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THE MULTIVALUE TECHNOLOGY MAGAZINE I JULY/AUGUST 2018

GOTO Hell

Part 1

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- Talking the Talk
- MV Your Way: PHP Edition
- Implementing Two-Factor Login using OWIN

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From the Inside

It is that time of year again. I'm starting my planning for the 2019 Spectrum Conference. If you haven't yet seen the information for the 2019 Spectrum, it will be April 8th-11th at The Wigwam in Arizona.

The Wigwam is always a great venue to have the conference at. Its uniqueness and tranquility is quite nice to escape to after months of hard work.

As always, I'm asking for session requests from the MultiValue Users and Programmers out there. I strive to make sure the Spectrum Conference provides all the knowledge you need to keep your businesses running.

I remember having to justify my attendance, so I've been watching the trends in the IT industry and will be working to create sessions that will help you understand and use them. While my speakers provide me with lots of good ideas, I would like to hear from you. I want to make sure you get the materials, education, and experiences that are needed to maximize your ability to create efficient enterprise applications.

There are a lot of different trends floating around right now. If you are unsure what you would like to see, here are a few that I've noticed:

Virtualization/Cloud Computing

Everyone is talking Cloud Computing and Virtualization, and for pretty good reasons. We have presented topics on Virtualization and Cloud Computing at the conference before, but what are you interested in hearing next? Do you need to know how to integrate MultiValue databases into a cloud API, like Azure or Google App Engine? Are you looking run a MultiValue server in a Virtual Machine?

Tablets and Mobile Apps

Mobile Line-of-Business applications are a must. Many companies are not taking full advantage of what mobile apps can bring or how they should be used in enterprise systems. How can we help you help them?

Windows 10 and Universal Apps

Working with Windows 10 development can be a pain. The new Universal Apps and Windows 10 features are nice, but very different from what most developers are used to. Would you like to see general sessions on how to use Windows 10? How Universal Apps are created? These would probably not be MultiValue specific, but we need to know about other software to make our jobs possible, so I'd be happy to include them.

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International Spectrum is eager to print your submissions of up-to- the-minute news and feature stories complementary to the MultiValue marketplace. Black and white or color photographs and diagrams are welcome. Although there is no guarantee a submitted article will be published, every article will be considered. Please send your press releases, articles, and queries to: editor@intl-spectrum.com. International Spectrum retains all reprint rights.

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Looking to integrate Office 365 more closely with your Line-of-Business application? Documents, Calendars, Email, Spreadsheets... there are versions that are free and versions for a fee. All can be integrated with your MultiValue data.

Integration – Amazon, SalesTax, Email, CRM, EMR, LDAP, Active Directory

Do you have other applications within your environment that you need to integrate with? We have been an island unto ourselves for so long, we sometimes forget that our business has information that other systems can use, or are necessary for business functions. What integration options do you need?

External Programming Languages

What languages is your business requiring you to work with? .NET, Java, Python, Javascript, HTML, JSON... there are many others. We can provide topics on all of these, both stand-alone and in connection with your databases.

These are just a few examples. What do you find most interesting? What trends and topics that you would like to have covered in sessions at Spectrum? I would like to hear from you. IS

NATHAN RECTOR
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Is Your Membership Profile Up to Date?

International Spectrum is currently working on updating membership information for all our readers. We always like to have the most current information so that we can keep you informed of current news in the MultiValue Market.

Please go online and update your membership profile today!

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GOTO Hell

Part 1

BY SUSAN JOSLYN

Look, I'm not a *bad programmer*. I'm not. In fact, I'm a doggone good programmer. I've got a genetic predisposition for it, in the first place. Secondly, I've been doing it for a very long time. It's because I'm so good at it, in fact — combining creative thinking with vast experience — that I got myself into this *boondoggle* in the first place.

What boondoggle? Well, like any of us, I code as efficiently and as cleverly as I can. I know the capabilities of my language, mvBASIC very well. I've experimented, looked over lots of other people's code, cherry-picked the best ideas and have generally done *anything I can get away with* that will solve the problem at hand. Pushing the envelope of what is possible. And just because I have only programmed in this "Pick-ish" world, I've still had to remain cognizant of lowest-common-denominator practicalities between our various sibling platforms. Having said that (rather defensively) it is true

But I had a few other GOTO-forgiveness policies that I regret.

that MultiValue and its high-octane BASIC language is the only thing I've ever used to solve real-world problems. That just makes me a native speaker! I can do tricks with my pony that riders of other breeds would never even consider. Should I adhere to practices that were born from limits of more restrictive environments? No!

