Leading the Way in Data Center Transparency With Unrelenting Innovation

QTS Innovation Lab pushes the boundaries of self-service data center visibility with groundbreaking AI-driven applications

Executive summary

The data center industry has lagged behind the curve when it comes to digital innovation, still relying heavily on human interaction to gather details, make decisions and perform tasks. This is changing with the introduction of the QTS Innovation Lab (QIL). Designed to quickly and scientifically evaluate new concepts, the lab is revolutionizing data center capabilities. Integrating artificial intelligence, machine learning and predictive analytics, QIL takes already-digitized data center information and sculpts it to deliver real-time, forward-thinking capabilities that forecast and automate data center operations. QIL's accelerated process quickly delivers dynamic innovations poised to change the way users interact with their environments

Data centers are ripe for digital innovation.

Rapidly evolving business needs and customer expectations have upped the ante when it comes to efficiency, productivity, cost control and an unlimited number of other business drivers. To meet the challenges of a fast-paced climate, businesses are demanding real-time, on-demand access to key business details. The good news is that the data is out there. The digital evolution has digitized massive amounts of data—IDC predicted there would be 40 zettabytes of data by 2020—providing an opportunity to put a deluge of information within end users' grasps.

Having access to this wealth of data is an important first step in transforming business capabilities. However, using innovative technologies like artificial intelligence (AI), machine learning (ML), data analytics and visualization to marry this information can be game changing. These technologies use complex models to aggregate silos of data and extrapolate business-driving solutions, powerful insights and seemingly endless value.

Healthcare organizations have taken this step, using AI to help diagnose disease, deliver treatment and improve patient outcomes. Businesses use AI and ML to predict growth rates, optimize supply chains, improve security and gauge the success of marketing campaigns.

While many industries have embraced digital transformation, the data center industry has been slower to adopt digitization. However, the ability to use data to analyze trends, predict outcomes and deliver actionable information is key—and in a mired data center environment, it can be a key differentiator.

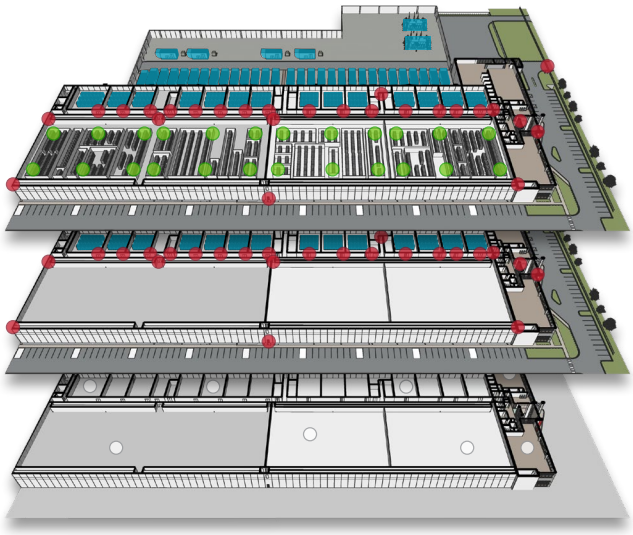
QTS Data Centers, a leading provider of hybrid colocation and mega scale data center solutions, is tackling digital innovation head on with its Service Delivery Platform (SDP) and the introduction of the QTS Innovation Lab (QIL).

"We stand for data transparency," said Brent Bensten, chief technology officer, product and innovation at QTS. "We want to give customers everything we know about their space and deliver it to them transparently. QIL is our investment in and commitment to continuing innovation and real-time capabilities."

> QIL conceives and rapidly evaluates next-generation data center capabilities to integrate with SDP—the industry's first digitized service platform—to provide real-time insight into customers' data center operations.

