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From Decadal Plan to actionable all-industry Roadmap

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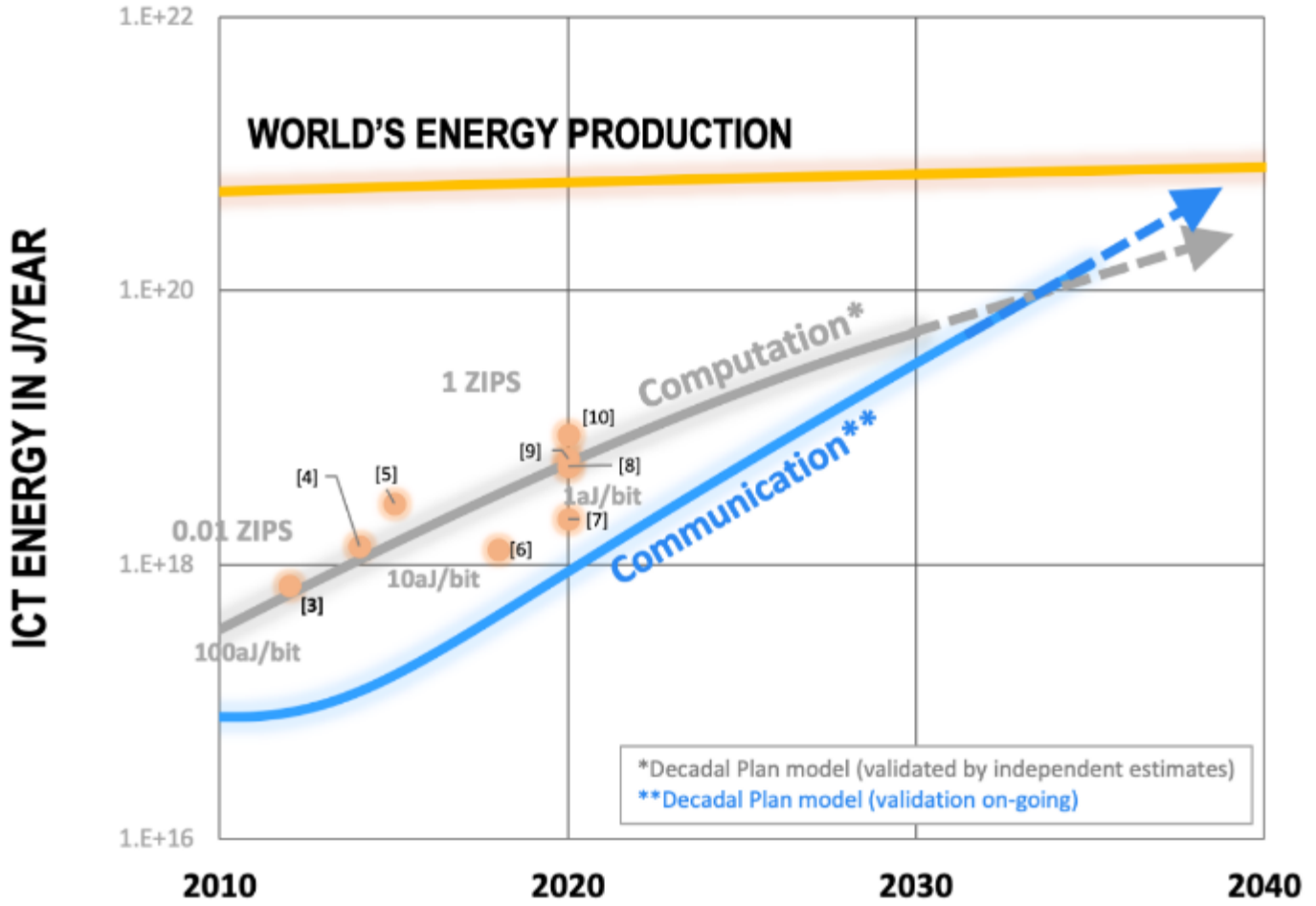
ICT ENERGY
COMPUTATION AND COMMUNICATION

