GLOBAL ENTERPRISE WAN VIRTUALIZATION STRATEGIES

SD-WAN Sets the Stage for Broader Adoption of Virtual Network Services

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Executive Summary

Top Tech Priorities
Enterprises ramped up their digital transformation efforts during COVID-19. The need to do more with less resources pushed businesses to further rely on technologies that directly impact business productivity.

| Hybrid and multi-cloud services | Network and application security | Big data analytics |

Adoption
North America leads the SD-WAN market adoption curve. Europe and LATAM regions hold significant potential in the next few years.

14% North American respondents have deployed an SD-WAN Solution, and another 15% stating they are expanding to more locations.

30% Respondents from Europe and LATAM indicated they will deploy SD-WAN in the next 24 months.

Primary Benefit
When it comes to buying preferences, global businesses continue to prefer a fully managed SD-WAN delivered by a managed service provider.

The ability to optimize IT personnel due to centralized policy administration and management is the #1 benefit from SD-WAN.

NFV is Gaining Traction
While businesses continue to expand SD-WAN to additional locations, virtual network services are gaining traction as the ability to deploy multiple VNFs on a single appliance dramatically simplifies deployment and management efforts for the enterprise IT teams. SD-WAN, WAN optimization and Firewall VNFs are of priority for businesses when deploying uCPE.

uCPE deployment has resulted in up to 50% reduction in hardware expenditure and more than 50% reduction in IT and network personnel time.
About the Survey

To understand global enterprise perceptions and activities regarding enterprise WAN virtualization, Frost & Sullivan, on behalf of Lumen, conducted an end-user survey in April 2021. The net result is a set of data, and conclusions drawn from that data, which provides directional insight regarding the SD-WAN and NFV market trends and its impact on enterprise WAN architectures globally. Web based survey administered to IT decision makers.

**Regions**
- 350 United States Respondents
- 194 Europe Respondents (evenly split among Germany, France, and UK)
- 153 LATAM Respondents (evenly split among Argentina, Brazil and Mexico)

**Industries Represented**
- Financial Services
- Healthcare
- Manufacturing
- Government and Technology
- Retail

**Respondents Role in Purchase Decisions**
- On my own: 74%
- Input from staff/management: 29%
- Part of a group or committee: 16%

**Respondents Job Title**
- Director of Network / IT / Infrastructure / Security Operations: 25%
- Manager of Network / IT / Infrastructure / Security Operations: 23%
- CIO / CTO / CISO (Chief Information Security Officer) / CRO (Chief Risk Officer): 18%
- Chairman / President / CEO / Managing Director: 16%
- Vice President / Senior Manager of Network / IT / Infrastructure / Security Operations: 10%
- Network / IT Engineer / Administrator: 5%

**Companies Represented**
- 650 Companies Represented
- 153 United States Respondents
- 194 Europe Respondents (evenly split among Germany, France, and UK)
- 153 LATAM Respondents (evenly split among Argentina, Brazil and Mexico)
Digital Transformation continues to be top-of-mind for business IT decision makers. In our survey, we asked respondents to rank the key business drivers influencing their DT initiatives.

Considering the impact COVID-19 pandemic continues to have on businesses, “optimize IT resources” being ranked the #1 driver seems apt, followed by “improve business productivity” and “increase operational efficiency.”

Clearly the pandemic tested the limits of most organizations globally, and forced them to rethink their digital strategy. It is clear that investment in technology is more critical now than ever as it is key to ensure continuity of operations.

