

# The Healthcare Operations Cloud™ & TeleTracking IQ® Platform: An Integrated Model for Patient Flow Efficiencies

Health System IT: Why a Cloud-Based Strategy is the Way Forward

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## The Rx for Healthcare IT:

### Transitioning from Legacy Apps to a Cloud Platform

A major obstacle facing hospitals and health systems is the ability to harness technology to achieve optimized patient care workflow efficiencies. Historically, hospitals have had predominantly hard-wired server-based IT system architectures, making it challenging to scale to the growth needs of multiple facilities or functional areas within a hospital. Legacy-based IT architectures are also restricted in their data backup and sharing capabilities, as well as security and user control and access.

To unleash the full benefits of what integrated clinical and operational software technology can accomplish for healthcare organizations and their patients, providers must completely reorient their IT development approach from plug-in, patchwork applications to a platform design where capability can be continuously delivered and scaled in the cloud.

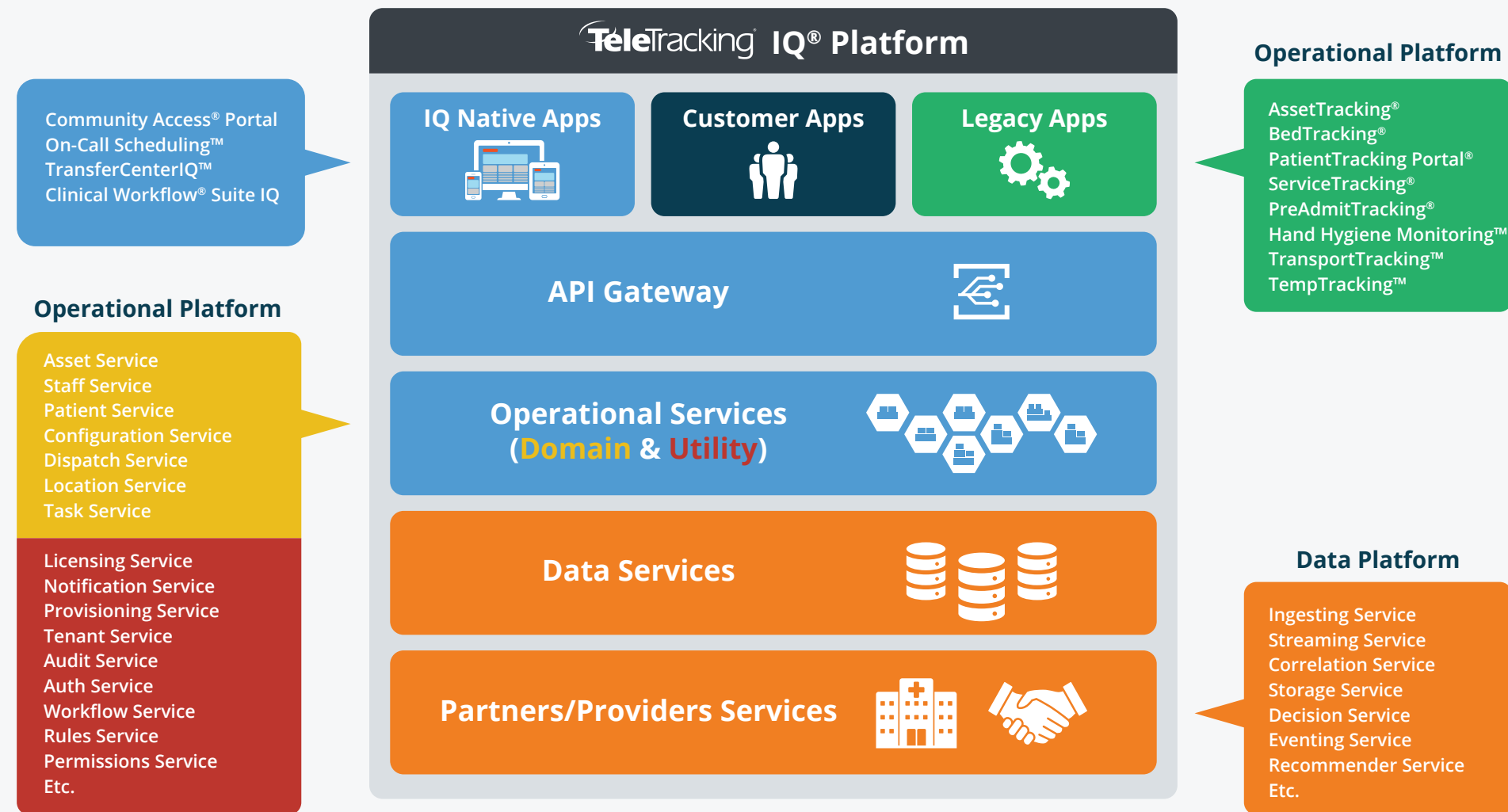


# The Healthcare Operations Cloud™

Technology that can enhance operational workflow efficiencies - and synchronize with clinical care and Electronic Health Record (EHR) systems - is the solution for sustaining healthcare delivery and improving patient outcomes. TeleTracking's cloud-based SaaS platform offers capabilities that hospitals and health systems can implement to integrate complementary operational and patient flow applications that remediate highly complex care access, transition and delivery deficiencies so clinical workflows can proceed in the most efficient and effective manner for patients.

TeleTracking IQ® Platform, built in the Healthcare Operations Cloud™, is designed to support organizational teams to nimbly manage changing capacity and flow challenges across their facilities and process and view patient movement data to make process

## TeleTracking IQ® Platform Architecture



The TeleTracking IQ® Platform is comprised of two components:

- 1) Operational Platform
- 2) Data (Cloud) Platform

adjustments in real-time. On the clinical side, the platform enables more informed patient treatment decisions based on care location availability and suitability, as well as projected patient flow volume patterns versus viewing EHR data in a vacuum.

The TeleTracking IQ® Operational Platform is developed with deeply embedded technologies based on microservices that support a range of operational capabilities including transfer centers, clinical workflow, preadmissions, transport, temporary employee, asset, bed and patient tracking, patient portals, referral management and On-Call Scheduling™. With this platform architecture, teams across a hospital or health system have the flexibility to “turn on” or “turn off” any capability such as bed management or transfer status, as needed. Other hospital/facility areas the microservices-based technology control include all aspects of staffing, dispatch, location, notification, audit, provisioning, and authorizations/permissions.

