Exercise 2

Institut für Technische Informatik

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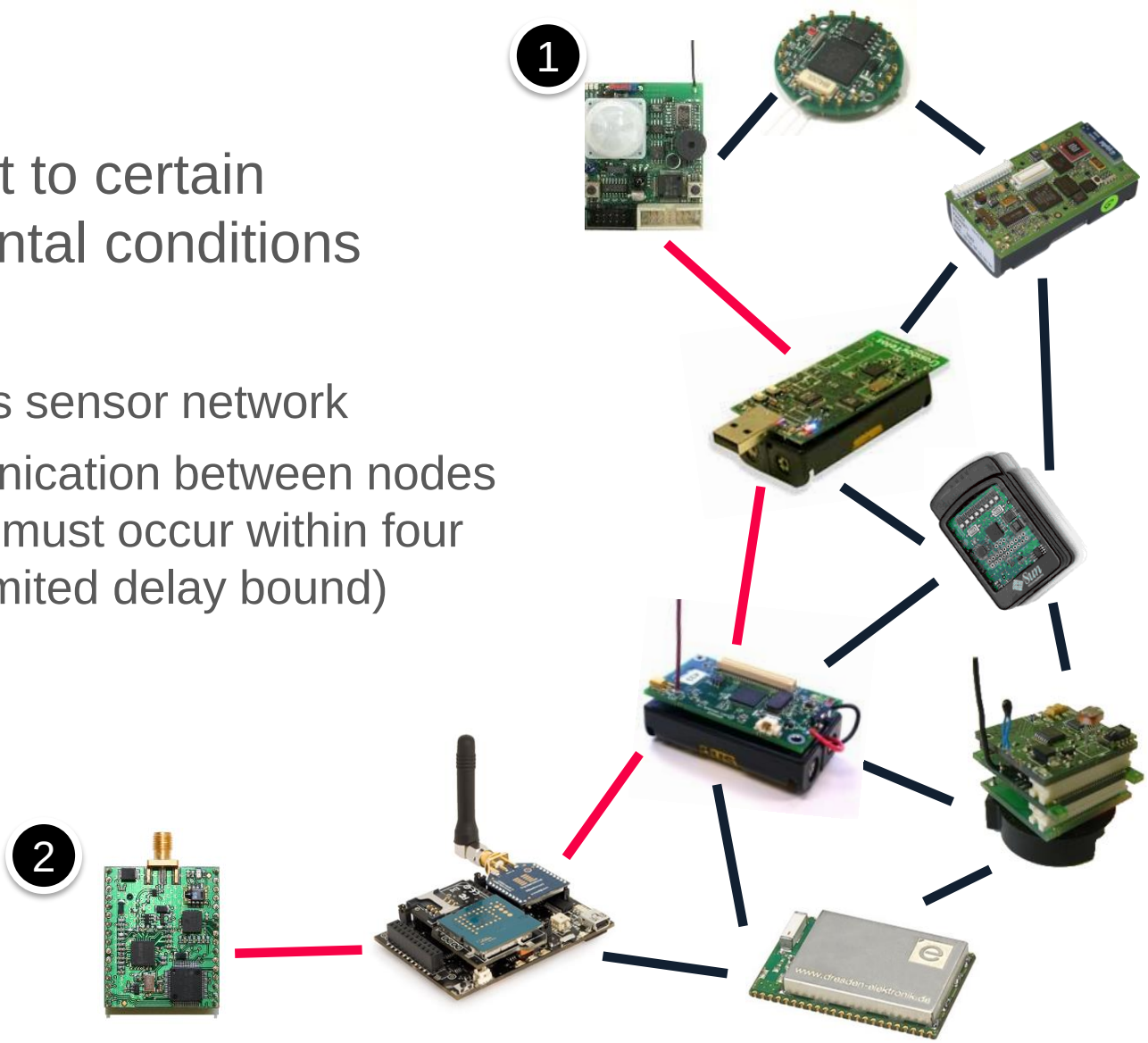
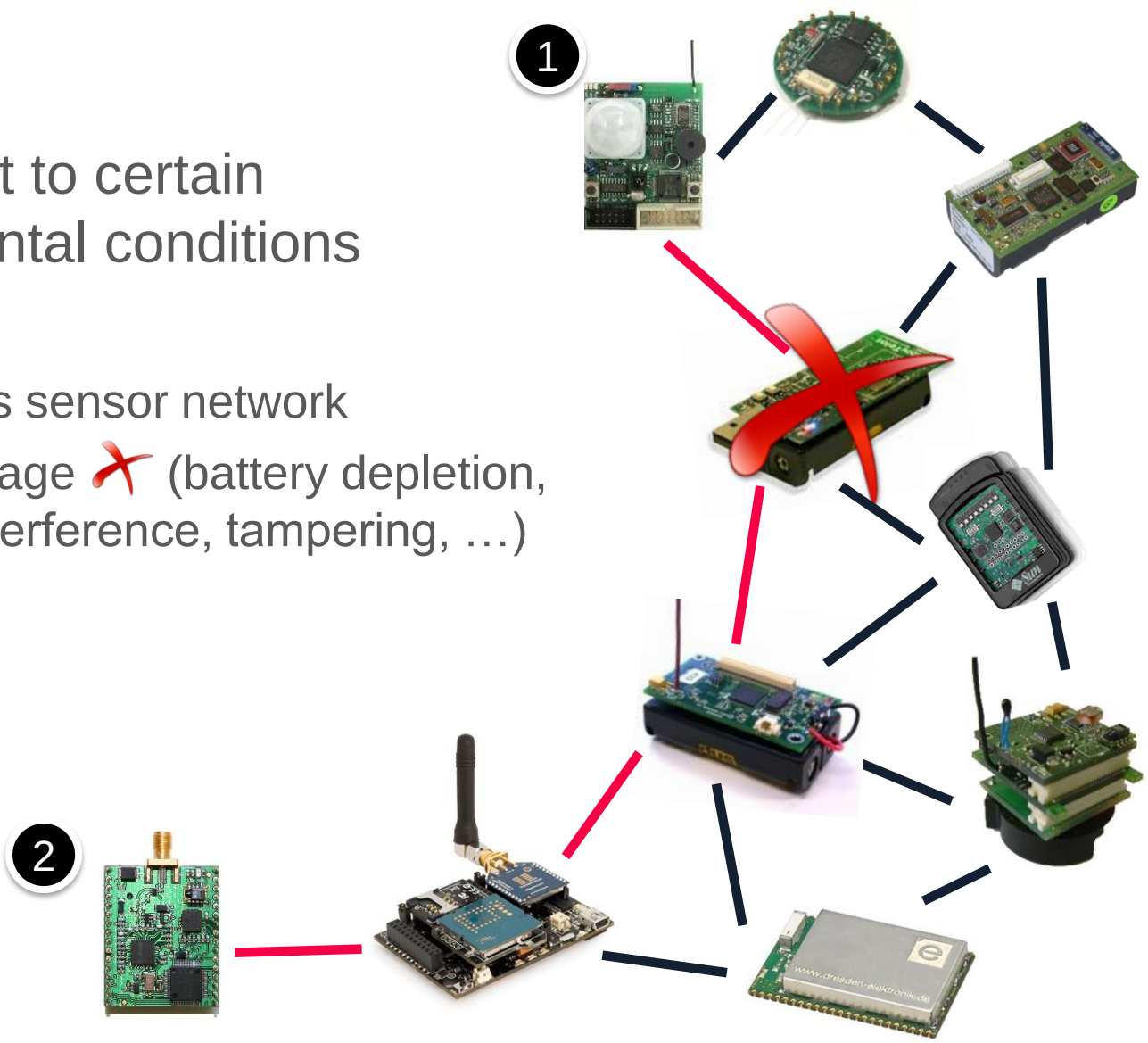
Adaptation

