



Data mules and their usage

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Task

A photograph of a sandy beach. The sand is light brown and shows numerous small, rhythmic ripples. Several dark, irregular footprints are scattered across the surface, some appearing as single prints and others as pairs. The text "Maximally efficient data exchange" is overlaid in white, bold, sans-serif font on the right side of the image.

**Maximally efficient
data exchange**

Possible solutions

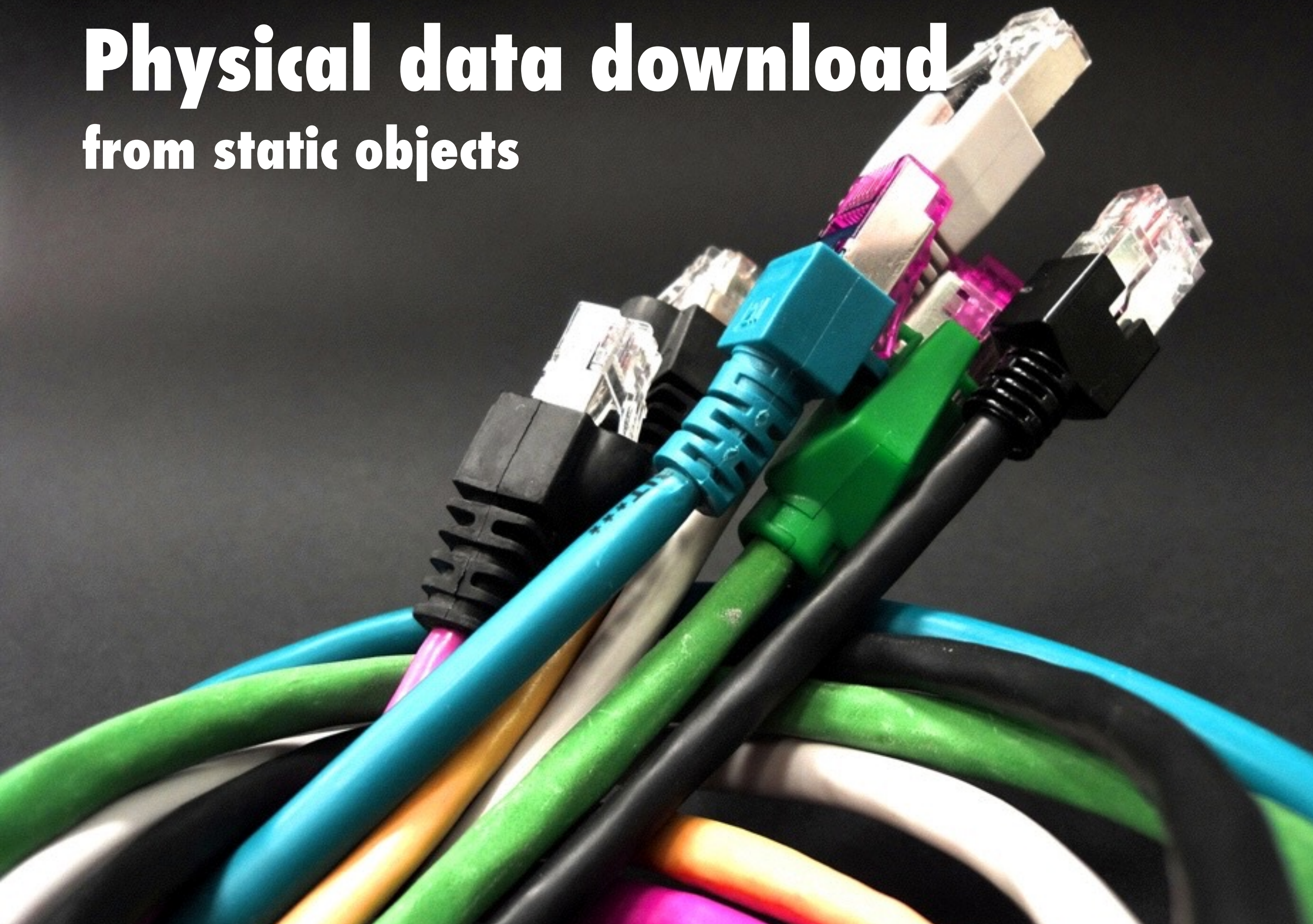


**RADIO
WLAN
GPRS
SMS**

Physical data download from moving objects



Physical data download **from static objects**



Multihop communication



Architecture

Architecture



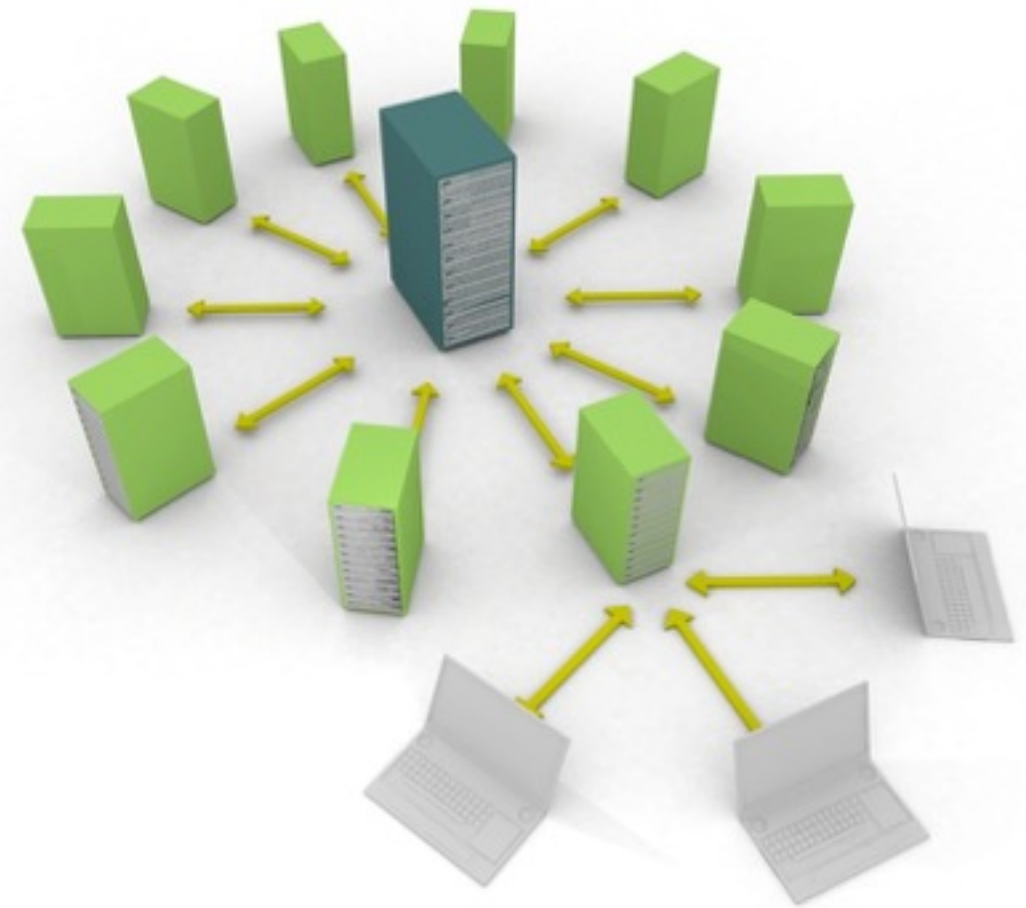
Wireless Sensor Node

Architecture



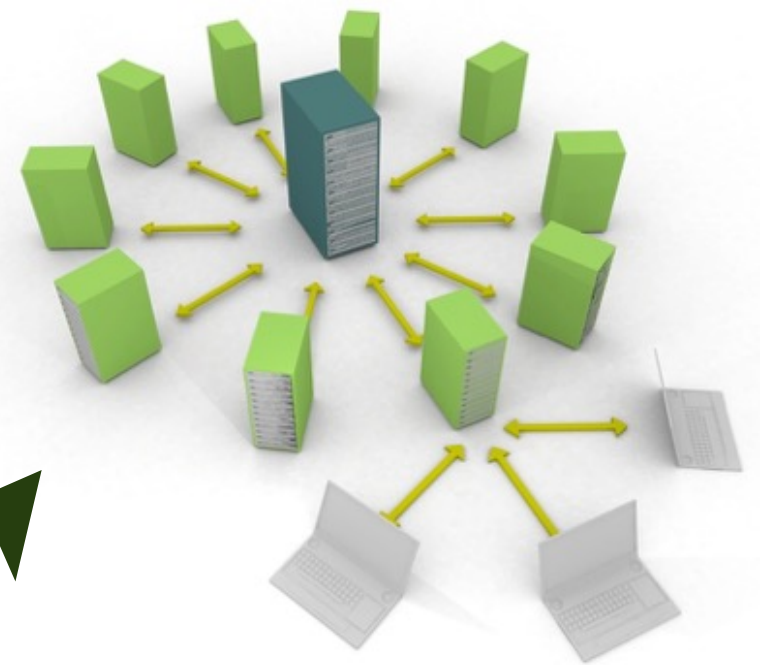
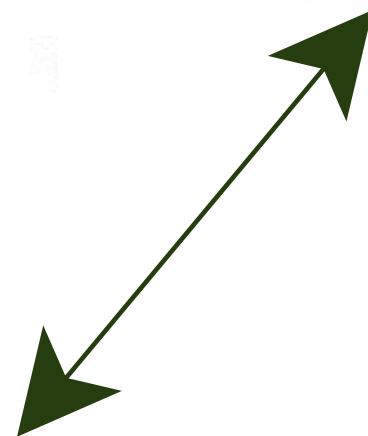
Data mule

