

Cloud Technology Challenge

Whether you are ordering a meal delivery or sharing a funny photo with your friends, you are accessing a network of data shared through a cloud-based system. Have you ever stopped and wondered how these systems work? In this patch program, we will challenge you to use your knowledge and skills in coding and app design to construct your own cloud-based platform for a personal data collection company.

Recommended Time: 2 hours and 35 minutes

Steps:

1. Engineer a physical cloud server space.
2. Create conversation pathways between the cloud and the user.
3. Develop an app that uses cloud data.
4. Create a cloud-based system.

Purpose:

When Girl Scouts have earned this patch, they will understand the connection between apps they use every day and cloud-based data.

Before Starting the Challenge

Throughout this patch we will be using coding terminology. If this topic area is new for you, we have a couple simple videos that explain the terms that we will be using.

Functions and Arguments:

https://drive.google.com/file/d/1_PDtmTfulycmg5UA9gzGtltl-m2FzbOF/view

Data Collection, Data Visualization, and Arrays:

<https://drive.google.com/file/d/1nC2zdBydswH5SRa4AmWBwgy7udQADVZ/view>

Please note: This is a **plugged-in patch program**, meaning Girl Scouts will need access to a computer or tablet. We suggest using the computers at your local library.



The program VidCode can run through the internet and is an approved education application.

We do encourage leaders to try out the activities before leading them with their troop. This will increase your comfort and theirs while completing this patch program.

Computer Set-Up:

To access VidCode: <https://www.vidcode.com/groups/join/draw-eight-silver-skunks>

You will need to create a free account to access the site. If you already have an account, you can use this code to access the classroom: **draw eight silver skunks**

Once in there, select the appropriate program level and then the program that is correlates to the step, for example "Cadette Basics". From there, follow the instructions on the left-hand side of the screen. Girl Scouts are encouraged to work in pairs, but it is not required.

Thanks to our generous support from STACK Infrastructure and Blue Owl we will be providing the exclusive STACK Cloud Technology Challenge patch for FREE. After completing this program, please fill out this form that provides your mailing information as well as a reflection on how the patch program went.

Form: https://gscolorado.formstack.com/forms/2024_stack_patch_program

Glossary

Arguments- A number, text string, or other value required for a function to run its code. An argument is the x in $f(x) = y$.

Array- A single variable that contains a list of data. For example, `myNumbers = [0,1,2,3]`. Here, `myNumbers` is an array of numbers.

Cloud- A remote data storage location, such as Dropbox. The cloud is a broad term that refers to general internet storage or services.

Code- The written content of a computer program. Code tells the computer what to do, where to store information, and what to show the user.

Coding- The process of writing a computer program. Coding is often the majority of what software engineers do.

Command- An order the computer must carry out. Copy, Paste, and Print are examples of commands.

Computer Program- A bundle of code that tells a computer what to do. Computer programs do all sorts of things. Some solve math problems. Some play music. Even video games are computer programs.

Data- Any information that can be stored or used in a computer program. Names, addresses, and phone numbers are data.

Data Types- The kind of information that a variable or constant can hold. Examples include strings, integers, and Booleans.

Database (d bms)- A digital vault that stores information. Databases look like tables in a spreadsheet. A website stores usernames and passwords in a database.

Digital Footprint- Any piece of information you leave on a website. A blog post, a comment, or a “like” can be a digital footprint.

Engineer- An individual who designs a program, device, or adaptation to solve problems.

Event- An event is something that triggers a response in a program. For example, a mouse click or a button press.

Exception- An error that may be caused by a user or missing piece of data.

Functions- A chunk of code that takes input, manipulates it, and produces some kind of output. Programmers create a function just once, but they can use it over and over.

Input- The information that goes into a computer. User input is one type, which includes text, clicks, and button presses.

Internet- The internet is made of many computers and servers that are connected to each other. The web exists on the internet, but the internet is much larger than the world wide web.

Online- Connected to the internet. Someone can be online with a computer, a mobile phone, or another electronic device.

