IBM Wave for z/VM

March 5, 2020

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Agenda

- IBM Wave for z/VM
- Functionality
- Benefits
- Fit in Portfolio
- Test Drive Environment
- Features and Architectural Overview
- Live Demo

What IBM Wave is NOT…

Not just for novice users

Not just a cloning tool

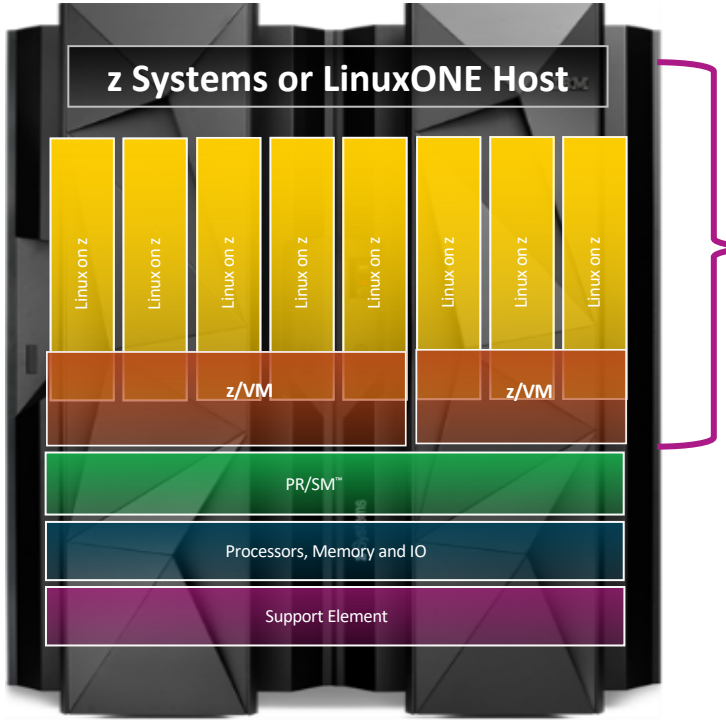
Not just a GUI (Graphical User Interface)

Not a z/VM sys prog replacement

Not excluded by in-house Scripts

Not just for 100s of servers

IBM Wave offers comprehensive support



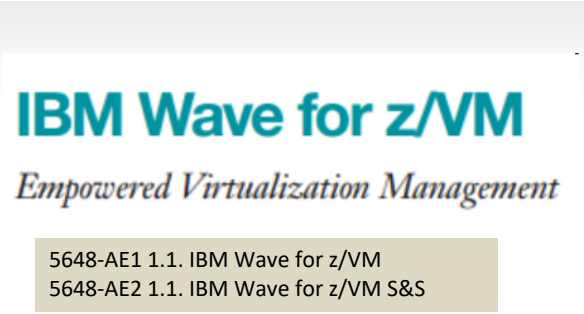
- Visualization
- Systems management
- Administration
- Configuration changes
- Productivity gains
- Provisioning & cloning
- CLI and API for automation
- Reporting & auditing

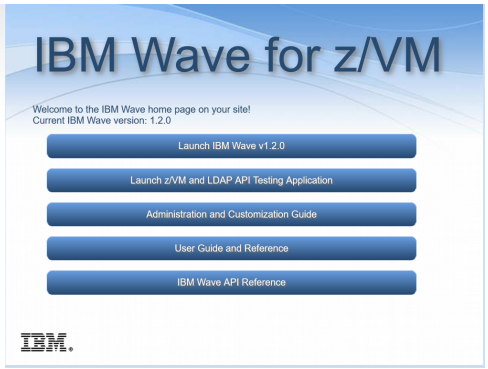
IBM Wave for z/VM V1.2 (IBM Wave)

- IBM Wave is a virtualization management product for z/VM® and Linux® 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
- Part of IBM Infrastructure Suite for z/VM and Linux

