Debugging HPC Applications
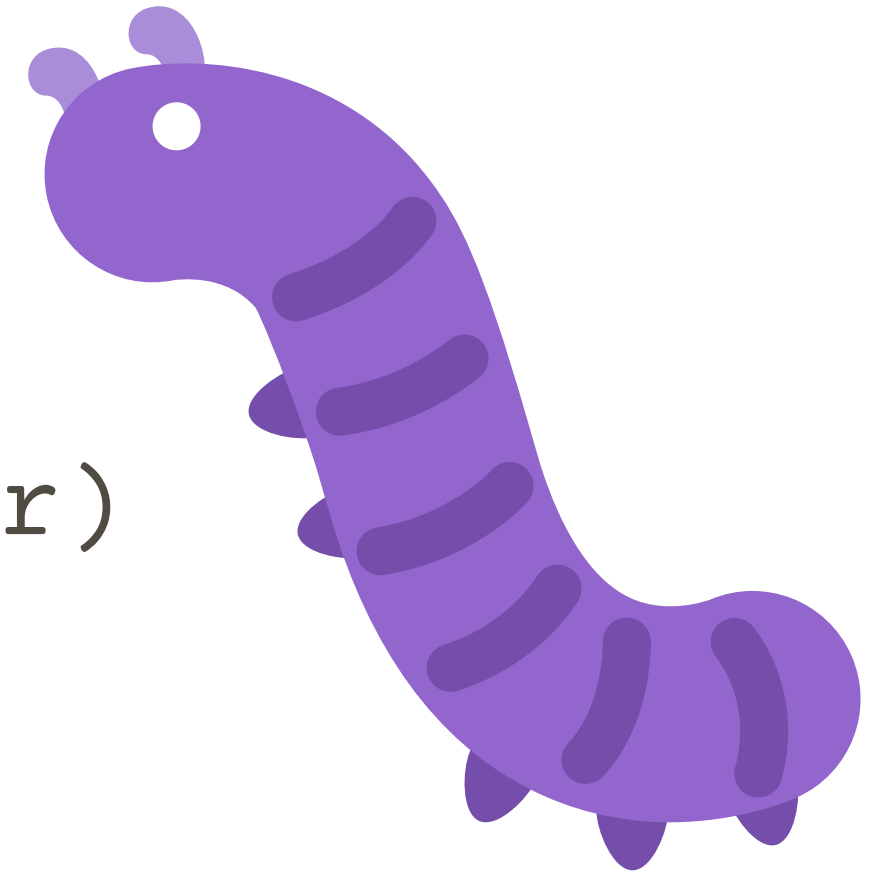
Tom Meltzer
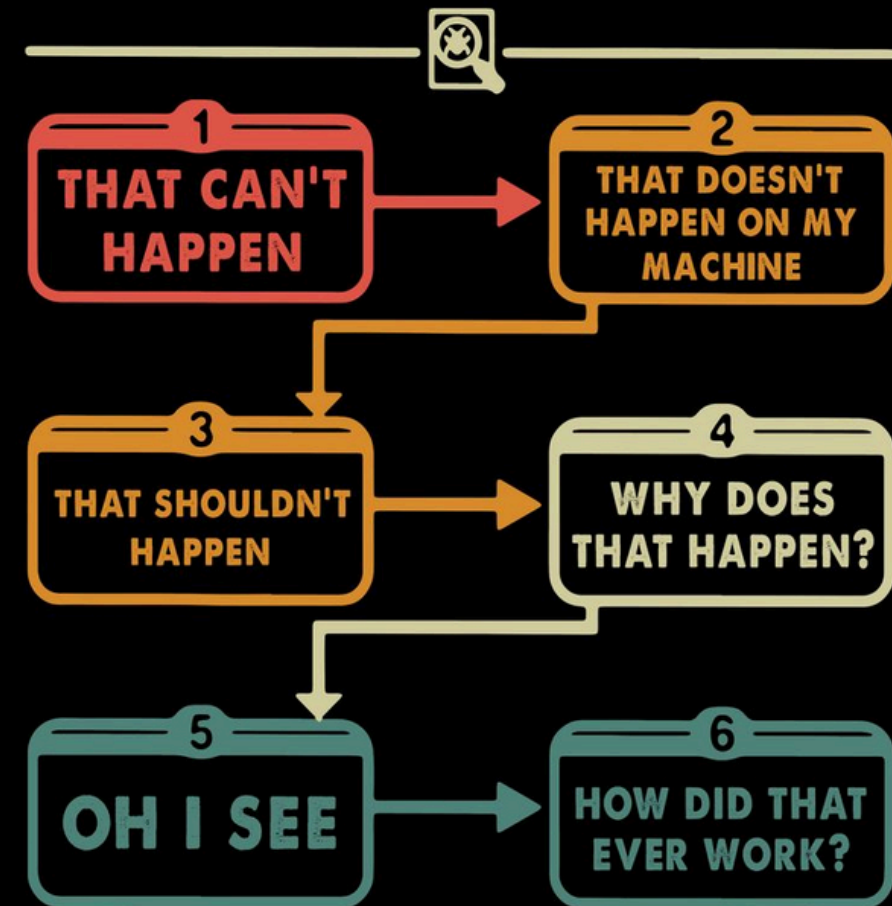
Institute of
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Climate Science

