

IBM Schematics Case Study

Kathy Wang

The Process

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Introduction

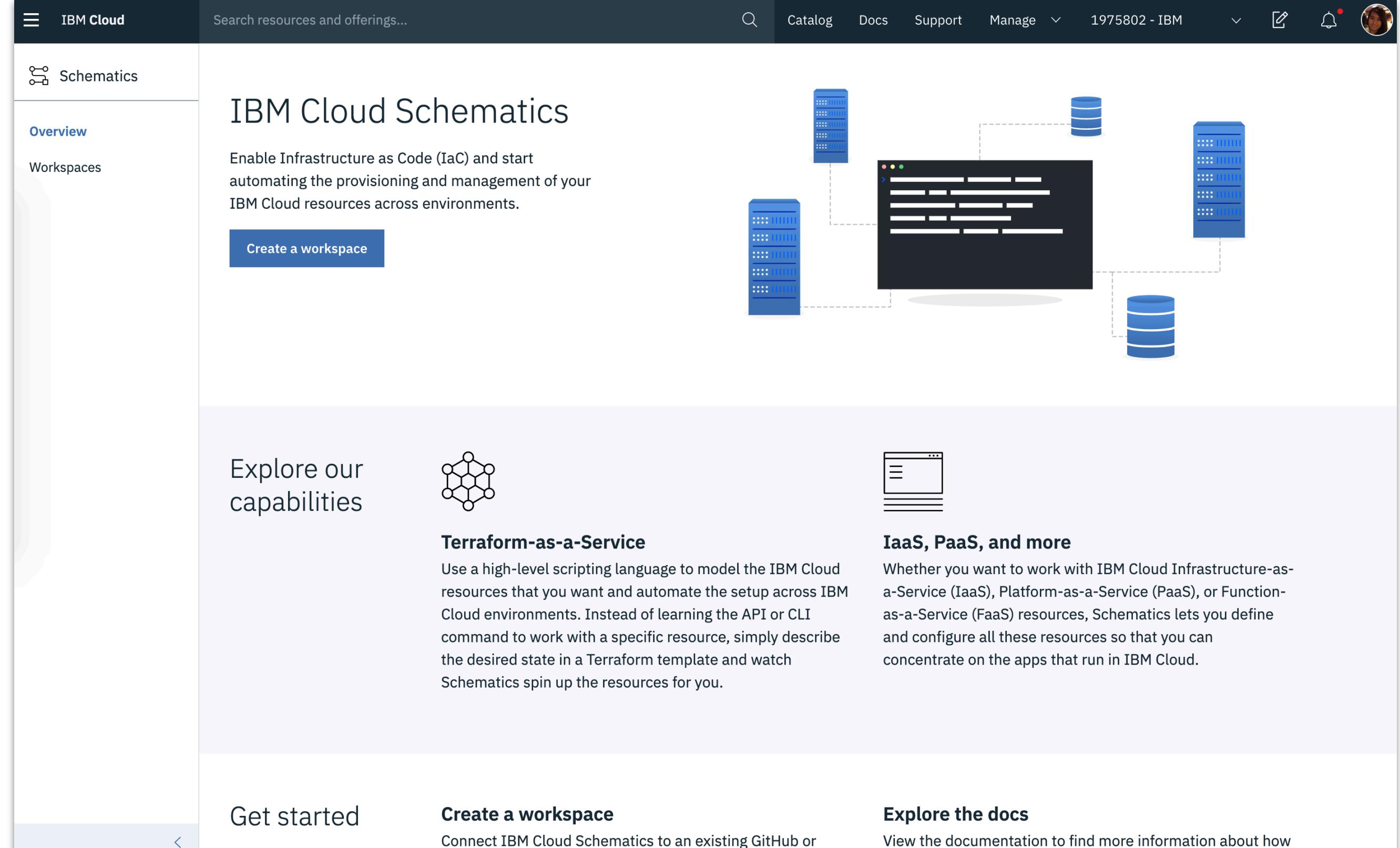


Introduction

The Product

Before, you had to manually deploy resources. Now, you can deploy resources via code.

Schematics is an infrastructure as code product, enabling a DevOps engineer to deploy several resources (i.e. a Kubernetes cluster).

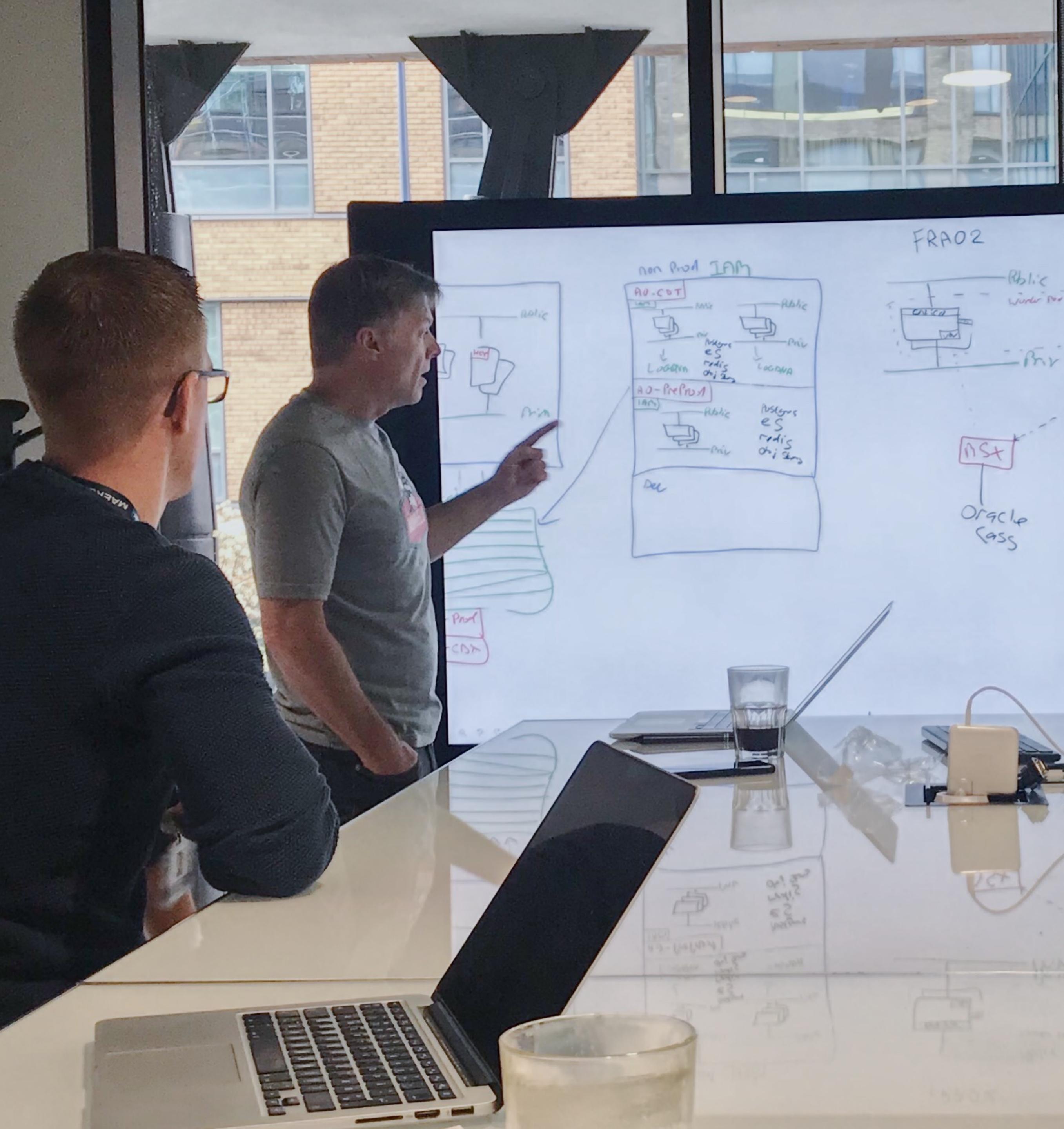


The screenshot shows the IBM Cloud Schematics interface. At the top, there's a navigation bar with 'IBM Cloud' and a search bar. Below it, a sidebar on the left lists 'Schematics' (selected), 'Overview', and 'Workspaces'. The main content area is titled 'IBM Cloud Schematics' and describes enabling Infrastructure as Code (IaC) to automate provisioning and management of resources. It features a large diagram of a central workspace connected to multiple server and database icons. Below this, there are sections for 'Explore our capabilities' (Terraform-as-a-Service and IaaS/PaaS), 'Get started', 'Create a workspace' (with GitHub or GitLab options), and 'Explore the docs'.

