PRAGMA 37: Overview and Updates

Shava Smallen
Co-chair, PRAGMA Steering Committee
University of California, San Diego

Shinji Shimojo
Co-chair, PRAGMA Steering Committee
Osaka University

Current NSF award: OCI 1234983

Pacific Rim Applications and Grid Middleware Assembly

PRAGMA seeks to address these challenges to improve *CI and scientific impact via practical implementation.* We focus on international *collaborations that uniquely team technology specialists and domain scientists*

- Science is **inherently international** and **requires collaboration**.
- Cyberinfrastructure is only one dimension; **people and trust are also essential**
- Collaboration is **enabled by sharing and exchanging data, algorithms and tools.**
- There are fundamental challenges in matching existing CI to hundreds of communities. **Deep interactions with long-tail communities has the potential to transform both science domains and CI development**

PRAGMA

Founded in 2002

Focused on researchers and institutions on the Pacific Rim

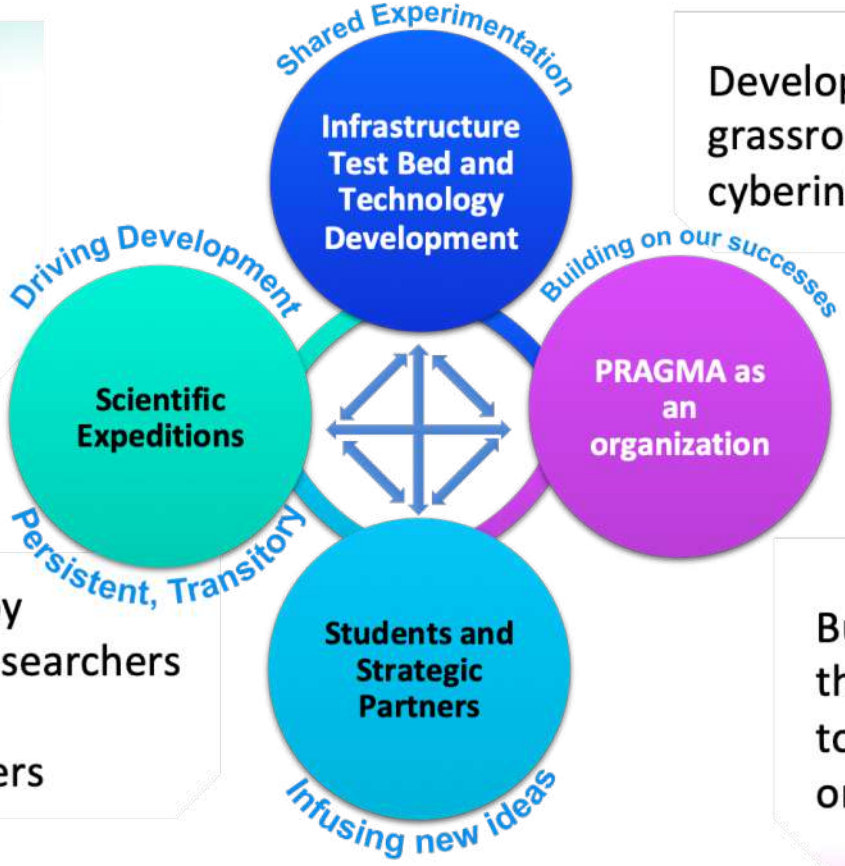
Open Community of Practice

Engages "Long Tail" science communities

Building Trusted Community of Practice through four strategies of collaborating

Fostering international **scientific expeditions** by forging teams of domain scientists and CI researchers

Developing and improving a grassroots, international cyberinfrastructure



Infusing new ideas by developing young researchers and by engaging with strategic partners

Building and enhancing the essential people-to-people trust and organization

Multi-institution collaborative leadership

PRAGMA as an organization

Operating Principles and Procedures

Working Groups

Student Committee

PRAGMA Steering Committee (23 representatives)

