

# **An Autonomic Control Plane**

**draft-behringer-anima-autonomic-control-plane-02.txt**

**92<sup>th</sup> IETF, 24 Mar 2015**

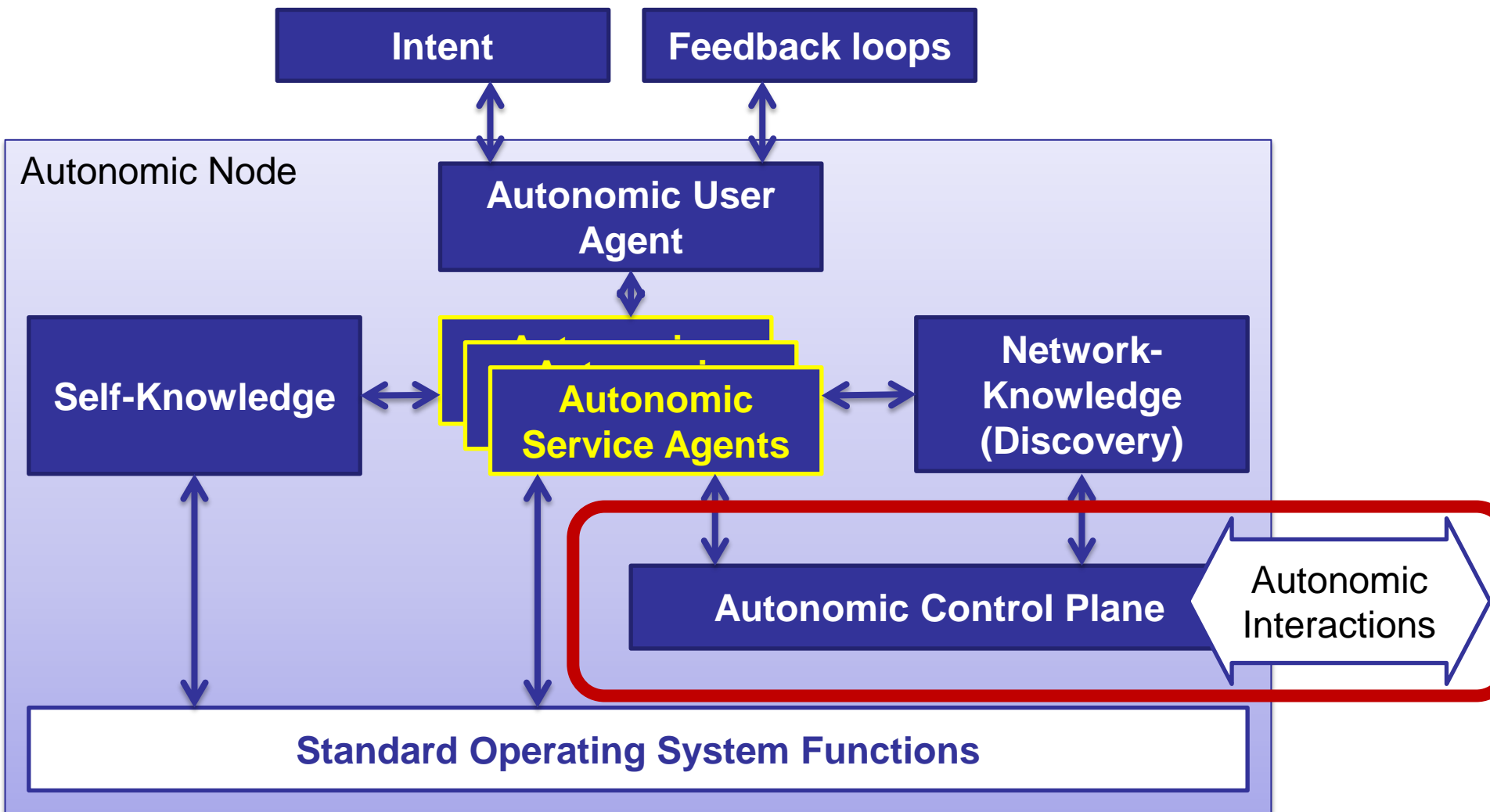
**Michael Behringer**

**Steinthor Bjarnason**

**Balaji BL**

**Toerless Eckert**

# Reference Model of an Autonomic Node



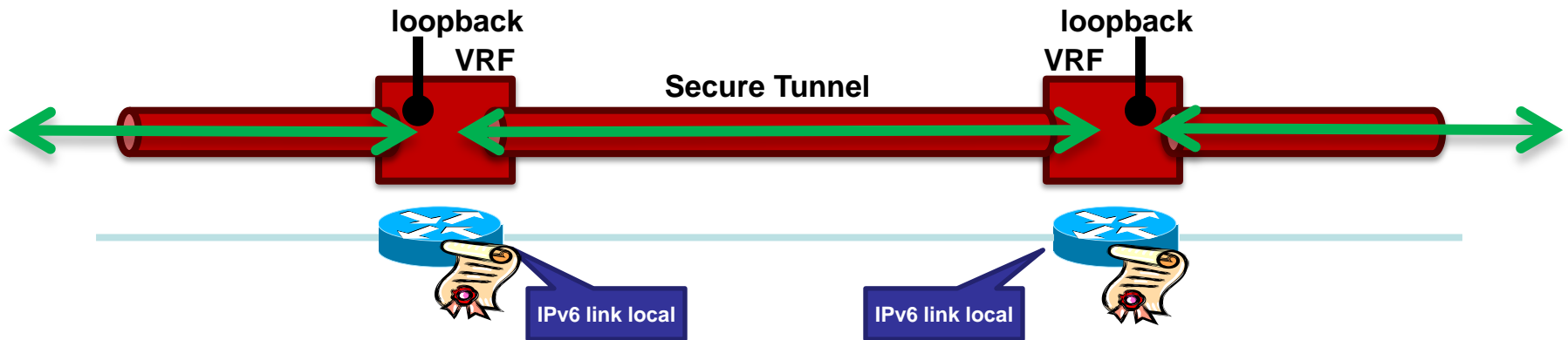
# The Autonomic Control Plane

- **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):**
  - Out of band: On a separate DCN
  - In a configured overlay network (VPN)
  - Inband: Like today's control plane protocols
  - In a self-managing overlay network (VPN) ← Main focus today

# Changes from -00 to -02

- **Now includes Connecting a controller / NMS**
- **Explicit mention: “exclusively IPv6”**
- **Include feedback from Rene Struik**
- **Include feedback from Brian Carpenter:**
