

Scott Jordan  
Department of Computer Science  
University of California, Irvine

# **SPECTRUM MARKETS: POLICYMAKERS AND TECHNOLOGISTS**

# what will matter in spectrum markets?

- applications
- architecture
- interference
- control
- economics ...
- legal stuff ...

# convergence



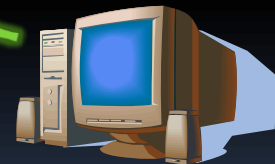
Telephone network



Cell phone networks

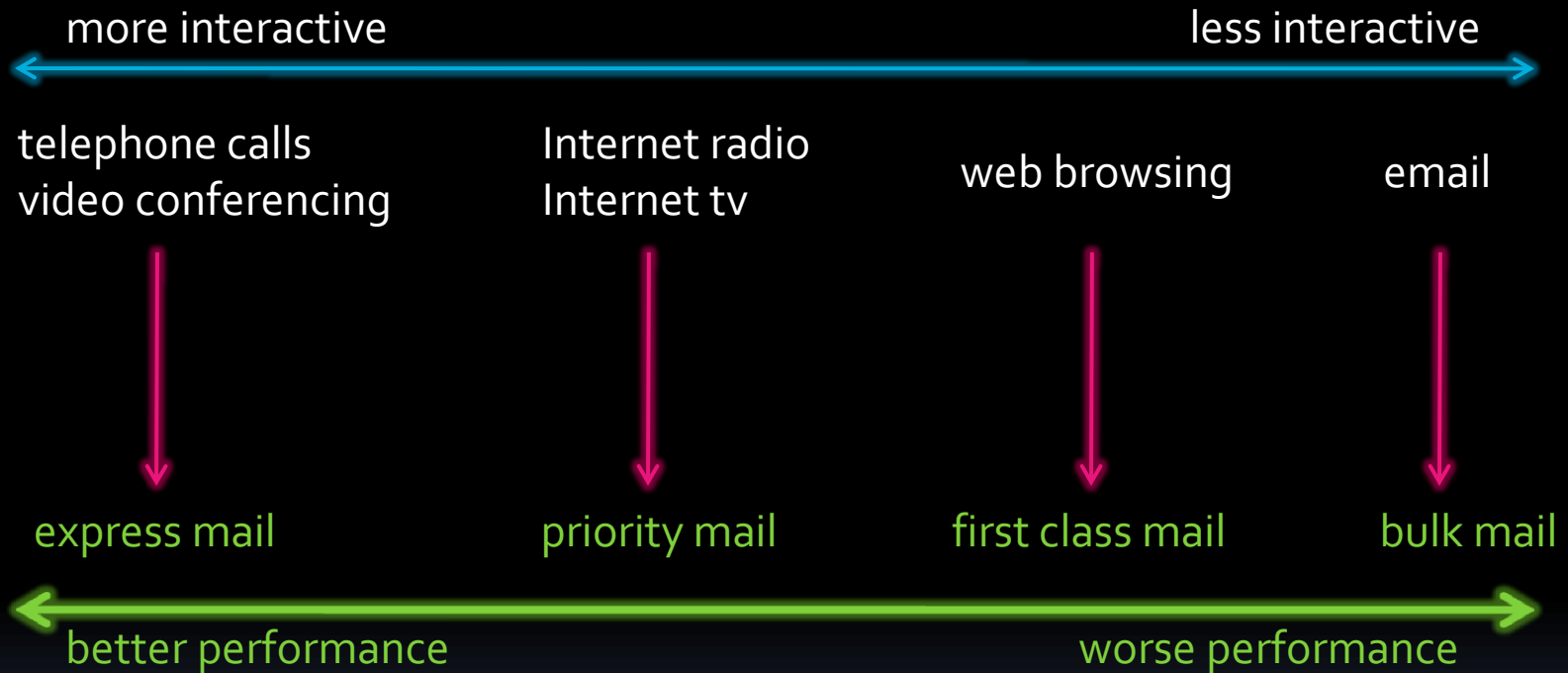


Cable tv networks



Internet

# matching QoS to application



# network architecture matters

- a variety of apps, thus packet switching
- capacity
  - architecture determines “capacity” or “achievable region” !
  - use doesn’t always sum linearly ! (“statistical multiplexing”)
  - sharing between service providers?
- QoS:
  - age-old tension between reserved resources vs. sharing
  - cost of QoS? (opportunity cost)
- architecture + econ + law

# interference

- architecture approach: limit interference
  - impact of interference on other users? other apps?
  - how to describe the “limit”?
  - implemented through architecture?
- economics approach: charge for externality
  - impact of interference on other users? other apps?
    - determined by architecture?
    - determined by economics?
  - cost of interference?
- architecture + econ + law

# control

Lots of work on this



- time scale

- power, bandwidth allocation, e.g. every 0.001 second
- rate allocation, e.g. every 0.1 second
- access, e.g. every 1 second
- secondary market, e.g. every ?? seconds

- user versus ISP control over device

- over apps?
- over app behavior?
- over QoS?

