PJama Discussion
Skeptics vs Hopefuls

Bilgen

Ryan

Orthogonal Persistence Hypothesis

- **If** applications developers are provided with a well-implemented and well-supported orthogonally persistent programming platform
- **Then** a significant increase in developer productivity will ensue
- **And** operational performance will be satisfactory
- Orthogonality, Completeness, Persistence Independence

Is Java the right language for the OPH?

Is Java the right language for the OPH?

- Hopefuls
  - Resources: SunLabs backing ($)
  - Type Safety
  - Popularity
  - JVM
- Skeptics
  - Rapid JDK changes
  - Prototype was complex and unreliable
  - Necessary to capture state (may be complicated in VM) at a checkpoint and then reconstruct upon restart
  - Use as Glueware

Existing Persistence Options for Java

- Java Object Serialization
- Links to Relational DBs (JDBC)
- Object-Relational Mapping
- Object Database Mapping
- Java Data Objects (JDO)
- Enterprise Java Beans (EJB)

Why are these approaches not good enough?

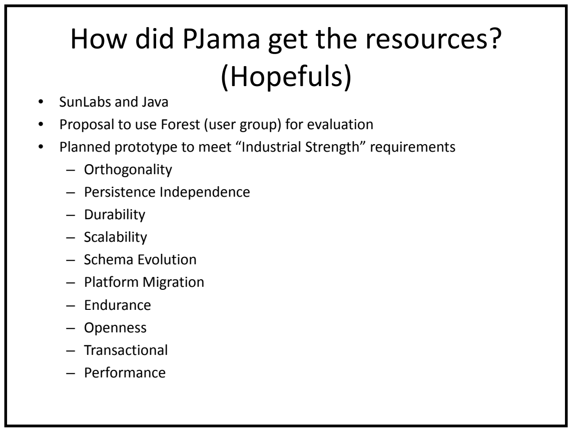
Why Not Enough? (Skeptics)

- Java Object Serialization
  - Not Orthogonal (must be serializable)
  - Not Complete (class info not preserved in object state)
  - Fails persistence independence (copy = obj ID lost)
  - Standard and customizable – at small scale
- Links to Relational DBs (JDBC)
  - Impedence Mismatch Java – relational
- Automated Object-Relational Mapping
  - Complex and difficult to automate object to relational
- Object Database Mapping
  - Java operations defeat persistence independences
- Java Data Objects (JDO)
  - No persistence independence
- Enterprise Java Beans (EJB)
  - Strict rules for developers = no persistence independence

Past Failures

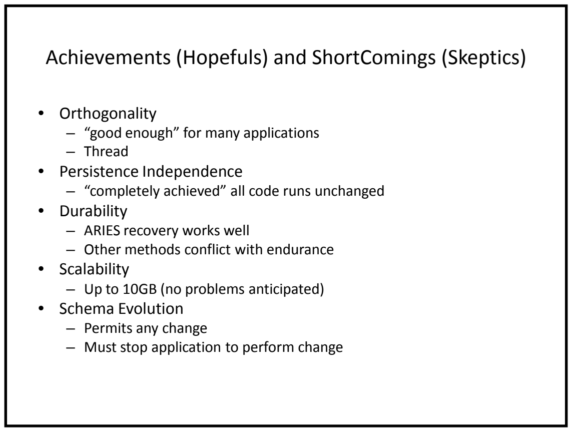
- “Host” of previously implemented orthogonally persistent languages lacked conclusive test of OPH
  - Insufficient Resources
  - Language not popular or type safe

How did PJama get the resources?



