Stack Usage Example

ECE2036

September 4, 2012

Stack Usage Example

```
1         void Sub2(int k)                    Stack Memory
2             {
3               k = 4;
4             }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10            }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()
23            {
24  PC →        Sub0(1, 2);
25            }                                   SP →
```

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```
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2             {
3               k = 4;
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5
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8               int k1 = 5;
9               Sub2(k1);
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11
12          void Sub0(int i,int j)
13            {
14  PC →        int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()                          SP →
23            {                                       Addr of Line 25
24              Sub0(1, 2);                           Sub0::i = 1
25            }                                       Sub0::j = 2
```

Stack Usage Example

```
1         void Sub2(int k)
2             {
3               k = 4;
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12          void Sub0(int i,int j)
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14              int d[4];
15  PC →        int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

```
SP →
        Sub0::d[0] = ?
        Sub0::d[1] = ?
        Sub0::d[2] = ?
        Sub0::d[3] = ?
        Addr of Line 25
        Sub0::i = 1
        Sub0::j = 2
```

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1         void Sub2(int k)
2             {
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16    PC →      char ch[]="Test";
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21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

```
SP →
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
        Sub0::d[2] = ?
        Sub0::d[3] = ?
        Addr of Line 25
        Sub0::i = 1
        Sub0::j = 2
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14              int d[4];
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17    PC →      Sub1(i);
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19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
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Stack Memory

```
SP →
        Sub0::ch[0] = 'T'
        Sub0::ch[1] = 'e'
        Sub0::ch[2] = 's'
        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
        Sub0::d[2] = ?
        Sub0::d[3] = ?
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        Sub0::i = 1
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Stack Memory

```
SP →
        Addr of Line 18
        Sub1::j = 1
        Sub0::ch[0] = 'T'
        Sub0::ch[1] = 'e'
        Sub0::ch[2] = 's'
        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
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        Addr of Line 25
        Sub0::i = 1
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Stack Memory

```
SP →
        Sub1::k1 = 5
        Addr of Line 18
        Sub1::j = 1
        Sub0::ch[0] = 'T'
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        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
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Stack Usage Example

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13           {
14             int d[4];
15             int x;
16             char ch[]="Test";
17             Sub1(i);
18             Sub2(j);
19           }
21
22         int main()
23           {
24             Sub0(1, 2);
25           }
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```
Stack Memory

SP →
        Addr of Line 10
        Sub2::k = 5
        Sub1::k1 = 5
        Addr of Line 18
        Sub1::j = 1
        Sub0::ch[0] = 'T'
        Sub0::ch[1] = 'e'
        Sub0::ch[2] = 's'
        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
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```
Stack Memory

SP →
        Addr of Line 10
        Sub2::k = 4
        Sub1::k1 = 5
        Addr of Line 18
        Sub1::j = 1
        Sub0::ch[0] = 'T'
        Sub0::ch[1] = 'e'
        Sub0::ch[2] = 's'
        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
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12         void Sub0(int i,int j)
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14             int d[4];
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21
22         int main()
23           {
24             Sub0(1, 2);
25           }
```

Stack Memory

```
SP →
        Sub1::k1 = 5
        Addr of Line 18
        Sub1::j = 1
        Sub0::ch[0] = 'T'
        Sub0::ch[1] = 'e'
        Sub0::ch[2] = 's'
        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
        Sub0::d[2] = ?
        Sub0::d[3] = ?
        Addr of Line 25
        Sub0::i = 1
        Sub0::j = 2
```

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6         void Sub1(int j)
7             {
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9               Sub2(k1);
10            }
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12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18    PC →      Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

```
SP →
        Sub0::ch[0] = 'T'
        Sub0::ch[1] = 'e'
        Sub0::ch[2] = 's'
        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
        Sub0::d[2] = ?
        Sub0::d[3] = ?
        Addr of Line 25
        Sub0::i = 1
        Sub0::j = 2
```

Stack Usage Example

```
1         void Sub2(int k)
2             {
3   PC →        k = 4;
4             }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
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11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

SP →

```
Addr of Line 19
Sub2::k = 2
Sub0::ch[0] = 'T'
Sub0::ch[1] = 'e'
Sub0::ch[2] = 's'
Sub0::ch[3] = 't'
Sub0::ch[4] = 0
Sub0::x = ?
Sub0::d[0] = ?
Sub0::d[1] = ?
Sub0::d[2] = ?
Sub0::d[3] = ?
Addr of Line 25
Sub0::i = 1
Sub0::j = 2
```

