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The Point (of Sale)

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6 Business Tech: The Point (of Sale)

Sometimes it seems that businesses have given up on expecting the best from their employees. We found a place where they aren't even expecting competent. Let the barkeep pour you a straight shot of truth about The Point (of Sale).

BY CHARLES BAROUCH

FEATURES | JANUARY/FEBRUARY 2016

8 OAUTH 2 Login with MultiValue BASIC — Part 3

Consuming web services like Avalara Saletax within your MultiValue applications is easy, but many web services are starting to require OAUTH 2 login authentication. OAUTH 2 adds an additional complexity to working with web services, but the complexity is much simpler than the documentation makes it look. This the final article on using OAUTH 2 and provides all the code needed to access OAUTH 2 web services. **BY NATHAN RECTOR**

15 /bin/bash-ing MultiValue

PROC is not the only scripting language available to the modern MultiValue programmer. Let's see how Unix/Linux bash scripting can help us get the job done. **BY KEVIN KING**

19 Building a Modern Line-Of-Business Application — Part 1

There has been many new Line-Of-Business applications developed for several years. Most business software either addresses a missing piece of the overall, or is just an extension of the existing monolithic applications that have been around for 15-20 years.

This is the start of an article series on exploring what it takes to build a Line-Of-Business application from scratch using the tools and features found in modern software technologies. **BY NATHAN RECTOR**

DEPARTMENTS

From the Inside page 4

From the Press Room page 11

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From the Inside

Unit Testing on a MultiValue Systems

One of the major trends in MultiValue application development is Unit Testing. For those of you that are new to MultiValue, you are likely saying, "Well Duh! Unit Testing is not a trend. That is what you are always supposed to do." For those that have been in the MultiValue Community for a long time, you are saying, "But why test my existing code? It doesn't have bugs in it".

Unit Testing in a MultiValue application brings a new twist compared to other systems. The reason for this, you ask? Because MultiValue doesn't describe just database repositories, nor is it just an application development platform. MultiValue is both. This causes us to have to re-evaluate the way Unit Testing will be used and written in our environment.

Unit Testing a Database

Many developers who are new to MultiValue are likely coming from a three-tier coding environment that doesn't include complex access to a database; or perhaps the developer has not truly coded against a business database at all. In a three-tier application, Unit Testing is a bit easier to implement since the second tier (business rules) can be tested with mock data, or static/hardcoded data collections.

This is an important part of any application, but not the only part. The assumption is that as long as the business rules work with the mock data that the Unit Tests provide, then there are no bugs. There is even a hard rule in Unit Testing

that states: "Never create a unit test against a database or external information source. Assume it is providing correct information."

Anyone that has worked with any form of database application knows that a database is never static, and it is never 100% clean and correct. Which leads to the other reason for the never-create-unit-tests-against-a-database rule; it is really really hard to do when the data is never the same.

The main issue with databases and Unit Testing is the fact that the test data can and should change. Which makes creating the normal hard-and-fast-test-against-static-data impossible. I've seen suggestions that say you should always reset your data back to the same point every time you start a new Unit Test run, but think about that for a minute. Many of the bugs found in "long-standing, solid, bug-free code" have to do with the changes in the data.

Business software developers know that the power of databases and software comes from flexibility. Ever changing business logic is required to meet the needs of a dynamic business model. So, new data is added, existing data is adapted for new uses, and new features are added because the "why" of the original data has evolved to mean something different.

Unit Testing just the business rules should be done, but that only addresses 80% of the issues. A Unit Test is designed to point out when a developer breaks something, but

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International Spectrum is published six (6) times per year at the subscription price of \$40.00 U.S. in the U.S.A.; \$45.00 U.S. in Canada and Mexico; \$50.00 U.S. for other countries. Single copy rates are \$7.00 U.S. in the U.S.A. and Canada, and \$9.00 U.S. in all other countries. *International Spectrum* is published by International Spectrum, Inc., 3691 E. 102nd Ct., Thornton, CO 80229; Tel: 720/259-1356; Fax: 603/250-0664 E-Mail: request@intl-spectrum.com. Copyright 2016 International Spectrum, Inc. All rights reserved. Reproduction in whole or in part, without written permission, is prohibited.

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every day there are new problems to address due to the changing nature of the data itself. As much as we try, a developer can't think of everything. Which is one of the reasons that there are bugs to begin with.

I believe this is why it is so important to create a Unit Test against the database in addition to tests against the business rules. There are several ways to address the issues inherent in working with ever-changing data, which is an article in-and-of-itself. This is also a popular topic at the International Spectrum Conferences. That format — the conference — allows our presenters to go more in-depth than what an article or two can cover.

Unit Testing Legacy Code

The other issue that exists for developers is legacy code. I want to make a clarification here: Legacy code is not bad code. It is not out-of-date code. It is just code that has been in place for many years and is perceived to be solid.

When implementing Unit Testing for an existing application, do you create Unit Tests for your legacy code? It depends. Writing Unit Tests takes a lot of time. In the short term, adding more of them seems like a waste of time, but over the long term, Unit Testing can save a software developer hours and companies tons of money.

Most systems have tens of thousands of hours of code already written. The vast majority of that code does not have Unit Test written for it. On top of that, much of that legacy code has proprietary UIs. Do you need to create a Unit Test for that code right away? Most of the time... no.

