

Time-Optimal Information Exchange on Multiple Channels



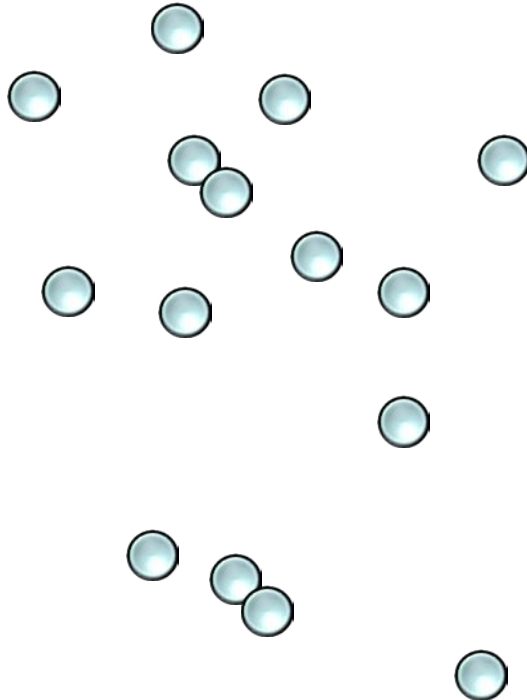
Stephan Holzer
Yvonne Anne Pignolet
Jasmin Smula
Roger Wattenhofer

Time-Optimal Information Exchange on Multiple Channels



$n := \# \text{ nodes}$

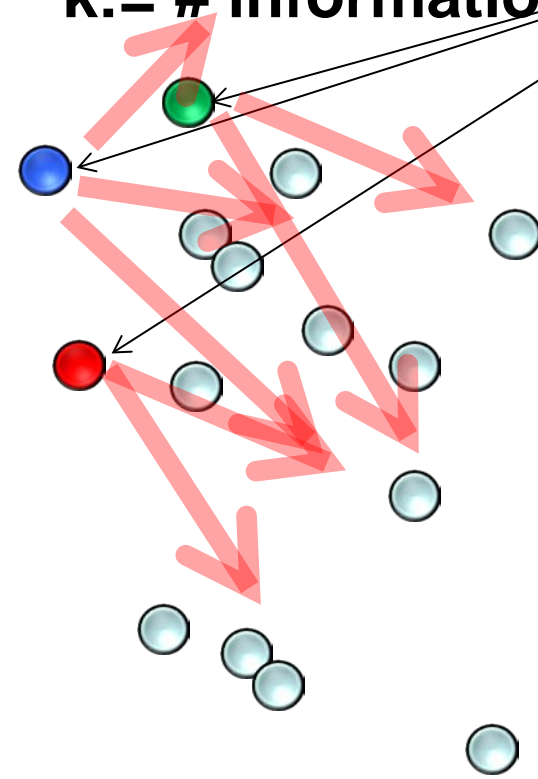
Problem:



Time-Optimal Information Exchange on Multiple Channels



Problem: $n := \# \text{ nodes}$
 $k := \# \text{ information}$ Have information

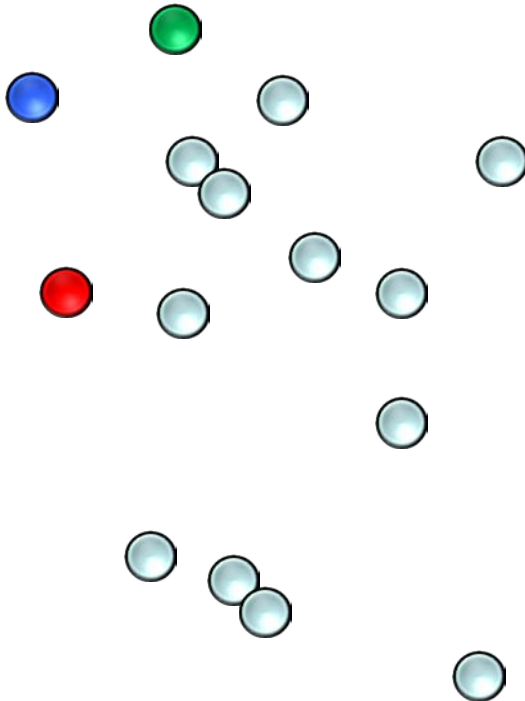



Disseminate to all! ?

