INTRODUCTION

Disruptive changes occurring in the financial services industry are largely the result of digital technologies that have been developed and refined over the past decade. Usually characterized as conservative and resistant to change, the financial services industry has been challenged by financial technology (fintech) companies that compete by combining digital technology, social media, and big data analytics to replace traditional models with financial products and services enabled by new technology. Burdened by obsolete, proprietary systems, many financial services companies have been slow to adapt to the market changes led by fintechs. Additionally, regulatory changes enacted after the global financial crisis in 2007-2008 require greater transparency and protections for individuals and the investment community.

To meet these new demands and stay competitive, the financial services industry and its CIOs are increasingly turning to digital transformation to improve their IT infrastructures. As a result of the inherent problems of legacy systems—including high investment and maintenance costs, isolated datastores, lack of visibility across systems, outdated applications that restrict innovation, and limited interoperability—industry decision makers are exploring open source technologies, hybrid cloud computing, and standardized IT infrastructures as ways to respond more effectively and efficiently to customer demands, security concerns, and regulatory mandates. In addition, financial services companies are learning from fintechs and implementing new business models to address dynamic market changes and reduce costs.

Intel and Red Hat have collaborated to develop hardware and software solutions that have been adopted by many major financial institutions to support digital transformation. The financial sector is Red Hat’s largest vertical market. More than 50% of the world’s financial trades are processed on Red Hat® Enterprise Linux®, and 100% of commercial banks in the Fortune 500 use Red Hat solutions.¹

Intel provides not only a hardware foundation for modern IT infrastructures, but also solutions that help companies enhance their customer experience. Intel components can be found in point of sale tablets, ATMs, and intelligent kiosks. Intel®-powered compute devices—including laptops, desktop machines, and mobile devices—keep financial services professionals informed and in close communication with customers, partners, and colleagues.

With digital transformation, financial services firms can take advantage of disruptive change in the industry to modernize and stay competitive.

¹ Red Hat client data and Fortune 500 list, 2014.
THE CHALLENGES OF I.T. MODERNIZATION

Financial services companies face many challenges in implementing effective end-to-end IT infrastructure. Regulatory mandates and industry standards must be met, including security protections that must be integrated at every level of infrastructure. Organizations must balance development of new applications on modern platforms with integrating essential traditional systems. Operations must be streamlined to increase revenue growth. Visibility must be gained into compute and network resources, with automated controls instituted to adapt to dynamic industry changes and data traffic.

In addition, the financial services industry is steadily shifting to a real-time economy that performs transactions automatically and instantly. For example, financial institutions involved in investments and trading require extremely fast IT environments with minimal latency. Virtualized networks that use software-defined networking (SDN) and network functions virtualization (NFV) provide the speed and flexibility to meet these requirements.

While retail banking has satisfied demand for lower-value, point of sale digital payments, enterprise-scale institutions are still searching for effective solutions for real-time transactions and transfers. These larger companies must overcome long-standing dependency on traditional systems, as well as complex clearing and settlement infrastructure that creates bottlenecks.

Technology investments can help financial services institutions enhance existing IT infrastructures to better respond to strict industry regulations, growing cybersecurity risks, and evolving consumer expectations.

Intel and Red Hat share a long history of co-engineering and deploying secure, open IT infrastructures that meet the core requirements of financial service institutions, from retail banks to trading firms to investment banks. Both companies are leaders in the development of virtualized IT infrastructures that can help financial institutions solve agility, scalability, visibility, and interoperability challenges.

THE POWER OF OPEN SOURCE

Intel and Red Hat are strong advocates of open source technology and major contributors to open source communities. The open source development model enlists contributions from hundreds of thousands of developers around the world to directly address vital IT needs. This vibrant community offers more responsive maintenance of the security, reliability, and interoperability of application code and operating systems. By using open source technology, financial institutions gain access to the latest patches, updates, and security protections—often within days of discovering an issue, rather than weeks or months.