Co-chairs

Shava Smallen

Shinji Shimojo

Functional Area Roles

- Communications
- Membership
- Mentoring
- Workshop Engagement

Heru Suhartanto

Fang-Pang Lin

Ruth Lee

Jason Haga

Prapaporn Rattanatamrong

Kohei Ichikawa

Expeditions: A Model of Collaboration

Domain Scientists

Long-Term sustained effort to answer scientific question(s) through co-design

Technology Developers

Expeditions

Lake Ecology: understand the processes that govern lake eutrophication and predict water quality

Biodiversity: understand spatial patterns of biological diversity and how they emerged

PRAGMA Experimental Network Testbed (ENT): understand impact of software defined networking in international context

Lake Expedition: Predicting Water Quality in Lakes

Paul Hanson (U. Wisconsin), **Cayelan Carey** (Virginia Tech), **Renato Figueiredo** (U. Florida)

Scientific Expeditions

- **Eutrophication:** excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life.
- **Lake eutrophication** is global issue, results in **degraded water quality**
- **Goal**: Integrate sensor data as inputs to **computational lake models** → science goal is to ***predict*** **water quality**

GLEON

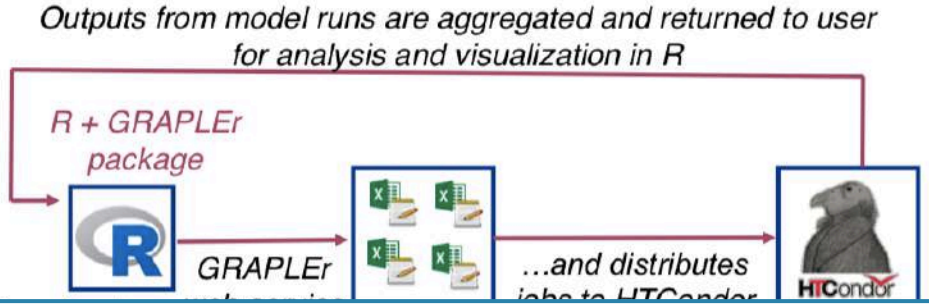
global lake ecological observatory network

Lake Expedition: Developing Predictive Models using High-Throughput Computing and Overlay Networking

Scientific Expeditions

- **Sensor gateways** link sensors to internet (connecting to storage and models)
- **IPOP overlay network** create virtual private network for sensor data and computation
- **GRAPLEr distributed computing** uses an R interface to allow ecologist access to distributed computing
- **Educational Modules** educate

Prof Carey teaching students to use GRAPLer at VaTech



PRAGMA 37 Student Presentations / Posters

Integrated Application and Performance Monitoring at the IoT Edge (Yutthana Boonpalit, Siwakorn Suwanjinda, *Thammasat University, Thailand*)

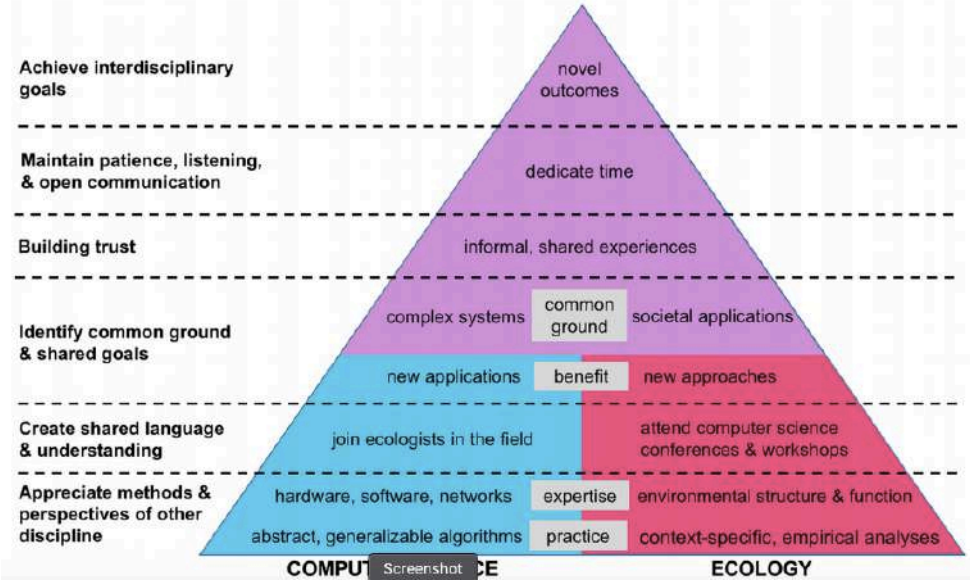
Investigating the Performance and Scalability of Kubernetes on Distributed Cluster of Resource-Constrained Edge Devices (Vahid Daneshmand University of Florida, USA)

