

# Linux Plumbers Conference

Richmond, Virginia | November 13-15, 2023



Linux  
Plumbers  
Conference | Richmond, VA | Nov. 13-15, 2023

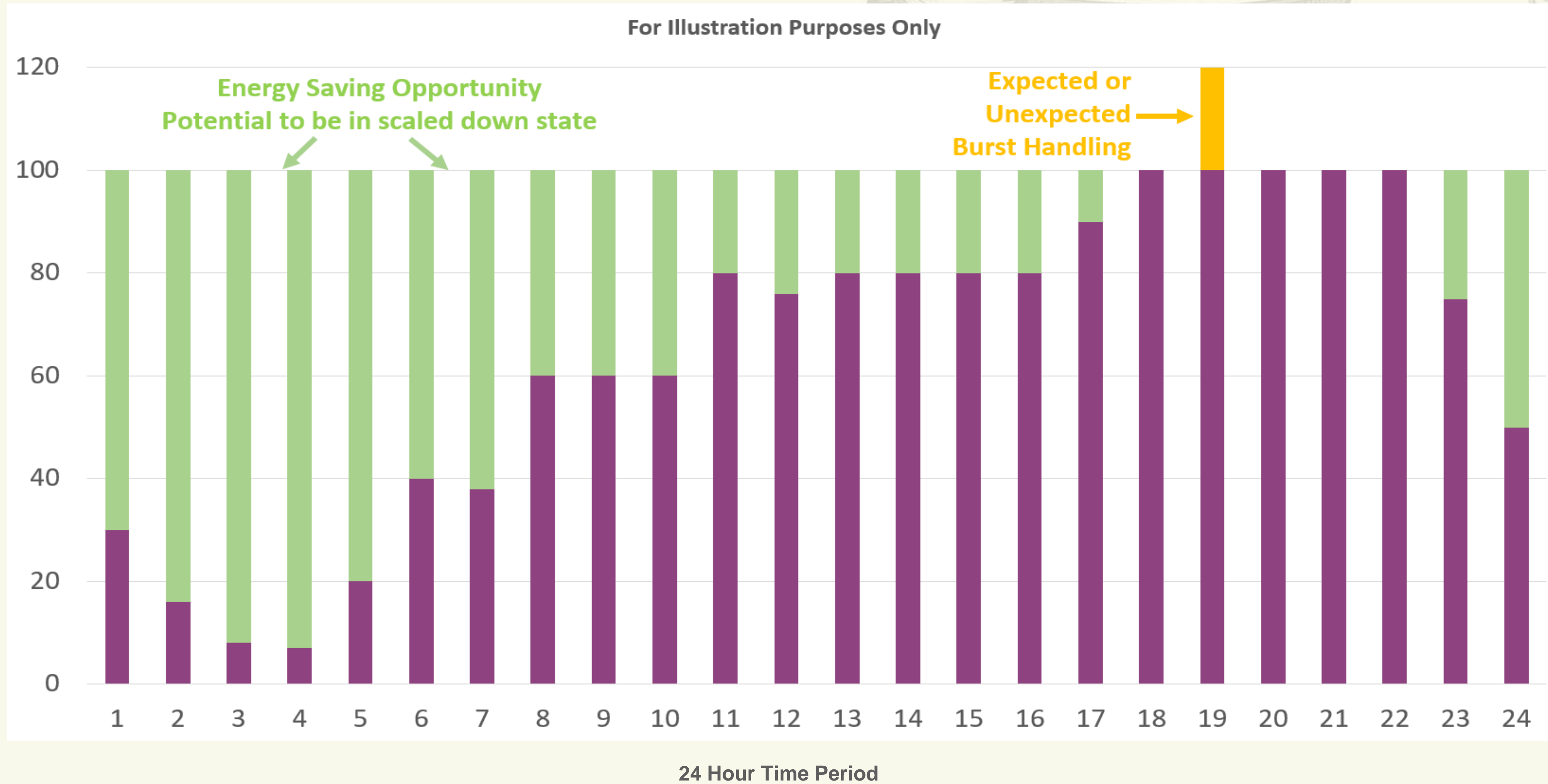


# Power Saving for Virtualised Workloads

Chris MacNamara  
Srinivas Pandruvada



# Energy Efficiency Opportunity



When to use power management technology?

