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Internship Defense Salle F801, TELECOM ParisTech 10:00 AM, 9/19/2016



Internship Environment

Goals and objectives CISCO & PIRL

Ideas and Strategies

ICN Brief Introduction Virtualization and Linux Containers

Routing Algorithms Results

TreeOnConsumer TreeOnProducer. MinCostMultiPath Maximum Flow

Conclusion





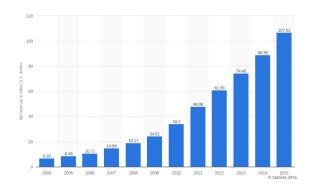
Internship Environment Goals and objectives CISCO & PIRL





Goals and objectives

Net Revenu for Video Delivery Applications in USA





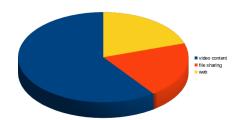
Conclusion



Goals and objectives

In 2016, More than 96 % of internet traffic is content.

Video \longrightarrow 60% File sharing $\longrightarrow 20\%$ Web \longrightarrow 20%

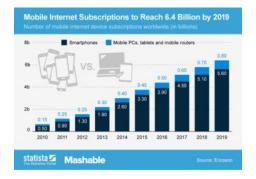






Goals and objectives

Mobile vs PC Internet Traffic user → 5G mobile networks





Internship Environment Ideas and Strategies

Routing Algorithms Results Conclusion Goals and objectives CISCO & PIRL



Cisco Systems France.





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Ideas and Strategies

ICN Brief Introduction Virtualization and Linux Containers



Named Data networking (NDN)

Why ICN?

- ▶ Named Data Networking ⇒ Name base Philosophy vs TCP/IP Calling Networking.
- ▶ V.Jacobson et al proposition, *Networking Named Content* 2009.
- ▶ A Good fit network designing for Video Delivery Applications in **5G**.



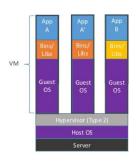
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Virtualization and Linux Containers

Virtual Machines (VM) vs Linux Containers.



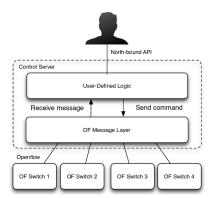
Containers are isolated, but share OS and, where appropriate, bins/libraries







- ▶ Lurch is an orchestrator originally developped for ccnx.
- We developed Lurch:
 - For NFD (NDN forwarder).
 - Different interfaces to interact with strategies at run time (Client, Repositories, forwading strategies, ...)
 - New Routing Strategies.

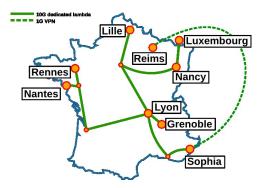






Large Scale Platform Grid5000

Grid5000 platform





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Virtualization Stack

App. Economy	Enhanced Mobile Broadband	Massive Machine Comms.	Ultra Reliable – Low Latency	App. Economy
Abstractions				Abstractions
Network OS	Message Bus Discovery	Orchestration	Security Analytics	Network OS
- Abstractions				Abstractions
Programmable Core Network Backbone (NFV/SDN)				
Integrated Transport Network				
Integrated Fronthaul & Backhaul				
Wireless Access				
5G Devices & Things				





Routing Algorithms Results

TreeOnConsumer TreeOnProducer MinCostMultiPath Maximum Flow



Routing Strategies

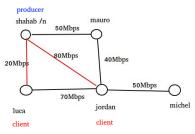
We proposed 4 different routing strategies for different situation of networks which can cover all of needs:

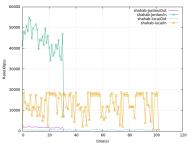
- ▶ TreeOnConsumer : N clients searching the same content from one repository detected by Lurch (Multicast mode).
- ► TreeOnProducer: One client who gets the packet from N Repositories of needed data.
- ▶ MinCostMultiPath: Using different paths with Equal Cost to retrieve the data using a proper forwarder strategy (load-balancing).
- ▶ MaxFlow: Allow to maximize the throughput using paths based on maximum flow algorithm between clients and repositories.



TreeOnConsumer

One producer to multiple consumer.

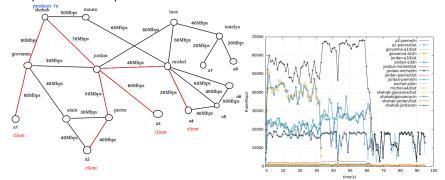






TreeOnConsumer

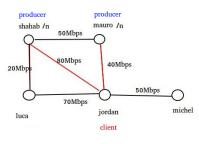
One producer to multiple consumer.

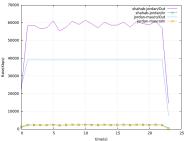




TreeOnProducer

One Consumer to multiple producer.

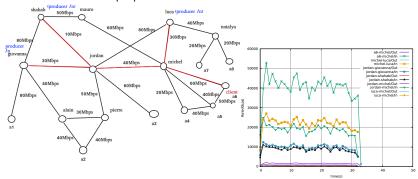






TreeOnProducer

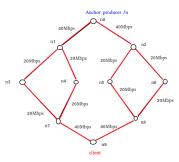
One Consumer to multiple producer.

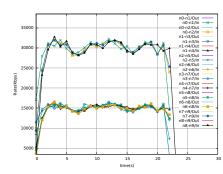




MinCostMultiPath

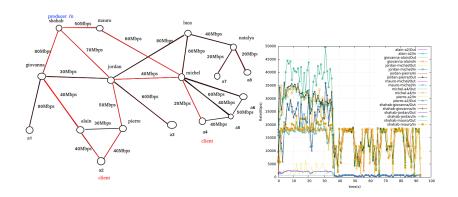
Load balancing strategies in equal cost multipath case.







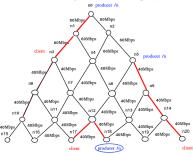
MinCostMultiPath

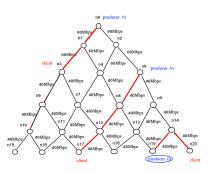




MinCostMultiPath

Producer Mobility with Routing update.

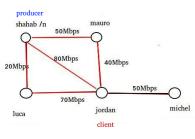


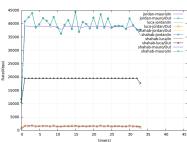




Maximum Flow

Maximum Flow algorithm chooses the path which maximizes through from consumer to producer.

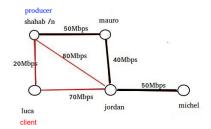






Maximum Flow

Maximum Flow algorithm chooses the path which maximizes through from consumer to producer.





Plan

Conclusion



Conclusion

- ▶ There is always some limitations in practical against pure theoritical works which can be seen when you work on experimental platforms.
- ▶ ICN is one of the most challenging domain who has a lot of field of work and domain in research and development.
- ▶ In Engineering there is always bottlnecks, understanding and discovering of where these bottlenecks are the responsbility of genius engineer.
- Coding is beautiful tool because through it you can realize your ideas in real world



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