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Logo

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Description automatically generated with medium confidence

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# Normalisation

## Raw Data

|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| sensorID  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage  gatewayID  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID\*  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID\*  networkID\*  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange |
| **accountID**  accountName | **accountID**  accountName | **accountID**  accountName |
| **networkID**  networkName | **networkID**  networkName | **networkID**  networkName |
| **applicationID**  applicationName | **applicationID**  applicationName | **applicationID**  applicationName |

## Sensor Data 1st Pass

|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| sensorID  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage  gatewayID  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **aqID**  sensorID\*  messageDate  gPerM3  PM1  PM2.5  PM10  units |
| **accountID**  accountName | **accountID**  accountName | **co2ID**  sensorID\*  messageDate  instantaneous  twa  units |
| **networkID**  networkName | **networkID**  networkName | **avID**  sensorID\*  messageDate  airVelocity  temperature  airVelocityUnits  temperatureUnits |
| **applicationID**  applicationName | **applicationID**  applicationName | **motionID**  sensorID\*  messageDate  value |
| **temperatureID**  sensorID\*  messageDate  temperature  units |
| **lightID**  sensorID\*  messageDate  LuxData  LightDetect  units |
| **humidityID**  sensorID\*  messageDate  humidity  temperature  dewpoint  gramsPerKilogram  humidityUnits  temperatureUnits  dewpointUnits  framsPerKilogramUnits |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange |

## Sensor Data 2nd Pass

|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| sensorID  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage  gatewayID  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID\*  networkID\*  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **aqID**  sensorID\*  messageDate  gPerM3  PM1  PM2.5  PM10  units |
| **accountID**  accountName | **accountID**  accountName | **co2ID**  sensorID\*  messageDate  instantaneous  twa  units |
| **networkID**  networkName | **networkID**  networkName | **avID**  sensorID\*  messageDate  airVelocity  temperature  airVelocityUnits  temperatureUnits |
| **applicationID**  applicationName | **applicationID**  applicationName | **motionID**  sensorID\*  messageDate  value |
| **temperatureID**  sensorID\*  messageDate  temperature  units |
| **lightID**  sensorID\*  messageDate  LuxData  LightDetect  units |
| **humidityID**  sensorID\*  messageDate  humidity  temperature  dewpoint  gramsPerKilogram  humidityUnits  temperatureUnits  dewpointUnits  framsPerKilogramUnits |
| **gatewayID**  gatewayName  accountID\*  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange |
| **accountID**  accountName |
| **networkID**  networkName |
| **applicationID**  applicationName |

## Sensor Data 3rd Pass

|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| sensorID  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage  gatewayID  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID  networkID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage | **sensorID**  sensorName  applicationID\*  networkID\*  dataMessageGUID  sensorState  bateryLevel  signalStrength  pendingChange  voltage |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **aqID**  sensorID\*  messageDate  gPerM3  PM1  PM2.5  PM10  unitID\* |
| **accountID**  accountName | **accountID**  accountName | **co2ID**  sensorID\*  messageDate  instantaneous  twa  unitID\* |
| **networkID**  networkName | **networkID**  networkName | **avID**  sensorID\*  messageDate  airVelocity  temperature  airVelocityUnitID\*  temperatureUnitID\* |
| **applicationID**  applicationName | **applicationID**  applicationName | **motionID**  sensorID\*  messageDate  value |
| **temperatureID**  sensorID\*  messageDate  temperature  unitID\* |
| **lightID**  sensorID\*  messageDate  LuxData  LightDetect  unitID\* |
| **humidityID**  sensorID\*  messageDate  humidity  temperature  dewpoint  gramsPerKilogram  humidityUnitID\*  temperatureUnitID\*  dewpointUnitID\*  framsPerKilogramUnitID\* |
| **gatewayID**  gatewayName  accountID\*  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange |
| **unitID**  unitName |
| **accountID**  accountName |
| **networkID**  networkName |
| **applicationID**  applicationName |

### Notes

This line of normalisation is flawed and needs to be re-done from the raw data.

