KIP-466: Add support for List<T> serialization and deserialization

Status

Current state: *Adopted*

Discussion thread: Link

JIRA: Unable to render Jira issues macro, execution error.

Motivation

I believe there are many use cases where List Serde could be useful:

- https://stackoverflow.com/questions/41427174/aggregate-java-objects-in-a-list-with-kafka-streams-dsl-windows
- https://stackoverflow.com/questions/46365884/issue-with-arraylist-serde-in-kafka-streams-api

For instance, aggregate grouped (by key) values together in a list to do other subsequent operations on the collection.

Public Interfaces

- New class *org.apache.kafka.common.serialization.ListSerializer<Inner> implements Serializer<List<Inner>>* interface
- New class *org.apache.kafka.common.serialization.ListDeserializer<Inner> implements Deserializer<List<Inner>>* interface
- New static subclass class ListSerde<Inner> extends WrapperSerde<List<Inner>> in *org.apache.kafka.common.serialization.Serdes*
- New method public static <L extends List, Inner> Serde<List<Inner>> ListSerde(Class<L> listClass, Serde<Inner> innerSerde) in *org.apache.kafka.common.serialization.Serdes* class

Proposed Changes

This KIP proposes adding new ListSerializer and ListDeserializer classes as well as support for the new ListSerde nested class inside the Serdes class. This will allow using Serde<List<Inner>> directly from Consumers, Producers and Streams.

Serde<List<Inner>> serialization and deserialization will be done through repeatedly calling a serializer/deserializer for each entry provided by passed generic Inner's serde. For example, if you want to create List of Strings serde, then serializer/deserializer of Serdes.StringSerde will be used to serialize /deserialize each entry in List<String>.

Proposed Configurations

List serde is an unusual type of serde because we need to consider two things here: the implementation of *List* interface(i.e. *ArrayList*, *LinkedList*, etc) **as well as** its enclosed elements' type.

First, we need to specify that we are going to use a list serde:

> *default.key/value.serde = org.apache.kafka.common.serialization.Serdes$ListSerde*

Then, we need to introduce two brand new configurations and here I'm proposing these four extra properties:

`CommonClientConfigs.class`: `DEFAULT_LIST_KEY/VALUE_SERDE_TYPE_CLASS = "default.list.key.serde.type"`

> *Ex. default.list.key/value.serde.type = java.util.ArrayList*

`CommonClientConfigs.class`: `DEFAULT_LIST_KEY/VALUE_SERDE_INNER_CLASS = "default.list.key.serde.inner"`

> *Ex. default.list.key/value.serde.inner = org.apache.kafka.common.serialization.Serdes$IntegerSerde*

P.S. *Properties* ***default.list.key/value.**** *will be ignored as long as* ***default.key/value.serde*** *is not set to* ***org.apache.kafka.common.serialization.Serdes$ListSerde***

Serialization Strategy

For the performance purposes the following serialization strategies were put in place:

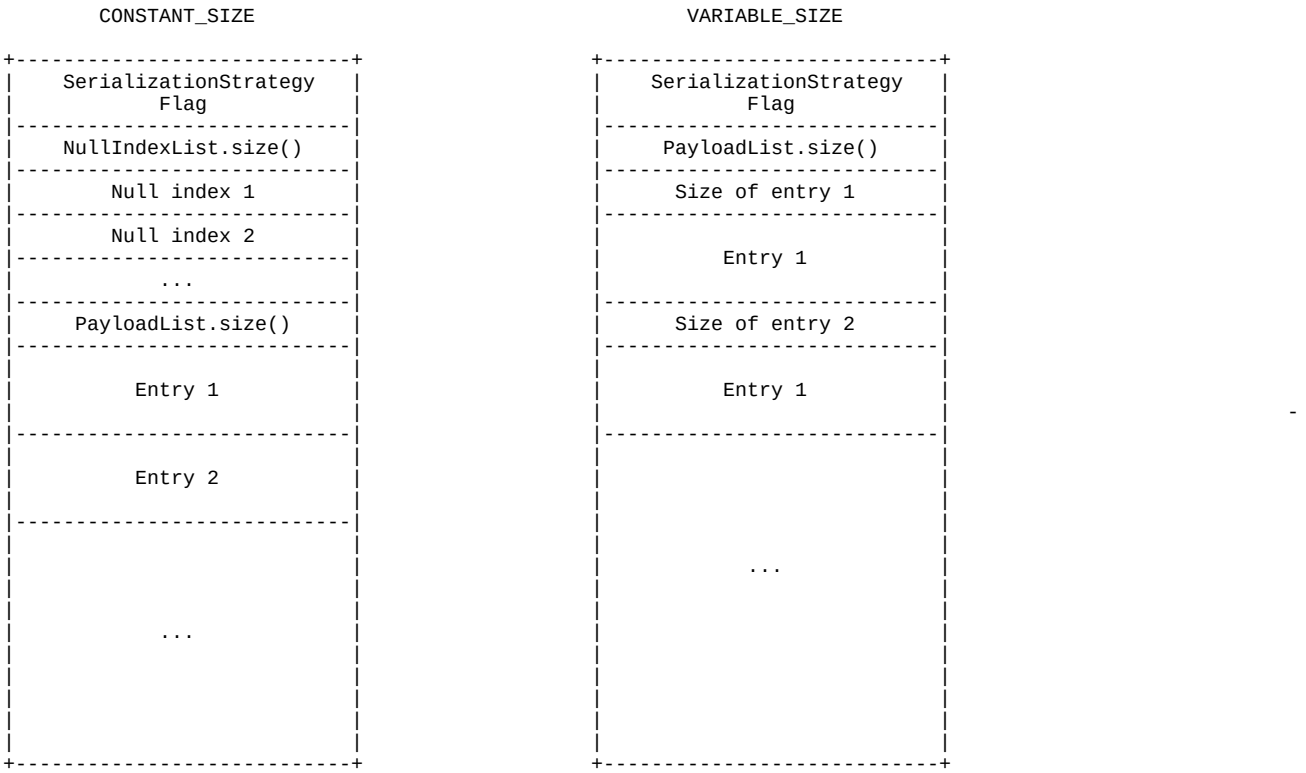
```
enum SerializationStrategy {
   CONSTANT_SIZE,
   VARIABLE_SIZE;
}
```

Depending on the type of an inner serde (a list's element type) the serialization will be performed in the following ways:

1. For SerializationStrategy.CONSTANT_SIZE, if an inner serde has one of the following serializers (*ShortSerializer.class*, *IntegerSerializer.class*, *FloatSerializer.class*, *LongSerializer.class, DoubleSerializer.class, UUIDSerializer.class*), then the final payload **will not** contain each **element's size encoded** since sizes of presented types are static (2 bytes, 4 bytes, 8 bytes, etc.)
2. For SerializationStrategy.VARIABLE_SIZE, if the inner serde doesn't have one of the serializers listed above, then a size of each element will be encoded in the final payload (see below)

Additionally, there are two different ways of serializing NULL values within the payload:

1. For SerializationStrategy.CONSTANT_SIZE, the list serializer will generate a null index list that contains indexes of all null entries within the payload
2. For SerializationStrategy.VARIABLE_SIZE, the list serializer instead will write Serdes.ListSerde.NULL_ENTRY_VALUE (-1 by default) for the size of a null entry



Compatibility, Deprecation, and Migration Plan

Does not apply

Rejected Alternatives

Not known