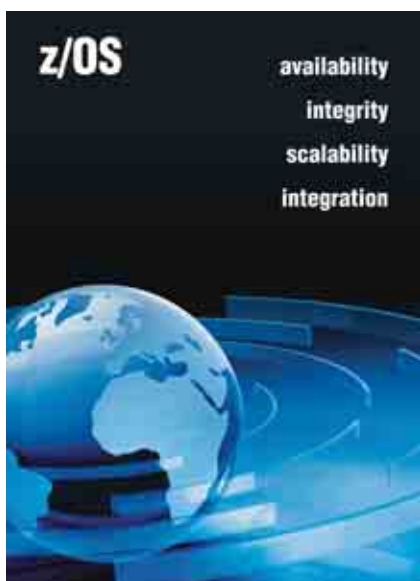# IBM z/OS

While IBM System z™ servers are supported by a number of different operating systems, their most advanced features are powered by z/OS. z/OS is designed to deliver the highest qualities of service for enterprise transactions and data, and extends these qualities to new applications using the latest software technologies. It offers a security-rich, scalable, high performance base on which to deploy SOA-enabled applications using Internet and Java™ technologies, designed to provide a comprehensive and diverse application execution environment coupled with a highly secure and resilient enterprise data store.

Highlights

- *Provides a security-rich, scalable, high-performance platform for your most demanding data serving requirements*

- *Can help simplify IT infrastructure by allowing the integration of applications and/or data in a single IBM z/OS® image*

- *Takes advantage of new technologies and supports IBM WebSphere® suite of Service-Oriented Architecture (SOA) products to leverage, extend and integrate core business applications*

- *Improves, simplifies, and streamlines platform configuration, management, and operations*

Enterprise data serving

Given the nature of how IT infrastructures have grown over time, you may be dealing with the pain of siloed data. This may be the result of having numerous databases, server platforms, line of

business needs, application require-
ments, and company mergers and
acquisitions. Managing database silos
can lead to multiple copies of disparate
data, which in turn can lead to
increased cost and complexity and
other inefficiencies.

Consolidating your data to z/OS can
help you reduce cost and complexity in
your IT infrastructure, simplify compli-
ance and leverage your core asset—
your data. The combination of z/OS
and System z provides you with the
scalability, availability, data integrity,
security, manageability and overall qual-
ities of service that you need for your
data. Data serving on z/OS can help:

- *Reduce requirements for data
  redundancy, storage, network and
  personnel*
- *Simplify disaster recovery scenarios,
  with fewer servers and server types
  deployed*
- *Improve privacy management by
  reducing points of control for secu-
  rity and the resources that need to
  be secured and by helping enforce
  privacy regulations*

IBM z/OS and Z/OS.e

Extreme scalability
z/OS and its subsystems provide capa-
bilities to assist you in handling
increased scale as your user base,
business processes and data process-
ing needs expand:

- *Up to 60 LPARS on a single server
  (z/OS 1.7 and IBM System z9™
  Enterprise Class (z9 EC), up to 30
  LPARS with z/OS 1.7 and
  System z9 Business Class (z9 BC)*
- *Up to 54 processors per logical par-
  tition (for z/OS 1.9 and
  System z9 EC).*
- *Up to 32 z/OS logical partitions can
  be configured in a single-image
  IBM Parallel Sysplex® cluster, with
  shared data (up to 1,728 engines
  total)*

- *Support is planned for up to 4 TB
  of real memory on a single z/OS
  image (z/OS 1.8). This is expected
  to allow the use of up to 512 GB of
  real memory on a single z/OS
  image on IBM System z9 servers
  and up to 256 GB on
  IBM eServer™ zSeries® 990
  (z990) servers.*
- *Support for larger data sets
  (z/OS 1.7)*
- *63.75K subchannels (in subchannel
  set =0) (z/OS 1.7 and System z9)*
- *Support for multiple subchannel
  sets−127.75K subchannels
  (z/OS 1.7 and System z9)*

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* All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

Support for large real memory eliminates expanded storage, can reduce paging and can allow you to consolidate current systems into fewer LPARs or to a single z/OS image. Starting with version 1.6, z/OS includes C/C++ support for the development of 64-bit applications including debug and run-time support. In addition, the Java SDK for z/OS, Java 2 Technology Edition, V5 is also available with 64-bit support. (Please note, 24-bit and 31-bit applications will continue to be supported.)