<table>
<thead>
<tr>
<th>Driver</th>
<th>North America</th>
<th>Europe</th>
<th>LATAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimize IT resources</td>
<td>44%</td>
<td>48%</td>
<td>59%</td>
</tr>
<tr>
<td>Improve business productivity</td>
<td>43%</td>
<td>43%</td>
<td>39%</td>
</tr>
<tr>
<td>Increased operational efficiency</td>
<td>40%</td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>Improve customer experience</td>
<td>41%</td>
<td>37%</td>
<td>38%</td>
</tr>
<tr>
<td>Better support remote working</td>
<td>36%</td>
<td>41%</td>
<td>33%</td>
</tr>
<tr>
<td>Faster time-to-market for products and services</td>
<td>35%</td>
<td>23%</td>
<td>29%</td>
</tr>
</tbody>
</table>

**Question:** Rate the key business drivers influencing your company’s digital transformation initiatives. Use a scale of 1-5 where 5 means extremely important and 1 means not at all important. Chart shows respondent % for “important” and “slightly important”
Hybrid Cloud/Multi-cloud Services is the Top Priority for Organizations in the Next 24 Months

Interestingly, Big Data & Analytics, and Virtual Network Services have moved up in terms of priority since we last surveyed in 2018. With the volume of internal and external data being collected and processed by organizations, it is no surprise that BDA is important to derive insights that directly help businesses achieve their DT goals.

SD-WAN technology has set the stage for WAN virtualization with global organizations realizing the value of software defined networking. Businesses are now ready to virtualize more WAN functions and are turning to virtual network services.

Question: Please rank the following technology trends in order of priority for your organization in the next 24 months.
SD-WAN Adoption Trends

- **We will deploy SD-WAN in the next 24 months**: 21% (North America), 32% (Europe), 34% (LATAM)
- **We are expanding SD-WAN to more locations**: 15% (North America), 11% (Europe), 13% (LATAM)
- **We have deployed a SD-WAN solution**: 14% (North America), 10% (Europe), 5% (LATAM)
- **We currently have our second SD-WAN deployment underway**: 13% (North America), 6% (Europe), 6% (LATAM)
- **We currently have our first SD-WAN deployment underway**: 13% (North America), 14% (Europe), 15% (LATAM)

Europe and LATAM regions hold significant potential for growth.

North America leads the SD-WAN market adoption curve with 14% of the respondents stating they have deployed an SD-WAN solution, and another 15% stating they are expanding to more locations.

The North American market is ahead in terms of deployment. As SD-WAN vendor solutions have evolved since 2014, several organizations are upgrading to generation 2.0 SD-WAN solutions.

Manufacturing (14%) and Technology (12%) verticals are top adopters of SD-WAN across all three regions.

Retail was an early adopter of SD-WAN. 21% of the respondents from retail vertical indicate they are expanding SD-WAN to more locations.

Retail (33%), Financial Services (32%) and Government (31%) verticals hold immense potential in the next 24 months as respondents indicate their plans to deploy SD-WAN in the next 2 years.

**Base:** Respondents who deployed an SD-WAN solution (n=216)

**Question:** Which of the following choices best reflects your organization’s SD-WAN deployment?
## Operational SD-WAN Sites at Branch and Remote/Home Office Locations

**OPERATIONAL SD-WAN BRANCH LOCATIONS**

<table>
<thead>
<tr>
<th>Number of Sites</th>
<th>North America</th>
<th>Europe</th>
<th>LATAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–49</td>
<td>54%</td>
<td>49%</td>
<td>49%</td>
</tr>
<tr>
<td>50–99</td>
<td>25%</td>
<td>24%</td>
<td>22%</td>
</tr>
<tr>
<td>100–249</td>
<td>19%</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>250–499</td>
<td>6%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>500 or more</td>
<td>5%</td>
<td>6%</td>
<td>5%</td>
</tr>
</tbody>
</table>

**OPERATIONAL SD-WAN SITES AT REMOTE/HOME OFFICE LOCATIONS**

<table>
<thead>
<tr>
<th>Number of Sites</th>
<th>North America</th>
<th>Europe</th>
<th>LATAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–49</td>
<td>52%</td>
<td>49%</td>
<td>49%</td>
</tr>
<tr>
<td>50–99</td>
<td>23%</td>
<td>22%</td>
<td>18%</td>
</tr>
<tr>
<td>100–249</td>
<td>14%</td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td>250–499</td>
<td>12%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>500 or more</td>
<td>8%</td>
<td>14%</td>
<td>12%</td>
</tr>
</tbody>
</table>

**Base:** Respondents who deployed an SD-WAN solution (n=216)

**Question:** What is the approximate number of operational SD-WAN sites (branch and remote users) that your organization has in use?

