

# Expand Networks, Inc. Accelerator 4800 Series

## WAN Compression Evaluation versus

## Packeteer PacketShaper 2500 and Peribit Sequence Reducer-20



Test  
Summary

***Premise:** Performance of networked applications at remote branches suffers greatly from insufficient bandwidth and challenging WAN conditions such as latency and packet loss. Application acceleration devices strive to optimize response times through a combination of compression and acceleration algorithms. Compression engines attempt to strike a delicate balance between speed and effectiveness. Any WAN compression engine on the market aims to be the most effective at compressing data over costly WAN links. Compression alone, though, is just half the story; the device's acceleration algorithms also are a major factor since application response times are impacted by both insufficient capacity and by WAN conditions.*

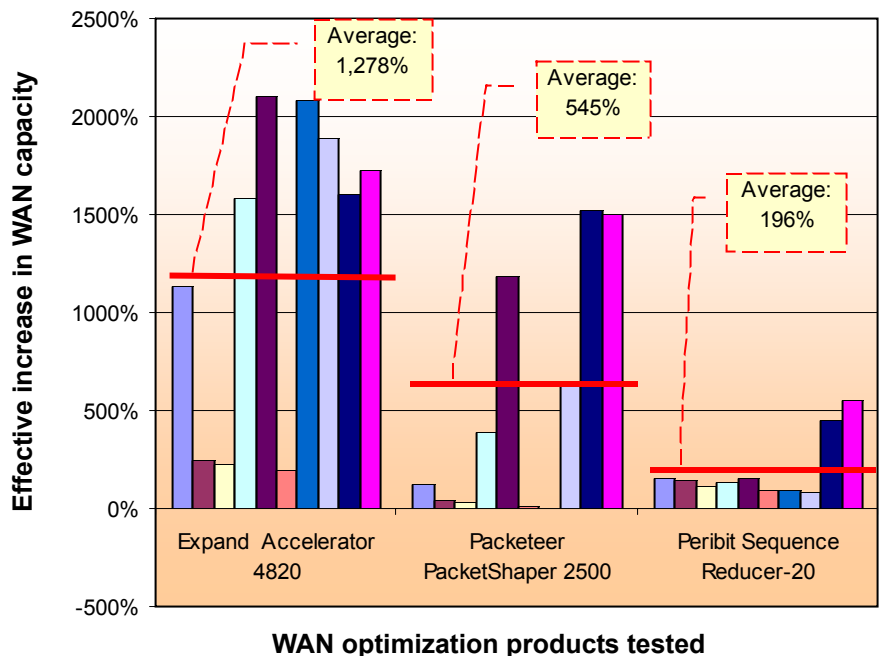
Expand Networks, Inc. commissioned The Tolly Group to benchmark the effectiveness of the Expand Accelerator 4820 over other application acceleration solutions from Packeteer, Inc. and Peribit Corp. Expand's Accelerator 4820 is a traffic management/compression appliance (pair) rated at up to 6 Mbps WAN speeds.

Engineers measured the effective "acceleration" (compression) rates achieved by the Accelerator 4820 when processing a variety of standard data files. The Tolly Group also performed the same tests on a PacketShaper 2500, a traffic management/compression appliance (pair) designed for a maximum throughput of 10 Mbps. Engineers also tested the Peribit Sequence Reducer-20, an application delivery (compression) appliance designed for WAN speeds up to 2 Mbps.

### Test Highlights

- Delivers nearly 13 times the effective WAN link capacity when compared to file transfer without compression
- Provides nearly 8 times more effective WAN link capacity than the Peribit and the Packeteer products tested
- Improves file transfer times by up to five times over the Peribit Sequence Reducer-20 and the Packeteer PacketShaper 2500 in a variety of WAN scenarios

