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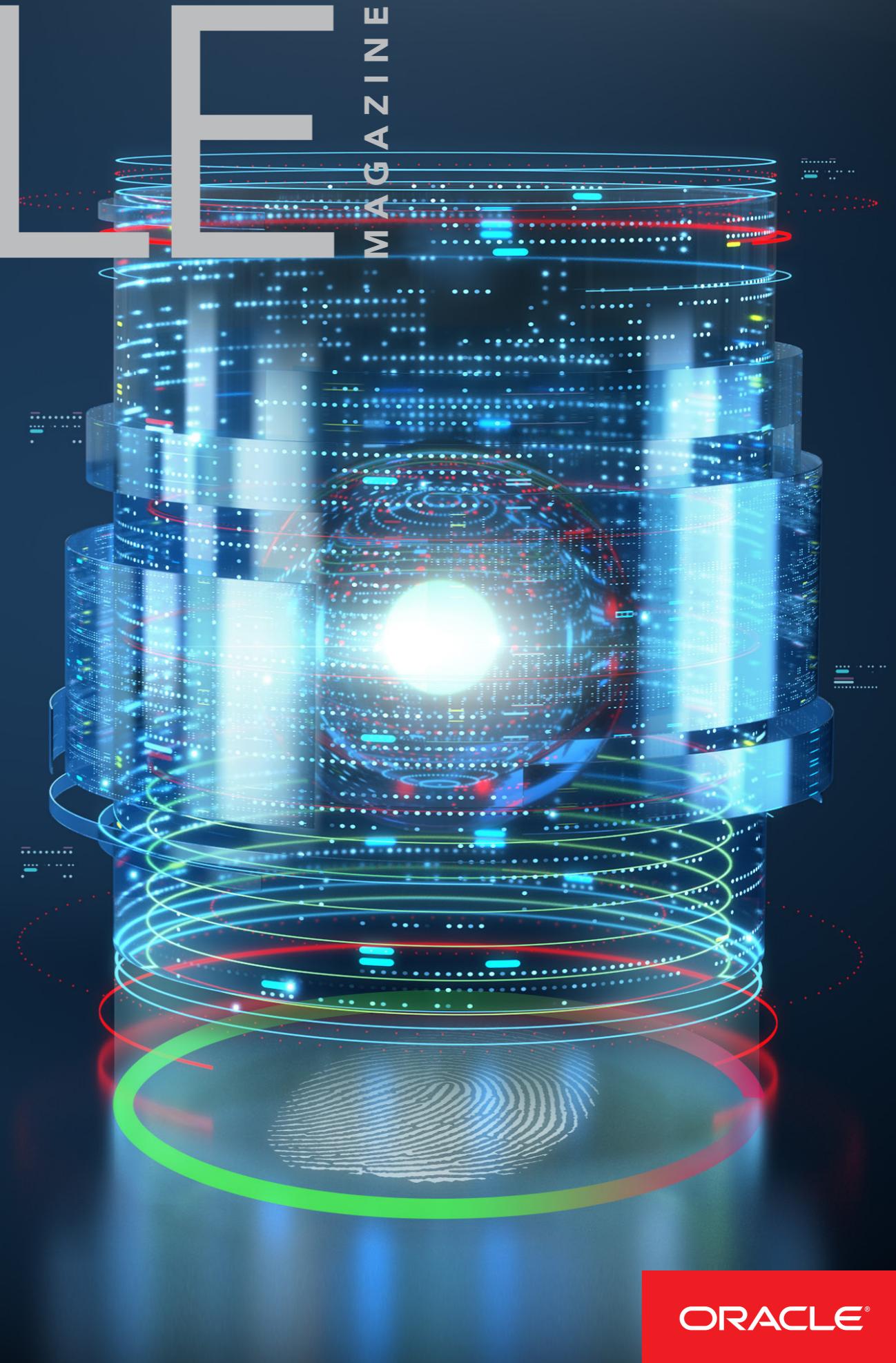
AUTONOMOUS AND SECURE

From self-secur ing database cloud services to the new cloud perimeter, Oracle technology protects your most valuable investment—your data

GETTING STARTED WITH
AUTONOMOUS DATABASE SECURITY

SECURITY WITHOUT WALLS AND DOORS

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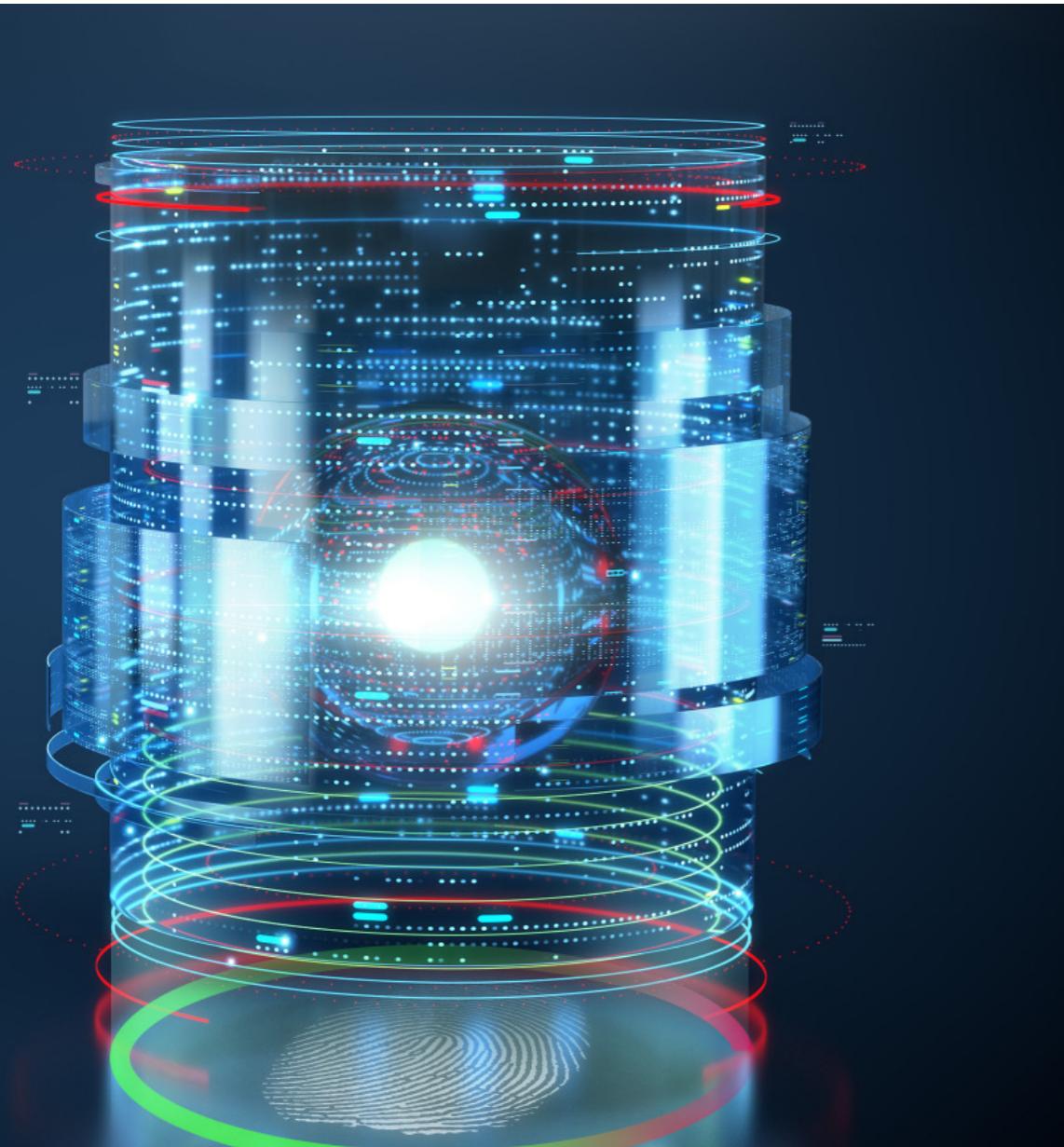
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44

Autonomous and Secure

From self-securing database cloud services to the new cloud perimeter, Oracle technology protects your most valuable investment—your data. **BY MIKE FADEN**

UP FRONT

5 FROM THE EDITOR

New Wave of Autonomous Services

Oracle releases services for integration, analytics, app dev, and more.

BY TOM HAUNERT

7 MASHUP

School Daze

Gadgets, apps, and curiosities for every classroom—and beyond **BY LESLIE STEERE**

12 INTERVIEW

Getting Started with Autonomous Database Security

Automatic encryption and patching are a solid beginning to the cloud database security journey.

BY TOM HAUNERT

16 INTERVIEW

Bringing Analytics Back to Questions

Oracle's Autonomous Analytics Cloud is here to get faster answers from more data.

BY TOM HAUNERT

22 INTERVIEW

Security Without Walls and Doors

In the cloud, identity has become the new perimeter.

BY TOM HAUNERT



22 Interview

CONTENTS

COMMUNITY



31 PEER-TO-PEER

Open for Business

Three peers champion open systems and the developer communities that build them.

BY BLAIR CAMPBELL



34 Developer Champion

34 ORACLE DEVELOPER CHAMPION

It's Always Time to Change

Oracle Developer Champion Roland Carrasco lives on a steady diet of daily transformation.

BY BOB RHUBART

37 DEVELOPER PRODUCTIVITY

Enhance Your Job Focus with Side Projects

Developer experience engineer Joe Levy strives to maintain a coding mindset.

BY ALEXANDRA WEBER MORALES

TECHNOLOGY

50 APPLICATION DEVELOPER

Parlez-Vous Français? Your Bot Does.

Build multilanguage bots with Oracle Intelligent Bots.

BY FRANK NIMPHIUS

69 LOW CODE

REST Up and Build Quickly

Mash up REST services with Oracle Autonomous Visual Builder Cloud Service.

BY SHAY SHMELTZER

84 OPEN SOURCE

Build REST APIs for Node.js, Part 2

Add database connection pooling to your new REST API.

BY DAN MCGHAN

95 OPEN SOURCE

Perform Basic CRUD Operations with cx_Oracle, Part 4

Here's how to use Python for CRUD operations in Oracle Database.

BY BLAINE CARTER

108 PL/SQL

When Is a Function Like a Table? When It's a Table Function!

Combine the power of SQL with the procedural control of PL/SQL.

BY STEPHEN FEUERSTEIN

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Tom Haunert



New Wave of Autonomous Services

Oracle releases services for integration, analytics, app dev, and more.

Following the availability of Oracle Autonomous Data Warehouse Cloud, Oracle's first autonomous cloud platform service, Oracle [announced the availability of three more autonomous services in May](#) and [four more in June 2018](#). That rapid-release schedule underscores Oracle's commitment to autonomous services and their self-managing, self-securing, and self-repairing capabilities—powered by machine learning technology.

Oracle Magazine, which explored Oracle Autonomous Data Warehouse Cloud in "[Driver's Education for the Self-Driving Database](#)," goes deeper into its security capabilities in this issue's

"[Getting Started with Autonomous Database Security](#)," an interview with Vipin Samar, senior vice president of Oracle Database Security. Samar describes the product's self-securing capabilities, from infrastructure to encryption to administration. "We take care of the security of the infrastructure including the database, and we automate it—leaving nothing to chance or human error," Samar says.

In this issue's interview on business analytics, "[Bringing Analytics Back to Questions](#)," John Hagerty, Oracle vice president of product strategy, explains that Oracle Autonomous Analytics Cloud—supported by natural language

processing, artificial intelligence, and machine learning—makes information “easier to consume and easier to understand.”

Also in this issue, Shay Shmeltzer, director of product management for Oracle’s cloud development tools, describes in “[REST Up and Build Quickly](#)” how to quickly build apps with Oracle Autonomous Visual Builder Cloud Service. In “[Parlez-Vous Français? Your Bot Does,](#)” Frank Nimphius, principal product manager in the Oracle Mobile Platform Product Management

group, steps readers through the process of using autonomous features in Oracle Intelligent Bots and Oracle Mobile Cloud Enterprise to build a single chatbot app for use in multiple languages.

There are more autonomous services in the forecast for Oracle and *Oracle Magazine*. Check back often for updates.



Tom Haunert,
Editor in Chief

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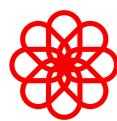
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NEXT STEPS

TRY Oracle autonomous cloud services.

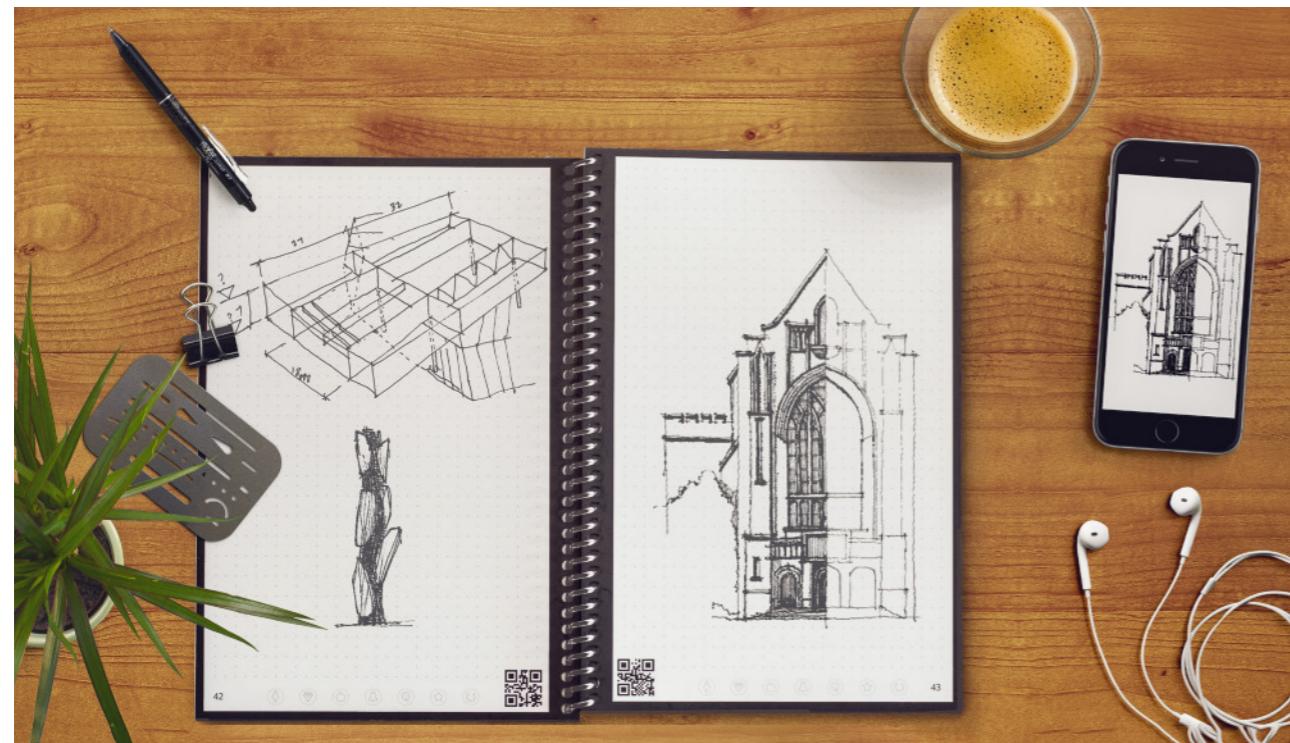
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IT Leaders in Education

Cybersecurity, budgets, and data privacy are high on the priority list for 2018.

The Consortium for School Networking (CoSN) recently released its sixth annual survey of IT leaders in education. This year, broadband and network security ties with cybersecurity as the #1 priority, with budget constraints remaining a top challenge. Among other findings:

86%

Are at least moderately involved in their district's decisions to purchase digital content—up from 75% in the prior year

60%

Spend the bulk of their time reacting to technical problems as opposed to working in a proactive mode

43%

Feel their IT department is stretched too thin

53%

Do not outsource any IT functions

68%

Rate privacy and security of student data more important than it was in the prior year

Source: [Consortium for School Networking's 2018 K-12 IT Leadership Survey Report](#)

DO YOU SPEAK TECH? QUIZ YOURSELF!

- 1. In the context of education, MOOC is**
 - A. An introductory class on dairy farming
 - B. An unofficial acronym for My Own Oracle Cloud, which connects like-minded students via the cloud
 - C. The acronym for massive open online course, in which materials and instruction are delivered—generally free—around the world via the internet

- 2. OER, in an educational context, most likely means**
 - A. Open educational resources—digital materials available for use in teaching, research, and learning via open licenses
 - B. A poet's contraction for over
 - C. Operational emergency—a text-message abbreviation used by school IT departments to signal an all-hands-on-deck security breach

- 3. To professionals tasked with creating online educational content, RIO stands for**
 - A. A river of material that organically broadens in scope as participants learn to interact with it
 - B. Reusable information object—a collection of content, practice, and assessment items assembled around a single learning objective
 - C. Random instructional objectives

Answers: 1. C; 2. A; 3. B

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Symantec Optimizes Security for Oracle Cloud

Protect your Oracle Cloud Infrastructure platform with Symantec solutions.

An Interview with Simon Moran, Vice President of Cloud Security, Symantec



Simon Moran, Vice President of Cloud Security, Symantec

The news today is loaded with stories about public cloud data breaches. For organizations new to the cloud, such stories can be especially daunting. These companies have likely spent decades building and fine-tuning their on-premises security policies and practices. Migrating to the cloud can feel a lot like moving their data and applications to the Wild West. With the right cloud security, it doesn't have to.

Symantec knows how to protect Oracle Cloud. As the largest pure-play security vendor in the world,

Symantec delivers security solutions to approximately 85 percent of the Global Fortune 500. In partnership with Oracle, Symantec is delivering key components of its Integrated Cyber Defense Platform, optimized for Oracle Cloud, so customers rest easier as they shift from on premises to the cloud.

Q. Why does public cloud security require special expertise?

A. Public cloud security is different from on-premises security because public cloud instances are componentized, preconfigured,

and template based. They're also dynamic, mobile, orchestrated, and automated. The public cloud model isn't set up to support extensive configuration efforts and long tuning cycles, two hallmarks of traditional on-premises security. And public cloud architecture isn't structured for retrofitted on-premises security systems. The cloud needs cloud security.

Q. What should organizations be aware of regarding cloud security?

A. Most public cloud security risks originate from components



For more information, visit
[www.symantec.com/theme/
oracle-cloud-security-solutions](http://www.symantec.com/theme/oracle-cloud-security-solutions)

“Oracle is responsible for securing the cloud itself, while customers are responsible for securing their data and workloads in the cloud. That’s where Symantec can help.”

—*Simon Moran, Vice President of Cloud Security, Symantec*

managed by the enterprise. Knowing where the lines of responsibility lie is critical. Cloud service providers are responsible for the security of the cloud. With Infrastructure as a Service deployments, organizations are responsible for the security of their data, platform, identity and access management, operating systems, antivirus and antimalware solutions, hardening of the systems, and so on. In other words, Oracle is responsible for securing the cloud itself, while customers are responsible for securing their data and workloads in the cloud.

That’s where Symantec can help. Symantec protects applications and instances—the subscriber-controlled components in Oracle Cloud.

Q. How does Symantec help customers unleash the power of the Oracle Cloud platform?

A. Symantec helps protect an enterprise’s Oracle Cloud Infrastructure platform so

that they can securely migrate legacy on-premises applications to the Oracle cloud, deploy new cloud-native applications and services, and leverage elastic capacity to meet spikes in demand. Our deep understanding of what makes the public cloud unique is key to our ability to fully protect the Oracle Cloud Infrastructure platform. Moving to the cloud is a journey—not a one-time event—so companies need a well-formulated hybrid security approach. When organizations use Symantec products in their move to the cloud, companies feel secure, knowing that we give them the same level of security that they enjoy today on premises, which is a critical consideration because the public internet has a much larger attack vector.

Q. How can customers add Symantec’s leading security products to their Oracle Cloud deployments?

A. Symantec offers organizations everything

they need to secure their Oracle Cloud Infrastructure. And they can consume our products in whichever method works best for them, whether that’s as a Bring Your Own License model or an as-a-service model. Our cloud security solutions also deliver capabilities such as infrastructure hardening and protection, protection and management of confidential data, business-aware security and risk visibility, industry-leading malware and threat detection, and endpoint protection.

Q. How are Symantec and Oracle working together to develop new approaches to cloud security?

A. We are working closely together to construct an architecture that helps customers ensure that their cloud infrastructure will always be secure. Bringing together the endpoints and the Oracle Cloud Infrastructure platform will transform cloud security for business applications. The advanced security services and monitoring capabilities of this next-generation environment will ensure complete protection from the user’s workstation to the cloud application. ■



INTERVIEW



Vipin Samar, senior vice president of Oracle Database Security, believes securing databases in the cloud is a shared responsibility.

Getting Started with Autonomous Database Security

Automatic encryption and patching are a solid beginning to the cloud database security journey. **BY TOM HAUNERT**

“Data is your most critical asset, but could become your biggest liability if not properly secured,” says Vipin Samar, senior vice president of Oracle Database Security, in the video [Security for the Autonomous Warehouse Database Cloud](#). At what point is data properly secured? *Oracle Magazine* sat down with Samar to talk about data assets and liabilities, appropriate security for databases in the cloud, and more.

Oracle Magazine: How is the cloud changing the database security conversation?

Samar: When organizations make the decision to move to the cloud, their first questions are often about security. Is the cloud secure? Can they limit Oracle administrator access to their data in the cloud? Can they meet their compliance requirements in the cloud? These are typically the top three questions I hear.

Oracle Magazine: Oracle Database Cloud services all run with their data encrypted. Is that enough to keep data safe in the cloud?

Samar: We use encryption by default in Oracle Database Cloud services so that hackers do not get access to the raw data.

Encryption closes one particular part of the attack surface—where the hacker gets access

to data blocks directly. But hackers can try many other techniques *without* access to the data blocks.

Hackers can impersonate users, they can steal an end user’s password, or they can exploit weaknesses in database applications. And they can do more—it’s a long list.

So encryption is one necessary tool, but it doesn’t address all possible security risks.

Oracle Magazine: How can organizations determine whether their databases are secure?

Samar: Many organizations don’t really know how secure their databases are, where their sensitive data is located, or how much data they have.

Oracle recently released the Oracle Database Security Assessment Tool feature of Oracle Database, which lets organizations answer these questions. The tool looks at various security configuration parameters, identifies gaps, and discovers missing security patches. It checks whether security measures such as encryption, auditing, and access control are deployed, and how those controls compare against best practices.

Additionally, it helps them discover where



"We take care of the security of the infrastructure including the database, and we automate it—leaving nothing to chance or human error," says Vipin Samar, senior vice president of Oracle Database Security.

their sensitive data is located and how much data they have. Oracle Database Security Assessment Tool searches database metadata for more than 50 types of sensitive data including personally identifiable information, job data, health data, financial data, and information technology data. This helps businesses to understand the security risks for that data. It also highlights findings and provides rec-

ommendations to assist with regulatory compliance. The findings and recommendations support both the European Union General Data Protection Regulation (EU GDPR) and the Center for Internet Security (CIS) benchmark.

Oracle Magazine: Oracle Autonomous Data Warehouse Cloud is described as the world's first self-securing database cloud service. What does *self-securing* mean for this service?

Samar: Self-securing starts with the security of the Oracle Cloud infrastructure and database service. Security patches are automatically applied every quarter or as needed, narrowing the window of vulnerability. Patching includes the full stack: firmware, operating system [OS], clusterware, and database. There are no steps required from the customer side. We take care of the security of the infrastructure including the database, and we automate it—leaving nothing to chance or human error.

Next, we encrypt customer data everywhere: in motion, at rest, and in backups. The encryption keys are managed automatically, without requiring any customer intervention. And encryption cannot be turned off.

Administrator activity on Oracle Autonomous Data Warehouse Cloud is logged centrally and monitored for any abnormal activities. We have enabled database auditing using pre-defined policies so that customers can view

logs for any abnormal access.