PRAGMA

Enhancing collaboration between ecologists and computer scientists: lessons learned and recommendations forward

Cayelan C. Carey,[1,†] Nicole K. Ward,[1] Kaitlin J. Farrell,[1] Mary E. Lofton,[1] Arianna I. Krinos,[1] Ryan P. McClure,[1] Kensworth C. Subratie,[2] Renato J. Figueiredo,[2] Jonathan P. Doubek,[1] Paul C. Hanson,[3] Philip Papadopoulos,[4] and Peter Arzberger[5]

[1]*Department of Biological Sciences, Virginia Tech, Blacksburg, Virginia, USA*
[2]*Electrical and Computer Engineering, University of Florida, Gainesville, Florida, USA*
[3]*Center for Limnology, University of Wisconsin-Madison, Madison, Wisconsin, USA*
[4]*San Diego Supercomputer Center, University of California-San Diego, La Jolla, California, USA*
[5]*Pacific Rim Applications and Grid Middleware Assembly (PRAGMA), University of California-San Diego, La Jolla, California, USA*



Screenshot

Kaitlin J. Farrell, Nicole K. Ward, Arianna I. Krinos, Paul C. Hanson, Vahid Daneshmand, Renato J. Figueiredo, Cayelan C. Carey, "**Ecosystem-scale nutrient cycling responses to increasing air temperatures vary with lake trophic state**", *under review*

Arianna I. Krinos, Kaitlin J. Farrell, Vahid Daneshmand, Kensworth C. Subratie, Renato J. Figueiredo, and Cayelan C. Carey, **"Including variability in air temperature warming scenarios in a lake simulation model highlights uncertainty in predictions of cyanobacteria**", *under review*

Biodiversity Expedition: Distributed analysis of biological diversity

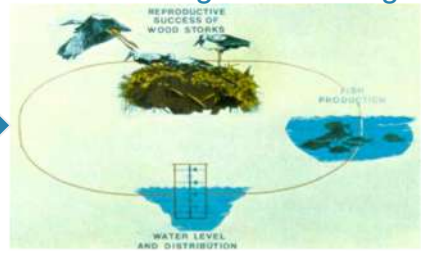
Aimee Stewart (University of Kansas, Biodiversity Institute), **Nadya Williams** (UC Irvine)

Scientific Expeditions

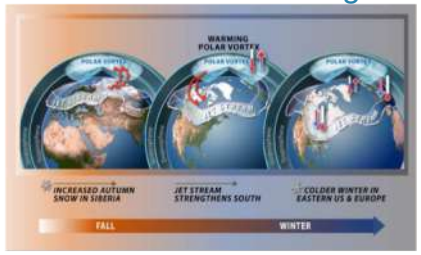
Lifemapper brings together

Biodiversity Inventory

Macroecological Modeling

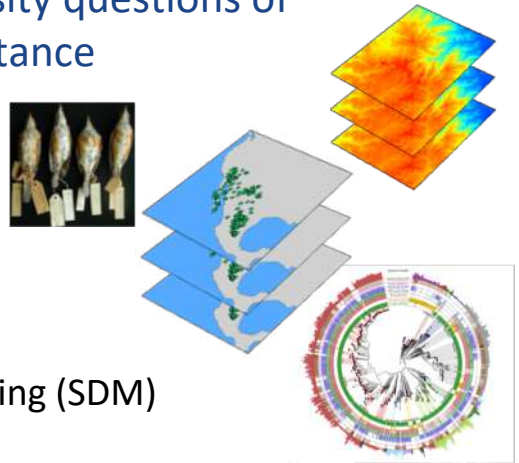


Global Climate Change

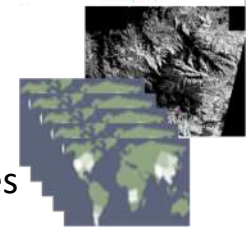


Biodiversity: understand spatial patterns of species diversity and how they emerged

