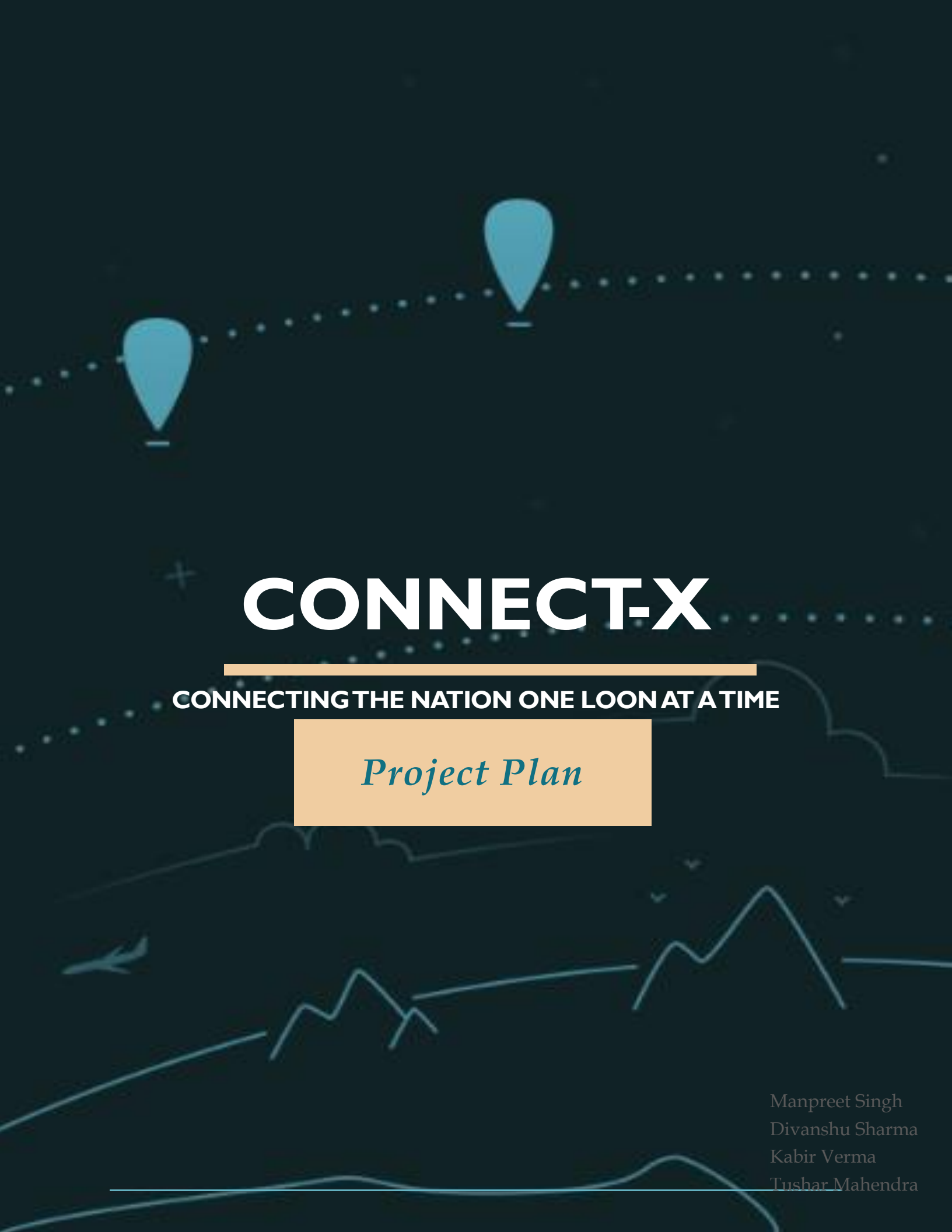

CONNECT-X

CONNECTING THE NATION ONE LOON AT A TIME

Project Plan

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INTRODUCTION

Disclaimer – This idea is inspired by Project Loon from GoogleX (loon.com).

