

NASA Advanced Computing Services (NACS)  
NNA15NACSL  
Questions and Answers  
January 8, 2016

Q1. Where can we find information about NAS' current high end computing systems?

A1. Information about the current high end computing environment at the NASA Advanced Supercomputing (NAS) facility can be found at <http://www.nas.nasa.gov/hecc>. Information about both NAS and the NCCS (NASA Center for Climate Simulation) HPC facility at NASA Goddard can be found through <http://hec.nasa.gov>.

Q2. How will the HPC baseline be provided?

A2. HPC baseline information can be found at the websites in A1 above. A snapshot of the HPC baseline will be provided in the RFP.

Q3. Why did the North American Industry Classification System (NAICS) Code for the NAS support contract change from 541519, Other Computer Related Services to 541513, Computer Facilities Management Services?

A3. NAICS Code 541513, Computer Facilities Management Services is the most applicable NAICS for this requirement based on the description of the NAICS code and future requirements to be completed in support of the NACS Statement of Work (SOW). As indicated by the draft SOW, NACS includes a set of services in support of the NAS facility that is broader than computer related services.

Q4. Will there be a tour of the NAS facilities during the pre-solicitation conference for NACS?

A4. Yes, there will be a tour of the NAS facilities, including a walk-through of the main computer floor in Building 258 at Ames.

Q5. Will NACS support other NASA Centers besides Goddard Space Flight Center (GSFC)?

A5. The NACS SOW includes the scope to support other NASA Centers that require advanced computing services. The requirement to actually provide advanced computing support to GSFC or other Centers might not be known until during the contract term.

Q6. How is NASA planning to get more space and power for supercomputing operations?

A6. NASA is currently using both prototype and analytical studies to evaluate options for providing additional space and power for supercomputing operations. The results of these studies, and selection of a path forward, should be complete prior to the release of the NACS RFP.

Q7. Has NASA had Contractors run its HPC facilities?

A7. No, and this is not expected to change under NACS.

Q8. What are the roles and responsibilities between the Government and Contractors?

A8. NAS operates using a Government-Contractor partnership model, where operational responsibilities are shared, and significant issues are investigated and discussed jointly, but major decisions are made by the Government. The Contractor employs the majority of technical staff at NAS, and therefore is responsible for the majority of the technical work. Most technical areas of the SOW have a Government expert who serves as Task or Subtask Requestor and Group Lead, supporting the Government oversight role. The contractor is encouraged and occasionally tasked to conduct studies, develop concepts, and draft plans for advanced computing initiatives to enhance NAS's mission impact.

Q9. Is there a timeframe when NAS will move to a new HPC architecture?

A9. No, NAS is not on a timetable to move to a new HPC architecture. NAS continually monitors advancements in HPC technologies, tests them when they seem promising, and acquires systems when they are found to offer an operational advantage over existing architectures for a sufficient fraction of the NASA HPC workload. The effectiveness of new technologies is examined using prototype or test systems prior to full expansion.

Q10. How does NAS manage user codes?

A10. The application software run on NAS HPC systems are selected by, and often developed by, NAS users. Users determine what they will run to complete their computational analyses. NAS supports users by monitoring the systems for anomalous behavior that can be traced to user codes, helping to find bugs in codes, optimizing codes, and developing workflow automation tools, such as for check-pointing or generation of results databases.

Q11. In the next 3 to 5 years, what key challenges does NAS see in migrating to a new HPC architecture?

A11. In the next 3-5 years, the pressure for NAS to migrate to more energy-efficient architectures will increase, as users of these architectures at other HPC facilities may be able to perform larger and more advanced computations. The primary challenge is finding an architecture that promises a significant cost-performance benefit over current architectures for a *sufficient set* of NASA science and engineering computations to make it cost-effective for NASA to invest in that architecture. Also, this architecture must have a roadmap of planned advancements, so that NASA's code porting effort is not a dead-end. Further, that code porting effort must be feasible, so that real (i.e., large, complex, important) NASA codes can be migrated to the improved architecture within a manageable amount of time and effort. The next challenge will be to implement an efficient and effective migration plan, including: identifying the key codes that will be feasible to move, with high-impact in accelerating/growing the computations; getting buy-in from the computational projects so that they support the migration all the way through code re-validation; and sustaining the effort for sufficient time to port a critical mass of applications to the new architecture in order to demonstrate the value to other users, who will then be motivated to migrate as well. Another challenge is achieving a world-class production computing environment, including training staff to efficiently support the new architecture, developing tools to enhance user and administration productivity, and achieving world-class availability.

Q12. What risks does NAS face?

A12. For supercomputing, the important risks are those that threaten production operations. These include: possible natural and human-caused disasters, resulting in facility damage, power loss, and/or equipment damage; delivery of unstable or buggy products by vendors, resulting in slow or failed transition to production; failure of complex operational hardware or software systems, resulting in loss of availability or productivity; inability to get timely approval of facility modifications to support needed future HEC systems; that laws, policies, or IT security threats may result in excessive operational constraints; and that NAS does not adequately predict or prepare for technology changes, such that NASA computational capabilities fall behind those of our counterparts.

For other Advanced Computing, the challenge is to help NASA assess which technologies are worth strategic investment, to help define a path for exploring and advancing these technologies in the absence of roadmaps, and to enhance and apply NAS expertise in support of new areas of computing for the agency. The risk is that NAS might inadequately understand or incorrectly predict the potential of a new technology, leading to excessive or inadequate NASA investment.