> **Overview**

- Benefits of using debuggers
- Basics of mdb (MPI-aware debugger)
- Live Demo of mdb

> What is a debugger?

A program used to test (or **debug**) another **"target"** program. The target program is run in a controlled environment that allows the user to inspect resources, interrupt program flow and even modify code execution.

> Can't I just use printf()?

> **Can't I just use printf()?**

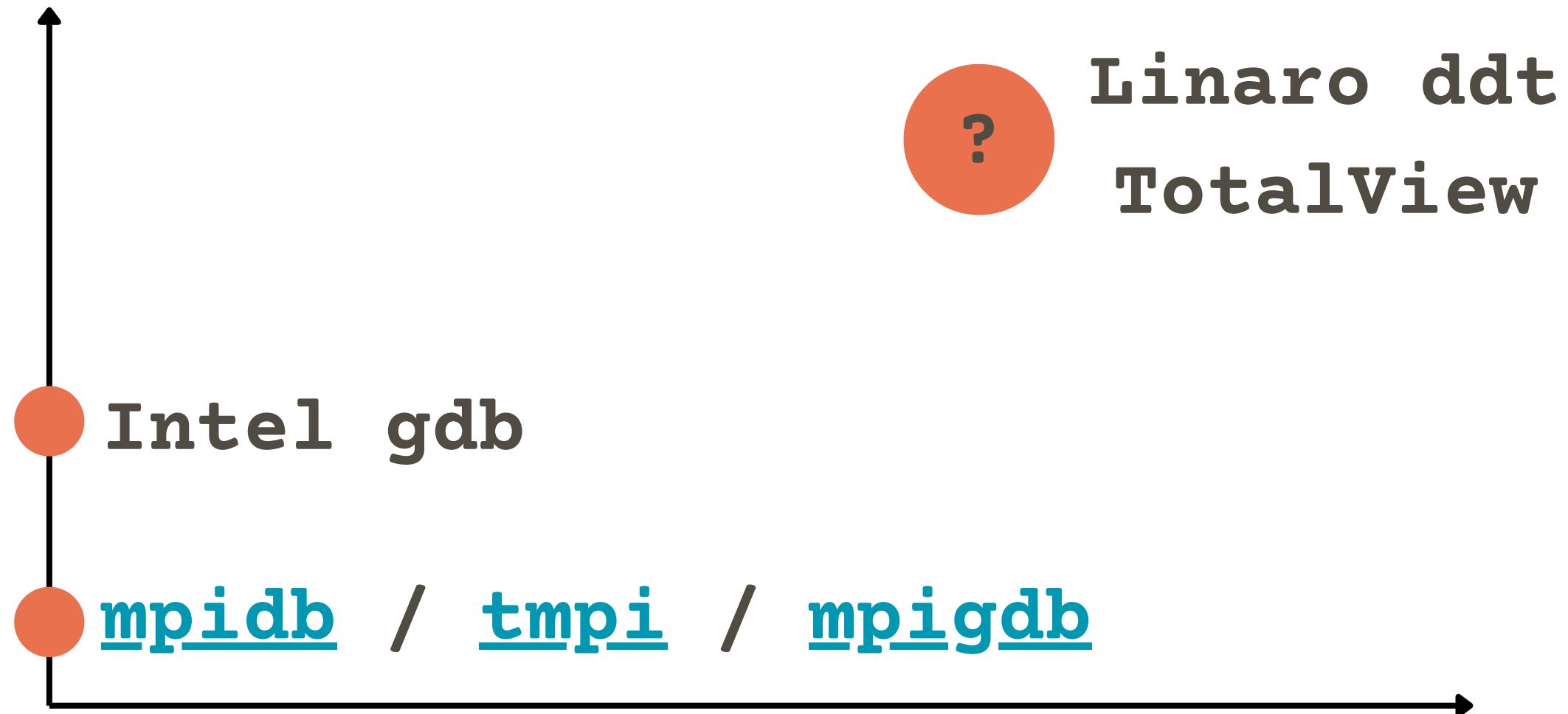✅ Valid if code cannot run without optimization

