IBM i

An executive guide to IBM's strategy and roadmap for its integrated operating environment for Power Systems

An IBM® White Paper

April 2016

As the integrated operating environment for IBM Power Systems™ servers, IBM i is used by all sizes of companies in all regions of the world. With its integrated DB2® database architecture, IBM i is known for providing a cost-efficient, highly resilient and secure foundation for running a wide variety of popular industry applications.

Doug Balog
General Manager
IBM Power Systems

This white paper is designed to help IT executives understand IBM's strategy and roadmap for the IBM i operating environment. But first, whether you are a long-time user of IBM i or if you are deploying our systems for the first time, let me thank you very much for the trust that you have placed in IBM and our IBM Business Partners.

IBM is a leading innovator in server solutions, with best-in-class service and support and a significant presence in both major and growth markets. The IBM i operating environment runs on the IBM Power Systems server platform. These servers, based on industry-leading POWER® processor-based technology, also feature applications running on Linux® and AIX®. IBM i also exploits IBM Power Systems software technologies, including PowerVM® for virtualization, PowerVC for cloud management and PowerHA® for system resiliency.

IBM i plays a critical role in our Power Systems software portfolio. We continuously provide new solutions and are actively engaged in expanding into new technology areas to support the new business requirements of our clients. This year, 2016, we have delivered IBM i 7.3, our latest new release. In addition, our ongoing commitment to IBM i is reflected by our regular semi-annual delivery of easy-to-deploy IBM i Technology Refreshes. And, right now, our IBM Rochester and Beijing IBM i development teams are hard at work on the next release.

Of course, IBM i is best known for being a cost-efficient platform for critical applications and data that are the Systems of Record at the heart of many businesses. Businesses running IBM i today are also using many new solutions including cloud-based services, mobile applications and business analytics. Let me encourage you to consider those new solutions and also to leverage new open industry technologies like PHP and Linux, which can offer exceptional value when integrated with your IBM i business solutions.

Thank you again for your business.

Doug Balog
General Manager, IBM Power Systems

Today's IT Environment and IBM i

Businesses today are undertaking digital transformations: rethinking what customers value most and creating operating models that take advantage of what's newly possible for competitive differentiation. The challenge for business is how fast and how far to go.

Business leaders have long used information technology to improve productivity and efficiency, reach new markets and optimize supply chains. What's new is that customer expectations have also changed. People everywhere are using social networks to find jobs and restaurants, and connect with lost friends and new partners. They are using the Internet for entertainment, shopping, socializing and household management. Work-life integration is no longer an ideal for the future, but it is the way of business today.

How can businesses best respond to this shift? How can they take advantage of the opportunity to innovate, differentiate and grow? And how can they do all this cost-efficiently, leveraging and optimizing the newest information technologies as part of their overall physical operations? IBM's analysis of leading companies has found that companies with a cohesive strategy for integrating digital and physical elements can successfully transform business models, setting new directions for entire industries. [1]

These leading companies focus on two complementary activities: reshaping customer value propositions and reconfiguring operating models using digital technologies for greater customer and partner interaction and collaboration. To do so, they are building a new set of capabilities that allows them to progress along both dimensions.

IBM i has typically been used to run Systems of Record, which for years has been used by successful businesses for their most critical business applications and secure data. But Systems of Record are transforming and evolving to include new capabilities, new insights and new interfaces. Systems of Engagement—enabling mobile applications and social interactions—are exploding in use and driving many new demands into the core Systems of Record. These new customer and employee engagement systems must deliver game-changing cloud, analytics, and mobile and social capabilities. Systems of Insight using the critical business data accumulated by Systems of Record are required to facilitate smarter, more agile business decisions. And in today's world, with the speed of this transformation accelerating, IT departments are expected to drive innovation and growth, and do so with declining IT budgets. As a result, more than ever, IT choices matter and IT infrastructure matters.

That's why governments, industry leaders, managed service providers (MSPs) and thousands of businesses around the world are transforming their organizations by infusing intelligence into systems and processes. They are building private and hybrid clouds to optimize the new workloads. They are extending their reach to clients and employees through mobile computing. They are implementing and securing their critical business data to protect their businesses from competitors and would-be data predators. They are expanding the business value of their infrastructure choices to include the technologies of transformation—mobile, cloud and analytics.

[1] IBM Institute for Business Value, Digital Transformation, http://www-935.ibm.com/services/us/gbs/thoughtleadership/ibv-digital-transformation.html

Implementing business applications using the IBM i operating system on IBM Power Systems servers can help companies outpace their competitors, differentiate their offerings from the competition and turn operational cost into investment opportunity.

Today's most agile companies are not limited by the business applications of the past. They are building applications that are a blend of technologies from traditional business solutions integrating with open-source solutions, either running on IBM i itself or deployed on Linux on Power. IBM i clients have a clear advantage in their ability to extend business solution choices in any of these modes. It's all about providing technical flexibility to help clients solve business problems and extend value. Since Linux runs together on the same virtualized Power Servers as IBM i, you can protect current investments while leveraging community innovation.

Power Systems

IBM Power Systems servers are the hardware platform for IBM i and feature the latest POWER8® processor technology. With the integrated set of resources that are always available and comprehensive data management capabilities, POWER8 servers can align technology with business demands, uncover new value in data to drive innovation, while securely and efficiently delivering business services to help reduce costs.

