

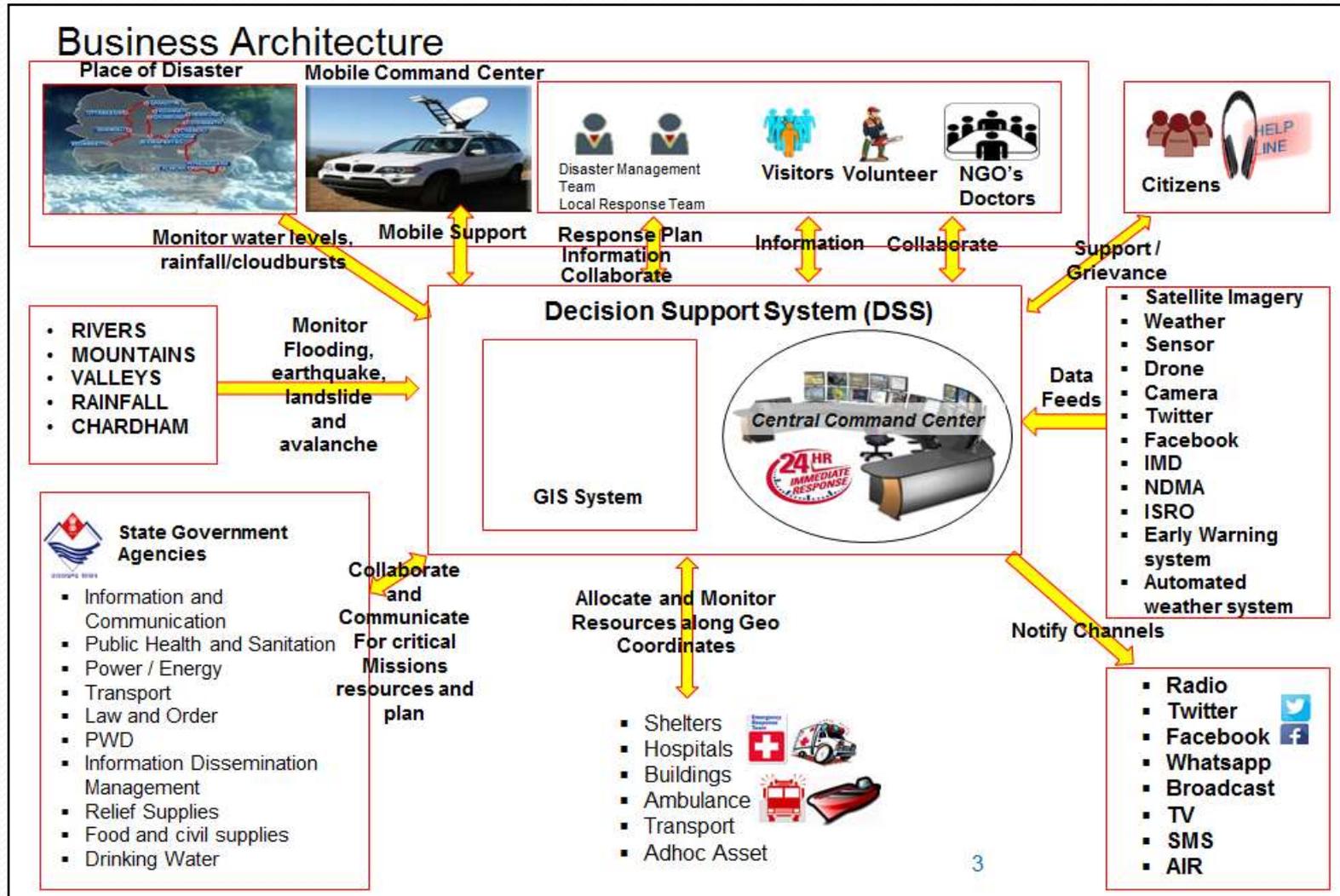
To use the predictive power of BigData, MPD, Drone mapping in rescue operations of disasters

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Presentation outline

- Disaster , Phases and its Types
- Business Architecture(DSS)
- Scope of work: Implementation phases
- Proposed Solution

Business Architecture(DSS)



