PoP - An Automated Policy Replacement Architecture for PBNM

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Outline

- Motivation
- Policy review
- PoP - Policy of Policies
- PoP architecture
- Conclusions and future work
Motivation

- In QoS-enabled networks, administrators are forced to use different solutions to proceed with policy deployment and QoS monitoring.
Motivation

- How to integrate policy deployment and QoS monitoring?
- How to automate policy replacement?

Policy deployment

PBNM system

Policy replacement

Monitoring system

Managed network
Policy review

- A policy can be composed by one policy rule, creating a simple policy, or a policy can be composed by two or more policy rules, creating more complex policies.
- Composed policies ease the policy maintenance task, since they keep together rules with common goals.
Policy review

- Example: policy composed by four rules

**Rule 1:** ERP and Sales applications receive highest priority
  
  if (Application = ERP) or (Application = Sales)
  
  then Priority = 4

**Rule 2:** VoIP
  
  if (Application = VoIP) and
  
  ((User = executive) or (User = Sales))
  
  then
  
  One-Way-Delay < 400ms
  MAX_BW < 64Kbps ; per call
  MAX_AGGR_BW < 512Kbps ; for all calls

**Rule 3:** HTTP traffic from office
  
  if (Application = HTTP)
  and (User = Executive)
  
  then
  
  Up to 256Kbps: Priority = 3
  Up to 0.5Mbps: Priority = 2
  Else : Priority = 1

**Rule 4:** Other is basically best effort
  
  if (Application = Other)
  
  then Priority = 0
Policy review

- Administrators are expected to have, even informally, a business plan of actions for the most common degradation situations

Example:
- Policy #1 for normal conditions
- Policy #2 for VoIP degradations
- Policy #3 for ERP degradations
- Policy #4 for general problems
- ...
Policy review

- Policy replacement is a task manually executed by administrators. Besides overloading them, policy replacement can be badly executed or can be delayed because it depends on human intervention.

- Although grouping policies allows for keeping rules with common objectives together, there is still a lack of another mechanism that allows the automation of the replacement of such policies when special events are observed.
Our approach:

- Allow the creation of higher level policies (PoPs) to coordinate the replacement of standard policies

Thus, PoPs can be seen as meta-policies designed to orchestrate the deployment and replacement of standard QoS policies when special events occur

- Such special events are typically triggered when problems in previously deployed policies are identified
PoP - Policy of Policies

- PoP requires:
  - References to every possible policy that can be deployed in a policy target (policy #1, #2, #3, #4, ...), either for direct deployment or defined to be the replacement of other policies
  - Identification of events that can trigger a policy replacement
PoPs are defined through a finite state machine

S1 script:
  action 1
  action 2
  :
  action n

S2 script:
  action 1
  action 2
  :
  action m
Example:

- S1: remove all deployed Policy1
- S2: remove Policy1, deploy Policy2
- S3: remove Policy1, remove Policy2, deploy Policy3
- S4: remove all deployed Policy4
PoP architecture

- **PR (policy repository)**
- **UI (user interface)**
- **PDP (policy decision point)**
- **IM (internal manager)**
- **IPDP (internal PDP)**
- **ES #1 (event source)**
- **ES #2 (event source)**
- **PEP (policy enforcement point)**
Conclusions

- Policy rules and standard policy definition
- PoPs allow the definition of the replacement strategy of policies, while PoP architecture implements the mechanisms needed to proceed with such replacement
- Policies have to be planned in a different way when PoPs are present
- PoPs make the definition of policies more complex, but the current manual replacement of policies is even more complex
**Future work**

- A prototype for the PoP architecture has to be implemented in order to verify the practical aspects involved in PoP.
- PoP and temporal issues still have to be investigated.
- Will we have more conflicts with PoP?
Questions?

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- Thanks for your attention!