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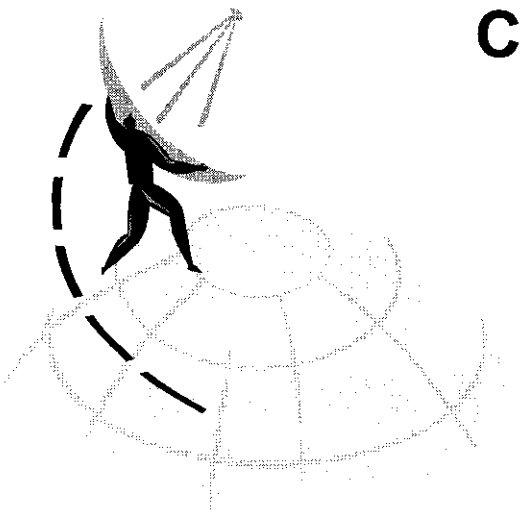
Federal Communications Commission
Office of the Secretary

Spectrum Policy and Technology

Spectrum Access and the Promise of Cognitive Radio Technology



19 May 2003

Spectrum Policy and Cognitive Radios

- **Spectrum Policy Task Force recognized the changes in technology and the profound impact that would have to spectrum policy**
  - Improved Spectrum Access can mitigate scarcity of the spectrum resource
  - Clearly defined interference metrics can improve utilization of the spectrum
  - Spectrum can be parceled in frequency, space, and time

Cognitive radio technology, inclusive of software and software definable radio technology, are key components for realizing this vision

Goal is to Promote Efficient Use of the Spectrum!

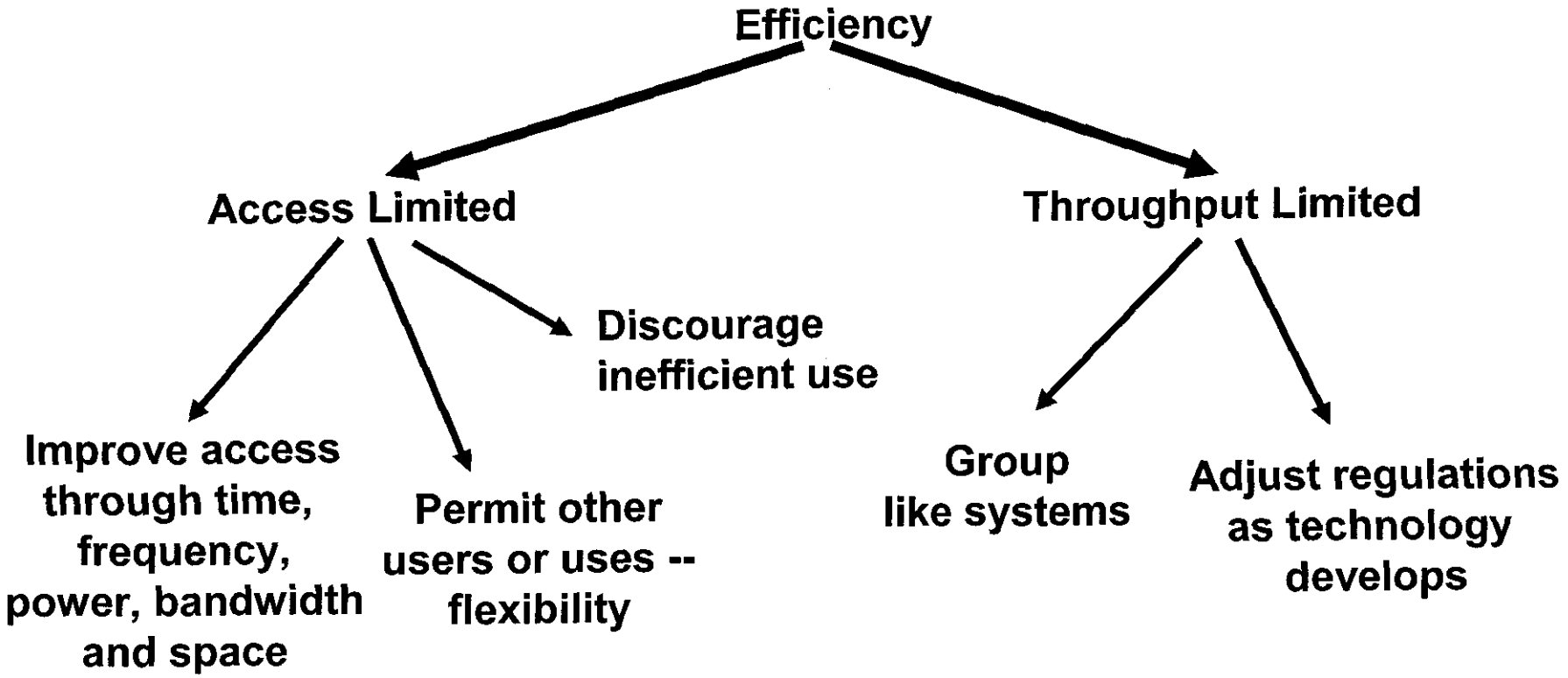
Cognitive and Software and Software-Definable Radio Technology