Oracle Magazine: What's needed to protect other attack surfaces?

Samar: Securing databases in the cloud is a shared responsibility, with Oracle securing the infrastructure and network; monitoring the OS and network activity; applying OS and database patches and upgrades; and providing encryption, appropriate separation of duties, and various certifications.

The customer organization still needs to secure its applications, users, and data. It needs to ensure that its applications can thwart attacks targeted at the company, that its users follow security best practices, and that its sensitive data is protected using appropriate controls. In some sense, these requirements are no different from those for an organization's current on-premises databases, except that Oracle has already handled the security infrastructure part. □

PHOTOGRAPHY BY
BOB ADLER/THE VERBATIM AGENCY

NEXT STEPS

WATCH *Security for the Autonomous Warehouse Database Cloud.*

LEARN more about Oracle Database Security Assessment Tool.

DOWNLOAD Oracle Database Security Assessment Tool.



INTERVIEW

John Hagerty, vice president of product strategy at Oracle, explains that information is easier to consume and easier to understand with Oracle Autonomous Analytics Cloud.



Bringing Analytics Back to Questions

Oracle Autonomous Analytics Cloud is here to get faster answers from more data.

BY TOM HAUNERT

Business analytics has evolved to support getting more and different results from more and different datasources for more and different people in the enterprise. But for a discipline that has also spent significant time setting up, adding, prepping, cleansing, and otherwise manipulating source data, it's time to renew the focus on the business questions your business leaders want answered—and answered quickly.

“Business analytics should be something that everybody who needs information taps into to drive their business performance.”

Oracle Magazine sat down with John Hagerty, vice president of product strategy at Oracle, to talk about the state of business analytics today, the effect of cloud on today's analytics, big data, the recently announced Oracle Autonomous Analytics Cloud, and more.

Oracle Magazine: What is the state of business analytics today?

Hagerty: There are a couple of things to consider in the state of business analytics.

First, we're all swimming in a sea of data—much more than in the past—and it's growing every day. It's coming from everywhere. Companies must figure out what data is important, what data is relevant, and how to look at all data regardless of where it's stored to make the most timely and defensible decisions. The wealth and abundance of data out there must be embraced and exploited.

Second, business analytics has been an intensely human activity since this discipline started. It has been about people gathering data, massaging numbers, and then presenting those facts and insights to other people. Because we're all being asked to move a lot faster, and we're being asked to use more data in our decision-making, it's becoming really hard for humans to keep up.

We're seeing the advent of artificial intelligence and machine learning as a way to assist humans to understand the scope of data that's available, to figure out what it means, to be able to make sense of it more quickly, and sometimes *not* make the decisions—if humans choose not to—but at least make the recommendations of what business decision-makers

should be doing, therefore accelerating the whole process.

Finally, business analytics used to be the province of the select few; now it's the province of the empowered many. Business analytics should be something that everybody who needs information taps into to drive their business performance.

WHAT IS IT?

Oracle Autonomous Analytics Cloud combines machine learning, artificial intelligence, and service automation to create an autonomous analytics platform that breaks down barriers between people, places, data, and systems, fundamentally changing the way you analyze, understand, and act on information. From dynamic user-driven what-if modeling to autonomous analytics that provide proactive insights, Oracle Autonomous Analytics Cloud delivers everything you need to ask any question of any data, on any device, at any time.

[TRY Oracle Autonomous Analytics Cloud.](#)

Oracle Magazine: How is cloud changing the technology and operations of business analytics?

Hagerty: In many cases in the past, business analytics had to wait for IT operations to procure and install the necessary hardware infrastructure and then install the software. That goes away with cloud. What could have been a several-months-long infrastructure process is condensed into minutes.

Cloud technology has really made a huge change in how nimble organizations can be as new challenges arise. It also allows them to expand on what they're doing more quickly, simply by being able to provision or expand new capabilities and then quickly move forward.

More and more data is born in the cloud—it didn't come from a system that was running on premises. The ability to pull data together from many different environments is driving a lot of innovation and change in business analytics. Consumers can take data from Oracle cloud applications, from other cloud applications, from systems and data on premises, and even from people's desktops, and then combine it all

together for new and enhanced analysis. Cloud enables this agility.

Oracle Magazine: How are business analytics technologies and processes integrating and addressing today's data volumes and data variety?

Hagerty: In the past, the holy grail for business analytics was an enterprise data warehouse. Everything was highly structured, cleansed, very well organized. It was the one source of truth that everyone went with. And for a lot of organizations, it's still the centerpiece of their information architecture.

But today, because of the huge volume of different types of information, including operational data, IoT streaming data, and information coming from all the different sources that have an impact on business performance, companies ask, "Why should I limit myself to an enterprise data warehouse view of the world when I really need to use the enterprise data warehouse *and* everything else to help drive a thorough understanding and new insights into how my business is operating."

Therefore, analytics has to address any type of data. And that's really where you see Oracle's

analytics scenarios coming to the forefront. Oracle doesn't care where the data is or what type of data it is. Whether it's on premises, in the cloud, or somewhere in between, businesses need to be able to address this data and analyze it to support the business scenarios they're looking at.

"Analytics has to address any type of data."

Some manipulation of data often has to happen in order for it to make more sense from a business context standpoint. It also needs to be enriched with more context. This is where the marriage of analytics and big data is coming together; businesses can prep data at scale using the big data environment.

If you look over the history of analytics, there was a data prep and store phase, followed by an analysis phase. What you're seeing now is a marrying of these things together where the data preparation, storage, and analysis are all becoming part and parcel of the same process.

Oracle Magazine: Oracle recently announced the availability of Oracle Autonomous Analytics

Cloud. What is it, and what is its role in Oracle's business analytics portfolio?

Hagerty: Oracle Autonomous Analytics Cloud will accelerate the time it takes to go from data to insight to action. How? It makes it easier to drill into data, making it easier to consume data, and making it easier to understand data quickly.

There are a couple of things driving Oracle's autonomous analytics strategy. First, it's critical that we make insights much easier to consume. To do that, the autonomous analytics environment needs to adapt to the way the business user works, rather than make the business user adapt to the way it works. When you want to get answers to questions, what do you do? You ask a question. In some cases, you search for it just using ubiquitous search technology. That's really how you want your analytics system to work—to be able to search for answers, either by typing the question or by asking the question verbally.

That involves natural language processing, which interprets what you're writing or saying and then retrieves the information that relates to your question. That's a huge time-saver for people who don't know how to use an analytics system today. And you can have

Oracle Autonomous Analytics Cloud bring that answer back to you on a regular basis, based on the time of day, based on a meeting that you're in, based on your role, based on where you're located, and so on, and that information can all be contextualized to what you're doing. Supported by natural language processing, artificial intelligence, and machine learning, information is easier to consume and easier to understand with Oracle Autonomous Analytics Cloud.

In the past, when you were asked to analyze a new scenario with new data, one of the things you had to be able to do was either to augment your data warehouse or create a new data-source—which took some time. With Oracle Autonomous Analytics Cloud, all you have to do is snap onto that new data and start analyzing. New connectors to data will make it a lot faster for people to address new questions on top of new data or new questions on top of a combination of new and existing data.

And it's not going to give you the answer and take action for you automatically. What Oracle Autonomous Analytics Cloud will do is give you a better understanding so that you can put the

human insight onto the decisions or dig deeper into the analysis. That, again, is going to assist the humans in getting to their answers faster.

It's really all about speed, and I think that's really what Oracle Autonomous Analytics Cloud

is bringing to the table with machine-assisted capabilities and arming decision-makers with the right information at the right time, not bogging them down with a lot of mundane administrative activities. □

PHOTOGRAPHY BY **DAVE BRADLEY**

NEXT STEPS

LEARN more about Oracle Autonomous Analytics Cloud.

TRY Oracle Autonomous Analytics Cloud.



"Cloud threats are much faster and bigger, and they're happening at a different scale than before the cloud," says Eric Olden, senior vice president and general manager at Oracle.

Security Without Walls and Doors

In the cloud, identity has become the new perimeter. **BY TOM HAUNERT**

At some point, the keycard readers on your data center doors may have been part of your company's "perimeter" data security. In today's cloud or multicloud enterprise, where's the new perimeter? And more importantly, how will you defend it?

Oracle Magazine sat down with Eric Olden, senior vice president and general manager at Oracle, to talk about today's enterprise identity management challenges, the cloud's effect on that conversation, what's needed when delivering an enterprise identity management service, and more.

Oracle Magazine: Identity management is about security, of course, but it's also about enabling access across platforms and applications. What are today's big enterprise identity management challenges and opportunities?

Olden: Enterprise identity management is responding to four big drivers today.

The first is the need to deliver a seamless experience for users, whether these are customers or employees or partners. The goal is to give an experience that's really simple and easy, but at the same time under secure control. Enterprise identity management needs to

manage the risk and provide the control.

The second enterprise identity management driver is handling the change that has been coming with the evolution of the cloud, and there are a lot of organizations today that are at very different points in their cloud journey. Some are very aggressively moving everything to the cloud and describe themselves as "cloud first," and others are, for many reasons, taking their time moving to the cloud. And you've got everything in between. Organizations are looking to identity management to enable, in an agile way, moving to the cloud on their terms and timelines.

The third driver is the simultaneous rise of mobile. The importance of delivering experiences that are secure and personalized becomes even more important on mobile devices, where the form factor is just smaller. You don't want to ask users for long passwords if they've got to type them in with their thumbs. Where identity can really make things easier and faster with mobile is the use of strong authentication such as the fingerprint reader a mobile phone provides. Enterprises no longer need to issue and manage authenticator tokens and key fobs

because they can use what their users already have, making it more convenient for the user and more efficient for the company.

The fourth thing that's driving enterprise identity is the type of threats that people are dealing with in the cloud. Cloud threats are much faster and bigger, and they're happening at a different scale than before the cloud. And the bad guys are not just looking to take the data the way

"As more intelligent or autonomous cloud services roll out, identity must evolve and become more intelligent as well."

they have in the past. They're also trying to use your compute resources to do things like mining cryptocurrency, which I would have never imagined 10 years ago, but it's a real problem today.

Oracle Magazine: How is cloud changing the identity management conversation?

Olden: The cloud is affecting identity management in two significant ways.

The first thing is that with the cloud, you can move your apps as well as your data outside

of the traditional firewall within your data center, because you're now dealing with stuff that's physically "out there" in the cloud. In the past, we used to build fortresses around our data—network defenses led to higher walls and deeper moats around the castle. But with the cloud, we are intentionally moving our data and apps outside this castle and beyond the protection of the network defenses.

And your users are out in the cloud as well. It's very common with SaaS applications to have people accessing them from their mobile phones from anywhere in the world, including a Starbucks or an internet access point in an airport. This user location change has driven a new level of requirement around how we defend the perimeter if we don't have the classic perimeter defenses of firewalls and network defenses. The approach of using a classic VPN [virtual private network] to gate access to apps and data that are outside the network is no longer enough when everything is all over the internet.

And that, in turn, is driving the idea that *identity has become the new perimeter*. If you think about identities as the objects in relationships

that you need to secure through data and applications, and you think about managing that relationship, that's the new and more central role that identity management plays in the cloud environment.

And the second cloud effect is that, in 2018, we have a whole lot of new technologies. We're in the next generation of the cloud, what Oracle calls the "autonomous cloud," and this includes technology that's self-driving, self-tuning, and self-securing and letting the machine do more of the work with intelligent software.

As more intelligent or autonomous cloud services roll out, identity must evolve and become more intelligent as well. The conver-

WHAT IS IT?

Oracle Identity Cloud Service manages user identities for both cloud and on-premises applications and integrations using open standards, including OpenID Connect, SAML, OAuth, and SCIM.

[TRY Oracle Identity Cloud Service.](#)

gence of identity becoming the new perimeter and identity and autonomous cloud technology becoming more intelligent is creating a new conversation in identity management today.

Oracle Magazine: How does a separate, stand-alone identity management cloud service enable identity and security across on-premises and cloud platforms and a variety of applications?

Olden: By approaching identity as infrastructure, organizations can get the benefits of reusability, scale, and security that come from a consistent policy in a way that things are integrated and secured. So when businesses talk about moving to the cloud and using an identity infrastructure, if they use a modern one, it's going to enable them to extend their identity infrastructure to bridge their on-premises investments: their applications, their databases, their directories, and their active directory.

So all of the technology that businesses have on premises and in a modern cloud infrastructure can connect with all of the new applications and environments in the cloud, whether it's SaaS, IaaS, or other technologies that businesses want to bridge with an identity infrastructure. That identity infrastructure allows

them to build new applications—including native mobile apps—and new experiences seamlessly across the on-premises and cloud worlds. It creates a framework to plug into and to roll out secure applications and new services very quickly.

Oracle Magazine: What is Oracle's current identity management cloud service solution, and how does it address current and future identity management challenges?

Olden: Oracle Identity Cloud Service is a complete identity management platform, built natively for the cloud world. Businesses use the service to manage secure user access to their applications, but it's also used across the entire Oracle platform. Most Oracle SaaS applications, PaaS services, and IaaS services are evolving to consume identity from Oracle Identity Cloud Service.

The service includes single sign-on, so instead of having 10 passwords for 10 apps, you have one password, and it's securely integrated into 10 applications. And the service provides different ways to authenticate users, whether it's with passwords or multifactor authentications for more-secure scenarios.

Oracle Identity Cloud Service authentication also includes federated identity. This is the idea of connecting identities between one organization and an external organization using standards such as SAML and OAuth. The service also provides access control policies so you can set the conditions and the rules for which users and groups have access to different applications. It allows you to have a complete directory in the cloud, where you can store and manage all of your identities.

“By approaching identity as infrastructure, organizations can get the benefits of reusability, scale, and security.”

When you sign up for an Oracle Cloud account, you get an Oracle Identity Cloud Service environment as part of the Oracle Cloud setup. This is a reflection of how easy it is to deploy identity in the cloud with this service. It's embedded in the cloud services you get from Oracle, and users can access the service both embedded in SaaS apps such as HCM

[human capital management] and within PaaS services, including database as a service. And organizations can use Oracle Identity Cloud Service to manage their own users accessing

IaaS, such as storage and compute. It is also integrated and works in all of the three main technology areas: the on-premises, hybrid, and multicloud worlds. □

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BOB ADLER/THE VERBATIM AGENCY

NEXT STEPS

LEARN more about
Oracle Identity
Cloud Service.

TRY Oracle Identity
Cloud Service.

Onapsis Automates Monitoring and Protection of Oracle Applications

Increase your Oracle EBS security posture with the Onapsis Security Platform.

An Interview with Juan Pablo Perez-Etchegoyen, Chief Technology Officer, Onapsis

Oracle E-Business Suite (EBS) applications are considered critical to the operations of many of the largest global companies. In fact, 60 percent of respondents to a recent Ponemon Institute study said the impact of information theft, modification of data and disruption of business processes on their company's Oracle EBS applications would be either catastrophic (16 percent) or very serious (44 percent), resulting in an average cost of \$5 million.

The frequency and sophistication of cybersecurity threats is expected

to significantly increase, making the protection of these critical applications even more important. Organizations can no longer rely on existing approaches to secure business-critical applications. They must develop a plan to operationalize security at the application layer.

Onapsis cybersecurity solutions automate the monitoring and protection of business-critical applications, keeping them compliant and safe from insider and outsider threats. Last September, Onapsis extended



Juan Pablo Perez-Etchegoyen, Chief Technology Officer, Onapsis

the Onapsis Security Platform to provide support for Oracle EBS applications. The new functionality enables organizations using Oracle EBS to manage the security and compliance of these critical, yet complex, applications within a constantly shifting threat landscape.

The Onapsis Security Platform combines a behavioral-based and context-aware approach to help organizations better protect their business-critical applications, whether they are on-premises or in hybrid or public cloud environments.



For more information, visit
www.onapsis.com

Q: Why was Onapsis founded? What problem were you trying to solve?

A: We launched the company in 2009 after we recognized an industry-wide problem: organizations were investing heavily in infrastructure security, but not in securing the technology layer to ensure their mission-critical applications were properly protected. Onapsis was created to work closely with Oracle and SAP customers to provide a security platform to help organizations protect their applications from cybersecurity attacks.

“We work with Oracle to deliver a platform that provides security against cybersecurity attacks. Onapsis and Oracle both want Oracle products to be secure.”

—Juan Pablo Perez-Etchegoyen, Chief Technology Officer, Onapsis

Q: What are some common myths regarding Oracle E-Business Suite security and why are they important for organizations to be aware of?

A: Many organizations rely on segregation of duties; governance, risk and compliance (GRC); or database security approaches to protect their Oracle EBS implementations, but they don't deal with the technology components and security

in those applications. Companies need to purposefully analyze how they are implementing those applications, how they are maintaining them, and how they are securing the technology layer. They need to do more.

Many companies believe that when they upgrade to the latest version of Oracle EBS, it will improve their security posture. That's true, but many companies upgrade only once a year or every other year, so it's not a bulletproof approach. You still need to manage risks, install patches, review your

security approach, and reduce the attack surface. The new version of the Onapsis Security Platform allows organizations to bridge a critical gap in their current processes and the ways they secure the applications they rely on to run their businesses.

Q: Tell us about the vulnerabilities that exist within Oracle E-Business Suite?

A: Our research team, the Onapsis

Research Labs, has found over 200 vulnerabilities in Oracle EBS over the last two years. Oracle EBS is a complex product with multiple protocols, components, and scenarios. Each component could have its own vulnerabilities and those vulnerabilities need to be holistically managed. That means patching, implementing security configurations, securing the interfaces, managing critical users and authorizations, performing an attack surface reduction, and more. Due to their potential exposure to untrusted networks, web-based components should be dealt with immediately, followed by components built on other technological layers.

Business data and supporting business processes are the most critical assets in many organizations and they must be protected. An Oracle EBS outage is considered by some organizations as a catastrophic event, potentially putting them out of business. Based on the existing threat landscape, it's no longer enough to deliver basic security. Organizations need to provide holistic security to secure the most critical assets in the organization. We work with Oracle to deliver a platform that provides security against cybersecurity attacks. Onapsis and Oracle both want Oracle products to be secure.

Q: Why is it critical to have the level of security that Onapsis provides to secure Oracle E-Business Suite?

A: The Onapsis context-aware solutions deliver vulnerability and compliance controls to reduce risks affecting critical business processes and data. Through open interfaces, the platform can be integrated with leading security information and event management, and GRC and network security products, seamlessly incorporating enterprise applications into existing vulnerability, risk, and incident response management programs.

Q: What is the importance of patch management and continuous monitoring for Oracle E-Business Suite?

A: We often see organizations without the time windows or resources to install patches promptly. It's important to invest in proper patch management and to implement governance and controls around that.

If an organization can't apply a patch right away, they need to monitor their Oracle EBS systems. They need to make sure they have visibility into what's happening, who's accessing what, and who's doing what on the system. If there is a threat actor exploiting vulnerabilities, they need to deal with it immediately. Unfortunately,

organizations are falling behind in monitoring activity in their systems.

Q: Why include security when moving Oracle E-Business Suite to the cloud?

A: Moving to the cloud is an opportunity for organizations to make a fresh start. It can help them avoid living with a backlog of security issues and continuously trying to catch up. We've calculated that it is five times less costly to implement security during digital transformation projects and/or cloud migrations than afterwards. That's because of change management processes, resources and the operational burden it takes to maintain and implement security after a new system is operational.

Onapsis works with customers to set up security during a cloud migration to provide the most cost-effective and secure environment. While adopting security for cloud used to be considered a roadblock, the market has evolved, and it is now viewed as an enabler.

Q: What role does the Onapsis Research Labs play in providing security for critical applications such as Oracle E-Business Suite?

A: The Onapsis Research Labs continuously provides leading intelligence on security

threats affecting Oracle enterprise applications. Our research team is a key component of the security capabilities we provide to our customers. The team is made up of security experts who provide the context and understanding of the Oracle-specific security threats. The results of their research is incorporated into our products to make the products more robust. Every time a new threat is discovered, we integrate that knowledge into our platform.

Q: How are Onapsis and Oracle working together to deliver enterprise security for Oracle customers going forward?

A: The Onapsis approach involves understanding the business processes, risks, and concepts as well as the supporting technology. Good security is built on years of experience and study of business applications and it takes time to understand the best approach.

We've been working closely with Oracle for years, reporting vulnerabilities in a number of Oracle products. After building trust through responsible disclosure and joint work, we have maintained a relationship that is beneficial for Oracle, for Onapsis, and—most importantly—for our shared customers. ■



Open for Business

Three peers champion open systems and the developer communities that build them.



Lukas Eder 

St. Gallen, Switzerland



Company/URL: [Data Geekery](#)

Job title: Founder and CEO

Length of time using Oracle products: 12 years

How did you get started in IT? It began when my dad bought a 286 computer for his work. I got really curious and played with it to the point of breaking it many, many times. He then bought me my own brand-new 386, which had QBasic on it. Later on, I got a hold of a Turbo Pascal copy, which I used and enjoyed a lot. I must have been

around 13 or 14 at the time, and my career was already decided.

What's the most common cause you see when IT projects go wrong? I would say one of the most common causes is Conway's Law. IT is very transformative, but only if we let it be. Most large corporations do not allow IT to "run loose," and as such, they follow Conway's Law by building complicated closed systems whose interfaces are designed along

the lines and units of the organization. It must feel painful to work on such a system.

What's your go-to Oracle reference book? Truth be told, Google and Stack Overflow function more for me as references, but I also like *Expert Oracle SQL* by Tony Hasler [Apress, 2014], which I read in ebook format. It's a great book for learning about the depths of Oracle technologies.



Øyvind Isene

Oslo, Norway



Company/URL: [Sysco AS](#)

Job title: Consultant

Oracle credentials: Oracle

Certified Professional (Oracle Database 10g)

Length of time using Oracle products: 22 years

What's the next big thing driving change in your industry? Data collection and machine learning, both of which will lead to changes almost everywhere. Combined with automation, this trend will lead to the disappearance of many manual tasks. The amount of data collection is already massive, and it's only going to grow. More of it will be in a form fit for automatic consumption by machines, so machine

learning is the logical next step, because the volume is way too big to be processed only by human experts.

What's the most common cause you see when IT projects go wrong?

Underestimating complexity, and trying to do too much at once. You can't solve a problem with a standard process when what's really needed is good old computer science. There's still a need to understand how things work in order to spot bad design. The only difference now from earlier days is that the tedious work has been automated—or will be automated, possibly with

the help of machine learning. The autonomous database is one example of that.

What would you like to see Oracle, as a company, do more of? I like the way Oracle is bridging the gap to open source communities and also encouraging more people to get involved with coding. The company has contributed to GitHub with several repositories, invested a lot in container technology such as Docker, and made it much easier for DevOps to get started with Oracle technology and to integrate it with different systems. I hope to see the company continuing in this direction.



Zhou Yanwei

Beijing, China



Company/URL: cloud-ark.com

Job title: CEO

Length of time using Oracle products: More than 10 years

What advice do you have about getting into information technology? First of all, you must gain a deep understanding of the technical underpinnings of your chosen area of focus. Once you have that foundation, you can then gradually move toward understanding technologies outside that area of focus—truly grasping their function and usage.

How are you using social media in your work these days? I frequently use WeChat, which is very popular in China. It

focuses on mobile messaging and social features and is super-easy to use—you can friend someone; send text and audio; shoot videos; or even do video calls with your family, friends, and workmates. WeChat also has the ability to create and manage groups, so you can discuss all kinds of topics, including technical ones. The MySQL communities that I run manage nearly 40 “super groups” on WeChat. Every group can have 500 accounts at most, and the accounts in these 40 groups cover nearly the whole MySQL expert community. These groups help us exchange insights and plan various kinds of

events such as forums and conferences.

What's your favorite thing to do outside of the office?

Contributing to the open source community. The most popular MySQL community in China is ACMUG [All China MySQL User Group]. Its membership includes almost every MySQL user in China; I'm one of the original members and now lead its operations. I've participated in and managed this community for years. We host seminars and tech conferences all over China, and it has become one of the main channels for people to share their tech experiences and expertise.



