Policies for the SIGOPS Hall of Fame Award

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1. INTRODUCTION

The SIGOPS Hall of Fame Award was established in 2005 to recognize "the most influential Operating Systems papers" of the past. See `http://www.sigops.org/awards/hall-of-fame.html` for the Web page that describes the award.

The initial specification of the award turned out to have some problems in practice, which have become visible in the process of granting these awards over the past three years. This article describes the evolution of the award's specification.

At the SIGOPS business meeting, held as usual at SOSP 2007, we discussed the policies for the Hall of Fame Award. Generally the attendees agreed that the policies established for 2007 should be retained.

The rest of this article discusses the policy issues in more detail.

2. POLICY ISSUES

I will address the following policy issues:

- What papers are eligible?
- Who should decide which papers win?
- What are the conflict-of-interest rules?
- How many awards per year?
- How do the rules get changed?

2.1 What papers are eligible?

In the original specification of the award, eligibility was limited to SOSP papers at least 20 years old. This raised at least two questions:

- SIGOPS sponsors two major operating systems conferences, SOSP and OSDI. In recent years, the community has viewed these as of approximately equivalent quality, and it seemed reasonable to grant Hall of Fame awards at OSDI. However, since the first OSDI was held in 1994, no OSDI papers would be eligible under the "20 year" rule until 2014. Handing out awards at OSDI when no OSDI papers were eligible seemed a little odd. It also wasn't clear whether a paper really needed 20 years to demonstrate its lasting value.
- Many of the seminal operating systems papers, especially in the early years of the field, were published outside of SOSP or OSDI. Many people felt the limitation to papers published in just one or two conferences was unnecessarily arbitrary.

Of course, any award of this kind is necessarily arbitrary with respect to eligibility; an awards limited to the "most influential SOSP paper at least 20 years old" would still be quite an honor. But after some discussion among the members of the 2006 OSDI Program Committee (PC), among members of the 2007 SOSP PC, and at the 2007 SIGOPS business meeting, the community consensus seems to be that our award should have a broader scope: "operating systems papers that have appeared in the peer-reviewed literature at least ten years in the past."

We expect future award committees, however, will usually favor older papers, since the authors of these papers deserve recognition while they are still active in the field.

Another question arose because the specification says "[n]ominations will be solicited of the SIGOPS membership via email." Does this mean that only papers so nominated are eligible? In particular, can committee members nominate papers that were not nominated by SIGOPS members outside the committee? Generally this seems acceptable, and in fact has been the practice given that the general membership has not submitted that many nominations. This seems to cause no harm, and the community nominations often come with much more detailed rationales, so they are not at a significant disadvantage.

2.2 How many awards per year?

The original specification said "[to] bootstrap the award, up to five awards will be given at SOSP 2005 and SOSP 2007." In fact, at SOSP 2005 only four papers received awards. The consensus following the 2007 award process was that, while the backlog of meritorious older papers is decreasing, if we continue at a rate of only one award per year, it will be a long time before we catch up – perhaps too long.

This is another arbitrary decision. Strictly limiting the number of future awards to one per year might increase the prestige value of the award, but might also lead to perceived unfairnesses as authors of highly influential papers may have to wait for many years before being recognized.

The consensus at the 2007 SIGOPS business meeting was somewhat vague, but my sense was that people were willing to give future award committees some latitude to confer more than one award per year. This might continue either until the award committees decide that they have caught up, or until the community decides to impose a strict limit because the committees have become too generous.

2.3 Who should decide which papers win?

Originally, the task of deciding on award winners was given to the SOSP (or OSDI) PC for that year. Both the SOSP 2005 and OSDI 2006 PC chairs discovered that this did not work very well; most PC members were already burned out from the heavy review load, as well as the tasks of shepherding papers and picking best-paper awards for the current year. As a result, PC members tended not to participate with sufficient enthusiasm in the process of choosing Hall of Fame award winners.

For SOSP 2007, we instituted a new model, in which the award committee chair (chosen by the current PC chair) constitutes a committee from the chairs of the most recent four SOSPS and one co-chair from the most recent four OSDIs. This approach provides some load balancing (assuming that these "retired" chairs aren't as burned-out as current PC members), while also providing some continuity year to year. The somewhat arbitrary decision to use former SOSP and OSDI chairs was based on an assumption that these people have already been chosen for their good judgement and familiarity with the OS literature.