A common practice with legacy code is to not create Unit Tests for it unless you are working with new code that must interact with the legacy code. In that case, a Unit Test is important because the new code — and the new data — may cause the legacy code to respond differently.

If there are no Unit Tests already created for your legacy code, I wouldn't worry about it. If you find that you are calling a common subset of the legacy code often in the new software, then you should have a Unit Test for that subset.

Any new code should have Unit Tests, even if it is to test known input and output. Unit Tests may build on each other, but you should always start with the simplest test using statically known parameters and work toward the complexity of dynamic data.

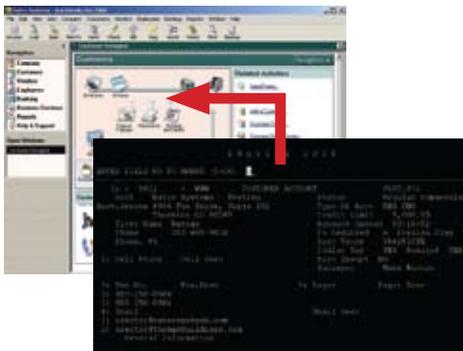
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The Point (of Sale)

BY CHARLES BAROUCH

The saloon doors swing open. The dark-haired stranger takes a mosey up to the bar. “Shot of whiskey. Leave the bottle,” he says. And, through some lost and arcane magic, the bartender knows the price of a shot, the price of a bottle, how many bottles he still has, and can calculate change from a quarter. Fast forward to today... sigh.

Warning: this article will start with whining and complaining, but we will get to the tech part. Promise.

The Candy Incident

I’m not saying that Old West barkeeps had access to better education; I’m just saying that we run into a lot of cashiers who can’t do math or understand pricing. Point-of-sale systems compensate by doing much of the work for the modern register operator. There is, however, a limit to technology.

For example, Syd and I walked into a <company name redacted> to buy some junk food to bring over to a

The cookies were simultaneously on two different sales. Schrödinger would be pleased.

friend’s house. The cookies were two for six dollars. The candy was three for four dollars. Simple, right?

Syd knows it isn’t. So, she tells the cashier her expectations, “These cookies are on sale. So are these candies.” She even specifies the prices from the signs. That would earn you a squinty-eyed stare from the olde-timey barkeep, but for the young man in front of us, it’s not uncommon.

“Cookies aren’t on sale,” he informs us.

We show him the sign. He was twice wrong. In addition to the sign saying the cookies were six dollars for two, was a sign saying the cookies were five dollars for two. The cookies were simultaneously on two different sales.

Schrödinger would be pleased. He gets a manager’s permission because direct proof is no longer enough in our technologically-advanced world of selling cookies. I miss that barkeep.

“This isn’t the candy on sale,” he says.

I take a picture of the sign so that he doesn’t have to walk again. Where I’m taking the picture, I am in full view from the register. No chance of flim-flam. He still goes to verify. He comes back with three bags of jelly beans. Syd and I smile at each other knowingly. We’ve seen this before.

He’s going to ring up three bags of a candy which will meet the price on the sign INSTEAD of ringing up the ones we bought.

Our tech-savvy brains work through the problem with this approach: Inventory. That point-of-sale system he’s using is pretty much guaranteed as having inventory-update tech. So, he’s now told the system that three bags of jelly beans are going out, not gummy

bears, spearmint leaves, and spice drops. The inventory sub-system will receive incorrect details about on-hand and about buying patterns. By trying to avoid bothering his manager again, he's accidentally — training issue? — wrecking the back-end data.

Turns out, both Syd and I were wrong. He's not doing a swap to get the prices right, he's decided that if we want three for four dollars; he's going to give us the candy which matches the price, not the candy we brought up to the register. This is a different training issue.

We make him undo it. He calls the manager and we show her the sign. For those of you worried about our finances: We got all our sale prices. For those worried about customer service: We found out that the sale price of the candy was only seventeen cents a bag cheaper. We lost twenty minutes getting a fifty-one cent discount because the sale price made us think the savings was meaningful. I'm sure the deal on the cookies wasn't much better.

It took a manager and a cashier to ring us up. Those sale signs cost the company twenty minutes of two different salaries. As a bonus, the same signs had the added benefit of creating delays for the customer and a sour experience on a trip to buy sweets.

The Tech We Deserve

What if the point-of-sale software allowed staff to scan in the discount signs? The register start-up could include a list of old signs to take down and a list of new signs to put up. With the signs scanned in, the sales would all be correctly registered in the... um.. register. Less price confusion. I know this store didn't have that tech because the sales signs didn't have barcodes or QR codes.

What if the register had a motion sensor pointed at the line. When there's no one there, it could run training videos. Our befuddled operator could have learned how to up-sell. He could have learned basic customer service. He could have learned the inventory-based implications of how he scans.

Or maybe, the register software should have some DSS (Decision Support Software) installed which would alert the manager that a pattern of add-cancel-add was going on, suggesting a cashier-in-distress or a customer-near-meltdown.

That same DSS module could help with the up-sell, too. Amazon popularized "People who bought this also bought" using that sort of data-mining. And, by tying in the inventory, we can make sure the algorithm only sug-

gests things we have in stock. Likewise, it could "predict" discounts: If you bought one more, the sale price would trigger, saving you a dollar. And, we could tailor the coupons on the back of the receipt, too.

