

# PJM Data Integration

Presented by **Ed Kovler, PJM Interconnection**  
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# PJM – Focus on Just 3 Things





## COMPANY and GOAL

PJM Interconnection manages 160GW of electricity over 13 states and DC.

## CHALLENGE

- A. Integrating real time data from disparate sources
- B. Improving situational awareness for end users

## SOLUTION

- A. Utilize PI System Tools to integrate data: Integrator for ARCGIS
- B. DIMA – Dispatch Interactive Map Application

## RESULTS

- Improved situational awareness
- “Best tool ever developed for Dispatchers”
- “Quick way to get an overview of the PJM system”

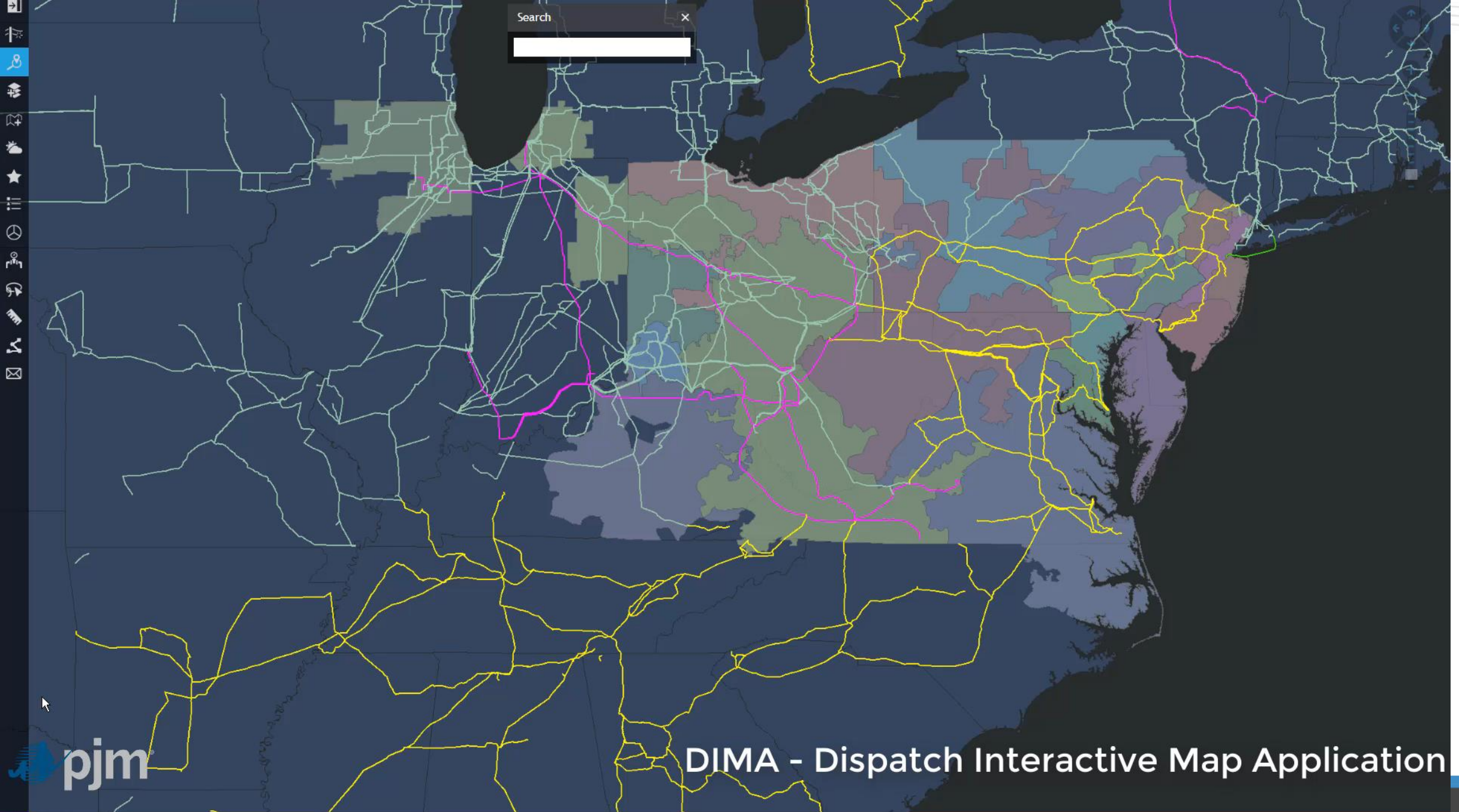
## Geospatial world and the PI System

PI Integrator for Esri  
ArcGIS

PI Web API

Fundamental building blocks of consuming real-time PI System Data  
in a web GIS application