Since it might be impossible to convince an eligible former chair to participate in the committee during a given year, the new model allows the award-committee chair to substitute as necessary to come up with enough committee members. For example, in 2007, John Wilkes (chair of SOSP 1999) graciously agreed to participate.

2.4 What are the conflict-of-interest rules?

The original specification did not explain how committee members should decide if they were conflicted with nominated papers. Since members of our PCs have learned to be highly cautious about declaring conflicts for the papers that they review, our norms are quite strict. This approach generally does not work for determining conflicts for the Hall of Fame process, since authors of influential, older papers tend to have made connections with many other researchers over the intervening years – especially with the well-connected researchers who end up on PCs. Conflicts also arise from same-institution relationships, which can also multiply over the years. (There is also some possibility that overburdened PC members declared conflicts so as to avoid having to participate in the process.) When only a few award-committee members are able to vote on a nomination, and especially when the eligible voters for two nominations do not overlap, it becomes very hard to make good decisions.

In 2007, we decided on an explicit conflict policy before considering any nominations, and tried to balance the level of strictness so that the process could be seen as fair without running the risk of running too low on voters. The policy declares a conflict if the committee member was or is:

1. Involved in writing nominated paper
2. Currently from same institution as paper's author(s)
3. Same institution at time nominated paper was written/published
4. Relative of author of nominated paper

Note that these rules are generally analogous to the classic ISCA rules [1] but are not nearly as strict.

Even with these relaxed rules, in 2007 we discovered that at least one nominated paper had three rule-2 conflicts (currently from the same institution as an author of the paper). This left us with just five voters (out of eight committee members) who could vote on this paper. We realized that we had failed to determine in advance how many votes would be required in such a case. For example, a majority of the eligible voters (3 of 5) would not have been a majority of the whole committee, so this paper might have been accepted with fewer votes than a conflict-free paper whose nomination was rejected by a 5 to 3 majority. We therefore decided to condition acceptance on a positive vote total equal to an actual majority of the entire committee, allowing only the unconflicted voters to vote. In this case, that required all five voters to approve.

Rule-1 conflicts (a committee member involved in writing the nominated paper) are likely to arise, given that the award committee is composed of people who have some seniority in the OS community and are therefore likely to have written some influential papers during their careers. For this kind of nomination, we of course excluded the affected member(s) from all discussions and voting. We also set a high standard; we agreed not to approve such nominations unless we unanimously believed that they were clearly superior to all alternative papers.

Such a high standard does disadvantage committee members who have written possibly award-winning papers and who might be on the award committee for many years, which is a potential flaw in the current model for composing the committee.

2.5 How do the rules get changed?

SIGOPS does not have a well-defined process for changing the rules for this award. In fact, the rules have been different in each of the first three years, which is mostly my fault: as a co-chair of OSDI 2006, I hastily instigated a change that allowed nomination of previous OSDI papers, and as the award committee chair in 2007, I somewhat more carefully instigated the changes that are described in this article. In both cases, I obtained the approval of the current SIGOPS chair, but that process lacked community input and transparency, and in 2006 led to some criticism.

The current rules were discussed and generally approved at the 2007 SIGOPS business meeting, but that was not a truly democratic process (especially since at least half of the SOSP attendees spent the time drinking some excellent local wines instead of at the business meeting). The consensus seems to be that the award committee should be trusted to make necessary and modest changes on its own, with approval from the SIGOPS chair, but that larger changes demand further discussion with the membership.

3. SUMMARY

The SIGOPS Hall of Fame Awards have become a significant honor, and an opportunity for the community to recognize the publications that have had lasting influence on our field. We have to balance the need to preserve the prestige of the Awards against the need to recognize a broad range of significant work. Stable policies that gain community consensus will maintain the value of this award.

4. REFERENCES

[1] Mark Hill. Program Chair's Message. In *Proc. International Symp. on Computer Architecture (ISCA)*, 2005.

APPENDIX

A. HISTORY OF THE AWARD

The first awards were made at SOSP 2005. The awards were chosen by the SOSP PC, from the set of SOSP papers published at least 20 years earlier (that is, in or prior to SOSP 1985). That committee was authorized to choose five papers, but decided to give out only four awards.