Let's add a bonus idea: If the upper left-hand corner of the point-of-sale screen showed the front door camera, the register operator could tell, even while watching a training video, when the store was getting new shoppers. That would allow him to anticipate when he might be getting busier. Or, he might signal the manager that a second register needs to open.

It is easy to think of point-of-sale as "known territory," but there is still room for pioneers to take it further.

Parting Thought

We used to assume that people had to be smart enough to do the job when we hire them. Using tech that covers for failings but doesn't equip the capable is a sad commentary. Sadder still, self-serve checkout is making a strong showing in a lot of stores. The essential message of self-serve: Even an untrained customer is better at the job than a — supposedly — trained employee. If you need me, I'll be the one drinking a sarsaparilla at the bar, next Spectrum Conference. **IS**

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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, PerhelionSF, and the Interrogative series, which begins with Tiago and the Masterless.

OAuth 2 Login with MultiValue BASIC Part 3

BY NATHAN RECTOR

In the last article, part 2, we talked about setup and subroutines needed to send an OAuth 2 request to a web service. This time, we'll talk about the request process used to get a valid OAuth bearer token which needs to be included in those requests.

The first thing that you have to decide is how you are going to login and authenticate with the web service. Sometimes the web service will dictate this and sometimes you can choose. See part 1 of the article for more information about the different ways it might work.

Attached to this article (on the International Spectrum Website) there is a program called IS.OAUTH 2.REQUEST which is an example of all that steps we're going to talk about here.

Initial OAuth Request

Much of the interaction with OAuth 2 login services is self-contained, but there are times when a user is required

OAuth requires developers to include additional information with every web service request to verify that the request is coming from an authenticated process or person.

to do something more complicated. In order to minimize the complexity, the OAuth 2 specification supplies a refresh token.

To get your refresh token for the first time, your program will need to make the initial request the long way. You need to create the HTTP post data to send to the request URL. Using the data found in the OAUTH.CONTROL.SUPT file for the Google+ OAuth, the URL would look like this, as seen in line three of the program:

```
https://accounts.google.com/o/oauth2/auth?scope=email profile
```

Once you have the URL, you have to add the additional data to authenticate with it.

Grant Type: Native or Code

Native or Code grant types are the most common and include some additional information, which can be found in the OAUTH.CONTROL record. You will need to pull the consumer key from line one, and the Redirect URL found in line twenty-five. If you want more information about this, look at the Redirect URL section.

Create the HTTP post data with this information (see [Figure 1]) and then make the request. It will then return back JSON-formatted information which you can send to the Get Access Token process.

Redirect URLs

The redirect URL is an odd piece of information. Normally this would be a URL on YOUR web server that the

```
URL = 'https://accounts.google.com/o/oauth2/auth'  
POST.DATA<-1> = 'scope' :VM: 'email profile'  
POST.DATA<-1> = 'response_type' :VM: 'code'  
POST.DATA<-1> = 'client_id' :VM: ITEM.OAUTH <1>  
POST.DATA<-1> = 'redirect_uri' :VM: ITEM.OAUTH <25>  
CALL IS.HTTPCLIENT('POST',URL,'',POST.DATA,RESP.HTTP.STATUS,'',RESP.DATA,HTTP.ERROR)
```

Fig. 1

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oAuth service can callback to and give you the oAuth bearer information. This allows additional security, but it also requires you to have a public webserver that can pass information back into your database.

Don't fear, that is not always required. The writers of the OAUTH 2 specification took into account that a public webserver may not be available to receive the callback, so you are allowed to supply a unique identifier that tells the authorizing web service that the user is willing to go through an additional effort to get the information.

This code is "oob" or "urn:ietf:wg:oauth:2.0:oob". Be aware that not all OAUTH 2 login services support this.

What does this mean? The authorizing web service will return a URL that the user can place into a web browser, which will take them to the additional login information that they will need to answer, after which the authorizing web service will provide a PIN number that can be used for future request.

The IS.OAUTH2.REQUEST program places the PIN Number Request URL into line eighteen and requires the user to place the PIN returned from that request into line seventeen.

Refresh Tokens

Refresh tokens allow the auto-refresh of bearer tokens without going through the whole login process each time. This allows your routines to update the OAUTH 2 tokens easily as long as the

refresh token has not expired. If the refresh token has expired, then you will have to repeat the whole login process described in the section above.

This really only becomes an issue if you don't call the oAuth service on a regular basis. Most authorizing web services will keep you logged in, and your bearer token active, as long as you are using their services on a regular basis.

Putting it All Together

I have included the source code for an enhanced version of the IS.HTTPCLIENT routines to support OAUTH 2. This routine can be found at:

<http://www.intl-spectrum.com/resource/category/190/httpclient.aspx>

The BASIC program call structure is the same as the IS.HTTPCLIENT subroutine, but it adds an extra argument for the OAUTH.CONTROL record id. This allows the IS.OAUTH.HTTPCLIENT to control and maintain the bearer token and the refresh tokens [figure 2].

When a new bearer token is required, then the subroutine will call IS.OAUTH2.REQUEST to do all the handshaking, as we discussed in the previous articles.

