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**ENTWURFSDOKUMENT**

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# Visualizing & Mining of Geospatial Sensorstreams with Apache Kafka

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# 1 Einleitung

Dieses Dokument ist das Ergebnis der Entwurfsphase und soll einen Überblick über den Entwurf aller Teilelemente des PaVoS-Projektes geben. Diese sind im Rahmen der im Pflichtenheft definierten Anforderungen entstanden. Dabei wurde eine Pakethierarchie und dazugehörige Klassen und Schnittstellen erzeugt, die wiederum einen Rahmen für die kommende Implementierungsphase bilden. Das Gesamtprojekt wurde dazu in verschiedene einzelne Elemente aufgeteilt.

Die zentralen Elemente sind dabei:

1. **Die Bridge** vom Frost-Server zu Kafka.
2. **Der Kern**, der direkt mit Kafka und den Streams arbeitet.
3. **Die Webansicht** für den Nutzer im Browser.

Dazu gibt es noch verschiedene Elemente die zwischen diesen Erstgenannten arbeiten, oder den Datenaustausch dieser übernehmen. Das sind folgende Elemente:

1. **Der Import** dient dazu Datenbestände in PaVoS einzuschleusen.
2. **Die DatabaseConnection** dient dazu Daten aus Kafka für die Karte der Webansicht bereitzustellen.
3. **Der DataTransferControl** dient dazu Daten aus Kafka für die Grafiken der Webansicht bereitzustellen.
4. **Der Export** dient dazu Daten aus Kafka in Dateien zu schreiben und diese der Webansicht zuzusenden.

Jedes dieser Elemente stellt ein oder mehrere Packages dar.

Als Entwurfsumgebung wurde StarUML verwendet. Die Entwicklung soll für alle serverseitigen Elemente in Java erfolgen, während bei der Webansicht auch Javascript zum Einsatz kommen wird.

Der Entwurf besteht aus insgesamt 118 Klassen und 10 Schnittstellen. Diese werden alle in diesem Dokument im Detail behandelt aber auch mithilfe der Klassendiagramme und einzelner Sequenzdiagramme in ihrem Kontext dargestellt und deren Funktionsweise erläutert.

## 2 Sequenzdiagramme

Die folgenden Sequenzdiagramme sollen den Ablauf von einzelnen Anwendungsfällen im PaVoS-System illustrieren. Die Interaktionen der Klassen miteinander in verschiedenen Situationen wird somit verdeutlicht.

### 2.1 Bridge

In diesem Sequenzdiagramm wird der Ablauf der Bridge beschrieben, die MQTT-Nachrichten in Records umwandelt und diese an Kafka weiterleitet. Die Bridge läuft komplett unabhängig vom restlichen System.

Die Bridge kann sich in einer von drei Phasen befinden:

1. **Aufbauphase:** Hier findet die Prüfung der Parameter und das Initialisieren der benötigten Klassen statt.
2. **Bereitschaftsphase:** Hier ist die Bridge bereit, Nachrichten von MQTT anzunehmen, zu konvertieren und an Kafka weiter zu senden.
3. **Abbauphase:** Hier werden die Verbindungen zu MQTT und Kafka getrennt, anschließend wird die Bridge beendet.

In der Aufbauphase (in diesem Diagramm Operationen 1-5) wird zunächst ein `JmkbKafkaProducer` erstellt, der intern einen `KafkaProducer` mit bestimmten Einstellungen initialisiert und eine Verbindung zum Kafka Broker aufbaut. Danach wird ein `JmkbMqttConsumer` erstellt, der intern einen `MqttClient` mit bestimmten Einstellungen initialisiert, welcher eine Verbindung zum MQTT-Server aufbaut und die Topics abonniert, die vom FROST-Server angeboten werden.

Nun beginnt die Bereitschaftsphase. Sobald eine Nachricht beim `MqttClient` ankommt, wird die Methode `messageArrived` des `JmkbMqttConsumers` aufgerufen. In dieser Methode wird aus der erhaltenen Nachricht die IOT-ID des Sensors gefiltert und die Nachricht wird in das Avro-Format konvertiert. Diese zwei Daten sind dann key und value für das Kafka `ProducerRecord` und werden über einen Aufruf der `send`-Methode des `JmkbKafkaProducers` in ein solches Format gewandelt. Anschließend wird das Record durch den `KafkaProducer` an Kafka gesendet.

In der Abbauphase werden die `disconnect`-Methoden von `JmkbMqttConsumer` und `JmkbKafkaProducer` aufgerufen, die jeweils die Verbindungen zu MQTT und Kafka sauber trennen und die Clients schließen. Die Abbauphase beginnt nur dann, wenn der Nutzer des Programms es willkürlich schließt oder das System es beendet.



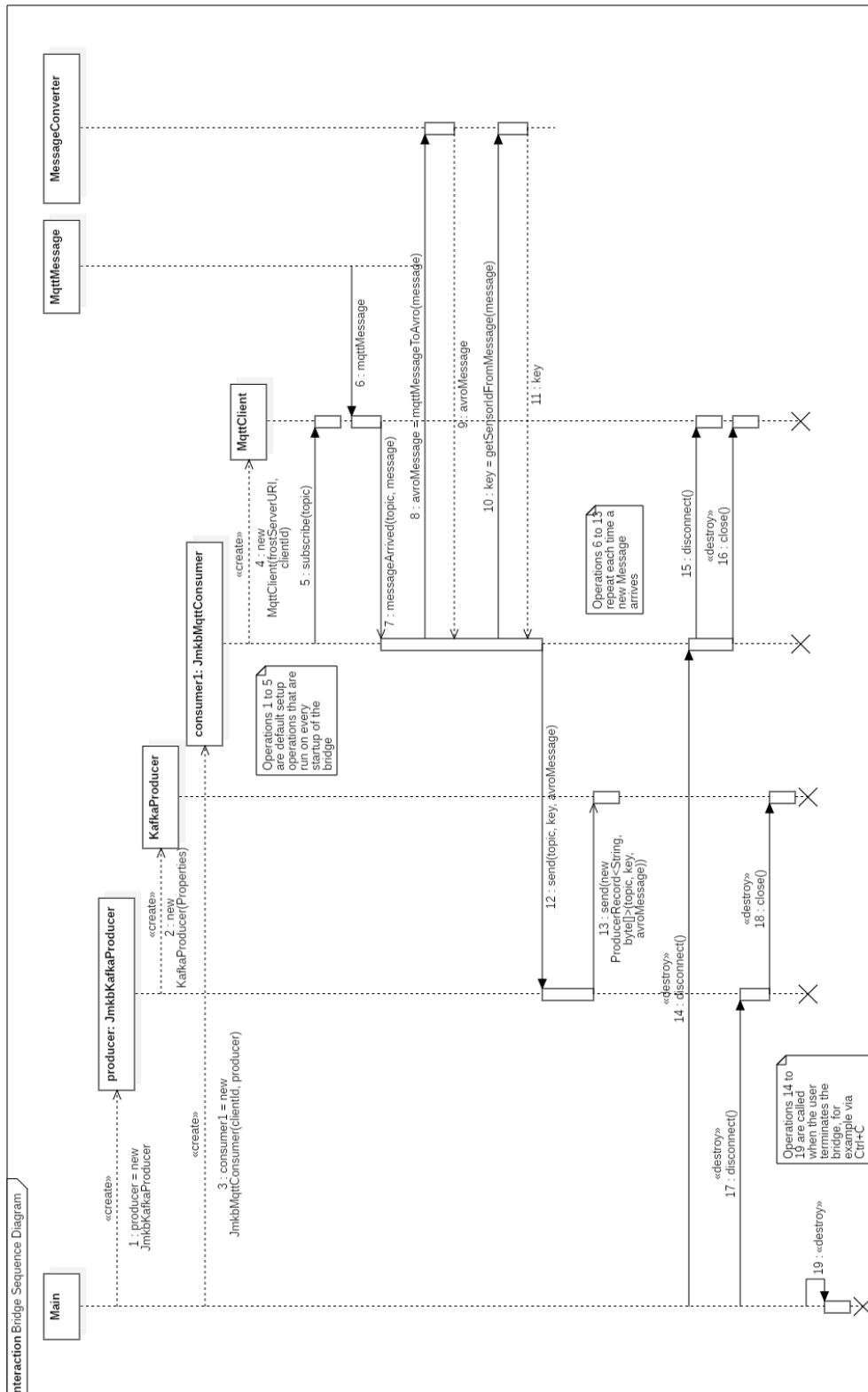


Abb. 2.1: Sequenzdiagramm Bridge

## 2.2 Core

Beim **Controller** werden alle Topics, welche von dem MQTT-Producer generierten wurden, in einer Schleife subscribed (abonniert). Dann erzeugt der **Controller** mit der `generateOutputtopic` einen neuen Output Topic für eine **StreamProcessingStrategy**, da dieser ein Output Topic benötigt, um die verarbeiteten Daten abzulagern. Der **Controller** konstruiert einen **TopologyBuilder**, um über diesen die **StreamProcessingStrategy** ausführen zu können. Mit `addSource` übergibt der **Controller** dem **TopologyBuilder** einen Input Topic, in dem die zu verarbeitenden Daten in einem Kafka Stream enthalten sind. Der **Controller** erstellt eine neue **StreamProcessingStrategy**, die zur Verarbeitung der Inputdaten dienen soll. Der **Controller** übergibt den **TopologyBuilder** mit Hilfe der `addProcessor`-Methode diese **StreamProcessingStrategy**. Der **Controller** übergibt den **TopologyBuilder** mit `addSink` dem zuvor generierten Output Topic, welcher diesen als Daten-Sink für Daten nutzt, die von der **StreamProcessingStrategy** verarbeitet wurden. Der **TopologyBuilder** startet nun mit der `kafkaStreamStart`-Methode die **StreamProcessingStrategy** und diese beginnt damit durch das Ausführen von `apply`, aus den Input Topic Daten in den Output Topic zu schreiben, bis der **TopologyBuilder** `kafkaStreamClose` aufruft und damit die Verarbeitung stoppt und der **TopologyBuilder** und die **StreamProcessingStrategy** zerstört werden.

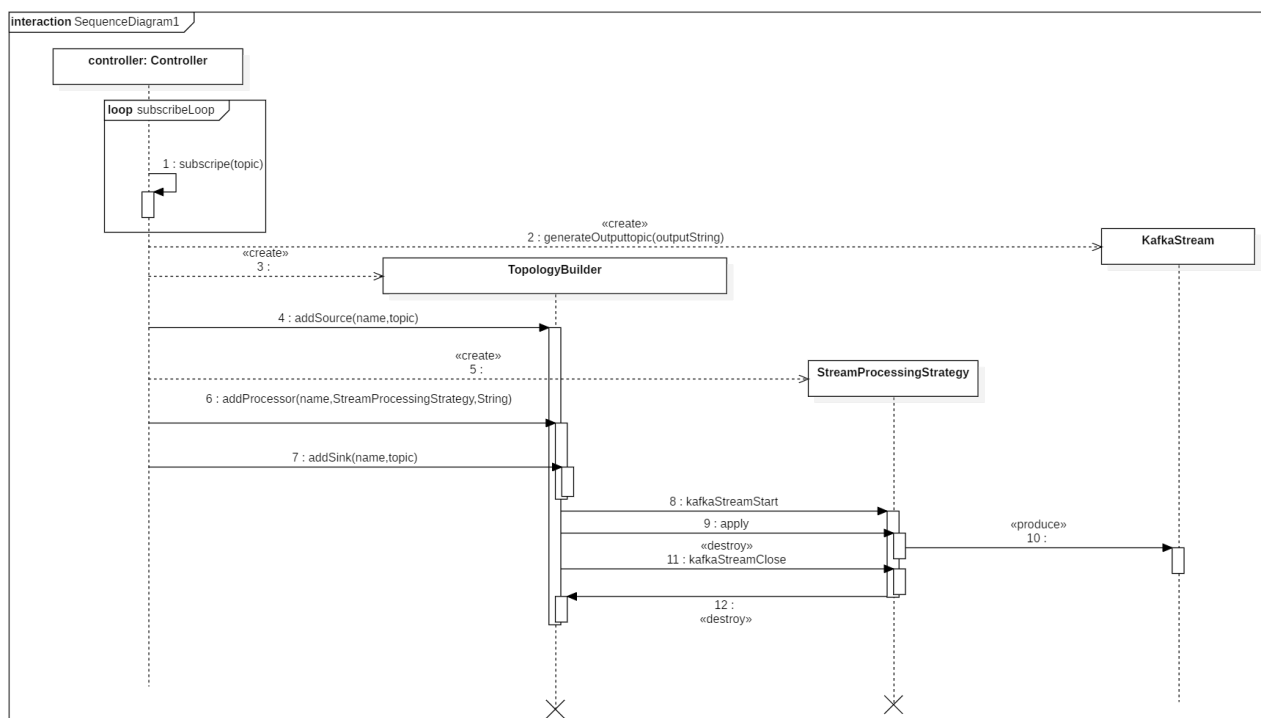


Abb. 2.2: Sequenzdiagramm Core

## 2.3 Import

Bei dem Import wird zuerst in dem Importordner nach Dateien gesucht und danach für jede vorhandene Datei ein separater Importprozess gestartet. Das folgende Sequenzdiagramm stellt diesen Vorgang dar. Hier wird ausschließlich der Import behandelt, wer diesen Anstößt soll nicht Teil des Diagramms sein. **External** soll hier das Element darstellen, das den Import aufruft. Dazu wird ein **DataImporter** erstellt und seine Methode **startImportingFileData** aufgerufen, womit der Importvorgang startet.

Für jede Datei in dem Importordner wird nun ein **FrostSender** und ein **FilePath**, der zum Pfad der Datei passt, erzeugt. Ist dies geschehen wird der **FileImporter** für diese Datei erschaffen und mit **addFileData** gestartet. Dazu wird der Pfad und der **FrostSender** übergeben. Aus dem Pfad wird jetzt eine **FileExtension** generiert, die dazu genutzt wird über den **ReaderType** eine Instanz einer Implementierung der **FileReaderStrategy** zu erhalten. Ist die **FileExtension** nicht bekannt würde es hier zu einer Exception kommen und der Import für diese Datei beendet.

In diesem Fall wurde als Beispiel eine **CSVReaderStrategy** genommen. Diese übernimmt den tatsächlichen Import der Daten aus der Datei zum FROST-Server vor. Dazu werden nach und nach einzelne Datensätze aus der Datei ausgelesen und über den **FrostSender** an den Server gesendet.

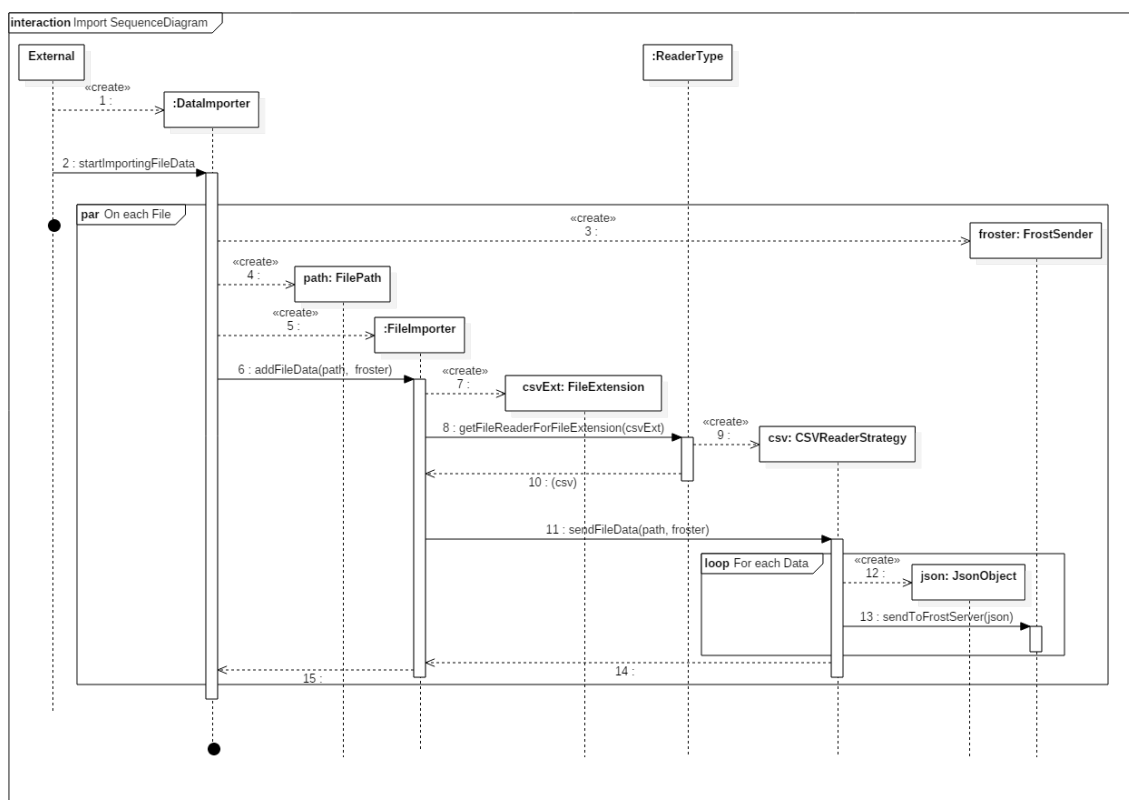


Abb. 2.3: Sequenzdiagramm Import

## 2.4 Graphite

Der Benutzer wählt im Webinterface die Daten aus, die er erhalten will. Dann erhält das **Servlet** den Auftrag und leitet dem **GraphDataTransferController** die Informationen über die Daten weiter, die übertragen werden sollen. Der **GraphDataTransferController** erstellt daraufhin einen neuen **KafkaToGraphiteConsumer**, der ebenfalls diese Informationen erhält und einen **GraphiteSender** generiert. Dann wird die Methode **run** des **KafkaToGraphiteConsumers** ausgeführt. Er ruft dann verschiedene Eigenschaften über die **GraphiteConfig** ab, die benötigt werden um mit Kafka zu kommunizieren. Weiterhin erzeugt er einen **KafkaConsumer**, der dann Kafka-Topics abonniert. Dann prüfen wir ob wir von vorne beginnen wollen. Danach betreten wir eine Schleife. Hier rufen wir Daten von Kafka ab und speichern sie in einem **ConsumerRecords** Objekt. Schlussendlich überprüfen wir, ob die abgerufenen Daten neue Daten enthalten. Falls ja, senden wir unsere Daten mit Hilfe des **GraphiteSender**, den wir vorher generiert hatten. Wenn wir nun die Übertragung der Daten stoppen möchten, müssen wir den **KafkaConsumer** aufwecken. Dies stoppt die Schleife.

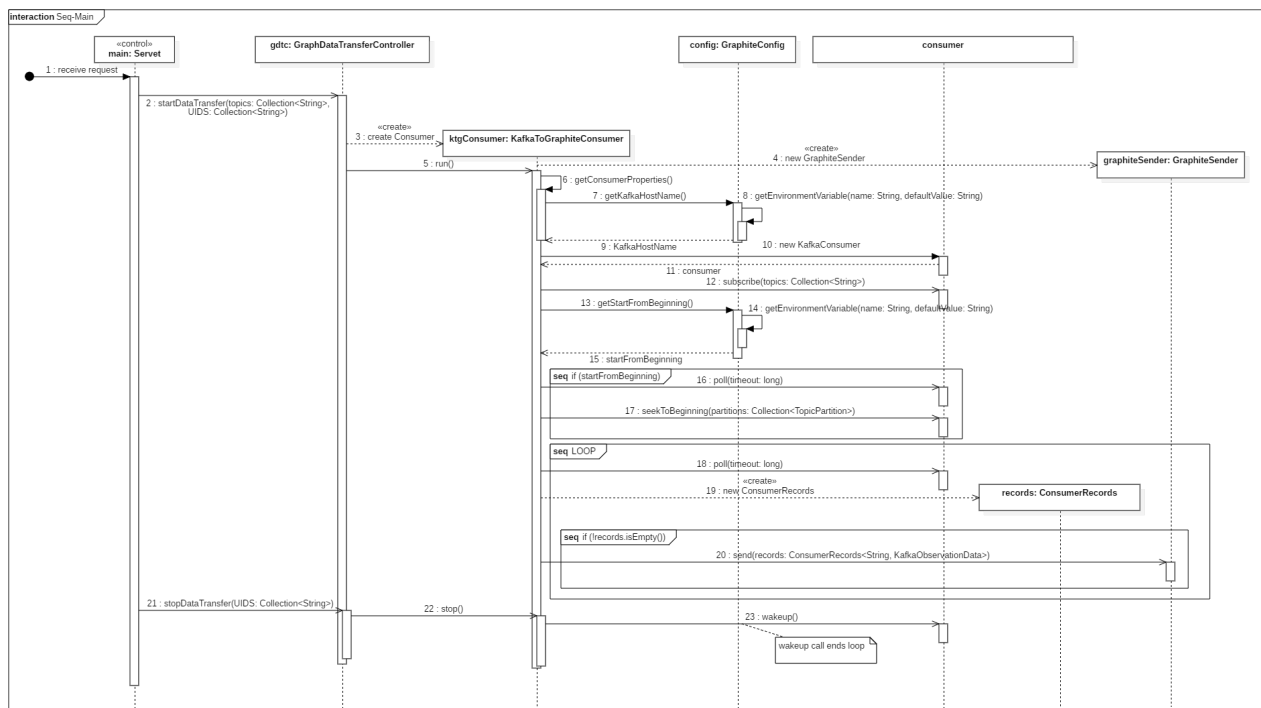


Abb. 2.4: Sequenzdiagramm Graphite

Hier werden die Daten die an Graphite gesendet werden sollen direkt an den **GraphiteSender** weitergegeben. Um seine Arbeit zu tun, ruft der **GraphiteSender** Eigenschaften der **GraphiteConfig** ab, die notwendig sind, um Daten zu Graphite zu übertragen. Danach betreten wir die Schleife. In dieser Schleife, fügt der **GraphiteSender** jede beobachtete Eigenschaft zur Liste der Daten hinzu, die an Graphite gesendet werden sollen. Der **GraphiteSender** tut dies, indem er die Daten zuerst in Metriken konvertiert und dann die Resultate dokumentiert. Nachdem alle beobachteten Eigenschaften hinzugefügt wurden senden wir die Daten an Graphite.

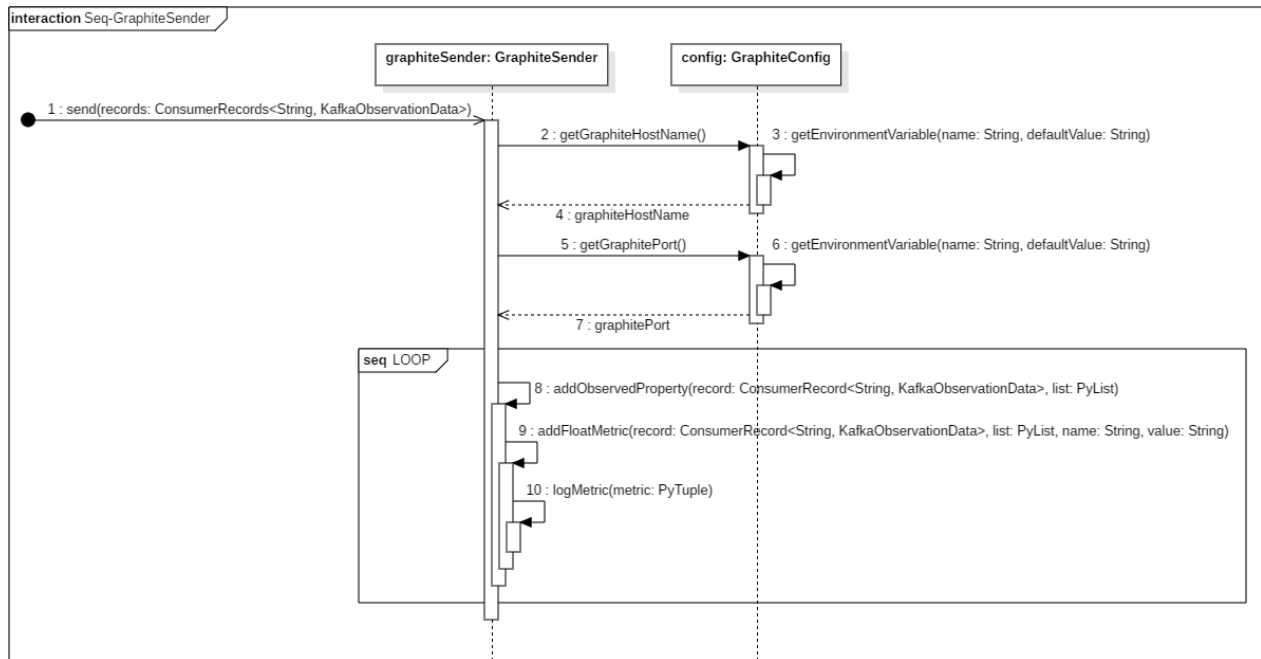


Abb. 2.5: Sequenzdiagramm GraphiteSender

## 2.5 View

In diesem Funktionsbeispiel der View, wird einem **MapLayer** einer **AbstractMap** zunächst ein **Grid** zugeordnet durch die Methode **setGrid**. Dann folgt das eigentliche Anzeigen des layers durch die **displayLayer** Methode. Diese ruft zunächst **getGrid** um auf die darin enthaltenen **Cluster** zugreifen zu können durch **getClusters**. Nun iteriert man über diese und führt für jedes **Cluster** die Operation **getTile** aus. Damit hat man Zugriff auf das ihnen zugeordnete **Tile**. Dies bildet eine graphische Representation und durch die Methode **display** lässt es sich auf der Karte darstellen. Durch das iterieren über alle **Cluster** und ihre Visualisierung ergibt sich am ende ein Raster, also die visuelle Representation des **Grid**.

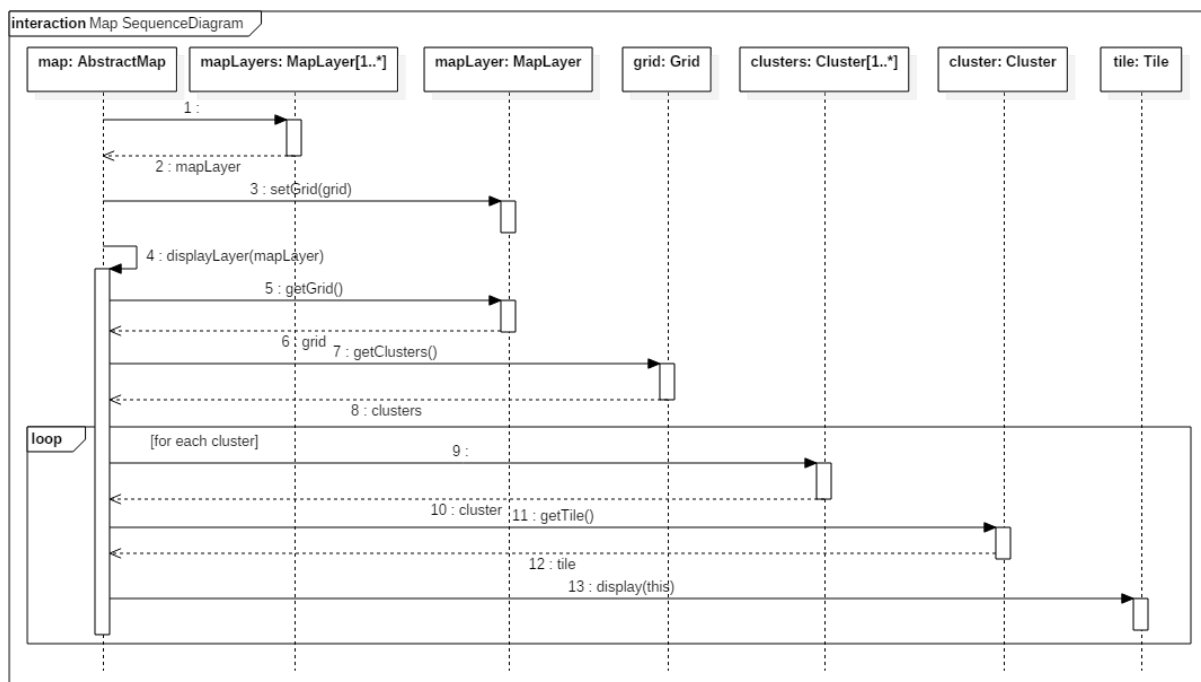


Abb. 2.6: Sequenzdiagramm View: Anzeigen eines Maplayers

## 2.6 Export

Der Export wird in der WebGUI von einem Nutzer angefragt. Die Daten für diesen Export werden an das `ExportServlet` übertragen, das den tatsächlich Export der Daten in eine Datei verwaltet. Ist diese Datei einmal erstellt, kann diese von dem Nutzer heruntergeladen werden. Dazu mehr in der folgenden Abbildung über den Download. Dieses Sequenzdiagramm zeigt wie der Export der Daten in eine Datei durchgeführt wird.

Sobald ein Export angestoßen wird, startet das `ExportServlet` und die Methode `doGet` wird ausgeführt. Darin werden zuerst die `ExportProperties` aus der Datei ausgelesen und zu einem Objekt zusammengestellt, das unter anderem eine `FileExtension` enthält. Danach wird ein `FileExporter` konstruiert, der in zwei Schritten vorgehen wird, um die Daten zu exportieren.

