IBM i – An efficient, resilient platform for modern business workloads

One of the industry's leading integrated operating environments

IBM

Highlights

- Integrated operating system (OS), database and middleware, built for business
- Virtualised to support multiple applications and processes with stability and integrity
- Optimised for exceptional business resilience and non-disruptive growth on IBM® Power servers
- Trusted security with auditing and compliance tools
- Designed for open application design choices with exceptional infrastructure support for mobile devices
- Thousands of industry application solutions available from Independent Software Vendors (ISVs)
- Simplified operations and storage management.

In today's era of cloud, mobile devices and analytics, IT decisions are more critical than ever before. Choosing IBM i running on an IBM Power Systems server as the foundation for a modern infrastructure means delivering on the promise of these key technologies. Companies need to know that their systems and business processes will meet the highest service levels defined by their business units while being adaptable to handle every new business opportunity. For many years, IBM i running on Power servers has helped companies to focus on innovation and deliver new value to their business, rather than diverting money and people to manage their data centre (DC) operations. When paired with the latest Power platform, IBM i applications get leading-edge performance plus dynamic infrastructure flexibility and modern capabilities with the opportunity to lower operations costs.

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.

IBM develops, fully tests and preloads the core middleware components of IBM i together upfront, whereas on other platforms, OS, database and middleware integration is done in the DC. The factory integration and testing of IBM i is a key factor in enabling companies to deploy applications faster and maintain them with fewer staff. The built-in virtualisation, including workload management, enables clients to run multiple applications together in a single instance of IBM i, driving up system utilisation, simplifying the IT environment and delivering a better return on IT investments.

IBM i integrates a trusted combination of a DB2 relational database, leading-edge security, standards based internet technology, networking and storage management capabilities. These provide an excellent foundation for efficiently deploying business applications, supporting 3,000 solutions from more than 2,500 ISVs. IBM i solutions are offered through an extensive, highly skilled worldwide network of IBM Business Partners (BPs), backed by IBM's trusted service and support infrastructure.

IBM i incorporates a runtime for UNIX applications – The Portable Application Solutions Environment (PASE) – enabling selected AIX and UNIX applications to be ported to the system. Not to be confused with an emulation environment, applications ported to PASE execute directly on the hardware, using the processor without additional layers or overhead. PASE applications run in IBM i jobs using standard IBM i work management, consequently, clients do not need to learn UNIX system administration. IBM and ISVs have leveraged PASE to provide support for high performance Java™, PHP and other solutions.

Integrated DB2 for i – Optimised for Business Data

The integrated DB2 database and middleware design of i provides extraordinary business value and differentiates it from component operating environments like UNIX and Windows. IBM builds in and integrates the SQL standards-based DB2 for i into the IBM i OS in every release and version. There is no separate installation or configuration. Included in the implementation is support for multiple file system options as well as connectivity options such as a native Java database connectivity (JDBC) driver further extending the options available to clients for integrating data across their business.

IBM DB2 for i provides a scalable and easy-to-secure environment for the business data behind transaction processing and business intelligence applications. DB2 can be used to provide data to applications regardless of whether they are running on i, Windows, UNIX or Linux OS with access via standards-based interfaces such as SQL, .NET, Distributed Relational Database Architecture (DRDA)/command line interface (CLI), ODBC and JDBC. DB2 also supports XML, a popular method of exchanging information between companies.

DB2 for i offers a wide range of features to help improve performance and reliability of your business applications. For example, DB2 offers object relational technology that allow the management of large, non-relational objects within the database, such as images, audio or XML documents. It also provides extensive tools to manage queries based on the SQL industry standard. DB2 advanced parallel processing and query optimisation techniques also support the exploitation of very large databases for analytical purposes – without the limitations of 'in memory' solutions.

In addition to handling data stored in the DB2 relational database, i also has an integrated file system that supports storage management of files in a similar way to Windows and UNIX OS. The integrated file system provides a hierarchical directory structure and management interface to 11 different file systems (including file systems compatible with UNIX, Windows and NFS), each with its own set of logical structures and rules. Compared to systems that focus only on their own native file system technology, the integrated file system gives companies much broader flexibility to integrate with a range of open applications from wide variety of operating environments.

