Overview of IBM PureSystems

During the last 100 years, information technology has moved from a specialized tool to a pervasive influence on nearly every aspect of life. From tabulating machines that simply counted with mechanical switches or vacuum tubes to the first programmable computers, IBM® has been a part of this growth, while always helping customers to solve problems.

IT is a constant part of business and of our lives. IBM expertise in delivering IT solutions has helped the planet become smarter. As organizational leaders seek to extract more real value from their data, business processes, and other key investments, IT is moving to the strategic center of business.

To meet those business demands, IBM is introducing a new category of system--systems that combine the flexibility of general-purpose systems, the elasticity of cloud computing, and the simplicity of an appliance that is tuned to the workload. Expert integrated systems are essentially the building blocks of capability. This new category of systems represents the collective knowledge of thousands of deployments, established best practices, innovative thinking, IT leadership, and distilled expertise.

The IBM PureSystems™ offerings are designed to deliver value in the following ways:

- Built-in expertise helps you to address complex business and operational tasks automatically.

- Integration by design helps you to tune systems for optimal performance and efficiency.

- Simplified experience, from design to purchase to maintenance, creates efficiencies quickly.

The IBM PureSystems offering are optimized for performance and virtualized for efficiency. These systems offer a no-compromise design with system-level upgradeability. IBM PureSystems is built for cloud, containing built-in flexibility and simplicity.

At IBM, expert integrated systems come in three types:

- IBM PureFlex™ System: Infrastructure systems deeply integrate the IT elements and expertise of your system infrastructure.

- IBM PureApplication™ System: Platform systems include middleware and expertise for deploying and managing your application platforms

- IBM PureData System. Systems designed for Big Data and analytics that are optimized for transaction processing, reporting analytics and operational analytics environments.

IBM PureFlex System

To meet today's complex and ever-changing business demands, you need a solid foundation of server, storage, networking, and software resources that are simple to deploy and hat can quickly and automatically adapt to changing conditions. You also need access to, and the ability to take advantage of, broad expertise and proven best practices in systems management, applications, hardware maintenance, and more.

IBM PureFlex System is a comprehensive infrastructure system that provides an expert integrated computing system, combining servers, enterprise storage, networking, virtualization, and management into a single structure. Its built-in expertise enables organizations to simply manage and flexibly deploy integrated patterns of virtual and hardware resources through unified management. These systems are ideally suited for customers interested in a system that delivers the simplicity of an integrated solution but who also want control over tuning middleware and the run-time environment.

IBM PureFlex System recommends workload placement based on virtual machine compatibility and resource availability. Using built-in virtualization across servers, storage, and networking, the infrastructure system enables automated scaling of resources and true workload mobility.

IBM PureFlex System undergoes significant testing and experimentation, so it can mitigate IT complexity without compromising the flexibility to tune systems to the tasks that businesses demand. By providing both flexibility and simplicity, IBM PureFlex System can provide extraordinary levels of IT control, efficiency, and operating agility that enable businesses to rapidly deploy IT services at a reduced cost. Moreover, the system is built on decades of expertise, enabling deep integration and central management of the comprehensive, open-choice infrastructure system and dramatically cutting down on the skills and training required for managing and deploying the system.

IBM PureFlex System combines advanced IBM hardware and software along with patterns of expertise and integrates them into three optimized configurations that are simple to acquire and deploy so you get fast time to value for your solution.

The three PureFlex System configurations are:

- IBM PureFlex System Express: Designed for small and medium businesses. The most affordable entry point for PureFlex System.

- IBM PureFlex System Standard: Optimized for application servers with supporting storage and networking, and is designed to support your key ISV solutions.

- IBM PureFlex System Enterprise: Optimized for transactional and database systems and has built-in redundancy for highly reliable and resilient operation to support your most critical workloads.

These are summarized in the following table.

