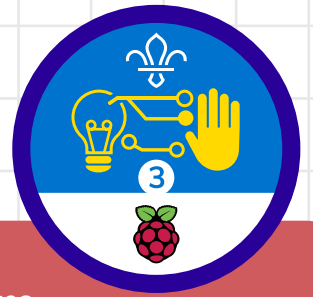


Interactive Map

1



Overview

This activity fulfills **Stage 3, Requirement 1** of the **Digital Maker Staged Activity Badge** ('In a coding language of your choice, create a basic program to meet a need of Scouting or your section'), and fulfils **Stage 3, Requirement 3** ('Design and create digital graphics for use as part of one of the above') if Scouts create custom icons for their project, as per the optional Part 5 of their instructions. Young people will use Google Earth and the programming language KML to create a custom interactive map of locations that are relevant to their Scouting group.

Key messages

- KML stands for **Keyhole Markup Language**, and it is used to display geographic data in mapping software such as Google Earth or Maps.
- Combined with mapping software, you can create KML files to pinpoint locations, add image overlays, and display data in new ways.
- KML is similar to HTML (Hypertext Markup Language), since they are both markup languages.
- KML tags are generally the same as HTML tags and work in the same way.
- KML is very specialised and allows us to practice coding with a markup language in new, useful, and interesting ways.



90 – 120 minutes



Flexible (ideally two young people per computer)



Setting up laptops with internet connection; before doing this activity, you may wish to have the young people record information about, and GPS coordinates of, a Scouting trip.



Indoors with internet connection

You will need:



- Laptop or desktop computers
- A simple pre-installed text editor (Notepad on Windows, TextEdit on Mac, or Leafpad on Linux works best)
- Activity handouts (at least one per group)
- Internet access; young people will need to search for relevant images to link to in their maps
- Optional: Google Earth pre-installed on laptops, instructions in the 'Installing Google Earth' section below

Safety



If the young people are working online, tell them to ask for permission before viewing any other websites. It's a good idea to set up parental controls — you can find instructions for this on the NSPCC website (rpf.io/scouts-nspcc-online). You should also give each young person a Stay Safe leaflet (rpf.io/scouts-staysafe).

Leader instructions



- 1** Explain to young people that Google Earth is an application that displays a three-dimensional representation of the Earth based on collected satellite imagery. It does this by overlaying satellite images, aerial photography, and GPS data onto a 3D-rendered globe. Young people will use the program and write a script in **Keyhole Markup Language** (KML) to create custom maps with data they have put together.
- 2** Explain that they are going to make custom maps using geographic points which are relevant or important to them and their Scouts Group. There are several steps to this:
 - a. Choosing the map points
 - b. Researching/collecting information and pictures about these points
 - c. Creating some KML code that can be loaded into Google Earth to show the places and information in a cool and interesting way
 - d. (Optional) Creating custom map marker icons with PiSKEL
 - e. Sharing the map overlay with friends
- 3** Ensure that all young people can access a version of Google Earth, and let them work through the handout.
- 4** Some young people may have trouble with coding correct coordinates in Google Earth: remind them to read the handout and follow the instructions carefully — they need to swap the order of their latitude and longitude in the KML script!
- 5** This project may take more than a single session, so remind young people to save their work.

Alternatives



- Other free platforms that can translate or parse KML files: **Merkaartor**, **Blender** (with Google Earth plug-in).
- Google Earth can be downloaded and pre-installed for offline use (though offline work will prohibit image searches); instructions are below.
- PiSKEL can be downloaded from www.piskelapp.com/download and pre-installed for offline use (though offline work will prohibit image hosting online).
- A PiSKEL account is not needed for creating custom icons, but may be helpful because it allows remote access to work created at meetings.

Adaptability



- To personalise their maps, young people can collect useful or interesting information about locations they've visited on Scouting trips and add these to the maps.
- Download the KML file for a finished map with locations around Scout HQ Gilwell here: rpf.io/scoutmap You can show this to the Scouts as an example (find instructions for how to load the file in Google Earth in the Scouts' instructions), and use the code to help them troubleshoot their programs.

Installing Google Earth

Google Earth can be used in the web browser of most computers or, if WiFi is unavailable for your Scouts, you can download and install it prior to the session.

Some web browsers may have trouble loading Google Earth. If this is the case for you, install the program instead.

