



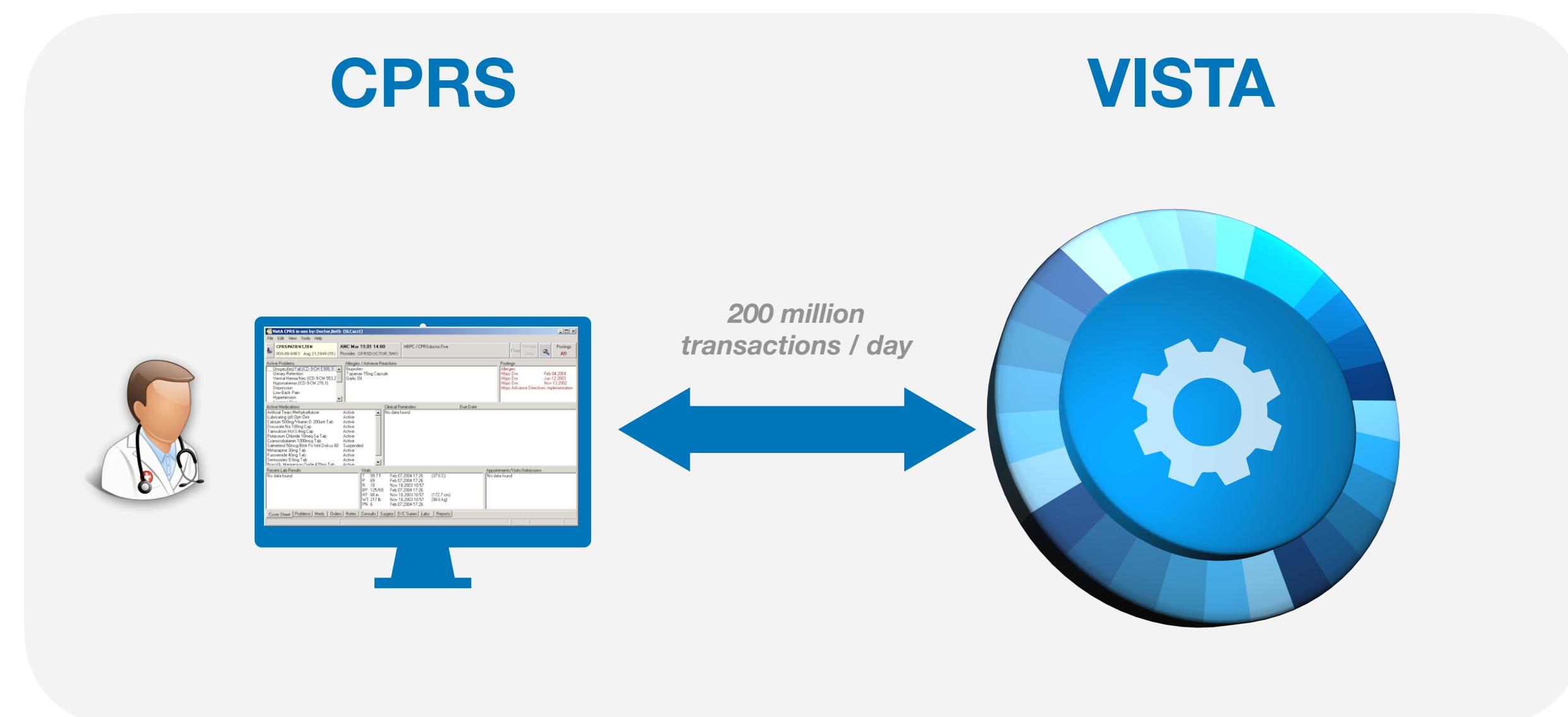
Cloud VISTA

*Streaming VA's Computerized Patient Record System anytime,
anywhere, on any device to provide the best care, anywhere*

VISTA/CPRS

VISTA-CPRS is the VA's integrated nationwide veteran health information system.

VISTA Data Scope



Volume

300 million veteran-years of data
100 Terabytes structured data
15 Petabytes image data

Variety

95,000 fields defined in 184 integrated applications

Velocity

200 million transactions/day
50 million clinical reminders
1 million new documents
1 million new lab tests
1 million new imaging tests
1 million new pharmacy orders

Veracity

Authoritative source of all veteran health data spanning 35 years;
entered and validated by 380,000 VA clinical and support staff.