Goal: address large-scale biodiversity questions of ecological and evolutionary importance

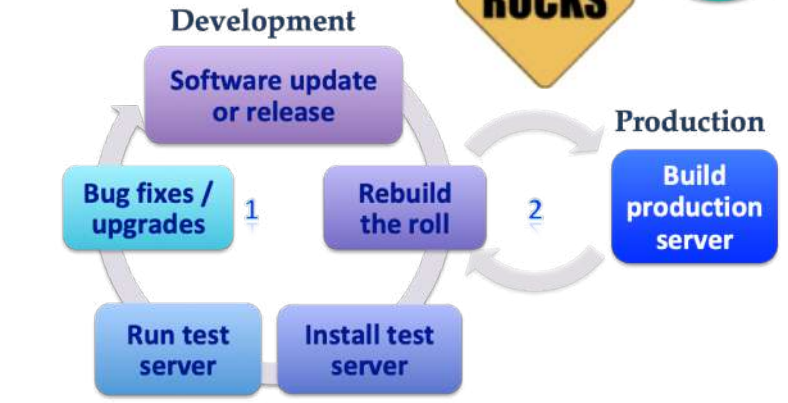


- **Inputs**
  - Species occurrence points
  - Bioclimatic layers
  - Phylogenetic trees
- **Tools**
  - Species Distribution Modeling (SDM)
  - Macroecological analyses
  - Meta-Community Phylogenetic Analyses
- **Results**
  - Species potential habitat “niche” maps
  - Biodiversity / phylogenetic diversity analyses



Biodiversity Expedition: Virtualizing Lifemapper to Expand and Enhance Lifemapper Deployments

- **Software engineering and using Rocks** clusters increased availability and flexibility of the Lifemapper platform as a complete system
- **Lifemapper deployed in a variety of environments** such as researcher laptops, project servers, HPC resources (US XSEDE Comet)
- **Working to facilitate data ingestion** to enable regional Lifemappers that use locally-available high resolution data
- **Training**



PRAGMA 37 Student Presentation / Poster

Lifemapper on SAGE 2 (*Michael Elliott, James Beach, Cj Grady, Aimee Stewart and Jose Fortes*)

