CAN PREDICTION AS A SERVICE API'S

Cognitive Assistant for Networks (CAN) Release 5.5

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AVANSEUS TECHNOLOGY PVT. LTD.

REVISION HISTORY

Version	Date	Change description	Created by	Updated by	Reviewed by
V 1.0	July, 2021	Initial Release	Hemanth	Sandeep Singh	Chiranjib

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1. Background

The overall idea of this architecture is to decompose the CAN prediction module. It ensures that the load distribution can happen at lowest (individual sequence) level that helps CAN prediction module to overcome the current limitation of cause based division. This architecture also enables each microservice to scale horizontally and thereby, increase the capacity as required. These smaller microservices focuses on a set of loosely coupled actions on a well-defined dataset and provide a clean way to expose prediction functionality towards the external consumer applications.

For this purpose, the CAN prediction is decomposed into 3 components, namely:

1. **Consumer**: Responsible for generation of prediction input.
2. **Controller**: Responsible for collecting the prediction input and calling the worker service in batch mode.
3. **Worker**: Responsible for performing atomic prediction.

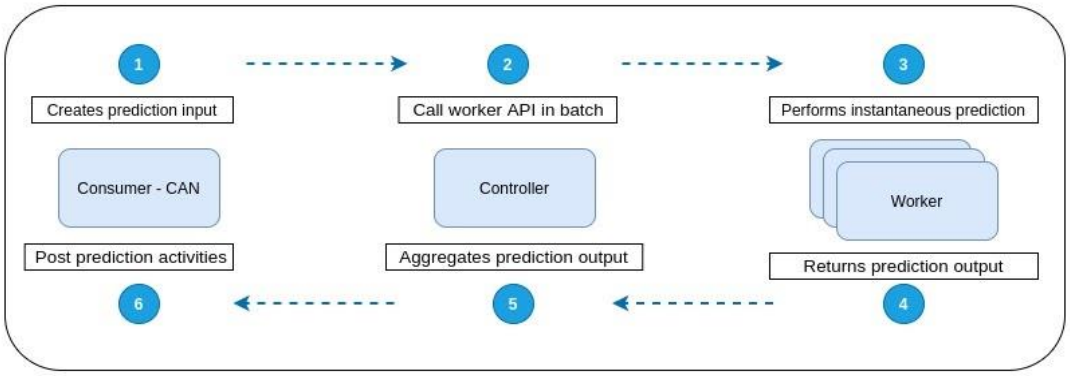


Figure 1: Overview of Prediction flow with microservices

This decomposed architecture allows each of the above components to perform its tasks independently and also allows components to remain completely autonomous and unaware of each other.

