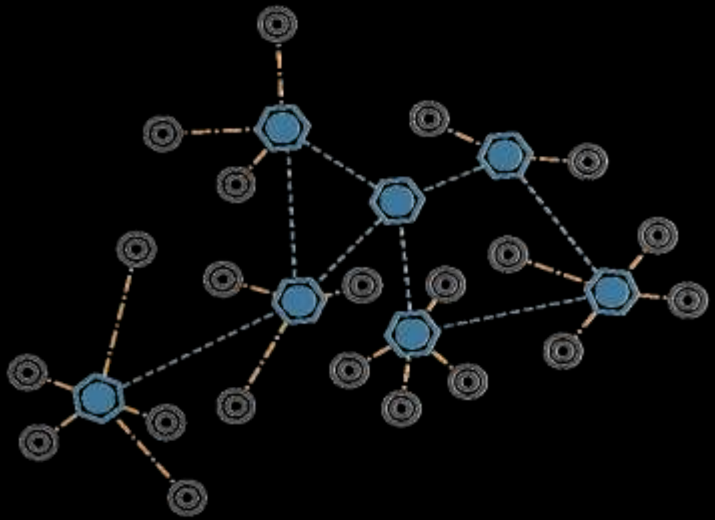
CST 3613 Fall 2018

Application Development with DB

EXAM-2

Sensor Network



Professor HG Locklear

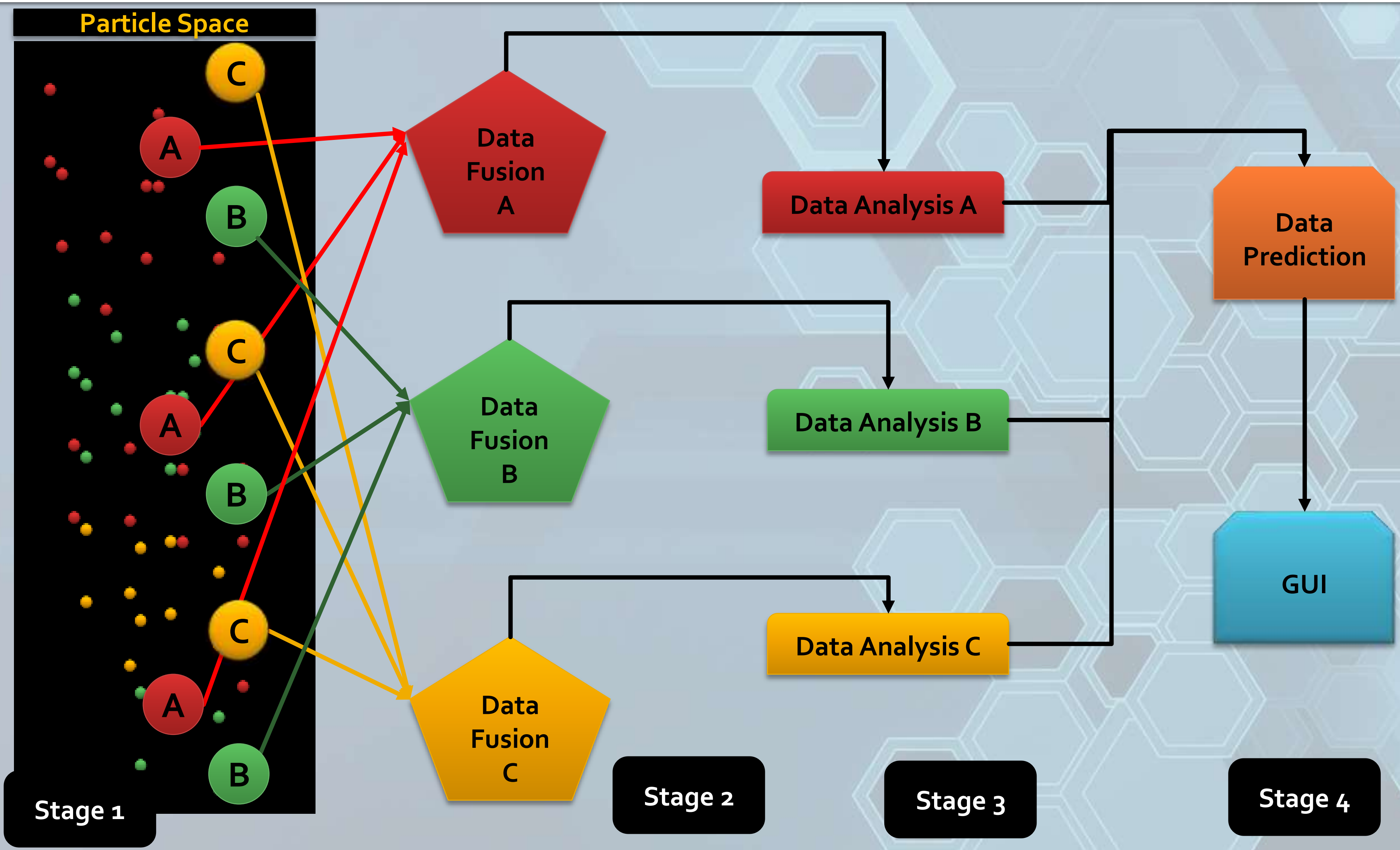
Exam Requirements

- Exam 2 is designed as a comprehensive evaluation of your Java Database Integration and GUI development skills.
- In order to successfully complete Exam 2, you will develop a simulation of a sensor network (see slide 3 and 4) that will require you to demonstrate the following skills:

1. Create Classes from UML Diagrams
2. Create and Implement Interfaces from UML Diagrams
3. Create and Implement Enums from UML Diagrams
4. Utilize Java IO to read and write to files
5. Utilize Java JDBC to connect to a MySQL database
6. Utilize JDBC to build persistent objects from database tables
7. Utilize Java Swing to develop a GUI for the Application

Exam submission must be uploaded to Blackboard by 8 AM Dec 19th
Submission must be Compressed NetBeans or Eclipse Project
A Correct (No Syntax or Logical Errors) submission is worth 20 points
A Late , Unreasonable or Incorrect Format Submission is worth 0 points

Sensor Network (Model)



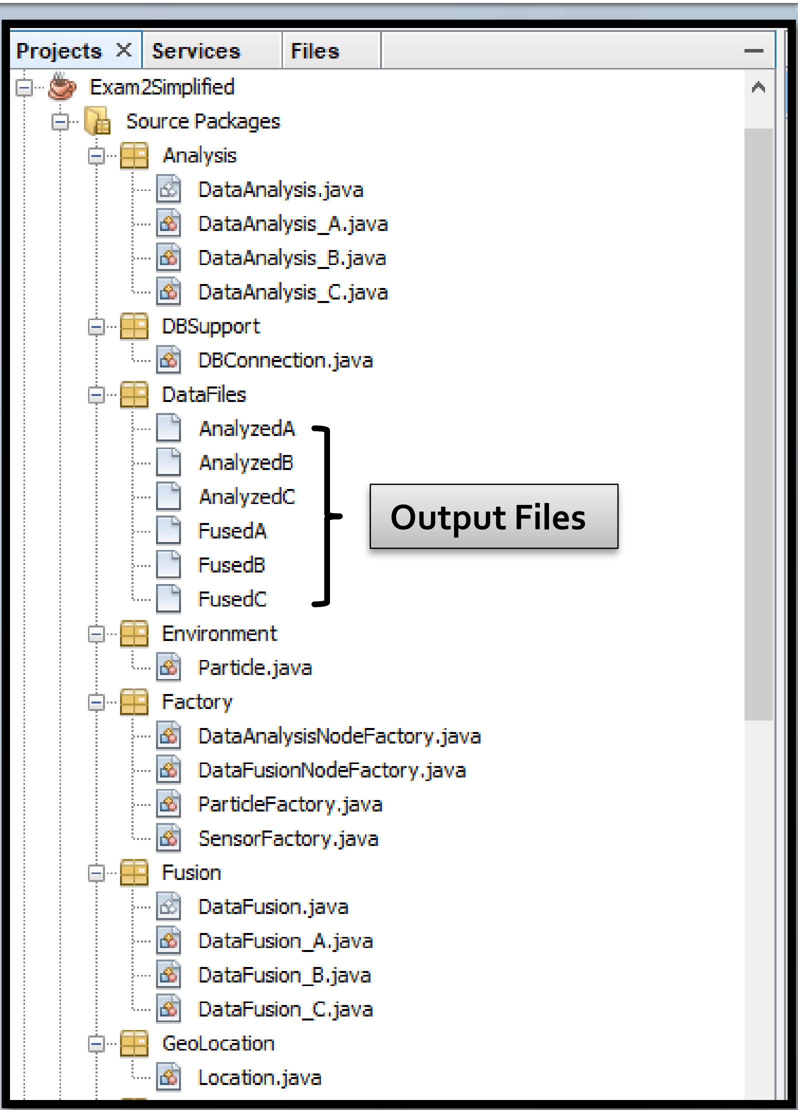
Sensor Network (Classes)

Class Name	Package	Abstract	Interfaces Implemented	Purpose
Sensor	Sensors	Yes	Detectable	Superclass of all Sensor types
SensorA		No		Detects and Decodes particles that have a PCode containing 'A'
SensorB		No		Detects and Decodes particles that have a PCode containing 'B'
SensorC		No		Detects and Decodes particles that have a PCode containing 'C'
DataFusion	Fusion	Yes	Fusionable	Superclass of all DataFusion types
DataFusionA		No		Fuses decoded data from all A-Type Sensors
DataFusionB		No		Fuses decoded data from all B-Type Sensors
DataFusionC		No		Fuses decoded data from all C-Type Sensors
DataAnalytics	Analysis	Yes	Analyzable	Superclass of all DataAnalytics types
DataAnalyticsA		No		Analyses all Sensor A data
DataAnalyticsB		No		Analyses all Sensor B data
DataAnalyticsC		No		Analyses all Sensor C data
DataPrediction	Prediction	No	NONE	Contains static method which display Data Prediction information as separate GUI windows

Sensor Network (Classes)

Class Name	Package	Abstract	Purpose
SensorFactory	Factory	No	Contains static methods which build and display persistent Sensor objects from database
ParticleFactory		No	Contains static methods which build and display persistent Particle objects from database
DataFusionNodeFactory		No	Contains static methods which build and display persistent DataFusion objects from database
DataAnalysisNodeFactory		No	Contains static methods which build and display persistent DataAnalysis objects from database
Location	GeoLocation	No	Represents a 3D Location
Particle	Environment	No	Represents a Tachyon particle
DBConnection	DBSupport	No	Contains static methods which allows for JDBC
AppGUI	*[your name]*	No	Contains static method for GUI creation
SensorNetwork		No	EXECUTION POINT FOR APPLICATION...contains only single line of executable code (static method from AppGUI