POWER processor technology is the foundation of the Power Systems server design that is optimized for both traditional transaction processing like financial and ERP applications as well as compute and data-intensive workloads like Web, analytics, mobile and social applications. To achieve maximum performance, POWER processor-based systems are designed with dynamic performance and virtualization optimization technologies that enable the system to tune automatically to a variety of workloads. The current POWER8 processor-based systems support three different operating systems—AIX, IBM i and Linux.

IBM Power Systems servers are optimized for the rigorous demands of enterprise computing, but IBM understands that applications and business processes have differing demands and that one size doesn't fit all. To ensure that technology aligns to business rather than the other way around, IBM offers a full range of Power Systems servers, each of which delivers leadership capabilities for security, performance and scalability in its class. A totally integrated approach to the design, development and testing of every Power server ensures the resiliency required for today's enterprise IT infrastructure. All Power Systems server models include innovative reliability, availability and serviceability features that help avoid unplanned downtime.

IBM Enterprise Power Systems deliver fit-for-purpose technology that optimizes workloads, data and cloud provisioning to support the most critical business requirements, while providing data security, efficient management, high availability and unmatched scalability. Based on an efficient and resilient architecture, the POWER8 servers support multiple workloads and, in the process, transform IT infrastructure options, creating efficiencies and releasing resources - capital and staff - to explore and drive new business value.

IBM Power Systems scale-out servers are affordable, easy-to-deploy and energy efficient. These servers offer an ideal choice for enterprises that need scale-out deployment options for business-

critical and infrastructure applications. They are especially designed for companies looking for a more efficient and lower cost scale-out environment than x86 commodity servers can deliver.

In addition to common hardware technologies such as POWER8 processors, Power Systems offers common software technologies, such as PowerVM for server virtualization, PowerVC for cloud management, PowerHA for high availability, PowerVP for managing and monitoring the performance of virtual workloads and PowerSC™ for security and compliance. Using a common foundation of software technologies with AIX and Linux positions IBM i in the mainstream of IBM's systems software portfolio and brings innovation together from all three environments.

The Power Systems platform offers businesses a highly flexible deployment platform for new applications. With a wide variety of IBM i, AIX and Linux applications to choose from, it is easier than ever before to optimize workloads deployed across multiple operating systems on the Power Systems platform. This increases the ability to solve business problems with the most appropriate business solutions. It's all about providing the flexibility to extend business value.

The Value of IBM i

IBM i running on an IBM Power System server provides a highly scalable and robust architecture with a proven reputation for exceptional business resilience and low operational costs. Running applications based on IBM i has helped companies over many years to focus on innovation and delivering new value to their business, not on managing their data center operations.

IBM i is a fully integrated and optimized combination of relational database, trusted object-based security model, integrated networking and the storage management capabilities required to run business applications. The integrated SQL standards-compliant DB2 for i database includes advanced database management utilities. IBM i also includes additional integrated middleware components such as multiple file systems, LDAP directory, an HTTP Web-server, WebSphere® Application Server and an integrated industry-leading security environment.

IBM's integration, optimization and testing of IBM i is a key factor in helping companies to realize lower operations costs by enabling them to deploy applications faster and maintain them with fewer staff. IBM assumes the responsibility for developing, testing and preloading the core middleware components of IBM i together. On most other computing platforms, the operating system, database and middleware are typically integrated and tested by clients themselves, in their data center. Fixes and enhancements for IBM i are delivered as an integrated set of updates. These are fully tested against all aspects of the operating system prior to distribution to clients. This too, contributes to the lower total cost of ownership (TCO) for which IBM i is renowned.

As most Independent Software Vendors (ISVs) will attest, this broad and highly scalable database and middleware foundation is ideal for efficiently deploying business applications. More than 2,300 registered solutions are available from more than 850 registered ISVs around the world. IBM i solutions are offered through an extensive, highly skilled worldwide network of certified IBM Business Partners, backed by IBM's trusted services and support infrastructure.

IBM i is a leader in the industry with regard to securing critical business data. The object-based architecture allows companies to be sure that viruses masquerading as files cannot be introduced onto the system. Database Row and Column Access Control security makes it simple to secure valuable business information for different groups of users with different business roles and requirements. This is critical as companies extend their mobile user access and have new regulatory requirements for privacy.

Strong virtualization enables businesses with IBM i to consolidate and run multiple applications and components together on the same system, driving up system utilization and delivering a better return on IT investments. Within a single operating system runtime image, IBM i can be virtualized with subsystems. These workload management containers enable secure isolation of workloads and application components, very simply allowing them to be assigned different runtime priorities and resources.

In addition, IBM i can take advantage of scalable and secure PowerVM server virtualization, enabling multiple operating system images to run on a single server in separate virtual machines or logical partitions. PowerVM also features dynamic resource allocation and balancing, extensive virtual I/O capabilities, as well as Live Partition Mobility to move active workloads between servers. PowerVC extends the value of PowerVM virtualization as clients implement hybrid or private cloud solutions, providing more advanced virtualization management and resource allocation, and simpler provisioning.

Virtualization on Power Systems also includes the ability to add AIX or Linux on Power applications to the same server used for IBM i applications. Many clients are choosing to solve business problems by using a combination of applications that may run on IBM i, AIX or Linux on Power. By allowing the focus to be on delivering value to the business, not on technology, companies can merge components, exploiting IBM i or other operating systems as needed. These leading virtualization capabilities make private clouds and software as a service cloud provisioning extremely popular for IBM i solutions.