ConnectX is a very innovative project with the aim of providing aerial internet connectivity to rural and remote regions of India through balloons forming a mesh network. After the brown-face incident, our team (DedSec) was actively looking for things that could help reconciliate the once healthy relations between the two countries. In our research, we found that despite being the second largest internet community in the world (Internet World Stats, 2019), the rural penetration for internet connectivity is below 25% (Mathur, 2019). Internet connectivity in these remote regions is limited by the need for "wired infrastructure" in those regions as it becomes inefficient for telecom companies to install new communication lines in less populated regions (Whitacre, 2019).

Other than serving as an everyday internet access point, ConnectX has a lot more potential. In the times of natural calamities, it is critical for people to communicate and connect. Here, ConnectX can serve as a backbone for emergency connectivity. This is partially inspired by Project Loon from Google X that provided emergency connectivity in Puerto Rico after hurricane Maria in 2017 (Lumb, 2017).

Moreover, Internet connectivity isn't just about giving the people access to the global community. It has far wider consequences. According to a study, internet connectivity has accounted for 21% of GDP growth in mature economies over past 5 years (Manyika, J., Roxburgh, C., 2011). This means that other than the obvious benefits to the educational and health sector, this would drastically boost the economy of the country and pave way for more innovations in other sectors.

Our objectives with this project are as follows –

- Provide free internet connectivity to selected remote and rural regions in India
- Provide an emergency backup network as an asset to Government of India
- Restore the friendly relationship between India and Canada

There are a number of stakeholders in this project that includes the Governments of India and Canada, Population without internet access, Kevin Renso, the telecom industry of India among many others. We will discuss this along with other critical information in Project Charter. This plan also includes a business case (with the financial analysis chart), the work breakdown structure (in detail), the project charter and the Gantt chart.

WHAT IS PROJECT CONNECT-X?

ConnectX is a project that uses aerial balloons that connect to a ground station and provide internet access to a region by flying above it in the stratosphere. There are many things at play here. So, we are going to explain everything in sections.

Design and Technology

A loon (i.e. balloon) is made of 3 main components. These are - Envelope, Solar Panels, LTE Equipment. The envelope is the polyethylene plastic that makes up the actual balloon. It also contains an emergency parachute that can be deployed for emergency landings. Each balloon is designed to last at least 100 days in the stratosphere, after which it can be brought down in controlled descent. Next, the Solar panels are used to power the equipment and the balloon which makes it 100% renewable energy based. These panels can produce 100 watts of power during daytime and use that to power the balloon at night. As the balloons fly in the stratosphere, there is no dependency on weather for solar power. Lastly, we have the Radio antennas and the LTE equipment which allow communications between ground-balloon and balloon-to-balloon. The ground stations are provided with a high-speed internet transmission signal which is then transmitted to the nearest balloon and then relayed across the balloon network so that users can connect with their LTE-enabled devices.

How the loons move?

After launching a balloon every 30 minutes from a custom-built Auto-launcher, the loons fly high up into the stratosphere 20 km from the ground. As described in our presentation, each loon consists of 2 balloons, one inside another. The inner balloon is filled with air and the outer one is filled with helium. By controlling the proportions of air and helium, the balloon can be moved vertically. When in the stratosphere, the loons use predictive models of wind and intelligent decision-making algorithms to navigate to their destination autonomously. This means that the entire system is completely autonomous with continual oversight. Plus, a GPS device is installed in each loon to precisely track its location.

Loon Network

The network in loons is kind of a mesh network where each loon forms up chain with a maximum of 5 balloons sharing internet connectivity across the chain. Therefore, the loons are continuously communicating with other loons and the ground station.

PRE-INITIATION TASKS

Determining the triple constraints (STC)

Here, we have explained project ConnectX in terms of the Scope, Time and Cost constraints of Project Management.

- **Scope –** The scope of our project is to build at least 5 ground stations to maneuver the 50 balloons in the stratosphere. For the test run, we are going to deploy 5 balloons with temporary ground stations. These balloons will be placed in Chandigarh (2), Manipur(1), Goa(1), Surat(1). These test locations will help to study the usage and maintenance according to the demographics and the geography of that region (wind speeds, humidity, usage, et cetera).
- **Time –** ConnectX will require 6 months of testing and in the meanwhile the construction of ground stations can be handled. Other than that, it would take 2 years to successfully deploy 50 balloons in different regions of India. We have also accounted 6-8 months for software development, 1-2 months for procurement and 3-5 months of training programs. This is explained in detail using the Gantt Chart later. We also have 1-2 months of buffer time for this project.
- **Cost –** The complete budget is $8,000,000 (CAD) which includes the estimate for buying all the materials for 50 balloons ($40000 per balloon including maintenance for 5 years) and building the 5 ground stations ($750,000 per station). Other than that, we $500,000 for procurement costs and beta-testing. We have also allocated $1,500,000 for hiring and software development. Further, $200,000 is to be used in overhead expenses. We have $50,000 of emergency fund in case something goes wrong. Costs are explained in greater detail in the financial analysis chart in the business case.