Table 1. IBM PureFlex System

Component	IBM PureFlex System Express	IBM PureFlex System Standard	IBM PureFlex System Enterprise
IBM PureFlex System 42U Rack	1	1	1
IBM Flex System™ Enterprise Chassis	1	1	1
IBM Flex System Fabric EN4093 10Gb Scalable Switch	1	1	2 with both port-count upgrades
IBM Flex System FC3171 8Gb SAN Switch, or IBM Flex System FC5022 24-port 16Gb ESB SAN Scalable Switch	1	2	2
IBM Flex System Manager Node	1	1	1
IBM Flex System Manager software license	IBM Flex System Manager with 1-year service and support	IBM Flex System Manager Advanced with 3-year service and support	Flex System Manager Advanced with 3-year service and support
Chassis Management Module	2	2	2
Chassis power supplies (std/max)	2 / 6	4 / 6	6 / 6
Chassis 80 mm fan modules (std/max)	4 / 8	6 / 8	8 / 8
IBM Flex System V7000 Storage Node, or IBM Storwize® V7000 Disk System	Yes (redundant controller)	Yes (redundant controller)	Yes (redundant controller)
IBM Storwize V7000 Software	Base with 1-year software maintenance agreement Optional Real Time Compression	Base with 3-year software maintenance agreement Optional Real Time Compression	Base with 3-year software maintenance agreement Optional Real Time Compression

The fundamental building block of IBM PureFlex System solutions is the IBM Flex System Enterprise Chassis complete with compute nodes, networking, and storage.

For more details about IBM PureFlex System, see the IBM Redbooks® publication *IBM PureFlex System Products & Technology*, SG24-7984, available here:
http://www.redbooks.ibm.com/abstracts/sg247984.html?Open

IBM PureApplication System

IBM PureApplication System is a platform system that pre-integrates a full application platform set of middleware and expertise in with the IBM PureFlex System with a single management console. It is a workload-aware, flexible platform that is designed to be easy to deploy, customize, safeguard, and manage in a traditional or private cloud environment, ultimately providing superior IT economics.

With the IBM PureApplication System, you can provision your own patterns of software, middleware, and virtual system resources. You can provision these patterns within a unique framework that is shaped by IT best practices and industry standards—standards that have been culled from many years of IBM experience with clients and from a deep understanding of smarter computing. These IT best practices and standards are infused throughout the system.

With IBM PureApplication System:

- IBM builds expertise into preintegrated deployment patterns, which can speed the development and delivery of new services.

- By automating key processes, such as application deployment, PureApplication System built-in expertise capabilities can reduce the cost and time required to manage an infrastructure.

- Built-in application optimization expertise reduces the number of unplanned outages through best practices and automation of the manual processes identified as sources of those outages.

- Administrators can use built-in application elasticity to scale up or to scale down automatically. Systems can use data replication to increase availability.

Patterns of expertise can automatically balance, manage, and optimize the elements necessary, from the underlying hardware resources up through the middleware and software. These patterns of expertise help deliver and manage business processes, services, and applications by encapsulating best practices and expertise into a repeatable and deployable form. This best-practice knowledge and expertise has been gained from decades of optimizing the deployment and management of data centers, software infrastructures, and applications around the world.

These patterns help you achieve the following types of value:

- Agility: As you seek to innovate to bring products and services to market faster, you need fast time-to-value. Expertise built into a solution can eliminate manual steps, automate delivery, and support innovation.

- Efficiency: To reduce costs and conserve valuable resources, you must get the most out of your systems with energy efficiency, simple management, and a fast, automated response to problems. With built-in expertise, you can optimize your critical business applications and get the most out of your investments.

- Increased simplicity: You need a less complex environment. Patterns of expertise can help you easily consolidate diverse servers, storage, and applications onto an easier-to-manage, integrated system.

- Control: With optimized patterns of expertise, you can accelerate cloud implementations to lower risk by improving security and reducing human error.

IBM PureApplication System is available in three classes:

- W1500-32 and W1500-64, using Intel Xeon E5-2670 processors, housed in a 25U rack
- W1500-96 through to W1500-608, using Intel Xeon E5-2670 processors, housed in a 42U rack
- W1700-96 through to W1700-608, using IBM POWER7+ processors, housed in a 42U rack

These configuration options enable clients to choose the size and compute power that meets needs for application infrastructure. They can upgrade within class to the next size when their organization requires more capacity, and in most cases, can do so without taking an application downtime.

