An Introduction to Dispersive Virtualized Networks

dispersive technologies

Dispersive Technologies' software and cloud-based virtualized networks deliver mission-critical communications over the public Internet to help organizations reduce costs, streamline and secure operations, and perform more efficiently.

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Introduction

Dispersive Technologies offers on-premise and cloud-based software solutions that make the public Internet fast, secure and reliable. These offerings run on off-the-shelf hardware and leverage readily available, low-cost broadband Internet connections (over any fixed, wireless or satellite network) to deliver mission-critical communications. This approach allows companies to utilize the public Internet and cloud computing to reduce costs, streamline and secure operations, and perform more efficiently. This paper will focus on describing one such offering from Dispersive – Dispersive Virtualized Networks (Dispersive VNs) – and the benefits these networks provide.

Solution Overview and Component Definition

Dispersive Virtualized Networks (Dispersive VNs) comprise a number of components that collaborate and route traffic in ways that significantly enhance network speed, security and reliability. These components are:

SoftSwitch: Server-based network management software that hosts the trusted peer database, stores communications protocols and route information, and authenticates all network components and their allowed services/service levels. The SoftSwitch also tracks the changing identity of mobile devices to ensure that communications continue without interruption when devices are moving.

Client: Software which allows an edge device to send and receive data via the Dispersive VN. As seen in Appendix A, client software, which configures devices automatically and sets the parameters for device communications, can typically reside on any IP-enabled device.

Deflect: Software which relays traffic between Dispersive VN Clients and/or Gateways.

Minimum System Requirements

SoftSwitch	Client	Deflect
• Intel I3 (Dual Core) or equivalent • Memory: 2GB • HDD: 1GB available • Linux (CentOS/Ubuntu/Fedora/ Red Hat)	• Dual Core • Memory: 4GB (Computer) • Memory: 1GB (SmartPhone) • HDD: 2MB • Linux (CentOS/Ubuntu/Fedora/ Red Hat)/Windows/Apple OS/ Android/Apple iOS	• Intel I3 (Dual Core) or equivalent • Memory: 2GB • HDD: 2MB • Linux (CentOS/Ubuntu/Fedora/ Red Hat)/Windows/Apple OS

Gateway Server: Software which allows an edge server to handle communications for multiple devices at a physical location so they can send and receive data via a Dispersive VN.

Interface Server: Software which allows Dispersive VN Clients to use services on hosts outside a Dispersive VN.

DART: Browser-based user interface tool which is installed on the Dispersive VN SoftSwitch and used to administer a Dispersive VN.

In managing traffic flowing between these components, Dispersive software performs several key functions that combine to significantly enhance network speed, security and reliability. Dispersive VN software:

1. Divides packet data into smaller, non-duplicated independent packet streams
2. Rolls these independent paths dynamically based on:
   a. Bandwidth availability
   b. Quality of line
   c. Measured time delay on each independent packet stream
   d. Other factors important to the customer
3. Reassembles the data at the receiving Client.

Dispersive's approach to routing differs fundamentally from the way data transits standard Internet networks, where devices are forced by routers to send data to other devices along a single path. This one stream/one path method creates a single point of failure due to congestion and router failures, and provides one big target for man-in-the-middle attacks.

Minimum System Requirements (continued)

Gateway Server	Interface Server
• Intel I3 (Dual Core) or equivalent • Memory: 4GB • HDD: 2MB • Linux (CentOS/Ubuntu/Fedora/ Red Hat)/Windows/Apple OS/	• Intel I3 (Dual Core) or equivalent • Memory:4GB • HDD: 2MB • Linux (CentOS/Ubuntu/Fedora/ Red Hat)/Windows/Apple OS

Divide and conquer. It's more than a military strategy. It's how Dispersive strengthens networks.

The Dispersive Difference: Delivering Real Advantages

Dispersive Virtualized Networks intelligently overcome limitations associated with traditional networks. They offer advantages that include:

Higher Speeds. Dispersive VNs send data up to five times faster than existing Virtual Private Network solutions by creating multiple independent paths and rolling away from congested pathways.

Tighter Security. Path selection changes continuously and message encryption varies from path to path during the session. Consequently, it's virtually impossible for man-in-the-middle attackers to know which routes are in use, or collect enough meaningful data to reassemble the communications.

Greater Reliability. Dispersive VNs bypass bottlenecks and avoid router failures by instantaneously rolling traffic to new paths when a Client senses a connection problem.

More flexibility. Dispersive VNs bring the benefits of Multiprotocol Label Switching (MPLS) to cloud-hosted services without any modifications to existing cloud architecture.