  - **Partitioning and Merging**
  - **Merging previously unrelated networks**

# Autonomic Control Plane – Self-Managing Overlay Network



- 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:** (see also draft-eckert-anima-stable-connectivity)

- **Bootstrapping an un-configured network**
- **Virtual Out Of Band Channel**
  - **ACP not dependent on configuration, addressing, routing**



# Discussion

- **Four ACP options**

- Inband
  - autonomic overlay
  - configured overlay
  - out of band
- } Must be covered, including interop and co-existence
- } Similar to inband
- } Out of scope

- **Is this useful?**

# Backup Slides



# Self-Creation of the Autonomic Control Plane

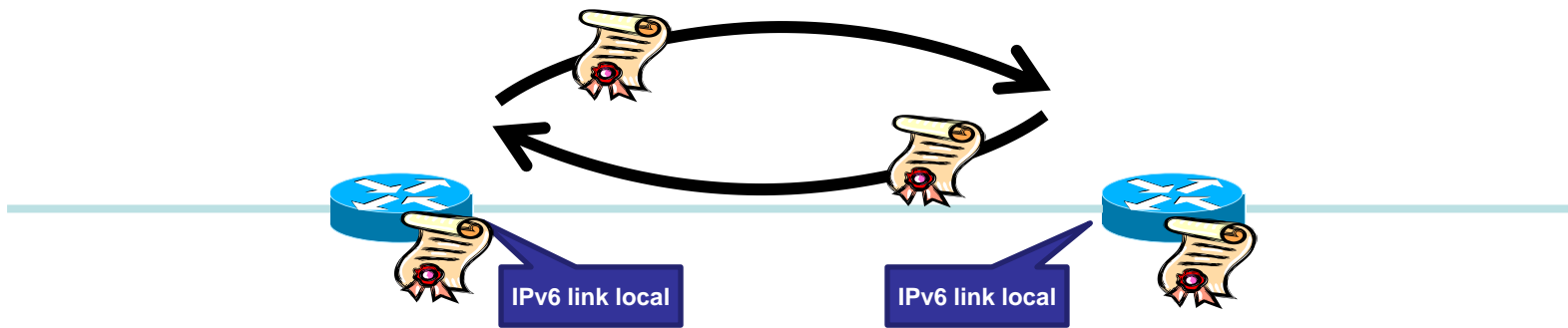
## 1) Preconditions



- **Each node must have a domain certificate**
  - Or other way to authenticate other nodes

