draft-anderson-forces-model-00

Todd A. Anderson

Intel Labs

Architecture

CE Manager
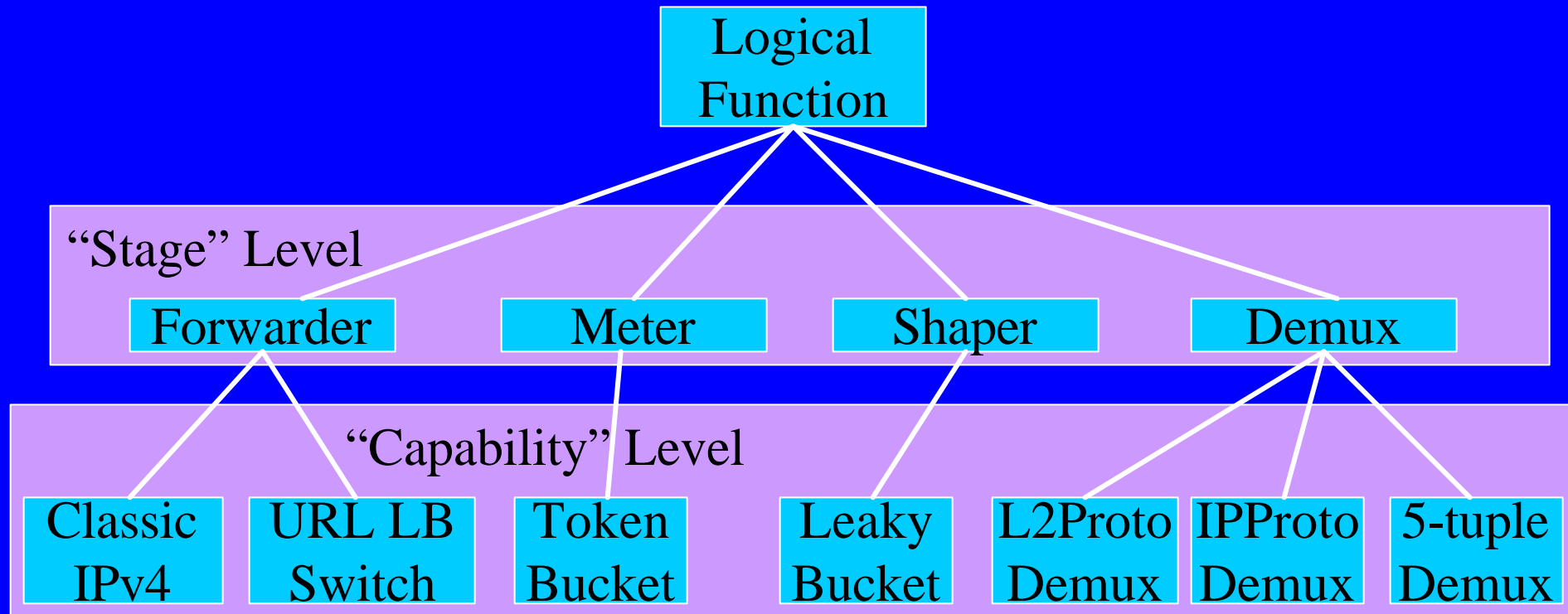
CE Set

CE ... CE

Gc

Gr

CE

Gl

Gr

...

