NASA Space Apps Challenge

Hello and welcome to the 2015 NASA Space Apps Challenge. This year IBM has made creating these apps a breeze using IBM Bluemix. The Bluemix Catalog contains easy to implement services including Watson, Analytics, Mobile, Internet of Things, Data Storage and many more.

To assist with creating solutions for the Challenges thrown this year, we linked Services/APIs to to specific Challenges. For example to store data from “Outer Space”, we have multiple data storage

options to choose from including NoSQL databases like CloudantDB. Also, the Watson services allow you to create innovative smart apps that have the ability to convert voice commands to text, translate text warnings to audible voice alerts, or even analyze pictures to identify a pattern.

With Bluemix you have the ability to choose any of the preinstalled runtimes or bring in any buildpack that is compatible with Cloud Foundry. These include Liberty for Java, Node.js, Ruby on Rails, Ruby on Sinatra, Go, PHP, Python, and more.

Bluemix offers a starting point for developers in the Boilerplate section of the catalog. These boilerplates include a sample app using a specific runtime with one or more services already bound to it. So for example if you decide that you want to use Java and have a database attached for storing water flow data, the Java DB Web Starter boilerplate gives you a head start. Or maybe you want to make a Node.js web app that will store audio communication between outer space and earth in a NoSQL database, the Node.js Cloudant DB Web Starter has you covered.

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Summary of Challenges

Earth Challenges

We have gone through each of the Earth challenges and provided you with Bluemix services that will not only solve the challenge, but take your app to the next level. Click on any Bluemix service to view code snippets , providing examples on how each service can be used.

Clean Water Mapping

Improve the mapping of drinking water resources.
Build a crowdsourcing app to monitor and map potable water availability, water quality, contaminants, and ground water.
Identify areas of priority that are experiencing water stress.
Feed data into early warning systems for regions under water stress.
Identify water availability from a source and water requirement for those who use the source.
Crowdsource information about issues that affect access to local water sources.

- Spatial and temporal monitoring and mapping is an urgent need

Services

- CloudantDB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents. For this challenge specifically you can store information gathered for water availability.
- Geocoding – The geocoding service is a third-party service offered by Pitney-Bowes that takes an address and returns the longitude and latitude of that location. In this challenge you can enter an address of a water source and receive the lat and long which you can then use for mapping.
- Twilio – Twilio is a service that allows your app to send and receive calls and SMS messages. For this challenge we believe that this service can be used to send SMS messages as part of an early warning system for areas under water stress.
- SendGrid – SendGrid is a service that allows your app to distribute emails. For this challenge we believe that this service, can be used to send mass messages out as part of the early warning system.
- Visualization Rendering – The Rapidly Adaptive Visualization Engine (RAVE) is a powerful tool that is used to visualize your data. What makes RAVE unique is that it allows you to mold your graph to fit the data, instead of having to manipulate your data to fit the graph. In this challenge, we recommend using RAVE to graphically represent data that has been collected on water availability and water requirement.

Crop Alert – Learning From the Growers

Mobile/web app/SMS Capability to help growers who face challenges from crop pests and disease.
Crowdsource local growers' information about pests/disease.
Map data or display data creatively (e.g. map the spread with time of pests/disease).
Create a community board for pictures to aid in identifying pests/disease
Your app will work as an early alert system for farmers in neighboring regions.

Data gathered by you can be used as data source for scientists later on.
What will need to be crowdsourced:

- Location – latitude, longitude
- Name and photo of pest/disease
- Date when pest/disease started
- Percent area currently affected
- An option to add pesticide application
- At the end of the harvest season
  - Date of harvest
  - Percent harvest that has been destroyed

Advanced specifications:

- Photo library that can be searched to help identify what is affecting their crops
- Incorporate weather data
- Alerts based on meteorological indicators