Red Hat is extensively involved in Linux communities, including Fedora and CentOS, as well as the JBoss® Developer community that focuses on application server and middleware development projects. Community-developed code is the foundation of many of Red Hat’s commercial, enterprise-ready solutions (Figure 1).

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Similarly, Intel maintains and contributes to the development of a wide range of open source projects. The Intel® Open Source Technology Center is committed to open source projects that include the Linux kernel, OpenStack®, Apache, Intel Graphics for Linux, Assistive Context Aware Toolkit (ACAT), and many more.

Co-engineering work in projects by Intel and Red Hat has been instrumental to optimizing and increasing the interoperability of hardware and software components in standardized operating environments (SOEs). This collaborative work has led to the creation of special-purpose reference architectures that can help financial institutions take advantage of the latest advances in hardware and software architectures. In addition, this collaboration has produced solutions that enhance cloud-based software environments, network management applications, and virtualization components. At the foundation of a modernized IT infrastructure, Intel® architecture hardware provides a reliable framework of compute, networking, storage, and security components for running Red Hat Enterprise Linux.

As the financial services industry works toward achieving real-time payments and enhanced customer experiences, Intel and Red Hat complement this effort with interoperable, open source IT components to help financial organizations meet these goals.
DIGITAL TECHNOLOGIES FOR BETTER CUSTOMER RELATIONSHIPS

Digital technologies—such as wearable devices, smartphones, social media, and tablets—offer an effective way for financial institutions to strengthen their relationships with customers.

Customers now expect services to be available 24/7 rather than just during traditional business hours. In addition, customer interfaces on any device must be easy to navigate and understand, as well as visually compelling. However, to meet these changing expectations, financial institutions must maintain back-end databases and analytics engines to deliver accurate, responsive intelligence on customer needs and preferences.

Harnessing big data is the key to resolving many of these industry challenges. Financial institutions must deploy solutions that help them analyze and take advantage of available data assets, deriving intelligence to become more competitive.

MOBILE APPLICATIONS

Banking customers are increasingly foregoing trips to branches in favor of using mobile applications to conduct transactions. The British Bankers’ Association (BBA) projects that by 2020, customers will use their mobile devices to manage their accounts 2.3 billion times a year—more than internet, branch, and telephone banking combined. Data from CACI shows that average visits to a branch per customer per year have declined from 13.7 in 2011 to 8.1 in 2016, and this number is forecasted to drop to 5.3 in 2021.4

Developing and establishing an effective mobile strategy to support financial institution operations can be a long and complex process. However, proven enterprise solutions can serve as an effective foundation to help financial institutions communicate more personally and directly with customers.

Red Hat Mobile Application Platform includes key components for integrating and sustaining mobility practices, including support for developing and integrating back-end services and data sources through Mobile Backend-as-a-Service (MBaaS).

Intel offers mobile tools and technologies that can extend services and support the creation of innovative applications. Intel® XDK is ideally equipped for developing Internet of Things (IoT) applications and mobile apps. Its software development capabilities include a quick path to build and deliver HTML-based apps, as well as additional tools for creating Node.js-based IoT apps for embedded systems.

Intel is also heavily invested in 5G mobile services, considering this technology as essential to the future of IoT. Intel’s 5G Mobile Trial Platform is powered by the Intel® Core™ i7 processor, a radio frequency unit, and baseband processor. This solution can be configured for use in infrastructure wireless access points (WAPs), as well as mobile devices. Intel’s collaborative work with industry partners promises to advance the development of comprehensive IoT solutions. For more information, visit http://blogs.intel.com/technology/2016/02/paving-the-road-to-5g-mobile-services/.

BACK-END SYSTEM CAPABILITIES

No matter how appealing an application's user-facing display may be, back-end operations—including storage, database transactions, analytics, and others—ultimately determine the value of a financial services application. The most demanding compute transactions take place in back-end systems—whether trading stocks, bonds, currencies, or derivatives, or allowing retail customers to make purchases using a smartphone app.