By Bob Rhubart

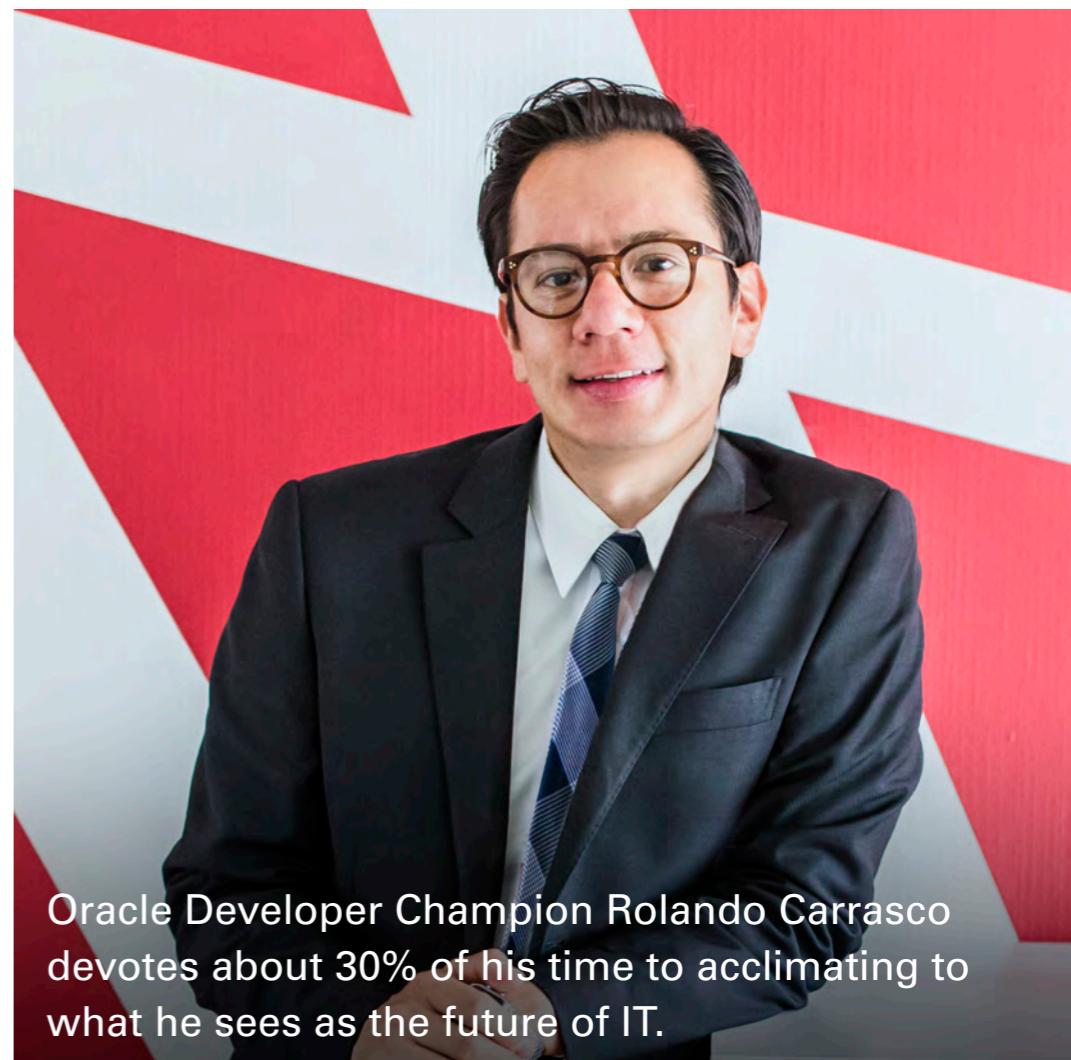


It's Always Time to Change

Oracle Developer Champion Rolando Carrasco lives on a steady diet of daily transformation.

Business and technology transformations come in waves and are often measured over years. For Oracle Developer Champion Rolando Carrasco, each day begins and ends with transformation.

While the bulk of his time as a developer, architect, and co-owner of S&P Solutions in Mexico still involves middleware and service-oriented architecture (SOA), the evolution of the IT landscape is shaping his future. That's why he devotes time each morning and evening to expanding his expertise for game-changing technologies. "In the mornings, before I do my daily activities, I really try to read and put into practice whatever new tech I am testing. At night, a little bit more," Carrasco explains.



Oracle Developer Champion Rolando Carrasco devotes about 30% of his time to acclimating to what he sees as the future of IT.

RECOGNIZE

The Oracle Developer Champion program recognizes modern expert developers who blog; write articles; and present on topics such as containers, microservices, SQL, NoSQL, open source technologies, machine learning, and chatbots. [Learn more and follow the Oracle Developer Champions.](#)

A 2001 graduate of the Universidad Iberoamericana, Ciudad de México, Carrasco got his first full-time job with HP in Mexico, where he discovered his aptitude for Java and middleware. In 2002, Carrasco began an eight-year stint with Oracle where he focused on application servers, eventually becoming Latin America regional principal product manager for Oracle Fusion Middleware.

But transformation never stands still, and in 2010 Carrasco took a big leap. "I realized there was an opportunity for consulting services in the Latin American market, because I was covering the whole region. So I started a company."

S&P Solutions, based in Mexico City, now has 35 employees. "I think 70% of our projects are based on SOA or Oracle SOA Suite on-premises," Carrasco says. "It's been good, but I think it's going to change in the coming years."

In preparing for that change Carrasco devotes about 30% of his time to acclimating to what he sees as the future of IT. "We are preparing for multiple things.

One is microservices. Everybody's engaging with how to model, design, and architect a solution from a microservices perspective," he explains. Containers are also on the agenda as the new backend and platform technology.

These days, nearly half of Carrasco's time is spent on APIs. "Because of my knowledge around SOA, my natural next step was API management," he says. "Most of our SOA projects now are publishing APIs, because most of those projects also have applications in the cloud that need to connect to on-premises back ends. We are doing that through APIs. It's been a natural thing."

Carrasco expects to be working with APIs well into the future. "APIs are one of the pillars of digital transformation," he explains. "Everyone is going to be trying to publish something for someone," and that's all about APIs.

Regardless of what's being developed, Carrasco still enjoys coding. Most of that coding is in Java, though he is also taking steps to learn Go, driven by his

interest in serverless technologies and the open source Fn Project. “I found that the Fn Project supports Go, so I thought this may be important.”

Carrasco equates that hunch to the decision he made nearly 15 years ago to specialize in middleware. “It’s still giving me a lot of work today,” he observes. “Maybe it’s a little bit romantic, but that changed my professional life. That’s the moment that changed everything.”

Despite his schedule and workload, Carrasco still finds time to share his insight and expertise with the community. Having already earned status as an Oracle ACE, he was one of the first group of inductees in the Oracle Developer

Champion program. A prolific writer, Carrasco has authored a number of articles for the Oracle community and was coauthor of *Oracle API Management 12c Implementation* (Packt, 2015). He has also presented at Oracle OpenWorld and Oracle Code events, and he is active in user groups in Mexico City. It’s all part of his ongoing effort to keep up with and be a force for transformation. □

*[Oracle Architect Community Manager](#)
[Bob Rhubart](#) is the host-engineer/producer of the [Oracle Developer Podcast](#) series, produces the [2 Minute Tech Tip](#) video series, and interviews technology experts in DevLIVE videos recorded at Oracle events.*

PHOTOGRAPHY BY
MARTIN VARGAS/THE VERBATIM AGENCY

NEXT STEPS

LEARN more about Oracle Developer Champions.

READ “Oracle API Cloud Services – Part 1.”

WATCH *Using Oracle Intelligent Bot Service from the Developer Point of View.*



Enhance Your Job Focus with Side Projects

Developer experience engineer Joe Levy strives to maintain a coding mindset.

By Alexandra Weber
Morales

As a developer, you have your ways of finding flow. As a technical manager, how do you stay in the zone—while helping others find it, too?

Although he hasn't yet hit his third decade, Joe Levy has packed his résumé with an impressive list of accomplishments. Prior to his current post working with Oracle Cloud Infrastructure services in Seattle, he spent five years working on Microsoft Azure. He has given dozens of talks at public conferences and is an avid entrepreneur. Today, Levy runs the eight-person developer experience team that builds Oracle Cloud Infrastructure SDKs

Joe Levy, software development manager at Oracle, sees side projects as a prerequisite to doing his job right.



for Python, [Ruby](#), Java, and Golang. He also leads the REST API design team to make sure developers can easily integrate with Oracle Cloud Infrastructure.

There's a common thread in Levy's tips for finding a productive flow both as a coder and as a manager: keep your developer mindset sharp, with custom tooling and by pushing your own limits.

FIND YOUR DREAM TOOL

With the surge in the popularity of microservices and REST, much of a developer's work nowadays is integrating into or providing service APIs. That's why [Swagger](#) is by far Levy's favorite developer tool. "Swagger makes both of those tasks drastically easier," he says. "It defines a common format—called a Swagger spec—for describing API interfaces, which makes reviewing a potential API design with others much easier, since everyone can understand the design by learning the Swagger format."

Swagger keeps these service interface definitions in a declarative file that can

be code-reviewed, branched, merged, or even linted just like any other piece of code, Levy says. On top of all that, Swagger provides open source tooling to parse API definitions and generate code to call those interfaces in a number of programming languages.

"We live in a very diverse world when it comes to programming languages, so building SDK clients can be hard—supporting all your customers usually means supporting Java, Python, Ruby, Go, C#, PHP, JavaScript, and more," says Levy. "Building, testing, and maintaining all those clients by hand is a ton of work." Swagger generates SDKs in all of those languages, along with REST API documentation. "It saves us countless hours of coding, testing, and debugging," he adds, "and helps us ensure consistent, high-quality APIs."

CUSTOMIZE YOUR TOOLS

The Oracle Cloud Infrastructure developer experience team started with the open source Swagger code generators,

“Every six weeks, my team does a multiday hackathon with no strict guidelines. Members of the team can work on whatever they’re passionate about, as long as it’s related to coding.”

—*Joe Levy, Software Development Manager, Oracle*

but team members have made a handful of tweaks to them for specific use cases, Levy says, such as improving backward compatibility and creating additional authentication methods. “On top of that,” he says, “we added a few custom fields for things we needed—for example, the ability to define the signing strategy each operation in the spec requires, and the ability to mark operations that aren’t quite production-ready yet as ‘internal only,’ so that our internal SDK clients can support those operations without the public SDKs exposing them.”

Much of the work in software development now is integrating into service APIs from your app or providing APIs for your service for app developers to use to integrate with your service. Whether you’re on the app side or the service side, there’s a lot Swagger can do to improve your efficiency, Levy believes. “As long as a service puts out a Swagger spec for its API, even if that service provider doesn’t provide a client in the language you write code in, you can always gen-

erate your own client for that service in your preferred language with Swagger, and boom! You have a package in the language you’re used to for calling into that service, instead of having to understand and code against the raw HTTP API endpoints,” he explains.

DO YOUR JOB RIGHT... WITH SIDE PROJECTS?

Levy’s side projects boast thousands of users and coverage in *Wired*, *Business Insider*, and *TechCrunch*. Side hustles are usually considered a financial backup plan, but Levy views them as mental fuel. “What motivates me is to think of them as a prerequisite to doing my job right,” he says.

As a software development manager, he must advocate for the needs of the customers (who are developers) for his team’s products, as well as weigh in on his team’s technical challenges and solutions. To do both of these things well, he says, “I need to think like a developer. The best way to do that is to put myself

in a developer's shoes as often as possible, by coding up a solution meant to solve some real problem. In doing that, I can keep my skills sharp as well as understand new paradigms, products, and trends in the landscape."

How does Levy come up with ideas that will keep his skills sharp? He finds ways to apply coding to the other passions in his life. For example, while caught up in the Pokémon GO craze, he found that using the app destroyed his battery life. "So, I created the PokeNotify app to alert players when there are Pokémon nearby," he says. "I'm also a big Google Voice user but was unimpressed by its lackluster support for Windows, so I built an app

for Windows 8 called GVoice. When I can find something to work on that's related to an area I'm passionate about, it motivates me to go the extra mile."

Levy advocates this mentality not just for himself but also for his entire team. "Every six weeks, my team does a multiday hackathon with no strict guidelines," he says. "Members of the team can work on whatever they're passionate about, as long as it's related to coding. In doing so, we usually end up exploring a whole bunch of new ideas and technologies, some of which go on to be part of the products we ship." □

Alexandra Weber Morales is director of developer content at Oracle.

PHOTOGRAPHY BY

BOB ADLER/THE VERBATIM AGENCY

NEXT STEPS

LEARN more about Oracle Cloud Infrastructure.

LIVE for the Code (Oracle Code).

WATCH Levy's talk on Swagger for Oracle Code.

FireEye and Oracle Bring FireEye Email Security to Oracle Cloud

FireEye Email Security has achieved Powered by Oracle Cloud status and is now available on Oracle Cloud Marketplace.

An Interview with Ken Bagnall, Vice President of Email Security, FireEye

Email is one of the most prevalent and successful attack vectors today. In fact, about 46% of all ransomware attacks originate from email, and those attacks cost businesses an average of \$133,000 in corporate losses.¹

Email security is especially challenging because cybercriminals constantly evolve their tactics. Organizations that hope to protect themselves need an agile and innovative email security service, one that comprehensively protects them from all variations of email-

borne attacks.

FireEye offers a single platform that blends innovative security technologies, nation-state grade threat intelligence, and consulting to eliminate the complexity of cybersecurity for organizations struggling to prepare for, prevent, and respond to cyberattacks.

In April, FireEye announced that FireEye Email Security had achieved Powered by Oracle Cloud status and is now available on Oracle Cloud Marketplace. The expanded partnership between FireEye and Oracle will provide organizations



Ken Bagnall, Vice President of Email Security, FireEye

that deploy FireEye's email security capabilities utilizing Oracle Cloud Infrastructure (OCI) better email security while facilitating their journey to the cloud.

Q: Tell us a little about the history of FireEye.

A: Ashar Aziz founded FireEye in Silicon Valley in 2004 to solve one problem—to detect the attacks that bypassed traditional security tools. To solve this problem, he created the industry's first virtualization-based detection and analysis engine, known as MVX technology.



For more information, visit
www.fireeye.com

¹ FireEye, "Changes in Email Attack Tactics," , <https://www.fireeye.com/content/dam/fireeye-www/products/pdfs/pf/email/rpt-changing-tactics-email-attacks.pdf>.

That same year, across the country in Washington, D.C., Kevin Mandia founded Mandiant, with the mission of responding to the most significant breaches in the world. After FireEye went public in 2013, the two companies came together and combined the insights they had learned from responding to the most advanced adversaries with the best detection technology available, making each offering better. This is what we call the FireEye innovation cycle. Today, FireEye offers comprehensive security solutions for email, networks, and endpoints, as well as full security and incident response capabilities and threat intelligence solutions for enterprises and governments worldwide.

Q: What are the primary email security challenges faced by businesses today?

A: There are three primary problem areas:

zero-day viruses in attachments, phishing attacks, and impersonation attacks. FireEye is the leader when it comes to detection in all three of those areas.

Threats are also constantly evolving, so we are always tracking changes in the email threat landscape. For example, the use of URL-based phishing attacks has increased significantly since mid-2017. The use of impersonation attacks has been accelerating as well. We invest in research in those areas to make sure we stay ahead of the curve and detect those threats before anybody else does.

Q: What makes FireEye Email Security so effective?

A: FireEye is on the front lines of cyberattacks every day, with more than two decades of experience and more than 700 highly experienced threat researchers,

platform engineers, malware analysts, intelligence analysts, and investigators. We know that, for a variety of reasons, there will always be a security gap that can be exploited. We also know that defending against cyberattacks is becoming increasingly difficult. The bad guys are highly sophisticated, well-funded, well organized, and highly incentivized. Their tactics, techniques, and procedures are constantly evolving, and they're more persistent than ever.

FireEye Email Security is designed to rapidly detect email-based cyberattacks and block some of the most dangerous email threats facing businesses today—things such as malware-laden attachments and malicious URLs, credential phishing, and impersonation attacks. Our real-time knowledge of the threat landscape ensures that FireEye products and services directly address today's threat actors and the techniques they employ. Our frontline expertise guides us as we design and build our products; analyze and produce our threat intelligence; and prepare for, respond to, and remediate breaches. We can help organizations level the playing field. It's our mission to relentlessly protect our customers from the impact and consequences of cyberattacks.

“The availability of FireEye products in Oracle Cloud Marketplace is great for us, and partnering with a security leader is beneficial to Oracle. In addition, Oracle’s aggressive global OCI rollout plan matches our own ambitions.”

—Ken Bagnall, Vice President of Email Security, FireEye

Q: How does Oracle make FireEye better? How does FireEye make Oracle better?

A: For Oracle, partnering with a leader in security and detecting cyberthreats is beneficial. FireEye is the only security vendor providing nation-state grade cyberthreat intelligence that Oracle uses to make its products more effective. When FireEye is deployed behind other solutions, we continuously detect what the other solutions miss. On average, when FireEye Email Security is inline behind another vendor, we detect 14,000 advanced attacks per month that would have otherwise reached their target.

For FireEye, Oracle delivers the bare metal cloud infrastructure we need, which is incredibly important to us because of the virtualization of our products. Those bare metal cloud services are hard to come by. We also have a complementary customer base, which is crucial for both companies. Our enterprise and government customers are very security conscious. Also, appearing in Oracle Cloud Marketplace is a benefit for us.

Q: How do Oracle customers benefit from having FireEye Email Security available on Oracle Cloud Marketplace?

A: On Oracle Cloud Marketplace, it is easy

to acquire, provision, and deploy FireEye Email Security. Enterprise-size scaling of FireEye Email Security is very fast for organizations of any size when they use Oracle Cloud Infrastructure. Customers embarking on a cloud strategy need to combine this with a serious security strategy, and when it comes to detecting targeted and advanced threats, FireEye is the market leader.

In addition, customers can go to the Jump Start portal within Oracle Cloud Marketplace to find out more about FireEye Email Security and take the solution for a test drive. The availability of FireEye products in Oracle Cloud Marketplace is great for us, and partnering with a security leader is beneficial to Oracle. In addition, Oracle's aggressive global OCI rollout plan matches our own ambitions.

Q: How does FireEye on OCI help Oracle customers navigate the email threat landscape?

A: Using Oracle Cloud Infrastructure allows us to scale quickly and to ensure that we have excess capacity to manage any peaks in traffic. Email attack campaigns by their nature are controlled by the adversary and can scale in volume and composition. Customers who deploy FireEye's Email

Security capabilities utilizing Oracle Cloud Infrastructure can more rapidly respond to changes in the email threat landscape.

FireEye has intelligence that nobody else has, and we have it first because of the strength of our incident response and consulting capabilities. We get that information into our products as quickly as possible. If a business needs to detect threats that others miss, FireEye is the only option.

Q: How are FireEye and Oracle working together to improve customer security in the future?

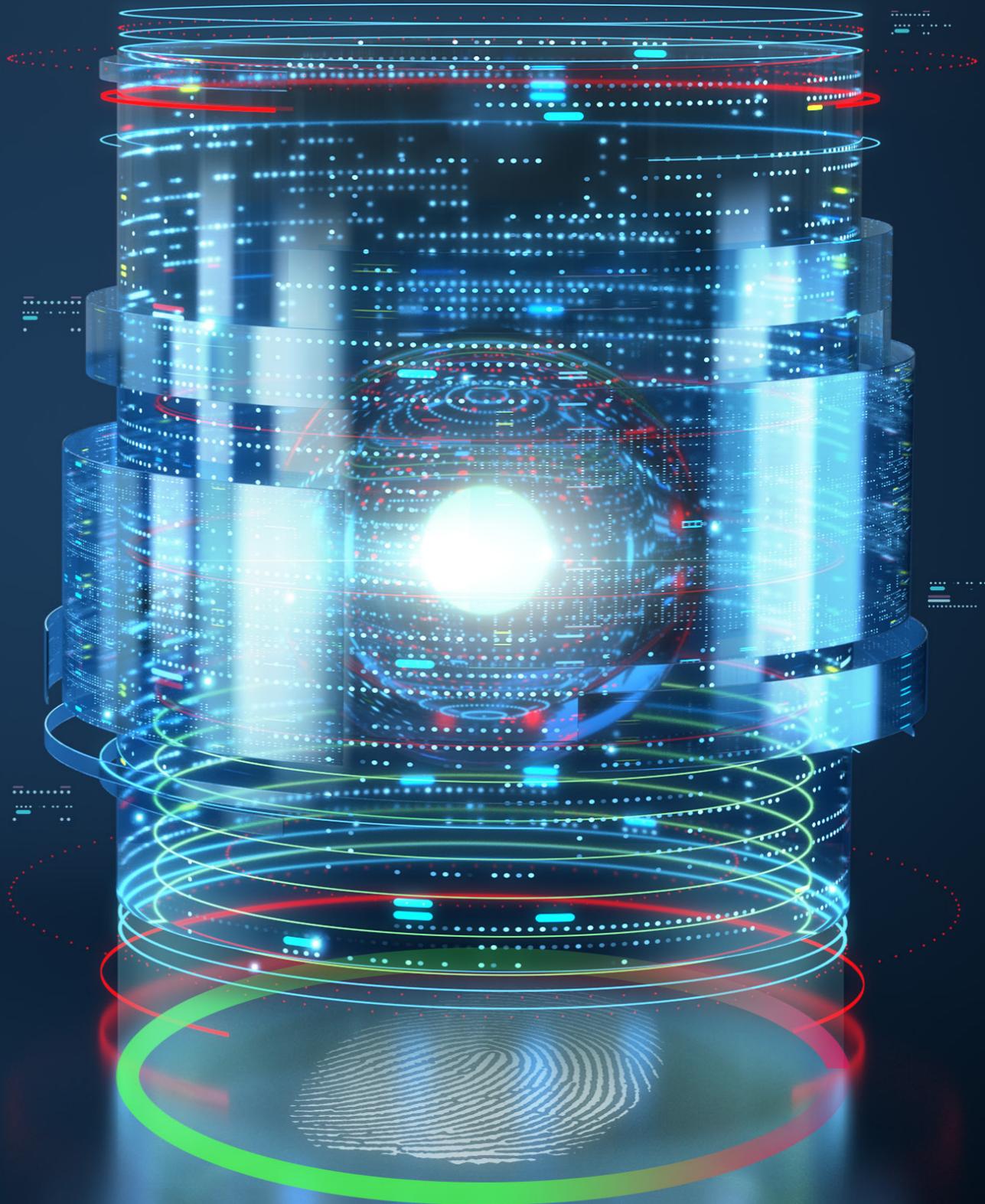
A: We will continue to constantly analyze email data to identify new trends and to improve the solutions that protect our customers. Together we hope to continue to grow our global footprint in security and to scale to our growing customer base to meet our customers' needs. OCI will help us scale at the pace we need and want.

To learn more, watch the [Impersonation Attacks – The New Email-Based Threats](#) webinar and read the FireEye report, [“Changes in Email Attack Tactics.”](#)

Autonomous and Secure

From self-secur ing database cloud services to the new cloud perimeter, Oracle technology protects your most valuable investment—your data.

BY MIKE FADEN



High-profile breaches have propelled security to the top of the agenda at many organizations, as the combination of faster, more-damaging attacks, increasingly complex technology environments, and demanding regulatory requirements continues to create new security challenges.

“Today’s attacks are wide and varied,” says Vipin Samar, senior vice president of Oracle Database Security. “They range from targeting infrastructure and databases to targeting your applications and users.”

This means that to protect vital information assets, companies need controls at multiple levels across their entire environment—both in the cloud and on premises. “The hackers only need to be successful once to break in,” Samar says, “but your business needs to be successful all of the time in order to avoid a data breach. The only way to do this and keep our data safe is through defense in depth—with multiple controls, security on by default, automation, best practices, and a secure infrastructure.”

