



Cerner Technology Services 2017 Annual Report



Table of Contents

Executive Welcome	1
CTS at a Glance	2
Mission, Strategic Plan and Value	4
Corporate Contribution	6
Stakeholder Satisfaction	12
Operational Excellence	14
Future Orientation	18


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Executive Welcome

In 2017 Cerner Technology Services (CTS) continued to grow in ways that shape the technology landscape of health care. In addition to our continued work on the Department of Defense health system, Cerner added the VA to our hosting repertoire, which necessitates a high degree of collaboration between each agency’s infrastructure and a continued emphasis on logical security vigilance.

High operational performance was central to the organization’s successes this year as demonstrated across nearly all of our key performance indicators. We were able to deliver on multiple strategic outcomes while hardening our security posture, driving service improvement, and supporting the launch of Cerner’s most technologically-enabled campus to date.

The reach and responsibility of CTS continues to grow with corporate expansion. Associate device needs grew in 2017 as Cerner increased its laptop distribution by 9%, resulting in nearly 38,000 devices in use. This technology growth helped associates increase productivity while still exceeding our goals

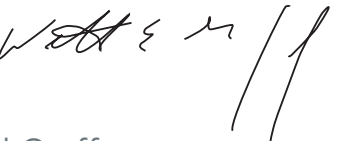
for combined incident free time and error-free change rate.

We are seeing progress within the Business Process Efficiency, Multi-Cloud Enablement and Global Application Performance initiatives, all of which will have long-term implications for CTS operations. From a risk mitigation and service perspective, our Vulnerability Management efforts have yielded significant reductions in remediation time across all risk ratings, allowing service quality to remain a top priority.

While this report is only a glimpse into your value to our clients and your impact on the health care industry, I hope you will use the contents to better grasp and share the significance of our responsibility to health care providers and patients throughout the world. I want to thank every associate on my team for their creativity, their insight, and most importantly their drive to deliver the highest-quality service in all their efforts over the last year and into 2018.



