Cluster API Feature Group: In-place upgrades

Zoom meeting link (passcode: 77777)

TOP LEVEL DOC: Cluster API Project Meeting Notes

⚠️ **For edit access to this document, join the sig cluster lifecycle mailing list.**

Cluster API In-place upgrades Feature Group Meeting Times:

- 8am PT on Wednesdays, weekly (11am Eastern, 4pm UK time)

Mission

- sig-cluster-lifecycle (SCL)
- Cluster API

Meeting Etiquette

- Use the Raise hand feature of zoom (click Reactions, then raise hand) to continue the current topic by expanding on a point, disagreeing, responding, etc.
- Edit the agenda (this document) to add a new, unrelated topic.
- The moderator for each meeting should help keep us on track by encouraging participants to add new topics to the agenda as we go.

Instructions for facilitators

- Get the host key from one of the maintainers
- Wait a few minutes for people to arrive (09:02 PT)
- Record the meeting to your computer - do not choose cloud recording
- Introduce the meeting “This is the Kubernetes SIG Cluster Lifecycle Cluster API Office Hours of [date].” Notify participants that we are abiding by the CNCF Code of Conduct.
- Ask participants to use the “raise hands” feature, and keep the Participants window open (or docked against the zoom window).
- Share your screen with the agenda, so it’s available for the recording.

[Template] Wed XX Month - 8am Pacific

Recording: TODO
Host: TBD

Attending

- <<add your name here>>

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [your name] <add your agenda items here>

Notes summary from weeks between May 21th and June 5th

- The CAPI objects (Machines, InfraMachineTemplate, etc.) are updated by CAPI controllers (CP and MD controllers) and not by the external upgraders. This means we need a way for external upgraders to communicate back the progress to CAPI controllers.
- Machines and MachineSets define the desired state of the machines and hence are updated before the actual in-place upgrade starts.
- When Machines in a MachineDeployment need to be updated, a new MachineSet is created with the new spec and Machines are moved one by one from the old MachineSet to the new one.
- The external upgrade semantics work at the machine level: the requests are to upgrade one machine and not a group of machines.
- CAPI controllers decide the order the machines are upgraded and how many machines can be upgraded at once.
- Although the original design allowed for external upgraders to implement their own ordering for upgrades, we are de-scoping that (consequence of the upgrade request being at a machine level). If we ever want to allow to customise this logic, we would probably introduce a separate runtime extension that doesn't need to be coupled to external upgrades.
- If external upgraders need to know anything about the rest of machines in a group (like number of machines in a MD or CP, k8s version of other machines, etc.) they should query the cluster to obtain this information. This info won't be in the upgrade request.
- There won't be any restriction about k8s version upgrades in the external upgrade logic. If we want to prevent consecutive updates that try to skip versions, this should be done at the validation level, preventing the user from even making the api change.
- CAPI controllers will track the Machine upgrade process by polling a sync API that external upgraders must implement. When the upgrade is not complete, this API endpoint might allow external upgraders to respond with the amount of time it should be waiting before the next pull.

- We want external upgraders to be able to only take care of part of the upgrade. This allows specialised upgraders that take care of one thing, favouring reusability and avoiding re-implementing the same functionality in multiple places: k8s version upgraders, file updater, OS updater, infra machine (metadata, compute resources, etc.) updater, etc.
- CAPI controllers will iterate over the registered external upgraders, asking them if they can take care of the request. These will be able to respond with the set of changes they are equipped to upgrade (all the requested changes, a subset of them or none of them). CAPI controllers will keep subtracting from the total set of changes until either all upgraders are questioned or the set is empty. If the set is not empty, the controllers will consider the changes not “in-place upgradable” and look for fallback strategies.
- If the set of changes is “in-place upgradable”, the CAPI controller will define an “upgrade plan”, with a list of external upgraders to be executed in a particular order. Then, it will update the first machine spec and run these external upgraders in order, only moving to the next one after the previous one has successfully completed. Once all upgraders have been executed for a particular machine, it will repeat the process for the next one.
- In order for CAPI to control the order of execution, external upgraders will implement another endpoint to start the upgrade on a particular Machine.

