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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 #005*  
(Transcription services provided by [PWOP Productions](#))



**John Savill on Application Virtualization  
May 9, 2007**



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**Carl Franklin:** From [runasradio.com](http://runasradio.com) you're listening to RunAs Radio - The weekly Internet talk show for IT professionals with Richard Campbell and Greg Hughes. This is Carl Franklin, introducing show #5, with guest John Savill, recorded April 23<sup>rd</sup>, 2007. RunAs Radio is produced each week by Pwop Productions - offering professional media and podcasting services, online at [pwop.com](http://pwop.com).

**Richard Campbell:** Hey, this is Richard Campbell, and you are listening to RunAs Radio, and with me as always Greg Hughes.

**Greg Hughes:** Hello, Richard.

**Richard Campbell:** Here we are again, a full month's worth of shows done.

**Greg Hughes:** Yeah, that's pretty exciting, I have been having a good time with this, been getting some great feedback from our listeners, who also seem to be having a good time, along with some terrific suggestions they are emailing them to [info@runasradio.com](mailto:info@runasradio.com) and what you all are suggesting are things that we are taking to heart and we are looking at for including for future shows.

**Richard Campbell:** Having a good time talking to, potential candidates, every time we talk to a new guest, I'm thinking, "Wow, there is three shows there."

**Greg Hughes:** Yeah, I think a lot of the guests that we have had on, we are already considering having back at sometime in the future, we seem to touch on topics, and we are able to drill down on one slice of their pie, but there is an awful lot of other information, that a lot of these people are willing to and excited to share.

**Richard Campbell:** So much to talk about and if you have any suggestions, or you want the show to be longer, or anything you're thinking about please contact us [info@runasradio.com](mailto:info@runasradio.com).

**Greg Hughes:** We received an email from Michael Minitello who says, "Good day Richard and Greg, it's good to hear my comments being read aloud on the show, at a recent show. It's the first time that I am aware that that's happened. I have been trying to consume the entire Pwop Tech empire since I finished university late last year. It's good to know that it's not all about C# versus VB.NET and fighting monkeys, although we certainly enjoy that part as well."

**Richard Campbell:** The whole Pwop Tech empire is a lot of stuff actually, some of it less serious than others.

**Greg Hughes:** Michael goes on to say, "Managing emails is one of those things that most people don't really worry about until the first time they've had to find something. I have never had to do it for legal reasons but for reputation management, well you better believe it." He also points out that the first episode which was of course about storage, and we talked about SAN's and NAS Infrastructure. He says, "The first episode was cool too, I love the quote about most organizations not knowing or being able to locate a large portion of their data. Having constructed a few document management systems for clients, I can certainly appreciate that many don't even have a clear understanding of how to organize their data, let alone where it is." He says, "Keep up the good work and I'll be hearing from you next week."

**Richard Campbell:** Well, thanks Mike. That was a great email and interesting problem, sounds like this is a guy who spent a lot of time looking for stuff actually.

**Greg Hughes:** I can tell you that I have. Somebody said it once, I don't remember who it was, but they told me, it was probably 10 or 11 years ago, they said, "It will be really, really great if my organization only knew what it knows."

**Richard Campbell:** Yeah, it's one of those very fundamental things around.

**Greg Hughes:** I think, that's the whole world there are people who make their livings doing nothing but taxonomy, and that's, how do I organize things and why do I do it the way that I do it, and you know it might make an interesting show somewhere down the road.

**Richard Campbell:** Is that really about being a data librarian?

**Greg Hughes:** It's about being a data something, and it's not all technology. Technology is one part of the pie, one slice of our pie that we can use in terms of solving problems, but there is more to it than just the bits that we stick on the computers.

**Richard Campbell:** You bet. Alright, let's get to our guest. John Savill is the Director of Technical Infrastructure at Geniant. He is a CISSP, a Security and Messaging MCSE on Windows Server 2003, an eight-time MVP, and a Krav Maga instructor. He is also the author of Windows Server 2003 Active Directory Design and Implementation from Packt Publishing. Hello John!