Supported IBM System z® processors: IBM System z10® Through z15®

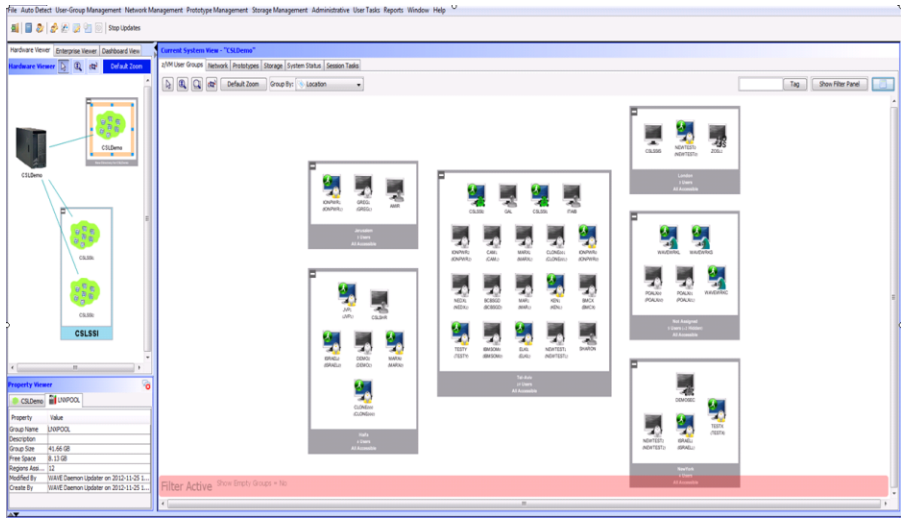
Supported z/VM versions/releases:
- z/VM 7.1
- z/VM 6.4





Simplify and Automate z/VM and Linux Management

- 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
- Use 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**

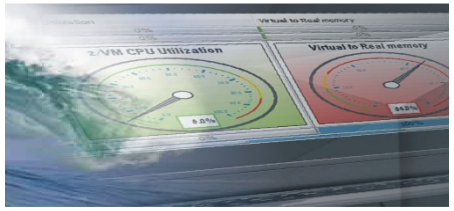
A simple, intuitive virtualization management tool providing management, provisioning, and automation for a z/VM environment supporting Linux® virtual servers

IBM Wave offers value in three major areas

Advanced Visualization

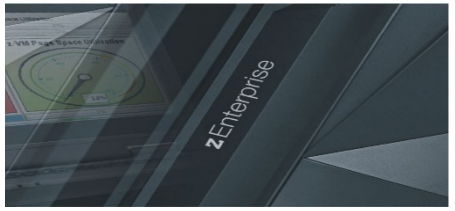
- Organize and simplify administration of Linux guests
- Automate and simplify management steps
- Shorten the learning curve needed to manage your Linux and z/V M environment
- View servers and storage utilization graphically
- View resource status at a glance
- Use graphical or tabular displays with 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
- Complement IBM OMEGAMON® XE for in-depth performance monitoring and historical views

Resource Management



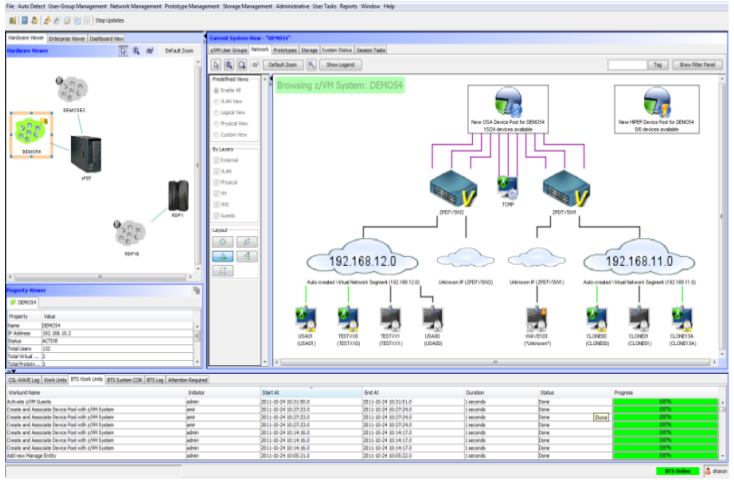
- Manage your systems from a single workstation
- Assign and delegate administrative access using role-based assignments
- Provision, clone, and activate virtual servers
- Define and control virtual network and storage devices
- Perform complex tasks such as live guest relocation using a few keystrokes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