Introduction

Persona

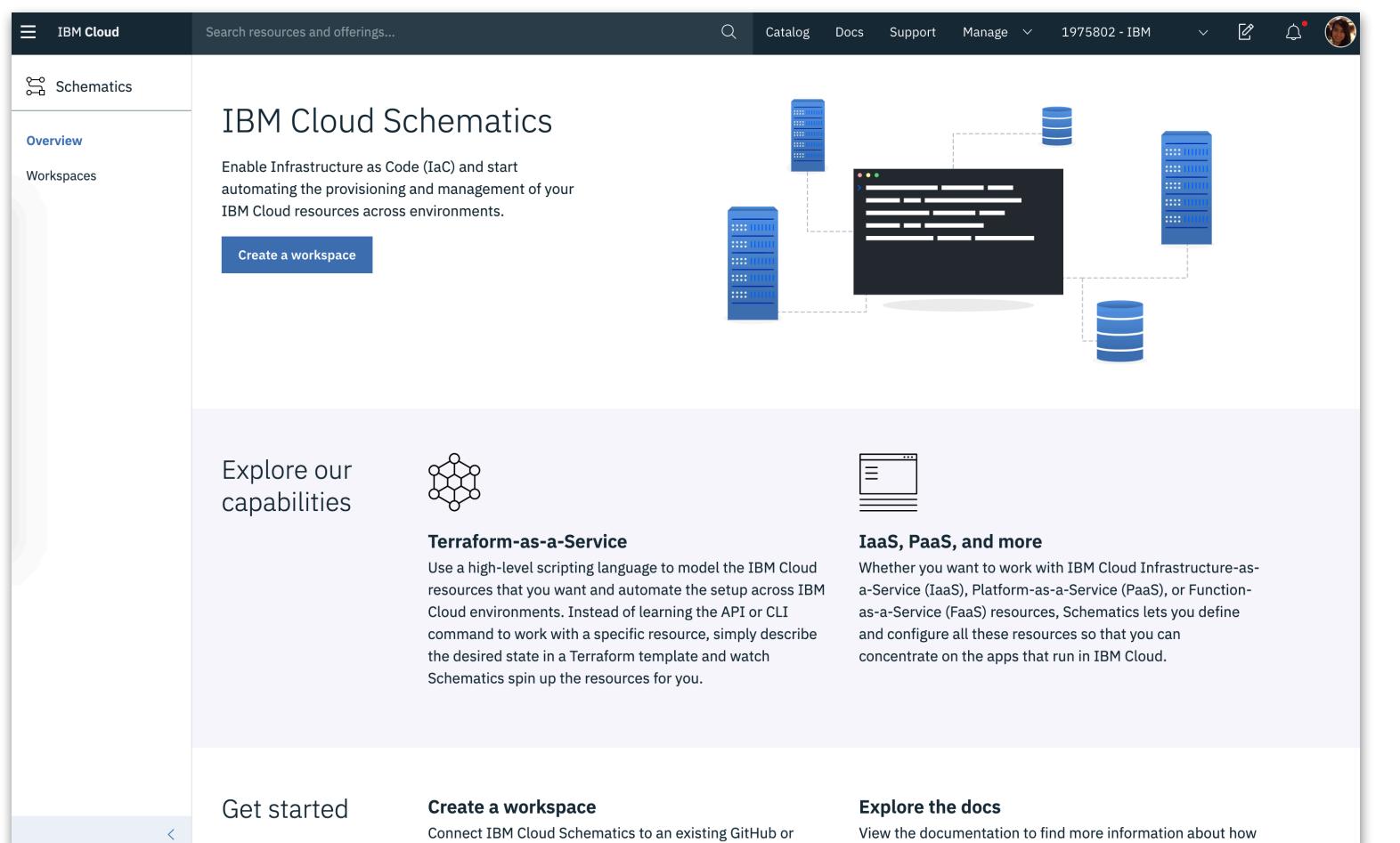
“RJ is an operations engineer with a holistic view of the network, infrastructure, applications, and services. He is responsible for the 24/7 operation of the environment including deployments, monitoring, automation, and troubleshooting. He often receives and responds to alerts in order to reduce and prevent disruptions in service.”