- Adjustment to certain environmental conditions
- Example
  - Wireless sensor network
  - Communication between nodes 1 and 2 must occur within four hops (limited delay bound)



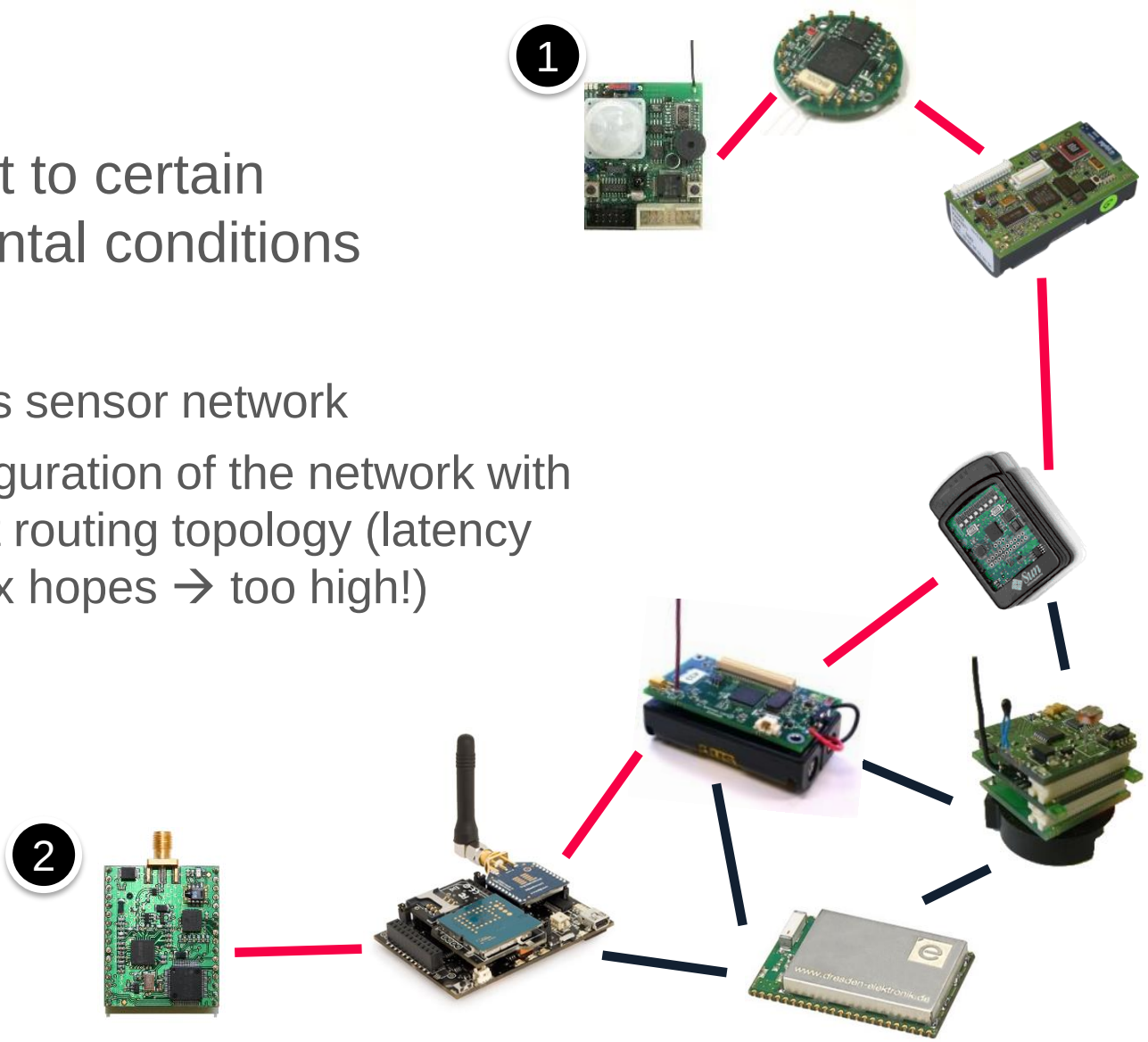
Adaptation

- Adjustment to certain environmental conditions
- Example
  - Wireless sensor network
  - Link outage (battery depletion, radio interference, tampering, …)