Output- The content that comes out of a computer. Output may be text or numbers. It could even be sound or video.

Server- A computer that hosts websites and data. Servers store the information that other people can access on the internet.

Storage Drive- Hardware that stores data without power until intentionally erased.

Introduction: What is cloud technology

Time: 10 minutes

Supplies:

- White board or chart paper
- Markers

Before diving into the challenge, we want to make sure Girl Scouts first understand what cloud technology is. For this activity, if you have a whiteboard or chart paper, it would be good to create a visual to accompany. We have created an example that you can find in the resources section at the end.

Say: Does anyone use any apps on a phone or tablet that are connected to the internet? What are those apps?

Create a short list off to the side. You should get answers like Netflix, Disney Plus, TikTok, Instagram, Amazon, Door Dash, Uber...

Say: Great, all these apps that you listed use cloud technology to operate. Does anyone know what the cloud is? Wait for answers.

Imagine the internet as a giant invisible cloud in the sky. It's like the place where all your favorite apps, websites, and files are stored. Now, cloud technology is like a magical way to use and store stuff on this cloud. Data Centers are big buildings that store the equipment that allows cloud technology to work. Just like you need a phone to operate an app - we need data centers to operate the cloud.

Say: So, let's take an app like Instagram. What type of stuff would we want to store there or what data are we putting into the app? Wait for answers and make a list. (pictures, captions, comments, stories, likes)

Great, now if this was just a storage site then this cloud would work like a virtual backpack, carrying all our digital files that we could access anywhere with an internet connection.

Say: But this is more complex right? How do you see this differently than just a storage drive? Wait for answers.

When we use the cloud for apps or games, that cloud technology makes it possible to access them on your computer, phone, or tablet. Without the cloud, most of the apps and games would not work. So, think of the cloud as a place on the internet where we can store and access things (such as photos, videos, or games) anytime we want, from anywhere.

Today we are going to dive deeper into cloud-based platforms in this patch. We are going to engineer the physical cloud server space, practice using the computers' language through coding, and develop an app that uses cloud data.

The Challenge

Total Time: 2 hour 25 minutes

In our scenario, Girl Scouts will step into a variety of tech roles to meet the needs of the client. Our client is a company that wants to create a personal data collection app that is for middle and high school students. Girl Scouts will have three tasks to complete the challenge and earn the patch.

1. Engineer a physical cloud server space.
2. Create coding between cloud and user.
3. Develop a personal data collection app that uses cloud data to meet customer needs.

Have Girl Scouts think for a couple minutes about what type of personal data they would want to collect in an app they designed. For example, you could use an app to track what you do all day while you are at school. Let them choose something that makes sense for them!

Step 1: Engineer a physical cloud server space.

Time: 30 minutes

Supplies:

- Computer or tablet
- Paper (graph paper preferred), pencil, and a ruler

Say: Before you can begin building your app, you need to secure a location and design your data center that will host the servers that will hold all the digital information of your cloud-based platform. This challenge is a bit of a puzzle to figure out how you can design your building and your server layout to best suit your needs.

We are going to first tour one of the STACK data centers for you to get an idea of what one would look like. Check out: <https://www.stackinfra.com/take-a-tour/>

We suggest giving Girl Scouts about 8–10 minutes to explore the STACK data center at their own pace.

As Girl Scouts virtually tour the STACK data center, engage them with questions such as:

- *Did the size of the data center surprise you? Why or why not?*
- *Where do you think data centers like this are usually built—and why do you think those locations are chosen?*
- *What do you think is stored in a data center?*
- *Why do you think security is important in a data center?*
- *How do you think data centers stay cool with all that equipment running?*
- *What careers do you think are needed to design, build, and maintain a data center like this?*

Girl Scouts are going to either use paper (preferably graph paper) and pencil or use a free web-based application, smartdraw, to practice creating a floor plan! Girl Scouts can choose the size and shape of the room and play around to create it. You will give them the remaining 20-22 minutes to complete their design.