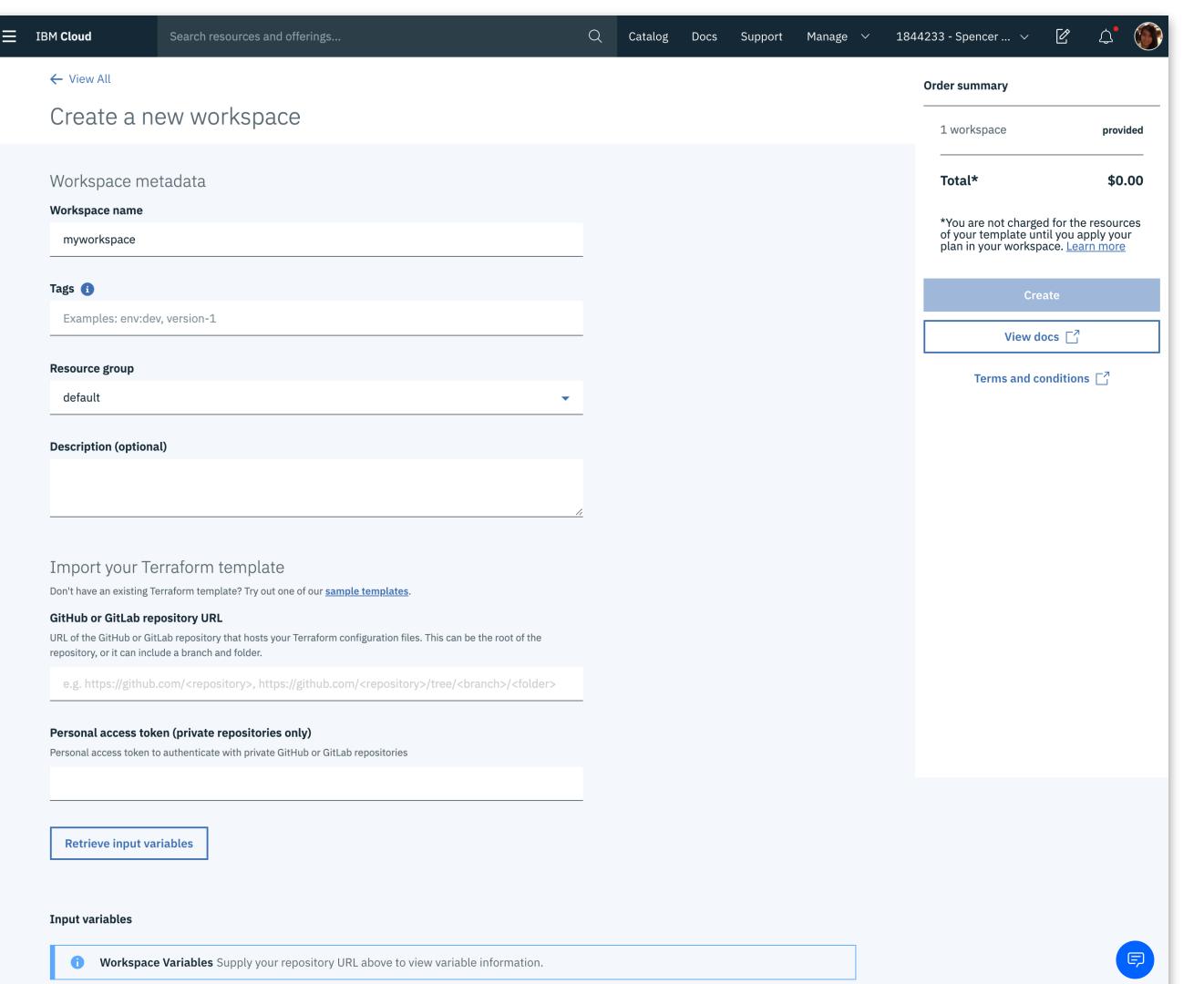
IBM

As-is

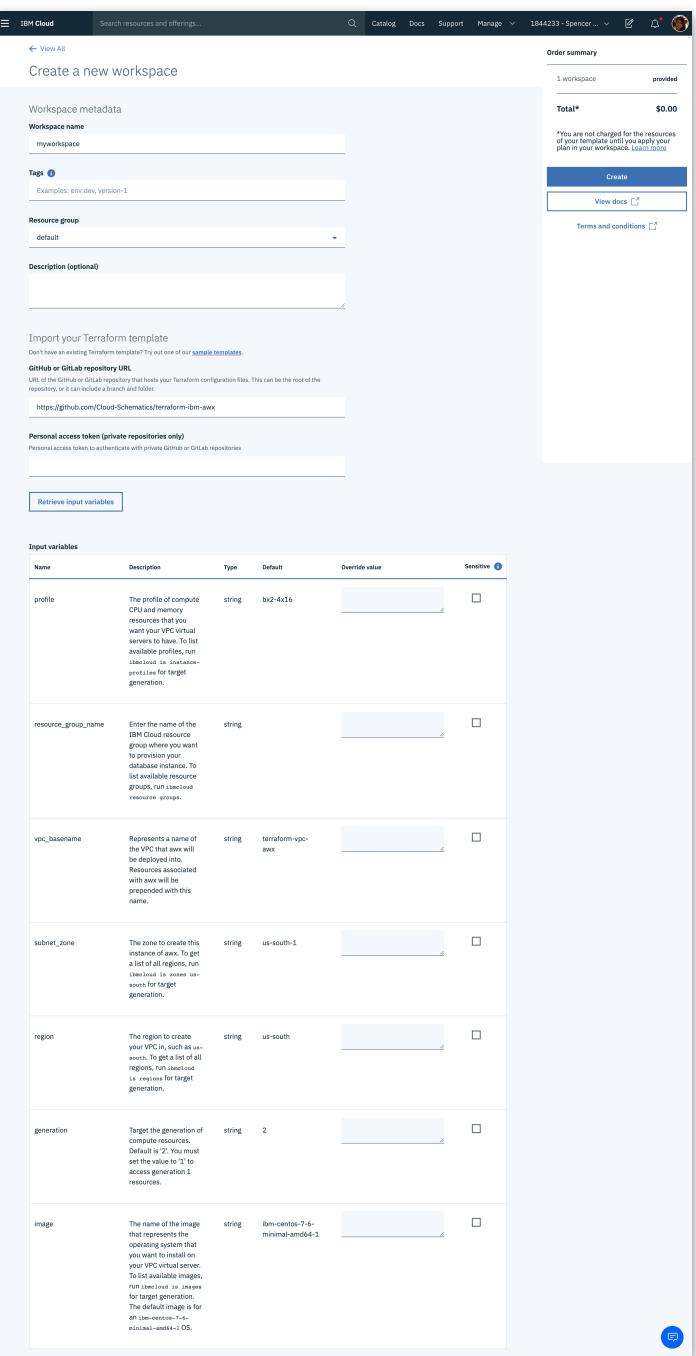
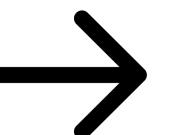
This is the current flow.



The screenshot shows the IBM Cloud Schematics interface. At the top, there's a navigation bar with 'IBM Cloud', 'Search resources and offerings...', 'Catalog', 'Docs', 'Support', 'Manage', and a user profile. Below the navigation is a section titled 'IBM Cloud Schematics' with a sub-section 'Overview'. A large blue button labeled 'Create a workspace' is prominently displayed. To the right of this button is a diagram illustrating the infrastructure-as-code concept, showing a central computer monitor connected to various cloud services like databases and storage. Below the diagram, there are sections for 'Explore our capabilities' (Terraform-as-a-Service, IaaS, PaaS, and more) and 'Get started' (Create a workspace, Connect IBM Cloud Schematics to an existing GitHub or GitLab repository, Explore the docs).

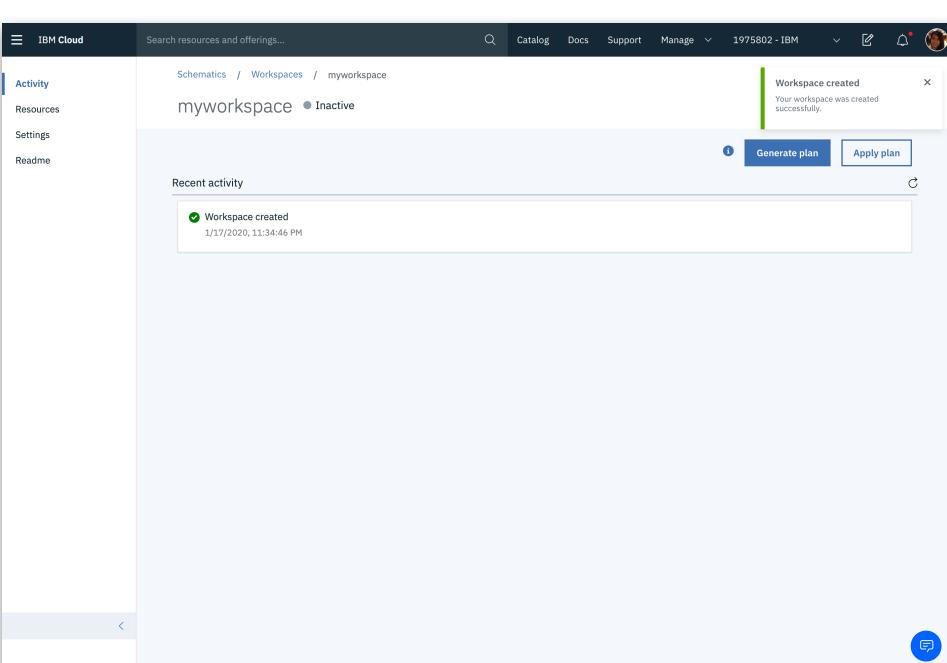
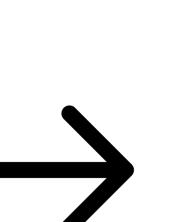


The screenshot shows the 'Create a new workspace' form. At the top, it says 'Create a new workspace' and 'Order summary' (1 workspace provided, Total \$0.00). Below this, there are fields for 'Workspace metadata' (Workspace name: myworkspace, Tags: env:dev, version:1, Resource group: default), 'Import your Terraform template' (GitHub or GitLab repository URL: https://github.com/SpencerHawkins/ibm-schematics), and 'Personal access token (private repositories only)' (Personal access token to authenticate with private GitHub or GitLab repositories). At the bottom, there are 'Create' and 'View docs' buttons, and a 'Terms and conditions' link. A note states: 'You are not charged for the resources of your template until you apply your plan in your workspace.' A 'Retrieve input variables' button is also present.

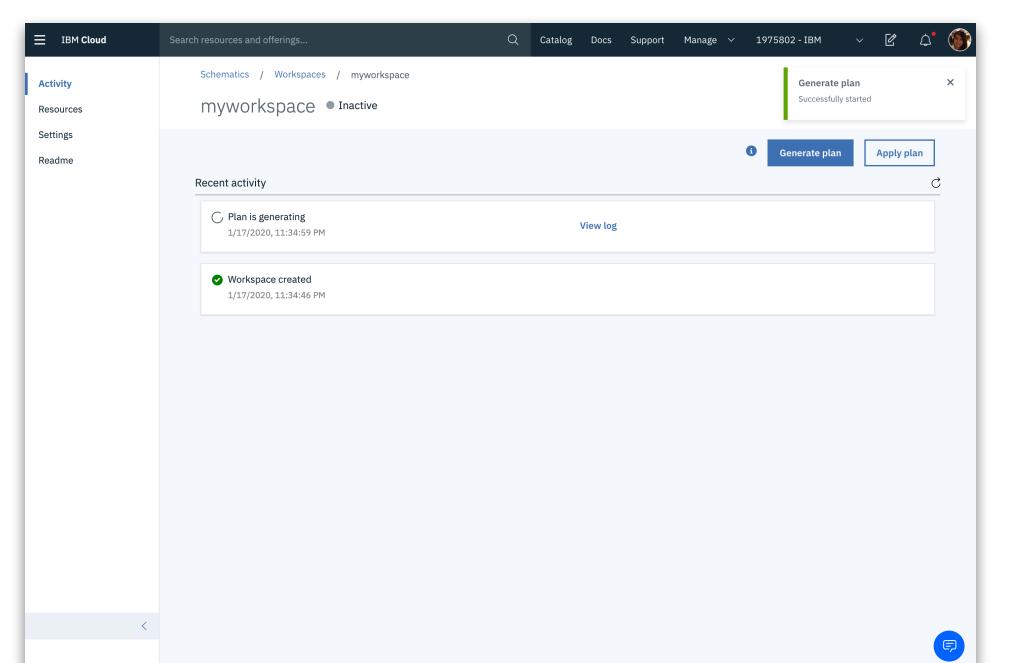


The screenshot shows the 'Create a new workspace' form with a focus on the 'Input variables' section. It lists several variables with their descriptions and default values:

- profile: The profile to compute CPU and memory resources for your VPC virtual machine. Default is 'us-east-1'.
- resource_group_name: Enter the name of the IBM Cloud resource group you want to use to provision your infrastructure. To list available resource groups, go to the 'Resource groups' page.
- vpc_subnetname: Represents a name of the VPC subnet that will be deployed into the resource group associated with this name.
- subnet_iprange: The range to create the instance in. To get a list of all ranges, run 'aws ec2 describe-subnet-attribute --subnet-id <subnet_id>' for target generation.
- region: The region to create your resources in. To get a list of all regions, run 'aws configure list regions' for target generation.
- generation: Target the generation of compute resources. Default is '1'. Set the value to '2' to generate compute v2 resources.
- image: The name of the image that represents the operating system that you want to use on your VPC virtual server. This image must be a valid image ID or ARN. For example, 'ami-0c9e0f3e' is a valid image ID for an AWS Lambda function.