Installation is straightforward:

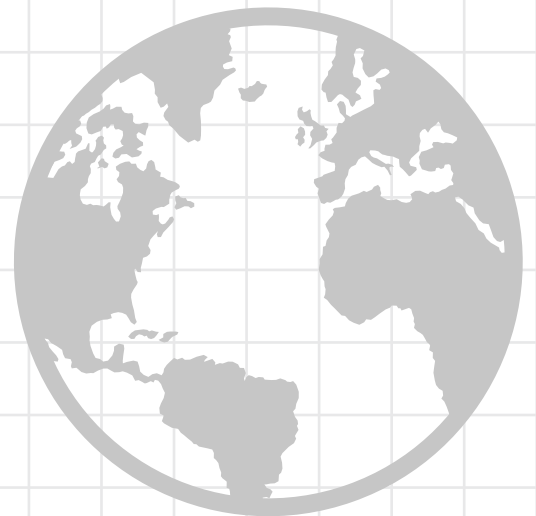
- 1** Navigate to earth.google.com/download-earth.html and click the blue button labelled **Agree and Download**. This will download an installer to your computer.
- 2** Run the installer by clicking on it in your Downloads menu in the browser, or navigating to the Downloads folder and double-clicking the installer.
- 3** Allow the computer to make changes if you are prompted, and wait until the installation process finishes. Then click **Close**.

Google Earth will then either run automatically, or you can start it up manually.

Community and sharing



Young people can host their completed KML files online on their Scout Troop's website or using free services like nofile.io. Then they can share the file links with friends, who can download and use the KML files with Google Earth on their own computers.



In this activity, you're going to use Google Earth and some code to create your own custom maps, complete with custom markers, info about locations, and even highlighted routes!


Part 1: Getting and opening the file for your map

1 Download the project KML file at rpf.io/scoutmap-demo

2 Check that your new file is named scoutmapDemo.kml

Open your file:

a. If you are using Google Earth in a web browser:

1. In your browser, navigate to earth.google.com to launch Google Earth.
2. Once it has loaded, click the 'burger' menu icon  at the top, and then click **Settings**.
3. Scroll to the bottom of the settings and click the button to **enable KML file import**, then **Save** the changes.
4. Click the menu icon again and then choose **My Places**.
5. Click the blue text reading **IMPORT KML FILE**, and then choose **Open File**.
6. Navigate to your scoutmapDemo.kml file, and choose **Open**.

b. If you are using the installed version of Google Earth:

1. Launch the Google Earth application.
2. Once it has loaded, click **File > Import** and navigate to the folder where you saved the KML file you downloaded.
3. Click on the drop-down menu next to the **File name** field and choose **All files (*.*)**:

File name:

4. Select scoutmapDemo.kml and click **OK**.

Once the Earth stops moving, you can click on the demonstration placemark to view the info contained in the placemark and KML file.

Part 2: Picking places

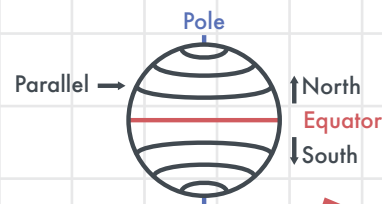
1 In order to make a custom interactive map, you'll first need to pick **at least four important places** that you want to create markers for. These could be important strategic locations in your town, places you have been with your Scouts group, or places you would like to visit. They may be buildings, landmarks, or simply geolocation coordinates.

Trivia

The **Keyhole Markup Language** (KML) was originally developed in 2004 specifically for **Google Earth**, which was then called Keyhole Earth Viewer. Four years later, KML became the international standard of the **Open Geospatial Consortium**, a volunteer organisation that works to standardise public geographic information.

2 Once you have chosen four places, put together information about each one by going online and researching them. Collect data on the following aspects of each place, and save it in a text file (or take notes!) for later:

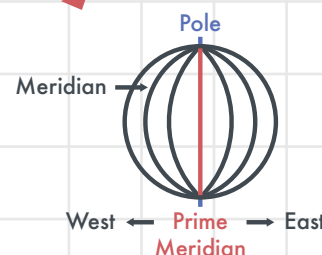
- A unique title or name.
- The exact geolocation coordinates (hover your mouse pointer over the location in Google Earth, and the coordinates will be displayed). Record both latitude and longitude values, and **be careful: longitude must come first in KML code** but usually comes second when you look up coordinates online.
- Latitude** is the distance north or south of the equator (an imaginary line around the Earth halfway between the North Pole and the South Pole) and is denoted with N or S. **Longitude** is the distance east or west of the prime meridian (an imaginary line running from north to south through Greenwich, England) and is denoted with E or W.