> Can't I just use printf()?

✅ Valid if code cannot run without optimization
❌ Requires recompiling code
❌ Could introduce new bugs
❌ Want to see a new variable?
  ◦ ❌ Recompile again :(
  • ❌ Cannot interactively alter runtime
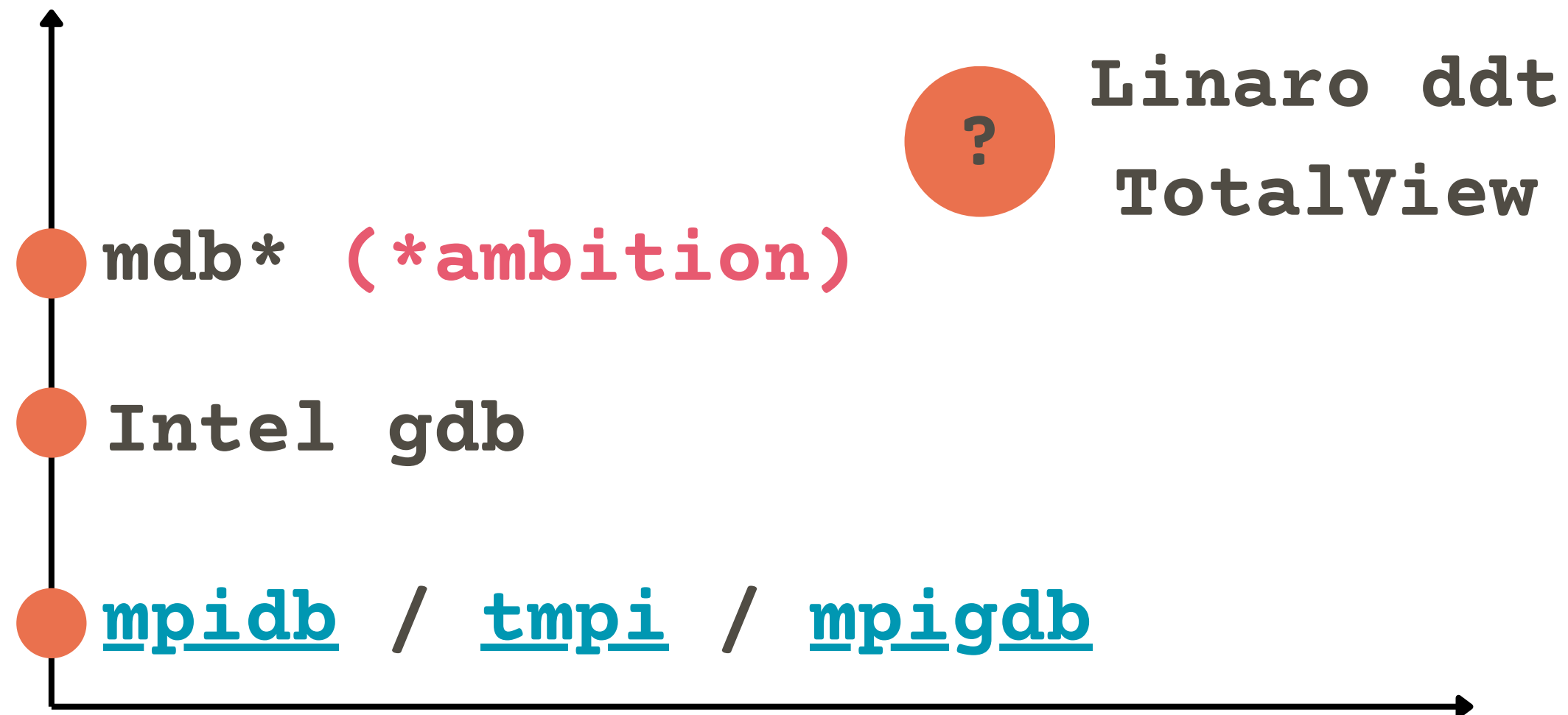
> Current Landscape of MPI Debuggers

features &
  support

Linaro ddt
TotalView

Intel gdb

mpidb / tmpi / mpigdb

money

Introducing

mdb...

