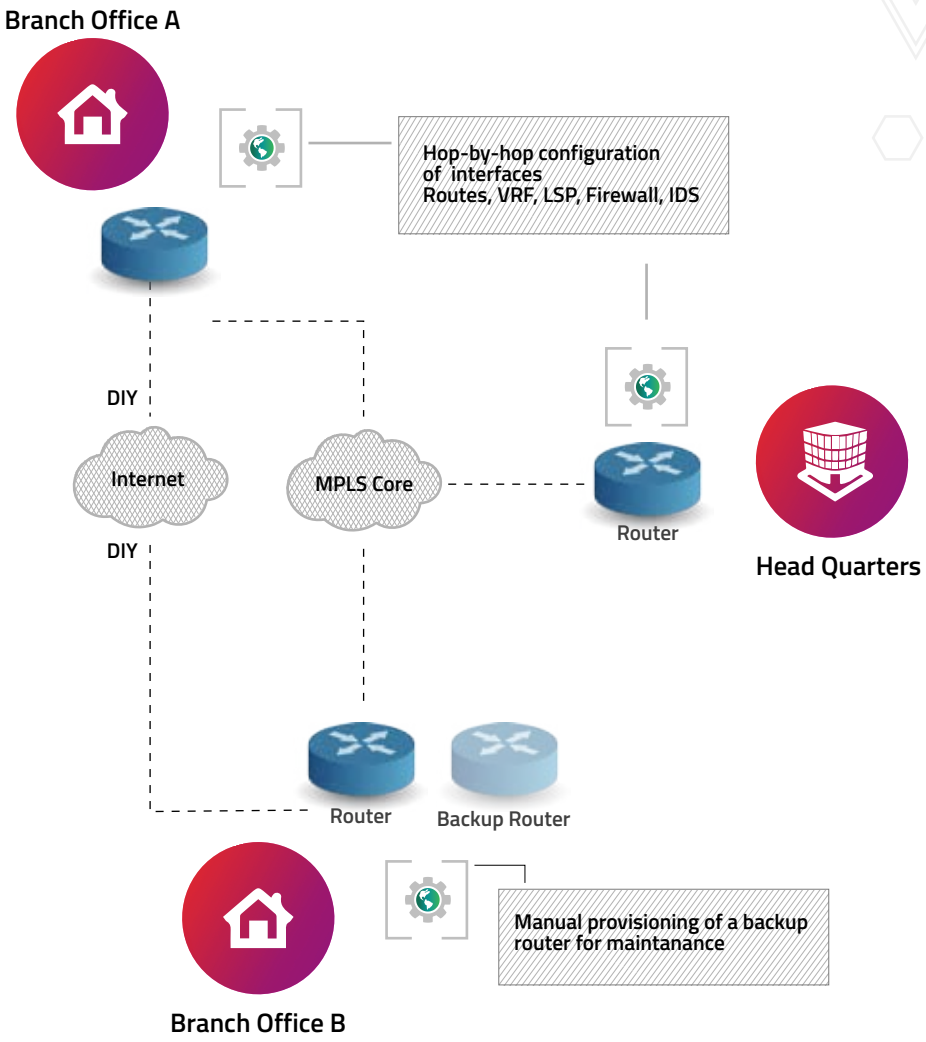
## Historical WAN deployments

Historically WAN deployment were carried out following a uniform static policy based on the type of connections:

- Connections to a branch-offices/data-center: Dedicated connections to geographically distributed offices, email servers, ERP, CRM systems. In most of the cases this is a primary WAN connection using MPLS.
- External Connections: Dedicated Internet Access(DIA) as a fallback link for the MPLS link or for the transport of non-critical services.

Figure 1: Traditional Hybrid-WAN Architecture



**Here are the key characteristics of this approach creating a motivating business case for SD-WAN deployment.**

## Centralized Management:

As opposed to device specific provisioning and monitoring, the SD-WAN architecture has a Centralized Management having complete visibility of all the network nodes along with the services provisioned. Operational procedures like the addition of a new service chain (Firewall, IPS, SPAN, Tunnels) is simplified with a rich GUI interface of an SDN application developed over the controller.