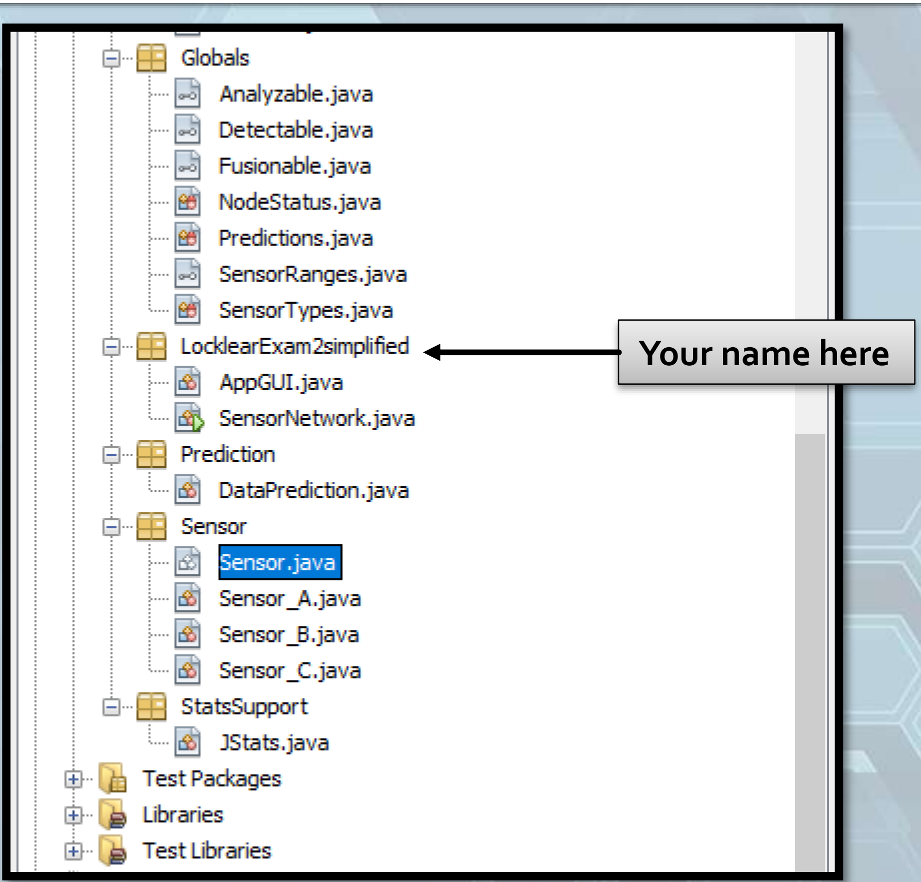
Project Packaging (NetBeans)



Projects × | Services | Files

```
Exam2Simplified
  Source Packages
    Analysis
      DataAnalysis.java
      DataAnalysis_A.java
      DataAnalysis_B.java
      DataAnalysis_C.java
    DBSupport
      DBConnection.java
    DataFiles
      AnalyzedA
      AnalyzedB
      AnalyzedC
      FusedA
      FusedB
      FusedC
    Environment
      Particle.java
    Factory
      DataAnalysisNodeFactory.java
      DataFusionNodeFactory.java
      ParticleFactory.java
      SensorFactory.java
    Fusion
      DataFusion.java
      DataFusion_A.java
      DataFusion_B.java
      DataFusion_C.java
    GeoLocation
      Location.java
```

Output Files

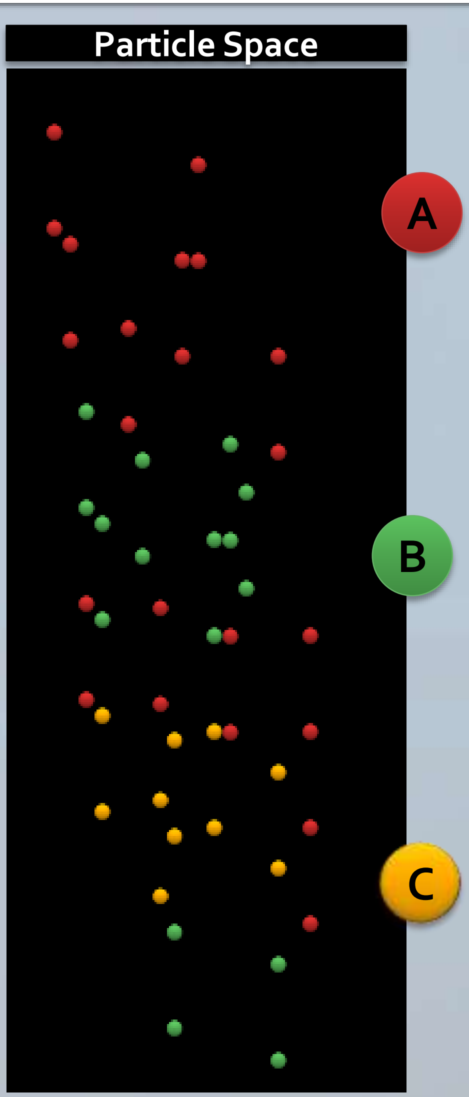


```
    Globals
      Analyzable.java
      Detectable.java
      Fusionable.java
      NodeStatus.java
      Predictions.java
      SensorRanges.java
      SensorTypes.java
    LocklearExam2simplified
      AppGUI.java
      SensorNetwork.java
    Prediction
      DataPrediction.java
    Sensor
      Sensor.java
      Sensor_A.java
      Sensor_B.java
      Sensor_C.java
    StatsSupport
      JStats.java
  Test Packages
  Libraries
  Test Libraries
```

Your name here

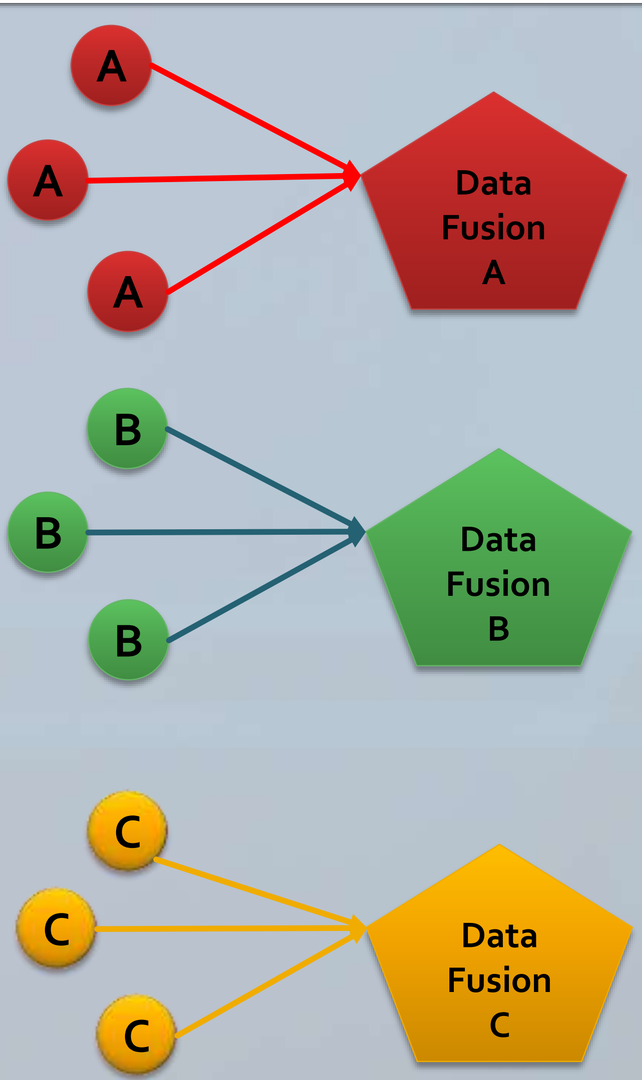
You must use this packaging format for your project

Sensor Particle Detection Model



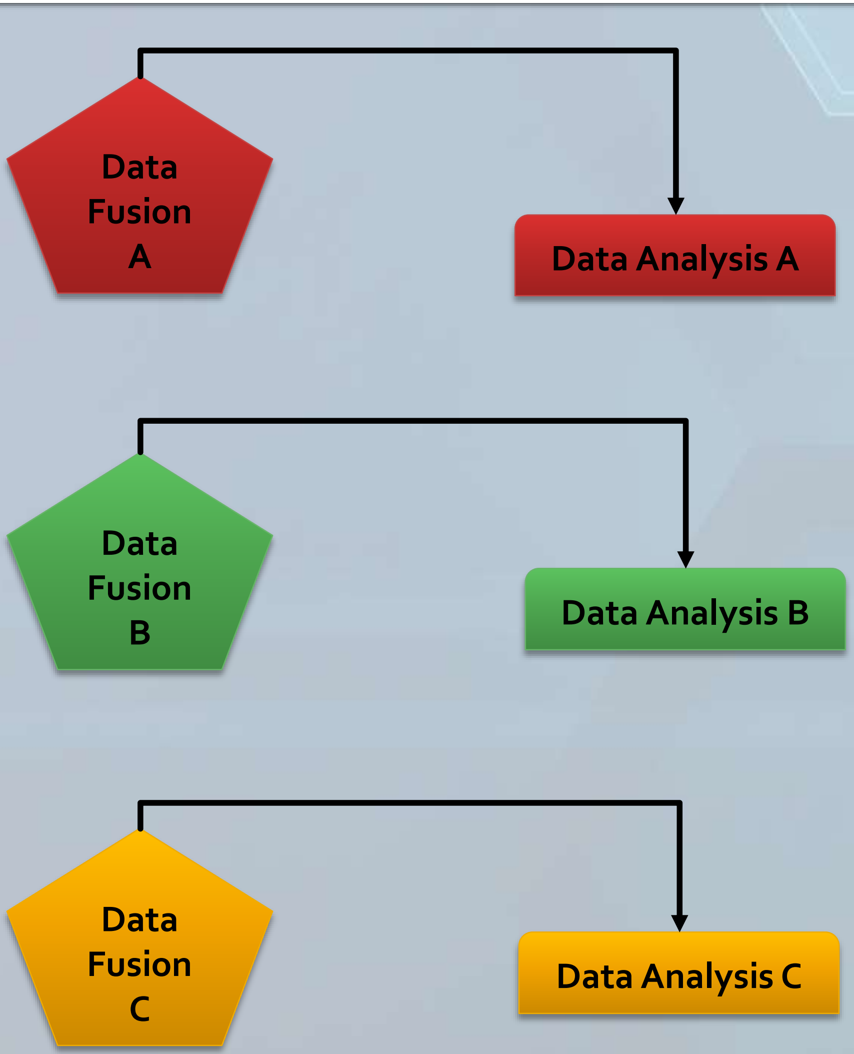
Sequence	Process
Step 1	Individual sensors scan the entire particle space and detect any detectable particle (particle type matches sensor type) within the range of the sensor
Step 2	Individual sensor stores all the particles it detects

