

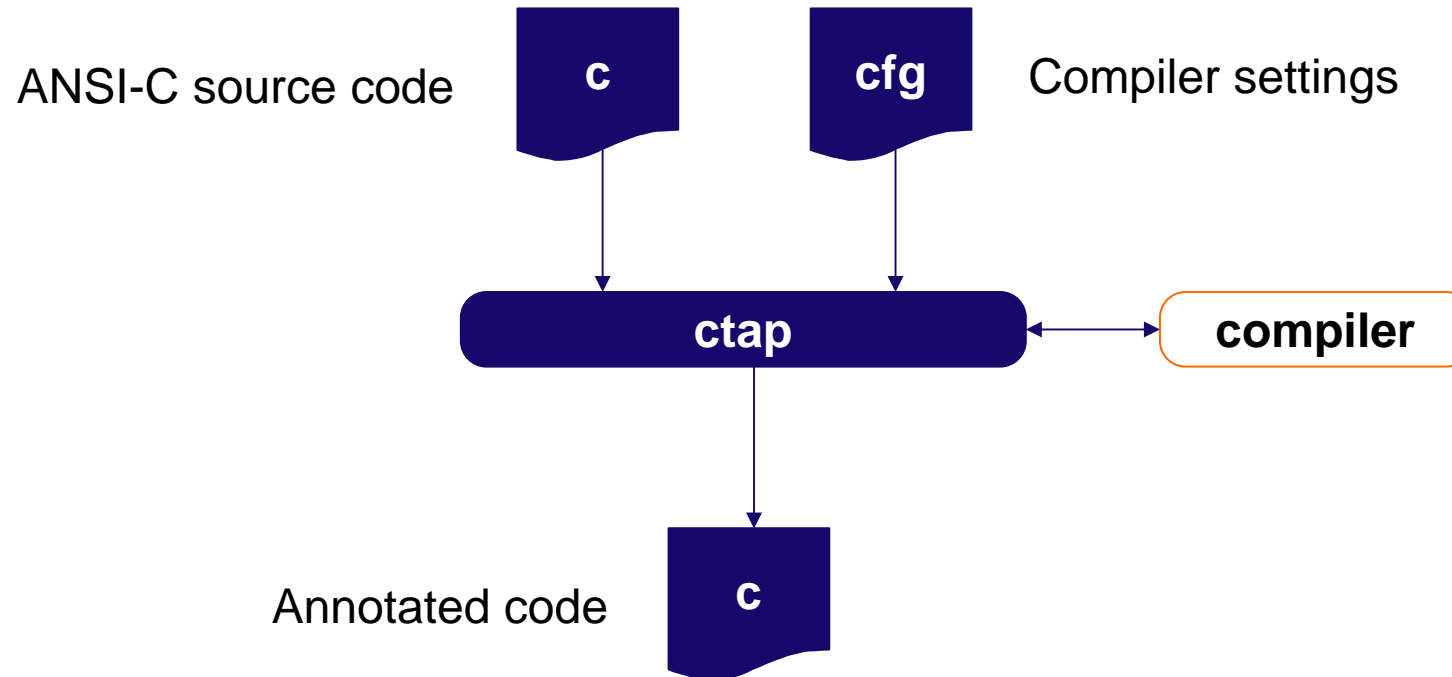
Simulation Strategies at TU/e

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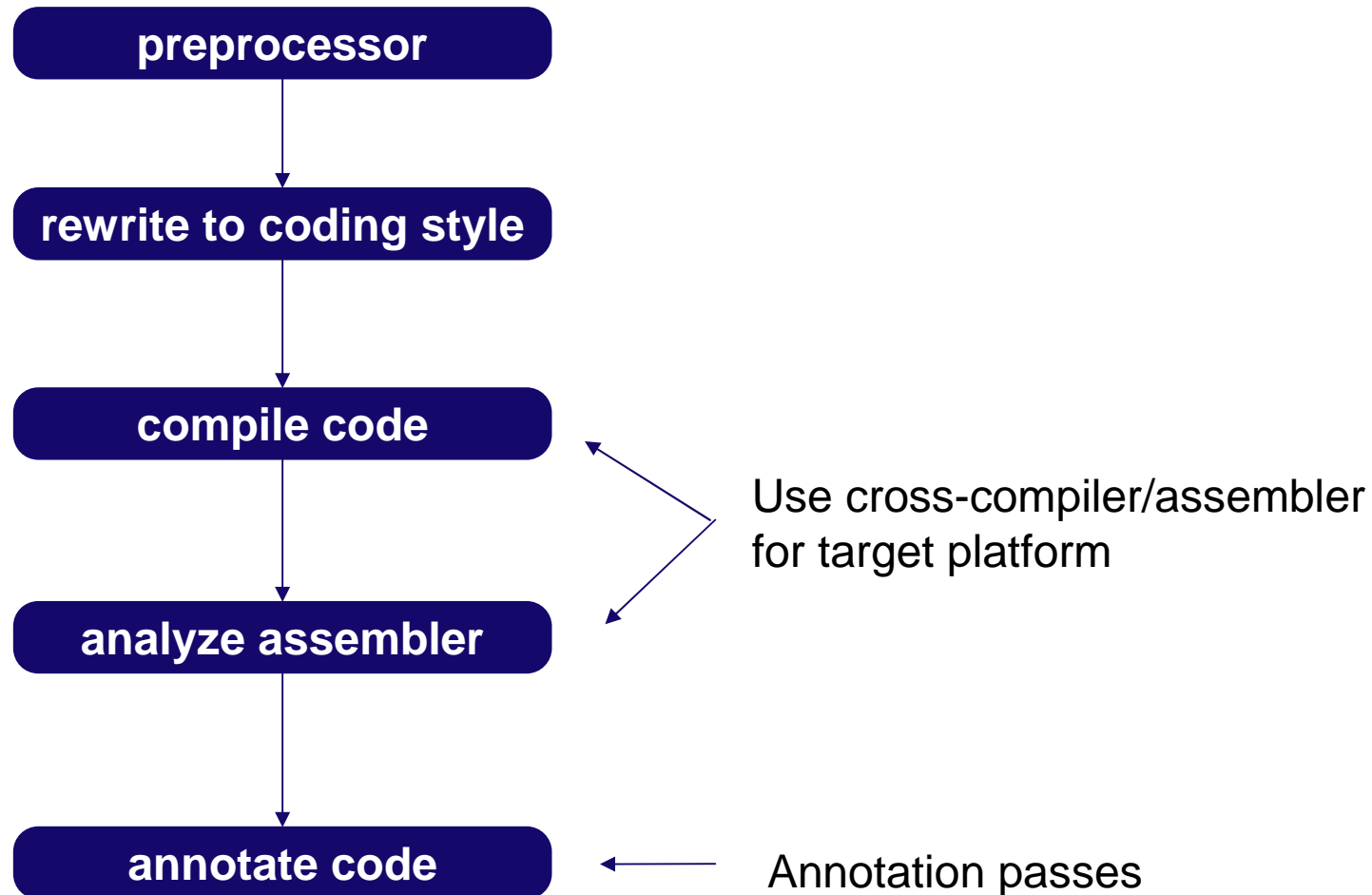
Department of Electrical Engineering
Electronic Systems



