

Fast Cloud

Mobile edge clouds for 5G networks



Technische Universität
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ComNets

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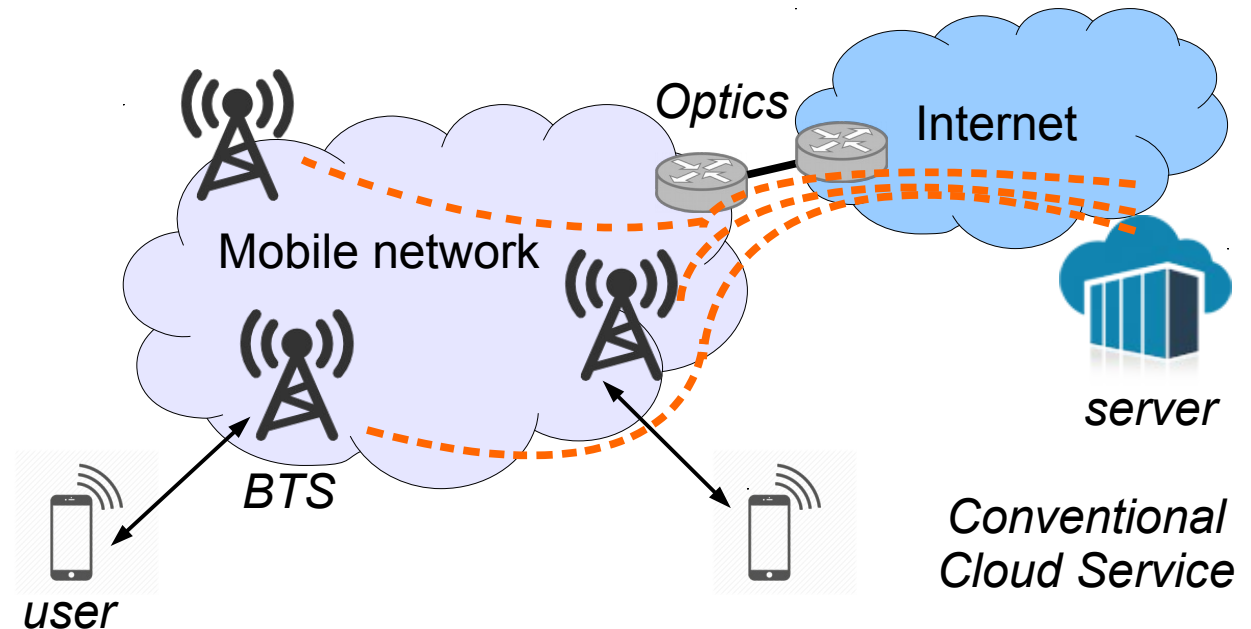
Highly Adaptive Energy
Efficient Computing

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10.06.2016

Motivation



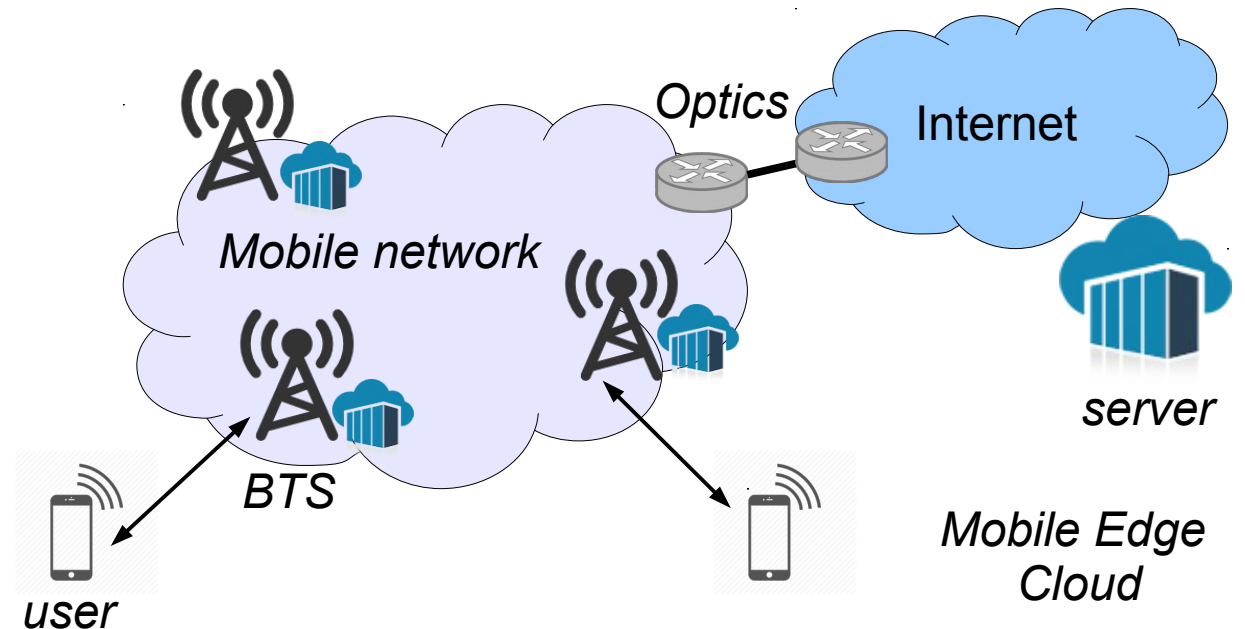
- Cloud services: more and more popular nowadays
- Cons of single cloud:
 - Long latency
 - Single PoF
- Multiple clouds:
 - More availability
 - Vendor lock-in
 - Delay variance
- 5G scenarios:
 - 500B devices
 - Massive latency requirement (1ms)



