Overview

World Wide Technology and MobiledgeX are enabling customers to accelerate global mobile edge computing deployments at scale utilizing certified infrastructure that is immediately ready to monetize by fulfilling next-gen application and device requirements for developers worldwide.
Who We Are

World Wide Technology is a technology solution provider with $12 billion in annual revenue serving more than half of FORTUNE 100 companies.

Founded in 1990, WWT boasts over 6,000 employees and is the No. 1 partner for Cisco, Dell EMC, NetApp, VMware, HPE, F5, Intel, Palo Alto, Fortinet, Pure Storage and Infoblox. WWT has been recognized by Fortune and Glassdoor for being a great place to work.

WWT operates over 4 million square feet of warehousing, distribution and integration space in more than 20 facilities throughout the world, with international sales of more than $2 billion.

VISION
To be the best technology solution provider in the world.

MISSION
To create a profitable growth company that is also a great place to work.

CORE VALUES: THE PATH
- Trust
  In character and competency
- Humility
  Stay grounded; never forget where you come from
- Embrace Change
  Diversity of people and thought
- Passion
  A strong work ethic
- Attitude
  Be positive and open-minded
- Team Player
  Proactively share ideas
- Honesty and Integrity
  Adherence to high standards

REVENUE GROWTH
With $12B in annual revenue, WWT is a financially strong, privately held technology solution provider.

STRATEGIC PARTNERSHIPS

ADVANTAGE PARTNERSHIPS

Pivotal  redhat  info\al\to splunk  TANiUM
The foundation of WWT’s success is its culture and core values. In order to support our culture we adopted a set of core values that center us in our relationships with employees, customers and partners. We refer to these core values as The Path and take every opportunity to reinforce The Path’s importance in our effort to deliver value to our customers and create a great place to work for our employees.
Executive Summary

WWT’S CORE BUSINESS MODEL ADDRESSES THE LIMITATIONS AND CHALLENGES THAT ARISE WHEN OEMS WORK DIRECTLY WITH SERVICE PROVIDERS.

WWT’S GO-TO-MARKET STRATEGY

WWT supports global service providers, enterprise and public sector customers by managing the planning, procurement and deployment of their technology and supply chain requirements. Understanding the complexities of our customers’ internal environment is key, especially as requirements continue to change and market demands grow.

WWT’s go-to-market strategy focuses on helping customers achieve greater agility in order to develop sustainable revenue growth. As a demonstration of this, WWT has successfully partnered with many of the world’s largest companies to improve their agility across logistics functions and core operations, enabling expansion efforts and resulting in successful outcomes.

HOW WWT’S GLOBAL SUPPLY CHAIN IMPROVES TECHNOLOGY INTEGRATION AND DEPLOYMENT

WWT understands the key challenges that face our service provider, enterprise and public sector customers, including the need to get to market faster with differentiated offerings, improve customer satisfaction, boost productivity and transform the experience of employees. WWT provides foundational support to:

SIMPLIFY global supply chain and systems integration.

DECREASE the total cost of supply chain processes, limit inventory liability exposure, reduce infrastructure inventory footprint and lower lead times for delivery to customer locations.

IMPROVE operational reporting and analytics, and enable OEM price changes to be realized immediately.

HISTORY OF WWT

Forward-thinking, innovative leadership has been a hallmark of WWT since being founded in 1990 and is a key driver behind our remarkable growth trajectory.

From our early days as a key supplier for Southwestern Bell to our growth as a top federal prime contractor for the U.S. government and partnering with industry-leading OEMs, we have continuously listened to customers to best meet their evolving needs.

Investments made in our Advanced Technology Center (ATC) and global integration centers were ahead of their time and have positioned us as a partner service providers can utilize to advise, deploy and deliver next-generation technology platforms.

Our pursuit of becoming the best technology solution provider in the world is never ending. Thus, we are constantly looking toward the future, monitoring the latest technology and industry trends to find ways to improve and best serve organizations along their digital transformation journeys.
WWT and MobiledgeX continue to collaborate in WWT’s ATC to develop validated edge architectures designed to create new 5G revenue streams for service providers by delivering industry vertical applications to their customers via their MEC platform.

ACCELERATE MOBILE EDGE COMPUTING DEPLOYMENTS AND POWER 5G PROFITABILITY

Deutsche Telekom-founded MobiledgeX helps operators make edge infrastructure widely accessible and easy to use for third parties by aggregating the capacity and processing power of existing 4G and new 5G infrastructure to rapidly roll out nationwide edge networks to support innovative new mobile services.

WWT and MobiledgeX are accelerating commercialization of scalable MEC deployments by validating edge infrastructure being evaluated and implemented by the global operator community to enable mobile operators to quickly and confidently deploy edge services at a global scale to meet the requirements of next-gen applications and devices.

Demand for MEC is expected to grow for a wide range of applications as the increased bandwidth and decreased latency of 5G enables more data to be processed at the edge of a network rather than the cloud.

“Service providers across the globe are under intense pressure to deploy 5G infrastructure while ensuring they can monetize their 5G investment,” said Joe Wojtal, WWT CTO for Global Service Providers. “WWT’s partnership with MobiledgeX will allow service providers to commercialize scalable MEC deployments via validated blueprints available from WWT’s global integration centers.”

Service providers can leverage the partnership between WWT and MobiledgeX to deliver 5G-based services via applications running on MEC platforms and consumed by hardware and software deployed on customer-premise equipment (CPE). The blueprints for these solutions are validated in WWT’s state-of-the-art Advanced Technology Center (ATC) and take advantage of WWT’s deep integration and deployment expertise through its global integration centers.

“Innovation is vital for service providers to play a key role in the 5G economy, especially as they’re under pressure to move quickly while limiting costs,” said Jason Hoffman, CEO of MobiledgeX. “5G deployments require scale and low latency to provide cost savings and fast speeds, and MEC serves as a key piece in delivering that. WWT’s ATC and global integration centers help bring it all to life.”
Diversity and Corporate Responsibility

WWT is proud to be a nationally certified minority-owned business enterprise (MBE) with award-winning supplier diversity and corporate social responsibility (CSR) programs.

OVERVIEW

Our Global Community Impact program is one of the main ways we give back and support the community around us. WWT conducts business with the highest degrees of ethics and integrity while following all applicable laws, regulations and company policies. We are proud to be a nationally certified Minority-owned Business Enterprise (MBE) with an award winning Supplier Diversity Program.

SUPPLIER DIVERSITY TOTAL WWT YEARLY SPEND

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Spend</th>
<th>Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>$305 million</td>
<td>294 suppliers</td>
</tr>
<tr>
<td>2018</td>
<td>$276 million</td>
<td>322 suppliers</td>
</tr>
<tr>
<td>2017</td>
<td>$355 million</td>
<td>344 suppliers</td>
</tr>
<tr>
<td>2016</td>
<td>$389 million</td>
<td>304 suppliers</td>
</tr>
<tr>
<td>2015</td>
<td>$258 million</td>
<td>224 suppliers</td>
</tr>
</tbody>
</table>

2019 WORKFORCE DIVERSITY HIGHLIGHTS

- 28% Women and 20% Minority
- Total Employee Count 2019: 5,725
- Total Number of Women 2019: 1,626
- Total Number of Minorities 2019: 1,130

AWARDS

- Mountain Plans Minority Supplier Development Council Class 4 Supplier of the Year
- Mountain Plans Minority Supplier Development Council MBE to MBE Award
- Dallas-Fort Worth Minority Supplier Development Council Sapphire Award
- Houston Minority Supplier Development Council Cutting Edge Award
- Vistra Energy Supplier of the Year Award
- Mid-States Minority Supplier Development Council Top MBE to MBE Award
- Houston Minority Supplier Development Council Supplier of the Year
- Western Region Minority Supplier Development Council All Money is Green Award and Cornerstone of the Year
SUPPLIER DIVERSITY

WWT purchases products from diverse suppliers, including professional technology resources, technology cables, technology materials, software, hardware products and transportation.

