Assignment 3

Software Analysis Studio (Week 8)

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University of Technology Sydney, Australia

Assignment 3: Data-Dependence

Andersen's points-to analysis

- You will be using what you have learned about Andersen's pointer analysis.
- **Goal**: implement Andersen's pointer analysis by solving the constraint graph of a program.

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- **Goal**: implement Andersen's pointer analysis by solving the constraint graph of a program.
- **Specification and code template**:
  `https://github.com/SVF-tools/SVF-Teaching/wiki/Assignment-3`
- **SVF CPP API**
  `https://github.com/SVF-tools/SVF-Teaching/wiki/SVF-CPP-API`

Andersen's Pointer Analysis

Algorithm

```
define i32 @main() #0 {
entry:
%a1 = alloca i8, align 1        // O1
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store i8* %a1, i8** %a, align 8
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call void @swap(i8** %a, i8** %b)
ret i32 0
}
define void @swap(i8** %p, i8** %q)
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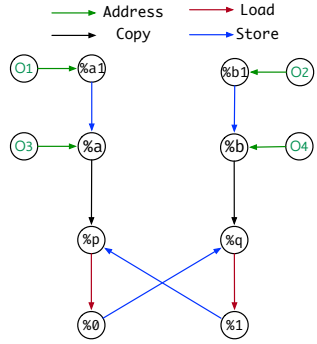


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  foreach o ∈ pts(p) do
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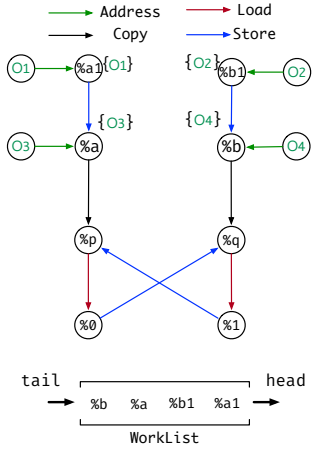


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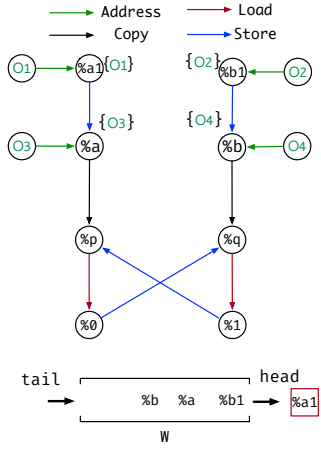


