

A Rapid Recovery Technical Whitepaper

**Lenovo Nutanix Data Protection:
Best Practices for Quest Software Data
Protection Solutions**



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Legend

 **WARNING:** A WARNING icon indicates a potential for property damage, personal injury, or death

 **CAUTION:** A CAUTION icon indicates potential damage to hardware or loss of data if instructions are not followed.

 **IMPORTANT, NOTE, TIP, MOBILE, or VIDEO:** An information icon indicates supporting information.

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Executive Summary

This Technical White Paper presents best practices on data protection for virtual machines in a server virtualization environment (VMware vSphere or Acropolis (AHV)) on Lenovo Nutanix.

Lenovo Japan and Quest Software Japan jointly verified the backup / restoration of the virtual machine of the server virtualization environment (VMware vSphere and AHV (Acropolis)) on the Lenovo Nutanix product with the data protection software Quest Rapid Recovery product .

Target of this white paper

This white paper is intended for those who are considering highly reliable data protection for virtual machines in Nutanix VMware vSphere.

Target of prerequisite skills and knowledge

- Knowledge of system construction and operation management related to Microsoft Windows 2012
- Knowledge of system construction and operation management related to CentOS 7
- Knowledge of software on VMware vSphere 6.0 including VMware ESXi 6.0, VMware vCenter Server 6.0, and vSphere Client
- Knowledge of Nutanix CVM, Prism management console software
- Knowledge of Quest Rapid Recovery software

Objective

The purpose of this verification is to validate backup / restoration of virtual machine of server virtualization environment (VMware vSphere and AHV (Acropolis)) on Nutanix by Rapid Recovery product of data protection software and to create best practice.

In this verification, virtual machines of Lenovo Nutanix's server virtualization environment (VMware vSphere and AHV (Acropolis)) are backed up by Rapid Recovery functions (Agent and Agentless) and restored in the assumed scenario.

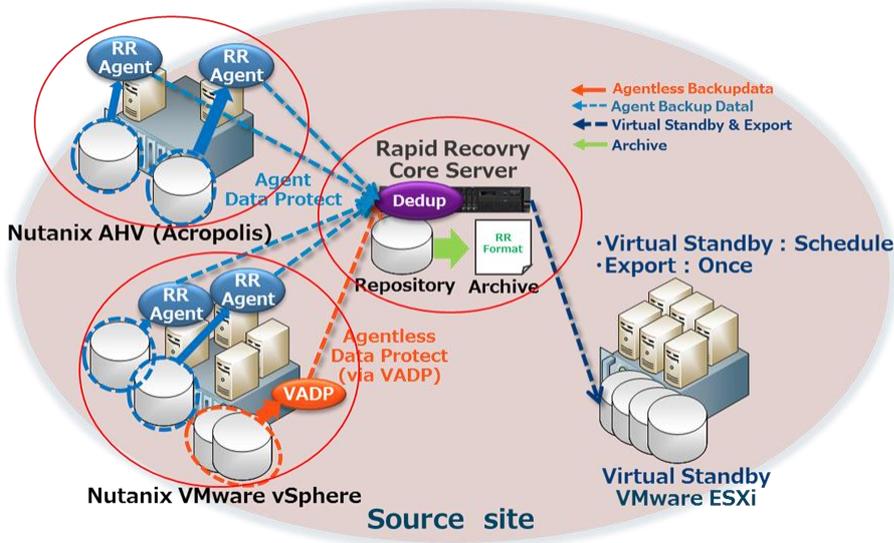
For details of Quest Rapid Recovery, please refer to the Quest Rapid Recovery Release Notes.

<https://support.quest.com/technical-documents/rapid-recovery/6.1.1/release-notes/>

i **NOTE:** Nutanix Hyper Converged Infrastructure Environment is Lenovo Nutanix product, so please contact Lenovo for inquiries about Nutanix.

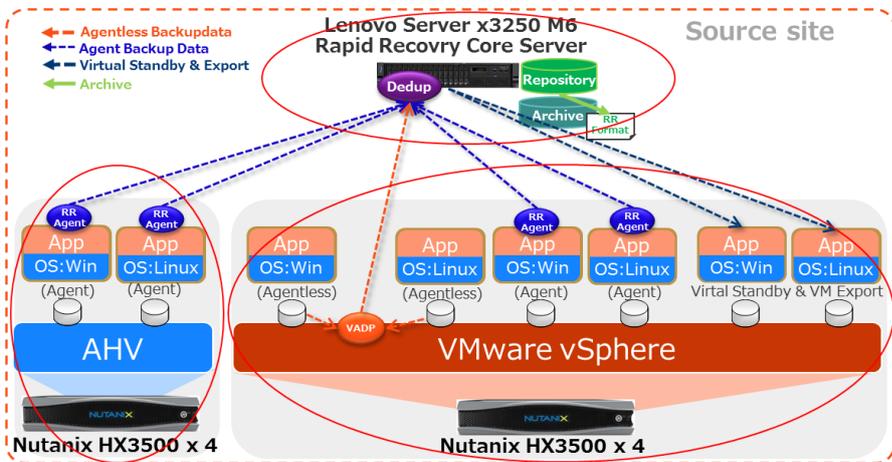
System Image

In this verification, Nutanix VMware vSphere, Nutanix AHV (Acropolis) and Rapid Recovery Core Server environment are configured at Source Site.



System Configuration

In this configuration, Rapid Recovery Core Server is installed on Lenovo System x 3250 hardware, and AHV (Acropolis) HyperVisor and VMware vSphere HyperVisor are configured in two groups of Nutanix HX 3500.



Hardware configuration

Hardware Spec for Nutanix VMware vSphere

Manufacturer	Lenovo
model name	HX3500 x 4 Set
Processor	Intel Xeon E5-2630 16 core x 2 cpu /Set
Memory	PC4-19200 DDR4 2400MHz LP RDIMM, 16 GB x 16 = 256 GB /Set
Storage	SSD 400 GB x 2 =800 GB, HDD 1TB x 6 = 6 TB /Set
HyperVisor	VMware vSphere 6.0

Hardware Spec for Nutanix Acropolis

Manufacturer	Lenovo
model name	HX3500 x 4 Set
Processor	Intel Xeon E5-2630 16 core x 2 cpu /Set
Memory	PC4-19200 DDR4 2400MHz LP RDIMM, 16 GB x 16 = 256 GB /Set
Storage	SSD 400 GB x 2 =800 GB, HDD 1TB x 6 = 6 TB /Set
HyperVisor	Nutanix Acropolis 4.7

Hardware Spec for System X3250

Manufacturer	Lenovo
model name	System X3250 M6 x 1 set
Processor	Intel Xeon E3-1240 v5 3.5Ghz 4 core x 1cpu
Memory	PC4-19200 DDR4 2400MHz LP RDIMM, 8GB
Storage	HDD 4TB(7,200rpm) NL-SAS
OS	Microsoft Windows Server 2012 R2

Software configuration

Rapid Recovery Core software	
OS	Windows Server 2012 R2
Backup software	Quest Rapid Recovery 6.1.1 Core x64 Quest Rapid Recovery 6.1.1 Local Mount Utility X64
Web Browser	Microsoft Internet Explorer 11
Tools	WinSCP
	TeraTerm
	Remote Desktop

Rapid Recovery Agent Software (Windows)	
OS	Windows Server 2012 R2
Backup software	Quest Rapid Recovery 6.1.1 Agent for Windows x64 Quest Rapid Recovery 6.1.1 Local Mount Utility X64
Tools	WinSCP
	TeraTerm
	Remote Desktop

Rapid Recovery Agent Software (Linux)	
OS	CentOS 7
Backup software	Quest Rapid Recovery 6.1.1 Agent for RHEL7 and CentOS x64 (Bundle Local Mount Utility) Quest Rapid Recovery 6.1.1 Linux Live DVD nbd (Network Block Device)
Tools	yum
	rpm
	systemctl

Rapid Recovery Agentless Software (Windows)	
OS	Windows Server 2012 R2
Tools	WinSCP
	TeraTerm
	Remote Desktop

Rapid Recovery Agentless Software (Linux)	
OS	CentOS 7
Tools	yum
	rpm
	systemctl

Scenario of VMware vSphere

In this verification scenario, the Rapid Recovery Agentless function backup / restore virtual machines on VMware vSphere with VADP. Also, use the Rapid Recovery Agent function to back up / restore directly to the virtual machine on VMware vSphere. Verify in these two scenarios and confirm that the backup and restore process is successfully completed and the data restoration is correct.

i | **NOTE:** For detailed contents, refer to the scenario details of the Appendix.