Im ersten Schritt, wird durch den Aufruf der `createFileInformation`-Methode der Export für den späteren Download eindeutig identifiziert, indem ihm eine `DownloadID` zugewiesen wird. Ein `AlterableDownloadState` wird erstellt und dessen Methode `savePersistent` ausgeführt, damit die Information über den Download auch auf dem Server hinterlegt wird, sodass parallel zum Export auch eine Anfrage gesendet werden kann, ob die Datei bereits fertig für den Download ist. Die `DownloadID` wird dann an den Nutzer zurückgesendet sobald der zweite Teil mit der `createFile`-Methode des `FileExporters` gestartet wurde.

Im zweiten Schritt, findet dann der tatsächliche Export der Daten in eine Datei statt. Dazu wird zuerst ein `ExportStreamGenerator` konstruiert, dessen Methode `createExportStream` einen `KStream` der gewünschten Daten für den Export erzeugt. Die Gewünschten Daten gehen aus den `ExportProperties` hervor. Mit der `FileExtension` aus den `ExportProperties` kann jetzt ein `FileType` generiert werden, über dessen Methode `getFileWriter` eine neue Instanz einer Implementierung einer `FileWriterStrategy` zurückgegeben wird. Dazu wird die statische Methode `getFileWriterForFileExtension` der Utilityklasse `FileTypesUtility` verwendet. In diesem Sequenzdiagramm wird als Beispiel eine Instanz der `CSVWriterStrategy` verwendet.

Nun wird ein passender neuer Pfad als `FilePath` erzeugt, um die Datei zu erzeugen. Zur Erzeugung wird die Methode `saveToFile` einer Implementierung der `FileWriterStrategy` genutzt. In diesem Fall einer `CSVWriterStrategy`. Diese Methode benötigt den Zielpfad und den Stream der Daten und erzeugt daraus eine Datei. Ist dies beendet, wird der `AlterableDownloadState` dazu genutzt, die nötigen Informationen abzuspeichern. Zuerst wird der Pfad der Datei eingegeben und anschließend wird festgelegt, dass die Datei bereit für den Download ist. Zum Schluss wird noch mit `savePersistent` sichergestellt, dass andere Instanzen eines `DownloadState` diese Information abrufen können.

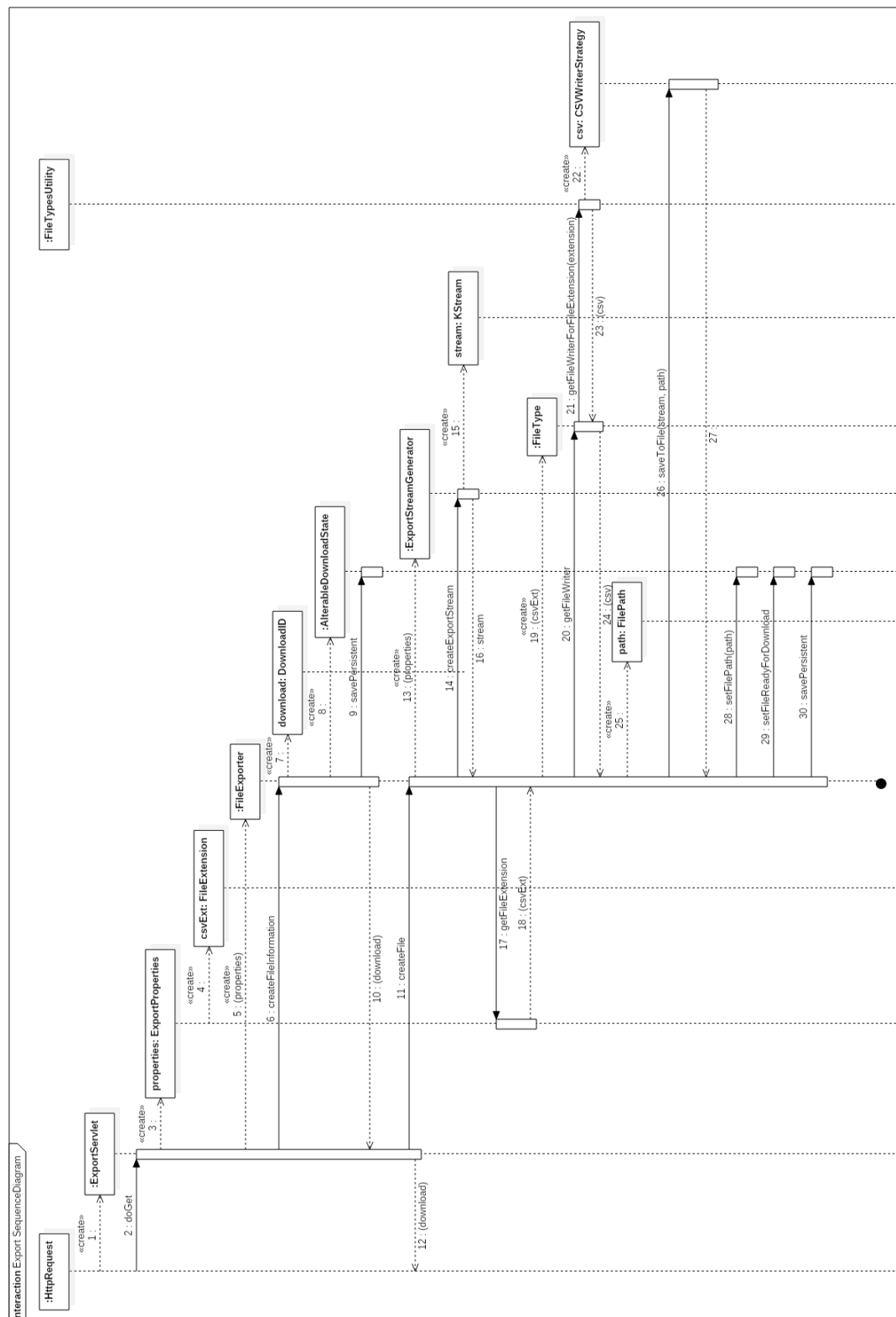


Abb. 2.7: Sequenzdiagramm Export



Ein Download wird grundsätzlich von einem Nutzer aus einem Browserfenster angefragt. Dazu wird das `DownloadServlet` benutzt. Diese wird vom Server erstellt sobald eine Anfrage des Nutzer ankommt. Dann wird `doGet` aufgerufen und das Servlet beginnt mit seiner Aufgabe, die in diesem Sequenzdiagramm dargestellt wird.

Die Anfrage des Nutzers enthält eine `DownloadID`, die für eine bestimmte Datei auf dem Server steht. Diese wird benutzt um eine `DownloadID` Objekt zu erstellen, das dazu dient einen `DownloadState` zu konstruieren. Dieser holt sich, sobald er erstellt wurde, die Informationen zu dem betreffenden Download. Diese Informationen könnten in einer Datei liegen. Nun wird zuerst geprüft, ob die Datei bereit für den Download ist, dazu dient die Methode `isFileReadyForDownload`. Ist dies der Fall kann nun mit der `getFilePath`-Methode nach dem Pfad der Datei gefragt werden. Dieser wird nun vom `DownloadServlet` genutzt, um die Datei dem Nutzer zu schicken.

Der Vorgang bei dem `StatusServlet` ist sehr Ähnlich. Dort geht es darum in Erfahrung zu bringen, ob ein Download bereit ist, um zum Beispiel zu wissen, ob dem Nutzer bereits ein Download-Button gezeigt werden kann. Der einzige Unterschied liegt darin, dass dort nicht nach dem Pfad gesucht wird, sondern gleich das Ergebnis der `isFileReadyForDownload` zurückgeschickt wird. Aus diesem Grund wurde darauf verzichtet ein separates Sequenzdiagramm dafür zu erstellen.

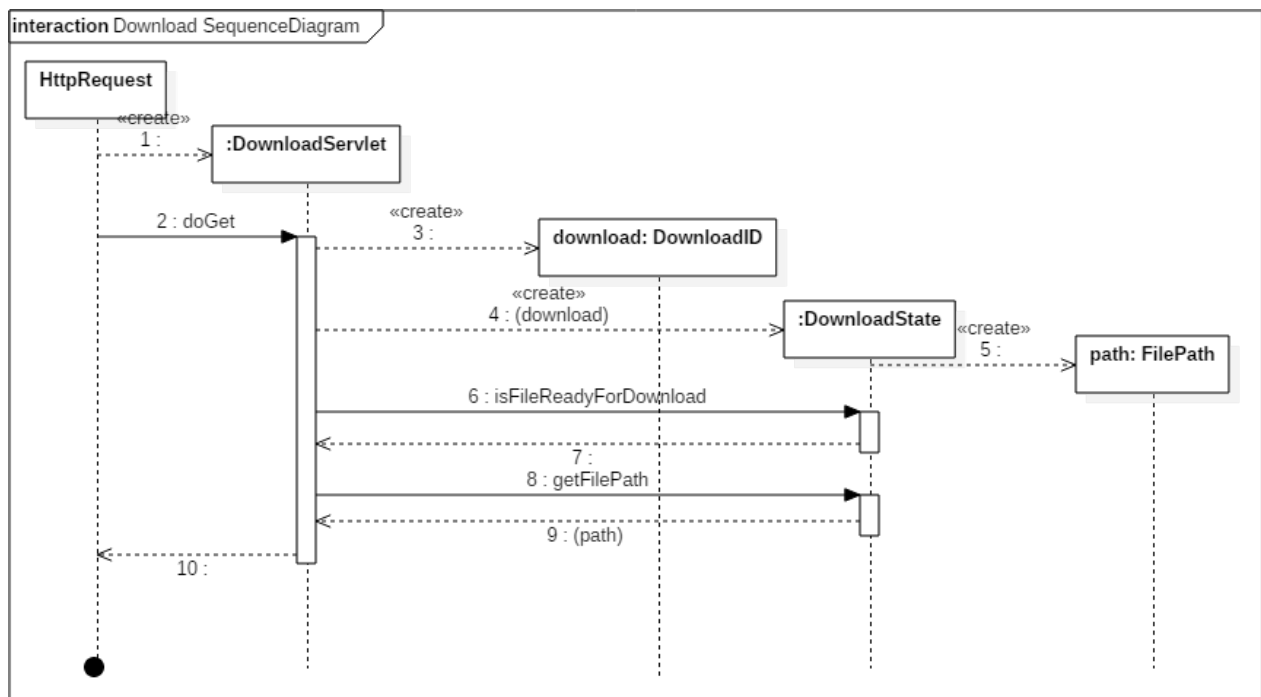


Abb. 2.8: Sequenzdiagramm Download

## 3 Klassenhierarchie

### Classes - Bridge

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## 4 Bridge

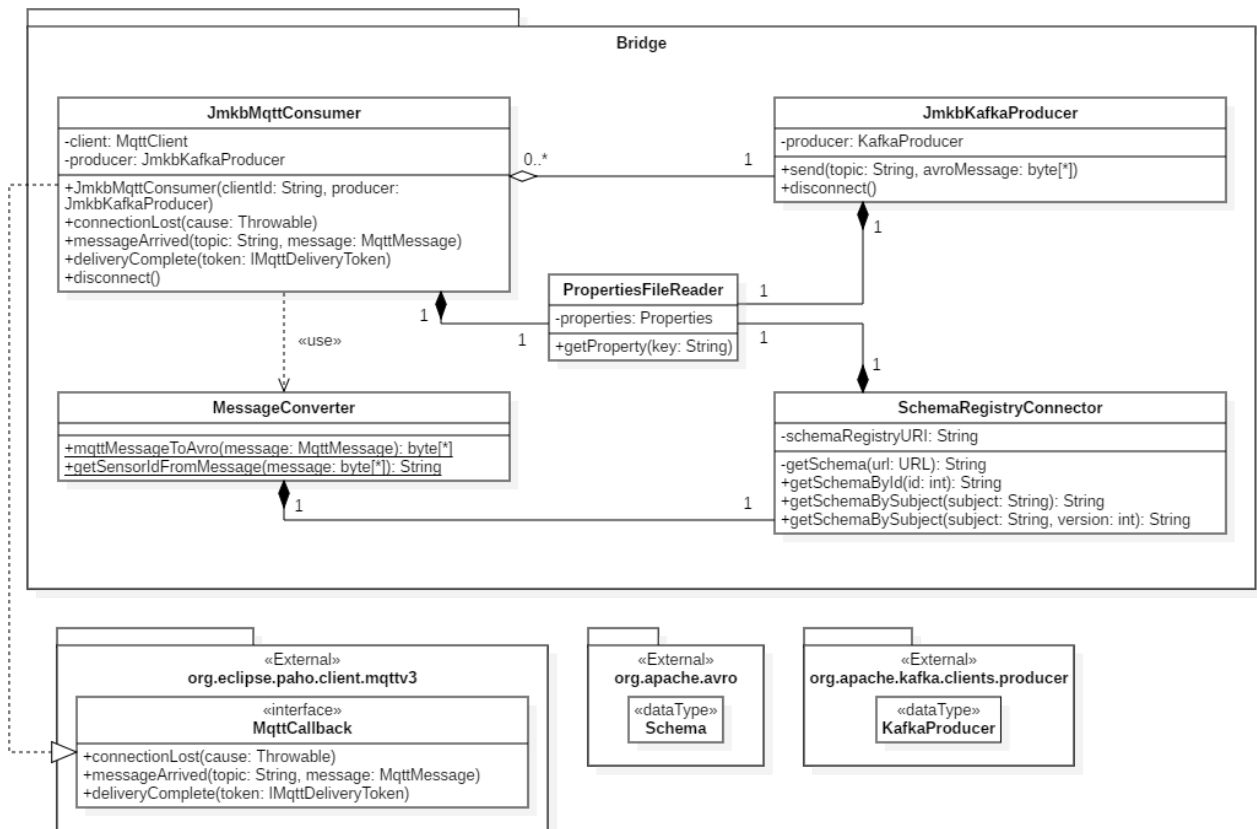


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### 4.1 Package Bridge

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### 4.1.1 Class JmkbKafkaProducer

This class creates a Kafka producer using defined settings and publishes records to the Kafka Cluster.

JmkbKafkaProducer
-producer: KafkaProducer
+send(topic: String, avroMessage: byte[]) +disconnect()

#### Declaration

```
public class JmkbKafkaProducer  
    extends java.lang.Object
```

#### Constructor summary

**JmkbKafkaProducer()** Default constructor

#### Method summary

**disconnect()** Disconnects this Kafka producer from the Kafka Cluster and closes the producer.

**send(String, byte[])** Asynchronously sends a record to the topic.

#### Constructors

- **JmkbKafkaProducer**

```
public JmkbKafkaProducer()
```

- **Description**

Default constructor

#### Methods

- **disconnect**

```
public void disconnect()
```

- **Description**

Disconnects this Kafka producer from the Kafka Cluster and closes the producer.



- **send**

```
public void send(java.lang.String topic, byte[] avroMessage)
```

- **Description**

Asynchronously sends a record to the topic.

- **Parameters**

- \* **topic** – The topic.
- \* **avroMessage** – The message to send.

#### 4.1.2 Class JmkbMqttConsumer

This class serves as an MqttClient that consumes messages from the specified FROST-Server address. On message arrival, it will initiate the conversion of the message to a desired format via MqttMessageConverter and supply the converted message to a JmkbKafkaProducer. An instance of this class should be destroyed with a call to the disconnect() method.

JmkbMqttConsumer
-client: MqttClient -producer: JmkbKafkaProducer
+JmkbMqttConsumer(clientId: String, producer: JmkbKafkaProducer) +connectionLost(cause: Throwable) +messageArrived(topic: String, message: MqttMessage) +deliveryComplete(token: IMqttDeliveryToken) +disconnect()

#### Declaration

```
public class JmkbMqttConsumer
    extends java.lang.Object
```

#### Constructor summary

**JmkbMqttConsumer()** Default constructor

#### Method summary

**connectionLost(Throwable)** This method is called when the connection to the server is lost.

**deliveryComplete(IMqttDeliveryToken)** Called when delivery for a message has been completed, and all acknowledgments have been received.

**disconnect()** Disconnects client from MQTT and closes the client.

**JmkbMqttConsumer(String, JmkbKafkaProducer)** This constructor for this class.  
**messageArrived(String, MqttMessage)** This method is called when a message arrives from the server.

## Constructors

- **JmkbMqttConsumer**

```
public JmkbMqttConsumer()
```

- **Description**

Default constructor

## Methods

- **connectionLost**

```
public void connectionLost(java.lang.Throwable cause)
```

- **Description**

This method is called when the connection to the server is lost.

- **Parameters**

\* **cause** – the reason behind the loss of connection.

- **deliveryComplete**

```
public void deliveryComplete(IMqttDeliveryToken token)
```

- **Description**

Called when delivery for a message has been completed, and all acknowledgments have been received. In this implementation of this method, nothing happens.

- **Parameters**

\* **token** – the delivery token associated with the message.

- **disconnect**

```
public void disconnect()
```

- **Description**

Disconnects client from MQTT and closes the client.

- **JmkbMqttConsumer**

```
public void JmkbMqttConsumer(java.lang.String clientId ,
    JmkbKafkaProducer producer)
```

- **Description**

This constructor for this class. Creates a new MqttClient and subscribes to the topics specified in the SensorThings API standard. A unique identifier and a JmkbKafkaProducer should be supplied.

- **Parameters**

- \* `clientId` – The unique identifier for the MqttClient.
- \* `producer` – A JmkbKafkaProducer.

- **messageArrived**

```
public void messageArrived(java.lang.String topic , MqttMessage
    message)
```

- **Description**

This method is called when a message arrives from the server. This method is invoked synchronously by the MQTT client. An acknowledgment is not sent back to the server until this method returns cleanly. Any additional messages which arrive while this method is running will build up in memory, and will then back up on the network. When this method is called, the supplied message will be converted to an Avro message and forwarded to an instance of JmkbKafkaProducer, which will then send the message to the Kafka Cluster.

- **Parameters**

- \* `topic` – name of the topic on the message was published to
- \* `message` – the actual message.

### 4.1.3 Class MessageConverter

This convenience class provides static methods to convert a given message to another format.



## Declaration

```
public class MessageConverter
    extends java.lang.Object
```

## Constructor summary

**MessageConverter()** Default constructor

## Method summary

**getSensorIdFromMessage(byte[])** This method returns the sensor ID that has supplied the information in the message.

**mqttMessageToAvro(MqttMessage)** This method converts a given MqttMessage, which contains information in the JSON format, to an Avro message in a byte array.

## Constructors

- **MessageConverter**

```
public MessageConverter()
```

- **Description**

Default constructor

## Methods

- **getSensorIdFromMessage**

```
public static java.lang.String getSensorIdFromMessage(byte[] message)
    )
```

- **Description**

This method returns the sensor ID that has supplied the information in the message. In detail, this method searches for the key 'iot.id' in the message and returns the value associated with the key.

- **Parameters**

\* **message** – The message from which to extract the sensor ID.

- **Returns** – The sensor ID.

- **mqttMessageToAvro**

```
public static byte[] mqttMessageToAvro(MqttMessage message)
```

- **Description**

This method converts a given `MqttMessage`, which contains information in the JSON format, to an Avro message in a byte array.

- **Parameters**

- \* `message` – The message to convert.

- **Returns** – The message in Avro format.

#### 4.1.4 Class `PropertiesFileReader`

A class that reads properties from the configuration file (`jmkb.properties`) and provides a method for getting a property by key.

<code>PropertiesFileReader</code>
<code>-properties: Properties</code>
<code>+getProperty(key: String)</code>

##### Declaration

```
public class PropertiesFileReader
    extends java.lang.Object
```

##### Constructor summary

`PropertiesFileReader()` Default constructor

##### Method summary

`getProperty(String)` Searches for the property with the specified key in `jmkb.property`.

##### Constructors

- **PropertiesFileReader**

```
public PropertiesFileReader()
```

- **Description**

Default constructor

## Methods

- **getProperty**

```
public void getProperty(java.lang.String key)
```

- **Description**

Searches for the property with the specified key in jmkb.property.

- **Parameters**

- \* **key** – The value associated with the key or null if the key is not found.

### 4.1.5 Class SchemaRegistryConnector

Convenience class which provides methods for interacting with the schema registry.

SchemaRegistryConnector
-schemaRegistryURL: String
-getSchema(url: URL): String +getSchemaById(id: int): String +getSchemaBySubject(subject: String): String +getSchemaBySubject(subject: String, version: int): String

## Declaration

```
public class SchemaRegistryConnector  
    extends java.lang.Object
```

## Constructor summary

**SchemaRegistryConnector()** Default constructor

## Method summary

**getSchemaById(int)** Requests the schema associated with the schema ID from the schema registry.

**getSchemaBySubject(String)** Requests the latest version of the schema associated with the given subject from the schema registry.

**getSchemaBySubject(String, int)** Requests the given version of the schema associated with the given subject from the schema registry.

## Constructors

- **SchemaRegistryConnector**

```
public SchemaRegistryConnector()
```

- **Description**

Default constructor

## Methods

- **getSchemaById**

```
public java.lang.String getSchemaById(int id)
```

- **Description**

Requests the schema associated with the schema ID from the schema registry. Returns the schema if successful, null if not.

- **Parameters**

\* **id** – The schema id.

- **Returns** – The schema if successful, null if not.

- **getSchemaBySubject**

```
public java.lang.String getSchemaBySubject(java.lang.String subject)
```

- **Description**

Requests the latest version of the schema associated with the given subject from the schema registry. Returns the schema if successful, null if not.

- **Parameters**

\* **subject** – The subject of the schema.

- **Returns** – The schema if successful, null if not.

- **getSchemaBySubject**

```
public java.lang.String getSchemaBySubject(java.lang.String subject ,  
int version)
```

- **Description**

Requests the given version of the schema associated with the given subject from the schema registry. Returns the schema if successful, null if not.

- **Parameters**
  - \* **subject** – The subject of the schema.
  - \* **version** – The schema version.
- **Returns** – the schema if successful, null if not.



## 5 Core

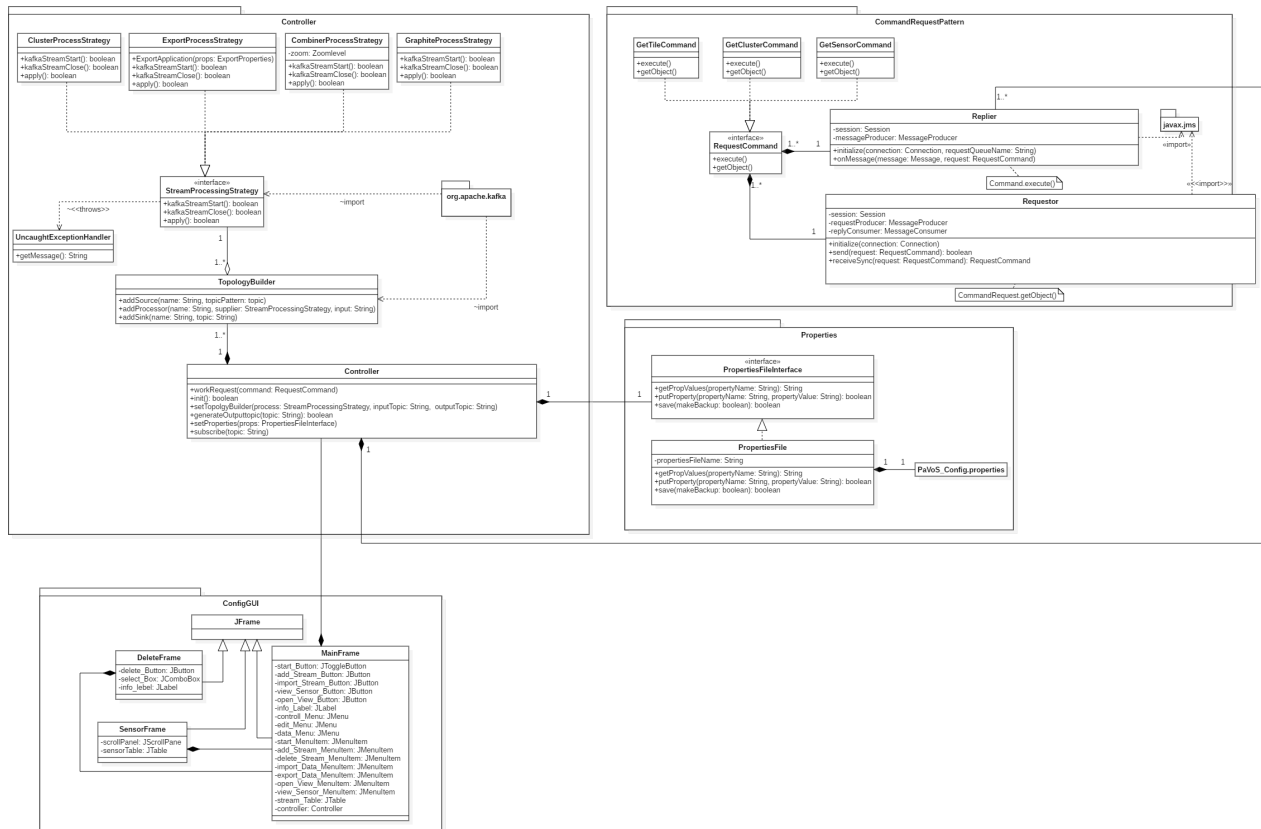


Abb. 5.1: Klassendiagramm Core

### 5.1 Package CommandRequestPattern

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All CommandsRequest implements this Interface.

**StreamProcessingStrategy** ..... 35

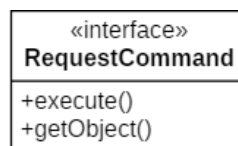
This Class is a Interface for the Stream Builder Applications which genereates an Output topic to provides data transformations.

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This Command request a Sensor in the System.	
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This Command request a Tile in the System.	
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This Class handels the Requests and Replies to them	
<b>Requestor</b> .....	41
The Implemente this class and request something to the System and a Replier answer to it.	

### 5.1.1 Interface RequestCommand

All CommandsRequest implements this Interface. CommandRequest are sendet form the View to request something out of the System.



## Declaration

```
public interface RequestCommand
```

### All known subinterfaces

GetTileCommand (in 5.1.5, page 38), GetSensorCommand (in 5.1.4, page 37), GetClusterCommand (in 5.1.3, page 36)

### All classes known to implement interface

GetTileCommand (in 5.1.5, page 38), GetSensorCommand (in 5.1.4, page 37), GetClusterCommand (in 5.1.3, page 36)

## Method summary

**execute()** This is the Execution form the requested Command

**getObject()** This Method Return the Requested Object

## Methods

- **execute**

**void** execute()

- **Description**

This is the Execution form the requested Command

- **getObject**

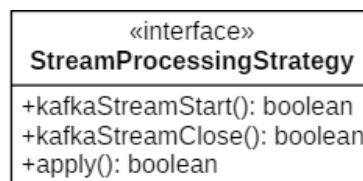
**void** getObject()

- **Description**

This Method Return the Requested Object

### 5.1.2 Interface StreamProcessingStrategy

This Class is a Interface for the Stream Builder Applications which generates an Output topic to provides data transformations. The ProcessingStrategy will use Kafka DSL API to process the data.



## Declaration

```
public interface StreamProcessingStrategy
```

## Method summary

**apply()** This Methode definite the Process of the Application.

**kafkaStreamClose()** This Method is used to explicitly close the Kafka Stream thread.

**kafkaStreamStart()** This Method is used to explicitly start the Kafka Stream thread.

## Methods

- **apply**

**boolean** apply()

- **Description**

This Methode definite the Process of the Application. What Application does specifcly.

- **Returns** – true if the Process got Successfully worked

- **kafkaStreamClose**

**boolean** kafkaStreamClose()

- **Description**

This Method is used to explicitly close the Kafka Stream thread. So that the Processing stops.

- **Returns** – true if the Kafka Stream closed, false otherwise

- **kafkaStreamStart**

**boolean** kafkaStreamStart()

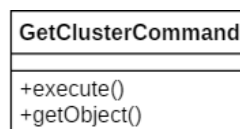
- **Description**

This Method is used to explicitly start the Kafka Stream thread. So that the Processing need to get started.

- **Returns** – true if the Kafka Stream Started false otherwise

### 5.1.3 Class GetClusterCommand

This Command request a Cluster in the System.



#### Declaration

```
public class GetClusterCommand
    extends java.lang.Object implements RequestCommand
```

#### Constructor summary

**GetClusterCommand()** Default constructor

**Method summary**

**execute()** This is the Execution form the requested Command.

**getObject()** This Method Return the Requested Cluster as a KStream

**Constructors**

- **GetClusterCommand**

```
public GetClusterCommand()
```

- **Description**

Default constructor

**Methods**

- **execute**

```
public void execute()
```

- **Description**

This is the Execution form the requested Command. So it will search for the Cluster

- **getObject**

```
public void getObject()
```

- **Description**

This Method Return the Requested Cluster as a KStream

**5.1.4 Class GetSensorCommand**

This Command request a Sensor in the System.