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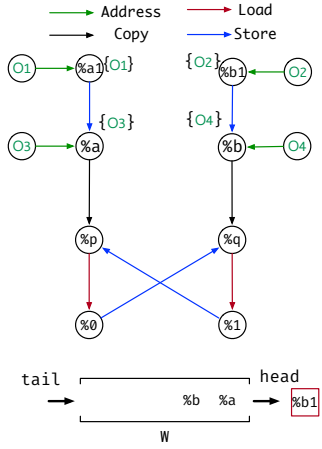


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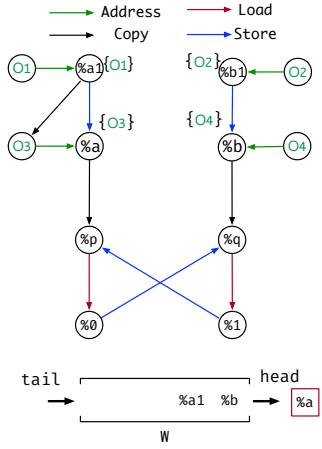


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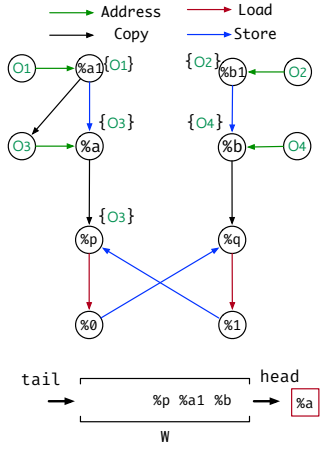


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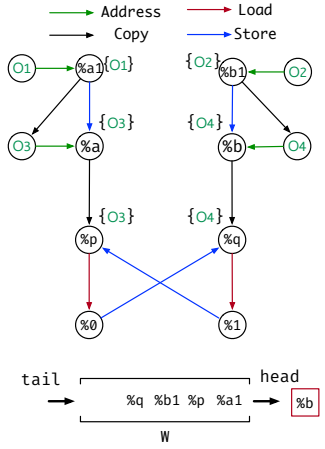


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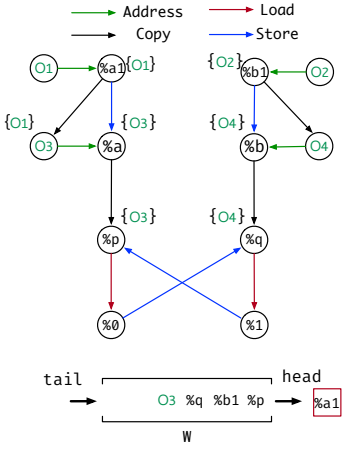


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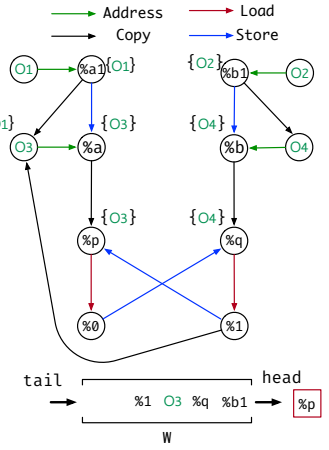


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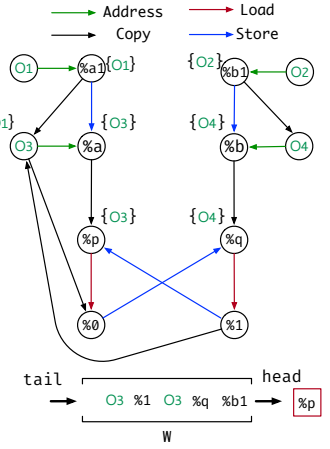


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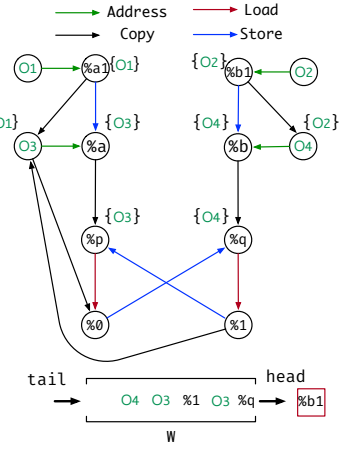


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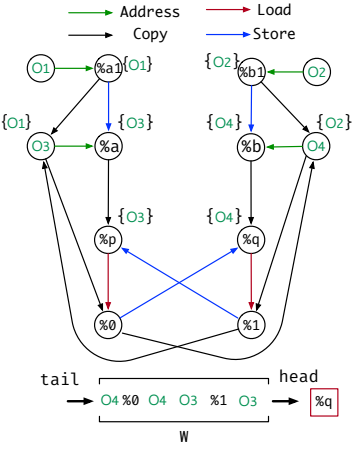
Andersen's Pointer Analysis

Algorithm

```
define i32 @main() #0 {
entry:
%a1 = alloca i8, align 1        // O1
%b1 = alloca i8, align 1        // O2
%a = alloca i8*, align 8        // O3
%b = alloca i8*, align 8        // O4
store i8* %a1, i8** %a, align 8
store i8* %b1, i8** %b, align 8
call void @swap(i8** %a, i8** %b)
ret i32 0
}
define void @swap(i8** %p, i8** %q)
#0 {
entry:
%0 = load i8** %p, align 8
%1 = load i8** %q, align 8
store i8* %1, i8** %p, align 8
store i8* %0, i8** %q, align 8
ret void
}
```




