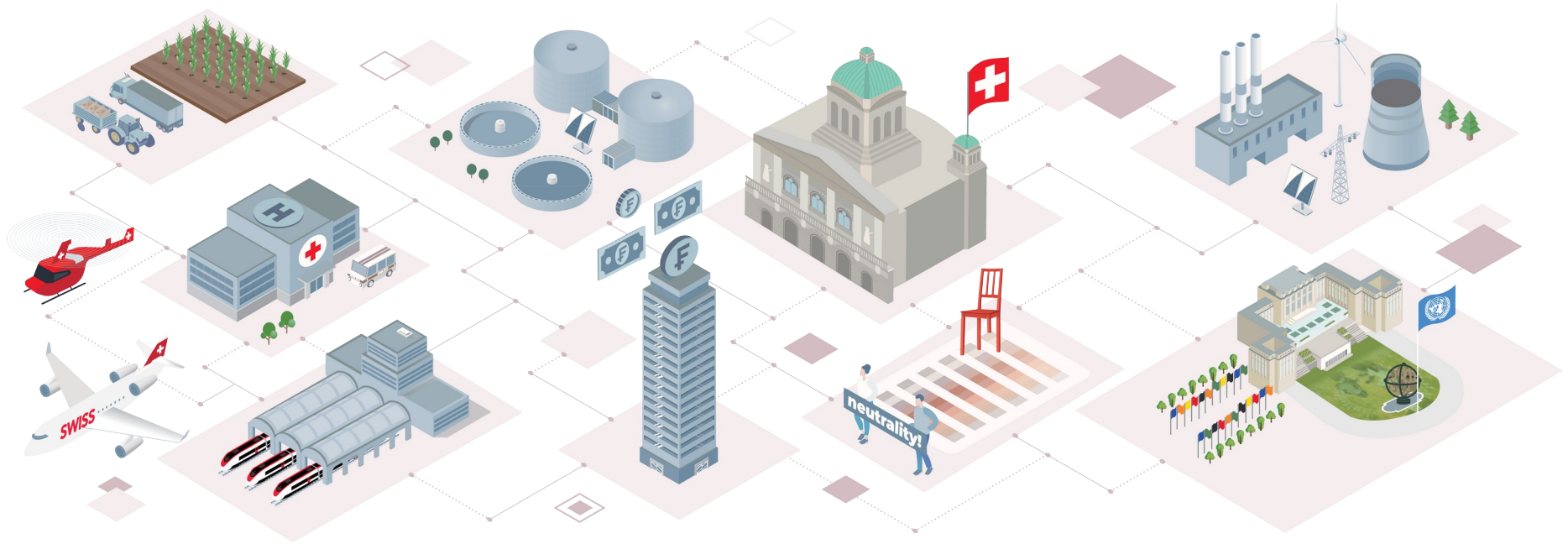


# seL4 on Big Iron: Experiences and Directions from the Atoll Hypervisor

# Context

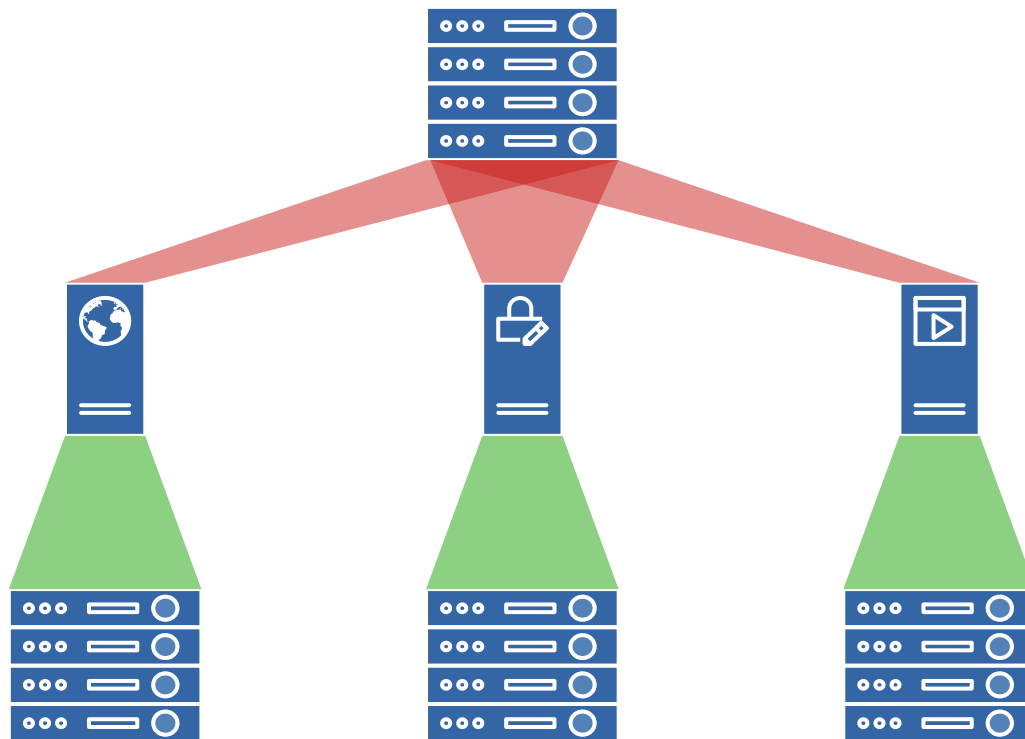


