Policy Architecture and Framework for NFV Infrastructures

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IETF 92 Recap

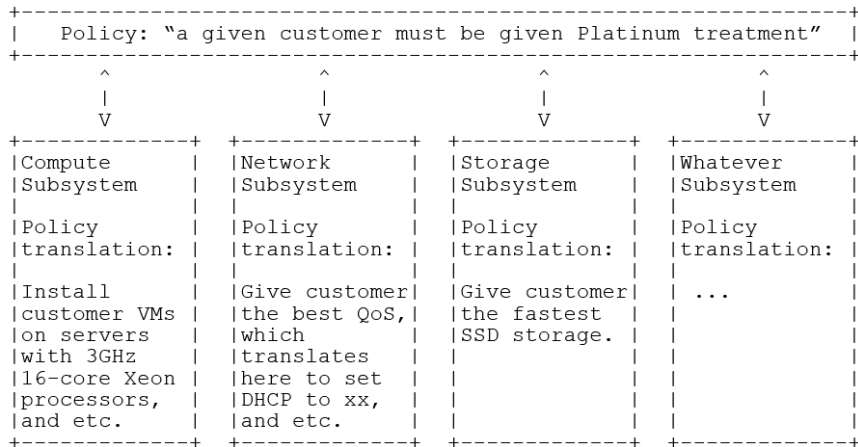- Policy Intent Statement versus Subsystem Actions and Configurations

```
+--------------------------------------------------------+
|   Policy: "a given customer must be given Platinum treatment"   |
+--------------------------------------------------------+
      ^              ^              ^              ^
      |              |              |              |
      V              V              V              V
+-------------+ +-------------+ +-------------+ +-------------+
|Compute      | |Network      | |Storage      | |Whatever     |
|Subsystem    | |Subsystem    | |Subsystem    | |Subsystem    |
|             | |             | |             | |             |
|Policy       | |Policy       | |Policy       | |Policy       |
|translation: | |translation: | |translation: | |translation: |
|             | |             | |             | |             |
|Install      | |Give customer| |Give customer| |   ...       |
|customer VMs | |the best QoS,| |the fastest  | |             |
|on servers   | |which        | |SSD storage. | |             |
|with 3GHz    | |translates   | |             | |             |
|16-core Xeon | |here to set  | |             | |             |
|processors,  | |DHCP to xx,  | |             | |             |
|and etc.     | |and etc.     | |             | |             |
+-------------+ +-------------+ +-------------+ +-------------+

  Figure 1: Example of Subsystem Translations of Policy Actions
```

- Global vs Local Policies

```
+----------------------------------------------------------------+
|  +----------------------------------------------------------+  |
|  |                 Global Policy Engine                     |  |
|  +----------------------------------------------------------+  |
|                                                                |
|  +----------------------------------------------------------+  |
|  |                 Global Policies                          |  |
|  +----------------------------------------------------------+  |
+----------------------------------------------------------------+
      ^              ^              ^              ^
      |              |              |              |
      V              V              V              V
+-------------+ +-------------+ +-------------+ +-------------+
|Compute      | |Network      | |Storage      | |Whatever     |
|Subsystem    | |Subsystem    | |Subsystem    | |Subsystem    |
|             | |             | |             | |             |
|Local Policy | |Local Policy | |Local Policy | |Local Policy |
|Engine       | |Engine       | |Engine       | |Engine       |
|             | |             | |             | |             |
|Local        | |Local        | |Local        | |Local        |
|Policies:    | |Policies     | |Policies     | |Policies     |
| P0, P1, …   | | P0, P1, …   | | P0, P1, …   | | P0, P1, …   |
|             | |             | |             | |             |
+-------------+ +-------------+ +-------------+ +-------------+

       Figure 2: Global versus Local Policy Engines
```
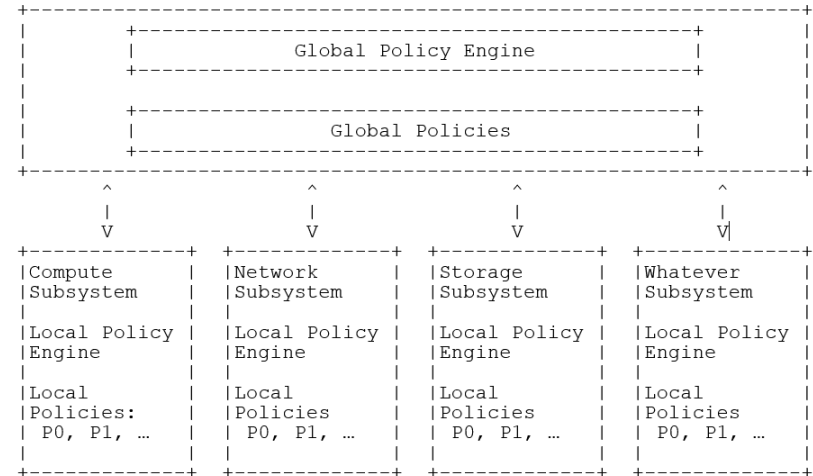
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- Hierarchical Policy Framework
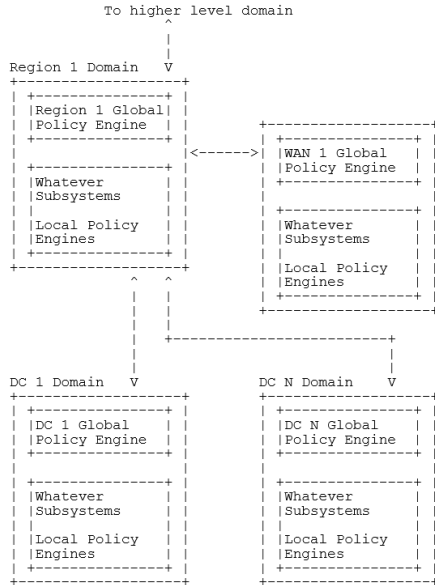
```
                    To higher level domain
                              ^
                              |
Region 1 Domain    V
+--------------------+
| +---------------+ |
| |Region 1 Global| |
| |Policy Engine  | |               +------------------+
| +---------------+ |               | +--------------+ |
|                    |  |<----->|   | |WAN 1 Global  | |
| +---------------+ |               | |Policy Engine | |
| |Whatever       | |               | +--------------+ |
| |Subsystems     | |               |                  |
| |               | |               | +--------------+ |
| |Local Policy   | |               | |Whatever      | |
| |Engines        | |               | |Subsystems    | |
| +---------------+ |               | |              | |
+--------------------+              | |Local Policy  | |
         ^    ^                     | |Engines       | |
         |    |                     | +--------------+ |
         |    |                     +------------------+
         |    +---------------------------+
         |                                |
DC 1 Domain    V              DC N Domain    V
+--------------------+        +------------------+
| +---------------+ |        | +--------------+ |
| |DC 1 Global    | |        | |DC N Global   | |
| |Policy Engine  | |        | |Policy Engine | |
| +---------------+ |        | +--------------+ |
|                    |        |                  |
| +---------------+ |        | +--------------+ |
| |Whatever       | |        | |Whatever      | |
| |Subsystems     | |        | |Subsystems    | |
| |               | |        | |              | |
| |Local Policy   | |        | |Local Policy  | |
| |Engines        | |        | |Engines       | |
| +---------------+ |        | +--------------+ |
+--------------------+        +------------------+

    Figure 3: A Hierarchical Policy Framework
```