2. Prediction Controller

2.1. Prediction Controller REST API Template

```
{
  "swagger": "2.0",
  "info": {
    "description": "Avanseus CAN controller application is responsible for performing batch prediction by interacting with CAN worker application.",
    "version": "0.0.1-SNAPSHOT",
    "title": "Avanseus Prediction Controller",
    "contact": {
      "name": "Avanseus Technologies Pvt. Ltd.",
      "url": "http://www.avanseus.com",
      "email": "support@avanseus.com"
    },
```

```
  "license": {
    "name": "Apache 2.0",
    "url": "http://www.apache.org/licenses/LICENSE-2.0.html"
  }
},
"host": "allbackend",
"basePath": "/PredictionController",
"tags": [
  {
    "name": "PredictionController",
    "description": "REST API for running batch prediction"
  }
],
"paths": {
  "/alarm/predict": {
    "post": {
      "tags": [
        "PredictionController"
      ],
      "summary": "API to run batch Alarm prediction",
      "operationId": "processAlarmInputFileUsingPOST",
      "consumes": [
        "multipart/form-data"
      ],
      "produces": [
        "*/*"
      ],
      "parameters": [
        {
          "name": "inputFile",
          "in": "formData",
          "description": "inputFile",
          "required": true,
          "type": "file"
        },
        {
          "name": "predictionInterval",
          "in": "query",
          "required": true,
          "type": "integer",
          "format": "int32"
        },
        {
```



```
        "name": "advancePrediction",
        "in": "query",
        "required": true,
        "type": "boolean"
      },
      {
        "name": "skipDays",
        "in": "query",
        "required": true,
        "type": "integer",
        "format": "int32"
      }
    ],
    "responses": {
      "200": {
        "description": "The request got processed successfully.",
        "schema": {
          "type": "string"
        }
      },
      "400": {
        "description": "Bad request. Please check the parameters."
      },
      "403": {
        "description": "Accessing the resource you were trying to reach is forbidden."
      },
      "404": {
        "description": "The server has not found anything matching the Request-URI."
      },
      "500": {
        "description": "Internal server error. Please contact admin."
      }
    }
  }
},
"/kpi/predict": {
  "post": {
    "tags": [
      "PredictionController"
    ],
    "summary": "API to run batch KPI prediction",
    "operationId": "processKpiInputFileUsingPOST",
    "consumes": [
```



```
    "multipart/form-data"
  ],
  "produces": [
    "*/*"
  ],
  "parameters": [
    {
      "name": "inputFile",
      "in": "formData",
      "description": "inputFile",
      "required": true,
      "type": "file"
    },
    {
      "name": "predictionType",
      "in": "query",
      "required": true,
      "type": "string",
      "enum": [
        "ALARM",
        "KPI",
        "SUPERPOSED"
      ]
    },
    {
      "name": "predictionInterval",
      "in": "query",
      "required": true,
      "type": "integer",
      "format": "int32"
    }
  ],
  "responses": {
    "200": {
      "description": "The request got processed successfully.",
      "schema": {
        "type": "string"
      }
    },
    "400": {
      "description": "Bad request. Please check the parameters."
    },
    "403": {
```

```
          "description": "Accessing the resource you were trying to reach is forbidden."
        },
        "404": {
          "description": "The server has not found anything matching the Request-URI."
        },
        "500": {
          "description": "Internal server error. Please contact admin."
        }
      }
    }
  }
},
"definitions": {
  "InputStream": {
    "type": "object"
  },
  "Resource": {
    "type": "object",
    "properties": {
      "description": {
        "type": "string"
      },
      "file": {
        "type": "file"
      },
      "filename": {
        "type": "string"
      },
      "inputStream": {
        "$ref": "#/definitions/InputStream"
      },
      "open": {
        "type": "boolean"
      },
      "readable": {
        "type": "boolean"
      },
      "uri": {
        "$ref": "#/definitions/URI"
      },
      "url": {
        "$ref": "#/definitions/URL"
      }
```



```
    }
  },
  "File": {
    "type": "object",
    "properties": {
      "absolute": {
        "type": "boolean"
      },
      "absoluteFile": {
        "type": "file"
      },
      "absolutePath": {
        "type": "string"
      },
      "canonicalFile": {
        "type": "file"
      },
      "canonicalPath": {
        "type": "string"
      },
      "directory": {
        "type": "boolean"
      },
      "file": {
        "type": "boolean"
      },
      "freeSpace": {
        "type": "integer",
        "format": "int64"
      },
      "hidden": {
        "type": "boolean"
      },
      "name": {
        "type": "string"
      },
      "parent": {
        "type": "string"
      },
      "parentFile": {
        "type": "file"
      },
      "path": {
```



```
        "type": "string"
      },
      "totalSpace": {
        "type": "integer",
        "format": "int64"
      },
      "usableSpace": {
        "type": "integer",
        "format": "int64"
      }
    }
  },
  "URI": {
    "type": "object",
    "properties": {
      "absolute": {
        "type": "boolean"
      },
      "authority": {
        "type": "string"
      },
      "fragment": {
        "type": "string"
      },
      "host": {
        "type": "string"
      },
      "opaque": {
        "type": "boolean"
      },
      "path": {
        "type": "string"
      },
      "port": {
        "type": "integer",
        "format": "int32"
      },
      "query": {
        "type": "string"
      },
      "rawAuthority": {
        "type": "string"
      },
```