GetSensorCommand
+execute() +getObject()

## Declaration

```
public class GetSensorCommand
    extends java.lang.Object implements RequestCommand
```

## Constructor summary

**GetSensorCommand()** Default constructor

## Method summary

**execute()** This is the Execution form the requested Command.

**getObject()** This Method Return the Requested Sensor as a KStream

## Constructors

- **GetSensorCommand**

```
public GetSensorCommand()
```

- **Description**

Default constructor

## Methods

- **execute**

```
public void execute()
```

- **Description**

This is the Execution form the requested Command. So it will search for the Sensor Uid

- **getObject**

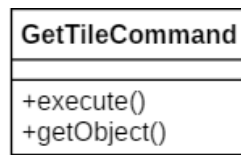
```
public void getObject()
```

- **Description**

This Method Return the Requested Sensor as a KStream

### 5.1.5 Class GetTileCommand

This Command request a Tile in the System.



### Declaration

```
public class GetTileCommand
    extends java.lang.Object implements RequestCommand
```

### Constructor summary

**GetTileCommand()** Default constructor

### Method summary

**execute()** This is the Execution form the requested Command.

**getObject()** This Method Return the Requested Tile as a KStream

### Constructors

- **GetTileCommand**

```
public GetTileCommand()
```

- **Description**

Default constructor

### Methods

- **execute**

```
public void execute()
```

- **Description**

This is the Execution form the requested Command. So it will search for the Tile

- **getObject**

```
public void getObject()
```

- **Description**

This Method Return the Requested Tile as a KStream

### 5.1.6 Class Replier

This Class handels the Requests and Replies to them

Replier
-session: Session -messageProducer: MessageProducer
+initialize(connection: Connection , requestQueueName: String ): void +onMessage(message: Message, request: RequestCommand): void

#### Declaration

```
public class Replier
    extends java.lang.Object
```

#### Constructor summary

**Replier()** Default constructor

#### Method summary

**initialize(Connection, String)** This is the initialisation Method for the Replier to connect to different Requestors

**onMessage(Message, RequestCommand)** This Methode triggers something in the System waht has to be done

#### Constructors

- **Replier**

```
public Replier()
```

##### – Description

Default constructor

#### Methods

- **initialize**

```
public void initialize (Connection connection ,java.lang.String
    requestQueueName)
```



- **Description**

This is the initialisation Method for the Replier to connect to different Requestors

- **Parameters**

- \* **connection** – This is the Connection parameter, so taht the replier knows where he answers
- \* **requestQueueName** – This a Simple name for the request Queue

- **onMessage**

```
public void onMessage(Message message, RequestCommand request)
```

- **Description**

This Methode triggers something in the System waht has to be done

- **Parameters**

- \* **message** – This is a simple Message parameter
- \* **request** – This is the RequestCommand Object wich Contains the Real request.

### 5.1.7 Class Requestor

The Implemente this class and request something to the System and a Replier answer to it.

Requestor
-session: Session -requestProducer: MessageProducer -replyConsumer: MessageConsumer
+initialize(connection: Connection): void +send(request: RequestCommand): boolean +receiveSync(request: RequestCommand): RequestCommand

#### Declaration

```
public class Requestor
    extends java.lang.Object
```

#### Constructor summary

**Requestor()** Default constructor

**Method summary**

**initialize(Connection)**  
**receiveSync(RequestCommand)** This Methode is there to got the Request again when it get lost or something  
**send(RequestCommand)**

**Constructors**

- **Requestor**

**public Requestor()**

- **Description**  
Default constructor

**Methods**

- **initialize**

**public void initialize(Connection connection)**

- **Parameters**
  - \* **connection** – This is the Connection parameter, so taht the repuestor knows where he requests something

- **receiveSync**

**public RequestCommand receiveSync(RequestCommand request)**

- **Description**  
This Methode is there to got the Request again when it get lost or something
- **Parameters**
  - \* **request** – It Returns the Requested RequestCommand
- **Returns** – A RequestCommand which contains a Request for a RequestCommand

- **send**

**public boolean send(RequestCommand request)**

- **Parameters**
  - \* **request** – This is the RequestCommand Object wich Conntains the Real request.
- **Returns** – true if the RequestCommand got send and false otherwise

## 5.2 Package ConfigGUI

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### 5.2.1 Class DeleteFrame

This Frame is the Delete Frame, where you delete Topics out of the Programm

DeleteFrame
-delete_Button: JButton
-select_Box: JComboBox
-info_label: JLabel

#### Declaration

```
public class DeleteFrame
    extends ConfigGUI.JFrame
```

#### Constructor summary

**DeleteFrame()** Default constructor

#### Constructors

- **DeleteFrame**

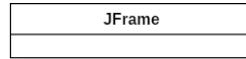
```
public DeleteFrame()
```

#### – Description

Default constructor

### 5.2.2 Class JFrame

This is the Basic Interface from Java for building a Frame.



#### Declaration

```
public class JFrame
    extends java.lang.Object
```

#### All known subclasses

SensorFrame (in 5.2.4, page 45), MainFrame (in 5.2.3, page 44), DeleteFrame (in 5.2.1, page 43)

#### Constructor summary

**JFrame()** Default constructor

#### Constructors

- **JFrame**

```
public JFrame()
```

- **Description**

Default constructor

### 5.2.3 Class MainFrame

This Class holds the main functionality of the PaVoS program. It starts/stops the whole System and manages the export/import.

#### Declaration

```
public class MainFrame
    extends ConfigGUI.JFrame
```

#### Constructor summary

**MainFrame()** Default constructor

MainFrame
-start_Button: JToggleButton -add_Stream_Button: JButton -import_Stream_Button: JButton -view_Sensor_Button: JButton -open_View_Button: JButton -info_Label: JLabel -controll_Menu: JMenu -edit_Menu: JMenu -data_Menu: JMenu -start_Menulitem: JMenuitem -add_Stream_Menulitem: JMenuitem -delete_Stream_Menulitem: JMenuitem -import_Data_Menulitem: JMenuitem -export_Data_Menulitem: JMenuitem -open_View_Menulitem: JMenuitem -view_Sensor_Menulitem: JMenuitem -stream_Table: JTable -controller: Controller

## Constructors

- MainFrame

```
public MainFrame ()
```

### – Description

Default constructor

## 5.2.4 Class SensorFrame

This Frame hold the data of all possible Sensors in the System.

SensorFrame
-scrollPanel: JScrollPane -sensorTable: JTable

## Declaration

```
public class SensorFrame  
    extends ConfigGUI.JFrame
```

## Constructor summary

**SensorFrame()** Default constructor

## Constructors

- **SensorFrame**

```
public SensorFrame ()
```

### – Description

Default constructor

## 5.3 Package Controller

### *Package Contents*

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#### Classes

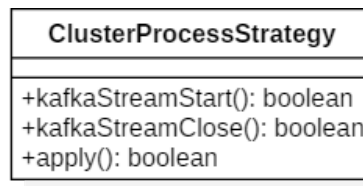
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### 5.3.1 Class ClusterProcessStrategy

This Class is for the generation of the Clusters for the View. It Generates a Cluster Outputtopic

#### Declaration

```
public class ClusterProcessStrategy
    extends java.lang.Object
```



### Constructor summary

**ClusterProcessStrategy()** Default constructor

### Method summary

**apply()** This Methode definite the Process of the Application.

**kafkaStreamClose()** This Method is used to explicitly close the Kafka Stream thread.

**kafkaStreamStart()** This Method is used to explicitly start the Kafka Stream thread.

### Constructors

- **ClusterProcessStrategy**

```
public ClusterProcessStrategy ()
```

- **Description**

Default constructor

### Methods

- **apply**

```
public boolean apply ()
```

- **Description**

This Methode definite the Process of the Application. What Application does specifically.

- **Returns** – true if the Cluster Process got Successfully worked, false otherwise

- **kafkaStreamClose**

```
public boolean kafkaStreamClose ()
```

- **Description**

This Method is used to explicitly close the Kafka Stream thread. So that the Processing stops.

- **Returns** – true if the Kafka Stream closed false otherwise

- **kafkaStreamStart**

```
public boolean kafkaStreamStart()
```

- **Description**

This Method is used to explicitly start the Kafka Stream thread. So that theProcessing need to get started.

- **Returns** – true if the Kafka Stream Started, false otherwise

### 5.3.2 Class CombinerProcessStrategy

This Class does combine the Clusters to bigger Cluster for the Different Zoom Levels

CombinerProcessStrategy
-zoom: Zoomlevel
+kafkaStreamStart(): boolean +kafkaStreamClose(): boolean +apply(): boolean

#### Declaration

```
public class CombinerProcessStrategy
    extends java.lang.Object
```

#### Constructor summary

**CombinerProcessStrategy()** Default constructor

#### Method summary

**apply()** This Methode definite the Process of the Application.

**kafkaStreamClose()** This Method is used to explicitly close the Kafka Stream thread.

**kafkaStreamStart()** This Method is used to explicitly start the Kafka Stream thread.

#### Constructors

- **CombinerProcessStrategy**

```
public CombinerProcessStrategy()
```



- **Description**

Default constructor

## Methods

- **apply**

```
public boolean apply()
```

- **Description**

This Methode definite the Process of the Application. What Application does specifcly.

- **Returns** – true if the Combiner Process got Successfully worked

- **kafkaStreamClose**

```
public boolean kafkaStreamClose()
```

- **Description**

This Method is used to explicitly close the Kafka Stream thread. So that the Processing stops.

- **Returns** – true if the Kafka Stream closed, false otherwise

- **kafkaStreamStart**

```
public boolean kafkaStreamStart()
```

- **Description**

This Method is used to explicitly start the Kafka Stream thread. So that theProcessing need to get started.

- **Returns** – true if the Kafka Stream Started false otherwise

### 5.3.3 Class Controller

This Class is the ControllerClass which manages the Requests and start new TopologyBuilders to start new Processing Application.

Controller
<pre> +workRequest(command: RequestCommand) +init(): boolean +setTopolgyBuilder(process: StreamProcessingStrategy, inputTopic: String, outputTopic: String) +generateOutputtopic(topic: String): boolean +setProperties(props: PropertiesFileInterface) +subscribe(topic: String): void </pre>

## Declaration

```

public class Controller
    extends java.lang.Object

```

## Constructor summary

**Controller()** Default constructor

## Method summary

**generateOutputtopic(String)** This Method generates a Output Topic, which uses a ProcessApplikation as OutputSink.

**init()** This Method initialise the Controler

**setProperties(PropertiesFileInterface)** This Method sets the Properties File

**setTopolgyBuilder(StreamProcessingStrategy, String, String)** Thsi Method starts a TopolgyBuilder to start a Kafka Stream Process.

**subscribe(String)** This method subscribe the controller to the Input Kafka Stream

**workRequest(RequestCommand)** This Method process the single Reuquest form the View

## Constructors

- **Controller**

```

public Controller()

```

### – Description

Default constructor

## Methods

- **generateOutputtopic**

```

public boolean generateOutputtopic(java.lang.String topic)

```

- **Description**

This Method generates a Output Topic, which uses a ProcessApplikation as OutputSink. This will use Apache Avro Format.

- **Parameters**

- \* **topic** – topic name of the new Topic in Kafka

- **Returns** – true when the Output Topic got successful generated

- **init**

```
public boolean init()
```

- **Description**

This Method initialise the Controller

- **Returns** – true when the initialise was successful and false otherwise

- **setProperties**

```
public void setProperties(PropertiesFileInterface props)
```

- **Description**

This Method sets the Properties File

- **Parameters**

- \* **props** – props is the Propertyfile form where the controller reads his Settings

- **setTopolgyBuilder**

```
public void setTopolgyBuilder(StreamProcessingStrategy process, java.lang.String inputTopic, java.lang.String outputTopic)
```

- **Description**

Thsi Method starts a TopolgyBuilder to start a Kafka Stream Process.

- **Parameters**

- \* **process** – process name of the Process Application

- \* **inputTopic** – inputTopic of the Kafka Topic

- \* **outputTopic** – outputTopic of the Kafka Topic

- **subscribe**

```
public void subscribe(java.lang.String topic)
```

- **Description**

This method subscribe the controller to the Input Kafka Stream

- **Parameters**

- \* **topic** – The Name of the Topic which you want to subscribe

- **workRequest**

```
public void workRequest(RequestCommand command)
```

- **Description**

This Method process the single Reuquest form the View

- **Parameters**

- \* **command** – command is Instance of the RequestCommand Interface which contains a Job Request

### 5.3.4 Class ExportProcessStrategy

This Class is for The Processing of the Export Stream and it generates a Output Stream

ExportProcessStrategy
+ExportApplication(props: ExportProperties) +kafkaStreamStart(): boolean +kafkaStreamClose(): boolean +apply(): boolean

#### Declaration

```
public class ExportProcessStrategy
    extends java.lang.Object
```

#### Constructor summary

**ExportProcessStrategy()** Default constructor

#### Method summary

**apply()** This Methode definite the Process of the Application.

**ExportApplication(ExportProperties)** This is the default Contructer for the Export Process

**kafkaStreamClose()** This Method is used to explicitly close the Kafka Stream thread.

**kafkaStreamStart()** This Method is used to explicitly start the Kafka Stream thread.

## Constructors

- **ExportProcessStrategy**

```
public ExportProcessStrategy()
```

- **Description**

Default constructor

## Methods

- **apply**

```
public boolean apply()
```

- **Description**

This Methode definite the Process of the Application. What Application does specifcly.

- **Returns** – true if the Export Process got Successfully worked.

- **ExportApplication**

```
public void ExportApplication(ExportProperties props)
```

- **Description**

This is the default Contructer for the Export Process

- **Parameters**

- \* **props** – ExportProperties is the Properties Object for the Application

- **kafkaStreamClose**

```
public boolean kafkaStreamClose()
```

- **Description**

This Method is used to explicitly close the Kafka Stream thread. So that the Processing stops.

- **Returns** – true if the Kafka Stream Started false otherwise

- **kafkaStreamStart**

```
public boolean kafkaStreamStart()
```

- **Description**

This Method is used to explicitly start the Kafka Stream thread. So that theProcessing need to get started.

- **Returns** – true if the Kafka Stream Started false otherwise

### 5.3.5 Class GraphiteProcessStrategy

This Class is for The Processing of the Data for Graphite, to represente the Sensors. It Generates a Graphite Output Stream

GraphiteProcessStrategy
+kafkaStreamStart(): boolean +kafkaStreamClose(): boolean +apply(): boolean

#### Declaration

```
public class GraphiteProcessStrategy  
    extends java.lang.Object
```

#### Constructor summary

**GraphiteProcessStrategy()** Default constructor

#### Method summary

**apply()** This Methode definite the Process of the Application.

**kafkaStreamClose()** This Method is used to explicitly close the Kafka Stream thread.

**kafkaStreamStart()** This Method is used to explicitly start the Kafka Stream thread.

#### Constructors

- **GraphiteProcessStrategy**

```
public GraphiteProcessStrategy()
```

- **Description**

Default constructor

## Methods

- **apply**

```
public boolean apply()
```

- **Description**

- This Methode definite the Process of the Application. What Application does specifcly.

- **Returns** – true if the Graphite Process got Successfully worked

- **kafkaStreamClose**

```
public boolean kafkaStreamClose()
```

- **Description**

- This Method is used to explicitly close the Kafka Stream thread. So that the Processing stops.

- **Returns** – true if the Kafka Stream closed, false otherwise

- **kafkaStreamStart**

```
public boolean kafkaStreamStart()
```

- **Description**

- This Method is used to explicitly start the Kafka Stream thread. So that theProcessing need to get started.

- **Returns** – true if the Kafka Stream Started false otherwise

### 5.3.6 Class TopologyBuilder

A component that is used to build a ProcessorTopology. A topology contains an acyclic graph of sources, processors, and sinks. A source is a node in the graph that consumes one or more Kafka topics and forwards them to its child nodes. A processor is a node in the graph that receives input records from upstream nodes, processes that records, and optionally forwarding new records to one or all of its children. Finally, a sink is a node in the graph that receives records from upstream nodes and writes them to a Kafka topic. This builder allows you to construct an acyclic graph of these nodes, and the builder is then passed into a new KafkaStreams instance that will then begin consuming, processing, and producing records

TopologyBuilder
+addSource(name: String, topicPattern: topic) +addProcessor(name: String, supplier: StreamProcessingStrategy, input: String) +addSink(name: String, topic: String)

## Declaration

```
public class TopologyBuilder
    extends java.lang.Object
```

## Constructor summary

**TopologyBuilder()** Default constructor

## Method summary

**addProcessor(String, StreamProcessingStrategy, String)** Add a new processor node that receives and processes records output by one or more parent source or processor node.

**addSink(String, String)** Add a new sink that forwards records from upstream parent processor and/or source nodes to the named Kafka topic.

**addSource(String, topic)** Add a new source that consumes from topics matching the given pattern and forward the records to child processor and/or sink nodes.

## Constructors

- **TopologyBuilder**

```
public TopologyBuilder()
```

### – Description

Default constructor

## Methods

- **addProcessor**

```
public void addProcessor(java.lang.String name,
    StreamProcessingStrategy supplier, java.lang.String input)
```

### – Description

Add a new processor node that receives and processes records output by one or more parent source or processor node.



- **Parameters**

- \* **name** – is the name of the Processor Strategie
- \* **supplier** – supplier is the supplier of the Process instant to generate more then 1 Process
- \* **input** – input Topic Stream name

- **addSink**

```
public void addSink(java.lang.String name,java.lang.String topic)
```

- **Description**

Add a new sink that forwards records from upstream parent processor and/or source nodes to the named Kafka topic.

- **Parameters**

- \* **name** – name of the Sink
- \* **topic** – name of the Topic Stream

- **addSource**

```
public void addSource(java.lang.String name,topic topicPattern)
```

- **Description**

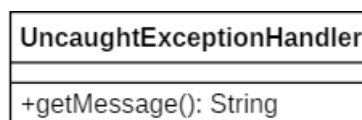
Add a new source that consumes from topics matching the given pattern and forward the records to child processor and/or sink nodes.

- **Parameters**

- \* **name** – name of the Input Topic Stream
- \* **topicPattern** – topicPattern is a Pattern to filter the data from the Input Topic Stream

### 5.3.7 Class UncaughtExceptionHandler

To catch any unexpected exceptions, you can set before you start the application. This handler is called whenever a stream thread is terminated by an unexpected exception.



**Declaration**

```
public class UncaughtExceptionHandler
    extends java.lang.Object
```

**Constructor summary**

**UncaughtExceptionHandler()** Default constructor

**Method summary**

**getMessage()** Returns the detail message string of this throwable.

**Constructors**

- **UncaughtExceptionHandler**

```
public UncaughtExceptionHandler()
```

- **Description**

Default constructor

**Methods**

- **getMessage**

```
public java.lang.String getMessage()
```

- **Description**

Returns the detail message string of this throwable.

- **Returns** – String with the error Message

**5.4 Package Properties**

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The Properties Interface is a special form of associative memory in which key-value pairs are always of type string.

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The Properties class is a special form of associative memory in which key-value pairs are always of type string.

### 5.4.1 Interface PropertiesFileInterface

The Properties Interface is a special form of associative memory in which key-value pairs are always of type string. Since the entries can be stored in a file and read out again, hardwired character strings can be externalized from the program text so that the values can be easily changed without retranslation.



#### Declaration

```
public interface PropertiesFileInterface
```

#### All known subinterfaces

PropertiesFile (in 5.4.2, page 60)

#### All classes known to implement interface

PropertiesFile (in 5.4.2, page 60)

#### Method summary

**getPropValues(String)** This Methodes returns the requestet propertie Value  
**putProperty(String, String)** The Method adds a key-value pair to the Properties object.  
**save(boolean)** This Method saves the PropertiesFile with the Option to do a Backup of the File

#### Methods

- **getPropValues**

```
java.lang.String getPropValues(java.lang.String propertyName)
```

- **Description**

This Methodes returns the requestet propertie Value

- **Parameters**

- \* **propertyName** – propertyName is the name of the Requested Property
- **Returns** – Return the Value to the Requested Property

- **putProperty**

```
boolean putProperty(java.lang.String propertyName,java.lang.String
    propertyValue)
```

- **Description**

The Method adds a key-value pair to the Properties object. To get back to the value later, is called with the key and then return

- **Parameters**

- \* **propertyName** – propertyName is the Name of the Property which you want to edit
- \* **propertyValue** – propertyValue is the Value of the Property which you want to edit
- **Returns** – true wenn the property got set false otherwise

- **save**

```
boolean save(boolean makeBackup)
```

- **Description**

This Method saves the PropertiesFile with the Option to do a Backup of the File

- **Parameters**

- \* **makeBackup** – true if you want to make a Bachup
- **Returns** – true when the file got saved, false otherwise

### 5.4.2 Class PropertiesFile

The Properties class is a special form of associative memory in which key-value pairs are always of type string. Since the entries can be stored in a file and read out again, hardwired character strings can be externalized from the program text so that the values can be easily changed without retranslation.

<b>PropertiesFile</b>
-propertiesFileName: String
+getPropValues(propertyName: String): String +putProperty(propertyName: String, propertyValue: String): boolean +save(makeBackup: boolean): boolean

## Declaration

```
public class PropertiesFile
    extends java.lang.Object implements PropertiesFileInterface
```

## Constructor summary

**PropertiesFile()** Default constructor

## Method summary

**getPropValues(String)** This Methodes returns the requestet propertie Value  
**putProperty(String, String)** The Method adds a key-value pair to the Properties object.  
**save(boolean)** This Method saves the PropertiesFile with the Option to do a Backup of the File

## Constructors

- **PropertiesFile**

```
public PropertiesFile()
```

- **Description**  
Default constructor

## Methods

- **getPropValues**

```
public java.lang.String getPropValues(java.lang.String propertyName)
```

- **Description**  
This Methodes returns the requestet propertie Value
- **Parameters**
  - \* **propertyName** – propertyName is the name of the Requested Property
- **Returns** – Return the Value to the Requested Property

- **putProperty**

```
public boolean putProperty(java.lang.String propertyName, java.lang.
    String propertyValue)
```

- **Description**

The Method adds a key-value pair to the Properties object. To get back to the value later, is called with the key and then return

- **Parameters**

- \* **propertyName** – propertyName is the Name of the Property which you want to edit
- \* **propertyValue** – propertyValue is the Value of the Property which you want to edit

- **Returns** – true wenn the property got set false otherwise

- **save**

```
public boolean save(boolean makeBackup)
```

- **Description**

This Method saves the PropertiesFile with the Option to do a Backup of the File

- **Parameters**

- \* **makeBackup** – true if you want to make a Bachup

- **Returns** – true when the file got saved, false otherwise

# 6 Import

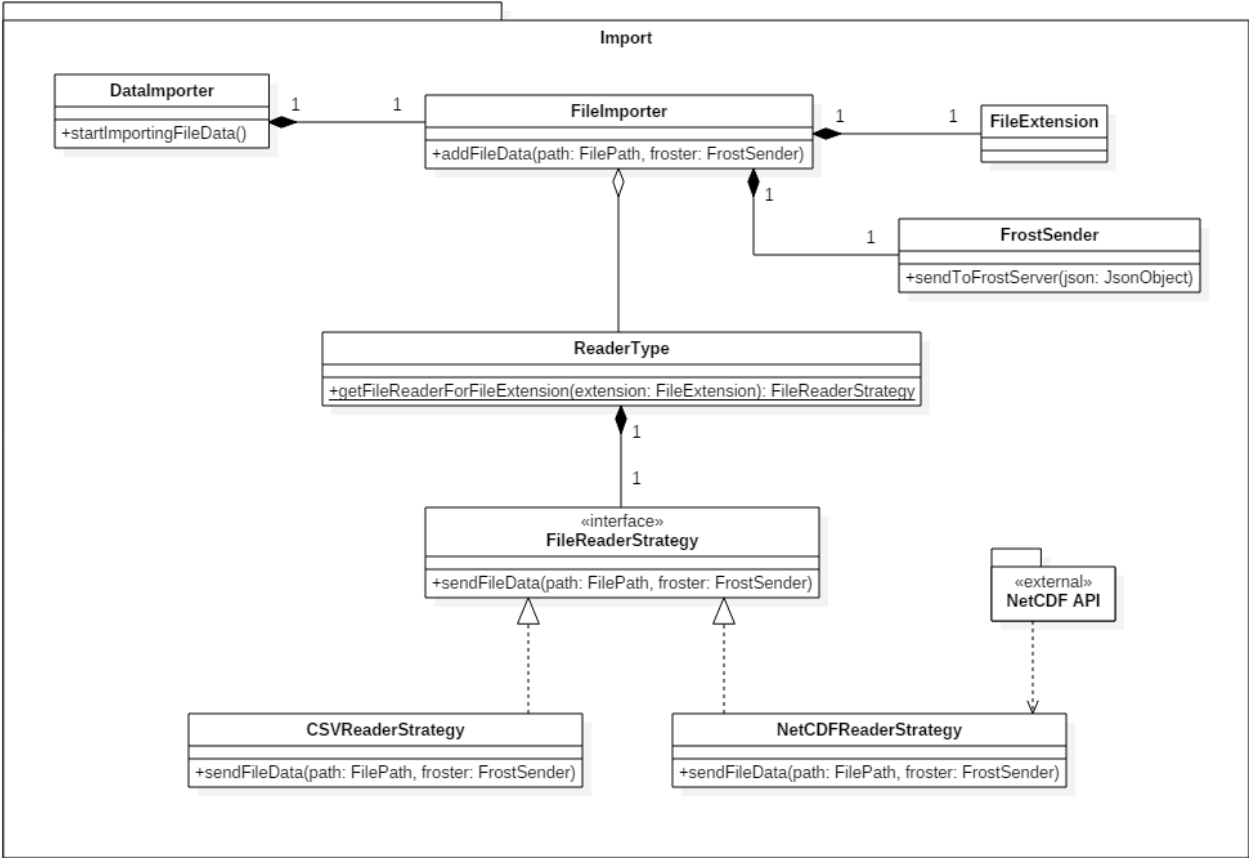


Abb. 6.1: Klassendiagramm Import

## 6.1 Package Import

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### 6.1.1 Interface FileReaderStrategy

Interface for the FileReaderStrategy classes. Realization of a Strategy to be able to swap out the way a File has to be read.



#### Declaration

```
public interface FileReaderStrategy
```

#### All known subinterfaces

NetCDFReaderStrategy (in 6.1.6, page 70), CSVReaderStrategy (in 6.1.2, page 65)

#### All classes known to implement interface

NetCDFReaderStrategy (in 6.1.6, page 70), CSVReaderStrategy (in 6.1.2, page 65)

#### Method summary

**sendFileData(FilePath, FrostSender)** Reads from a File as specified by the File-Path and sends the information in it to the FROST-Server using the FrostSender that was provided.



## Methods

- **sendFileData**

```
void sendFileData(FilePath path,FrostSender froster)
```

- **Description**

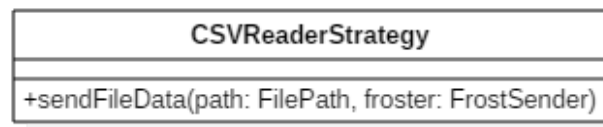
Reades from a File as specified by the FilePath and sends the information in it to the FROST-Server using the FrostSender that was provided.

- **Parameters**

- \* **path** – Is the FilePath of the File to Import.
    - \* **froster** – Is the FrostSender instance that will be used to send the files data to the Frost-Server.

### 6.1.2 Class CSVReaderStrategy

Implementation of the FileReaderStrategy interface for CSV files.



## Declaration

```
public class CSVReaderStrategy
    extends java.lang.Object implements FileReaderStrategy
```

## Constructor summary

**CSVReaderStrategy()** Default constructor

## Method summary

**sendFileData(FilePath, FrostSender)** Reades from a File as specified by the File-Path and sends the information in it to the FROST-Server using the FrostSender that was provided.

**sendFileData(FilePath, FrostSender)** Reades from a File as specified by the File-Path and sends the information in it to the FROST-Server using the FrostSender that was provided.

## Constructors

- **CSVReaderStrategy**

```
public CSVReaderStrategy()
```

- **Description**

Default constructor

## Methods

- **sendFileData**

```
public void sendFileData(FilePath path, FrostSender froster)
```

- **Description**

Reads from a File as specified by the FilePath and sends the information in it to the FROST-Server using the FrostSender that was provided.

- **Parameters**

- \* **path** – Is the FilePath of the File to Import.
- \* **froster** – Is the FrostSender instance that will be used to send the files data to the Frost-Server.

- **sendFileData**

```
public void sendFileData(FilePath path, FrostSender froster)
```

- **Description**

Reads from a File as specified by the FilePath and sends the information in it to the FROST-Server using the FrostSender that was provided.

- **Parameters**

- \* **path** – Is the FilePath of the File to Import.
- \* **froster** – Is the FrostSender instance that will be used to send the files data to the Frost-Server.

### 6.1.3 Class DataImporter

Importer for data that should be added to PaVoS. Import takes place for files in a specified folder of the server.

## Declaration

```
public class DataImporter
    extends java.lang.Object
```

## Constructor summary

**DataImporter()** Default constructor

## Method summary

**startImportingFileData()** Checks for files in the specified import folder and opens a new thread for each of them, where a FileImporter is started to import the contained data.