Some of the common and complex operational procedures in a hybrid-WAN getting highly simplified and also bringing down WAN operational costs are:

- **Service Instantiation based on the type of outgoing WAN link. For e.g.**
  - **Firewall Instance for External-> Internal Traffic but not for MPLS traffic.**
  - **IPS only for Web traffic but not for MPLS traffic**
  - **Disabling DIA if firewall or IPS is down**

- **Centralized and remote configuration of VRFs, LSP in edge routers for configuring MPLS link**
- **Dynamic application of various policies via Open-Flow rules on traffic characteristics. For e.g.**
  - **Office365, Facebook, YouTube traffic via DIA**
  - **Datacenter, Lync traffic via MPLS link**

## Efficiency in Bandwidth Management:

Open-Flow protocols enable to gather statistics from all network nodes to determine the overall health of the WAN. A centralized controller would be able to get various traffic counters, flow counters which can be utilized to gather analytics for dynamic programming to optimize bandwidth costs and to apply different policies.

- **Determine the percentage of overall DIA or MPLS traffic** consumed by various applications. There could be an observed poor performance of a particular application, so the user can add rules to steer the corresponding traffic to the MPLS link.
- **Anomaly Detection: Configuring pre-defined action against**
  **-Abnormal Rx(Received) and Tx(Transmitted) Traffic counters over a given period against its defined threshold**
  **-Deviation of Source & Destination IP pair ranges for an interface or application.**
- **Dynamic Traffic Steering for capacity utilization: Depending upon bandwidth usage** the SD-WAN application can program to steer the traffic dynamically to alternate links or apply policies to enforce optimized use of the service. For e.g.
  **-Configuring a particular time of the day to reset the threshold of Facebook usage based on monthly usage reports. This action enables freeing of bandwidth for UC application during this period.**
  **-Freeing up MPLS bandwidth by moving Email, Lync to DIA in a branch office during a bulk transfer to/from data-center.**
- **Using Internet as a WAN by optimizing the use of DSL, Fiber, Wireless at the same time dynamically to reduce the reliability factor of an internet connection.**

## Challenges with SD-WAN

Our ongoing study of various equipment vendors show that there is no single vendor offering a complete SD-WAN solution in a branch or in the service provider network. The overall market is currently segmented in terms of the options available and key features like zero-touch provisioning is in its nascence.
Key motivating factors for the adoption a SD-WAN solution would be in terms of

- **Initial CAPEX**
- **Availability of on field performance test result of various services c) Accessibility to legacy network nodes and WAN interfaces E1/T1**
- **Unified orchestration capability with multiple controller platforms.**

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## Author

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Purnendu is responsible for developing solution and products around SDN & NFV technologies for global customers. He has been instrumental in leading the research and development along with developing different proof of concepts around this space for Happiest Minds. He has around 13+ years of experience and has extensively worked developing products/features/solutions around in GSM, 3G, LTE, Routing & Switching domains.

## About Happiest Minds Technologies

Happiest Minds, the Mindful IT Company, applies agile methodologies to enable digital transformation for enterprises and technology providers by delivering seamless customer experience, business efficiency and actionable insights. We leverage a spectrum of disruptive technologies such as: Big Data Analytics, AI & Cognitive Computing, Internet of Things, Cloud, Security, SDN-NFV, RPA, Blockchain, etc. Positioned as "Born Digital . Born Agile", our capabilities spans across product engineering, digital business solutions, infrastructure management and security services. We deliver these services across industry sectors such as retail, consumer packaged goods, edutech, e-commerce, banking, insurance, hi-tech, engineering R&D, manufacturing, automotive and travel/transportation/hospitality.

Headquartered in Bangalore, India; Happiest Minds has operations in USA, UK, The Netherlands, Australia and Middle East.

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