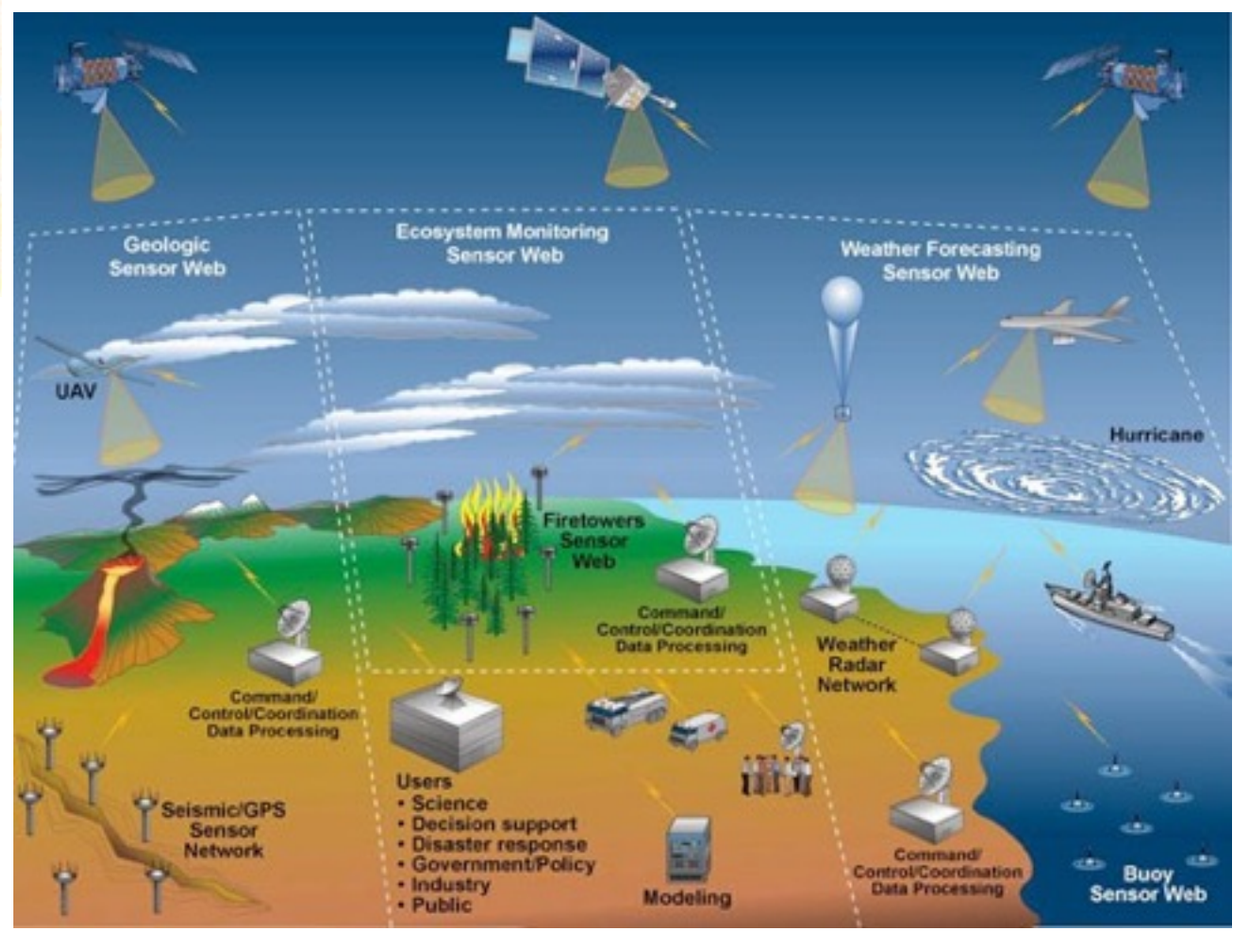
Network Algorithms

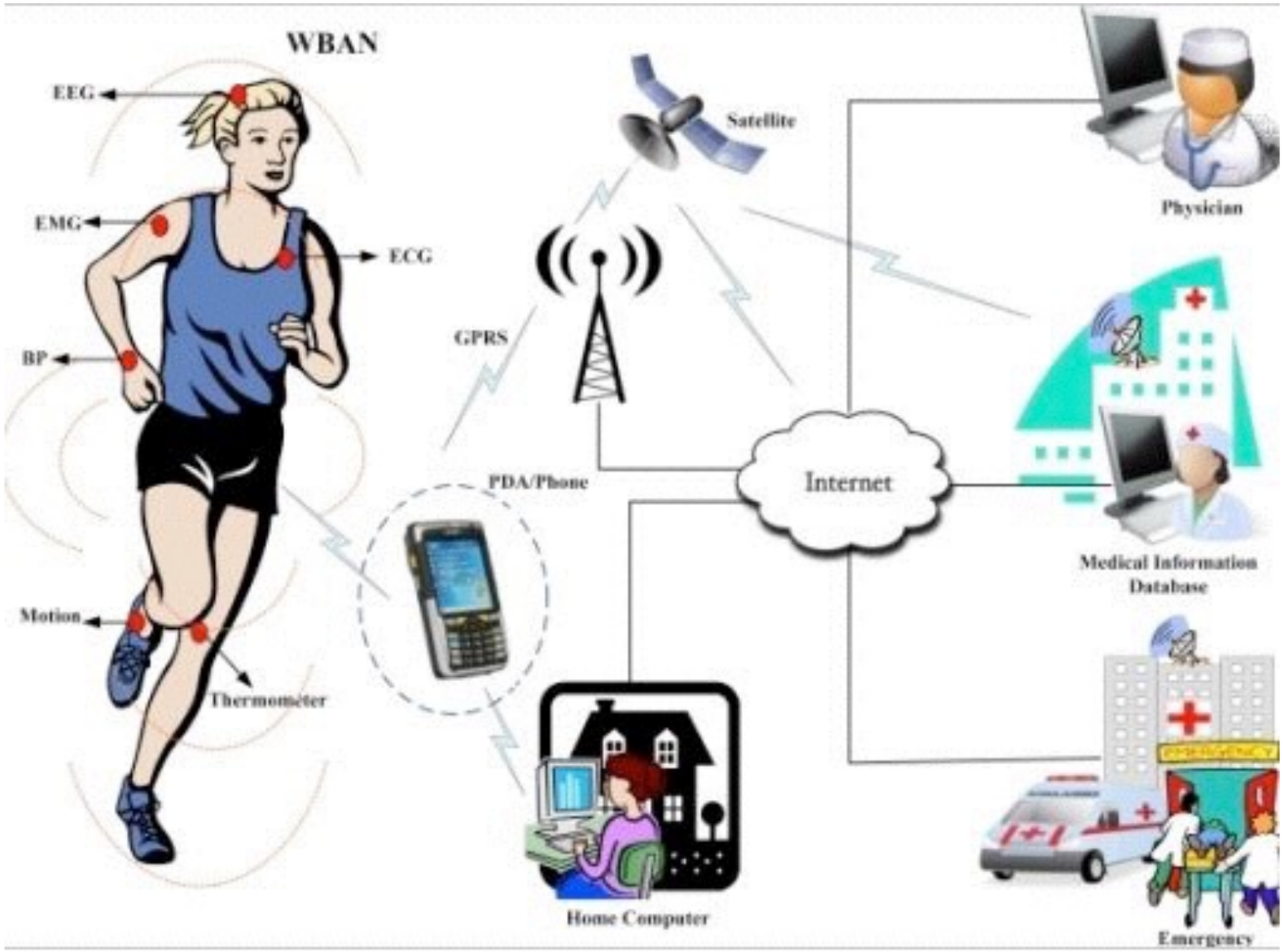
Internet

Wireless networks

Sensor Networks

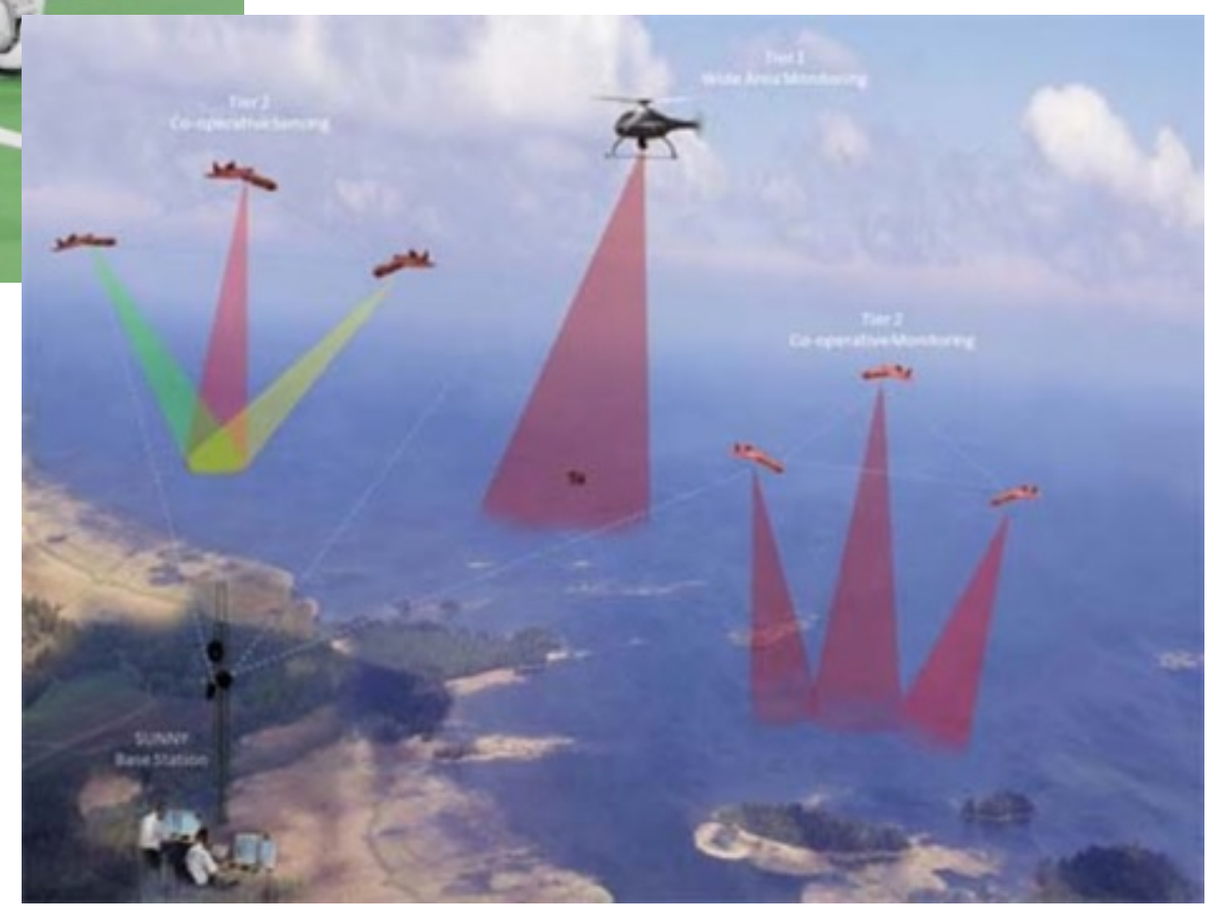