However, ensuring that a full range of effective controls is in place can be challenging. To address that challenge, Oracle Autonomous Database Cloud and other autonomous Oracle

PaaS solutions start with built-in self-secur ing features. Oracle also offers database-specific security features and identity management solutions to help achieve true defense in depth.

The Secure Database

For organizations connecting their Oracle SaaS, custom SaaS, and PaaS solutions, security starts with Oracle Database cloud services. As Samar notes, hackers often target databases because that’s where the organization’s most sensitive data resides.

The protection provided by Oracle Database cloud services, including [Oracle Autonomous Data Warehouse](#), begins with encrypting data at all times. “We encrypt your data everywhere—whether it is in SQL*Net traffic, data in tablespaces, or in backups,” Samar says. Encryption cannot be turned off, and encryption keys are managed automatically.

But while encryption is an essential tool—it prevents hackers from getting direct access to raw data—it closes off only one part of the organization’s attack surface, Samar says. If companies don’t patch on-premises systems with the latest security updates and other updates—because of downtime restrictions, patch testing

“The hackers only need to be successful once to break in, but your business needs to be successful all of the time in order to avoid a data breach.”

—Vipin Samar, Senior Vice President, Oracle Database Security

requirements, or any other reason—they are still vulnerable. “For many organizations, patching is the biggest issue; that’s what they are struggling with,” he says.

With Oracle Database cloud services, security patches are automatically applied every quarter or as needed—narrowing the window of vulnerability. “By patching, we mean patching the full stack—including the firmware, the OS, clusterware, and the database,” Samar says. “By applying patches in a rolling fashion across the nodes of a cluster, there is no application downtime.” That lifts a huge burden from database administrators, who can then spend more time focusing on other aspects of security and data management. Oracle Autonomous Database Cloud services also continually monitor cloud administrator actions for any abnormal activity,

and predefined policies for database auditing are turned on by default.

Locking Up the Crown Jewels

However, security is a shared responsibility, Samar says: although Oracle automates functions such as encryption and patching, organizations are still responsible for business-specific security functions such as securing users and ensuring sensitive data is appropriately protected. To facilitate those goals, Oracle provides a broad range of features and tools designed to help assess and control database security.

Among them is Oracle Database’s free Database Security Assessment Tool (DBSAT), which analyzes the database and reports findings such as the sensitive data stored, users along with roles and privileges, and configu-

ration settings. For example, DBSAT discovers and reports sensitive healthcare and credit-card information. “Many people really don’t know how much sensitive data they have and how secure their database is,” Samar says. “It’s better that you assess your database’s security before the hackers do it for you.” Once the tool has identified potential problems, it makes recommendations for fixing them, he adds.

Multiple features in Oracle Database cloud services allow fine-grained control over data access. Data masking scrambles or masks sensitive data. For test and development, “Even if the hackers succeed, they’ll get fake crown jewels,” Samar says. Data redaction lets organizations limit who can view sensitive data such as Social Security numbers. Oracle Virtual Private Database and Oracle Label Security allow control over which users can see which rows

of data. And Oracle Database Vault restricts privileged users’ access to application data—reducing the risk of insider and external threats.

Identity Is the New Perimeter

While security is more critical than ever, so is providing a seamless experience for users needing access to applications. Identity management technology can help by providing users with single-sign-on capability to multiple applications. But as organizations move to the cloud, the challenge becomes more complex.

Today, it’s not only the organization’s applications and data that are moving outside a company’s firewall, says Eric Olden, senior vice president and general manager at Oracle; the users are, too. “It’s very common with SaaS applications, for example, to have people accessing them from their mobile phones from anywhere in the world, including a Starbucks or an internet access point in an airport,” he says. “This user location change has driven a new level of requirement around how we defend the perimeter without the classic perimeter defenses of firewalls and network defenses.”

That, in turn, is driving the idea that identity has become the new perimeter—placing iden-

“It’s better that you assess your database’s security before the hackers do it for you.”

—Vipin Samar, Senior Vice President,
Oracle Database Security

tity management in a new, more central role in cloud environments. In addition, to truly deliver single-sign-on capability to applications, identity management technology must include both on-premises and cloud applications. “You really want this identity management infrastructure to be able to bridge these two worlds and allow you to build new applications and new experiences seamlessly across the on-premises and the cloud worlds,” Olden says.

Oracle Identity Cloud Service is designed to achieve that goal. The cloud-based technology enables organizations to manage user access to enterprise applications in the cloud and on premises. It’s also used across all Oracle SaaS, PaaS, and IaaS cloud services, and it supports federated identity with other applications via the SAML and OAuth standards. “The service includes single sign-on, so instead of having 10 passwords for 10 applications, you have 1 password, and it’s securely integrated into 10 applications,” Olden says.

Automatically Secure

As the scale and speed of attacks continue to increase, security is set to remain at the top of the corporate agenda. The automated security technologies in Oracle Autonomous Database Cloud and cloud-based identity management with Oracle Identity Cloud Service can help organizations manage the risks. As Oracle’s Samar observes, attackers may be nation states, organized crime, or even disgruntled insiders: “They come from different angles—they could attack your infrastructure, operating systems, applications, users, and certainly your databases,” he says. “Data is your most critical asset, but it could become your biggest liability if not properly secured.” □

Mike Faden is a principal at Content Marketing Partners. He has covered business, technology, and science for more than 30 years as a writer, editor, consultant, and analyst. Faden is based in Portland, Oregon.

ILLUSTRATION BY **PEDRO MURTEIRA**

NEXT STEPS

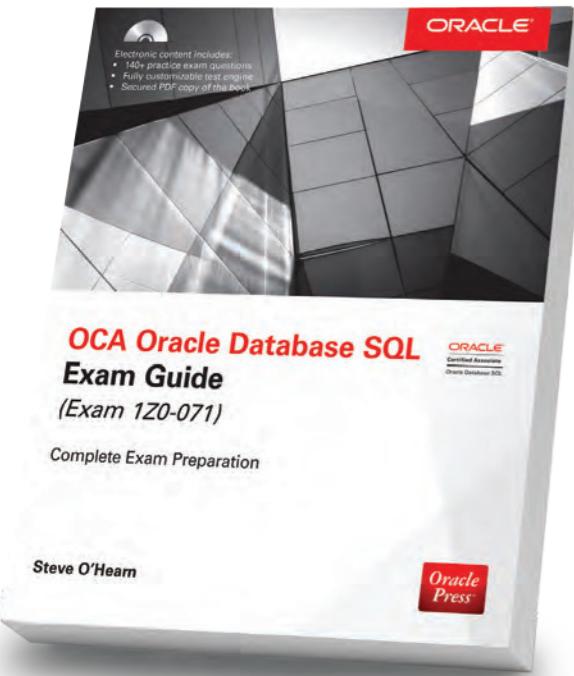
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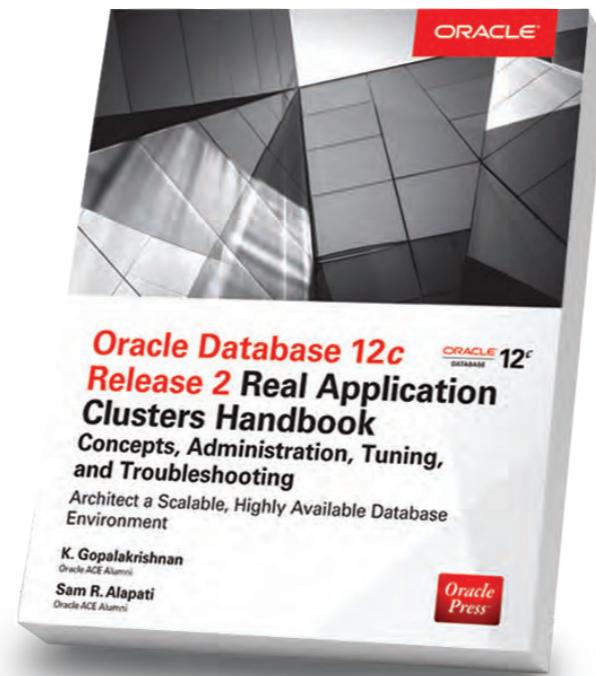
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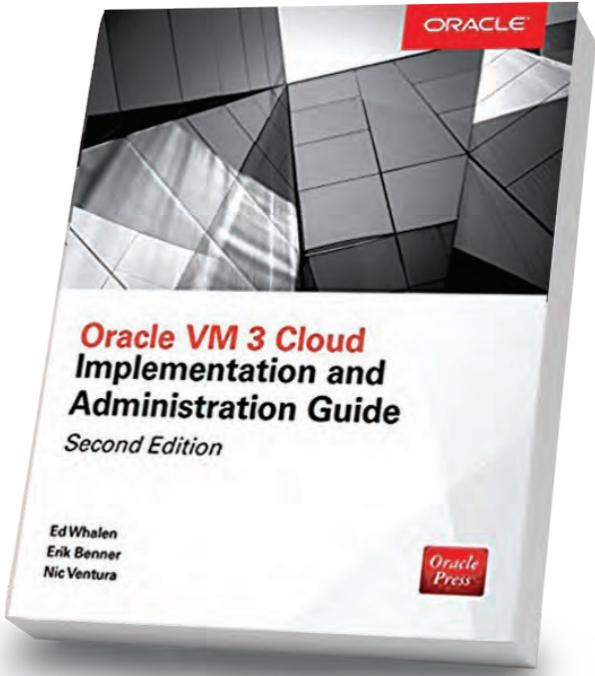
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ORACLE MOBILE CLOUD ENTERPRISE, ORACLE INTELLIGENT BOTS

Parlez-Vous Français? Your Bot Does.

By Frank Nimphius



Chatbot support for multiple languages is a worldwide requirement. Almost every country has the need to support foreign languages, be it for immigrants, refugees, tourists, or even employees crossing borders on a daily basis for their jobs.

According to the Linguistic Society of America article "[How Many Languages Are There in the World?](#)" by Stephen R. Anderson, almost 7,000 languages are spoken in the world. Although no bot needs to support *all* languages, building multilanguage bots is a challenge for developers, especially if they're not familiar with all the languages for which they need to implement support.

In case you were hoping, artificial intelligence alone *does not* build you a multilanguage bot. Multilanguage support needs to be implemented by design with tools and best practices.

This article explains an approach to building multilanguage bots with the Oracle Intelligent Bots feature of Oracle Mobile Cloud Enterprise as well as the configurations and options available.

In the hands-on instructions, you are going to create an internationalized pizza bot that accepts input messages in the user language and displays labels, prompts, and response messages in the user language.

MULTILANGUAGE SUPPORT IN ORACLE INTELLIGENT BOTS

Broadly speaking, there are two approaches for building bots that understand different languages:

- **Native language bots** use a single language for utterances, entities, prompts, titles, descriptions, and labels. To support multiple languages, you create multiple separate bots, each using a language-specific natural-language-processing engine for the intent resolution and entity extraction that you train and test with language-specific utterances. Building native language bots is a viable approach if there are not too many languages to support with a bot and if developers have the required languages in their skill portfolios.
- **Single-base-language bots** serve multiple languages from a single base language for natural language understanding and entity extraction as well as for designing prompts, titles, descriptions, and labels during development. A translation service is used at runtime to detect and translate foreign language user input into the base language for intent resolution and entity extraction. Single-base-language bots are suitable if a bot needs to support a larger set of languages.

As of today, Oracle Intelligent Bots has superior support for the English language—it knows how to handle the English received by the language-processing engine best. From a development perspective, creating bots in English is more likely to give better results. As such, Oracle Intelligent Bots' approach to multilanguage chatbot applications is to build single-base-language bots in English and use translation services and resource bundles to support foreign languages.

With this approach, response messages as well as labels and prompts are either autotranslated to the detected user language or reference language-specific strings in resource bundles. From a bot user's perspective, the bot appears as a native language bot.

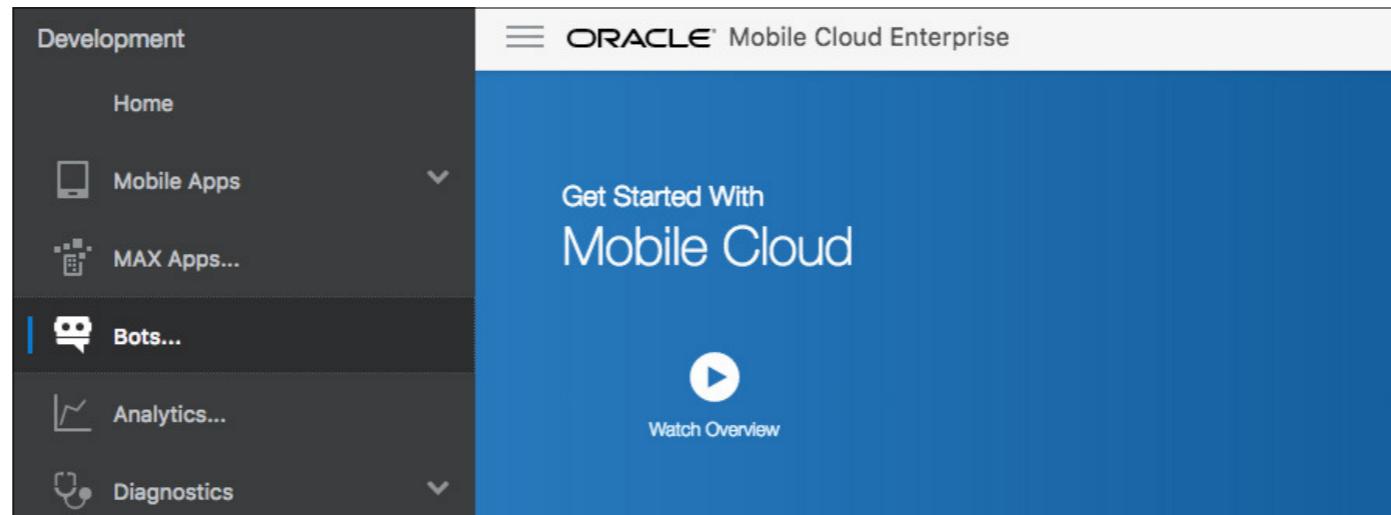
GETTING STARTED

To follow the hands-on instructions in this article, you need access to [Oracle Mobile Cloud Enterprise](#), which is available as a free trial.

The [download for this article](#) contains a bot you need to import to your Oracle Intelligent Bots instance to complete the hands-on steps for this article. To import the bot, download the zip file containing the starter bot and then do the following:

1. Open a browser, and access the Oracle Mobile Cloud Enterprise home page.
2. Authenticate with the user credentials you defined when you provisioned the cloud service.
3. Click the hamburger icon in the upper left to open the Oracle Mobile Cloud Enterprise menu.
4. Click the **Bots** menu item (shown in [Figure 1](#)), which opens the Oracle Intelligent Bots dashboard in a separate browser window or tab.
5. Click the **Import Bot** button in the upper right of the dashboard.
6. In the opened dialog box, navigate to the location to which you extracted the downloaded zip file.
7. Select the **OracleMagazineOnlinePizzaBot3.zip** import file, and click **Open**.
8. Close the upload confirmation dialog box, by clicking the **X** at the right side.
9. Keep the browser window open.

Figure 1: Oracle Mobile Cloud Enterprise with Oracle Intelligent Bots selected

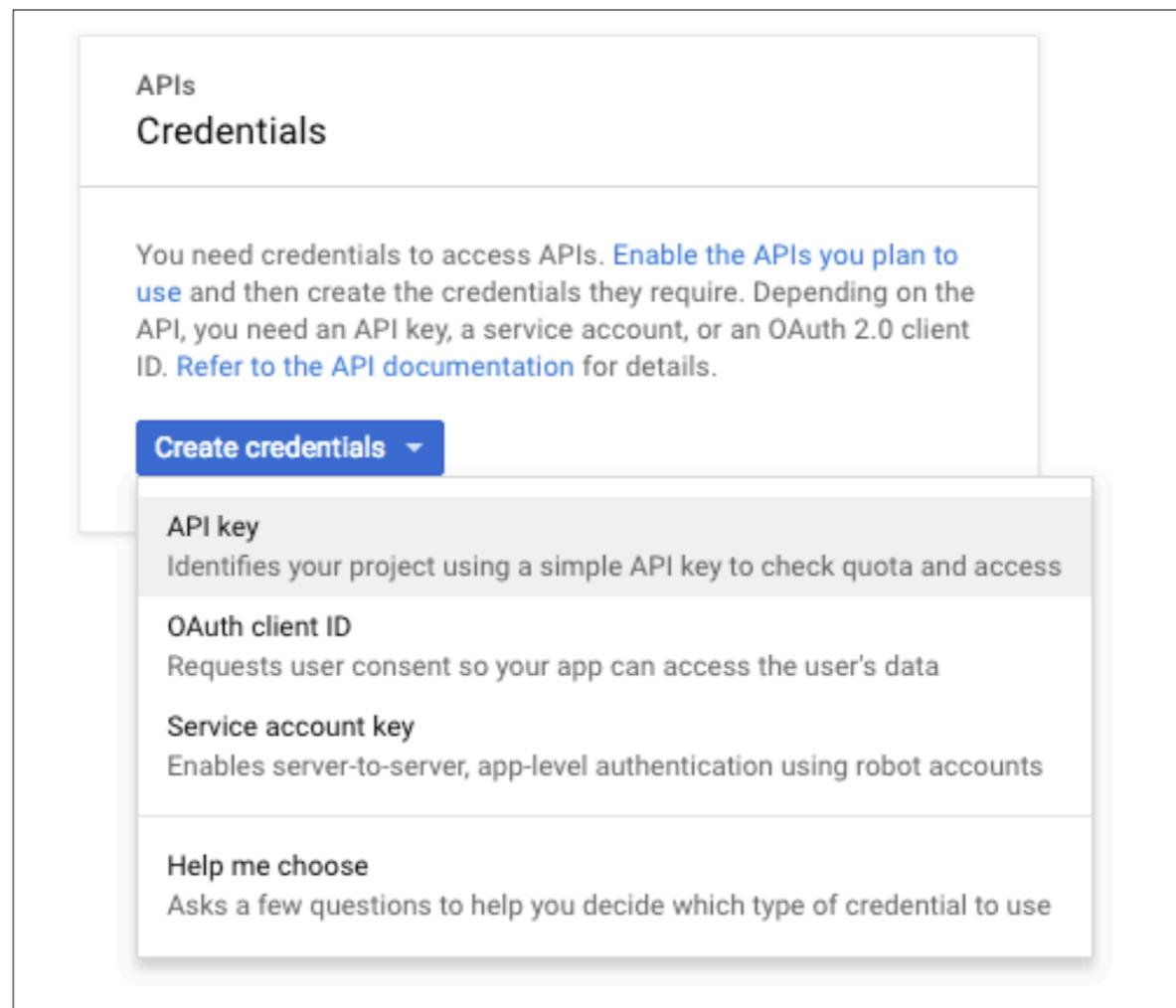


SIGNING UP FOR GOOGLE TRANSLATION SERVICE

Oracle Intelligent Bots supports translation services from Microsoft and Google. This article uses the Google translation service—for which you need a Google account and a credential key to access the translation service API—to translate bot conversations. The following steps assume that you have a Google account.

10. Open a new browser window or tab.
11. Go to the [Google developer page](#) to request a credential key, using your Google account username and password.
12. On the Google APIs & Services dashboard, click the **ENABLE APIS AND SERVICES** link and select the **Cloud Translation API** option.
13. Back in the dashboard, select the **Credentials** menu option to create a credential key. From the list shown in [Figure 2](#), select the **API key** option. When the key is displayed in the opened dialog box, click **Close** to get back to the dashboard. Note that Google translation service is not free of charge. If, however, translation

Figure 2: Google dialog box for creating a credential key



is the only Google paid API or service you use, the free credits you have from your account will keep you going for a very long time.

ADDING THE TRANSLATION SERVICE TO YOUR BOT INSTANCE

To use a translation service in Oracle Intelligent Bots, you need to register the service and the credential key in your Oracle Intelligent Bots instance. To do this, first navigate back to the Oracle Intelligent Bots dashboard.

14. In the Oracle Intelligent Bots dashboard, select the menu icon (☰) in the upper right corner and choose **Translation Services**.
15. Click the **+ Service** button and choose **Google** for **Service Type**. Enter the following REST URL in the **Base URL** field:

`https://translation.googleapis.com/language/translate/v2`

16. Copy and paste your Google credential key from the Google developer website into the **Authorization Token** field, and click **Save**.

RUNNING THE SAMPLE BOT

Before adding translations, let's run the sample bot to see its current functionality and ability to understand foreign languages.

17. Open the browser window or tab with the Oracle Intelligent Bots dashboard in it.
18. If you already have existing bots defined in your environment, chances are good that you won't immediately spot the downloaded bot. To find the bot, type OracleMagazine into the **Filter** field above the green **New Bot +** icon.
19. Click the **OracleMagazineOnlinePizzaBot3** bot to open it.
20. Click **Train** (at the top right of the screen). Before you click it, Train should show an exclamation point, because the bot is not yet trained after the download and import. After you click **Train**, a dialog box appears confirming that the bot is trained. Training the model is required for the bot to understand free text input.
Note: You cannot import two bots with the same name. If you need to import the starter bot more than once or if you share an Oracle Intelligent Bots instance, rename any previous imports of the starter bot before importing the new bot.

You can rename a bot by opening it, clicking the settings icon (≡), renaming the bot, and exiting the bot.

21. Run the embedded bot tester by clicking the tester icon (▶) in the upper right.
22. Type Hi into the **Message** field, and click **Send**.
23. Type Show me the menu into the **Message** field, and click **Send**.
24. Choose a pizza, and complete the order process.
25. Click the **Reset** button, at the top right of the embedded bot tester.
26. Type Montrez moi le menu, and click **Send**.
27. The bot should reply with Sorry, I did not understand the request. Please try again.
28. Click **Reset**.
29. Close the tester window by clicking the tester icon.

What you just did: The sample bot is designed and trained in English, which means that all intents and utterances are provided in English. Testing the bot with an English sentence works fine and produces a menu from which you can choose a pizza. Testing the bot with a language other than English, such as French or German, fails. So what you just did was prove that the bot works but that it does not understand foreign languages.

ENABLING AUTOTRANSATION

The quickest route to enabling the bot to handle languages other than English is to enable autotranslation for everything in the bot. And this is what you will do next.

30. Click the settings icon (≡) in the left menu.
31. On the **General** tab, change the **Translation Service** select list value from **None** to **Google**.

32. Click the flow icon (💬) in the same menu to open the dialog flow. The dialog flow is defined in OBotML, a markup language for defining bot conversation flows.
33. Create a new context variable autotranslate of type "boolean" in the **Context -> Variable** section:

context:

variables:

```
iResult: "nlpresult"  
pizzaType: "PizzaType"  
pizzaSize: "PizzaSize"  
orderNumber: "NUMBER"  
cancelOrderYesNo: "YesNo"  
pizzaMenu: "string"  
cardsRangeStart: "int"  
autoTranslate: "boolean"
```

Note: Check the spelling, and note the uppercase *T* in *autoTranslate*.

34. Click the green + **Components** button at the top of the dialog flow.
35. Select **Variables** in the opened Select a Component Type dialog box.
36. Click the **Set variable** menu item.
37. Select **initializeMenu** from the **Insert After** select box, and toggle the **Remove Comments** button on (as shown in [Figure 3](#)).
38. Click **Apply**.
39. In the dialog flow editor, change the name of the added setVariable state to `enableAutoTranslation` and set the `variable` property to "autotranslate" and the `value` property to true.

```
enableAutoTranslation:  
    component: "System.SetVariable"  
properties:  
    variable: "autoTranslate"  
    value: true
```

Figure 3: Creating and configuring a setVariable state and component



40. Ensure that the enableAutoTranslation state was added above the setCardsRange state. If not, move it by copying and pasting the enableAutoTranslation state.
41. Click the **Validate** link in the blue menu bar on top. If validation fails, verify the indentation and syntax. The enableAutoTranslation label should be indented

exactly the same as the setCardsRangeStart label below.