```
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  foreach o ∈ pts(p) do
    foreach store ⋆p = q do// Store rule
      if q→o ∉ E then
        E ← E ∪ {q→o}  // Add copy edge
        pushIntoWorklist(q)
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Andersen's Pointer Analysis

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}
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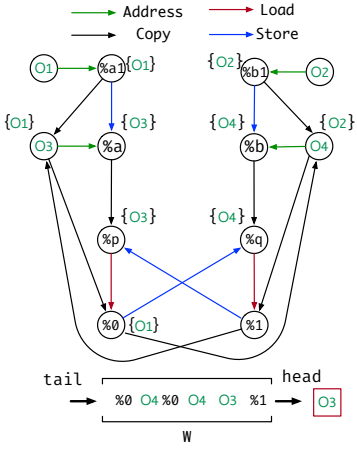
entry:
%0 = load i8** %p, align 8
%1 = load i8** %q, align 8
store i8* %1, i8** %p, align 8
store i8* %0, i8** %q, align 8
ret void
}
```

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Andersen's Pointer Analysis

Algorithm

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%0 = load i8** %p, align 8
%1 = load i8** %q, align 8
store i8* %1, i8** %p, align 8
store i8* %0, i8** %q, align 8
ret void
}
```

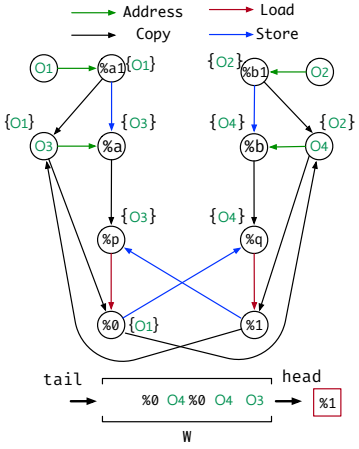


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10                 pushIntoWorklist(q)
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12             if o→r ∉ E then
13                 E ← E ∪ {o→r}  // Add copy edge
14                 pushIntoWorklist(o)
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Andersen's Pointer Analysis

Algorithm

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ret i32 0
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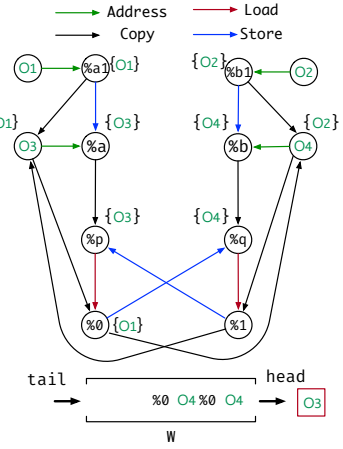
#0 {
entry:
%0 = load i8** %p, align 8
%1 = load i8** %q, align 8
store i8* %1, i8** %p, align 8
store i8* %0, i8** %q, align 8
ret void
}
```

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Andersen's Pointer Analysis

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call void @swap(i8** %a, i8** %b)
ret i32 0
}
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#0 {
entry:
%0 = load i8** %p, align 8
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store i8* %1, i8** %p, align 8
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ret void
}
```

