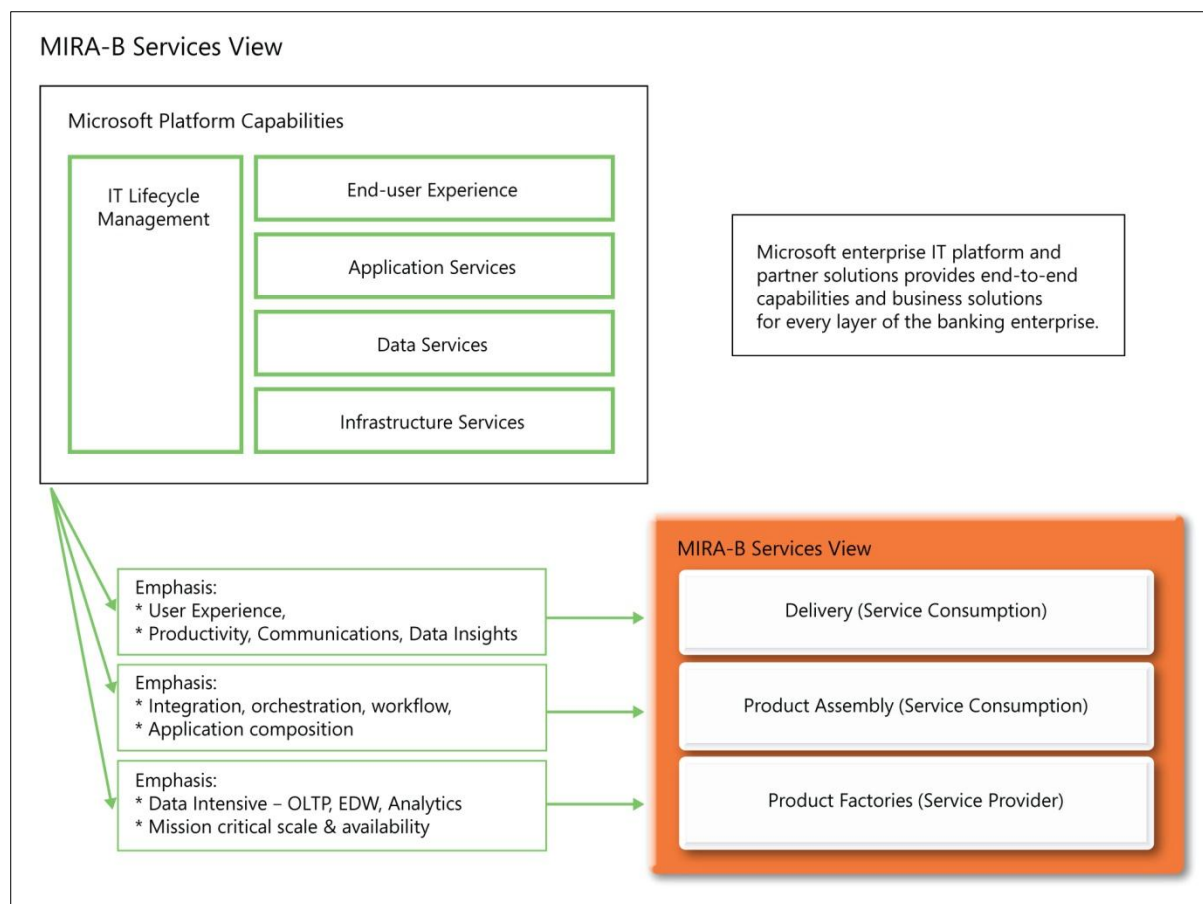
Front-office and Back-office – Different Focus and Operating Models	
	Front office and delivery channels (customer experience and product delivery) <ul style="list-style-type: none"> • This is the point of differentiation in the marketplace, where financial institutions compete on functionality of products and service • The primary point of customer experience • Major driving forces being innovation, agility for rapid product delivery, and customer service.
	Operations (traditionally, the back office) <ul style="list-style-type: none"> • The commoditized area of banking and should be a black-box to customers • New channels create stress and change on operations; an area that demands stability and a slow rate of change • The major drivers are stability, efficiency and reuse of shared services.

To enable agility, reduce integration cost, and increase reuse across the enterprise, financial institutions must decouple the rapid change cycle of the channels from the stable processing of the back office. To achieve this state, a multi-layered modular approach to enterprise architecture is recommended to decouple business services from front-end processes.

The MIRA-B *services view* highlights the integration capabilities of the Microsoft platform which enables banks to implement modern-day integration including the integration of cloud computing resources into the banking architecture. The services view also shares Microsoft's vision of how banking industry-specific service definitions and messaging standards like BIAN, ISO, and IFX fit into the reference architecture and how they could provide a foundation for building repeatable and standardized software, not only across the banking enterprise, but across the banking industry. Figure 25 shows the simplified capabilities view, introduces the typical workloads found in each layer and shows how these capabilities support the *services view* of banking application architecture.

The MIRA-B *services view* is segmented into the following three strata: Service Factories (Service Providers), Product Assembly (Service Composition), and Delivery (Service Consumption).

Figure 25: MIRA-B Services View



The provider/composer/consumer model is one of many ways to logically depict banking integration, and it is an appropriate view for demonstrating the points mentioned above including the alignment to the BIAN Service Landscape within the architecture. The three strata are further defined (bottom up) as follows:

1. Business Service Factories (Service Provider)

The Business Service Factories (Service Providers) are to all intents and purposes operational black boxes. The Business Service Factories (Service Providers) tend to perform data intensive processes dedicated to specific applications and functions of business operations; such as Payments, Lending, Enterprise Risk and Customer. Each service provider will contain only the applications and services specific to the nature of that service factory's (provider's) business. These service factories provide functions that are exposed for reuse, by multiple consumers of the services. This loose coupling helps to isolate the services provided by back office operations from the vast range of user-specific requirements in the different end-user applications.

The service provider's services are consumed directly or via an intermediary "product assembly" (services composition) layer. All factories may provide and consume services either directly or via the product assembly (services composition) layer.

2. Product Assembly (Service Composition)

The service composition layer combines discreet services into business processes and applications for consumption by service consumers. This is the logical layer where standardized application, integration and collaboration technology is used to define processes and workflows between the delivery channels and core banking applications. This layer enables channels to integrate vertically to core banking applications and also provides platform services for application enrichment such as using itinerary-based workflow, orchestration, data transformation, collaboration, and productivity tools – thus producing a more valuable “composite application” for consumption and reuse by the Delivery (Services Consumer) layer. The Product Assembly (Service Composition) layer is the point in the service view at which multi-channel delivery begins to diverge and it is logically where the Enterprise Services Bus as well as distributed services such as those built with Windows Communication Foundation ([WCF Services](#)) resides.

3. Delivery (Service Consumption)

Consumers of the enterprise services are typically applications supporting the front-office, mid-office, or delivery channels; or another service (provider or composer). The Delivery (Services Consumption) Layer of the MIRA-B services view defines the applications and devices that consume enterprise services. The service consumer layer also enriches the services being consumed with collaboration and productivity capabilities. At this layer, the focus is on end user experience and accomplishing the task at hand in the most effective and efficient manner.

The Delivery (Services Composition) layer includes applications and devices by which customers interact with the financial institution. This includes Teller, Advisor, Trader, Wealth Manager applications as well as other applications for contact centers, branches, ATMs, voice response units (VRU), online applications, mobile device applications, direct host to host communications for commercial clients, and emerging channels such as the television and gaming consoles.

Taking this 3-layered model one step further, Figure 26 shows several examples of Delivery, Product Assembly processes, and Product Factories (along with typical applications/modules one might expect to find in the Risk and Payments service factories).

