

Performance Analysis of Cognitive Radio Systems with Imperfect Channel Knowledge

Doctorate Presentation

M. Sc. Ankit Kaushik | 31 January 2017

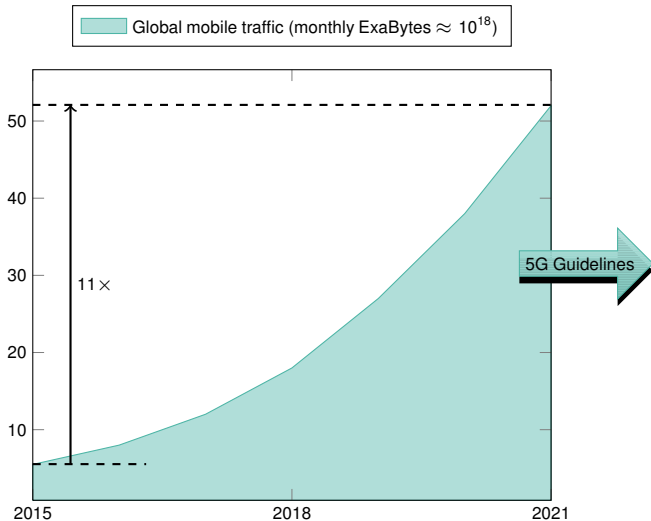
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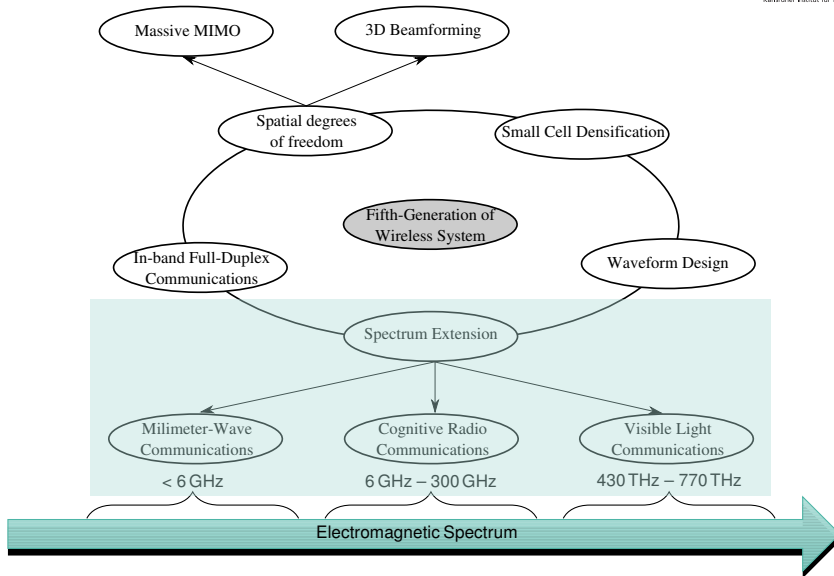
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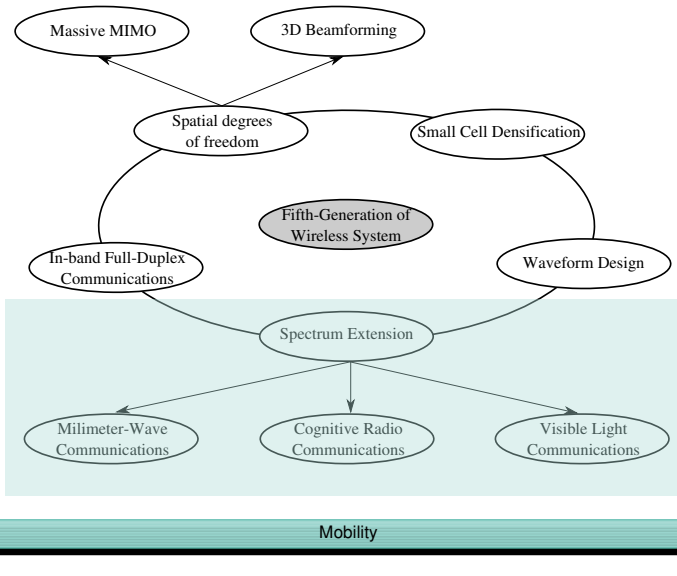


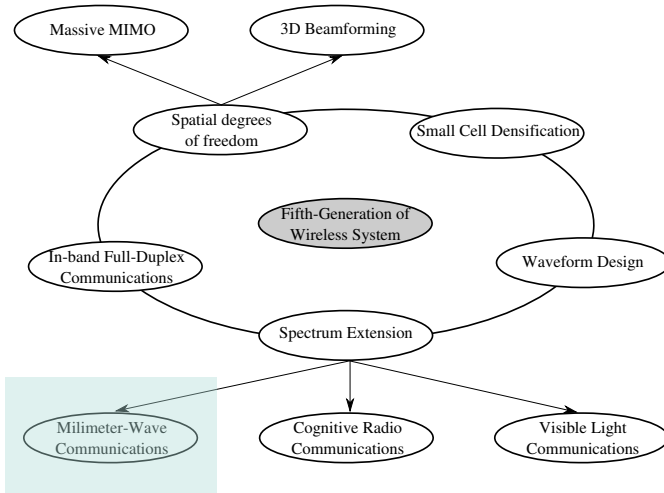
- 1 Motivation
 - Cognitive Small Cell
- 2 Interweave System
- 3 Underlay System
- 4 Hybrid System
- 5 Hardware Implementation
 - Validation
 - Demonstration
- 6 Conclusion



