

VARIABLES *css* *css*[*r*]: the *n*-ary digraph maintained at replica *r*

$NextEdge(r, u, g) \triangleq \text{CHOOSE } e \in g.edge : \wedge e.from = u$
 $\wedge \forall ue \in g.edge \setminus \{e\} :$
 $(ue.from = u) \Rightarrow so(e.cop.oid, ue.cop.oid, serial[r])$

$Perform(r, cop) \triangleq \text{LET } xform \triangleq xForm(NextEdge, r, cop, css[r])$
 $\text{IN } \wedge css' = [css \text{ EXCEPT } ![r] = @ \oplus xform.xg]$
 $\wedge \text{apply } xform.xcop.op \text{ to } list[r]$

$Do(c, op) \triangleq \text{LET } cop \triangleq [op \mapsto op, oid \mapsto [c \mapsto c, seq \mapsto cseq[c]], ctx \mapsto ds[c]]$
 $u \triangleq ds[c] \quad v \triangleq u \cup \{cop.oid\}$
 $\text{IN } \wedge css' = [css \text{ EXCEPT } ![c] = \text{append } cop \text{ to } u \text{ (i.e., } ds[c])]$
 $@ \oplus [node \mapsto \{v\}, edge \mapsto \{[from \mapsto u, to \mapsto v, cop \mapsto cop]$
 $\wedge \text{apply } op \text{ to } list[c]; \text{ send } cop \text{ to the Server}$

$Rev(c, cop) \triangleq Perform(c, cop)$

$SRev(cop) \triangleq \wedge Perform(Server, cop)$
 $\wedge \text{broadcast } cop \text{ to clients other than } ClientOf(cop)$