Digitizing the data center with SDP

SDP, the industry's first digitized service platform, helps organizations visualize, manage and optimize their data center environments. Using SDP, QTS shares the abundance of data it acquires by digitizing the data center. Its APIs support real-time, on-demand visibility and transparency into the data center environment including self-service access to 3D visuals of their environment, power usage, asset and badging system data as well as sustainability progress via a computer, tablet or mobile device. Temperature and humidity data is also available with an optional sensor deployment.



QTS's commitment to full transparency also means customers can compare actual and contracted power consumption metrics—something no other data center provides. Data analytics are used across the software-defined platform to detect trends and drive real value for its users—and the success is evident in its numbers. Users engage SDP for an average 18:27 minutes—a far cry from the two-minute mark that is widely accepted as world-class. Customers also access the platform at the start of each business day—another sign of its value.

"We didn't just create a platform," said Bensten. "We changed an industry. SDP delivers the real-time, actionable insights customers need to optimize their environments. No other data center provider offers this."

The success of SDP has inspired QTS to investigate more forward-thinking applications that integrate innovative technologies to deliver business and efficiency-enabling insights. QIL was designed to do just this.

QIL: An investment in the future of data center operations

QIL was formed in 2019 as an accelerated and dedicated development environment for SDP innovations. Focused on moving beyond developing rote SDP features and functionality, QIL rapidly conceptualizes and vets new, pivotal and industry-advancing capabilities that enrich the data center environment.

"QIL is harnessing cutting-edge technologies to energize an industry that has not necessarily been on the forefront of innovation in years past," said Bensten. "QIL is a natural extension of our Service Delivery Platform and a unique development environment for new industry innovation."

With a dedicated team of technology leaders—including data scientists; AI, ML, and visualization experts; and leadership from the CTO level—QIL engages in more innovative thought and development around ways to think about the data center, the problems it faces and the critical insights and details customers and QTS would like to access to optimize data center operations.

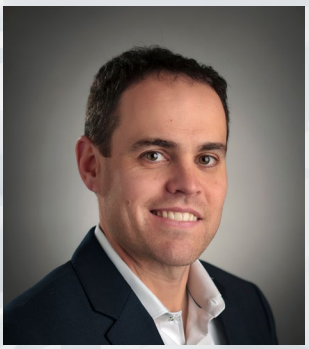
QIL pairs the wealth of data already captured in SDP with AI, ML and data analytics to rapidly deliver customer-

facing, industry-advancing innovations. These critical "moonshots" provide essential opportunities to enhance data center functionality by offering automated ways to visualize assets in real-time, optimize power usage, tighten security and reduce downtime.

This is a critical shift in operability as Gartner predicted that more than 30% of data centers that don't deploy AI and ML would not be operationally and economically feasible by 2020.

Utilizing a concentrated proof-of-concept process, QIL assesses the merit of an idea to determine "minimal viability," meaning a concept has enough merit to move into the traditional development roadmap for delivery as an SDP feature. Concepts that do not meet the minimally viable criterion are quickly terminated. This abbreviated process eliminates lengthy level of effort (LOE) analyses to get more innovations in customers' hands more quickly. By setting finite parameters around the vetting process, QTS is able to control costs without restraining innovation to create a pipeline of AI- and ML-driven products.

"We have invested heavily in our ability to deliver groundbreaking products and services that dynamically alter the data center industry," said Bensten. "No other providers are offering this capability."



Brent Bensten

Chief Technology Officer, Product and Innovation

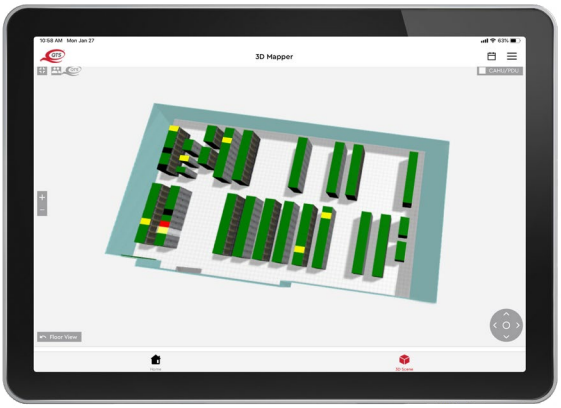
QIL: Driving innovation forward with leadership at the CTO level

