NFVRG@IETF-94

Resource Management in Service Chaining

draft-irtf-nfvrg-resource-management-service-chain-02

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Recall

- Problems
  - VNF placement/scheduling in building/maintaining service chains to satisfy given policies
- Use cases
  - path optimization, load balancing, redundancy, traffic optimization, energy efficiency
- Goals
  - build a framework, algorithms, contributions to SFC

Changes since IETF-93

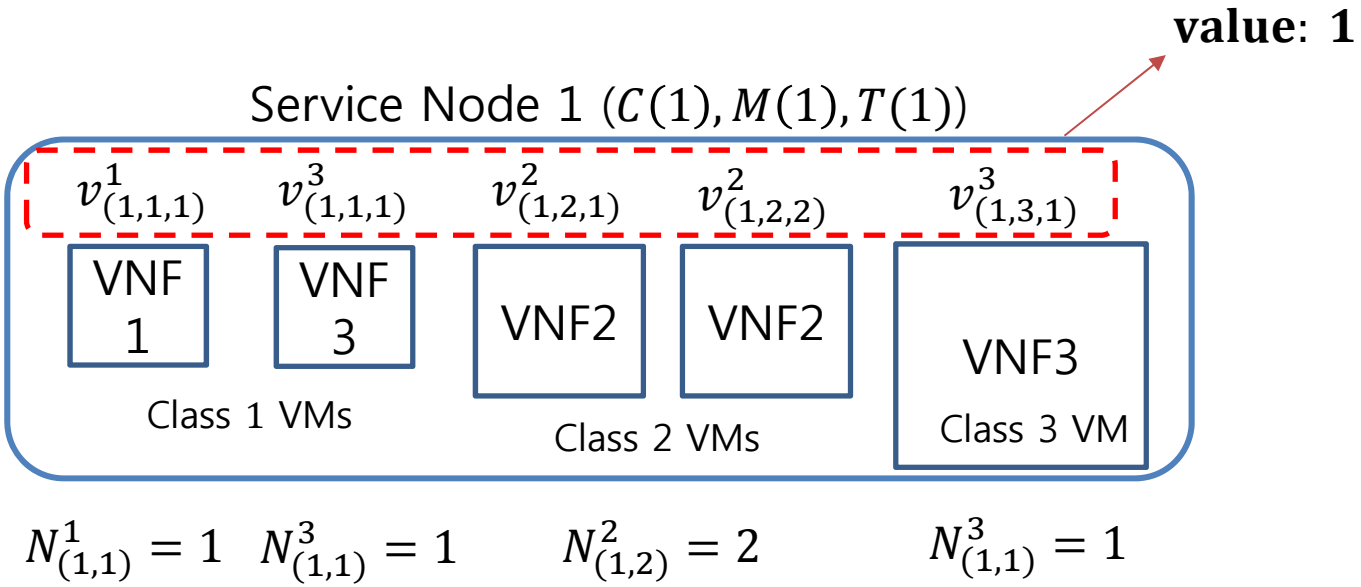
- -02
  - added an evaluation model
  - as a new section #5

Evaluation Model

- Objective
  - determine optimal service chains for the use cases
- Key considerations
  - traffic processing capacity of a VNF instance
  - amount of traffic passed on a VL instance
- System models
  - VNF placement
  - flow distribution ratio
- Objective functions
  - throughput optimization
  - load balancing