42. Click the green **+ Components** button.
43. Select **Language** from the opened Select a Component Type dialog box.
44. Click the **Detect language** menu item.
45. Ensure that Remove Comments is still enabled, and select **enableAutoTranslation** from the **Insert After** select list.
46. Navigate to the getIntent state, below setCardsRangeState. Add a translate property under the variable property as highlighted in the code:

```
getIntent:  
    component: "System.Intent"  
    properties:  
        variable: "iResult"  
        translate: true  
        confidenceThreshold: 0.7  
    transitions:  
        actions:  
            Order Pizza: "startOrder"  
            Cancel Pizza: "cancelOrder"  
            Show Menu: "startOrder"  
            Welcome: "welcome"  
            unresolvedIntent: "unresolved"
```

47. Run the embedded bot tester by clicking on the tester (►) icon.
48. Type Bonjour into the **Message** field, and click **Send**.
49. Type Montrez moi le menu into the **Message** field, and click **Send**.

Figure 4: Pizza menu understanding French and translating to French



50. You should see a bot response as shown in **Figure 4**.
 51. Choose a pizza, and then complete the order process.
 52. Try to memorize the printed order output, because this is what you are going to customize in a next set of steps.
 53. Click **Reset**.
 54. Now type Hallo in the **Message** field and click **Send** to test German.
 55. Type Kann ich bitte die Speisekarte sehen to get the menu in German.
 56. Choose a pizza, and complete the order process.
 57. Try to memorize the printed order output, because this is what you are going to customize in a next set of steps.
 58. Click **Reset**.
 59. Click the tester icon (▶) to close the tester.
- What you just did:** It may feel like you didn't do much, but you actually achieved a lot. In configuring a translation service for Oracle Intelligent Bots and enabling autotranslation for the pizza bot, you created a multilanguage bot that understands foreign language input and displays messages in the language detected for a user.

USING RESOURCE BUNDLES

Although autotranslation and translation services usually do a good job of translating user input and bot messages, they may not do it perfectly every time. To ensure reasonably good bot responses or to preserve business terminology from translation, you can use resource bundles.

Resource bundles are key-value pairs in which the value is the message string to display to the user. Message strings may be provided for each

language supported by the bot to control the wording, tone, and voice of the bot response.

For example, in German, users can be addressed as *Sie* or *du*. *Du* is less formal and may be used by bots that are more casual, such as the pizza bot in this example. For formal business bots, you would use *Sie*. Resource bundles can help ensure that the right form of address is used.

In the following hands-on instructions, you are going to change the printOrder state message from "Your order (#15687) of a \${pizzaType.value} pizza, size \${pizzaSize.value} is complete" to use a resource bundle instead. The German response returned by the resource bundle will use *du* instead of *Sie* to ensure a more casual tone for the pizza bot.

60. Select the **Resource Bundles** menu item () from the left menu to open the resource bundles designer page.
61. Click the green **+ Bundle** button.
62. The first entry is a key and a message string for the default language, English.
63. Enter printOrderMsg as a value of the **Key** field. The value must be unique and is used in all translation bundles.
64. In the **Text** field, enter

Your order (#15687) of a {0} pizza, size {1} is complete

Note: The {0} and {1} characters are placeholders that enable you to pass values into the sentence.

65. Click the **Create Entry** button.

Note: You just created a first message bundle string. In a real bot project,

you would now add more messages for the default language by clicking the **+ Key** button.

66. Click the **+ Language** button to create a translation. Enter printOrderMsg in the **Key** field in the Create Entry dialog box.
67. Enter de in the **Language** field.
68. In the **Text** field, enter

Die Bestellung (Nr. 15687) deiner Pizza {0}, in der Größe {1}, kann abgeholt werden

69. Click the **Create Entry** button.
70. Click the **+ Language** button a second time to add a French translation. Enter printOrderMsg in the **Key** field in the Create Entry dialog box.
71. Enter fr, for French, in the **Language** field.
72. In the **Text** field, enter

Ta commande (N° 15687) pour une {1} pizza {0} est prête

Note: In the French message, the placeholders {1} and {0} are in a different order than for English and German. Please pay attention to this detail.

73. Click **Create Entry**.
74. Click the flow icon () to open the dialog flow.
75. Create a new context variable rb of type "resourcebundle" at the end of **Context -> Variables**. The variables section should now look like this:

variables:

iResult: "nlpresult"

```
    pizzaType: "PizzaType"
    pizzaSize: "PizzaSize"
        orderNumber: "NUMBER"
    cancelOrderYesNo: "YesNo"
    pizzaMenu: "string"
        cardsRangeStart: "int"
    autoTranslate: "boolean"
    rb: "resourcebundle"
```

Note the rb context variable at the end of the variables block (in bold).

76. Navigate to the printOrder state (which should be on line 157 or close to it), and change the text property value to

```
 ${rb('printOrderMsg', '${pizzaType.value}', '${pizzaSize.value}')}
```

The text property should look like it does in **Figure 5**.

Figure 5: printOrder state after change to use resource bundles

```
printOrder:
    component: "System.Output"
    properties:
        text: "${rb('printOrderMsg', '${pizzaType.value}', '${pizzaSize.value}')}"
        keepTurn: false
        translate: false
    transitions:
        return: "done"
```

77. Insert an additional property translate below the keepTurn property, and set its value to false.
78. Navigate to the askSize state (which should be on line 149 or close to it).
79. Insert a new property translate with a value of false into the System.List component properties. See the code fragment below with the translate property highlighted in bold:

```
askSize:  
  component: "System.List"  
  properties:  
    prompt: "What size do you like your pizza in?"  
    options: "${pizzaSize.type.enumValues}"  
    variable: "pizzaSize"  
translate: false  
  nlpResultVariable: "iResult"
```

80. Click the tester icon (▶).
81. In the **Message** field, enter Kann ich bitte die Speisekarte sehen, and click **Send**.
Note: The pizza bot enables you to ask for the menu directly, without saying “Hallo” up front. Of course, starting your bot conversation with “Hallo” does still work.
82. Choose a pizza and then a pizza size.
Note: The pizza size now shows in English (small, medium, large). This is because you set the translate property to false. For this sample, “small,” “medium,” and “large” are considered business terms that should not be translated.

83. Note the different output message compared to the autotranslated message before.
84. Reset the tester, by clicking the **Reset** button.
85. Type Montrez moi le menu into the **Message** field, and click **Send**.
86. Choose a pizza and a pizza size.
87. Again, note the changed output message for French compared to the autotranslated version earlier.
88. Reset the tester, by clicking **Reset**.
89. Finally, enter Show me the menu into the **Message** field and click **Send**. This works as before, but it also uses the resource bundle to print the order.

What you just did: In this part of the hands-on steps, you used a resource bundle to control the bot response message for German and French when printing the order. The English bundle, which also is the default, is used for all languages for which you did not define a language-specific bundle and—of course—for English.

Note: Setting the translate property on the `System.Output` component of the `printOrder` state to true will autotranslate the printed message to the user language. In this case, if a resource bundle translated the output message, no auto-translation will be performed. If, however, you try a language for which you don't have a resource bundle defined, the output message will be autotranslated to the user language.

ADDITIONAL CONSIDERATIONS

As you've seen in this article, autotranslation enables you to build a multilanguage bot from a single base language. In Oracle Intelligent Bots, this base language is English. To control the tone, wording, and voice in bot responses and labels displayed to the user, you use resource bundles. So a first design decision for your bot

is when to use resource bundles and when to use autotranslated strings.

A second design decision is to be clear about the languages your bot should support. There are strategies and techniques to limit support to a controlled set of languages. How to do this is documented in "[Building Single-Base-Language Chatbots with Oracle Intelligent Bots](#)."

A third consideration is to plan testing. You should be aware that natural language understanding (intents, utterances, and entities) in Oracle Intelligent Bots is defined and trained in English. This means that when testing your bot, you should try typical sentences used in the foreign language. If the input fails, check with the translation service how the sentence string got translated to English. Then add the English string to the utterances and retrain the bot so it will understand the string the next time.

For example, it is common in German to ask "Kann ich die Karte sehen" to see the menu. *Karte* is a casual synonym for *Speisekarte*. If you add this sentence into the message field of the tester and run it, the bot response would be that it cannot understand the request. The reason is that Google translates "Kann ich die Karte sehen" as "Can I see the map." This refers to a cartographic map and not a menu. However, knowing this and adding "Can I see the map" to the utterances will help solve the problem without any harm or side effect to the behavior of the bot.

A fourth thing to consider is that no multilanguage bot will work perfectly the first time you use it. "Blind testing," however, can help you improve the quality of your bot. Ask users who speak the language you support through a translation service to try your bot. The users should not know how the bot was developed and what they need to pay attention to (thus "blind") but should simply be asked to try to work it out.

CONCLUSION

Artificial intelligence alone doesn't build you a multilanguage bot. In reality, developing and supporting bots in multiple languages is hard.

An easier way to build multilanguage bots is to use a single base language for designing bots and a translation service for supporting non-base-language languages. This article briefly showed you how to use the Google translation service with Oracle Intelligent Bots to create a multilanguage version of the pizza bot featured in previous *Oracle Magazine* articles. □

Frank Nimphius is a senior principal product manager in the Oracle Mobile Platform Product Management group, where he focuses on Oracle Mobile Cloud Enterprise, chatbots, and content experience and analytics.

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ORACLE AUTONOMOUS VISUAL BUILDER CLOUD SERVICE

REST Up and Build Quickly

By Shay Shmeltzer



Mash up REST services with Oracle Autonomous Visual Builder Cloud Service.

One of the main features introduced in Oracle Autonomous Visual Builder Cloud Service, released in May 2018, was the simplification of REST service consumption. This feature makes it very easy to integrate data from various back-end systems into your web and mobile applications. Oracle Autonomous Visual Builder Cloud Service makes the experience of consuming REST services as declarative and visual as possible.

In the following how-to steps, you are going to see how to integrate data from two different systems into a single cohesive app user experience—all without manually writing a single line of code.

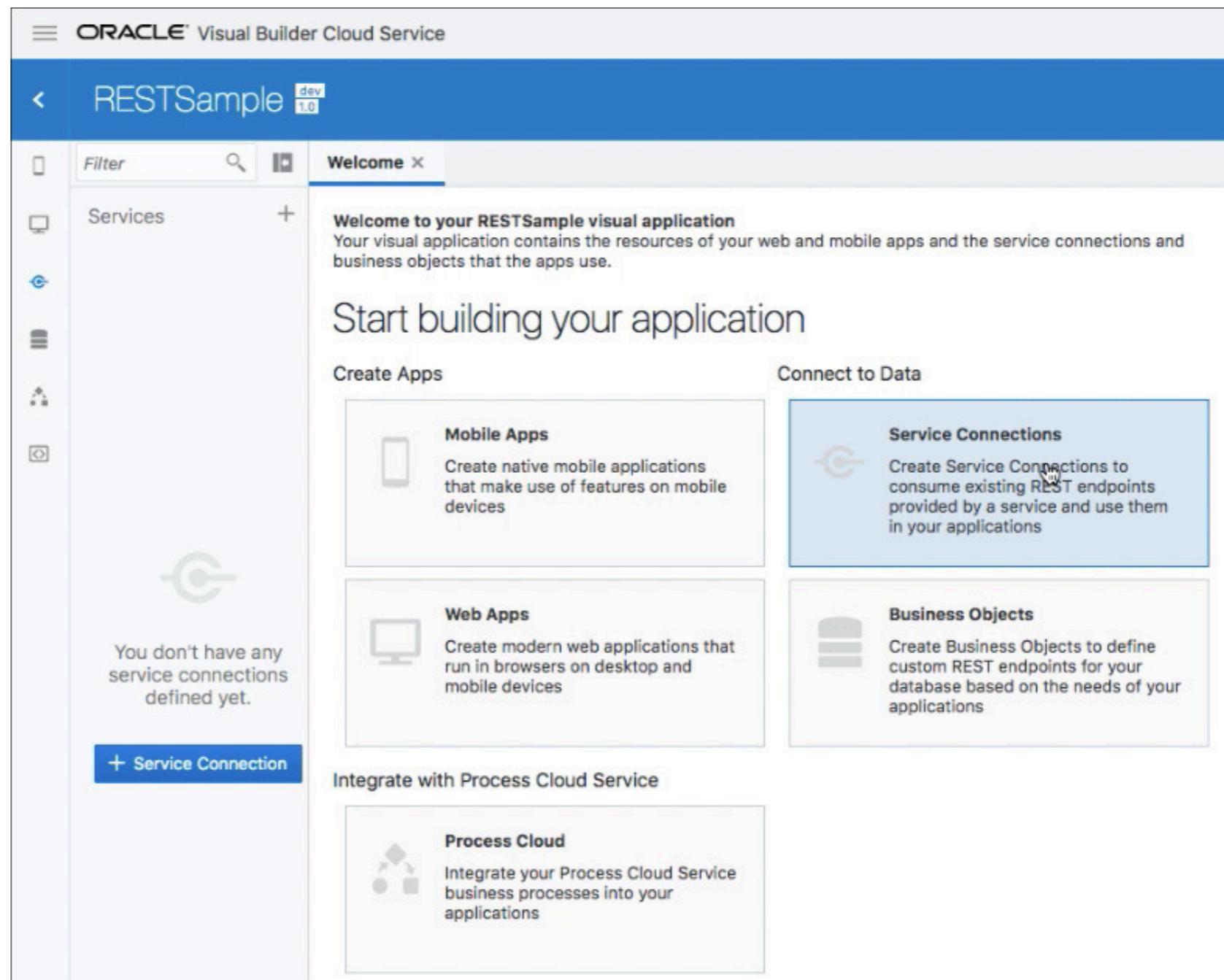
You can follow the steps in this tutorial [in this video](#).

DEFINING SERVICE CONNECTIONS

Start by creating a new Oracle Autonomous Visual Builder Cloud Service application, and name it RESTSample. (You can [sign up for a cloud trial to create your app](#).)

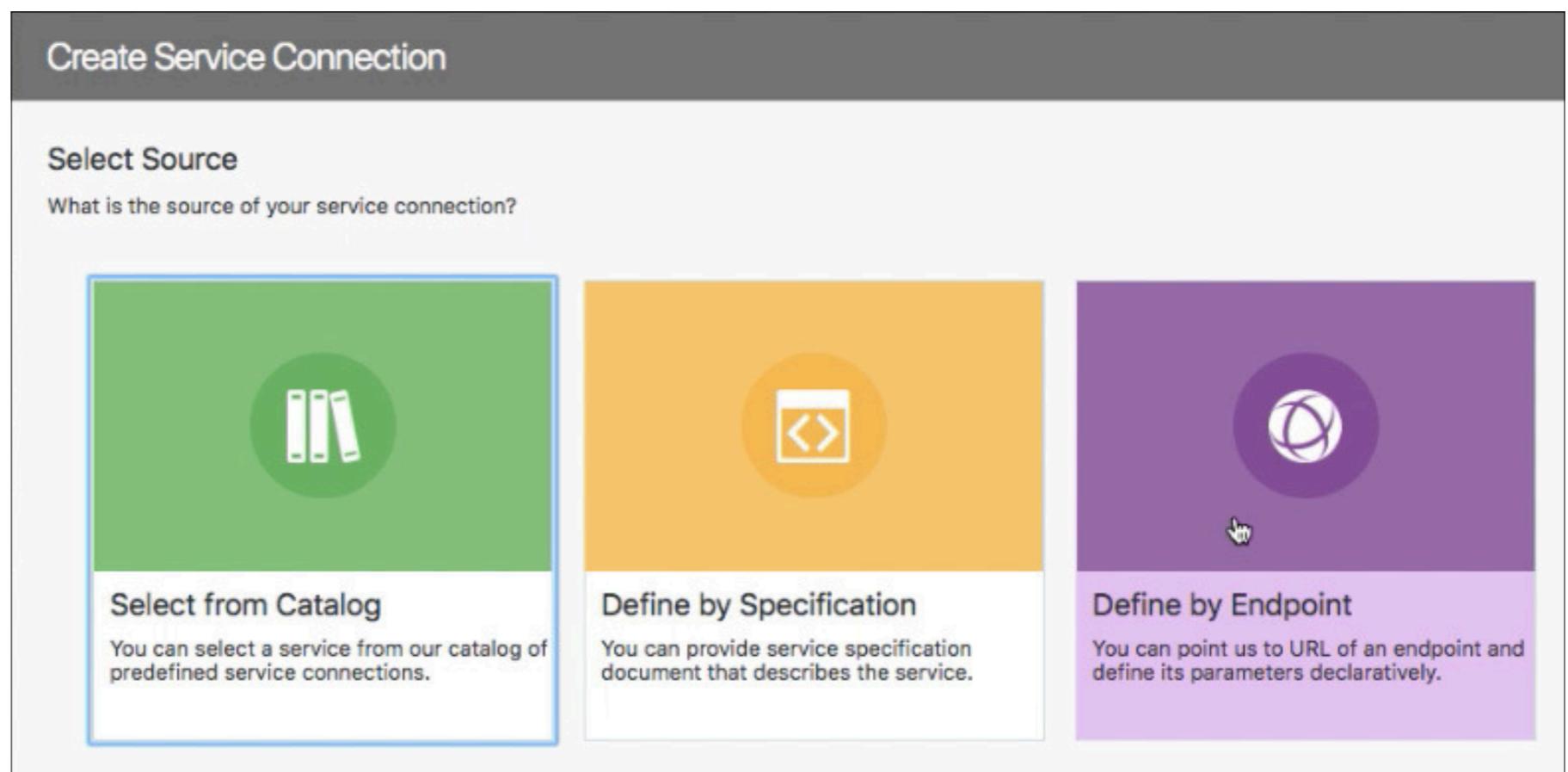
With the new application created, choose the service connection to direct to the application, as shown in **Figure 1**.

Figure 1: Creating a service connection to the new application



When you click **Service Connections** to create a new service connection, you'll see three options for the source of the service you are consuming, as shown in **Figure 2**.

Figure 2: Service connection options



The first option, **Select from Catalog**, is the built-in service catalog in Oracle Autonomous Visual Builder Cloud Service. It automatically shows you services in your cloud environment that you have access to. For example, if you have access to Oracle SaaS apps, you will see a list of the built-in SaaS REST services. This

will enable you to easily build Oracle SaaS extension apps leveraging data from those apps.

The second option, Define by Specification, enables you to use a service that provides a specification. Oracle Autonomous Visual Builder Cloud Service supports the Swagger industry standard for REST service description. If your service provides such a description, Oracle Autonomous Visual Builder Cloud Service will be able to parse the description and create the service endpoint definitions for you. A similar process is also available for services that were exposed with the REST service wizards of the Oracle ADF Business Components feature of Oracle Application Development Framework.

The third option, Define by Endpoint, enables you to simply provide the URL to a service and then define the properties for the endpoints.

Define by Endpoint is the option you will use in this article. You will leverage a public REST service that provides [a list of the world's countries](#).

Click **Define by Endpoint**, paste this URL into the **URL** field, select **GET** for Method, and select **Retrieve Many** for Action Hint, as shown in [Figure 3](#), so that Oracle Autonomous Visual Builder Cloud Service will return many rows.

Click **Next** to open a dialog box where you can further define the properties of the service.

In this case, you need only provide a service name, GetCountries, as shown in [Figure 4](#). In the same interface, you can define security aspects (under Authentication) as well as headers and URL parameters.

Click the **Test** tab and the **Send** button, as shown in [Figure 5](#), to test the service to see the returned results. Click **Copy to Response Body** to copy the results to the Response tab. Oracle Autonomous Visual Builder Cloud Service uses the response to analyze the REST values returned and helps you use them later on.

WHAT IS IT?

Oracle Autonomous Visual Builder Cloud Service empowers developers to rapidly create and deploy engaging web and mobile apps directly from a browser, using a visual development environment with built-in autonomous capabilities.

TRY [Oracle Autonomous Visual Builder Cloud Service](#).