Services

- CloudantDB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents. For this challenge, Cloudant can be used to store historical crop data and to store images of pests/disease as part of the public library for pest/disease identification.
- Mobile Cloud Boilerplate – The Mobile Cloud Boilerplate is a starting point, if the challenger decides to go the mobile route. This specific boilerplate comes with SDK for Node.js and the Mobile Application Security, Push, Mobile Data, and Mobile Quality Assurance services.
- Visual Rendering – The Rapidly Adaptive Visualization Engine (RAVE) is a powerful tool that is used to visualize your data. In conjunction, with geo data and data on the pest/disease spread, you can use this service to graphically represent areas affected, the rate of spread, etc.
- Geocoding – The geocoding service is a third-party service offered by Pitney-Bowes that takes an address and returns the longitude and latitude of that location, you can use the address of farms that have been affected by the pest/disease to get the exact location (longitude and latitude) which you can then use to more accurately map the areas affected.
- Twillio – Twillio is a service that allows your app to send and receive calls and SMS messages. For this challenge we believe that this service can be used to send SMS messages as part of the early warning system to warn nearby farmers of pest/disease spread.
- SendGrid – SendGrid is a service that allows your app to distribute emails, you can send emails as part of the early warning system to warn nearby farmers.

Food Directions

Identify and visualize the current capacity and potential of countries to be self-sufficient in food production, and to map their reliance on foreign food trade.
Use the following data:

- Recent land cover maps
- Country level land cover usage data
- Crop import and export data

Start with a demonstration on a country that has all of the above data, then extend the functionality globally.
Could be used to develop a map using the following:

- Existing raster layers of land cover data
- A method to quantify arable land
- Identification of what arable land is being used for

- Government statistics of crop yield

Display information in an interesting way
Incorporate a forum for open discussion
Advanced:

- Develop an index to determine potential of country being self-sufficient
- Develop an index to determine how sustainable each country's approach is
- Map historical variability
- Include additional economical/environmental/livelihood factors

Services

- CloudantDB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents, you can use the service to hold data about international food trade, arable land coverage, etc.
- Geocoding – The geocoding service is a third-party service offered by Pitney-Bowes that takes an address and returns the longitude and latitude of that location. In this challenge you can enter the address of a plot of land, have the coordinates returned, and use the coordinates to identify what the land is being used for and if it that location is suitable for farming or not.
- Visual rendering – The Rapidly Adaptive Visualization Engine (RAVE) is a powerful tool that is used to visualize your data, you could use RAVE to graphically compare farmland output vs international food trade or comparing the uses of different farmland.

Forest Monitor Mapping

Use crowdsourced data to assess land coverage change and the contributing factors.
Develop an app to monitor forest deforestation and degradation
Incorporate data collection and visualization
App could capture local people's feelings
At a minimum include:

- GPS locations
- Estimation of land area
- Reasons behind deforestation/degradation
- Picture upload functionality
- Dates of when observations were made

Additionally:

- Include a list of common reasons for deforestation/degradation
- Visual mapping of crowdsourced data

Services

- Visual rendering – The Rapidly Adaptive Visualization Engine (RAVE) is a powerful tool that is used to visualize your data. In this challenge, you can use RAVE to graphically represent deforestation trends over time.
- CloudantDB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents. You can use Cloudant to store data pertaining to deforestation as well as storing images of the effects of deforestation.
- Geocoding – The geocoding service is a third-party service offered by Pitney-Bowes that takes an address and returns the longitude and latitude of that location. For this challenge, you can use geocoding to get the exact locations (longitude and latitude) of areas of deforestation.

Leaf Me Alone

Develop a tool to quantify and classify the amount of injury to leaves on ozone sensitive plants
The app will:

- Handle uploads of pictures of leaves
- Calculate the ozone damage of the leave
- Display the results

Use color to determine how much of the leaf has been injured by ozone
Present the results of the analysis
Present the last 5 days of surface ozone for the user's location