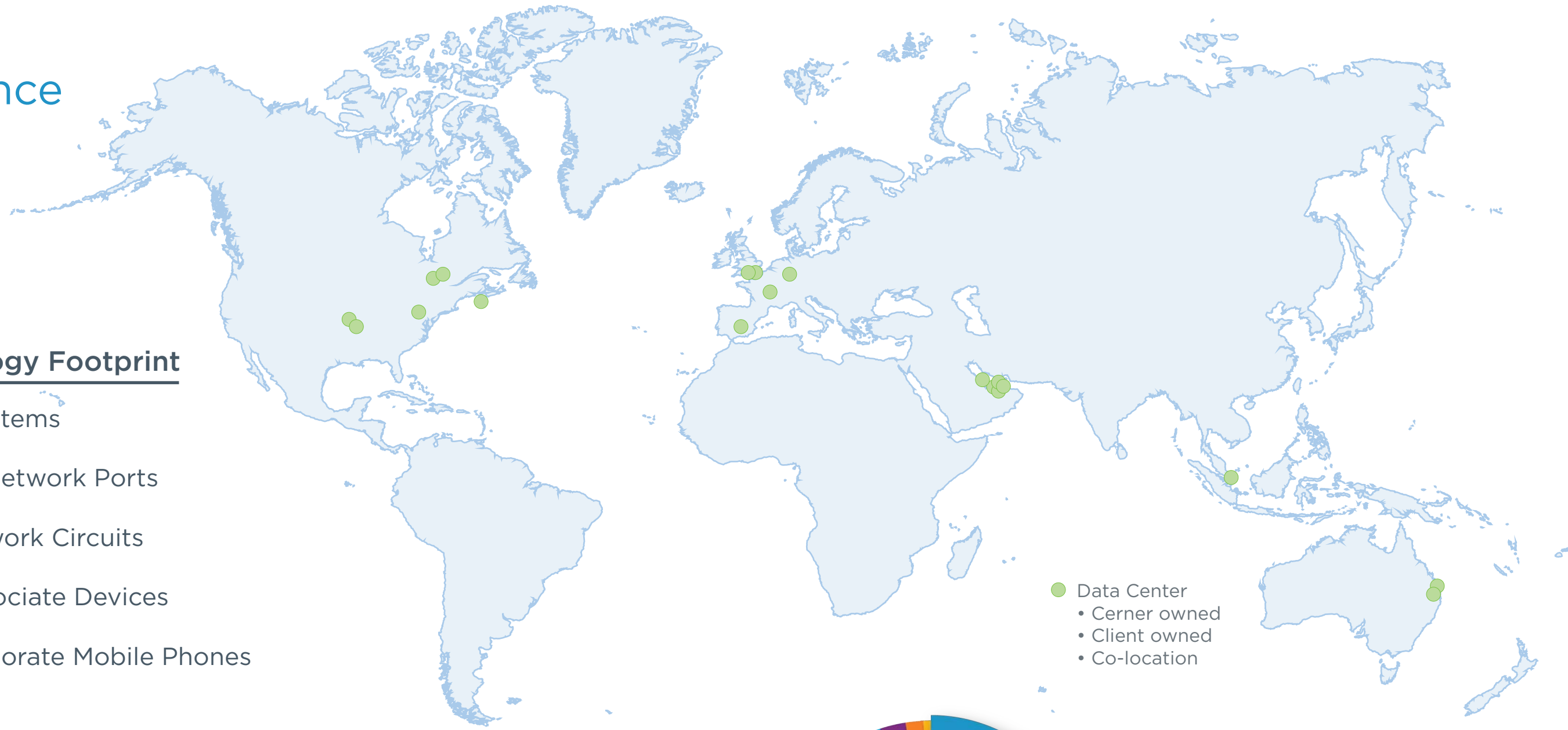
Respectfully,



Bill Graff
Chief Information Officer
Cerner Corporation

CTS

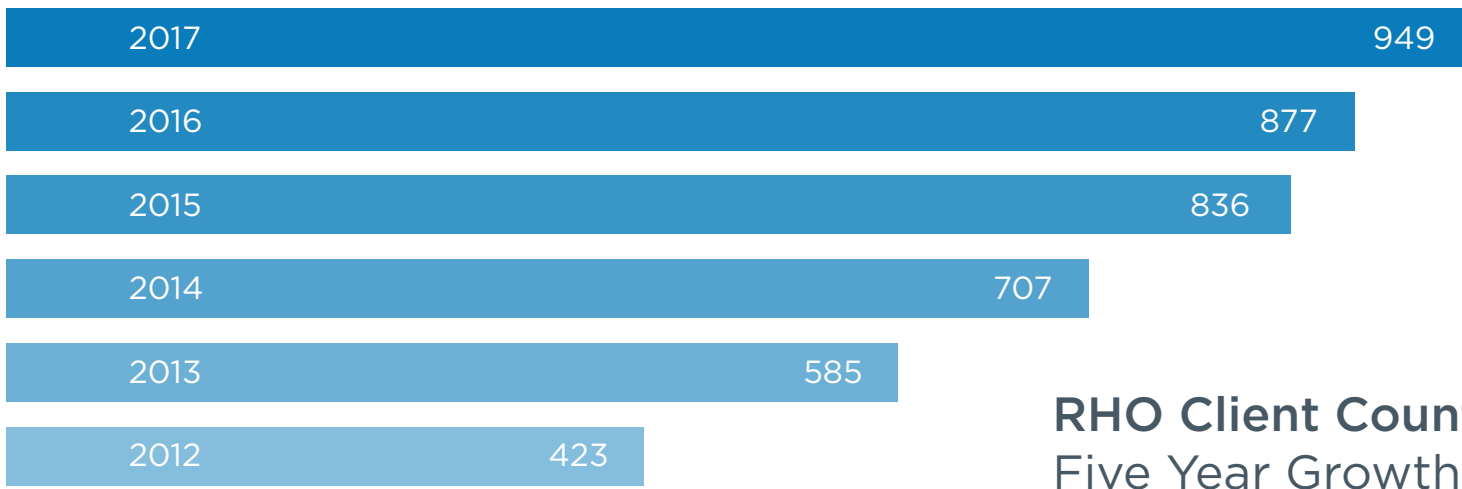
At a Glance



CTS Technology Footprint

-  131,572 Systems
-  300,494 Network Ports
-  1,303 Network Circuits
-  37,182 Associate Devices
-  9,747 Corporate Mobile Phones

- Data Center
 - Cerner owned
 - Client owned
 - Co-location



RHO Client Count
Five Year Growth



Associate Distribution

Infrastructure & Operations	579
Enterprise Services	542
Enterprise Security	266
IT Governance	93
Data Center Services	44
Technology Analysis & Alignment	4
Other CTS	2



Mission, Strategic Plan and Value

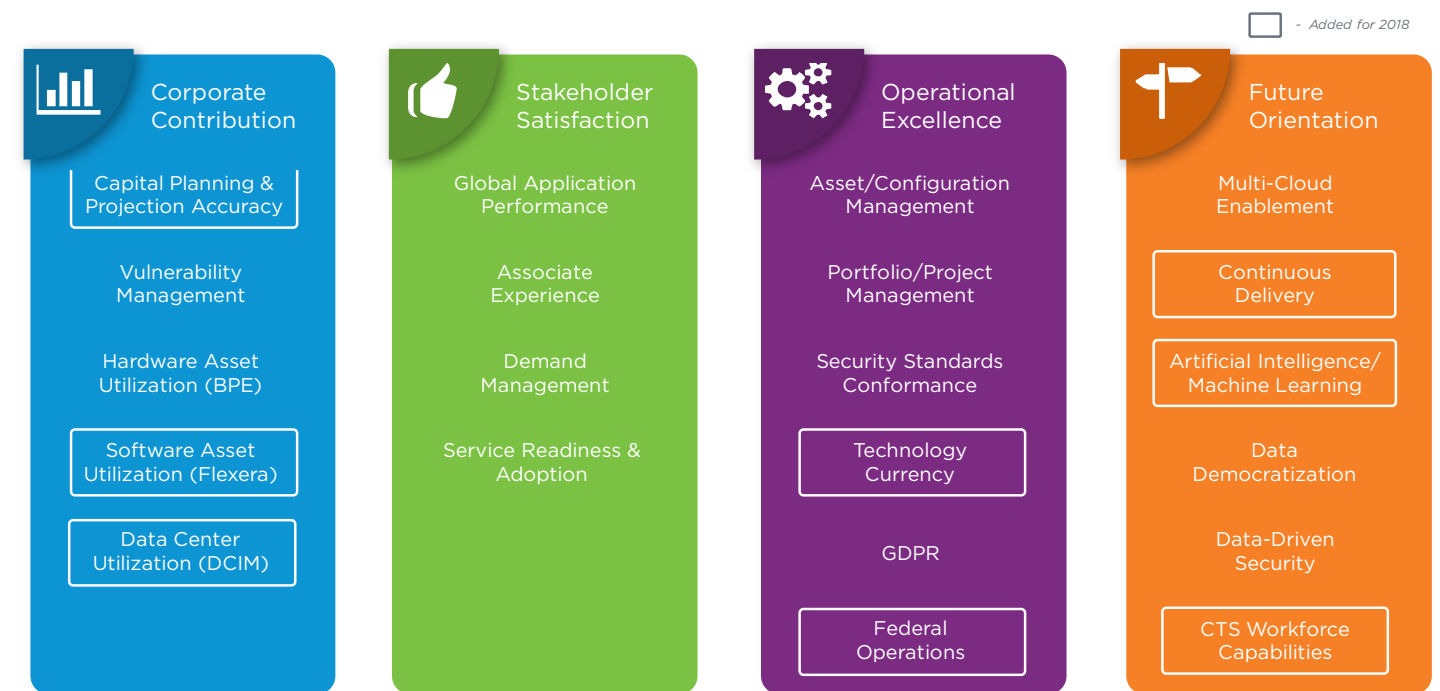
The Mission of Cerner Technology Services is to drive operational excellence, breakthrough innovation and market-leading value through the power of technology.

