National Science Foundation

Part 2: Computing and Networking Capacity
(for research and instructional activities)

FY 2013 Survey of Science and Engineering Research Facilities

Who should be contacted if clarification of Part 2 networking or computing answers is necessary?

	Contact 1	Contact 2
Name:		
Title/position:		
Telephone:		
Email address:		

Please complete the questionnaire and send it to your institutional coordinator according to the arrangements you made with your institutional coordinator. You may complete this questionnaire online at www.facilitiessurvey.org. You will need to click on "Part 2" and then enter the survey ID and password obtained from your institutional coordinator.

If you have a question, please contact Lorraine Lewis via e-mail at facilitiessurvey@westat.com or call 1-888-811-1838. The survey director at the National Science Foundation is Mr. Michael Gibbons. If you do not have exact figures for any part of this questionnaire, please provide estimates.

Thank you for your participation.

- **Question 1 on total bandwidth** has been modified to allow for precise reporting of bandwidth.

- **Question 2 on bandwidth through consortia** has been modified to clarify that Internet2 and National LambdaRail should not be considered consortia for the purposes of this question.

- **Question 3 on connections to Internet2 and National LambdaRail** has been added.

- **Question 4 on dark fiber** has been modified to clarify that indefeasible rights of use should be reported and to capture ownership of dark fiber for the next fiscal year.

- **Questions 5 through 11 on centrally administered high-performance computing (HPC)** have been modified to include only systems that are 10 teraflops or faster.

- **Question 5 on architectures for centrally administered HPC** has been modified to drop the restriction that only systems that are "generally available to the campus community" should be considered. In addition, the category for special purpose architectures has been dropped; such architectures can be reported as "other architecture."

- **Question 7 on centrally administered HPC systems** has been added.

- **Questions 9 through 11 on storage for centrally administered HPC** have been modified to allow for precise reporting of storage capacity.

- **Question 12 on archival storage from external cloud services** has been added.

- **Question 13 on research computing from external cloud services** has been added.

- **Question 14 on survey completion time** has been added.

- **Twelve questions from the last survey cycle have been deleted** (question numbers shown below refer to those appearing in the FY 2011 survey):

  – Internet2 bandwidth (Question 2)

  – National LambdaRail bandwidth (Question 3)

  – Federal government research network connections (Question 4)

  – Desktop port connections (Question 6)

  – Speed on your network (Question 8)

  – Wireless connections (Question 9)

  – Comments on networking (Question 10)

  – Centrally administered clusters of 1 teraflop or faster (Question 13)

  – Centrally administered MPP of 1 teraflop or faster (Question 14)

  – Centrally administered SMP of 1 teraflop or faster (Question 15)

  – Centrally administered experimental/emerging computing systems of 1 teraflop or faster (Question 16)

  – Centrally administered special purpose computing systems of 1 teraflop or faster (Question 17)

Questions 1–4 include networking capacity for: research, instruction, and residence halls.

1. At the end of your FY 2013, what was your institution's total bandwidth including the commodity internet (Internet1), Internet2, and the National LambdaRail? What is your estimate of this total for your institution at the end of your FY 2014?

    Bandwidth is the amount of data that can be transmitted in a given amount of time, measured in bits per second, e.g. megabits per second (Mbps) or gigabits per second (Gbps).

    Commodity internet (Internet1) is the general public, multiuse network often called "the Internet."

    Internet2 is a high-performance IP (layer 3) network service with options for Layer 2 and Layer 1 networking. The network was designed for research and education to provide leading-edge production services as well as a platform for the development of new networking ideas and protocols.

    National LambdaRail (NLR) is an advanced optical network infrastructure for research and education. NLR enables cutting-edge exploration in the sciences and network research.

    Please do <u>not</u> include:

    - Redundant connections, which are not normally active but available if a failure occurs with the active connection; or
    - Burstable bandwidth.

<div align="center">

Speed

(Mark one "X" for each row.)

</div>

Fiscal year	Total bandwidth	Mbps	Gbps
a. At the end of FY 2013...	_____	☐	☐
b. Estimated at the end of FY 2014.......................................	_____	☐	☐

2. At the end of your FY 2013, did your institution obtain any of its bandwidth through a consortium? Do you expect to obtain bandwidth through a consortium at the end of your FY 2014?

   A **consortium** is a collaboration of any combination of educational institutions (e.g., university system, regional collaboration), state and local agencies, vendors, or non-profit organizations with the purpose of coordinating and facilitating networking activities.

   Bandwidth is the amount of data that can be transmitted in a given amount of time, measured in bits per second, e.g. megabits per second (Mbps) or gigabits per second (Gbps).

   For the purposes of this question, Internet2 and NLR are not considered to be consortia.

   (Mark one "X" for each row.)

Fiscal year	Yes	No
a. Bandwidth through consortia at the end of FY 2013.............................	☐	☐
b. Expect bandwidth through consortia at the end of FY 2014....................	☐	☐

   Please provide the names of all consortia through which you expect to obtain bandwidth at the end of your FY 2014.

