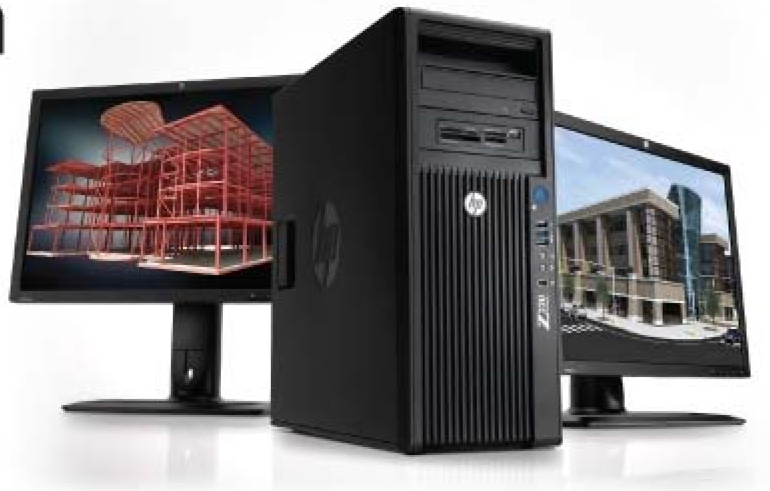
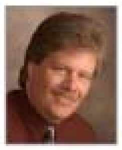
Workstation Innovation News



by **Robert Green**, *Cadalyst Contributing Expert*



High Tech Geospatial = High Tech Hardware

HP Workstations powered by Intel® Xeon® processors deliver computing power to fulfill geospatial technology needs.

Have you ever wondered how to design a lake or map a mountain? What about the hardware you would need for those computations or databases? Geospatial applications, such as civil engineering, mapping, GIS (graphical information systems), aerial photography, topography scanning, and hydrology require increasingly complex computing environments to support them.

Of course, when we start talking about designing lakes, mapping mountain ranges, correlating aerial photography with GPS data points or mapping out underground utility lines, the size of the data files involved become huge. Therefore, computing in the geospatial market becomes a much more network- and distribution-centric problem than a traditional network environment used by most architects or engineers. Understanding and dealing with these new types of geospatial computing environments is a special challenge that must be solved within the context of rapidly changing networks and cloud data storage.

In this edition of Workstation Innovation News we'll examine the unique computing challenges that geospatial users can expect to encounter in the near future and make some recommendations for how HP computing products, along with Intel®, can help.

Centralized Data — The Remote Consumer

Remember the last time you were driving in a part of town you didn't know, trying to find the office building where your next Big Meeting was being held in 15 minutes? Where do you turn? Yes, your phone-based GPS navigation system, one of the most commonly used geospatial data-use applications. In a GPS system, a large amount of mapping data is stored in a central set of files on a remote server that uses your current GPS location to give you directions to your destination. The centralized mapping data is not located on your phone or GPS, you are merely a consumer of that data via your phone.

This begs the question: who is the creator of the data and where does that data live?

Further, what type of infrastructure does it take to store the data and send it to a mobile device — the cell phone, in this case?

When you start to ponder hosting a large central database to deliver to remote appliances using Wi-Fi or even cellular connections, you quickly realize that computing infrastructures won't be the traditional, in-office network most of us are used to working with.

Distribution Network

As our cell phone/GPS example suggests, geospatial data will increasingly be consumed by a wide variety of devices. Map data can be stored at a server farm and then workstations, tablets, laptops, or even lightweight devices such as diskless workstations can link to it. In the geospatial computing environment, you need to think about what types of devices store the data and which will access the data for the remote user to plan for a high performance network.

In the end, the data model that emerges is one of relatively few information processors that upload data to a centralized server farm with a wide variety of consumers using any number of Internet-connected devices. In fact, as the use of geospatial data becomes more commercialized, consumers may no longer care where the data is coming from — much like Netflix or iTunes.

High-Power Workstations

Obviously, before consumers can access the centralized geospatial data, someone has to collect, format, and upload it to the shared location. Real workstations such as the HP Z620 or Z820 powered by Intel® Xeon® processors are required, for applications such as:

- Remote sensing
- Photogrammetry
- Point cloud analysis and modeling
- Digital elevation
- Terrain models

These tasks require high amounts of processing power, plus plenty of RAM and fast access disk components to crunch through geospatial datasets.

