ForCES: Forwarding and Control Element Separation in IP Networks

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Agenda

- **Motivation**: Foster Parallel Innovation in IP Nets
- **Requirements**: Flexible, Scalable, Interoperable
- **Call to Action**: Join us in the NP Forum, ForCES
Motivation: IP Forwarding & Control Separation

- Standardize the interaction between IP control (slow path) and forwarding (fast path) elements

- Control Element
  - CPU & memory intensive protocols and algorithms
  - Slow timescale – many packets/operation

- Forwarding Elements
  - Throughput oriented
  - Fast timescale – packet-by-packet operations
Motivation: Why Do It?

● **Parallel Control-Forwarding Innovation**
  - Wirespeed NPUs unsuitable for complex control SW
  - Most boxes already *have* CE/FE comm method (RPC, protocol, etc).
  - An IETF solution (requirements, framework, FE model, message format/protocol) fosters interoperability w/o re-inventing the wheel.
  - I.E. A *building block* emerges, which fosters CE-FE parallel innovation

● **Scalability**
  - Add forwarding capacity w/o the adding another point of management.

● **Interoperability**
  - Agree on a common message format between CE’s and FE’s.
Motivation: Parallel Innovation

Control Plane
- Executes Routing Protocol, stacks, etc.

Data Plane (Forwarding)
- Wire speed packet processing
- Programmability for new services

NP Forum APIs

SW (Protocols, Apps, OS)

HW (PHY, MAC, NPU, SAR, etc.)

Interconnect
- IETF ForCES protocol

Control Messages
NP Forum APIs and IETF ForCES* foster

Parallel Innovation in IP Networks

* Forwarding and Control Element Separation

www.npforum.org
www.ssttanamera.com/~forces
ForCES Protocol Requirements

Why is it required?
- Provides **Flexible** connectivity between the control plane and data plane(s) via any interconnect.

What is required?
- **Scalable** to multiple data planes without programming changes.
- **Interoperable** between all control and forwarding planes.

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ForCES Architectural Overview

Network Element

Control Element
Which FEs do I control?

Interconnect

Forwarding Element 1
Which CE controls me?

Forwarding Element
Which CE controls me?

REQUIREMENTS
1. **Flexible:**
   - Variety of interconnects
2. Auto-membership &
   - topology discovery
3. Inter-FE forwarding
4. Single “box”
5. **Scalable:** 1-10s of FEs
6. **Interoperable** CE-FE protocol
Given:

FEs have a variety of functionality

Problem:

How does the CE control the FE if it doesn’t know what it can do?

Requirement:

Define a functional model by which FEs can describe their functionality
ForCES Protocol Overview

Network Element

- CE
- Interconnect
- Ingress Filter
- Forwarder
- FE
- Egress

REQUIREMENTS
1. Port configuration
   1a. Packet redirection
2. Filter installation
3. Forward table install
4. QoS configuration
5. Secure communication
6. Event notification
7. Statistics gathering
ForCES Protocol is flexible, scalable, and interoperable

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Summary: ForCES Status/Mailing List/Web site

- **Status**
  - Working Group formed August 2001
  - Well attended session at London IETG Meeting
  - Design Team formed for Requirements Document

- **Mailing list:**
  - [forces@peach.ease.lsoft.com](mailto:forces@peach.ease.lsoft.com)
  - To subscribe: [listserv@peach.ease.lsoft.com](mailto:listserv@peach.ease.lsoft.com)
    - In body of message “subscribe forces <your name>”

- **Web site**
  - [http://www.sstanamera.com/~forces](http://www.sstanamera.com/~forces)

- **Drafts**
  - draft-anderson-forces-req-02.txt
Call to Action

- Join us in the NP Forum
  www.npforum.org

- Join us in the IETF ForCES effort
  www.sstanamera.com/~forces