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This techpaper provides a performance overview of the R&S®LANCOM routers. The routers, which are typically used as CPE or branch office devices, and the VPN gateways of the ISG series, which are typically used as central devices, are presented in terms of routing and VPN/IPSec performance.

For a clear presentation of the test results and thus better comparability of performance, devices are grouped into categories with similar hardware equipment.

The performance values shown are particularly suitable for comparing the different device categories with each other. They also allow conclusions to be drawn about the performance that can be expected in a real application. However, this may differ from the tech paper, e.g. because the device configuration, network environment or the measurement itself are different.

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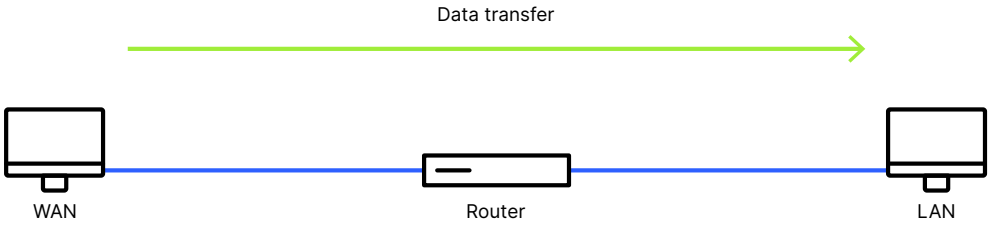
Definition of performance and associated measurement setups

Performance UDP



With UDP, IP datagrams are sent without a connection - sometimes as a continuous data stream. In contrast to TCP, there are no internal protocol mechanisms that guarantee or confirm the successful transmission of individual datagrams. There is also no adaptation of the transmission rate to the characteristics of the transmission path (e.g. lines or devices).

For the measurement of UDP performance, this means that it is not the reliable transmission itself, but the measurement method that must reflect its behavior. This is usually done using a search method that determines the highest possible transmission rate (in constant packets per second) at which the packet losses on the receiving side remain below a defined threshold. In the measurements presented in the tech paper, this target threshold is generally 1%.

With manual simulation, you start with a low transmission rate and gradually increase it until the losses observed on the receiving end exceed the defined threshold.

Important: It is not permissible to simply select a transmission rate that is clearly too high and then only evaluate what is still arriving on the receiving end.

It should be noted that not only the device itself, but also the interfaces and lines used can limit the measurable performance. This is particularly evident in the UDP measurements: While the measurement results for smaller frames or packets still differ significantly between the various device categories, they largely converge for larger ones.

The following requirements must be observed when using UDP packet generators:

- Uniform transmission: All packets must be sent evenly at the packet or frame rate to be examined - not in bursts.
- Adapted packet size: The packet size should match the MTU (Maximum Transfer Unit) of the route so that the device to be examined does not have to perform any additional fragmentation. Important: The MTU can vary depending on the tunnel type. This is often less important for TCP measurements, as a negotiated MSS (Maximum Segment Size) is usually reduced by mechanisms such as MSS clamping on the router.
- No fragmentation: Only non-fragmented packets or frames should be generated. Fragments can - depending on the router settings - trigger complex reassembly.

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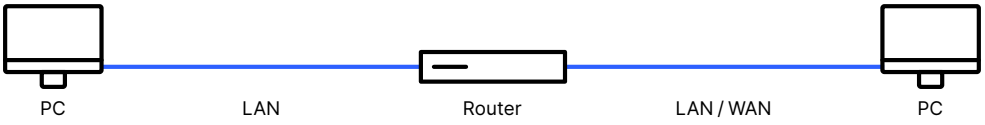
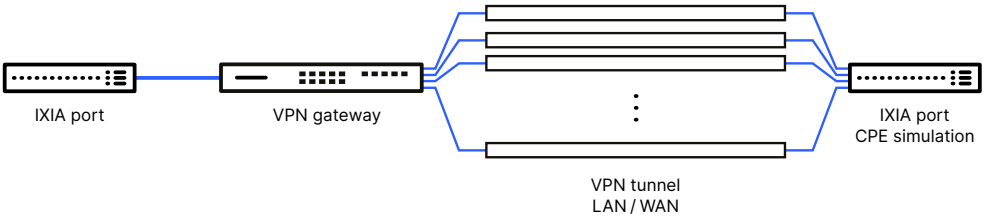
Measurement setup UDP

