FedXI-IDS: AN EXPLAINABLE FEDERATED INCREMENTAL LEARNING APPROACH FOR INTRUSION DETECTION SYSTEM

Nguyen Huu Quyen[1,2]

[1] Information Security Laboratory, University of Information Technology, Ho Chi Minh city, Vietnam

[2] Vietnam National University, Ho Chi Minh city, Vietnam

What ?

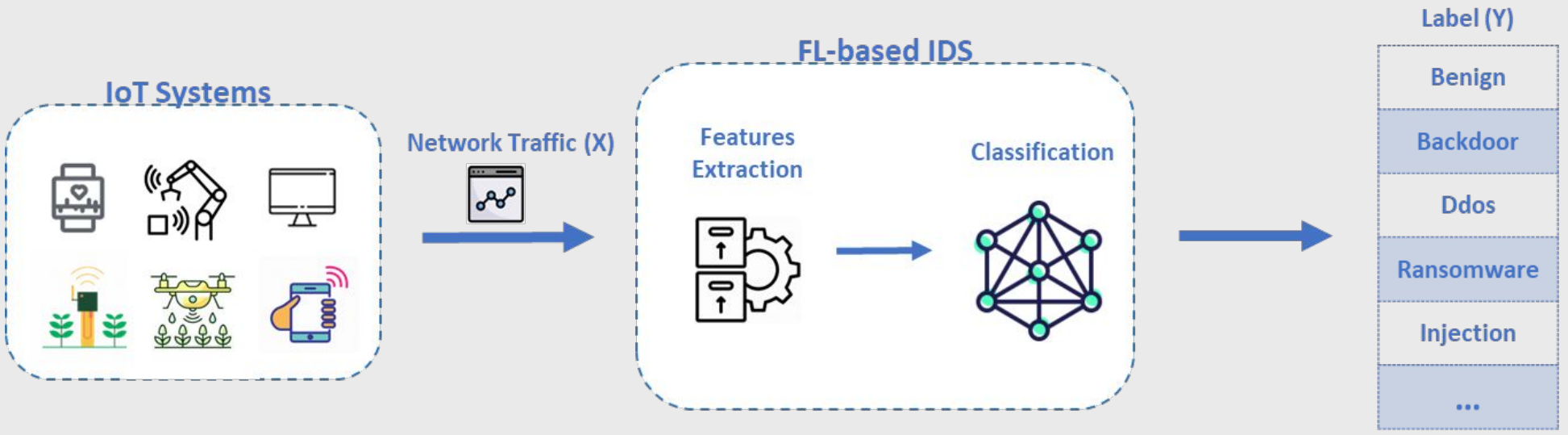
We introduce an explainable federated incremental learning approach for intrusion detection system FedXI-IDS, in which we have:

- Proposed a robust federated incremental training method to detect zero-day attacks in the context of cybersecurity.
- Compared with several incremental training methods and also several ML-based IDSes.

Why ?

- ***Non-id data*** and ***new classes*** are always the biggest problem in building and applying ML model in real world application. Especially, with recent federated IDS, zero-day attacks and label-skew in client have a high effect to the performance of global model.
- Machines participates in federated training often have ***limited*** storage ***resources***.
- Most ML model unable to ***explain*** their ***decisions*** to humans users.

Overview



Description

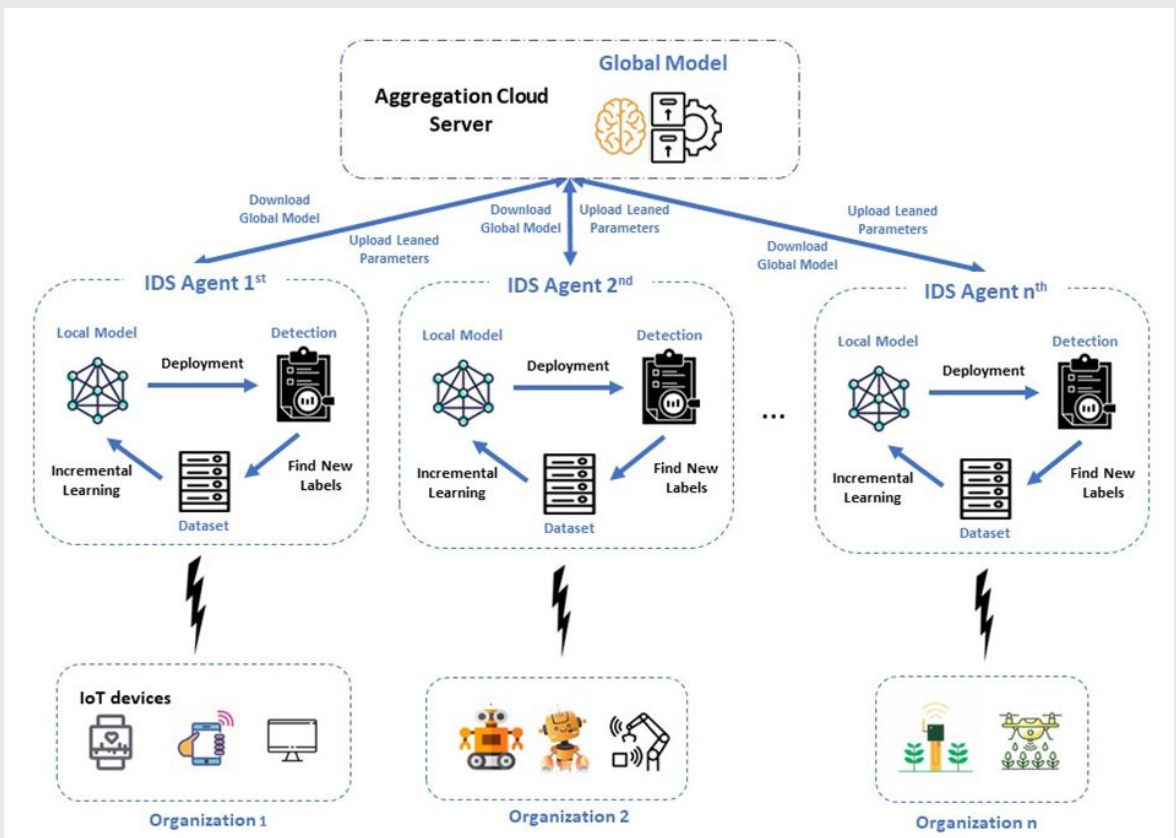


Figure 1. FedXI-IDS architecture.

1. XAI-based IDS

- XAI-based IDS helps to interpret the influence of data features on the model's predictions.

2. XAI-based FedIDS

- The weights of the global model are aggregated from the weights of the all IDS agents based on the FedAVG formula.
- XAI-based FedIDS model is trained with decentralized dataset to reduce training costs and protect data privacy of participants.

3. FedXI-IDS

- We propose an explainable federated incremental learning approach for intrusion detection system (FedXI-IDS) based on deep learning methods.
- FedXI-IDS helps to improve the performance of the model in detecting "new attack classes".
- Moreover, this proposed will deal with the effect of NonIID data and large amounts of data when constantly updating new data, without increasing storage and computational costs during retraining.

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Nguyễn Hữu Quyền – Trường Đại học Công nghệ Thông tin

TEL : 0336310354 Email : Huuquyen2606@gmail.com