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HACKATHON '17

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Ministry of Earth Sciences

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Ministry of Earth Sciences

The Government of India further reorganized the Ministry of Ocean Development and the new Ministry of Earth Sciences (MoES) came into being vide Presidential Notification dated the 12th July, 2006 bringing under its administrative control India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM) and National Centre for Medium Range Weather Forecasting (NCMRWF).

Intensity map generation

#MES30 Total Submissions : 11

Immediately after occurrence of a significant earthquake (M≥5.0) in India, the areas likely to be affected are also to be shown on a map through this application. This will be done by drawing iso-lines of intensities, on

Map plotting of earthquake

#MES29 Total Submissions : 10

The software should support selection of multi-configurations with click for various options, such as i) plotting of recent earthquake ii) plotting past earthquakes from the database in a text file, iii) limiting the plot of past earthquakes to a particular year, month, date and magnitude, etc. iv) color schemes (option to configure color of icons) v) size and color of symbol (circle, square, triangle, etc.) according to the magnitude, focal depth and time of occurrence of earthquake vi) plotting the selected (or all) seismic observatories in the area of interest vii) depicting the seismic zones, tectonic features and hazard map with Latitude and Longitude information viii) District and State boundaries with important towns and cities, ix) legends, etc.

Sample data required: No

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Data Processing and issue of earthquake messages

#MES28 Total Submissions : 19

The Mobile Application s/w system should collect the earthquake information from all auto-location systems working independently and apply a rule-based decision support through a sophisticated, easy-to-use graphical user interface (GUI) to finalize the earthquake messages and transfer the same to ID system for further processing of prompt and quick delivery to designated decision making authorities, in the earliest possible time. The application should issue unscrutinised SMS Level-I and scrutinised SMS level -2 to the user.

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In-house software test bench for application security.

#MES27 Total Submissions : 8

Several vulnerabilities / security flaw exist in web application security. When authentication functions related to the application are NOT implemented correctly, will allow hackers to compromise passwords or session ID's or to exploit other implementation flaws using other users credentials. (Eg. Injection, Broken Authentication and Session Management, Cross-site Scripting (XSS), Security Misconfiguration, Sensitive Data Exposure, Using Components with known vulnerabilities, and un-validated re-directs and forwards.)

Challenge: Develop an in-house test bench which verifies and validates a given code with Application Security Verification Standard and assist flaw less development.

Sample data required: No

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Print Management Software.

#MES26 Total Submissions : 12

An organisation may have network of printers. Users, based on printing needs, time to time, would have given multiple copies of print. However, no mechanism exist locally to track the pages printed per printer unless Managed Print Services is incorporated. If the pages print per printer is tracked based on the IP's from which the print is given, accountability can be implemented and that leads to a step towards "go green" initiative.

Challenge: Develop a Print Management Software which routes through all the prints to the designated printers, but by capturing the information like hostname, IP from which the print is given, MAC address, number of

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Software for system hardware inventory.

#MES25 Total Submissions : 16

An organisation may have procured PC's/Workstations/Laptops time to time. They may differ in configurations like RAM memory, hard disk storage, computing capability etc. Spares like keyboard, monitor memory, hard disk, graphics cards would have been changed / upgraded in due course but the changes doesn't get tracked / reflect in the asset inventory.

Challenge: Develop a software to map the inventory of each system connected to the network, build an inventory of the hardware and track when changes occur.

Sample data required: No

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To track list of software installed in the PC's / Workstation's attached to the network.

#MES24 Total Submissions : 4

Any organization will have authorized software preinstalled on their PC's/Workstations during system build. Later, by mistake, staff may tend to install software that are freely available over the internet, which in turn may pave the way to virus/spyware/spamware which potentially paralyze the network.

Challenge: Develop a software (scheduler based) to track the list of all software installed on the PC's & Workstations attached on the network and generate a report based on IP's.

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Software solution for E-Mail Load Balancing

#MES23 Total Submissions : 5

An organisation would use multiple leased lines (Internet Service Providers (ISP's)) for redundancy. The primary leased line will be always active and the secondary will take over when the primary fails. When secondary leased line is active, and if a load balancer (Hardware) does not exist, then the outbound mails through the secondary ISP will be blocked by DNS-based Block lists (DNSBLs) mechanism, considering it as a spam, though they are genuine.

Challenge: To mitigate, devise a virtualized (software based) load balancer as an alternative to the hardware load balancers that are available in the market.

Sample data required: No

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Encryption & Decryption Hacks

#MES22 Total Submissions : 6

Various encryption and cracking/decryption techniques exist. Utilising the best encryption technique, ocean based platform data to be encrypted. Similarly, utilising the best cracking/decryption technique the encrypted data to be decrypted.

Challenge: Involving two groups of students, one group has to develop encryption software for encrypting sea surface temperature data obtained from ocean based platforms and the other group has to ethically hack the encrypted data. The team that develops a hack proof encryption will win over if the hacking group doesn't crack the encrypted data.

