WHITE PAPER

Best Practices for Writing an RFP for the Acquisition of High Performance Computing Equipment

Prepared by

advanced clustering technologies, inc.

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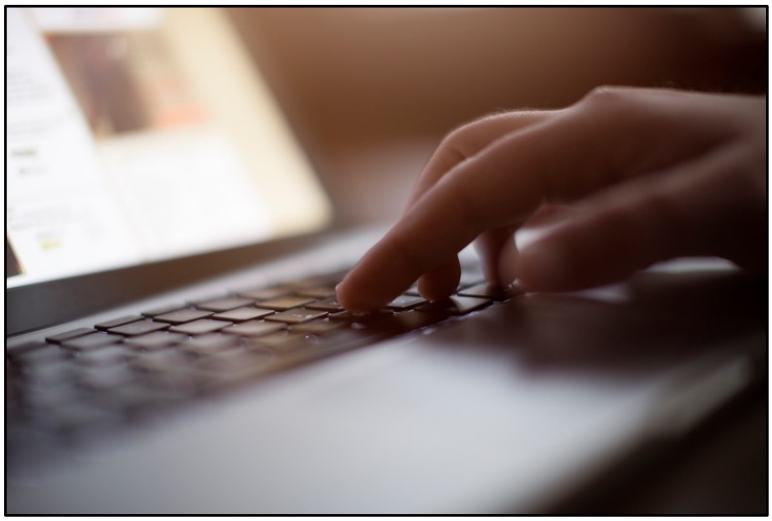
Introduction

In our 18+ years in business as a provider of high performance computing clusters, servers, storage solutions and workstations, we at Advanced Clustering Technologies have seen hundreds of Requests for Proposals (RFPs).



We have seen successful RFPs that were completed with timelines intact. We have also seen RFPs that were incomplete, resulting in broken timelines and/or re-bids. That is a painful road, one we hope to help you avoid with this white paper.

This white paper is possible through the support of our customers, many of whom agreed to share their RFP writing experiences. We want to thank the following recent RFP writers who contributed mightily to this white paper:

William Garrick
Manager, Research Computing
Portland State University

Doug Jennewein*
Director of Research Computing
University of South Dakota
* *Jennewein has since moved on to Arizona State University.*

Dr. Evan Lemley
Assistant Dean, College of Math and Science
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Dr. Gopinath Subramanian
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University of Southern Mississippi

RFPs by the numbers

Advanced Clustering did an analysis of all RFPs that we saw in 2018, and the results of that analysis are being shared here:

48 was the *estimated* average number of days until the award is made as published in the RFP.

80 was the *actual* average number of days until the award was made.

115 was the longest number of days between the issuance of an RFP and the award announcement. This particular university had estimated this would take 55 days.

8% of the RFPs we saw met their published deadlines for making an award announcement.

Worst case scenarios:

36% of RFPs were cancelled and later reissued due to technical requirement issues.

One RFP was delayed by one entire year. The original draft had to be completely re-written and re-issued due to insufficient technical details

RFP Q&As:

38 was the average number of questions submitted during the initial Q&A period.

98 was the most number of questions asked during one university RFP's Q&A period.

4 was the average number of amendments issued to fix technical issues in the RFP.

What does it mean?

The numbers we have shared here clearly demonstrate the importance of planning ahead and getting the technical details of your RFP correct the first time. Failure to do so will result in delays and, quite possibly, the need for a re-issuance of the RFP.

First Things First: Information Gathering

Information gathering is the first step toward writing your RFP, and there are a number of people who have information to help you through the process. They include:

- your purchasing department
- your datacenter personnel
- outside vendors
- your peers at other universities
- the other PIs (assuming you won a grant)

Your Purchasing Department

One of your first meetings should be with your purchasing department to discuss the details of the equipment you plan to purchase and get answers to key questions, including:

Is an RFP the right way to facilitate this purchase?

The are other kinds of proposal request documents that you want want to use. Ask your purchasing department which format you should use. Other options include:

- Request for Quote (RFQ)
- Invitation for Bid (IFB)
- Invitation to Negotiate (ITN)

Has purchasing dealt with ordering HPC hardware before?