Near continuous availability

There is more to "availability" than just the server being up—the application and the data must be available as well. For the System z platform, this also means hardware, I/O connectivity, operating system, subsystem, database and application availability. z/OS and System z hardware together can help provide outstanding single system availability:

- *The hardware has a base design point that is expected to provide over 30 years mean time between failures through self-healing capabilities, redundant componentry, dynamic sparing and the ability for concurrent upgrades and microcode changes*

- *z/OS continues to refine its error checking, fault tolerance, isolation and error recovery*
- *Data integrity upheld with capabilities such as address space isolation, storage protect keys, I/O channel redundancy, I/O error checking and Basic HyperSwap® (planned for z/OS 1.9) high availability disk solution.*

Beyond the single system is z/OS Parallel Sysplex clustering. Parallel Sysplex is designed to provide your applications and data with not only continuous availability for both planned and unplanned outages but also near-linear scalability and read/write access to shared data across all systems in the sysplex for data sharing applications. With IBM Parallel Sysplex technology, you can harness up to 32 z/OS systems into a single, logical computing facility while the underlying Parallel Sysplex clustering technology remains virtually transparent to users, outside networks, and applications. Sophisticated tools manage a sysplex to the highest levels of performance and availability:

- *Workload Manager—Automatic and dynamic workload balancing, and interactions with Enterprise Workload Manager*

- *Sysplex Distributor—autonomic and dynamic network traffic balancing, with advice from Workload Manager*
- *z/OS Load Balancing Advisor— interaction with network-based load balancers (z/OS 1.7)*
- *Dynamic VIPA (virtual IP addresses) take over/ reclamation— high availability network (z/OS 1.7)*
- *Creation of "subplexes"—multiple networks for different security needs (z/OS 1.8).*
- *Services for troubled applications— subsystem health communication used to help avoid directing more workload to malfunctioning servers*

Business continuity

Your Parallel Sysplex cluster need not be all in one location. The IBM GDPS® suite of services provide extensive end-to-end continuous availability and disaster recovery solutions. GDPS is a multi-site or single-site, end-to-end application availability solution. Although running on z/OS, GDPS can provide the capability to manage and automate the remote copy configuration and provide data consistency not only for z/OS, but for Linux® and open system data. GDPS is designed to automate Parallel Sysplex operation tasks and perform

disaster recovery from a single point of control. GDPS is designed to meet your business requirements of a Recovery Time Objective (RTO) of under one hour, with a Recovery Point Objective (RPO) of as little as zero seconds by removing people as single points of failure in an outage event.

Enterprise security

But why do System z and z/OS persist as such a phenomenal data serving platform? The platform's classic strengths of availability, scalability, reliability, application development/ integration, and security all come to mind. But at the root of these classic capabilities—a foundational element of the platform—is z/OS' tight interaction with System z hardware and its high level of system integrity.

System integrity

First issued in 1973, IBM's MVS™, OS/390®, and z/OS System Integrity statements have stood for over 3 decades as symbol of IBM's confidence in and commitment to the z/OS operating system. Today, IBM reaffirms its commitment to z/OS System Integrity.

IBM's commitment includes designs and development practices intended to prevent unauthorized application programs, subsystems, and users from bypassing z/OS security—that is, to prevent them from gaining access, circumventing, disabling, altering, or obtaining control of key z/OS system processes and resources unless allowed by the installation. Specifically, z/OS "System Integrity" is defined as the inability of any program not authorized by a mechanism under the installation's control to circumvent or disable store or fetch protection, access a resource protected by the z/OS Security Server (RACF®), or obtain control in an authorized state; that is, in supervisor state, with a protection key less than eight (8), or Authorized Program Facility (APF) authorized. In the event that an IBM System Integrity problem is reported, IBM will always take action to resolve it.

