University of Pittsburgh

Creating an Open Exchange for HPCSoC

(The "Three Pillars" to creating *more* value from exchange.)

Bruce Childers
childers@cs.pitt.edu
http://www.cs.pitt.edu/~childers
Dietrich School of Arts and Sciences
Department of Computer Science

Open HPCSoC

- An active exchange (community) for open, shared and accountable artifacts
  - Artifacts: Designs, experiments, simulators, models, ...
  - Capture everything (as much as you can) for leverage and accountability
  - Artifacts are the digital objects (the "currency") to be curated

OCCAM — Open Curation for Computer Architecture Modeling

www.occamportal.org

CNS-1305220
CCF-1148646

- Pilot: Community-supported exchange for curation of simulation & experimental results in computer architecture

Federated Group Collaboration
- Repository, software services
- Shared artifacts and experiments
- Access to specialized hardware
- Pool resources for sim & modeling
- SST, Manifold, DRAMSim2, McPAT, Sniper & more

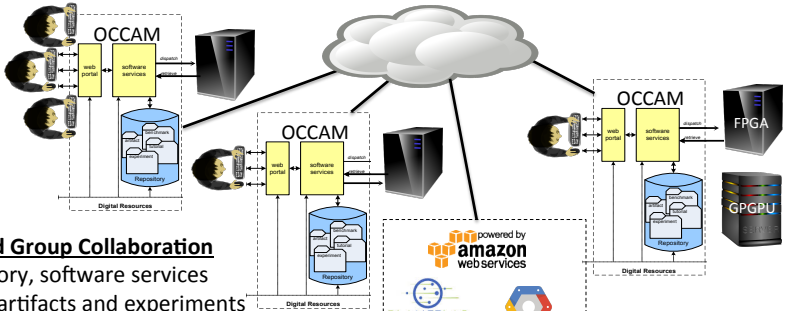Demand Resources

Video demo
www.occamportal.org

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Three Pillars to Creating Value from Exchange
1. Instrument: HW+SW services
2. Education: Values of & for exchange
3. Community: Contributors, users

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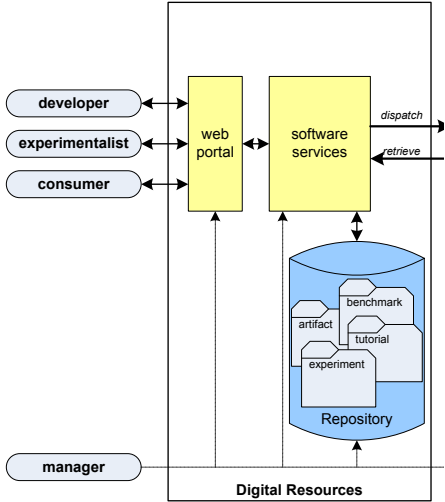
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Pillar 1: Instrument

SW + HW of exchange: Sharing, Publish/retrieve repository, try before "buy", simplified deployment, access to specialized HW/tools, contribution
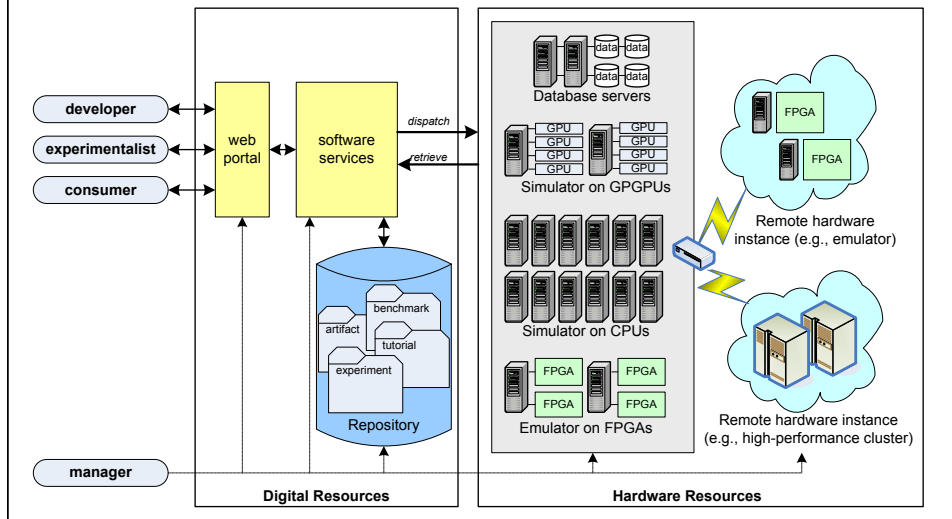