How to reduce the latency of cloud services for 5G networks?

1. Introduction
2. Research questions
3. Micro data center
4. Evaluation methodology
5. Summary

- Mobile Edge Cloud:
 - Clouds close to users
 - Orchestration
- Expected features:
 - Agile
 - Distributed
- Advantages:
 - More security
 - More availability
 - Extremely low latency for control or steering



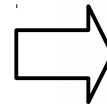
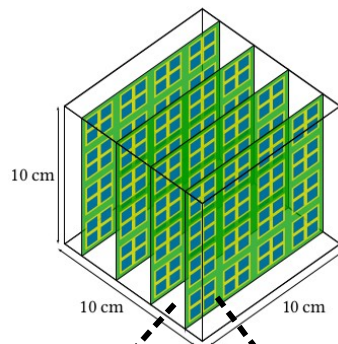
- 1) How to provision and orchestrate cloud services?
- 2) How to migrate cloud service for moving users?
- 3) Which micro data center at the edge?
- 4) How can we evaluate our solutions?

Micro data center (HAEC box)

- Electricity consumption of ICT: on the rise
 - 4.6% worldwide (in 2012)
 - Annual growth rates of 7%
- HAEC: Highly Adaptive Energy-efficient Computing

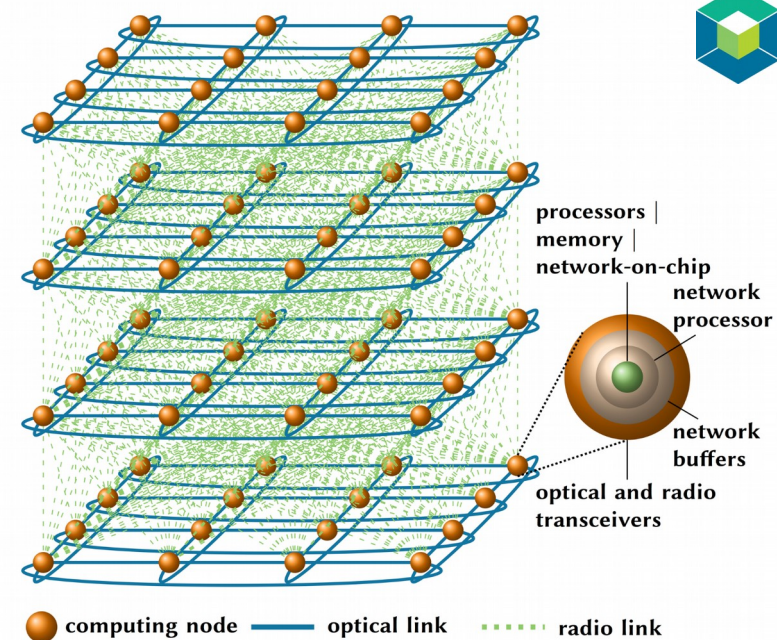
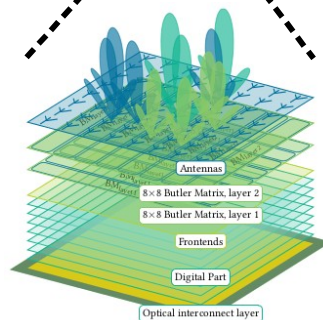
HAEC box:

- 1 liter
- 100M cores



Chip stacks:

- 50k cores
- Antenna array



Model of the HAEC box

Hardware:

- Chip stack
- Optics
- Radio

Architecture:

- Phy. layer security
- Adaptive routing
- Edge caching

Software:

- Energy-adaptivity
- Exploits versatility



HAEC Playground
as a melting pot

Evaluation methodology (1)

- Network simulation: widely used
- Advantages
 - Cost effective
 - Suitable for what-if situations
 - Applied at many different levels of abstraction
- Drawbacks
 - Simplified models
 - Unrealistic assumption on system's behaviors



NS-3
NETWORK SIMULATOR



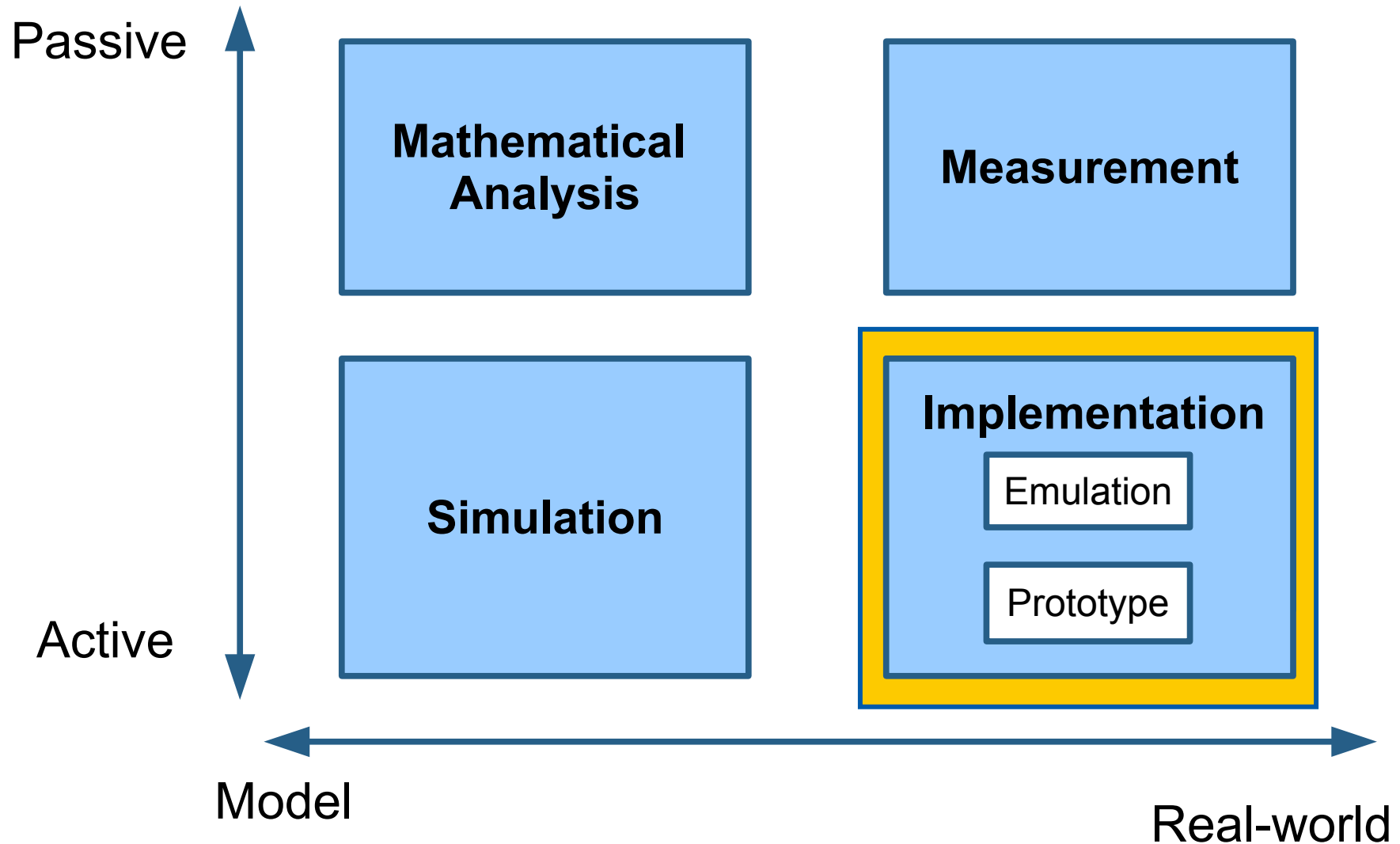
OPNET



OMNET++

What are the alternatives?

