Digital transformation and Hybrid Cloud

WebSphere Application Server works in conjunction with the entire hybrid cloud landscape. Hybrid clouds empower businesses to create new solutions, connect to systems of engagement (such as Web, mobile devices, and IoT), and optimize enterprise applications by moving the appropriate applications to the cloud. WebSphere's hybrid cloud approach enables:

- Provisioning and running WebSphere either on- or off-premises or in a hybrid environment with flexible runtimes and ready-to-run pattern-based deployments
- A simplified approach to the deployment of workloads across any cloud or container service
- Scaling infrastructure to match demand across multi-sourced and hybrid cloud models with workload scheduling and cloud brokerage services
- Predicting, detecting, and automating fixes to IT and application performance issues that impact user experiences through continuous feedback and optimization

WebSphere Application Server Family

All aboard: Your Journey to Cloud Begins Here

Today's enterprise must deliver strategic business initiatives that capitalize on the growth of social, mobile, analytics, and cloud technologies. These technologies serve as the foundation of the connected economy, empowering organizations to drive revenue growth and enhance their competitive edge by uncovering innovative ways to engage customers on-demand, across the digital landscape. IT plays a vital role in enabling organizations to become connected economy leaders by extending the value of their systems and data. IT leaders are looking towards the cloud to drive their digital transformation while capitalizing on more efficient and cost effective operations. However, IT leaders recognize the journey to the cloud is not without complications. The needs of existing enterprise applications must be balanced with those of next-generation systems of engagement.

Recognizing these challenges, IBM introduced WebSphere on Cloud, the next-generation application infrastructure strategy. A simplified IT transformation can be achieved by employing an entry point approach to incorporating cloud-based solutions. The WebSphere on Cloud strategy provides many benefits from improving time to market, reducing development efforts through available APIs and microservices, and lowering costs by moving all or part of your applications to the cloud.

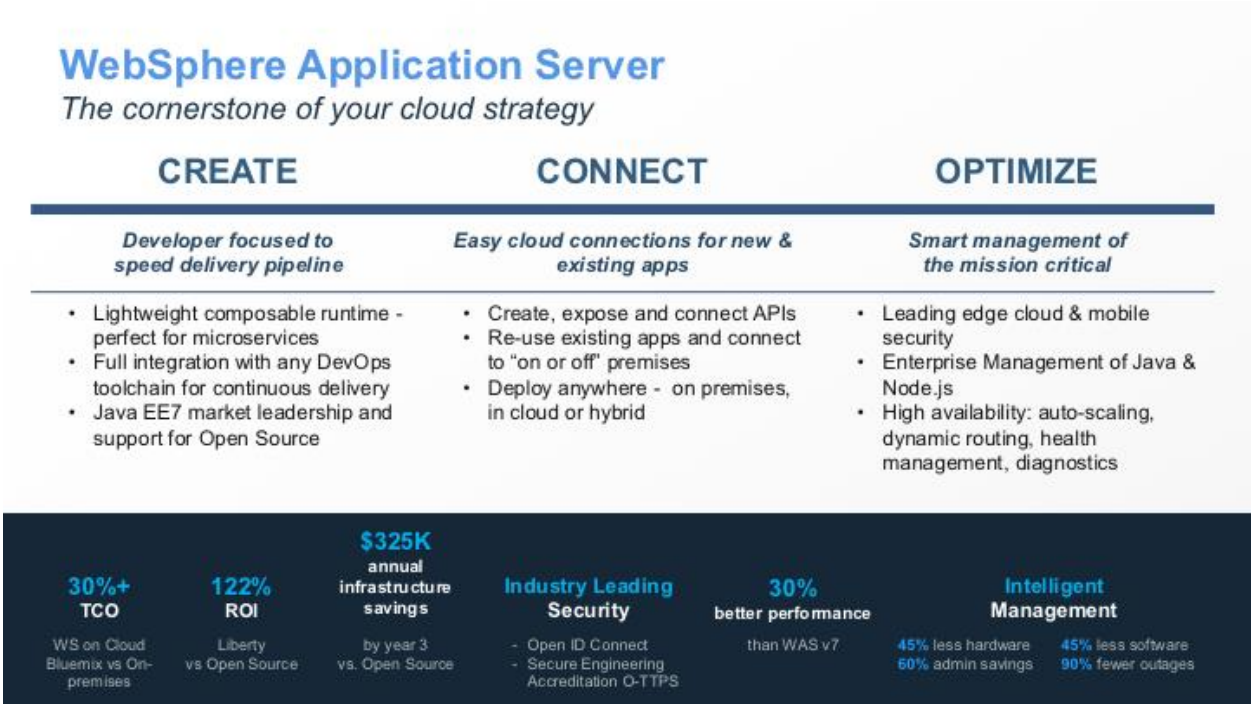
At the heart of this next-generation application strategy is a WebSphere Application Server that provides premier infrastructure and tooling for Java applications with a range of workloads. WebSphere Application Server delivers two standards-based server runtimes and tools in a single offering:

- WebSphere Application Server traditional
- WebSphere Application Server Liberty

WebSphere Application Server traditional continues to be an industry leader for System of Record workloads. While WebSphere Application Server Liberty supports System of Record workloads, it excels in modern workloads characterized by microservices. WebSphere Application Server Liberty provides a modular architecture offering next-generation integration techniques, a cloud/mobile-first mindset, and seamless portability across all topologies.

Moreover, WebSphere Application Server Liberty is especially developer friendly, allowing for integration with DevOps workflows for continuous integration and delivery. Along with traditional, WebSphere Application Server Liberty supports seamless deployment to hybrid topologies through IBM Container Services and Docker containers. These qualities allow IT to drive their enterprise digital strategy in the connected economy, enabling the links between people, machines, and organizations that will align products and business models around the customer. Specifically, the WebSphere on Cloud strategy is a partner in achieving market differentiation by providing you the platform to:

- **Create cutting-edge applications, APIs and microservices quickly**, enabling you to deliver compelling on-demand customer experiences that drive differentiation
- **Connect to cloud services** such as IBM Watson cognitive services and data services, maximizing the value of existing investments and assets
- **Optimize existing applications by adopting a lift-and-shift approach** to replicate in-house workloads on the cloud, either through a single or multi-tenant option, allowing organizations to benefit from increased scalability, reduced cost, and increased agility while also maintaining the security necessary to satisfy regulatory and legal compliance needs



Create innovative solutions at the speed of business

WebSphere for microservices strategy

- A light weight, composable runtime architecture that utilizes less than a 64MB footprint and supports a large Developer base using Java Framework (including Spring)
- Proven, enterprise development tools and platform for microservices
- Easy integration with DevOps workflows and Docker container strategies
- Seamless connectivity to cloud-based data and

Rapid application development and continuous delivery of innovation is paramount to thrive in the rapid pace of today's digital landscape. WebSphere empowers you to create, deploy and manage new microservices quickly using WebSphere Liberty, Bluemix services, and WebSphere Connect capabilities. Together they facilitate the continuous delivery capability needed to be responsive to new business needs and ultimately delight customers.

WebSphere Liberty App Accelerator is a starting point for developers to build Java-based microservices apps by providing a complete file system with Apache Maven built files. It can be used to build an application, run tests on a WebSphere Liberty server, and pull in the correct dependencies and features. Most importantly, by improving developer productivity, Liberty App Accelerator speeds time-to-value for WebSphere Liberty users, allowing a broader reach to new customers and new markets. You can access Liberty App Accelerator at the following web address: http://liberty-app-accelerator.wasdev.developer.ibm.com

To help organizations transition to a microservices architecture, IBM provides Game On!, a microservices exemplar app that contains best practices and methodologies for creating a brand new microservices application.

Connect to valuable new services

Your organization has made substantial investments in the solutions currently driving your business. However successful they may be, they can quickly fall prey to digital disruptions. Rather than becoming a connected economy laggard, WebSphere on Cloud allows you to invigorate those solutions by exposing them through APIs to an ecosystem of developers, customers and partners. Through WebSphere Connect capabilities, WebSphere empowers you to easily make existing assets part of the API economy, unlocking new opportunities for innovation, revenue streams and expanded channels.

