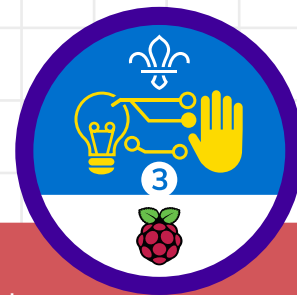# Interactive map

Overview

This activity meets **requirement one** of **stage three** 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'). If people create custom icons (the optional 'step five'), it'll also meet **requirement three** of **stage three** ('Design and create digital graphics for use as part of one of the above'). The activity shows people how to use Google Earth and the programming language KML to create a custom interactive map of locations that are relevant to their group.

Key messages

- KML stands for Keyhole Markup Language, it's 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) – they're both markup languages.
- KML tags are generally the same as HTML tags and work in the same way.
- KML is very specialised. This activity lets people practise coding with a markup language in a new, useful, and interesting way.

90 to 120 minutes

Flexible (ideally two young people at each computer)

Set up computers with internet connection. Before you begin, people may want to record information about (and GPS coordinates of) some locations.

Indoors with internet connection

You will need:

- Computers

- A simple pre-installed text editor (Notepad on Windows, TextEdit on Mac, or Leafpad on Linux work best)

- Activity handouts (at least one for each group)

- Internet access: people will need to search for relevant images to link to in their maps

- Online access to Google Earth (**rpf.io/googleearth**) or Google Earth pre-installed on laptops (see the instructions in the 'Installing Google Earth' section)

Safety

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

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Leader instructions

1 Explain that Google Earth (**rpf.io/googleearth**) is an application that displays a three dimensional representation of the Earth. It does this by overlaying satellite images, aerial photography, and GPS data onto a 3D rendered globe. In this activity, people will write a script in **Keyhole Markup Language** (KML) to create custom maps with data they have put together.

2 Explain that people will make custom maps using geographic points which are relevant or important to them and their group. There are several steps to this process:

a. Choosing the map points

b. Researching and collecting pictures about the 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 Make sure that everyone can access a version of Google Earth. Let them work through the handout.

4 Remind everyone to read the handout and follow the instructions carefully. If anyone's finding it tricky to code correct coordinates, they may need to swap the order of their latitude and longitude in their KML script.

5 This project may take more than a single session, so remind everyone to save their work.

Alternatives

○ Other free platforms that can translate or parse KML files include **Merkaartor** and **Blender** (with Google Earth plug-in).

○ Google Earth can be downloaded and pre-installed for offline use, the instructions are below (though if you're offline, you won't be able to image search).

○ PiSKEL can be downloaded from **www.piskelapp.com/download** and pre-installed for offline use (though if you're offline, you won't be able to host images online).

○ You don't need a PiSKEL account to create custom icons, but it does allow remote access to work you've created.

Adaptability

○ To personalise their maps, young people can collect useful or interesting information about locations they've visited and add it to their maps.

○ Download the KML file for a finished map with locations around Scout's HQ (Gilwell Park) here: **rpf.io/scoutmap**. There are instructions to load it into Google Earth below, so you can everyone a finished example. People could use the code to help them troubleshoot their programs.

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Installing Google Earth

Google Earth (**rpf.io/google-earth**) can be used in the web browser of most computers. If you don't have internet access, you can download and install it before the session.

Some web browsers may have trouble loading Google Earth. Use another browser, or install the program instead.

Installation's straightforward:

1 Head to **rpf.io/google-earth-dl** and click the blue button labelled '**Agree and download**'. This will download an installer to your computer.

2 Run the install by clicking on it in the downloads menu in your browser, or head to the downloads folder on your computer and double-click the installer.

3 If you're prompted, allow the computer to make changes. Wait until the installation finishes, then click '**Close**'.

Google Earth may run automatically, otherwise you'll need to start it up manually.

Community and sharing

People could host their completed KML files online on their group's website. They could even share the link with friends, who could download and use the KML files with Google Earth on their own computers.