Body Area Networks

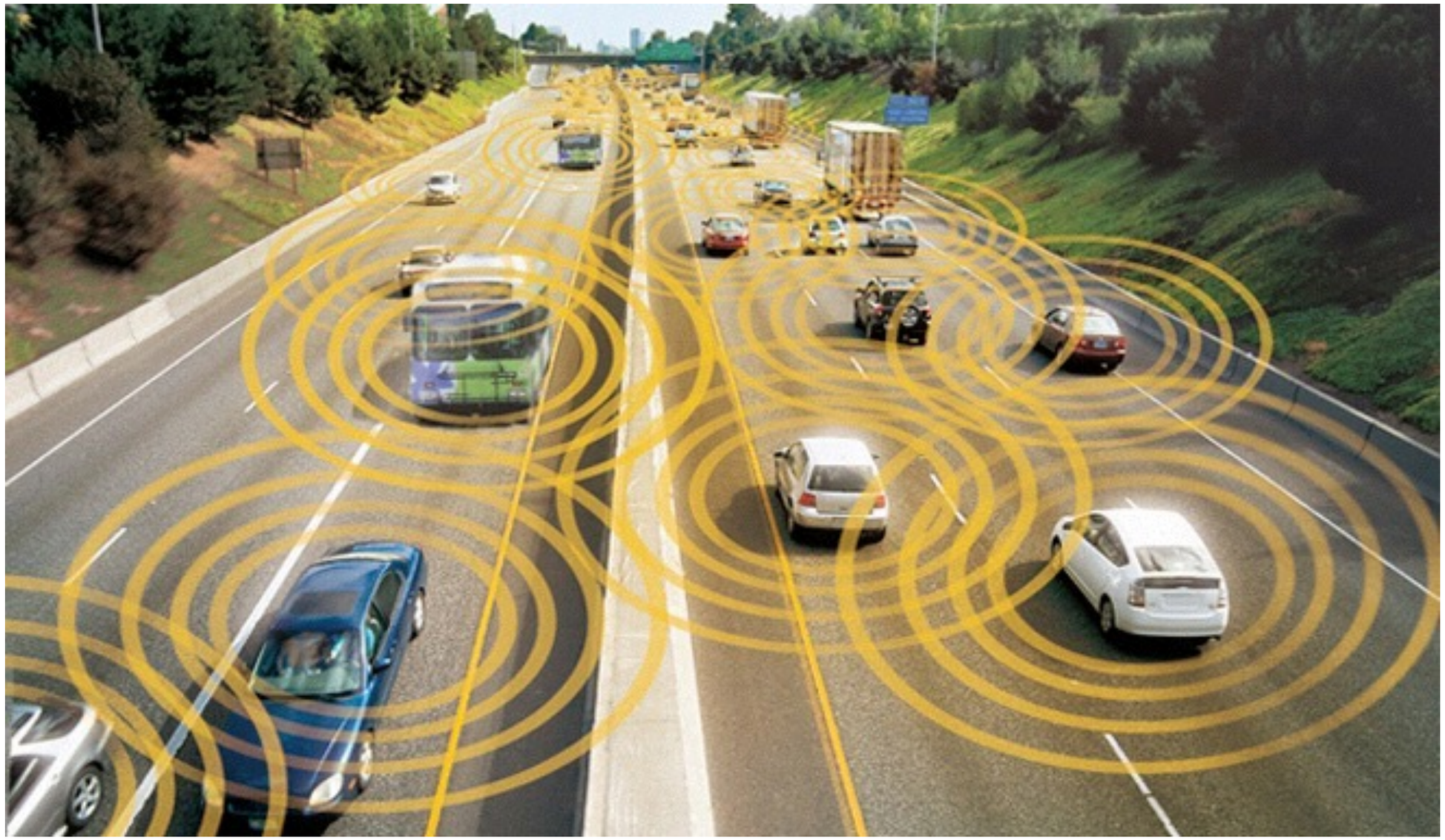


Internet of Things

Robot Networks

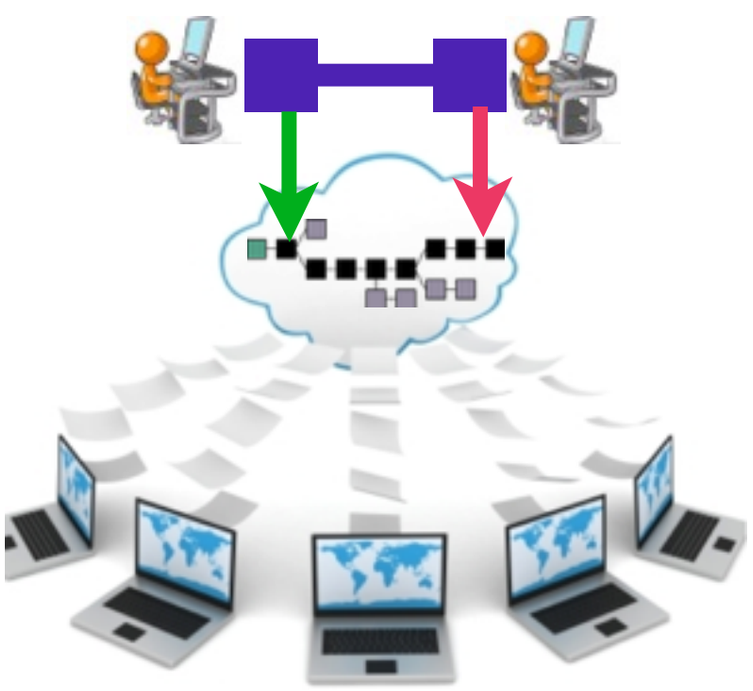


VANETs

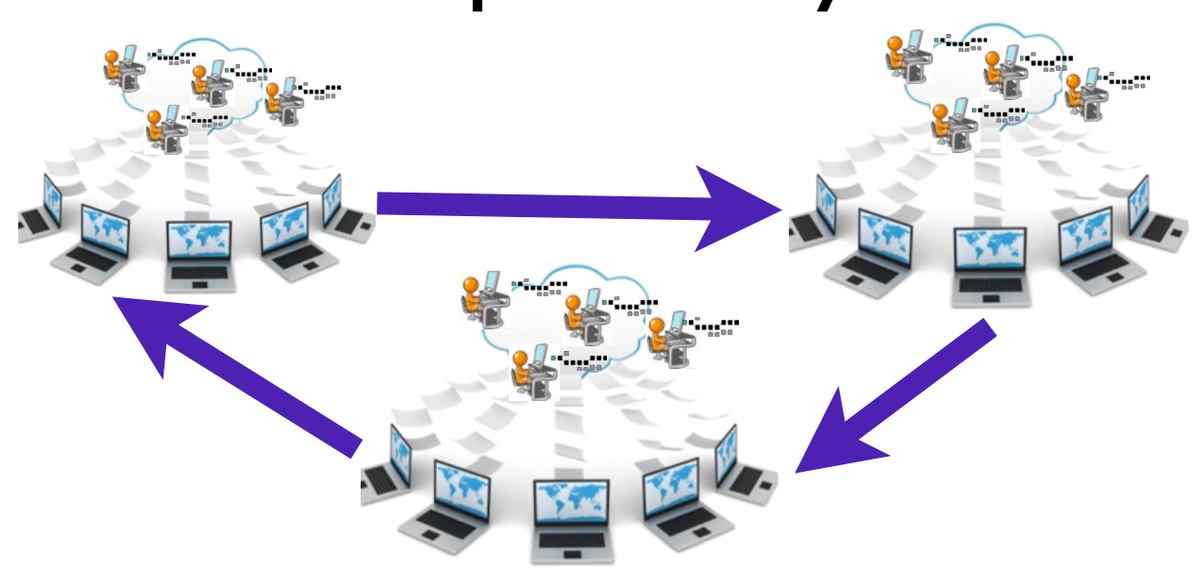


