

# Dynamic Time and Power Allocation for Opportunistic Energy Efficient Cooperative Relay

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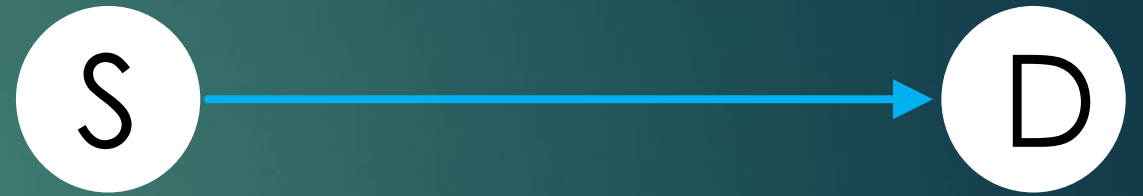
# Energy efficient wireless communications

## Why ?

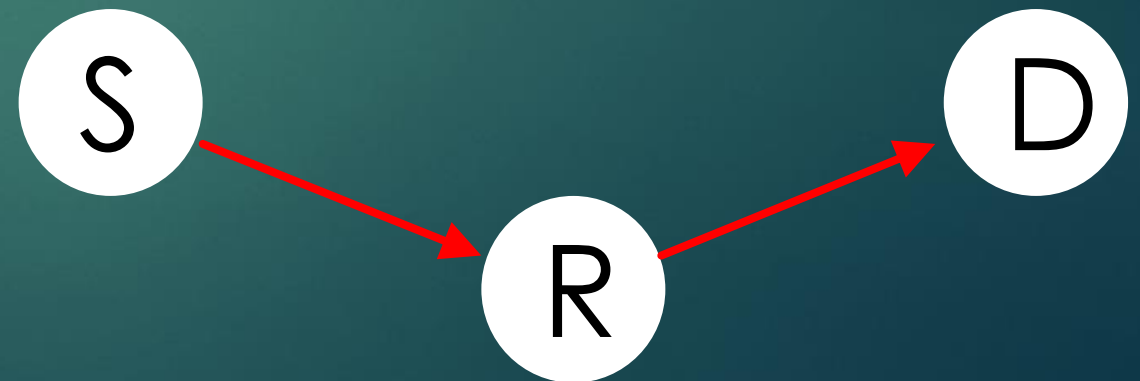
- ▶ Data demand will only get bigger
  - ▶ More data rate means more energy consumption!
- ▶ User-side – phone batteries
- ▶ Supply-side – energy bill

# Relays

- ▶ Shorter transmission range
- ▶ Linear P-d relationship (instead of exponential)
- ▶ Reduced interference due to lower transmission power

