시스템 프로그래밍을 위한 C언어

Variable Liveness Scope

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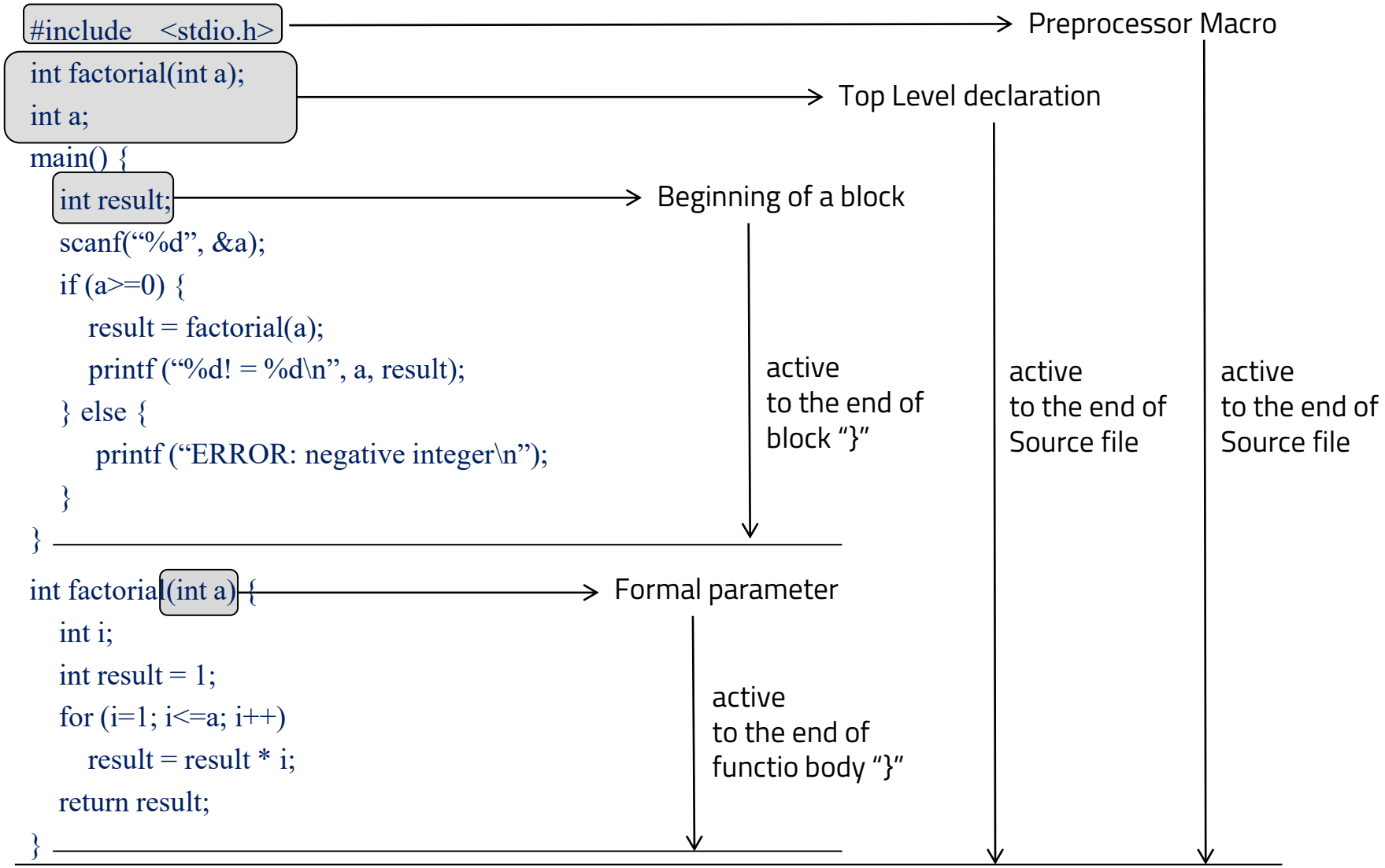
Active Region of Variable Declaration

