



VIRTUALIZED PROGRAMMABLE INTER-  
FACES FOR INNOVATIVE COST-EFFECTIVE  
IoT DEPLOYMENTS IN SMART CITIES

# EU ICT-VITAL Project

[ICT-2013.1.4] A Reliable, Smart and Secure Internet of Things for Smart Cities

## Smarter Traffic Management



**Esmâ DİLEK**

**Istanbul Metropolitan Municipality (IMM)**

Brussels, November 30th, 2016

# VITAL-IoT IMM's Goals

VITAL  
www.vital-iot.eu



Managing Traffic & Traffic Measurement Systems Smartly & Efficiently  
in Istanbul

Cost Effective & Quickly Identification of Traffic Events

**Standardized, easily extendible & leveragable traffic  
management platform for both  
Traffic Managers & Operators**



VITAL



# VITAL-IoT IMM's Goals

VITAL  
www.vital-iot.eu



Develop & operate practical smart city applications for Istanbul

Integrate IMM traffic measurement data with VITAL platform & Utilize the Services provided by VITAL

Validate Smart Traffic Management Scenarios in Istanbul

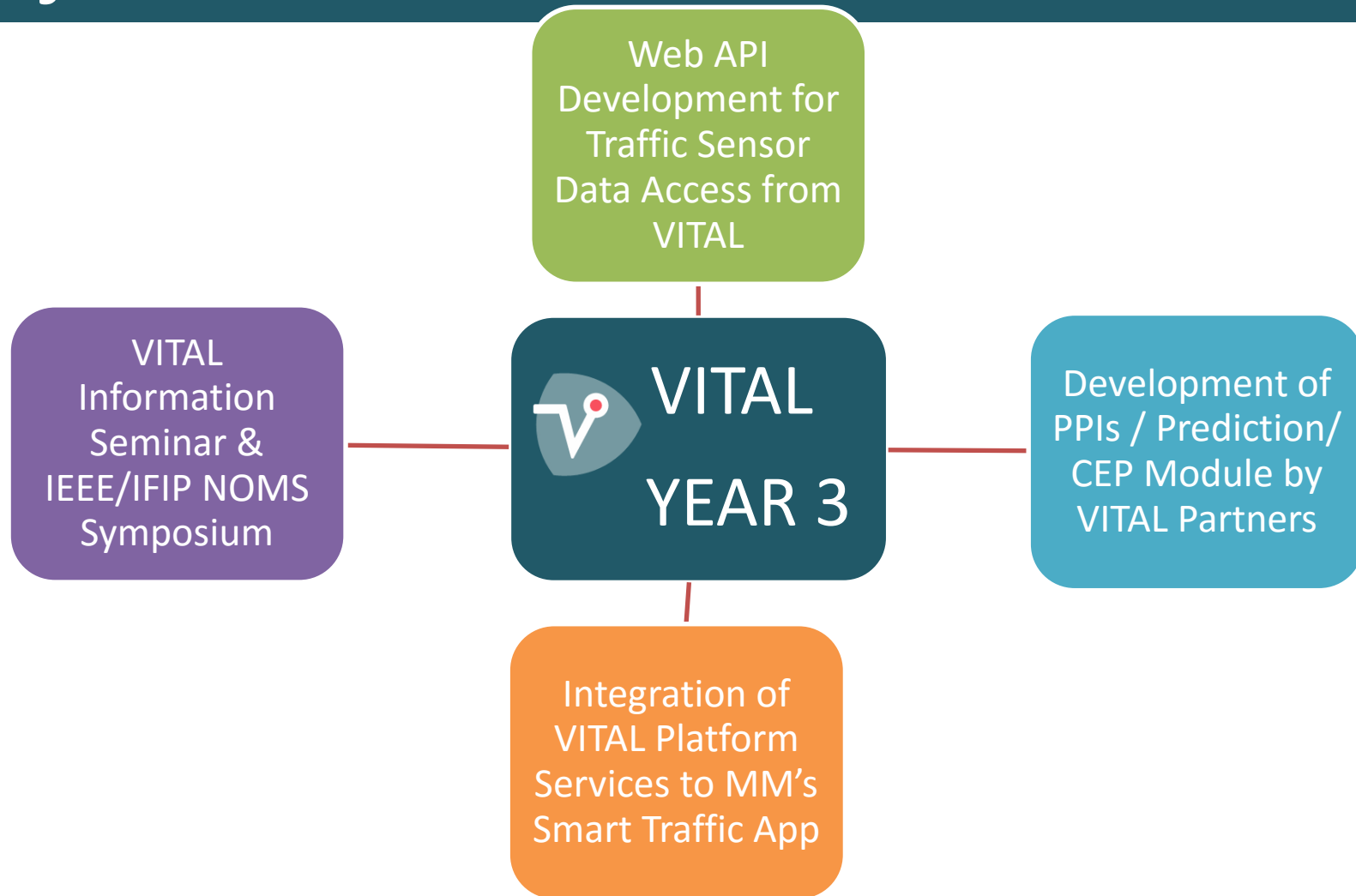
Facilitate the daily tasks of Traffic Operators working on a 24/7 basis

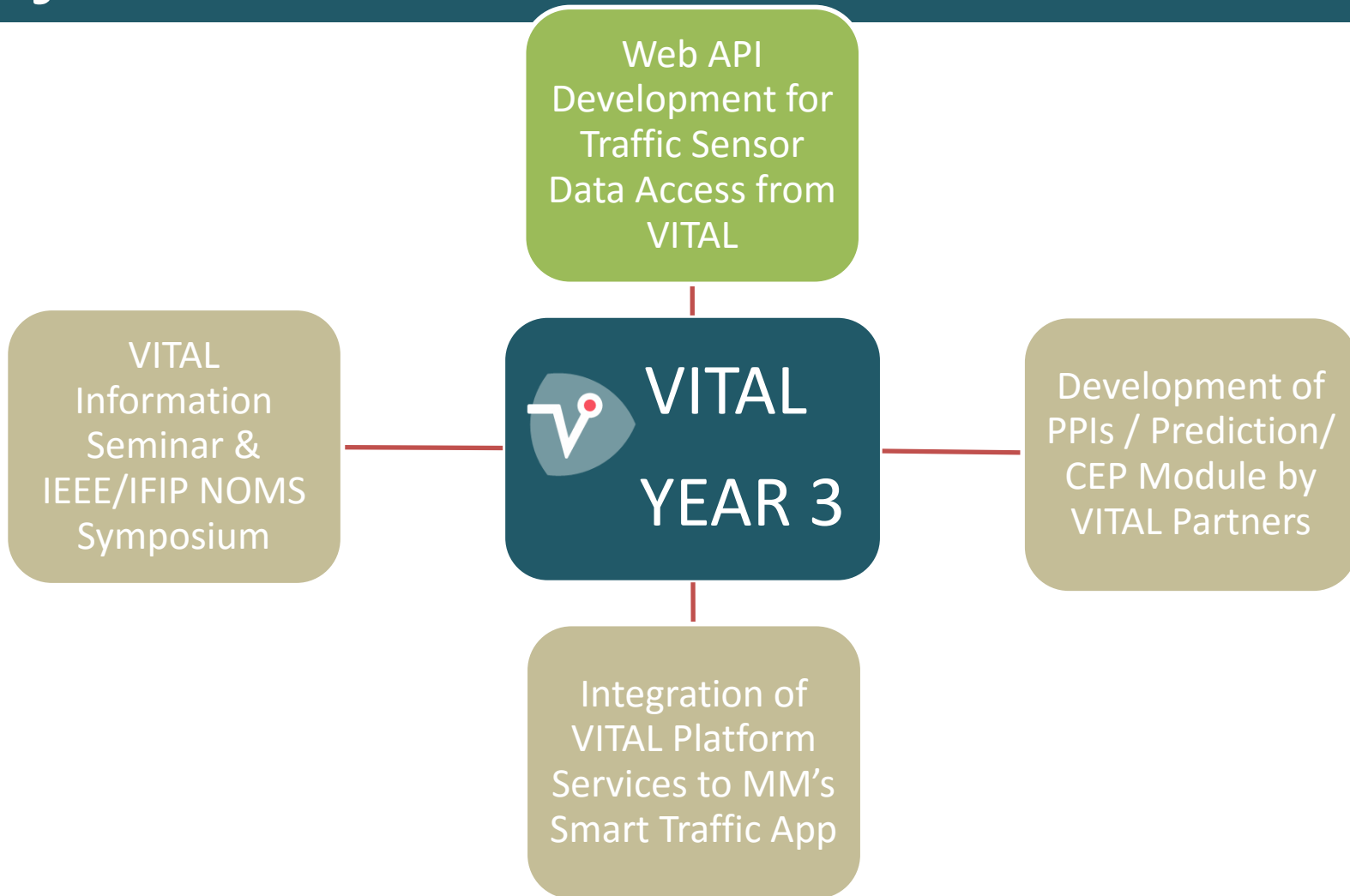


# VITAL-IoT

## Project Overview Year 3

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# VITAL-IoT IMM Web API

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← → ↻ 🔍 <http://tkmservices.ibb.gov.tr/vital>

