Murat Ulasir (OHM Advisors): Welcome to the show "Advancing Communities: Thinking That Enhances the World Around Us", brought to you by OHM Advisors. I am your host, Murat Ulasir. Today, I am pleased to have Robert Czachorski on our show. Robert is a partner at OHM Advisors, and he is also the cofounder of H2Ometrics, a collaborative water analytics software company.

Of course, we won't necessarily get into the detailed technical jargon, if you will, of analytically technical software tools and technologies. However, we are going to explore the theme of how smart technology can comb through data utilities collected through their SCADA system, and at times, just discard data that can house vital information for reliable system operation and management. In other words, basically how can we more effectively use computers to better manage our infrastructure systems.

And perhaps, it is time to move beyond SCADA. If you want to find out more information about H2Ometrics, please do visit the website H2Ometrics dot com. Robert, welcome to the show.

Robert Czachorski (OHM Advisors): Thanks for having me, Murat.

Murat: Robert, I am intrigued about this topic because we are talking about moving beyond SCADA; we are talking about computers now being able to do things that can be extremely valuable for managing infrastructure assets. So let me ask you this question – what has happened in the last few years that has enabled us to look at computers and technologies in a different light?

Robert: Well, that's a great question. First of all, municipalities, water utilities, and utility systems in general, are collecting and generating so much data that I think a lot of times they're just overwhelmed with data. And in the past, they haven't had very good tools to manage that data and to create actionable output, or get intelligence from their data to help them operate their water or their sewer systems.

Some of the things that have happened in the last 5 or 10 years are that we're having a big data revolution. Computers have gotten so fast. They can process so much data now that we have the tools and the computing power to just plow through a ton of data and get all kinds of valuable information out of it. So that's one of the biggest changes, the big data movement.

Now, in parallel to all of the things happening with big data, we've also seen a big movement of everything going to the cloud, and everyone is now familiar with the cloud, understands that a lot of these tools, and email systems, and music, and videos are all in the cloud. The same thing is happening with data. The web now has become a huge repository for all of this data.

So the combination of municipalities generating a ton of water and sewer data, and the ability of the cloud now to house and store all of that data has created a new world and a new opportunity of collaboration and working with your data.

One other big advancement that's happened right in parallel to all that is the web browser has actually gotten very powerful in terms of its graphics-rendering capabilities. Even just a few years ago, some of the tools that we would want to use with graphing of data and getting metrics and analytics would really require the heavy lifting dedication of a processor, a computer on your desk.

And nowadays, all that heavy lifting and the graphics can be done right in the browser. So all you need in order to access these types of tools – and to build these tools – is a web browser that accesses the web and get to your data in the cloud. So that's really a game changer. You no longer need software installed on your computer or on your desktop that your IT department has to manage, and install, and maintain with updates.

Now, you just go to a web browser, log into a service, all your data's in the cloud, all the graphing and heavy lifting of all of the visualizations, and metrics, and analysis can be done right in the browser.

So those are really the big advancements. And those are the advancements that H2Ometrics was founded to tap. We founded the company because we believe that this was the future of data and analytics for water and sewer utilities. And so that's what H2Ometrics does.

Murat: So, Robert, if I hear you correctly, I'm almost thinking about a paradigm shift here, a shift in the way of looking at things. For example, back then up to this point, before H2Ometrics, we needed to have heavy computers, we needed to have SCADA, that data was housed. If the data could not be housed, it was discarded.

You are saying, "Well, wait a minute. This is a new era. Data can be managed outside of an IT platform." It can be pushed outside into a cloud platform, one. Two, what I hear you say is, "You don't have to have invested in heavy-duty infrastructure to be able to take advantage of these technologies and tools that are out there." That is what I'm hearing you say.

Robert: Absolutely.

Murat: And thirdly, I think what I'm also hearing you say is if, for example, a utility manager were to be listening to this podcast, he or she may be worried in that, hey, as soon as they hear the word "web," they associate it with hacking and there is obviously sensitive information about infrastructure. But of course, I think with this new technology, there is security embedded in it as well.

Robert: Yes, that's all true. A lot of things there. Let's just take them one at a time. Let's start with the paradigm shift. I completely concur, there's a paradigm shift that's happening. One of the things that's happening with this paradigm shift is because the tools are in the cloud, and we are now building them and implementing them once and making them available on the web to everyone, it brings the cost down.

