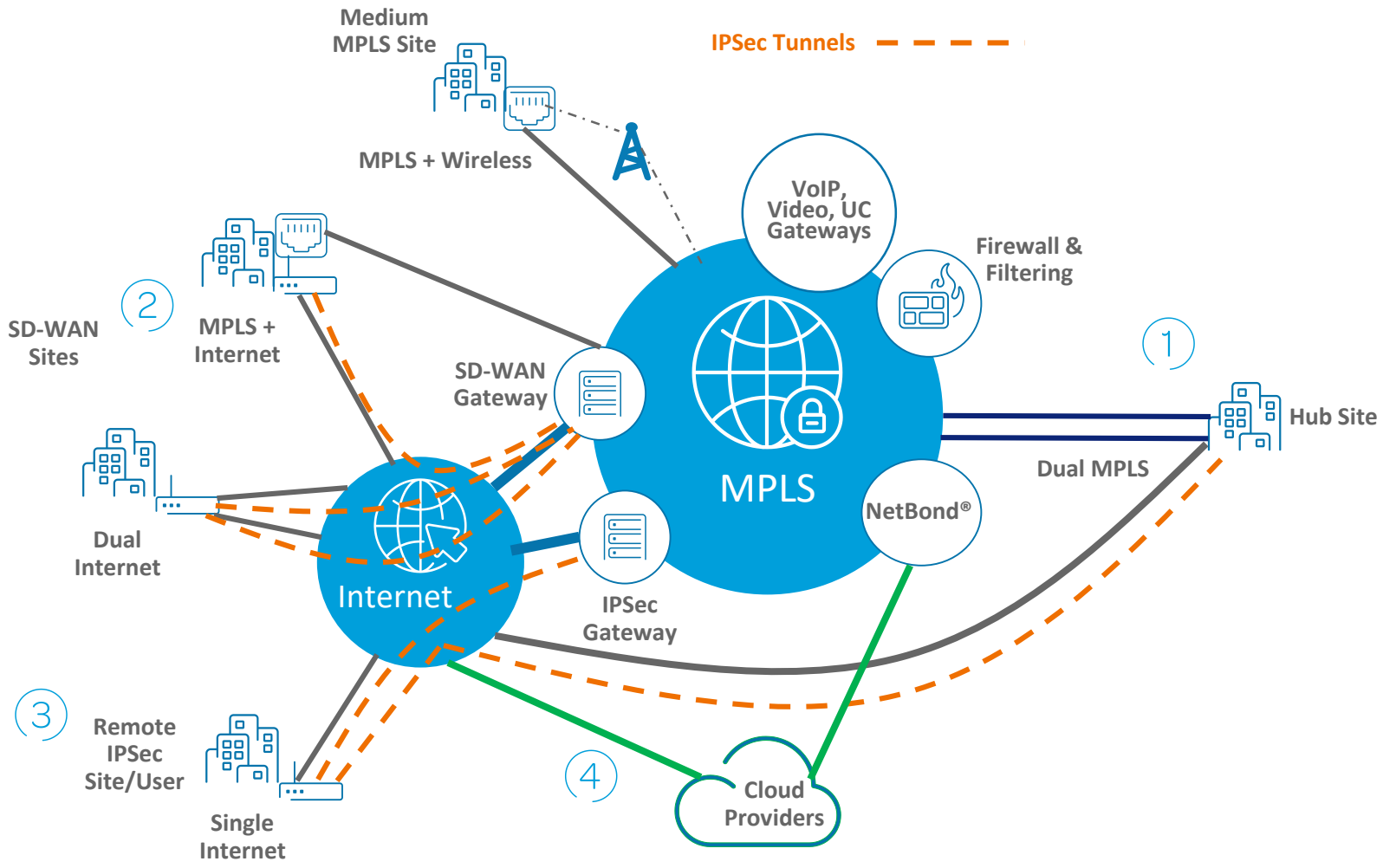
AT&T SD-WAN Solutions

January 19, 2018

Evolving VPN Configurations

All can live in One Network



1 Major Hub Site

Needs high bandwidth, Class of Service and SLAs to support critical applications and MPLS network.