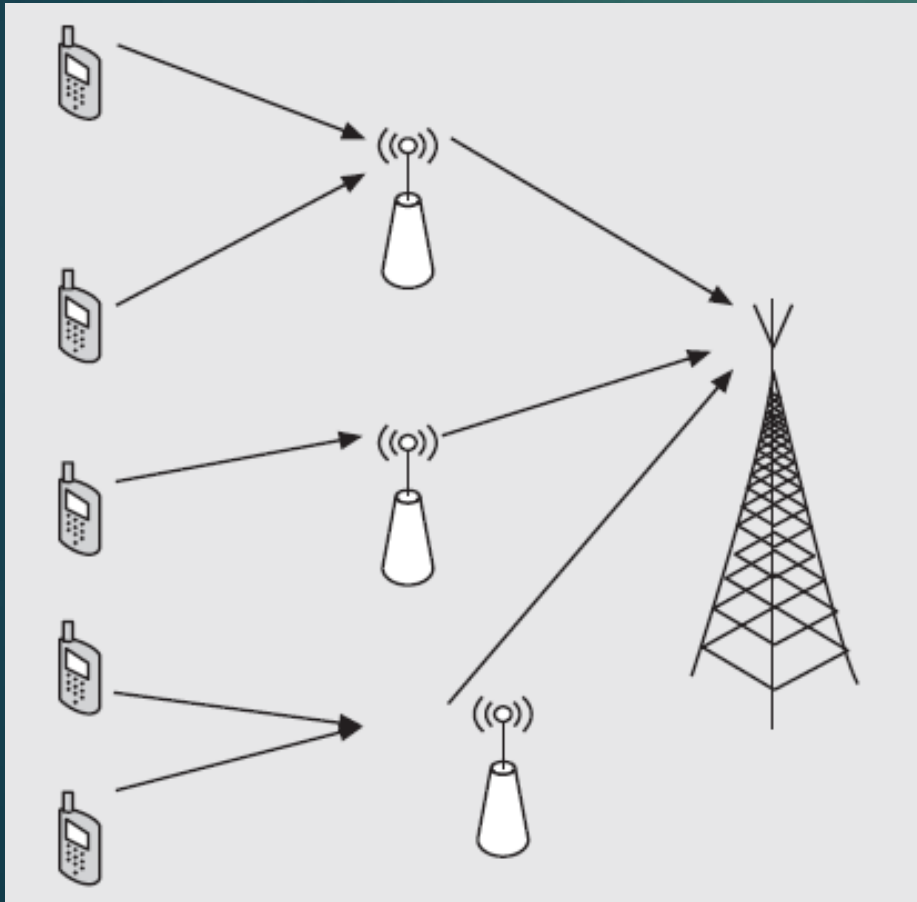


OR

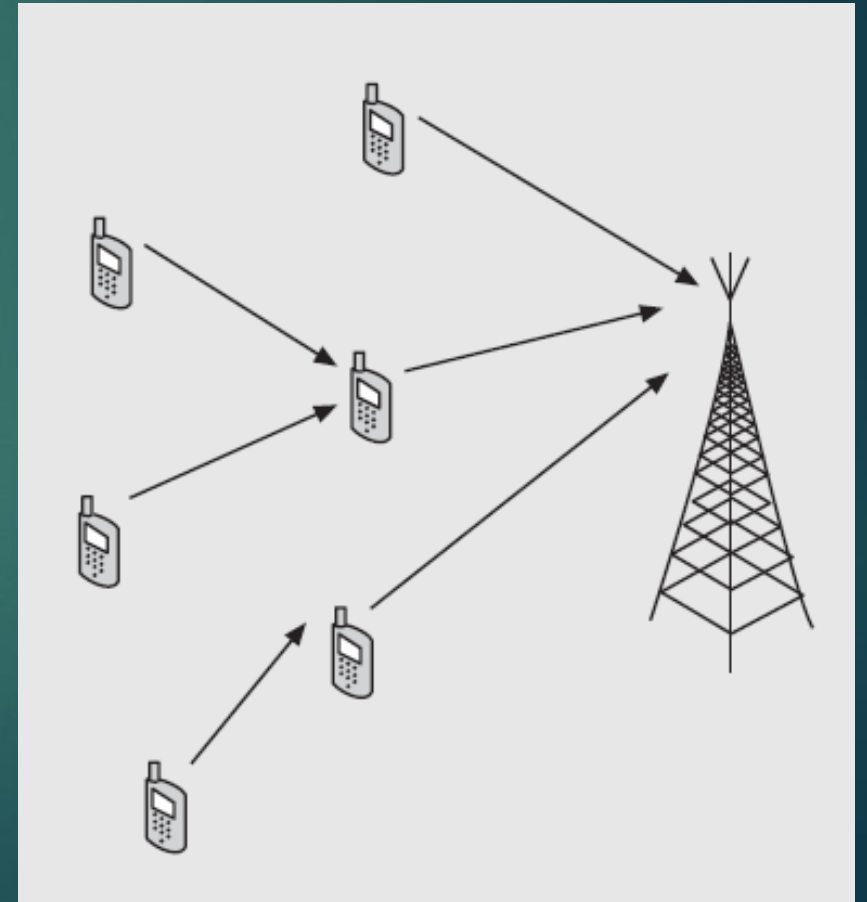


# Cooperative Relays

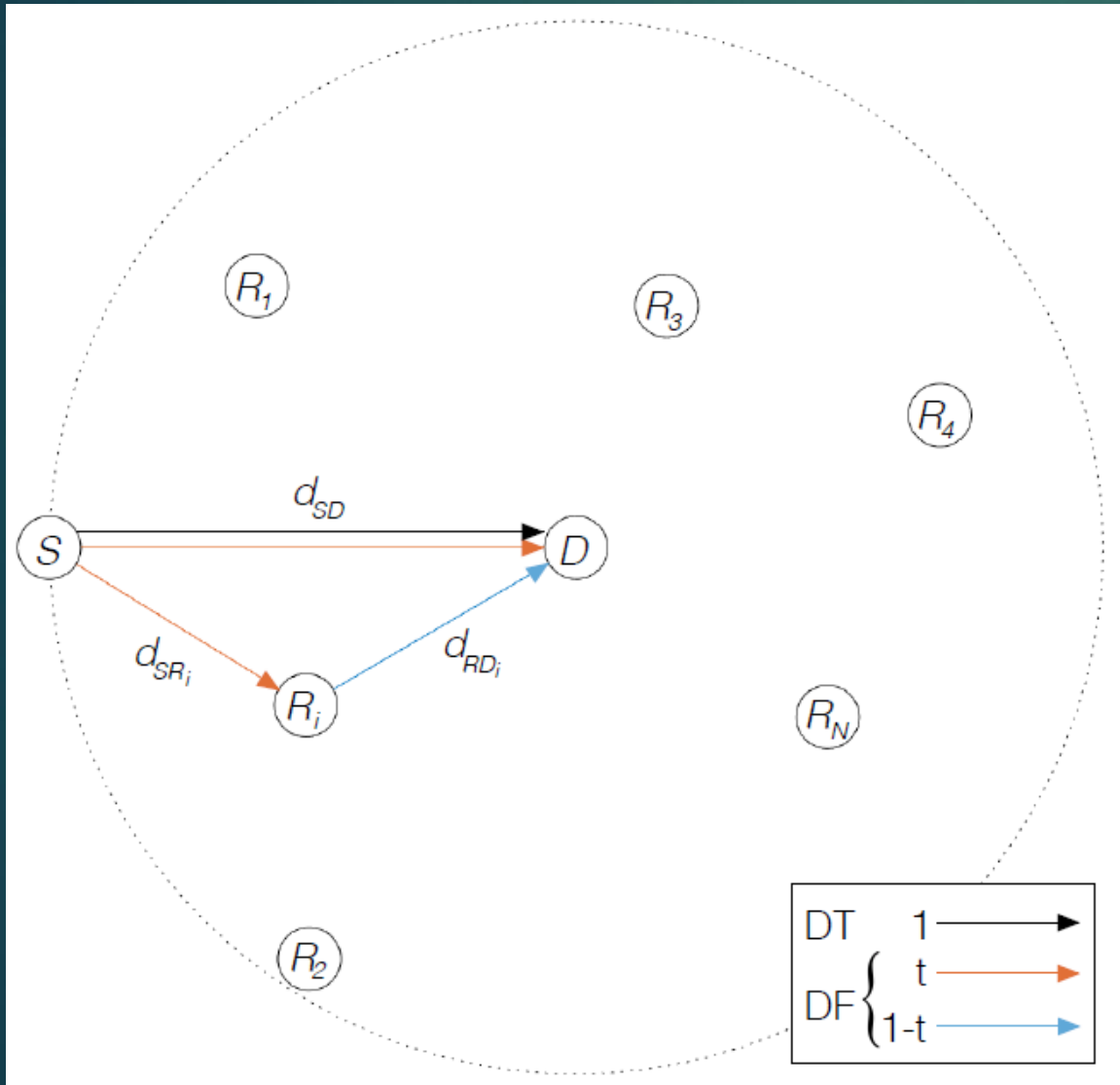
## Traditional Relay



## Cooperative Relay



# Cooperative Relay Network



- ▶ Relay ?
- ▶ Worth it ?
- ▶ Which relay ?
- ▶ Which time ?
- ▶ What power ?

