

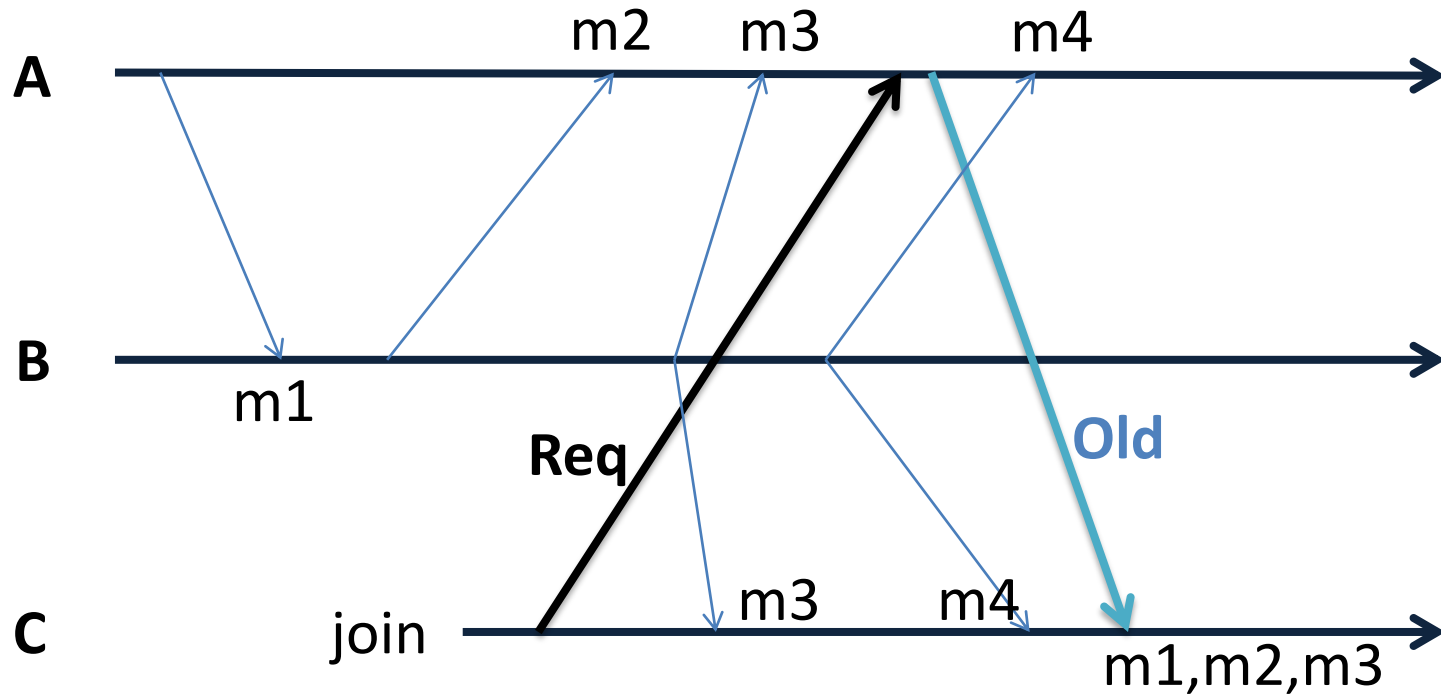
# Questions and Answers

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Construct a bulletin board system using Ensemble