Middleware offers an intermediary solution to link back-end systems with each other and user interfaces. Red Hat JBoss Data Virtualization integrates structured, semistructured, and unstructured data from multiple sources in near real time, whether data resides on-premise or in the cloud. Red Hat JBoss BRMS is a business rules management system that can streamline and automate business operations. It provides visibility into business application rules along with powerful tools for updating and managing business policies. To complement these capabilities, Red Hat JBoss BPM Suite provides a platform for designing, developing, and deploying process-led applications. With these Red Hat software solutions, financial institutions can gain improved visibility across IT infrastructure to better evaluate and manage operational processes.

REGULATORY COMPLIANCE AND REPORTING

Creating innovative services that meet regulatory compliance is a key challenge for traditional banks—and even more difficult for smaller fintech startups that lack experience with regulatory issues. However, agile fintech firms tend to have cloud-based infrastructures that can easily adapt and support new services that are innovative yet compliant, such as peer-to-peer credit or robo-advisors. As a result, fintech companies are moving into established markets and cutting into the market shares of traditional banks.

The Second Directive on Payments Services (PSD2) will affect every major bank operating in the European Union by 2018. This directive covers security, protection of financial data, access to account information, and electronic payment processing. It also requires the creation of an application programming interface (API) to connect merchants and banks through a central portal. To comply with the directive, many banks will need to modernize existing IT infrastructures and older payment systems.

Other jurisdictions in the United States and around the world are planning or implementing similar mandates. Financial institutions that proactively develop and deploy modern IT infrastructures will have a clear competitive advantage over organizations that fail to adapt quickly.

INNOVATION IN FINANCIAL SERVICES

The following examples highlight some of the ways that Red Hat and Intel have engaged with financial institutions to modernize their IT infrastructures, improve their efficiency, and optimize their business practices.

FICO DEVELOPS CLOUD-BASED ANALYTICS WITH RED HAT OPENSOURCES CONTAINER PLATFORM

Analytics are an increasingly important part of decision making for financial institutions. To increase its market reach to major corporations, FICO developed the FICO Analytic Cloud using Red Hat OpenShift Container Platform. This solution offers a comprehensive set of tools for developers, partners, and customers to design and implement analytics services. Clients use these tools to produce solutions that include built-in security and certification, a crucial requirement for the financial services sector.
Compared to on-premise applications, the solution reduced development time for analytic solutions by as much as 70%. In addition, the Platform-as-a-Service (PaaS) tools available in Red Hat OpenShift Container Platform automate application provisioning and system management, freeing FICO's IT staff to more rapidly develop and launch services that support business operations.

**MUFG UNION BANK SERVES CUSTOMERS FASTER WITH PRIVATE CLOUD**

MUFG Union Bank N.A. sought to deliver applications faster to customers and partners. With over 422 retail branches, the bank needed an infrastructure solution that could take advantage of the latest technology to increase its competitive edge in the industry and better meet customer expectations. With a 45-day deadline for the project, easy integration and automated operations were vital.

The bank turned to Red Hat to quickly develop and deploy a private cloud solution with support for Infrastructure-as-a-Service (IaaS) and PaaS using Red Hat CloudForms. From a centralized portal, the development team built and provisioned 700 virtual machines (VMs) and numerous hypervisors in under two months, then migrated the existing e-commerce infrastructure into the new cloud environment.

As a result, the bank's application development has been streamlined significantly. Deploying applications on the previous infrastructure required from 8 to 12 months, but developers can now design and deploy new applications in just a few hours. After its initial success migrating its e-commerce unit, MUFG Union Bank has begun using the orchestration and configuration capabilities in other business units and plans to move to a full PaaS environment.

For more details, read the full case study at redhat.com/en/resources/mufg-union-bank-serves-customers-faster-private-cloud-red-hat.

