

Introducing Neutral Access Networks

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Agenda

- Problem statement
- Access networks
- Shared access
- Neutral Access Networks
 - Positive externality
- Testbeds



Problem statement

- IP traffic doubles every 2 years
- IP services becomes more and more pervasive

HOWEVER

- There is a stagnation in the broadband market due to
 - Lack of supply (digital divide)
 - Lack of demand (limited penetration)
- Dominant broadband access models fail in triggering *positive externality*



Externality

- Externality
 - Effect induced by an action (or decision) on third-party stakeholders who are not directly involved in it
- Positive externality of communication networks
 - The entrance of a new user into the network adds to the communication/networking opportunities of all other users
- The Internet benefits from positive externality, while typical access networks do not



IP traffic

- IP traffic doubles every 2 years
- Consumer traffic grows faster
- Metro traffic grows faster
- Non-Internet IP traffic grows faster
 - 43% of non-Internet IP traffic expected in 2011
- Streaming grows faster
 - 30% of streaming IP traffic expected in 2011
- P2P grows slower

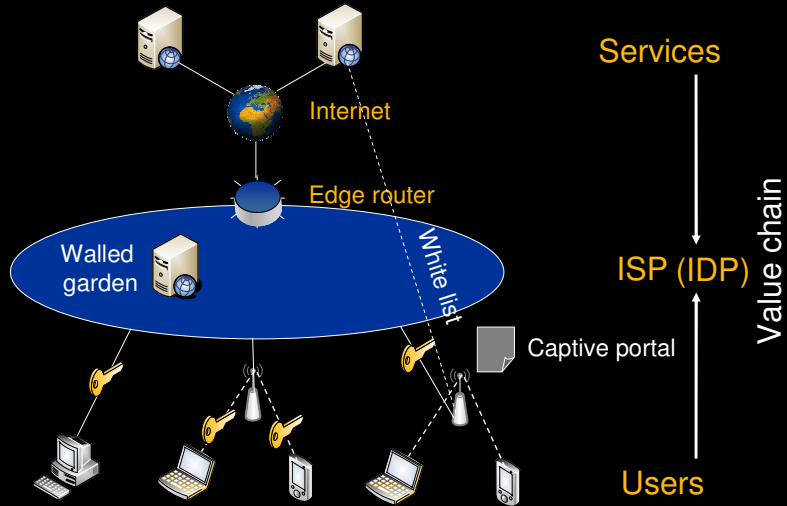
Cisco, "Global IP traffic forecast and methodology," *Cisco White Paper*, 2008.



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Access networks



Broadband market

- Vertical integration
 - Inter-layer dependences
 - Entry barriers
 - Lack of statistical traffic sharing
 - Enforced neutrality
- Flat-fee pricing
 - No correlation with bandwidth costs
 - Traffic shaping required
 - Weak motivation for non-Internet users
- Broadband incentive problem

Broadband Working Group, "The broadband incentive problem,"
MIT Communications Futures Program White Paper, September 2005.

