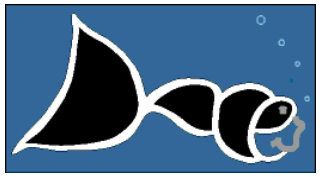
Object implementations out of faulty base objects

Prof R. Guerraoui
Distributed Programming Laboratory



Failure modes

- Responsive: once $\perp$, forever $\perp$
- Non-responsive: no reply

NB. In the asynchronous model, it is impossible to distinguish a non-responsive failed object from a slow object

Register implementations

- Algorithm 1: implements a SWMR ***register*** out of t+1 SWMR base responsive failure-prone ***registers***
- Algorithm 2: implements a SWSR ***register*** out of 2t+1 SWSR base non-responsive failure-prone ***registers***
- Algorithm 3: implements a ***C&S*** object out of t+1 base responsive failure-prone ***C&S***

Responsive model

- Write(v)
  - For j = 1 to (t+1) do
  - Reg[j].write(v);
  - return(ok)

- Read()
  - For j = t+1 to 1 do
  - **v :=** Reg[j].read();
  - if v ≠ ⊥ then return(v)

Non-responsive model

- Init: seq := 1

- Write(v)
  - w_seq := w_seq + 1;
  - For j = 1 to (2t+1) do **||**:
  - Reg[j].write(w_seq, v);
  - « wait until a majority of oks are returned »
  - return(ok)

Non-responsive model

- Init: (sn,val) := (-1,⊥);

- Read()
  - For j = 1 to (2t+1) do **||**:
  - (s,v) := Reg[j].read();
  - (sn,val) := (s,v) with the highest s from majority, including (sn,val)
  - return (val)

Responsive model (single-shot compare&swap)

- C&S(v)
- r := v;
- for j = 1 to t+1 do
- r' := CS[j].C&S(r);
- if r' ≠ ⊥ then r := r’;
- return(r)