SDN/NFV Forums, Conferences/Journals and Summary

홍원기교수, 이건박사, 정세연연구원

Dept. of Computer Science & Engineering

POSTECH

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

jwkhong@postech.ac.kr

ONF (Open Networking Foundation)

- Non-profit organization promoting SDN, founded in 2011
- Funded by service providers such as AT&T, China Unicom, Comcast, Deutsche Telekom, Google, NTT Communications, SK Telecom, Verizon, and vendors such as Cisco, Ericsson, Huawei, Nokia, Samsung, Intel, etc. (currently over 150 members companies)
- Standardized the OpenFlow protocol
- Offers product and skills certifications
  - OpenFlow® Conformance Testing Program
  - ONF-Certified SDN Professional Program (OCSP)
- Recently merged with Open Networking Lab (ON.Lab)
- Led by Guru Parulkar, Executive Director

OPEN NETWORKING
FOUNDATION

SDN/NFV Forum (http://www.sdnnfv.org)

- **Founded Oct. 1, 2014 in Korea**

SDN/NFV Forum

비전

ICT 기반의 창의적 사회 실현

목표

차세대 네트워크산업의 핵심, SDN/NFV 활성화 기반 마련

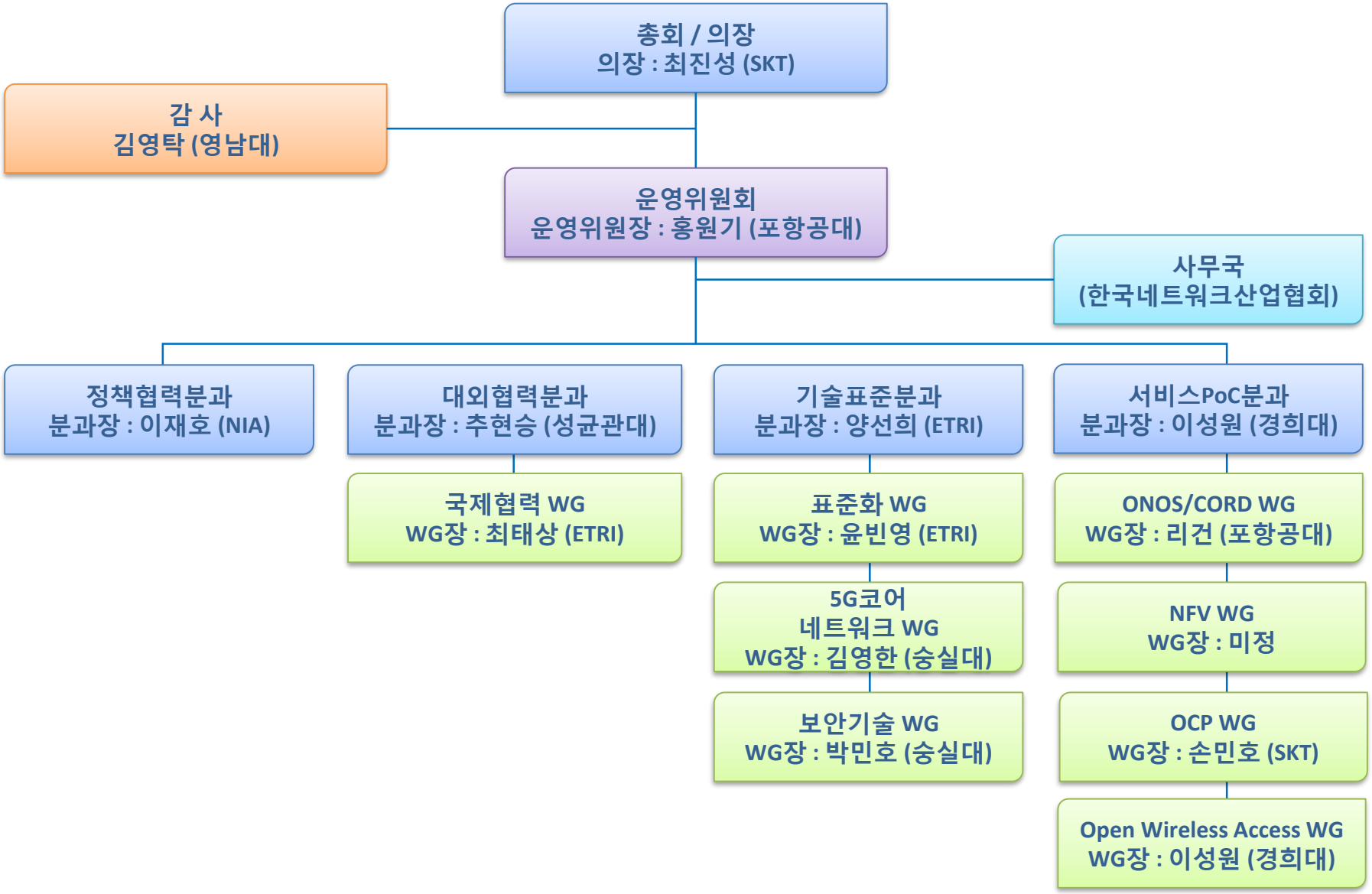
선순환 산업 생태계 구축을 위한 산업 Framework 도출 및 표준화	SDN/NFV 기반 유망 서비스모델 발굴, 시범사업 및 상용화 확산	미래 국가 인프라의 정부 정책 수립 지원 및 수행