Scope of the work

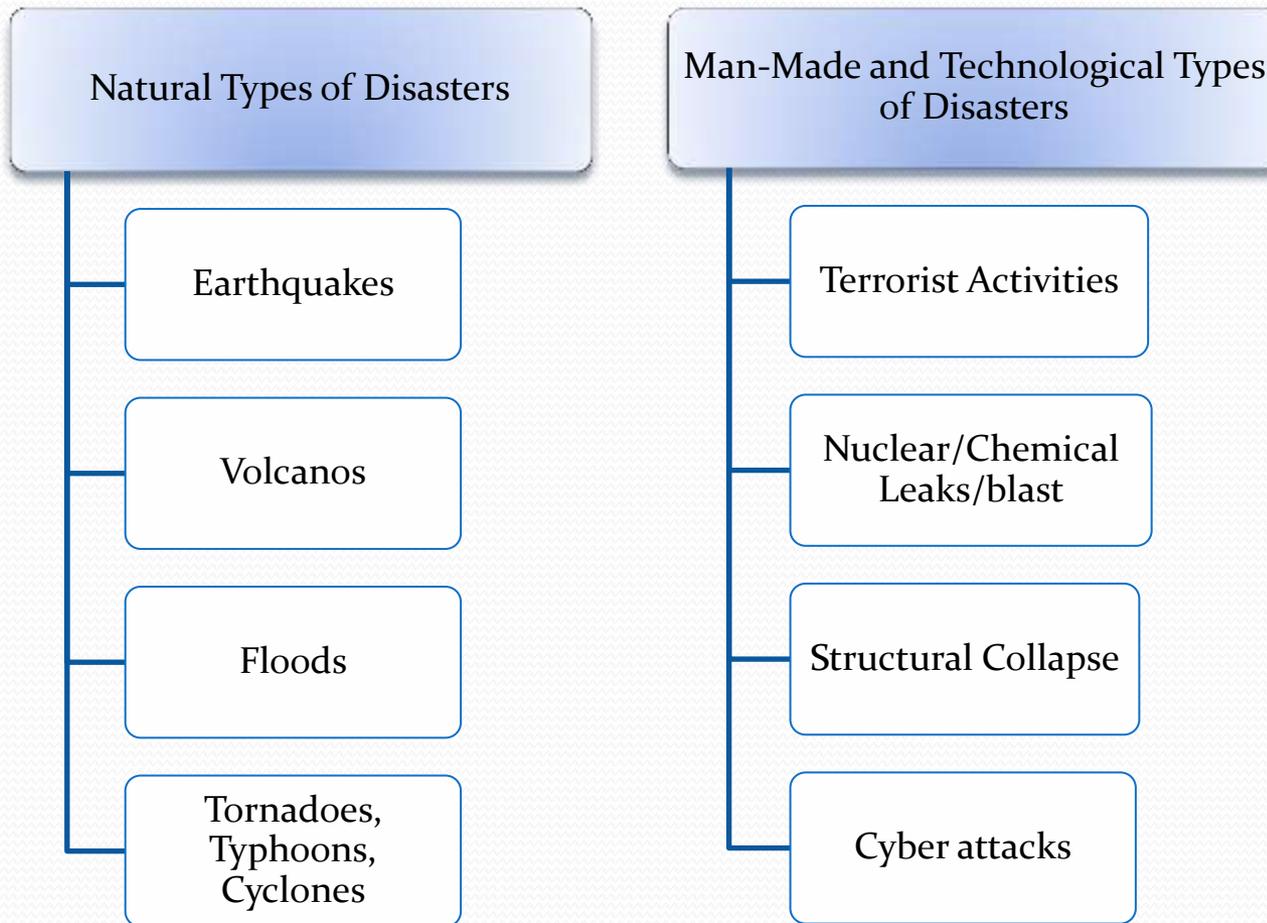
- Would receive information from various sources like Face book, Twitter and Drone, Sensors, camera, Satellite imagery etc
- Would have the capacity to coordinate information from all response units (civil and military) and provide operational support to field operations during an emergency.
- Would be the primary means of displaying real-time information from field operations, and would include geospatial tools to assist operational decision-making.
- Would also be the primary means of communicating information to first responders.
