An Autonomic Control Plane

draft-behringer-anima-autonomic-control-plane-00.txt

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Reference Model of an Autonomic Node

From draft-irtf-nmrg-autonomic-network-definitions:

Autonomic Node

- Intent
- Feedback loops

Autonomic User Agent

Self-Knowledge

Autonomic Service Agents

Network-Knowledge (Discovery)

Autonomic Control Plane

Standard Operating System Functions

Autonomic Interactions
The Autonomic Control Plane

- **Definition:** The conjunction of protocols and interactions between autonomic service agents on nodes and registrars.
  - Includes: Discovery, negotiation, messaging, etc.

- **Four options (from draft-irtf-nmrg-autonomic-network-definitions):**
  - Inband: Like today’s control plane protocols
  - Out of band: On a separate DCN
  - In a configured overlay network (VPN)
  - In a self-managing overlay network (VPN)  ➡️ Main focus today
Self-Creation of the Autonomic Control Plane

1) Preconditions

- Each node must have a domain certificate
  - Or other way to authenticate other nodes
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2) Adjacency Discovery

- Nodes discover each other
- Exchange their identities
- Use IPv6 link local
  → No dependency on configuration or routing!
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3) Authentication

• Nodes validates certificate of adjacent node
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4) Capability Negotiation

- Negotiation of:
  - Tunnel type supported; ex: GRE/IPsec
  - Other parameters
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5) Channel Establishment

- Establish secure channel
- Based on IPv6 link local
  → No dependency on configuration or routing!
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5) Context Separation

- Auto-create VRF
- Insert tunnel into VRF
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6) Addressing

- Auto-create IPv6 loopback address
- Suggestion: Use IPv6 ULA
  - Global ID: Hash of domain name
  - Subnet and interface ID: Device specific, unique in network
    - Derive from device name, or
    - Assign at time of first registration of device
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7) Routing

- Routing inside the ACP to distribute loopbacks
- Automatic
- Routing protocol must be scalable and light-weight
  - Should not cause undue load on devices
  - We suggest RPL
Properties of the Autonomic Control Plane (self-managing overlay)

- Self-Creating
- Self-Managing
- Self-Healing
- Self-Optimising
- Self-Protecting

The Autonomic Control Plane is autonomic itself!

Use Cases:
- Bootstrapping an un-configured network
- Virtual Out Of Band Channel
  - ACP not dependent on configuration, addressing, routing
Relationship with other IETF activities

• The self-managing ACP could be used in other contexts, but not mandatory.
  – Ex: Homenet
Next Steps

• Clarify the four ACP options
  – (inband, out of band, configured overlay, autonomic overlay)
• Include feedback from Rene Struik
• Include feedback from Brian Carpenter:
  – Partitioning and Merging
  – Merging previously unrelated networks

• Is this useful?