2 SD-WAN Sites

Has some critical applications needing bandwidth and has some non-critical needs such as Internet access for employees.

3 Remote IPsec Site

Has basic connectivity need but no strict uptime or performance requirements.

4 Hybrid Access to cloud

Provide public and private (highly secure, SLA-supported performance) access to cloud providers

SD-WAN and its Benefits

SD-WAN Characteristics

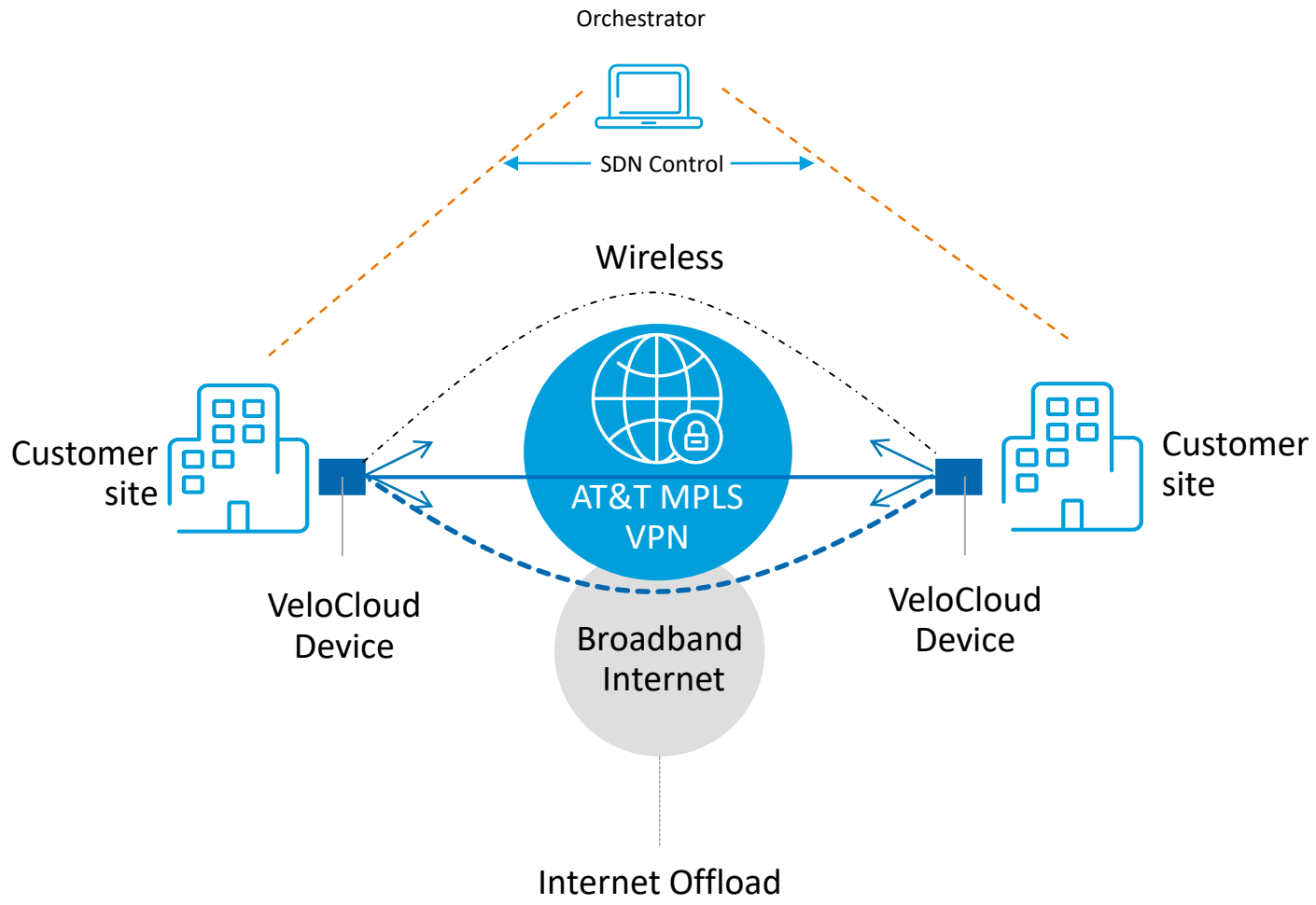
- Lightweight **replacement for WAN routers**
- **Access Agnostic** (support MPLS, Internet, LTE, etc.)
- Customer sets business and/or **application specific policies** for efficient and **dynamic load sharing** of traffic across **multiple WAN connections**
- A graphical user interface (GUI)-based management platform enables **network administrators to define application-specific business policies**, which the controller translates into routing policies enforced in the edge devices
- Can **offload Internet-destined traffic** closer to the edge of the network
- Shifts control intelligence from customer premises equipment (CPE) or edge devices into a **centralized software-based controller**

