

File Edit View History Bookmarks Tools Help

Man on the Corner - 2007 x Telegram Web reveal.js


file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/

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ENTITY COMPONENT SYSTEMS AND ASCETIC PROGRAMMING

HOW DO THEY COMPARE?

Samuel A. Falvo II
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2022 Sep 24




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Man on the Corner - 2007 x Telegram Web reveal.js

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/1

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ASCETIC PROGRAMMING



A screenshot of a web browser window. The address bar shows a file path: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/2. The browser has several tabs open, including 'Man on the Corner - 2007', 'Telegram Web', and 'reveal.js'. The main content area is dark with white text. The text reads: 'Ascetic: Characterized by or suggesting the practice of severe *self-discipline* and abstention from all forms of *indulgence*.' There are navigation arrows in the bottom right corner.

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Man on the Corner - 2007 x Telegram Web x reveal.js x +

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/2

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Ascetic:
Characterized by or suggesting the practice of severe *self-discipline* and abstention from all forms of *indulgence*.

A screenshot of a web browser window, similar to the one above. The address bar shows the same file path but with a different slide number: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/3. The main content area is dark with white text. The text reads: 'Forth Demands Discipline. You are responsible for:' followed by a bulleted list: '• Pointer provenance.', '• Pointer validity.', '• Controlling access to shared resources.', and '• Type safety.' There are navigation arrows in the bottom right corner.

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Man on the Corner - 2007 x Telegram Web x reveal.js x +

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/3

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Forth Demands Discipline. You are responsible for:

- Pointer provenance.
- Pointer validity.
- Controlling access to shared resources.
- Type safety.

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Man on the Corner - 2007 x Telegram Web reveal.js

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/4

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Forth abstains from all indulgences.

- No resource management tools.
- Impossibility of validating pointers.
- No isolation between systems or processes.
- Arbitrary stack parity.

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Like It or Not - 2007 Rem x Telegram Web reveal.js

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/5

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In a nutshell:

- Use *discipline*
- to turn Forth's disadvantages into *competitive* advantages
- by exploiting the *lack of indulgences*.

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Like It or Not - 2007 Rem... x Telegram Web x reveal.js x +

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/6

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Ascetic Programming is/was

- first documented around 2010.
- an alternative to OOP for maintainable software.
- free of dependencies: no language extensions needed.
- used in two real-world programs: Unsuitable and Equilibrium.

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Second Home by the Sea... x Telegram Web x reveal.js x Process Name of Pop!_Sh... x +

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/8

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Entities

- are the *key concept* instead of objects.
- have *identity*, but **do not** have any *address*.

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Illegal Alien - 2007 Rema x Telegram Web x reveal.js x Process Name of Pop!_Sh x +

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/9

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Modules

- encapsulate state for entities.
- frequently map to cross-cutting *concepts*, not types.
- use relational concepts just about everywhere.
 - Replaces typing.
 - Replaces containment.
 - Replaces static *is-a* relationships.



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Illegal Alien - 2007 Rema x Telegram Web x reveal.js x Process Name of Pop!_Sh x +

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/10

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Examples from Equilibrium:

- dimensionable — all entities which have a concrete *size* (width and height).
- punctual — all entities which must do something at some point in the future.
- mobility — all entities which are capable of moving.
- visible — all entities which are visible on the screen.



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file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/11

