University of Notre Dame

AnalytiXIN

AnalytiXIN Manufacturing Data Assets Research Project

Emerging Manufacturing Collaboration Center Energy Insights Data Codebook

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Data collection Description

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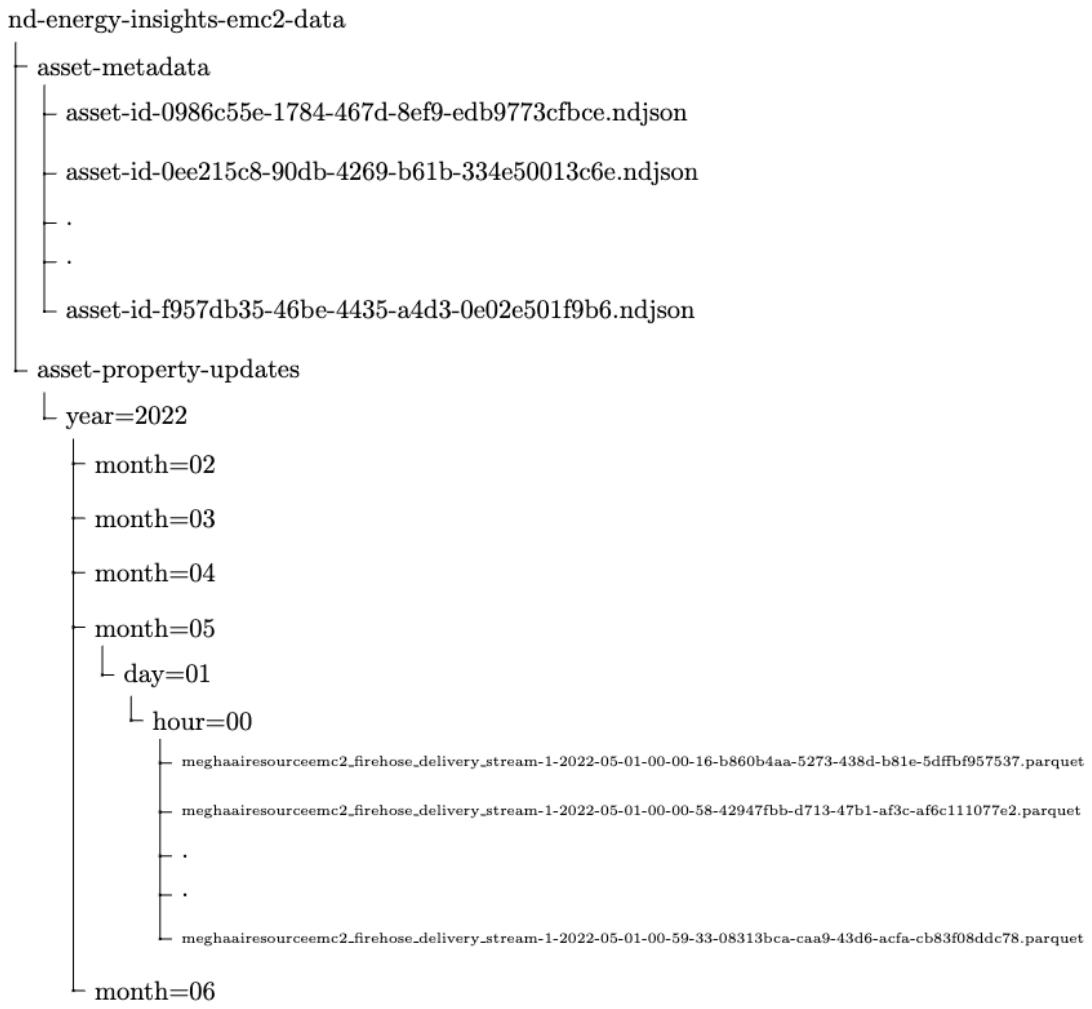
1 Data Parsing and Pre-processing