Figure 26: MIRA-B Capabilities Services View

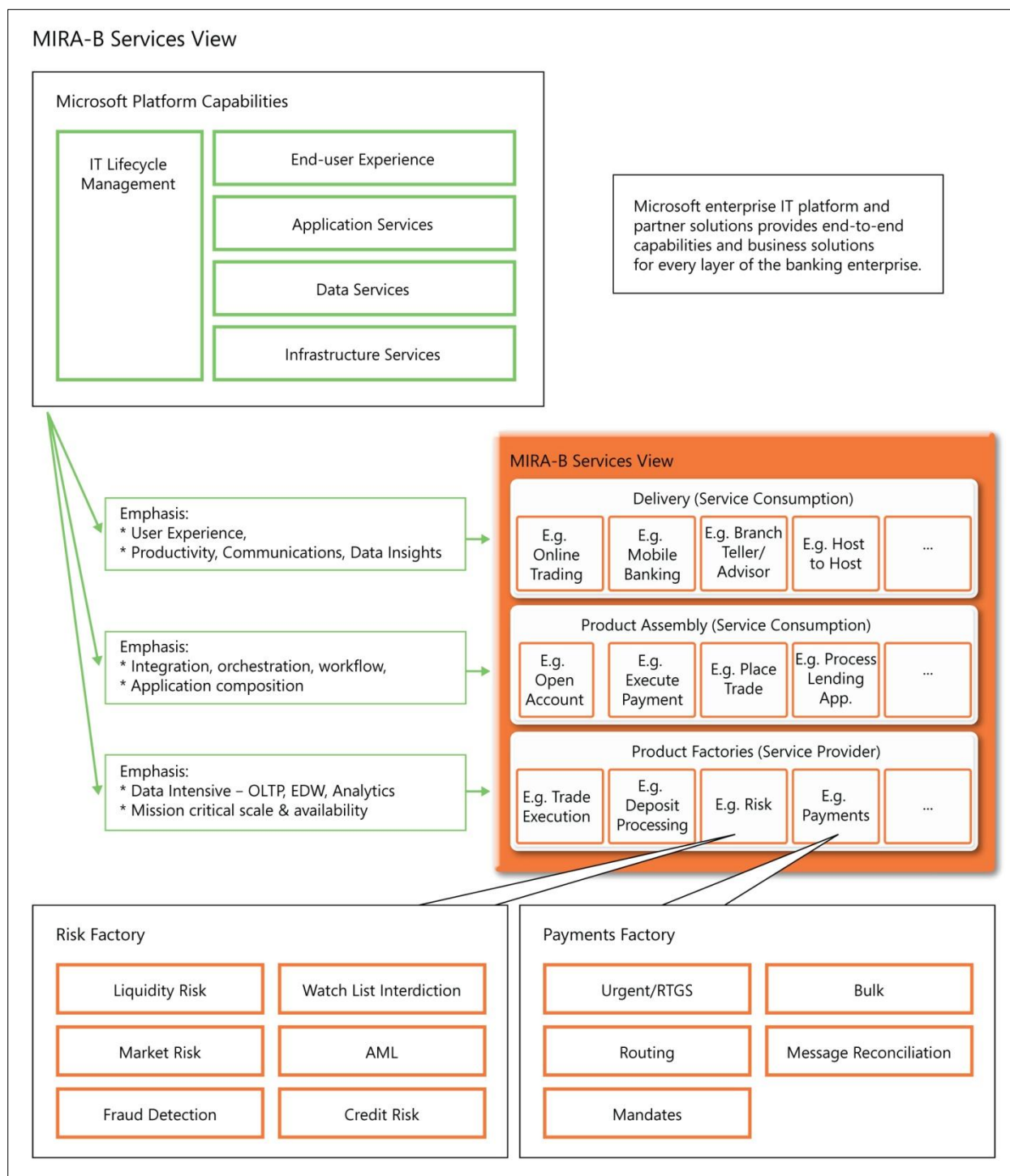
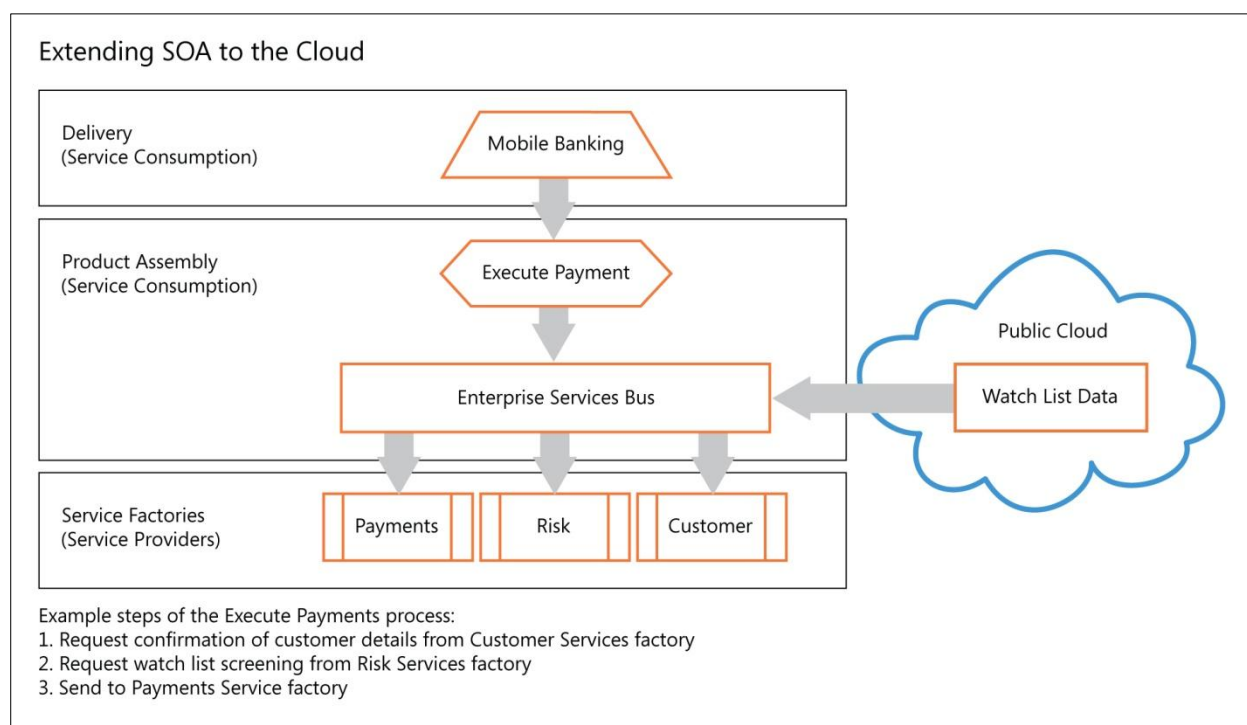


Figure 27 shows a sample business process for the Payments Services Factory which includes services (which could be traditional applications) to perform high and low value payments, external messaging and integration to payments networks, and a reconciliations service. Figure 27 shows a sample business model for executing payments via the mobile banking channel. In this example the Services Factories will provide services to the Product Assembly layer as needed by composite processes. The 'Execute Payment' service will require a payment screening service from the Risk Factory, and also one or more payment services from the Payments Service Factory,

based on the characteristics of the transaction. As part of daily operations, any given Services Factory may also consume services from other Service Factories via the Product Assembly integration layer (such as via a service bus). This is essentially what is defined as 'itinerary-based processing.'