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```
( Examples )
entity aSpark !           ( creates a new entity )
aSpark @ >R
  1 1 R@ sized           ( entity has a 1x1 pixel size )
  1 0 R@ mobile         ( and is slowly moving to the right )
  [' ] draw-proc R> visible ( entity is now visible )
```

See also [Equilibrium's code](#).



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Illegal Alien - 2007 Rema x Telegram Web reveal.js Process Name of Pop!_Sh x +

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/12

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Modules

- maintain their own storage privately.
- **never, ever** pass pointers into or out of the module without good reason.
- uses entity IDs as keys to index private state.
- expose declarative interfaces when possible. (Declarative, Imperative, then Inquisitive pattern.)

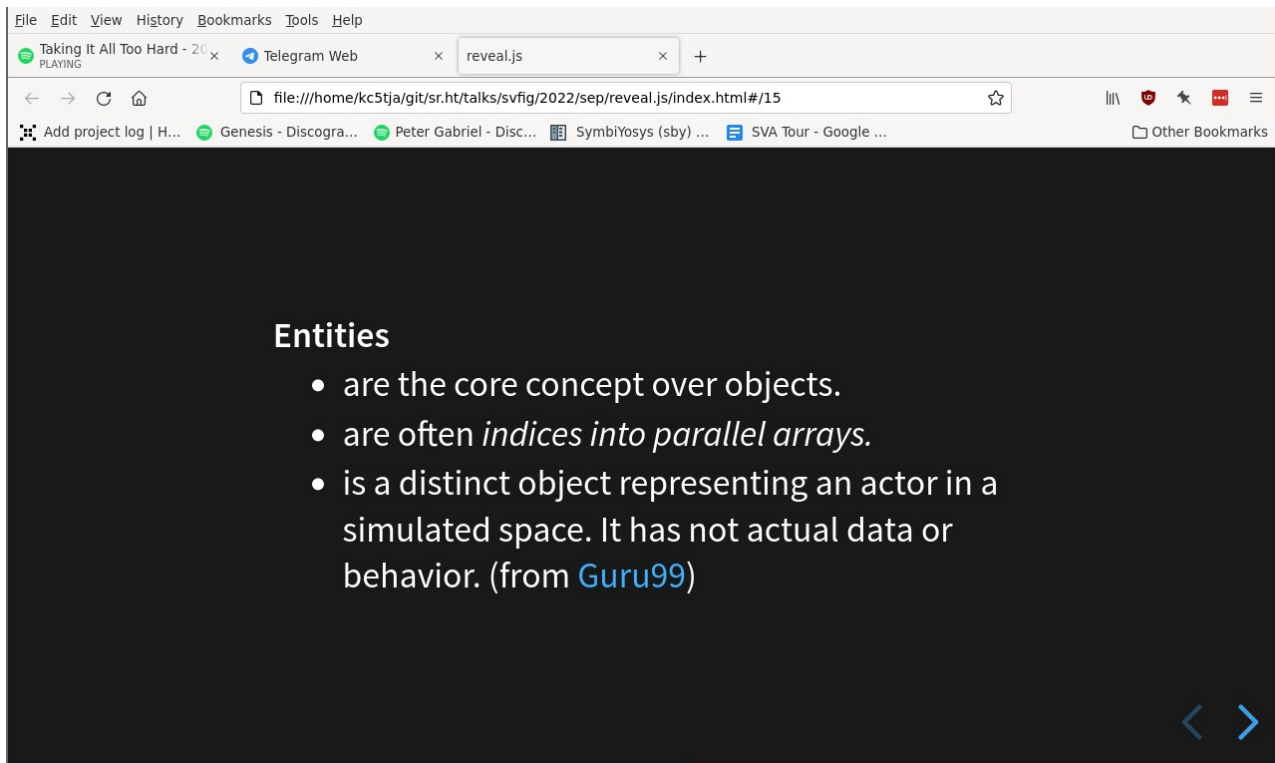


A screenshot of a web browser window. The address bar shows the file path: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/13. The browser tabs include 'Taking It All Too Hard - 20...', 'Telegram Web', and 'reveal.js'. The main content area is a dark slide with the title 'ENTITY COMPONENT SYSTEMS' in large, white, bold, sans-serif font. There are navigation arrows in the bottom right corner.

A screenshot of a web browser window, similar to the one above, but showing a different slide. The address bar shows the file path: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/14. The main content area is a dark slide with the title 'Entity component systems' in white, bold, sans-serif font. Below the title is a bulleted list of characteristics. There are navigation arrows in the bottom right corner.

Entity component systems

- are often associated with Data-Oriented Programming.
- intended to be orthogonal to OOP.
- has no dependencies: no language extensions needed.
- can be found in video/arcade games and Forth's own OKAD.



The screenshot shows a web browser window with the following details:

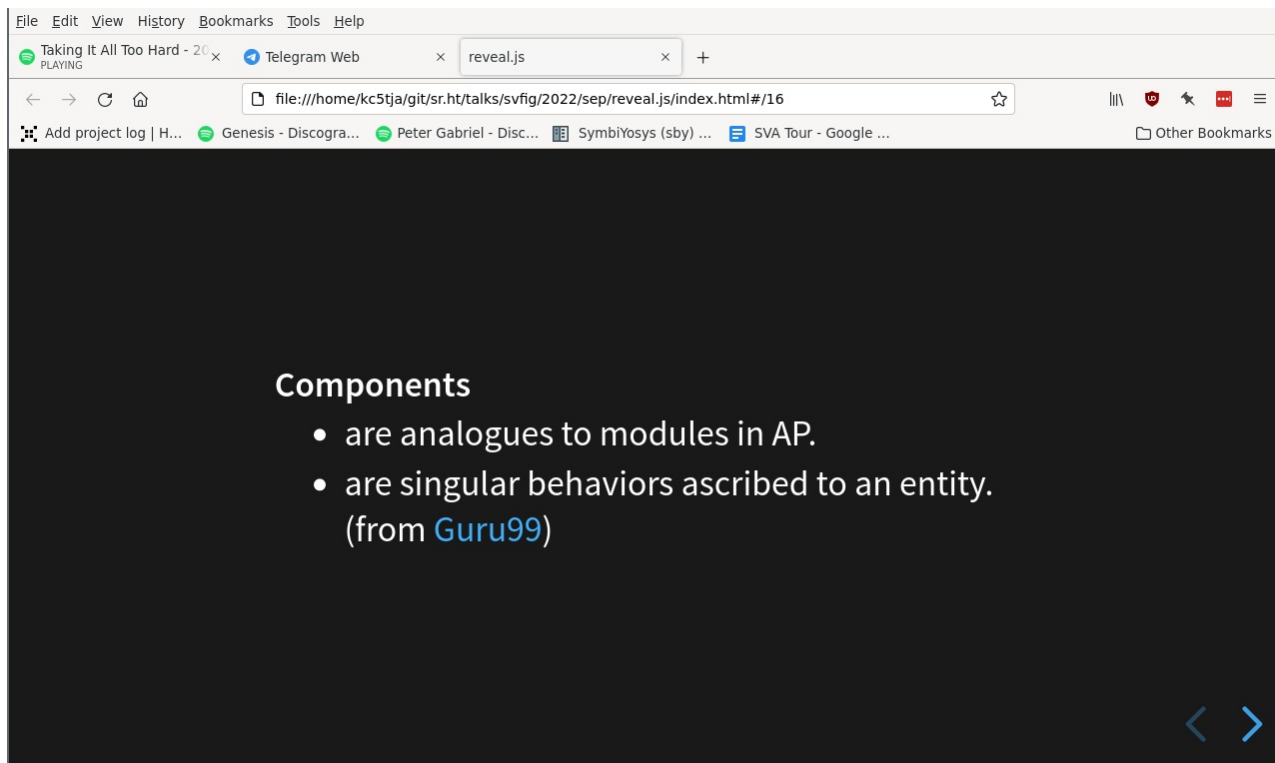
- Menu bar: File, Edit, View, History, Bookmarks, Tools, Help
- Address bar: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/15
- Browser tabs: Taking It All Too Hard - 20x, Telegram Web, reveal.js