## Constructors

- **DataImporter**

```
public DataImporter()
```

- **Description**

Default constructor

## Methods

- **startImportingFileData**

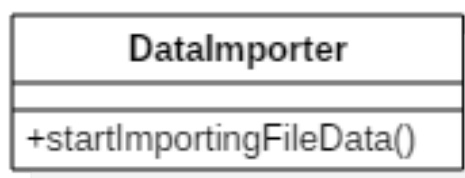
```
public void startImportingFileData()
```

- **Description**

Checks for files in the specified import folder and opens a new thread for each of them, where a FileImporter is started to import the contained data.

### 6.1.4 Class FileImporter

Importer for the Data contained in a File. Takes the Data and sends them to the FROST-Server.



## Declaration

```
public class FileImporter
    extends java.lang.Object
```

## Constructor summary

**FileImporter()** Default constructor

## Method summary

**addFileData(FilePath, FrostSender)** Adds the Data of a File at a specified FilePath to the FROST-Server.

## Constructors

- **FileImporter**

```
public FileImporter()
```

- **Description**

Default constructor

## Methods

- **addFileData**

```
public void addFileData(FilePath path, FrostSender froster)
```

- **Description**

Adds the Data of a File at a specified FilePath to the FROST-Server. To do so, the FileExtension of the File is determined. With help of the readerTypeClass the matching implementation of the FileReaderStrategy interface for the FileExtension is generated and can be used to get the Data from then File.

- **Parameters**

- \* **path** – Is the FilePath of the File to Import.
- \* **froster** – Is the FrostSender instance that will be used to send the files data to the Frost-Server.



### 6.1.5 Class FrostSender

sends Data to the FROST-Server.



#### Declaration

```
public class FrostSender
    extends java.lang.Object
```

#### Constructor summary

**FrostSender()** Default constructor

#### Method summary

**sendToFrostServer(JsonObject)** Sends the given JsonObject to the FROST-Server.

#### Constructors

- **FrostSender**

```
public FrostSender()
```

- **Description**

Default constructor

#### Methods

- **sendToFrostServer**

```
public void sendToFrostServer(JsonObject json)
```

- **Description**

Sends the given JsonObject to the FROST-Server.

- **Parameters**

\* **json** – Represents a single ObservedProperty.

### 6.1.6 Class NetCDFReaderStrategy

Implementation of the FileReaderStrategy interface for NetCDF files.



#### Declaration

```
public class NetCDFReaderStrategy
    extends java.lang.Object implements FileReaderStrategy
```

#### Constructor summary

**NetCDFReaderStrategy()** Default constructor

#### Method summary

**sendFileData(FilePath, FrostSender)** Reads from a File as specified by the File-Path and sends the information in it to the FROST-Server using the FrostSender that was provided.

**sendFileData(FilePath, FrostSender)** Reads from a File as specified by the File-Path and sends the information in it to the FROST-Server using the FrostSender that was provided.

#### Constructors

- **NetCDFReaderStrategy**

```
public NetCDFReaderStrategy()
```

##### – Description

Default constructor

#### Methods

- **sendFileData**

```
public void sendFileData(FilePath path, FrostSender froster)
```

- **Description**

Reads from a File as specified by the FilePath and sends the information in it to the FROST-Server using the FrostSender that was provided.

- **Parameters**

- \* **path** – Is the FilePath of the File to Import.
- \* **froster** – Is the FrostSender instance that will be used to send the files data to the Frost-Server.

- **sendFileData**

```
public void sendFileData(FilePath path, FrostSender froster)
```

- **Description**

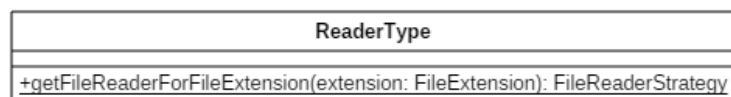
Reads from a File as specified by the FilePath and sends the information in it to the FROST-Server using the FrostSender that was provided.

- **Parameters**

- \* **path** – Is the FilePath of the File to Import.
- \* **froster** – Is the FrostSender instance that will be used to send the files data to the Frost-Server.

### 6.1.7 Class ReaderType

Is like a chooser for the right FileReaderStrategy. If a new Strategy is added, this class needs some changes to use the new Strategy.



#### Declaration

```
public class ReaderType
    extends java.lang.Object
```

#### Constructor summary

**ReaderType()** Default constructor

**Method summary**

**getFileReaderForFileExtension(FileExtension)** Gives a new Instance of a FileReaderStrategy for the specified FileExtension.

**Constructors**

- **ReaderType**

```
public ReaderType()
```

- **Description**

Default constructor

**Methods**

- **getFileReaderForFileExtension**

```
public static FileReaderStrategy getFileReaderForFileExtension(  
    FileExtension extension)
```

- **Description**

Gives a new Instance of a FileReaderStrategy for the specified FileExtension.

- **Parameters**

\* **extension** – is the FileExtension for which a FileReaderStrategy has to be generated.

- **Returns** – An instance of an implementation of the FileReaderStrategy interface.



## 7 Database

### 7.1 Package DatabaseConnection

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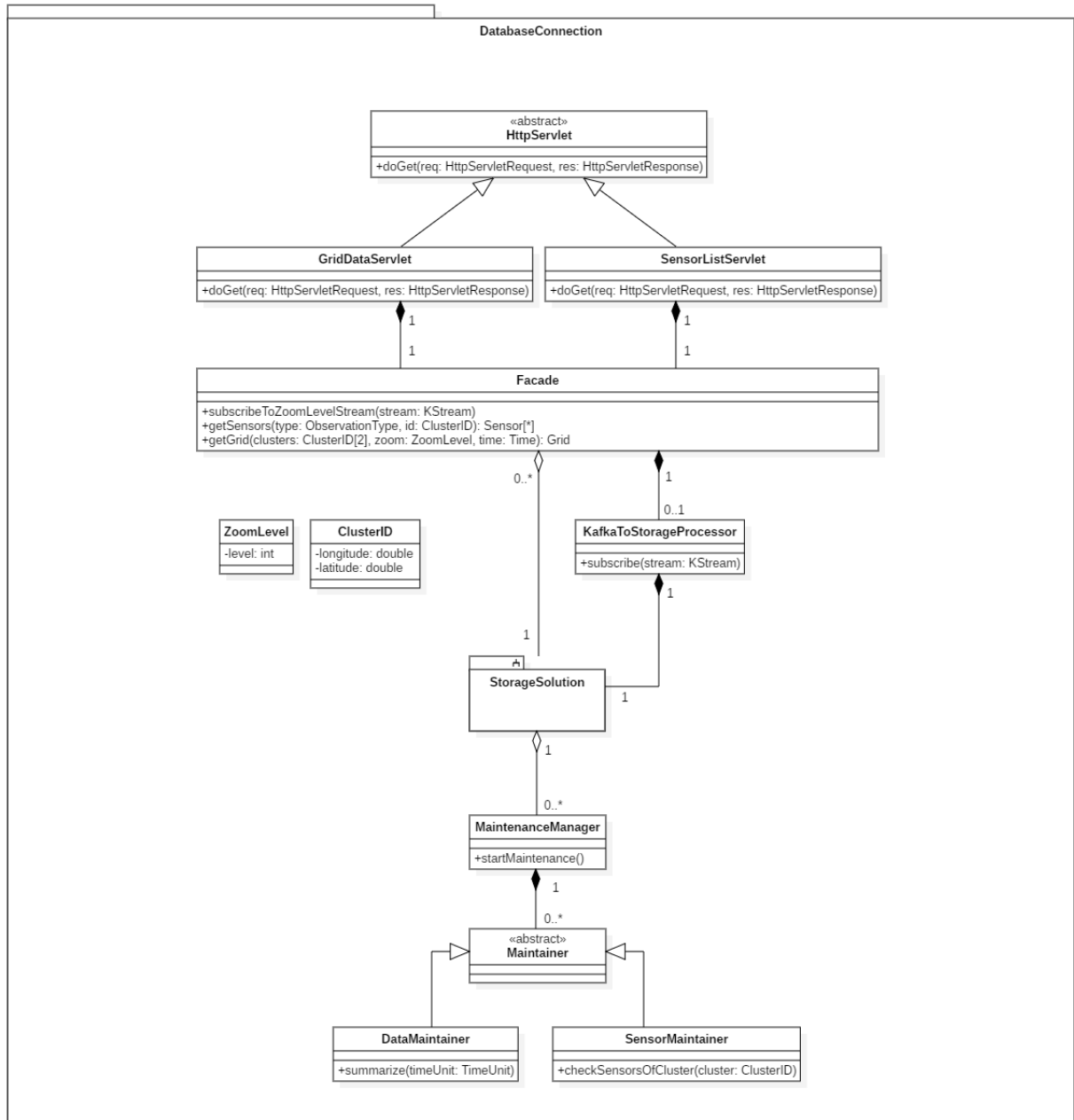
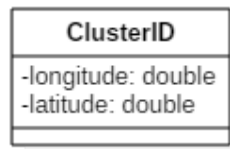


Abb. 7.1: Klassendiagramm Database

### 7.1.1 Class ClusterID

This class describes a unique identification of a cluster via longitude and latitude.



#### Declaration

```
public class ClusterID
    extends java.lang.Object
```

#### Constructor summary

**ClusterID()** Default constructor

#### Constructors

- **ClusterID**

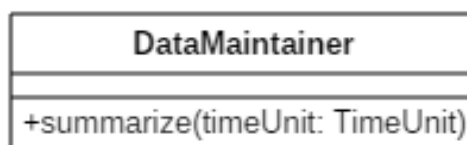
```
public ClusterID ()
```

#### – Description

Default constructor

### 7.1.2 Class DataMaintainer

This class maintains the sensordata in the StorageSolution.



**Declaration**

```
public class DataMaintainer
    extends DatabaseConnection.Maintainer
```

**Constructor summary**

**DataMaintainer()** Default constructor

**Method summary**

**summarize(TimeUnit)** This method takes data of a certain TimeUnit and summarizes it into the next higher TimeUnit.

**Constructors**

- **DataMaintainer**

```
public DataMaintainer()
```

- **Description**

Default constructor

**Methods**

- **summarize**

```
public void summarize(TimeUnit timeUnit)
```

- **Description**

This method takes data of a certain TimeUnit and summarizes it into the next higher TimeUnit. The summarized data is then saved back into the StorageSolution. The original data of the lower TimeUnit is then deleted from the database.

- **Parameters**

\* **timeUnit** – The TimeUnit to summarize.

**7.1.3 Class Facade**

A facade to simplify access to a StorageSolution, such as a database. Through the methods, data can be inserted into the StorageSolution and certain information about its content requested.

## Declaration

```
public class Facade
    extends java.lang.Object
```

## Constructor summary

**Facade()** Default constructor

## Method summary

**getGrid(ClusterID[], ZoomLevel, Time)** Returns an appropriate grid of clusters in the requested grid section for the specified ZoomLevel and time.

**getSensors(ObservationType, ClusterID)** Fetches all sensors from the given cluster that observe the given ObservedProperty and returns an array of sensors.

**subscribeToZoomLevelStream(KStream)** Subscribes to the given KafkaStream, which contains ZoomLevel-specific data and initiates processing of its records.

## Constructors

- **Facade**

```
public Facade()
```

- **Description**

Default constructor

## Methods

- **getGrid**

```
public Grid getGrid(ClusterID[] clusters, ZoomLevel zoom, Time time)
```

- **Description**

Returns an appropriate grid of clusters in the requested grid section for the specified ZoomLevel and time. The (first) two values of the ClusterID array define the grid section from which to get the data.

- **Parameters**

Facade
+subscribeToZoomLevelStream(stream: KStream) +getSensors(type: ObservationType, id: ClusterID): Sensor[*] +getGrid(clusters: ClusterID[2], zoom: ZoomLevel, time: Time): Grid

- \* **clusters** – An array of ClusterIDs from which the first two entries are taken to compute the section of the Grid to get the data from.
- \* **zoom** – The ZoomLevel from which to get the data.
- \* **time** – The point in time.
- **Returns** – A grid with the computed data.

- **getSensors**

```
public java.util.Set getSensors(ObservationType type, ClusterID id)
```

- **Description**

Fetches all sensors from the given cluster that observe the given ObservedProperty and returns an array of sensors.

- **Parameters**

- \* **type** – The ObservationType of the requested sensors.
- \* **id** – The ID of the cluster.

- **Returns** – An array of sensors.

- **subscribeToZoomLevelStream**

```
public void subscribeToZoomLevelStream(KStream stream)
```

- **Description**

Subscribes to the given KafkaStream, which contains ZoomLevel-specific data and initiates processing of its records.

- **Parameters**

- \* **stream** – The stream to subscribe to.

#### 7.1.4 Class GridDataServlet

An HttpServlet for requesting Grid data.



## Declaration

```
public class GridDataServlet
    extends DatabaseConnection.HttpServlet
```

## Constructor summary

**GridDataServlet()** Default constructor

## Method summary

**doGet(HttpServletRequestRequest, HttpServletResponse)** This method calls the getGrid method of the Facade to get a Grid of clusters at a certain ZoomLevel and Time .

## Constructors

- **GridDataServlet**

```
public GridDataServlet()
```

- **Description**

Default constructor

## Methods

- **doGet**

```
public void doGet(HttpServletRequestRequest req, HttpServletResponse res)
```

- **Description**

This method calls the getGrid method of the Facade to get a Grid of clusters at a certain ZoomLevel and Time . This saves the Grid into res.

- **Parameters**

- \* **req** – An HttpServletRequest object that contains the request the client has made of the servlet.
- \* **res** – An HttpServletResponse object that contains the response the servlet sends to the client.

## Members inherited from class HttpServlet

DatabaseConnection.HttpServlet (in 7.1.5, page 80)

- public void **doGet**(HttpServletRequest req, HttpServletResponse res)

### 7.1.5 Class HttpServlet

An abstract HttpServlet.



#### Declaration

```
public class HttpServlet
    extends java.lang.Object
```

#### All known subclasses

SensorListServlet (in 7.1.9, page 84), GridDataServlet (in 7.1.4, page 78)

#### Constructor summary

**HttpServlet()** Default constructor

#### Method summary

**doGet(HttpServletRequest, HttpServletResponse)** Called by the server (via the service method) to allow a servlet to handle a GET request.

#### Constructors

- **HttpServlet**

```
public HttpServlet()
```

- **Description**

Default constructor

#### Methods

- **doGet**

```
public void doGet(HttpServletRequest req, HttpServletResponse res)
```



– **Description**

Called by the server (via the service method) to allow a servlet to handle a GET request.

– **Parameters**

- \* **req** – An `HttpServletRequest` object that contains the request the client has made of the servlet.
- \* **res** – An `HttpServletResponse` object that contains the response the servlet sends to the client.

### 7.1.6 Class `KafkaToStorageProcessor`

This class converts `KafkaStream` records to data that can be inserted into the `StorageSolution`.



#### Declaration

```
public class KafkaToStorageProcessor
    extends java.lang.Object
```

#### Constructor summary

**KafkaToStorageProcessor()** Default constructor

#### Method summary

**subscribe(KStream)** Subscribes to the given `KafkaStream` and converts the data to the appropriate format for the `StorageSolution`.

#### Constructors

- **KafkaToStorageProcessor**

```
public KafkaToStorageProcessor()
```

– **Description**

Default constructor

## Methods

- **subscribe**

```
public void subscribe(KStream stream)
```

- **Description**

Subscribes to the given `KafkaStream` and converts the data to the appropriate format for the `StorageSolution`. If a stream is already subscribed to, unsubscribes from the old stream and subscribes to the new one.

- **Parameters**

- \* **stream** – The `KStream` to subscribe to.

### 7.1.7 Class Maintainer

An abstract class describing a `Maintainer`, which performs maintenance on certain data in the `StorageSolution`.



## Declaration

```
public class Maintainer
    extends java.lang.Object
```

## All known subclasses

`SensorMaintainer` (in 7.1.10, page 85), `DataMaintainer` (in 7.1.2, page 75)

## Constructor summary

`Maintainer()` Default constructor

## Constructors

- **Maintainer**

```
public Maintainer()
```

- **Description**

Default constructor

### 7.1.8 Class MaintenanceManager

This class manages the way the methods of Maintainers are called to make sure the StorageSolution content is maintained.



## Declaration

```
public class MaintenanceManager
    extends java.lang.Object
```

## Constructor summary

**MaintenanceManager()** Default constructor

## Method summary

**startMaintenance()** This method should be called as soon as the database is started.

## Constructors

- **MaintenanceManager**

```
public MaintenanceManager()
```

- **Description**

Default constructor

## Methods

- **startMaintenance**

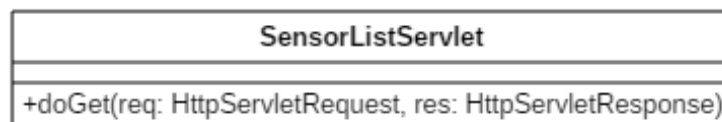
```
public void startMaintenance()
```

- **Description**

This method should be called as soon as the database is started. Through calls to instances of Maintainers, summarizes data in the database and deletes data that has become obsolete as a result of the summarization.

### 7.1.9 Class SensorListServlet

An HttpServlet for requesting a list of sensors.



## Declaration

```
public class SensorListServlet
    extends DatabaseConnection.HttpServlet
```

## Constructor summary

**SensorListServlet()** Default constructor

## Method summary

**doGet(HttpServletRequest, HttpServletResponse)** This method calls the `getSensors` method of the Facade to get a list of Sensors that are in a certain cluster.

## Constructors

- **SensorListServlet**

```
public SensorListServlet()
```

- **Description**

Default constructor

## Methods

- **doGet**

```
public void doGet(HttpServletRequest req, HttpServletResponse res)
```

- **Description**

This method calls the `getSensors` method of the Facade to get a list of Sensors that are in a certain cluster.

- **Parameters**

- \* **req** – An `HttpServletRequest` object that contains the request the client has made of the servlet.
    - \* **res** – An `HttpServletResponse` object that contains the response the servlet sends to the client.

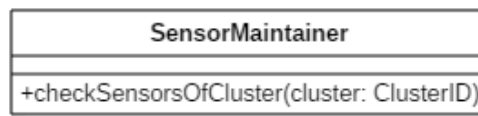
## Members inherited from class `HttpServlet`

`DatabaseConnection.HttpServlet` (in 7.1.5, page 80)

- `public void doGet(HttpServletRequest req, HttpServletResponse res)`

### 7.1.10 Class `SensorMaintainer`

This class maintains the list of sensors saved in the `StorageSolution`.



## Declaration

```
public class SensorMaintainer
    extends DatabaseConnection.Maintainer
```

## Constructor summary

`SensorMaintainer()` Default constructor

## Method summary

**checkSensorsOfCluster(ClusterID)** This method checks if the sensors registered to the given cluster are up to date.

## Constructors

- **SensorMaintainer**

```
public SensorMaintainer()
```

- **Description**

Default constructor

## Methods

- **checkSensorsOfCluster**

```
public void checkSensorsOfCluster(ClusterID cluster)
```

- **Description**

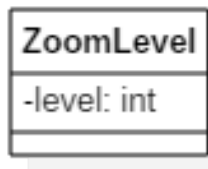
This method checks if the sensors registered to the given cluster are up to date. A sensor is up to date if data has been received from it in the last 24 hours. If this requirement is not met, the sensor is deleted from the database.

- **Parameters**

\* **cluster** – The cluster to check.

### 7.1.11 Class ZoomLevel

This class describes a zoom level for the map.



## Declaration

```
public class ZoomLevel
    extends java.lang.Object
```

## Constructor summary

**ZoomLevel()** Default constructor

**Constructors**

- **ZoomLevel**

```
public ZoomLevel()
```

- **Description**

- Default constructor

## 8 Graphite

### 8.1 Package DataTransferControl

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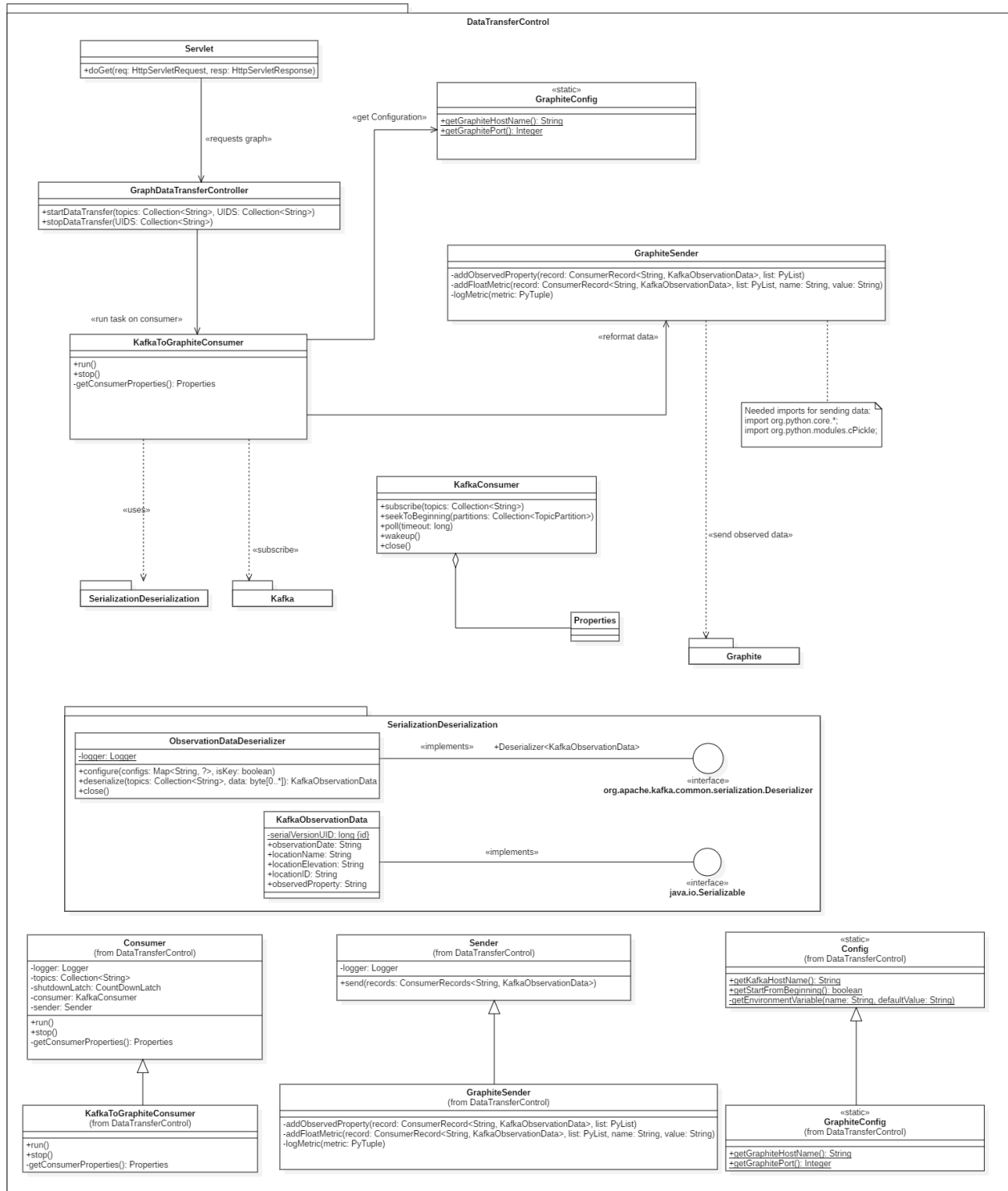


Abb. 8.1: Klassendiagramm Graphite

### 8.1.1 Class Collection

A Collection that stores multiple objects of one type

#### Declaration

```
public class Collection
    extends java.lang.Object
```

#### Constructor summary

**Collection()** Default constructor

#### Constructors

- **Collection**

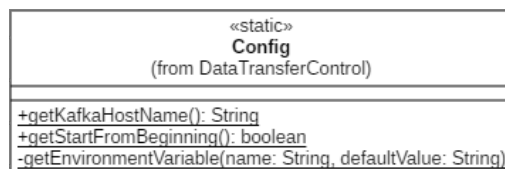
```
public Collection()
```

- **Description**

Default constructor

### 8.1.2 Class Config

The specified configuration-object that stores all needed configurations for the connection from Kafka to another specified component



#### Declaration

```
public class Config
    extends java.lang.Object
```

#### All known subclasses

GraphiteConfig (in 8.1.7, page 95)

#### Constructor summary

**Config()** Default constructor

**Method summary**

**getKafkaHostName()** Gets the Kafka-host-name

**getStartFromBeginning()** Returns whether a start from the beginning is required

**Constructors**

- **Config**

```
public Config()
```

- **Description**

Default constructor

**Methods**

- **getKafkaHostName**

```
public static java.lang.String getKafkaHostName()
```

- **Description**

Gets the Kafka-host-name

- **Returns** – The host-name of Kafka

- **getStartFromBeginning**

```
public static boolean getStartFromBeginning()
```

- **Description**

Returns whether a start from the beginning is required

- **Returns** – Tells us whether a start from the beginning is required

**8.1.3 Class Consumer**

Consumes data from Kafka

**Declaration**

```
public class Consumer
    extends java.lang.Object
```

**All known subclasses**

KafkaToGraphiteConsumer (in 8.1.10, page 99)

<b>Consumer</b> (from DataTransferControl)
-logger: Logger -topics: Collection<String> -shutdownLatch: CountDownLatch -consumer: KafkaConsumer -sender: Sender
+run() +stop() -getConsumerProperties(): Properties

### Constructor summary

**Consumer()** Default constructor

### Method summary

**run()** Starts the transferring-process

**stop()** Stops the transferring-process

### Constructors

- **Consumer**

**public Consumer()**

#### – Description

Default constructor

### Methods

- **run**

**public void run()**

#### – Description

Starts the transferring-process

- **stop**

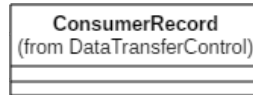
**public void stop()**

#### – Description

Stops the transferring-process

### 8.1.4 Class ConsumerRecord

One single record of data from Kafka



#### Declaration

```
public class ConsumerRecord
    extends java.lang.Object
```

#### Constructor summary

`ConsumerRecord()` Default constructor

#### Constructors

- `ConsumerRecord`

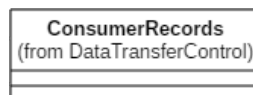
```
public ConsumerRecord()
```

#### – Description

Default constructor

### 8.1.5 Class ConsumerRecords

Multiple records of data from Kafka



#### Declaration

```
public class ConsumerRecords
    extends java.lang.Object
```

#### Constructor summary

`ConsumerRecords()` Default constructor

**Constructors**

- **ConsumerRecords**

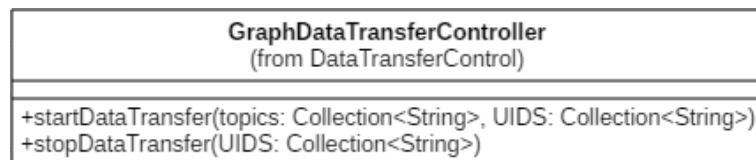
```
public ConsumerRecords()
```

- **Description**

Default constructor

**8.1.6 Class GraphDataTransferController**

The Control-Unit in charge of creating and destroying KafkaToGraphiteConsumer as well as passing on the users request.

**Declaration**

```
public class GraphDataTransferController
    extends java.lang.Object
```

**Constructor summary**

**GraphDataTransferController()** Default constructor

**Method summary**

**startDataTransfer(, )** Starts data-transfer  
**stopDataTransfer()** Stoppt den Datentransfer.

**Constructors**

- **GraphDataTransferController**

```
public GraphDataTransferController()
```

- **Description**

Default constructor

**Methods**

- **startDataTransfer**

```
public void startDataTransfer( Collection<String> topics , Collection<
    String> UIDS)
```

- **Description**

Starts data-transfer

- **Parameters**

- \* **topics** – Kafka-Topics that should be subscribed
- \* **UIDS** – The unique identifiers, that tell us which data should be transfered. Everything else will be ignored.

- **stopDataTransfer**

```
public void stopDataTransfer( Collection<String> UIDS)
```

- **Description**

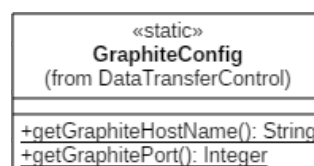
Stoppt den Datentransfer.

- **Parameters**

- \* **UIDS** – The unique identifiers, that tell us which data should no longer be transfered. Everything else will be ignored.

**8.1.7 Class GraphiteConfig**

The specified configuration-object that stores all needed configurations for the connection from Kafka to Graphite

**Declaration**

```
public class GraphiteConfig
    extends DataTransferControl.Config
```

**Constructor summary**

**GraphiteConfig()** Default constructor

**Method summary**

**getGraphiteHostName()** Returns the host-name of Graphite  
**getGraphitePort()** Returns the port of the Graphite-connection

**Constructors**

- **GraphiteConfig**

```
public GraphiteConfig()
```

- **Description**

Default constructor

**Methods**

- **getGraphiteHostName**

```
public static java.lang.String getGraphiteHostName()
```

- **Description**

Returns the host-name of Graphite

- **Returns** – The Graphite-host-name

- **getGraphitePort**

```
public static java.lang.Integer getGraphitePort()
```

- **Description**

Returns the port of the Graphite-connection

- **Returns** – The port of the Graphite-connection

**Members inherited from class Config**

`DataTransferControl.Config` (in 8.1.2, page 90)

- `public static String getKafkaHostName()`
- `public static boolean getStartFromBeginning()`

**8.1.8 Class GraphiteSender**

Reformats the data and sends it to Graphite



<b>GraphiteSender</b> (from DataTransferControl)
-addObservedProperty(record: ConsumerRecord<String, KafkaObservationData>, list: PyList) -addFloatMetric(record: ConsumerRecord<String, KafkaObservationData>, list: PyList, name: String, value: String) -logMetric(metric: PyTuple)

## Declaration

```
public class GraphiteSender
  extends DataTransferControl.Sender
```

## Constructor summary

**GraphiteSender()** Default constructor

## Constructors

- **GraphiteSender**

```
public GraphiteSender()
```

### – Description

Default constructor

## Members inherited from class Sender

**DataTransferControl.Sender** (in 8.1.12, page 101)

- **public void send( records)**

## 8.1.9 Class KafkaConsumer

The Kafka Consumer is described in Apache-Kafka and will only be included in this diagram for a better understanding of the required functionality.

