

# SDN Security

COINS Summer School

Dr. Sandra Scott-Hayward

23 August 2015



ECIT Institute (Est.2003)

Research Excellence & Innovation  
180 people

4 Queen's University Belfast Research Groups

- Digital Communications
- High Frequency Electronics
- Speech, Imaging and Vision Systems
- Secure Digital Systems

CSIT (Est.2009)

A GLOBAL  
**INNOVATION HUB** FOR  
CYBER SECURITY

**NETWORK SECURITY**

**DATA SECURITY**

**CYBER PHYSICAL SYSTEMS**

**MOBILE SECURITY**

**OPEN INNOVATION**

**TIERED MEMBERSHIP**

**KNOWLEDGE TRANSFER**

**VENTURE CREATION**

# Centre for Secure Information Technologies



Est.2009, Based in The ECIT Institute

Initial funding over £30M (CSIT 2 - £38M)

80 People

- Researchers
- Engineers
- Business Development

Largest UK University lab for cyber security technology research

GCHQ Academic Centre of Excellence

Industry Informed

- Open Innovation Model

Strong international links

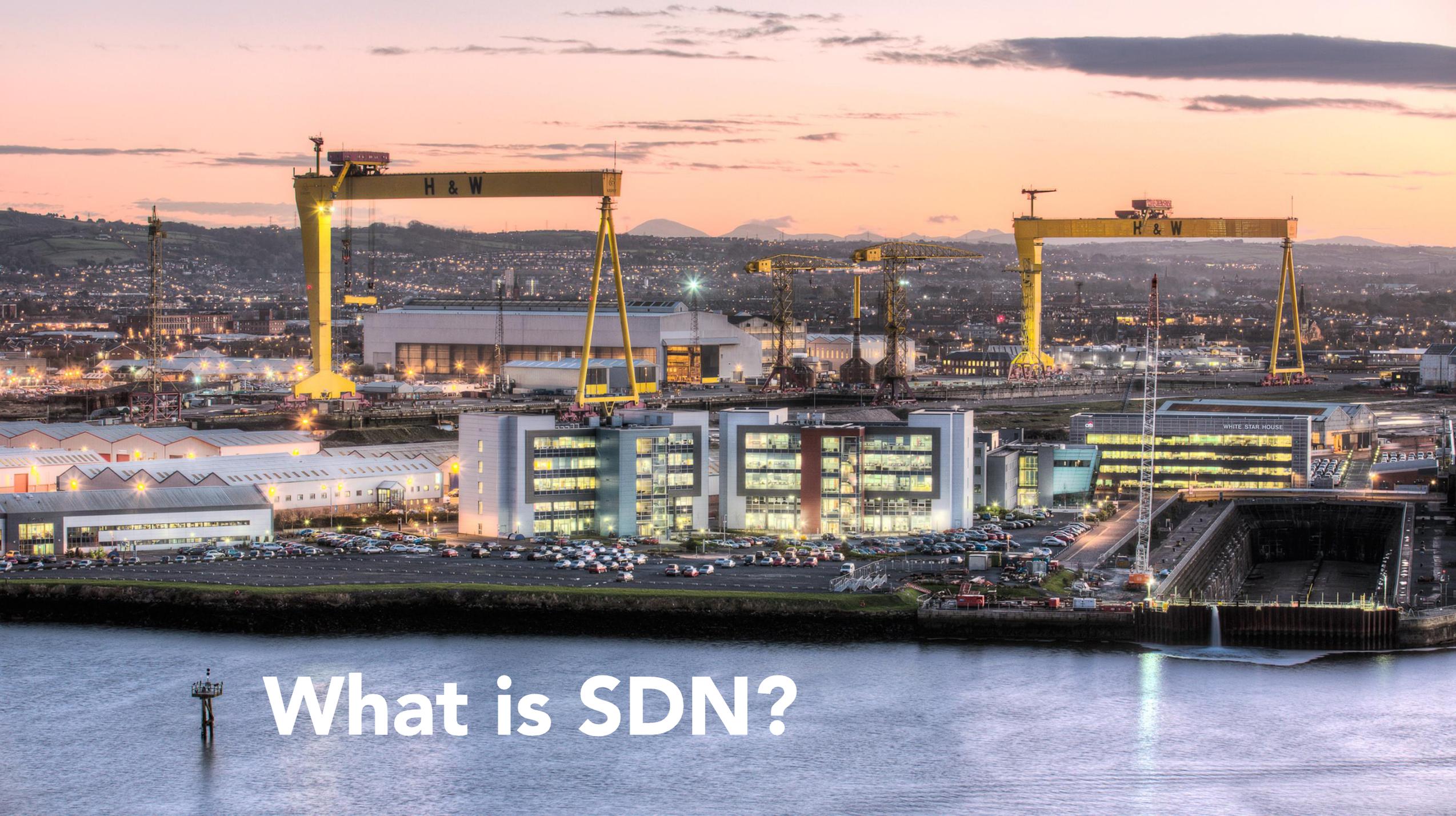
- ETRI, CyLab, GTRI, SRI International
- Cyber Security Technology Summit

