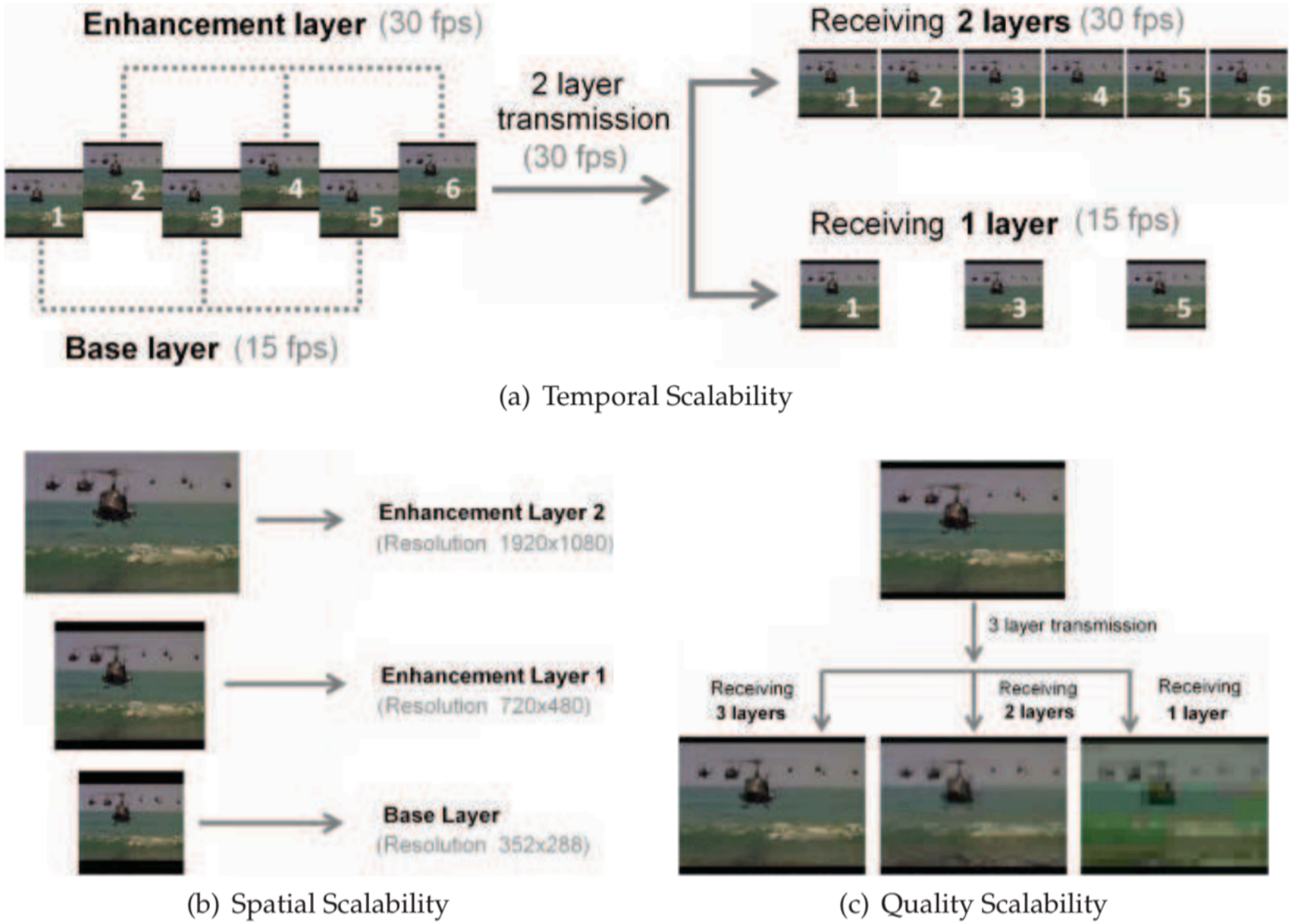
Scalable Video Streaming with Media Aware-Network Element implement in P4 Language

