Remote Monitoring

What is that -and- why do I need it?

Introduction

Remote Monitoring is the ability to see and record information of a remote device attached to a data or voice network connection. The key word here is "remote", which means that you do not need to have physical proximity to the device to be able to monitor it – all that is required is a network connection to it. Remote Monitoring is applicable to both consumer and commercial users. Consumer applications include helping to care for a loved one, managing a rental property, and watching your primary residence while away. Commercial applications include reducing system downtime, enhancing your image and service to your customer base by making sure your systems are running and are available to them, and being aware of unauthorized activity.

Aside from the ***techno-babble*** that is necessary to discuss this topic, this article is written from a functional perspective, to help you find the answers to the problems you have and/or peak your interest in this subject, so you can implement this technology into your life. The following information can be a bit of a heavy read for someone new to this topic. Even so, read on. It is not that bad and certainly is worth having Remote Monitoring in your life. The hyperlinks throughout this document will help you quickly grasp the necessary information.

Remote Monitoring is, simply stated, knowing what is going on when you are not looking at something. It is an extension of the RMON model. From a computing perspective, it is a series of automated activities to check your network and devices you may have attached to it, to see if these are doing what you expect them to be doing. Some examples of what you may have attached to your network are computers, printers, wireless access points, IP thermostats, switches, etc. Going even deeper, Remote Monitoring can supervise the many attributes of your hardware and the individual services and programs that you have running on each piece of hardware. Remote Monitoring is a member of the Remote Administration family. Remote Administration is simply remotely fixing a problem and/or remotely doing some type of maintenance. *Please note that it is **not** necessary to have Remote Administration in order to have Remote Monitoring*. Remote Administration brings the ability to deal with whatever problem Remote Monitoring may find in a prompt manner. Think of it as the other side of the coin. Knowing about a problem, but not being able to do anything about it without travelling to the remote device, would not be very practical for most folks.

Let us now go deeper in the explanation of Remote Monitoring. The operating principle of Remote Monitoring is what some consider as complicated, but it is really quite

undemanding. Remote Monitoring automates checks that you would do from your computer when you connect to another computer. The principle is that your necessary input actions of typing, clicking with a mouse, and watching with your eyes are automated by the Remote Monitoring system. The computer by means of which you perform your Remote Monitoring acts as the Remote Monitoring Server. The computer that you are monitoring becomes the Monitored Client. The events and parameters (monitored information) of whatever is happening with your hardware (network and monitored client) must go through a network connection to another off site machine (the Remote Monitoring Server), because you are not there in person to check the monitored computer yourself. The monitored information is then stored in the server and automatically analyzed by the server system to see if any of the reported events and parameters exceeds alarm thresholds. If so, you will receive some type of notification through an email, SMS message to your cellphone, a pre-recorded voice telephone call, or a report of some kind. This in summary is how a Remote Monitoring system is structured and how it functions.

Applications

So, if you are wondering, "why do I need this technology in my life?" there are several viable and probable reasons. Typical Remote Monitoring applications include:

- *Internet Connection*, to know if your computer or your Internet Service Provider (ISP) is the reason you cannot get to your favorite website (or your email!), or when your children are not able to get their homework finished and get to bed at a ***reasonable hour*** because your ISP (not your computer) is down.
- *Physical Conditions*, to know if part or all of a computer is getting too hot.
- *IP Thermostat,* to know if your property far away is cool or warm enough.

History

The early days of connecting computers together for networking involved a struggle to define the standards that are indeed necessary to accomplish this. The list of definitions included the physical connections of the cabling, protocols for communication, and a seemingly endless list of decisions by both end users and manufacturers. These decisions had to happen before large-scale networking could occur. Ultimately, all of these matters came to an agreement for mass implementation, and the modern day Internet lives upon these decisions. Having standards for networking greatly helps the adoption of networking, as with any other subject relevant to communication. It is certainly cheaper to manufacture and sell networking products when the computers they connect to have the same standards. End users can employ these computing and networking products easier when they all work together in a common plan. Remote Monitoring would be very difficult to implement without common standards on all of this technology.