This is because repeating attributes are introduced to the data through the normalisation process, such as the repetition of the data values themselves as they would need to be processed and stored into different tables.

A better solution is to maintain a single table for all the data values but pre-process them into a format that can be easily queried.

## Corrected Sensor Data

|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| sensorID  sensorName  applicationID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage  gatewayID  gatewayName  accountID  networkID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **sensorID**  sensorName  applicationID  networkID | **sensorID**  sensorName  applicationID  networkID | **sensorID**  sensorName  applicationID\*  networkID\* |
| **readingID**  **dataMessageGUID**  rawData  messageDate | **readingID**  **dataMessageGUID**  rawData  messageDate | **readingID**  **dataMessageGUID**  sensorID\*  dTypeID\*  rawData  messageDate |
| **dTypeID**  dataType | **dTypeID**  dataType | **dTypeID**  dataType |
| **batteryID**  batteryLevel | **batteryID**  batteryLevel | **batteryID**  dataMessageGUID\*  batteryLevel |
| **signalID**  signalStrength | **signalID**  signalStrength | **signalID**  dataMessageGUID\*  signalStrength |
| **changeID**  pendingChange | **changeID**  pendingChange | **changeID**  dataMessageGUID\*  pendingChange |
| **voltageID**  voltage | **voltageID**  voltage | **voltageID**  dataMessageGUID\*  voltage |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID\*  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange |
| **applicationID**  applicationName |
| **networkID**  networkName |
| **accountID**  accountName |

### Notes

Reliant on generated IDs for duplicate prevention, switch to using a composite key system.

## Corrected Sensor Data 2nd Pass\*

|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| sensorID  sensorName  applicationID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage  gatewayID  gatewayName  accountID  networkID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **sensorID**  sensorName  applicationID  networkID | **sensorID**  sensorName  applicationID  networkID | **sensorID**  sensorName  applicationID\*  networkID\* |
| **dataMessageGUID**  rawData  messageDate | **dataMessageGUID**  rawData  messageDate | **dataMessageGUID**  **sensorID\***  dTypeID\*  rawData  messageDate |
| **dTypeID**  dataType | **dTypeID**  dataType | **dTypeID**  dataType |
| batteryLevel | batteryLevel | **sensorID\***  **dataMessageGUID\***  batteryLevel |
| signalStrength | signalStrength | **sensorID\***  **dataMessageGUID\***  signalStrength |
| pendingChange | pendingChange | **sensorID\***  **dataMessageGUID\***  pendingChange |
| voltage | voltage | **sensorID\***  **dataMessageGUID\***  voltage |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID\*  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange |
| **applicationID**  applicationName |
| **networkID**  networkName |
| **accountID**  accountName |

### Notes

Removal of generated IDs has broken the ability to split sensor messages before insertion, and so Readings table will need a generated ID but the other tables can use a composite key instead.

