



Retainer topic indexing

Ilya Averyanov

2022





Retaining feature



```
>emqtt pub -C c1 -t "x/a" --payload "message a" --retain  
>emqtt pub -C c1 -t "x/b" --payload "message b" --retain  
>emqtt pub -C c1 -t "y/c" --payload "message c" --retain
```

```
>emqtt sub -C c2 -t "x/+"  
message a  
message b
```

```
>emqtt sub -C c2 -t "x/+"  
message a  
message b
```





Retaining feature Externally

- ▶ Each topic can have a "retained" message
- ▶ This message is sent to each subscriber on topic subscribe
- ▶ A subscriber can subscribe to many topics at once using wildcards and receive many retained messages



Retaining feature Internally



- ▶ A broker needs to keep a "database" of topics and their corresponding retained messages
- ▶ On topic subscribe, a broker makes a lookup of corresponding retained messages





Retainer database Internally



- ▶ A subscribed topic can be "concrete", like a/b/c/d. Then we need a simple lookup in a key-value storage to find a retained message
- ▶ A subscribed topic can be a wildcard topic, like +/b+/d. Then we first need to select relevant topics and only then lookup the corresponding retained messages
- ▶ There may be a lot of topics with retained messages so selecting relevant topics may be resource consuming
<https://github.com/emqx/emqx/issues/6014>





Retainer indexing Solution

To provide effective topic search we introduce topic indexing. Topic indexing allows to specify topic segment positions that are supposed to be meaningful and not wildcard during subscriptions. Retained messages will be searched effectively during such subscriptions.





Retainer indexing Example

Assume we have the following topic structure:

`<Country>/<City>/<Office>/<DeviceModel>/<Owner>`

For example:

`UK/London/HQ/ModelA/User4534`

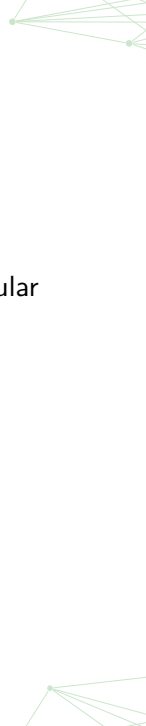




Retainer indexing Example

We want to subscribe to topics corresponding to some particular `DeviceModel` and `Owner`.

The wildcard will be: `+/+/+/<DeviceModel>/<Owner>`





Retainer indexing Example

To optimize finding retained messages for such a subscription we can specify the following index:

```
retainer {  
  backend {  
    ...  
    index_specs = [ [4, 5] ]  
  }  
}
```





Retainer indexing Notes

- ▶ By default there are indices that help to handle wildcard subscriptions having any meaningful segments in the first 3 positions
- ▶ To enable new indices after config change one should explicitly run reindex: `emqx_ctl retainer reindex start`





Thank you!