- Data rate ($1000\times$)
- Latency ($< 1\text{ ms}$)
- Energy- and cost-efficiency







A Cognitive Radio (CR) is an agile system that allows efficient usage (secondary access) of the spectrum below 6 Hz

Cognitive Small Cell

An Cognitive Small Cell (CSC) is a network entity that enable CR communications for the devices operating indoor

Network Elements

- Cognitive Small Cell-Base Station (CSC-BS)
- Mobile Station (MS)
- Macro Cell-Base Station (MC-BS)

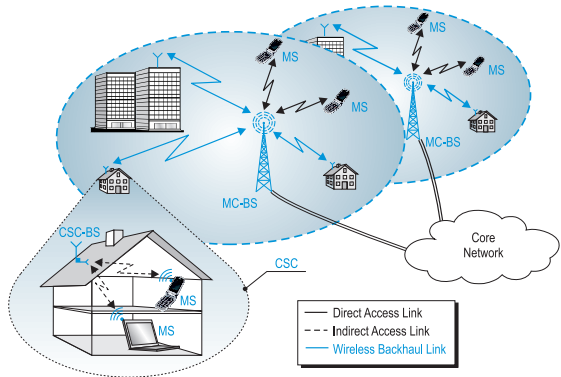
Spectrum Access

- Wireless backhaul link (CSC-BS \leftrightarrow MC-BS)
- Direct link (MC-BS \leftrightarrow MS)
- Indirect link (CSC-BS \leftrightarrow MS)

Indoor?

- 70% traffic is originated indoor \leftrightarrow Traffic Management
- Spatial separation \leftrightarrow Interference suppression

CSC in a preliminary 5G network



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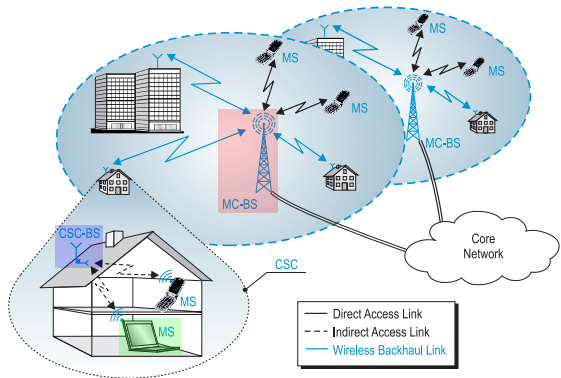
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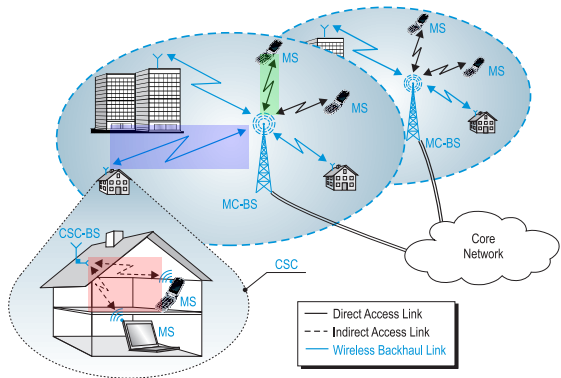
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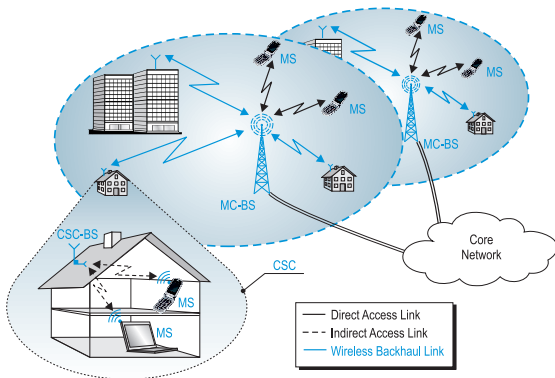
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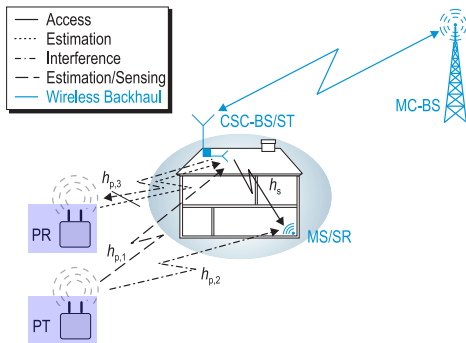


- CR system involves the coexistence of two different system: **primary** and **secondary**
- Objective is ensure the interference at PR below a certain value

PT, PR, ST(\Leftrightarrow CSC-BS) and SR(\Leftrightarrow MS)

Performance characterization

- Interference at PR
- Throughput at SR



Conclusion

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Thank you for your Attention!