Scalable Video Coding



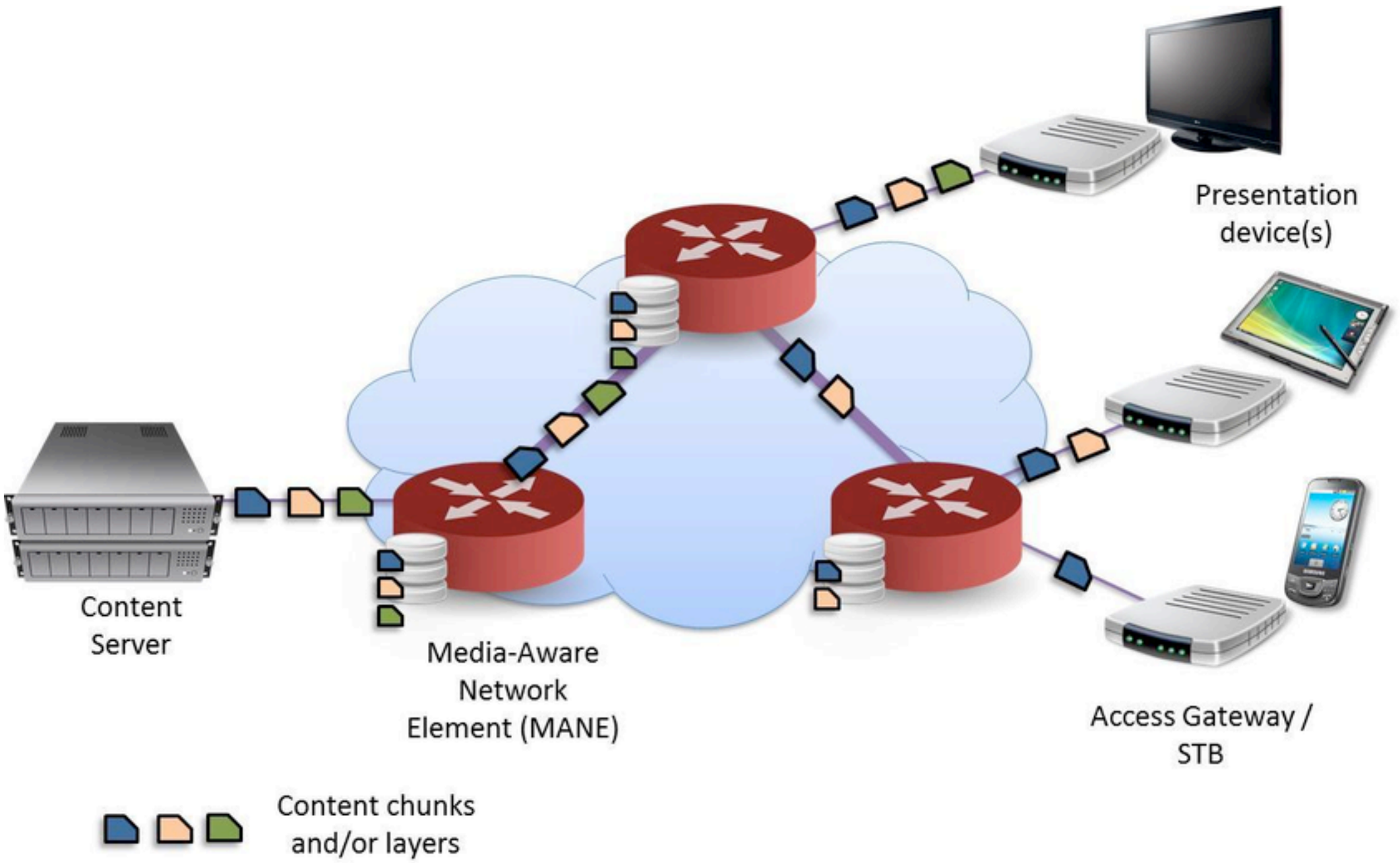
(a) Temporal Scalability

(b) Spatial Scalability

(c) Quality Scalability

Fig. 2. Illustrative example of scalability approaches in H.264/SVC.