Various packet generators and search algorithms are used to measure UDP performance:

- Routing performance: TRex is used as a packet generator for pure routing performance. This runs under Linux on a standard PC.



- IPSec performance: For IPSec measurements, IxLoad from Keysight/IXIA is used on a PerfectStorm One appliance. This simulates one side of the VPN tunnel at a time, while the other side is taken over by the R&S®LANCOM device under test. This also allows tests to be carried out with a larger number of VPN tunnels that are terminated together on a R&S®LANCOM VPN gateway.



Definition measured values UDP

UDP measurements typically determine how many packets or Ethernet frames are successfully transmitted per second. A throughput value in Mbps is calculated by multiplying this by the total size of the respective IP packet or Ethernet frame.

These values are specified for a range of different packet sizes in the UDP measurement tables. The maximum possible packet size depends on whether it is an IPSec or a pure routing measurement, as the MTU in an IPSec tunnel is lower than on an unencrypted route due to the additional overhead.

In addition, some IMIX profiles are also taken into account in the measurements - i.e. mixtures of different packet sizes. Such “Internet mixes” simulate typical size distributions in real data traffic.

There is no binding standard for the selection of the frame sizes used. Therefore, in addition to the default setting of the IXIA test system (IMIX 0), two other common patterns are used: IMIX 1 and IMIX 2.

IMIX 1	IMIX 2	IMIX 3
64 bytes (45 %) 128 bytes (20 %) 256 bytes (5 %) 512 bytes (3 %) 1024 bytes (2 %) 1280 bytes (1 %) 1418 bytes (24 %) for IPSec resp. 1518 bytes (24 %) for Routing	64 bytes (58.4 %) 570 bytes (33.3 %), 1418 bytes (8.3 %) for IPSec resp. 1518 bytes (8.3 %) for Routing	90 bytes (58 %) 92 bytes (2 %) 594 bytes (24 %) 1418 bytes (16 %) for IPSec resp. 1518 bytes (16 %) for Routing

For the measurement, only a single tunnel is set up over the WAN link. However, the R&S®LANCOM ISG-5000 and ISG-8000 devices achieve higher total throughputs when several tunnels are used simultaneously.

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Performance TCP

With TCP, the transmission of each data segment is already monitored by the protocol itself. TCP dynamically adjusts the transmission rate on this basis, among other things. This automatically sets the maximum possible performance that can be achieved via the devices and lines involved.

However, TCP measurements are highly dependent on the specific endpoints used - for example, the PC or mobile device, the network adapter (NIC) and its TCP offloading capabilities, the TCP stack of the respective operating system, the browser used, etc.
These components influence both the internal control of TCP behavior and the overhead caused by TCP.

The properties of the underlying WAN route also have an impact on TCP performance. Delay/latency, jitter and packet loss are particularly important factors here.
The relationship between the latency time (RTT, round-trip time) and the TCP window parameters plays a central role here. These buffer sizes must be sufficiently dimensioned to compensate for the delay on the connection. The required size results from the so-called BDP (Bandwidth-Delay Product) of the route.

To ensure that the measured performance is not artificially limited, the TCP implementation or generator used must actually be able to utilize this BDP.