# Relay Selection, Time Allocation, Power Allocation

## ODF

- ▶ “Opportunistic Decode and Forward”
- ▶ Maximises capacity

## OEE

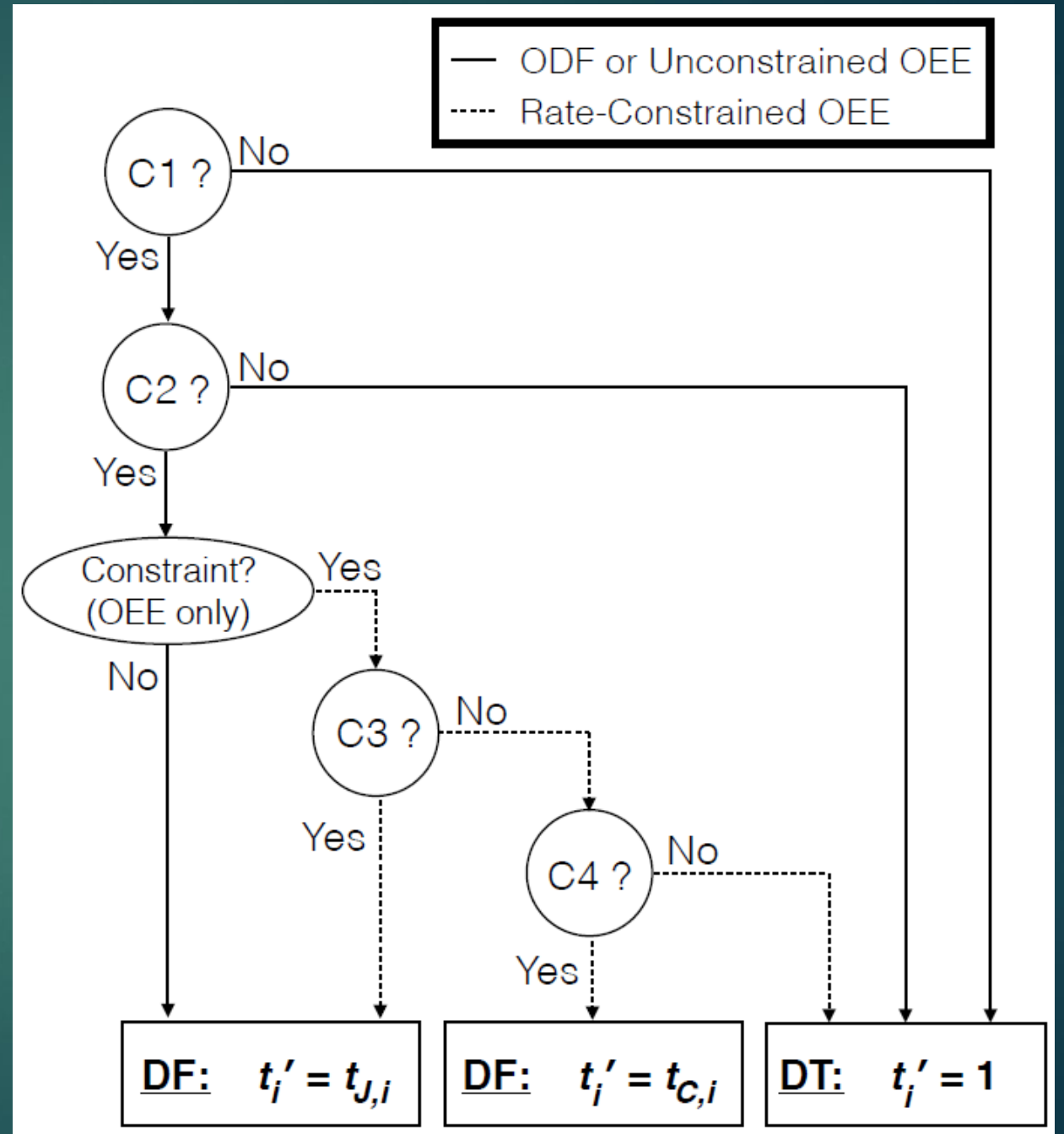
- ▶ “Opportunistic Energy Efficiency”
- ▶ Maximises energy efficiency

# My Contributions...

- ▶ Optimised time allocation algorithm for ODF & OEE
- ▶ Globally optimum time & power allocation for EE
- ▶ Simulation showed improvement in network performance

