IBM z Systems

zSystems Q2 Launch

Java, WebSphere and Operational Decision Manager update for System z

June 2015
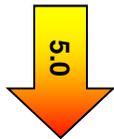
IBM

Java road map

IBM z Systems
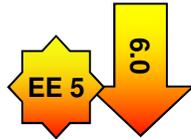
IBM

Language Updates

Java 5.0
- New Language features:
  - Autoboxing
  - Enumerated types
  - Generics
  - Metadata

Java 6.0
- Performance Improvements
- Client WebServices Support

Java 7.0
- Support for dynamic languages
- Improve ease of use for SWING
- New IO APIs (NIO2)
- Java persistence API
- JMX 2.x and WS connection for JMX agents
- Language Changes

Java 8.0**
- Language improvements
- Closures for simplified fork/join

IBM Java 8 (J9 R28)
- Improvements in
  - Performance
  - RAS
  - Monitoring
- z13™ Exploitation
  - SIMD
  - SMT
  - Crypto acceleration

SE8 >= 20 platforms

5.0 | EE 5 | 6.0 | EE 6.x | 7.0

| 04 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |

WAS 6.0

SE 5.0 18 platforms

WAS 6.1

SE 6.0 20 platforms

WAS 7.0

SE601/ 7.x >= 20 platforms

WAS 8.5

SE601/ 7.x >= 20 platforms

IBM Java 7R1 (J9 R27)
- Improvements in
  - Performance
  - RAS
  - Monitoring
- zEC12™ Exploitation
  - zEDC for zip acceleration
  - SMC-R integration
  - Transactional Execution
  - Runtime instrumentation
  - Hints/traps
- Data Access Accelerator

IBM Java Runtimes

IBM Java 5.0 (J9 R23)
- Improved performance
  - Generational Garbage Collector
  - Shared classes support
  - New J9 Virtual Machine
  - New Testarossa JIT technology
- First Failure Data Capture
- Full Speed Debug
- Hot Code Replace
- Common runtime technology
  - ME, SE, EE

IBM Java 6.0 (J9 R24)
- Improvements in
  - Performance
  - Serviceability tooling
  - Class Sharing
- XML parser improvements
- z10™ Exploitation
  - DFP exploitation for BigDecimal
  - Large Pages
  - New ISA features

IBM Java 6.0.1/Java 7 (J9 R26)
- Improvements in
  - Performance
  - GC Technology
- z196™ Exploitation
  - OOO Pipeline
 - 70+ New Instructions
- JZOS/Security Enhancements

IBM Java 7 (J9 R26 SR3)
- Improvements in
  - Performance
- zEC12™ Exploitation
  - Transactional Execution
  - Flash 1Meg pageable LPs
  - 2G large pages
  - Hints/traps

IBM z13: SMT – Simultaneous Multi-Threading

- **Double the number of hardware threads per core**
  - Independent threads can be more effective utilizing pipeline
  - Only on zIIPs and IFL's

- **Threads share resources – may impact single thread perf**
  - Pipeline (eg. physical registers, fxu, fpu, lsu etc)
  - Cache

Two zIIP lanes handle more traffic overall
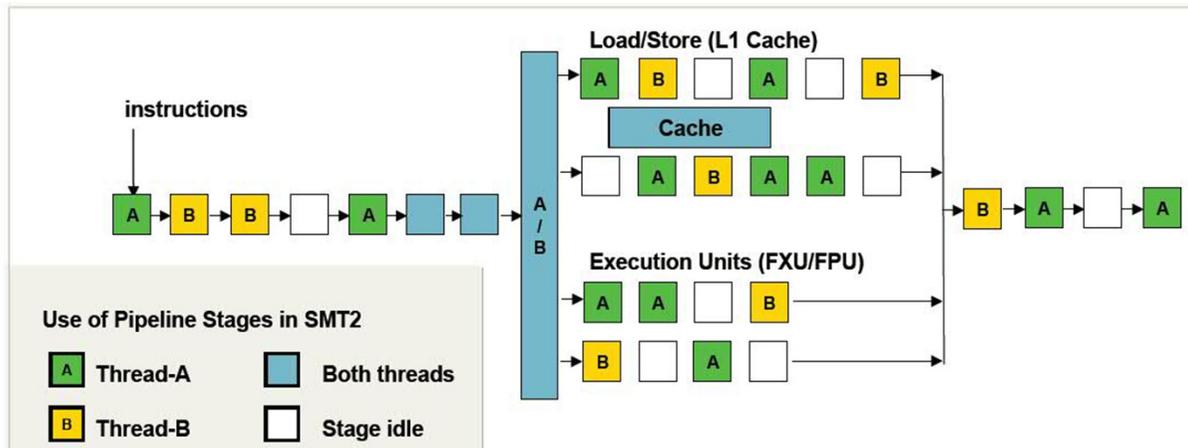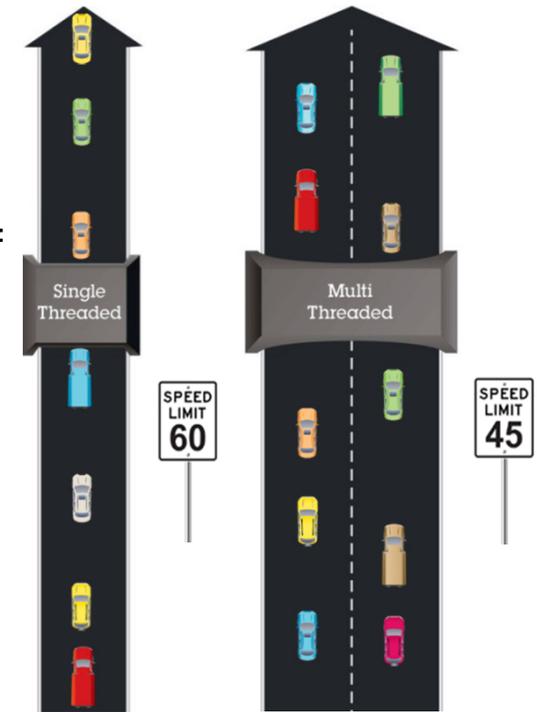
Significant improvements due to hardware and software

