NonStop Java & Middleware Update

5th December 2013

HP NonStop Product Management
Forward-looking statements

This is a rolling (up to three year) Roadmap and is subject to change without notice.

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Agenda

Why Middleware and What should it offer?

Modern NonStop Software stack

Middleware product updates (product overview, new features, ordering information, future plans)

- NonStop server for Java (NSJ)
- NonStop Application Server for Java (NSASJ)
- NonStop Message Queue (NSMQ)
- Open Source Java Frameworks (SASH)
- NonStop Servlets for JavaServer Pages (NSJSP)
- iTP Secure Web Server
- New XML Parser
- NonStop SOAP

Summary
Why Middleware and What should it offer?

- **Simplified programming** – Common services via high-level APIs
- **Workload management** (scalability, performance)
- **Continuous availability** – Automatic failure detection and recovery
- **Concurrency control** and transaction data integrity
- **Interoperability** – Support standard communication paradigms with simple APIs
- **Manageability** – Make it easy to operate large pools of application resources, provide security controls, status and error reporting
Modern NonStop middleware stack

- Financial Services
- Communication Media Entertainment
- Manufacturing
- Healthcare & Public Sector
- Travel, Retail

- Jtoolkit
- NSDEE (Eclipse)
- NSJSP (Tomcat Servlets)
- NSASJ (JBoss AS)
- NSMQ (ActiveMQ)
- SASH (Open Source Java)
- Cache*
- SOAP

Certified Java SE Platform (JDK and JVM) (NSJ)

- Clustering
- Availability
- Scalability
- Transactions

- NonStop TS/MP
- NonStop TMF

- NonStop OS

The NonStop Fundamentals

* - Future availability
NonStop Basket for Java

Java™ 7 Standard Edition

- JDK 7 compliance
- Hotspot compiler
- 32 & 64 bit
- Parallel & CMS GC
- Much larger Heap
- PUT Library

Java Infrastructure APIs

NSASJ
- Value added port of JBoss App Server

NSMQ
- Value added port of Web App Servlets

NSJSP
- Value added port of Apache Tomcat

SASH

JToolkit
- JPathway
- JPathsend
- JEnscribe
- JRequester

POJO App
- JPathway
- JPathsend
- JEnscribe
- JRequester
NonStop Server for Java (NSJ)
NonStop Server for Java 7 features (1...)

**NSJ 7 features**

Based on Oracle JDK 1.7.0_01 version
- Certified Java implementation
  - Optimized for Intel Itanium

First 64-bit NSJ release
- Supports both 32 and 64 bit installations

Improved garbage collection
- Parallel and Concurrent Mark Sweep GC
- Reduces application pause time
- Main app & the GC processes run on different cores of the CPU
- Enabled only in J-series systems

**NSJ 7 features**

Supports a very large Java heap
- Size is only limited by the physical memory of the system
- Typically a few hundreds of Giga Bytes

**PUT Library**
- ZPUTDLL (32-bit) and YPUTDLL (64-bit)
- More compliance to POSIX standards
- All I/Os are non-blocking
- SPT library is no longer part of NSJ
**NonStop Server for Java 7 features (2)**

**NSJ 7 features**

**Java Infrastructure Library (JI Library)**

- Plain Java socket interface
- Readily deploy Java Apps as TS/MP Serverclasses
  - With no/minimal NonStop specific modifications
  - Abstraction of TS/MP & FS specific NonStop APIs
- App developer need not know NonStop specifics to leverage *NonStop Fundamentals*
- Bidirectional operation
- App can be a Server or a Client
Future enhancements

Maintain concurrency with industry standard JVM releases

Continuing performance improvements

New Garbage Collection Algorithms

This is a rolling (up to three year) Roadmap and is subject to change without notice
NSJ 7 Ordering information

• No need to order!!!

