ASPires

Advanced Systems for Prevention & Early Detection of Forest Fires

November 08-09, 2018 (Bansko, Bulgaria)

Advanced systems for prevention and early detection of forest fires

Advanced Systems for Prevention & Early Detection of Forest Fires (ASPires)

Advanced Open IoT Platform for Prevention and Early Detection of Forest Fires

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Project financed under the Civil Protection Programme Call 2016:
Agreement No.: ECHO/ SUB/2016/742906/PREV03 by European Commission:
DG for European Civil Protection and Humanitarian Aid Operations (ECHO)

AGENDA

- Objectives
- Platform Benefits
- Platform Overview
- State of the Art
- Demo

Advanced systems for prevention and early detection of forest fires

Objectives

- **Open and interoperable**
  - Wide range of interfaces, protocols and devices
  - Existing Crisis Management Systems (National, EU-level)
- **Continuous monitoring** of disaster related data
  - Retrospective disaster assessment
- **New methods** for fire detection (AI, drones, sensors)
- **Command devices** in surrounding area (i.e. barriers)
- **Automatic** processing and alert generation
- **Decision making** support
- **Cost efficient** monitoring

Platform Benefits

- Open source and free license components
- Deployment on-premises and public cloud
- Adaptable – multiple abstraction points
- Cutting edge technologies
  - AI, Machine Learning, Time Series data, Drones support
- High performance
  - 30’000+ connections, 7’000 req/second, 10M sensor parameters
- Built with security in mind
- TRL 6 (test in relevant environment)

The cloud platform aims to **combine the best approaches** to achieve **10% better fire assessment and prevention**.

European Commission | Horizon 2020 European Union funding for Research & Innovation

