ONOS Southbound & Application

James Won-Ki Hong, Jian Li, Seyeon Jeong

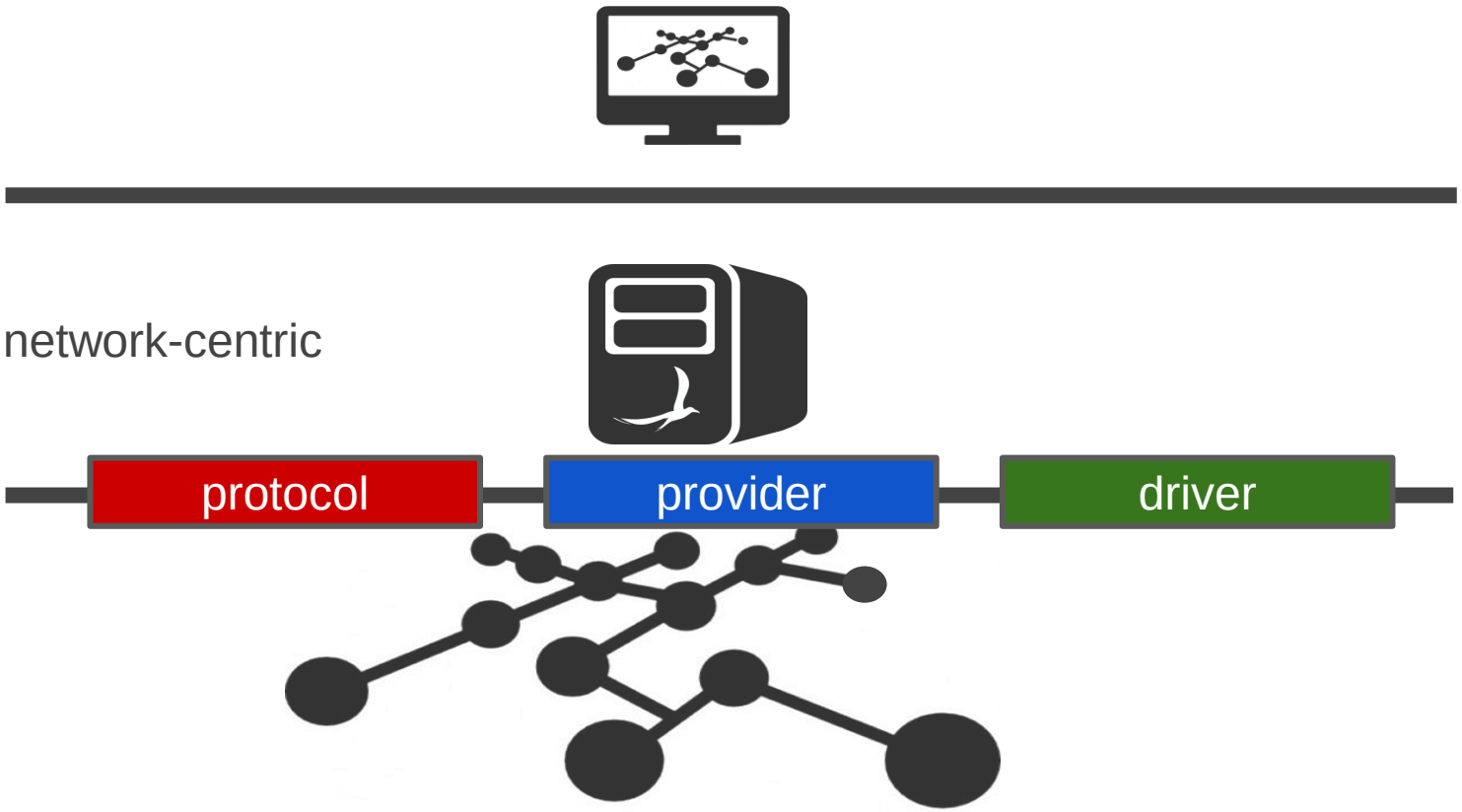
Dept. of Computer Science & Engineering

POSTECH

http://dpnm.postech.ac.kr/~jwkhong

jwkhong@postech.ac.kr

Southbound



Southbound Overview (1/2)

