### You will produce:

1. Source code to implement the solution of this challenge
2. Technical summary that explains the challenge

### Background:

1. Vibration transducer that encapsulates two vibration sensors that measure the acceleration in units of g(9.8m/s^2). At regular intervals, they wake up and capture 4096 measurements at a rate of 8192 Hz, transmit their results, and return idle.
2. Each periodic measurement is referred to as a ***burst***.
3. Each transducer package records vibration on two axes: x – parallel to the base and y - perpendicular.
4. There can be more than one transducer package mounted on an individual asset is called the ***monitoring point***
5. The acceleration data received at each ***monitoring point*** indicates the health of the machine/asset and is used for maintenance decisions

### The Challenge:

1. Based on sensor data, determine if the machine is on or off
2. Your program should take zip archive as input and produce CSV file as output with two columns: the first column is a timestamp, and 2nd column is a number where 0 represents “off” and “1” represents m/c on
3. The output file should not have a header row and be ordered by timestamp.
4. Divide each data sheet into a 70:30 ratio. 30% for evaluation.

### The Data:

1. The data for this coding challenge is in the zip file, containing data from different sensors. The sensors are on different monitoring points on the same asset.
2. The following is the organization structure of data:

7bfbb0a6-f81e-40a5-8aca-2d9b00cda47a\Fan Inboard\D2C4E3D0\X\ 0621.csv

* 1. Unit Asset: 7bfbb0a6-f81e-40a5-8aca-2d9b00cda47a
  2. Monitoring point: Fan Inboard
  3. Sesnor serial #: D2C4E3D0
  4. Oriantation: Z axis
  5. Data: Month and year.csv

1. There are 8 files in the zip archive, all from June 2021, all from the same m/c
2. Columns of the file:

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Description automatically generated with medium confidence

Timestamp: measured in milliseconds since midnight Jan 1970 UTC

Sample rate : measured in HZ

Sample length : Number of samples in burst

Sample data: remaining in each row are the acceleration measurements

1. The measurements are taken by accelerometers, and they report the force of gravity as experienced by the sensor in the direction of measurement, as well as acceleration due to mechanical vibration. Depending on the orientation of the sensor, this shows up in the data as a constant offset between -g and +g.
2. Each CSV contains some bursts acquired when the machine was running.

### The Program and writeup:

1. The program should be complex enough to execute the challenge.
2. Explain the statistical algorithm used
3. Write up to 1-3 pages explaining the relationship between Zip data data and the output's on/off column. Include formulas to explain. Additionally, support the answer with physical reasoning and state the assumptions made.
4. What can you infer about the production schedule at the plant where this m/c is installed.