IBM i clients know there is value in the large amounts of data stored in their database. The ability to analyse that data and turn it into actionable information is critical when company leaders are making business decisions. Good information leads to improved decisions. IBM i clients have a variety of options for analytics. DB2 Web Query can analyse data and display key performance metrics in real time dashboards. Advanced visualisations like heat maps and drill down reports make it easier to understand trends or pinpoint problem areas. The IBM Cognos and the stock products system support (SPSS) family of products provide enterprise business analytics that can access IBM i databases for advanced functions, like predictive analytics, to help with customer retention, risk analysis or targeted marketing applications.

Web Serving for efficient business processing

IBM integrates a complete web serving infrastructure including security into the IBM i OS in addition to DB2 for i. The latest version of WebSphere Application Server Express for i, used for Web-based J2EE application serving is added to the environment as well as a hypertext transfer protocol (HTTP) web server powered by Apache, a Java J2C Web application server powered by WebSphere Liberty Core server and an

Integrated Web services environment that allow easy creation, hosting and calling of Web services for RPG or Common Business Oriented Language (COBOL) programs. In recent years, the addition of Zend Server for Web-based PHP application serving has extended application serving to embrace open source options.

Virtualised to manage multiple applications and processes

One of the key factors contributing to the efficiency of IBM i is the ability to run multiple business processes and applications reliably and securely together. Customers running workloads using multiple OSs report higher utilisation rates on i-based servers than those found on Intel, UNIX and other midrange-based systems. The high rate of utilisation of Power Systems with IBM i is achieved through the use of a variety of proven virtualisation technologies, such as subsystems (multiple workloads managed in a single OS image) and logical partitions using IBM PowerVM. Logical partitions allow multiple workloads to run on one system, managed in independent OS images.

Subsystems are independent operating environments within an IBM i instance. The system coordinates and automatically manages work flow and resource use for jobs, processes and applications, while keeping specific job information, such as data, completely separate. One IBM i instance can contain many subsystems, each of which can be assigned defined system resources such as memory pools and processor priority. IBM i subsystems are routinely used to separate multiple Web, batch and transaction processing application components, allowing them to be the ideal choice for specific types of workloads.

IBM PowerVM provides virtualisation technology that enables multiple images of IBM i, AIX or Linux OS to be run on the same Power processor-based system with resources automatically balanced between partitions. Unlike most industry virtualisation implementations on Intel processor-based systems, the Micro-Partitioning capability of PowerVM is directly based on the proven IBM mainframe hypervisor architecture. The PowerVM hypervisor ensures true separation of OS functionality from the performance-optimised firmware layer that handles management of system hardware resources. The PowerVM hypervisor ensures each OS partition – IBM i, AIX or Linux – is completely independent and secure. Up to 20 Micro-Partitions can be defined per processor, with dynamic or automatic balancing of processor resources between the Micro-Partitions. PowerVM Active Memory Sharing (AMS) provides advanced memory virtualisation technology, which intelligently flows memory from one partition to another for increased utilisation and flexibility of memory usage. PowerVM Virtual I/O Server (VIOS) can virtualise input/output (I/O) resources to improve asset utilisation and decrease system costs. Companies deploying IBM i have routinely deployed their business applications using logical partitioning to optimise their IT operations over the past decade.

Optimised for exceptional business resilience

For most companies today, the ability to provide high service levels for employees and customers is critical. Cloud implementations and working with mobile devices demands continual availability. Over many years and in many businesses, IBM i has established the reputation as one of the top operating environments in the industry for resilient application deployment. Companies routinely trust the IBM i operating environment to deploy their most critical business applications.

PowerHA high availability (HA) solutions from IBM provide clients with the confidence that comes from integrated design and testing. These solutions are designed as an integrated extension of the OS environment. A critical factor for business environments is to reduce the risk of failures resulting from combining disparate components from multiple vendors. IBM PowerHA solutions provide the advantage of IBM Power Systems, the IBM AIX or IBM i OS, IBM System Storage options and the PowerHA SystemMirror offering. PowerHA clusters are backed by comprehensive offerings and resources that provide value at every stage of IT implementation. These include HA Cluster Implementation Services, providing customised assistance designed to meet our customer requirements for on-demand business needs.

