Policy Architecture and Framework for NFV Infrastructures

NFVRG Interim
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draft-norival-nfvrg-nfv-policy-arch-03

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IETF 97 Recap

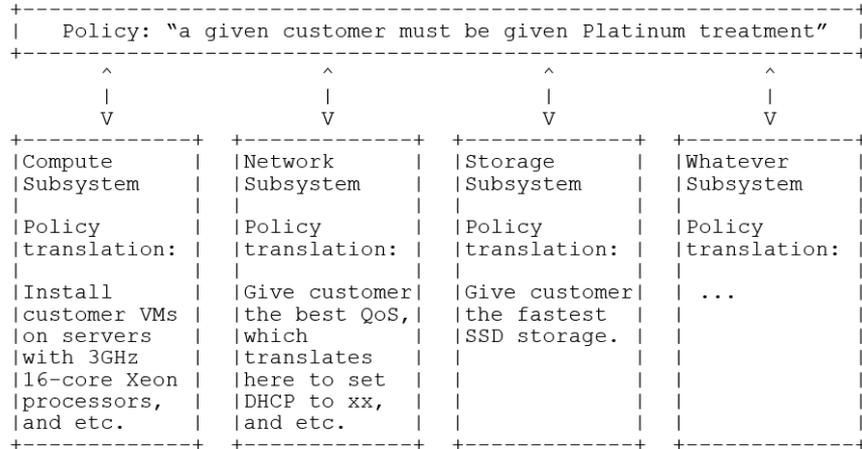- Policy Intent Statement versus Subsystem Actions and Configurations

```
+---------------------------------------------------------------+
|   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
```
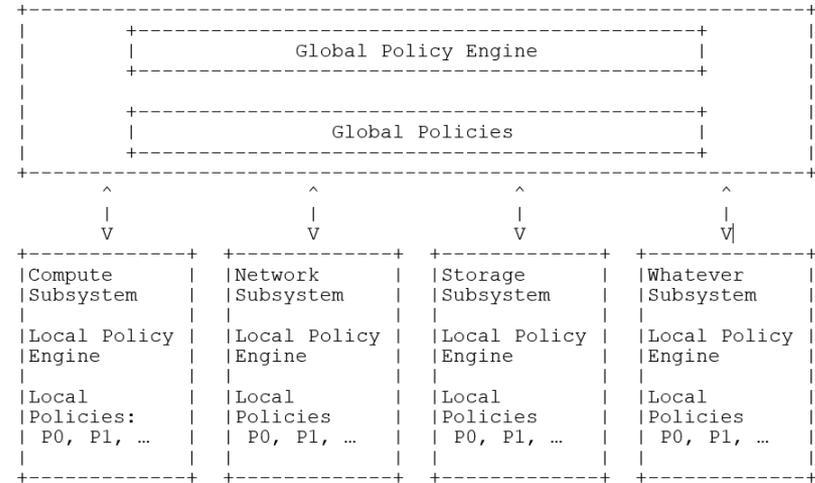
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- Hierarchical Policy Framework
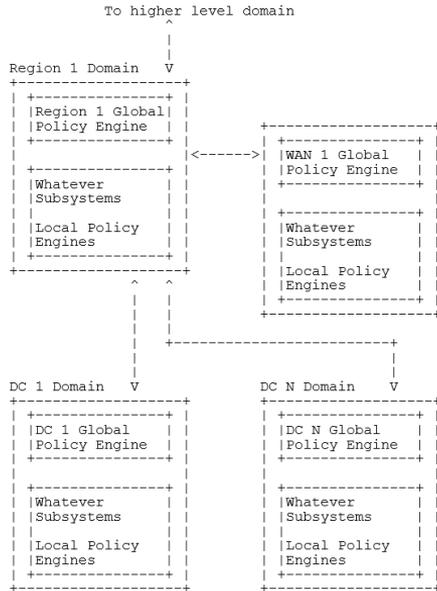
```
                   To higher level domain
                             ^
                             |
Region 1 Domain     V
+--------------------+
| +---------------+ |
| |Region 1 Global| |