NUMBER OF SUPPLIERS IN EACH CLASSIFICATION

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minority-owned (MBE)</td>
<td>43</td>
</tr>
<tr>
<td>Woman-owned (WBE)</td>
<td>54</td>
</tr>
<tr>
<td>Disabled Veteran (DVBE)</td>
<td>8</td>
</tr>
<tr>
<td>Small Business (SB)</td>
<td>222</td>
</tr>
<tr>
<td>Veteran-owned (VOSB)</td>
<td>10</td>
</tr>
<tr>
<td>Disabled Veteran (DVBE)</td>
<td>5</td>
</tr>
<tr>
<td>Small Disadvantage Business (SDB)</td>
<td>52</td>
</tr>
<tr>
<td>8a</td>
<td>5</td>
</tr>
<tr>
<td>HUBZone (HZ)</td>
<td>4</td>
</tr>
<tr>
<td>Woman-owned Small Business (WOSB)</td>
<td>42</td>
</tr>
</tbody>
</table>

SNAPSHOTS OF DIVERSE FIRMS

INSPIRED SOLUTIONS

Inspired Solutions is a Minority Woman and Service-Disabled Veteran-Owned small business that provides world-class Information Technology (IT) and cybersecurity solutions to meet the business and operational needs of their customers. Inspired Solutions has proven experts in the areas of information technology, cybersecurity, audio/visual design and installation, inside and outside plant installation and management, program and project management and strategic supply chain management. Inspired Solutions’ expertise covers Layer 1 Cabling Audio/Visual, Collaboration, Risk Mitigation, Managed IT Services and Mobility services.

MIND SAFETY MANAGEMENT (MSM)

Mind Safety Management is a business consulting services firm that draws upon more than 30 years experience providing business solutions for a broad spectrum of individual and multiple clients. Mind Safety makes significant investment in their community, while providing mentors to business entrepreneurs and high school students. Chief Executive Officer and Co-Founder Ralph Thompson has been an influential member in the St. Louis community and looks to continue these efforts while growing MSM’s footprint in the commercial and federal space.

COMMUNITY

BEYA

WWT Chairman Dave Steward and the Corporate Development Program (CDP) team participates in the annual Black Engineer of the Year Awards (BEYA) in Washington, D.C. BEYA features the largest gathering of Science, Technology, Engineering and Math (STEM) professionals, corporate sponsors, students, and top military and civilian federal government leaders — all committed to increasing the percentage of people from historically underrepresented communities in the STEM workforce. This important objective aligns closely with a core value at WWT — embracing diversity of people and thought.

NPOWER

NPower creates pathways to economic prosperity by launching digital careers for military veterans and young adults from underserved communities. They accomplish this goal by teaching students in-demand digital and professional skills and encouraging corporations, volunteers and nonprofits to invest in the long-term success of those students.

NAF

NAF is a national network of education, business and community leaders working together to ensure high school students are college, career and “Future Ready.” They accomplish this by infusing learning environments with STEM and industry-specific curricula, all accompanied by work-based learning experiences like internships. WWT’s partnership with NAF advances strategic initiatives to amplify this type of transformative work-based learning throughout the country.
5G Enablement

WWT is focused on providing service providers with support across 5G’s major solution areas. In doing so, we will leverage our strong relationships with leading OEMs, ability to provide services that cover 5G architectures from end to end, resources to help service providers accelerate time to revenue, an integrated approach to software and hardware solution development and a proven model for supporting the entire technology infrastructure.

WWT’s 5G Solution Areas: From the Radio Through the Core

1. CONNECTED DEVICES
   - 5G Enabled Devices
   - IoT Gateways
   - Access (uCPE, SD-WAN)

2. RADIO NETWORK
   - Small Cells and Densification
   - Macro Cell
   - cRAN and vRAN

3. TRANSPORT NETWORK
   - Deep Fiber Investments
   - Microwave and Fiber BH
   - Carrier SDN
   - MPLS, CE and DWDM

4. DATA CENTER
   - NFVI Platforms with vEPC, vIMS and 5Gi-LAN
   - SDN Controllers
   - MEC Platforms with VNFs

5. AUTOMATION & ORCHESTRATION
   - MANO
   - DevOps
   - Continuous Integration/Continuous Delivery (CI/CD)

Creating the 5G Roadmap

WWT’s 5G strategy builds on a vision of enabling customers to cost-effectively accelerate time to revenue by validating with speed and integrating at scale complex multi-vendor solutions.

The objective is to help our customers capture the opportunity to be first to market, driving new revenue streams and creating economies of scale. To take advantage of this opportunity, customers must develop new business models and conceptualize new forms of revenue generation. WWT provides a framework for envisioning, integrating and activating products and services that will thrive on 5G’s revolutionary speed and low latency.
WWT’s Global Reach

With international sales making up approximately 10% of total revenue, WWT now operates more than 4 million square feet of warehousing and distribution facilities around the world, as well as more than 250,000 square feet of staging and integration space. WWT is also importer of record for more than 41 countries and serves over 200 customers globally.

WWT’s Global Integration Centers are climate-controlled production environments with advanced networking, secure remote access and certified procedures specifically designed for configuring, kitting, testing and staging the latest advanced technology solutions.

**NORTH AMERICAN INTEGRATION CENTER: ST. LOUIS**

The North American Integration Center, located in St. Louis, Missouri, operates more than 250,000 square feet of secure integration space with the capacity to simultaneously configure and integrate thousands of systems per week.

**EUROPEAN INTEGRATION CENTER: AMSTERDAM**

The Amsterdam-based Integration Center provides a range of services to support customer projects and programs. It also offers lab services, including rack and stack, cabling, configuration and custom crating for systems shipment.

**ASIAN INTEGRATION CENTER: SINGAPORE**

WWT’s Integration Center in Singapore includes flexible integration space, and enables new innovation workstreams and collaboration opportunities while accelerating the development of new supply chain solutions and capabilities for the region and beyond.

**ASIAN INTEGRATION CENTER: MUMBAI**

WWT expanded its global footprint in Asia by opening its Mumbai integration center in September 2019. This 10,000-square-foot facility combines the latest technology in data analytics, multicloud, storage, networking and the Internet of Things, and allows customers to build and manage IT infrastructures easily and effectively without risk.
Transformation Through Innovation: Delivering Business and Technology Results from Idea to Outcome

SINCE 1990, WWT HAS EDUCATED COMPANIES ON HOW TECHNOLOGY CAN DRIVE EFFICIENCY AND SCALE WITHIN THEIR ORGANIZATION.

WWT’s early experience with architecting complex infrastructure solutions established credibility within organizations, but it was WWT’s willingness to look beyond the technology and drive to an organization’s desired business outcomes that solidified WWT as a consultative partner.

This shift in role has resulted in WWT taking the lead on transformation initiatives for numerous Fortune 500 companies and government entities. For each of these customers, WWT leveraged our Idea to Outcome methodology outlined here. The central premise of the methodology is to establish an environment that allows companies to push themselves past the status quo and disrupt their legacy way of doing business.

WWT first helps stakeholders articulate their ideas, then refine the scope to a viable solution and finally create a business and technology roadmap that quickly delivers the desired results and fully optimizes the investment. This is WWT’s unique value — the ability to lead organizations through both the planning and the execution phase of their transformation.