   _____
   _____
   _____
   _____

3. At the end of your FY 2013, did your institution have connections to Internet 2 or National LambdaRail? Do you expect to have connections to either of these networks at the end of your FY 2014?

   Internet2 is a high-performance IP (layer 3) network service with options for Layer 2 and Layer 1 networking. The network was designed for research and education to provide leading-edge production services as well as a platform for the development of new networking ideas and protocols.

   National LambdaRail (NLR) is an advanced optical network infrastructure for research and education. NLR enables cutting-edge exploration in the sciences and network research.

   (Mark one "X" for each row.)

At the end of FY 2013	Yes	No
a. Internet2...	☐	☐
b. National LambdaRail..	☐	☐

Expected at the end of FY 2014	Yes	No
c. Internet2...	☐	☐
d. National LambdaRail..	☐	☐

4. At the end of your FY 2013, did your institution own or have an indefeasible right of use (IRU) contract for any dark fiber to your institution's internet service provider (ISP) or between your institution's buildings? Do you expect to own or have an indefeasible right of use contract (IRU) for any dark fiber to your ISP or between your institution's buildings at the end of your FY 2014?

   Dark fiber is fiber-optic cable that has already been laid but is not being used. Include only fiber that was dark (i.e., unlit) when it was purchased by your institution.

   Indefeasible right of use (IRU) is a contractual agreement between the operators of a communications cable, such as a fiber optic network, and a client. An IRU provides for the exclusive, unrestricted, and indefeasible right to use one, a pair, or more strands of a fiber cable for any legal purpose over a given period of time.

(Mark one "X" for each row.)

At the end of FY 2013   Yes   No

a.   To your institution's ISP.. ☐   ☐

b.   Between your institution's buildings................................... ☐   ☐

Expected at the end of FY 2014   Yes   No

c.   To your institution's ISP.. ☐   ☐

d.   Between your institution's buildings................................... ☐   ☐

If you would like to provide any comments regarding your institution's networking, please include them in Question 15 at the end of the survey.

of 10 teraflops or faster

5. At the end of your FY 2013, did your institution provide centrally administered high-performance computing (HPC) of 10 teraflops or faster at peak performance for each type of architecture listed below? If you had a high-performance computing system (10 teraflops or faster) with an accelerator component (e.g., GPU, Intel MIC), please report that system under the one most appropriate architecture below.

    Centrally administered HPC is located within a distinct organizational unit with a staff and a budget, the unit has a stated mission that includes supporting HPC needs of faculty and researchers.

    If some of your high-performance computing systems are slower than 10 teraflops and some are faster, please report only the systems that are 10 teraflops or faster.

                                                                            Had at end of FY 2013

                                                                            (Mark one "X" for each row.)

    Centrally administered HPC architectures   Yes   No

    a. **Cluster**... ☐ ☐

        This architecture uses multiple commodity systems each running its own operating system with an Ethernet based (e.g., 10Mb/100Mb/GigE) or high-performance interconnect network (e.g., InfiniBand or Myrinet) to perform as a single system.

    b. **Massively parallel processors (MPP)**.. ☐ ☐

        This architecture uses multiple processors within a single system with a specialized high-performance interconnect network. Each processor uses its own memory and operating system (e.g., IBM Blue Gene, Cray XT5 and XE6).

    c. **Symmetric multiprocessors (SMP)**.. ☐ ☐

        This architecture uses multiple processors sharing the same memory and operating system to simultaneously work on individual pieces of a program (e.g., SGI Altix UV, HP Superdome, IBM Power 775).

    d. **Parallel vector processors (PVP)**.. ☐ ☐

        This architecture uses multiple vector processors sharing the same memory and operating system to simultaneously work on individual pieces of a program.

    e. **Experimental/Emerging architecture** *(Please describe.)*........................ ☐ ☐

        This architecture uses technologies not currently in common use for HPC systems.

        _____

    f. **Other architecture** *(Please describe.)*.. ☐   ☐

        _____

6. How many of the centrally administered high-performance computing systems you reported in Question 5 (a-f) have accelerators (e.g., GPU, Intel MIC)?

If your institution did not report any centrally administered HPC, check this box and go to Question 13................................. ☐

Number of systems with accelerators *(If none, enter "0.")*...................... _____ systems

7. At the end of your FY 2013, what was the peak theoretical performance of (a) **all** your centrally administered HPC systems of 10 teraflops or faster, and (b) your ***fastest*** system? What was the architecture of your fastest system? Include only HPC systems that are centrally administered.

   If some of your systems for high-performance computing are slower than 10 teraflops and some are faster, please report only the systems that are 10 teraflops or faster.

   If you have only one HPC system that is 10 teraflops or faster, report the same number for rows a and b.