Morning Session: 9.30am – 1pm

1. What is SDN?
2. What is OpenFlow?
3. Implementation Challenges of SDN
4. Attacks and Vulnerabilities in SDN
5. Solution to Security Issues in SDN

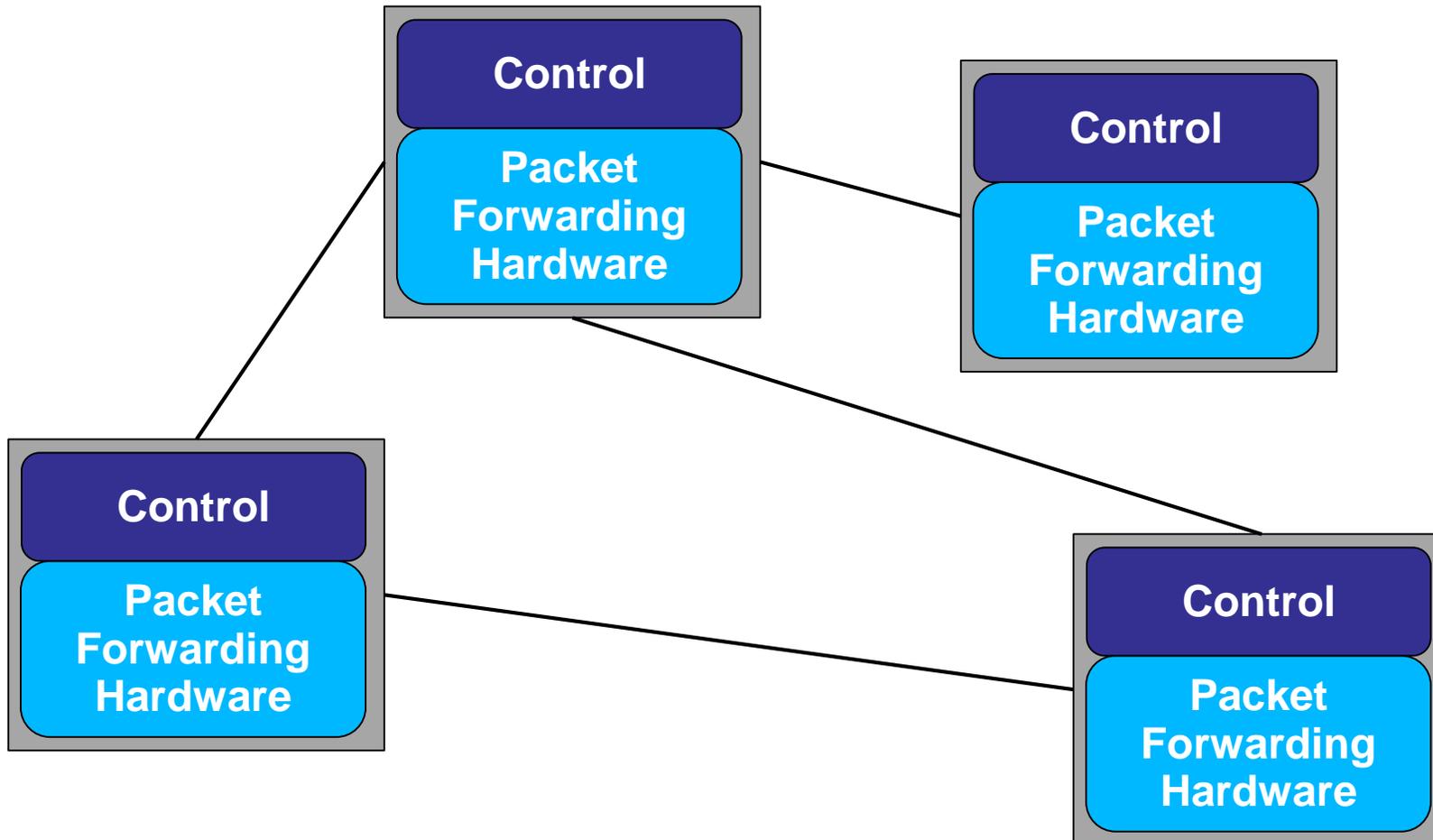