Use of virtualized storage area networks (SANs) and flash systems with IBM i is also growing compared to the more traditional use of internal storage. Virtualized external storage solutions are often used in conjunction with PowerHA to deliver high availability solutions. PowerHA for IBM i is a disk clustering solution that integrates and leverages IBM Storage devices and management software.

IBM i Marketplace

The IBM Power Systems family offers the latest POWER8 processor-based systems to support small, midsized, and enterprise clients. The range of servers available starts from a four-core POWER8 server and extends to 192 cores and some of the largest and fastest servers in the industry.

IBM i is used by more than 150,000 companies in more than 115 countries around the world to run their business applications. It is used by clients of all sizes—small, medium and large. For more than 25 years, IBM i has been used for transaction processing workloads such as ERP and banking applications that exploit the integrated database and take advantage of the highly

securable environments. It has been designed explicitly for commercial workloads like warehouse management or retail banking, not high performance computing workloads like oil exploration analysis or weather forecasting. Traditionally, IBM i has been used in industries such as wholesale distribution, retail distribution, manufacturing, local government and school administration. Today's digital transformation is taking IBM i usage into many new areas. Industries such as banking and financial services, insurance, healthcare and retail have contributed to tremendous growth of IBM i use.

The IBM i market has a dual nature: an extensive small and midsized client community and a strong but select group of IBM i users in large enterprises. Approximately 70 percent of IBM i users are small and midsized enterprises and 30 percent large enterprises with 1,000+ employees.

IBM i has a strong base of clients in major markets such as North America, Western Europe and Japan, accounting for more than 80 percent of IBM i sales annually. IBM i has strong growth in the emerging markets such as Latin America, Eastern Europe and the ASEAN region, especially in the banking and distribution sectors. While China is a growth market strongly dominated by UNIX, IBM i has a strong presence there in the banking and financial services sectors.

In the last few years, approximately 85 percent of IBM i shipments were on the entry or scale-out Power Systems server models, ideal for midsized companies. In large companies, IBM i generally is run in the data center on highly virtualized, enterprise class Power Systems. Large companies highly value the exceptional system resiliency and capacity on demand features of the high-end Power systems that scale up to 192 cores on the largest POWER8 model.

IBM i has a very strong and passionate community of users, which IBM applauds, strongly encourages and helps promote. IBM i community initiatives and groups include the extensive network of COMMON user groups, many other local user groups, the Large User Group, iSUC Japan, the Power Academic Initiative, and LinkedIn and Facebook communities. The IBM i development team works with all of these groups to gather feedback and requirements for the platform. IBM meets regularly with the COMMON Americas Advisory Council (CAAC) and COMMON Europe Advisory Council (CEAC) to understand and prioritize requirements for future releases of IBM i.

IBM i and Midsized Companies

Many thousands of midsized companies around the world rely on IBM i because they want a more resilient, more secure and more cost-efficient alternative to Windows technology-based servers for their most important business data and applications.

Midsized companies have two key requirements: to maximize their IT investments and to exploit these investments as the company's requirements grow. Unlike Windows technology-based servers, the IBM i operating environment is almost always used to run multiple business applications *and* database securely and efficiently on the *same* server. As a result, clients report that they have fewer servers to manage with IBM i compared to Windows. That helps a company better utilize its IT assets today, while avoiding the costs of deploying and managing a new server every time the business needs to deploy another application. This ease of deployment,

ease of upgrading and ease of management gives IBM i a significant advantage when evaluating the TCO.

This lower TCO has been written in many studies over the years. The most recent study, undertaken in 2015 by Help Systems, cites a full 94 percent of IBM i clients agree that they see a lower cost of ownership when compared with Windows environments.[2] Other industry analysts such as ITG have provided more detailed results showing the components that were studied and analyzed.[3]

The focus of most midsized companies is to grow their business, while increasing customer and employee satisfaction. They need proven solutions and experts who know their industry, both the current state and future directions. The thousands of solutions that run on IBM i are sold through an extensive network of experienced solution providers who have successfully demonstrated the ability to help small and midsized companies solve business issues. Experienced IBM i solution providers deliver business value in understanding industry trends and providing recommendations on implementation and support for modern technologies such as where to use data analytics or how and where to implement mobile support.

Of course, midsized companies are also focused on improving productivity and keeping operating costs low. Deploying IBM i solutions can help businesses improve employee productivity and customer service by securely integrating information from across the company into its built-in DB2 database. Unlike Windows technology-based servers, IBM i has an all-in-one system design that helps integrate the wide range of information and processes that lie behind a successful business. It is this integration, stability and availability that provides midsized clients with the secure base from which to launch mobile interfaces and cloud access.

A top priority for all growing companies is to keep the business up and running. In today's marketplace, this becomes even more important as clients, employees and partners require 24x7 access to information. Companies who deliver information and services to their customers on the Web are even more sensitive to the requirement for available services. Over many years and in many businesses, IBM i has developed a well-earned reputation as the business system that "just keeps running." It helps companies avoid downtime and keeps their business secure.