CTS continues to grow along with the ceaseless demand for business value, elite service performance, and a proactive response to evolving security needs. In 2017, we added 226 new associates and transfers to the organization, an increase of 16%.

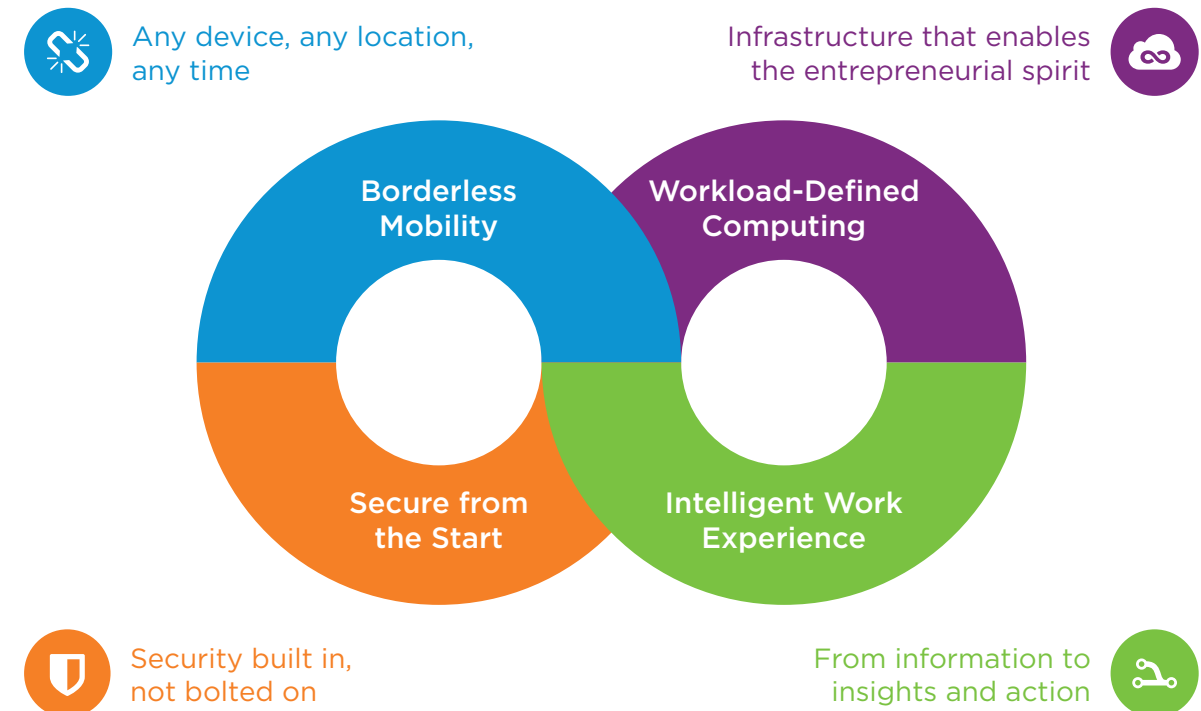
However, influencing the health care IT landscape requires more than just adding numbers to our organization; each member of the organization knows how technology has the potential to drive or impede the success of the business. CTS associates value service availability and the contribution each one of us makes to ensuring services are executed with precision in a secure environment. We are a culture of innovation, one that enables collaboration and embraces the ideas of those individuals who look to positively impact the health of the global population.

Ultimately, CTS associates know that supporting those who support health care is a charge that carries both significant privilege and responsibility. Each year the charge is elevated to improve operations, uplift associate capabilities, strengthen our security posture, and tangibly demonstrate our value. 2017 was no exception in pursuing that mission.

Our Strategic Plan



Delivering Business Value



Corporate Contribution

With more than 26,000 associates working from around 30 countries to execute on behalf of Cerner, the demand for modern business platforms has never been greater. Recent investments in service management, portfolio/project management, human resource management, and configuration, price, and quote (CPQ) platforms will serve as the foundation on which Cerner can continue to operate successfully at scale. CTS-owned communication and collaboration platforms such as Microsoft OneDrive, Teams and Outlook Exchange have helped to bridge geographic and cultural gaps that existed previously.

Future considerations for multiple current business platforms include Cerner's customer relationship management (CRM), financial management, call center management, venue management, and sales process management functions. We believe each of these arenas hold great potential for increased efficiency and value delivery through the adoption of market-available solutions that can streamline or automate business processes and introduce new capabilities, including mobile and social, not currently available in Cerner's enterprise architecture.