Social Networks

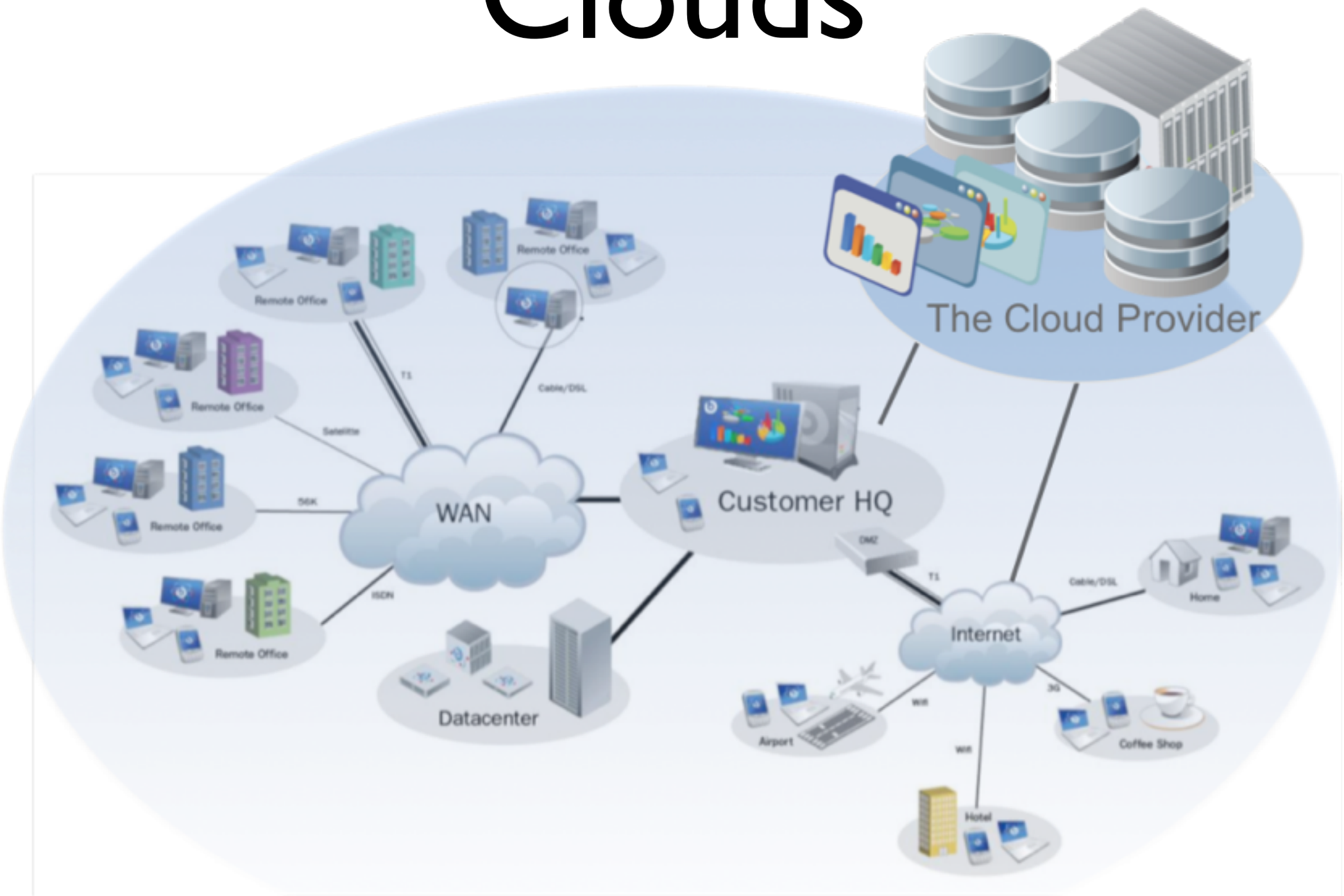
Decentralized Finance



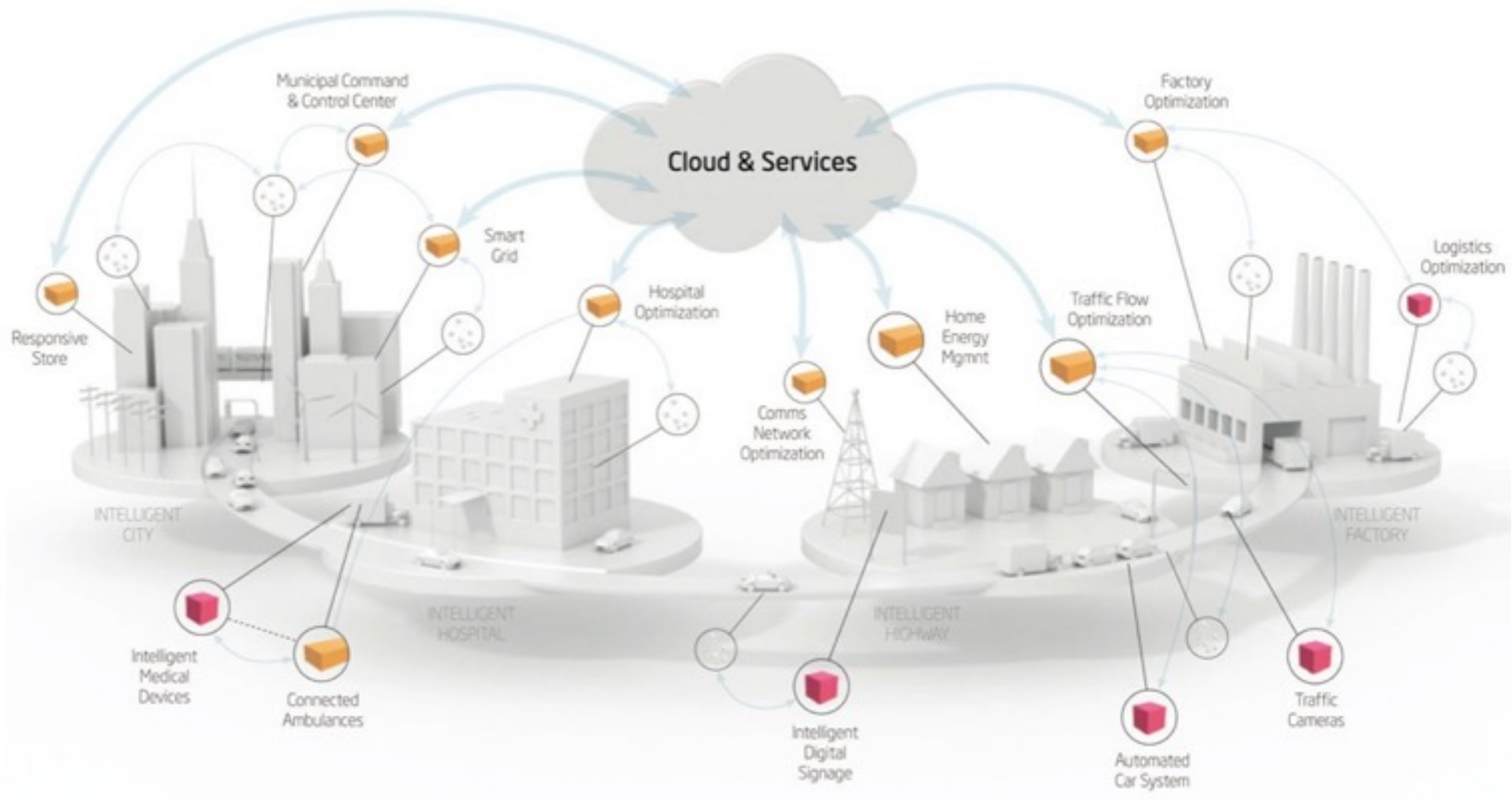
- blockchains
- smart contracts
- layer 2 networking
- interoperability



Clouds


The Cloud Provider
Remote Office
Remote Office
Remote Office
Remote Office
Remote Office
T1
Cable/DSL
Satellite
56K
ISDN
WAN
Customer HQ
DMZ
T1
Cable/DSL
Home
Internet
Datacenter
Wifi
3G
Wifi
Airport
Coffee Shop
Hotel

Internet of Everything



Common Issues

Topologys & Overlays

- What is the (best) network topology ?
- How to discover the network topology ?
- What is a virtual topology ?
- How to maintain the topology under the network churn ?

Transmission

- How to schedule transmissions without collisions ?
- Synchronous vs Asynchronous ?

Routing

- Is the actual internet routing (e.g. link state, distance vector) satisfying ?
- What are the ingredients to do an optimal routing ?
- What is the future of routing ?