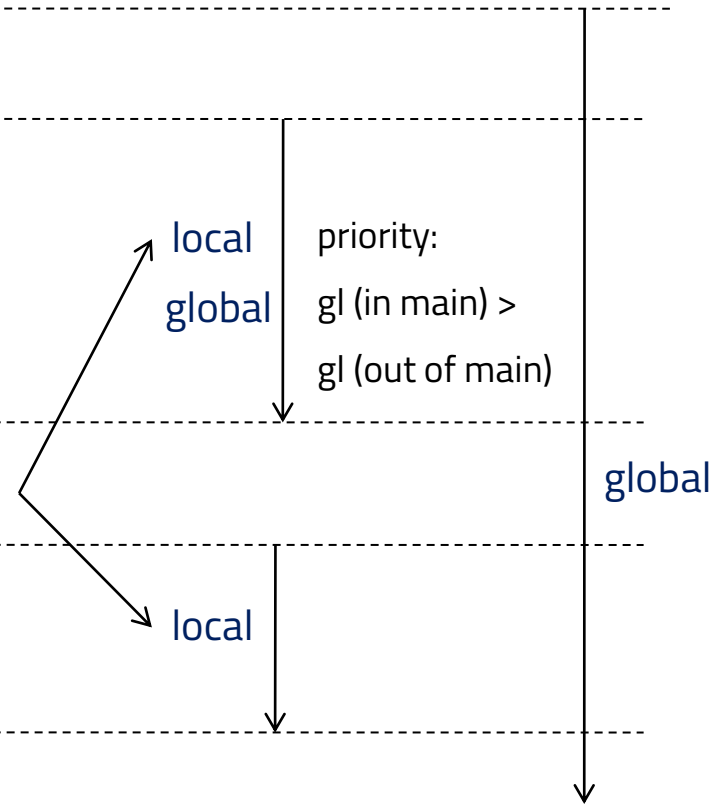


Scope: Local vs. Global Variable

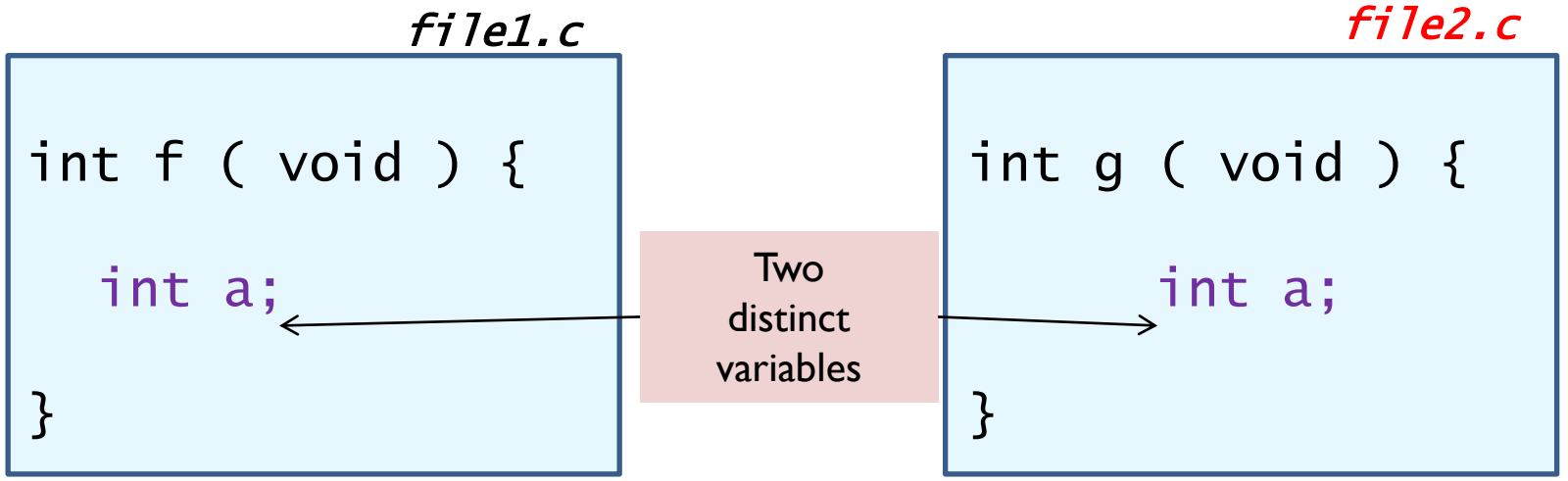
```
#include<stdio.h>
void func1();
int gl;

main() {
   int lo = 1, gl = 1;
   func1( );
   printf("initial value of global : %d\n", gl);
   printf("initial value of local : %d\n", lo);
}

func1( ) {
   int lo = 2;
   ...
}
```

