

CSE 452

Distributed Systems

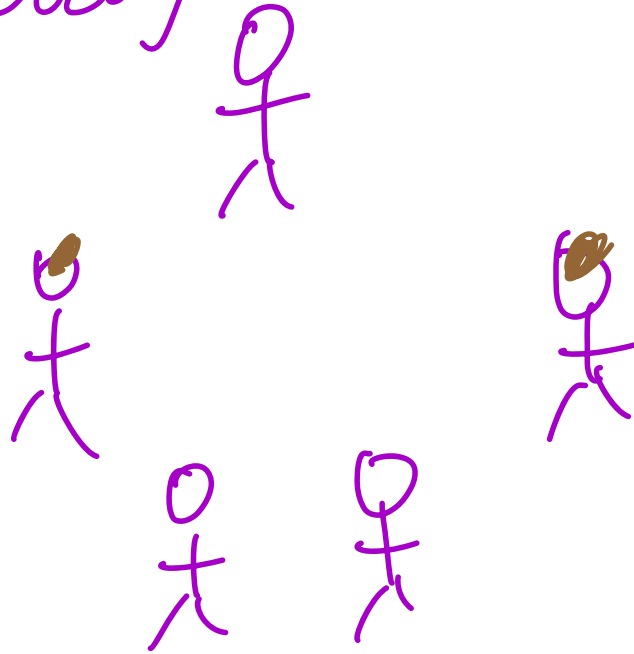
Knowledge

Muddy Foreheads

n children

k have mud on their forehead

→ teacher: "Somebody has mud"



Kinds of Knowledge

$K_i \varphi$ i is a node

means "node i knows φ "

$(K_i \varphi \rightarrow \varphi)$

$S_G \varphi$ G is a set of nodes

someone in G knows φ

Kinds of Knowledge (cont)

$D_G \varphi$ "distributed knowledge of φ "

if you know everything all of G knew, then you'd know φ

$E_G \varphi$ everyone in G knows φ

$E_G^K \varphi$ ("everyone knows")^K of φ

Common Knowledge

$C_G \varphi$

" φ is common knowledge"