Scenario of Nutanix AHV (Acropolis)

In this verification scenario, the Rapid Recovery Agent function directly backup / restore to the virtual machine on AHV (Acropolis), and confirms that the normal end of the backup / restore process and the data restoration are correct.

In addition, the Agentless function of Rapid Recovery 6.1.1 of the current version is not subject to verification because the backup / restore function of the virtual machine using AHV (Acropolis) API is not implemented.

i | **NOTE:** For detailed contents, refer to the scenario details of the Appendix.

Result of VMware vSphere

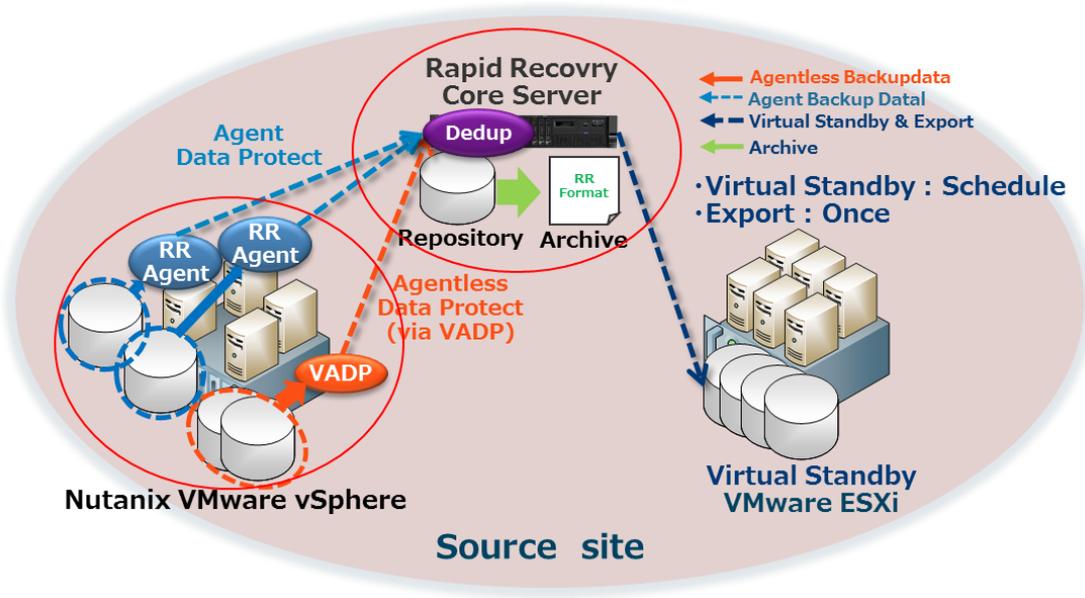
It was confirmed that the backup / restore process of the combination of the following list was successful.

Backup Software	Function	No	OS Type	Backup/Restore	Level	Result
Rapid Recovery	Agentless	1	Windows	Backup	Image level	Success
		2		Restore (VM Export)	Image level	Success
		3		Restore (BMR)	Image level	Success
		4		Restore (Mount)	File level	Success
		5		Restore (Restore)	Drive level	Success
		6	Linux	Backup	Image level	Success
		7		Restore (VM Export)	Image level	Success
		8		Restore (BMR)	Image level	Success
		9		Restore (Mount)	File level	Success
		10		Restore (Restore)	Drive level	Success
	Agent	Windows	11	Backup	Image level	Success
			12	Restore (VM Export)	Image level	Success
			13	Restore (BMR)	Image level	Success
			14	Restore (Mount)	File level	Success
			15	Restore (Restore)	Drive level	Success
		Linux	16	Backup	Image level	Success
			17	Restore (VM Export)	Image level	Success
			18	Restore (BMR)	Image level	Success
			19	Restore (Mount)	File level	Success
			20	Restore (Restore)	Drive level	Success

i | **NOTE:** For detailed contents, refer to the result details of the Appendix.

Backup/restore of virtual machines (Windows and Linux) on VMware vSphere was verified by Rapid Recovery Agentless and Agent functions.

It was confirmed that all the processes of the test items of "image level backup", "image level restore", "file level restore", and "drive level restore" normally operate. From this result, it is shown as a best practice for virtual machine backup/restore with combination of Lenovo Nutanix, VMware vSphere 6.0 and Quest Rapid Recovery 6.1.1.



Result of Nutanix AHV (Acropolis)

It was confirmed that the backup / restore process of the combination of the following list was successful.

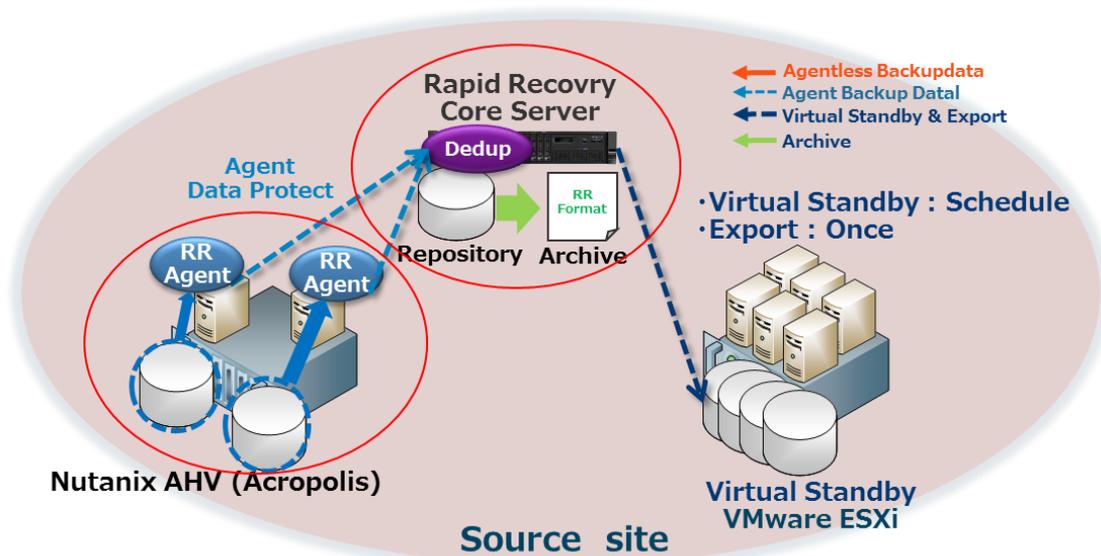
Backup Software	Function	No	OS Type	Backup/Restore	Level	Result
Rapid Recovery	Agent	1	Windows	Backup	Image level	Success
		2		Restore (BMR)	Image level	Success
		3		Restore (Mount)	File level	Success
		4		Restore (Restore)	Drive level	Success
		5	Linux	Backup	Image level	Success
		6		Restore (BMR)	Image level	Success
		7		Restore (Mount)	File level	Success
		8		Restore (Restore)	Drive level	Success

i | **NOTE:** For detailed contents, refer to the result details of the Appendix.

Backup/restore of virtual machine (Windows and Linux) on AHV (Acropolis) was verified with Rapid Recovery Agent function. It was confirmed that all the processes of the test items of "image level backup", "image level restore", "file level restore", and "drive level restore" normally operate. From this result, it is shown as a best practice for virtual machine backup/restore with combination of Lenovo Nutanix, AHV 4.7 (Acropolis) and Quest Rapid Recovery 6.1.1.

For the image level restoration of the virtual machine, use the Bear Metal Restore function to boot the virtual machine with Boot CD and restore directly from the Rapid Recovery Core to the virtual machine.

