MEDIUM ACCESS CONTROL LAYER COMPARISON

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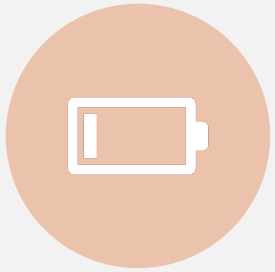
MAC LAYERS CHALLENGES FOR WIRELESS SENSOR NETWORK



LOW POWER

MOBILITY

SCALABILITY

SECURITY

Protocols based on **CSMA**

- T-MAC
- S-MAC
- P-MAC
- B-MAC
- B-MAC+
- X-MAC
- Wise-MAC

S-MAC

SENSOR MAC

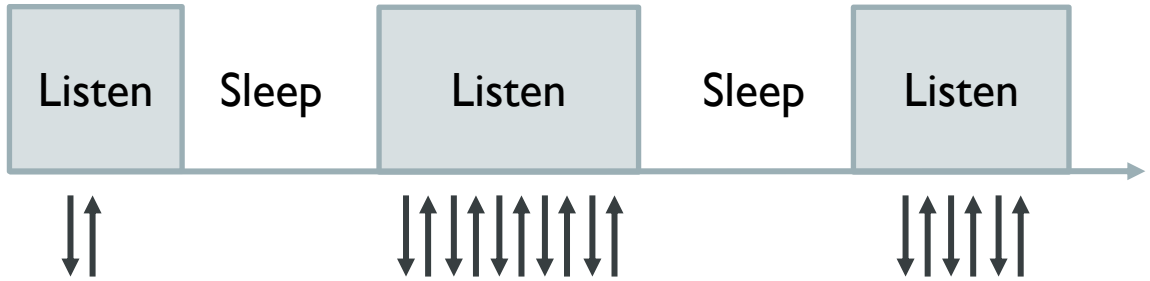
- Nodes periodically sleeping, with static duty cycle

- Synchronization between neighbor nodes, through SYNC messages
- RTS/CTS for collision avoidance
- Possible adaptive listening

T-MAC

TIMEOUT MAC

- Nodes sleeping, with dynamic timeout mechanism



- Synchronization & acknowledgment
- FRTS (Future Request To Send) to avoid early sleeping

PATTERN MAC

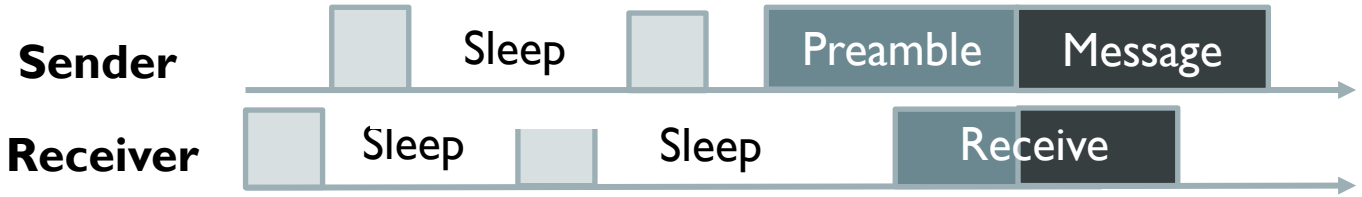
P-MAC

- Pattern with information about the neighborhood
- Node chose to sleep for a long time if no traffic
- Node chose to wake up at reception time if transmission planned (known thanks to pattern)

BERKLEY MAC

B-MAC

- Adaptive preamble sampling scheme : Long preamble with dest. add. before sending message.
- Low Power Listening (LPL) : receiver senses the network and go back to sleep if no message .

