# BioTrack

[Product Introduction]

### BioTrack v1.0

2025.05





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### **Logistics for Pharmaceuticals**

Pharmaceuticals are sensitive to temperature and humidity, so a stable, reliable cold-chain distribution system is essential to manage quality and provide traceability throughout the entire process—from production and storage to delivery and sales.



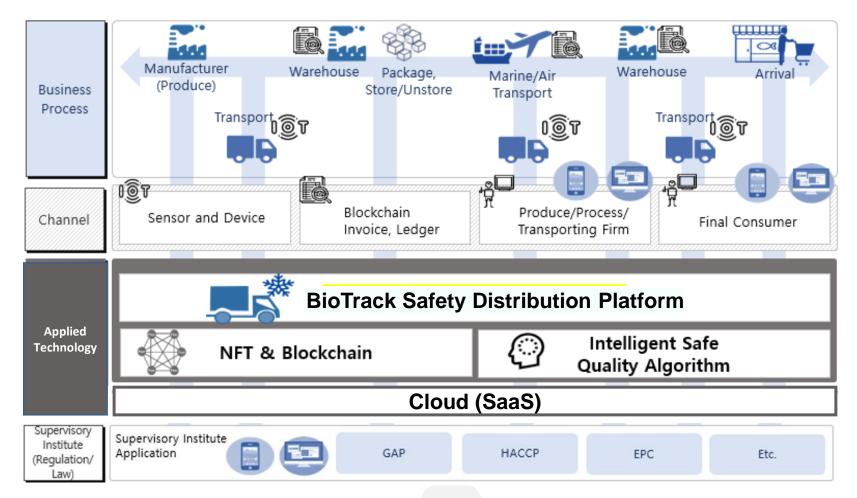
2. Storage



### **Concept Map**



A cold-chain distribution system for pharmaceuticals requires active participation from all stakeholders throughout every stage—production, logistics, processing, and distribution—as well as a stable and reliable platform to respond effectively to any events.





### **Design of BioTrack**

**BioTrack Service Model** 

BioTrack is designed with a focus on traceability, data integrity, flexibility, customization, and IoT integration to meet the needs of logistics stakeholders. It helps prevent process contamination caused by data/document forgery or errors, while providing tailored services.

#### **Requirements by Participants**

# Producer

- Raw materials, machines (NSF certified), processing (HACCP certified), and logistics (quarantine/disinfection certified) and Digitalization of Documents
- Create product packaging embedded with information labeling via barcode or NFT certificate
- · Forecasting, Recommendation Service

# **Processor**

- · Disassembly or repackaging tasks for product packages
- · Conduct package verification to prevent illegal substitutions
- · Acquire end-to-end visibility of product throughout delivery chain

# Distributor

- Track the distribution process from producer to consumer
- · Confirm transaction history/result
- Rapid response capability in case of events or risks. forecasting
- · Monitoring of events and product-related data

# Operator

- End-to-End visibility about the distribution process
- Inspection of regulatory compliance (e.g., expiration dates, product quantity)
- Generation of certified inspection and supply chain records

# Consumer

- End-to-End visibility about the distribution process
- Confirmation of product origin
- Verification of regulatory compliance items
- · Reliability and integrity of distribution information

### **Development Focus**

**Traceability** 

**Data Integrity** 

**Flexibility** 

Customized **Service** 

**Automated** Data **Management** 

#### **Development Direction of BlockRoad**

Develop an end-to-end cold chain solution to establish a secure logistics and distribution system for operators

Ensure the reliability of distribution data by managing and analyzing cold chain history using databased methods

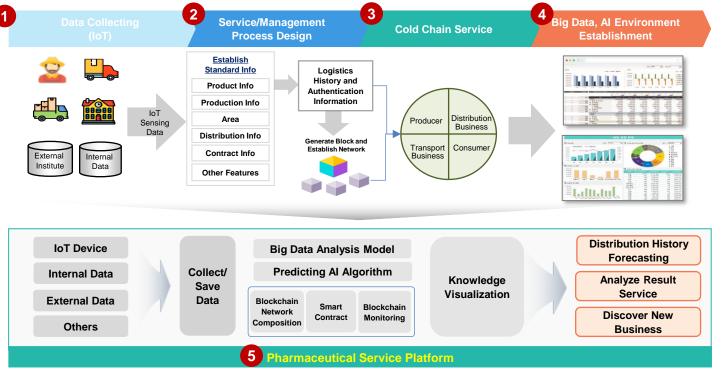
Utilize IoT-based real-time tracking of distribution routes to provide diverse analysis and forecasting services that support efficient logistics operations and informed decisionmaking



