The science behind the report:

Safeguard your data while maintaining SLAs by enabling Intel QuickAssist Technology (Intel QAT)

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Safeguard your data while maintaining SLAs by enabling Intel QuickAssist Technology (Intel QAT).

We concluded our hands-on testing on July 10, 2025. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on July 2, 2025 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 1: Results of our testing.

Backup times with performance BIOS			
Backup time (sec)	Intel with QAT hardware accelerated compression	AMD with software compression	Percent less time with Intel QAT
Idle scenario	76	130	42%
Active scenario	99	161	39%

System configuration information

Table 2: Detailed information on the systems we tested.

Server configuration information	Supermicro SYS-212H-TN	Supermicro AS-2115HS-TNR
BIOS name and version	Supermicro 1.3 4/22/2025	Supermicro 3.5 5/15/2025
Non-default BIOS settings	Power determinism: Performance mode	Power determinism: Performance mode
Operating system name and version/ build number	VMware® ESXi™ 8.0.3 24677879	VMware ESXi 8.0.3 24677879
Date of last OS updates/patches applied	7/2/2025	7/2/2025
Power management policy	Performance mode	Performance mode
Processor		
Number of processors	1	1
Vendor and model	Intel® Xeon® 6731P	AMD EPYC™ 9355
Core count (per processor)	32	32
Core frequency (GHz)	2.5	3.55
Stepping	1	1
Microcode	0xa0000d4	0xb002147
Memory module(s)		
Total memory in system (GB)	512	768
Number of memory modules	8	12
Vendor and model	Micron MTC40F2046S1RC64BDY	Samsung M321R8GA0PB2-CCPKC
Size (GB)	64	64
Type	DDR5	DDR5
Speed (MHz)	6,400	6,400
Speed running in the server (MHz)	6,400	5,200
Local storage		
Number of drives	8	8
Drive vendor and model	Intel SSDPF21Q016TB	Intel SSDPF21Q016TB
Drive size	1.6TB	1.6TB
Drive information (speed, interface, type)	NVMe	NVMe
Network adapter		
Vendor and model	Intel Ethernet E810-XXV	Intel Ethernet E810-XXV
Number and type of ports	2x 25Gb	2x 25Gb
Driver version	1.11.1.9	1.11.1.9
Cooling fans		
Number of cooling fans	10	4

Server configuration information	Supermicro SYS-212H-TN	Supermicro AS-2115HS-TNR
Power supplies		
Vendor and model	Supermicro PWS-1K63A-1R	Supermicro PWS-1K63A-1R
Number of power supplies	2	2
Wattage of each (W)	1,600	1,600

About our testing

Our testing compared the following single-socket solutions:

- Supermicro SYS-212H-TN with an Intel Xeon 6731P 32-core processor and 512GB DDR5 memory
- Supermicro AS-2115HS-TNR with an AMD EPYC 9355 32-core processor and 768GB DDR5 memory

We used VMware vSphere® 8.0 as our hypervisor. We created a Windows Server 2025 virtual machine with 60 vCPU. We sized the memory on the VM to use up the memory on the host, leaving a few GB for hypervisor overhead. We used HammerDB 4.12 to build a 5,000 warehouse TPROC-C database on five NVMe drives (four for data, one for logs). We set the backup target to two additional NVMe drives. We used an eighth NVMe drive to hold the virtual machine OS. We tested backup speeds with hardware acceleration enabled on the Intel server, and with default software compression on the AMD server. We tested again while running a TPROC-C workload against the database during backup. We ran each test three times and report the median backup time in seconds.

How we tested

Installing VMware vSphere 8

1. Boot to the VMware vSphere 8 installation media.
2. To continue, press Enter.
3. To accept the license agreement, press F11.
4. Select the OS installation location.
5. Select a language, and create the root password.
6. To install, press F11.

Installing the QAT ESXi driver

1. Download the QAT ESXi driver hardware version 2.0 from here: https://www.intel.com/content/www/us/en/download/761741/intel-quickassist-technology-driver-for-vmware-esxi-hardware-version-2-0.html
2. Extract the archive and use SCP move the Intel-qat*.zip file to the ESXi host.
3. SSH to the ESXi host and install the driver:

```
esxcli software component apply --depot /path/to/Intel-qat*.zip
```

4. Reboot the host.
5. On the Intel system, enable passthrough for the three Intel QAT PCIe devices using the vSphere UI.