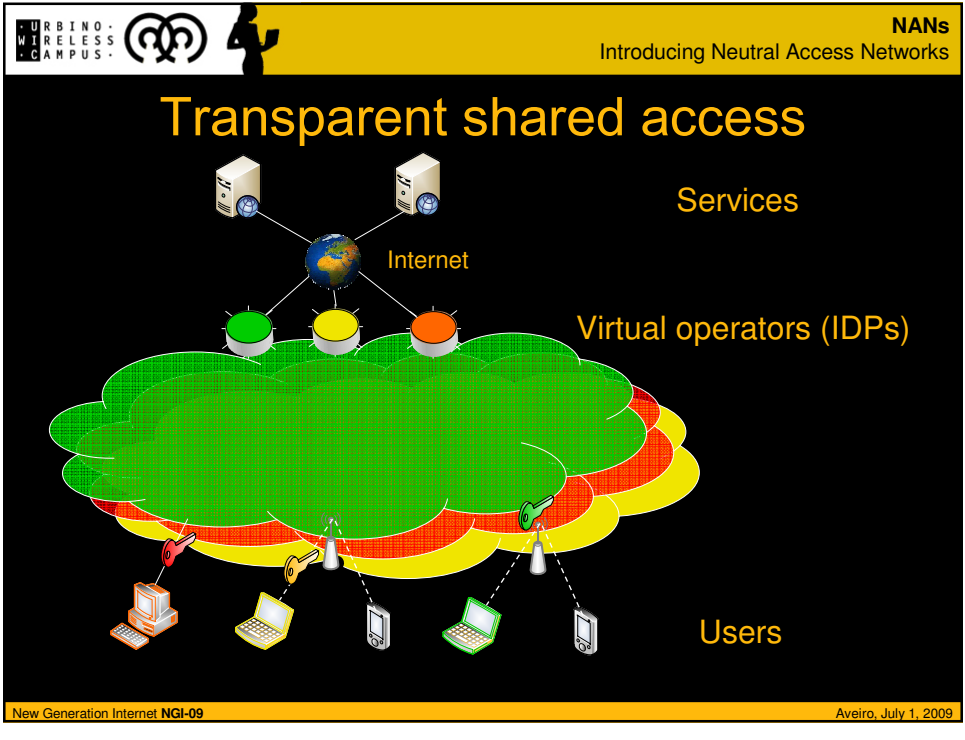
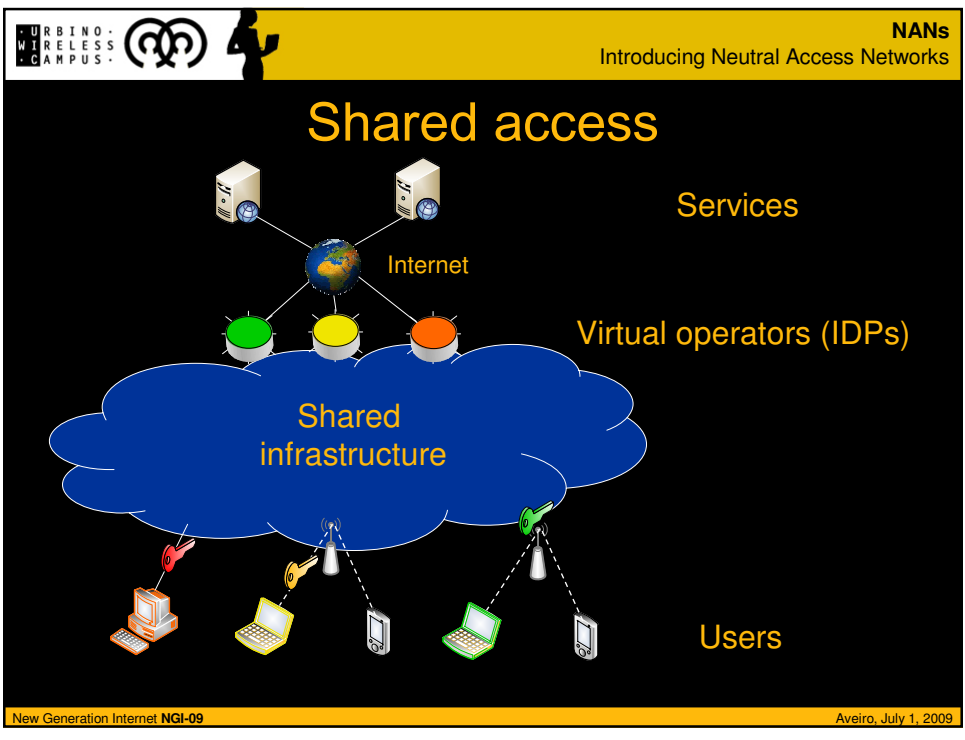
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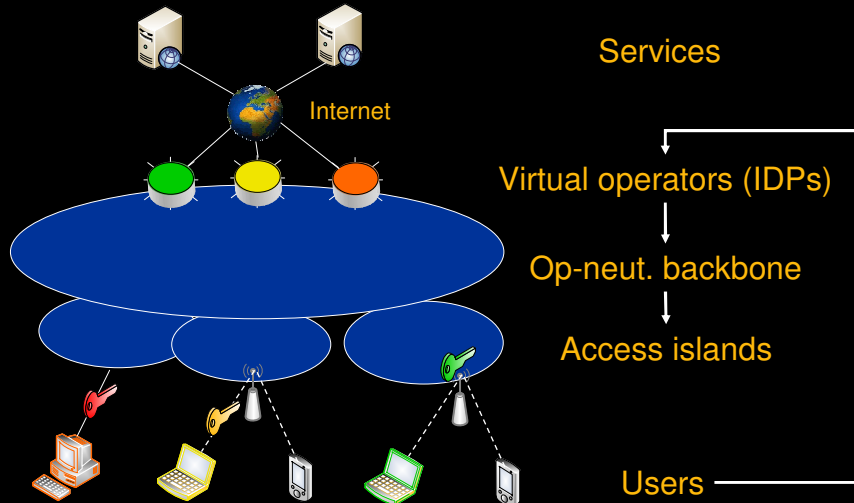
Shared access