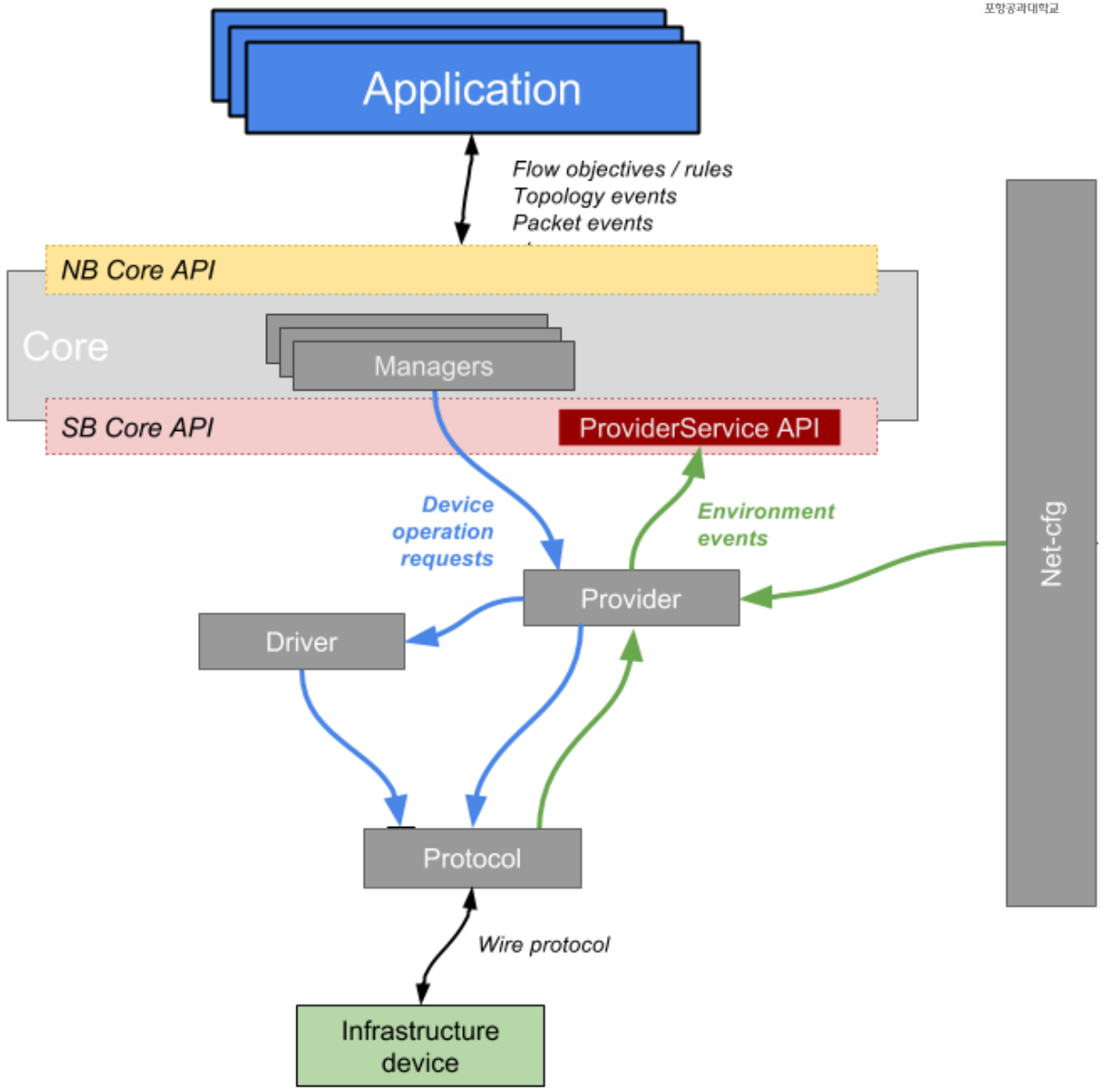
❖ Southbound Protocols in 1.11.0

- OpenFlow 1.3 + optical extension → 1.5 is work-in-progress
- OVSDB
- NETCONF + YANG → Yang tools and Yang management system (IETF)
- SNMP → Simple Network Management Protocol (IETF)
- P4 → thrift API for BMv2 softswitch
- BGPLS, ISIS, OSPF → interoperability with legacy network
- PCEP → Path Computation Element Protocol (IETF)
- REST and RESTCONF
- LISP → Locator/Identifier Separation Protocol (IETF)
- TL1
- gRPC

