

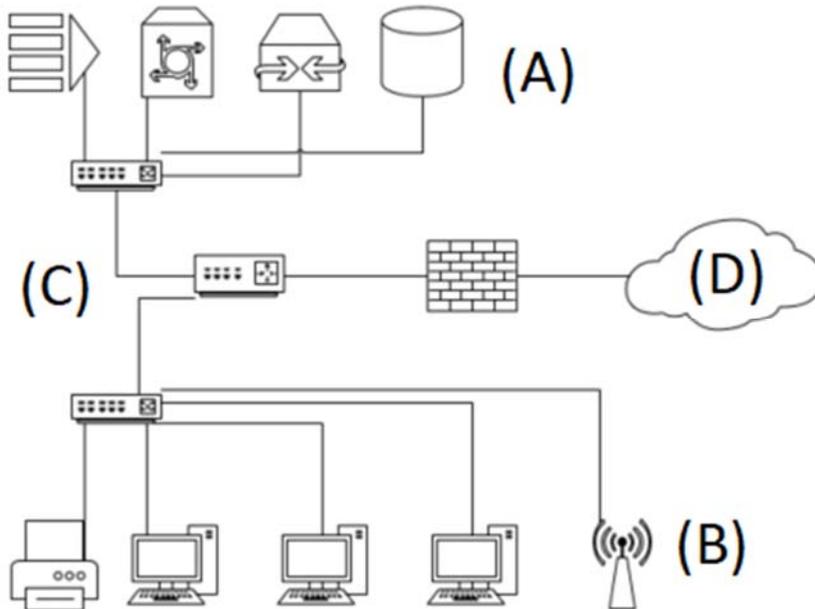
MCAWW Technology Advisory Committee: Cloud Computing Primer

By: Tyler Wisenburg, Key Mechanical

With help from: Doug Moore, McKinstry Co.; Seth LaRiviere, MacDonald-Miller Facility Solutions; Jennifer Nelson, Hermanson Company; Ryan O'Rourke, Holaday-Parks; Parker Seaman, Ferguson Enterprises

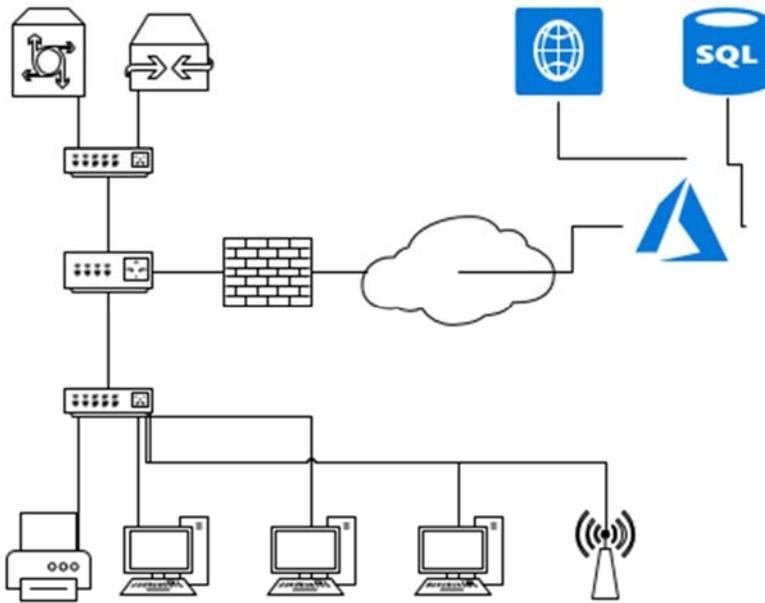
The biggest buzzword by far in technology these days is “Cloud.” Enterprise Resource Planning (ERP) systems, data storage, mobile access, everything is tied to the cloud. This creates confusion for many as to what the cloud really means. This whitepaper should address many questions and misconceptions revolving around the concept of cloud computing. By the end you should be ready to have a conversation with your IT team to determine where you are in the process, and have a full understanding of how that might impact your business on a macro level. While there is no perfect cloud move for every company, the cloud is here to stay. If you are not utilizing it at least in part that may be a red flag, and you should be able to evaluate that after reading this report.

At its most basic level the cloud is simply about accessing data across the internet. When network engineers draw diagrams of their system they use a fluffy cloud to visualize the internet. In the following diagram there are a group of servers (A) connected to a switch, a group of computers (B) connected to a switch, both of those are aggregated into a router (C), the router connects across a firewall to the Internet which is represented by the cloud (D).



