



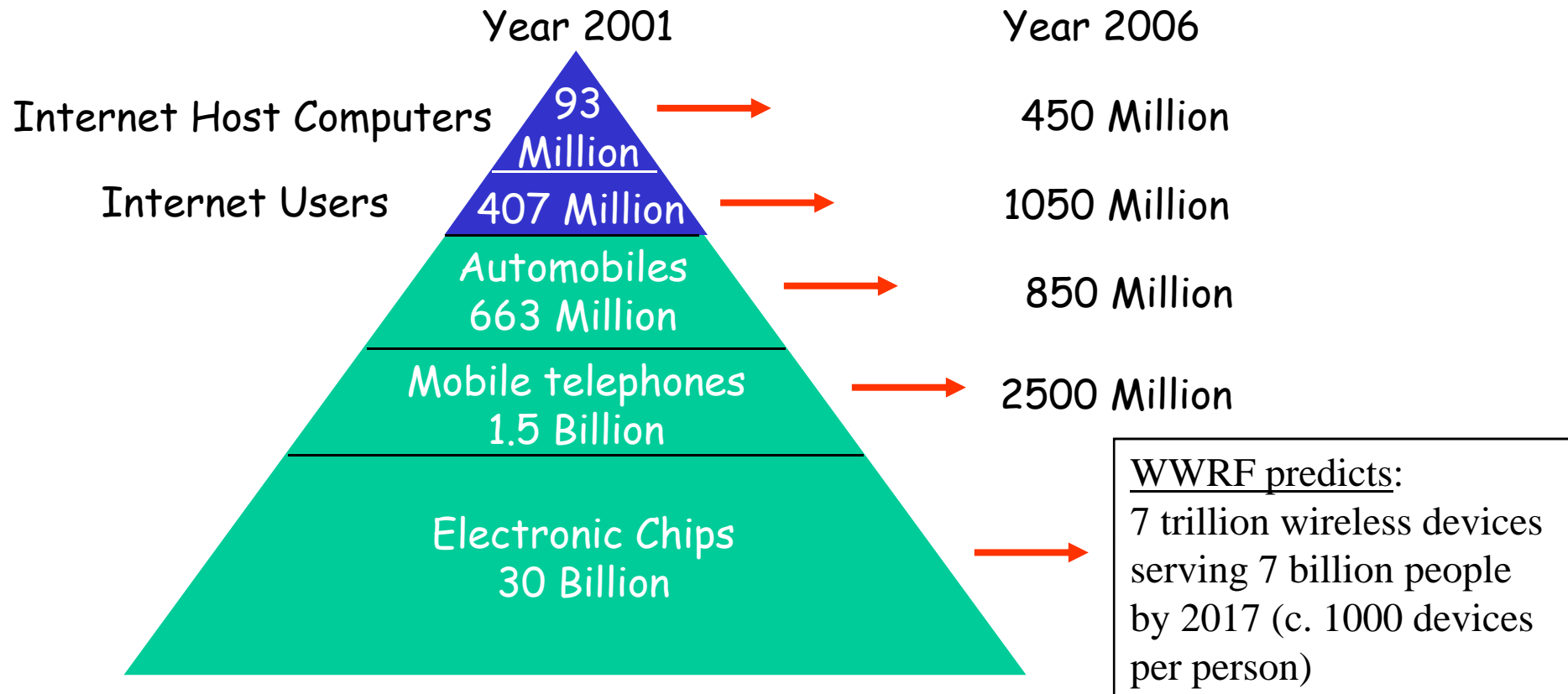
# **Radiotaajuuksien markkinadynamiikan uudet tuulet**

## *Trends in Market Dynamics of Radio Spectrum*

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Tietoliikenne- ja tietoverkkotekniikan laitos  
Teknillinen korkeakoulu



# Internet Drives Usage of Radio Spectrum



Can Internet technology stretch to the need of

- larger address space ?
- higher transport capacity ?
- lower costs ?