**John Savill:** Hi! How are you doing?

**Richard Campbell:** I am great. Eight-time MVP, I don't even know what Krav Maga is.

**Greg Hughes:** I was going to ask the same question, I bet there is a lot of people that would like to know.

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**John Savill:** It's actually a martial art and it was created for the Israeli Special Forces and it's very much created so that people can come in without a lot of background in martial arts or high fitness and just learn to defend themselves. So, it's very practically based, it's a street self-defense system.

**Greg Hughes:** I imagine that comes in handy in an IT environment?

**John Savill:** It is, because if you do poke and someone is saying, the client wants to attack you, you can defend and empower you for a little bit.

**Greg Hughes:** Good deal.

**Richard Campbell:** I mean, you've obviously done a lot of interesting things here around X directory and so forth, but it sounds like the hot topic today is Application Virtualization.

**John Savill:** You see, Microsoft have very much been pushing, they are trying to move away from selling individual products, to very much a software subscription model. So, software assurance, Enterprise Agreement and one of the ways they are trying to push that and encourage people to move to that, is to offer additional services, if you purchase software assurance for example. Application Virtualization was very much earmarked by them as a very new technology that has a lot of opportunity and so the bundled this along with three other products they call the Desktop Optimization Pack, which is a body you add on for anyone with software assurance.

**Greg Hughes:** So, what does Application Virtualization really mean?

**John Savill:** Okay, so you're probably used to the idea of sort of server based Terminal Services for example, and in Terminal Services, a user runs like a dumb client effectively, that creates a session on a terminal server, it's like a star bar, a full Windows interface and they can run programs and applications on that and just the screen output is sent back to their local terminal. Essentially all the processing, all the

calculations is performed on the terminal server. So, if I disconnect from the network, I can't run those applications. It's really a waste, I have this powerful Dual core 64-bit, with four gig of RAM laptop, that's effectively nothing more than a dumb screen. So, that's Terminal Services. Then we actually came to like Server Virtualization, which -- the idea was, I can run special software on a server or desktop, like Virtual Server R2 or Virtual PC. To create a virtualized operating system, so it virtualizes hard disks, so you just have a single file on your computer like a PHD file, and a virtualized operated memory and processor, and resources and it runs separately from the underlying operating system.

So, I could be running Windows Vista or Windows Server 2003 R2 and in this virtualized environment, it can run Windows NT4 or Windows 2000 and it really gives me a Sandbox capability, so that I can run multiple operating system instances on one physical piece of hardware. For compatibility issues, I may have to run an application on Windows 2000. Yeah, I don't want to keep a Windows 2000 physical box in my environment and it makes be for supportability. I want to be have to reboot that instance of an operating system without affecting all the other applications running on the system, but that there is a lot of overhead in that, when I virtualized an entire machine, it's still a set for operating system. So, from a patch management perspective, from an updating applications, from a monitoring perspective, that is still a whole operating system I have to monitor.

**Greg Hughes:** We have seen server virtualization in data center applications or maybe some development organizations, the places where maybe you're wanting to reduce the capital expenditure associated and the amount of hardware that you need to physically put in a space.

**John Savill:** Right, it's very much a great tool for consolidation. I mean, there are multiple technologies around. Virtualization is one, I can run multiple operating systems on one physical piece of hardware, or I can use a thing like Windows Server Resource Manager, which is really a component of Windows Server 2003 Enterprise Edition that lets you allocate certain amounts of CPU as memory to individual services or applications. So, it's really designed to stop a rogue application, using up all the memory or all the CPU on a box and it allows you to bottleneck it and say, "Hey, during the day, this application can use 20% of the CPU. At night, maybe some batch processing, you can use 80% of the CPU." So, it stops one application bottlenecking the whole machine.