History of WAS on z/OS Hardware/Software Performance
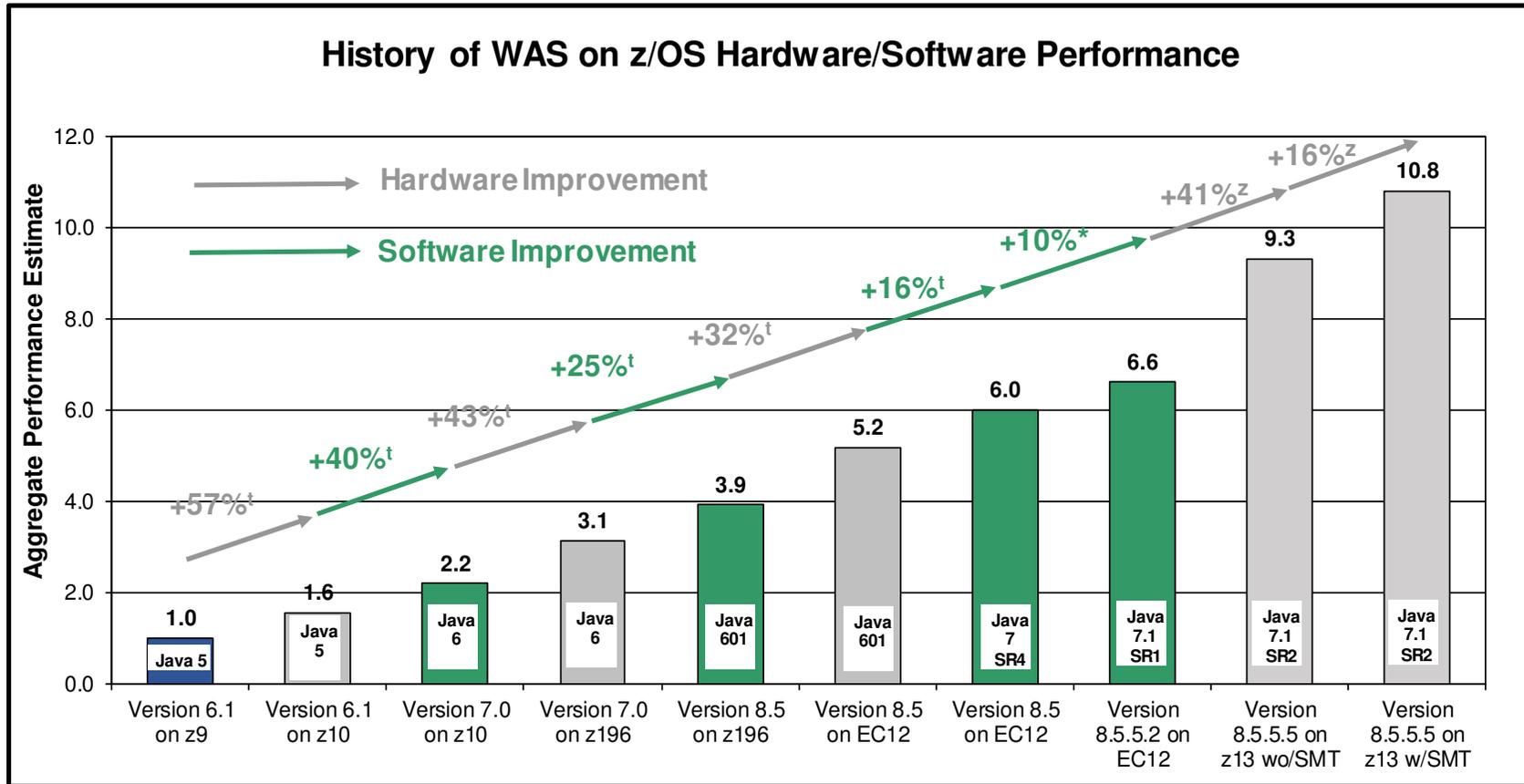
z   zIIPs DayTrader 3
*   DayTrader3
t   DayTrader2

Customer experience - WAS on z/OS V7.0.27 vs V8.5.5.1 migration

- USA HCSC
  - Health Care company

- Application #1
  - MDB Application in 64 bit mode.
  - MDB response times went down 25-30% and throughput increased, using a little more CPU

- Application #2
  - MDB Application in 64 bit mode.
  - 15-20% CPU reduction

- Application #3
  - Java Application that is being converted from COBOL, running in CICS.
  - 28% CPU reduction

Liberty – Use the features you need

Install and Repository

Repository only

zOS			
zosSecurity-1.0	zosTransaction-1.0	zosWlm-1.0	zosConnect-1.0
			zosLocalAdapters-1.0

ND		
collectiveController-1.0	clusterMember-1.0	scalingController-1.0
		scalingMember-1.0
		dynamicRouting-1.0