This is important to ask because if they have done this before, they may have tools or advice that can help you. If there is no experience with RFPs for HPC hardware, you will be collaborating together to successfully navigate the process.

Is Board of Regents approval required for this purchase?

In some states, grant winners are required to get approval from the state Board of Regents prior to starting the purchasing process. If you need such approval, you will need to get on the board's agenda, which could affect your RFP timeline.

Are there state laws/university requirements to follow?

You will want to make sure your RFP is in full compliance with all relevant laws and requirements. It's very important to find out if you are allowed to include your budget amount in your RFP. If not, you will need to make sure you're including enough detail about your new cluster to get the desired responses.

Is there a template you can use for writing your RFP?

Most RFP templates are designed for equipment purchases other than HPC. It's common for templates to only ask for Product Name,

Manufacturer Name and Part Number. It's important to discuss with your purchasing department the ways in which HPC hardware is more complex than other kinds of equipment. The template will likely only be a starting point for you. You will need to expand the information you include in the RFP to ensure vendors provide complete responses.

Are there examples of successful RFPs I can review?

Because RFP templates are typically not designed for HPC equipment purchases, it's helpful to take a look at RFPs that have been successful in the past. If your purchasing department cannot provide sample RFPs, reach out to your peers at other universities or ask outside vendors for suggestions about where to find examples of strong RFPs.

Are there scoring guidelines I need to follow?

Your scoring system is critical to the success of your RFP. It's not only going to be the thing that guides you through the evaluation process. It's going to be the means by which you select the winning proposal. It's important that you understand how your RFP will be scored before you begin writing it. Here are some questions to ask your purchasing department:

- Am I required to accept the lowest bid or can I make a decision based on the best fit?
- Does the university have a scoring system in place that I need to follow?

Your Datacenter Personnel

It is equally important that you speak with the people who manage your datacenter or the facility where your new equipment will be installed. You need to learn about the physical properties of the site You will need answers to the following questions:

- How much available space do we have in our datacenter?
- Will my new cluster fit in the datacenter?
- How much power is available in the datacenter?
- What type of power connectors do we have?
- What is the cooling capacity of our datacenter?
- What is the current rack configuration?
- Is there room for new racks and, if so, how much?

Knowing the answers to these questions will help you avoid the disaster of purchasing a cluster that cannot be accommodated by your datacenter.

Outside Vendors

Before you can adequately describe the HPC system you need in your RFP, you must have an understanding of what is available in the marketplace. It's important that you seek information and quotes from outside vendors. They have expertise working with all current technologies, and they will be able to help you plan for any emerging technologies that are available as well. Failure to seek vendor input will likely result in an RFP that fails to deliver the responses you seek or the best equipment you can buy.

Your Peers at Other Universities

Your purchasing department may have examples of other technology RFPs on file to guide you, but it will also be very helpful to review RFPs written by your peers at other institutions. Reach out to colleagues elsewhere and ask if they would be willing to share their RFPs.

The Other Principal Investigators and Co-PIs

Do not forget to stay in communication with your other PIs as you work through the RFP writing process. Their input and advice will be helpful as well. Together you should compile a complete list for the user types who will be relying on your new equipment. What departments will be using the cluster? What kinds of research will they be conducting? What software applications will be required? All of this information will help you determine the ideal configuration for your new cluster.

The Next Step: Writing the RFP

Once you have finished collecting information, you are ready to start writing your RFP. If your purchasing department was able to provide you with a template, that is a good starting point. Realize, however, that most RFP templates were designed for simple purchases of a simple piece of equipment and ask merely for Product Name, Manufacture Name and Model Number. You must provide more product details in your RFP to get the desired responses.

Essential Elements of Your RFP

Q&A Period

Look at the Question and Answer period as an opportunity to fail-proof your RFP by using vendor questions to clarify what you need.

Make sure you allow at least a week between RFP publication date and the deadline for vendor questions. Also make sure you allow yourself enough time (at least one week) to answer the questions.

Consider offering two Q&A periods. Why? Because the first round of answers will inevitably lead to more questions. Allowing vendors a chance to further clarify makes it all the more likely that you will have a successful RFP. It also helps you avoid mistakes or omissions that could cause the whole process to fail. You want to avoid re-bids and vendor appeals.