# News

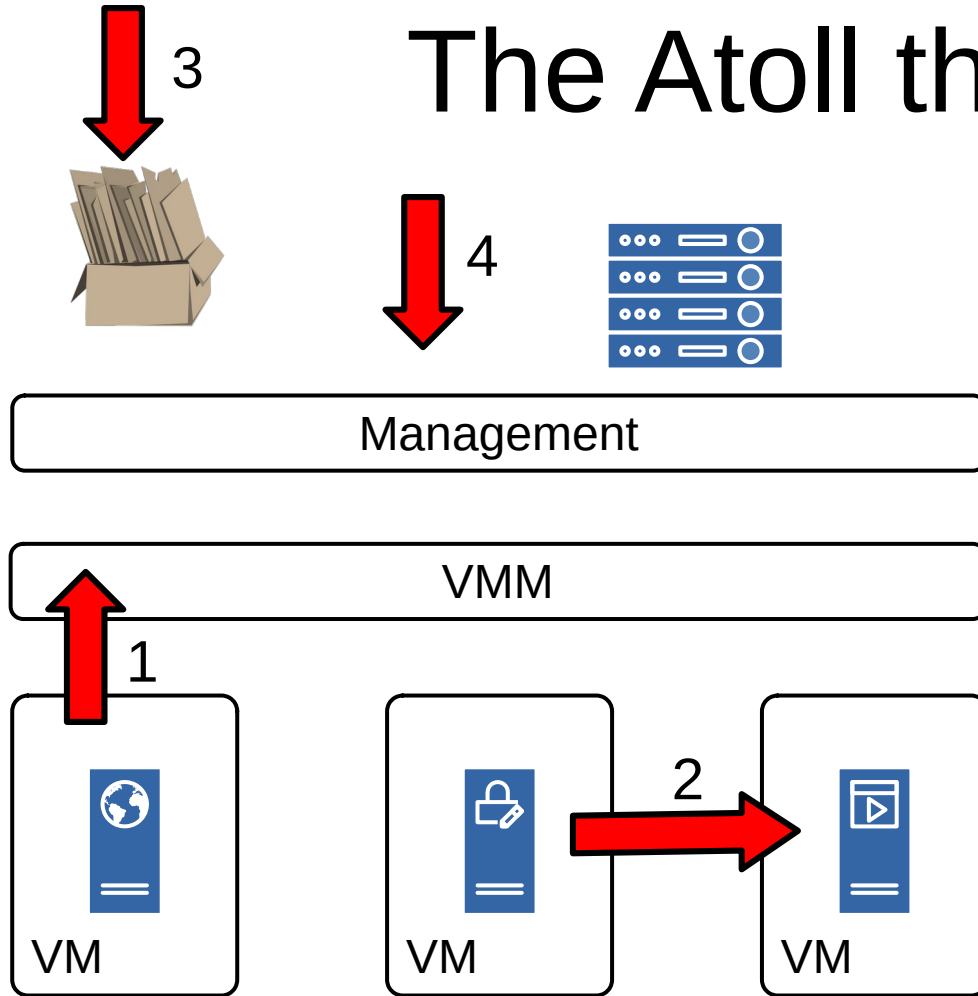
- Functional demonstrator end '25
- Multiple industrial pilots in '26
- Engineering team growing rapidly
  - **Yes, we're hiring!**

