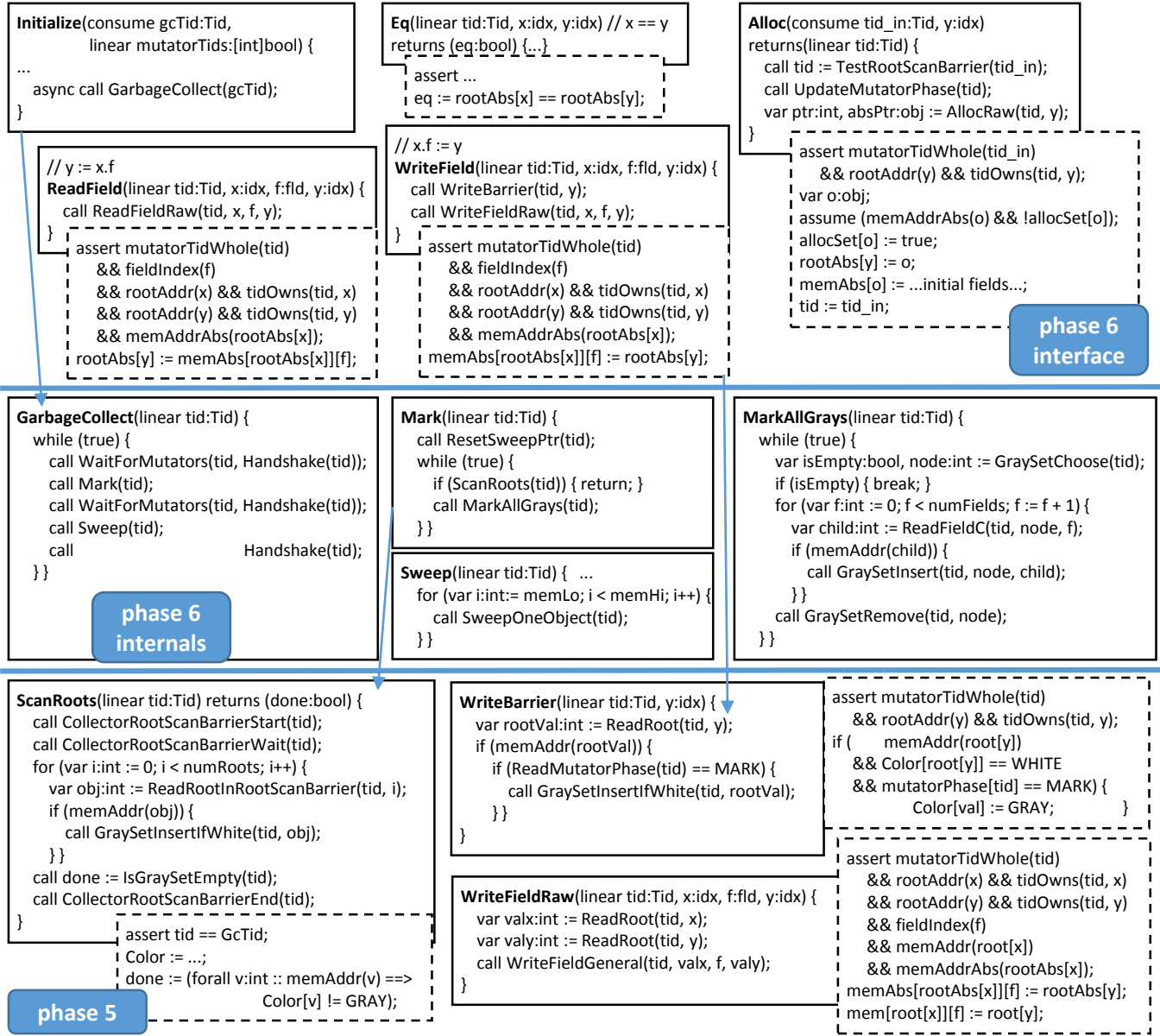
Initialize(consume gcTid:Tid,
linear mutatorTids:[int]bool) {
...
async call GarbageCollect(gcTid);
}
Eq(linear tid:Tid, x:idx, y:idx) // x == y
returns (eq:bool) {..}
assert ...