IBM's long-term commitment to System Integrity is unique in the industry and forms the basis of z/OS' industry leadership in system security. z/OS is designed to help you protect your system, data, transactions and applications from accidental or malicious modification. This is one of the many reasons System z remains the industry's premier data server for mission-critical workloads.

Security hub

With its sound foundation of system integrity, z/OS is a natural choice if you want a solution that can help keep enterprise wide data and transactions secure. Time proven z/OS technologies include RACF to manage authorization and access to z/OS resources, Public Key Infrastructure (PKI) to provide low cost Certificate Authority life-cycle management on z/OS, and multilevel security (MLS) designed to meet the stringent security requirements of multi-agency access to data.

Recent z/OS Communication Server network security enhancements include Intrusion Detection Services (IDS), Application Transparent—Transport Layer Security (AT-TLS) and Network Security Services (NSS). Furthermore, z/OS Communication Server Policy Agent technology to centrally collect and distribute the network settings you define—a great help if you need to address networking audit and compliance issues.

In addition, IBM's recent acquisition of Consul means its security management offerings can not only provide additional z/OS audit, alert, monitoring, and security policy enforcement capabilities, but can also provide a solution that helps

centralize and simplify mainframe and distributed security administration, audit, and compliance.

Protecting sensitive data—Encryption
With new regulations and security breaches making headlines daily, there are many encryption solutions available for the z/OS platform. These include encryption options for applications and file transfers over the internet using industry standards such as SSL/TLS, IPSec, and OpenSSH. Sensitive data within a data base can also be encrypted with features in IBM DB2® v8 and v9, and with the IBM IMS and DB2 Encryption Tool.

Two tape encryption options are also available. The Encryption Facility for z/OS can help protect valuable assets from exposure by encrypting data on tape prior to exchanging it with trusted business partners. The Encryption Facility for z/OS 1.2 with OpenPGP support provides a host-based security solution designed to help businesses protect data from loss and inadvertent or deliberate compromise.

IBM System Storage™ tape drives (TS1120) with integrated encryption and compression are intended to satisfy the needs for high volume data archival and back-up/restore processes. Handling encryption and compression in the tape

drive will offload this processing from System z server to the tape subsystem, freeing up cycles for your mission critical workloads.

All of these encryption solutions can benefit from System z robust encryption infrastructure, which includes encryption acceleration built into every engine, the Crypto Express2 feature that provides tamper-resistant secure key processing, and z/OS Integrated Cryptographic Server Facility (ICSF).

Enterprise collaborative computing and SOA
The ultimate implementation of flexibility is a Service-Oriented Architecture (SOA), an innovative approach to technology based on an integrated, open-standards-based set of software, best practices and patterns. Long the platform of choice for mission-critical applications and the repository for corporate data, System z is also becoming the platform of choice for running and supporting this new generation of applications. In addition to providing an advanced platform upon which to build your SOA, as well as providing support for open standards such as J2EE™ and Web Services, the unique technical and business capabilities provided by z/OS make it the premiere platform

choice to serve as the hub of an enterprise for collaborative computing within an SOA.

Support for open standards and new application development tools
Like other operating systems, z/OS provides support for current application enablement technologies, but what sets z/OS apart is the ability to operate both new and existing applications within the same system, and in close proximity to the corporate data residing on z/OS. Applications can run on WebSphere in the same z/OS system as the DB2 database, which can enable tight, security-rich local connections ideal for high volume transactional throughput. Current CICS® or IMS™ transactions can be extended with these new technologies to deliver value in new and innovative ways, without incurring the substantial cost required to rip and replace current core assets. Here are some of the technologies you can use to modernize and extend existing z/OS applications:

- *Java,*
- *Perl*
- *PHP,*
- *XML*
- *Unicode,*
- *System REXX facility*
- *METAL C facility*
- *Web services and SOAP*

Support for SOA tools and applications
WebSphere Application Server can take advantage of many of the inherent strengths of System z. It can deliver exceptional self-optimizing and self-healing operational capabilities to critical business workloads. For example, the self-optimizing capabilities of z/OS and WebSphere Application Server are designed to respond to periods of peak demand by managing the workloads and allocating system resources (memory, capacity, I/O…) according to business priority workloads.