If you look closely at the code of IS.OAUTH.HTTPCLIENT, you will also see support for OAUTH 1.0A. OAUTH 1.0A was originally created by Twitter, and is still used by Twitter, but it is more complex, and not something I'll get into here.

See [Figure 3] for a full example using IS.OAUTH.HTTPCLIENT and

```
SUBROUTINE IS.OAUTH.HTTPCLIENT (OAUTH.ID, HTTP.METHOD, URL, HEADER.DATA, POST.DATA, RESP.HTTP.STATUS, RESP.HEADER.DATA, RESP.DATA, HTTP.ERROR)
```

Fig. 2

```

001 OAUTH.ID = "GOOGLE.NATIVE"
002 *
003 URL = https://www.googleapis.com/plus/v1/people/me
004 CALL IS.OAUTH.HTTPCLIENT(OAUTH.ID,"GET",URL,"","",RESP.HTTP.STATUS,RESP. .DATA,OAUTH.ERROR)
005 CRT RESP.DATA

```

Fig. 3

Google's API. The output can be found in [Figure 4].

You'll notice that [Figure 4] is JSON, as most web services these days require. If you are looking for information on JSON parsers that can be used within your MultiValue databases, then go to the following URL:

<http://www.intl-spectrum.com/resource/category/69/JSON.aspx>

Conclusion

You should now have all you need to make OAuth work within a MultiValue database. This can be used in many different places to enhance your application and interact with Office 365, Google Drive, Salesforce, and others. **IS**

```

{
  "kind": "plus#person",
  "etag": "\"40Z_Kt6ujOh1jaML_U6RM6APqoE/fwy9zqRNk6f6v6VM0sZCmoLvPXY\"",
  "gender": "male",
  "emails": [
    {
      "value": "Nathan@intl-spectrum.com",
      "type": "account"
    }
  ],
  "urls": [
    {
      "value": "http://www.intl-spectrum.com/experts/experts.aspx?a=243655",
      "type": "contributor",
      "label": "International Spectrum Magazine"
    }
  ],
  "objectType": "person",
  "id": "112065600037302709921",
  "displayName": "Nathan Rector", "name": {
...
}

```

Fig. 4



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With the release of AccuTerm Mobile 1.0.9, AccuTerm Mobile continues to gain adoption and create excitement as the easiest automatic way to access your Pick MultiValue apps on iPhone, iPad and Android devices. AccuTerm Mobile provides industry-leading terminal emulation and includes functionality to integrate features such as browser, email, and phone into your legacy applications. Users can take advantage of both SSH and telnet connectivity, allowing you to connect to any Linux, Unix or AIX system on the go. Telnet connections to MultiValue platforms running on Windows are also supported.

AccuTerm Mobile version 1.0.9 is available in the iTunes App Store and Android Google Play Store.

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For more information, visit <http://www.zumasy.com> ■



Drexel Management Adds EMV Card Support to Credit Card Processing

Credit cards with “EMV chips” are now being accepted by most retailers nationwide. Drexel Management has added support for EMV cards in their CCListen credit card software to handle this new requirement.

Most financial institutions and card issuers are sending their customers chip cards that require signatures for verification, rather than PINs. While both types of cards improve security, PINs protect against forged signatures and are more secure. Most major retailers will be equipped to accept PINs or signatures and are urging card issuers to of-

fer customers chip-and-PIN technology (see below for more detail on chip-and-PIN versus chip-and-signature technology).

In addition to the EMV Card support, NFC (Near Field Communications) technology has been added to support ApplyPay transactions. Drexel Management’s CCListen is a database agnostic middleware that supports seamless integration between any MultiValue and Non-MultiValue application. CCListen includes support for credit card process, card vaulting, Level 1 and Level 2 card processing, as well as tokenization to fully conform to PCI requirements, in addition to US Pin Debit and store gift card programs. Partner programs are available as well.

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For more information, visit <http://www.drexelmgmt.com> ■



BlueFinity and ONgroup Collaborate on .NET

ONgroup Intl and BlueFinity International are pleased to announce the certification of BlueFinity’s mv.NET with ONgroup’s ONware product line. This connectivity opens up the full Microsoft .NET development and run-time environment to ONgroup’s MVON SQL Server and MVON Oracle customers. ONware users can now use code from their MV applications for their .NET client programs running on computer workstations and mobile devices.

The announcement also creates a framework for ONgroup’s clients to further enhance their products with additional BlueFinity products such as Evoke. Evoke is the rapid application development platform designed to produce complete line-of-business systems that can be deployed quickly across multiple platforms. It provides for limitless customization of the generated code for each targeted platform.

For more information regard-

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ing BlueFinity products and to download them visit bluefinity.com.

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About BlueFinity

BlueFinity International, part of the Mpower1 group of companies, supplies leading-edge software development tools and consultancy services to the MultiValue database and Microsoft developer communities. Founded in 2002, BlueFinity has created a series of products. Its flagship product - mv.NET - is a comprehensive solution for developers wishing to access MultiValue databases from within Microsoft's .NET environment.

For more information, visit <http://www.bluefinity.com/> ■



Mercury Console 4.0 Released for UniData

Paradigm Systems, creator of Mercury Database Console, has released version 4

for UniData and expects to release its updated UniVerse version, which is currently entering beta testing, during the first quarter of 2016.