WWT’S LIFECYCLE APPROACH ADDRESSES CUSTOMERS CHALLENGES

WWT UNDERSTANDS THE FAST MOVING, COMPETITIVE AND COMPLEX SERVICE PROVIDER ENVIRONMENTS. WWT recognizes customers face challenges propelled not only by digital transformation, but also changes associated with the consumption patterns of subscribers and the need to quickly implement 5G infrastructure at scale.

WWT’S Value Proposition and Core Capabilities

WWT’s value proposition enables service providers to cost-effectively accelerate time to revenue by more efficiently consuming next-generation technology with validated, multi-vendor solutions on a global scale.
Today, companies need to find new ways to get to market faster, disrupt the status quo, optimize operational models and create experiences their employees and consumers desire. Companies know they must embrace digital, but often start the process at the end — with prescriptive technology. WWT starts with the customer, leveraging digital technologies to help companies create experiences that go beyond the ordinary. WWT applies cross-functional practices in the areas of research and insight, creative services, omnichannel planning, experience prototyping and application dependency mapping to develop digital transformation solutions.

Innovation Labs reside within the Advanced Technology Center which is a physical campus of buildings and labs that are virtualized and accessible to customers, partners and employees around the world via a proprietary hyperscale cloud portal. The lab consists of $500M+ in technology infrastructure, 500+ racks of equipment and more than 1,000 integrated systems demonstrations. WWT’s ATC teams have extensive engineering experience and utilize lab testing best practices and rigorous methodologies to ensure sound decision making without compromising on project schedules and requirements.

WWT’s global integration centers are climate-controlled production environments with advanced networking, secure remote access and certified procedures specifically designed for staging, kitting and configuring the latest advanced technology solutions. WWT operates four global integration centers — in St. Louis, Amsterdam, Mumbai and Singapore — that are staffed with certified engineers whose logistical and technical expertise help reduce the risk, cost and complexity of IT deployments.
Digital Transformation

As a Gartner Top 20 Digital Business Consultant, WWT is a trusted advisor to service provider, enterprise and public sector customers that can solve a wide range of digital transformation challenges. WWT’s expertise in creating and executing digital strategies can enable customers to deliver consistent digital experiences across multiple lines of business that create a unified brand solution.

Strategy and Execution

WWT understands that service provider’s approach to transforming areas such as customer experience and workforce productivity must align with the organization’s business strategy. To support both our customers’ strategic planning and execution of digital transformation initiatives, WWT’s resources and capabilities, along with our strategic OEM partnerships, creates a differentiated model that includes planning, design, deployment and adoption.

Empower Employees to Engage your Customers

A successfully executed digital strategy will not only create a work experience that is connected, collaborative and enables employees to engage with customers when and where they want, but it will also provide a consistent experience for multiplay customers that drives brand loyalty.

WWT’s Integration Expertise

Digital transformation is intense and can be overwhelming if not well planned out and implemented. Isolated legacy systems and over-populated data lakes across multiple lines of businesses limit an organization’s ability to transform business processes. WWT’s extensive experience in platform integration and automation will enable consolidated business work streams to help our customers solve for these issues.

Digital Workshop

WWT’s Digital Workshop helps customers develop and accelerate transformational experiences across the network of digital focus areas.

By working collaboratively with WWT experts to identify isolated systems and gaps, customers develop a roadmap, from idea to outcome, to overcome their strategic challenges.

WWT also helps customers develop their engagement plan, integrate technology systems and deploy the right architecture for their business.
TRANSFORMING CUSTOMER AND EMPLOYEE EXPERIENCES

Today, innovative applications and services are both enhancing and transforming customer and employee experiences. WWT’s Digital Consulting Group helps service providers integrate strategic and technical services that help their customers navigate digital transformation. Areas of focus include:

CUSTOMER EXPERIENCE

Customer perception is a company’s brand lifeblood. WWT integrates legacy and digital systems, as well as optimizes processes to deliver omnichannel, customer-aware experiences.

RETAIL EXPERIENCE

Storefronts are high-touch extensions of the customer experience and represent untapped revenue potential. WWT can create sophisticated designs to delight and upsell customers.

EMPLOYEE EXPERIENCE

By utilizing process automation across platforms to streamline employee onboarding and day-to-day workflows, WWT can help empower employees to deliver great customer experiences.

DIGITAL WORKPLACE

WWT can foster productivity by creating a work experience that is connected and collaborative, giving employees access to the applications they need on the devices they use anywhere in the world.

FAN EXPERIENCE

WWT can deliver next-generation, immersive fan experiences that create incredible encounters, including virtual and augmented reality, to transform the fan of the future and drive new revenue streams.

INTERNET OF THINGS

WWT can apply IoT solutions to connect the unconnected and derive actionable insight from the integration of devices and sensors with software and analytics to drive strategic business outcomes.

ATC CONNECT

DIGITAL AND PHYSICAL INTERACTIONS THAT DEEPEN EMPLOYEE AND CUSTOMER EXPERIENCE

ATC Connect provides instant and dynamic access to information while connecting on the go with WWT engineers and application developers or on-site at WWT’s global headquarters for hands-on learning.
**Global Integration Centers**

WWT TARGETS AND OPTIMIZES CORE SUPPLY CHAIN OPERATIONS BY APPLYING METHODOLOGIES BASED ON THE CONCEPTS OF LEAN AND AGILE, THAT PRIORITIZE THE REDUCTION OF WASTE AND INEFFICIENCY.

**OPTIMIZING OEM FULFILLMENT**

Supply chain management combines technology, logistics and information to help organizations decrease product lead time and increase fulfillment predictability. WWT’s expertise in global supply chain management enables customers to execute technology refresh programs in an efficient and cost-effective manner, so its teams can focus on enabling the business to achieve its objectives.

**WWT FULFILLMENT OPTIMIZATION ACTIVITIES**

- Order Management
- Lead Time Management
- Inventory Management and Forecasting
- Inventory Reporting and Visibility
- Dead on Arrival/Shipping Damage
- Shortage Management
- DSI (Days Supply of Inventory)
- Procure to Demand (Just in Time)
- Historical Usage Pattern
- Customer-Provided Forecasts
- Firm Orders in the System
- Existing Purchase Orders Placed

**MATERIAL PLANNING**

WWT’s material planning process accounts for fluid Bills of Material (BOMs) and bridges the gap between procurement and engineering teams. By analyzing historical BOM data WWT identifies patterns in each customer’s supply chain and develops a plan for advanced stocking of product.

**GLOBAL SUPPLY CHAIN RESULTS**

- Simplify global supply chain
- Decrease total cost of supply chain
- Decrease inventory liability exposure
- Decrease DC inventory footprint
- Immediately realize price changes
- Decrease lead times for delivery to customer DCs
- Maintain (or add) value-added services
- Perform customer ERP planning functions
- Improve reporting and analytics
**INTEGRATION CENTER SERVICES**

WWT’s Integration Centers meet the highest industry standards for quality control, secure supply chain services and inventory management. Work instructions for each customer engagement are documented in our quality system and electronically tracked on a per-asset basis. Individual components and integrated systems are fully tested prior to delivery, lowering the risk of hardware failures in our customers’ production environments.

