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**MIT WORLD PEACE
UNIVERSITY** | PUNE

TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

T.Y.B.Tech (CSE)

High Performance Computing

Lab Assignment No – 1

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Batch: E1

Panel: E

Assignment no: 1

Title: High-Performance Computing

Aim: To understand the application of HPC in various domain

Objective:

1. To improve presentation skills.
2. To understand the need of HPC.

Theory:

1. Application of HPC (any one of your choice)

Driverless cars use HPC based systems on a large scale. A single self-driving car generates an average of 4 terabytes of data per day.

So to compute such big operations at a faster rate we need to take the help of High performance computing systems.

To process this data in real time, autonomous vehicles require HPC systems on board to enable the vehicle to make split-second decisions, as well as in connected cloud data centers that run analytics on the constant stream of bits and bytes.

FAQ:

1. Name top 3 current supercomputers of the world with their specification.

Ans 1 : The top 3 current supercomputers of the world are:

1. Fugaku : It has cpu cores of $158,976 \times 48$ -core Fujitsu A64FX (ARM-based) @2.2 GHz and its manufacturer is Fujitsu.
2. Summit :It has cpu cores of $9,216 \times 22$ -core IBM POWER @3.07 GHz and its manufacturer is IBM.
3. Sierra : It has cpu cores of $40,960 \times 260$ -core Sunway SW26010 @1.45 GHz and its manufacturer is IBM.

Conclusion: Thus we have seen various applications of HPC and also helped us to understand how HPC simplifies and optimizes various operations so as to save time.

HPC Application : Driverless Cars

Need of HPC in driverless cars :

Autonomous vehicles will generate and use a large variety of data to permanently analyse their geographical position, condition of the road, state of the vehicle, passenger comfort and safety. To manage all this data, we need High Performance Computing. Driverless cars will be equipped with a large number of sensors, embedded cameras, in-car computers, high precision GPS and satellite receivers, short-range wireless network and 5G interfaces to connect to the Internet.

Working :

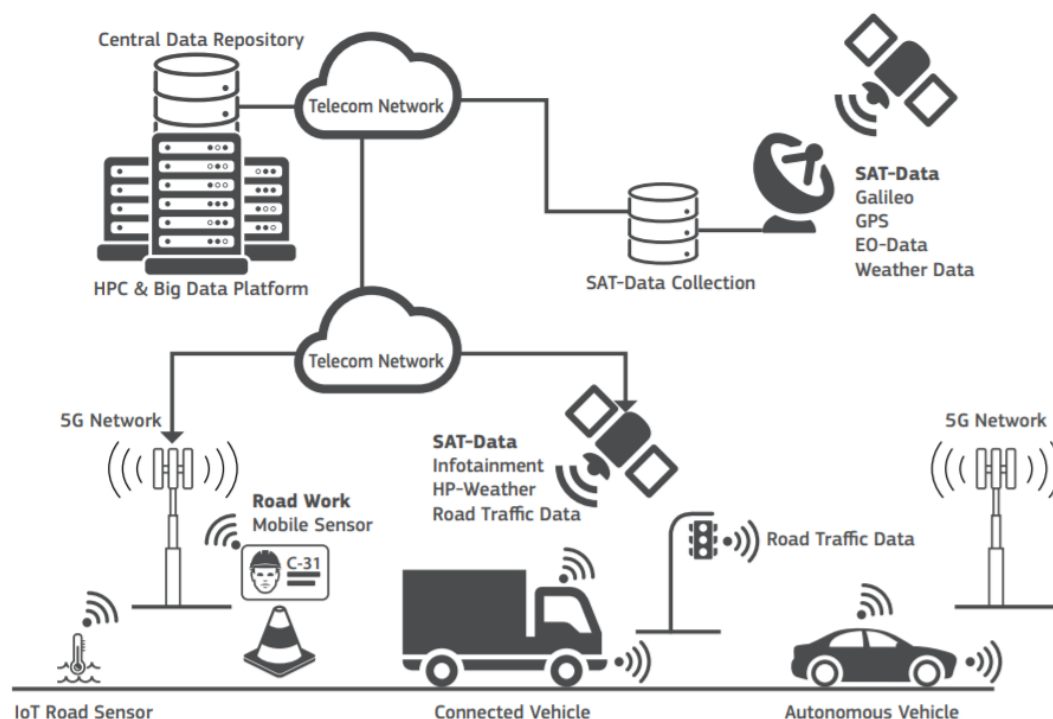
These vehicles will permanently exchange data with management and supervising systems and will sync up with large data-bases that are constantly feeding them with real-

time information about the local environment, traffic situation, emergency alerts and weather conditions.

The transmitted information will be used by predictive driving functions to avoid road hazards and increase passenger safety. When this type of vehicles will go mainstream, the amount of data generated will grow exponentially. According to Intel, driverless vehicles will send more than four terabytes of data (approximately 1000 DVDs) in about an hour and a half of driving to the cloud.

In the future, cars will create significantly more data than today the entire Internet community. Only next generation exascale High Performance Computing (HPC) and Big Data capabilities can deliver the required computing power to implement predictive decision support systems based on Artificial Intelligence to evaluate this enormous amount of data.

Block Diagram :



In what way HPC has impacted the world :

- The “Smart Space - Mobility Application” is a new collaboration with the countries involved in the IPCEI: Italy France and Spain.
- It will combine “Connected Car” and “Big Data” technologies through the application of data cross-fertilization techniques to gain new insights required for innovative Intelligent Transportation Solutions.
- Multiple data streams comes from
 - Earth Observation and Galileo satellites
 - Car and road sensors
 - Weather models
 - Traffic management
- With HPC, It will be possible to process and convert them into meaningful information that can be delivered to people, vehicles and roadside infrastructures to improve on-road interactions, transport safety and travel comfort.