Akraino Annual Report 2022

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Executive Summary

- **Akraino continues to generate edge computing blueprints and use case examples. TSC meetings are twice-a-week, holding a steady average of around 10-12 participants**

- **Trend in use cases has shifted in 2021 and 2022 from telco-oriented to a wider range of cloud interfacing and smart edge**

- **Examples of ongoing effort include cloud – edge interface and architecture, connected/intelligent vehicles, and robotics**

- **Progress in establishing regional Akraino organizations is a notable accomplishment in 2022**

- **Promotion and marketing to a wider technical audience continues to be Akraino's main challenge**

Akraino Overview

- **For anyone who may need an overview …**

- **Akraino is an LF Edge open source community focusing on edge computing**
  - covers a broad range of use cases and technologies
  - publishes blueprints – a high level combination of software, architecture, and data flow diagrams, working code, and documentation
  - collaborates with SDOs such as ETSI MEC
  - applies a multidisciplinary approach with key subcommittees
  - key strengths - wide range of industry participants, technology diversity

Activities

- **Nov 2021 get-together and tech presentations**
  - Akraino held its first face-to-face meeting since Mar 3 2020 ! It worked out well and was exciting for people to see each other again
  - 1 day face-to face in Palo Alto (at Hanahaus)
  - attendance around 12, with additional remote participants

- **Spring Technical Summit, Mar 2022**
  - 3 days in hybrid format
  - 1 day face-to-face in Palo Alto (at Hanahaus)
  - attendance around 20, with additional remote participants

- **Fall Summit, Technical and Organizational, Sep 2022**
  - 3 days in hybrid format, both technical and organizational topics
  - 1 day face-to-face at Google Mountain View location
  - 2nd day live at locations in Germany, China, and S Korea, 3rd day live at Arm (Santa Clara)
  - 42 registrants for Day 1 (actual in-person around 30), 57 over all 3 days with additional remote participants, and 28 presenters. Excellent !

- **Upcoming**
  - ETSI MEC Hackathon, Edge Computing World conference, 10-12 Oct. Hackathon organized by ETSI and LF Edge/Akraino

Modifications to Key Documents

- **Modifications to governing documentation**
  - required TSC voting approval
  - required brief Q&A with LF legal counsel

- **Technical Community Document wiki page**
  - TSC responsibilities, section 4.5.1, Identifying and Recruiting Akraino Localized Organizations
  - cross-reference to regional communities wiki page
  - summary – new regional organizations have a step-by-step list for marketing and compliance, the TSC actively reviews and then votes

- **Regional Communities wiki page**
  - clarify policy and operational procedure
  - cross-reference to Tech Community Document wiki page

- **Technical Community subcommittee wiki page**
  - modifications to blueprint review procedure

Security Subcommittee

- ## New chair
  - Danill Egranov @ Arm has taken over from Randy Stricklin @ AT&T. Randy laid the foundation for automated security processes, logs and log review, and weekly detailed discussion of security issues

- **Defining security requirements for blueprint execution environments and software components used by blueprint owners (maturity and incubation releases)**
  - 1. **Minimum OS requirements (OS vendor, release version).**
  - 2. **Minimum OS configuration including security and runtime services**
  - 3. **Minimum CVE level permitted for maturity and incubation releases**

- **Reviewing and updating security requirements every 6 months (aligned with Akraino releases)**

- **Reviewing blueprint security logs generated by BluVal (https://wiki.akraino.org/display/AK/Bluval+-+Akraino+blueprint+validation+framework)**

- **Working with blueprint owners on security issues found with Lynis, Vuls and kube-hunter (BluVal test package), and helping to resolve them**

- **Day-to-day monitoring of of Lynis, Vuls, and kube-hunter security issues and databases**

- **Defining platform security requirements (work in progress)**

- ## Chair Danill Egranov

API Subcommittee

- **Improvements to API Info gathering spreadsheet and procedures**
  - additional subcategories
  - required brief Q&A with LF legal counsel

- **Discussion about 2nd sources**
  - Ongoing, this started up after the Google IoT Core deprecation, which was an attention getter
  - the current thinking is to ask blueprint teams to list and/or comment on possible 2nd sources for upstream dependencies

- **Subcommittee help with other activities**
  - the subcommittee took the lead in ironing out issues with regional Akraino organization application and approval process
  - the subcommittee helped organize the Nov 2021 face-to-face and Spring Technical Summit

- **Blueprint API information reporting approved in 2022**
  - IEC Type 3: Android cloud native applications on Arm servers in edge
  - Smart Cities
  - MEC-based Stable Topology Prediction for Vehicular Networks
  - Smart Data Transaction
  - Robot basic architecture based on SSES