**INTEL PARTNERS WITH LUCERA AND PERSEUS ON SDN/NFV ARCHITECTURE MODEL**

Legacy enterprise financial systems are poorly equipped to meet modern trading requirements. Fast-moving markets typically require rapid product launches, scaling, or retirement as needed to ensure profitability. Traditional design architectures rely on physical servers, routers, switches, appliances, cabling, and patch cords—all of which must be manually provisioned and maintained.

In comparison, software-defined networking (SDN) and network functions virtualization (NFV) provide a layer of abstraction across a virtualized set of network nodes. All infrastructure resources can be viewed, configured, provisioned, and redefined from a central control point. Network services and resources can be automatically and dynamically scaled as needed. As a result, financial services companies can reduce the cost of operations, reach new markets rapidly, and take advantage of standard high-volume servers, virtualized network components, and centralized management tools.

Used with Intel architecture-based hardware, SDN/NFV architectures provide a powerful, agile foundation for financial services IT infrastructure. To support this model, Lucera and Perseus partnered to create a virtualized SDN/NFV environment using Lucera's IaaS technologies and software-defined wide-area network (SD-WAN) capabilities combined with worldwide managed services and high-speed connectivity to major liquidity centers globally from Perseus.

For more information, visit https://networkbuilders.intel.com/blog/creating-a-global-sd-wan-for-financial-services.
INTEL SUPPORTS INNOVATIVE FINTECH PROJECTS

In response to the fast-growing fintech market segment, Intel has partnered with The Floor, a hub of innovation at the Tel Aviv Stock Exchange, to support its innovative projects. Current projects include developing mechanisms for using bitcoin currency, blockchain databases, biometrics, and IoT applications in banking and finance. Local fintech entrepreneurs plan to use The Floor as an incubator for collaboration and provide access channels for international companies to work with Israeli fintech companies.

In addition, Intel has expanded its involvement with distributed ledger technologies and recently became a member of Hyperledger, a project established by the Linux Foundation to create an open ledger platform to meet the needs of several industries.

INTEL HELPS CAIXABANK TAKE ADVANTAGE OF BIG DATA INSIGHTS

CaixaBank, a Spanish financial group with insurance and retail banking divisions, is seeing a large shift in customer behavior and predicts that much of its customer base will soon use only mobile devices to gain information and perform transactions. To gain real-time responsiveness, collect large volumes of data in parallel processes, and improve risk management with predictive analytics, the firm migrated its analytics applications to a high-performance platform, supported by servers powered by Intel® Xeon® processors.

"Big data is here to stay; it is not a departmental solution," said Luis Esteban Grifoll, chief data officer at CaixaBank. "Big data is our new mainframe at Caixa Bank, and we have to change the culture so that people transition from the transactional world to the informational world."5

THE FUTURE OF BANKING

The transformations that are reshaping the financial services industry offer banks and other financial institutions opportunities to adopt technology that can increase their competitiveness and agility. By applying this technology intelligently, financial institutions can dramatically improve customer experiences and build responsive, effective data management platforms.

While technology alone cannot solve the challenges of modern financial markets, it can help organizations improve services, personalize customer interactions, and develop innovative products and solutions. Intel and Red Hat are committed to working together to continue to develop IT infrastructure technology that supports the banking industry.

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ABOUT INTEL

Intel Makes Possible the Most Amazing Experiences of the Future

You may know us for our processors. But we do so much more. Intel invents at the boundaries of technology to make amazing experiences possible for business and society, and for every person on Earth.

Harnessing the capability of the cloud, the ubiquity of the Internet of Things, the latest advances in memory and programmable solutions, and the promise of always-on 5G connectivity, Intel is disrupting industries and solving global challenges. Leading on policy, diversity, inclusion, education, and sustainability, we create value for our stockholders, customers, and society.

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ABOUT RED HAT

Red Hat is the world’s leading provider of open source software solutions, using a community-powered approach to provide reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.

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