- The DSS would share databases and communication infrastructure to ensure that warnings are disseminated in a timely and consistent manner through all channels.
- Would also function as a management information system (MIS) for ongoing and future reconstruction work, which would be used to maintain the currency of vulnerability and exposure information to help mitigate future disasters

What is a disaster?

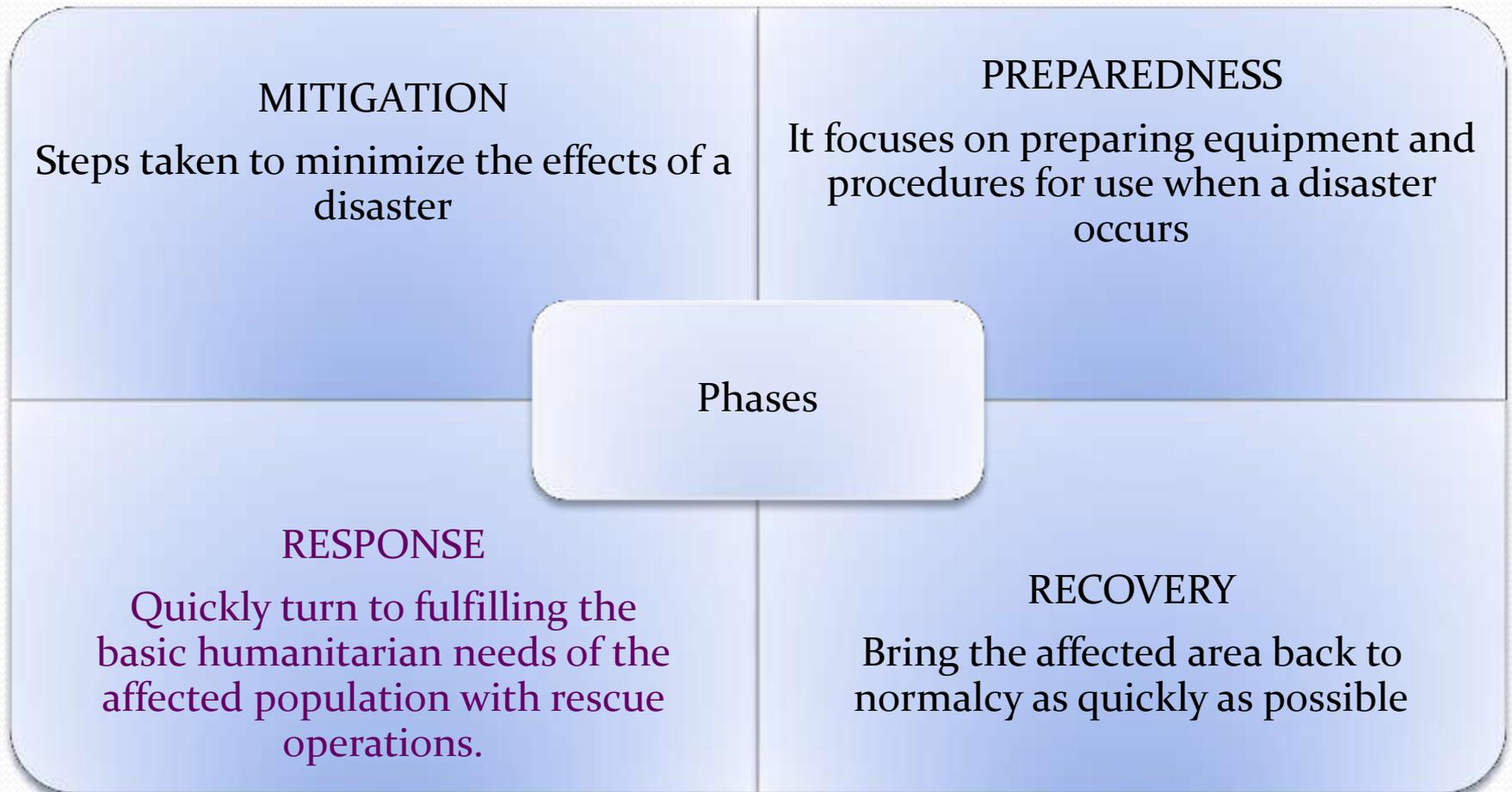
- A sudden accident or a natural catastrophe that causes great damage or loss of life.