Tue 14 May - 7am Pacific

Recording: TODO
Host: TBD

Attending

- Furkat Gofurov, Alex Demicev - SUSE
- Guillermo Gaston - AWS

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you’d like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [your name] <add your agenda items here>

Wed 24 April- 8am Pacific

Recording: TODO
Host: TBD

Attending

- Furkat Gofurov - SUSE
- Dharmjit Singh - VMware by Broadcom

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Dharmjit Singh] <add your agenda items here>

Wed 19 April- 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Alex Demicev, Furkat Gofurov - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [your name] <add your agenda items here>

Wed 17 April- 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Alex Demicev - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Continue conversation from the day before
    - [Guillermo] List of real life use-cases for in-place
    - [your name] <add your agenda items here>

Tue 16 April- 8am Pacific

Attending

- Furkat Gofurov, Alex Demicev - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - Alex - Testing in-place upgrades
        - [Alex] Added a section to the proposal about testing with CAPD https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?view#Test-Plan
        - [Alex] CAPD-kubeadm upgrader will be a reference implementation
        - [Alex] We should try to keep it simple so we can maintain it with less time
        - [Alex] This will be a good way to test fallback mechanism
    - Furkat - we should invest in "marketing the idea": why in place is valuable, how does it fit in the CAPI history, how does it relate with immutability, why now
        - [Furkat] Will add couple lines about growing interest in on-premises platforms in Motivation part
        - The main idea is, in the context of CAPI started with immutability in mind, and they often refer to CAPI machine as being immutable. However, after growing interest and number of on-premise infrastructure providers with different use cases (i.e in-place upgrades), there is a need now to think about mutability in CAPI since that is not a new in the project where things like in-place label/annotation propagation is already supported.

- [Qi Liang] Added a section on remediation and in-place upgrade working together
  - New section: https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?view#Machine-Health-check
- [Qi Liang] Update or upgrade, naming problem
  - [Qi Liang] Update is more generic and should be a more appropriate name
  - [Alex] Update is also currently used in CAPI API https://github.com/kubernetes-sigs/cluster-api/blob/main/api/v1beta1/machinedeployment_types.go#L164
- [Furkat] Let's meet tomorrow again as usual at 8am Pacific time to go through remaining points from the meetings on 27th March.

Wed 10 April- 8am Pacific

Cancelled

Wed 03 April- 8am Pacific

Cancelled

Wed 27 March - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Furkat Gofurov - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Go over Fabrizio's feedback and split the work
        - We should invest in "marketing the idea": why in place is valuable, how does it fit in the CAPI history, how does it relate with immutability, why now…
            - [Guillermo] This is probably just adding more info to the doc and doesn't need to change the design: where do we come from, why we want this now and we didn't do it before, why capi started with immutability, why is capi now in a place where we feel confident removing that axiom…
            - Furkat is taking this to think and will present ideas next week.
        - It is required to think a little bit more about the API and UX: conditions, timeouts, API field names, fallback strategy…
            - [Guillermo] We need more time to think about this. Go comment by comment and see if we want to push for what we have or we want to change. Specially conditions set by an external controller seem to be a contentious topic.
        - We should not defer to external upgrader the task to upgrade CAPI objects (duplication of efforts, too risky)
            - Guillermo: we can explore moving this back to capi controllers (CP and MD). The external upgrader still takes care of the condition. When this condition becomes true, the capi controllers update the machine and other objects.
                - The problem with this is now the whole concept of external upgrader is tied to in-place upgrades where machines need to be updated in place. The original idea was that the external upgrader could be used for any kind of custom upgrade logic, including rolling upgrades.
            - Furkat: not necessarily better, but let's explore it.
            - Guillermo is taking this to think and will present ideas next week.
        - Suspending remediation while in-place upgrading is a regression, we should think how to make things to work together
            - [Guillermo]: maybe we were being a bit too conservative. Can we just allow it? The risk is to delete a machine too early while it's still being updated. We could have a configurable timeout that the capi controllers respect and allow a machine to be

unhealthy if it's marked as "upgrade in process". In the end, MHC are optional and users can decide not to use them if they consider them too risky or not fitting their usecase, we don't have to prescribe one way or the other.
        - [Furkat]: +1 to explore this
    - We should plan for a stronger test signal on this effort
        - [Furkat] Is this a messaging problem? Maybe we didn't explain what we are intending on testing and why we don't have to implement an external upgrader, since the only thing that capi is offering here is an integration point.
            - Is IPAM an example here we can follow? Does capi have an internal implementation of the IPAM provider for testing?
        - [Guillermo] If we only need this for testing, we can be very intentional in narrowing the scope of the testing upgrader. For example: only for capd: execute some commands with `docker exec` to download the new `kubeadm` version and just run the upgrade command. It might require a bit more work than this, but it sounds like something doable.
- [your name] <add your agenda items here>