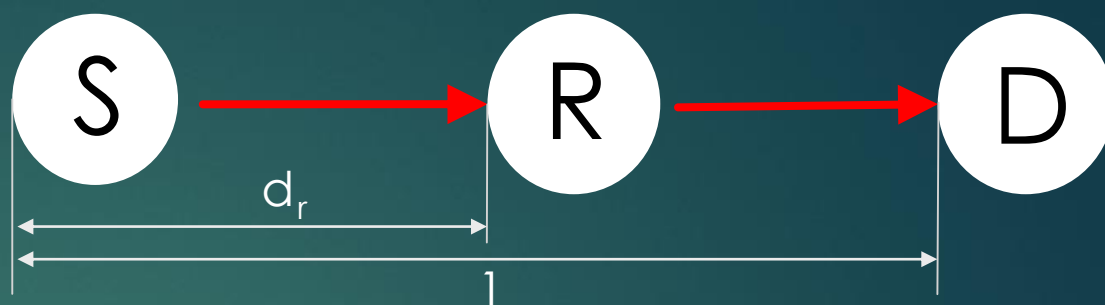
# Algorithm

Optimum time allocation  $\longrightarrow$

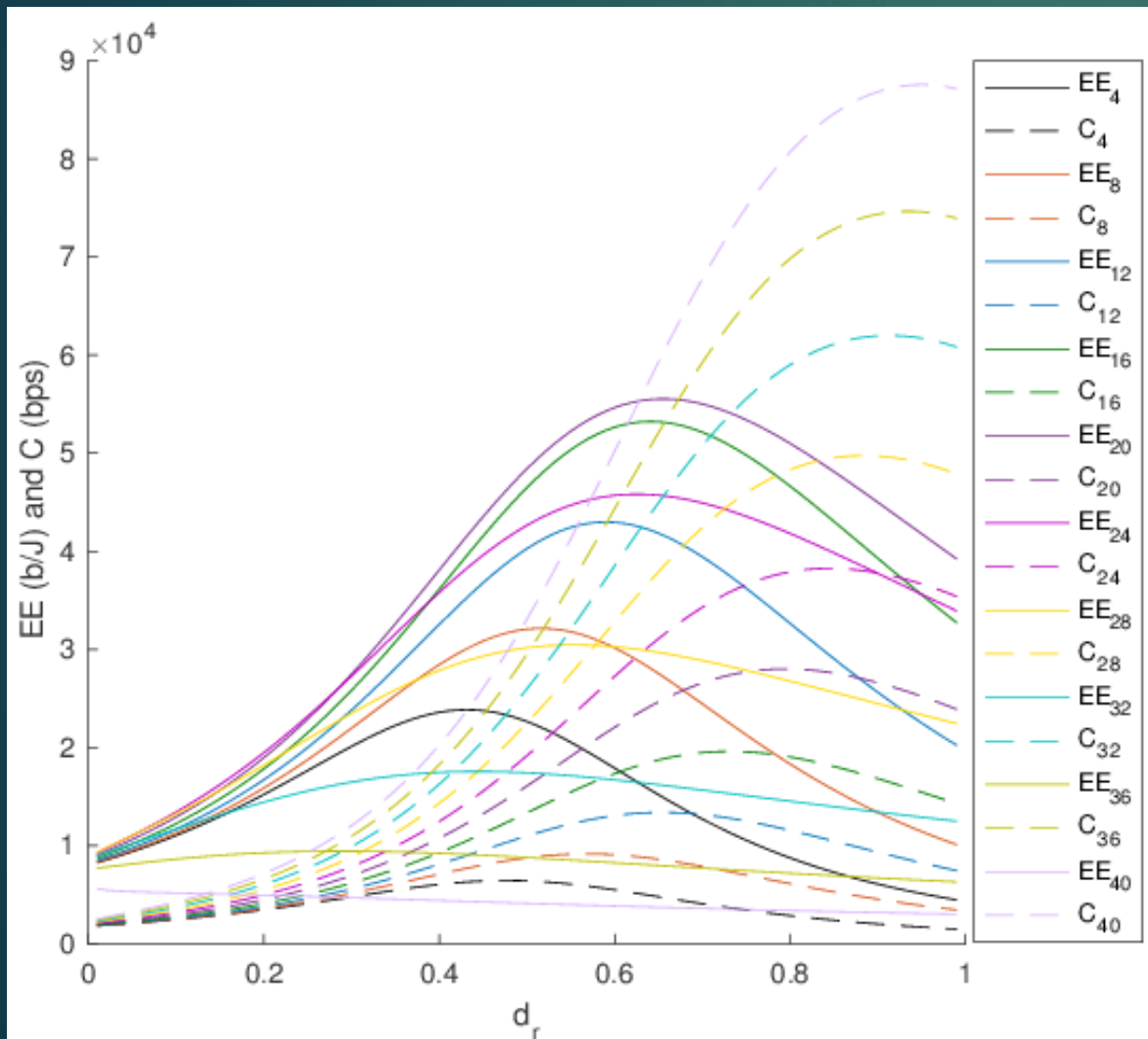




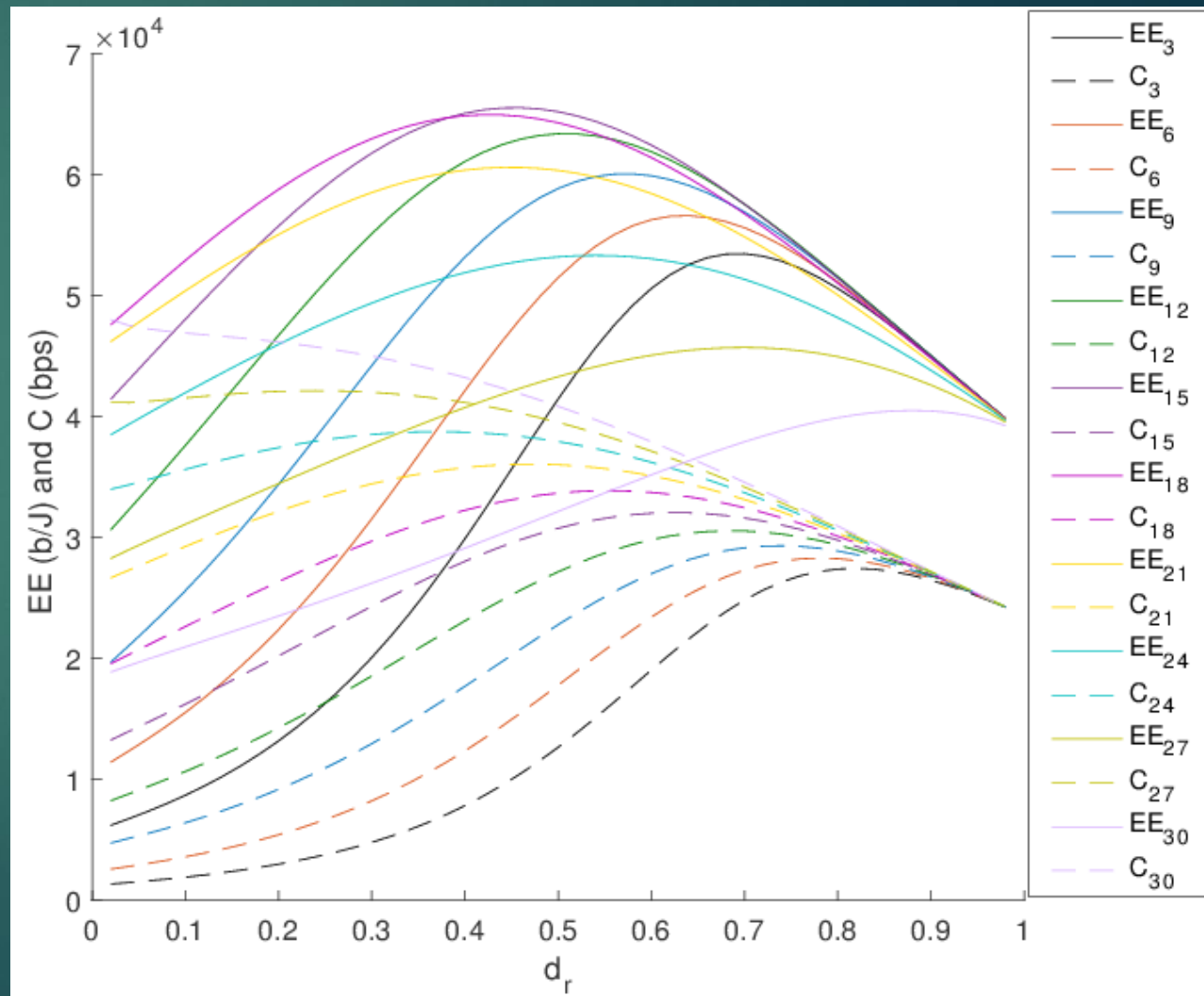