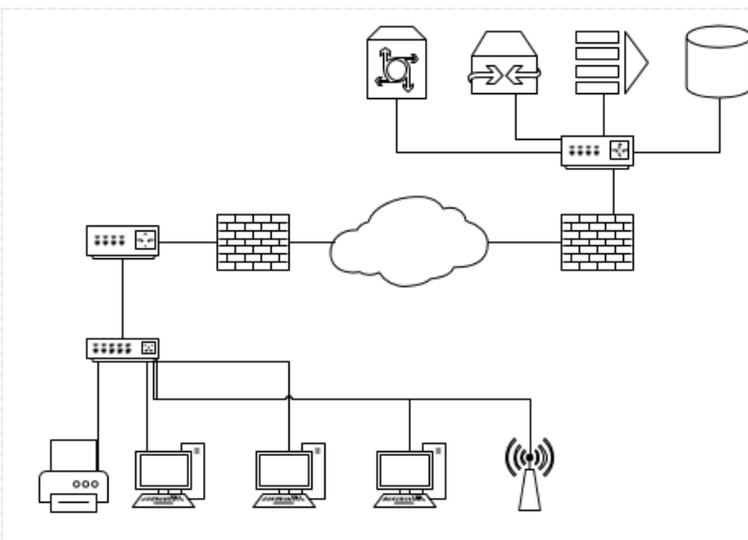
In this scenario the only thing being accessed over the internet are web resources such as web pages. What we would traditionally think of as being “the internet.”

When a company moves to the cloud some, or all, of their local resources are moved to the other side of the cloud icon, and their system may start to look more like this:



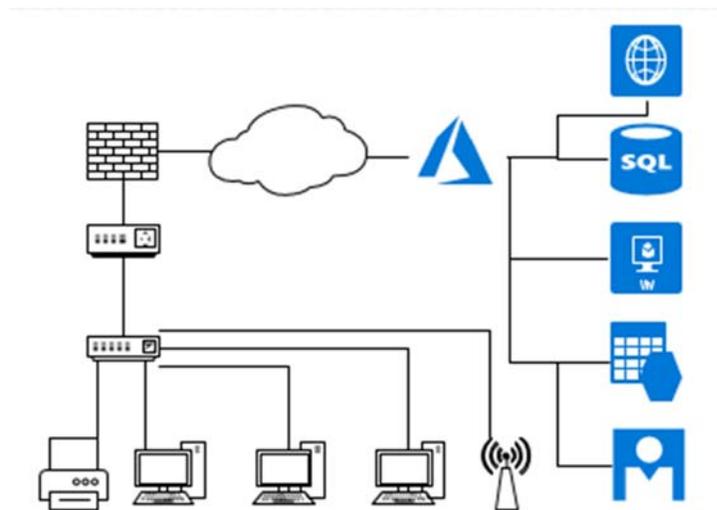
In this case we have decided to move our database and web services “into the cloud.” When a user accesses those resources, they must travel across the internet to reach those systems. This type of cloud integration is called a Hybrid Cloud system because some of the network resources are still located on site and some resources are cloud based. There are three main categories of cloud systems that all count as being “in the cloud” and yet cause great confusion for those not familiar with the terms. Here are the other two:

Private



This type of network architecture takes the existing network system and simply moves the same roles and services to another location. This type of configuration can pencil out for larger organizations with multiple locations to support. Since these organizations are already servicing access to their data and services over the internet it makes sense for them to leverage the economy of scale in hardware purchases that a data center can offer for single-tenant hardware. They can also buy private virtual machines on multi-tenant hardware (referred to as “Virtual Private Cloud”). In either instance, the data center usually becomes liable for the maintenance of the hardware, internet access via private, vendor diverse, connections, and reducing the need for internal IT staff for maintenance costs.

Full Public:



A public cloud leverages cloud services instead of servers. This is the least utilized cloud platform because it requires an organization to completely change their system to conform to the services offered by their cloud provider. For this reason, most organizations leverage the Hybrid Cloud where they can take advantage of services like cloud Email, hosted Databases, web services, etc. while maintaining either local, or some version of private, cloud services for legacy systems and customize workloads.

