POLITECNICO DI TORINO

Dipartimento di Automatica e Informatica

PhD in Computer and Control Engineering

XXX cycle

Supervisor

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Distributed services across the network from edge to core

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1. Introduction

The current internet architecture is evolving from a simple carrier of bits to a platform able to provide multiple complex services running across the entire Network Service Provider (NSP) infrastructure.

Currently, a NSP infrastructure is composed of a large amount of low-cost, resource-limited Customer Premise Equipment (CPE), as well as more powerful appliances at the edge of the network and in dedicated data-centers.

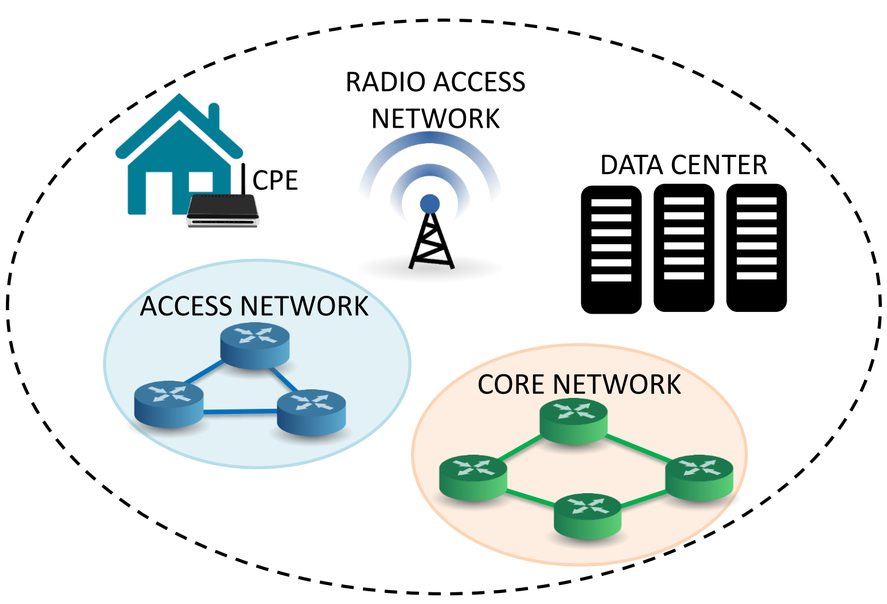

Figure 1: Telco infrastructure

In this work we study different solutions to fully utilize these resources to provide various distributed on-demand services, which can be a new source of revenue for NSPs.

2. Distributed traffic processing

With MEDINA [1] we propose to exploit the NSP core network, today dedicated solely to packet routing, to perform **distributed packet processing.** In particular, we propose a method for core network devices to achieve **task distribution** through **seamless coordination** among the peers involved. The aim is to transform existing network nodes (e.g., routers, switches, access points) into a highly distributed data acquisition and processing platform, which will significantly reduce the storage requirements at the Network Operations Center and eliminate any packet duplication overhead.

3. High speed traffic filtering

With U-Filter [2] we present a novel technique to deploy a distributed web filtering service to leverage both the low latency of a CPE and the computational power of a data center.

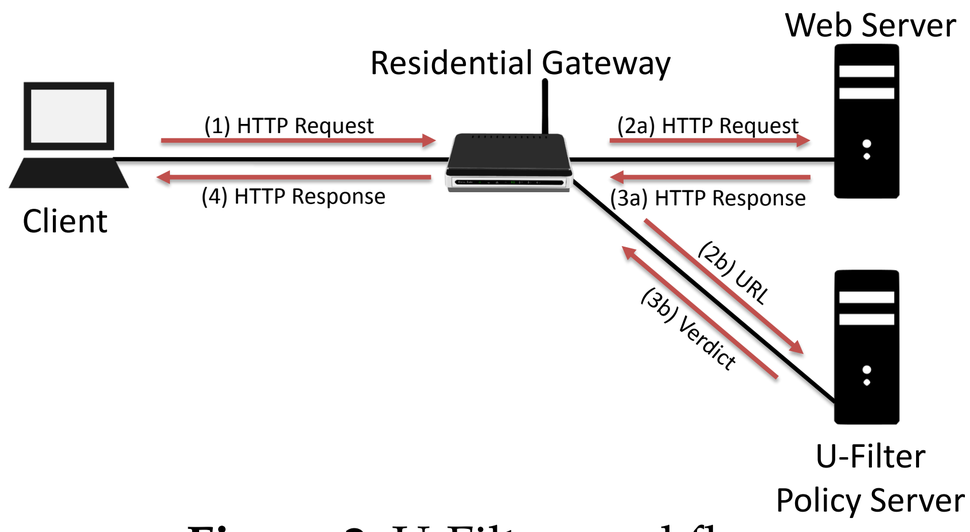

Figure 2: U-Filter workflow.

Realistic experiments showed that U-Filter can scale to support large deployments without affecting the user browsing experience.

4. In-network aggregation

With DAIET [3] we propose to use novel network devices with programmable data plane deployed in data center networks to provide much needed services to distributed applications, with the goal of reducing both network traffic and the overall job completion time.

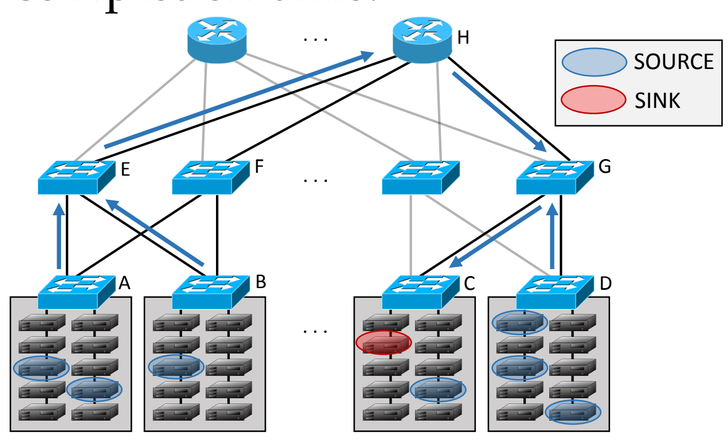

Figure 3: In-network aggregation

5. References

1. A. Sapio, M. Baldi, F. Risso, N. Anand and A. Nucci "Packet Capture and Analysis on MEDINA, a Massively Distributed Network Data Caching Platform", 2017.
2. R. Bonafiglia, A. Sapio, M. Baldi, F. Risso and P. Pomi "Enforcement of dynamic HTTP policies on resource-constrained residential gateways", Computer Networks, 2017.
3. A. Sapio, I. Abdelaziz, A. Aldilaijan, M. Canini, P. Kalnis "In-Network Computation is a Dumb Idea Whose Time Has Come", ACM Workshop on Hot Topics in Networks, 2017.