Southbound Overview (2/2)

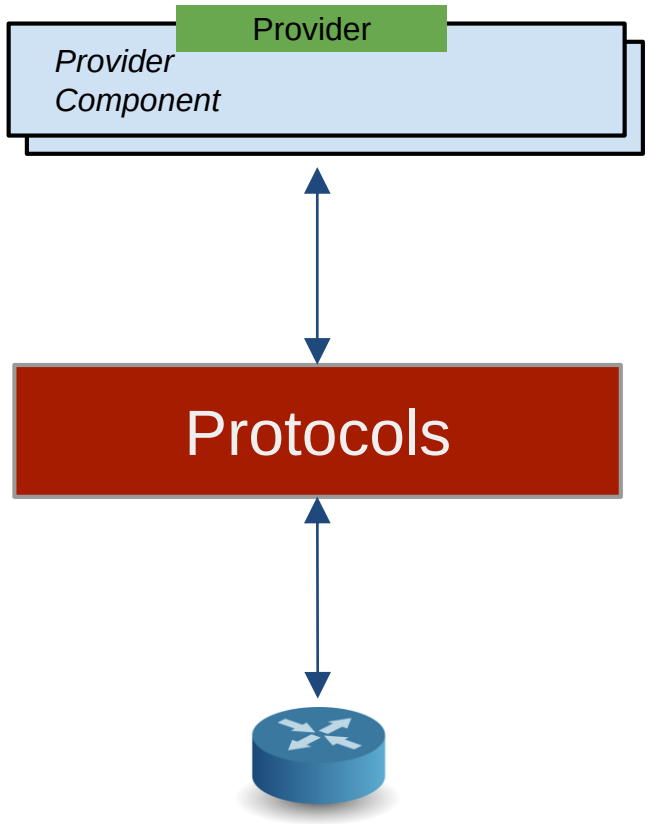
❖ SBI Interactions

- ONOS interacts with the underlying network with the help of its providers
- Providers
  - Hide complexity from upper layers
- Protocols
  - Features and modules to communicate with devices
- Drivers
  - Define specific capabilities offered by the device