The following three table provides a high-level overview of the configurations.

Table 2. IBM PureApplication System W1500 configurations

IBM PureApplication W1500	IBM PureApplication System W1500-32 25U Rack	IBM PureApplication System W1500-64 25U Rack
Cores (Intel Xeon processors)	32	64
RAM	0.5 TB	1.0 TB
SSD Storage	2.4 TB	2.4 TB
HDD Storage	24.0 TB	24.0 TB
Application Services Entitlement	Included	Included

Table 3. IBM PureApplication System W1500 configurations

IBM PureApplication W1500	IBM PureApplication System W1500-96 42U Rack	IBM PureApplication System W1500-192 42U Rack	IBM PureApplication System W1500-384 42U Rack	IBM PureApplication System W1500-608 42U Rack
Cores (Intel Xeon processors)	96	192	384	608
RAM	1.5 TB	3.1 TB	6.1 TB	9.7 TB
SSD Storage	6.4 TB	6.4 TB	6.4 TB	6.4 TB
HDD Storage	48.0 TB	48.0 TB	48.0 TB	48.0 TB
Application Services Entitlement	Included	Included	Included	Included

Table 4. IBM PureApplication System W1700 configurations

IBM PureApplication W1700	IBM PureApplication System W1700-96 42U Rack	IBM PureApplication System W1700-192 42U Rack	IBM PureApplication System W1700-384 42U Rack	IBM PureApplication System W1700-608 42U Rack
Cores (IBM POWER7+ processors)	96	192	384	608
RAM	1.5 TB	3.1 TB	6.1 TB	9.7 TB
SSD Storage	6.4 TB	6.4 TB	6.4 TB	6.4 TB
HDD Storage	48.0 TB	48.0 TB	48.0 TB	48.0 TB
Application Services Entitlement	Included	Included	Included	Included

For more information about IBM PureApplication, see this URL:
http://www.ibm.com/ibm/puresystems/us/en/pf_pureapplication.html

IBM PureData System

With the challenge of growing volume, velocity and variety of data used today in all aspects of the business, using a multi-purpose systems for all data workloads is often not the most cost effective or low risk approach, and definitely not the fastest to deploy.

PureData System is optimized exclusively for delivering data services to today's demanding applications. Like IBM PureApplication System, it offers built-in expertise, integration by design, and a simplified experience throughout its life cycle. Features include:

- Built-in expertise

  Data management best practices are provided for each workload. PureData System delivers automated pattern-based deployment and management of highly reliable and scalable database services.

- Integration by design

  Hardware, storage and software capabilities are designed and optimized for specific high performance data workloads such as patented data filtering using programmable hardware for ultrafast execution of analytic queries without the need for indices.

- Simplified experience

  The PureData System provides single part procurement with no assembly required (ready to load data in hours), open integration with third-party software, integrated management console for the entire system, single line of support, and integrated system upgrades and maintenance.

PureData System comes in different models that have been designed, integrated and optimized to deliver data services to today's demanding applications with simplicity, speed and lower cost.

IBM PureData System is available in four offerings:

- IBM PureData System for Transactions
- IBM PureData System for Analytics
- IBM PureData System for Operational Analytics
- IBM PureData System for Hadoop

IBM PureData System for Transactions

PureData System for Transactions contains factory-integrated and optimized server, storage, network and software resources selected specifically for online transactional processing (OLTP) workloads. The hardware and software are designed, integrated and tuned to support high-volume transactional processing applications with high scalability, high reliability and consistent response time with high throughput.

The IBM PureData System is a perfect companion to the IBM PureApplication System. While both systems provide data services, PureApplication System provides standard database availability and performance. If an application requires higher levels of scalability and availability, PureApplication System can automatically deploy the database to PureData System to meet higher levels of service. This policy-driven, cross-system integration simplifies database management by placing databases on the system best able to meet the applications needs.

