ForCES-based BNG

draft-haleplidis-forces-bng-00

IETF 106, Singapore, Singapore
Friday 22 November 2019

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¹Activities carried with funding provided via the StandICT.eu initiative with Grant Agreement no. 780439 under the European Commission's Horizon 2020 Programme.
ForCES Quick Intro

• Forwarding and Control Element Separation (FEs & CEs)
• Defines
  – Data/Information model (RFC5812, RFC7408)
  – Protocol (RFC5810, RFC7121, RFC7391)
  – Transport Layer (TML) (RFC5811)
• Two interoperability tests (RFC6053, RFC 6984)
• Features
  – High Availability
  – Publish/Subscribe & Request/Response
  – Transport Layer Agnostic
  – Extensible data model
  – Model independent protocol
Intro to ForCES LFB class

• Abstraction of a function of the data plane
• Object-Oriented
• Defines:
  – Components
  – Capabilities
  – Events
Why ForCES

• Existing IETF protocol
• Provides data model describing state, capabilities and events
• Create new packet services
  – Dynamic LFB graphs
• Native support for any type of access
  – Fixed
  – Mobile
• Model agnostic protocol
  – No change on the protocol on any new LFB definition
BNG Control Traffic Handling

- Subscriber Information
- Control Plane
- Tunneling Infrastructure
- Classifier LFB
- Port LFB

1. Subscriber
2. Ethertype 0x8863
3. Or
4. Ethertype 0x8864
5. &&
6. Protocol (0xCXXX)
7. 0x5
8. 0x8863

- e.g. VxLAN, GRE, ForCES
BNG Basic Connectivity Service (Upstream)

Subscriber Information

Control Plane

ForCES Protocol

Classifier LFB → PPPoE LFB → IPv4 Routing LFB

Port LFB

Network

Subscriber
BNG Basic Connectivity Service (Downstream)

Subscriber Information

Control Plane

ForCES Protocol

PPPoE LFB

IPv4 Routing LFB

Classifier LFB

Port LFB

Network

Subscriber
Traffic Monitoring

• Multiple approaches
  – Control Plane Poll LFB (PPPoE)
  – Subscriber to notifications for statistics
Supporting multiple access types

• Can support any kind of access type
  – Fixed
  – Mobile

• Requires
  – Definition of LFB class
  – Augment classifier to distinguish different packet types

• No impact on the protocol
Augmenting BNG Services

- Adding new LFBs in the graphs
  - Bandwidth Management Service (Policer LFB)
  - Stateless access control service (ACL LFB)
  - Quota Enforcement service (QE LFB)
  - Troubleshooting Monitoring (Mirroring LFB)

- **No impact on the protocol**
BNG Bandwidth Management Service (Upstream)

- Subscriber Information
- Control Plane

- PPPoE LFB
- Classifier LFB
- Port LFB
- IPv4 Routing LFB
- Policier LFB
- Port LFB

ForCES Protocol

Network
BNG Bandwidth Management Service (Downstream)
Advanced Services
Service per Subscriber

Classifier
LFB

Port LFB

Classifier LFB

Subscriber

Control Plane

ForCES Protocol

Network
Q & A?

• Thanks for listening.
• Questions / Suggestions?
Backup Slides
ForCES Protocol Features

• Transport independence
• Simplified ForCES layer
• Degrees of reliability
• Node overload
• Transactions
• Wire serialization and optimization
• Various execution modes
• Request/Response & Publish/Subscribe
• Simple & Powerful API
• Traffic sensitive heartbeats
• Dynamic association between FEs/CEs
ForCES Model

- Data model modularity
- Hierarchical Data model definition
- Metadata modeling
- Publish/subscribe LFB events
- Flexibility/extensibility – augments & inheritance
- Backward and forward compatibility with versioning
- Formal constrains for validation
FE

- An FE Contains instances of LFB classes
- A graph of LFBs composes a service
- The graph of LFBs can be configured by the CE
BNG ForCES LFB classes

Subscriber Information

Control Plane

ForCES Protocol

Tunneling Infrastructure

Classifier LFB

PPPoE LFB

IPv4 Routing LFB

Port LFB

Network

Subscriber
BNG ForCES LFB classes

• Port LFB
  – Input/Output port for the FE

• Classifier LFB
  – An LFB that can perform matches on protocol fields and decide what to do next (redirect/continue)

• PPPoE LFB
  – An LFB to perform encapsulation and decapsulation of PPPoE/PPP headers

• IPv4 routing LFB
  – An LFB that performs routing
Traffic Monitoring

- Multiple approaches
  - Control Plane Poll LFB (PPPoE)
  - Subscriber to notifications for statistics
Subscriber Information

• Subscriber Information such as:
  – Session ID
  – Subscriber IP address
  – Subscriber MAC Address

• Reside either:
  – Control plane
  – As LFB at the FE
BNG Use case

• Authenticate Subscriber

• Authorize Subscriber

• Monitor Subscriber Traffic