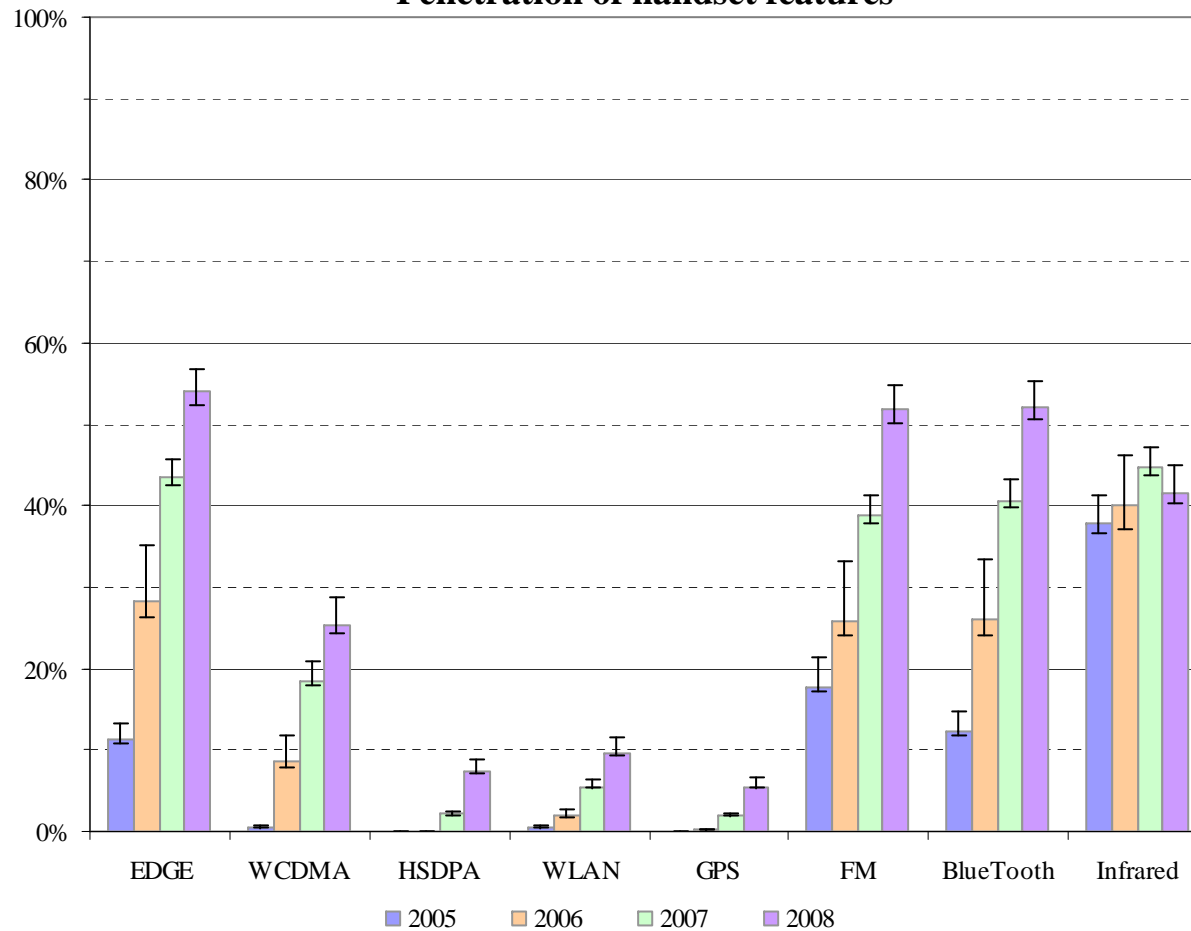
Source: Internet World Stats, 2006



# Mobile Handset as Hub of Value Networks

## Radio Feature Penetration of Handsets - Finland

Penetration of handset features



- Features offering higher data transmission speeds spreading
  - EDGE 44% → 54%
  - WCDMA 18% → 25%
  - HSDPA 2% → 7%
  - WLAN 6% → 10%
- Especially 3G (WCDMA), due to handset bundling
  - Very steep S curve, growth comparable to more mature features