- Regulatory measures
 - Local loop unbundling
 - Line sharing
 - Bitstream access
 - Virtual operators
- Scope economies
- Enhanced competition
- Enhanced broadband penetration
 - More than twice larger in countries with sharing regulation

S. Turner, "Broadband reality check II,"
Free Press, 2006.



(Wireless) open access networks



J. Barcelò et al., "Wireless open metropolitan area networks," *Mob. Comp. Comm. Rev.*, 2008.

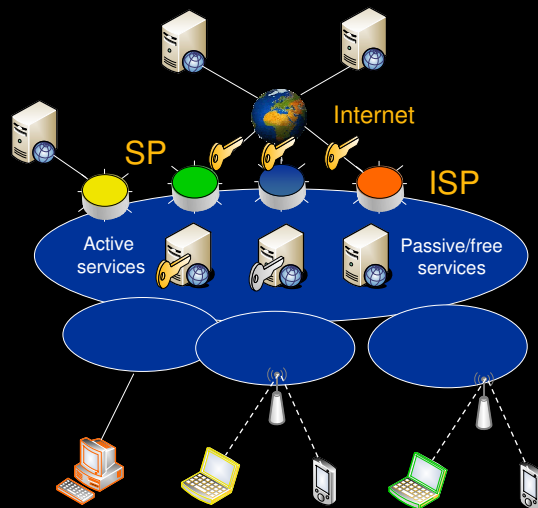
(Wireless) open access networks

- Pros:
 - Scope economies
 - Enhanced competition
 - Separation between network and services
- Cons:
 - Limited scope (if wireless access only)
 - No scope economies from a user perspective (e.g. CPE cost)
 - Access-oriented commercial paradigms
 - Lack of externality (**transparency is not a value!**)

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NANs
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Neutral Access Networks

