Data Formats

Prox data

GASTech has installed proximity detectors throughout the building to enhance the safety and security of its employees. There are two types of proximity sensors, fixed sensors that register when a badge crosses a boundary and a mobile sensor reader. The mobile reader moves throughout the building and will register badges within a 4 foot radius. (Note: the mobile sensor scans for prox badges every second, but reports out in 1 minute aggregations).

The CSV formats are as follows:

Fixed-prox

```
timestamp, type, prox-id, floor, zone
2016-05-31 07:15:00, fixed-prox, proxName002, 1, 1
2016-05-31 07:18:00, fixed-prox, proxName1001, 1, 1
```

Mobile prox

```
timestamp, type, prox-id, floor, x, y
2016-05-31 09:00:00, mobile-prox, proxName1001, 1, 174, 15
2016-05-31 09:09:00, mobile-prox, proxName2001, 2, 15, 78
```

The (x,y) coordinates are based per floor with the lower left of the provided map being (0,0) and the upper right being (189,111).

The JSON formats are as follows:

The message format for fixed prox sensors

```
"message": {
    "zone": "4",
    "floor": "1",
    "datetime": "2016-5-14 23:59:46",
    "type": "fixed-prox",
    "proxCard": "proxName002"
}
```

The message format for mobile prox sensors

```
"message": {
    "x": "40",
    "y": "100",
    "floor": "1",
    "datetime": "2016-5-14 23:59:46",
    "type": "mobile-prox",
    "proxCard": "proxName002"
}
```

Building data

As part of this year's data, we are simulating a 3 story building with multiple air handling zones per floor. The data is sampled every 5 minutes.

Two main types of data are provided

Building

This is provided as a CSV and a JSON structure All field definitions (and units) can be found on the challenge website.

Note: Some field names may be simplified after the point this document is created – or even removed to remove unnecessary complexity. The basic structure of the file formats will remain the same.

CSV

The row header and sample row can be found in the .csv attachment. All data for all floors is in a single record.

JSON

The data is divided into 4 JSON objects, "general", "floor 1", "floor 2" and "floor 3". Each floor may have a different number of field/value pairs because each floor has a differing number of HVAC zones.

```
"message": {
            "F_1_Z_8A: Thermostat Heating Setpoint": "15.6000",
            "F_1_BATH_EXHAUST:Fan Power": "0.0000",
            "F_1_Z_8B VAV REHEAT Damper Position": "0.0000",
            "F_1_Z_8A REHEAT COIL Power": "0.0000",
            "F_1_Z_2: Thermostat Heating Setpoint": "15.6000",
            "F_1_VAV_SYS SUPPLY FAN:Fan Power": "0.0000",
            "F_1_Z_2 SUPPLY INLET Temperature": "24.4533",
            "F_1_Z_8A RETURN OUTLET CO2 Concentration": "287.5286",
            "F_1_Z_1 SUPPLY INLET Temperature": "24.4533",
            "F_1_Z_8A: Thermostat Temp": "25.0116",
            "F_1_Z_7 RETURN OUTLET CO2 Concentration": "823.2590",
            "F_1_VAV_SYS HEATING COIL Power": "0.0000",
            "F_1_Z_4 SUPPLY INLET Mass Flow Rate": "0.0000",
            "F_1_Z_8B SUPPLY INLET Mass Flow Rate": "0.0000",
            "F_1_Z_1: Thermostat Heating Setpoint": "15.6000",
            "F_1_Z_8B REHEAT COIL Power": "0.0000",
            "F_1_Z_3: Thermostat Cooling Setpoint": "26.7000",
            "F_1_Z_7 SUPPLY INLET Temperature": "24.4533",
            "F_1_Z_7: Thermostat Heating Setpoint": "15.6000",
            "F_1_Z_8B: Thermostat Cooling Setpoint": "26.7000",
            "F_1_Z_5: Thermostat Cooling Setpoint": "26.7000",
            "F_1_VAV_SYS SUPPLY FAN OUTLET Mass Flow Rate": "0.0000",
```

