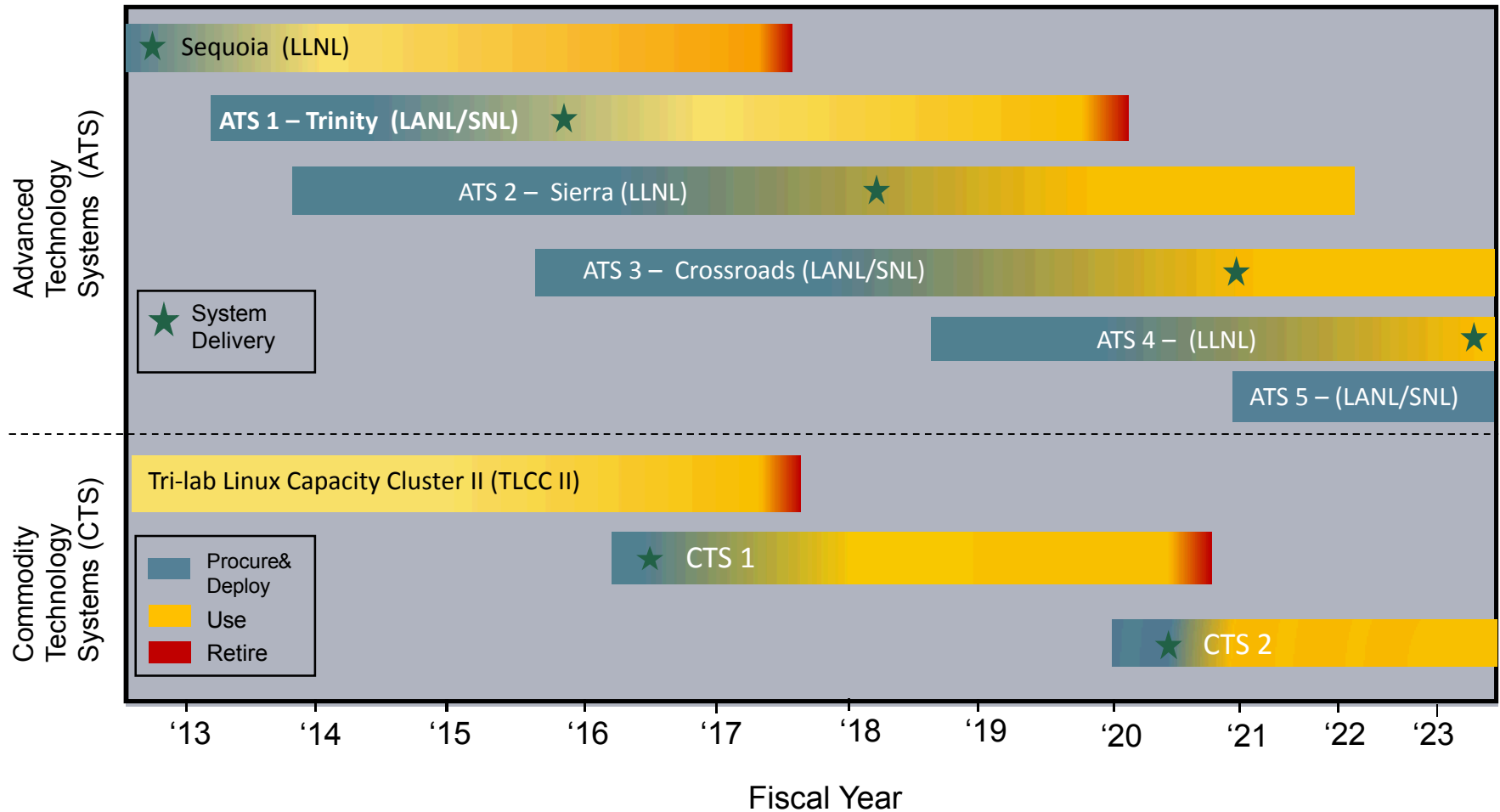# ASC NNSA Vanguard Program

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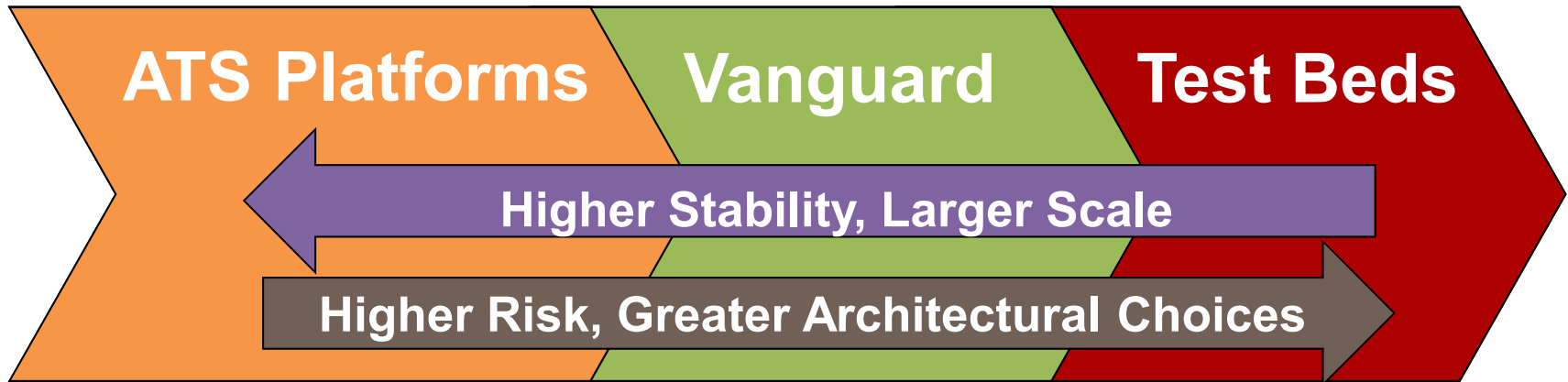
Current NNSA Architecture Strategy

Advanced Technology Systems (ATS)

- Sequoia (LLNL)
- ATS 1 – Trinity (LANL/SNL)
- ATS 2 – Sierra (LLNL)
- ATS 3 – Crossroads (LANL/SNL)
- ATS 4 – (LLNL)
- ATS 5 – (LANL/SNL)

★ System Delivery

Commodity Technology Systems (CTS)

- Tri-lab Linux Capacity Cluster II (TLCC II)
- CTS 1
- CTS 2

Legend:
- Procure& Deploy
- Use
- Retire

Fiscal Year: '13 '14 '15 '16 '17 '18 '19 '20 '21 '22 '23

VANGUARD

Problem

- We have seen a contraction in viable HPC architecture choices
  - Technology and OEM
- Our current architecture strategy does not adequately support wider participation
  - Every 2.5 years within NNSA
  - Even expanding out to ASCR is not much help
- In addition, does not allow for risk necessary to accelerate advanced technology
  - Advanced Technology Systems (ATS) is not defined the same across the tri-lab complex
    - NRE is defined and applied differently
  - Mission drivers are in conflict with risk (mission will always win)

Approach

ATS Platforms   **Vanguard**   **Test Beds**

Higher Stability, Larger Scale

Higher Risk, Greater Architectural Choices

- Bridge the gap between what we can accomplish with Testbed project and fielding an advanced technology pltform

- Vanguard is a program, not a single platform – hopefully

- Accelerate maturity of emerging technologies for ASC program

Approach (cont.)

- **Appropriate** Scale systems
  - Must be large enough to serve as proof of concept for future advanced technology systems

- **Appropriate** Investment
