Software-Defined Networking:
A Service Provider's Perspective
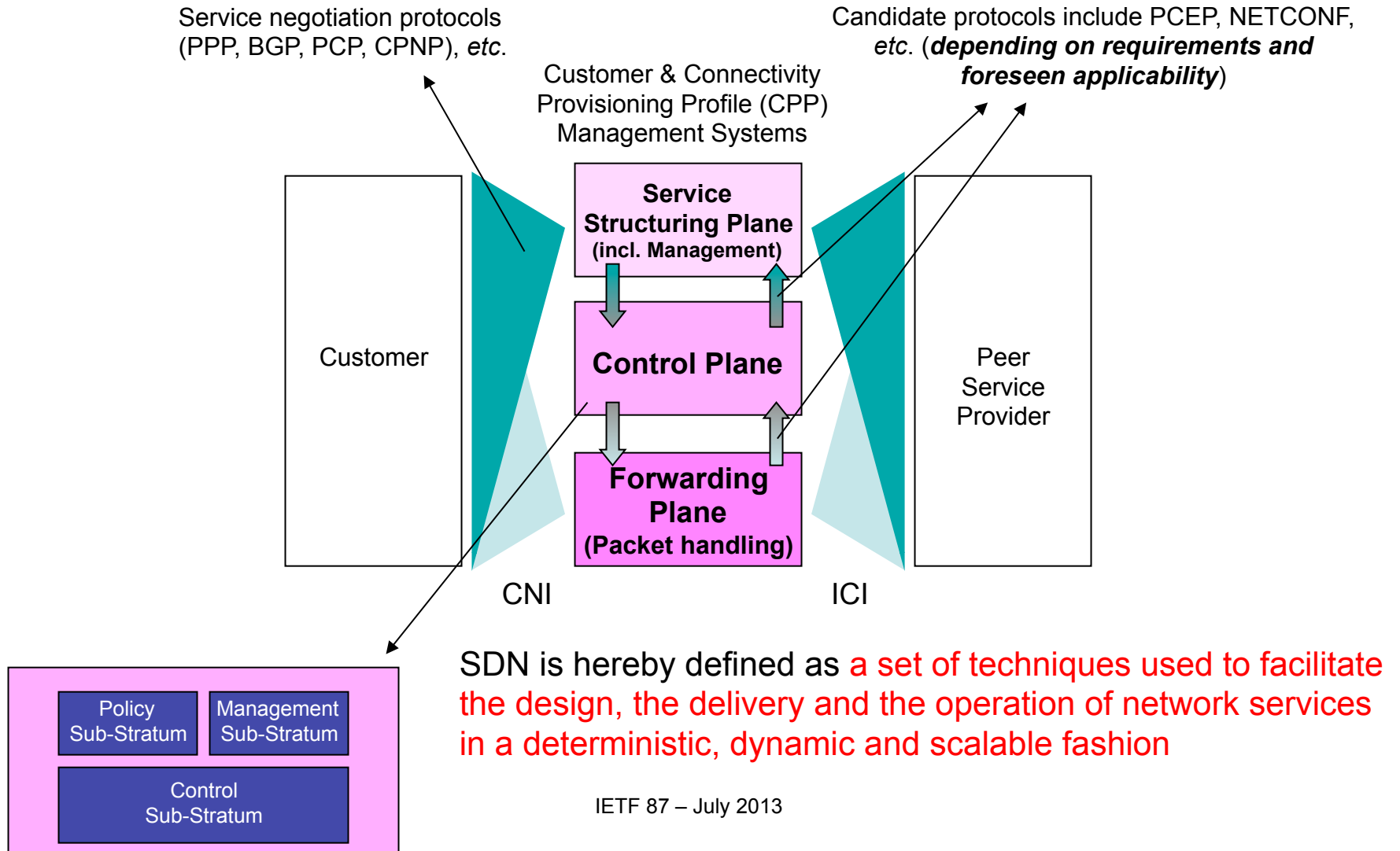
`draft-sin-sdnrg-sdn-approach`

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Rationale

- Introduce *robust automation* in complex service delivery for the sake of cost optimization and improved service production times
  - Based upon a set of service-specific policies
  - According to customer's requirements, possibly yielding a dynamic negotiation of service parameters
- Exploit *dynamic resource allocation and policy enforcement schemes*
  - Likely based upon the use of various protocols and tools, depending on the nature of the service
- Need for *feedback mechanisms* to assess efficiency of service delivery procedure and service parameter compliance
  - For the sake of service assurance and fulfillment

Global Framework

Service negotiation protocols
(PPP, BGP, PCP, CPNP), *etc*.

Candidate protocols include PCEP, NETCONF,
etc. (***depending on requirements and
foreseen applicability***)

Customer & Connectivity
Provisioning Profile (CPP)
Management Systems

Customer

**Service
Structuring Plane
(incl. Management)**

Control Plane

**Forwarding
Plane
(Packet handling)**

Peer
Service
Provider

CNI

ICI

| Policy
Sub-Stratum | Management
Sub-Stratum |
| Control
Sub-Stratum | |

SDN is hereby defined as a set of techniques used to facilitate
the design, the delivery and the operation of network services
in a deterministic, dynamic and scalable fashion

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Dynamics Of An SDN Architecture

- **Discovery** of network topology, devices and their capabilities
  - Further documented by information models and data

- **Service exposure and parameter negotiation**
  - By means of standard, commonly agreed, Connectivity Provisioning Profile templates

- **Policy enforcement and resource allocation schemes**
  - Based upon automated configuration procedures

- **Feedback** mechanisms
  - To assess how efficiently a given policy (or a set thereof) is enforced from a service fulfillment and assurance perspective

On Automation Challenges (Besides Complexity)

- Self adaptability to new services, features, technologies

  - As a function of performances and scalability

- Test methodologies to assess overall efficiency

  - Hence the importance of feedback mechanisms

  - Test purpose and scope are service-dependent and may yield extra complexity

    - Probe techniques, correlation intelligence, interactions with decision-making components of the SDN architecture, *etc*.