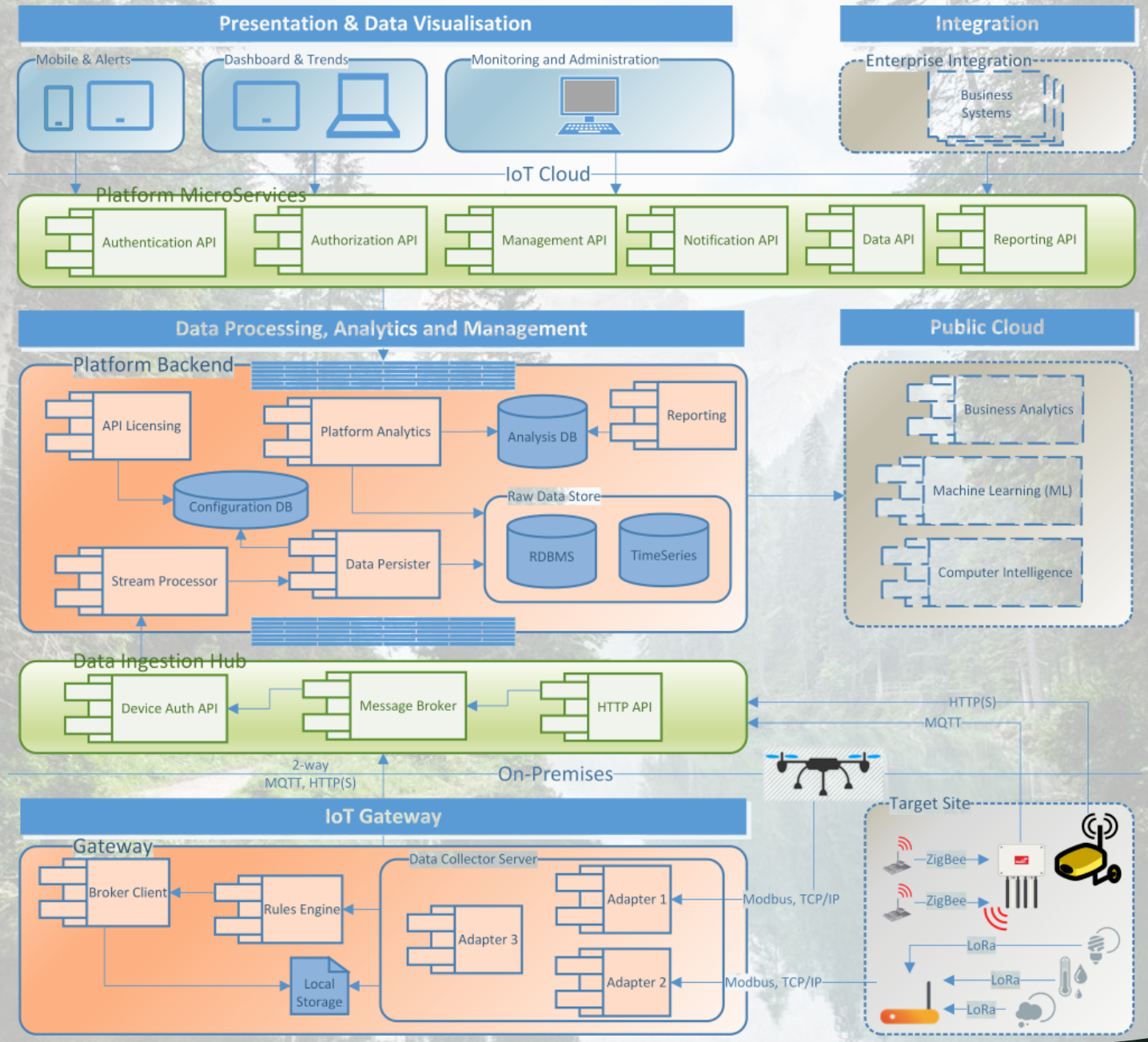
ASPires

Distributed & Open IoT Platform

Funded by

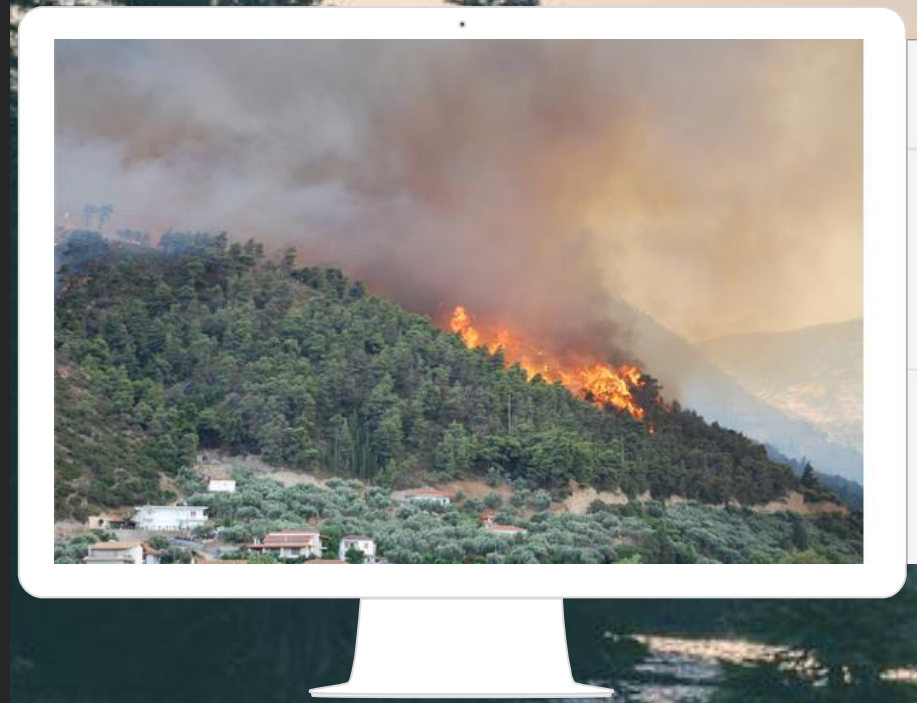
EUROPEAN CIVIL PROTECTION AND HUMANITARIAN AID OPERATIONS

ECHO/SUB/742906/PREV03 (ASPIRES)