  - Gain and maintain vendor and collaborator attention

- **Appropriate** level of risk
  - Goals target mission workloads but not turn-key production mission support

- Delicate balance

- Might be different balance based on target technology and other factors

Vanguard 2019

- Vanguard (overall program)

- Apply Vanguard principles and field an ARM based HPC platform

- Emerging 64 bit ARM processors promise to be competitive with existing HPC processor options
  - Gaps identified in the software ecosystem

- Software ecosystems have become increasingly proprietary
  - Limits ability of the laboratories and HPC community to influence and impact

2019 ARM Platform

- **ARM 2019 platform requirements**
  - 64-bit ARM processor
  - On-package high-bandwidth memory
  - Advanced HPC interconnect
  - Analyze and address gaps in software ecosystem
- **ARM software stack effort**
  - Harden compilers, math libs, and tools
  - Pursue new usage models with a more open and modular stack
  - Tri-lab team working closely with vendors, ARM and HPC community

Significance

- **Vanguard allows the DOE to take necessary risks to ensure a healthy HPC ecosystem for future production mission platforms**
  - Increase technology choices for future ATS (and CTS) platforms
- **Prove viability of ARM as candidate for large-scale HPC platform**
  - Specifically for future ATS procurements

Current ARM platform schedule

- Rack scale Comanche ThunderX2 platform August 2017 (wave 2)
- Software Readiness Testbed (SRT) Q2CY18
- Large scale proof of concept platform Q4CY19
- Software stack testing and development underway
- RFP Status (discuss)

Architecture Futures Discussion

Space is an opportunity and a limitation