CDNI Request Routing with SDN

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Motivation and Basic Idea

• SDN (software-defined networking)
  – One of the most promising technologies to provide centralized, programmable control planes for network service providers

• CDNI Request Routing with SDN
  – A new candidates protocol of “Request Routing Interface - Redirection” protocols
    • This draft discusses how SDN can be used for downstream CDN selection within CDNI request routing
  – This topic is quite exploratory, but SDN is emerging within many areas including NSP’s networks, so it could be also considered as one of candidates to facilitate CDNI Request Routing.
SDN Controls - Assumption

SDN Controls

- Assumption

Data Plane (Forwarding Hardware)

Programmable Control Plane

Network OS

- SDN Services, Apps
  - SDN Language
  - App APIs

East-west Interface

Programmable Control Plane

Network OS

- (ALTO client) Cost map
  - ALTO (I2AEX), SNMP, etc.

Northbound Interface

E.g., ALTO (I2AEX), SNMP, etc.

(ALTO server) Network map

Southbound Interface

E.g., OF, L2/L3 VPN, MPLS-TE, CLI/NetConf, etc.

Control and Data Planes Separation

Data Plane (Forwarding Hardware)

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Example of Selecting a dCDN with SDN (+ ALTO)

1) A content request from a user agent arrives in the CFS/Gateway of uCDN. *(CFS: CDN Frontend Server)*

2) The CFS/Gateway at uCDN relays the message to the SDN controller by a "Packet-In" message.

3) ALTO client at the SDN controller requests the best dCDN information to ALTO server.

4) ALTO server responds and then SDN controller in uCDN knows which is the best dCDN.

5) The SDN controller sends a query to the SDN controller or the Gateway of the best dCDN.

0) dCDN advertises information relevant to its delivery capabilities (e.g., content availability, geographic footprint, etc.) using ALTO extension (e.g., I2AEX) provisioning prior to any content request being redirected.
Advantages and Further Consideration

• Advantages of using SDN
  – Synchronous CDNI operations
  – Integrated with SDN architecture (e.g., OpenFlow)
    • More centralized, programmable (e.g., SDN apps for CDNi)
    • Traffic isolated with desired QoS/QoE
  – More extensible (suitable for i2aex)
  – Mobile support, possibly

• Further considerations
  – ALTO extension (i2aex)
  – Northbound interfaces of SDN
  – Multi-controllers
  – (East-west bound interfaces between SDN controllers)