Objective

- The proposed prefetching model aims to proactively preload data from servers instead of passively waiting on user requests.
- The preloading of content is based on prefetching related data that is expected to be used by the user in the near future as per the user’s request pattern and request’s naming relationship.
- The user request pattern is stored as a historical request model based on trie data structure, due to hierarchically structured names.

Introduction

- In Name Data Network (NDN) [1], every data chunk is named uniquely making data content independent of source of creation and its destination. Hence data content can be cached in-network to satisfy future requests.
- To request data, consumer creates Interest packet with data identifier. Router forwards the packet based on Forwarding Information Base Table (FIB). Interest packet is responded by producer with data packet. Router stores upstream and downstream request details in Pending Information Table (PIT).
- NDN design assumes hierarchically structured names.
- In the scenario of Internet of thing devices, which tend to fetch the same or similar content repeatedly and during the same time period, each day defining a pattern of user requests.

Approach

- Compute user access model based on the content popularity.
- Determine the next requests for the current request based on the user access model.

Results

- Prefetching improved the cache hits by 43% for uniform distribution of requests.
- The content was retrieved faster due to caching on pre-fetched contents on the intermediate content routers, resulting in lower hop-count.

Conclusion

- The pre-fetching of contents based on user request pattern in a uniform distribution, enables the user to fetch content faster as requests are pre-loaded at the intermediate node with cache hit ratio of 43% for initial content requests.
- The trie based data structure to store the user access pattern allows efficient storage as content from same domain will share the same prefixes.

References

[3] [No.3]. https://www.nsnam.org/
[4] [Mfd]. NFD - named data networking forwarding daemon. data.net/doc/NFD/current/