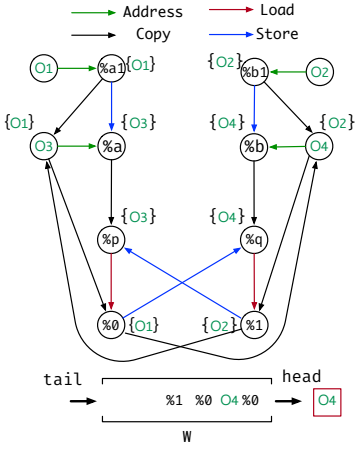


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Andersen's Pointer Analysis

Algorithm

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store i8* %b1, i8** %b, align 8
call void @swap(i8** %a, i8** %b)
ret i32 0
}
define void @swap(i8** %p, i8** %q)
#0 {
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%0 = load i8** %p, align 8
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store i8* %1, i8** %p, align 8
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ret void
}
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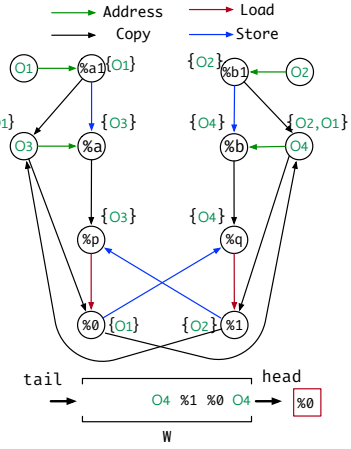


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Andersen's Pointer Analysis

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}
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#0 {
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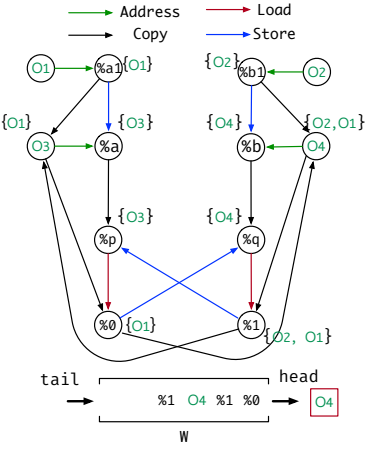
store i8* %1, i8** %p, align 8
store i8* %0, i8** %q, align 8
ret void
}
```

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Andersen's Pointer Analysis

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call void @swap(i8** %a, i8** %b)
ret i32 0
}
define void @swap(i8** %p, i8** %q)
#0 {
entry:
%0 = load i8** %p, align 8
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store i8* %1, i8** %p, align 8
store i8* %0, i8** %q, align 8
ret void
}
```

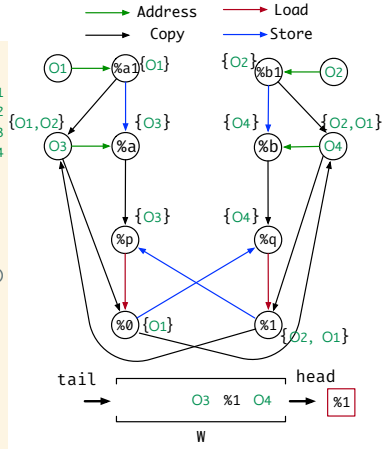


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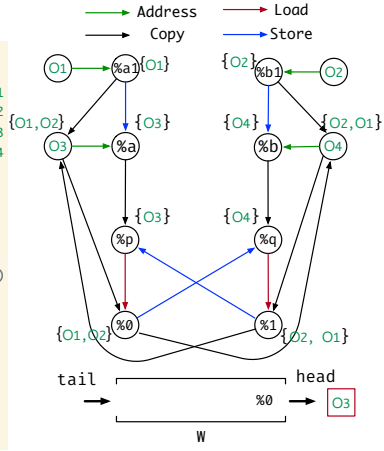


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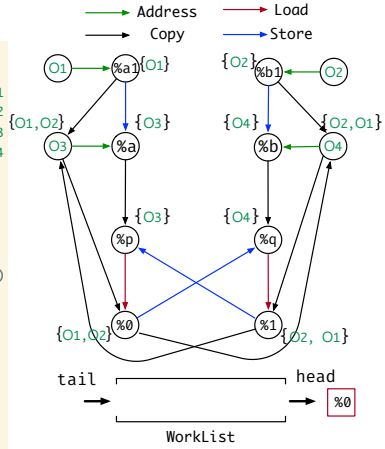


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