Figure 27: Extending Banking Services to the Cloud (Payments Example)



Reference architectures and development practices must also allow for composite applications that utilize cloud-based resources. To that end, this model also allows for consumption of services from the cloud. The example in Figure 27 also shows that the Watch List data published by national governments is offered as a service in the public cloud rather than downloaded and stored in multiple databases across any given banking entity. This approach opens up the opportunity to provide commoditized banking services to an entire industry, thereby realizing the type of efficiencies espoused by BIAN.

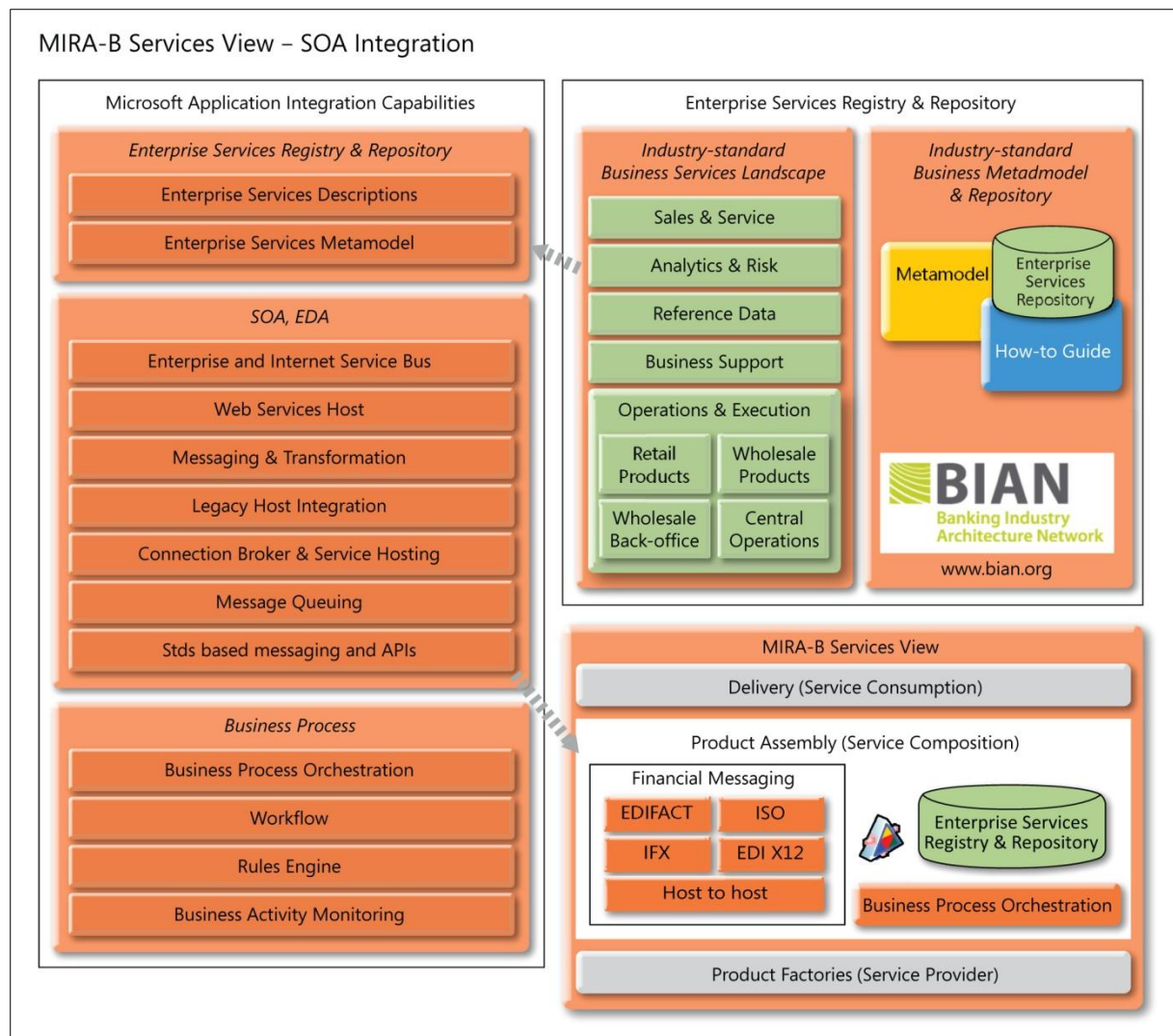
Cloud-Based Integration Example

By leveraging the cloud platform and services, government agencies, banks and compliance software vendors all stand to benefit. For example, governments could publish reference data to the cloud repository. Compliance vendors could deploy on-premise or cloud-based applications that consume reference data from the aforementioned data repositories. Finally, banks around the world would benefit from lowered technology costs and reduced compliance risk as the reference data would be universally accessible on demand from local access points.

Microsoft Capabilities as an Enabler of Industry-standard Banking Services

This section illustrates how the integration capabilities of the Microsoft technology stack can be leveraged to develop composite banking services that conform to the models developed and maintained by BIAN. Figure 28 shows how BIAN services can be implemented leveraging to Microsoft's integration capabilities.

Figure 28: MIRA-B Services View Showing BIAN Integration



Starting at the top right, the BIAN architecture meta-models and service descriptions are published and stored in an enterprise services registry and repository (components modelled in the [BizTalk Enterprise Service Bus Toolkit v2.1](#)). Microsoft platform capabilities provide both centralized and/or distributed service hosting capabilities (for example in an ESB built on BizTalk Server) as well as distributed hosting such as in the Windows Communication Foundation and AppFabric (an integration component within Microsoft Windows and Windows Azure). The left area of the diagram shows an expanded view of Microsoft's application integration capabilities, originally covered in Section V of this document. These relate to the discrete areas of: Enterprise Services Registry and Repository; SOA and EDA; Business Process.

The lower right of the diagram illustrates a view of a Service Composition layer which leverages Microsoft's integration and messaging capabilities that enable faster development and integration of services. For example, financial messaging components delivered by BizTalk Server and the Accelerators for SWIFT and EDI to handle compliant SWIFT and EDIFACT/X12 message exchange.

More details of the Microsoft Capabilities Model can be found in Appendix C. Additional details regarding BIAN can be found in Appendix G or at www.bian.org.

Section VIII

Why Microsoft?

Management of data and technology is the cornerstone of financial services, and of banking in particular. Financial institutions that can best manage data and systems, orchestrate business processes and transactions, and have the highest level of insight into business operations can gain a competitive edge in the industry in terms of product innovation, operational efficiency, and risk management.

Microsoft believes that a modern, agile banking architecture based-on Microsoft technology is a key enabler in helping financial institutions quickly address industry trends and resolve technical challenges to create new business opportunities in today's banking industry.

So what differentiates the Microsoft value proposition in banking? There are four key areas:

1. Standards Based Integration

The Microsoft platform provides for deep integration with third party technology including Oracle, IBM DB2, Sybase, and even proprietary mainframe applications and data. Industry-specific standards such as ISO 20022 and those being developed within BIAN and W3C are directly supported. Such flexibility allows for a financial institution to stage a core system migration or a new solution using existing financial institution data and avoid business disruption.

2. Assets for the Front, Middle, & Back Office

Microsoft provides industry solutions that span devices to desktop, and datacenter to cloud. No other company provides a "full solution stack". Microsoft continues to innovate in R&D around devices and the cloud to drive new technology models. The benefit is consistency across the development platform, security model, and IT services that can help a financial institution optimize its operational efficiency and impact the cost income ratio.

3. Price/Performance and Reliability for Mission Critical Solutions

The Microsoft back office platform has matured to the point where it is now being used to run entire stock exchanges such as [DirectEdge](#) in the US, and to replace mainframes for core banking such as in the case of [Skandinavisk Datacenter](#), and in a [growing number of mission critical solutions across the industry](#). Microsoft works diligently with leading industry partners to optimize their solutions for the Microsoft stack and develop benchmarks that demonstrate performance and reliability.