- **Software and Software Definable Radio Capabilities**
  - Flexible … "capable of responding or conforming to changing or new situations"
  - Agile … "marked by ready ability to move with quick easy grace"

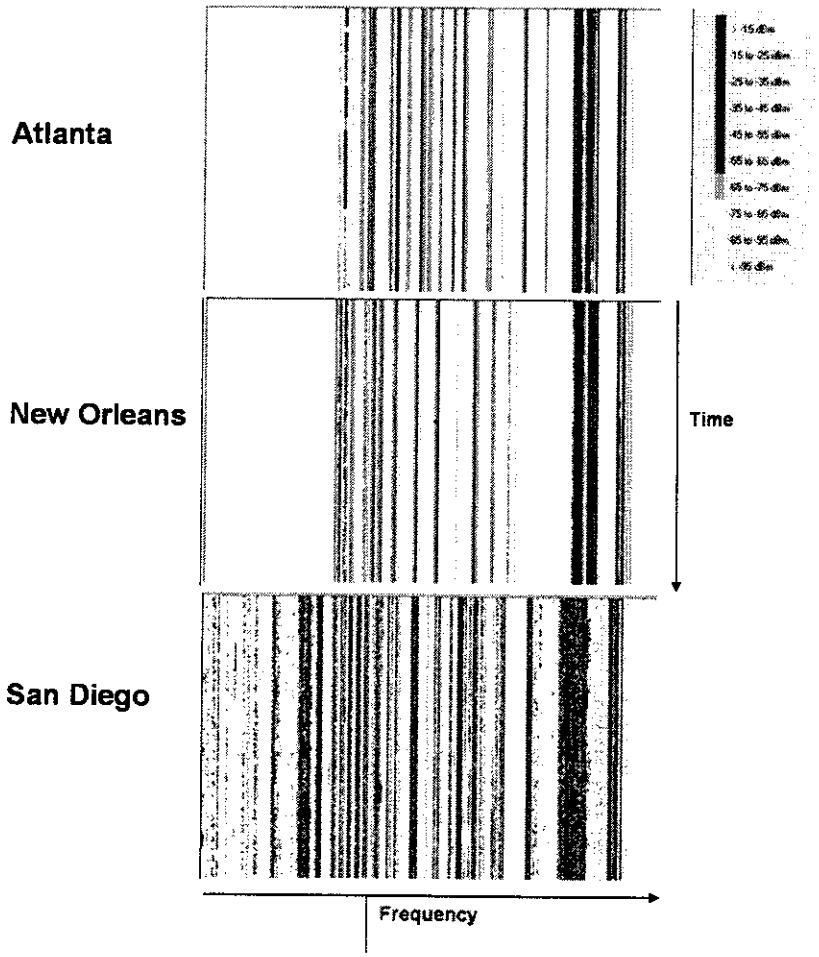
- **Cognitive Radio Capabilities**
  - Cognitive … "knowing, or apprehending by the understanding"