2017 Business Value Generated
\$18.7 million (156% goal)

Total Cost of Ownership Reduction
\$7.7 million

Business Process Efficiency

Ongoing investments in automation have resulted in significant improvements in our platform intended to increase efficiencies in our traditional infrastructure components. The technology industry in general has struggled to create a consistent automation framework for traditional heterogeneous data center infrastructures.

Acknowledging a lack of commercial maturity in automation, CTS created [ClosedStack](#), a platform that has the ability to enable end-to-end automation of the disparate technologies in our data center. ClosedStack is providing the infrastructure API for automation at Cerner. The value achieved is realized through the process and automation efficiencies gained within the Data Center Operations by the transformation to Infrastructure as Code.

Building upon server provisioning automation that has been released, the automation team has recently released functionality that allows for the creation of storage volumes, presentation of volumes as LUNs, zoning of hosts and arrays on the SAN fabric, and configuration of volumes for 3Par storage arrays. This automation enables associate efficiency, and will reduce risk of issues resulting to manual storage array operations.



Protecting Cerner: Secure From the Start

Cerner



Secure

Cerner faces the constant challenge of delivering the processes and technology that enable a productive work environment, while still putting into practice measures that protect data for clients, patients and themselves.

Maintaining an elite security posture must begin at the root level, with intuitively-developed software that reinforces security through testing and quality assurance before seeing real-world application. Enterprise Security can anticipate and mitigate threats, both physical and logical, by adhering to industry standard practices. Key factors that drive our success in security include following the NIST framework, keeping information systems protected through Identity & Access Management, and maintaining security continuity through Governance, Risk & Compliance.

Security Standards Conformance and General Data Protection Regulation

In the interest of continuously reinforcing our security posture, Security Architecture has implemented a set of security configuration baselines for all hardware assets and OS infrastructure. Compliance with those baselines will be measured relative to the DISA Security Technical Implementation Guidelines (STIGs) for IP Dev domains.

We are mitigating risk exposure to the European Union's General Data Protection Regulation (GDPR) by strengthening Cerner's data management practices across all impacted areas of the business. GDPR becomes an enforceable law in May of 2018. OneTrust Privacy Management and Data Inventory tooling has been implemented, and business liaisons from across Cerner are actively identifying high-risk areas.

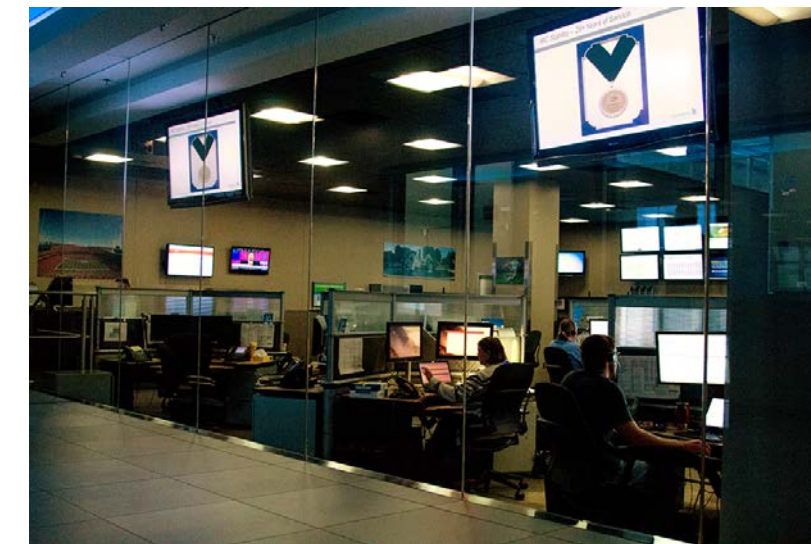
Vulnerability Management

The magnitude of information exchanged across Cerner's systems is almost unfathomable when broken down into raw numbers. Every second 40,000 messages are processed by data center systems, and billions of logs are cycled through the Security Incident and Event Management (SIEM) tool each day. With such an inundation of data, precise vulnerability detection through log scanning is crucial. While log scanning is currently used to create more visibility into alerting and investigation of incidents and events, the scope of the information that can be documented and applied to all facets of security includes mitigation of external data breaches, proactive and corrective actions following an alert, and physical security alerts such as early identification of unauthorized access attempts and automated communication to associates in the event of a security breach.

In May of 2017, the WannaCry ransomware attack affected tens of thousands of systems in over 150 countries. Teams in CTS Enterprise Security responded quickly, executing software patching to address potential vulnerabilities in nearly 110,000 Windows systems. Following the NIST framework and leveraging Tanium to determine the impacted systems, the Cyber Security Incident Response Center

(CSIRC) and operational teams were able to patch the bulk of vulnerable assets within 48 hours, and the few infected assets were taken offline. As a result, no clinical data was encrypted or lost during the attack.

In asserting a vision of an established and maintained process for identification, analysis and remediation of threats within the Cerner risk remediation timeline, Cerner has addressed 898,589 internet-facing vulnerabilities since the start of 2017. On-time remediation of internet-facing threats improved to 90% in Q3 2017, with substantial reduction in remediation mean time across all risk ratings.



"Confidentiality, integrity and availability are the foundation of [our] security program. Think about the trust our clients put in us to make sure their data is taken care of and secured."