WebSphere Connect is one of a new series of Connect offerings from IBM. It consists of a set of capabilities built into WebSphere Application Server that allows you to easily expose your assets in WebSphere as APIs with a click of a mouse. With WebSphere Connect you can:

- Expose backend applications and data as APIs, connecting to and from the cloud to rapidly extend the value of your WebSphere investments
- Easily create and manage APIs and publish directly from WebSphere to API Connect, which includes IBM support and additional API call limits

- Capitalize on existing WebSphere expertise for seamless implementation and management
- Provide easy access to APIs in and outside the organization to foster new partner ecosystems
- Apply end-to-end API lifecycle management and security to your WebSphere application infrastructure while maintaining high levels of service and performance

Pre-built integrations allow you to quickly connect existing data and applications to IBM Cloud, without the need for customization, added complexity or disruption caused by a myriad of third party alternatives. Simply capitalize on your current skills and resources for fast and easy implementation and manage within the WebSphere environment you already have and know.

WebSphere Connect allows you to connect to and from the cloud to enhance existing on-premises applications with hundreds of innovative cloud services, such as cognitive computing capabilities from IBM Watson as well as operational services that provide performance insights. Now developers can leverage their existing skills to expose, create, and connect applications leveraging the Bluemix cloud platform.

Ultimately, these connect capabilities can help your business minimize costs, reduce time to market, and extend the value of critical enterprise data and services by eliminating costly rip-and-replace strategies.

Optimize infrastructure for availability, flexibility and security

WebSphere Application Server is the next generation application infrastructure for developing and deploying modern applications through seamless portability across hybrid cloud landscapes. Whether it is to maintain an on-premises strategy, move completely to cloud, or a hybrid design, WebSphere Application Server provides the flexibility to choose whichever platform works best for you. By incorporating Bluemix with WebSphere Application Server, you can accelerate your digital transformation through new starting points, rules of engagement, decomposition of best practices, and best-of-breed tooling. Migrating or expanding your on-premises Java applications to the cloud can help improve profitability, reducing labor and management hours while lowering both capital and operation expenses through pay-as-you-go pricing.

Control costs

- Time and resources remain the same. Without making changes, simply take what you already have – including code, topologies, and applications – and move them to the cloud. WebSphere on Bluemix requires no download, no installation and no tuning of the application server environment, providing the convenience and experience of the cloud that is highly optimized for developers and operational productivity. This approach creates huge advantages whether driven by current business needs or long term strategies.

Build scale

- No longer do you have to add computing capacity or new hardware/software infrastructure when you want to grow. You can scale up or down on-demand as business dictates