Support for SOA introduces new capabilities to mainframe customers. WebSphere Studio Asset Analyzer helps identify valuable, potential services for reuse. WebSphere Developer for zSeries provides a robust application development tool for new Java applications, as well as COBOL support, with embedded tooling specifically designed to unleash the potential in existing core assets, such as CICS and IMS applications. WebSphere Message Broker creates an advanced enterprise service bus designed to provide connectivity and universal data transformation for both standard and non-standards-based applications and services. The latest versions of CICS, IMS, DB2 and MQSeries® are enabled for SOA and designed to deliver legendary mainframe availability, security,

and recoverability to an SOA solution. Other System z products featured in the announcement include: WebSphere Business Modeler, WebSphere Integration Developer, WebSphere Process Server, WebSphere ESB and WebSphere Message Broker.

Excellence in workload management and resource optimization
With the ability to intelligently manage workloads, dynamically reallocate system resources between applications quickly and efficiently, z/OS and System z can handle unexpected workload spikes, helping to improve your system's efficiency and availability to meet business priorities. It also can help reduce the systems management skills and time required to define the I/O configuration. A cornerstone for this capability is z/OS Workload Manager.

The z/OS Workload Manager is another key element to z/OS leadership in on demand computing. The workload manager (WLM) component of z/OS is designed to manage the processing of mixed diverse workloads according to your business goals, including response time goals. WLM can also manage the use of system resources such as processors and storage to help you accomplish these goals. WLM allows you to monitor and adapt the system to

help you match resources to meet business goals. Performance management goals are expressed in Service Level Agreement terms. This policy can also be used across the sysplex to provide a single control point and can help eliminate the need to manage each individual image.

The scope of the Workload Manager extends from managing the incoming TCP/IP and SNA traffic, to managing requests for I/O. z/OS middleware like DB2, CICS, IMS, WebSphere MQ and other WebSphere products can take advantage of the WLM to manage the priority and execution of transaction requests across the z/OS system.

Simplification
Provides improvements in the areas of simplifying diagnosis and problem determination, network and security management, as well as overall z/OS, I/O configuration, Sysplex and storage operations. These improvements can help simplify systems management, improve application programmer, system programmer and operator productivity, and make the functions easier to understand and use:

- *IBM Health Checker for z/OS– simplifies diagnosis and problem avoidance (in the z/OS base with downloadable checks)*

- *IBM OMEGAMON® z/OS Management Console V4.1– Simplifies Operations (a no-charge product)*
- *Migration Checker for z/OS– Simplifies migration to z/OS V1.8 and V1.9 (a downloadable tool)*
- *Hardware Configuration Manager (HCM)–simplifies I/O configuration (a z/OS priced feature)*
- *IBM System z Hardware Management Console (HMC)– simplifies hardware operations*
- *z/OS Workload Manager– Simplifying workload management (in z/OS base)*
- *z/OS Communications Server and the Configuration Assistant for z/OS Communication Server Simplify network and security management (a downloadable tool)*

Improved economics

z/OS allows portions of eligible workloads to be redirected off of general purpose processors on to the System z Application Assist Processor (zAAP) and System z9 Integrated Information Processor (zIIP) specialty engines. But not just any work is eligible. Many of today's new application technologies and data serving demands are getting more and more CPU-intensive and, as a result, may not be cost competitive on System z. The zAAP and zIIP specialty engines may help make some of the new technologies more attractive to be hosted on the mainframe.

Java workloads

The first exploiter for zAAP was Java programming under control of the IBM's implementation of the Java Virtual Machine (JVM). This function was made available with z/OS 1.6 and the IBM Software Developer's Kit (SDK) for z/OS, Java 2 Technology Edition V1.4 (with PTF) and SDK for z/OS, Java 2 Technology Edition V5. Use zAAP to help integrate Java Web applications with mission critical data for high performance, reliability, availability and security.