Wed 13 March - 8am Pacific

- Meeting cancelled, no topics
- Waiting for early feedback from some folks on doc

Wed 6 March - 8am Pacific

- Meeting cancelled, we'll resume next week

Wed 28 February - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- <<add your name here>>

Agenda

- Welcome new attendees!

- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Added new section for conditions: https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?view#Conditions
    - [Alex] Is it ready for PR?
        - We will ask furkat and dharmjit on slack
        - Guillermo will create PR when ready and own answering and processing review comments
    - [your name] <add your agenda items here>

Wed 21 February- 8am Pacific

Meeting cancelled, we will resume next week.

Wed 14 February - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Dharmjit Singh - VMware by Broadcom
- Guillermo Gaston - AWS
- Furkat Gofurov - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Dharmjit] Are there any comments around the section https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?both#Reflecting-the-relevant-Machine-Images-in-the-CAPI-CRs

Wed 7 February - 8am Pacific

Recording: TODO
Host: Furkat Gofurov

Attending

- Guillermo Gaston - AWS
- Furkat Gofurov, Alex Demicev - SUSE

- Qi Liang - Microsoft

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Dharmjit additions: https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?both#Reflecting-the-relevant-Machine-Images-in-the-CAPI-CRs
        - We will discuss the details once everyone has a chance to review and discuss it next week
    - [Guillermo] From a couple weeks ago, design extension proposal
        - https://hackmd.io/CM9pJl4bQJOnjFjwudJcbg?view
        - We will work on this separately and keep out of the main design scope, since it builds on top of it and doesn't condition it.
        - This will probably be the "phase 2" of our effort to implement in-place upgrades in capi
    - [your name] <add your agenda items here>

Wed 31 January - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Furkat Gofurov - SUSE
- <<add your name here>>

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Review changes to https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?view
        - Added comments about changes and additions
        - Furkat will take this for next week
    - Review for this one is moved to next week https://hackmd.io/CM9pJl4bQJOnjFjwudJcbg?view
    - [your name] <add your agenda items here>

[Template] Wed 24 January - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Dharmjit Singh - VMware by Broadcom
- Qi Liang - Microsoft
- Furkat Gofurov, Alex Demicev - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Review CAEP doc changes: https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?view
        - New proposed idea/patter: https://hackmd.io/CM9pJl4bQJOnjFjwudJcbg?view
            - Please take a look and leave feedback so we can review it next week
        - Next steps:
            - Review new UpgradeTask doc
            - Add more context to some sections, specially around infra machine image
            - Talk again about one webhook vs two for CP/MachineDepoyment external upgrade
            - Furkat: will work on remaining sections at the bottom
            - Dharmjit: will complete the sections I already started working on
    - [your name] <add your agenda items here>

Wed 17 January - 8am Pacific

Recording: TODO
Host: TBD

Meeting cancelled because no one could attend. Agenda will be moved to next week.

Attending

- Guillermo Gaston - AWS
- <<add your name here>>

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Review CAEP doc changes: https://hackmd.io/Wv_u2xXJQsaj4wWFQ3PqCQ?view
    - [your name] <add your agenda items here>

Wed 10 January- 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston, Abhinav Pandey - AWS
- Dharmjit Singh - VMware by Broadcom
- Furkat Gofurov, Alex Demicev - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Are we ready to start working on the CAPI proposal?
        - [Dharmjit] Yeah, we can start. Do we get feedback from the broader community first or do we do it through the proposal?
        - [Guillermo] We should get feedback from the community through the actual proposal. We can put it up even if it's not complete.
        - Guillermo to create the first draft and send you a link.
    - [Dharmjit] Questions regarding Design Gap 1
        - Do we need to solve for MHC/remediation for in-place upgrades differently?
        - [Dharmjit] We can identify this as a future goal in the design doc based on consensus and just mention the annotation to disable them as the short term solution.
    - [Furkat] Timeline?
        - [Guillermo] Maybe a month from now to have the PR ready for review?