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**Richard Campbell:** I saw a lot more of this back in Windows 2000 with the Datacenter Editions, where we were able to re-allocate the number of processors to a given OS, so you would have a 64 processor box and you would split it, half and half, or quarter to three quarters between Exchange and OLAP and then switch it around at night and so forth, is this beyond that?

**John Savill:** I mean, what you are talking about is processor affinity. The idea of being, I can allocate individual processors to certain processes running on the system. Yeah, I mean this kind of basically a step further, I can now slice up portions of a processor's usage to individual services and applications, and I can also slice up the amount of physical memory in the box for example. So, it's really a step beyond a processor affinity. That's the Windows Server Resource Manager, that again just a server side solution.

**Greg Hughes:** Let's talk again, drill down into what specifically then is the Application Virtualization?

**John Savill:** So, lets take the idea of virtualizing an operating system. We have a lot of over head, we create virtual disk environments and a virtual Operating System. It is a complete OS. What we have with Application Virtualization is, we sequence an application, it's kind of like packaging a special format, and we essentially perform an installation of the application on a special PC, and it captures all the file system activity it makes during an installation, all the registry changes, components it may register, and it captures all the changes it makes during installation, and it's basically a data stream file.

Then it sends that stream in on demand fashion to the application virtualization client. Now, the way that actually functions is you have a special SystemGuard Environment running on your client PC and this SystemGuard Environment is a sandbox nature i.e. anything running in this SystemGuard Environment, is restricted from talking directly to elements of the operating system. The way it functions is, the SystemGuard has a Virtual Registry, a virtual file system, virtual font system services, etcetera. So, when it takes this stream of an application from the server, it runs within this sandboxed environment. So, the application believes it's talking to the real registry, it believes it's talking to the file system. In actual fact, it is communicating with these virtual file systems or virtual registry layers within this SystemGuard, this sandbox environment. So, the application just runs normally, it's running locally on the user's machine, it's not running on the

server remotely, so I'm actually using my local machine's power and features. But it's not modifying the underlying operating system in any fashion, I am not writing files to the file systems to program file systems that I need to. I am not modifying the registry, but it's running completely locally on the box, and the whole fact that you're streaming on demand is facilitated by -- if any of us has ever packaged an application, so we might have used WinInstall Light for example, and we would take a blank machine, we would say, "Snapshot now," so this is what the machine looks like, you install the application and you say snapshot again, and basically it would capture the differences in the state of the machine and create an MSI file for you.

Think of that exactly the same as when we sequence an application for virtualization, except in addition to it saying what changed, it then asks you to execute the application a few times. So, it can actually see, when I run and if it's 120 megabyte word installation, I only actually need 30 megabytes of data to get the interface up and running and as a usable by the end user. So, not only does it install a single file stream of data about the Virtual File System and registry that's required, it breaks it into two blocks, a feature block one and a feature block two, and the feature block one is everything that's needed to get the application initially initialized, and that's all that it sends when I fire up an application. So, when I double click my Word icon that appears on my machine, because of the SoftGrid Client, SoftGrid is the name of the service that they purchased. It just pulls down feature block one, which runs inside the SystemGuard environment, to create that virtual registry and file system overlay and the app is up and running.

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It thinks, it's locally installed, but it's running in this protected environment, if I then go and run a feature that wasn't part of that initial feature block, it pulls it down on demand from that full feature block two, in 32K chunks, so for example, if I'm in Word and then I select help, help may not have been something that I originally selected, when I was sequencing the application i.e. getting it ready for virtualization. So, we can pull that down from the SoftGrid Server, so it can be shown on the local machine.

**Richard Campbell:** That's pretty incredible, really.

**John Savill:** It's a really cool technology, and it's what makes it so fast. I mean, if you look at traditional software deployment technologies, group policy, SMS even, if I'm willing to push out Office, I can get the icon, I can assign the



application to a PC, they can click the icon and it will install Office. So, that's pretty quick, but it's three, four, or five minutes before they're actually up and running.