State of the Art

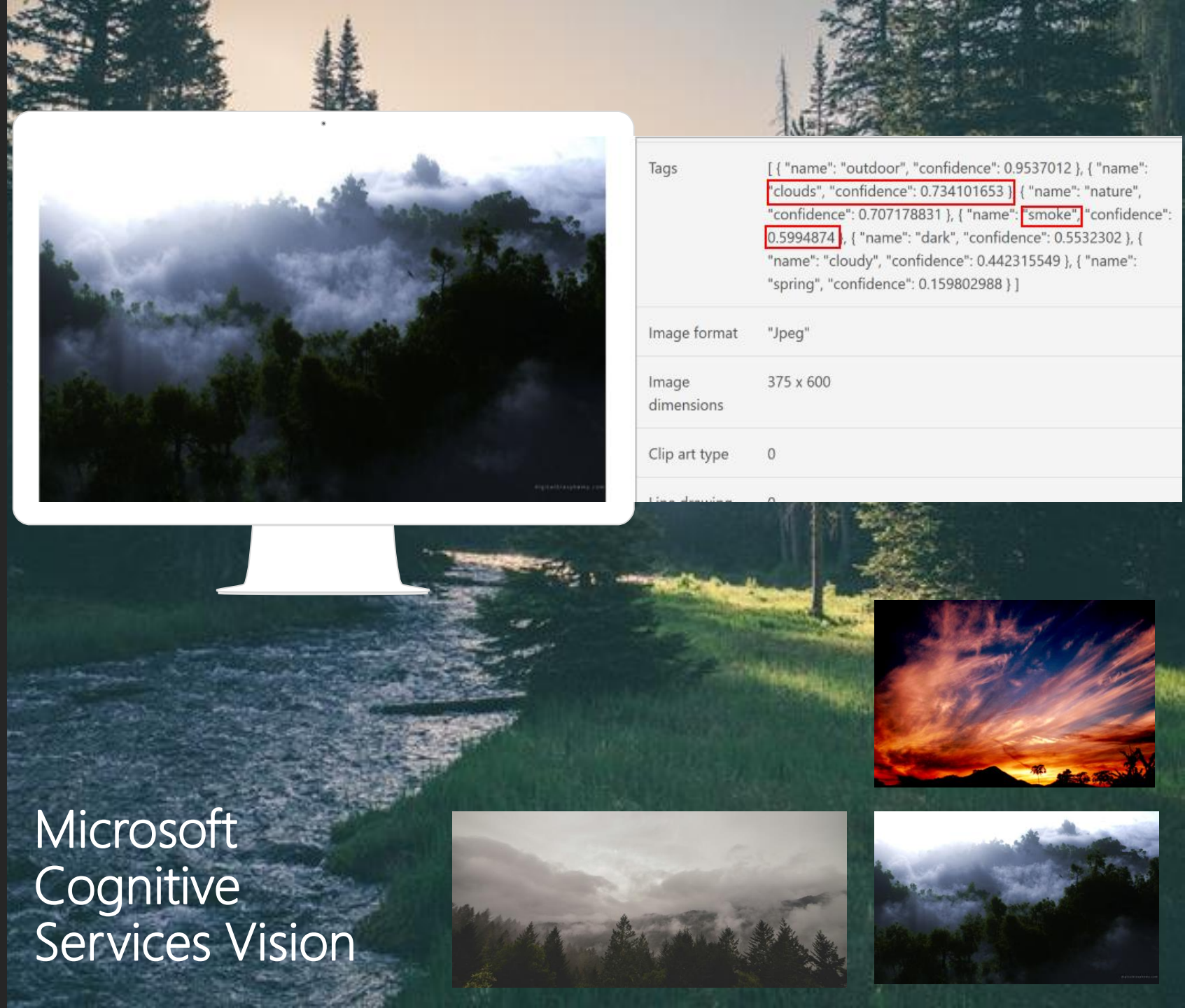
- Computer intelligence and computer vision could be used for **automated alerting**
- Works on predefined **description tags**
- **Less operators** could cover larger area



FEATURE NAME:	VALUE
Description	{ "Tags": ["mountain", "outdoor", "nature", "train", "background", "water", "smoke", "forest", "large", "small", "hill", "river", "track", "green", "city", "lake", "field", "riding", "tree", "traveling", "rainbow", "grassy", "red", "road", "air", "steam", "flying"], "Captions": [{ "Text": "a tree with a mountain in the background", "Confidence": 0.9032793 }] }
Tags	[{ "Name": "mountain", "Confidence": 0.998070061 }, { "Name": "outdoor", "Confidence": 0.994166851 }, { "Name": "nature", "Confidence": 0.863600254 }, { "Name": "background", "Confidence": 0.712349 }, { "Name": "forest", "Confidence": 0.2915216 }, { "Name": "hillside", "Confidence": 0.155092016 }]