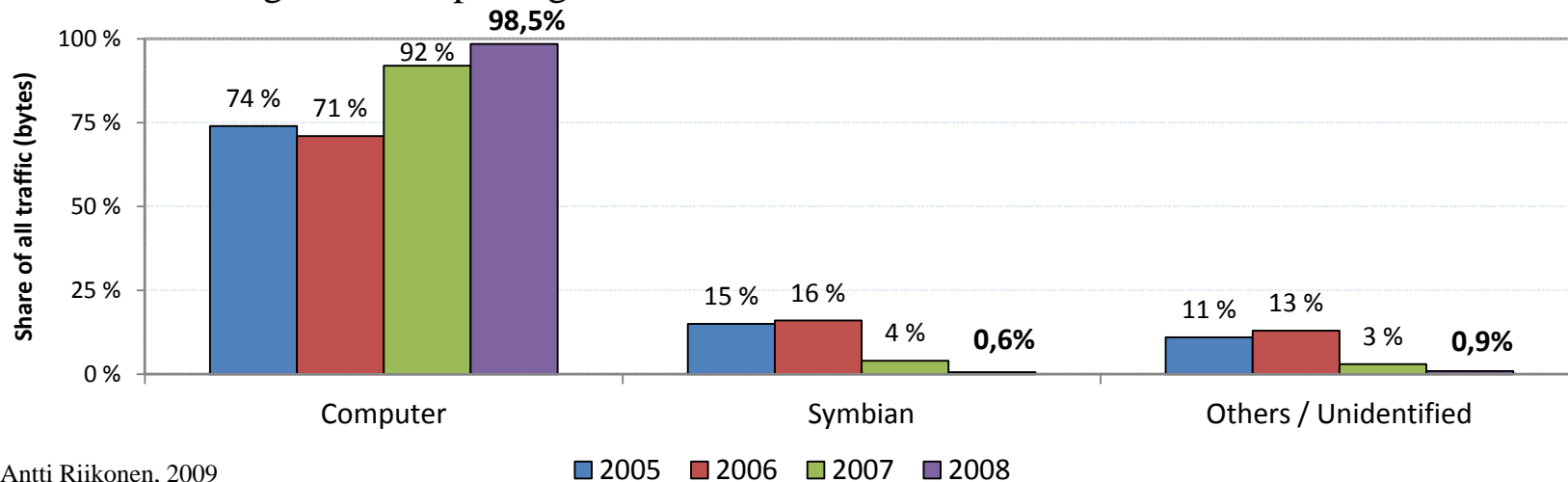
Source: Antero Kivi, 2009



# Internet Traffic Moving over to Wireless

## Traffic by Mobile Device Type - Finland

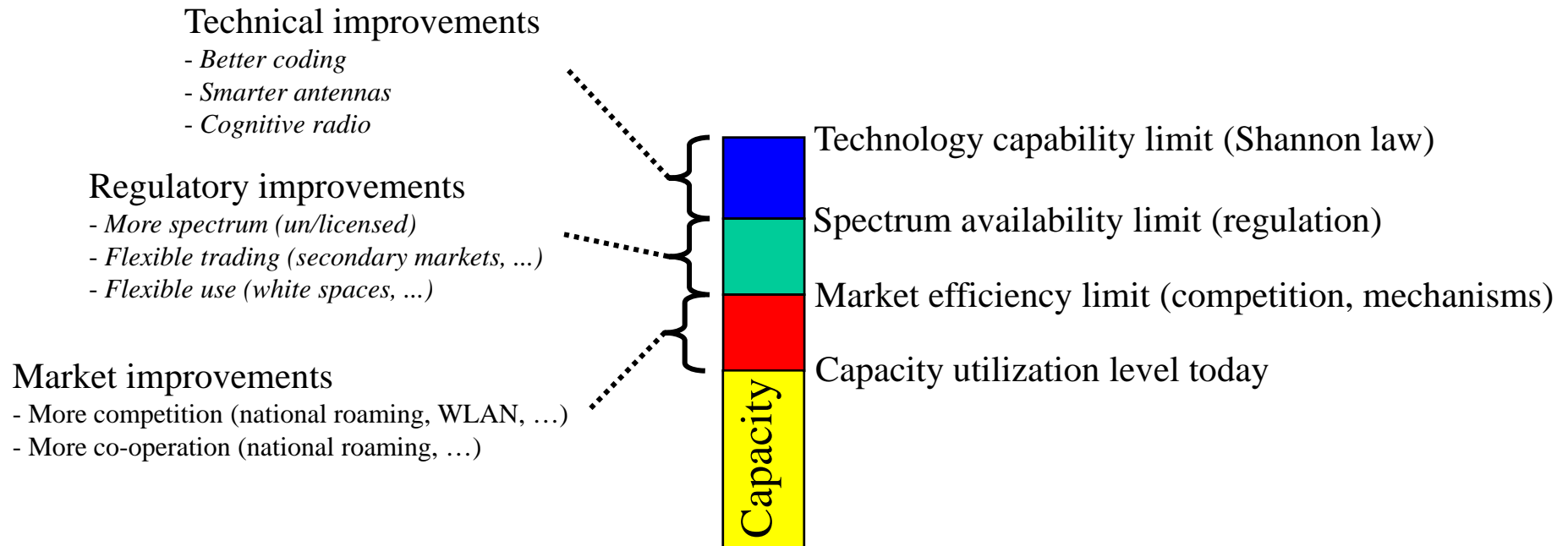
- Computers originate over 98% of traffic in the mobile network
  - Computer: Mostly Windows (over 93% of total traffic)
  - USB modems, data cards
  - OS identification necessary to uncover handset traffic
- < 1% of traffic generated by handsets
  - Handset: Symbian OS, no significant amount of iPhone / other OS traffic identified
  - Exclusive distributor of iPhone (TeliaSonera) not included in the measurements
  - Symbian traffic increasing in absolute terms
  - On average one computer generates hundreds times the traffic than one mobile handset



Source: Antti Riikonen, 2009



# Internet Spectrum Utilization Problem



- Technical, regulatory and market aspects are inter-dependent
- Consumers, producers and social planner have different intentions
- Social planner looking for economic efficiency:
  1. Allocative efficiency (right products => optimal mix)
  2. Distributive efficiency (right customers => highest value)
  3. Productive efficiency (right producers => lowest cost)
  4. Dynamic efficiency (maintain those above => continuous improvement)