Given the outline for this project, it is safe to assume that the Government of Canada will be sponsoring this project as a diplomatic token of apology to the Government of India. Further, some other pre-initiation tasks seem out of context for this project. So, we have decided to just create a business case instead.

Business Case

Background
ConnectX is inspired by Google X's Project Loon. ConnectX aims to increase the internet usage in remote areas of India by providing an aerial mesh network made of balloons that act as internet access points. It will provide free-of-cost connectivity in selected 50 regions of India and act as a backup communication network in times of natural calamities.

Business Objectives

- To increase internet usage in remote areas of India
- To reboot relations between India and Canada
- To provide free and fast internet in India
- To expand educational and economic opportunities

Current situation - According to a newly released Kantar IMRB ICUBE report, the internet penetration in Indian rural areas is at 25% (Mathur, 2019). This provides a great opportunity for the Government of Canada to gift project Connect X to India. Increased internet connectivity will directly contribute to an increase in the overall GDP of the nation. It will also help in rebooting the India-Canada relations. This project will also help in expanding educational and economic opportunities for rural people of India.

Critical assumptions - The balloon must have a range of at least 40-60 Kms so that maximum rural area can be covered. Government of India should be in support of this project. People must have at least LTE enabled devices that can connect to internet. The project must pay its value by driving the economic growth and trade within 2-3 years. All safety considerations must be carefully handled to avoid any damage to public property. The balloons must be capable of autonomous navigation with minimal oversight. Each loon should last at least 100 days in the stratosphere.

Preliminary Project Requirements

- The network will be consistent and fast.
- The balloons can last 100 days and descent safely afterwards.
- There must be a ground station for every 10 balloons.
- There should be a window for extensibility in future.

Approach

- Develop a survey to know the current users in rural areas.
- Get signal transmission rights from a local telecom partner
- Beta test the loons in 4 different topographical regions.
- Analyse the results and optimize the software for full scale launch.
- Construct ground stations after finalizing locations.
- Train the staff for the ground stations
- Deploy the 50 balloons

Schedule Estimate - The sponsor wants the project to be completed by December 31, 2021. If starting from Jan 2020, the initiation and planning phase will be completed by April 2020. After this the process of procuring the material for the balloons and material for construction of ground stations will occur. Afterwards, beta testing will take place in four select cities within 4-5 months. It'll take 1 month of time for analysing the test results and making any hardware or software changes. Meanwhile construction of ground stations and major part of software development will take place. All this comes under execution and it will be over by Feb 2021. By this time, we will have the 5 ground stations and 50 balloons ready for deployment. Deploying the balloons should not take more than 5 months of time. After that monitoring and controlling will take place and weekly reports will be submitted. The closing will be done by October 31, 2021. We will have 2 months of buffer time.

Potential Risks

- Loons are suspectable to hacks which can present national security concerns.
- Vulnerable to protests by telecom companies.
- Another risk is what if the Government of India refuses land permissions or deny permission to balloons in the sky.
- Potential risk of delay in case of issue with patent or licensing rights.
- Risk of safety to public and public property in case of loon crash.
- Risk of potential software flaws in loon's autonomous navigation

Financial Analysis

Cost of 1 Loon over 5 years (Qty. 50)	
Items	**Cost (CAD)**
Envelope	$1,200
Cost of electronics	$12,000
Solar Panels	$1,100
Battery	$2,400
Gas cylinder	$700
Parachute	$500
Labour Cost	$500
Total (Cost of 1 launch)	$18,400
Cost of Envelope in 5 years	$21,600
Total cost in 5 years	**$40,000**

Cost of 1 Station over 5 years (Qty. 5)	
Items	**Cost (CAD)**
Construction workers	$20,000
Construction material	$180,000
On-site Developer Cost ($30,000/year)	$150,000
On-site Network Manager ($30,000/year)	$150,000
On-Call electrician ($10,000/year)	$50,000
Building 3 auto-launchers	$150,000
Land Costs	$50,000
Total Cost (per station)	**$750,000**

The Envelop would have to be changed after every 100 days (21,600 cad in 5 years).