1.1 Raw data files

Raw data files, collected from the MVP Kits at the Emerging Manufacturing Collaboration Center (EMC2) facility in Indianapolis, IN [1], are streamed to the MeghaAI AWS S3 buckets whenever a field or a property value for an asset changes.The files are streamed to the bucket as parquet files. Apache parquet is a file format designed to support fast data processing and analytical querying for complex data. They also use less space on S3 buckets as compared to other file formats. File dumps from the MeghaAI S3 buckets are then transferred to University owned S3 buckets on a regular interval. Following is the folder structure for the raw files in the University owned S3 bucket:

[1] `https://www.iedc.in.gov/program/emc2/overview`

1.1.1 Folder structure on the S3 bucket



1.2 Data Parsing

As seen from the folder structure above, there are large number of parquet files that are streamed to the S3 bucket hourly ranging from about 75 to 100 files an hour. Also there a 5 assets we are getting the data from at EMC2. Following are the steps performed to parse these hourly parquet files using pyarrow package in python and convert them to monthly parquet and csv files:

- Using os.walk or glob package in Python, parse all parquet files in a day as data-frames
- Take a subset of the data-frame with EMC2 assets
- Append all these parsed data-frames to a list
- Concatenate the list to form a single data-frame and write it out as daily parquet file
- Again walk through the directory of daily parquet files in a month and repeat the steps above to form monthly parquet and csv files and save it in the directory