**ASSET MANAGEMENT:** Asset Tagging, System Tagging, Serial Control, Custom Labeling, Reporting, Configuration Records, RFID Tagging, Color Coding and B2B Integration

**IMAGING AND CONFIGURATION:** Mobile Devices, Desktops & Laptops, Servers, Blade Enclosures, Router & Switch, Printers, Multimedia Devices, Thin Clients and Phones

**RACK INTEGRATION:** Custom Rack Building, Diagnostics, Cable Management, Custom Crate Building, Driver Maintenance, Physical Design, Consulting & Engineering, Custom Labeling and Devices/Cable

**TESTING AND BURN-IN:** Device Inspection, 24/48/72 Hour Burn-In and Device Performance

**COMPONENT INSTALLATION:** Standard, PC & Laptop, Servers, Network and Printers

---

**WWT’S RACK BUILD SERVICES**

Many customers utilize WWT’s Integration Centers to build integrated rack solutions, at scale, for deployment to locations across the globe. These solutions combine technology from leading manufacturers to function as pre-configured technology platforms. Using WWT’s rack build services can increase deployment speed and reduce field engineering costs by up to 40%.

**WWT METHODOLOGY**

WWT’s best practices for the integration of fully assembled, cabled and tested racks focus on:

- Uniformity and Consistency
- Organization and Planning
- Cabling
- Proper Tightness and Spacing of Hardware
- Preparation for Shipment

**RACK INTEGRATION GENERAL WORKMANSHIP**

WWT’s general workmanship approach maintains consistent processes in order to deliver an aesthetically pleasing finished product. Consideration for the aesthetics of the finished product benefits functionality and longevity. For instance, unorganized cables that restrict airflow can heat up and reduce equipment performance and shorten the overall lifespan of a rack.

WWT operates more than 250,000 square feet of secure integration space with the capacity to simultaneously configure and integrate thousands of systems per week.
Mobility RAN Experience

WWT PROVIDES A SCALABLE SUPPLY CHAIN PROGRAM WITH THE ABILITY TO FLUCTUATE WITH DEMAND ENABLING CUSTOMERS TO BUILD A COST EFFECTIVE MODEL FOR SERVICE PROVIDERS.

FLEX AND SCALE TO SUPPLY CHAIN RADIO ACCESS NETWORK (RAN) DEMAND

With over 4 million square feet of warehousing and technical labs globally, as well as dedicated subject matter experts, WWT is able to help flex and scale to demand through the installation and deployment of fully configured outdoor cabinets and platforms deployed to site.

WWT manages Radio Access Network (RAN) equipment for several Tier 1 service providers generating annual savings through acceleration of deployments and reduction in Capital in Progress (CIP).

WWT BUILD SERVICES

WWT collaborates with customer engineers to provide innovative solutions in their Integration Services Lab. WWT continues to add scope to the builds as the quality, standardization and efficiency of having tasks completed in factory as opposed to the field are recognized resulting in direct savings.
BUILD PROGRAM: WALK IN CABINET (WIC)

WWT’s WIC Build Program delivers a fully wired and integrated cell site that is ready for install when it reaches the field.

WIC INTEGRATION SERVICES HIGHLIGHTS

- Reduces costs and cycle time while providing quality and consistency to the network.
- Creates savings versus traditional cell site install.
- Supported Flex 21 and WUC (walk-up-cabinets) solutions for high-rent relocation efforts.
- 100% WWT on-time delivery on confirmed delivery dates.
- 99.5+% quality on builds.

WWT’S NEXT GENERATION 5G CAPABILITIES

WWT continues to invest in its Advanced Technology Center (ATC) lab environment for our service providers and partners to leverage for testing and evaluating next generation solutions. WWT built a Virtual Central Office (VCO) lab environment that contains a live vRAN environment based on Altiostar’s next generation architecture and additional software from Affirmed Networks, F5, Cumulus and Linux.

WWT’S PARTNERSHIPS AND LAB CAPABILITIES

WWT has made significant investments in people, partnerships and technology to help service providers fundamentally transform themselves in a virtualized 5G world. WWT’s extensive experience and capabilities with Network Function Virtualization (NFV), VNF testing, service chain validation and 5G-specific capabilities ensure our customers have a trusted advisor when making this network transition. WWT’s 1,200 partner ecosystem means there is a partner and solution when and where our customers need it.

VALUE ADDED CRAN DEPLOYMENTS

With hundreds of thousands of telephone and utility poles targeted for 5G deployment over the next several years, service providers must centralize and standardize the design, integration, kitting and deployment of kit to these individual sites to realize cost efficiencies and ensure product integrity. Through WWT’s centralized staging approach, we can provide a one-stop shop to address all of these needs for our service provider customers.

LOOKING AHEAD: SUPPORT FOR 5G

WWT is strategically positioned to enable service providers with large scale testing, staging, supply chain and fulfillment services to enable a smooth transition from a 4G LTE to 5G network architecture. Our strategic partnership with industry-leading and emerging 5G OEMs enables service providers to successfully roll out these next generation platforms.
Advanced Technology Center (ATC)

THE ATC IS A PHYSICAL CAMPUS OF BUILDINGS AND LABS THAT ARE VIRTUALIZED AND ACCESSIBLE TO CUSTOMERS, PARTNERS AND EMPLOYEES AROUND THE WORLD VIA A PROPRIETARY CLOUD PORTAL.

ATC LABS

The ATC helps customers accelerate value and innovation by supporting the product evaluation, testing and design phases of enterprise IT initiatives. With best-in-class testing tools, public cloud integration and hooks into major SaaS providers, the ATC has seen more than 10,000 customer engagements since opening in 2013. WWT’s ATC teams have extensive engineering experience and utilize lab testing best practices and rigorous methodologies to ensure sound decision making without compromising on project schedules and requirements.

PROOF OF CONCEPT

Proof of concept environments enable customers to evaluate the introduction of new technology and upgrades to existing investments in order to determine effects and forecast outcomes relative to desired business objectives. Proofs of concept use infrastructure from the ATC’s pre-built environments, as well as hardware and software from strategic partners and OEMs to facilitate accelerated testing.

ON DEMAND

On-demand environments provide exposure and learning opportunities to engineering teams. WWT has more than 1,000 product or integrated solution demonstrations and can quickly spin up sandbox environments for training exercises.

FULL STACK REPRESENTATION

WWT provides validation lab services that mimic customer infrastructure, from compute through networking, to quickly create a full-stack representation of their production environment.

PROOF OF CONCEPT

Proof of concept environments enable customers to evaluate the introduction of new technology and upgrades to existing investments in order to determine effects and forecast outcomes relative to desired business objectives. Proofs of concept use infrastructure from the ATC’s pre-built environments, as well as hardware and software from strategic partners and OEMs to facilitate accelerated testing.

LAB AS A SERVICE

WWT’s Lab as a Service (LaaS) offers dedicated lab resources and is built to suit customer performance, security and access requirements. LaaS facilitates rapid prototyping and provisioning of multi-OEM topologies for evaluation, testing and proofs of concept.

LAAS TO SUPPORT THE TECHNOLOGY LIFECYCLE

The ATC can be utilized to bridge the gap between equipment validation, certification and deployment. By combining lab services with supply chain and integration operations, customers can add substantial velocity to their refresh of legacy environments, as well as new infrastructure deployments, eliminating common bottlenecks that can constrain project schedules.

ATC FAST FACTS

The ATC is one of WWT’s most strategic differentiators and largest investments. What started as a single data center lab has evolved into multiple buildings hosting hundreds of IT racks at the company’s headquarters in St. Louis.