Okay, maybe.

It mattered more when I decided to push my application through a process dubbed a 'transpiler' that converted my BASIC code into C# code. Cool, right? It is! But it turns out that while it can transform my syntax, it can't fix my structure.

Yeah, structure.

Remember those debates about structured programming? All that shouting about 'GOTO' statements? I scoffed at people that got hard-nosed about it, maintaining that you can take it too far and make your code less readable and less efficient. (I still do believe this, not going to lie.) Thus, I created a forgiving philosophy on structure and GOTO statements. There are times and places, I argued, when a GOTO is your very best option.

"Oh, yeah?" I hear you demand.

Yeah. I mean, yeah, I thought so. For example, I don't like to have RETURNs out of a program scattered around. I want a single exit point. So, in my programs, label 999 RETURN is always at the bottom, and there are GOTO 999s scattered throughout. I know what RETURN that is – it is always the main exit from the subroutine. That's how I do it. That's how my father did it … and it's been working pretty well so far. (~Tony Stark)

But I had a few other GOTO-forgiveness policies that I regret. I used a GOTO as a sort of jump-over. Why? Don't laugh. I hate it when my program gets deeply indented. I prefer

```
IF NOT(THIS) THEN GOTO 50
Do something.
50 * CARRY ON
```

Over

```
IF THIS THEN
  Blah blah blah blah
END
CARRY ON
```

Admittedly, it's not so bad when there are one or two levels, but if you keep going, you can get so far indented that you need a scooter to get far enough over to the right to follow the logic. My policy of judicious use of GOTO has applied here, too.

Don't think I can't hear you judging me.

This worked out well enough in simple scenarios. But I got creative, and I would jump over to places inside the same loop, or another loop, or another IF-THEN indent. And it was still fine — I would go so far as to say beautifully efficient — in our platform. For example, say I've got one of *these*. I need to do *this* first, but after that, it's the same as one of *those*.

```
VITAMIN.C=0
POTASSIUM=0
BEGIN CASE
CASE FRUIT = ORANGE
  COLOR=ORANGE
  GOTO ALL.CITRIS
CASE FRUIT = LEMON
  COLOR=YELLOW
  GOTO ALL.CITRIS
CASE FRUIT = LIME
  COLOR=GREEN
  GOTO ALL.CITRIS
CASE FRUIT = BANANA
  POTASSIUM = 1
CASE 1 ;* ALL CITRIS
ALL.CITRIS *   ← LABEL
  VITAMIN.C=1
  Do a bunch of other stuff
to citrus
END CASE
```

Same deal with an IF clause. I do the specific thing and then jump into the THEN or the ELSE of another common clause to do other stuff in common. In truth, it is pure laziness dressed up in a frilly gown of efficiency.

It gets worse, so if you are on your high horse, just stay up there.

I did this also in a FOR NEXT loop. I coded for 30+ years in mvBASIC and never knew (or even ran into) the CONTINUE statement. Seriously, hush. So, I would do this.

```
FOR THISX= 1 TO 100
 IF THIS THEN
  DO THIS
  GOTO 50
  END
  Do stuff
50 NEXT THISX
```

And it let me.

In case you never ran into it either, this functions identically:

```
FOR THISX= 1 TO 100
  IF THIS THEN
   CONTINUE
  END
  Do stuff
NEXT THISX
```

We glory in the epic flexibility, creativity, and code-speed that programming in mvBASIC has given us. But now, when trying to be more compatible with the outside world, this extreme forgiveness in the language has a price. These constructs will not even compile.

We have choices in our approach to fixing the problem. One thing we could do is read all the mainstream books and truly write our software according to structure regulations to which much of the not-privileged-to-be-PICK world adheres. Burn out our eyeballs, burn up our free time and burn out our advantage. I propose a more holistic treatment plan. Yes, haters, I'm going to stick with some of my GOTO use. But I *had* to restructure around things that would not compile. In doing so, I tried some things that weren't smart and eventually arrived at some solutions that were … smarter. So, I thought I'd share. I bet you're feeling bad about judging me now that you realize that I'm going to help make your life easier, don't you?

Let's dispense with the formalities:

Structured programming is a logical programming method that is considered a precursor to object-oriented programming (OOP). Structured programming facilitates understanding and modification and has a top-down design approach, dividing a system into compositional subsystems.