• H-series and J-series
  – NSJ 7 is available by default on the HSN01 and QSN01 SUT
    • From H06.26/J06.15 (Feb 2013 RVU)
NonStop Application Server for Java (NSASJ)

(Pronounced “En-Sas-Jay”)

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NonStop Application Server for Java (NSASJ) 1.1

JBoss EJB & WEB Containers are...

Part of JBoss Application Server
- Open Source
- One of the widely used Java App Servers
- Full compliance to JEE 6 specifications

JBoss is Mature
- Top level project
- Developed & tested for 10+ years
- Extremely active development community
- Releases with new features + bug fixes occurring regularly

NonStop Fundamentals (Scalability + Fault Tolerance)

JBoss is a flourishing ecosystem
- Of developers, vendors, resellers, enterprise users
- Not just an implementation of JEE specifications

Strong support from Red Hat

Note: “JBoss AS” community project has been renamed as “Wildfly” by Red Hat in May 2013. Release 8 will called “Wildfly 8”.
NSASJ 1.1 features (1...)  

NSASJ enhances the enterprise capabilities of NonStop

**EJB 3.0/3.1 Specifications**  
- Stateless, Stateful and Message Driven Beans

**Servlet 3.0, JSP 2.2 Specifications**  
- Asynchronous request processing  
- Web Fragments  
- Annotations

**On and Off Platform Clients**  
- Clients on the same NonStop system, a different NonStop system or an altogether different platform  
- NSASJ supports JBoss Remoting 3 interface for off platform client access to EJB container  
- Clients can also use HTTP(S) protocol to access the EJB container via the NSASJ Web Container

**Continuous availability and near linear scalability**  
- NSASJ is a TS/MP Serverclass
NSASJ 1.1 features (2...)  
NSASJ enhances the enterprise capabilities of NonStop

Transactions and Data Integrity
- The JTA implementation of JBoss (formerly Arjuna TS) is integrated with NonStop TMF
- Enables NonStop TMF controlled non-XA resources such as SQL/MX and Enscribe to participate in an XA transaction

Java Persistence API (JPA)
- Standard JPA APIs for sessions persistence (using Hibernate Entity manager)
- No need to know the specifics of NonStop T2 & T4 connectors

Security
- Off platform Remoting EJB clients’ interactions are protected by Secure Socket Layer 3.0 (SSL 3.0)
- HTTP access to NSASJ 1.1 is protected by TLS 1.0/1.1/1.2 protocol
- Authentication & authorisation subsystem of JBoss AS is available as-is in NSASJ 1.1 for client verification and for validating the administrators/managers
NSASJ 1.1 features (3)

NSASJ enhances the enterprise capabilities of NonStop

Temporary State Information Storage
- NSASJ uses Infinispan cache cluster that is part of the JBoss AS to store temporary state information of client sessions

Integration with NSMQ
- NSASJ has been integration tested with NSMQ using the JCA compliant Resource Adaptor provided by NSMQ
  - SLSB & SFSB are message producers; MDB is the message consumer

Application Deployment
- NSASJ CLI can be used to Deploy, un-deploy, redeploy, enable, disable and remove applications.
- Application development environments using Maven can be integrated with NSASJ similar to how it is done with JBoss AS
Future enhancements

Web GUI based management

Enhancements to JTA & NonStop transactions integration

JAX WebServices & REST services

JBoss AS version refresh

This is a rolling (up to three year) Roadmap and is subject to change without notice.
NSASJ 1.1 Ordering information

- H & J-series
  - NonStop Application Server for Java 1.0 Update 1 is the current software version
  - RVU H06.26/J06.15 Onwards

**Product ID**

HSJ87V1 - HP NonStop Application Server for Java 1.0 Update 1

QSJ87V1 - HP NonStop Application Server for Java 1.0 Update 1

**Ordering Example**

- HP NonStop Application Server for Java 1.0 Update 1 – QSJ87V1, * 2–16 processors
  - Ordering example: for a 2-processor system, order two of H/QSJ87V1
NonStop Messaging Queue (NSMQ)
NonStop Message Queue (NSMQ) 1.0

NSMQ

The Java Messaging Service provider on NonStop

- A port of Apache ActiveMQ

Active MQ...