**Richard Campbell:** You are still talking about hauling most of the application across the network?

**John Savill:** Exactly, whereas in this capacity, it's only pulling down what's actually needed to get it up and running. In reality, it starts within 10 seconds, because if you have a 120 meg app, just like Word, it only takes 30 meg of that to actually get up and running.

**Richard Campbell:** So, how do you decide on that 30 meg? You mentioned this whole, you decide what goes into the initial load, what figures that out or how do you figure that out?

**John Savill:** So, when you want to actually capture an application to allow it to be virtualized, you go for a sequencing process, and that's really in two parts. The first part is like I described, it does a snapshot before, install the app, snapshot after and that's what it knows is the total content of the stream. It then asks you to execute the application and during that execution, it's looking at, so what is being used out of this stream.

So, it's that person's responsibility as a sequencer to decide, well these are probably the most common functions. So, I should do a File Open, I should do some Word Art and I should do some spell checking.

**Richard Campbell:** It's all about that scenario that you walk through, that makes it feel like what the user would use.

**John Savill:** Exactly, and it's not the end of the road if you get it wrong. I mean, if you miss things, it doesn't matter, all that it means is when the user accesses those functions, they will get pulled down in real time from the SoftGrid server, so it might see a second delay.

**Greg Hughes:** So, the efficiencies that are built in really can be quite valuable, especially maybe if you are not on a very fast network?

**John Savill:** This is the whole point, so speed of delivery of this is a great factor. I mean, that really is a big selling point, but when you start to look at the way that it's not actually installing itself on the computer, and it's protected from other virtualized applications, you get into a whole second selling point, which is compatibility.

**Richard Campbell:** Get rid of these interaction problems.

**John Savill:** Exactly, I mean imagine today, we're bring in a new application into a new environment, if I got 10 apps, which is a small number, when I bring an app number 11, I have to say, well is it compatible with app one, three and five are installed, what about if seven is installed, what about if it's just two and four?

So, there is a huge amount of aggression testing, compatibility testing to get anything out today. If you virtualize it, they are invisible to one another, because it's not installing anything locally on the machine, they do not know the other applications are even installed. So, my time to deploy this business critical application that sets me ahead of my competitors, instead of taking two weeks or four weeks or months to test and get deployed, I can deploy in days. I mean, it's a huge boon to business to be able to get these technologies out there so much quicker.

**Richard Campbell:** You certainly mitigated the threat of a new application deployment.

**John Savill:** Exactly, this really is compatibility problems that comes right down, and my underlying operating system is much healthier. If I am not installing applications, actually locally on the box any more, my trouble tickets, my helpdesk calls are going to go down. Instead of, hey word is corrupt, you have to go down, troubleshoot, try and work out what's wrong. You just delete the local cache at the stream, and it will pull it down again. There is nothing installed on the box.

**Richard Campbell:** Right, and getting new boxes online is just a trivial mater.

**John Savill:** Exactly, and the underlying OS now doesn't have a registry full of settings, that a ton of components registered. So, my machine is going to start up a lot faster. I have got less junk in the registries, the amount of non-pageable kernel memory is less. So, I have a leaner, healthier machine.

**Greg Hughes:** Are there any limits to the types of the applications that I can do this with? If I have corporate legacies, say financial applications which have a tendency to fester and sit around for years and years quite often. Some of these lie in the business applications that's written by some company that doesn't exist any longer, using an older installer technology. Am I going to be able to work with those or are there any limitations?

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**John Savill:** That's a great question, and that's really if it is possible and is it supported? So, take away all the idea of virtualizing applications. Essentially, all this technology is doing, is laying an overlay over the physical machines, file systems, registries, services. It's nothing more than adding a little filter over it, so anything that can install on a machine can be virtualized, because all it's doing is saying, "When I install this machine, this application, it lays down these files on the file system, let's capture that in the overlay." It makes these registry changes, let's capture that in the overlay. You can do ODBC configuration, you can do anything you want in this, so from a just legacy application, there should be no issues.