Services

- CloudantDB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents. You can use Cloudant to store the images taken and hold the data to compare the images to.
- Reverse-geocoding – Reverse-geocoding is a third-party service from Pitney-Bowes that returns an address from the latitude and longitude entered. Since geographical data can be attached to a picture, you can use this service to determine the address of where that picture was taken based on the coordinates found in the metadata.
- Watson Visual Recognition – Watson Visual Recognition utilizes the cognitive computing power of Watson to identify patterns in images based on a predefined body of source images. The service works by taking the image it is given to be processed and comparing it to the "corpus" of images that it has been fed. The service then looks for similarities based on the patterns present in the corpus then returns what Watson has concluded is in the picture and how confident Watson is that the answer is correct. For this challenge we believe that the service can be trained to identify ozone damage in leaves.
- IBM Insights for Twitter – The IBM Insights for Twitter service is used to access the twitter stream and gather tweets. With this service you can retrieve tweets and images tweeted based on a query submitted. For this challenge you could pull the images of leaves from tweets that feature a specific hashtag.

My Sky Color

Your app will provide qualitative indication of aerosol loading in atmosphere.
Gather sky color data in a consistent manner and compare it to the level of aerosols from air quality monitors.
Create a tool that lets people record the color of the sky using consistent and qualitative standards.
Compare results to nearest data from Aeronet.
Use smartphone camera.
Pull data from Aeronet.
Match user data with data from Aeronet.
Compare different time and locations.

Services

- CloudantDB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents. You can use Cloudant to store the images taken and also to hold the data to compare the images to, specifically data from Aeronet.
- Reverse-geocoding – Reverse-geocoding is a third-party service from Pitney-Bowes that returns an address from the latitude and longitude entered. Since geographical data can be attached to a picture, you can use this service to determine the address of where that picture was taken based on the coordinates found in the metadata.
- IBM Insights for Twitter – The IBM Insights for Twitter service is used to access the twitter stream and

gather tweets. With this service you can retrieve tweets and images tweeted based on a query submitted. For this challenge you could pull the images of the sky from tweets that feature a specific hashtag.

- Watson Visual recognition – Watson Visual Recognition utilizes the cognitive computing power of Watson to identify patterns in images based on a predefined body of source images. The service works by taking the image it is given to be processed and comparing it to the "corpus" of images that it has been fed. The service then looks for similarities based on the patterns present in the corpus then returns what Watson has concluded is in the picture and how confident Watson is that the answer is correct. For this challenge, the service can be trained to identify aerosol loading in the atmosphere based on data from Aeronet.

Open-source Air Traffic Tracking

Build an open-source air traffic tracking tool that allows users to select a flight and see out the window or other views of the aircraft and airspace.
Incorporate live and/or historical data from different sources (radio, weather, air trafficking, flight plans, etc).
Flight and meteorological datasets will be provided

Services

- Cloudant DB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents. For this challenge the Cloudant service can be used to store historical flight data, weather data, flight plans, etc.
- Reverse-Geocoding – Reverse-geocoding is a third-party service from Pitney-Bowes that returns an address from the latitude and longitude entered. In this challenge, if you are given the latitude and longitude of the plane while it is in flight, you could potentially use this service to display the town that the plane is currently flying over, interesting facts about the town, and even what towns will be coming up next.
- Visual Rendering – The Rapidly Adaptive Visualization Engine (RAVE) is a powerful tool that is used to visualize your data. For this challenge you could use RAVE to visually compare how historical and live weather data differs, you could compare historical and live flight times to see how flight times have changed, etc.

Stream Gazer

Animate or visualize changes in streamflow on a GIS layer.
Stream data will be provided to you.
Bonus:

- Visualize extremes in streamflow with storm track data from thunderstorms and hurricanes
- Choose an even that controls streamflow and map it

Services

- Visual Rendering – The Rapidly Adaptive Visualization Engine (RAVE) is a powerful tool that is used to visualize your data. For this challenge you can use RAVE to graphically represent the stream flow data.
- CloudantDB – Cloudant is a NoSQL database that can be used to store all kinds of data as JSON documents. In this challenge you can use the Cloudant service to hold the data gathered from the National Water Information System and the National Hydrography Dataset Plus
- Geocoding – The geocoding service is a third-party service offered by Pitney-Bowes that takes an

address and returns the longitude and latitude of that location. You can use this service to obtain the exact location (longitude and latitude) of the streams based on an address, or if latitude and longitude are already given, you could use Reverse-geocoding.