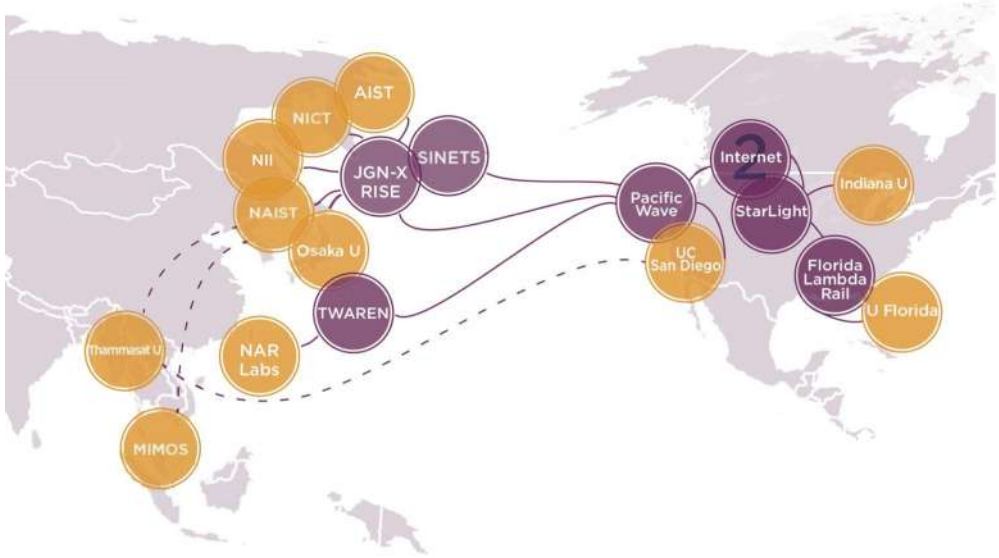
Experimental Network Testbed Expedition

Scientific Expeditions

Infrastructure Test Bed and Technology Development

Kohei Ichikawa (NAIST)

- **Software-defined networking (SDN)** provides programmatic access to networking switches
- **Goal**: an international SDN testbed for use by PRAGMA researchers and collaborators
- **4 countries and 11 institutions** currently participate in testbed
- Using NAIST's **AutoVFlow** as



PRAGMA 37 Student Presentation and Demo

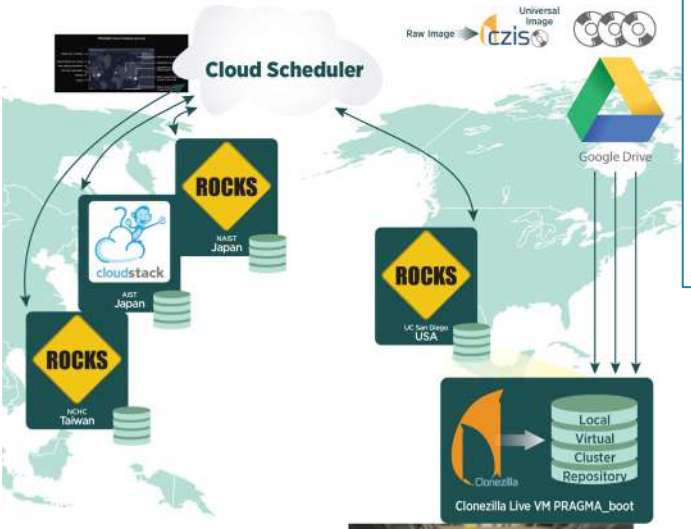
An Interactive Monitoring Tool for OpenFlow Networks (Wassapon Watanakeesuntorn, Nara Institute of Science and Technology, Japan)

Near Real-time Failover Model for Continuous Inter-Domain Communication (Juan Sebastian Aguirre, Yoshiyuki Kido, Susumu Date, Shinji Shimojo, Kohei Ichikawa and Atsuko Takefusa)

PRAGMA

Infrastructure Test Bed and Technology Development

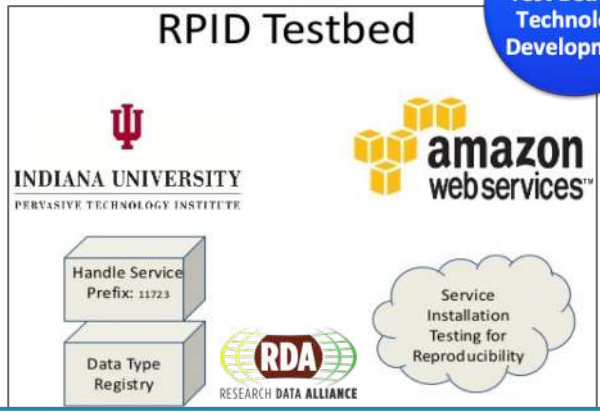
PRAGMA Cloud Testbed



Edge Computing Testbed

24 Raspberry Pi 3B+ nodes on two sites:
16 Nodes at University of Florida, USA
8 Nodes at NAIST Japan

RPID Testbed

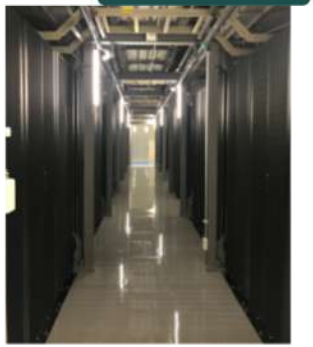


PRAGMA 37 Student Poster

Digital Object Architecture data layer over a network storage system (*Yu Luo, Beth Plale, Martin Swany and Jeremy Musser*)