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Pillar 2: Education

- "Build it and they'll come" is not a paradigm that has worked well for open-access exchange
- Address barriers to adoption
  - Values of and for exchange
  - Best practices: build & use artifacts, experiments
  - Scientific process (accountability)
- Training: Tangible materials
  - Roles: Developer vs. Experimentalist, Student vs. Grizzled Practitioner
  - Boot camps and code-a-thons to facilitate participation, education
  - Summer School for Simulation and Emulation
  - Online training & tutoring
  - Community leaders (e.g., Dagstuhl Perspectives Workshop)

Pillar 3: Community

- **Create, foster, sustain a community**
  - ① Advocacy to attract contribution and active participation
  - ② Dedicated to maintain contribution
  - ③ Community-derived policies, procedures, standards

- **Policies & procedure issues**
  - ① **Licensing** (BSD, GNU, dependences betw. tools, upfront agreement)
  - ② Resources (fair allocation, credit/pricing for contribution & use)
  - ③ Methodology (guidelines, checks, **rewards & incentives**)
  - ④ Education (training modules, tutorials)
  - ⑤ Assessment (usage, QoS to users, benefit to developers)
  - ⑥ Ontology (terminology, classification for query & search)
  - ⑦ Privacy and security (privacy, data/code safety, access rights, time limits, **proprietary and competiveness**)

Three Pillars: Oriented Around Value

- Today's Island model: ***Work individually, occasionally share***
  - – We're used to operating this way!
  - – Limited packaging, distribution needs
  - – Don't have to support something
  - – Less testing, might validate, gotchas & glitches OK, lots of duct t...
  - – Lightweight, flexible approach for research
  - – Focus put on producing results, research expediency
- Island model is successful (we do innovate).
- Yet, ***many challenges & impeding research*** with this model!
  - – Lack leverage, significant wasted effort, poor scientific method
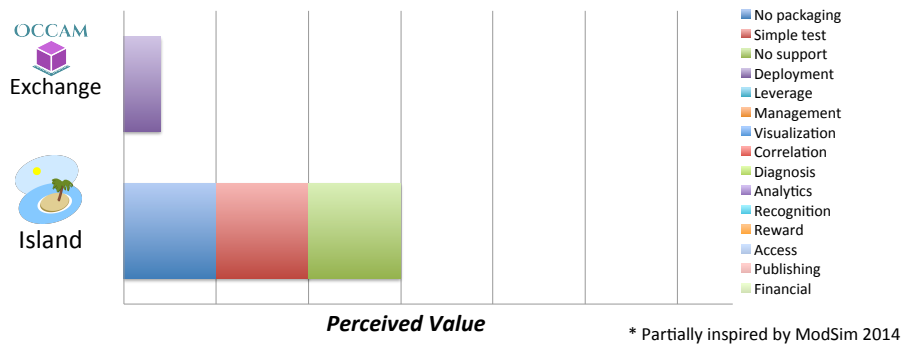 - – Impedes research progress due to the wasted time, credibility

Changing the Value Balance*

Create **more value** from open-access exchange

Judge decisions in building the exchange on value creation

Today: Easier to "roll your own" but value is recognized in distribution

Perceived Value
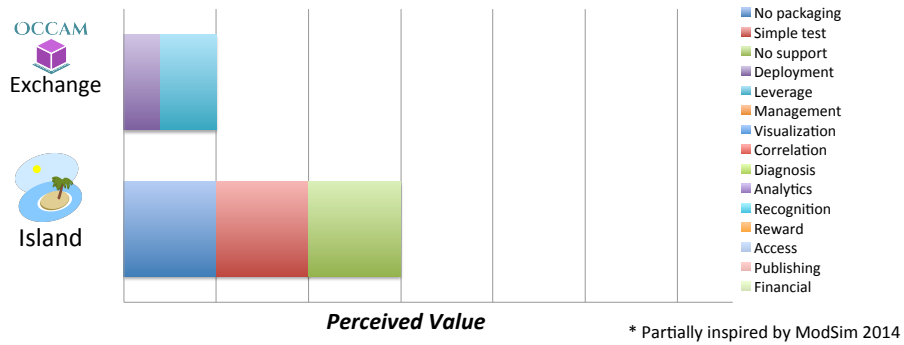
* Partially inspired by ModSim 2014

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Leveraging other experiments to reduce burden for comparison

Perceived Value
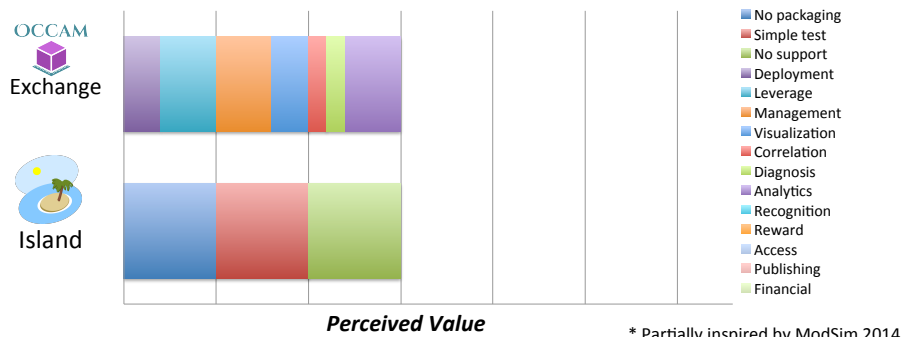
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Create **more value** from open-access exchange