eq := rootAbs[x] == rootAbs[y];
Alloc(consume tid_in:Tid, y:idx)
returns(linear tid:Tid) {
call tid := TestRootScanBarrier(tid_in);
call UpdateMutatorPhase(tid);
var ptr:int, absPtr:obj := AllocRaw(tid, y);
}
assert mutatorTidWhole(tid_in)
&& rootAddr(y) && tidOwns(tid, y);
var o:obj;
assume (memAddrAbs(o) && !allocSet[o]);
allocSet[o] := true;
rootAbs[y] := o;
memAbs[o] := ...initial fields...;
tid := tid_in;
phase 6 interface
// y := x.f
ReadField(linear tid:Tid, x:idx, f:fld, y:idx) {
call ReadFieldRaw(tid, x, f, y);
}
assert mutatorTidWhole(tid)
&& fieldIndex(f)
&& rootAddr(x) && tidOwns(tid, x)
&& rootAddr(y) && tidOwns(tid, y)
&& memAddrAbs(rootAbs[x]);
rootAbs[y] := memAbs[rootAbs[x]][f];
// x.f := y
WriteField(linear tid:Tid, x:idx, f:fld, y:idx) {
call WriteBarrier(tid, y);
call WriteFieldRaw(tid, x, f, y);
}
assert mutatorTidWhole(tid)
&& fieldIndex(f)
&& rootAddr(x) && tidOwns(tid, x)
&& rootAddr(y) && tidOwns(tid, y)
&& memAddrAbs(rootAbs[x]);
memAbs[rootAbs[x]][f] := rootAbs[y];
GarbageCollect(linear tid:Tid) {
while (true) {
call WaitForMutators(tid, Handshake(tid));
call Mark(tid);
call WaitForMutators(tid, Handshake(tid));
call Sweep(tid);
call Handshake(tid);
}}
phase 6 internals
Mark(linear tid:Tid) {
call ResetSweepPtr(tid);
while (true) {
if (ScanRoots(tid)) { return; }
call MarkAllGrays(tid);
}}
Sweep(linear tid:Tid) { ...
for (var i:int:= memLo; i < memHi; i++) {
call SweepOneObject(tid);
}}
MarkAllGrays(linear tid:Tid) {
while (true) {
var isEmpty:bool, node:int := GraySetChoose(tid);
if (isEmpty) { break; }
for (var f:int := 0; f < numFields; f := f + 1) {
var child:int := ReadFieldC(tid, node, f);
if (memAddr(child)) {
call GraySetInsert(tid, node, child);
}}
call GraySetRemove(tid, node);
}}
ScanRoots(linear tid:Tid) returns (done:bool) {
call CollectorRootScanBarrierStart(tid);
call CollectorRootScanBarrierWait(tid);
for (var i:int := 0; i < numRoots; i++) {
var obj:int := ReadRootInRootScanBarrier(tid, i);
if (memAddr(obj)) {
call GraySetInsertIfWhite(tid, obj);
}}
call done := IsGraySetEmpty(tid);
call CollectorRootScanBarrierEnd(tid);
}
assert tid == GcTid;
Color := ...;
done := (forall v:int :: memAddr(v) ==>
Color[v] != GRAY);
phase 5
WriteBarrier(linear tid:Tid, y:idx) {
var rootVal:int := ReadRoot(tid, y);
if (memAddr(rootVal)) {
if (ReadMutatorPhase(tid) == MARK) {
call GraySetInsertIfWhite(tid, rootVal);
}}
}
assert mutatorTidWhole(tid)
&& rootAddr(y) && tidOwns(tid, y);
if (memAddr(root[y])
&& Color[root[y]] == WHITE
&& mutatorPhase[tid] == MARK) {
Color[val] := GRAY; }
WriteFieldRaw(linear tid:Tid, x:idx, f:fld, y:idx) {
var valx:int := ReadRoot(tid, x);
var valy:int := ReadRoot(tid, y);
call WriteFieldGeneral(tid, valx, f, valy);
}
assert mutatorTidWhole(tid)
&& rootAddr(x) && tidOwns(tid, x)
&& rootAddr(y) && tidOwns(tid, y)
&& fieldIndex(f)
&& memAddr(root[x])
&& memAddrAbs(rootAbs[x]);
memAbs[rootAbs[x]][f] := rootAbs[y];
mem[root[x]][f] := root[y];