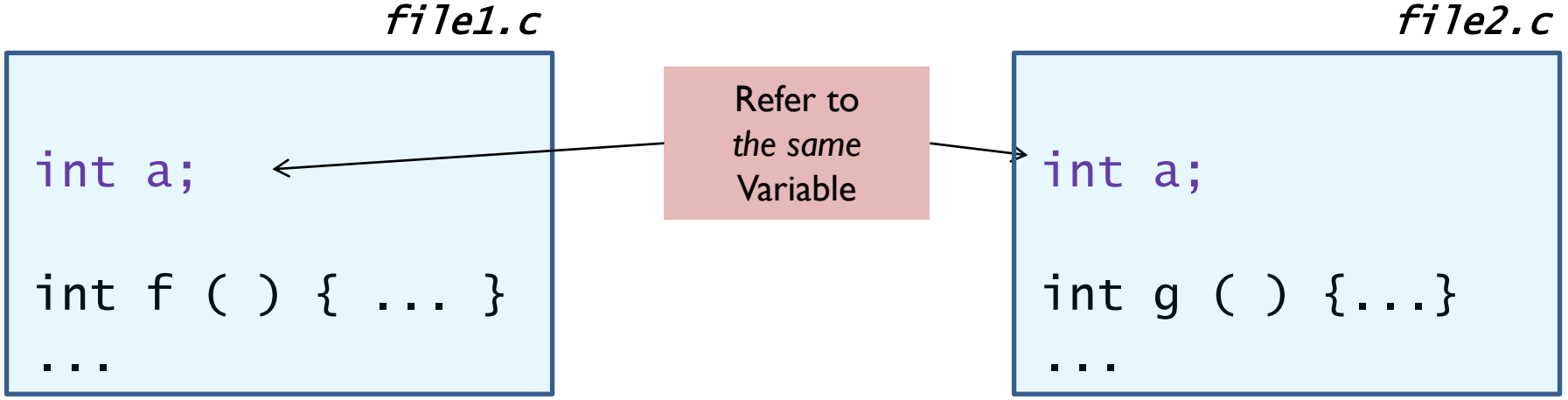


Memory Allocation on Multiple Files



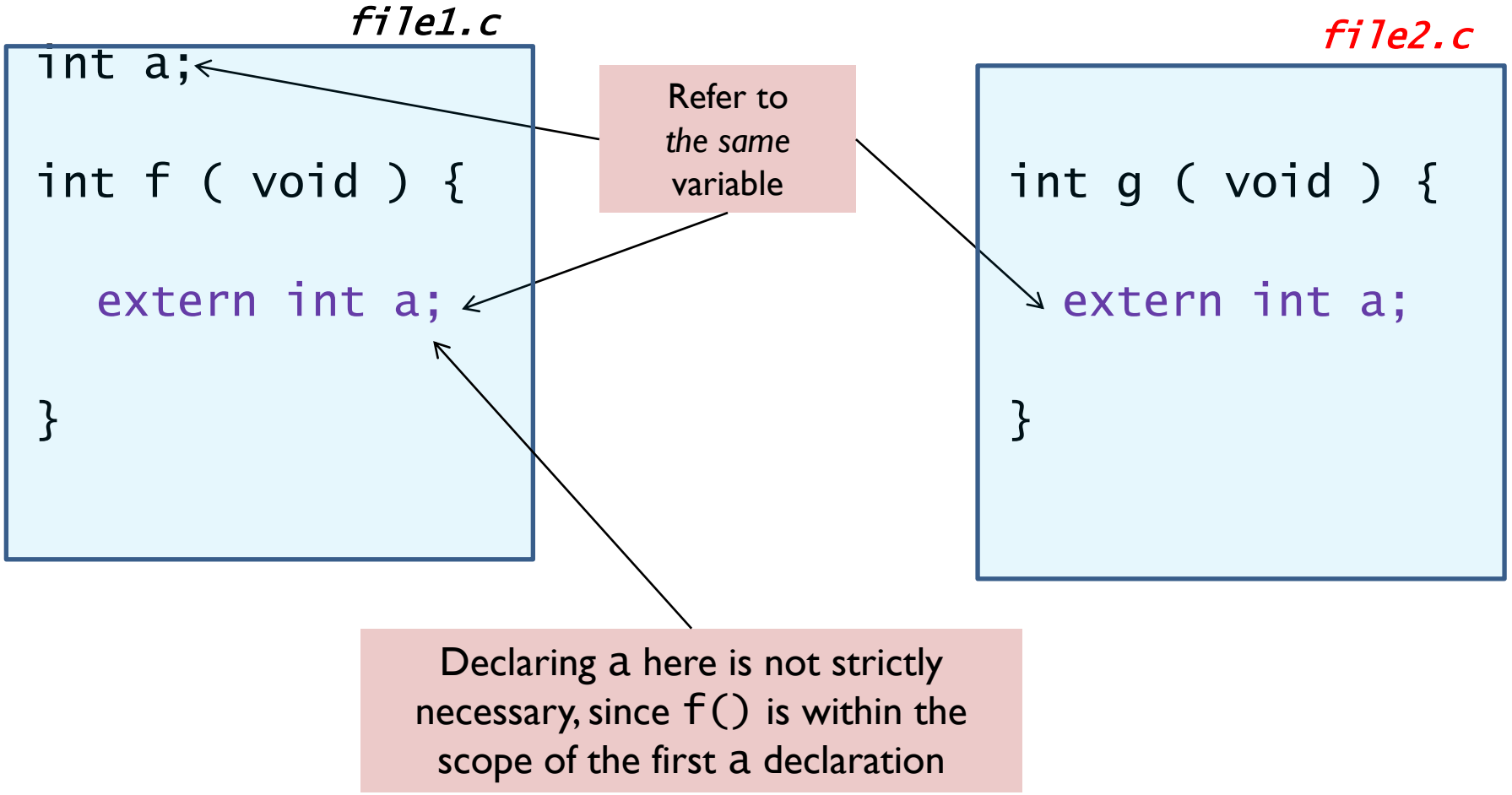
Both a's are auto storage class (local extent)

external linkage



Somewhere allocated declaration: 'extern'

A local variable declared as extern has an external linkage.



Memory Allocation: Static vs. auto(local)

- Static vs local extent
  - static extent (cf: does not mean "global" which is related to scope)
    - Allocation remains from the beginning of program execution to program termination
    - Avoid overhead of allocating, initialization, de-allocating memory with each function call
  - local extent
    - Create upon entry to a block or function and destroy upon exit from the block or function