Trusted security with auditing and compliance tools

For companies running Windows and UNIX OS-based servers, security and virus management are major challenges in terms of time and money. According to secunia.com, IBM i has a long-term track record of significantly fewer security advisories than Microsoft Windows Server and UNIX operating environments. A recent ITG study of the integrated security environment concluded that IBM i provides companies with an unparalleled level of OS security.[1]

The simple-to-deploy, object-based security model of the IBM i operating environment provides comprehensive capabilities for deploying and managing a highly secure system environment. Its object-based architectural design provides virus resistance by protecting the OS code from modification (via hardware storage protection) and by preventing the running of executable instructions stored in a file, a common source of viruses. IBM i also helps safeguard data against hackers with built-in intrusion detection and prevention and has an audit journal to track security changes and breaches to help with compliance and auditing.

IBM i 7.2 added additional security options for DB2 for i. Allowing clients to choose a more granular definition of security for data is critical in today's world of mobile and social computing. These IBM i 7.2 enhancements allow clients to lock down critical business data while opening applications.

In today's world where systems are opened up to mobile and web interaction and users sign on to do work from anywhere at anytime, it is critical to ensure that the right level of security is maintained on all objects on the system. With the announcement of IBM i 7.3, IBM has introduced the capability to monitor, record and then analyse the usage of objects on IBM i. This information provides critical information allowing security officers to design a security scheme with the right levels of 'lock-down' on their objects – neither too little nor too much.

Of course, i supports options for encrypting data on disk as well as backups, encrypting selected database information, and common network networking standards, including secure sockets layer (SSL) and virtual private network (VPN).

Multiple IBM and ISV tools are available to help create, deploy and comply with business security policies.

Designed for open application design choices

Applications today are created as a blend of technologies, using the languages and techniques most suited for the task. IBM i offers an integrated language environment that supports a broad range of open application options, such as C, RPG, COBOL and C++. Combined with the Web-based and open source applications such as Java, PHP, EGL and Ruby, traditional business solutions can be modernised and extended to the web and mobile devices. ISV solutions available for IBM i, are routinely deployed with a combination of development languages.

Binary compatibility means that existing business application assets can be moved from older environments to the latest IBM i 7.3 running on IBM Power Servers. This investment protection allows traditional applications written in RPG, COBOL and CL to exploit newer capabilities of the OS without requiring changes to the application code.

Java and PHP offer powerful and open Web application environments on i with thousands of applications and components. With its easy-to-use development approach, PHP is a natural fit for companies that have invested in i, offering rapid deployment and simple integration with existing business applications. Zend Server for i includes an environment suited for support of mobile devices connecting through the PHP Server.

For many years, IBM has been on a path to continuously enhance the suite of Open Source languages and environments available on IBM i. The announcement of 7.3 adds Git and Orion to the already strong set of products such as PHP, Ruby, Python, node.js, GCC and Samba.

Simplified operations and storage management

IBM i is renowned for its ease-of-use and powerful systems management features. Typically, companies require fewer administrators to manage the IBM i operating environment compared to their UNIX and Windows systems. IBM Navigator for i is a browser-based graphical interface that enables the system to be managed with minimal skills and resources. Now running as a Web application, Navigator can be manage many IBM i functions through a browser running on a number of interfaces – Windows, Web, Android and tablets to name a few.

Storage management software is also a key advantage of IBM i when compared to UNIX and Windows OS. Applications running in IBM i do not directly access disk drives as they would when running in a Linux, UNIX or Windows environment. Instead, IBM i automatically manages and balances the storage of data across multiple disk drives. The automated storage balancing both optimises performance and helps companies avoid reorganising disk units and defragmenting disks to reclaim unused space. Of course, IBM i also enables protection of disk storage through various resiliency options, including RAID-6, mirroring, as well as IBM System Storage solutions.