- Is one of the popular JMS implementations
- Complies with JMS 1.1 Specifications
- Provides Enterprise Features
  - Clustering for scalability and continuous availability
  - Can be accessed across platforms (Java, .NET, C/C++...)
    - However NSMQ 1.0 provides only Java APIs
  - Provides for persistence of messages via SQL/MX
- Supports asynchronous messaging, loose coupling between applications
NonStop Message Queue (NSMQ) 1.0
NSMQ 1.0 features (1…)
Standards based Interconnectivity with loose coupling

**JMS 1.1# compliance**
- As implemented by ActiveMQ 5.6.0

**Java APIs to clients for sending, receiving, publishing and subscribing to messages**

**JCA compliant Resource Adaptor (RA) for Java Applications Servers such as NSASJ to connect to queues and topics**
- NSASJ has been integration tested with NSMQ

**Supports both Point-to-point and publish-subscribe# message exchanges**
- Via Queues and Topics

**Optionally persist messages in SQL/MX**
- Mission critical applications will not lose messages in transit from sender/publisher to receiver/subscriber

# NSMQ 1.0 release does not support durable subscribers for topics. This feature is targeted for a future NSMQ release.
NSMQ 1.0 features (2...) 

Standards based Interconnectivity with loose coupling

Continuous availability using Master-Slave Broker instances
- The slave takes over in the event of a master failure
- Slave recovers the messages persisted in SQL/MX to continue the operations

Scale by clusters of brokers
- More clusters of 2 brokers each can be added to enhance message processing capacity

TCP, UDP and Java NIO protocols are supported for clients
- Secure transfer of message is achieved through SSL 3.0
NSMQ 1.0 features (3)

Standards based Interconnectivity with loose coupling

**JMS and Transactions**

- JMS transactions (commit and rollback) are supported in both sending and receiving directions
- NSMQ clients can use the JTA compliant library to become part of NonStop TMF transactions

**Supports Java Authentication and Authorization Services (JAAS)**

- Clients are authenticated using username and password combination before allowing to operate
- Authorisation to READ, WRITE and to do ADMIN operations can be configured for each client
- Plug-ins can be used to extend JAAS
Future enhancements

Web GUI for management

Integration of C/C++ Applications

RESTful interface

Dynamic clustering

STOMP protocol support for clients

ActiveMQ version refresh

This is a rolling (up to three year) Roadmap and is subject to change without notice.
NSMQ 1.0 Ordering information

• H & J-series
  – NonStop Message Queue 1.0 is the current software version
  – Supported on RVU versions H06.25/J06.14 Onwards

**Product ID**

HNSMQ01V1 - HP NonStop Message Queue 1.0
QNSMQ01V1 - HP NonStop Message Queue 1.0

**Ordering Example**

• HP NonStop Message Queue 1.0 – QNSMQ01V1, * 2–16 processors
  – Ordering example: for a 2-processor system, order two of QNSMQ01V1
Open Source Java Frameworks on NonStop (SASH)
Open Source Java Frameworks on NonStop

- **Apache MyFaces**
  Component based web UI framework (JSF)

- **Apache Axis2**
  Web services framework (for SOA)

- **Spring**
  Framework to develop Apps using POJO components

- **Hibernate**
  Object Relational Mapping (ORM) framework (JPA)

**SASH**: MyFaces, Axis2, Spring, Hibernate

Note that the frameworks themselves are not distributed by HP, but they are supported by HP.
SASH 1.2 features

**Spring (3.1.0)**
- Integration of Spring Platform Transaction Manager with NonStop TMF
- Spring transactions can readily become part of TMF transactions
  - Spring application developers need not know NonStop TMF specifics