While global organizations embraced and extended SD-WAN solution to remote/home office locations, NA leads in terms of number of sites the technology is operational today—100 to 249 sites. As US businesses transitioned to remote working due to COVID-19, some verticals embraced SD-WAN for home faster than others. Healthcare, Technology and Contact Centers, for example.
CHAPTER 2: SD-WAN ADOPTION TRENDS

Perceived Benefits of SD-WAN

- We are able to optimize IT personnel due to centralized policy administration and network management
  - North America: 57%, Europe: 42%, LATAM: 68%

- We have seen improvement in application performance (based on metrics such as availability, response times, user experience)
  - North America: 54%, Europe: 50%, LATAM: 54%

- We are able to better embrace a cloud-first strategy
  - North America: 52%, Europe: 40%, LATAM: 54%

- We are able to optimize and securely connect remote employees to cloud-based applications
  - North America: 47%, Europe: 48%, LATAM: 62%

- We are able to plan security better due to a more granular policy administration
  - North America: 46%, Europe: 46%, LATAM: 59%

- We have seen a reduction in WAN expenditure
  - North America: 29%, Europe: 19%, LATAM: 32%

Base: Respondents who deployed an SD-WAN solution (n=216)
Question: Which of the following statements apply to the benefits your organization has achieved from the SD-WAN deployment?
Perceived Benefits of SD-WAN (Continued)

**VOICE AND UCaaS APPLICATION PERFORMANCE IMPROVEMENT**

39% of the respondents across regions state they have seen 25–50% improvement

**IMPROVEMENT IN PERFORMANCE FOR CLOUD APPLICATIONS**

48% of the respondents across regions state they have seen 25–50% improvement

**Respondents saying they have seen 10–25% WAN expenditure reduction**

- North America: 43%
- Europe: 60%
- LATAM: 42%

**Respondents saying they have seen 25–50% WAN expenditure reduction**

- North America: 35%
- Europe: 10%
- LATAM: 58%

_Base_: Respondents who deployed an SD-WAN solution (n=216)

**Question**: Which of the following statements apply to the benefits your organization has achieved from the SD-WAN deployment?
Challenges Faced While Deploying SD-WAN

**Question:** What do you see as the number one challenge your organization has encountered while deploying SD-WAN?

**Answer:** Rationalizing network and security across branch sites (30%)

**Question:** ... and what do you see as the number two challenge your organization has encountered while deploying SD-WAN?

**Answer:** Ensuring interoperability with existing WAN (27%)

**Question:** ... and finally, what do you see as the number three challenge your organization has encountered while deploying SD-WAN?

**Answer:** Deployment times took longer than we expected (26%)

**Base:** Respondents who deployed an SD-WAN solution (n=216)
### Network Services Choice with SD-WAN

#### NORTH AMERICA
1. DIA + Wireless
2. Ethernet + Wireless
3. MPLS + Wireless
4. Dual MPLS
5. Dual Broadband

#### EUROPE
1. Ethernet + Broadband
2. DIA + Wireless
3. Ethernet + Wireless
4. Dual Broadband
5. Dual Wireless

#### LATIN AMERICA
1. DIA + Wireless
2. Ethernet + Wireless
3. MPLS + Broadband
4. Ethernet + Broadband
5. Dual Broadband links

**Base:** Respondents who deployed an SD-WAN solution (n=216)

**Question:** Which of the following network service choices reflects your organization’s current SD-WAN deployment?
# Benefits Organizations Expect from SD-WAN