Evening Session: 5pm – 7pm

6. Controller Security
7. Network Security Enhancements using SDN
8. ONF Activities



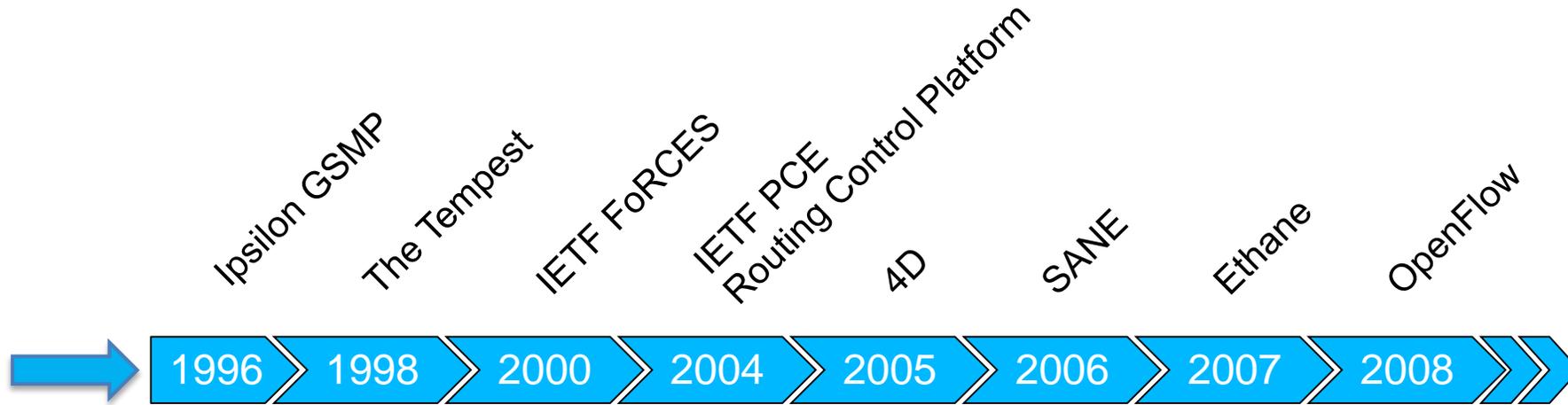
**What is SDN?**

Control and Data Planes combined in Network Elements:



# SDN Evolution

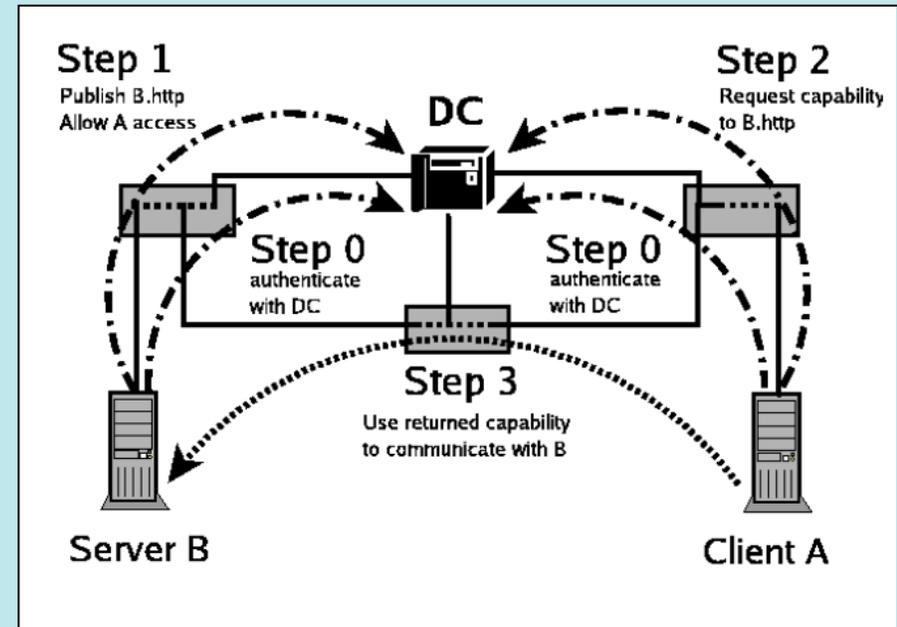
Driven by  
desire to  
provide user-  
controlled  
management  
of forwarding  
in network  
nodes



SANE = *Secure Architecture for the Networked Enterprise*

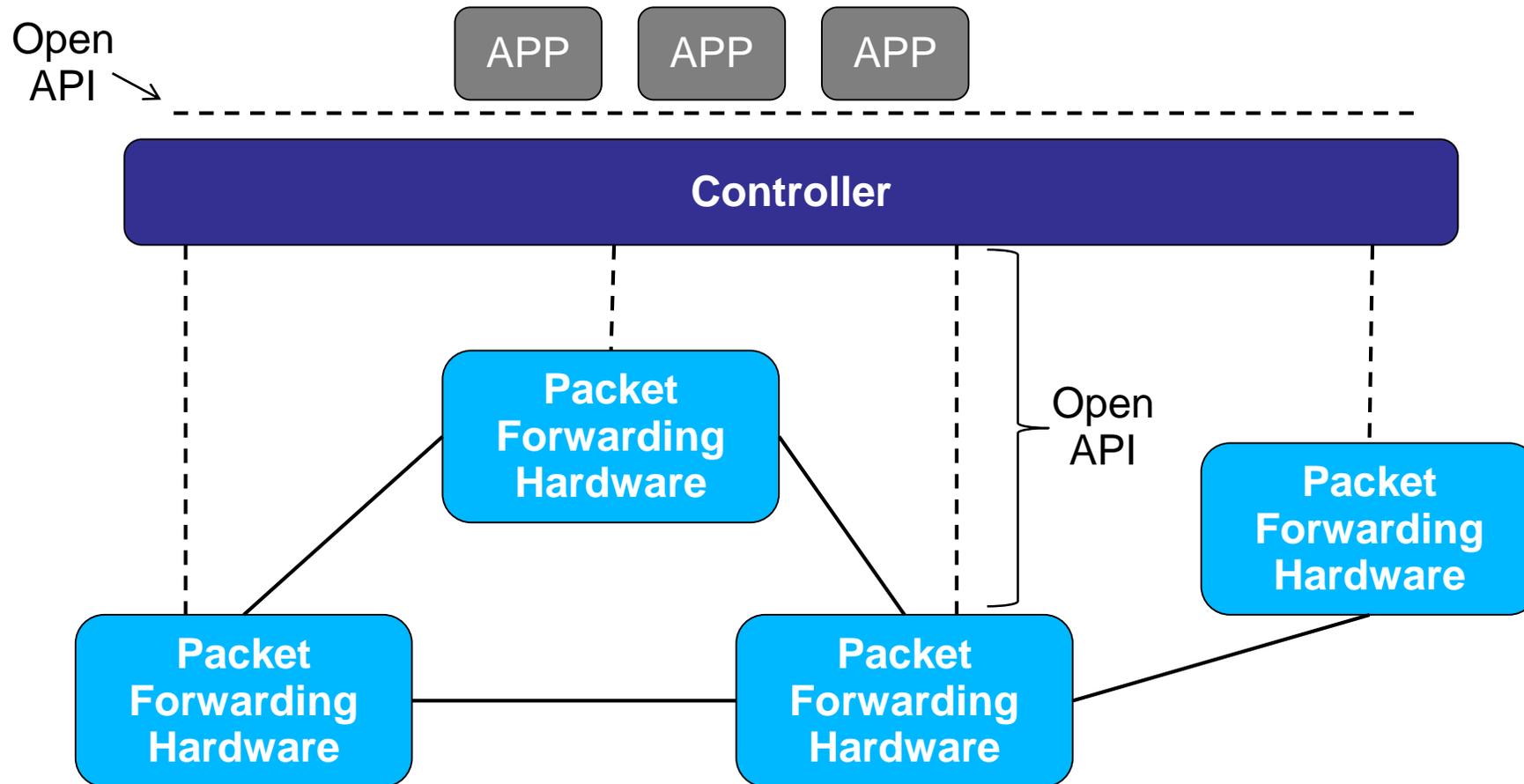
2006 – M. Casado et al.

