



Research Consortium in Speckled Computing

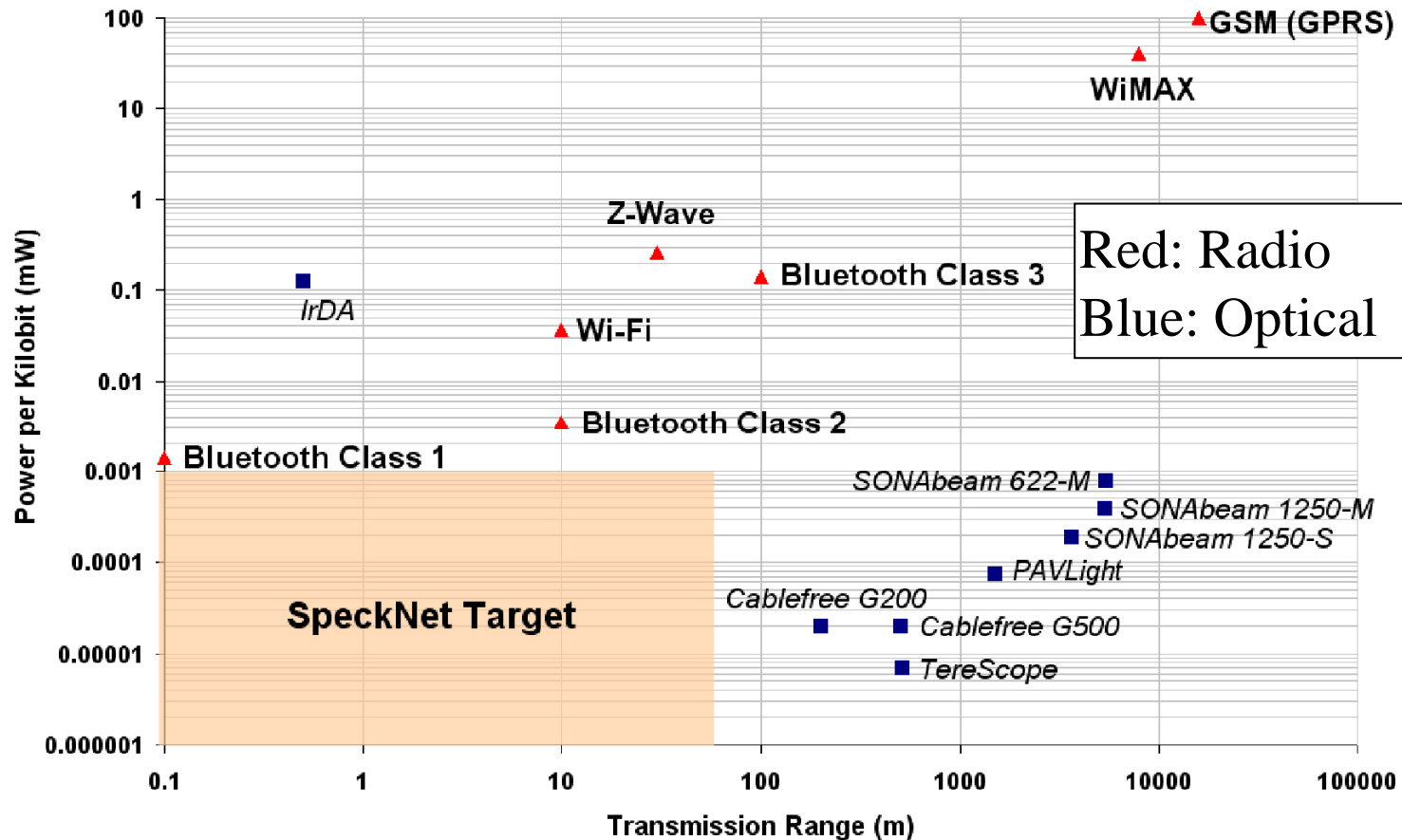
Optical Interconnects in Specknet

Chris Reardon, Karl Welna, Andrea Di Falco and Thomas F. Krauss



