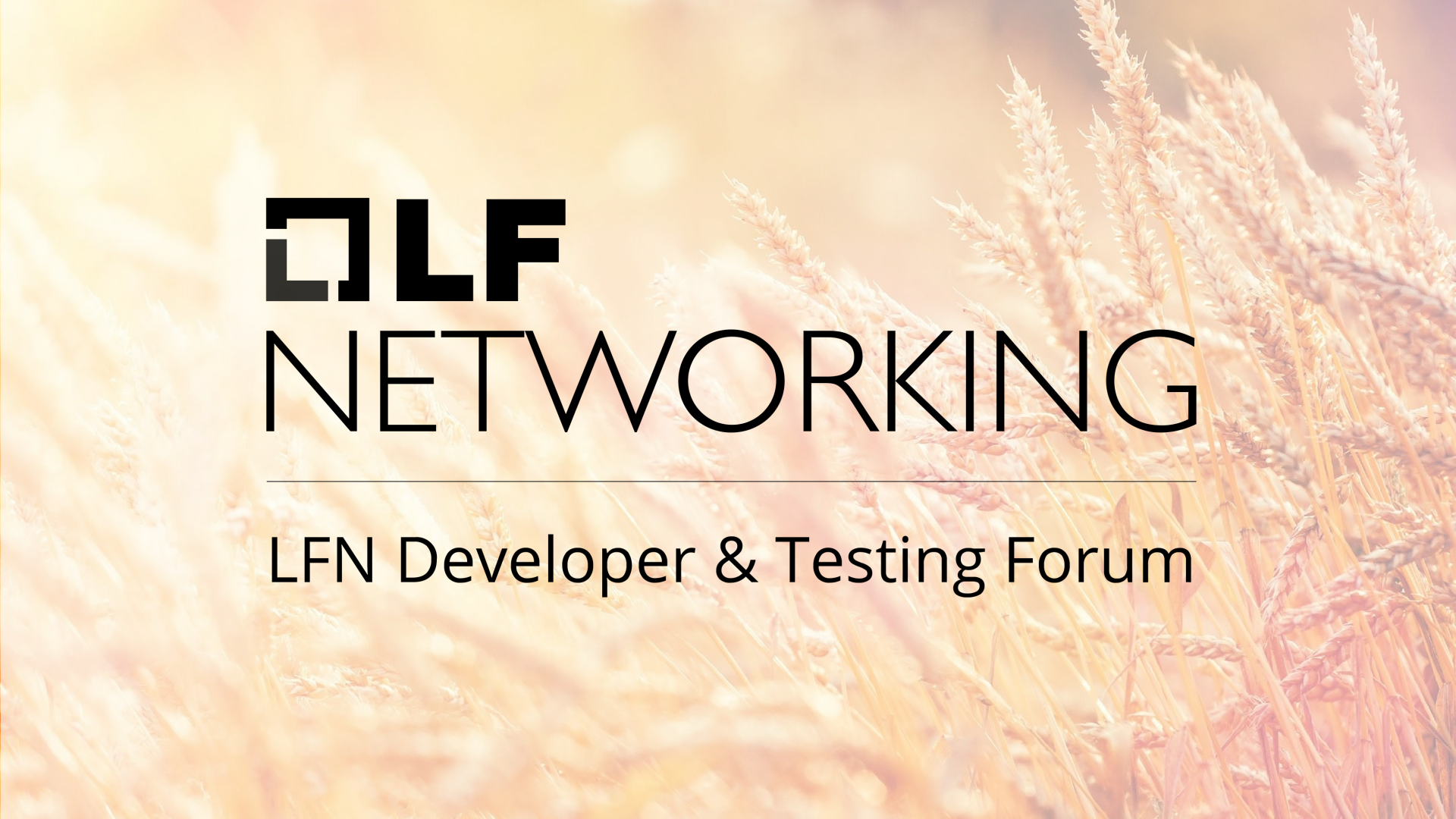
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Thoth Action Plan for Collaborative Innovation of Network Intelligence

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Background

- **Mission:**

- AI has potential in creating value in terms of enhanced workload availability and improved performance and efficiency for NFV usecases. This work aims to build machine-Learning models and Tools that can be used by Telcos (typically by the operations team in Telcos).
- This project also aims to define set of data models for each of the decision making problems, that will help both provider and consumer of the data to collaborate.