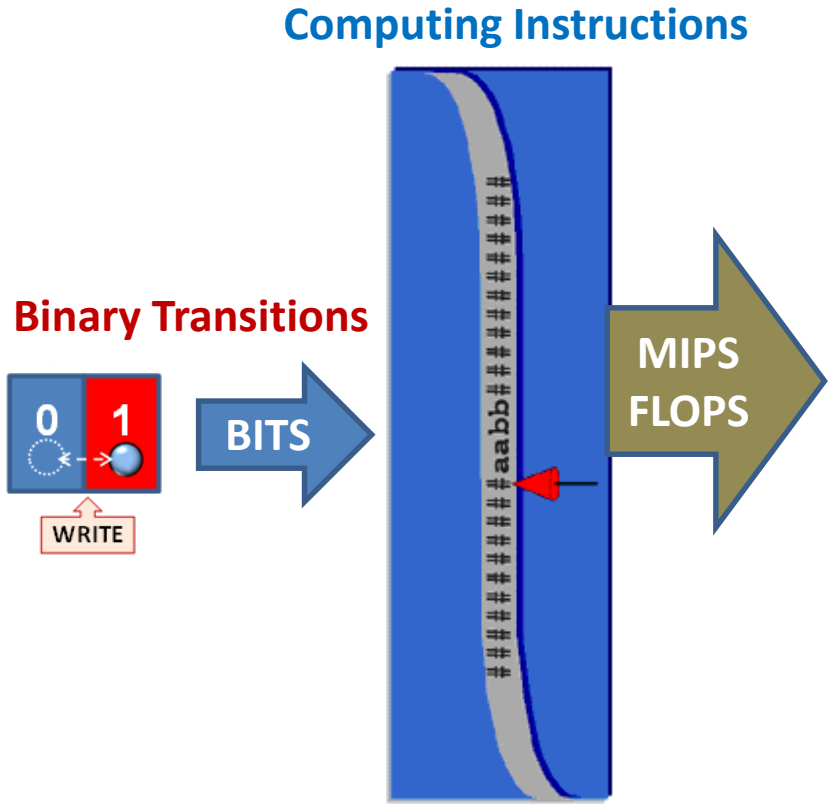


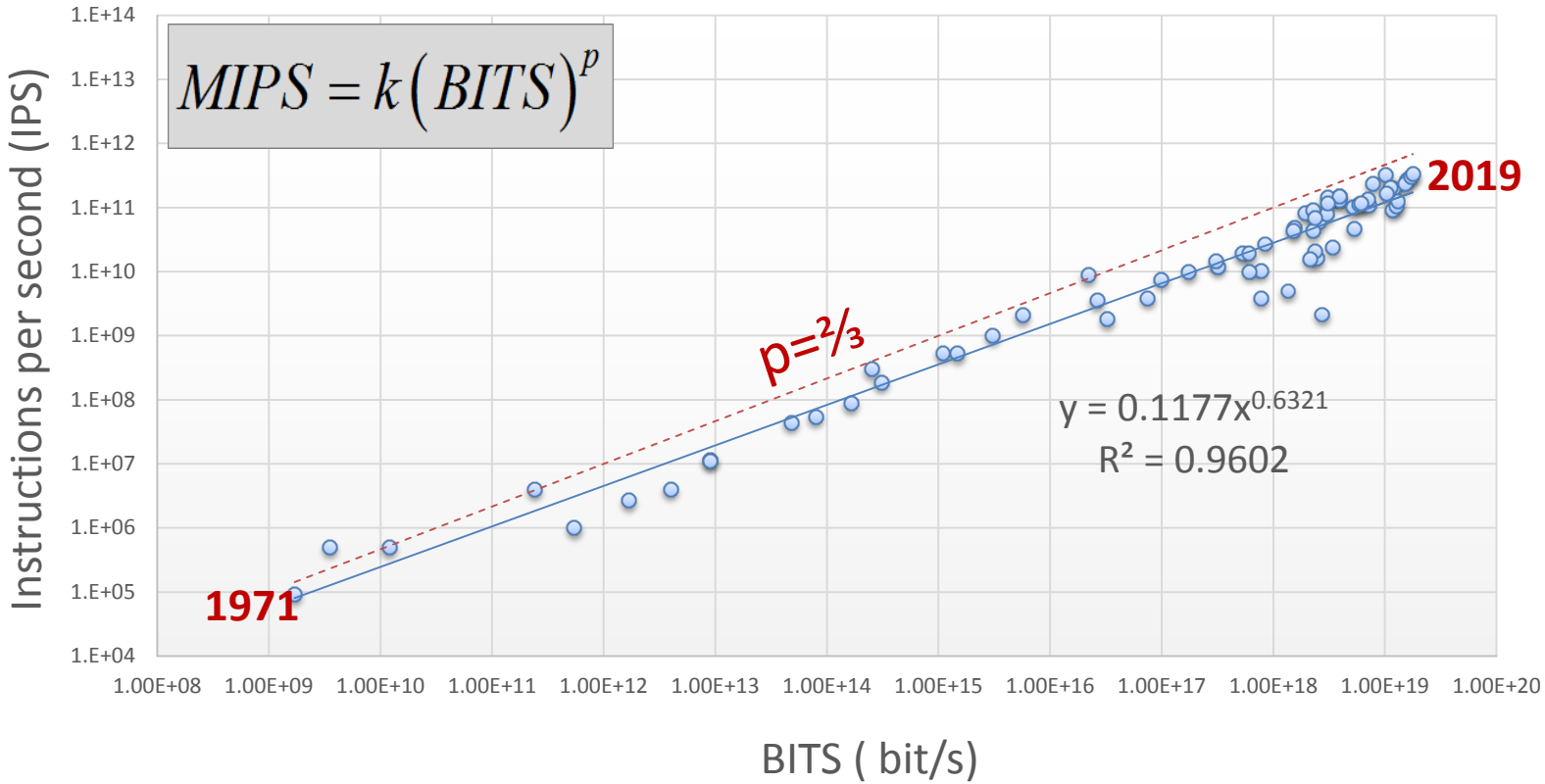
By design, the Decadal Plan focuses on WHAT to accomplish, not HOW to accomplish it.