<b>KafkaConsumer</b> (from DataTransferControl)
+subscribe(topics: Collection<String>) +seekToBeginning(partitions: Collection<TopicPartition>) +poll(timeout: long) +wakeup() +close()

## Declaration

```
public class KafkaConsumer
    extends java.lang.Object
```

## Constructor summary

**KafkaConsumer()** Default constructor

## Method summary

**close()** Closes the KafkaConsumer

**poll(long)** Gathers the data

**seekToBeginning()** Jumps to the beginning of an existing record

**subscribe()** The Consumer subscribes Kafka-Topics.

**wakeup()** Wakes up the KafkaConsumer, which then stops any current requests.

## Constructors

- **KafkaConsumer**

```
public KafkaConsumer()
```

- **Description**

Default constructor

## Methods

- **close**

```
public void close()
```

- **Description**

Closes the KafkaConsumer

- **poll**

```
public void poll(long timeout)
```

- **Description**

Gathers the data

- **Parameters**

\* **timeout** – A timeframe, limiting the longest possible duration of the poll request

- **seekToBeginning**

```
public void seekToBeginning(Collection<TopicPartition> partitions)
```

- **Description**

Jumps to the beginning of an existing record

- **Parameters**

- \* **partitions** – Kafka-Partitions

- **subscribe**

```
public void subscribe(Collection<String> topics)
```

- **Description**

The Consumer subscribes Kafka-Topics.

- **Parameters**

- \* **topics** – Kafka-Topics that should be subscribed

- **wakeup**

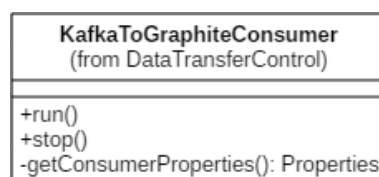
```
public void wakeup()
```

- **Description**

Wakes up the KafkaConsumer, which then stops any current requests. Useful to limit polls in general.

### 8.1.10 Class KafkaToGraphiteConsumer

Receives the data from Kafka and sends it to Graphite



## Declaration

```
public class KafkaToGraphiteConsumer
    extends DataTransferControl.Consumer
```

## Constructor summary

**KafkaToGraphiteConsumer()** Default constructor

## Method summary

**run()** Starts the process of consumption and readying the sender object  
**stop()** Starts the process

## Constructors

- **KafkaToGraphiteConsumer**

```
public KafkaToGraphiteConsumer()
```

- **Description**

Default constructor

## Methods

- **run**

```
public void run()
```

- **Description**

Starts the process of consumption and readying the sender object

- **stop**

```
public void stop()
```

- **Description**

Starts the process

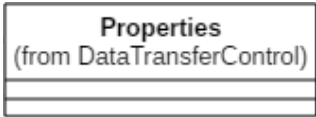
## Members inherited from class Consumer

`DataTransferControl.Consumer` (in 8.1.3, page 91)

- `public void run()`
- `public void stop()`

8.1.11 Class Properties

The Properties of the KafkaConsumer, using Java.Util.Properties



Declaration

```
public class Properties
    extends java.lang.Object
```

Constructor summary

**Properties()** Default constructor

Constructors

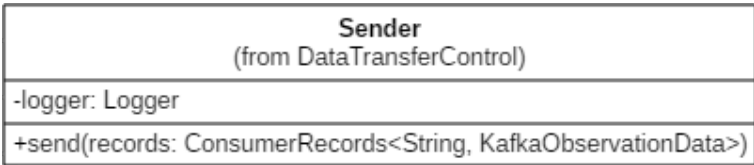
- **Properties**

```
public Properties()
```

- **Description**  
Default constructor

8.1.12 Class Sender

Reformats the data and sends it to another component



Declaration

```
public class Sender
    extends java.lang.Object
```

All known subclasses

GraphiteSender (in 8.1.8, page 96)

**Constructor summary**

**Sender()** Default constructor

**Method summary**

**send()** Sends the resulting data to the specified component

**Constructors**

- **Sender**

```
public Sender()
```

- **Description**

Default constructor

**Methods**

- **send**

```
public void send(ConsumerRecords<String, KafkaObservationData>  
    records)
```

- **Description**

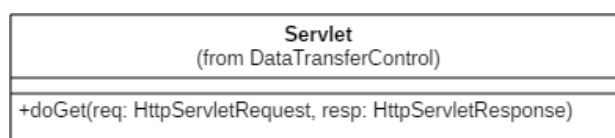
Sends the resulting data to the specified component

- **Parameters**

\* **records** – Multiple records of data from Kafka

**8.1.13 Class Servlet**

A Servlet, which accepts the user-requests from the webinterface and passes them on to the responsible structures



**Declaration**

```
public class Servlet
    extends java.lang.Object
```

**Constructor summary**

**Servlet()** Default constructor

**Method summary**

**doGet(HttpServletRequest, HttpServletResponse)** Receives the information of the data, that will be send back

**Constructors**

- **Servlet**

```
public Servlet()
```

- **Description**

Default constructor

**Methods**

- **doGet**

```
public void doGet(HttpServletRequest req, HttpServletResponse resp)
```

- **Description**

Receives the information of the data, that will be send back

- **Parameters**

- \* **req** – A http servlet request
- \* **resp** – A http servlet response

**8.2 Package DataTransferControl.SerializationDeserialization***Package Contents**Page***Classes**

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A serializable object that contains the observed data from kafka	
<b>ObservationDataDeserializer</b> .....	105
Deserializes KafkaObservationData objects	

### 8.2.1 Class `KafkaObservationData`

A serializable object that contains the observed data from kafka

<b>KafkaObservationData</b> (from Serialization & Deserialization)
<u>-serialVersionUID: long {id}</u> +observationDate: String +locationName: String +locationElevation: String +locationID: String +observedProperty: String

#### Declaration

```
public class KafkaObservationData  
    extends java.lang.Object implements java.io.Serializable
```

#### Field summary

**locationElevation** The height of the observations location  
**locationID** The id of the observations location  
**locationName** The name of the observations location  
**observationDate** The date of the observation  
**observedProperty** The observed property

#### Constructor summary

**KafkaObservationData()** Default constructor

#### Fields

- `public java.lang.String observationDate`
  - The date of the observation
- `public java.lang.String locationName`
  - The name of the observations location
- `public java.lang.String locationElevation`
  - The height of the observations location
- `public java.lang.String locationID`
  - The id of the observations location
- `public java.lang.String observedProperty`
  - The observed property



## Constructors

- **KafkaObservationData**

```
public KafkaObservationData ()
```

- **Description**

Default constructor

### 8.2.2 Class ObservationDataDeserializer

Deserializes KafkaObservationData objects

ObservationDataDeserializer (from Serialization & Deserialization)
<u>-logger: Logger</u>
+configure(configs: Map<String, ?>, isKey: boolean) +deserialize(topics: Collection<String>, data: byte[0..*]): KafkaObservationData +close()

## Declaration

```
public class ObservationDataDeserializer  
    extends java.lang.Object
```

## Constructor summary

**ObservationDataDeserializer()** Default constructor

## Method summary

**close()** Closes this object

**configure(Map, boolean)** Configures the deserializer

**deserialize(Collection, Set)** Deserializes an object

## Constructors

- **ObservationDataDeserializer**

```
public ObservationDataDeserializer ()
```

- **Description**

Default constructor

## Methods

- **close**

```
public void close()
```

- **Description**

Closes this object

- **configure**

```
public void configure(java.util.Map configs, boolean isKey)
```

- **Description**

Configures the deserializer

- **Parameters**

- \* **configs** – The Configuration

- \* **isKey** – A variable, telling us whether we want to configure the key or the value

- **deserialize**

```
public KafkaObservationData deserialize(java.util.Collection topics,  
    java.util.Set data)
```

- **Description**

Deserializes an object

- **Parameters**

- \* **topics** – Kafka-Topics that should be subscribed

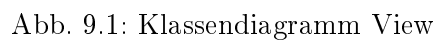
- \* **data** – These are our serialized bytes

- **Returns** – A serializable object that contains the observed data from kafka

## 9 View

### 9.1 Package Grid

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A Tile whose graphical representation consists of a shape, specified by an array of vertices.	
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A graphical structure that can be displayed on an AbstractMap.	



### 9.1.1 Class Cluster

Encapsulates multiple sensors into a single object by using their specific SensorIDs and provides a graphical representation of their values average by using a Tile.

Cluster
-clusterId: ClusterID -sensorIds: SensorID[1..*] -observedProperty: ObservedProperty -tile: Tile
+getClusterId(): ClusterID +setSensorIds(sensorIds: SensorID[1..*]) +getSensorIds(): SensorID[1..*] +setObservedProperty(observedProperty: ObservedProperty) +getObservedProperty(): ObservedProperty +getTile(): Tile

#### Declaration

```
public class Cluster
    extends java.lang.Object
```

#### Constructor summary

**Cluster()** Default constructor

#### Method summary

**getClusterId()** Get the ClusterID of this Cluster.  
**getObservedProperty()** Get the ObservedProperty of this Cluster.  
**getSensorIds()** Get all SensorIDs of the sensors contained in this cluster.  
**getTile()** Get the Tile of this Cluster.  
**setObservedProperty(ObservedProperty)** Set the ObservedProperty of this Cluster.  
**setSensorIds(Set)** Set the SensorIDs of the sensors contained in this cluster.

#### Constructors

- **Cluster**

```
public Cluster()
```

##### – Description

Default constructor

**Methods**

- **getClusterId**

```
public ClusterID getClusterId()
```

- **Description**

- Get the ClusterID of this Cluster.

- **Returns** – the ClusterID of this Cluster.

- **getObservedProperty**

```
public ObservedProperty getObservedProperty()
```

- **Description**

- Get the ObservedProperty of this Cluster.

- **Returns** – the ObservedProperty of this Cluster.

- **getSensorIds**

```
public java.util.Set getSensorIds()
```

- **Description**

- Get all SensorIDs of the sensors contained in this cluster.

- **Returns** – all SensorIDs of the sensors contained in this cluster.

- **getTile**

```
public Tile getTile()
```

- **Description**

- Get the Tile of this Cluster.

- **Returns** – the Tile of this Cluster.

- **setObservedProperty**

```
public void setObservedProperty(ObservedProperty observedProperty)
```

- **Description**

- Set the ObservedProperty of this Cluster.

- **Parameters**

- \* `observedProperty` –

- **setSensorIds**

```
public void setSensorIds(java.util.Set sensorIds)
```

- **Description**

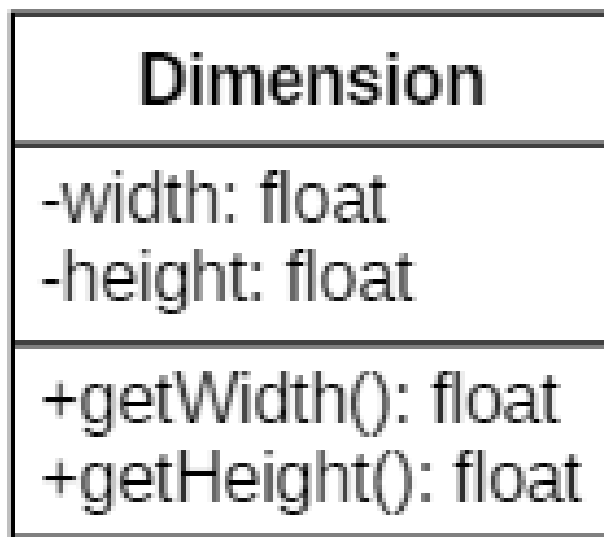
- Set the SensorIDs of the sensors contained in this cluster.

- **Parameters**

- \* `sensorIds` –

### 9.1.2 Class Dimension

Encapsulates the width and height of a component in float precision.



#### Declaration

```
public class Dimension
    extends java.lang.Object
```

#### Constructor summary

**Dimension()** Default constructor

**Method summary**

**getHeight()** Get the height of this Dimension.  
**getWidth()** Get the width of this Dimension.

**Constructors**

- **Dimension**

**public** Dimension()

- **Description**

Default constructor

**Methods**

- **getHeight**

**public float** getHeight()

- **Description**

Get the height of this Dimension.

- **Returns** – the height of this Dimension.

- **getWidth**

**public float** getWidth()

- **Description**

Get the width of this Dimension.

- **Returns** – the width of this Dimension.

**9.1.3 Class Grid**

Encapsulates multiple Clusters into a single object.

**Declaration**

```
public class Grid
    extends java.lang.Object
```

**Constructor summary**

**Grid()** Default constructor



**Method summary**

**getClusters()** Get all Clusters contained in this Grid.  
**selectClusters(Set)** Select Clusters contained in this Grid by using their specific ClusterIDs.  
**setClusters(Set)** Set the Clusters contained in this Grid.

**Constructors**

- **Grid**

```
public Grid()
```

- **Description**

Default constructor

**Methods**

- **getClusters**

```
public java.util.Set getClusters()
```

- **Description**

Get all Clusters contained in this Grid.

- **Returns** – all Clusters contained in this Grid.

- **selectClusters**

```
public java.util.Set selectClusters(java.util.Set ids)
```

- **Description**

Select Clusters contained in this Grid by using their specific ClusterIDs.

- **Parameters**

\* **ids** –

Grid
-clusters: Cluster[1..*]
+setClusters(clusters: Cluster[1..*]) +getClusters(): Cluster[1..*] +selectClusters(ids: ClusterID[1..*]): Cluster[1..*]

- **Returns** – selected Clusters contained in this Grid identified by their specific ClusterIDs.

- **setClusters**

```
public void setClusters(java.util.Set clusters)
```

- **Description**

Set the Clusters contained in this Grid.

- **Parameters**

- \* **clusters** –

#### 9.1.4 Class Image

Represents a graphical image.



##### Declaration

```
public class Image
    extends java.lang.Object
```

##### Constructor summary

**Image()** Default constructor

##### Constructors

- **Image**

```
public Image()
```

- **Description**

Default constructor

### 9.1.5 Class ImageTile

A Tile whose graphical representation consists of an image.



#### Declaration

```
public class ImageTile
    extends Grid.Tile
```

#### Constructor summary

**ImageTile()** Default constructor

#### Constructors

- **ImageTile**

```
public ImageTile ()
```

#### – Description

Default constructor

#### Members inherited from class Tile

**Grid.Tile** (in 9.1.7, page 117)

- protected **color**
- public void **display**(java.util.AbstractMap map)
- protected **opacity**
- protected **position**
- public void **setColor**(Color color)
- public void **setOpacity**(float opacity)
- public void **setPosition**(Point position)

### 9.1.6 Class ShapeTile

A Tile whose graphical representation consists of a shape, specified by an array of vertices.



#### Declaration

```
public class ShapeTile
    extends Grid.Tile
```

#### Constructor summary

**ShapeTile()** Default constructor

#### Constructors

- **ShapeTile**

```
public ShapeTile()
```

##### – Description

Default constructor

#### Members inherited from class Tile

**Grid.Tile** (in 9.1.7, page 117)

- protected **color**
- public void **display**(java.util.AbstractMap map)
- protected **opacity**
- protected **position**
- public void **setColor**(Color color)
- public void **setOpacity**(float opacity)
- public void **setPosition**(Point position)

### 9.1.7 Class Tile

A graphical structure that can be displayed on an `AbstractMap`.

#### Declaration

```
public class Tile
    extends java.lang.Object
```

#### All known subclasses

`ShapeTile` (in 9.1.6, page 116), `ImageTile` (in 9.1.5, page 115)

#### Field summary

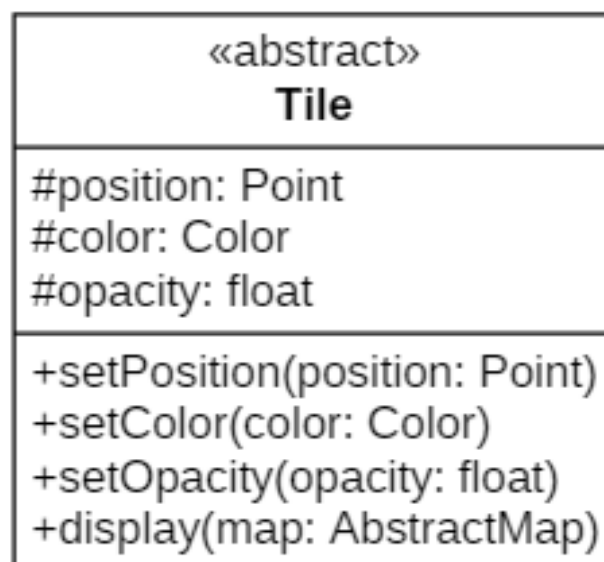
`color`  
`opacity`  
`position`

#### Constructor summary

`Tile()` Default constructor

#### Method summary

`display(AbstractMap)` Display this tile on the submitted map.  
`setColor(Color)` Set the color of this `Tile`.



**setOpacity(float)** Set the opacity of this Tile.  
**setPosition(Point)** Set the position of this Tile.

### Fields

- protected Point **position**
- protected Color **color**
- protected float **opacity**

### Constructors

- **Tile**

```
public Tile()
```

- **Description**

Default constructor

### Methods

- **display**

```
public void display(java.util.AbstractMap map)
```

- **Description**

Display this tile on the submitted map.

- **Parameters**

\* **map** –

- **setColor**

```
public void setColor(Color color)
```

- **Description**

Set the color of this Tile.

- **Parameters**

\* **color** –

- **setOpacity**

```
public void setOpacity(float opacity)
```

– **Description**

Set the opacity of this Tile.

– **Parameters**

\* `opacity` –

• **setPosition**

```
public void setPosition(Point position)
```

– **Description**

Set the position of this Tile.

– **Parameters**

\* `position` –

## 9.2 Package View

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An Implementation of AbstractViewFactory.	
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Initializes and runs the AbstractView.	

### 9.2.1 Class AbstractView

Encapsulates all ViewComponents created by the AbstractViewFactory into a single object.

## Declaration

```
public class AbstractView
    extends java.lang.Object
```

## All known subclasses

View (in 9.2.3, page 125)

## Constructor summary

**AbstractView()** Default constructor

## Method summary

**getExportOptionPanel()** Get the AbstractExportOptionPanel.  
**getGraph()** Get the AbstractGraph.  
**getGraphOptionPanel()** Get the AbstractGraphOptionPanel.  
**getMap()** Get the AbstractMap.  
**getMapOptionPanel()** Get the AbstractMapOptionPanel.  
**getSensorOptionPanel()** Get the AbstractSensorOptionPanel.  
**getSensorTable()** Get the AbstractSensorTable.  
**getTimeOptionPanel()** Get the AbstractTimeOptionPanel.

## Constructors

- **AbstractView**

```
public AbstractView()
```

### – Description

Default constructor

«abstract» <b>AbstractView</b>
#components: ViewComponent[1..*]
+getMap(): AbstractMap +getMapOptionPanel(): AbstractMapOptionPanel +getGraph(): AbstractGraph +getGraphOptionPanel(): AbstractGraphOptionPanel +getSensorOptionPanel(): AbstractSensorOptionPanel +getSensorTable(): AbstractSensorTable +getTimeOptionPanel(): AbstractTimeOptionPanel +getExportOptionPanel(): AbstractExportOptionPanel



**Methods**

- **getExportOptionPanel**

```
public AbstractExportOptionPanel getExportOptionPanel()
```

- **Description**

- Get the AbstractExportOptionPanel.

- **Returns** – the AbstractExportOptionPanel.

- **getGraph**

```
public AbstractGraph getGraph()
```

- **Description**

- Get the AbstractGraph.

- **Returns** – the AbstractGraph.

- **getGraphOptionPanel**

```
public AbstractGraphOptionPanel getGraphOptionPanel()
```

- **Description**

- Get the AbstractGraphOptionPanel.

- **Returns** – the AbstractGraphOptionPanel.

- **getMap**

```
public java.util.AbstractMap getMap()
```

- **Description**

- Get the AbstractMap.

- **Returns** – the AbstractMap.

- **getMapOptionPanel**

```
public AbstractMapOptionPanel getMapOptionPanel()
```

- **Description**

- Get the AbstractMapOptionPanel.

- **Returns** – the AbstractMapOptionPanel.

- **getSensorOptionPanel**

```
public AbstractSensorOptionPanel getSensorOptionPanel()
```

- **Description**  
Get the AbstractSensorOptionPanel.
- **Returns** – the AbstractSensorOptionPanel.

- **getSensorTable**

```
public AbstractSensorTable getSensorTable()
```

- **Description**  
Get the AbstractSensorTable.
- **Returns** – the AbstractSensorTable.

- **getTimeOptionPanel**

```
public AbstractTimeOptionPanel getTimeOptionPanel()
```

- **Description**  
Get the AbstractTimeOptionPanel.
- **Returns** – the AbstractTimeOptionPanel.

### 9.2.2 Class AbstractViewFactory

A factory for the creation of a View.

#### Declaration

```
public class AbstractViewFactory  
    extends java.lang.Object
```

#### All known subclasses

ViewFactory (in 9.2.5, page 127)

#### Constructor summary

**AbstractViewFactory()** Default constructor

## Method summary

**createExportOptionPanel()** Create an AbstractExportOptionPanel.  
**createGraph()** Create an AbstractGraph.  
**createGraphOptionPanel()** Create an AbstractGraphOptionPanel.  
**createMap()** Create an AbstractMap.  
**createMapOptionPanel()** Create an AbstractMapOptionPanel.  
**createSensorOptionPanel()** Create an AbstractSensorOptionPanel.  
**createSensorTable()** Create an AbstractSensorTable.  
**createTimeOptionPanel()** Create an AbstractTimeOptionPanel.

## Constructors

- **AbstractViewFactory**

```
public AbstractViewFactory ()
```

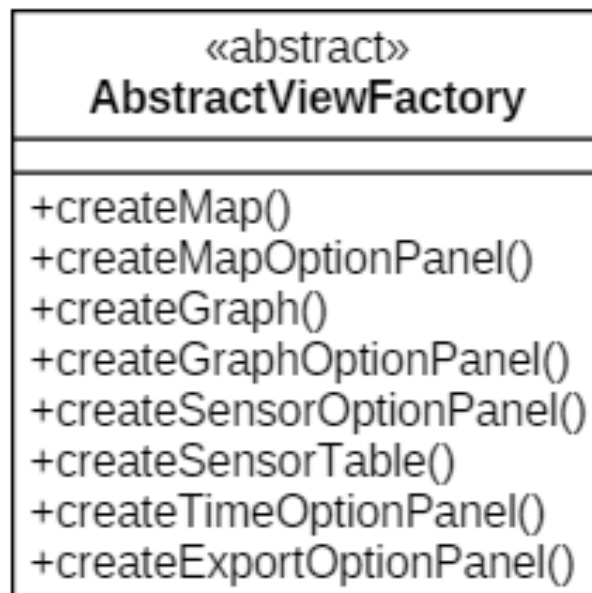
- **Description**

Default constructor

## Methods

- **createExportOptionPanel**

```
public void createExportOptionPanel()
```



- **Description**

Create an `AbstractExportOptionPanel`.

- **createGraph**

```
public void createGraph()
```

- **Description**

Create an `AbstractGraph`.

- **createGraphOptionPanel**

```
public void createGraphOptionPanel()
```

- **Description**

Create an `AbstractGraphOptionPanel`.

- **createMap**

```
public void createMap()
```

- **Description**

Create an `AbstractMap`.

- **createMapOptionPanel**

```
public void createMapOptionPanel()
```

- **Description**

Create an `AbstractMapOptionPanel`.

- **createSensorOptionPanel**

```
public void createSensorOptionPanel()
```

- **Description**

Create an `AbstractSensorOptionPanel`.

- **createSensorTable**

```
public void createSensorTable()
```

- **Description**

Create an `AbstractSensorTable`.

- **createTimeOptionPanel**

```
public void createTimeOptionPanel()
```

- **Description**

Create an `AbstractTimeOptionPanel`.

### 9.2.3 Class View

An implementation of `AbstractView`.



#### Declaration

```
public class View  
    extends View.AbstractView
```

#### Constructor summary

`View()` Default constructor

#### Constructors

- **View**

```
public View()
```

- **Description**

Default constructor

### Members inherited from class **AbstractView**

`View.AbstractView` (in 9.2.1, page 119)

- `public AbstractExportOptionPanel getExportOptionPanel()`
- `public AbstractGraph getGraph()`
- `public AbstractGraphOptionPanel getGraphOptionPanel()`
- `public AbstractMap getMap()`
- `public AbstractMapOptionPanel getMapOptionPanel()`
- `public AbstractSensorOptionPanel getSensorOptionPanel()`
- `public AbstractSensorTable getSensorTable()`
- `public AbstractTimeOptionPanel getTimeOptionPanel()`

### 9.2.4 Class **ViewComponent**

A view component which the View is made up of.



#### Declaration

```
public class ViewComponent
    extends java.lang.Object
```

#### Constructor summary

`ViewComponent()` Default constructor

#### Constructors

- **ViewComponent**

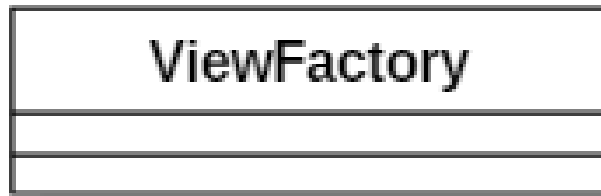
```
public ViewComponent()
```

##### – Description

Default constructor

### 9.2.5 Class ViewFactory

An Implementation of AbstractViewFactory.



#### Declaration

```
public class ViewFactory
    extends View.AbstractViewFactory
```

#### Constructor summary

**ViewFactory()** Default constructor

#### Constructors

- **ViewFactory**

```
public ViewFactory()
```

#### – Description

Default constructor

#### Members inherited from class AbstractViewFactory

View.AbstractViewFactory (in 9.2.2, page 122)

- public void **createExportOptionPanel()**
- public void **createGraph()**
- public void **createGraphOptionPanel()**
- public void **createMap()**
- public void **createMapOptionPanel()**
- public void **createSensorOptionPanel()**
- public void **createSensorTable()**
- public void **createTimeOptionPanel()**

### 9.2.6 Class ViewManager

Initializes and runs the AbstractView.

## Declaration

```
public class ViewManager
    extends java.lang.Object
```

## Constructor summary

**ViewManager()** Default constructor

## Method summary

**init()** Initializes the ViewManager by creating the View and its ViewComponents.

**run()** Run the View by looping the refresh method located in the AbstractTimeOption-Panel in your AbstractView.

## Constructors

- **ViewManager**

```
public ViewManager()
```

- **Description**

Default constructor

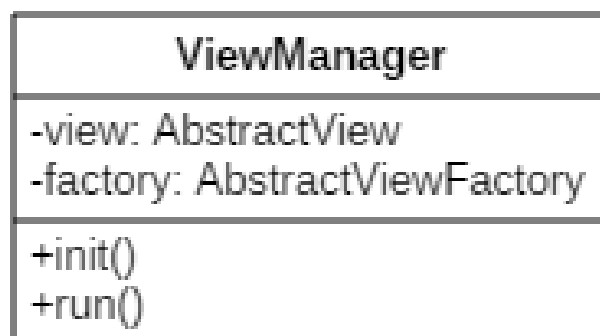
## Methods

- **init**

```
public void init()
```

- **Description**

Initializes the ViewManager by creating the View and its ViewComponents.





- **run**

```
public void run()
```

– **Description**

Run the View by looping the refresh method located in the AbstractTimeOptionPanel in your AbstractView.

## 9.3 Package View.ExportOption

*Package Contents*

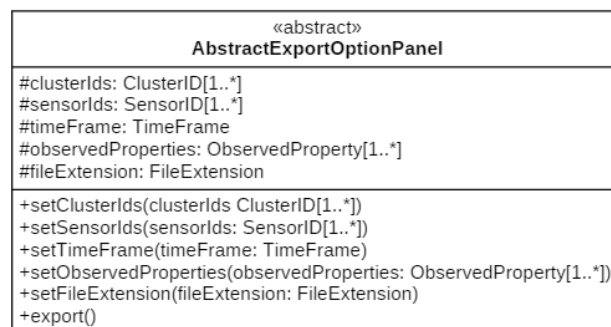
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### Classes

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A panel for handling user input, that deals with exporting datasets.	
<b>ExportOptionPanel</b> .....	132
An implementation of AbstractExportOptionPanel.	

