ONNX Training Working Group Update

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IBM

Outline

- Background
- Overview of ONNX training approach
- New features in ONNX IR
- New operators
- Next steps

ONNX Training working group history and status

Working group created in February 2019

Led by IBM, meetings on Tuesdays at 10:30 am US Pacific time.

Gitter room: **`https://gitter.im/onnx/training`**

Several Pull Requests merged into Master for ONNX **1.7** release “**Preview**”.

Converters and open source ONNX RT do not **yet** support this.

Wei-Sheng Chin (Microsoft) created the proposal, with inputs from others.

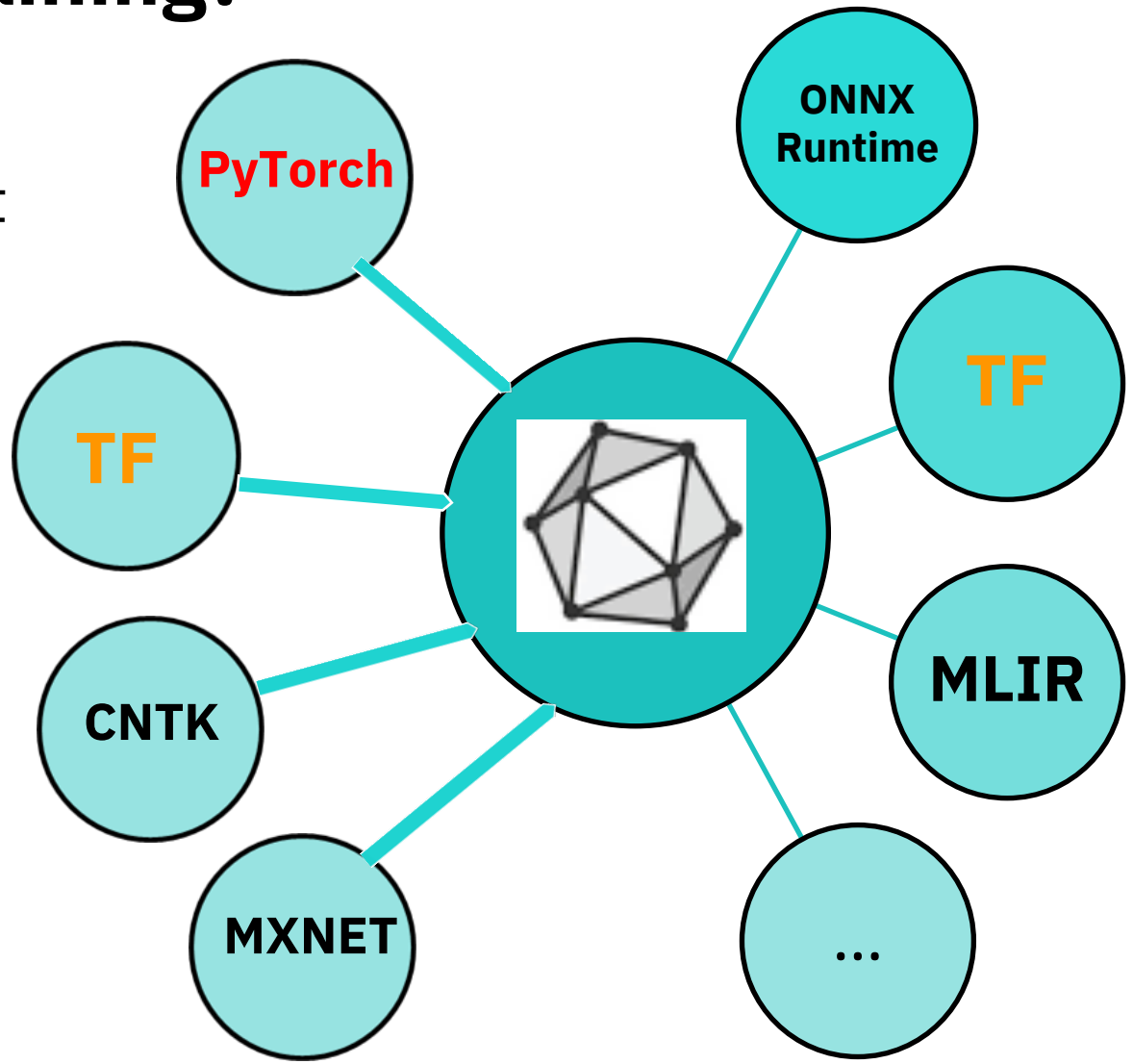
Background: Why ONNX Training?