Base

wsSecurity-1.1	wasJmsServer-1.0	mongodb-2.0		jms-1.1
jaxb-2.2	wmqJmsClient-1.1	jmsMdb-3.1	mdb-3.1	jcaInboundSecurity-1.6
jaxws-2.2	wasJmsClient-1.1	wasJmsSecurity-1.0	couchdb-1.0	jca-1.6

Core

	ldapRegistry-3.0			
jaxrs-1.1	collectiveMember-1.0	osgiConsole-1.0		adminCenter-1.0
json-1.0	restConnector-1.0	oauth-2.0		osgiAppIntegration-1.0
concurrent-1.0	monitor-1.0	timedOperations-1.0		openid-2.0
wab-1.0	sessionDatabase-1.0	webCache-1.0		openidConnectClient-1.0
blueprint-1.0	serverStatus-1.0	distributedMap-1.0	spnego-1.0	openidConnectServer-1.0

New in 1Q15

Web Profile

ejbLite-3.1	jdbc-4.0	ssl-1.0	jdbc-4.1	
jsf-2.0	jndi-1.0	beanValidation-1.0	websocket-1.1	websocket-1.0
jsp-2.2	appSecurity-2.0	cdi-1.0	el-3.0	jsonp-1.0
servlet-3.0	managedBeans-1.0	jpa-2.0	jsp-2.3	servlet-3.1

Liberty on z/OS trial:
http://www.ibm.com/developerworks/downloads/ws/waszosliberty/

WAS and Java EE 7

"IBM intends to certify WebSphere Application Server to Java EE 7 full platform compliance.

WebSphere Application Server has made good progress towards this with the WebSphere Application Server Liberty profile features that were made available in WebSphere Liberty Repository through the continuous delivery model.

WebSphere Application Server Liberty profile intends to complete Java EE 7 full platform compliance by using this approach.

In addition, it remains the intention of IBM to certify WebSphere Application Server full profile to Java EE 7 full platform compliance."

- IBM Statement of Direction, RFA 61349 , 02/17/15

Liberty – full J2EE 7 support – GA 26 June 2015

zOS				
zosSecurity-1.0	zosTransaction-1.0	zosLocalAdapters-1.0	zosWlm-1.0	zosConnect-1.0

ND			
scalingController-1.0	collectiveController-1.0		dynamicRouting-1.0
scalingMember-1.0	clusterMember-1.0		

Base

batch-1.0	appClientSupport-1.0	javaeeClient-7.0		ejbHome-3.2
ejb-3.2	j2eeManagement-1.1	ejbPersistentTimer-3.2	jacc-1.5	ejbRemote-3.2
wsSecurity-1.1	wasJmsServer-1.0	mongodb-2.0	jaspic-1.1	jms-2.0
jaxb-2.2	wmqJmsClient-2.0	jmsMdb-3.2	mdb-3.2	jcaInboundSecurity-1.0
jaxws-2.2	wasJmsClient-2.0	wasJmsSecurity-1.0	couchdb-1.0	jca-1.7

Core

javaMail-1.5	ldapRegistry-3.0	eventLogging-1.0		
oauth-2.0	collectiveMember-1.0	osgiConsole-1.0		adminCenter-1.0
json-1.0	restConnector-1.0	requestTiming-1.0		osgiAppIntegration-1.0
concurrent-1.0	monitor-1.0	timedOperations-1.0		openid-2.0
wab-1.0	sessionDatabase-1.0	webCache-1.0		openidConnectClient-1.0
blueprint-1.0	serverStatus-1.0	distributedMap-1.0	spnego-1.0	openidConnectServer-1.0

Web Profile

ejbLite-3.2	jdbc-4.1	ssl-1.0		
jsf-2.2	jndi-1.0	beanValidation-1.1	jaxrs-2.0	jaxrsClient-2.0
jsp-2.3	appSecurity-2.0	cdi-1.2	webSocket-1.1	webSocket-1.0
servlet-3.1	managedBeans-1.0	jpa-2.1	el-3.0	jsonp-1.0

Announcement: http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=an&subtype=ca&appname=gpateam&supplier=897&letternum=ENUS215-269

- Supports Java 8
- Delivered via 8.5.5.6

What's in WAS Liberty V9

BETA

Java EE 7 components

- Tools and runtime to write portable transactional & secure business logic

  Completing a pluggable yet consistent set of full EE7 features – added JSF 2.2 and remote EJB in March

  EE7

WebRTC

- Write rich, real time multimedia apps (voice and video) on web without requiring plug-ins, downloads or installs.

  Strong industry support.
  Enables contextual communications!

Integrated Analytics

- Ease of Problem Determination to ensure high availability of your app-infrastructure

Java Batch++

- Batch modernization with support for standardized programming model (JSR 352)
- Ease of managing jobs through GUI tools & support for industry leading Enterprise Schedulers

  e.g. Nightly credit-card processing, bank reconciliation statements, payroll….

Additional features available on WASdev.net:

- Developer Productivity:
  – Java EE 7 Web Profile and Full platform technologies
- Operations and scale.:
  – Contextual monitoring
  – Admin center filters
  – ELK Integration (Elasticsearch, Logstash, Kibana)
- And more to come

Also available as a Docker container: https://registry.hub.docker.com/_/websphere-liberty/

# JSR-352 – Standard for Java batch application processing

- JSR-352
  - part of the J2EE 7 specification

- Statement of Direction
  - IBM intends to support the JSR-352 framework, along with additional functionality, in **WebSphere Liberty Profile**
  - IBM intends to support the JSR-352 framework, along w **WebSphere Application Server Full Profile** release.

