

## White Paper

# For Many Businesses, It's Time to Upgrade Their Best-Kept Secret: IBM i

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### IDC OPINION

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The unique characteristics of the IBM i platform and the legendary loyalty of its users mean that there is little distance between those who know the platform intimately and those who are unfamiliar with it. Organizations that run their business on the IBM i platform take advantage of the fact that the platform requires minimal administrative support to run high-volume transactions and maintain the core enterprise database; that it is easy to upgrade when new operating system (OS) versions arrive; that thousands of ISV solutions and custom applications simply run on the platform without requiring complex integrations; and that the platform is open source-friendly and supports modern popular languages. For these organizations, the most important decision to make today is when and how to upgrade to IBM i 7.4.

Organizations that have never had IBM i in their datacenter and are unfamiliar with its characteristics may find the platform "different" at first glance – and "different" can be easily dismissed without first weighing the benefits. The uniqueness of IBM i, such as the integration of the operating system with the virtualization layer, the transactional system, the database, and the application servers, provides businesses with a strong, fully integrated foundation for innovation with much lower operational expense. The deeply integrated nature of IBM i enables the platform to reliably run itself and keep business operations secure while requiring few, if any, full-time staff. That in turn allows IBM i businesses to allocate resources to new initiatives.

IBM just released a new version of IBM i 7.4 – with some significant new capabilities. For most operating systems, a new version means that experts need to make sure that the new OS will work seamlessly with the existing database and applications. Often, this leads to the hiring of expensive consultants. Because of IBM i's integrated functionality, upgrading is generally so simple that in many cases an organization's business partner can do it overnight.

This white paper describes the unique nature of the IBM i platform in a world of otherwise thin, kernel-based operating systems. It also discusses why organizations that are running their operations on IBM i can benefit from upgrading to IBM i 7.4, whereas businesses that currently do not have IBM i in their datacenter could benefit from introducing the platform into their environment.

## SITUATION OVERVIEW

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### A Brief History of IBM i

In the history of operating systems, the dominant approach in the industry has been the slim, kernel-based operating system that allows programs to obtain access to the hardware that they virtualize. Kernel-based operating systems facilitate program execution, perform memory management, enable multitasking, control disk access, manage file systems, manage device drivers, and provide basic security. They typically sit between the hardware and the database, transaction systems, and applications.

IBM i has been based on a radically different approach. The purpose of what was in the past called AS/400 – AS stands for "application system" – was to provide an operating system that would be simple and attractive to deliver new solutions because the OS incorporates all the integration complexities associated with installing and running a new application on the platform. IBM achieved this by designing the virtualization software, the transaction software, the database, and the application servers as an integral part of the operating system.

With most of the integration built in, application providers are empowered to deliver solutions that are simple to install and manage. For example, the fact that the database is an integral part of the operating system means that the system is already set up to manage the storage. An application provider therefore does not need to create storage access technology. Another example is security. Thanks to an integrated security module in the OS, it is near impossible for malicious code to affect applications, removing the need for each application to be designed with a comprehensive security component.

IBM i is the modern, rebranded generation of this approach that started with AS/400. The IBM i architecture continues to evolve based on the concept that the operating system contains all the elements that an application provider needs to allow the solution to simply run. The end user does not have to manage the complications of installing, integrating, deploying, optimizing, and managing updates – or hire expensive consultants to take care of the integration, as is typically required with kernel-based operating environments.

For end users, the platform therefore allows them to run and scale their business, whether they are aiming for modest or aggressive growth, without having to make substantial ongoing investments in IT staff to maintain applications. The platform continuously helps businesses grow into new applications as these manifest themselves without the complexities of having to integrate them.

Businesses that run on IBM i can also rest assured that their older applications will continue to run on new versions of the hardware and the OS. IBM i is designed for backward compatibility. There are examples of successful businesses that wrote critical code for their operations in the 1980s and continue to leverage that code today on IBM i running on the latest Power Systems (POWER9) hardware. This capability is possible despite the fact that there have been countless changes to the underlying POWER processors over the years.