추진전략

- SDN/NFV 기술 연구
- 산업 활성화 촉진
- 국가정책 수립 지원
- 대외협력 및 홍보 강화

차세대 네트워크산업 발전을 위한 産 • 學 • 研 • 政 협의의 場 마련

SDN/NFV Forum



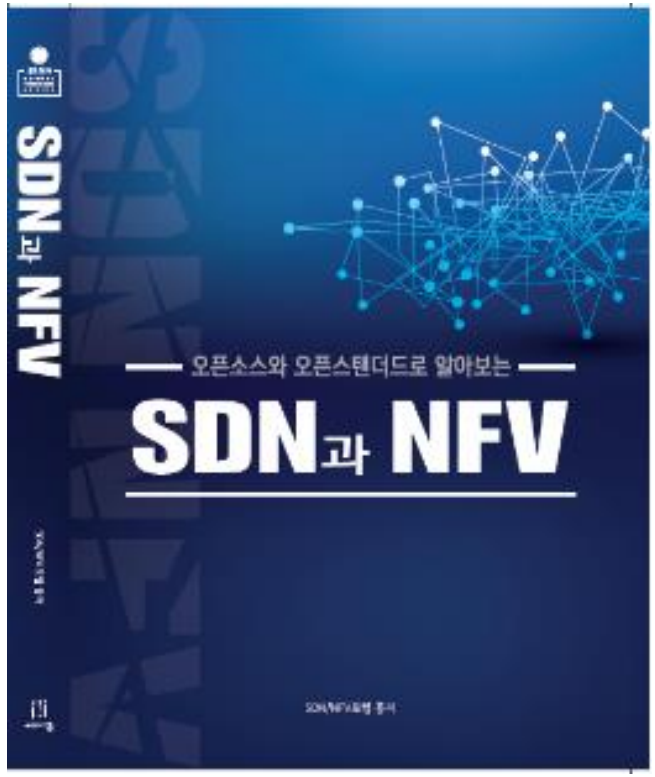
SDN/NFV관련 산학연관 41개사 참여

- 국내외 SDN/NFV 관련 산학연관 41개 기관 참여
  - 135명 회원이 포럼 활동중
- 회원 구성
  - 산업계 : KT, SKT, LGU+, 에릭슨LG, 삼성전자, 유비쿼스, 코위버, 우리넷, 나임네트웍스, 인텔, 파이오링크, 콘텔라, 유엔젤, 아토리서치, Vmware, 이루온, 다산네트웍솔루션즈, 지니테크, 넷비젼텔레콤, 구름네트웍스, 크로스젠, 안랩, 텔레필드
  - 기관(협회) : IITP, NIA, KISA, ETRI, KISTI, TTA
  - 학계 : 포항공대, 영남대, 경희대, 성균관대, 서울대, 고려대, 연세대, KAIST, 광주과기원, 광운대, 계명대, 숭실대

산업체 (24)	학 계 (12)	연구소 및 정부기관 (6)
kt, SK telecom, U+, SAMSUNG, LG, NAIM, ERICSSON, intel, Atto Research, ubiQuoss	서울대학교, KAIST 한국과학기술원, 경희대학교 KYUNG HEE UNIVERSITY, 연세대학교 YONSEI UNIVERSITY, POSTECH 포항공과대학교, 계명대학교 KEIMYUNG UNIVERSITY, 광운대학교 KWANGWOON UNIVERSITY, 광주과학기술원 Gwangju Institute of Science and Technology	KISA Korea Internet & Security Agency, NIA NATIONAL INFORMATION SOCIETY AGENCY, ETRI, KISTI 한국과학기술정보연구원, TTA, IITP 정보통신기술진흥센터