# What is Atoll?

# Cloud efficiency with neutrality



# The Atoll threat model

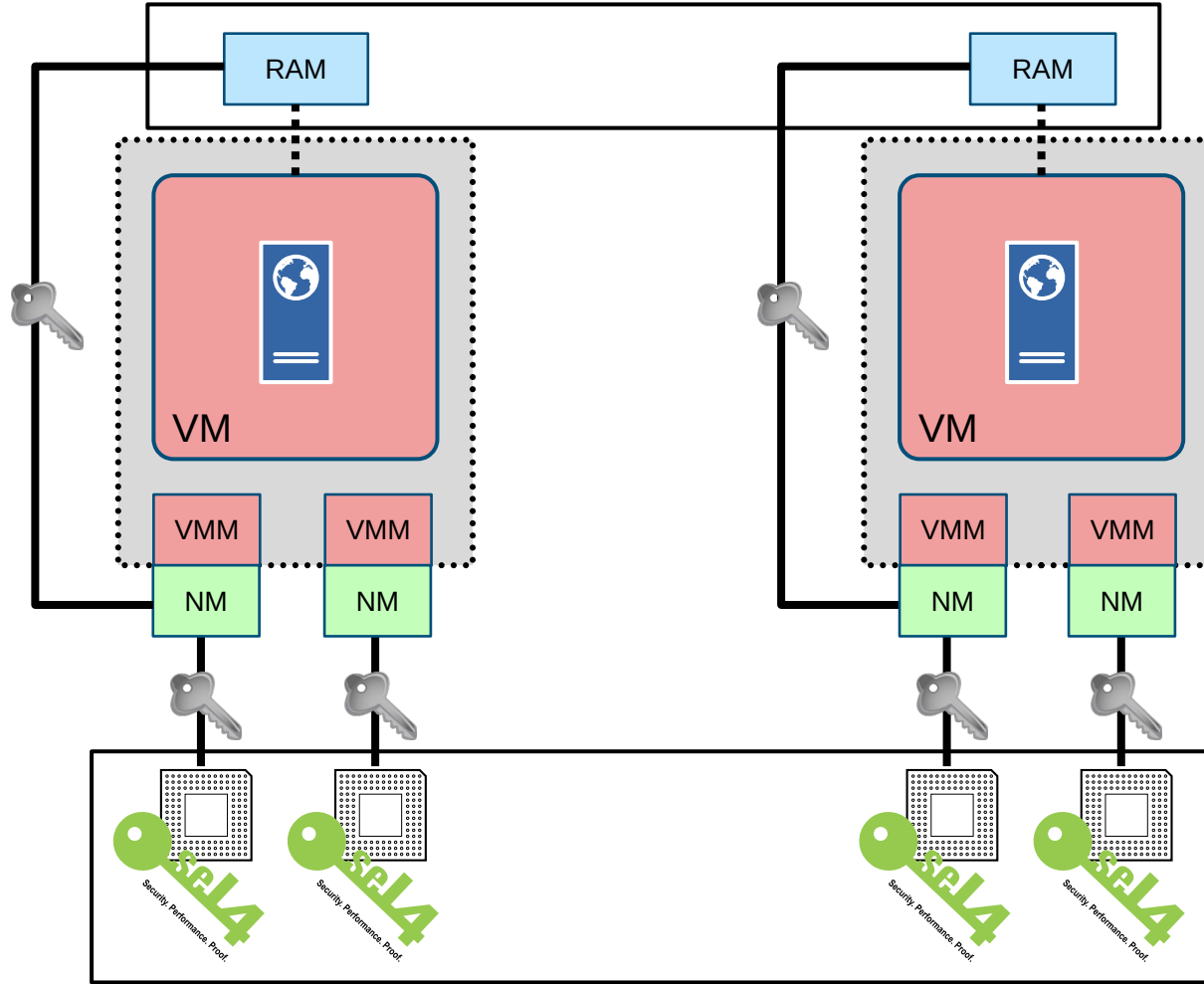


1.VM escape

2.Cross-VM attack

3.Compromised storage

4.Compromised  
management plane



