ROUTING AND COMPRESSING (THROUGH THE FOG)

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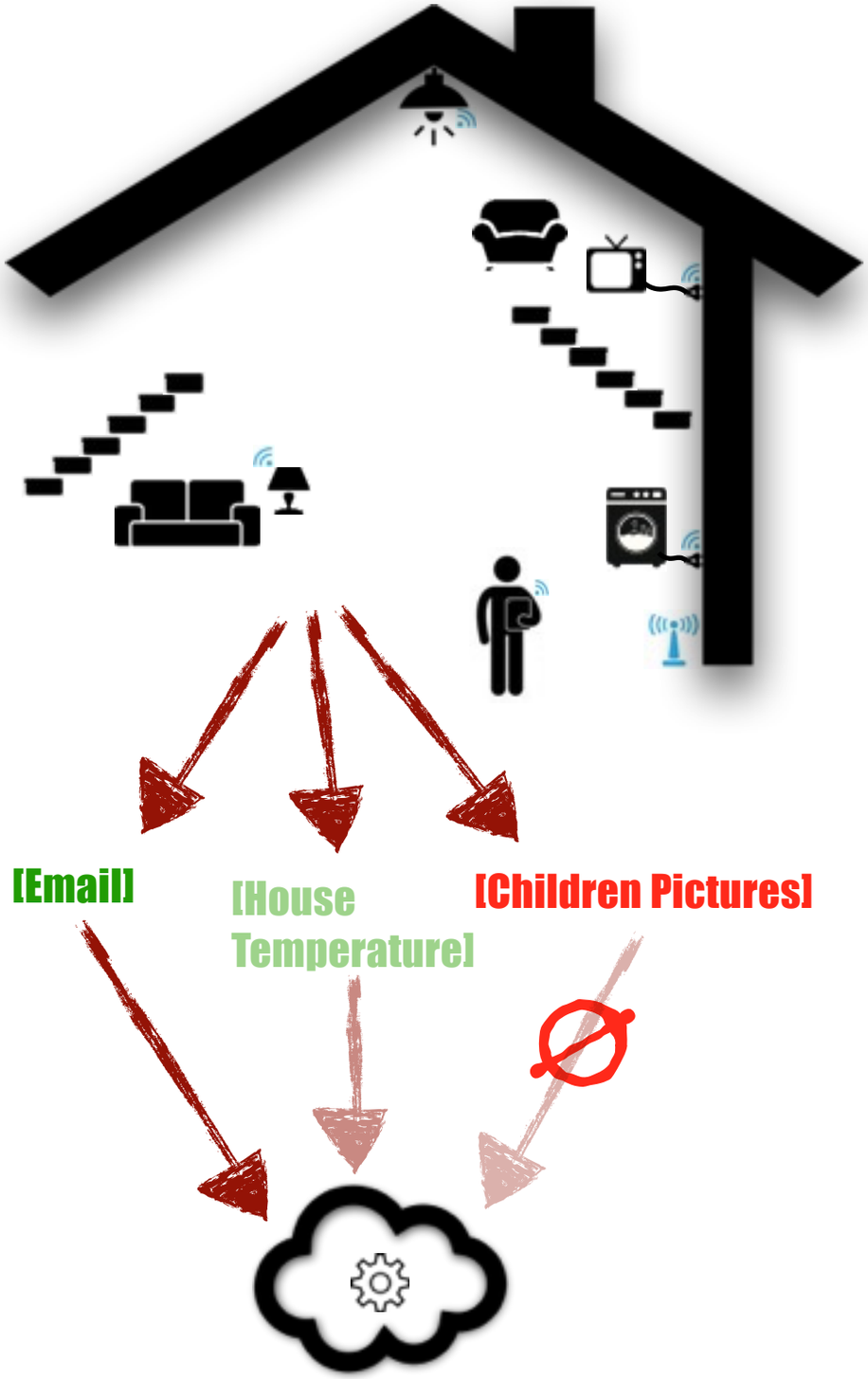
ROUTING

- Delivery of a piece of information from a sender to a recipient
- Several strategies
  - Static
  - Dynamic
    - Distance Vector, Link State
- Multi-path

ADAPTIVE ROUTING

- The nodes may dynamically associate, disassociate, or disappear from the network
- Costs of routing can change over time
  - Hop, bandwidth, delay, reliability, load, and cost
  - Network administrators
- Failures (infinite cost for traversing an edge)
  - Fault-tolerant tables
    - Distributed computations of alternatives paths (swap edges) when “normal” ones cannot be used (e.g., because of a temporary failure)

