

# zMasters 2016

Advanced LinuxONE and Linux on z  
Systems management with IBM Wave  
for z/VM

Eduardo C. Oliveira  
Executive CTS  
eduardoc@us.ibm.com  
IBM





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HiperSockets	Performance Toolkit for VM	System z10*	z Systems
IBM*	RACF*	zEnterprise*	z Enterprise
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- IBM Wave for z/VM
- Functionality
- Benefits
- Fit in Portfolio
- Test Drive Environment
- JumpStart Services
- Features and Architectural Overview
- Live Demo



# What IBM Wave is NOT...

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Not just for novice users

Not just a cloning tool

Not just a GUI (Graphical User Interface)

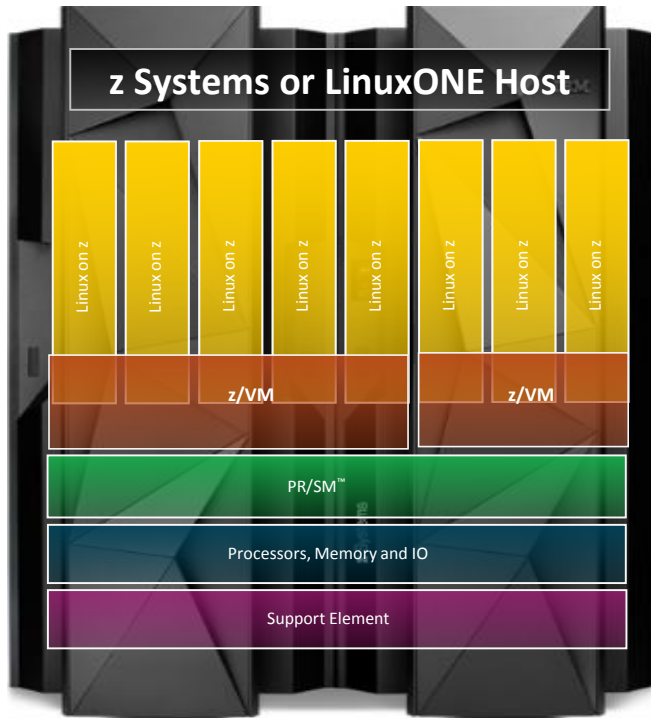
Not a z/VM sys prog replacement

Not excluded by in-house Scripts

Not just for 100s of servers

# IBM Wave offers the following

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- Systems management
- Administration
- Configuration changes
- Productivity gain
- Provisioning & cloning
- CLI for automation
- Reporting & auditing

# Why do you want IBM Wave?

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- Reductions in budgets means IT needs to **leverage existing staff** to do more with less. 70-80% of IT spend goes to operations alone.
- Managers and administrators benefit from having **tools offering self service**, with easier and simpler administration
- z/VM® managers need **fast and accurate insight** into changes in their environment
- Administrators need to **eliminate continual maintenance**, and increased management complexity of writing and maintaining scripts
- Managers need to train **staff new to z/VM to perform complex tasks**, quickly and easily
- Linux® administrators need to **manage** a powerful z System or LinuxONE environment without significant z/VM skills

**70 - 80%**  
**of IT budgets**  
**are spent on**  
**ongoing**  
**operations**  
**and**  
**maintenance**  
**costs**

Robert Frances Group, "Data Center Optimization Planning – Dashboard Metrics," December 2012

*"IBM Wave is a virtualization management tool for administrators that could reduce the administration and management of IBM z/VM and Linux virtual servers up to 85 to 95 percent."*

Robert Frances Group 2014

# IBM Wave for z/VM V1.2 (IBM Wave)

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- IBM Wave is a new virtualization management product for z/VM<sup>®</sup> and Linux<sup>®</sup> virtual servers that uses visualization to dramatically automate and simplify administrative and management tasks
- LinuxOne (z/VM version) comes with IBM Wave for z/VM
- IBM Infrastructure Suite for z/VM and Linux V1.1
- Jumpstart Services to help customers get started with IBM Wave

Supported IBM System z<sup>®</sup> processors: IBM System z10<sup>®</sup> Enterprise Class (z10 EC<sup>™</sup>), IBM System z10 Business Class<sup>™</sup> (z10 BC<sup>™</sup>) and later

Supported z/VM versions/releases:

- z/VM 6.3
- z/VM 6.2
- z/VM 5.4



## IBM Wave for z/VM

*Empowered Virtualization Management*

5648-AE1 1.1. IBM Wave for z/VM  
5648-AE2 1.1. IBM Wave for z/VM S&S

## IBM Wave for z/VM

Welcome to the IBM Wave homepage on your site!  
Current IBM Wave version: 1.1.0

Launch IBM Wave v1.1.0

Launch z/VM API Testing Application

Administration and Customization Guide

User Guide and Reference

IBM.

# IBM Wave for z/VM

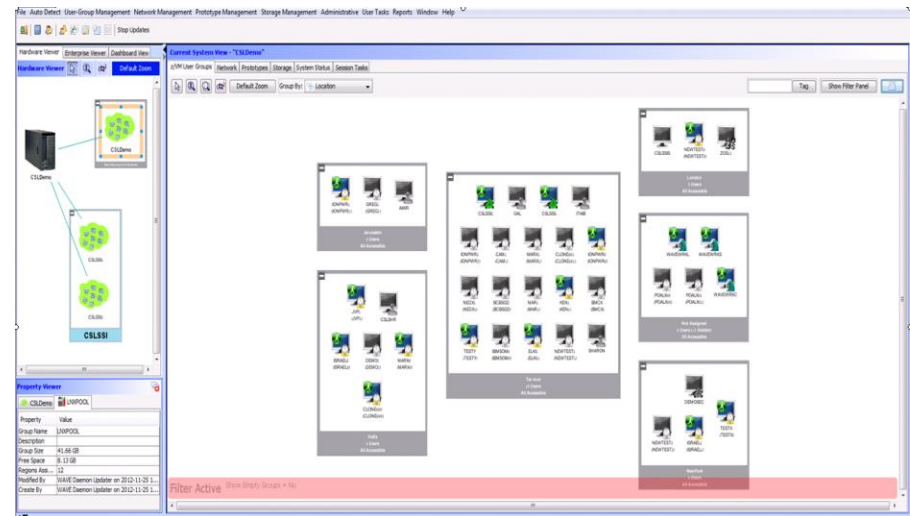
## Helps Simplify and Automate Virtualization Management

### For z/VM and Linux virtual servers

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- Automate, simplify management and monitor virtual servers and resources—all from a single dashboard
- Perform complex virtualization tasks in a fraction of the time compared to manual execution
- Provision virtual resources (Servers, Network, Storage) to accelerate the transformation to cloud infrastructure
- Supports advanced z/VM® management capabilities such as Live Guest Relocation with a few clicks
- Delegate responsibility and provide more self service capabilities to the appropriate teams



IBM Wave enables the **management of the entire Enterprise** and its multiple z/VM guests **across LPARs and CECs**

**A simple, intuitive virtualization management tool providing management, provisioning, and automation for a z/VM environment supporting Linux® virtual servers**



# IBM Wave offers value in 3 major areas:

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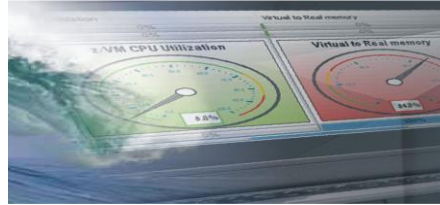


## Advanced Visualization



- Organize and simplify administration of virtual Linux servers; automate and simplify management steps
- Shorten the learning curve needed to manage your Linux and z/V M environment
- View servers and storage utilization graphically; view resource status at a glance
- Use graphical or tabular displays with layered drill down; customize and filter views
- Attach virtual notes to resources for additional policy-based management

## Simplified Monitoring



- Monitor z/VM system status through an innovative and interactive UI
- Monitor performance of CPU, paging devices, spool disks and more;
- Use agentless and lightweight discovery for a current view of your environment
- Use advanced filters, tagging, layout and layer selection to manage in a meaningful way
- Complements IBM OMEGAMON® XE used for in-depth performance monitoring and historical views