Measurement setup TCP

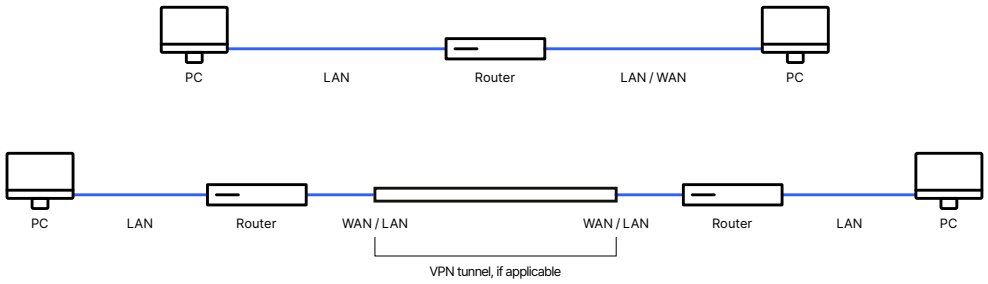
The measurements shown are intended to provide an orientation with regard to the performance of different routing and tunnel variants.

Two scenarios are considered in each case:

- Single system: A single device under test.
- Two-point scenario: Two devices of the same type that are connected to each other via a WAN link. Different tunnel types are configured and compared on this route.

Linux-based PCs are used to measure TCP performance. A distinction is made between two types of measurement:

- TCP measurement with iperf3: The iperf3 tool is used here to carry out targeted TCP throughput measurements.
- HTTP measurement with nginx and siege: In this scenario, data is transferred between an nginx web server and the siege tool, which serves as an HTTP load generator.



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Definition measurement values TCP

The information relates exclusively to the transported user data - for example, the transfer of larger files or complete HTTP pages.

General information vRouter

For the UDP-IPSec measurements, a vRouter was operated on a Xeon E-2176G @ 3.7 GHz under an ESXi hypervisor. Intel X710 adapters via VMXNET3 were used as network interfaces.

For the TCP/HTTP measurements, a vRouter was used on a Xeon E3-1230v5 @ 3.4 GHz, also under ESXi, was used for the TCP/HTTP measurements. Intel X710 interfaces with VMXNET3 were also used here.

The performance of a vRouter depends heavily on the host system used - in particular on its hardware, configuration and parallel use by other virtual machines.

The measured values shown in the tech paper therefore only provide a rough guide for vRouters. In contrast, hardware-based devices offer a much higher degree of practical relevance due to their fixed system environment.

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Category assignment of the devices under test (DUT) for a better overview of the measurement results

In the left-hand column of the following table you will find the name of your R&S®LANCOM device. The corresponding device category is shown in the right-hand column.

Using this category, you can clearly assign the corresponding performance values for your device in the tables on the following pages.

LANCOM device name	Device category
1650E	A
1800EF, 1800EF-4G, 1800EF-5G, 1800EFW IGR-750EF-5G	B
1800VA 1800VA-4G 1800VAW 1800VAW-4G 1803VA 1803VA-4G 1803VAW 750-5G IAP-5G OAP-5G	C
1800EFW-5G 1800VA-5G 1803VA-5G 1803VAW-5G 1930EF 1930EF-5G 1936VAG 1936VAG-5G	D
1926VAG-4G	E
2100EF ISG-5000	G
ISG-8000	H
vRouter	I

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UDP measurement values for all devices

Note: When using large frames, the measured performance may not be limited by the device performance itself, but by the bandwidth of the Ethernet interfaces used (1G or 10G).