- Bookmarks: Add project log | H..., Genesis - Discogra..., Peter Gabriel - Disc..., SymbiYosys (sby) ..., SVA Tour - Google ..., Other Bookmarks

The slide content is as follows:

Entities

- are the core concept over objects.
- are often *indices into parallel arrays*.
- is a distinct object representing an actor in a simulated space. It has not actual data or behavior. (from [Guru99](#))

Navigation arrows: < >



The screenshot shows a web browser window with the following details:

- Menu bar: File, Edit, View, History, Bookmarks, Tools, Help
- Address bar: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/16
- Browser tabs: Taking It All Too Hard - 20x, Telegram Web, reveal.js
- Bookmarks: Add project log | H..., Genesis - Discogra..., Peter Gabriel - Disc..., SymbiYosys (sby) ..., SVA Tour - Google ..., Other Bookmarks

The slide content is as follows:

Components

- are analogues to modules in AP.
- are singular behaviors ascribed to an entity. (from [Guru99](#))

Navigation arrows: < >

The screenshot shows a web browser window with the following details:

- Menu bar: File, Edit, View, History, Bookmarks, Tools, Help
- Address bar: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/17
- Page content: A slide with a dark background and white text.

Systems

A *system* is basically the engine that performs the iterative, low-level logic. For OKAD, that'd be the simulation of analog voltages and currents. For a video game, that's the input loop. It's basically the core application you're trying to write.

Navigation arrows: < >

The screenshot shows a web browser window with the following details:

- Menu bar: File, Edit, View, History, Bookmarks, Tools, Help
- Address bar: file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/18
- Page content: A slide with a dark background and white text.

Some differences with AP

- A *central data structure* that maintains all important program state.
- Co-arrays map to concepts, not modules.
- Entity ID i will index element i in all co-arrays.
- Emphasis on imperative, rather than declarative, procedures.

Navigation arrows: < >

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Taking It All Too Hard - 20x PLAYING Telegram Web reveal.js

file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/19

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Example of ECS centralized structure in Rust

