CDNI Request Routing with SDN

draft-shin-cdni-request-routing-sdn-01

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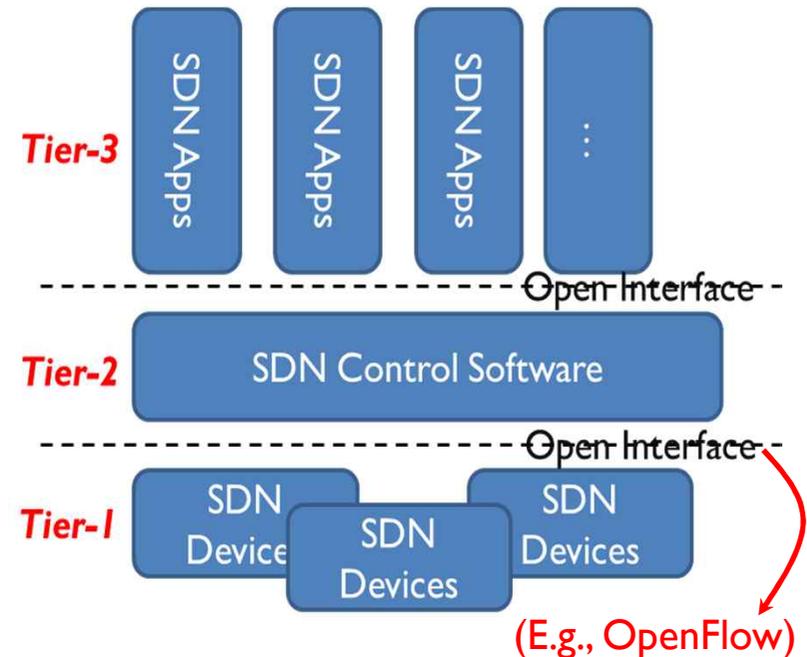Seoul National Univ.

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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
  - IETF/IRTF has started to work on this topic (SDNRG, I2RS, etc.)

- 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.
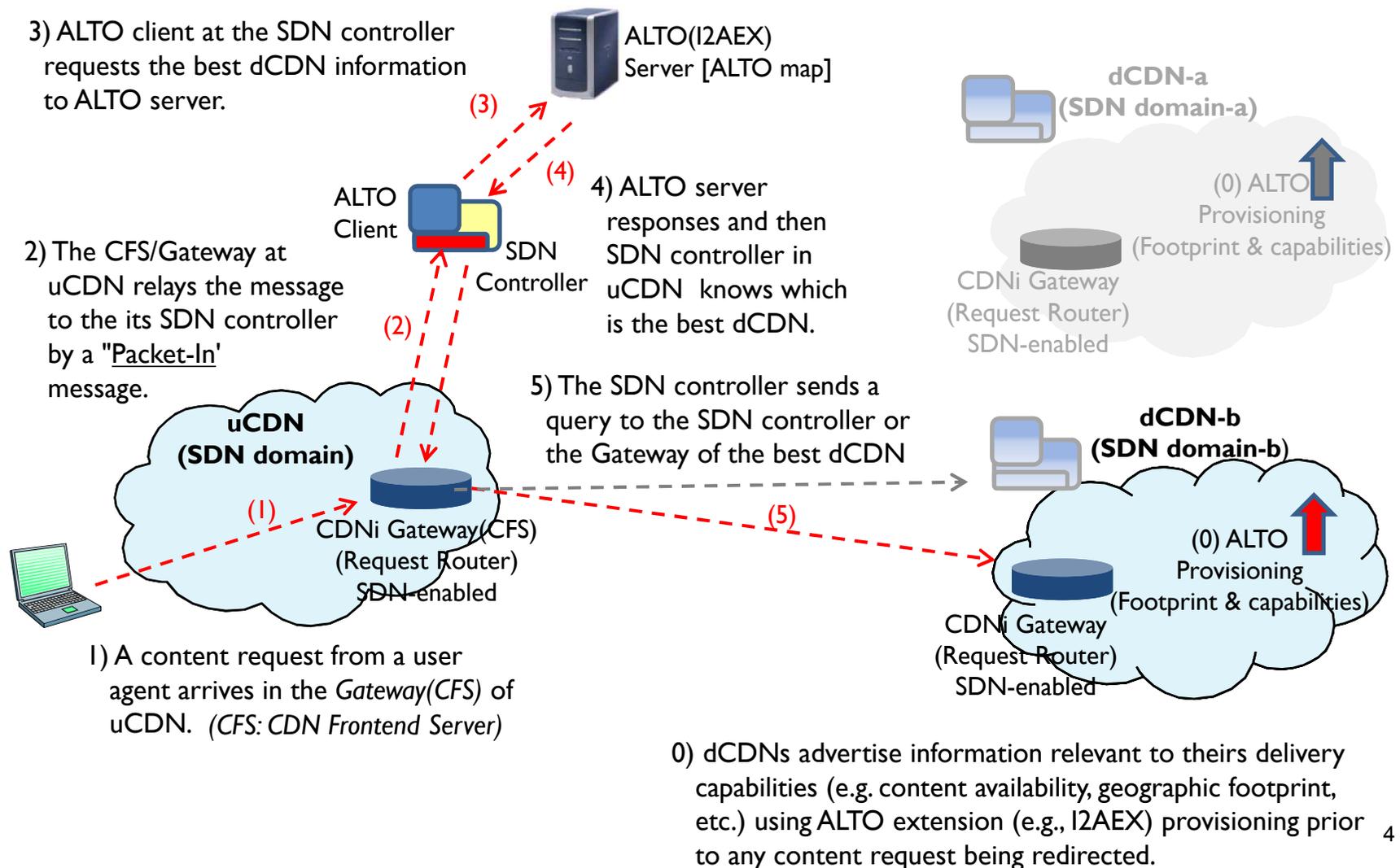
We are assuming that