- **300+ RACKS OF EQUIPMENT**
- **250 INTEGRATED SYSTEMS DEMONSTRATIONS IN WWT’S NEW DIGITAL PLATFORM**
- **$500M+ IN TECHNOLOGY INFRASTRUCTURE**
HOW WWT’S ATC LAB SERVICES ENABLE SERVICE PROVIDERS TO ACCELERATE TIME TO MARKET AND REDUCE COSTS

Service providers use WWT’s Lab as a Service (LaaS) offering to create dedicated lab resources, built to meet their performance, security and access requirements. These resources enable the rapid prototyping and provisioning of disaggregated multi-OEM architectures. In creating their LaaS environments customers can utilise numerous ATC labs, including:
- DevOps and Automation Lab
- Public Cloud Integration Lab
- Security Lab
- Testing Automation Lab
- Artificial Intelligence Lab
- Branch Lab

USE CASE: MULTICLOUD AND MOBILE EDGE COMPUTING LABS IN THE ATC

WWT’s ATC provides service providers and their customers with an environment that provides complete control over data. Service providers can achieve data sovereignty and end-to-end security for both data and meta-data for their critical business applications, whether they reside in their data centers, NCF such as Equinix, or through public cloud providers, including AWS, Microsoft (Azure) and Google (GCP). Utilizing the Equinix facility in Ashburn, VA, WWT can employ the ATC to support multi-cloud Proofs of Concept to help service providers and their customers explore ways to migrate from a private cloud model to a multicloud platform using multiple cloud providers and service providers edge scenarios.

The ATC helps customers bring apps and data closer to their users by interconnecting with clouds locally, with data and security services at the intersection points.
Delivering Proven Solutions for 5G and MEC in Vertical Markets

WWT’s validation services with Intel and MobiledgeX focus on delivering optimized and certified reference architectures for vertical markets.

**Healthcare**

**Telco-Cloud Type:** The healthcare industry is under pressure to increase and optimize patient and physician experience while leveraging state-of-the-art technology and innovating around improving treatment outcomes. An integrated market place with AI capabilities, alongside dense compute and storage footprint, coupled with faster and low latency networks delivered by 5G, will drive the revolution in patient experience and IoT-enabled services, allowing doctors to monitor patients in a cost efficient manner.

**Utilities**

**Ruggadised Edge:** Major technology, market and policy changes are driving utilities to digitize and automate their core service delivery business, while also pursuing strategic initiatives, such as grid modernization and energy affordability. 5G network slicing and massive IoT will enable full end-to-end smart grid monitoring with real-time predictive maintenance analytics and automation.

**Manufacturing**

**Deep Device Integration, Computer & GPU Heavy:** For manufacturers, MEC can impact numerous areas, including secure edge processing, hosting latency-sensitive applications and the management of devices, such as smartphones, headsets, sensors, robots and drones, and the ability to securely provision and de-provision devices, locate and track devices, monitor device usage and support data fencing and ownership.

**Retail**

**Storage and GPU Heavy:** In the omnichannel world, points of failure have increased significantly between silos of data and disparate systems. Revenue and consumer loyalty are at stake. WWT brings together cross-functional practices to quickly integrate and activate solutions. 5G will enable real-time analytics everywhere, previously only seen in online retailers.
5G USE CASE: AUTONOMOUS VEHICLES

The automotive industry is rapidly moving toward a future where intelligent, connected vehicles avoid collisions and let people drive completely autonomously.

WWT can support organizations working to address the challenges facing the automotive industry’s effort to enable autonomous driving.

As companies bring new software features to market at a high pace using new business models, WWT can provide unique resources and capabilities that advance these organizations business objectives.

WWT’S APPROACH

From the very beginning of an IoT initiative, WWT works hand-in-hand with our customers through a series of consultative ideation sessions and workshops to solicit ideas and jointly create the outcomes the business is trying to achieve. From there, we collaborate with our clients to design, build and ultimately deploy the IoT solution.

CORE CAPABILITIES

WWT has expertise in the fields of sensor analytics and IoT that prove valuable to 5G use cases, such as autonomous driving:

- Connected Devices
- Edge Analytics
- Location Analytics
- Monitors, Alerting

KEY WWT RESOURCE: WWT’S ANALYTICS AND DATA SOLUTIONS

Companies working to become dedicated, long-term partners to vehicle manufacturers need to clearly demonstrate how they can help the automotive industry achieve success in selling self-driving vehicles. WWT understands success depends on more than demos. Customers expect their self-driving cars to work in daily life.

WWT’s value proposition focuses on helping companies translate the requirements for advanced driver assistance systems and automated driving into technical requirements that can be utilized to create analytical and data solutions that advance capabilities.
*Edge Enabled SD-WAN Design Labs*

SD-WAN is core to network slicing, multicloud network fabrics and data and meta-data real-time mesh networking. WWT can help customers compare and contrast products from different SD-WAN vendors, including Cisco Viptela, Silver Peak, VMware and VeloCloud, illustrating how they fit into an edge-to-cloud strategy. WWT has a number of SD-WAN lab environments within the ATC, which enable service providers to accelerate the evaluation of OEMs against requirements.

To support customers’ evaluations, WWT focuses on the following areas, as well as different techniques for automation and orchestration, to deliver a seamlessly integrated MEC and multicloud experience.

**SCALABILITY**

Architect a scalable WAN architecture.

**TRANSPORT INDEPENDENCE**

Leverage high-speed bandwidth across multiple transports such as MPLS, internet, 3G/4G/LTE, etc., with the right security and Quality of Service (QoS).

**PATH CONTROL**

Utilize multiple WAN paths for resilience and bandwidth efficiency.

**APPLICATIONS**

Optimize the performance of applications to maximize WAN bandwidth and provide great user experience.

**ZERO-TOUCH DEPLOYMENT**

Quicken the deployment of sites by remotely provisioning new equipment and services.

**PROGRAMMABILITY**

Extend the WAN with software-defined and programming extensions via APIs.

**FLEXIBILITY**

Choose whether on-prem or cloud-based deployments are best suited to the organization’s policies and processes.

Using lab resources and artifacts generated during a customer’s evaluation process, WWT can quickly move into the design phase of the project, supported by activities such as architectural validation testing, Proof of Concept development and the creation of a pilot program.
**Case Study:**
**WWT Helps Telco Deliver on SD-WAN Commitment to Wall Street**

**CHALLENGE:** A large North American multiple system operator (MSO) on a tight deadline needed to move quickly to develop and deploy SD-WAN pods to deliver next-generation services to its end customers as rival telcos raced toward developing similar platforms.

The customer’s engineering team was caught off guard when its CEO told investors the MSO would have an SD-WAN platform capable of supporting 10,000 customers by year’s end. The company hadn’t yet designed or tested the pods that would act as the backbone of the SD-WAN platform. Missing the deadline would risk future revenue, market share and potentially unsettle Wall Street.

**SOLUTION:** The customer engaged WWT to design and deploy 14 SD-WAN sites. WWT utilized its North American Integration Center to provide additional power and capacity that helped drive down the time to deployment. Additionally, WWT provided dedicated engineers and resources which ensured the customer, OEM and vendors were on the same page.

**RESULTS:** The customer was able to realize accelerated time to market while satisfying a difficult deadline from the C-suite. The customer also committed to engaging with WWT to deploy future SD-WAN sites and route all hardware purchases through WWT moving forward.
Security Transformation

Cybersecurity offerings are rapidly evolving to provide service providers and their end customers with solutions that address the security transformation maturity curve. WWT can assist customers in delivering solutions by providing a range of resources and services that enhance the value of their offerings.

Understanding and Overcoming Today’s Security Challenges

The maturity of a company’s security posture is a reflection of the stability of their brand. All companies risk loss of reputation, business assets and intellectual property when there are security breaches and many strong leaders have lost their positions over the exposure of even minor security vulnerabilities.

WWT approaches security transformation using every component of an enterprise security posture: security architecture, next-generation firewall platforms, endpoint protection, enterprise segmentation, application assurance and identity and access management.