   Number of
   teraflops

   a. All systems of 10 teraflops or faster................. _____

   b. Fastest system of 10 teraflops or faster.............. _____

   c. Architecture of fastest system reported in (b) above. See question 5 for architecture definitions.
   (Mark one "X")

   Cluster.. ☐
   Massively parallel processor (MPP)................... ☐
   Symmetric multiprocessor (SMP)...................... ☐
   Parallel vector processor (PVP)........................ ☐
   Experimental/Emerging...................................... ☐
   Other.. ☐

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8. During your FY 2013, which types of external users listed below used any of your institution's centrally administered HPC of 10 teraflops or faster?

Used your HPC during
FY 2013

(Mark one "X" for each row.)

Type of external user	Yes	No	Uncertain
a. Colleges and universities... Include public and private academic institutions and systems.	☐	☐	☐
b. Governments... Include local, state, and regional jurisdictions.	☐	☐	☐
c. **Non-profit organizations**... Include legal entities chartered to serve the public interest and that are exempt from most federal taxation.	☐	☐	☐
d. **Industry**... Include for-profit companies, either publicly or privately held.	☐	☐	☐

e...**Other** *(Please describe.)*

☐ .... ☐

_____

_____

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9. At the end of your FY 2013, what was the total **usable** online storage available for centrally administered HPC of 10 teraflops or faster?

   Usable storage is the amount of space for data storage that is available for use after the space overhead required by file systems and applicable RAID (redundant array of independent disks) configurations is removed.

   Online storage includes all storage providing immediate access for files and data from your HPC systems (of at least 10 teraflops). Storage can be either locally available to specific HPC systems or made available via the network. For example, storage may be available via SAN (storage area network) or NAS (network attached storage) environments.

   (Mark one "X")

	Storage	Terabytes	Petabytes
Usable online storage at the end of FY 2013 *(If none, enter "0.")*..	_____	☐	☐

10. At the end of your FY 2013, how much of the usable online storage reported in Question 9 was shared storage?

   Usable storage is the amount of space for data storage that is available for use after the space overhead required by file systems and applicable RAID (redundant array of independent disks) configurations is removed.

   Online storage includes all storage providing immediate access for files and data from your HPC systems (of at least 10 teraflops). Storage can be either locally available to specific HPC systems or made available via the network. For example, storage may be available via SAN (storage area network) or NAS (network attached storage) environments.

   Shared storage includes the portion of online storage that is available simultaneously to multiple HPC systems (of at least 10 teraflops) via a network making use of SAN, NAS, file system mounting, or similar technologies.

   (Mark one "X")

	Storage	Terabytes	Petabytes
Usable shared storage at the end of FY 2013 *(If none, enter "0.")*..	_____	☐	☐

11. At the end of your FY 2013, what was the total archival storage available specifically for centrally administered HPC of 10 teraflops or faster? ***Do not*** include backup storage.

Archival storage can be either on-line or off-line. It is typically long-term storage for files and data and does not support immediate access from your HPC resources.

	Storage	*(Mark one "X")*	
		Terabytes	Petabytes
Archival storage at the end of FY 2013 *(If none, enter "0.")*..	_____	☐	☐

12. What percentage of the archival storage reported in Question 11 was provided by external cloud services? Do you expect to obtain or increase archival storage capacity provided by external cloud services in FY 2014?

Archival storage can be either on-line or off-line. It is typically long-term storage for files and data and does not support immediate access from your HPC resources.

Cloud services are the use of external computing resources that are delivered as a service over a network (typically the Internet).

a. Percent of archival storage reported in Question 11
    provided by cloud services *(If none, enter "0.")*..._____%

                                                      Percent

(Mark one "X")

          Yes   No

b. Expect to obtain or increase archival storage provided by cloud services in FY 2014...............☐   ☐

13. During your FY 2013, did your institution obtain any research computing cycles from external cloud services? Do you expect to obtain any research computing cycles from external cloud services during your FY 2014? Were any of these research computing cycles obtained through a central IT department?

Cloud services are the use of external computing resources that are delivered as a service over a network (typically the Internet).

(Mark one "X" for each row.)

During FY 2013   Yes   No

a.   Computing cycles from external cloud services......................☐   ☐
b.   If Yes to (a), obtained through central IT department..............☐   ☐

Expected during FY 2014   Yes   No

c.   Computing cycles from external cloud services......................☐   ☐
d.   If Yes to (c), obtained through central IT department..............☐   ☐

Please provide the names of all the external cloud service providers from which your institution obtained research computing cycles.

_____
_____
_____
_____

14. Considering all offices involved, approximately how long did it take your institution to complete Part 2 of this survey? Please round to the nearest hour. If it took less than 1 hour, report 1 hour.

         Number of hours *(rounded to nearest hour)*.._____

Question 15:   **Comments**

15. Please add any comments for Part 2 below.

     _____
     _____
     _____
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Thank you. This is the end of Part 2. Please send this part of the survey to your institutional coordinator or enter your responses into the web survey according to the arrangements you made with your institutional coordinator.