Don Kleoppel
Chief Security Officer

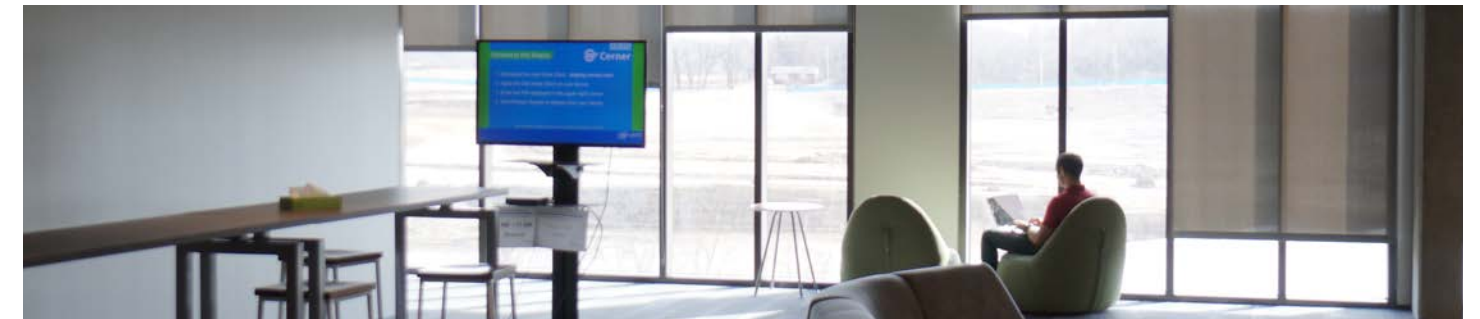
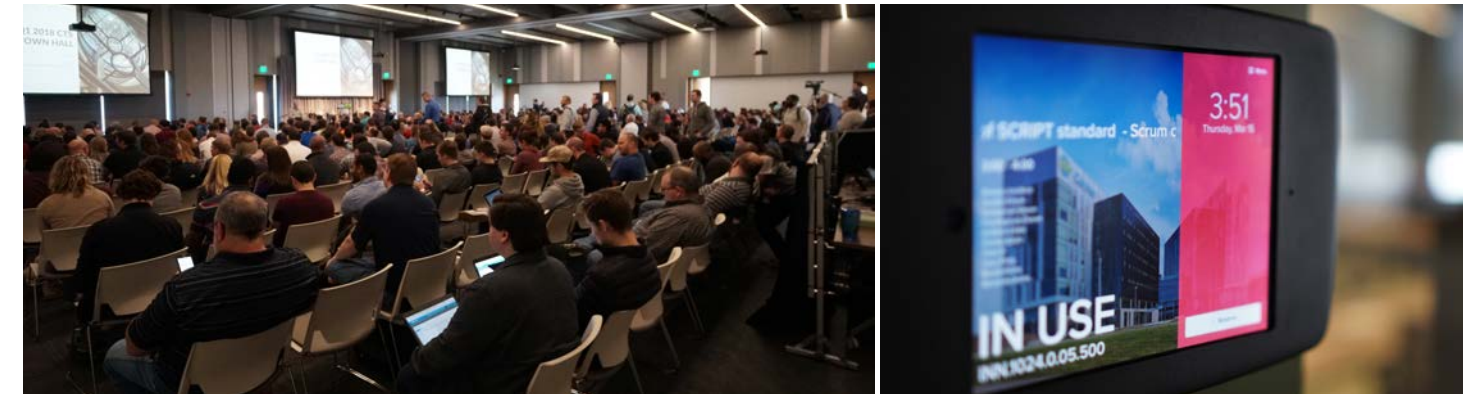
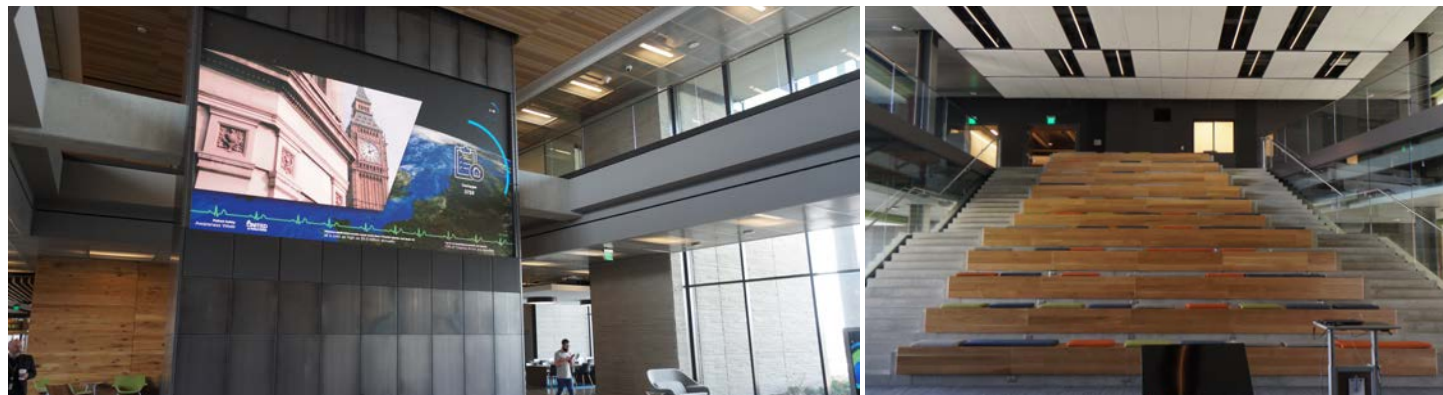
Cerner Innovations Campus

The intersection between health care and technology is a phrase with which every Cerner associate should be familiar. It's a mantra that speaks to the ambition, the proficiency, and the heart of why we do what we do. Cerner Technology Services drives those who drive health care innovation, so we play a special and vital role in ensuring that intersection is a viable one.