C is called a structured programming language because to solve a large problem, C programming language divides the problem into smaller modules called functions or procedures each of which handles a particular responsibility. The program which solves the entire problem is a collection of such functions.

Truly there are advantages; I'm sure we all agree.

- Reduced complexity
- Complexity is what you make of it. You can write more or less complex code, either way.
- Modularity to tackle problems in a logical bite-sized (no pun intended) progression. There is a simple beauty in this.
- Maintenance is easier.
- Like the story about the guy who never gets a new suit. He gets a new jacket one year, new shirt another. If the software is truly modular,

there is no wholesale refactoring project on the horizon.

Convinced? Let's do it!

Here's where we use INCLUDES, right? No.

Our collective instinct to create massive semi-modularized INCLUDEs is just smashing bits together to create an old-school monolithic program. It's quinoa-coding. Sure there are lots of little separate bits, but a spoonful is still basically mush. And yes, I have a number of these giant programs broken into INCLUDEs and recognize that I am pointing out the color of the kettle.

Then we should switch out any GOTO in our code with a GOSUB, right? No.

The common argument is that without structure we end up with spaghetti code. I would contend that you haven't seen a pasta nightmare until you've written code with a bunch of GOSUBs and RETURNs all over the place.

Some people like to create a program that goes like this:

```
Header
Header
Header
GOSUB 100
GOSUB 200
GOSUB 300
RETURN
100 *
Do stuff
RETURN
200 *
Do stuff
RETURN
300 *
Do stuff
RETURN
```

If you like this structure, well, that's fine. Lots of people do. Lots of people also leave the walls in their house painted white. It's a perfectly valid choice.

Still, it isn't really modularized. You can't re-use those century-labeled chunks outside of this program. Not without jumping through hoops, anyway.

After some tinkering and cussing, it became apparent that the best choice was to go straight to external subroutines — even if they have (gasp) arguments. I would argue (get it?) that arguments can be controlled in a way that INCLUDES, internal GOSUBs and COMMONs cannot. With an external subroutine, you decide exactly what gets passed and what comes back. No accidental variable switching. It is the closest thing to a METHOD in some environments, a FUNCTION in others. The functionality, the *purpose* of the routine is fully nugget-ized.

Now that you have external nuggets that you hope to reuse, the issue of naming and keeping track of them gains urgency. Meet me here next issue for this discussion.

I know many people will have *thoughts* on this subject matter. I've heard some of the arguments and I'm open to hearing others. You know where to find me. IS

SUSAN JOSLYN is the President of SJ+ Systems Associates, Inc. and is the author of PRC?, a complete, integrated software development life-cycle management / IT Governance tool for U2. She has worked with U2 (nee Pick/Multivalue) and SB+ software the beginning (both hers and its) and has specialized in IT Governance, including quality, compliance and life-cycle productivity issues since the early 1990's.

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Talking the Talk

BY CHARLES BAROUCH

Back in High School, I volunteer taught Special Ed. After I left college, I taught online. I've spoken at user groups, conferences, and for the last six years, I've taught Creative Writing at Otakon, which is an Amine event. I've also run internships.

I know that many tech people don't have those things on their resumes. I'd like to make the case that you should. Have a look at the job boards, have a chat with some of the talented recruiters in our industry, and you will see it: Excellent Written and Verbal Skills. It will be the second bullet point on pretty much every posting.

Seriously, go check out a few posting for nearly any profession, not just ours. People want communication skills when they hire. And, like every other skill, it requires practice.

Selfish Generosity

Now, to be clear, I don't write and teach solely to improve my skills. I genuinely want to help others. However, I find that writing and speaking professionally has given me hefty muscles in this critical department.

One of the tools that has helped me is a common phrase for the younger generation that my daughter, Danielle introduced me to: ELI5 (Explain Like I'm Five). Trying to simplify our ideas, taking the time to distill them down, helps us reassess what we do and see it with fresh eyes. I've killed off a lot of lazy programming habits by realizing that I might have to explain (and justify) my code to others.

> ***Tell your children about the importance of indenting and commenting***

To get another take on this perspective, try writing a description of one of your projects using this very targeted word processor: http://splasho.com/upgoer5/.

Know Your Audience

I had a terrible boss give me a wonderfully good bit of advice once. She said: "When some people say 'show me the data' they mean 'I've been in my field of business longer than you, give me the raw data.' However, some people mean 'show me your analysis, what do you think I'm paying YOU for?' And for others, draw a pie chart and don't put any numbers on it because that would confuse them."