Security Transformation Maturity Curve leveraging NIST & CMMI

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Existent</td>
<td>0</td>
</tr>
<tr>
<td>PERFORMED</td>
<td>1</td>
</tr>
<tr>
<td>MANAGED</td>
<td>2</td>
</tr>
<tr>
<td>DEFINED</td>
<td>3</td>
</tr>
<tr>
<td>Quantitatively Managed</td>
<td>4</td>
</tr>
<tr>
<td>OPTIMIZED</td>
<td>5</td>
</tr>
</tbody>
</table>

- Non-Existent: Minimal skillsets, processes and toolsets to defend the organization
- Performed: Fragmented, siloed organizational effort
- Managed: Security capabilities consistently achieved and procedures partially documented
- Defined: Roles and responsibilities are defined, assigned and trained
- Quantitatively Managed: Security policies and procedures are measured and enforced, aligned to organizational strategy
- Optimized: Proactive security performance improvement across people, processes and technology

Security capabilities consist of:
- Security Policy
- Security Architecture
- Technical requirements
- Security tools
- Security training
- Security incident
- Security testing
- Security monitoring
- Security governance
**TIER 1 SERVICE PROVIDER AND WWT CYBERSECURITY USE CASE**

As service providers’ customers explore and develop digital workspaces, challenges may arise as to how they can achieve their end user productivity goals while maintaining a mature security policy. These challenges arise from the evolving nature of productivity and the fact that employee demands are dissolving the perimeter and creating new paths for threats.

WWT is uniquely positioned to assist service providers in helping customers leverage tools such as VMware’s Workspace One to empower workforces to more securely bring the technology of their choice to work.

**DUAL PLATFORM APPROACH: WORKSPACE ONE AND TANIUM**

Today, organizations have too many tools, not enough integrations and automation, face resource constraints and growing IT complexity. Creating environments in which these platforms work together poses challenges. Platforms such as Tanium and Workspace One simplify the complex, secure endpoints, enforce compliance and reduce costs. WWT can provide customers with innovative platform integration solutions that help strengthen security posture, develop Unified Endpoint Management capabilities and meet IT and security operational goals with unprecedented speed and agility.

---

**WWT’S SECURITY TRANSFORMATION CAPABILITIES**

WWT has experience in analytics, automation, orchestration, endpoint, segmentation and governance, all necessary components for successful security transformation. Additionally, WWT possesses a deep understanding of the security landscape that is informed by battle-tested security experts that include former CISOs and senior members of the intelligence community.

Our world-class partnerships with security industry leaders, leading security OEMs and the security venture capital community make WWT an unparalleled partner for security transformation.

By working with WWT on security transformation initiatives, customers can:

- Champion a security-centric corporate culture across the enterprise.
- Communicate the business value and demonstrate the ROI of security investments to executive leadership and boards of directors.
- Defend their organization.
- Manage and reduce risks.

**ATC SECURITY LAB**

WWT eliminates the pains of evaluating new security technologies and helps customers speed up and de-risk these evaluations by utilizing the security lab resources of the ATC. The objective is to help enterprise customers benefit from the knowledge, speed, agility and independence WWT can provide by combining ATC resources with engineering and architectural expertise, ultimately enabling them to make the most informed technology and business decisions.

---

The stakes continue to increase when it comes to security breaches.

**DURATION:** Average Number of Days to Contain a Data Breach Incident: 69 Days

**COST:** Global Average Cost of a Data Breach: $3.86M
Telcobuy

SERVICE PROVIDERS FACE COMPLEX CHALLENGES THAT INHIBIT THEIR ABILITY TO SOURCE, STAGE AND DEPLOY TECHNOLOGY. TELCOBUY, A SUBSIDIARY TO WWT, IS A MINORITY-OWNED VALUE-ADDED FULFILLMENT PARTNER ENABLING SERVICE PROVIDERS TO GROW THEIR OUTRIGHT RESALE AND MANAGED SERVICES BUSINESS.

TELCOBUY’S VALUE PROPOSITION

Telcobuy enables scalability with an optimized back-end process and validated multi-vendor designs, reducing time to market and improving customer experience. Telcobuy’s single-source solution allows service providers to simplify order management, enhance procurement and accelerate time to revenue all while allowing service providers to focus on what they do best in the creation of next generation technologies and services.

Central to Telcobuy’s value proposition is its ability to create a streamlined, more efficient process for delivering quotes and global supply chain services to service providers’ end customers. Telcobuy also provides engineering support to service provider team members to help identify the best customer solution. Telcobuy can then source and stage (configuration, kitting, etc) the solution, leveraging components across OEMs and then package and ship just-in-time.

Key Benefits to Service Providers

- Accurate Booking Credit for OEM
- Deal Creation and Tracking Support
- Eliminates Need for Two-Tier Deals
- Pre-sales Engineering Support
- Single-source Procurement
- Improved Time to Market
- BOM Creation/Validation
- Corporate Diversity Retirement
- Partner Retains VIP Rebates
- Vendor Managed Inventory
- Telcobuy Diversity Plus Program (Federal)
LEVERAGE THE FULL WEIGHT OF TELCOBUY

Telcobuy’s end-to-end capabilities help service providers monetize technology faster by rapidly designing, deploying and delivering hardware and services to end customers. Telcobuy tests and validates multi-vendor solutions in the ATC, and integrates and deploys the solutions at scale while maximizing ROI through seamless multi-site, complex IT implementations.

SUPPORTING EDGE NEXT GENERATION TECHNOLOGY

As service providers forge new Customer Premise Equipment (CPE) solutions at the edge, Telcobuy is positioned to assist with iterative NFV software testing to accelerate new VNFs to market and streamline the ecosystem of the VNF OEMs. Telcobuy is continuing to partner with vendors to be at the forefront of upcoming edge technologies.

ARE YOU READY FOR 5G?

Speed of innovation will be critical for service providers to play a key role in the 5G economy. An extremely fragmented 5G infrastructure ecosystem, a main underpinning of the promise of 5G, adds complexity to deployment. Telcobuy can help service providers identify and implement new technologies that enable rapid service delivery to end customers.

UNMATCHED PRE-SALES ENGINEERING SUPPORT

Telcobuy’s pre-sales engineering support is unmatched in the distribution space and able to work closely with service providers on design solutions for its customers. With engineering resources spanning across OEMs in networking, data center, converged infrastructure, security and collaboration, Telcobuy’s expertise can be extended through the service provider.

TELCOBUY USE CASE: DEDRONE

Telcobuy has partnered with Dedrone to extend physical and cybersecurity into the airspace of critical infrastructure, high-profile events and other vulnerable environments. Telcobuy and Dedrone address emerging challenges that security organizations must overcome related to drone activity, such as threat variance, a lack of design standards and general vulnerability to drone attacks.

TELCOBUY AND DEDRONE: ENABLING THE CONVERGENCE OF PHYSICAL AND CYBERSECURITY

Telcobuy has incorporated Dedrone technology in WWT’s ATC in order to provide customers with the opportunity to evaluate Dedrone’s open system architecture to develop strategies and use cases for utilizing Dedrone’s technology.
WWT's Innovation Platform and Edge Computing Ecosystem

WWT provides an innovation platform and Edge Computing ecosystem that enables service providers to accelerate global Edge Computing deployments at scale, utilizing certified infrastructure that is immediately ready to monetize by fulfilling next-generation application and device requirements for developers.

This ecosystem offers value to service providers as they strive to address demand for edge services and accelerate time to revenue by tapping into new economic opportunities. Distributed mobile infrastructure is already deployed and ready to use. The edge is the missing piece in a new value chain that expands the types of devices on mobile networks, secures IoT, makes possible next-generation content (AR/MR) and readies mobile infrastructure to drive the next-generation of applications.

