

## Connection of a Fibre channel library to an ESXi 6.0 and configuration of the devices in VM for use by backup software.

### Hardware


- One Server (Certified and compatible with VMware vSphere).
- Two fiber channel HBAs in the Server.
- An IBM TS3100 library with fiber channel connection.
- Two SAN switches to which the server and the library will be connected.
- The TS3100 library (3573) must have two internal drives (3580).
- FC cables between the server HBAs and the SAN switches
- FC cables between the library and the SAN switches.

### Software

- VMware ESXi version 6.0 Update 3
- VMware vSphere Client 6.0
- VM Windows 2012R2 (installed and configured on ESXi 6.0)
- Install latest Firmware on HBAs, Library and Switch SAN (recommended)

By logging in to the GUI of the library we have.

### TS3100 Tape Library



Library Identity	
Serial Number	78CE631
Product ID	3573-TL
Currently Installed Library Firmware	E.60 / 3.20e
Bootcode Firmware Revision	0.82
Barcode Reader	SE625
IPv4 Address	172.25.0.145
MAC Address	000E11163221
Library Mode	Random
WWide Node Name	2000000E11163221

#### System Status

[View Legend](#)

10/15/2019 11:48:03

Status ✓ Ready

Drive 1 Status ✓ Ready

Drive 2 Status ✓ Ready

Slots (Empty/Total) 2/23

I/O Station Closed

Library Time 11:48:21

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Drive Identity	1 (LUN)
Vendor ID	IBM
Product ID	ULT3580-HH7
Serial Number	10WT060285
Firmware Revision	H9E3
Element Address	256
Control Path Drive	Yes
Data Compression	Yes
Interface Type	Fibre Channel
Node Name	2001000E11163221
Port A	Enabled
Port Name	2002000E11163221
Topology	LN-Port
FC-AL Loop ID	Manual
Speed	4 Gb/sec
Port B	Disabled

Drive Identity	2
Vendor ID	IBM
Product ID	ULT3580-HH7
Serial Number	10WT063224
Firmware Revision	H9E3
Element Address	257
Control Path Drive	No
Data Compression	Yes
Interface Type	Fibre Channel
Node Name	2004000E11163221
Port A	Enabled
Port Name	2005000E11163221
Topology	LN-Port
FC-AL Loop ID	Manual
Speed	4 Gb/sec
Port B	Disabled

Here we see the WWN of the TS3100 library, Drive 1 and Drive 2.

## Configuration steps

1. Fiber cables are connected between the HBAs and the SAN Switches. A connection in each Switch.
- 2.- The fiber cables are connected between the Drivers (library) and the SAN Switches. One connection in each Switch.
- 3.- Login to the GUI of the Switch SAN and configure and activate the following Zones:

HBA1\_Drive1 (SW1)

HBA2\_Drive2 (SW2) (It is recommended to create zones by WWN)

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4.- Log into the ESXi 6.0 using the VMware vSphere client 6.0 and activate the SSH access. Then in the configuration/adapters section verify which devices were detected and their status.

Devices were detected and their status, in the HBAs (vmhba1 and vmhba2).

**Adaptadores de** [Reescanear todos...](#) [Agregar](#)

Dispositivo	Tipo	WWN
<b>Emulex LPe12000 8Gb PCIe Fibre Channel Adapter</b>		
vmhba1	Canal de fibra	20:00:00:c9:b6:0a:54 10:00:00:c9:b6:0a:54
vmhba2	Canal de fibra	20:00:00:c9:b6:0a:55 10:00:00:c9:b6:0a:55
<b>LSI1064E</b>		
vmhba0	Bloquear SCSI	

**Detalles**

**vmhba1**  
 Modelo: Emulex LPe12000 8Gb PCIe Fibre Channel Adapter  
 WWN: 20:00:00:c9:b6:0a:54 10:00:00:c9:b6:0a:54  
 Destinos: 1 Dispositivos: 1 Rutas de acceso: 2

**Ver:** [Dispositivos](#) [Rutas de acceso](#)

Nombre de tiempo...	Destino	LUN	Estado
vmhba1:C0:T3:L0	20:01:00:0e:11:16:32:21 20:02:00:0e:11:16:32:21	0	◊ Inactivo
vmhba1:C0:T3:L1	20:01:00:0e:11:16:32:21 20:02:00:0e:11:16:32:21	1	◆ Activo (E/S)

Here we see drive 1 and the library, HBA1\_Drive1 zone on the Switch (SW1).