4. Enterprise Class Development Tools

Microsoft offers a comprehensive suite of application lifecycle management tools for teams to ensure quality results, from design to deployment. Whether you are creating new solutions or enhancing existing applications, Visual Studio enables a quicker time to market, low TCO and enterprise class robustness.

Section IX

Summary

MIRA-B incorporates the elements discussed into a graphical view of the banking enterprise. This includes how IT capabilities are mapped to the Microsoft platform, how industry standards are leveraged, and how mission critical disciplines are applied. Microsoft has aligned MIRA-B to Industry standards such as BIAN and explained the combination of great technology, people and processes as key facets of mission-critical operations.

The Microsoft platform provides the foundational building blocks that allow financial institutions to deliver world class solutions in the areas of Sales and Service, Digital Marketing, Governance, Risk, and Compliance, Business Insight, and Operations. Case studies and customer success stories can be found online at the [Microsoft Financial Services](#) industry pages. That said, banking solutions are most successful when the success pillars of people, process, policy, governance, and technology are considered in delivery.

In order to implement MIRA-B and the solutions it enables, Microsoft offers the services of its [industry partners](#) as well as the architectural services of [Microsoft Consulting Services](#). Our enterprise banking customers are also invited to visit the [Executive Briefing Center](#) in Redmond Washington to hear directly from Microsoft product teams and industry experts and see some of the latest game changing solutions first-hand.

In summary, the repeatable standards based reference architecture provided by MIRA-B can help the banking industry reduce overall costs and provide a platform for sustained innovation in financial services. MIRA-B outlines a roadmap for the future with the architectural flexibility to deliver industry solutions on-premise or in the cloud. This will lead to new business models, profit streams, and customer experiences that enable a financial institution to be present in the financial lives of their customers any time, any place, on any device, and across any channel.

At the end of the day, a by-product of sound architecture is a seamless customer experience.

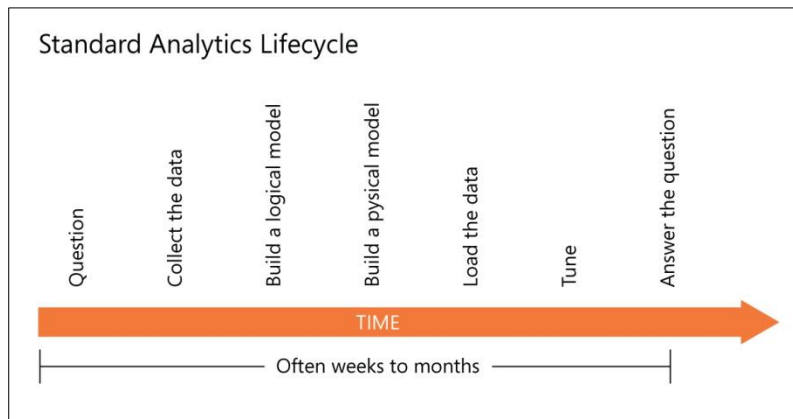


Appendices

Appendix A – Big Data

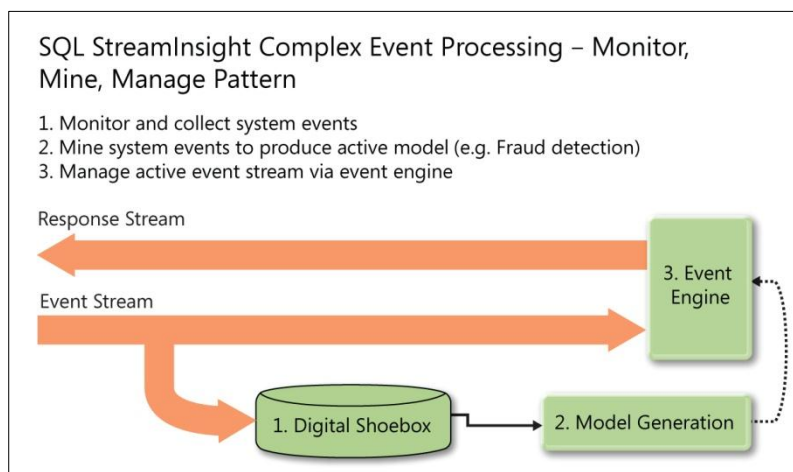
Traditional models for delivering analytics cannot address the growing quantities of data in the same way as the past because the Time to Insight (TTI) can be too long to create, load and analyze information.

Figure 29: Big Data – Standards Analytics Lifecycle



The second diagram shows one approach possible with the Microsoft Data platform to analyze data in-flight, dynamically create models and then query the data stream going-forward based on the models. If desired, the analysis results can be stored in an archive but the key-is that users do not have to wait for latent batch extract Transform and Load processes. This model is but one example of many in-why Microsoft is considered a world thought leader around big data and analytics.

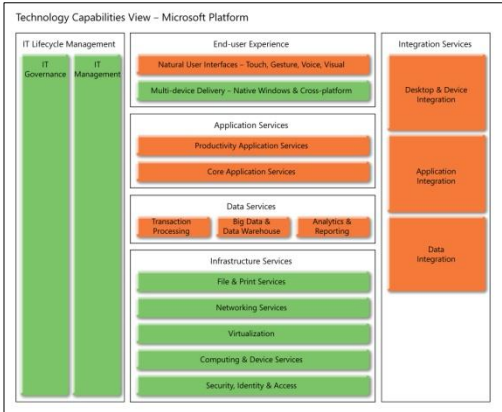
Figure 30: Big Data – SQL StreamInsight



Appendix B – Innovative End User Experience

Delivering innovative, collaborative end user experiences and answering challenges to CoIT