SD-WAN Benefits

- **Cost Savings**
  - Enables efficient use of less expensive Internet connections to replace or supplement MPLS connections
  - Ease of CPE deployment and central management and control of multiple edge devices reduces network management costs
- **Agility**
  - Transport routing changes can be made in virtually real-time
  - Policy changes can be rapidly made across multiple sites
- **Speed to Market**
  - CPE is a plug-and-play device that can be configured without oversight by on-site network personnel
  - New branch locations can deploy SD-WAN equipment, and start with readily available wireless LTE service, while waiting for a network service provider to provision wired services (Internet or MPLS)
- **Improved Application Performance**
  - Near real-time performance monitoring of the transport networks included in the SD WAN, to make application-aware, policy-based network selections
  - Near Real-time monitoring of traffic paths allows problems related to availability (sufficient bandwidth) and reliability (latency, jitter, and packet loss) to be sensed before they affect the users, and traffic is moved to a different path

Utilizing VeloCloud Device

- ✓ Deploy SD-WAN at all sites
- ✓ Application performance improvement via dynamic policy routing
- ✓ Provide resiliency at critical sites by spare CPE
- ✓ Most MPLS features supported and it can offer higher quality transport supported by SLAs



SD-WAN OTT Country List

AT&T SD-WAN Over-the-Top Country List			
CALA Region	**AP Region**	**EMEA Region**	**EMEA Region**
Argentina	Austraiia	Austria	Italy
Brazil	Hong Kong	Belgium	Latvia
Canada	India	Bulgaria	Lithuania
Chile	Japan	Croatia	Luxembourg
Colombia	South Korea	Republic of Cyprus	Netherlands
Costa Rica	Malaysia	Czech Republic	Norway
Dominican Republic	New Zealand	Denmark	Poland
Ecuador	Philippines (Via ATT Singapore)	Estonia	Portugal
Guatemala	Singapore	Finland	Romania
Mexico	Taiwan	France	Slovakia
Panama	Thailand	Germany	Slovenia
Venezuela		Greece	Spain
		Hungary	Sweden
		Ireland	Switzerland
			UK