SDN/NFV Book

- SDN/NFV 책자 발간 (‘16년 5월)
- 책자명 : 오픈소스와 오픈스탠더드로 알아보는 SDN과 NFV
  - 저　자 : SDN/NFV포럼 공저
    (SDN/NFV포럼 표준화WG & TTA PG220 표준전문가 25명 공저)
  - 내　용
    . 1부 : SDN과 NFV에 대한 이해
    . 2부 : SDN 오픈소스와 오픈스탠더드
    . 3부 : NFV 오픈소스와 오픈스탠더드
    . 4부 : SDN과 NFV의 결합
    . 5부 : SDN/NFV의 새로운 분야와 서비스
    . 6부 : 시사점



- 책 및 구매 정보
  - http://www.acornpub.co.kr/book/sdn-nfv

ONK (Open Networking Korea)

- **Open Networking Korea 2015 (‘15년 11월)**
  - SDN/NFV기술에 대한 R&D현황, 통신사 기술도입 계획, 표준화 동향, 325여명 참석

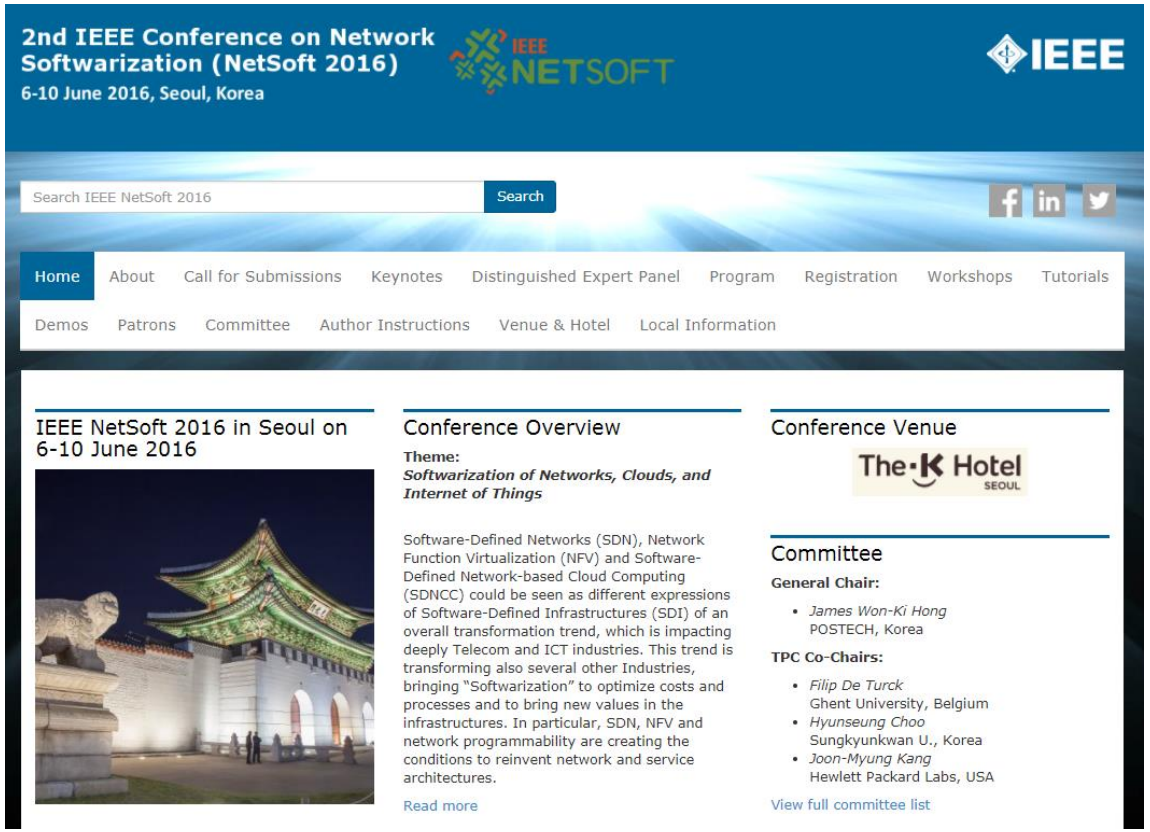
- **Open Networking Korea 2016 Spring (‘16년 4월)**
  - 산학연에서 추진중인 SDN/NFV 기술개발 현황 공유, ONOS 및 CORD 소개, 140여명 참석