! | **CAUTION:** If the target is Windows OS, it is necessary to incorporate the VirtIO driver provided by Nutanix when making Boot CD with Bear Metal Restore. (See Creating BootCD in Appendix)
 Rapid Recovery's Bear Metal Restore feature requires backup and restore to be run on the same product HyperVisor.



About Nutanix

Nutanix Xtreme Computing Platform is a modular hyper-converged infrastructure solution that integrates servers and storage and has all the necessary elements for virtualization infrastructure in a 2U housing. It is possible to introduce / extend just by connecting to the network. In addition, it is possible to implement distributed file system (NDFS), support automatic detection of new nodes, and add nodes one at a time without breaking the existing cluster resources according to the needs of corporate growth and workload it can.

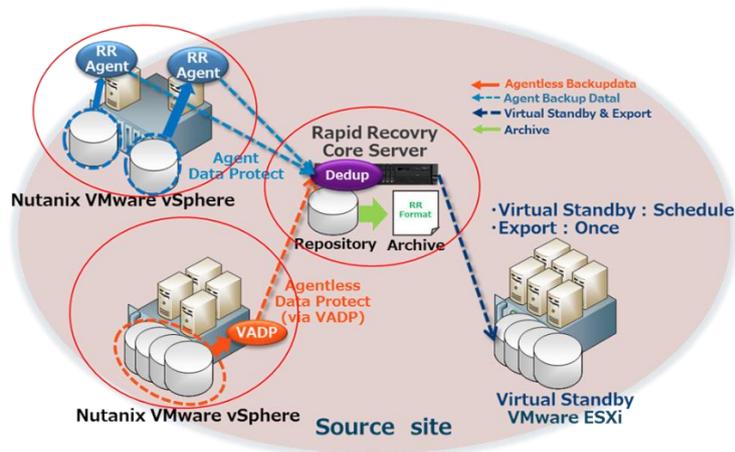
Data protection of Rapid Recovery with Nutanix hypervisor

VMware vSphere hypervisor

The Rapid Recovery product has a virtual environment backup/restore function (Agentless of Rapid Recovery) using VMware VADP API. This function collectively backup/restore virtual machines.

In addition, Rapid Recovery Agent realizes continuous backup / restore in cooperation with file system, application, and database.

Specifically, Rapid Recovery Agentless realizes virtual machine backup / restore using VMware VADP function. In addition, Rapid Recovery Agent is directly installed in the virtual machine, and the file system, application, and database continuous backup/restoration are realized directly from the virtual machine.

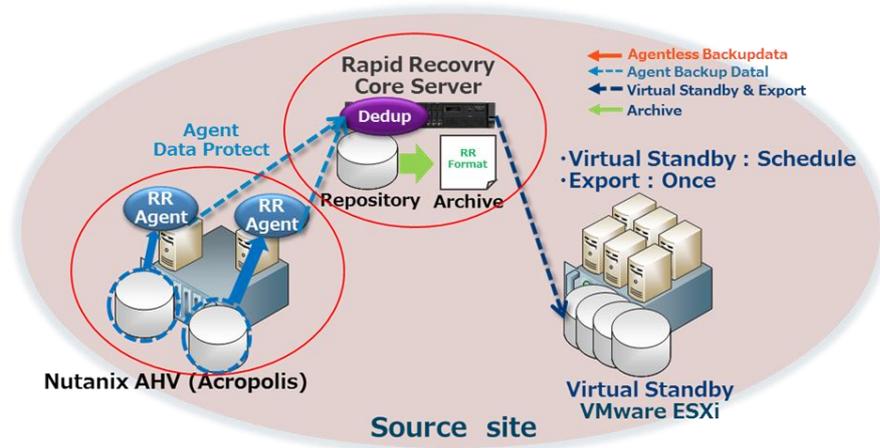


Nutanix AHV (Acropolis) hypervisor

Since the Rapid Recovery product does not have the virtual machine backup/restore function using the AHV (Acropolis) API, backup/restore directly from the virtual machine OS.

Specifically, install Rapid Recovery Agent on the virtual machines that are subject to data protection, and realize backup/restore at file level, application, and database with plugin.

For the image level restoration of the virtual machine, use the Bear Metal Restore function to launch the virtual machine with Boot CD and restore directly from the Rapid Recovery Core to the virtual machine.



Scenario details

Scenario list of VMware vSphere

Backup			
Verification Number	HyperVisor	Backup	OS Type
BV-1	VMware vSphere	Agent	Microsoft Windows Server 2012 R2
BV-2			CentOS 7
BV-3		Agentless	Microsoft Windows Server 2012 R2
BV-4			CentOS 7

Archive			
Verification Number	HyperVisor	Backup	OS Type
AV-1	VMware vSphere	Agent	Microsoft Windows Server 2012 R2
AV-2			CentOS 7
AV-3		Agentless	Microsoft Windows Server 2012 R2
AV-4			CentOS 7

Restore					
Verification Number	HyperVisor	Restore	Restore Level	Backup	OS Type
RV-1	VMware vSphere	Local Mount Utility	File & Folder	Agent	Microsoft Windows Server 2012 R2
RV-2				Agentless	CentOS 7
RV-3				Agentless	Microsoft Windows Server 2012 R2
RV-4				Agentless	CentOS 7
RV-5		RR core Mount	File & Folder	Agent	Microsoft Windows Server 2012 R2
RV-6				Agentless	Microsoft Windows Server 2012 R2
RV-7		Restore to drive or device other than System	Drive(Win) Device(Linux)	Agent	Microsoft Windows Server 2012 R2
RV-8				Agentless	CentOS 7
RV-9				Agentless	Microsoft Windows Server 2012 R2
RV-10				Agentless	CentOS 7
RV-11		Virtual Standby & Export	Image	Agent	Microsoft Windows Server 2012 R2
RV-12				Agentless	CentOS 7
RV-13				Agentless	Microsoft Windows Server 2012 R2
RV-14				Agentless	CentOS 7
RV-15		Bare Metal Recovery	Image	Agent	Microsoft Windows Server 2012 R2
RV-16				Agentless	CentOS 7
RV-17		Attache Archive File Local Mount Utility	File & Folder	Agent	Microsoft Windows Server 2012 R2
RV-18				Agentless	CentOS 7
RV-19				Agentless	Microsoft Windows Server 2012 R2
RV-20				Agentless	CentOS 7
RV-21		Attache Archive File RR core Mount	File & Folder	Agent	Microsoft Windows Server 2012 R2
RV-22				Agentless	Microsoft Windows Server 2012 R2

In this verification scenario, the Rapid Recovery Agentless function backup / restore virtual machines on VMware vSphere with VADP. Also, use the Rapid Recovery Agent function to back up / restore directly to the virtual machine on VMware vSphere. Verify in these two scenarios and confirm that the backup and restore process is successfully completed and the data restoration is correct.

Scenario list of Nutanix AHV (Acropolis)

Backup			
Verification Number	HyperVisor	Backup	OS Type
BA-1	AHV (Acropolis)	Agent	Microsoft Windows Server 2012 R2
BA-2			CentOS 7

Archive			
Verification Number	HyperVisor	Backup	OS Type
AA-1	AHV (Acropolis)	Agent	Microsoft Windows Server 2012 R2
AA-2			CentOS 7

Restore					
Verification Number	HyperVisor	Restore	Restore Level	Backup	OS Type
RA-1	AHV (Acropolis)	Local Mount Utility	File & Folder	Agent	Microsoft Windows Server 2012 R2
RA-2					CentOS 7
RA-3		RR core Mount	File & Folder	Agent	Microsoft Windows Server 2012 R2
RA-4		Restore to drive or device other than System	Drive(Win) Device(Linux)	Agent	Microsoft Windows Server 2012 R2
RA-5					CentOS 7
RA-6		Bare Metal Recovery	Image	Agent	Microsoft Windows Server 2012 R2
RA-7					CentOS 7
RA-8		Attache Archive File Local Mount Utility	File & Folder	Agent	Microsoft Windows Server 2012 R2
RA-9		Attache Archive File RR core Mount	File & Folder	Agent	CentOS 7
RA-10					Microsoft Windows Server 2012 R2

In this verification scenario, the Rapid Recovery Agent function directly backup/restore to the virtual machine on AHV (Acropolis), and confirms that the normal end of the backup/restore process and the data restoration are correct.