For companies running Windows technology-based servers, security and virus management are major challenges in terms of time and money. Compare that with the simple-to-deploy security of the IBM i platform. Industry thought leaders often cite IBM i as one of the most securable platforms in the world today. Its virus-resistant design helps companies keep their business more secure, safeguarding data against hackers with built-in intrusion detection. This secure operating environment has been the studied over the years and most recently in the ITG Management Brief: IBM i for Enterprise Businesses: Value of Resilience for Next-generation Analytics, Cloud, Mobile and Social Media - September 2014.[4]

---

[2] IBM i Marketplace Survey, 2015; HelpSystems; http://www.helpsystems.com/ibm-i-marketplace-survey-results

[3] IBM i on Power Systems for Midsize Businesses, Minimizing Costs and Risks for Cloud, Analytics and Mobile Environments, ITG, September 2014

[4] IBM i on Power Systems for Enterprise Businesses; Value of Resilience for Next-generation Analytics, Cloud, Mobile and Social Media, ITG, September 2014

Large Enterprises and IBM i

Patterns of use of IBM i in large enterprises have changed dramatically over the past 15 years. With significant changes in networking costs and dramatic advances in server virtualization technology, large enterprises have taken advantage of significant cost savings by consolidating their distributed servers back into the data center. Now, large enterprises typically run IBM i for high-volume transaction processing on fewer, highly virtualized systems.

The trends for storage architecture and deployment have also changed for large enterprise users of IBM i. Today, the trend is to balance the use of traditional internal storage with a growing use of SANs, such as IBM DS8000® and Storwize® V7000. Flash storage can also be attached directly to IBM i or through a SAN. The trend toward using external storage has enabled IBM i users to leverage mainstream technologies for storage and associated software like IBM PowerHA, FlashCopy, Metro Mirror and Global Mirror.

For companies moving to cloud management, external storage has also enabled the ability to move workloads from system to system using Live Partition Mobility. In addition to PowerHA, this is another critical capability for companies needing to provide 24x7 availability.

The community of large enterprises using IBM i is represented by the aptly named Large User Group (LUG), a client sponsored group of more than 100 major companies that use the IBM i platform. The LUG meets regularly with IBM and provides a forum for IT professionals from large enterprises to exchange information about topics of particular interest and discuss strategy and requirements for the IBM i platform.

Business Partners and ISVs

IBM i is offered through a strong network of local, regional and national IBM Business Partners. Business Partners have played an integral role in the sales, installation and support of IBM i systems and, today, IBM Business Partners are responsible for more than 85 percent of IBM i system sales. Not only are these partners trained and certified on Power Systems servers and IBM i, but they also bring their own specific industry expertise and local marketplace knowledge. Many partners offer a wide range of IT services and consulting ranging from migration assistance to guidance on implementing the latest technologies.

The original AS/400 was launched as an *Application System*, delivering thousands of application solutions to small and midsized business. This solution focus remains strong today, with the majority of IBM i clients running a solution from an Independent Software Vendor (ISV). A wide range of partners offers these solutions from global ISVs such as Infor, SAP and Oracle JD Edwards, as well as key regional solution providers such as Misys, Fiserv and Silver Lake. IBM i has a very strong group of solution providers focused on high availability, security and compliance, application development and modernization, printing solutions, and systems management. Today, more than 2,300 applications from 850+ ISVs are registered in the IBM Global Solutions Directory as supported on IBM i 7.1 and IBM i 7.2. Many unregistered ISV Solutions are also available, typically offered in only one country or regional marketplace.

Some IBM Business Partners have been expanding their business to become IBM i Managed Service Providers (MSP), providing clients an alternative for off-premise cloud management. ISVs also routinely provide their IBM i solutions via a Software-as-a-Service model, allowing clients to run their line-of-business applications hosted on a cloud platform. Many IBM i partners also offer Disaster-Recovery-as-a-Service, providing a resiliency option without requiring clients to manage multiple machines in their own data centers.

POWER Processor Technology

IBM has a consistent track record of delivering on its POWER processor roadmap for IBM i, AIX and Linux operating environments. The current POWER8 processor-based servers offer the fastest processors in the industry. From 4 to 192 core servers, POWER8 processor-based systems offer the performance and scalability to meet the varied requirements of IBM i clients.

The latest POWER8 processor-based family of servers was announced in April 2014, as IBM delivered new scale-out, or entry-level, servers. Based on the POWER8 chip technology, this new family delivers increased power and processing speed for most midsized business clients. The new POWER8 processor, with features designed to process big data, offers clients new ways to incorporate business analytics into their traditional transaction processing environments.

A strong advantage for the Power architecture is its range of scalability. It can be used for midsized companies wanting to run an entry business solution, larger companies deploying ERP and business analytics solutions, and large banks running their core financial services operations.

IBM i 7.1, IBM i 7.2 and IBM i 7.3 run on the POWER8 processor-based servers. With binary compatibility, clients can easily deploy new systems based on the latest processors without changing, recompiling or re-optimizing their applications.

