Neural Network Processing Model for Data Flow Optimization

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Abstract –This paper focuses on a new concept of processing data flow in networks, a process which will take place over the network, using NPU powered routers managing data and evaluating packet flow and post process. Imagine all this data which wait in the queues of routers, processed in a few nodes before delivery.

Keywords – **data flow; neural network processing; transmition**

I. Introduction

Every day data flow increases, leading to the movement of bigger packets of information troubling the network stream. Concept routers are fast but it is a matter of time for our networks to become congested. This enormous amount of data needs to be aggregated and we need a more comprehensive approach. This paper focuses on a new concept of processing data flow in networks, a process which will take place over the network, using NPU powered routers managing data and evaluating packet flow and post process. Imagine all this data which wait in the queues of routers, processed in a few nodes before delivery.

The subject of this study is data flow. The object of the study is data flow optimization. Its analysis is a key aspect in achieving better services [6]. The main goal of the present analysis is to reveal opportunities for improving the processes. Our aim of this study is to propose a neural network processing model for data flow optimization. The results are analyzed and discussed.

A. Conventional Computing Outline

In a conventional computing scheme given in Figure 1 one network is used only for communication, processes are aggregated in CPUs and storage is allocated in memory. Throughout years, there have been different approaches for finding a better and optimized compute method. For example, distributed or centralized computing. Here primary, secondary, cache storage devices take the idea that processing, storage of information, and communication are done in processor, memory, and network separately.

In the past, there were a few attempts for adopting a different methodology, even if the results will lead to significant advantages. For example, a different approach is to perform processing directly into memory, which modifies the slightly traditional approach of the CPU and memory being on separate silicon. If we combine them on one chip, moving data from memory to cpu and vise versa will be eliminated, leading to reduced latency, lower power consumption and increased bandwidth. There are some work in this field of using a network processing model for adhoc networks, design specially for sensor networks. In such sensors power consumption is one of the most critical problem. In [5] a model for multi objective optimization is proposed. It is arranged according to Pareto principle of business interaction.

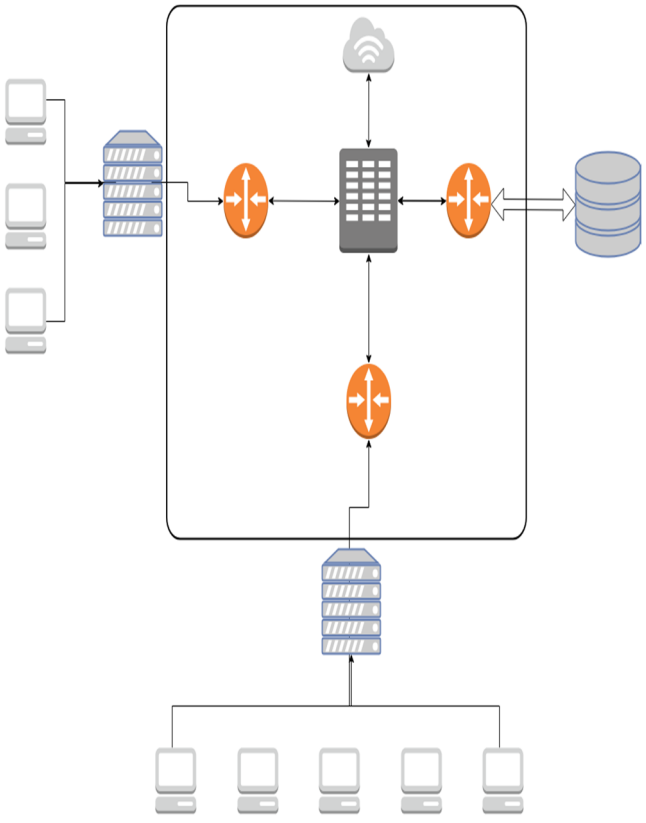

Fig. 1. Regular Data Flow

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B. *The In-Network-Processing Alternative*

Another alternative is in-network-processing [2], which emphasis on energy saving by reducing the number of transmissions. In-network processing is a technique used and integrated in sensor database systems. This model use sensor nodes themselves to process the recorded data. The difference from standard approach, is that this data demands to be transferred to a so-called sink computer, located outside the network for processing. In-network processing is critical for sensor nodes because they are highly resource constrained, especially in terms of battery power. Using this technique, their useful life capacity will be extended considerably. In [7] distributed neural networks for big data implementation is proposed.