Reduced costs. Dispersive's customers typically slash Wide Area Network (WAN) communications costs by up to 25% by offloading private net traffic to the public Internet.

Dispersive Virtualized Networks transform networking technology. By virtualizing routing at the MAC and Link layers of servers, computers, and mobile phones, Dispersive's software enables the creation of multiple independent paths per session. This dramatically improves the performance of current Internet protocols and allows Dispersive VNs to outperform expensive private networks.

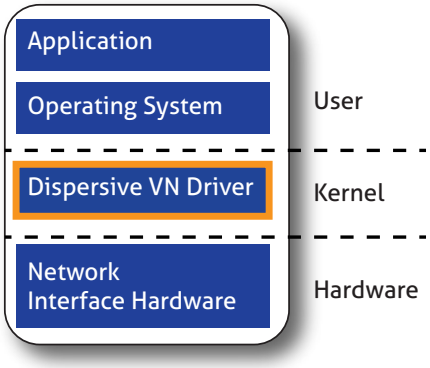

Figure 1

Dispersive VN on the Host Machine

As shown in Figure 1, Dispersive VN software installs as a driver and resides on the network access layer between the host's operating system and network interface hardware. (For a complete list of compatible operating systems see Appendix A.) Because Dispersive software runs as drivers, user applications operate as usual.

With Dispersive VN software running at the network access layer, the driver communicates directly with the network interface hardware to control signaling, routing and network communications. This allows network components to collaborate to move traffic across routes that meet established criteria such as bandwidth availability, quality of line and others important to the customer.

Packets flow through the drivers in response to requests and commands from user-facing applications (e.g., Microsoft Office, mobile device apps, etc.) running at the Application Layer. By operating at the bottom of the network stack, Dispersive VNs control packet traffic at the most efficient point on the host with the result that there is no perceptible latency for the user.

Dispersive VNs use a new type of communications protocol known as Spread Spectrum Protocol (SSP) to define a number of parameters that govern data transmission on a Dispersive VN. SSPs can be configured by the Dispersive VN administrator using DART to define the number of paths over which traffic disperses, the length of time between path rolling, and other parameters customizable by the customer.

Dispersive VN in Action: Two Examples

Scenario One: A Remote Worker Securely Accesses a Corporate Network via Dispersive VN