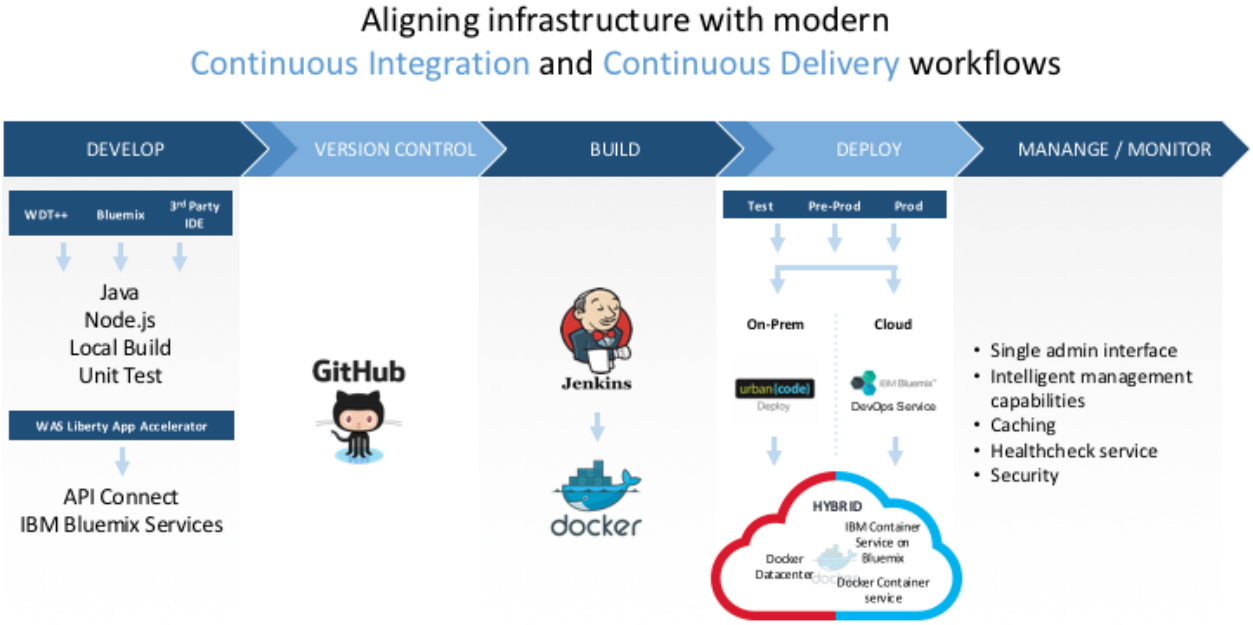
Accelerate application delivery

- Done right, application delivery goes beyond deployment and availability, incorporating the security, scalability, and management required to properly run and maintain it. With ease of deployment portability, organizations can support the hybrid topology, accelerating delivery of critical business workloads between their on- and off-premises environments. As hybrid cloud adoption continues to grow, organizations must stay up-to-date with the best practices and solutions to help them optimize application delivery and achieve their business needs. The latest features of the WebSphere on Cloud strategy helps them do just that.

Feeding in to DevOps Toolchains: Application release and deployment automation for WebSphere Application Server

Developing in and for the cloud presents unique challenges. IT organizations are currently automating their builds, tests, infrastructure deployments, and application deployments in an attempt to align with a certain level of continuous delivery. DevOps requires that best practices and development tooling be in place to address the needs of software delivery teams. It is designed to facilitate rapid feedback and continuous delivery in agile development while providing the audit trails, versioning, and approvals needed in production. For a WebSphere Application Server on-premises administrator, UrbanCode Deploy provides capabilities for automating configuration and application deployments, improving an organization's ability to deliver products and services to market faster.

WebSphere Application Server, both traditional and Liberty, align well with Docker containers and is readily integrated with container services such as Docker Datacenter or IBM Container services on Bluemix.



Deployment flexibility on all clouds including third party

WebSphere Application Server Liberty can be deployed across a broad spectrum of public and private cloud environments that include: IBM Bluemix, Open Shift, Pivotal Cloud Foundry (running on SoftLayer), Amazon Web Services, and Microsoft Azure. In addition, there's the added flexibility of using existing WebSphere Application Server on-premises licenses, both traditional and Liberty, to install and run in virtual machines on any private or dedicated cloud.