2 CTAP



3 CTAP overview



4 How does the rewriting work?

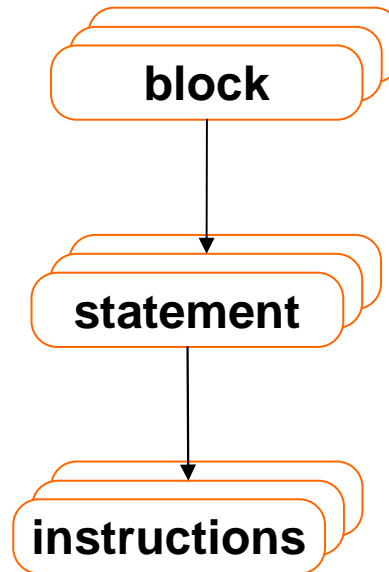
The rewrite module converts arbitrary C code to a coding style which allows analysis and simpler parsing in the next steps.

Coding style

- Each line contains exactly zero or one statements.
- Left brace (if present) is on the same line as the statement it belongs to. Exception is the left brace of a function declaration, which is on a separate line.
- Right brace (if present) is on a separate line. Exception is a right brace with a do..while statement, the brace is then put on the same line as the while.
- Each (variable/control) scope start and end is explicitly indicated with braces.

5 Annotation passes

- Implemented passes
 - Duration
 - Stack size
 - Instruction type
- Data structure



- insertStatement()
- getInstructions()

6 How is the duration determined?

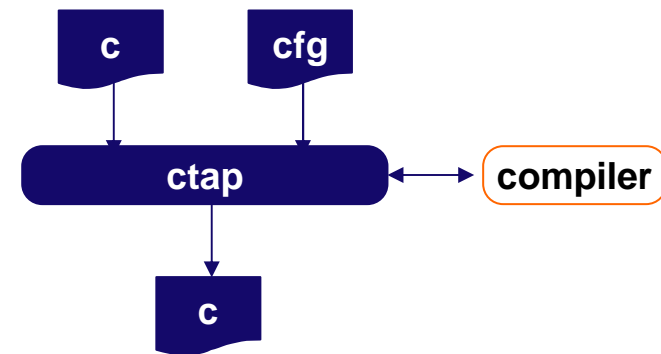
- Compile the source code for the platform the task will be mapped onto.
- Relate each assembler instruction to a statement in the source code.
- The execution time is considered to be equal to the number of assembler instructions it is translated into (default).
- Mapping between duration and assembler instructions.

7 Example: source code

```
int foo(int a, int b)
{
    int x, c;

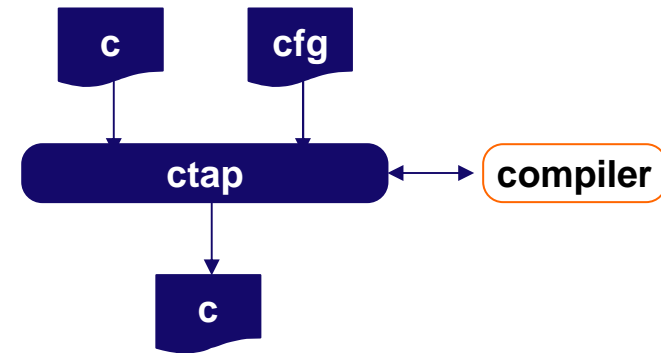
    for (x = 0; x < 8; x++) {
        if (a == 1)
            c += b;
        else
            c -= b;
    }

    return c;
}
```



8 Example: configuration

```
<ctap>
<files>
  <file name='example.c'/>
</files>
<arch name='arm7tdmi'>
  <settings>
    <compiler cmd='gcc-arm'/>
    <objdump cmd='objdump-arm'/>
  </settings>
  <instructions>
    <instruction mnemonics='add' duration='2'/>
  </instructions>
  <types>
    <type name='arth'>add;sub;mul</type>
  </types>
</arch>
</ctap>
```