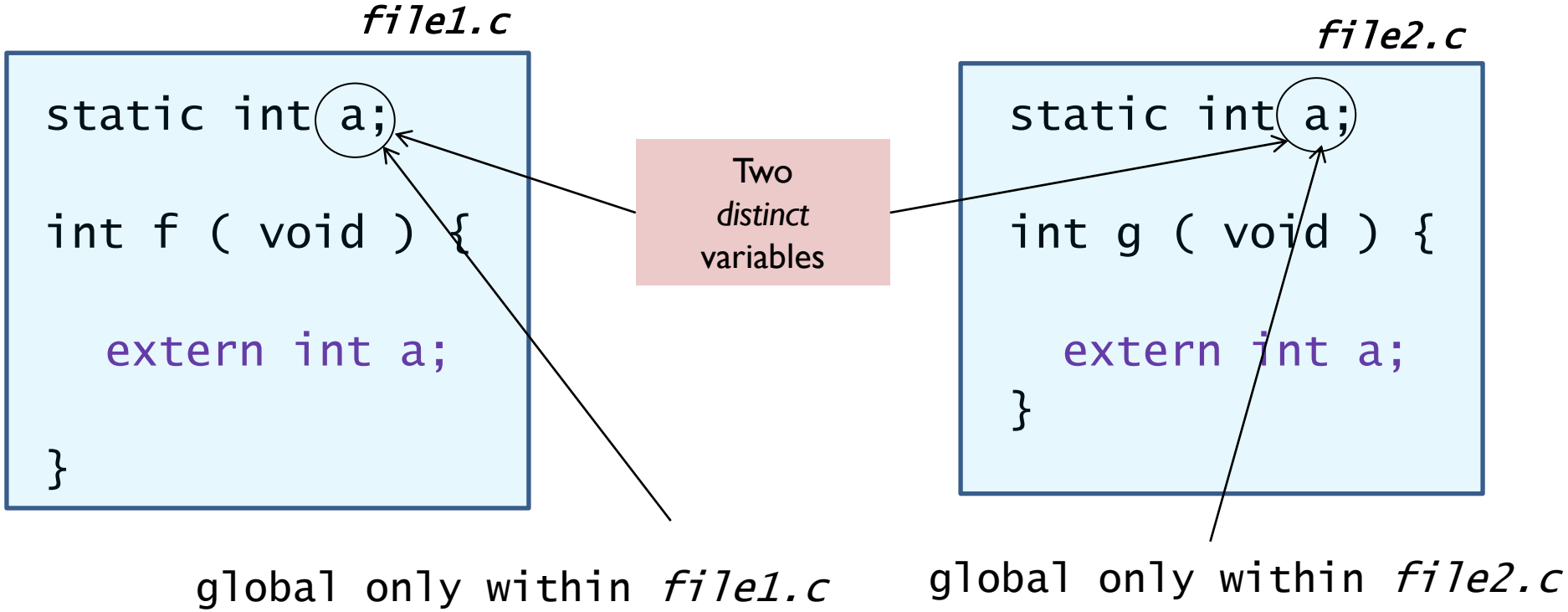
```
{
    static int S = 0;
    auto int L = 0;
    L = L + 1; S = S + 1;
    printf ("L = %d, S = %d \n", L, S);
}
```

After execution many times : L = 1, S = 1
L = 1, S = 2
L = 1, S = 3

Static variable vs. global variable

Q: What if you have a "global" variable just within a file but not visible outside the file?

A: Declare it as static within the file:



Source code refactoring (1/5)

```
int g1;
int g2;
int foo1(int i) {
    return i + g1;
}
int foo2(int i) {
    int g2=100;
    return i + g2;
}
```

```
int main(…) {
    ….
    int sum;
    g1 = 3
    sum = foo1(g1)+g1;
    ….
}
```

Source code refactoring (2/5)

```
int g1;
int g2;

int foo1(int i);

int foo2(int i);
```

```
int main(…) {
    ……
}
int foo1(int i) {
    return i + g;
}
int foo2(int i) {
    int g2=100;
    return i + g2;
}
```

Source code refactoring (3/5)

foo.h

```
int g1;
int g2;

int foo1(int i);

int foo2(int i);
```

```
#include “foo.h”
int main(…) {
    ……
}
```

foo.c

```
#include “foo.h”
int foo1(int i) {
    ….
}
int foo2(int i) {
    ….
}
```

Source code refactoring (4/5)

foo.h

```
int g1;
int g2;

int foo1(int i);

int foo2(int i);
```

```
#include “foo.h”
int main(…) {
    ……
}
```

foo1.c

```
#include “foo.h”
int foo1(int i) {
    ….
}
```

foo2.c

```
#include “foo.h”
int foo2(int i) {
    ….
}
```

Source code refactoring (5/5)

foo.h

```
int foo1(int i);

int foo2(int i);
```

main.c

```
#include “foo.h”
extern int g1;
int main(…) {
    int sum;
    g1 = 3
    sum = foo1(g1)+g1;
}
```

foo1.c

```
#include “foo.h”
int g1;
int foo1(int i) {
    ….
}
```

```
#include “foo.h”
static int g2;
int foo2(int i) {
    ….
}
```

foo2.c