- **Problem:** Lack of operator scenarios and data, also lack of ecological collaboration mechanism
- **Follow-up:** From 2022, we introduce Network Intelligent Collaborative Innovation Project in Thoth, gather R&D resources in Telcos, IT, academia, etc. pull together industry to jointly build network intelligence use cases.

Contents

- Thoth Introduction
  - Network Intelligent Collaborative Innovation Project
  - Other works in Thoth Moselle Release
- Panel-Thinking about Network Intelligent Collaborative Innovation

Background-Introduction of Intelligent Networking

- **What is Intelligent Networking?**

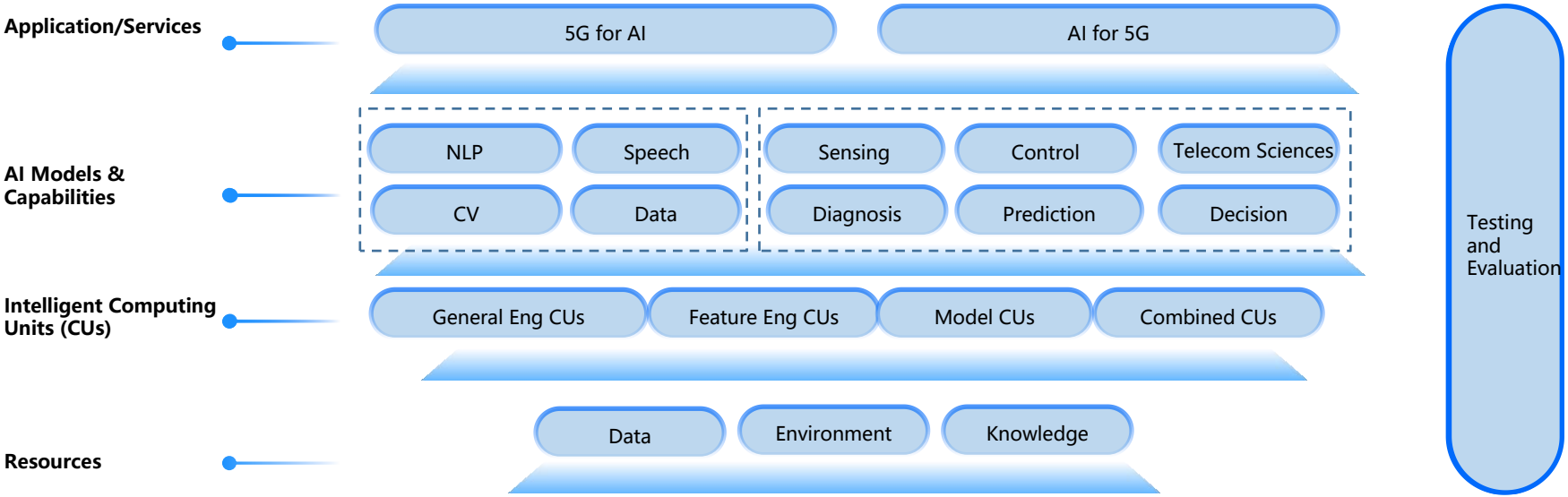
  -A network empowered by AI technologies and systematic integration of AI and communication network on hardware, software, systems and processes to realize lower cost, higher efficiency and agile business.

- **What is Intelligent Networking Ecosystem?**

  -Through open source and standards organizations, jointly build intelligent network ecosystem, share network intelligent R&D resources, define industry standards, and provide open source reference implementations.

Action for Building Intelligent Network Ecosystem

- The current bottleneck problems of network intelligence technology include data, algorithms, etc.
- In order to solve these problems, LFN Board Chair -Dr. Junlan Feng proposed at LFN ONEEF that it is better to connect industry organizations in LFN, establish joint working group for open source network innovation.