For the past four years Brent Bensten has been the driving force behind the digitization of the QTS data center environment and the resulting development of the QTS Service Delivery Platform (SDP). Brent's unyielding quest for innovation was the catalyst for the QTS Innovation Lab (QIL). Under Brent's leadership, QIL remains focused on assessing new, enabling technology with a focus on AI, visualization and automation to deliver dynamic capabilities that reshape how customers interact with the data center. Connect with Brent and QIL at qil@qtsdatacenters.com

3D Mapper delivers real-time visual representation of the data center environment

In its short lifespan, QIL has already vetted some trailblazing innovations destined to reinvent the data center industry and the way businesses manage and interact with their data center environment.

3D Mapper, the only 3D visualization app designed and delivered by a data center provider, is the first innovation to come out of QIL. By digitizing the data center, 3D Mapper provides a live, interactive model of the customer's environment with real-time, 360-degree views of their space. Users can rotate, pan, pivot and zoom on any portion of the virtualized rending to achieve unique views.



The visualization also integrates with a variety of SDP applications including Power Analytics, Sensor Analytics, Asset Manager, Online Ordering and Badging for more granular details of the environment. This allows users to drill down on individual assets for more in-depth details.

To provide an at-a-glance overview of power capacity for each cabinet, 3D Mappers color codes cabinets to visually depict power usage: red signifies the cabinet has exceeded 105% capacity, yellow warns that the cabinet is above the recommended 80% threshold—ranging between 81% and 104%—and green confirms the cabinet is running under the recommended 80% usage mark. Users can drill on individual cabinets for more granular visibility into real-time power details down to the circuit and pole levels to better control performance.

3D Mapper also integrates with the Asset Manager app in SDP to easily manage assets. The nested architecture allows users to view specific cabinets and the individual assets within them. Users can view where a cabinet is located, and drill down to access individual asset or component details such as make and model, scheduled maintenance cycles and more. Users can also inventory assets, designate rack elevations and detail cabling settings directly in the app. This functionality eliminates the cumbersome process of listing and tracking assets on a large spreadsheet with hundreds—and maybe thousands—of assets or relying on employees' legacy knowledge.

The 3D visuals also detail open space within the environment to help data center managers visualize where a new cabinet can be installed. Using a drop-down menu of common assets, users can quickly populate virtual racks and design a build online.

3D Mapper also integrates with the QTS badging system to provide a visual of who is in the data center and where they are at any time to enhance physical security.

VALUE PROPOSITION

Save time. 3D Mapper's visual interface provides a quick look into a unique data center environment to identify issues and quickly make changes to optimize performance. Its remote accessibility also saves trips to the data center, allowing client data center managers to virtually manage the environment.

Cost effective. Time is money. The time efficiencies built into 3D Mapper result in cost savings. It also allows users to quickly identify concerns to avoid potentially expensive issues.

USE CASES

Remote data center visibility. Offering an on-demand, holistic view of a data center environment and its performance from a computer or mobile device, 3D Mapper is ideal for organizations that do not reside near the data center. In some cases, it can limit the need to deploy a service provider to manage the environment or fly in technicians to scope, isolate and address issues onsite.

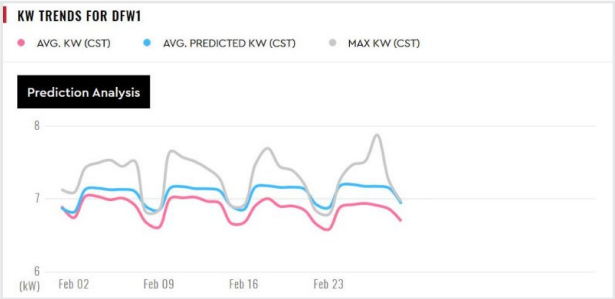
Space planning. The exact replication of an environment can be used to reconfigure a floor plan or identify open space for additional racks or new cabling.