- **Open Networking Korea 2016 Fall (‘16년 11월)**
  - 산학연에서 추진중인 SDN/NFV 관련 국가과제(IITP)의 개발 기술 소개공유, ODL Code Walkthrough 소개, 200여명 참석

- **Open Networking Korea 2017 Spring (‘17년 4월)**
  - 산학연에서 추진중인 SDN/NFV 기술개발 현황 공유, OPNFV, Open Source SDN/NFV/CLOUD 소개, 260명 참석

NetSoft (http://sites.ieee.org/netsoft)

- **New IEEE conference focusing on *"Network Softwarization"***
- **NetSoft 2016 (June 6-10, 2016)**
  - 7 keynote speakers, 57 technical papers
  - 250 attendees (http://sites.ieee.org/netsoft-2016/)
- **General Chair**
  - Prof. James Won-Ki Hong
- **Workshops**
  - SDN and IoT
  - Open-Source Software Networking (OSSN)
  - Software Defined 5G Networks (Soft5G)
  - Security in Virtualized Networks (Sec-VirtNet)
- **Tutorials**
  - Smart Applications on Virtual Infrastructure (SAVI)
  - NFV Management and Orchestration in the Age of 5G
  - P4
  - Central Office Re-architected as a Data Center (CORD)
  - Powering Internet of Things with Cloud and NFV
  - Software Defined Network Security – In Practice



- NetSoft 2015 (London, UK, Apr. 13-17, 2015) (http://sites.ieee.org/netsoft-2015/)
- NetSoft 2017 (Bologna, Italy, July 3-7, 2017) (http://sites.ieee.org/netsoft)
- NetSoft 2018 (Montreal, Canada, June 25-29, 2018)

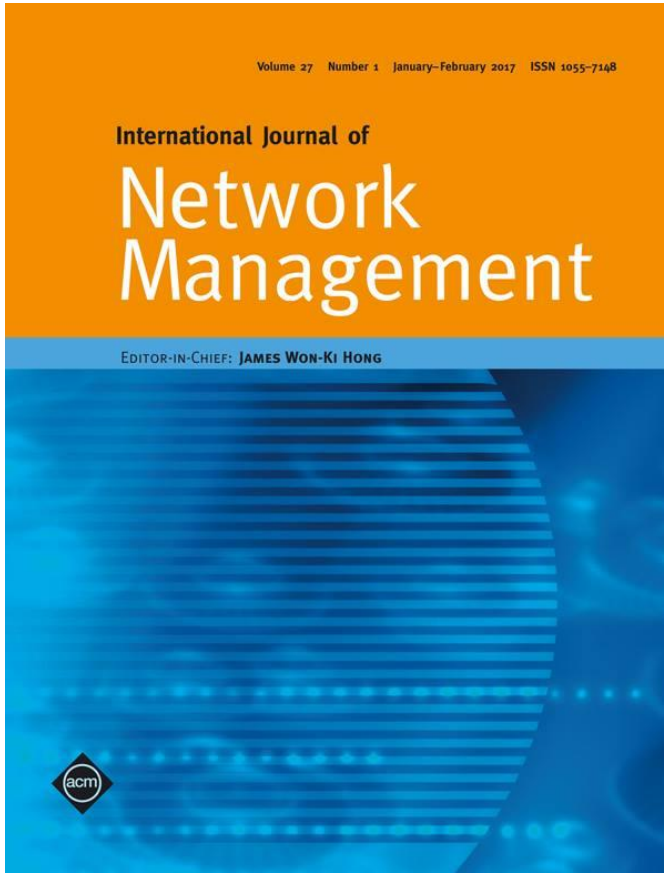
ONOS Build 2017 (http://onosbuild.org)

- Open Networking Foundation (ONF)'s developers conference focusing on the ONOS project
- More than 300 ONOS developers from around the world is expected to attend
- Program: keynotes, oral/poster presentations, hands-on tutorials, hackathon
- The first ONOS Build (2016) was held in Paris
  - https://onosbuild16.lip6.fr/
- Sept 20~22, 2017 @ Samsung R&D Campus, Seoul
- Organized by ONF, sponsored by Samsung & SDN/NFV Forum

IJNM

International Journal of Network Management

- Publisher: Wiley
- Editor-in-Chief: Prof. James Won-Ki Hong
- Impact Factor: 1.118, SCI(E)
- http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1190



Keywords

- SDN/NFV
- IoT management
- 5G network management
- Mobile network management
- Telecommunications networks
- Network & service management
- Network monitoring and analysis
- Network security

Virtual Issue (free!)