**Hibernate and its Dialect (4.1.1, 3.6.8, 3.5.1)**
- Mapping Hibernate’s JDBCExceptions to sub-exceptions
  - Saves writing SQL/MX specific code by Application developers to extract error subgroups
- Mapping between Java Objects’ “id” parameter to “Identity Column” of NonStop SQL/MX database
- Various caching mechanisms and connection pooling configurations are studied and recommendations provided
- Leveraging Module File Caching (MFC) feature of SQL/MX in Hibernate queries

**Artifacts from HP**
- T0874 – This package contains sample apps
- T0873 – This contains the Hibernate Dialect file for SQL/MX
- T0937 – TMF Wrapper jar file
- T0873, T0874 & T0937 can be downloaded from Scout
  - Integrated and tested by NED
  - Open Source Java Frameworks on NonStop User's Guide
Spring integration with NonStop TMF

NonStop Server for Java (NSJ)

Spring Container

Plain Java App

Axis2/J

May need changes in Apps to connect to TMF

TmfTransaction Manager

TMF

Enscribe

SQL / MX

JToolkit

JDBC
Mapping Hibernate exceptions

Error mapping

- With Error Mapping, App developer’s code stays same on NonStop as it is elsewhere

- Unchecked Hibernate exceptions are converted to an appropriate JDBCException category using two converter methods in the Dialect:
  - public SQLExceptionConverter buildSQLExceptionConverter()
  - public ViolatedConstraintNameExtracter getViolatedConstraintNameExtracter()

- Exceptions are categorized into one of the following Hibernate subtypes:
  - JDBCConnectionException, SQLGrammarException, ConstraintViolationException, LockAcquisitionException
  - Users are able to easily extract the SQL error’s sub-category and take remedial/recovery actions
Future enhancements

Dialect for SQL/MX corresponding to new Hibernate Releases

Version updates for Spring, Axis2/J

Samples, Configurations, Guidelines for more Java Open Source Frameworks

This is a rolling (up to three year) Roadmap and is subject to change without notice.
NonStop Servlets for JavaServer Pages (NSJSP)
NonStop Servlets for JavaServer Pages (NSJSP) 7.0 (64-bit)

Value-added port of Apache Tomcat

Apache Tomcat is ...
- Open Source
- Market leader in Java app server market
  - >60% of enterprises use Tomcat
  - Used by most Fortune 1000 companies

Tomcat is mature
- World’s most popular Servlet Container
- Developed & tested over 10+ years
- Very active development community
- Regular releases with new features + bug fixes
Tomcat vs NSJSP

NSJSP: Standard Tomcat, optimized for scale & continuous availability on NonStop

- Apache Web Server
- Tomcat Server
  - Servlet Container (Catalina)
  - Web Apps
- iTP Web Server
- NSJSP Server
  - Servlet Container (Catalina)
  - Web Apps
- TS/MP Environment
  - Pathsend
  - TS/MP Serverclasses

AJP Protocol
**NSJSP 7.0 (64-bit) features**

**NSJSP 7.0 (64-bit) offers three installation types viz:**
- A 32-bit NSJSP installation for NSJ 7 (H06. 26/J06.15 or later)
- A 64-bit NSJSP installation for NSJ 7 (H06. 26/J06.15 or later)
- A 32-bit NSJSP installation for NSJ 6 (H06.23/J06.12 or later)

**New Features**
- Based on Tomcat 7.0.10
- Complies with Servlet 3.0 Specifications
  - Asynchronous request processing
  - Web Fragments
  - Annotations
- Complies to JSP 2.2
- Unified Management Interface
- Support for SSL attributes, security realms
- Role based Security for administrators
Future enhancements

Improve scalability using shared memory cache

Rebase to most recent Tomcat version

Comply to the latest Servlet, JSP & EL specifications supported by the Tomcat version

Management improvements such as
  - Configure alert conditions thru NSJSP Manager
  - View logs via NSJSP Manager
  - Display additional statistics & health of the container in NSJSP Manager