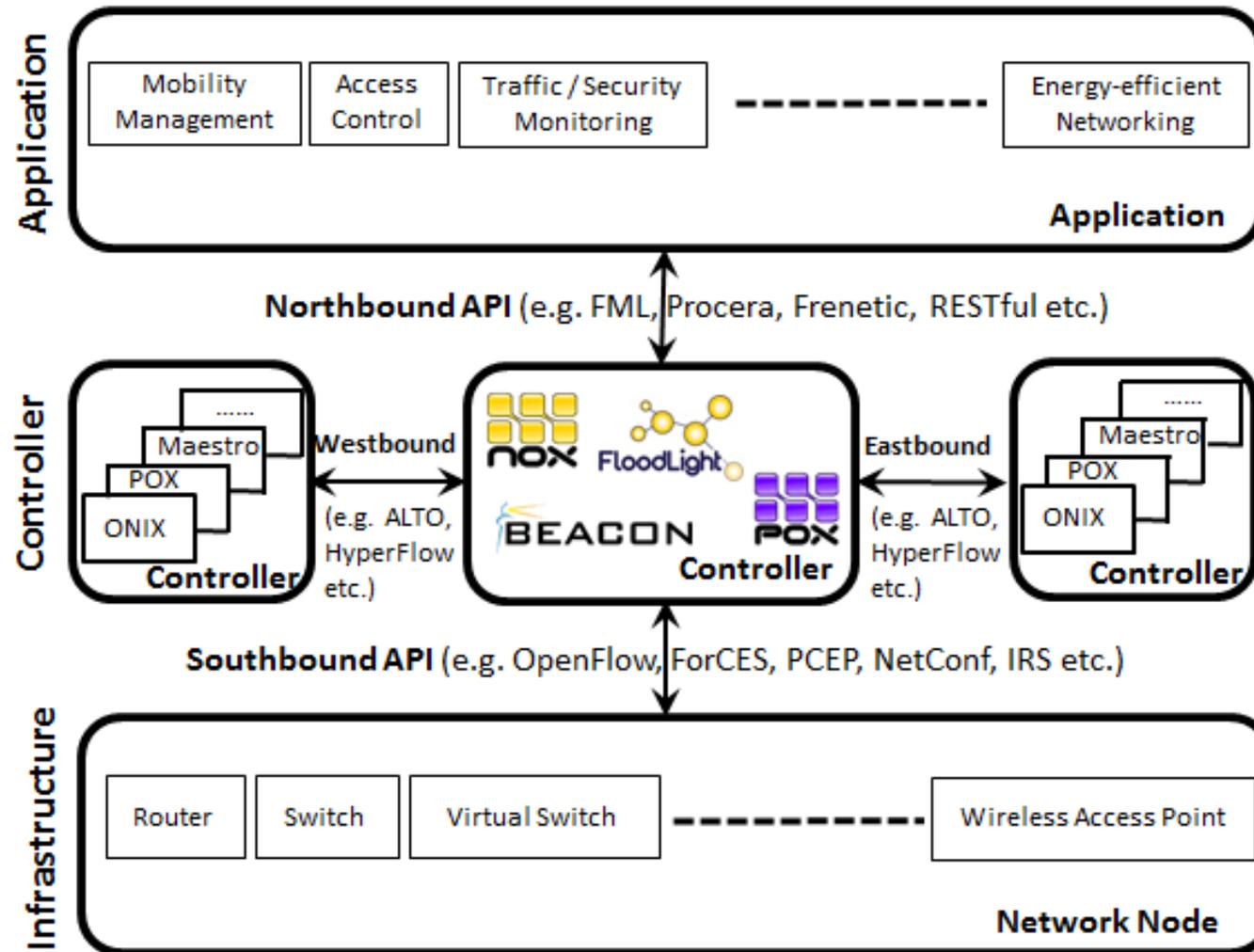
- Logically Centralized Server
  - Trusted Domain Controller (DC)
  - Providing routing and access control decisions
  - Access Control Policies
- Authentication of Hosts and Policy Enforcement
- Principle of least privilege and least knowledge