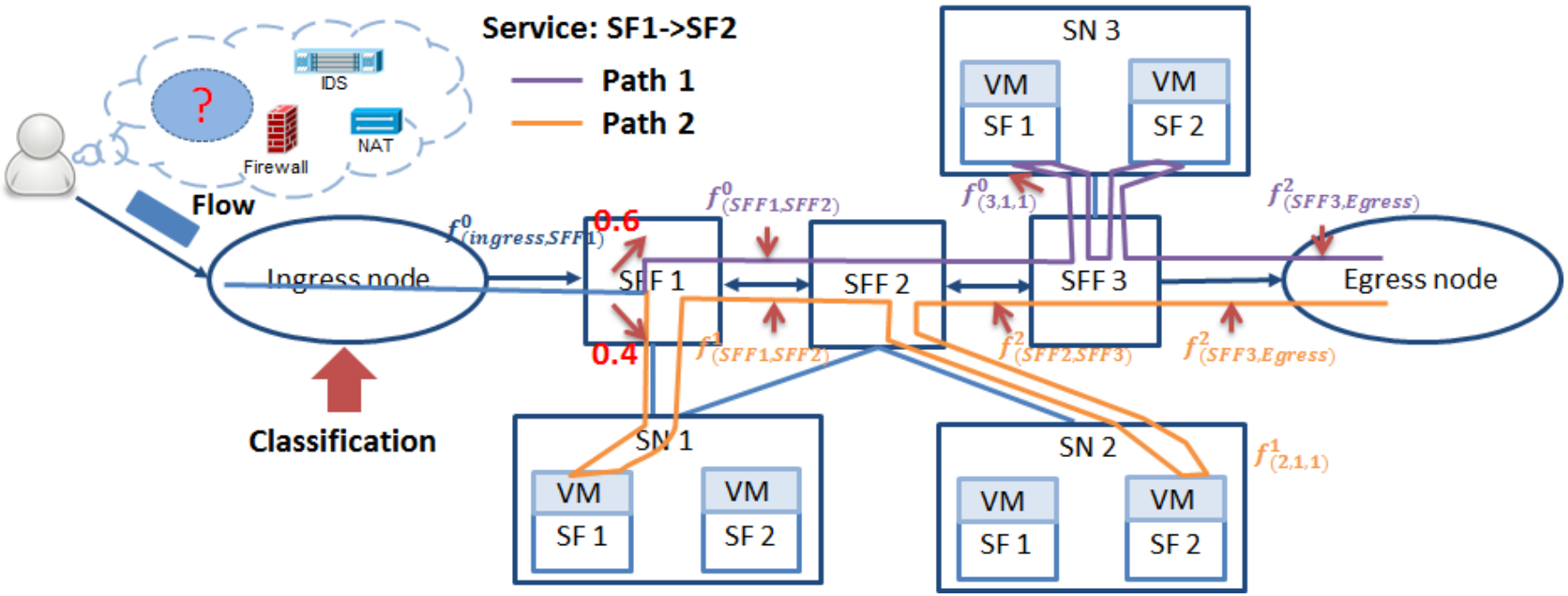
VNF Placement

- Indicator function $v^{s}_{(i,k,n)}$ for VNF placement (VPIF)
  - If $v^{s}_{(i,k,n)} = 1$, function s is installed on nth VM with class k in SN i
  - $N^{s}_{(i,k)} = \sum_{n} v^{s}_{(i,k,n)}$: the number of VNF instances where function s is installed with class k in SN i



Flow Distribution Ratio

- Traffic flow distribution ratio among NFPs (TFR)
  - $f^{s}_{(i,j)}$: flow ratio that passes link (i,j) and is already processed by function s
  - The amount of flows assigned to link (i,j) for function s : $F^{c}_{d} f^{s}_{(i,j)}$



F^{c}_{d}: CPU demand for processing the flow (or Flow rate)

Objective Functions

- Throughput optimization

$$\max_{(f,v)} \underbrace{\sum_{(i,j)\in E}\sum_{s\in F} f^{s}_{(i,j)}\, C(i,j)}_{\text{Throughput for VL}} + \underbrace{\sum_{s\in F}\sum_{k\in H}\sum_{i\in V_{SN}}\sum_{n} f^{s}_{(i,k,n)} c_k}_{\text{Throughput for VM (VNF)}}$$

- Load balancing for VNF

$$\max_{(f,v)} \left(\min_{(i,k,n)} \underbrace{c_k - F^{c}_{d} f^{s}_{(i,k,n)}}_{\text{Remaining CPU capacity for each VNF instance (i.e., VM)}} \right), s \in F, i \in V_{SN}, k \in H$$

- Load balancing for Virtual Link

$$\max_{(f,v)} \left(\min_{(i,j)\in E} \underbrace{C(i,j) - F^{c}_{d} f^{s}_{(i,j)}}_{\text{Remaining capacity for each link}} \right), s \in F$$

Next Steps

- Build a framework and heuristic algorithms for prototyping
- Merging I-Ds for “Policy-based Resource Management”
  - sub-topics:
    - policy, service chains, use cases (reliability), orchestrations
  - relevant I-Ds
    - draft-irtf-nfvrg-nfv-policy-arch
    - draft-krishnan-nfvrg-policy-based-rm-nfviaas
    - draft-irtf-nfvrg-resource-management-service-chain
    - draft-bernini-nfvrg-vnf-orchestration
    - draft-felix-nfvrg-recursive-orchestration
    - *and any others?*
  - → needs further discussion