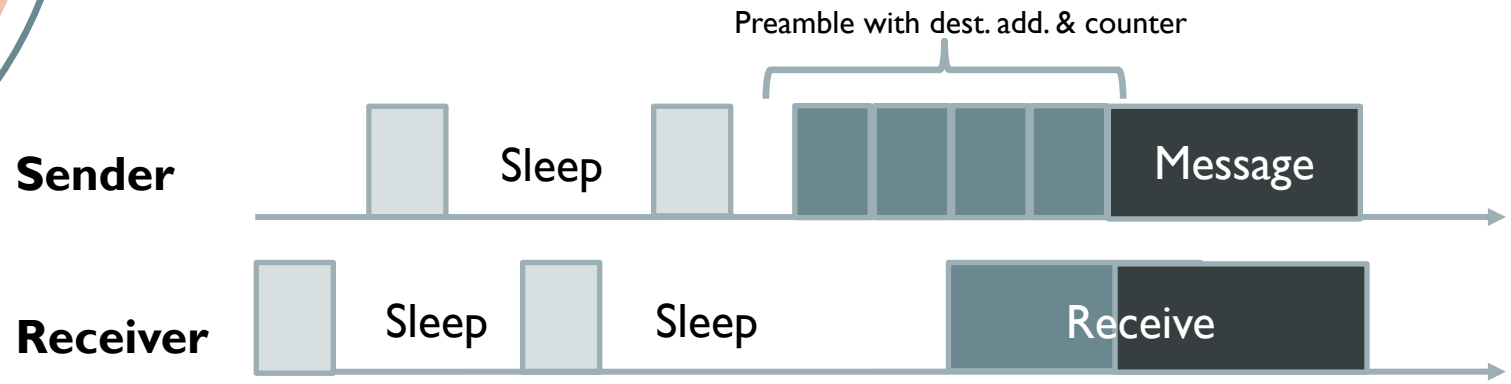


- Clear Channel Assessment (CCA)

BERKLEY MAC +

B-MAC+

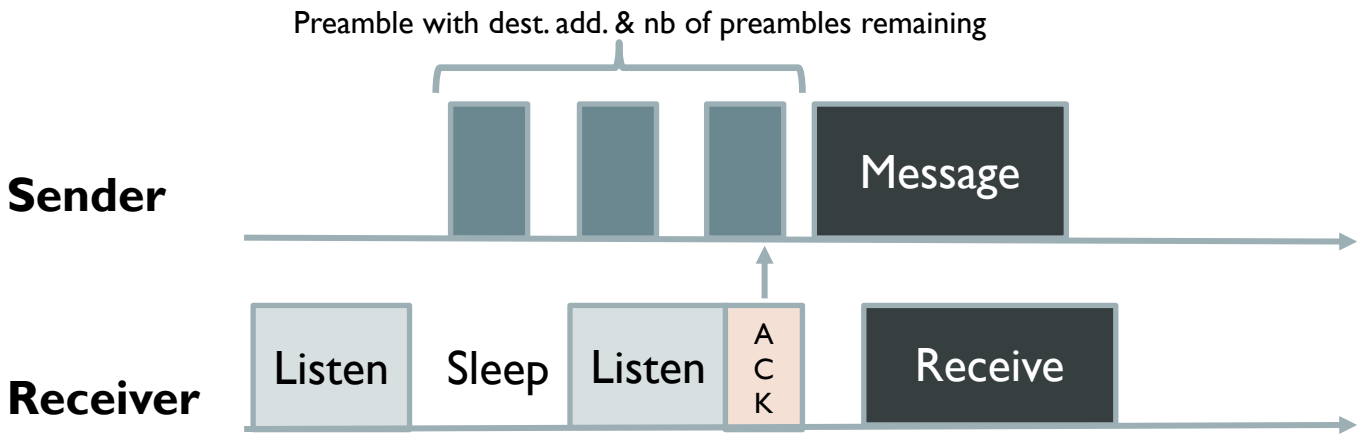
Improvement of B-MAC+ thanks to
short preambles mechanism