Figure 3: Configure your app to point to a public REST service

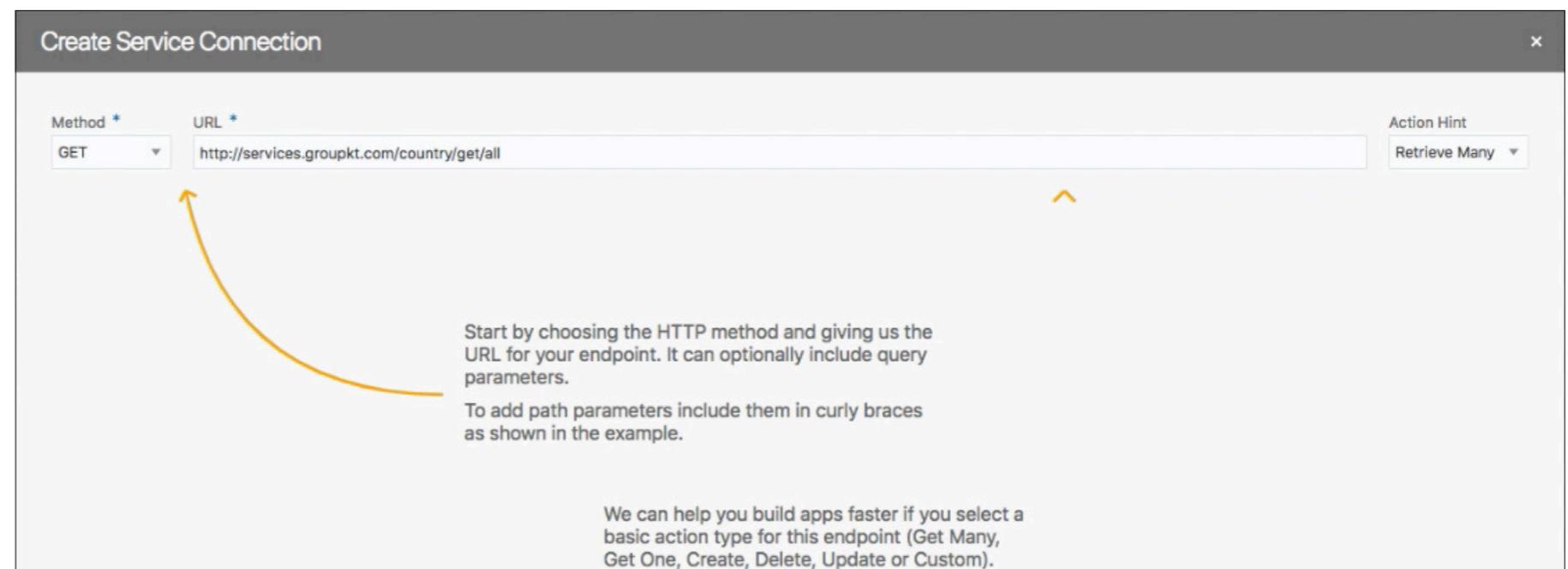


Figure 4: Adding the service name, security parameters, and more to the app

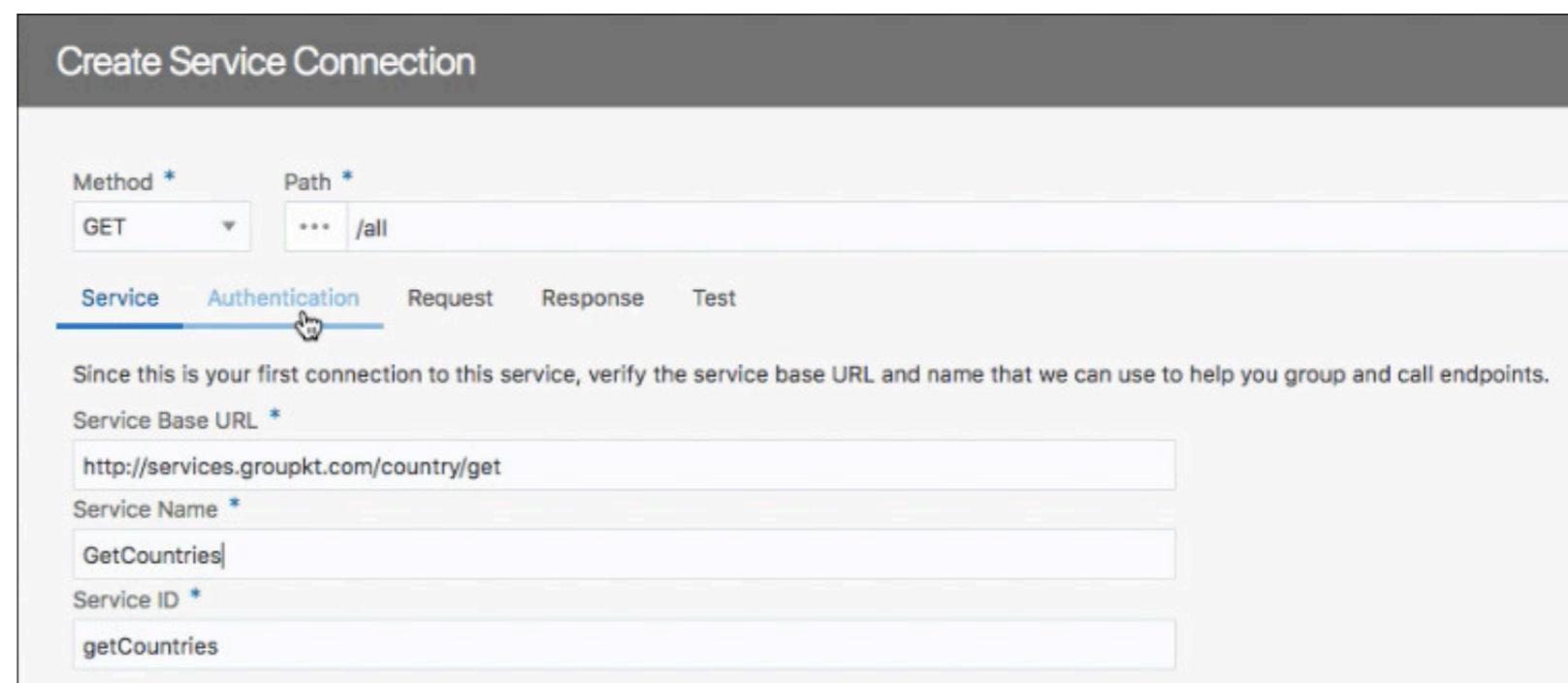
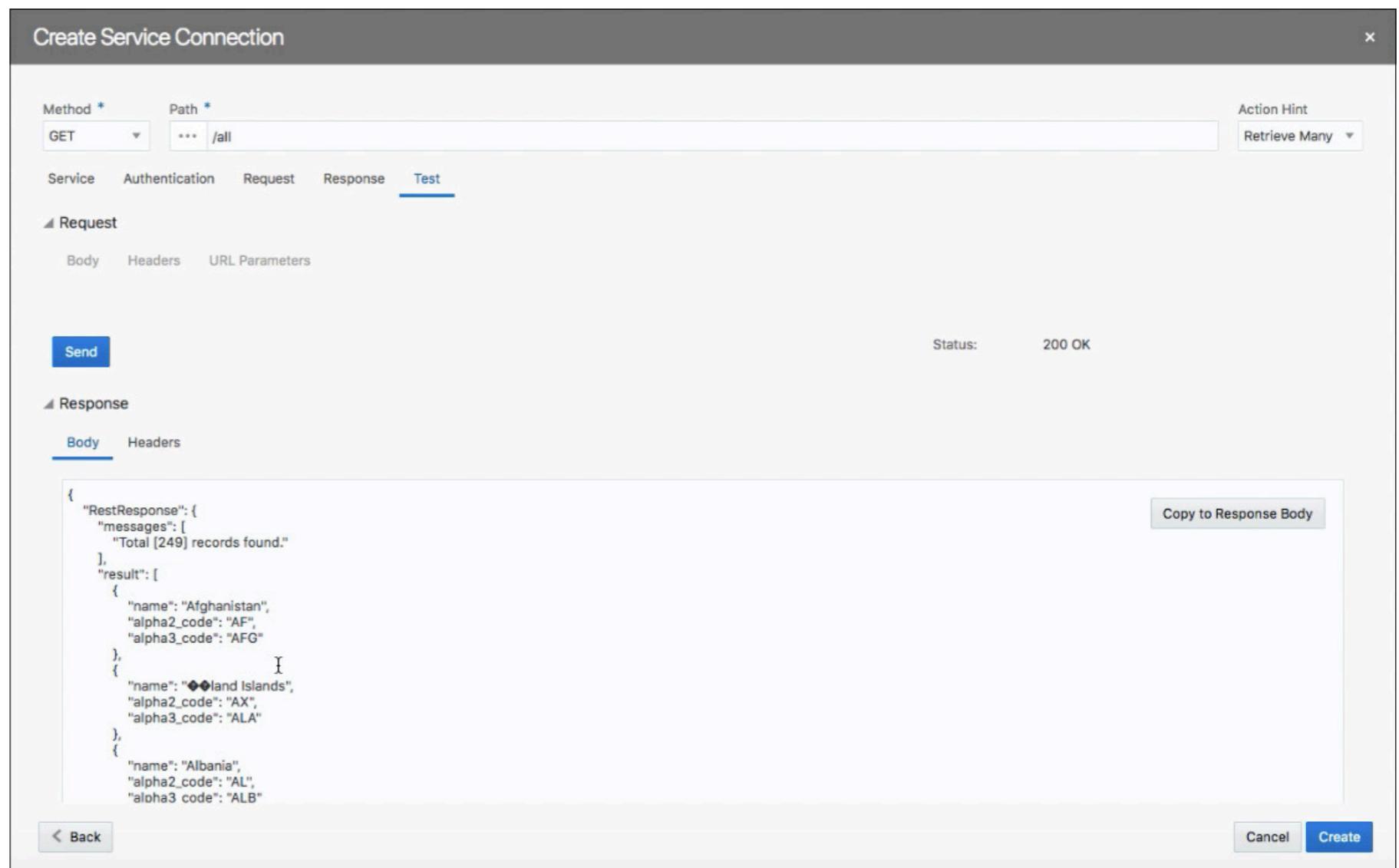


Figure 5: Testing the response

Click the **Response** tab to see the results, and click **Create** to complete the wizard and create the service connection.

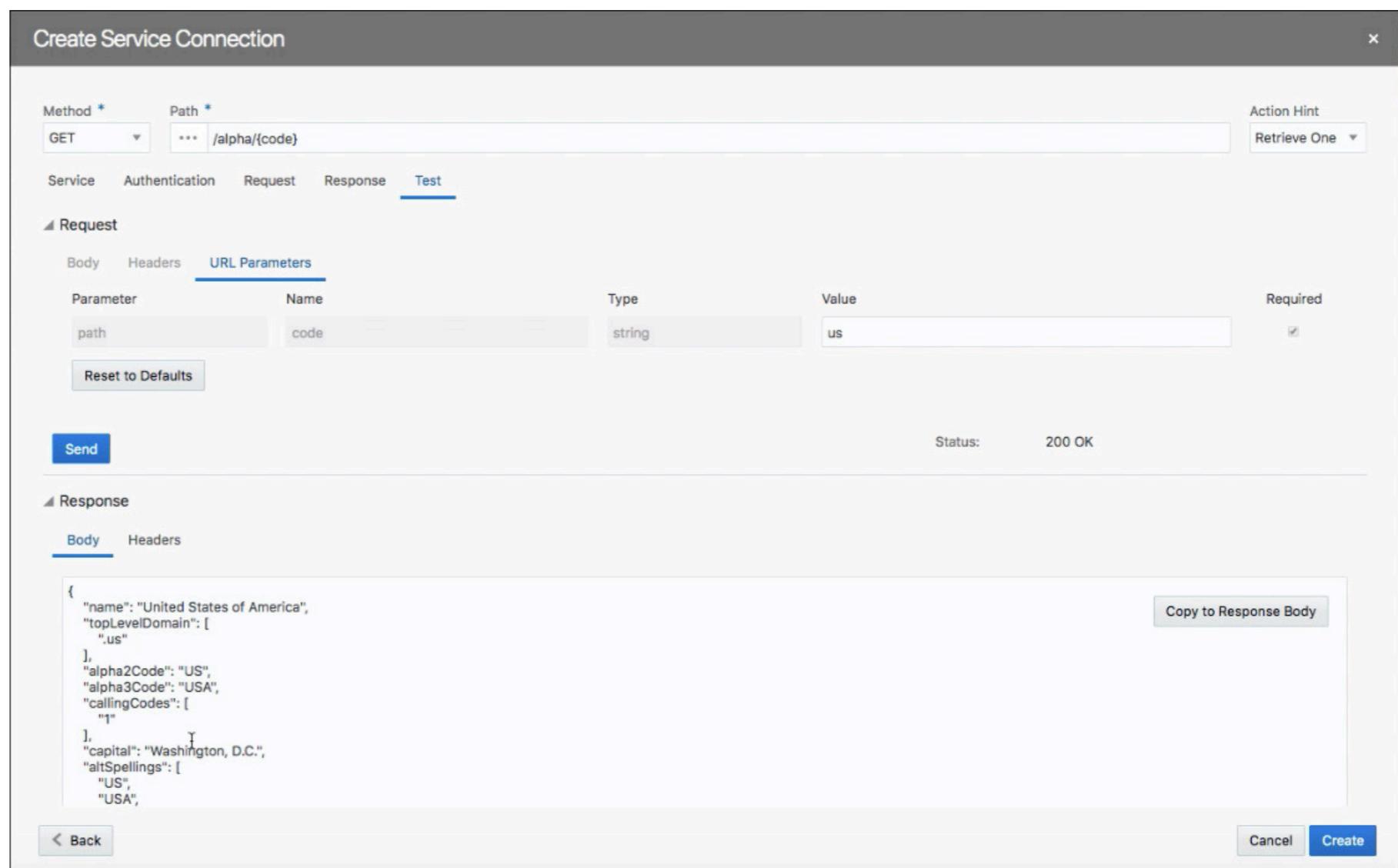
Next follow a similar set of steps to add a connection to another service that provides information about a specific country.

In the URL for this service, note {code}, which indicates a URL path parameter.

To add this service, click **+ Service Connection**; click **Define by Endpoint**, paste `https://restcountries.eu/rest/v2/alpha/{code}` into the **URL** field; and select **GET** for Method, as shown in **Figure 6**. To indicate that this service connection returns a single record, select **Retrieve One** for Action Hint.

Click **Next**, and enter the service name **CountryInfo** for the service connection. Click the **Test** tab, enter `us` as the value for **Path Parameter**, and click **Test**. Finally,

Figure 6: Creating and testing a second service connection



click **Copy to Response Body** and **Create** to complete the service connection.

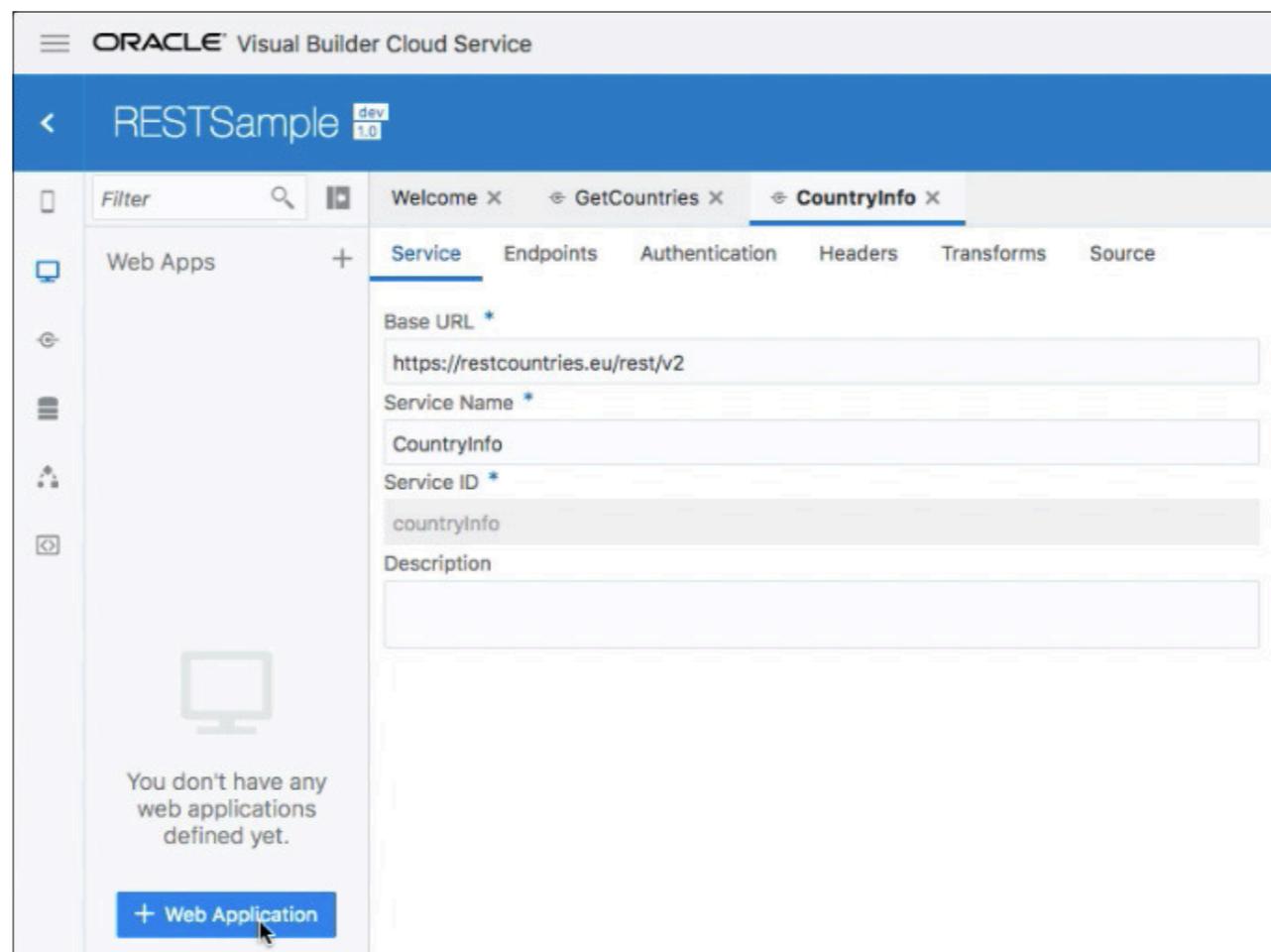
You are now ready to build the user interface for your application.

VISUALLY DESIGNING USER INTERFACES

Click **+ Web Application** to create a new web application, as shown in **Figure 7**.

Enter Countries for **Id** in the Create Web Application dialog box. (Note that you can follow a similar set of steps to create an on-device mobile application in Oracle Autonomous Visual Builder Cloud Service.)

Figure 7: Creating a new web application

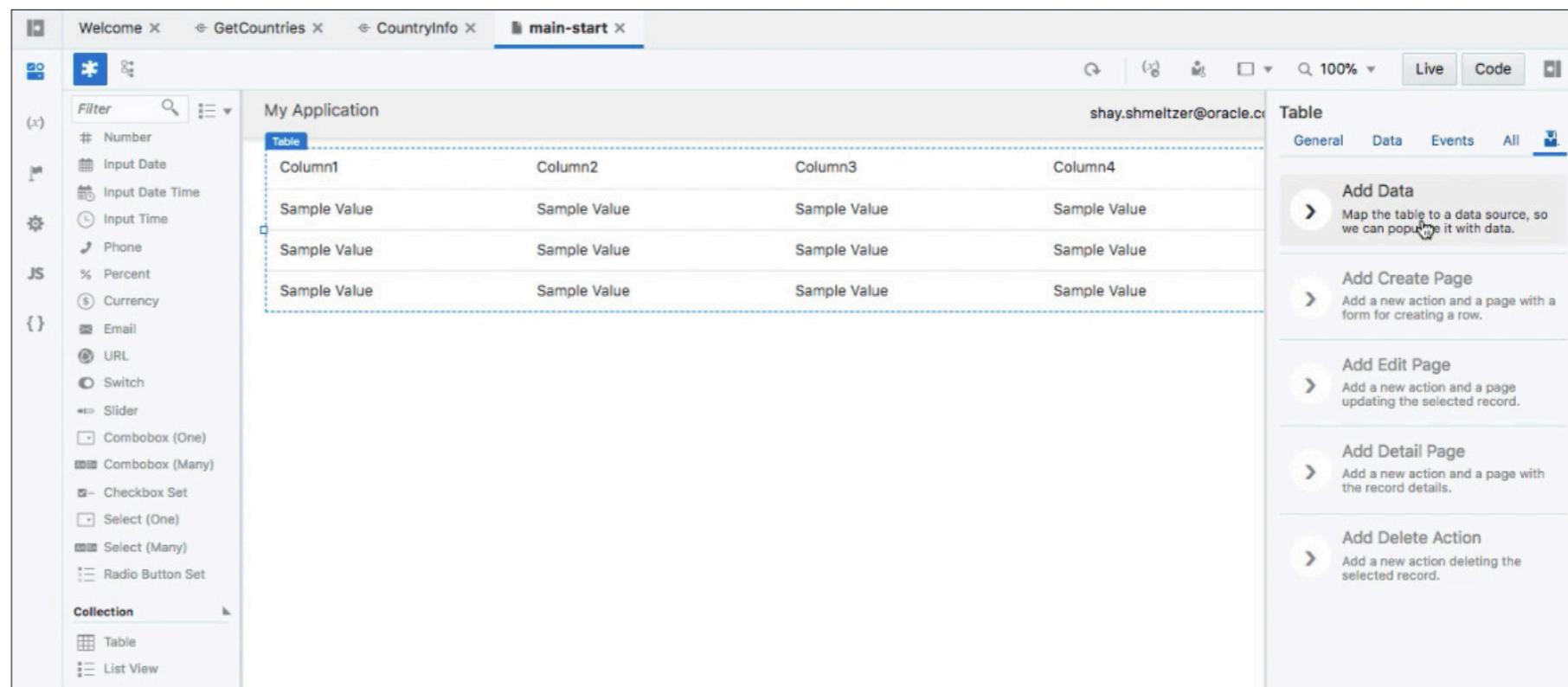


Oracle Autonomous Visual Builder Cloud Service will then direct you to the visual page editor, providing you with a WYSIWYG interface for creating your web application page. On the left side, you'll see a list of many Oracle JavaScript Extension Toolkit (Oracle JET) components you can add to your page.

In the visual page editor, drag the **Table** component from the left to the center of the page. Note that when the table is selected, the quick-start options on the right of the editor enable you to add data to the table.

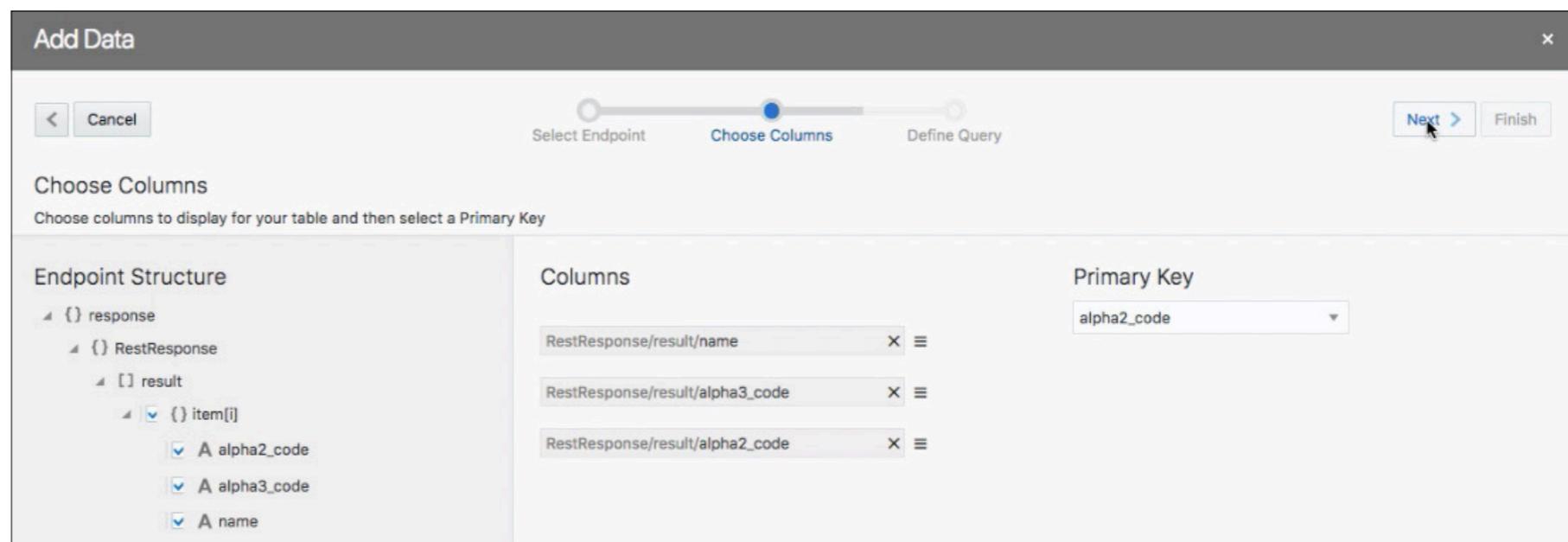
Click **Add Data**, as shown in **Figure 8**. In the wizard that opens, you'll be able to select the methods that return many records as sources of data. Locate the REST method for the first service connection you added, GetCountries, and select it. In the next dialog box in the wizard, Oracle Autonomous Visual Builder Cloud Service

Figure 8: Creating a table in the visual page editor



shows you the columns this method returns. You can select all the columns, but for this example, make sure to choose **alpha2_code** as the primary key of the record, as shown in **Figure 9**. This will be helpful later on, because this ID will be passed in the row selection event to help identify which record is selected. When you have selected the columns you want to appear in the app, click **Next**.

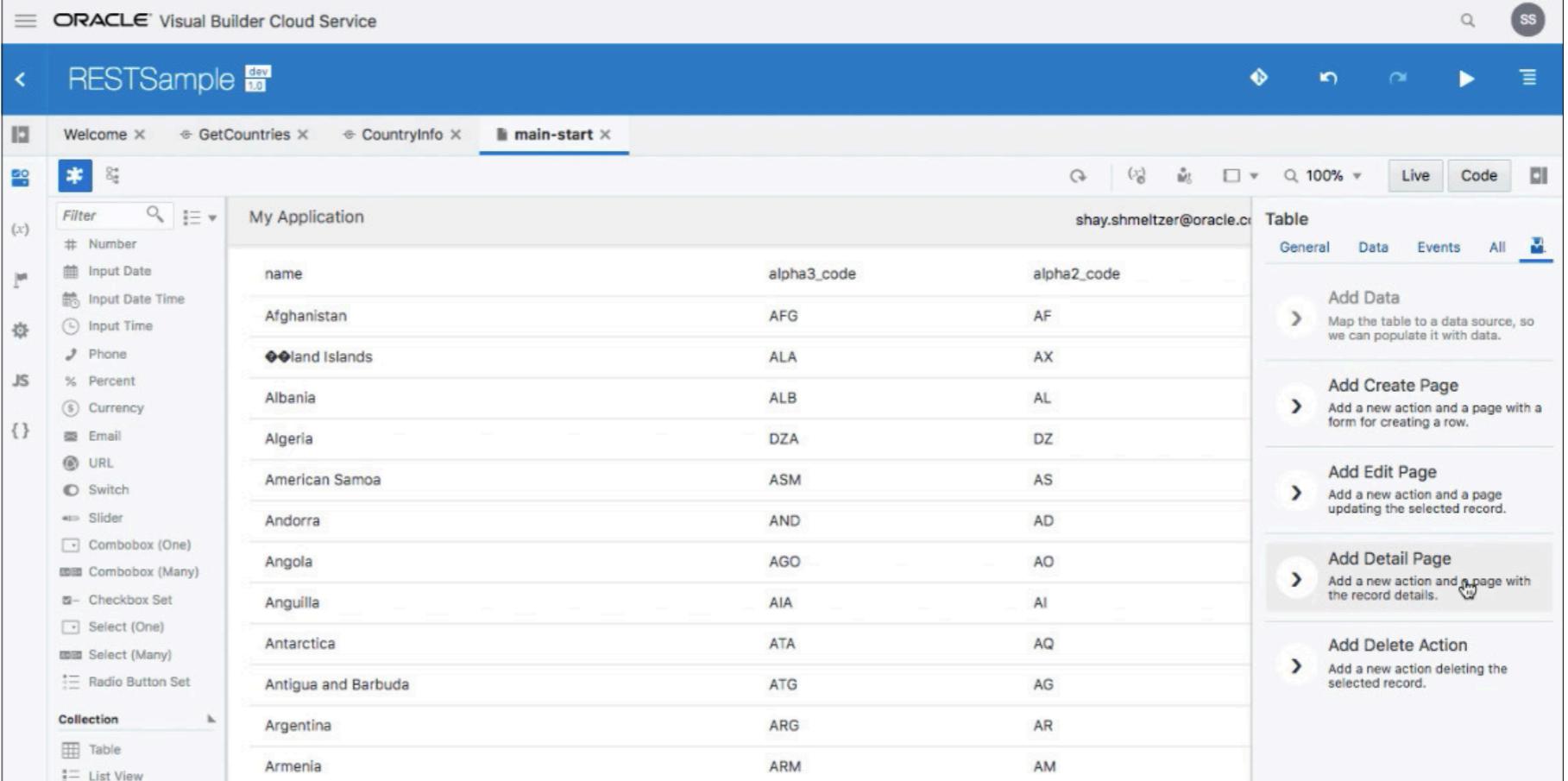
Figure 9: Choose the columns to appear in the records returned by the app



Click **Finish** to complete the wizard, and the application page will refresh to show you the real data returned from the service in the table (see [Figure 10](#)).