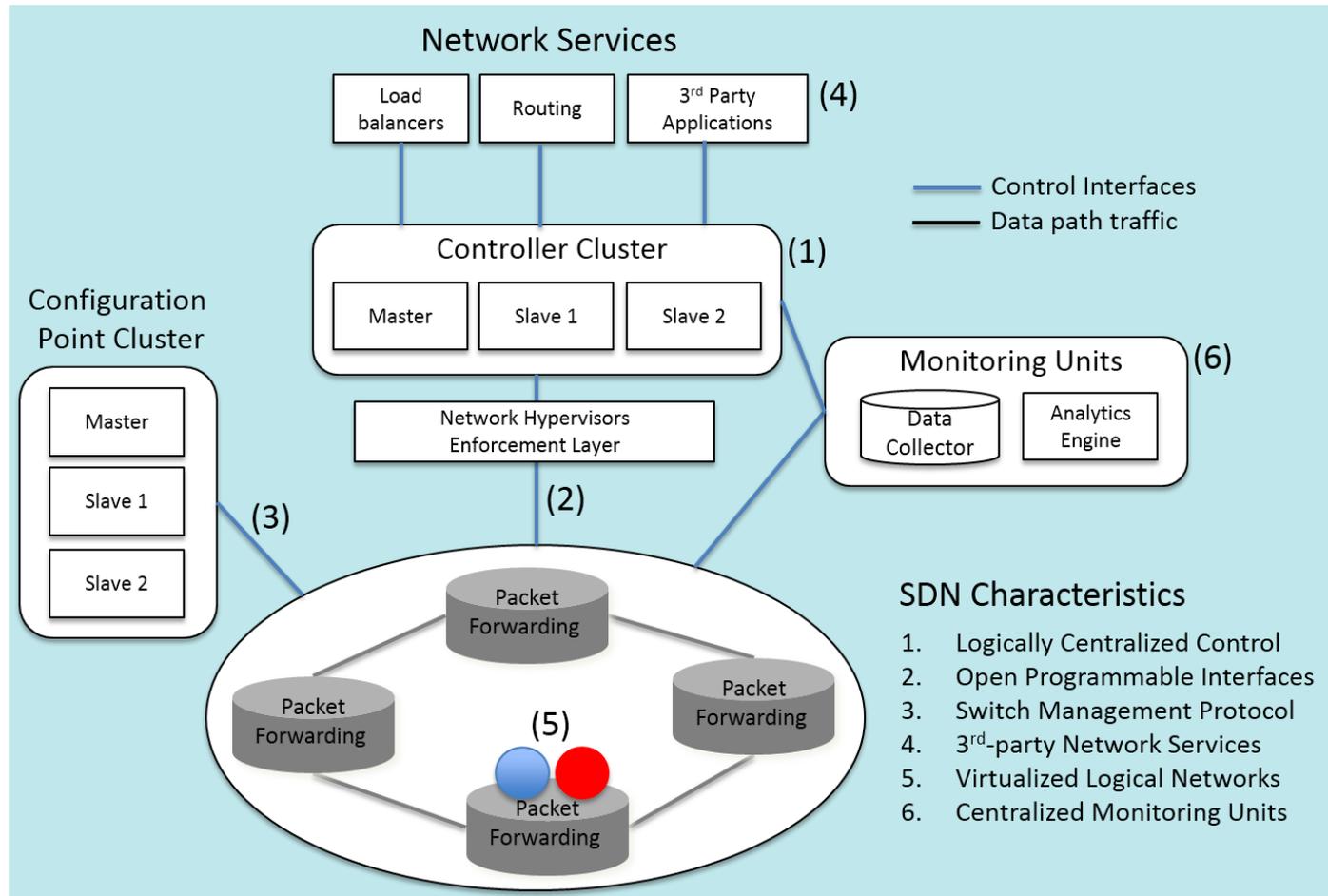


Casado, M. et al., "SANE: A Protection Architecture for Enterprise Networks," Usenix Security, 2006.