Action for Building Intelligent Network Ecosystem-Network Intelligent Collaborative Innovation Project (1/1)

- **Goal:** Gather operators, vendors, research institutions, etc. to share model scenarios and data/R&D resources according to common network intelligence requirements of industry, jointly construct network intelligence algorithm models, then create network intelligence collaborative innovation ecosystem.
- **Project Form:** Taking the form of AI competition for reference, **operators** put forward requirements for network intelligence scenarios, then **researchers**(include vendors, IT companies,etc.) conduct R&D and submission of AI models based on scenario requirements.
- **Project Works**

(1) Platform: Used to submit, store and maintain network intelligence scenario description files, data, and models

(2) Use case scenario: Collect and review network intelligence scenario requirements

(3) Model: Network intelligence scenario model R&D

(4) Data: Network intelligence dataset construction

(5) Evaluation: Network intelligence scenario model evaluation and ranking

Action for Building Intelligent Network Ecosystem-Network Intelligent Collaborative Innovation Project(1/2)

- **Project Implementation Plan/Process**

1. Kickoff work for the project, including community reporting, contribution recruitment, platform development, marketing promotion, etc.

2. Requirements collection of Network Intelligent Collaborative Innovation Project

3. Project technical committee reviews use case scenario requirements, and pushes the approved scenario requirements to be launched and publicized

4. Researchers/developers develop and submit algorithm models based on the use case scenario requirements

5. Models evaluation and ranking, finally publish models ranking list

6. In addition to project implementation process, Thoth conducts daily operation and maintenance of platform, data, etc.

Project Organization Process Design

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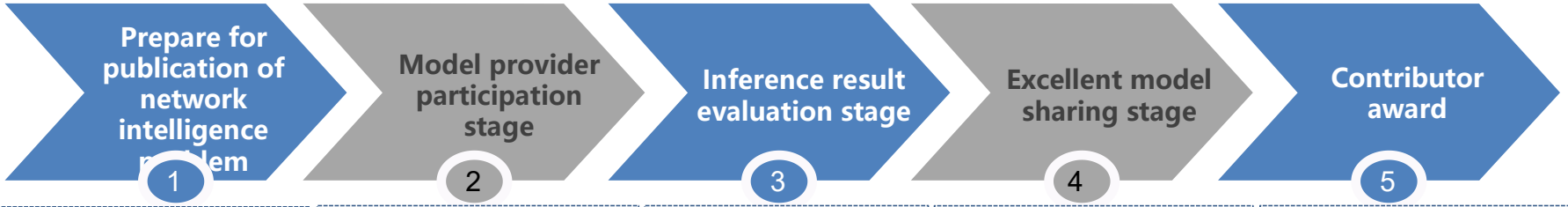
Five stages to advance project operation and cycle iterations



1	2	3	4	5
Collect network intelligence problems, data sets and evaluation procedures. Depending on the collection of questions, 1~2 questions or more will be released per issue. The questions will be published directly to gitlab, and will be reviewed and stored by the technical committee.	Model providers check the network intelligent questions, download data set, conduct model training and development, upload the inference results,and the technical committee and the question definer will jointly review the result.	The inference result merge triggers gitlab-CI to start the evaluation program to refresh the ranking results, and record the real-time ranking results through ranking.txt	According to the release cycle of the problem, for the model with the final result ranking such as top5, it is required to open and share the model and upload it to gitlab, and the technical committee is responsible for reviewing and incorporating it.	Periodically, awards or badges are issued to contributors to network intelligence problems and model providers, and the technical committee will recommend and review the final award list.