Intuitive Reports, Graphical Monitoring and Easy Integration

- **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**
  - Observe the state of resources; icons show additional resource details
  - 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
  - Export table-based views to CSV files for import into other applications
- **Integration**
  - Use Automatic Guest Classification (AGC) to integrate with existing provisioning process
  - Exploit LDAP/Active Directory support for Authentication and Authorization

Intelligent Visualization – Quickly Understand Resource Status

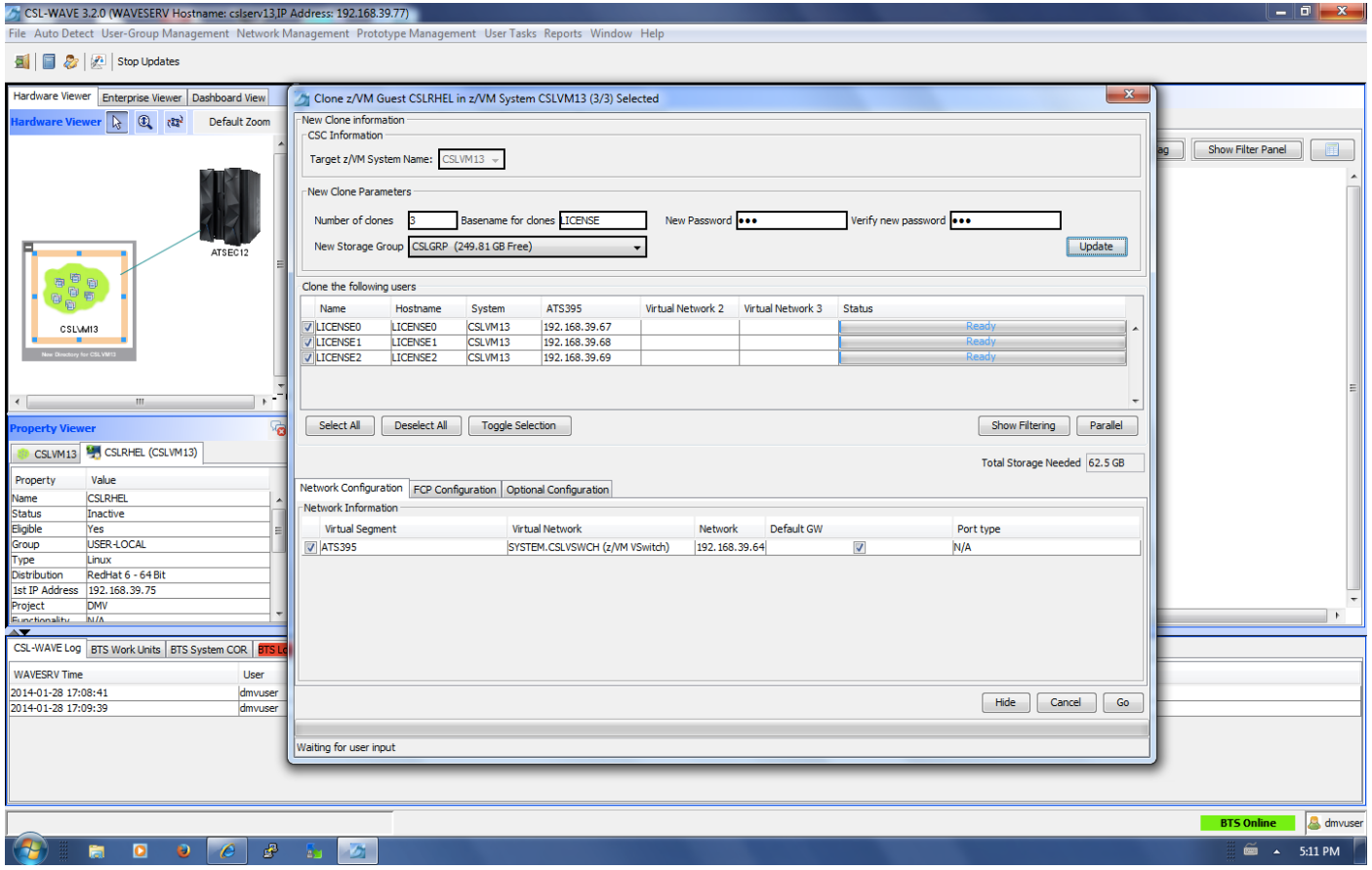
- **Get a current and accurate view of your managed environment**
  - Network Topology
    - Centralized view of the entire network topology per z/VM System, view Virtual LANS (VLANS)
    - Annotate network topology view to identify external resources such as routers and switches
  - Linux Servers
    - 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)