The screenshot shows the 'Recent activity' log for the 'myworkspace' workspace. It displays a single entry: 'Workspace created' at 1/17/2020, 11:34:46 PM. Below this, there are buttons for 'Generate plan' and 'Apply plan'.



The screenshot shows the 'Recent activity' log for the 'myworkspace' workspace. It displays two entries: 'Plan is generating' at 1/17/2020, 11:34:59 PM and 'Workspace created' at 1/17/2020, 11:34:46 PM. Below this, there are buttons for 'Generate plan' and 'Apply plan'. A note indicates: 'Plan is generating'.

A photograph of a person sitting at a desk, viewed from the side. They are wearing a grey hoodie and are looking down at a laptop screen. Their right hand holds a silver pen over an open notebook, and their left hand rests on the laptop's trackpad. A white mug sits on the desk to the left, and a small potted plant is visible in the bottom left corner.

User Research

User Research

Interviews

4 usability sessions

1. DevOps Engineer, Toyota Connected
2. SRE, brightwheel
3. STSM, IBM
4. Executive IT Specialist, IBM

Interviewee Background

LinkedIn

Intro (5 min)

How's it going? We're with the IBM Cloud team here in Austin, TX. We have a new feature that we're hoping to do some usability testing.

Before we begin, do you mind if we record?

1. What's your role? And can you tell us a little bit about what you do?
2. I see that you have been working as a ___ for X time. Is that correct?
3. I see that you listed Terraform as a tool that you use, how are you using it today?

Tasks (20 min)

We're going to give you a task related to Terraform. As you are doing it, tell us what you are thinking out loud. There is no right or wrong answer here and we are not testing you on your skills but we are more looking to smooth out the feature before it goes to Generally Availability. If you have a question, like if something is not clear, definitely voice it in the moment and we will come back to it at the end.

1. Task #1: Here's some TerraForm starters. Deploy one of these to IBM Cloud.
 - a. [Starter link](#)
 - b. Things to Validate (Observe and Probe):
 - i. Time (?)
 - ii. Task completion rate
2. Dig into workspace creation, generate plan, apply plan. What if we generated on create workspace?

Notes

Post-Assessment (5 min)

1. Satisfaction rating
2. Was there anything you found particularly enjoyable about your experience?
3. Was there anything you found particularly challenging?
4. Is there anything you would change?

User Research

Synthesis

We took the important data points, and then gathered them into one document.

We found out that users were really annoyed with the fact that variables were not retrieved for them.

Participants

2 external (DevOps Engineer at Toyota Connected, SRE at [brightwheel](#))

2 internal (STSM, Executive IT Specialist)

Satisfaction

- 3 initially bc confused at prompt; actual task solid 4, only issue is logs and feedback
- 4, close to 5 but 5 is perfect so he said 4, it's simple, it works, it might be missing some things
- 3.6, it's ok, it's not terrible, i would want to see how hard it is to pull my terraform into this, modules, output variables

Task completion (follow up)

- no, got stuck at GitHub URL and second time at input variables
- partial, plan generate started but no input variables
- partial, plan generate started but no input variables
- yes

Issues to open

1. Input Variable Defaults: i'm logged into my account, why haven't you retrieved those variables for me? api key, username
 - a. external
 - b. (internal)
 - c. (internal)
 - d. - external
2. GitHub Repo URL: difficulty getting the right formatting for [github](#) URL, 3+ tries, 2+ minutes (Note: may be an easy change to the readme: deploy to [ibm](#) cloud vs deploy locally)
 - a. - external
 - b. - external
3. Log Navigation: difficulty viewing most recent logs and navigating around in general, wished for floating buttons to make this easier
 - a. (external)
 - b. (internal)
4. Rename Workspace: would like option to rename a workspace
 - a. (internal)
5. ReadMe Appearance: readme looks broken
 - a. (internal)

Issues already in progress

1. Workspace Create Feedback: to show system is processing / in progress (spinner or logs), to show whether activity was success or failure
 - a. (external)
 - b. (internal)
 - c. (internal)
2. Terminology confusion: confused if frozen/frozen and locked/unlocked are referring to the same thing
 - a. (internal)
3. Terraform actions: clicking buttons lead to error while workspace is creating

Feature requests

- Output variables (2 / 3)
- Download Pure Terraform: ability to download pure terraform. google lets you generate terraform state from pure infrastructure, they create template and state file for you (1 / 3)

Content review

- Inconsistent Wording: he clicked on sample templates in UI but the [github](#) repo says examples.
- Template Wording: passed over app sample template bc he says it implies he needs an app ready to go -
- Sample Naming: didn't match expectations -
- GitHub Repo URL: difficulty getting the right formatting for [github](#) URL, 3+ tries, 2+ minutes (Note: may be an easy change to the readme: deploy to [ibm](#) cloud vs deploy locally)

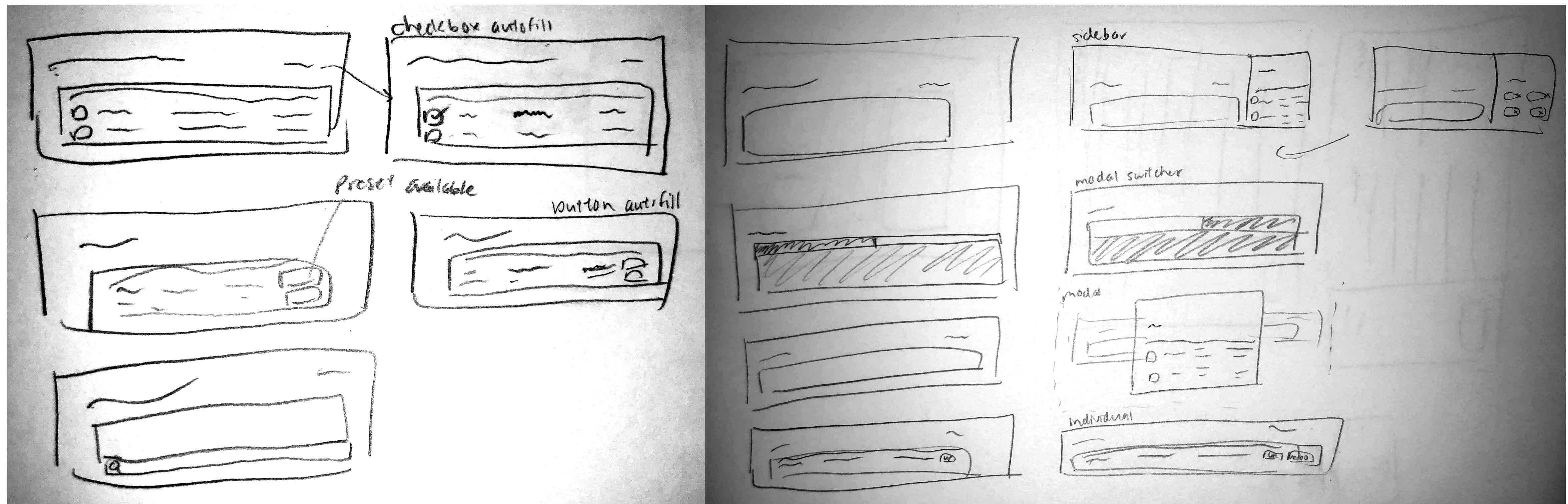
Define

Schematics users want to fill out the values for variables so that they can generate and apply plan, but they get annoyed having to fill out the values.