### 9.3.1 Class AbstractExportOptionPanel

A panel for handling user input, that deals with exporting datasets. The user can select Clusters by their ClusterIDs, Sensors by their SensorIDs, a time frame, sensor types and a file format.



### Declaration

```
public class AbstractExportOptionPanel
    extends ViewComponent
```

### All known subclasses

ExportOptionPanel (in 9.3.2, page 132)

**Field summary**

**clusterIds**  
**fileExtension**  
**observedProperties**  
**sensorIds**  
**timeFrame**

**Constructor summary**

**AbstractExportOptionPanel()** Default constructor

**Method summary**

**export()** Request an export with the given parameters.  
**mapUpdate()**  
**sensorOptionUpdate()** Update the observer with the current SensorOptionPanel state.  
**setClusterIds(Set)** Set the ClusterIDs.  
**setFileExtension(FileExtension)** Set the ExportFormat.  
**setObservedProperties(Set)** Set the SensorTypes.  
**setSensorIds(Set)** Set the SensorIDs.  
**setTimeFrame(TimeFrame)** Set the TimeFrame.  
**timeOptionUpdate()** Update the observer with the current TimeOptionPanel state.

**Fields**

- protected java.util.Set **clusterIds**
- protected java.util.Set **sensorIds**
- protected TimeFrame **timeFrame**
- protected java.util.Set **observedProperties**
- protected FileExtension **fileExtension**

**Constructors**

- **AbstractExportOptionPanel**

**public** AbstractExportOptionPanel()

– **Description**

Default constructor

**Methods**

- **export**

```
public void export()
```

- **Description**

Request an export with the given parameters.

- **mapUpdate**

```
public void mapUpdate()
```

- **sensorOptionUpdate**

```
public void sensorOptionUpdate()
```

- **Description**

Update the observer with the current SensorOptionPanel state.

- **setClusterIds**

```
public void setClusterIds(java.util.Set clusterIds)
```

- **Description**

Set the ClusterIDs.

- **Parameters**

- \* `clusterIds` –

- **setFileExtension**

```
public void setFileExtension(FileExtension fileExtension)
```

- **Description**

Set the ExportFormat.

- **Parameters**

- \* `fileExtension` –

- **setObservedProperties**

```
public void setObservedProperties(java.util.Set observedProperties)
```

- **Description**

Set the SensorTypes.

- **Parameters**

- \* `observedProperties` –

- **setSensorIds**

```
public void setSensorIds(java.util.Set sensorIds)
```

- **Description**

Set the SensorIDs.

- **Parameters**

- \* `sensorIds` –

- **setTimeFrame**

```
public void setTimeFrame(TimeFrame timeFrame)
```

- **Description**

Set the TimeFrame.

- **Parameters**

- \* `timeFrame` –

- **timeOptionUpdate**

```
public void timeOptionUpdate()
```

- **Description**

Update the observer with the current TimeOptionPanel state.

### 9.3.2 Class `ExportOptionPanel`

An implementation of `AbstractExportOptionPanel`.

## Declaration

```
public class ExportOptionPanel
    extends View.ExportOption.AbstractExportOptionPanel
```

## Constructor summary

**ExportOptionPanel()** Default constructor

## Constructors

- **ExportOptionPanel**

```
public ExportOptionPanel()
```

### – Description

Default constructor

## Members inherited from class AbstractExportOptionPanel

View.ExportOption.AbstractExportOptionPanel (in 9.3.1, page 129)

- protected **clusterIds**
- public void **export()**
- protected **fileExtension**
- public void **mapUpdate()**
- protected **observedProperties**
- protected **sensorIds**
- public void **sensorOptionUpdate()**
- public void **setClusterIds**(java.util.Set **clusterIds**)
- public void **setFileExtension**(FileExtension **fileExtension**)
- public void **setObservedProperties**(java.util.Set **observedProperties**)
- public void **setSensorIds**(java.util.Set **sensorIds**)
- public void **setTimeFrame**(TimeFrame **timeFrame**)
- protected **timeFrame**
- public void **timeOptionUpdate()**



## 9.4 Package View.Graph

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An implementation of AbstractGraphOptionPanel.	

### 9.4.1 Interface GraphOptionPanelObserver

An observer that is meant to observe changes in the GraphOptionPanel.



#### Declaration

```
public interface GraphOptionPanelObserver
```

#### All known subinterfaces

GraphiteGraph (in 9.4.5, page 141), AbstractGraph (in 9.4.2, page 135)

#### All classes known to implement interface

AbstractGraph (in 9.4.2, page 135)

**Method summary**

**graphOptionUpdate()** Update the observer with the current GraphOptionPanel state.

**Methods**

- **graphOptionUpdate**

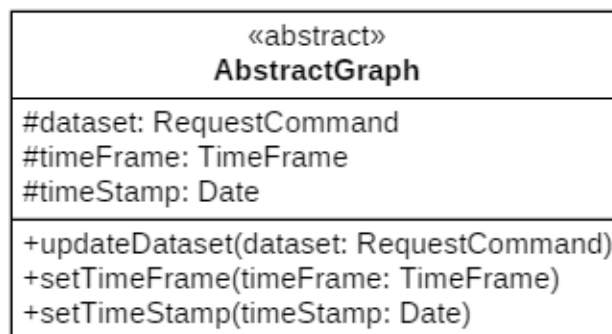
**void** graphOptionUpdate()

– **Description**

Update the observer with the current GraphOptionPanel state.

**9.4.2 Class AbstractGraph**

A graph that visualizes the data in its dataset.

**Declaration**

```
public class AbstractGraph  
    extends ViewComponent implements GraphOptionPanelObserver
```

**All known subclasses**

GraphiteGraph (in 9.4.5, page 141)

**Field summary**

dataset  
timeFrame  
timeStamp

### Constructor summary

**AbstractGraph()** Default constructor

### Method summary

**graphOptionUpdate()** Update the observer with the current GraphOptionPanel state.

**mapUpdate()**

**sensorOptionUpdate()** Update the observer with the current SensorOptionPanel state.

**setTimeFrame(TimeFrame)** Set the starting and end time point of the displayed dataset segment.

**setTimeStamp(Date)** Set a time stamp.

**timeOptionUpdate()** Update the observer with the current TimeOptionPanel state.

**updateDataset(RequestCommand)** Update the dataset of this AbstractGraph by giving it a new RequestCommand.

### Fields

- protected RequestCommand **dataset**
- protected TimeFrame **timeFrame**
- protected java.util.Date **timeStamp**

### Constructors

- **AbstractGraph**

**public AbstractGraph()**

– **Description**

Default constructor

### Methods

- **graphOptionUpdate**

**public void graphOptionUpdate()**

– **Description**

Update the observer with the current GraphOptionPanel state.

- **mapUpdate**

**public void mapUpdate()**



- **sensorOptionUpdate**

```
public void sensorOptionUpdate()
```

- **Description**

Update the observer with the current SensorOptionPanel state.

- **setTimeFrame**

```
public void setTimeFrame(TimeFrame timeFrame)
```

- **Description**

Set the starting and end time point of the displayed dataset segment.

- **Parameters**

- \* `timeFrame` –

- **setTimeStamp**

```
public void setTimeStamp(java.util.Date timeStamp)
```

- **Description**

Set a time stamp.

- **Parameters**

- \* `timeStamp` –

- **timeOptionUpdate**

```
public void timeOptionUpdate()
```

- **Description**

Update the observer with the current TimeOptionPanel state.

- **updateDataset**

```
public void updateDataset(RequestCommand dataset)
```

- **Description**

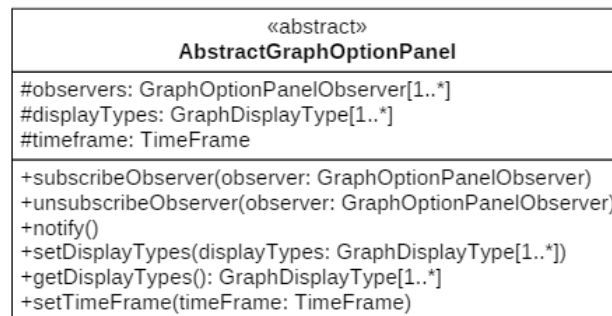
Update the dataset of this AbstractGraph by giving it a new RequestCommand.

- **Parameters**

- \* `dataset` –

### 9.4.3 Class AbstractGraphOptionPanel

A panel for handling user input, that deals with which time segment of the graphs dataset is being displayed, how that is done and notifying all observers about changes in its state.



#### Declaration

```
public class AbstractGraphOptionPanel
    extends ViewComponent
```

#### All known subclasses

GraphOptionPanel (in 9.4.6, page 142)

#### Field summary

**timeframe**

#### Constructor summary

**AbstractGraphOptionPanel()** Default constructor

#### Method summary

**getDisplayTypes()** Get the GraphDisplayTypes.

**notify()** Notify all subscribed GraphOptionPanelObservers about a change in this AbstractGraphOptionPanel.

**setDisplayTypes(Set)** Set the GraphDisplayTypes.

**setTimeFrame(TimeFrame)** Set the starting and end time point of the displayed dataset segment..

**subscribeObserver(GraphOptionPanelObserver)** Subscribe a GraphOptionPanelObserver to this AbstractGraphOptionPanel.

**unsubscribeObserver(GraphOptionPanelObserver)** Unsubscribe a GraphOptionPanelObserver from this AbstractGraphOptionPanel.

**Fields**

- `protected TimeFrame timeframe`

**Constructors**

- **AbstractGraphOptionPanel**

```
public AbstractGraphOptionPanel()
```

- **Description**

Default constructor

**Methods**

- **getDisplayTypes**

```
public java.util.Set getDisplayTypes()
```

- **Description**

Get the GraphDisplayTypes.

- **Returns** – the GraphDisplayTypes.

- **notify**

```
public void notify()
```

- **Description**

Notify all subscribed GraphOptionPanelObservers about a change in this AbstractGraphOptionPanel.

- **setDisplayTypes**

```
public void setDisplayTypes(java.util.Set displayTypes)
```

- **Description**

Set the GraphDisplayTypes.

- **Parameters**

\* `displayTypes` –

- **setTimeFrame**

```
public void setTimeFrame(TimeFrame timeFrame)
```

– **Description**

Set the starting and end time point of the displayed dataset segment..

– **Parameters**

\* `timeFrame` –

• **subscribeObserver**

```
public void subscribeObserver(GraphOptionPanelObserver observer)
```

– **Description**

Subscribe a `GraphOptionPanelObserver` to this `AbstractGraphOptionPanel`.

– **Parameters**

\* `observer` –

• **unsubscribeObserver**

```
public void unsubscribeObserver(GraphOptionPanelObserver observer)
```

– **Description**

Unsubscribe a `GraphOptionPanelObserver` from this `AbstractGraphOptionPanel`.

– **Parameters**

\* `observer` –

#### 9.4.4 Class `GraphDisplayType`

The display type of a graph.



**Declaration**

```
public class GraphDisplayType
    extends java.lang.Object
```

**Constructor summary**

**GraphDisplayType()** Default constructor

**Constructors**

- **GraphDisplayType**

```
public GraphDisplayType()
```

– **Description**

Default constructor

**9.4.5 Class GraphiteGraph**

An AbstractGraph that uses the Graphite API.

**Declaration**

```
public class GraphiteGraph
    extends View.Graph.AbstractGraph
```

**Constructor summary**

**GraphiteGraph()** Default constructor

## Constructors

- **GraphiteGraph**

```
public GraphiteGraph()
```

- **Description**

Default constructor

## Members inherited from class AbstractGraph

View.Graph.AbstractGraph (in 9.4.2, page 135)

- protected **dataset**
- public void **graphOptionUpdate()**
- public void **mapUpdate()**
- public void **sensorOptionUpdate()**
- public void **setTimeFrame(TimeFrame timeFrame)**
- public void **setTimeStamp(java.util.Date timeStamp)**
- protected **timeFrame**
- public void **timeOptionUpdate()**
- protected **timeStamp**
- public void **updateDataset(RequestCommand dataset)**

### 9.4.6 Class GraphOptionPanel

An implementation of AbstractGraphOptionPanel.



## Declaration

```
public class GraphOptionPanel
    extends View.Graph.AbstractGraphOptionPanel
```

## Constructor summary

**GraphOptionPanel()** Default constructor

## Constructors

- **GraphOptionPanel**

```
public GraphOptionPanel()
```

- **Description**

Default constructor

## Members inherited from class AbstractGraphOptionPanel

View.Graph.AbstractGraphOptionPanel (in 9.4.3, page 138)

- public Set **getDisplayTypes()**
- public void **notify()**
- public void **setDisplayTypes(java.util.Set displayTypes)**
- public void **setTimeFrame(TimeFrame timeFrame)**
- public void **subscribeObserver(GraphOptionPanelObserver observer)**
- protected **timeframe**
- public void **unsubscribeObserver(GraphOptionPanelObserver observer)**

## 9.5 Package View.Map

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The type of a tile.	

### 9.5.1 Interface MapObserver



#### Declaration

```
public interface MapObserver
```

#### Method summary

```
    mapUpdate()
```

#### Methods

- `mapUpdate`

```
    void mapUpdate()
```

### 9.5.2 Interface MapOptionPanelObserver

An observer that is meant to observe changes in the `MapOptionPanel`.





**Declaration**

```
public interface MapOptionPanelObserver
```

**All known subinterfaces**

LeafletMap (in 9.5.5, page 152), AbstractMap (in 9.5.3, page 145)

**All classes known to implement interface**

AbstractMap (in 9.5.3, page 145)

**Method summary**

**mapOptionUpdate()** Update the observer with the current MapOptionPanel state.

**Methods**

- **mapOptionUpdate**

```
void mapOptionUpdate()
```

- **Description**

Update the observer with the current MapOptionPanel state.

**9.5.3 Class AbstractMap**

A world map with displayable and hideable MapLayers, move and zoom function. It notifies its observers about changes in its state.

**Declaration**

```
public class AbstractMap
    extends ViewComponent implements MapOptionPanelObserver
```

**All known subclasses**

LeafletMap (in 9.5.5, page 152)

**Field summary**

```
dataset
position
timeStamp
zoom
```

## Constructor summary

**AbstractMap()** Default constructor

## Method summary

**addLayer(MapLayer)** Add a MapLayer.  
**displayLayer(MapLayer)** Display a MapLayer.  
**hideLayer(MapLayer)** Hide a MapLayer.  
**mapOptionUpdate()** Update the observer with the current MapOptionPanel state.  
**notify()** Notify all subscribed MapObservers about a change in this AbstractMap.  
**removeLayer(MapLayer)** Remove a MapLayer.  
**sensorOptionUpdate()** Update the observer with the current SensorOptionPanel state.  
**setPosition(Point)** Set the center position of the AbstractMap.  
**setTimeStamp(Date)** Set a time stamp and display the data from the dataset at the specified point in time.  
**setZoom(int)** Set the zoom level of this AbstractMap.  
**subscribeObserver(MapObserver)** Subscribe a MapObserver to this AbstractMap.  
**timeOptionUpdate()** Update the observer with the current TimeOptionPanel state.  
**unsubscribeObserver(MapObserver)** Unsubscribe a MapObserver from this AbstractMap.  
**updateDataset(RequestCommand)** Update the dataset of this AbstractMap by giving it a new RequestCommand.

## Fields

- protected RequestCommand **dataset**

«abstract» <b>AbstractMap</b>
#observers: MapObserver[1..*] #dataset: RequestCommand #timeStamp: Date #layers: MapLayer[1..*] #position: Point #zoom: int
+subscribeObserver(observer: MapObserver) +unsubscribeObserver(observer: MapObserver) +notify() +updateDataset(dataset: RequestCommand) +setTimeStamp(timeStamp: Date) +addLayer(layer: MapLayer) +removeLayer(layer: MapLayer) +displayLayer(layer: MapLayer) +hideLayer(layer: MapLayer) +setPosition(point: Point) +setZoom(zoom: int)

- protected java.util.Date **timeStamp**
- protected Point **position**
- protected int **zoom**

### Constructors

- **AbstractMap**

```
public AbstractMap()
```

- **Description**

Default constructor

### Methods

- **addLayer**

```
public void addLayer(MapLayer layer)
```

- **Description**

Add a MapLayer.

- **Parameters**

\* **layer** –

- **displayLayer**

```
public void displayLayer(MapLayer layer)
```

- **Description**

Display a MapLayer.

- **Parameters**

\* **layer** –

- **hideLayer**

```
public void hideLayer(MapLayer layer)
```

- **Description**

Hide a MapLayer.

- **Parameters**

- \* `layer` –

- **mapOptionUpdate**

```
public void mapOptionUpdate()
```

- **Description**

- Update the observer with the current MapOptionPanel state.

- **notify**

```
public void notify()
```

- **Description**

- Notify all subscribed MapObservers about a change in this AbstractMap.

- **removeLayer**

```
public void removeLayer(MapLayer layer)
```

- **Description**

- Remove a MapLayer.

- **Parameters**

- \* `layer` –

- **sensorOptionUpdate**

```
public void sensorOptionUpdate()
```

- **Description**

- Update the observer with the current SensorOptionPanel state.

- **setPosition**

```
public void setPosition(Point point)
```

- **Description**

- Set the center position of the AbstractMap.

- **Parameters**

\* point —

- setTimeStamp

```
public void setTimeStamp(java.util.Date timeStamp)
```

- **Description**

Set a time stamp and display the data from the dataset at the specified point in time.

- Parameters

- \* timeStamp –

- `setZoom`

```
public void setZoom(int zoom)
```

- **Description**

Set the zoom level of this AbstractMap.

- Parameters

\* zoom —

- subscribeObserver

```
public void subscribeObserver(MapObserver observer)
```

- **Description**

Subscribe a MapObserver to this AbstractMap.

- Parameters

```
* observer -
```

- timeOptionUpdate

```
public void timeOptionUpdate()
```

– Description

Update the observer with the current TimeOptionPanel state.

- unsubscribeObserver

```
public void unsubscribeObserver(MapObserver observer)
```

- **Description**

Unsubscribe a MapObserver from this AbstractMap.

- **Parameters**

- \* **observer** –

- **updateDataset**

```
public void updateDataset(RequestCommand dataset)
```

- **Description**

Update the dataset of this AbstractMap by giving it a new RequestCommand.

- **Parameters**

- \* **dataset** –

#### 9.5.4 Class AbstractMapOptionPanel

A panel for handling user input, that deals with setting a new TileType and notifying its observers about the change.

«abstract» <b>AbstractMapOptionPanel</b>
#observers: MapOptionPanelObserver[1..*] #tileTypes: TileType[1..*]
+subscribeObserver(observer: MapOptionPanelObserver) +unsubscribeObserver(observer: MapOptionPanelObserver) +notify() +setTileTypes(tileTypes: TileType[1..*]) +getTileTypes(): TileType[1..*]

#### Declaration

```
public class AbstractMapOptionPanel
    extends ViewComponent
```

#### All known subclasses

MapOptionPanel (in 9.5.7, page 155)

#### Field summary

**observers**

**Constructor summary**

**AbstractMapOptionPanel()** Default constructor

**Method summary**

**getTileTypes()** Get the TileTypes.

**notify()** Notify all subscribed MapOptionPanelObservers about a change in this AbstractMapOptionPanel.

**setTileTypes(Set)** Set the TileTypes.

**subscribeObserver(MapOptionPanelObserver)** Subscribe a MapOptionPanelObserver to this AbstractMapOptionPanel.

**unsubscribeObserver(MapOptionPanelObserver)** Unsubscribe a MapOptionPanelObserver from this AbstractMapOptionPanel.

**Fields**

- `protected java.util.Set observers`

**Constructors**

- **AbstractMapOptionPanel**

**public** AbstractMapOptionPanel()

– **Description**

Default constructor

**Methods**

- **getTileTypes**

**public** java.util.Set getTileTypes()

– **Description**

Get the TileTypes.

– **Returns** – the TileTypes.

- **notify**

**public void** notify()

- **Description**

Notify all subscribed MapOptionPanelObservers about a change in this AbstractMapOptionPanel.

- **setTileTypes**

```
public void setTileTypes(java.util.Set tileTypes)
```

- **Description**

Set the TileTypes.

- **Parameters**

\* **tileTypes** –

- **subscribeObserver**

```
public void subscribeObserver(MapOptionPanelObserver observer)
```

- **Description**

Subscribe a MapOptionPanelObserver to this AbstractMapOptionPanel.

- **Parameters**

\* **observer** –

- **unsubscribeObserver**

```
public void unsubscribeObserver(MapOptionPanelObserver observer)
```

- **Description**

Unsubscribe a MapOptionPanelObserver from this AbstractMapOptionPanel.

- **Parameters**

\* **observer** –

### 9.5.5 Class LeafletMap

An AbstractMap that uses the Leaflet API.

#### Declaration

```
public class LeafletMap
    extends View.Map.AbstractMap
```

#### Constructor summary

**LeafletMap()** Default constructor



## Constructors

- **LeafletMap**

```
public LeafletMap()
```

- **Description**

Default constructor

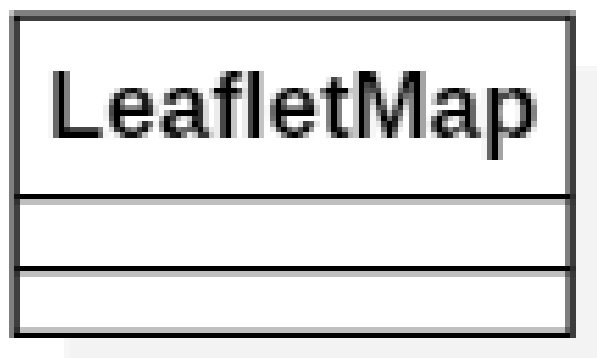
## Members inherited from class AbstractMap

View.Map.AbstractMap (in 9.5.3, page 145)

- public void **addLayer**(MapLayer layer)
- protected **dataset**
- public void **displayLayer**(MapLayer layer)
- public void **hideLayer**(MapLayer layer)
- public void **mapOptionUpdate**()
- public void **notify**()
- protected **position**
- public void **removeLayer**(MapLayer layer)
- public void **sensorOptionUpdate**()
- public void **setPosition**(Point point)
- public void **setTimeStamp**(java.util.Date timeStamp)
- public void **setZoom**(int zoom)
- public void **subscribeObserver**(MapObserver observer)
- public void **timeOptionUpdate**()
- protected **timeStamp**
- public void **unsubscribeObserver**(MapObserver observer)
- public void **updateDataset**(RequestCommand dataset)
- protected **zoom**

### 9.5.6 Class MapLayer

A map layer that can be displayed on an AbstractMap.



**Declaration**

```
public class MapLayer
    extends java.lang.Object
```

**Field summary**

layers

**Constructor summary**

**MapLayer()** Default constructor

**Method summary**

**getGrid()** Get the Grid of this MapLayer.  
**setGrid(Grid)** Set the grid of this MapLayer.

**Fields**

- protected AbstractMap layers

**Constructors**

- MapLayer

```
public MapLayer()
```

– **Description**

Default constructor

**Methods**

- getGrid

MapLayer
-grid: Grid
+setGrid(grid: Grid) +getGrid(): Grid

```
public Grid getGrid()
```

- **Description**

Get the Grid of this MapLayer.

- **Returns** – the Grid of this MapLayer.

- **setGrid**

```
public void setGrid(Grid grid)
```

- **Description**

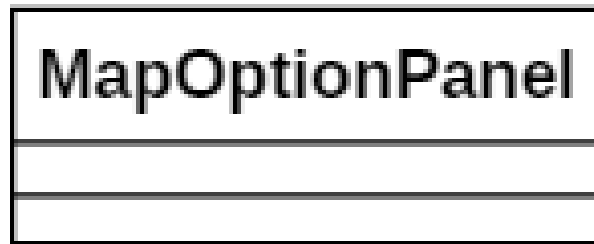
Set the grid of this MapLayer.

- **Parameters**

- \* **grid** –

### 9.5.7 Class MapOptionPanel

An implementation of AbstractMapOptionPanel.



#### Declaration

```
public class MapOptionPanel
    extends View.Map.AbstractMapOptionPanel
```

#### Constructor summary

**MapOptionPanel()** Default constructor

#### Constructors

- **MapOptionPanel**

```
public MapOptionPanel()
```

### – Description

Default constructor

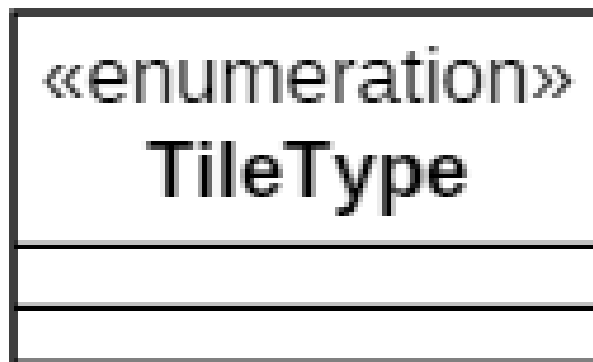
### Members inherited from class `AbstractMapOptionPanel`

`View.Map.AbstractMapOptionPanel` (in 9.5.4, page 150)

- `public Set getTileTypes()`
- `public void notify()`
- `protected observers`
- `public void setTileTypes(java.util.Set tileTypes)`
- `public void subscribeObserver(MapOptionPanelObserver observer)`
- `public void unsubscribeObserver(MapOptionPanelObserver observer)`

### 9.5.8 Class `TileType`

The type of a tile.



#### Declaration

```
public class TileType
    extends java.lang.Object
```

#### Field summary

`tileTypes`

#### Constructor summary

`TileType()` Default constructor

#### Fields

- `protected AbstractMapOptionPanel tileTypes`

**Constructors**

- **TileType**

```
public TileType ()
```

- **Description**

Default constructor

**9.6 Package View.SensorOption***Package Contents**Page***Interfaces**

**SensorOptionPanelObserver** ..... 157  
 An observer that is meant to observe changes in the SensorOptionPanel.

**Classes**

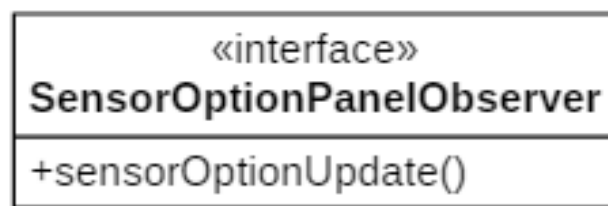
**AbstractSensorOptionPanel** ..... 158  
 A panel for handling user input, that deals with setting a new ObservedProperty and notifying its observers about changes.

**ObservedProperty** ..... 160  
 The data type measured by a sensor.

**SensorOptionPanel** ..... 161  
 An implementation of AbstractSensorOptionPanel.

**9.6.1 Interface SensorOptionPanelObserver**

An observer that is meant to observe changes in the SensorOptionPanel.

**Declaration**

```
public interface SensorOptionPanelObserver
```

**Method summary**

**sensorOptionUpdate()** Update the observer with the current SensorOptionPanel state.

**Methods**

- **sensorOptionUpdate**

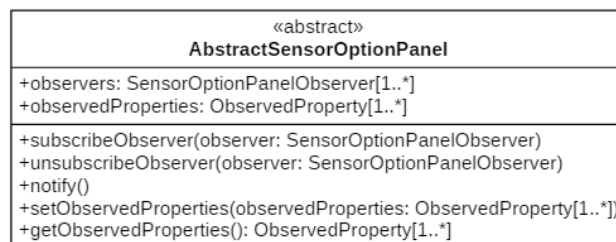
```
void sensorOptionUpdate()
```

– **Description**

Update the observer with the current SensorOptionPanel state.

**9.6.2 Class AbstractSensorOptionPanel**

A panel for handling user input, that deals with setting a new ObservedProperty and notifying its observers about changes.

**Declaration**

```
public class AbstractSensorOptionPanel  
    extends ViewComponent
```

**All known subclasses**

SensorOptionPanel (in 9.6.4, page 161)

**Constructor summary**

**AbstractSensorOptionPanel()** Default constructor

**Method summary**

**getObservedProperties()** Get the sensor types.

**notify()** Notify all subscribed SensorOptionPanelObservers about a change in this AbstractSensorOptionPanel.

**setObservedProperties(Set)** Set the sensor types.

**subscribeObserver(SensorOptionPanelObserver)** Subscribe a SensorOptionPanelObserver to this AbstractSensorOptionPanel.

**unsubscribeObserver(SensorOptionPanelObserver)** Unsubscribe a SensorOptionPanelObserver from this AbstractSensorOptionPanel.

## Constructors

- **AbstractSensorOptionPanel**

```
public AbstractSensorOptionPanel()
```

- **Description**

Default constructor

## Methods

- **getObservedProperties**

```
public java.util.Set getObservedProperties()
```

- **Description**

Get the sensor types.

- **Returns** – the sensor types.

- **notify**

```
public void notify()
```

- **Description**

Notify all subscribed SensorOptionPanelObservers about a change in this AbstractSensorOptionPanel.

- **setObservedProperties**

```
public void setObservedProperties(java.util.Set observedProperties)
```

- **Description**

Set the sensor types.

- **Parameters**

\* **observedProperties** –

- **subscribeObserver**

```
public void subscribeObserver(SensorOptionPanelObserver observer)
```

- **Description**

- Subscribe a SensorOptionPanelObserver to this AbstractSensorOptionPanel.