Project Design Based on Gitlab(1/2)

- **Design goal**: Minimize project maintenance costs and achieve the core goal of collaborative innovation ecosystem construction (sharing and building typical scenarios, data sets and algorithm models)
- **Design scheme**: build a network intelligent collaborative innovation project platform based on gitlab

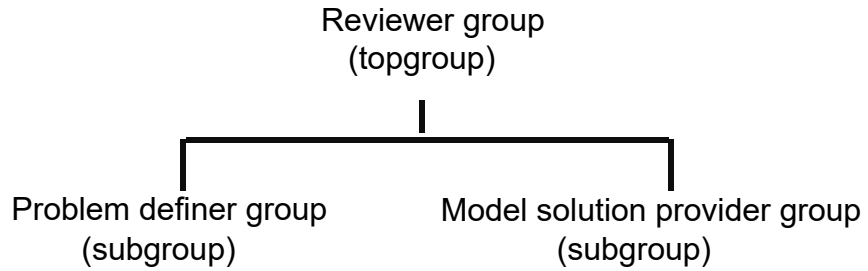
Role

✓Problem definer: Contribute questions, data, evaluation procedures and related instructions

✓Model provider: Download data and upload inference results, and contribute model code according to the evaluation ranking

✓Reviewer: Responsible for reviewing the uploaded content, (Virtual or newly formed community technical committee teams)

Grouping suggestion in gitlab



Project Design Based on Gitlab(2/2)

Project suggestion in gitlab

- Problem Definition Project
(Problem definer group)

```
Dummy resource compliance detection
  description.txt

dataset
      archive.zip
      description.txt

evaluation
       description.txt
       evaluation.py
```

- Each network intelligence problem is maintained as a separate project
- Dataset storage requires additional external storage

- Model Sharing Project
(Model solution provider group)

```
01-Dummy resource compliance detection
    results
        playlID
            sequence_predict_result.csv
        play2ID
            sequence_predict_result.csv
    topModel
        01-playerID
            model.py
        02-playerID
            model.py
02-NFV log exception analysis
    results
        playlID
            sequence_predict_result.csv
        play2ID
            sequence_predict_result.csv
    topModel
        01-playerID
            model.py
        02-playerID
            model.py
```

- results: inference result submission directory
- topModel: excellent model sharing and storage directory

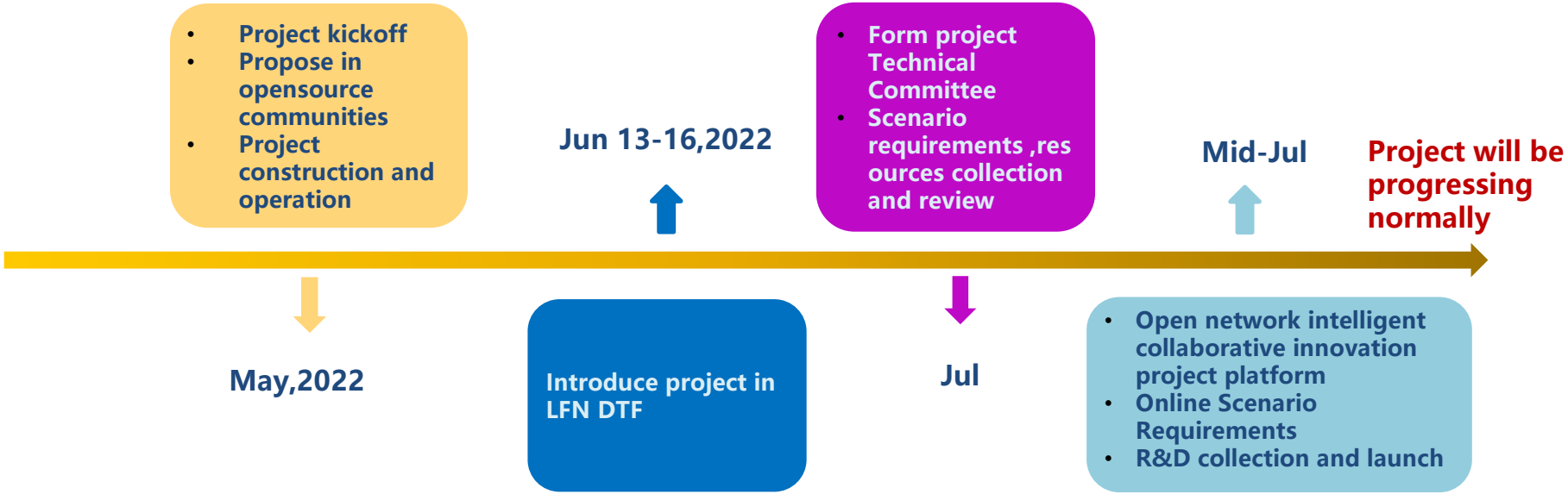
- Model ranking project
(Reviewer group)

```
Dummy resource compliance detection
      ranking.txt

NFV log exception analysis
       ranking.txt
```