Microsoft Cognitive Services Vision

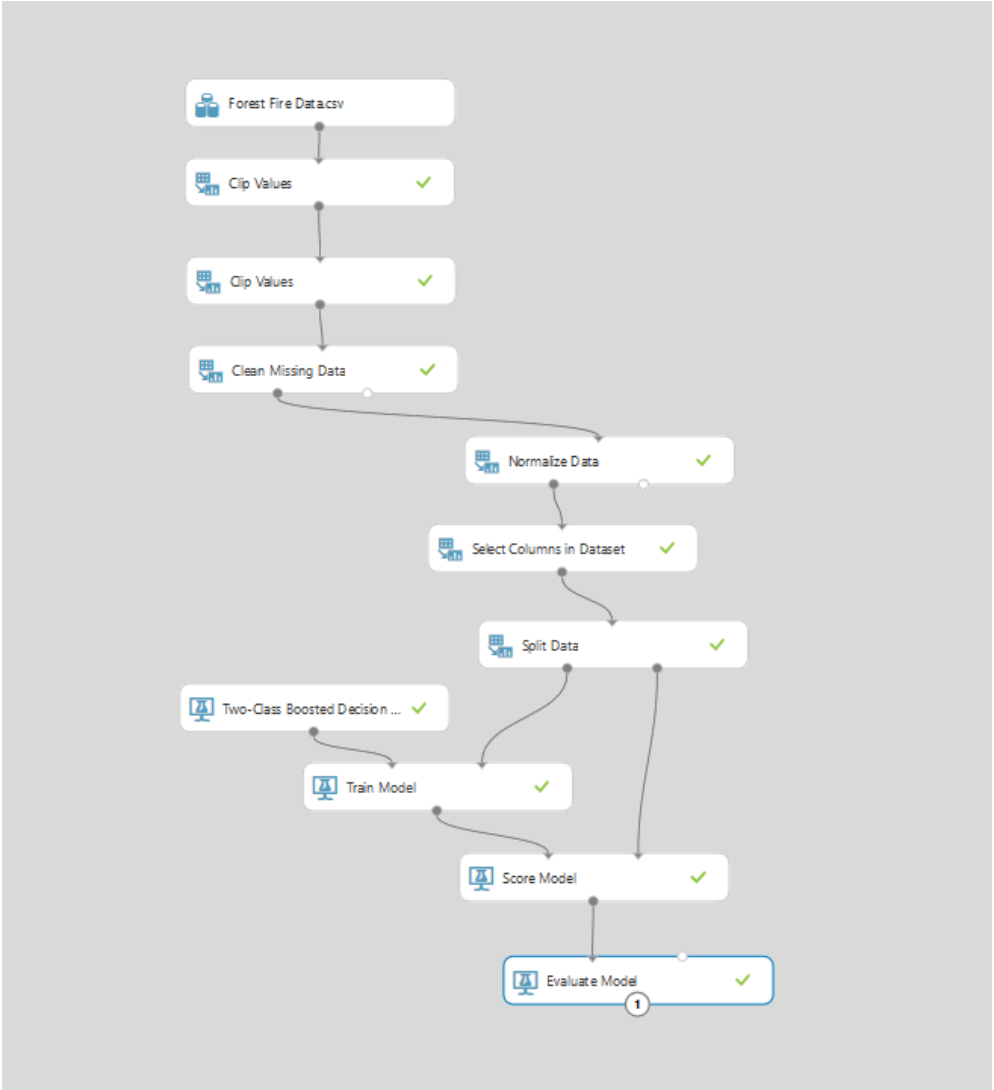
- Computer vision can process **low resolution images** (VGA)
- Capable to **distinguish clouds from smoke**
- **Alerts** are raised based on **confidence level**



Machine Learning

- Predict fire state with certain **confidence level**
- **Predictive features** identified by analysis of processes in crisis management systems
- Model consumed as **cloud web service**

(ML Studio & Azure Model Management Service)



Platform Openness

- Open source technologies
  - Microsoft Azure IoT Edge
  - Influx DB
  - Mosquitto MQTT
  - IdentityServer4
- Open protocols
- Inbound & Outbound Interfaces
- Data & Alerts Services
- CMS Systems: EFFIS, MKFFIS


Sensors Map
Frame counter
18951
Radio Frequency
868.1 Hz
RSSI
-120 dBm
Spreading Factor
12
Lora Signal to Noise Ratio
-0.5 dB
Lora Signal to Noise Ratio
Lora Signal to Noise Ratio (Live)
Last 2 hours
RH
34%
RH
RH (Live)
Last 2 hours
CO2
691 ppm
CO2
CO2 (Live)
Last 2 hours
DEMO