# Lessons from seL4 on big iron





# Overview

The seL4 build system is a beast

CapDL is a great tool

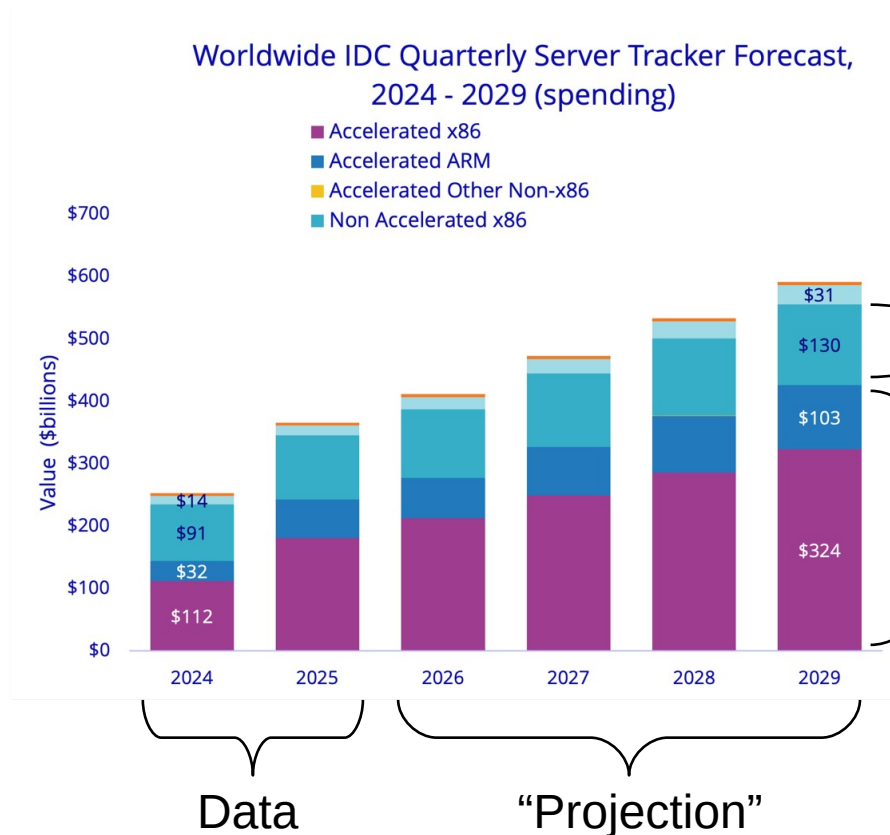
Proof and spec are hard to work with

**HOWTO:** X86 + PCIe + IOMMU + SRIOV



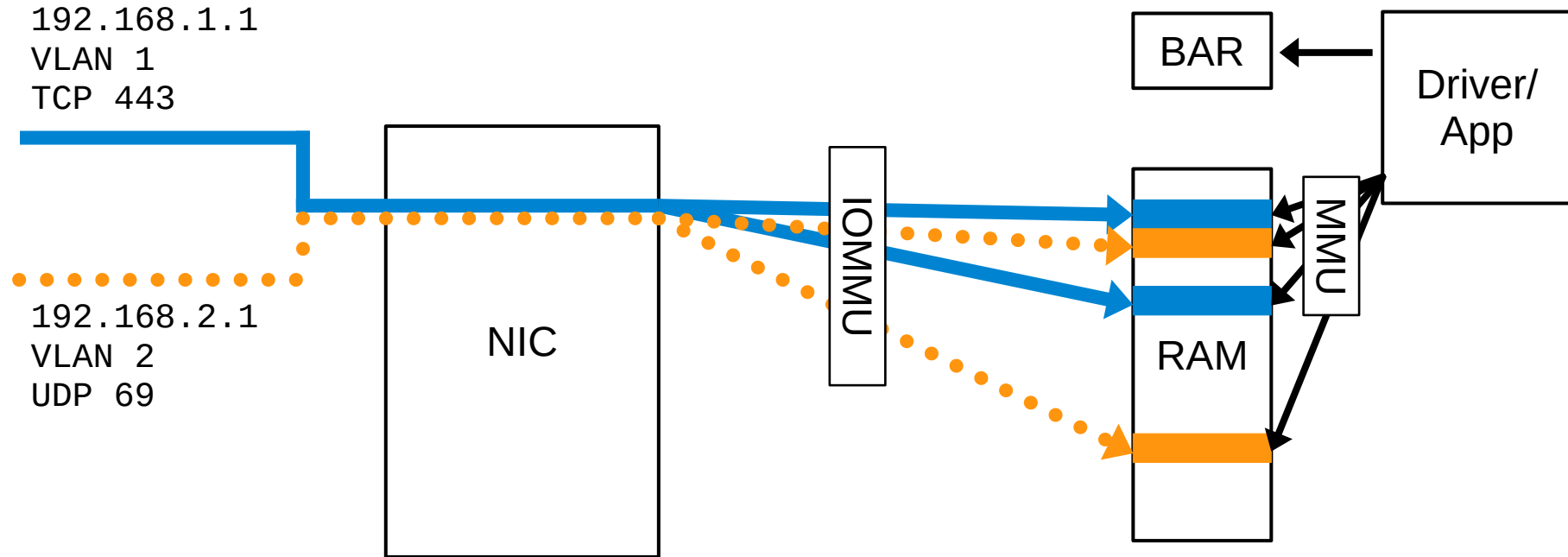