New Generation Internet NGI-09

Aveiro, July 1, 2009

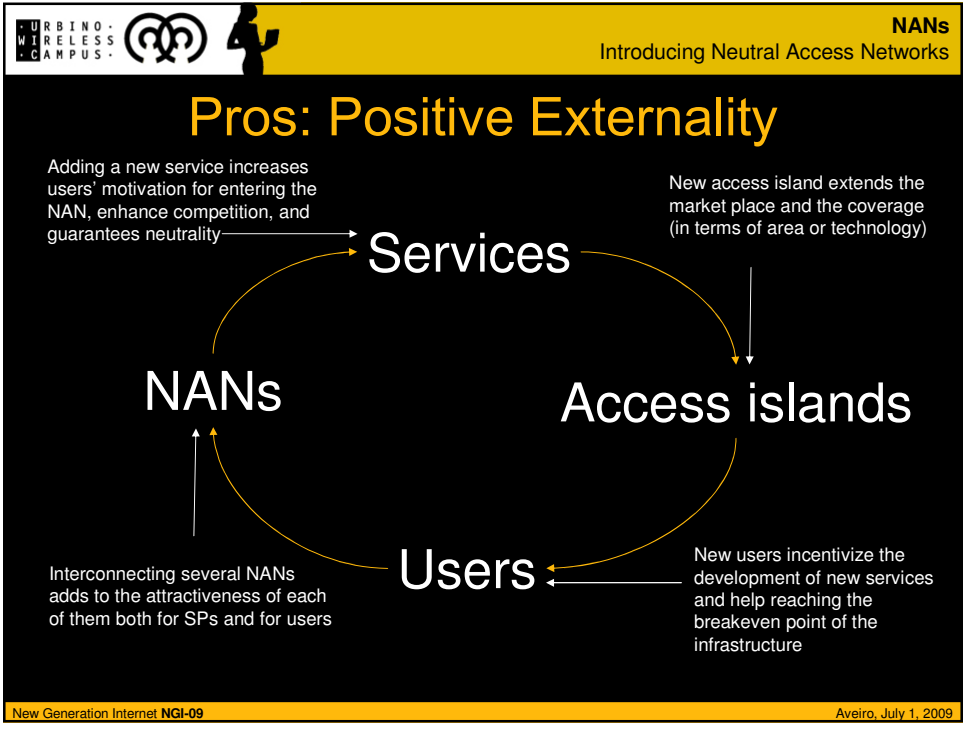
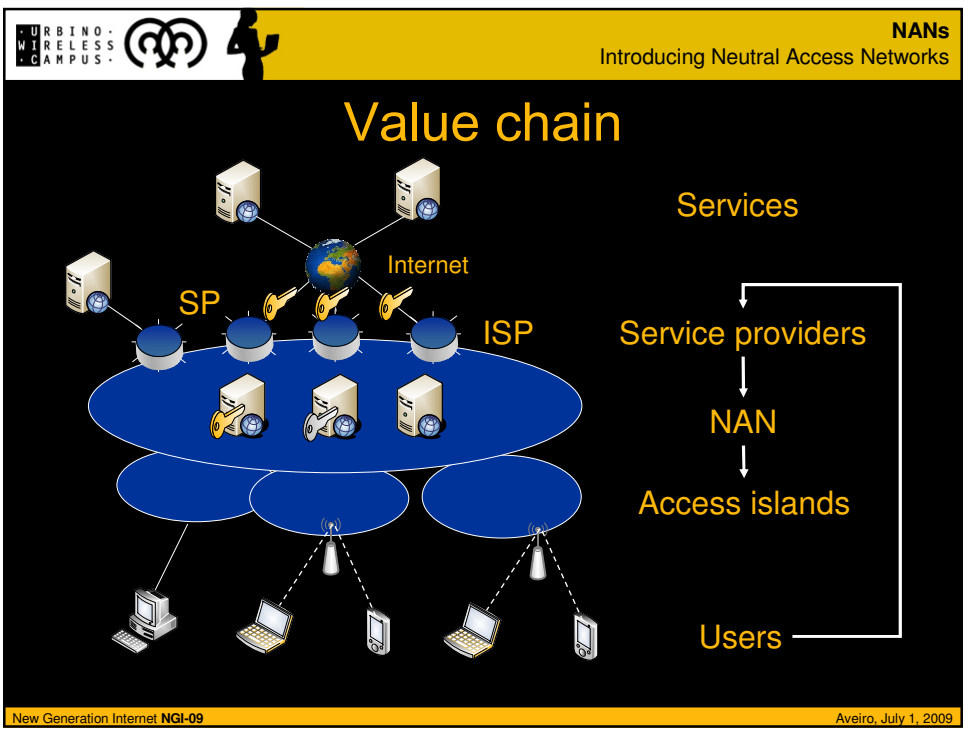
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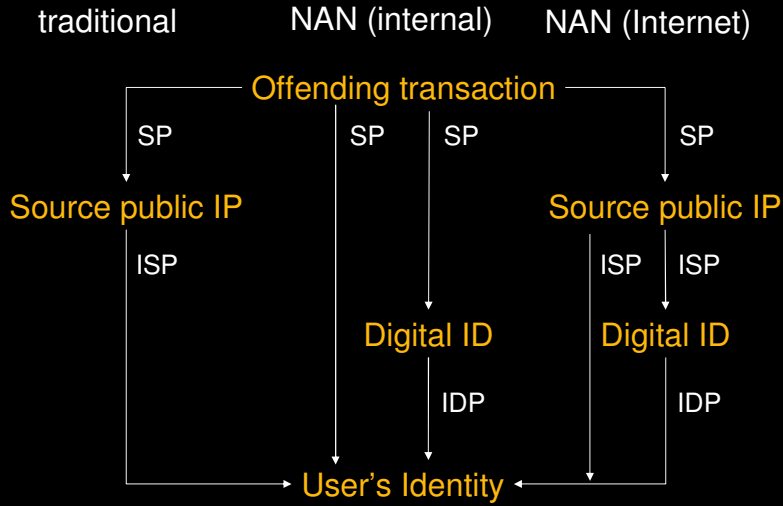
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Cons: Security



Cons: QoS

- Depending on the implementation, NANs might hamper ISPs to implement their own end-to-end QoS policies and SLAs

HOWEVER

- However, QoS is an issue only in case of under-provisioned access networks
- Under provisioning is not an issue if the access infrastructure is paid by its usage



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 - Access sharing
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Testbed

- Urbino wireless campus (UWiC)
 - University-driven project
 - Geographical wireless access network
 - WiFi/Hiperlan
 - Linux source-based policy routing
 - 3 main gateways (University, EsaWay, Wi-Fly)
 - 2 interoperating partner networks
 - Student-oriented online services
- Under development
 - WiMAX extensions
 - Internal services (tourist information, active maps, IPTV, energy efficiency, social policies, e-government, ...)



Conclusion

- The exponential growth of the Internet is due to the positive externality triggered by network neutrality and layer separation
- NANs brings the same concepts within the access networks in order to help overcoming broadband market stagnation
- Current work:
 - Distribution of an open-source virtual server farm for NANs
 - Development and characterization of agent-based simulation models to conduct large scale economic experiments
 - Implementation of extensive real-world testbeds