Mercury Console version 4 has been redesigned to support UniData version 8.x with support for 64bit files systems, including the new type-3 static files as well as WHOLEFILE based dynamic files. Other new features include "SmartSize," which has the ability to learn how your database grows, allowing Mercury to learn your file system and your data patterns over time.

Mercury Console is the solution to file analysis, file re-size and even file repairs. Mercury was designed from the ground-up by an industry leading developer and U2 database engineer, to provide a tool that can manage your entire U2 database. Mercury Console has numerous features that allow you to schedule your database analysis, resizing and even performing database repairs. Advanced users can even develop their own plug-ins for complete customization. Other features include query analysis allowing you to identify how your dictionary fields and indices are used and how to improved data selection, and our index management console allows you to add, delete, and re-index your files.

About Paradigm Systems, Inc

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vides software utilities for the U2 database environment for a wide range of functions designed to fill various gaps within the database environment, allowing those responsible for the management of the U2 environment, more time and resources for other important tasks. Paradigm Systems, Inc is headquartered Boca Raton, FL

For more information, visit <http://www.paradigm-systems.us>. ■



Entrinsik Announces New Partnership with Technology Advisors to Deliver Advanced Reporting and Visualization for CRM

Entrinsik Inc. has signed a partnership agreement with Technology Advisors, Inc., a global business and technology consulting company specializing in the development of Customer Relationship Management (CRM) processes, working with technology solutions like SugarCRM, Act-On, DocuSign, Infor, Microsoft Dynamics, SalesFusion, Zendesk

and more. This agreement enables Technology Advisors to provide organizations with the advanced reporting, real-time data analysis and dashboarding capabilities they need from an operational BI solution.

Informer enables organizations to perform ad-hoc reporting and analysis, blending data from multiple sources to create interactive reports and visualizations. Regardless of technical expertise, users can easily customize views, drill down into underlying data, dynamically group & sort, export & embed, all in real time, all on one screen.

Technology Advisors works with companies globally on consulting, project management, marketing automation, sales automation, customer service and support, field service, call center optimization, analytics, and mobile and social solutions. Their expertise spans a wide-range of markets including government industries, financial services, property, healthcare, manufacturing, and construction.

"CRM is not successful without accurate reporting. Entrinsik enables Management and your CRM team to analyze their data and turn it into knowledge. This improves everyone's productivity," says Sam Biardo, CEO of Technology Advisors. "We chose Informer because it was cost effective and had an incredible feature set."

"Organizations often have lots of data but no quick

FROM THE PRESS ROOM

and easy way to glean critical insights from the data to make the best day-to-day decisions. We are excited to partner with Technology Advisors to offer their customers a unified, holistic approach to reporting and data analysis so that organizations can extract business-critical insight from data across the entire organization," says Tad Buck, Director of Informer Solutions.

About Entrinsik

Entrinsik, Inc. is the market leader in providing web-based operational and analytical reporting tools to the MultiValue marketplace. Today, with Entrinsik Informer, thousands of end-users using MultiValue databases enjoy the ability to leverage the Web to share information assets with virtually unlimited number of people anywhere at any time. With its intuitive, easy-to-use interface, Informer provides end-users, IT staff, and executives a business intelligence environment and consistent, real-time information impacting key business processes. Spectrum Magazine has described Informer as a "supercharged reporting tool...designed for decision-makers."

Founded in 1984 and in the MultiValue market since, Entrinsik aims to provide leading edge technology and unsurpassed service to their customers.

For more information, visit <http://www.entrinsik.com> ■



Ladybridge Systems Releases QM 3.4-4

Release 3.4-4 of the QM Multivalue Database is now available for download from www.openqm-zumasys.com/downloads or www.openqm.com/downloads.htm.

Release Contents

For improved compatibility with other products, if field 3 of a VOC Q-pointer is null, QM now assumes VOC by default.

The CREATE.DICT.NO.CASE mode of the OPTION command can be used to make CREATE.FILE create dictionaries with case-insensitive IDs. The NO.CASE option of the CREATE.FILE command has also been extended to allow selection of case-insensitivity for the data and/or dictionary portions of the file.

The SEARCH command has been extended to add a DISPLAY option that shows each line that contains any of the search strings. When this option is used, a select list is only created if the TO option is also used.

The query processor SORTED.SAMPLE keyword is simi-

lar to the SAMPLE keyword but is applied after sorting.

A new QMBasic \$MODE setting, EXECUTE.CLEARLIST, has been added to improve compatibility with other products regarding how the default select list is handled by the EXECUTE statement.

As an aid to debugging programs, the QMBasic PDUMP statement creates a process dump file of the process in which it is executed.

The QMBasic OPENTEMP statement has been extended to create the file in the QM temporary directory if the pathname is omitted or is a null string.

The QMClient API now supports sequential file processing.

The QMClient API QMTxn() function can now commit non-durable transactions.

The WEBSVC command and !CALLHTTP class module can be used to implement simple web services.