The drive1 fiber connection on the TS3100 library gives access to both drive1 and the Medium changer (usually called the library).

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In vmhba2 we have the drive2

**Adaptadores de** Reescanear todos... Agregar.

Dispositivo	Tipo	WWN
<b>Emulex LPe12000 8Gb PCIe Fibre Channel Adapter</b>		
vmhba1	Canal defibra	20:00:00:00:c9:b6:0a:54 10:00:00:00:c9:b6:0a:54
vmhba2	Canal defibra	20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55
<b>LSI1064E</b>		
vmhba0	Bloquear SCSI	

**Detalles**

**vmhba2**  
 Modelo: Emulex LPe12000 8Gb PCIe Fibre Channel Adapter  
 WWN: 20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55  
 Destinos: 0 Dispositivos: 0 Rutas de acceso: 1

**Ver:** Dispositivos Rutas de acceso

Nombre de tiempo...	Destino	LUN	Estado
vmhba2:C0:T4:L0		0	Inactivo

5.- Login to ESXi 6.0 through a SSH connection (Putty), to verify how the devices are recognized in VMware vSphere. devices are recognized in VMware vSphere.

We use the following command

```
[root@ESXi1:~] esxcli storage nmp device list
```

```
t10.IBM_____35732DTL_____00L2U78CE631_LL0
Device Display Name: IBM Fibre Channel Medium Changer (t10.IBM_____35732DTL_____00L2U78CE631_LL0)
Storage Array Type: VMW_SATP_DEFAULT_AA
Storage Array Type Device Config: {action_OnRetryErrors=off}
Path Selection Policy: VMW_PSP_FIXED
Path Selection Policy Device Config: {preferred=vmhba1:C0:T3:L1;current=vmhba1:C0:T3:L1}
Path Selection Policy Device Custom Config:
Working Paths: vmhba1:C0:T3:L1
Is USB: false
[root@VMwareB7:~]
```

Here we have the medium changer on vmhba1:C0:T3:L1, which is our only active device. Drive1 (vmhba1:C0:T3:L0) is inactive.

With the following command we can see that Drive2 (vmhba1:C0:T4:L0) is not registered so the path is not active.

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```
[root@VMwareB7:/var/log] vi vmkernel.log
```

```
2019-10-14T08:49:11.339Z cpu3:3305153)WARNING: NMP: nmpPathClaimEnd:1204: Device, seen
through path vmhba1:C0:T4:L0 is not registered (no active paths)
```

## Theoretical Detail

VMware Pluggable Storage Architecture (PSA) Framework loads the multi-path add-on, which is generally responsible for I/O operations of certain classes of devices.

Two plugins are included with the hypervisor:

The Native Multipath Plugin (NMP) add-on and the "MASK\_PATH" add-on that hides unnecessary devices. Some vendors develop their own MP plugins, such as EMC PowerPath / VE or Symantec / Veritas DMP.

NMP implements its functionality through Path Selection Plugin (PSP) and Storage Array Type Plugin (SATP).

For devices, rules have been created that determine how exactly MP and SATP handle this or that device.

With the following command we can view the list of SATP rules

```
[root@ESXi1:~] esxcli storage nmp satp list
```

In step 5 we obtained the data from the Medium Changer library.