Free-space communication systems

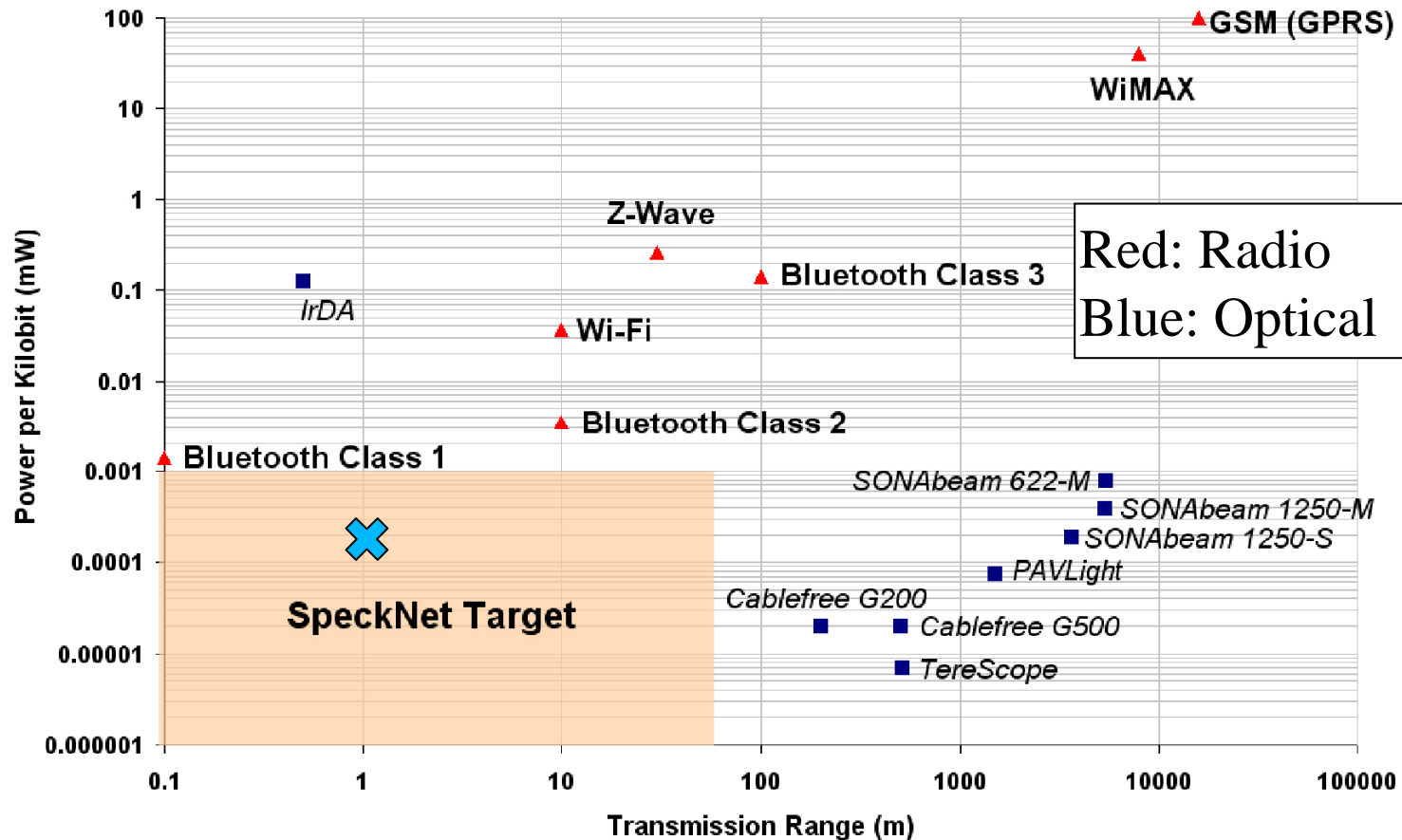
Goals



To provide localization between individual Specks using Optical elements
Leading to Optical communication between Specks