X-MAC

X-MAC

Improvement of B-MAC and B-MAC+ thanks to short preambles with fixed intervals

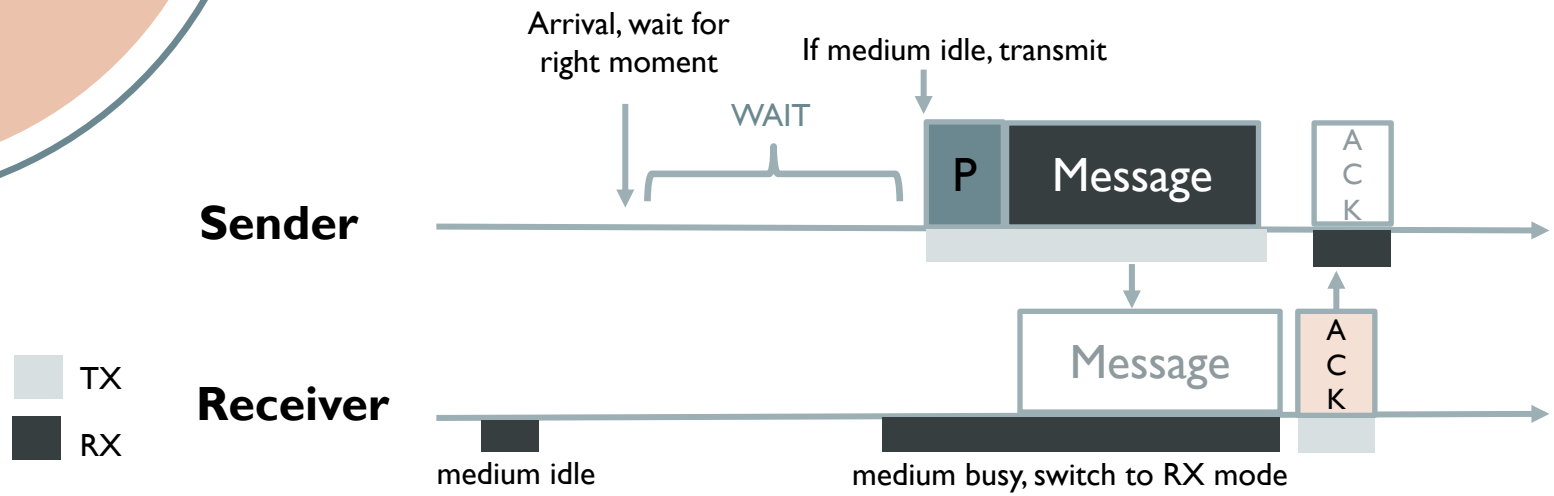


- ACK when preamble sensed by the receiver → transmitter stop preambles and sends messages

WISE MAC

WISE MAC

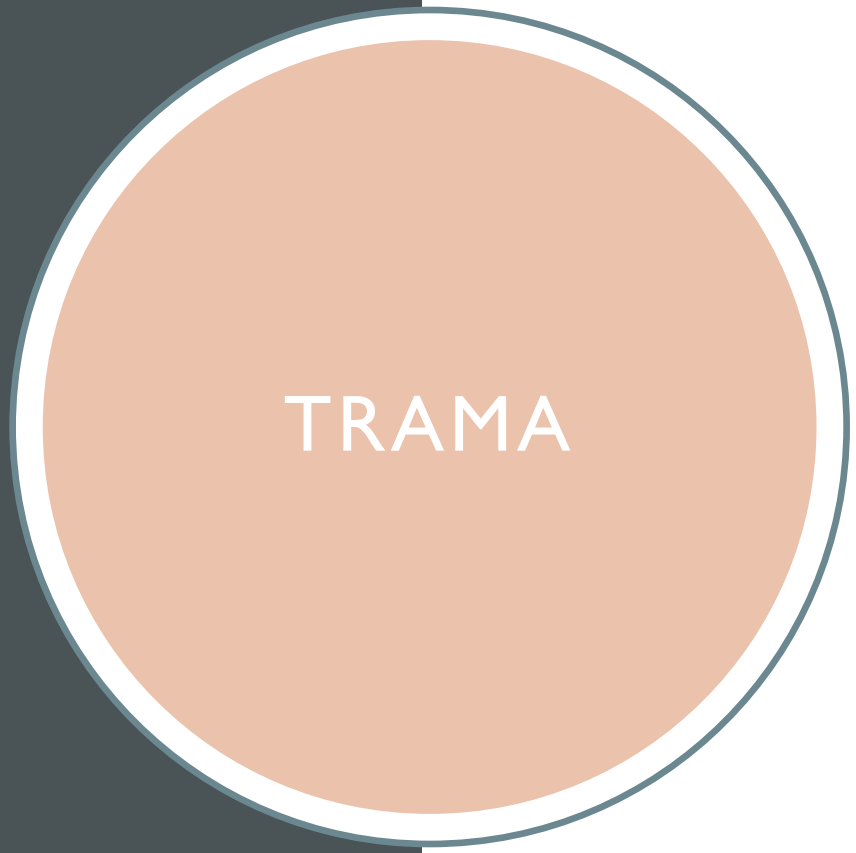
- No network-wide synchronization needed & adaptive to traffic load
- Learning sampling tables of direct neighbor nodes → send at the right time



