



University
of Glasgow

State of the Union:
which **Virtual Machines**
can I run on **CHERI?**

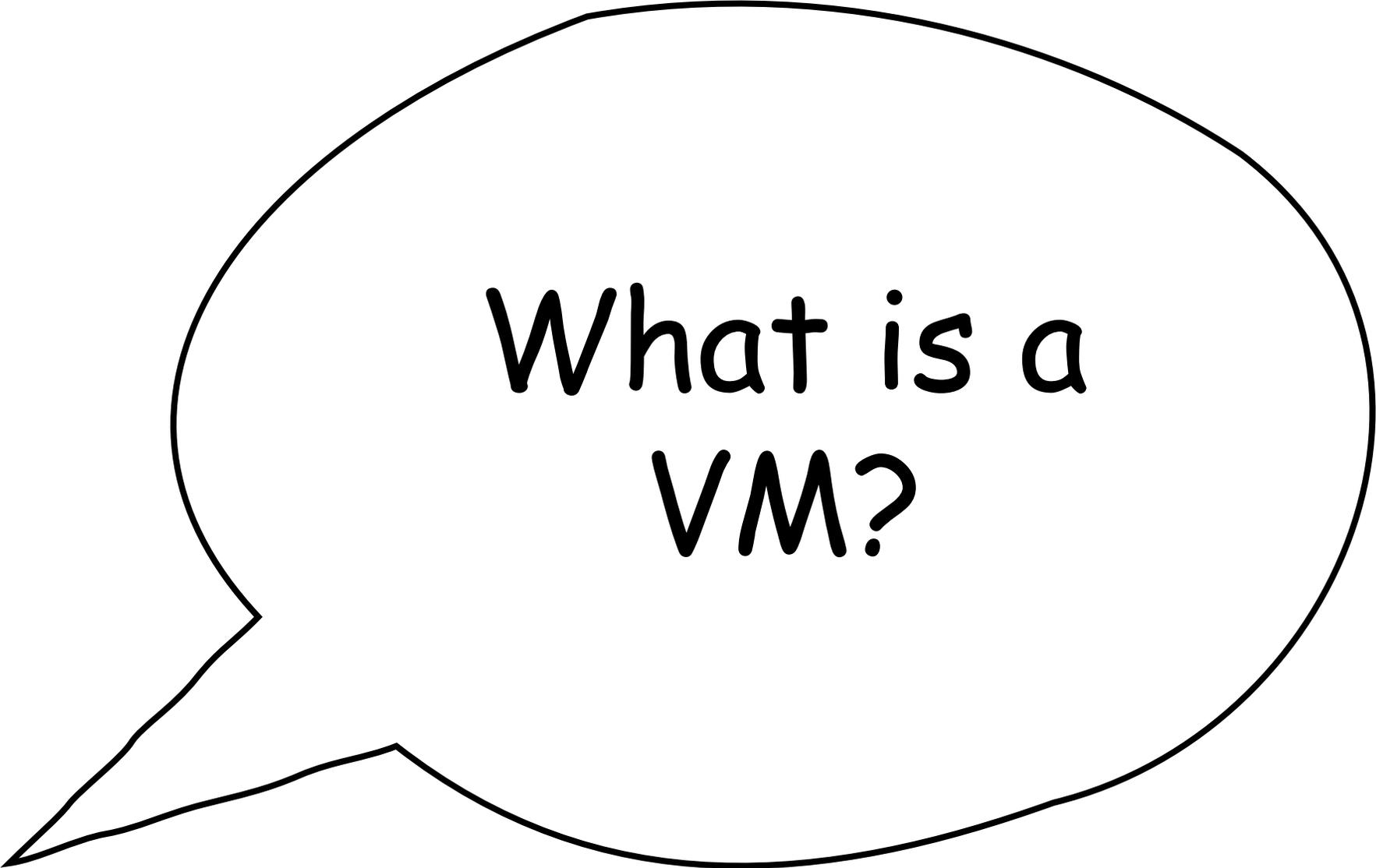
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focus on
programming language virtual machines

platform VMs also supported on CHERI

For more info, see Hesham @ Capabilities Ltd





What is a
VM?