## Business Solutions

IBM i has in the past heavily tilted toward serving as a solutions platform for manufacturing and distribution customers, but over the past several years, it has gained a foothold in banking, retail, and healthcare. In the banking industry, for example, vendors such as Jack Henry, Fiserv, FIS (Fidelity's financial services), and Silver Lake provide IBM i core banking solutions to regional, state, and local banks in the Americas. Many of these banks take it for granted that they have been running their services reliably for many years on the same platform with a low TCO. According to IBM, banking is a distinct growth area for the platform.

Solutions deployed in banking are a good example of how IBM i operates. A banking solution requires a transactional system, which in IBM i is part of the operating system. The platform has its own version of a relational database, IBM Db2 for i, also integrated into the operating system. As IBM puts it, "The operating system is the database. The database is the operating system." An interface into the database makes it possible to optimize around the Db2 file system, and the transaction processing takes place inside the operating system together with that integrated database.

## Open Source Solutions

Even as new commercial solutions for IBM i continue to be developed, it is today unthinkable to run a business without utilizing open source software. ISVs and IBM i customers have been expanding beyond the platform's core business solutions, which were written in legacy languages, toward new solution areas that are better served by open source languages like AI and IoT.

The architecture of IBM i enables open source solutions to easily run on the platform. Indeed, businesses can solve problems by choosing the right open source solution without having to know the underlying technology. For example, IBM i customers and ISVs have been leveraging IBM i open source options to enable mobile- and web service-based computing on the platform. They can simply port the application to IBM i and run it there. Enabling IBM i for open source has opened the platform up for solutions in other industries.

## Why a Higher Price Tag?

Since the operating system takes on so many functions that are not included with kernel-based operating systems, IBM i naturally comes with a higher price tag. As mentioned previously, included in IBM i are the operating system, the virtualization software, the transaction software, the database, and the application servers. On a Windows, Linux, or Unix platform, these components need to be added and priced out separately.

IBM claims ROI advantages with IBM i that are based on the continuing integration of more capabilities inside the operating system, the low staff requirements needed for the platform, and the ongoing evolution of the Power Systems hardware which, measured in core performance cost, is considered to be extremely competitive with the most advanced alternative offerings.

## Cost Efficiencies

Because of its packaged and integrated nature, IBM i enables businesses to operate with fewer staff to administer the platform. In smaller businesses that run on IBM i, there's often a single staff member who manages the platform.

Many organizations with IBM i run their system completely unattended. These organizations don't have any in-house IT staff to manage the platform. Instead, they have a business partner who comes in periodically or who manages the system remotely. That same organization may have a half dozen staff members who are managing the business' other operational environments. IDC sees staffing as one of the largest contributors to opex in the datacenter, so any platform that drastically reduces the need for human management delivers immediate cost efficiencies.

In addition to staffing, another cost advantage is that businesses can run multiple workloads simultaneously inside a single virtual machine on IBM i. They can run their customer relationship management (CRM) application next to their enterprise resource planning (ERP) application while deploying web serving on a single instance. There is no need for separate virtual machines or separate servers. In contrast, to run multiple workloads on alternative operating systems, end users need to create different partitions or images and often must add physical servers.

This white paper is not an ROI study; therefore, IDC cannot state definitively whether IBM i customers end up paying less over time than businesses that leverage alternative platforms. IDC, however, has some anecdotal evidence that customers can indeed achieve cost efficiencies. Businesses that are considering IBM i for the first time should base their evaluation of comparative platforms on a different ROI calculation and don't just compare IBM i with other operating systems, but rather compare IBM i with other operating systems plus the various additional components.

## IBM I AS A MODERN PLATFORM

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The IBM i platform has continuously evolved with new technologies, some of which will be discussed in the sections that follow.

### IBM i for Developers

There are two types of developers on IBM i. The first type is the traditional IBM i developer, who codes using IBM's high-level programming language RPG for business applications, or COBOL that is primarily used in business, finance, and administrative systems. These developers are deeply invested in these languages, and IBM continues to advance RPG and COBOL while modernizing them to make them look more like contemporary languages. For example, IBM has a completely free-form version of RPG, which looks like Python or Ruby.