<table>
<thead>
<tr>
<th>Benefit</th>
<th>NORTH AMERICA (%)</th>
<th>EUROPE (%)</th>
<th>LATAM (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve application performance</td>
<td>47</td>
<td>44</td>
<td>53</td>
</tr>
<tr>
<td>Better support bandwidth intensive applications</td>
<td>42</td>
<td>40</td>
<td>49</td>
</tr>
<tr>
<td>Faster deployment of branch sites</td>
<td>39</td>
<td>40</td>
<td>53</td>
</tr>
<tr>
<td>Support optimized and security connectivity to remote workers</td>
<td>35</td>
<td>33</td>
<td>43</td>
</tr>
<tr>
<td>Better embrace our cloud-first strategy</td>
<td>35</td>
<td>31</td>
<td>43</td>
</tr>
</tbody>
</table>

**Base:** Respondents for whom SD-WAN deployment in process or planned (n=267)

**Question:** Which benefits does your organization expect to achieve from the SD-WAN deployment?
Question: SD-WAN Customer Premises Equipment (SD-WAN CPE) comes with integrated routing and security functionalities, and can enable businesses to replace dedicated, hardware-based branch routers and firewalls. Please indicate to what extent each of the following statements reflects your organization’s perspective on router strategy in current and planned SD-WAN deployments.
**Chapter 3: Impact of SD-WAN on WAN Network Functions**

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**SD-WAN CPE Replacing Branch Firewalls**

<table>
<thead>
<tr>
<th>Replacement Status</th>
<th>North America</th>
<th>Europe</th>
<th>LATAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacements planned in more than 50% of our sites</td>
<td>14%</td>
<td>12%</td>
<td>16%</td>
</tr>
<tr>
<td>Replacements planned in up to 50% of our sites</td>
<td>24%</td>
<td>19%</td>
<td>25%</td>
</tr>
<tr>
<td>Replacements done in more than 50% of our sites</td>
<td>28%</td>
<td>26%</td>
<td>25%</td>
</tr>
<tr>
<td>Replacements done in up to 50% of our sites</td>
<td>24%</td>
<td>26%</td>
<td>24%</td>
</tr>
</tbody>
</table>

**Impact from Replacing Traditional Firewalls with SD-WAN CPE with Integrated Security**

- **Impact on hardware expenditure**:
  - A reduction of more than 50%: 57%
  - A reduction of up to 50%: 34%
  - A reduction of more than 50%: 43%

- **Impact on data breaches**:
  - A reduction of more than 50%: 49%
  - A reduction of up to 50%: 41%

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**Base:** All respondents (n=652)

**Question:** SD-WAN Customer Premises Equipment (SD-WAN CPE) comes with integrated routing and security functionalities, and can enable businesses to replace dedicated, hardware-based branch routers and firewalls. Please indicate to what extent each of the following statements reflects your organization’s perspective on router strategy in current and planned SD-WAN deployments.
**Perspective on Current and Planned uCPE Deployments**

<table>
<thead>
<tr>
<th>Deployment Scenario</th>
<th>North America</th>
<th>Europe</th>
<th>LATAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment in up to 50% of our branch locations</td>
<td>29%</td>
<td>28%</td>
<td>26%</td>
</tr>
<tr>
<td>Deployment in more than 50% of our branch locations</td>
<td>28%</td>
<td>28%</td>
<td>16%</td>
</tr>
<tr>
<td>Deployment planned in up to 50% of our branch locations</td>
<td>20%</td>
<td>19%</td>
<td>29%</td>
</tr>
<tr>
<td>within the next 24 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deployment of uCPE planned in more than 50% of our</td>
<td>13%</td>
<td>9%</td>
<td>13%</td>
</tr>
<tr>
<td>branch locations within the next 24 months</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXPECTED IMPACT FROM uCPE DEPLOYMENT**