**Richard Campbell:** That still presumes, a sort of a Classic Windows App with multiple DLL's and registry entries and so forth. If I had a really old app that's just one monolithic executable, what control do you have?

**John Savill:** It's one legacy executable, but it's still just something sitting on a file system. So, there is no complex registry overlay or anything else, but I can still overlay instead of putting that one executable on the local file system, and just virtualize them on a virtualized file system. I mean, you are not putting in a lot of benefit at that point, other than when you want to update it, because we have not actually got into the technology if I want to update an application yet. Even before we go there, back to the question, there are issues and they call them recipes. So, if you have more of an application that's part of the operating system, so it's then like Internet Explorer, that it's very much a core part of the OS now, and so there is more complications with – So I'm running Internet Explorer 7. Can I virtualize Internet Explorer 6, Internet Explorer 5? Yes, you can, but it's limited to what's supported by Microsoft at this time. So, absolutely yes, you can do it and there is recipes, which are really the guidelines on how to do it, but it's not fully supported. So, there's doing it and then there is what you will get support for.

**Greg Hughes:** One of the things that I am curious about, having not dived into the details of this hands on myself is, what about applications, lets take Outlook for example, where there is profiles and there is data that's stored, you know on a per user basis. How is that dealt within this technology?

**John Savill:** So, I said it had this virtual file system, this virtual registry, which would totally make you think okay, well it's virtualized its Sandbox, I can't save any state, every time I start up Office, is it going to prompt me for my name

and my initials. Well, yes it has this -- remember I tried to use the word overlay, it has a file system overlay, which means when it goes to look for a file, it checks the overlay first and then it can go down and read for natural underlying file system. Now, it has SafeGuard, it's like a one way bounce, it can go down and read from the file system and the registry, but it can't write to it, and that's a general rule for most of the file system, so program files, Windows, etcetera. However, it does let you write information into your local profile. So, otherwise it will be useless. If I could run Word, but I couldn't save any documents...

**Richard Campbell:** Not much point.

**John Savill:** Not much use to me.

**Greg Hughes:** Exactly.

**John Savill:** So, it's exactly the same thing, exactly as you are talking about. So, data around configuration and customizations, it's allowed to write through into your local profile. So, anything that's not considered part of the operating system protected program files, the video, your My Documents for example, it's allowed to write down to installed configuration information.

**Richard Campbell:** Now, that still presumes, I am not sure how it knows, if I have to have an app that writes that configuration information properly, doesn't try and write to program files or to the route or anything inappropriate or write in a registry to the hardware configuration?

**John Savill:** Now, it has a redirection layer as well, so if you don't find an application that's really in effect misbehaving and trying to write some places it's not allowed to, it will actually capture that and store it away locally into your profile and it's sort of add on overlay.

**Richard Campbell:** Aren't we seeing some of this behavior in Vista today?

**John Savill:** Well, Vista has a redirection capability, for like normal users. So for example, if you try and write to a protected part of the operating system or protected areas of registries, it does exactly what you are saying. It redirects it to a special place on to your profile, so yes this is performing a very similar task. Vista is protecting you from yourself, SoftGrid is protecting itself from you, I think.

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**Greg Hughes:** I am thinking here about some of the side benefits of doing this, one of them I can think of is -- take the Office applications, if I was upgrading from Office 2003 to Office 2007 and



had to do that across every laptop and desktop across my environment, sounds like it could be substantially a different type of effort using this technology.