Using the hierarchal storage management provided by IBM i, solid state drives (SSDs) can help to improve the performance of long-running queries or batch jobs. The most active data can be automatically placed on SSDs making it easier to get the benefit from the faster I/O response times of SSDs. IBM i supports a variety of SSDs in a variety of storage devices.

The value of IBM i advanced storage management capabilities can also be extended to other operating environments by hosting storage for IBM i, AIX and Linux logical partitions. IBM i is also supported by PowerVM, allowing the VIOS to virtualise I/O resources for IBM i, AIX and Linux partitions. Using this virtualising technology, it is possible to reduce the requirement to purchase separate adapters for each environment, delivering a financial benefit to clients.

The strategic web-based IBM Navigator for i product interface continues to be enhanced to help system administrators and database engineers. In addition to performance and usability updates, many new features have been added in IBM i 7.3. New perspectives such as looking at historical system data have been added.

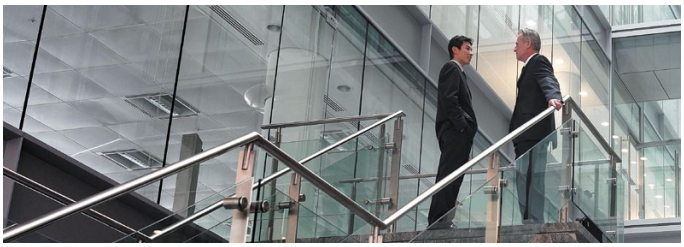
Scalable to enable non-disruptive business growth

IBM i offers a variety of expansion options to help a company maximise return on its IT investments. With support for the wide breadth of IBM Power Systems servers, IBM i can support the computing requirements of small and midsized businesses to large enterprises.

Key for this non-disruptive growth is the Technology Independent Machine Interface (TIMI) that provides a protective layer between applications and hardware devices, such as processors and disks. Proven over many years and technology generations, the TIMI protects applications from changing hardware devices and processor technologies, enabling applications to be upgraded without recompilation. IBM i supports software upgrades when moving to the current release from either of the two previous releases, with the system automatically changes system data structures and other object characteristics to the new OS levels.

Live Partition Mobility (LPM) allows clients to move running workloads between systems. This is essential for planned downtime when machines need maintenance or other types of service work.

Capacity on Demand (CoD) is an additional aid to nondisruptive business growth, enabling additional built-in processors to be activated without disrupting business operations. When using CoD with IBM i, neither the operating environment, nor the database or applications need to be restarted to take advantage of the additional performance.



Feature	Benefits
Integrated middleware for efficient business processing	• Standards-based DB2 database is built in • Significantly lower total cost of ownership (TCO) and total cost of acquisition (TCA) • IBM designed and tests before delivering the infrastructure stack to clients
Virtualised to manage multiple applications and processes	• Subsystem workload manager • PowerVM technology providing Micro-Partitioning and shared processor pools
Optimised for exceptional business resilience	• Highly resilient with built-in cluster architecture • IBM PowerHA for i disk-based clustering • IBM Storage System resiliency solutions • Transaction-based journaling leveraged by many ISV logical replication solutions
Trusted security with auditing and compliance tools	• Simple-to-deploy, object-based security model • Virus resistance object architecture • Intrusion detection, prevention, and audit journal • Encryption of data on disk and backups • Secure networking with SSL and VPN
Designed for open application design choices	• IBM Rational development tools • C, RPG, COBOL, C++, Java, PHP and CL • Supports open source applications • Web services application support built in
Simplified operations and storage management	• Web-based systems management • Integrated storage management • Hierarchal storage management for solid state drives • Host managed storage for i, AIX and Linux • Supported by PowerVM and VIOS virtualisation
Scalable to handle nondisruptive business growth	• Support for IBM POWER processor-based systems, including Power nodes in IBM Pure Systems • Technology independent machine interface • CoD (processor & memory)

For more information

To learn more about IBM i and the supported IBM server platforms, please contact your IBM marketing representative or IBM Business Partner (BP) or visit the following websites: **ibm.com**/systems/power/ or **ibm.com**/power/i/

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