### **Service Model**

2 BioTrack Service Model

- Provide end-to-end smart cold chain management services, offering customized solutions through an IoTbased data collection system, verification and sharing of collected data via an NFT blockchain platform and network, big data, and Al algorithms.
- As an intelligent solution capable of tracking real-time distribution routes, it is a platform that prevents
  data forgery through blockchain and provides data analysis, anomaly tracking, and forecasting services



① Data Collecting&Management service

Provide IoT-based real-time data management service

**2** Logistics Management Service

Safe and reliable transaction between network participants

③ Intelligent Cold Chain Platform

Al-NFT Blockchain-IoT-based combined cold chain service management platform

Analysis, Forecasting Service

Various utilization of real-time data which is generated through blockchain network (analysis, recommendation)



### **Main Service**

**BioTrack Service Model** 

#### IoT-based Real-time Data Collecting and History Management Service

- Auto-generation of distribution history tracking data through IoT sensing and management service
- Accident prediction and response services based on the detection of abnormal phenomena through real-time data collection and analysis
- Using sensor data accumulated during the distribution process—such as temperature, humidity, and acceleration analyze and develop optimized algorithms for anomaly detection and tracking

### Distribution Data Based on consumer pattern analysis and transaction data,

Bigdata/AI Recommendation Service based on Real-time

- provide customized services to participants using big data and Al—such as delivery route recommendations, menu suggestions, and optimal product storage environment settings
- Offer responsive services based on real-time changes in fresh food distribution data, including product recommendations, stock sharing, and distributor suggestions
- Provide alerts and response notifications in the event of abnormalities detected during the distribution process

#### Distribution History Tracking Management

- Data generation and tracking service by using blockchain and generate history data by product units through entire logistics process
- Generate and inquire distribution data by participants (producer/distributor/logistics etc.) to blockchain network
- NFT Issuance/Inquiry/Tracking/Management
- Consumers can easily access detailed distribution history data



#### **Monitoring Service**

- Real-time monitoring service with efficient tracking management of distribution data, and prevent quality abnormality beforehand to take initiatives (Vehicle location tracking, storage environment monitoring)
- Quality monitoring service which forecasts the quality changes according to the distribution environment (temperature, humidity, etc.)
- Pharmaceutical delivery status and route monitoring





### **Solution Summary**

3

**Solution Summary** 

BioTrack is a pharmaceutical cold chain solution fused with Al/Bigdata-IoT-NFT Blockchain technology, with enhanced stability, reliability, responsiveness, and expandability compared to the normal logistics system.

### **BioTrack**

#### **Service**

#### **Intelligent Cold Chain Platform**

- Al-NFT Blockchain-IoT-based combined cold chain service management platform
- Data verification/history management protocol
- Tamper-proof platform ensuring the trustworthiness of distribution history data

#### **Logistics Management Service**

- Provide various service for safe and reliable transaction between business owners
- Participant can use the service without establishing extra system

#### **Forecasting Management Service**

- Provide Bigdata-Al-based data analysis model and recommendation service for cold chain service efficiency
- Diverse services based on secure data generated from the blockchain network

### Data Collecting&Management Service

- Provide IoT-based real-time data collecting and management service
- With location tracking and temperature/humidity management, connects physical environment and digital world

Core Tech



#### **AI-Bigdata**

Develop **AI framework** for prediction management service like recommendation, abnormality detection



loT

Develop IoT device-based realtime data auto-collecting and saving technology



#### **NFT Blockchain Platform**

Develop blockchain platform and management technology which distinct from existing blockchain

#### Background

#### Growth of Healthcare Cold Chain Logistics Market

- 8-9% growth rate each year from 2015 to 2023
- Growth rate by 2030s of 10% (Asia), 5-6% (Europe), 6-8.2% (North America), 3% (Developing country)
- Market value \$55B and 8,9% grow expected until 2032