About Ladybridge Systems Ltd

Ladybridge Systems was founded in 1992 by former Prime Computer personnel and is headquartered in Hardingstone, Northampton, England. The primary activity of the company is the OpenQM multivalue database for which Zumasys were appointed as worldwide sales and marketing partner in January 2015. Ladybridge Systems also provide training,

consultancy, development, and maintenance services to MultiValue databases in the UK and worldwide. Ladybridge Systems remains a small privately owned company, offering a personal level of service to clients around the world.

For more information, visit <http://www.ladybridge.com> ■



Columbia Ultimate Partners with Zumasys, Leading Cloud Provider, to Offer Premier Hosting Services

At the forefront of technology and integrated solutions for the collections industry, Columbia Ultimate ("CUBS") is pleased to announce that all of the companies' platforms can be deployed in the cloud. By partnering with Zumasys the company now offers clients across all platforms and configurations a service model that has transformed IT infrastructure. Columbia Ultimate is one of the largest resellers of jBASE, a provider that Zumasys acquired earlier this year, bring-

FROM THE PRESS ROOM

ing a natural synergy to the partnership.

"Our 35 years of development is now available as a cloud service — revolutionizing the way we do business and providing the forward-thinking approach the collections industry requires," explained Fred Houston, president and CEO of Columbia Ultimate. "Our products align with Zumasys to deliver reliability, accessibility, and business value to our clients.

Paul Giobbi, President, co-founded Zumasys Inc. in 2000 with the intent of providing cloud computing so-

lutions for businesses. The company has since grown to more than \$25 million. "The partnership with Columbia Ultimate is the perfect fit," Giobbi said. "Columbia Ultimate has the vertical expertise with collections, application knowledge, and a loyal customer base. We have ten years of experience in migrating MultiValue applications into the cloud, giving customers a smooth path that is high-touch."

Cloud computing offers Columbia Ultimate users unmatched cost efficiency, flexibility, and speed of service delivery. In an industry where

businesses cannot afford to have their main application confidence disaster recovery planning, looking at platforms that provide a hosting option is increasingly critical.

About Zumasys, Inc

Zumasys helps companies of every size transition their infrastructure and applications to the cloud. With Zumasys cloud services, customers can easily access the latest software and hardware technologies over the Web, allowing them to focus on growing their core business instead of managing their IT infrastructures. Zumasys delivers personalized service, integrated

disaster recovery and the confidence companies need to out-source the hosting of all their databases including SQL, Oracle and Pick MultiValue systems.

For more information, visit <http://www.zumasys.com> ■

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/bin/bash-ing

MultiValue

BY KEVIN KING

One thing about system upgrades: They rarely go as quickly or as simply as we might hope. As more time passes, the risk of things changing *independently* on the two systems increases until things can get downright ugly.

I've been converting a UniData customer from a near-ancient AIX system to Red Hat Enterprise Linux for a while now. Procedurally, the basics of the conversion are pretty straightforward: Install the current versions of UniData and SB+, setup printers and external connections to the new system, move and convert the data from the old system to the new system, and perform general cleanup as needed. However, nothing ever goes quite to plan. Due to factors outside of my control, several months have passed from the beginning of this project until it went live. And as that time passed, a great deal changed on both systems.

Copying and converting the data from one system to another can be done many different ways. Using rsync, rcp, ftp, sftp — whatever is available — the gigs of data and programming can be moved nearly effortlessly. Moving the

There is a subdirectory for each letter of the alphabet, and an additional "X" directory for those compiled objects that don't start with a letter.

global catalog — a completely separate area used by UniData — was an adventure. To understand why we need to dive into the weeds.

UniData actually has three separate catalog spaces. The global catalog holds a copy of compiled code and supports some nifty memory management to ensure that if a hundred people access a particular program, that code is loaded into memory only once. Also, programs in the global catalog can be used by all accounts on the system without compiling the code in each account. For programs which are not in the *global* catalog, UniData will look at the VOC pointer in the account to determine if the program is in the *local* catalog, or if the program has been cataloged *direct*.

Unlike the global version, there is a separate local catalog stored inside each specific account which holds a copy of the compiled code. If a program runs out of the local catalog, when a hundred people access it the object code is loaded a hundred times.

The direct catalog is actually not a catalog space at all; it refers to all the catalog pointers within a VOC. Those pointers are NOT copies of the compiled code; they tell Unidata to run the actual p-code produced by the BASIC command. With the direct catalog, there is no copy of the object anywhere. Once something has been cataloged direct you will never have to catalog it again.

Programs that are cataloged locally or globally must be updated every time the source is recompiled.

With this AIX to RHEL conversion, the version of UniData and SB+ running on the two platforms are different. UniData and SB+ had already updated the global catalog on RHEL with many entries before we moved the AIX programming over. We couldn't simply overlay the global catalog on

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RHEL with the global catalog on AIX, as many critical things in the new versions of Unidata and SB+ would be lost.

Adding complexity to this mix, the global catalog on Unidata is a multi-dimensional directory structure at \$UDTHOME/sys/CTLG. There is a subdirectory for each letter of the alpha-

bet, and an additional "X" directory for those compiled objects that don't start with a letter. The globally cataloged p-code for UniData programs lives under each of these subdirectories.

So as we approached our go-live, I noticed the global catalog from AIX had been updated by several programs over the past months and the global catalog on RHEL had also been updated as we converted programs to that platform. With thousands of items in these subdirectories, how could I tell which things had changed in AIX since the last copy over to RHEL? More importantly, how could I get these answers quickly?