- Reverse-geocoding- Reverse-geocoding is a third-party service from Pitney-Bowes that returns an address from the latitude and longitude entered. For this challenge you could use this service to get the address of streams and possibly list what towns they go through.

Volcanoes, Icebergs, and Cats From Space

Crowdsource the discovery of interesting natural events.
Users will be able to find and tag an event using NASA's satellite imagery.
Your app should implement a voting system where users get to vote on the submitted events.

Services

- Gamification – Gamification is a service that allows you to create a game out of your app. You can create user accounts, create missions, and indicate rewards for completing missions. For this specific challenge you can create a polling game that allows users to vote on pictures that are submitted. Rewards could be given out for having your own pictures voted for and you could even receive rewards for voting on other pictures.
- IBM Insights for Twitter – The IBM Insights for Twitter service is used to access the twitter stream and gather tweets. With this service you can retrieve tweets and images tweeted based on a query submitted. In this challenge you could pull image submissions from Twitter when the user posts an image with a specific hashtag.
- Reverse- geocoding – Reverse-geocoding is a third-party service from Pitney-Bowes that returns an address from the latitude and longitude entered. In this challenge you could use the latitude and longitude to find a near-by addresses. You could then reach out to somebody on the ground in that location to take a few pictures of the event from the ground.

Humans Challenges

Survivor Mars Lava Tubes

Look for Lava Tubes on Earth, Mars and the Moon, also found in Hawaii (Locations).
Use coordinates to spot actual lava tubes, create a virtual city within each.
Look for habitation spots and mass of each resource, and how long those resources will be valid.
Tubes could provide shelter to humans, from meteoroids and other perils (dust storms and radiations).
Optimize resources from 10 people or more, for over a year, with minimal consumption and interaction from earth, and focus on survival for a year.
Optimize based on future needs as well. Some supplies may run out.
Use orbital imagery, satellite data (location coordinates), resources on the tube.
Locate water, food, oxygen and hydrogen for air and fuel, mineral and metals.
Use mars dataset.
Make sure communication between ground and space station is minimal.

Services:

- Data Cache To avoid repeated communication with earth, cache the data. Can be useful for analytics and projection
- Gamification – To maneuver through mazes and labyrinths to get to an end goal and collect brownie points(resources) along the way
- Geospatial Analytics – Based on previous resource locations, deduce locations for current tube.

Friends in Higher Places

Create an interactive app (maybe using an open source platform), to intercept archaic and real time data to facilitate conversation between astronauts and humans on earth.
If data is waves(waving to a person), then app should depict a visualization of "waves" of hellos over the months
If data is trace of 1000+ orbits, then app should build a digital art piece, of the ISS
If data is live video, then app should build a visual calendar.
App should be able to transfer data through sufficient Bandwidth and Frequency.
To increase interaction. Make environment more conducive to living, for astronauts.
Use social media interaction. Data gathered while astronaut has been in orbit. Use data connections.

Services:-

- Visual Recognition service: In order to identify body parts, face and hands for gesture recognition.
- Visual Renderings service: In order to take actions after recognizing gestures.

Fit as a Moose - Metabolic Observations of Space Explorers

Develop an app that monitors an astronaut's health on board the ISS, health and exercise options on earth.
Record physiological movements before and after exercise.
Project them on micro gravity. (Could Use IoT to transfer data from sensors and devices that monitor body parameters like heart rate etc.).
For example, Hydration for instance, indicates athletic performance, and have impacts on physical tasks.
Loss could result in bone density loss and muscle atrophy. Water is the largest consumed resource. Hence it could be recycled.
Mass could be saved for experiments
Monitor health of astronauts as a healthy body and state of mind is key to performance.
Use data from previous human spaceflight mission. Data variables to consider:
Body Mass Change
Fluid Intake
Blood Density
Body and Environmental temperature.
Saliva PH
Hydration
Minimize invasive data collections and time required to collect data. Work on preexisting data sets. (Project and learn from it)

Services:-

- Watson Predictive Analytics :- This is a cool service that provides Predictive Analytics and builds models on data.