Clinical User Interface

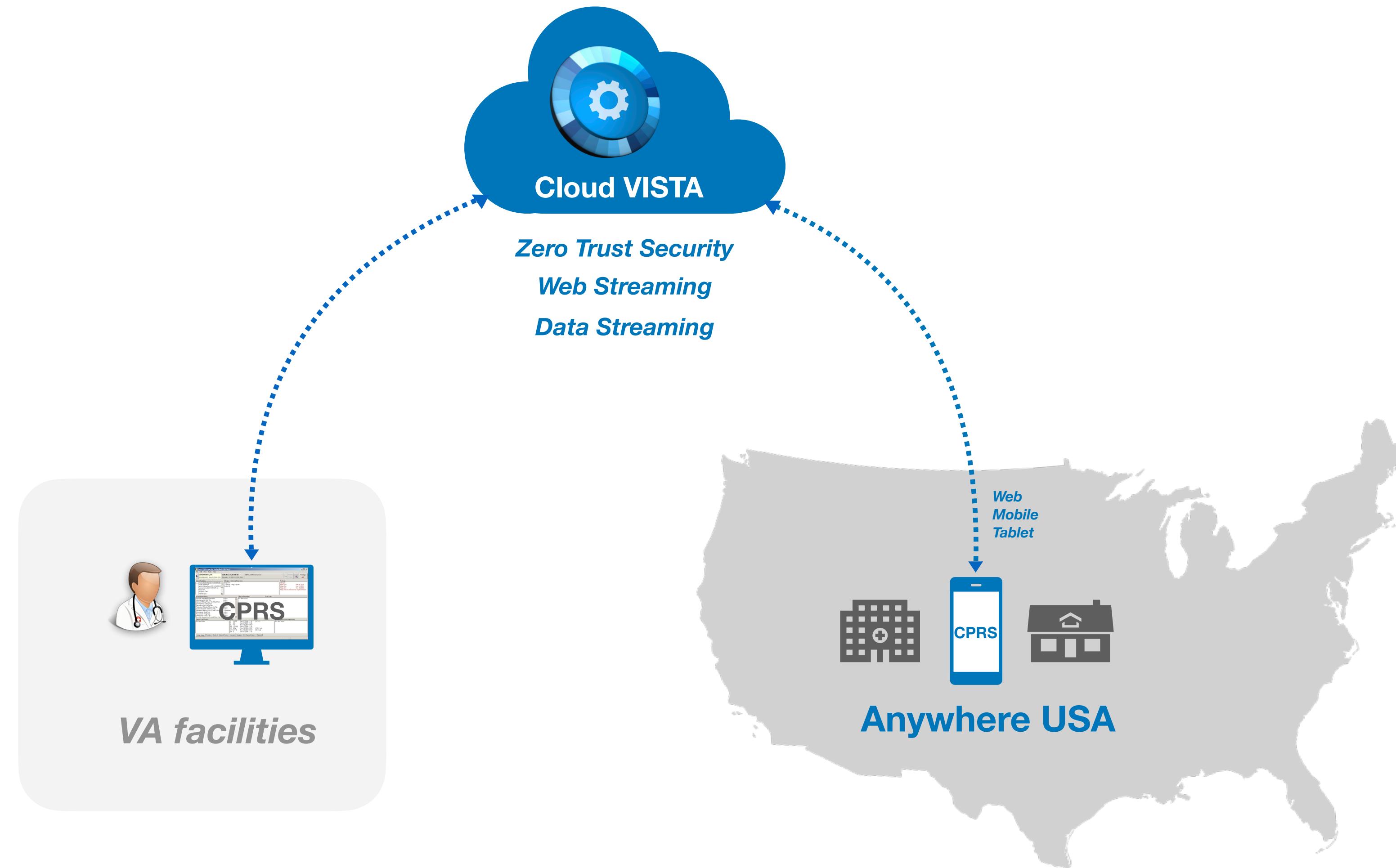
400,000 workstations
2000 facilities
380,000 end-users

Integrated Transaction Database

300 million veteran-years data
184 integrated applications
200 million transactions / day

Cloud VISTA

Cloud VISTA provides secure web streaming access to CPRS anytime, anywhere, to any device.



Cloud VISTA leverages Amazon's AppStream technology to transform CPRS into a web streaming service. This is the same technology that streams Netflix into hundreds of millions of living rooms across the USA every day.

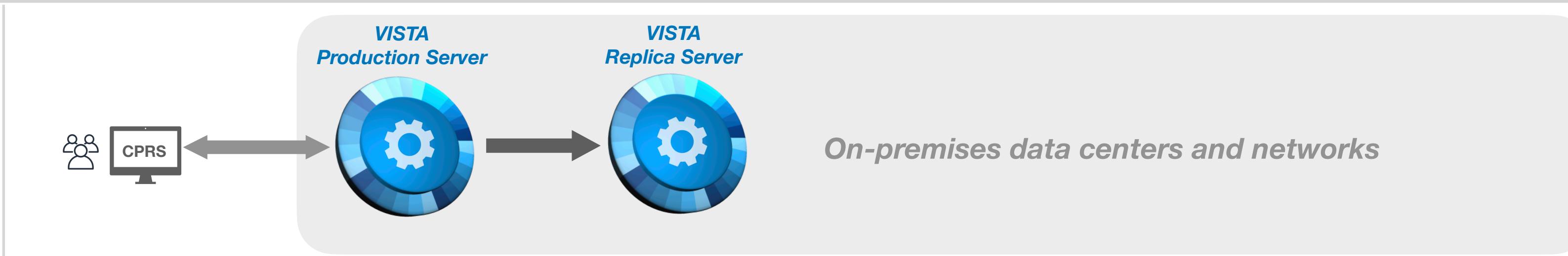
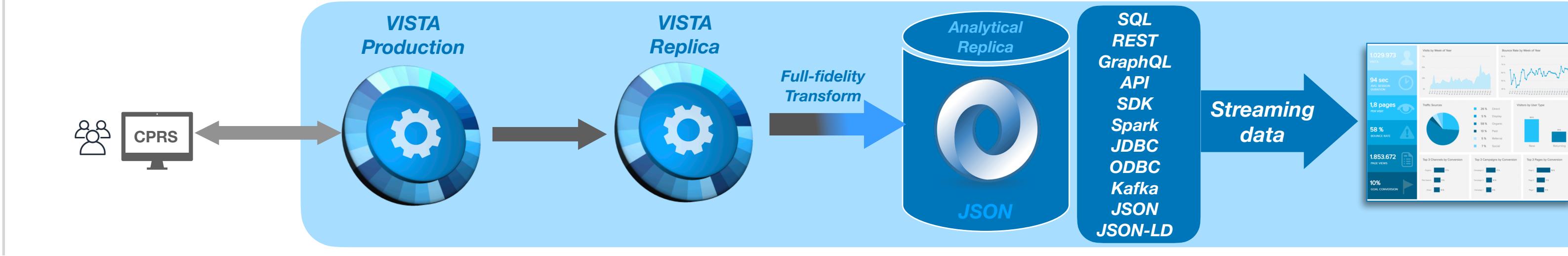
NETFLIX