Sensor to Data Fusion Model

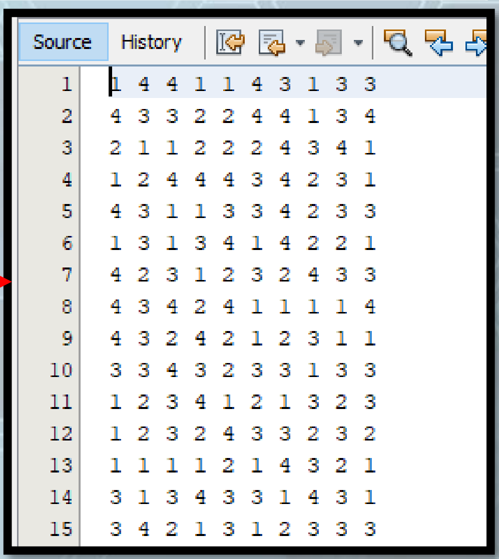


Sequence	Process
Step 1	Sensor detects particles that are within its range of detection and are of the type it detects
Step 2	Sensor decodes the PCode of each particle it detects and translates that PCode into its corresponding integer value
Step 3	Sensor checks its Transmit Authorization Flag to determines if it has permission to transmit its data
Step 4	If the Sensor has permission to transmit its data, it acquires its Data Fusion node and transmits its data

Data Fusion to Data Analysis Model

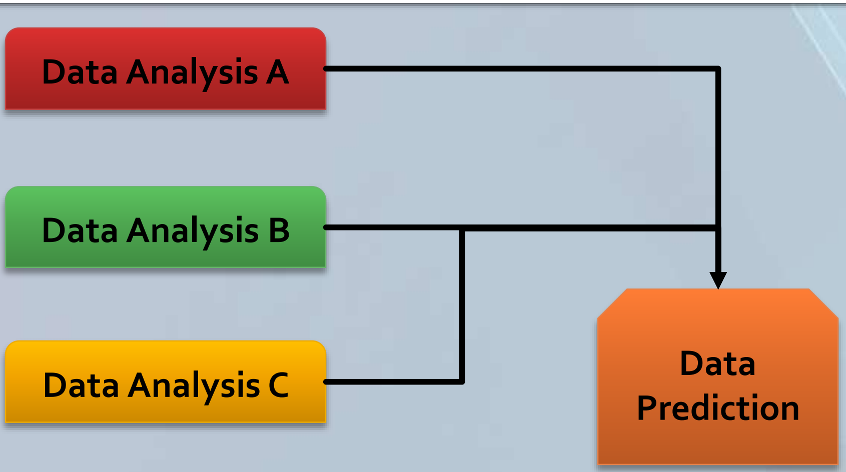


Sequence	Process
Step 1	The DataFusion object takes the detected particles from each sensor and stores it in the FusedBuffer of the DataFusion object
Step 2	The DataFusion object writes the individual integer values from the translated PCode of each detected particle.

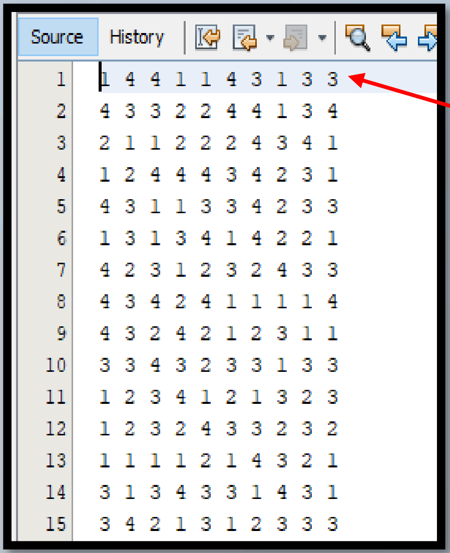


```
1 4 4 1 1 4 3 1 3 3
4 3 3 2 2 4 4 1 3 4
2 1 1 2 2 2 4 3 4 1
1 2 4 4 4 3 4 2 3 1
4 3 1 1 3 3 4 2 3 3
1 3 1 3 4 1 4 2 2 1
4 2 3 1 2 3 2 4 3 3
4 3 4 2 4 1 1 1 1 4
4 3 2 4 2 1 2 3 1 1
3 3 4 3 2 3 3 1 3 3
1 2 3 4 1 2 1 3 2 3
1 2 3 2 4 3 3 2 3 2
1 1 1 1 2 1 4 3 2 1
3 1 3 4 3 3 1 4 3 1
3 4 2 1 3 1 2 3 3 3
```

Data Analysis to Data Prediction Model

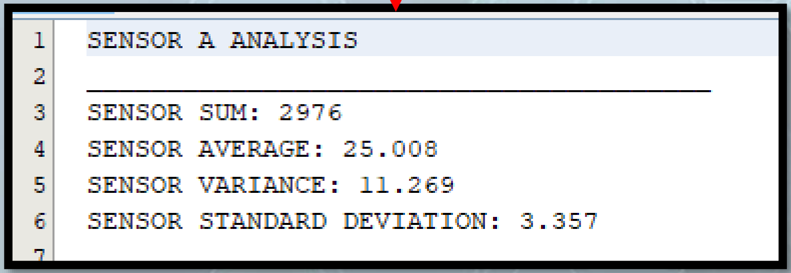


Sequence	Process
Step 1	Reads the corresponding DataFusion file
Step 2	Sums the individuals values of each line and adds this sum to the DataAnalysis FileBuffer
Step 3	The DataAnalysis objects calculates the sum, mean, variance, and standard deviation of the values in the FileBuffer of the DataFusiion object
Step 4	Writes the statistical values calculated in step 4 to the corresponding DataAnalysis file



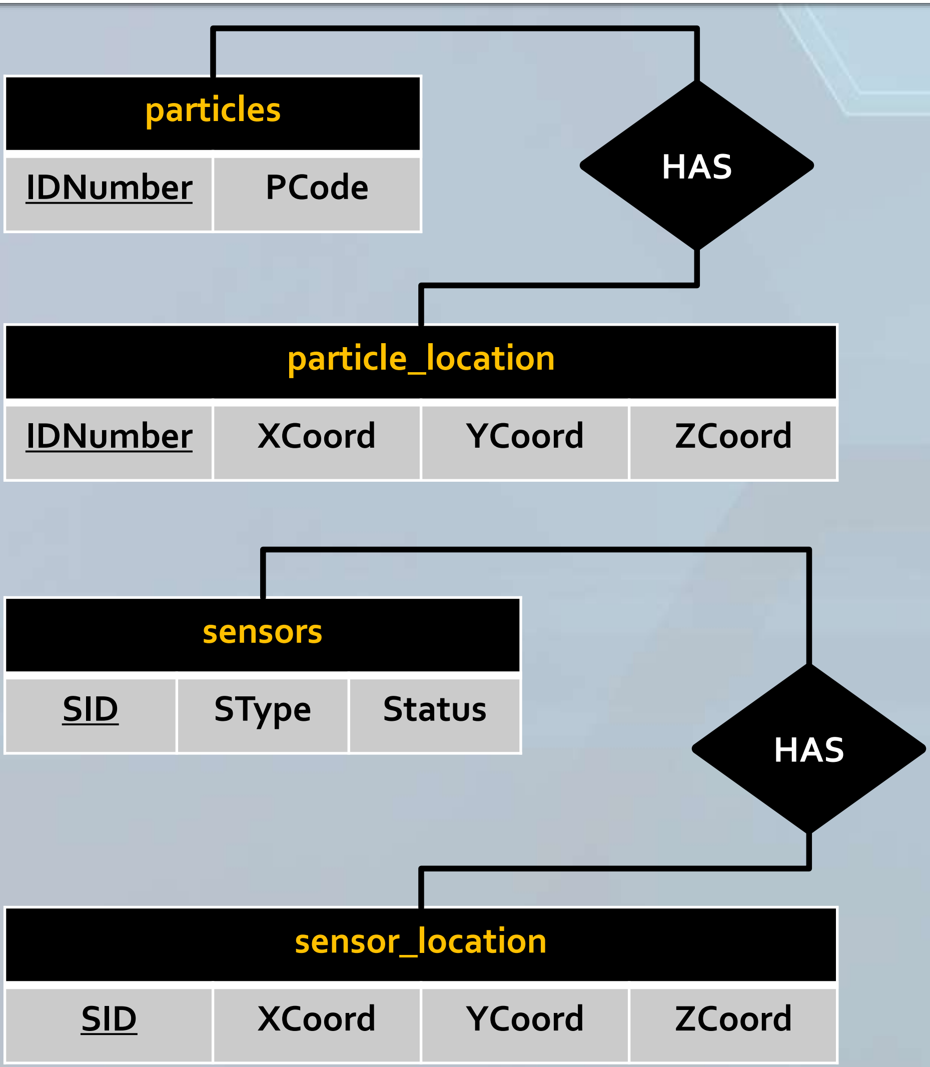
```
1 4 4 1 1 4 3 1 3 3
4 3 3 2 2 4 4 1 3 4
2 1 1 2 2 2 4 3 4 1
1 2 4 4 4 3 4 2 3 1
4 3 1 1 3 3 4 2 3 3
1 3 1 3 4 1 4 2 2 1
4 2 3 1 2 3 2 4 3 3
4 3 4 2 4 1 1 1 1 4
4 3 2 4 2 1 2 3 1 1
3 3 4 3 2 3 3 1 3 3
1 2 3 4 1 2 1 3 2 3
1 2 3 2 4 3 3 2 3 2
1 1 1 1 2 1 4 3 2 1
3 1 3 4 3 3 1 4 3 1
3 4 2 1 3 1 2 3 3 3
```

Calculate the sum, mean, variance, and standard deviation of each line



```
SENSOR A ANALYSIS
________________________________________________
SENSOR SUM: 2976
SENSOR AVERAGE: 25.008
SENSOR VARIANCE: 11.269
SENSOR STANDARD DEVIATION: 3.357
```