```
t10.IBM      35732DTL      00L2U78CE631_LL0
Device Display Name: IBM Fibre Channel Medium Changer (t10.IBM      35732DTL      00L2U78CE631_LL0)
Storage Array Type: VMW_SATP_DEFAULT_AA
Storage Array Type Device Config: {action_OnRetryErrors=off}
Path Selection Policy: VMW_PSP_FIXED
Path Selection Policy Device Config: {preferred=vmhba1:C0:T3:L1;current=vmhba1:C0:T3:L1}
Path Selection Policy Device Custom Config:
Working Paths: vmhba1:C0:T3:L1
Is USB: false
[root@VMwareB7:~] █
```

The type is **VMW\_SATP\_DEFAULT\_AA** which is the default for non-specific Arrays.

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The library is identified as a set of LUNs of a SCSI Target

LUN 0 - Fiber Channel Tape

LUN 1 - Fiber Channel Medium Changer

It is necessary to convert the devices to simple local, for which the type must be manually modified to **VMW\_SATP\_LOCAL**

6.- Execute the following commands to include the rules for the library and the drives.

```
esxcli storage nmp satp rule add --satp=VMW_SATP_LOCAL --vendor="IBM" --model= "3573-TL"
```

```
esxcli storage nmp satp rule add --satp=VMW_SATP_LOCAL --vendor="IBM" --model="ULT3580-HH7"
```

The TS3100 library has 2 internal LTO 7 HH drives, which are technically identified as ULT3580-HH7 (Product ID).

The vendor and model data can be obtained with the following command, but if it is the IBM TS3100 or TS3200 Library they are the same.

```
[root@ESXi1:~] esxcli storage core device list
```

Finally, we release the original location of the library (vmhba1:C0:T3:L1) with the following command.

```
esxcli storage core claiming unclaim -t location -A vmhba1 -C 0 -T 3 -L 1
```

7.- Now we restart the ESXi so that all the devices are recognized correctly and their respective paths are activated.

8.- We enter the ESXi 6.0 through the web client and observe that the library and the two drives are present and recognized.

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**VMware VTSP-SV / VTSP-HCI**

Nombre	Condición	Tipo	Capacidad	Profundida...	Proveedor
LSILOGIC Serial Attached SCSI Disk (naa.600508e0000000000000000000000000)	Normal, Degradado	Disco	278,46 GB	64	LSILOGIC
IBM Fibre Channel Tape (naa.2004000e11163221)	Normal	Desconocido	Desconocido	N/D	IBM
IBM Fibre Channel Tape (naa.2001000e11163221)	Normal	Desconocido	Desconocido	N/D	IBM
IBM Fibre Channel Medium Changer (t10.IBM____35732DTL____00L2U78CE631_LL0)	Normal	Desconocido	Desconocido	N/D	IBM

4 elementos

Log back into ESXi 6.0, using Putty to check that the devices are correctly recognized and active. Execute the following command

**[root@ESXi1:~] esxcli storage nmp device list**

```
naa.2004000e11163221
Device Display Name: IBM Fibre Channel Tape (naa.2004000e11163221)
Storage Array Type: VMW_SATP_LOCAL
Storage Array Type Device Config: SATP VMW_SATP_LOCAL does not support device configuration.
Path Selection Policy: VMW_PSP_FIXED
Path Selection Policy Device Config: {preferred=vmhba2:C0:T4:L0;current=vmhba2:C0:T4:L0}
Path Selection Policy Device Custom Config:
Working Paths: vmhba2:C0:T4:L0
Is USB: false

naa.2001000e11163221
Device Display Name: IBM Fibre Channel Tape (naa.2001000e11163221)
Storage Array Type: VMW_SATP_LOCAL
Storage Array Type Device Config: SATP VMW_SATP_LOCAL does not support device configuration.
Path Selection Policy: VMW_PSP_FIXED
Path Selection Policy Device Config: {preferred=vmhba1:C0:T4:L0;current=vmhba1:C0:T4:L0}
Path Selection Policy Device Custom Config:
Working Paths: vmhba1:C0:T4:L0
Is USB: false