http://tkmservices.ibb.gov.tr/vital/api/Sensor. Below the help page, a REST client interface shows a GET request to <http://tkmservices.ibb.gov.tr/vital/api/Sensor> with a status of 200 OK and a response in JSON format showing a list of sensor information."/>

```
1- [{"sensorID": 1,
2-   "sensorDirection": 0,
3-   "sensorSpeed": 71,
4-   "sensorMeasurementDate": "2016-11-22T12:47:01.633",
5-   "sensorSpeedColor": 2},
6-   {"sensorID": 2,
7-   "sensorDirection": 0,
8-   "sensorSpeed": 31,
9-   "sensorMeasurementDate": "2016-11-22T12:47:01.64",
10-  "sensorSpeedColor": 4},
11-  {"sensorID": 3,
12-   "sensorDirection": 0,
13-   "sensorSpeed": 77,
14-   "sensorMeasurementDate": "2016-11-22T12:48:29.677",
15-   "sensorSpeedColor": 2},
16-  {"sensorID": 4,
17-   "sensorDirection": 0,
18-   "sensorSpeed": 5,
19-   "sensorMeasurementDate": "2016-11-22T12:46:00.43",
20-   "sensorSpeedColor": 3},
21-  {"sensorID": 5,
22-   "sensorDirection": 0,
23-   "sensorSpeed": 13,
24-   "sensorMeasurementDate": "2016-11-22T12:49:15.327",
25-   "sensorSpeedColor": 5},
26-  {"sensorID": 6,
27-   "sensorDirection": 1,
28-   "roadID": 404,
29-   "mobileSpeed": 57,
30-   "mobileSpeedMeasurementDate": "2016-11-22T12:46:00.43",
31-   "mobileSpeedColor": 3}
32- ]
```

Sensor  
Info

http://tkmservices.ibb.gov.tr/vital/api/Observation with a status of 200 OK and a response in JSON format showing a list of sensor observations."/>

```
1- [{"sensorID": 1,
2-   "sensorDirection": 0,
3-   "sensorSpeed": 71,
4-   "sensorMeasurementDate": "2016-11-22T12:47:01.633",
5-   "sensorSpeedColor": 2},
6-   {"sensorID": 2,
7-   "sensorDirection": 0,
8-   "sensorSpeed": 31,
9-   "sensorMeasurementDate": "2016-11-22T12:47:01.64",
10-  "sensorSpeedColor": 4},
11-  {"sensorID": 3,
12-   "sensorDirection": 0,
13-   "sensorSpeed": 77,
14-   "sensorMeasurementDate": "2016-11-22T12:48:29.677",
15-   "sensorSpeedColor": 2},
16-  {"sensorID": 4,
17-   "sensorDirection": 0,
18-   "sensorSpeed": 5,
19-   "sensorMeasurementDate": "2016-11-22T12:46:00.43",
20-   "sensorSpeedColor": 3},
21-  {"sensorID": 5,
22-   "sensorDirection": 0,
23-   "sensorSpeed": 13,
24-   "sensorMeasurementDate": "2016-11-22T12:49:15.327",
25-   "sensorSpeedColor": 5},
26-  {"sensorID": 6,
27-   "sensorDirection": 1,
28-   "roadID": 404,
29-   "mobileSpeed": 57,
30-   "mobileSpeedMeasurementDate": "2016-11-22T12:46:00.43",
31-   "mobileSpeedColor": 3}
32- ]
```

Sensor  
Observation  
= Sensor  
Speeds

http://tkmservices.ibb.gov.tr/vital/api/IdentifyConflicts with a status of 200 OK and a response in JSON format showing a list of identify conflicts."/>

```
1- [{"sensorID": 4,
2-   "sensorDirection": 0,
3-   "sensorSpeed": 30,
4-   "sensorMeasurementDate": "2016-11-22T12:49:15.307",
5-   "sensorSpeedColor": 5,
6-   "roadID": 404,
7-   "mobileSpeed": 57,
8-   "mobileSpeedMeasurementDate": "2016-11-22T12:46:00.43",
9-   "mobileSpeedColor": 3},
10-  {"sensorID": 6,
11-   "sensorDirection": 0,
12-   "sensorSpeed": 13,
13-   "sensorMeasurementDate": "2016-11-22T12:49:15.327",
14-   "sensorSpeedColor": 5,
15-   "roadID": 313,
16-   "mobileSpeed": 11,
17-   "mobileSpeedMeasurementDate": "2016-11-22T12:46:00.43",
18-   "mobileSpeedColor": 3}
19- ]
```

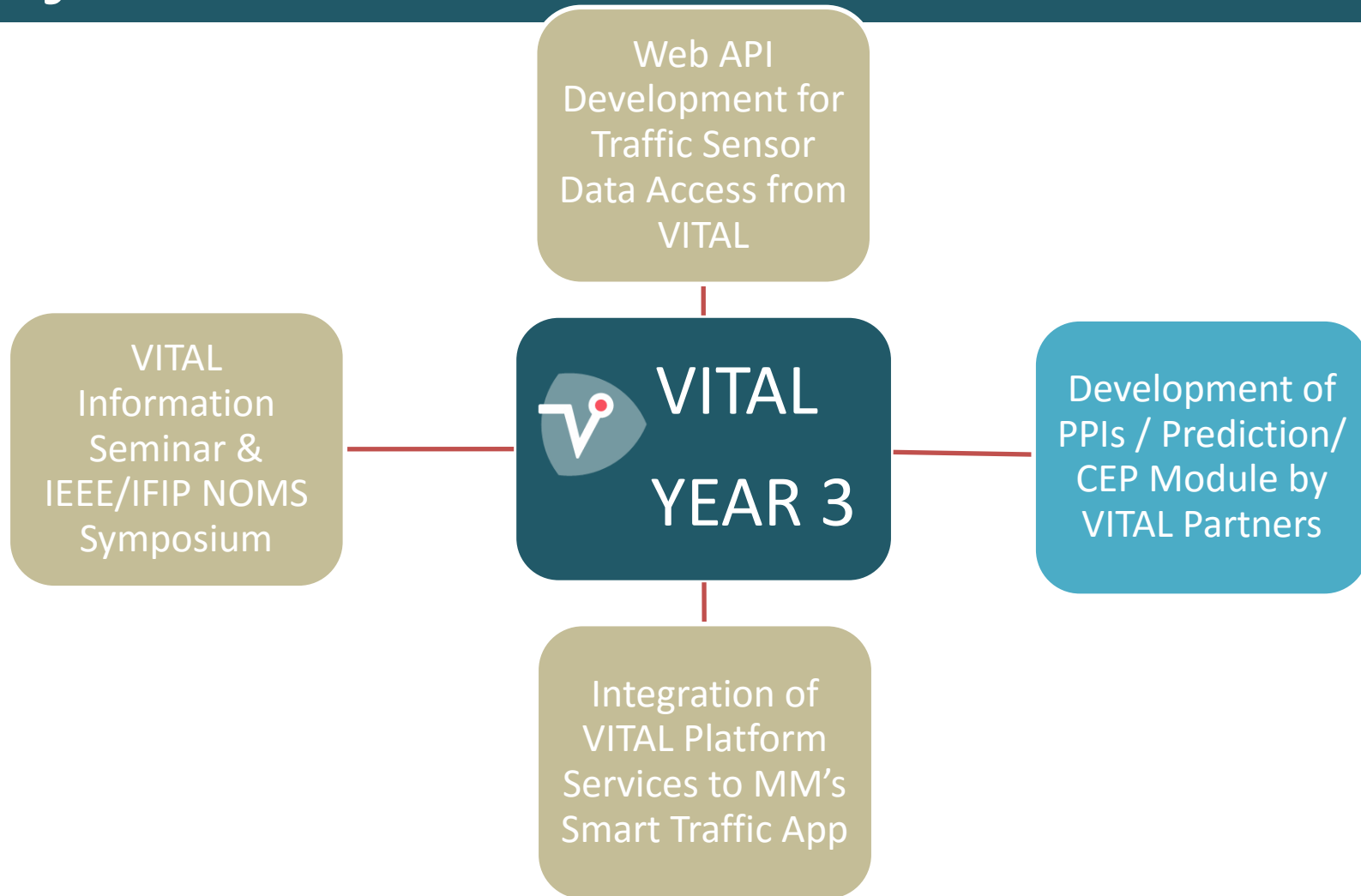
Identify  
Conflicts



# VITAL-IoT

## Project Overview Year 3

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# VITAL-IoT

## IMM Use Case Contributors

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[www.vital-iot.eu](http://www.vital-iot.eu)