Sometimes training is a part of deployment (model refinement)

Create training spec (or possibly partially trained model) in one framework and train in another or in ONNX Runtime

More flexibility for computation-intensive workloads

Attractive for hardware manufacturers



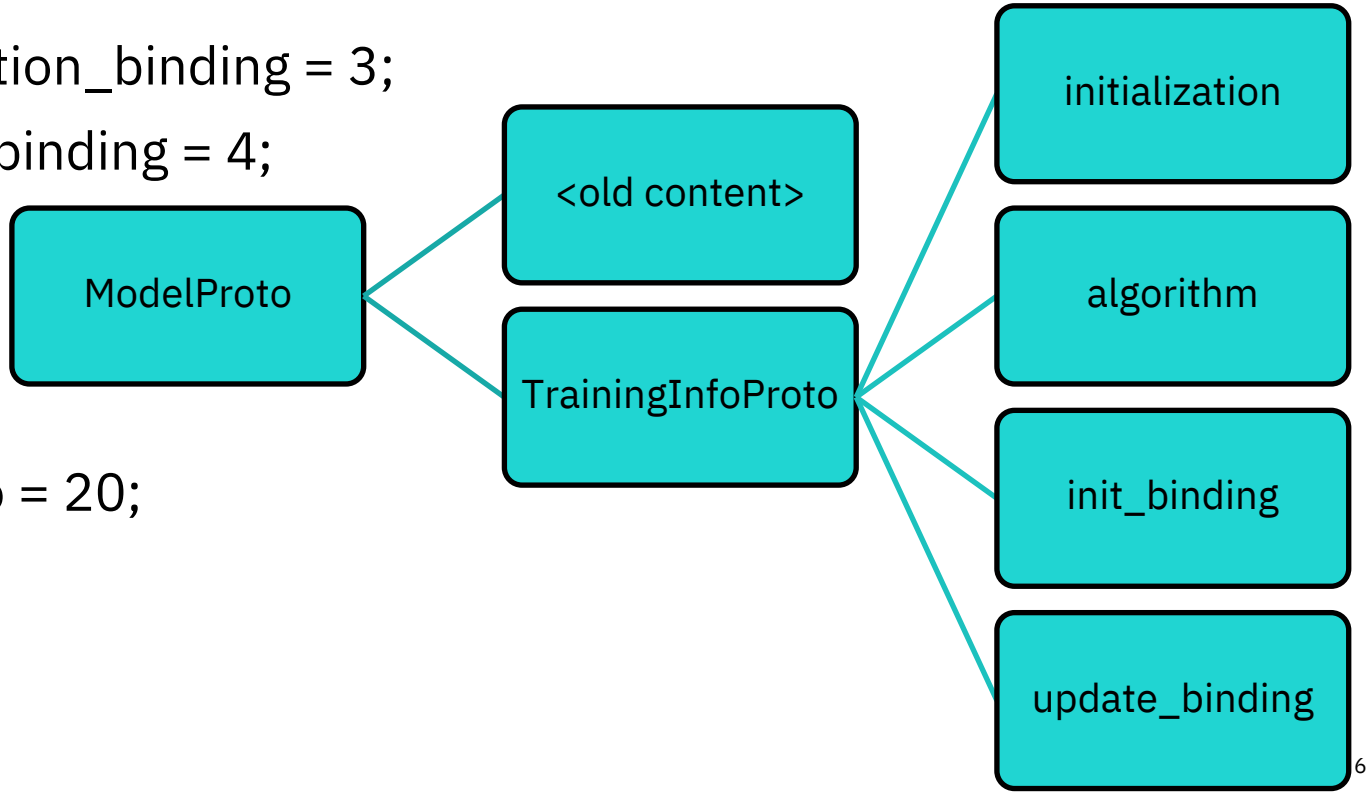
ONNX Training Approach as described in PR #2314

1. Added a protobuf message, **`TrainingInfoProto`**, to store training information.
2. In `TrainingInfoProto`, the user can store training algorithm in algorithm field as a `GraphProto`.
3. Can also store initialization algorithm for resetting the model in `TrainingInfoProto.`**`initialization`**.
4. `ModelProto.graph` is callable inside `TrainingInfoProto.algorithm`.
5. `ModelProto.graph.initializer` is visible to nodes in `TrainingInfoProto.`**`algorithm`**`.node`.
6. Also introduced a **`Gradient`** operator to differentiate a function represented by a (sub-) graph and `GraphCall` operator to call the inference graph.
7. Defined new operators for most widely used loss functions and optimizers.