Type of Disasters



Phases of Disaster



Proposed Solution

Mobile
Positioning
Data

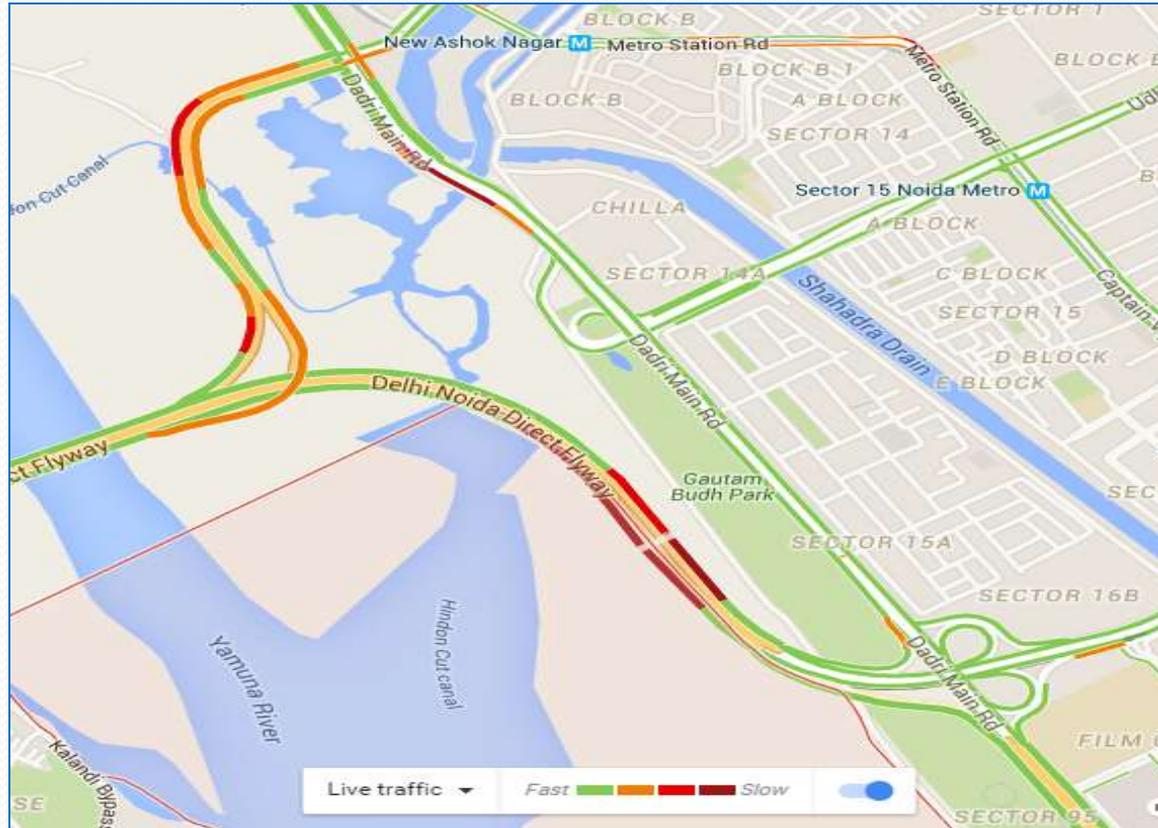
BigData

Drone
Mapping

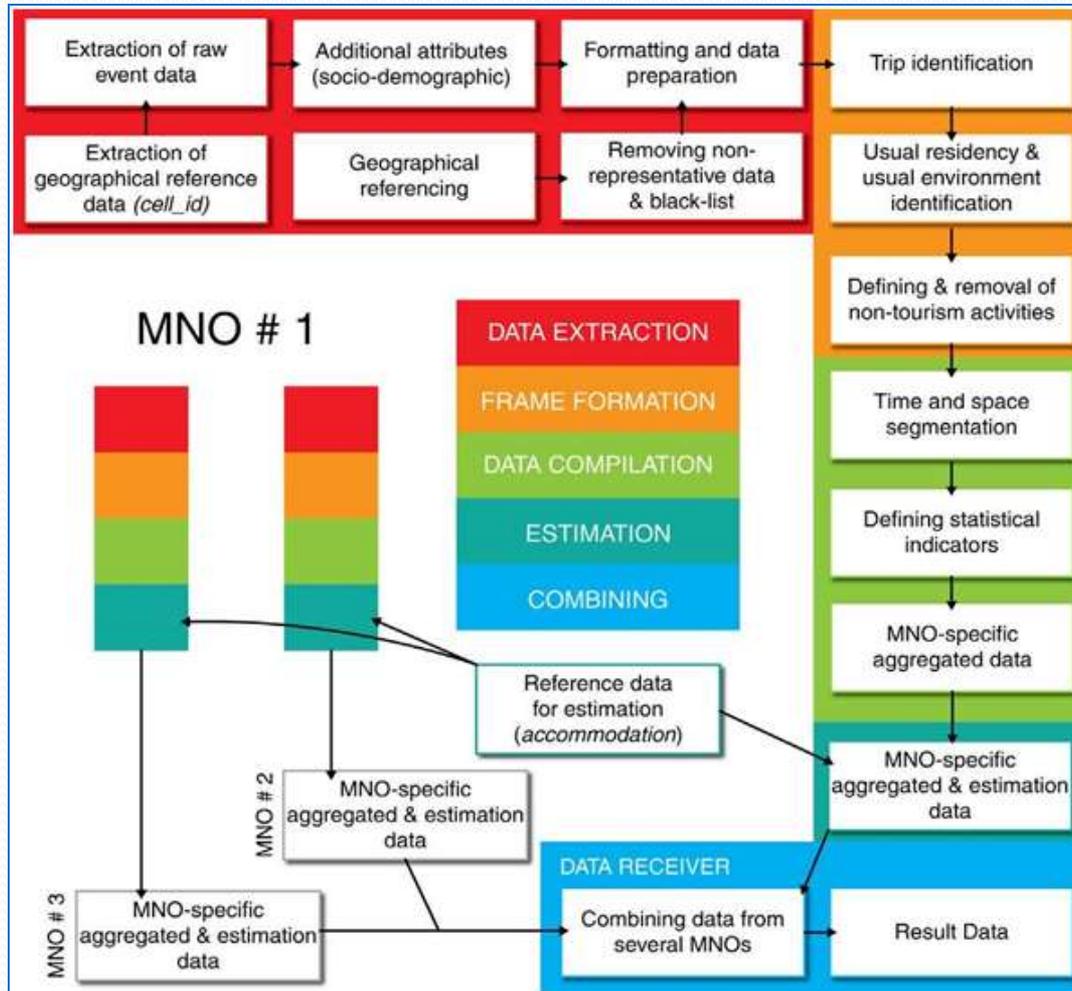