## 1) Operational Platform - Advanced, Workflow-Driven Built Architecture



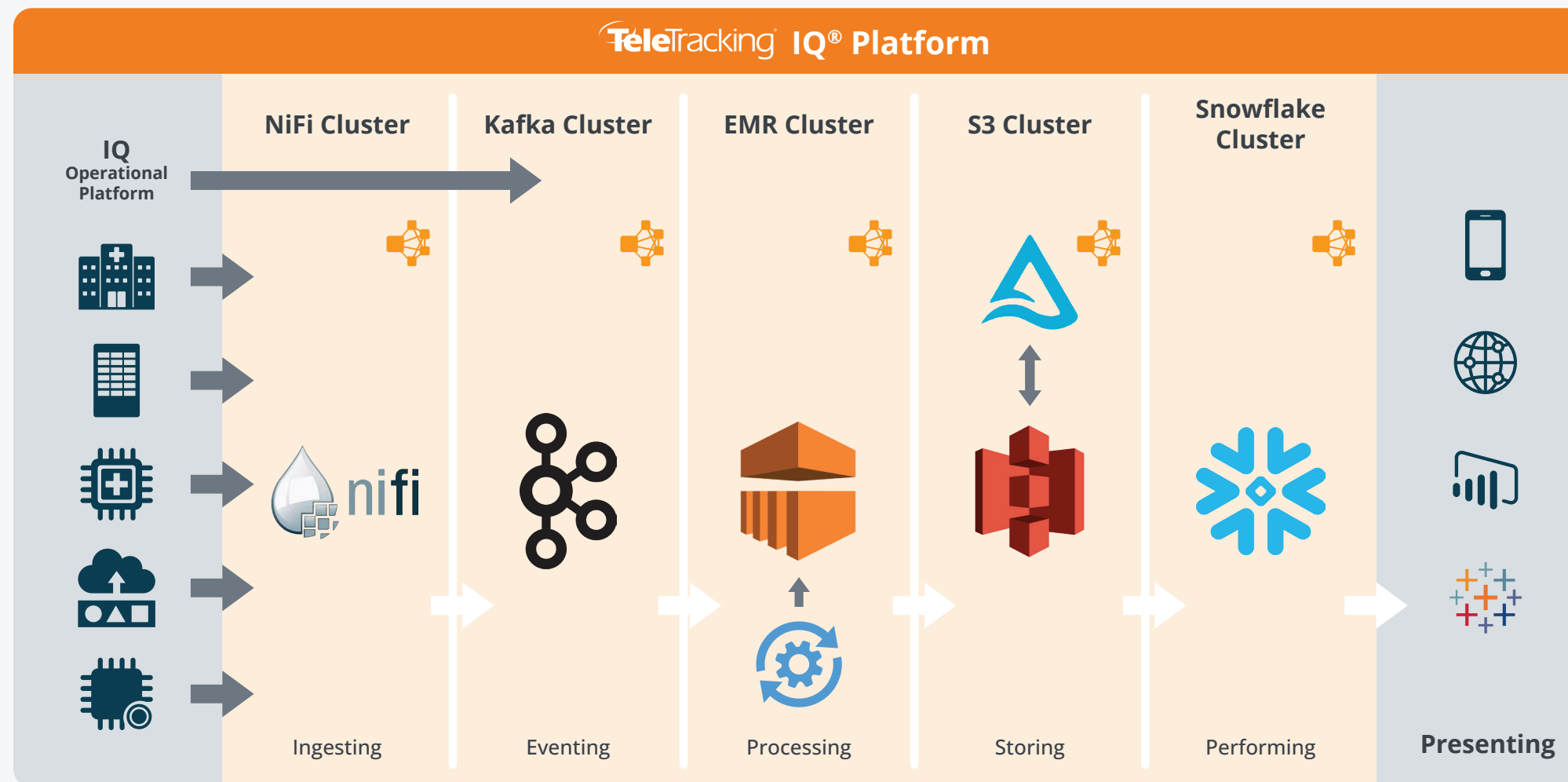
### The Platform's microservices are built with underlying advanced component technologies that include:

- Service Framework: Spring Boot
- Service Eventing: Apache® Kafka
- Service Packaging: Docker, Nexus
- Service Clustering: Kubernetes
- Service Storage: MongoDB
- Service Workflow: Flowable
- Service API Gateway: Netflix Zuul
- Service Build/Deploy: Spinnaker
- Service Metrics/Log Management (Observability): Grafana Cloud
- Service Protocols: REST and GraphQL
- Service Testing: Junit, Aloe, JMeter
- Service Languages: Java, Python
- UI: React and React Native (Internal: Mosaic Design Framework)
- Platform Alerting: Atlassian Status Page and OpsGenie

