ABOUT THE BANDWIDTH

ASSUMPTIONS

#1

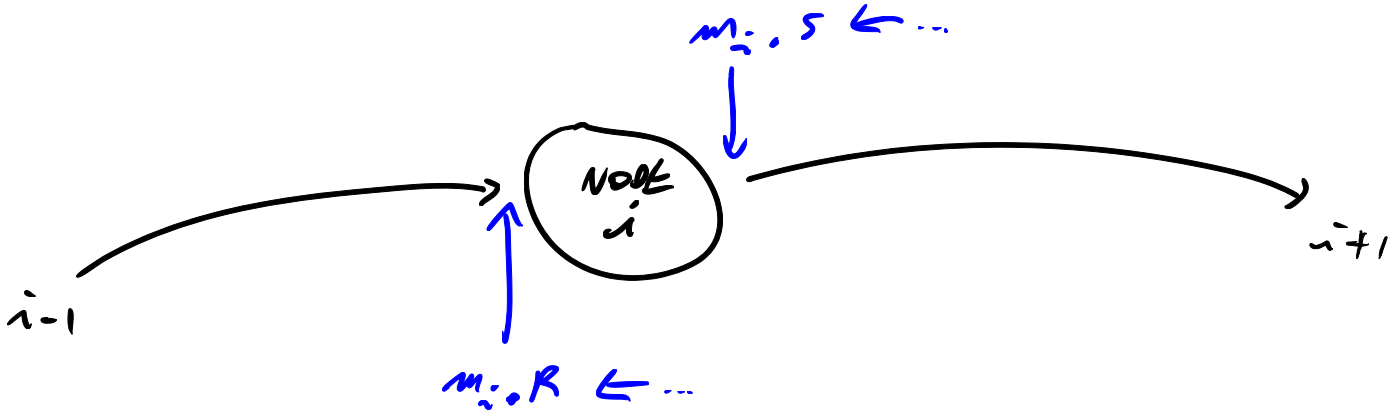
m_i IS THE MESSAGE PROCESSED BY THE i-TH NODE OF THE NETWORK; IT CONTAINS 2 (INTERESTING) FIELDS:

- $m_i.R$ RECEIVING TIME
- $m_i.S$ SENDING TIME

#2

WHEN A NODE RECEIVES THE MESSAGE, IT REWRITES $m_i.R$ IMMEDIATELY AFTER THE SYSCALL READ(), AND WHEN IT HAS TO SEND THE MESSAGE TO THE NEXT NODE, IT REWRITES IMMEDIATELY THE FIELD $m_i.S$.

SEE THE DRAWING:



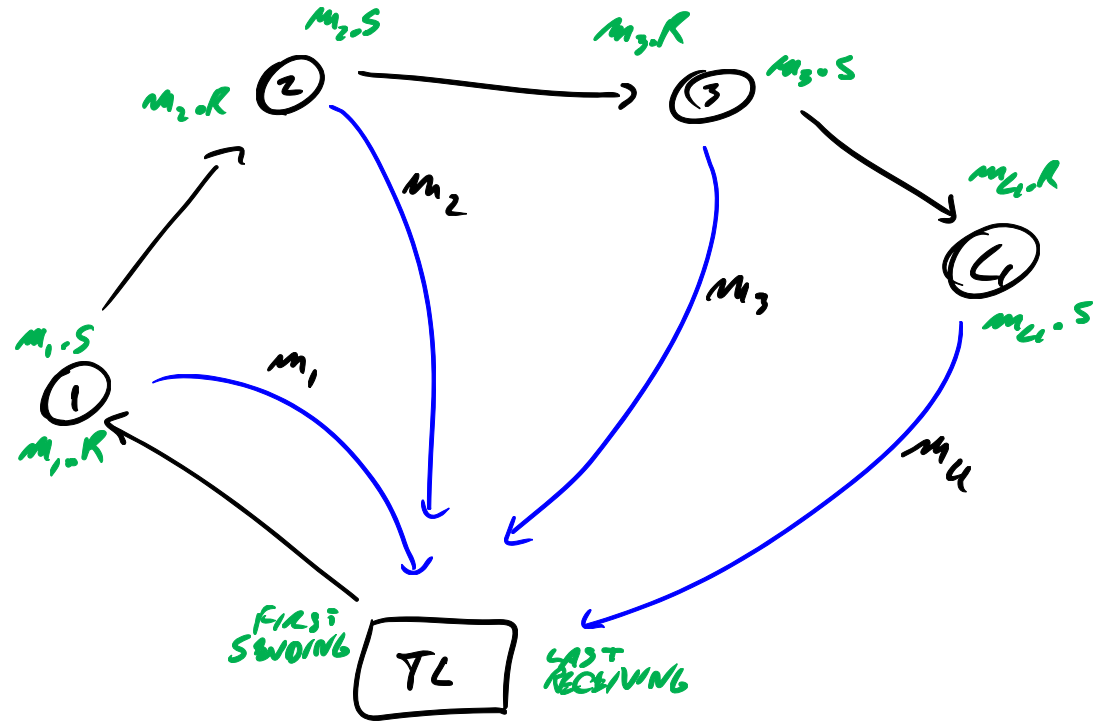
#3

THE NODE SENDS A COPY OF THE MESSAGE TO THE TURN LEADER ONLY AFTER THE HOP.

#4

THE TURN LEADER HOLDS TWO VARS FIRST_SENDING AND LAST_RECEIVING, BOTH INSTANTS OF TIME. (SEE #2)

AN EXAMPLE



	R	S	Δm
m_1	1	3	2
m_2	5	7	2
m_3	9	10	1
m_4	11	15	4

FIRST_SENDING : 0

LAST_RECEIVING: 17

$\Delta m_i := m_i.S - m_i.R$

TOTAL TIME:

$Tot\_T = LAST\_RECEIVING - FIRST\_SENDING = 17$

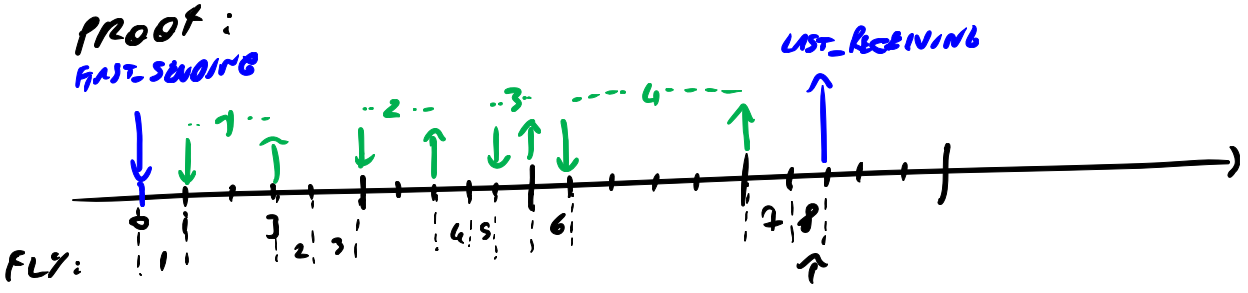
COMPUTATION TIME:

$Comp\_T = \sum_{i}^{4} \Delta m_i = 2+2+1+4 = 9$

FLY TIME:

$Fly\_T = Tot\_T - Comp\_T = 17 - 9 = 8$

PROOF:



AVERAGE TIME

$$TOT\_T\_AVERAGE = \frac{1}{INNERLOOPS} \sum_{i}^{INNERLOOPS} TOT\_T(i)$$

$$FLY\_T\_AVERAGE = \frac{1}{INNERLOOPS} \sum_{i}^{INNERLOOPS} FLY\_T(i)$$

BANDWIDTH

$$BITS := 8 * SIZEOF(MESSAGE\_T)$$

$$TOT\_BW = \frac{BITS}{TOT\_T\_AVERAGE}$$

$$FLY\_BW = \frac{BITS}{FLY\_T\_AVERAGE}$$