BigData and MPD

MPD(BigData) Example

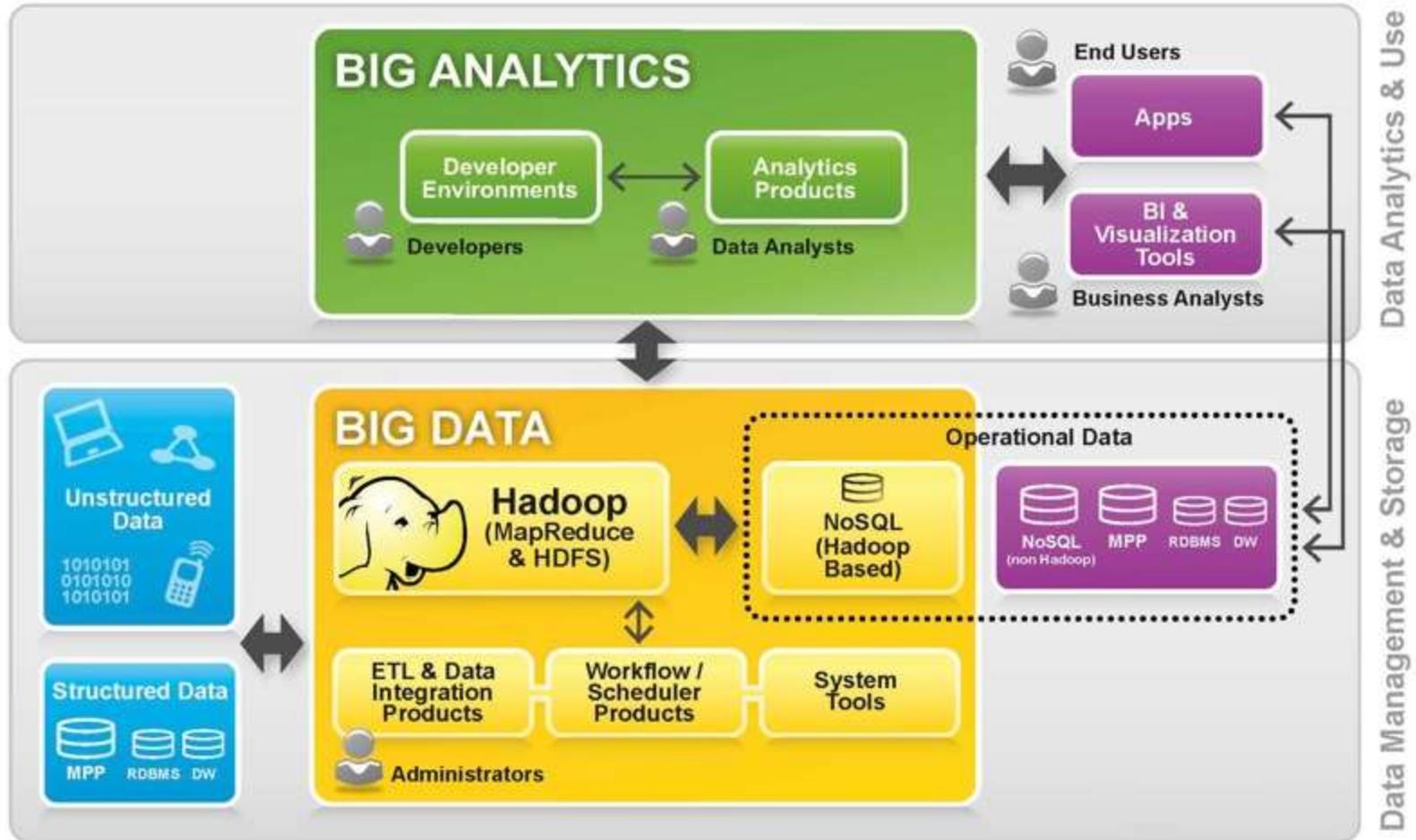
Google Live Traffic at DND Toll Bridge flyover by taking Mobile Positioning Data and generating heat map