## Corrected Sensor Data 3nd Pass\*

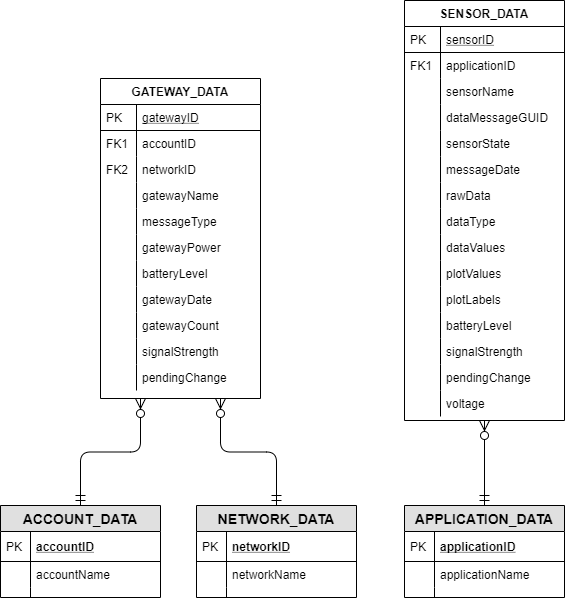
|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| sensorID  sensorName  applicationID  dataMessageGUID  sensorState  messageDate  rawData  dataType  dataValue  plotValues  plotLabels  bateryLevel  signalStrength  pendingChange  voltage  gatewayID  gatewayName  accountID  networkID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **sensorID**  sensorName  applicationID  networkID | **sensorID**  sensorName  applicationID  networkID | **sensorID**  sensorName  applicationID\*  networkID\* |
| **dataMessageGUID**  rawData  dataValue  plotValues  messageDate | **dataMessageGUID**  rawData  dataValue  plotValues  messageDate | **readingID**  **dataMessageGUID**  sensorID**\***  dTypeID\*  plotLabelID\*  rawData  dataValue  plotValues  messageDate |
| dataType | dataType | **dTypeID**  dataType |
| plotLabels | plotLabels | **plotLabelID**  plotLabels |
| batteryLevel | batteryLevel | **readingID\***  **dataMessageGUID\***  batteryLevel |
| signalStrength | signalStrength | **readingID\***  **dataMessageGUID\***  signalStrength |
| pendingChange | pendingChange | **readingID\***  **dataMessageGUID\***  pendingChange |
| voltage | voltage | **readingID\***  **dataMessageGUID\***  voltage |
| **applicationID**  applicationName |
| **networkID**  networkName |
| **accountID**  accountName |
| **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange | **gatewayID**  gatewayName  accountID\*  messageType  gatewayPower  batteryLevel  gatewayDate  gatewayCount  signalStrength  pendingChange |

## User Data

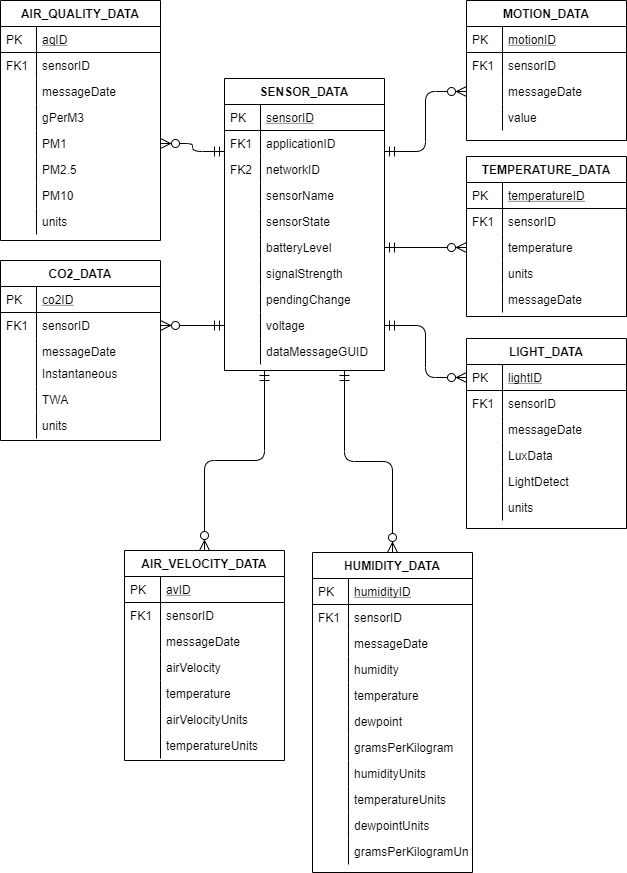
|  |  |  |  |
| --- | --- | --- | --- |
| UNF  Repeating attributes indented | 1NF  Remove repeating attributes and identify a primary key | 2NF  Remove partial dependencies | 3NF  Remove non-key dependencies |
| userID  username  forename  surname  password  email  contactNo  salt  isAdmin  permissions | **userID**  username  forename  surname  email  password  salt  contactNo | **userID**  username  forename  surname  email  contactNo | **userID**  username  forename  surname  email  contactNo |
| **adminID**  isAdmin | **adminID**  isAdmin | **adminID**  userID\*  isAdmin |
| **permissionsID**  permissions | **passwordID**  password  salt | **passwordID**  userID\*  password  salt |
| **permissionsID**  permissions | **permissionsID**  userID\*  permissions |