# Self-Creation of the Autonomic Control Plane

## 2) Adjacency Discovery

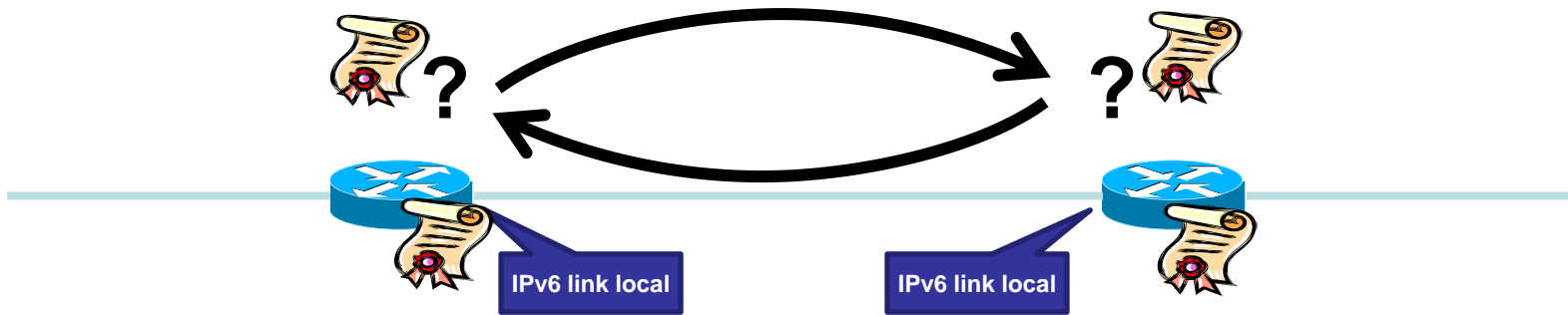


- Nodes discover each other
- Exchange their identities
- Use IPv6 link local
  - No dependency on configuration or routing!



# Self-Creation of the Autonomic Control Plane

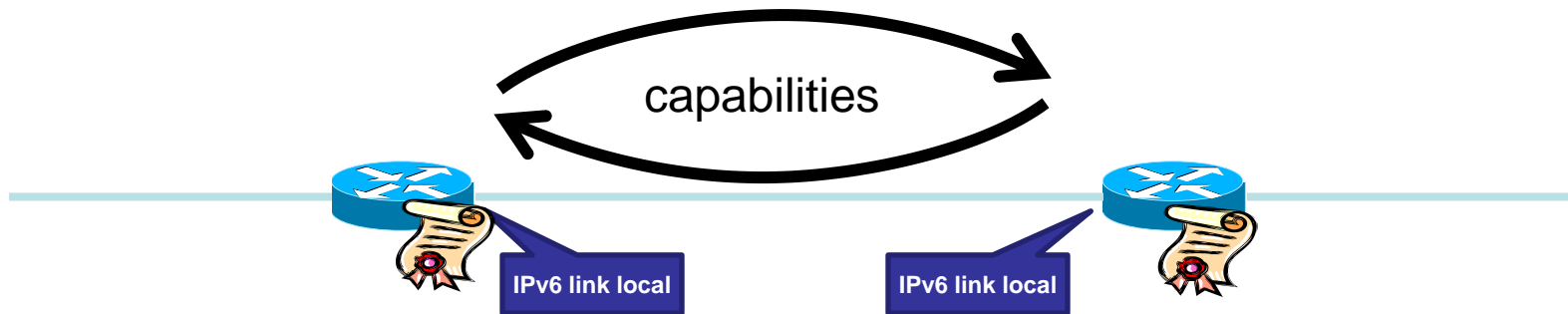
## 3) Authentication



- Nodes validates certificate of adjacent node

# Self-Creation of the Autonomic Control Plane

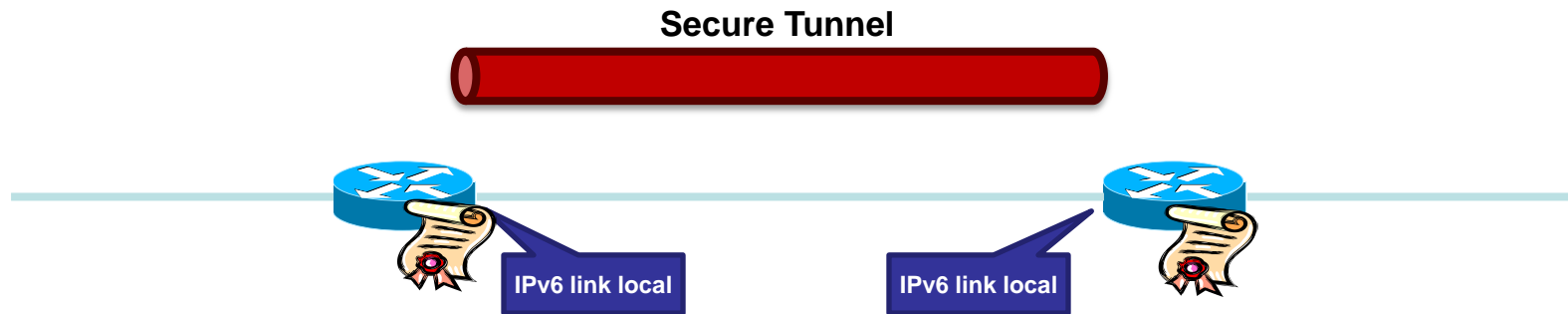
## 4) Capability Negotiation



- **Negotiation of:**
  - Tunnel type supported; ex: **GRE/IPsec**
  - Other parameters