Data serving and business intelligence

The first exploiter for zIIP was DB2 for z/OS. DB2 gives z/OS the necessary information to have portions of eligible DB2 workloads directed to the zIIP. This capability was available starting with z/OS 1.6 and 1.7 (with web deliverable and PTFs), DB2 for z/OS V8 (with PTFs), DB2 9 for z/OS and System z9 servers with appropriate maintenance levels. Use zIIP to help grow applications and to provide business intelligence (BI) and data warehousing (DW) against your real-time online transaction processing (OLTP) data.

Network encryption

The z/OS Communication Server (z/OS CS) exploits zIIP for portions of IPSec processing. This capability is available on z/OS 1.8 (with PTFs), z/OS 1.9, and zIIPs, when present. (APAR PK40178). Using zIIP assisted IPSec can help reduce the total cost of ownership of IPSec encryption, which can help you to establish virtual private networks for your mainframe network traffic.

z/OS XML System Services

IBM announced its intent to enhance z/OS XML System Services to exploit zAAP and zIIP specialty processors. z/OS XML System Services exploitation of zAAP and zIIP processors is expected to be rolled out over time.* In z/OS 1.9, z/OS XML System Services is enabled to exploit the zAAP specialty processor. Specifically, all z/OS XML System Services parsing performed in TCB mode is eligible to be executed on the zAAP processor. The immediate exploiter and benefactor of this enhancement is DB2 9 for z/OS. This means that locally attached applications (ISV or homegrown) can store XML data in DB2 with the TCO benefit of the zAAP processor without any anticipated changes to the application. XML parsing from individual XML document inserts, XML updates requested from

local thread or stored procedures, and bulk table loads are eligible for the zAAP. The function is available with z/OS 1.9 and will be rolled back to z/OS 1.7 and 1.8 with PTFs.

z/OS 1.7 enhancements

z/OS 1.7 is designed to provide advances in business resiliency and security with extensions to GDPS for system recovery and improvements in RACF interoperability. Customers may see a reduction in their need for IPLs with dynamic service activation for z/OS UNIX® System Services.

To help customers build and extend their z/OS applications, z/OS delivers C/C++ enhancements and enhanced support for TLS (Transport Layer Security) designed to be transparent to applications.

To help simplify systems management, the IBM Health Checker for z/OS is now a base component of z/OS, providing an included tool for checking on best practices for con-figuration values. Many more checking features are available and the tool has a simplified user interface design.

The dynamic capabilities of z/OS are also extended with the TCP/IP Sysplex Load Balancing Advisor designed for

better interaction with network-based load balancers and integration between Sysplex Distributor and Workload Manager. In addition, z/OS 1.7 can simplify network management with JES2 NJE support for TCP/IP.

z/OS 1.8 enhancements

Scalability enhancements include support for more real memory, GRS support for more concurrent ENQs, continued 31-bit constraint relief, support for large data sets and more. Availability enhancements include more options to help with fast data replication and the potential for improved recoverability in a sysplex. Resource optimization advances include improved I/O priority for tape devices and improved Workload Manager (WLM) processing options for zAAP workloads. z/OS 1.8 also can deliver several important functions for support of application integration and industry and de facto standards.

This new release sports ease of use enhancements for the IBM Health Checker framework, IBM Configuration Assistant for z/OS Communications Server and ISPF. IBM also plans to provide an optimized directory server, called IBM Tivoli® Directory Server for z/OS, designed to allow greater consolidation of LDAP directories on z/OS. This is planned to enable you to collapse user registries typically used by

distributed applications on z/OS, which can help simplify enterprise management and disaster recovery.

z/OS 1.9 enhancements

z/OS 1.9 provides many improvements for simplified systems, networking, security, storage and sysplex management. Improvements include new System REXX facility; expanded IBM Health Checker; simplified RACF administration; new z/OS Communications Server Network Management Interfaces (NMIs); ISPF support for z/OS UNIX and ASCII files; expanded Hardware Configuration Manager (HCM, an optionally priced feature of z/OS) reporting capabilities; expanded z/OS Communication Server Policy agent to centrally collect and distribute network settings; expanded IBM Configuration Assistant for the z/OS Communication Server; improved Coupling Facility management with new data collection, performance monitoring, and maintenance options; expanded RRS, SDSF, DFSMS functions and more.