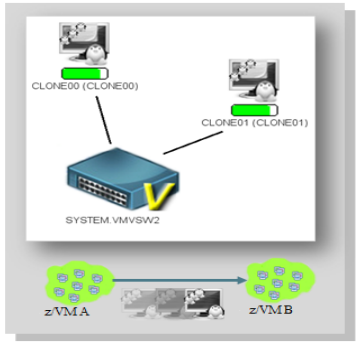


- **Visualize and control virtual resources**
  - Views can be graphical or easily switched to tabular mode
  - View relationships between resources easily and graphically
  - View the entire environment graphically and easily zoom in
- **Advanced filters, tagging, layout and layer based views for every display**

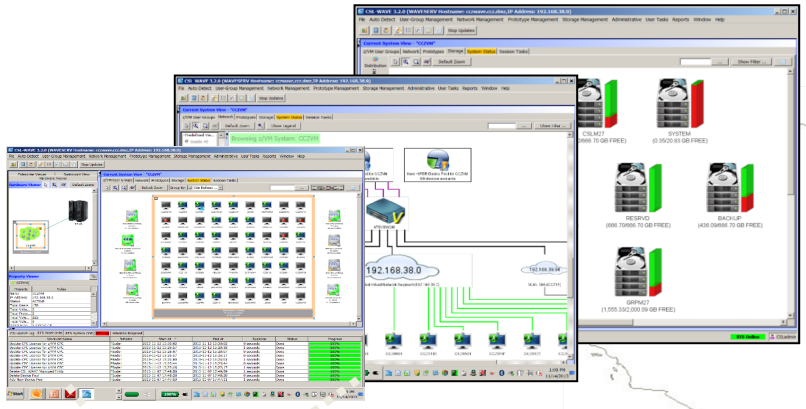
Performance Monitoring – At a Glance Status of all z/VM instances

Simplify Systems Management – Provision Quickly and Easily





Learn More with IBM Wave Client Hands on Experience



Client Sites Worldwide

IBM Advanced Technical Support
Washington Systems Center
Gaithersburg, MD

Hands on IBM Wave Environment available

- Client hands-on experience using IBM Wave for z/VM
- Secure remote access from client site to z/VM 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

IBM Wave for z/VM
Features and Architectural Overview

Feature overview – Automation and Simplification

- 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
- WAVE Restful APIs – for cloud based access to Wave functionality
- Access z/Linux guests directly from the GUI using SSH, 3270 or CLC – no host names or IP addresses to remember, simply right-click on the server and select the desired access

Feature overview – Provisioning

- 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 management

- 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 configuration and use
- Management of VSwitches with protocol layer 2 or 3
- Customize network topology view with external resources such as routers and other LPARs

IBM Wave Requirements

CLIENT

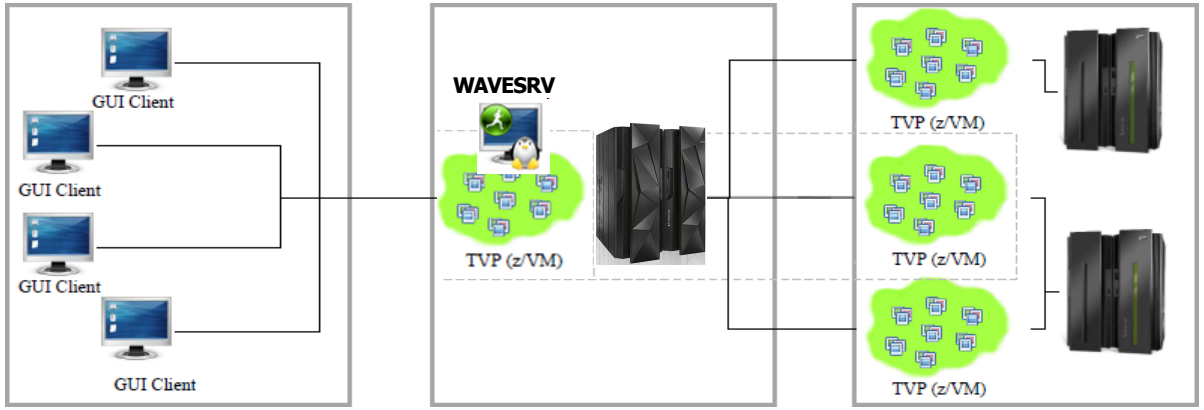
- Windows 7 or higher Workstation
- Internet Explorer or Firefox
- Java Runtime 1.8 with Web Start Support
- PuTTY or equivalent telnet/SSH client