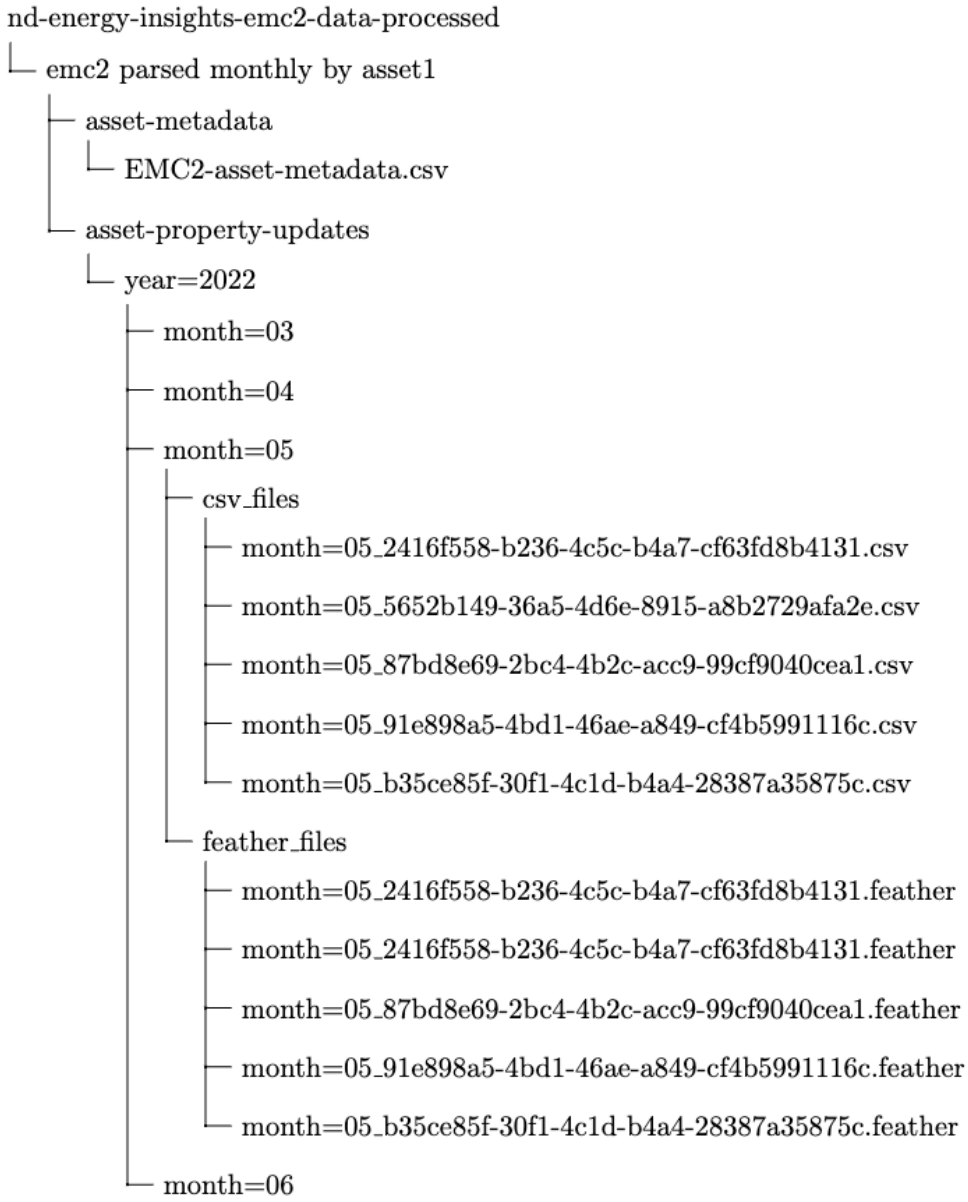
1.3 Data Pre-processing

The monthly parquet files parsed from the raw data files are structured and converted to the monthly csv and feather files per asset for further analysis using pyarrow package in Python. Following are the steps performed:

- Loop over all the monthly parquet files and parse them as a data-frame using the pyarrow package
- Read the metadata with asset properties into a different data-frame
- Convert the epoch/unix time_in_seconds to actual times†amp
- Loop over all 5 assets from EMC2 one at a time and subset the monthly on asset and its properties present in the metadata
- Pivot the columnar parquet table to normal row based data-frame on ['time_in_seconds', 'timestamp', 'offset_in_nanos' and 'asset_property_quality']
- Now the data frame has asset property ids as its columns and the value of all the properties at a particular timestamp as rows
- Rename the columns names of different properties/fields from 'asset_property_id' to "'asset_property_name'_'asset_property_unit'_'asset_property_data_type'" using the information from the metadata file
- Save the required data frame as monthly csv and feather files per asset for further analysis

1.3.1 Processed data folder structure

Following is the folder structure after parsing and pre-processing the raw stream of parquet files from the one S3 bucket to another.



2 Asset Properties and Summary Statistics

Data is being collected from 4 different assets at EMC2 facility, namely:

Table 2.1: Asset list at EMC2

Asset Name	Asset ID	Description
Energy/EMU1	b35ce85f-30f1-4c1d-b4a4-28387a35875c	Energy Monitoring Unit
Energy/Siemens PAC4200_1	2416f558-b236-4c5c-b4a7-cf63fd8b4131	Service meter
HVAC/Air Handling Unit 1	87bd8e69-2bc4-4b2c-acc9-99cf9040cea1	Air handling Unit
HVAC/Hot Water	5652b149-36a5-4d6e-8915-a8b2729afa2e	Hot Water Unit

Metadata and Summary Statistics for all the assets for the month of May 2022 are as follows:

2.1 Energy monitoring Unit (EMU1)

Table 2.2: Metadata for EMU1

Asset Property	Unit	Description
time_in_seconds		Unix timestamp
timestamp		Human readable timestamp from time_in_seconds
offset_in_nanos		Nanosecond offset for time_in_seconds
asset_property_quality		Indicator for data quality (GOOD, BAD, UNCERTAIN)
ApparentPowerVA/Max	VA	
ApparentPowerVA/Min	VA	
ApparentPowerVA/Value	VA	
NetEnergyKwh/Energy	kwh	
NetEnergyKwh/Max	kwh	
NetEnergyKwh/Min	kwh	
NetEnergyKwh/Value	kwh	
PhA-Arms/Max	A	
PhA-Arms/Min	A	
PhA-Arms/Value	A	
PhA-FrequencyHz/Max	hz	
PhA-FrequencyHz/Min	hz	
PhA-FrequencyHz/Value	hz	
PhA-PowerFactor/Max		
PhA-PowerFactor/Min		
PhA-PowerFactor/Value		
PhA-TruePowerWatts/Max	w	
PhA-TruePowerWatts/Min	w	
PhA-TruePowerWatts/Value	w	
PhA-Vrms/Max	Vrms	
PhA-Vrms/Min	Vrms	
PhA-Vrms/Value	Vrms	
PhB-Arms/Max	A	
PhB-Arms/Min	A	
PhB-Arms/Value	A	
PhB-FrequencyHz/Max	hz	
PhB-FrequencyHz/Min	hz	
PhB-FrequencyHz/Value	hz	
PhB-PowerFactor/Max		
PhB-PowerFactor/Min		
PhB-PowerFactor/Value		
PhB-TruePowerWatts/Max	w	
PhB-TruePowerWatts/Min	w	
PhB-TruePowerWatts/Value	w	
PhB-Vrms/Max	Vrms	
PhB-Vrms/Min	Vrms	
PhB-Vrms/Value	Vrms	