# Entity Relations

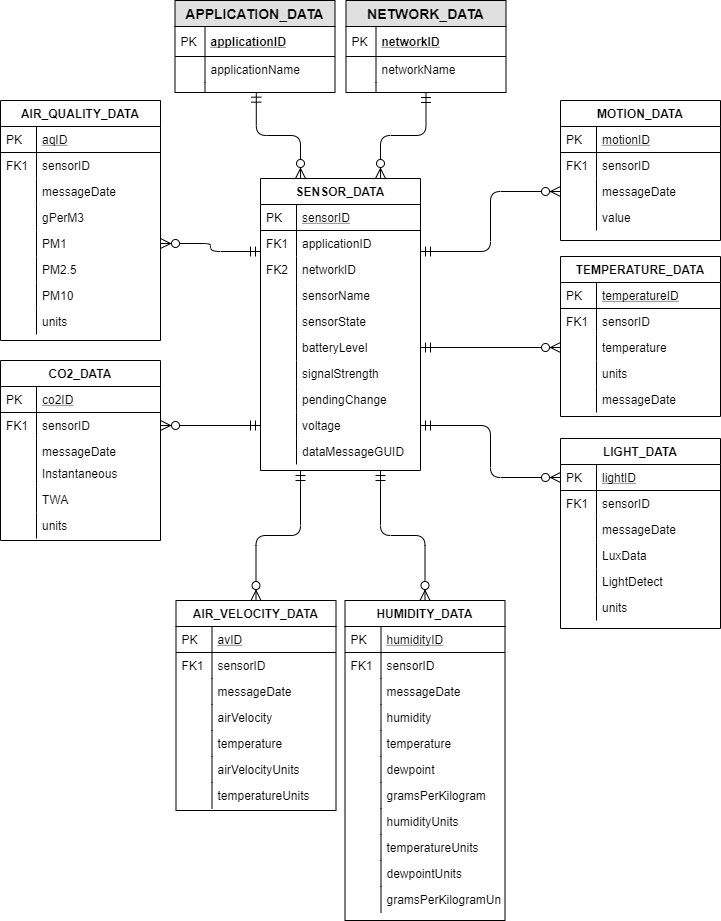
## Raw Data



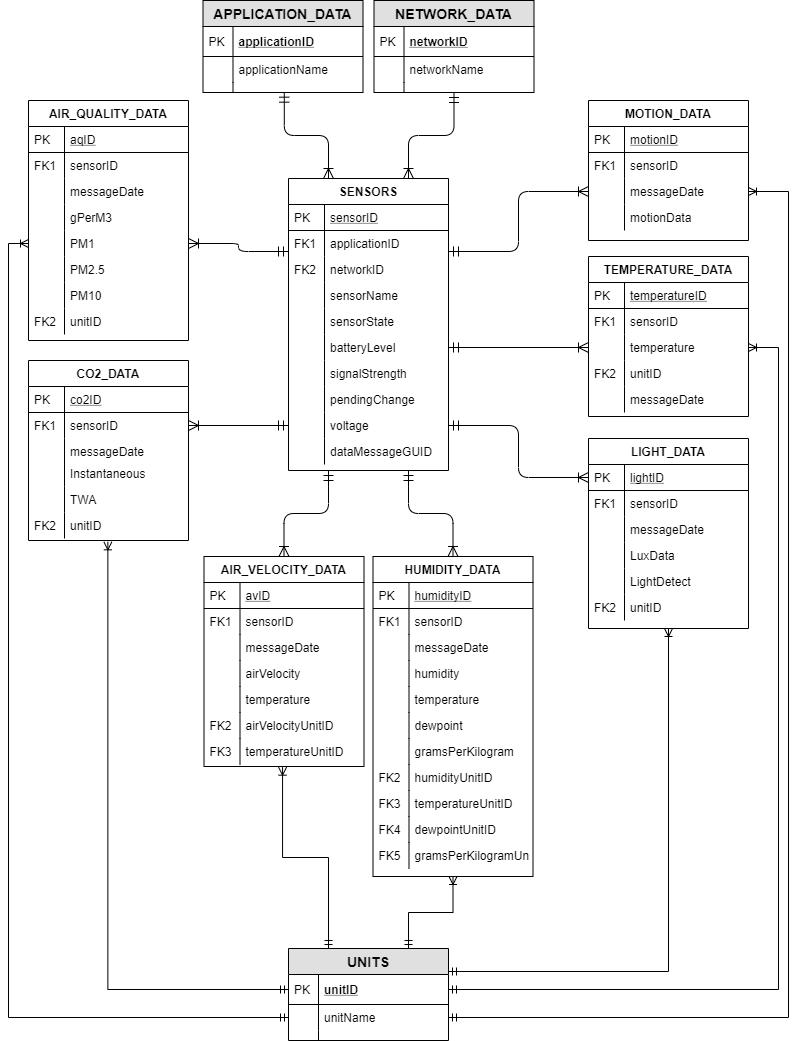
## Sensor Data 1st Pass



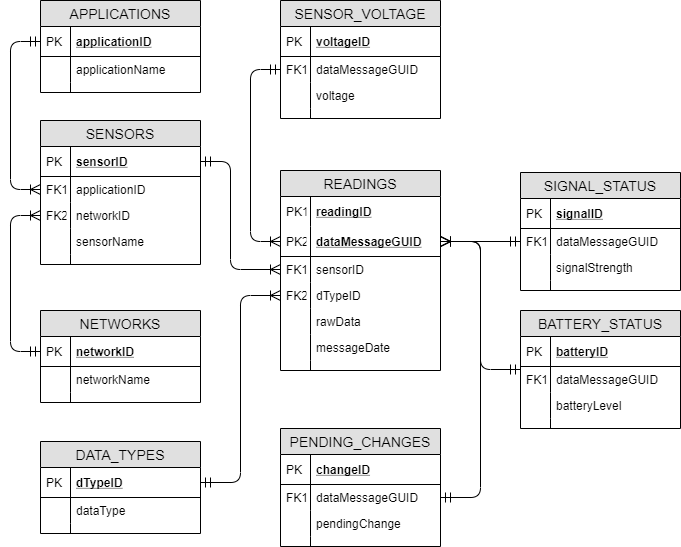
## Sensor Data 2nd Pass



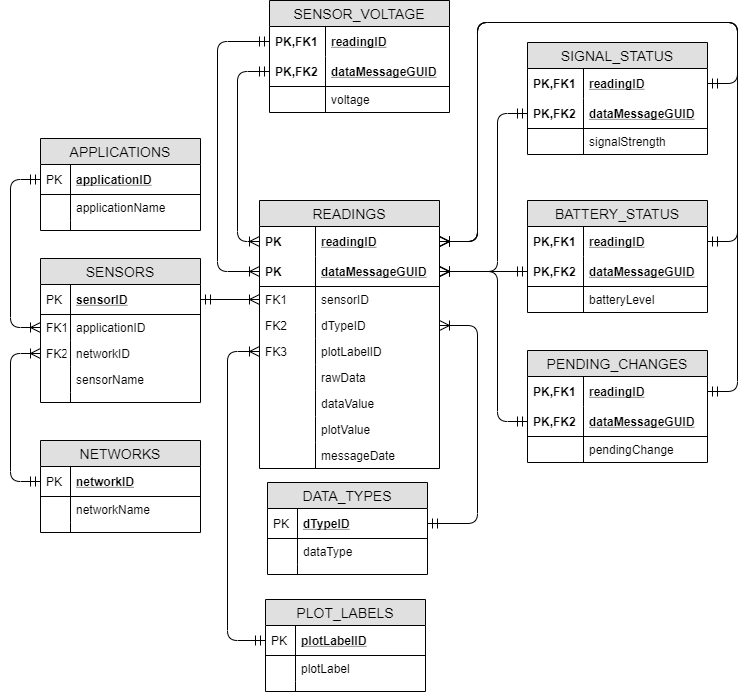
## Sensor Data 3rd Pass



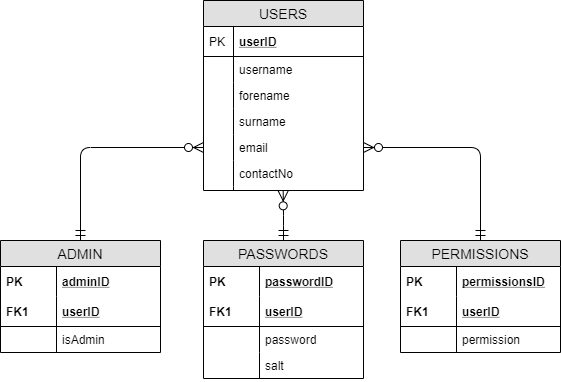
## Corrected Sensor Data



## Corrected Sensor Data 2nd Pass



## User Data



# Data Dictionaries

## Sensors

### Sensors

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | SENSORS |
| **Definition:** | Contains fixed data for individual sensors |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| sensorID | PK | GUID | - | N/A | GUID of a specific sensor, is unique because each sensor should only have one entry. |
| sensorName | - | NVARCHAR | 20 | N/A | The name of the sensor. Used for initially finding if a sensor exists in the DB. |
| applicationID | FK | INT | - | 00000 - 99999 | ID of the application that the sensor is associated with. (Data from MONNIT) |