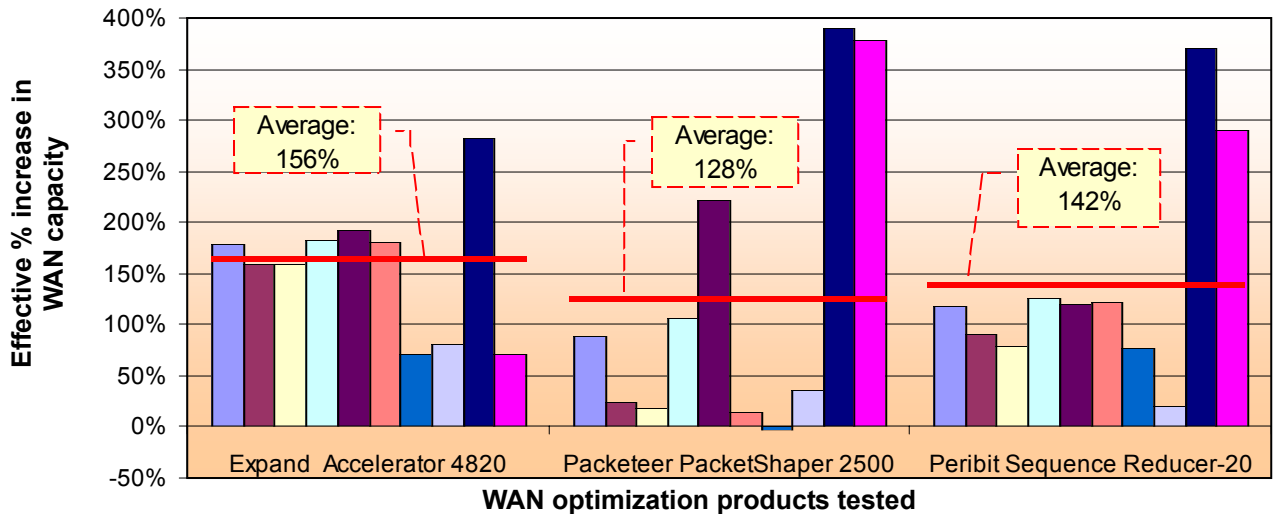
### WAN Compression Effectiveness – Second Pass



Source: The Tolly Group, October 2004

Figure 1

### WAN Compression Effectiveness – First Pass



Source: The Tolly Group, October 2004

Figure 2

Engineers subjected all three devices to a series of file transfer tests in which they had to use real-time compression techniques to move the Canterbury Files, a collection of large files, including the Bible, the first million digits of Pi, and the complete genome of the E. coli bacterium. In all, during each WAN

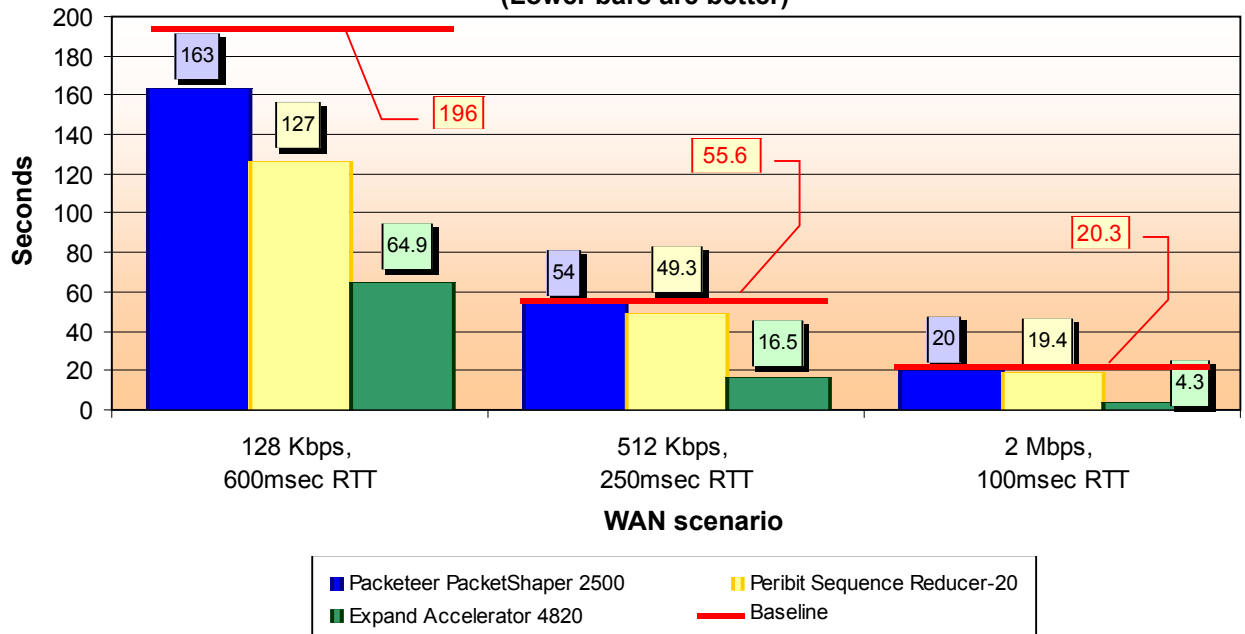
compression test, 10 file transfers were conducted. Tests were conducted during October 2004.