Table 01 - WAN-LAN routing / IMIX

Throughput [Mbps] @ frame size [bytes] and frame rate [fps]

Category	Reference	64	128	256	512	1,024	1,280	1,518	IMIX 1	IMIX 2	IMIX 3	
A	1650E	83	166	332	665	972	972	986	624	449	551	Mbps
		162,000	162,000	162,000	162,000	118,000	95,000	81,200	162,000	162,000	162,000	fps
B	1800EF	94	183	345	670	972	972	986	638	477	576	Mbps
		185,000	178,000	168,000	163,000	118,000	95,000	81,200	166,000	172,000	170,000	fps
C	1800VAW-4G	78	157	313	630	972	976	977	588	426	519	Mbps
		153,000	153,000	153,000	153,000	118,000	95,300	80,400	153,000	153,000	153,000	fps
D	1800VA-5G	98	197	395	787	972	976	977	738	534	654	Mbps
		192,000	192,000	192,000	192,000	118,000	95,300	80,400	192,000	192,000	192,000	fps
E	1926VAG	79	157	315	630	972	976	977	588	423	519	Mbps
		154,000	153,000	153,000	153,000	118,000	95,300	80,400	153,000	153,000	153,000	fps
G	ISG-5000	371	740	1,470	2,810	5,800	7,200	8,470	2,650	1,990	2,430	Mbps
		725,000	722,000	720,000	686,000	708,000	703,000	697,000	691,000	720,000	717,000	fps
H	ISG-8000	758	1,510	3,020	6,060	9,720	9,790	9,860	5,660	4,080	5,000	Mbps
		1,480,000	1,470,000	1,470,000	1,480,000	1,180,000	956,000	812,000	1,470,000	1,470,000	1,470,000	fps
I	vRouter	572	1,100	2,160	4,350	7,880	9,720	9,860	3,960	2,990	3,470	Mbps
		1,110,000	1,070,000	1,050,000	1,060,000	962,000	950,000	812,000	1,030,000	1,080,000	1,020,000	fps

Table 02 - LAN-WAN routing / IMIX

Throughput [Mbps] @ frame size [bytes] and frame rate [fps]

Category	Reference	64	128	256	512	1,024	1,280	1,518	IMIX 1	IMIX 2	IMIX 3	
A	1650E	76	154	309	624	972	972	986	580	415	513	Mbps
		150,000	151,000	151,000	152,000	118,000	95,000	81,200	151,000	150,000	151,000	fps
B	1800EF	90	174	327	645	972	972	986	600	449	542	Mbps
		176,000	170,000	160,000	157,000	118,000	95,000	81,200	156,000	162,000	160,000	fps
C	1800VAW-4G	62	123	249	499	972	976	977	468	337	416	Mbps
		122,000	120,000	121,000	121,000	118,000	95,300	80,400	121,000	121,000	122,000	fps
D	1800VA-5G	70	141	281	563	972	976	977	528	380	466	Mbps
		137,000	138,000	137,000	137,000	118,000	95,300	80,400	137,000	137,000	137,000	fps
E	1926VAG	64	128	257	515	972	976	977	483	348	426	Mbps
		125,000	125,000	125,000	125,000	118,000	95,300	80,400	125,000	125,000	125,000	fps
G	ISG-5000	264	538	1,080	2,160	4,760	5,320	6,550	2,050	1,490	1,810	Mbps
		517,000	525,000	531,000	528,000	582,000	520,000	539,000	534,000	540,000	534,000	fps
H	ISG-8000	745	1,500	2,890	5,880	9,720	9,790	9,860	5,590	4,110	5,040	Mbps
		1,450,000	1,460,000	1,410,000	1,430,000	1,180,000	956,000	812,000	1,450,000	1,480,000	1,480,000	fps
I	vRouter	473	979	1,880	3,680	7,520	8,890	9,630	3,550	2,570	2,920	Mbps
		925,000	956,000	918,000	900,000	918,000	868,000	793,000	925,000	931,000	862,000	fps

