

Notes from CFN (Compute First Networking) side meeting during IETF 106 on Thursday 21st November, 2019 (830-9:45 AM), in Singapore

Participants: around 46 from blue sheet.

CFN Side meeting chairs:

- Liang Geng (China Mobile)
- Georgios Karagiannis (Huawei)

Goal:

- Discuss the following topics:
 - CFN Problem statement, scenario and requirements
 - Framework of Compute First Networking (CFN)
 - A Report on Compute First Networking (CFN) Field Trials
 - Related Work: Distributed function chaining with anycast

Materials:

- It will be uploaded to the Internet later

Detailed information from CFN (Compute First Networking) side meeting during IETF 106 on Thursday 21st November, 2019 (830-9:45 AM), in Singapore

Agenda:

1. Admin (chairs) [3 min]: Georgios Karagiannis (Huawei) and Liang Geng (China Mobile)
2. Problem statement, scenario and requirements: Liang Geng (China Mobile) [8 min]
 - [draft-geng-rtgwg-cfn-req-00](#)
 - Framework of Compute First Networking (CFN): Yizhou Li [8 min]
 - [draft-li-rtgwg-cfn-framework-00](#)
4. A Report on Compute First Networking (CFN) Field Trial: Shuheng Gu [8 min]
 - [draft-gu-rtgwg-cfn-field-trial-00](#)
5. Related Work: Distributed function chaining with anycast: Luigi I. Annone (Telecom ParisTech) [8 min]

6. Questions to shape our work (chairs and discussion) [35 min]
7. Wrap up (chairs) [5 min]

Summaries of the presentations:

- Use cases show principles and requirements:
 - Principles:
 - 1. Service equivalency, 2. Service dynamics
 - Requirements:
 - 1. Explicit Service Identification, 2. Network & Computing Joint Optimization, 3. Flow Affinity, 4. Minimized OAM Overhead
- Framework supports Two-D (Dynamic & Distributed):
 - Dynamic anycast:
 - Anycast based service identification
 - Computing load information
 - Service dispatch on the fly
 - Ensure flow affinity
- PoC Field Trial:
 - showing performance gains from service dynamics, e.g., job completion time for different traffic patterns and status update frequencies
- Distributed function chaining with anycast:
 - Providing a way to augment IGP to Chain Services by using Service Function Chaining and leveraging on anycast addressing

Questions and Discussions

Clarification Question James GUICHARD (Futurewei)

- Can I assume that this is what you would like to propose in CFN?
- I have some resources in the network that can be a service that is common. Therefore I have possible instances of that in the network that I am going to address using anycast address; Instead of relying in standard routing practice that is going to take me to the closest node based on my location using my anycast address, I would want to add some other parameters to the route selection such that when a packet first access the network can choose a resource that is not the closest to me, because I added these parameters/ metrics for the route calculation
- **Answer Shuheng GU (Huawei):** Yes, your explanation is right

Question Jamal Hadi Salim (Mojatatu Networks): What is the definition of a service? If I am running a database is that a service or is it an infrastructure service, IDS or firewall, is a website a service?

- **Liang Geng (China Mobile):** There are several cases; You can have a common service that can be called by different applications, that is the cases, but it can also be a stand-alone application/service, not providing APIs, for other applications, it is just for the application itself that are implemented and distributed in a multiple website
- **Jamal Hadi Salim** but this has implications on the registration that is using and policy management and as well other topics. What about inter-box type of services
- **Yizhou Li (Huawei):** we expect that the service will consume a lot of computing resources, that is why this topic is about edge computing; That is why caching or high bandwidth or storage is probably not the main focus of this work
- **Jamal Hadi Salim:** So it is purely compute; If I have an ASIC that does for simplicity packet processing, it does not count as being part of the scope?

