Policy Processing Architecture for the 3.5 GHz Spectrum Access System (SAS)

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Key Points

- **Policy-Based Management (PBM) is useful for managing complex systems and networks**
  - E.g. Security Policy, Network Policy, etc.
  - Often a “formalization” of what would have been done anyway

- **Cognitive systems frequently apply PBM techniques**
  - Particularly useful with “declarative” policies
  - Helps to isolate external constraints, conditions (state), internally imposed constraints, etc.

- **The SAS is a cognitive system**

- **SAS will control other cognitive systems**

- **Suggests the need of a hierarchical PBM**

  The author encourages the use of more formal PBM techniques when architecting the SAS and systems it manages
Elements of a PBM / policy controlled system

- Policy often formatted as *if “Event” with “Conditions” (state), then “Actions”*
  - Other formats as well
- **PBM elements that are widely used and defined for example in RFC 3198**
  - Policy Decision Point (PDP)
  - Policy Enforcement Point (PEP)
  - Policy Repository (PR)
- Often these elements are logical / functional rather than explicitly defined components
- **Many systems for example IEEE 1900.5-2011 add the following**
  - Policy Management Point
- **IEEE 1900.5-2011 introduces another important formalization**
  - System Strategy Reasoner Component termed SSR in this presentation
  - Not typically a PBM component
Hierarchical PBM

- A cognitive system controlling other cognitive systems needs to generate policy for those systems
  - Should be an autonomous process
  - Having a hierarchical framework is useful
    * Same components / interfaces applied recursively in tiers
- Introduce a “Policy Generation Point” (PGP)
  - Creates lower level policy consistent with high policies
  - Could be viewed as part of SSR
- Introduce concept of feedback to policy elements on higher tiers
Single Tier Policy Controlled Cognitive System

Environment

State (Conditions - System State, environment, etc.)

Lower Tier System

Policy Management Point or Higher Tier System

Policy Repository

Policy Enforcement Point

Policy Decision Point

System Strategy Reasoning Component

Same Tier System Components

Policy Generation Point

Single Tier Cognitive System
Summary

- **Policy-Based Management (PBM) can play an important role in the SAS and associated systems**
  - Important to understand where policy is generated, applied (decided) and enforced
  - Introducing PBM architectural elements facilitates analysis

- **Many PBM concepts have been standardized and additional work is ongoing**
  - IETF RFC 2748, RFC 3198, RFC 2904
  - IEEE 1900.1-2008, IEEE 1900.5-2011
  - Etc.

- **A hierarchical PBM approach seems most appropriate for the SAS**
References