



<http://www.runasradio.com>



Richard
Campbell

RunAs Radio is a weekly Internet Audio Talk Show for IT Professionals working with Microsoft products. The full range of IT topics is covered from a Microsoft-centric viewpoint.



Greg
Hughes

Text Transcript of Show #084
(Transcription services provided by [PWOP Productions](#))



John Rodriguez Troubleshoots Exchange!
November 19, 2008



[Music]

Brandon Wenn: From runasradio.com, you're listening to RunAs Radio, the Internet audio talk show for IT professionals with Richard Campbell and Greg Hughes. This is Brandon Wenn, announcing show #84, with guest John Rodriguez, recorded live, Wednesday, November 5, 2008, at TechEd IT Pro in Barcelona. RunAs Radio is produced each week by PWOP Productions, providing professional media and podcasting services online at pwop.com.

Richard Campbell: This is Richard Campbell here at TechEd IT Pro in Barcelona. We're right in the middle of a floor in the community area. I'm sitting with my good friend Greg Hughes.

Greg Hughes: That's me and this is RunAs Radio.

Richard Campbell: I remember that, yeah. We're here doing RunAs Radio and we've got a guest with us and his name is John Rodriguez. John, what do you do?

John Rodriguez: I'm a Senior Premier Field Engineer in Minneapolis, Minnesota.

Richard Campbell: I'm coming to have a lot of love for the premier field engineers. You guys are the guys on the ground making key things actually work.

John Rodriguez: It's more we're fixing them when they're broken.

Richard Campbell: Yeah.

John Rodriguez: We also do a lot of risk assessments now, so we go in and we take the experience that we've had fixing things and we turn it into helping customers prevent them from being broken in the first place.

Richard Campbell: So, I mean a very powerful experience to be able to go from business to business looking at different installations and figuring out the best practices from that.

John Rodriguez: Absolutely. We can really take a lot of lessons learned from all of this. We can go through and kind of take the lessons from one customer, apply it to another customer in a similar situation and, like I said, help them prevent the problem from occurring in the first place.

Richard Campbell: Absolutely.

John Rodriguez: And then we codify that and turn it into, you know, best practices guidance or some other deliverable.

Richard Campbell: And I just love the fact that that's a feedback mechanism right out of the customer's hands like that couldn't get more real for me. So, what were you doing at TechEd?

John Rodriguez: Well, I've done two presentations both yesterday morning, one on Exchange performance demystified, sort of explaining and covering some of the different performance issues that we've seen with Exchange Server 2007 in the field and then second on troubleshooting strategies for Exchange Server 2007.

Richard Campbell: Troubleshooting, so what trouble does Exchange get into?

John Rodriguez: Well, it depends on where you're looking. We have had different issues with disaster recovery.

Richard Campbell: Sure.

John Rodriguez: People experiencing issues when they're trying to failover cluster mailbox servers from one node to another. We've had issues with mail flow. We've had issues with scalability, servers losing connections because too many users are connected to the system, kind of general issues like we would see in Exchange Server 2003, just manifesting in a different form.

Greg Hughes: I would imagine that you, sorry, I'm trying to speak up for you here, I would imagine that you probably see certain problems that recur time after time after time that you then, as you mentioned, you do write best practices and make recommendations. What are some of the common things that you tell people or that you want people to know ahead of time before the problem starts?

John Rodriguez: There are a couple of different things that I really want to get into when I talk about troubleshooting. The first one is we have so much logging in the system that if there's an issue occurring, you should know about it before you see the symptoms because you'll see events in the event log or you'll see events at some of the other logs, the pipeline log, the public transport logs, and so on.

Richard Campbell: And often, after we failed, then we go back to those logs and see we've had signals of this failure for weeks or months.

John Rodriguez: Absolutely and that speaks to the idea of monitoring. Monitoring is absolutely critical so that you can detect departures from the established norm. Not only that, I often talk to new engineers or to IT professionals who only think of the



event logs as something to look at or to be looked at when there's a problem.

Richard Campbell: Right.