Tests show that on both the compression and the time-to-transfer tests, the Expand Accelerator 4820 exceeds the capabilities of the Peribit and the Packeteer products tested. In fact, for

compression tests, the Expand Accelerator 4820 delivered eight times more effective WAN capacity than the competitive products tested. And in time-to-transfer tests, the Expand Accelerator 4820 demonstrated that it is up to five times faster than the Peribit and the Packeteer offerings.

### File Transfer Times Compared to Baseline

(Lower bars are better)



Source: The Tolly Group, October 2004

Figure 3

## RESULTS

### REAL-TIME TRANSPARENT COMPRESSION

Engineers measured the effective "acceleration" (compression) rates achieved by tested devices when processing a variety of standard data files representative of "enterprise traffic." As compression devices typically improve their effectiveness when processing the same data stream a second time, two "passes" of each file were measured. (*Note: Compression solutions build dictionaries that enable more effective compression on a second run of the same file.*)

The greatest benefits of compression were evidenced in the second-pass tests. The Expand Accelerator 4800 delivered nearly 13 times of effective WAN link capacity when compared to file transfer without compression. By contrast, the Packeteer PacketShaper

2500 delivered five times more effective capacity and the Peribit Sequence Reducer-20 delivered almost twice the effective capacity. (See Figures 1 & 4.)

On the first pass of the compression test, the Expand Accelerator 4800 achieved a 156% increase in average WAN capacity. The Peribit Sequence Reducer-20 averaged a 142% increase in WAN capacity and the Packeteer PacketShaper 2500 averaged a 128% gain in WAN capacity. (See Figures 2 & 4.)

### EFFECTIVE WAN THROUGHPUT USING COMPRESSION AND TCP FLOW ENHANCERS

Network managers are concerned not just about compression ratios but also how efficiently (quickly) data transfer can take place. Thus, "time to transfer" provides a valuable comparison of the actual time savings a particular solution might offer. By nature, TCP-based FTP throughput can be further

**Expand Networks, Inc.**

**Expand Accelerator 4800**

**Application Acceleration and WAN Compression**



limited by the time it takes required acknowledgements to flow across the WAN. Vendors like Expand (TCP Acceleration) and Peribit (Packet Flow Acceleration) have implemented schemes to optimize those flows. This "time to transfer" test shows the aggregate benefits of data compression and TCP flow enhancement.

Engineers measured the time to transfer several files (DNA2, E.coli) across simulated WANs of varying link speeds and latency using both

### Expand Networks, Inc. Expand Accelerator 4800 Product Specifications\*

#### Next-generation WAN compression

- Works on all applications
- Expands average capacity by 100% to 400% with peaks of 1,000% and often more

#### Application-specific acceleration

- Reduces latency and packet loss while improving application response times

#### End-to-end performance monitoring

- Automatically discovers, classifies and reports on hundreds of enterprise applications
- Detects WAN performance problems via a centralized reporting platform

#### Layer 7 Quality of Service

- Enables network automatic control of different applications via easy-to-setup templates

#### Performance

- WAN speed: 256 Kbps – 6 Mbps
- LAN speed: 100 Mbps
- Supports up to 50 remote sites

#### Resiliency/failover

- Switch-to-wire, no moving parts/spinning media
- Standards-based with HSRP (RFC-2281) and VRRP (RFC-2338)

#### Management/Security

- Out-of-band management: 10/100 Ethernet and/or AUX modem
- HTTP/HTTPS WebUI, Cisco-like CLI via console/telnet/SSH
- SNMP v3 (MIBII) and Private MIB
- Authentication/Authorization: RADIUS (RFC 2138), TACACS+
- Software upgrades: FTP, HTTP, TFTP, SCP