IBM has designed z/OS 1.9 to help improve and extend the world-class security capabilities of the platform in the following: z/OS Communications Server allows IPSec processing to take advantage of IBM System z9 Integrated

Information Processors (zIIPs) which helps provide better price performance for select network encryption workloads; enhancements to PKI Services, RACF and SAF help improve the creation, authentication, renewal, and management of digital certificates; z/OS System SSL and Application Transparent-TLS are opened up to more application exploiters; RACF has added infrastructure for password phrase support and AES cryptography; and the z/OS Communications Server has introduced many functions for centralized security and policy-based management, in addition to other items.

z/OS 1.9 continues to address requirements for highly scalable, uninterrupted database and application availability. Scalability enhancements include: up to 54-way single image support, improved SMF data collection and management, improved Coupling Facility duplexing performance, and improvements for Global Resource Serialization (GRS), Couple Data Set (CDS) I/O and applications using IBM Language Environment® heap pools. In z/OS 1.9, support designed to help improve system and application availability is provided in the Consoles component of the BCP, System Logger, z/OS UNIX System Services, z/OS UNIX File System (zFS), Sysplex Failure Management, RRS, WLM and others.

IBM continues to embrace open and industry standards to support your requirements for application portability. z/OS 1.9 has several important functions intended to extend existing applications, integrate new applications and support industry and de facto standards: the ability for select XML processing to be eligible for the zAAP processor means new XML-based workloads become more attractive on the platform; adopting the PKCS#11 standard allows mainframe encryption and centralized key management to be used by Web-based applications and networking environments; the IBM Tivoli Directory Server enables application registries to be more easily centralized, managed, and recovered; improvements to z/OS UNIX System Services help enable porting of UNIX applications to z/OS; new C/C++ interfaces to WebSphere Developer for System z, METAL C facility, dbx GUI, and Language Environment enhancements all help improve application development.

z/OS 1.9 continues to offer outstanding overall resource utilization capabilities: the z/OS WLM (Workload Manager) is enhanced with improved performance routing, priority settings, and cancel

functionality; z/OS supports the latest Common Information Model (CIM) standard to help z/OS to integrate with more industry tools; z/OS support for EWLM is enhanced to include the OpenGroup ARM 4.1 (Application Response Management) extensions of the ARM standard; and new DFSMSrmm™ options.

Simplified ordering and installation
Customers can use the following tools:

- *The ShopzSeries Web tool (where available) not only simplifies the ordering of z/OS products and service but also has features for software inventory management. Customers can select a complete z/OS package through ServerPac or CBPDO. Delivery of service and ServerPac can be via the Internet or on physical media.*
- *IBM CustomPac is a suite of offerings designed to help efficiently install, migrate and maintain z/OS systems, including z/OS-related products and/or independent software vendor products. Internet delivery available for CustomPac now.*
- *SMP/E Internet Service Delivery function can be used to help automate the acquisition of service and hold data.*

- *Migration Checker for z/OS can help simplify your migration to the latest release of z/OS. It is a set of batch programs that you can run on your current system to help determine whether a z/OS migration action is even applicable to your system, or you can run it on your target system to help determine if the migration action you did was completed properly. This tool will not perform any migration actions on your system. It is intended to be used with z/OS Migration book to help you create your migration plan.*

For more information, see **ibm.com**/servers/eserver/zseries/zos/installation/

IBM support

IBM's z/OS software support is available 24 hours a day, every day. Web accessible and searchable knowledge bases, Systems Center books and white papers, online documentation, Resource Link™, searchable online problem databases, electronic problem support and telephone support from product-level and component-level experts are all available. The IBM Support Center infrastructure has highly trained and experienced product support specialists located in call centers around the world. They have experience in solving customer problems, and they can engage design and development teams when needed. In addition, they provide valuable inputs to design, development and test teams in z/OS and other product groups around the world to help improve z/OS's world-class availability, serviceability and diagnosis.