### Growth of domestic/overseas 4th industrial core technology market

- Global IoT market: Growing 19.7% CAGR from 2016
- Global AI logistics/SCM market : Grew 45.5% CAGR till 2018
- Domestic IoT market: Average of 23% growth rate each year from 2014 to 2018

#### Increase social demands and needs about pharmaceutical distribution history tracking management

- Absence of trust about distribution history data
- Lacking trustworthiness about the transaction
- Absence of prediction service through intelligent analysis

#### Need of enhancing competitiveness through acquiring technology bridgehead for cold chain system business

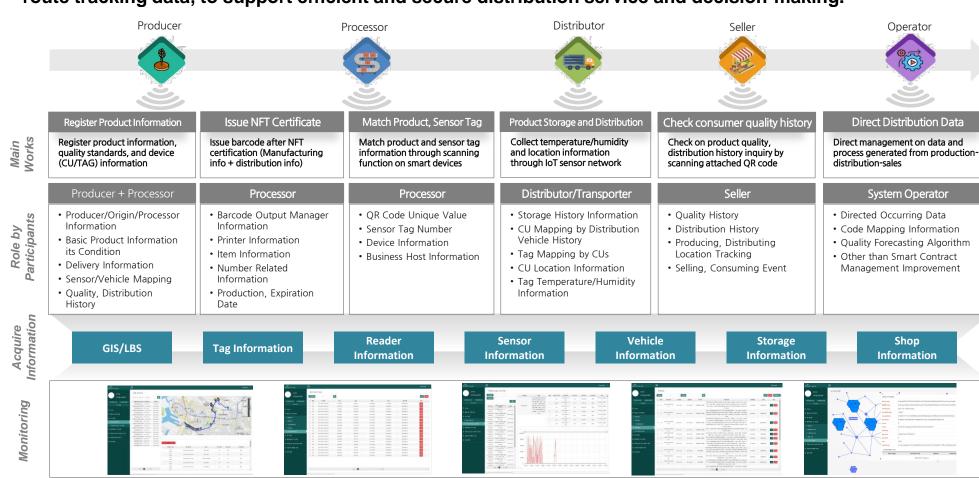
- Acquire and advance technical skills of 4th industrial revolution core technology
- Acquire new market through combining 4 major technologies



### **BioTrack-based Info System**

Solution Summary

Provide various analysis and forecasting service through IoT sensing data-based real-time distribution route tracking data, to support efficient and secure distribution service and decision-making.



### **BioTrack Features**

3

**Solution Summary** 

### Korea's first cold chain solution integrating IoT, Al, and NFT blockchain technology

- Enhance real-time data accuracy by integrating IoT technology
- Reduce logistics costs and support optimal decision-making by applying AI technology to logistics systems, thereby improving forecasting and management services
- · Advance logistics convergence by strengthening NFT blockchain-based trust technology capabilities

### Enhance the security and integrity of logistics data

- Ensure high data security by implementing a blockchain platform structure that enables easy detection and exposure of data tampering
- Prevent data forgery by requiring consensus from the majority of participants, making unauthorized manipulation extremely difficult
- Strengthen forgery prevention and enable shared data ledgers through consensus and distributed algorithms within a blockchain network composed of multiple service participants

#### **Distribution process Abnormality detection service**

- Provide abnormality detection using AI technology based on temperature, humidity, and acceleration sensor data collected during the distribution process
- Utilize sensor technologies such as RFID and IoT for real-time data collection
- Enable real-time mapping and sharing of product information between producers and consumers at the level of individual delivery units

### Productivity improvement and innovation for competitiveness and efficiency

- Standardize platforms and interfaces across various formats to improve development productivity and create synergy across the industry
- Promote the adoption of IoT, AI, and blockchain technologies by issuing standardized solutions tailored to small businesses. Strengthen
  cooperation with global enterprises through core technologies, contributing to increased export potential of related solutions and
  services.

