



# Overview

Version 0.9

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Scenera, Inc., Nikon Corporation, Sony Semiconductor Solutions Corporation, Wistron Corporation and Hon Hai Precision Industry Co., Ltd.(NICE Alliance Promoters) contributed to this document.

## Revision History

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## 1. Introduction

The Network of Intelligent Camera Ecosystem Alliance was formed to create standards that enable cameras to interoperate with applications. The NICE specification enables Applications to determine the capabilities of a network of cameras and configure this network in a way that is optimized to the data requirements of the Application. NICE also provides a standardized format for data that is generated by cameras. This enables the fast search and analysis of data that is produced by cameras. It also enables multiple applications to simultaneously use data generated by a network of cameras.

NICE's architecture embodies the concept of a layered interface. This enables the creation of Data Services that aggregate the capabilities of Devices and components in the cloud into more powerful Devices all of which present the same API to Apps and Services that utilize these capabilities. By using this layering older cameras or less powerful cameras can be augmented by combining the camera with capabilities that are implemented in the cloud.

NICE provides an infrastructure for gathering and sorting massive amounts of raw video data. NICE enables big data processing by organizing video data into event driven SceneMark and SceneData from multiple cameras that is time and space relevant. Video is indexed and made searchable via SceneMarks. This process of sorting and organizing is performed in real time as the video is produced. This enables real time processing of big video data.

### 1.1. About NICE

The Network of Intelligent Camera Ecosystem Alliance was founded on a vision to propel and advance computer vision to bring forth the next generation of smart cameras to the market through strategic alliance and a proprietary framework to share and process data via smart cameras.

- Established in 2018
- Founding Members:
  - Foxconn
  - Nikon
  - Scenera
  - Sony Semiconductor Solutions Corporation
  - Wistron

### 1.2. What NICE Provides?

NICE addresses the needs of multiple players in the camera ecosystem.

- For consumers:
  - Choosing Apps of their choice from wide variety of cameras of their preference and ease of installation and maintenance from different types and multiple vendors
- For Enterprise User:
  - Manage their own data using variety of Apps for cost effective cameras
  - Easy to build a secure and protected environment and own data with applications of their choice
- App/Service Developer:
  - Universal Applications for massively adopted NICE cameras using open and standardized API
- Cloud Infrastructure Service Provider:
  - They don't need to manufacture their own cameras
  - Target mass market with consistent infrastructure with their own expertise

- Device Manufacturer:
  - Mass adoption enables increase in sales
- AP/SoC Manufacturer:
  - Mass adoption enables increase in market share
- Sensor Manufacturer:
  - Early access to new market developments

### 1.3. Key Trends Driving NICE

AI: The biggest trend is the emergence of Artificial Intelligence for automatically processing of video images. So far, this processing has been done in the cloud. New generations of Systems on Chip, Application Processors and Image Sensors is moving this AI processing into the edge and even the sensor. Applications utilize multiple stages of AI processing to extract meaning from multiple video streams.

Application Processor has integrated AI capabilities for analyzing visual image and now in use for various types of camera and IoT devices with built-in video image sensors

Edge Computing in video AI analytics greatly improves overall performance when integrated well with the cloud-based AI computing. This trend along with advanced sensor capabilities may bring human-vision analytics to low cost cameras

Deployment of 5G enables everything especially cameras and IoT devices with image sensors connected to the Internet and the cloud infrastructure for much improved analytic performance a low latency, enabling interaction between end-users and those devices much more practically useful