t10.IBM____35732DTL____00L2U78CE631_LL0
Device Display Name: IBM Fibre Channel Medium Changer (t10.IBM____35732DTL____00L2U78CE631_LL0)
Storage Array Type: VMW_SATP_LOCAL
Storage Array Type Device Config: SATP VMW_SATP_LOCAL does not support device configuration.
Path Selection Policy: VMW_PSP_FIXED
Path Selection Policy Device Config: {preferred=vmhba1:C0:T4:L1;current=vmhba1:C0:T4:L1}
Path Selection Policy Device Custom Config:
Working Paths: vmhba1:C0:T4:L1
Is USB: false
```

We log in to ESXi 6.0 through the VMware vSphere Client and also check that the devices are recognized and with their paths active.

Adaptadores de				Reescanear todos...	Agregar... Quitar Actualizar
Dispositivo	Tipo	WWN			
<b>Emulex LPe12000 8Gb PCIe Fibre Channel Adapter</b>					
vmhba1	Canal defibra	20:00:00:00:c9:b6:0a:54 10:00:00:00:c9:b6:0a:54			
vmhba2	Canal defibra	20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55			
<b>LSI1064E</b>					
vmhba0	Bloquear SCSI				

<b>vmhba1</b>					
Modelo: Emulex LPe12000 8Gb PCIe Fibre Channel Adapter					
WWN: 20:00:00:00:c9:b6:0a:54 10:00:00:00:c9:b6:0a:54					
Destinos: 1 Dispositivos: 2 Rutas de acceso: 2					
Ver: Dispositivos Rutas de acceso					
Nombre	Identificador	Nombre de tiempo...	Estado ...	LUN	Tipo