- Liberty profile adds qualities of service around the batch pro
  - Dynamic configuration
  - Operational management
  - Transactions
  - Logging
  - High availability
  - Scalability
  - Tooling

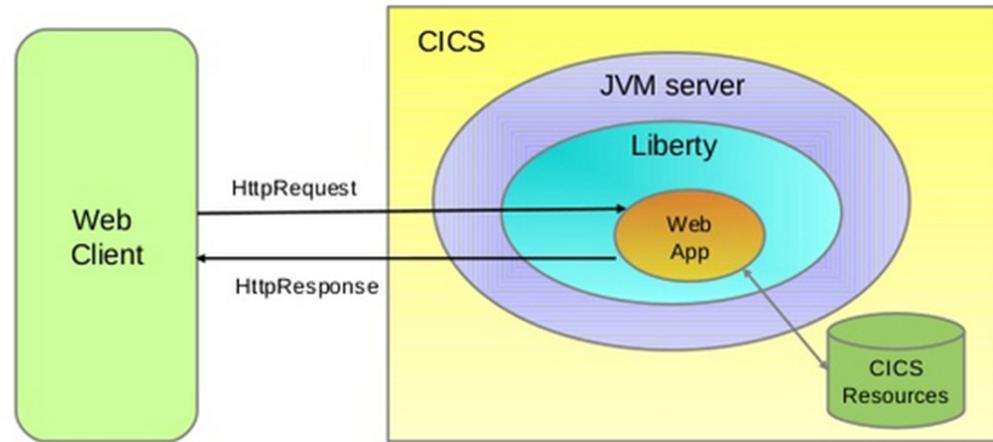# z/OS Connect – single point of entry for RESTful calls

- **Web Service provider:** WebSphere Liberty on z/OS
- **Data transform:** WSBind files
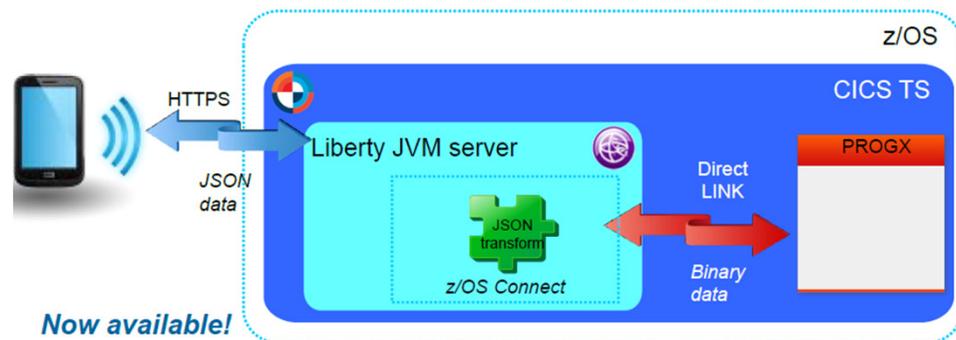- **CICS integration:** WebSphere Optimized Local Adapter (WOLA)
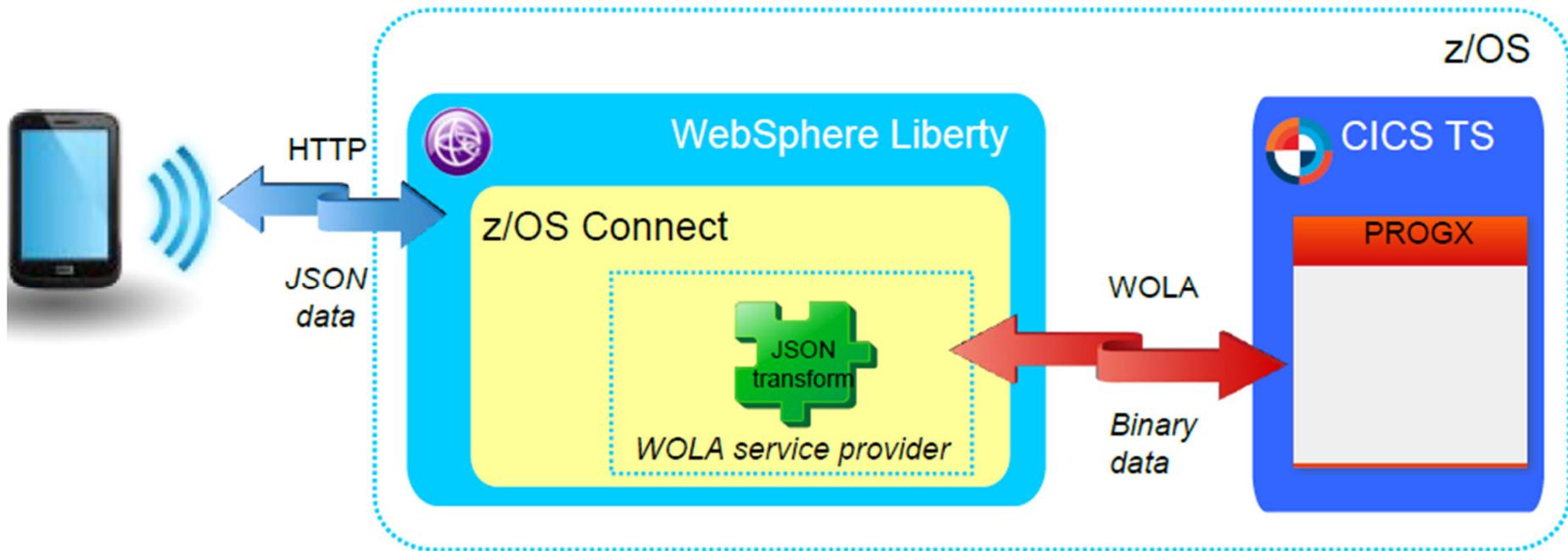
CICS and Liberty

