Platform Overview, Releases and Use Cases

LFAI Day, Châtillons, France
Agenda

- Acumos AI
  - What is Acumos AI
  - Platform Overview
  - Value and Benefits
  - Community
  - Architecture, CI/CD, OSS
  - Clio Release

- Key Features & Use Cases
  - Network AI
  - ONAP Integration

- 5G/ORAN RIC Deployment
- Pluggable ML Workbench
- Collaboration, Federated Training
- Real Time Video Analytics

- LFAI Landscape & Acumos AI
- Machine Learning Stack
- Q&A
What is Acumos AI?

- Open Source Platform to Harmonize AI Solutions
- Distributed AI Marketplace
- Interoperable Microservices
- LFAI Ecosystem to Expedite Collaboration & Innovation
Platform Overview

1. Create & On-Board Models
   - AI Development Service and tools (Scikit-Learn, TensorFlow, H2O, RCloud)

2. Enhance Model With Application Data
   - Data Sources
   - Data Lakes
   - Data Router

3. Sharing Models In Marketplace
   - Training / Testing
   - Lifecycle
   - Training Dataset
   - Feature Recognition

4. Execute In Target Environment
   - Runtime Systems
   - Local Learning Testing
   - K8/Docker Images
   - Reporting / Exceptions

Acumos Platform

- DNN
- Train
- Deploy
- Publish
- Enhance Model With Application Data
- Data Access
- Feature Recognition
- Transforms
- Action
- Search
- Review
- License
- Chain
- Enhance Model With Application Data

Acumos AI
Platform Value and Benefits

**Portable Models**

Athena
Models Marketplace, Onboarding, Deployment

**Portable Training**

Boreas
Models licensed and retrained for different purposes

**Portable Data**

Clio
Reusable Data Pipelines

Models are containerized microservices which can be deployed where necessary to any application. Any system can reuse the logic if it supports Docker.

Models are adapted to different problems through training which can be done anywhere in order to comply with security principles (e.g. HIPAA) even if the model is to be executed elsewhere.

A data pipeline (acquire, select, combine, transform, etc.) can be used with any model so data access can be done once and used to build many solutions.
Linux Foundation Acumos AI Members

- Amdocs
- AT&T
- Baidu 百度
- BYOND
- DiDi
- Ciena
- Ericsson
- Intel AI
- Huawei
- Nokia
- Orange
- Red Hat
- Tech Mahindra
- Tencent 腾讯
- UNIVA
- ZTE
Acumos AI Platform Architecture

External API Gateway
- E2 - Web APIs
  - Model Repository
    - Model Selection
    - Data Collection
    - Data Transformation
    - Validate Solution
    - Design Canvas (drag & drop)
- Design Studio
  - TOSCA Topology
- Portal/MarketPlace
  - Admin Dashboard
    - Admin Management
    - Security Management
    - Monitoring
    - Federation
  - User Profile
    - Performance
    - Configuration
    - System Logs

Internal API Services
- Validation
  - Validation Toolkits
    - Validation Dashboard
  - Workflow Engine
    - System Component
    - Data Model & Policy
    - Rules
    - Importing/Exporting Model
    - Model Search/Review/Rating
- CDS
  - Model Repository
    - Catalogs
    - Model Artifacts
    - Test Data
- Portal/MarketPlace
  - Private/Local/Public Catalogs
  - Publishing Model
  - Importing/Exporting Model
  - Model Search/Review/Rating

Onboarding
- CLI Onboarding
- Web Onboarding
- Authentication
- Converter/Dockerizer
- Notification

Design Studio
- Model Selection
- Data Collection
- Data Transformation
- Validate Solution
- Design Canvas (drag & drop)

Modeler
- User
- Operator

Pre-training/Testing Data

Target Deployment Environments (including external data sources for training and execution)
- Data Source
- Data Broker
- Training Client
- Training Cache
- Execution Client
- Data Source
- Data Broker
- e.g. Data Lake
- e.g. Streaming Data
- ML Model Deployed

Acumos Platform Federation
- Acumos MarketPlace
  - Acumos Company X
  - Acumos Company Y
- Acumos Co. Y-1
CI/CD - Test Automation and Deployment

- Gerrit: Commit
- Jenkins: Build
- JUnit: Test
- Nexus: Stage
- Robot Framework: Deploy Dev/QA...