Asset Property	Unit	Description
PhC-FrequencyHz/Max	hz	
PhC-FrequencyHz/Min	hz	
PhC-FrequencyHz/Value	hz	
PhC-PowerFactor/Max		
PhC-PowerFactor/Min		
PhC-PowerFactor/Value		
PhC-TruePowerW/Max	w	
PhC-TruePowerW/Min	w	
PhC-TruePowerW/Value	w	
PhC-Vrms/Max	Vrms	
PhC-Vrms/Min	Vrms	
PhC-Vrms/Value	Vrms	
PowerFactor/Max		
PowerFactor/Min		
PowerFactor/Value		
TruePowerWatts/Max	w	
TruePowerWatts/Min	w	
TruePowerWatts/Value	w	

Table 2.3: Summary Statistics for EMU1

Variable	N	Mean / Percent	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
time_in_seconds	1	1653703143		1653703143	1653703143	1653703143	1653703143
timestamp	1	2022-05-28		2022-05-28	2022-05-28	2022-05-28	2022-05-28
		01:59:03		01:59:03	01:59:03	01:59:03	01:59:03
offset_in_nanos	1	9.21e+08		9.21e+08	9.21e+08	9.21e+08	9.21e+08
asset_property_quality	1						
UNCERTAIN	1	100%					
ApparentPowerVA.Max_VA_DOUBLE	1	32.837		32.837	32.837	32.837	32.837
ApparentPowerVA.Min_VA_DOUBLE	1	0.726		0.726	0.726	0.726	0.726
ApparentPowerVA.Value_VA_DOUBLE	1	0.825		0.825	0.825	0.825	0.825
NetEnergyKwh.Energy_kwh_DOUBLE	1	-18		-18	-18	-18	-18
NetEnergyKwh.Max_kwh_DOUBLE	1	0		0	0	0	0
NetEnergyKwh.Min_kwh_DOUBLE	1	0		0	0	0	0
NetEnergyKwh.Value_kwh_DOUBLE	1	0		0	0	0	0
PhA.Arms.Max_A_DOUBLE	1	2.726		2.726	2.726	2.726	2.726
PhA.Arms.Min_A_DOUBLE	1	0.311		0.311	0.311	0.311	0.311
PhA.Arms.Value_A_DOUBLE	1	0.731		0.731	0.731	0.731	0.731
PhA.FrequencyHz.Max_hz_DOUBLE	1	50		50	50	50	50
PhA.FrequencyHz.Min_hz_DOUBLE	1	25		25	25	25	25
PhA.FrequencyHz.Value_hz_DOUBLE	1	50		50	50	50	50
PhA.PowerFactor.Max_nan_DOUBLE	1	0.043		0.043	0.043	0.043	0.043
PhA.PowerFactor.Min_nan_DOUBLE	1	-0.549		-0.549	-0.549	-0.549	-0.549
PhA.PowerFactor.Value_nan_DOUBLE	1	0.002		0.002	0.002	0.002	0.002
PhA.TruePowerWatts.Max_w_DOUBLE	1	0.035		0.035	0.035	0.035	0.035
PhA.TruePowerWatts.Min_w_DOUBLE	1	-6.576		-6.576	-6.576	-6.576	-6.576
PhA.TruePowerWatts.Value_w_DOUBLE	1	0.02		0.02	0.02	0.02	0.02
PhA.Vrms.Max_Vrms_DOUBLE	1	1.683		1.683	1.683	1.683	1.683
PhA.Vrms.Min_Vrms_DOUBLE	1	0.149		0.149	0.149	0.149	0.149
PhA.Vrms.Value_Vrms_DOUBLE	1	0.149		0.149	0.149	0.149	0.149
PhB.Arms.Max_A_DOUBLE	1	2.857		2.857	2.857	2.857	2.857
PhB.Arms.Min_A_DOUBLE	1	0.378		0.378	0.378	0.378	0.378
PhB.Arms.Value_A_DOUBLE	1	0.879		0.879	0.879	0.879	0.879
PhB.FrequencyHz.Max_hz_DOUBLE	1	50		50	50	50	50
PhB.FrequencyHz.Min_hz_DOUBLE	1	25		25	25	25	25
PhB.FrequencyHz.Value_hz_DOUBLE	1	50		50	50	50	50
PhB.PowerFactor.Max_nan_DOUBLE	1	0.077		0.077	0.077	0.077	0.077