## Resource Management



- Manage your systems from a single workstation
- Assign and delegate administrative access using role based assignments
- Provision, clone, and activate virtual servers. Define and control virtual network and storage devices
- Perform complex tasks such as live guest relocation using a few keystrokes
- Execute complex scripts with a single mouse click
- Report on resources with flexible resource reporting



- **Agentless Resource Discovery**

- Discover, manage and monitor z/VM resources and their relationships across multiple LPARs and CECs
- Identify resource and relationship changes; reflect current environment in the user interface

- **Monitoring**

- Allows the state of resources to be observed; icons show additional content for the resources
- Use graphical and tabular displays with layered drill down to hone in on only the resources you need to view
- Perform ongoing monitoring of changes that occur after initial auto-detection

- **Reporting**

- Automatically generate charts like pie charts to report on utilization and more
- All table-based views can be exported to a CSV file for import into other applications

- **Integration**

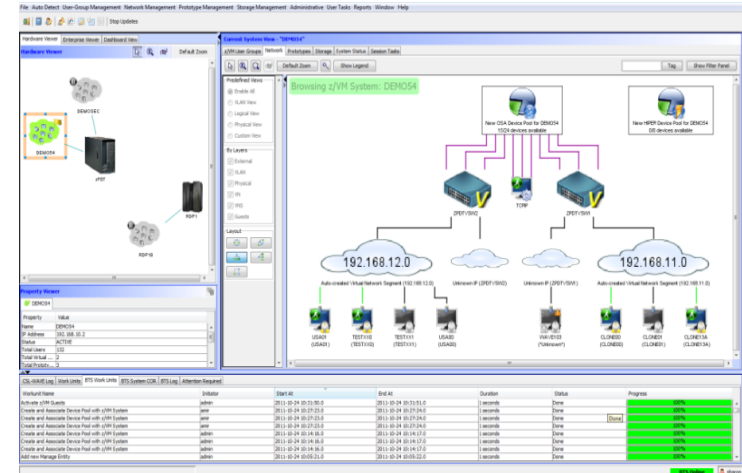
- Use Automatic Guest Classification (AGC) to integrate with existing provisioning process
- LDAP/Active Directory Support for Authentication and Authorization

# IBM Wave Intelligent Visualization Quickly Understand the Status of System Resources 2016

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- **Get a current and accurate view of your managed environment**
  - Network Topology
    - Centralized view of the entire network topology per z/VM System, view Virtual LANS (VLANs)
    - Annotate network topology view to identify external resources - routers, switches, etc
  - Linux Servers
    - View performance gauges for all z/VM systems from one screen:
    - See resource consumption by guest or type
    - CPU, Virtual to Real, Paging, Spool
  - Storage
    - Visual representation of all storage resources (ECKD™ and FCP-SCSI)
- **Visualize and control virtual resources**
  - Views can be graphical or easily switched to tabular mode
  - View relationships between resources easily and graphically
  - View the entire environment graphically and easily zoom in
- **Advanced filters, tagging, layout and layer based views for every display**



# Performance Resource Monitoring At a Glance Status of all z/VM instances

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IBM Wave for z/VM 1.1.0 (WAVESERV Hostname: N/A, IP Address: 10.10.7.156)

File Auto Detect User-Group Management Network Management Prototype Management Storage Management Administrative User Tasks Reports Window Help

Stop Updates

Hardware Viewer  
Enterprise Viewer Dashboard View

Enterprise Status Viewer

Filter selection

z/VM System = \*

Clear Go

Property Viewer

PROD

Property	Value
Name	PROD
IP Address	10.10.6.124
Status	ACTIVE
Total Users	196
Total Virtu...	4
Total Proto...	2
Total Volu...	126
Total Volu...	2

Enterprise Dashboard View

z/VM System Name	CPU Utilization	Virtual to Real Ratio	Page Space Utilization	Spool Space Utilization
PROD	z/VM CPU Utilization 40.0%	Virtual to Real Ratio 127.0%	z/VM Page Space Utilization 59.0%	z/VM Spool Space Utilization 46.0%
DEV01	z/VM CPU Utilization 8.0%	Virtual to Real Ratio 367.0%	z/VM Page Space Utilization 91.0%	z/VM Spool Space Utilization 33.0%

IBM Wave for z/VM Log | BTS Work Units | BTS System COR | **BTS Log** | Attention Required

WAVESERV Time	User	System	Code	Type	Message
2014-07-24 16:13:45	eduardoc	WAVE	WAVSEC0011	I	Administrator: eduardoc logged in from ADMINIB-4L955IB(169.254.81.207).

SSL Enabled eduardoc

# Simplify Systems Management Tasks

## Provision resources quickly and easily

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CSL-WAVE 3.2.0 (WAVESERV Hostname: cslserv13, IP Address: 192.168.39.77)

File Auto Detect User-Group Management Network Management Prototype Management User Tasks Reports Window Help

Stop Updates

Hardware Viewer Enterprise Viewer Dashboard View

Hardware Viewer Default Zoom

ATSEC12

CSLVM13

Property Viewer

CSLVM13 CSLRHEL (CSLVM13)

Property	Value
Name	CSL RHEL
Status	Inactive
Eligible	Yes
Group	USER-LOCAL
Type	Linux
Distribution	Red-Hat 6 - 64 Bit
1st IP Address	192.168.39.75
Project	DMV
Eligibility	N/A

CSL-WAVE Log | BTS Work Units | BTS System CDR | **BTS Log**

WAVESERV Time	User
2014-01-28 17:08:41	dmvuser
2014-01-28 17:09:39	dmvuser

Waiting for user input

BTS Online dmvuser 5:11 PM

**Clone z/VM Guest CSLRHEL in z/VM System CSLVM13 (3/3) Selected**

New Clone information

CSC Information

Target z/VM System Name: CSLVM13

New Clone Parameters

Number of clones: 3 Basename for clones: LICENSE New Password: ... Verify new password: ...

New Storage Group: CSLGRP (249.81 GB Free) [Update]

Clone the following users

Name	Hostname	System	AT5395	Virtual Network 2	Virtual Network 3	Status
<input checked="" type="checkbox"/> LICENSE0	LICENSE0	CSLVM13	192.168.39.67			Ready
<input checked="" type="checkbox"/> LICENSE1	LICENSE1	CSLVM13	192.168.39.68			Ready
<input checked="" type="checkbox"/> LICENSE2	LICENSE2	CSLVM13	192.168.39.69			Ready

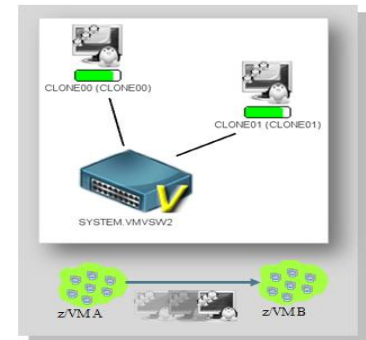
Select All Deselect All Toggle Selection Show Filtering Parallel Total Storage Needed: 62.5 GB

