Autonomous Network Configuration by Negotiation: Problem Statement

draft-jiang-config-negotiation-ps

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Motivation

- Many ISP networks contain >100k network devices

  - Devices are often managed by different staffs

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

  - Substantial staff training and coordination

  - More directly coordination among devices is desired

- 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

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 what 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 coincidence resources or configuration on multiple other devices

- Automatic recovery (renegotiation) after faults
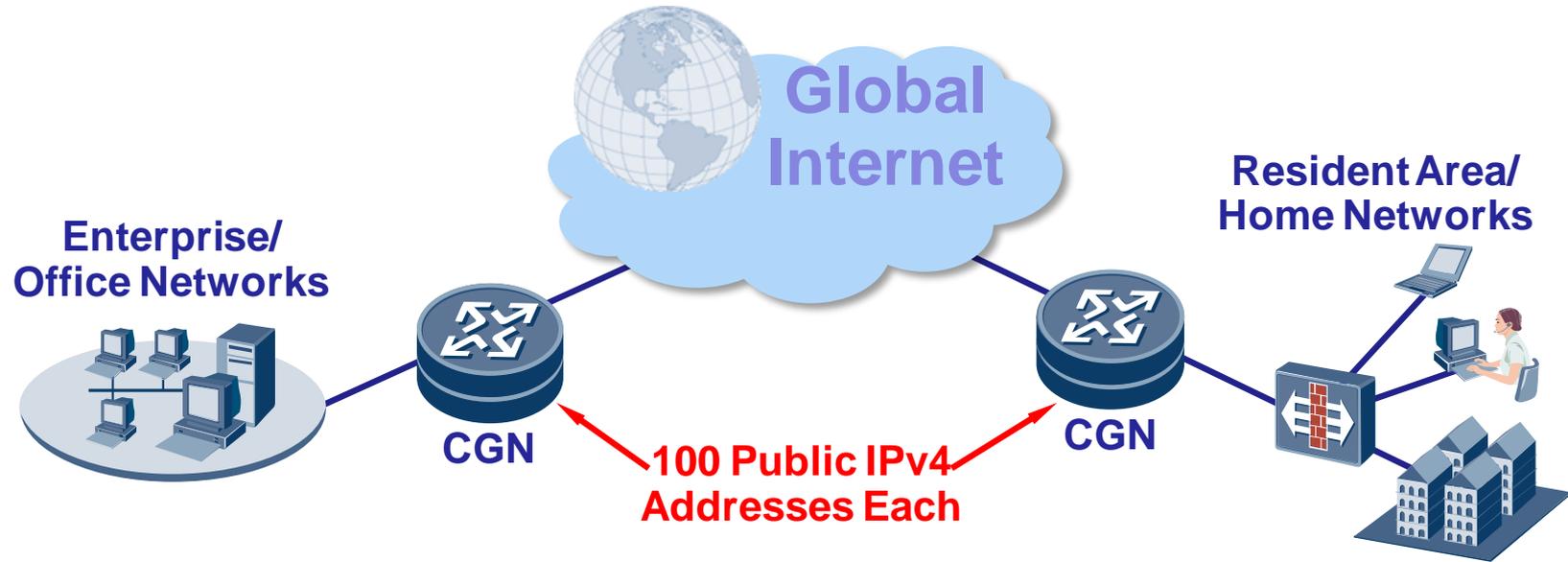
- Strong authentication