Innovative End-user Capabilities


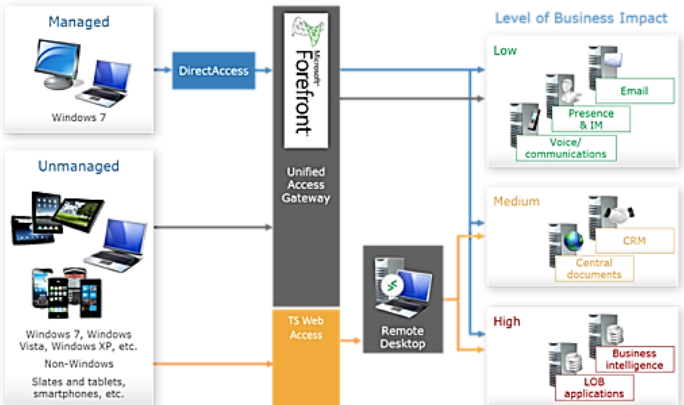
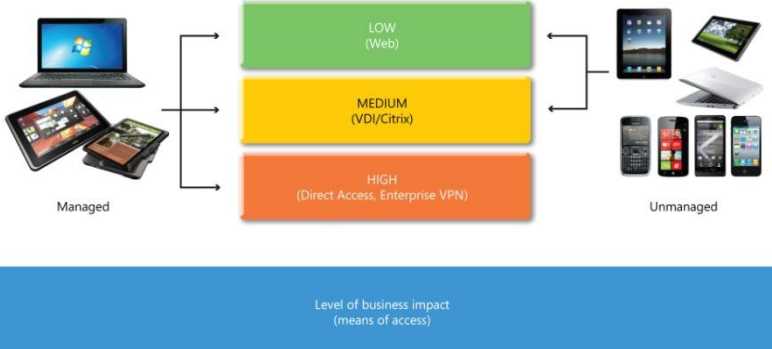
Requirement	Microsoft-based Capabilities	Benefit/differentiator
The Banking industry demands rapid delivery of new products and services.	<p>Microsoft has an industry-leading application platform and finished software services portfolio that is rich with functionality.</p> <ul style="list-style-type: none"> Rapid, team application development for cloud and on-premise deployments, Windows and non-Windows clients. Leveraging highly-functional services such as SharePoint and Lync as components of the application platform significantly decreases the coding effort to deliver client applications. Rapidly deliver the end-user experience in managed and highly automated fashion for VDI/RDS, rich clients and browser clients. <p>Key Microsoft capabilities include:</p> <ul style="list-style-type: none"> Award winning design and development environment Leverages pre-built application capabilities and solution accelerators Versatile cloud and/or on-premise application platform. Support for Model View Controller (MVC) Robust driver development kit for banking peripherals such as receipt & validation printers, image scanner, etc. Integrated instrumentation plus automated management and monitoring. 	<p>Rapid delivery to market for both Windows and non-Windows client devices by using robust application development tools, prebuilt platform functionality, and automated systems management capabilities.</p>  <p>The diagram, titled 'Technology Capabilities View - Microsoft Platform', illustrates a layered architecture. On the left, two vertical green bars represent 'IT Lifecycle Management' (IT Governance and IT Management). The main body consists of several horizontal layers: 'End-user Experience' (Natural User Interfaces - Touch, Gesture, Voice, Visual; Multi-device Delivery - Native Windows & Cross-platform), 'Application Services' (Productivity Application Services; Core Application Services), 'Data Services' (Transaction Processing; Big Data & Data Warehouse; Analytics & Reporting), and 'Infrastructure Services' (File & Print Services; Networking Services; Virtualization; Computing & Device Services; Security, Identity & Access). On the right, a column of orange boxes represents 'Integration Services' (Desktop & Device Integration; Application Integration; Data Integration).</p>
Today's users need efficient application interaction in the workplace.	<p>Innovative application capabilities and client applications enhance the effectiveness of employees, raise customer satisfaction, and decreases cost to serve.</p> <p>Key Microsoft Capabilities include;</p> <ul style="list-style-type: none"> Intuitive interfaces for delivery across multiple platforms, both Windows and non-Windows. Advanced platform capabilities (finished services <u>and</u> platform components): <ul style="list-style-type: none"> Integrated customer management (CRM) Integrated business productivity - Collaboration, enterprise search, presence, unified communications, data visualization, data connectivity, content management, etc. 	<p>Improved end user productivity via highly-integrated application services and business productivity capabilities as well as standalone client applications.</p> <p>Integrated customer management and business productivity capabilities provide finished software services as well as extend the capabilities of the application platform.</p> <p>Eliminates need to write infrastructure and integration code to develop enterprise solutions. Also enables upgraded functionality from Microsoft over time.</p>

Support for new model of interaction with applications	<p>In-addition to a traditional keyboard and mouse for input; touch, gesture, pen/stylus, and voice have become mainstream input mechanisms and are supported by an extensive set of APIs.</p> <p>Key Microsoft capabilities include:</p> <ul style="list-style-type: none"> • Windows Touch API • Gestures API • Speech Recognition API • Windows Presentation Foundation • Kinect API • Tellme 	<p>Prebuilt functionality and APIs for rapid application development of applications with Natural User Interfaces.</p> <p>Build touch-screen Advisory applications for a shared experience customer to provide new level of transparency and trust in banking processes.</p> <p>Pen/stylus support supports signature capture to reduce paper processing.</p>
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Device, Security and Access Management

Employees need to perform their jobs across an expanded range of locations and with an expanded array of devices; both corporate-issued and personal, Microsoft Windows-based and non-Windows. IT organizations in the financial institution need to secure sensitive data and provide low cost operations and management. To address this balance, Microsoft feels the best TCO and highest level of information security can be achieved by standardizing on Windows-based devices, applications, security, and management solutions. Microsoft also recognizes the financial institutions need for multi-platform device and security management of non-Windows based client devices in-addition to Windows devices. Microsoft provides the necessary strategies, capabilities, applications and tools for managing and providing access to corporate resources by Windows-based and non-Windows devices.

Requirement	Microsoft-based Capabilities	Benefit/differentiator
Support multiple device form factors for different use-cases within the financial institution.	<p>Microsoft OEM partners provide an array of Windows-based devices and form factors to fit the range of banking users including; roaming and stationary tellers, mobile and branch-based advisors, analysts, and business leaders.</p> <p>Devices are available in a range of form factors:</p> <ul style="list-style-type: none"> • Desktops, laptops, netbook, slates, terminals, phones and more. 	<p>The benefits of a being able to leverage a common Windows operating environment across such a large range of devices includes consistent compatibility, deployment, management, and especially security which will ultimately lead to lowest overall cost of operations and lower information security risk.</p> 
Manage & secure Windows and non-Windows devices via one toolset and process.	<p>Microsoft provides Windows and non-Windows based device management including Windows Phone 7, iOS and Android.</p> <p>Key Microsoft capabilities include:</p> <ul style="list-style-type: none"> • Exchange ActiveSync policy enforcement • Advanced Windows device management via System Center Configuration Manager • Active Directory for Digital Rights Management. 	<p>Ability to enforce password policies, remote wipe, restore factory image, attachment handling, etc. Varies by manufacturer and device. For more information about mobile management capabilities by vendor, refer to this link. http://blogs.technet.com/b/jribeiro/archive/2010/08/06/comparison-of-exchange-activesync-clients-windows-phone-windows-mobile-android-nokia-apple-palm.aspx</p>

	<ul style="list-style-type: none"> • BitLocker • AppLocker • Active Directory & Group Policy • Windows Identity Foundation 	 <p>Single, end-to-end security and management platform</p>
<p>Provide access to corporate applications and information while protecting sensitive customer and business information</p>	<p>Microsoft infrastructure provides policy-based access to corporate resources depending upon user, level of trust of the device and type of information being accessed.</p> <p>Key Microsoft-based application access capabilities include:</p> <ul style="list-style-type: none"> • Remote Access via VPN or DirectAccess and Forefront Unified Access Gateway • Network Access Protection (NAP) • Remote Desktop Services • Application virtualization • Cloud/web-based applications such as Outlook Web Access and Office 365. 	<p>Leverages management and security capabilities for both Windows and non-Windows based devices to enable different methods of accessing corporate applications and information depending upon the capabilities and security of the device as well as the sensitivity of information being accessed.</p> <p>For example, an unmanaged device may only be allowed access via a remote desktop connection to a corporate device or given access to a web based application while, domain-joined devices can access corporate resources via these methods and additionally allowed remote access via VPN and/or DirectAccess with Network Access Protection policies via Forefront's Threat Management Gateway.</p>
	<div data-bbox="411 1099 1209 1574"> <h3>Access control based on the level of trust</h3>  <p>The diagram illustrates access control based on the level of trust. On the left, 'Managed' devices (Windows 7) and 'Unmanaged' devices (Windows 7, Windows Vista, Windows XP, etc., and Non-Windows devices like slates, tablets, and smartphones) are shown. Managed devices connect via 'DirectAccess' to the 'Forefront Unified Access Gateway'. Unmanaged devices connect via 'TS Web Access' and 'Remote Desktop' to the same gateway. The gateway then routes traffic to different levels of business impact: 'Low' (Email, Presence & IM, Voice/communications), 'Medium' (CRM, Central documents), and 'High' (Business intelligence, LOB applications). The 'Level of Business Impact' is indicated by a color-coded bar on the right.</p> </div> <div data-bbox="411 1608 1209 1982">  <p>This diagram shows the level of business impact (means of access) for managed and unmanaged devices. Managed devices connect to 'LOW (Web)', 'MEDIUM (VDI/Citrix)', and 'HIGH (Direct Access, Enterprise VPN)'. Unmanaged devices connect to 'LOW (Web)' and 'MEDIUM (VDI/Citrix)'. The 'Level of business impact (means of access)' is indicated by a color-coded bar at the bottom.</p> </div>	

