

# Uhana by VMware

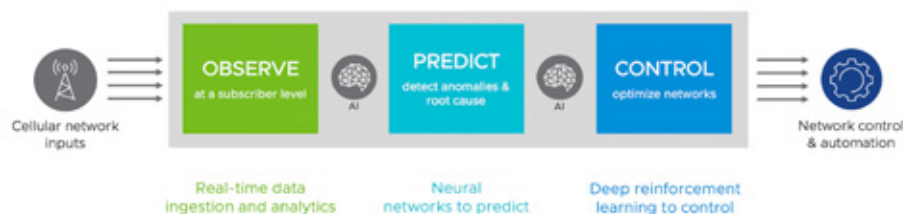
## Real-time RAN Analytics for Mobile Operators

### AI-based Analytics for Mobile Networks

Uhana by VMware is an AI-based analytics platform that provides mobile network operators (MNOs) the ability to generate actionable insights from their 4G & 5G radio access network to improve customer experience and reduce operational costs. Uhana correlates and enriches high volumes of streaming data from mobile network elements in real-time to provide unprecedented visibility at a subscriber-level. Using artificial intelligence, Uhana automatically determines the root cause of network issues and recommends remediations.

### At-a-Glance

- **Subscriber-level RAN analytics** in real time for new insights
- **Improve customer experience** by understanding call quality and data performance on a per subscriber basis
- **Prioritize alerts** based on subscriber and network impact
- **Eliminate ‘average blindness’** with granular RAN visibility
- **Use Machine Learning** to detect, classify and localize issues in the mobile network in an automated fashion
- **Automate Root Cause Analysis** and recommend remediations via AI
- **Automate data preparation** for data science analysis and realize time savings of 30%

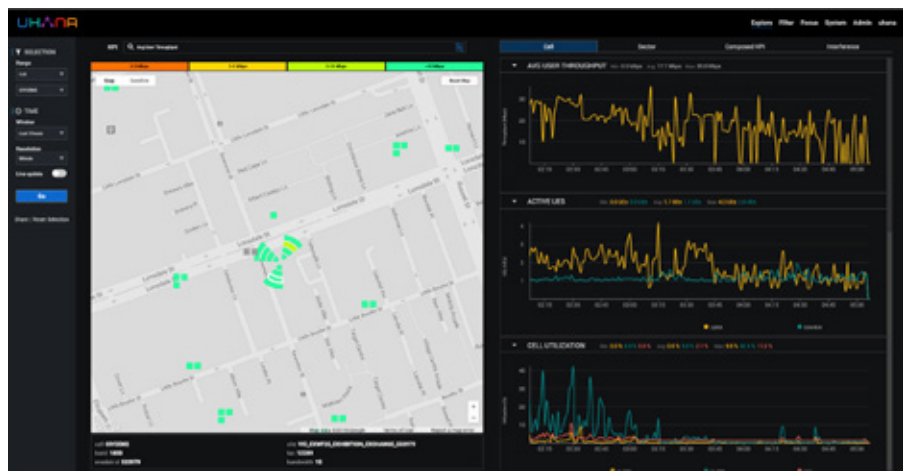


### Today's Reality

Mobile network operators are limited by the state of traditional radio access network (RAN) analytics and telemetry. Coarse-grained telemetry data presented at a cell site level, in 15 minute increments, severely restricts performance, customer experience measurements and radio interference detection to historical analysis. Because actual network conditions change within seconds, any user experience or network efficiency guidance derived from coarse-grained data will suffer from “average blindness” which severely limits visibility. As 5G latency-sensitive applications are being rolled out and network slicing becomes mainstream, this historical, ‘average’ analysis becomes crippling and will hinder any meaningful, real-time corrective actions in the RAN.

## Uhana by VMware Innovative Approach

Uhana by VMware has taken an innovative, automated approach. Leveraging machine learning and AI, Uhana detects, classifies and localizes issues in the mobile network in an automated fashion. The Uhana AI platform ingests and processes concurrent call trace events from tens of thousands of cells, correlates this with user session data and calculates Key Performance Indicators (KPIs) in real-time. Mobile network operators can now see detailed subscriber session records within seconds. This granularity gives operators unprecedented visibility and allows them to see problems that were previously hidden.



### Cloud-native

Uhana by VMware is a state-of-the-art cloud-native application leveraging a micro-services architecture. Built on Docker containers, micro-services enable resiliency and scale-out and allows the platform to be deployed on bare metal or virtual machine infrastructure.

### Automated Incident Detection and Impact Prioritization

Uhana's AI-enabled Alerts Pipeline automatically establishes dynamic baselines for subscriber level KPIs that adjust according to the ebbs and flows of the network. Using dynamic thresholding, it then detects anomalies, clusters them using neural networks and generates alerts as needed. Alerts are prioritized based on impact, for example, how many subscribers are affected and the significance of service degradation, so that responses can be prioritized accordingly.