Expert Interview

Given all the variables of data size, remote workstations, and data deliver to a wide range of consuming devices, I thought it would be a good idea to talk to some of HP's technical experts.

To get a better perspective on how HP and Intel® support geospatial customers in building their computing environments, I spoke with Cathy Brett, Segment Marketing Manager for Commercial Solutions and Frank Deming, Technical Marketing Consultant. Our conversation covered a range of computing infrastructure and software issues. Here's what we talked about:

Robert Green (RG): With such a wide variety of devices (from workstations to tablets) consuming geospatial information, is there a rule of thumb companies should use to plan their GIS computing environments? How many high-end, mid-level and low-level workstations will they need?

Cathy Brett (CB): We've observed approximately 5% high-level; 15% mid-level; 25% low-level workstations, 40% some type of handheld device and 15% other (such as a business PC or laptop).

RG: Is it fair to assume that with the huge databases involved in geospatial design that those users collecting and formatting the shared data require the high performance workstations?

CB: Yes, on many levels. Often processed geospatial data products that require workstation processing capabilities are a data input for additional geospatial products that also require workstation capabilities.

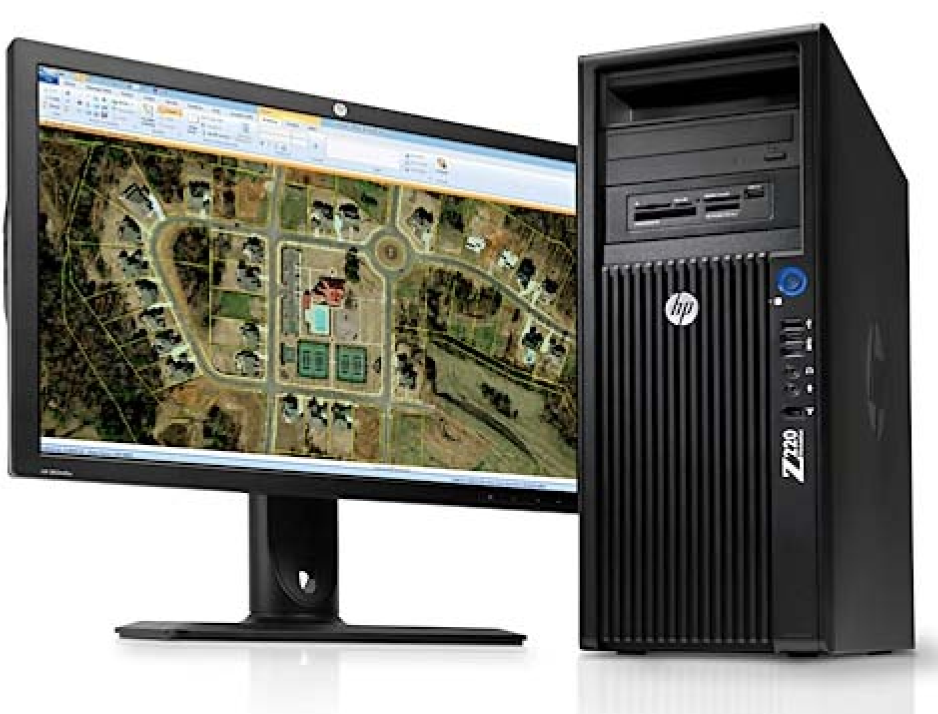
For example, to make an image more accurate, meaning you can get coordinates of a feature from an image with a certain measurement of accuracy, you need to use an elevation model of that location to correct a 2D image for the 3D earth surface.

To create the elevation model you need a mid- to high-end workstation (input 1) to process. Next, you need a mid-level workstation to use the elevation model to correct your data and then perform a feature classifications (such as ponds/lakes) and produce an accurate dataset of those ponds/lakes (input 2). In addition, a mapping user could then take that dataset and update or create a map for a water department on a low-end workstation. All these tasks are computer intensive.