Deliver well-performing applications and services amongst varying network conditions and costs.	<p>Microsoft Windows is based on SMB 2.1 - an evolution of Server Message Block. SMB 2.1 provides caching and compression services for the network to reduce network impact and increase application performance.</p> <p>Key Microsoft capabilities include:</p> <ul style="list-style-type: none">• BranchCache• Offline File Caching• File copy restart• Remote Differential (Network) Compression• Distributed File Services (advanced replication)• Background Intelligent Transfer Service	<p>Reduce impact on WAN links between Branch offices and Datacenters.</p> <p>Improve application performance across WAN links; improve task efficiency by reducing wait time for file copy operations.</p>
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Appendix C – Detailed Capability View

Figure 31: Microsoft Products mapped to Logical Technology Architecture

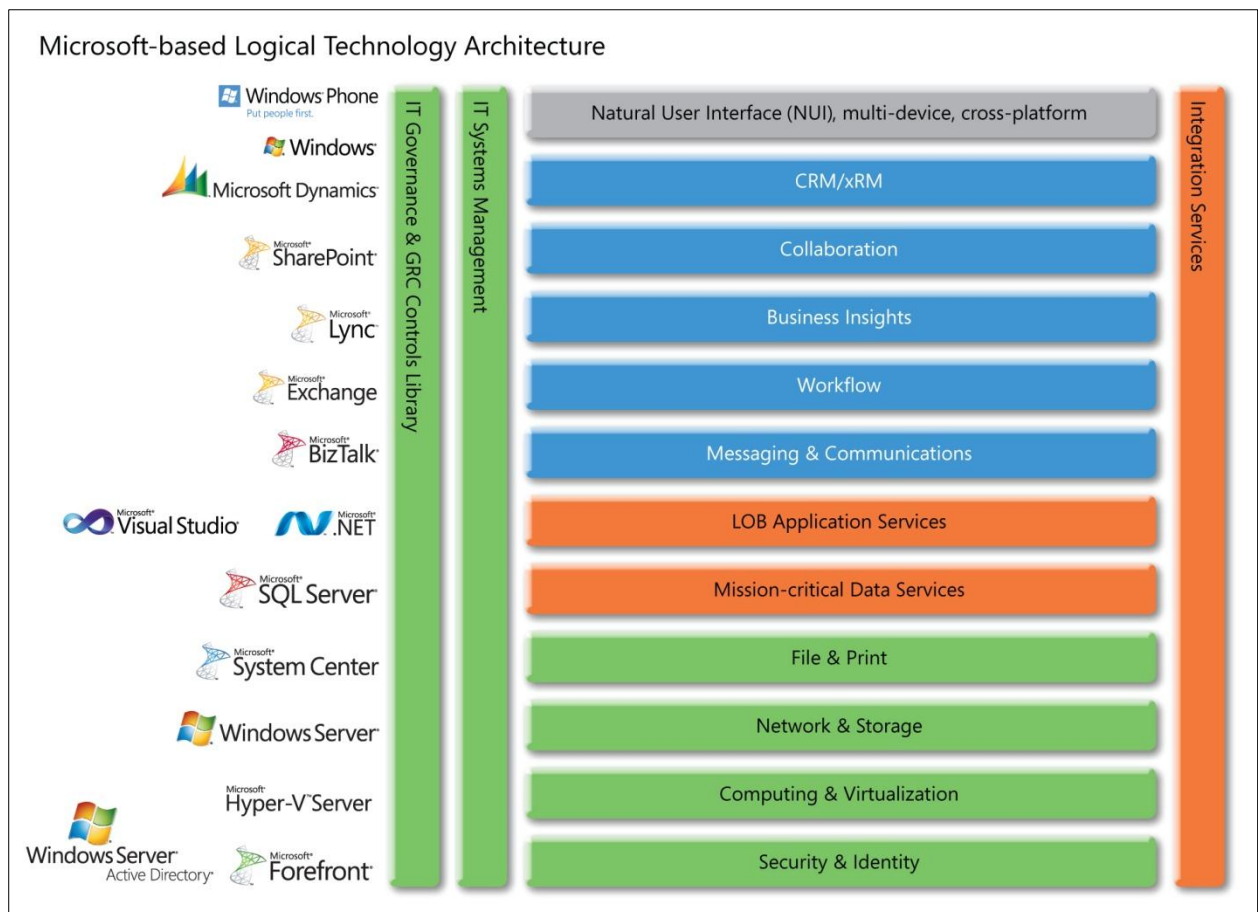


Figure 32: Detailed Capabilities View

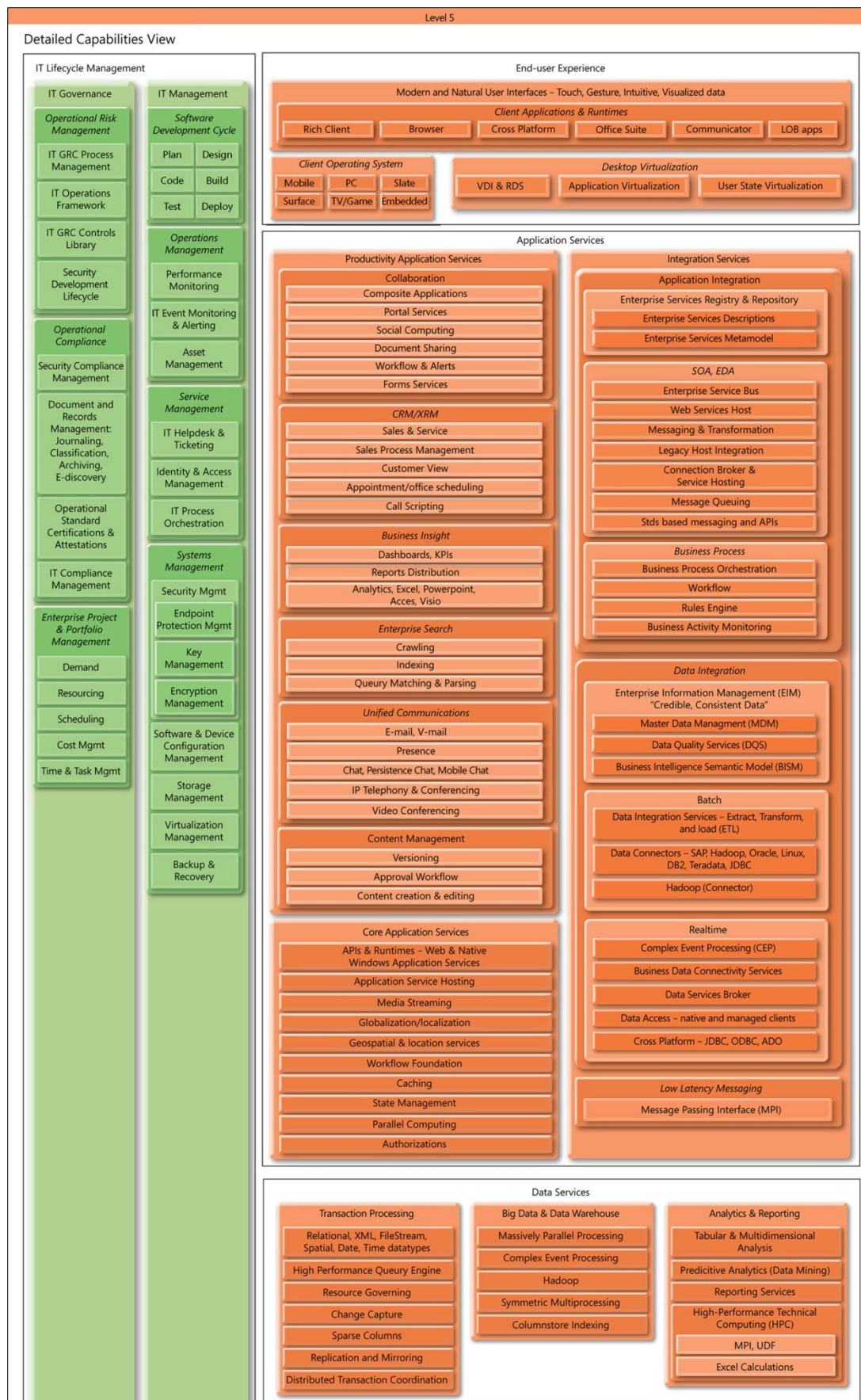
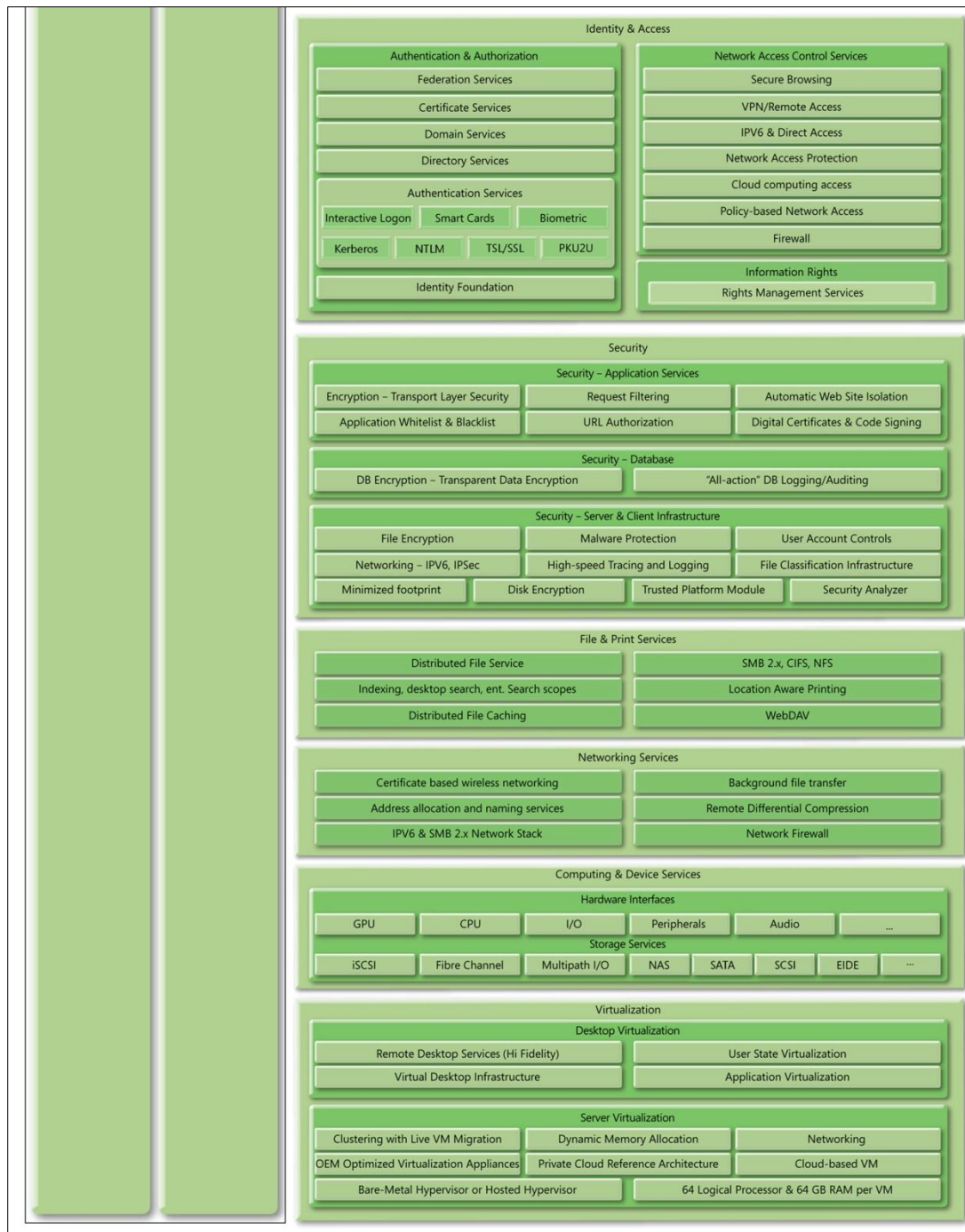