Architecture



Data processing facility

Architecture



Advantages



Privacy



Mobility



Energy economy

Drawbacks

Undetermined latency





**No assurance for
data delivery**

Scientific problem



PROBLEM:
No delay tolerant IP protocol



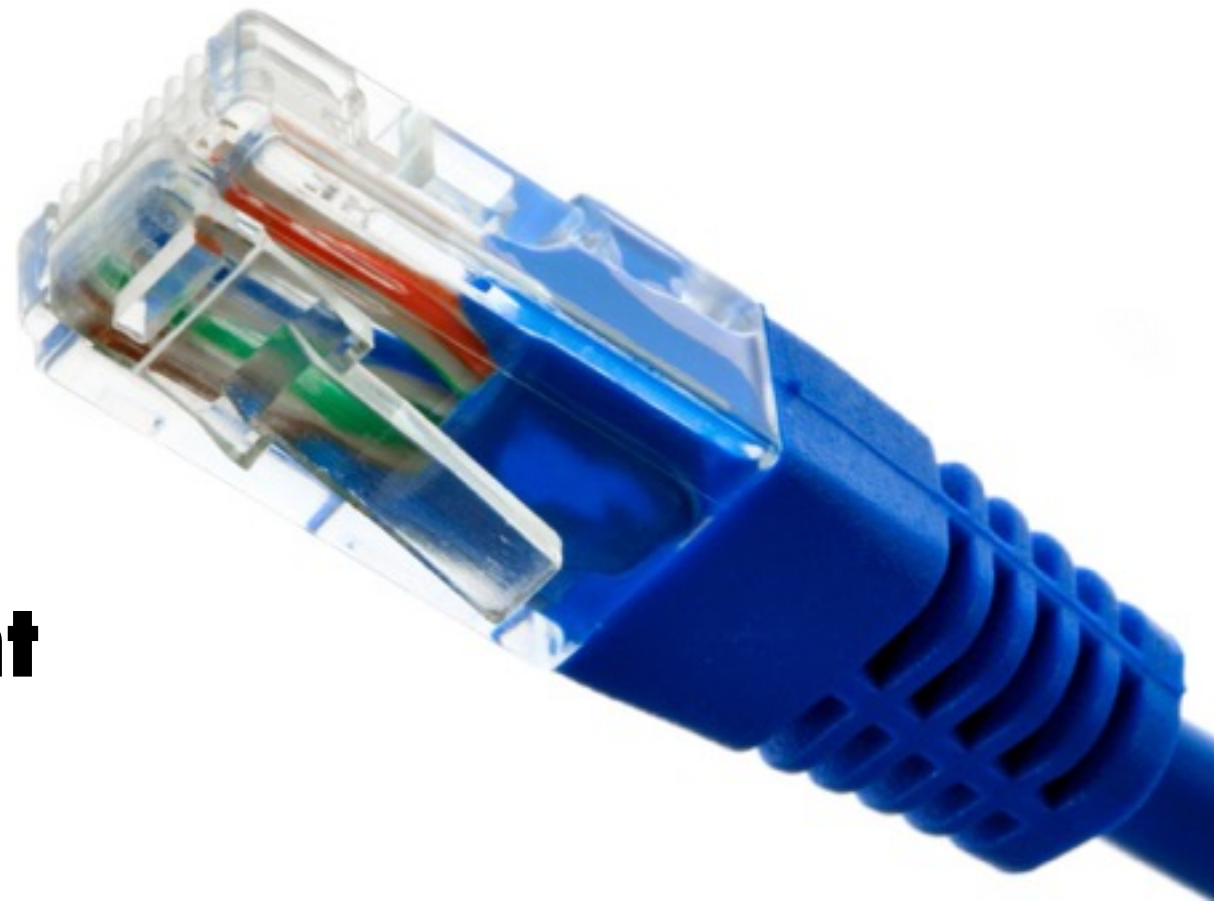
CHALLENGE:
Fixity against latency

SOLUTION:
Adaptive protocol



Data transmission protocol

- ➔ **OS module**
- ➔ **Session based, store-and-forward type protocol**
- ➔ **Data transmission using packets**
- ➔ **Packet prioritization**
- ➔ **Packet encryption**
- ➔ **Two way realization:**
 - **with acknowledgement**
 - **without acknowledgement**
- ➔ **Address space**