#### Physical

- 1U device (Width x Height x Depth) 7" x 1.7" x 13.2" (43.2cm x 4.4cm x 33.7cm)
- Power: Auto sensing 100-240 Volt, 50/60 Hz – 50W consumption
- Approvals
- Safety: UL 1950, CAN/CSA C22.2, EN60950/A4, No. 950-95
- EMC: FCC Part 15 subpart B Class A, EN55022, EN61000-4-2, EN61000-4-3, ENV5024, EN61000-4-4, CISPR16

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\*Vendor-supplied information not verified by The Tolly Group

compression and TCP flow enhancement. Only Expand and Peribit offered TCP flow control enhancement mechanisms; Packeteer's PacketShaper 2500 completed the tests with only the benefit of compression.

During transfer of the DNA2 file over a simulated 128-Kbps WAN connection, with 600 milliseconds of roundtrip delay, the Expand Accelerator 4820 transferred the file twice as fast as the Peribit Sequence Reducer-20 and 2.5X faster than the PacketShaper 2500.

Over a 512-Kbps simulated WAN link, with 250 ms. of roundtrip delay, the Expand Accelerator 4820 was three times faster transferring the file than the PacketShaper 2500 and the Peribit Sequence Reducer-20. And, over a 2-Mbps simulated WAN link, with 100 ms. roundtrip delay, the Expand Accelerator 4820 was nearly five times faster than the other devices in transferring the file.

In every WAN scenario tested, the Expand Accelerator 4820 outperformed its rivals. During the DNA2 file transfer, the Expand Accelerator 4820 improved file transfer time by up to 4.7 times faster than rivals tested. In the Bible file transfer test, the Expand Accelerator 4820 performed up to 3.9 times faster, and in the E.coli file transfer scenario, the Expand Accelerator 4820 improved file transfer time more than four times faster than rivals tested. (See Figures 3 & 5.)

## ANALYSIS

When it comes to real-time compression, the Expand Accelerator 4820 provided eight times more effective WAN link capacity when compared to the Peribit Sequence Reducer-20 and the Packeteer PacketShaper 2500 tested during a second-pass of real-time compression tests. During the first pass of data through the compression engines, the Expand Accelerator 4820 lead all devices

Percentage Increase in WAN Capacity				
First pass				
File name	File size (bytes)	Expand Accelerator 4820	Packeteer PacketShaper 2500	Peribit Sequence Reducer-20
Bible	4,047,392	179%	89%	119%
DNA.human	3,213,395	159%	24%	91%
DNA2	2,995,127	159%	18%	80%
World192	2,473,400	182%	107%	125%
Kennedy	1,029,744	192%	222%	120%
E.coli	4,638,690	182%	14%	122%
PI	1,000,000	71%	-3%	77%
Plrabn12	481,861	80%	37%	20%
Pic	513,216	282%	389%	371%
Ptt5	513,216	72%	378%	291%
Average		156%	128%	142%
Second pass				
File name	File size (bytes)	Expand Accelerator 4820	Packeteer PacketShaper 2500	Peribit Sequence Reducer-20
Bible	4,047,392	1130%	125%	152%
DNA.human	3,213,395	247%	42%	148%
DNA2	2,995,127	229%	35%	113%
World192	2,473,400	1577%	388%	128%
Kennedy	1,029,744	2097%	1188%	151%
E.coli	4,638,690	196%	15%	93%
PI	1,000,000	2084%	-3%	89%
Plrabn12	481,861	1889%	635%	86%
Pic	513,216	1605%	1516%	452%
Ptt5	513,216	1723%	1502%	551%
Average		1278%	544%	196%

Source: The Tolly Group, October 2004

Figure 4

with a 158% increase in effective WAN capacity. What tests show, however, is the Expand Accelerator 4820 is able to identify repeat patterns in data transmitted a second time, resulting in higher compression ratios.

This suggests that the Expand Accelerator 4820 would provide significant benefits to remote branches, where employees use networked applications repeatedly to access applications hosted in the data center.

Moreover, while the Peribit and the Packeteer models offered up to five times the effective WAN capacity, they significantly trailed the transfer speed increase delivered by the Expand Accelerator 4820. With TCP Flow enhancer, the Expand Accelerator 4820 exceeded the physical speed of the WAN link, achieving a sizeable speed increase over rival products tested. In

every WAN scenario tested, the Expand Accelerator 4820 outperformed its rivals, sometimes delivering files nearly five times faster. (See Figures 4 & 5.)

