



CAMA

Cache-Aware Memory Allocation for WCET Analysis

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Current Situation

- WCET analyses strive for safe and precise bounds on execution times of programs
- Such analyses need to derive bounds on cache behavior
- Challenges:

```
...  
x = malloc(8);  
y = malloc(4);  
...  
x->data = y->data + 2;  
...
```

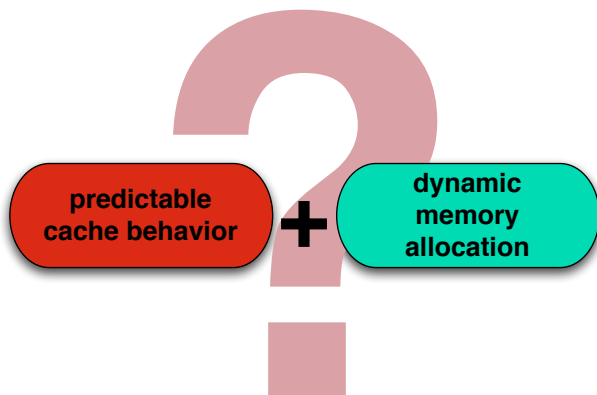
2 Is the access to *y* a cache hit?

(a) allocation to cache sets unknown!

1 How long will malloc take?

(b) effects of calls to malloc on cache?

Self-Evident Question



A Possible Solution?

Step 1



Replace the memory allocator by a predictable one that

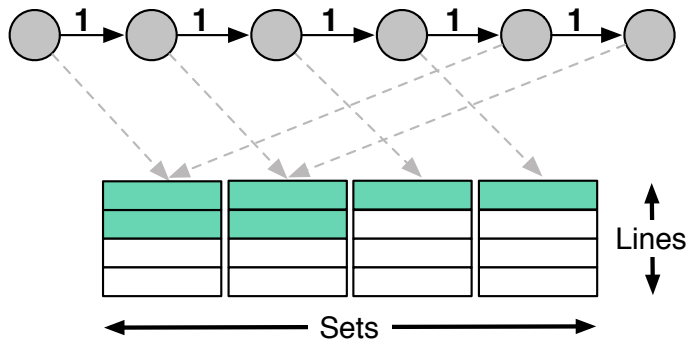
- can explicitly allocate to a given cache set
... by adding new argument: `malloc(size, cache set)`
- causes minor, predictable cache pollution
... by using a segregated-lists allocator
- has constant execution times
... by using a segregated-lists allocator



A Possible Solution?

Step 2

Compute shapes of data structures and their mapping to cache sets;
e.g.:



- at most 2 lines per cache set affected by list traversal
- bounded information loss about the cache
- able to infer cache hits on further traversals

Thanks!



Thank you!