IBM Fibre Channel Tape (naa.2001000e11163221)	naa.2001000e11163221	vmhba1:C0:T4:L0	Monta...	0	tape
IBM Fibre Channel Medium Changer (t10.IBM____...	t10.IBM____35732DTL____00L2U78CE631_LL0	vmhba1:C0:T4:L1	Monta...	1	media d

Adaptadores de				Reescanear todos...	Agregar... Quitar Actualizar
Dispositivo	Tipo	WWN			
<b>Emulex LPe12000 8Gb PCIe Fibre Channel Adapter</b>					
vmhba1	Canal defibra	20:00:00:00:c9:b6:0a:54 10:00:00:00:c9:b6:0a:54			
vmhba2	Canal defibra	20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55			
<b>LSI1064E</b>					
vmhba0	Bloquear SCSI				

<b>vmhba2</b>					
Modelo: Emulex LPe12000 8Gb PCIe Fibre Channel Adapter					
WWN: 20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55					
Destinos: 1 Dispositivos: 1 Rutas de acceso: 1					
Ver: Dispositivos Rutas de acceso					
Nombre	Identificador	Nombre de tiempo...	Estado ...	LUN	Tipo
IBM Fibre Channel Tape (naa.2004000e11163221)	naa.2004000e11163221	vmhba2:C0:T4:L0	Monta...	0	tape



**Adaptadores de** [Reescanear todos...](#)

Dispositivo	Tipo	WWN
<b>Emulex LPe12000 8Gb PCIe Fibre Channel Adapter</b>		
vmhba1	Canal defibra	20:00:00:00:c9:b6:0a:54 10:00:00:00:c9:b6:0a:54