9 Example: relating assembler to source code

/home/sander/tmp/wcet/example.c:2

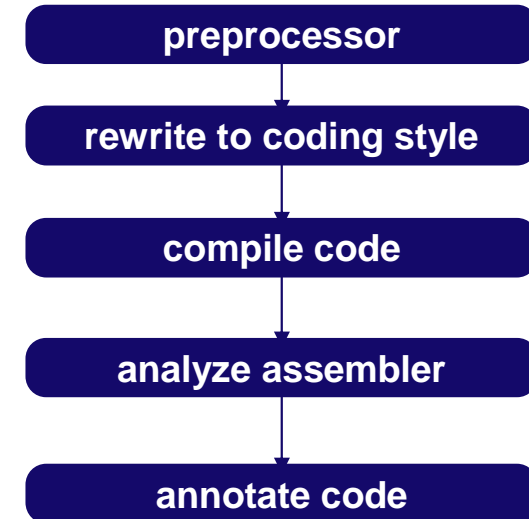
```
0:  push  %ebp
1:  mov   %esp,%ebp
3:  push  %ebx
4:  mov   0x8(%ebp),%ebx
7:  mov   0xc(%ebp),%edx
```

/home/sander/tmp/wcet/example.c:6

```
a:  mov   $0x7,%ecx
f:  nop
```

/home/sander/tmp/wcet/example.c:7

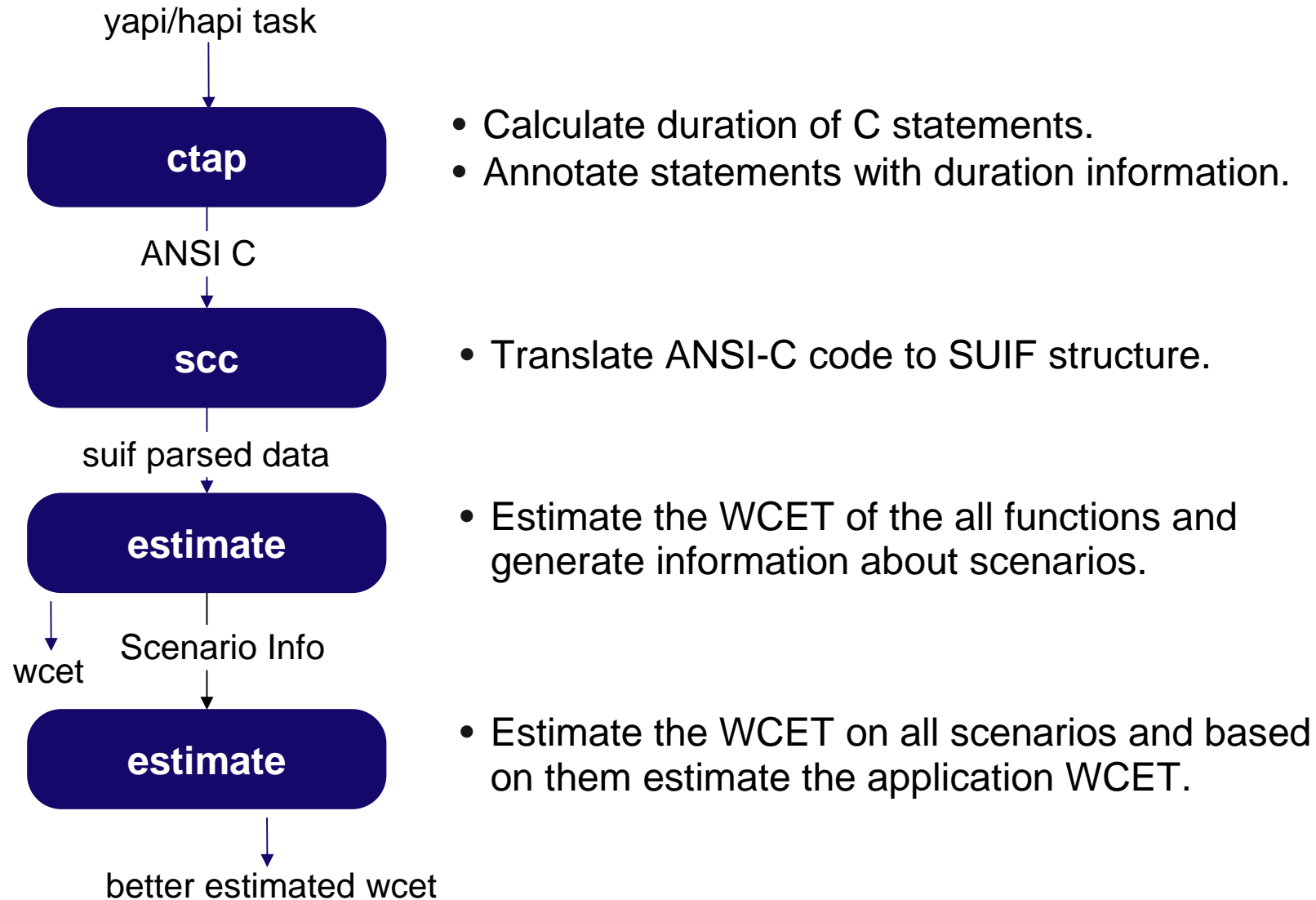
```
10:  cmp   $0x1,%ebx
13:  jne   20 <foo(int, int)+0x20>
```