In addition, the Agentless function of Rapid Recovery 6.1.1 of the current version is not subject to verification because the backup/restore function of the virtual machine using AHV (Acropolis) API is not implemented.

Result details

Result details list of VMware vSphere

It was confirmed that the backup / restore process of the combination of the following list was successful.

Backup						
Verification Number	HyperVisor	Backup	OS Type	Target of backup	Result	Note
BV-1	VMware vSphere	Agent	Microsoft Windows Server 2012 R2	Image of All Drives	Success	Direct backup from virtual machine
BV-2			CentOS 7	Image of All Devices	Success	Direct backup from virtual machine
BV-3		Agentless	Microsoft Windows Server 2012 R2	ALL VMDKs	Success	VADP
BV-4			CentOS 7	ALL VMDKs	Success	VADP

Archive						
Verification Number	HyperVisor	Backup	OS Type	Target of Archive	Result	Note
AV-1	VMware vSphere	Agent	Microsoft Windows Server 2012 R2	All Backup Data	Success	Repository to Archive drive
AV-2			CentOS 7	All Backup Data	Success	Repository to Archive drive
AV-3		Agentless	Microsoft Windows Server 2012 R2	All Backup Data	Success	Repository to Archive drive
AV-4			CentOS 7	All Backup Data	Success	Repository to Archive drive

Restore								
Verification Number	HyperVisor	Restore	Restore Level	Backup	OS Type	Target of Restore	Result	Note
RV-1	VMware vSphere	Local Mount Utility	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RV-2					CentOS 7	Some files on the User Device	Success	nbd software required
RV-3				Agentless	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RV-4					CentOS 7	Some files on the User Device	Success	nbd software required
RV-5		RR core Mount	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RV-6				Agentless	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RV-7		Restore to drive or device other than System	Drive(Win) Device(Linux)	Agent	Microsoft Windows Server 2012 R2	E drive	Success	Live Recovery
RV-8					CentOS 7	User Device	Success	Reboot required
RV-9				Agentless	Microsoft Windows Server 2012 R2	E drive	Success	Reboot required
RV-10					CentOS 7	User Device	Success	Reboot required
RV-11		Virtual Standby & Export	Image	Agent	Microsoft Windows Server 2012 R2	All Drives	Success	
RV-12					CentOS 7	All Devices	Success	
RV-13				Agentless	Microsoft Windows Server 2012 R2	All VMDKs (All Drives)	Success	
RV-14					CentOS 7	All VMDKs (All Devices)	Success	
RV-15		Bare Metal Recovery	Image	Agent	Microsoft Windows Server 2012 R2	All Drives	Success	Use BootCD
RV-16					CentOS 7	All Devices	Success	Use BootCD
RV-17				Agentless	Microsoft Windows Server 2012 R2	All Drives	Success	Use BootCD
RV-18					CentOS 7	All Devices	Success	Use BootCD
RV-19		Attache Archive File Local Mount Utility	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RV-20					CentOS 7	Some files on the User Device	Success	Bundle Local Mount Utility nbd software required
RV-21				Agentless	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RV-22					CentOS 7	Some files on the User Device	Success	Bundle Local Mount Utility nbd software required
RV-23		Attache Archive File RR core Mount	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RV-24				Agentless	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	

Backup/restore of virtual machines (Windows and Linux) on VMware vSphere was verified by Rapid Recovery Agentless and Agent functions.

It was confirmed that all the processes of the test items of "image level backup", "image level restore", "file level restore", and "drive level restore" normally operate. From this result, it is shown as a best practice for virtual machine backup/restore with combination of Lenovo Nutanix, VMware vSphere 6.0 and Quest Rapid Recovery 6.1.1.

Result details list of Nutanix AHV (Acropolis)

It was confirmed that the backup/restore process of the combination of the following list was successful.

Backup						
Verification Number	HyperVisor	Backup	OS Type	Target of backup	Result	Note
BA-1	AHV (Acropolis)	Agent	Microsoft Windows Server 2012 R2	Image of All Drives	Success	Direct backup from virtual machine
BA-2			CentOS 7	Image of All Devices	Success	Direct backup from virtual machine

Archive						
Verification Number	HyperVisor	Backup	OS Type	Target of Archive	Result	Note
AA-1	AHV (Acropolis)	Agent	Microsoft Windows Server 2012 R2	All Backup Data	Success	Repository to Archive drive
AA-2			CentOS 7	All Backup Data	Success	Repository to Archive drive

Restore								
Verification Number	HyperVisor	Restore	Restore Level	Backup	OS Type	Target of Restore	Result	Note
RA-1	AHV (Acropolis)	Local Mount Utility	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RA-2					CentOS 7	Some files on the User Device	Success	nbd software required
RA-3		RR core Mount	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RA-4		Restore to drive or device other than System	Drive(Win) Device(Linux)	Agent	Microsoft Windows Server 2012 R2	E drive	Success	Live Recovery
RA-5		CentOS 7	User Device	Success	Reboot required			
RA-6		Bare Metal Recovery	Image	Agent	Microsoft Windows Server 2012 R2	All Drives	Success	Use BootCD
RA-7		CentOS 7	All Devices	Success	Use BootCD			
RA-8		Attache Archive File	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success	
RA-9		Local Mount Utility			CentOS 7	Some files on the User Device	Success	Bundle Local Mount Utility nbd software required
RA-10		Attache Archive File	RR core Mount	File & Folder	Agent	Microsoft Windows Server 2012 R2	Some files on the E drive	Success

Backup/restore of virtual machine (Windows and Linux) on AHV (Acropolis) was verified with Rapid Recovery Agent function. It was confirmed that all the processes of the test items of "image level backup", "image level restore", "file level restore", and "drive level restore" normally operate. From this result, it is shown as a best practice for virtual machine backup/restore with combination of Lenovo Nutanix, AHV 4.7 (Acropolis) and Quest Rapid Recovery 6.1.1.

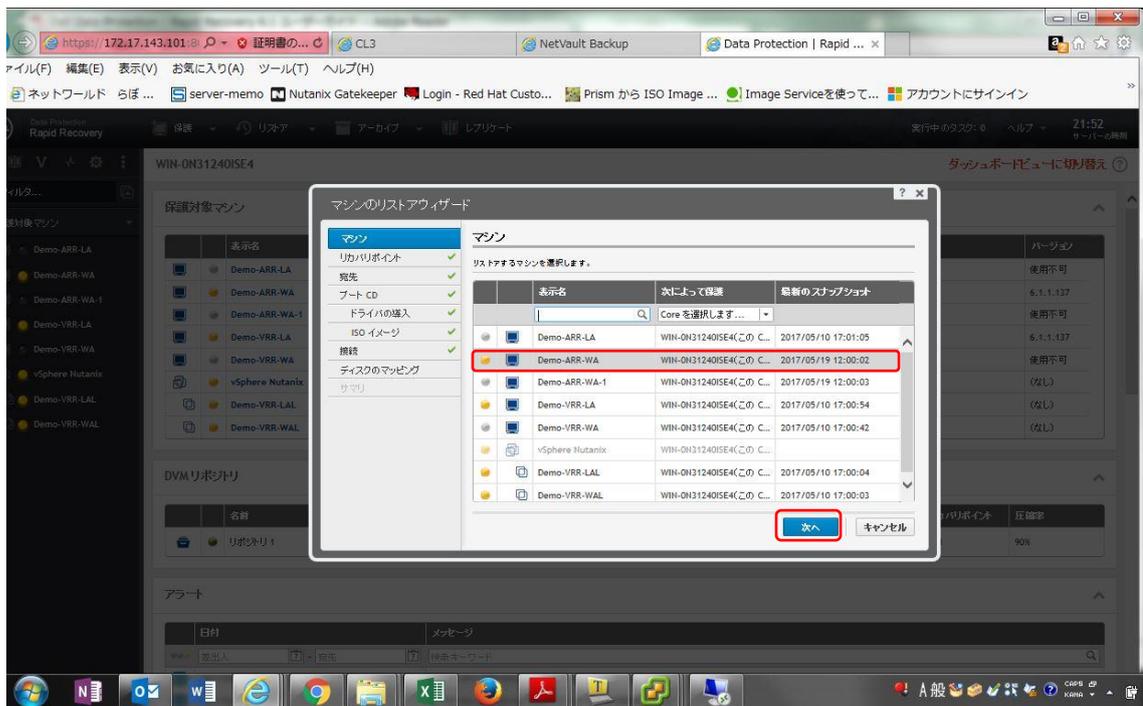
For the image level restoration of the virtual machine, use the Bear Metal Restore function to boot the virtual machine with Boot CD and restore directly from the Rapid Recovery Core to the virtual machine.