- ranking.txt stores model real-time ranking
- The inference result merge operation triggers gitlab-ci to refresh the ranking in real time

Project Timeline



Participation Way

- Join project Technical Committee
- Provide network intelligence use case scenario requirements
- Develop network intelligence use case scenario model
- Contribute to project operation and maintenance

Join project Technical Committee

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- **Work：** The Technical Committee of Network Intelligent Collaborative Innovation Project is responsible for pre-release review of network intelligence scenario requirements, include but not limited to-

1. Whether the scenario requirements are sufficient and reasonable；

2.Whether the scenario relevant R&D resources are complete, including data resources, evaluation scripts, etc.

- **Condition：** Experts of Technical Committee should satisfy one of the following conditions-

1. AI related work experience；

2. Deep experience in network technology.

- **Recruitment Scope：** LF communities, including but not limited to LFN, LF AI, etc.

Provide Network Intelligence Use Case Scenario Requirements

- **Work:** Provide network intelligence use case scenario requirements, and responsible for relevant resources required for scenario model development
- **Condition:** Network intelligence use case scenario should have following contents, which will be released on the project platform after being reviewed and approved by project Technical Committee-

1.Use case scenario description;

2.Data resources;

3.Code specification;

4.Model evaluation script

- **Recruitment Scope:** LF communities, mainly from operators, including but not limited to LFN EUAG, etc.

Develop Network Intelligence Use Case Scenario Model

- **Work:** Responsible for R&D of algorithm models and submit model results based on network intelligence use case scenario requirements
- **Condition:** According to network intelligence use case scenario requirements, follow code specifications, and submit model results to the project platform
- **Recruitment Scope:** LF communities, including but not limited to LFN, LF AI, etc.

Contribute to Project Operation and Maintenance

- **Work:** Become a contributor to Anuket Thoth project, responsible for operation and maintenance of the network intelligent collaborative innovation project, work includes-

1.Operation and maintenance for Network intelligent collaborative innovation project platform

2.Network intelligence scenario requirements management

3.Network intelligence dataset construction

4.Network intelligence scenario model evaluation

- **Recruitment Scope:** Contributors will be recruited from LFN according to LFN project management regulations. Relevant work has been started, wiki page shown as follows

https://wiki.anuket.io/display/HOME/Network+Intelligent+Collaborative+Innovation+Project-+Call+for+Contributions

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Moselle Release Highlights

- VM Failure Prediction Models (LSTM and its variations, CNN and decision tree).
- Tools
  - AlgoSelector: Interactive tool to suggest the best AI/ML model to start with.
  - Data Extractor: Prometheus.
- Research Studies
  - Observability Data Generation using GANs（ITU-Competition）
  - AI/ML Problems in NFV
  - Opensource Tools for AI/ML in NFV

Nile Release Plan

- Model:
  - Log Analysis.
    - Intern and Student Volunteer
  - Observability Data Generation using GANs
    - Intern and ITU-Competition
- Framework:
  - Kubeflow.
    - Student Volunteer
  - Include Algoselector-Models.
- Tools
  - Data Extractor.

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Panel-Thinking about Network Intelligent Collaborative Innovation

Panlists Introduction

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ITU-T 13 Project Chair, Verizon

Sridhar K. N. Rao
LF Senior Architect,research interests include next-generation wired and wireless networking, use of ML in Networking

Ranny Haiby
LF Technical CTO,works with open source Networking and Edge projects under the Linux Foundation

Zhipeng Huang
LFAI TAC Member, Director of Open Source for Huawei Compute product line covering Operating System, Database and Artificial Intelligence

Scot Steele
Anuket TSC Member, Microsoft Senior Program Manager, working on the Azure for Operators - Network Cloud project