\equiv

$\bigwedge_{k=1}^{\infty} E_G^k \varphi$

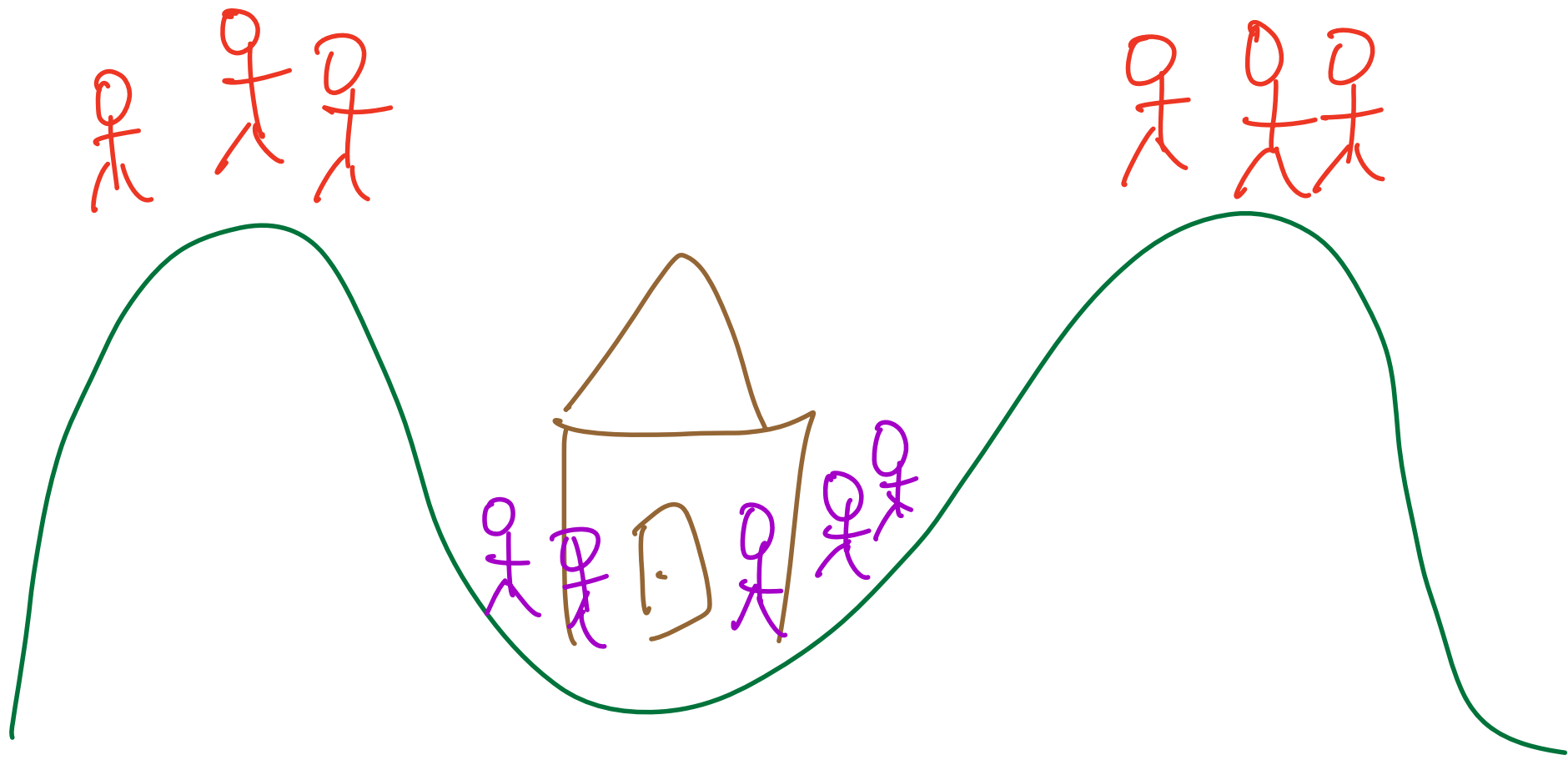
Evolution of a protocol

$K_i \varphi \rightsquigarrow E_G \varphi$

$D_G \varphi \rightsquigarrow S_G \varphi$

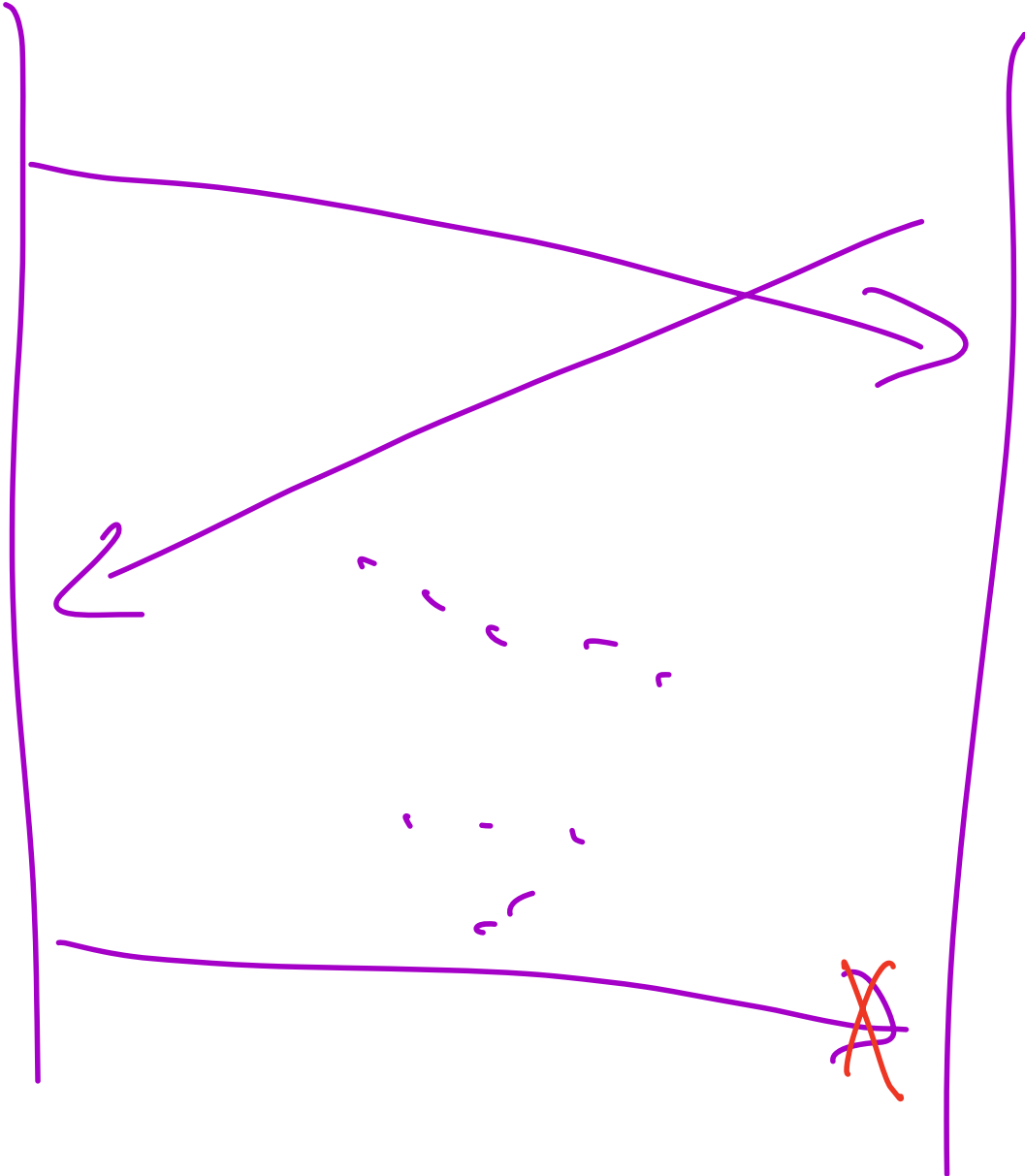
Gaining common knowledge is impossible

Impossibility of Coordinated Attack



A

B



Consensus

- get nodes to agree on something
- majority voting
- impossible