Stack Usage Example

```
1         void Sub2(int k)
2            {
3              k = 4;
4   PC →     }
5
6         void Sub1(int j)
7            {
8              int k1 = 5;
9              Sub2(k1);
10           }
11
12         void Sub0(int i,int j)
13           {
14             int d[4];
15             int x;
16             char ch[]="Test";
17             Sub1(i);
18             Sub2(j);
19           }
21
22         int main()
23           {
24             Sub0(1, 2);
25           }
```

Stack Memory

```
SP →
        Addr of Line 19
        Sub2::k = 4
        Sub0::ch[0] = 'T'
        Sub0::ch[1] = 'e'
        Sub0::ch[2] = 's'
        Sub0::ch[3] = 't'
        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
        Sub0::d[2] = ?
        Sub0::d[3] = ?
        Addr of Line 25
        Sub0::i = 1
        Sub0::j = 2
```

Stack Usage Example

```
1         void Sub2(int k)
2             {
3               k = 4;
4             }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10            }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19    PC →    }
21
22          int main()
23            {
24              Sub0(1, 2);
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Stack Memory

```
SP →
        Sub0::ch[0] = 'T'
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        Sub0::ch[4] = 0
        Sub0::x = ?
        Sub0::d[0] = ?
        Sub0::d[1] = ?
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        Sub0::d[3] = ?
        Addr of Line 25
        Sub0::i = 1
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```

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```
1         void Sub2(int k)                    Stack Memory
2            {
3              k = 4;
4            }
5
6         void Sub1(int j)
7            {
8              int k1 = 5;
9              Sub2(k1);
10           }
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12         void Sub0(int i,int j)
13           {
14             int d[4];
15             int x;
16             char ch[]="Test";
17             Sub1(i);
18             Sub2(j);
19           }
21
22         int main()
23           {
24             Sub0(1, 2);
25   PC →    }                                  SP →
```

Stack Usage Example (more realistic)

```
      void Sub2(int k)
         {
           k = 4;
         }

      void Sub1(int j)
         {
           int k1 = 5;
           Sub2(k1);
          }

       void Sub0(int i,int j)
          {
            int d[4];
            int x;
            char ch[]="Test";
            Sub1(i);
            Sub2(j);
          }

       int main()
          {
PC →        Sub0(1, 2);
          }
```

```
Stack Memory

      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
      ?
SP →  ?
```

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```
1          void Sub2(int k)
2              {
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22           int main()
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24               Sub0(1, 2);
25             }
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Stack Memory

```
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
SP →    ?
        Addr of Line 25
        Sub0::i = 1
        Sub0::j = 2
```

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```
1         void Sub2(int k)
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Stack Memory

```
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
          ?
SP →      ?
Sub0::d[0] = ?
Sub0::d[1] = ?
Sub0::d[2] = ?
Sub0::d[3] = ?
Addr of Line 25
Sub0::i = 1
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Stack Memory

```
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
        ?
SP →    ?
Sub0::x = ?
Sub0::d[0] = ?
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```
Stack Memory

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                ?
                ?
                ?
                ?
                ?
                ?
SP →            ?
                Sub0::ch[0] = 'T'
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Stack Memory

```
                ?
                ?
                ?
                ?
                ?
SP →            ?
                Addr of Line 18
                Sub1::j = 1
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Stack Memory

```
        ?
        ?
        ?
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SP →    ?
        Sub1::k1 = 5
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Stack Memory

```
                ?
                ?
SP →            ?
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                Sub2::k = 5
                Sub1::k1 = 5
                Addr of Line 18
                Sub1::j = 1
                Sub0::ch[0] = 'T'
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Stack Memory

```
          ?
          ?
SP →      ?
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          Sub1::k1 = 5
          Addr of Line 18
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6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10  PC →      }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

```
Stack Memory

                ?
                ?
                ?
                Addr of Line 10
SP →            Sub2::k = 4
                Sub1::k1 = 5
                Addr of Line 18
                Sub1::j = 1
                Sub0::ch[0] = 'T'
                Sub0::ch[1] = 'e'
                Sub0::ch[2] = 's'
                Sub0::ch[3] = 't'
                Sub0::ch[4] = 0
                Sub0::x = ?
                Sub0::d[0] = ?
                Sub0::d[1] = ?
                Sub0::d[2] = ?
                Sub0::d[3] = ?
                Addr of Line 25
                Sub0::i = 1
                Sub0::j = 2
```

Stack Usage Example (more realistic)