- **Parameters**

- \* **observer** –

- **unsubscribeObserver**

```
public void unsubscribeObserver(SensorOptionPanelObserver observer)
```

- **Description**

- Unsubscribe a SensorOptionPanelObserver from this AbstractSensorOptionPanel.

- **Parameters**

- \* **observer** –

### 9.6.3 Class ObservedProperty

The data type measured by a sensor.



#### Declaration

```
public class ObservedProperty
    extends java.lang.Object
```

#### Constructor summary

**ObservedProperty()** Default constructor



**Constructors**

- **ObservedProperty**

```
public ObservedProperty()
```

- **Description**

Default constructor

**9.6.4 Class SensorOptionPanel**

An implementation of AbstractSensorOptionPanel.

**Declaration**

```
public class SensorOptionPanel  
    extends View.SensorOption.AbstractSensorOptionPanel
```

**Constructor summary**

**SensorOptionPanel()** Default constructor

**Constructors**

- **SensorOptionPanel**

```
public SensorOptionPanel()
```

- **Description**

Default constructor

## Members inherited from class `AbstractSensorOptionPanel`

`View.SensorOption.AbstractSensorOptionPanel` (in 9.6.2, page 158)

- `public Set getObservedProperties()`
- `public void notify()`
- `public void setObservedProperties(java.util.Set observedProperties)`
- `public void subscribeObserver(SensorOptionPanelObserver observer)`
- `public void unsubscribeObserver(SensorOptionPanelObserver observer)`

## 9.7 Package `View.SensorTable`

*Package Contents*

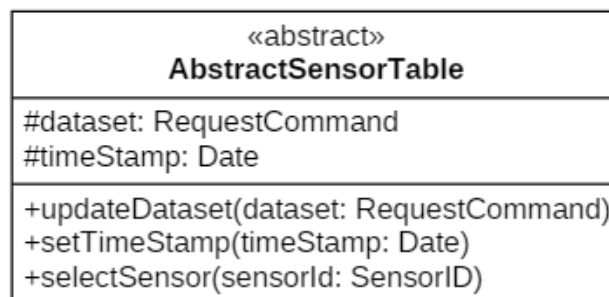
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An implementation of <code>AbstractSensorTable</code> .	

### 9.7.1 Class `AbstractSensorTable`

A table that visualizes the data in its dataset and enables the selection of a Sensor by using its `SensorID`.



### Declaration

```
public class AbstractSensorTable
    extends ViewComponent
```

### All known subclasses

`SensorTable` (in 9.7.2, page 164)

**Field summary**

`dataset`  
`timeStamp`

**Constructor summary**

**AbstractSensorTable()** Default constructor

**Method summary**

**mapUpdate()**  
**selectSensor(SensorID)** Select a sensor in the dataset by using its SensorID.  
**sensorOptionUpdate()** Update the observer with the current SensorOptionPanel state.  
**setTimeStamp(Date)** Set a time stamp and display the data from the dataset at the specified point in time.  
**timeOptionUpdate()** Update the observer with the current TimeOptionPanel state.  
**updateDataset(RequestCommand)** Update the dataset of this AbstractSensorTable by giving it a new RequestCommand.

**Fields**

- `protected RequestCommand dataset`
- `protected java.util.Date timeStamp`

**Constructors**

- **AbstractSensorTable**

`public AbstractSensorTable()`

– **Description**

Default constructor

**Methods**

- **mapUpdate**

`public void mapUpdate()`

- **selectSensor**

`public void selectSensor(SensorID sensorId)`

- **Description**

Select a sensor in the dataset by using its SensorID.

- **Parameters**

- \* `sensorId` –

- **sensorOptionUpdate**

```
public void sensorOptionUpdate()
```

- **Description**

Update the observer with the current SensorOptionPanel state.

- **setTimeStamp**

```
public void setTimeStamp(java.util.Date timeStamp)
```

- **Description**

Set a time stamp and display the data from the dataset at the specified point in time.

- **Parameters**

- \* `timeStamp` –

- **timeOptionUpdate**

```
public void timeOptionUpdate()
```

- **Description**

Update the observer with the current TimeOptionPanel state.

- **updateDataset**

```
public void updateDataset(RequestCommand dataset)
```

- **Description**

Update the dataset of this AbstractSensorTable by giving it a new RequestCommand.

- **Parameters**

- \* `dataset` –

### 9.7.2 Class SensorTable

An implementation of AbstractSensorTable.

## Declaration

```
public class SensorTable
    extends View.SensorTable.AbstractSensorTable
```

## Constructor summary

**SensorTable()** Default constructor

## Constructors

- **SensorTable**

```
public SensorTable()
```

### – Description

Default constructor

## Members inherited from class AbstractSensorTable

View.SensorTable.AbstractSensorTable (in 9.7.1, page 162)

- protected **dataset**
- public void **mapUpdate()**
- public void **selectSensor(SensorID sensorId)**
- public void **sensorOptionUpdate()**
- public void **setTimeStamp(java.util.Date timeStamp)**
- public void **timeOptionUpdate()**
- protected **timeStamp**
- public void **updateDataset(RequestCommand dataset)**



## 9.8 Package View.TimeOption

### Package Contents

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#### Interfaces

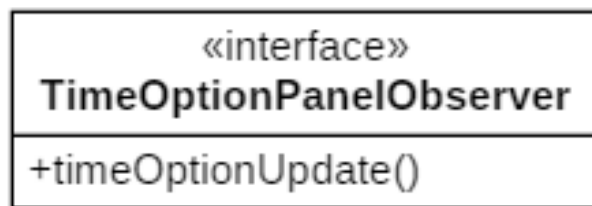
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Encapsulates the logic of switching between historical and live data mode and starting and stopping the loop mode.	
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A state	
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An implementation of AbstractTimeOptionPanel.	

### 9.8.1 Interface TimeOptionPanelObserver

An observer that is meant to observe changes in the TimeOptionPanel.



#### Declaration

**public interface** TimeOptionPanelObserver

**All known subinterfaces**

RefreshContext (in 9.8.7, page 178)

**All classes known to implement interface**

RefreshContext (in 9.8.7, page 178)

**Method summary**

**timeOptionUpdate()** Update the observer with the current TimeOptionPanel state.

**Methods**

- **timeOptionUpdate**

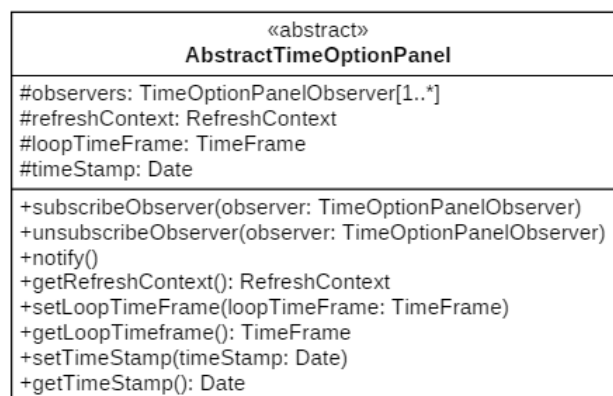
**void** timeOptionUpdate()

– **Description**

Update the observer with the current TimeOptionPanel state.

## 9.8.2 Class AbstractTimeOptionPanel

A panel for handling user input, that deals with timing options and notifying its observers about changes in its state.



## Declaration

```
public class AbstractTimeOptionPanel
    extends ViewComponent
```

## All known subclasses

TimeOptionPanel (in 9.8.9, page 183)

## Field summary

```
    loopTimeFrame
    refreshConfig
    timeStamp
```

## Constructor summary

**AbstractTimeOptionPanel()** Default constructor

## Method summary

```
getLoopTimeframe() Get the loop time frame.
getRefreshContext() Get the RefreshContext.
getTimeStamp() Get the time stamp.
notify() Notify all subscribed TimeOptionPanelObservers about a change in this AbstractTimeOptionPanel.
setLoopTimeFrame(TimeFrame) Set the start and end time point of the loop.
setTimeStamp(Date) Set the time stamp.
subscribeObserver(TimeOptionPanelObserver) Subscribe a TimeOptionPanelObserver to this AbstractTimeOptionPanel.
unsubscribeObserver(TimeOptionPanelObserver) Unsubscribe a TimeOptionPanelObserver from this AbstractTimeOptionPanel.
```

## Fields

- protected TimeFrame **loopTimeFrame**
- protected java.util.Date **timeStamp**
- protected RefreshConfiguration **refreshConfig**

## Constructors

- **AbstractTimeOptionPanel**

```
public AbstractTimeOptionPanel()
```



- **Description**

Default constructor

## Methods

- **getLoopTimeframe**

```
public TimeFrame getLoopTimeframe()
```

- **Description**

Get the loop time frame.

- **Returns** – the loop time frame.

- **getRefreshContext**

```
public RefreshContext getRefreshContext()
```

- **Description**

Get the RefreshContext.

- **Returns** – the RefreshContext.

- **getTimeStamp**

```
public java.util.Date getTimeStamp()
```

- **Description**

Get the time stamp.

- **Returns** – the time stamp.

- **notify**

```
public void notify()
```

- **Description**

Notify all subscribed TimeOptionPanelObservers about a change in this AbstractTimeOptionPanel.

- **setLoopTimeFrame**

```
public void setLoopTimeFrame(TimeFrame loopTimeFrame)
```

- **Description**

Set the start and end time point of the loop.

- **Parameters**

- \* `loopTimeFrame` –

- **setTimeStamp**

```
public void setTimeStamp(java.util.Date timeStamp)
```

- **Description**

Set the time stamp.

- **Parameters**

- \* `timeStamp` –

- **subscribeObserver**

```
public void subscribeObserver(TimeOptionPanelObserver observer)
```

- **Description**

Subscribe a `TimeOptionPanelObserver` to this `AbstractTimeOptionPanel`.

- **Parameters**

- \* `observer` –

- **unsubscribeObserver**

```
public void unsubscribeObserver(TimeOptionPanelObserver observer)
```

- **Description**

Unsubscribe a `TimeOptionPanelObserver` from this `AbstractTimeOptionPanel`.

- **Parameters**

- \* `observer` –

### 9.8.3 Class `HistoricalRefreshState`

In this state the refresh function simulates the historical data mode. The `timeStamp` parameter isn't altered and the currently selected dataset entries stay the same.

## Declaration

```
public class HistoricalRefreshState
    extends View.TimeOption.RefreshState
```

## Constructor summary

**HistoricalRefreshState()** Default constructor

## Method summary

**continueRoutine(RefreshContext)** Switch to loop mode.  
**liveDataMode(RefreshContext)** Switch to live data mode.  
**refresh(Date)** Returns the submitted time stamp without any change.

## Constructors

- **HistoricalRefreshState**

```
public HistoricalRefreshState()
```

- **Description**

Default constructor

## Methods

- **continueRoutine**

```
public void continueRoutine(RefreshContext context)
```

- **Description**

Switch to loop mode.

- **Parameters**

\* **context** –

- **liveDataMode**

HistoricalRefreshState
+liveDataMode(context: RefreshContext) +continueRoutine(context: RefreshContext) +refresh(timeStamp: Date): Date

```
public void liveDataMode(RefreshContext context)
```

– **Description**

Switch to live data mode.

– **Parameters**

\* `context` –

• **refresh**

```
public java.util.Date refresh(java.util.Date timeStamp)
```

– **Description**

Returns the submitted time stamp without any change.

– **Parameters**

\* `timeStamp` –

– **Returns** – the submitted time stamp without any change.

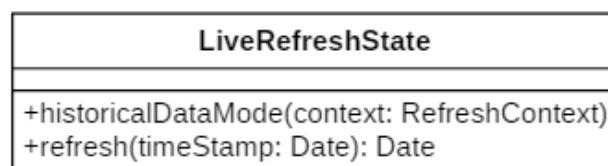
### Members inherited from class RefreshState

`View.TimeOption.RefreshState` (in 9.8.8, page 181)

- `public void continueRoutine(RefreshContext context)`
- `public void historicalDataMode(RefreshContext context)`
- `public void liveDataMode(RefreshContext context)`
- `public Date refresh(java.util.Date timeStamp)`
- `public void stopRoutine(RefreshContext context)`

### 9.8.4 Class LiveRefreshState

In this state the refresh function simulates the live data mode. Depending on the RefreshConfiguration the refresh function fetches live data. The timeStamp parameter isn't altered.



**Declaration**

```
public class LiveRefreshState
    extends View.TimeOption.RefreshState
```

**Constructor summary**

**LiveRefreshState()** Default constructor

**Method summary**

**historicalDataMode(RefreshContext)** Switch to historical data mode.  
**refresh(Date)** Fetch live data and return the most up-to-date time stamp.

**Constructors**

- **LiveRefreshState**

```
public LiveRefreshState()
```

- **Description**  
Default constructor

**Methods**

- **historicalDataMode**

```
public void historicalDataMode(RefreshContext context)
```

- **Description**  
Switch to historical data mode.
- **Parameters**
  - \* **context** –

- **refresh**

```
public java.util.Date refresh(java.util.Date timeStamp)
```

- **Description**  
Fetch live data and return the most up-to-date time stamp.
- **Parameters**
  - \* **timeStamp** –
- **Returns** – the most up-to-date time stamp.

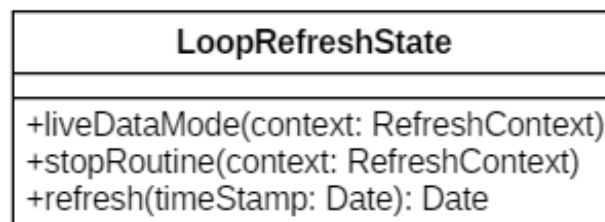
### Members inherited from class RefreshState

View.TimeOption.RefreshState (in 9.8.8, page 181)

- public void **continueRoutine**(RefreshContext context)
- public void **historicalDataMode**(RefreshContext context)
- public void **liveDataMode**(RefreshContext context)
- public Date **refresh**(java.util.Date timeStamp)
- public void **stopRoutine**(RefreshContext context)

### 9.8.5 Class LoopRefreshState

In this state the refresh function simulates the loop data mode. Depending on the loopTimeFrame value and the RefreshConfiguration, the refresh method modifies the submitted timeStamp which can be submitted to other ViewComponents to iterate to the next dataset entries.



#### Declaration

```
public class LoopRefreshState
    extends View.TimeOption.RefreshState
```

#### Constructor summary

**LoopRefreshState()** Default constructor

#### Method summary

**liveDataMode(RefreshContext)** Switch to live data mode.

**refresh(Date)** Returns the submitted time stamp modified according to the Refresh-Configuration.

**stopRoutine(RefreshContext)** Switch to historical mode.

#### Constructors

- **LoopRefreshState**

```
public LoopRefreshState()
```

- **Description**

Default constructor

## Methods

- **liveDataMode**

```
public void liveDataMode(RefreshContext context)
```

- **Description**

Switch to live data mode.

- **Parameters**

\* `context` –

- **refresh**

```
public java.util.Date refresh(java.util.Date timeStamp)
```

- **Description**

Returns the submitted time stamp modified according to the RefreshConfiguration.

- **Parameters**

\* `timeStamp` –

- **Returns** – the submitted time stamp modified according to the RefreshConfiguration.

- **stopRoutine**

```
public void stopRoutine(RefreshContext context)
```

- **Description**

Switch to historical mode.

- **Parameters**

\* `context` –

## Members inherited from class RefreshState

View.TimeOption.RefreshState (in 9.8.8, page 181)

- public void **continueRoutine**(RefreshContext context)
- public void **historicalDataMode**(RefreshContext context)
- public void **liveDataMode**(RefreshContext context)
- public Date **refresh**(java.util.Date timeStamp)
- public void **stopRoutine**(RefreshContext context)

### 9.8.6 Class RefreshConfiguration

Encapsulates the preferences about the fetching of live data and the loop mode of historical data.

RefreshConfiguration
-autoRefresh: boolean -refreshInterval: float
+setAutoRefresh(bool: boolean) +autoRefresh(): boolean +setRefreshInterval(int interval) +refreshInterval(): float

#### Declaration

```
public class RefreshConfiguration  
    extends java.lang.Object
```

#### Constructor summary

**RefreshConfiguration()** Default constructor

#### Method summary

**autoRefresh()** In live mode return whether data should be fetched automatically or manually.

**refreshInterval()** Returns the interval in which automatic refreshes are made.

**setAutoRefresh(boolean)** In live mode set whether data should be fetched automatically or manually.

**setRefreshInterval(Interval)** Set the interval in which automatic refreshes are made.

#### Constructors

- **RefreshConfiguration**

```
public RefreshConfiguration()
```

#### – Description

Default constructor



**Methods**

- **autoRefresh**

```
public boolean autoRefresh()
```

- **Description**

In live mode return whether data should be fetched automatically or manually. In historic mode return whether in loop mode the time stamp should be refreshed automatically or manually.

- **Returns** – in live mode whether data should be fetched automatically or manually and In historic mode whether in loop mode the time stamp should be refreshed automatically or manually.

- **refreshInterval**

```
public float refreshInterval()
```

- **Description**

Returns the interval in which automatic refreshes are made.

- **Returns** – the interval in which automatic refreshes are made.

- **setAutoRefresh**

```
public void setAutoRefresh(boolean bool)
```

- **Description**

In live mode set whether data should be fetched automatically or manually. In historic mode set whether in loop mode the time stamp should be refreshed automatically or manually.

- **Parameters**

- \* `bool` –

- **setRefreshInterval**

```
public void setRefreshInterval(Interval inv)
```

- **Description**

Set the interval in which automatic refreshes are made.

- **Parameters**

- \* `inv` –

### 9.8.7 Class RefreshContext

Encapsulates the logic of switching between historical and live data mode and starting and stopping the loop mode. Through LiveRefreshConfiguration it also encapsulates whether live data is fetched automatically or manually and in which interval.

RefreshContext
-refreshState: RefreshState -refreshConfig: RefreshConfiguration -loopTimeFrame: TimeFrame
+setRefreshState(refreshState: RefreshState) +getRefreshConfig(): RefreshConfiguration +setLoopTimeFrame(loopTimeFrame: TimeFrame) +getLoopTimeFrame(): TimeFrame +liveDataMode() +historicalDataMode() +continueRoutine() +stopRoutine() +refresh(timestamp: Date): Date

#### Declaration

```
public class RefreshContext
    extends java.lang.Object implements TimeOptionPanelObserver
```

#### Constructor summary

**RefreshContext()** Default constructor

#### Method summary

**continueRoutine()** Continue the current routine.  
**getLoopTimeFrame()** Get the loop time frame.  
**getRefreshConfig()** Get the RefreshConfiguration.  
**historicalDataMode()** Switch to historical data mode.  
**liveDataMode()** Switch to live data mode.  
**refresh(Date)** Refresh the submitted time stamp depending on the TimeStampState by returning a new time stamp.  
**setLoopTimeFrame(TimeFrame)** Set the start and end time point of the loop.  
**setRefreshState(RefreshState)** Set the current refresh state.  
**stopRoutine()** Stop the current routine.  
**timeOptionUpdate()** Update the observer with the current TimeOptionPanel state.

## Constructors

- **RefreshContext**

```
public RefreshContext ()
```

- **Description**

Default constructor

## Methods

- **continueRoutine**

```
public void continueRoutine ()
```

- **Description**

Continue the current routine.

- **getLoopTimeFrame**

```
public TimeFrame getLoopTimeFrame ()
```

- **Description**

Get the loop time frame.

- **Returns** – the loop time frame.

- **getRefreshConfig**

```
public RefreshConfiguration getRefreshConfig ()
```

- **Description**

Get the RefreshConfiguration.

- **Returns** – the RefreshConfiguration.

- **historicalDataMode**

```
public void historicalDataMode ()
```

- **Description**

Switch to historical data mode.

- **liveDataMode**

```
public void liveDataMode()
```

- **Description**

Switch to live data mode.

- **refresh**

```
public java.util.Date refresh(java.util.Date timeStamp)
```

- **Description**

Refresh the submitted time stamp depending on the TimeStampState by returning a new time stamp.

- **Parameters**

- \* **timeStamp** –

- **Returns** – the submitted time stamp altered depending on the TimeStampState.

- **setLoopTimeFrame**

```
public void setLoopTimeFrame(TimeFrame loopTimeFrame)
```

- **Description**

Set the start and end time point of the loop.

- **Parameters**

- \* **loopTimeFrame** –

- **setRefreshState**

```
public void setRefreshState(RefreshState refreshState)
```

- **Description**

Set the current refresh state.

- **Parameters**

- \* **refreshState** –

- **stopRoutine**

```
public void stopRoutine()
```

- **Description**

Stop the current routine.

- **timeOptionUpdate**

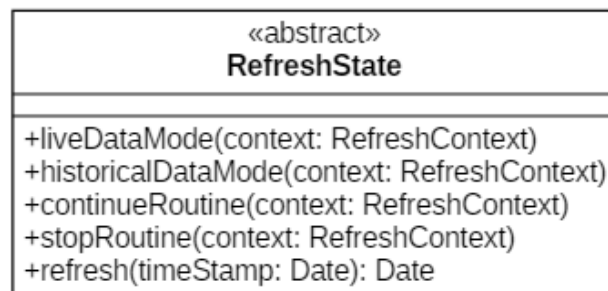
```
public void timeOptionUpdate()
```

- **Description**

Update the observer with the current TimeOptionPanel state.

### 9.8.8 Class RefreshState

Encapsulates behaviour concerning refreshing time stamps and dealing with historical and live data fetching.



#### Declaration

```
public class RefreshState
    extends java.lang.Object
```

#### All known subclasses

LoopRefreshState (in 9.8.5, page 174), LiveRefreshState (in 9.8.4, page 172), HistoricalRefreshState (in 9.8.3, page 170)

#### Constructor summary

**RefreshState()** Default constructor

#### Method summary

**continueRoutine(RefreshContext)** Continue the current routine.

**historicalDataMode(RefreshContext)** Switch to historical data mode.

**liveDataMode(RefreshContext)** Switch to live data mode.

**refresh(Date)** Refresh the the submitted time stamp depending on the TimeStampState by returning a new time stamp.

**stopRoutine(RefreshContext)** Stop the current routine.

## Constructors

- **RefreshState**

```
public RefreshState()
```

- **Description**

Default constructor

## Methods

- **continueRoutine**

```
public void continueRoutine(RefreshContext context)
```

- **Description**

Continue the current routine.

- **Parameters**

\* `context` –

- **historicalDataMode**

```
public void historicalDataMode(RefreshContext context)
```

- **Description**

Switch to historical data mode.

- **Parameters**

\* `context` –

- **liveDataMode**

```
public void liveDataMode(RefreshContext context)
```

- **Description**

Switch to live data mode.

- **Parameters**

- \* `context` –

- **refresh**

```
public java.util.Date refresh(java.util.Date timeStamp)
```

- **Description**

Refresh the the submitted time stamp depending on the `TimeStampState` by returning a new time stamp.

- **Parameters**

- \* `timeStamp` –

- **Returns** – the most up-to-date time stamp.

- **stopRoutine**

```
public void stopRoutine(RefreshContext context)
```

- **Description**

Stop the current routine.

- **Parameters**

- \* `context` –

### 9.8.9 Class `TimeOptionPanel`

An implementation of `AbstractTimeOptionPanel`.



#### Declaration

```
public class TimeOptionPanel
    extends View.TimeOption.AbstractTimeOptionPanel
```

**Constructor summary**

**TimeOptionPanel()** Default constructor

**Constructors**

- **TimeOptionPanel**

```
public TimeOptionPanel()
```

– **Description**

Default constructor

**Members inherited from class AbstractTimeOptionPanel**

View.TimeOption.AbstractTimeOptionPanel (in 9.8.2, page 167)

- public TimeFrame **getLoopTimeframe()**
- public RefreshContext **getRefreshContext()**
- public Date **getTimeStamp()**
- protected loopTimeFrame
- public void **notify()**
- protected refreshConfig
- public void **setLoopTimeFrame**(TimeFrame loopTimeFrame)
- public void **setTimeStamp**(java.util.Date timeStamp)
- public void **subscribeObserver**(TimeOptionPanelObserver observer)
- protected timeStamp
- public void **unsubscribeObserver**(TimeOptionPanelObserver observer)

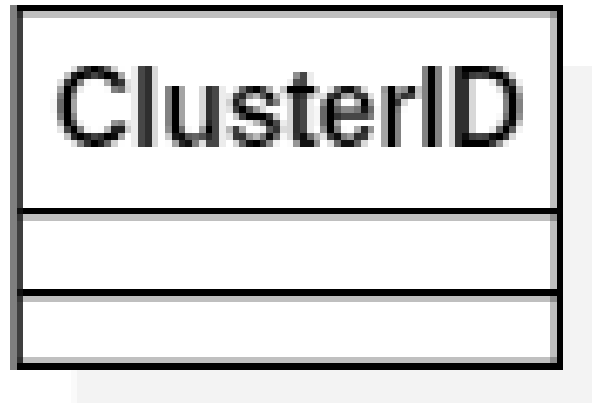
**9.9 Package View.Util***Package Contents**Page***Classes**

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Represents a specific point in time.	
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Represents an identifier made up of a String.	
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A Sensor Identifier.	
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A period of time, specified by a start and end date.	



### 9.9.1 Class ClusterID

A Cluster Identifier.



#### Declaration

```
public class ClusterID
    extends View.Util.Identifier
```

#### Constructor summary

`ClusterID()` Default constructor

#### Constructors

- `ClusterID`

```
public ClusterID ()
```

- **Description**

Default constructor

#### Members inherited from class Identifier

`View.Util.Identifier` (in 9.9.3, page 186)

- `public boolean equals(Identifier other)`

### 9.9.2 Class Date

Represents a specific point in time.

**Declaration**

```
public class Date
    extends java.lang.Object
```

**Constructor summary**

**Date()** Default constructor

**Constructors**

- **Date**

```
public Date()
```

– **Description**

Default constructor

**9.9.3 Class Identifier**

Represents an identifier made up of a String.

**Declaration**

```
public class Identifier
    extends java.lang.Object
```



**All known subclasses**

SensorID (in 9.9.5, page 189), ClusterID (in 9.9.1, page 185)

**Constructor summary**

**Identifier()** Default constructor

**Method summary**

**equals(Identifier)** Returns whether this identifier is equal to the submitted identifier or not.

**Constructors**

- **Identifier**

```
public Identifier()
```

- **Description**

Default constructor

**Methods**

- **equals**

```
public boolean equals(Identifier other)
```

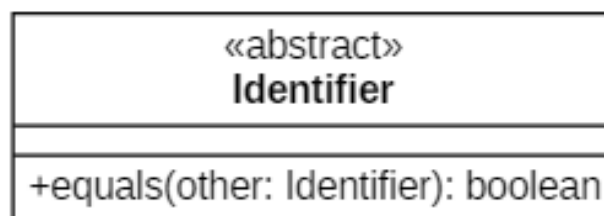
- **Description**

Returns whether this identifier is equal to the submitted identifier or not.

- **Parameters**

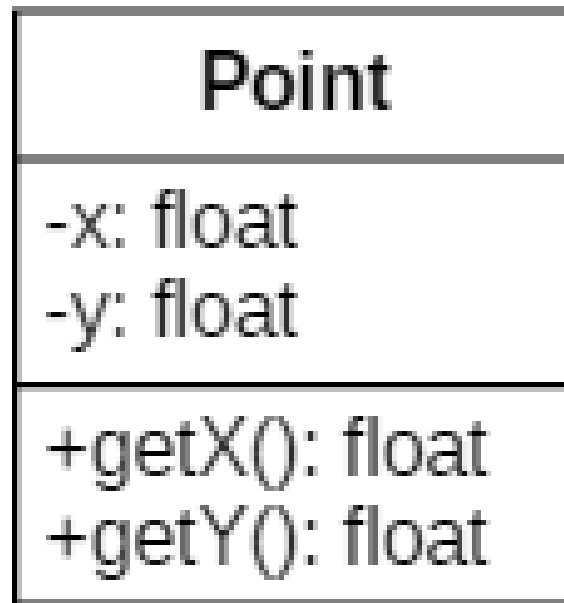
\* **other** –

- **Returns** –



### 9.9.4 Class Point

A point representing a location in (x,y) coordinate space, specified in float precision.



#### Declaration

```
public class Point
    extends java.lang.Object
```

#### Constructor summary

**Point()** Default constructor

#### Method summary

**getX()** Returns the x coordinate of this point.

**getY()** Returns the y coordinate of this point.

#### Constructors

- **Point**

```
public Point()
```

- **Description**

Default constructor

**Methods**

- **getX**

```
public float getX()
```

- **Description**

Returns the x coordinate of this point.

- **Returns** –

- **getY**

```
public float getY()
```

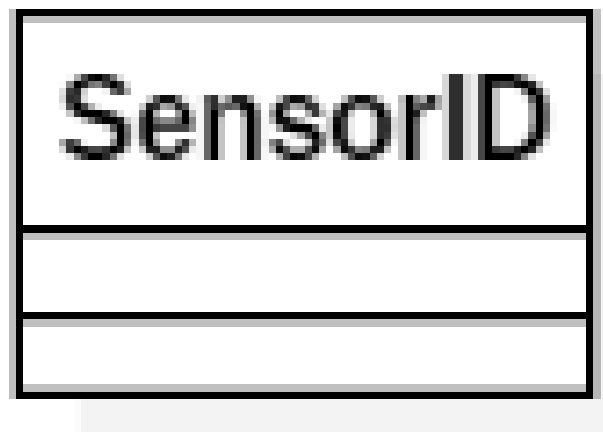
- **Description**

Returns the y coordinate of this point.