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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 one: 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're using Google Earth in a web browser:

1. In your browser, navigate to earth.google.com to launch Google Earth.

2. Once it's 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 **Projects**.

5. Click **Open** and choose **Import KML file from computer**.

6. Navigate to your scoutmapDemo. kml file, and choose **Open**.

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

1. Launch the Google Earth application.

2. Once it's 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: scoutmap.kml | All files (*.*)

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.

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Part two: picking places

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

2 Once you've 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. A unique title or name.

b. The latitude and longitude. To get a place's longitude or latitude, click on the 'burger' menu (the three lines), then '**Settings**'. Change the Latitude/Longitude formatting to '**Decimal**', then click 'Save'. Hover your mouse pointer over the location in Google Earth, and the coordinates will be displayed. Jot them down – **but remember, longitude must come first in KML code**, even though it's usually second when you look up coordinates online.


Trivia

The **Keyhole Markup Language** (KML) was originally developed in 2004 specifically for **Google Earth**, which was then called Keyhole EarthViewer. Four years later, KML became the international standard of the **Open Geospatial Consortium**, a volunteer organisation that works to standardise public geographic information.
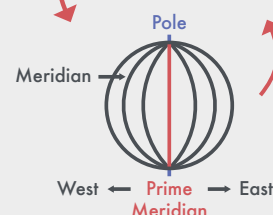
Latitude's the distance north or south of the equator (an imaginary line around the Earth, halfway between the North Pole and South Pole). **Longitude's** the distance east or west of the prime meridian (an imaginary line running from north to south through Greenwich in England). Latitude's shown with 'N' or 'S'; longitude's shown with 'E' or 'W'.

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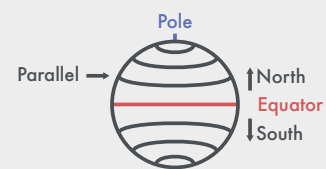
c. Online images (copy their addresses), or photos you've taken (you'll need to host them online, check out the instructions below).

d. A relevant icon (no bigger than 64×64 pixels) – you'll need to copy the web address. You'll learn to create your own custom icon in a later step.

Images that you upload to **Imgur** without an account are anonymous and hidden. This means that your images or account cannot be found by online searches – only the people you share the URL with will be able to see them. However, you should still **never** upload pictures of yourself, where you live, or where you go to school. Ask a trusted adult if you're not sure whether it's OK to upload an image.

Note

You can search for images to reuse at **commons.wikimedia.org**. Click on an image and choose 'Use this image on the web', then copy the HTML code from the 'Embed' box. Paste the code you've copied into a text file, so you can use it later. Always check that you have permission to reuse images.

1. Open your browser and navigate to **www.imgur.com/upload**.

2. Upload the image you've 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's 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 the text editor program where you've been editing the KML file.

7. Find the <href> tag belonging to the placemark you made the image for.

8. Paste the URL you've 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>

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Part three: creating the markers

1 The KML file you've just downloaded contains all the information you need 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 – just double-click the file name to open it. **If your file doesn't 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'll be able to just 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
<?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>
```

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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
<?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's different. Add the information about each location that you looked up earlier in between <description> and </description>.

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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):

○ Click **Projects**, then click the **Delete** icon for the KML file.

○ 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 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 make sure 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've accidentally swapped the markers' coordinates.

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Part four: 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 icons that have already been created for you to use for your map. Use the URL **rpf.io/scouts-icon-sign** to get a sign icon. For more icons, replace '**sign**' in the address with any of the following words: **tree**, **campsite**, **campfire**, **rocks**, **grass**, **hill**, **pond**, **building**, **food**, **crops**, or **tree**. Paste the URL in between your <href> tags as shown above.

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.

4 Whenever you make changes to your code, repeat step five and six from Part three to save and check your work.

5 See 'Part five: create custom map icons' for instructions on creating custom icons using the free online tool PiSKEL.

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Part five: create custom map icons

PiSKEL is a really 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's 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 **rpf.io/piskel**.

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 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

You won't be able to use an animation for your map icon, so just create **images that contain one frame** for now.

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**.

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6 If you need to change the size of your Sprite, click on the **Resize** icon on the right of the screen canvas size. **Don't go over 64x64 px.**

7 When you're happy with your new icon, download it. First, click on the **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 two 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.

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