Welcome Participation

- Contact : huangleiyjy@chinamobile.com
- Thoth Weekly Meeting Time：Every week on Friday, 1300 UTC
- Zoom Link：https://zoom.us/j/96163911066

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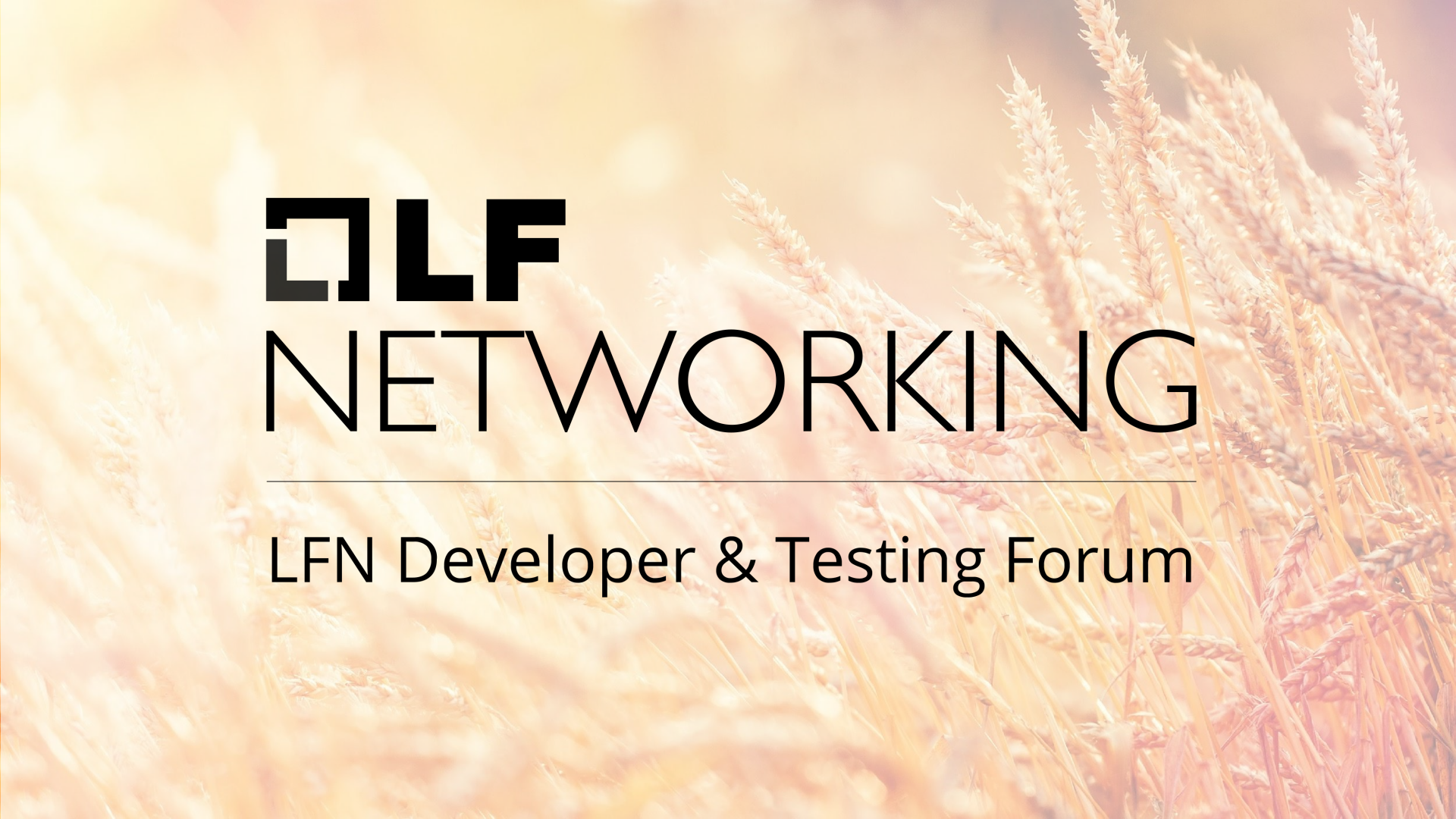
Thanks!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