

This started in <https://github.com/kubernetes-sigs/gateway-api-inference-extension/pull/1173> (<https://github.com/kubernetes-sigs/gateway-api-inference-extension/pull/1173/files#r227795013> specifically) but is broader than that. Sorry it got long, please loop other folks in as needed.

The question is how we should handle required / optional for non-pointer struct fields, how that might differ between CRD and built-ins, and how that might change when the fields =~ a subresource.

PART ONE:

Consider a built-in type with this construction:

```
...
type Foo struct {
    metav1.TypeMeta `json:",inline"`

    // +optional
    Bar Bar `protobuf:"bytes,9,opt,name=bar"`
}

type Bar struct {
    // +required
    Baz string `json:"baz,omitempty" protobuf:"bytes,7,opt,name=baz"`
}
...
```

Declarative validation seeks to drive logic from these tags. A Go client might create a Foo with any of these forms:

```
...
Foo{} // Bar is not specified

Foo{ Bar: Bar{} } // Bar is zero-value

Foo{ Bar: Bar{ Baz: "" } } // Baz is invalid
...
```

All of these produce the same Go object, even though there SEEMS to be a distinction being made by whomever wrote these.

If you bypass Go and look at it from a JSON encoding, a client might send any of these forms:

```
...
{}
```

```
{ "bar": null }
```

```
{ "bar": {} }
```

```
{ "bar": { "baz": null } }
```

```
{ "bar": { "baz": "" } }
```

```
...
```

All of those will decode to the same Go type, even though there SEEMS to be a distinction being made.

If you look at the proto encoding, it says Bar is optional but the generated code ALWAYS serializes the tag for it.

Declarative validation for built-in types operates on the Go object, and so doesn't know whether to skip validating `.bar` (because it is optional and was not specified) or to report that `.bar.baz` is a required value (because the `.bar` field EXISTS in the Go type). For the moment, DV just says that you can't call a non-pointer struct "optional" at all. That said, we DO call them optional in many places(see appendix), but we do not currently DO ANYTHING with that.

For the same construct in CRD, if I understand, we CAN tell the difference between present and absent (it's effectively a pointer), because the server doesn't use the Go type. As soon as we decode into a typed client, the distinction is lost.

So my first questions are:

- Do we want these tags to be different in built-in vs. CRD?
- If no, what should we do to normalize them?

We could say that non-pointer structs are neither optional nor required, and that only scalar fields can be optional/required.

OR we could say that optional non-pointer struct fields are OK, but ONLY IF they have no required fields (which would cause an error). Declarative validation can do a zero-value check on the struct or we can just ignore that and do field-by-field optional checks. Same result. (Similarly, a required struct with no required fields is weird and should perhaps be flagged as wrong).

That leaves optional non-pointer struct fields with required child fields as the only corner case. This leads to...

PART TWO:

Consider a similar construction:

```
...
type Foo struct {
    metav1.TypeMeta `json:",inline"`

    // +optional
    Spec FooSpec `protobuf:"bytes,9,opt,name=spec"`

    // +optional
    Status FooStatus `protobuf:"bytes,9,opt,name=status"`
}

type FooSpec struct {
    // +required
    SpecField string `json:"specField,omitempty" protobuf:"bytes,7,opt,name=specField"`
}

type FooStatus struct {
    // +required
    StatusField string `json:"statusField,omitempty" protobuf:"bytes,7,opt,name=statusField"`
}
...
```

``Foo.spec`` corresponds to the `"/"` subresource and ``Foo.status`` to the `"/status"` subresource. If things are working right, a user CAN'T set status fields on a create op, and CAN'T set spec fields on a `"/status"` update. So what does required even mean?

Declarative validation has automatic ratcheting, so the update to ``.status`` will ignore ``.spec`` as long as it is unchanged (which it should always be, thanks to field wiping).

