Defining SDN for IETF Purposes

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A Perhaps Controversial View

- OF/SDN is a point in a larger design space
  - But not the only one

- The larger space includes
  - Control plane programmability
  - Overlays
  - ...

- Basically “CSNSE” Programmability
  - Compute, Storage, Network, Security and Energy
The Design Space
“SDN Continuum”

• Separation of Control and Data planes
  – And how much

• Centralized vs. Distributed Control
  – And how much

• Open/Standardized Interfaces
  – Data plane vs. Control plane vs. Mgmt. plane vs. ...

• Other Dimensions?

• Northbounds?

• Interaction with other “SDOs”
A Simplified View of the SDN Continuum

Service Layers

May be repeated (stacked or recursive)

Apps

Control and Orchestration
(overly simplified view)

Apps

Physical and Virtual Resources
(CSN)

FP/SDN
Properties:
-- Complete Separation of CP and FP
-- Centralized Control
-- Open Interface/programmable Forwarding Plane
-- Examples: OF, ForCES, various control platforms

CP/SDN
Properties:
-- “Peels off” control plane functionality
-- Examples: PCE, I2RS, BGP-LS, vendor SDKs

OL/SDN
Properties:
-- Retains existing (simplified) Control Planes
-- Programmable overlay control plane
-- Examples: NSX, ...

OL/SDN: Retains existing (simplified) Control Planes

CP/SDN: "Peels off" control plane functionality

FP/SDN: Complete Separation of CP and FP, Centralized Control, Open Interface/programmable Forwarding Plane

Examples:
OF, ForCES, various control platforms
BTW, How Does All of this Interact with the Internet Architecture?

Open Loop Control + s/w + Moore’s Law → Randomness, Uncertainty, and Volatility

- **OF/SDN?**
- **CP/SDN** makes existing control planes programmable
- **OL/SDN** is an application *from the perspective of the Internet’s waist*