- Liberty in CICS
  - Same code as Liberty from WAS product

- Available since CICS TS V5.1

CICS

JVM server

Liberty

Web Client

HttpRequest →

← HttpResponse

Web App

CICS Resources

JSON data ← **JSON transform** → Binary data

- **Web Service provider:** CICS TS z/OS Connect (embedded)
- **Data transform:** WSBind files
- **CICS integration:** Direct LINK

z/OS

CICS TS

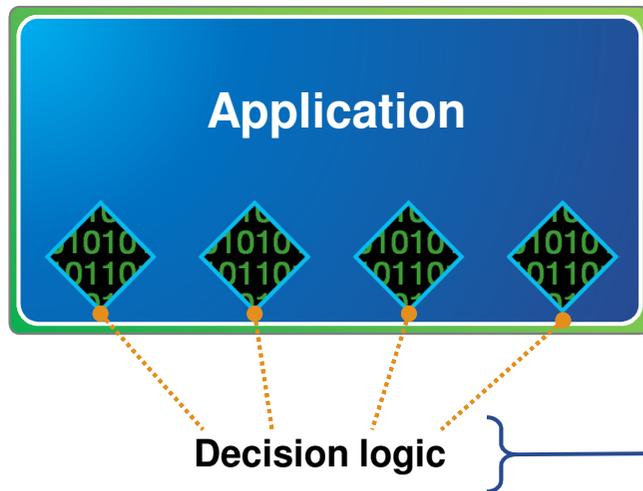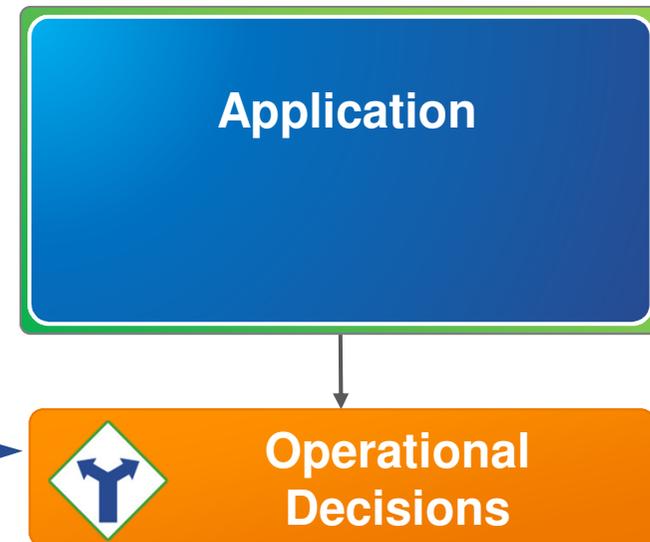HTTPS

JSON data

Liberty JVM server

JSON transform

z/OS Connect

Direct LINK

Binary data

PROGX

Now available!

- **CICS TS V5.3 open beta** includes embedded z/OS Connect
  - *Also available in CICS TS V5.2 via APAR PI25503*

IBM z Systems

Operational Decision Manager (ODM)

Without ODM

Application

Decision logic

With ODM

Application

Operational Decisions

- Hard coded decisions are difficult to change

- Rules intertwined within applications cannot be reused by other systems

- Externalized decisions are easy to change

- Centralized decisions enable reuse and consistency

ODM – Rules that business can understand

	Grade	Amount of loan		Insurance required	Insurance rate
		Min	Max		
0		< 100,000		false	⊘
1	A	100,000	300,000	true	0.001
2		300,000	600,000	true	0.003
3		≥ 600,000		true	0.005
		< 100,000		false	⊘
	B	100,000	300,001	true	0.0025
		300,000	600,000	true	0.005
		≥ 600,000		true	0.0075
8		< 100,000		true	0.0035
9	C	100,000	300,000	true	0.006
10		300,000	600,000	true	0.0085
11		≥ 600,000		true	0.0145
12	Otherwise			true	0.022