Judge decisions in building the exchange on value creation

More than simply leverage: Compelling services for users/developers
- Data management (DOE/NSF), visualization, correlation/discovery
- Simulation analytics and diagnostics

OCCAM

Exchange

Island

Perceived Value

* Partially inspired by ModSim 2014

Legend:
- No packaging
- Simple test
- No support
- Deployment
- Leverage
- Management
- Visualization
- Correlation
- Diagnosis
- Analytics
- Recognition
- Reward
- Access
- Publishing
- Financial

Changing the Value Balance*

Create **more value** from open-access exchange

Judge decisions in building the exchange on value creation

Community & education providing **tangible incentives**
- Recognition & reward for artifacts, experiments, e.g., www.artifact-eval.org
- Access to data, services, unique hardware/tools in return

OCCAM

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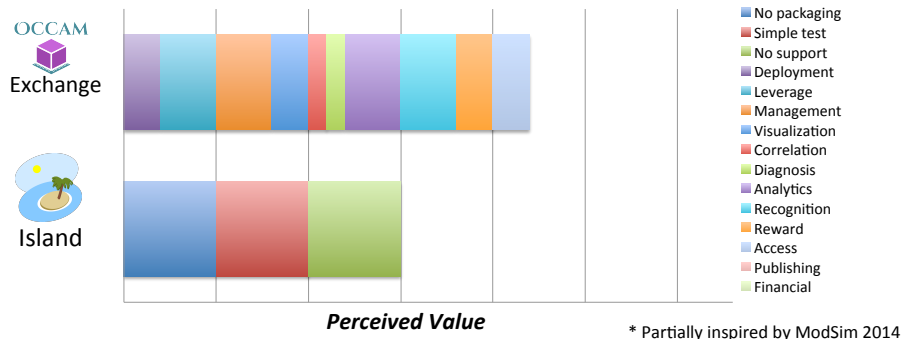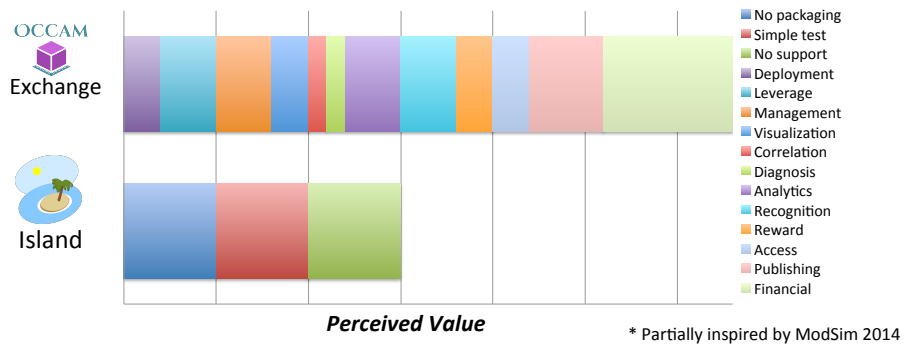- Publishing
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- Publishing – incorporate as part of reviewing process for journals/conferences
- Services or financial – Software Institute to help develop, manage, train

OCCAM

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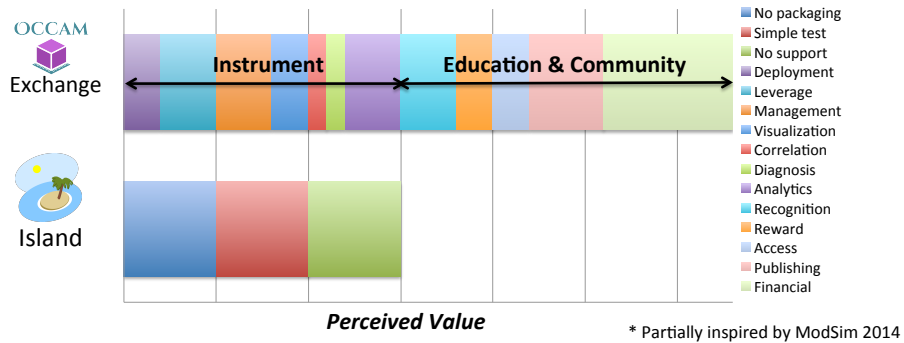* Partially inspired by ModSim 2014

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Instrument ← → Education & Community

Island

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The End