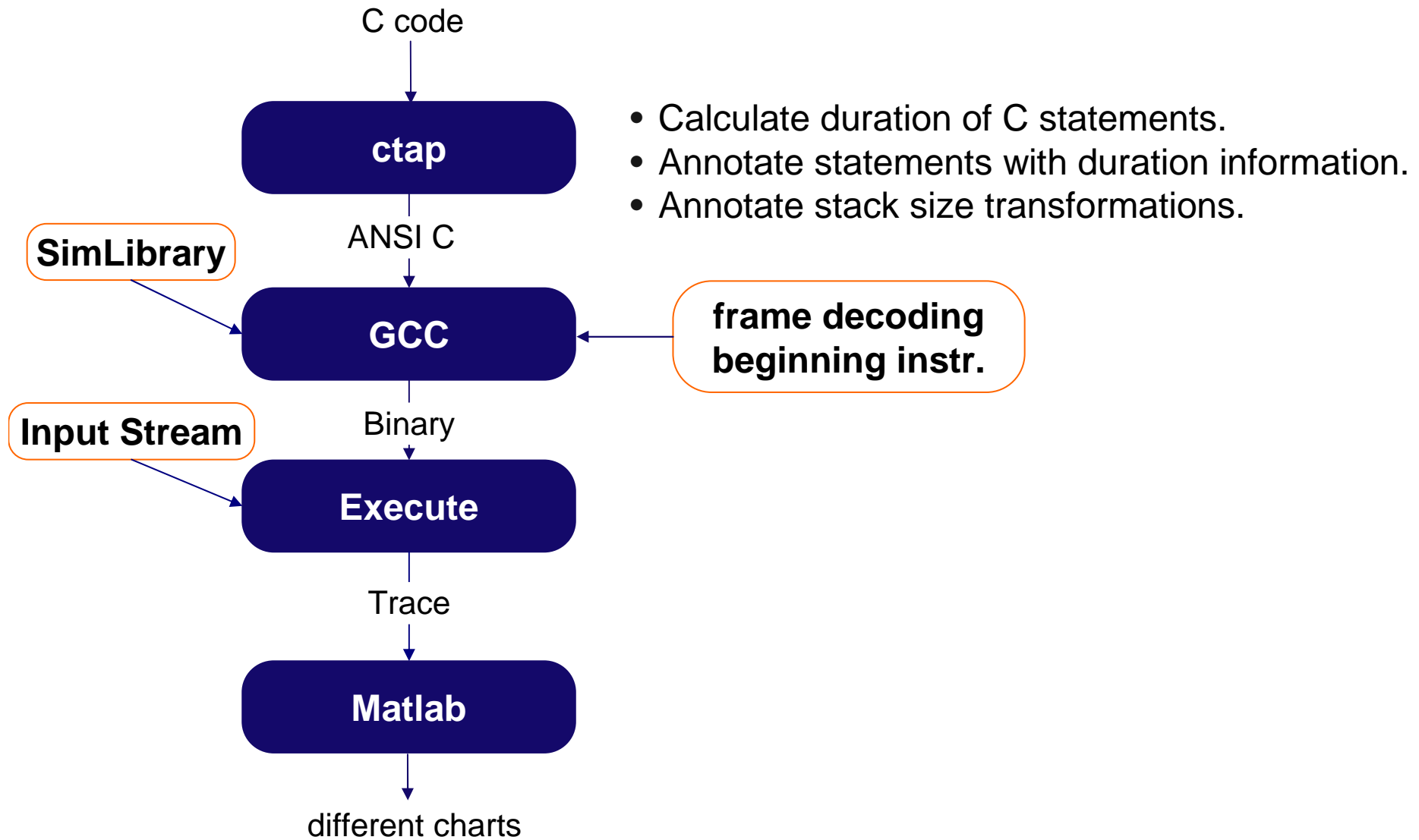
10 Example: annotated code

```
int foo (int a, int b) {  
    duration(5);  
    int x, c;  
  
    duration(2); ←———— initial test  
    for (x = 0; x < 8; x++) {  
        duration(2); ←———— loop repetition  
        duration(2);  
        if (a == 1) {  
            duration(3);  
            c += b;  
        }  
        else {  
            duration(1);  
            c -= b;  
        }  
    }  
    duration(2);  
    return c;  
}
```