Integrated testing

z/OS is system-integration tested using a production-like environment. The z/OS environment includes subsystems, such as CICS, IMS, DB2, WebSphere MQ and other WebSphere products. This additional testing supplements existing functional tests, with a focus on tasks performed by customers in production environments, aimed at helping enterprises move more quickly to new functions.

Publications

For a list of the publications available for z/OS, visit the z/OS library Web site at: **ibm.com**/servers/eserver/zseries/zos/bkserv

z/OS.e and zNALC

z/OS.e 1.8 (5655-G52), was the last release of z/OS.e. z/OS.e 1.8 will remain orderable until its withdrawal from marketing in October 2007. Other key dates are as follows:

- *September 30, 2007: Withdrawal from service of z/OS.e 1.6*
- *September, 2008: planned withdrawal from service of z/OS.e 1.7*
- *September, 2009: planned withdrawal from service of z/OS.e 1.8.*

IBM has provided a new pricing alternative for z/OS, System z New Application License Charges (zNALC). zNALC replaces New Application License Charges (NALC) and z/OS.e and is intended to be IBM's strategic z/OS offering for new workloads.

System z New Application License Charges (zNALC) offers a reduced price for the z/OS operating system on LPARs where you are running a qualified "new workload" application (Qualified Application) such as Java language business applications running under WebSphere Application Server, Lotus® Domino®, SAP, PeopleSoft and Siebel.

The zNALC offering extends the IBM commitment to sub-capacity pricing, allowing customers with a Qualified Application to obtain a reduced price for z/OS where charges are based on the size of the LPAR(s) executing a Qualified Application, assuming all applicable terms and conditions are met.

z/OS with zNALC provides many benefits over previous "new workload" pricing offers. It provides a strategic pricing model available on the full range of System z servers for simplified application planning and deployment. zNALC provides similar pricing benefits to both z/OS.e pricing and z/OS with NALC pricing. zNALC allows for aggregation across a qualified Parallel Sysplex, which can provide a lower cost for incremental growth across "new workloads" that span a Parallel Sysplex. zNALC is the IBM strategy, replacing the z/OS.e operating system and the NALC pricing metric. For more information see **ibm.com**/servers/eserver/zseries/swprice/znalc.html

z/OS Version 1 Release 9 optional priced companion products

- *IBM Encryption Facility for z/OS V1.2*
- *IBM Tivoli suite of products*
- *Linux Utilities for z/OS*
  — *Web.App Secure Web application security*
  — *StoneSoft firewall*
  — *webSeal Web transaction authentication (with Tivoli Enterprise Portal)*
  — *IBM Communications Controller for Linux on System z*

z/OS Version 1 Release 9 optional no-charge companion products

- *IBM Migration Checker for z/OS (downloadable tool)*
- *IBM Configuration Assistant for the z/OS Communications Server (downloadable tool)*
- *IBM OMEGAMON z/OS Management Console V4.1*
- *IBM Ported Tools for z/OS V1.1.2*
- *IBM XML Toolkit for z/OS V1.9*
- *Java support:*
  — *IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5*
  — *IBM 64-bit SDK for z/OS, Java 2 Technology Edition, V5*
  — *IBM SDK for z/OS, Java 2 Technology Edition, V1.4*
  — *IBM 64-bit SDK for z/OS, Java 2 Technology Edition, V1.4*

z/OS Version 1 Release 9 base components and optional features

Updated for z/OS 1.9	z/OS 1.9 Component or Option	Base	Optional Priced Feature	Optional Non-priced Feature
✓	Base Control Program (BCP) The Base Control Program (BCP) provides essential operating system services, including: • I/O configuration program (IOCP) • Workload Manager (WLM) • System Management Facilities (SMF) • z/OS UNIX System Services (z/OS UNIX) kernel • program management binder • support for Unicode™ Standard • z/OS XML System Services (z/OS XML) • IBM Health Checker for z/OS	x		
	BDT (Bulk Data Transfer)	x		
	BDT File-to-File[3]		x	
	BDT SNA NJE		x	
	IBM BookManager® BUILD[3]		x	
	BookManager READ[3]	x		
✓	C/C++ without Debug Tool • New METAL C facility		x	
✓	Common Information Model (CIM)	x		
✓	Communications Server	x		
✓	Communications Server Security level 3			x
✓	Cryptographic Services Cryptographic Services supports the following components: • Integrated Cryptographic Service Facility (ICSF) • Open Cryptographic Services Facility (OCSF) • PKI Services • System Secure Sockets Layer (SSL)	x		