**John Savill:** Exactly, now there are some caveats, so there are some pros and there are some cons. So, Office is a great example, so one of the things when I demo this to client, is I go in and today it's very difficult to try and run multiple versions of Office side by side. If I had need for backwards compatibility to run Word XP or Word 2000 or Access 2000, it's very hard to do that on a machine with Access 2007 installed. But if I virtualize, I can run every version under the sun as many times as I want with no issues. But now let's think about the Sandbox idea, applications running inside virtualization cannot today talk to other applications. Now, if you consider Office 2007 for example, you might have many applications running on your machine that use underlying services of Office. So, if I Virtualize Office 2007, those other applications that call on its services, may experience problems. Now, you can package multiple applications together in one virtualized app, which would let them talk to each other, but that becomes quite messy and problematic.

**Richard Campbell:** Well you're back to the original problem of application interaction.

**John Savill:** Exactly.

**Richard Campbell:** But if that's a feature you need that these apps have to interoperate, I am thinking about a CRM App that's connected to Outlook for example. You pretty much have to put those in the same virtual application instances.

**John Savill:** Or you make a decision, well something that's caught most of what I have run, I am not going to virtualize that. So, things like Office 2007, that's kind of like a foundation for a lot of what you run, you may not virtualize Office 2007, that you may run locally on the box, and deploy that. What you would virtualize is like Access 2000, Word XP, any legacy versions, and then we get a lot of advantages from patching. When I want to update a virtualized application, I don't have to do that whole pushing out the update. I just once on the sequencing machine, the one I use to capture it, I can replay that sequence and apply the patch, and it will automatically ascertain that delta was changed and just sent down those changed bytes to any of my software clients in real time, so patching is very easy.

**Greg Hughes:** You mentioned that these virtualized applications cannot communicate with

one another, that raises a question for me which is, are there any benefits or side effects related to applications security by running them in this particular type of environment?

**John Savill:** I think it could, I mean from a security perspective, yes you are protecting how well they can communicate with, so if I am worried about the sensitivity of an information maybe, the content of the memory dumping out. If I run it in this virtualized instance, it does have a -- I guess a more protected state than normal application running locally on the box. I mean, what they are planning on doing in the future is, you will be able to link sequenced applications together. So, I think this is version 5.0 we are talking about now. In version 5.0, you will be able to create ties between multiple sequenced applications, and they will be able to talk to each other. So, it's still running in individual sandboxes, you're effectively thinking like a firewall, you are opening up little holes in that Sandbox.

**Richard Campbell:** Yeah communication channel.

**John Savill:** Exactly, to let them communicate.

**Richard Campbell:** So, how does someone get involved in this product?

**John Savill:** Okay, so Microsoft as I mentioned before, they are trying to get there, they're getting into the subscriptions, they want you to buy services software assurance. So, you have to be a software assurance customer, enterprise, EA, whatever. You purchase this, it's part of the desktop optimization pack. So, the cost of this varies, it can be between \$7 to 10\$ per desktop and it's a subscription, you are not buying these products, you're basically leasing them for a year.

**Richard Campbell:** Interesting.

**John Savill:** So, this is an annual charge. Microsoft went out and bought four separate companies, they bought Softricity, which is obviously what we are talking about, the application virtualization.

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**Richard Campbell:** That's the root app here.

**John Savill:** Yeah, this is the one part of it. They then created it -- the Microsoft Asset Inventory Services. So, if you've seen SMS, SMS future inventory information. Well, that relies on really what's in Add/Remove programs and WMI codes. It doesn't go and detect well this executable sitting in this folder or this registry key exists. What the Microsoft Asset Inventory Services



does, is it actually goes out, scan the file system, scan the registry and find pieces of information and then compare it to an online catalogue of hundreds of thousands of apps to tell you what's really installed on the box, what type is installed, is it registered, is it trial.