John Rodriguez: It needs to be an ongoing -- absence of an event is just as good as the presence of an event. In other words, if you expect to see something and you don't see it, why don't you see it.

Richard Campbell: Yeah.

John Rodriguez: Is there something that you need to correct? When I'm talking about troubleshooting, one of the first parts of my presentations, what I call the three B's. In other words, they actually start with B; they all start with the word "be."

Richard Campbell: Oh.

John Rodriguez: The first one is be thorough. Just because you found something doesn't mean you should stop looking.

Richard Campbell: Right.

John Rodriguez: Because one problem can actually manifest itself with different symptoms or the same symptom can be caused by different problems.

Richard Campbell: Right.

John Rodriguez: So, the second one is be conscientious. It's kind of the technical version of the Hippocratic Oath, do good or at least do no harm.

Richard Campbell: Yeah.

John Rodriguez: Make sure that any change that you might make won't have a negative impact on the system. Third is be precise. Make sure that what you're saying or what you see is exactly what you think it is. A great example from my past is I used to refer to the /3GB switches, the 3 gig switch, and I was on a customer site once, they were running into virtual memory fragmentation problems, which is a common issue in Exchange Server 2003, and I asked the customer, "Do you have the 3 gig switch in place?" He said, "Yeah, I sure do." I took him at his word, it was only after when I went to look in the boot .ini file that I found that yes, he did have the 3 gig switch, /3gig.

Richard Campbell: Oh!

John Rodriguez: And since that day, I've only referred to it as /3GB.

Richard Campbell: Right.

John Rodriguez: So, it's important to be precise, thorough and conscientious. That often means using all available tools including the event logs, which to me are a dramatically underused resource.

Richard Campbell: So, how do we get into this behavior? I mean is it really nothing more than just going and looking at the logs on a routine basis or are there tools or configurations you can make that bring forward concerns sooner?

John Rodriguez: It depends on what you're trying to do. If we're talking about establishing a baseline, the event logs aren't going to necessarily help you. Baselining performance is always critical because that way you can detect departures from the norm.

Richard Campbell: Right.

John Rodriguez: If you're experiencing very high RPC average latency and you have no idea what the server normally does in terms of workload, you can't tell if the server is busy or less busy than normal. However, if you know that RPC average latency is usually about 50 milliseconds and the number of RPC operations per second is about 400, well, if RPC latency suddenly doubles to 100 milliseconds and the number of RPC operations per second had gone to 5000, well, I think the problem is the workload on the server, not that the server is broken. However, if the other way is true, if the RPC latency has doubled, but the number of operations hasn't changed at all, the workload didn't change, what the users are doing has not changed, something about the server has changed. It's important to be able to scope and detect the differences from the beginning so that you don't spend time chasing down a problem that is really not related to the issue at hand.

Richard Campbell: Well, the challenge here is in an initial configuration, usually we don't know what normal looks like. So, we may keep a record of those settings, but I don't know the number of times I've come in as a consultant and looked at the system and said, "Wow. That's just not right."

John Rodriguez: Right.

Richard Campbell: "This kind of gear with this kind of configuration, you should be doing so many more transactions per second or be able to handle so many more connections. Somethings wrong and it's been wrong since you installed it. You just didn't know enough to know it was wrong."

John Rodriguez: Right and that's one of the things that we've struggled with in the past. One of the best things that we ever did from the Exchange



team was creating the Exchange Best Practices Analyzer, which brought up a number of different settings that customers just didn't know about. Heap decommit free block threshold is a classic example and most customers never knew it existed, but ExBPA brought it to light, brought it to peoples attention. Now, ExBPA is one of our greatest strengths, but it can also be a bit of a weakness because customers often do things because our tools tell them to do it.

Richard Campbell: Right.

John Rodriguez: And I would like to recommend to everyone don't make a change unless you understand what the change is. ExBPA will surface all sorts of different settings, but unless you've researched it, unless you follow the link to understand what that actually does, I wouldn't make the change.

Richard Campbell: Right.

John Rodriguez: I would only want to make a change that I can understand.

