WebAssembly in HbbTV 2.0.5

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WebAssembly ...

2019 : W3C published 1.0

- Was already implemented in many browsers.

2024 : W3C published 2.0

- A new snapshot incorporating *Feature Extensions* with mature implementations already deployed.

Still continuously evolving through a *Feature Extensions* development process. https://webassembly.org/features/

Browsers, specs and **compiler tooling** are still evolving as new features continue to be proposed, implemented and reach maturity.

... a moving target

Application compiled to use newest extensions will not work on older browsers.

Desktop and laptop browsers are very frequently updated ... but TVs have lifespans measured in years.

- *Profile a set of features*
- *Enable developers to target that featureset*

"lime1" : A (new*) target for developers

** November 2024*

*"**Lime** is a series of defined and stable subsets of WebAssembly features that producers and consumers can both use to promote interoperability.*

It is intended to be implemented by producers such as LLVM, using features such as LLVM's concept of target CPUs.

Once a Lime configuration is defined, it will be stable and not add or remove any features."

https://github.com/WebAssembly/tool-conventions/blob/main/Lime.md

What will be in HbbTV 2.0.5?

HbbTV 2.0.5 will be aligned with *lime1*:

- Web Assembly Core 2.0
- Web Assembly JS API 2.0
- Web Assembly Web API 2.0

... plus Feature Extension: Extended constant expressions

** WASM 2.0 includes: JS Bigint to WASM i64 integration, Bulk Memory Operations, Multi-value, Import/Export of Mutable Globals, Reference Types, Non-trapping float-to-int Conversions, Sign-extension Operators, Fixed-width SIMD.*

Supported since:

114
May 2023

112
April 2023

17.4
March 2024

21.0
October 2023

Compiling for HbbTV 2.0.5

** Other tools are available!*

Target "CPU" for core feature set

```
emcc -mcpu=mvp ...
emcc -mcpu=lime1 ...
```

SIMD

```
emcc -msimd128 ...
```

- Source code contains SIMD instructions?
- Are flags needed to enable "auto-vectorisation"?
  See: https://emscripten.org/docs/porting/simd.html

... using emscripten / llvm*

⚠️ "**mvp**" target is not stable and may change in future.

✅ **Use "lime1"** as soon as tools support it
Supported by llvm version 20.1.x and later

⚠️ **emscripten** might silently enable unsupported features if a codebase tries to use them (e.g. *threads* or atomics because a `./configure` script enabled *pthreads*)

✅ Tools such as **wasm-opt** can check which features used by a compiled WASM binary.
See: https://github.com/WebAssembly/binaryen

Timeline for 2.0.5 and WebAssembly

Now

WebAssembly is already supported by some devices...

... but supported features vary*

Mid 2025

HbbTV 2.0.5 specification expected to be published.

2026 and beyond

More widespread support for WebAssembly profile defined in 2.0.5.

Beyond 2026:

- Test suite coverage for 2.0.5.
- Devices supporting all new features of 2.0.5 coming to market.

* https://github.com/GoogleChromeLabs/wasm-feature-detect

Thank you.