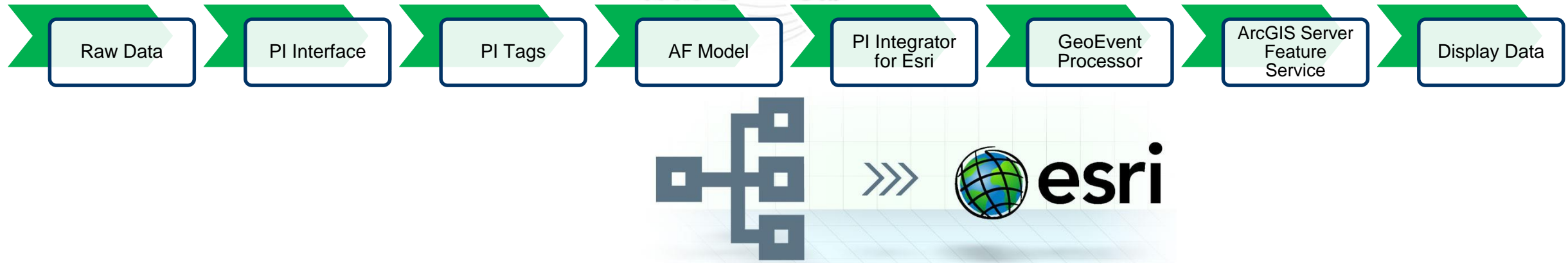


Search

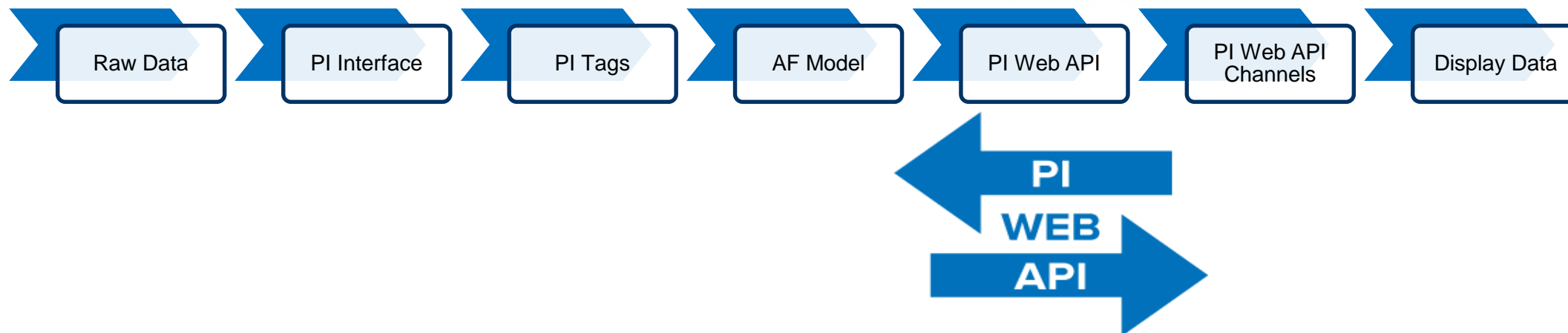


# DIMA - Dispatch Interactive Map Application

## DIMA Implementation



## PI Web API Implementation







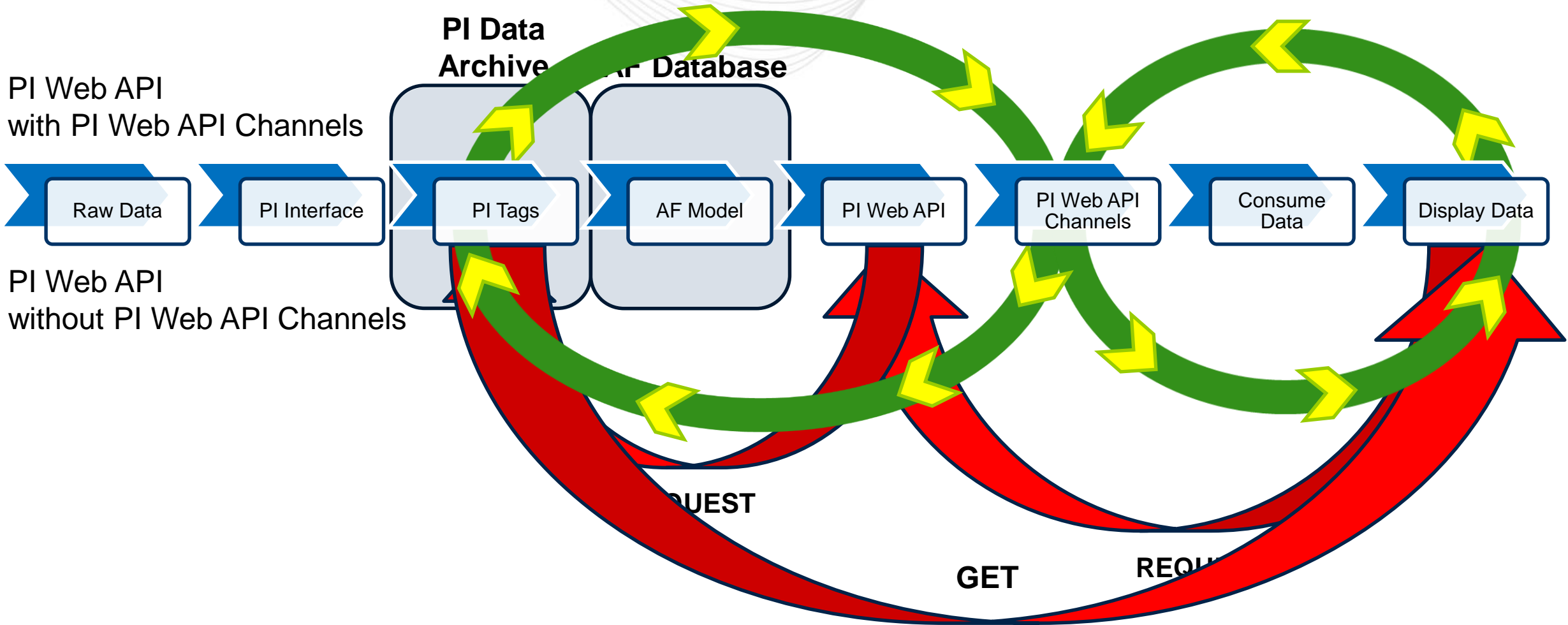
## PI Tags data and AF Elements accessible from the PI Web API REST endpoint

```

< > ↻ 🏠 //web-pi.integralgis.local/piwebapi/dataservers/s0P6UAp6nJ30CFji2aaQBIOwUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FM/points
Help pages: PI Web API Help > DataServer > GetPoints
{
  "Links": {},
  "Items": [
    {
      "WebId": "P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU",
      "Id": 1089,
      "Name": "09MONUMT DIESEL GEN UNIT",
      "Descriptor": "",
      "PointClass": "",
      "PointType": "I-----",
      "DigitalSetName": "",
      "EngineeringUnits": "",
      "Step": false,
      "Future": false,
      "Links": {
        "Self": "https://web-pi.integralgis.local/piwebapi/points/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU",
        "DataServer": "https://web-pi.integralgis.local/piwebapi/dataservers/s0P6UAp6nJ30CFji2aaQBIOwUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FM",
        "Attributes": "https://web-pi.integralgis.local/piwebapi/points/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU/attributes",
        "Value": "https://web-pi.integralgis.local/piwebapi/streams/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU/value",
        "InterpolatedData": "https://web-pi.integralgis.local/piwebapi/streams/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU/interpolated",
        "RecordedData": "https://web-pi.integralgis.local/piwebapi/streams/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU/recorded",
        "PlotData": "https://web-pi.integralgis.local/piwebapi/streams/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU/plot",
        "SummaryData": "https://web-pi.integralgis.local/piwebapi/streams/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU/summary",
        "EndValue": "https://web-pi.integralgis.local/piwebapi/streams/P0P6UAp6nJ30CFji2aaQBIOwQQQAAAUEktU0VSVkVSLkIOEVHUKFMR0ITLkxPQ0FMXDA5TU90VU1UIERJRVNFTCAgIEdFTiBVtklU/end"
      }
    }
  ]
}