Now click **Add Detail Page** to add a detail page—a page where you'll see more information about a specific record.

For this page, use the endpoint you added in the other service connection, **CountryInfo**, as shown in [Figure 11](#). This endpoint provides information on a country,

Figure 10: Real data on display in the main application page


The screenshot shows the Oracle Visual Builder Cloud Service interface. The title bar says "ORACLE Visual Builder Cloud Service" and the page title is "RESTSample dev". The left sidebar contains a navigation menu with items like Welcome, GetCountries, CountryInfo, and main-start. The main content area displays a table titled "My Application" with columns "name", "alpha3_code", and "alpha2_code". The data rows are: Afghanistan (AFG, AF), Island Islands (ALA, AX), Albania (ALB, AL), Algeria (DZA, DZ), American Samoa (ASM, AS), Andorra (AND, AD), Angola (AGO, AO), Anguilla (AIA, AI), Antarctica (ATA, AQ), Antigua and Barbuda (ATG, AG), Argentina (ARG, AR), and Armenia (ARM, AM). To the right of the table, there is a sidebar titled "Table" with options: Add Data, Add Create Page, Add Edit Page, Add Detail Page, and Add Delete Action. The "Add Detail Page" option is currently selected.

name	alpha3_code	alpha2_code
Afghanistan	AFG	AF
Island Islands	ALA	AX
Albania	ALB	AL
Algeria	DZA	DZ
American Samoa	ASM	AS
Andorra	AND	AD
Angola	AGO	AO
Anguilla	AIA	AI
Antarctica	ATA	AQ
Antigua and Barbuda	ATG	AG
Argentina	ARG	AR
Armenia	ARM	AM

based on the country code. The table selection event automatically passes this ID/code to the service call.

In the second step of the wizard, select the service-returned fields you want to show on the detail page, as shown in [Figure 12](#). You can also modify the title of the button that navigates to this page (**Button label**) and the page title (**Page title**). Change the **Page title** value to **Country Detail**. When you have made all the selections and changes, click **Finish**.

You can now run the application and see it in action. Click the run button (right arrow) in the upper right.

Figure 11: The Select Endpoint screen of the Add Detail Page

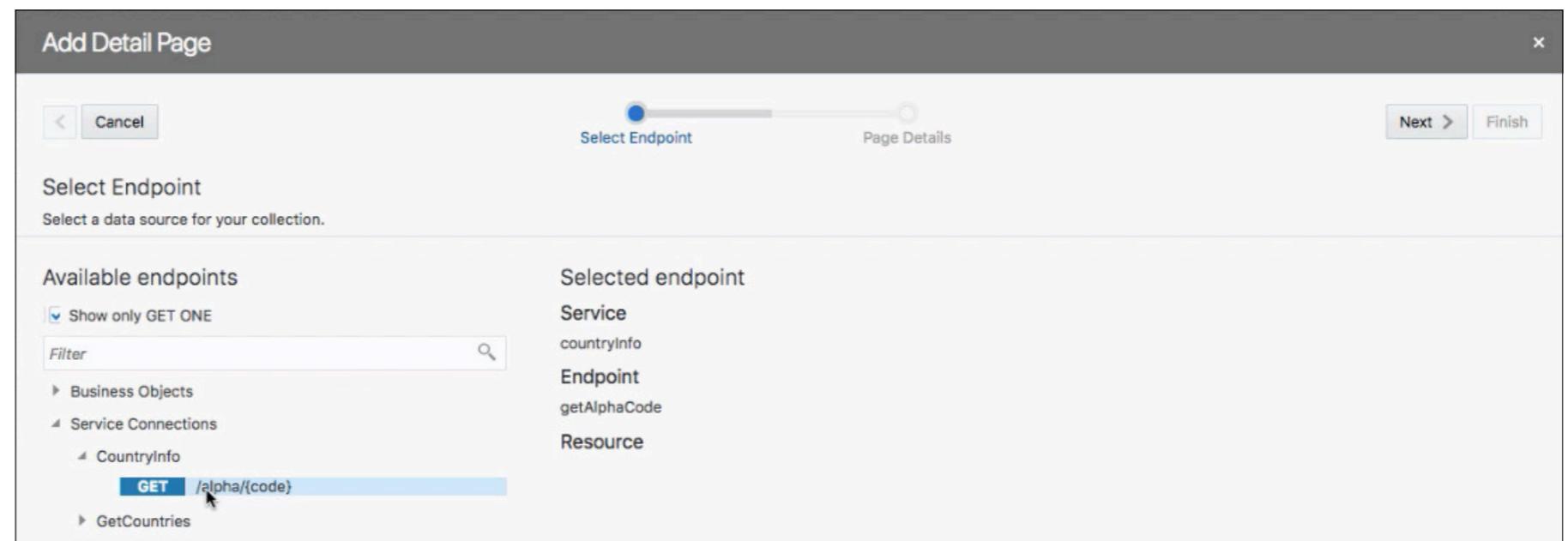
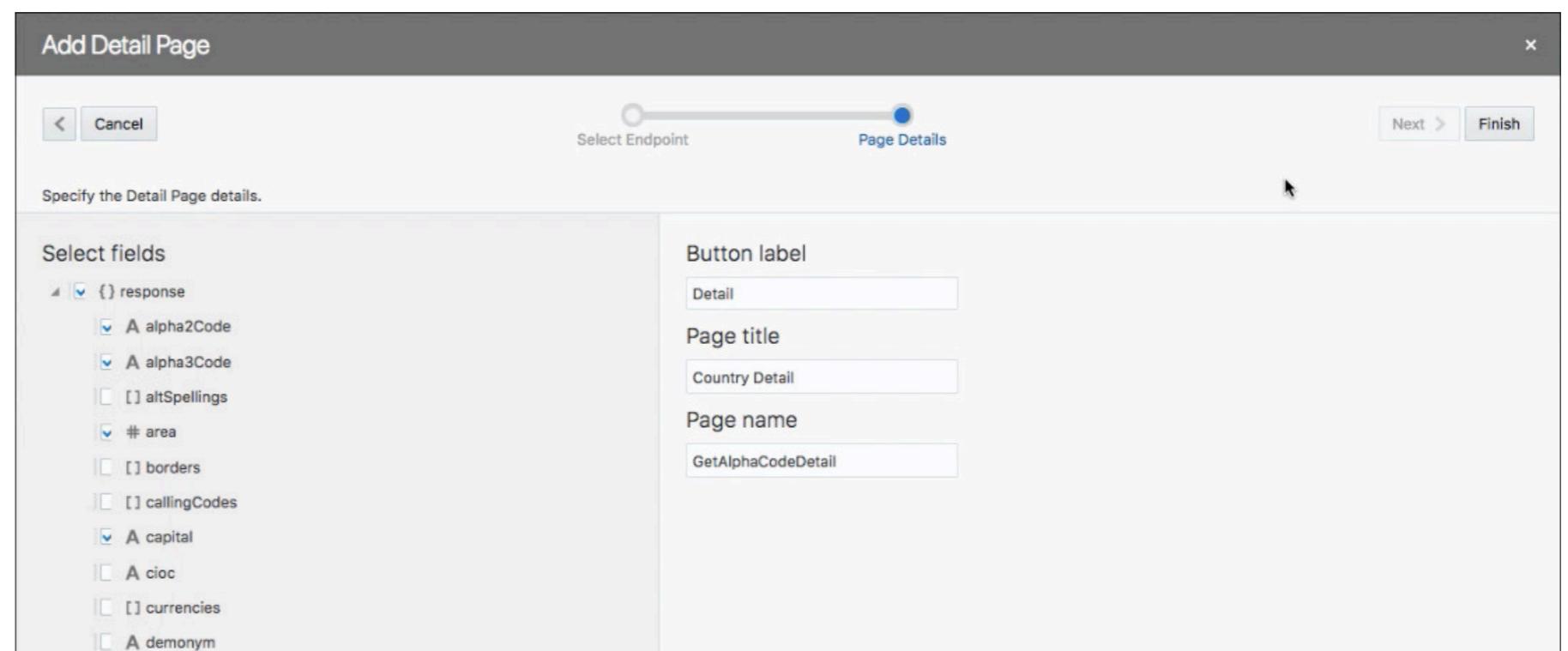
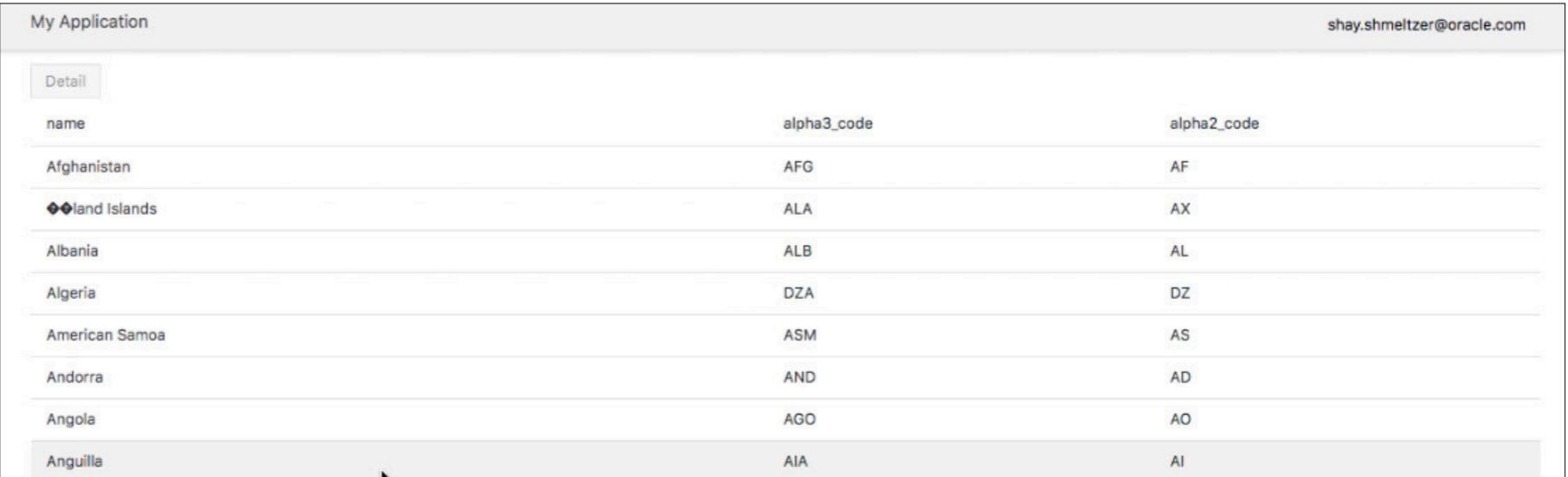


Figure 12: The Add Detail Page's Page Details screen



The application opens in a new browser tab. You will see a page listing countries and will be able to select one of the countries and click the **Detail** button to go to the Country Detail page to see more information about that country, as shown in **Figure 13**.

Figure 13: The main application page, ready to provide country details



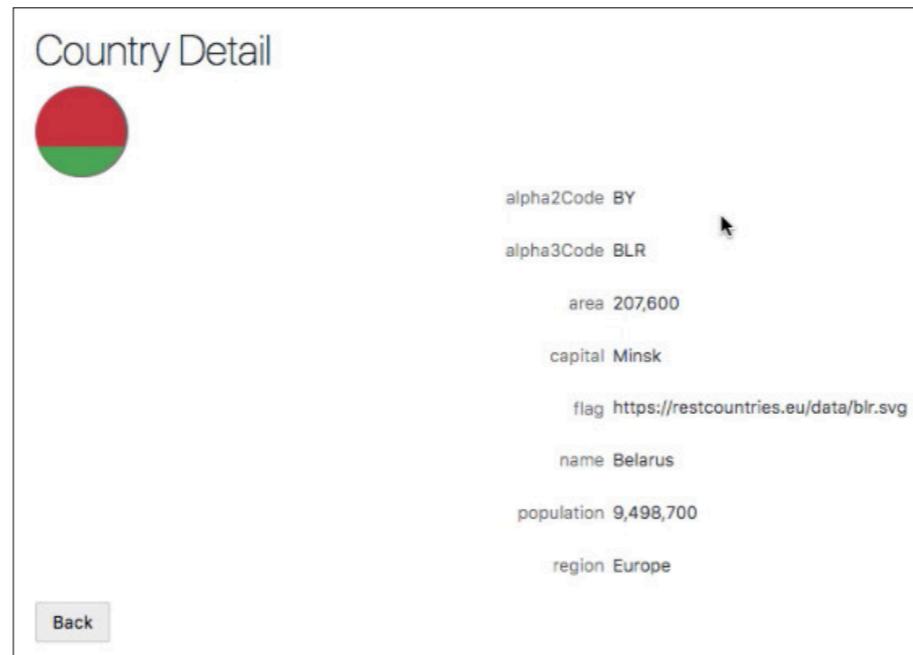
My Application			
		shay.shmeltzer@oracle.com	
Detail			
	name	alpha3_code	alpha2_code
	Afghanistan	AFG	AF
	↳ Island Islands	ALA	AX
	Albania	ALB	AL
	Algeria	DZA	DZ
	American Samoa	ASM	AS
	Andorra	AND	AD
	Angola	AGO	AO
	Anguilla	AIA	AI

Of course, you can continue to tweak your application. For example, you can reorder fields in the Country Detail page or represent some of the data in other ways, using the rich visualization components available in Oracle Autonomous Visual Builder Cloud Service. [Figure 14](#), for example, shows a Country Detail page with an added avatar component to show the flag of the selected country.

CONCLUSION

As this article demonstrates, integrating REST services into your application is quite easy. Oracle Autonomous Visual Builder Cloud Service was built from the ground up

Figure 14: Updated Country Detail page showing information on and the flag of the selected country



to support the modern HTML5/JavaScript/REST architecture, and with the latest features of the service, creating these apps is easier than ever. □

Shay Shmeltzer is director of product management for Oracle's cloud development tools. He is focused on helping developers simplify and streamline their work by leveraging the right tools and technologies.

NEXT STEPS

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By Dan McGhan



Build REST APIs for Node.js, Part 2

Add database connection pooling to your new REST API.

In the previous article in this series, you started a new REST API app and created a web server module to handle incoming HTTP requests. In this article, you'll focus on database basics by adding a module that's responsible for starting up and shutting down a database connection pool. You'll also add a function that simplifies executing simple statements by getting and releasing connections from the pool automatically.

Note: The instructions and steps in this article assume that you have completed the steps in Part 1 in this article series.

STARTING UP THE CONNECTION POOL

Generally speaking, there's some overhead involved when establishing a connection to a database. When apps use many connections for short periods of time, Oracle recommends using a connection pool. Connection pools can dramatically increase

performance and scalability by creating groups of connections that stay open and are reused many times.

Because node-oracledb is built on top of the Oracle Call Interface (OCI) client libraries, it has built-in support for creating OCI pools, which work on the client side and have excellent performance characteristics.

To create a connection pool, start by creating a new configuration file named database.js in the config directory. Copy and paste the following code into the file, and save your changes.

```
module.exports = {
  hrPool: {
    user: process.env.HR_USER,
    password: process.env.HR_PASSWORD,
    connectString: process.env.HR_CONNECTIONSTRING,
    poolMin: 10,
    poolMax: 10,
    poolIncrement: 0
  }
};
```

As with the config/webserver.js file (in Part 1 of this series), this file enables some properties to be set via environment variables. Using environment variables provides flexibility when deploying the app to different environments and helps keep passwords and other sensitive information out of source code.

Run the following commands from a terminal to set the required environment variables and ensure that they're available in future terminal sessions.

```
echo "export HR_USER=hr" >> ~/.bashrc
echo "export HR_PASSWORD=oracle" >> ~/.bashrc
echo "export HR_CONNECTSTRING=0.0.0.0/orcl" >> ~/.bashrc
source ~/.bashrc
```

You may have noticed that the poolMin and poolMax values were the same and that poolIncrement was set to 0. This will create a pool with a fixed size that requires fewer resources to manage—a good idea for pools that get consistent usage.

Although Node.js is often described as “single-threaded,” it does have a thread pool available for certain operations that would otherwise block the main thread running the JavaScript code. This thread pool is used by node-oracledb to run all of its asynchronous operations, such as getting connections and executing SQL and PL/SQL code. However, the default size of the thread pool is four threads. If you want all 10 connections in the pool to be able to work at the same time, you must increase the number of threads accordingly.

The environment variable UV_THREADPOOL_SIZE adjusts the size of the thread pool. The value of UV_THREADPOOL_SIZE can be set before the Node.js app runs or from within the app, but it must be set before the app makes the first call that uses the thread pool. This is because the thread pool is created when it’s first used, and once created, its size is fixed.

Open the index.js file in the root of the application, and add the following lines after the first line (which brings in the web server module).

```
// *** line that requires services/web-server.js is here ***
const dbConfig = require('./config/database.js');
const defaultThreadPoolSize = 4;
```

```
// Increase thread pool size by poolMax  
process.env.UV_THREADPOOL_SIZE = dbConfig.hrPool.poolMax + defaultThreadPoolSize;
```

Now that the thread pool is sized appropriately, you can move on to the database module. In the services directory, create a new file named database.js. Copy and paste the following code into it, and save your changes.

```
const oracledb = require('oracledb');  
const dbConfig = require('../config/database.js');  
  
async function initialize() {  
    const pool = await oracledb.createPool(dbConfig.hrPool);  
}  
  
module.exports.initialize = initialize;
```

This module first brings in node-oracledb and the configuration file. Next, an `async` function named `initialize` is defined and later exposed via the module `.exports` object. The `initialize` function creates a connection pool that is stored in an internal connection pool cache as the “default” pool.

Now you need to wire things up so that the connection pool starts before the web server opens. Return to the index.js file, and add the following below line 1.

```
// *** line that requires services/web-server.js is here ***  
const database = require('./services/database.js');
```

And now add the following try block within the startup function, just before the existing try block that starts the web server.

```
try {  
    console.log('Initializing database module');  
  
    await database.initialize();  
} catch (err) {  
    console.error(err);  
  
    process.exit(1); // Non-zero failure code  
}  
  
// *** existing try block in startup here ***
```

At this point, you can install node-oracledb and test the code so far. Run the following commands in the terminal from the hr_app directory.

```
npm install oracledb -s  
node .
```

If you see messages indicating that the database module and the web server started up, congratulations—you now have a connection pool running! I'll show you that it's working in the last part of this article, but before that, you need to add some code to make the application shut down cleanly.

SHUTTING DOWN THE CONNECTION POOL

If you shut down the application now (using Ctrl + c as in Part 1), the Node.js process will be killed before the connection pool is closed. Although all of the related database processes *should be* cleaned up automatically, it's best to explicitly close the connection pool before exiting the Node.js process.

Return to the services/database.js file, add the following lines of code to the end, and save your updates.

```
// *** previous code above this line ***

async function close() {
    await oracledb.getPool().close();
}

module.exports.close = close;
```

The `close` function uses the `oracledb.getPool()` method to synchronously retrieve the default connection pool and then invokes the `close` method on the pool to close it.

To invoke the `close` function at the right time, add the following lines of code to the index.js file inside the `shutdown` function, just after the existing try block that stops the web server.

```
// *** existing try-catch block in shutdown here ***
```

```
try {
    console.log('Closing database module');

    await database.close();
} catch (err) {
    console.log('Encountered error', e);

    err = err || e;
}
```

If you rerun and shut down the application again, you should see that the database module closes after the web server closes but before the process exits.

SIMPLIFYING SIMPLE CRUD OPERATIONS

Executing SQL or PL/SQL code with node-oracledb is typically a three-step process: get a connection, execute the code, and release the connection. If all you want to do is make a single call to execute (no multistep transaction needed), getting and releasing a connection can feel like using boilerplate code. I like to create a function that does all three operations with a single call.

Return to the services/database.js file, add the following code to the bottom, and save your changes.

```
// *** previous code above this line ***

function simpleExecute(statement, binds = [], opts = {}) {
    return new Promise(async (resolve, reject) => {
```

```
let conn;

opts.outFormat = oracledb.OBJECT;
opts.autoCommit = true;

try {
    conn = await oracledb.getConnection();

    const result = await conn.execute(statement, binds, opts);

    resolve(result);
} catch (err) {
    reject(err);
} finally {
    if (conn) { // conn assignment worked, need to close
        try {
            await conn.close();
        } catch (err) {
            console.log(err);
        }
    }
}
});
```

}

```
module.exports.simpleExecute = simpleExecute;
```

Typically you wouldn't use the database module in the web server module, but you'll add it now just to ensure that it's working correctly. Open the services/web-server.js file, and add the following line under the existing constant declarations at the top.

```
// *** line that requires ../config/web-server.js here ***
const database = require('./database.js');
```

Next, use the following code to replace the entire app.get handler that responds with "Hello World!" (all three lines).

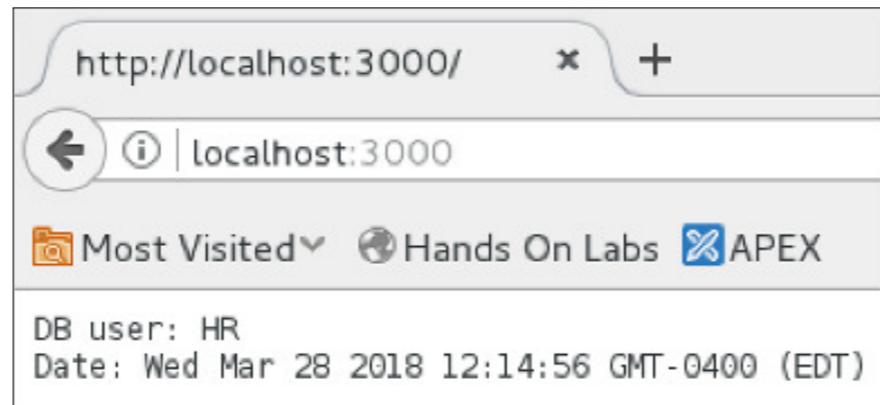
```
// *** line that adds morgan to app here ***
app.get('/', async (req, res) => {
  const result = await database.simpleExecute('select user, systimestamp from dual');
  const user = result.rows[0].USER;
  const date = result.rows[0].SYSTIMESTAMP;

  res.end(`DB user: ${user}\nDate: ${date}`);
});
```

The new handler is using the database module's simpleExecute function to fetch the current user and systimestamp values from the database. The values are then used in a template literal to respond to the client with a dynamic message.