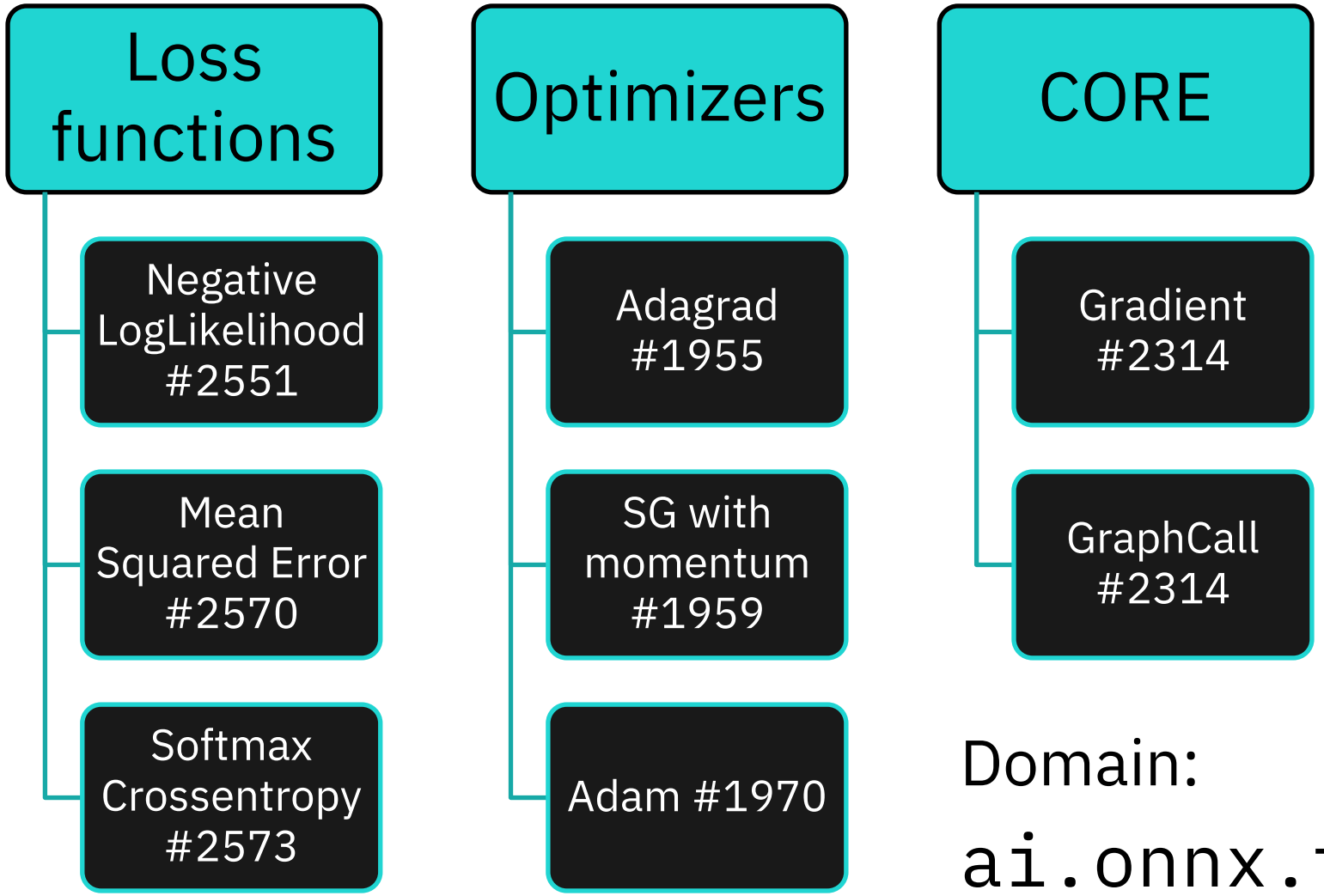
New features in ONNX IR (version 7)

onnx/onnx.proto Added lines 210-316 and 367-377

```
message TrainingInfoProto {
  optional GraphProto initialization = 1;
  optional GraphProto algorithm = 2;
  repeated StringStringEntryProto initialization_binding = 3;
  repeated StringStringEntryProto update_binding = 4;
};
message ModelProto {
    ...
    repeated TrainingInfoProto training_info = 20;
};
```



New operators (and PR #’s)



Domain:

`ai.onnx.training`

Next steps

- Wei-Sheng finished ADAM PR #1970, but not in 1.7 release
- Add more details into current primitives, ***define gradient behavior for each operator***
- Helper functions:

  Create TrainingInfoProto

  To go from inference to training graph and back
- Work with Converters teams to help them to support ONNX training
- How are users doing auto-diff? Need it in ONNX? Need ***your*** answers!

- Longer term: Get feedback on the spec and update

Contact me

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