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Software to track any new IP assigned and joins the network other than the approved list of IP's.

Total Submissions : 5

#MES21

Any organization will have authorized list of IP's assigned to official PC's, Workstations & Servers. However, at times, users attempt assigning an IP on devices (eg. BYOD) and will try to connect to the network.

Challenge: Develop a real time tracking software to compare and track IP's other than the approved list which are getting connected to the network along with their username/hostname & MAC ID's and send a mail notification to sysadmin along with the port and switch details.

Sample data required: No

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Port Management Software

#MES20 Total Submissions : 2

Discrete information on ships that are sailing in Indian waters and are waiting at anchorage points to get berths at ports are available. If they are made collective, then parameters like port efficiency, capacity of the ports vs their actual utilisation, idle fuel consumption, CO_2 emission contributing to global warming can be derived. The overall information can be used for operational optimisation of ports, economic realisation, and a step towards "green initiative".

Challenge: Based on the data available, develop a software, to identify the ships which are sailing in Indian waters with its coordinates and those which are waiting at anchorage points to get berths. Also, calculate the efficiency of the port(s), actual utilisation, idle fuel consumption, and CO_2 emissions.

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Digitalization of Andaman Biodiversity information

#MES19 Total Submissions : 26

Huge volume of data that are available on the flora and fauna surrounding the Andaman and Nicobar group of Islands. The information is not digitised and leads to strenuous effort to comprehend the data.

Challenge: Develop a digitised biodiversity information portal on Andaman and Nicobar group of Islands that encompasses flora and fauna of terrestrial and marine origin, with interactive interfaces enabling comprehensive insights to users on the island biodiversity.

Sample data required: No (Sample application may be prepared from information available on the net).

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Integrated portal for Coastal Ocean Monitoring and Prediction System

#MES18 Total Submissions : 8

Marine Bio-Technology based researchers required to conduct exhaustive, search and retrieve environmental parameter information and perform statistical interpretations related to marine pollution and water quality parameters related to Indian sub-continent.

Challenge: In order to gain wide knowledge with respect to marine pollution and water quality parameters, develop an one-stop repository to obtain information about the various environmental parameters that are being monitored along the long coastlines of Indian sub-continent.

Sample data required: No (simulated data may be used on port of call, from.., to.., dates, Ship capacity and cargo, fuel consumption rate, etc).

#MES17 Total Submissions : 10

An exhaustive tool is needed to view and search information on various marine species that are reported from the Bay of Bengal, Arabian sea and the Indian Ocean. Invasive species, which pose a serious threat to the native marine environment are also identified time to time.

Challenge: Create an web interface that provides information about the marine species including bacteria, fungus, algae, zooplanktons, phytoplanktons and the benthos.

Sample data required: No (Sample application may be prepared from information available on the net).

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Marine Bio-Diversity Web and Mobile Application

#MES16 Total Submissions : 7

Information about various marine species are collected by researchers from different geographical locations but with very little meta data information and that leads to duplication of data and information.

Challenge: Develop a mobile based web application to collage the information about various marine species from different geographical locations with its latitude and longitude coordinates and the information stored need to be retrieved and viewed by filtrations techniques, avoiding duplication.

Sample data required: No (Sample application may be prepared from information available on the net).

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Thermal cameras exist to track warm blooded species. However, in ocean most of the species are cold blooded. There exist a threat to the people who swim in sea, near the coast, getting attacked by sharks and salt water crocodiles.

Challenge: Develop pattern recognition technique to identify the marine species using high resolution camera's and alert the swimmers when such sea animals approach the coast.

Sample data required: No (Videos are available on the internet including National Geography site)

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Video Compression algorithm for GSM & Satellite telemetry

#MES14 Total Submissions : 9

Devices exist to transmit real time video and images through GSM network. However, they use high bandwidth while transmitting the video and images. Transmission through satellite telemetry (INMARSAT, INSAT) has constraints and limited to small packets of data (bytes) that can be transmitted at a given time.

A compression, splitting and stitching algorithm for video and images can be developed to split the videos and images into small data packets (less than 110 / 55 bytes), compress AND transmit them using satellite telemetry, un-compress, composite the data packets at the reception end and present the video and images fully.

Challenge: Devise an algorithm to transmit the data packets in an efficient manner to finally display the video / image.

Sample data required: No (any video / photo images can be used)

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Total Submissions : 4

Parallelization of the Tsunami application (consisting of TUNAMI-F2 and TUNAMI-N3 models) on a suitable platform to incorporate multiple nested grids B, C, D for single A grid for gaining performance while retaining the accuracy of output and to modify the given code so that it produces separate output netcdf files for each of the grids A, B, C and D.

NOTE:

TUNAMI-F2 – Far field tsunami combines transoceanic propagation and detailed simulation in coastal water with linear long wave equation.

