

Main Core (High-level)

Main Core (Assembly)

Monitoring Core

```
1: int *x = malloc(4*sizeof(int));
```

```
1: call malloc  
   ; return pointer 0x12340000 in r1
```

```
1: rf_metadata[1] = {r1, r1 + 0xf}  
   // {base, bounds} of array
```

```
2: int *y = x + 2;
```

```
2: add r2, r1, #8
```

```
2: rf_metadata[2] = rf_metadata[1]
```

```
3: x[3] = 1;
```

```
3a: mov r3, #1
```

```
3a: rf_metadata[3] = NULL
```

```
3b: str r3, [r1, #12]  
    ; store to 0x1234000c
```

```
3b: if (r1 + 12 < base(rf_metadata[1]) ||  
      r1 + 12 > bound(rf_metadata[1])) {  
    // raise error  
}  
    mem_metadata[r1 + 12] = rf_metadata[3];
```

```
4: y[3] = 1;
```

```
4: str r3, [r2, #12]  
    ; store to 0x12340014
```

```
4: if (r2 + 12 < base(rf_metadata[2]) ||  
      r2 + 12 > bound(rf_metadata[2])) {  
    // raise error  
}  
    mem_metadata[r2 + 12] = rf_metadata[3];
```