Variable	N	Mean / Percent	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
PhB.PowerFactor.Min_nan_DOUBLE	1	-0.504		-0.504	-0.504	-0.504	-0.504
PhB.PowerFactor.Value_nan_DOUBLE	1	0.07		0.07	0.07	0.07	0.07
PhB.TruePowerWatts.Max_w_DOUBLE	1	0.015		0.015	0.015	0.015	0.015
PhB.TruePowerWatts.Min_w_DOUBLE	1	-9.504		-9.504	-9.504	-9.504	-9.504
PhB.TruePowerWatts.Value_w_DOUBLE	1	0.01		0.01	0.01	0.01	0.01
PhB.Vrms.Max_Vrms_DOUBLE	1	4.265		4.265	4.265	4.265	4.265
PhB.Vrms.Min_Vrms_DOUBLE	1	0.292		0.292	0.292	0.292	0.292
PhB.Vrms.Value_Vrms_DOUBLE	1	0.292		0.292	0.292	0.292	0.292
PhC.FrequencyHz.Max_hz_DOUBLE	1	50		50	50	50	50
PhC.FrequencyHz.Min_hz_DOUBLE	1	25		25	25	25	25
PhC.FrequencyHz.Value_hz_DOUBLE	1	50		50	50	50	50
PhC.PowerFactor.Max_nan_DOUBLE	1	0.154		0.154	0.154	0.154	0.154
PhC.PowerFactor.Min_nan_DOUBLE	1	-0.61		-0.61	-0.61	-0.61	-0.61
PhC.PowerFactor.Value_nan_DOUBLE	1	0.109		0.109	0.109	0.109	0.109
PhC.TruePowerW.Max_w_DOUBLE	1	0.04		0.04	0.04	0.04	0.04
PhC.TruePowerW.Min_w_DOUBLE	1	-11.607		-11.607	-11.607	-11.607	-11.607
PhC.TruePowerW.Value_w_DOUBLE	1	0.03		0.03	0.03	0.03	0.03
PhC.Vrms.Max_Vrms_DOUBLE	1	2.538		2.538	2.538	2.538	2.538
PhC.Vrms.Min_Vrms_DOUBLE	1	0.315		0.315	0.315	0.315	0.315
PhC.Vrms.Value_Vrms_DOUBLE	1	1.261		1.261	1.261	1.261	1.261
PowerFactor.Max_nan_DOUBLE	1	0.083		0.083	0.083	0.083	0.083
PowerFactor.Min_nan_DOUBLE	1	-0.554		-0.554	-0.554	-0.554	-0.554
PowerFactor.Value_nan_DOUBLE	1	0.06		0.06	0.06	0.06	0.06
TruePowerWatts.Max_w_DOUBLE	1	0.089		0.089	0.089	0.089	0.089
TruePowerWatts.Min_w_DOUBLE	1	-27.687		-27.687	-27.687	-27.687	-27.687
TruePowerWatts.Value_w_DOUBLE	1	0.06		0.06	0.06	0.06	0.06