Installation script enhancements

This is a rolling (up to three year) Roadmap and is subject to change without notice.
NSJSP 7.0 (64-bit) Ordering information

- H & J-series
  - NonStop Servlets for JavaServer Pages 6.0 Update 4 is the current software release

**Product ID**

- HSJ88V6 - HP NonStop Servlets for JavaServer Pages 6 Update 4
- QSJ88V6 - HP NonStop Servlets for JavaServer Pages 6 Update 4

**Ordering Example**

- HP NonStop QSJ88V6 - HP NonStop Servlets for JavaServer Pages 6 Update 4, *2–16 processors*
  - Ordering example: for a 2-processor system, order two of QSJ88V6

- Note that the product ordering name for NSJSP 7.0 is HP NonStop Servlets for JavaServer Pages 6 Update 4
iTP Secure WebServer context in NonStop

Gateway to NonStop from WWW & Enterprise networks

- All modern applications rely on HTTP / HTTPS for a highly secure, scalable and available transport layer

**Transparent Scalability**

**Fault Tolerance**
iTP Secure WebServer 7.4 features (1…)

Full featured web serving

**New Features in release 7.4 (Feb ‘13)**

- Diffie-Hellman Key Exchange Algorithm
- TLS 1.2 Protocol support added
  - A significant enhancement in TLS 1.2 is that the pseudorandom function is specified by the cipher suite now
- Serverclass Renaming
  - HTTPD Serverclass name can be configured
  - Multiple serverclasses can be configured within the same Pathmon

**New Features in release 7.4**

- Configurable HTTP header maximum size
- Enhanced information logging
  - iTP WebServer 7.4 can be configured to log cookie and CGI variable REMOTE_PORT
  - Logging the remote port information helps track the source of requests
  - Cookie logging enables iTP WebServer logs to be analysed by generally available web traffic analysis software such as Google Urchin.
iTP Secure WebServer 7.4 features (2)

Full featured web serving

**Other Features**

- RSA Key exchange algorithm
- HTTP 1.1
- TLS 1.0, 1.1, SSL 3.0, Digest access authentication, Certificate authentication, 4096 bit long RSA keys, 256 bit encryption, stronger cipher suites AES & Camellia
- CGI support

**Other Features**

- Ticketing
- Scalable, continuously available -- runs as Pathway serverclass
  - Support for parallel TCP/IP
  - Multi-threaded -- each iTP WebServer instance can concurrently process up to 255 HTTP requests
Future enhancements

Export security keys in PCKS #8 encrypted form
- And also import encrypted keys into our keydatabase

Support for SHA256 hash algorithm

Distinction between Client and Server root, intermediate and leaf certificates

Allow restart of individual serverclasses

Configurable maximum size for HTTP POST messages

This is a rolling (up to three year) Roadmap and is subject to change without notice.
iTP WebServer 7.4 Ordering information

- J-series
  - iTP Secure WebServer is available by default on the QSN01 SUT from Q06.15
  - For RVU versions prior to Q06.15 iTP Secure WebServer needs to be ordered using the PID QSJ95 or QSJ98

- H-series
  - iTP Secure WebServer needs to be ordered using the PID HSJ95 or HSJ98
  - HSJ98 for use within the USA
  - HSJ95 for use in rest of the world

Ordering Example

- HP iTP Secure WebServer – HSJ98, * 2–16 processors
  - Ordering example: for a 2-processor system, order two of HSJ98

This is a rolling (up to three year) Roadmap and is subject to change without notice.
New XML Parser
New XML Parser

Salient Points

• T0970 is included in the SUT from RVU version H06.27/J06.16 (Aug ’13)

• Based on the latest releases of open source Xerces and ICU# libraries

• Based on Xerces 3.1.1 and ICU version 50.1.2

• Supports both IEEE and Tandem floating types

• New parser is released in addition to the old XML parsers T0535 & T0563

• All new C++ applications are recommended to be developed using the new XML parser