The second type of developer is the open source developer who wants to utilize open source technologies on IBM i. Open source developers are generally unconcerned with what the back end looks like as long as they know what kind of database they are talking to, which IBM i ensures by supporting the database interfaces and integration tools they need. Open source developers can be immediately productive as IBM i supports the same application development tools, such as Orion or Visual Studio Code, that are available on any other platform and that look and feel the same, including graphical user interfaces for standard procedural programming or object-oriented programming. Developers can run standard Python or PHP on IBM i. In other words, what developers tend to think of as "Linux tools" are fully available on IBM i. What's more, on IBM i, developers do not need to concern themselves with such tedious processes as patching, performing backup and recovery, or database analysis.

## Open Source on IBM i

Open source software runs on IBM i by leveraging the POWER processor's OS versatility. IBM i has a somewhat unique way of addressing storage, using pointers that are considerably longer than in other architectures and that have hardware protection so they cannot be altered. This allows the POWER processor to have IBM i running natively on top of it while allowing it to switch to a mode in which it is running a Unix-like operating system with Unix-like addressing and pointers.

This capability, which has existed for many years, makes it possible to have an AIX kernel inside of IBM i so users can switch to Unix mode whenever they need to. As a result, they can run pure binary compatible AIX – IBM's Unix operating system – within the IBM i operating system, which is the most efficient way of running open source software on the platform. IBM i uses pointers that work well with the database; when users want to move to open source, they can flip the processor to run code in Java, Python, or Perl.

The majority of open source code can remain unchanged to run on IBM i – it merely requires a compile on a POWER processor. In the past, IBM has worked with partners to compile certain open source solutions for the platform, but today, there's an open source community that compiles open source software for IBM i and makes it available, mostly on GitHub and other repositories. GitHub is used to store entire packages of various applications, libraries, and frameworks, which is why users turn to GitHub to compile for IBM i.

This versatility is such that organizations can run all three Power Systems operating systems (IBM i, AIX, and Linux) in different partitions on one physical server. IBM says that some of its clients run both IBM i and AIX, and many of them run both IBM i and Linux. There are distinct business advantages from running both IBM i and Linux on the same system and having their respective application suites interact with each other.

## IBM i in the Cloud

IBM i has traditionally been a popular platform for managed cloud service providers (managed SPs). Businesses have been able to use existing industry-standard cloud technology to boot up IBM i since the 7.1 release, which was in 2010. They can create an image of IBM i that can boot from a virtual disk. Often, this is done by large customers in their own datacenters (e.g., to virtualize their custom development environments) or by ISVs that want to be able to quickly spin up a new customer.

Recently, IBM announced that organizations can run IBM i in the IBM Cloud as well, enabling service calls from a public cloud environment. Some businesses that are integrating AI functionality into their workloads are using this capability. They can run a workload on their private cloud, and then push processes that execute AI functions like voice recognition or natural language processing out to the public cloud. This is an example of how businesses implement their hybrid cloud with IBM i. They keep their core business solutions running on IBM i, and then extend them into the cloud using the services offerings that are available in the operating system.

There is a version of OpenStack that runs on Power Systems and that can use an IBM i image the same way it would use a Linux image. Underneath the IBM i operating system, there is a hypervisor layer called PowerVM, which interacts with a layer below it where image management takes place. However, not many IBM i users take advantage of this approach. IBM expects that organizations will start leveraging OpenStack more with upcoming implementations in the IBM Cloud and in other clouds.

IBM i is now available in an infrastructure-as-a-service (IaaS) model similar to those offered by other major cloud service providers (cloud SPs). IBM i is also now available on POWER9 in the IBM Cloud with IBM Power Systems Virtual Servers.

## Machine Learning

Running AI on IBM i is an emerging workload among the platform's customers, but IBM says it is starting to see organizations run machine learning software on IBM i. IBM has also integrated IBM i with Watson Machine Learning Accelerator (formerly known as PowerAI), which is IBM's open source AI software stack including Spark, TensorFlow, PyTorch, Chainer, and Keras.

## IoT, Edge

IBM i supports a range of modern features and functions including Python, which enables developers to build functionalities like IoT processing. Meters, monitors, and sensors often run on Python. The ability to connect IoT systems directly to IBM i is being used by clients and some vendors in order to build applications that collect data from such devices.