### ■ IMM

- IoT Data Provider
- Development of Traffic Web API
- Development of Smart Traffic App

### ■ ITU

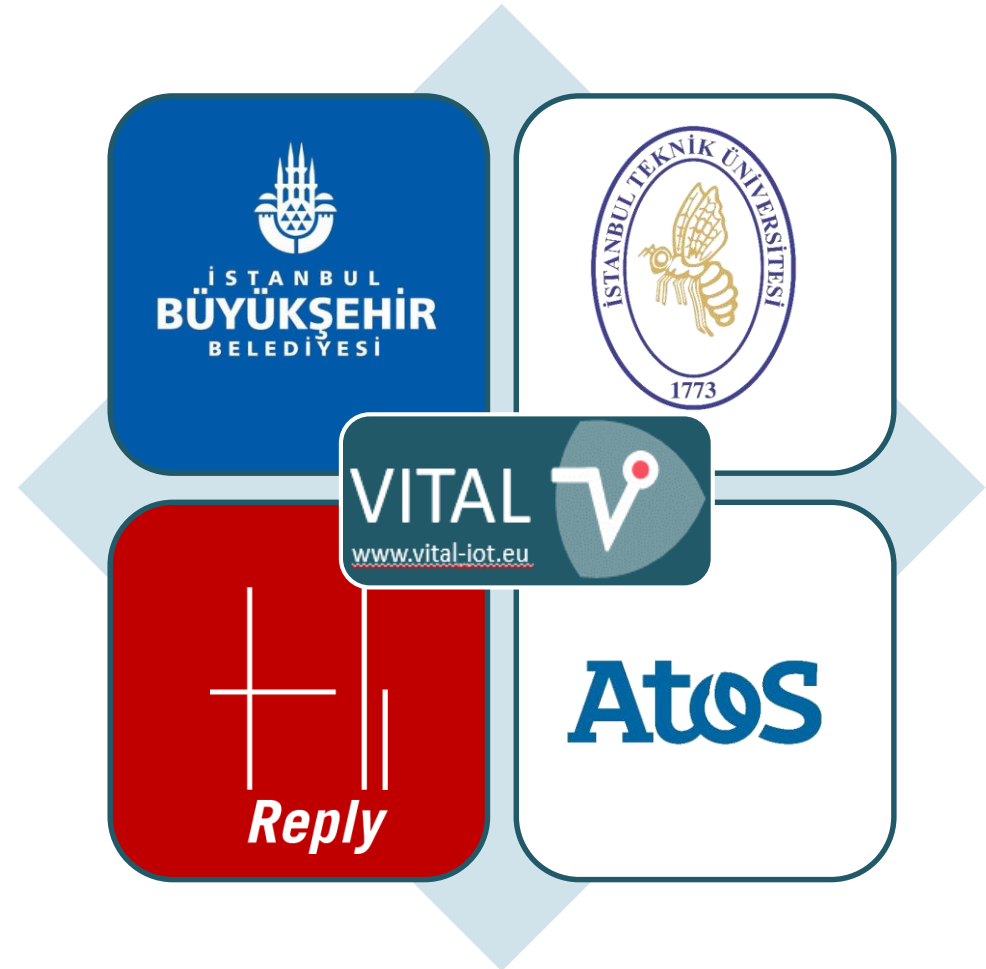
- Traffic Prediction

### ■ Reply

- Development of PPIs

### ■ ATOS

- Development of CEPICO for
  - Incident Detection
  - Sensor Failure Detection







# VITAL-IoT Authentication

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← → ↻ 🔍 <https://vital-integration.atosresearch.eu:8843/securitywrapper/rest/authenticate>

**POST** <https://vital-integration.atosresearch.eu:8843/securitywrapper/rest/authenticate> Params Send Save

Authorization Headers (1) **Body** Pre-request Script Tests Code

form-data  x-www-form-urlencoded  raw  binary

<input checked="" type="checkbox"/>	name	Mehemet	⋮ ×
<input checked="" type="checkbox"/>	password	Mehemet1	⋮ ×
<input checked="" type="checkbox"/>	testCookie	false	⋮ ×
	key	value	

Bulk Edit

Body Cookies (2) Headers (9) Tests Status: 200 OK Time: 209 ms

Pretty Raw Preview JSON ⋮

```
1 {
2   "uid": "Mehemet",
3   "name": "Mehemet",
4   "fullname": "Mehemet Mehemet",
5   "creation": {
6     "year": "2016",
7     "month": "November",
8     "day": "07"
9   },
10  "mailhash": "cc40a1fa4ebe482b824d0194a425f9ef"
11 }
```



# VITAL-IoT Traffic Prediction

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← → ↻ 🔍 <http://vital-integration2.atosresearch.eu:8280/vital-prediction-service/prediction>

The screenshot shows a REST client interface with the following details:

- Method:** POST
- URL:** http://vital-integration2.atosresearch.eu:8280/vital-prediction-service/prediction
- Body (Request):**

```
1 {
2   "city": "hireplyppi",
3   "property": ["Traffic"],
4   "gt": "2016-11-19T12:06:02.039Z",
5   "lt": "2016-11-19T12:21:02.039Z"
6 }
```
- Status:** 200 OK
- Time:** 6422 ms
- Body (Response):**

```
1 [
2   {
3     "predicted_time": "2016-11-09T14:15:00Z",
4     "city": "hireplyppi",
5     "property": "Traffic",
6     "prediction_time": "2016-11-09T13:25:00Z",
7     "sensor": "http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_122Dir0",
8     "value": 46,
9     "minute_later": 999
10  },
11  {
12    "predicted_time": "2016-11-09T14:15:00Z",
13    "city": "hireplyppi",
14    "property": "Traffic",
15    "prediction_time": "2016-11-09T13:25:00Z",
16    "sensor": "http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_378Dir0",
17    "value": 85,
18    "minute_later": 999
19  },
20  {
21    "predicted_time": "2016-11-09T14:15:00Z",
```



# Incident Detection Use Case

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The DOLCE rule that triggers a Traffic Incident compares the “colour” property of the last three observations (colors assigned to sensor speeds) of every sensor to match the cases

The “colour” property represents the degree of traffic congestion with values from 1 to 5