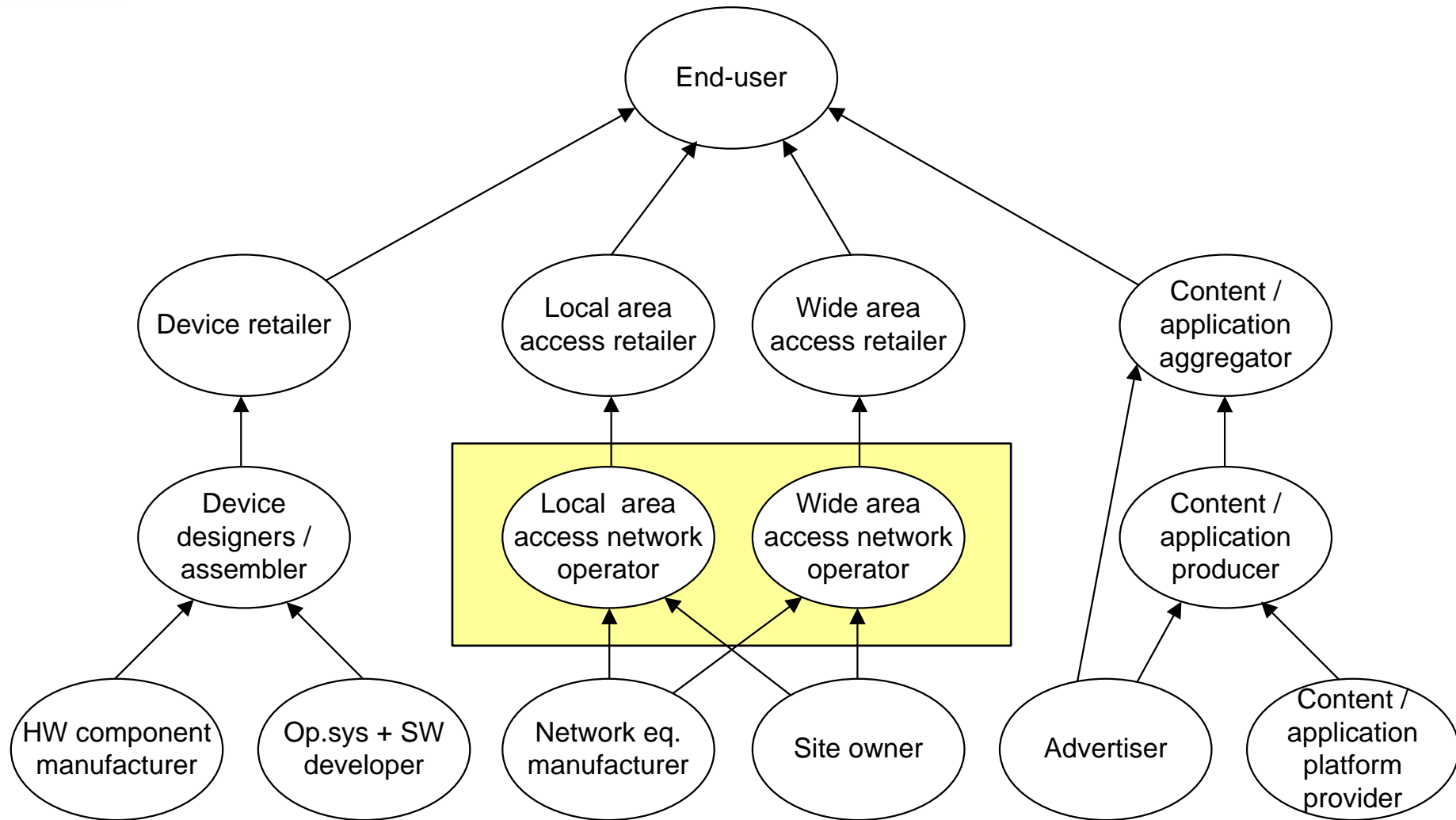


# Evolution of Mobile Spectrum Market

1. Long-term cellular licenses (e.g. GSM 20 years)
  - a) Comparative evaluation ("beauty contest")
  - b) Auction
2. Unlicensed spectrum (e.g. WLAN/decentralized)
3. Secondary markets
  - a) Reselling of long-term licenses (fully or partially, e.g. MVNO)
  - b) Reuse of licensed spectrum (e.g. TV white spaces in the US)
4. Dynamic sharing of licensed spectrum
  - a) Centralized approach
  - b) Decentralized approach



