Autonomous Network Configuration by Negotiation: Problem Statement

draft-jiang-config-negotiation-ps-02

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Context

- Configuration, management, maintenance, troubleshooting and recovery of devices is a major OPEX burden.

- Autonomy of configuration would be a major benefit

  - "Plug and play for the ISP"

  - Network devices decide configurations by themselves

  - Network devices need to "talk" and "negotiate" with each other directly

- The idea of "autonomic networking" is now being discussed in the IRTF Network Management Research Group.

  - This draft concerns a specific approach.

Model

- In routing protocols, distributed autonomous configuration is a well established mechanism

  ➢ Mainly one-way information announcement model

- The question is how to extend autonomy to cover all kinds of distributed configuration

  ➢ needs to be less hierarchical and less dependent on human operators than a traditional NMS

- This will need peer negotiation between network elements

  ➢ The network devices need to know more information from the relevant devices

  ➢ The configuration should be decided in coordination model

Contents of the draft

- Analysis of requirements for a generic negotiation protocol

- Analysis of scenarios

- Considerations for detailed design requirements

- Brief review of some existing protocols

  ➢ We have not found one that does everything we want

- Possible protocol behavior model

Brief look at requirements

- Able to manage any type of information about a node, flow, link, VPN, tunnel or security setting

- No human intervention

- Support of forecasting or "dry run" before changing configuration

- When a new user/device appears, able to set up corresponding resources or configuration on multiple other devices

- Automatic recovery (renegotiation) after faults

- Strong authentication

Brief look at scenarios

- Classical: negotiation between downstream and upstream network devices

  ➢ Typically when a new device or customer connects

  ➢ Particularly when downstream devices trigger the upstream devices to create/modify a corresponding configuration, or allocate/change corresponding resources

  ➢ Dynamically optimize configuration of all nodes concerned

Brief look at scenarios (2)

- Negotiation between peer network devices

  ➢ Typically when a new customer-to-customer flow arises, or a faulty node has to be bypassed

  ➢ When sharing limited resource among peer network devices

- Negotiation between networks

  ➢ Typically when a change in traffic engineering settings is needed (multiple connections)

  ➢ Dynamic establishment and adjustment of differentiated service classes to support Service Level Agreements

  ➢ Better coordination among networks

Existing protocols

- Routing protocols: basically one-way announcements.

- SNMP (command/response): not recommended for configuration.

- NETCONF (RPC model): heavyweight for single data elements.

- DHCP[v6], ND, PCP, RADIUS, Diameter: elements of negotiation, but limited.

- RSVP or GIST: per-flow, not device-to-device, negotiation. Some flexibility.

- Any others to consider?

Some design considerations

- Generic protocol, independent of negotiation contents.

- Simple request/response model (not a multi-party model).

- Uniform pattern for negotiation contents (TLV or YANG-like?)

  - Adopt an existing information model or design a new one?

  - Able to carry message formats used by existing configuration protocols?

- Security and trust architecture.

Questions?
Comments?
Is there interest in further work?

Thanks!

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Network Configuration Negotiation Problem Statement and Requirements
draft-jiang-config-negotiation-protocol-00
Configuration Negotiation Protocol for Network Devices