| networkID | FK | INT | - | 00000 - 99999 | ID of the network that the sensor is associated with. (Data from MONNIT) |

### Readings

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | READINGS |
| **Definition:** | Contains data relating to measurements collected by the installed sensors. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| readingID | PK | GUID | - | N/A | GUID generated when a reading is written to the database. |
| dataMessageGUID | PK | GUID | - | N/A | GUID generated by MONNIT for a set of readings from a specific sensor. Some sensors have multiple measurands, so this field duplicates after data is split. |
| sensorID | FK | GUID | - | N/A | GUID for the sensor that collected the reading. Foreign key from Sensors table |
| rawData | - | NVARCHAR | 5 | N/A | The raw value recorded by the sensor. |
| dataValue | - | NVARCHAR | 5 | N/A | The value recorded by the sensor with respect to its data type. Actual difference from rawData unclear, likely interchangeable. |
| dataTypeID | FK | GUID | - | N/A | GUID for the data type of the current reading. Foreign key from Data Types table. |
| plotValue | - | NVARCHAR | 5 | N/A | The value recorded by the sensor with respect to its recorded Plot Label. Actual difference from rawData unclear, likely interchangeable. |
| plotLabelID | FK | GUID | - | N/A | GUID for the plot label of the current reading. Foreign key from Plot Labels table |
| messageDate | - | DATETIME | - | YYYY-MM-DD HH:MM:SS | The datetime when the reading was collected by the sensor. |

### Data Types

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | DATA\_TYPES |
| **Definition:** | Table for storing data relating to the data types of the readings stored in the Readings table |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| dTypeID | PK | GUID | - | N/A | GUID generated to identify a data type. |
| dataType | - | NVACHAR | 10 | N/A | The data type of a value in the Readings table. |