- **Impact on hardware expenditure**
  - A reduction of more than 50%: 54%
  - A reduction of up to 50%: 34%
  - A reduction of more than 50%: 44%

- **Impact on network and IT personnel time**
  - A reduction of more than 50%: 48%

**Question:** Virtual Network Services based on network function virtualization offers enterprises the choice to mix and match, and deploy VNFs on an uCPE. Please indicate to what extent each of the following statements reflects your organization’s perspective on your current and planned uCPE deployments.
VNFs of Priority on uCPE

**Question:** Which of the following VNFs are of priority to you in your current and planned uCPE deployments?

**Base:** Respondents who have done or planned deployment of uCPE (n=568)

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**SD-WAN**
- North America: 69%
- Europe: 56%
- LATAM: 57%

**WAN optimization**
- North America: 61%
- Europe: 48%
- LATAM: 55%

**Firewall**
- North America: 53%
- Europe: 53%
- LATAM: 60%

**Routing**
- North America: 45%
- Europe: 23%
- LATAM: 32%

**Virtual OS (CentOS)**
- North America: 32%
- Europe: 22%
- LATAM: 38%

**Session border controller**
- North America: 25%
- Europe: 16%
- LATAM: 32%
SD-WAN Buying Preferences

- Fully managed: 64% (North America), 56% (Europe), 56% (LATAM)
- Co-managed: 16% (North America), 31% (Europe), 30% (LATAM)
- Do-it-yourself: 20% (North America), 11% (Europe), 11% (LATAM)

**Base:** All respondents (n=652)

**Question:** What is your organization’s preference in buying and managing an SD-WAN solution?
Why Managed SD-WAN?

**NORTH AMERICA**
- Gives us the flexibility to buy and pay for the service in a subscription-based billing
- Simplified vendor management, unified billing and portal capabilities as the managed SD-WAN provider acts as the single point
- Unified management of all my network services—access, data, voice, security

**LATAM**
- Service Providers can troubleshoot and restore services quicker than our internal team
- Managed service provider provides a SLA for the SD-WAN service
- Gives us the flexibility to buy and pay for the service in a subscription-based billing

**EUROPE**
- Unified management of all my network services—access, data, voice, security
- Service providers have already vetted the providers making the decision process shorter
- Managed service provider provides a SLA for the SD-WAN service
CHAPTER 5: SD-WAN BUYING PREFERENCES

Expected Value of Working with a Managed Service Provider

**Base:** Respondents who are working with a managed service provider (n=371)

**Question:** Which value do you expect from working with a managed service provider?

### Time savings
- **North America:** 48%
- **Europe:** 34%
- **LATAM:** 36%

### TCO for WAN
- **North America:** 49%
- **Europe:** 55%
- **LATAM:** 47%

- A reduction of up to 50%
- A reduction of more than 50%
Preferred Partner to Deploy Managed SD-WAN

**Base:** All respondents (n=652)

**Question:** If you had a choice, which type of partner would you prefer to deploy managed SD-WAN in your organization?

**North America**
- 8% VALUE ADDED RESELLER
- 11% SYSTEM INTEGRATOR
- 28% NETWORK SERVICE PROVIDER
- 38% MANAGED SERVICE PROVIDER

**Europe**
- 11% NETWORK SERVICE PROVIDER
- 15% MANAGED SERVICE PROVIDER
- 37% NETWORK SERVICE PROVIDER

**LATAM**
- 9% VALUE ADDED RESELLER
- 25% SYSTEM INTEGRATOR
- 13% NETWORK SERVICE PROVIDER
- 26% MANAGED SERVICE PROVIDER
About Lumen
Lumen is guided by our belief that humanity is at its best when technology advances the way we live and work. With approximately 450,000 route fiber miles and serving customers in more than 60 countries, we deliver the fastest, most secure platform for applications and data to help businesses, government and communities deliver amazing experiences.
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Learn more about Lumen SD-WAN solutions

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