ROUTING THROUGH THE FOG



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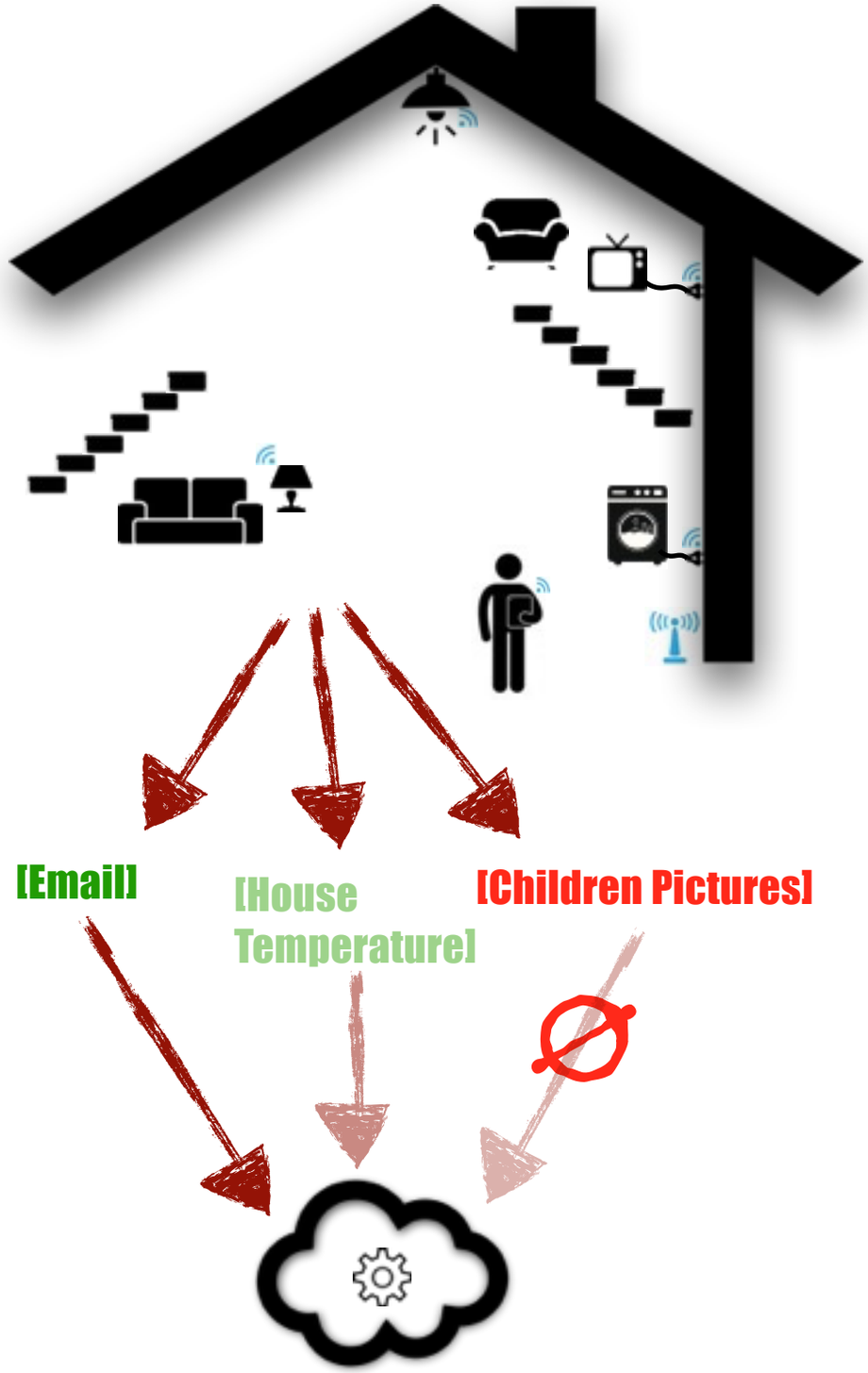
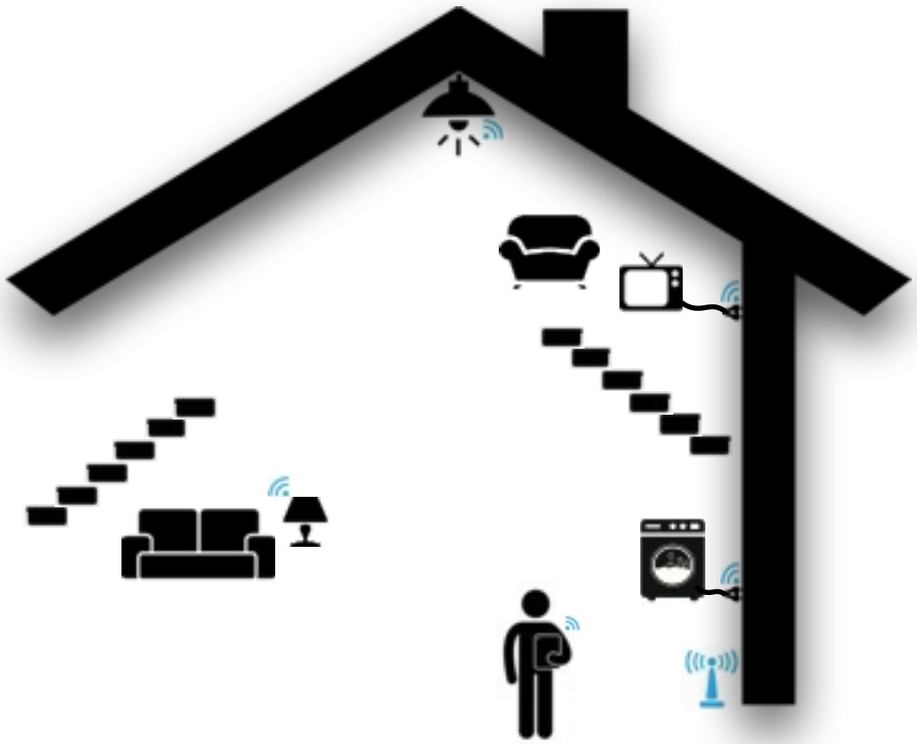