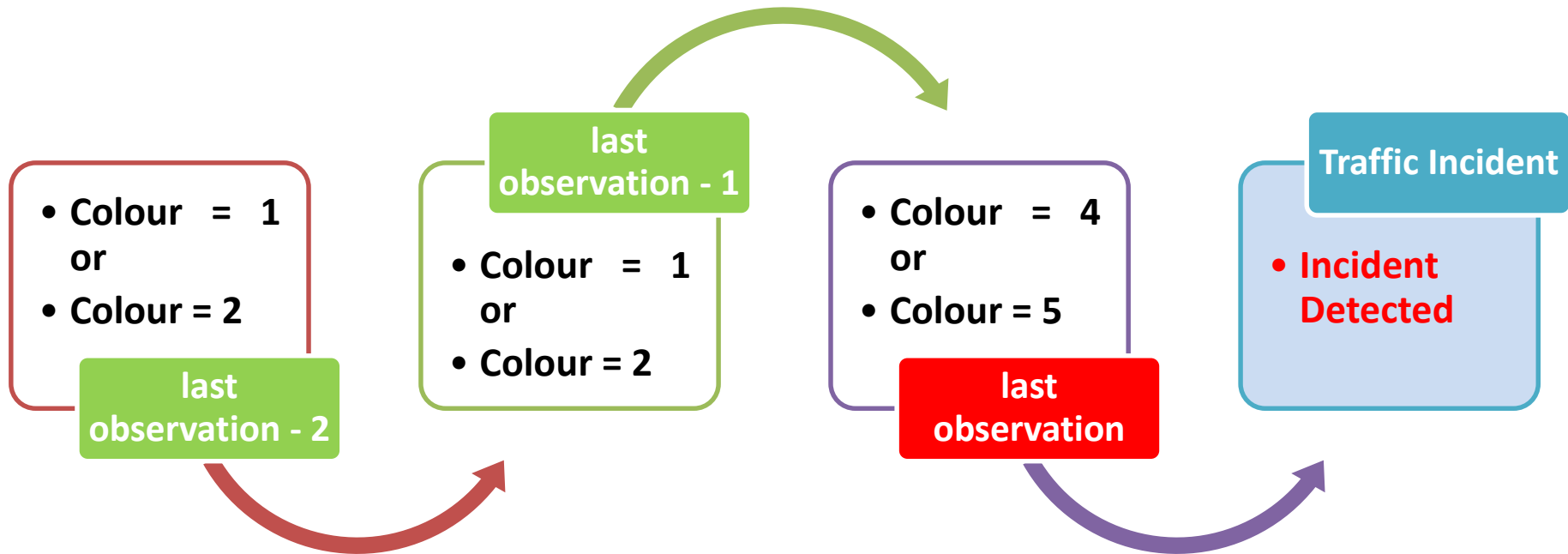
5 => High Congestion



1 => No Congestion



# Incident Detection Use Case



The output observations of the CEPICO are provided through the VITALCEP PPI that provides the “**ObservationService**” & “**getObservation**” operation & requested by the Smart Traffic Management App



# VITAL-IoT Create CEPICO for Incident Detection

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← → ↻ 🔍 <https://vital-integration2.atosresearch.eu:8843/cep/createcepico>

**PUT** `https://vital-integration2.atosresearch.eu:8843/cep/createcepico` Params Send Save

Authorization Headers (4) **Body** Pre-request Script Tests Code

form-data x-www-form-urlencoded raw binary **JSON (application/json)**

```
1 - {
2   "name": "Istanbul_Traffic_Incident",
3   "description": "Traffic incident detection ",
4   "dolceSpecification": {
5     "id": "ppDoce",
6     "complex": [{
7       "definition": {
8         "payload": [{" "id": "Incident" }],
9         "detect": "Traffic",
10        "where": "(Traffic@0.color==4 && (Traffic@1.color==1 || Traffic@1.color==2) && (Traffic@2
11        .color==1 Traffic@0.color==2)) || (Traffic@0.color==5 && (Traffic@1.color==1 || Traffic@1
12        .color==2) && (Traffic@2.color==1 || Traffic@2.color==2))",
13        "in": "3"
14      },
15      "id": "Incident"
16    }],
17    "event": [{" "id": "http://vital-integration2.atosresearch.eu:8280/cep/sensor/2e632316-6f44-4f47-86ac-b5de3a376671" }]
```

Body Cookies (2) Headers (11) Tests Status: 200 OK Time: 2663 ms

Pretty Raw Preview **JSON**

```
1 - {
2   "id": "http://vital-integration2.atosresearch.eu:8280/cep/sensor/2e632316-6f44-4f47-86ac-b5de3a376671"
3 }
```



# VITAL-IoT

## Get Detected Incidents' List

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← → ↻ 🔍 <https://vital-integration2.atosresearch.eu:8843/cep/sensor/observation>

The screenshot displays a REST client interface with a POST request to `https://vital-integration2.atosresearch.eu:8843/cep/sensor/observation`. The request body is a JSON object:

```
1 {
2   "property": "ComplexEvent",
3   "sensor": ["http://vital-integration2.atosresearch.eu:8280/cep/sensor/d3e7eb7d-8ad5-4f4c-81b8-3b75e9ac635c"],
4   "from": "2016-11-16T00:00:00Z"
5 }
```

The response status is `200 OK` with a time of `780 ms`. The response body is a JSON array containing a single object:

```
1 [
2   {
3     "ssn:observationResultTime": {
4       "time:inXSDDateTime": "2016-11-17T16:36:46Z"
5     },
6     "ssn:observationResult": {
7       "ssn:hasValue": {
8         "type": "vital:ComplexObservationValue",
9         "value": {
10          "SensorId": "http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_4Dir",
11          "Speed": "33.000000",
12          "complexEvent": "Incident",
13          "Color": "4",
14          "Time": "2016-11-17T15:51:01Z",
15          "ssn:observedBy": "http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_4Dir0",
16          "sensorId": "http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_4Dir0"
17        }
18      }
19    }
20  }
21 ]
```

An orange arrow points to the `"complexEvent": "Incident"` field in the response body.



# Sensor Failure Detection Use Case

The DOLCE rule that triggers a Sensor Failure Detection compares the “colour” property with the “mobileColour” property of the last observation of every sensor to match the condition that there is a contradiction in the observation.

The “colour” property represents the degree of traffic congestion with values from 1 to 5



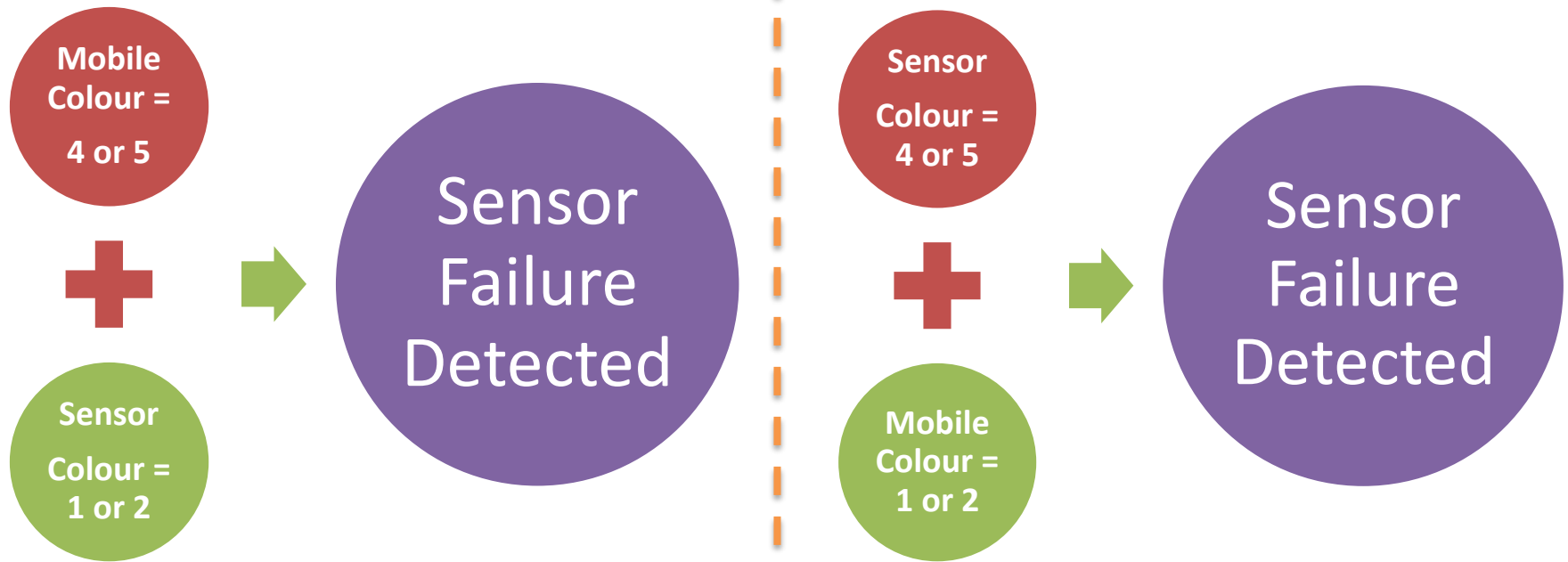
**5 => High Congestion**



**1 => No Congestion**



# Sensor Failure Detection Use Case



The output observations of the CEPICO are provided through the VITALCEP PPI & requested by the Smart Traffic Management App