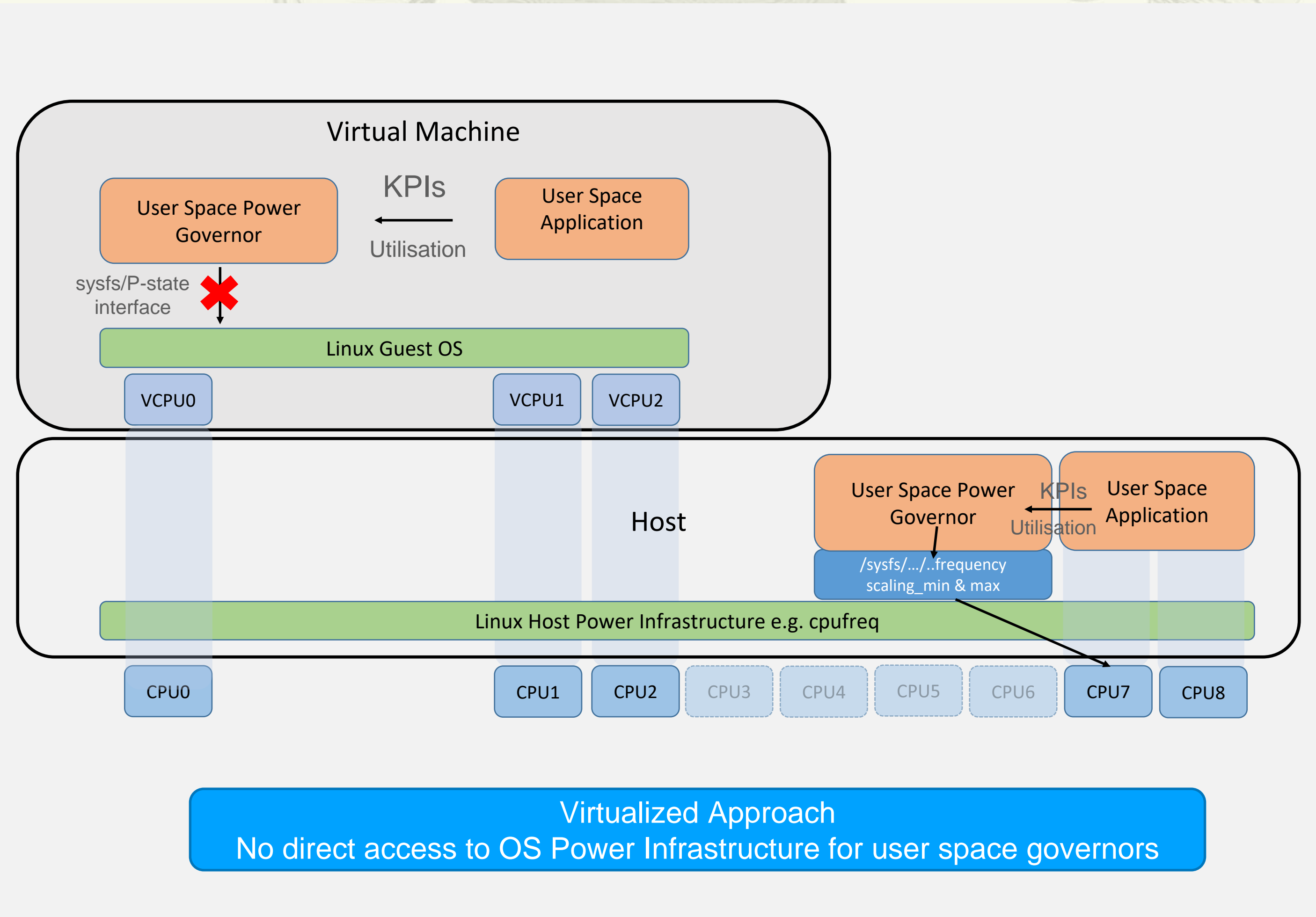


# Common Challenges

Use case: User space governor, implements P-state control on behalf of applications

## Challenges

- Nature of the application** preventing the OS governors to act  
Polling threads, e.g. Telco use cases => limits impact of kernel power infra. & governors.  
All cores appear 100% busy.
- Root access** for application
- Application implementation** of power monitor/measure/act  
User space governor manages power for workload/application overcomes root & implementation of power control
- Metrics visibility**  
Power control decision relies on Key Performance Indicators (KPIs) specific to the application => not OS visible
- Diversity** between virtualised and host approach, write once run anywhere not possible
- Availability of Power controls** in the guest