Cloud VISTA Program

Program	Phase	VISTA Systems	Status	Benefits
Migration				
Cloud Migration I	1	VISTA Replica Server	Certified; in production	Reliability
Cloud Migration II	2	VISTA Production Server	Certified; in production	Performance
Adaptive Maintenance				
Zero Trust Security	3	RPC interface monitoring	Certified; in production	Real-time machine learning based fingerprinting and monitoring of all remote access of VISTA
Application Streaming	4	CPRS web streaming	Certified; in production	Anytime, Anywhere, Any Device Streaming Web Access of CPRS
Data Streaming	5	JSON VISTA Data	POC Completed	Comprehensive Full-fidelity Data Access and Analytics



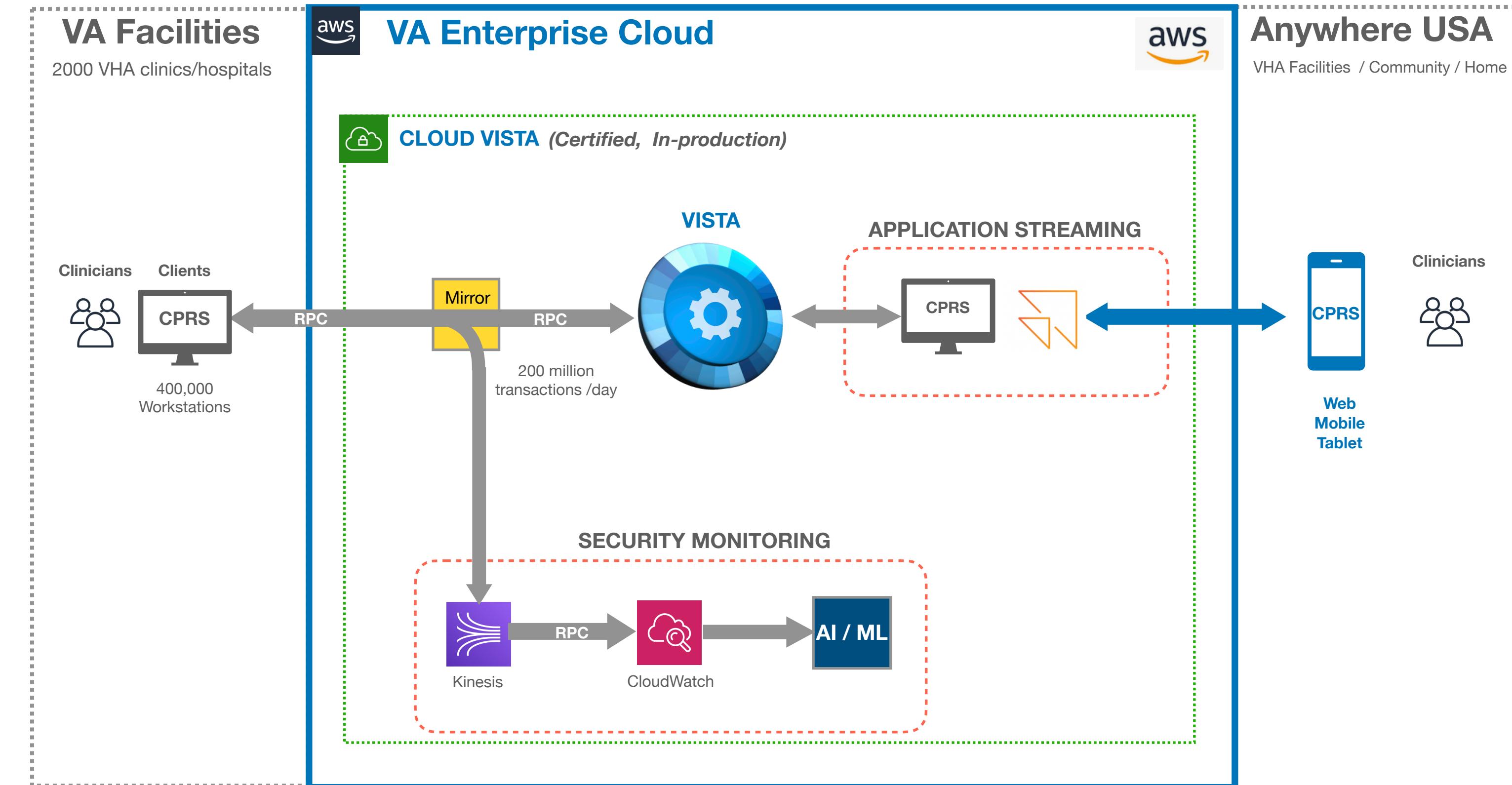
Cloud VISTA Program

Stage / Status	Data Management and Configuration	Key Benefits
0 VA Infrastructure	 <p>VISTA Production Server</p> <p>VISTA Replica Server</p> <p>CPRS</p> <p>On-premises data centers and networks</p>	NA
1 Cloud Migration I: VISTA Replica Server <i>IN OPERATION: All VAMCs</i>	 <p>VISTA Production</p> <p>VISTA Replica</p> <p>CPRS</p> <p>VA Enterprise Cloud</p>	High Reliability
2 Cloud Migration II: VISTA Production Server <i>IN OPERATION: Texas, Omaha VAMCs</i>	 <p>VISTA Production</p> <p>VISTA Replica</p> <p>CPRS</p> <p>VA Enterprise Cloud</p>	Security and Performance
3 Cloud Connectivity (Comprehensive Access) <i>POC PROVEN</i>	 <p>VISTA Production</p> <p>VISTA Replica</p> <p>CPRS</p> <p>Full-fidelity Transform</p> <p>Analytical Replica</p> <p>JSON</p> <p>SQL REST GraphQL API SDK Spark JDBC ODBC Kafka JSON JSON-LD</p> <p>Streaming data</p> <p>Online Transaction Processing</p> <p>Comprehensive Connectivity</p> <p>Online Analytics</p>	Comprehensive Secure Streaming Data Access, APIs, and Analytics



Cloud VISTA Architecture

Cloud VISTA in operation in the
VA Enterprise Cloud on AWS



VISTA: Veteran Health Information Systems Technology and Architecture
FileMan: File Manager. Hierarchical data store of all Vista data.
RPC: Remote Procedure Call (transaction processing calls)
Clients: CPRS, JLV, CAPRI (total: 49 clients)
Prod: production **Replica:** real-time replica (reliability)

VAEC: VA Enterprise Cloud (commercial)
MongoDB: hierarchical data store (commercial)
AWS: Amazon Web Services

Certification:
U.S. GovCloud: FedRAMP-HIGH
VA: RiskVision (425 controls)
DoD: eMASS (1600+ controls)
NIST: FISMA-HIGH
Commercial: HIPAA

Application Streaming



AppStream CPRS

The screenshot shows the Amazon AppStream 2.0 landing page. At the top, it features the title "Amazon AppStream 2.0" and a subtitle "Secure, reliable, and scalable access to applications and non-persistent desktops from any location". Below this are two buttons: "Create an AWS Account" (orange) and "Try Sample Applications for Free" (white). The main content area is divided into four dark blue boxes with white text:

- Empower your remote workforce and react quickly to changing conditions with access to applications and desktops from anywhere.**
- Strengthen security by storing data on AWS instead of vulnerable endpoint devices.**
- Optimize costs through on-demand cloud scalability with a range of compute, memory, and storage options.**
- Reduce downtime with fully managed application delivery and reliable AWS infrastructure offering 99.9% uptime.**

Cloud VISTA leverages Amazon's AppStream technology to transform CPRS into a web streaming service. This is the same technology that streams Netflix into hundreds of millions of living rooms across the USA every day.