# VITAL-IoT Create CEPICO for Sensor Failure Detection

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www.vital-iot.eu



← → ↻ 🔍 <https://vital-integration2.atosresearch.eu:8843/cep/createcepico>

PUT <https://vital-integration2.atosresearch.eu:8843/cep/createcepico> Params Send Save

Authorization Headers (4) **Body** Pre-request Script Tests Code

form-data x-www-form-urlencoded raw binary JSON (application/json)

```
1 - {
2   "name": "Istanbul_Traffic_Incident",
3   "description": "Traffic incident detection ",
4   "dolceSpecification": {
5     "id": "ppDoce",
6     "complex": [{
7       "definition": {
8         "payload": [{" "id": "SensorFailure" ←
29       "detect": "TrafficMatch",
30       "where": "( (mobileColour==4 || mobileColour==5)&& (colour==1 || colour==2) ) || ((colour==4 ||
31         colour==5)&& (mobileColour==1 || mobileColour==2))"
32     }
33   ],
34   "event": [{"
35     "source": [
36       "http://vital-integration.atosresearch.eu:8280/hireplyppi2TrafficMatch/sensor/vital-I_TrS_1Dir0",
37       "http://vital-integration.atosresearch.eu:8280/hireplyppi2TrafficMatch/sensor/vital-I_TrS_2Dir0",
38       "http://vital-integration.atosresearch.eu:8280/hireplyppi2TrafficMatch/sensor/vital-I_TrS_2Dir1",
39       "http://vital-integration.atosresearch.eu:8280/hireplyppi2TrafficMatch/sensor/vital-I_TrS_3Dir0",
40     ]
41   }
42 }
```

Body Cookies (2) Headers (11) Tests Status: 200 OK Time: 2663 ms

Pretty Raw Preview JSON ↻

```
1 - {
2   "id": "http://vital-integration2.atosresearch.eu:8280/cep/sensor/Ze632316-6f44-4f47-86ac-b5de3a376671"
3 }
```



# VITAL-IoT Get Detected Sensor Failures' List

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www.vital-iot.eu



← → ↻ 🔍 <https://vital-integration2.atosresearch.eu:8843/cep/sensor/observation>

The screenshot shows a REST client interface with a POST request to `https://vital-integration2.atosresearch.eu:8843/cep/sensor/observation`. The request body is a JSON object:

```
1 - {
2   "property": "ComplexEvent",
3   "sensor": ["http://vital-integration2.atosresearch.eu:8280/cep/sensor/55f29a52-a682-4865-b743-8c5abb8bce0c"],
4   "from": "2016-11-19T11:51:02Z"
5 }
```

The response status is `200 OK` with a time of `303 ms`. The response body is a JSON object:

```
1 - [
2   {
3     "ssn:observationResultTime": {
4       "time:inXSDDateTime": "2016-11-17T16:54:37Z"
5     },
6     "ssn:observationResult": {
7       "ssn:hasValue": {
8         "type": "vital:ComplexObservationValue",
9         "value": {
10          "Speed": "44.000000",
11          "complexEvent": "SensorFailure",
12          "MobileSpeed": "25.000000",
13          "Color": "3",
14          "Time": "2016-11-17T15:56:03Z",
15          "ssn:observedBy": "http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_1Dir0",
16          "MobileColor": "4",
17          "sensorId": "http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_1Dir0"
18        }
19      }
20    }
21  }
22 ]
```

An orange arrow points to the `"complexEvent": "SensorFailure"` field in the response body.



# VITAL-IoT Create CEPICO for Sensor Failure Detection

VITAL  
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Browser address bar: <https://vital-integration2.atosresearch.eu:8843/vitalcep/#/cepico/list>

Page title: VITAL-IoT CEP

User: Mehemet

### CEPICOs List

Home > CEPICOs List

Name:  Description:

#	Id	Name	Status			
1	55f29a52-a682-4865-b743-8c5abb8bce0c	Istanbul_sensor_failure	Running	View	Observations	Delete
2	900e5d06-d9c9-4232-8d2d-96cb44f53c69	DNitrogen	Running	View	Observations	Delete
3	d3e7eb7d-8ad5-4f4c-81b8-3b75e9ac635c	Istanbul_Traffic_Incident	Running	View	Observations	Delete

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# VITAL-IoT Get Detected Sensor Failures' List

← → ↻ 🔍 <https://vital-integration2.atosresearch.eu:8843/vitalcep/#/cepico/observations>

VITAL-IoT CEP ☰ Mehemet ▾

Home > CEPICOs List

Hello, Mehemet ● Online

- CEPICOs ▾
  - New
  - List
- Alert Monitors <
- Adaptive Filtering <

### CEPICOs List


CEPICO Observations

Date range (UTC)

---

Description

**Id:** <http://vital-integration2.atosresearch.eu:8280/cep/sensor/55f29a52-a682-4865-b743-8c5abb8bce0c>

**Name:** Istanbul\_sensor\_failure 

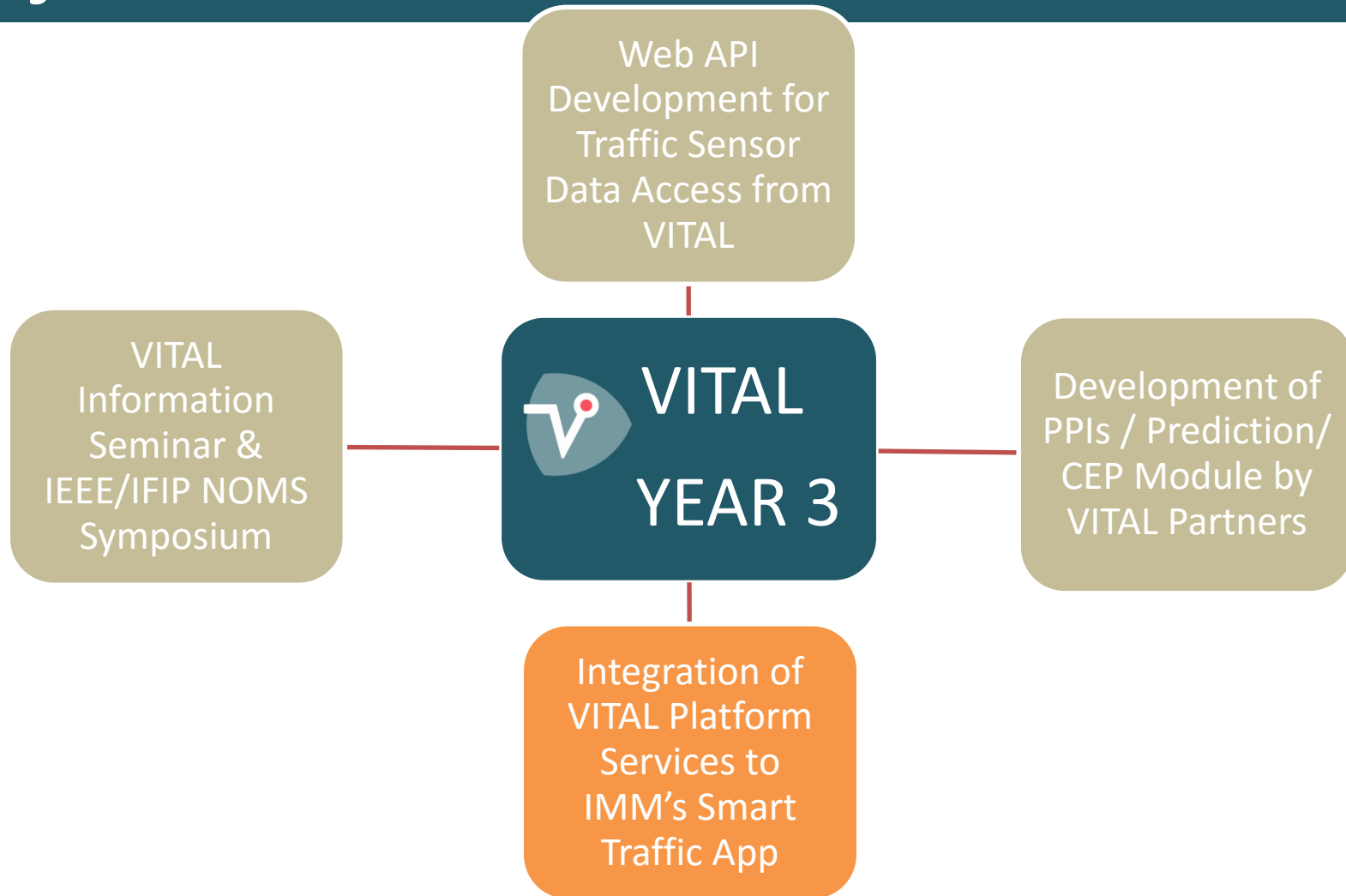
**Description:** Traffic sensor failure detection