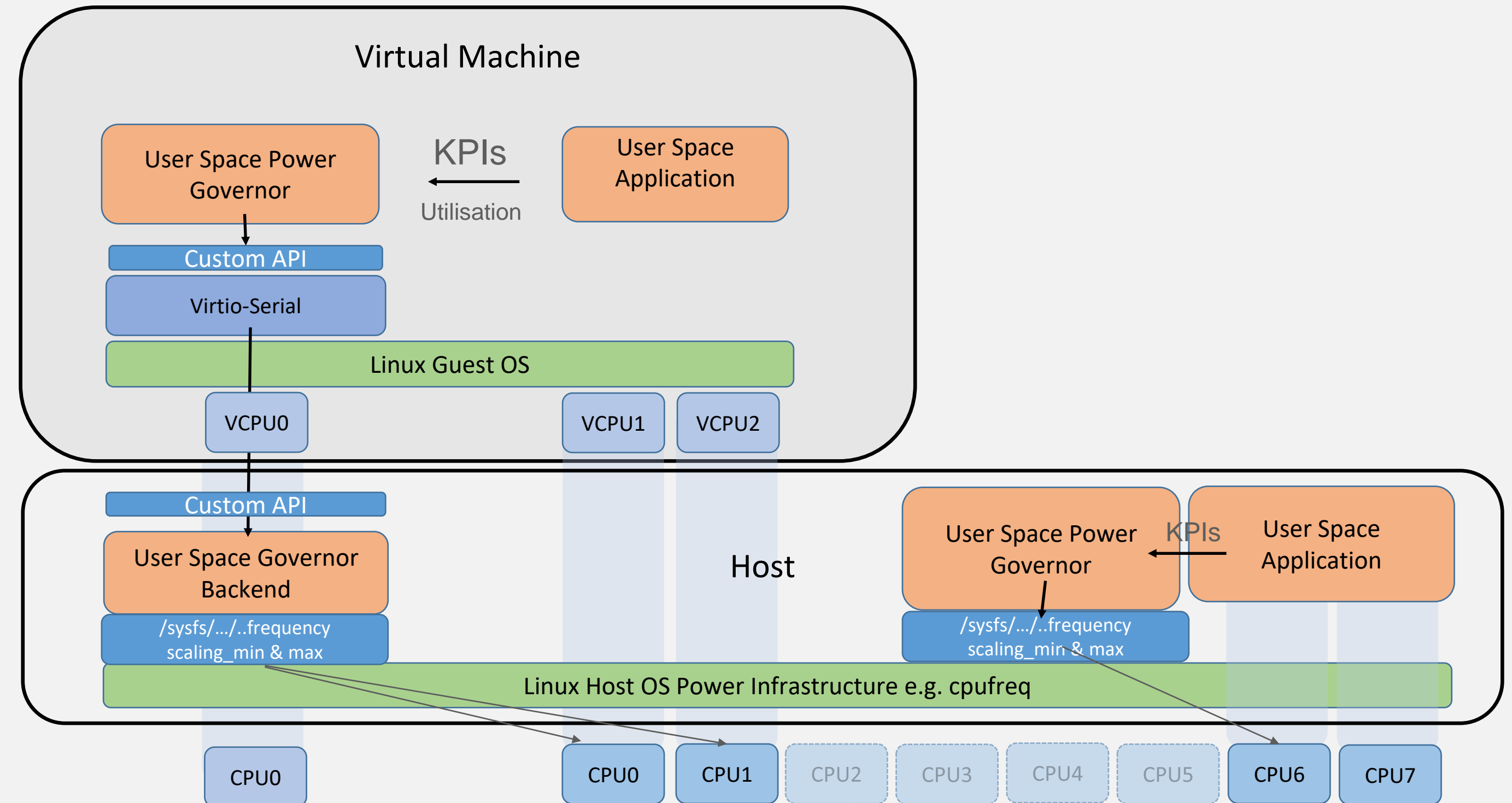


Overall benefit is to achieve residency in Low Power Modes, in this example via slow down / P-state controls



# Components in a Solution (Simplified)

- **User space governor** manages power for workload/application
- Access to Power control relies on Key Performance Indicators (KPIs) specific to the application
- **Virtualised Power Controls** requires a “custom” API, interface and backend to get access
- Build components
  - Custom P-state API for requests from Guest to Host
  - Virtio-serial for transport guest => host
  - Backend daemon / agent
  - Backend module to interface to cpufreq / intel\_pstate
  - Latency range is single digit milli-seconds
- **Opportunity**
  - Guest visible proxy sysfs/.../scaling min and max.frequency requests, a future evolution for virtualised use cases?
  - Backed by a simple precedence policy in the host kernel