Your Overall Timeline

You need to allow a minimum of three weeks between the end of your QandA period(s) and the RFP deadline. Vendors need time to negotiate deals on equipment. If you don't give them enough time, you won't be getting the best deal.

Technical Requirements

This is the most important part of your RFP because this section outlines the configuration for the cluster being requested. The technical requirements need to be as detailed as possible. Without precise requirements, the responses you receive will not present you with the best options for your hardware needs.

Do your homework. Have a strong knowledge of the equipment you want to buy. Consult with vendors to understand the current technologies. Do not become too attached to a specific technology, manufacturer, processor, etc. unless you understand fully what it means for your cluster.

If you are not able to publish a budget amount in your RFP, you need to give vendors other limiting factors to ensure you get responses that meet your need. Without a budget amount, at a minimum vendors will need to know a total core count or the total number of nodes you require.

Without this, some vendors will refuse to participate in your RFP because they won't have a clear understanding of what you want. The vendors who do participate will only be guessing what you need. Either way, this is a situation worth avoiding.

If you are required to accept the lowest bid, it's going to be important for you to ask for, as an example, the best cost for X number of cores.

Understanding the number and types of jobs being run should dictate the quantity and types of nodes to get. Some machines (such as high memory nodes) can cost many times more than a standard compute node, but if only one user needs it, it doesn't make sense to purchase multiples of these as it will cut into the number of other types of nodes you can purchase.

For your overall system, answer the following questions:

- What is your preferred core count?
- How many total compute servers do you need?
- You can request Best Price for X number of cores or X number of servers that fit your specifications

Avoid using "or better" in your RFP. Example: "Please provide 50 cores or better." This is asking for something for free. Better to ask for what you really need.

For storage solutions, define requirements clearly and try to include redundancy, volume, file system and use cases.

To demonstrate the importance of being verbose in the technical section of your RFP, we are sharing some common questions that get asked by vendors during the RFP question. Providing enough details to answer these kinds of question will enable vendors to provide with the best possible solutions from which to choose.

Sample Vendor Questions from Recent RFPs:

Compilers

Are there any specific compiler requirements?

If you want an Intel Compiler Suite, can you specify which version (there are several)?

CPUs

Does the university have any requirements for which Skylake CPU they'd like to receive?

You're requesting 128GB of RAM. However, the new Skylake CPUs have six memory channels and thus, we'd need to go to 192GB or 96GB or Ram (or more). Do you have a preference?

GPU Computing

Is there a steady growth in the interest in GPU computing? If so, in what applications or fields?

Concerning GPU nodes, will you accept non-Skylake GPU nodes?

How much memory do you need on your NVIDIA Tesla P100 GPUs? 12 or 16GB?

Interconnects

Is there a high speed interconnect other than Ethernet required? If so, what kind of performance (bandwidth and latency) is needed?

Can EDR be substituted for FDR InfiniBand?

I/O

How should the I/O solution function when a failure is exposed beyond the RAID level?

Nodes and Node Counts

How are specific nodes to be configured? In other words, what CPUs, how much memory, how much storage, etc.?

Is there a preferred core count, clock frequency or model number?

Do you want the head/login node to have high availability?

Concerning the compute nodes, is there a target quantity or performance level that you are trying to reach?

Parallel File Systems

Will scratch space be allocated in the Parallel File System (PFS)?

What is the desired throughput for the PFS?

Do you have an existing PFS? If so, what is it?

How many files do you currently have on your PFS?

What is the average file size on the existing PFS?

Where do you intend to mount the PFS (compute only, compute + management, etc.)?

Is there a preferred Parallel File System or should we recommend (GPFS, Lustre, etc.)?

Racks, Cables, Cooling and Power

Are we supposed to supply the racks and PDUs? If so, please provide makes and models.

Is there a room diagram or will the racks be adjacent to each other?

Will a floor map with environmental and connectivity configurations be made available?

Are there Vizio drawings of existing rack layouts?

Are there cable trays for networking either above or below the racks? If so, what is the distance from the top or bottom of the racks to the cable tray?

Is there a per-rack limitation on cooling?