As recently as 5 or 10 years ago, a municipality who wanted access to this technology, they certainly could get it. You would have to hire a big integrator or a programming company to come in and perhaps spend millions of dollars building some kind of a customized solution just for your utility.

Nowadays, because it's built in the cloud, you just subscribe to the service, and instead of being millions of dollars, we're talking about thousands of dollars to get access to these tools. I think that's a game changer, that's a paradigm shift that the cloud and the web are bringing down these cost of development and cost of these tools.

I think another aspect of the paradigm shift is when you get the data in the cloud, it creates a collaborative environment in the cloud. You now have access to the data, not by just one computer, one person who has the software on one machine; instead, everyone has access to it from home, from work, from anywhere. You can give access to your vendors, your engineers, all of your staff.

Now, when everyone's working from that same common database and all have access, you can start to collaborate around the data, make comments. If someone does an analysis, another person can see it, ask a question about that analysis right in the tool, in a messaging thread. So it's a shift, not only through making things more efficient and more cost-effective, but also it's creating a collaborative workspace in the web. So I think there's a lot of paradigm shifts that are all happening there at once.

I guess to your second point, which was a comment about security, people think of the web, I would like to think this is an older way of thinking of the web of, oh, it's the realm of hackers, and people can get in and do bad things. Well, that's certainly true anytime you're dealing with computers. But people have been conducting credit card transactions and doing online banking for decades – 10, 15, 20 years on the web. So there certainly are security tools that exist to make transactions on the web very secure and safe.

And so we're just simply implementing those very same technologies. We're talking about encryption of your data, protecting it. We use the same exact encryption to transmit the data through the web, as you would use when you're doing an online credit card transaction. So no one's going to hack in and sniff out your data. And I think that's probably the single most important aspect of security.

But let's also talk about just a base level of security that I think is important for everyone to understand, and that is when we're bringing the data into the cloud from these control systems, from these sensors, it's a one-way transaction.

The data's being pushed from the sensor or from the SCADA system to the cloud in a one-way access. H2Ometrics has a service; we do not access the control layer that operates the pumps and runs the water system. We don't have access to it, we don't access it, the customers don't want us to have access to it. It's simply just a pipeline of data piping out to the cloud for us to receive.

So because we don't have that access to the control layer, there's really a very limited amount of, I think, security risk. And then you're only dealing with the security risk relative to what's in the data. Is there security inherent in the data? There may be some, and so because of that, let's encrypt it and make sure that no one can sniff out that data stream, and that just locks everything down and makes it very secure.

Murat: Okay, that is very interesting. So what I almost hear you say, Robert, is I think H2Ometrics in essence seems to have, through this paradigm shift, found the right balance between system security and collaboration. You don't want to tie things down so tightly that only a single person can access it, only a single person can look at, where it's housed in a single location.

You're saying, "Well, I'm going to give enough security to this thing so that multiple people can look at it, multiple people can comment on the data, make infrastructure decisions on it, and then save it for later use and review."

In addition, what I'm curious about is this: we are talking about these technologies, clouds, encryption, and some intelligence, smart technologies, and tools that look at your data, analyze it, extract information out of...turn data into knowledge. I don't think we are talking science here. If I was a municipal engineer, I don't think I have to have a master's degree or a PhD to be able to use this data and get information from, right? I think that's another benefit and value of what you are trying to do with H2Ometrics, for example.

Robert: Yeah, absolutely. One of the main things we're trying to do with the software is to make it very easy and fast to get to your data and to get knowledge, information, metrics, and actionable output from that data. Let's face it, utility operators, like all of us, are incredibly busy. They're managing their utility system, they're managing their staff, they're managing their customers.

They certainly don't have time to sit in front of a computer 24/7 just watching their data feeds, watching their utility system and control systems all of the time. So it makes a lot of sense, let's

have a smart computer system, a smart water and sewer system that is watching that data for you all the time, telling you if something goes wrong.

Now you might ask, "Well, wait a second, having a system that watches our control system and monitors the utility system, well, we have that already. We have that in our control system. Our control system is running the system. It turns pumps on and off. It keeps our tanks full. It operates things automatically. And that control system has alarms and alerts that will tell us if there's a problem." That's certainly true. We're not talking about that type of an alarm, or an alert, or monitoring when we talk about smart water and sewer.

We're talking about something different, something more. And let's just talk about, if I can, let's drill down on that for a few minutes. So these utilities are generating so much data, primarily for control purposes. They have to make a measurement of the tank level or a flow rate, in order to do control function, turn a pump on or off, operate a gate, keep a tank full. For the most part though, after that control function is done, that data that's collected is archived, and it's really discarded and not accessed again.

