

Virtual Trust Platform Analysis for CIOs-Gold

The Virtual Trust Platform (often referred to as **VirtualTRUST®**) is described as a **patient-centric Platform as a Service (pPAAS)** with the motto "**Empowering Privacy**".

Its core mission is to transform healthcare by putting patient privacy first and generating immense value for patients, providers, the industry, and society as a whole. It represents a fundamental shift in how health data is managed, shared, and protected, while making that data more useful and actionable.

The platform is designed to **reduce an organization's risk for non-compliance** by establishing a **data-compliant fabric** where personal data protection for consumers is the critical driving factor. It aims to make privacy a consumer's right through direct connectivity and data sharing across a vast network of healthcare entities, including hospitals, nursing homes, labs, ambulatory providers, government agencies, clinical trials, and AI solutions. This forms the groundwork for a true **patient's longitudinal record**, providing a complete, ongoing, and securely managed health history.

Virtual Trust Platform achieves its goals through a suite of "SMART" functionalities:

- **SMART Interoperability®**: This is the bedrock for seamlessly connecting health data, designed to meet federal rules like the 21st Century Cures Act and directly tackle information blocking. It ensures seamless connection to modern networks like QHINs or direct FHIR endpoints and can automatically convert data from older standards (e.g., HL7 v2, CCD) into the modern FHIR standard, preventing historical data loss.

Interoperability encompasses four key layers:

- **Foundational Interoperability**: Basic transfer of data between Health IT systems.
- **Structural Interoperability**: Standardizing the format and structure of data exchanges.
- **Semantic Interoperability**: Ensuring the actual meaning and content of data, including codification and terminology, is understood by receiving systems.
- **Organizational Interoperability**: Managing crucial governance, social, legal, and policy issues, such as patient consent and privacy, to ensure practical and respectful data exchange.

- **SMART Compliance®**: This feature uses **Artificial Intelligence (AI)** to actively manage complex federal privacy mandates and regulations. A critical component is **Data Segmentation for Privacy (DS4P)**, which carefully sequesters highly sensitive data elements (like substance use disorder treatment records under 42 CFR Part 2), ensuring they are not accessed or viewed without explicit authorization for that specific data piece. It offers **granular, consent-based control** over data sharing, allowing patients to specify the type, purpose, and time limits of consent. SMART Compliance® also manages privacy rules across different jurisdictions (e.g., US HIPAA, California's rules, Europe's GDPR, Brazil, China) and covers specific sensitive data categories such as mental health, behavioral health, and social determinants of health (SDOH). An embedded AI in the compliance engine allows the system to adapt to evolving regulations, new data types, and cyber threats in near real-time, helping personal health record (PHR) vendors meet rules like the FTC's Health Breach Notification Rule.

- **SMART DataLake®**: This moves beyond traditional data storage by employing different data fabrics on FHIR Healthcare Interoperability:

- **Relational Data Fabric**: Organizes data into tables with columns and rows, identifying entities and their attributes.

- **Graph Data Fabric**: Stores data using graph structures (nodes, edges, properties) to explicitly map relationships between data pieces. This helps discover complex patterns, such as links between unrelated symptoms for rare diseases or interactions in biological pathways, which is crucial for personalized medicine and integrating multi-omics data.

- **Vector Data Fabric**: Stores mathematical representations (vectors) of data in high-dimensional space, organizing data by meaning rather than keywords. This is incredibly powerful for AI, enabling similarity searches, relevant recommendations, and powering advanced Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG) for more accurate, domain-specific health answers.

- **SMART Analytics®**: This is the Business Intelligence (BI) platform layered on top of the data fabrics, utilizing **machine learning and AI** to transform complex data into visual, actionable insights. For patients, this leads to **hyper-personalized treatments**, preventative care based on individual risks, and a clear understanding of their health journey. For the industry, it enables cracking complex problems and making truly data-driven decisions.