AIST
NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

AI Bridging Cloud Infrastructure (37 PF - 5th in Top 500)



NCHC

Taiwania 2 (15 PF - 20th in Top 500)

PRAGMA 37 Demo

Japan-Taiwan Data AI Module Platform for Analyzing Remote Sensing data, Part 3 (Hidemoto Nakada, et al)

Preparing the next-generation of researchers

Students and Strategic Partners

PRAGMA Student Committee


Wassapon Watanakeesuntorn


Can Wu


Kundjanasith Thonglek


Suchanat Mangkhangcharoen


Michael Elliott


Yutthana Boonpalit


Siwakorn Sywanjinda

International Research Experiences

PRIME

Pacific Rim Experiences for UCSD Undergraduates (2004-2015)

MONASH University

MURPA (2008-current)

The University Of Queensland AUSTRALIA

QURPA (2014-current)

AIST NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

Internship Program (2014-current)

Thammasat University

Undergraduate projects (2016-current)

CNU 충남대학교 CHUNGNAM NATIONAL UNIVERSITY

Undergraduate internships (2017-current)

Workshops: Driving progress and fostering new ideas, launching new activities

PRAGMA as an organization

PRAGMA workshops held two times a year (location rotates) + affiliated workshops

SEAIP
Southeast Asia International
Joint-Research and Training Program
科技部東南亞國際共同研究暨培訓研習會

GLEON
global lake ecological observatory network

Most Beautiful Bays in the World Club (MBBW)

https://world-bays.com

- MBB Congress leaders presented their organization at PRAGMA 34 in May 2018
- Fang-Pang, Shava, Nadya, and Jason attended **XIV World Bays Congress** held on Penghu Bay in Taiwan in September 2018
- Daniel Hung (Penghu Country Government) interested in **blue economy** issues
  - "Sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem." – World Bank
- The 15th World Bays Congress will be held under the theme of "Looking Forward" 16th to 20th October, Toyama, Japan

PRAGMA 37 Invited Talk

The Maritime Alliance, BlueTech and International Collaboration
(Michael Jones)

TMA BlueTech™
Promoting BlueTech & Blue Jobs®

PRAGMA 37 Highlights

- **63 participants** registered for main PRAGMA workshop, SAGE2 Tutorial, and Student Workshop, 42 participants are international
- **23 posters** (lightening talks and posters session today)
- **5 demos** (Thursday and Friday)
- Invited talk from our previous PRAGMA chair: **Phil Papadopoulus**
- Two international infrastructure invited talks: Pacific Research Platform by **Tom Defanti** and Open Science Grid by **Igor Sfiligoi**
- Invited talk from National Science Foundation by **Manish Parashar** followed by panel “PRAGMA perspective on AI, Data Cyberinfrastructure, and Training” moderated by **Beth Plale**
- Wildfire application (WIFIRE) talk by **Ilkay Altintas**

Yesterday

SAGE 2 Tutorial

Student Workshop

Working Groups: Organizing our activities, goals, and structure (in transition)

PRAGMA as an organization

Resources and Data / Cyberlearning

At PRAGMA 36, decided to break into smaller focus groups:

- AI Focus Group
- DTN and data transfer focus group
- Edge computing focus group
- EDISON focus group