Different people have different expectations of your role in the process. Sometimes the same person has different needs based on how time-crunched they are. You need to shift your story based on that. Delivering the entire story every time is a recipe for being ignored and avoided. If the goal is communication, that's one of the worst outcomes. Getting someone the five percent they need is better than being excluded from the conversation entirely.

Developing Techniques

Often, the amount of information a person is willing to accept is incompatible with the amount you do need to tell them. My best technique for handling this is to say: "The short answer is 'no.' The long answer is 'maybe.' Do you want to hear the long answer?"

Giving the other person a choice is called 'agency.' When someone elects to get the long answer, giving them the extra information isn't a war between you, it is an agreed outcome. It also allows them to accept the short answer for now and put off the longer answer for a better time. It is only agency if

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you let their choice matter. Never offer someone tofu or steak when all you intend to give them is tofu.

For some people, I've found sentences like: 'Yes, but it will cost a thousand dollars and take three months' leads them into requesting — demanding — more information. Time and money are business concepts. I could say 'Yes, but we have to refactor the code, infer the optional limits, and impose some very specific constraints which might not serve us in the future.' Instead, I offered the time and money expected to do it right. Doing that opens the door to a dialogue about expectations and outcomes.

The worst answer to most questions of the can-we-make-it-do-X sort is "Yes" or "No." Short, absolute answers often lead to one of you thinking that the equivalent of the Taj Mahal needs to be built while the other thinks the project is about standing up a pup tent.

Back to School

In most tech people's lives, the critical conversations happen in situations where we are not the seniormost person in the room. Communicating up is harder and has more consequences than communicating down. Teaching is communicating down.

I don't mean that to say that the teacher is above the student. I mean that people in a classroom… or internship… or conference… or reading a magazine… they are in a receiving mode. They are open to the conversation and expect you to bring forth something worth absorbing. In a meeting with your boss, you may not get that same sort of reception.

Spread the Word

If you don't have a venue for practicing this skill, tell your cat. Seriously. The habit of explaining works best with an interactive audience but if that's not available, make sure your dog knows

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all about variable naming. Have a deep conversation with your pet rabbit or snake about why you chose to use a dimensioned array instead of a dynamic one. Tell your children about the importance of indenting and commenting. In a pinch, open up to a potted plant about code reuse.

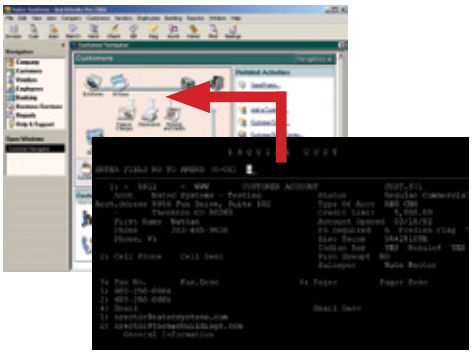
One of the benefits you'll get is that you'll learn how to be concise. In business, there's a concept called the elevator pitch. The idea is to convey enough in the time it takes to go up one floor that you'll get asked to keep talking. Once you learn how to pitch, your students will learn more. When you use a compelling pitch, your boss is more likely to listen.

Some people like to sing in the shower. I don't. I practice pitches in the bath. It's quiet. I won't be bothering anyone. I'm completely relaxed. The second best place for me is the car, driving to or from work. Of course, be careful what you rehearse because, in the car, you are always just a butt-dial from having an audience. IS

CHARLES BAROUCH is the CTO of HDWP, Inc. and the Publisher at HDWPbooks. You can read his writing in International Spectrum, Theme-Thology, Novo Pulp, Pax Solaria, PerehelionSF, and the Interrogative series, which begins with Tiago and the Masterless.

mvQB

QuickBooks API for the MultiValue Database



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From the Press Room

Carnation Software releases MacWise Version 17.0

MacWise 17.0 is compatible with the upcoming Mac OS Mojave. (Previous versions of MacWise may not be able to use the MacWise screen font with Mojave).

Version 17 also adds support for the Touch Bar on the new MacBook Pros.

Note: With High Sierra and Mojave, you will need to hold down the FN key to see the functions keys in the Touch Bar.

32-Bit vs 64-Bit

When running Mac OS High Sierra or Mojave, you may get a message stating that MacWise is not optimized for OS X and needs to be updated. That is because MacWise is a 32-bit application, but this does not affect the operability of the program.