! **CAUTION:** If the target is Windows OS, it is necessary to incorporate the VirtIO driver provided by Nutanix when making Boot CD with Bear Metal Restore. (See Creating BootCD in Appendix)
Rapid Recovery's Bear Metal Restore feature requires backup and restore to be run on the same product HyperVisor.

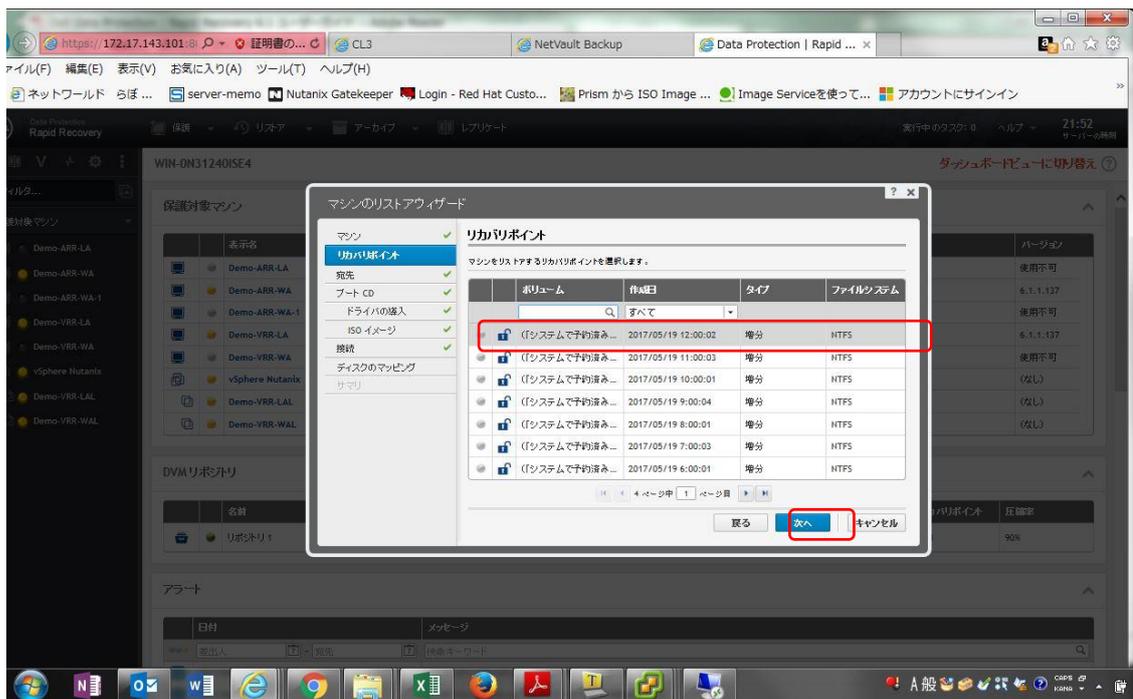
BootCD creation

Windows BootCD creation (driver included)

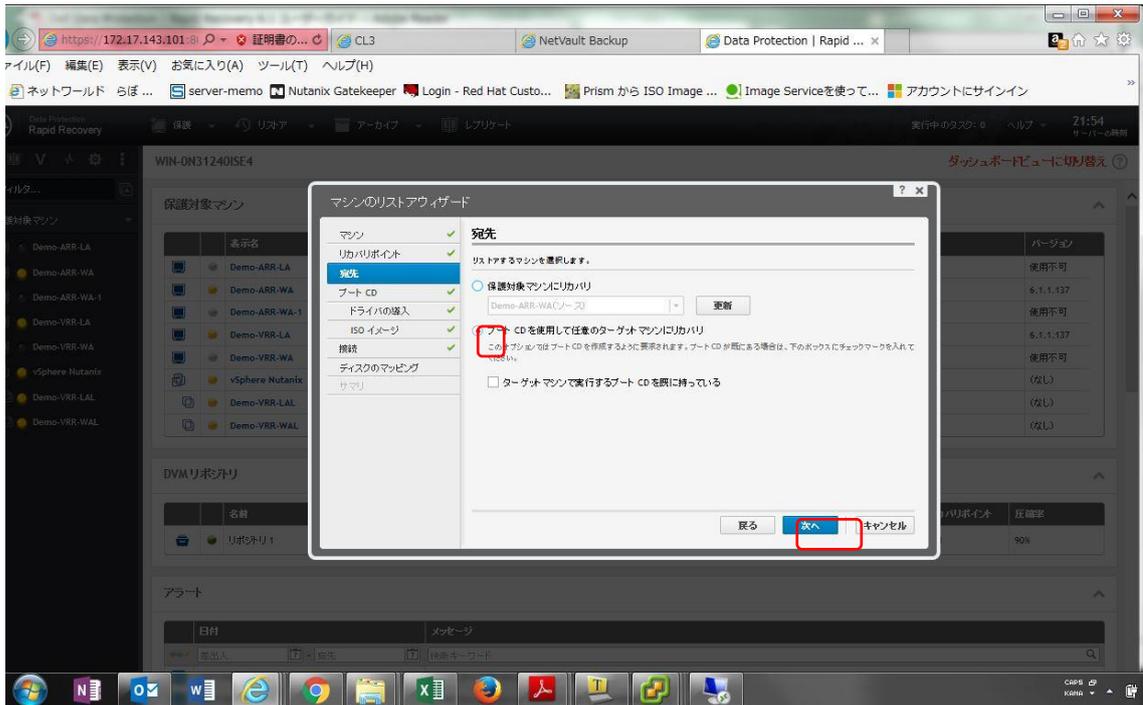
- 1 Start the Restore Machine Wizard, select the machine to restore on the machine screen and click "Next"



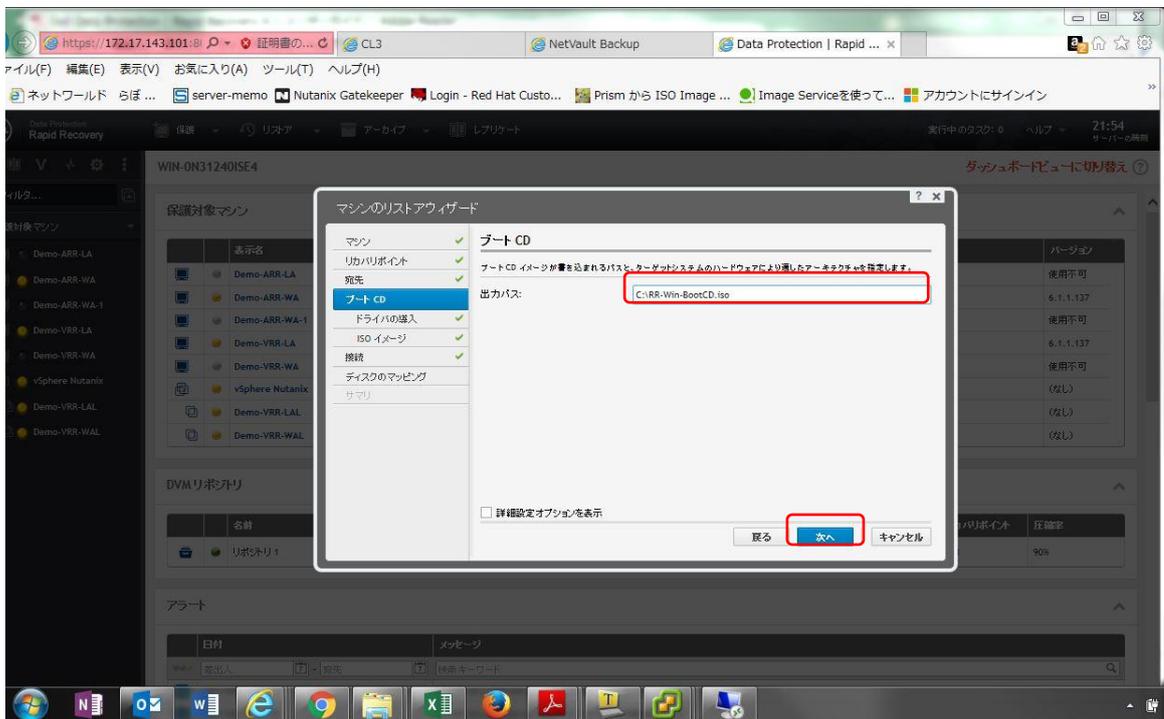
- 2 Select the recovery point on the Recovery Point screen and click "Next"