When the new Innovations Campus opened in early 2017, executing the vision of the most technologically enabled Cerner property was an unprecedented effort. Requiring contributions from associates across the CTS organization, Innovations was launched with resounding success. The tech footprint, both seen and unseen, is a

substantial one and unlike anything Cerner has developed before. From hundreds of wireless conference spaces, to a purpose-built multi-room event center with dynamic audio/video capabilities, to a 275 square foot media wall, Innovations provides an environment that is not only inviting for the engineers and developers based there, but that also fulfills the vision of technological innovation implicit in its name.

Every screen, every foot of fiber cable, and every network connection in operation on campus has the mark of CTS associates who are a critical component of the Cerner vision. Without a commitment to advancing the state of health care, patients face greater risk of insufficient care. And without technology, health care stays the same.



Innovations Campus Technology Contribution

Collaboration

300+ wireless video connections in conference rooms and mobile carts

1000 seat event center automatically adjusts a/v configuration based on room partitioning and size

Distributed Antenna System for AT&T, Sprint, T-Mobile and Verizon cellular

150 seat Assembly

22 x 12.5 foot media wall

Networking

550 interior and 8 exterior 802.11ac wireless access points

130+ switches, including 2 core switches to support future construction

Labs and Health

Abilities Lab and Tech Lab with dedicated network rooms

Pharmacy and Clinic utilize Cerner Solutions

Motion Lab, User Experience Lab

Fitness center with integrated sound and internet-connected cardio machines

Security

Approximately 300 integrated surveillance cameras

250+ controlled access doors

30+ emergency phones in elevator lobbies, stairwells and parking lots

Stakeholder Satisfaction

Associate Experience

Of all of the functions that CTS fulfills on the enterprise level, the value provided by the Associate Experience initiative is among the most transparent. Delivering a digital work environment that enables productivity and engagement in a familiar consumer-oriented technology experience has been a long standing objective of CTS.

In 2017 we initiated several hardware and software improvement rollouts that targeted this objective. Cisco WebEx and Intel Unite open communication avenues that previously were costly, inefficient and unreliable. Eventboard allows for fast room scheduling with a simple touch-based UI

outside each conference space. Exchange Online and Teams provide continuity in communication under the umbrella of Microsoft Office 365, which was rolled out to all Cerner associates in a large-scale and multi-phase transition.

The Device Choice Program saw updates in several areas, including core spec improvements, a standard device change, and associate choice assistance documentation. Eight premium choices were offered and included touch-screen device options. In total, 6,606 devices were distributed at a total cost savings of \$1.1 million.



CTS Associate Device Choice
2017 Distribution

14" Laptop (New Hire) - 31.8%		
14" Laptop - 34.0%	15" Laptop - 17.0%	
	14" Tablet - 10.7%	13" Laptop - 3.8%
		12" Laptop - 0.2%
		12" Tablet - 2.5%



Service Readiness & Adoption

One complex element of managing a successful IT organization has less to do with the technology itself, and more with preparing those who depend on technology to do their work every day. Associate devices, collaboration platforms, and all the tools we provide for associate productivity do not attain their intended value unless each user understands how to fully engage with their work environment. In the fast-paced and ever-changing world of IT, tools and services risk failure to meet their potential unless associates are properly prepared for change.

The Service Readiness & Adoption initiative seeks to establish a standard practice for ensuring associate change readiness and drive adoption for the technology services that CTS provides. A team of associates has developed and is maturing a process that involves evaluating the business goals and desired behavior changes in order to deliver the necessary marketing, education, and other strategic elements that will drive successful adoption. The Readiness & Adoption framework has been integrated with the strategy and project management pipeline, resulting in more than 20 associate-facing projects with executed adoption plans in 2017.

In 2017, Readiness & Adoption effectiveness was tested as CTS continued to roll out Microsoft Office 365 to all associates

across the globe. Changes ranging from eliminating .pst files for all users, to migrating millions of associate files into OneDrive folders marked a significant shift in associate workflows.



Multi-Factor Authentication (MFA) has become a staple of access management in corporate environments. CTS rolled out MFA from industry leader Duo, enabling notifications to be sent to associate mobile devices in order to verify login credentials for certain enterprise solutions. Readiness & Adoption efforts helped associates prepare for this process change with awareness and training documentation throughout its release. As this initiative matures, so will associate capacity for efficient and effective change.



Operational Excellence

Asset and Configuration Management

In order to ensure that technology serves as a tool for innovation and stability rather than a roadblock, Cerner took significant steps forward in building and maintaining a reliable inventory of assets and configuration items necessary to support IT business operations. This asset and configuration management model highlights Cerner's efforts toward continual service improvement and growth, while focusing attention on the attributes and relationships pertinent to the Configuration Management System (CMS).

2017 was largely spent gathering data with a shift toward consumption in 2018 as teams focus on relevant use of gathered

data sets. The network discovery success rate has improved over 19.47% since the start of 2017, with 93.46% of assets currently discovered. The remainder of assets to be discovered fall into the US RHO and Cloud environments including those located in Malvern, PA, all of which have a plan for discovery in Q2 2018. The full CMS Data Quality Score is on track to attain the end of 2018 goals.

As Cerner grows, a reliable model for asset and configuration management is essential; consistency and efficiency in this arena helps to drive scalability with heightened agility and the ability to respond rapidly to associate and client needs. With that in mind, a rebrand of the CMS name was announced in 2018, and will be known as Beacon moving forward.



Service Availability

The single most important component of a successful data hosting service is availability of data at every moment a client needs it. The incident free time goal for 2017 was exceeded, providing virtually uninterrupted service for clients across Cerner's hosting network.

A purple rectangular graphic containing four lines of white text. The background of the graphic shows a blurred image of a server room or data center.