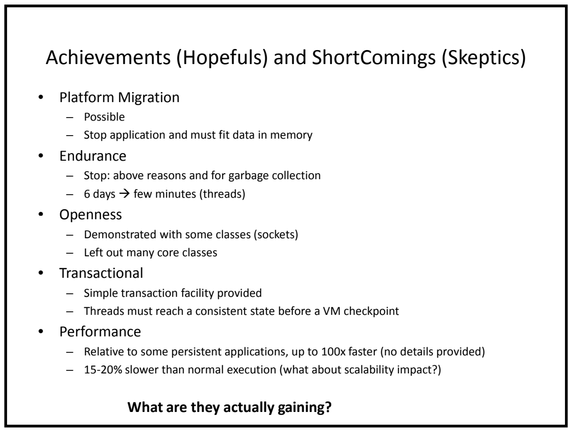
How did PJama get the resources? (Hopefuls)

- SunLabs and Java
- Proposal to use Forest (user group) for evaluation
- Planned prototype to meet “Industrial Strength” requirements
  - Orthogonality
  - Persistence Independence
  - Durability
  - Scalability
  - Schema Evolution
  - Platform Migration
  - Endurance
  - Openness
  - Transactional
  - Performance



Achievements (Hopefuls) and ShortComings (Skeptics)

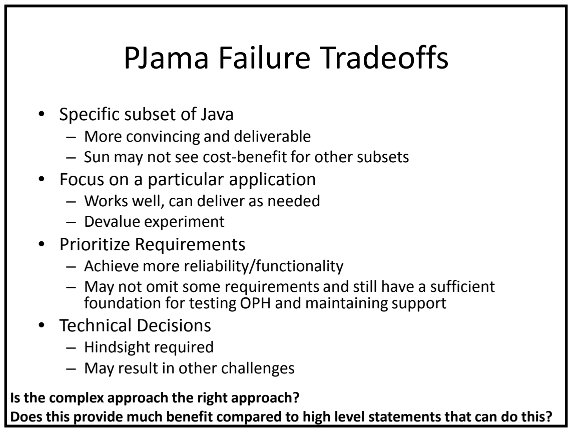
- Orthogonality
  - “good enough” for many applications
  - Thread
- Persistence Independence
  - “completely achieved” all code runs unchanged
- Durability
  - ARIES recovery works well
  - Other methods conflict with endurance
- Scalability
  - Up to 10GB (no problems anticipated)
- Schema Evolution
  - Permits any change
  - Must stop application to perform change



Achievements (Hopefuls) and ShortComings (Skeptics)

- Platform Migration
  - Possible
  - Stop application and must fit data in memory
- Endurance
  - Stop: above reasons and for garbage collection
  - 6 days → few minutes (threads)
- Openness
  - Demonstrated with some classes (sockets)
  - Left out many core classes
- Transactional
  - Simple transaction facility provided
  - Threads must reach a consistent state before a VM checkpoint
- Performance
  - Relative to some persistent applications, up to 100x faster (no details provided)
  - 15-20% slower than normal execution (what about scalability impact?)

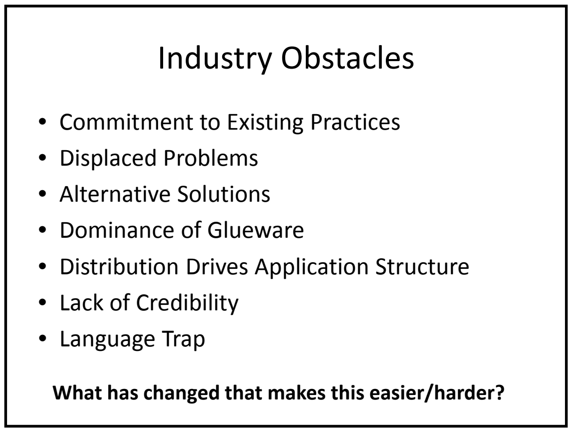
What are they actually gaining?