WAVESRV

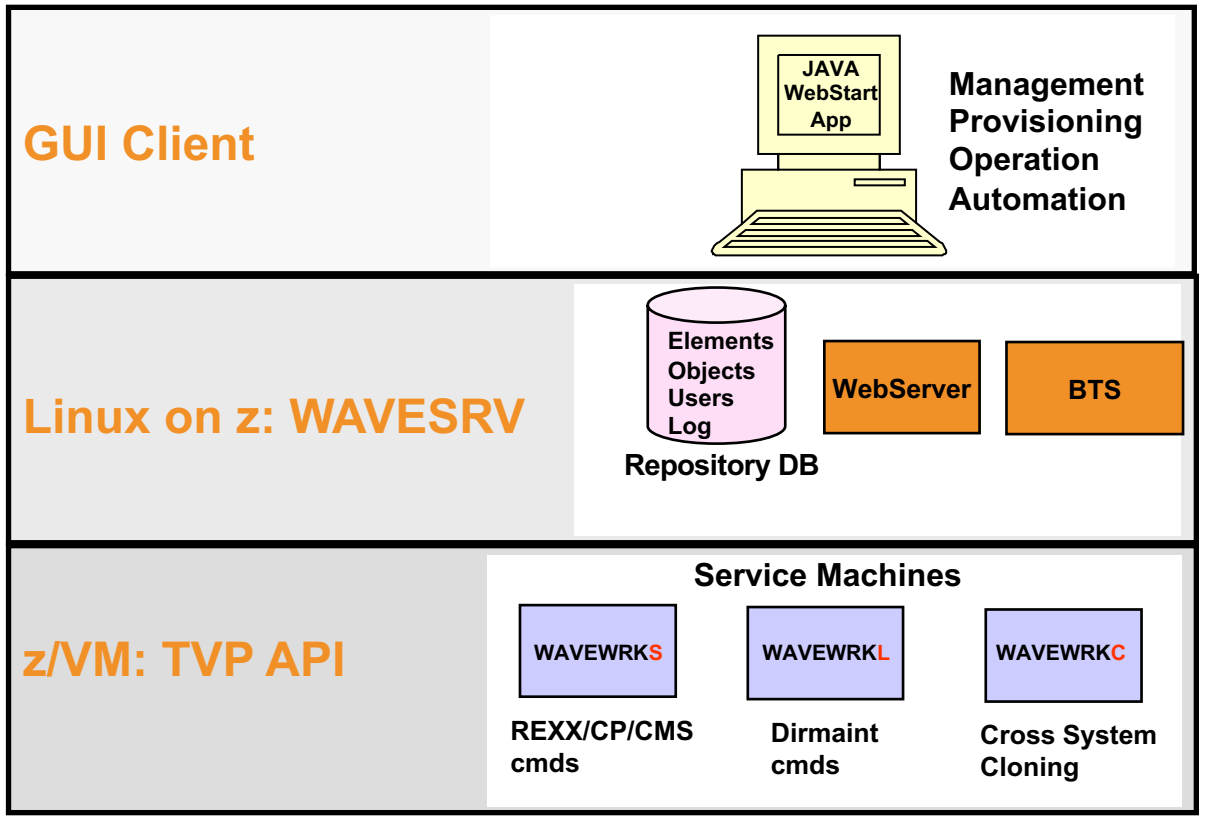
- z/VM Guest or LPAR
- RHEL 7 or SLES 12
- MySQL V5.6 or higher
- IBM Java SE Runtime 1.8
- Apache