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Table 03 - LAN-LAN routing / IMIX												
		Throughput [Mbps] @ frame size [bytes] and frame rate [fps]										
Category	Reference	64	128	256	512	1,024	1,280	1,518	IMIX 1	IMIX 2	IMIX 3	
A	1650E	98 192,000	197 192,000	394 192,000	788 192,000	972 118,000	972 95,000	986 81,200	739 192,000	529 192,000	648 192,000	Mbps fps
B	1800EF	115 225,000	222 217,000	409 200,000	798 195,000	972 118,000	972 95,000	986 81,200	744 193,000	560 202,000	669 197,000	Mbps fps
C	1800VAW-4G	112 219,000	224 219,000	449 219,000	896 218,000	972 118,000	976 95,300	977 80,400	663 172,000	480 173,000	585 172,000	Mbps fps
D	1800VA-5G	90 175,000	179 175,000	358 175,000	713 174,000	972 118,000	976 95,300	977 80,400	822 214,000	592 214,000	728 214,000	Mbps fps
E	1926VAG	92 179,000	184 179,000	368 179,000	732 178,000	972 118,000	976 95,300	977 80,400	669 174,000	482 174,000	590 174,000	Mbps fps
G	ISG-5000	388 759,000	771 753,000	1,540 753,000	3,040 742,000	6,080 742,000	7,600 742,000	8,980 739,000	2,870 748,000	2,060 745,000	2,500 739,000	Mbps fps
H	ISG-8000	809 1,580,000	1,600 1,560,000	3,210 1,560,000	6,420 1,560,000	9,720 1,180,000	9,790 956,000	9,860 812,000	6,020 1,560,000	4,300 1,550,000	5,300 1,560,000	Mbps fps
I	vRouter	521 1,010,000	1,010 993,000	2,030 993,000	3,940 962,000	7,680 937,000	9,340 912,000	9,860 812,000	3,860 1,000,000	2,780 1,00,000	3,300 975,000	Mbps fps

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Table 04 - IPSec 1 tunnel AES-GCM via WAN - decryption									
		Throughput [Mbps] @ frame size [bytes] and frame rate [fps]							
Category	Reference	64	128	256	512	1,024	1,280	1,418	
A	1650E	48.8 95,400	99.8 97,400	192 93,700	378 92,200	728 88,800	906 88,400	941 82,900	Mbps fps
B	1800EF	77.7 151,000	153 149,000	292 142,000	549 134,000	931 113,000	943 92,000	948 83,600	Mbps fps
C	1800VAW-4G	46.2 90,200	92.5 90,300	185 90,500	375 91,500	747 91,200	911 88,900	947 83,400	Mbps fps
D	1800VA-5G	68.9 134,000	141 137,000	291 141,000	583 142,000	930 113,000	943 92,100	948 83,600	Mbps fps
E	1926VAG	44.4 86,600	91.5 89,300	183 89,100	369 90,000	727 88,700	904 88,300	941 82,900	Mbps fps
G	ISG-5000	237 463,000	467 456,000	900 439,000	1,750 429,000	3,330 406,000	4,120 403,000	4,570 403,000	Mbps fps
H	ISG-8000	447 873,000	790 771,000	1,450 711,000	2,880 703,000	4,440 543,000	5,140 502,000	5,160 455,000	Mbps fps
I	vRouter	389 760,000	759 741,000	1,440 704,000	2,710 662,000	4,600 561,000	5,180 506,000	5,160 455,000	Mbps fps

Table 05 - IPSec 1 tunnel AES-GCM via WAN - encryption									
		Throughput [Mbps] @ frame size [bytes] and frame rate [fps]							
Category	Reference	64	128	256	512	1,024	1,280	1,418	
A	1650E	40.6 74,600	107 101,000	232 111,000	454 109,000	881 106,000	944 91,700	940 82,600	Mbps fps
B	1800EF	112 205,000	219 207,000	429 206,000	858 206,000	928 112,000	948 92,000	944 83,000	Mbps fps
C	1800VAW-4G	54.8 100,000	105 99,700	214 102,000	422 101,000	831 100,000	948 91,300	952 82,900	Mbps fps
D	1800VA-5G	90.5 166,000	178 168,000	350 167,000	698 167,000	935 112,000	948 91,700	952 83,100	Mbps fps
E	1926VAG	52.9 97,300	107 100,000	210 100,000	408 98,000	797 96,500	940 91,100	952 82,900	Mbps fps
G	ISG-5000	291 533,000	560 525,000	1,050 507,000	1,920 463,000	3,250 396,000	3,890 379,000	4,290 376,000	Mbps fps
H	ISG-8000	578 1,050,000	1,070 1,000,000	2,530 1,210,000	4,130 1,000,000	5,250 639,000	5,200 506,000	5,180 455,000	Mbps fps
I	vRouter	427 783,000	824 774,000	1,550 748,000	2,770 668,000	4,590 557,000	5,200 506,000	5,180 455,000	Mbps fps