NETFLIX

<https://aws.amazon.com/appstream2>

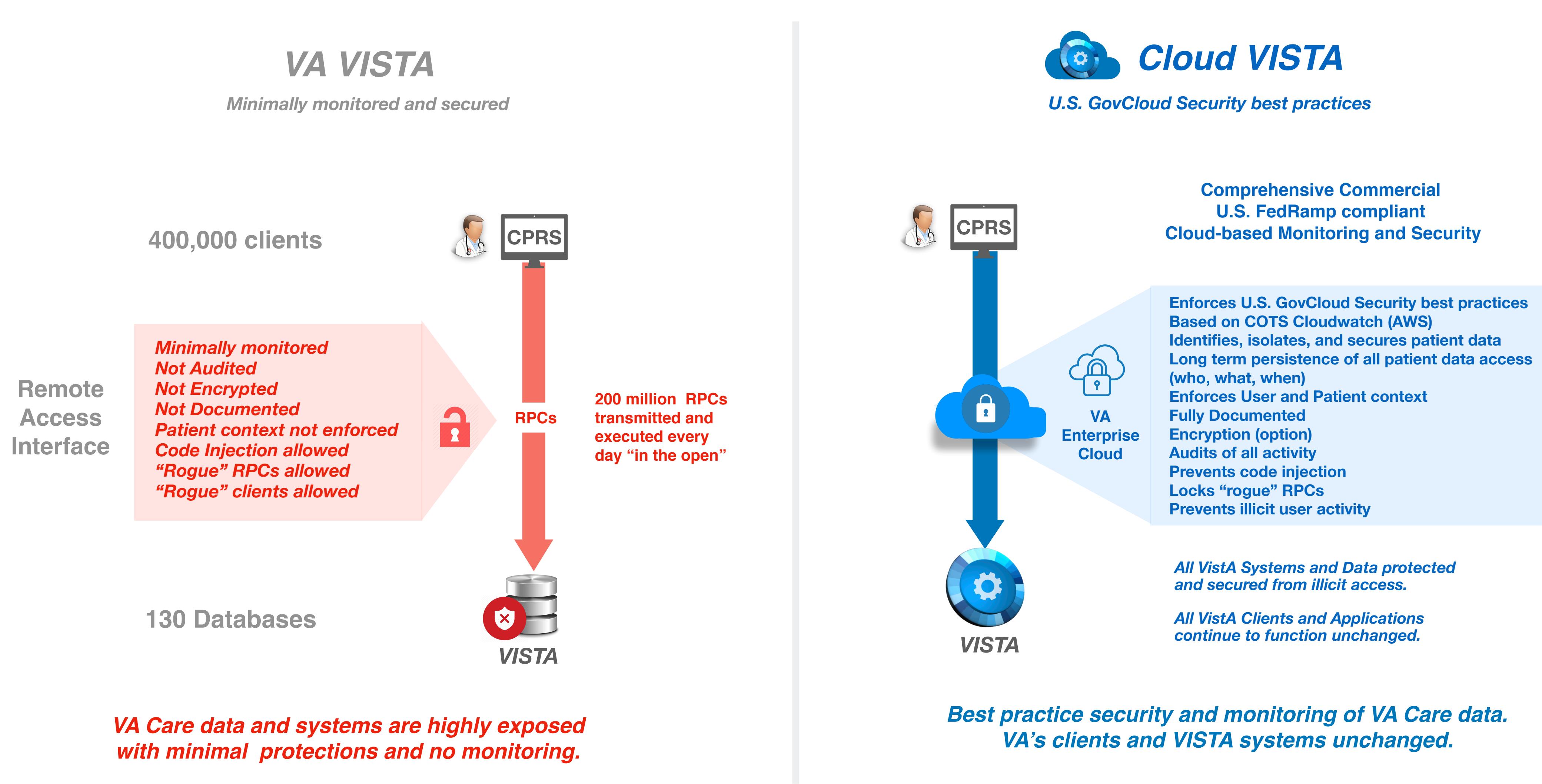
Security Monitoring



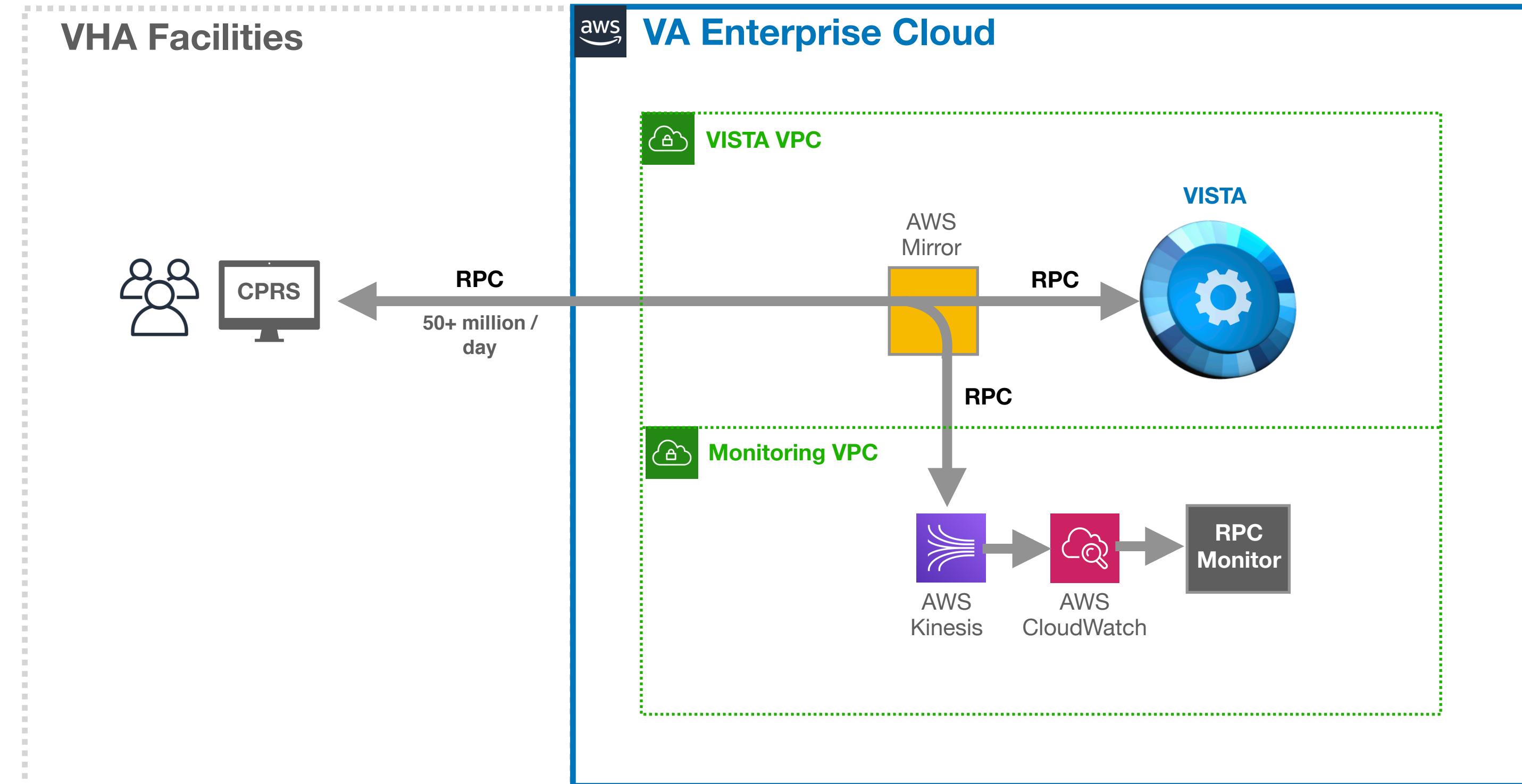
Cloud VISTA Security Monitoring



*VISTA's main interface is the Remote Procedure Call (RPC) Interface.
The RPC interface connects all 400,000 CPRS clients to all 130 VISTA systems and
supports 200 million Veteran care transactions each day.*



VA Enterprise Cloud implementation



VISTA: Veteran Health Information Systems Technology Architecture

VISTA Clients: CPRS, JLV, CAPRI (and 45 others)

RPC: Remote Procedure Call (MUMPS)

VAM: VISTA Adaptive Maintenance

VAEC: VA Enterprise Cloud (U.S. FedRAMP-HIGH)