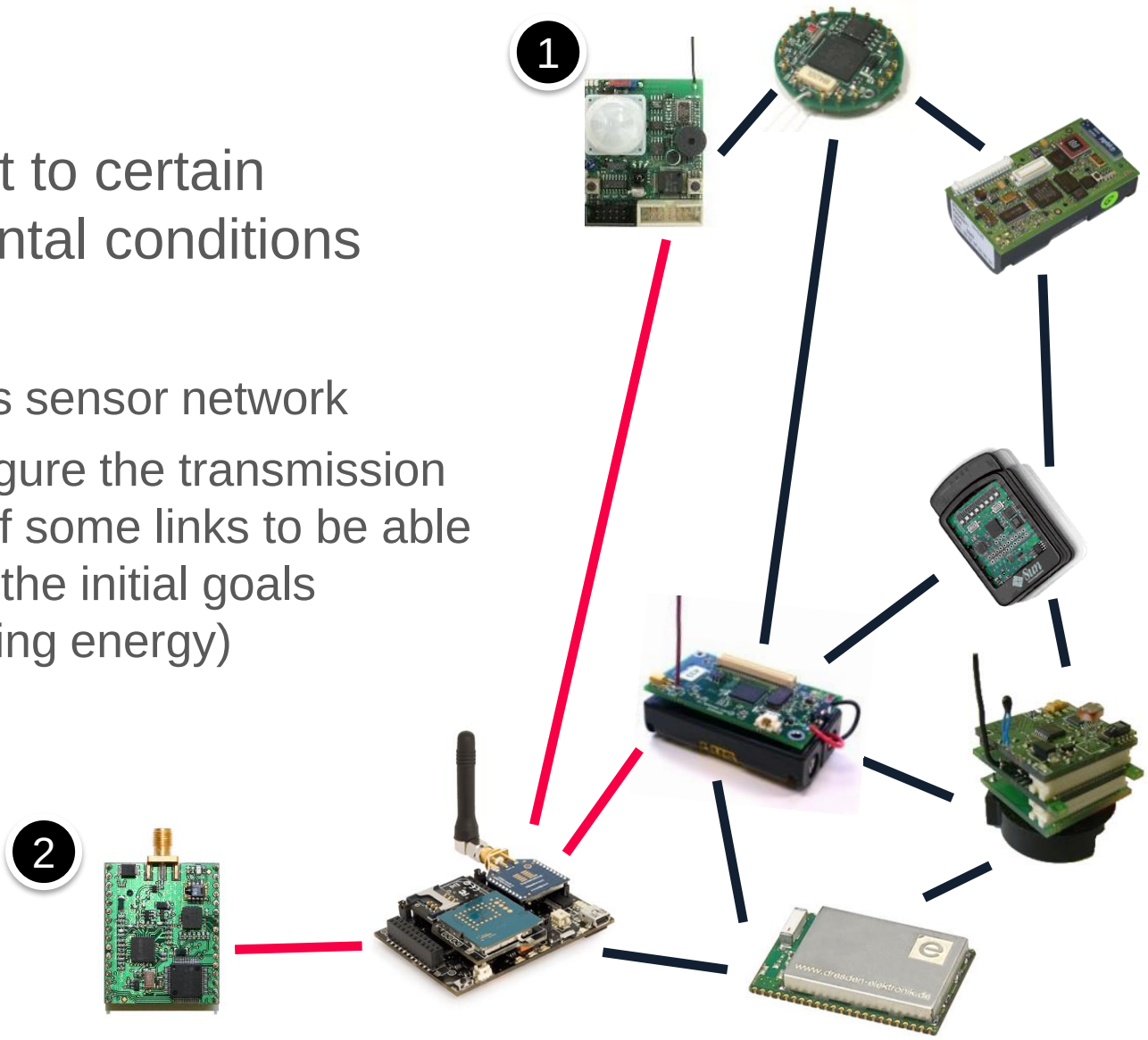
Adaptation

- Adjustment to certain environmental conditions
- Example
  - Wireless sensor network
  - Reconfiguration of the network with different routing topology (latency is not six hopes → too high!)