"F_1_Z_8A: Equipment Power": "1462.6655",

"F_1_Z_3 RETURN OUTLET CO2 Concentration": "830.1438",

"F_1_Z_8B: Lights Power": "2542.0762",

"F_1_Z_3: Thermostat Temp": "26.6981",

"F_1_Z_4: Thermostat Heating Setpoint": "15.6000",

"F_1_Z_4 REHEAT COIL Power": "0.0000",

"F_1_Z_4: Thermostat Cooling Setpoint": "26.7000",

"F_1_Z_2 VAV REHEAT Damper Position": "0.0000",

"F_1_Z_8A: Thermostat Cooling Setpoint": "26.7000",

"F_1_Z_1: Thermostat Temp": "24.4499",

"F_1_Z_5 REHEAT COIL Power": "0.0000",

"F_1_Z_1: Thermostat Cooling Setpoint": "26.7000",

"F_1_Z_7: Thermostat Cooling Setpoint": "26.7000",

"F_1_VAV_SYS SUPPLY FAN OUTLET Temperature": "24.4533",

"F_1_Z_7: Lights Power": "0.0000",

"F_1_Z_2 SUPPLY INLET Mass Flow Rate": "0.0000",

"F_1_Z_5: Thermostat Heating Setpoint": "15.6000",

"F_1 VAV Availability Manager Night Cycle Control Status": "0.0000",

"F_1_Z_7: Thermostat Temp": "25.0360",

"F_1_Z_2: Lights Power": "0.0000",

"F_1_Z_4: Thermostat Temp": "22.9962",

"Date/Time": "2016-05-31 00:00:00",

"F_1_Z_1 REHEAT COIL Power": "0.0000",

```
"F_1_Z_7 REHEAT COIL Power": "0.0000",

"F_1_VAV_SYS Outdoor Air Mass Flow Rate": "0.0000",

"F_1_VAV_SYS AIR LOOP INLET Temperature": "24.4533",

"F_1_Z_1 VAV REHEAT Damper Position": "0.0000",

"F_1_Z_1 SUPPLY INLET Mass Flow Rate": "0.0000",

"F_1_VAV_SYS AIR LOOP INLET Mass Flow Rate": "0.0000",

"F_1_Z_4: Lights Power": "0.0000",

"F_1_Z_4 RETURN OUTLET CO2 Concentration": "657.2557",

"F_1_Z_5: Equipment Power": "135.4708",

"floor": 1,

"F_1_Z_2 RETURN OUTLET CO2 Concentration": "764.2446",

"F_1_Z_8A SUPPLY INLET Temperature": "24.4533",

"F_1_Z_1: Lights Power": "0.0000",

"F_1_Z_3: Thermostat Heating Setpoint": "15.6000",

"F_1_Z_5 SUPPLY INLET Temperature": "24.4533",

"F_1_Z_8B: Equipment Power": "1890.0194",

"F_1_Z_7 SUPPLY INLET Mass Flow Rate": "0.0000",

"F_1_Z_4: Equipment Power": "89.5674",

"F_1_Z_8B: Thermostat Temp": "25.0004",

"F_1_VAV_SYS COOLING COIL Power": "0.0000",

"F_1_Z_7 VAV REHEAT Damper Position": "0.0000",

"F_1_Z_4 VAV REHEAT Damper Position": "0.0000",

"F_1_Z_5 RETURN OUTLET CO2 Concentration": "1087.6308",
```

"F_1_Z_2 REHEAT COIL Power": "0.0000",

"F_1_Z_3 VAV REHEAT Damper Position": "0.0000",

"F_1_VAV_SYS Outdoor Air Flow Fraction": "0.0000",

"F_1_Z_8B SUPPLY INLET Temperature": "24.4533",

"F_1_Z_5 SUPPLY INLET Mass Flow Rate": "0.0000",

"F_1_Z_8A: Lights Power": "1967.2850",

"F_1_Z_1 RETURN OUTLET CO2 Concentration": "841.5161",

"F_1_Z_4 SUPPLY INLET Temperature": "24.4533",

"type": "bldg",

"F_1_Z_5 VAV REHEAT Damper Position": "0.0000",

"F_1_Z_7: Equipment Power": "212.7227",

"F_1_Z_8A VAV REHEAT Damper Position": "0.0000",

"F_1_Z_3: Equipment Power": "2659.0336",

"F_1_Z_8A SUPPLY INLET Mass Flow Rate": "0.0000",

"F_1_Z_1: Equipment Power": "268.7023",

"F_1_Z_1: Mechanical Ventilation Mass Flow Rate": "0.0000",

"F_1_Z_2: Thermostat Cooling Setpoint": "26.7000",

"F_1_Z_8B RETURN OUTLET CO2 Concentration": "828.9911",

"F_1_Z_3 REHEAT COIL Power": "0.0000",

"F_1_Z_2: Equipment Power": "377.8627",

"F_1_Z_3 SUPPLY INLET Mass Flow Rate": "0.0000",

"F_1_Z_2: Thermostat Temp": "23.1248",

"F_1_Z_8B: Thermostat Heating Setpoint": "15.6000",

```
            "F_1_Z_3: Lights Power": "3798.6195",
            "F_1_Z_3 SUPPLY INLET Temperature": "24.4533",
            "F_1_Z_5: Lights Power": "0.0000",
            "F_1_Z_5: Thermostat Temp": "23.2866"
        }
```


General fields


```
"message": {
            "Supply Side Inlet Temperature": "57.9886",
            "Date/Time": "2016-05-31 00:00:00",
            "Water Heater Gas Rate": "0.0000",
            "Total Electric Demand Power": "83922.6009",
            "Supply Side Outlet Temperature": "59.3726",
            "Wind Speed": "6.2000",
            "Pump Power": "91.3744",
            "Water Heater Setpoint": "60.0000",
            "COOL Schedule Value": "12.8000",
            "Drybulb Temperature": "22.8000",
            "HVAC Electric Demand Power": "13405.3319",
            "Supply Side Inlet Mass Flow Rate": "0.3179",
            "HEAT Schedule Value": "16.0000",
            "type": "bldg",
            "DELI-FAN Power": "0.0000",
            "Wind Direction": "50.0000",
```

```
    "Loop Temp Schedule": "60.0000",
    "Water Heater Tank Temperature": "59.3726"
}
```