Website: <https://app.smartdraw.com/>

We know for our cloud-platform, we need to have...

- A minimum of 30 servers, each measuring 2 feet by 3 feet
- One monitoring room with two large desks, each at least 6 feet long, that can accommodate two monitors (each at least 2 feet wide)
- Temperature control equipment, including fans (at least 12 inches long) and AC units capable of cooling a space (at least 4 feet by 4 feet)

For Girl Scouts choosing to sketch their data center layout with paper and pencil, we recommend using a ruler to scale the equipment and rooms. A good scale to use is $\frac{1}{2}$ inch = 1 foot.

After Girl Scouts have completed their design, have them pair and share their idea.

Optional: Choose one of the designs that will be the design for the whole group.

Step 2: Create conversation pathways between cloud and user.

Time: 50 minutes

Supplies:

- Computer or tablet
- Scratch paper and pencil

Now that we have our physical server space created, Girl Scouts are going to practice using JavaScript to create functions and arguments. Using VidCode, Girl Scouts will learn how the labeling and language that we use will allow our cloud-based app users to access their files.

Computer Set-Up:

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You will need to create a free account to access the site. If you already have an account, you can use this code to access the classroom: **draw eight silver skunks**

Once in there, select the appropriate program level and then Basics, for example “Cadette Basics”. **From there, follow the instructions on the left-hand side of the screen.**

If you don’t have enough computers or if some Girl Scouts would benefit from additional support, they are encouraged to work in pairs.

Say: Girl Scouts, if we wanted to access something on the cloud, how does our device talk to the server? Wait for answers.

Right, it would have used a computer language to talk to the server. Today we are going to practice using a computer language called JavaScript. It is OK if you have not worked with this before, we are going to use a fun program called VidCode to try it out!

Instructions in VidCode will walk Girl Scouts through how to create a video meme. Girl Scouts should read them carefully as the codes needed are provided to them in each step.

Allow at least 40 minutes of time for them to work. If a Girl Scout is really into the activity and does not finish, that is OK, you can always share the link and they can access it at home to continue practicing.

Reflection Activity- Approximately 10 minutes

Invite Girl Scouts to share their progress:

- What did they enjoy most about coding their video meme?
- What challenges did they encounter, and how did they work through them?
- If they completed their video meme, encourage them to share it with the group.

Ask one or more of the following questions to deepen reflection:

- *Once you've created your video meme, what cloud-based applications could you use to post or upload your creation?*
- *Where does your video meme live while you're still working on it, and where does it live once it's posted or uploaded?*
- *Why might someone choose a cloud-based app over saving their work directly to their computer?*
- *How do you think coding skills like this could be used in real careers or industries?*
- *What would you do differently if you had more time or a chance to improve your video meme?*

Step 3: Develop an app that uses cloud data.

Time: 50 minutes

Supplies:

- Computer or tablet
- Scratch paper and pencil

Computer Set-Up:

To access VidCode: <https://www.vidcode.com/groups/join/draw-eight-silver-skunks>

You will need to create a free account to access the site. If you already have an account, you can use this code to access the classroom: **draw eight silver skunks**

Once in there, select the appropriate program level and then Basics, for example "Cadette App". From there, follow the instructions on the left-hand side of the screen.

For this activity we strongly recommend Girl Scouts work in pairs, but it is not required.

Say: Now that we get the structure of coding using JavaScript language, we are going to practice creating an app for a user. The app that we will be creating is a personal data tracking app.

Note: Each program level has a different type of personal data tracking app they will be creating. If you have a multilevel troop, we recommend you have them all work on the same one.

This type of app takes data from multiple sources, the user, a database, and world wide web. As you are completing the activity, take note on how you are pulling the data from multiple sources.

Again, allow at least 40 minutes of time for them to work. If a Girl Scout is really into the activity and does not finish, that is OK, you can always share the link and they can access it at home to continue practicing.