2.2 Service Meter (Siemens PAC4200_1)

Table 2.4: Metadata for Siemens PAC4200_1

Asset Property	Unit	Description
time_in_seconds	seconds	Unix timestamp
timestamp		Human readable timestamp from time_in_seconds
offset_in_nanos		Nanosecond offset for time_in_seconds
asset_property_quality		Indicator for data quality (GOOD, BAD, UNCERTAIN)
Current L1	A	Current through line 1
Current L2	A	Current through line 2
Current L3	A	Current through line 3
Neutral Current	A	Current through the neutral
Voltage L1	V	Voltage across line 1
Voltage L2	V	Voltage across line 2
Voltage L3	V	Voltage across line 3
Active Power L1	W	Active power delivered through line L1
Active Power L2	W	Active power delivered through line L2
Active Power L3	W	Active power delivered through line L3
Total Active Power	W	Total Active Power
Power Factor L1		Ratio of active and apparent power of line 1
Power Factor L2		Ratio of active and apparent power of line 2
Power Factor L3		Ratio of active and apparent power of line 3
Total Power Factor		Ratio total active and total apparent power
Total Apparent Power	VA	Total apparent power
Line Frequency	Hz	Electric frequency

Table 2.5: Summary Statistics for Siemens PAC4200_1

Variable	N	Mean / Percent	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
time_in_seconds	5634777	1652663902.01	761431.59	1.65e+09	1.65e+09	1.65e+09	1.65e+097
timestamp	5634777	2022-05-16		2022-05-01	2022-05-08	2022-05-23	2022-05-31
		01:18:22		00:00:13	12:06:17	06:50:46	22:29:14
offset_in_nanos	5634777	4.99e+08	2.8e+08	0	2.5e+08	7.49e+08	9.99e+08
asset_property_quality	5634777						
GOOD	5634723	99.999%					
BAD	54	0.001%					
Current L1_A_DOUBLE	2522407	34.81	26.15	13	20.5	39	375
Current L2_A_DOUBLE	2522378	38.33	25.68	16.1	25.5	38.5	382
Current L3_A_DOUBLE	2522447	36.17	26.31	12.4	23.7	35.7	395
Neutral Current_A_DOUBLE	2496902	6.56	3.02	1.92	4.89	7.64	20.5
Voltage L1-N_V_DOUBLE	2518586	288.32	1.16	275	287	289	292
Voltage L2-N_V_DOUBLE	2518479	288.51	1.27	273	288	289	292
Voltage L3-N_V_DOUBLE	2518605	288.54	1.42	280	288	290	292
Active Power L1_W_DOUBLE	2522975	8710.98	6684.1	3.32e+03	4.89e+03	1.04e+04	6.94e+04
Active Power L2_W_DOUBLE	2522980	9937.57	6542.91	4.27e+03	6.48e+03	1.02e+04	7.54e+04
Active Power L3_W_DOUBLE	2522981	8888.31	6455.58	2.81e+03	5.56e+03	9.09e+03	7.34e+04
Total Active Power_W_DOUBLE	2522977	27536.81	19542.29	1.06e+04	1.69e+04	2.92e+04	2.18e+05
Power Factor L1_nan_DOUBLE	2374539	0.85	0.05	0.316	0.807	0.898	0.967
Power Factor L2_nan_DOUBLE	2344649	0.9	0.02	0.374	0.88	0.914	0.96
Power Factor L3_nan_DOUBLE	2351332	0.85	0.04	0.354	0.821	0.877	0.939
Total Power Factor_nan_DOUBLE	2321993	0.87	0.03	0.358	0.843	0.891	0.952
Total Apparent Power_VA_DOUBLE	2522975	31517.37	22387.94	1.23e+04	2e+04	3.22e+04	3.29e+05
Line Frequency_Hz_DOUBLE	248286	60.0	0.02	59.9	60	60	60.1

