Whack – A – Mole

WSN TEAM 15

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The architecture for Whack-A-Mole design consists of a Master and 4 slave nodes performing the following tasks:

Master: Polls slave nodes periodically asking for light values by sending out packets. The first packet consists of a message containing the 'Slave number' followed by the 'Light Up' command. If a 1 is received, the master sends a second packet with the 'Slave Number' and the 'Light Down' command, else it continues to poll with the previous packet.

Slave: The slave replies to the master's polling message by sending out a packet with the 'Slave Number', 'Light Up Acknowledgement' and 'Status' for the first message.
The slave responds by sending the 'Slave Number', 'Light Down Acknowledgement' and the 'Game Score' respectively for the master's second packet. Sampling rate

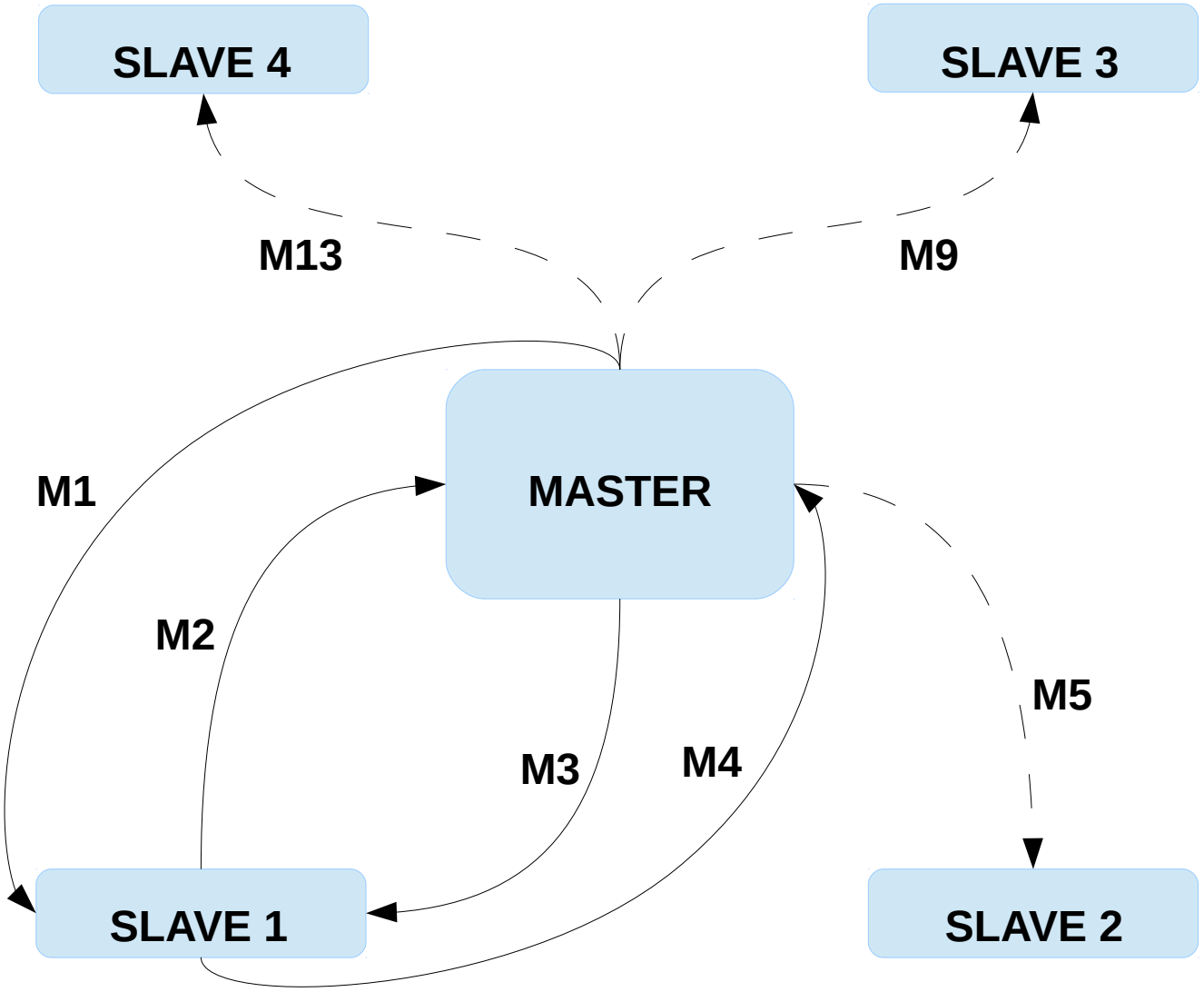
The master performs one task. However the slave performs two tasks:
TASK 1: THE WHACKY TASK:
Status: It indicates 0 for normal light and 1 if there is no light i.e. the light sensor is covered.
If a 'Light Up' message is received from the master, corresponding time values are initiated. If light level (Status) of 1 is received, then the slave sends out its slave number, Light Up acknowledgement and 1,else a 0 is sent.
If 'Light Down' message is received, the game score is calculated using the start and end time values. The slave then sends out the slave number, light down acknowledgment and score respectively.

TASK 2: THE LIGHT TASK:
If no signal is received, it waits until the next signal. Once received, value of the light sensor is read and depending on the threshold, the leds are turned off. The status is initialized to 1 else it is 0 depending on the leds.

The values of variables light_level, start_scoring and end_timestamp are placed within wait and signal since they are common to both task 1 and task 2.Semaphores were utilized to make sure that the two tasks run almost in a parallel manner. This task has a sampling rate of 50 samples per second.

System Latency: The master sends an average of 10 bytes i.e., 80 bits in every message. We can assume this be around 100 bits due to other headers, etc. Since the transmission rate is 250 kbps, the time spent on sending the 100 bit message is roughly 0.4 ms. So, for a complete cycle, the latency contribution is 2.4ms. The time out rate decides on the system latency, which is 1s in this case. Neglecting the transfer time, we get a rough latency time of 1.0024 seconds.

Battery Life: Assuming the nodes receive 99% of the time, and transmits 1% of the active time, the life-time of the batteries can be calculated as roughly the receiving life time of the batteries i.e., 4.6 days.



MESSAGE	SENDER	RECIPIENT	FORMAT	IMPLICATION
M1, M5, M9, M13	Master	Slave	SN:LU	Master transmits with slave number (SN) and command of 'light up' (LU).
M2	Slave	Master	SN:LUA:(0/1)	Slave responds with slave number (SN), light up acknowledgement (LUA) and signal (0/1) to show if it has lighted up.
M3	Master	Slave	SN:LD	Master commands the corresponding slave (SN) to go into 'light down' (LD) state.
M4	Slave	Master	SN:LDA:SCORE	Slave agrees by responding with slave number (SN), light down acknowledgement (LDA) and the score (SCORE).