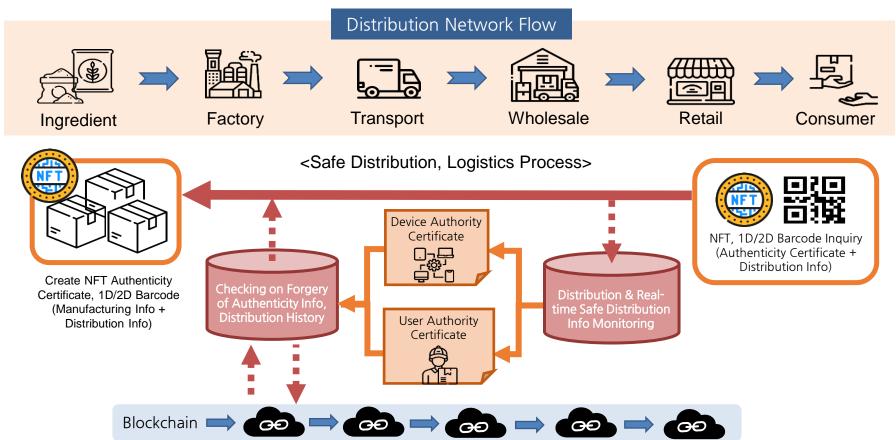


### **Core Technology Composition**

4

Technological Features

BioTrack fused and applied 'Al/Bigdata-IoT-NFT & Blockchain' technology to provide End-to-End cold chain management service, which guarantees the reliability of the data generated at logistics/distribution process, provides intelligent data service.

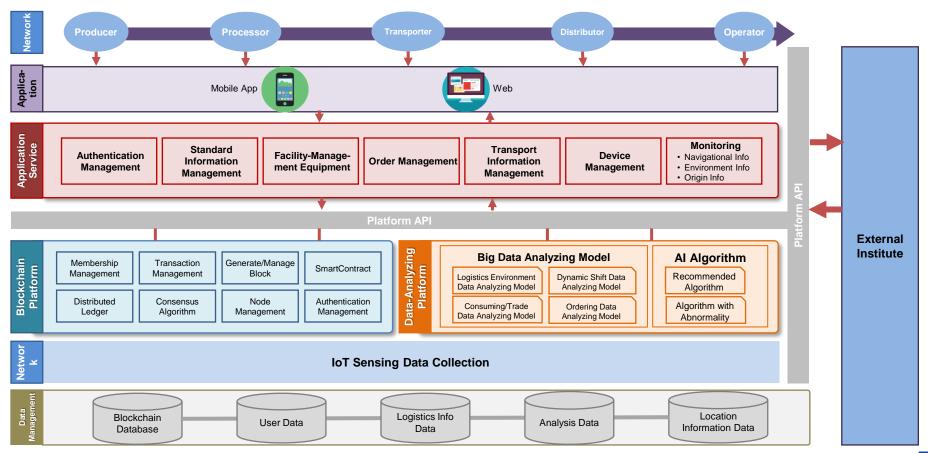


### **Intelligent Cold Chain Application System**

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Technological Features

The intelligent cold chain application system consists of a mobile application, application services, interfaces, and data storage for medicine logistics and distribution. It is integrated with a blockchain platform, data analytics platform, and IoT platform.



### **IoT Device Linkage, Real-time Transmission**



IoT Data Real-time Collection (Protocol I/F Technology)

Transmit temperature, humidity, location, and acceleration data from IoT devices during the logistics and distribution process

- IoT Device Protocol & Linkage Technology Development
  - ✓ Certificate, access control, protocol technology of IoT device etc
  - ✓ Secure real-time and accuracy of data through integration with IoT technology
  - ✓ Linkage with AI Edge platform for IoT collection and analysis
  - Distribution process history of IoT collected data, linkage of blockchain platform for tracking
- IoT Info Data Definition and Collection, Management Development
  - ✓ IoT sensing data collection & definition
  - ✓ Implement protocol for IoT data linkage
  - Develop IoT collection, management, monitoring





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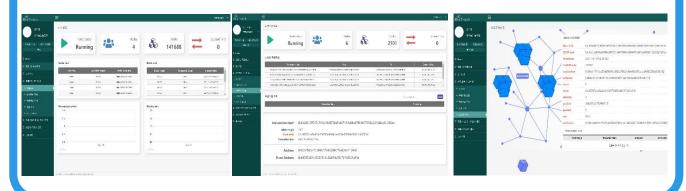
### DID, NFT Blockchain Technology



**DID Authentication &** NFT-Based Manufacturer Certification

DID, NFT-based authenticity certificate, safe distribution info real-time monitoring