For example, Kawasaki, the motorcycle, ATV, and watercraft company with an annual revenue of \$1.6 billion, uses IBM i in its U.S. plants to track the manufacturing line. The company also uses IBM i as a decision maker on when to restock certain stations using meters and monitors. When the volume of certain components drops below a given minimum, IBM i ensures that those components are ordered, and the assembly line station is restocked.

## Security

Security on IBM i is not implemented the way it is on other platforms where the user adds various security solutions that supervise everything that's going on the platform. On IBM i, security is part of the operating system architecture.

Also, thanks to the object-based architecture of the platform, allowable actions are predetermined. Unauthorized actions are not allowed. This makes it possible to define classes of objects and what a file looks like, and then only allow certain activities on files and disable others, such as the ability to call a file, for example. A user can look at the file, and add records to it, but the user cannot call the file. This built-in security means that Trojan horses, for example, cannot be executed on IBM i by inadvertently calling on an object.

What's more, all changes to the security authorities are permanently tracked and delivered as an audit trail, allowing businesses to prove that their data is secure to auditors. As security requirements change, such as the industry needs different payment card protocols to be supported or different encryption technologies to be available, IBM integrates those new requirements into IBM i and makes them available in a new release, often well before the industry needs them.

## THE BENEFITS OF UPGRADING TO IBM I 7.4

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IBM i 7.4 provides enhancements across a significant portion of the operating system. IBM has added several new open source programming languages, including R, the programming language for statistical computing and graphics, as well as additions to Python, PHP, Node.js, and the ecosystem of tools around them.

At the same time with new features and functions, IBM i 7.4 provides enhancements to the traditional languages of RPG and COBOL. In addition, new functionality is included for messaging and handling service tools that are built into the operating system. The communications protocols are updated to include the latest industry standards such as the features and functions in the tools and editors for programming languages.

## IBM Db2 Mirror for i and PowerHA

In this release, IBM includes a new licensed program product (LPP) called IBM Db2 Mirror for i. This LPP addresses the need for 24 x 7 operational availability, which is increasingly required by organizations.

Db2 Mirror for i allows users to pair two systems and have them run as an active-active pair. This means that the database is being operated on by applications running on two separate systems at the same time. The database itself is automatically updated across the two systems every time there is a change in the records. If one system is down for planned or unplanned reasons, all applications continue to run on the second system with zero downtime.

Currency between the databases happens across a high-speed connection. This is not replication, so there can never be an inconsistency in the data because a record was changed on one database but not in the other. Only when one system has been down and then restarted will the database on that previously offline system briefly spend time to catch up with the system that remained online. An added advantage is that, since the applications communicate simultaneously with the databases in system A and system B, organizations can distribute the users across these two systems, reducing the load on each.

IBM also has an LPP called PowerHA. 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 the IBM Storage servers and software.

## Moving to IBM i 7.4 from Previous Versions

IBM i 7.4 is now generally available. This is IBM i's first major release since 2016 when 7.3 was released. Officially, IBM supports N-2 upgrading and says upgrading from 7.1 should cause no complications. Businesses with earlier versions than IBM i 7.1 should refer to the documentation when upgrading.

IBM i runs on Power Systems E980, S914, S922, and S924. In terms of backward compatibility as stated previously, IBM typically guarantees that code compiled long ago will still run on today's processors.

## POWER and OS Upgrades

IBM i 7.4 runs on POWER8 and POWER9. It will not run on older Power Systems generations. This means that businesses that are on POWER7 or older will need to upgrade to POWER8 or POWER9. However, 7.2 runs on POWER8 and POWER9 as well. Businesses that don't want to upgrade their operating system and hardware at the same time can upgrade the software first, followed by the hardware or vice versa.