Start the application again, and navigate Firefox to localhost:3000. You should see something like [Figure 1](#). If you see a message like the one in [Figure 1](#), your database module is in good shape.

Figure 1: Database module in good shape



In the next article, you will continue to build out the API by adding routing, controller, and database logic for a GET request. 

Dan McGhan is the Oracle developer advocate for JavaScript and Oracle Database. He enjoys sharing what he's learned about these technologies and helping others be successful with them.

NEXT STEPS

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Perform Basic CRUD Operations with cx_Oracle, Part 4

By Blaine Carter



Here's how to use Python for CRUD operations in Oracle Database.

Python is a powerful open source language, and the cx_Oracle driver gives your Python application access to the full power of Oracle Database.

This article series takes a look at how to perform create, retrieve, update, and delete (CRUD) operations in Python with the cx_Oracle driver. Part 1 of this series included setup information and examples for *create*: the *C* in *CRUD*. Part 2 continued with information and examples of how to perform operations for the *R* in *CRUD*: *retrieve*. Part 3 provided examples of how to perform operations for the *U* in *CRUD*: *update*.

This article, Part 4, concludes the series with examples of how to perform operations for the *D* in *CRUD*: *delete*.

For setup information for the complete article series—including links and instructions for downloading the cx_Oracle driver and setting up the sample data—refer to

“Perform Basic CRUD Operations Using CX_ORACLE, [Part 1.](#)”

ADDITIONAL SETUP

Before you run the delete examples with cx_Oracle, create a reset script and a template that will handle all the delete examples.

Reset template. To keep the examples clean and precise, you’ll want to reset the data at times. Create a new file called `reset_data.py` with the following code, and then run it whenever you would like to reset the data. (Note that this version adds people and pet data not included in other articles in this series.)

```
import cx_Oracle
import os
connectString = os.getenv('db_connect')
con = cx_Oracle.connect(connectString)
cur = con.cursor()

# Delete rows
statement = 'delete from cx_pets'
cur.execute(statement)

# Reset Identity Column
statement = 'alter table cx_pets modify id generated BY DEFAULT
as identity (START WITH 8)'
cur.execute(statement)

# Delete rows
```

```
statement = 'delete from cx_people'
cur.execute(statement)

# Reset Identity Column
statement = 'alter table cx_people modify id generated BY DEFAULT
as identity (START WITH 8)'
cur.execute(statement)

# Insert default rows
rows = [(1, 'Bob', 35, 'I like dogs'),
         (2, 'Kim', 27, 'I like birds'),
         (3, 'Cheryl', 23, 'I like horses'),
         (4, 'Bob', 27, 'I like rabbits'),
         (5, 'Stacey', 45, 'I like snakes'),
         (6, 'Pete', 23, 'I like cats'),
         (7, 'Pat', 36, 'I like dogs')]
cur.bindarraysize = 2
cur.setinputsizes(int, 20, int, 100)
cur.executemany("insert into cx_people(id, name, age, notes)
values (:1, :2, :3, :4)", rows)
con.commit()

# Insert default rows
rows = [(1, 'Duke', 1, 'dog'),
         (2, 'Dragon', 2, 'bird'),
```

```
(3, 'Sneaky', 5, 'snake'),
(4, 'Red', 2, 'bird'),
(5, 'Red', 3, 'horse'),
(6, 'Buster', 1, 'dog'),
(7, 'Fido', 7, 'cat'])

cur.bindarraysize = 2
cur.setinputsizes(int, 20, int, 100)
cur.executemany("insert into cx_pets (id, name, owner, type)
values (:1, :2, :3, :4)", rows)
con.commit()

cur.close()
```

The delete template. To run the delete examples in this article, create a new file called `delete.py` with the following code:

```
import cx_Oracle
import os
connectString = os.getenv('db_connect')
con = cx_Oracle.connect(connectString)

def get_all_rows(label, data_type='people'):
    # Query all rows
    cur = con.cursor()
    if (data_type == 'pets'):
```

```
statement = 'select id, name, owner, type from cx_pets order by owner, id'
else:
    statement = 'select id, name, age, notes from cx_people order by id'
cur.execute(statement)
res = cur.fetchall()
print(label + ': ')
print(res)
print(' ')
cur.close()

get_all_rows('Original Data', 'pets')

# Your code here

get_all_rows('New Data', 'pets')
```

Then, for each example exercise, replace the # Your code here line with the specific example code.

The delete.py template includes the helper function `get_all_rows()`, which encapsulates a SELECT statement to verify that the deletes worked. The SELECT functionality is covered in [Part 2](#) of this series.

Note: Please review all the example code in this article and run it only if you are sure it will not cause any problems with your system.

Reset the data. Before you perform your first delete operation, run `reset_data.py` to set up the data.

SIMPLE DELETE

Now perform a simple delete that removes a single record from the cx_people table. Replace the # Your code here line in delete.py with the following code snippet, and run delete.py in your Python session:

```
cur = con.cursor()
statement = 'delete from cx_pets where id = :id'
cur.execute(statement, {'id':1})
con.commit()
```

When I run this code in my Python session, I see

Original Data:

```
[(1, 'Duke', 1, 'dog'), (6, 'Buster', 1, 'dog'), (2, 'Dragon', 2, 'bird'), (4, 'Red',
2, 'bird'), (5, 'Red', 3, 'horse'), (3, 'Sneaky', 5, 'snake'), (7, 'Fido', 7, 'cat')]
```

New Data:

```
[(6, 'Buster', 1, 'dog'), (2, 'Dragon', 2, 'bird'), (4, 'Red', 2, 'bird'), (5, 'Red',
3, 'horse'), (3, 'Sneaky', 5, 'snake'), (7, 'Fido', 7, 'cat')]
```

Here's what delete.py does:

- Gets a [cursor object](#) from the connection. You will use this cursor to perform your database operations.
- Prepares a SQL DELETE statement, deleting the cx_pets record with an id of 1.
- Executes the statement, using bind variables. (See [Part 2](#) of this series for an explanation of bind variables.)

- Commits the transaction.

DEEPER DIVE

Now delete all the birds. When you're done, the results should be

Original Data:

```
[(6, 'Buster', 1, 'dog'), (2, 'Dragon', 2, 'bird'), (4, 'Red', 2, 'bird'), (5, 'Red', 3, 'horse'), (3, 'Sneaky', 5, 'snake'), (7, 'Fido', 7, 'cat')]
```

New Data:

```
[(6, 'Buster', 1, 'dog'), (5, 'Red', 3, 'horse'), (3, 'Sneaky', 5, 'snake'), (7, 'Fido', 7, 'cat')]
```

What does the successful code look like? Like this:

```
cur = con.cursor()
statement = 'delete from cx_pets where type = :type'
cur.execute(statement, {'type':'bird'})
con.commit()
```

Reset the data. Now is a good time to run `reset_data.py`.

BOILERPLATE CHANGE

Now change the boilerplate `get_all_rows` statements in `delete.py` to get people *and* pet data. Replace the last three code lines of `delete.py` with

```
get_all_rows('Original People Data', 'people')
get_all_rows('Original Pet Data', 'pets')

# Your code here

get_all_rows('New People Data', 'people')
get_all_rows('New Pet Data', 'pets')
```

DELETING RECORDS REFERENCED BY FOREIGN KEYS

If you are using integrity constraints in your database (*of course* you are, because you let the database do some heavy lifting for you), you will sometimes need to change the way you process your changes.

In this article's data design, a foreign key constraint in cx_pets ensures that if a pet has an owner, that owner exists. Here is the statement that creates this constraint in the "*Create the Database Objects*" section of [Part 1](#) of this article series.

```
ALTER TABLE CX_PETS ADD CONSTRAINT FK_CX_PETS_OWNER FOREIGN KEY ("OWNER")
REFERENCES "CX_PEOPLE" ("ID")
/
```

If you attempt to delete a record in cx_people that is referenced in cx_pets (where a pet has that owner), you will get an error.

To see this, replace the # Your code here line in delete.py with the following code snippet and run delete.py in your Python session:

```
cur = con.cursor()
statement = 'delete from cx_people where id = :id'
cur.execute(statement, {'id':1})
con.commit()
```

When I run this code in my Python session, I see

```
Traceback (most recent call last):
  File "delete.py", line 25, in <module>
    cur.execute(statement, {'id':1})
cx_Oracle.IntegrityError: ORA-02292: integrity constraint (DD.FK_CX_PETS_OWNER)
violated - child record found
```

Before deleting the person, you must handle the pets (watch out for claws and teeth).

There are handling options, depending on the database design:

If pets are not required to have an owner. And if you want to delete only the person, not the pets, you can update the pets' data and set the pet owner value to null.

If pets are required to have an owner. You can delete the pets of the owner.

In either of the above scenarios, you can update the data and set the pet owner to another person.

The delete is successful. Bob is moving out of the area, and his new apartment doesn't allow pets, so he's giving his dogs to Kim. Let's use that last option here.

Replace the # Your code here line in delete.py with the following code snippet, and run delete.py in your Python session:

```
cur = con.cursor()

statement = 'update cx_pets set owner = :1 where owner = :2'
cur.execute(statement, (2, 1))

statement = 'delete from cx_people where id = :id'
cur.execute(statement, {'id':1})
con.commit()
```

When I run this code in my Python session, I see

Original People Data:

```
[(1, 'Bob', 35, 'I like dogs'), (2, 'Kim', 27, 'I like birds'), (3, 'Cheryl', 23,
'I like horses'), (4, 'Bob', 27, 'I like rabbits'), (5, 'Stacey', 45, 'I like snakes'),
(6, 'Pete', 23, 'I like cats'), (7, 'Pat', 36, 'I like dogs')]
```

Original Pet Data:

```
[(1, 'Duke', 1, 'dog'), (6, 'Buster', 1, 'dog'), (2, 'Dragon', 2, 'bird'), (4, 'Red',
2, 'bird'), (5, 'Red', 3, 'horse'), (3, 'Sneaky', 5, 'snake'), (7, 'Fido', 7, 'cat')]
```

New People Data:

```
[(2, 'Kim', 27, 'I like birds'), (3, 'Cheryl', 23, 'I like horses'), (4, 'Bob', 27,
'I like rabbits'), (5, 'Stacey', 45, 'I like snakes'), (6, 'Pete', 23, 'I like cats'),
(7, 'Pat', 36, 'I like dogs')]
```

New Pet Data:

```
[(1, 'Duke', 2, 'dog'), (2, 'Dragon', 2, 'bird'), (4, 'Red', 2, 'bird'), (6, 'Buster', 2, 'dog'), (5, 'Red', 3, 'horse'), (3, 'Sneaky', 5, 'snake'), (7, 'Fido', 7, 'cat')]
```

Here's what delete.py does:

- Gets a cursor object from the connection.
- Prepares a SQL UPDATE statement, changing the owner to 2 (Kim) for the records with an owner of 1 (Bob). Updating is covered in [Part 3](#) of this series.
- Executes the statement, using bind variables.
- Prepares a SQL DELETE statement, deleting records with an id of 1 (Bob).
- Executes the statement, using bind variables.
- Commits the transaction.

When you change data, it's a good idea to verify the number of affected rows. This is covered in [Part 2](#) of this series.

ANOTHER DEEPER DIVE

Due to a zoning change, snakes are no longer allowed in the area. Stacey has decided to move and take Sneaky (her snake) with her. Let's fix the data to reflect that.

When you're done, the results should be

Original People Data:

```
[(2, 'Kim', 27, 'I like birds'), (3, 'Cheryl', 23, 'I like horses'), (4, 'Bob', 27, 'I like rabbits'), (5, 'Stacey', 45, 'I like snakes'), (6, 'Pete', 23, 'I like cats'), (7, 'Pat', 36, 'I like dogs')]
```

Original Pet Data:

```
[(1, 'Duke', 2, 'dog'), (2, 'Dragon', 2, 'bird'), (4, 'Red', 2, 'bird'), (6, 'Buster',  
2, 'dog'), (5, 'Red', 3, 'horse'), (3, 'Sneaky', 5, 'snake'), (7, 'Fido', 7, 'cat')]
```

New People Data:

```
[(2, 'Kim', 27, 'I like birds'), (3, 'Cheryl', 23, 'I like horses'), (4, 'Bob',  
27, 'I like rabbits'), (6, 'Pete', 23, 'I like cats'), (7, 'Pat', 36, 'I like dogs')]
```

New Pet Data:

```
[(1, 'Duke', 2, 'dog'), (2, 'Dragon', 2, 'bird'), (4, 'Red', 2, 'bird'), (6, 'Buster',  
2, 'dog'), (5, 'Red', 3, 'horse'), (7, 'Fido', 7, 'cat')]
```

What does the successful code look like? Like this:

```
cur = con.cursor()  
  
statement = 'delete from cx_pets where owner = :owner'  
cur.execute(statement, {'owner':5})  
  
statement = 'delete from cx_people where id = :id'  
cur.execute(statement, {'id':5})  
con.commit()
```

SOME OTHER THINGS YOU COULD TRY

Here are some other deletes to try with the sample data:

- Change the database constraints to delete the child record or make it null on

delete (a cascading delete). Delete a person, and let the database handle the child (pet) records.

- Remove the people who don't have any pets. 
-

Blaine Carter is the Oracle developer advocate for open source. He applies his exploratory eye and tinkering inclinations to the intersection of open source software and Oracle Database.

NEXT STEPS

[DOWNLOAD cx_Oracle.](#)

[GET](#) this article's code examples from GitHub.

[READ](#) the previous articles of this series.

Part 1.

Part 2.

Part 3.



By Steven Feuerstein



ORACLE DATABASE

When Is a Function Like a Table? When It's a Table Function!

Combine the power of SQL with the procedural control of PL/SQL.

What does a PL/SQL function do? A function returns a value. That value can be a scalar, such as a string, as in this function:

```
CREATE OR REPLACE FUNCTION longer_string (
    string_in IN VARCHAR2, to_length_in IN INTEGER)
RETURN VARCHAR2
AUTHID DEFINER
IS
BEGIN
    RETURN RPAD (string_in, to_length_in, 'x');
END;
/
```

A function can also return a more complex data type, such as a record or even a collection. To demonstrate that, I first declare a schema-level nested table type:

```
CREATE OR REPLACE TYPE strings_t IS TABLE OF VARCHAR2 (100)
/
```

Then I define a function that returns a collection of randomly generated strings of that type:

```
CREATE OR REPLACE FUNCTION random_strings (
    count_in IN INTEGER)
RETURN strings_t
AUTHID DEFINER
IS
    l_strings    strings_t := strings_t ();
BEGIN
    l_strings.EXTEND (count_in);

    FOR indx IN 1 .. count_in
    LOOP
        l_strings (indx) := DBMS_RANDOM.string ('u', 10);
    END LOOP;

    RETURN l_strings;
END;
/
```

This article takes a closer look at functions that return collections and how they can be used as *table functions*, which means that you can query the contents of the value returned as if it were a relational table.

USE CASES FOR TABLE FUNCTIONS

There are several scenarios in which table functions come in handy.

Merge session-specific data with data from tables. You've got data—lots of it—sitting in tables. But in your session (and not in any tables), you have some data, and you need to “merge” these two datasources together in a SQL statement. In other words, you need the set-oriented power of SQL to get some answers. With the TABLE clause and table functions, you can accomplish precisely that.

Programmatically construct a dataset to be passed as rows and columns to the host environment. Your web page needs to display some data in a nice, neat report. That data is, however, far from neat. In fact, you need to execute procedural code to construct the dataset. Sure, you could construct the data, insert it into a table, and then do a SELECT from the table. But with a table function, you can deliver that data immediately to the web page, without any need for nonquery data manipulation language (DML).

Emulate a parameterized view. Oracle Database does not support true parameterized views, as in

```
CREATE OR REPLACE VIEW my_view (param1_in IN INTEGER) ...
```

You can achieve a similar effect with system contexts, in which the WHERE clause calls the SYS_CONTEXT function to obtain a value from your session. But you can also use a table function, which certainly *does* accept parameters.

Restrict developer access to tables. If you follow strictly the “Smart Database” or “Thick Database” paradigm, neither users nor developers are ever given direct access to tables—not even with the SELECT privilege! For nonquery DML (inserts, updates, deletes), the recommendation is to provide PL/SQL packaged procedures to perform those operations. For queries, you can achieve complete control over access to underlying tables by making the data available only through a table function. Instead of granting the SELECT privilege on a table, you grant the EXECUTE privilege on the package containing the table function.

Perform data warehouse transformations. A common requirement in data warehouse environments is to perform transformations—and usually multiple such transformations—from one table to another, as shown in **Figure 1**.

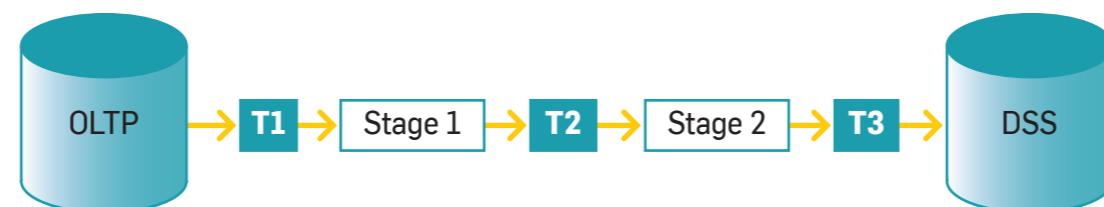
A special type of table function, called a streaming table function, supports these transformations elegantly and with high performance.

EXPLORING TABLE FUNCTIONS

Now let’s see how to use the random_strings function, both as a “normal” function in a PL/SQL block and as a table function.

In the following block, I call the random_strings function and then display the resulting strings using DBMS_OUTPUT.PUT_LINE:

Figure 1: Table transformations on the way to a data warehouse



```
DECLARE
    l_strings    strings_t := random_strings (5);
BEGIN
    FOR indx IN 1 .. l_strings.COUNT
    LOOP
        DBMS_OUTPUT.put_line (l_strings (indx));
    END LOOP;
END;
/
```

And here's an example of the output you might see (but likely not, because these values are produced by a sophisticated pseudorandom generator):

```
KKEMEEIPES
QOZKUGIFWF
CDYPAOTORD
PHRPCHZQIT
LOUVRRMWBX
```

And now I forgo the PL/SQL block, along with the declaration of a local variable, and simply call the function in a query:

```
SELECT COLUMN_VALUE my_string
  FROM TABLE (random_strings (5))
/

```

And I see

MY_STRING

PGITKKZYAV
IYXWISVYAC
ZTTQATVKLC
MJVAXASRNC
CHOFPTGQTR

And there it is: a table function.

As we have all come to expect with Oracle Database, the SQL engine does most of the heavy lifting for us when it comes to table functions. When you call your function inside the TABLE clause of a SELECT statement, the SQL engine transforms the set of data returned by the function into a relational result set. This result set can then be manipulated like a result set from a table or a view.

When each element of the collection type is a scalar value, as is the case with strings_t above, the name of the single column for that result set is automatically set to COLUMN_VALUE. You can change it, of course, with a column alias, as I showed above.

When you are returning a collection of object types (possible since Oracle9i Database) or of records (possible in Oracle Database 12.2 and higher), the names of the object type attributes or record fields can be referenced as individual columns. Here's an example:

```
CREATE OR REPLACE TYPE two_strings_ot
    AUTHID DEFINER IS OBJECT
(
    string1 VARCHAR2 (10),
    string2 VARCHAR2 (10)
)
/

CREATE OR REPLACE TYPE two_strings_nt IS TABLE OF two_strings_ot
/


CREATE OR REPLACE FUNCTION three_pairs
    RETURN two_strings_nt
    AUTHID DEFINER
IS
    l_strings    two_strings_nt;
BEGIN
    RETURN two_strings_nt (two_strings_ot ('a', 'b'),
                           two_strings_ot ('c', 'd'),
                           two_strings_ot ('e', 'f'));
END;
/


SELECT string1, string2 FROM TABLE (three_pairs ())
```

STRING1	STRING2
---------	---------

a	b
c	d
e	f

HOW CAN I USE THE FUNCTION'S RESULT SET?

Once you've nestled your function call inside the TABLE clause, you can use the result set just as you would the result set from a table or an inline view. You can join to that set, you can use columns in WHERE clauses, and you can use set operators. Here are some examples using the three_pairs function, plus this simple table:

```
CREATE TABLE string_pairs
(
    string1    VARCHAR2 (10),
    string2    VARCHAR2 (10)
)
/
BEGIN
    INSERT INTO string_pairs
        VALUES ('a', 'bb');

    INSERT INTO string_pairs
        VALUES ('cc', 'dd');
```

```
    COMMIT;  
END;  
/
```

Now I use the UNION ALL set operator, combining data from the table and the table function:

```
SELECT * FROM string_pairs  
UNION ALL  
SELECT * FROM TABLE (three_pairs ())  
/
```

STRING1	STRING2
a	bb
cc	dd
a	b
c	d
e	f

Next, I join the table and the table function together:

```
SELECT sp.string1,  
       sp.string2 sp_string2,  
       p3.string2 ps_string2  
  FROM string_pairs sp, TABLE (three_pairs ()) p3
```

```
WHERE sp.string1 = p3.string1  
ORDER BY string1  
/
```

STRING1	SP_STRING2	PS_STRING2
a	bb	b

I could even hide the fact that I am using a table function, by putting it inside a view:

```
CREATE OR REPLACE VIEW three_pairs_v  
AS  
SELECT * FROM TABLE (three_pairs ())  
/
```

```
SELECT * FROM string_pairs  
UNION ALL  
SELECT * FROM three_pairs_v  
/
```

STRING1	STRING2
a	bb
cc	dd
a	b

c	d
e	f

WHAT COLLECTION TYPES CAN BE USED?

You can use nested table and varray types defined at the schema level with a CREATE OR REPLACE TYPE statement, as shown earlier for two_strings_nt.

You can also use nested table and varray types defined in the specification of a package, but only for *pipelined table functions* (a special kind of table function).

Here is a very simple example of a pipelined table function based on a package-specified collection type:

```
CREATE OR REPLACE PACKAGE my_pkg AUTHID DEFINER
AS
    TYPE names_t IS TABLE OF VARCHAR2 (100);
    FUNCTION my_names RETURN names_t PIPELINED;
END;
/
```

```
CREATE OR REPLACE PACKAGE BODY my_pkg
AS
    FUNCTION my_names RETURN names_t PIPELINED
    IS
        BEGIN
            PIPE ROW ('Loey');
            PIPE ROW ('Juna');
            PIPE ROW ('Grandpa Steven');
```

```
    RETURN;
END;
END;
/
SELECT COLUMN_VALUE a_name FROM TABLE (my_pkg.my_names)
/
A_NAME
_____
Loey
Juna
Grandpa Steven
```

You'll see more about pipelined table functions in future articles.

Note that if you try to use a collection type that is defined locally, you will get an error:

```
DECLARE
  TYPE numbers_t IS TABLE OF NUMBER;

  l_numbers  numbers_t := numbers_t ();
  l_count    INTEGER;
BEGIN
  SELECT COUNT (*) INTO l_count FROM TABLE (l_numbers);
END;
```

/

ORA-06550: line 7, column 46:
PLS-00642: local collection types not allowed in SQL statements

FLEXIBILITY AND POWER: TABLE FUNCTIONS TO THE RESCUE

Table functions give database developers an incredible amount of flexibility and power. You can use table functions to combine the set-oriented, declarative power of SQL with the procedural control of PL/SQL to meet a variety of challenges.

Future articles will explore table function use cases, streaming table functions, and pipelined table functions. 

Steven Feuerstein is a developer advocate for Oracle, specializing in PL/SQL. Feuerstein's books, including Oracle PL/SQL Programming; videos; and more than 1,500 quizzes at the Oracle Dev Gym (devgym.oracle.com) provide in-depth resources for Oracle Database developers.

NEXT STEPS

LEARN more about PL/SQL.

EXPLORE the code used in this article at Oracle's Live SQL.