IBM i Software Roadmap

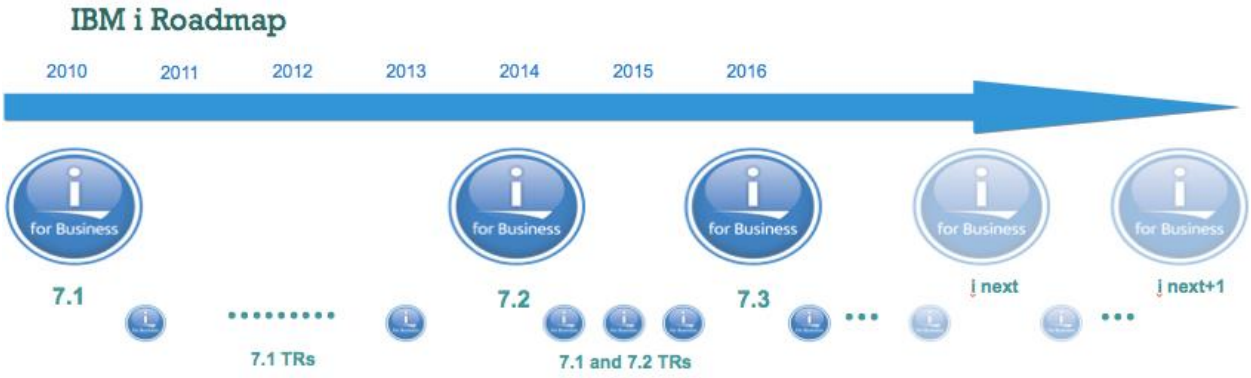
IBM i release cycles are based on a number of factors, including but not limited to the need for a full release in order to implement a new major technology capability. Historically, IBM offered a new IBM i software release approximately every two years. Feedback from IBM i clients, however, was that they wished to get new function faster and not wait for a full release cycle. /Independent Software Vendors (ISVs) wanted IBM to provide an interim way to get new function without having to do the extensive testing required by a full release.

So, with the announcement of IBM i 7.1 in 2010, IBM began a new paradigm of agile development and delivery. New features and functions for IBM i are now delivered through two vehicles—full new operating system releases and smaller and more regular Technology Refreshes (TRs).

Since 2010, IBM has delivered 11 Technology Refreshes for IBM i 7.1 and 4 for IBM i 7.2. Technology Refreshes are specific to a release. Some, but not all, functions delivered in TRs for a current release are made available for earlier IBM i releases.

IBM i Technology Refreshes enable IBM to provide support for new hardware and enhance system software and virtualization capabilities. For example, some of the key enhancements delivered via Technology Refresh are simplifying the installation of new virtual images from stored images on the network (IBM i 7.1 TR1), Live Partition Mobility between servers (IBM i 7.1 TR4), Free Format RPG (IBM i 7.1 TR7) and Node.js Open Source language (IBM i 7.2 TR 1) and Python Open Source language (IBM i 7.2 TR2).

Following the same paradigm of using Technology Refreshes, set in IBM i 7.1 and IBM i 7.2, it is IBM's plan to distribute significant new features and functions for IBM i 7.3 as we move into the future.



IBM i 7.1

Available since 2010, the highlights of the current IBM i 7.1 release included enhancements and extensions to many of the core functions. Native support for XML was included into the integrated DB2 database, enabling easier storage and searching of XML documents and data. DB2 for IBM i was enhanced to provide column level data encryption. PowerHA added support for asynchronous replication, extending the disk clustering-based disaster recovery solution over longer distances. Solid State Disk (SSD) drives can be utilized automatically, with the operating system moving frequently accessed data for optimal application performance. IBM RPG, a common language for transaction processing application development, was enhanced to simplify integration with a broad range of client applications and devices, including Web services, mobile devices and XML.

There have been 11 TRs for IBM i 7.1, delivered twice per year, usually April and October. Added together, the IBM i team has delivered far more than another full release of technology enhancements to 7.1 using the TR process. Being delivered with the TR process, these enhancements have been relatively easy for clients to install and adopt, if they have already installed IBM i 7.1.

IBM i 7.2

Announced on April 28, 2014, IBM i 7.2 has two main themes around which most enhancements were made.

Solutions for Today's IT includes growth areas and modern workloads. This is a focal area as IBM continues to provide the plumbing required to enable mobile and graphical interfaces as well as other growth areas such as cloud, both off premise and in house. This is also the theme for providing support for the latest generation of Power Servers and allows the latest industry-leading middleware to run on IBM i.

Integrating Advanced Technology covers many aspects of the enhancements in IBM i 7.2. Crucial here is the infrastructure required to support clients as they move to future technologies. This is where DB2 advanced security is considered as well as the inclusion of many new open-source languages and services such as Python, node.js and Gnu Compiler Collection.

As always, *Security* is a critical consideration that is kept at the forefront of all development work for IBM i. Now more than ever before, security is an integral part of the development design, review and testing process.

The IBM i 7.2 release offers several highlights from both the base operating system and additional program products. Row and Column Access Control (RCAC) added to the integrated DB2 for i, provides a more consistent interface for locking down critical business data as the world continues to move toward mobile and social applications. System Management is made easier with the new features and functions of IBM Navigator. The Integrated Web Application Server (IAS) previously based on Apache Tomcat, is now built on the same Liberty Profile on which all WebSphere Application Server (WAS) products are written today. This change will provide a near seamless transition as clients move from the lighter weight Web applications to a more robust environment found in the WAS family of products. Many other enhancements were made to security, networking and PTF installation, to name just a few.

Building on the TR process established with IBM i 7.1, new technologies and additional capabilities have been added to IBM i 7.2, through 3 TRs to date. The open-source language Python was added to IBM i 7.2 in April 2015 with TR2. Additionally, node.js, REST based Web Services as well as new functions in the database to support a more consistent method of access from the cloud have all been added.

It is IBM's plan to continue to use TRs to provide enhancements and extensions to IBM i 7.2 and for future releases. TRs are implemented using Program Temporary Fixes (PTFs) that can be applied without requiring downtime. This is a method of delivery that our marketplace—large enterprises and small and midsized companies—is demanding.