---

Observations

Complex Event	Observation Time	Source Sensor Id
SensorFailure	2016-11-17T16:40:37Z	<a href="http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_1Dir0">http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_1Dir0</a>
SensorFailure	2016-11-17T16:40:37Z	<a href="http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_2Dir0">http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_2Dir0</a>
SensorFailure	2016-11-17T16:26:36Z	<a href="http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_2Dir0">http://vital-integration.atosresearch.eu:8280/hireplyppi/sensor/vital2-I_TrS_2Dir0</a>



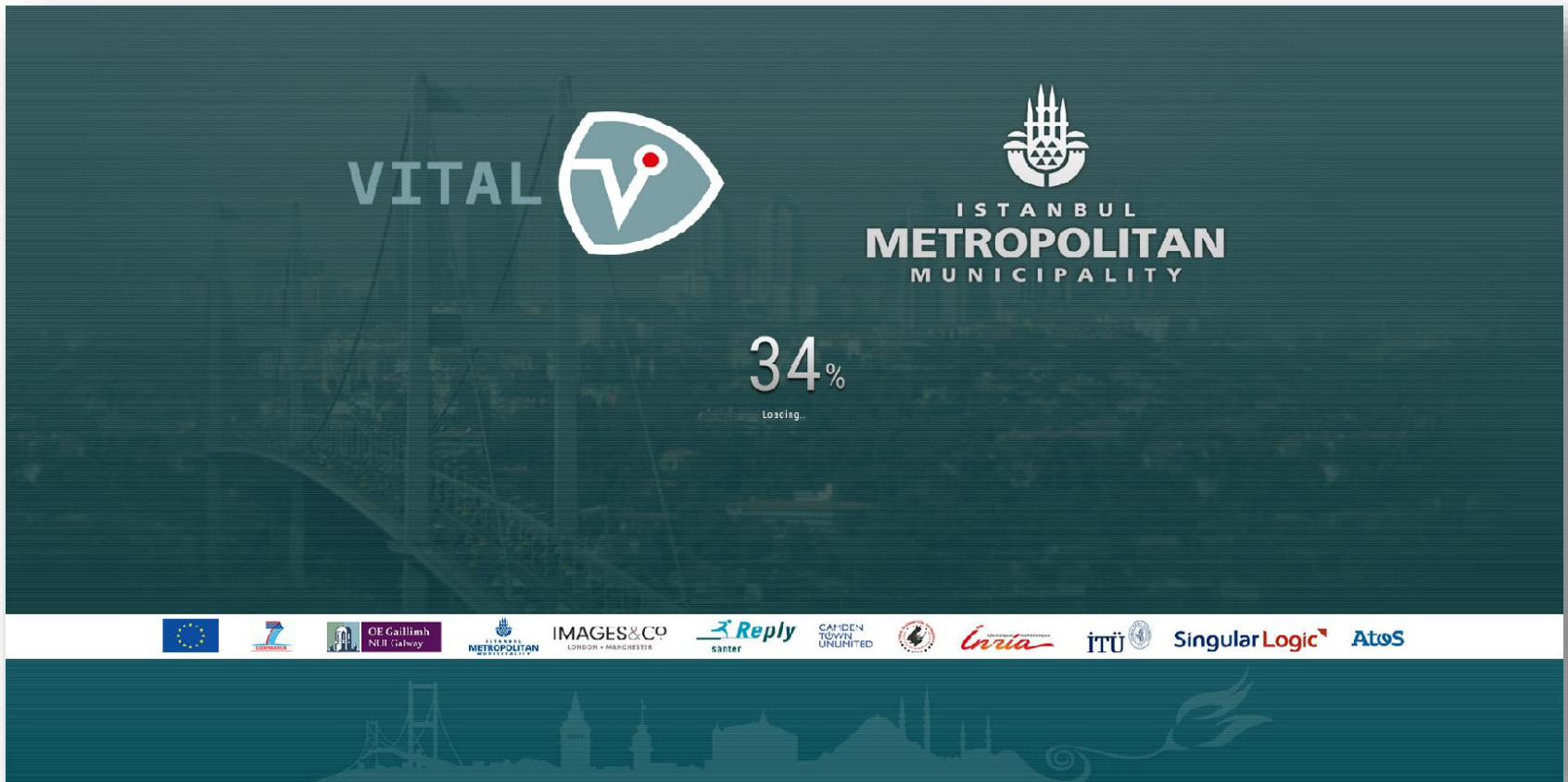


# VITAL-IoT Smart City Traffic Management



IMM developed a web-based **Smart Traffic Management App** accessible at

← → ↻ 🔍 <http://tkm.ibb.gov.tr/vital>

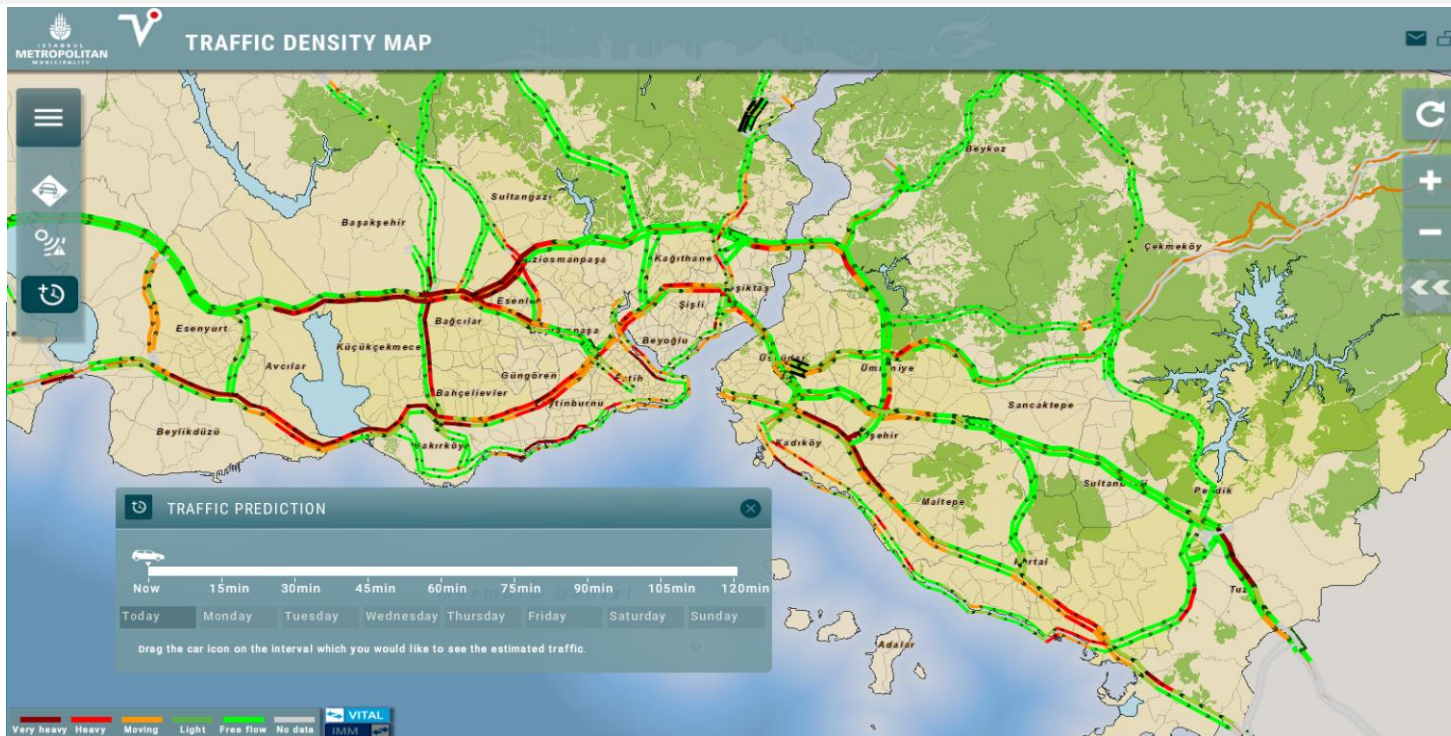






## Smart Traffic Management in İstanbul by the Help of VITAL Platform

← → ↻ 🔍 <http://tkm.ibb.gov.tr/vital>



**Traffic  
Prediction**

**Incident  
Detection**

**Sensor  
Failure**



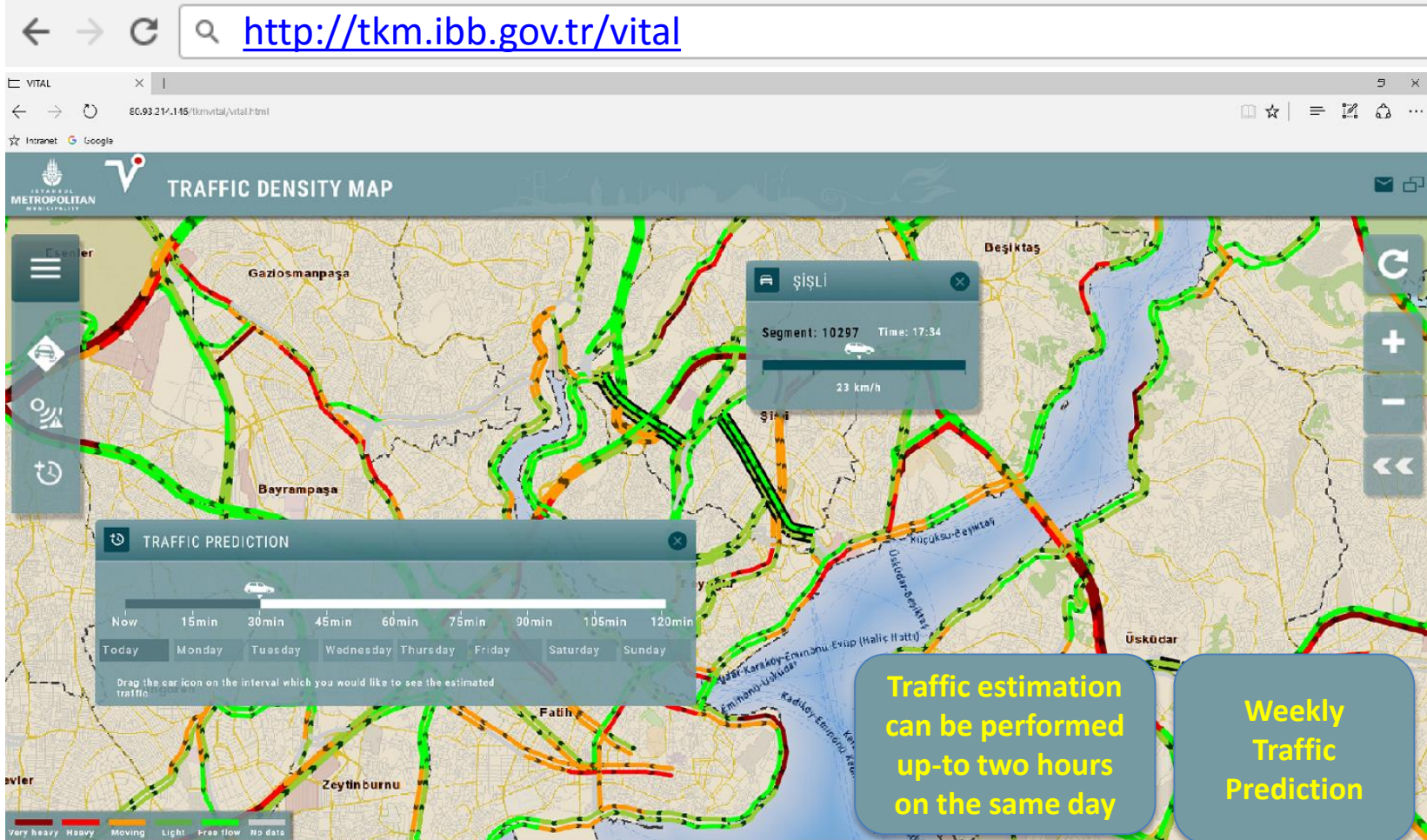


# Smart Traffic Management Web App - Traffic Prediction

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*Smart Traffic Management in İstanbul by the Help of VITAL Platform*



# Smart Traffic Management Web App - Incident Detection

VITAL  
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*Smart Traffic Management in İstanbul by the Help of VITAL Platform*