- SDN has Three-Tier Architecture
  - *Tier-1* : Forwarding entities and any software/hardware components comprising of them
  - *Tier-2* : Control and management entities for the *Tier-1*
  - *Tier-3* : Applications and services that take advantage of the infrastructures based on *Tier-1* and *Tier-2*.

Tier-3 · SDN Apps · SDN Apps · SDN Apps · ...

Open Interface

Tier-2 · SDN Control Software

Open Interface

Tier-1 · SDN Devices · SDN Devices · SDN Devices

(E.g., OpenFlow)

➢ In this draft, it is also assumed that OpenFlow is as one of architectural components for SDN framework to facilitate CDNI Request Routing, as an example, but any other existing and/or possible solutions for SDN, such as I2RS and ALTO(I2AEX) could be also integrated without any big modifications.

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Example of Selecting a dCDN with SDN

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

ALTO(I2AEX) Server [ALTO map]

(3)

(4)

ALTO Client

SDN Controller

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

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

(2)

dCDN-a (SDN domain-a)

(0) ALTO Provisioning (Footprint & capabilities)

CDNi Gateway (Request Router) SDN-enabled

uCDN (SDN domain)

(1)

CDNi Gateway(CFS) (Request Router) SDN-enabled

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

(5)

dCDN-b (SDN domain-b)

(0) ALTO Provisioning (Footprint & capabilities)

CDNi Gateway (Request Router) SDN-enabled

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

0) dCDNs advertise information relevant to theirs delivery capabilities (e.g. content availability, geographic footprint, etc.) using ALTO extension (e.g., I2AEX) provisioning prior to any content request being redirected.

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Advantages and Further Consideration

- Advantages of using SDN
  - Synchronous CDNI operations
  - Integrated with SDN architecture (e.g., OpenFlow, I2RS)
    - 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)

Next Steps

- SDN-related protocol issues will be intensively studied in other WGs (e.g., I2RS, ALTO/I2AEX, SDNRG, etc.)

- Continue to work on this topic, as a separate individual document, if interested.

- Leverage this topic when basic CDNi works are done and this extension is required in some future.