- Liang Geng: It does count, actually it is the main purpose of this, since different edge nodes might not have the same CPU/GPU capabilities
- **Jamal Hadi Salim:** I did not see the CPU load as a metric that is being advertised in the presentations
- **Yizhou Li:** yes it is; this will be one of the possible scenarios

Question Chongfeng Xie (China Telecom): Edge nodes will select the service not only based not only in topology, but also based on compute node capabilities. Will the edge node need to get all the topology information of the network. If so, I think that the Compute node need to get information from the IGP context and maybe interact with other devices in the network and get the information quickly when are changes in the network; But this might cause that the networks becomes unstable

- **Yizhou Li:** That is why we use BGP, because BGP tries to establish peer to peer relationships; BGP can get information from underlying network and can accommodate frequently information and provide synchronization; That is why we propose BGP; But Luigi can provide information on the Telecom ParisTech approach IGP is used;
- **Luigi Iannone (Telecom Paris):** This was a first choice; We use IGP sessions among cloud providers to build an overlay; However, we want to leverage whatever exists; Important is that we use of anycast; In our approach we use as metrics network distance and CPU load in order to load balance among the different nodes

Question James GUICHARD (Futurewei): There are two point to mention

- From services standpoint, what I have seen so far is quite naïve, in terms of just naming services or service type is more complicated than it looks; So for example, you cannot have a service, saying that I am a firewall, because there are resilient firewall vendors, have different resilient features that are specific to that particular firewall. Therefore the service itself is the firewall across the capabilities and then on top of that you get policy; So firewall A and firewall B are not necessarily equivalent, even if everything else than policy is equivalent. So what you end up is, we went through this in SFC WG, is that you can have a bulk load of service types and defining these is a complex problem.
- The second thing to bear in mind is that not about the identification of a service because you need on how to integrate policy with that service as well. So when a packet hits the edge of the network, yes it might be saying I need service X, but is probably policy associated with that service, where one packet from a particular client is going to get a different treatment than somebody else, even if they are using the same service elements. So this is another thing that you need to think about and integrate them in this kind of architecture
- Answer **Luigi Iannone (Telecom Paris):** To comment, there are two things:
 - Firstly, in the Telecom Paris presented approach, the policies are in the classifier. So when traffic is coming in, policies are there to decide what you do with the traffic. Policies come from outside
 - The second thing: the fact that you associate a service to an IP address, how you do it in SFC? It is the same problem; Yes, you can have several different firewalls, but you have the same problem in SFC; What is the meaning of having a service ID identifying a firewall, is a different a more complex problem
- **James GUICHARD:** to provide a response to your question will be that in SFC we centralize it. The reason of centralize it is because you need to make a decision of each instance of the service to use and is a larger and complex problem if you distribute it. If it is centralized in some type of controller that is able to have a knowledge of the network and then essentially pick a path, and then have a message –path ID and distribute it to the network
- **Luigi Iannone (Telecom Paris):** In the telecom followed approach the solution is something similar to what you mentioned that; I did not mention that who decides and how the IP address is assigned to the service is something that goes to the policy server. So in my approach this is centralized and there is no distributed and dynamic binding; The policy server decides which IP address is used for a service and which flow goes to each service
- **James GUICHARD:** the identification of the service needs to be an IP address at the end
- **Shuheng GU (Huawei):** Yes, agree, in CFN we should have a policy server that is centralized, but maybe the policy information can be distributed or synchronized to the CFN node. In this case it makes the decision on one time
- **Luigi Iannone:** The decision can be centralized and then push the decision to the classifiers
- **James GUICHARD:** You can distribute the decision centrally and have the centralized controller to make the decision for you
- **Shuheng GU:** Agree, just like the orchestrator which will orchestrate the decision

Question Jamal Hadi Salim:

- From all the presentations that I have seen the path to the resource which has been the computation is intermingled with the selection to a specific service. Are you intending to do that? This sounds like an optimization and that is why people like BGP, since it is widespread. But could you have these two concepts separated?
- Placement of where the service is, versus on how to get to the service execution point, sound to me like two different things
- **Answer Luigi iannone:** What you mentioned are two different things; So far : In the Telecom Paris approach, we did show how to reach the place, not where the place should be, and we are working as well on that;
- **Jamal Hadi Salim:** You are showing distribution of the resources as a dynamic approach
- **Luigi iannone** in the Telecom Paris approach we have a control loop that allows you where to send the traffic once you have the different instances. But now we are working in web placed resources in a dynamic way, without using a complex centralized algorithm
- **Jamal Hadi Salim** If I am running the data center in a closed network, or a tiny data centre (edge data center)
- **Luigi iannone:** this is not a data center; You need to keep latencies low and spread the services closed to the client, so you will have a distribution of edge computing centers closed to the client, in for example a similar way as it is done in 5G scenarios Therefore, this is a different problem then looking to a data center
- **Liang Geng:** These are two different things; Where the services are deployed, can be considered as an orchestrated way to do it, because the operator will know the computing resource and what the client require for the service to be deployed; The CFN does not deal with that part
- **Jamal Hadi Salim:** maybe Kubernetes load balancing may not be the right approach here, but Kubernetes can take care of compute node, memory utilization, there hooks to GPU monitoring. How to get the packet to a specific node can be considered as path selection
- **Luigi iannone:** Kubernetes is based on snapshots, which depend on the use case and is different than what we do here
- **Yizhou Li:** To understand this correctly, you are doing something that is called early binding from application layer, or application layer system; I should know where I should go to, and then I steer the traffic to the place that I want to go; For us, most of the edge computing task be very short, maybe like only two packets; When the first packet comes in, we do a dispatch on the fly. So this is something like late binding; We do not do the query first; We steer the traffic and do the determination on the fly and direct the traffic to the right place.
- **Jamal Hadi Salim** But that is a load balancing function, you selecting the service node
- **Yizhou Li:** Load balancing will not take network path status into consideration; First it picks a site and then network considers how to go there, this way or that way, and which way is better. They are two isolated procedures. Here we use a combined way. Have information about computation resources available; and as well another set of information about the path and we can give weighs to this information. This is most straightforward way; For example for computation the weight can be 70%, and for network quality the weight can be 30%, The algorithm is can be used to calculate an overall cost and it chooses the best path together with the computation resources and network status at once; So it is a hybrid approach, rather than do the query first and then do the steering afterwards; Just to mention that this might be not the best way for all cases, but just to point out the differences

Georgios Karagiannis (Huawei) Offline received question: What is the relation of this work with Application-aware IPv6 Networking (APN6) ?

- **Answer James GUICHARD:** APN6 is really about using information about an application to make a policy decision in the network. So it has nothing to do with compute resource, it has nothing to do with having additional metrics to do routing. Is basically about marking a packet to indicate an application or the characteristics of an application and have the network use that information in the data plane to make a forwarding decision; That forwarding decision might be in the service chain, it might be into segment routing path, it could be in many other different areas. So it is completely a different space;

Question Colin Perkins (IRTF chair): Can you discuss on how CFN relates to the IRTF COIN (Computing in the Network) research group?

- **Answer Jianfei He** - Jeffrey (Huawei and co-chair of the IRTF COIN RG and coauthor of one of the CFN drafts): The CFN proposal has a near term objective and the relationship in this proposal between the compute and network is quite traditional, the network still is in position connecting the compute and not taking the computing resource as an inherent part of the network. So in this is one of the differences between COIN and CFN. Moreover, the CFN solution is more

related to routing protocols, leverage anycast; Please note that CFN will be presented on 22 November (Friday) at the IRTF COIN RG meeting. This will let IRTF COIN RG to see if this is interesting to them or not;

- **Liang Geng:** In my understanding COIN RG focuses on how to induce computing capability in e.g., a layer 2 switch and the problem space is to increase the efficiency of computing; But CFN is dealing with routing and selecting the path according to the compute and network joint type of status. That is a different type of view to the problem
- **Colin Perkins:** So COIN has a much bigger scope than CFN has;
- **Liang Geng:** yes it is a research group, so it has a much bigger scope, but is not focusing in what we have presented here in CFN, in terms of routing optimization
- **Colin Perkins:** So you see the issue covered by CFN as a routing optimization problem?
- **Liang Geng:** Yes it is focusing on routing optimization issue

Wrap-up Discussions and Next Steps

Chairs asked to show hands as way of agreement for each of the following questions:

- Is the problem space clearly defined?
 - 15 hands up
- Should this work be done in IETF?
 - 20 hands up
- Is there interest to participate in this work?
 - 16 hands up

Next steps:

- Set up mailing list for discussion (cfn@ietf.org)
- Minutes and presented materials to be sent after the mailing list is set up