Section 1: Week 1: Software Defined Networks

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# Software Defined Networking

Traditional networks are built as ‘thick closed systems’ and are intended for deployments that are statically provisioned. The monolithic design of these Network Functions (NF) (e.g. routers, load balancers, protocols, etc.) limits innovation, as it is non-trivial to replace an individual component within the system (Lopez, Caraguary, Villalba, & Lopez, 2015). This introduces complexities for organizations as they move toward dynamic systems and agile methodologies.

To improve on these scenarios the notion of Virtual Network Functions (VNF) transitioned traditional network functions onto hypervisors. This allowed for dynamic provisioning and elastic scenarios. While these virtualized technologies addressed challenges related to deployment of network functions, these virtual functions are cloned after their physical monolithic predecessors (Jammal, Signh, Shami, Asal, & Li, 2014).

Modern software design decomposes monolithic systems into (1) reusable modules; (2) higher level abstractions; (3) and removes shared responsibility by decoupling components. Software Defined Networking (SDN) is an approach to bring these patterns and practices to NF and VNF topologies.

SDN exposes a clear separation of duty between (1) the forwarding plane; (2) the network state; and (3) the control plane (Eissa, Bozed, & Younis, 2019). This enables a network application (e.g. new multi-cast protocols or security filters) to be added at the appropriate level without rebuilding the entire stack. If new features require 100s of lines of code versus 100s of 1000s, then it (1) promotes innovation; (2) gives rise to the broad adoption of programable networking; and (3) improves efficiency through highly dynamic real time configurations.