```

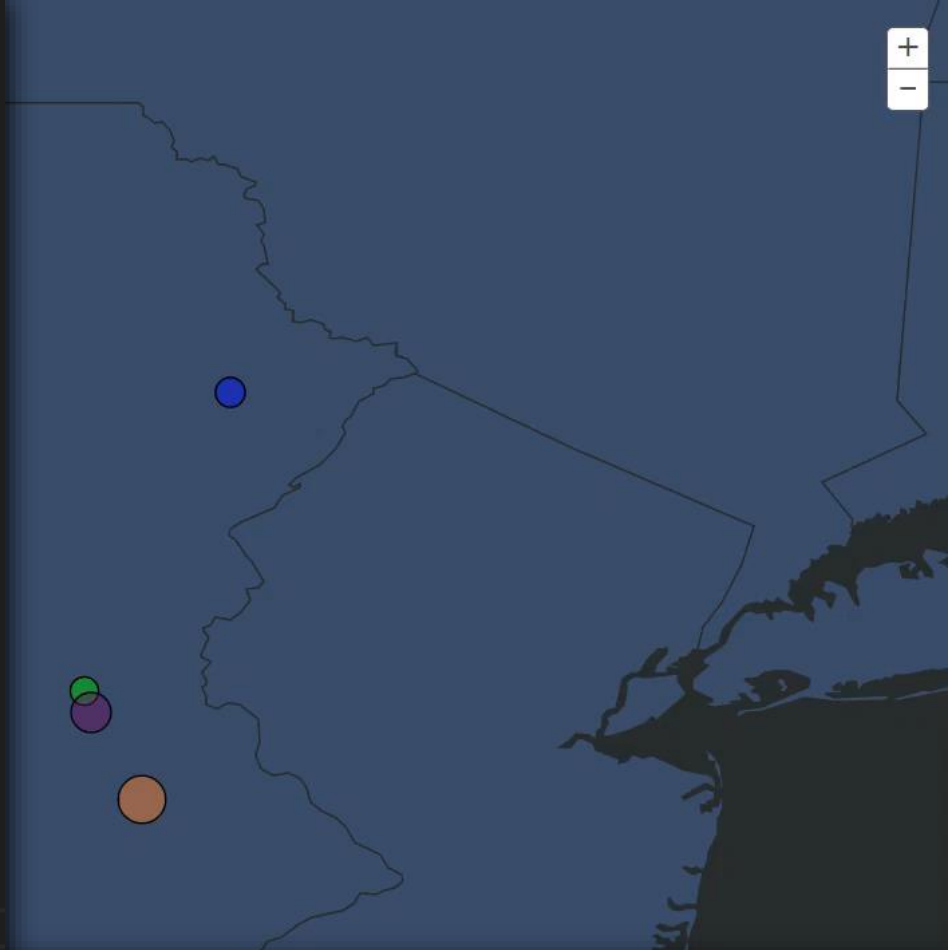
# WEBSOCKET COMMUNICATION



```
function drawPoints() {
  graphicsLayer.clear();
  var Points = data.getPoints();

  markerSymbol = new esri.symbol.SimpleMarkerSymbol().setColor(new dojo.Color([255, 0, 0]));

  for (var i = 0; i < Points.length; i++) {
    var point = Points[i];
    point.geometry = new Point(point.geometryObject);
    var gfx = new Graphic(point);
    markerSymbol = new SimpleMarkerSymbol({
      "color": new dojo.Color(point.attributes.COLOR),
      "size": 10 + (point.attributes.MW * 4),
      "outline": {
        "color": new dojo.Color([0, 0, 0]),
        "width": 1,
        "type": "esriSLS",
        "style": "esriSLSSolid"
      }
    });
    gfx.setSymbol(markerSymbol);
    graphicsLayer.add(gfx);
  }
}
```



```
for (var i = 0; i < channelWebIDs.length; i++) {
  // Create
  _Websocket
  // Attach
  _Websocket
  _Websocket
  _Websocket
  _Websocket
}
```

```
function onMessage(event) {
  // Receive message in JSON, parse into Javascript object and process
  var data = JSON.parse(event.data);

  // Process message data and relay to Map services
  processPoint(data);
}
```

```
i] + "/channel");
```