## TEST CONFIGURATION AND METHODOLOGY

For performance tests, The Tolly Group tested an Expand Accelerator 4820 running software version 5.0(3). The Accelerator 4820 was outfitted with two 10/100Base-T interfaces. Engineers also tested a Packeteer PacketShaper running software version 6.2.1, and outfitted with two 10/100Base-T interfaces. Finally, engineers tested a Peribit Sequence Reducer-20 running software version 5.0.1.4 and outfitted with two 10/100Base-T interfaces.

File Transfer Acceleration Rates				
DNA.Human				
	Time to transfer [seconds]			
Link type	Baseline	Expand Accelerator 4820	Peribit Sequence Reducer-20	Packeteer PacketShaper 2500
128 Kbps, 600msec RTT	210.0	65.6	136.9	129.0
512 Kbps, 250msec RTT	59.6	16.9	52.6	57.0
2 Mbps, 100msec RTT	21.8	4.4	20.6	22.0
DNA2				
	Time to transfer [seconds]			
Link type	Baseline	Expand	Peribit	Packeteer
128 Kbps, 600msec RTT	196.0	64.9	127.0	163.0
512 Kbps, 250msec RTT	55.6	16.5	49.3	54.0
2 Mbps, 100msec RTT	20.3	4.3	19.4	20.0
Bible				
	Time to transfer [seconds]			
Link type	Baseline	Expand	Peribit	Packeteer
128 Kbps, 600msec RTT	208.3	103.4	173.9	176.0
512 Kbps, 250msec RTT	74.9	26.3	67.2	67.0
2 Mbps, 100msec RTT	27.4	6.8	26.5	25.0
E.coli				
	Time to transfer [seconds]			
Link type	Baseline	Expand	Peribit	Packeteer
128 Kbps, 600msec RTT	300.0	110.0	192.0	258.3
512 Kbps, 250msec RTT	75.0	28.6	75.8	83.3
2 Mbps, 100msec RTT	31.3	7.2	30.3	31.3

Source: The Tolly Group, October 2004

Figure 5

The test bed simulated two offices communicating across a 512-Kbps WAN with a 100-millisecond round trip time latency. The devices under test (DUTs) were connected via a Fast Ethernet hub (to allow for the connection of the traffic capture device) to each of the two WAN simulator ports. The other port of each DUT was connected to a Layer 2 Fast Ethernet switch – one representing each simulated office. (See Figure 6.)

One of the switches supported connection to a PC running Microsoft IIS Server 5.0 and implementing an FTP server. The other switch connected to a PC running a standard FTP client (e.g., CuteFTP). The traffic capture device (e.g., Ethereal) was connected to the client side network at a point after the data has been compressed and before it reaches the decompressing device.

In the Real-Time Transparent Compression test, engineers conducted file transfers across a simulat-

ed 512-Kbps WAN using 10 different "standard" files. As compression devices typically improve their effectiveness on subsequent "passes," both a first and a second pass were run. The files were drawn from the "Canterbury Corpus" which is a standard set of public domain files specifically constructed as input to compression tests. This test used a varied subset of the entire corpus.

Engineers connected a DUT pair to the network, established the session between the FTP client and server and verified that all processes were functioning normally by transferring a file that was not be used in the test. Leaving client session up, engineers started the analyzer and let it run for 10 seconds to make sure that the network was idle. Simultaneously, they initiated the download of a test file and started the timing device.