AWS: Amazon Web Services

VPC: Virtual Private Cloud

Contract:
 VA: T4NG-0411
 VISTA Adaptive Maintenance
 VA Enterprise Cloud Security
 TAC: 19-54164

Certification:
 U.S. GovCloud: FedRAMP-HIGH
 VA: RiskVision (425 controls)
 DoD: eMASS (1600+ controls)
 NIST: FISMA-HIGH
 Commercial: HIPAA

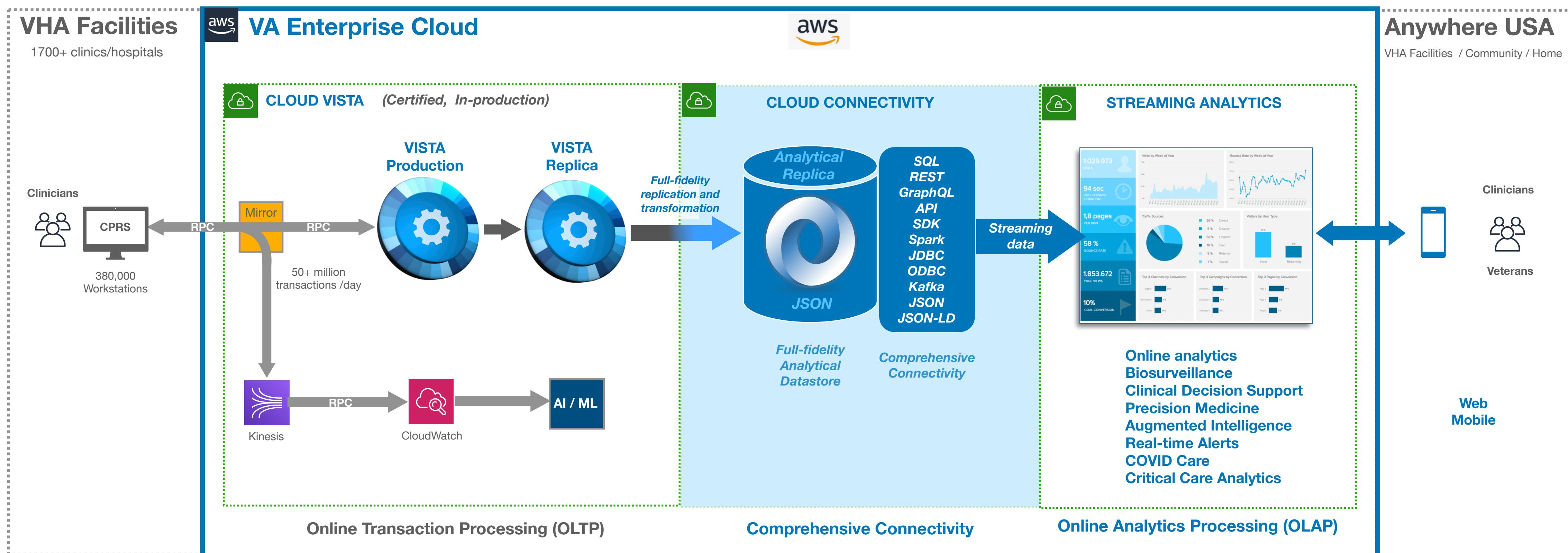
Deployment:
 ATO: 2020-01
 IOC: 2020-03

Cloud Connectivity Roadmap



Cloud VISTA: Connectivity Roadmap

VISTA Cloud Connectivity provides a proven roadmap and technology to transform VA's cloud-resident VISTA transactional databases into online analytical databases as demonstrated in a prior VA proof-of-concept (vistadataproject.info). Cloud Connectivity leverages modern, mainstream, open, industry-standard commodity tools and technologies as endorsed by the U.S. Digital Services (code.gov, data.gov, digital.gov), and comprehensively future-proofs veteran health data with full-fidelity in portable industry-standard form with no vendor-lock or licensing restrictions. Cloud Connectivity enables real-time streaming analytics, clinical decision support at the point of care, individualized precision medicine with full-fidelity data, and real-time streaming data interfaces for Big Data, AI/ML, and Biosurveillance.



VISTA: Veteran Health Information Systems Technology and Architecture
FileMan: File Manager. Hierarchical data store of all Vista data.
RPC: Remote Procedure Call (transaction processing calls)
Clients: CPRS, JLV, CAPRI (total: 49 clients)
Prod: production **Replica:** real-time replica (reliability)

VAEC: VA Enterprise Cloud (commercial)
MongoDB: hierarchical data store (commercial)
AWS: Amazon Web Services

Certification:
U.S. GovCloud: FedRAMP-HIGH
VA: RiskVision (425 controls)
DoD: eMASS (1600+ controls)
NIST: FISMA-HIGH
Commercial: HIPAA



Comprehensive Mainstream Connectivity and Interfaces

Online Analytical Datastore	Connectors [1]	Interface	VA Applications and Platforms [2]
 <i>VISTA Data</i>  <i>Industry Standard JSON</i>	Business Intelligence	SQL	PowerBI, Tableau, Qlik, SAS, SPSS, SYSTAT, Minitab, TIBCO, Alteryx, Crystal Reports
	Web and Mobile	REST JSON	Android, iOS, .NET, Node.js, Web
	Data governance	JDBC	Apache Atlas, DataHub, CKAN, Collibra
	Modeling	ODBC	MS-Excel, Mathematica, MATLAB, LabVIEW, SEMOSS, Weka
	Data science	Spark	Apache Spark, Databricks, Tensorflow
	Composite Data	GraphQL	Composite data services
	Pub-Sub	Kafka	Real-time Clinical Decision Support systems
	Programming	API	C++, C#, Go, Rust, Node.js, Python, Ruby, Java, Scala, Swift
	Linked Data	JSON-LD	Semantic inferencing and Graph data stores