- **Chair Jeff Brower**

Upstream / Downstream Subcommittee

Dependencies of the release (upstream version, patches)

S. No	Software	Version	Remarks	
1.	Edge Gallery	1.5.1		
2.	Docker	18.09+		
3.	Kubernetes	1.18.7		
4.	EdgeX	Edinburgh	This old version used due to k8s deployment	
5.	OPC-UA	Geneva		

- Release 6/7 review going well. Most BPs have no upstream changes. Any BPs with upstream changes will need to inform us in advance
    - https://wiki.akraino.org/display/AK/Release+6+Upstream+Review+Status

- Worked with API subcommittee in review of three (32) regional labs (so far in 2022). Africa lab and China north lab are fully approved. China south lab in TSC process.
    - https://wiki.akraino.org/display/AK/Akraino+Regional+Communities

- **Chair Jim Xu**

Technical Discussion Subcommittee

Primary role is to review blueprints in incubation stage

Gain an understanding of the blueprint

- Overall goals, objectives, and long-term direction in edge computing

Look for areas of synergy with

- Other blueprints, upstream communities, downstream communities, and Akraino regional organizations

Map the blueprint into areas being promoted by Akraino and LF Edge

- Such as: edge cloud, data privacy, security, 5G/6G, Metaverse, Blockchain, MEC, high performance computing (HPC), robotics, etc.

- **Chair Doug Eng**

Technical Discussion Subcommittee, cont.

3 incubation reviews approved in 2022

pipelineDP Blueprint

- Conversation led by Wenhui Zhang

CFN (Computing Force Network) Ubiquitous Computing Force Blueprint

- Conversation led by Hanyu Ding and Yanjun Chen

Edge Service Enabling Platform Blueprint

- Conversation led by Colin Peters
- Special Thank You to Jeff Brower for chairing this meeting!!!

Documentation Subcommittee

- **Background -** the Akraino Documentation subcommittee's objective is to promote consistent documentation structure and quality assurance across both the Akraino Project level and all individual Blueprint (BP) Families. It also serves Akraino TSC requirements to follow Akraino procedures for quality assurance and documentation review.

- **Blueprints reviewed in 2022**
  - IEC Type 3: Android cloud native applications on Arm servers in edge
  - Smart Cities
  - MEC-based Stable Topology Prediction for Vehicular Networks
  - Smart Data Transaction
  - Robot basic architecture based on SSES
  - PCEI
  - Integrated Cloud Native NFV/App
  - Enterprise Applications on Lightweight 5G Telco Edge
  - ELIOT R6 IoT Gateway
  - SmartNIC for Integrated Edge Cloud

- **Procedures -** all Akraino BPs are required to fill in and submit the following documentation templates as part of their maturity evolvement and/or new blueprint release participation:

  1. Blueprint (BP) API template

  2. BP Architecture template

  3. BP Datasheet (1-2 pages BP overview) template

  4. BP Installation Guide template

  5. BP Release notes template

  6. BP Test template

- **Chair Ike Alisson**

Documentation Subcommittee, cont.

- **The Akraino Documentation subcommittee assists the Akraino TSC with gathering and storing BP documentation and filled-in templates and performs review of submitted templates. During documentation review, the subcommittee advised BP PTLs that all provided remarks and comments are advisory and should be treated as "recommendations"**

- **Subcommittee final approval and "acceptance" falls within the authority of the Akraino TSC (for an example you may look at: https://wiki.akraino.org/display/AK/2021+year)**

- **If needed, the subcommittee cooperates closely with the Akraino API subcommittee regarding BP API usage. For BP submission of the documentation API template, the subcommittee utilizes API subcommittee expertise and experience for its review**

- **Note there is no specific requirements by the Akraino TSC on the content, format, and structure of BP documentation; it's up to BPs to determine the extent and content of their documentation**

Regional Akraino Organizations

- ## Two new organizations approved

  - Africa – The Edge Hub, aka The Cortex Hub
    -East London, S Africa
    -theedgehub.org
    -thecoretexhub.africa
    -an ICT incubator

  - China north – SDN Lab
    -Nanjing
    -sdnlab.com
    -agency offering services ranging from web
      content, technical materials, labs, events, etc.

- ## Pending

  - China south – Green Computing Consortium
    -Shenzhen
    -opengcc.org
    -open and innovative ecosystem in China for green
      computing in cloud data center infrastructure

More Info / Q&A

- **Ask me for any follow-up info**
  - specific blueprints
  - subcommittee chair and co-chair contact info
  - blueprint project team leader (PTL) contact info

- **Top level Wiki page**
  - https://wiki.akraino.org

- **Q&A**
  - fire away !