Power capacity planning. Users can view power draw for each rack to easily identify over- and underutilized racks and normalize the environment. This accessibility also helps data center managers identify if new cabinets are needed for new workloads or if an existing cabinet has the physical space or power capacity to handle the workload.

Locate assets. The search feature within 3D Mapper allows users to quickly find specific assets within the environment. This is particularly valuable for companies managing large environments, saving service technicians from manually searching for a particular server.

A peek into the QIL pipeline

As 3D Mapper revolutionizes data center visibility and ease of access, QIL continues to modernize the data center industry with a series of industry-first innovations. The following projects are still in development with QIL. To collaborate with the QIL team and learn more about these evolving projects, visit QIL at https://www.qtsdatacenters.com/why-qts/innovation-lab



Project Potential | Predictive power

Concept: *Can we predict power use into the future?*

Project Potential leverages AI and predictive analytics to accurately forecast future power consumption. Integrating digitized power data with atmospheric pressure data, cooling data and a series of anomalies and additional data points, QIL discovered trends in power usage that can be used to accurately predict future power usage out seven days with 1–2% accuracy and 30 to 60 days with 6–7% accuracy. Project Potential uses 3D Mapper to display this landmark information in an easy-to-digest graphic.

VALUE PROPOSITION

Capacity planning. Discover trends to improve long- and short-term capacity planning.

Cost-effective. The predictive nature and granularity of Project Potential delivers cost savings by enabling users to proactively plan and avoid over-ordering power supply.

Business continuity. The ability to better manage power supplies avoids supply-related outages, keeping the lights on and business operating.

Improved control. The ability to understand power usage trends and predict consumption provides opportunities to implement sustainable energy efforts to conserve energy and further control costs.

USE CASES

Capacity management. Clients can better understand power utilization to more accurately purchase power. This may also help them achieve lower utilization rates from utilities.

Troubleshooting. Technicians can isolate and address potential areas of concern in advance to minimize time spent scoping and diagnosing problems.

Sustainability. Businesses can boost their sustainability efforts by pre-buying extra wind power or other forms of sustainable energy.

Project Parley | Intelligent communication

Concept: *How can we quickly provide customers with the information they want?*

Project Parley introduces a conversational interface into the SDP environment. Compatible with Apple IOS and iPad OS, Droid, web interface and API, the AI-enabled bot uses slack to interact with users. Users can make specific requests for environment details such as "How many badges have been created in the last 20 days," and quickly receive an answer. Project Parley also provides follow-up details on questions requiring the bot to build upon the initial request.

This innovation is still in development as the QIL team continues to build out a tool chest of useful, enabling data sets to continually improve the intelligence of the bot.

VALUE PROPOSITION

Efficiency. The slack bot performs tasks more quickly than a human could.

Cloud-like experience. Customers crave on-demand experiences that deliver the information they need, when they need it. Project Parley provides this operability with a slack bot to quickly deliver information.

Versatile communication. Project Parley adds a fifth communication tool to SDP, allowing users to choose the tool that best suits their immediate situations.

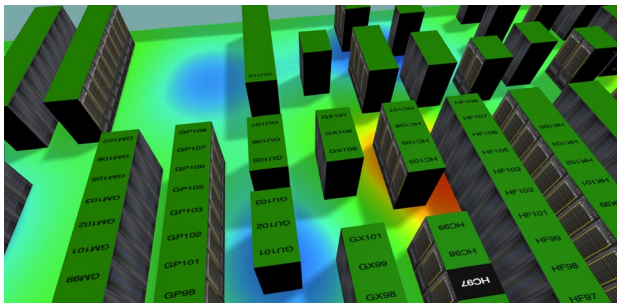
Layer of intelligence. Bots remember conversations with users and can proffer additional information that was not specifically requested, connecting dots for users to deliver more value.