Is the power single phase or 3 phase?

How many receptacles can the University provide per rack?

Should the server racks come pre-cabled for all compute nodes or just for the parallel file system and associated components?

Software

For commercial software, how many years of maintenance is required?

Storage

Is there an overall storage speed requirement?

Do you need to support CIFS and NFS on storage system?

When you say battery backup on the storage solution, do you mean batteries on the storage controllers or batteries for the entire storage array, as in a UPS?

Training

How many people will be attending training? And on what software and hardware products?

Allow for Innovation

You must allow for innovation in vendor responses. Vendors are the subject matter experts when it comes to HPC equipment, and you want to receive the value adds that they bring to your project. You should welcome options in your RFP process because more options mean more choices for you and, ultimately, the best HPC cluster for the job.

If the goal, for example, is to get as many nodes as you can, let vendors present you with that option. One word of caution: You need to strike a balance between how much leeway you offer vendors and how you will score such innovations when you are evaluating the responses. If vendors have too much leeway, you may not be comparing apples to apples when scoring responses.

Delivery

HPC Equipment is big and heavy. Shipping it is costly. Delivering it is painstaking work that requires a lot of pre-planning. There are countless things that can go wrong with delivery. In this, the devil is in the details. Providing delivery details will help the vendor pack, ship and deliver your equipment without issue.

Here are questions your vendors will have. You should seek answers in consultation with your datacenter personnel:

- Where will the cluster be delivered?
- Is there a loading dock?
- What are the dimensions of the loading dock?
- Any overhead limitations?
- What are the hours of operation for your loading dock?
- Will someone be there to receive the shipment?
- Are carts available for use? Size/weigh limitations?
- Are pallet jacks available?
- What is the cluster's final destination?
- How far is the final destination from the loading dock?
- Can you provide a map from loading dock to destination?
- Are there doors along the route from loading dock to destination? Dimensions of doors?
- Do we know keys/access codes? Will someone be there to assist?
- Are there elevators along the route from loading dock to destination?
- If so, what are the door dimensions and size/weight limitations?

Installation/Training

This is an often overlooked part of any RFP. Do not forget to provide your requirements for installation and training services as part of your HPC purchase. If you are going to require on-site installation, provide vendors with details about the location. This would be a good place to include details about datacenter power and cooling capabilities.

Scoring

Use all requirements or guidelines provided by your purchasing department as the basis for your scoring system. You will include each factor and its possible score.

Make sure you ask for at least three references from each submitter. Preferably references will be for customers who bought systems of similar size or configuration. Contact all references and let what they say be a factor in your selection process.

Here is an example:

Sample: Scoring Your RFP

Total Cost for Required Items	150
Technical Merit	50
Vendor Experience/References	50
Installation/Support	50
Subtotal	300
Errors/Missing Information	-20 each
Total	

The Last Steps

After you have written your RFP, have all Primary Investigators and Co-PIs review the content and offer any suggestions for changes before you arrive at what you consider to be the finished draft.

Review the Deadline

Make sure your deadline is realistic. Are you allowing enough time for vendors to write their responses? Remember, they will often be collecting quotes from suppliers and manufacturers, which can be a time-consuming process. Also make sure your time between response deadline and your decision is allowing enough time for you to evaluate and score the responses. Finally, are your deadlines in keeping with any requirements you have to spend the money by a specified date?

Be Open to Post-Award Recommendations

You should consider adding a statement within your RFP that states you are open to discussions with the winning vendor after the contract has been awarded to ensure that you have been given the best possible configuration with the most appropriate technologies and components. In the end, you want the best HPC hardware and software solutions that you can get within your budget. Allowing vendors the opportunity to present you with recommendations that might not have been possible within the constraints of the RFP is a worthwhile exercise.

Keep Your Team in the Loop

Hopefully you have kept your purchasing department and datacenter team in the loop throughout the course of your RFP information gathering and writing process. Don't forget to keep them informed as you publish the document and collect and score responses.

Share Your RFP experiences

This white paper is a work in progess. We will be updating it as we hear about the RFP writing experiences of others. Please share your experiences with us (info@advancedclustering.com) and also let us know what you thought of this white paper and its tips for RFP writers.

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