Usages

real and potential



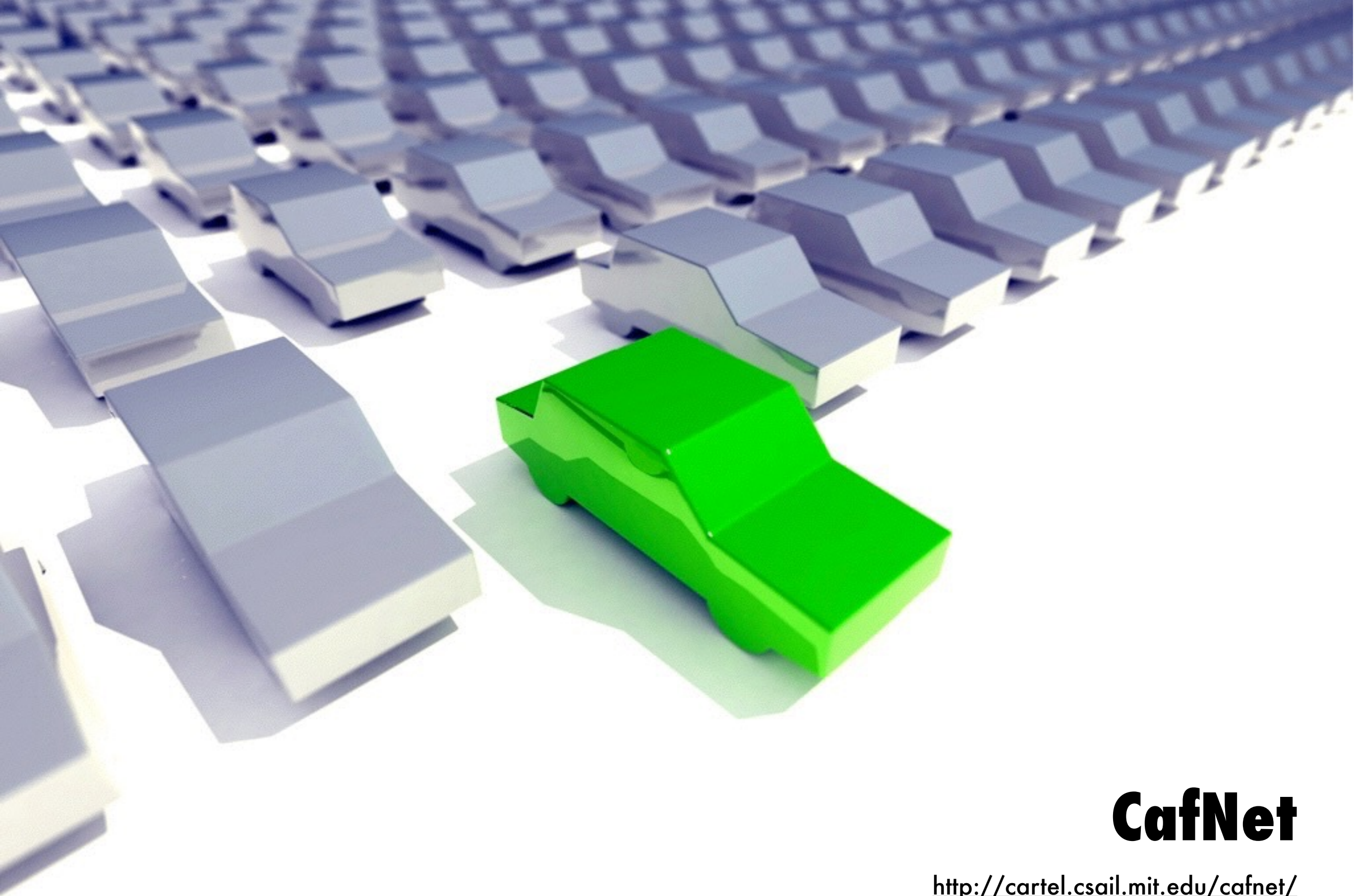
ZebraNet

<http://www.princeton.edu/~mrm/zebranet.html>



BikeNet

<http://bikenet.cs.dartmouth.edu/>



CafNet

<http://cartel.csail.mit.edu/cafnets/>



LynxNet

<http://jupiter.cs.fmf.lu.lv/dilab/index.php/LynxNet>



CARS as data mules

**ROADSIDE
INFRASTRUCTURE
as base stations
or static data
mules**



Scientific expectations

from “Smithy of Ideas 2010”



**More potential
usages for
data mules**

THANK YOU!

Questions?

My contacts:

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Photos sources:

Google (<http://www.google.lv>)

stock.xchng (<http://www.sxc.hu>)

HubbleSite (<http://www.hubblesite.org>)