Richard Campbell: What's that old story of when you have a fire, don't pour more gas on it.

John Rodriguez: Absolutely.

Richard Campbell: Step number one, stop making it bigger.

John Rodriguez: Absolutely and that goes right back into be conscientious. Make sure you know the implications and the consequences of your actions.

Richard Campbell: The challenge of course is sometimes the only way to know for sure how your actions are going to affect things is to actually do it and see the results. What kind of test case scenarios can we really do with Exchange?

John Rodriguez: That's where virtualization typically comes into play.

Richard Campbell: Oh yes.

John Rodriguez: Most of us don't have an unlimited supply of servers that we can run all of our tests against so we end up doing four or five virtual machines in a single host.

Richard Campbell: Right.

John Rodriguez: However, it's sometimes difficult to simulate all of the different moving parts, for example, the SAN. How do you create shared storage on a single cluster?

Richard Campbell: Yes.

John Rodriguez: You simulate an EMC CLARiiON or an HP EVA, you can't do that without a virtual environment. You have to actually have the real one.

Richard Campbell: Yeah, there's no way around that.

John Rodriguez: Yeah. One of the most important parts of doing the troubleshooting is actually understanding the moving parts, understanding the components within it and, again, it goes right back to conscientious. I've really distilled my troubleshooting philosophy to those three items.

Richard Campbell: Sure.

John Rodriguez: Being conscientious means understanding the components, not just understanding the narrow text of the recommendation, but understanding the reasons for the recommendation.

Richard Campbell: Right.

John Rodriguez: Exchange Server 2007 is a 64-bit application.

Richard Campbell: Yeah.

John Rodriguez: Exchange Server 2003 was a 32-bit application. So, there were things that we used to need to do in the 32-bit world, set /3GB, set user VA, set heap decommit free block threshold, things that we no longer need to do in the 64-bit world, but a lot of people can't tell you why, a lot of people don't understand why.

Richard Campbell: They don't understand the rules of memory between 32-bit and 64-bit.

John Rodriguez: Precisely. I mean 64-bit memory is actually a lie.

Richard Campbell: Yeah, it is a lie.

John Rodriguez: It's actually a 44-bit memory.

Richard Campbell: Yeah.

John Rodriguez: We're only using 16 terabytes of the available 16 exabytes. How many people have done the math? Not very many. So, being conscientious means digging into the why, not just the what. Now, I realize this talk is supposed to be about troubleshooting and it may seem that I haven't talked at all about troubleshooting. I'm not talking about actual tools to troubleshoot, that would be things like



event tracing for Windows, that will be things like the pipeline tracing logs and so on. What we're talking really is the methodology behind troubleshooting, the approach that you need to take to do a professional job of troubleshooting an issue. What's the issue itself? How many users are affected? Is it affecting all the users in a single server? Is it affecting all users in a single database? Is it affecting multiple users that have some kind of common point? We need to scope the question, scope the issue itself to understand what we need to look at in more detail and then we start to drill down. If it's a performance issue, select the appropriate performance counters. If it's an error message that clients see, what do we see on the client configuration as well as on the server?

Richard Campbell: Right.

John Rodriguez: We need to actually be able to focus on the real issue at hand using the appropriate tools. There's a common expression, when all you have is a hammer, everything looks like a nail.

Richard Campbell: Right.

John Rodriguez: People learn about a new tool and they use it to the exclusion of all else.

Richard Campbell: And there is a mixture of tools here that really are effective things to do to make this work.

John Rodriguez: Absolutely. I mean there are so many different tools that we have available for troubleshooting an Exchange issue. Not all of these different tools work for the same problems. So, if you're trying to use event tracing for Windows for a performance issue, you may detect the eventual root cause of an issue, a stalled IO or a bad message processing, but it will take you much, much longer because you won't know necessarily what you should focus on, which particular parts of the stack.

Richard Campbell: Sure.