TVP

- IBM System z10® or later
- z/VM V6.4 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



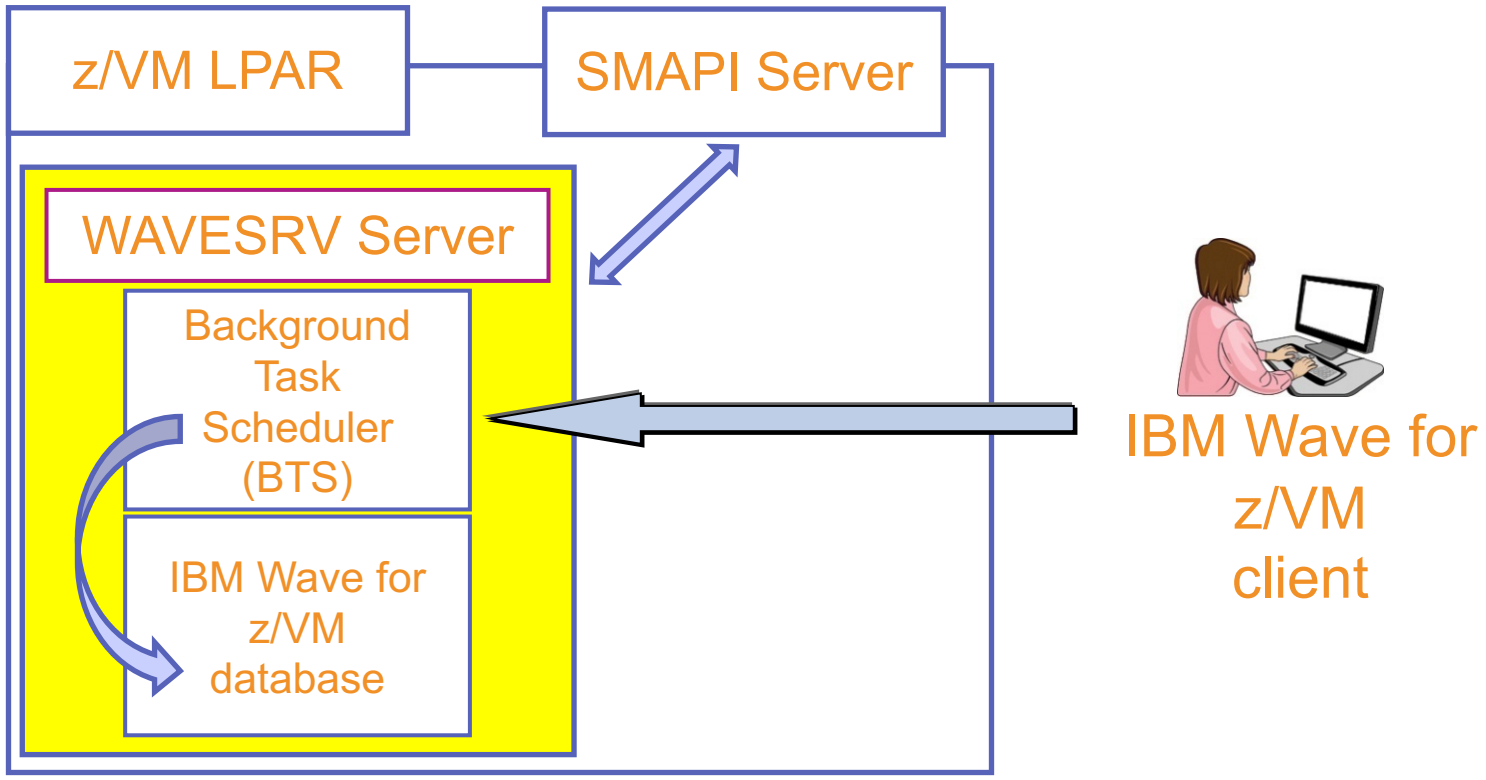
Scope

- Physical servers
- z/VM instances, Linux guest objects
- Virtual networks (Guest LANs/VSwitches)
- Virtual server connections to virtual networks
- 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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IBM Wave for z/VM WAVESRV server foundation