The screenshot shows a web browser window with the URL <http://tkm.ibb.gov.tr/vital>. The page title is "TRAFFIC DENSITY MAP" and it features the Istanbul Metropolitan Municipality logo. The main content is a map of Istanbul with traffic density overlays. A notification panel titled "DETECTED INCIDENTS' LIST" is open, showing a list of incidents with sensor details and road IDs. A legend at the bottom left indicates traffic density levels: Very heavy (red), Heavy (orange), Moving (yellow), Light (green), Free flow (light green), and No data (grey). A text box at the bottom right explains that a notification is generated when an incident is detected for a road segment.

SensorID	Sensor Name	Sensor Speed	Road ID
3	D100 Sefaküy	15	81
7	TEM Mahmutbey Gişeler	14	128
9	Mahmutbey	20	140
20			

When an incident is detected for a road segment, a notification is generated to inform about a potential incident in the app



# Smart Traffic Management App

## Sensor Failure Detection

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*Smart Traffic Management in İstanbul by the Help of VITAL Platform*

The screenshot shows a web browser displaying the VITAL Traffic Density Map. The browser address bar shows the URL <http://tkm.ibb.gov.tr/vital>. The page title is "TRAFFIC DENSITY MAP" and it includes the Istanbul Metropolitan Municipality logo. The map displays traffic density with color-coded lines (green, yellow, orange, red) over a street map of Istanbul, with labels for "Kadıköy" and "Ataşehir". A sidebar on the left contains navigation icons and a "DETECTED SENSOR FAILURES" panel. This panel lists three sensor failure notifications:

Location	Sensor Speed	Mobile Speed	Road ID
KADIKÖY	40km/h	15km/h	6
ÜSKÜDAR	34km/h	8km/h	10042
BEYLİKDÜZÜ	74km/h	24km/h	10404

A text box at the bottom of the screenshot states: "When a sensor failure is detected for a road segment, a notification is generated to inform about a potential sensor failure".