- NFT Token Issuance/Management
  - ✓ NFT Issuance/Inquiry/Tracking/Management
    - Lazy Naming Method
    - Support ERC-721, ERC-1155 Type
- DID Certificate and NFT-based Safe Distribution Info Management
  - ✓ Issue NFT for manufacturer, production info, location, production time, and shipment time, etc.
  - ✓ NFT product info, registration, history, searching, shipment info management
  - ✓ NFT creation/management/transaction info monitoring(NFT Contract)
  - ✓ NFT authenticity certificate history real-time monitoring management
  - ✓ Establish NFT, DID blockchain platform





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### **Data Collection, Loading/Processing**

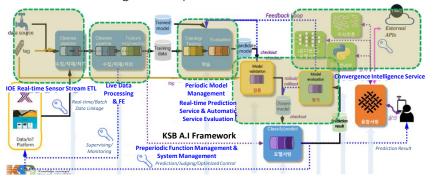




Safe Distribution Info Analysis, Risk Detection, **Prediction Monitoring** 

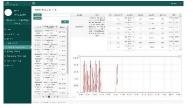
Safe Distribution Process Info Saving, Sharing, Data Analysis, Prediction

- Data Analysis, Learning, Real-time Inference Model A.I Technology Development
  - ✓ IoT device temperature, humidity, location, shock data analysis
  - ✓ Abnormality detection, prediction service automized task model definition
  - ☑ Real-time data collection, loading/processing, model learning and valuation
  - ✓ Real-time inference service
- Safe Distribution Info Data Analysis, Visualization
  - ✓ Shortest distance distribution route and delivery optimized route recommendation service
  - ✓ Safe logistics, distribution data analysis real-time monitoring development











### **Safe Distribution**

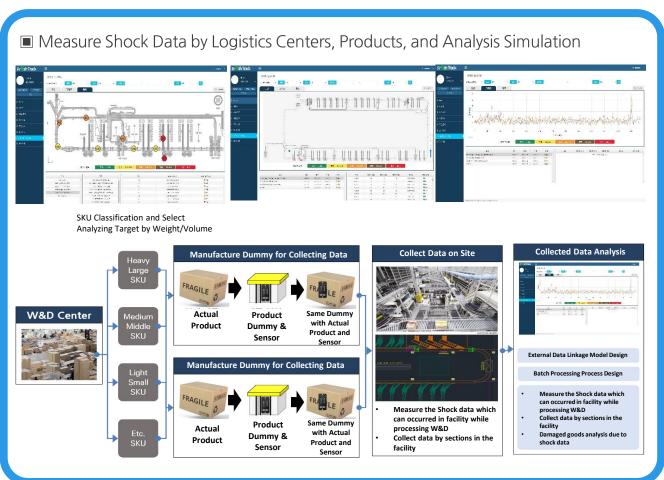
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Technological Features



Safe Distribution & Shock Data Analysis Simulation

Shock Data Analysis Simulation Monitoring by Logistic Centers, Products



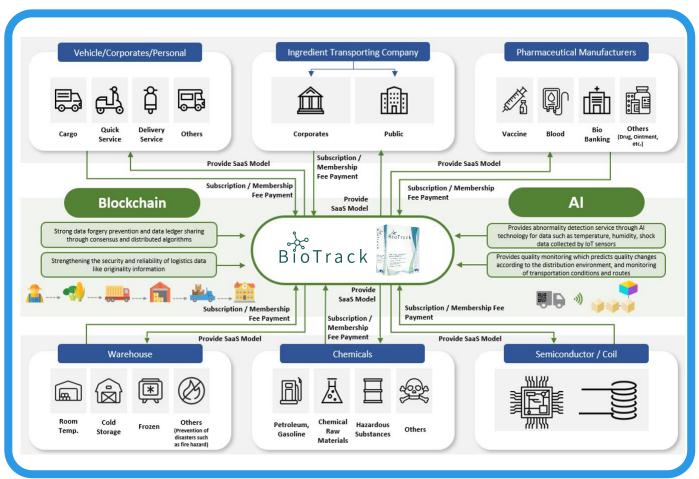


### **Platformization of Safe Distribution**

4

Technological Features







### Improved Functionality over Traditional Systems

BioTrack, based on Leadpoint System's NeuralBlock Platform, not only guarantees the integrity of generated data and excellent performance, but also meets various requirements through smart contracts and automates the logistics process.