- Policy Conflicts and Resolution
- Policy Pub/Sub Bus

```
+----------------------------------------------------------+
|  |                Global Policy Engine               |   |
|  +---------------------------------------------------+   |
|                                                          |
|  +---------------------------------------------------+   |
|  |                  Global Policies                  |   |
+----------------------------------------------------------+
                              ^
                              |
Policy Pub/Sub Bus            V
   ----------------------------------------------------------
      ^              ^               ^               ^
      |              |               |               |
      V              V               V               V
+------------+  +-------------+  +-------------+  +-------------+
|Compute     |  |Network      |  |Storage      |  |Whatever     |
|Subsystem   |  |Subsystem    |  |Subsystem    |  |Subsystem    |
|            |  |             |  |             |  |             |
|Local Policy|  |Local Policy |  |Local Policy |  |Local Policy |
|Engine      |  |Engine       |  |Engine       |  |Engine       |
|            |  |             |  |             |  |             |
|Local       |  |Local        |  |Local        |  |Local        |
|Policies:   |  |Policies     |  |Policies     |  |Policies     |
| P0, P1, …  |  |  P0, P1, …  |  |  P0, P1, …  |  |  P0, P1, …  |
+------------+  +-------------+  +-------------+  +-------------+

      Figure 4: A Policy Pub/Sub Bus
```
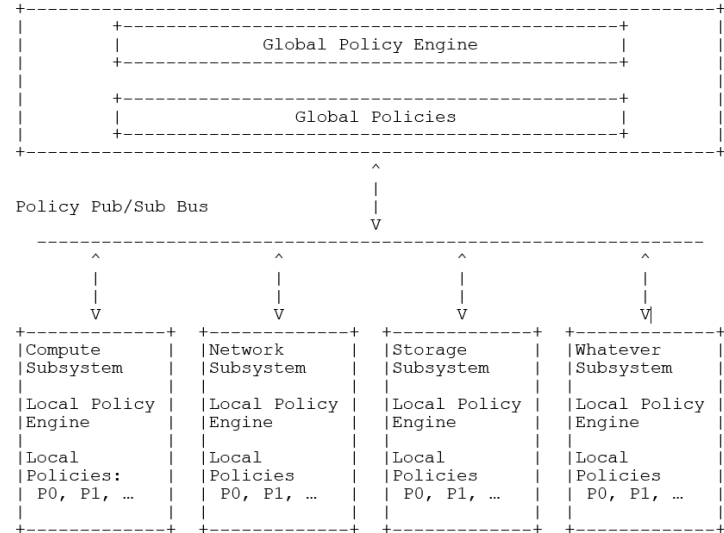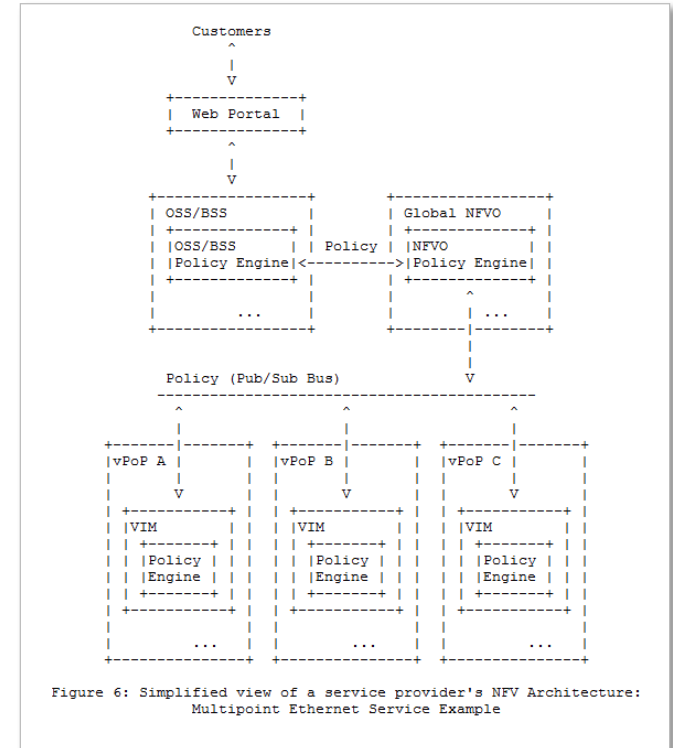
NFVRG Interim ICC London Recap