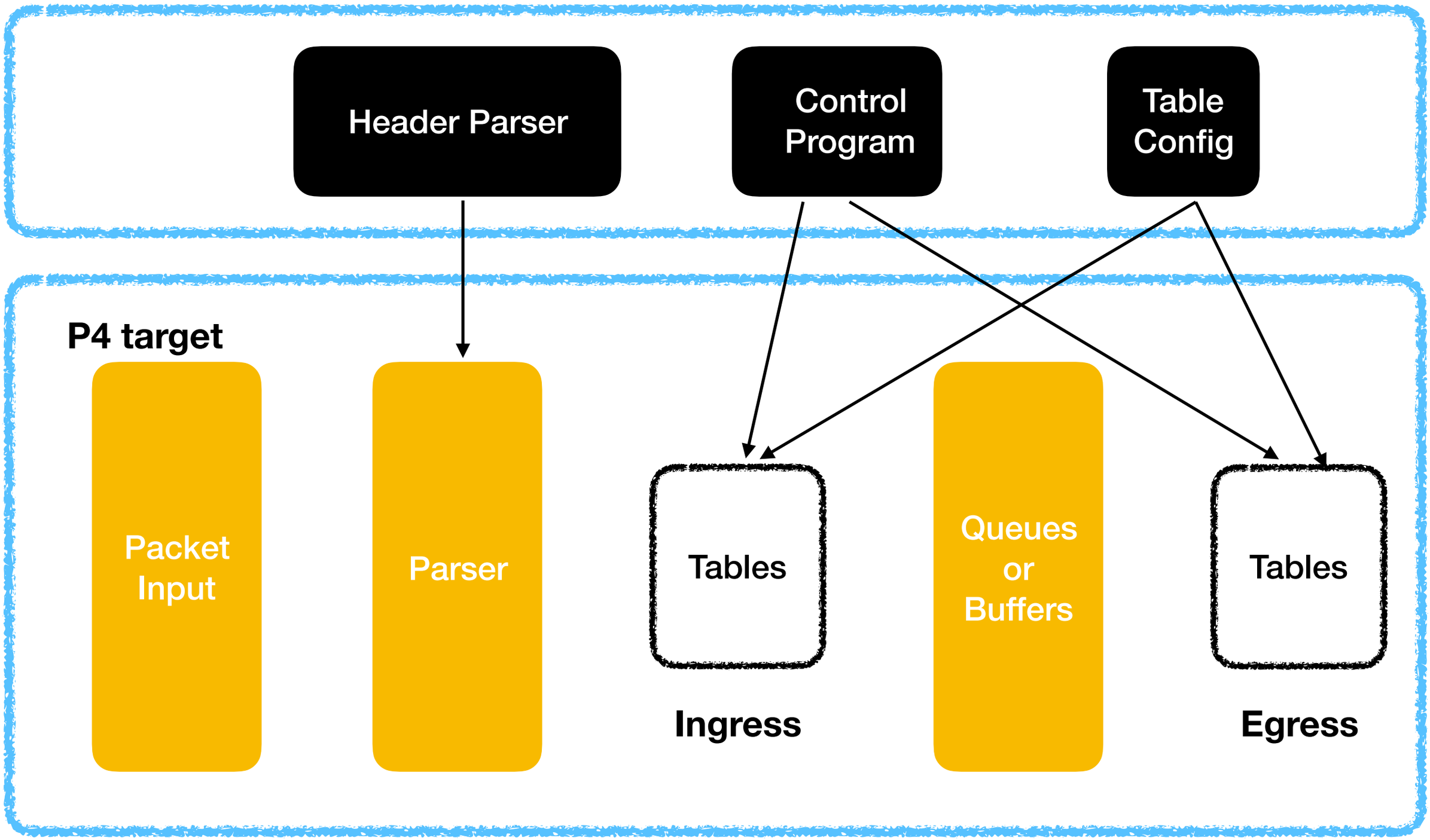
MANE


Presentation
device(s)
Content
Server
Media-Aware
Network
Element (MANE)
Access Gateway /
STB
Content chunks
and/or layers

