

15-410

“...Should we “crash”?...”

Errors
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Dave Eckhardt

Dave O'Hallaron

Outline

Three kinds of error

Important to classify & react appropriately

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- ?
- ?
- ?

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Three kinds of error

- Hmm...
- That's not right...
- Uh-oh...

Important to classify & react appropriately

“New Player” - Take 1

```
// Improve memory locality:  
// store players in array; use index, not ptr  
struct player players[MAX];  
int new_player(int team, int num)  
{  
    int i;  
    if ((i = emptyslot()) == -1) {  
        /* OH NO!!! */  
        MAGIC_BREAK;  
    }  
    ...  
}
```

“New Player” - Take 2

```
// Improve memory locality:
// store players in array; use index, not ptr
struct player players[MAX];
int new_player(int team, int num)
{
    int i;
    if ((i = emptyslot()) == -1) {
        /* OH NO!!! */
        while(1)
            continue;
    }
    ...
}
```

What's Going On?

“Out of table slots” - what kind of thing?

- Should really never happen?
- Might happen sometimes?
- Likely to happen once a day?

What's Going On?

“Out of table slots” - what kind of thing?

- **Should really never happen?**
- **Might happen sometimes?**
- **Likely to happen once a day?**
 - **Remember: users always want 110%!**

What's Going On?

“Out of table slots” - what kind of thing?

- Should really never happen?
- Might happen sometimes?
- Likely to happen once a day?
 - Remember: users always want 110%!

What to do?

- *Resolve* reasonable issues when possible
 - How to resolve this one?

“New Player” - Take 3

```
struct player *players;
int playerslots;
int new_player(int team, int num)
{
    int i;
    if ((i = emptyslot()) == -1) {
        if ((i = grow_table_and_alloc()) == -1)
            /* OH NO!!! */
            while(1)
                continue;
    }
    ...
}
```

What's Going On?

“Out of heap space” - what kind of thing?

- Should really never happen?
- Might happen sometimes?
- Likely to happen once a day?

What's Going On?

“Out of heap space” - what kind of thing?

- Should really never happen?
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- Likely to happen once a day?

My suggestion

- “Might happen sometimes”

What to do?

- Hard to say what the right thing is for all clients
 - Is it fatal or not?
- Often: pass the buck

“New Player” - Take 4

```
struct player *players;
int playerslots;
int new_player(int team, int num)
{
    int i;
    if ((i = emptyslot()) == -1) {
        if ((i = grow_table_and_alloc()) == -1)
            return (-1);
    }
    ...
}
```

“Free Player” - Take 1

```
void free_player(int slot)
{
    assert((slot >= 0)&&(slot < total_slots));
    struct player *p = &players[slot];
    switch(p->role) {
    case CONTENDER:
        free(p->cstate); break;
    case REFEREE:
        free(p->refstate); break;
    }
    free(p->generic);
    mark_slot_available(slot);
}
```

What's Wrong?

There is a sanity-check missing...

- Probably somebody will make a mistake eventually
- Let's catch it

“Free Player” - Take 2

```
void free_player(int slot)
{
    assert((slot >= 0)&&(slot < total_slots));
    struct player *p = &players[slot];
    switch(p->role) {
    case CONTENDER:
        free(p->cstate); break;
    case REFEREE:
        free(p->refstate); break;
    default: return;
    }
    free(p->generic);
    mark_slot_available(slot);
}
```


All Fixed?

All Fixed?

No!

- The program *has a bug*
 - Maybe the client is passing us stale player pointers
 - Maybe we are handing out invalid p->role values
- We happened to catch the bug this time
- We might not catch it every time!
 - Sometimes a stale player pointer might have a “valid” p->role

The program is *broken*

- Hiding the problem isn't our job
- Hiding the problem isn't even *defensible*

Should We “Crash”?

If the program is “broken”, should we “crash”?

- Often: yes
 - Dumping core allows debugger inspection of the problem
 - Throwing running program into a debugger is probably nicer

Two More Vital Questions

When trying to figure out what to do...

- If we got here, what must have happened?
- Now that we're here, what should happen next?

Not a universally applicable answer

- `return -1;`

Summary

Three kinds of error

- **Hmm...**
 - Try to *resolve*
- **That's not right...**
 - Try to *report*
- **Uh-oh...**
 - Try to *help the developer* find the problem faster