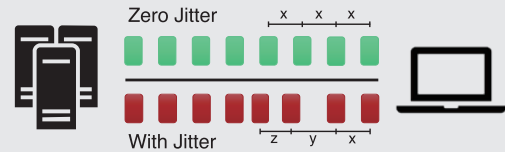


Towards Autonomous Packet Forwarding in Deterministic Networking

Zero-Jitter Network with Deep Reinforcement Learning-Based Packet Forwarding

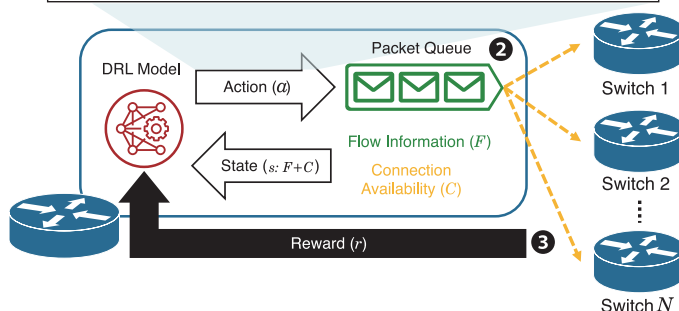
Jitter is the variation in the delay of received packets. It is an important metric that impacts the quality of service (QoS).

We proposed a deep reinforcement learning (DRL) model to enables autonomous packet forwarding within the switch itself.



① Example of action (a) space if N is 5

Switch	1	2	3	4	5	Not Transmit
Minimum Jitter Likelihood	0.01	0.37	0.13	0.29	0.02	0.18



Each switch in the network has its own DRL model for distributed packet forwarding.

The model observations:

- Flow Information (F) including flow size, period, and timestamp.
- Connection Availability (C) for each switch.
- F and C are combined into a State (s), which is used as an input parameter to the model.

The model training loop:

- ① Based on the inputs, State (s) and Reward (r), the model calculates Action (a), which represents the likelihood of selecting the neighbor switch.
- ② Packet is forwarded to the neighbor switch or held in the queue up to the highest likelihood to minimize jitter.
- ③ Reward (r) evaluates the action to improve model's decision in the next iteration.

This research is based on results obtained from the project, "Research and Development Project of the Enhanced infrastructures for Post-5G Information and Communication Systems" (JPNP20017), commissioned by the New Energy and Industrial Technology Development Organization (NEDO).

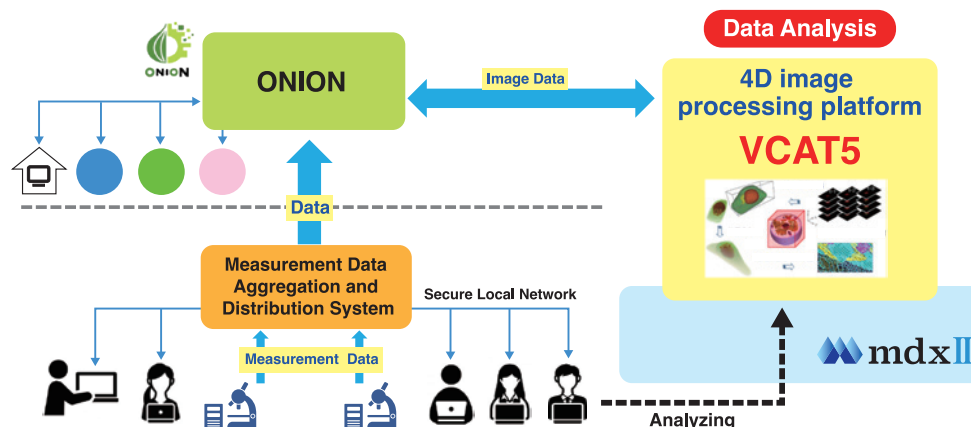


Contact: sc25@ais.cmc.osaka-u.ac.jp

Initiatives Toward an Open Science Information Infrastructure at The University of Osaka

Construction of Four-Dimensional Image Analysis Infrastructure with ONION and mdx II

As part of ongoing research at The University of Osaka on research data management infrastructure to support open science, the Measurement Data Aggregation and Distribution System from small-scale analysis laboratories has been developed. This system utilizes ONION, a data aggregation and management platform currently under trial operation by the D3 Center, to enable the safe collection and dissemination of large volumes of research data over networks. While the system successfully facilitates data aggregation and distribution, its functionality remains limited in terms of enabling effective utilization of the collected data. To address this limitation, we aim to establish a service infrastructure that provides four-dimensional image analysis capabilities integrated with the existing system, thereby enabling data analysis within the data flow. For this purpose, we adopt "VCAT5", a software developed by RIKEN that enables high-speed processing and advanced analysis of four-dimensional image data. The proposed 4D image analysis service platform is constructed by integrating VCAT5 with the "ONION" and a cloud platform for supporting data science and cross-disciplinary research collaborations "mdx II", thereby enhancing the usability and analytical potential of aggregated measurement data.



Contact: sc25@ais.cmc.osaka-u.ac.jp