Actions

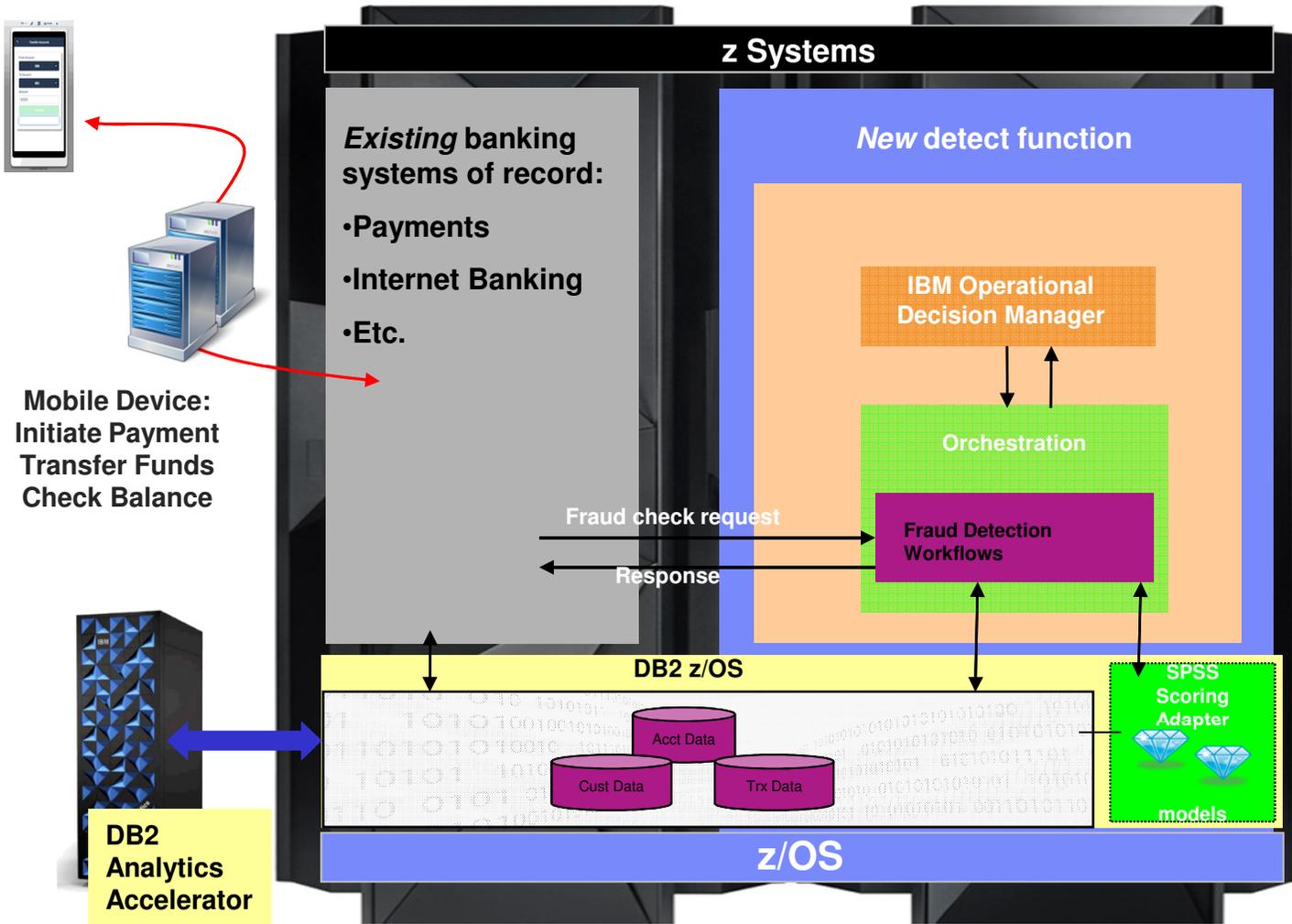*Built-in Gap/Overlap checking*

if
   all of the following conditions are true :
      - the loan grade in 'the loan report' is "C"
      - the amount of 'the loan' is at least 600000 ,
then
   set insurance required in 'the loan report' to *true* ;
   set the insurance rate in 'the loan report' to 0.0145 ;

Automatic Rule generation

Architecture view - bank: enhance existing fraud detect with predictive approach

z Systems

***Existing* banking systems of record:**

- Payments
- Internet Banking
- Etc.

Mobile Device: Initiate Payment Transfer Funds Check Balance

***New* detect function**

IBM Operational Decision Manager

Orchestration

Fraud Detection Workflows

Fraud check request

Response

DB2 z/OS

Acct Data

Cust Data

Trx Data

SPSS Scoring Adapter

models

z/OS

DB2 Analytics Accelerator

Benefits

Fraud detection rates improved through integrated infrastructure that delivers new capabilities without sacrificing SLAs or compromising security

- Flexibility to invoke processes real-time or scheduled, tight or loose coupled to invoking application

- Prioritize detect operations based on inputs (tran, LOB, amounts, etc)

- Leverage same infrastructure across multiple functions with both standardized processes & variations for specific LOBs as needed

