Autonomic Network Configuration using SDN and NFV

Cris Flagg - CS788 Autonomic Computing
Term Paper 2 Presentation

Autonomic Networking

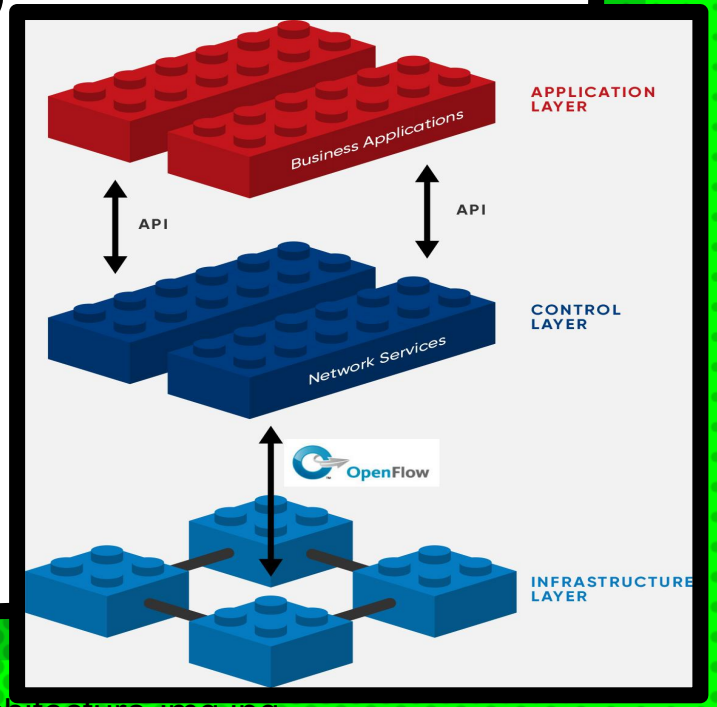
- Modify network configuration in response to changing environment
- Self-organizing networks
- Program agnostic optimization

SDN

SOFTWARE DEFINED NETWORKING

Two Layer Networks

- **Application Layer** – Normal network
- **Control Plane** – Coordination Network
- Physical SDN Devices



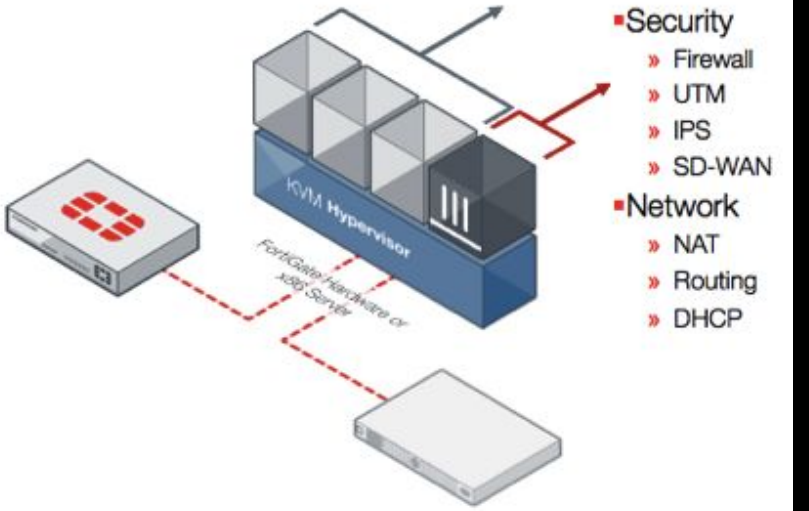
https://www.opennetworking.org/wp-content/uploads/2017/06/sdn-architecture-img.jpg

NFV

Network Function Virtualization

VIRTUAL DEVICES

- Create virtual networking devices in a manner similar to virtual machines.
- Use underlying hardware's networking



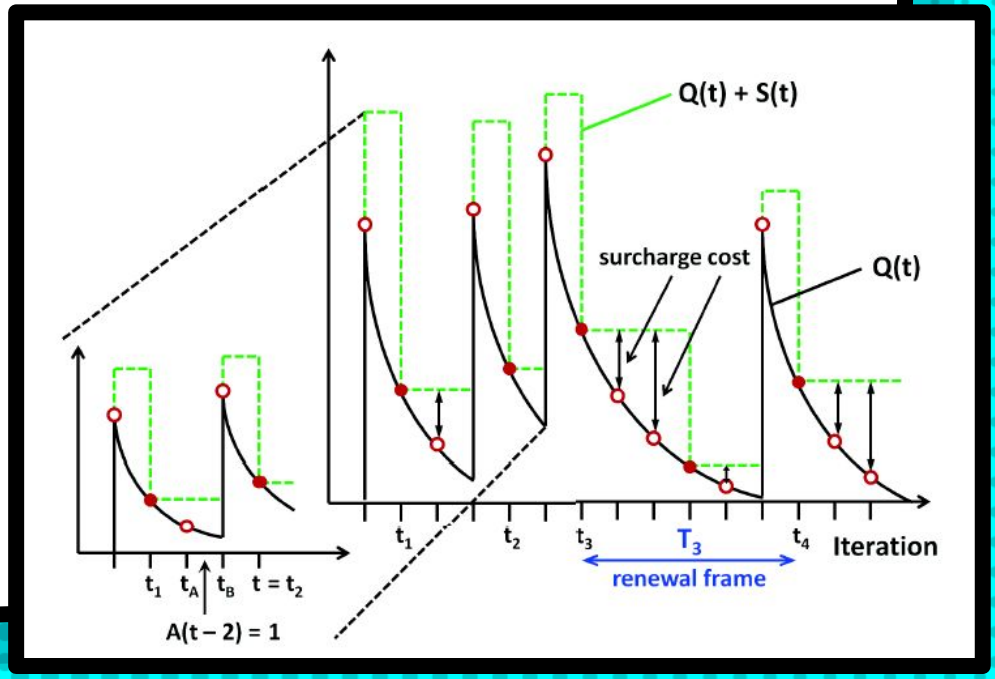
https://d3qpjj9d20n0p3.cloudfront.net/nqblog/uploads/files/vmwe2.png