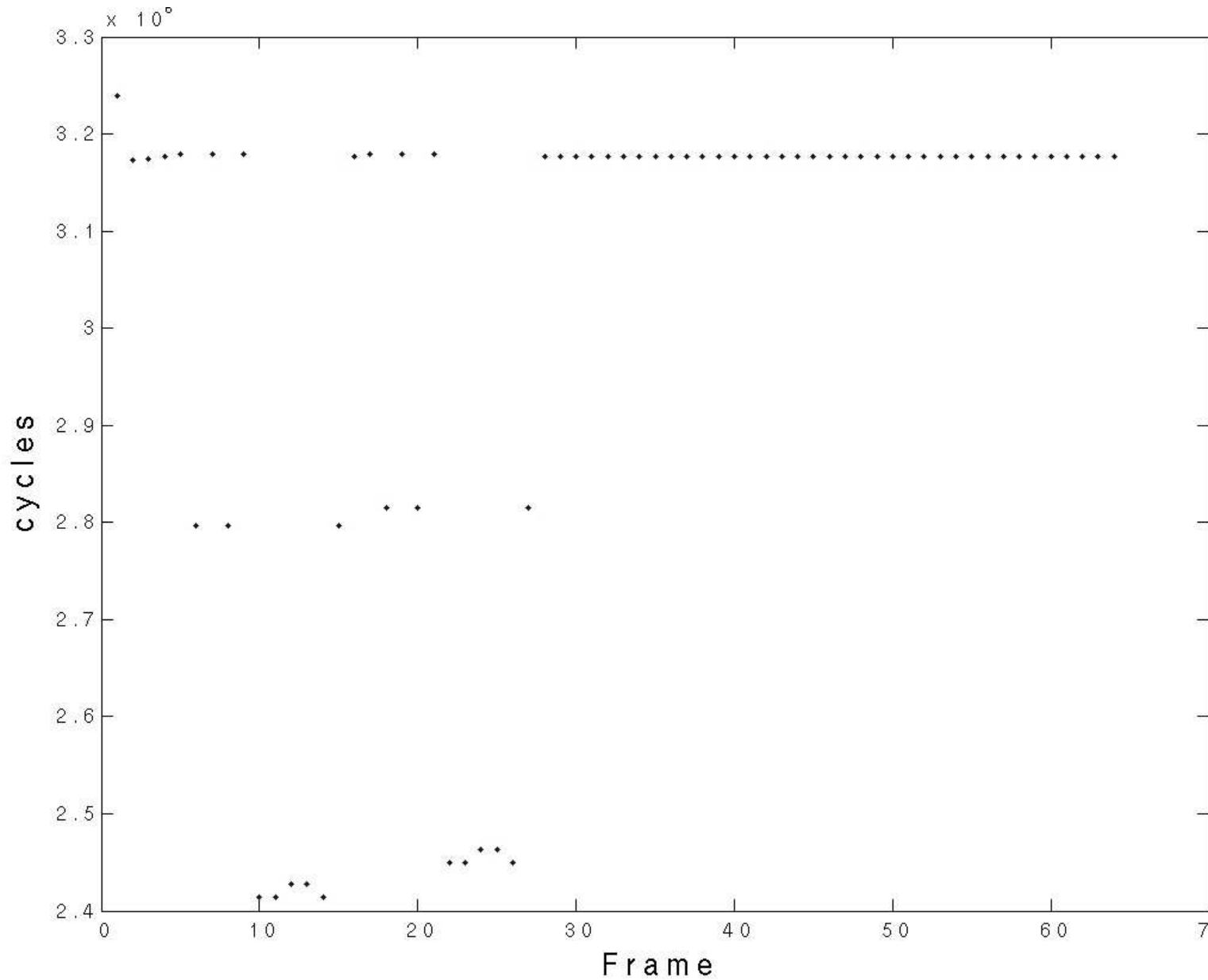
11 Application: WCET estimation



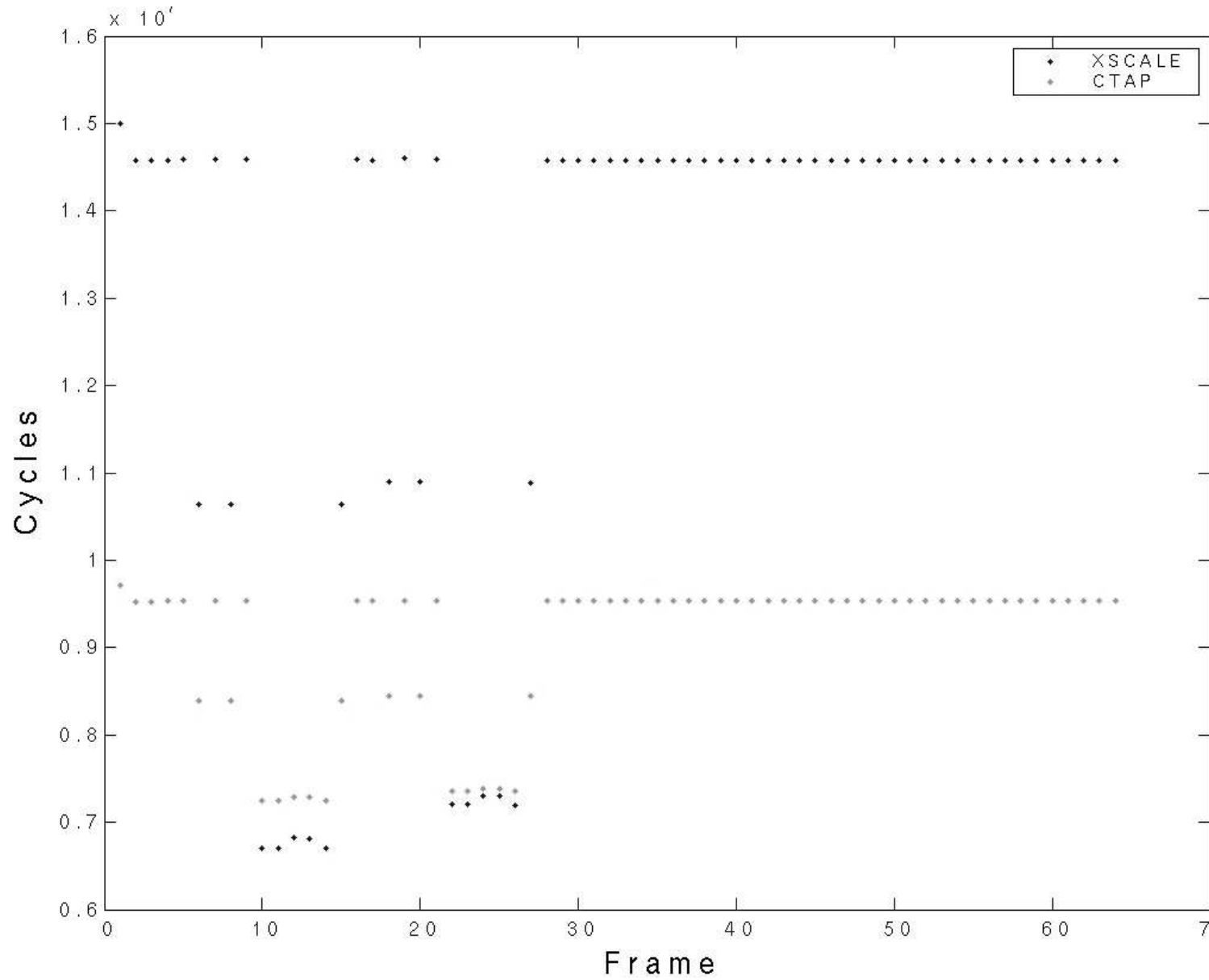
12 Application: High Level Simulation (I)