- Monitoring and Analytics:- Use health parameters to read them in terms of its implications on the body.
- Tradeoff Analytics:- Compare measured parameters against standards. By taking into account conflicting decisions, it helps arrive at an optimal solution

Can you hear me now ? Space-y Sounds

Develop an app that leverages NASA audio files(historic and current: space rocket engine roars, beeps and whirs from outer space, human documentary during missions.
Decode audio messages. Categorize them. Enhance them. New ways to include NASA audio files in regular daily activity like new email, boot up and boot down.
Discover new information that might be useful in furthering the space mission.
MP3 and M4R audio files. eg: Apollo 10 and 11 recordings, each worth half an hour, recording conversations and other noise.
Services:-

- Language Identification:- Use the REST API to identify noise and classify it as useful information. Use social media analytics for cognitive services.
- Machine Translation Translate text form one language to another
- Relationship Extraction: Perform contextual analysis and map relationship between words for better understanding.
- Speech to Text:- Convert sound to data that can be used for sending messages

3D Astromed Devices

Use 3D printing to model medical devices.
Consider ergonomic factors owing to factors of grip in space. Make it multipurpose to avoid having to carry many individual devices.
They should generic so that they applicable in multiple scenarios.
Either model the following: Syringes, Forceps, Scalpel, Thermometer, Elastic Wraps, Bandagees and Neck Braces AND/OR create new ones that could be more important

Services:

- Concept Expansion:- Can interpret commonly used medical terms and translate them to specific phrases thus aiding in the build of the correct instrument.
- Cognitive Commerce:- Owing to a large capital investment on the product, this service provides insight into industry specific standards to meets criteria of clients(space stations that would buy the product), to avoid wastage of money invested in creating something not everyone may need.
- Tradeoff Analytics:- Helps in the decision making process concerning quality vs quantity.

Print your own space food

Let astronauts print food on space facilities like ISS using additive manufacturing.
Investigate its benefits and feasibility.
Feature recycling of food, or look for common elements across food domains
Formulate ideas on applications of food.
Loop for options for recycling 3D printed food.
Consider drawbacks
Identify basic ingredients it

Services:

- Question and Answer:- Perform actions based on user's answer to objective questions
- Cognitive Commerce:- Owing to a large capital investment on the product, this service provides insight into industry specific standards to meets criteria of clients(space stations that would buy the product), to avoid wastage of money invested in creating something not everyone may need.
- Tradeoff Analytics:- Helps in the decision making process concerning quality vs quantity.

Space Station Telemetry App

An app that telecasts live data from ISS to the general public.
Could also be made useful to those working in ground systems.
Consider the small size of a mobile screen and limited computing power and memory of a mobile over its web counterpart.
Use Human Computer Interaction to make it more interesting and UI/UX for appeal.

Services:

- Alchemy API:- To leverage NLP and computer vision to deeply understand conversations, documents and photos, maybe categorize it. For example, if somebody screams, varies their tone, automatically flash a screen and increase noise to gain attention.
- Text to Speech:- Convert textual data to give voice and tone to it, for more interaction with humans.
- Speech to Text:- Convert conversations in space to meaningful text, for people who prefer reading to listening, and for documentation purposes.
- Message Resonance:-Provide data to people that is more preferable for receiving, eg:- if they prefer a conversation which explains the stats, over simply reading stats on the screen. This is decided by public review from the past. Helps in making a better judgment call. Give users what they want.
- Load Impact:- Test before deploying. As it involved transmitting data to countless devices, servers should handle stress test under multiple scenarios.
- AutoScaling:- Increases and decreases instances based on load.

Space Wearables

Design prototype for wearable clothing and accessories for technicians who stay away from PCs for long hours but need computation services on the go, without interruption
Integrate computers and humans using fitness bands, smart watches, augmented reality display etc.
Build prototypes (HW or SW) for the same
Design using current technology and audience in mind
Consider the ever changing user's environment
Be wary of comfort factor, durability and materials that hamper work environments.

