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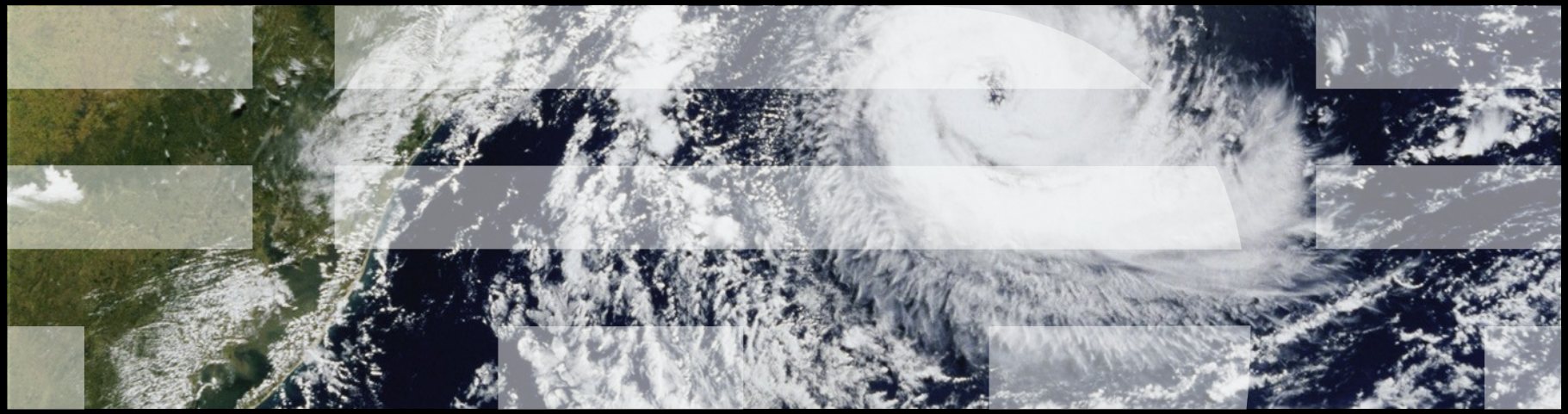
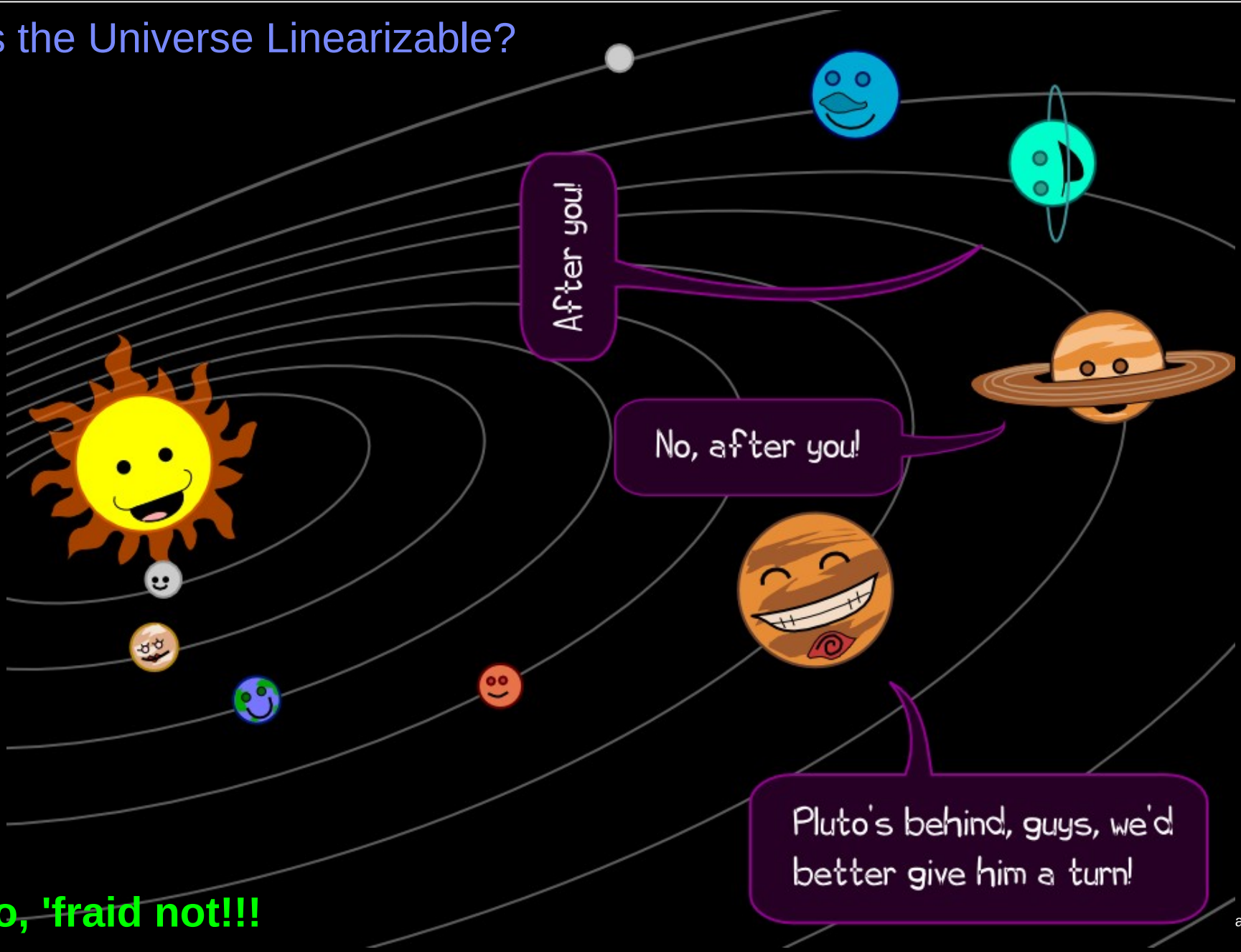
Linearizability: Who really needs it?



Is the Universe Linearizable?



No, 'fraid not!!!

Costs, Benefits, and Roles of Linearizability

- Costs:
  - "Linearizable counting networks" by Herlihy, Shavit, and Waarts:
    - "Finally, we prove that these trade-offs are inescapable: an ideal linearizable counting algorithm is impossible. Since ideal non-linearizable counting algorithms exist, these results establish a substantial complexity gap between linearizable and non-linearizable counting."
  - Doesn't necessarily help client code much
    - Haas et. al, "How FIFO is Your Concurrent FIFO Queue?"
  - I recently received a an RCU iterator patch to remove a ***single load from the stack***
- Benefits:
  - Simplifies analysis and verification (but doesn't necessarily help the client code much)
  - In the concurrent theoretician's toolbox, it is analogous to the hammer
- Role:
  - Legacy proof systems
  - Reasoning about "bulk concurrent code"
  - Both unnecessary and insufficient for critical hotpath code: Need something else for:
    - Extreme real-time response (30 microseconds in Linux kernel in 2006)
    - Extreme performance and scalability (OS kernels, server applications)
    - Code for statistics gathering and some classes of diagnostics
- Yes, can transform non-linearizable specifications to linearizable w/complex specification
  - You can also describe planetary movements using epicycles

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