## 2) Data (Cloud) Platform – Horizontally-Scalable, Big Data Architecture

### TeleTracking IQ® Data Platform

Providing Hindsight, Insight and Foresight for Mature Health Systems



The same microservices-based development for the Operational Platform also drives processing and analytics for cross-health system and hospital operational data within the Data Platform, including capabilities for data ingestion, eventing, correlation, decisioning, recommending and streaming, supported by an advanced AI/ML foundation. TeleTracking SynapseIQ® Enterprise Analytics Integration capability supports data assimilation from a wide range of data sources across hospital operations, including transfer centers, operational workflows and integration of EMR (Electronic Medical Record) data. The Data Platform technology stack supporting the SynapseIQ® capability includes Apache NiFi & MiNiFi (data ingestion), Apache Kafka (eventing), Amazon Web Services (AWS) S3 (data storage), AWS EMR (Apache Spark) (data processing), Docker, Nexus, Kubernetes (data packaging/clustering) Snowflake (data access performance), Tableau (data visualization/dashboarding), Terraform/Ansible (data deployment), MLFlow, Keras, TensorFlow, Pandas, NumPy, SciPy, Scikit-Learn (ML/AI Framework) and Java, Scala, Python (data languages).

## The Differentiators:

### A “Utility”-Focused Cloud Platform

The cloud-based Platform is a comprehensive, complete, foundational system with multi-dimensional “utility” for IT teams to provide optimized operational and patient flow efficiency to internal process and logistics management and patient care teams. It is a managed services provider-based system in which TeleTracking supports and removes the burden from internal tech teams of managing and maintaining the running and performance of hospital and health system operations by moving all applications to the cloud.

#### These differentiating “utilities” for a hospital or health system include:

1. Extensibility
2. Scalability/Reliability
3. Supportability
4. Availability/Visibility
5. Configurability/Serviceability
6. Deployability/Recoverability/Maintainability
7. Testability/Quality – Continuous Validation
8. Usability/Reusability
9. Securability

#### 1 Extensibility

The system has been engineered for maximum extension of new capabilities, applications and application feature sets without needing to change the design of the platform in any way, so it aligns with the future growth requirements of a health system. The Platform’s extensibility is driven by its unique service logic, events, API gateway and self-contained storage technology elements.

#### 2 Scalability/Reliability

The unique microservices architecture of the Platform particularly supports the scalability and reliability that health systems and their facilities’ operations can depend on. Each of the Platform’s operational “services” are created in a self-contained software module stored in a Docker container and deployed in a specific Kubernetes cluster dedicated for that service over Amazon EKS. Each distinct operational service is run over three nodes simultaneously, so if any

fail, it continues to run backed up by the other two while the failed node is recreated by the Platform, ensuring the Platform is always “on.” Amazon EKS runs and scales each operational service shifting to AWS zones that have highest availability at any given time, ensuring maximum scalability for that operational area. If a load balance request is made in the system, the underlying microservices architecture quickly enables a recommendation for a decision to be made.

#### 3 Supportability

The Platform introduces a direct online “help desk” support feature that is integrated into all operational capabilities that are deployed in which support questions can be asked. The technology supporting the online customer support system enables the system to grow “smarter” and more intuitive by building a knowledge base of aggregate customer troubleshooting data over time.

## 4 Availability/Visibility

TeleTracking's platform capabilities were designed with a total transparency focus with functions and features - including automated platform communications - that alert health system IT teams on how it is performing at any time in real-time, and of any issues that have come up, along with real-time proactive message updates of how the issue is being rectified.

The Platform, in a "transparency-first" for healthcare industry technology, is the first integrated system with a "status page" feature in which staff across a health system can receive real-time SMS text messaging alerts that take them to a page that provides ongoing updates of any functional issues that come up, negating the need for time-consuming phone follow-up communications to a help desk. Users can subscribe to have text and email alerts broadcasted from the status page that can then be shared with other staff. They can also follow the status of platform maintenance and

enhancements while TeleTracking ensures the system remains available to them, and when an issue is resolved and closed a link to the event history lives on the status page for review at any time.

"As hospitals and health systems face growing capacity constraints, it is critical for the IT operations teams to have real-time visibility to their system without having to call their providers for constant updates. For over 32 years, TeleTracking has continued to invest in our operational and patient flow technology, culminating in the development of the of the Healthcare Operations Cloud and the TeleTracking IQ® platform design architecture with communications features that support enterprise-wide transparency and system visibility", comments Michael Coen, Chief Technology Officer, TeleTracking.