# Results



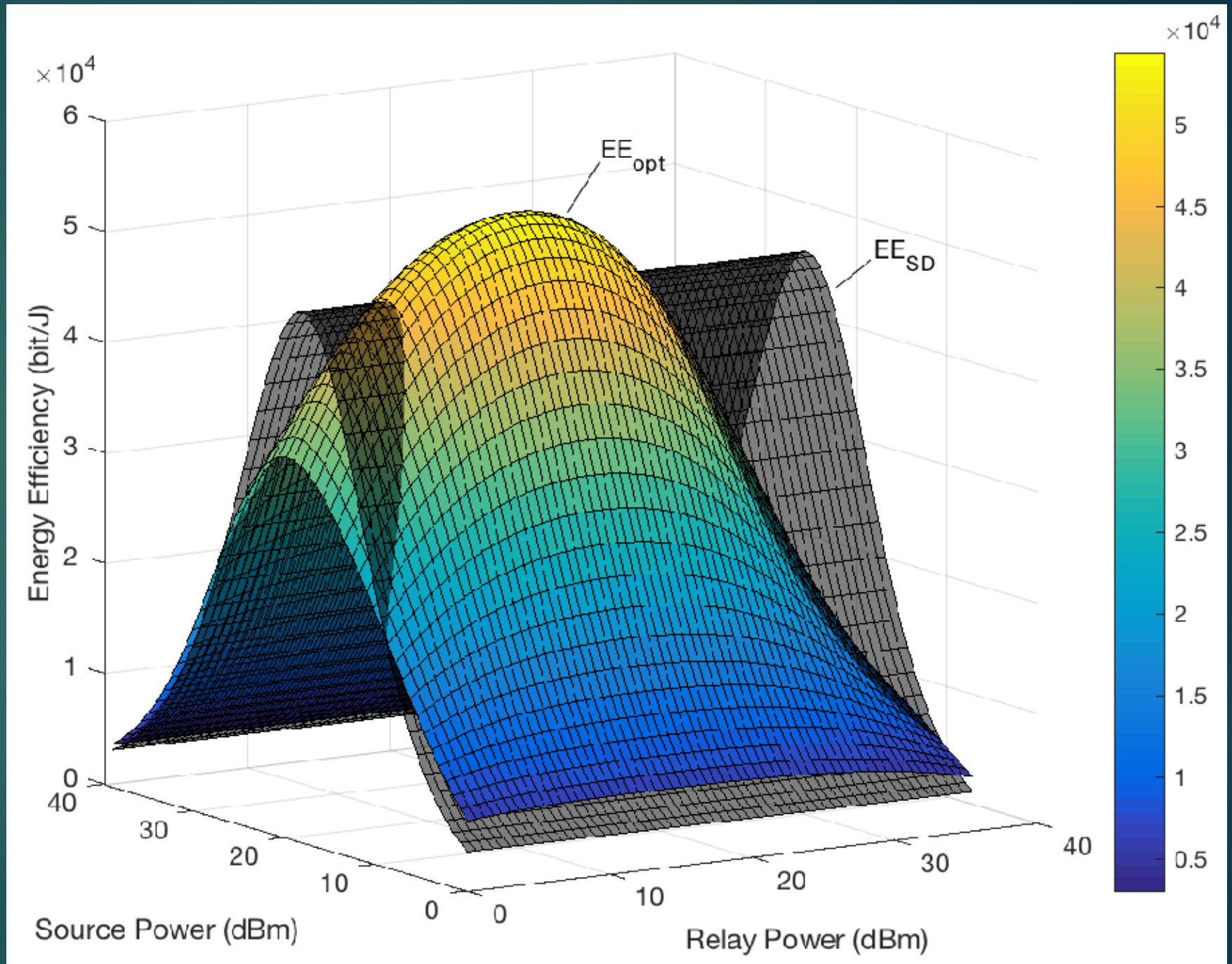
Source Power



Relay Power



# Results



# Conclusion

- ▶ Optimum dynamic time allocation algorithm
- ▶ Globally optimum time and power allocation
- ▶ Simulation:
  - ▶ Improvement in system performance
  - ▶ Applicable to mobile, ad hoc & vehicular networks, as well as traditional networks