Network Configuration FCP Configuration Optional Configuration

Network Information

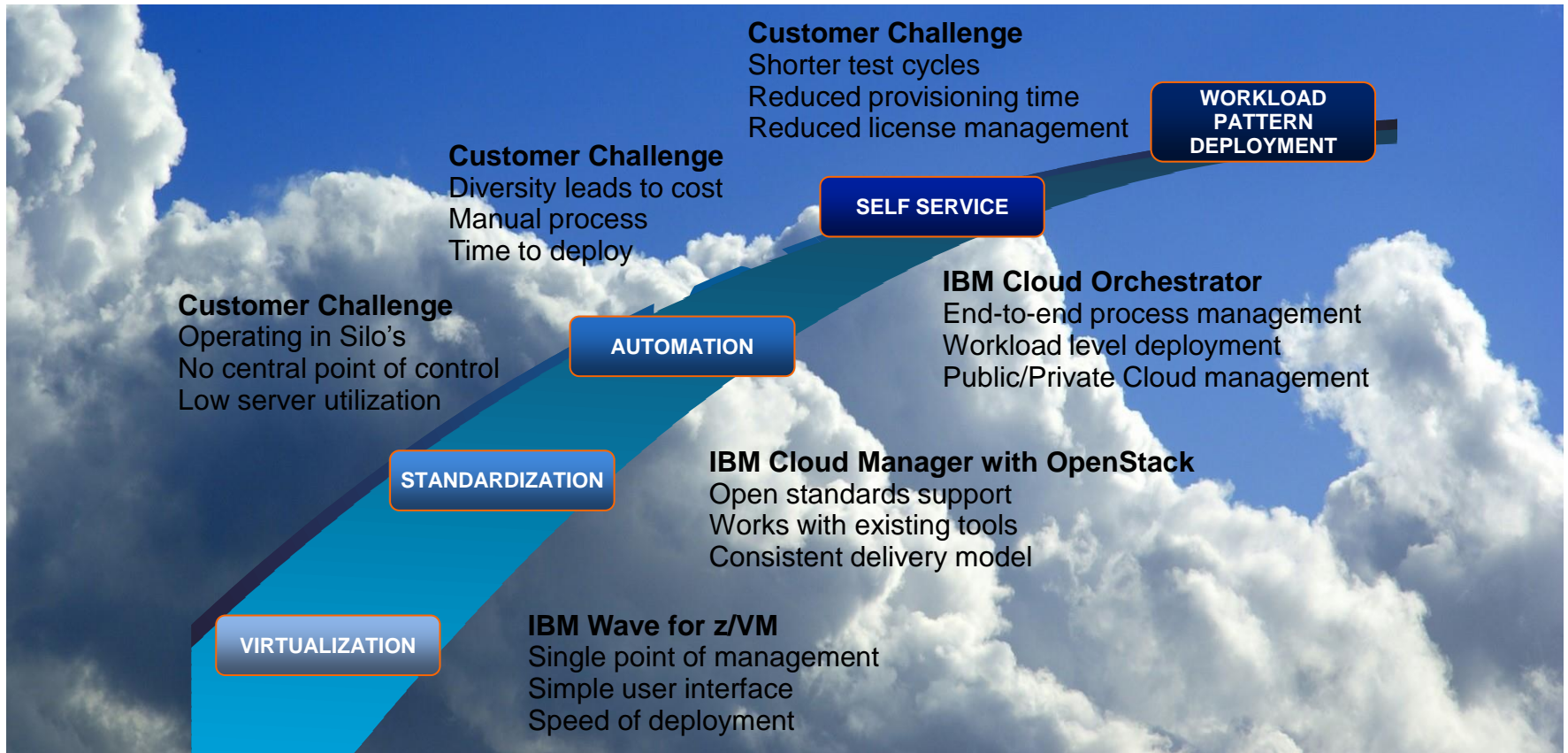
Virtual Segment	Virtual Network	Network	Default GW	Port type
<input checked="" type="checkbox"/> AT5395	SYSTEM.CSLVSWCH (z/VM VSwitch)	192.168.39.64	<input checked="" type="checkbox"/>	N/A

Hide Cancel Go



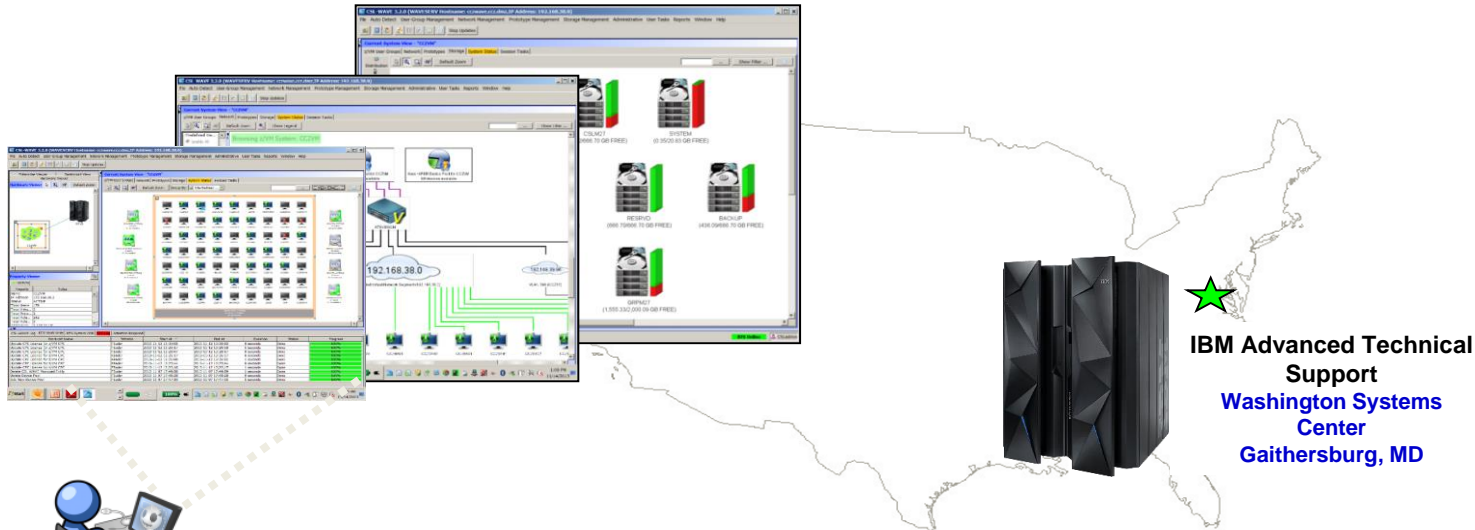


# IBM Tools Enhance the Evolving Customer Cloud Journey<sup>2016</sup>



# Learn More with IBM Wave Client Hands on Experience

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Client Sites Worldwide

## Hands on IBM Wave Environment now available

- Client hands-on experience using IBM Wave on a IBM zEnterprise EC12 (zEC12)
- Secure remote access from client site to zEC12 in Gaithersburg, MD
- Accessible 24 hours a day, 7 days a week (except for occasional planned outages)
- Guided exercises provide hands on experience with IBM Wave
- Contact your representative to get started today



# STG Lab Services – IBM Wave Jumpstart Services for z Systems 2016

- This Jumpstart service can help to accelerate your IBM Wave implementation.
- This service offering provides planning, installation, and usage assistance.
- We tailor the installation to your environment and provide skills transfer by reviewing common use cases of the interface with your support staff.

## Key Features:

- This service helps accelerate the implementation and ROI with IBM Wave
- Assistance in planning the implementation by those who have implemented and used for several years
- Provide recommendations on integration and configuration in your environment
- Demonstrate how to implement custom REXX™ Execs with IBM Wave to extend functionality
- Integration with your AD for authentication
- Demonstration and review of common IBM Wave use cases with your staff in a workshop setting
- Demonstrate how to enable existing Linux servers to be managed by IBM Wave
- The Jumpstart is usually typically complete in one week depending upon the size of the deployment

## Target Audiences:

- zEnterprise z/VM and Linux Administrators
- Existing and First in Enterprise customers
- Organization who want augment the z Systems support staff with less experienced IT professionals

## Business Drivers:

- Reduced staff z/VM experience requirements
- Increased IT staff productivity
- Reduce systems management costs

## Contact:

- [stqls@us.ibm.com](mailto:stqls@us.ibm.com) for questions specific to this service.

ZSP03858-USEN-00

**Our z Systems experts have years of experience in working with IBM Wave**





## IBM Wave for z/VM Features and Architectural Overview



IBM System z Tiger Team: News



IBM.