Remote Monitoring was ultimately designed for what is called "flow-based" monitoring (sending instructions to and from different hardware), while SNMP was designed for what is called "device-based" management (permissions of a user account, programs need to operate in association with other programs, and anything else necessary for the device to operate). One of the original implementations of Remote Monitoring was to inform you that your car has a problem, by sending a message to your dashboard in your car. FYI, Bluetooth and WI-FI technology now extends this last example by also sending you an email or a text message of this problem. The combinations of Remote Monitoring are literally and unquestionably endless, in both the number of combinations and the scale of the implementation.

The newest aspect of Remote Monitoring is the addition of the wireless networking technologies that are more and more popular today. WI-FI, Blackberry, and cell phones with an Internet Connection are examples of this wireless option. Having Remote Monitoring in place with a wireless enabled device such as a cell phone provides for real time notification of a problem with your hardware. On a good note, you know when an important event has occurred that you have been waiting for.

It is important to note here that the monitoring functions and the notification functions are separate in and of themselves. When you choose to monitor a computer function, it does not necessarily mean that you need to be notified of everything that happens to it, only what you have selected.

Product Choice

The productivity increase provided by Remote Monitoring is far beyond the cost to have Remote Monitoring. This is due to machines working faster and more accurately than people, when the predetermined logic for a usage is decided. The cost savings from this newfound speed and accuracy provided by Remote Monitoring provides great benefits to any part of life.

Software

Through both long-term consideration and evaluation, it is my sincere and humble conviction that the most cost effective and productive method of implementing Remote Monitoring is by using the Nagios application and its suite of plugin. Setting up a Nagios system is a good bit of work. Once it is running, it runs very, very well. A significant benefit of using Nagios as a Remote Monitoring system is *the fact that it is well integrated with its plugins, enabling the implementation of relatively flexible and stable system architecture, as opposed to trying to connect many different technologies together through weak networking designs*. Extending the Nagios system to interface with any of hundreds of different devices has a better chance of success if the core system is well designed and strong enough for the task. The part of a Remote Monitoring program

where we the user reviews the recorded data is separate from the part that does the Remote Monitoring. Remote Monitoring is actually a collection of many programs, both large and small.

Hardware

There are ***so many*** different types of hardware and software combinations available to choose from to setup a Remote Monitoring system. As mentioned already, Remote Monitoring works on a client-server principle. This occurs all around us everyday through many of the ways we use computers. Remote Monitoring extends that client-server principle to that of an Application server. This is to provide for recording, reviewing, and doing something productive with the Remote Monitoring data. *Please note that this does **not** mean a separate computer system has to be dedicated to this purpose*. What it does mean is that this computer system has to be able to run when you need your Remote Monitoring to take place. Very often, that Remote Monitoring means 24-hours a day, 7-days a week, every day of the year. The hardware of a desktop or laptop computer that runs CPU intensive programs on a continual basis is not designed to operate for extended periods of time (days on end). The hardware simply gets too hot and eventually reaches a point where it needs to cool down in order to avoid damaging it. There are several differences between a server and other computers. These differences can help you decide how you will implement Remote Monitoring into your life.

The argument of old is that it is not the hardware that defines a server, but the operating system that runs it. My belief is that the hardware first and foremost has to work in order to run any operating system, let alone whatever programs one wants to run on that hardware. Hardware that is "*burned out*" does not run, simple as that. Therefore, the priority is to have quality hardware that can do the job of the assigned task. "Right tool for the right job", is another way to say this. Building a Remote Monitoring server and not using it around the clock, day after day, is not a realistic application of Remote Monitoring. This type of scenario is used, but it is seldom used. Most folks are coming and going enough that if they need Remote Monitoring, they need it all of the time.

The hardware that connects your computers to the Internet is commonly referred to as network hardware. Examples of network hardware include routers, switches, modems, and wireless-access-points. Performance of network products with consumer grade features in constant usage represents a hit or miss scenario. Sometimes the hardware works and sometimes it does not. This is because the circuit boards inside that hardware get too hot. That is sad to say, and speaks to the quality of both design and manufacturing. I hold the standard that no $50 device is going to perform as well as a $500 device with like features. There is a fair perception that something that cost more does provide the buyer (whether buying to own or buying to rent) a right to expect more. The features of each device out there are different and hopefully stronger performing in the more expensive option. I have not seen any consumer grade electronics that perform as well as their commercial grade count parts. I have never seen a network product of

consumer grade that did not eventually need go through a restart sequence to fix some type of problem. On the contrary, I have seen network products of commercial grade perform for years without any problem at all. The small additional cost is not the priority. The dependability needed, and the ability to remotely deal with problems when you are not there, is the priority. Shutting down a system to deal with problems means no Remote Monitoring is happening, or a service outage. For rental property, that may mean your renters do not have their Internet service, causing renters to be dissatisfied and perhaps not renting from you anymore.