USE CASES

Automated and intelligent conversations. Data centers can be noisy. Project Parley allows users to interact with the slack bot without interference.

Virtual assistant. Quickly gather information that would ordinarily take users longer to compile on their own.

Improved insights. Slack bot can provide additional information for users to consider in addressing their environment.



Project Isobar | Real-time heat mapping

Concept: *Can we visualize heat in the data center?*

Project Isobar leverages machine learning to deliver a real-time visual view of data center weather over time, allowing users to identify atypical weather patterns that may impact hardware performance, and address these issues to optimize the data center environment. Integrating with 3D Mapper, the innovation displays past, current and predicted future temperature patterns as a visual heat map overlaid on the data center image.

INNOVATION BREEDS INNOVATION

While working on Project Isobar, the QIL team discovered a new, AI-driven opportunity.

Correlating power readings at the rack level with atmospheric data and a host of other data points, QIL discovered it could predict cabinet temperature to within a degree. This groundbreaking innovation eliminates the need for expensive, complex physical sensors.

Virtual sensors can be calibrated for individual environments and utilized at various heights using ML. They can be deployed on their own or to augment physical sensors.

VALUE PROPOSITION

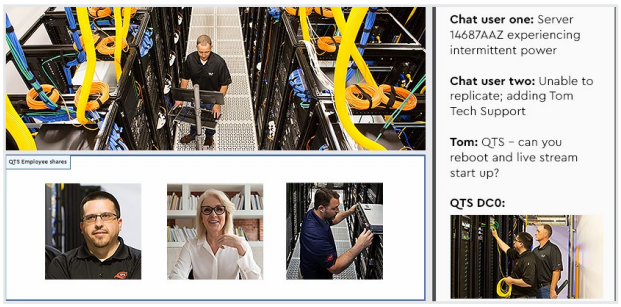
Protect equipment. The ability to predict temperature using power can be an early predictor of issues within a data center, allowing DCOs to address potential heat issues before they impact hardware.

Time and cost savings. Physical sensors are time consuming and expensive to install and maintain, and in a large data center, it would be impossible to set them up on every cabinet.

Minimize risk. Installing physical sensors poses inherent risks associated with working within a production environment. Deploying virtual sensors can eliminate the potential headaches of a physical deployment.

USE CASES

Normalize environment. Heat mapping provides the visibility customers covet to help them identify and rectify potential issues. With so many variables impacting the data center environment, this comprehensive view provides an opportunity to stay abreast of environmental changes to ensure the environment remains normalized.



Project 4th Wall | Conversational interface

Thesis: How do we provide customers with remote, real-time collaboration capabilities?

Project 4th Wall reimagines customer support by offering mixed-media collaboration for up to eight users. The app ensures collaborators can remotely share and visualize real-time data, images and live video on mobile devices to complete physical tasks in one user experience.

Allowing everyone to share in a singular experience is a long-standing desire in the realm of troubleshooting and hardware management. Customers have clamored to "see what the technician is seeing"—a need well documented in NPS feedback. This real-time visibility lets customers work remotely with a team of experts to share knowledge and efficiently complete tasks.

The app also delivers co-browsing, multi-way chat and live-streaming video—all of which are logged and audited to document the session.

VALUE PROPOSITION

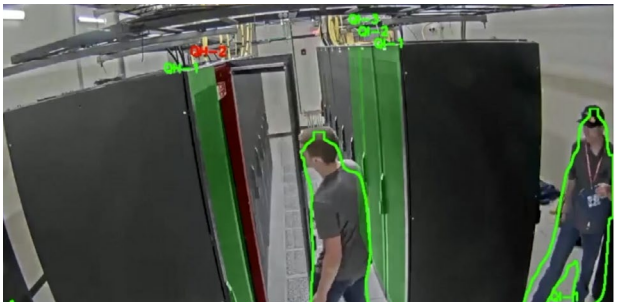
Accuracy. Project 4th Wall ensures everyone sees the same thing and is working efficiently.