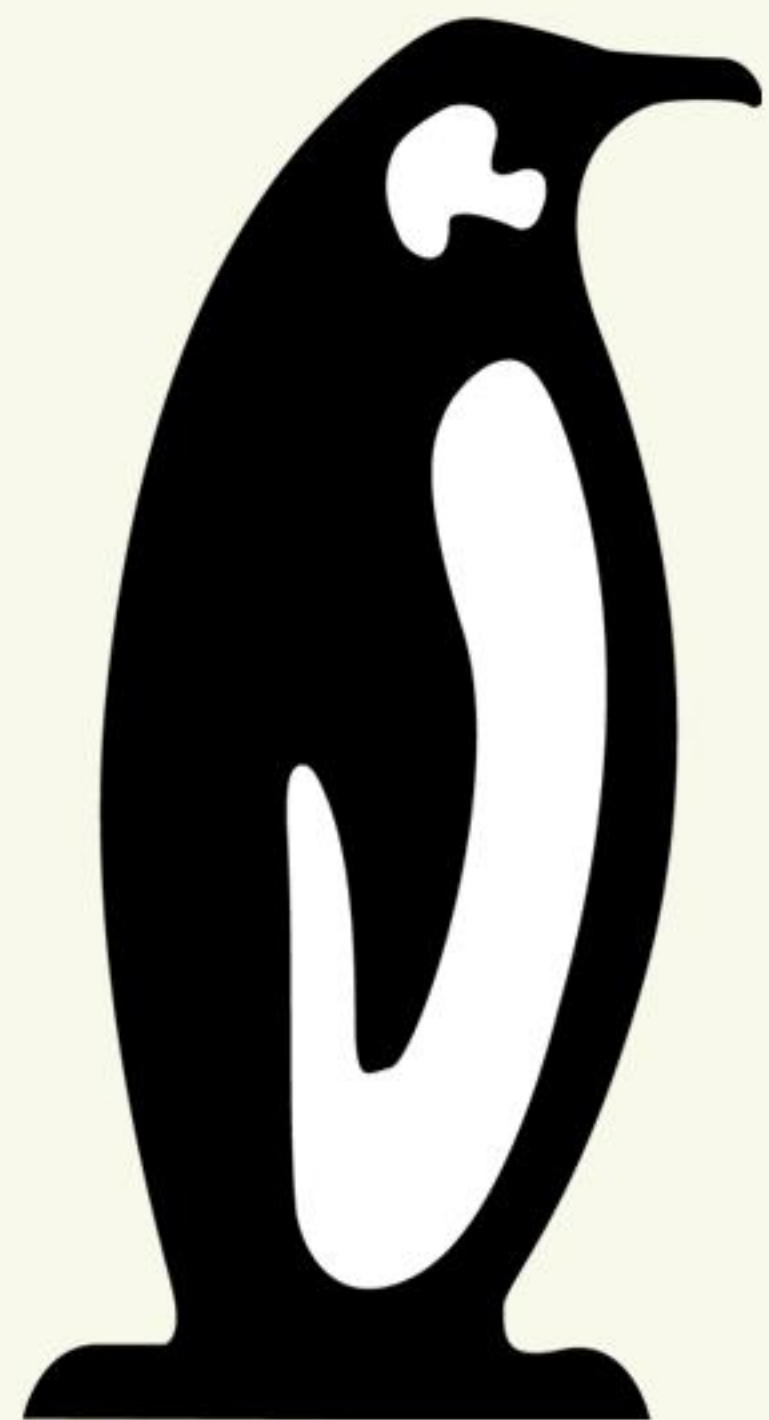
Many use cases, support for direct control, virtualized architecture

# Summary & Discussion



Linux  
Plumbers  
Conference | Richmond, VA | Nov. 13-15, 2023

- Why? Direct control path allows wider adoption and usage of power technology
- Opportunity to move away from "custom" build to standard approach (APIs and driver for Guest OS)
  - Guest OS driver for P-states?
- Increase adoption of lower power modes and reduce carbon footprint via lower electricity consumption
- Thank you!



# Linux Plumbers Conference

Richmond, Virginia | November 13-15, 2023