The Cloud and You

Many business owners may be unsure about the cloud and what it means for their business. However, the cloud has been around for over a decade now. Microsoft launched Azure in 2010 while Amazon Web Services started in all the way back in 2006. Today the question for most businesses should not be “if” they plan on moving services to the cloud but, instead, what is the current plan to move.

Even though the cloud is likely to continue to be a worthwhile investment there are pitfalls. It is very important to come up with a solid plan of not only how to move, but what makes sense to move. Every business has different needs and requirements and a thorough analysis of your current system as well as an ROI plan is a good place to start. Here, again, is a place where you have many options. Some companies have enough resources in place to come up with a plan in house, while others may want to consider hiring an outside vendor to help guide them in the process. Below is a table of pros for each option:

In-House IT Staff	Consultant
Understands your network and requirements	Understands different Cloud vendors more intimately
Established lines of communication	Can help get better pricing
Incentivized for complete and thorough migration	Specialized knowledge

Process

The process of moving to the cloud, while greatly varied in execution, has specific phases:

- a. Determine your goals and system requirements for what needs to be in the cloud
- b. Break each system into component services which can be moved
- c. Find the right partner for cloud services, or determine what is required to setup a private cloud
- d. Decide on an order for moving services
- e. Move one service at a time, where possible, and do continuous evaluations to make sure your assumptions before the move are still viable
- f. Cleanup: make sure all systems are functioning properly after services are moved

Like any construction job, planning is the most important phase. A full system and services inventory will be the first critical step of the project. Whether you decide to hire a consultant to help with the migration or your company wants to keep the project internal, you will still need to create this documentation. As a rule, this document should be kept and updated on a schedule after the migration is complete.

A good system inventory should have each physical system broken down with all network shares, all services provided, a thorough listing of the hardware that server runs on, and virtual systems which are running on the platform, storage requirements, and network information for both public and private access. Once this process is complete it is time to decide how to move forward.

When deciding on an order of migration it is important to understand how each system you are migrating effects the others. For instance, if your accounting system requires a connection to the email server it will be important to plan how that connection will work after the move. The more detailed your system and service inventory is, the easier this process will be to identify. One of the biggest hurdles of IT is the desire to move everything at one time. The problem with this approach is that when problems arise there is a web of possible causes. By moving one service at a time and cleaning up each project you can ensure that problems don't snowball.

The last step is to clean up the system and make sure each project is completed. Many times, IT projects get 90% done and then distractions cause the IT department to move on before they have finished. A strong project manager with attention to detail is a must.

Next Steps

If you have read to this point you may be considering how to embrace cloud computing in your business. First, you will want to consult with your IT staff to understand what, if any, cloud services you may already be using; and what the plan is for rollout if they have identified any more services that should be moved. If your staff is inexperienced with cloud migrations or projects it would be helpful to bring in a consultant who specializes in that area. Even in the initial discovery phases a consultant can help identify opportunities your team might be unaware of. You don't have to use them to do all the work, but a second set of eyes with different experiences can help in such a large field.

ROI is extremely difficult to calculate when planning for a cloud migration. Licenses and hardware are only part of the picture. IT staff time, maintenance, increased capacity or capabilities, etc., are important to add into the equation. Rarely do cloud migrations save money in just hardware and software costs, but they usually increase your ability to work more efficiently in some way. For example, an email server running in your headquarters will cost far less than a cloud based email provider. However, you increase uptime with distributed systems and high availability. You may increase your per-person mailbox size, and there may be other tools which are available. In the past, most software was developed to run on a local network and the cloud features were added in. However, software is quickly becoming cloud first, meaning the bulk of the tools will be available on the cloud either first or exclusively, and depend greatly on the provider you choose.

You should be more prepared to have a conversation with IT stakeholders after understanding the benefits of a cloud strategy. Choosing between hybrid, private/VPC, or public cloud offerings will depend on your team, system, and requirements. In order to maintain a leadership position in the mechanical contracting field, it is important for all of us to embrace the technology which can help us stay ahead. Falling behind can create costly infrastructure upgrades in the future which can become prohibitively expensive.

More Information about the cloud and how to leverage the resources available to you can be found at these links:

<https://azure.microsoft.com/en-us/overview/what-are-private-public-hybrid-clouds/>

<https://aws.amazon.com/whitepapers/>

<http://money.cnn.com/2014/09/03/technology/enterprise/what-is-the-cloud/index.html>

<https://mashable.com/2013/08/26/what-is-the-cloud/#HiObtud7IggF>