IBM i 7.3

In April of 2016, IBM announced IBM i 7.3. As the industry is moving toward the need to understand and access data, the main themes for IBM i 7.3 are in that category as well. It is

critical for IBM i clients to be able to glean critical information about their businesses and to do this with good performance, ease of use and security. These were the main tenants of this release.

Temporal database support allows DB2 for i to contain time-varying data. Conventional databases represent the state of an enterprise at a single moment of time. Investigation and queries happen using a single dimension. In a temporal database, queries over previous states are easy to specify. Also, modifications using information only available in previous versions of the data are easier to find and implement using temporal support, such as correcting errors which can only be detected by comparing live data with data from the past.

IBM i 7.3 also added additional OLAP capabilities to the SQL language on IBM i. OLAP is a database technology that has been optimized for querying and reporting, instead of processing transactions. In addition, adding OLAP into DB2 for i and SQL significantly improves the speed of retrieval when accessing data for analytics types of software.

Security Authority Collection added in IBM i 7.3 is unique in the industry. IBM i clients are opening up their systems to the internet, social activity and mobile devices. Using the information available from Authority Collection, companies can design an intelligent security schema.

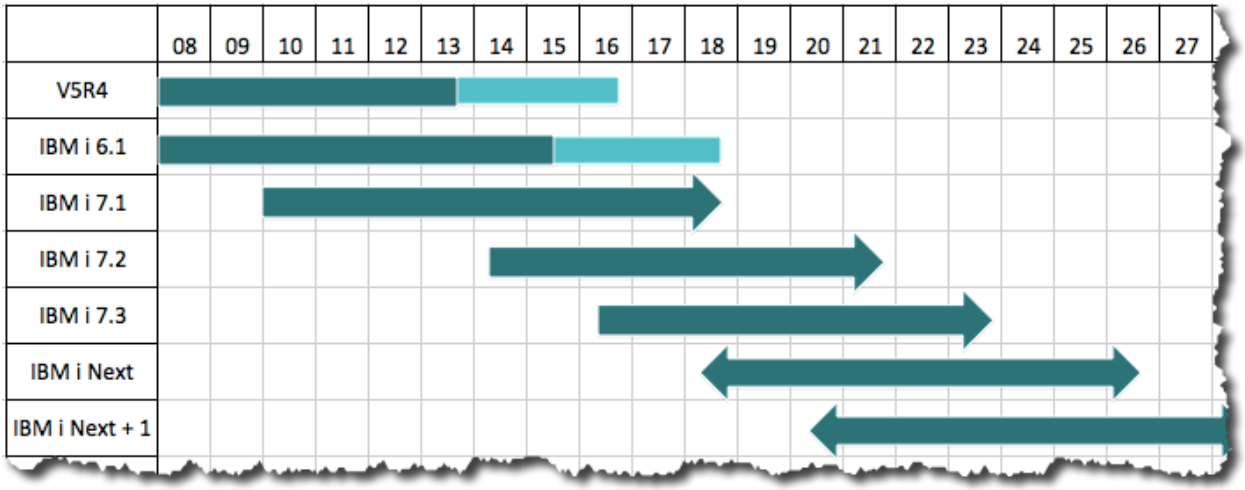
The application development portfolio, used by programmers has been expanded in IBM i 7.3 to include additional enhancements to both RPG and COBOL. In addition, in answer to many requirements from clients and ISVs, IBM has added both Git and Orion to the open source portfolio, currently available for IBM i.

IBM i 7.3 added improved GUI interfaces to system management tools and mobile access to many others. It also saw significant enhancements to almost all other areas of the system – system value enhancements, increased system limits and more.

IBM i Support Life Cycle

Few, if any, other operating systems in today's marketplace have a published support roadmap stretching for 10 years into the future. The current publicly available IBM i support roadmap shows release support for IBM i until 2026. As new releases are announced, the IBM i Support Roadmap will be updated to reflect the associated support dates.

IBM's software support and life cycle strategy reflects the fact that most companies using IBM i run their most critical business applications on the platform. This strategy includes the practice of supporting an IBM i release until the next two releases have been made available, plus at least 24 months—which translates to approximately six years of support. Automated operating system upgrades are available to easily move up to the next two releases providing for an ongoing supported IBM i environment. For example, clients running IBM i 6.1 or 7.1 can easily upgrade to IBM i 7.2.



IBM i Support Roadmap:
Dark green indicates normal SWMA. Light green indicates extended support.

IBM i Strategies

Database

The many capabilities and enhancements provided in DB2 for i have enabled clients to embrace data-centric and analytics technologies. By handing over the responsibility of processing to DB2, clients are able to focus on solving the next wave of business requirements, while still continuing to satisfy their performance and scaling expectations. Whether clients are modernizing from DDS to SQL DDL, renovating their SQL DDL to accommodate very large data, becoming skilled at set-at-a-time SQL query composition, protecting business-critical data with database rules, or revamping what it means to be a Database Engineer, DB2 for i has the right tool for the task.

While “in-memory” database technology seems to be a new concept in the industry, IBM i architecture has had in-memory database since 1988. Single level storage on IBM i means that the system treats memory and disk as one address space, as if it was all memory. With the current releases, the in-memory capabilities on IBM i have taken a leap ahead of other implementations by allowing clients to pick and choose not only the tables and indexes to place in memory, but also which subsets of tables and indexes. Through the use of media and memory preferences, an IBM i client has granular control of which data is positioned the closest to their Power processors.