Free-space communication systems

Goals

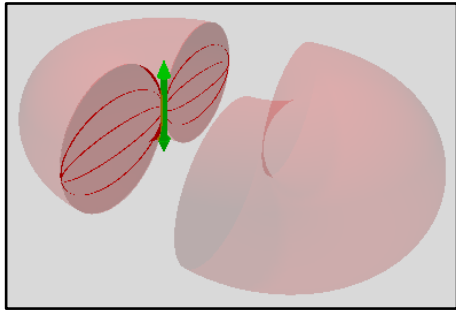


To provide localization between individual Specks using Optical elements
Leading to Optical communication between Specks

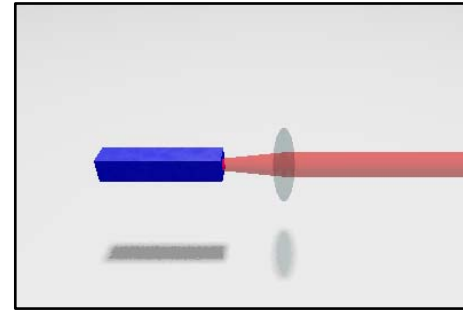
Optical Communication

Improved system efficiency

Radio emits over an angle of 4π sr



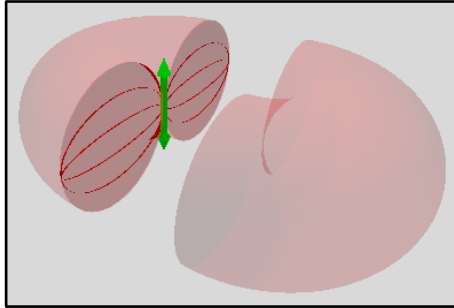
Optical beams can be collimated