With so many different types of hardware and software available for Remote Monitoring, it is no wonder that there are many different types of Remote Monitoring service providers available from which to choose. Some Remote Monitoring services promise the world and some allude to promise the world, but no one can actually deliver the world. The Remote Monitoring services perceived as valuable state very well what they do for the service subscriber. Anything that is not stated in their service agreement means they are not bound to provide it. You have to make the hard decision of doing this Remote Monitoring yourself or going with a Remote Monitoring service provider. Some of the criteria you need to look at to make this decision are:

- Do you need or want the benefit of a Managed Service Provider (MSP)?
- Do you need or want to extend that MSP relationship to include an Application Service Provider (ASP)?
- Do you need or want your Remote Monitoring to include the benefit of a complete Network Management System (NMS)?
- Do you need or want the data that you have recorded to feed data into a larger computer program as a Web Service?

These are some of the questions to start the decision making process with, but the reality of having Remote Monitoring can be much simplified by choosing the right supplier for you. Having the ***dependability*** and ***promptness*** of a Remote Monitoring server requires a few more decisions in order to get your Remote Monitoring up and running. If making these types of decisions is a big deal for you, consider going with a Remote Monitoring service provider. Doing so with a service provider that is dependable and responds promptly to your Remote Monitoring needs reduces the time and effort required to have Remote Monitoring. Beware though that anyone can sell a product or service. The reputable service provider, on the other hand, adds value to your Remote Monitoring efforts through a relationship with them by leveraging their skill set. This is not where a service provider tells a subscriber to fill in a complaint form online and look for a response by email within 48 hours, Monday through Friday only. It is a relationship based on *trust*, *flexibility*, and *reliability*. The service provider has to address your specific needs through a personal relationship based on understanding. It is not a matter of not being able to do this yourself. It is a matter of the *cost effectiveness*, *timesavings*, and *peace of mind* you achieve with a service provider when you have lot of work ahead of you to setup a Remote Monitoring system.

Pressing on, you then need to have a data network that has a constant connection to what you need to watch. Consumer grade ISP service does not have an assurance, a guarantee that it will always work for you. This guarantee is the part of the agreement called quality of service. If the Internet service is out with a consumer ISP agreement, the ISP will say they are sorry and fix it as fast as they can, per their agreement. Their definition of the term ***fast*** may not be what you call **F-A-S-T**. To have the assurance Internet service will always be there for you, that only comes from a commercial grade ISP service agreement. This grade of service also has a compensation of some kind to you if it ever goes down. All the same, the only real way to know if it goes down is to have Remote Monitoring of your Internet service as well. Subscribing to a commercial grade ISP service with a Service Level Agreement may not be always necessary. If the consumer grade ISP in your area has a reliable reputation and you are comfortable with that, then it is certainly worth trying it to start your Remote Monitoring efforts. Take note that a commercial grade Internet service has a higher cost than a consumer grade Internet service. The difference in network speed and reliability is both objective and measurable. Other service attributes may be more subjective and therefore somewhat difficult to evaluate, but the commercial grade cost is always more.

Finally, you need to get the location of your Remote Monitoring server set up with everything it needs to run 24-hours a day. That is referred to below as *Installation*.