- 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 for z/VM Target Virtualization Platform (TVP)

- IBM Wave uses the SMAPI interface to mediate requests from the BTS and the GUI Client

- Specific functions execute 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 EXECs, including directory manager commands
  - WAVEWRKC
    - The 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 three service machines are created and started on the z/VM System automatically

Planning and Design

- Sizing
  - 2GB RAM
  - Filesystems
    - / 4GB
    - /var 10GB – includes Wave DB/Knowledgebase and Logging

- 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

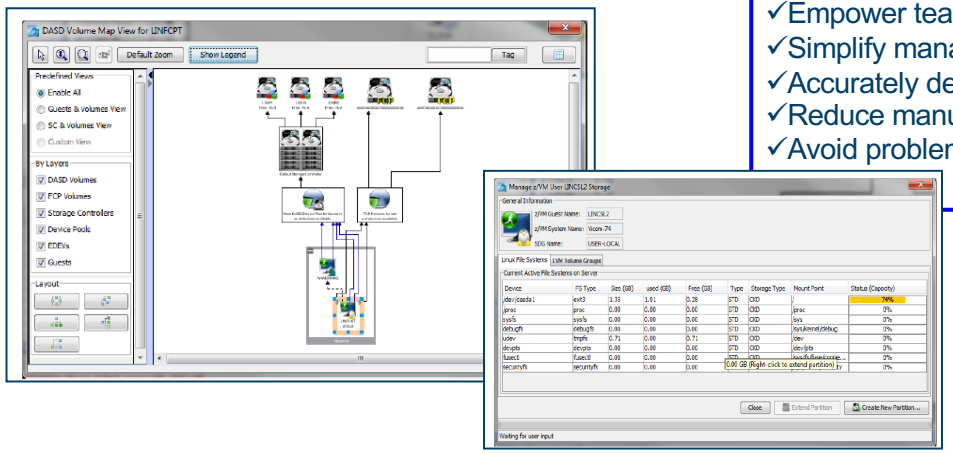
- Location of WAVESRV server
  - The server runs as a guest on a z/VM LPAR

Sample Systems Management Task: Add Disk Space To A Virtual Server

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:

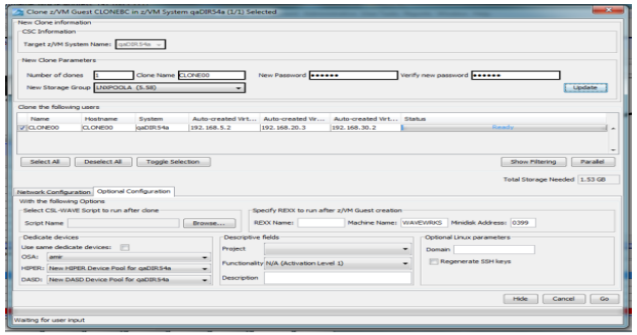
- ✓Reduce reliance on scarce skills
- ✓Respond faster to IT customer needs
- ✓Reduce costs
- ✓Empower team to do more independently
- ✓Simplify management
- ✓Accurately depict current environment
- ✓Reduce manual procedure errors
- ✓Avoid problematic situations downstream

Sample Systems Management Task: Clone a Virtual Machine

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.

Clone a Linux Virtual Server



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

Sample Systems Management Task: Live Guest Relocation

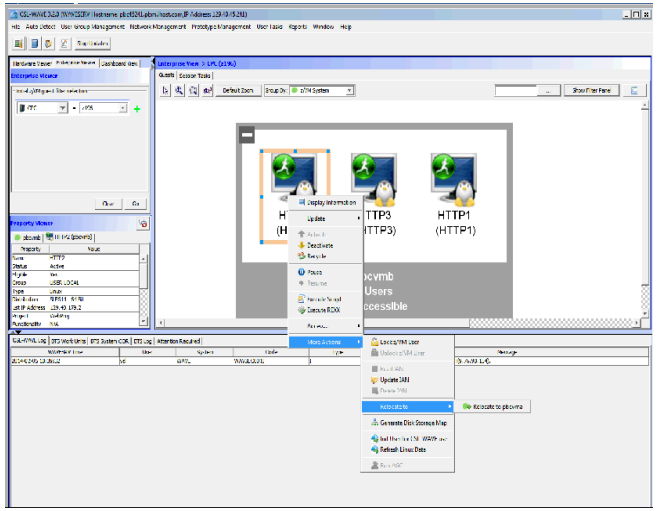
Without IBM Wave

- 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

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



IBM Wave for z/VM Tested Productivity Savings*

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 had 128G of memory.