C. *A Concept of NPU Based Network*

A more interesting combination, which is our proposal, is to attempt to process data flow through the network using distributed packet flow controlled by NPU powered (shown in Figure 2) brain controlling NPU powered routers.

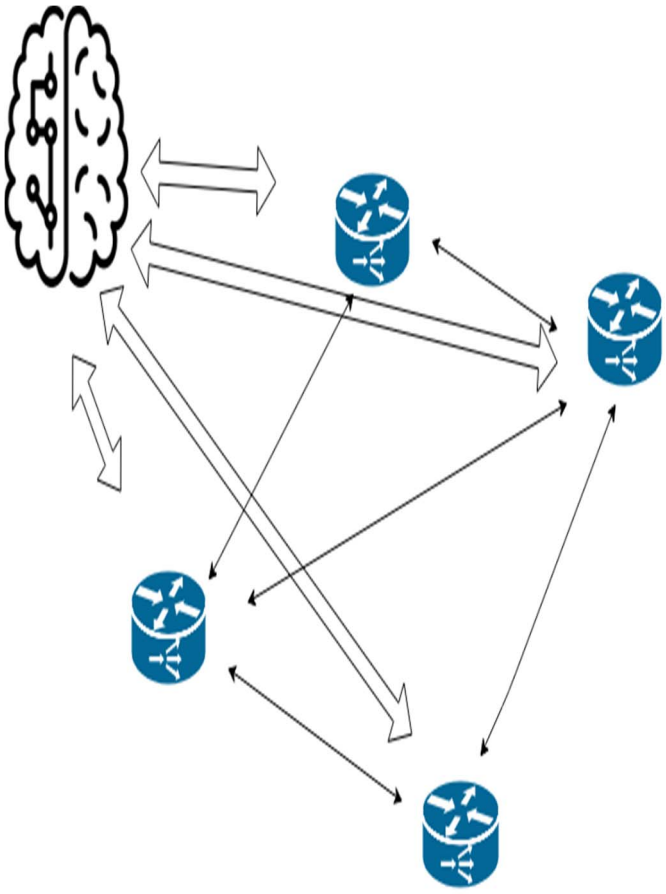

Fig. 2. A concept of NPU based network

This novel concept could be called "Process-over-Network", shown in Figure 3, which meanest the possibility for the network itself to processes information as it is being transmitted.