Creating the Windows Server 2025 VM

1. Use a web browser to connect and log into the vSphere instance.
2. Right-click the host, and click New VM.
3. Assign the VM the following properties:
   - 60 virtual CPU
   - 480GB memory on the Intel server, 640GB memory on the AMD server
   - 100GB OS VMDK on the first NVMe drive
   - Reserve all guest memory
4. Add seven VMDKs with 500GB capacity, thick-provision eager-zeroed, on a separate VMware Paravirtual controller.
5. On the Intel system, add three PCIe devices, selecting a separate Intel QAT device for each one.
6. Click Finish.

Installing Windows Server 2025

1. Boot the VM to the Windows Server 2025 installation media.
2. Press any key to boot from the virtual CD.
3. At the Select language settings screen, click Next.
4. At the Select keyboard settings screen, click Next.
5. At the Select Image screen, select Windows Server 2025 Datacenter Evaluation (Desktop Experience), and click Next.

6. At the Applicable notices and license terms, click Accept.
7. At the Select location screen, select the base VMDK, and click Next.
8. Click Install.
9. After the install finishes and the VM reboots, enter and reenter a password, and click Finish.
10. In the Windows Search bar, type Firewall.
11. Click Windows Defender Firewall with Advanced Security.
12. Under Public Profile, click Windows Defender Firewall Properties.
13. On the Domain profile page, under Firewall State, click the drop-down menu, and select Off.
14. Click on Private profile, and under Firewall State, click the drop-down menu, and select Off.
15. Click on Public profile, and under Firewall State, click the drop-down menu, and select Off.
16. Click OK.
17. From Server Manager, click Local Server.
18. On the Local Server properties page, next to Remote Desktop, click Disabled.
19. In the System Properties menu that appears, select Allow remote connections to this computer.
20. On the warning that appears, click OK.
21. Click OK to exit.
22. In the Windows Search bar in the lower left, type `Update`, and click Check for updates.
23. Click Check for Updates.
24. Click Install All.

Installing Microsoft SQL Server 2022

1. Attach the installation media ISO for SQL Server 2022 to the VM.
2. Double-click the Setup application.
3. In the left pane, click Installation.
4. Click New SQL Server stand-alone installation or add features to an existing installation.
5. Select Evaluation, and click Next.
6. Click the checkbox to accept the license terms, and click Next.
7. Click Use Microsoft Update to check for updates, and click Next.
8. On the Install Rules page, click Next.
9. Check the boxes for the following features, and click Next:
   - Database Engine Services
   - Full-Text and Semantic Extractions for Search
10. Leave the Default instance, and click Next.
11. Leave the default Service Accounts, and click Next.
12. On the Server Configuration tab, choose Mixed Mode, and enter and confirm a password for the SQL Server system administrator (sa) account.
13. Click Add Current User to Specify the SQL Server administrators.
14. Click Next.
15. At the Error and usage reporting screen, click Next.
16. At the Installation Configuration Rules screen, check that there are no failures or relevant warnings, and click Next.
17. At the Ready to Install screen, click Install.
18. Close the installation window.
19. Download and install SQL Server Management Studio.

Enabling hardware offload on Windows and SQL Server

Perform the following steps on the Intel VM only.

1. Download the QAT Windows driver hardware version 2.0 from here: https://www.intel.com/content/www/us/en/download/765502/intel-quickassist-technology-driver-for-windows-hw-version-2-0.html
2. Extract the archive, and run QatSetup.exe.
3. Reboot the virtual machine.
4. Open SQL Server Management Studio, and connect to the default instance.