Tachyon Database Schema



particles	
IDNumber	PCode

particle_location			
IDNumber	XCoord	YCoord	ZCoord

sensors		
SID	SType	Status

sensor_location			
SID	XCoord	YCoord	ZCoord

fusionNodes			
FCode	XCoord	YCoord	ZCoord

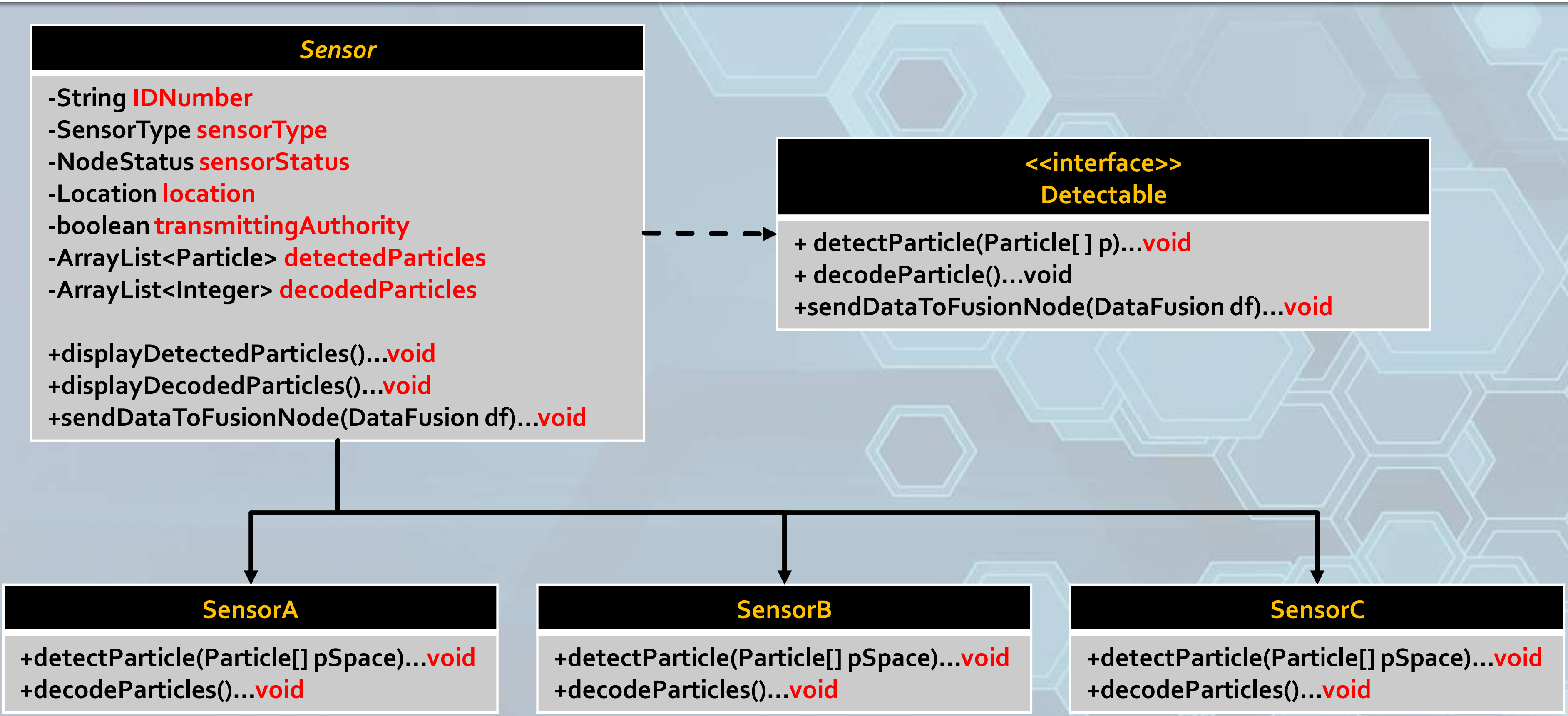
analysisNodes			
ACode	XCoord	YCoord	ZCoord

Sensor Network (Interfaces / Enums)

Interface	Package	Purpose
Analyzable	Globals	Provides abstract method signatures for DataAnalysis objects and constants for the file path for the output file of each DataAnalysis object
Detectable		Provides abstract method signatures for Sensor objects
Fusionable		Provides abstract method signatures for DataFusion objects and constants for the file path for the output file of each DataFusion object
SensorRanges		Contains constants for the range of all three Sensor types

Enum	Package	Purpose
SensorTypes	Globals	Contains Enum for each Sensor type
NodeStatus		Contains Enum for the status of a Node
Predictions		Contains Enum and Enum methods for DataPrediction class

Sensors (UML)



Sensor

-String IDNumber
-SensorType sensorType
-NodeStatus sensorStatus
-Location location
-boolean transmittingAuthority
-ArrayList<Particle> detectedParticles
-ArrayList<Integer> decodedParticles

+displayDetectedParticles()...void
+displayDecodedParticles()...void
+sendDataToFusionNode(DataFusion df)...void

<<interface>>
Detectable

+ detectParticle(Particle[ ] p)...void
+ decodeParticle()...void
+sendDataToFusionNode(DataFusion df)...void

SensorA

+detectParticle(Particle[] pSpace)...void
+decodeParticles()...void

SensorB

+detectParticle(Particle[] pSpace)...void
+decodeParticles()...void

SensorC

+detectParticle(Particle[] pSpace)...void
+decodeParticles()...void

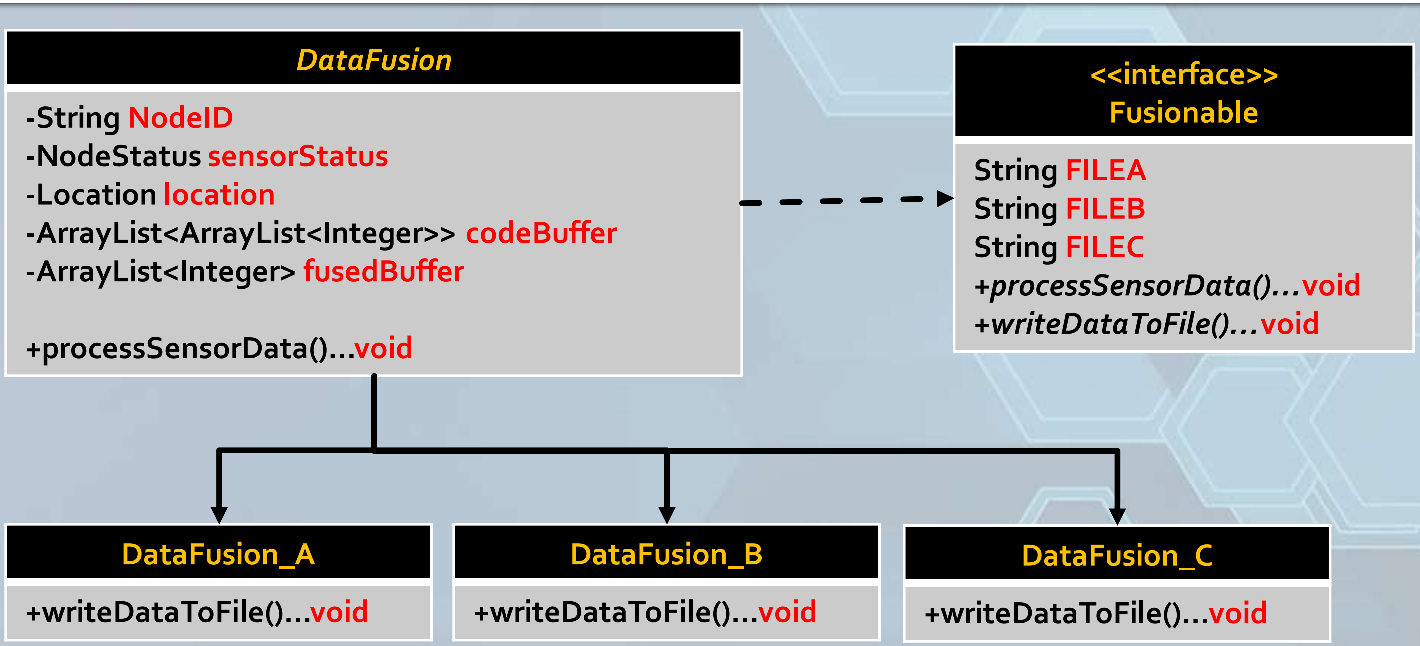
Sensors (UML)

Sensors (Method Specifications)

No.	Method Name	Parameters	Method Returns
1	displayDetetctedParticles	NONE	Displays to the console the Particle IDNumber of every particle detected by the Sensor (See Expected Output)
2	displayDecodedParticles	NONE	Displays to the console the particles (utilizing a toString method) in the decodedParticles of this object (See Expected Output)
3	sendDataToFusionNode	DataFusion df	Transfers the values in the DecodedParticles of this object to the CodeBuffer of the specified DataFusion object if the transmitAuthority of this object is true
4	detectParticles	Particle[] pSpace	Adds a Particle object from the specified Particle array to the DetectedParticles of this object if the particle is within range of this Sensor object and the Particle object's PCode has as its first character the Sensor type (i.e. Sensor_A detects particle whose code begins with an 'A')
5	decodeParticle	NONE	Translate the PCode of each detected particle in the DetectedParticles of this object based on the *chart below*

A Particles	B Particle	C Particle
AAAA = 1	BBBB = 1	CCCC = 1
AAAX = 2	BBBX = 2	CCCX = 2
AAXA = 3	BBXB = 3	CCXC =3
AXAA= 4	BXBB= 4	CXCC= 4

DataFusion (UML)



DataFusion

-String NodeID
-NodeStatus sensorStatus
-Location location
-ArrayList<ArrayList<Integer>> codeBuffer
-ArrayList<Integer> fusedBuffer

+processSensorData()...void

<<interface>>
Fusionable

String FILEA
String FILEB
String FILEC
+processSensorData()...void
+writeDataToFile()...void