MacWise version 17 works correctly with High Sierra and the upcoming Mojave Mac OS. Mojave is the last OS that will support 32-bit applications. Therefore, in the fall of 2019, Apple will most-likely release a new Mac OS that will not work with 32-bit apps.

We are working on a 64-bit MacWise version and plan for it to be available before 64-bit apps are required by Apple. We do not yet have a release date, but will keep you informed. ■

DesignBais and Zumasys partner to bring Release 7 to jBase

DesignBais Intl announces that Zumasys will be the exclusive worldwide distributor of DesignBais. Zumasys will provide administrative, support and training services for DesignBais clients.

Zumasys has also ported DesignBais Release 7 to jBASE and will be working with the DesignBais team on Release 8 which will bring full Responsive Design capabilities. ■

Aptron Acquires WebWizard

Aptron Corporation announced that it has acquired the WebWizard family of products from Eagle Rock Information Systems, Inc. on May 31, 2018. WebWizard is an application development tool kit and run-time environment for Internet-based applications and services that integrate with enterprise databases. Also acquired are web service integration products that support applications developed by Credentials LLC, Nelnet Business Solutions and Modo Labs. WebWizard products are installed across North America and particularly at colleges and universities that use the Ellucian Colleague Higher Education Management Software.

Aptron and Eagle Rock have cooperated over the years, first on the Collegix self-service portal and more recently on mobile applications. The acquisition of WebWizard and other products from Eagle Rock made perfect sense. It adds complementary solutions to our Collegix product line, expands our educational customer base and brings new staff with needed technological experience and abilities to Aptron.

Eagle Rock founder Melvin Soriano has joined the Aptron team as Director, Integration and Innovation. In this role, Mr. Soriano is leading the ongoing development of the WebWizard product family as well as providing new directions for other Aptron products and services. Mr. Soriano brings with him a shared commitment for excellent service, deep expertise and an environment that supports and encourages clients and employees.

This is an exciting time at Aptron. May of 2018 marked the company's 35th anniversary. The acquisition of WebWizard, together with Mr. Soriano joining our team provides great growth opportunity through comprehensive technical solutions for our combined clients. As organizations move towards integrated systems across multiple Cloud-based platforms, we are wonderfully positioned to support them on that journey. Our expanded business will serve enterprise organizations across the USA and beyond. ■

ONgroup release Free IDE for MultiValue Developers

ONgroup Intl announced the availability of two free-to-use software products which are improving the lives of MultiValue developers. The software products are extensions for Visual Studio Code:

The MV# Developer extension provides MultiValue developers with a VS-like IDE. The extension works with most MV types (UD, UV, QM, MVON#, D3 and others) and has these features:

- Code formatting, folding and highlighting
- Intellisense for statements and functions
- GOTO / Peek for internal subroutines, CALL, CHAIN and INCLUDE routines
- Syntax checking and linting

The MV# Debugger extension, which currently depends on MVON#, adds full visual and interactive debugging functionality.

To download, go to https://marketplace.visualstudio.com/items?itemName=ongroup.mvon ■

Paradigm Systems release Mercury Flash v5.0

Paradigm Systems release Mercury Flash v5.0 with a completely redesigned interface, and lots of new features. Mercury Flash is no longer just an analysis and resizing tool, it's a complete database management system for U2.

This latest version introduces:

- A redesigned user interface
- HTTPS support for secure access to the Mercury Console
- Improved stability of the Master Scheduler
- Greater control over Mercury Scheduled processes
- Improved statistics collection
- Improved Mercury Theme Editor
- Menu Translation
- Improved monitoring of remote servers ■

NexusTek Acquires Zumasys Cloud Hosting, Infrastructure and Managed Services

NexusTek announced that it has acquired the cloud hosting, infrastructure and managed services business units from Zumasys, an Orange County-based national provider of cloud computing solutions.

Today, tens-of-thousands of users rely on Zumasys Cloud, now NexusTek, to host their most critical applications 24/7/365.

"Businesses need to embrace the almost unlimited potential for technology to serve as a strategic asset and not a cost center," said Mike Jenner, CEO, NexusTek. "Zumasys' success reflects their shared belief in this philosophy and unique understanding of what it takes to help customers align corporate goals with technology. We are confident this transaction is a significant step forward in our mission to be the nation's most complete service provider."