Prototyping

Prototyping

Low-Fidelity Explorations

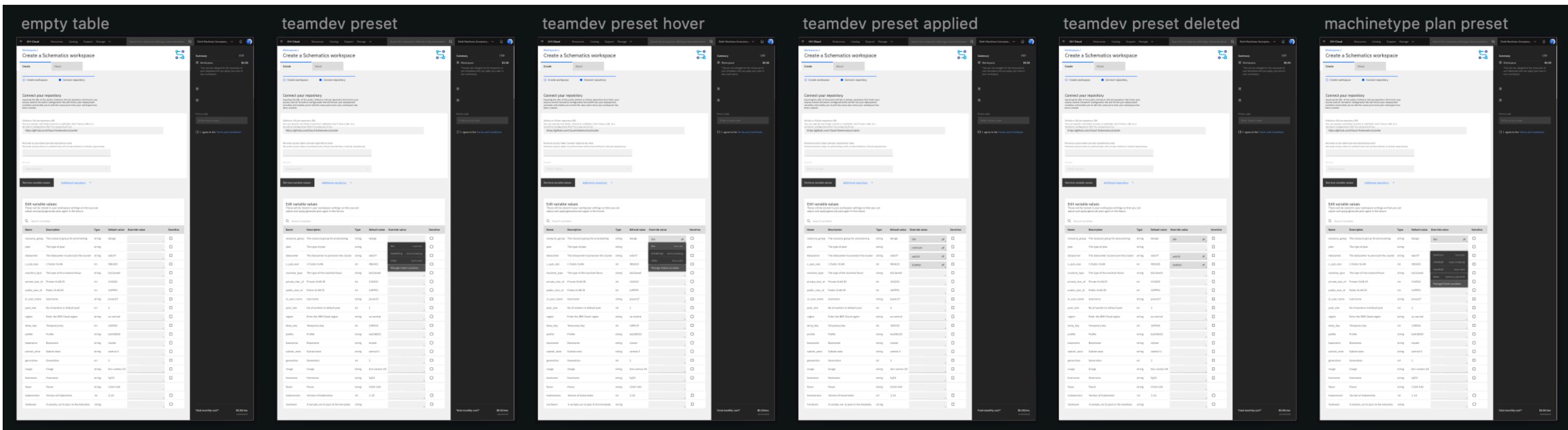


Prototyping

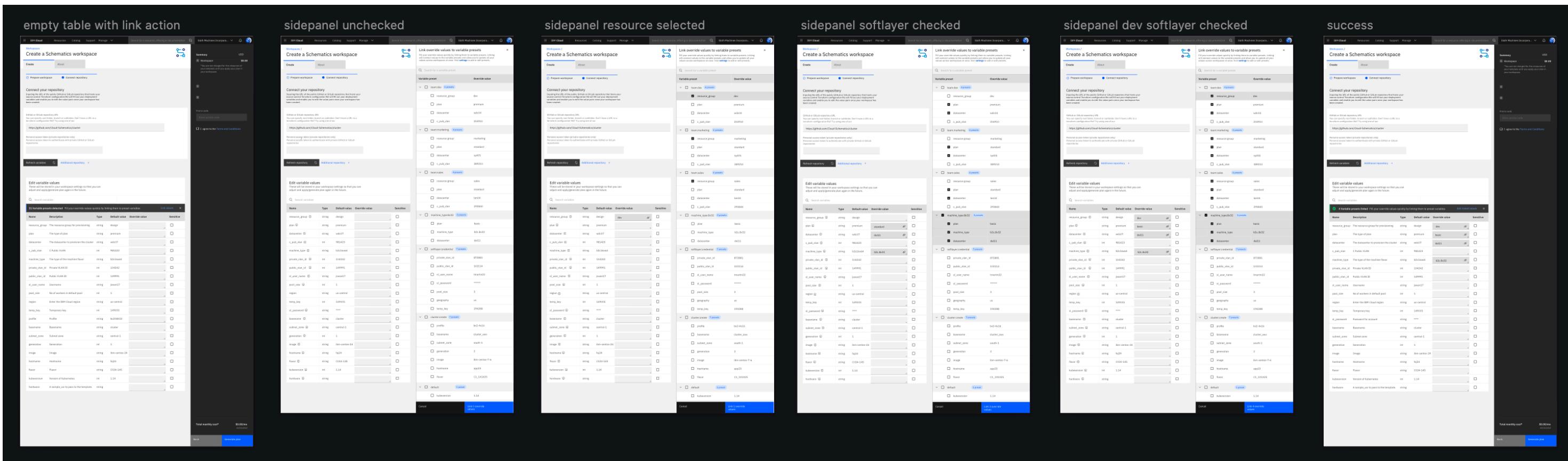
High-Fidelity Prototyping

We ended up with two concepts: autofill and side panel.

Autofill



Side panel



Discussion Point: Reveal System vs. Provide Convenience

The advantages of the autofill were discoverability and convenience, while the advantages of the side panel were visibility and understanding. The question here was, do we need to reveal the system in order for it to be useful (similar to Google Chrome's autofill feature)? We decided to test this out.

The image displays two screenshots side-by-side. On the left is a screenshot of a travel booking form on Google. It shows a 'PERSONAL DETAILS' section where 'First name' is set to 'Kathy'. A dropdown menu is open over this field, showing suggestions: 'Kathy', 'Kathy T Wang', and 'Manage...'. On the right is a screenshot of the Google Chrome settings page under 'Passwords'. It lists several saved password entries, each with a website, username, and password (represented by dots). The entries include 'dl.acm.org', 'login.activebuilding.com', 'aetna.com', 'amazon.com', 'passport.amazon.work', and 'americanexpress.com'. Both screenshots illustrate how the system provides convenience through autofill or password storage.

User Testing

Testing

Research plan

We created a research plan, ensuring that we captured our existing assumptions, so that we could test them.

Motivation

When creating a workspace, users of schematics are shown an option to fill in [a certain area of tags/metadata]. Past testing has shown that people do not want to and sometimes will not fill in these tags. However, filling this is could be very useful for them in the long run. (why) We want to make this understandable for users and easy for them to complete.

General research goal

The goal of the research is to decide between two design options.

The options aim to solve the problem that users *are annoyed about filling out a specific section of Schematics*.

We want to know which design solves that problem better and helps them to complete this stage of the flow.

In scope: We don't know if users understand these presets and can use them in a way that makes sense.

Out of scope: exploration into other ways in journey to avoid filling this section out.

Research Questions:

1. Which design leads to less experience of annoyance?
2. With which design do we see more of the intended behavior (what user was "supposed" to do)?
 - a. Which design leads to a greater fill-in rate of adding variable values?
 - b. Are they filling in the "correct" variable values? -- *what's correct*
3. Do users feel confident in what they're doing?
 - a. With which design do we see more confidence?

Methods:

In person user testing

- Usability test of two designs (half start with design A, half start with design B)
 - Task completion (binary), count of tags added
 - Answers question #2.
 - Self-reported measures
 - SEQ, Simple/Cumbersome to answer question #1
 - Confidence on task completion to answer question #3

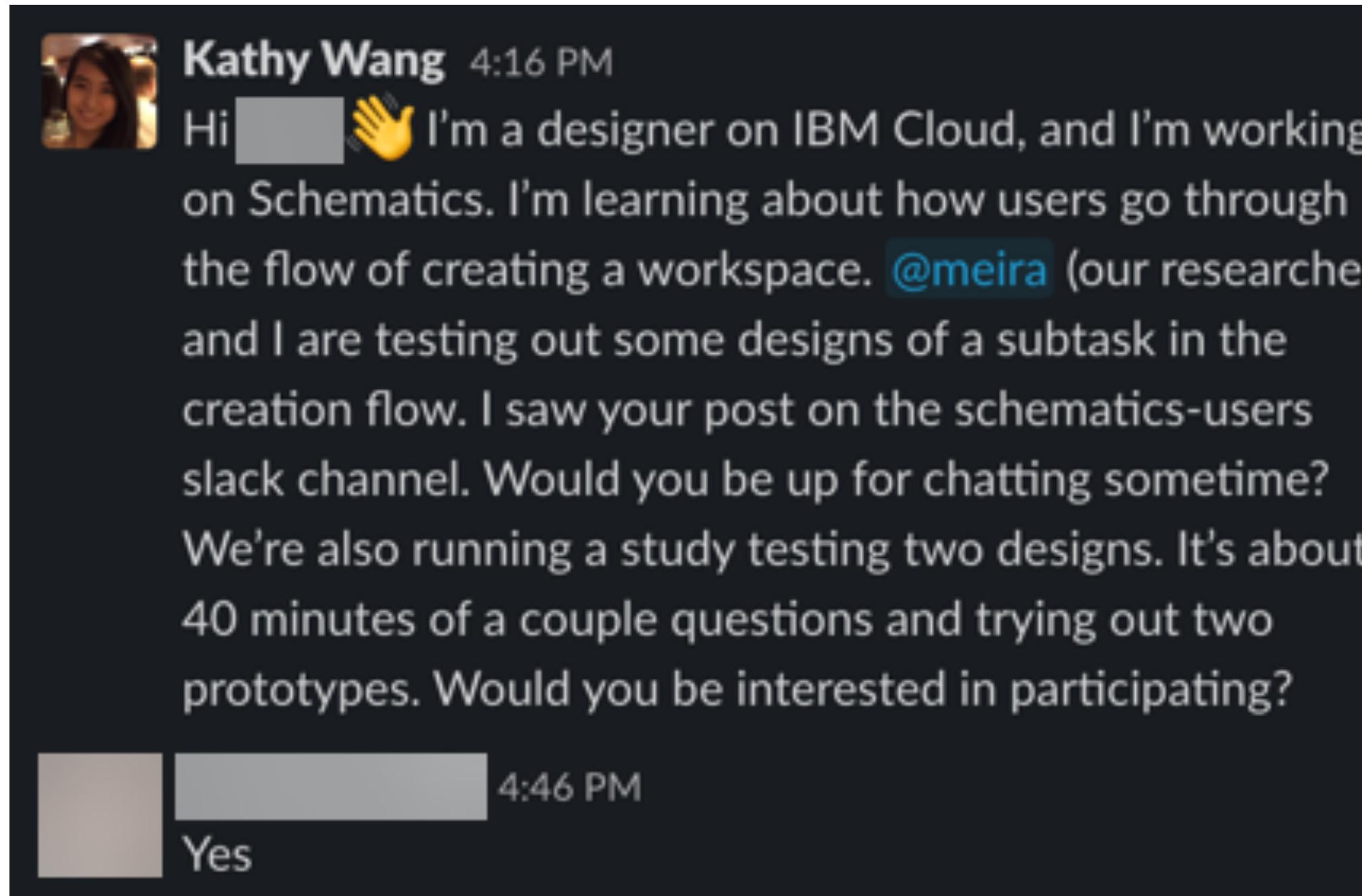
Post-test user interviews on context of text

- Gather type of employee (sales, marketing, dev, design)
- Need to gather any other details that may impact how they populate variable values
- Ask additional questions to answer above research questions

Testing

Recruit participants

We recruited participants via Slack, and I kept track of this through a spreadsheet.



