

Spectrum Trading or Sharing?

New Approaches to Spectrum Management

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Presented to:

ITU Workshop on Radio Spectrum Management for a Changing World

February 16-18, 2004

Geneva, Switzerland

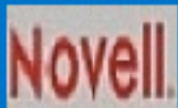
Virtual Markets and Wireless Grids

A collaborative research project supported by NSF grant #0227879

The views expressed are those of the speaker, and do not represent the institutions with which I am more or less affiliated.

See www.wirelessgrids.net for more information.

And/or www.marengoresearch.com.



Agenda

- A New Approach to Spectrum Management
- Open Communication Policy
 - Spectrum Sharing Options and Issues
 - Spectrum Trading Costs and Benefits
- Can Two Spectrum Approaches Co-Exist, or Must Regulators Choose?
 - Universities and Spectrum Management Innovation
 - Jamaica as a Regulatory Testbed
 - A New Mission for the ITU – and Spectrum Regulators?

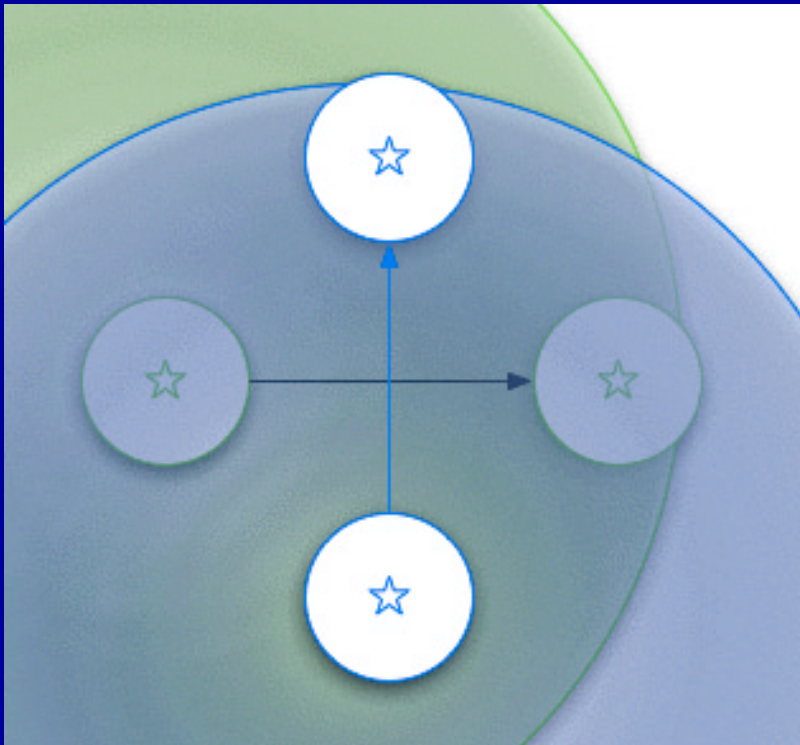
Wireless Grid Qualities

- Ad hoc mobile and nomadic resource sharing
- Shared Resources:
 - Computational cycles
 - Network interfaces
 - Sensors
 - Output (eg screens, sound)
 - Power
- The future of wireless devices?
 - Co-operative, intelligent, adaptive and capable