# economics matters

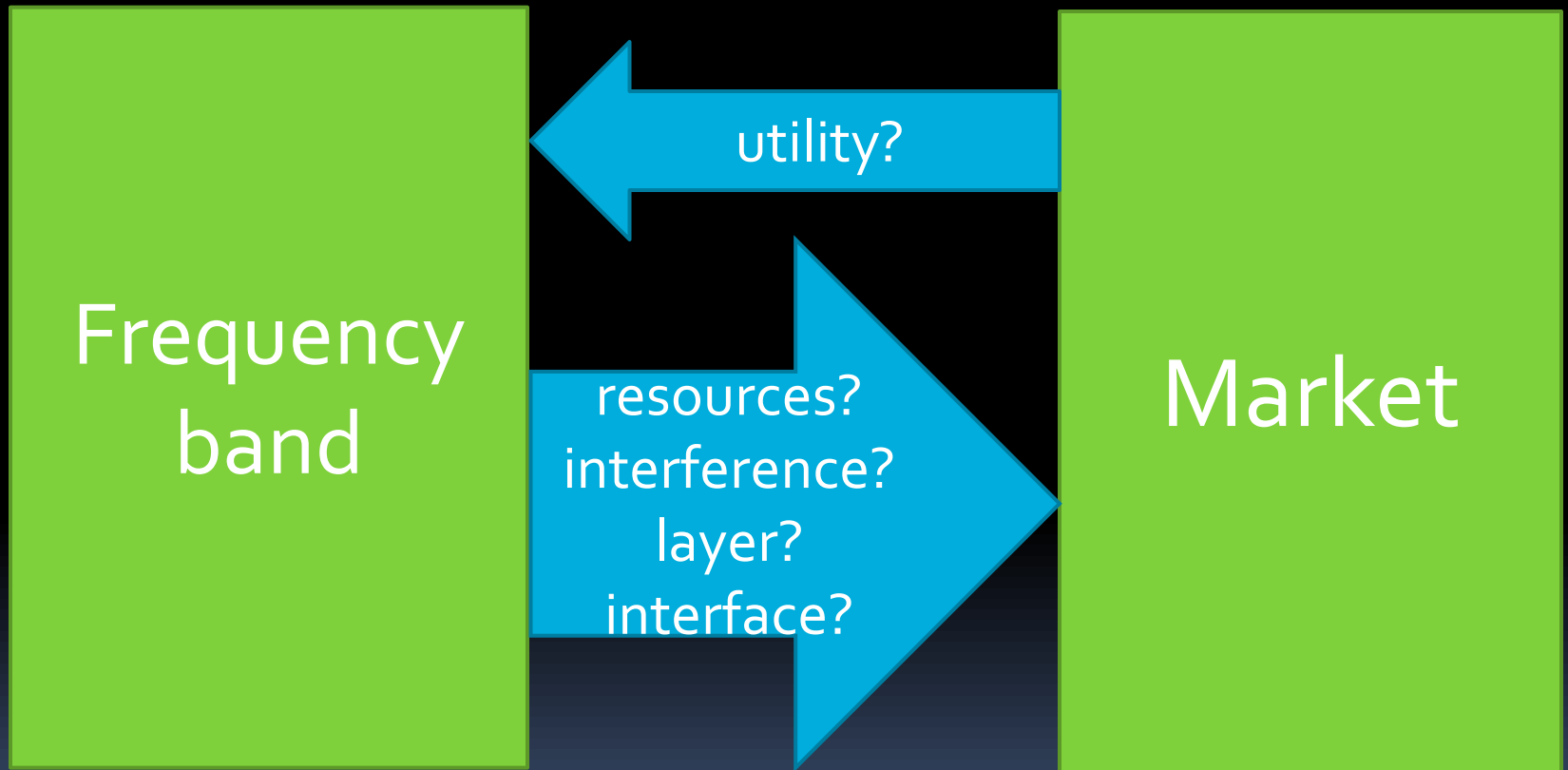
- auctions
  - what to auction?
  - partly determined by architecture
    - interference
    - time scale?
    - usage?
- econ + architecture + law



# legal stuff ...

- property rights, public interest
  - objective?
    - utility?
    - revenue?
    - innovation?
- legal terms
  - demarcation point?
  - harm?
  - interconnection?
- how to extend from past systems?
- law + econ + architecture

# Frequency as a black box?



# markets: sell what?