Questions:

- Does this mean that every field underneath status MUST be optional (or optional+default), so that validation passes upon create?
- Or should we be more explicit that a field can be "required for /status operations"?
- Or should we make ``.status`` tagged such that validation of a `"/"` operation ignores it? And vice-versa?
- How does this extend to potential other subresources?
- Should we ever be calling ``.spec`` optional in the first place?

Appendix I: Use of optional / required non-pointer struct fields

I wrote a quick tool to see how often we do this:

Optional

- `k8s.io/api/admission/v1.AdmissionRequest.Object` is an optional non-pointer struct
- `k8s.io/api/admission/v1.AdmissionRequest.OldObject` is an optional non-pointer struct
- `k8s.io/api/admission/v1.AdmissionRequest.Options` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.MutatingWebhookConfiguration.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.MutatingWebhookConfigurationList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.ValidatingAdmissionPolicy.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.ValidatingAdmissionPolicy.Status` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.ValidatingAdmissionPolicyBinding.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.ValidatingAdmissionPolicyBindingList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.ValidatingAdmissionPolicyList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.ValidatingWebhookConfiguration.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/admissionregistration/v1.ValidatingWebhookConfigurationList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ControllerRevision.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ControllerRevisionList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.DaemonSet.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.DaemonSet.Spec` is an optional non-pointer struct
- `k8s.io/api/apps/v1.DaemonSet.Status` is an optional non-pointer struct
- `k8s.io/api/apps/v1.DaemonSetCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/apps/v1.DaemonSetList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.DaemonSetSpec.UpdateStrategy` is an optional non-pointer struct
- `k8s.io/api/apps/v1.Deployment.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.Deployment.Spec` is an optional non-pointer struct
- `k8s.io/api/apps/v1.Deployment.Status` is an optional non-pointer struct
- `k8s.io/api/apps/v1.DeploymentList.ListMeta` is an optional non-pointer struct

- `k8s.io/api/apps/v1.DeploymentSpec.Strategy` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ReplicaSet.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ReplicaSet.Spec` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ReplicaSet.Status` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ReplicaSetCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ReplicaSetList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.ReplicaSetSpec.Template` is an optional non-pointer struct
- `k8s.io/api/apps/v1.StatefulSet.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/apps/v1.StatefulSet.Spec` is an optional non-pointer struct
- `k8s.io/api/apps/v1.StatefulSet.Status` is an optional non-pointer struct
- `k8s.io/api/apps/v1.StatefulSetCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/apps/v1.StatefulSetList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/authentication/v1.SelfSubjectReview.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/authentication/v1.SelfSubjectReviewStatus.UserInfo` is an optional non-pointer struct
- `k8s.io/api/authentication/v1.TokenRequest.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/authentication/v1.TokenRequest.Status` is an optional non-pointer struct
- `k8s.io/api/authentication/v1.TokenReview.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/authentication/v1.TokenReview.Status` is an optional non-pointer struct
- `k8s.io/api/authentication/v1.TokenReviewStatus.User` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.LocalSubjectAccessReview.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.LocalSubjectAccessReview.Status` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.SelfSubjectAccessReview.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.SelfSubjectAccessReview.Status` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.SelfSubjectRulesReview.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.SelfSubjectRulesReview.Status` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.SubjectAccessReview.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/authorization/v1.SubjectAccessReview.Status` is an optional non-pointer struct
- `k8s.io/api/autoscaling/v1.HorizontalPodAutoscaler.ObjectMeta` is an optional non-pointer struct