# Feature overview - Automation and Simplification<sup>2016</sup>

- View the entire server farm laid out graphically
- Ordered Activation/Deactivation of servers
- Execution of customer's REXX as part of the cloning process to allow local z/VM customization
- Run Linux shell scripts against dynamically grouped/filtered servers, as IBM Wave for z/VM background tasks, listing the results for each selected server - All via the GUI
- Run REXX EXECs against any virtual object with customized parameters and results listing - All via the GUI
- WAVECLI – A CLI for IBM Wave for z/VM actions that can be utilized from Linux shell scripts or Windows Batch files
- Access z/Linux guests directly from the GUI using SSH, 3270 or CLC– No hostnames or IP addresses to remember, simply right-click on the server and select the desired access

# Feature overview - Provisioning

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- Sophisticated guests cloning including Cross System Clone (across LPARs and CPCs)
- Ability to customize the first boot of a cloned server (before TCP/IP is initialized)
- Simple creating and manipulation of Vswitches and Guest LANs
- Connect/disconnect guests to Vswitches or Guest LANs via the GUI
- Storage management and provisioning at the z/VM and Linux levels (including LVM support)
- Automatic handling of Real or Dedicated devices via IBM Wave for z/VM's user defined Device Pool

# Feature overview – Network support

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- Centralized, layer based view of the entire network topology per z/VM system
- Define and control all network devices such as VSwitches and guest LANs
- Manipulation of servers-to-network connect/disconnect using GUI
- Support for VLAN usage
- Management of VSwitches with protocol layer 2 or 3
- Customize network topology view with external resources such as routers, LPARs etc.

# IBM Wave Requirements

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## CLIENT

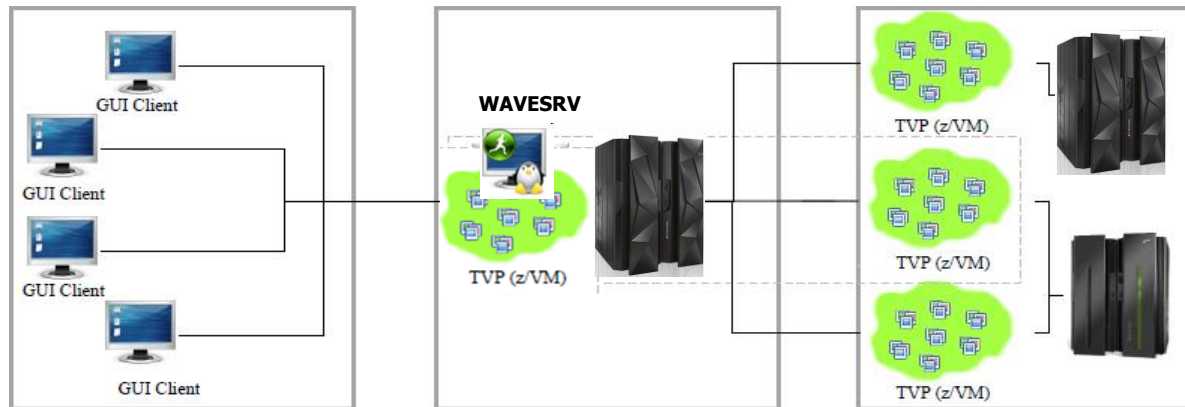
- Windows 7 Workstation
- Internet Explorer or Firefox
- Java Runtime 1.7 with Web Start Support
- PuTTY or equivalent telnet/SSH client

## WAVESRV

- z/VM Guest or LPAR
- RHEL 6 or SLES 11
- MySQL V12.22 or higher
- Java SE Runtime 1.7
- Apache

## TVP

- IBM System z10® or later
- z/VM V5.4, V6.2 or higher with Systems Management API configured
- IBM Directory Maintenance for z/VM (DirMaint™) or equivalent
- Performance Toolkit for VM™ (Perfkit, optional but suggested)

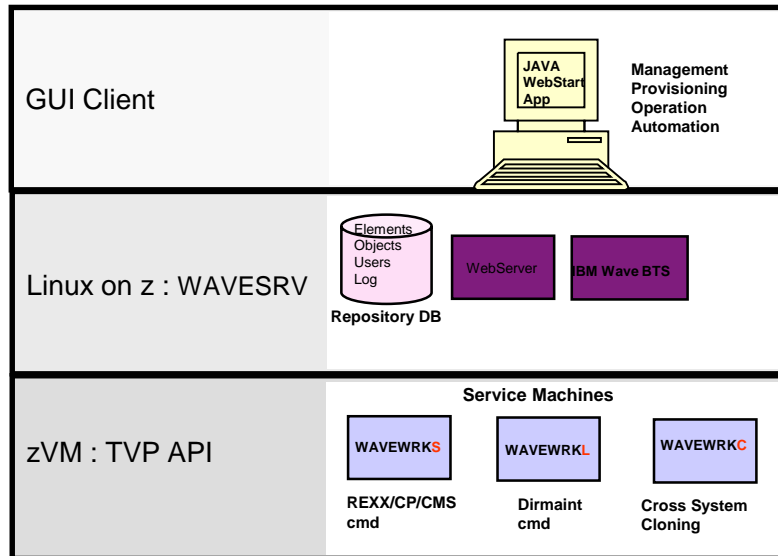


# IBM Wave Operational Model

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## Scope



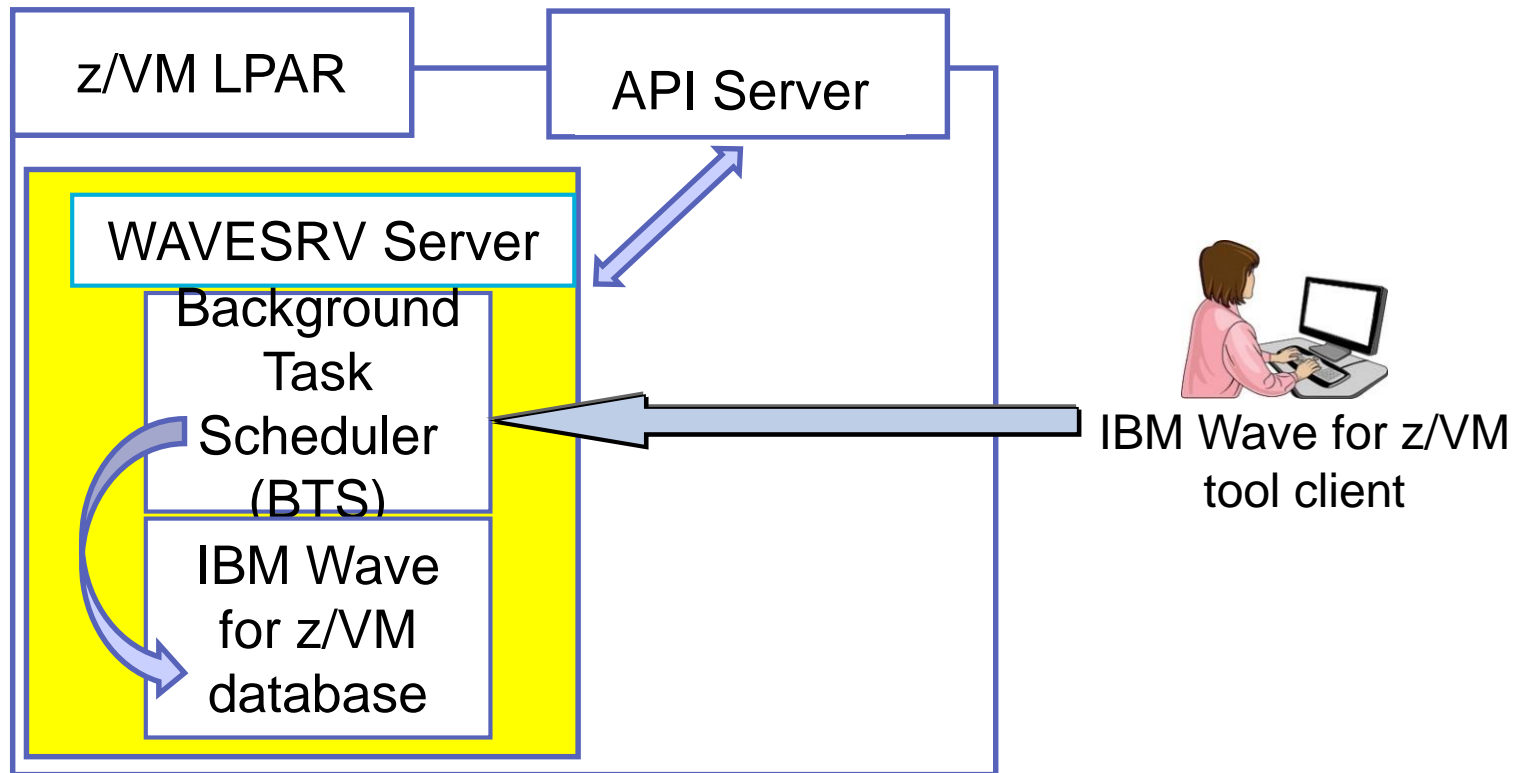
- Physical Servers
- z/VM instances, Virtual Linux Server Objects
- Virtual Networks (Guest LANs/VSwitches)
- Virtual-servers-to-Virtual Networks Connections
- Storage Volumes/Groups