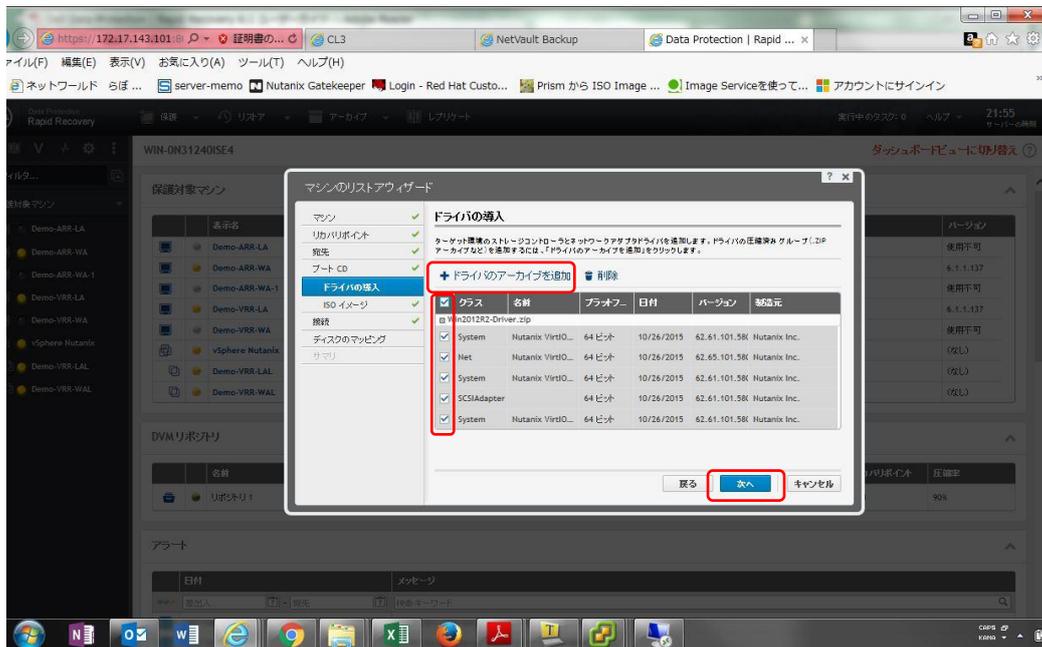
- 3 On the address screen, select "Recover to any target machine using Boot CD" and click "Next"



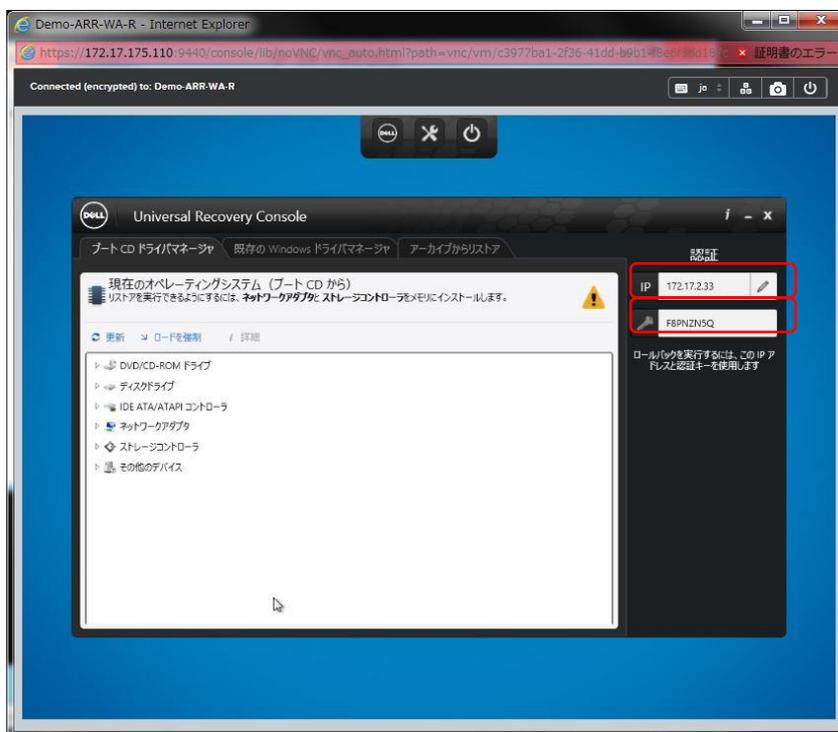
- 4 On the boot CD screen, enter the output path on Core Server and click "Next"



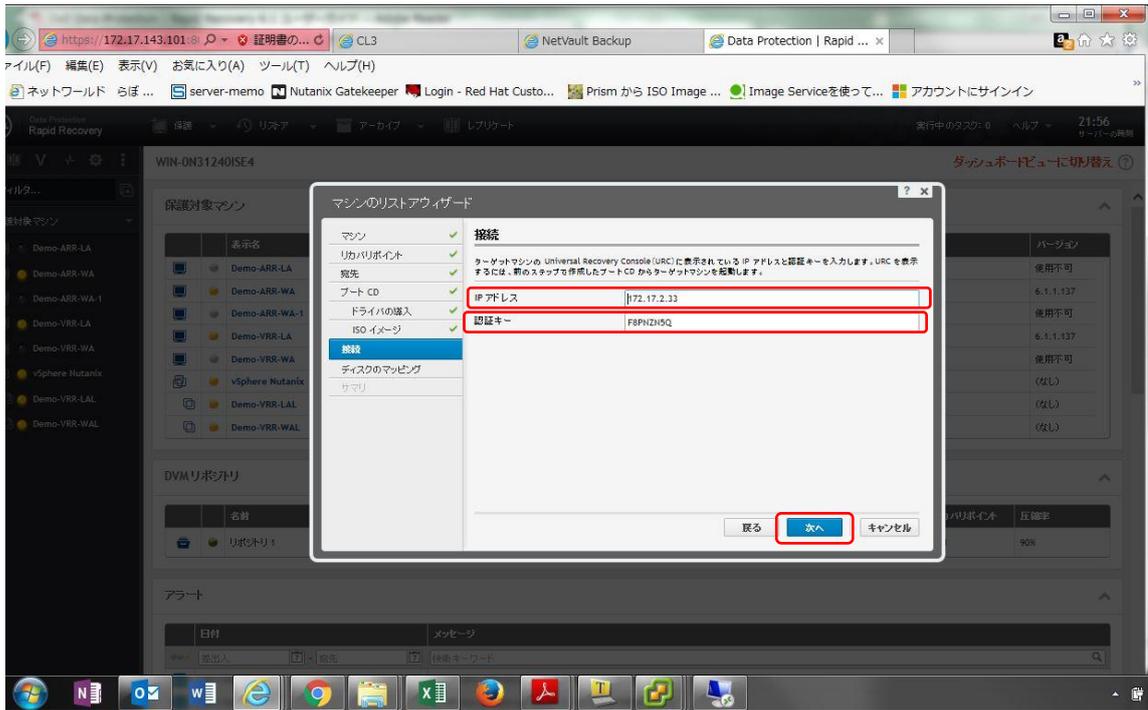
- Click "+ Add driver archive" on the driver introduction screen, specify the storage location of VirtIO pack (Zip) provided by Nutanix, select all files and click "Next"