Order	Name	Slack	Profile	Location	Contacted	Follow up	Scheduled	First test	Interview Notes	Recording	Roles
1	[redacted]	[redacted]	Bluepages LinkedIn	Durham, NC	<input checked="" type="checkbox"/>	N/A	1/27 Monday 10:15-11am	A	Link	Recording Password: DvUe7wJU	Facilitator: Meira Notetaker: Kathy Other(s): Spencer
2	[redacted]	We know him	Bluepages LinkedIn	Austin, TX	<input checked="" type="checkbox"/>	N/A	1/27 Monday 11:15am-12pm	A	Link	Recording Password: tR5A9Sx3	Facilitator: Meira Notetaker: Kathy Other(s): Spencer
3	[redacted]	[redacted]	Bluepages LinkedIn	Austin, TX	<input checked="" type="checkbox"/>	N/A	1/27 Monday 1:15-2pm	B	Link	Recording Password: AdWZ5vQ3	Facilitator: Meira Notetaker: Kathy Other(s): Spencer
4	[redacted]	[redacted]	Bluepages LinkedIn	Durham, NC	<input checked="" type="checkbox"/>	Followed up 1/27	1/29 Wednesday 12-12:45pm	B	Link	Recording Password: 8zPWdwKf	Facilitator: Meira Notetaker: Kathy Other(s): Spencer
5	[redacted]	[redacted]	Bluepages LinkedIn	Cambridge, MA	<input checked="" type="checkbox"/>	N/A	1/29 Wednesday 1:15-2pm	A	Link	Recording Password: gRE5FAM4	Facilitator: Spencer Notetaker: Kathy Other(s): N/A
6	[redacted]	[redacted]	Bluepages LinkedIn	Portland, Oregon	<input checked="" type="checkbox"/>	N/A	1/29 Wednesday 4-4:45pm	B	Link	Recording Password: JrtV3YFp	Facilitator: Meira Notetaker: Kathy Other(s): Spencer
7	[redacted]	[redacted]	Bluepages LinkedIn	Arlington, VA	<input checked="" type="checkbox"/>	N/A	1/29 Thursday 1-1:45pm	A	Link	Recording Password: wGkwjPb3	Facilitator: Spencer Notetaker: Kathy Other(s): N/A
8	[redacted]	[redacted]	Bluepages LinkedIn	Austin, TX Building 45	<input checked="" type="checkbox"/>	N/A	2/1 Friday 3:30-4:15pm	B	Link	Recording Password: rXAdu3fJ	Facilitator: Spencer Notetaker: Kathy Other(s): N/A

Testing

Facilitating user sessions

We then went on to facilitate eight user testing sessions.

Introduction (5 min)

- How's it going? We're with the IBM Cloud team here in Austin, TX [Introduce each person on the call]. We have a new feature with which we're hoping to do some usability testing.
- Before we begin, do you mind if we record?
- How long have you used terraform or infrastructure as code?
- After creating a workspace, what are the major tasks you have to do?
- For stuff that you're doing in prod, what's a normal number of variables in a workspace?
- And are you mostly filling those out manually?

Prototype A (15min)

Set up scenario

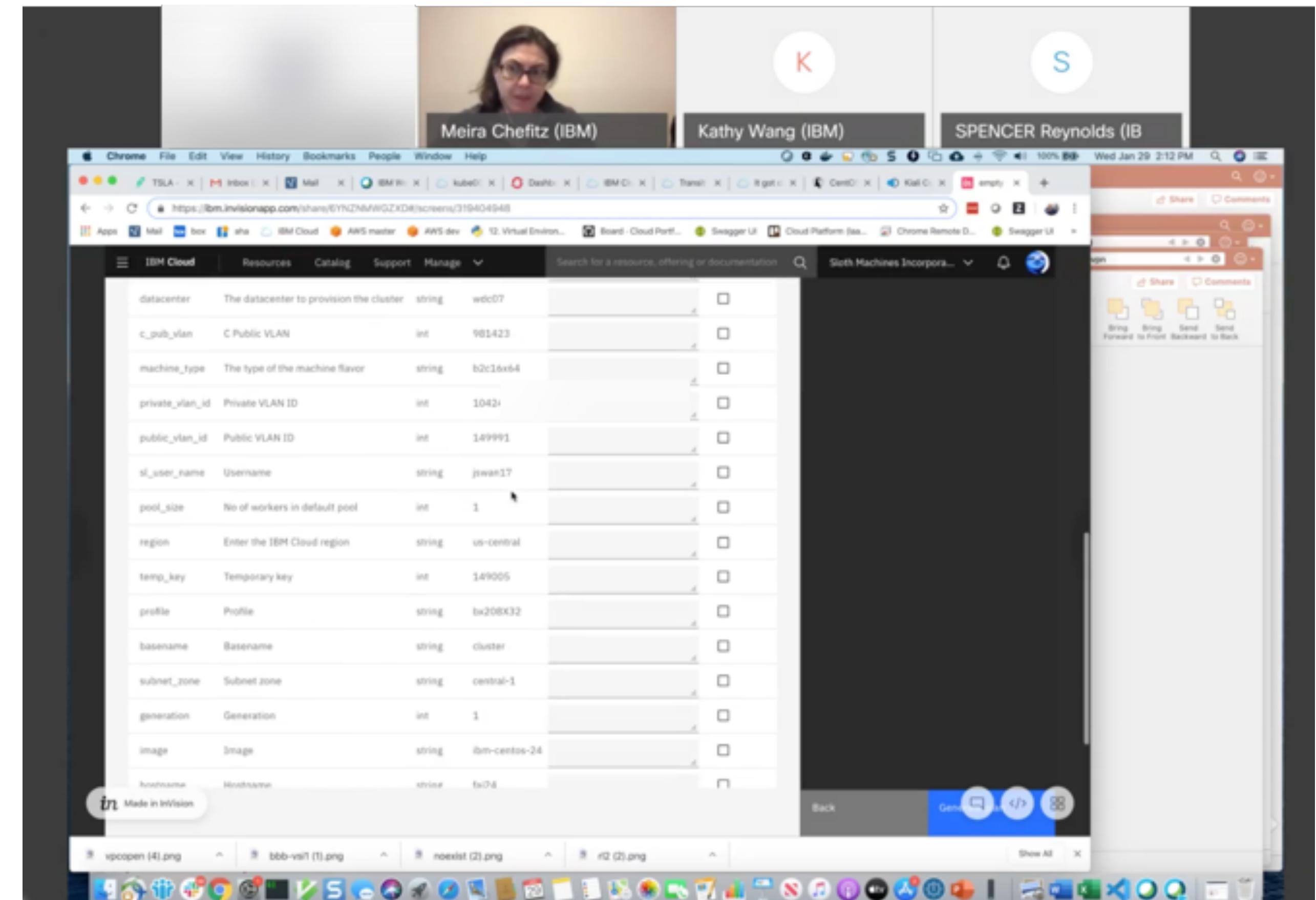
- Send link to autofill prototype.
 - https://ibm.invisionapp.com/share/NDZNISTR3W#/319401610_schematics_Prepares_Workspace
- Could you share your screen?
- Read out message, and Slack it.
 - You're using Schematics to deploy your infrastructure as code for a **dev environment**, and your manager is telling you to use the override values he put in the Schematics tool.
 - It needs an **8x32 machine type** (32 gigabyte of ram machine type),
 - the **datacenter is in Dallas**, and
 - it's on a **basic plan**
- Based on your understanding of this task and service, on a scale for 1 to 7, with 1 being extremely difficult and 7 being extremely easy, how difficult or easy do you expect this task to be?