2.3 HVAC - Hot Water Unit

Table 2.6: Metadata for Water Heater

Asset Property	Unit	Description
time_in_seconds		Unix timestamp
timestamp		Human readable timestamp from time_in_seconds
offset_in_nanos		Nanosecond offset for time_in_seconds
asset property quality		Indicator for data quality (GOOD, BAD, UNCERTAIN)
Heating Water Supply Temp	°F	
Heating Water System Differential Pressure	Psi	
Heating Water Pump 2 Status		Boolean
Heating Water Pump 2 Command		Boolean
Boiler Setpoint	°F	
Outside Air Humidity	°F	
Heating Water Return Temp	°F	
Heating Water Pump 2 Output	%	
Outside Air Temp	°F	
Heating Water System Flow	GPM (gal/min)	
Heating Water Pump 1 Output	%	
Heating Water Pump 1 Status		Boolean
Boiler Enable		Boolean
Heating Water Pump 1 Command		Boolean

Table 2.7: Summary Statistics for Water Heater

Variable	N	Mean / Percent	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
time_in_seconds	1282334	1652017775.458	429313.938	1651363216	1651683949	1652338098.75	1654036154
timestamp	1282334		2022-05-08 13:49:35	2022-05-01 00:00:16	2022-05-04 17:05:49	2022-05-12 06:48:18	2022-05-31 22:29:14
offset_in_nanos	1282334	500600918.325	289199090.792	0	2.5e+08	7.51e+08	9.99e+08
asset_property_quality	1282334						
BAD	29	0%					
GOOD	1282305	100%					
Heating.Water.Supply.Temp.F_INTEGER	15115	95.208	9.249	0	88	101	133
Heating.Water.System.Differential.Pressure.1_psi_DOUBLE	890076	5.203	5.129	-0.027	-0.016	10.009	29.654
Heating.Water.Pump.2.Status_nan_BOOLEAN	67						
No	50	74.6%					
Yes	17	25.4%					
Heating.Water.Pump.2.Command_nan_BOOLEAN	41						
No	41	100%					
Boiler.Setpoint.F_INTEGER	144	121.007	10.288	0	120	123	127
Outside.Air.Humidity.F_INTEGER	29789	53.308	20.048	0	39	67	98
Heating.Water.Return.Temp.F_INTEGER	7068	85.945	7.109	0	81	90	117
Heating.Water.Pump.2.Output_._INTEGER	335	43.585	31.269	0	16	70	100
Outside.Air.Temp.F_INTEGER	2554	69.752	11.289	0	62	78	98
Heating.Water.System.Flow_gpm_DOUBLE	42	245.2	38.758	0	251.18	251.18	251.18
Heating.Water.Pump.1.Output_._INTEGER	424144	64.519	4.98	0	61	67	100
Heating.Water.Pump.1.Status_nan_BOOLEAN	67						
No	50	74.6%					
Yes	17	25.4%					
Boiler.Enable_nan_BOOLEAN	63						
No	48	76.2%					
Yes	15	23.8%					
Heating.Water.Pump.1.Command_nan_BOOLEAN	63						
No	48	76.2%					
Yes	15	23.8%					

2.4 HVAC - Air Handling Unit

Table 2.8: Metadata for Air Handling Unit 1

Asset Property	Unit	Description
time_in_seconds	seconds	Unix timestamp
timestamp		Human readable timestamp
offset_in_nanos		Nanosecond offset for time_in_seconds
asset_property_quality		Indicator for data quality (GOOD, BAD, UNCERTAIN)
Discharge Air Temp	°F	Discharge Air Temperature
Mixed Air Humidity	%	Humidity of the mixed air
Exhaust Air Damper Output	%	Output of the exhaust air damper
Smoke Detector Alarm		Boolean
Supply Fan Speed Output	%	Output of the supply fan
Preheat Valve Output	%	Output of the preheat valve
Humidifier Alarm		Boolean
Low Temp Alarm		Boolean
Cooling Coil Pump Status		Boolean
Cooling Valve Output	%	Output of the cooling valve
Supply Air Pressure		
Supply Fan Flow	cfm	Volumetric flow rate through the supply fan
Outside Airflow	cfm	Volumetric flow rate of the outside air
Supply Fan Status		Boolean
Supply Fan Command		Boolean
Filter Alarm		Boolean
Return Air Humidity	%	Humidity of the return air
Return Fan Flow	cfm	Volumetric flow rate through the return fan
Heating Coil Pump Command		Boolean
Mixed Air Temp	°F	Temperature of the mixed air
Return Fan Speed Output	%	Output of the return fan
Cooling Coil Pump Command		Boolean
Heating Coil Pump Status		Boolean
Humidifier Enable		Boolean
Outside Air Damper Output	%	Output of the outside air damper
Preheat Coil Temp	°F	Temperature of the preheat coil
Preheat	°F	Temperature
Outside Air Damper End Switch		Boolean
Return Air Damper Output	%	Output of the return air damper
Humidifier Output	%	Output of the humidifier
Return Fan Command		Boolean
High Static Pressure Alarm		Boolean
Return Fan Status		Boolean
Return Air Temp	°F	Temperature of the return air