### Plot Labels

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | PLOT\_LABELS |
| **Definition:** | Table for storing data relating to the plot labels of the readings stored in the Readings table |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| plotLabelID | PK | GUID | - | N/A | GUID generated to identify a plot label. |
| dataType | - | NVARCHAR | 10 | N/A | The data type of a value in the Readings table. |

### Battery Status

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | BATTERY\_STATUS |
| **Definition:** | Table for storing the battery status of a sensor when a reading was taken. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| readingID | PK/FK | GUID | - | N/A | GUID for a specific reading, referenced to the Readings table.  Used as part of a composite key. |
| dataMessageGUID | PK/FK | GUID | - | N/A | GUID from the MONNIT dataset identifying a specific set of readings, used as part of a composite key. |
| batteryLevel | - | INT | - | N/A | Integer reading of the battery level of the sensor when a reading was taken. |

### Signal Status

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | SIGNAL\_STATUS |
| **Definition:** | Table for storing the signal strength of a sensor when a reading was taken. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| readingID | PK/FK | GUID | - | N/A | GUID for a specific reading, referenced to the Readings table.  Used as part of a composite key. |
| dataMessageGUID | PK/FK | GUID | - | N/A | GUID from the MONNIT dataset identifying a specific set of readings, used as part of a composite key. |
| signalStrength | - | FLOAT | - | N/A | Float representing the signal strength of a sensor when a reading was taken. |

### Pending Changes

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | PENDING\_CHANGES |
| **Definition:** | Table for storing if a sensor has any outstanding changes to be applied to its configuration when a reading was taken. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| readingID | PK/FK | GUID | - | N/A | GUID for a specific reading, referenced to the Readings table.  Used as part of a composite key. |
| dataMessageGUID | PK/FK | GUID | - | N/A | GUID from the MONNIT dataset identifying a specific set of readings, used as part of a composite key. |
| pendingChange | - | BIT | - | N/A | Boolean/Bit representing if a change was scheduled or not. |

### Sensor Voltage

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | VOLTAGE |
| **Definition:** | Table for storing the current voltage reading of a sensor when a reading was taken. |

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| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| readingID | PK/FK | GUID | - | N/A | GUID for a specific reading, referenced to the Readings table.  Used as part of a composite key. |
| dataMessageGUID | PK/FK | GUID | - | N/A | GUID from the MONNIT dataset identifying a specific set of readings, used as part of a composite key. |
| voltage | - | FLOAT | - | N/A | Float representing the voltage level of a sensor when a reading was taken. |

## Miscellaneous

### Applications

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | APPLICATIONS |
| **Definition:** | Table for storing simple metadata about the applications the MONNIT sensors are assigned to. Data aggregated from MONNIT data JSON. |

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| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| applicationID | PK | INT | - | 00000 - 99999 | ID of the application that the sensor is associated with. (Data from MONNIT) |
| applicationName | - | NVARCHAR | 20 | N/A | Name of an application. |

### Networks

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | NETWORKS |
| **Definition:** | Table for storing simple metadata about the networks the MONNIT sensors are assigned to. Data aggregated from MONNIT data JSON. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| networkID | PK | INT | - | 00000 - 99999 | ID of the network that the sensor is associated with. (Data from MONNIT) |
| networkName | - | NVARCHAR | 20 | N/A | Name of a network. |

### Accounts

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | ACCOUNTS |
| **Definition:** | Table for storing simple metadata about the accounts the MONNIT sensors are assigned to. Data aggregated from MONNIT data JSON. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| accountID | PK | INT | - | 00000 - 99999 | ID of the account that the gateway is associated with. (Data from MONNIT) |
| accountName | - | NVARCHAR | 20 | N/A | Name of an account. |