The following table shows the configurations available for PureData System for Transactions.

Table 5. PureData System for Transactions

Specifications	Small (Quarter Rack)	Medium (Half Rack)	Large (Full Rack)
IBM Flex System Enterprise Chassis	1	1	2
IBM Flex System x240 Compute Nodes • Two Intel Xeon E5-2670 8C 2.6 GHz processors • One EN4132 2-Port 10Gb Adapter with RoCE support • One FC3172 2-port 8Gb FC Adapter	6	12	24
IBM System Networking RackSwitch™ G8264 • 48 ports SFP+, 4 ports QSFP+	2	2	2
Total cores	96	192	384
Total memory	1.5 TB	3.1 TB	6.2 TB
IBM Storwize V7000 Disk Units	1	2	4
IBM Storwize V7000 Disk expansion units	1	2	4
Unformatted HDD storage capacity (400 GB drives)	4.8 TB	9.6 TB	19.2 TB
Unformatted HDD storage Capacity (900 GB drives)	32TB	64 TB	128 TB
Power consumption	5.6 KW	9 KW	16.6 KW
Cooling	19,000 BTU/Hr	31,000 BTU/Hr	57,000 BTU/Hr
Weight	531 kg	636 kg	950 kg

For more information on IBM The PureData System for Analytics see this URL:
http://www.ibm.com/ibm/puresystems/us/en/pd_transactions.html

IBM PureData System for Analytics

PureData System for Analytics, powered by Netezza® technology, is a simple data appliance for serious analytics. It simplifies and optimizes performance of data services for analytic applications, enabling very complex algorithms to run in minutes not hours. This system is designed specifically for running complex analytics on very large data volumes.

PureData System for Analytics delivers the proven performance, scalability, intelligence, and simplicity aligned to business needs. It is a low cost option requiring minimal ongoing administration or tuning, for a low total cost of ownership (TCO).

The following table shows the specifications of the PureData System for Analytics.

Table 6. PureData System for Analytics

Specifications	Single rack systems			Multi-rack systems	
	N10001-002	N1001-005	N1001-101	2 Racks	3+ Racks
Racks	1	1	1	2	3 - 10
Active S-Blades	4	7	14	28	# racks x 14
CPU cores	32	56	112	224	# racks x 112
FPGA cores	32	56	112	224	# racks x 112
User data	32 TB	64 TB	128 TB	256 TB	# racks x 128 TB
Power/rack	2820 W	3960 W	7635 W	7400 W	7000 W
Cooling/rack (BTU/Hr)	9600 BTU/Hr	13,500 BTU/Hr	26,100 BTU/Hr	25,500 BTU/Hr	24,000 BTU/Hr
Weight/Rack	454 kg	590 kg	907 kg	907 kg	907 kg

For more information on IBM The PureData System for Analytics see this URL:
http://www.ibm.com/ibm/puresystems/us/en/pd_analytics.html

IBM PureData System for Operational Analytics

The PureData System for Operational Analytics is a data warehouse system for delivering insights to business operations for real-time decision-making. It is optimized to handle complex analytics and designed to handle large numbers of concurrent operational queries.

With in-database analytics, you run analytics on your data where it resides - in the warehouse. This eliminates the time, cost and risk associated with copying data out of the warehouse to analyze it.

Using multidimensional cubing services, this PureData System delivers rapid insight into high volumes of fast-moving data. Users can create, edit, import, export and deploy cube models over the relational warehouse schema to analyze multiple business variables. Cubing services help optimize performance for online analytical processing (OLAP) queries, providing more power for users to analyze data and generate business insight, providing the potential to enhance both profitability and customer satisfaction

The following table shows the specifications of the PureData System for Analytics.