| |Policy Engine  | |
| +---------------+ |        +------------------+
|                    |        | +--------------+ |
| +---------------+ |<------>| |WAN 1 Global  | |
| |Whatever       | |        | |Policy Engine | |
| |Subsystems     | |        | +--------------+ |
| |               | |        |                  |
| |Local Policy   | |        | +--------------+ |
| |Engines        | |        | |Whatever      | |
| +---------------+ |        | |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
```
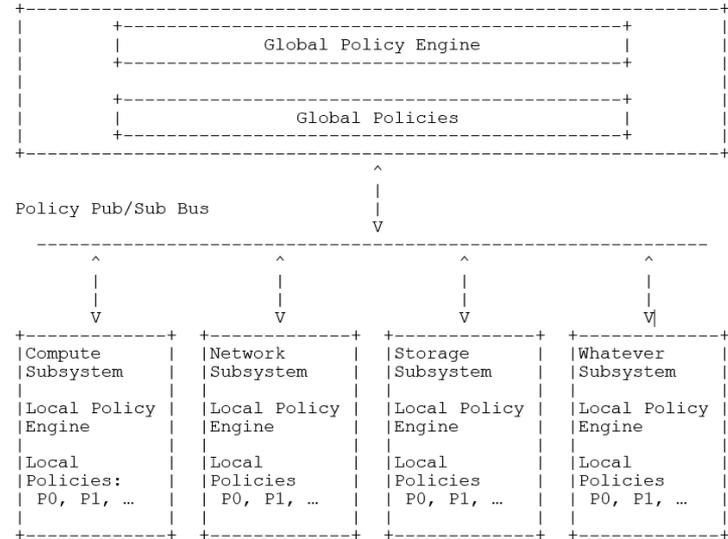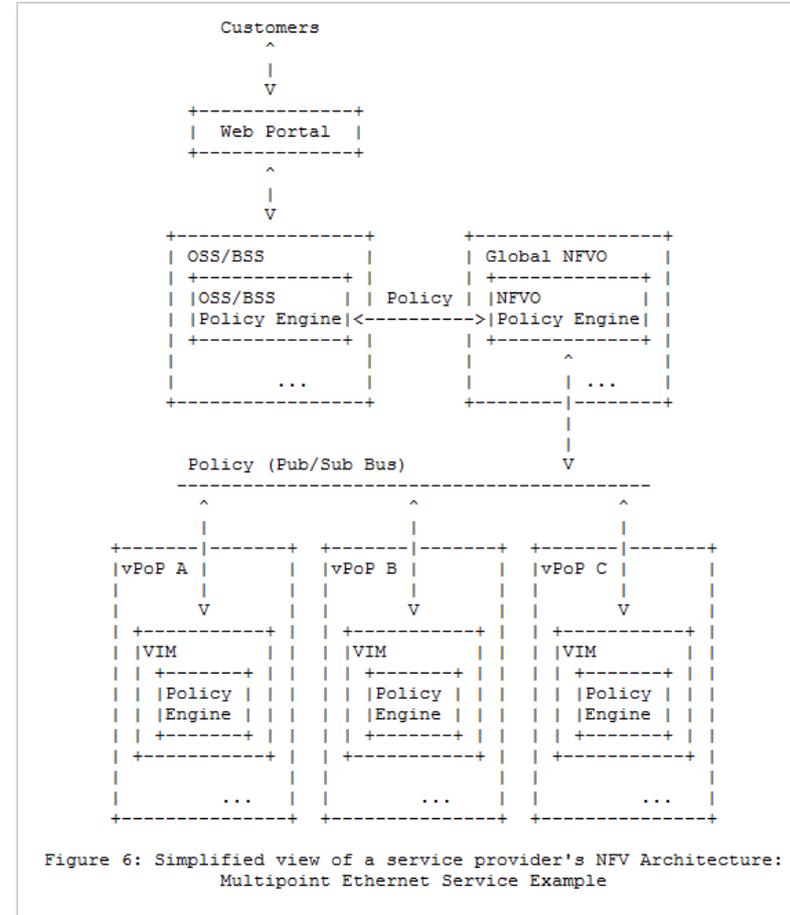
New Additions

- 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
```

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

- More on conflict detection and resolution
  - Commit and rollback of policies
  - Policy "grouping", and etc.

- Other?

- RG adoption?