Eliminate future migration cost with WebSphere Liberty Continuous Delivery model

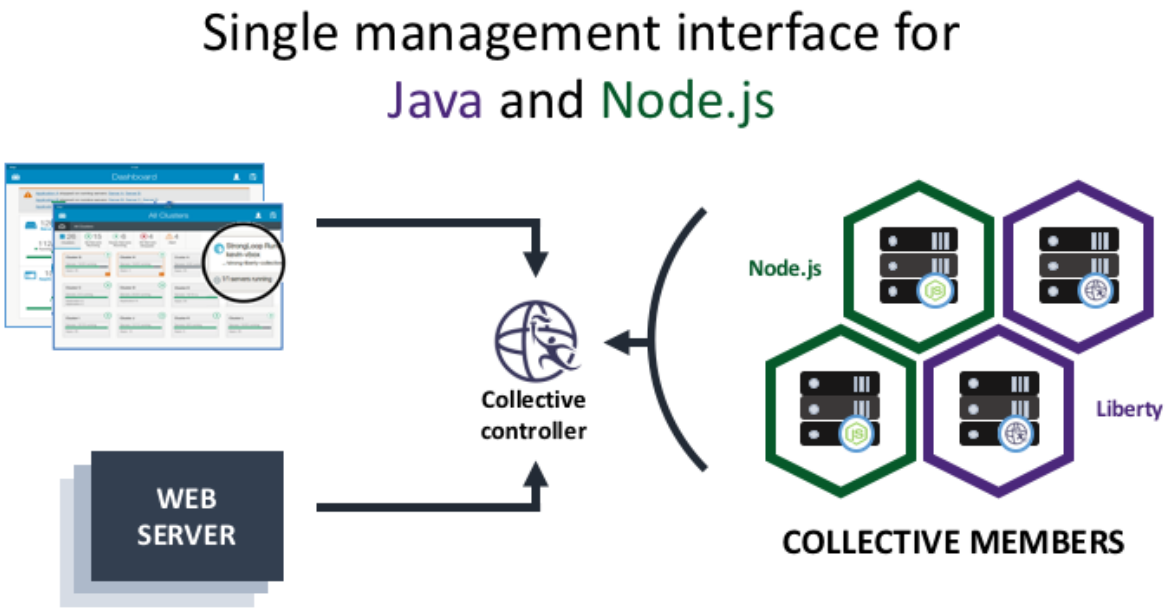
An important design principle of WebSphere Liberty continues to be zero migration. For example, Java EE6 features were retained as Java EE7 was introduced into Liberty. Existing applications will run unchanged on newer iterations of Liberty if configured with the same set of Java EE6 features. Since you can bring your own Java, Liberty empowers you to run new and old Java applications side-by-side. What's more, Liberty aligns with the continuous delivery model, eliminating the requirement for a configuration migration as you move to WebSphere V9.

Furthermore, WebSphere V9.0 introduces a new 9.0.0.0 service stream for traditional WAS fixpacks, while WebSphere Liberty follows a continuous delivery model with a single service stream. As Liberty offers a 'versionless' single delivery stream, its fixpack numbering is changing to Y.R.M.F: *year.release.modlevel.fixpack*. Once customers deploy to WebSphere Liberty, feature or configuration migration is never required to leverage new features delivered on WebSphere Application Server V9.0 or beyond.

Single management interface

With the advent of systems of engagement built for social and mobile, developers are composing applications from multiple languages, such as Java and Node.js, and are using container technologies to gain freedom from a single vendor, platform, or enterprise environment. These modern application workloads are typically characterized by unpredictable demand surges and require sub-second response times, subsequently requiring additional capacity on-demand. Oftentimes IT employs cloud vendors to handle these surges, leading to a hybrid topology of polyglot applications and servers across a hybrid environment. WebSphere Application Server provides a single, integrated interface to securely and intelligently manage polyglot applications and servers. By combining WebSphere Liberty's Collectives feature and WebSphere Administration Center, IT administrators can use a single interface to easily manage large scale topology comprised of WebSphere Java and Node.js applications and servers, deployed across bare-metal, Docker container, or virtual machine (VM), whether on-premises or in the cloud. Key features include:

- An administration center for visualization and operational control over both Java and Node.js applications
- Scalable clustering for Java applications
- Dynamic routing support (through a WebSphere Application Server plug-in) for Java and Node.js applications
- Scriptable deployment for both Java and Node.js applications



What's new with WebSphere Application Server V9?

WebSphere Application Server V9.0, with entitlement to its traditional and Liberty runtimes, continues to offer industry-leading, production-ready, standards-based Java EE 7 compliant architecture. The highlights of version 9.0 include:

- Java EE 7 Web Profile and Java EE Full Platform certification of WebSphere Application Server traditional brings the traditional runtime to the same Java EE level as the WebSphere Liberty runtime. This capability supports deployment of any Java EE 7 based application that uses the latest industry standards for on-premises or in the cloud. This runtime flexibility enables you to easily exploit HTML 5 to:
    - Improve application responsiveness.
    - Increase developer productivity.
    - Help to meet the most demanding enterprise requirements.
- Java Platform Standard Edition (Java SE 8) support for WebSphere Application Server V9.0 traditional and WebSphere Liberty deliver enhanced developer productivity and significant application performance improvements. With HTML 5 and Java batch applications you can simplify the application architecture and deliver scalable applications. Along with greater platform currency comes the opportunity to develop and deploy more efficiently.
- Docker container and Docker Datacenter support accelerate delivery of modern applications with easier integration of WebSphere Application Server into your DevOps tools chain. Use of WebSphere Application Server with Docker Datacenter enables seamless portability to deliver applications from development to test to production across a hybrid landscape, and supports the management of WebSphere Application Server Docker containers as part of a broader Docker-centric ecosystem.
- Updated Docker images with the latest WebSphere Application Server Liberty binaries accelerating software deployment in hosts containing Docker engines.
- A new WebSphere Application Server on Bluemix Single Tenant offering, providing deployment flexibility. You can deploy applications on isolated single tenant hardware, with an optional dedicated backend database connection to the client's data center. This option is also available for WebSphere Application Server V8.5.5.
- A single management interface for managing and administering WebSphere Application Server Liberty Java and Node.js applications that are deployed across bare-metal, Virtual Machines (VMs), and Docker environments in on-premises, cloud, or hybrid topologies.
- Enhanced WebSphere eXtreme Scale provides an easy-to-configure, easy-to-deploy, distributed caching solution where speed and performance are the main drivers of business success.
- Easy-to-deploy WebSphere Liberty applications to Red Hat OpenShift and Pivotal Cloud Foundry that run in IBM Bluemix, SoftLayer, Amazon Web Services, and Microsoft Azure. In addition, these application can be in on-premises environments and apply sub-capacity pricing for suitable configurations.
- Enhanced portability option for VMware clients to take better advantage of the speed of the cloud and economics by enabling them to easily extend their existing workloads, as

they are, from their on-premises, software-defined data center (SDDC) to the cloud. The solution takes advantage of jointly designed architecture by VMware and IBM to automatically provision pre-configured VMware SDDC environments, which consist of VMware vSphere, VMware NSX, and VMware Virtual SAN on the IBM Cloud. With VMware SDDC environment clients can deploy workloads into this hybrid cloud environment without modification because of common security and networking models that are based on VMware.

Configuration options aligned to a range of needs

No-charge and no-support option

All editions of WebSphere Application Server have a no-charge entitlement for development. WebSphere Application Server traditional and Liberty provide a no-charge and no-support option for web-centric applications for use in test and production environments. Usage in test and production environments is restricted to a maximum of 2 GB of JVM heap size across all instances of application servers for the licensee. IBM provides an in-place option to upgrade from a no-charge, no-support to other WebSphere Application Server editions.

WebSphere Application Server Liberty Core V9.0

WebSphere Application Server Liberty Core V9.0 is a lightweight and dynamic offering that is Java EE 7 Web Profile compliant. It enables rapid development and deployment of web and mobile-centric applications allowing businesses to quickly respond to enterprise and market needs. Liberty Core profile servers can be members of collectives that can be managed by a collective controller from a Network Deployment installation. Liberty Core capabilities are a subset of those provided in the WebSphere Application Server and Network Deployment. Highlights include:

- Fast time-to-value through an extremely lightweight offering that is composed of a subset of the Java EE 7 Web Profile, making it an excellent production and development runtime for web applications
- A turnkey solution for entering the API economy through its support for IBM API Connect, helping to easily create, discover, and publish APIs, while also integrating with API Management
- Composable, small download, small footprint, and fast startup easily packaged applications (includes configuration) for deployment, extensible through Liberty features SPI

WebSphere Application Server V9.0

WebSphere Application Server, which includes traditional and Liberty, is a flexible solution for configurations supporting departmental or large-scale, dynamic web applications that require web tier clustering and failover across application server instances. The Liberty runtime

includes a superset of capabilities found in WebSphere Application Server Liberty Core V9.0, providing additional programming models, such as Web Services, full JEE, and Java Message Service. It enables web request load balancing across servers, and includes WebSphere eXtreme Scale with support for session distribution and DynaCache.