- Elements
- Objects
- Users
- Log

- WAVEWRKS – REXX executables, CP/CMS commands
- WAVEWRKL – Directory Manager commands
- WAVEWRKC – Cross System Clone feature

# IBM Wave for z/VM: Tier 2 – WAVESRV server

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- **Background Task Scheduler (BTS)**
  - Employs Work Unit processing architecture for BTS worker threads
  
- **Knowledge Base**
  - Keeps track of the managed system components and their associated metadata
  
- **Common Output Repository (COR)**
  - Stores output generated by each BTS work unit
  
- **Message Brokers**
  - Efficiently moves messages across all system components
  
- **Security Enforcer**
  - Controls the scope and permission of every user action
  
- **Device Management**
  - Simple and automatic control of all virtual and real/dedicated devices





- IBM Wave utilizes the SMAPI interface in order to mediate requests from the BTS and the GUI Client.
- Specific functions executed on the z/VM System using the following Service Machines:
  - **WAVEWRKS**
    - The Short Service Machine executes various compiled REXX EXECs to interact with the z/VM environment
  - **WAVEWRKL**
    - The Long Service Machine provides an additional thread of execution to run longer scripts or executes some directory manager commands
  - **WAVEWRKC**
    - This Cross-System Cloning Service Machine is used to stream minidisks from a source z/VM system to a target z/VM system during cloning actions.
- As part of the auto-detection process when adding a new z/VM System to IBM Wave management, these 3 service machines are created and started on the z/VM System automatically.



## ▪ Sizing

### ▪ 1GB RAM

### ▪ Filesystems:

- /boot 100MB (approx. 100 Cyls)
- / 2GB (approx. 3000 Cyls)
- /var 3GB (approx. 4500 Cyls)

## ▪ Sizing the log space areas

- By default, logs are stored in /var
  - configure the /var filesystem as a logical volume under LVM so it can be extended when needed

## ▪ Location of WAVESRV server

The server is implemented as a virtual server within a z/VM LPAR.