Services:

- Internet of Things:- Transmit data from the device(sensor), let a platform manipulate it and send it back to the device for immediate response if required.
- Twilio:- For instance to send text notifications for alert, under emergency situations of overheating for example.
- Wearable Fitness:- Due to different conditions for existing in space, astronaut's need fitness to be monitored as well.
- Link your device:- Add a personal device to a system

Space glove - Gesture and voice commanding

Control computer applications via wearable devices (smartphone)
Establish wireless connectivity to the main computer, respond to gesture and voice commands
Use accelerometers and positioning sensors as CLI.
Spilt functions to be executed on a mobile device vs main computer.
Data is to be exchanged between main computer and wireless device. Use voice as input.
Watch for failure of any one device.
Use gestures based on accelerometer
Write an app to use this data and control CLI
If device is worn on both hands use them to depict zoom in and out. If worn on one hand, use it for moving left, right, rotate, up and down.

Services:

- Text to Speech:- Convert text data to be read out to humans for interactivity.
- Speech to Text:- Convert human speech to text for processing.
- Internet of Things:- Transmit data from the device sensor to the foundation, for processing.
- Link your device:- Add a personal device to the system.

Data Treasure Hunting

Using keywords discover uses for NASA's data
Data is available at no cost, on the web, in a machine readable and non-proprietary form
Search for this and integrate into innovative databases and applications
Work with inconsistent metadata
App should allow anyone to add meaningful keywords to the descriptions of our data and discover used for open data.
A crowd sourcing application could display information about these assets and query people about how the assets can be used.
Predictive analysis and machine learning techniques can be used.
Retain they log file that explains how these key words were discovered
Use the starter toolkit available.

Services:

- Concept Expansion:- Maps euphemism to colloquial terms to more commonly understood phrases, analyzing text and interpreting its meaning based on usage in similar contexts.
- Concept Insight:- Maps user-input words to underlying concepts thus linking and giving meaning to a certain description.
- Language Identification:-= Detects languages coded in UTF-8
- Machine Translation:- Enables the translation of text from one language to another.
- Relationship Extraction:- Extract useful units of information from text
- DataWorks:- Cleanse and handle all kinds of data.

Bodies in space-y motion

Develop an app that helps a player/user understand motions of different entites(humans/rovers/spacecraft) in space.
Local gravity field and atmosphere have huge variations, they translate into variations in forces which acts upon objects.
Player must learn physically about the work that technicians perform and how differences in environments affect them.
Physics of various planetary bodies need to be scaled and modeled for tasks.

For example, create a fun game that will make the player move from inside the ISS to making him walk on the moon, and reduce/increase speed as that happens. This will help player understand the effect of gravity inside the ISS, compared to Moons, or on earth.
Make a javelin travel in Mars vs Saturn.

Services:

- Visual Recognition:- Track trajectories based on astronaut's body movement. This service is used to recognize each object in a scene or a picture. It can break down the picture into various categories and can describe what each category contains.
- Visual Rendering:- Display, manipulate and render trajectories on the screen based on how the body moves. This is graph based and various graphs like pie chart, bar graphs can be rendered on the screen based on data that is generated or provided to it from different sources.
- Gamification:- Labyrinth and mazes can be introduced to make the solution more fun and interactive. This contributes to the business aspect of the game.

Additional Bluemix Runtimes & Services

Hey there coders ! Welcome to the NASA Space Apps challenge 2015. You've decided to use the right tool, IBM Bluemix. Here's why, being a platform as a service, this tool offers a barrage of runtimes and services which can be integrated in a breeze. Through the rest of the document we give you an idea (not to be limited) of which Bluemix service can be used according to the challenge.