## FUTURE OUTLOOK

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There are several trends to be taken into consideration when discussing the future of a platform like IBM i:

- The first trend is the growth of platforms, which run on alternative processors other than x86. Because of the end of Moore's law, IDC is seeing the emergence of a more heterogeneous datacenter and cloud, with alternative processors and coprocessors penetrating once homogeneous environments. Data-intensive workloads have especially driven the demand for platforms with powerful processors, strong I/O capabilities, fast interconnects, and coprocessors such as GPUs. As a result, a cultural shift is occurring in which alternatives are no longer being shunned. IBM Power Systems will benefit from this new willingness to embrace the right technology for the right workload.
- The second trend to consider is the continuing importance of operating systems other than the dominant Linux and Windows – the most prominent of which are IBM i, IBM AIX, and IBM z/OS. Here, there's a different trend, namely the extensive work that is being done to make these alternative operating systems "invisible" to today's application developers while continuing to support traditional application developers for those platforms. Tomorrow's developers will not even be aware of the underlying platform on which they are developing.
- The third trend to consider is the cloud. Any modern platform has to play well *as a* cloud (when on-premise), *with the* public clouds (in a multicloud model), and – ideally – also as IaaS *within the* various clouds, which means enabling a private and hybrid cloud with open source cloud management software as well as virtualization such as containerization and open source container orchestration software.
- The final and the fourth trend is AI. In the near future, many applications will be AI-infused, meaning that, at a minimum, a platform must be equipped to perform intense AI inferencing. However, if that same platform houses core enterprise data, there will be a growing desire to also leverage that data for AI model training. ETLing (extract, transform and load) core enterprise data off the system of record for AI training is increasingly seen as a waste of time and resources, not to mention a compliance risk. Therefore, future enterprise platforms will need to be able to perform AI training as well.

## CHALLENGES/OPPORTUNITIES

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### For IBM i Users

The considerations in the Future Outlook section are part of the many reasons why IBM i users need to remain up to date with the latest version of the operating system. This is never a trivial exercise, but it is fair to say that it is easier on the IBM i platform than with several other operating systems, thanks to the deeply integrated nature of IBM i with the database, virtualization, and application servers. Remaining up to date ensures that the IBM i platform in an organization's datacenter does not slowly devolve into an isolated silo that cannot meet contemporary requirements. The opportunities associated with staying up to date are numerous – attract app developers who code with open source languages, operate as a cloud and with the clouds, enhance applications with use of AI, and achieve greater resiliency and security, to name a few.



## For IBM

It is sometimes said that a political candidate with a long history in office is more vulnerable than a newcomer who doesn't have a past to defend. IBM suffers a little from this phenomenon. IBM i has one of the richest histories in the marketplace and has managed to sustain one of the most loyal customer bases in the market today. However, because of its long history, the platform is also vulnerable to biases from nonusers – primarily because these nonusers have not had an opportunity to get acquainted with the platform. This lack of understanding is both to the detriment of organizations that, as a result, do not consider the platform and to IBM. Therein lies the challenge for IBM.

The opportunity for IBM, on the other hand, can be found in continuing on the trajectory that the company is on: opening the platform up for open source, making it easy and accessible (indeed, practically unnoticeable) for modern app developers, cloudifying it, and AI enabling it while maintaining its core value proposition. This will require ongoing technology development. IDC will not call any platform "unique" unless it is objectively unique, which is the case with IBM i. Many more businesses could benefit from its capabilities and near autonomous nature – it's up to IBM to remove their preconceptions and help them see the possibilities.

## CONCLUSION

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When in the title of this document we refer to IBM i as the "best-kept secret" of many organizations, we're quite serious. Businesses that run on IBM i gain a distinct competitive edge:

- Thanks to IBM i's unique capabilities as an integrated transactions, database, and business solutions platform
- The system's low operational expenses, thanks to the limited resources that are needed for day-to-day management
- The performance and capabilities of the underlying Power Systems hardware, including the same POWER9 processors that are used in Summit and Sierra, the two most powerful supercomputers in the world
- The platform's developer-friendly affinity for modern languages and open source solutions

IBM i can be thought of as autonomous driving for the datacenter: the platform manages most of the intricacies of maintaining a complex system that reliably processes massive amounts of critical data with very little supervision. IDC believes that the combination of POWER9 and IBM i 7.4 provides a strong enterprise platform for organizations of all sizes that prefer a platform that takes care of business rather than the business having to take care of the system.

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