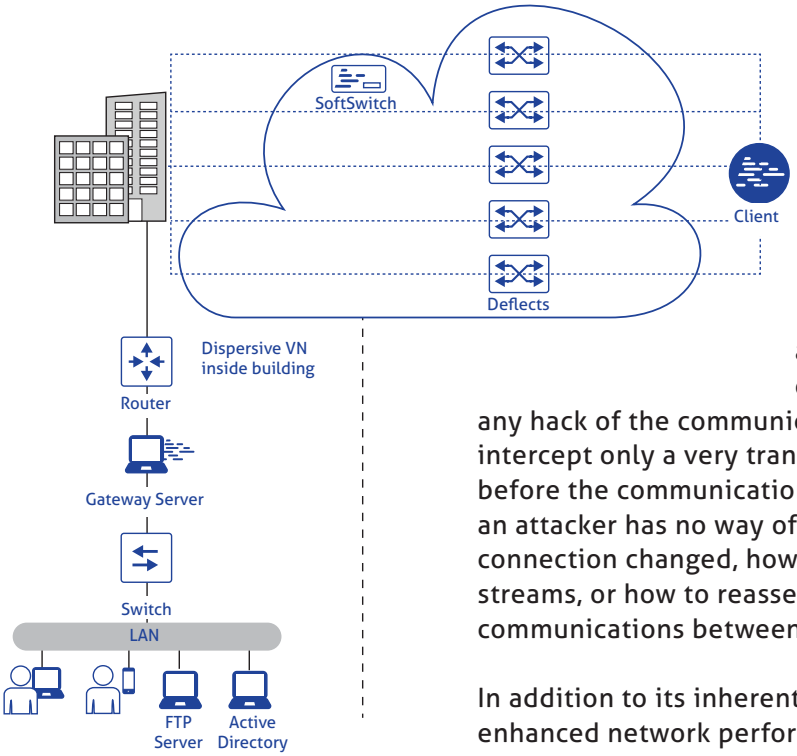

Figure 2

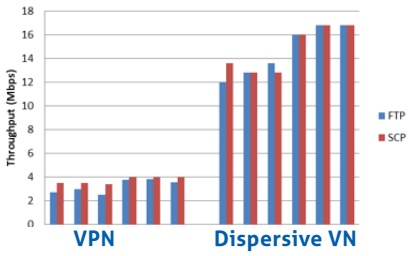

Figure 3

As depicted in Figure 2, Dispersive VNs divide and disperse packet data across multiple, independent paths. This approach provides enhanced data protection for remote workers accessing corporate networks: the rolling of data paths is constantly changing based on multiple dimensions that include time, number of paths, destination IP address and port (among others). The reassembly algorithm and path decryption key are known only to the receiving Client. These factors combine to yield an exponentially complex and ever-changing range of highly secure connections over which data can flow. Thus, any hack of the communications between the two locations would intercept only a very transient, small fraction of the total transmission before the communications stream would roll and "disappear." Since an attacker has no way of determining which dimension of the connection changed, how to intercept other portions of the packet streams, or how to reassemble and decrypt that which was intercepted, communications between the two locations remain secure.

In addition to its inherent security advantages, a Dispersive VN also has enhanced network performance. Regardless of the native transmission protocol an application applies to the packets (e.g., TCP, HTTP, or FTP), a sending Client converts packet data into parallel TCP and/or UDP channels before releasing it to the Dispersive VN. By leveraging the speed advantages of independent transmission paths, Dispersive VN's multi-route delivery capabilities create a synergy that results in data transmission speeds that are 2 to 5 times faster than VPN. This increase is not dependent on compression, but rather is due to the constant refresh of connections based on transmission speed.

The performance improvements, consistency and predictability of Dispersive VNs translate into higher levels of Quality of Service (QoS). A Client receiving data conducts end-to-end measurement of QoS for each of the independent routes over which it is receiving data. In the event a problem emerges along any route, the receiving Client immediately signals the sending Client to resend missing packets via an alternate route. This real-time, on-the-fly, adaptive traffic flow control

introduces a new level of fault tolerance for networks, giving them the ability to self-optimize and self-heal. This results in a better QoS, automatic, continuously and dynamically optimized route utilization, enhanced reliability, and less potential for down time.

Scenario Two: Using Dispersive VNs for Communications between Two Corporate Locations

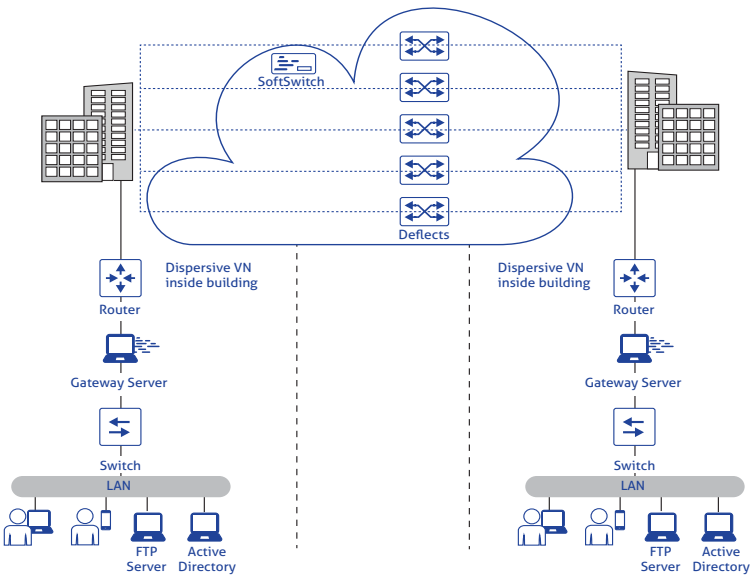

Figure 4

Figure 4 depicts a Dispersive VN that supports communications between two corporate locations such as headquarters and a field office, a Network Operations Center (NOC)-to-NOC, or other situations with physically or logically separated LANs. As shown in Figure 3, devices behind a Dispersive Gateway Server are not required to run the Dispersive Client. Instead, they communicate over standard LAN connections to the Dispersive Gateway Server, which controls data transmission over the public Internet between the two sites.

The Site-to-Site Dispersive VN is configured and supported using DART. Benefits of faster speed, better security and improved network reliability are extended to all users of the corporate WAN.

Conclusion

Dispersive Technologies' on-premise and cloud-based solutions make the public Internet fast, secure and reliable. These offerings run on off-the-shelf hardware, leverage readily available, low-cost broadband Internet connections (over any fixed, wireless or satellite network), and are inherently compatible with all major operating systems and end-user applications. This approach, which is particularly important in Bring Your Own Device and multi-platform environments, allows companies to utilize the public Internet and cloud computing to reduce costs, streamline and secure operations, and perform more efficiently.