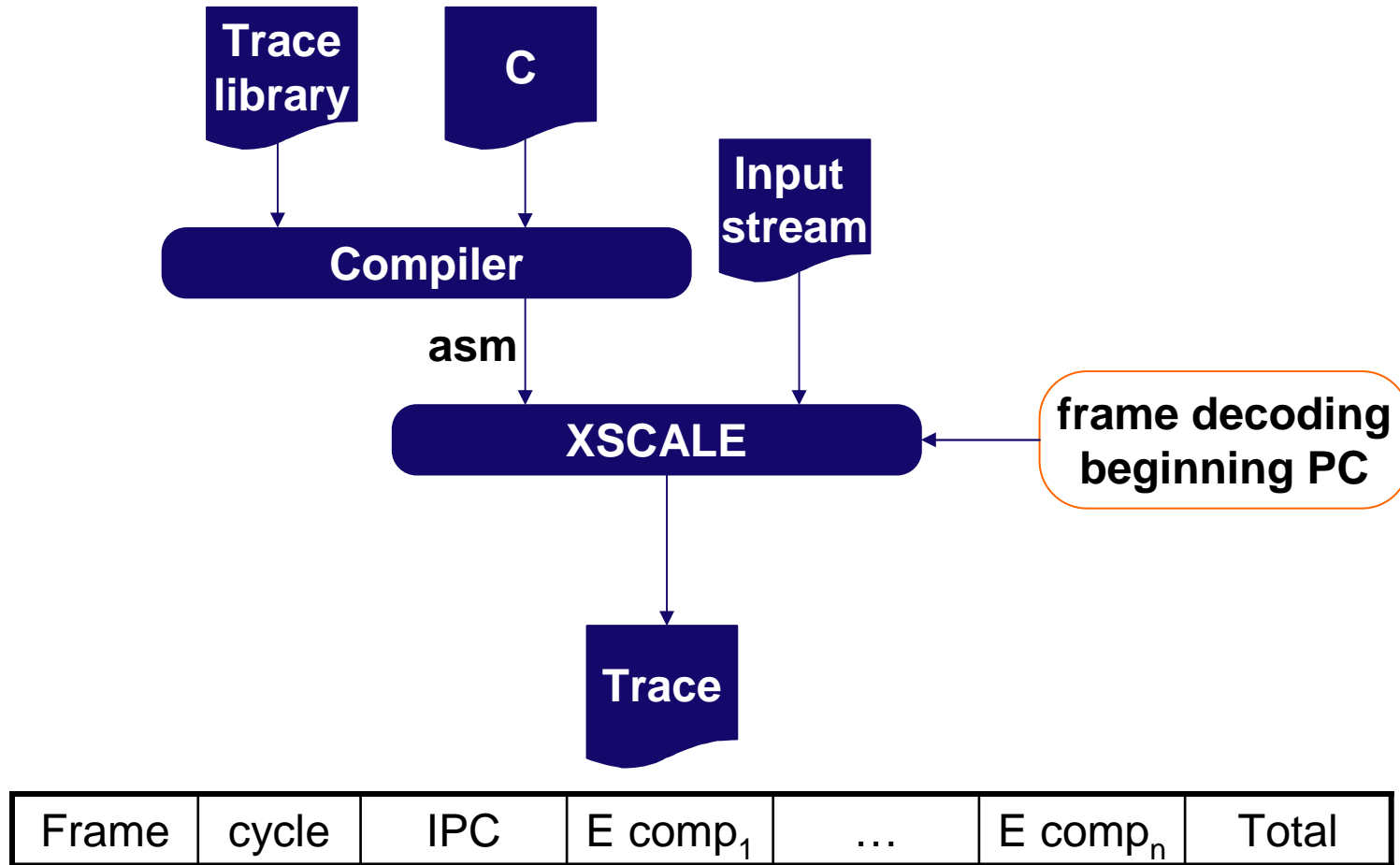
13 Application: High Level Simulation (II)