# Sample directory entry for the WAVESRV virtual server

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```
*****
*****
USER WAVESRV <Password Here> 1G 2G GC
CPU 00
IPL CMS
MACHINE ESA 4
OPTION QUICKDSP
CONSOLE 0009 3215
NICDEF 0800 TYPE QDIO LAN SYSTEM <GLAN/VSWITCH Name here>
SPOOL 000C 3505 A
SPOOL 000D 3525 A
SPOOL 000E 1403 A
LINK MAINT 0190 0190 RR
LINK MAINT 019D 019D RR
LINK MAINT 019E 019E RR
MDISK 0191 3390 1 3 <DASD Volume Name here> - This is a CMS
minidisk
MDISK 0150 3390 1 3000 <DASD Volume Name here> - This
minidisk will be used for „/“
MDISK 0151 3390 1 4500 <DASD Volume Name here> - This
minidisk will be used for „/var“
MDISK 0152 3390 1 200 <DASD Volume Name here> - This
minidisk will be used for swap
*****
*****
```

# IBM Wave Systems Management Task Example:

## “Add Disk Space To A Virtual Server”

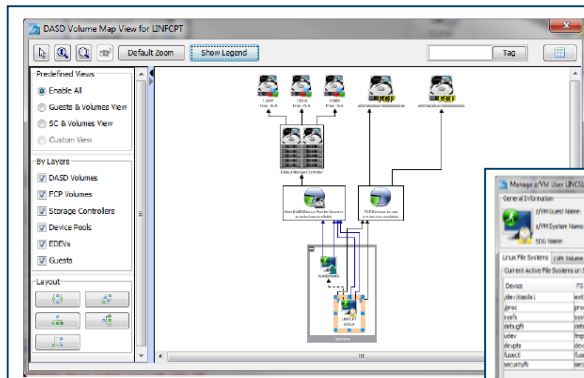
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### Without IBM Wave

1. Find requested disk space
2. Create disk definition
3. Activate definition
4. Connect storage to virtual server
5. Mount device
6. Create a File System

### View Storage at a Glance



### With IBM Wave

1. Open the “Add Storage” form
2. Fill the storage capacity requested
3. Press the “Go” button

### Benefits:

- ✓ Reduce reliance on scarce skills
- ✓ Respond faster to IT customer needs
- ✓ Reduce costs
- ✓ Empower team to do more independently
- ✓ Simplify management
- ✓ Accurately depict current environment
- ✓ Reduce manual procedure errors
- ✓ Avoid problematic situations downstream

Device	FS Type	Size (GB)	Used (GB)	Free (GB)	Type	Storage Type	Mount Point	Status (Capacity)
java000001	ext2	1.15	1.15	0.00	DD	DD		Full
java0	ext2	0.80	0.80	0.00	DD	DD	java	Full
java01	ext2	0.80	0.80	0.00	DD	DD	java	Full
java02	ext2	0.80	0.80	0.00	DD	DD	java	Full
java03	ext2	0.80	0.80	0.00	DD	DD	java	Full
java04	ext2	0.80	0.80	0.00	DD	DD	java	Full
java05	ext2	0.80	0.80	0.00	DD	DD	java	Full
java06	ext2	0.80	0.80	0.00	DD	DD	java	Full
java07	ext2	0.80	0.80	0.00	DD	DD	java	Full
java08	ext2	0.80	0.80	0.00	DD	DD	java	Full
java09	ext2	0.80	0.80	0.00	DD	DD	java	Full
java10	ext2	0.80	0.80	0.00	DD	DD	java	Full
java11	ext2	0.80	0.80	0.00	DD	DD	java	Full
java12	ext2	0.80	0.80	0.00	DD	DD	java	Full
java13	ext2	0.80	0.80	0.00	DD	DD	java	Full
java14	ext2	0.80	0.80	0.00	DD	DD	java	Full
java15	ext2	0.80	0.80	0.00	DD	DD	java	Full
java16	ext2	0.80	0.80	0.00	DD	DD	java	Full
java17	ext2	0.80	0.80	0.00	DD	DD	java	Full
java18	ext2	0.80	0.80	0.00	DD	DD	java	Full
java19	ext2	0.80	0.80	0.00	DD	DD	java	Full
java20	ext2	0.80	0.80	0.00	DD	DD	java	Full
java21	ext2	0.80	0.80	0.00	DD	DD	java	Full
java22	ext2	0.80	0.80	0.00	DD	DD	java	Full
java23	ext2	0.80	0.80	0.00	DD	DD	java	Full
java24	ext2	0.80	0.80	0.00	DD	DD	java	Full
java25	ext2	0.80	0.80	0.00	DD	DD	java	Full
java26	ext2	0.80	0.80	0.00	DD	DD	java	Full
java27	ext2	0.80	0.80	0.00	DD	DD	java	Full
java28	ext2	0.80	0.80	0.00	DD	DD	java	Full
java29	ext2	0.80	0.80	0.00	DD	DD	java	Full
java30	ext2	0.80	0.80	0.00	DD	DD	java	Full
java31	ext2	0.80	0.80	0.00	DD	DD	java	Full
java32	ext2	0.80	0.80	0.00	DD	DD	java	Full
java33	ext2	0.80	0.80	0.00	DD	DD	java	Full
java34	ext2	0.80	0.80	0.00	DD	DD	java	Full
java35	ext2	0.80	0.80	0.00	DD	DD	java	Full
java36	ext2	0.80	0.80	0.00	DD	DD	java	Full
java37	ext2	0.80	0.80	0.00	DD	DD	java	Full
java38	ext2	0.80	0.80	0.00	DD	DD	java	Full
java39	ext2	0.80	0.80	0.00	DD	DD	java	Full
java40	ext2	0.80	0.80	0.00	DD	DD	java	Full
java41	ext2	0.80	0.80	0.00	DD	DD	java	Full
java42	ext2	0.80	0.80	0.00	DD	DD	java	Full
java43	ext2	0.80	0.80	0.00	DD	DD	java	Full
java44	ext2	0.80	0.80	0.00	DD	DD	java	Full
java45	ext2	0.80	0.80	0.00	DD	DD	java	Full
java46	ext2	0.80	0.80	0.00	DD	DD	java	Full
java47	ext2	0.80	0.80	0.00	DD	DD	java	Full
java48	ext2	0.80	0.80	0.00	DD	DD	java	Full
java49	ext2	0.80	0.80	0.00	DD	DD	java	Full
java50	ext2	0.80	0.80	0.00	DD	DD	java	Full
java51	ext2	0.80	0.80	0.00	DD	DD	java	Full
java52	ext2	0.80	0.80	0.00	DD	DD	java	Full
java53	ext2	0.80	0.80	0.00	DD	DD	java	Full
java54	ext2	0.80	0.80	0.00	DD	DD	java	Full
java55	ext2	0.80	0.80	0.00	DD	DD	java	Full
java56	ext2	0.80	0.80	0.00	DD	DD	java	Full
java57	ext2	0.80	0.80	0.00	DD	DD	java	Full
java58	ext2	0.80	0.80	0.00	DD	DD	java	Full
java59	ext2	0.80	0.80	0.00	DD	DD	java	Full
java60	ext2	0.80	0.80	0.00	DD	DD	java	Full
java61	ext2	0.80	0.80	0.00	DD	DD	java	Full
java62	ext2	0.80	0.80	0.00	DD	DD	java	Full
java63	ext2	0.80	0.80	0.00	DD	DD	java	Full
java64	ext2	0.80	0.80	0.00	DD	DD	java	Full
java65	ext2	0.80	0.80	0.00	DD	DD	java	Full
java66	ext2	0.80	0.80	0.00	DD	DD	java	Full
java67	ext2	0.80	0.80	0.00	DD	DD	java	Full
java68	ext2	0.80	0.80	0.00	DD	DD	java	Full
java69	ext2	0.80	0.80	0.00	DD	DD	java	Full
java70	ext2	0.80	0.80	0.00	DD	DD	java	Full
java71	ext2	0.80	0.80	0.00	DD	DD	java	Full
java72	ext2	0.80	0.80	0.00	DD	DD	java	Full
java73	ext2	0.80	0.80	0.00	DD	DD	java	Full
java74	ext2	0.80	0.80	0.00	DD	DD	java	Full
java75	ext2	0.80	0.80	0.00	DD	DD	java	Full
java76	ext2	0.80	0.80	0.00	DD	DD	java	Full
java77	ext2	0.80	0.80	0.00	DD	DD	java	Full
java78	ext2	0.80	0.80	0.00	DD	DD	java	Full
java79	ext2	0.80	0.80	0.00	DD	DD	java	Full
java80	ext2	0.80	0.80	0.00	DD	DD	java	Full
java81	ext2	0.80	0.80	0.00	DD	DD	java	Full
java82	ext2	0.80	0.80	0.00	DD	DD	java	Full
java83	ext2	0.80	0.80	0.00	DD	DD	java	Full
java84	ext2	0.80	0.80	0.00	DD	DD	java	Full
java85	ext2	0.80	0.80	0.00	DD	DD	java	Full
java86	ext2	0.80	0.80	0.00	DD	DD	java	Full
java87	ext2	0.80	0.80	0.00	DD	DD	java	Full
java88	ext2	0.80	0.80	0.00	DD	DD	java	Full
java89	ext2	0.80	0.80	0.00	DD	DD	java	Full
java90	ext2	0.80	0.80	0.00	DD	DD	java	Full
java91	ext2	0.80	0.80	0.00	DD	DD	java	Full
java92	ext2	0.80	0.80	0.00	DD	DD	java	Full
java93	ext2	0.80	0.80	0.00	DD	DD	java	Full
java94	ext2	0.80	0.80	0.00	DD	DD	java	Full
java95	ext2	0.80	0.80	0.00	DD	DD	java	Full
java96	ext2	0.80	0.80	0.00	DD	DD	java	Full
java97	ext2	0.80	0.80	0.00	DD	DD	java	Full
java98	ext2	0.80	0.80	0.00	DD	DD	java	Full
java99	ext2	0.80	0.80	0.00	DD	DD	java	Full
java100	ext2	0.80	0.80	0.00	DD	DD	java	Full

# IBM Wave Systems Management Task Example: “Clone a Virtual Machine”

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## Without IBM Wave

1. Determine if required resources exist
2. Create clone VM definition
3. Define clone VM resources
4. Create copies of private VM resources (server)
5. Create copies of private VM resources (disk)
6. Customize clone VM
7. Authorize clone VM access / VSwitch Access
8. Add clone to management groups
9. Activate clone
10. Configure the network
11. Run middleware configuration scripts
12. Monitor and report on cloning operation.

## With IBM Wave

1. Open the “Clone” form
2. Fill in the needed information
3. Press the “Go” Button

### Benefits:

- ✓ Reduce time for a highly complex task
- ✓ Reduce costs