The answer came in the form of a shell script, shown in [Figure 1]. I copied the AIX global catalog over to the /tmp directory on RHEL so that I had both global catalogs on the same system, taking great care to preserve the last modification times on the AIX global catalog when doing the copy. With both catalogs on the same system, I could then compare the two directories to find out what was different. Now, I really don't care about things that are on RHEL that aren't on AIX; my concern was making sure that any globally cataloged programs that changed on AIX

since the last copy to RHEL would be updated.

Line three loads a profile called unidata.sh. This sets the \$PATH and other variables for UniData to run properly in the script.

Line five is the *golden ticket* for this task. This for-loop issues a find command that retrieves all of the file names in the AIX global catalog (that I temporarily stored at /tmp/CTLG on RHEL) and then it iterates through that list. This is a remarkably easy way to navigate through a directory of files regardless of how many files are in that directory tree.

I didn't want to bring over any global catalog stuff from old versions of SB+, so I used this variable SBCHECK to see if the name of the file contains any of the SB+ global catalog prefixes. On line eight, I check to see if the file name given to me by the find command is an actual file (-f = is a file) and if the \$SBCHECK variable is empty (-z = zero length string). If both of those are true then we can figure out which file is newer; the one on AIX or the one on RHEL.

On line ten, I'm cutting off the "/tmp/" from the front of the file name and assigning that to a new variable BASE.

```
#!/bin/bash
. /etc/profile.d/unidata.sh
for FILE in `find /tmp/CTLG`
do

SBCHECK=`echo $FILE | egrep \_SB543|\_SB524|\_SB534|\_SB538|\_SB543`
if [[ -f "$FILE" && -z "$SBCHECK" ]]
then
BASE=`echo $FILE | cut -c6-999`
if [[ ! -f "/usr/udthome/sys/$BASE" || "$FILE" -nt "/usr/udthome/sys/$BASE" ]]
then
#convcode $FILE
#cp $FILE /usr/udthome/sys/$BASE
echo $FILE
fi
fi
done
```

Fig. 1

This will leave “CTLG/*programName*” in BASE. From there, I check to see if this file does not exist (! = not, -f = is a file) or if the AIX catalog is newer (-nt) than the version on RHEL. If the file on AIX has a newer last-modification time than the one on RHEL, that file needs to be converted and brought it to RHEL.

In this particular version, I’ve commented-out the UniData routine that converts the byte-order of the p-code and also commented-out the copy command that installs this into the RHEL global catalog. All I want to do here is display the name of each AIX item that is newer than the RHEL item, which is where I started — and also ended — with this task.

Once I knew the discrepancies, I un-commented those two lines to convert and install the AIX globally cataloged version into the RHEL global catalog.

There are, of course, some variations that can be done with this technique, but this simply illustrates how powerful the for-loop can be in shell scripting. With shell scripts being able to do looping, if-conditions, simple variable assignment, and much more, you might find — as I did — that this can provide the perfect solution for those onerous programs where a BASIC routine just doesn’t seem like the right fit. **IS**



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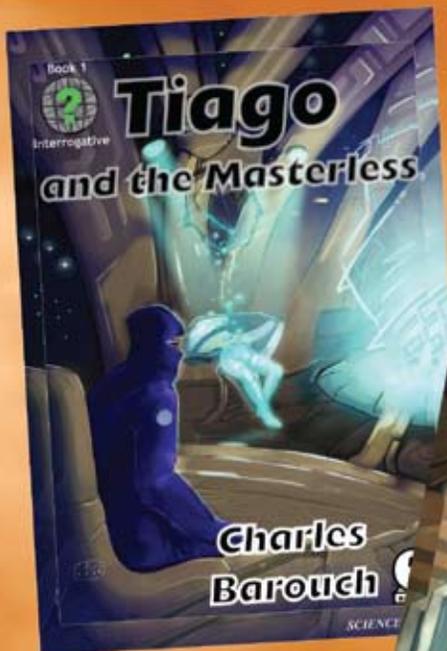
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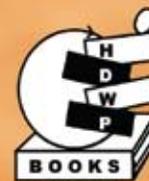
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Modern Line-Of-Business Application

Part 1

BY NATHAN RECTOR

Warning: I intend to re-invent the wheel. Not because I have too much time on my hands, but because we need to take a fresh look at the entire process of developing LOB (Line-of-Business) applications. Simply adding new features to the monolithic systems we currently have is a losing battle. Things are changing too rapidly.

Most of you who are reading this are software developers, working with a well-developed and mature LOB application, so I'm sure you know that this article series has the potential to become a full-blown business book. There's enough material

As developers and administrators, it is our job to keep the business current, but what we have today is not always flexible in the ways we need it to be. Developers of twenty and thirty years ago had no way of anticipating the radical evolution in software, interfaces, and expectations. And yes, some of us are simultaneously “the previous developers” and “the current developers.”

Everything needs a framework to build on top of. Line-of-Business applications are no different, and it may be even more import for them to use one that some other applications.

Time to Start from Scratch

Easy to say, but hard to do. Start where? UI? Core logic? Database layout? Interfaces? Standards? Eventually, yes to everything. We're not going to focus on the details — which all of those are — we're going to start with a concept: What type of LOB application are we going to build?