PJama Failure Tradeoffs

- Specific subset of Java
  - More convincing and deliverable
  - Sun may not see cost-benefit for other subsets
- Focus on a particular application
  - Works well, can deliver as needed
  - Devalue experiment
- Prioritize Requirements
  - Achieve more reliability/functionality
  - May not omit some requirements and still have a sufficient foundation for testing OPH and maintaining support
- Technical Decisions
  - Hindsight required
  - May result in other challenges

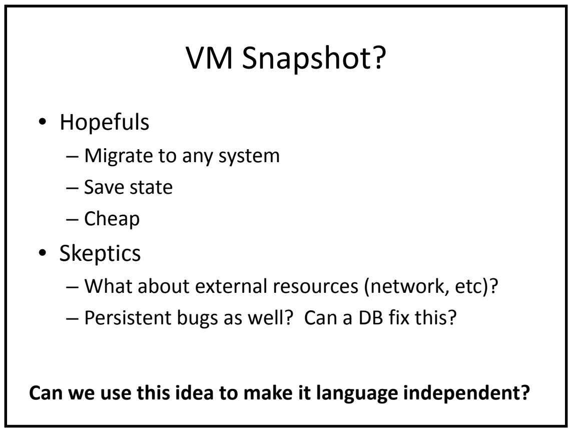
Is the complex approach the right approach?
Does this provide much benefit compared to high level statements that can do this?



Industry Obstacles

- Commitment to Existing Practices
- Displaced Problems
- Alternative Solutions
- Dominance of Glueware
- Distribution Drives Application Structure
- Lack of Credibility
- Language Trap

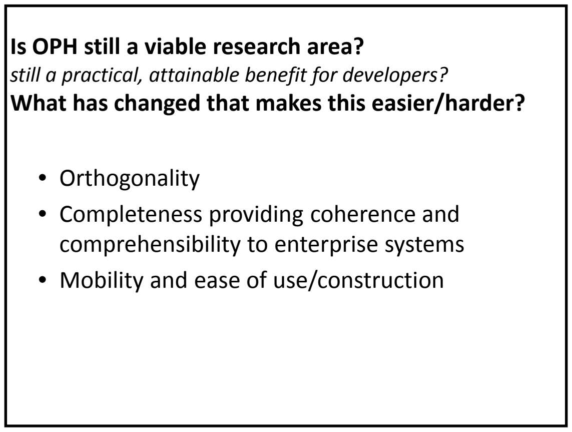
What has changed that makes this easier/harder?



VM Snapshot?

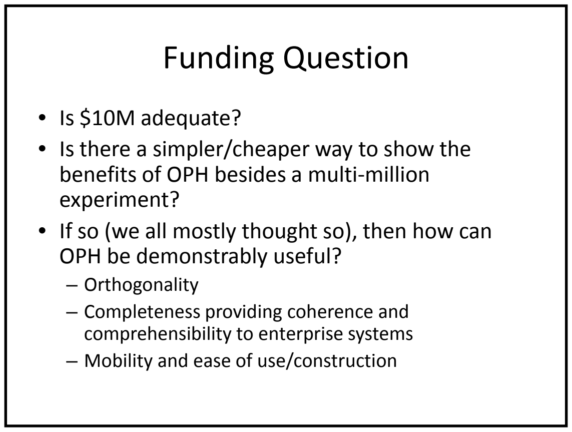
- Hopefuls
  - Migrate to any system
  - Save state
  - Cheap
- Skeptics
  - What about external resources (network, etc)?
  - Persistent bugs as well? Can a DB fix this?

Can we use this idea to make it language independent?



Is OPH still a viable research area?
still a practical, attainable benefit for developers?
What has changed that makes this easier/harder?

- Orthogonality
- Completeness providing coherence and comprehensibility to enterprise systems
- Mobility and ease of use/construction



Funding Question

- Is $10M adequate?
- Is there a simpler/cheaper way to show the benefits of OPH besides a multi-million experiment?
- If so (we all mostly thought so), then how can OPH be demonstrably useful?
  - Orthogonality
  - Completeness providing coherence and comprehensibility to enterprise systems
  - Mobility and ease of use/construction