When the client reports that the data transfer is complete, engineers

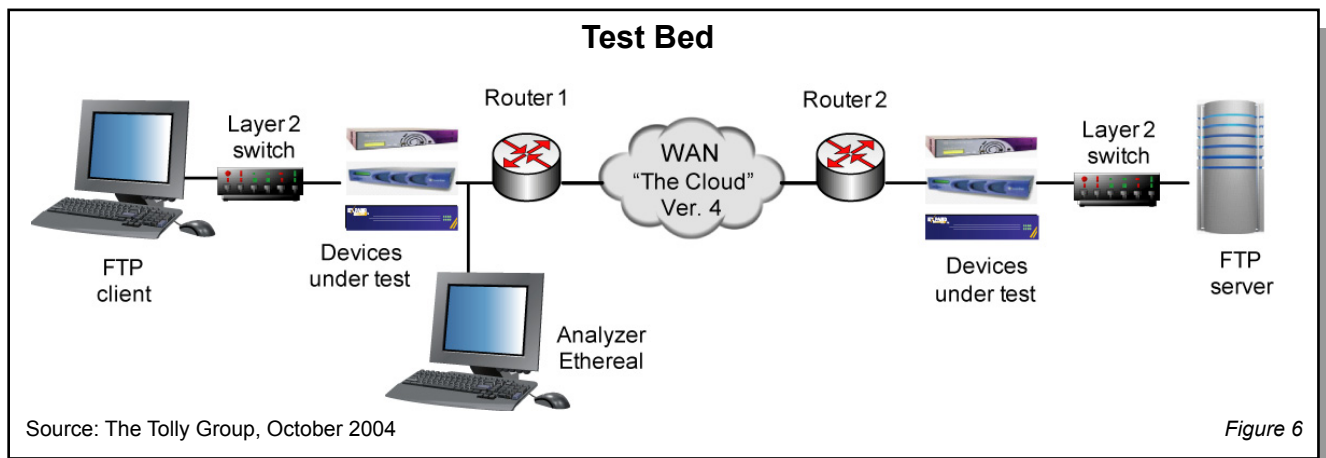
stopped the timing device. Then they stopped the analyzer and saved the file and recorded the results.

To determine the compression rate, engineers examined the trace file and determined when the first data frame and last data frame arrived. From this information the engineer derived a more precise data transfer time. To calculate the post-compression data size, the engineer filtered the trace to see only the FTP data packets received (and not, for example, acknowledgements or other background traffic). Ethereal filter was set to "ftp-data and ip.dst = xx.xx.xx.xx" where xx, etc. was the IP address of the client station. The engineer then displayed the summary of bytes transferred (which included packet headers) and recorded this as the "effective file size" results. The formula to calculate total effective compression is (InputBytes/OutputBytes)-1.

For the Effective WAN Throughput using Data Compression and TCP Flow Enhancers test, engineers connected a DUT pair to the network, established a session between the FTP client and the server and verified that data transfer was functioning normally by transferring a file that was not used in the test. Next, they left up the client session, started analyzer and let it run for 10 seconds to make sure that the network was idle. Simultaneously they initiated the download of a test file and started the timing device. When the client reported that the data transfer was complete, engineers stopped the timing device and recorded the elapsed time between different WAN configurations.

### EQUIPMENT ACQUISITION AND SUPPORT

The Peribit Networks Sequence Reducer-20 and Packeteer PacketShaper 2500 were acquired through normal product distribution channels. The Tolly Group contacted



executives at the vendor companies and invited them to provide a higher level of support than available through normal channels. The vendors neither accepted nor declined the offer due to a lack of response. The software level as supplied was 5.0.1.4

and 6.2.1 respectively for the Peribit Sequence Reducer-20 and the Packeteer PacketShaper 2500. Peribit and Packeteer phone technical support was used to configure/tune the device for the test suites executed by The Tolly Group.

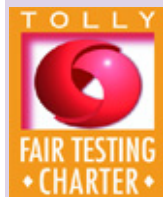


**The Tolly Group gratefully acknowledges the providers of test equipment used in this project.**

Vendor	Product	Web address
Ethereal	Ethereal v0.10.2	<a href="http://www.ethereal.com">http://www.ethereal.com</a>
Public domain	Canterbury Corpus	<a href="http://corpus.canterbury.ac.nz">http://corpus.canterbury.ac.nz</a>
Shunra Software, Ltd.	Shunra/Cloud v. 4.0	<a href="http://www.shunra.com">http://www.shunra.com</a>

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## PROJECT PROFILE

**Sponsor:** Expand Networks, Inc.

**Document number:** 204155

**Product class:** Traffic management/compression appliance

**Products under test:**

- Expand Accelerator 4820 v. 5.0(3)
- Packeteer PacketShaper SW v. 6.2.1
- Peribit Sequence Reducer-20 SW v. version 5.0.1.4

**Testing window:** October 2004

**Software status:**

- Generally available

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