D. *Process-over-Network*

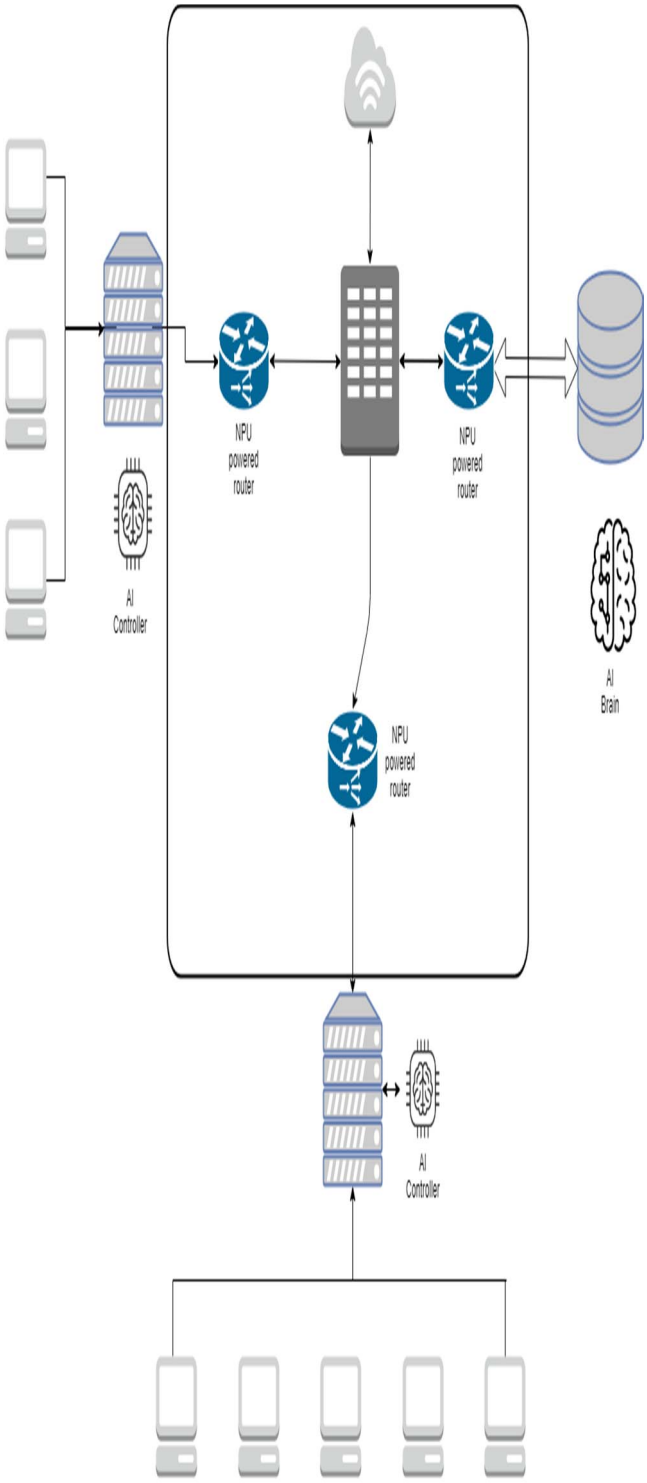

Fig. 3. Integration with NPU based routers.

In our concept processing will be executed into the network nodes located between the origin of the package and throughout its final destination. The idea here is to make use of the waiting times in router queues, the idling which does

not utilize 100 percent's of the processing capacity in the nodes, and the information itself that flows into the network. The NPU main brain processor will handle and evaluate the processing of data, distributing and controlling of the free resources.

It is important to take under consideration the ability for leveraging information while it goes through the network, using information fusion from NPU processed data [3], based on information in the single node or from the result of the aggregation of more. Delivered information will be better, richer and lighter compared to the one originally sent.

E. Benefits of the Model

The main benefits of our model can be divided into three main statements. Taking into consideration that each of this three, can occur simultaneously with the other, depending on the specific occasion:

- Simplification of data leads to significant reduction in network bandwidth utilization and faster transmission. This process does not affect and lead to a loss of semantic content.
- The merge while transferring and processing data flow leads to the enrichment of final information.
- End nodes are less occupied with processing, because information reaches them pre-processed, gaining better transfer speeds and saving time.

The core idea of simplification process is that lesser information is being transmitted after each hop in the network nodes. This process is not intended to give the final result, this will be very hard to accomplish, even not possible in the near future, but instead transferring less information as better optimized packets traveling through the network. For example, images that are being sent into the network but in a simplified manner. Here we do not send the entire images but instead only a few selected elements of the them analyzed and post-processed, dumping unnecessary bits.

Another case for our thesis can be the usage of character recognition software. Similar to what the police and government agencies are using with the idea for recognizing the characters of automobiles plates. Starting from the images extracted from video surveillance systems, which takes live media streams and introducing them to the network, as a video or an already selected image, helping a lot the performance and processing the information before delivering the final result. Transferring such information in optimized network, we will be able to process the search for corresponding name, address and other vital information enriching the whole database a lot faster. Images will be simplified as they travel through the processing nodes, and only the information that the application needs will be extracted in the last phase. In [8, 9, 10] a free multidimensional search is applied to global optimization problems.

II. Conclusion

The suggested model of performing processing over the network is going to add a lot of value when solving important problems. Our model can lead to a more innovative and comprehensive approach than solutions offered so far.

Initial scenarios to start including this method are heterogeneous intelligent networks, ambient intelligence applications, advanced security systems and more.

The Process-over-network approach can be used for the integration of more efficient, time and energy saving communication platform. Supporting more demanding applications with the need of problem free transmission of complex multimedia information data, in a multiplex heterogeneous network.

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