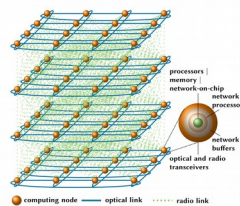
Evaluation methodology (2)



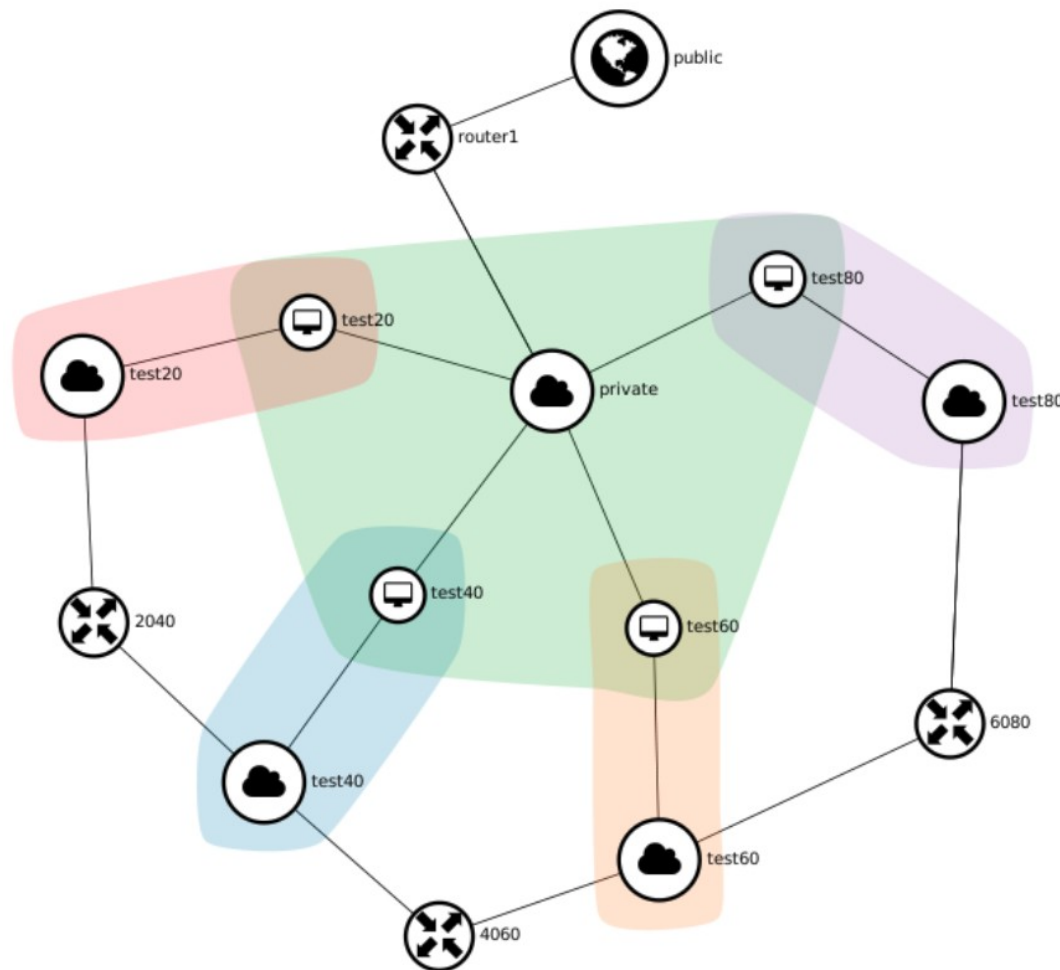
Evaluation methodology (3)



- OCCI
- Avoid vendor lock-in
- Open source



For HAEC, and more...



Topology generated and orchestrated in OpenStack

- 1) For cloud service to meet demands of 5G:
To reduce latency
- 2) Fast cloud: to place clouds closer to end users
- 3) Many challenges
 - Provision of cloud service deployment
 - Migration of cloud service for mobile users
- 4) Selective on-going activities
 - Micro data centers (HAEC Box)
 - Emulation/testbed with OpenStack