RG: For these high-performance workstations, should users configure them with the maximum amount of cores and memory or should they start to look at solid state drives or other technologies to maximize performance?

Frank Deming (FD): For the general ESRI and Intergraph mapping user, I suggest concentrating on 8 GB of RAM and solid state drives. The performance of solid state drives and the reliability of the latest generation is a compelling story.

If an end user works with photogrammetry or remote sensing applications, then cores, memory, and RAID 0 with solid state drives would be important. One common factor for all of the users in this community is the fact that a great deal of data is in the cloud either public or private. Therefore, networking connectivity with good bandwidth and low latency characteristics are required. In fact, these guidelines are valid for many engineering-based industries that manage large datasets now.



The HP Z220 Workstation powered by Intel® Xeon® processors configured with dual monitors for land development work. Screen image courtesy of Intergraph Corp.

RG: When would it make sense to use lower end workstations and more centralized

All screen images courtesy of Autodesk

Additional Resources

HP Certification

HP Performance Advisor

HP Remote Graphics

HP Total Care

HP ePrint & Share

HP & Autodesk Brochure

AutoCAD 2012 and HP Z Workstation Hardware Productivity Study

Autodesk Strategic Partners

HP Workstations and Architecture, Engineering & Construction

HP Workstations and Product Development

Intel® Xeon® Processor E3 Family

computational capacity? What is the recommended lower end workstation specification in such cases?

CB: When end users are using primarily mapping/cadastre-type applications, the HP Z220 is a great option to provide faster processing and have adequate memory to assure the integrity and accuracy of their data.

FD: The HP Z220 powered by Intel® Xeon® processors is perfect for those who run a variety of mapping applications and web services from various GIS vendors. The HP Z220 is a good choice and its entry-level to mid-level graphics ability are helpful if users are mapping with 3D views and building fly-throughs of terrain.

RG: Can geospatial users take advantage of functions such as remote graphics (RGS) to access remote workstations? Do you see this type of use in the field?

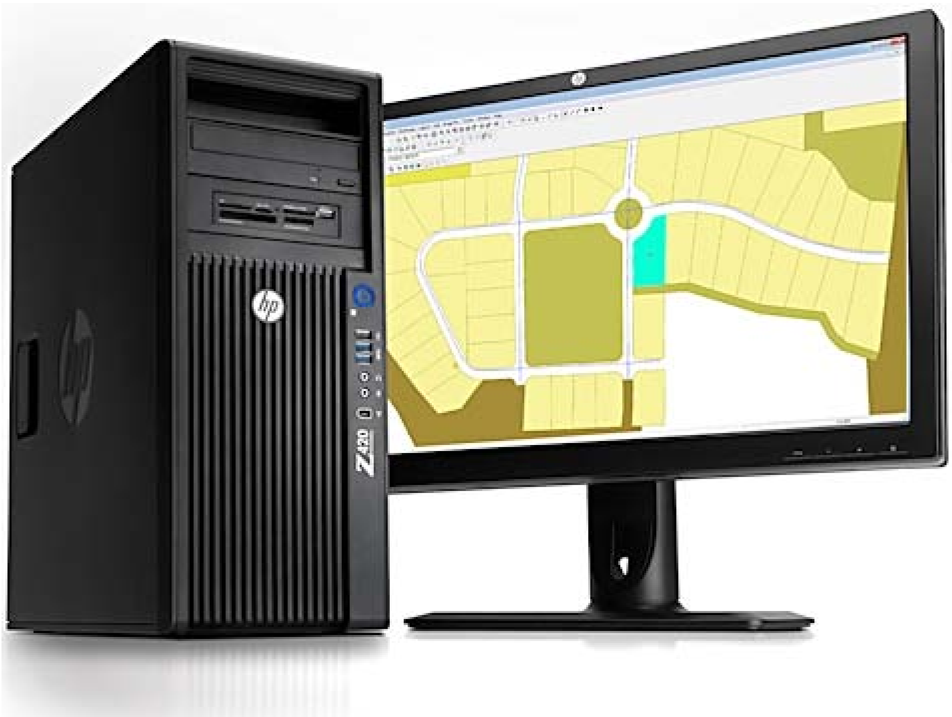
FD: There are several advantages to using an in-the-field mobile workstation to access a virtual desktop in a centralized office. One is that you don't have to move your data to a field operation that, with a large enough dataset becomes a performance issue. A second advantage is that you can secure your data in the back office while displaying the data computation results in the field. With concerns of IP and security in our minds these days, this second advantage is intriguing.