Time-Optimal Information Exchange on Multiple Channels



Problem:

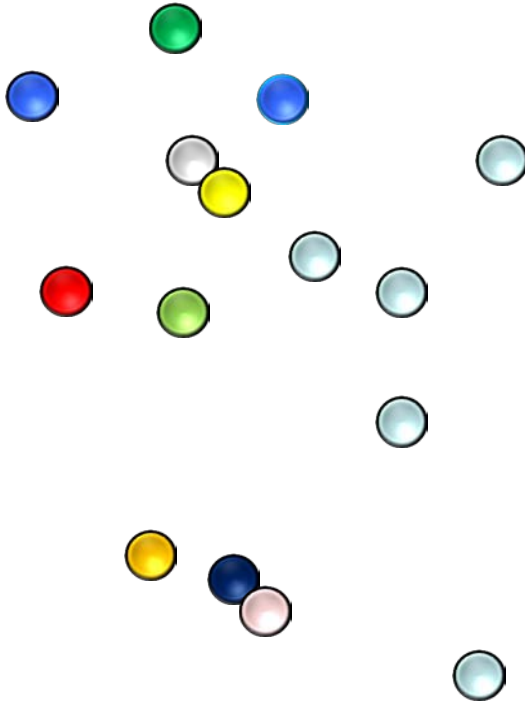


Disseminate to all! 

Time-Optimal Information Exchange on Multiple Channels



Problem:



Disseminate to all! ?

Easy: $O(n)$

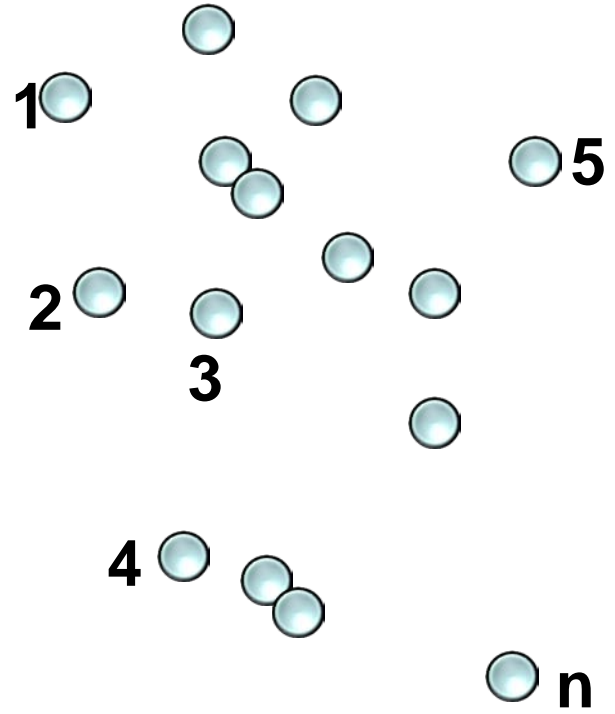
Faster?

Time-Optimal Information Exchange on Multiple Channels



$n := \# \text{ nodes}$

Problem:



Unique IDs 1...n

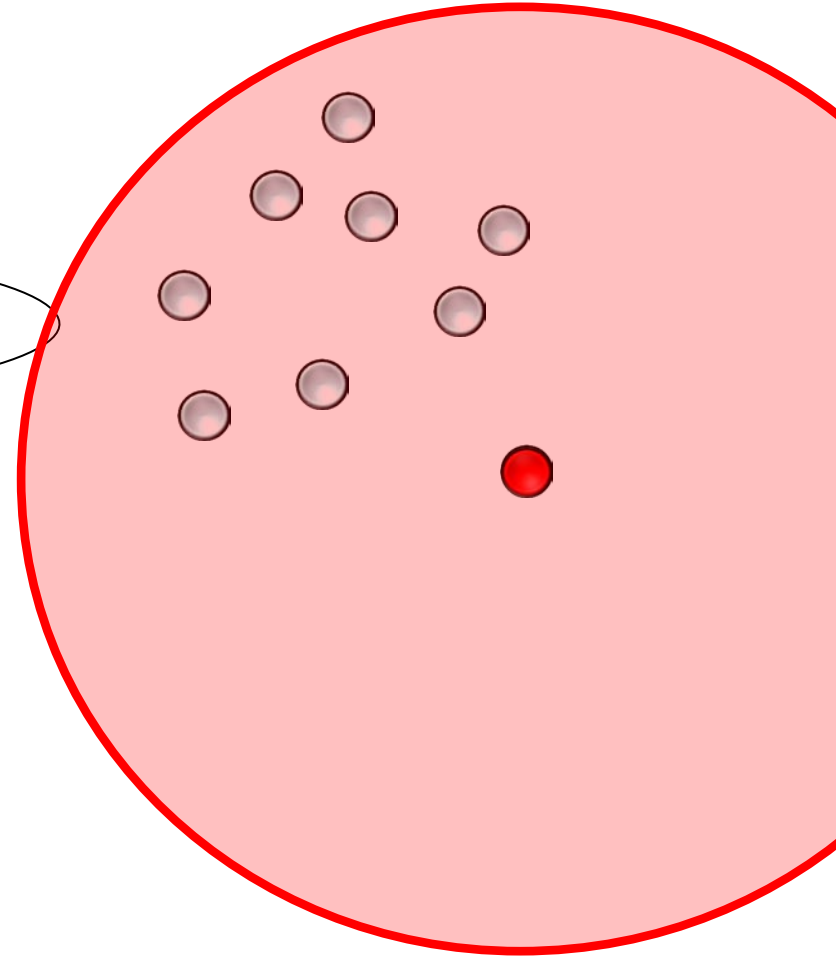
Time-Optimal Information Exchange Channels



I can:

send / receive

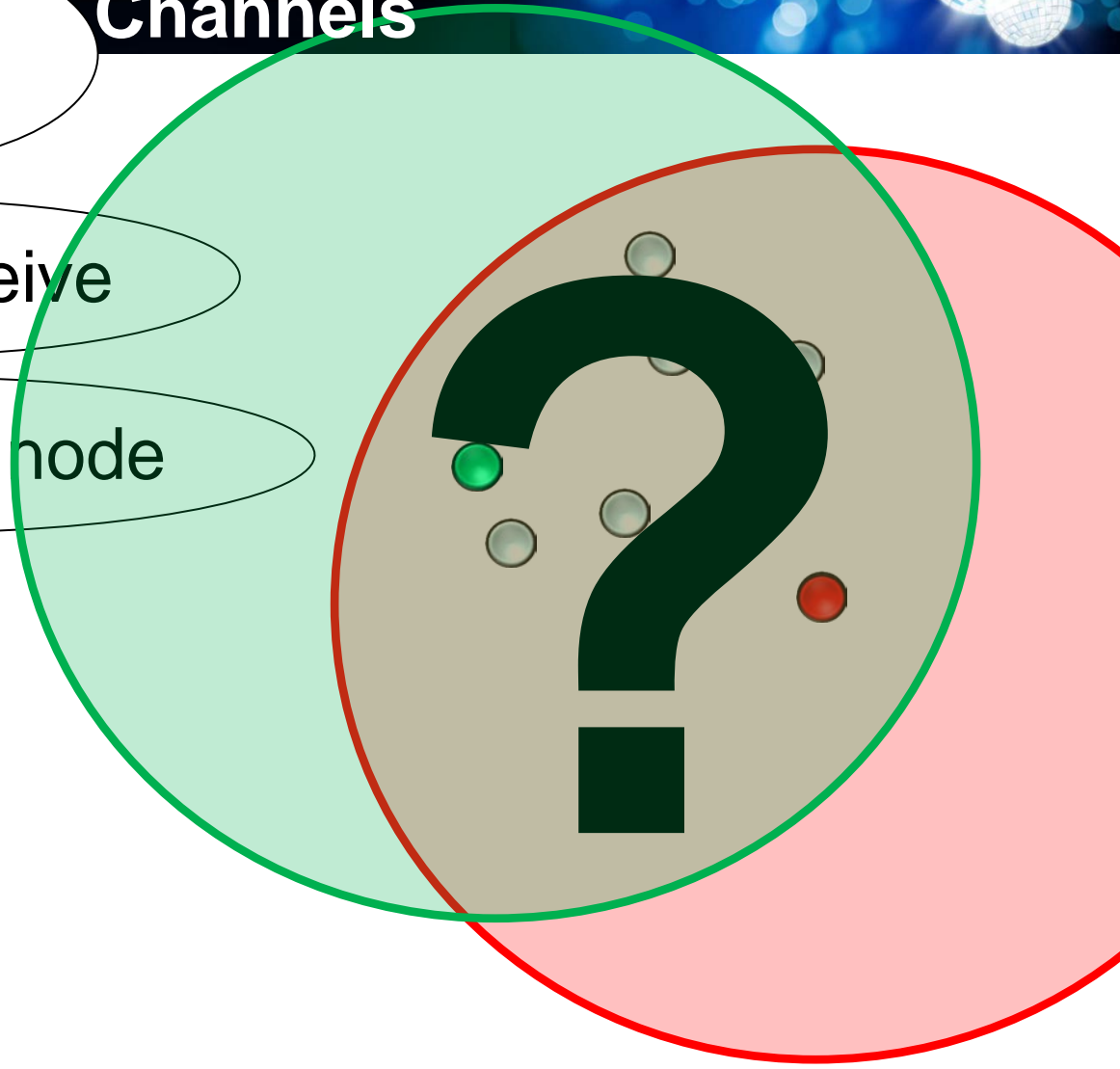
reach each node



Time-Optimal Information Exchange Channels



- I can:
- send / receive
- reach each node