John Rodriguez: However, if you're going into the performance counters looking at the fact that the average disk times are 110 milliseconds, you're going to have a much greater idea, greater understanding of where the problem actually lies. Just like you wouldn't use a hammer to pound in a screw, you'd use a screwdriver, you wouldn't use some of the different tools, you wouldn't use pipeline tracing for a performance issue. That would be preposterous.

Richard Campbell: Don't you find that folks they get lost? Like I'm busy analyzing the heck out of Exchange and what I've got is a bad NIC?

John Rodriguez: Yeah. That's another thing that comes up. Understanding the architecture can give you a better idea of where the different problems on a server, how it manifests itself. For example, if clients are complaining of high RPC latency, they're complaining that they can't connect to the Exchange Server, but you go look at the Exchange Server and you see their RPC latency is in fact very low, you may be able to reasonably conclude that the problem lies somewhere in front of the Exchange Server.

Richard Campbell: Yeah, the firewall is wreaking havoc.

John Rodriguez: Yeah, firewall intermediary network device or the client configuration.

Greg Hughes: Yeah. I can't tell you how many times with Exchange RPC problems are actually tied to a bad switch or a bad NIC somewhere else.

John Rodriguez: Yeah.

Greg Hughes: That classic network problem of, you have, auto configuration turned on for Full Duplex and they won't do it and next thing you know you're losing 1/2 or 3/4 of your packets, but the only place you can see it is somewhere in the middle.

John Rodriguez: Yeah. It's a classic expression that I love to tell in my troubleshooting stories. Exchange is the canary in a coal mine.

Richard Campbell: Right.

John Rodriguez: Because anything that happens anywhere in your environment, Exchange will typically turn up. If you have a problem with Active Directory, Exchange will see the symptoms. DNS, we see the symptoms.

Richard Campbell: Yup.

John Rodriguez: Storage, we see the symptoms. Network, we see the symptoms and so on and so forth.

Richard Campbell: Yes. It's really spread through the whole system. I had a scenario where somebody in their infinite wisdom had stuck a 10BASE-T switch as the connector between 2 gigabit switches and we're wondering why some guys think that everything was really slow and yet nothing was ever busy. You're not diagnosing the right area.

John Rodriguez: Absolutely and that goes into scoping the problem. Understand what you're actually seeing. What's the implication?



Richard Campbell: Do you tend to start with the hardware and work your way up? What's your approach to troubleshooting these kinds of things like...

John Rodriguez: I actually start by asking a lot of questions about what the actual problem is. I get the customer to define what's wrong, what is the problem...

Richard Campbell: To clearly manifest ...

John Rodriguez: To clearly define this and also to define their success criteria. What do they consider fixed? Because sometimes fixed is either an incremental improvement or is the elimination, you know, complete and total completion or complete and total elimination of the issue.

Greg Hughes: Do you start with symptoms? Is this a differential diagnosis kind of approach that you take or do you have specific questions that you ask?

John Rodriguez: It's generally going to be differential. It's going to be based on the specific symptoms. If I hear issues that the clients are complaining of high latency, that they see the Outlook dialogue box saying that "Outlook is requesting data from the server," then I'm going to start asking questions, the scoping questions I mentioned earlier. Okay, is it all users? Is it only users in online mode? Do they see that in cache mode as well? I want to find out as much as I can about the different aspects and to find out how many users, are they all in the same database, are they in multiply databases on the same server, are they in different servers and the same site, are all the users in the same office, are all the users using the same version of Office, all of these different detailed questions because we need to know what to look at. Once I get the answers to those and I don't always get the answers to all of them, then I can start focusing on the specific individual areas. For example, I typically do performance so a lot of the calls or a lot of the issues I get are related directly to server performance, so I'll ask those questions and then start looking at performance counters, RPC, average latency, RPC requests, and so on.

Richard Campbell: It seems like we're generally presented these problems as partial diagnoses. "The server is slow." "Sir, are you actually looking at the server?" "No, no. I'm using Outlook and it seems slow, so I'm blaming the server." Actually, your Outlook is slow.

John Rodriguez: Absolutely and that's what the questions are designed to avoid like when you call the partial diagnosis, it's a great term.