PI Web API Channels could be valuable asset for your organization.

Mapping platform agnostic.

Start simple, prove the concept, promote it.

You can do this.



## Integrating data resulted in the successful implementation of DIMA

The screenshot displays the DIMA interface with several key components:

- Map:** A central map showing the PJM region with power lines, weather radar, and various data points.
- Search:** A search bar at the top center.
- Substations Panel:**
  - Generators:** Includes checkboxes for Nuclear, Hydro, Steam, Coal, Oil, Gas, Renewables, Dual, and Other.
  - CT & Diesel:** Includes checkboxes for Oil, Gas, Dual, and Other.
  - Renewables:** Includes checkboxes for Battery, Flywheel, Landfill, Solar, and Wind.
  - Combined Cycle:** Includes checkboxes for Oil, Gas, Dual, and Other.
  - Reactive:** Includes checkboxes for Capacitors, Reactors, LTC, and SVC.
  - Statuses displayed:** A legend for substation statuses.
- Lines & Outages Panel:**
  - Summary: All 69, 115, 138, 161, 230, 345, 500, 765, DC.
  - Visible Outages Table:

Name	Zone	kV	Status
Calvert Cliffs - Waugh Chapel	PEPCO, BGE	500	---
Glenwillow - Perry	ATSI	345	----
Glenwillow - Perry	ATSI	345	----
Jacksons Ferry - Antioch	AEP,	500	---
Miami Fort Gas Turbine - West Milton	DEOK, Dayton	345	---
Tri State - tap	AEP	345	---
Tri State - tap	AEP	345	---
- Weather Panel:**
  - Typical Conditions: Radar/Satellite (checked), Infrared.
  - Observations: Temperatures - °F, Wind Speed - (mph), Dew Point - °F, Relative Humidity.
  - Lightning: Cloud-to-Ground, Prediction.
  - Timeline: Feb 22 13:40, with Past and Future checkboxes.

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**Come see DIMA at the Integral Booth #21**

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## **Jason Berney**

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## Questions

Please wait for the **microphone** before asking your questions



State your **name & company**

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谢谢

Danke

Merci

Gracias

**Thank You**

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Спасибо

Obrigado