- ✓ Reduce reliance on scarce skills
- ✓ Improve speed to clone
- ✓ Simplify management
- ✓ Reduce errors associated with manual procedures
- ✓ No need to monitor every step of the process



### Clone a Linux Virtual Server

A screenshot of the 'Clone aVM' form in IBM Wave Systems Management. The form is titled 'Clone aVM Guest CLONER: on aVM System ap00R4a (12) Selected'. It contains several sections: 'New Clone Information' with fields for 'Target aVM System Name' (set to 'ap00R4a'), 'Number of clones' (set to 1), 'Clone Name' (set to 'CLONED'), and 'New Password'; 'Clone the following users' section with a table listing users like 'root', 'system', and 'nfs'; 'Network Configuration' section with a 'Select CIDR VRRP Script to run after clone' dropdown; and 'Optional Linux parameters' section with fields for 'Script Name', 'MIDN Name', 'Machine Name', 'Hostid Address', 'Use same obsolete devices', 'OSDK', 'MIDN', 'DASD', 'Project', 'Domain', 'Functionality/NAK (Modification Level)', and 'Regenerate SSH keys'. The form has 'Go' and 'Cancel' buttons at the bottom.



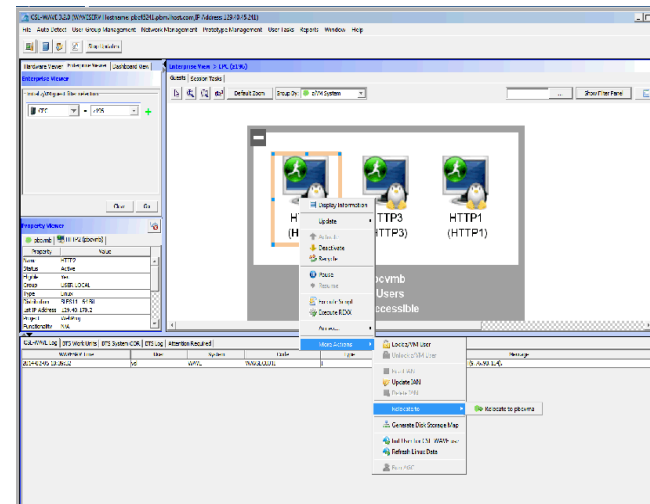
### Without IBM Wave

- Using manual control program commands

Task	Task Steps
Log into both z/VM instances	Login PBCVMA Login PBCVMB
Find out which instance has the running guest	q HTTP2 in PBCVMA q HTTP2 in PBCVMB
Verify the guest can be moved	vmrelo test HTTP2 to PBCVMB
Move the guest	vmrelo move HTTP2 to PBCVMB
Log out of both z/VM instances	Logoff PBCVMA Logoff PBCVMB

### With IBM Wave

- Using the GUI's Drag-and-Drop techniques
- Or Execute via menu selection



# IBM Wave for z/VM Tested Productivity Savings\* 2016

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IBM Wave is designed to help automate and improve the productivity of many administrative tasks. Tests were run on a zEnterprise processor both with and without the IBM Wave interface\*\*.

Tasks	Manual Times in seconds	With IBM Wave Times in seconds	Reduction in time
Clone a Guest Linux Server	576	29	95%
Activate/deactivate a guest	65	10	85%
Add a virtual switch	88	20	77%
Execute scripts for a guest	96	18	81%
Monitor z/VM	30	13	58%
Live guest migration	95	13	87%

\*These are sample task timings conducted by the IBM Competitive Project Office. Manual test times assumed a base knowledge of z/VM and assume no additional scripting. Individual test results may vary.

\*\*Tests used a zEnterprise 196.model 2817-H10 running z/VM 6.3 with 6 cores shared by LPARS in the test. Each z/VM has 128G of memory.

# Complete Solution for administration and management of the zMasters z/VM and Linux on z Systems environment

2016



## IBM Infrastructure Suite

### OMEGAMON XE on z/VM and Linux

Performance monitoring of  
z/VM and Linux guest

### Spectrum Protect (formerly TSM)

File Level backup and recovery for  
Linux Virtual Machines

### IBM Wave for z/VM

Simple, intuitive, graphical z/VM  
management tool

### Operations Manager for z/VM

Facilitate operational monitoring and  
automated operations, take action  
based on events

### Backup and Restore Manager for z/VM

Image and file level backup/restore  
of z/VM environment

Image level backup/restore of Linux

Add Tape Manager for z/VM (5697-J08) for customers backing up from z/VM to tape

### Single PID

5698-IS2 OTC  
5698-IS1 Annual  
S&S



# IBM LinuxONE Systems

# zMasters 2016



## IBM LinuxONE Emperor

6 to 141 LinuxONE Cores

350 to 8,000 Virtual Machines



The world's fastest processor

Massive I/O throughput

Large memory pools with 4 levels of Cache (64MB L1-L3 + 960MB L4)

IT analytics to avoid future outages

Dedicated cryptographic processors



## IBM LinuxONE Rockhopper

NEW

2 to 20 LinuxONE Cores

40 to 800 Virtual Machines



Entry point into LinuxONE family

All the same great capabilities in a smaller package



# Linux your Way - Greater flexibility and choice

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Choose the distribution, runtime, hypervisor, database and analytics – it's the Linux you know and love with the openness, flexibility and agility you need for you business.

Distributions	Hypervisors	Languages	Runtimes	Management	Other	Database	Analytics
Supported by Canonical  	 	          	      	   vRealize         	      Open Source eCommerce 	     <small>Diamond Partner</small>    	        

# IBM Wave Enhancements Since V1.1

Benefits	IBM Wave Enhancement
Easier to customize IBM Wave for your site	<ul style="list-style-type: none"> <li>▪ Use additional Exits for site-specific configuration</li> </ul>
More extensive support for Linux distros	<ul style="list-style-type: none"> <li>▪ Red Hat Enterprise Linux (RHEL) 7</li> <li>▪ SUSE Linux Enterprise (SLES) 12</li> <li>▪ Bare Metal Install for SLES10, 11 and RHEL5, 6 + Layer 2 Network support</li> <li>▪ Ext4 File System Support (RHEL6 only)</li> </ul>
Improved FCP SCSI device support	<ul style="list-style-type: none"> <li>▪ Enhanced storage support for               <ul style="list-style-type: none"> <li>- FCP SCSI-only environments using EDEVs</li> <li>- Richer EDEV support</li> <li>- SAN (FCP/SCSI) improved support for direct attached FCP devices</li> </ul> </li> <li>▪ Expanded management from a central point of control</li> </ul>
Easier to get started with cloud	<ul style="list-style-type: none"> <li>▪ Enhanced Cross System Cloning</li> </ul>
Easier serviceability and support	<ul style="list-style-type: none"> <li>▪ LDAP configuration checker</li> <li>▪ Improved Auto-detection</li> <li>▪ First Failure Data Capture to help capture diagnostics to aid in problem resolution</li> </ul>
Strengthened security and audit	<ul style="list-style-type: none"> <li>▪ Verisign authenticated code signing certificates</li> <li>▪ Mixed case password support</li> <li>▪ Additional audit records generated</li> <li>▪ Supports your LDAP configuration</li> </ul>

# IBM Wave Enhancements Since V1.1

Benefits	IBM Wave Enhancement
Generate reports on demand, using customized data	<ul style="list-style-type: none"><li>▪ Improved Flexible Reporting Capability with many new data points for richer report content</li><li>▪ Export reports as needed to CSV or other formats</li><li>▪ Automatically provides current view of environment</li></ul>
SoD for Audit	<ul style="list-style-type: none"><li>▪ SOD for enhanced audit logging</li><li>▪ Allows an IBM Wave administrator to satisfy corporate auditing needs by accessing a consolidated log of auditable activities.</li></ul>
SoD for IBM Wave Server	<ul style="list-style-type: none"><li>▪ IBM intends to support the installation and execution of the IBM Wave server (IBM WAVESRV) on Red Hat Enterprise Linux (RHEL) 7 and SUSE Linux Enterprise Server (SLES) 12 distributions</li></ul>