New with Draft-03

Section 7. Examples
Section 7.1 A Multipoint Ethernet Service

- Example of NFV service creation

- Highlights policy framework concepts
  - Hierarchical, conflict resolution, pub/sub bus, and etc.

- Discusses the role and scope of policy *name space* definitions
  - i.e., a *name space* per policy pub/sub bus

- Discusses the need for subsystems to publish tables of configured services

```
                        Customers
                           ^
                           |
                           v
                   +---------------+
                   |  Web Portal   |
                   +---------------+
                           ^
                           |
                           v
        +---------------+       +---------------+
        | OSS/BSS       |       | Global NFVO   |
        | +-----------+ |       | +-----------+ |
        | |OSS/BSS    | | Policy| |NFVO       | |
        | |Policy Engine|<--------->|Policy Engine| |
        | +-----------+ |       | +-----------+ |
        |               |       |        ^      |
        |    ...        |       |        |  ... |
        +---------------+       +--------|------+
                                         |
           Policy (Pub/Sub Bus)          v
        -----------------------------------------
            ^               ^               ^
            |               |               |
        +---|-------+   +---|-------+   +---|-------+
        |vPoP A |   |   |vPoP B |   |   |vPoP C |   |
        |       v   |   |       v   |   |       v   |
        | +-------+ |   | +-------+ |   | +-------+ |
        | |VIM    | |   | |VIM    | |   | |VIM    | |
        | | +-----+ |   | | +-----+ |   | | +-----+ |
        | | |Policy| | |   | | |Policy| | |   | | |Policy| | |
        | | |Engine| | |   | | |Engine| | |   | | |Engine| | |
        | | +-----+ | |   | | +-----+ | |   | | +-----+ | |
        | +---------+ |   | +---------+ |   | +---------+ |
        |    ...      |   |    ...      |   |    ...      |
        +-------------+   +-------------+   +-------------+

Figure 6: Simplified view of a service provider's NFV Architecture:
              Multipoint Ethernet Service Example
```

New with draft-04

Section 5 - Policy Conflicts and Resolution

- Defined "Commit Group"
  - A set of policies in which the whole set must be committed for a desired result to be obtained
  - Commit Group conflict detection mechanism and subsequent addition to the policy database should be implemented as an atomic process
    - To avoid multiple writers issues: No changes to the policy database should be allowed by other processes until either the whole Commit Group is checked and committed or a conflict is detected and the process stopped,

Related Work

- OpenStack Congress – Policy as Service
  - Link: https://wiki.openstack.org/wiki/Congress
  - Energy efficiency using analytics-driven policies
    - Congress policy delegation to VM placement engine using published tables
    - VM placement engine migrates under-utilized VMs
  - Talk and demo at the Vancouver OpenStack summit
    - Topic: "Helping Telcos go Green and save OpEx via Policy"
      - Video Link: https://www.openstack.org/summit/vancouver-2015/summit-videos/presentation/helping-telcos-go-green-and-save-opex-via-policy

Next Steps

- Need alignment with ETSI NFV policy?

  - At this time, there seems to be no specific activity at ETSI NFV on policy-based VIM/MANO stack components

  - Opportunity for this WG to transfer results to ETSI NFV?

- More on policy abstractions?

- RG adoption?