[1] JSON Database Connectors

<https://www.mongodb.com/products/bi-connector>
<https://docs.mongodb.com/spark-connector/>
<https://docs.mongodb.com/drivers/>

<https://docs.mongodb.com/realm/sdk/>
<https://docs.mongodb.com/realm/graphql/>

[2] VA approved technologies (Technical Reference Model)

<https://www.oit.va.gov/Services/TRM/TRMHomePage.aspx>

Spec

Tools

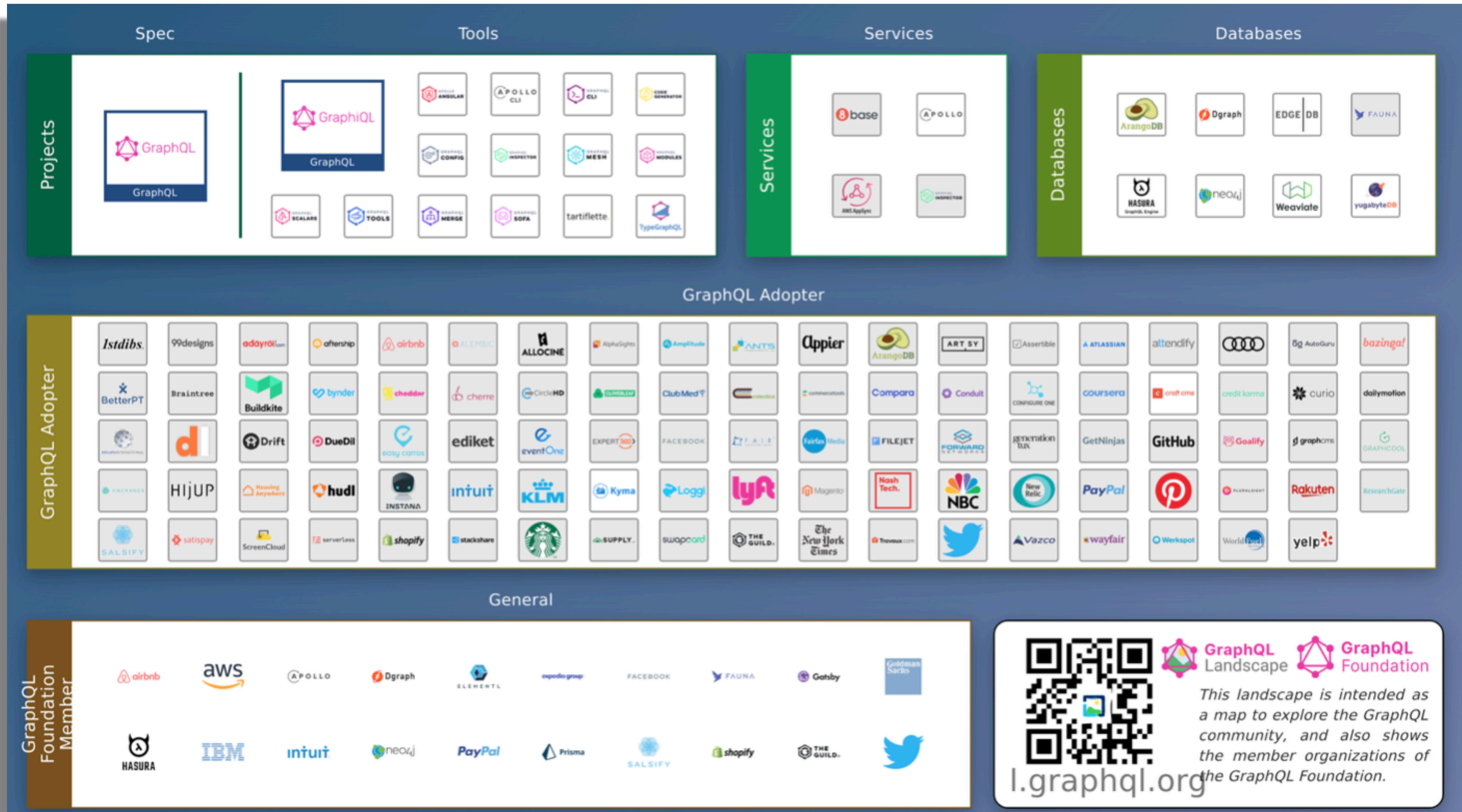
Services

Databases

GraphQL Adopter

General

GraphQL Foundation Member

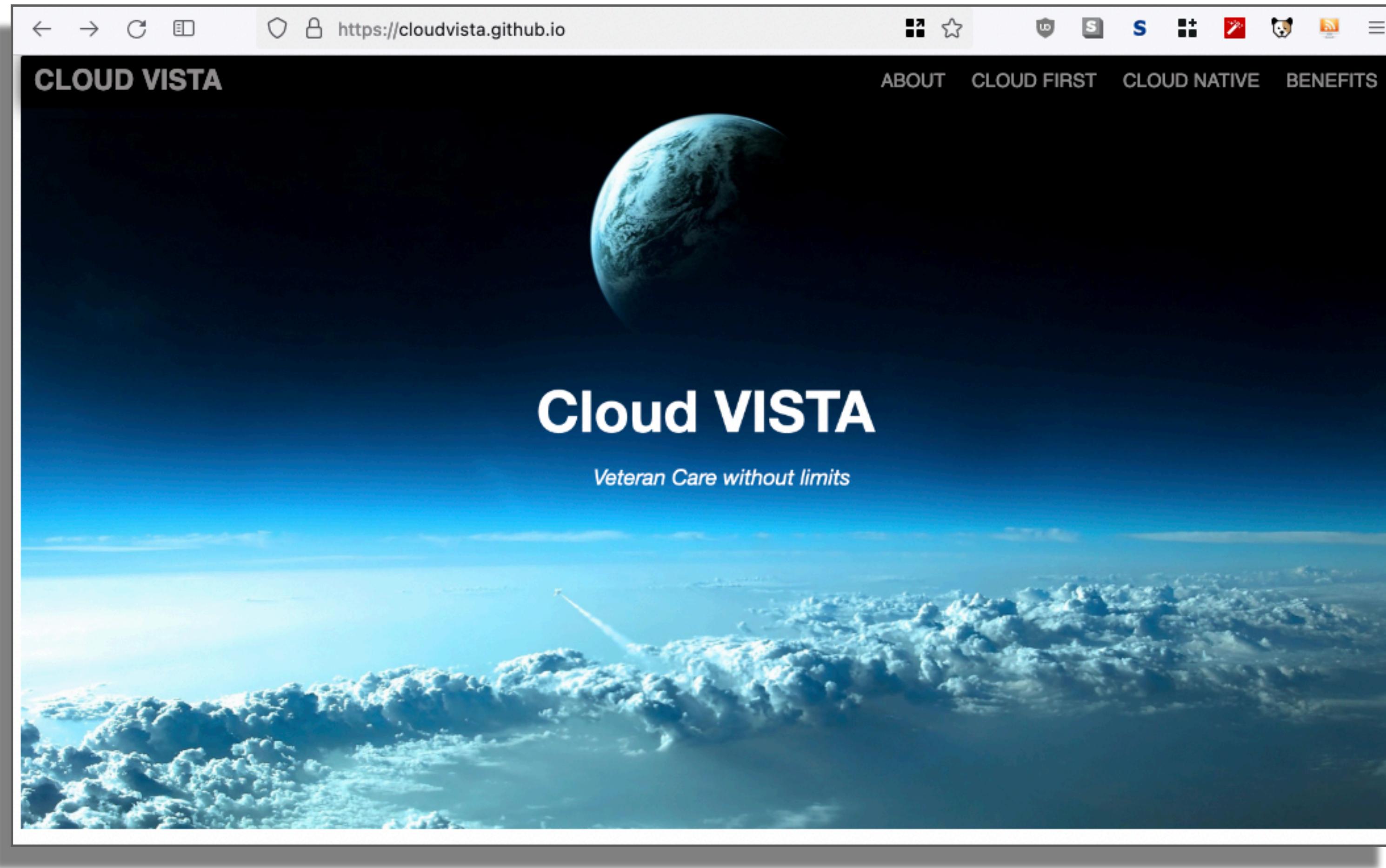


This landscape map illustrates the GraphQL ecosystem across various domains:

- Projects:** GraphQL, GraphiQL, GraphQL Scalars, GraphQL Tools, GraphQL Merge, GraphQL SOFA, tartiflette, TypeGraphQL.
- Tools:** ANGULAR, APOLLO CLI, GraphQL CLI, CODE GENERATOR, GraphQL CONFIG, GraphQL INSPECTOR, GraphQL MESH, GraphQL MODULES.
- Services:** base, APOLLO, AWS AppSync, AWS Inspector.
- Databases:** ArangoDB, Dgraph, EDGE DB, FAUNA, HASURA, neo4j, Weaviate, YugabyteDB.
- GraphQL Adopter:** A grid of logos from various companies including Istibis, 99designs, eddyrol, aftership, airbnb, ALEMBIC, ALLOCINE, AlphaSights, Amplitude, ANTS, Appier, ART