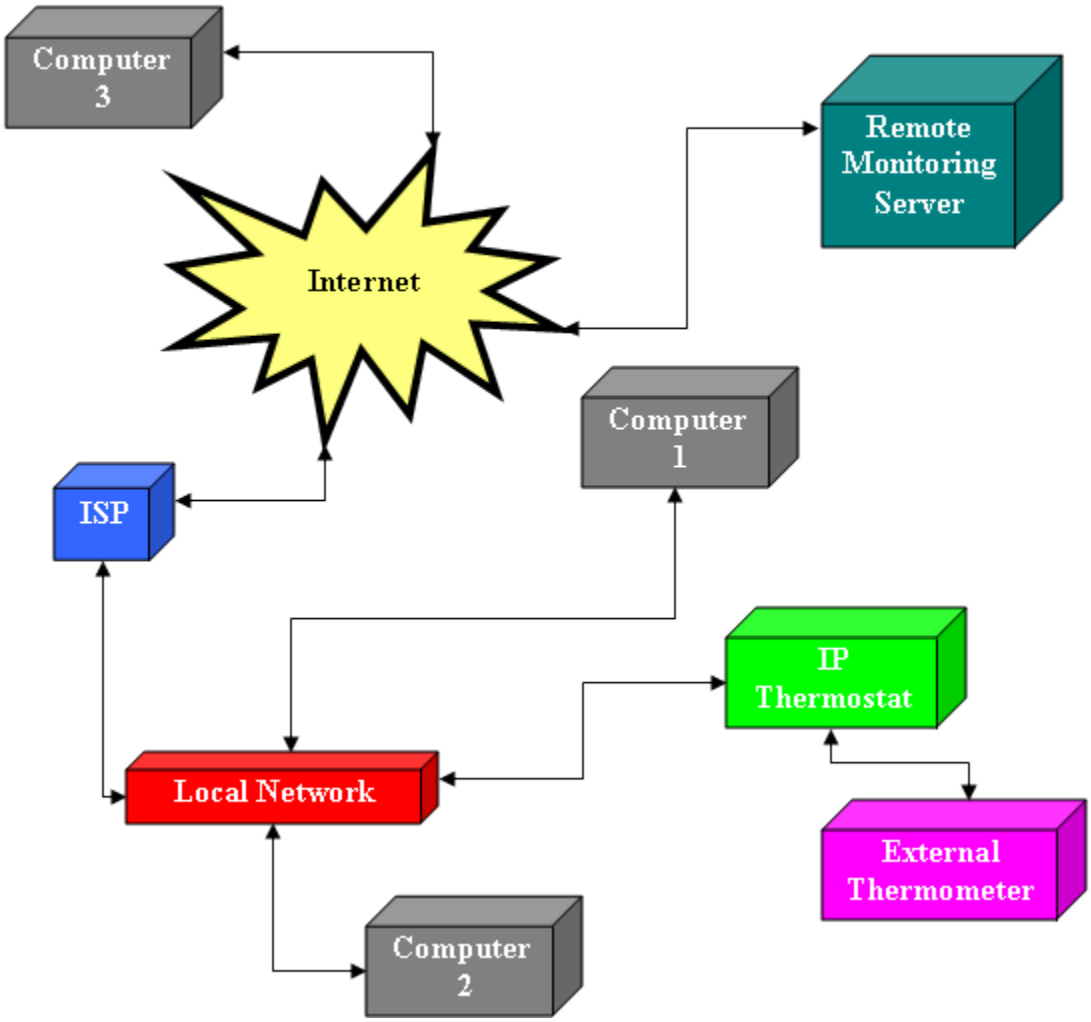
Installation

The premise of implementing a Remote Monitoring server is that the data network it runs on is both consistent and secure. Consistent, in the form of an "always on" Internet connection, such as Cable Internet, DSL Internet, or T-1 connection(s) with a guarantee of service from the service provider. Secure, in the form of only having the necessary user accounts, strong passwords, ports, and firewall openings to allow data network traffic to and from your IP Thermostat. Explanation of a consistent and secure data network is out of the scope of this article. Please contact us for more in depth discussion on this topic.

Once your data network connection is running, you then need to setup the Remote Monitoring server. This occurs after you have setup your server hardware with the server operating system. Finally, you setup the networking behavior (configuration) of the Remote Monitoring server to the devices that are being monitored. This infamous configuration is the heart and soul of any Remote Monitoring server.

When the aforementioned is complete, here is a straightforward look at your network:

Block Diagram of Network Topology



Your personal computer, say your everyday laptop, is Computer 3. You use it to review the data recorded by your Remote Monitoring server. You get to your devices and your account on the Remote Monitoring Server from Computer 3. Using a server, you are monitoring:

- ISP connection
- Router and switch that serves the local network (LAN) where your hardware is located
- Networked Devices (such as an IP Thermostat and PCs in your LAN)
- Some external devices which are connected to a device being monitored. The External Thermometer is the example here of such an external device, which is connected to the IP Thermostat, but does not have itself direct access to the Internet (not routable).