Network Functions Virtualization

Traditional Network Appliance Approach

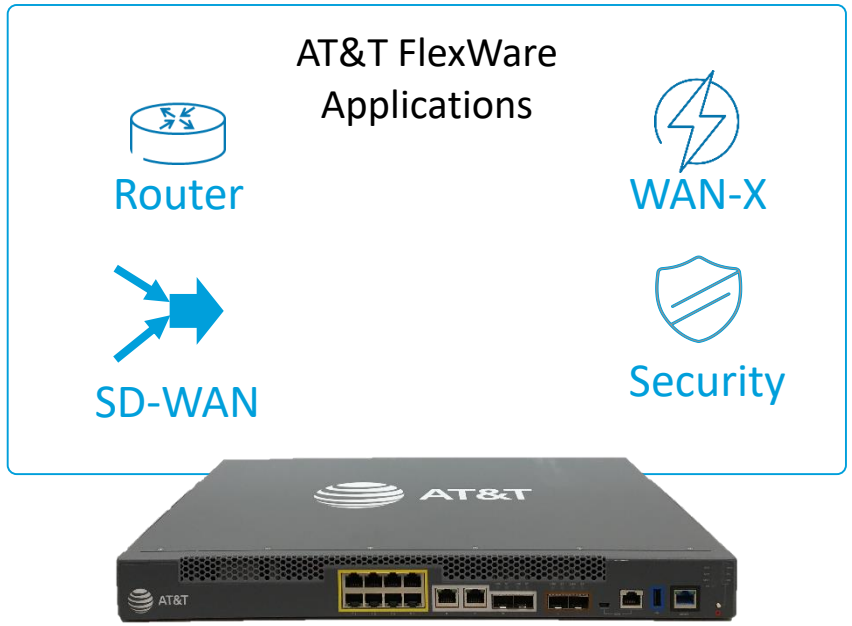
WLAN

WAN-X

Security

Router

Network Function Virtualization Approach



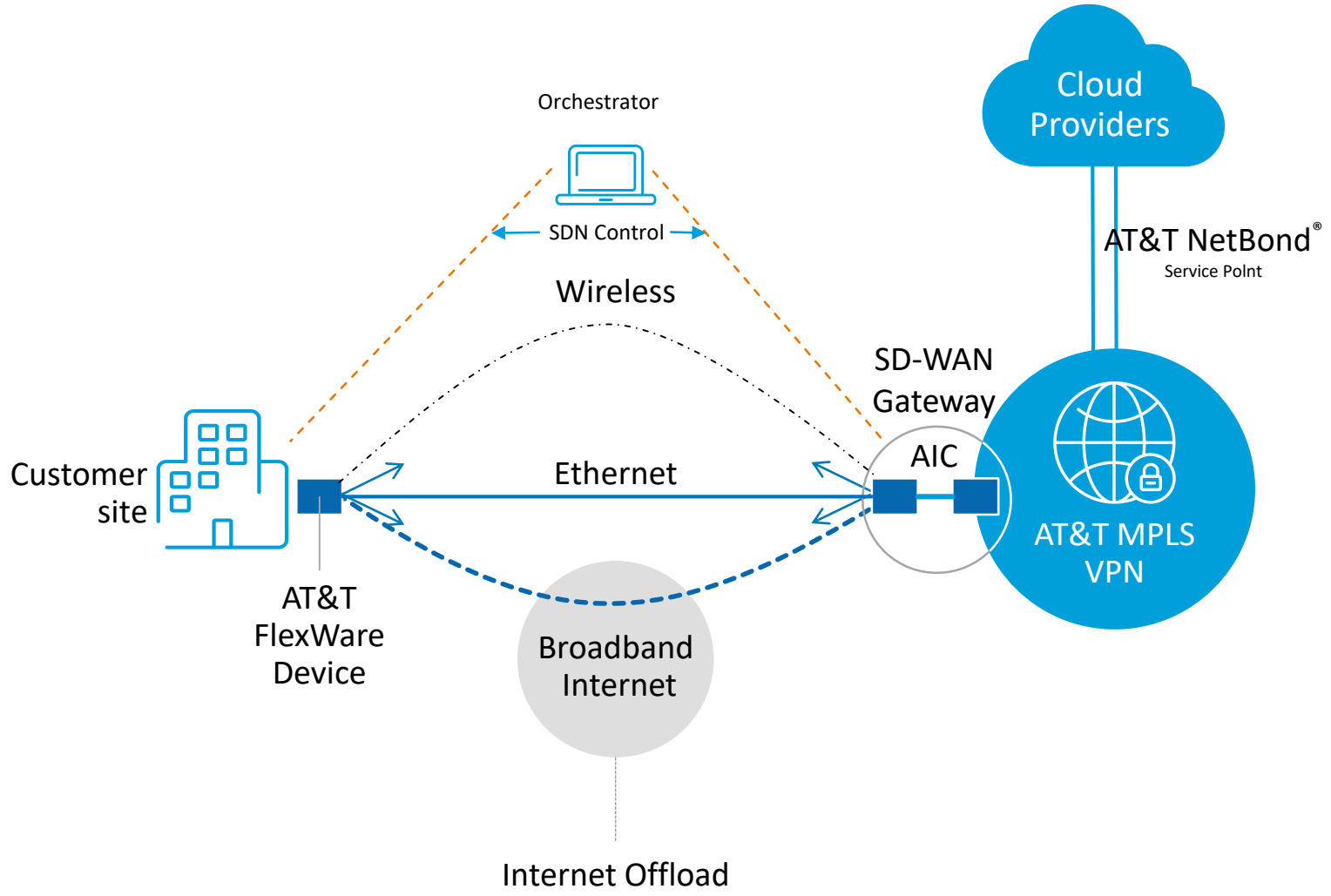
Standard x86 hardware platform

Multiple functions on a single device