- **SMART Workflow®**: A transformative solution that uses **BPMN 2.0 (Business Process Model and Notation)** and the **CDS Hooks API** to streamline processes and integrate data from Electronic Health Records (EHRs), consumer apps, and medical devices. CDS Hooks allow external systems to securely integrate into clinical workflows, providing timely information and decision support. This creates a holistic view of patient health by pulling in diverse data beyond what native EHRs offer and supports highly customizable workflows for various scenarios, such as managing patient privacy consents (DS4P), remote patient monitoring (RPM), annual wellness visits, prior authorization, and applying AI/ML solutions for clinical pathway precision medicine or enhanced recovery after surgery protocols.
- **SMART Dashboard®**: Provides patients and providers with seamless, **near real-time access** to comprehensive clinical data from over 150 data layers sourced from a nationwide network. It is fully customizable based on user access policies, ensuring secure and relevant information is at the user's fingertips.
- **SMART Chronic Disease Management®**: Directly addresses chronic conditions by integrating data from various **Internet of Things (IoT) devices** like continuous glucose meters, smart blood pressure cuffs, smart weight scales, pulse oximeters, smartwatches (Fitbit, Garmin, Apple Watch), and even radar-based monitors that passively track vital signs. This data integrates into care plans via **Remote Patient Monitoring (RPM)**, allowing providers to see trends, receive alerts, check for drug-drug interactions, and develop proactive care.
- **SMART Medicine®**: An **AI precision medicine solution** that uses evidence-based clinical guidelines and leverages a patient's unique clinical and personal health information to guide them toward personalized care pathways. It proactively engages patients with prompts for screenings and tailored educational content. A key capability is its potential to help consumers proactively **detect signs of over a thousand different diseases** (e.g., asthma, congestive heart failure, type 2 diabetes, hypertension, mental health conditions, Parkinson's disease) often earlier than symptoms might be noticed.
- **Financial Transparency Tools**:
 - **SMART Transparency Pricing®**: Addresses federal mandates for price transparency by offering **point-of-care suggestions for the least costly options** for hospital procedures, lab tests, and radiology/imaging, based on cost and quality metrics.

- **SMART Rx Pricing®**: Provides pricing and therapeutic alternatives for medications, and can utilize "pass-through PBMs" to potentially **pass manufacturer rebates directly back to consumers**, lowering out-of-pocket costs and offering options for automatic home delivery.

- **SMART Value-Based Care®**: Helps Primary Care Providers (PCPs) calculate **Risk Adjustment Factor (RAF) scores** for Medicare/Medicaid patients and **HEDIS scores** (quality measures for pediatric care management) in near real-time. This aligns financial incentives with quality care and better patient outcomes, encouraging a shift towards a more sustainable, patient-centered healthcare model.

- **SMART Open Banking®**: Ensures the **secure processing of healthcare payments** by integrating with payment processors and adhering to the **Payment Card Industry Data Security Standard (PCI DSS)**. This encrypts or masks credit/debit card numbers (PANs) and allows for secure, interoperable linking of payment data with healthcare data layers while embedding SMART Compliance® for patient privacy.

Additional SMART functionalities mentioned include **SMART Questionnaire®**, **SMART Forms®**, **SMART Ambulatory®**, and **SMART Clinical Trials®**, which facilitate data gathering, editing, and patient matching for clinical studies.

The Virtual Trust Platform leverages modern technologies and standards such as FHIR (Fast Healthcare Interoperability Resources), SMART APPS, BPMN 2.0, CDS Hooks API, Angular, Camunda, Kafka, KeyCloak, OpenAPI, Plotly, and SmileCDR (HAPI FHIR Interoperability Engine) to build its ecosystem.

In essence, Virtual Trust aims to fundamentally reshape the healthcare ecosystem by combining **deep interoperability, strong compliance, intelligent data management, and financial transparency** with a resolute focus on **empowering privacy**. This leads to more trust, greater efficiency, truly personalized, proactive care, and ultimately a future where personal health data actively works for the patient.

Discuss Patient Privacy.

Patient privacy is a foundational principle for Virtual Trust Platform (VirtualTRUST®), which operates with the motto "**Empowering Privacy**". Its core mission is to transform healthcare by placing patient privacy first, generating significant value for patients, providers, the industry, and society by fundamentally shifting how health data is managed, shared, and protected.

VirtualTRUST® aims to **reduce an organization's risk for non-compliance** by establishing a **data-compliant fabric** where personal data protection for consumers is the critical driving factor. The platform makes privacy a consumer's right through direct connectivity and data sharing across a vast network of healthcare entities, including hospitals, nursing homes, labs, ambulatory providers, government agencies, clinical trials, and AI solutions. This forms the groundwork for a true **patient's longitudinal record**, providing a complete, ongoing, and securely managed health history.

The platform ensures patient privacy through several key "SMART" functionalities:

- **SMART Compliance®**: This is a primary mechanism for managing and enforcing patient privacy.

- It utilizes **Artificial Intelligence (AI)** to actively manage complex federal privacy mandates and regulations, such as G(10) which includes mandatory mandates for security tags for sending and receiving data elements for privacy to consent sharing.