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

Single PID

5698-IS2 OTC
5698-IS1 Annual S&S

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

Recent IBM Wave Enhancements

Benefits	IBM Wave Enhancement
Easier to customize IBM Wave for your site	▪ Use additional Exits for site-specific configuration
More extensive support for Linux distros	▪ Red Hat Enterprise Linux (RHEL) 7, SoD RHEL 8 ▪ SUSE Linux Enterprise (SLES) 12, SLES 15 ▪ Bare Metal Install for SLES11, 12, 15 and RHEL6, 7 and SoD RHEL 8
Improved FCP SCSI device support	▪ Enhanced storage support for – FCP SCSI-only environments using EDEVs – SAN (FCP/SCSI) improved support for direct attached FCP devices
Easier to get started with cloud	▪ Enhanced Cross System Cloning
Easier serviceability and support	▪ LDAP configuration checker ▪ Improved Auto-detection ▪ First Failure Data Capture to aid problem resolution
Strengthened security and audit	▪ Verisign authenticated code signing certificates ▪ Mixed case password support ▪ Additional audit records generated ▪ Supports your LDAP configuration ▪ HTTPS for Launch Page, Certificate verification for GUI-BTS, GUI-zVM, and BTS-zVM

Recent IBM Wave Enhancements …

Benefits	IBM Wave Enhancement
Generate reports on demand, using customized data	▪ Improved Flexible Reporting Capability with many new data points for richer report content ▪ Export reports as needed to CSV or other formats ▪ Automatically provide current view of environment
Audit	▪ Enhanced audit logging ▪ Allow an IBM Wave administrator to satisfy corporate auditing needs by accessing a consolidated log of activities
IBM Wave Server	▪ Support for 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
Dynamic Memory and CPUs	▪ Ability to add memory or CPUs to a running Linux Server
Enterprise integration	▪ RESTful API

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

Reporting Capabilities

Business Value	How
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	Generate accurate inventory of your environment ▪ Customize reports with filtering and tagging ▪ Discover unused resources ▪ Easily manage and report on resources using detailed templates

Benefits:

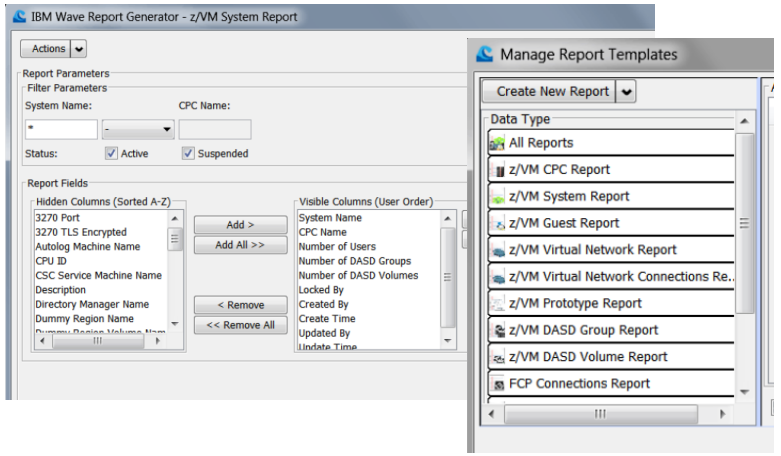
Provides visibility into your z/VM systems whenever you need it

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 to retain documentation

View and customize reports easily



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 then 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

For more information

Collateral

- IBM Wave External Webpage
- 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 Knowledge Center

IBM Wave for z/VM Redbooks

- IBM Wave for z/VM Installation, Implementation, and Exploitation SG24-8192-01 December 2015
- IBM Wave for z/VM: An Introduction TIPS1080 February 2014

IBM Wave for z/VM - Live Demo