5. Run the following commands to enable hardware offload:

```
SP_CONFIGURE 'show advanced options', 1;
RECONFIGURE
GO
SP_CONFIGURE 'hardware offload enabled', 1;
RECONFIGURE
GO
```

6. Restart the SQL instance.
7. Run the following command to turn on hardware offload:

```
ALTER SERVER CONFIGURATION
SET HARDWARE_OFFLOAD = ON (ACCELERATOR = QAT);
```

8. Restart the SQL instance.

Creating the TPROC-C database

On the SQL Server VM, use SQL Server Management Studio to create a new database named `tpcc` with four 100GB data files and one 100GB log file. Place each file on a separate NVMe drive.

1. On a separate Linux VM, download and extract the HammerDB files:

```
wget https://github.com/TPC-Council/HammerDB/releases/download/v4.12/HammerDB-4.12-Linux.tar.gz
tar -zxf HammerDB*
```

2. Navigate to the HammerDB-4.12 folder, and run the `mssql_tprocc_build.tcl` script from the Scripts section:

```
cd HammerDB-4.12
./hammerdbcli auto mssql_tprocc_build.tcl
```

3. Create a backup of the database on the OS drive to use for restoring the database in between test runs.

Running the test

1. Restore a fresh copy of the database.
2. Shut down the VM, reboot the host, start the VM, and allow it to idle for 5 minutes.
3. If running the backup-only scenario, go to step 5 to start the backup immediately. If running the backup-during-workload scenario, use the client VM to start the TPCC workload:

```
cd HammerDB-4.12
./hammerdbcli auto mssql_tprocc_run.tcl
```

4. Allow the TPCC workload to run for 10 minutes.
5. On the SQL Server VM, run the following command to back up the database to the two NVMe drives (two files per drive). For the AMD system, replace the compression algorithm “QAT_DEFLATE” with “MS_XPRESS”:

```
BACKUP DATABASE [tpcc] TO
DISK = N'R:\BACKUP01\backup_01.bak',
DISK = N'S:\BACKUP02\backup_02.bak',
DISK = N'R:\BACKUP03\backup_03.bak',
DISK = N'S:\BACKUP04\backup_04.bak'
WITH NOFORMAT, NOINIT,  NAME = N'tpcc-Full Database Backup', SKIP, NOREWIND, NOUNLOAD, COMPRESSION
(ALGORITHM = QAT_DEFLATE),  STATS = 10
GO
```

6. Record the backup completion time in seconds.
7. Repeat three times, and report the median score.

Scripts

mssql_tprocc_build.tcl

```
dbset db mssqls
dbset bm TPC-C
diset connection mssqls_tcp false
diset connection mssqls_port 1433
diset connection mssqls_azure false
diset connection mssqls_encrypt_connection true
diset connection mssqls_trust_server_cert true
diset connection mssqls_authentication sql
diset connection mssqls_server <IP_ADDRESS>
diset connection mssqls_linux_server <IP_ADDRESS>
diset connection mssqls_uid sa
diset connection mssqls_pass <PASSWORD>
diset connection mssqls_linux_authent sql
diset connection mssqls_linux_odbc {ODBC Driver 18 for SQL Server}
diset tpcc mssqls_use_bcp false
diset tpcc mssqls_count_ware 5000
diset tpcc mssqls_num_vu 64
diset tpcc mssqls_dbase tpcc
buildschema
```

mssql_tprocc_run.tcl

```
dbset db mssqls
dbset bm TPC-C
diset connection mssqls_linux_server <IP_ADDRESS>
diset connection mssqls_server <IP_ADDRESS>
diset connection mssqls_linux_authent sql
diset connection mssqls_authentication sql
diset connection mssqls_uid sa
diset connection mssqls_pass <PASSWORD>
diset connection mssqls_tcp true
diset connection mssqls_port 1433
diset tpcc mssqls_count_ware 5000
diset tpcc mssqls_use_bcp false
diset tpcc mssqls_total_iterations 1000000000
diset tpcc mssqls_driver timed
diset tpcc mssqls_rampup 10
diset tpcc mssqls_duration 15
diset tpcc mssqls_allwarehouse false
loadscript
vuset vu 64
vuset logtotemp 1
vucreate
tcstart
tcstatus
set jobid [ vurun ]
vudestroy
tcstop
```

Read the report ▶

This project was commissioned by Intel.

Principled Technologies®

Facts matter.®