- A critical component is **Data Segmentation for Privacy (DS4P)**. DS4P is the process of carefully sequestering specific highly sensitive data elements or "datatypes" that are considered undesirable to share without explicit authorization. This is particularly important for records like substance use disorder (SUD) treatment records, which fall under strict regulations like 42 CFR Part 2. DS4P ensures that such data is not captured, accessed, or viewed unless there is explicit authorization for that specific piece of data.

- It offers **granular, consent-based control** over data sharing, allowing patients to specify the **type of disclosure, the purpose of disclosure, and even set time limits on that consent**. This means patients have fine-grained control, deciding which parts of their record to share and under what conditions.

- SMART Compliance® manages privacy rules across **different jurisdictions**, including US HIPAA, California's specific rules, Europe's GDPR, Brazil, Canada, China, India, and other countries.

- It also covers specific sensitive data categories like **mental health, behavioral health, SUD (substance use disorder), and Social Determinants of Health (SDOH)** data, ensuring meticulous adherence to the specific rules for each.

- The embedding of AI in the compliance engine is crucial because it allows the system to **adapt to changes in regulations, new data types, and evolving cyber**

threats almost in real time, providing a proactive approach to staying ahead of the curve.

- The **SMART Compliance® API** can also be licensed by personal health record (PHR) solutions to meet the **Federal Trade Commission's Health Breach Notification Rule (HBNR)**, clarifying rules for health apps and expanding information covered entities must provide during a health data breach. This extends consumer privacy protection by requiring PHR vendors and related entities to notify individuals of breaches of unsecured personally identifiable health data.

- **Organizational Interoperability:** This layer of SMART Interoperability® specifically handles crucial **governance, social, legal, and policy issues, including patient consent and privacy policies**. It ensures that even if data can technically move, the necessary policies and permissions are in place to make the exchange practical and respectful of patient wishes.

- **SMART Workflow®:** This functionality includes **customizable workflows** for managing patient privacy to share consents using DS4P, for interactions between a patient and a guardian, a patient and a user (provider, lawyer, etc.), and a patient and an organization.

- **SMART Dashboard®:** Provides patients and providers with seamless, near real-time access to comprehensive clinical data, but it is **fully customizable based on user access policies**. This ensures that a patient sees what they are authorized to see, and providers see what they need, all while keeping the information secure.

- **SMART Open Banking®:** When linking financial and health data, this feature ensures that patient privacy is maintained. It achieves this by embedding SMART Compliance® to govern the interoperable sharing of financial patient card payments with healthcare patient FHIR data layers for charges and payments. It adheres to the Payment Card Industry Data Security Standard (PCI DSS) to protect credit/debit card numbers (PAN) through encryption or masking during transactions.

The overall benefit for patients is **much finer control over their data, with their privacy being respected at a granular level**. For healthcare organizations, this translates to **less risk of non-compliance and increased trust from consumers**, which is vital for the ecosystem. By embedding this resolute focus on empowering privacy with deep interoperability, strong compliance, and intelligent data management,

VirtualTRUST® aims to fundamentally reshape the healthcare ecosystem for more trust, efficiency, and truly personalized, proactive care.

Discuss Data Interoperability.

Data interoperability is a cornerstone of the VirtualTRUST® platform, which aims to transform healthcare by enabling seamless, secure, and meaningful exchange of health data. It is the bedrock for creating a **true patient's longitudinal record**, which is a complete, ongoing, and securely managed health history.

VirtualTRUST® addresses the challenge of fragmented health data, where different doctors and systems often operate in silos, through its **SMART Interoperability®** functionality.

Here's a breakdown of data interoperability as described by the sources:

- **Purpose and Federal Mandates:**

- SMART Interoperability® is specifically built to meet federal rules such as the **21st Century Cures Act (45 CFR 170.215)**.

- It directly tackles the significant challenge of **information blocking**, ensuring that data can flow freely and securely where authorized.

- The goal is to move beyond the current complex system to make health data more useful and actionable.

- **How VirtualTRUST® Achieves Interoperability:**

- The system ensures **seamless connection to modern networks** like Qualified Health Information Networks (QHINs) or direct Fast Healthcare Interoperability Resources (FHIR) endpoints.

- A key feature is its ability to **automatically convert data from older standards** such as HL7 version 2.x, CCD, and CDA into the modern FHIR standard. This ensures that historical data is not lost and can be integrated, allowing old and new systems to "speak the same language".

- It establishes a **data-compliant fabric** using SMART APIs and SMART clinical workflows to connect a vast network of entities, including hospitals, nursing homes, labs, ambulatory providers, government agencies, clinical trials, and AI solutions.

- The platform leverages **FHIR Interoperability Engine** from SmileCDR.