## Gateways

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | GATEWAYS |
| **Definition:** | Data relating to gateways associated with the Monnit platform. Data is l |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| gatewayID | PK | INT | - | 000000 - 999999 | Integer generated by Monnit for identifying a specific gateway. |
| gatewayName | - | NVARCHAR | 20 | N/A | The name given to the gateway. |
| accountID | - | INT | - | N/A | Integer generated by Monnit for identifying an account the gateway is assigned to. |
| messageType | - | NVARCHAR | 100 | N/A | Data generated by Monnit. Unclear what its purpose is. |
| gatewayPower | - | INT | 20 | N/A | Likely represents if the gateway is online. Unclear why it’s recorded. |
| batteryLevel | - | INT | - | N/A | Integer reading of the battery level of the sensor when a reading was taken. |
| gatewayDate | - | DATETIME |  | N/A | The datetime of the gateway when the data was sent. |
| gatewayCount | - | INT | - | N/A | Data generated by Monnit. Unclear what its purpose is. |
| signalStrength | - | INT | - | N/A | Float representing the signal strength of a gateway when the data was sent. |
| pendingChange | - | BIT | - | N/A | Boolean/Bit representing if a change was scheduled or not. |

## Users

### Users

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | USERS |
| **Definition:** |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| userID | PK |  | - | =>000001 And =<900000 |  |
| Username | - |  | 50 | N/A |  |
| Forename | - |  | 50 | N/A |  |
| Surname | - |  | 128 | N/A |  |
| Email | - |  | 20 | VALID-EMAIL |  |
| contactNo |  |  |  |  |  |

### Admins

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | ADMINS |
| **Definition:** |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| adminID | PK |  | - | =>000001 And =<900000 |  |
| userID\* | - |  | 50 | N/A |  |
| isAdmin | - |  | 50 | N/A |  |
|  | - |  | 128 | N/A |  |
|  | - |  | 20 | N/A |  |

### Passwords

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | PASSWORDS |
| **Definition:** |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| passwordID | PK |  | - | =>000001 And =<900000 |  |
| userID\* | - |  | 50 | N/A |  |
| Password | - |  | 50 | N/A |  |
| salt | - |  | 128 | N/A |  |
|  | - |  | 20 | N/A |  |

### Permissions

|  |  |
| --- | --- |
| **Database:** | salfordMove |
| **Entity:** | PERMISSIONS |
| **Definition:** |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Key** | **Data Type** | **Size** | **Input Mask/Validation** | **Definition** |
| permissionsID | PK |  | - | =>000001 And =<900000 |  |
| userID\* | - |  | 50 | N/A |  |
| Permissions | - |  | 50 | N/A |  |
|  | - |  | 128 | N/A |  |
|  | - |  | 20 | N/A |  |

# Future Work

## Location Included Normalisation

The current normalised data form does its job in breaking the available data down into non-repeating forms it does not take the physical locations of the sensors into account.

A further round of normalisation can be performed on top of the current final normalised form to introduce two new tables for the physical location and the zone of a sensor or gateway, as it would allow sensors installed in different museums to be easily separated.

Additional separation of the data in this manner will require additional processing of the data and will be heavily dependent on the naming scheme of the sensors connected to the platform for example using the ‘AQ - Z01 - NA – 498841’ sensor will require the sensors name to be parsed and the ‘Z01’ to be used to associate the sensor with its zone.

For sensors installed in the GEM to be processed an additional tag will need to be included in the names of the sensors that are to be installed in the museum for example a sensor named ‘AQ - Z01 - NA – 498841’ would need to be set to ‘AQ - Z01 - NA – 498841 – GEM’ instead.

This can also be achieved using the sensor ID included in the name of every sensor, and this could be a more efficient method of separating the sensors but will require an extensive list of sensors and locations to be assembled beforehand.

## Gateway Data Normalisation

Data relating to the Monnit gateways has not been normalised because it isn’t used as part of the frontend dashboard and doesn’t include data with concatenated measurands.

A complete normalisation of the gateway is advisable because the system is put into production just to improve the efficiency of the database storage, but this is a low priority at this time.