# Self-Creation of the Autonomic Control Plane

## 5) Channel Establishment

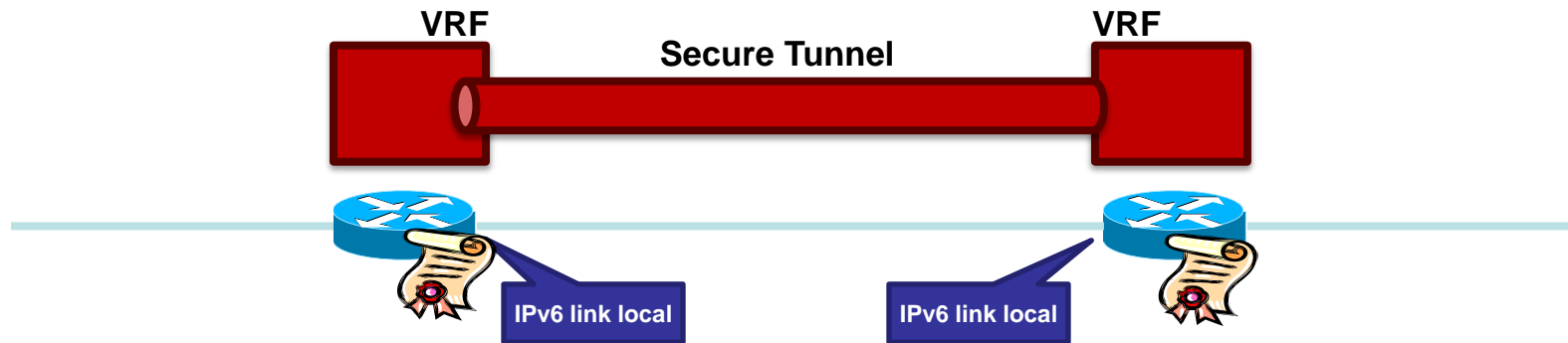


- Establish secure channel
- Based on IPv6 link local
  - No dependency on configuration or routing!



# Self-Creation of the Autonomic Control Plane

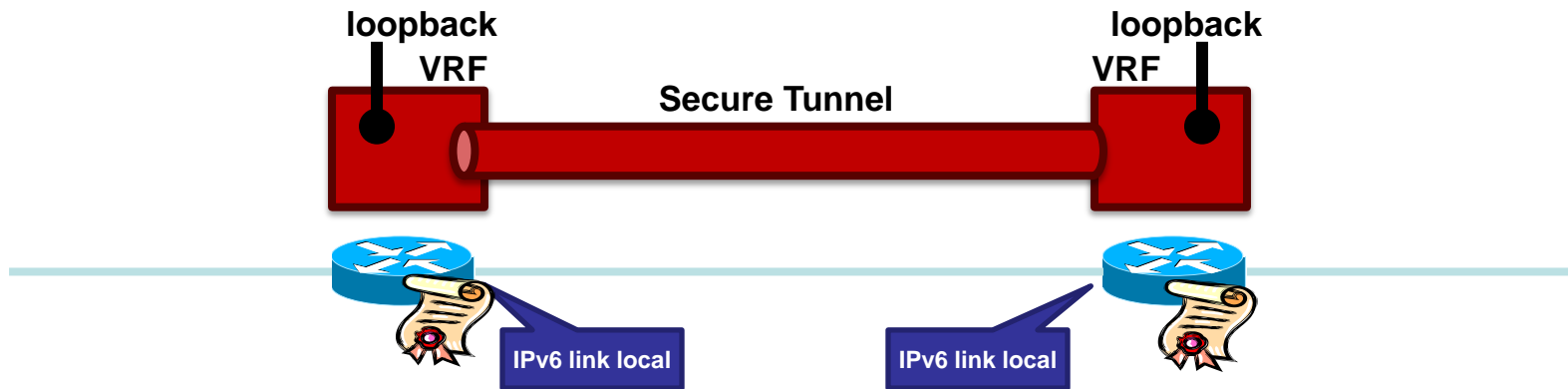
## 5) Context Separation



- Auto-create VRF
- Insert tunnel into VRF

# Self-Creation of the Autonomic Control Plane

## 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**