### 1.4. NICE Vision

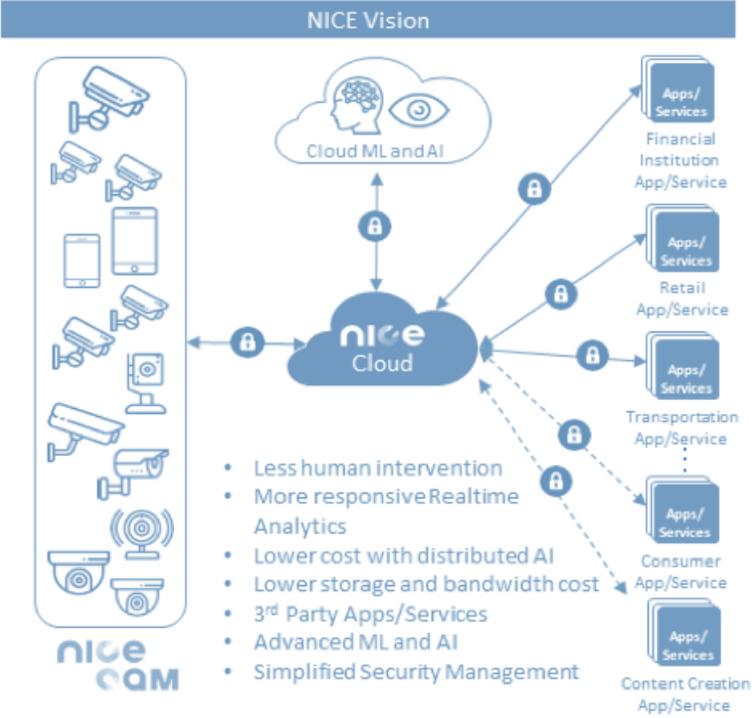


Figure 1. NICE Vision

The following table illustrates the pro's and con's of locating AI processing in the cloud, the edge and in the sensor. The objective of NICE is to enable the application to flexibly shift AI processing where it is the most optimum.

AI in the Cloud	AI at the Edge	AI in the Sensor
<ul style="list-style-type: none"> <li>• Required high bandwidth</li> <li>• Heavy computation in the cloud</li> <li>• High cost and Power</li> <li>• High Latency</li> <li>• Low Privacy</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce bandwidth</li> <li>• Less computation in the cloud</li> <li>• Reduce cost and power</li> <li>• Low Latency</li> <li>• Privacy</li> <li>• May become more costly and power hungry when sensor resolution and frame rate increases</li> </ul>	<ul style="list-style-type: none"> <li>• AI on Sensor reduce bandwidth and # of blocks to pass on to AP</li> <li>• Computation on the Edge is now more manageable</li> <li>• Super Low Latency</li> <li>• Privacy</li> </ul>

## 1.5. System Overview

NICE provides a simple way for end users to manage their devices and sensor devices. The user can simply assign a Device that they have purchased to their NICE User Account and then link Apps that they select to their account.

NICE enables an App to be linked to a Users Account and request data from Devices that are assigned to that User's Account.



Figure 2. NICE System Overview

A NICE **App** is a Smart phone application, a Cloud application or a Web page application which is mainly capable of ingesting NICE data and it's compliant with the NICE App Specification.

A NICE **Device** is a device, a Sensor Module or a Cloud Service which is capable of generating NICE complaint data and it's compliant with the NICE Device Specification.

A NICE **Account Services** is a collection of services and client interface that manages the User Accounts, the Apps interaction with Devices and takes care of end to end security end privacy.

A NICE **Data Services** is collection of cloud services such as: Pipeline Control and configuration, Distributed AI Manager, Artificial Intelligent Services, Computer Vision Service, storage and more.

A NICE **Media Services** is a collection of cloud services that handles live video, audio and other media types streaming and provides Encoding, Decoding, Broadcasting, Recording and broadcasting.