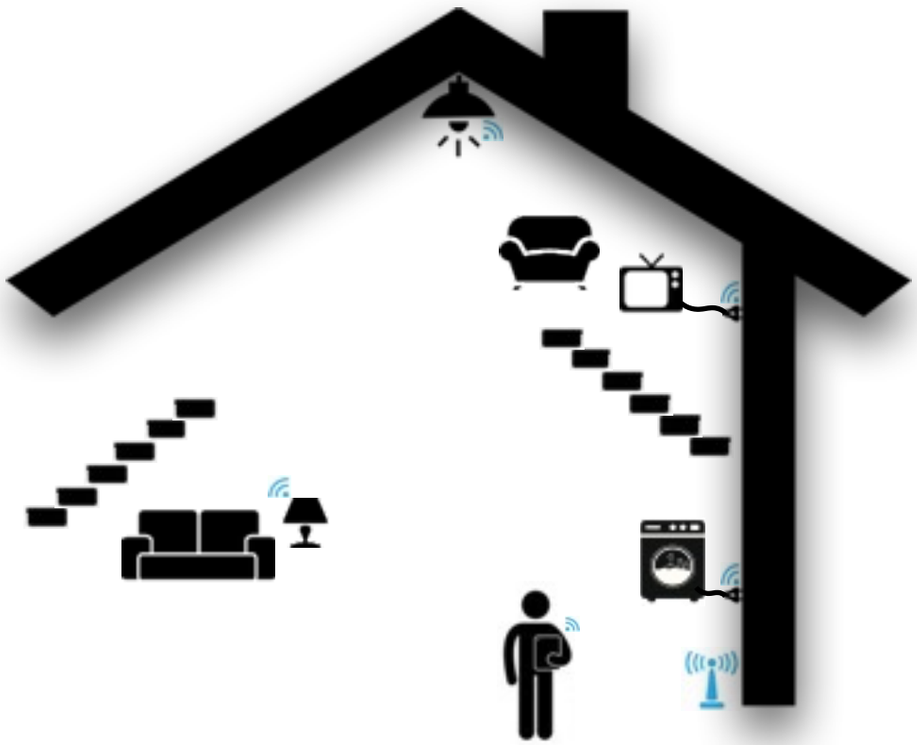
- Network not connected to the world via single out-point
  - Bluetooth, Wifi, 4G….
- Routing in dynamic networks based on the content of transmitted data
- Costs depend on the interpretation of the packet's payload
  - 'Routing Tree' depends on payload
  - Rules decided by the user — Classical firewalls are of no use

COMPRESSION



- Nodes of the network exchange packets
  - The content of a packet is a key-value dictionary in some format (e.g., JSON)
- Packets generated by a each node have a lot of redundancy
  - Most of the keys are repeated in every packet
  - Most of the values would change slightly from a packet to the next one

COMPRESSION



- Goal: Design a compression "protocol" used by nodes to communicate
  - Efficient key-value access without the whole decompression of the packet
  - Pattern matching operations
  - Asymmetric computational effort
    - Nodes have different computational capabilities (e.g., fridge vs gateway)

mattmahoney.net/dc/text.html

Program	Compression Options	Compressed size enwik8	Compressed size enwik9	Decompresser size (zip)	**Total size** enwik9+prog	Time (ns/byte) Comp	Decomp	Mem	Alg	Note
durilca'kingsize	-m13000 -o4					98	1797	13000	PPM	31
paq8hp12any	-8					60	37584	1850	CM	41
paq8pxd_v7	-8					51		1633	CM	29
zpaq 6.42	-m s10.0.5i					699	14739	14000	CM	61
drt|lpaq9m	9	17,964,751	143,943,759	110,579 x	144,054,338	868	898	1542	CM	41

Do you want to fight this war?

- Understand if there is a room for a scientific/experimental contribution
- Why does it may be interesting?
  - The redundancy is not within a packet but in a sequence of packets
    - Similar to delta-compression in which we send a new version of a file
- Compression strategy should be known by all the nodes of the path followed by the packet
  - Nodes on the path have to communicate auxiliary information to allow decompression. Need an adaptive strategy to balance achieved level of compression and amount of auxiliary information.