S. Paris, A. Destounis, L. Maggi, G. S. Paschos, and J. Leguay, "Controlling flow reconfigurations in SDN," in Computer Communications, IEEE INFOCOM 2016-The 35th Annual IEEE International Conference on. IEEE, 2016, pp. 1-9.

FLOW RECONFIGURATION (SDN)

Studied the optimal time to reconfigure SDN network to maximize network throughput and minimize reconfiguration costs.

+ Considered different strategies
- Unclear if periodic or greedy was better

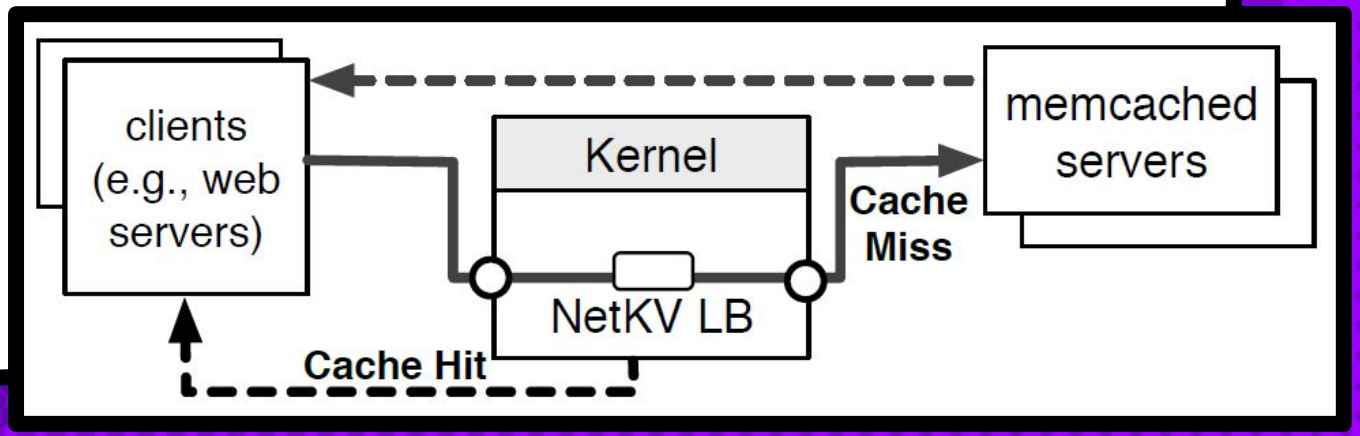


Zhang, Wei, Timothy Wood, and Jinho Hwang. "NetKV: Scalable, self-managing, load balancing as a network function." Autonomic Computing (ICAC), 2016 IEEE International Conference on. IEEE, 2016.

Memcached Optimization (NFV)

Create proxy device in front of memcached servers to balance keys exhibiting Zipf distribution (popular is very popular)..

+ Improve Hot Key distribution



Beigi-Mohammadi, Nasim, et al. "On efficiency and scalability of software-defined infrastructure for adaptive applications." Autonomic Computing (ICAC), 2016 IEEE International Conference on. IEEE, 2016.

SOFTWARE DEFINED INFRASTRUCTURE (SDN)

”A fully programmable cloud, also known as Software Defined Infrastructure (SDI), enables applications to dynamically provision resources as their workloads change over time”

+ Covers costs from multiple angles and application scenarios
- Analytical performance model in Python (custom testbed)
- Took average time to complete as cost

Jehan, Naseela, and Aneesh M. Haneef. "Scalable Ethernet architecture using SDN by suppressing broadcast traffic." Advances in Computing and Communications (ICACC), 2015 Fifth International Conference on. IEEE, 2015.

Scalable Ethernet (SDN)

- DHCP messages handled by control plane
- ARP requests handled by control plane
- Limiting requirements for broadcasts frees up data plane for actual transfers

\+ Extremely useful concept
– No adaptation, simply alternate control scheme
– Used packet traces from Rice University, Yahoo, and Emulab, but only to establish the amount of traffic generated by broadcasts

USE OF SDN TO **TRANSMIT ADVANCED CONTROL DATA** (IN PLACE OF NFV PROXIES) WOULD PROVIDE IMPROVED PERFORMANCE WITH AN **AUTOMATED CONTROL STRATEGY**

QUESTIONS?