CPU operations vs. binary transitions

$$\mu = f(\beta) = k\beta^{p}$$

k=0.1, p= 0.64 ≈ ⅔

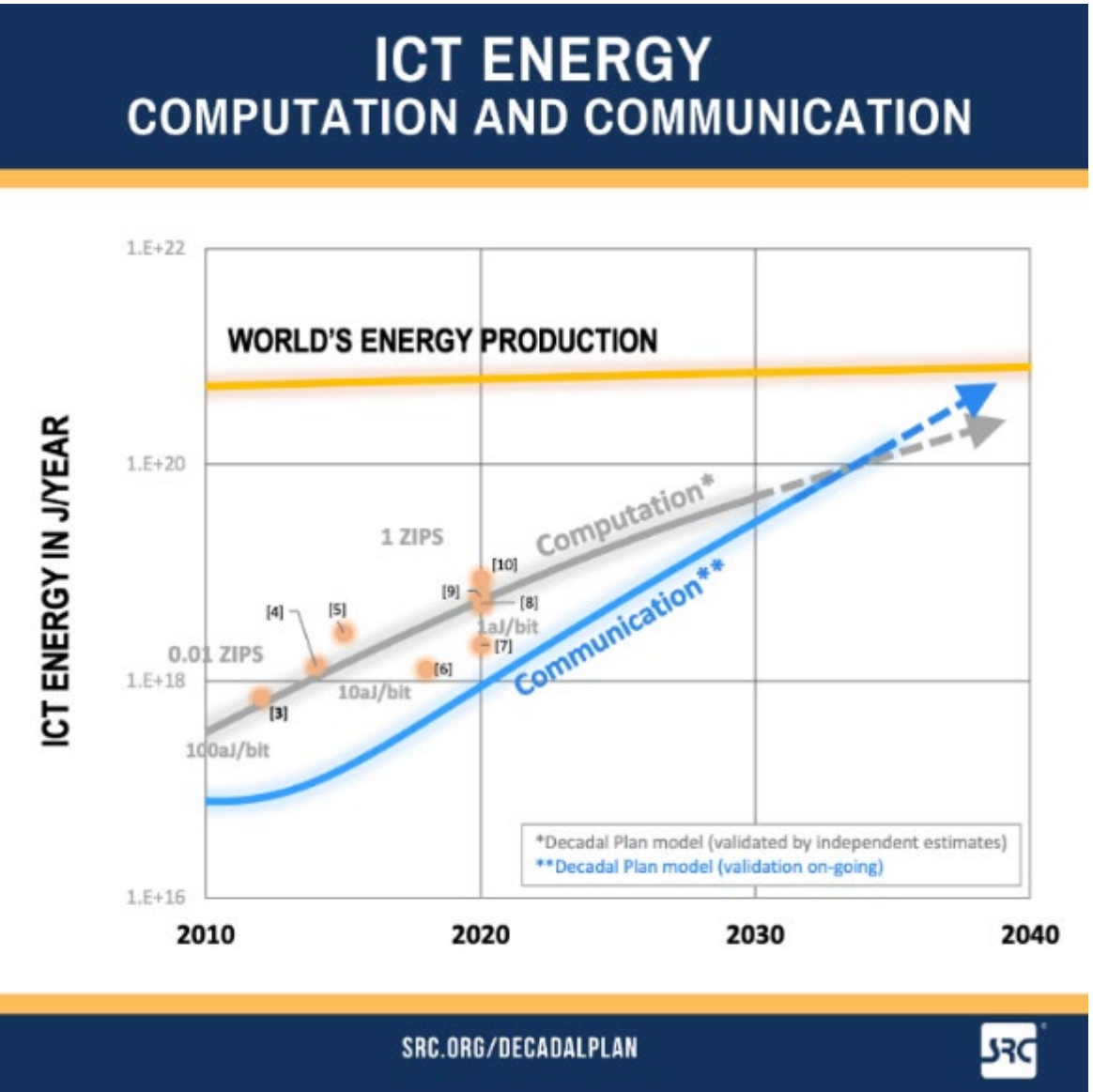




The key question is *bit-utilization efficiency* in computation

$$\beta = \alpha N_{tr} \cdot f \quad \Rightarrow \quad P = \beta E_{bit}$$

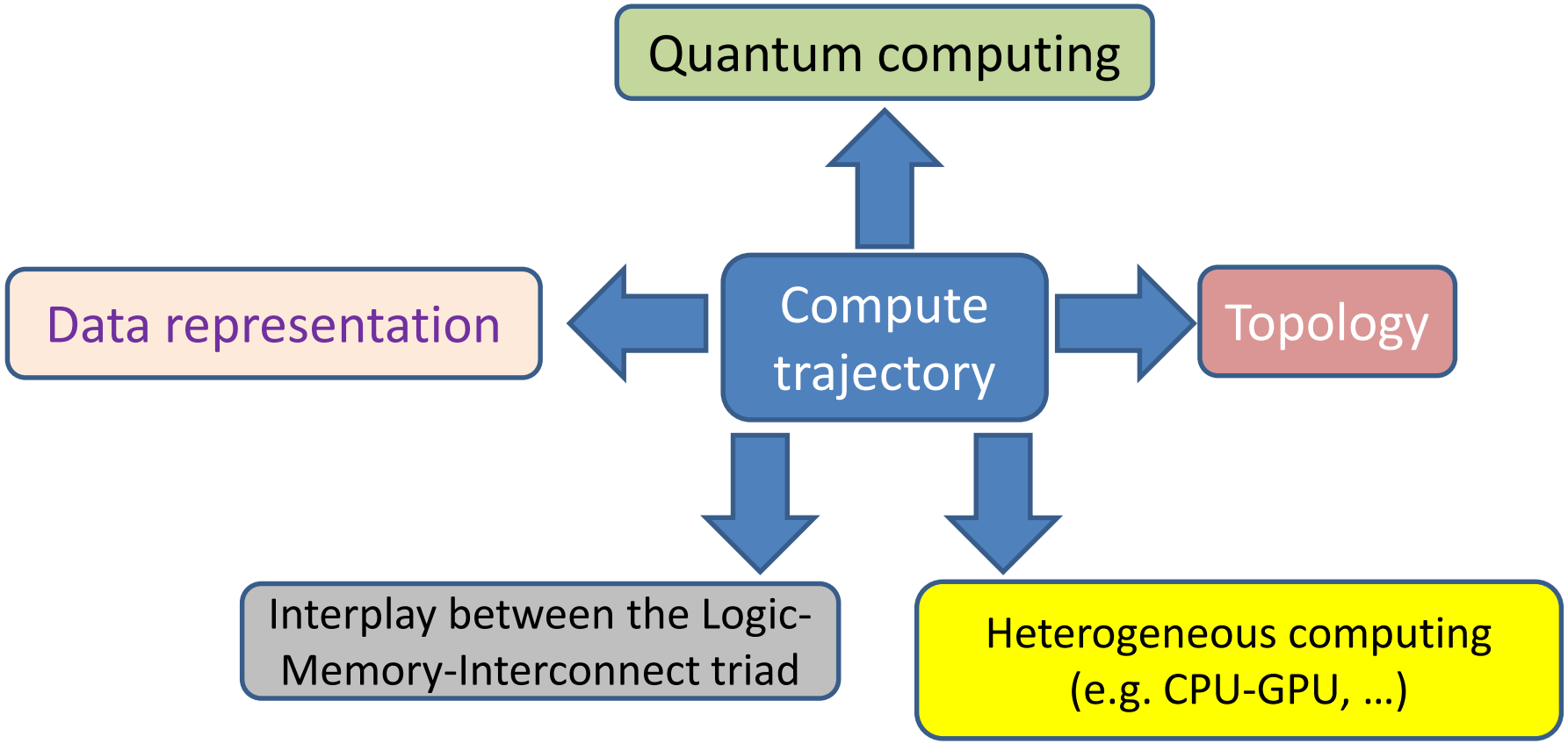
Compute Energy Challenge



$$MIPS = k\left(BITS\right)^{p}$$

- Discover compute trajectories with $p \sim 1$
- How do we get from ~2/3 to 0.9 or 1?
- What "silicon" solutions can push the coefficient toward 1?
  - Does AI?
  - Does Neuromorphic?
  - Does Quantum?

Research directions towards new compute trajectories



MAPT: A natural next step for Decadal Plan