This deal marks NexusTek's fifth M&A transaction in four years. NexusTek is backed by Abry Partners, an experienced media, communications, business and information services-focused private equity firm with over $77 billion of leveraged transactions under its belt.

"Abry believes that strategic acquisitions allow NexusTek to increase its competitive advantage in the highly fragmented cloud and managed IT services market," said James Scola, a principal with Abry. "Small and middle-market businesses can only reap the full benefits of running mission-critical applications in the cloud by working with a partner equipped to personalize services built around their specific operations. NexusTek helps clients reduce their technology spend while increasing efficiency and extracting maximum value from their investment."

Over the last three years, NexusTek has grown at a CAGR of 34%, and currently serves more than 2,000 organizations.

"Whereas other companies struggle with M&As, Abry's vast experience and resources eliminate funding concerns and lowers execution risk," added Jenner. "Coupled with NexusTek's track record of successfully integrating acquired companies, being partnered with Abry empowers NexusTek with the means for continued, aggressive nationwide expansion."

NexusTek managed services eliminate the administrative overhead and variable cost associated with cloud and IT environments; customers receive 24/7 monitoring of their IT environments and proactive responses to issues for a fixed monthly fee. With this acquisition, NexusTek inherits a strong presence in the Western United States, extending its reach and ability to create IT solutions that combine storage, virtualization, data protection, and networking technologies from the industry's leading vendors.

NexusTek serves businesses across the country, providing IT solutions and professional recommendations to strengthen the customer's IT infrastructures. By virtue of its SSAE 16 SOC II certification, NexusTek proves its adherence to rigorous, industry-accepted auditing standards for service companies.

"We are pleased to have our cloud, infrastructure and MSP team join NexusTek to further their mission of helping companies small and large increase productivity, lower costs and improve business outcomes," said Zumasys President, Paul Giobbi. "I am confident that customers and employees alike will benefit from the increased depth, capital and engineering expertise of NexusTek and I am excited to watch the combined entity grow." ■

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PHP Edition

BY CHARLES BAROUCH

They will still need to use PRINT instead of ECHO but our mvBASIC will look better to their eyes.

Imagine trying to attract a new PHP developer to a job where you'll be training them to do mvBASIC work. They have to learn a new command line, a new programming language, and a new database. What if we made some of that easier by letting them bring some of their things into our home.

In the last issue, we use FUNCTION to make mvBASIC easier for us, the existing developers. We can also use the same trick to welcome our new friends inside.

PHP, like every other language, has a vast number of commands. We'll focus on some core ones for now. We'll start with date handling.

```
<?php
$idt=gregoriantojd(1,13,1998);
echo jddayofweek($idt,1);
?>
```

We could teach them to do it our way, and they should learn that eventually. That would leave them with something like:

```
idt = iconv('01/13/1998','D')
print oconv(oconv(idt,'DWA'),'MCT')
```

Instead, we could make two functions like:

```
FUNCTION gregorianotjd(month,day,year)
idt = iconv(month:'/':day:'/':year,'D')
return idt

FUNCTION jddayofweek(idt,mode)
begin case
case mode = 0
dow = oconv(idt,'DW')
case mode = 1
dow = oconv(oconv(idt,'DWA'),'MCT')
case mode = 2
dow = oconv(oconv(idt,'DWA'),'MCT')[1,3]
return dow
```

And what we did here works for other commands. Lets' reinvent file handling their way. PHP has several ways, we can start with file_get_contents and file_put_contents.

```
FUNCTION file_get_contents(thePath)
* thePath = /<filename>/<itemname>
theFname = oconv(thePath,'g1/1')
theIname = oconv(thePath,'g2/1')
*
theRecord = '-1':@AM:'not found'
open theFname to theHandle then
   read theRecord from theHandle,
theIname else null
end
return theRecord

FUNCTION file_put_
contents(thePath,theRecord)
* thePath = /<filename>/<itemname>
theFname = oconv(thePath,'g1/1')
theIname = oconv(thePath,'g2/1')
open theFname to theHandle then
 write theRecord on theHandle, theIname
end
return
```

Keeping going like that and they can code in *our* mvBASIC using *their* syntax. What we've done here can be extended to a large percentage of their commands. Yes, they will still need to use PRINT instead of ECHO but our mvBASIC will look better to their eyes. I do not advocate making this a long-term strategy, but putting a little of the familiar in our world makes it more inviting to others. **IS**

