# Tax Technology on the Edge: Strategies to Improve Accuracy, Performance and Scale for Retailers

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>
> **Tim Allen**
> *Senior Tax Technology Manager, DMA*

Until recently, most businesses have deployed customer-facing technology that is geared toward transactions such as processing sales, generating invoices, and managing inventory. However, as information-empowered individuals increasingly dictate the terms of engagement, businesses must find new ways to apply IT to enhance customer interactions.

"This includes the calculation of indirect tax, especially in customer-facing scenarios such as e-commerce where a slow experience can mean the difference between a satisfied shopper and an abandoned shopping cart," said Tim Allen, Senior Tax Technology Manager, DMA.

Modernizing tax calculation and making it more responsive and localized improves customer satisfaction by providing instantaneous and accurate information about the cost of purchases. Legacy systems that calculate taxes after a completed sale frustrate customers and lead to abandoned shopping carts. A 2021 survey of more than 4,300 US adults by Baymard Institute found that the number-one cause of abandonment is higher-than-expected extra charges added at checkout. This was the leading cause of defection by more than a two-to-one margin over the second most common frustration, the need to create an account.

Improving the customer experience is now a top priority in most organizations. A Walker Information study found that executives believe experience is the most important brand differentiator, ahead of price and product. Accenture says more than three-quarters of CEOs intend to fundamentally change the way their companies engage and interact with customers.

These factors push customer experience to the top of CIOs' priority lists as well. The IDG 2022 State of the CIO research found that more than 80% of IT leaders are focusing on digital initiatives that improve customer experiences and interactions.

Yet, there is only so much they can do from the confines of a remote data center. Experience is mostly defined at the front lines of the organization. IT needs to go where the customers are. "In traditional retail, this is the point of sale (POS) in the store," Allen said. "In e-commerce, it means co-locating as much of the processing pipeline (including indirect tax calculation) with the e-commerce cart system as possible."

## Getting closer to customers

Equipping frontline employees to provide optimal customer experiences means supplying them with the tools to make on-the-spot decisions powered by data. This mandate has far-reaching implications for the way IT resources are distributed.

Cloud computing has given IT leaders a broad range of options for serving the customer—from stream data processing to machine learning and mobile apps. Yet, there are structural limitations to how effectively centralized clouds can deliver the split-second performance employees need at the point of decision.

Edge computing is a rapidly evolving IT architecture that distributes processing among a network of intelligent devices. Gartner defines it as "solutions that facilitate data processing at or near the source of data generation.

The ultimate goal is to move data collection, processing, and services to the point at which they are most effective. This enables faster decision-making and reduces risk by identifying anomalies such as mislabeling, employee errors, and credit card fraud in time to take immediate action.

## Understanding edge computing

Evolving edge strategies center on a multi-tiered architecture with each tier having a unique role. In a retail environment, for example:

- Endpoint devices like POS systems and self-service kiosks may be equipped with the intelligence to make split-second decisions that recommend cross-sell or upsell opportunities. Local servers are equipped with the functionality needed to keep the business running even if communication with the data center is disrupted.

- Indirect tax is a critical component of retail and e-commerce transaction processing. Having the intelligence either onsite or co-located with the calling systems provides speed and redundancy while minimizing the risk of errors due to out-of-date information.

- Hub servers orchestrate inventory levels across a network of regional stores to ensure adequate supply. They also aggregate transaction data from local devices for purposes such as sales reporting, anomaly detection, and tax calculation.

- Central cloud servers collect summary data from across the company so managers can analyze trends, spot opportunities for greater efficiency, and direct resources to the places of the highest impact.

- High-volume indirect tax processing benefits from having co-located edge tax intelligence to relieve the burden on central servers.

Edge is the fastest-growing segment of the cloud category with retail usage expected to increase by 580%, according to the National Retail Federation. In addition, Grand View Research says the market for edge devices and software will grow 38% annually through 2027.

Nearly 70% of enterprises have deployed, are piloting, or are researching edge computing tools, according to Network World's 2020 State of the Network survey. The phenomenon is global. The epicenter of the next few years of deployment will be Asia Pacific with nearly 38% of global infrastructure expected to be in the region by 2028, according to the Linux Foundation. Europe is expected to comprise 29% of the global footprint by 2028, with North America accounting for about 20%.