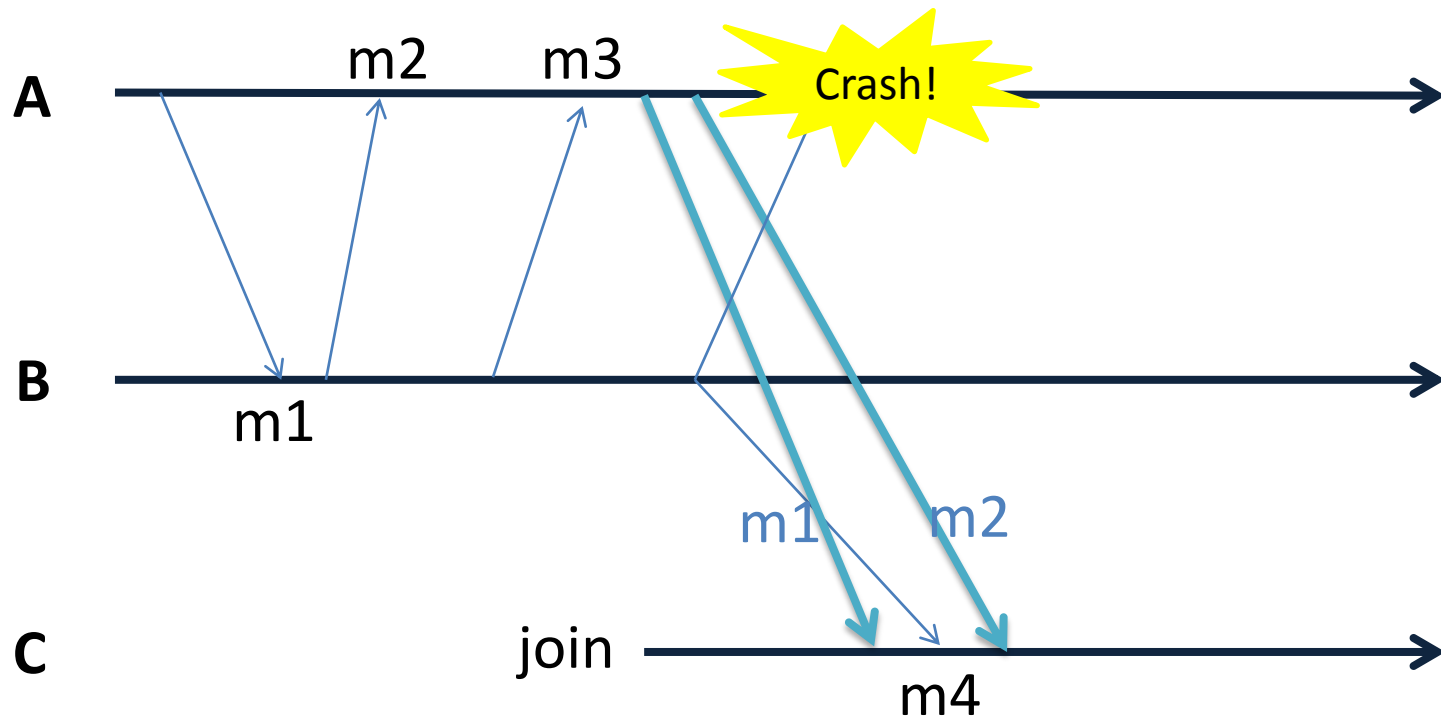
# **LAB 1**



Delivered by C: 

m1	m2	m3	m3	m4
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Duplicate!



What should C deliver?

Implementing a reliable and ordered multicast protocol

# LAB 2

# Reliable multicast

- Requirements: integrity, validity, *agreement*

*Received* := {};

***R-multicast( g, m)*** at process *p*: ***B-multicast( g, m)***;

*On B-deliver( m)* at process *p* from process *q*

*if( m*  $\notin$  *Received*)

*Received* := *Received*  $\cup$  {*m*};

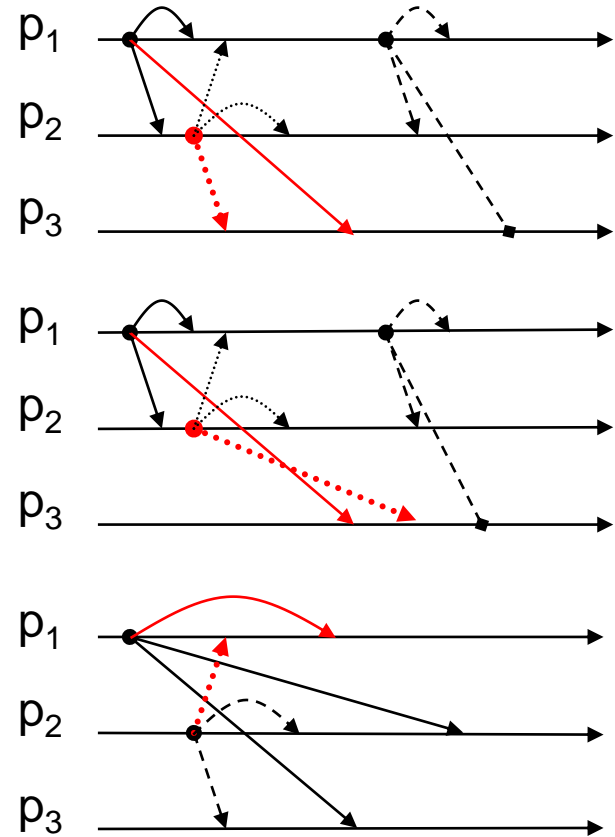
*if( q*  $\neq$  *p*) ***B-multicast( g, m)***;