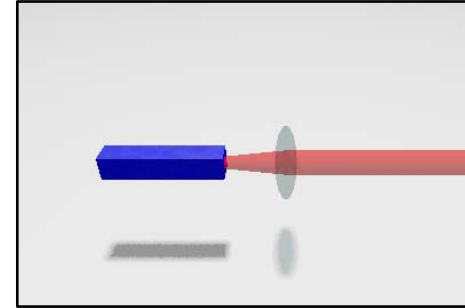
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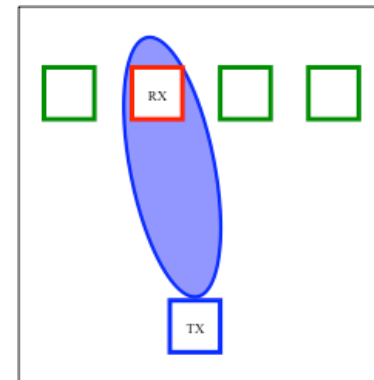
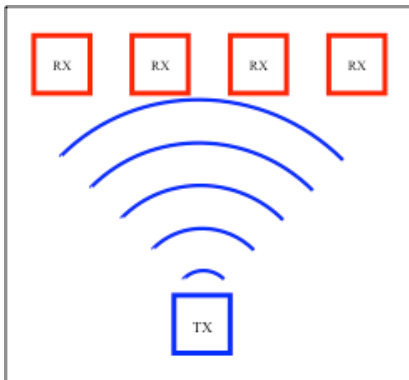
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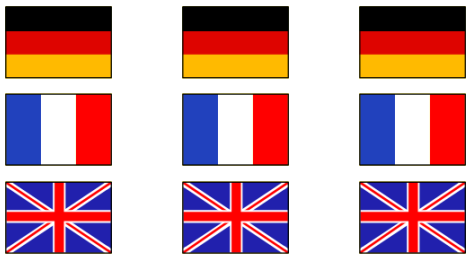
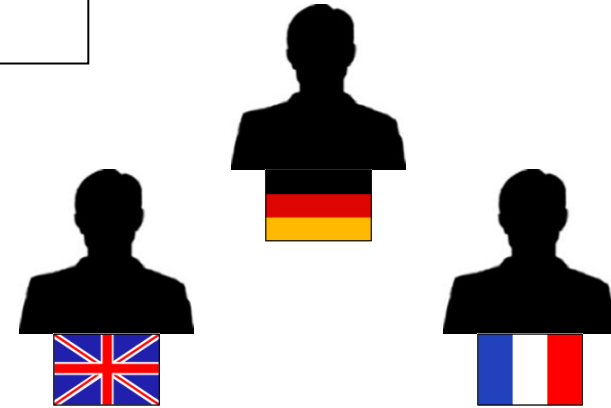
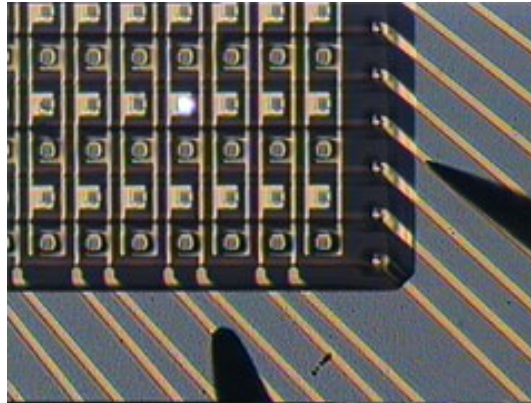
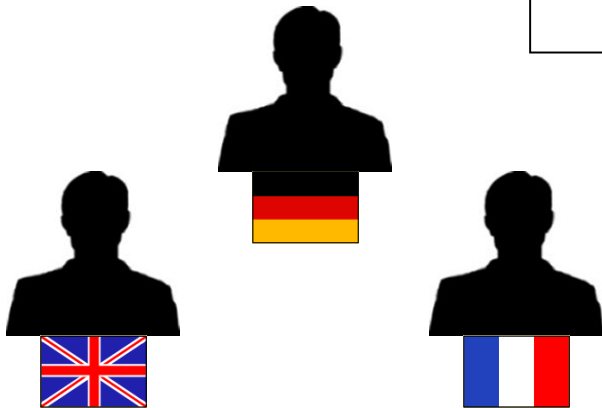