Installation and Configuration - Considerations
The following items are things you as the owner have to decide as to what you need/want to do and what you need/want help with. Sometimes it is a matter of choice, other times it is a matter of necessity. I recommend you choose whatever makes you the most comfortable for the integration process. If you can do it all yourself, great. If not, get some help.

Physical Installation
If you are going to run your own Remote Monitoring server, you need to have it in a location that is ready to support continuous operation. You will need the appropriate heating and air conditioning, a battery backup system, and a good air filtration system to keep the dust from building up *in* **and** *on* your Remote Monitoring server. If you smoke, use a device that keeps the smoke from collecting on your computers circuit boards. This device would be a very high-quality air filtration system. The tar and ash from smoking builds up on the circuit boards and makes them run hotter than what they are designed. The hotter a circuit board, the shorter its life expectancy

Network Installation
This is a matter of, "got the skill set to edit (or setup) the data network?", as defined above. If you do not have the skill set, take my advice: Don't experiment with opening up your Internet connection to the world, unless you're ready for hackers to play with everything connected to it. It really, really is not worth the chance. Employ the skill set of someone who understands and is experienced in configuring data networks to make the necessary edits and get this part running. If and when a hacker finds your network, they will try to access the network. If you have properly secured you network, nothing much hackers can do about that. They will either try different password combinations until they figure the necessary password, or they can monitor your data network and find the password which is sent in clear text by legitimate users. Eventually, when they find your network is secure and your passwords are strong, they will get bored and move on.

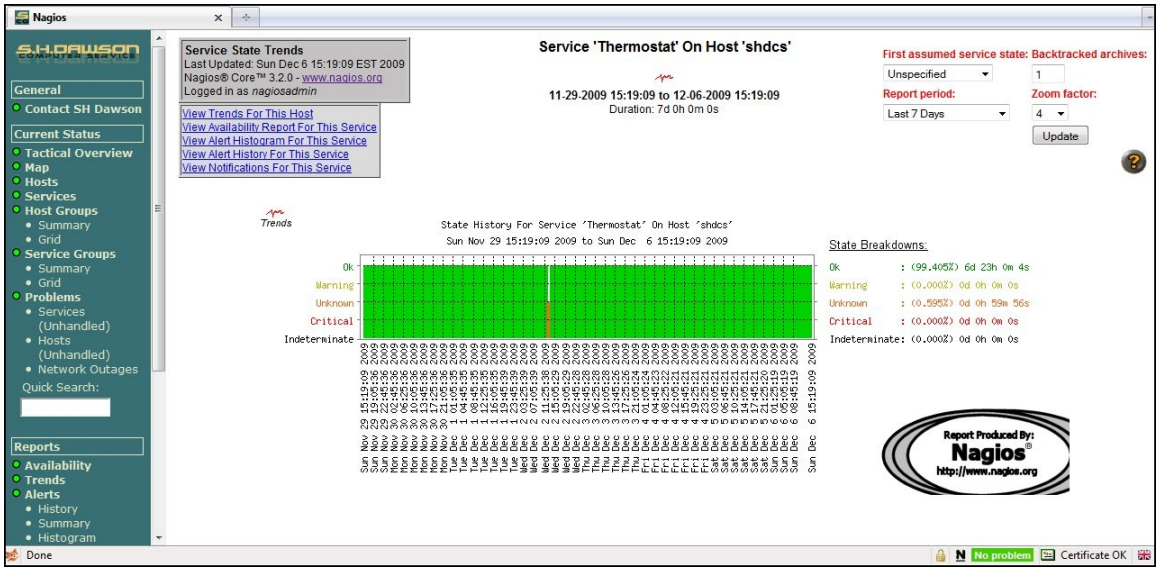
Be sure to use randomly selected upper and lower case letters, in association with characters and numbers when defining your passwords. Use as many characters as you can when you make your passwords. Those combinations are almost impossible to break. Keep a record of your passwords somewhere safe. KeePass is a great tool to help with this if you need help managing your passwords.