**this talk**

# In servers, it's still all x86



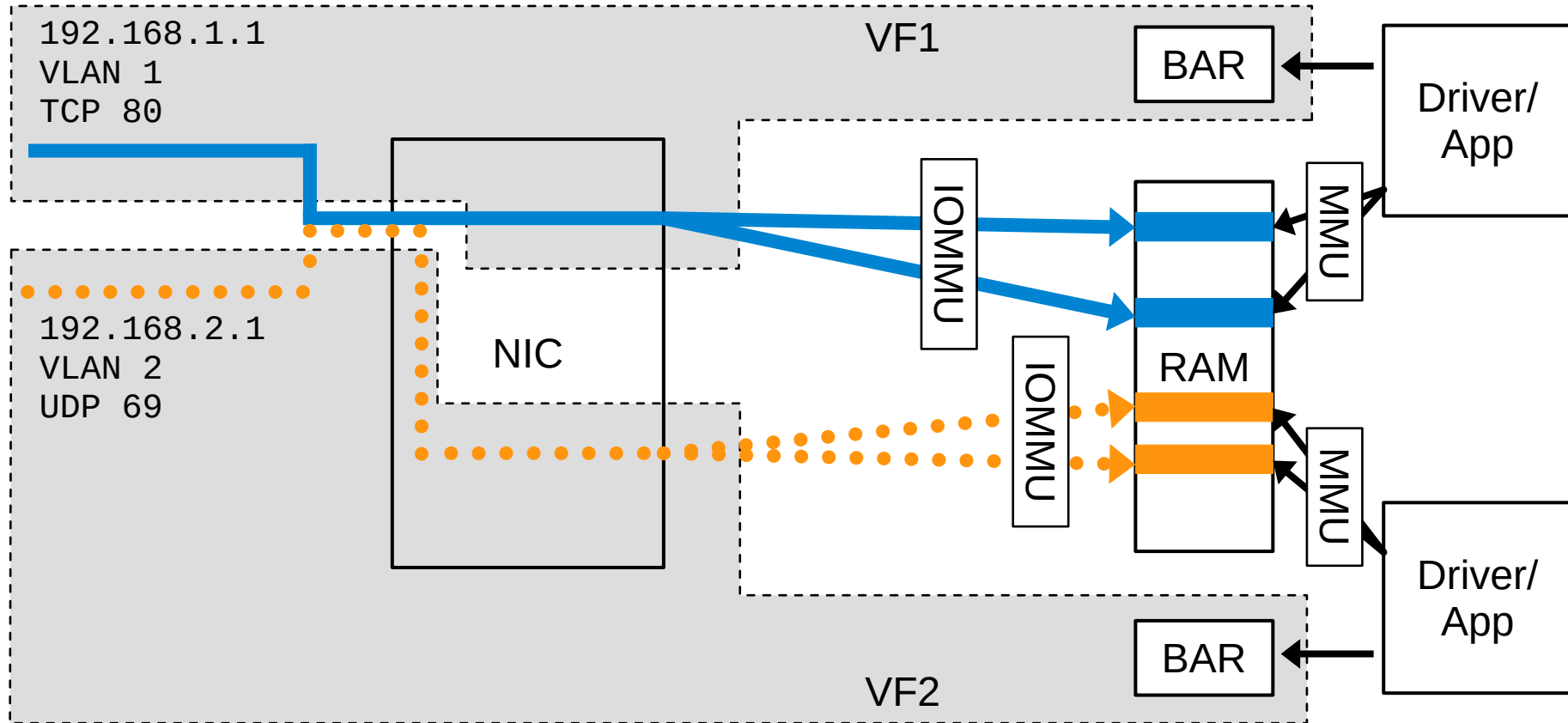
- Non-AI ARM not even measured
- Mostly Graviton etc.
- AI ARM mostly NVIDIA
- Outside hyperscale cloud, x86 is where the \$ are.