Increased Localization accuracy



Integration and Dedicated communication channels

Multiple emitters lead to multiple communications per Speck



A single speck, using its multiple emitters, would be able to have separate dedicated conversations with its neighbours



Single Emitter

Multiple Emitters

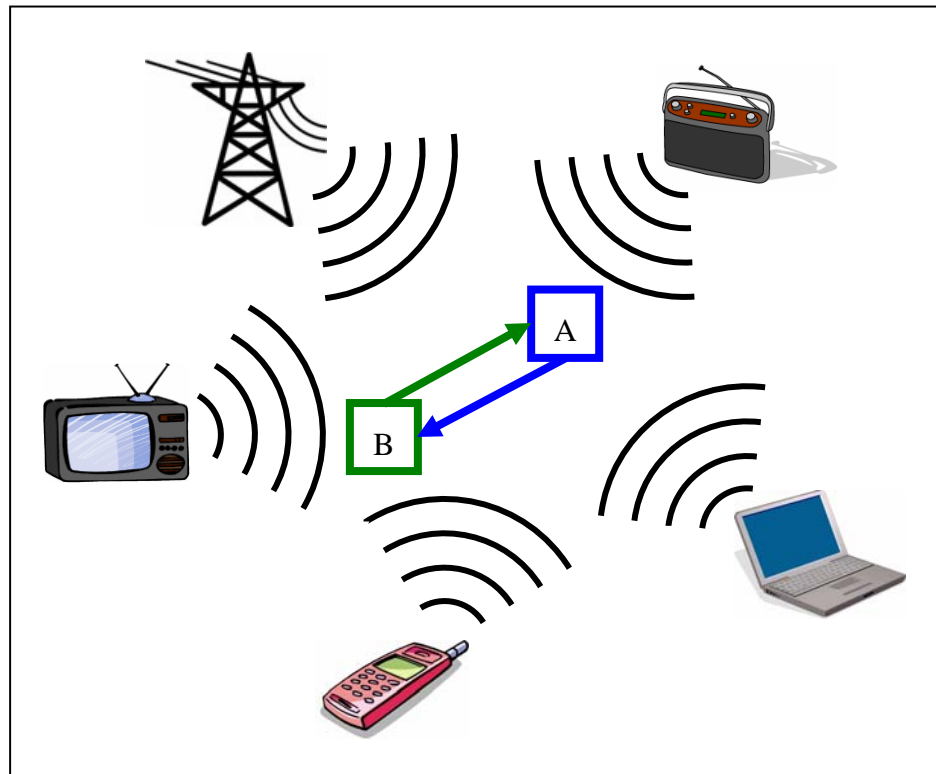
Noise tolerance



International Herald Tribune, October 27, 1989. Kal, Cartoonists and Writers Syndicate, 1989.

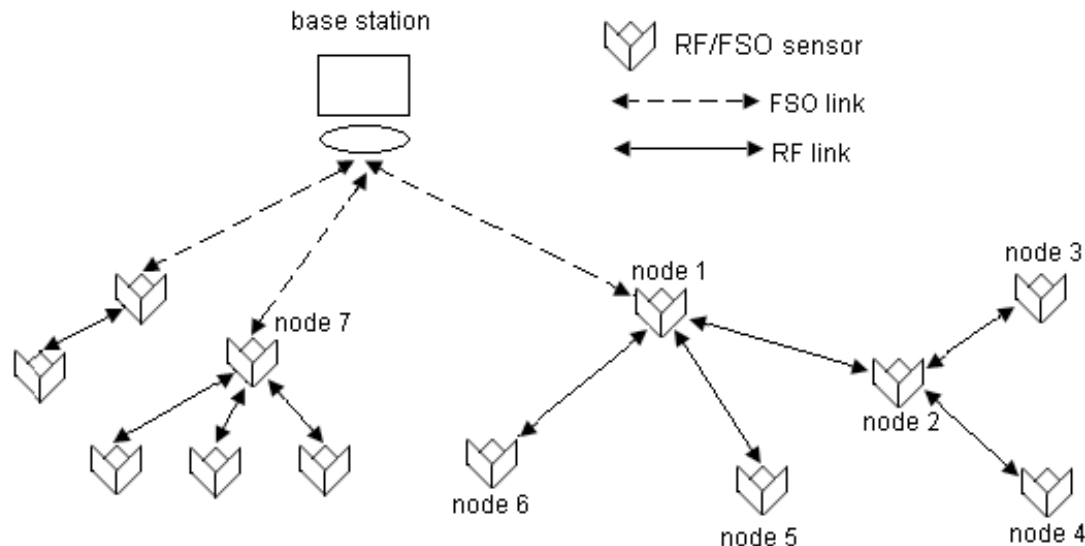
Noise tolerance

Optical components do not suffer from interference from other transmission sources: less susceptible to interference



Radio Frequency/Free Space Optics hybrid systems

Lifetime Comparison of RF-only and hybrid RF/FSO Wireless Sensor



“This paper shows that for the range of scenarios considered, the RF/FSO WSN outlasts its traditional RF-only counterpart”