Appendix A: Requirements for Dispersive Virtualized Networks

Minimum Hardware Requirements	
Client (Computer)	• Processor: Intel I3 (Dual Core) or equivalent • Memory: 4GB • HDD: 2MB available • Network Interface Card (Recommended: Max Link Speed)
Client (Android)	• Processor: Dual Core • Memory: 1GB • SD Card: 2MB available • Network Interface: 3G/WiFi
Client (Apple iOS)	• Application specific
Deflect	• Processor: Intel I3 (Dual Core) or equivalent • Memory: 2GB • HDD: 2MB available • Network Interface Card (Recommended: Max Link Speed)
Gateway Server	• Processor: Intel I3 (Dual Core) or equivalent • Memory: 4GB • HDD: 2MB available • Network Interface Card (Recommended: Max Link Speed)
Interface Server	• Processor: Intel I3 (Dual Core) or equivalent • Memory: 4GB • HDD: 2MB available • Network Interface Card (Recommended: Max Link Speed)
SoftSwitch	• Processor: Intel I3 (Dual Core) or equivalent • Memory: 2GB • HDD: 1GB available • Network Interface Card (Recommended: Max Link Speed)

Compatible Operating Systems

Linux/Unix

OS Name	32 bit	64 bit	Client	Deflect	Gateway Server	Interface Server	Soft-Switch
CentOS (5.7 /5.8/5.9/6.2/ 6.3/6.4/6.5*)	•	•	•	•	•	•	•
Ubuntu 10.04 LTS/12.04 LTS* /12.10/13.04/13.10	•	•	•	•	•	•	•
Fedora (16/17/18)	•	•	•	•	•	•	•
Back Track 5 R3	•	•	•	•	•	•	•
Linux Mint 15	•	•	•				

Microsoft Windows

Windows XP	•			•			
Windows 7*	•	•	•	•			
Windows 8		•	•				
Windows Server 2003	•		•	•			
Windows Server 2008*	•	•	•	•			
Windows Server 2012		•	•				

Apple OS X

10.8 (Mountain Lion)*		•	•	•			

Apple iOS: All support for Apple iOS is application specific; custom integration is required.

Android: All support for Apple iOS is device specific.

Samsung Galaxy SIII*	Android 2.x (GB)
Samsung Galaxy Note	Android 3.x (HC)
Samsung Galaxy Tab 2	Android 4.0 (ICS)
Motorola Xoom	Android 4.1/2 (JB)

* Recommended

Glossary

BYOD	The acronym for "Bring Your Own Device," a system management policy decision to allow end-users to access corporate networks using personally-owned computing devices.
Client	Software which allows an edge device to send and receive data on the Dispersive VN.
DART	The acroynm for "Dispersive Administrative Remote Terminal," the browser-based user interface tool which is installed on the Dispersive VN Softswitch and used to administer a Dispersive Virtualized Network.
Deflect	The software which relays traffic between Dispersive VN Clients along the independent pathways in a Dispersive VN.
Dispersive Virtualized Network	A network that utilizes Dispersive software components to split and disperse packet data across multiple, independent paths before reassembling the data at the receiving Client.
Dispersive VN	The acronym for "Dispersive Virtualized Network." See definition above.
Gateway Server	Software which allows an edge server to handle communications for multiple devices at a physical location so they can send and receive data via a Dispersive VN.
Interface Server	Software which allows Dispersive VN Clients to use services on hosts outside a Dispersive VN.
MPLS	The acronym for "Multiprotocol Label Switching." See definition below.
Multiprotocol Label Switching	A technology which uses labels to direct and forward packets in communications networks.
SoftSwitch	Server-based network management software that hosts the trusted peer database, stores communications protocols and route information, authenticates all network components and their allowed services/ service levels, and tracks mobile devices.
Spread Spectrum Protocol™	The communications protocol used by Dispersive VNs to define the set(s) of independent routes and the properties of those routes.
SSP	The acronymn for "Spread Spectrum Protcol." See definition above.
VPN	The acronym for "Virtual Private Network," a computer networking technology that establishes and supports secure connections between private networks and/or remote clients using public network infrastructures.

The Solution is Dispersive

Different Drivers. Different Industries.
One Need: Mission-Critical Communications.

"Dispersive Virtualized Networks transform the way organizations use the Internet. By operating at the bottom of the network stack, Dispersive Virtualized Networks control packet traffic at the most efficient point on the host. This provides signficant advantages for all users of our solutions."

— Robert W. Twitchell, Jr., CEO and Founder, Dispersive Technologies

Find out more: www.dispersivegroup.com

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