It's actually running in a service mode so you have no server side installation, you just deploy the client and it goes and talks to the Microsoft servers. They create -- the Microsoft advanced quick policy management, so if you use group policy, it lets you change management around your group policy objects, offline editing, Role Based Management. For a lot of the fanboys, Wininternals, you know they purchased Wininternals. So, that whole suite of tools is now a part of this as well. If you took the individual components, its hundreds and hundreds of dollars per desktop this would cost and you get it for like 10. Now, originally we wanted to give it away for free, but I think Microsoft got fed up being sued, and by the competition and everything else, so it's easier for them to sort of sell it for 10 bucks. I mean that's really how you get this technology, you buy the Desktop Optimization Pack. If you have terminal servers, you can purchase application virtualization in a Terminal Server model. So, you can run the virtualized applications just from the Terminal Server. Now you may wonder why would I bother to do that?

**Richard Campbell:** Yeah.

**John Savill:** Well, even with terminal servers, if I have a farm of 10, 20, 30 terminal servers, I am still pushing applications out of the terminal server, I'm still testing compatibility, I am still testing the amount of time it pushes. I get all the same benefits and plus I remove that frequent reboot, I typically have with terminal servers where I am running 50, 60 instances of an app, memory gets fragmented and corrupted and I have to reboot the server.

**Richard Campbell:** And take everybody down with you.

**John Savill:** Exactly, when I run it in a Sandbox, the garbage collection is spot on, it cleans up every remnant of that and it's not an issue anymore.

**Richard Campbell:** What about the licensing of the apps that run from this environment like Office for example?

**John Savill:** This is a technology designed to deploy any application, they are not given special consideration, or that would obviously be a nice to have to thing okay. If one of the things this

technology lets you do is restrict the execution to a number of concurrent usage. So, if I purchase like a CAD application, I can only run 10 concurrent usage, this will help you do that. This does not help you with Office licensing where, I'm now running a licensed 20 copies, somebody is going to run 20 concurrently. It differs by application, but you still have to purchase one per machine that will ever run this Office.

**Richard Campbell:** Yeah, if your licensing model is the Cal model and you need one per machine...

**Steve Hughes:** Then you still have to have the Cals on a per user or a per machine basis.

**John Savill:** Exactly, this is not designed to help you get away from licensing the software.

**Steve Hughes:** Well, we are still waiting for that one.

**Richard Campbell:** But it sounds like licensing is going to have to evolve to live in this model too?

**John Savill:** I mean I agree. This will open up a lot of doorways. This technology Microsoft are looking at, this might be the future of app deployment totally. So, Windows Vista introduced this image based deployment of the OS. They are totally looking at in the future, we may see applications deployed as a stream. So, one of the things I think we need to talk a lot about is these streams are cached locally on the machine, which is obviously viable for laptop users, they don't want to have to be stay connected to the network. While it caches all of that content that's running, and you can't configure it to cache the entire stream. I don't want to be on the plane selecting a new feature I have never run before, and it not being available.

So, I think to figure that stream to run locally and I still get the benefit of compatibility, testing clean machine is just now cached locally in a stream.

**Richard Campbell:** Yeah, they could see you getting to work while plugged in and in the background the rest of the app is streaming down from when you do get disconnected.

**John Savill:** Exactly.

**Steve Hughes:** Ultimately, one of the things that can allow companies like Microsoft and others to reduce the cost of licensing is to be able to track what's being used and to have a little more control over the actual deployment and it sounds like at least some time in the future as this technology grows, this is something they maybe



able to take advantage of to help them do just that.

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**John Savill:** Yeah, I think it's a phenomenal technology. It is certainly what we are basing a lot of our architecture around at Geniant now is actually using this to push out those major applications, and I can track it exactly, I can set this user can run this application for 30 days. After that, they can't use it anymore. I can select groups of users that are allowed to run these applications. So, I have so much more control than a locally installed application.

**Richard Campbell:** I think there's a huge potential here in licensing by usage going forward. John, it's been a really great conversation; I appreciate your thoughts around application virtualization. I think it's a new world out there and I think we will have to come back again and get into some of the other topics.

**John Savill:** No, that's great. It's been a pleasure talking to you.

**Richard Campbell:** Thanks very much and you're listening to RunAs Radio. Talk to you next week.