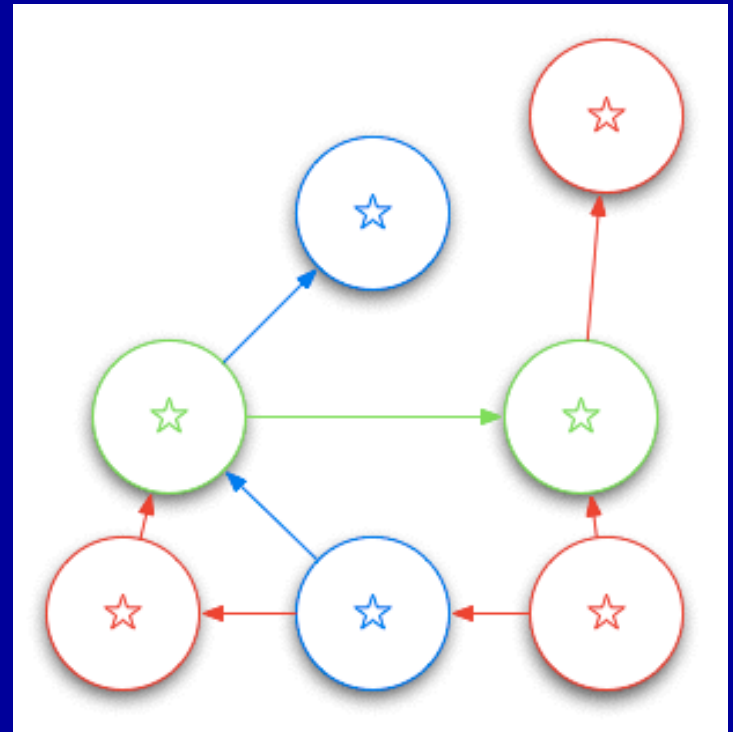
Devices collaborating

- There is no such thing as interference
 - Just bad listeners
 - Software Radios and Digital Signal Processors
- Intelligent endpoints collaborating can make most efficient use of spectrum
 - Mesh networks
 - “Listen before send” (Agile Radio)
 - Underlay (UWB)
 - Wireless links as “just another route”

Internetworking via Repeater Networks



High Power to reach partner



Lower Power shorter links
Collaborating to reach partner

Managing Spectrum, or Information Capacity?

- Noise is good, and is not noise
 - Multipath a major problem for ‘dumb radios’
 - BLAST experiment, and C-OFDM research in Europe showed significant gains from understanding multipath
- A New Philosophy: The more the merrier
 - The more spectrum is used, the more it can be used.
 - Argued to suggest linear scaling!
- Proper metric is “information capacity”
 - How many bits moved at what energy costs?

Open Spectrum Policy

- Spectrum policy is out of sync with technology
- Obsessed with interference
 - Much spectrum lies fallow
 - Potential interference is key metric
- Property rights 'slices' the spectrum
 - discourages development of co-operative devices
 - high-investment service provider networks vs user-owned networks
- David Reed
 - Generally hostile to repeaters
 - New UWB experiment bars repeaters
 - Traditional barring of interconnection between network types eg. Phone patches

Spectrum Ownership and Spectrum Trading: Dangers of Exclusivity

- Current policy is one of spectrum exclusivity
 - Encourages development of ‘dumb listeners’
 - Dumb listeners are vulnerable to interference
- Hospitals and Emergency services beginning to see interference
 - Is the answer more exclusivity or more intelligence?
- Unlicensed spectrum promotes innovation
 - WiFi, antenna arrays, repeater networking

Spectrum policy for innovation?

- Should spectrum managers promote innovation?
- How do spectrum managers learn about technology innovation?
- future vs current value and uses.
- Can auctioned spectrum be reclaimed for commons use? At what costs?
- Will spectrum 'owners' protect their technologies against agile competition?

Resources

- William Lehr and Lee W. McKnight, ‘Wireless Internet Access: 3G vs WiFi?,’ *Telecommunications Policy* 27 (2003) 351-370
- Lee W. McKnight et. al., ‘Mobile Regions,’ *Trends in Communication* 10, (2003) 9-34
- W. Russell Neuman, Lee W. McKnight, Richard Jay Solomon, *The Gordian Knot. Political Gridlock on the Information Highway*, MIT Press 1997, 1999.
- Open Spectrum FAQ
 - <http://www.greaterdemocracy.org/OpenSpectrumFAQ.html>
- David Reed submission to Spectrum Policy Taskforce
 - <http://www.reed.com/OpenSpectrum/>
- Kevin Werbach, “SuperCommons”, TPRC
 - <http://werbach.com/research/supercommons.html>