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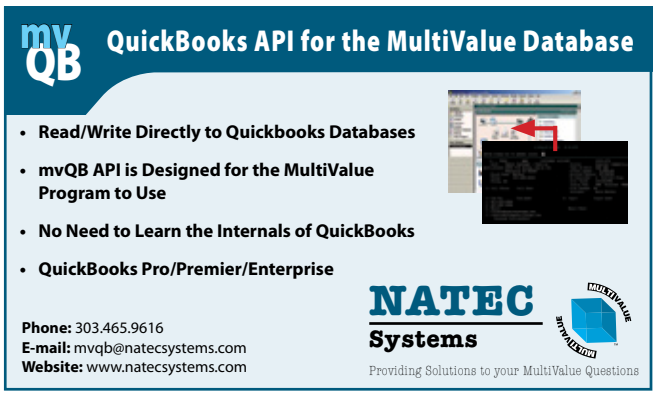

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BY NATHAN RECTOR

Using OWIN Security with MultiValue Data

Part 4: Two-Factor Login

In my previous articles in this series, I have explained how to implement a structurally sound OWIN identity Framework using a MultiValue database. For some shops, that's all you'll need. However, Two-Factor Authentication (2FA) has been moving from the nice-to-have to the need-to-have list for a lot of us. OWIN can help us here, too.

To be clear: Two-Factor can be accomplished in many different ways. OWIN is not required. Since we already have an OWIN connection, I figured that we should use what has already been provided for us. While this is simpler than building it all from scratch, you'll see that it takes more effort to implement Two-Factor logins than it does to implement a standard login process.

What is Two-Factor Login?

Two Factor Authentication [Figure 1], also known as Two-Step Verification, is an extra layer of security that requires not only a password and username but also something that only that user would know or be able to do. For example, if I provided you with a device that generates numbers in a sequence,

…makes it harder for potential intruders to gain access and steal that person's personal data or identity

I could ask for the current number on the device and match it to the output of my server-side copy of the same generator. Another example is having the person respond to a text message or an email, assuming that only they would have access to their phones and email.

The theory is that using a username and password together with a piece of information that only the user knows makes it harder for potential intruders to gain access and steal that person's personal data or identity.

OWIN Implementation

OWIN provides you a way to implement email and SMS components for two-factor authentication. The catch is that the developer has to create all the code for talking to the email server or to the SMS server. While this is not hard at all, it is a slight departure from the rest of the OWIN implementations we have done so far.

Startup.Auth

As we have talked about in the previous articles, the Startup Auth class does a lot of setup for the project. One of the things that you have to define in this class is how to handle the tokens

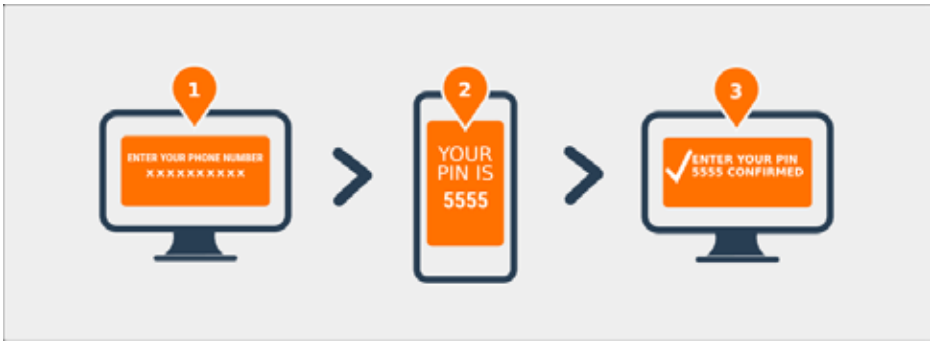

Figure 1

used by two-factor authentication. [Figure 2]

You have to implement the UseTwoFactorSignInCookie and UseTwoFactorRememberBrowserCookie routines in ConfigureAuth. Unless you have another reason, I would recommend just using the default process that OWIN uses for Two-Factor logins. You can always get fancier later.

ApplicationUserStore

You also have to implement the IUserTwoFactorStore interface in the ApplicationUserStore. This interface only implements two methods: SetTwoFactorEnabled and GetTwoFactorEnabled. This lets us determine, based on the user information, if we have enabled this feature for this user.

ApplicationUserManager

The last place you have to implement some code is in the ApplicationUserManager class. This class contains all the instructions on how to implement sending the two-factor token. [Figure 3]

You will also see that we are defining the EmailService and the SMSService. These classes will do all the work of sending the token to the needed two-factor devices. In other words, this is the part you'll have to build.