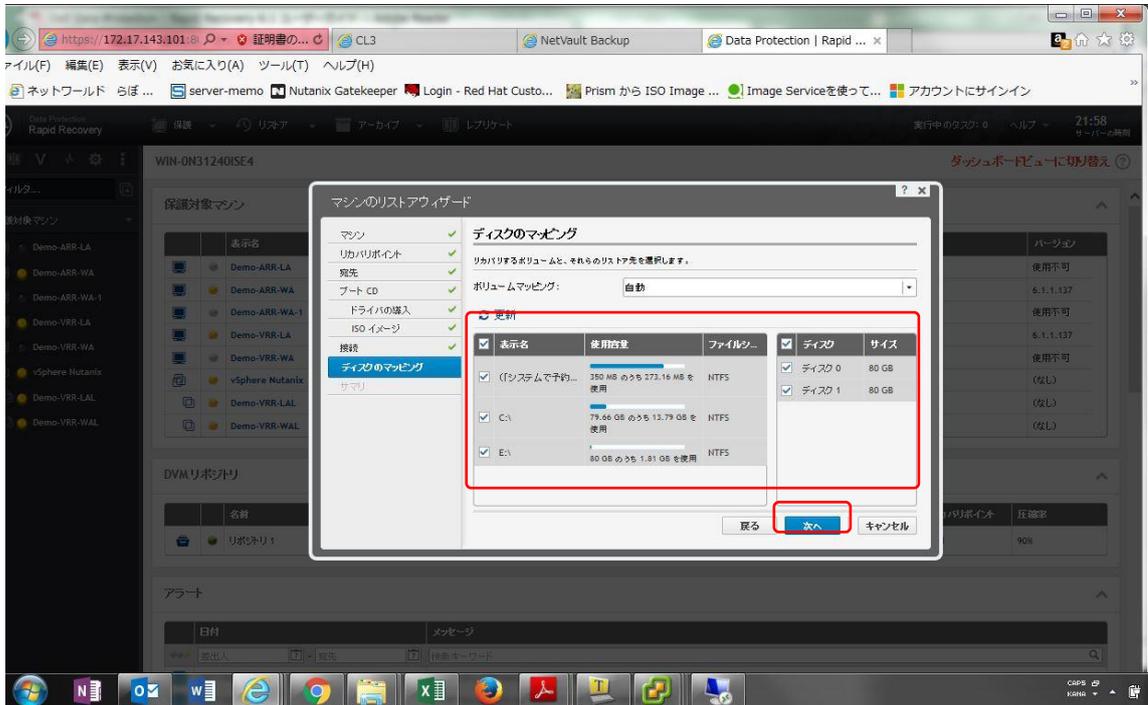
- Boot with the CD image in the virtual machine to be restored by AHV, launch the monitor of the virtual machine from the Nutanix management screen, confirm the IP address and authentication key from the Universal Recovery Console screen



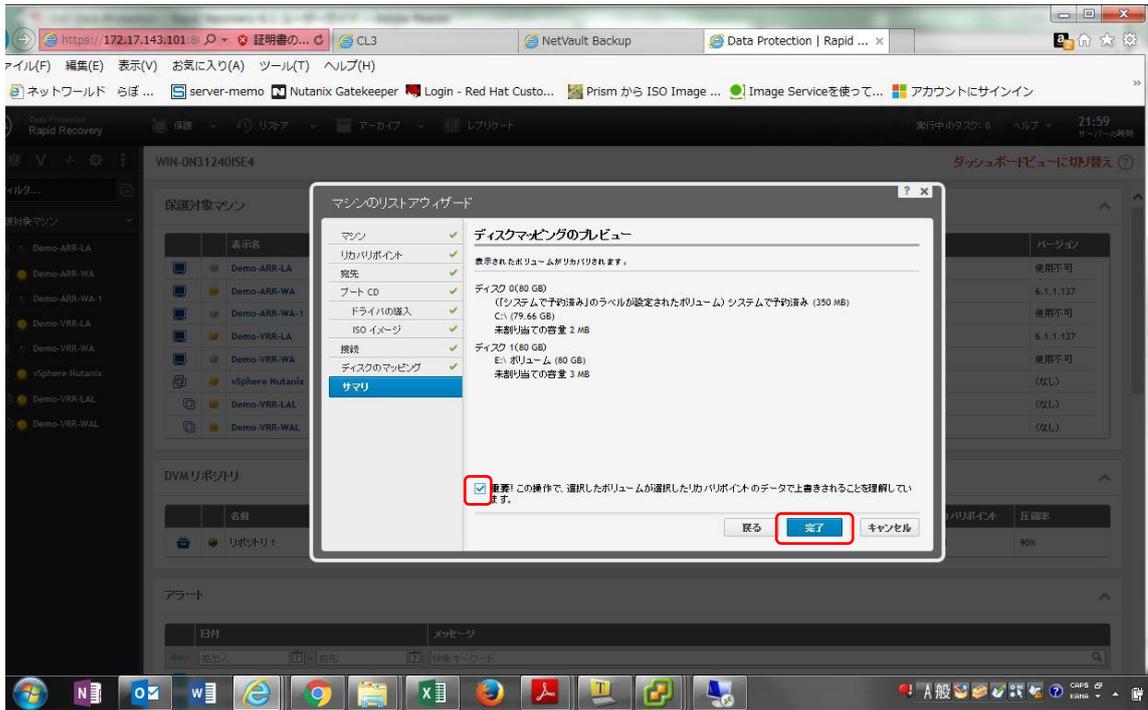
7 Enter the IP address and authentication key from the connection screen and click "Next"



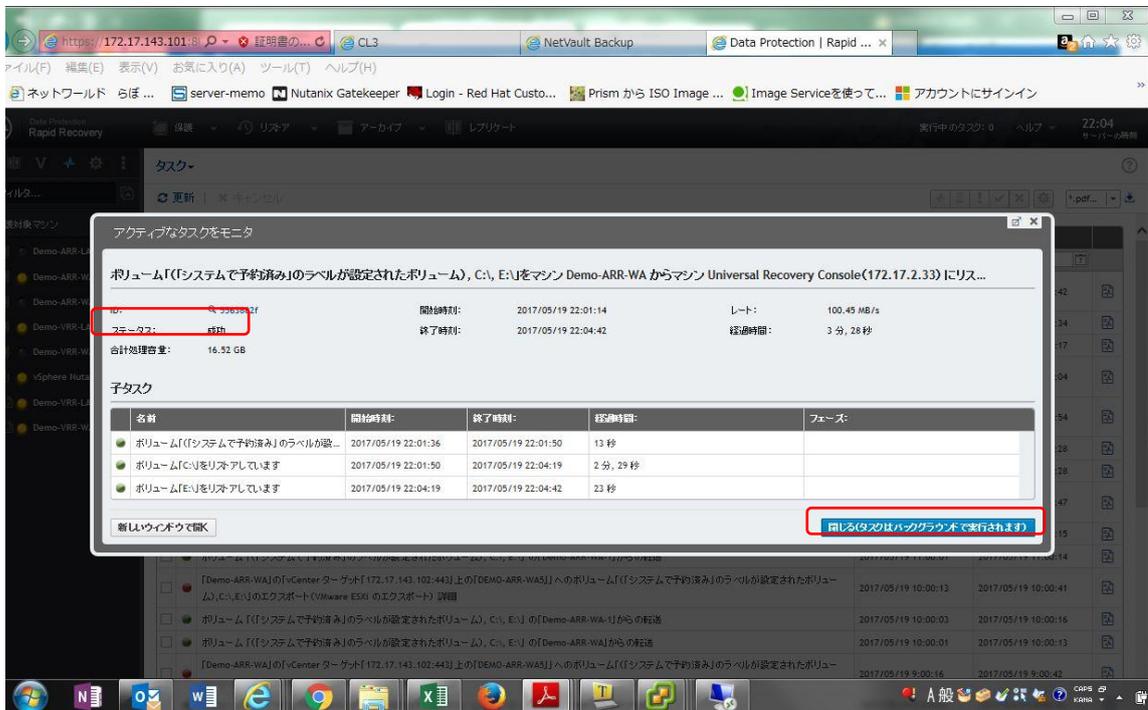
8 Check the restore destination on the disk mapping screen and click "Next" if it is OK