Richard Campbell: Yeah. For me, the whole concept of partial diagnosis is this you've assumed what the problem is rather than actually focusing on just "all I want to do is describe the symptoms to you. That's all I need." I'll figure out what the problem is. That's my job.

John Rodriguez: Yeah. It's kind of the idea of having the professionals handle their specific area.

Richard Campbell: How come people keep telling us the Internet is slow.

John Rodriguez: Because it is.

Greg Hughes: And because we let them. We encourage that, right? So, for the IT pro who's sitting on the helpdesk or is responsible for taking calls that are Exchange-related, for example, or Outlook-related, what would you say are the first three questions they should ask every time?

John Rodriguez: What are the specific symptoms? Users often refer to any dialogue box that appears as an error message. Well, they're not all error messages. Some of them are notifications. So, what does the error message specifically say? Does the name of the Exchange Server appear in the dialogue box? It says, "Outlook is requesting data from the server." Does it say the name of the domain controller? Does it say the name of the Exchange Server? Does it say just the short name of the Exchange Server or does it say the long name, the fully qualified domain name? Obviously, it's more than three questions there. The first question is what was the exact message that you're seeing. Second, what were you doing when the error message appeared because different tasks will spawn different results in the Exchange Server. If you were sending an email and you saw a delay, that could potentially point to log record stalls on the server. However, if you were trying to read a large attachment, that could point to read latency on the database disks, especially for a client in online mode. The third question I would want to know is what's the Outlook client, how is it configured, so what version, what add-ins, are you in cache mode or online mode, different things that will tell me about the expected behavior.

Richard Campbell: It's surprising. The configurations, well, especially now we've got into add-ins with Outlook, is just so hard to know what Outlook is up to in all of those situations.

John Rodriguez: Absolutely.



Richard Campbell: I've also found it very challenging to deal with diagnoses around intermittent network problems, problems with VPNs, problems with bad wireless, those sorts of things. It just seems to wreak havoc with Exchange in Outlook.

John Rodriguez: It potentially could. We're kind of co-mingling Exchange and Outlook as if they're one object.

Richard Campbell: Yes.

John Rodriguez: And for a lot of managers, they really do view them as one object. Well, they're not obviously.

Richard Campbell: What is the client of the server, right?

John Rodriguez: Well, different teams own them. The Exchange program obviously was Exchange and Outlook is owned by the Office team and although they do work together, they're not the same products.

Richard Campbell: Sure.

John Rodriguez: So, first thing is, you know, how does the one work connecting to the other?

Richard Campbell: Yeah.

John Rodriguez: Outlook is a mappy client connecting to an ESC server, Exchange uses the accessible storage engine, but Outlook doesn't talk directly to the database. It talks to the information store on the symptom, which then retrieves the information and writes the information to the database.

Richard Campbell: Right.

John Rodriguez: So, things like that have a major impact on the way you would attack a problem.

Greg Hughes: I know even just using Outlook Web Access to actually see if the behavior is different there than it is on the Outlook client sometimes, not in every case, but sometimes provides useful information as to where the problem might be.

John Rodriguez: Absolutely and there are no add-ins typically in an Outlook Web Access session.

Greg Hughes: Right.

John Rodriguez: So, you'll see completely different behavior because you're not seeing all of the different interaction or competition for access to the mappy DLL on the client side.

Greg Hughes: Right, but to take your example, I believe, so if you're opening large attachments for example and you see a problem in Outlook Web Access as well as in the Outlook the FAT client, if you will, then that really gives you a clue as to where to start looking for your problems.

John Rodriguez: Well, it helps you rule out the individual Outlook client, but it doesn't necessarily tell you the problem isn't the mailbox, it doesn't tell you the problem isn't the server, it doesn't tell you the problem isn't the network. It helps you rule out one issue. It shows you can reproduce it.

Richard Campbell: John, do you generally find that the bulk of the time we're spending on is all about the diagnosis? That once you've diagnosed the problem, the fix is apparent?