- `k8s.io/api/autoscaling/v1.HorizontalPodAutoscaler.Spec` is an optional non-pointer struct
- `k8s.io/api/autoscaling/v1.HorizontalPodAutoscaler.Status` is an optional non-pointer struct
- `k8s.io/api/autoscaling/v1.HorizontalPodAutoscalerCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/autoscaling/v1.HorizontalPodAutoscalerList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/autoscaling/v1.Scale.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/autoscaling/v1.Scale.Spec` is an optional non-pointer struct
- `k8s.io/api/autoscaling/v1.Scale.Status` is an optional non-pointer struct
- `k8s.io/api/batch/v1.CronJob.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/batch/v1.CronJob.Spec` is an optional non-pointer struct
- `k8s.io/api/batch/v1.CronJob.Status` is an optional non-pointer struct
- `k8s.io/api/batch/v1.CronJobList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/batch/v1.Job.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/batch/v1.Job.Spec` is an optional non-pointer struct
- `k8s.io/api/batch/v1.Job.Status` is an optional non-pointer struct
- `k8s.io/api/batch/v1.JobCondition.LastProbeTime` is an optional non-pointer struct
- `k8s.io/api/batch/v1.JobCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/batch/v1.JobList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/batch/v1.JobTemplateSpec.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/batch/v1.JobTemplateSpec.Spec` is an optional non-pointer struct
- `k8s.io/api/certificates/v1.CertificateSigningRequest.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/certificates/v1.CertificateSigningRequest.Status` is an optional non-pointer struct
- `k8s.io/api/certificates/v1.CertificateSigningRequestCondition.LastUpdateTime` is an optional non-pointer struct
- `k8s.io/api/certificates/v1.CertificateSigningRequestCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/certificates/v1.CertificateSigningRequestList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/coordination/v1.Lease.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/coordination/v1.Lease.Spec` is an optional non-pointer struct
- `k8s.io/api/coordination/v1.LeaseList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Binding.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ComponentStatus.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ComponentStatusList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ConfigMap.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ConfigMapList.ListMeta` is an optional non-pointer struct

- `k8s.io/api/core/v1.Container.Resources` is an optional non-pointer struct
- `k8s.io/api/core/v1.ContainerStateRunning.StartedAt` is an optional non-pointer struct
- `k8s.io/api/core/v1.ContainerStateTerminated.StartedAt` is an optional non-pointer struct
- `k8s.io/api/core/v1.ContainerStateTerminated.FinishedAt` is an optional non-pointer struct
- `k8s.io/api/core/v1.ContainerStatus.State` is an optional non-pointer struct
- `k8s.io/api/core/v1.ContainerStatus.LastTerminationState` is an optional non-pointer struct
- `k8s.io/api/core/v1.Endpoints.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.EndpointsList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.EphemeralContainerCommon.Resources` is an optional non-pointer struct
- `k8s.io/api/core/v1.Event.Source` is an optional non-pointer struct
- `k8s.io/api/core/v1.Event.FirstTimestamp` is an optional non-pointer struct
- `k8s.io/api/core/v1.Event.LastTimestamp` is an optional non-pointer struct
- `k8s.io/api/core/v1.Event.EventTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.EventList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.LimitRange.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.LimitRange.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.LimitRangeList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.List.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Namespace.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Namespace.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.Namespace.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.NamespaceCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.NamespaceList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Node.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Node.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.Node.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.NodeCondition.LastHeartbeatTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.NodeCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.NodeDaemonEndpoints.KubeletEndpoint` is an optional non-pointer struct
- `k8s.io/api/core/v1.NodeList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.NodeStatus.DaemonEndpoints` is an optional non-pointer struct
- `k8s.io/api/core/v1.NodeStatus.NodeInfo` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolume.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolume.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolume.Status` is an optional non-pointer struct

- `k8s.io/api/core/v1.PersistentVolumeClaim.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeClaim.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeClaim.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeClaimCondition.LastProbeTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeClaimCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeClaimList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeClaimSpec.Resources` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeClaimTemplate.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PersistentVolumeList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Pod.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Pod.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.Pod.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodCondition.LastProbeTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodCondition.LastTransitionTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodStatusResult.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodStatusResult.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodTemplate.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodTemplate.Template` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodTemplateList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodTemplateSpec.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.PodTemplateSpec.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.PreferAvoidPodsEntry.EvictionTime` is an optional non-pointer struct
- `k8s.io/api/core/v1.RangeAllocation.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ReplicationController.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ReplicationController.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.ReplicationController.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.ReplicationControllerCondition.LastTransitionTime` is an optional non-pointer struct