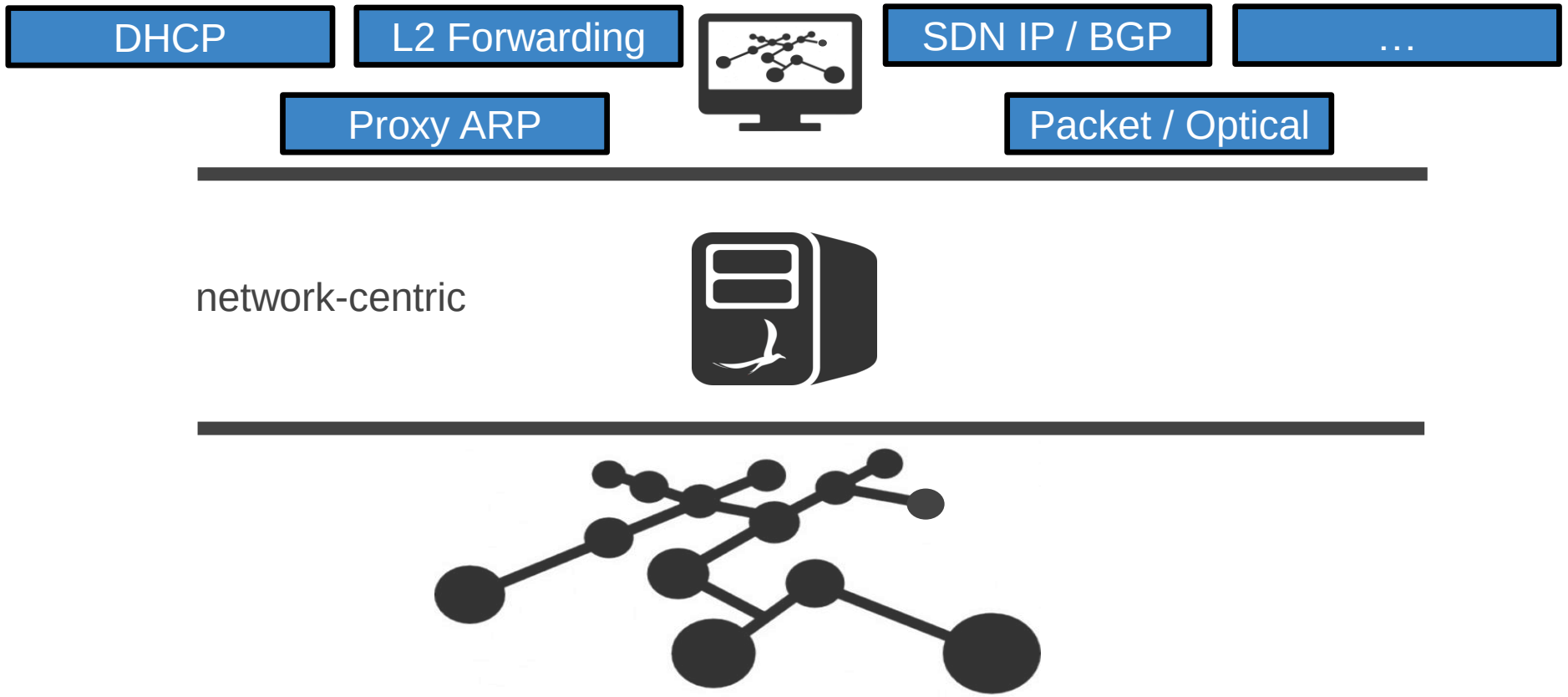


Southbound Protocols

- **Expose the Standard set of APIs and Enabled Operations**
  - OpenFlow
    - FlowMods, GroupMods
  - REST
    - Implements CURD operations
  - NETCONF
    - Open/close session, setConfiguration, getConfiguration
- **Usually leverage 3rd party communication libraries**
  - Openflowj, snmp4j, thrift, gRPC, netty, etc.



Applications



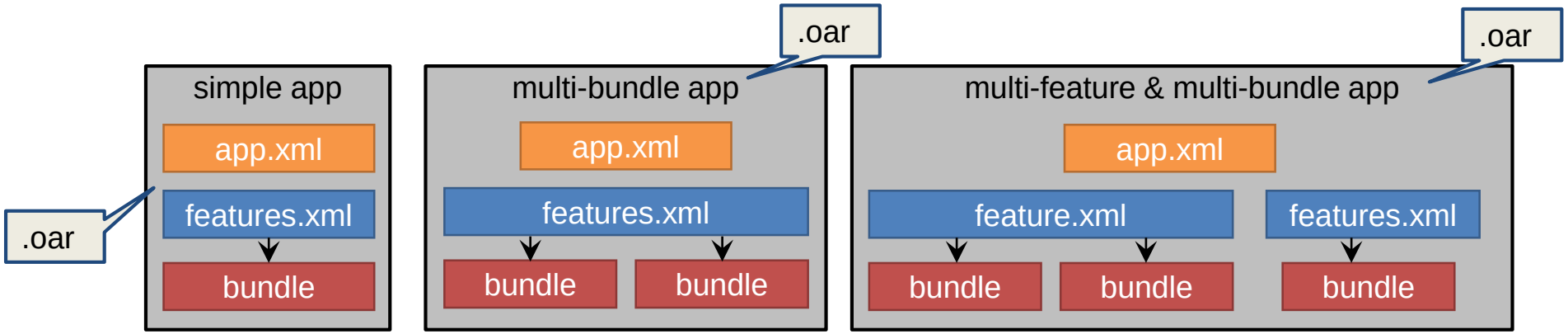
Application Subsystem (1/2)