To build 50 balloons it would take a total of 2 Million dollars which is 25% of the budget. Another major cost would be the ground stations where each ground station would cost around $750K (CAD). This means that building 5 ground stations will cost around $3.7 Million dollars which takes away another 45% of the budget. Finally, we have other costs that include software development, hiring costs, overhead expenses and emergency funds.

Other Expenses	
Category	Cost (CAD)
Beta Testing/Procurement Costs	$500,000
Software Development	$1,000,000
Project Manager's Salary	$500,000
Overhead Expenses	$200,000
Emergency Funds	$50,000
Total	$2,000,000

PROJECT PHASES - INITIATION

The first phase of project ConnectX is Initiation and it will have some of the key tasks that are important in formally introducing and starting the project. There are different parts that include identifying key stakeholders, preparing project charter, getting a pre-liminary cost estimate, and holding a project kickoff meeting. These are explained further below in detail –

Identifying Key Stakeholders

There are a lot of stakeholders in this project since it is a multi-national project. The obvious primary stakeholders are the governments of India and Canada. Others include -

Name	Role
Kevin Renso	Boss
Government of Canada	Primary Sponsor
Government of India	Primary Stakeholder
People of India	Secondary Stakeholder
Indian Telecom Industry	Secondary Stakeholder

The Project Charter

Here we have prepared a project charter that outlines the deliverables, the project objectives, project constraints and a projected timeline.

PROJECT CHARTER

Project Name: Connect X	**Date: 18 October 2019**
1. PROJECT GOALS	
The Connect X project provides internet access to small towns and cities. It will deliver LTE connection from the loons to remote rural areas of India. People from rural areas get connected to the world. This will lead to a drastic growth in market as people get opportunity to access online services like YouTube, Netflix, iTunes and Amazon Prime etc. It will also improve education system in India as online education would provide flexibility, cost reduction and accessibility to study material outside school premises. It also helps people to gain skills by learning online from Khan Academy, edX and MathXL etc.	

The project aims to enhance the relations between India and Canada by providing advanced networking technology that extends internet connectivity in rural & remote regions of India.

2. *DELIVERABLES*

	Deliverable Name	*Description*	*Assigned To*
1	**Business Case**	*It includes the benefits, background, potential risk and expected cost for the project. It also provides the advantage and disadvantage of the project.*	Divanshu Sharma
2	**Project Charter**	*The project charter gives a brief description of the whole project. It includes the project goals, workings and stakeholders.*	Tushar Mahendra
3	**Financial Analysis**	*The financial analysis includes evaluation of project, budget and business. It focuses on accounting of the project like income statements and balance sheet.*	Kabir Verma
4	**Gantt Chart**	*It is a horizontal bar chart that shows a graphical representation of the tasks and timeline.*	Manpreet Singh & Divanshu Sharma
5	**Work-Breakdown Structure**	*A work-breakdown structure provides that manages the team work. It breaks the project into smaller parts and manageable parts.*	Manpreet Singh

3. *SCOPE DEFINITION*

DedSec wants this project to assist the government of India in providing connectivity to rural and remote regions of India with low population density. ConnectX will also have the capability to serve as a backup system in case of emergencies like natural disasters.

The project will include:

- *Providing 50 balloons and 5 ground stations for monitoring and controlling the balloons*
- *Providing a software for autonomous navigation of the loons in the stratosphere*
- *Training the staff for oversight of loons in ground stations*

4. PROJECT MILESTONES

Project Phases	Start Date	End Date
Pre-initiation	January 1, 2020	January 31, 2020
Initiation	February 1, 2020	February 29, 2020
Planning	March 1, 2020	April 30, 2020
Executing	May 1, 2020	October 31, 2021
Monitoring & Controlling	Weekly	
Closing	December 15, 2021	

5. ASSUMPTIONS, CONSTRAINTS & DEPENDENCIES

The project should be completed before 31st December 2021*. We are assuming that the government of India will accept this project and there will be proper security implementations to prevent national security threats.*

Dependencies – *This project is dependent on the government of India for regulatory approvals. There is an external dependency on the telecom industry for providing internet connectivity to the ground stations that can be transmitted to the loons afterwards.*

6. Communications Strategy

The communication between the project manager and the project management team will be daily basis for everyday progress. The project manager will also be responsible for holding bi-weekly meetings with all department heads to discuss the progress of the project. Communication with the sponsors and stakeholders will be through a weekly status report sent through email.