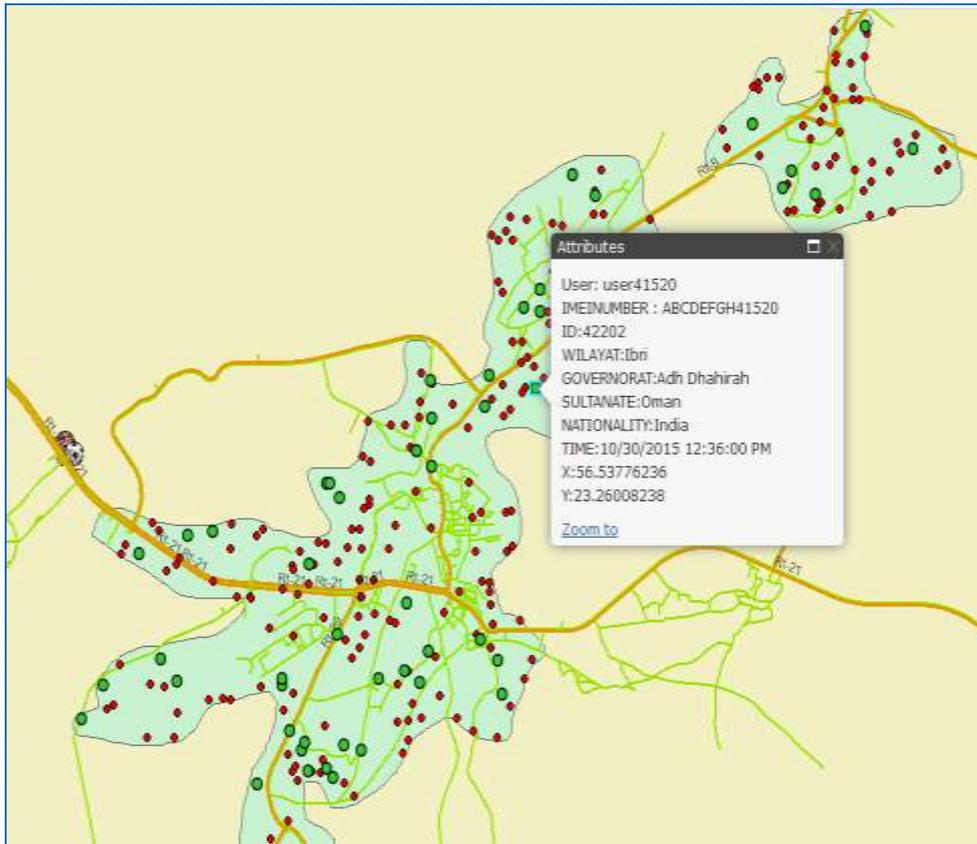
MPD Architecture



BigData Architecture



MPD in Disaster

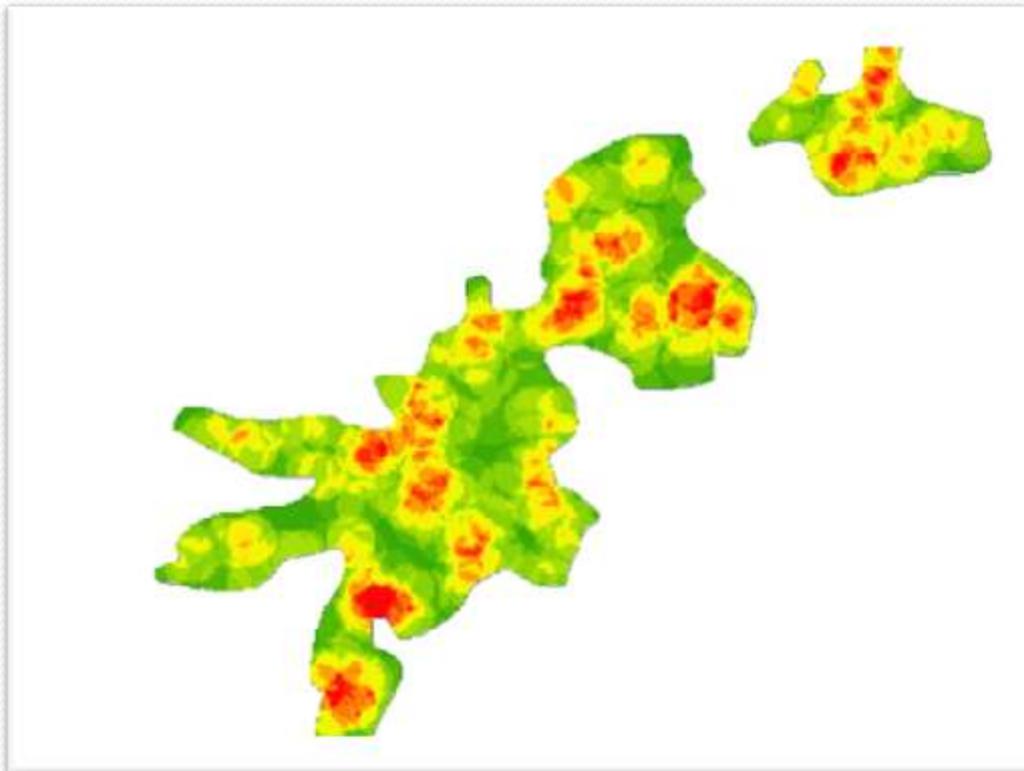


Mobile Companies that is Mobile Network Operator (MNO's) are continuously tracking your location for their n number of reasons. They can sell these data (by KPO's and SLA's) to government/pvt sector to access that relevant information through exposed web services. This data is known as raw Mobile positioning data.

Mobile Positioning Data (MPD) contains latitude and longitude of user's location as well. We can re-process this data and use it to make a better qualitative decision system to the community. That means system will take your data as input, process it and will produce analytics for the benefit of the stakeholders.

Heat Map – Point Density Analysis

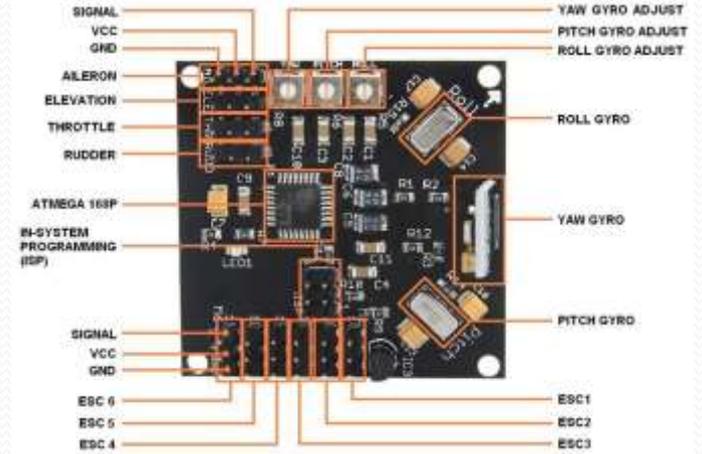
- ❑ Interpolated Surface displaying point density occurrence using Getis-Ord G_i^* Algorithms



0 - 2,905.961413
2,905.961414 - 7,603.464734
7,603.464735 - 12,300.96806
12,300.96807 - 16,998.47138
16,998.47139 - 21,695.9747
21,695.97471 - 26,393.47802
26,393.47803 - 31,090.98134
31,090.98135 - 35,788.48466
35,788.48467 - 40,485.98798
40,485.98799 - 45,183.4913
45,183.49131 - 49,880.99462
49,880.99463 - 54,578.49795
54,578.49796 - 59,276.00127
59,276.00128 - 83,118.96094