DataFusion_A

+writeDataToFile()...void

DataFusion_B

+writeDataToFile()...void

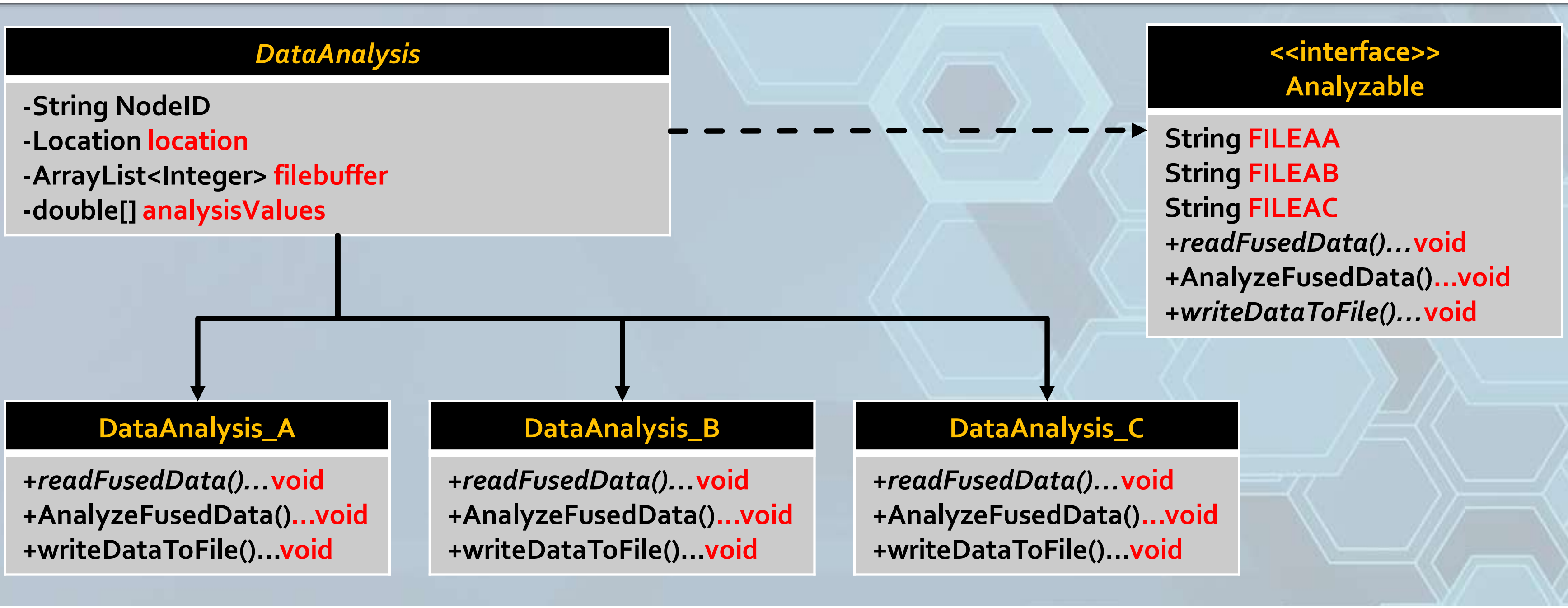
DataFusion_C

+writeDataToFile()...void

DataFusion (Method Specifications)

No.	Method Name	Parameters	Method Returns
1	processSensorData	NONE	Gets each ArrayList from this DataFusion object's CodeBuffer and place each individual value from all ArrayList in CodeBuffer into this object's FusedBuffer
2	writeDataToFile	NONE	Write all the values in this DataFusion object's FusedBuffer to an output file (see format of file on Expected Output slide)

DataAnalysis (UML)



DataAnalysis

-String NodeID
-Location location
-ArrayList<Integer> filebuffer
-double[] analysisValues

<<interface>>
Analyzable

String FILEAA
String FILEAB
String FILEAC
*+readFusedData()…*void
+AnalyzeFusedData()…void
*+writeDataToFile()…*void

DataAnalysis_A

*+readFusedData()…*void
+AnalyzeFusedData()…void
+writeDataToFile()…void

DataAnalysis_B

*+readFusedData()…*void
+AnalyzeFusedData()…void
+writeDataToFile()…void

DataAnalysis_C

*+readFusedData()…*void
+AnalyzeFusedData()…void
+writeDataToFile()…void

DataAnalysis (Method Specifications)

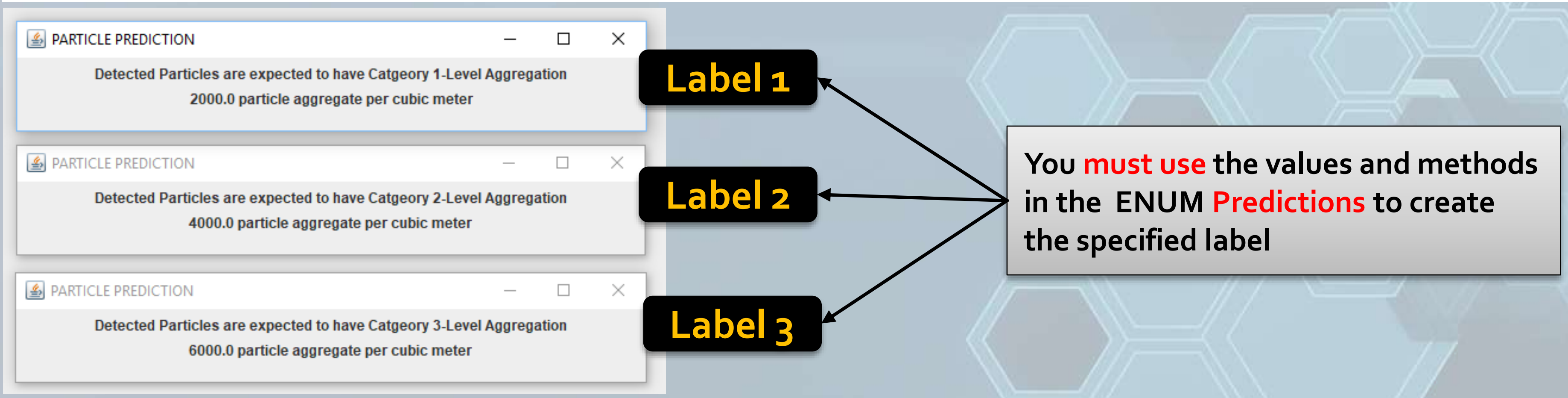
No.	Method Name	Parameters	Method Returns
1	readFusedData	NONE	Reads the file output by the corresponding DataFusion object and sums the values on each line of the file and adds these sums to FileBuffer of this object
2	AnalyzeFusedData	NONE	Stores the sum, mean, variance, and standard deviation of the values in the FileBuffer into AnalysisValues of this object
3	writeDataToFile	NONE	Writes the values in the AnalysisValues of this object to the corresponding DataAnalysis file (filepaths are specified in the Analyzable interface)

DataPrediction (UML)

DataPrediction
+ STATIC predictParticleAggregation(DataAnalysis da)...void

DataPrediction (Method Specifications)

No.	Method Name	Parameters	Method Returns
1	predictParticleAggregation	DataAnalysis da	Creates a Swing Frame that contains a label (LABEL 1) if the sum of the values in the AnalysisValues array of the specified DataAnalysis object is greater than 0 and less than or equal to 1000 or a label (LABEL 2) if the sum of the values in the AnalysisValues array of the specified DataAnalysis object is greater than 1000 and less than or equal to 2000 or a label (LABEL 3) if the sum of the values in the AnalysisValues array of the specified DataAnalysis object is greater than 2000



PARTICLE PREDICTION

Detected Particles are expected to have Catgeory 1-Level Aggregation
2000.0 particle aggregate per cubic meter

PARTICLE PREDICTION

Detected Particles are expected to have Catgeory 2-Level Aggregation
4000.0 particle aggregate per cubic meter

PARTICLE PREDICTION

Detected Particles are expected to have Catgeory 3-Level Aggregation
6000.0 particle aggregate per cubic meter

You must use the values and methods in the ENUM Predictions to create the specified label

Location (UML)

Location

-int X
-int Y
-int Z

+euclidean(Location L)...double
+STATIC euclidean3D(Location L1, Location L2)...void

Location (Method Specifications)

No.	Method Name	Parameters	Method Returns
1	euclidean	Location L	Returns the 3D Euclidean distance between the Location object and another Location object
2	euclidean3D	Location L1 Location L2	Returns the 3D Euclidean distance between two Location objects

DBConnection (UML)

DBConnection
+STATIC establishDBConnection()...Connection

DBConnection (Method Specifications)

No.	Method Name	Parameters	Method Returns
1	establishDBConnection	NONE	A Connection object with the MySQL database

JStats (UML)

JStats

+STATIC sumArrayList(ArrayList<Integer> a)…double
+STATIC muArrayList(ArrayList<Integer> a)…double
+STATIC sigma2ArrayList(ArrayList<Integer> a)…double
+STATIC sigmaArrayList(ArrayList<Integer> a)…double

JStats (Method Specifications)

No.	Method Name	Parameters	Method Returns
1	sumArrayList()	ArrayList<Integer>	The sum of the values in the specified ArrayList
2	muArrayList()	ArrayList<Integer>	The mean of the values in the specified ArrayList
3	sigma2ArrayList()	ArrayList<Integer>	The variance of the values in the specified ArrayList
4	sigmaArrayList()	ArrayList<Integer>	The standard deviation of the values in the specified ArrayList

Factory Classes (UML)

SensorFactory
+STATIC createDBSensors()…Sensor[ ] +STATIC displaySensors()…void

ParticleFactory
+STATIC createDBParticles()…Particle[ ] +STATIC displayParticles()…void

DataFusionNodeFactory
+STATIC createDBFusionNodes()…DataFusion[ ] +STATIC displayFusionNodes()…void

DataAnalysisNodeFactory
+STATIC createDBAnalysisNodes()…DataAnalysis[ ] +STATIC displayAnalysisNodes()…void

FACTORY METHODS (Method Specifications)

No.	Method Name	Parameters	Method Returns
1	createDB*[X]*	NONE	Utilizes JDBC and the specified class to create the specified objects from the database and returns the objects in an array of the class type
2	Display*[X]*	NONE	Displays the persistent objects created in the createDB[X] method in the format shown (See Expected Output)

Enums (UML)

NodeStatus

ONLINE
OFFLINE

Predictions

Prediction1(“Category 1-Level Aggregation,2000)
Prediction2(“Category 2-Level Aggregation,4000)
Prediction3(“Category 3-Level Aggregation,6000)