7. Project Development Contacts

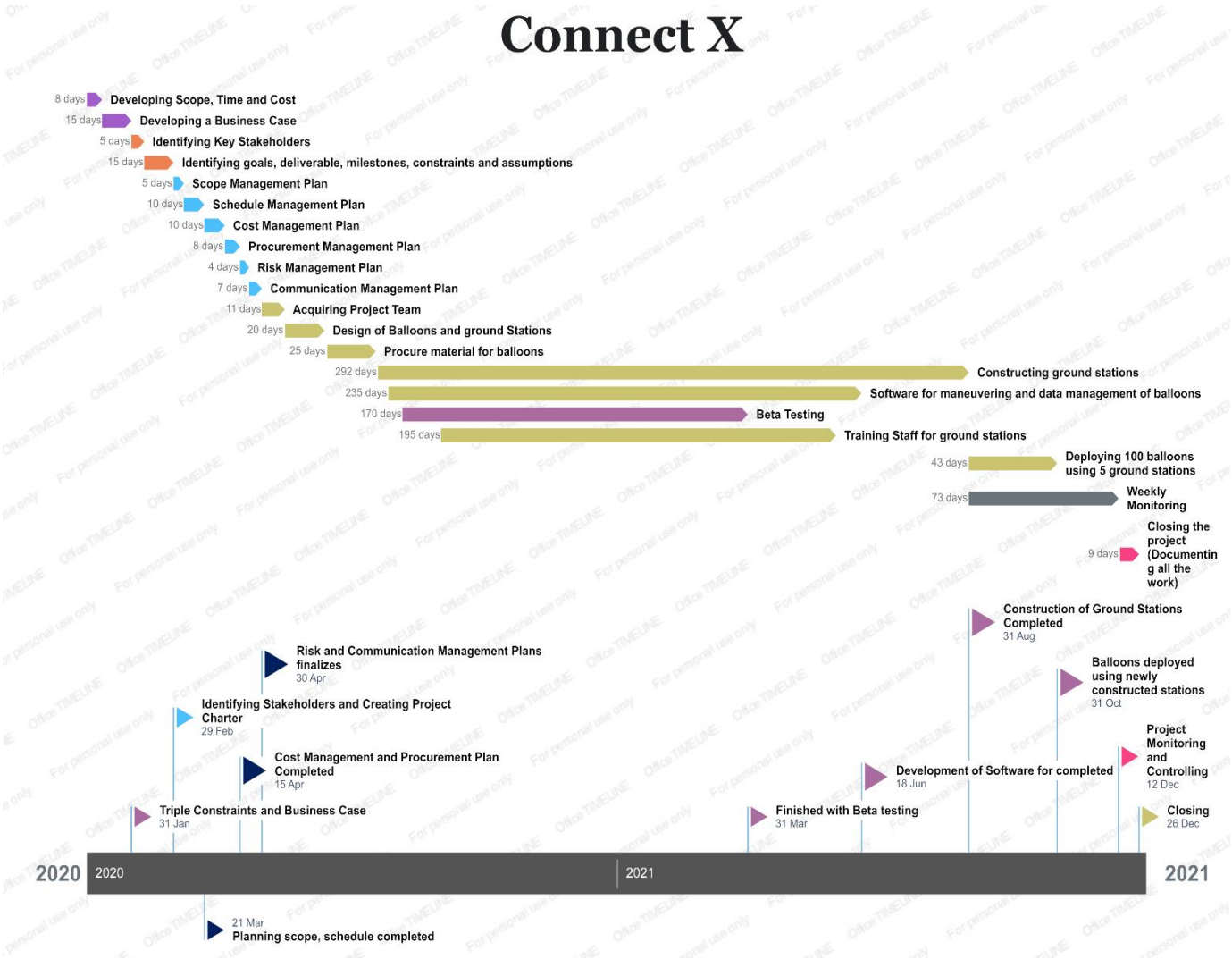
Name	Position	Email
Julius Romero	Project Sponsor (Representative)	jromero@gov.ca
Kevin Renso	Project Manager	Kevin.renso@ufv.ca
Manpreet Singh	IT Manager	Singhmanpreet21@gmail.com
Tushar Mahendra	Operations Manager	t.mahendra@gmail.com
Divanshu Sharma	Human Resources Clerk	Sharma989@gmail.com
Kabir Verma	Diplomatic Advisor	Kverma9991@gmail.com