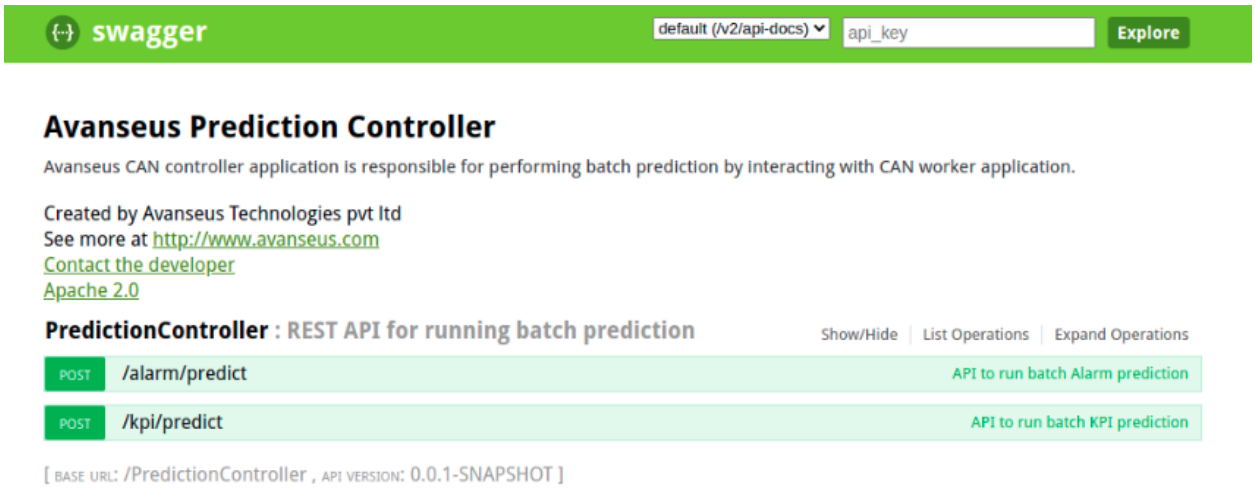


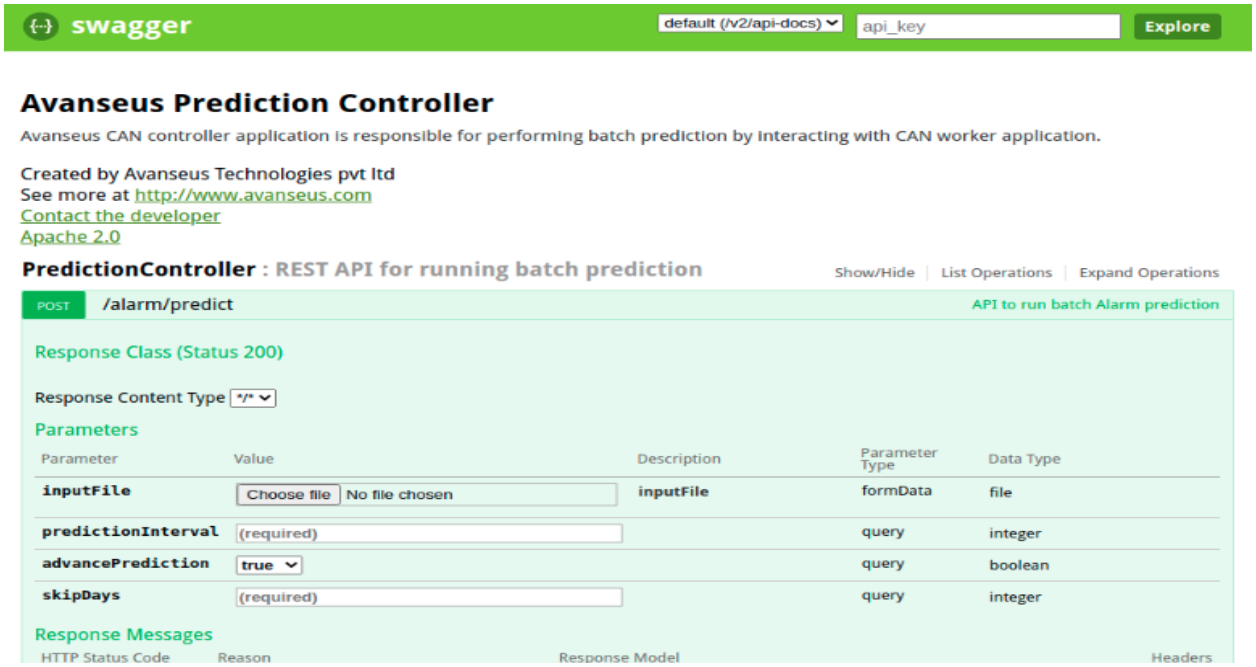
```
      "rawFragment": {
        "type": "string"
      },
      "rawPath": {
        "type": "string"
      },
      "rawQuery": {
        "type": "string"
      },
      "rawSchemeSpecificPart": {
        "type": "string"
      },
      "rawUserInfo": {
        "type": "string"
      },
      "scheme": {
        "type": "string"
      },
      "schemeSpecificPart": {
        "type": "string"
      },
      "userInfo": {
        "type": "string"
      }
    }
  },
  "URL": {
    "type": "object",
    "properties": {
      "authority": {
        "type": "string"
      },
      "content": {
        "type": "object"
      },
      "defaultPort": {
        "type": "integer",
        "format": "int32"
      },
      "file": {
        "type": "string"
      },
      "host": {
```



```
        "type": "string"
      },
      "path": {
        "type": "string"
      },
      "port": {
        "type": "integer",
        "format": "int32"
      },
      "protocol": {
        "type": "string"
      },
      "query": {
        "type": "string"
      },
      "ref": {
        "type": "string"
      },
      "userInfo": {
        "type": "string"
      }
    }
  }
 }
}
```