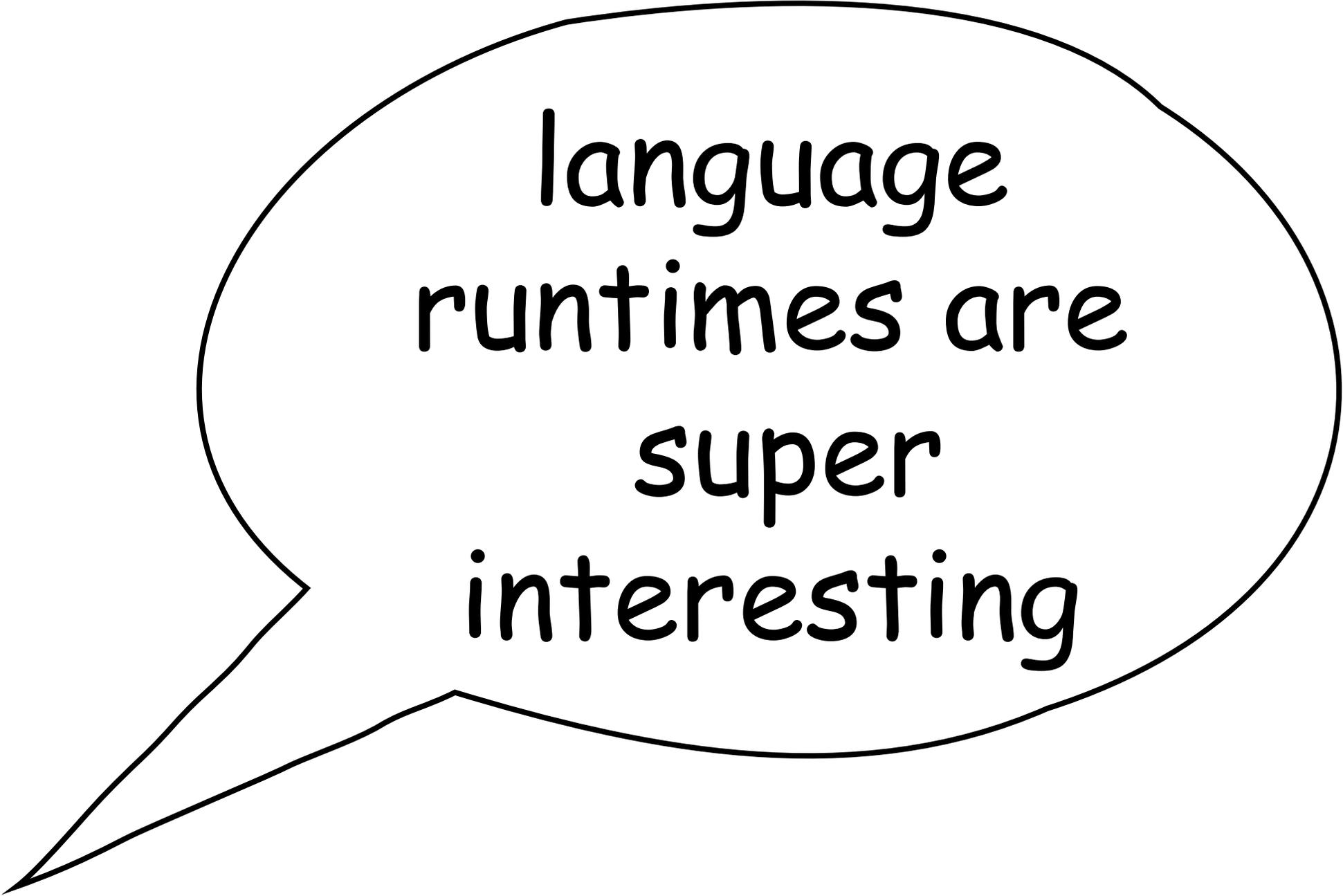


image from easy-peasy.ai



Importance of Managed Languages

Nov 2025	Nov 2024	Change	Programming Language	
1	1			Python
2	4	▲		C
3	2	▼		C++
4	3	▼		Java
5	5			C#
6	6			JavaScript
7	9	▲		Visual Basic
8	11	▲		Delphi/Object Pascal
9	27	▲▲		Perl
10	10			SQL

A hand-drawn speech bubble with a black outline and a tail pointing towards the bottom-left. The text inside is written in a casual, handwritten style.

language
runtimes are
super
interesting

Tour of VMs

open source, freely available

can build on Morello or cross compile

Ruby



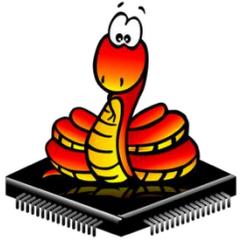
- CRuby interpreter developed by U.Tokyo
- Available at <https://github.com/plasgroup/cheri-ruby>
- Runs on CheriBSD RISC-V and Morello
- Tech Report available: '*Porting System Software to CHERI: Lessons from Porting CRuby*'



WebAssembly

- WARDuino embedded interpreter developed by U.Ghent
- Ported to Morello by U.Glasgow
- Available at <https://github.com/glasgowpli/WARDuino>
- Runs on CheriBSD Morello
- Aiming to target Sonata/CHERIoT

MicroPython



- Lean Python interpreter
- Ported to CHERI by U.Glasgow
- Available at <https://github.com/glasgowpli/micropython>
- Runs on CheriBSD Morello and Sonata/CHERIIoT
- Papers available, e.g. ‘*Secure Scripting with CHERIIoT MicroPython*’

BoehmGC

- Plugin garbage collector for C programs
- Conservative collector by default
- Ported to CHERI by U.Glasgow
- Available at <https://github.com/bdwgc/bdwgc>
- Runs on CheriBSD RISC-V and Morello
- Paper in preparation

Other VMs are available

- OpenJDK HotSpot (from U.Manchester)
- V8 (from Capabilities Ltd)
- CPython (from U.Cambridge)

- harder to build!
- CHERI source code not always readily available!

What needs to happen next?

- get VMs into OS package managers
- showcase CHERI safety features
- adapt for different CHERI processors/platforms

How can you help?

- join **CHERI VMs WG** at wg-virtualmachines@cheri-alliance.org
- consider which VMs need porting
- check out **CHERI VMs survey** at https://github.com/jeremysinger/cheri_vms_survey
- Use existing VMs and send us any of feedback / bug reports/ feature requests