### InnoBlock Platform, Ensuring Data Integrity and Trust integrity and reliability of data

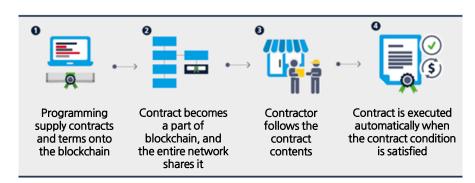
- Utilizes technology to generate and store block data, ensuring the origin and integrity of distribution information
- Implements Korea's first PoN (Proof of Networking) consensus protocol, enabling real-time IoT data to be recorded directly onto the blockchain in a fast and efficient manner.
- Combines blockchain with IoT technology to track the entire distribution process—from factory or production site to final customer delivery.
- Automatically identifies tag information on pallets (or product boxes), logs product status and delivery time, and verifies both status and delivery history on the blockchain.
- Open API integrates with internal and external systems, recording all related data on an immutable blockchain database.
- Optimizes the message transmission/receiving protocol between nodes during the consensus process, achieving higher TPS compared to conventional blockchain platforms.
  - Blockchain Distribution History Information Forgery Prevention Technology
  - User Identification Technology (DID)
  - Smart Contract

Main

Technology

### Automation of logistics process by using smart contract

- When digitalized documents (contract, receipt, etc.) and realtime delivery tracking data is delivered to blockchain platform right away, not only product's status, but the contract condition and implementation history is also verified and recorded through the simulation of relevant smart contract
- If the contract condition is been satisfied with verification result, smart contract is executed automatically, and the execution result is recorded and saved on blockchain



<Operation Method of Smart Contract at Logistics System>



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### **Core Technology Status**

Leadpoint System possesses in-house expertise in core IoT, AI, and blockchain technologies required for the design and development of BioTrack, a pharmaceutical logistics and distribution solution.

Field	Technology	Technology Contents
loT	IoT multi-purpose sensing device technology for industry	<ul> <li>To collect and analyze data which can occur at the entire industry by using all-purpose hardware platform, load sensor for acceleration, temperature, humidity, illuminance, infrared lights, NFC, air quality, etc., provide function which can utilize collect and analyze generated signal and preservation of quality forecasting</li> </ul>
AI	Al Framework	<ul> <li>Provide common function required for establishing various AI service by fusing IoT, Bigdata, machine learning, and domain knowledge</li> <li>Design the loading and interlocking of multi model data processing, multi model simultaneous learning and inference, auto-machine learning, distributed parallel learning and inference, learning model and domain knowledge as a structure which can select/combine/execute/serving/recycle based on workflow</li> <li>Main function: Data processing, Analytics (DevAI), AI Serving, AI service distribution and monitoring (DevOps), AI/SW Assets, WebToolkit</li> </ul>
Al	Pharmaceutical safety distribution platform and forecasting model	Pharmaceutical safety distribution platform technology     Pharmaceutical dynamic quality forecasting model
Block- chain	Blockchain platform	<ul> <li>Customer-based verified blockchain platform</li> <li>Provide consensus algorithm suitable for business environment</li> <li>Apply manufacturer pharmaceuticals certificate NFT technology</li> <li>Web-based individual combined management GUI tool</li> <li>Anchoring which can connect with public blockchain, external I/F technology which utilized smart oracle</li> </ul>

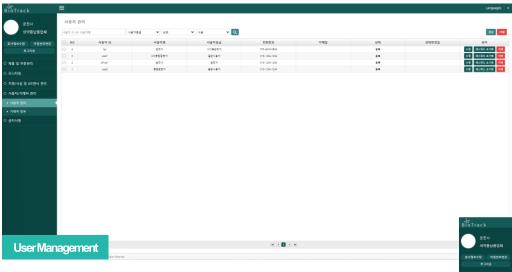


### **Setting Management**

5

**Main Functions** 

Set and manage basic data being used at BioTrack like user, equipment, facility (vehicle, processing site, warehouse), quality group, etc.