Figure 32: Detailed Capabilities View (cont...)



NOTE: The Service Categories in this document are *derived* from Microsoft's Infrastructure Optimization (IO) assessment models. The models were developed in-partnership between Microsoft and the Massachusetts Institute of Technology (MIT), a private research university located in Cambridge, Massachusetts. For applicability to this architecture document, the models have been revised.

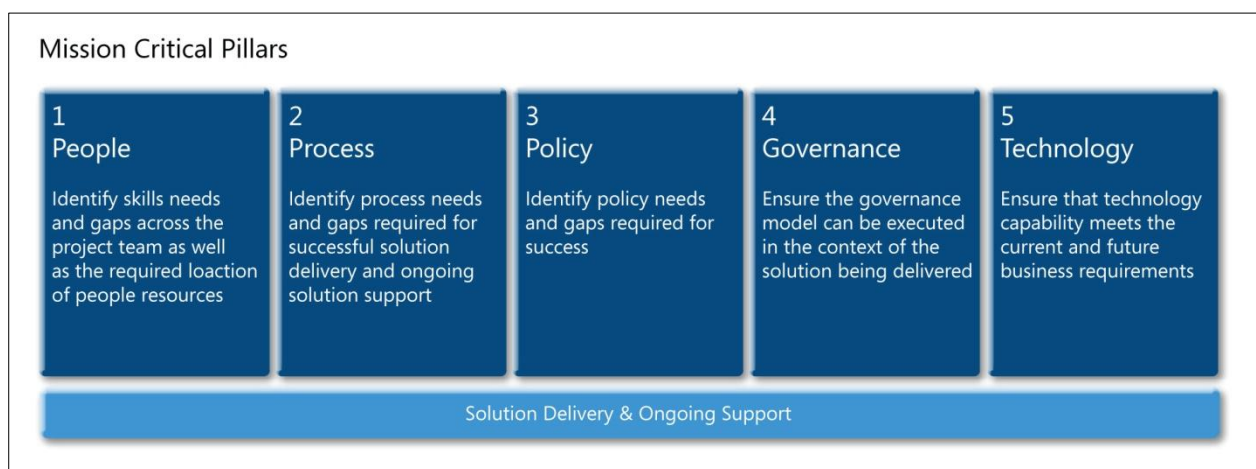
The optimization models assess IT capabilities for existence in the enterprise as well as the maturity-level of the IT capability.

Appendix D – Approach to Mission Critical Architectures

One of the key value points of industry reference architecture is that it provides a financial institution with increased predictability and reliability when deploying IT solutions that solve for critical business needs. However, technology capability as it relates to banking architecture is just one of the success factors required for the implementation of highly available mission-critical solutions.