Supplemental

Following slides are supplemental material

Cloud Native

- **NFV stack**
  - SDWAN, customer edge, edge clouds – deploy VNFs and CNFs as micro-services
  - key organization: Intel

- **Multi-tenant security**
  - deploy secure and trusted workloads and bare-metal containers
  - key organization: Intel

Cloud / Edge Border

- **Public cloud / edge interface**
  - set of open APIs for edge applications (primarily telco) to expose towards public cloud providers

  - key organization: Equinix

- **Network cloud**
  - network cloud architecture allowing single SDN controller for containers, VMs, and bare metal servers. Incorporates Tungsten Fabric

  - key organization: Juniper Networks

Integrated Edge Cloud

- **Edge stack**
  - Integrated Edge Cloud (IEC) family of blueprints
  - deployment of edge VR/AR streaming
  - key organization: Tencent

- **Smart NIC**
  - accelerate performance of VPCs and 5G UPFs
  - key organizations: ByteDance, SocNoc, Arm

- **Edge Arm Servers**
  - run Android cloud native apps at the edge
  - key organizations: ByteDance, Arm

Telco

- **Lightweight 5G**
  - enable enterprise applications at the telco edge
  - key organization: Huawei

- **Private 5G**
  - end-to-end LTE/5G connectivity using CBRS band
  - key organizations: Cohere Technologies, Verizon

- **5G MEC slicing**
  - high performance cloud gaming, HD video, and live broadcasting edge applications
  - key organizations: Tencent, China Mobile

AI

- **Federated machine learning**
  - machine learning across mobile and IoT devices
  - key organizations: WeBank, inwinStack

- **School monitoring**
  - school safety, security, and surveillance
  - key organizations: Baidu, Arm, Intel, Penn State Univ

- **Intelligent vehicle cooperation**
  - AVs – current focus is on autonomous taxis
  - key organizations: Baidu, Intel, Arm

IoT

- **Robotics**
  - current focus is industrial and enterprise robots (e.g. food preparation and production)
  - areas of emphasis:
    - technical challenges: tactile/touch, speech recognition, real-time operation
    - robot safety (cloud independence as needed)
    - privacy of user data
  - key organizations: Fujitsu, Signalogic

- **Cloud gateway for IoT apps**
  - enable industrial IoT use cases

  - key organization: Huawei

- **SD-WAN**
  - networking for edge and micro CPE use cases

  - key organization: Huawei

Connected Edge Nodes

- **Cities**
  - smart cities – AVs, utilities management, smart buildings, safety and emergency services
  - key organizations: Arm, Microsoft, Nexcom

- **Vehicles**
  - connected vehicles – vehicle communication of route, action, safety information. Key org: Tencent
  - MEC-based topology prediction – AV path prediction, communication. Key org: Jeju Nat Univ

Areas of Common Work

- **Whitepapers**
  - collaborative publications between different blueprint teams
  - Akraino Edge Stack APIs, Jun 2020
  - Cloud interfacing at the telco edge, Jul 2020
  - Sharpening the Edge: Overview of the LF Edge Taxonomy and Framework (LF Edge, Aug 2020)

- **Security**
  - security subcommittee oversees cert process for blueprints prior to release
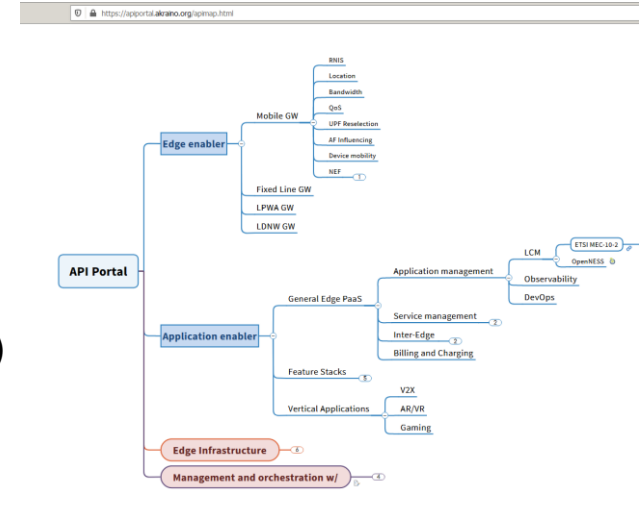 - automated checks include Lynis scan, vulnerabilities, Kubernetes ("kube hunter")

- **Documentation**
  - documentation subcommittee

- **APIs**
  – API subcommittee oversees gathering of organization-wide API info
  – standardized API form
  – API map (https://apiportal.akraino.org/apimap.html)

- **TSC planning, review, and approval process**
  – technical steering committee
  – review and voting approval for all BPs
  – discussion and planning of organization wide issues