John Rodriguez: Not always, maybe a third of the time I find that.

Richard Campbell: Right.

John Rodriguez: Quite often, the problems are a little bit deeper, you know.

Richard Campbell: There aren't easy answers to that problem.

John Rodriguez: Sometimes there is, but more often than not, it's actually a little bit more than just a simple click this checkbox and with one bound Jack was free. It's nothing like that. In the past, there was a lot of information which didn't expose to customers, but now with the ExBPA, with msexchangeteam.com, the Exchange team's blog, we've done a much better job of getting information out there. Now, obviously, people have to read the information, but with search engines and the ability to actually harvest the content quickly from an IT professional's standpoint, they can usually find additional information online. Now, of course, our knowledge base is what's publicly visible is only a portion of what we actually have and not every tool that we have is available to the public, so we can do more, but a lot of the stuff that we used to do in the past, you know, the hidden settings so to speak, they've been publicized.

Richard Campbell: Right.

John Rodriguez: So, people know about those. So, people are doing the tuning on their own. People are doing the troubleshooting. They're using the tools on their own. So, in the past, I would say that 80% of the issues had a simple fix.

Richard Campbell: Right.



John Rodriguez: Virtual memory fragmentation issues, yeah, /3GB, heap decommit free block threshold, call me in the morning.

Richard Campbell: Yeah.

John Rodriguez: Now, especially with 64-bit computing, the entire memory picture has really been reduced to one major issue, working set.

Richard Campbell: Right.

John Rodriguez: And that's it. We don't have to worry about virtual memory fragmentation right now. We don't have to worry about kernel mode limitations right now. We may in the future, but we don't now. Additionally, with the changes in memory, disks are no longer quite the same problem that they were in the past. Of course, we've introduced new issues by introducing replication technology, with CCR and FCR, log replay.

Greg Hughes: I've had the experience of working with field support, field services and premier services. It can be a really great resource not just for solving problems, but also for transfer of knowledge and education for people that otherwise may not be able to have another resource to be able to learn about troubleshooting Exchange. I'm thinking about troubleshooting Exchange specifically where Exchange administrators that I've had working in my environments have really benefited from working with people like you on the phone or in person just in terms of learning.

John Rodriguez: A lot of it, knowledge is power. The more you know about the product actually works, the better job you can do as a troubleshooter. For example, if you understand how Exchange writes information to the transaction logs and writes to the database, you can understand the different symptoms. You can differentiate between two different slow Outlook issues and determine where the real problem would be. I gave the example before. Is the problem occurring when you click send? If so, it could point to a problem with transaction log buffers or with the transaction log disks, log record stalls in other words, but if the problem is when you read an attachment or you read an email, that points to problems either with the size of the database cache or with the access times for the database disks. If you didn't understand the mechanism, you wouldn't be able to make that differentiation to focus on the appropriate points.

Greg Hughes: As you mentioned earlier, one of the real risks is what do you not know. What do you recommend or how should Exchange administrators out there in the real world assess their knowledge or their gaps in their knowledge? Are

there specific publications or certain resources that you would point people to as sort of the de facto standards for a good place to start to make sure that you need that? Does that exist?

John Rodriguez: No. The ExBPA includes a lot of information, but it also includes links to TechNet and content published up on the web. Unfortunately, there's a lot of content up there and I have yet to meet administrators willing to sift through and read all of that straight through. So, some of it is going to be very opportunistic. You have an issue, you learn a little bit more about the technology behind what's actually caused the issue like you have a problem with disaster recovery so read a lot about log replication.

Richard Campbell: Sure, but I also think that that understanding the architecture of Exchange doesn't make sense to you until you've gotten your fingers dirty, until you're in there to some degree. It's very hard to read all of the architecture of those things in advance. Until you're really working with Exchange, it's hard to value the different bits.

John Rodriguez: Yeah. Can you become a black belt by reading books about karate? Yeah, I don't think so.