Latitude

lat 48.327874° lon -3.021437°

Longitude



- d. A short description, explanation, or important information.
- e. Online images (copy the addresses of the images), or photos you have taken of the place (which we can host online - instructions below).
- f. A relevant icon (max. 64×64 pixels big; copy the web address); you can also create your own custom icon in a later step.

To host images you've taken or created yourself, you can use the free site **Imgur**. Images that you upload to Imgur without an account are anonymous and hidden. This means they cannot be found by online searches, and only the people with whom you share the URL will be able to see them. However, **be very careful** to never upload pictures of yourself or where you live or go to school. Ask your leader if you have any doubts about particular images.

Note

To get the web address (also called the URL) of an image, right-click on it and either click on **Copy image address** or click on **Open image in new tab** and then copy the text in the address bar. Paste the URL you've copied into a text file, so you can use it later.

1. Open your browser and navigate to **www.imgur.com/upload**.
2. Upload the image you have saved: either click the **Browse** button and navigate to the file in the window that opens, or drag the icon image onto the screen directly from your Downloads bar or file folder. Then wait until it is processed.
3. Hover your mouse over the processed icon on your screen until you see a drop-down menu appear.
4. Click on the drop-down menu on the right and choose **Get Share Links**.
5. Copy the image's URL by clicking the **Copy** button under **BBCode(Forums)**.
6. Switch from your browser to your text editor program where you've been editing the KML file.
7. Find the `<href>` tag belonging to the placemark for which you have created the image.
8. Paste the URL you have copied in between your `<href>` tags. **Make sure to remove the `[img]` tags**, so that the final `<href>` tag looks something like this: `<href>https://i.imgur.com/E0miSeL.png</href>`

Part 3: Creating the markers

- 1 The KML file you've just downloaded contains all the information required to create a custom map marker in either Google Earth or Google Maps.
- 2 You can edit any KML file in Notepad (on PC) or TextEdit (on Mac) like you would edit any other text file — simply double-click the file name to open it. **If your file does not open** and your computer asks you which program to use:
 - i. Select **Choose a pre-installed program from a list**
 - ii. Choose either **Notepad** or **TextEdit**. From now on, this will be the default program that opens KML files. You will be able to simply double-click to open. At its most basic, a KML file with a single placemark in it looks like this (here, it's marking New York City):

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
  <Document>
    <Placemark>
      <name>New York City</name>
      <description>New York City</description>
      <Point>
        <coordinates>0.0007, 51.3859,0</coordinates>
      </Point>
    </Placemark>
  </Document>
</kml>
```

Thus, for a KML file with two placemarks, you need two copies of the `<Placemark>` section of the code — the `<Placemark>` and `</Placemark>` tags and everything in between. Below, the two different placemarks are highlighted in green and red:

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
  <Document>
    <Placemark>
      <name>New York City</name>
      <description>New York City</description>
      <Point>
        <coordinates>-74.006393,40.714172,0</coordinates>
      </Point>
    </Placemark>
    <Placemark>
      <name>London</name>
      <description>London</description>
      <Point>
        <coordinates>-0.127747, 51.507617,0</coordinates>
      </Point>
    </Placemark>
  </Document>
</kml>
```

3 In the KML file you've opened, create the file structure for your map: copy the whole of the placemark section, and paste it enough times so that you have one placemark section for each location you've picked. Make sure the sections are **all in between** the `<Document>` and `</Document>` tags!

4 In each of your placemark sections, edit what's in between the `<name>` tags and the `<coordinates>` tags so that each section is different. Add the information about each location that you looked up earlier in between `<description>` and `</description>`.



5 Now check your work: Save the file by pressing **Ctrl** and **S** at the same time. Then switch back to Google Earth and discard your KML layer (this is the information your KML file overlays on the map):

- If you're working in a **browser**, click the blue link to **Discard your KML Layer**.
- If you're using **Google Earth** installed on your computer, right-click on the **scoutmap.kml layer** in the left-hand pane and choose **Delete**.

6 Load your updated KML file again. You should now see a map, customised with markers of your chosen locations! Click on them to check the descriptions are showing correctly.

7 If your KML layer doesn't load, check the error log in Google Earth to find out what's wrong in your code. Then go fix the bugs.

Advanced

If you want to change how the information inside the `<description>` tags looks in the Google Earth display, you can create a `!CDATA` tag like this:

```
<description><![CDATA[ In this section you can now use HTML tags, such as <b>, <i>, and <li>]] > </description>
```

The description section of your tag can then be styled exactly the same way as HTML code. You can even embed URLs and images.