Continuous Integration/Delivery

Development

Code Commit

Production
Acumos AI Open Source Software Technologies and Tools
Clio Open Source Release, Nov 2019

Features

- ONAP DCAE Integration
- O-RAN RIC/XApp Deployment
- ML Workbench, Notebooks
- Data/Training Pipelines, NiFi
- Model Ratings
- Predictor Scoring
- CI/CD for Kubernetes
- IPR Licensing Protection
- Cross Company Licensing
- Pluggable MLWB Framework
- Integrated Catalog Search
- Locality/International Design
- Platform Co-branding
- Support for C/C++ Client
- Onboarding Spark/Java

Key Stats (60%)

- 8 Projects
- 62 Repositories
- 1.27M+ lines of code
- 4K+ Commits
- 84 Contributors
- 78 Reviewers
- 33 Epics, 104 US, 28 Tasks
- 178 Jira Items
- 200+ Internal API Functional
- 50+ External API’s
- 50%+ Code Coverage
Key Features and Use Cases
AT&T Network AI
Autonomous, Contextual & Predictive Network to drive new experiences at higher velocity

OPEN SOURCE

AKRAIN/AIRSHIP

ONF/ORAN

ONAP

ACUMOS

Network AI

Edge Compute

SG Access

Software defined Network & Storage

Artificial Intelligence
ONAP / Acumos AI Integration

1. Acumos Private Market Place
2. Acumos Public Market Place
3. Model training, refinement, & Validation
4. Trained Model Catalogue
5. DCAE Design Studio
6. DCAE Analytic Application Creation
7. Service Design & Creation (SDC)
   - xNF Onboarding
   - Service/xNF / workflow Design
   - Config Design / Controller Design Studio
   - DCAE Design Studio
   - ONAP Module Deployment Blueprints
8. OOM Model / Apps Deployment
9. Edge DCAE
10. Central Data Lake

- Published
- Independent Sampled Data
- Historical Data
- Validate
- (Re)Train
- Refine
- Selected, Sampled batch data feed
5G/ORAN RIC - ML model lifecycle

1. Design Model
2. Deploy Untrained Model
3. Collect
4. Upload Trained Model
5. Publish to Non-RT RIC
6. Package model, set policies
7. Download to near-RT RIC, O-DU, O-RU
8. ML models (loop 2)

- ML Training Host can be part of non-RT RIC or can be executed offline
5G/ORAN RIC - Acumos Integration

- Acumos microservices deployment with GRPC/Protobuf and self-contained request/response usage pattern
- New Acumos microservices adapter connecting ML model to RIC via Python interface for messages on the bus using RMR.
- Controlled by JSON Config file for mapping incoming messages of interest onto calls to prediction/classification functions offered by the Acumos MS
- Two Docker images deployed together to serve as a single xApp via Helm chart
- Performance measurement results are acceptable for non-real-time and many near-real-time xApps.
- XApps use cases: 5G traffic steering, QoE optimization, MIMO beam forming optimization, etc
ML Workbench
Plug and Play
Acumos Collaboration

Acumos Marketplace facilitates iterative ML model development, training and improvement among collaborators.
Acumos Vendor Collaboration and Federated Training

Acumos Marketplace facilitates iterative ML model development, training and improvement among collaborators

- Vendor Develops Model
- Trains On Ideal Data
- Federates Via Acumos
- Model Retrained On Actual Data
- Model Deployed
- Refinements Shared With Collaborators
Video Analytics for Real Time Streaming Data

Build using Acumos AI open source platform

Uses AT&T Research Labs Acumos AI instance which provides various video analytics machine learning models.

Streaming Video Analytics powered with following Acumos AI Models:

- Object – to classify the images in the video for ad insertion
- Sentiment – to detect the mood of the scene for ad insertion
- Face Detection – to detect human face
- Face Recognition – to recognize well known celebrities
- Privacy – to pixelate and provide privacy of the detected faces.
- Logo Recognition – to detect various company logos for advertising purposes
- Frame Ranking - compute the best frame in the video

Fast, Easy, Drag and Drop building of complex AI Applications using Acumos AI Design Studio by chaining multiple ML models
Video Analytics Models Chaining in AccuCompose
LFAI Landscape and Acumos AI
Acumos AI Integration within LF AI Landscape
**Machine Learning Stack**

### Data Governance
- Data cleansing
- Data ingestion
- Data analysis
- Data transformation
- Data validation
- Data splitting

### Ethics Management
- Building a model
- Training optimization
- Model validation
- Training at scale
- Model

### Security Management
- Deploying
- Serving
- Monitoring & Logging
- Finetune & improvements

### Rollout
- Cloud
- Edge

### Model creation
- Marketplace (AI Hub)

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*Acumos AI*
Open Source Machine Learning Stack

Data
- Data cleansing
- Data ingestion
- Data analysis
- Data transformation
- Data validation
- Data splitting

Data Governance

Ethics Management
- Training optimization
- Model validation
- Training at scale

Security Management
- Deploying
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Acumos AI Framework Integration (Proposed)
Q&A?

Thank You!