- http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1190/homepage/VirtualIssuesPage.html

Concluding Remarks

- Urgent need to reduce CAPEX & OPEX by Telcos
- Need for more flexible, agile, efficient infrastructure to reduce time-to-market for new services & to be competitive
- **SDN/NFV = 'Open Networking'** is a promising solution
- Many related startups in US & Europe, very few in Korea
- Global vendors (including Ericsson, Huawei, Nokia, HPE) are actively participating
- Korean vendors need to participate more on these open networking R&D projects

SDN/NFV Course Overview

POSTECH SDN/NFV Course Overview

- Week 1: SDN/NFV and Open Networking Ecosystem Intro
- Week 2: Introduction to SDN and OpenFlow
- Week 3: SDN Applications and Controllers
- Week 4: Open Network Operating System (ONOS)
- Week 5: ONOS Installation Tutorial
- Week 6: Mininet Tutorials & ONOS NBIs
- Week 7: ONOS Code Walkthrough
- Week 8: NFV-MANO (MANagement and Orchestration)
- Week 9: Fast Packet Processing Methods & OpenStack Intro.
- Week 10: OpenStack Installation
- Week 11: OpenStack Setup using Horizon
- Week 12: OpenStack Additional Setup
- Week 13: Open vSwitch with DPDK Installation on OpenStack


Q & A

Appendix

Glossary

- BSS: Business Support Systems
- OSS: Operations Support Systems
- GSR: Gigabit Switch Router
- ACR: Access Control Router
- RAS: Radio Access Station
- vOLT: virtual Optical Line Terminal
- vSG: virtual Subscriber Gateway
- RRU: Remote Radio Unit
- BBU: BaseBand Unit
- SON: Self-Organizing Networks
- GPON: Gigabit Passive Optical Network
- ONT: Optical Network Terminal
- PCE: Path Computation Element
- MSPP: Multi Service Provisioning Platform
- OXC: Optical Cross-Connect
- PTN: Packet Transport Network
- RNE: Radio Network Elements
- CNE: Core Network Elements
- FuAg: Function Agent
- SE: Switching Elements
- RAT: Radio Access Technology
- MBH: Mobile BackHaul
- MFH: Mobile FrontHaul
- FQAM: Frequency & Quadrature Amplitude Modulation
- SCMA: Sparse Code Multiple Access
- NOMA: Non-Orthogonal Multiple Access
- SOMA: Semi Orthogonal Multiple Access
- D2D: Device To Device
- eMTC: enhanced Machine-Type Communication

References (1/2)

Hardware

- P4 – http://p4.org
  - P4 Introduction/Tutorial 2016 – http://www.eventbrite.com/e/p4-introductiontutorial-2016-tickets-23066146465
  - P4 Workshop 2016 – https://www.eventbrite.com/e/p4-workshop-2016-tickets-22712549848
- OCP - http://www.opencompute.org/

Network Switch Operating Systems

- ONL - https://opennetlinux.org/
- OpenSwitch – http://www.openswitch.net/
- Indigo - http://www.projectfloodlight.org/indigo/

Programmable Data Plane Services

- DPDK - http://dpdk.org/
- FD.io - https://fd.io/
- Open vSwitch - http://openvswitch.org/

Network Controllers

- ONOS - http://onosproject.org/
- OpenDaylight - https://www.opendaylight.org/

Carrier Networking Functions

- OPNFV - https://www.opnfv.org/

References (2/2)

- **Operating Systems**
  - Linux - http://www.linuxfoundation.org/
  - FreeBSD - https://www.freebsd.org/
- **Virtual Machines**
  - Xen – http://www.xenproject.org/
  - KVM - http://www.linux-kvm.org/page/Main_Page
- **Containers**
  - Docker - https://www.docker.com/
- **VM/VI Managers**
  - Kubernetes - http://kubernetes.io/
  - OpenStack - https://www.openstack.org/
  - Mesos - http://mesos.apache.org/
- **Management & Orchestration**
  - Open O - https://www.open-o.org/
  - OSM - https://osm.etsi.org/, http://sdn.ieee.org/newsletter/july-2016/opensource-mano
  - ONAP - https://www.onap.org/
- **Application Platforms**
  - Cloud Foundry - https://www.cloudfoundry.org/
  - OpenShift - https://www.openshift.com/
- **Programming Frameworks**
  - Node.js - https://nodejs.org/en/
  - Django - https://www.djangoproject.com/