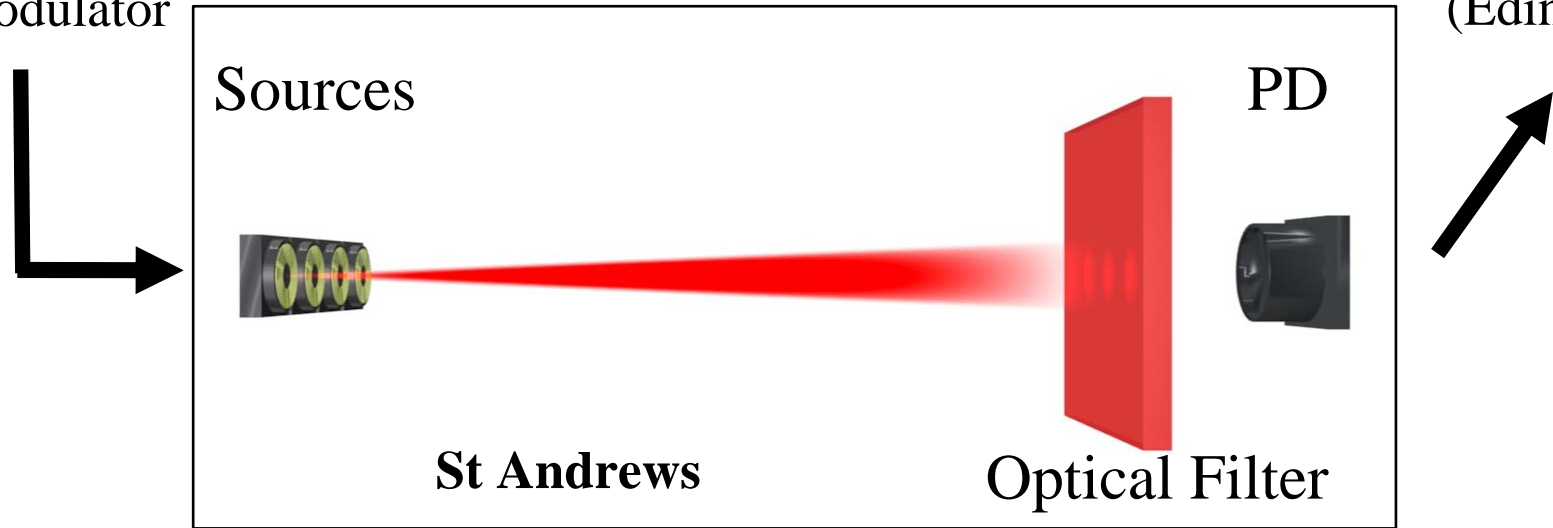
S. Sivathanan, D. C. O’Brien, Proceedings of the International Conference on Computer and Communication Engineering 2008, 2008 Kuala Lumpur, Malaysia

Optics in Specknet

CDMA coding scheme (Strathclyde)

Direct Pulsed
Modulator

Base band data
(Edinburgh)

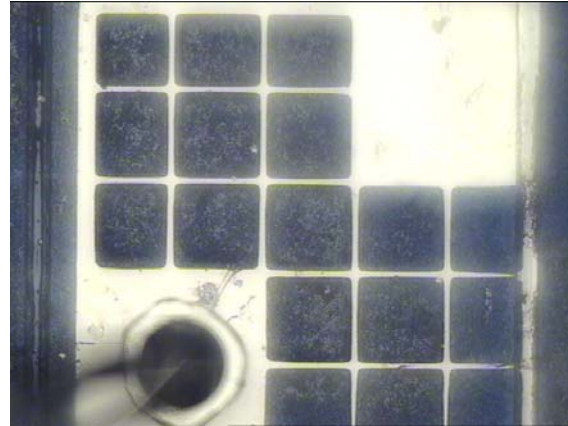
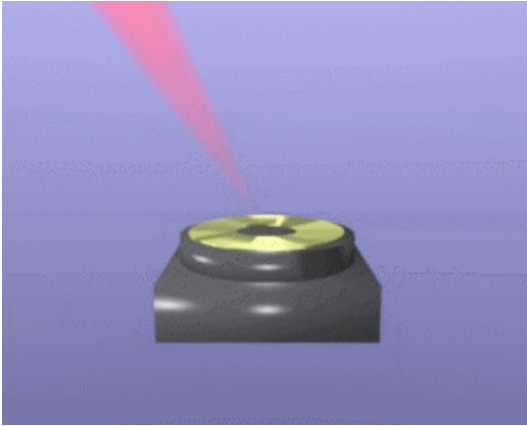


Localisation algorithm

MAC layer protocols

In the next talks...

Sources + Detectors (Chris)



Applications

- James (p2p communication/location discovery)
- Ryan (Location discovery)
- Louise (Coding)

Integration (Karl)