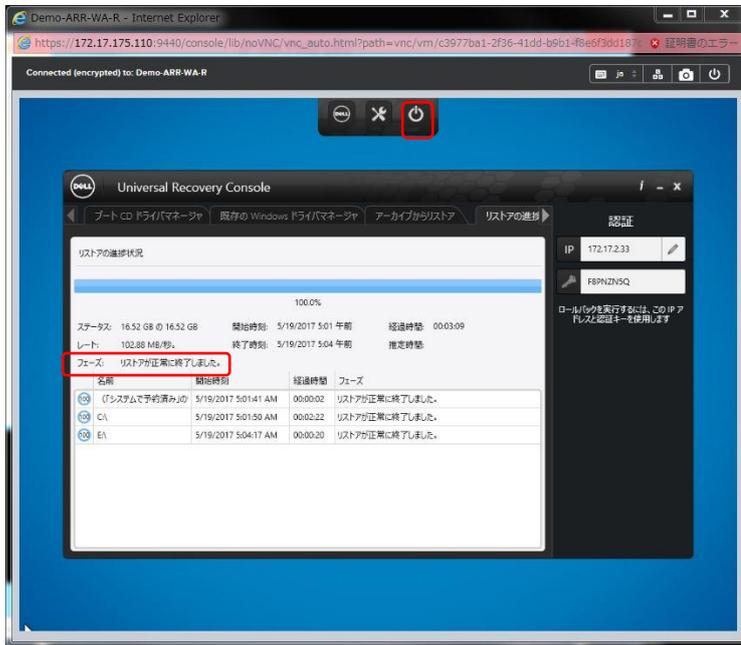
9 Check the final restoration on the disk mapping preview screen and click "Finish" if it is OK



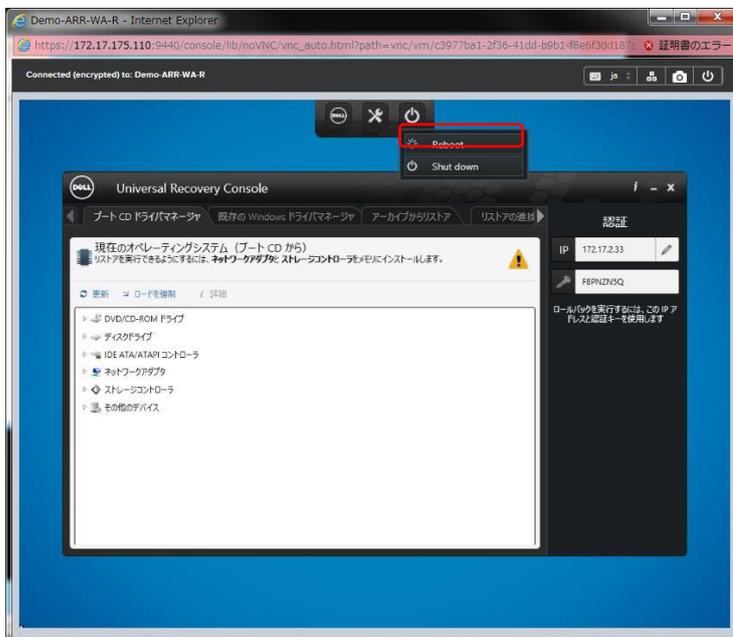
10 Click the details of the job at the right end of the target job from the event, confirm the processing result of the restored job on the monitor screen of the active task and click "Close"



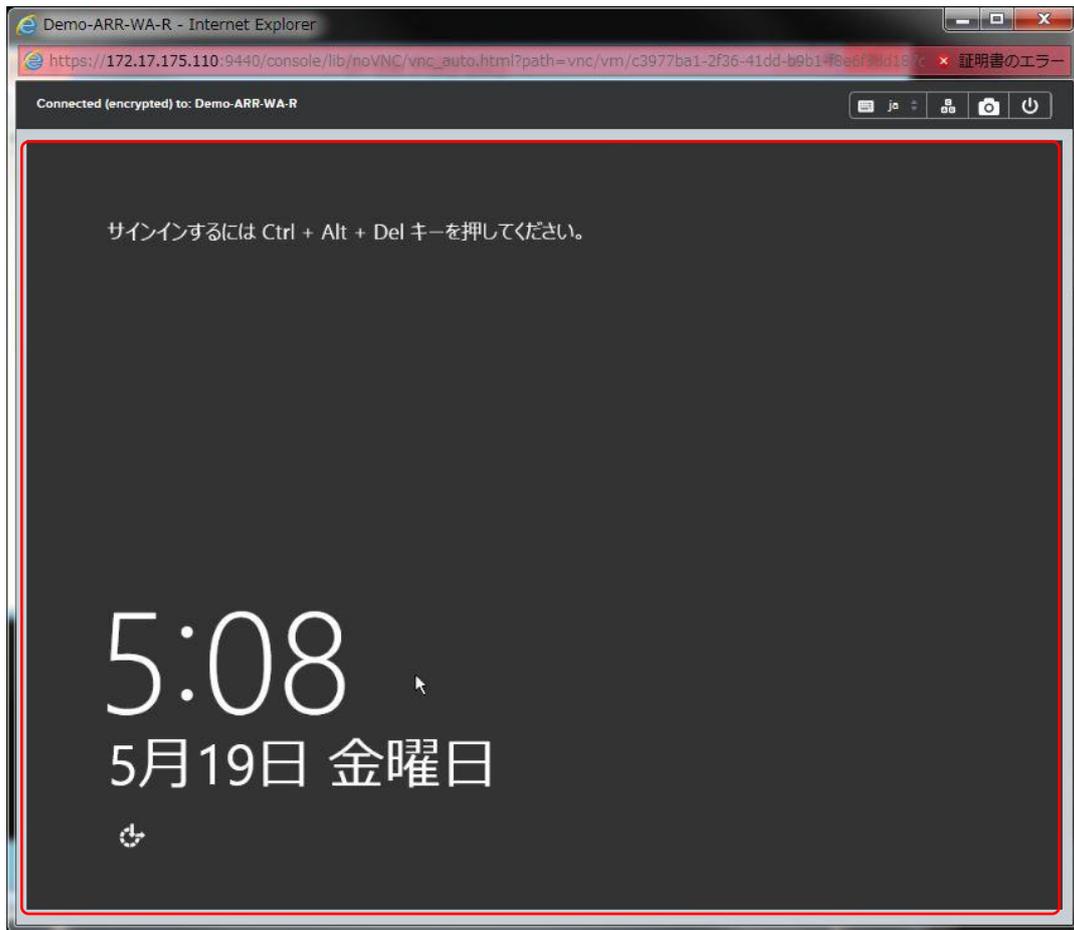
- Click on the progress tab of the restoration of the Universal Recovery Console screen displayed on the monitor of the virtual machine from the Nutanix management screen, check the processing result of the restore, and click the top power button mark if it is normal termination



- From the Nutanix management screen, check the restore processing result on the Universal Recovery Console screen displayed on the monitor of the virtual machine, if OK, click the top power button mark and select Reboot



- 13 Log in from the Universal Recovery Console screen displayed on the monitor of the virtual machine from the Nutanix management screen and confirm the data recovery



About Us

Quest helps our customers reduce tedious administration tasks so they can focus on the innovation necessary for their businesses to grow. Quest® solutions are scalable, affordable and simple-to-use, and they deliver unmatched efficiency and productivity. Combined with Quest's invitation to the global community to be a part of its innovation, as well as our firm commitment to ensuring customer satisfaction, Quest will continue to accelerate the delivery of the most comprehensive solutions for Azure cloud management, SaaS, security, workforce mobility and data-driven insight.