<table>
<thead>
<tr>
<th>Product T-number</th>
<th>Product Name</th>
<th>Xerces-C++ version</th>
<th>ICU version</th>
<th>Floating-point support</th>
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<td>2.6.1</td>
<td>TANDEM</td>
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<td>IEEE</td>
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<td>T0970</td>
<td>XML Parser</td>
<td>3.1.1</td>
<td>50.1.2</td>
<td>IEEE, TANDEM</td>
</tr>
</tbody>
</table>

# ICU = International Components for Unicode; open source library from IBM Inc.
SOA on NonStop
NonStop SOAP 4.1

Leverage valuable Pathway applications from outside of NonStop too

**SOAP brings Web Services standards to NonStop**

- Pathway services are inherently SOA adherent – except the standard I/F to external world
  - All they need is a Web Services adapter to make them compliant to SOA
- Exposing Pathway services as web services enables:
  - Standards-based interoperability with other apps in the Enterprise & the WWW
  - Service delivery without service consumers needing to know Pathway
  - Existing & new Enterprise services easily achieve scalability and fault tolerance of Pathway while exposing standard an interface
NonStop SOAP 4.1

SOAP engine for web service app development in “C” language

No programming required; No changes to Pathway server

Pathway service interface defined by WSDL

Web Service Client

Invoked via SOAP Message payload defined by WSDL

NonStop SOAP Design Tools

NS SOAP is a scalable, continuously available SOA adapter that provides the standard Web Services Interface

Invoked via Pathsend Message payload defined by DDL

NonStop SOAP Runtime Engine based on Apache Axis2/C

Target NonStop Pathway service

Pathway service interface described by DDL

No programming required; No changes to Pathway server

Invoked via SOAP Message payload defined by WSDL

WSDL

DDL

NS SOAP is a scalable, continuously available SOA adapter that provides the standard Web Services Interface
NS SOAP 4.1 components

Design Time Tools

SoapAdminCL tool
• Exposes the underlying TS/MP application or NonStop process as a Web service and generates the corresponding WSDL contract

WSDL2C tool
• Facilitates development of web service components (clients and services) on HP NonStop platform using C programming language, taking an existing WSDL service definition as input

WSDL2PWY tool
• Creates C-language TS/MP application-based Web services from the WSDL contract

Sample code for developing client & server side applications

......and of course the NS SOAP Run Time engine built on Apache Axis2/C 1.5.0
NS SOAP 4.1 features (1...)

**WS-Security related enhancements**

Supports SOAP message encryption and signature

WS-Security Policy based configurations

- To secure the web service
- Complies to security policy assertions

Both Symmetric as well as Asymmetric policy bindings

Supports username tokens

- send and verify username with both plaintext and encrypted password
- Allows timestamps to be added to a SOAP message
  - enable the server to verify the message validity

**Other Enhancements**

WSDL parameter names need not be the same as the DDL field names

- Previously the DDL field names had to be exactly same as in the WSDL

Multiple DDL definitions can be used to create a single request/response WSDL structure

- Enhanced flexibility in mapping DDL to/from WSDL
NS SOAP 4.1 features (2)

Other Features
Compliant to SOAP 1.2 Specs

WS-Security
- X.509 certificates, private keys, digital signatures, symmetric/asymmetric encryptions
- Both Service First & Contract First modes of development
- Out of the box WSDL creation
- Requires no SOAP specific coding
  - Only user’s business logic needs to be coded

Other Features
TS/MP scalability & availability

Transaction integrity through TMF

User written plug-ins
- Supports modules/handlers & Message Receiver User functions (MRUF) to modify default message flow
- Can be applied on per-service basis or globally

Hot deployment of new services
- No need to stop SOAP & other services
Future enhancements

Improved compliance to WS-Security
- WS-Secure Conversation support
- Security context per client – server interaction
- New key generation per exchanged message

Support for WS-RM specifications (Reliable Messaging)