Complete task

-

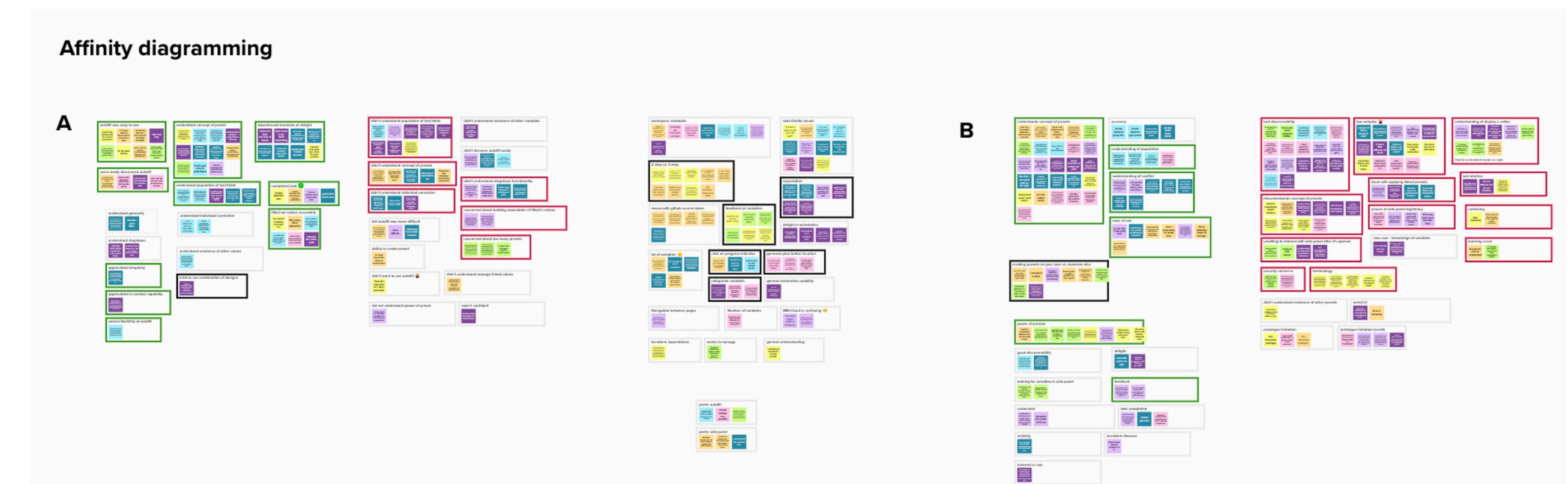
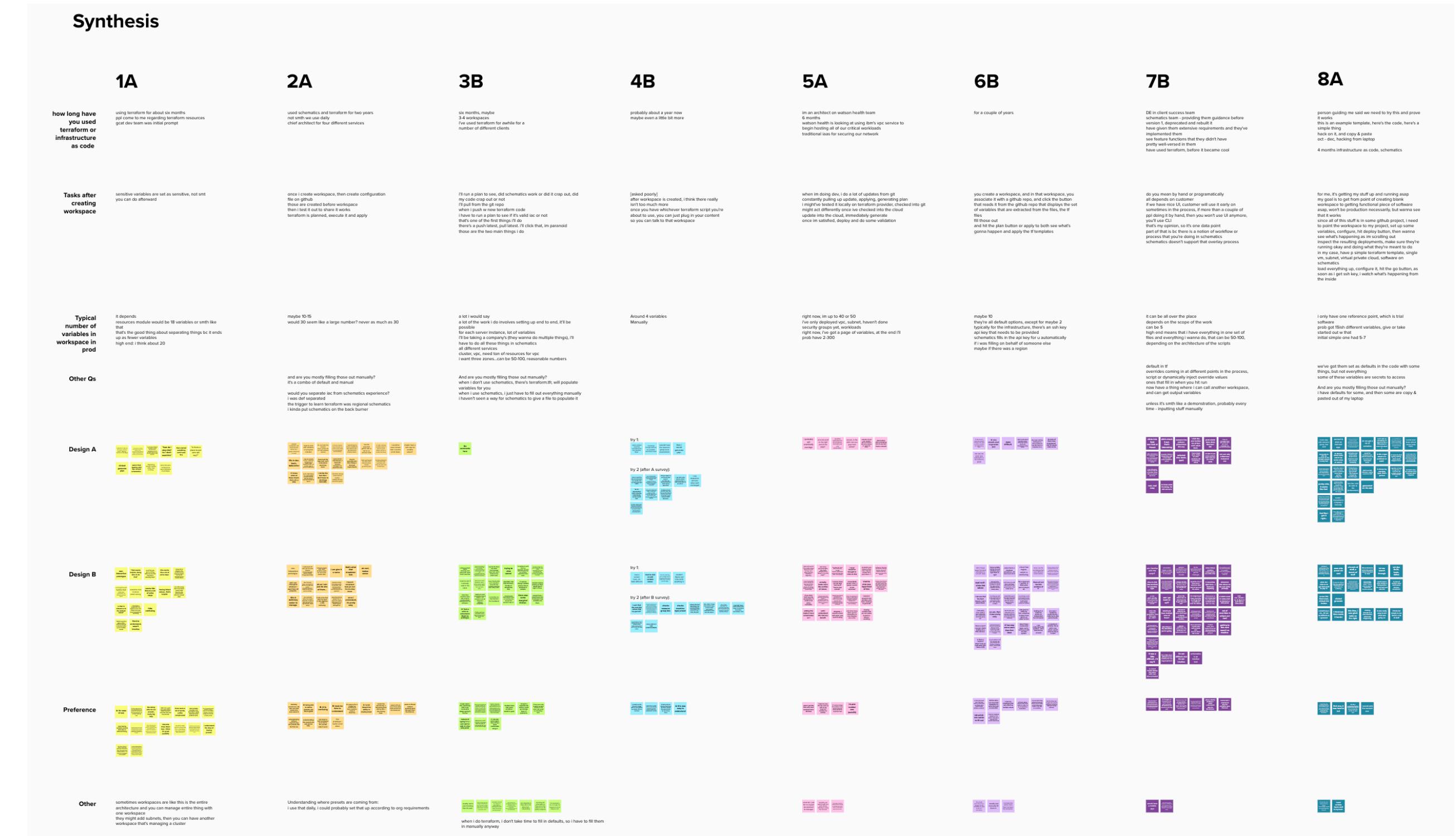
Reflect

- Based on that experience, on a scale of 1 to 7 with 1 being extremely difficulty and 7 being extremely easy, how difficult or easy was that task?
 - Why do you say that?
- Send link to survey
 - <https://www.surveygizmo.com/s/5424974/Schematics-Test-Design-A>



Testing Synthesis

I compiled all of the interview notes into a Mural, where I could synthesize them.



Testing

Findings

From the synthesis, we found the following pros and cons.

Autofill

Pros

1. High discoverability: users easily discovered autofill
 2. High ease: autofill was easy to use
 3. High accuracy: users filled out values accurately
- Note: someone tried to use combination of designs

Cons

1. Low understanding: didn't understand the concept of presets
2. Low understanding: didn't expect or understand the population of other text fields
3. Low Understanding: didn't understand individual correction

Side panel

Pros

1. High understanding: understood concept of presets
 2. High understanding: understood conflict scenario
 3. High ease: felt it was easy to use - once they understood it / got past learning curve
- Note: people assumed you could create presets on your own, didn't assume someone else created them

Cons

1. Low discoverability: users never knew to click on the inline notification
 2. High complexity: users thought it was too complex (not intuitive, confusing, learning curve)- some didn't even want to interact with it even after it was opened
 3. Low trust: security concerns - unsure of side panel legitimacy
- Note: display v. editor

Findings

We found that the side panel is high in understanding and low in discoverability and ease of use. In contrast, autofill is high in discoverability and ease of use, but low in understanding.

Thus, there seems to be a trade-off between understanding and discoverability / ease of use.

How might we design for both understanding and discoverability / ease of use?
Or do we value one over the other?

Prototyping Round 2



Prototyping

Initial Create flow

The image consists of three side-by-side screenshots of the IBM Cloud workspace creation interface, illustrating the initial create flow.

Screenshot 1 (Left): Shows the workspace details page for 'myworkspace'. It includes sections for Overview, Settings (selected), Activity, and Resources. The workspace is running, created by elraymond@us.ibm.com, version v0.11.14, and frozen. It has a repository linked to https://github.com/Cloud-Schematics/Cloud-Foundry-App. A 'Variable values' section allows setting variables like kubeversion, resource_group, plan, etc. A modal at the bottom right shows a 'Save as a group' dialog with a 'Save and generate' button.