Hsiu-Mei Chou

Ruth Lee

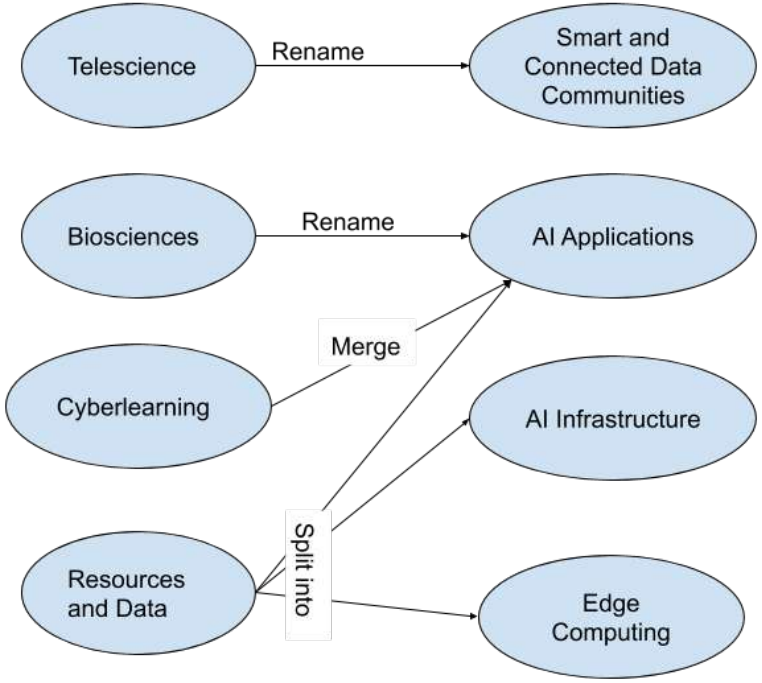
Telescience

Making and improving access to or use of remote equipment (e.g., tiled-display walls or sensors**). Current application areas** of the group include environmental monitoring and traffic flow.

Fang-Pang Lin

Shinji Shimojo

~~**Biosciences**~~



Meet twice during this meeting to review progress and decide on action items for next meeting. Everybody is welcome to participate and share your ideas.

PRAGMA

PRAGMA as an organization

Steering Committee Items this meeting

- Updates from FAR leads (Communications, Membership, Mentoring, Workshop Engagement)
- Proposal to host PRAGMA 38
- Proposal to reorganize working groups
- Updates from US - CESER

PRAGMA Proceedings

Speakers who present posters or demos are invited to submit a short abstract (< 4 pages) to be published at the end of the year.

PRAGMA 36 entries due September 28.

Steering Committee members will meet tomorrow during lunch

Thank you to the National Science Foundation

This workshop and US Participation is enabled through SAVI: **PRAGMA--ENABLING SCIENTIFIC EXPEDITIONS AND INFRASTRUCTURE EXPERIMENTATION FOR PACIFIC RIM INSTITUTIONS AND RESEARCHERS** (NSF Award # OCI 1234983)

Thank you to our PRAGMA 37 Program Committee

Lilian Chan, University of Hong Kong

Hsiu-Mei Chou, National Center for High-performance Computing

Renato Figueiredo, University of Florida

Jason Haga, AIST, Japan

Sri C. Haryanti, Universitas YARSI, Indonesia

Weicheng Huang, National Applied Research Laboratories

Kohei Ichikawa, Nara Institute of Science and Technology

JongSuk Lee, KISTI

Hongliang Li, Jilin University

Fang-Pang Lin, National Center for High-performance Computing

Prapaporn Rattanatamrong, Thammasat University

Shinji Shimojo, Osaka University, Japan

Yoshio Tanaka, AIST

Wassapon Watanakeesuntorn, Nara Institute of Science and Technology

Thank you to our local crew

Project Manager

Johnny Nguyen

Events

Megan Eastin

Daniel Barragan-Chavez

Sara Fam

Maximino Carreon

AV

Joel Polizzo

Isaac Nealey

Areli Alvarez

Next Meeting

PRAGMA 38 in Spring 2020

Software: https://github.com/pragmagrid
Web: www.pragma-grid.net
Info: pragma-discussion@googlegroups.com

US Participation enabled through SAVI: PRAGMA--ENABLING SCIENTIFIC EXPEDITIONS AND INFRASTRUCTURE EXPERIMENTATION FOR PACIFIC RIM INSTITUTIONS AND RESEARCHERS (NSF Award # OCI 1234983)