❖ Overview

- Facilitate easy software delivery and management across all ONOS instances
- Relies on the underlying Apache Karaf feature mechanism
  - No need to restart ONOS for installing/uninstalling new applications

❖ Application Package

- Applications can be packaged into a single .oar (ONOS Application aRchive) file
  - .oar file is a JAR file contains all artifacts
    - E.g., app.xml, features.xml and a set of (OSGi) bundles
  - onos-maven-plugin generates an *.oar file as part of Maven build



Application Subsystem (2/2)

❖ Application Types

- Application as a mere Component
  - Offers no API, self-contained
- Application with Service Interface
  - Offers API for other applications (e.g., CLI, REST API, web gui)
- Application may have its own state
  - Delegates responsibility for tracking state

❖ Builtin Sample Applications

No.	Full App Name	Description
1	org.onosproject.bgprouter	BGP router application
2	org.onosproject.config	Network configuration application
3	org.onosproject.demo	Flow throughput test application
4	org.onosproject.fwd	Reactive forwarding application using flow subsystem
5	org.onosproject.intentperf	Intent performance test application
6	org.onosproject.mobility	Host mobility application
7	org.onosproject.proxyarp	Proxy ARP/NDP application
8	org.onosproject.sdnip	SDN/IP use-case application

ONOS Recap

OpenStack Integration

Segment Routing

SDN-IP

*CORD

DHCP Server

Control Plane Manager

Virtual Tenant Networks

Load Balancer

ProxyARP

Distributed DPI

Service Function Chaining

Virtual Private LAN

Fault Management

TL1

OSPF

REST

IS-IS

SNMP

P4

PCEP

LISP

BGP

NETCONF

OVSDB

OpenFlow

ONOS Release History

Q4/14 Avocet
Base Architecture

Q4/15 Emu
OPNFV
SONA
AARNET
KREONET-S

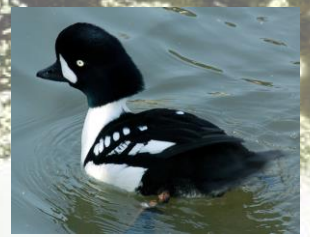
Q4/16 Ibis
BUCK Build Tool
Trellis Fabric enhancement
LISP SBI support, REST
Client, FatTree simulator

Q1/15 Blackbird
Performance

Q1/16 Falcon
ONS Use Cases
{A, E, M} CORD
Disaggregated ROADM
Global R&E Deployment

Q1/17 Junco
TL1 SBI support
Virtualization support
Regionalization support
Dynamic conf. enhancement

Q2/15 Cardinal
ONS Use Cases
SDN-IP
Packet Optical
R-CORD



Q2/16 Goldeneye
CPMan Apps
Intents using Flow Objectives
P4 DEMO support
YANG tool chain

Q2/17 Kingfisher
YANG Tools 2.0
OpenFlow 1.4 support
Intent F/W imprement
vRouter, OpenROADM support

Q3/15 Drake
ONF ATRIUM
Secure Mode ONOS
VxLAN
Device Configuration

Q3/16 Hummingbird
RabbitMQ, Kafka Message buses
YANG NBI, SBI CODECs
ACTN Traffic Engineering
Distributed system primitives
SB - OSPF, ISIS

Q3/17 Loon
Coming soon…

References

1. ONOS: http://onosproject.org/
2. ONOS Wiki: http://wiki.onosproject.org/
3. ONOS gerrit: http://gerrit.onosproject.org/
4. BMv2: https://wiki.onosproject.org/display/ONOS/P4+Experimental+Support+via+BMv2
5. CPMan: https://wiki.onosproject.org/display/ONOS/Control+Plane+Management+Application
6. ONOS Release Model: https://wiki.onosproject.org/display/ONOS/Release+Model