Service Production Chain

- Service orchestration is mastered by Service Provider
  - Based upon abstract Service Components
- CPP Template-derived policy-formatted information is forwarded towards PDP
  - As per negotiation results
- PDP then forwards policy decisions and configuration information to devices
  - Yielding automated service production

Services

SSS Layer

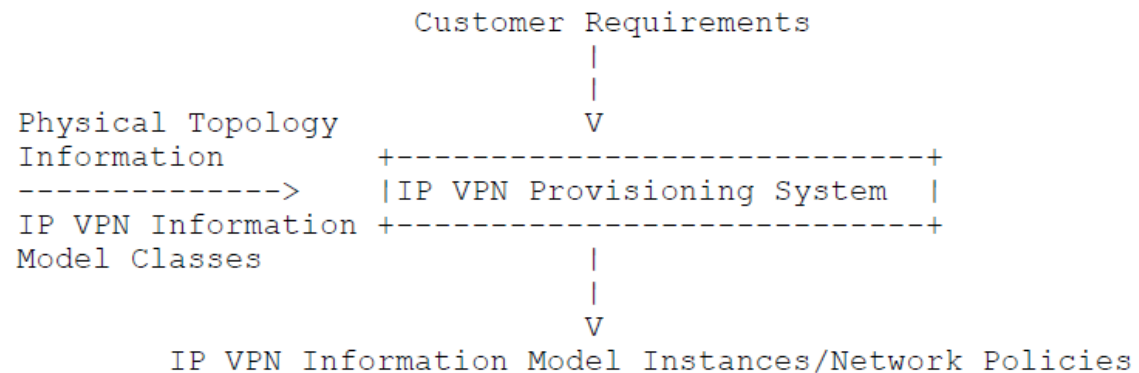PDP · SDX-300 · Policy and Control

Packet handling
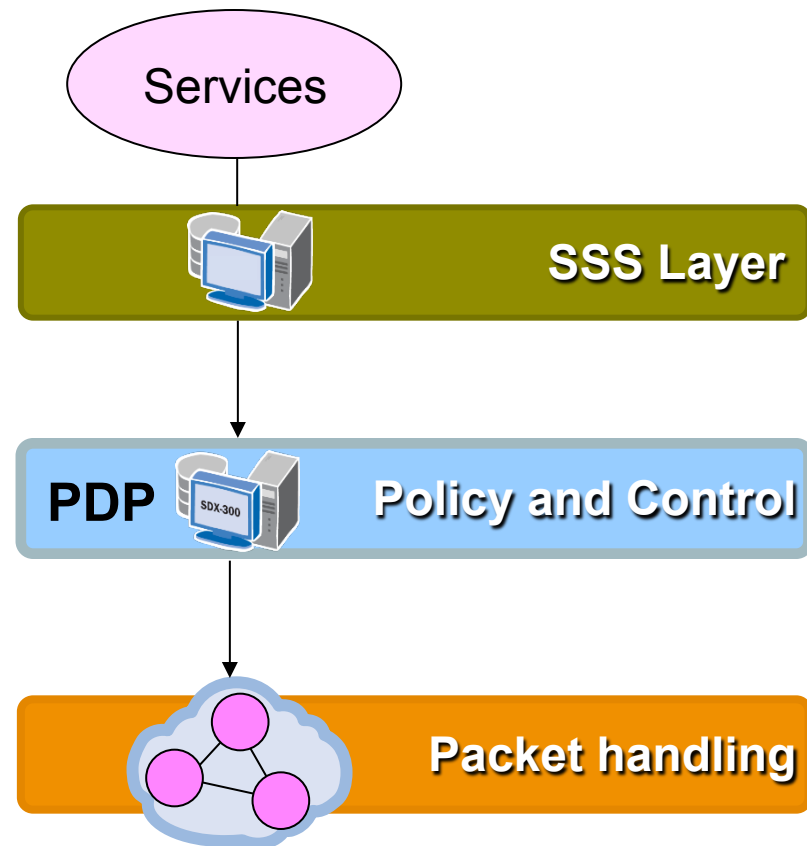
From Service Exposure And Negotiation To Delivery

- *Service level* documents requirements (scope, QoS, security, forwarding)
  - Documented in a CPP template
- *Network level* is where decisions are made
  - Details policy provisioning information derived from CPP (Connectivity Provisioning Profile) negotiation
- *Device level* is where decisions are applied, *i.e.*, upon receipt of configuration information
  - Whatever the device technology

Need For Standard Information And Data Models

- Dynamic service provisioning relies upon a set of policies, *e.g*.,:
  - Forwarding and routing policies
  - Security policies (automated ACLs, firewall configuration, *etc*.)
  - QoS policies that yield DiffServ-based traffic forwarding policies, for example
  - Traffic engineering policies
  - *Etc*.

```
                                Customer Requirements
                                        |
                                        |
Physical Topology                       V
Information                +----------------------------+
--------------->           |IP VPN Provisioning System  |
IP VPN Information         +----------------------------+
Model Classes                           |
                                        |
                                        V
            IP VPN Information Model Instances/Network Policies
```

Additional Reading Material

- Automation requirements
  - http://tools.ietf.org/html/draft-boucadair-network-automation-requirements-01

- CPP template and negotiation protocol
  - http://tools.ietf.org/html/draft-boucadair-connectivity-provisioning-profile-02
  - http://tools.ietf.org/html/draft-boucadair-connectivity-provisioning-protocol-00

Comments?

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