### Benefits

#### Fine-Grain Visibility

- Subscriber-level
- Sub-second granularity

#### Automated Data Enrichment Pipeline

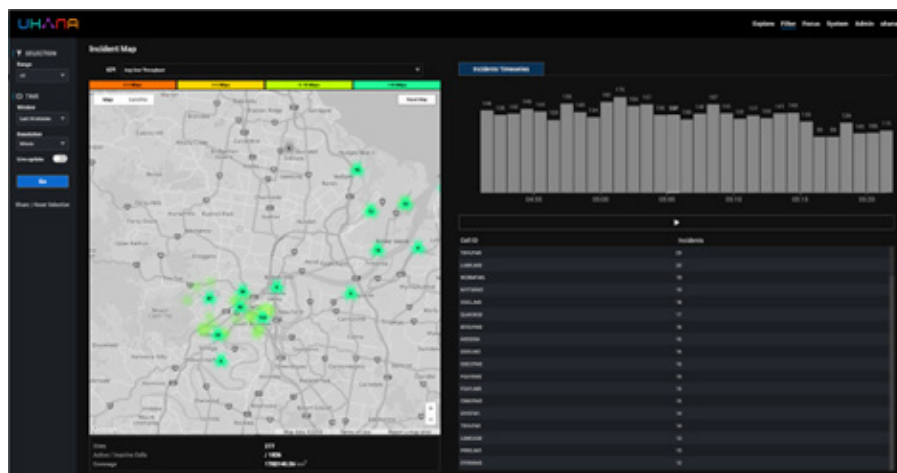
- Joins call trace events
- Creates subscriber session record

#### Automated Incident Detection

- Detects anomalies
- Leverages neural networks

## AI-driven Root Cause Analysis

Each alert is further analyzed by identifying a root cause (leveraging neural network classifiers) and providing relevant KPIs and recommendations specific to the identified root cause. Operators no longer have to spend precious engineering resources on analysis to identify the true cause of the problem. In addition to enabling quicker remediation actions and better control, correctly diagnosing the root cause of issues enables predictive network intelligence for application and RAN control guidance.



## Benefits, Continued

### AI-based Root Cause Analysis

- Automatically determines root cause
- Recommends remediations

### Cloud-native

- Containers-based
- Micro-services architecture

### Carrier Scale

- High velocity (millions of events per sec)
- High volume (tens of thousands of cells)

## Use Cases

All use cases leverage AI & ML for detection, impact and 'what-if' analysis and guidance.

### Uplink Interference Detection



Automate detection and classification of uplink interference (external, PIM, infrastructure) with prioritization based on type and number of subscribers impacted.

### Interference Localization and Triangulation



Localize external interference with a prioritized list of search area and heatmap visualization. Reduce area of interference triangulation from miles/kms to blocks, saving hours of reconnaissance time.

### Downlink Throughput Impact



Use machine learning root cause and impact analysis algorithms to determine if cause of poor downlink throughput is related to load imbalance of antenna frequencies for optimum use of spectrum.

### CAPEX Prioritization



Increase effective spectral capacity by improving RAN optimization engineering. Prioritize network investments that maximize subscriber impact and reduce CAPEX spending.

### OPEX Reduction



Automate RAN optimization analysis and improve efficiency of RAN optimization engineering & operations through AI based RCA, granular visibility, and impact prediction.

### Automated Data Enhancement for Data Scientists



Reduce data science analysis cycle time by up to 30% through the automation of data preparation, freeing up valuable time for higher value functions.

## Benefits, Continued

### Customizable

- Design custom KPIs
- Deploy in real time

### Fast Time-to-Value

- Offered as a managed SaaS
- On-prem or in public cloud

### Data Science Friendly

- Automates data enhancement
- Reduces time spent by 30%

## Uhana Building Blocks

The Uhana AI platform is an open multi-stage stream processing AI pipeline that operates on an operator's cloud or public cloud infrastructure. It is managed by VMware and offered as a Managed Software as a Service (SaaS). The platform leverages RAN and evolved packet core (EPC) telemetry information streamed directly into the data ingestion and distribution engine from the RAN infrastructure and EPC. This data is not inline to the user plane and therefore does not affect the performance of the network. This data is then processed by the real-time stream processing engine, which calculates relevant KPIs and feeds the Uhana AI-engine for learning and neural network creation. This ultimately provides guidance to operators via the Uhana API which can be applied manually or directly through closed-loop automation.



## Features and Components

### Data Ingestion and Distribution Engine

Ingests real-time telemetry information from a variety of sources, such as cell trace records (CTR) from eNodeBs, and cell trace UE-ID mapping (CTUM) from MMEs, and replicates it to multiple downstream systems via an open API.

- Scale-out ingestion of real-time encoded RAN and EPC Telemetry
- Data ingestion (1M events/sec) and replication (3M events/sec)
- Support for multiple simultaneous RAN software releases for in-service RAN/EPC release upgrades
- Real-time feed replication for up to 3M events/sec
  - Ability to replicate full/partial feed based on pre-filtering criteria
  - Dynamic Kafka topic management with authentication
  - Optional anonymization of selective fields (IMSI, IMEI, etc.)

## Real-time Stream Processing Engine

Uses real-time feeds and applies stream processing, for example: data filtering, joining and KPI calculation. Over 400 KPIs are supported out-of-the-box and custom KPIs are defined via the KPI composer and calculated in real-time. The resulting streaming data is accessible via the Uhana web dashboard, the Uhana dashboard API and Kafka-based open API. Data can be sliced in multiple dimensions (e.g. per-QCI, per device type, per device release, etc.), aggregated over different time intervals, and calculated using different statistical functions.

- Real-time stream processing for RAN KPIs (with resolution as high as 10 seconds)
- Sub-second processing latency at scale
- Access to real-time and historic operations data with configurable data retention policy
- Rich filtering capabilities (e.g. per-UE, UE group, QCI, device type, device release, bands, sectors, geographic regions, antenna type, etc.)
- Temporal KPI aggregation
- Dynamic threshold based alerting

## Network Operations Optimization and Automation Suite

Consists of applications focused on optimizing mobile operator infrastructure. It applies Uhana's AI and ML technology to detect network anomalies, predict network KPIs, offer control guidance or provide closed loop control automation. This suite is made up of independently licensed applications that can range from anomaly detection, interference detection, end-to-end service assurance and more.

## Learn More

For additional information about Uhana by VMware:

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