WWT'S INNOVATION PLATFORM

A key resource of WWT's ecosystem is our ATC B2B Innovation Platform, which is built around technology communities of accelerated learning. Some communities are specific to new areas of technology, while others are focused on industry solutions. In all cases, our customers, partners and our own industry-recognized engineers come together to form peer-to-peer connections that create a force multiplier of speed and agility. The communities and digital experiences enabled by the platform are truly one of a kind and will create the architectures and digital outcomes of the future.

EDGE SOLUTIONS

WWT's edge solution profiling and optimization helps to reduce upfront investment and increase agility, enabling faster time to production.

HARDWARE GUIDE

• BOM mapped to solution
• Physical infrastructure setup
• Easy to order sales ordering ID

EASY BUTTON FOR DEPLOYMENT

• Mapped to virtual infrastructure solution
• Virtual infrastructure setup
• Deployment guide
• Recipes & scripts for ease of deployment

ADAPTIVE WORKFLOWS

• Onboarding & PLC guide
• Workflow optimization & tuning guidelines
• Test & benchmark testing (under NDA)
WWT LAB OFFERINGS

WWT’s ATC hosts our initial set of validated edge architectures. These blueprints have been designed to help service providers accelerate the creation of new revenue streams by providing the resources necessary for emerging industry applications that require low latency, high performance compute and close proximity to users.

IOT & EDGE APPLICATION

- Customer Experience for Retail Workshop
- Intellisite Water Management Platform
- Mobile Field Kit Public Safety
- Intellisite Cell Tower Monitoring – Connected Bus
- Fybr Smart and Connected Agriculture IoT
- N3N IoT Visibility for Buildings & Facilities

VIRTUAL CENTRAL OFFICE, NETWORK FUNCTION VIRTUALIZATION & SDN

- Next Generation Central Office (NGCO)
- Virtual Central Office
- Red Hat Openstack Virtualized Network Function Lab
- Juniper Contrail Networking
- Cisco NSO Workshop
- Introduction to NSX
- Application Centric Infrastructure (ACI)
- Network Visualization – Pluribus VCF-IF

HYPER CONVERGED INFRASTRUCTURE

- Cohesity
- Nutanix
- Dell EMC VxRail
- Cisco Hyperflex
- Red Hat HCI

SD-WAN & U-CPE

- u-CPE Validation Lab
- Cisco SD-WAN Viptela
- NSX SD-WAN (Velocloud)
- SteelConnect SD-WAN (Riverbed)
- Silver Peak SD-WAN
- Meraki SD-WAN

MULTICLOUD

- Cloud Strategy Workshop
- Cloud Networking Workshop
- AWS Automation Using Teraform
- Azure Autoscale with Vertical Machine Scale Sets
- VMware vRealize Automation (vRA) – Amazon Web Services
- Cisco CloudCenter – Service Now Integration
- Cisco CloudCenter – Jenkins Integration
- DevOps Automation Workshop
- Public Cloud Segmentation
- CheckPoint CloudGuard IaaS – Azure
- Equinix SD-WAN

CYBERSECURITY

- Palo Alto SaaS Security
- Incident Response Automation and Orchestration
- Cisco Umbrella
- Cyber Analytics Reference Architecture
- Tanium
- Network Segmentation Workshop
- Fortinet Sandbox
- NGFW Integration using Cisco ASA and PBR
- VMware NSX Segmentation Migration

HYBRID CLOUD

- Hybrid Cloud Platforms Workshop
- Google Kubernetes Application Deployment
- VMware Cloud Foundation
- Cisco Hybrid Cloud Platform – Application Deployment Pipeline
- Azure Stack Development Kit
Ready Solutions for Telco Edge

WWT AND MOBILEDGEX ARE ACCELERATING COMMERCIALIZATION OF SCALABLE MOBILE EDGE COMPUTING DEPLOYMENTS BY PROVIDING SERVICE PROVIDERS WITH A SET OF VALIDATED EDGE INFRASTRUCTURE BLUEPRINTS THAT CAN BE QUICKLY IMPLEMENTED AND LEVERAGED TO DELIVER NEXT-GEN SERVICES TO END CUSTOMERS.

“Innovation is vital for service providers to play a key role in the 5G economy, especially as they’re under pressure to move quickly while limiting costs. 5G deployments require scale and low latency to provide cost savings and fast speeds, and MEC serves as a key piece in delivering that. WWT’s ATC and global integration centers help bring it all to life.”

- Jason Hoffman, CEO of MobiledgeX
WWT’s edge solution profiling and optimization helps to reduce upfront investment and increase agility, enabling faster time to production.

**HARDWARE GUIDE**
- BOM mapped to solution
- Physical infrastructure setup
- Easy to order sales ordering ID

**EASY BUTTON FOR DEPLOYMENT**
- Mapped to VMware/Red Hat NFV solution
- Virtual infrastructure setup
- Deployment guide
- Recipes & scripts for ease of deployment

**ADAPTIVE WORKFLOWS**
- VNF onboarding & PLC guide
- Workflow optimization & tuning guidelines
- Test & benchmark testing (under NDA)

**PHASE 1**
- **LOW LATENCY OPTANE BASELINE**
  - Customised infrastructure for optimal workflow performance (Intel/Dell EMC VMware/Red Hat)
  - Virtual compute – VMware vSphere, KVM
  - Virtual storage – VMware vSAN/Ceph
  - External storage
  - Virtual networking – VMware NSX, Open Networking

**PHASE 2**
- **AI & MEDIA GPU BASELINE**
  - Adaptive Workflows
    - Intel GPU
    - NVIDIA GPU
  - Solution guide with VNF
  - On-boarding recipes
  - Functionality & benchmarking test report

**PHASE 3**
- **AI & NETWORK FPGA BASELINE**
  - Adaptive Workflows
    - Intel FPGA
  - Solution guide with VNF
  - On-boarding recipes
  - Functionality & benchmarking test report
**Overview**

Edge computing is not a single technology, but an emerging ecosystem of use cases, applications and resources that help businesses participate in the next generation of digital transformation.

**Challenge Statement**

Given edge computing’s nascent nature, it can be difficult for decision makers to understand how to best leverage it. Further complicating matters is the fragmented ecosystem of hardware and software providers needed to make up an edge solution, which must be designed and tailored to industry verticals.

**Edge Deployment Models**

Edge computing can be located essentially anywhere in a network architecture. From our perspective, there exists four types of edges — device, on-premise, telecom and centralized cloud.

No matter the location, the goal remains the same — to provide computing power as close to the device producing data as possible to increase speed and lower latency. In addition to latency and bandwidth, organizations must consider which edge environment is most appropriate in terms of application performance, connection mode and business model.

---

**Locations**

**Device**

- Home, Factories, Offices and Buildings

**Benefits**

Ultimate Control

**Challenges**

Complex/Not Hybrid Ready

**Locations**

**On-Premise**

- Virtualized (5G) Base Stations and Regional Data Centers

**Benefits**

Ultimate Service Presence

**Challenges**

Complex/Fragmented/Unknown

**Locations**

**Telecom**

- Virualized (5G) Base Stations and Regional Data Centers

**Benefits**

Ultimate Service Presence

**Challenges**

Complex/Fragmented/Unknown

**Locations**

**Centralized Cloud**

- Virualized (5G) Base Stations and Regional Data Centers

**Benefits**

Ultimate Service Presence

**Challenges**

Complex/Fragmented/Unknown
OVERVIEW OF EDGE ARCHITECTURES

Edge computing will drive a wave of new applications and services that require low latency and higher bandwidth. WWT’s partnership with MobiledgeX allows service providers to commercialize scalable mobile edge computing deployments via validated blueprints that make edge infrastructure widely accessible and easy to use for third party software vendors.