Table 7. PureData System for Operational Analytics

Specification	Extra Small	Small	Medium	Large
Contains:	• Foundation rack • 1 foundation module	• Foundation rack + 1/3 Rack • 1 foundation node • 1 data node	• Foundation + 2/3 Rack • 1 foundation node • 2 data nodes	• Foundation + full rack • 1 foundation node • 3 data nodes
Cores	32	64	80	96
Memory	256 GB	512 GB	640 GB	768 GB
SSD Storage	4.8 TB	9.6 TB	12 TB	14.4 TB
HDD unformatted storage	64.8 TB	151.2 TB	237.6 TB	324 TB
HDD RAID capacity	54 TB	126 TB	198 TB	270 TB
HDD user data uncompressed	29.7 TB	69.3 TB	108.9 TB	148.5 TB
Primary servers	1	2	3	4
Standby servers	1	2	2	2
Uncompressed disk bandwidth • 3.2 GB/s for each foundation node • 6.4 GB/s for each data node	3.2 GB/s	9.6 GB/s	16 GB/s	22.4 GB/s
Database disk performance	34K IOPS	57K IOPS	148K IOPS	205K IOPS
Data load rate - Uncompressed	1,161 GB/h	3,484 GB/h	5807 GB/h	8130 GB/h
Data load rate - Compressed	890 GB/h	2,670 GB/h	4,450 GB/h	6,230 GB/h
Database software and tools	IBM Data Warehousing and analytics software entitlements included			
Processors and operating system	IBM POWER7® with AIX®			
Max power - foundation rack	6196 W	6196 W	6196 W	6196 W
Max power - data rack	Not applicable	4647 W	7551 W	10,454 W
Cooling - foundation rack	14160 BTU/h	14160 BTU/h	14160 BTU/h	14160 BTU/h
Cooling - data rack	Not applicable	11601 BTU/h	19543 BTU/h	27467 BTU/h
Weight - foundation rack	658 Kg	658 Kg	658 Kg	658 Kg
Weight - data rack	Not applicable	567 Kg	749 Kg	976 Kg

For more information on IBM The PureData System for Operational Analytics see this URL:
http://www.ibm.com/ibm/puresystems/us/en/pd_operational_analytics.html

IBM PureData System for Hadoop

The PureData System for Hadoop is a purpose-built, standards-based, expert integrated system that architecturally integrates IBM InfoSphere BigInsights Hadoop-based software, server, and storage into a single, easy-to-manage system that can accelerate time to value.

IBM PureData System for Hadoop combines IBM InfoSphere BigInsights and IBM System x hardware for an integrated Hadoop system. It delivers enterprise Hadoop capabilities with easy-to-use analytic tools and visualization for business analysts and data scientists. It includes rich developer tools, powerful analytic functions, and exceptional administration and management capabilities, as well as the latest versions of Hadoop and associated projects. In addition, IBM PureData System for Hadoop provides extensive capabilities with enhanced big data tools for monitoring, development, and integration with many more enterprise systems.

IBM PureData System for Hadoop:

- Provides an exploratory environment for data analysts to help understand new and emerging data sources
- Provides a landing area for data from other sources, enabling aggregation, initial integration, visualization, and exploration before data moves to other parts of the analytic ecosystem
- Provides an integrated management console for the entire system
- Provides built-in analytics and enterprise functionality, on top of Hadoop technology, to help meet big data enterprise requirements
- Integrates advanced hardware cluster management capabilities with IBM InfoSphere BigInsights
- Incorporates integrated data archiving and transfer capabilities with connectivity to enterprise data warehouse systems
- Integrates with IBM DB2, IBM Netezza, IBM PureData System for Analytics, and IBM InfoSphere Guardium

The following table shows the specifications of the PureData System for Hadoop

Table 8. PureData System for Hadoop

Specification	42U Rack
Management nodes (1 primary, 1 standby)	2 IBM System x3550 M4 servers with two 8-core Intel Xeon processors at 2.4 GHz, 128 GB RAM, three 3 TB 3.5" drives
Data nodes	18 IBM System x3630 M4 severs with two 6-core Intel Xeon processors at 2.2 GHz, 96 GB of RAM, 14x 3 TB 3.5" drives
Total processor cores	216 cores
Memory	96 GB per node, 1,728 GB total
Raw space	216 drives, 3 TB each. 648 TB total
User space	216 TB uncompressed / 864 TB compressed
Management switch	48 ports, each 1 Gb Ethernet
Rack switch	48 ports each 10 Gb Ethernet, 4 ports each 40 Gb Ethernet
Power requirements	9.6 kW
Cooling requirements	32,757 BTU/hr