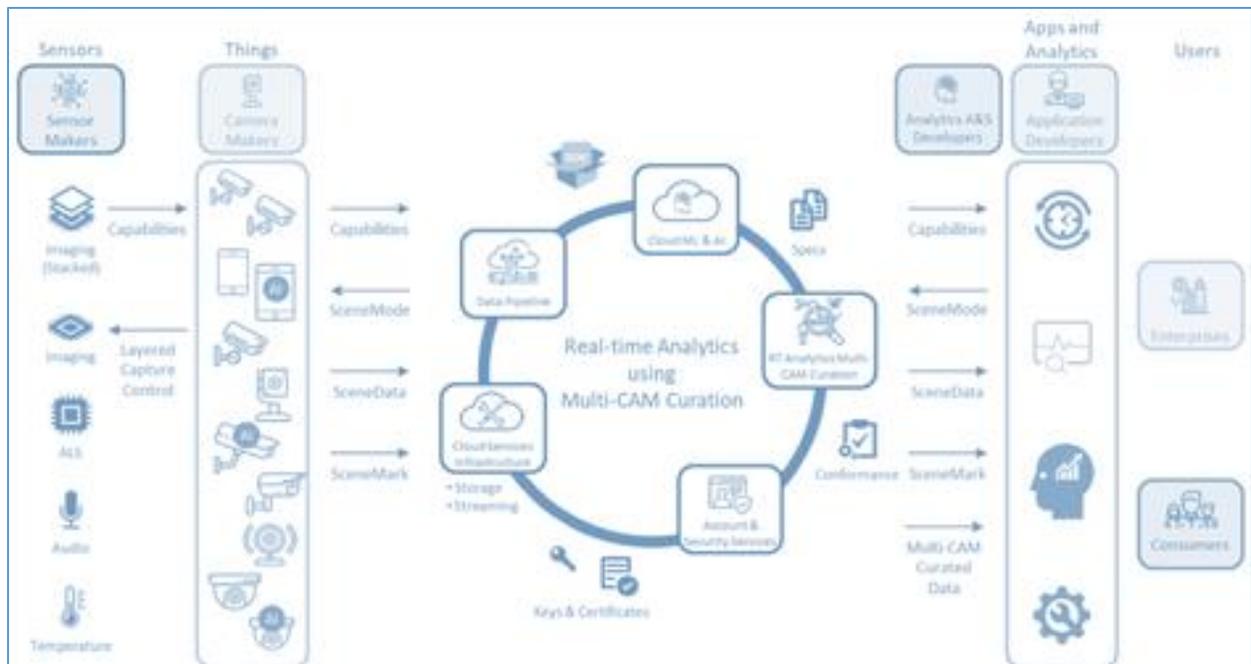


Figure 3. NICE Overview

## 1.6. Key Features

### 1.6.1. Secure Management

NICE devices connect directly to the cloud server for secure automatic configuration. A simple app enables users to link the device to their accounts using centralized security server that manages encryption keys and password credentials on behalf of the user.



Figure 4. Secure Management

## 1.6.2. Layered Interface

NICE enables to reduce the complexity of integration for device makers. The layered interface enables the device to expose advanced image capture and processing capabilities to applications.

Video analytic algorithms can be performed at different layers enabling to optimize image capture using sensor's or device's capabilities and to adjust the stream of locally processed video data to the cloud video analytics.

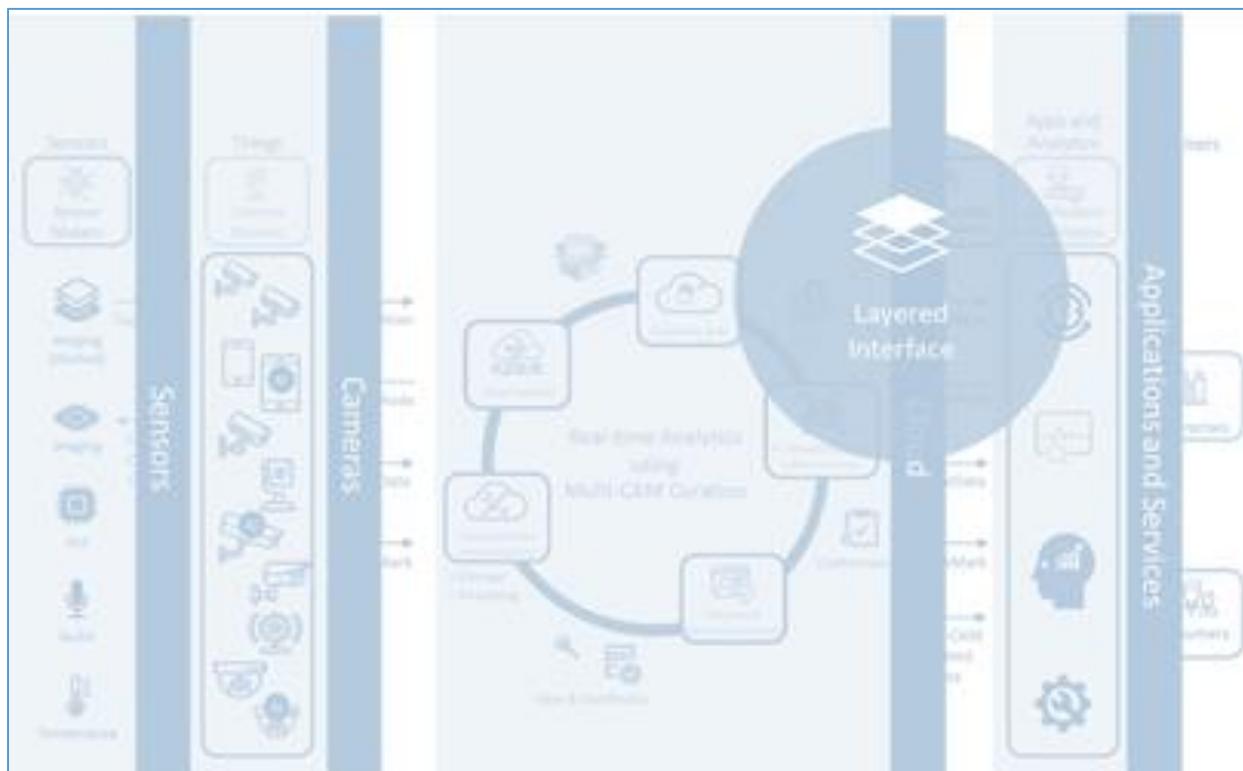


Figure 5. Layered Interface

### 1.6.3. Scene-based API

Application developers can determine the physical and analytical capabilities of devices. App developer can set a SceneMode to configure a data stream describing detected events, including relevant video clips, metadata generated by local analytics and other auxiliary data. Multidevice curation further sorts the data from multiple devices, reducing the cost of processing and storing multiple raw video streams.