Business Analytics and Optimization

Studies show that organizations that apply analytics outperform their peers. And those with a high “Analytics Quotient”—that is, a broad-based, analytics-driven culture—perform, on average, three times better. Business analytics helps organizations to recognize subtle trends and patterns allowing them to anticipate and shape events and improve outcomes. Not only is it

possible to drive more top-line growth and control costs, but risks are more easily identified upfront, allowing correction before derailing business plans.

IBM business analytics software enables organizations to apply analytics to decision-making, anytime, anywhere. IBM i clients can better analyze their data to reduce costs and improve service across their business with DB2 Web Query for IBM i. IBM, in cooperation with Information Builders, offers a full suite of query, reporting, OLAP and dashboard technologies to meet a wide variety of business intelligence solutions. With DB2 Web Query, clients have fast access to current data, while avoiding the complications of offloading data to another system.

Clients using the IBM i platform also often implement IBM Cognos® business intelligence and SPSS® predictive analytics solutions, which are deployed on a Linux on Power or AIX partition running on the same Power Systems server with PowerVM. Clients choosing this approach see the best of both worlds. They preserve their investment in IBM i applications and database while incorporating their choice of advanced analytics solution.

Mobile Computing and Mobile Access

Providing access from mobile devices has become a key consideration for delivering applications. Mobile users demand mobile websites and mobile applications that enable them to securely transact business with a wide variety of enterprises.

IBM i has numerous enabling technologies to assist companies as they embrace mobile computing. Building on top of IBM i integrated security and the ability to easily lock down critical business data, tools such as IBM Rational® HATS and IBM Access for Web allow clients to expand the application user interfaces to mobile phones and tablets.

Extending the breadth of reach of IBM's tools, many experienced vendors provide tools and services to assist companies that are building mobile interfaces to their business applications. Companies such as LANSA, looksoftware division of Fresche Legacy, Profound Logic and others have assisted many clients to extend the value of their business applications by adding support for mobile devices.

Enterprise Modernization

While many IBM i clients run industry specific applications from ISVs, many clients also develop and maintain their own applications. IBM i offers a broad choice of development languages including RPG, COBOL, C, C++, Java, PHP and other open-source languages. Typically, Java and PHP are used to develop Web actions, whereas RPG and COBOL are used for transaction processing applications. IBM i has an integrated language environment, which makes it simple to mix and match languages to fit application requirements.

IBM provides compilers and a range of development tools and enterprise modernization capabilities for IBM i. Based on the Eclipse standard, Rational Developer for i and Rational Team Concert™ for i maximize developer productivity and application deployment. Additional application development tools for IBM i are available from tool providers such as Arcad, Fresche Legacy (including looksoftware), LANSA, Linoma Software, Profound Logic and many others.

Given that many IBM i clients use RPG and COBOL for their core transaction processing applications, IBM is committed to invest in and support these languages on IBM i. IBM Rational introduced RPG Open Access that enables RPG to directly interface with a wide range of new devices and resources. Many IBM i clients are capitalizing on the opportunity to interface directly to mobile devices and they are updating applications to be rendered on devices such as mobile phones and tablets.

With the announcement of RPG IV Free Format capability in IBM i 7.1 TR7, IBM has opened the RPG language to a new generation of developers. The new format allows application developers to learn and use RPG as they would other languages such as Java, PHP, Ruby, etc. RPG in this new format is well positioned as a strategic choice for companies modernizing and extending the business value of their current business solutions.

For clients extending their application portfolio to include Java or the Web, IBM i is tightly integrated with the IBM WebSphere portfolio of products. IBM WebSphere Application Server Express ships as part of IBM i, allowing easy installation, configuration and management of Web application serving. Additionally, the Integrated Application Server, imbedded in IBM i, provides an easy-to-use high performance environment for clients who require support for less complicated web applications.

IBM has also worked with Zend to deliver the popular open-source scripting language PHP for IBM i. The Zend Server PHP product is shipped with IBM i, providing the PHP runtime and a toolkit to provide easy access to IBM i applications and data. With PHP, clients can easily develop Web applications that tie into IBM i DB2 data and applications. The most current release of Zend Server supports PHP applications split between server components and code running on mobile devices.

Systems Storage

Historically, most IBM i clients deployed integrated, or *internal* storage, that was managed and optimized directly by the operating system. The use of high-speed RAID adapters ensured that internal storage provided optimal performance, especially for high volume transaction processing applications. Over time, however, more IBM i clients have adopted SANs, or *external* storage, that is managed both by the operating system and the SAN server. For many years, performance of IBM i applications has been comparable between internal and external storage.

IBM i clients have a variety of storage requirements based on capacity, performance and cost. IBM i supports many storage servers including IBM DS8000, Storwize V7000, Storwize V5000, Storwize V3700, XIV, SVC and DS5000™ storage solutions. Most recently, IBM i now supports the hottest disk storage—Flash: FlashSystem 900 and FlashSystem V9000. Attachment can be through a variety of methods providing the flexibility to match client requirements.

In addition, SSD drives with their ultra-fast I/O performance have enabled many IBM i users significantly to reduce the runtimes of their daily, weekly and monthly batch jobs. IBM i maintains its leadership position in the intelligent management of data on SSDs, placing the most frequently accessed data onto the SSDs and managing a hierarchy of storage options.