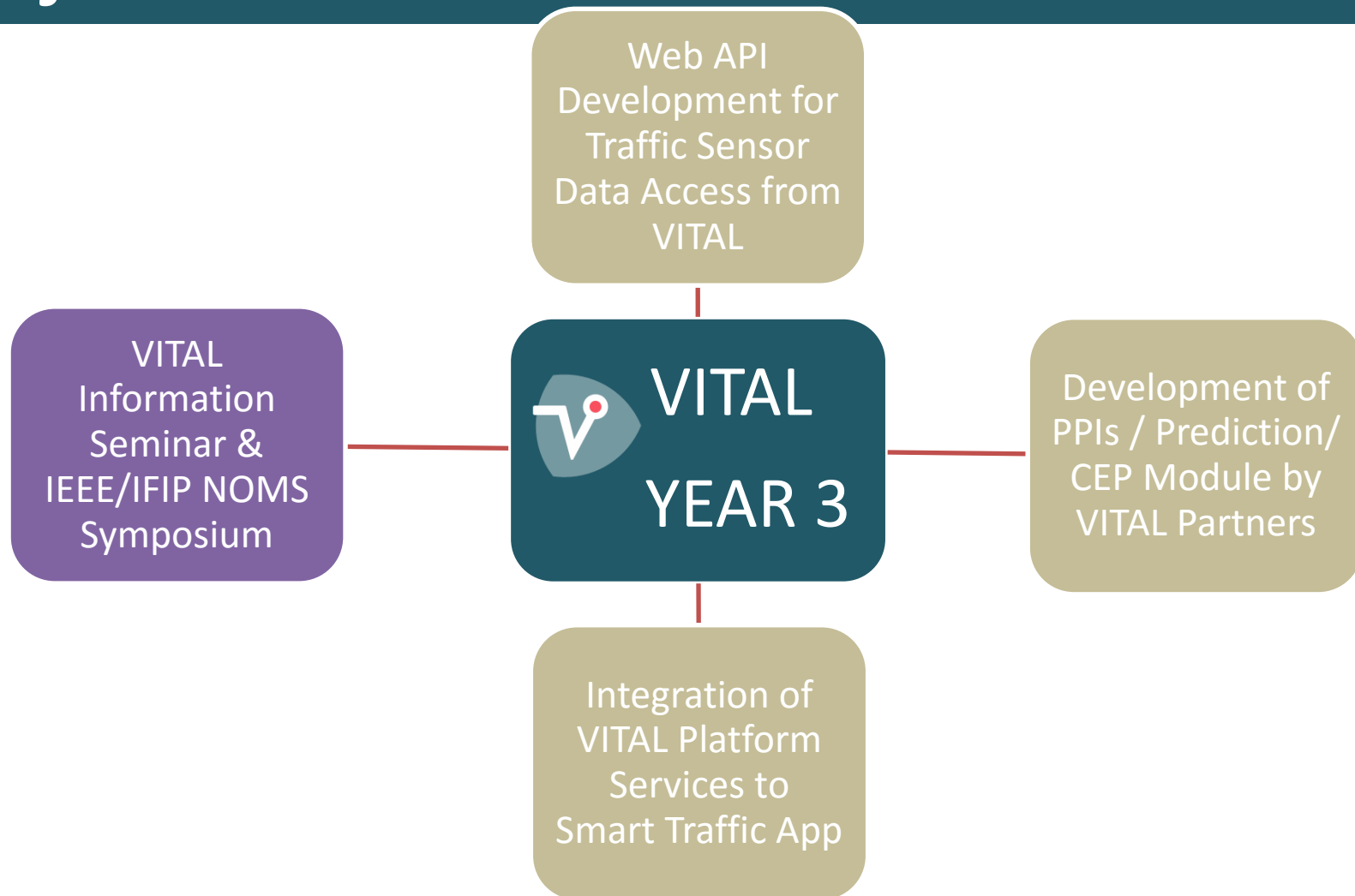
# VITAL-IoT IMM Use Cases Summary

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Scenario	Scope	City
Smart Traffic Management	Manage Traffic & Traffic Measurement Systems Smartly & Efficiently in Istanbul	





# Smart Traffic Management & VITAL Information Seminar

VITAL  
www.vital-iot.eu



← → ↻ 🔍 <http://tkm.ibb.gov.tr/corporate/news-and-announcements/smart-traffic-management-and-vital-information-seminar>



## Smart Traffic Management and VITAL Information Seminar

15.03.2016



- Our Vision and Mission
- Authority and Our Responsibilities
- News and Announcements
- Video Archive
- Library



Istanbul Metropolitan Municipality (IMM) Deputy Traffic Manager Esmâ Dilek gave a seminar at Istanbul Technical University about effective use of city's transportation infrastructure, systems established across the city for efficient traffic management and applied Intelligent Transportation System solutions in the city of Istanbul. Within the scope of "Digital Solutions for Smart Cities" course of Computer Engineering Department, Graduate and PhD students were enlightened about the technologies used for IMM's Intelligent Traffic Management and the services that IMM offers at University's Ayazaga Campus.

Students were also informed about VITAL (Virtualized programmable InTerFaces for smart, secure and cost-effective IoT deployments in smart cities) project, which is carried out by the partnership of IMM Directorate of Traffic, Directorate of European Union Relations and Istanbul Technical University (ITU) under the scope of European Union 7th Framework Programme. As being an IoT platform, VITAL is represented as an open source platform where students, academics or private companies can easily access to IMM's sensor and other integrated data and develop smart applications readily. Moreover, the information of providing tools and services for intelligent traffic monitoring, managing and analyzing with the VITAL platform, which forms a basis for shareable virtual layers of different types of technologies and sensor systems used in traffic management, was shared with students.

VITAL's Istanbul Application Scenarios are performed with the collaboration of IMM's Directorate of Traffic, ITU and ATOS. Within the context of these scenarios, studies on traffic prediction up to 1 week, automatic detection of instant events and sensor failures and libraries and tools for application developers were detailed. In addition, student's all questions regarding contribution of students during development and use of VITAL platform were answered. Demo videos describing VITAL platform were also shown to students which were prepared by IMM during project development.



# IEEE/IFIP NOMS Symposium

VITAL  
www.vital-iot.eu



← → ↻ 🔍 <http://tkm.ibb.gov.tr/corporate/news-and-announcements/ieeefip-network-operations-and-management-symposium-noms>

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## IEEE/IFIP Network Operations and Management Symposium (NOMS)

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NOMS has been the primary IEEE Communications Society's forum for technical exchange on management of information and communication technology focusing on research, development, integration, standards, services, and user communities. It has been held in even-numbered years since 1988.

NOMS 2016 which has been held at Istanbul Technical University between 25-29 April 2016 in Istanbul has focused on the theme "Managing Everything towards a Secure, Smart, and Hyperconnected World". Recent, emerging approaches, and technical solutions for dealing with future network and ICT infrastructures, as well as with novel services provided in smart and hyper-connected environments (e.g., smart cities, Internet of Things) has been discussed.

Academicians, students, researchers, representatives and managers from the IT sector and private companies from all over the world have participated NOMS 2016 Symposium.

Dr. Martin Serrano from Insight Center has presented VITAL (Virtualized programmable InterFaces for smart, secure and cost-effective IoT deployments in smart cities) Project at IEEE/IFIP International Workshop on Platforms and Applications for Smart Cities (PASC) on 29th of April. VITAL is an Research&Development Project developed under the scope of European Union 7th Framework Programme. Dr. Serrano has provided detailed information about VITAL platform to academicians and participants of the workshop.

Istanbul Metropolitan Municipality's (İMM) Deputy Traffic Manager Esma Dilek has also presented her paper during PASC workshop called **SMART MOBILITY IN ISTANBUL WITH "İBB CepTrafik"** which is co-authored with İMM's Traffic Manager Yunus Emre Aydoğan. She has explained the data architecture of İBB CepTrafik mobile traffic application and how students, academics or private



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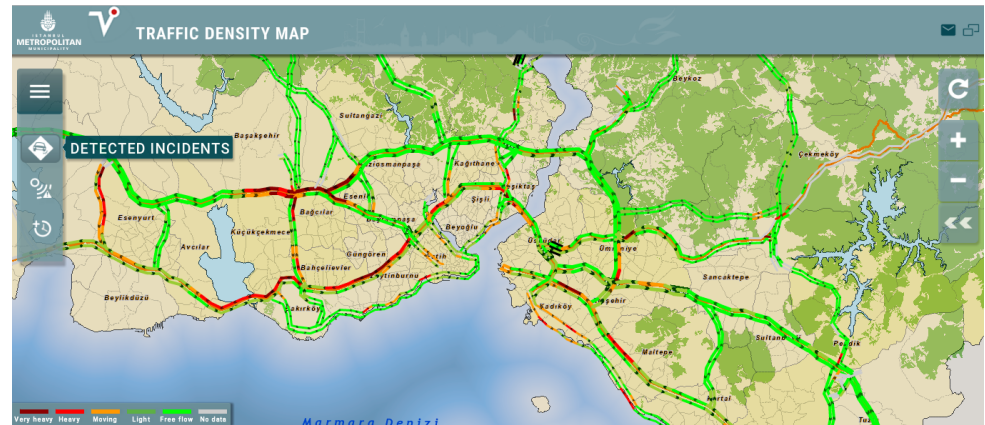


# More Information

VITAL  
www.vital-iot.eu



VITAL Smart Traffic Management Web Site:  
<http://tkm.ibb.gov.tr/vital>



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VIRTUALIZED PROGRAMMABLE INTER-  
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IOT DEPLOYMENTS IN SMART CITIES

“Virtualized Programmable Interfaces for innovative  
cost-effective IoT deployments in Smart Cities”

*A novel Approach for Integrating Application silos in Modern Smart Cities*

Thank You!



Esmâ DİLEK

Istanbul Metropolitan Municipality – Directorate of Traffic

Brussels, November 30th, 2016