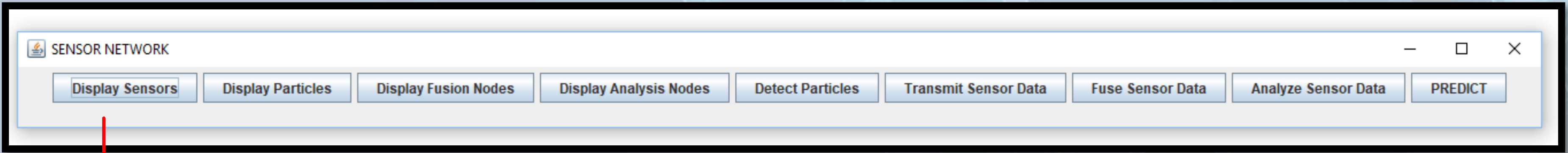
-String classification
-Double values

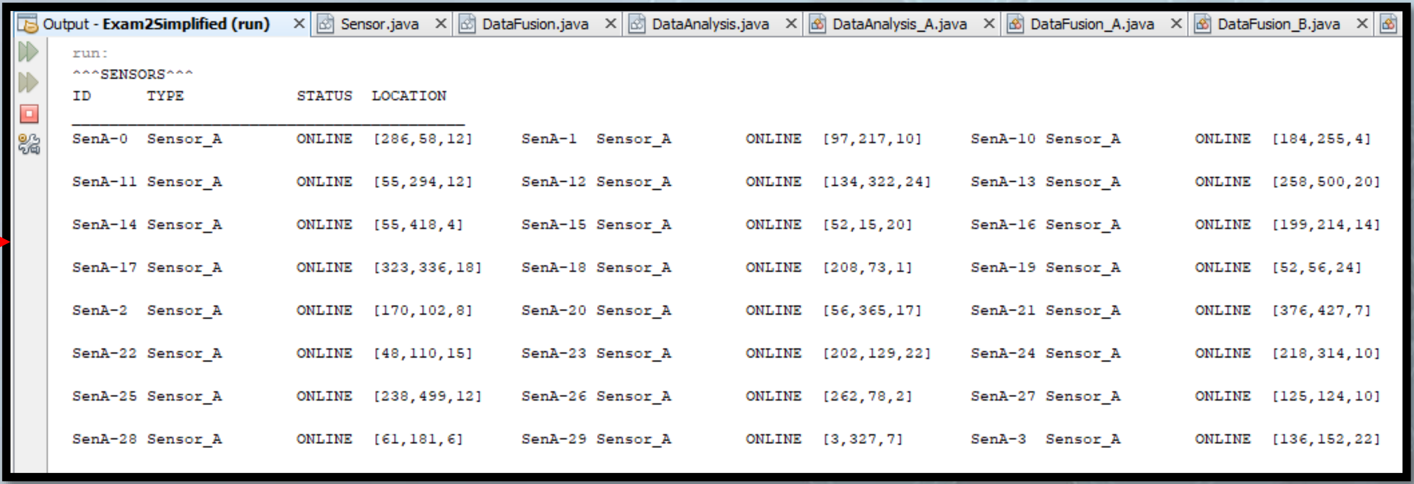
+displayClassification()…String
+displayValue()…String

SensorTypes

Sensor_A
Sensor_B
Sensor_C

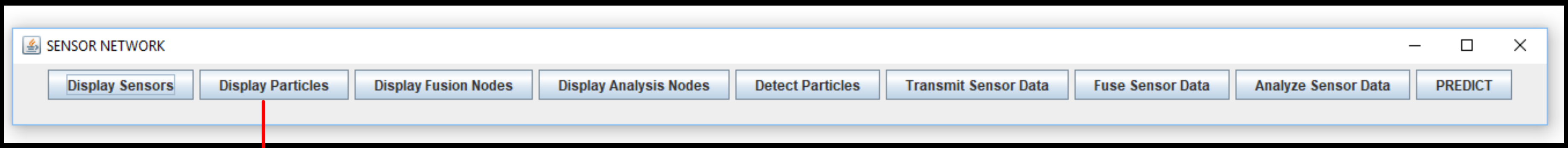
GUI Design

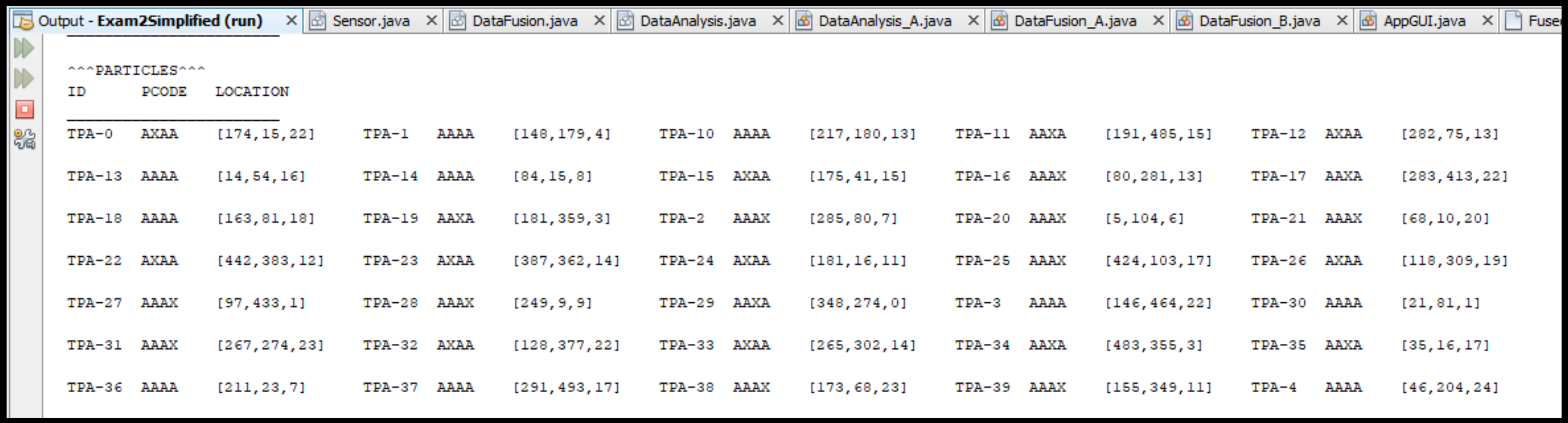




```
run:
^^^SENSORS^^^
ID      TYPE            STATUS  LOCATION
__________________________________________
SenA-0  Sensor_A        ONLINE  [286,58,12]     SenA-1  Sensor_A        ONLINE  [97,217,10]     SenA-10 Sensor_A        ONLINE  [184,255,4]

SenA-11 Sensor_A        ONLINE  [55,294,12]     SenA-12 Sensor_A        ONLINE  [134,322,24]    SenA-13 Sensor_A        ONLINE  [258,500,20]

SenA-14 Sensor_A        ONLINE  [55,418,4]      SenA-15 Sensor_A        ONLINE  [52,15,20]      SenA-16 Sensor_A        ONLINE  [199,214,14]

SenA-17 Sensor_A        ONLINE  [323,336,18]    SenA-18 Sensor_A        ONLINE  [208,73,1]      SenA-19 Sensor_A        ONLINE  [52,56,24]

SenA-2  Sensor_A        ONLINE  [170,102,8]     SenA-20 Sensor_A        ONLINE  [56,365,17]     SenA-21 Sensor_A        ONLINE  [376,427,7]

SenA-22 Sensor_A        ONLINE  [48,110,15]     SenA-23 Sensor_A        ONLINE  [202,129,22]    SenA-24 Sensor_A        ONLINE  [218,314,10]

SenA-25 Sensor_A        ONLINE  [238,499,12]    SenA-26 Sensor_A        ONLINE  [262,78,2]      SenA-27 Sensor_A        ONLINE  [125,124,10]

SenA-28 Sensor_A        ONLINE  [61,181,6]      SenA-29 Sensor_A        ONLINE  [3,327,7]       SenA-3  Sensor_A        ONLINE  [136,152,22]
```

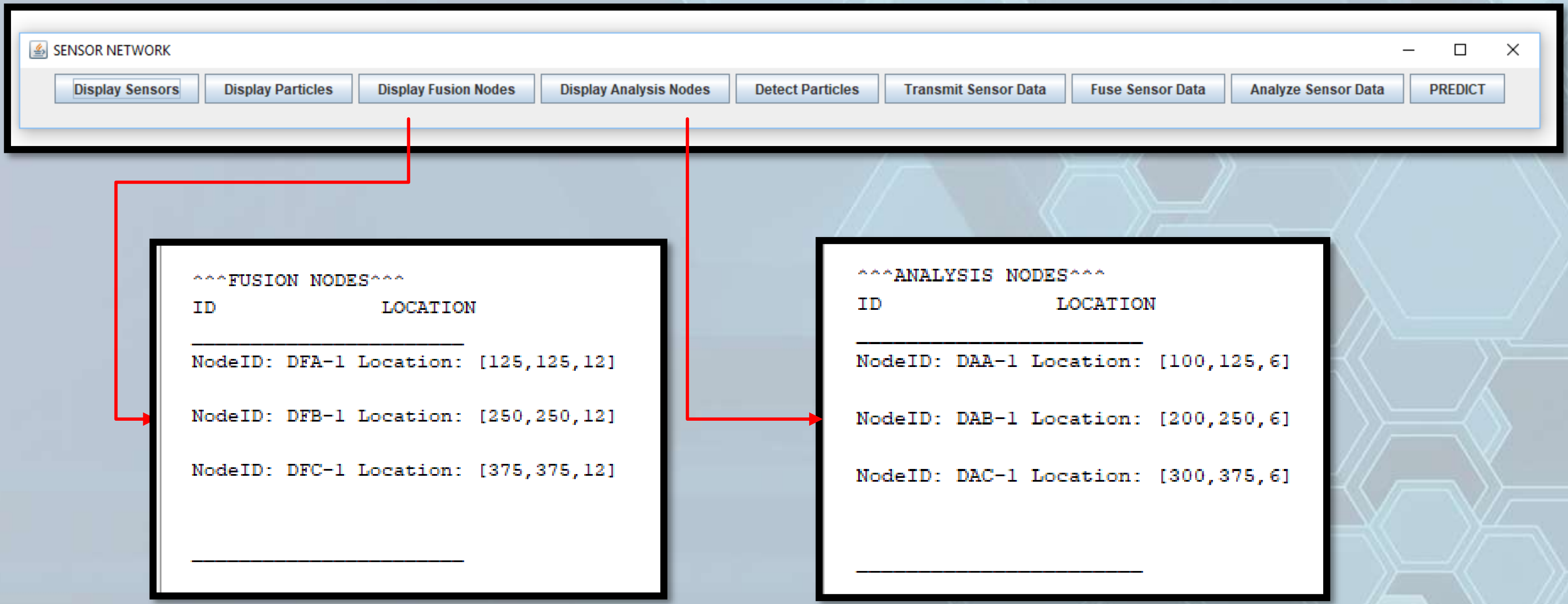
GUI Design





```
______________________________

^^^PARTICLES^^^
ID        PCODE    LOCATION
______________________________
TPA-0   AXAA    [174,15,22]     TPA-1   AAAA    [148,179,4]     TPA-10  AAAA    [217,180,13]    TPA-11  AAXA    [191,485,15]    TPA-12  AXAA    [282,75,13]

TPA-13  AAAA    [14,54,16]      TPA-14  AAAA    [84,15,8]       TPA-15  AXAA    [175,41,15]     TPA-16  AAAX    [80,281,13]     TPA-17  AAXA    [283,413,22]

TPA-18  AAAA    [163,81,18]     TPA-19  AAXA    [181,359,3]     TPA-2   AAAX    [285,80,7]      TPA-20  AAAX    [5,104,6]       TPA-21  AAAX    [68,10,20]

TPA-22  AXAA    [442,383,12]    TPA-23  AXAA    [387,362,14]    TPA-24  AXAA    [181,16,11]     TPA-25  AAAX    [424,103,17]    TPA-26  AXAA    [118,309,19]

TPA-27  AAAX    [97,433,1]      TPA-28  AAAX    [249,9,9]       TPA-29  AAXA    [348,274,0]     TPA-3   AAAA    [146,464,22]    TPA-30  AAAA    [21,81,1]

TPA-31  AAAX    [267,274,23]    TPA-32  AXAA    [128,377,22]    TPA-33  AXAA    [265,302,14]    TPA-34  AAXA    [483,355,3]     TPA-35  AAXA    [35,16,17]

TPA-36  AAAA    [211,23,7]      TPA-37  AAAA    [291,493,17]    TPA-38  AAAX    [173,68,23]     TPA-39  AAAX    [155,349,11]    TPA-4   AAAA    [46,204,24]
```