# PCIe is good\*, actually

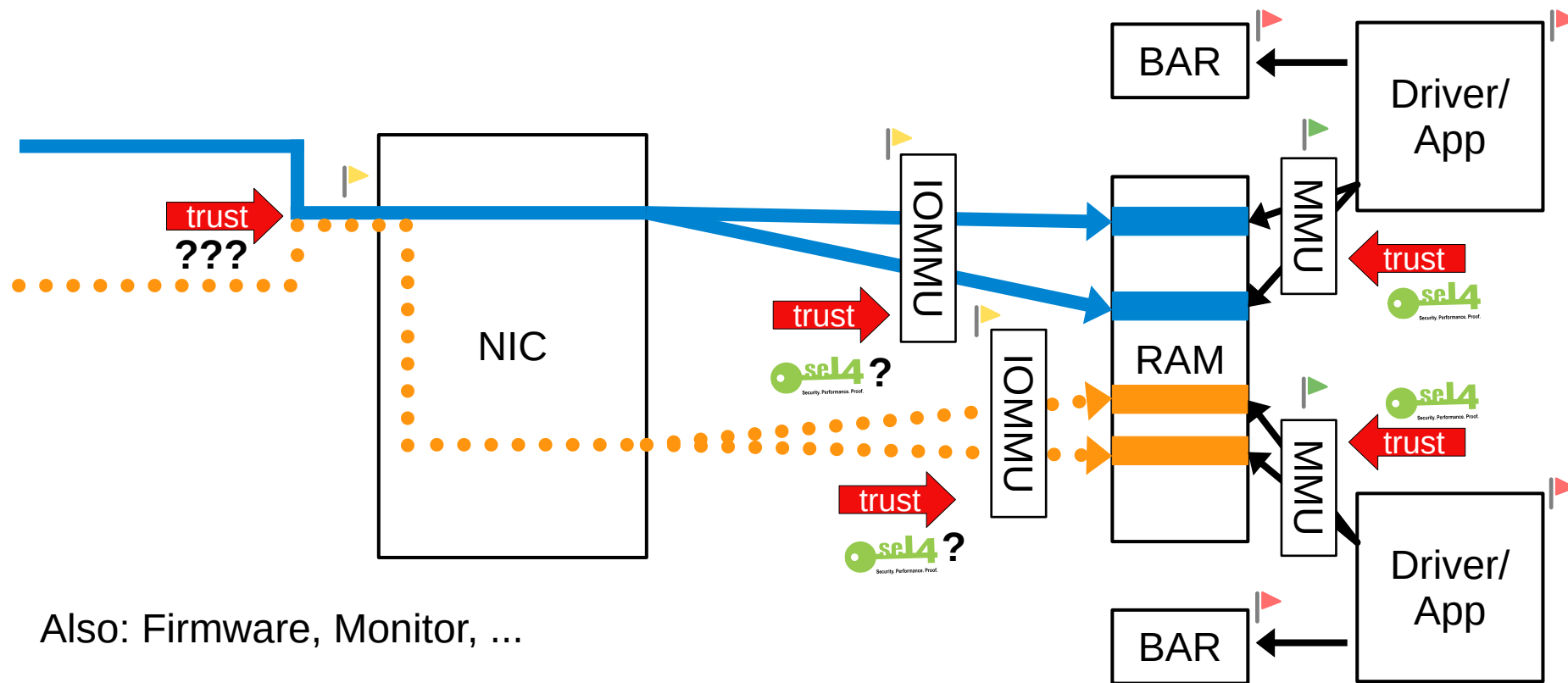


*\*well, sometimes*

# SR-IOV for components

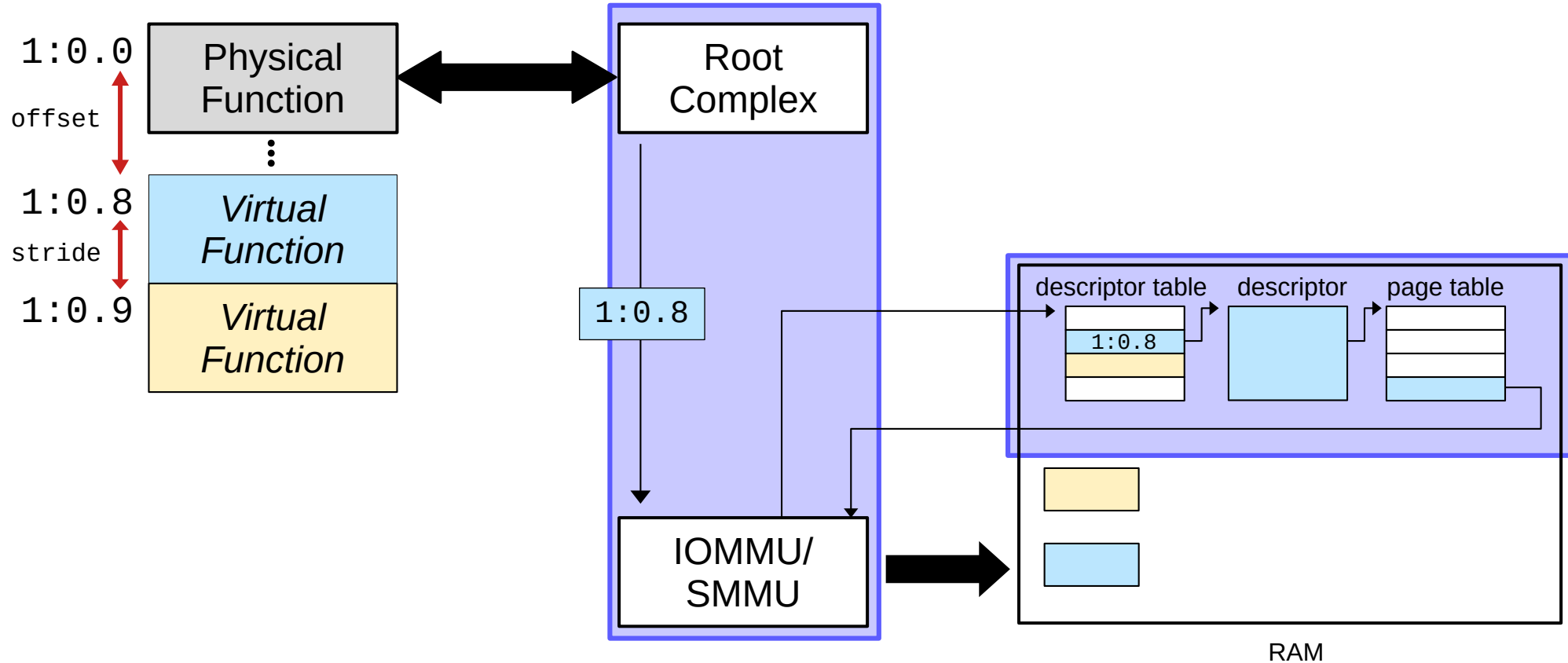


# seL4 is not the (only) root of trust

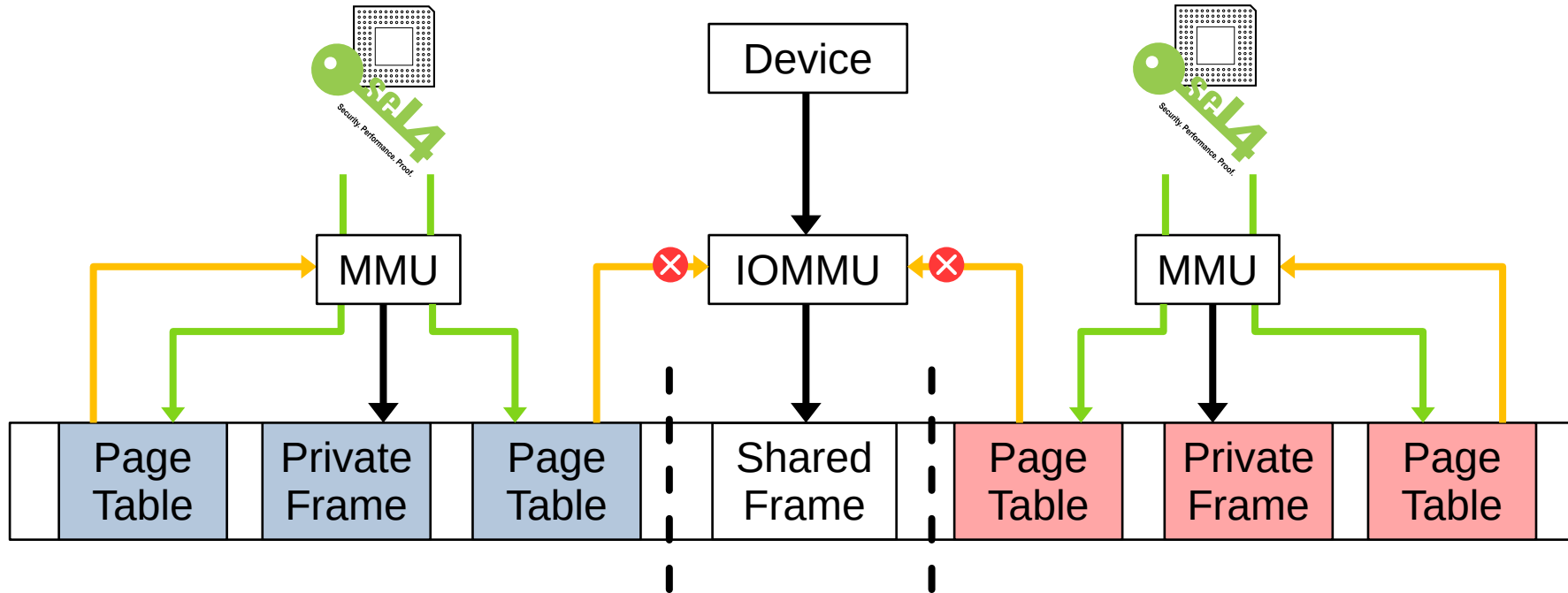


Also: Firmware, Monitor, ...

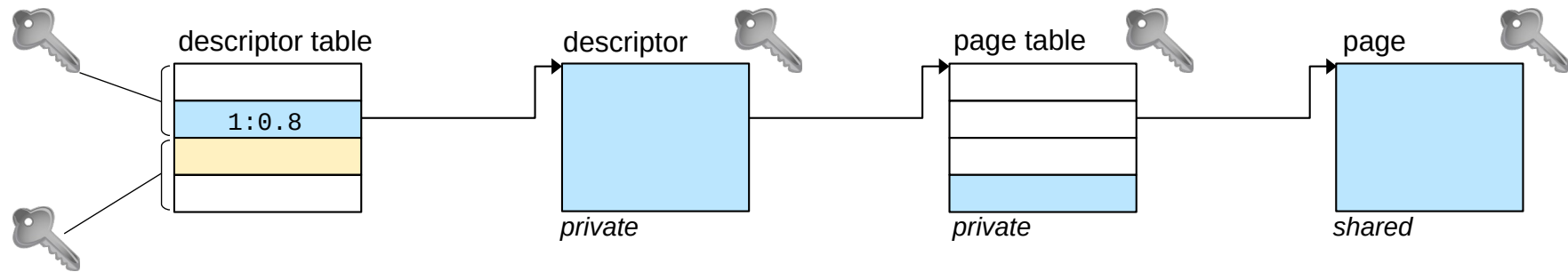
# PCI/SRIOV Basics



# Static multikernel challenges



# The IOMMU under an neutrality





# Summary

- Take x86, PCIe, “messy” HW seriously
- SR-IOV + IOMMU on seL4 multikernel will work