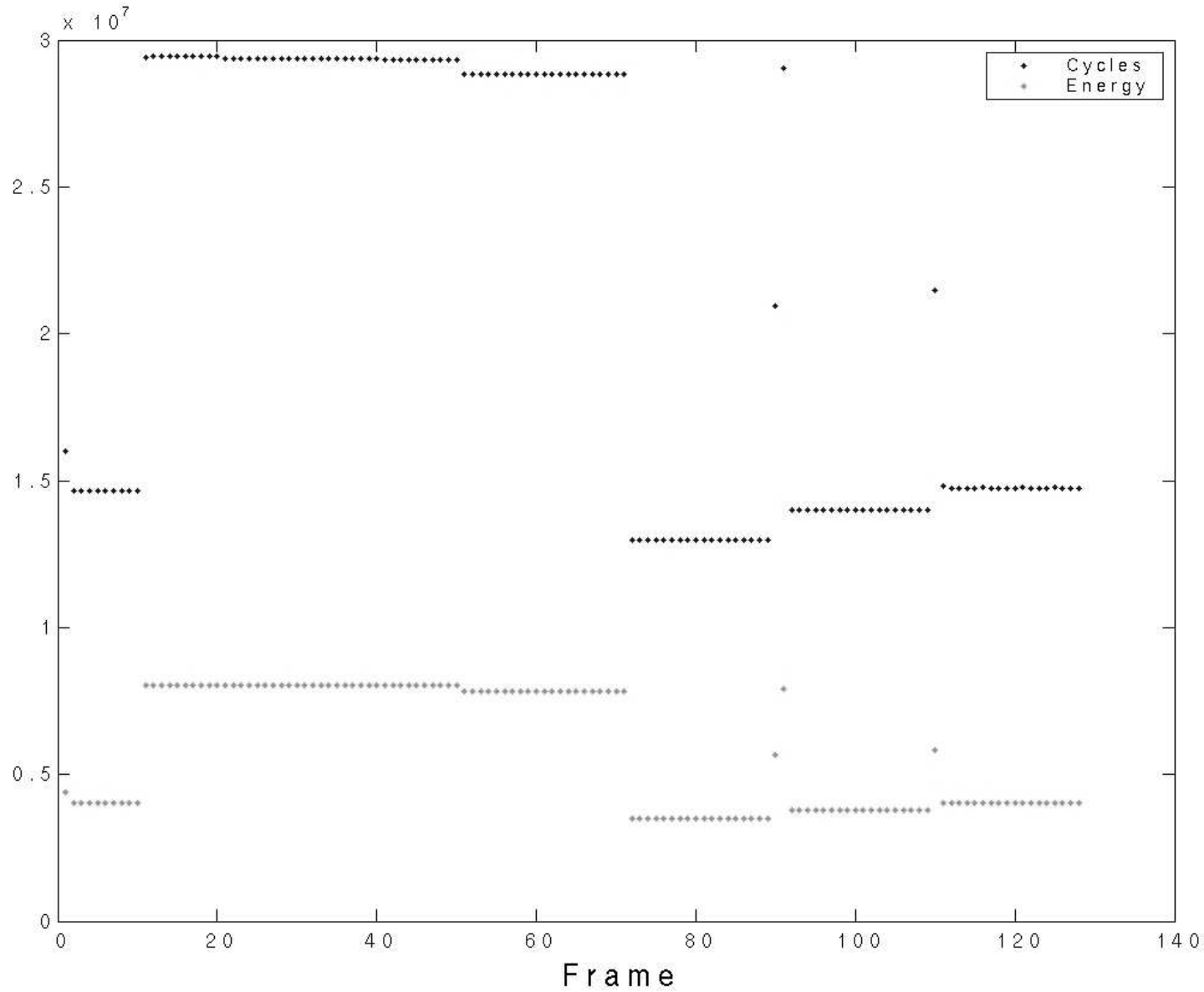
14 XSCALE vs. CTAP



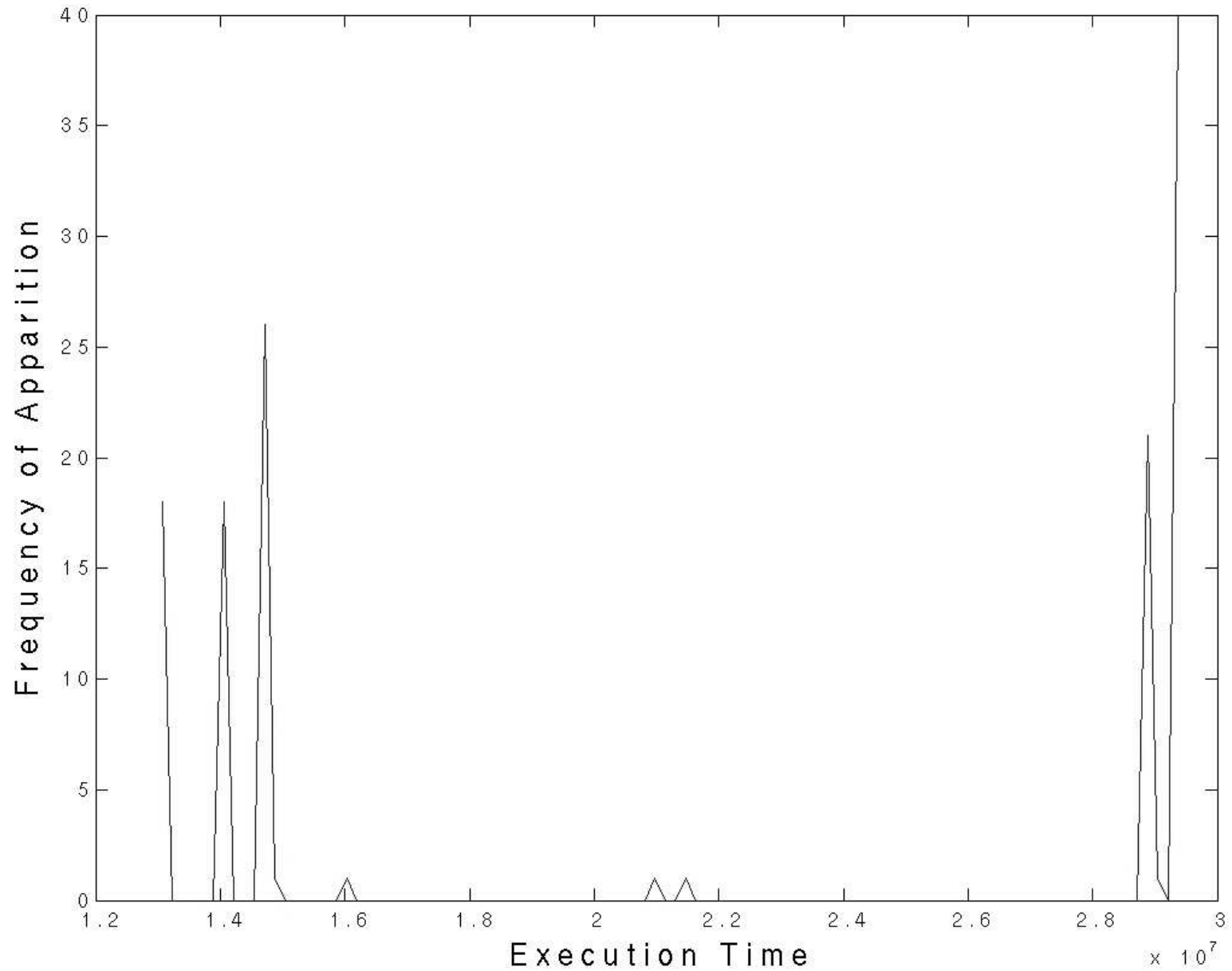
15 Scenarios Detection (I)