Reflection Activity- Approximately 10 minutes

Now that Girl Scouts have tested their skills in VidCode, have each Girl Scout (or pair/group) think of a unique app idea that would help them or their community by tracking important data. Have Girl Scouts share these ideas with the group.

- What will their app track?
- Why is this data important?
- Who would use the app?
- Identify Data Sources- Make a list of the types of data their app would need and where that data would come from (i.e. user input, sensors, surveys, external data feeds, etc.)

Ask one or more of the following questions to deepen reflection:

- *What kind of data does your app need to work well?*
- *How would your app collect and organize this data?*
- *Who might benefit from your app, and how?*
- *What challenges might you face in designing or coding this app?*
- *How do you think real developers use data to make apps smarter and more helpful?*

Step 4: Create a cloud-based system.

Time: 15 minutes

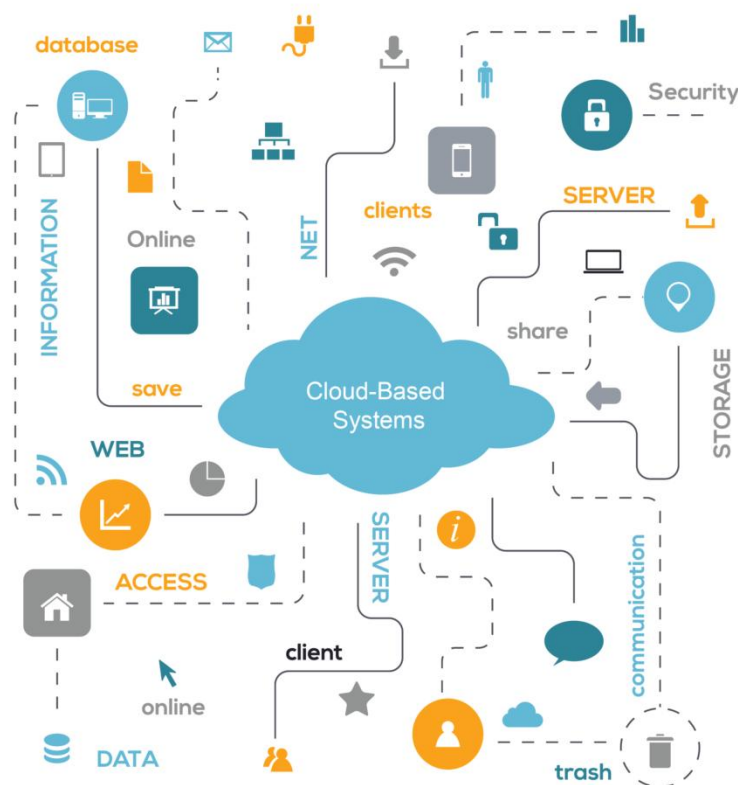
Supplies:

- Scratch paper
- Pencil
- Colored markers or pencils

Say: We are going to bring everything that we learned together and create a road map of our cloud architecture. Remember when we started and drew this cloud diagram? We are going to expand on it now that we have more knowledge of coding and the system.

Using the supplies in front of you, I want you to map out your cloud architecture. Make sure to include the three data sources: user input, world wide web, and database. Think about the variety of access points and any other elements that might be needed.

Example Complex Cloud Based System Road Map



Wrap Up: Share your cloud-based platform.

Finish the meeting by having Girl Scouts reshare their app idea and how they would be using the cloud system to create it. Have them share what worked well for them and how they would improve for the future.

In completing this patch program, your Girl Scouts have earned both the STACK Cloud Technology Challenge patch and met the requirements for two Girl Scout badges: Coding Basics and App Development.

Please make sure to complete this form to receive the FREE STACK Cloud Technology Challenge patch for your Girl Scouts.

Form: https://gscolorado.formstack.com/forms/2024_stack_patch_program

Continue the learning: If your Girl Scouts enjoyed creating a cloud-based app in this patch program, check out code.org/educate/applab for free education programs to start coding their app from scratch.