Table 06 - IPSec 1 tunnel AES-GCM via WAN - decryption / encryption IMIX									
		Throughput [Mbps] and frame rate [fps]							
		Decryption			Encryption				
Category	Reference	IMIX 1	IMIX 2	IMIX 3	IMIX 1	IMIX 2	IMIX 3		
A	1650E	310 84,100	213 77,200	221 65,100	270 72,000	218 78,000	249 72,800	Mbps fps
B	1800EF	446 120,000	308 111,000	300 87,800	334 88,800	259 92,000	243 71,100	Mbps fps
C	1800VAW-4G	333 90,200	252 91,100	306 90,200	379 101,000	293 104,000	349 101,000	Mbps fps
D	1800VA-5G	513 139,000	380 137,000	472 139,000	607 162,000	455 161,000	550 160,000	Mbps fps
E	1926VAG	321 87,200	247 89,500	293 86,900	364 97,300	277 98,400	334 97,600	Mbps fps
G	ISG-5000	1,550 421,000	1,170 427,000	1,360 402,000	1,660 446,000	1,260 452,000	1,520 444,000	Mbps fps
H	ISG-8000	2,390 649,000	1,860 674,000	2,310 684,000	4,010 1,070,000	3,110 1,110,000	3,670 1,070,000	Mbps fps
I	vRouter	2,500 680,000	1,910 692,000	2,290 676,000	2,490 669,000	2,020 722,000	2,300 672,000	Mbps fps

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UDP measurement values for devices with 10G interfaces

Note: For large frames or TCP, the measured performance may not be determined by the performance of the device, but is limited by the Ethernet interfaces (1G or 10G).

Table 07 - IPSec 10 tunnel AES-GCM via LAN - decryption

		Throughput [Mbps] @ frame size [bytes] and frame rate [fps]							
Category	Reference	64	128	256	512	1,024	1,280	1,418	
G	ISG-5000	**221** 431,000	**449** 438,000	**1,020** 500,000	**1,760** 430,000	**3,480** 425,000	**4,080** 398,000	**4,400** 388,000	**Mbps** fps
H	ISG-8000	**406** 1,180,000	**1,210** 1,180,000	**2,470** 1,200,000	**4,830** 1,180,000	**9,320** 1,130,000	**9,450** 923,000	**9,480** 835,000	**Mbps** fps
I	vRouter	**342** 667,000	**674** 658,000	**1,310** 640,000	**2,430** 594,000	**4,120** 503,000	**5,100** 498,000	**5,530** 488,000	**Mbps** fps

Table 08 - IPSec 10 tunnel AES-GCM via LAN - encryption

		Throughput [Mbps] @ frame size [bytes] and frame rate [fps]							
Category	Reference	64	128	256	512	1,024	1,280	1,418	
G	ISG-5000	**255** 466,000	**453** 428,000	**698** 335,000	**1,950** 468,000	**3,470** 419,000	**4,080** 397,000	**4,540** 396,000	**Mbps** fps
H	ISG-8000	**788** 1,430,000	**1,400** 1,330,000	**2,910** 1,390,000	**5,660** 1,350,000	**9,430** 1,130,000	**9,540** 923,000	**9,500** 835,000	**Mbps** fps
I	vRouter	**372** 683,000	**602** 570,000	**1,370** 659,000	**2,630** 635,000	**4,430** 539,000	**4,830** 466,000	**4,660** 409,000	**Mbps** fps