Table 2.9: Summary Statistics for Air Handling Unit 1

Variable	N	Mean / Percent	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
time_in_seconds	10849856	1652149117.193	454890.705	1651363215	1651765291	1652539511	1654036154
timestamp	10849856	2022-05-10 02:18:37		2022-05-01 00:00:15	2022-05-05 07:41:31	2022-05-14 14:45:11	2022-05-31 22:29:14
offset_in_nanos	10849856	501233060.513	289371238.041	0	2.49e+08	7.52e+08	9.99e+08
asset_property_quality	10849856						
GOOD	10849806	100%					
BAD	50	0%					
Discharge Air Temp_°F_DOUBLE	713224	70.745	8.506	0	63.282	77.781	89.847
Mixed Air Humidity_%_DOUBLE	1373543	56.199	18.036	0	42.342	71.908	92.485
Exhaust Air Damper Output_%_INTEGER	6008	59.003	40.099	0	10	100	100
Smoke Detector Alarm_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Supply Fan Speed Output_%_INTEGER	448816	80.458	7.879	0	75	89	100
Preheat Valve Output_%_INTEGER	42	97.619	15.43	0	100	100	100
Humidifier Alarm_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Low Temp Alarm_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Cooling Coil Pump Status_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Cooling Valve Output_%_INTEGER	41	100	0	100	100	100	100
Supply Air Pressure_nan_DOUBLE	1459544	1.379	0.181	0	1.251	1.501	1.831
Supply Fan Flow_cfm_DOUBLE	1182844	1.323	1.604	-0.402	-0.334	2.254	4.861
Outside Airflow_cfm_DOUBLE	574897	167.834	6.124	152.065	162.03	171.899	181.865
Supply Fan Status_nan_BOOLEAN	41						
No	0	0%					
Yes	41	100%					
Supply Fan Command_nan_BOOLEAN	41						
No	0	0%					
Yes	41	100%					
Filter Alarm_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Return Air Humidity_%_DOUBLE	1272982	48.222	10.344	0	39.431	56.422	69.779
Return Fan Flow_cfm_DOUBLE	1328665	0.854	0.979	-0.245	-0.168	1.229	3.568
Heating Coil Pump Command_nan_BOOLEAN	41						
No	41	100%					

Variable	N	Mean / Percent	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
Yes	0	0%					
Mixed Air Temp_°F_DOUBLE	1256153	68.608	9.737	0	60.72	75.922	91.691
Return Fan Speed Output_%_INTEGER	661037	54.495	10.787	0	48	60	100
Cooling Coil Pump Command_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Heating Coil Pump Status_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Humidifier Enable_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Outside Air Damper Output_%_INTEGER	5827	59.135	40.449	0	10	100	100
Preheat Coil Temp_°F_DOUBLE	1109667	68.905	9.824	0	60.801	76.613	91.081
Outside Air Damper End Switch_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Return Air Damper Output_%_INTEGER	5827	59.135	40.449	0	10	100	100
Humidifier Output_%_DOUBLE	41	0	0	0	0	0	0
Return Fan Command_nan_BOOLEAN	41						
No	0	0%					
Yes	41	100%					
High Static Pressure Alarm_nan_BOOLEAN	41						
No	41	100%					
Yes	0	0%					
Return Fan Status_nan_BOOLEAN	41						
No	0	0%					
Yes	41	100%					
Return Air Temp_°F_DOUBLE	926157	73.111	4.559	0	69.312	76.626	83.73