- Can provide as a service across multiple clients, differentiate through context
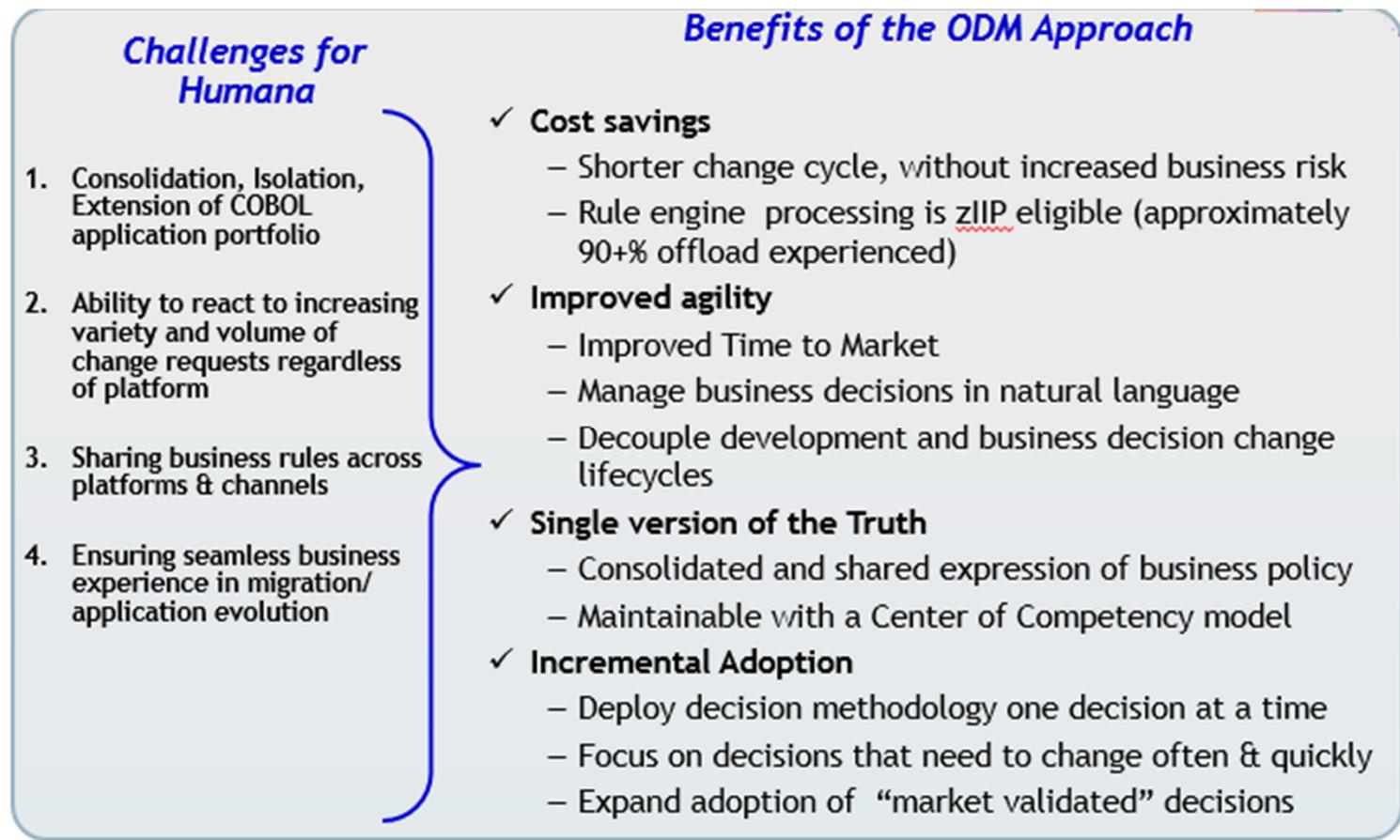
ODM – Decision Insights (NEW !)

Detect a Risk

```
when a transaction occurs
    where the location is not the home country of the owner of 'the credit card'
definitions
    set 'out of country transactions' to all transactions
        where the location is not the home country of the owner of 'the credit card' ;
    if
        the propensity to travel of the owner of 'the credit card' is less than 0.25
    and
        there are more than 2 transactions in 'out of country transactions' during the last period of 2 days
    and
        the average amount of 'out of country transactions' is more than 500
    then
        emit a new fraud alert where
            the customer is the owner of 'the credit card' ,
            the fraud level is Medium ,
            the message is "Out of Country Fraudulent Use" ;
```

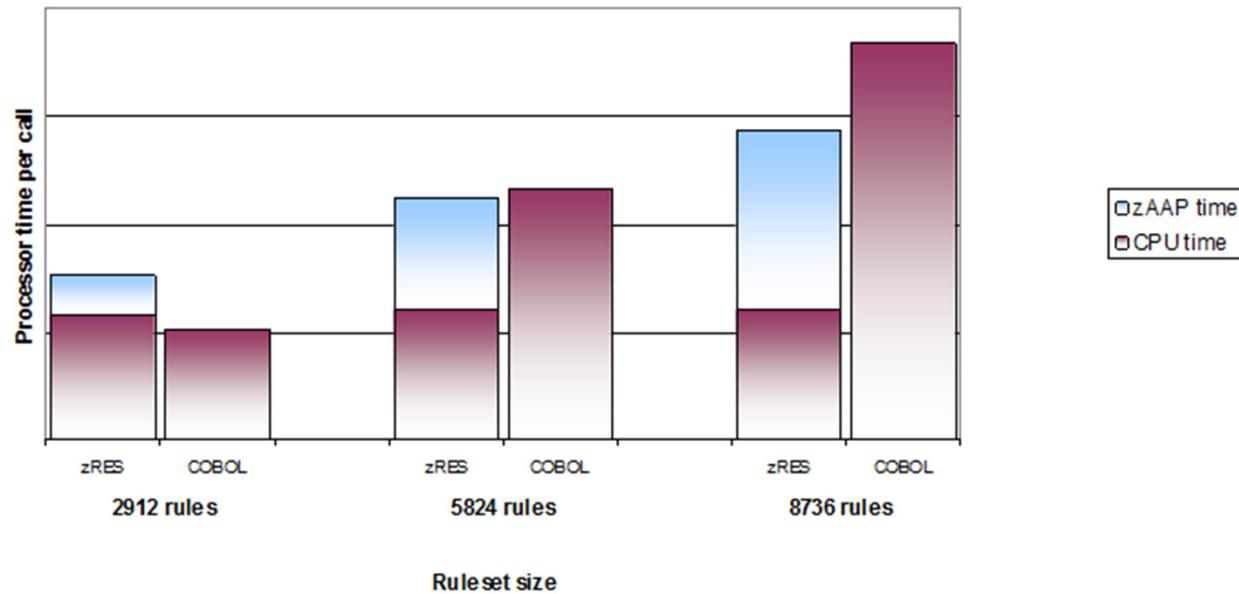**Seize an Opportunity**

```
when a credit card activated event has occurred 7 days ago
    if
            the home country of the owner of 'the credit card' is US
        and
          ( there is no transaction during the last period of 7 days
              or
            the average amount of all transactions during the last period of 7 days
                                    is less than 'Average Last Week Transaction Amount' )
    then
        emit a new offer where
            the customer is the owner of 'the credit card' ,
            the offer type is Discount ,
            the message is "We offer you a 10% discount" ;
```