Updated for z/OS 1.9	z/OS 1.9 Component or Option	Base	Optional Priced Feature	Optional Non-priced Feature
	DCE Base Services	x		
✓	DFSMSdfp™	x		
✓	DFSMSdss™		x	
✓	DFSMShsm™ (and DFSMSdss)		x	
✓	DFSMSrmm		x	
✓	DFSMStvs		x	
	DFSORT™		x	
✓	Distributed File Service Distributed file Service provides support for: • The DCE file serving (DFS™) • System z File System (zFS) • Hierarchical File System (HFS) • Server Message Block (SMB) file/print serving support. Included in the support is access to HFS, sequential, PDS, PDSE, and VSAM data sets from Microsoft® Windows® XP Professional, Windows Terminal Server on Windows 2000, Windows Terminal Server on Windows 2003, SUSE Linux with Samba and Red Hat Linux with Samba. Windows workstation users can also exploit z/OS and z/OS.e printer capabilities using the SMB file/print server interface to the z/OS or z/OS.e Infoprint Server feature.	x		
	EREP	x		
	IBM ESCON® Director Support	x		
	IBM FFST™	x		
	GDDM®	x		

Updated for z/OS 1.9	z/OS 1.9 Component or Option	Base	Optional Priced Feature	Optional Non-priced Feature
	GDDM-PGF		x	
	GDDM-REXX		x	
✓	HCD	x		
✓	HCM		x	
	HLASM	x		
	HLSAM Toolkit		x	
	IBM HTTP Server	x		
	IBM Tivoli Directory Server for z/OS IBM Tivoli Directory Server for z/OS provides client access to an LDAP server. It consists of a new, rewritten LDAP server; an LDAP client; and LDAP client utilities. The LDAP client and LDAP client utilities can be used with the Integrated Security Services LDAP Server or the IBM Tivoli Directory Server for z/OS LDAP server.	x		
	ICKDSF	x		
	InfoPrint Solutions Company Infoprint® Server Infoprint Server allows you to print files on z/OS and z/OS.e printers from any workstation that has TCP/IP access. This feature consists of the following components: IP PrintWay™, NetSpool™, Print Interface, Printer Inventory Manager, Transform Interface, and z/OS Infoprint Central.		x	
✓	Integrated Security Services Integrated Security Services provides the following security functions: • Public Key Infrastructure Services • DCE Security Server • Open Cryptographic Enhanced Plug-ins • Firewall Technologies • LDAP Server • Network Authentication Service • Enterprise Identity Mapping	x		

Updated for z/OS 1.9	z/OS 1.9 Component or Option	Base	Optional Priced Feature	Optional Non-priced Feature
✓	ISPF	x		
✓	JES2	x		
✓	JES3		x	
✓	Language Environment	x		
✓	Library Server	x		
	MICR/OCR	x		
	Msys for Setup Support for DB2 for z/OS V8 and DFSMS only	x		
✓	Network File System	x		
	OSA/SF	x		
✓	IBM RMF™		x	
✓	Run-Time Library Extensions	x		
✓	SDSF		x	
✓	Security Server (RACF)		x	
	SMP/E	x		
	TIOC	x		
✓	TSO/E[6]	x		
✓	z/OS Security Level 3 The components in this feature are: • IBM Tivoli Directory Server for z/OS Security Level 3 • Network Authentication Service Level 3 • OCSF Security Level 3 • System Secure Sockets Layer (SSL) Security Level 3			x
✓	z/OS UNIX	x		
	3270 PC File Transfer Program	x		

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