Table 09 - IPSec 10 tunnel AES-GCM via LAN - decryption / encryption IMIX

		Throughput [Mbps] and frame rate [fps]						
		Decryption			Encryption			
Category	Reference	IMIX 1	IMIX 2	IMIX 3	IMIX 1	IMIX 2	IMIX 3	
G	ISG-5000	**1,630** 444,000	**1,290** 468,000	**1,050** 309,000	**1,210** 324,000	**992** 354,000	**1,110** 325,000	**Mbps** fps
H	ISG-8000	**4,380** 1,190,000	**3,230** 1,170,000	**3,970** 1,170,000	**5,120** 1,360,000	**3,810** 1,360,000	**4,680** 1,350,000	**Mbps** fps
I	vRouter	**2,130** 578,000	**1,750** 632,000	**1,670** 495,000	**1,970** 528,000	**1,290** 457,000	**2,140** 622,000	**Mbps** fps

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Table 10 - IPSec 10 tunnel AES-GCM via WAN - decryption									
		Throughput [Mbps] @ frame size [bytes] and frame rate [fps]							
Category	Reference	64	128	256	512	1,024	1,280	1,418	
G	ISG-5000	**213** 416,000	**460** 448,000	**942** 459,000	**1,690** 414,000	**3,210** 392,000	**4,010** 392,000	**4,420** 390,000	**Mbps** fps
H	ISG-8000	**552** 1,070,000	**1,060** 1,040,000	**2,170** 1,060,000	**4,280** 1,040,000	**8,590** 1,040,000	**9,450** 923,000	**9,470** 835,000	**Mbps** fps
I	vRouter	**390** 761,000	**755** 737,000	**1,410** 692,000	**2,620** 641,000	**4,590** 560,000	**5,390** 527,000	**5,850** 516,000	**Mbps** fps

Table 11 - IPSec 10 tunnel AES-GCM via WAN - decryption									
		Throughput [Mbps] @ frame size [bytes] and frame rate [fps]							
Category	Reference	64	128	256	512	1,024	1,280	1,418	
G	ISG-5000	**272** 497,000	**524** 493,000	**1,050** 504,000	**2,030** 491,000	**3,320** 401,000	**4,120** 400,000	**4,220** 371,000	**Mbps** fps
H	ISG-8000	**751** 1,370,000	**1,430** 1,340,000	**2,860** 1,360,000	**5,390** 1,300,000	**9,390** 1,130,000	**9,540** 923,000	**9,500** 835,000	**Mbps** fps
I	vRouter	**412** 757,000	**802** 755,000	**1,510** 720,000	**2,590** 628,000	**4,590** 557,000	**5,460** 531,000	**5,720** 503,000	**Mbps** fps

Table 12 - IPSec 10 tunnel AES-GCM via WAN - decryption / encryption IMIX								
		Throughput [Mbps] and frame rate [fps]						
		Decryption			Encryption			
Category	Reference	IMIX 1	IMIX 2	IMIX 3	IMIX 1	IMIX 2	IMIX 3	
G	ISG-5000	**1,390** 377,000	**1,040** 379,000	**1,030** 304,000	**1,500** 401,000	**1,100** 395,000	**978** 283,000	**Mbps** fps
H	ISG-8000	**3,930** 1,060,000	**2,920** 1,050,000	**3,560** 1,050,000	**5,040** 1,340,000	**3,780** 1,340,000	**4,570** 1,330,000	**Mbps** fps
I	vRouter	**2,340** 636,000	**1,850** 670,000	**1,920** 571,000	**2,120** 567,000	**1,870** 668,000	**1,680** 490,000	**Mbps** fps

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TCP measurement values for all devices

Note: When using large frames or TCP transfers, the measured performance may not be limited by the device performance itself, but by the bandwidth of the Ethernet interfaces used (1G or 10G).