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int		<input type="checkbox"/>
resource_group	The resource group for provisioning	string		<input type="checkbox"/>
plan	The type of plan	string		<input type="checkbox"/>
datacenter	The datacenter to provision the cluster	string		<input type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input type="checkbox"/>
sl_user_name	Username	string	iswan17	<input type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input type="checkbox"/>
temp_key	Temporary key	int	149005	<input type="checkbox"/>
profile	Profile	string	bx208x32	<input type="checkbox"/>
basename	Basename	string	cluster	<input type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input type="checkbox"/>

Screenshot 2 (Middle): Shows the workspace details page for 'myworkspace'. It includes sections for Overview, Settings (selected), Activity, and Resources. The workspace is running, created by elraymond@us.ibm.com, version v0.11.14, and frozen. It has a repository linked to https://github.com/Cloud-Schematics/Cloud-Foundry-App. A 'Variable values' section allows setting variables like kubeversion, resource_group, plan, etc. A modal at the bottom right shows a 'Save as a group' dialog with a 'Save and generate' button.

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int	1.15	<input type="checkbox"/>
resource_group	The resource group for provisioning	string	dev	<input type="checkbox"/>
plan	The type of plan	string	premium	<input type="checkbox"/>
datacenter	The datacenter to provision the cluster	string	wdc07	<input type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input type="checkbox"/>
sl_user_name	Username	string	iswan17	<input type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input type="checkbox"/>
temp_key	Temporary key	int	149005	<input type="checkbox"/>
profile	Profile	string	bx208x32	<input type="checkbox"/>
basename	Basename	string	cluster	<input type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input type="checkbox"/>

Screenshot 3 (Right): Shows the workspace details page for 'myworkspace'. It includes sections for Overview, Settings (selected), Activity, and Resources. The workspace is running, created by elraymond@us.ibm.com, version v0.11.14, and frozen. It has a repository linked to https://github.com/Cloud-Schematics/Cloud-Foundry-App. A 'Variable values' section allows setting variables like kubeversion, resource_group, plan, etc. A modal at the bottom right shows a 'Save as a group' dialog with a 'Save and generate' button.

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int	1.15	<input type="checkbox"/>
resource_group	The resource group for provisioning	string	dev	<input type="checkbox"/>
plan	The type of plan	string	premium	<input type="checkbox"/>
datacenter	The datacenter to provision the cluster	string	wdc07	<input type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input type="checkbox"/>
sl_user_name	Username	string	iswan17	<input type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input type="checkbox"/>
temp_key	Temporary key	int	149005	<input type="checkbox"/>
profile	Profile	string	bx208x32	<input type="checkbox"/>
basename	Basename	string	cluster	<input type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input type="checkbox"/>

Prototyping

Second Create flow

Left Screenshot (Initial State):

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int		<input type="checkbox"/>
resource_group	The resource group for provisioning	string		<input type="checkbox"/>
plan	The type of plan	string		<input type="checkbox"/>
datacenter	The datacenter to provision the cluster	string		<input type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input type="checkbox"/>
sl_user_name	Username	string	iswan17	<input type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input type="checkbox"/>
temp_key	Temporary key	int	149005	<input type="checkbox"/>
profile	Profile	string	bx208x32	<input type="checkbox"/>
basename	Basename	string	cluster	<input type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input type="checkbox"/>

Right Screenshot (After Changes):

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int	1.15	<input type="checkbox"/>
resource_group	The resource group for provisioning	string	dev	<input type="checkbox"/>
plan	The type of plan	string	premium	<input type="checkbox"/>
datacenter	The datacenter to provision the cluster	string	lon04	<input type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input type="checkbox"/>
sl_user_name	Username	string	iswan17	<input type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input type="checkbox"/>
temp_key	Temporary key	int	149005	<input type="checkbox"/>
profile	Profile	string	bx208x32	<input type="checkbox"/>
basename	Basename	string	cluster	<input type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input type="checkbox"/>

Prototyping

Designing for understanding

Including the ability to save the variables as a group upon generation of the plan facilitated user understanding of the group concept.

The screenshots illustrate the evolution of a workspace configuration interface:

- Screenshot 1:** Shows the workspace overview with basic details like Workspace ID (myworkspace), Resource group (Default), and a list of variables in the Variable values table.
- Screenshot 2:** Similar to the first, but the variable values table has been populated with specific values for each variable.
- Screenshot 3:** A modal dialog titled "Save as a group" is displayed, asking if you want to save the current group of variables. It includes a "Save and generate" button.

Variable values table (Visible in all three screenshots):

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int	1.15	<input type="checkbox"/>
resource_group	The resource group for provisioning	string	dev	<input type="checkbox"/>
plan	The type of plan	string	premium	<input type="checkbox"/>
datacenter	The datacenter to provision the cluster	string	wdc07	<input type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input type="checkbox"/>
sl_user_name	Username	string	iswan17	<input type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input type="checkbox"/>
temp_key	Temporary key	int	149005	<input type="checkbox"/>
profile	Profile	string	bx208x32	<input type="checkbox"/>
basename	Basename	string	cluster	<input type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input type="checkbox"/>

Prototyping

Designing for discoverability

Users also quickly discovered the dropdown.

The screenshot shows the 'myworkspace2' workspace details page. The 'Settings' tab is selected. Under 'Variable values', there is a table with columns: Name, Description, Type, Value, and Sensitive. The table contains the following data:

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int	1.15	<input checked="" type="checkbox"/>
resource_group	The resource group for provisioning	string	dev	<input checked="" type="checkbox"/>
plan	The type of plan	string	premium	<input checked="" type="checkbox"/>
datacenter	The datacenter to provision the cluster	string	lon04	<input checked="" type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input checked="" type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input checked="" type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input checked="" type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input checked="" type="checkbox"/>
sl_user_name	Username	string	jswan17	<input checked="" type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input checked="" type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input checked="" type="checkbox"/>
temp_key	Temporary key	int	149005	<input checked="" type="checkbox"/>
profile	Profile	string	bx208x32	<input checked="" type="checkbox"/>
basename	Basename	string	cluster	<input checked="" type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input checked="" type="checkbox"/>

The screenshot shows the same workspace details page as the first one, but with a dropdown menu open. The 'Group' dropdown is set to 'prod'. The table of variable values remains the same as in the first screenshot.

Prototyping

Designing for ease of use

Users also easily grasped the concept of groups through the dropdown.

The image displays two side-by-side screenshots of the IBM Cloud Workspaces interface, illustrating the concept of variable grouping.

Screenshot 1 (Left): Shows the 'myworkspace2' workspace settings. In the 'Variable values' section, there is a 'Group' dropdown menu labeled 'Choose an option'. A search bar below it shows 'myworkspace-cloudfound...'. The table lists various variables with their descriptions, types, and values. For example, 'kubeversion' is set to '1.15' and 'resource_group' is set to 'dev'.

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int	1.15	<input checked="" type="checkbox"/>
resource_group	The resource group for provisioning	string	dev	<input checked="" type="checkbox"/>
plan	The type of plan	string	premium	<input checked="" type="checkbox"/>
datacenter	The datacenter to provision the cluster	string	lon04	<input checked="" type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input checked="" type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input checked="" type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input checked="" type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input checked="" type="checkbox"/>
sl_user_name	Username	string	jswan17	<input checked="" type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input checked="" type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input checked="" type="checkbox"/>
temp_key	Temporary key	int	149005	<input checked="" type="checkbox"/>
profile	Profile	string	bx208x32	<input checked="" type="checkbox"/>
basename	Basename	string	cluster	<input checked="" type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input checked="" type="checkbox"/>

Screenshot 2 (Right): Shows the same workspace settings with a different grouping. The 'Group' dropdown now shows 'prod'. The table data remains the same as in Screenshot 1.

Name	Description	Type	Value	Sensitive
kubeversion	Version of Kubernetes	int	1.15	<input checked="" type="checkbox"/>
resource_group	The resource group for provisioning	string	dev	<input checked="" type="checkbox"/>
plan	The type of plan	string	premium	<input checked="" type="checkbox"/>
datacenter	The datacenter to provision the cluster	string	lon04	<input checked="" type="checkbox"/>
c_pub_vlan	C Public VLAN	int	981423	<input checked="" type="checkbox"/>
machine_type	The type of the machine flavor	string	b2c16x64	<input checked="" type="checkbox"/>
private_vlan_id	Private VLAN ID	int	104242	<input checked="" type="checkbox"/>
public_vlan_id	Public VLAN ID	int	149991	<input checked="" type="checkbox"/>
sl_user_name	Username	string	jswan17	<input checked="" type="checkbox"/>
pool_size	No of workers in default pool	int	1	<input checked="" type="checkbox"/>
region	Enter the IBM Cloud region	string	us-central	<input checked="" type="checkbox"/>
temp_key	Temporary key	int	149005	<input checked="" type="checkbox"/>
profile	Profile	string	bx208x32	<input checked="" type="checkbox"/>
basename	Basename	string	cluster	<input checked="" type="checkbox"/>
subnet_zone	Subnet zone	string	central-1	<input checked="" type="checkbox"/>



Thank You!