For this series, we'll create an “Accounting and Bookkeeping” application. The reason for this is because it's the basis of almost all LOB applications, and it will also demonstrate three of the key features of any modern application: Flexibly, Adaptability, and Extensibility.

Before any modern software can be written, a developer needs to decide on a framework or design pattern to follow. Why? These frameworks and design patterns help a developer code consistently and with flexibility. Let's keep this moving by defining what our LOB framework will look like.

Line-Of-Business Framework

The framework is where most of the monolith code resides. Let that sink in. We won't be writing all of the code. That's the old way. Developing software becomes the process of connecting your application's procedures to the framework. Modular thinking, not monolithic thinking. Now keep in mind, while there are UI frameworks, we're talking about the deeper kind here. This is something which will handle the processing of the overall application.

Our framework should contain of the following:

- Workflow Engine
- Background Processor/Scheduler
- Asynchronous Processor

Work-flow Engine

Work-flows are what drive all business processes. For example, creating a new customer would trigger all of the following: a processes in accounting to verify credit, a process in sales to send welcome emails, and an administrative process to request additional contact information. Most work-flows are pretty simple, like the one above, but others can become rather complex.

An order work-flow, for example, might trigger multiple different work-flows depending on what needs to be done. It might trigger a processes to notify manufacturing, reserve product in inventory, request pickers to retrieve inventory AND also one in accounting to submit liens or send invoices. In turn, reserving product in inventory may trigger work-flows for purchasing and/or EDI transactions.

Modern work-flows must be able to process tasks synchronously and asynchronously. The vast majority of older systems can only handle the synchronous approach. The background processor comes into play as a tool for making the tasks less bound to linear execution. Keep in mind that the background process is not dedicated to any one work-flow, but is used by multiple work-flows to help handle all asynchronous processing. This is how we define the order in which something is done: 1st, 2nd, and 3rd, as well as what happens when the work-flow process fails.

Entity requests — we'd like to place an order, for example — and business rules are the main entry points for any work-flow. Think of the entity request and the business rules as the finger, and the work-flow as the dominoes. Like dominoes, each task should be a small quick routine that does one thing.

For example:

Workflow: Write Customer

- Update Contacts
- Update Terms
- Write Customer
- Link To Other Customers

This allows the developer to add their own extensions to the work-flow. As an example, say a developer wants to add a social networking task. They can add “Post to Facebook Customer Status” before or after any step.

Background Processor/ Scheduler

Any large software system has a background/scheduler process of some kind. Whether it is something at the O/S level, like cron on Linux/Unix, or at that database level, like a phantom processor; there's a way to trigger hourly, nightly, or on-the-fly tasks.

For the most part, this is just a large loop that checks to see if something needs to be run now, or if it can wait. This process is a must for any LOB system because it is the basis for report processing, back-ups, and database maintenance. It is also the basis for building the asynchronous processor.

Asynchronous Processor

An asynchronous processor is often overlooked in application design. Asynchronous programming can be a pain to debug and not all environments or databases have good, or any, tools built-in to do this type of programming. .NET, JAVA UI, and other software make use of async design a lot. However, even in those systems, it is not widely used. But some of the newest technologies being created are starting to force UI and UX developers to address it.



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Asynchronous programming in an LOB application is generally not as complex as you would find in a UI/UX Client. This is mainly because developers already do it without realizing it.

The core of any asynchronous process is to push it into another thread, or phantom port, so it can do its work at the same time as the process that called it is doing something else. This allows a task to complete faster, as long as there is not conflict in changing data.

Doing two things at once using the same data and processes seem really complex, but it isn't — assuming you don't make it complex. Let's look at an order creation work-flow.

During order creation, the system needs to notify the warehouse that inventory needs to be retrieved. The order creation work-flow does not need to wait for these notifications to complete in order to be written to disk. This is, therefore, asynchronous.

i.e.:

Workflow: Order Creation

- *async* Validate Product in Inventory
- Validate Customer
- Validate Customer Account Aging
- If Customer Account Closed then Terminate
- Calculate Gross Dollars
- Calc Tax
- Update GL
- WaitForComplete Validate Product in Inventory
- If Inventory Has Error then Terminate
- Print Picking

- *async* Notify Customer of Order Status

In the pseudo-flow above, you will see that there is an *async* flag on "Validate Product in Inventory". This would push the long drawn out process of checking inventory and availability to the background while the immediate checks ("Customer Account Aging", "Calculate Gross Dollars") are being done.

Once the immediate items are completed, the process will then "WaitForComplete" on the "Validate Product in Inventory" before going any further. If "Validate Product in Inventory" has not completed, then the "Order Creation" work-flow will continue to wait.

If you look further into the example you will see the "*async* Notify Customer of Order Status", but it does not have a "WaitForComplete" associated with it. This is done because there is no reason to wait for the completion of "Notify the customer of order status" in order to finish completing the "Order Creation" work-flow task. It just needs to be done.

Conclusions

I've only scratched the surface here. There is a lot more to get into and talk about, and I haven't even started talking about the business rules and database layouts for an "Accounting and Bookkeeping" application.

Stay tuned for more details on this ongoing project. **IS**



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