- **Returns** –

**9.9.5 Class SensorID**

A Sensor Identifier.



**Declaration**

```
public class SensorID
    extends View.Util.Identifier
```

**Constructor summary**

**SensorID()** Default constructor

**Constructors**

- **SensorID**

```
public SensorID ()
```

- **Description**

Default constructor

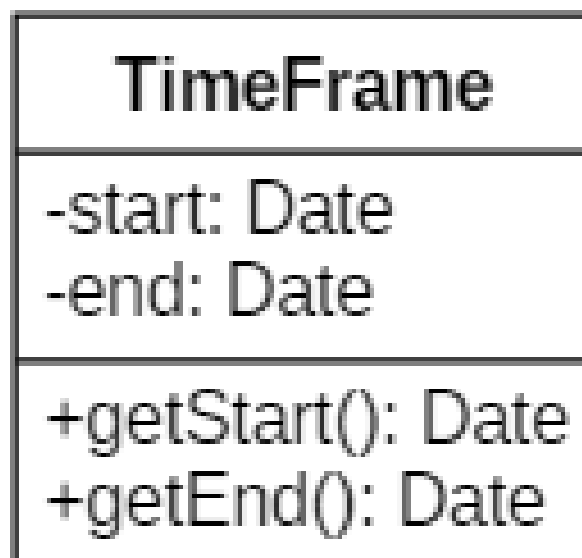
**Members inherited from class Identifier**

`View.Util.Identifier` (in 9.9.3, page 186)

- `public boolean equals(Identifier other)`

**9.9.6 Class TimeFrame**

A period of time, specified by a start and end date.



**Declaration**

```
public class TimeFrame
    extends java.lang.Object
```

**Constructor summary**

**TimeFrame()** Default constructor

**Method summary**

**getEnd()** Returns the end date of this time frame.  
**getStart()** Returns the start date of this time frame.

**Constructors**

- **TimeFrame**

```
public TimeFrame()
```

- **Description**  
Default constructor

**Methods**

- **getEnd**

```
public Date getEnd()
```

- **Description**  
Returns the end date of this time frame.
- **Returns** –

- **getStart**

```
public Date getStart()
```

- **Description**  
Returns the start date of this time frame.
- **Returns** –

# 10 Export

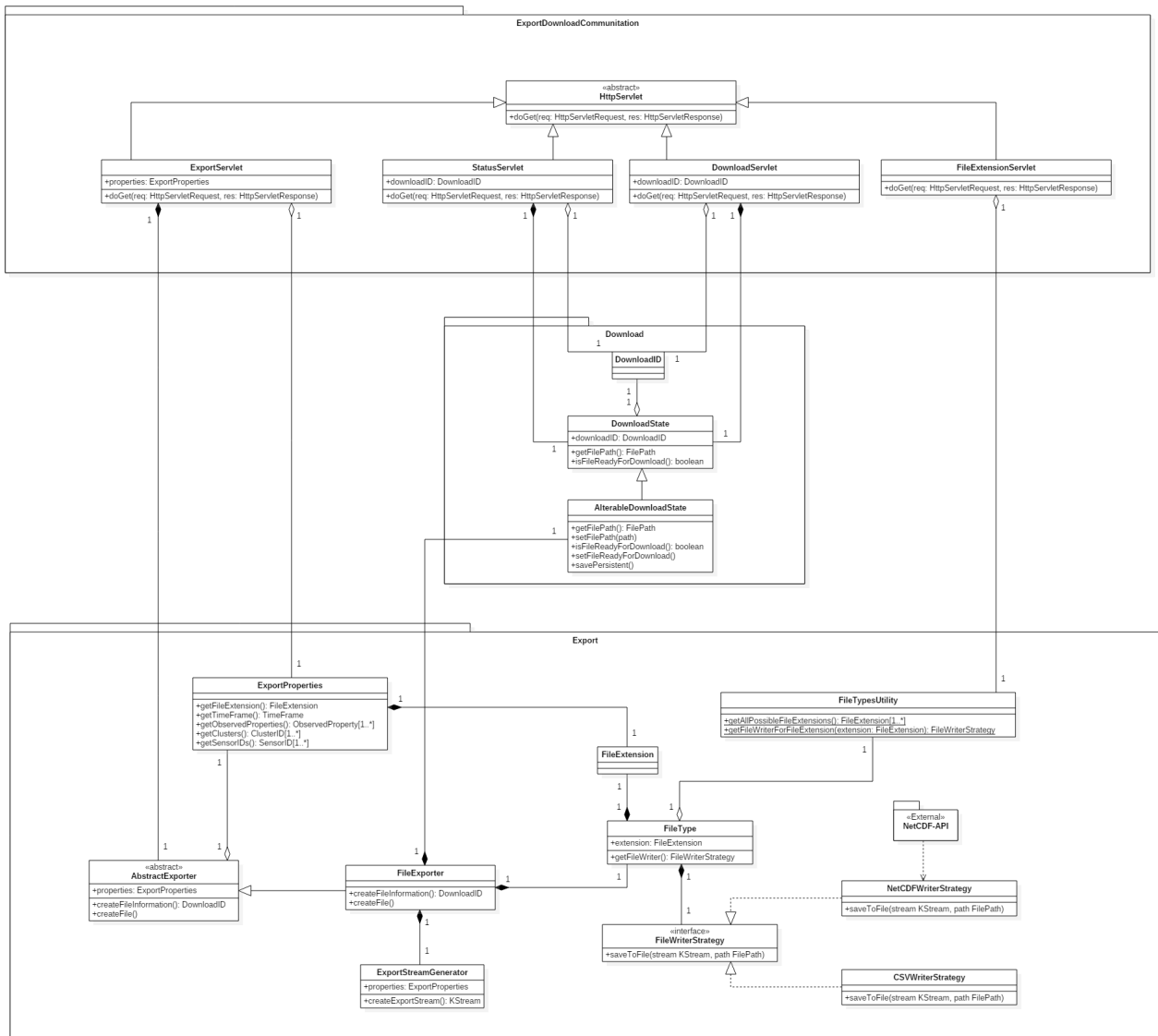


Abb. 10.1: Klassendiagramm Export und Download



## 10.1 Package Export

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### 10.1.1 Interface FileWriterStrategy

Interface for the FileWriterStrategy classes. Realization of a Strategy to be able to swap out the way a File has to be saved.



## Declaration

**public interface** FileWriterStrategy

### All known subinterfaces

NetCDFWriterStrategy (in 10.1.10, page 205), CSVWriterStrategy (in 10.1.3, page 196)

### All classes known to implement interface

NetCDFWriterStrategy (in 10.1.10, page 205), CSVWriterStrategy (in 10.1.3, page 196)

## Method summary

**saveToFile(KStream, FilePath)** Creates a File as specified by the FilePath and saves the Data from the provided KafkaStream into it.

## Methods

- **saveToFile**

**void** saveToFile(KStream stream, FilePath path)

- **Description**

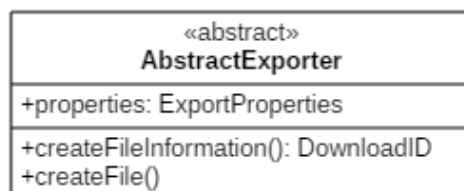
Creates a File as specified by the FilePath and saves the Data from the provided KafkaStream into it.

- **Parameters**

- \* **stream** – is the KStream, that should be exported to a File.
- \* **path** – Is the FilePath, where the new File should be created.

## 10.1.2 Class AbstractExporter

Abstract Exporter of Data to a File.



**Declaration**

```
public class AbstractExporter
    extends java.lang.Object
```

**All known subclasses**

FileExporter (in 10.1.6, page 200)

**Field summary**

**properties** Contains the Properties of an Export Request.

**Constructor summary**

**AbstractExporter()** Default constructor

**Method summary**

**createFile()** Generates the File with the desired Data.

**createFileInformation()** Creates Information for that Export.

**Fields**

- **public ExportProperties properties**
  - Contains the Properties of an Export Request.

**Constructors**

- **AbstractExporter**

```
public AbstractExporter()
```

- **Description**

Default constructor

**Methods**

- **createFile**

```
public void createFile()
```

- **Description**

Generates the File with the desired Data.

- **createFileInformation**

```
public DownloadID createFileInformation()
```

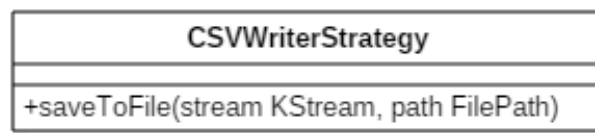
- **Description**

Creates Information for that Export. These Information will be used to identify a File for the WebGUI, that gets the created DownloadID.

- **Returns** – Is the DownloadID for the started Export.

### 10.1.3 Class CSVWriterStrategy

Implementation of the FileWriterStrategy interface for CSV files.



#### Declaration

```
public class CSVWriterStrategy
    extends java.lang.Object implements FileWriterStrategy
```

#### Constructor summary

**CSVWriterStrategy()** Default constructor

#### Method summary

**saveToFile(KStream, FilePath)** Creates a File as specified by the FilePath and saves the Data from the provided KafkaStream into it.

**saveToFile(KStream, FilePath)** Creates a File as specified by the FilePath and saves the Data from the provided KafkaStream into it.

#### Constructors

- **CSVWriterStrategy**

```
public CSVWriterStrategy()
```

- **Description**

Default constructor

## Methods

- **saveToFile**

```
public void saveToFile(KStream stream, FilePath path)
```

- **Description**

Creates a File as specified by the FilePath and saves the Data from the provided Kafka-Stream into it.

- **Parameters**

- \* **stream** – is the KStream, that should be exported to a File.
- \* **path** – Is the FilePath, where the new File should be created.

- **saveToFile**

```
public void saveToFile(KStream stream, FilePath path)
```

- **Description**

Creates a File as specified by the FilePath and saves the Data from the provided Kafka-Stream into it.

- **Parameters**

- \* **stream** – is the KStream, that should be exported to a File.
- \* **path** – Is the FilePath, where the new File should be created.

### 10.1.4 Class ExportProperties

Contains the Properties of an Export Request.

ExportProperties
+getFileExtension(): FileExtension +getTimeFrame(): TimeFrame +getObservedProperties(): ObservedProperty[1..*] +getClusters(): ClusterID[1..*] +getSensorIDs(): SensorID[1..*]

## Declaration

```
public class ExportProperties
  extends java.lang.Object
```

## Constructor summary

**ExportProperties()** Default constructor

**Method summary**

**getClusters()** Get the ClusterIDs that should be exported.  
**getFileExtension()** Get the FileExtension for the Export File.  
**getObservedProperties()** Get the ObservedProperties that should be exported.  
**getSensorIDs()** Get the SensorIDs that should be exported.  
**getTimeFrame()** Get the TimeFrame of the Data that should be exported.

**Constructors**

- **ExportProperties**

```
public ExportProperties()
```

- **Description**

Default constructor

**Methods**

- **getClusters**

```
public java.util.Set getClusters()
```

- **Description**

Get the ClusterIDs that should be exported. Always only exports a Group of Sensors or a Group of Clusters. The other Option is Empty.

- **Returns** – The Clusters that should be taken in the Export.

- **getFileExtension**

```
public FileExtension getFileExtension()
```

- **Description**

Get the FileExtension for the Export File.

- **Returns** – The FileExtension for the File to export.

- **getObservedProperties**

```
public java.util.Set getObservedProperties()
```

- **Description**

Get the ObservedProperties that should be exported.

- **Returns** – The ObservedProperties that should be used for the export.

- **getSensorIDs**

```
public java.util.Set getSensorIDs()
```

- **Description**

Get the SensorIDs that should be exported. Always only exports a Group of Sensors or a Group of Clusters. The other Option is Empty.

- **Returns** – The SensorIDs of the Data that should be exported.

- **getTimeFrame**

```
public TimeFrame getTimeFrame()
```

- **Description**

Get the TimeFrame of the Data that should be exported.

- **Returns** – The TimeFrame of the Data to be exported.

### 10.1.5 Class ExportStreamGenerator

Generates a Stream for the Export by asking for one at the PaVoS Core and Subscribing to it.

ExportStreamGenerator
+properties: ExportProperties
+createExportStream(): KStream

#### Declaration

```
public class ExportStreamGenerator
    extends java.lang.Object
```

#### Field summary

**properties** Contains the Properties of an Export Request.

#### Constructor summary

**ExportStreamGenerator()** Default constructor

**Method summary**

**createExportStream()** Asks for a KafkaStream and subscribes to it.

**Fields**

- **public ExportProperties properties**
  - Contains the Properties of an Export Request.

**Constructors**

- **ExportStreamGenerator**

**public** ExportStreamGenerator()

- **Description**  
Default constructor

**Methods**

- **createExportStream**

**public** KStream createExportStream()

- **Description**  
Asks for a KafkaStream and subscribes to it. Then gives it through to the needed part for the export.
- **Returns** – Is a KStream of the Data that should be exported.

**10.1.6 Class FileExporter**

Exporter of Data from Kafka to a File.





**Declaration**

```
public class FileExporter
    extends Export.AbstractExporter
```

**Constructor summary**

**FileExporter()** Default constructor

**Method summary**

**createFile()** Generates the File with the desired Data.  
**createFileInformation()** Creates Information for that Export.

**Constructors**

- **FileExporter**

```
public FileExporter()
```

- **Description**

Default constructor

**Methods**

- **createFile**

```
public void createFile()
```

- **Description**

Generates the File with the desired Data.

- **createFileInformation**

```
public DownloadID createFileInformation()
```

- **Description**

Creates Information for that Export. These Information will be used to identify a File for the WebGUI, that gets the created DownloadID.

- **Returns** – Is the DownloadID for the started Export.

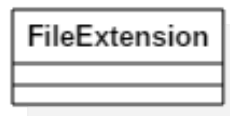
### Members inherited from class **AbstractExporter**

`Export.AbstractExporter` (in 10.1.2, page 194)

- `public void createFile()`
- `public DownloadID createFileInformation()`
- `public properties`

### 10.1.7 Class **FileExtension**

Represents the `FileExtension` of a `File`. Is used to match the right `FileFormat` for an export or import.



#### Declaration

```
public class FileExtension
    extends java.lang.Object
```

#### Constructor summary

`FileExtension()` Default constructor

#### Constructors

- `FileExtension`

```
public FileExtension()
```

#### – Description

Default constructor

### 10.1.8 Class **FileType**

Is used to store a `FileExtension` information and give the right `FileWriter` for this `FileExtension`.

**Declaration**

```
public class FileType
    extends java.lang.Object
```

**Field summary**

**extension** The FileExtension is defining the FileType.

**Constructor summary**

**FileType()** Default constructor

**Method summary**

**getFileWriter()** Gives an instance of the implemented FileWriter that is associated with this FileType, thus this FileExtension.

**Fields**

- **public FileExtension extension**
  - The FileExtension is defining the FileType.

**Constructors**

- **FileType**

```
public FileType()
```

- **Description**  
Default constructor

**Methods**

- **getFileWriter**

```
public FileWriterStrategy getFileWriter()
```

FileType
+extension: FileExtension
+getFileWriter(): FileWriterStrategy

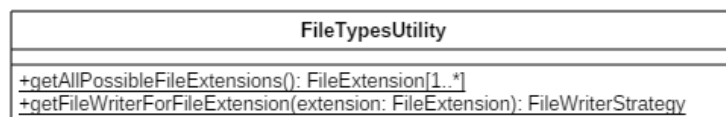
– **Description**

Gives an instance of the implemented `FileWriter` that is associated with this `FileType`, thus this `FileExtension`. To do so it uses the static method `getFileWriterForFileExtension` from the `FileTypesUtility` class.

– **Returns** – Is a new instance of an implementation of a `FileWriterStrategy`.

### 10.1.9 Class `FileTypesUtility`

Utility class that provides static methods to get all supported `FileExtensions` and one to get a new Instance of the `FileWriter` associated with a given `FileExtension`. If a new `FileWriter` is added to PaVoS, this class needs some changed to be able to return the new `FileWriter`.



#### Declaration

```
public class FileTypesUtility
    extends java.lang.Object
```

#### Constructor summary

`FileTypesUtility()` Default constructor

#### Method summary

`getAllPossibleFileExtensions()` Gives all supported `FileExtensions` in an `ArrayList`.  
`getFileWriterForFileExtension(FileExtension)` Gives a new Instance of the `FileWriter` associated with a given `FileExtension`.

#### Constructors

- **`FileTypesUtility`**

```
public FileTypesUtility()
```

– **Description**

Default constructor

## Methods

- **getAllPossibleFileExtensions**

```
public static java.util.Set getAllPossibleFileExtensions()
```

- **Description**

- Gives all supported FileExtensions in an ArrayList.

- **Returns** – Is an Array of the possible FileExtensions for an Export.

- **getFileWriterForFileExtension**

```
public static FileWriterStrategy getFileWriterForFileExtension(  
    FileExtension extension)
```

- **Description**

- Gives a new Instance of the FileWriter associated with a given FileExtension.

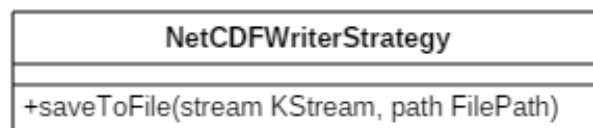
- **Parameters**

- \* **extension** – Is the FileExtension for which a new instance of an Implementation of the FileWriterStrategy is wanted.

- **Returns** – Is the instance of the implementation of a FileWriterStrategy.

### 10.1.10 Class NetCDFWriterStrategy

Implementation of the FileWriterStrategy interface for NetCDF files.



## Declaration

```
public class NetCDFWriterStrategy  
    extends java.lang.Object implements FileWriterStrategy
```

## Constructor summary

**NetCDFWriterStrategy()** Default constructor

**Method summary**

**saveToFile(KStream, FilePath)** Creates a File as specified by the FilePath and saves the Data from the provided KafkaStream into it.

**saveToFile(KStream, FilePath)** Creates a File as specified by the FilePath and saves the Data from the provided KafkaStream into it.

**Constructors**

- **NetCDFWriterStrategy**

```
public NetCDFWriterStrategy ()
```

- **Description**

Default constructor

**Methods**

- **saveToFile**

```
public void saveToFile (KStream stream ,FilePath path)
```

- **Description**

Creates a File as specified by the FilePath and saves the Data from the provided Kafka-Stream into it.

- **Parameters**

- \* **stream** – is the KStream, that should be exported to a File.

- \* **path** – Is the FilePath, where the new File should be created.

- **saveToFile**

```
public void saveToFile (KStream stream ,FilePath path)
```

- **Description**

Creates a File as specified by the FilePath and saves the Data from the provided Kafka-Stream into it.

- **Parameters**

- \* **stream** – is the KStream, that should be exported to a File.

- \* **path** – Is the FilePath, where the new File should be created.

## 10.2 Package Download

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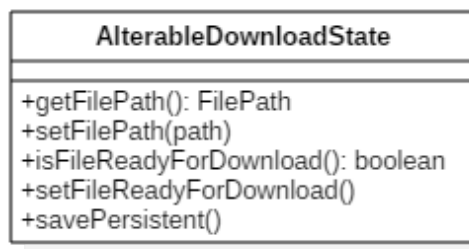
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Is an Identifier for a specific Download, so that the right file can be found for a requested Download.	
<b>DownloadState</b> .....	210
Verifies for the State of a Download.	

### 10.2.1 Class AlterableDownloadState

Verifies for the State of a Download. Can also change it.



### Declaration

```
public class AlterableDownloadState
    extends Download.DownloadState
```

### Constructor summary

**AlterableDownloadState()** Default constructor

### Method summary

**getFilePath()** Gives the FilePath associated with this DownloadID.  
**isFileReadyForDownload()** Checks if a File is Ready to be downloaded.  
**savePersistent()** Save the changed Data persistently.  
**setFilePath(void)** Defines the FilePath for the DownloadID.  
**setFileReadyForDownload()** Validate, that the File is ready to be downloaded.

## Constructors

- **AlterableDownloadState**

```
public AlterableDownloadState()
```

- **Description**

- Default constructor

## Methods

- **getFilePath**

```
public FilePath getFilePath()
```

- **Description**

- Gives the FilePath associated with this DownloadID.

- **Returns** – The FilePath of the File for the Download.

- **isFileReadyForDownload**

```
public boolean isFileReadyForDownload()
```

- **Description**

- Checks if a File is Ready to be downloaded.

- **Returns** – A boolean whether the file is downloadable or not.

- **savePersistent**

```
public void savePersistent()
```

- **Description**

- Save the changed Data persistently.

- **setFilePath**

```
public void setFilePath(void path)
```

- **Description**

- Defines the FilePath for the DownloadID.

- **Parameters**



\* `path` – Is the `FilePath` to be set.

- **`setFileReadyForDownload`**

```
public void setFileReadyForDownload()
```

- **Description**

Validate, that the File is ready to be downloaded.

### Members inherited from class `DownloadState`

`Download.DownloadState` (in 10.2.3, page 210)

- `public downloadID`
- `public FilePath getFile_path()`
- `public boolean isFileReadyForDownload()`

### 10.2.2 Class `DownloadID`

Is an Identifier for a specific Download, so that the right file can be found for a requested Download.



#### Declaration

```
public class DownloadID
  extends java.lang.Object
```

#### Constructor summary

`DownloadID()` Default constructor

#### Constructors

- **`DownloadID`**

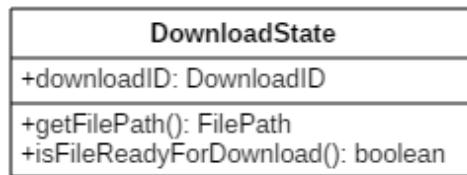
```
public DownloadID()
```

- **Description**

Default constructor

### 10.2.3 Class DownloadState

Verifies for the State of a Download.



#### Declaration

```
public class DownloadState
    extends java.lang.Object
```

#### All known subclasses

AlterableDownloadState (in 10.2.1, page 207)

#### Field summary

**downloadID** Is an Identifier for a specific Download.

#### Constructor summary

**DownloadState()** Default constructor

#### Method summary

**getFilePath()** Gives the FilePath associated with this DownloadID.

**isFileReadyForDownload()** Checks if a File is Ready to be downloaded.

#### Fields

- **public DownloadID downloadID**
  - Is an Identifier for a specific Download.

#### Constructors

- **DownloadState**

```
public DownloadState()
```

- **Description**

Default constructor

## Methods

- **getFilePath**

```
public FilePath getFilePath()
```

- **Description**

Gives the FilePath associated with this DownloadID.

- **Returns** – The FilePath of the File for the Download.

- **isFileReadyForDownload**

```
public boolean isFileReadyForDownload()
```

- **Description**

Checks if a File is Ready to be downloaded.

- **Returns** – A boolean whether the file is downloadable or not.

## 10.3 Package ExportDownloadCommunication

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HttpServlet to get a Dataexport request from the WebGUI.	
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Servlet, to let the WebGUI ask for the available FileExtensions for the Export.	
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Provides an abstract class to be subclassed to create an HTTP servlet suitable for a Web site.	
<b>StatusServlet</b> .....	217
Servlet to let the WebGUI check if a Download is ready.	

### 10.3.1 Class DownloadServlet

Servlet to let the WebGUI download a finished Export.

**Declaration**

```
public class DownloadServlet
    extends ExportDownloadCommunication.HttpServlet
```

**Field summary**

**downloadID** Is an Identifier for a specific Download.

**Constructor summary**

**DownloadServlet()** Default constructor

**Method summary**

**doGet(HttpServletRequest, HttpServletResponse)** Handles a GET request by sending the desired File to the WebGUI.

**Fields**

- **public DownloadID downloadID**
  - Is an Identifier for a specific Download.

**Constructors**

- **DownloadServlet**

```
public DownloadServlet()
```

- **Description**  
Default constructor

**Methods**

- **doGet**

```
public void doGet(HttpServletRequest req, HttpServletResponse res)
```

DownloadServlet
+downloadID: DownloadID
+doGet(req: HttpServletRequest, res: HttpServletResponse)

– **Description**

Handles a GET request by sending the desired File to the WebGUI.

– **Parameters**

- \* **req** – Is the `HttpServletRequest`.
- \* **res** – Is the `HttpServletResponse`.

**Members inherited from class `HttpServlet`**

`ExportDownloadCommunication.HttpServlet` (in 10.3.4, page 215)

- `public void doGet(HttpServletRequest req, HttpServletResponse res)`

### 10.3.2 Class `ExportServlet`

`HttpServlet` to get a Dataexport request from the WebGUI.

<b>ExportServlet</b>
+properties: <code>ExportProperties</code>
+doGet(req: <code>HttpServletRequest</code> , res: <code>HttpServletResponse</code> )

**Declaration**

```
public class ExportServlet
    extends ExportDownloadCommunication.HttpServlet
```

**Field summary**

**properties** Contains the Properties of an Export Request.

**Constructor summary**

**ExportServlet()** Default constructor

**Method summary**

**doGet(HttpServletRequest, HttpServletResponse)** Handles a GET request by starting the export of the desired Data.

**Fields**

- `public ExportProperties properties`
  - Contains the Properties of an Export Request.

## Constructors

- **ExportServlet**

```
public ExportServlet()
```

- **Description**

Default constructor

## Methods

- **doGet**

```
public void doGet(HttpServletRequest req, HttpServletResponse res)
```

- **Description**

Handles a GET request by starting the export of the desired Data. At the same time a DownloadID is sent back to the WebGUI, so that it can check for the File.

- **Parameters**

- \* **req** – Is the HttpServletRequest.
- \* **res** – Is the HttpServletResponse.

## Members inherited from class HttpServlet

ExportDownloadCommunication.HttpServlet (in 10.3.4, page 215)

- public void **doGet**(HttpServletRequest **req**, HttpServletResponse **res**)

### 10.3.3 Class FileExtensionServlet

Servlet, to let the WebGUI ask for the available FileExtensions for the Export.



## Declaration

```
public class FileExtensionServlet
    extends ExportDownloadCommunication.HttpServlet
```

## Constructor summary

**FileExtensionServlet()** Default constructor

## Method summary

**doGet(HttpServletRequest, HttpServletResponse)** Handles a GET request by sending Information about the available FileExtensions.

## Constructors

- **FileExtensionServlet**

```
public FileExtensionServlet ()
```

- **Description**

Default constructor

## Methods

- **doGet**

```
public void doGet (HttpServletRequest req ,HttpServletResponse res )
```

- **Description**

Handles a GET request by sending Information about the available FileExtensions.

- **Parameters**

- \* **req** – Is the HttpServletRequest.
- \* **res** – Is the HttpServletResponse.

## Members inherited from class HttpServlet

ExportDownloadCommunication.HttpServlet (in 10.3.4, page 215)

- public void **doGet**(HttpServletRequest **req**, HttpServletResponse **res**)

## 10.3.4 Class HttpServlet

Provides an abstract class to be subclassed to create an HTTP servlet suitable for a Web site.  
(javax.servlet.http.HttpServlet)

## Declaration

```
public class HttpServlet
    extends java.lang.Object
```

## All known subclasses

StatusServlet (in 10.3.5, page 217), FileExtensionServlet (in 10.3.3, page 214), ExportServlet (in 10.3.2, page 213), DownloadServlet (in 10.3.1, page 211)

## Constructor summary

**HttpServlet()** Default constructor

## Method summary

**doGet(HttpServletRequestRequest, HttpServletResponse)** Called by the server (via the service method) to allow a servlet to handle a GET request.

## Constructors

- **HttpServlet**

```
public HttpServlet()
```

- **Description**

Default constructor

## Methods

- **doGet**

```
public void doGet(HttpServletRequestRequest req, HttpServletResponse res)
```

- **Description**

Called by the server (via the service method) to allow a servlet to handle a GET request.

- **Parameters**





- \* **req** – Is the `HttpServletRequest`.
- \* **res** – Is the `HttpServletResponse`.

### 10.3.5 Class `StatusServlet`

Servlet to let the WebGUI check if a Download is ready.

<b>StatusServlet</b>
+downloadID: DownloadID
+doGet(req: HttpServletRequest, res: HttpServletResponse)

#### Declaration

```
public class StatusServlet
    extends ExportDownloadCommunication.HttpServlet
```

#### Field summary

**downloadID** Is an Identifier for a specific Download.

#### Constructor summary

**StatusServlet()** Default constructor

#### Method summary

**doGet(HttpServletRequest, HttpServletResponse)** Handles a GET request by checking the availability of the desired download.

#### Fields

- **public DownloadID downloadID**
  - Is an Identifier for a specific Download.

#### Constructors

- **StatusServlet**

```
public StatusServlet()
```

– **Description**

Default constructor

## Methods

- **doGet**

```
public void doGet(HttpServletRequest req,HttpServletResponse res)
```

- **Description**

Handles a GET request by checking the availability of the desired download.

- **Parameters**

- \* **req** – Is the `HttpServletRequest`.

- \* **res** – Is the `HttpServletResponse`.

## Members inherited from class `HttpServlet`

`ExportDownloadCommunication.HttpServlet` (in 10.3.4, page 215)

- `public void doGet(HttpServletRequest req, HttpServletResponse res)`