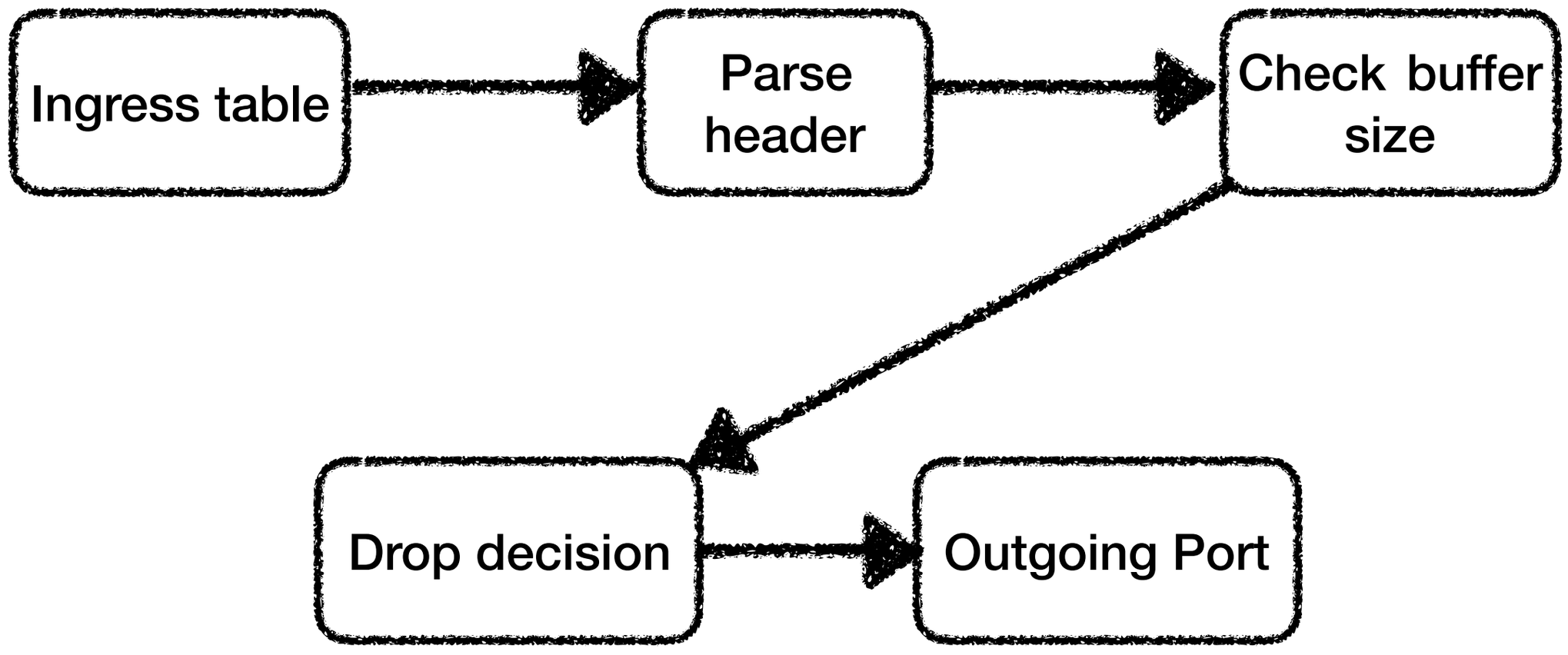
P4

- Protocol Independent
  - P4 program specifies how a switch processes packets
- Target Independent
  - P4 is suitable for describing everything from high-performance forwarding ASICs to software switches
- Field Configurable
  - P4 allows network engineers to change the way their switches process packets after they deployed