But the fact of the matter is that the data has an incredible amount of useful information and knowledge about how that water or sewer utility is operating. So things like, if you were to have a water main break that occurred, or perhaps there's a blockage in your sewer system where the depth is starting to back up. These things are not going to be alerted by your SCADA or your control system. Your control system's not going to know that a water main break occurred. It's just going to pump more water into the system as it's designed to do.

So what you really need is a combination of the data with some type of analytics, or modeling, or metrics, so that when you bring those two things together, you can detect that, "Hey, wait a second. We're pumping in 20% more water than we usually do this time of year at this level of temperature and irrigation. Something has changed out there."

A smart system that's watching how the system normally behaves, knows what the trends and patterns are, and then detects if something different is happening, that's really what we're talking about when we say smart water and sewer. The smart system knows how things usually behave. There's a trending model there, there's some background information on how things normally go. And then the system tells you, "Hey, something's different here."

Murat: So, Robert, I like where this discussion is going because now we are actually going away from a theoretical discussion about technology into the realm of implementation, and you gave a really good example. What I hear you say is, there are tools and technologies out there – cost-effective, cheap – at your fingertips that will look at your system, look at its historic performance, look at climatological variations, put it all together and tell you whether your system's behaving normally or whether it's deviating from normal.

Meaning, even though the system hasn't triggered alarms, a huge pressure drop in the system, a huge water main break that broke the ground and geysers are going off to the top, even if there are some variations that may be indicative of this break occurring, the SCADA will not notice it until it occurs. But these smart technologies are going to alert you to it, they are going to say, "Your system has changed and it's changing to this degree – faster, slower – where, and you decide."

Robert: Yep, that's right. That's right. And actually I wouldn't even say the SCADA would know that it occurred. The SCADA system is just going to keep on controlling the system and pumping in more water. It really isn't going to know that a problem like a water main break, or an open valve or something like that has occurred.

Murat: Oh, it would think that it may be an increase in demand, usual consumption...

Robert: Yeah, a SCADA system doesn't really know, it's not smart. It doesn't really know what the system should be doing, it only knows the system is calling for more water, so the SCADA system just pumps more water in.

Murat: It's a reactive system.

Robert: Exactly. It's a reactive system.

Murat: But you're talking about a proactive system.

Robert: A proactive smart solution. So let me give you just a couple examples, real-world examples that we've seen out there. One is the example of the water main break. We have a customer who was in the process of evaluating H2Ometrics last summer, and they had a water main break that occurred right before they started using the service. This water main break occurred at about 11 o'clock at night. No one noticed that the water main break had occurred until the next morning. The water was running down the ditch line and no one saw it because it was night time.

In the morning, one of the residents noticed the water flooding through the ditch, called the city, and they came out and fixed the water main break. The city estimates that that break cost them about $2,000 to $3,000 of lost water. Well, they tell me that if they had a smart system watching, they would have known in real-time...I mean, their water demands tripled overnight, during that time period. And like I said, their regular monitoring systems didn't alert them to that, they had no idea that should not be happening.

If they had had a smart system in place, within about five minutes of that water main break occurring, the knowledge of that water main break exists in the data. You just need something to be watching that data to alert you that it happened.

Murat: The data that usually gets discarded.

Robert: The data that usually gets discarded. So they tell me that if they had had a smart system in place, and they had received a notification by text message or by email, and this particular person says that they monitor their cellphone for these types of alerts, if they had gotten an alert, they would have gone out at 11 o'clock at night.

Now in this case, they know where most of their water main breaks occur. They have one neighborhood that has all of their cast iron main in it, and that's where they get 90% of their water main breaks. So the utility director tells me, "I would have just gone out to that neighborhood at 11 o'clock at night and drove up and down the streets until I found it, and then we would have repaired it right away, instead of the next day, saving us thousands of dollars in lost water."

Now, that savings actually is about the cost of what it would take to even just buy H2Ometrics. So they would've gotten an instant return on investment, total payback of that cost, just from one incident. So that's a very simple and direct example. But there are so many more.

Let me just give you just one other example. It's very common for cities that develop next to each other, as their systems expand and they get close to each other, to put an emergency connection in between two cities. And that emergency connection can get opened if one of them loses their water main feed or has a major break and needs to get some water from the other community; this is a fairly common practice in utilities in cities. Well, the valve that's on that emergency connection really needs to stay closed.