```
dx: usize,
dy: usize,
};

struct DrawProc<P: FnOnce()>(Option<P>);

struct GameState {
    // ...
    dimensionables: [Dimensionable; N_OBJECTS],
    puctuals: [FrameAlarm; N_OBJECTS],
    mobiles: [Velocity; N_OBJECTS],
    visibles: [DrawProcs; N_OBJECTS],
    // ...
};
```

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Taking It All Too Hard - 20x PLAYING Telegram Web reveal.js

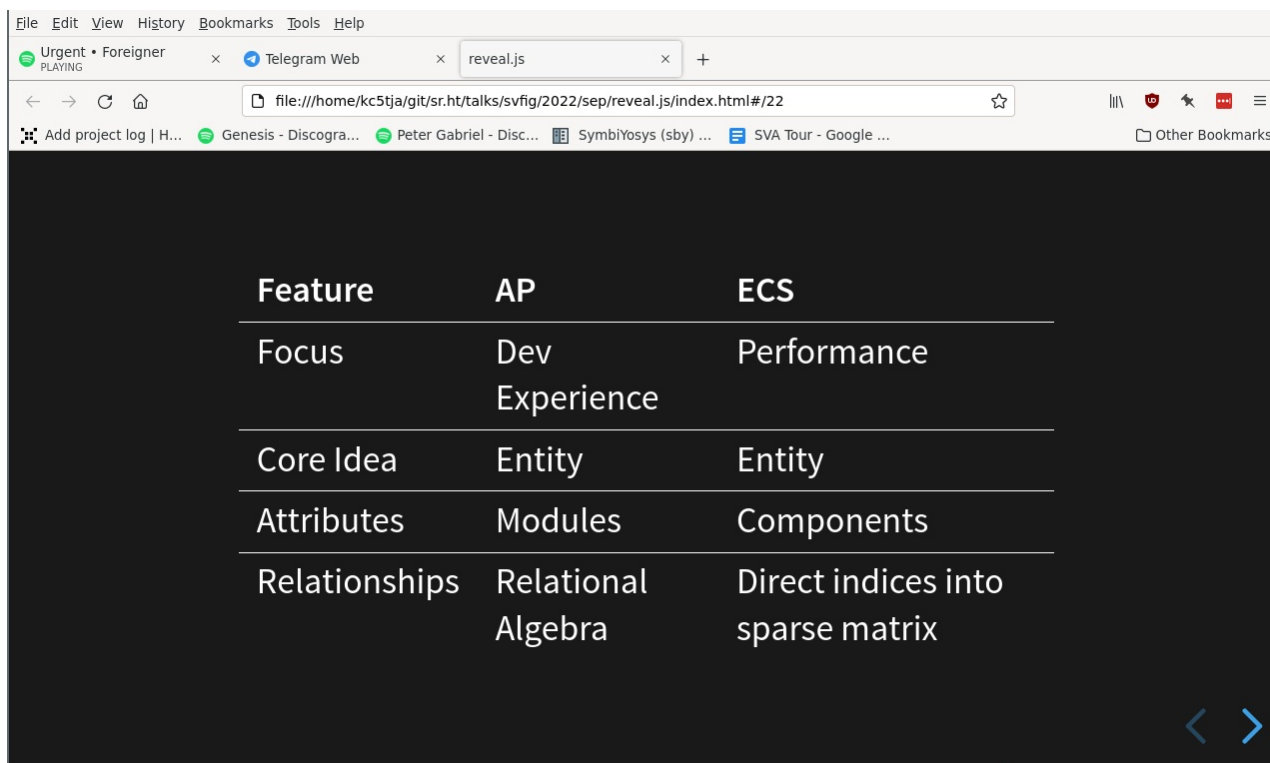
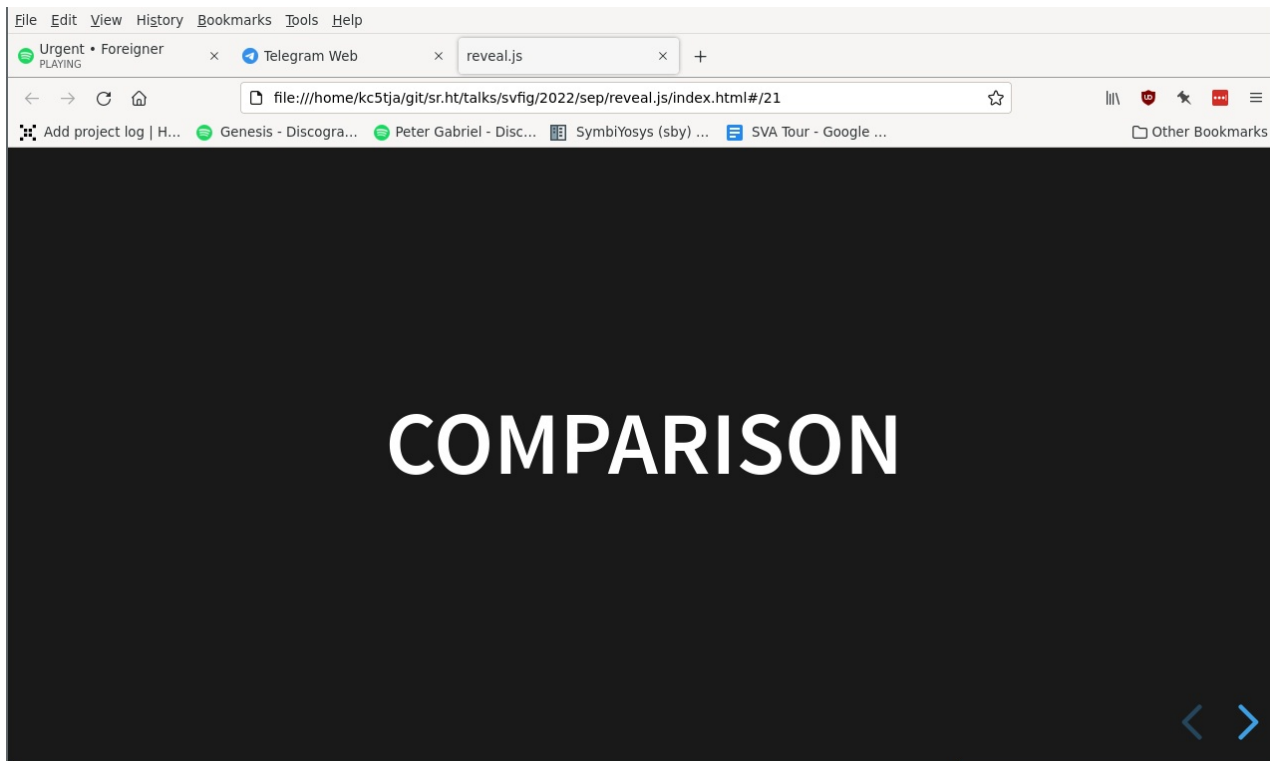
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But also some similarities too

- Also uses relational concepts, sometimes, maybe.
- Different modules can be responsible for maintaining their own co-array(s).

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file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/23 ☆

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Feature	AP	ECS
Pointer Provenance	Pointers don't cross module boundary; no need to manage provenance.	Anything goes; performance is king.

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file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/24 ☆

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Feature	AP	ECS
Pointer Validation	Declarative interface maps entity to internal data; always valid unless buggy.	Feature of the language usually (C/C++/Rust/...)
Access Control	Modules implements mutex-backed interface.	Components implement mutex-backed interface.

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file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/25 ☆

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Feature	AP	ECS
Type Safety	Small, well-defined concepts helps keep stack depth small.	Feature of the language usually (C/C++/Rust/...)

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file:///home/kc5tja/git/sr.ht/talks/svfig/2022/sep/reveal.js/index.html#/26 ☆

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WHAT I CALLED *ECS* SO FAR IS JUST ONE OF MANY WAYS OF DOING IT.

To teach you the correct way, I must first teach you the wrong way.

— my Ving Tsun sifu

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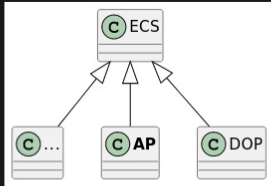
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THE REALITY...



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FIN.

Q&A

Thank you!

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