Systems

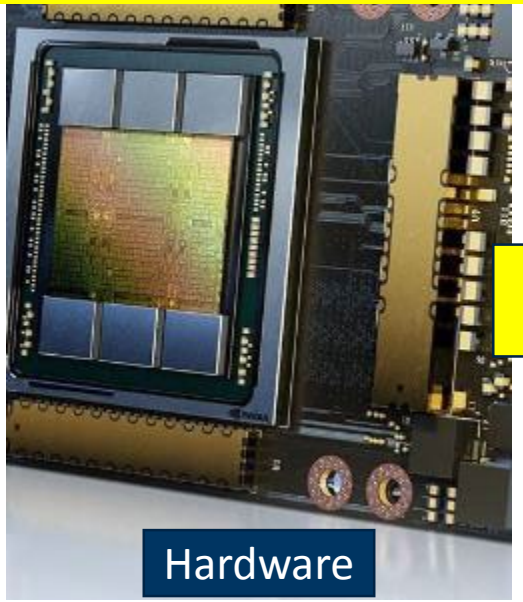
Decadal Plan

defines **WHAT** is needed

- Plan for 10 years

$$MIPS = k(BITS)^p$$

Microelectronics and Advanced Packaging Technology (MAPT) Roadmap



Hardware

MAPT Roadmap

defines **HOW** to accomplish

MAPT team is developing the first industry-wide 3D semiconductor roadmap to guide the forthcoming microelectronic revolution

Who/When/Where?

Support

CHIPS Funding

implementation plan

- Industry, academia, gov. labs
- NSTC, NAPMP
- SRC Manufacturing Inst.

The MAPT roadmap needs to be aligned with the DOE Energy-efficiency roadmap

Thank You

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