Q13. Is storage an issue?

A13. NAS user data and storage resources are expanding rapidly, and data-intensive workflows and computing are an increasing challenge. In particular a major issue is the development of an I/O infrastructure that can efficiently handle the increasing I/O requirements of computations that

are scaling to massive numbers of nodes. We can foresee that the cost and management of storage will offer greater challenges for NAS in the future.

Q14. From the six key technical areas (High Performance Computing Environment, Network and Communications, User Services, Facility Operations, Applications Services, Visualizations and Data Analysis), what are the key important areas?

A14. All technical areas within the Statement of Work (SOW) are important and key to NASA mission of success in providing world-class delivery of advanced computing services. The HPC environment is currently the most visible service that NAS provides to the agency, so optimizing the HPC service often defines the other services (technical areas) needed, and drives how NAS implements those other services to optimize HPC.

Q15. There are two buildings, will there be a third building?

A15. This is to be determined. The NAS facility was built approximately 30 years ago. While the facility has shown remarkable flexibility and upgradeability over this time, NAS currently faces facility-related constraints that are slowing the growth in HEC capacity that NAS provides. Specifically, NAS is operating at the limit of electrical power and cooling in the current N258 facility. As a result, when new HEC systems are installed, an equivalent amount of older systems (with lower but still useful compute power) must be removed. Further, the NAS facility's PUE (power usage effectiveness), while competitive with modern HEC facilities, is still higher than that of state-of-the-art data centers in industry, meaning that NAS may be using more electrical power than necessary for cooling and other overheads. NAS is challenged to determine and pursue the most cost-effective approach to create electrical and cooling capacity headroom at a lower PUE, to enable NAS to continue to provide the maximum computing capacity within facility and funding constraints. NAS is currently studying whether the best solution to resolving facility constraints is to pursue a new building or some other approach. The approach should be chosen before the NACS RFP is released.

Q16. Does the Government manage the acquisitions or assist with the acquisitions?

A16. The government closely manages major acquisitions. However, members of the contractor staff provide key technical support. The NACS contract may be used as the procurement vehicle. For smaller acquisitions, the contractor may be asked to conduct market research, gather quotes, and propose a specific purchase. In all cases, the Government approves purchases.

Q17. Does the Government allow Contractors to work remotely?

A17. Yes, the Government allows the contractor to manage its workforce, including remote work, unless restricted by contract terms. Contractor policies such as remote work can impact performance, which NAS evaluates periodically. In certain cases, a task statement of work will indicate when on-site work is necessary, such as periodic computer room inspections, hands-on system and network administration, facility work, or use of custom equipment.

Q18. Is the NASA ARC responsible for the network for the agency?

A18. No. The NASA CIO oversees the NASA network. See <http://itcd.hq.nasa.gov/NICS.html>.

Q19. Is the current contract involved with NEX?

A19. Yes, NAS operates, administers, and ensures IT security for the NEX compute and storage environments, as well as the NEX website, <https://nex.nasa.gov>. NAS also supports NEX accounts and provides NEX project management.

Q20. Is the Government planning on creating any other partnerships with Amazon for Cloud?

A20. The Government is open to any partnerships that would benefit the NASA mission.

Q21. What are the aspects of addressing NAS's facilities issues?

A21. The primary, inter-related aspects of NAS's facility challenges are: NASA's overall advanced computing requirements; power, cooling, and space capacity and efficiency to meet those requirements; the most productive and efficient computer architectures; and cost and staffing implications. NASA's HPC requirements are always far greater than available funding will provide, so NAS seeks to provide the greatest mission impact within the allocated budget. Optimal approaches to increasing NAS facility space, power, and cooling capacities are being studied. NAS is always researching and testing HPC and other advanced computing architectures to determine the most efficient and productive for NASA's workload. Cost and staffing implications are considered as part of any facility change and in developing a long-term strategy.

Q22. Has the Government considered a remote facility or another computer facility?

A22. Yes, the Government is exploring these and other options for mitigating current facility constraints.

Q23. What is the current utilization?

A23. The NAS System Status web page at [http://www.nas.nasa.gov/hecc/support/system\\_status.html](http://www.nas.nasa.gov/hecc/support/system_status.html) shows up-to-the-minute statistics on current utilization. You can find historical utilization data at [http://www.nas.nasa.gov/hecc/about/hecc\\_historic.html](http://www.nas.nasa.gov/hecc/about/hecc_historic.html), and at [http://www.nas.nasa.gov/hecc/about/hecc\\_monthly.html](http://www.nas.nasa.gov/hecc/about/hecc_monthly.html).

Q24. What does NAS foresee happening with quantum computing?

A24. Quantum computing is currently in the exploratory stage, and mission impact is not certain. NASA's on-going investment and use of quantum computing depends on how much promise of future mission impact is shown by early research, and how the technology evolves and advances.

Q25. Is security an area where you are seeing any challenges?

A25. Yes, IT security is a significant concern and challenge for NAS, as it is for most organizations, since IT is a pervasive enabler of mission success. NAS faces the challenge of maintaining both strong security and productive access for users who may be anywhere in the world. NAS follows federal requirements for IT security, and has pioneered improved IT security approaches in order to achieve productive access with strong security.