Resource allocation. Team members can work collaboratively from wherever they are, prompting time and cost efficiencies.

USE CASES

Remote collaboration. Bring remote users—whether across town, the country or the world—together to collaborate in real time. Project 4th Wall brings this versatility into the data center environment to enable multidimensional collaboration.

Real-time resolution. Solve problems quickly. Project 4th Wall delivers this capability allowing businesses to collaborate with QTS associates, remote SMEs and others to quickly rectify issues and perform tasks.



Project B-Roll | Video surveillance using facial recognition and masking technologies

Concept: *How can we use cameras in the data center to deliver value?*

QTS operates more than 2,200 dedicated cameras across its 26 data centers. Project B-Roll integrates those camera feeds with badging data, facial recognition and masking technologies to provide complete transparency into data center activity without any human interaction.

Utilizing masking technology, Project B-Roll can capture visitor activity and detect cabinets being opened without physical sensors. Additionally, masking outlines flash red to identify non-badged temporary visitors or QTS associates. Without Project B-Roll, these details would only be available by combing through badge access logs or watching raw video footage.

Integrating with SDP, Project B-Roll could also allow customers to set notifications for specific activities such as a particular employee entering a space or a unique asset being accessed. While this is not a replacement for biometrics, it may provide a useful secondary validation source.

This innovation is particularly relevant for Federal customers or those with stiff compliance obligations as it allows them to visually monitor, track and log interactions within their environments, and analyze

video for data center activity without human involvement for improved efficiency.

This innovation is still being explored in QIL to determine additional applications for the technology.

VALUE PROPOSITION

Efficiency. Grounded in AI, Project B-Roll provides video surveillance data more quickly and accurately than a human could deliver.

Security and compliance. Project B-Roll allows businesses to assess efficiency, ensure procedures and standards are being followed, and demonstrate compliance.

USE CASES

Eyes in the data center, 24/7. See who is in data center and what they are doing, any time.

Compliance. Logged surveillance can be provided to auditors to demonstrate compliance.

Driving the future of the data center with QIL

As QTS continues to deliver on its commitment to provide complete visibility and transparency for its customers, QIL is leading the way to find new, exciting ways to deliver on this promise. Given the tremendous amount of data that has already been compiled, the possibilities are endless.

"With QIL, we will continue to integrate the data we have using AI, machine learning and predictive analytics and invest in new applications that deliver value to our customers," said Bensten.

One area of continued focus is the use of sensors—both physical and virtual—to derive critical data points that can be tied together to deliver valuable information and insight.

"Data centers generally rely on humans to deliver information. This is inherently inefficient and error prone," said Bensten. "Sensors deliver more precise, accurate results and are far more scalable. There is tremendous potential to use sensor data for non-given purposes."

Focused on transparency and visibility, QTS is dedicated to continuing to provide its customers with new, exciting ways to interact with their data center environments. Its investment in QIL promotes its mission to transform "moonshots" into value-added capabilities that reinvent the data center industry and validate its place as the industry's leading innovator.

We invite you to collaborate with the QIL team: QIL@qtsdatacenters.com.

See the innovations we are working on: https://www.qtsdatacenters.com/why-qts/innovation-lab

ABOUT QTS

QTS Realty Trust, Inc. (NYSE: QTS) is a leading provider of data center solutions across a diverse footprint spanning more than 6 million square feet of owned mega scale data center space within North America and Europe. Through its software-defined technology platform, QTS is able to deliver secure, compliant infrastructure solutions, robust connectivity and premium customer service to leading hyperscale technology companies, enterprises, and government entities. Visit QTS at www.qtsdatacenters.com, call toll-free 877.QTS.DATA or follow on Twitter @DataCenters_QTS.