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

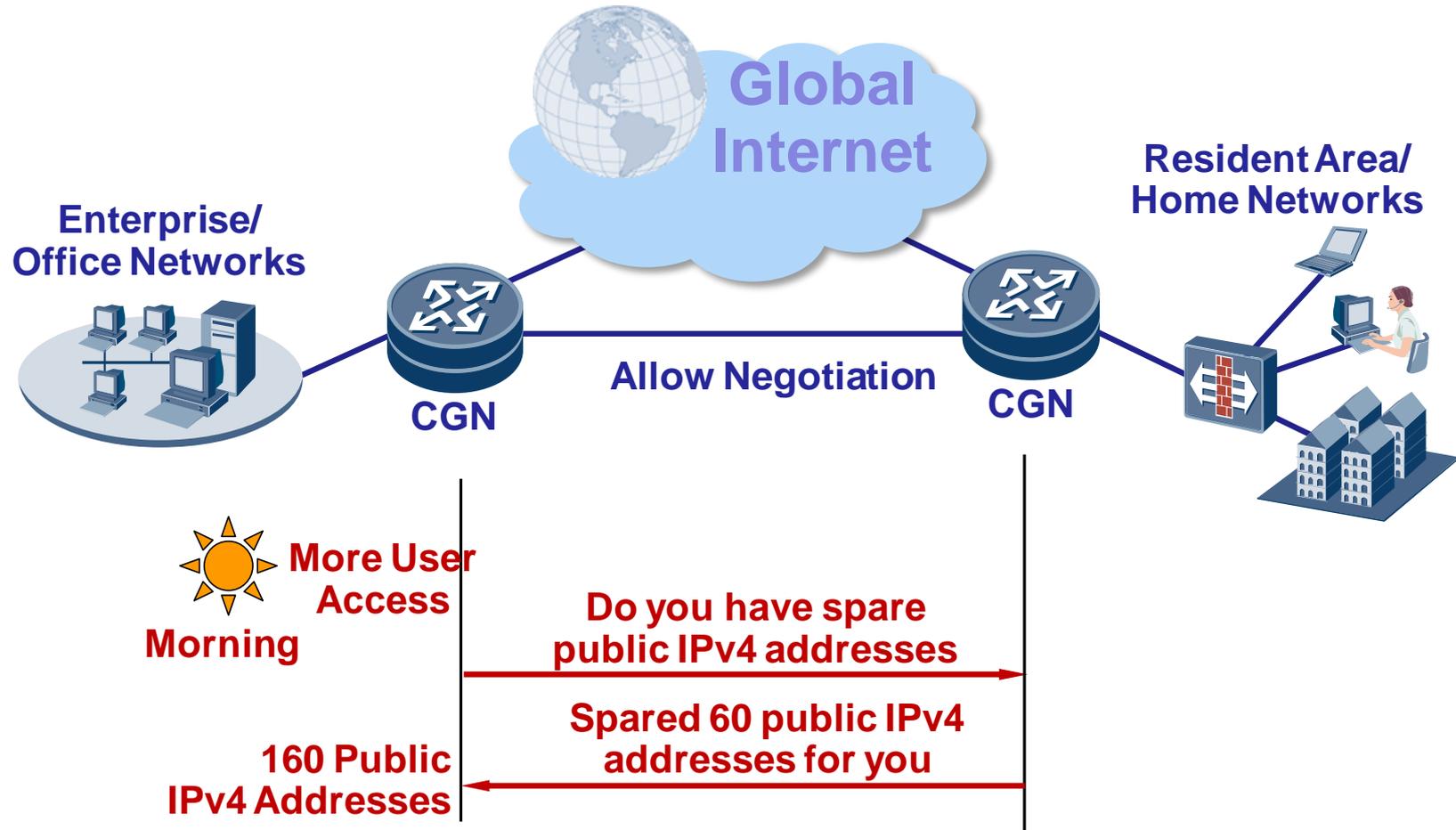 - When dynamically optimizing coincidence configuration interactively