vmhba2	Canal defibra	20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55
<b>LSI1064E</b>		
vmhba0	Bloquear SCSI	

**Detalles**

**vmhba1**  
 Modelo: Emulex LPe12000 8Gb PCIe Fibre Channel Adapter  
 WWN: 20:00:00:00:c9:b6:0a:54 10:00:00:00:c9:b6:0a:54  
 Destinos: 1 Dispositivos: 2 Rutas de acceso: 2

Ver: [Dispositivos](#) [Rutas de acceso](#)

Nombre de tiempo...	Destino	LUN	Estado
vmhba1:C0:T4:L0	20:01:00:0e:11:16:32:21 20:02:00:0e:11:16:32:21	0	◆ Activo (E/S)
vmhba1:C0:T4:L1	20:01:00:0e:11:16:32:21 20:02:00:0e:11:16:32:21	1	◆ Activo (E/S)

**Adaptadores de** [Reescanear todos...](#)

Dispositivo	Tipo	WWN
<b>Emulex LPe12000 8Gb PCIe Fibre Channel Adapter</b>		
vmhba1	Canal defibra	20:00:00:00:c9:b6:0a:54 10:00:00:00:c9:b6:0a:54
vmhba2	Canal defibra	20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55
<b>LSI1064E</b>		
vmhba0	Bloquear SCSI	

**Detalles**

**vmhba2**  
 Modelo: Emulex LPe12000 8Gb PCIe Fibre Channel Adapter  
 WWN: 20:00:00:00:c9:b6:0a:55 10:00:00:00:c9:b6:0a:55  
 Destinos: 1 Dispositivos: 1 Rutas de acceso: 1

Ver: [Dispositivos](#) [Rutas de acceso](#)

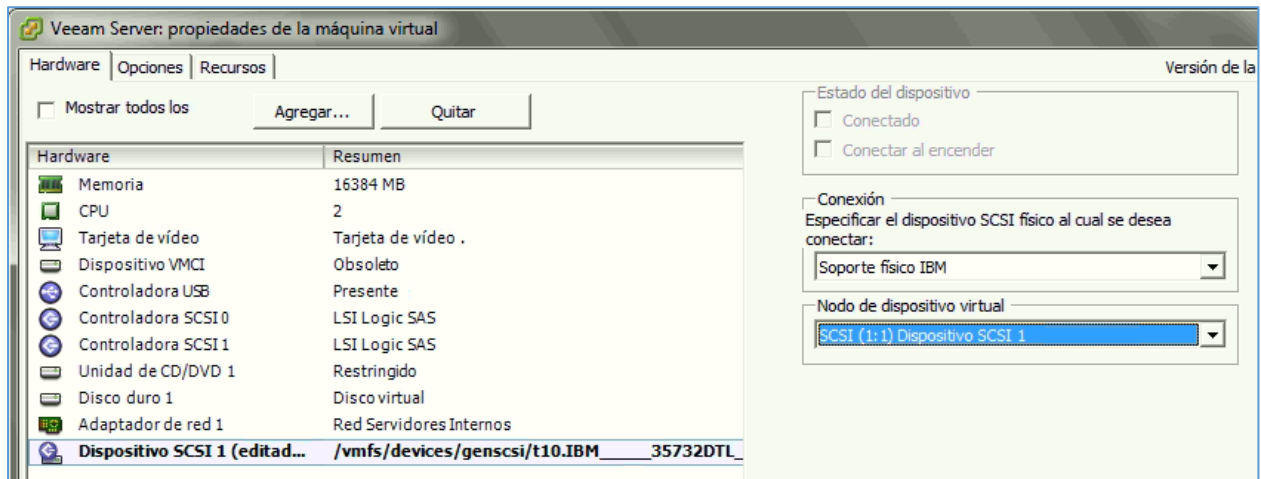
Nombre de tiempo...	Destino	LUN	Estado
vmhba2:C0:T4:L0	20:04:00:0e:11:16:32:21 20:05:00:0e:11:16:32:21	0	◆ Activo (E/S)