Categories in which Bluemix Services are available

Watson Services
Data Management
Mobile
Web
DevOps
Integration
Big Data
Security
Business Analytics
Internet of things

Following are the runtimes you can use via Bluemix

PHP
Python
Go
Liberty for Java
SDK for node JS
Ruby Sinatra
Ruby on Rails
.NET and more

Service names, their use in Challenges thrown by NASA in tabular format

Please click on the service name, to see the code snippets, illustrating how you can use the Service

Service Name	Use	Challenges that can use the service in(Pick any that you think might work)
Concept Expansion	Convert euphemisms to commonly understood terms. For example, Interpret the 'Big Apple' as 'New York City'. Collect all words that could mean the same and map	**Challenge : Data Treasure Hunting** Many key words could mean the same thing. Link them to get the right meaning.

	them with each other.	
Concept Insight	Broaden user's investigation by mapping user input to underlying concepts.	**Challenge : Data Treasure Hunting** Broaden information beyond actual words to extract meaning out of potential ones.
Language Identification	Detect language of text, then look for similar words that could mean the same in that language.	**Challenge: Can you hear me now?** If someone speaks a command in a new language, use that to find the language and meaning associated with it
Machine Translation	Translate text from one language to another and maybe use that in an app that can be customized based on the language.	**Challenge: Can you hear me now?** If instructions are to be given in a certain language
Message Resonance	Assign a weight to each word in a sentence based on how it's going to be received by a certain audience. For example, nasopharyngitis is relevant to a doctor vs common cold to a general mass.	**Challenge : Space Station Telemetry App** Control the words that are broadcast to a common audience vs astronauts, Data treasure hunting – Categorize given data based on the audience. This can better serve people.
Personality Insights	Use the Personality Traits returned by the service based on a person's social data.	Use in challenges where we need to make decisions based on personality traits.
Question and Answer	Allows the app to post questions and receive responses	Currently you can use Q&A service on Travel and Health Care Corpus
Relationship Extraction	Extract useful information from text. For example, John is in NY and he has been there since 2001. Here he can correspond to John, deducted by the service.	Data Treasure Hunting – Link two different parts of the same sentences by understanding the relationship between the first and second half.
Speech to Text	Convert human voice to written words.	**Challenge : Friends in higher spaces** When an astronaut says something, record it for documentation, or text archiving. Can you hear me now ? - Convert voices and words from space into text to be used interactively in a display device, Space Station Telemetry App – Convert conversations in space to be read as a mobile or web article. Use IoT for device integration. Space Glove: Gesture and voice commanding – Commands can be issued and signals can be sent.
Text to Speech	Read out text in the form of human voice, with appropriate cadence and intonation, in US EN voice and Spanish voice.	**Challenge:Space Station Telemetry App** Integrate commands issued over the system and enunciate it in an interactive app, Space Glove: Gesture and voice commanding – Combined with IoT,

		device can convey messages to audience.
Tradeoff Analytics	Based on scenarios find the best possible option. For example, cost vs weight of a phone.	**Challenge : Fit as a Moose** If consumption of more food makes an astronaut productive vs increases payload in the space station, choose the better option, Print your own space food – Device quality over quantity as these are expensive devices and buyers should co-operate for its existence in the market.
Visual Recognition	Identify body parts, face and hand gestures for recognition. For example, in the picture of a windmill in a green farm, the service will help find out the amount of blue, green, landmark % in a picture. This can contribute to classifying data in appropriate categories.	**Challenge : Friends in higher places** In the presence of multiple astronauts recognize each of them and interpret their body movement, Bodies in space-y motion – Find out the path of motion for each astronaut. Leaf me Alone, Me Sky Color
Visualization Rendering	Create powerful graphics and visual charts using rendering, for comparison and visualizing data.	**Challenge : Bodies in space-y motion** Based on the tracked movement, render motion curvature on the screen for visualization, Clean Water Mapping, Crop Alert, Food directions, Open source Air Traffic Trafficking, Stream gazer
Auto Scaling	Use it to make sure server can handle load when many users open the page. Memory, CPU usage, throughput and JVM heap can be configured. Application is made more elastic.	Can be used for any app that is expected to host varied number of audience/users at any given minute.
Monitoring and Analytics	Track application's performance, and health to make sure it hasn't gotten too complex for its own good. Solve bugs quicker, look at code diagnostics, embedded analytics, reduce maintenance costs	Can be used with any piece of code that needs to be tracked to survive with a much larger code base, advance features which introduces complexity and has monetary constraints.
Data Cache	Store data to avoid repeated gathering of it. Saves on communication time. Specify time-to-live and locking capabilities.	**Challenge : Survivor Mars Lava Tubes** Get resource and geographical location data from ground. If it doesn't change frequently, cache it to use it for further processing.
Gamification	Helps in creating the app which can help maneuvering through mazes and labyrinths to get to an end goal.	**Challenge : Survivor Mars Lava Tubes** Bodies in space-y motion – Make it more interactive by increasing user engagement. This could improve the business outcome. Volcanoes, Icebergs and Cats from space