## 5 Configurability/Serviceability

Unlike on-premise IT systems, TeleTracking's cloud platform microservices architecture allows for

flexible configuration in advance before the platform or any application is deployed live. The scalable platform and all hospital operational-related applications can also be adjusted and reconfigured as a health system's operations needs and requirements evolve.

## 6 Deployability/Recoverability/Maintainability

- The development and deployment of any new, added capabilities on TeleTracking's platform include:
- Building and validating the underlying code
- Configuring with other IT system functionality
- Observing and testing different aspects of the new capability in various versions
- Supporting needed hospital operational process changes
- Real-time capacity testing and vulnerability scanning prior on the production and final launch version of the cloud platform

- Repeating of these steps through each development stage while continuous integration and delivery with other system components and applications is performed

## 7 Testability/Quality - Continuous Validation

TeleTracking's platform performs automated continuous functional and performance testing.

## 8 Usability/Reusability

Any UI design for applications deployed over the Platform is built within TeleTracking's Micro UI Framework in which user interface design and functional elements are pre-created and reused across all capabilities for efficiency of build and consistent user experience, easing the onboarding and learning of new capabilities. The Micro UI Framework also allows TeleTracking product design teams to work independently and in parallel on parts of a UI design without overwriting any work by team members, significantly streamlining development times overall.

## 9 Securability

Organizations with on-premise operational technologies have never been more vulnerable to security and data breaches. TeleTracking's platform is designed with a deep, multi-level security architecture specific to healthcare data handling requirements. It has been uniquely developed around a "zero-day vulnerability" approach to significantly lower hospital and health system data breach attempts and data loss risks and threats.

"We have found that IT organizations have still not been able to adequately address security threats despite successful penetrations continuing to rise," adds Coen. "TeleTracking has gone through a meticulous, purposeful design process as we wanted to create a cloud-based platform in a very different way that healthcare provider facilities - for the first time - can depend on to make real inroads in their operational and clinical efficiencies that are so critical for them at this time."

### The Platform's comprehensive, rigorous "defense in-depth" security elements include:

- Access to multiple servers behind the firewall in cloud architecture is locked down in event of a breach with secure protective measures of main platform "key"
- Real-time, continuous highest level encryption technologies and techniques embedded in all

high-risk sensitive operational and patient data to ensure data availability and regulatory compliance, always including HIPAA for health systems

- Active, continuous real-time assets security and penetration testing, scanning and remediation program, including 24/7 scanning technology to detect and fix latest security and Internet threats like unidentified open-source code;

this is unique to hospital data centers.

- Ongoing, continuous platform operating system security "patch" software updates
- AssetNote platform utilized to scan the TeleTracking Cloud Platform environment every hour for new assets that are deployed within the platform and provides continuous assessment of their security/vulnerability posture



## Appendix

1. Platform Observability Dashboards (<https://go.teletracking.com/Appendix1>)
2. Platform Deployability/Recoverability/Maintainability Dashboard #1 (<https://go.teletracking.com/Appendix2>)
3. Platform Deployability/Recoverability/Maintainability Dashboard #2 (<https://go.teletracking.com/Appendix3>)
4. Platform Deployability/Recoverability/Maintainability Dashboard #3 (<https://go.teletracking.com/Appendix4>)
5. Platform Observability - Applications Metrics Dashboards (<https://go.teletracking.com/Appendix5>)



TeleTracking is an integrated healthcare Operations Platform that is Expanding the Capacity to Care™ by combining comprehensive technology solutions with clinical expertise. Our products and services help streamline care delivery and reduce delays. We understand that for every hour a patient waits to be seen, they face objectively worse outcomes; so our mission is simple—to ensure that no one waits for the care they need.



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