Time-Optimal Information Exchange Channels

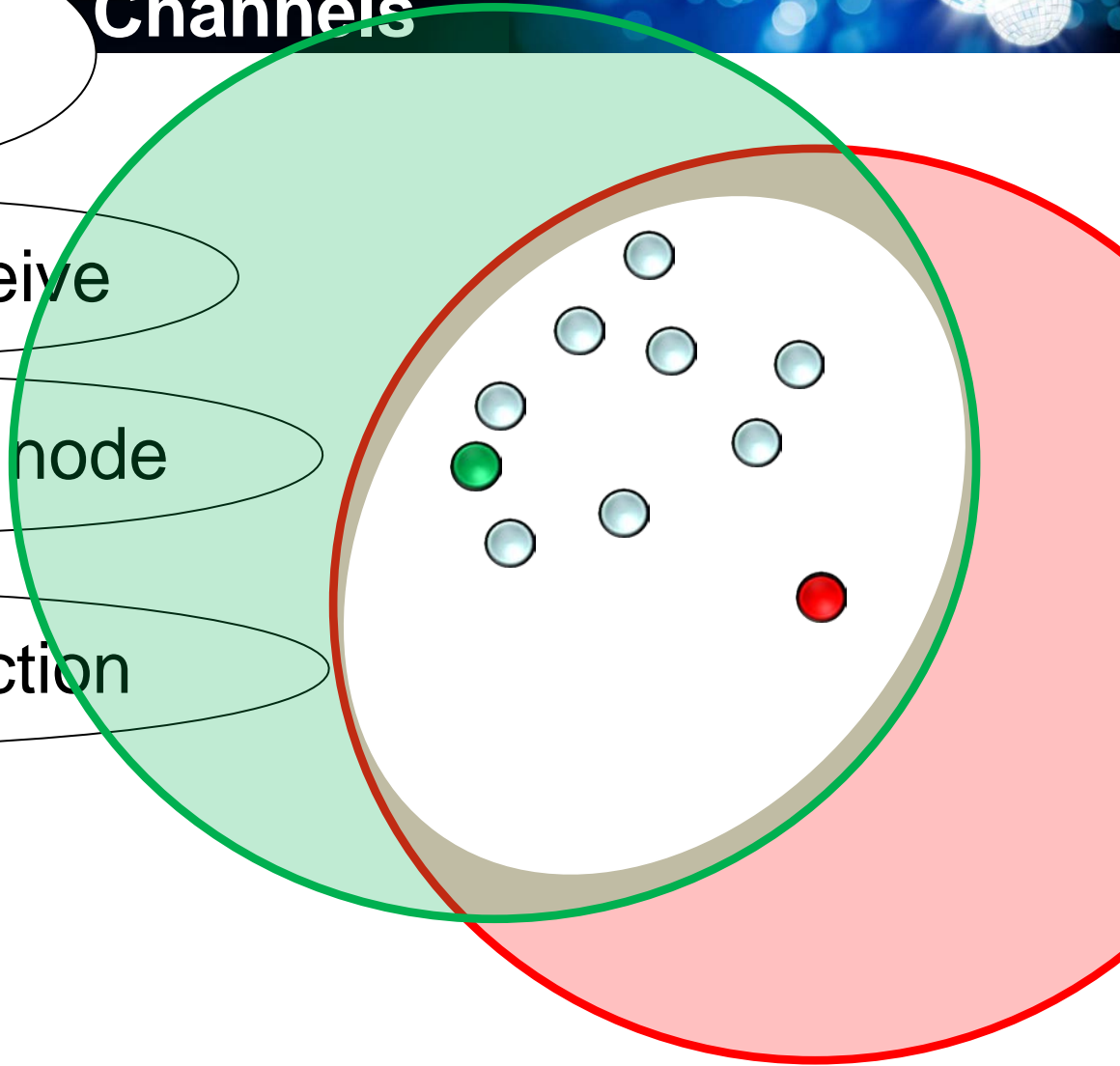


I can:

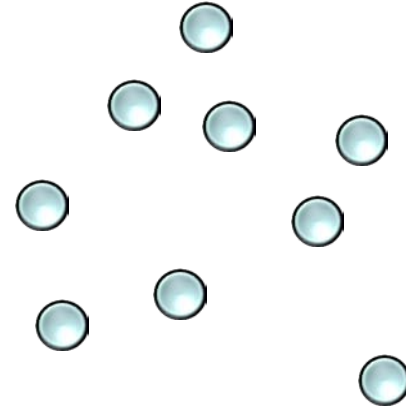
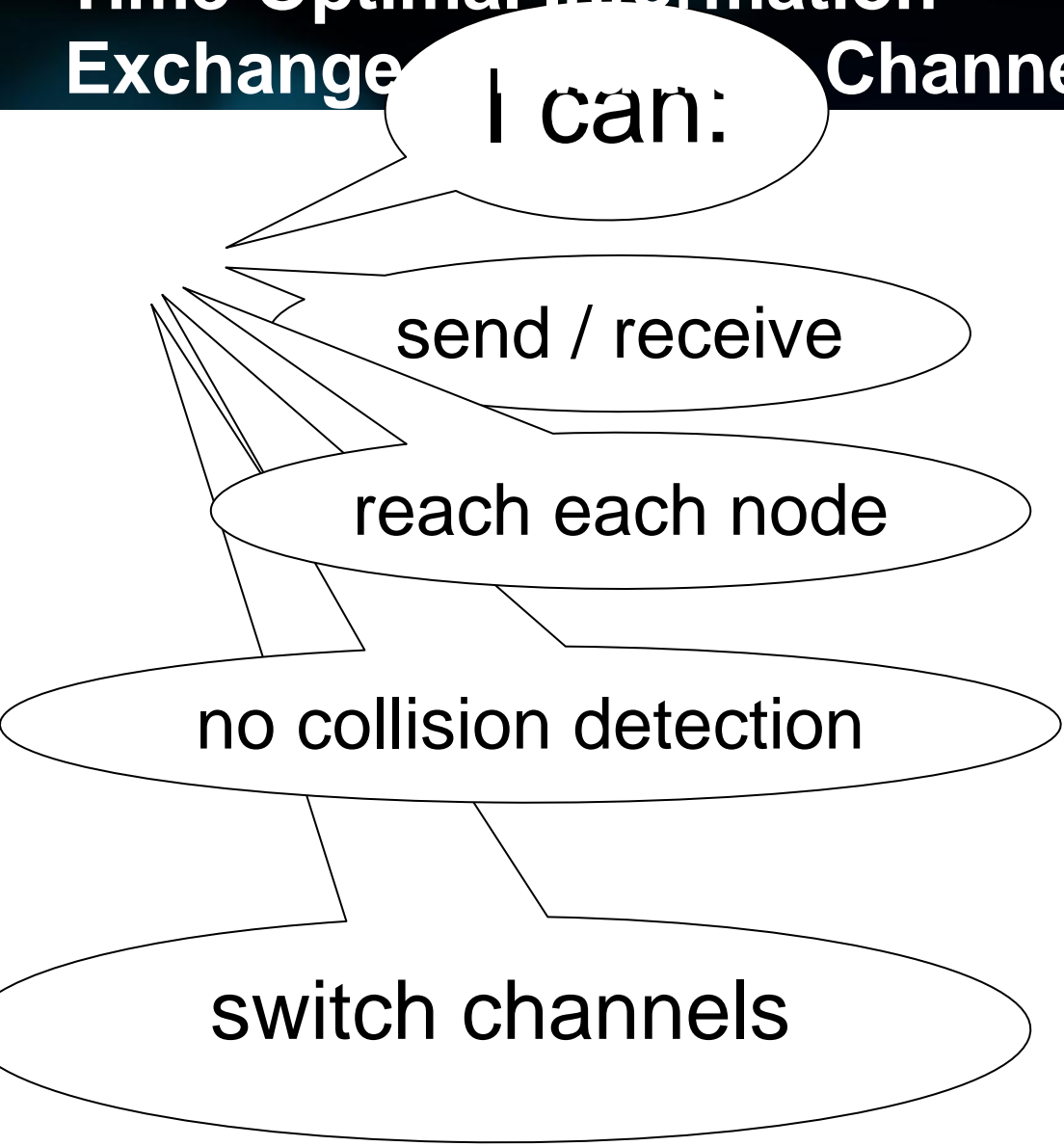
send / receive