Microsoft believes that there are 5 pillars that require thought, planning, and resourcing in order to achieve the expected results from the implementation of industry reference architectures, as represented in the diagram below.

Figure 33: Mission Critical Approach



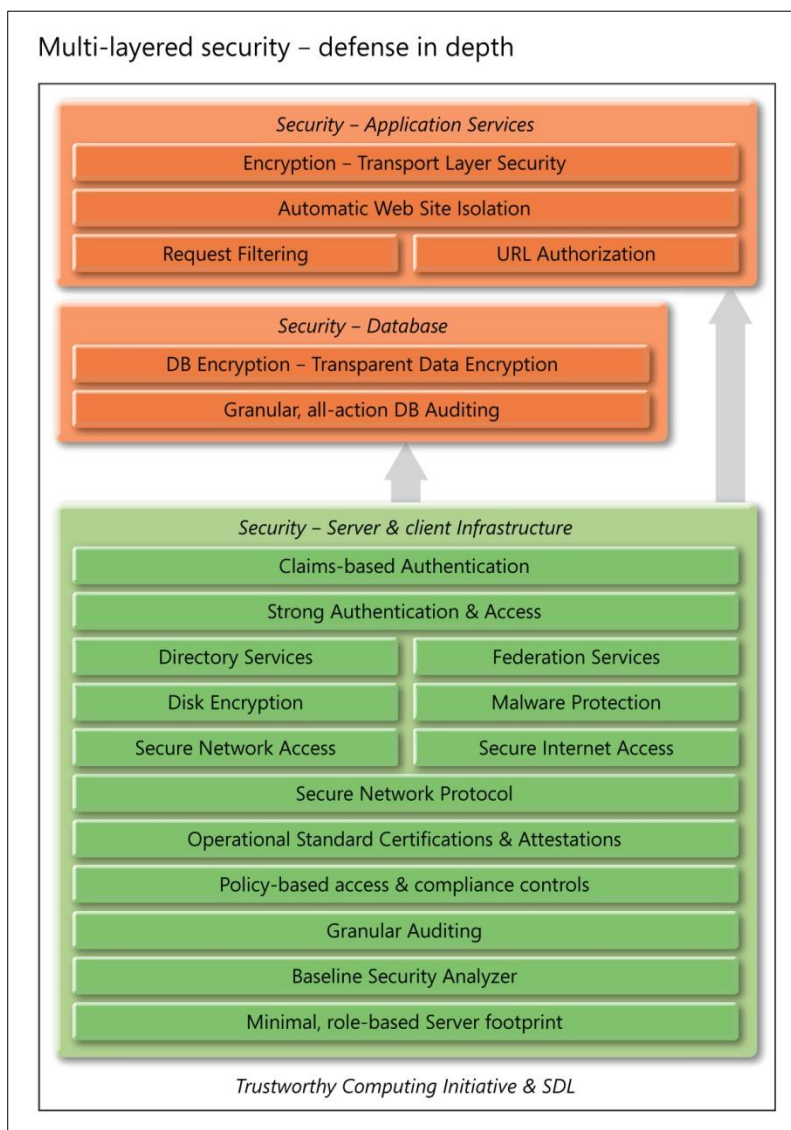
Implementation of a reference architecture model requires more than a commitment to technology investment. There must also be buy-in and commitment to change from business groups to whom solutions are delivered. In fact, failure in any one pillar can jeopardize the ability to successfully transform to an agile banking architecture.

Appendix E – Integrated Security Services

Security is always a critical concern for banks and their customers. Criminals, both external and internal are constantly trying to exploit security vulnerabilities to steal money and valuable information. Security challenges today are exacerbated by the increasing volumes of data, personal devices finding their way into the enterprise, and sources of security information including botnets, phishing sites, social networks, portable and internet based storage.

Microsoft believes that there is no single solution for security and that protection is needed at multiple layers of the technology stack and throughout the entire IT lifecycle. The multilayered defense in depth is reflected in the suite of products that work in an integrated fashion to provide and manage security and identity services for the enterprise. As shown in figure 32, Microsoft's platform provides integrated security, information protection, digital rights management, as well as Identity lifecycle management services throughout Microsoft's infrastructure, application, database, and end users both on-premises and in the public cloud.

Figure 34: Multi-layered Security – Defense in Depth



At the foundation to Microsoft's security approach, processes, and philosophy is the Trustworthy Computing Initiative (TWC). This is a process guidance and governance model for software security to implement multi-layered 'defense in depth' security program spanning from a Secure Development Lifecycle (SDL), through all operations, all the way through to decommissioning. The TWC initiative is a full lifecycle security process that governs all Microsoft products that are delivered to the marketplace. Additionally the guidance is shared with the public so similar processes and best practices can be implemented for banking enterprise operations.

Results from the National Vulnerability Database (NVD) which is maintained by the National Institute of Standards and Technology (NIST) exemplify the returns of the TWC initiative in Microsoft for the enterprise: SQL Server 2008 R2 had zero (0) critical vulnerabilities identified in the year 2010. As TWC marks its tenth year and continues into the future, focus will be placed on the new world of device, data, and cloud services proliferation and everyone has a role to play. For more information about Trustworthy Computing Initiative 'v-next', Secure Development Lifecycle and Defense-in-depth, visit www.microsoft.com/twc.

Appendix F – Rapid Provisioning with Cloud Computing

Financial Services is a highly commoditized industry with rapidly changing regulation making “time to market” a very clear benefit whether it is to capture a quickly emerging market opportunity or to comply with changing regulations within the industry. As banks focus on strategic priorities, an architecture that enables cloud-based business and technology services will facilitate the strategic sourcing of business functions and enable faster delivery of business capabilities.

Microsoft cloud computing platform, both public and private, can help address these challenges in ways that have outgrown traditional datacenter operations. By providing automated, self service provisioning and elastic scaling capabilities; cloud computing capabilities can be a key asset to help address time to market for financial institutions. The traditional process of sizing hardware requirements, software and hardware procurement, setup and tuning, and then ongoing operations seems to be the Achilles heel of “speedy delivery” for any technology-dependent business initiative. Delivering business results can be a lengthy, costly, and hard to expand when needed. Systems for projects are provisioned (often purchased) in-advance to handle redundancy and the highest bursts of activity that can be expected. Next is the struggle for development systems, lab and datacenter space, heating/cooling, etc. as well as ongoing maintenance. Before delivering any business capabilities, significant time and cost is expended in this procurement and provisioning process. Microsoft’s cloud capabilities on the other hand, whether public, private, or hybrid provides a distinct value by enabling the *automatic* provisioning of computing services in minutes instead of days, weeks, or even months can cut significant time to market for the solutions.

Costs are also clearly a factor in initiating new innovation and another clear benefit with cloud computing. With Microsoft-based private cloud in your datacenter and public cloud configurations in Azure, the underlying computing power is designed to be scaled-out as demand requires and this can help limit upfront investments and time to provision. In addition to upfront costs, the ongoing cost of operations for cloud infrastructures is hard to match with typical datacenter operations due to the high-degree of automation and the large set of computing resources which are pooled. Microsoft provides massive, public cloud computing at-scale via the [Windows Azure platform](#) and provides private cloud computing via Windows and Hyper-v Server with automation and management tools that span public cloud, private cloud, and traditional datacenter operations. Microsoft also works with Original Equipment Manufacturers (OEMs) to provide pre-tuned and pre-configured virtualization ‘appliances’ as part of the [Microsoft Private Cloud Fast Track](#) program which is optimized for price and performance.

Appendix G – BIAN Service Landscape



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