[logo coming soon...]

> Current Landscape of MPI Debuggers

features &
support

mdb* (*ambition)

? Linaro ddt
TotalView

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> Current Landscape of MPI Debuggers

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Linaro ddt
? TotalView

mdb* (*ambition)

Intel gdb
mdb (reality)

mpidb / tmpi / mpigdb
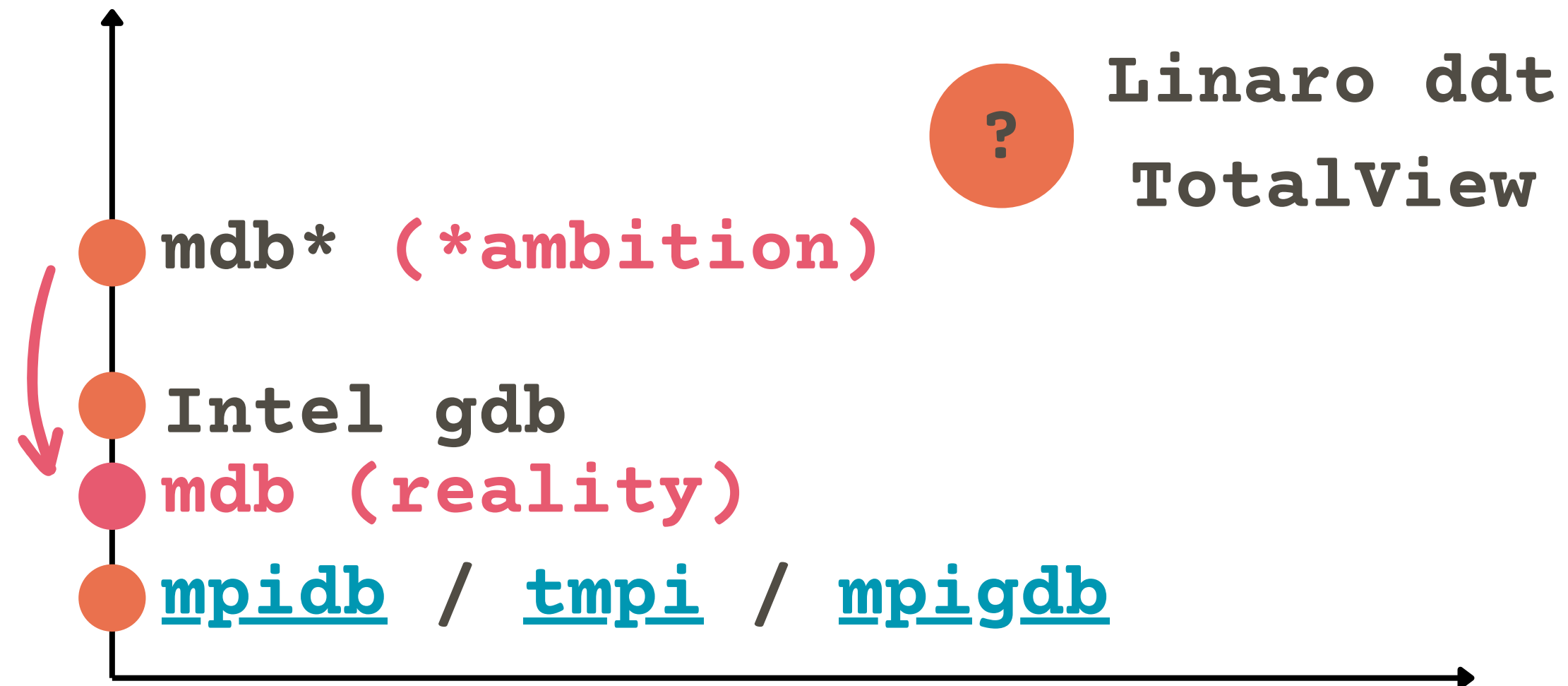
money

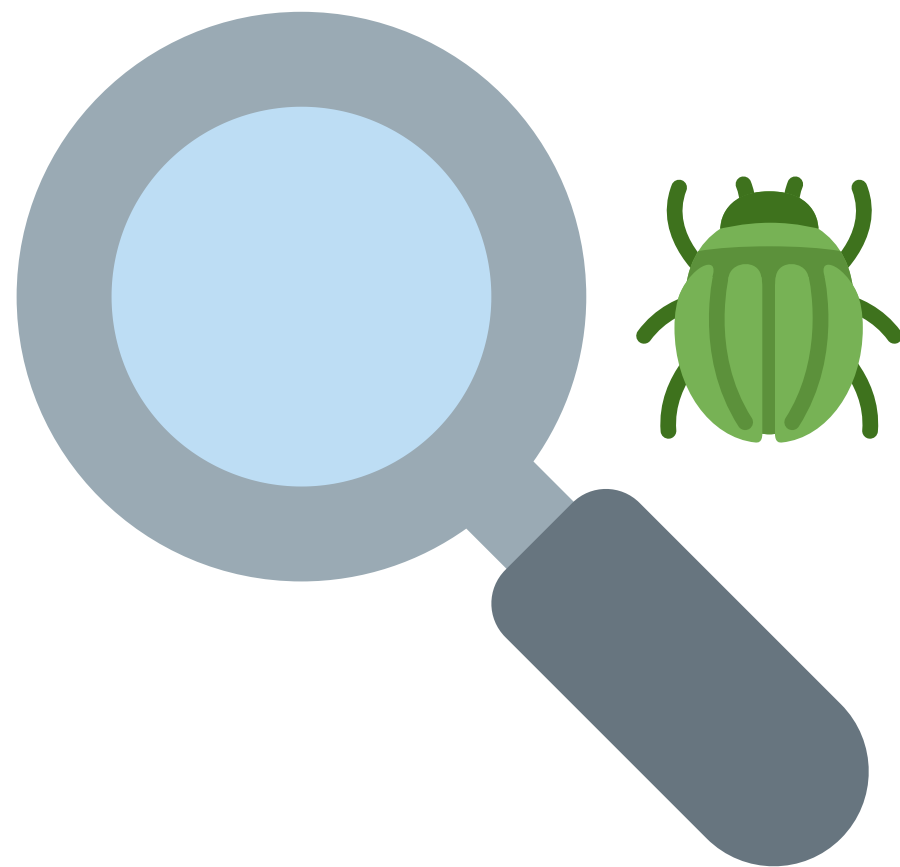# mdb

> **Key Features**

- Terminal-based (debug local to code)
- Can use multiple backends (gdb/lldb)
- Uses python's asyncio library
- Can provide holistic analysis (plot)
- Scriptable
- Free and Open-Source

[github.com/TomMelt/mdb]

> **Live Demo**

- how does mdb work?
- where to get help (man/rtd/github)