**IBM Wave offers increased automation and simplification around management of virtual Linux environments on z Systems**

# New Reporting Capabilities (v1.2)

## Business Value

Obtain the current and specific information you need, on demand

Handle report management workflow with ease

Create reports on demand in a self sufficient manner

## How

### Generate accurate inventory of your environment

- Customize reports with filtering and tagging
- Discover unused resource
- Easily manage and report on resources using detailed templates

### Benefits:

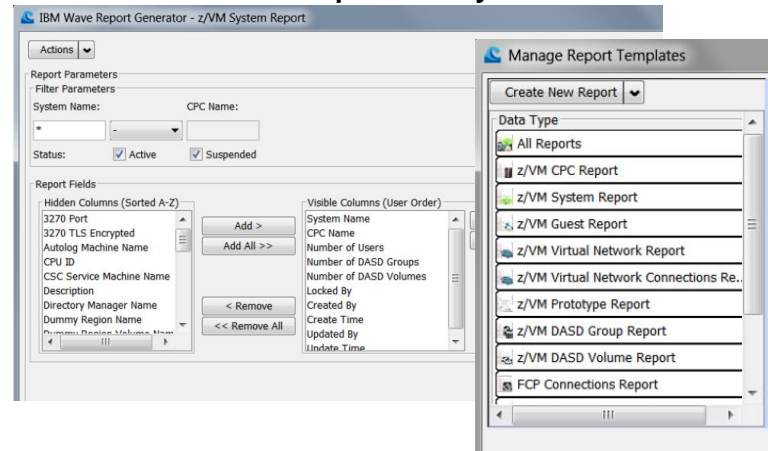
Provides visibility into your z/VM systems whenever you need it

Templates and Customization to help you create detailed reports for more meaningful content

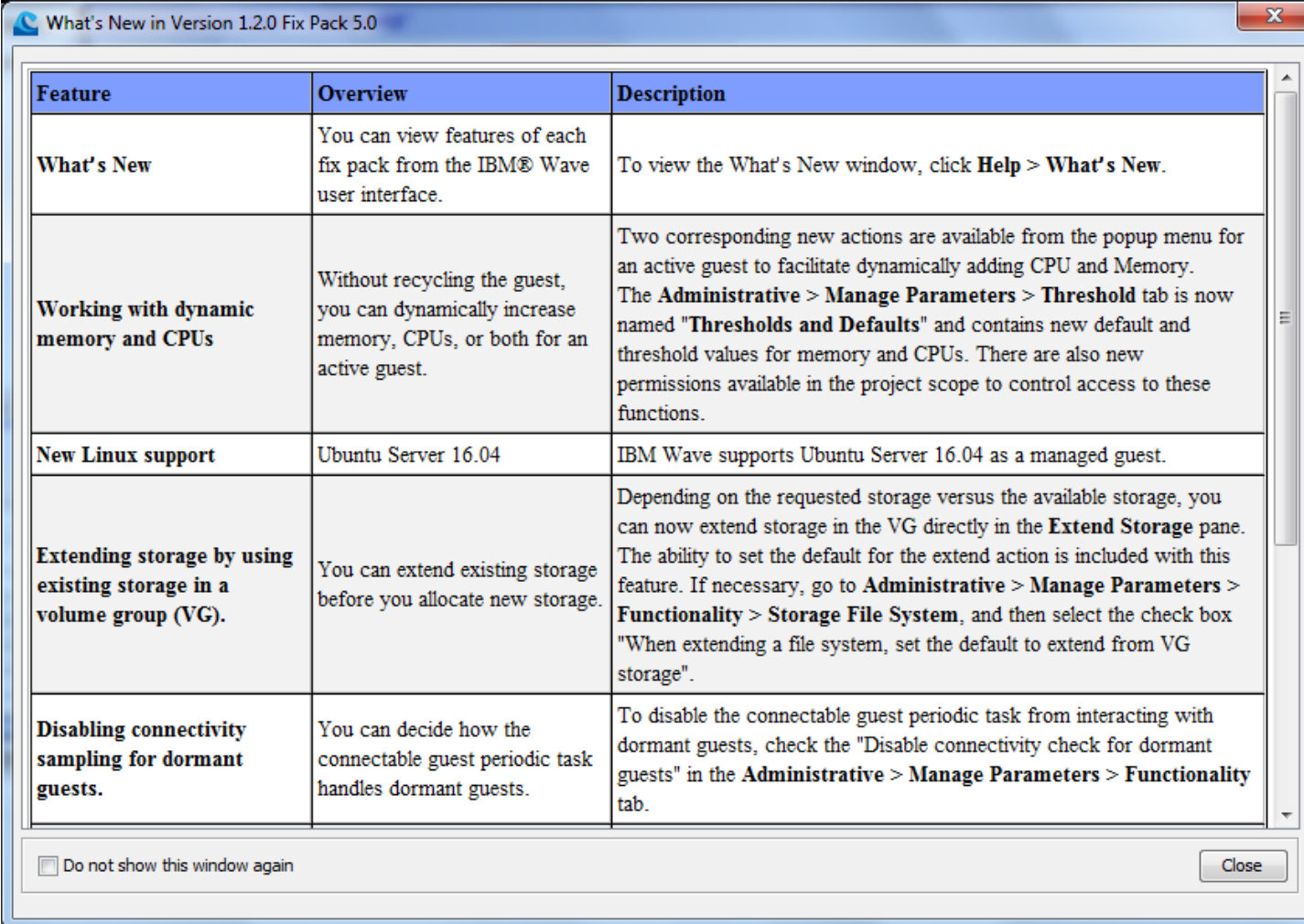
Uses IBM Wave's scopes and permissions to restrict unauthorized access

Export reports (e.g.; CSV format) for further analysis and reporting workflow and get it documented

### View and customize reports easily



# Service Pack 5



The screenshot shows a window titled "What's New in Version 1.2.0 Fix Pack 5.0". Inside the window is a table with three columns: "Feature", "Overview", and "Description". The table lists five new features. At the bottom of the window, there is a checkbox labeled "Do not show this window again" and a "Close" button.

Feature	Overview	Description
What's New	You can view features of each fix pack from the IBM® Wave user interface.	To view the What's New window, click <b>Help &gt; What's New</b> .
Working with dynamic memory and CPUs	Without recycling the guest, you can dynamically increase memory, CPUs, or both for an active guest.	Two corresponding new actions are available from the popup menu for an active guest to facilitate dynamically adding CPU and Memory. The <b>Administrative &gt; Manage Parameters &gt; Threshold</b> tab is now named " <b>Thresholds and Defaults</b> " and contains new default and threshold values for memory and CPUs. There are also new permissions available in the project scope to control access to these functions.
New Linux support	Ubuntu Server 16.04	IBM Wave supports Ubuntu Server 16.04 as a managed guest.
Extending storage by using existing storage in a volume group (VG).	You can extend existing storage before you allocate new storage.	Depending on the requested storage versus the available storage, you can now extend storage in the VG directly in the <b>Extend Storage</b> pane. The ability to set the default for the extend action is included with this feature. If necessary, go to <b>Administrative &gt; Manage Parameters &gt; Functionality &gt; Storage File System</b> , and then select the check box "When extending a file system, set the default to extend from VG storage".
Disabling connectivity sampling for dormant guests.	You can decide how the connectable guest periodic task handles dormant guests.	To disable the connectable guest periodic task from interacting with dormant guests, check the "Disable connectivity check for dormant guests" in the <b>Administrative &gt; Manage Parameters &gt; Functionality</b> tab.

Do not show this window again Close

# Reference Account

- **Problem:** Large Insurance Company wanted to improve its server-cloning methodology. The goal was to provide management with a status dashboard and to be able to delegate server on/off functions to server administrators.
- **Solution:** Client engaged IBM Systems Lab Services and Training to implement IBM Wave for z/VM software in order to simplify the administration and management of its IBM z/VM hypervisor-based servers.
- **Value:** The client reduced **server deployment** time by more than 83 percent, from 1.5 hours to 15 minutes, and the time it takes to **add disks** to an existing server by **more than 93 percent**, from 30 minutes to as few as two minutes.

## Client's quote...

- "The biggest benefit I see from the IBM Wave software is the **reduction in time it takes to deploy a server**. Users think I'm pre-allocating servers for them, I can create them so quickly. If the users want to think I'm a wizard, I won't disagree. "IBM Wave software has made my job significantly easier. Pushing out updates is incredibly easy."
- I really **like the monitoring dashboard and displays**; I keep the dashboard open on my desktop at all times. What used to take minutes now takes seconds, such as adding a storage volume. The impact it has on the tasks it automates has been enormous."  
--J systems programmer



# Top Reasons Why you Need IBM Wave

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- Does your company need to simplify advanced virtualization functions?
- Do you need to accelerate the productivity of less experienced staff?
- Would you like the convenience of reporting capabilities without having to navigate to another product?
- Would it be convenient to easily visualize configuration and status of virtual guests?
- Do you ever need to limit authority to effect resource changes to certain staff?
- Could you use automatic notifications to alert staff from performing certain operations during critical periods?
- Would you like to be able to perform easy drag and drop connections, like connecting z/VM to a virtual network?
- Can you group and filter virtual resources and manage them in a way that is meaningful to your users?
- Would you like to perform complex tasks like LGR in seconds?
- Would you like to simplify the capturing and cloning of virtual Linux guests in a few clicks? Would you like to be able to customize cloning and add scripts?

**Would you like to do all of this with one product?**

IBM Wave
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓
✓

# For more information

## Collateral

- [IBM Wave External Webpage](#)
- [Oracle Database deployment using IBM Wave for zVM Whitepaper](#)
- [Demo: IBM WAVE Video](#)
- [Video: Master IT Complexity with the IBM Enterprise Linux Server and IBM Wave](#)
- [Brochure: Empowered Visualization Management IBM Wave for z/VM](#)

## IBM Wave for z/VM Redbooks

- [IBM Wave for z/VM Installation, Implementation, and Exploitation](#) SG24-8192-00 June 2015
- [IBM Wave for z/VM: An Introduction](#) TIPS1080 February 2014



IBM-NA (CSLVM17)  
28 Users  
All Accessible



IBM-SEC (CSLVM17)  
12 Users  
All Accessible



IBM-DIRM (CSLVM17)  
6 Users  
All Accessible



IBM-UTIL (CSLVM17)  
11 Users  
All Accessible



USER-LOCAL (CSLVM17)  
9 Users (+1 Hidden)  
All Accessible



WAVE-INTERNAL (CSLVM17)  
4 Users  
All Accessible



IBM-SYSTEM (CSLVM17)  
5 Users  
All Accessible



IBM-SMAPI (CSLVM17)  
11 Users  
All Accessible



IBM-COM (CSLVM17)  
37 Users  
All Accessible



IBM-OPER (CSLVM17)  
6 Users  
All Accessible



IBM-ENS (CSLVM17)  
4 Users  
All Accessible

IBM System z Tiger Team: News



IBM.



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