## Separation of Control and Data Planes:



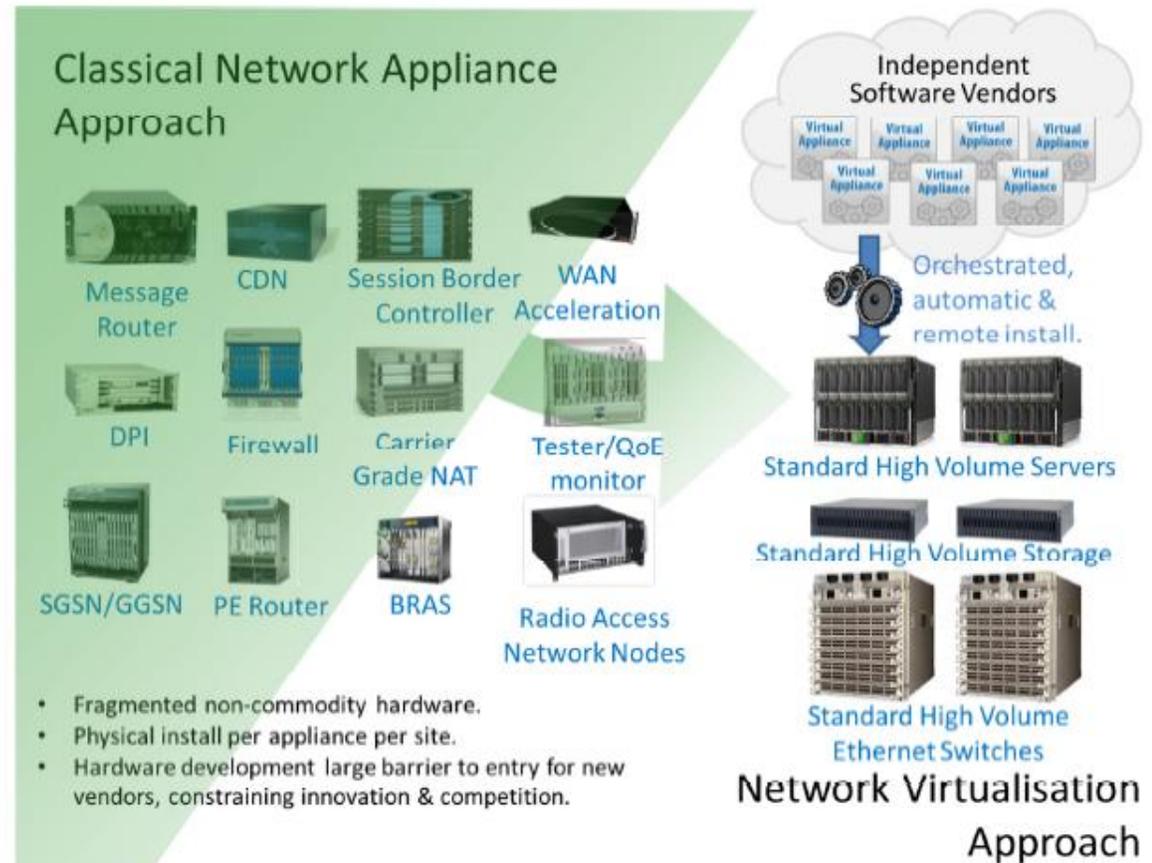




## Network Functions Virtualization –

“...implementation of network functions in software that can run on a range of industry standard server hardware, and that can be moved to, or instantiated in, various locations in the network as required...”

Network Functions Virtualisation – Introductory White Paper, October 2012 - [http://portal.etsi.org/NFV/NFV\\_White\\_Paper.pdf](http://portal.etsi.org/NFV/NFV_White_Paper.pdf)



# End Session 1