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## More than devices

Edge computing is the subject of many misconceptions—in particular, the belief that it is primarily a way to monitor devices like thermostats and security cameras. While that is one prominent use case, edge services add intelligence that enable new applications. For example, some retailers are experimenting with in-store cameras that can see the contents of customers' shopping carts and total their orders automatically without requiring a physical checkout line.

Edge platforms also aren't necessarily small. They can be full-blown data centers that support transactions, e-commerce, and interconnection across a network of locations, providing low-latency services that were previously impractical to deliver because of data volumes or bandwidth limitations. The major cloud platform providers understand the value of edge services, and all are deploying computing architectures to support them.

"One of the key components to any retail or e-commerce flow is the calculation of sales tax," said Allen. "Retailers are using edge computing to improve the customer experience in both traditional and online storefronts. Tax that is calculated on-premises eliminates bandwidth and network connectivity issues that inconvenience customers."

**Projected Epicenters of Edge Computing**

By 2028

Asia Pacific

# 38%

Europe

# 29%

North America

# 20%

Source: Linux Foundation

## Containers drive the edge revolution

A key driver of edge computing is software containers such as Docker, AWS Fargate, CoreOS, and Apache Mesos. Containers are a type of virtualized infrastructure that bundles both applications and their dependent components into a single, portable software unit. This gives developers a consistent platform on which to build applications and ensures that those applications can run anywhere that containers are supported.

Among the many benefits of containers are rapid deployment, portability, and modularity. The leading containers run on standard platforms such as Linux, Windows, and MacOS, and on everything from smartphones to supercomputers without modification. This provides organizations with significant flexibility in configuring, deploying, and modifying their application portfolios.

Nearly any software can be containerized. For example, a POS application can be bundled with relevant databases, application program interfaces, network protocols, and development tools for deployment as a unit without the need for special configuration or testing. Preconfigured containers can be stored in libraries, reused, modified, and distributed rapidly at scale. This presents IT organizations with the opportunity to rethink how processing is done and to significantly reduce the risks and bottlenecks inherent in centralized computing environments.

## A transformed business environment

Omnichannel delivery is now a necessity for nearly every business. Customers want seamless interaction with companies through their devices. They expect to receive products by whatever means they prefer—whether delivered, purchased in a store, or bought online and picked up in a store (BOPIS).

The most sophisticated retailers are beginning to actively leverage multi-channel experiences by, for example, guiding buyers to products on shelves from a mobile device or fulfilling online orders from within the store. Satisfying customers simultaneously across these multiple channels requires the careful IT orchestration that containers and edge environments allow, enabling retailers to withstand disruptions such as poor or nonexistent connectivity, and variations in the performance characteristics of endpoint devices.

Latency issues can make sending round-trip transactions to a central cloud impractical or impossible in some scenarios. That can limit a company's ability to deliver services promptly, particularly in high-volume settings. Edge networks can supply intelligence encapsulated in containers to local devices to make instantaneous decisions and update cloud servers when necessary.

"This is important to tax processing because the inability to calculate tax due to an outage or because of a slow system means not applying tax to sales—or lost sales, which reduces profitability and customer satisfaction," said Allen. "It could also result in incomplete tax calculation, directly affecting the bottom line because the retailer must still remit sales tax to relevant jurisdictions. For procurement processing in an environment of high volume and globally located ERP systems, having edge tax

intelligence co-located can reduce processing times and increase productivity. ”

Edge networks provide the scalability to accommodate surges in demand or to enable expanded or temporary outlets such as pop-up retail locations equipped with the latest versions of applications, prices, and promotions. Properly designed edge networks are managed from a centralized location, ensuring maximum control over the user's experience across all business channels.

Containers enable these capabilities by providing a means to deliver intelligence to the point of customer contact in a form factor that is rapidly and easily deployed and can be updated almost immediately.

Containerized applications can operate independently and exchange data with central clouds as connectivity permits in the same way that smartphone apps run locally and communicate occasionally with the cloud for updates and storage.