RG: For in-house engineers who need to consume geospatial data for their design work, what is the rule of thumb for how they should configure their workstations? What is the sweet spot for normal engineering workstation working in geospatial environments?

CB: As a rule of thumb, there are three overarching uses which use different applications: mapping/cadastre, remote sensing, and photogrammetry. The sweet spots for workstations for each of these, based on our experience are: mapping/cadastre uses HP Z220, remote sensing uses HP Z420 and photogrammetry/remote-sensing uses HP Z620.

FD: The HP Z220 Workstations are fine with a low- to midrange professional graphics card while remote sensing apps and the HP Z420 Workstations benefit from a midrange professional graphics card and photogrammetry apps and the HP Z620 Workstations should be equipped with a high-end professional graphics card. Many of the applications in this space are OpenGL-based and require thorough certification testing. Professional graphics cards serve best from a performance and reliability point of view.

Good CPU performance is another important consideration. Intel® processors such as the Intel® Xeon® processor E3 line[1,2,3] supported in the HP Z220 line are good price performance selections for mapping professionals. In photogrammetry applications, 8 core processors available in the Intel® Xeon® E5 lines[1,2,3] is critical these days for the throughput they deliver during the transformation of the raw imagery data in to the consumable imagery demanded by professionals these days. Remote sensing applications straddle these two Intel® lines and can depend on the user's workflow pattern.



The HP Z420 with a midrange graphics card works well for remote sensing software. Screen image courtesy of Intergraph Corp.

RG: Will geospatial-oriented firms keep more of their data on the cloud in coming years or will they maintain their databases on in-house servers?

CB: Geospatial technology has been taking advantage of cloud technology for years. Often datasets are served up through web mapping services with data being stored in large data centers worldwide. So, yes, remote and cloud services will continue to become the norm.

RG: How do you see the geospatial computing environment evolving during the next two to three years? In the longer term? Will the computing environments we build today be obsolete in a few short years?

CB: Geospatial technology is ubiquitous. It is part of our everyday life as well an important part of most government and business decisions. Additionally, the abundance of data will grow exponentially. This is a result of an increase and affordability of data collection vehicles such as unmanned aerial vehicles (UAVs) and satellites and more sensors such as spectral and global positioning (GNSS), light detection and ranging (LiDAR) scanning, as well as video feeds and crowd sourcing.

Geospatial compute environments will require tools and hardware that can process data and manage it in a timely manner. Cloud and software as a service (SaaS) will continue to drive the need for automation and automated decision-making. Compute environments will also to continue to grow and support 3D and 4D geospatial data.

Wrapping Up

As geospatial data is more commonly connected to items we engineer such as buildings, building distributed computing environments to share that data are becoming more commonplace. Given how rapidly our computing environments are changing, the best you can do is plan, budget, and think through your options so you can build a geospatial environment that delivers the goods.

I hope you found this look at configuring GIS computing environments useful and that the expert interview gave insight on how to allocate resources around your network, to get the best computing impact.

Authors note: I'd like to personally thank Cathy Brett and Frank Deming from HP for

making themselves available for our interview.

About the Author

Robert provides CAD implementation, consulting, and programming services for a variety of companies throughout the United States and Canada. He holds a degree in mechanical engineering from the Georgia Institute of Technology and is the author of *Expert CAD Management: The Complete Guide*. Reach him via his web site at www.cad-manager.com.

Notes and Disclaimers

Windows 7 systems may require upgraded and/or separately purchased hardware and/or a DVD drive to install the Windows 7 software and take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

1. Dual-, quad-, six-, and eight-core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; Not all customers or software applications will necessarily benefit from use of these technologies.
2. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See http://www.intel.com/info/em64t for more information.
3. Intel's numbering is not a measurement of higher performance.