Configuration of library and drives in VM for use with Backup Software.  
 It requires a VM (Windows 2012R2) installed and configured on ESXi 6.0, in which the library connections were previously configured.

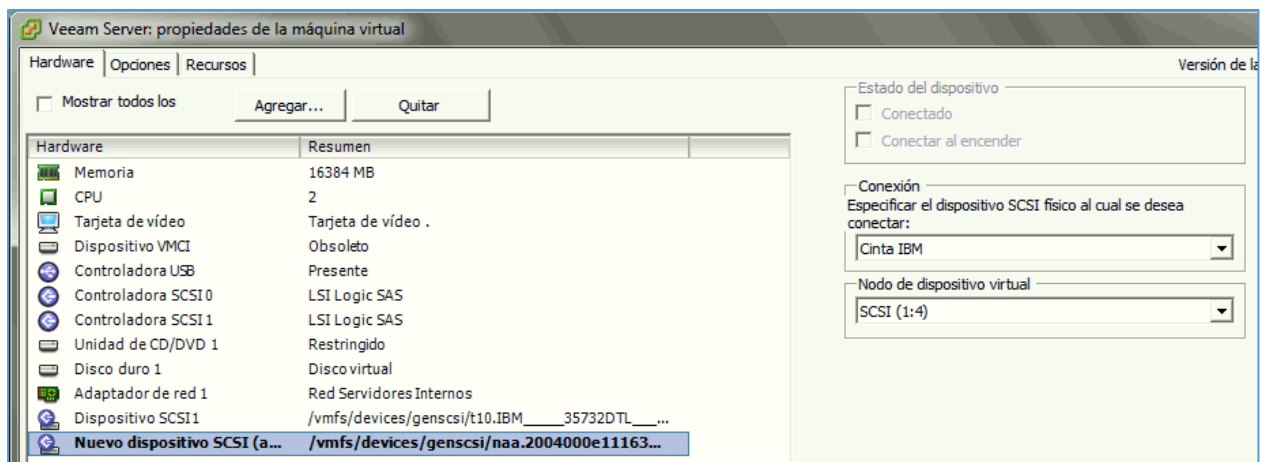
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 And Veeam Backup.  
 VMware VTSP-SV / VTSP-HCI

In the edit setting section of the VM, proceed to include the devices (NEW SCSI). For each device a different SCSI Controller must be created.

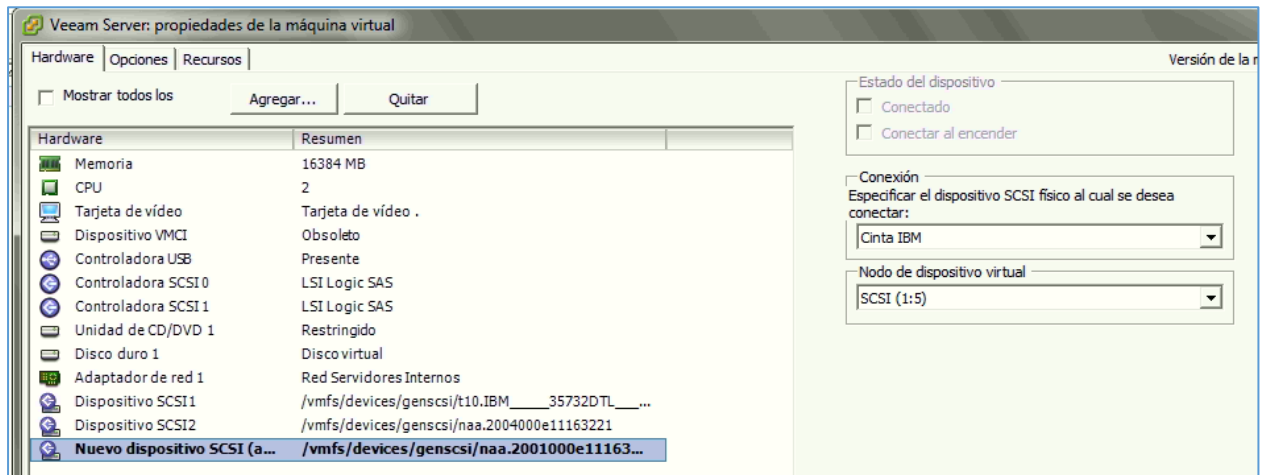
## Library (Medium Changer) SCSI (1:1)



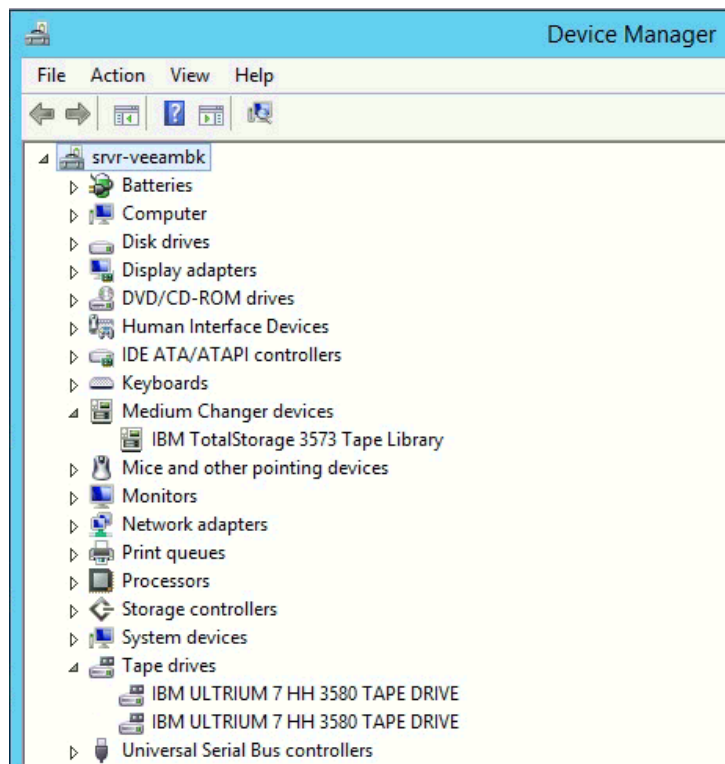
## Drive 2 SCSI (1:4)

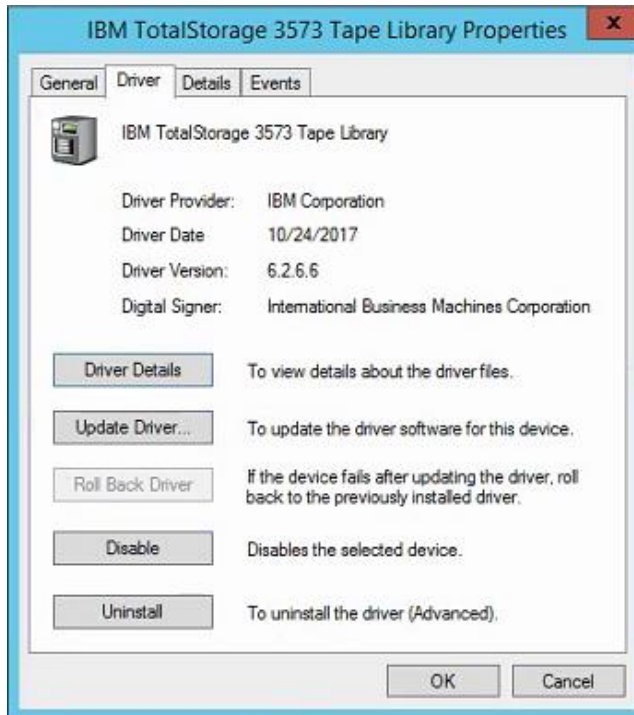


## Drive 1 SCSI (1:5)



The VM is turned on and the drivers are installed so that Windows recognizes the devices, in this case we use the driver version 6.2.6.6, obtained from IBM's Fixcentral web site





## Conclusions

We have used the IBM TS3100 library, but the process in general can be applied to other libraries from different manufacturers, with minor modifications.

## Disclaimer

None of the opinions and/or expressions herein are offered by VMware or my employer. Everything here is my personal experience and point of view.