The blueprints are standardized utilizing leading-OEM-defined compute, storage and network architectures both physical and virtual. WWT complements these blueprints by providing racking and ancillary materials along with an optimized and validated version of MobiledgeX software.

BLUEPRINTS IN WWT’S ATC

FULL LIFECYCLE SOLUTIONS THAT CREATE BUSINESS AND TECHNOLOGY OUTCOMES

Deploying the infrastructure necessary to support pre-validated edge services can be incredibly complex and failing to efficiently resolve this complexity can limit the number of revenue-generating solutions coming to market. WWT’s lifecycle services model, which supports lab, supply chain and integration and deployment services, delivers an end-to-end solution that accelerates time to revenue, improves operational efficiencies and reduces cost.
**VMware vCloud NFV**

VMWARE VCLOUD NFV IS A FULLY INTEGRATED, MODULAR, MULTI-TENANT NETWORK FUNCTIONS VIRTUALIZATION (NFV) PLATFORM. IT PROVIDES COMPUTE, STORAGE, NETWORKING, MANAGEMENT AND OPERATIONAL CAPABILITIES ENABLING OPERATORS TO SIMPLIFY, SCALE, AND SECURE PRODUCTION NFV SERVICES.

This transformative platform allows service providers to accelerate time to market and increase revenue with new services, streamline operations, reduce network infrastructure costs and deploy elastic business models for telecommunication workloads.

**KEY FEATURES**

- Accelerated network performance
- Intent based assurance
- Carrier-grade networking

**CLOUDLET DNA EDGE ARCHITECTURE**
Cisco VIM

Cisco’s Virtualized Infrastructure Manager (VIM) provides a carrier-class foundation for high-performing edge computing solutions that are simple, flexible and secure.

VIM helps service providers deliver next-generation services via the edge by reducing the complexity of private cloud deployment — bringing up fully-functional clouds in hours, with integrated end-to-end control and data plane verification in place — while optimizing network resources and lifecycle management processes.

Key Features

- Carrier class platform
- Automated deployment
- Ubiquitous security

Cisco VIM Edge Architecture
HPE

HPE’S EDGELINE EL8000 CONVERGED EDGE SYSTEM BRINGS HIGH-POWER COMPUTING TO THE EDGE OF THE NETWORKS AND ALLOWS FOR NEW COMPUTE POSSIBILITIES DIRECTLY WHERE DATA IS BEING GENERATED. THE OPEN STANDARDS-BASED SYSTEM ENABLES SERVICE PROVIDERS TO PROCESS VAST AMOUNTS OF DATA IN REAL TIME DIRECTLY AT THE EDGE, BASED ON OPEN STANDARDS TO BOOST FLEXIBILITY AND REDUCE COSTS.

HPE Edgeline EL8000 Converged Edge System’s unique design delivers high performance and ultra-low latency for the most demanding use cases in a compact and ruggedized form factor, equipped with edge-optimized serviceability and remote systems management.

KEY FEATURES

- Open-standards-based
- Compact and rugged design
- Data center class security

HPE EDGELINE EL8000 CONVERGED EDGE ARCHITECTURE
Overview of Applications

SERVICE PROVIDERS FACE THE SIGNIFICANT CHALLENGE OF MONETIZING THEIR INFRASTRUCTURE INVESTMENTS BY EXPLOITING OPPORTUNITIES THAT HAVE NOT YET FULLY REVEALED THEMSELVES AND ARE SURFACING WITHIN A BUSINESS AND TECHNOLOGY LANDSCAPE THAT IS EVOLVING RAPIDLY.

MONETIZE 5G INFRASTRUCTURE

WWT and MobiledgeX are enabling service providers to quickly deliver industry vertical applications to their customers via total stack edge infrastructure architectures and designs, thus creating new 5G revenue streams to propel service providers into a new age of commerce.

The infrastructure is necessary, but simply a cost to service providers. The true value lies in the applications that run on top of this infrastructure.

KNOW BEFORE YOU GO

Before service providers can tap into the new value being created at the edge, they must identify and understand vertical use cases and related applications most likely to gain market traction. WWT, which works with 70 of the top Fortune 100 companies across a range of commercial sectors, can offer service providers a first-hand view of emerging vertical use cases.

VERTICAL FOCUS AREAS

Integrated edge solutions should not be treated as a Swiss Army Knife that can easily support a broad range of use cases. Unique combinations of hardware and software need to be aligned with specific use cases to optimize performance.

WWT stands ready to collaborate with service providers to explore edge computing use cases. Operators can draw upon the knowledge WWT has acquired by providing industry-leading solutions that have helped customers of all shapes and sizes deliver business outcomes and combat digital disruption. WWT’s experience includes supporting nearly every sector of the economy and helping customers grow revenue, accelerate time to market, rapidly innovate, control costs and mitigate risks. Specifically, WWT is focused on delivering solutions in the following industries:

- HEALTHCARE
- MANUFACTURING
- UTILITIES
- RETAIL
- ENTERTAINMENT

ATC VALIDATION AND GLOBAL DEPLOYMENT

Edge solutions are inherently complex. Service providers and their end customers need fully-integrated hardware and software solutions that are interoperable and scalable in the new world of 5G.

Successfully deploying these integrated solutions — applications on mobile edge computing platforms plus customer premise equipment (CPE) and in-network sites — requires an ability to quickly validate multi-vendor architectures and deploy them at scale.

- Integration Testing
- Regression Testing
- Use Case Testing

To succeed, edge architectures must be easy to consume — for both service providers and their end customers. Once validated in the ATC, service providers can leverage WWT’s global integration centers to integrate applications and customer premise equipment (CPE) before deploying fully-built solutions at scale anywhere in the world.
**Application: QiO**

ACCESS DATA FROM DISPARATE, SILOED SYSTEMS AND REMOVE THE DEPENDENCY ON MANUAL PROCESSES TO REDUCE COSTS, MEET REGULATIONS AND PREVENT DOWNTIME. QIO PROVIDES OFF-THE-SHELF AI-INFUSED APPLICATIONS TAILORED FOR INDUSTRIAL AND MANUFACTURING COMPANIES.

**LIBERATING THE INDUSTRIAL ENGINEER**

Industrial engineers demand proven, repeatable, secure compute and communications infrastructure with Software-as-a-Service-enabled AI that can handle complex heterogeneous systems of industrial scale. QIO delivers the latter with its unique Foresight Suite of applications, while the former is made possible by MobiledgeX and WWT.

**MARKETS SERVED**

- **STEEL**
- **GLASS**
- **AEROSPACE**
- **OIL AND GAS**
- **MARINE**
- **UTILITIES**
Application: Stratacache

Link online interests to in-store behavior by building a 360-degree customer view. Apply intelligent analytics to driver smarter signage that delivers personalized digital experiences on any screen at any time and drives sales with measurable results.

Customized Shopping Experiences

Expectations for the customer experience have never been higher. To acquire new customers, retailers need to know who their customers are and what they want before they walk through the door. Stratacache delivers a more compelling and customized shopping experience to customers that brings the ease of online shopping into the brick and mortar store by tying online personas to in-store personas.

Markets Served

- Retail/Convenience Stores
- Quick Serve Restaurants
- Banking/Finance
- Stadiums
- Corporate Communications
- Gaming/Casinos
- Education
- Airports
VALIDATED EDGE INFRASTRUCTURE TO ACCELERATE COMMERCIALIZATION OF MOBILE EDGE COMPUTE ON A GLOBAL SCALE