- · Basic quality information management
- Quality group management for quality's changes and grade evaluation

- Register/manage member company, which is participant of BioTrack
- User management of membership company's employees
- Authority management by users



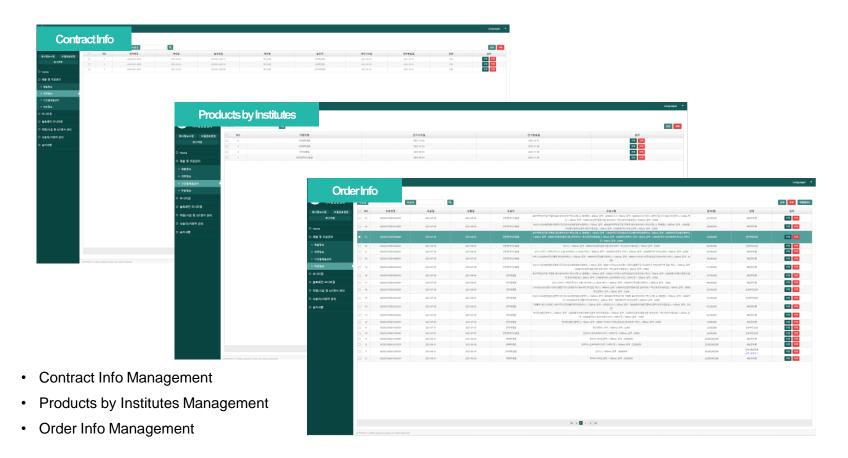


### **Orders and Product Management**

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**Main Functions** 

Set and manage the contract info, products by institutes, and order info.



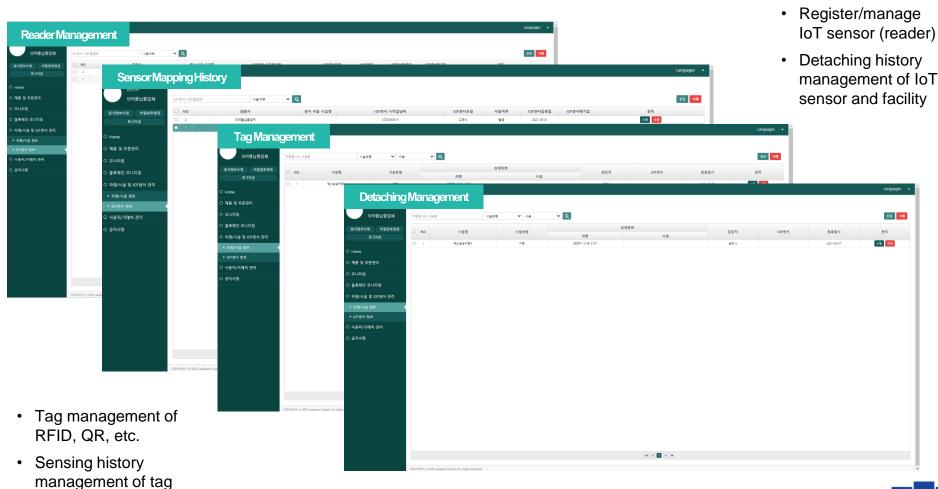


### **Equipment and Tag Management**

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**Main Functions** 

### Register and manage detaching history of IoT sensing equipment and facility of relevant equipment.

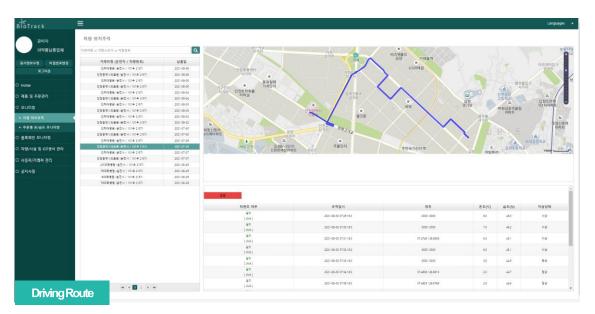


### **Location/Route Management**

5

**Main Functions** 

Reset the optimal route based on vehicle location and route tracking monitoring, in order to prevent situations that may cause quality abnormalities in advance.



- Vehicle driving route history management
- Driving route inquiry

- Vehicle location history management
- Vehicle location inquiry





### **Monitoring**

5

**Main Functions** 

Able to monitor by combining the map with vehicle location and route, violation history, production site, storage, and real-time temperature/humidity status..