2.2. Prediction Controller Testing from Swagger UI





3. Prediction Worker

3.1. Prediction Worker REST API Template


```
{
  "swagger": "2.0",
  "info": {
    "description": "Avanseus Worker application is responsible for performing instantaneous prediction.",
    "version": "0.0.1-SNAPSHOT",
    "title": "Avanseus Prediction Worker",
    "contact": {
      "name": "Avanseus Technologies Pvt. Ltd.",
      "url": "http://www.avanseus.com",
      "email": "support@avanseus.com"
    },
    "license": {
      "name": "Avanseus Software License Agreement",
      "url": "http://www.avanseus.com/legal/"
    }
  },
  "host": "allbackend",
  "basePath": "/PredictionWorker",
  "tags": [
    {
      "name": "PredictionWorker",
```

```
    "description": "REST API for running instantaneous prediction"
  }
 ],
 "paths": {
  "/alarm": {
   "post": {
    "tags": [
     "PredictionWorker"
    ],
    "summary": "API to run instantaneous Alarm prediction",
    "operationId": "runPredictionForGivenLineUsingPOST",
    "consumes": [
     "application/json"
    ],
    "produces": [
     "*/*"
    ],
    "parameters": [
     {
      "in": "body",
      "name": "alarmPredictionInputParam",
      "description": "alarmPredictionInputParam",
      "required": true,
      "schema": {
       "$ref": "#/definitions/PredictionInputParam"
      }
     }
    ],
    "responses": {
     "200": {
      "description": "The request got processed successfully.",
      "schema": {
       "type": "string"
      }
     },
     "400": {
      "description": "Bad request. Please check the parameters."
     },
     "403": {
      "description": "Accessing the resource you were trying to reach is forbidden."
     },
     "404": {
      "description": "The server has not found anything matching the Request-URI."
```



```
      },
      "500": {
        "description": "Internal server error. Please contact admin."
      }
    }
  }
},
"/kpi": {
  "post": {
    "tags": [
      "PredictionWorker"
    ],
    "summary": "API to run instantaneous KPI prediction",
    "operationId": "runPredictionForGivenKpiLineUsingPOST",
    "consumes": [
      "application/json"
    ],
    "produces": [
      "*/*"
    ],
    "parameters": [
      {
        "in": "body",
        "name": "kpiPredictionInputParam",
        "description": "kpiPredictionInputParam",
        "required": true,
        "schema": {
          "$ref": "#/definitions/PredictionInputParam"
        }
      }
    ],
    "responses": {
      "200": {
        "description": "The request got processed successfully.",
        "schema": {
          "type": "string"
        }
      },
      "400": {
        "description": "Bad request. Please check the parameters."
      },
      "403": {
        "description": "Accessing the resource you were trying to reach is forbidden."
```

```
      },
      "404": {
        "description": "The server has not found anything matching the Request-URI."
      },
      "500": {
        "description": "Internal server error. Please contact admin."
      }
    }
  }
},
"/superposed": {
  "post": {
    "tags": [
      "PredictionWorker"
    ],
    "summary": "API to run instantaneous KPI prediction",
    "operationId": "runPredictionForGivenKpiLine2UsingPOST",
    "consumes": [
      "application/json"
    ],
    "produces": [
      "*/*"
    ],
    "parameters": [
      {
        "in": "body",
        "name": "kpiPredictionInputParam",
        "description": "kpiPredictionInputParam",
        "required": true,
        "schema": {
          "$ref": "#/definitions/PredictionInputParam"
        }
      }
    ],
    "responses": {
      "200": {
        "description": "The request got processed successfully.",
        "schema": {
          "type": "string"
        }
      },
      "400": {
        "description": "Bad request. Please check the parameters."
```

```
        },
        "403": {
          "description": "Accessing the resource you were trying to reach is forbidden."
        },
        "404": {
          "description": "The server has not found anything matching the Request-URI."
        },
        "500": {
          "description": "Internal server error. Please contact admin."
        }
      }
    }
  }
},
"definitions": {
  "PredictionInputParam": {
    "type": "object",
    "required": [
      "predictionInterval",
      "probabilityThreshold",
      "sequence",
      "skipDays"
    ],
    "properties": {
      "advancedPrediction": {
        "type": "boolean"
      },
      "predictionInterval": {
        "type": "integer",
        "format": "int32"
      },
      "probabilityThreshold": {
        "type": "number",
        "format": "double"
      },
      "sequence": {
        "type": "string"
      },
      "skipDays": {
        "type": "integer",
        "format": "int32"
      }
    }
```



```
    }
  }
}
```

3.2. Prediction Worker Testing from Swagger UI