Adaptation

- Adjustment to certain environmental conditions
- Example
  - Wireless sensor network
  - Reconfigure the transmission power of some links to be able to meet the initial goals (sacrificing energy)



Self-adaptation

- A self-adaptive system adapts to changing environments on its own
  - Works in a top-down manner
  - The system evaluates its own global behavior
  - If the evaluation indicates that the goal is not reached (or that better performance is possible), the system autonomously tries to change its behavior

- In the second assignment, the task is to build a self-adaptive system!

Exercise 2: Adaptation

- Farmer breeding goats
  - Farmer owns a farm modeled as a 50x50 torus and some goats
  - The land of the farm is normally rich of grass
  - The goats eat the grass to get energy and survive
  - Therefore, the amount of grass will diminish with time…
- The farmer needs to regularly buy grass to feed its goats

Exercise 2: Adaptation

- Farmer breeding goats
  - Goats lose energy while moving (and looking for food)
  - If there is not enough grass, and they do not have enough energy the goats will die…
  - … the farmer wants to avoid this!
- The farmer wants to minimize costs!
  - Periodically collect statistics
  - Model the system and calculate the amount of grass that the farmer should buy so that all goats survive for at least 10.000 ticks

Example: Child picking poppies

- Draw a field full of red poppies
  - One child is picking all them one by one
  - The child moves randomly over the field
- NetLogo model
  - *setup* procedure

```
to setup
  ca
  setup-flowers
  setup-girl
end

to setup-flowers
  ask patches [
    set pcolor red
  ]
end
```

Example: Child picking poppies

- NetLogo model
  - *setup* procedure

```
to setup-girl
  create-turtles 1
  ask turtles [
    set color blue
    set size 2
    set shape "person"
  ]
end
```

  - *go* procedure

```
to go
  ask turtles [ find-flower ]
  ask turtles [ pick-up-flower ]
end
```

Example: Child picking poppies

- NetLogo model
  - *go* procedure

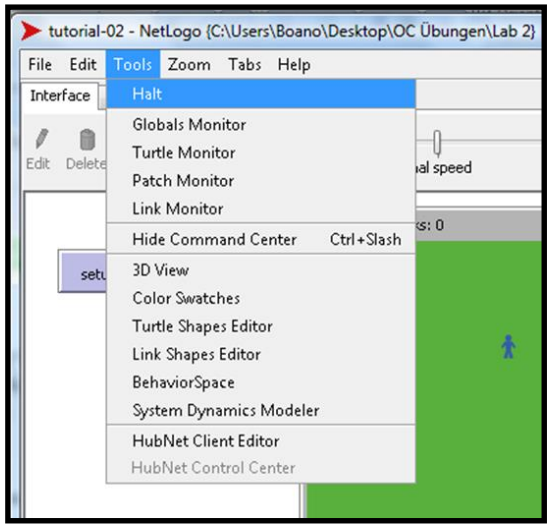
```
to find-flower
   while [ pcolor != red ]
   [
      explore
   ]
end

to explore
  fd 1
  rt random-float 50
  lt random-float 50
end

to pick-up-flower
   set pcolor green
end
```

  - Rather easy
  - Let's run this program...

Example: Child picking poppies

- Everything fine in the beginning
  - And then?
  - Infinite loop: the simulation cannot be stopped through the go button anymore!

```
to find-flower
  while [ pcolor != red ]
  [
    explore
  ]
end
```



- Code seems correct
  - In the scenario in which there are no poppies left, the child will look forever for a flower that is not there!

Example: Child picking poppies

- Several alternatives
  - Change the find-flower proceed and do not loop if there is no flower left

```
to find-flower
  if any? patches with [ pcolor = red ] [
  while [ pcolor != red ]
    [
      explore
    ]
  ]
end
```

  - The child returns home when all flowers are gone

```
to pick-up-flower
    set pcolor green
    if all? patches [ pcolor = green ] [
      die
    ]
end
```

Exercise 2: Adaptation

- Farmer breeding goats
  - Deadline is Friday, 23.11.2018, at 23:59 CET
  - Follow the instructions carefully!

Questions?