Richard Campbell: Exactly. You need to be involved in that. So, it does strike me as an ongoing thing. One of the things I like about ExBPA is just that starting point of these numbers look good, these numbers don't look good and that gives you an area to say, "I'm going to go study there because it's not happy with that for some reason."

John Rodriguez: Okay.

Richard Campbell: Not that I'm immediately going to implement its recommendations, but it's given me an area to focus on.

John Rodriguez: Yeah. That's going to be for configuration and one of the things about the ExBPA is we do update the rules set on a regular basis. Now, running ExBPA on a regular basis will tell you about things that may recommend you change, non-recommended settings or non-recommended configuration.

Richard Campbell: Right.

John Rodriguez: However, it's not a troubleshooting tool. It will give you an idea of baseline, it will tell you if there's something that's going on, but even though when you call into Microsoft support with a question, you know, you have a particular issue on your system, they will ask you if you've run the ExBPA because that allows us to



quickly determine, "Okay, is this what we call low-hanging fruit? Is this something we can quickly and easily take care of?"

Richard Campbell: The next step is to run it.

John Rodriguez: Absolutely, absolutely, but often the issue is beyond that. A lot of customers have really gotten into the habit of running ExBPA on a regular basis.

Richard Campbell: Yeah, which is not a bad thing.

John Rodriguez: It's not a bad thing at all, not a bad thing at all.

Richard Campbell: It's not the be-all and end-all of anything either.

John Rodriguez: No, it's not. Just imagine that you got a customer that doesn't understand the benefits of configuring the logs and databases on separate drives.

Richard Campbell: Right.

John Rodriguez: The ExBPA would tell them you need to do that.

Richard Campbell: "You should do this."

John Rodriguez: They're having a problem so they see this, they go ahead and they do that. They moved them onto separate drives and they still have the problem. Okay? They're following the recommendations, but there's some kind of issue occurring.

Richard Campbell: Yeah. Just because you've followed the recommendations doesn't mean you actually fixed your real issue.

John Rodriguez: Exactly, exactly. So, what are some of the different tools we could use? If we have a log replication issue, we've got a CCR cluster. We can't do log replication between the two different nodes, the active and passive node. Okay, what next? Well, we've got a whole bunch of different PowerShell commands that can help you there. Test system health, test replication health, those are both pretty useful. I use test replication health pretty often. I did a concurrency about four weeks ago in Oklahoma City where the administrator didn't know it existed, so he saw me running it repeatedly, asked me finally about an hour later and said, "What was that command you kept running?" I said, "Test replication health." I showed him this PowerShell command and he thought, "Okay, this is one I'm going to keep for the future."

Richard Campbell: Yeah. I'm going to write that one down.

John Rodriguez: Yeah. So, that goes kind of back to what Greg was saying about the knowledge transfer. We can do a lot of knowledge transfer when we're on site. As we're going through and showing, "Okay, this is the problem, I understand that. Here's what I'm trying to do to fix it and here's why I'm doing it to try to fix it." So, you give him a little bit beyond just "okay, I'm going to click here, click here, click here. We're done."

Richard Campbell: Right.

John Rodriguez: What benefit did that provide you? None.

Richard Campbell: Yeah, I know.

John Rodriguez: But if I said, "I'm clicking here because the Fetzer valve is clogged and we need to open up the doohickey, then at least you have a better idea.

Richard Campbell: You have some idea of why we're doing that and certainly explaining as you go so these guys have a chance of fixing it themselves in the future.

John Rodriguez: Yeah.

Richard Campbell: The goal is actually just to get more service calls.

John Rodriguez: No. The goal is definitely not to get more service calls. The idea is to get customers healthy.

Richard Campbell: Yeah. Well, John, it's really been great talking to you. Any final words? Blog we can shout out to?

John Rodriguez: Unfortunately, no. I do not actually have a blog.

Richard Campbell: All that genius kept to yourself.

Greg Hughes: And shared with customers.

John Rodriguez: And shared with customers, right.

Richard Campbell: Yes. Well, thanks very much for coming on the show.

John Rodriguez: Thank you.

Richard Campbell: And we'll talk to you next time on RunAs Radio.