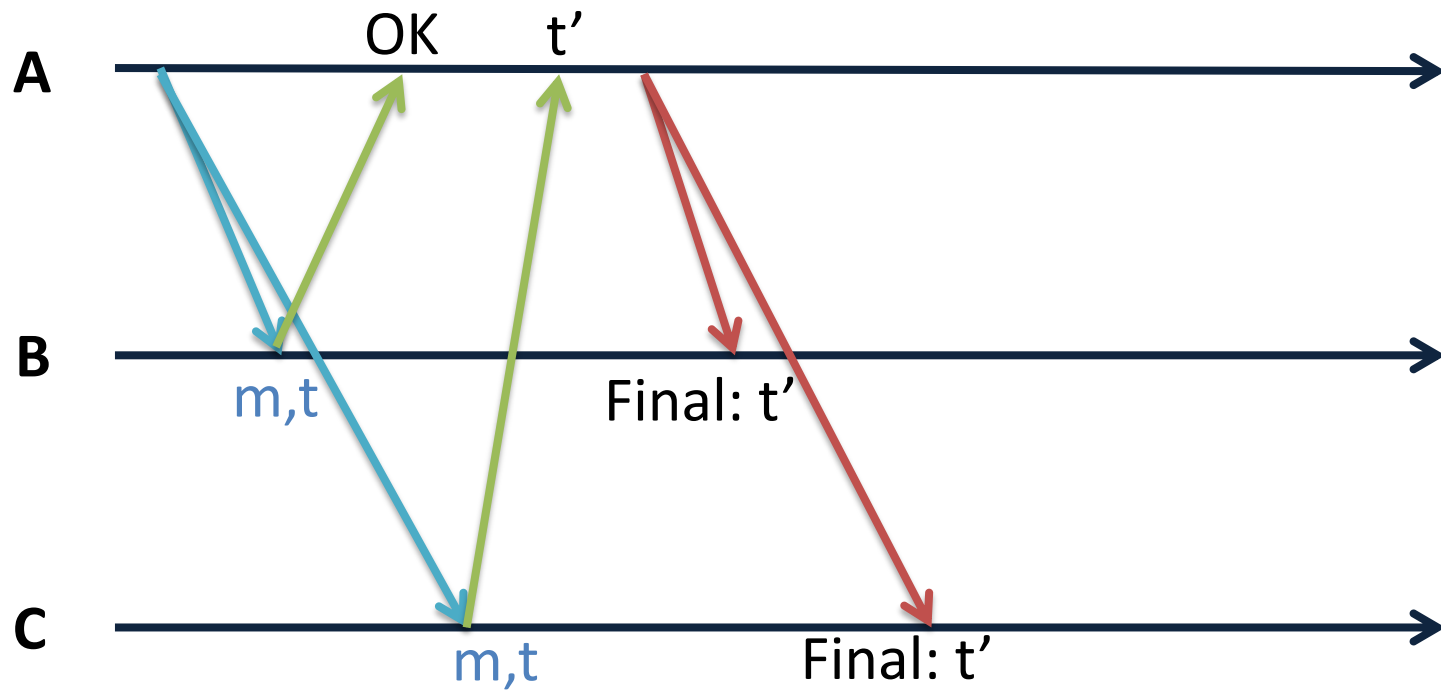
***R-deliver( m)***;

*end if*

# Ordering

- FIFO
  - if  $m_p \rightarrow m'_p$ , all correct processes *that deliver  $m'_p$*  will deliver  $m_p$  (that is from the same sender) before  $m'_p$ .
- Causal
  - if  $m \rightarrow m'$ , all correct processes *that deliver  $m'$*  will deliver  $m$  before  $m'$ .
- Total
  - if a correct process delivers  $m$  before  $m'$ , all other correct processes *that deliver  $m'$*  will deliver  $m$  before  $m'$ .





Queue at B:

x,t1,pending	m,t,pending	
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x,t1,pending	y,t2,ready	m,t',ready
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**Don't forget to sort!**