# Mobile Services Value Network

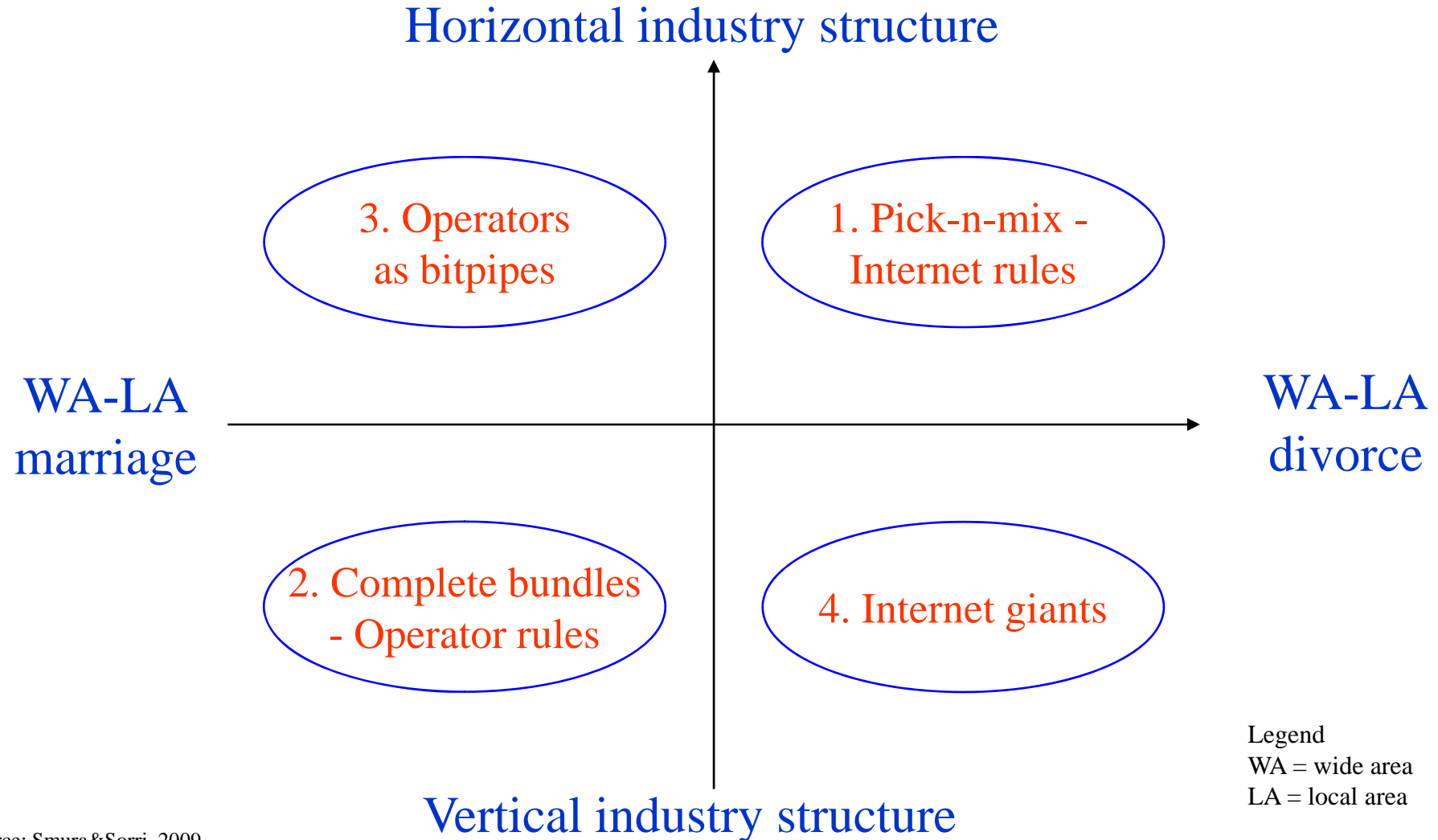


Source: Smura&Sorri, 2009



# Radio Access Scenarios

Four possible scenarios placed in a matrix

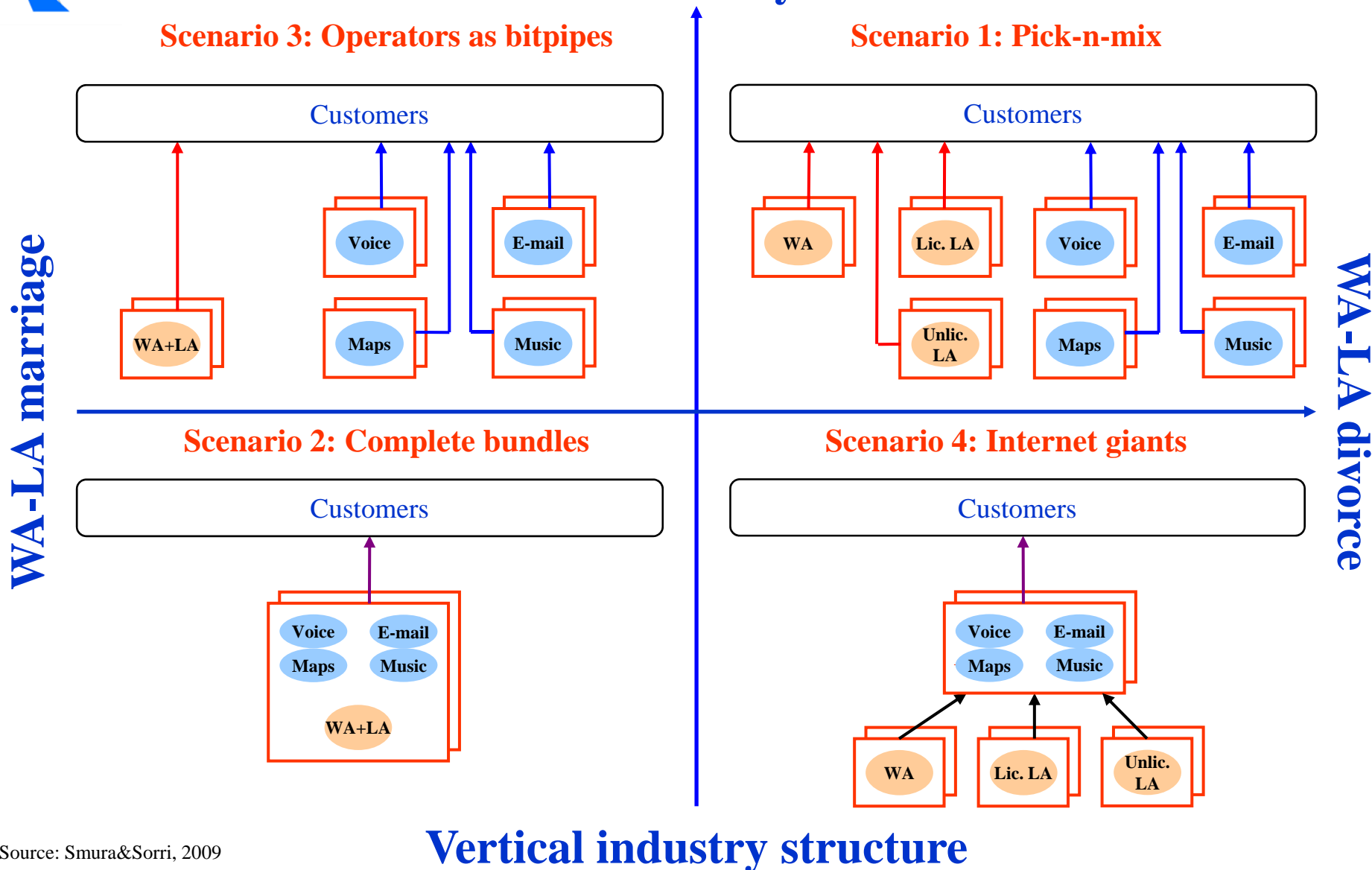


Source: Smura&Sorri, 2009



# Scenario Descriptions

## Horizontal industry structure



Source: Smura&Sorri, 2009



# Conclusions

- Spectrum usage is driven by the evolution of Internet
- Spectrum market is becoming more dynamic as the technology evolution and law makers allow
- Managing the spectrum resource efficiently will require wise coordination between technology, regulation and market mechanisms



# CONTACT

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