Webster's New Collegiate Dictionary

Improving Spectrum Efficiency



Spectrum Use in Practice



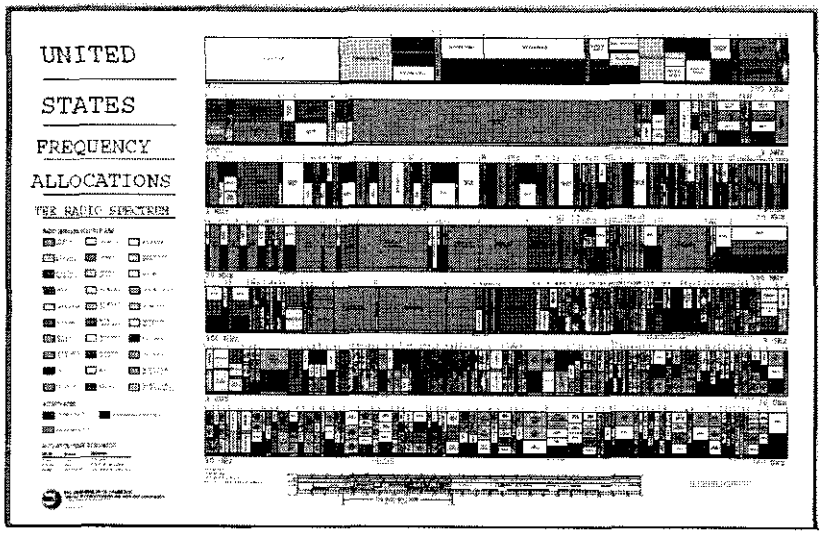
- Some spectrum is intensively used
- Other spectrum has highly variable use in when viewed in terms of time and geography

Spectrum Policy Reform: Access is Key

- **Increased <u>access</u> can mitigate scarcity of spectrum resource**

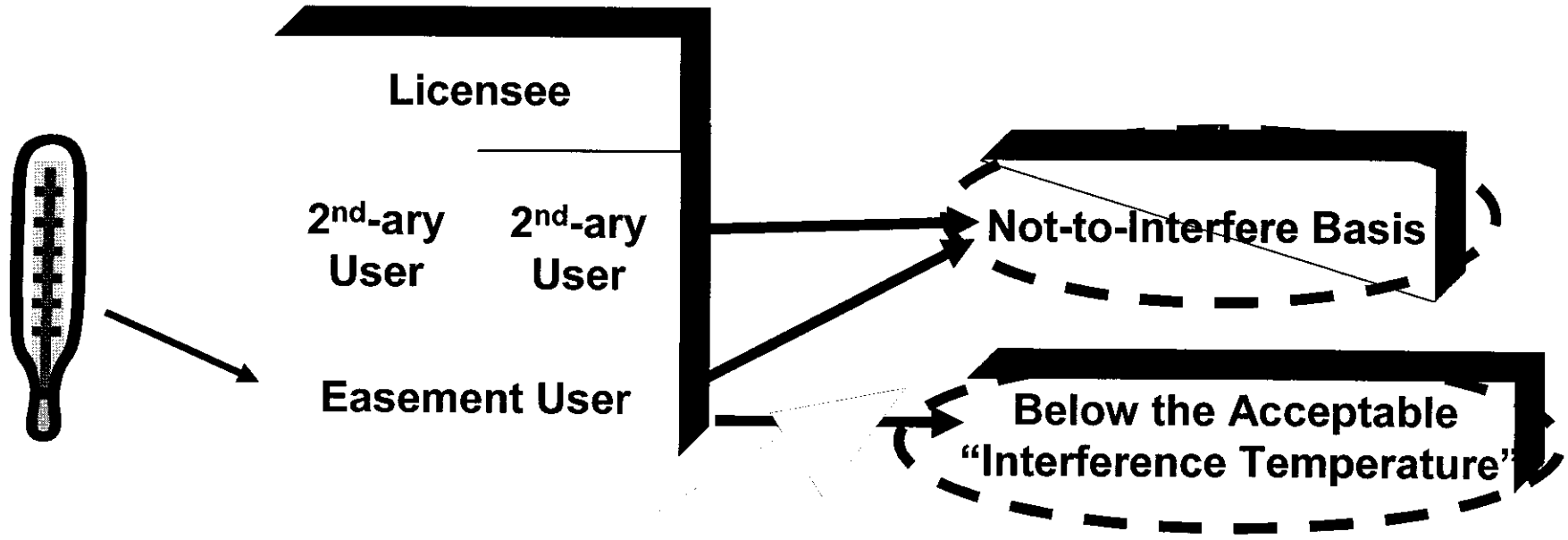
  – Most "prime spectrum" has already been assigned to one or more parties, and it is becoming increasingly difficult to find spectrum that can be made available either for new services or to expand existing ones.

  – Improving access to the spectrum can be achieved through permitting licensees greater flexibility and other means.