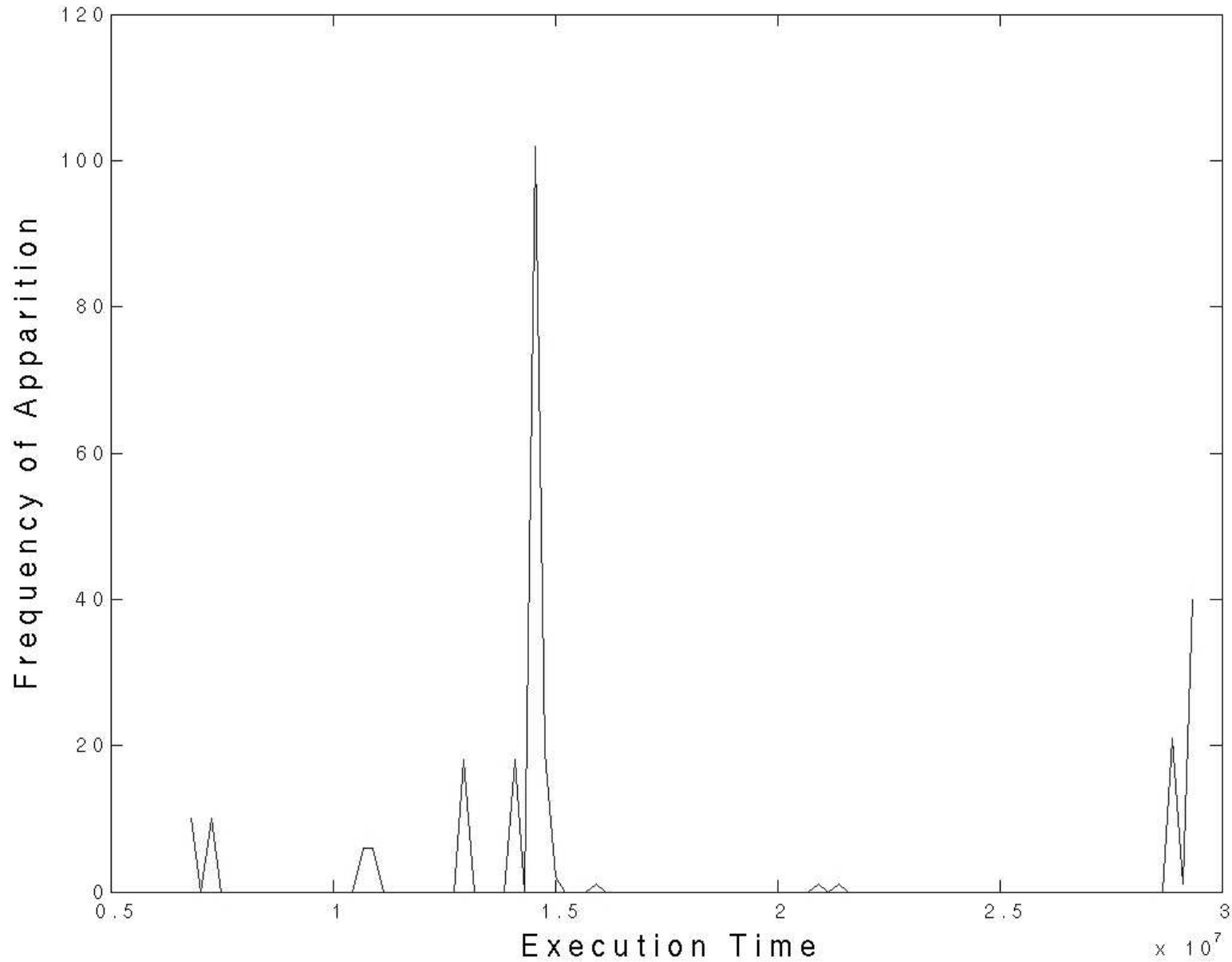
16 MP3 Simulation: he_mode sample (I)



17 MP3 Simulation: he_mode sample (II)



18 MP3 Simulation: multiple samples



19 Scenarios Detection (II)