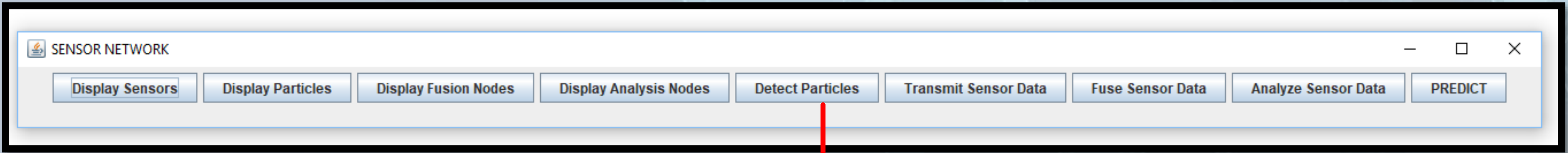
GUI Design

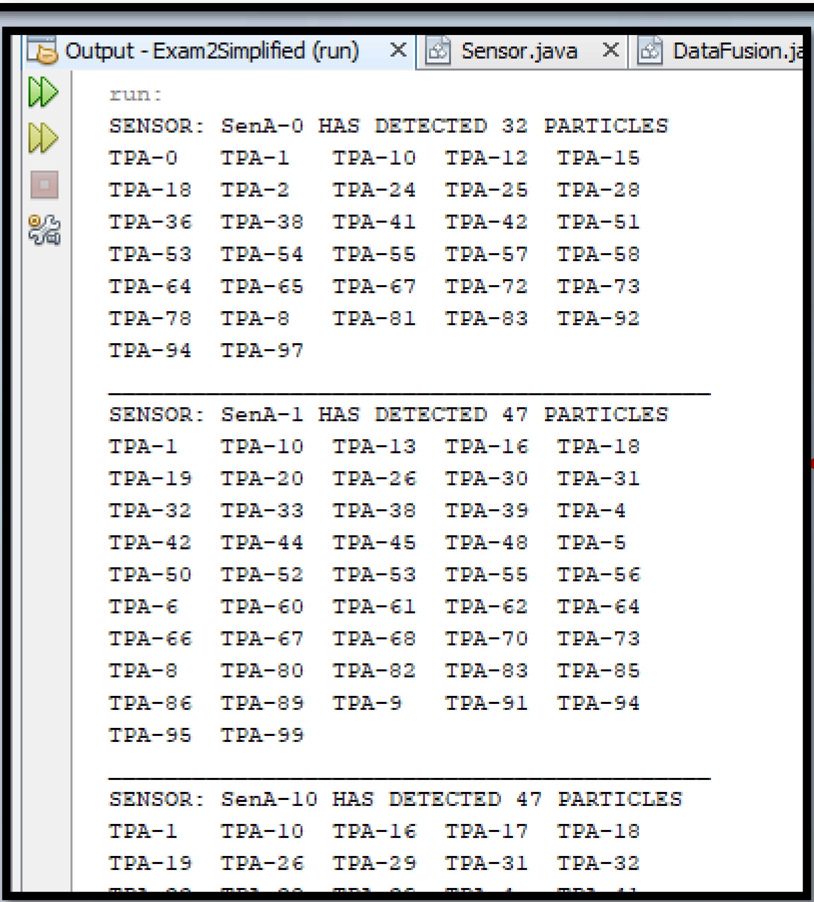


```
^^^FUSION NODES^^^
ID                LOCATION

________________________
NodeID: DFA-1 Location: [125,125,12]

NodeID: DFB-1 Location: [250,250,12]

NodeID: DFC-1 Location: [375,375,12]


________________________
```

```
^^^ANALYSIS NODES^^^
ID                LOCATION

________________________
NodeID: DAA-1 Location: [100,125,6]

NodeID: DAB-1 Location: [200,250,6]

NodeID: DAC-1 Location: [300,375,6]


________________________
```

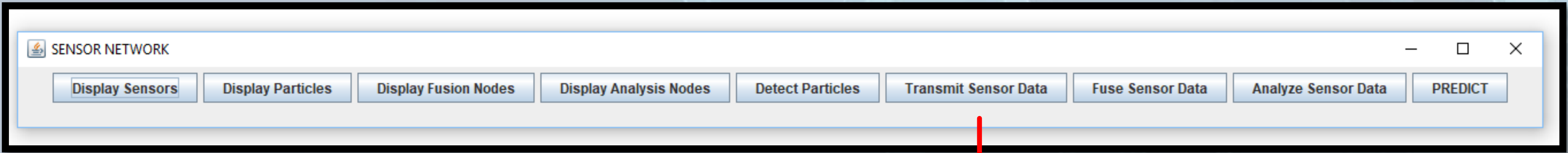
GUI Design

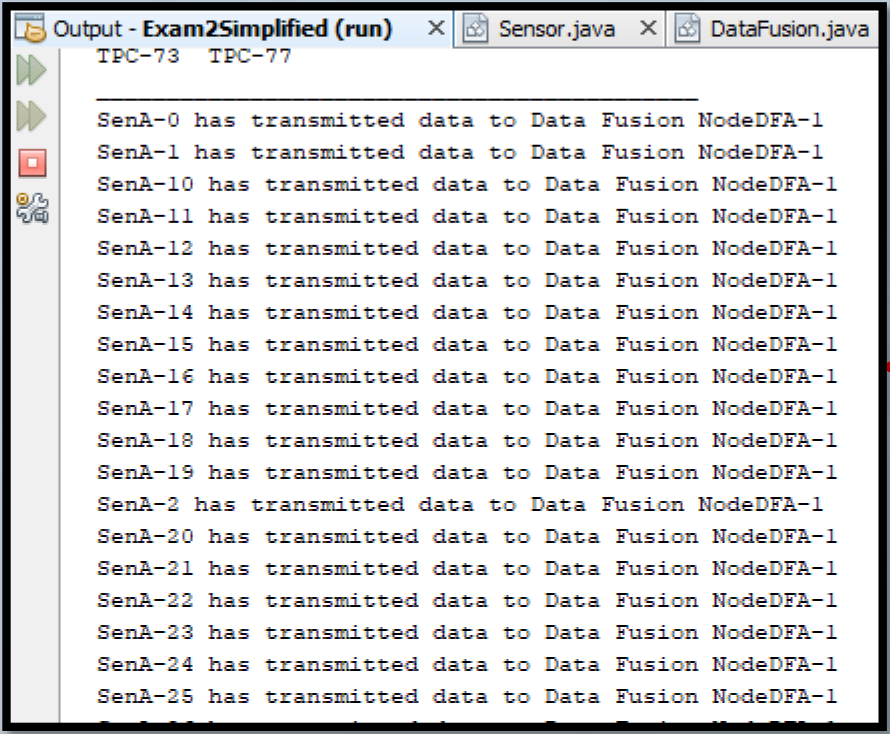




```
run:
SENSOR: SenA-0 HAS DETECTED 32 PARTICLES
TPA-0   TPA-1   TPA-10  TPA-12  TPA-15
TPA-18  TPA-2   TPA-24  TPA-25  TPA-28
TPA-36  TPA-38  TPA-41  TPA-42  TPA-51
TPA-53  TPA-54  TPA-55  TPA-57  TPA-58
TPA-64  TPA-65  TPA-67  TPA-72  TPA-73
TPA-78  TPA-8   TPA-81  TPA-83  TPA-92
TPA-94  TPA-97

_____________________________________________
SENSOR: SenA-1 HAS DETECTED 47 PARTICLES
TPA-1   TPA-10  TPA-13  TPA-16  TPA-18
TPA-19  TPA-20  TPA-26  TPA-30  TPA-31
TPA-32  TPA-33  TPA-38  TPA-39  TPA-4
TPA-42  TPA-44  TPA-45  TPA-48  TPA-5
TPA-50  TPA-52  TPA-53  TPA-55  TPA-56
TPA-6   TPA-60  TPA-61  TPA-62  TPA-64
TPA-66  TPA-67  TPA-68  TPA-70  TPA-73
TPA-8   TPA-80  TPA-82  TPA-83  TPA-85
TPA-86  TPA-89  TPA-9   TPA-91  TPA-94
TPA-95  TPA-99

_____________________________________________
SENSOR: SenA-10 HAS DETECTED 47 PARTICLES
TPA-1   TPA-10  TPA-16  TPA-17  TPA-18
TPA-19  TPA-26  TPA-29  TPA-31  TPA-32
```