- `k8s.io/api/core/v1.ReplicationControllerList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ResourceFieldSelector.Divisor` is an optional non-pointer struct
- `k8s.io/api/core/v1.ResourceQuota.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ResourceQuota.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.ResourceQuota.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.ResourceQuotaList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Secret.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.SecretList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.SerializedReference.Reference` is an optional non-pointer struct
- `k8s.io/api/core/v1.Service.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.Service.Spec` is an optional non-pointer struct
- `k8s.io/api/core/v1.Service.Status` is an optional non-pointer struct
- `k8s.io/api/core/v1.ServiceAccount.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ServiceAccountList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ServiceList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/core/v1.ServicePort.TargetPort` is an optional non-pointer struct
- `k8s.io/api/core/v1.ServiceStatus.LoadBalancer` is an optional non-pointer struct
- `k8s.io/api/discovery/v1.EndpointSlice.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/discovery/v1.EndpointSliceList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/events/v1.Event.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/events/v1.Event.Regarding` is an optional non-pointer struct
- `k8s.io/api/events/v1.Event.DeprecatedSource` is an optional non-pointer struct
- `k8s.io/api/events/v1.Event.DeprecatedFirstTimestamp` is an optional non-pointer struct
- `k8s.io/api/events/v1.Event.DeprecatedLastTimestamp` is an optional non-pointer struct
- `k8s.io/api/events/v1.EventList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/flowcontrol/v1.FlowSchema.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/flowcontrol/v1.FlowSchema.Spec` is an optional non-pointer struct
- `k8s.io/api/flowcontrol/v1.FlowSchema.Status` is an optional non-pointer struct
- `k8s.io/api/flowcontrol/v1.FlowSchemaList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/flowcontrol/v1.PriorityLevelConfiguration.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/flowcontrol/v1.PriorityLevelConfiguration.Spec` is an optional non-pointer struct
- `k8s.io/api/flowcontrol/v1.PriorityLevelConfiguration.Status` is an optional non-pointer struct

- `k8s.io/api/flowcontrol/v1.PriorityLevelConfigurationList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IPAddress.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IPAddress.Spec` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IPAddressList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.Ingress.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.Ingress.Spec` is an optional non-pointer struct
- `k8s.io/api/networking/v1.Ingress.Status` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IngressClass.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IngressClass.Spec` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IngressClassList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IngressList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IngressRule.IngressRuleValue` is an optional non-pointer struct
- `k8s.io/api/networking/v1.IngressStatus.LoadBalancer` is an optional non-pointer struct
- `k8s.io/api/networking/v1.NetworkPolicy.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.NetworkPolicy.Spec` is an optional non-pointer struct
- `k8s.io/api/networking/v1.NetworkPolicyList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.NetworkPolicySpec.PodSelector` is an optional non-pointer struct
- `k8s.io/api/networking/v1.ServiceCIDR.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/networking/v1.ServiceCIDR.Spec` is an optional non-pointer struct
- `k8s.io/api/networking/v1.ServiceCIDR.Status` is an optional non-pointer struct
- `k8s.io/api/networking/v1.ServiceCIDRList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/node/v1.RuntimeClass.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/node/v1.RuntimeClassList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/policy/v1.Eviction.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/policy/v1.PodDisruptionBudget.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/policy/v1.PodDisruptionBudget.Spec` is an optional non-pointer struct
- `k8s.io/api/policy/v1.PodDisruptionBudget.Status` is an optional non-pointer struct
- `k8s.io/api/policy/v1.PodDisruptionBudgetList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/rbac/v1.ClusterRole.ObjectMeta` is an optional non-pointer struct