Field	Units	Description
F_#_BATH_EXHAUST:Fan Power	[W]	Power used by the bathroom exhaust fan
F_#_VAV_SYS AIR LOOP INLET Mass Flow Rate	[kg/s]	Total flow rate of air returning to the HVAC system from all zones it serves
F_#_VAV_SYS AIR LOOP INLET Temperature	[C]	Mixed temperature of air returning to the HVAC system from all zones it serves
F_# VAV Availability Manager Night Cycle Control Status		On/off status of the HVAC system during periods when the system is normally scheduled off. The night cycle manager cycles the HVAC system to maintain night and weekend set point temperatures.
F_#_VAV_SYS COOLING COIL Power	[W]	Power used by the HVAC system cooling coil
F_#_VAV_SYS HEATING COIL Power	[W]	Power used by the HVAC system heating coil
F_#_VAV_SYS SUPPLY FAN OUTLET Mass Flow Rate	[kg/s]	Total flow rate of air delivered by the HVAC system fan to the zones it serves
F_#_VAV_SYS SUPPLY FAN OUTLET Temperature	[C]	Temperature of the air exiting the HVAC system fan
F_#_VAV_SYS SUPPLY FAN:Fan Power	[W]	Power used by the HVAC system fan
F_#_VAV_SYS Outdoor Air Flow Fraction		Percentage of total air delivered by the HVAC system that is from the outside
F_#_VAV_SYS Outdoor Air Mass Flow Rate	[kg/s]	Flow rate of outside air entering the HVAC system
COOL Schedule Value		The supply air temperature set point. Air exiting the HVAC system fan is maintained at this temperature during cooling operation

DELI-FAN Power	[W]	Power used by the deli exhaust fan
Drybulb Temperature	[C]	Drybulb temperature of the outside air
Wind Direction	[deg]	Direction of wind outside of the building
Wind Speed	[m/s]	Speed of wind outside of the building
HEAT Schedule Value		The supply air temperature set point. Air exiting the HVAC system fan is maintained at this temperature during heating operation
Pump Power	[W]	Power used by the hot water system pump
Water Heater Setpoint		Water heater set point temperature
Water Heater Gas Rate	[W]	Rate at which the water heater burns natural gas
Water Heater Tank Temperature	[C]	Temperature of the water inside the hot water heater
Loop Temp Schedule		Temperature set point of the hot water loop. This is the temperature at which hot water is delivered to hot water appliances and fixtures.
Supply Side Inlet Mass Flow Rate	[kg/s]	Flow rate of water entering the hot water heater
Supply Side Inlet Temperature	[C]	Temperature of the water entering the hot water heater
Supply Side Outlet Temperature	[C]	Temperature of the water exiting the hot water heater
F_#_Z_# REHEAT COIL Power	[W]	Power used by the zone air supply box reheat coil
F_#_Z_# RETURN OUTLET CO2 Concentration	[ppm]	Concentration of C02 measured at the zone's return air grille
F_#_Z_# SUPPLY INLET Mass Flow Rate	[kg/s]	Flow rate of the air entering the zone from its air supply box

F_#_Z_# SUPPLY INLET Temperature	[C]	Temperature of the air entering the zone from its air supply box
F_#_Z_# VAV REHEAT Damper Position		Position of the zone's air supply box damper. 1 corresponds to fully open, 0 corresponds to fully closed
F_#_Z_#: Equipment Power	[W]	Power used by the electric equipment in the zone
F_#_Z_#: Lights Power	[W]	Power used by the lights in the zone
F_#_Z_#: Mechanical Ventilation Mass Flow Rate	[kg/s]	Ventilation rate of the zone exhaust fan
F_#_Z_#: Thermostat Temp	[C]	Temperature of the air inside the zone
F_#_Z_#: Thermostat Cooling Setpoint	[C]	Cooling set point schedule for the zone
F_#_Z_#: Thermostat Heating Setpoint	[C]	Heating set point schedule for the zone
Total Electric Demand Power	[W]	Total power used by the building
HVAC Electric Demand Power	[W]	Total power used by the building's HVAC system including coils, fans and pumps.

Hazium

The GasTech headquarters has installed a limited number of Hazium sensors throughout the building. The sensors are part of the building air handling system. They are placed in an HVAC zone. Not all HVAC zones have sensors.

So F_1_Z_1 is floor 1, zone 1.

CSV

Date/Time , F_#_Z_#: Hazium Concentration

2016-05-31 00:00:00, F_1_Z_1, 0.0

2016-05-31 00:05:00, F_1_Z_1, 0.0

2016-05-31 00:10:00, F_2_Z_1, 0.0

JSON

```
"message": {
            "F_1_Z_1: Hazium Concentration": "0.0",
            "type": "sensor",
            "Date/Time": "2016-05-31 00:00:00"
        }
```

F_#_Z_#: Hazium Concentration	[ppm]	Concentration of Hazium measured at the zone's return air grille