99.9951%
CTS Malvern Incident Free Time

99.9966%
Technical Services Incident Free Time

99.9760%
Application Services Incident Free Time

99.9959%
Combined Incident Free Time
Goal: 99.9950%

2017 Recognition

A blue rectangular graphic with a background image of a modern building. The text is white and lists several achievements.

CTC-KC 3200 Energy Star® Certified Building rating by the United States Environmental Protection Agency (EPA)

NetApp Innovation Award

Maintained ISO 27001 and PCI Certifications

47th Best Place to Work in IT (ComputerWorld)

Portfolio/Project Management

One of the key requirements of rapid corporate expansion is ensuring that development and service conventions aren't neglected in the course of large-scale change. There is an inherent risk of declining consistency when innovation is driving progress; fortunately the culture of innovation at Cerner can be cultivated through standardization of service and support processes.

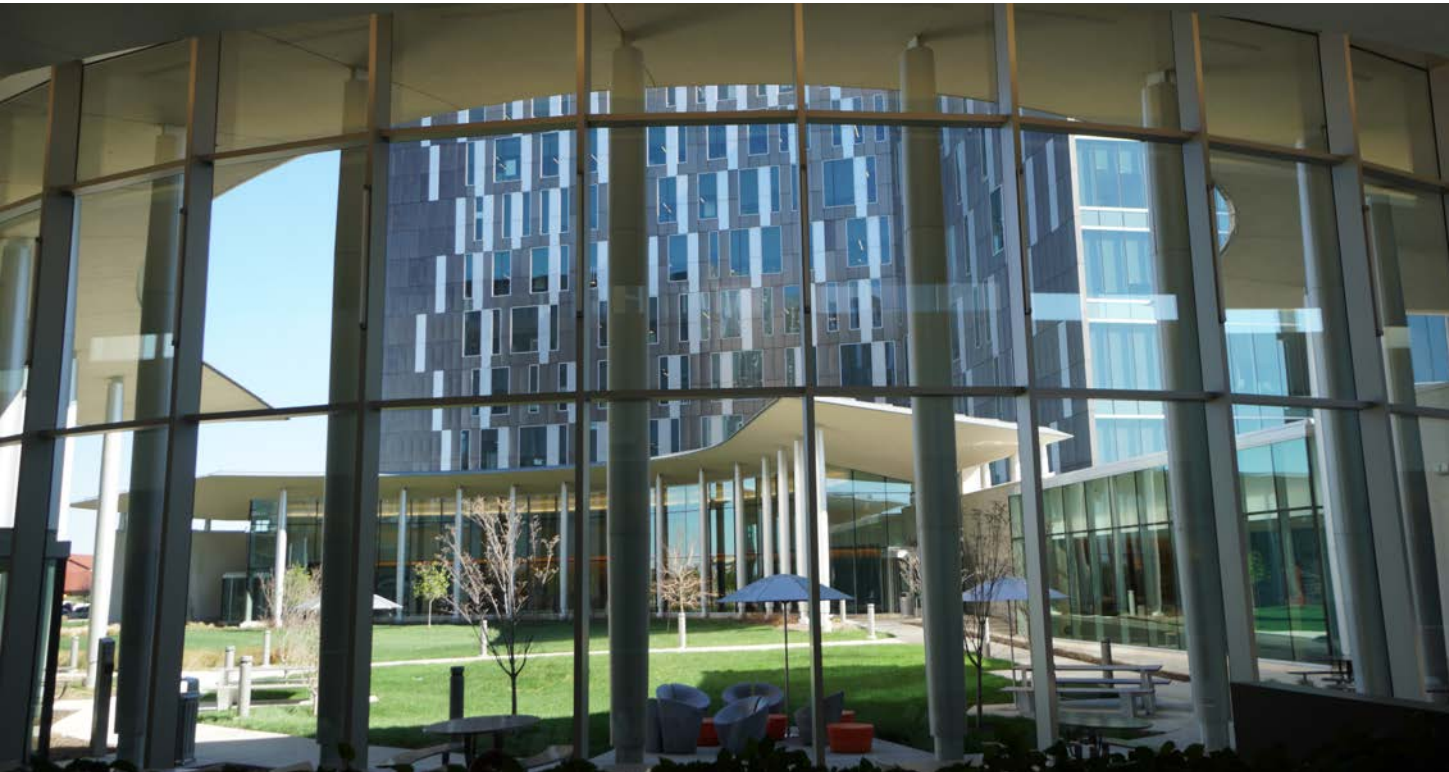
An optimal client support experience is a crucial component of CTS growth and relies on the use of common data and internal processes to thrive. Project and Portfolio Management (PPM) aims to improve associate productivity, accuracy and efficiency in an effort to elevate the quality and consistent delivery of service to our clients.

Portfolio/project management practices have been standardized in Project Central ahead of the implementation of PPM for CTS, which is scheduled for the first half of 2018. We are currently tracking on 247 projects in Project Central with 138 under active development (55%).

The main operational benefit is that all project work across CTS is now visible in a single location and dependencies are being coordinated and tracked clearly and each new project has a planned value proposition. This visibility has led to the project demand and closure rates being much more closely aligned than at any time over the past year, which aids in resource planning and alignment moving forward.

“Leveraging PPM gives us a streamlined, centralized platform for project management that lets us prepare associates for CTS releases in a way that was never as easy or efficient with our past framework. PPM saves so much time.”