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

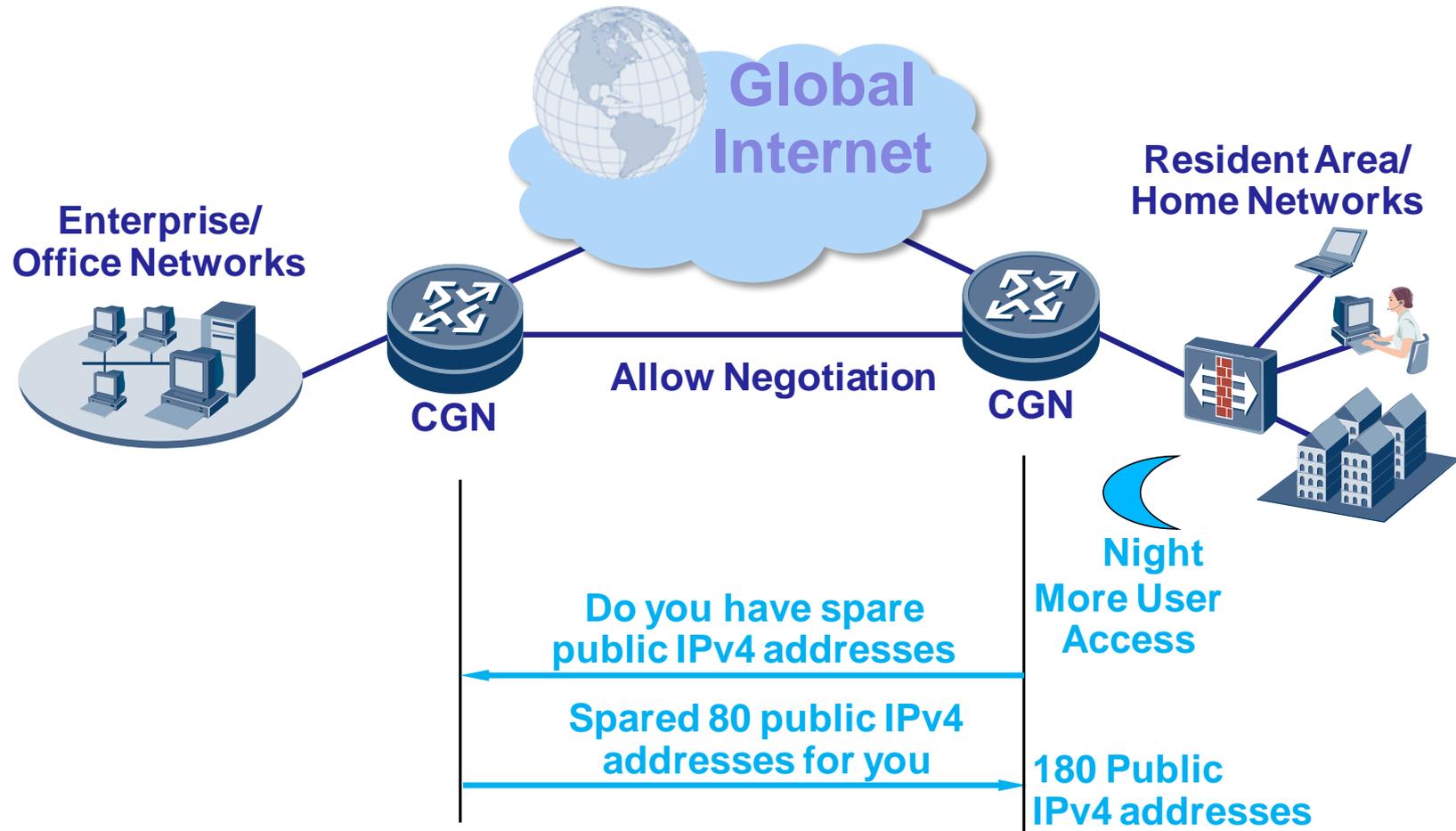 - Better coordination among networks

A Simple Autonomous Example With Device Negotiation

Global Internet

Enterprise/ Office Networks

Resident Area/ Home Networks

CGN

CGN

100 Public IPv4 Addresses Each

A Simple Autonomous Example With Device Negotiation

Global Internet

Resident Area/ Home Networks

Enterprise/ Office Networks

CGN

Allow Negotiation

CGN

More User Access

Morning

Do you have spare public IPv4 addresses

Spared 60 public IPv4 addresses for you

160 Public IPv4 Addresses

A Simple Autonomous Example With Device Negotiation

Global Internet

Enterprise/ Office Networks

Resident Area/ Home Networks

CGN

Allow Negotiation

CGN

Night More User Access

Do you have spare public IPv4 addresses

Spared 80 public IPv4 addresses for you

180 Public IPv4 addresses

Questions? Discussion?

Thanks!

draft-jiang-config-negotiation-ps-01
Network Configuration Negotiation Problem Statement and Requirements
draft-jiang-config-negotiation-protocol-00
Configuration Negotiation Protocol for Network Devices