Upgrade of Axis2/C version

Support for MTOM optimised message transfer

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NonStop SOAP 4.1 Ordering information

- J-series
  - NonStop SOAP 4.1 is available by default on the QSN01 SUT

- H-series
  - NonStop SOAP 4.1 needs to be ordered using the PID HSX21

Ordering Example

- HP NonStop SOAP 4.1 – HSX21, * 2–16 processors
  - Ordering example: for a 2-processor system, order two of HSX21
Option 2 – SOAP using Axis2/J

HP NonStop offers SOA on Java too
  • Axis2/J is the software that is recommended by HP

Axis2/J is open source software from Apache Org

HP tests & certifies Axis2/J on NonStop
  • T0874 – This package contains sample apps

Documentation and tools provided for easy deployment
  • ddl2java converts DDL information into Java data structures
  • java2wsdl converts Java data structures to standard WSDL

Users may download Axis2/J 1.5.2 from http://axis.apache.org/axis2/java/core/
A modern application environment...
...with NonStop fundamentals

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<th>Common Standards</th>
<th>Uncommon Advantages</th>
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<tr>
<td>• Open APIs</td>
<td>• Highly scalable</td>
</tr>
<tr>
<td>• Open Accessibility</td>
<td>• Continuously available</td>
</tr>
<tr>
<td>• Open Source Frameworks</td>
<td>• Easily manageable</td>
</tr>
<tr>
<td>• Standard Tools</td>
<td>• Secure</td>
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### Develop

**Application programming models**

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<th>Open Source Java Frameworks – Axis2/J, Spring, Hibernate &amp; MyFaces</th>
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<tr>
<td></td>
<td>NSJSP Servlets, Server Pages, NSASJ EJB &amp; Web containers, NSMQ</td>
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<tr>
<td></td>
<td>Standard JDK</td>
</tr>
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<td></td>
<td>SOA Infrastructure (iTP WS, SOAP, XML, HTTP, WSDL)</td>
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### Deploy

**Application infrastructure**

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<th>NonStop TS/MP &amp; TMF, Certified Java SE Platform (JRE), SQL/MX</th>
<th>NonStop OS</th>
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### Differentiate

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<th>Network access</th>
<th>SOA infrastructure</th>
<th>Open source Java frameworks</th>
<th>Business logic</th>
<th>Database</th>
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</thead>
<tbody>
<tr>
<td>Transparent Scalability</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Transparent Fault Tolerance</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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</table>
## NonStop modernization toolset at a glance

### Application Development
- **Eclipse Plug-ins**
- **NSDEE (Eclipse)**
- **C and C++ compilers**
- **Visual Inspect**

### Modern programming paradigms
- **NonStop Server for Java (JVM+JRE)**
- **NSJSP (Tomcat Servlet container)**
- **NSASJ (JBoss EJB + Web containers)**
- **JVM/JDK, JToolkit, Java Infrastructure**

### SOA/web services & Integration
- **iTP Web Server**
- **NonStop SOAP**
- **NSMQ (Apache ActiveMQ Currently Java APIs only)**
- **Open Source Java Frameworks**

### DB and Connectivity
- **JDBC Drivers**
- **ODBC Drivers**
- **SQL/MX**
- **Escort^vSQL Enscribe-2-SQL Toolkit**

### Standard OS APIs and utilities
- **OSS**
- **Posix User Thread Package**
- **AF_UNIX Sockets**

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This is a rolling (up to three year) Roadmap and is subject to change without notice.
You can realize modernization benefits on NonStop today

Architect your apps using industry standard programming paradigms

Develop your apps using industry standard development tools

Deploy your apps on a highly scalable, continuously available, industry standard app server

Integrate your apps with other apps in the enterprise as SOA services

Connect to your apps using industry standard network protocols

Access your data via industry standard database access technologies

Going forward, existing middleware products will continue to be enhanced and new industry standard toolsets and paradigms supported, while always maintaining NonStop levels of availability and scalability – transparently!
Thank you