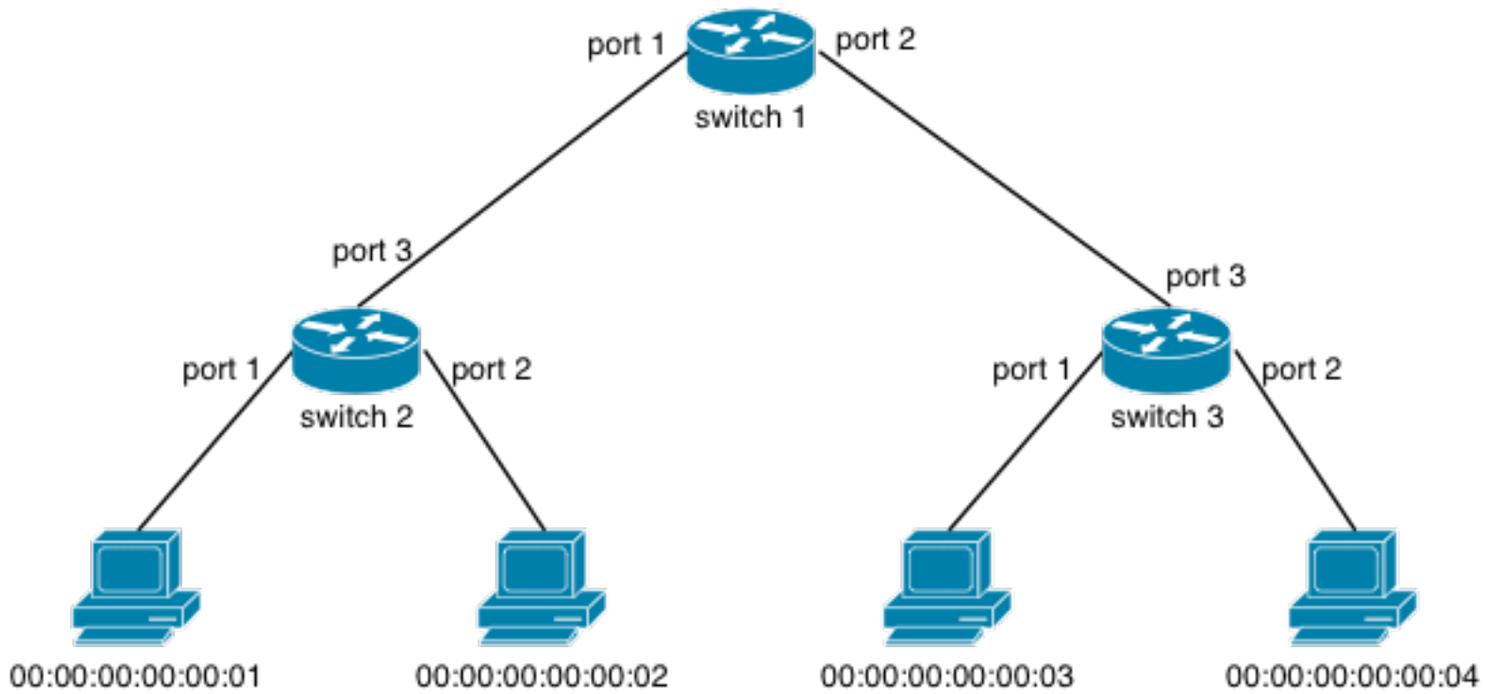
Architecture



Implementation



P4-Switch


port 1
port 2
switch 1
port 3
port 1
port 2
switch 2
port 3
port 1
port 2
switch 3
00:00:00:00:00:01
00:00:00:00:00:02
00:00:00:00:00:03
00:00:00:00:00:04


App.p4
App.json
bmv2

Drop Logics

1. Tail

2. Enhancement-Layer

3. Rate Distortion Optimize

ONOS

- The only SDN controller platform that supports the transition from legacy networks to SDN networks.
- High Availability and Resiliency
- Performance at Scale
- Modular Software
- GUI Framework and Base UI

P4 Runtime

- A protocol for controller to control p4-based switch
  - Device discovery
  - p4 pipeline provisioning
  - Match-Action table operations (via existing ONOS APIs such as FlowRule, FlowObjective, or Intent)
  - Action profile group operations (via Group ONOS API)
  - Packet-ins and packet-outs
  - Counter reads

Scenarios

1. Intelligent packet drop of a single video stream

2. Optimal packet drop across multiple video streams

3. Error resilience with real P4 switches