Drone Mapping

Quadcopter Control Flow



Workshop Learning @ IIT Delhi

- Assembling Quad copter



Team in the field



QuadCopter

- Ready to Fly



Recent Quadcopters

Increasingly more popular

- Unmanned and small
- Mechanically simple
- Electronic stabilization



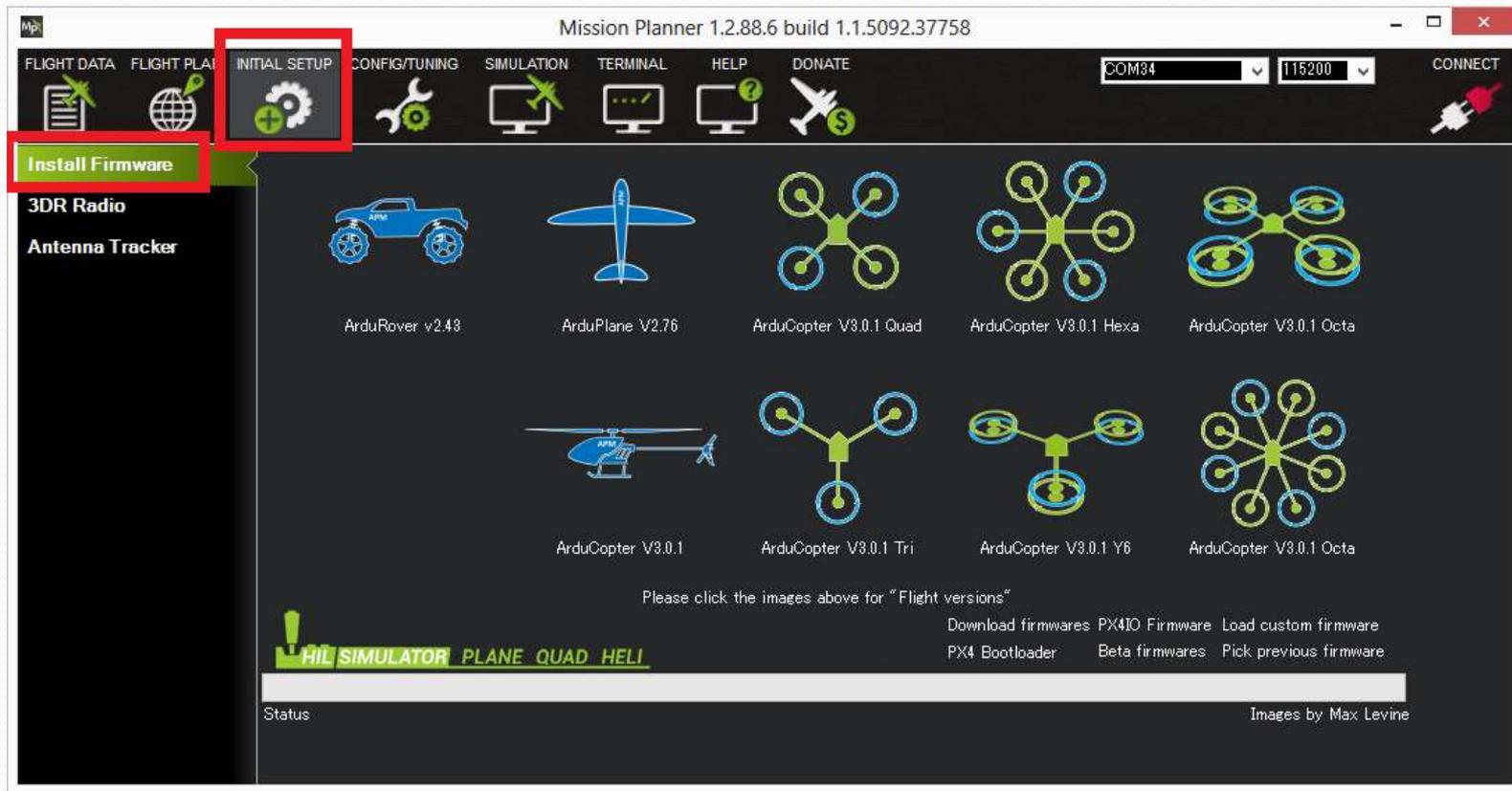
Wide Applications

- Photography, inspections, military ... toys.

Drone with Gimble and High resolution Camera



Ardupilot - Mission Planner:



Mission Planner 1.2.88.6 build 1.1.5092.37758

FLIGHT DATA FLIGHT PLAN INITIAL SETUP CONFIG/TUNING SIMULATION TERMINAL HELP DONATE COM34 115200 CONNECT

Install Firmware

3DR Radio
Antenna Tracker

ArduRover v2.43 ArduPlane V2.76 ArduCopter V3.0.1 Quad ArduCopter V3.0.1 Hexa ArduCopter V3.0.1 Octa

ArduCopter V3.0.1 ArduCopter V3.0.1 Tri ArduCopter V3.0.1 Y6 ArduCopter V3.0.1 Octa

Please click the images above for "Flight versions"