Table 13 - iPerf single DUT routing Throughput [Mbps] for 5 parallel transfers				
Category	Reference	LAN download / upload	WAN download	WAN upload
A	1650E	926	926	926
B	1800EF	938	938	938
C	1800VAW-4G	940	940	936
D	1800VA-5G	940	940	937
E	1926VAG	926	925	925
G	ISG-5000	8,030	6,240	5,740
H	ISG-8000	9,400	9,400	9,400
I	vRouter	9,400	9,400	9,400

Table 14 - HTTP single DUT routing Throughput [Mbps] for 5 parallel transfers				
Category	Reference	LAN download / upload	WAN download	WAN upload
A	1650E	909	907	907
B	1800EF	928	931	932
C	1800VAW-4G	931	921	931
D	1800VA-5G	933	929	928
E	1926VAG	912	909	911
G	ISG-5000	4,680	4,640	4,700
H	ISG-8000	9,400	9,400	9,400
I	vRouter	9,400	9,400	9,400

Table 15 - iPerf DUT2DUT WAN routing Throughput [Mbps] for 5 parallel transfers						
Category	Reference	IPv4	PPP NAT	L2TP	EOGRE tunnel	L2TPv3 tunnel via LAN bridge
A	1650E	915	903	795	894	880
B	1800EF	940	935	747	916	908
C	1800VAW-4G	931	927	771	701	735
D	1800VA-5G	934	928	781	780	814
E	1926VAG	907	904	796	751	799
G	ISG-5000	5,330	5,040	2,580	2,960	3,120
H	ISG-8000	9,400	7,690	7,310	5,980	5,530
I	vRouter	9,120	8,970	6,080	5,760	4,860

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Table 16 - iPerf DUT2DUT WAN routing via VPN					
		Throughput [Mbps] for 5 parallel transfers			
Category	Reference	IPSec tunnel AES-CBC	IPSec tunnel AES-GCM	L2TPv3 tunnel in IPSec tunnel AES-GCM	WireGuard
A	1650E	756	806	530	496
B	1800EF	891	903	775	517
C	1800VAW-4G	777	820	473	310
D	1800VA-5G	883	896	600	314
E	1926VAG	812	811	469	304
G	ISG-5000	796	3,950	2,170	2,970
H	ISG-8000	1,620	4,930	5,010	7,420
I	vRouter	1,400	4,230	2,580	2,500

Table 17 - HTTP DUT2DUT WAN routing						
		Throughput [Mbps] for 5 parallel transfers				
Category	Reference	IPv4	PPP NAT	L2TP	EOGRE tunnel	L2TPv3 tunnel via LAN bridge
A	1650E	905	902	878	893	884
B	1800EF	930	926	905	903	895
C	1800VAW-4G	921	922	883	812	844
D	1800VA-5G	921	921	877	897	889
E	1926VAG	905	900	879	868	874
G	ISG-5000	3,660	3,640	2,520	2,850	2,890
H	ISG-8000	9,310	7,580	7,500	7,060	6,000
I	vRouter	8,920	8,790	5,920	5,730	4,920

Table 18 - HTTP DUT2DUT WAN routing via VPN					
		Throughput [Mbps] for 5 parallel transfers			
Category	Reference	IPSec tunnel AES-CBC	IPSec tunnel AES-GCM	L2TPv3 tunnel in IPSec tunnel AES-GCM	WireGuard
A	1650E	855	860	598	496
B	1800EF	880	893	857	517
C	1800VAW-4G	864	883	527	310
D	1800VA-5G	870	886	713	314
E	1926VAG	860	876	514	304
G	ISG-5000	778	3,400	2,170	2,970
H	ISG-8000	1,620	5,080	4,760	7,420
I	vRouter	1,410	4,150	2,590	2,500

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