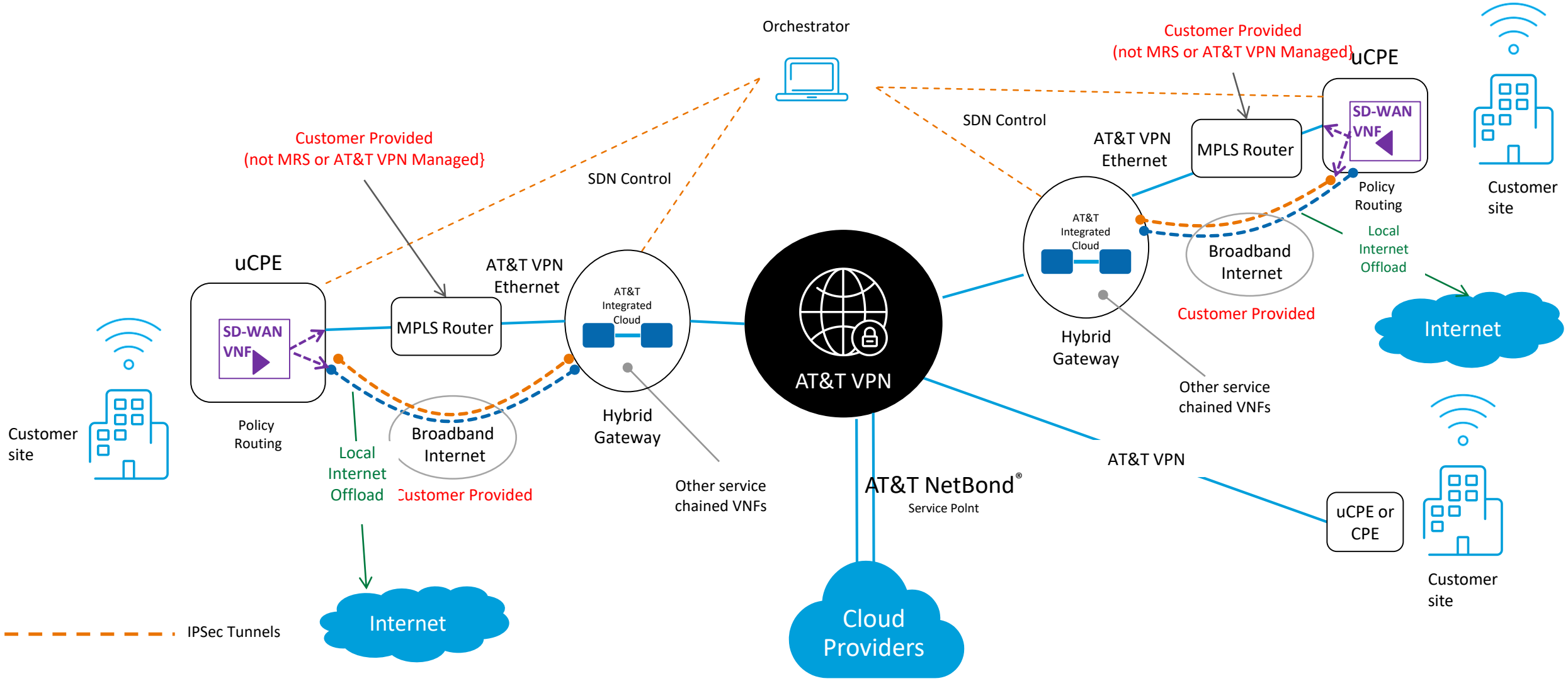
Less complexity, improved TCO

Utilizing AT&T FlexWare

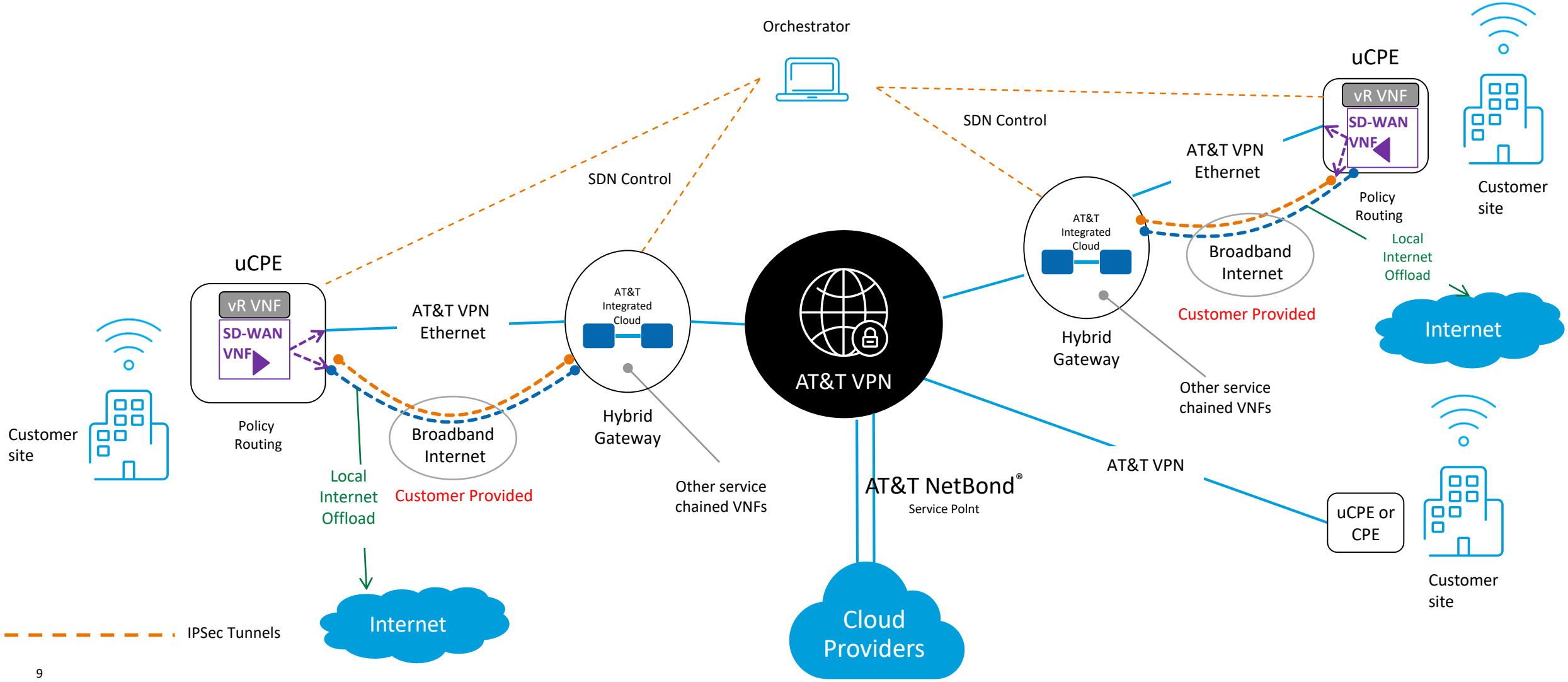
- ✓ Location-by-location flexibility. Don't have to deploy SD-WAN across the entire network, can be site by site choice.
- ✓ Easy introduction of SD-WAN in existing VPNs
- ✓ Application performance improvement via dynamic policy routing
- ✓ MPLS features such as Multicast and any-to-any routing can be supported (future capability)
- ✓ Inherent resiliency on SD-WAN gateways
- ✓ Highly secure access to cloud via AT&T NetBond®