IBM continues to make enhancements in hardware and software to support all of these storage options, providing flexibility to meet all of our clients' requirements.

Server Virtualization and Cloud Technologies

IBM i has a heritage of virtualization technology going back more than 40 years. The operating system design featured subsystems that enabled multiple applications to run separately in a single system image. Originally, subsystems were used to differentiate interactive and batch applications, but over time they have grown to be used for assigning priorities and system resources to a wide variety of processes and services.

In 1999, IBM also introduced the first PowerVM logical partitioning technology, enabling separate virtual machines to run on the same Power Systems server. PowerVM, which ships on more than 90 percent of midrange and high-end Power System servers, provides scalable and secure server virtualization for AIX, IBM i and Linux environments. PowerVM features micro-partitioning with up to 20 partitions per core, Live Partition Mobility between servers (available with IBM i 7.1 TR4), dynamic or automatic movement of processor and memory resources, and a wide range of I/O virtualization capabilities. PowerVM and IBM i subsystem virtualization are used extensively by IBM i clients and are a key driver of lower operations costs.

PowerVM virtualization also provides the foundation technologies for implementing cloud computing. The unprecedented interest in and projected IT spend on cloud computing is coming from all types of organizations, businesses and governments who are seeking to transform the way they deliver IT services and improve workload optimization so they can respond to changing business demands. Cloud computing can significantly reduce IT costs and complexities while improving workload optimization and service delivery.

Implementing a private cloud with IBM i can help reduce administrative tasks and improve productivity by enabling you to automate provisioning of resource requests from authorized users. It helps improve compliance and reduce errors by enabling you to standardize deployments and configurations while leveraging approval policies to maintain oversight and the optimal performance of your cloud, while workload metering capabilities support a transition to pay-per-use business models. By deploying an effective cloud computing environment, you enable organizations to reduce IT costs, improve service delivery and enable business innovation.

Resiliency and High Availability

There are two approaches to providing high availability/disaster recovery solutions for IBM i—logical replication and hardware clustering. Both solutions replicate data from a production system to a backup system and enable switching (also known as a role swap) between the two systems in the event of an outage on the production system.

IBM PowerHA provides a disk clustering solution for IBM i. PowerHA is an easy-to-manage clustering solution that makes it simple to switch between systems, is easy to maintain and is supported directly by IBM. As more IBM i clients transition to SANs, PowerHA also offers the

advantage of a resiliency solution that is tightly integrated with both the IBM i operating system and IBM System Storage servers and software.

Logical replication solutions are available from ISVs that base their software on the remote journaling capability of the IBM i operating system. These ISVs include Maxava, Rocket Software, Traders and Vision Solutions.

With both disk clustering and logical replication options, IBM i clients continue to have a broad range of choices for their high availability and disaster recovery needs.

Social Applications

Lotus® Domino® was first introduced on the AS/400 in the mid-'90s and hundreds of IBM i enterprises use Domino as their strategic email server and for running collaborative types of applications. Domino 9 is the latest version and now includes IBM Traveler. Many IBM i Domino users are taking advantage of Traveler's ability to provide access to email from phones and tablets.

For many years, IBM Sametime® products have provided integrated real-time social communications for businesses, providing a unified user experience through instant messaging, online meetings, voice, video and data.

Systems Management

Systems Management is a broad term used when referring to the ability to configure hardware and software, allocate resources, distribute workload, monitor performance, maintain security and access to the system, plan capacity, and execute other tasks that pertain to efficient resource allocation.

The IBM Navigator for i offers an easy-to-use, web-based management solution. In the most current TRs, IBM Navigator has been significantly enhanced to help the system administrator better understand the performance and activity on their system through monitors and analysis views. Integration with the latest version of Access Client Solutions (predecessor product was IBM i Client Access) significantly enhances the features.

There is also a wide range of additional integrated service management tools available from IBM Software, as well as from IBM i focused management tools providers such as Centerfield Technology, Help/Systems and Midrange Performance Group.

IBM i Community Resources

In addition to the user groups referenced earlier in the paper, a wide range of resources are available to the IBM i community.

- The *developerWorks IBM i Zone* is aimed at technical professionals, containing a wide variety of easily accessible technical articles, tutorials, new release and IBM i Technology Refresh information.
- The *You and i* blog by Steve Will, the Chief Architect of IBM i, discusses trends and strategies for the IBM i platform.
- The *i Can* blog written by Dawn May, IBM i Business Architect, shares "hidden gems" and best practices advice for IBM i technical professionals.
- The *Modern-i-zation* blog by Tim Rowe, Business Architect for Application Development, focuses on best practices used by application developers.
- Tips found in the *DB2 for i* blog by Mike Cain, Team Leader DB2 for i Center of Excellence, can assist database administrators and database programmers in learning new features and functions but also learning new ways to do old things.
- The *IBM Champions* program recognizes thought leaders from the business and technical community of IBM clients and business partners. These respected IBM i subject matter experts comment on a wide range of topics, and can be accessed at the *Power Champions* website.
- For RPG developers, IBM Champions Jon Paris and Susan Gantner's *iDevelopment* blog is an outstanding resource.
- Using his electronic publication, *iTalk with Tuohy*, IBM Champion, Paul Tuohy publishes interviews with leading industry experts from all parts of the IBM i community.
- *IBM Technical Conferences* feature Power Systems and IBM i topics for IT professionals.