Humana – USA Health Company – Using ODM on z/OS

Challenges for Humana

1. Consolidation, Isolation, Extension of COBOL application portfolio

2. Ability to react to increasing variety and volume of change requests regardless of platform

3. Sharing business rules across platforms & channels

4. Ensuring seamless business experience in migration/ application evolution

Benefits of the ODM Approach

✓ **Cost savings**
  - Shorter change cycle, without increased business risk
  - Rule engine processing is zIIP eligible (approximately 90+% offload experienced)

✓ **Improved agility**
  - Improved Time to Market
  - Manage business decisions in natural language
  - Decouple development and business decision change lifecycles

✓ **Single version of the Truth**
  - Consolidated and shared expression of business policy
  - Maintainable with a Center of Competency model

✓ **Incremental Adoption**
  - Deploy decision methodology one decision at a time
  - Focus on decisions that need to change often & quickly
  - Expand adoption of "market validated" decisions

IBM z Systems

© 2015 IBM Corporation

Comparing CPU usage: COBOL vs COBOL plus use of zRES

- Move business logic buried in program code to rules in ODM
  - Could result in some CPU moving from chargeable MLC to zIIP

Business Rules Processing – IBM z13 vs Intel Haswell

Business Rules Processing with IBM z13 with Java8 - Small Ruleset

Business Rules Processing with IBM z13 with Java8 - Large Ruleset
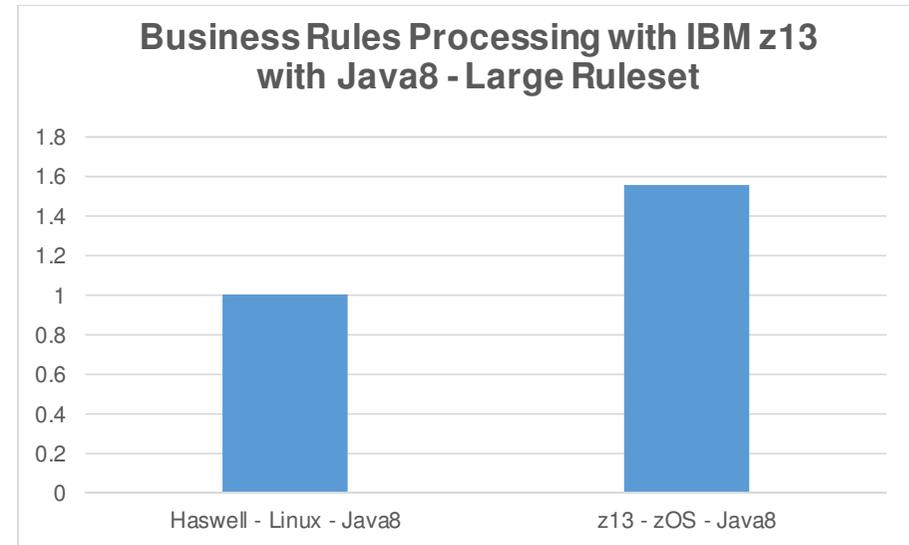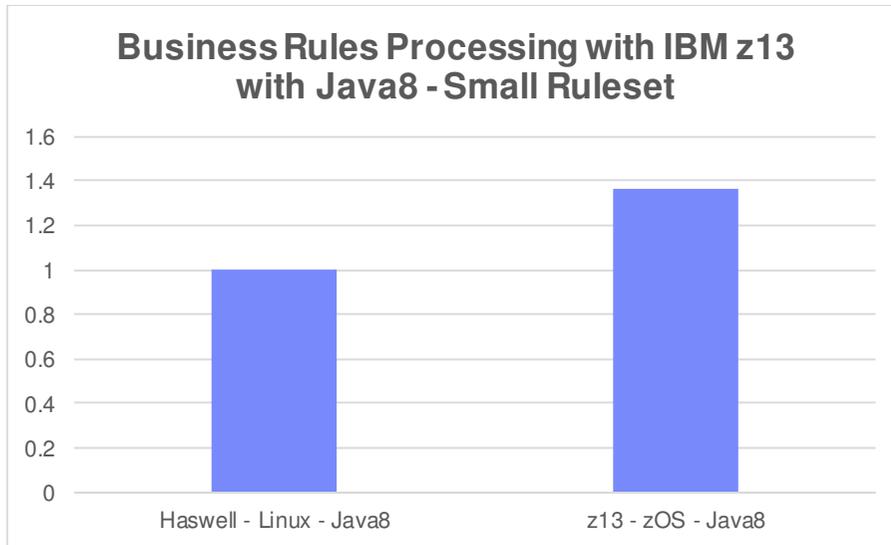
IBM z13 up-to 1.56x better throughput/core processing business rules than Intel Haswell

Questions ?

The message to take back to the troops

- Java on System z
  – Record of significant performance improvement over past 10 years

- WebSphere Application Server on System z
  – Run your business applications where you always have

- Operational Decision Manager
  – Change the way your applications manage business rules
  – Opportunity for business area to make real time decisions for large proportion of transactions