SY, Assertible, ATlassian, attendify, Audi, AutoGuru, bazingal, BetterPT, Braintree, Buildkite, Drift, DueDil, ediket, easy carros, eventOne, EXPERT 360, FACEBOOK, Club Med, commercetools, Compara, Conduit, FORWARD NETWORKS, generation tux, GetNinjas, GitHub, Goalify, graphcms, GRAPHCOOL, credit karma, curio, dailymotion, HACKAGES, HIJUP, Housing Anywhere, hudl, INSTANA, intuit, KLM, Kyma, Loggi, lyft, Magento, Nash Tech., NBC, New Relic, PayPal, Pinterest, PLURALIGHT, Rakuten, ResearchGate, ScreenCloud, serverless, shopify, stackshare, SUPPLY., SWAPCARD, THE GUILD., The New York Times, Trevorux.com, Vazco, wayfair, Werkspot, World Bank, yelp.
- General:** airbnb, aws, APOLLO, Dgraph, ELEMENTL, expedia group, FACEBOOK, FAUNA, Gatsby, Goldman Sachs, IBM, intuit, neo4j, PayPal, Prisma, SALSIFY, THE GUILD., Twitter.
- GraphQL Foundation Member:** airbnb, HASURA, IBM, intuit, neo4j, PayPal, Prisma, SALSIFY, THE GUILD., Twitter.
- GraphQL Landscape & Foundation:** QR codes linking to l.graphql.org, GraphQL Landscape, and GraphQL Foundation.

This landscape is intended as a map to explore the GraphQL community, and also shows the member organizations of the GraphQL Foundation.

Website and Information



<https://cloudvista.github.io>