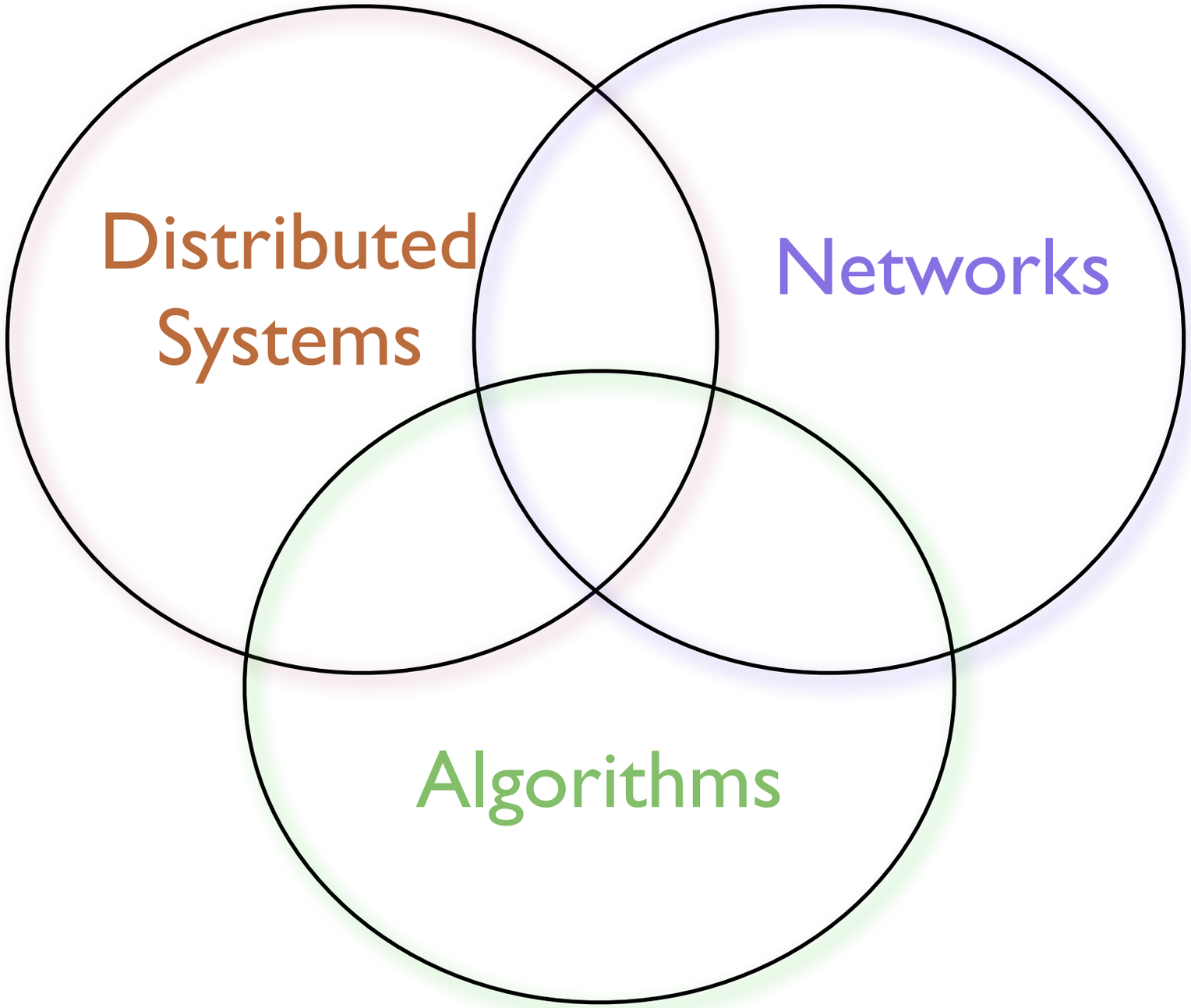
Communication Primitives

- How to efficiently send data from one node to all nodes in the network (or some of them) ?
- How to gather efficiently data from all nodes (or some of them) into a single node ?

Placing and retrieving data

- Where to place most demanded data ?
- How to retrieve efficiently data ?

Solutions


Distributed Systems
Networks
Algorithms

Distributed Network Algorithms

- Networks model
- Computational model
- Techniques to develop algorithms
- Techniques to analyse and prove algorithms correctness

Why distributed ?

Organization

- Lectures 2023-2024 :
  - Franck Petit (franck.petit@lip6.fr)
  - Maria Potop-Butucaru (maria.potop-butucaru@lip6.fr)
- Exercises (TD)
- Page web http://www-npa.lip6.fr/~tixeuil/m2r/pmwiki.php?n=Main.ALGORES

Evaluation

- Final exam : 40%
- Mid-term Exam : 40 %
- Report : 20%
  - 5 pages (team work)
  - critical analysis recent paper (2020/2021/2022) from PODC, DISC, SODA, STACS, FOCS, IPDPS, ICDCS, OPODIS, SSS, Tokenomics, Financial Crypto, NCA, ICDCN,SRDS, DSN, SPAA.

Organization

- Lectures
  - Coloring, MIS, DS, Matching (Maria Potop)
  - Trees Algorithms (Maria Potop)
  - Leader Election (Maria Potop)
  - Echo Algorithms (Franck Petit)
  - Compact Routing (Franck Petit)

Bibliography

- Distributed Computing : A locality-sensitive approach - David Peleg