- **Layers of Interoperability:** The sources highlight that interoperability is not a single concept but comprises several layers:

1. **Foundational Interoperability:** This is the basic ability to transfer data from one Health IT (HIT) system to another **without necessitating interpretation or modification** by the recipient. It's about simply moving data.

2. **Structural Interoperability:** This layer focuses on the **format structure of data exchanges** for messaging.

3. **Semantic Interoperability:** This is considered a "real breakthrough". It ensures that the **actual content and meaning of the data** transmitted between HIT systems are understood by the receiving system, beyond just the structure. This includes systematic arrangement of data transmission, data codification, and terminology, allowing receiving systems to decode data meaningfully. An example is ensuring two systems using slightly different terms for the same condition can still understand each other.

4. **Organizational Interoperability:** This layer addresses crucial **governance, social, legal, and policy issues**, including patient consent and privacy policies, related to data exchange. It ensures that even if data can technically move, the policies and permissions are in place to make the exchange practical, respectful of patient wishes, and integrated into care processes and workflows. This level enables "shared consent, trust, and integrated end-user processes and workflows".

- **Benefits of Enhanced Interoperability:**

- **For patients:** It means their complete health data can intelligently and securely follow them wherever they receive care, leading to much **better, more coordinated treatment**.

- **For providers:** They gain a **more complete, unified picture** of the patient, which enables faster decisions, potentially more accurate diagnoses, fewer errors, and a more efficient system overall.

- Ultimately, the value of robust interoperability stacks up for both patients and providers.

- **Interoperability and Data Management:**

- VirtualTRUST®'s **SMART Data Lake®** employs a data fabric on FHIR Healthcare Interoperability for relational, knowledge graph, and vector data lakes.

- This data fabric weaves together data from internal silos and external sources, creating a network of information that powers applications, AI, and analytics.

- For example, a **Knowledge Graph Data Lake** uses graph structures for semantic queries, linking concepts and relationships without changing the underlying data, making it an ideal tool for enterprise data integration and discovering complex patterns.

By prioritizing these layers and capabilities, VirtualTRUST® aims to fundamentally reshape the healthcare ecosystem for more trust, efficiency, and truly personalized, proactive care.

Discuss Smart Analytics.

SMARTAnalytics® is the **Business Intelligence (BI) platform** layered on top of the VirtualTRUST® ecosystem, designed to interpret and transform complex data into actionable insights. It plays a crucial role in making sense of the vast amounts of health data collected and managed by the platform.

Here's a detailed discussion of SMARTAnalytics®:

- **Core Functionality and Technology**

- SMARTAnalytics® is a **visual analytics platform** that leverages **machine learning (ML) and Artificial Intelligence (AI)**.
- It transforms complex data sourced from VirtualTRUST®'s various data fabrics—including **Relational, Knowledge Graph, and Vector Data Fabrics**—into clear, **visual, and actionable insights**.
- The platform utilizes a Business Intelligence, Machine Learning, and AI Engine, with **PLOTLY** specifically mentioned as a component within the VirtualTRUST® architecture that aligns with this functionality.

- **Purpose and Impact**

- The primary goal of SMARTAnalytics® is to empower both individuals and healthcare organizations to effectively utilize their data to solve problems and make informed decisions.
- It moves beyond traditional data storage by enabling a deeper interpretation of the data, which was previously impossible.

- **Benefits for Patients**

- Through SMARTAnalytics®, the healthcare industry can analyze patient data in ways that lead to **hyper-personalized treatments tailored to a patient's specific profile**, moving beyond general guidelines.

- It facilitates **preventative care** by providing deep insights into an individual's unique health risks.

- Ultimately, it fosters a **clear understanding of a patient's unique health journey**, enabling more proactive and precise care.

- **Benefits for the Healthcare Industry**

- For providers and the industry, SMARTAnalytics® is instrumental in **cracking complex problems** and making **truly data-driven decisions**.

- By offering these deep insights, it contributes to a more efficient system overall, potentially leading to faster decisions and more accurate diagnoses.

- **Integration with Other SMART Functions**

- SMARTAnalytics® is designed to be highly integrated within the VirtualTRUST® suite. For example, **SMARTWorkflow®**, which manages customizable clinical processes, can **activate SMARTAnalytics®** as one of the many "SMART APPS" within its ecosystem.

- It can also be utilized as a **SMART Business Intelligence (BI) APP** for reviewing personal FHIR data layers and analytics as part of customizable workflows.

By transforming raw, complex data into understandable and actionable intelligence, SMARTAnalytics® enables a proactive and personalized approach to healthcare, benefiting both patients and the entire industry.

Discuss Care Coordination.