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Containerized software can run on any standalone device, with autonomous operation and rapid reconciliation with a central cloud when conditions permit. Together, autonomous operation and rapid reconciliation capabilities enable resiliency so unpredictable environmental factors don't disrupt the pace of business. They also ensure that changes to policies and configurations—specifically in regard to sales tax, rate changes, or changes to product taxability such as sales tax holidays—can be distributed to all the applicable endpoints in a timely manner. Doing so means the user's experience can be customized, such as for geographic region, while remaining uniform across business channels.

## Tax advantages

Containerized tax calculation enables organizations to support modern, frictionless omnichannel models for retail and e-commerce, maximizing flexibility and minimizing risk. As organizations containerize their frontline applications such as POS, credit card processing, and inventory management, they should consider also modernizing tax calculation.

Containerized tax modules can be easily integrated with other operational applications to compute tax at the point of the transaction. This combination allows large amounts of transaction data to be processed where it is needed, with tax content optimized for local regulations.

Tax calculators can be customized to the location, size, and type of business. Tax software running at the store level can act as backup to a central system in case of a network outage. Individual retail stores can run independently of each other and send aggregated data to central servers over a secure connection.

In an e-commerce scenario, multiple tax engines can be deployed in parallel to ensure consistent performance during peak traffic times. If data processing is spread across multiple data centers and cloud regions, tax engine containers can be updated with zero downtime.

The result is that tax determination is accelerated with less risk of errors that could trigger refunds or penalty payments. This solution scales to whatever size an organization needs, with complete consistency across the infrastructure. Tax determination is also resistant to fluctuations in internet quality and availability. Checkout lines keep moving, regardless of the quality of connection.

Another advantage to edge computing is consistency. This is important in omnichannel; all channels will be using the same tax engine to calculate tax and ensure it is consistent, regardless of the method of customer purchase—including in-store, curbside, and delivery.

Computing tax at the edge provides for more accurate tax estimation and protects against system failures by enabling tax computation to continue if central servers are down. The approach scales faster by unburdening servers from the tax workload. Furthermore, tax calculation at the edge can be customized to local laws, exceptions, and tax holidays—enabling more accurate reporting and reducing the risk of errors. Mistakes can be more quickly spotted by local managers and fixed without extensive delays.

"In a customer-facing e-commerce environment, latency at any point can affect customer satisfaction and sales," said Allen. "Implementing edge tax processing into the e-commerce flow allows the business control over latency and reliability."

The combination of edge infrastructure and software containers improves overall efficiency, security, and scalability. Containers can be configured to automatically scale up and down based on demand, improving both reliability and customer experience.

## Summary

The taxation landscape has never been more complex. Each jurisdiction has its own rules, which change constantly. Vertex reported that in the first six months of 2021, 127 new district taxes and 23 new city taxes went into effect in the US, followed by 54 city rate changes in July 2021. For companies doing business internationally, complexity is increased by orders of magnitude.

Containerizing tax calculation in an edge-computing architecture enables organizations to accommodate these changes and deploy them to any device in the field rapidly, securely, and reliably. They can assure customers that tax applied to the sale is current and accurate while providing reporting that customers can take to the bank. Tax calculation is part of the overall experience that keeps customers coming back.

"In the competitive world of retail and e-commerce, every advantage is needed to keep customers satisfied and returning," said Allen. "Incorporating edge tax processing into the customer-facing sales flow improves the customer experience by providing a quick POS or e-commerce cart experience."

**Click here to learn more about how edge computing and containers can help your retail business improve the customer experience.**

DMA is a corporate tax advisory with offices in North America and Europe that has been assisting retailers with tax administration for decades. It has helped many clients navigate the implementation of better systems for tax calculation.

## About Vertex

Vertex is a leading global provider of indirect tax software and solutions. The company's mission is to deliver the most trusted tax technology enabling global businesses to transact, comply and grow with confidence. Vertex provides solutions that can be tailored to specific industries for major lines of indirect tax, including sales and consumer use, value added and payroll. Headquartered in North America, and with offices in South America and Europe, Vertex employs over 1,300 professionals and serves companies across the globe.

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