TUNAMI-N3 – linear long wave theory using spatial grid length varying from coarse grids in deep sea to fine grids in shallow sea.)

These numerical simulations are applied on specific area of interest in the ocean. The area of interest is considered with certain assumptions at the beginning of the computation. The region is divided into sub regions B, C and D with their spatial and temporal grid lengths vary as 9:3:1 respectively. Vertical walls are set in place of slopes and computation not carried out on water depth shallow than 0.1cm. The application uses TUNAMI-F2 to solve Grid A and TUNAMI-N3 to solve B, C and D grids.

Sample Data Required: Yes (Tunami F2 and N3 Model Codes and boundary co-ordinates for each grid).

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To build a n sided m dimensional polyhedron with least volume

#MES12 Total Submissions : 5

Oceanographic studies generates lot of sub-surface data sets from different instruments. Quality Control (QC) is performed on them. Some time bad data are flagged as good and vice versa. As these data are huge in number

a n sided, m dimensional structure with least volume with in which the oceanographic profile can be cross checked for its correctness.

Availability of such an application could be useful for detecting outlier from huge amount of data from all instruments. This eliminates manual intervention and speed up the process of quality control.

Sample Data Required: Yes

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Real-time data processing and dissemination

#MES11 Total Submissions : 6

Currently, INCOIS receives different marine meteorological and oceanographic data in real-time from various oceanographic platforms (~ 100) viz., wave rider buoys, wave height meters, ship mounted AWS, coastal AWS, tide gauges etc., through INSAT communication system. Each platform is configured to send combination of sensor data at different intervals (i.e. 1 minute to 3 hours). The data are received in binary format and stored into a local hard disk. The raw data files are then extracted as per the programme ID, platform ID in the prescribed format and pushed into database. Further, quality control procedures are applied on these data (such as position check, time check, range test, spike test) and are disseminated to users and user agencies through E-Mail and FTP in near-real time.

We wish to have a system which will enable us to receive this data without performing many read-write operation on the hard disk, i.e. on the fly extracting the data and pushing it to the database and parallely transmitting the data through E-Mail and FTP without fail. Incase of failure repeat the transmission for some predefined number of time.

Sample Data Required: No

gaming & feedback collection

#MES10 Total Submissions : 7

Currently, Indian National Centre for Ocean Information Services (INCOIS) provides several ocean information services for the benefit of seafaring communities in the country. The services are more fruitfully utilized when the advisories reaches the end user in timely manner and in user readable format. Now-a-days ICT facilities in the country are accessible to large population and that plays a major role in effective dissemination of information to the end users.

We wish to have a foolproof application which will enable users to get INCOIS services in timely manner and help INCOIS to collect users' feedback and also encourage users to spend more time on App by providing gaming features (theme should be on INCOIS services) with notification facility.

Sample Data Required: Yes (will be provided by INCOIS; Service details are available @ www.incois.gov.in)

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A Standalone application for Generation of Tuna Fishing Advisory

#MES9 Total Submissions : 12

Tuna inhabits over a wide range of ecosystems and hence search for these resources by fishery fleets/vessels are a high cost activity. ESSO-INCOIS has streamlined the operational generation of Tuna fishery advisories using the satellite derived parameters that helps fishermen to catch Tuna fish.

The idea is to enable users to generate their own decision support for Tuna Fisheries using a desktop application with basic features like retrieving & storing of satellite images & in situ data from INCOIS server, create suitability maps based on satellite parameters threshold, offline geo-processing capabilities like analysis, data management, geostatistics, data interoperability, editing etc, create user-friendly maps and texts.

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Real Time Satellite Imagery dissemination app

#MES8 Total Submissions : 4

Development of an app for dissemination of satellite imagery data in jpeg format of INSAT-3D and INSAT-3DR from central server placed in Satellite Meteorology Division on real time basis. The app should have user selection features such that:

Satellite Selection,
Payload Selection,
Channel selection,
Sector selection,
Product Selection,
Date &Time Selection
Animation feature should also be provided in app with the data of at least last two days, along with user selection features as mentioned above on the lines of RAPID (https://rapid.imd.gov.in/).

The app should be able to run on Android/Windows/MAC OS.

Sample Data required:
Yes; https://satellite.imd.gov.in/archive/REQUESTS/Data_Samples_Hackathon2017/MES8/

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Subset Wizard along with Data Format Conversion Utility

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Input: Satellite Data: various products (HDF5 format)

Output:

Latitude Longitude Selection: Selection on Map and Selecting by manually entering corner coordinates.

Format: HDF5, NetCDF, ASCII, Grib, GeoTIFF.

Platform: Linux (Red Hat) and Windows.

Sample Data required:
Yes, https://satellite.imd.gov.in/archive/REQUESTS/Data_Samples_Hackathon2017/MES7/

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