- help command (?)
- plot
- broadcast
- mdb scripts

> Benefits of mdb

- Use all your favourite gdb/lldb commands!
- Debug HPC code where it lives
- Scriptable MPI debug sessions
- Debug 100-1000s of ranks (no extra $$$)
- Holistic commands
- Beautiful ascii plots 😍
- Ctrl-C is handled correctly (intel gdb 👀)
- (coming soon - debug parties)
- (coming soonish - TUI mode) 🎉

> Other tools

- vscode (serial)
- vim/emacs plug-ins (serial)
- [Intel's gdb](#)
- [github.com/mystery-e204/mpidb](#)
- [github.com/Azrael3000/tmpi](#)
- [github.com/robertu94/mpigdb](#)
- [Linaro ddt](#) (proprietary/license)
- [TotalView](#) (proprietary/license)
- ...

Special Thanks to:
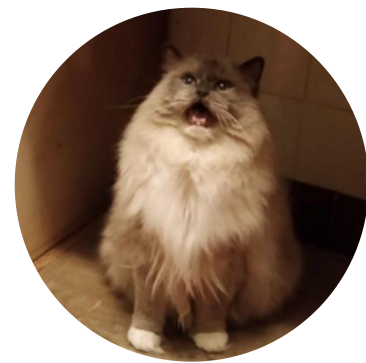
 @fjebaker

 github.com/TomMelt/mdb

 mdb.readthedocs.io/