Wed 3 January- 8am Pacific

Meeting cancelled, we will resume next week.

Wed 20 December - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Dharmjit Singh - VMware by Broadcom
- Furkat Gofurov - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Review async tasks for doc from last week
        - [Dharmjit] Updating Machine/OS Image

Wed 13 December - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Dharmjit Singh - VMware by Broadcom
- Guillermo Gaston - AWS

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Review gaps and todos from the design doc: https://hackmd.io/ZO8fqUOQQSuR1MHp1-43wQ
    - [Guillermo] Should we cancel next week's meeting for the holidays? Most people are off.
        - Yes, **next week's meeting is cancelled**.
    - [your name] <add your agenda items here>

Wed 6 December- 8am Pacific

Recording: TODO

Host: TBD

Attending

- Guillermo Gaston - AWS
- Qi Liang - Microsoft

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Gaps/TODOs in design doc
        - None identified yet.
        - Qi is going to add some based on his previous comments (around machine remediation in KCP, etc.)
    - [Guillermo] Thoughts on PoC?
        - Not reviewed yet, leaving for next week.
    - [your name] <add your agenda items here>

Wed 29 November - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Dharmjit Singh - VMware
- Furkat Gofurov, Chris Kim, Alex Demicev - SUSE
- Yanzhao Wang - Microsoft

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Let's talk about scope based on collected usecases
        - Let's cover
            - Only k8s version upgrade
                - OS updates are out of scope but we won't prevent them if the proposed solution allows folks to implement them using the same strategy

                - Any infra provider
                - Any bootstrap provider
                - Any CP provider that uses Machines
    - [Guillermo] Comparing the two current proposed solutions
        - Starting with the one in hackmd
        - We want to include the google doc ideas in the “alternatives” section of the hackmd one.
        - Next steps
            - [Dharmjit] Add alternatives ideas pointing to other doc
            - [Guillermo] Share PoC code
                - https://github.com/kubernetes-sigs/cluster-api/compare/main...g-gaston:cluster-api:in-place-upgrades-poc
            - [Guillermo] Give write permissions to hackmd
            - [Everyone] Identify design doc gaps and TODOs
    - [your name] <add your agenda items here>

Wed 22 November - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Dharmjit Singh - VMware
- Qi Liang, Yanzhao Wang - Microsoft

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you’d like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Lazy consensus on Use cases doc. New use-cases?
    - [Guillermo] Comments on https://hackmd.io/@gstn/rkWgYh74a (moved to new doc: https://hackmd.io/ZO8fqUOQQSuR1MHp1-43wQ)
    - [Dharmjit] Controlled mutability for in-place upgrade- https://docs.google.com/document/d/1VXE5FdTkhB9CgHH8RwUB29EkUobizhzUhcB-cWJm2PA/edit?usp=sharing
        - [Guillermo] Next steps: include reference to this in the other doc on alternatives section and come up with a pros/cons comparison between the two ideas.

Wed 15 November - 8am Pacific

Recording: TODO

Host: TBD

Attending

- Dharmjit Singh, Shivani Singhal - VMware
- Alex Demicev, Furkat Gofurov, Danil Grigorev - SUSE
- Guillermo Gaston - AWS
- Qi Liang, Yanzhao Wang - Microsoft
- Mcbenjemaa - IONOS Cloud

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Use-cases closed?
        - https://docs.google.com/document/d/1nPGWB1ctG7Fg78NPWjF0Q1yIFXvy5dwDzGcCZqCi_08/edit#heading=h.hw8jsdleqz6v
        - [Alex] Lazy consensus Wed next week.
        - [Dharmjit] Are there any use cases around what need to be considered for in-place upgrades? That is only K8s version, or kubernetes configurations or OS configurations?
    - [Guillermo] Let's talk about scope.
        - 4 fold problem
            - UX: has to be the same as rolling update. Both need to be compatible with the capi config
            - CP/MD controllers integration
            - How is the upgrade process run inside of nodes
            - How are CAPI Machine (and other) objects updated
    - [Guillermo] Collection of thoughts: https://hackmd.io/@gstn/rkWgYh74a (moved to new doc: https://hackmd.io/ZO8fqUOQQSuR1MHp1-43wQ)
        - Original doc that started the conversation, not a complete design, just for history: https://docs.google.com/document/d/1CqQ1SAqJD264PsDeMj_Z3HhZxe7DViNkpJ9d5q-2Zck/edit#heading=h.vum8h55q3k9f

Wed 9 November - 8am Pacific

Meeting cancelled because of Kubecon.