Just stay inside the square brackets! Take a look at the code at rpf.io/scoutmap for some styling ideas and examples.

Tip

- Google Earth will display error messages, identifying the line in your KML code where the error is. Search the code and ensure all **syntax** (punctuation, brackets, and indentation) is correct.
- Coordinates in KML code are in the order **longitude, latitude, elevation** (you don't need to add elevation to make your code work). If your markers are in the wrong places, check whether you have accidentally swapped the markers' coordinates.

Part 4: Individual icons

To make your map even cooler, you can display custom icons as your markers. These icons need to be pictures that are online so you can copy their web address. Also make sure that any new icon images you use are **64×64 pixels or smaller**.

- 1 To find the right pictures, restrict your online search to images of this size: use the Tools drop-down menu to choose an exact size for your search.
- 2 In the KML file, insert a `<Style>` tag below the `</description>` closing tag and above the `<Point>` tag, like so:

```
</description>
<Style>
  <IconStyle>
    <Icon>
      <href>http://URL\_of\_your\_icon\_image</href>
    </Icon>
  </IconStyle>
</Style>
<Point>
```

- 3 A very easy way to put different icons on your map is by copying the reference URLs of the marker icons used by Google. If you've installed the Google Earth application, you can access a list of all the available icons and their URLs in this software, or you can find the icons and URLs online at **rpf.io/icons**. Just right-click on the icon you want, and then click on **Copy image address**. Paste the URL in between your `<href>` tags as shown above.
- 4 Whenever you make changes to your code, repeat step 5 and 6 from Part 3 to save and check your work.
- 5 See 'Part 5: Create custom map icons' for instructions on creating custom icons using the free online tool PiSKEL.

Tip


If you have trouble viewing more complex KML files, try installing **Google Earth** on your laptop, as this version supports all KML features; your leader can walk you through how to do this.

Part 5: Create custom map icons

PiSKEL is a wonderfully simple and free program for creating pixel art and animations. You can use it online in any browser, or download and install it for offline work. It's designed for beginners and has lots of help available that makes it easy to navigate.


Here you'll use the online version of PiSKEL without signing up for a user account, because you only need to create a few small icons. You may want to create an account later, as PiSKEL is a really great tool for creating animations and icons for games, applications, and other things.

Create an icon in PiSKEL

- 1 Open your browser and navigate to www.piskelapp.com.
- 2 Click the yellow **Create Sprite** button in the top left-hand corner.
- 3 Take a minute to explore PiSKEL and discover some of the cool tools available.
- 4  Import an image that you want to edit by clicking on the **Import** icon on the right side of the PiSKEL window and then choosing the right file from the menu. If the image is larger than 64×64 pixels, resize it when you're starting the import process with the option in the **Import** dialogue box.

Note

For your map icon, you **will not be able to use an animation** so right now you should only create **images that contain one frame**.

- 5  Change the name of the Sprite you're creating to something memorable and useful: click on the **Save** icon on the right side of the PiSKEL window and edit the information in the dialogue box. Then click **Save in Browser**.

6



If you need to change the size of your Sprite, click on the **Resize** icon on the right of the screen and adjust the canvas size. **Don't go over 64×64 px!**

7



When you're happy with your new icon, download it! First click on **Export** icon on the right side of the PiSKEL window, then select the **Other** tab and click the yellow **Download** button at the bottom, the one labelled **Export selected frame as png**. This will download the icon image to your computer, ready to be uploaded to Imgur (or if you prefer, another cloud storage service like Google Drive).

Display your icon in Google Earth

1

Follow the instructions in Part 2 above that tell you how to host images on Imgur to upload and get a URL for your icon.

2

Copy the URL, go to the `<href>` tag of the placemark you want to use the icon for, and paste the URL in between them. **Make sure to remove the `[img]` tags**, so that the final `<href>` tag looks something like this:
`<href>https://i.imgur.com/E0miSeL.png</href>`

3

Save your KML file again and reload it into Google Earth to see your new custom icon displayed!

Note

If your custom icon doesn't load, check the following:

- Is your icon 64×64 pixels or smaller? If it's bigger, Google Earth can't display it.
- Are you using the correct URL for the image, taken from the right place? Sometimes imgur provides two URLs — make sure you follow the steps above to copy the correct one!
- Have you left in the `[img][img]` tags from imgur? Google Earth doesn't understand these, so you need to remove them.
- Does your URL start with `https://i.imgur.com/?` Sometimes you can miss out the first, single i. Without it, your URL won't work.