8. PROJECT AUTHORIZATION		
Approved by:	*Business Manager*	*Date*
Approved by:	*Project Manager*	*Date*

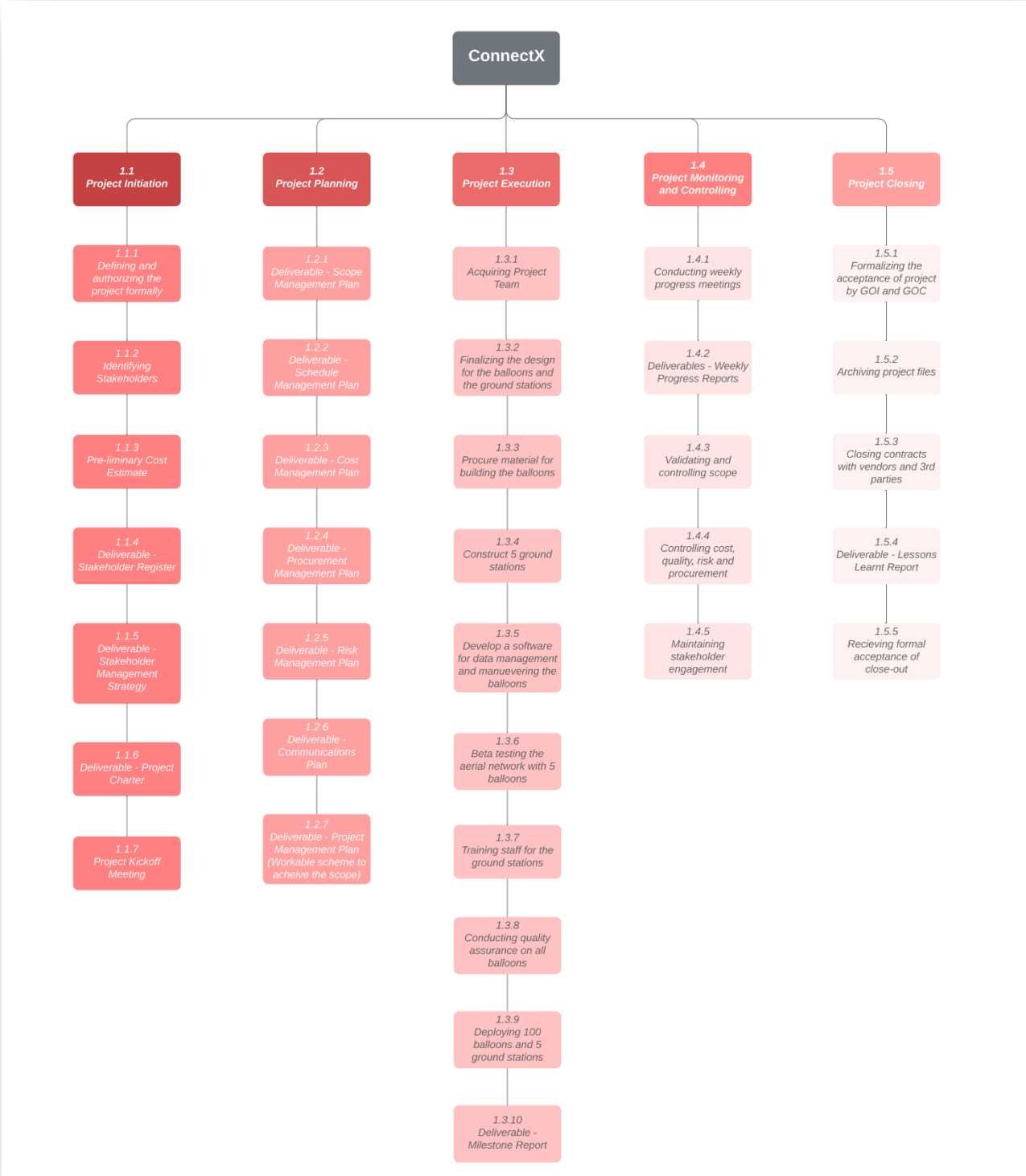
PROJECT PHASES – PLANNING & EXECUTION