WebSphere Application Server Network Deployment V9.0

WebSphere Application Server Network Deployment which includes traditional and Liberty offers enterprises near-continuous availability, advanced management, and automated performance optimization for their mission-critical applications. Its capabilities include a superset of those found in WebSphere Application Server. It offers:

- World-class, clustering and high-availability management to help minimize the cost of system downtime
- Auto-scaling, auto-routing, and Internet-scale clustering for intelligent and efficient management of compute resources
- Enterprise-level, Java batch capabilities, such as parallel job processing, job checkpoints and restart, workload management, and shared OLTP and batch processing, to support batch modernization and modern batch projects
- Advanced centralized management and administration to make management of more complex environments less time-consuming and resource-consuming
- High performance that maximizes business competitiveness while minimizing total cost of ownership
- Liberty collective cluster administration that improves resiliency of server and provides high availability for mission-critical application
- Distributed caching through WebSphere eXtreme Scale that provides responsiveness to enterprise, cloud, and mobile application

WebSphere Application Server Family Edition V9.0

The WebSphere Application Server Family Edition brings together the following key WebSphere Application Server products that are bundled under a common license entitlement.

- WebSphere Application Server Network Deployment, which includes the Network Deployment editions of both traditional WebSphere and Liberty application servers
- WebSphere Application Server, which includes the single server editions of both the traditional and Liberty application servers
- WebSphere Application Server Liberty Core

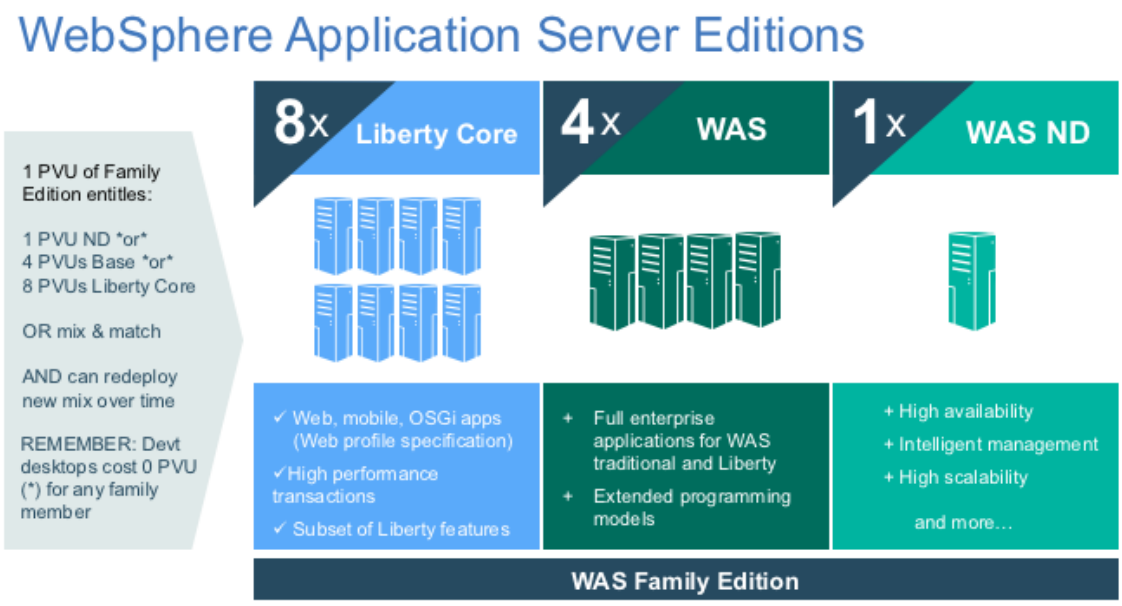
WebSphere Application Server Family Edition gives you the flexibility to deploy the application server edition that is specific to your business needs. It also allows you to easily adjust the mix of products deployed from the bundle as the needs of your business change without additional charges.