### **Monitoring**

5

**Main Functions** 

By monitoring pharmaceutical distribution conditions (e.g., temperature, humidity), the system forecasts quality changes like freshness, offers quality management recommendations, and helps prevent abnormalities in advance.



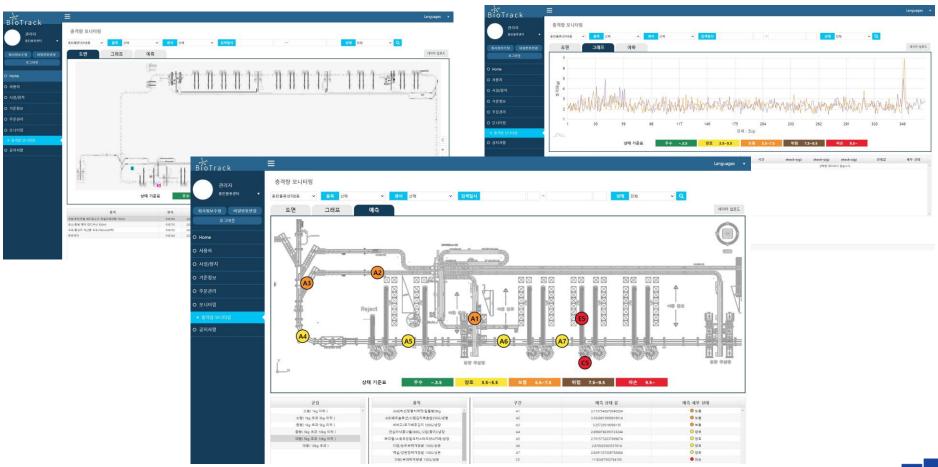


### **Shock Data Monitoring**

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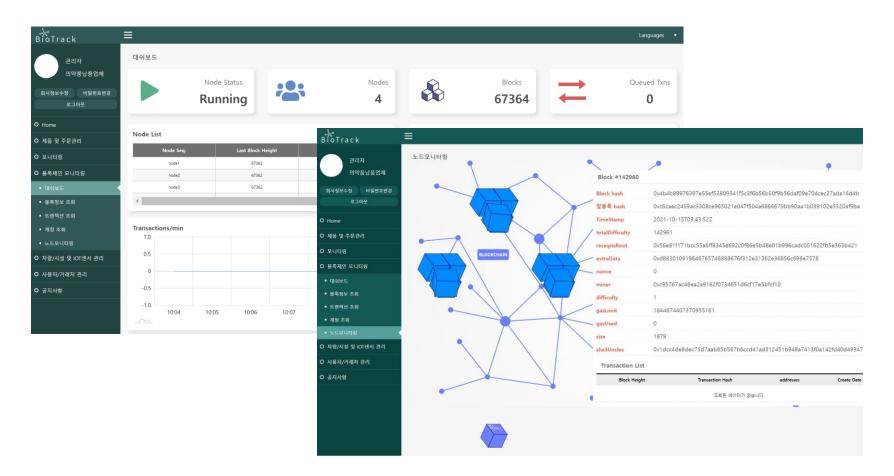
**Main Functions** 

Able to predict by updating in real-time through blockchain of shock data information occurred during pharmaceutical distribution.



### **Blockchain Monitoring**

Information on drug distribution can be quickly responded to in real-time drug safety problems through blockchain.





### **Expected Effects**

6

**Expected Effects** 

#### Administration

Solve supply chain-wide problems such as complex document administration, data errors, and lack of real-time processing

#### Competitiveness

Enhance business competitiveness by reducing logistics costs and delivery time

#### **Forecasting**

Provide AI and Big Data-based analysis models and recommendation services to enhance distribution efficiency with forecasting

#### Competitiveness

Monitor product movement in real time and allow preemptive responses to abnormal situations

#### **Forecasting**

Enable preemptive responses through forecasting and management services

#### Transparency

Ensure transparency in tracking the distribution flow, encode transaction records, and verify transaction authenticity by scanning a QR/RFID code via a user app

#### Security

Secure and tamper-proof data management leads to safe, seamless transactions between network participants

#### Prevention

Increase public trust (from end consumers to partners) in the logistics of small businesses and prevent fraudulent and illegal transactions

#### **Empowermenet**

Enable small businesses (producers, logistics providers, distributors, etc.) to easily establish a cold-chain logistics network



# Thank You