And we had one customer who had a situation where, accidentally, that valve, for one reason or the other, ended up getting opened and inter-connected these two cities together. It went on for, in this case, several years before somebody noticed that one city was actually feeding a big portion of the water to another city.

And you want to know who noticed it? It wasn't an engineer or a utility worker, it was an accountant, it was somebody paying the bills. Saying, "Hey, I'm noticing here that suddenly our costs went up at this one point in time. What happened there exactly?" And you drilled down on it and you realize, "Wow, we started using a lot more water. Where's that water going? Where is it coming from?" And you realize it's all going through this open valve. Again, a smart technology would have watched those trends and known within 5 or 10 minutes that the valve got opened.

Murat: That the valve got opened, right.

Robert: I think in this case, we were talking about millions of dollars that had to be transferred from one city to the other for the water that flowed through this emergency connection.

Murat: That is fascinating. And I think I probably wouldn't be surprised that we could add even one final example to it, and that would probably be relating to sewer systems, especially now with...certainly there is a debate about whether climate change is real or not, but something is changing about the climate and it's causing more storms, it's causing more backups, it's causing things in the system that are headaches for residents, and for municipalities.

And as we talked, these smart technologies have a climate component to it, they relate the climate variations to flow variations and observations, and I can see a smart tool like this coming in very handy for municipalities who try to get a handle on how their sewer system responds to storm events.

Robert: Yep, absolutely. We've focused a lot on what I call SCADA systems and data coming out of control systems. I think that's one of two very common data sources that municipalities, water and sewer utilities have. I think the second big data source is data collected from temporary flow metering. A lot of times when you're doing a sewer project, an I&I analysis, you'll install flow meters temporarily, maybe for three or four months, maybe sometimes for a year. Some of our customers have permanent sewer meters that they use.

But that's another data source that's just from the measurement of flow from sewer metering, or from master water meters that are used for billing of flow between municipalities, that's a whole other data source. And then, of course, H2Ometrics is set up to take in that data, perform I&I analysis, perform rainfall analysis, do all of that data analysis, repository, and metrics that you would want.

So certainly there's an engineering analytics function to H2Ometrics as well that we've not really talked about much. But as far as the smart technology goes for sewers, I'll just give you an example. We have one customer that we've talked to, and they regularly experience blockages in their sewer interceptor. These are probably from something like a root ball that forms and eventually clogs the pipe up, or in some cases, it's a grease ball from grease that gets put into the system from users, and restaurants, and things like that, which causes a blockage.

Well, the failure mode and the detection mode for those kinds of blockages is that the sewer gets completely blocked, and then it backs up upstream to the point where it spills to the ground and you get an SSO, a sanitary sewer overflow. And somebody will notice that, hey, there's this murky, smelly water that's leaking out here and going into the creek or the river.

And so the kinds of detection systems we have in place today, they're miserable. It's a sewer overflow and sewage in the environment, people smelling it and interacting with it, that's just really not good.

It makes a lot of sense that in a smart sewer utility, we could simply put a depth sensor at some key locations along the interceptor. And then if that depth sensor detects that the sewer is starting to back up, get a detection that it's happening way before it backs up to the ground and starts to cause a dry weather sanitary sewer overflow. So I think that's a really nice example of how you could make a sewer system smart to prevent some of those problems with blockages and overflows.

Murat: So in closing then, what I hear you say, Robert, is quite amazing. There is a paradigm shift taking place in the technology industry, which you are trying to reflect back to benefit municipalities. And what I hear you say is that for a fraction of a cost, we are talking a few thousand dollars possibly per year, you can virtually hire a PhD inside a computer that harvests your data, and in return, gives you information to be able to manage your infrastructure, even to operate it better and more strategically and more timely, thus saving you money in the long run.

Robert: That's very well said. It's like having a full-time employee, 24/7, just watching your data for anything unusual, and that employee actually knows how the system should be operating because they have a trending model in their head and know exactly what should happen at different times of the year. That's a very, very nice description. We have a full-time person watch your system, your data for you all the time.

Murat: Fascinating. Well, thank you very much, Robert, for this rather engaging conversation.

Robert: Sure. Thank you for having me, Murat. It's been a pleasure.

Murat: Thank you. Tune in next time and visit us at ohm dash advisors dot com slash blog, you'll find links, transcripts, and you can sign up to receive notifications of blog postings. You can also provide suggestions for future topics. Just email us at podcast at ohm dash advisors dot com. Goodbye.