Remote Monitor server
This is a matter of time and effort devoted to do a lot of reading. Thankfully, the Internet is a way of life for many and greatly assists by providing forums and email to talk with others that have done this before. Setting up a Remote Monitoring server is not that bad. What takes the time is setting up all of the necessary automation steps (configuration) to

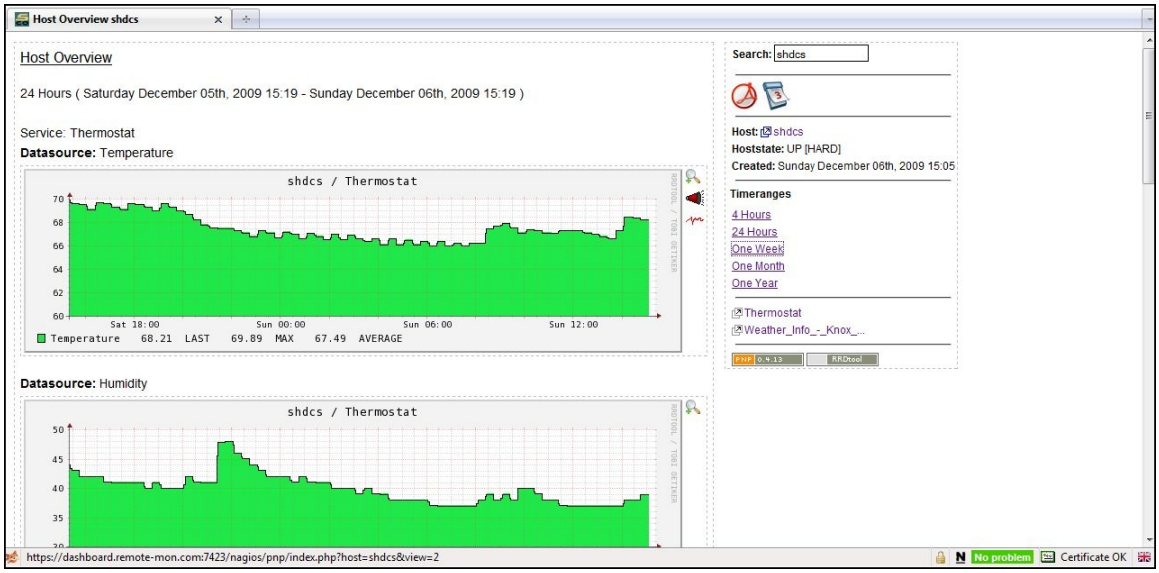
monitor the device that you need to watch, and all of the parameters that you care about on that device as well.

Arrival and Success

Here is a look at what you will see when you have your Remote Monitoring server up and running.



Taking review of the interface through only the numbers (speed, time, et cetera) is not always that much fun. Taking review of the data through graphing often provides an entirely new insight as to the meaning of that data.



There can be different user accounts in the many different programs necessary to run a Remote Monitoring server. Granted, there can theoretically be just one (administrator), but you will find that you need people to help you take care of this server when you are busy with other activities. Be sure to use randomly selected upper and lower case letters when setting up your user accounts, in association with characters and numbers. Use as many characters as you can when you make your passwords. Those combinations are almost impossible to break. Keep a record of your passwords somewhere safe. KeePass is a great tool to help with this if you need help managing your passwords.

You will probably find that having in place Remote Monitoring of a device like your HVAC thermostat is a convenient way to manage the activities of life. The flexibility of using the Internet to setup your TiVo box is a nice and helpful way to save lots of time and effort when selecting what you want to record for later viewing. Most folks I speak with say they monitor more and more devices and attributes about those devices as time goes on. They also compare the ease of Remote Monitoring to that of a TiVo. It is something that once it is in place, you find more and more uses for it. The biggest hurdle is getting that initial setup running.

Conclusion

If you need to Remotely Monitor anything, and it really matters that you really know what is going on with a remote service, system or device, this technology is for you. Perhaps you need to take care of the thermostat of a loved one soon, but not so much now, and want to get things ready for that day. Perhaps your business needs round the clock operation, but you do not want to be there to operate it. As stated in the introduction of this article, there are many reasons to do this. Life is not a regularly scheduled thing. Thinking it through, you will probably find several reasons why you need Remote Monitoring. It can be, and often is, some work to set up, but you will find the benefits of having Remote Monitoring will prove highly valuable.

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