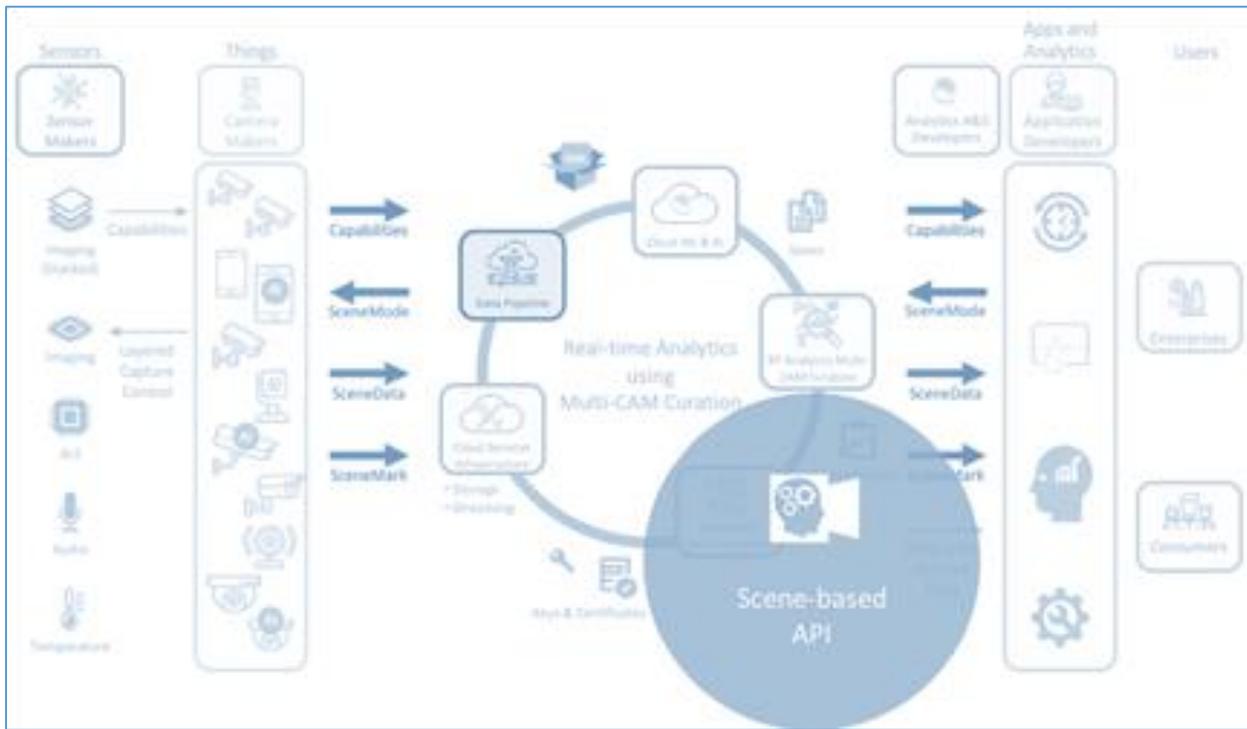


Figure 6. Scene-based API

### 1.6.4. Distributed AI

NICE allows applications to distribute AI algorithms to where they can perform best for real-time analytics. Analytical algorithms can be executed in sensors or device or in the cloud to enable managing multiple streams of video images for a fast and accurate analysis. This resembles the human vision system where simple reflex actions are processed in the spinal cord for fast response, while the brain handles complex processing.



Figure 7. Distributed AI

## 2. Conclusions

### What would NICE meant to be for each of ecosystem Players?

- Consumers
  - Cameras that work with any App
- Enterprise users
  - Cost effective infrastructure that enables multiple sources of camera hardware and interoperation with both proprietary Apps and 3<sup>rd</sup> party Apps
- System Integrator
  - Provide end-to-end solution
- App and Cloud Service Providers
  - Expanded market for intelligence services by making easier for cameras to work with the cloud
- Camera brands makers
  - Expands market with NICE compliant camera
- AP makers
  - Increased demand for advanced Application Processors
- Module makers
  - Simplify verification procedure
  - Same reference design with OEM led differentiations
- Sensor makers
  - Expands market with advanced sensor