Internet as a Downloadable SW Package
Observations about the Internet

• The Internet has come from the perspective of interconnecting networks, mainly belonging to organisations, ISPs, businesses, ...

• The WWW has come from the perspective of interconnecting services, mainly being provided by organisations, ISPs, businesses, ...

• Users’ access to Internet via mobile has surpassed fixed usage in 2016
  • 95% of Chinese Internet users access via mobile devices

• With proliferation of smartphones, Internet access has become an experience of installing the right application!
So what is the Next Generation Internet?

...there is an app for that, surely?

**BUT:**
1. What is the platform?
2. What is the value chain?
The Internet is all About Resources

End-to-End Service

Service Function Chain

Endpoint

Network Service

Endpoint

Logical link

Virtual Network Function (VNF) Instances

VNF1  VNF2  VNF2

Infrastructure

Virtual Compute  Virtual Storage  Virtual Network

Virtualization Layer

Compute  Storage  Network

Logical Abstractions

SW Instances

Orchestration templates

Virtual Resources

Virtualization SW

HW Resources
Emerging Platforms drive the App View

- **Application-specific Service Functions**
  - Surrogate Mgr
  - Orchestration
  - CLMC
  - App Comp 1
  - ... App Comp N
  - PCE
  - NAP

- **Infrastructure Platform**
  - XOS
  - OPENSTACK
  - ONOS
  - ODL
  - Linux Kernel
  - Thin Abstraction Agent (e.g. OpenvSwitch)

- **Application Platform**
  - Computing
  - Storage
  - Networking

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Case Study 1: SW-based Community Networks

- **Objective**
  - Bring the Internet to communities who have otherwise problems to afford the deployment

- **Realization**
  - Pure SW solution, including SW-based switching, deployed directly over Layer 2 connected computing devices
  - Realized in H2020 RIFE project
Case Study 2: FLAME-on-a-Stick

- **Objective**
  - Allow for personalized, mobile, interactive, and lontext-aware (PIML) media services in rich environments, such as Smart Cities

- **Realization**
  - Developed as a pure SW package, deployed from a mere USB stick (or similar)
  - Realized in H2020 FLAME project
Traditional Value Chain

Primary Value Chain
- Telecom infrastructure
- Network Equipment
- Hosting platforms
- Tech & Chipset makers
- Tech & Chipset makers
- Hosting Operator
- Network Operator
- Service & App developers
- Subscription & devices resellers
- Content & service portals
- Subscribers

Secondary Value Chain
- Experience Providers
- Tech & Chipset makers
- Service & App developers
- Experience Providers
- Subscribers

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Intermediary Value Chain with the Network as a Distribution Computing Platform
Value Chain of a True SW-based Internet
Research Challenges

• Real-time control in a multi-domain & multi-tenant fashion
  • Not all is owned what needs to be controlled!

• Control in situations with high dynamicity
  • Mobile, edge, multi-domain, ..., all add to dynamicity of control environments at any point
  in time

• Testing and conformity
  • Safeguard the interests of the many stakeholders in an end-to-end deployment

• Accountability
  • Who’s done it and what is it worth?
    • New pricing models (why paying the truck driver?)
    • currency models (if blockchain is the answer, what is the question?)

• Anybody mentioned neutrality? Of what?
Conclusion

• We have moved from interconnecting networks and services to an app-driven personalized experience

• SW-based technologies are sinking deep into the networks providing those apps over the top nowadays

• New platforms and marketplaces will emerge that extend the app experience across all elements of the end-to-end experience

My Personal Internet -> there is an app for it!