Wed 1 November - 8am Pacific

Recording: TODO
Host: TBD

Attending

- Guillermo Gaston - AWS
- Furkat Gofurov, Alex Demicev - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [your name] <add your agenda items here>
    - [Guillermo] Look over use-cases doc
    - [Guillermo] microk8s implementation
        - Certificate renewal (Alex) OS upgrades (Chris)
            - In scope? Maybe not but we should take into consideration
            - [Guillermo] Want to start small but we should think about it.
            - [Chris] We should plan for the future because it might be the next thing to come. We don't want to run into a one way door.
    - [Chris Kim] Talk about CAPR (cluster-api-provider-rancher)

Wed 25 October - 8am Pacific

Recording: TODO
Host: Guillermo

Attending

- Guillermo Gaston - AWS
- Mayur Das, Dharmjit Singh - VMware
- Furkat Gofurov - SUSE

Agenda

- Welcome new attendees!
- Discussion Topics
  Use this section for PSAs, demos, topics you'd like to discuss, issues or pull requests that might need more attention, or any generic questions.
    - [Guillermo] Presentations
    - [Guillermo] Let's talk use cases
        - Guillermo
            - Baremetal
                - Single node
                - Multi-node
                    - Host level customization
                        - Network config

                - Cev updates
                - Kernel updates
                - …
            - No extra hardware
            - Replace OnDelete doesn't work for everyone
        - Air-gapped
    - Dharmjit
        - vSphere
            - Single Node
                - Customizations at VM and OS level for Telco high performance and resource hungry workloads
                - Reduce downtime for applications
                    - Downtime is expected, goal to minimise it.
    - Mayur
        - Renew certs without replacing machines.
        - Guillermo: maybe not in scope for this group? But needs to be considered and surfaced.
        - Mayur: this might be a gap in the experience if we don't cover it, so we need to at least cover the problem in our design/proposal.
        - Dharmjit: the use-case is valid but lets start small, and slowly increase the scope. It might be helpful to keep this in mind while designing this feature.
    - Furkat
        - Bootstrap providers different than kubeadm.
    - Questions to answer in the future
        - Furkat: what about other bootstrap providers that are not kubeadm? SUSE has a different bootstrap provider.
        - Furkat: for single node what to do if something goes wrong? back-up/restore?
            - Guillermo: vote to have this out of scope.
            - SUSE has something in place. We might be able to learn from it/leverage it.
- [Guillermo] Prior art?
    - Dharmjit
        - Looked at the ecosystem but it seems like there is nothing out there that uses capi for the upgrades, there is stuff out there doing the upgrades orthogonally to capi.
        - There are in-place upgrade offerings out there in the ecosystem but these are not directly associated with CAPI or probably use proprietary control planes. Openshift uses machine-config-operator/OSTree commits and Rancher has system-upgrade-controller which could execute scripts in the K8s node. Hyperscalers provide their own specialized container operating systems which could do in-place upgrades via A/B upgrades.

        - Mayur
            - https://github.com/canonical/microk8s
            - https://cluster-api.sigs.k8s.io/tasks/control-plane/microk8s-control-plane
        - Guillermo
            - Been thinking about a set of ideas on how to do this
                - Implement logic outside capi but hooking into capi
                    - Allows faster iteration
                    - Allows different implementations for different scenarios (different bootstrap providers, etc.)
                - This gets configured in capi through a `external` upgrade strategy
    - Next steps
        - Finalise use cases first
            - Guillermo to compile everything we talked about today and share with this group for edits and with the community so they can add more.
            - Tracking use-cases here: https://docs.google.com/document/d/1nPGWB1ctG7Fg78NPWjF0Q1yIFXvy5dwDzGcCZqCi_08/edit#heading=h.hw8jsdleqz6v