WebSphere Application Server for z/OS®, V9.0

WebSphere Application Server for z/OS offers all the capabilities that are available in the WebSphere Application Server Network Deployment. Most notably, it takes advantage of the unique qualities of service of IBM z Systems™ hardware and the z/OS operating system, such as policy-driven workload management, advanced transactional integrity, unsurpassed scalability and availability, built-in enterprise security capabilities, and more. It also includes z/OS -specific features that large enterprise customers value, such as z/OS Connect and WebSphere optimized local adapters. Highlights of V9.0 include:

- Installation improvements, including a reduction in the installation package size
- Product customization simplification and improvements
- A total transition to 64-bit for WAS for z/OS
- A number of Liberty on z/OS WOLA enhancements, including support for IMS two phase commit global transactions

WAS



WAS configuration features and functions comparison matrix

WebSphere Application Server editions

*2Q - 2016

Capability	WAS Liberty Core	WAS V9 (Base)		WAS ND and WAS for z/OS	
		Liberty	Traditional	Liberty	Traditional
Java EE7 Web profile + JDBC + OSGI	✓	✓		✓	
Java EE6 Web profile + JAX-RS + JDBC + OSGI	✓	✓	✓	✓	✓
Full Platform Java EE7		✓	✓	✓	✓
Full Platform Java EE6			✓		✓
API Connect Essential entitlement	(A0) ✓	(A0) ✓	(A0) ✓	(A0) ✓	(A0) ✓
Java Platform, Standard Edition 8	✓	✓	✓	✓	✓
Fidelity from Liberty to full WAS	✓	✓	✓	✓	✓
Optional provisioning & management through ND job manager	✓	✓	✓	✓	✓
IHS routing and Load balancing (# of servers allowed)	2 (A1) ✓	25(A1) ✓	25(A1) ✓	Unlimited	Unlimited
SPI (allows 3rd party extensions to Liberty features)	✓	✓		✓	
Zip or Archive install	✓	✓		✓	
Collective Controller Membership and Management	✓	✓		✓	
Programming model support for SIP , WebRTC		✓	SIP only	✓	SIP only
WXS entitlement (PVUs dependent on joint or separate installs) - **Joint:** WXS and WAS can share up to the entitled WAS PVUs - **Separate:** WAS PVUs plus WXS PVUs cannot exceed entitled WAS PVUs		(A2) ✓	(A2) ✓	(ND: A3) ✓ (zOS: A4)	(ND: A3) ✓ (zOS: A4)
Edge of Network Services				✓	✓
Liberty z/OS extensions (WOLA, z/OS Connect)				X(z/OS) ✓	
Intelligent Management (dynamic cluster, Edition Management., Health Policy)				(A5) ✓	✓
WebSphere App Server Developer Tools (Java EE, OSGI)	(A6) ✓	(A6) ✓	(A6) ✓	(A6) ✓	(A6) ✓
Rational Application Developer (for WAS v9)	(A7) ✓	(A7) ✓	(A7) | SOD	(A7) ✓	(A7) | SOD

- ✓ **(A0)** Usage of the API Connect Essentials server is unrestricted, and entitlement provides for up to 500 Monthly API Calls per WebSphere Application Server Processor Value Unit (PVU) purchased.
- ✓ **(A1)** Unlimited in v8.5.5 and above
- ✓ **(A2)** WXS capabilities are limited to HTTP session management and DynaCache , and can only be used in support of entitled WAS
- ✓ **(A3)** WXS capabilities are not limited, and can be used in support of entitled WAS or for other purposes
- ✓ **(A4)** WXS capabilities are limited to only the WXS client on z/OS
- ✓ **(A5)** Intelligent Management Assisted Lifecycle Management in WAS-ND cell, Dynamic Routing, Auto-scaling & Health management in WAS-ND Collective
- ✓ **(A6)** Available from the Eclipse Marketplace or WASdev
- ✓ **(A7)** Customers need to purchase separate entitlement outside WAS

  Note: Support for CEA, and CG programming model is limited to WAS traditional

- WAS Express, WAS HV and WAS for Developers are NOT available with WAS V9.
- Life cycle for WAS Express, WAS HV and WAS for Developers prior to WAS v9 is not impacted.
- WAS Express 7 and 8.x customers are eligible for trade up to WAS v9 (base)
- WAS Express 8.5.5 limited to 480 PVUs per machine (physical or virtual)
- SCA, Web2.0 and Mobile toolkit- are removed from WAS v9