```
1         void Sub2(int k)
2             {
3               k = 4;
4             }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10            }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18  PC →        Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

```
                ?
                ?
                ?
                Addr of Line 10
                Sub2::k = 4
                Sub1::k1 = 5
                Addr of Line 18
SP →            Sub1::j = 1
                Sub0::ch[0] = 'T'
                Sub0::ch[1] = 'e'
                Sub0::ch[2] = 's'
                Sub0::ch[3] = 't'
                Sub0::ch[4] = 0
                Sub0::x = ?
                Sub0::d[0] = ?
                Sub0::d[1] = ?
                Sub0::d[2] = ?
                Sub0::d[3] = ?
                Addr of Line 25
                Sub0::i = 1
                Sub0::j = 2
```

Stack Usage Example (more realistic)

```
1         void Sub2(int k)
2             {
3   PC →        k = 4;
4             }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10            }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

```
                ?
                ?
                ?
                Addr of Line 10
                Sub2::k = 4
SP →            Sub1::k1 = 5
                Addr of Line 19
                Sub2::k = 2
                Sub0::ch[0] = 'T'
                Sub0::ch[1] = 'e'
                Sub0::ch[2] = 's'
                Sub0::ch[3] = 't'
                Sub0::ch[4] = 0
                Sub0::x = ?
                Sub0::d[0] = ?
                Sub0::d[1] = ?
                Sub0::d[2] = ?
                Sub0::d[3] = ?
                Addr of Line 25
                Sub0::i = 1
                Sub0::j = 2
```

Stack Usage Example (more realistic)

```
1         void Sub2(int k)
2             {
3               k = 4;
4   PC →      }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10            }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

```
                ?
                ?
                ?
                Addr of Line 10
                Sub2::k = 4
SP →            Sub1::k1 = 5
                Addr of Line 19
                Sub2::k = 4
                Sub0::ch[0] = 'T'
                Sub0::ch[1] = 'e'
                Sub0::ch[2] = 's'
                Sub0::ch[3] = 't'
                Sub0::ch[4] = 0
                Sub0::x = ?
                Sub0::d[0] = ?
                Sub0::d[1] = ?
                Sub0::d[2] = ?
                Sub0::d[3] = ?
                Addr of Line 25
                Sub0::i = 1
                Sub0::j = 2
```

Stack Usage Example (more realistic)

```
1         void Sub2(int k)
2             {
3               k = 4;
4             }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10            }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19  PC →      }
21
22          int main()
23            {
24              Sub0(1, 2);
25            }
```

Stack Memory

```
                ?
                ?
                ?
                Addr of Line 10
                Sub2::k = 4
                Sub1::k1 = 5
                Addr of Line 19
SP →            Sub2::k = 4
                Sub0::ch[0] = 'T'
                Sub0::ch[1] = 'e'
                Sub0::ch[2] = 's'
                Sub0::ch[3] = 't'
                Sub0::ch[4] = 0
                Sub0::x = ?
                Sub0::d[0] = ?
                Sub0::d[1] = ?
                Sub0::d[2] = ?
                Sub0::d[3] = ?
                Addr of Line 25
                Sub0::i = 1
                Sub0::j = 2
```

Stack Usage Example (more realistic)

```
1         void Sub2(int k)
2             {
3               k = 4;
4             }
5
6         void Sub1(int j)
7             {
8               int k1 = 5;
9               Sub2(k1);
10            }
11
12          void Sub0(int i,int j)
13            {
14              int d[4];
15              int x;
16              char ch[]="Test";
17              Sub1(i);
18              Sub2(j);
19            }
21
22          int main()
23            {
24              Sub0(1, 2);
25  PC →      }
```

Stack Memory

```
                ?
                ?
                ?
                Addr of Line 10
                Sub2::k = 4
                Sub1::k1 = 5
                Addr of Line 19
                Sub2::k = 4
                Sub0::ch[0] = 'T'
                Sub0::ch[1] = 'e'
                Sub0::ch[2] = 's'
                Sub0::ch[3] = 't'
                Sub0::ch[4] = 0
                Sub0::x = ?
                Sub0::d[0] = ?
                Sub0::d[1] = ?
                Sub0::d[2] = ?
                Sub0::d[3] = ?
                Addr of Line 25
                Sub0::i = 1
SP →            Sub0::j = 2
```