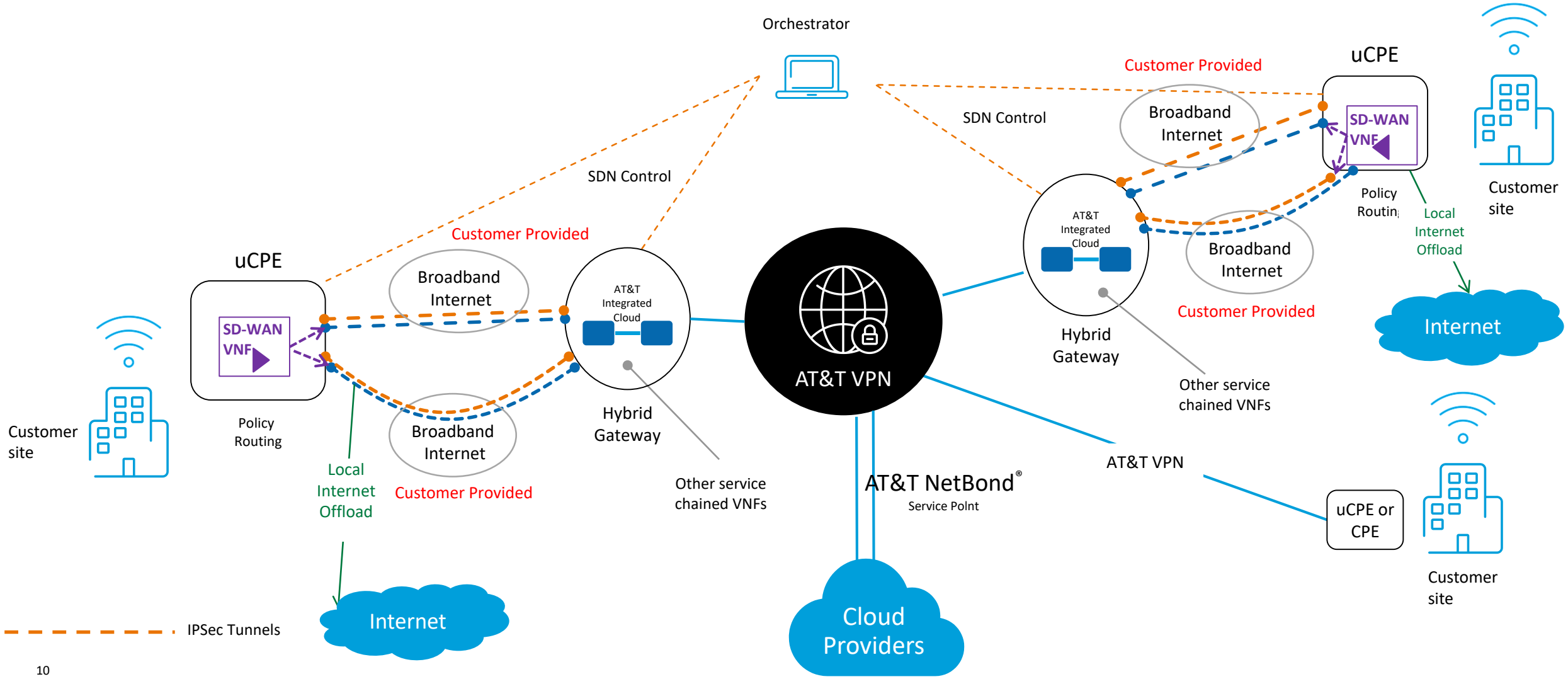
AT&T VPN + Internet With Customer Provided MPLS Router



AT&T VPN + Internet With Virtual Routing VNF



Dual Internet Connections



Pricing Construct

- ✓ Site specific, bandwidth sensitive pricing tiers for the AT&T SD-WAN Solution
- ✓ Customer selects desired SD-WAN throughput at a given site (based on available bandwidth from network links provisioned at that site)
- ✓ Internet offload data traffic not included in AT&T SD-WAN bandwidth (i.e., no charges for Internet offload traffic)
- ✓ Options for self-administered and AT&T-administered SD-WAN policies

AT&T SD-WAN Solution VNF Bandwidth Throughputs	
10M	500M
30M	1G
50M	2G
100M	3G
200M	5G
300M	10G

Future Throughputs