Routing with Confidence:  
Supporting User Discretion in Policy Based Networks  
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**Problem**  
- Policy Based Networks (PBN) enforce coarse-grained mandatory policies for routing  
- Users may desire additional discretionary control on their routes based on Quality of Protection (QoP) metrics  
- Need a mechanism to compute desirable routes of “high confidence” based on dynamic trust attributes

**Solution**  
- Attribute based route selection  
- Assign confidence values to routers/attributes based on current threat model  
- Order routes according to highest confidence

**Approach**  
- Model the network as a Kripke structure  
  » Nodes are labeled with the router’s trust attributes  
  » Attributes can be physical security, administrative domain, processor speed, etc.  
- Specify Regular Expression Path Formulas  
  » Global properties: these properties must be true at all nodes  
  » Precedence properties: properties must appear in a particular order (e.g., non-decreasing security levels)  
- Assign confidence values based on threat  
- Compute \( k \) highest confidence paths  
  » use an appropriate combiner to calculate path confidence  
  » e.g., multiplicative combinators, min, etc.

**Applications**  
- High performance and military environments  
- Ubiquitous computing  
- Peer to Peer overlay networks

**Issues**  
- Need user friendly policy definition languages  
- How to adapt established routes to changing trust attributes  
- How to assign and combine confidence values

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**Scenario: intruder on premises**  
- User u1 excludes physically insecure routers (shaded) from route selection  
- User degrades confidence in routers with outdated OS (square nodes)  
- User suspects intruder in domain D1 and degrades confidence for those routers  
- User experiences large delays in D2 and degrades confidence for those routers  
- Three highest confidence routes are computed as shown