CE Set

CE ... CE

Gr

CE

Gp

FE Manager

FE ... FE

Gf

Gi

Network Element
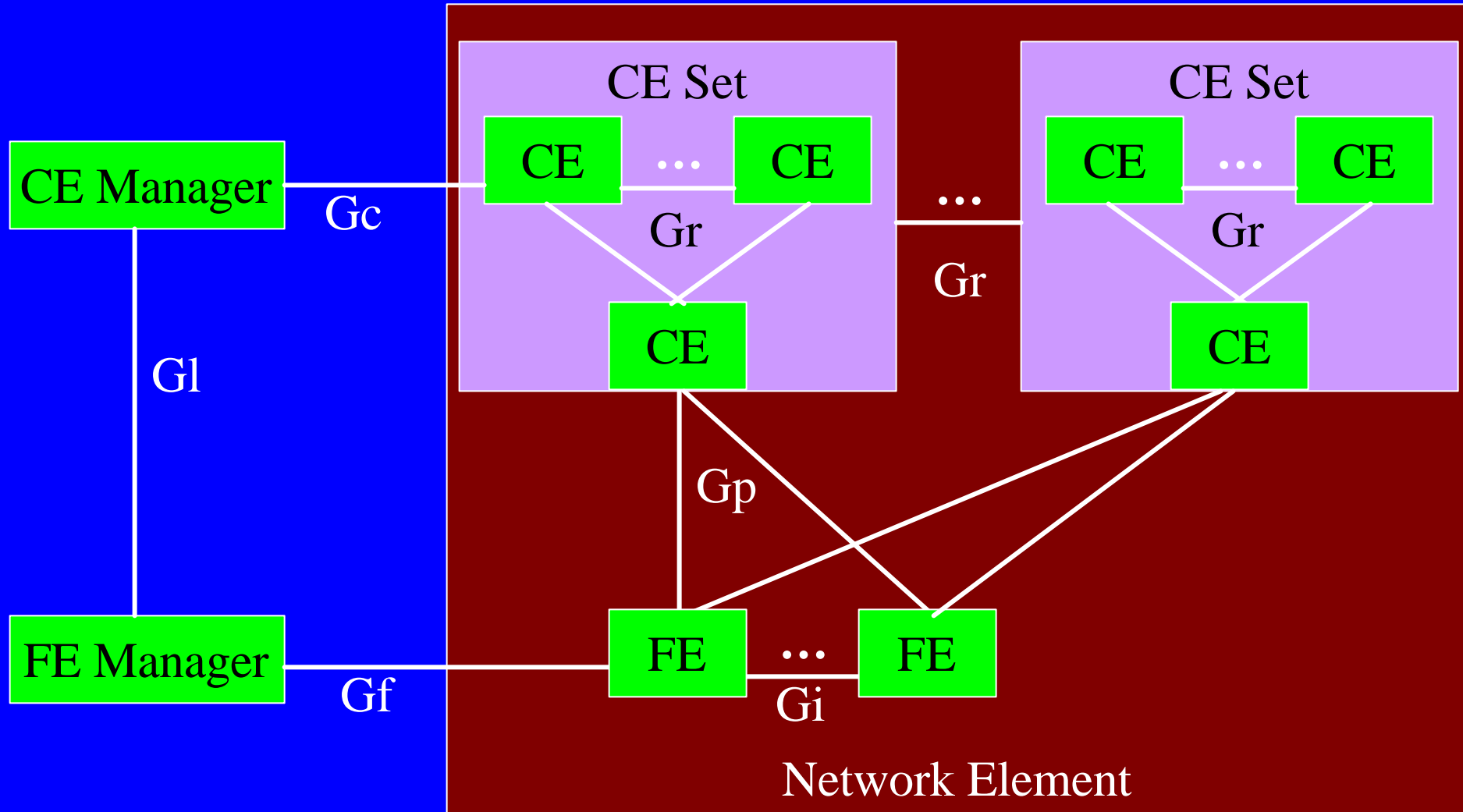
Forwarding Element Model

- Goal: define a way to express the capabilities of a FE in a manner convenient to CEs.

- Solution: use a two level hierarchy.

```
                        Logical
                        Function

"Stage" Level

        Forwarder      Meter      Shaper      Demux

                    "Capability" Level

Classic    URL LB    Token    Leaky    L2Proto   IPProto   5-tuple
IPv4       Switch    Bucket   Bucket   Demux     Demux     Demux
```

Stage Level

- Gives an overview of what the FE can do in terms of the stages it supports.
  - Need a namespace for different stage types.
- Allows multiples of the same stage in a FE.
  - Need per stage instance IDs.
- Allows the description of arbitrary stage topologies.
- Estimate 15-20 kinds of stages.

Capability Level

- Describes the detailed abilities of each stage instance.

- Uses a uniform methodology across different stages.

- Each stage does at most 5 things:
  - Classifies the packet.
  - Acts on the result of the classification.
  - Keeps statistics.
  - Generates events.
  - Uses parameters.

- Stages can be:
  - Read-only.
  - Have default classification/action pairs or parameters.
  - Have restrictions on allowable values.

Classification Abilities

- Variable length sequence of "properties" on which the stage can classify.

- Two varieties of properties:
    - Packet properties (e.g., IPproto, SIP, DIP, TOS)
    - Metadata properties (e.g., ingress/egress port)

- Uses a property namespace.

Action Abilities

- Variable length sequence of "actions" that the stage can perform.

- Three varieties of actions:
  - Packet editing (e.g., modify TOS or DIP).
  - Metadata editing (e.g., set egress port).
  - Target selection (e.g., send packet to "drop" target).

- Uses an action namespace.

Event Abilities

- Variable length sequence of "events" that the stage might generate.

- Example events: packet redirection, port up/down, forwarding table miss.

- Uses an event namespace.

Statistics Abilities

- Variable length sequence of "statistics" that the stage maintains as it processing packets.

- Example statistics: # of packets processed, # of forwarding table misses.

- Uses a statistics namespace.

Parameter Abilities

- Variable length sequence of "parameters" used by the stage.

- Parameters are the "knobs and dials" of the stage.

- Affects how the stage processes packets…not a per packet configuration.

- Uses a parameter namespace.

Default Values

- Stage capability description must include:
  - # of default classification/action entries.
  - # of default properties.
  - List of TLVs for each classification/action entry.
  - List of TLVs for each property.
- T = one of the namespace "names".
- L = straight-forward.
- V = a standard data structure associated with the given name.

Restrictions on Allowable Values

- Stages may place restrictions on the values of properties, actions, parameters, statistics, or events.

- Solution:
  - For each ability, the min and max allowable values are specified using the existing TLV approach.
  - For properties, equality, inequality, and range matching abilities are also specified.

Questions?