- `k8s.io/api/rbac/v1.ClusterRoleBinding.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/rbac/v1.ClusterRoleBindingList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/rbac/v1.ClusterRoleList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/rbac/v1.Role.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/rbac/v1.RoleBinding.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/rbac/v1.RoleBindingList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/rbac/v1.RoleList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.AllocationResult.Devices` is an optional non-pointer struct
- `k8s.io/api/resource/v1.DeviceClass.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.DeviceClassList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceClaim.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceClaim.Status` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceClaimList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceClaimSpec.Devices` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceClaimTemplate.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceClaimTemplateList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceClaimTemplateSpec.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceSlice.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/resource/v1.ResourceSliceList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/scheduling/v1.PriorityClass.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/scheduling/v1.PriorityClassList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.CSIDriverList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.CSINodeList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.CSIStorageCapacity.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.CSIStorageCapacityList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.StorageClass.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.StorageClassList.ListMeta` is an optional non-pointer struct

- `k8s.io/api/storage/v1.VolumeAttachment.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.VolumeAttachment.Status` is an optional non-pointer struct
- `k8s.io/api/storage/v1.VolumeAttachmentList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.VolumeAttributesClass.ObjectMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.VolumeAttributesClassList.ListMeta` is an optional non-pointer struct
- `k8s.io/api/storage/v1.VolumeError.Time` is an optional non-pointer struct

Required

- `k8s.io/api/resource/v1.Counter.Value` is a required non-pointer struct
- `k8s.io/api/resource/v1.DeviceCapacity.Value` is a required non-pointer struct
- `k8s.io/api/resource/v1.OpaqueDeviceConfiguration.Parameters` is a required non-pointer struct
- `k8s.io/api/resource/v1.ResourceSliceSpec.Pool` is a required non-pointer struct

Appendix II: Use of required field in optional structs and vice-versa

Required field in optional struct

- `k8s.io/api/coordination/v1alpha2.LeaseCandidate.Spec.LeaseName` is a required field in an optional struct
- `k8s.io/api/coordination/v1alpha2.LeaseCandidate.Spec.BinaryVersion` is a required field in an optional struct
- `k8s.io/api/coordination/v1alpha2.LeaseCandidate.Spec.Strategy` is a required field in an optional struct
- `k8s.io/api/coordination/v1beta1.LeaseCandidate.Spec.LeaseName` is a required field in an optional struct
- `k8s.io/api/coordination/v1beta1.LeaseCandidate.Spec.BinaryVersion` is a required field in an optional struct
- `k8s.io/api/coordination/v1beta1.LeaseCandidate.Spec.Strategy` is a required field in an optional struct
- `k8s.io/api/networking/v1.IPAddress.Spec.ParentRef` is a required field in an optional struct
- `k8s.io/api/networking/v1beta1.IPAddress.Spec.ParentRef` is a required field in an optional struct

Required struct with only optional fields

- `k8s.io/api/resource/v1.Counter.Value` is a required struct with only optional fields
- `k8s.io/api/resource/v1.DeviceCapacity.Value` is a required struct with only optional fields
- `k8s.io/api/resource/v1.OpaqueDeviceConfiguration.Parameters` is a required struct with only optional fields
- `k8s.io/api/resource/v1beta1.Counter.Value` is a required struct with only optional fields
- `k8s.io/api/resource/v1beta1.DeviceCapacity.Value` is a required struct with only optional fields
- `k8s.io/api/resource/v1beta1.OpaqueDeviceConfiguration.Parameters` is a required struct with only optional fields
- `k8s.io/api/resource/v1beta2.Counter.Value` is a required struct with only optional fields
- `k8s.io/api/resource/v1beta2.DeviceCapacity.Value` is a required struct with only optional fields
- `k8s.io/api/resource/v1beta2.OpaqueDeviceConfiguration.Parameters` is a required struct with only optional fields