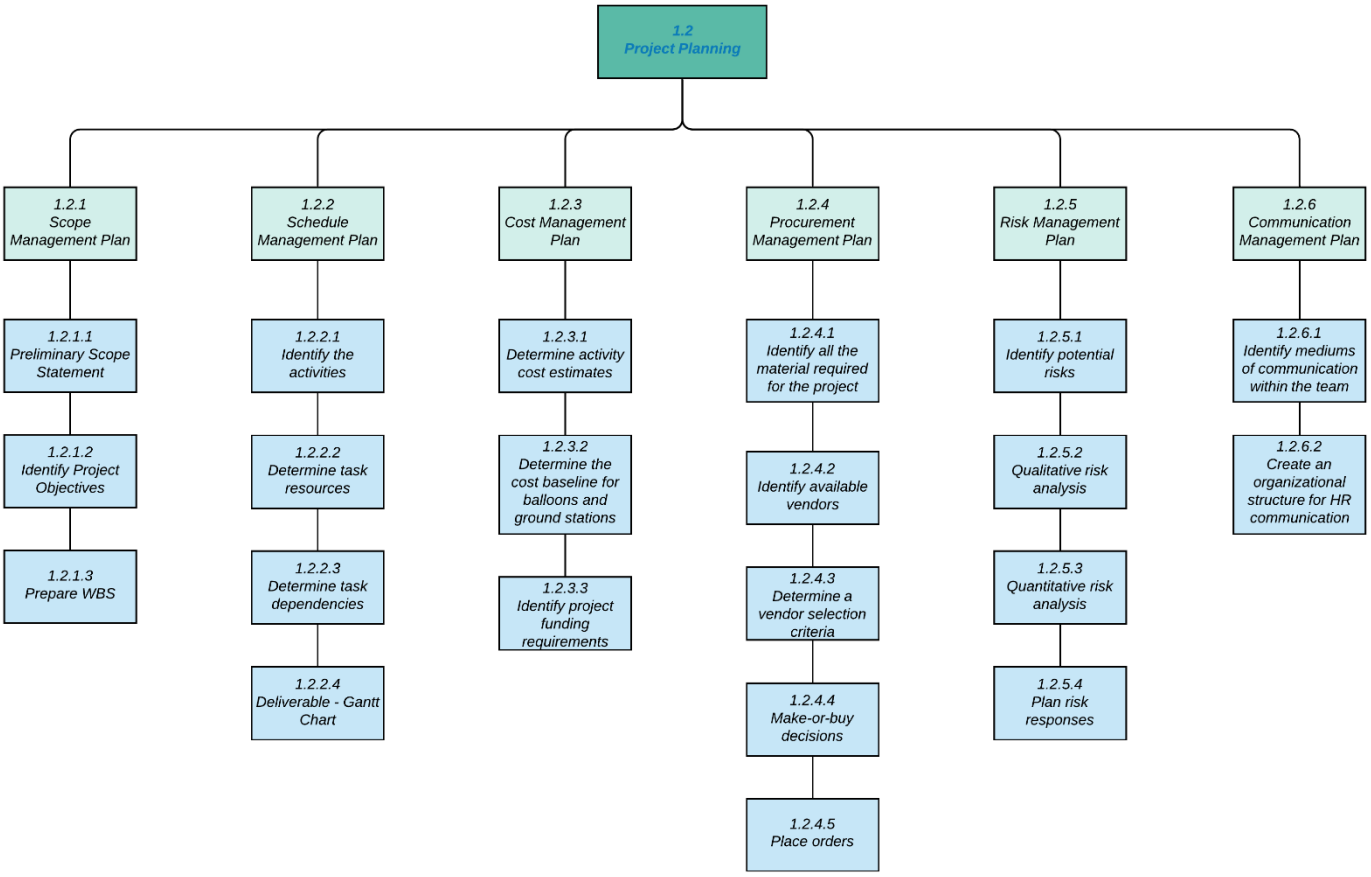
Gantt Chart and Its Data

Using officetimeline.com tool, we created a Gantt chart. The Gantt chart is given below:



Work Breakdown Structure (WBS)




1.2
Project Planning
1.2.1
Scope Management Plan
1.2.1.1
Preliminary Scope Statement
1.2.1.2
Identify Project Objectives
1.2.1.3
Prepare WBS
1.2.2
Schedule Management Plan
1.2.2.1
Identify the activities
1.2.2.2
Determine task resources
1.2.2.3
Determine task dependencies
1.2.2.4
Deliverable - Gantt Chart
1.2.3
Cost Management Plan
1.2.3.1
Determine activity cost estimates
1.2.3.2
Determine the cost baseline for balloons and ground stations
1.2.3.3
Identify project funding requirements
1.2.4
Procurement Management Plan
1.2.4.1
Identify all the material required for the project
1.2.4.2
Identify available vendors
1.2.4.3
Determine a vendor selection criteria
1.2.4.4
Make-or-buy decisions
1.2.4.5
Place orders
1.2.5
Risk Management Plan
1.2.5.1
Identify potential risks
1.2.5.2
Qualitative risk analysis
1.2.5.3
Quantitative risk analysis
1.2.5.4
Plan risk responses
1.2.6
Communication Management Plan
1.2.6.1
Identify mediums of communication within the team
1.2.6.2
Create an organizational structure for HR communication

REFERENCES

- Abdulbasitkha. (2015). Google project loon report. Slideshare.net. Retrieved 18 October 2019, from https://www.slideshare.net/abdulbasitkha/google-project-loon-report

- Build native PowerPoint timelines online - Office Timeline Online. (2019). Retrieved October 22, 2019, from Office Timeline Online website: https://online.officetimeline.com/app/#/file/147411ba-ec8f-4fb3-b247-7a06ef2fc17f/gantt-view

- Carlson, M. (2019). Andrew.cmu.edu. Retrieved 18 October 2019, from https://www.andrew.cmu.edu/user/marjorie/loon.pdf

- Introducing Project Loon: Balloon-powered Internet access. (2019). Official Google Blog. Retrieved 18 October 2019, from https://googleblog.blogspot.com/2013/06/introducing-project-loon.html

- Kanatar. (2019). Imrbint.com. Retrieved 18 October 2019, from https://imrbint.com/images/common/ICUBE%E2%84%A2_2019_Highlights.pdf

- Loon – Technology. (2013). Retrieved October 23, 2019, from Loon website: https://loon.com/technology/

- Lumb, D. (2017, November 9). Project Loon delivers internet to 100,000 people in Puerto Rico. Retrieved October 10, 2019, from Engadget website: https://www.engadget.com/2017/11/09/project-loon-delivers-internet-100-000-people-puerto-rico/?guccounter=1&guce

- Manyika, J., & Roxburgh, C. (2011). The great transformer: The impact of the Internet on economic growth and prosperity. Retrieved October 12, 2019, from McKinsey & Company website: https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-great-transformer

- Perinpam, G. (2019). Roar.Media. Retrieved 18 October 2019, from https://roar.media/english/life/startups/google-loon-sri-lanka/

- Schwalle, K.Information technology project management(8 th Ed, Pg. 89-98,46-59) Cengage Learning

- Simonite, T. (2019). Google's Loon Balloons Are Ready to Deliver Cheap Internet. MIT Technology Review. Retrieved 18 October 2019, from https://www.technologyreview.com/s/534986/project-loon/

- Whitacre, B. (2019, August 27). Technology is improving – why is rural broadband access still a problem? Retrieved from https://theconversation.com/technology-is-improving-why-is-rural-broadband-access-still-a-problem-60423

- (2019). Roar.sgp1.digitaloceanspaces.com. Retrieved 18 October 2019, from https://roar.sgp1.digitaloceanspaces.com/Reports/2016/05/loon-white-1-e1462430320317.jpg?fit=clip&w=1000