Promoting Access to Spectrum

The New Model



Cognitive Radios

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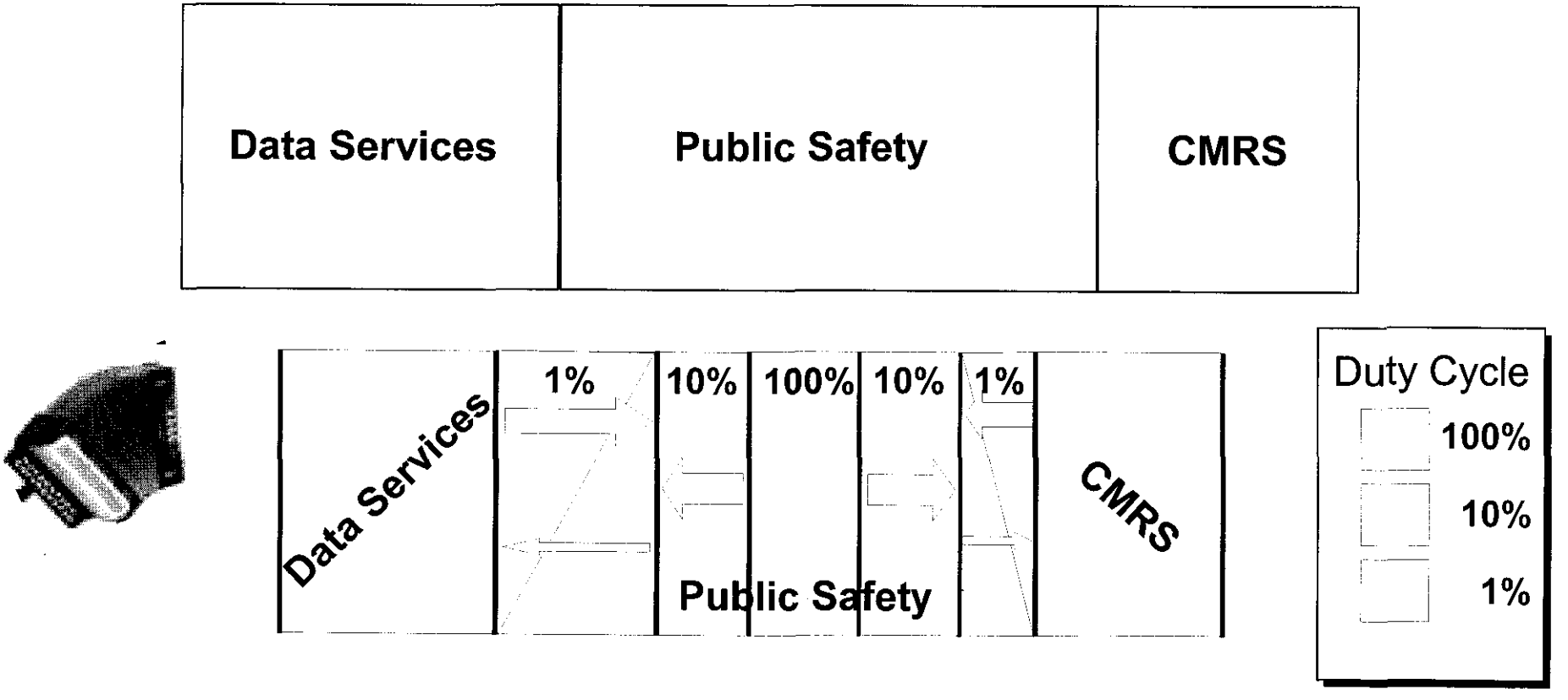
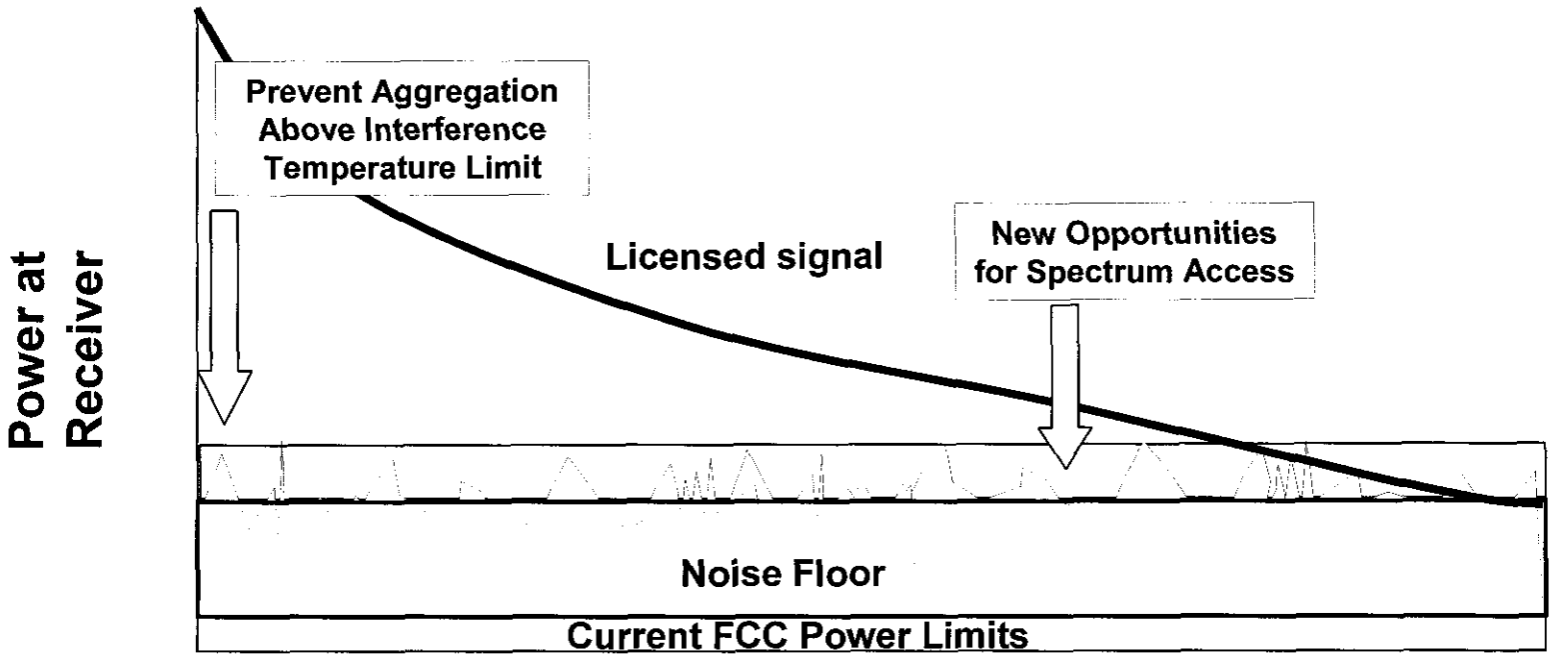
Promoting Access to Spectrum Through Increased Flexibility