For more information on IBM PureData System for Hadoop see this URL:
http://www.ibm.com/software/data/puredata/hadoop/

IBM Flex System: The building blocks

PureData System for Transactions, PureApplication and PureFlex system are based on the IBM Flex System platform. IBM Flex System is designed for multiple generations of technology, supporting your workload today while being ready for the future demands of your business.

Management

IBM Flex System Manager is designed to optimize the physical and virtual resources of the IBM Flex System infrastructure while simplifying and automating repetitive tasks. From easy system setup procedures with wizards and built-in expertise, to consolidated monitoring for all of your resources (compute, storage, networking, virtualization, and energy), IBM Flex System Manager provides core management functionality along with automation. It is an ideal solution that allows you to reduce administrative expense and focus your efforts on business innovation.

From a single user interface you get:

- Intelligent automation
- Resource pooling
- Improved resource utilization
- Complete management integration
- Simplified setup

Compute nodes

Taking advantage of the full capabilities of IBM POWER7® processors or Intel Xeon processors, the compute nodes are designed to offer the performance that you need for your critical applications.
With support for a range of hypervisors, operating systems, and virtualization environments, the compute nodes provide the foundation for:

- Virtualization solutions
- Database applications
- Infrastructure support
- Line of business applications

Storage

The storage capabilities of IBM Flex System give you advanced functionality with storage nodes in your system, and take advantage of your existing storage infrastructure through advanced virtualization.

Storage is available either integrated within the chassis using the IBM Flex System V7000 Storage Node that integrates inside the Flex System Chassis, or externally using the IBM Storwize V7000.

IBM Flex System simplifies storage administration with a single user interface for all your storage with a management console that is integrated with the comprehensive management system. These management and storage capabilities allow you to virtualize third-party storage with non-disruptive migration of the current storage infrastructure. You can also take advantage of intelligent tiering so you can balance performance and cost for your storage needs. The solution also supports local and remote replication and snapshots for flexible business continuity and disaster recovery capabilities.

Networking

The range of available adapters and switches to support key network protocols allow you to configure IBM Flex System to fit in your infrastructure. However, you can do so without sacrificing being ready for the future. The networking resources in IBM Flex System are standards-based, flexible, and fully integrated into the system. This combination gives you no-compromise networking for your solution. Network resources are virtualized and managed by workload. And these capabilities are automated and optimized to make your network more reliable and simpler to manage.

IBM Flex Systems gives you these key networking capabilities:

- Supports the networking infrastructure you have today, including Ethernet, Fibre Channel, FCoE, and InfiniBand

- Offers industry-leading performance with 1 Gb, 10 Gb, and 40 Gb Ethernet; 8 Gb and 16 Gb Fibre Channel; and FDR InfiniBand

- Provides pay-as-you-grow scalability so you can add ports and bandwidth when needed

Infrastructure

The IBM Flex System Enterprise Chassis is the foundation of the offering, supporting intelligent workload deployment and management for maximum business agility. The 14-node, 10U chassis delivers high-performance connectivity for your integrated compute, storage, networking, and management resources. The chassis is designed to support multiple generations of technology and offers independently scalable resource pools for higher utilization and lower cost per workload.

More information

For more information about IBM Flex System, see:

- IBM PureSystems home page
  http://ibm.com/puresystems

- *IBM Flex System Products & Technology*, SG24-7984
  http://www.redbooks.ibm.com/abstracts/sg247984.html?Open

- Product guides about the components of IBM Flex System
  http://www.redbooks.ibm.com/portals/puresystems?Open&page=pgbycat

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This document was created or updated on September 20, 2013.

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