MQLite		
Rapid Apps	Eliminate the need to write code, for businesses which focus more on a different product and intend to use the app just for communication.	
Session Cache		
Workflow		
Workload Scheduler		
Geocoding	Allows you to lookup longitude and latitude from an entered address	Clean Water Mapping, Crop Alert, Food Directions, Forest Monitor Mapping, Stream gazer
Reverse-geocoding	Allows you to look up an address from entered latitude and longitude	Leaf Me Alone, My Sky Color, Open-source Air Traffic Traficking, Stream Gazer, Volcanoes, Icebergs, and Cats From Space
SendGrid	Enables your app to send out emails	Clean Water Mapping, Crop Alert
RabbitMQ		
Redis		
Ustream for IBM Cloud		
API Management		
Cloud Intergration		
Secure Gaetway		
Cloudant NoSQL Database		Clean Water Mapping, Crop Alert, Food Directions, Forest Monitor Mapping, Forest Monitor Mapping, Leaf Me Alone, My Sky Color, Open-source Air Traffic Trafficking, Stream Gazer
IBM DataWorks		Data Treasure Hunting
Object Storage v1	Eg:Useful to bind an application, where no user interaction with the file is required. Eg: Bind audio from an MM file, into a bluemix app, to indicate playback.	Can you hear me now ? - Use audio files from space station archive, store it in this DB and incorporate it in the app
Object Storage v2		
Probabilistic Match		
SQL Database		
MondoDB		
MySQL		

PostgreSQL		
Analytics for Hadoop		
BigInsights		
dashDB		
Geospatial Analytics	Monitor moving devices from the Bluemix application	Survivor Mars Lava Tubes – Check if the tube is nearing a resource or going further away from it, based on its latitude and longitude
IBM Insights for Twitter	Connect to the twitter stream to retrieve information on tweets	Leaf Me Alone, My Sky Color. Volcanoes, Icebergs, and Cats From Space
Time Series Database		
AppScan Dynamic Analyzer		
AppScan Mobile Analyzer		
Mobile Analyzer for iOS		
Single Sign On		
Static Analyzer		
Embeddable Reporting		
Predictive Modeling		
Internet of Things	Send data from device to app, using sensors, and manipulate it. Data could be in any form, JSON, Mulitmedia etc.	Space Wearables – To avoid the astronaut from constantly monitoring a computer, Can you hear me now ? - Send audio from space to a device like a car or TV remote etc. Space Glove: Gesture and voice commanding – The glove is a device which can
Wearable Fitness	Bring data from various fitness wearables to better understand personalized data.	Space Wearables – Useful for anyone whose lifestyle is challenging(engineers, technicians, scientists involved in ground work), to track dangerous levels any quintessential parameter.
Twilio	For sending messages to phone from the app. This could potentially eliminate the use of physical presence if information can be transferred to them using the phone.	Clean Water Mapping, Crop Alert
Alchemy API	Leverage NLP and computer vision to understand conversations, documents and	Space Station Telemetry App – While transferring data to public, hide classified

	photos	and sensitive information, Data Treasure Hunting – To understand data and leverage its potential
Load Impact	Used for testing, from various geogrpahical location. Use a GUI to create tests or connect via the API offered.	An application that needs to be tested under varied conditions