Two-Factor Authentication with Email

I'll make the assumption that all of our business systems already have a connection to sending out emails. If this is the case, I would recommend just using your existing business systems to send out the OWIN emails.

```
Public Sub ConfigureAuth(app As IAppBuilder)
    ...

    ' Enables the application to temporarily store user information when they are
verifying the second factor in the two-factor authentication process.
     app.UseTwoFactorSignInCookie(DefaultAuthenticationTypes.TwoFactorCookie, TimeSpan.
FromMinutes(5))

    ' Enables the application to remember the second login verification factor such as
phone or email.
    ' Once you check this option, your second step of verification during the login
process will be remembered on the device where you logged in from.
    ' This is similar to the RememberMe option when you log in.
    app.UseTwoFactorRememberBrowserCookie(DefaultAuthenticationTypes.
TwoFactorRememberBrowserCookie)

    ...
End Sub
```

Figure 2

```
Public Class ApplicationUserManager
     Inherits UserManager(Of ApplicationUser)

    Public Shared Function Create() As ApplicationUserManager
    ...

         ' Register two factor authentication providers. This application uses Phone
and Emails as a step of receiving a code for verifying the user
         ' You can write your own provider and plug it in here.
         manager.RegisterTwoFactorProvider("Phone Code", New
PhoneNumberTokenProvider(Of SpectrumUser) With {
                            .MessageFormat = "Your security code is {0}"
                                            })
         manager.RegisterTwoFactorProvider("Email Code", New EmailTokenProvider(Of
SpectrumUser) With {
                                          .Subject = "Security Code",
                                          .BodyFormat = "Your security code is {0}"
                                            })
         manager.EmailService = New EmailService()
         manager.SmsService = New SmsService()

    ...
   End Function
End Class
```

Figure 3

There are two advantages to doing it this way. First, you don't have to maintain code in two places. Secondly, you may want to integrate the login process with your CRM (Customer Relationship Manager) or CSM (Customer Service Manager) systems so that you can provide the needed phone support (and auditing) when people try to connect.

If you want to see more on how to send emails from your MultiValue system, please look under the "Email" keyword on the Spectrum website and see what your options are.

For OWIN to use the Email systems in your MultiValue application, you will have to create an EmailService class similar to Figure 4. You will notice that I'm using a MultiValue Stored Procedure (subroutine) to send the email.

Two-Factor Authentication with SMS

SMS message is a different story. Most business systems don't have a way to send text messages from within your system, but it is just as easy to send text messages as it is to send email. Again, if you want to see how to send SMS messages from your MultiValue system, please look under the "SMS" keyword on the Spectrum website to see what your options are.

As with the sending information through Email, you have to implement the SMSService class. The class basically matches the class created in Figure 4, but we replace "SEND.EMAIL" with "SEND.SMS".

If you don't want to use your business system to send SMS messages, you can use NuGet packages like Twillio, but I always like to have a record of when something like this is done. You never know when a user thinks they provided the required token but didn't press all the buttons.

Conclusion

If you need to have Two-Factor Authentication, it can be done with OWIN relatively easily, but it will require you to implement a bit of code to accomplish it. IS

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```
Public Class EmailService
    Implements IIdentityMessageService

    Public ReadOnly Property DBContext As SpectrumDBContext
        Get
            If _DBContext Is Nothing Then
                Try
                    _DBContext = HttpContext.Current.GetOwinContext.Get(Of
SpectrumDBContext)
                Catch ex As Exception
                End Try
                If _DBContext Is Nothing Then
                    _DBContext = SpectrumDBContext.Create
                End If
            End If
            Return _DBContext
        End Get
    End Property
    Private _DBContext As SpectrumDBContext

    Public Function SendAsync(message As IdentityMessage) As Task Implements
IIdentityMessageService.SendAsync
        ' Plug in your email service here to send an email.
        Return Task.FromResult(0)


        Dim _RequestItem As String = "SEND.EMAIL"
        _RequestItem = _RequestItem & mvFunctions.AM & Message.Destination
        _RequestItem = _RequestItem & mvFunctions.AM & Message.Subject
        _RequestItem = _RequestItem & mvFunctions.AM & Message.Body

        Dim _DataItem As String = String.Empty
        Await DBContext.CallSubroutineAsync("SPECTRUM.OWIN.USER", _RequestItem, _
DataItem)
    End Function
End Class
```

Figure 4