Protocols based on **TDMA**

- TRAMA
- L-MAC
- EMACS
- DEMAC
- BMA
- SS-TDMA

…



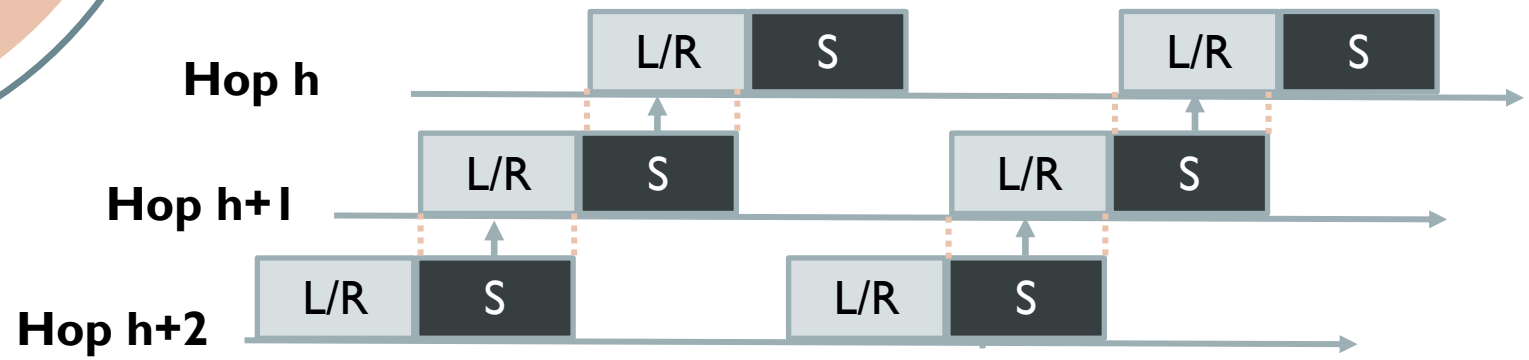
TRAMA

- Neighbor Protocol (NP) : discovering of their 2-hops neighbors.
- Schedule Exchange Protocol (SEP) : Nodes exchange their sleeping/listening schedules
- Adaptative Election Algorithm (AEA) : senders and receivers are chosen for each time slot dedenping on NP and SEP.

LIGHTWEIGHT MAC

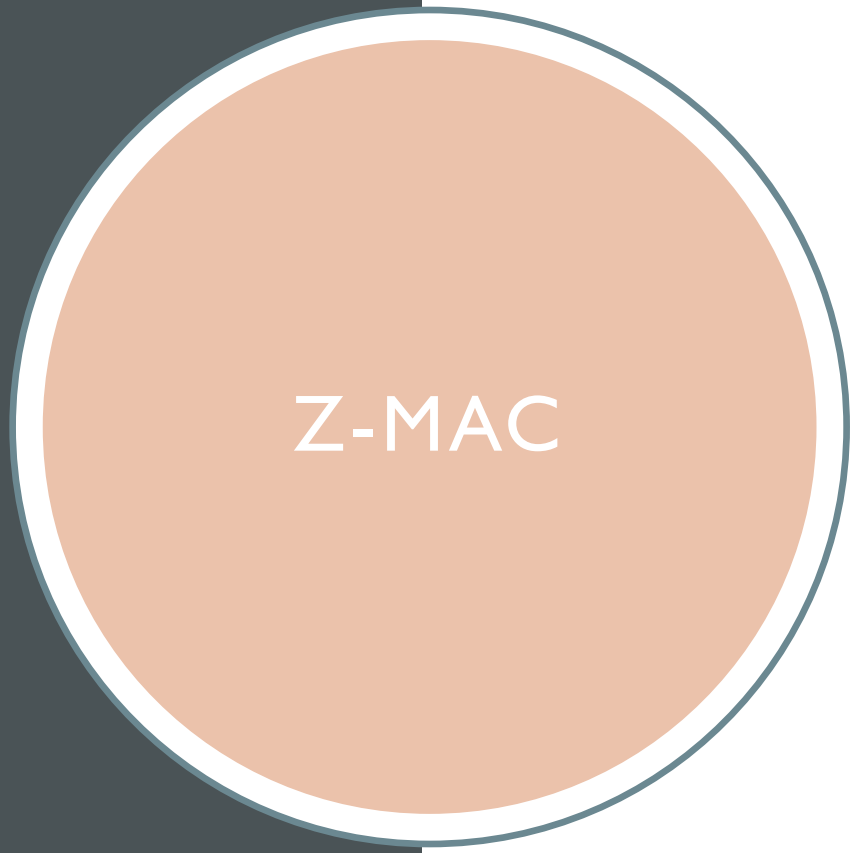
L-MAC

- Reciever-intitiated protocol
- Self-synchronized network : coordination of wake up times for child and parents.



Hybrid protocols

- Z-MAC
- Sift MAC
- H-MAC
- PTDMA
- μMAC
- R-MAC
- AMAC



ZEBRA MAC

- Setup phase :
  - Construction of the **network topology** : pings
  - Distribution of **time slots** : DRAND algorithm
  - Exchange of **local time frame**
  - Network-wide **synchronization**
- High Contention Level & Explicit Contention Notification

CONCLUSION

	CSMA based protocols	**TDMA based protocols**	**Hybrid protocols**
Throughput	Low	High	Moderate
Scalability	Low, *(Good for B-MAC, B-MAC+ and X-MAC)*	High	Good
Collision	Quite high	Way less	Way less
Idle listening	Low	Way less	Low
Overhearing	Low	Low	Low
Latency	Low	High	Low