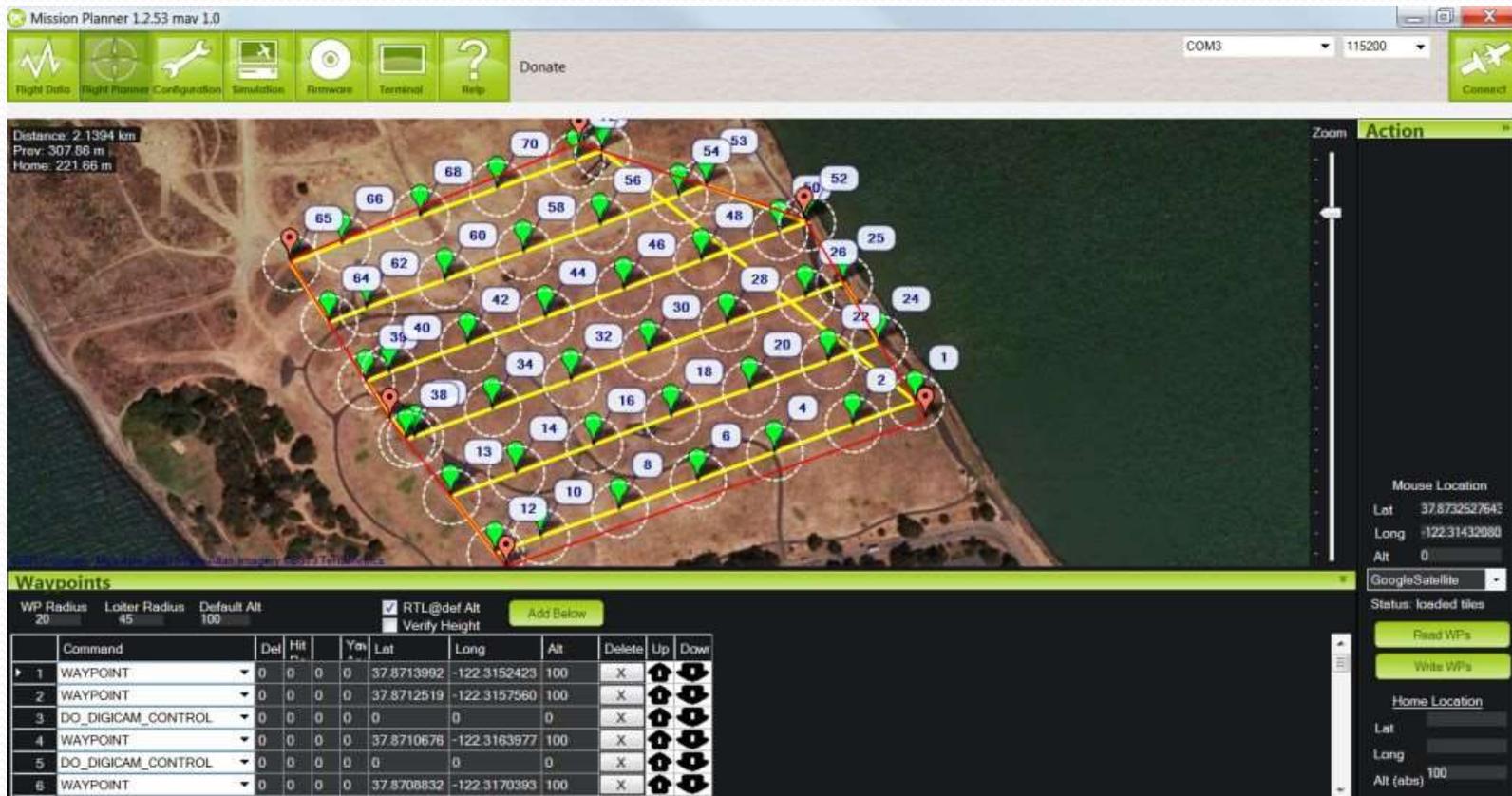
! SIMULATOR PLANE QUAD HELI

Download firmwares PX4IO Firmware Load custom firmware
PX4 Bootloader Beta firmwares Pick previous firmware

Status Images by Max Levine

Ardupilot - Mission Planner:

- Configuration using GPS Waypoints



Mission Planner 1.2.53 mav 1.0

Distance: 2.1394 km
Prev: 307.86 m
Home: 221.66 m

Waypoints

WP Radius: 20, Loiter Radius: 45, Default Alt: 100

RTL@def Alt
 Verify Height

	Command	Del	Hit	Y	Lat	Long	Alt	Delete	Up	Down
1	WAYPOINT	0	0	0	37.8713992	-122.3152423	100	X		
2	WAYPOINT	0	0	0	37.8712519	-122.3157560	100	X		
3	DO_DIGICAM_CONTROL	0	0	0	0	0	0	X		
4	WAYPOINT	0	0	0	37.8710676	-122.3163977	100	X		
5	DO_DIGICAM_CONTROL	0	0	0	0	0	0	X		
6	WAYPOINT	0	0	0	37.8708832	-122.3170393	100	X		

Mouse Location
Lat: 37.8732527643
Long: -122.31432080
Alt: 0

GoogleSatellite

Status: loaded files

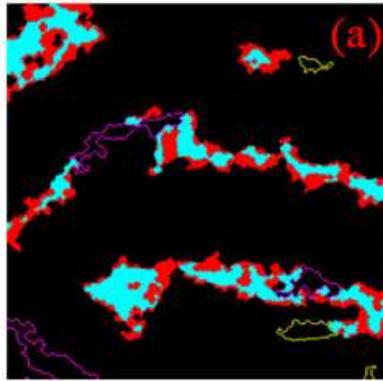
Read WPs
Write WPs

Home Location
Lat: _____
Long: _____
Alt (abs): 100

Images mosaiced



Change Detection Analysis



- B_{sta0}
- F (spurious changes)
- B_{sta}
- B_{add}
- B_{sub}



Uses

❖ **Research platform**

- Flight control theory,
- Navigation,
- Real time systems,
- Robotics.
- Military and law enforcement
- Surveillance and reconnaissance.
- Search and rescue missions in urban environments.
- The largest use in aerial imagery.

Software Technology in DSS

Components	Licensed Based	Open Source Based	Remarks
Database Server (Centralized database server for Data storage.)	Oracle Server	Bigdata Hadoop	Oracle Server is a licensed one which cost around 12 Lacs. No alternate of Millions and trillions of data. Postgres is an open source database with a limitation of 8TB data size. So preferred Big Data (Hadoop) which is open source.
Application Server	ArcGIS Server with Network Analyst	Geoserver with Geomesa and Custom algorithms for Analytics and machine learning.	ArcGIS Server with Network Analyst itself cost many lacs. Geoserver with Geomesa are open source. Custom algorithm has to write for heat map analysis, hot map analysis, algorithm on machine learning on big data.
Visualizations	ArcGIS Javascript API	Openlayers, HTML5,CSS3,	ArcGIS Javascript API is free with ArcGIS Server but dependent. Openlayers with HTML5 and CSS3 is an open source.

Software Technology in DSS

Components	Licensed Based	Open Source Based	Remarks
SOA Services	Dot net Web Services	Jersey REST Service	Visual Studio 2010 is licensed
IDE	Dot net framework	Java Spring framework	Visual Studio 2010 is licensed
Deployment	IIS framework	Apache Tomcat	Apache Tomcat is a free version. Used in Server side implementation as Application Server and hosting web services.
Responsive framework	Bootstrap	Bootstrap	To create the responsive design of the solution.

Questions?