Care coordination is a fundamental aspect of the VirtualTRUST® platform, which aims to transform healthcare by ensuring that a patient's entire health journey is managed seamlessly and effectively across various providers and settings. The platform's ecosystem is designed to overcome the fragmentation of health data and processes that often hinders coordinated care in traditional systems.

Here's how VirtualTRUST® supports and enhances care coordination:

- **Foundation of Interoperability for Seamless Data Flow**

- **SMARTInteroperability®** serves as the bedrock, ensuring that health data can move seamlessly and meaningfully between different systems and providers. This includes converting data from older standards (like HL7 v2.x, CCD) into the modern FHIR standard, preventing historical data from being lost and ensuring all systems "speak the same language".

- The platform establishes a **data-compliant fabric** that connects a vast network of entities, including hospitals, nursing homes, labs, ambulatory providers, and even secondary users like government agencies and AI solutions. This connectivity is crucial for building a **true patient's longitudinal record**, which is a complete, ongoing, and securely managed health history.

- **SMARTWorkflow® for Streamlined Processes**

- **SMARTWorkflow®** is explicitly designed to make clunky, disconnected healthcare processes flow seamlessly, directly addressing efficiency and better care coordination.
- It integrates data not only from traditional Electronic Health Records (EHRs) but also from an "explosion of data" from **consumer apps, fitness trackers, diet logs, and home medical devices**. This comprehensive data integration provides a truly holistic view of a patient's health, going beyond what native EHRs alone can offer.
- The technology behind SMARTWorkflow® includes **BPMN 2.0 (Business Process Model and Notation)** for modeling complex business processes and the **CDS Hooks API**. CDS Hooks allow external systems to securely and intelligently "hook into the clinical workflow at the right moment," providing timely information and decision support directly within the provider's existing workflow.
- **Customizable SMARTWorkflows** can adapt to specific patient situations rather than being rigid and one-size-fits-all. Examples include:
 - Managing **patient privacy and consent** (P2S with DS4P).
 - **Remote Patient Monitoring (RPM)**, triggering alerts based on device readings.
 - Streamlining **annual wellness visits** (AWV) and **prevention and wellness visits** (PWV) by prompting for necessary screenings based on a patient's full data profile.
 - Managing **prior authorization (PA)** processes more smoothly.
 - Enabling **AI/ML solutions** directly into the workflow for **clinical pathway precision medicine** (CPPM), **enhanced recovery after surgery** (ERAS) protocols, and reducing insurance claim rejections.

- **SMARTChronicDiseaseManagement® for Proactive Care**

- This specific module directly tackles care coordination for patients with chronic conditions. It incorporates **Remote Patient Monitoring (RPM)**, **Chronic Care Management (CCM)**, and **Principal Care Management (PCM)**.

- It integrates data from a wide array of **Internet of Things (IoT) devices**, such as continuous glucose meters (e.g., Dexcom, Freestyle Libre), smart blood pressure cuffs, weight scales, pulse oximeters, smart pill boxes for medication adherence, and even radar-based monitors for passive tracking of heart and respiratory rates.

- This data flows into the system, allowing doctors to **see trends, get alerts for concerning readings**, and catch potential problems much earlier, fostering a richer and more proactive picture for managing chronic conditions. The system can also check for drug-drug, drug-food, and drug-disease interactions, as well as therapeutic duplications.

- **SMARTMedicine® for Personalized Pathways**

- As an AI precision medicine solution, SMARTMedicine® actively engages patients in their own health journey by leveraging their unique clinical data and personal health information to guide them towards **personalized care pathways**. This proactive approach to health management, including prompts for screenings and tailored educational content, further enhances coordinated care by empowering patients to be active participants.

- **SMARTDashboard® for Unified Insights**

- Provides patients and providers with seamless, near real-time access to comprehensive clinical data from over 150 data layers across a nationwide network. This clear, unified view of a patient's health information, accessible based on user access policies, is crucial for effective care coordination.

- **Benefits of Enhanced Care Coordination:**

- **For patients:** Leads to **much better, more coordinated treatment**, hyper-personalized care tailored to their profile, preventative care based on individual risks, and a clear understanding of their unique health journey. It means their complete health data can intelligently and securely follow them wherever they receive care.

- **For providers and the industry:** Results in a **more complete, unified picture** of the patient, enabling faster decisions, potentially more accurate diagnoses, fewer errors, and a more efficient system overall. It significantly reduces administrative burden and streamlines processes.

By integrating these SMART functions, VirtualTRUST® aims to fundamentally reshape the healthcare ecosystem, moving towards a model of more trust, efficiency, and truly personalized, proactive care.