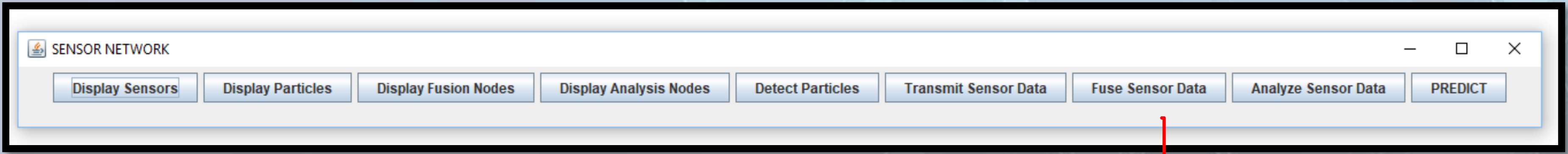
GUI Design

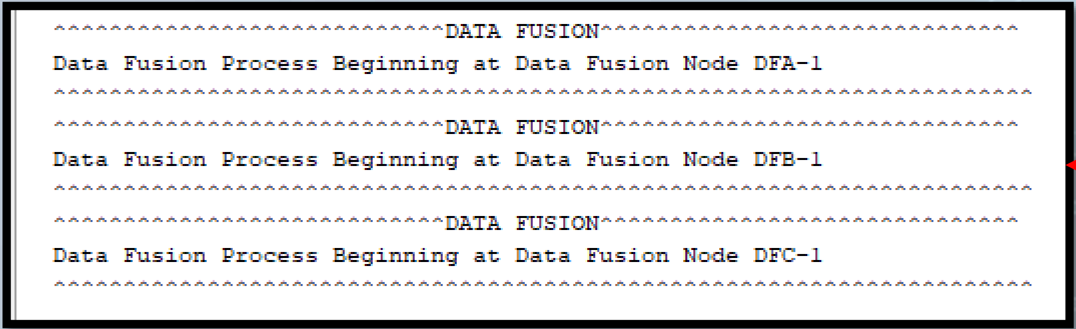




```
TPC-73  TPC-77

___________________________________________
SenA-0 has transmitted data to Data Fusion NodeDFA-1
SenA-1 has transmitted data to Data Fusion NodeDFA-1
SenA-10 has transmitted data to Data Fusion NodeDFA-1
SenA-11 has transmitted data to Data Fusion NodeDFA-1
SenA-12 has transmitted data to Data Fusion NodeDFA-1
SenA-13 has transmitted data to Data Fusion NodeDFA-1
SenA-14 has transmitted data to Data Fusion NodeDFA-1
SenA-15 has transmitted data to Data Fusion NodeDFA-1
SenA-16 has transmitted data to Data Fusion NodeDFA-1
SenA-17 has transmitted data to Data Fusion NodeDFA-1
SenA-18 has transmitted data to Data Fusion NodeDFA-1
SenA-19 has transmitted data to Data Fusion NodeDFA-1
SenA-2 has transmitted data to Data Fusion NodeDFA-1
SenA-20 has transmitted data to Data Fusion NodeDFA-1
SenA-21 has transmitted data to Data Fusion NodeDFA-1
SenA-22 has transmitted data to Data Fusion NodeDFA-1
SenA-23 has transmitted data to Data Fusion NodeDFA-1
SenA-24 has transmitted data to Data Fusion NodeDFA-1
SenA-25 has transmitted data to Data Fusion NodeDFA-1
```

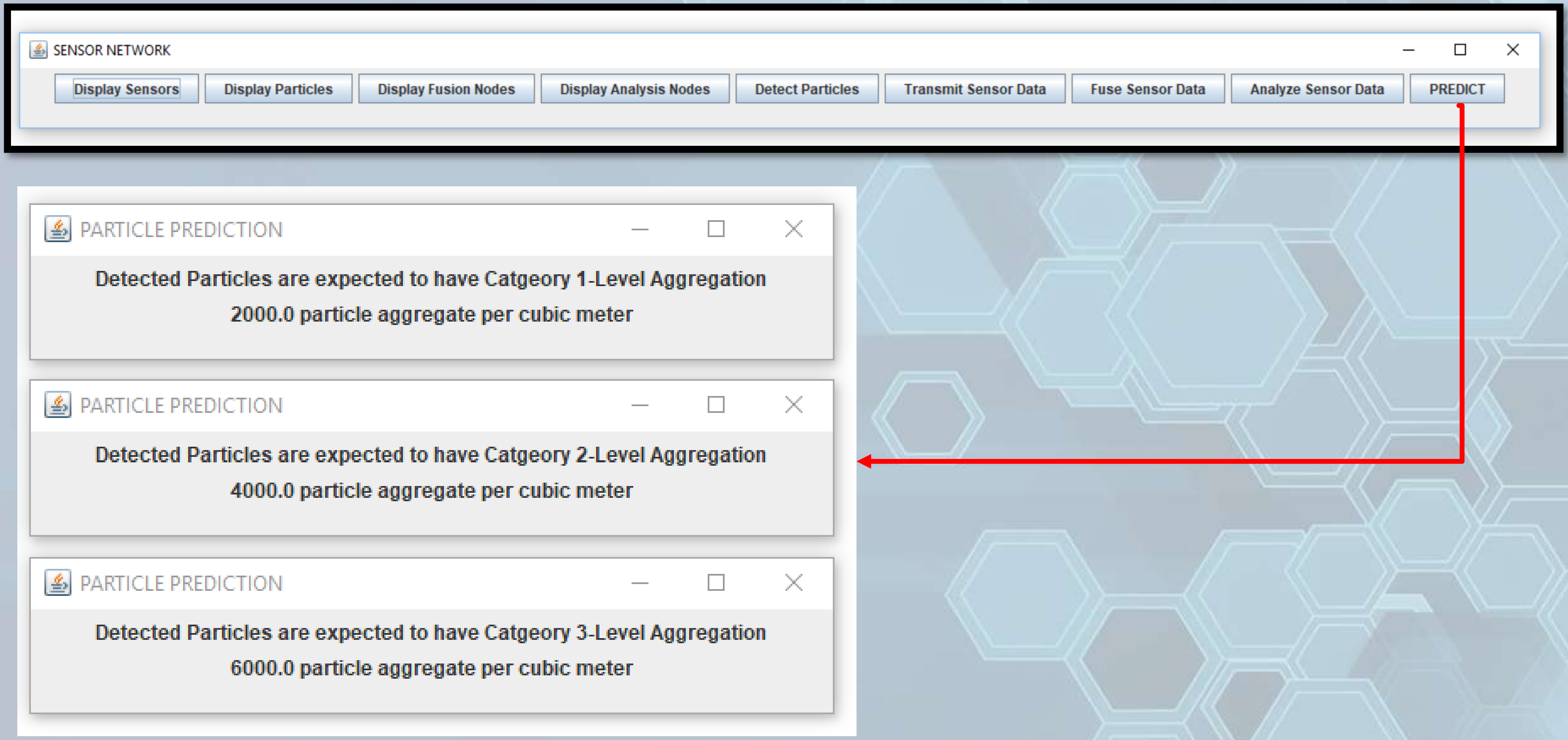
GUI Design





```
^^^^^^^^^^^^^^^^^^^^^^^^^^^^DATA FUSION^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
Data Fusion Process Beginning at Data Fusion Node DFA-1
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
^^^^^^^^^^^^^^^^^^^^^^^^^^^^DATA FUSION^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
Data Fusion Process Beginning at Data Fusion Node DFB-1
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
^^^^^^^^^^^^^^^^^^^^^^^^^^^^DATA FUSION^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
Data Fusion Process Beginning at Data Fusion Node DFC-1
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```

GUI Design

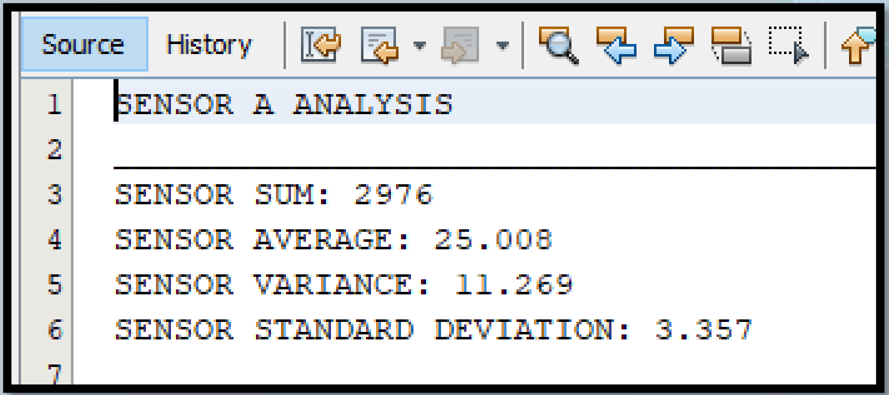


Detected Particles are expected to have Catgeory 1-Level Aggregation
2000.0 particle aggregate per cubic meter

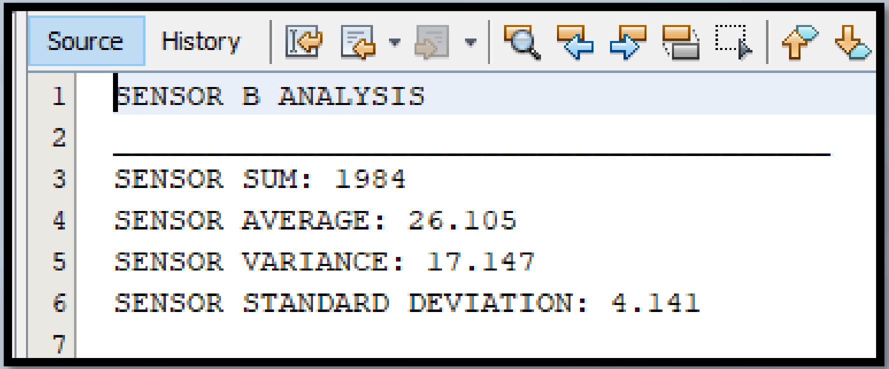
Detected Particles are expected to have Catgeory 2-Level Aggregation
4000.0 particle aggregate per cubic meter

Detected Particles are expected to have Catgeory 3-Level Aggregation
6000.0 particle aggregate per cubic meter

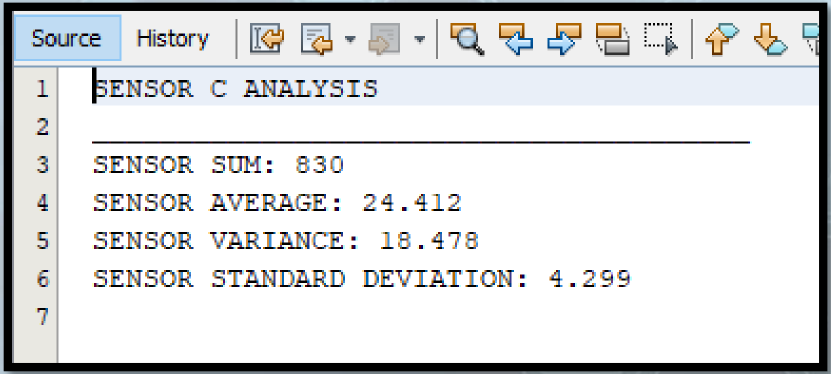
Expected Output (Data Analysis Files)



```
SENSOR A ANALYSIS
_______________________________________
SENSOR SUM: 2976
SENSOR AVERAGE: 25.008
SENSOR VARIANCE: 11.269
SENSOR STANDARD DEVIATION: 3.357
```



```
SENSOR B ANALYSIS
_______________________________________
SENSOR SUM: 1984
SENSOR AVERAGE: 26.105
SENSOR VARIANCE: 17.147
SENSOR STANDARD DEVIATION: 4.141
```



```
SENSOR C ANALYSIS
_______________________________________
SENSOR SUM: 830
SENSOR AVERAGE: 24.412
SENSOR VARIANCE: 18.478
SENSOR STANDARD DEVIATION: 4.299
```