- seL4 is a *component* + one size does not fit all
  - A clever build system makes things *harder*
- ***We are hiring!***

# Backup slides



# Team



**Stevens Le Blond, Ph.D.**

Founder and Co-CEO

Formerly: Senior researcher, EPFL  
Led EPFL-ICRC partnership  
on cybersecurity



**Charlotte Lindsey**

Co-CEO

Formerly: Director, ICRC  
ICT, data, and  
cybersecurity policy



**Gernot Heiser, Ph.D.**

Chief Scientific Officer

Formerly: CRO, Data61  
Co-invented seL4



**David Cock, Ph.D.**

Head of Verification

Formerly: Senior researcher, ETHZ  
seL4 team



**Mathieu Mirmont**

Head of Engineering

Formerly: Co-founder,  
Ampyxpower  
high-assurance engineering  
03/09/2025



**Daniel Schwyn, Ph.D.**

Senior Engineer

Formerly: Doctoral researcher, ETHZ



**Orestis Korakitis**

Senior Engineer

Formerly: Researcher,  
Huawei, Zurich Research Center



**Vincent Bieri**

Advisor

Co-Founder,  
Nexthink (B2B unicorn)

# Cap transfer *is* coming...

- Virtual functions are *dynamic*
- Duplicating caps is expensive
- There are known approaches...