*Bill Elliott
Senior Portfolio Leader*



Workforce Enablement Through Automation

Along with the growth we continue to see across Cerner, the need to scale CTS's ability to support that growth is a factor constantly in transition. In order to prevent our headcount growing at the same rate as our revenue, we need to identify opportunities for automation that allow us to better define the scale of each. Artificial Intelligence (AI) and workforce automation technology have matured in a way that there are now several viable options available for Cerner to automate processes in order handle our company growth.

CTS is leading the way in implementing these technologies. AI affords Cerner the opportunity to use cost effective means

to automate many repetitive and basic tasks such as support requests, as well as augment our associates' workflows to increase their productivity. CTS is actively in talks with various organizations throughout Cerner to coordinate and lead efforts in driving AI adoption across the enterprise. Workflow opportunities provided by our internal businesses include standard support requests, recruiting needs, booking and scheduling resources, and resource discovery. CTS is leading the effort to target and implement the right workflow-specific and commercially-available AI technologies to advance this vision.

Future Orientation

Multi-Cloud Enablement

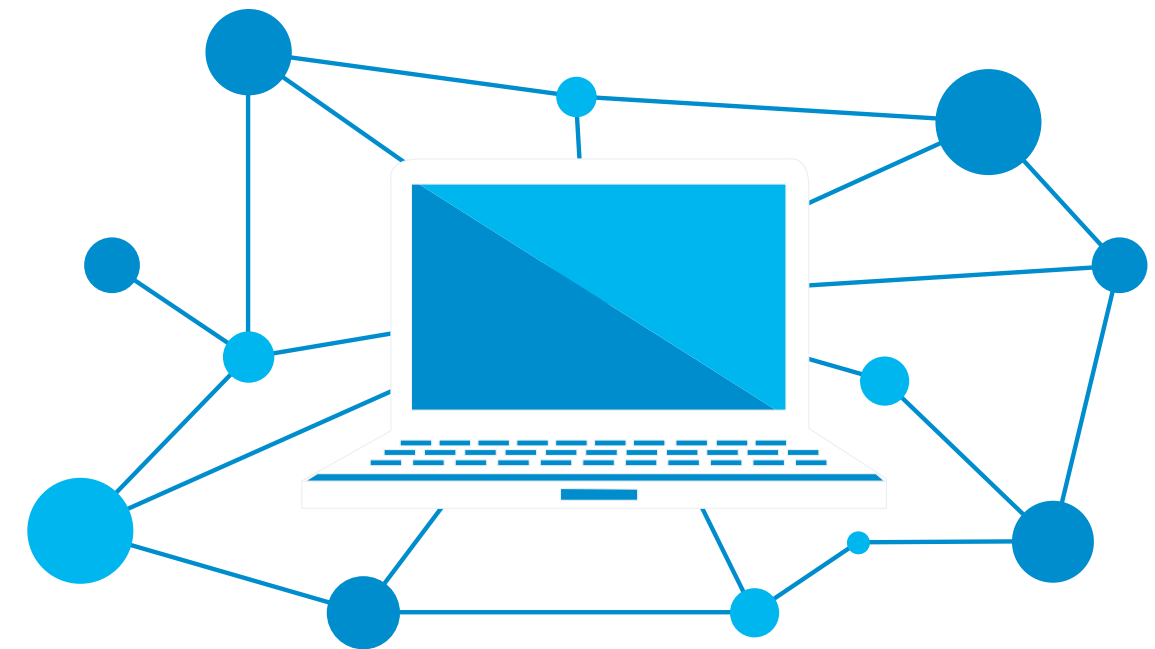
Reorienting our cloud approach focuses on one specific goal; to deliver the capabilities necessary to accelerate the path from a new idea to a market-ready solution, flexing and scaling to meet global demand without compromising performance or reliability.

More than 65 active cloud tenants, both corporate and IP facing, have been deployed for use through the Cloud Broker Management process. This process provides critical financial and operational insights ensuring these cloud projects are appropriately managed and monitored.

As we consider the next three years, our focus is three-fold: Modernize the existing, enable the next, and position ourselves for the future. With this focus, the public cloud offers us much promise and opportunity.

We believe the public cloud can change the way we approach and think about our infrastructure delivery model, both internal for Cerner's platforms as well as for our clients' solutions.

Core tenants to Cerner's strategic direction include continuous delivery and artificial intelligence, which are well positioned for cloud delivery given the toolsets and capabilities today's public cloud providers can deliver. However, considering the cost reality associated with cloud enablement, we must provide a flexible infrastructure that enables the interoperability between existing systems and future capabilities. Ultimately, we must deploy a multi-cloud capability that allows for flexible delivery models and ease to land workloads in the most suitable environment for success.



Data Democratization

In the key areas of Finance, HR, Marketing and Production Management, how we capture, organize, relate, and analyze data to maximize efficiencies, or create new revenue streams helps determine how we strategize for future growth at Cerner. The same transformative and innovative approach we bring to improving health care is relevant in the data space as well.

Data democratization at Cerner exists to provide associates with the data, access, and tools necessary to inform business decisions. Foundational data lake technologies delivered on Microsoft Azure in support of the CMS initiative (Beacon), enable rapid progress in our ability to analyze system configuration.

By focusing on four key elements of data management, we foster a Data First culture, and in doing so we maintain an environment that is secure, effective, and competitive in the health care IT marketplace:

- Implementing an enterprise-wide information management practice to ensure information is locatable, accurate, relatable, accessible, and secure across the company
- Recognizing and reinforcing a culture that understands that good data and analysis are the foundation under every impactful business decision
- At a leadership level, trusting and utilizing the data to make critical business decisions to improve day to day operations and efficiencies
- Growing the number of data analysts and data science practitioners available to tackle our most complex target spaces where widened margins provide the most impact

Cerner Technology Services