reach each node

no collision detection



Time-Optimal Information Exchange Channels



- 101 Mhz
- 117 Mhz
- 132 Mhz
- ...

Time-Optimal Information Exchange Channels



I can:

send / receive

reach each node

no collision detection

switch channels

complexity

computation: free

radio: time 1

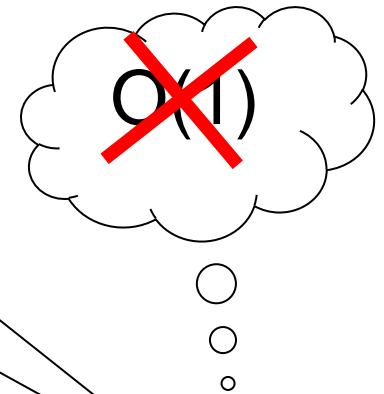
Time-Optimal Information Exchange on Multiple Channels



$n := \# \text{ nodes}$

$k := \# \text{ information}$

One Information / $\log n$
bits per message



$$\Rightarrow \Omega(k)$$

Time-Optimal Information Exchange on Multiple Channels



$n := \# \text{ nodes}$

$k := \# \text{ information}$

Multi channel

$$\Theta(k)$$

one channel

$$\Rightarrow \Omega(k + \log n)$$

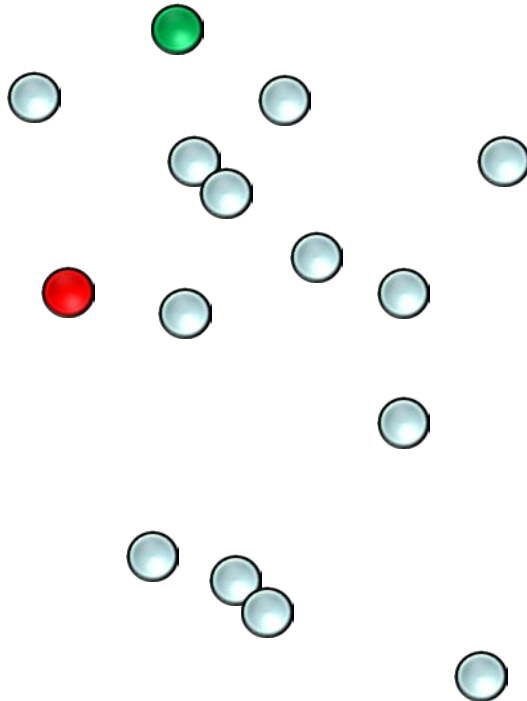
?

[Kushilevitz, Mansour SIAM JComp 1998]

Time-Optimal Information Exchange on Multiple Channels



Problem:



How to find them
In time $O(2)$



Thank You!

Questions & Comments?



Stephan Holzer

Yvonne Anne Pignolet

Jasmin Smula

Roger Wattenhofer