Illustration: Public Safety & Dynamic Spectrum Use



Use of public safety spectrum is highly variable

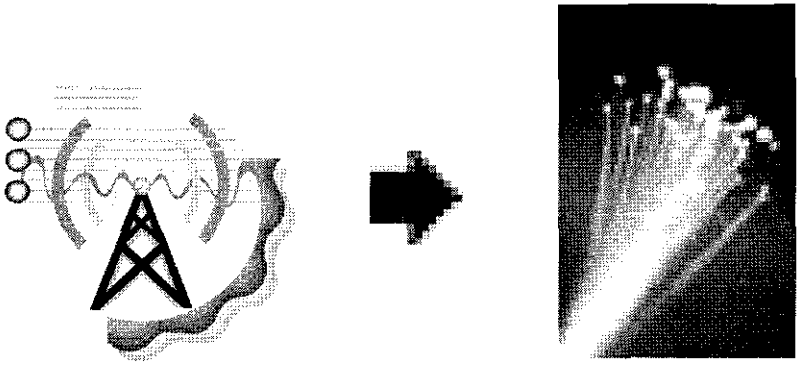
Interference Avoidance
Tolerance of Interference



- **Quantify acceptable levels of interference**
  - Can Cognitive Radios capture the Interference Temperature?
  - How should Cognitive Radios exploit this information ?

Promoting Access to Spectrum Discouraging Inefficient Use

- **Situations where the Commission finds it necessary to promote spectrum or technical efficiency**
  - Consider user fees or other steps to stimulate improvements in efficiency when marketplace is inadequate.
  - To the extent that wireline or hybrid technologies may be more efficient alternatives to existing use of radio spectrum in some instances, promote the use of such alternatives whenever appropriate.



Key Questions

- **Since Cognitive Radios span a large range of capabilities …**
  - What subset of capabilities are needed?
  - What subset of capabilities are in hand? Near term? Far term?

- **Economics, Reliability, and Capability impact the viability of a technology**
  - What are the impediments for a cost-effective system?
  - How do we determine the reliability constraints for different applications of Cognitive Radio technology (e.g. public safety, DoD, consumer handsets)

These Key Questions will hopefully be addressed during this workshop