SIGOPS co-sponsors the OSDI conference, in even-numbered years. For OSDI 2006, the official rules did not seem to apply, since the first OSDI was held in 1994. The OSDI co-chairs (myself and Brian Bershad) contacted the SIGOPS chair for guidance, and we ended up improvising modified rules: for 2006, the Hall of Fame award would be given to one paper published in OSDI at least 10 years earlier (that is, in 1994 or 1996). Again, the PC chose the award paper. These rules led to some complaints.

For SOSP 2007, the PC chair asked me to handle the Hall of Fame Award. After discussion among the SOSP PC members and with the new SIGOPS chair, we tried to rationalize the process with rules that seem to have achieved consensus: We would again give out up to five awards (the last chance to give out more than one, under the original design); we would consider any peer-reviewer paper in the operating systems literature at least 10 years old; and the award committee would consist of eight recent chairs or co-chairs of SOSP and OSDI. In 2007, five papers were chosen to receive awards; the youngest was from 1990 (17 years old) and not all of them were originally published in SOSP.

B. PAST AWARDS AND CITATIONS

Here is a list of the Hall of Fame awards to date, along with the statements prepared by the Award committee that describes why each paper was selected.

Links to all award papers are available via `http://www.sigops.org/awards/hall-of-fame.html`

B.1 2005 Awards

Edsger W. Dijkstra, *The Structure of the THE Multiprogramming System*, Proceedings of the First ACM Symposium on Operating Systems Principles, October 1967, Gatlinburg, TN, USA.

> The first paper to suggest that an operating system be built in a structured way. That structure was a series of layers, each a virtual machine that introduced abstractions built using the functionality of lower layer. The paper stimulated a great deal of subsequent work in building operating systems as structured systems.

Peter J. Denning, *The Working Set Model for Program Behavior*, Proceedings of the First ACM Symposium on Operating Systems Principles, October 1967, Gatlinburg, TN, USA.

> This paper introduced the working set model, which has became a key concept in understanding of locality of memory references and for implementing virtual memory. Most paging algorithms can trace their roots back to this work.

Dennis M. Ritchie and Ken Thompson, *The UNIX Time-Sharing System*, Proceedings of the Fourth ACM Symposium on Operating Systems Principles, October 1973, Yorktown Heights, NY, USA.

> At a time when operating systems were trending towards complexity, UNIX emerged as a hallmark of elegance and simplicity.

Butler Lampson, *Hints for Computer System Design*, Proceedings of the Ninth ACM Symposium on Operating Systems Principles, pp. 33-48, October 1983, Bretton Woods, NH, USA.

> A classic study of experience building large systems, distilled into a cookbook of wisdom for the operating systems researcher. As time has passed, the value of these hints has only grown and the range of systems to which they apply enlarged.

B.2 2006 Award

George C. Necula and Peter Lee, *Safe Kernel Extensions Without Run-Time Checking*, Proceedings of the Second USENIX Symposium on Operating Systems Design and Implementation, October 1996, Seattle, WA.

> This paper introduced the notion of proof carrying code (PCC) and showed how it could be used for ensuring safe execution by kernel extensions without incurring run-time overhead. PCC turns out to be a general approach for relocating trust in a system; trust is gained in a component by trusting a proof checker (and using it to check a proof the component behaves as expected) rather than trusting the component per se. PCC has become one of the cornerstones of language-based security.

B.3 2007 Awards

Leslie Lamport, *Time, Clocks, and the Ordering of Events in a Distributed System*, Communications of the ACM 21(7):558-565, July 1978.

> Perhaps the first true "distributed systems" paper, it introduced the concept of "causal ordering", which turned out to be useful in many settings. The paper proposed the mechanism it called "logical clocks", but everyone now calls these "Lamport clocks."

Andrew D. Birrell and Bruce Jay Nelson, *Implementing Remote Procedure Calls*, ACM Transactions on Computer Systems 2(1):39-59, February 1984.

> This is *the* paper on RPC, which has become the standard for remote communication in distributed systems and the Internet. The paper does an excellent job laying out the basic model for RPC and the implementation options.

J. H. Saltzer, D. P. Reed, and D. D. Clark, *End-To-End Arguments in System Design*, ACM Transactions on Computer Systems 2(4):277-288, November 1984.

> This paper gave system designers, and especially Internet designers, an elegant framework for making sound decisions. A paper that launched a revolution and, ultimately, a religion.

Michael Burrows, Martin Abadi, and Roger Needham, *A Logic of Authentication*, ACM Transactions on Computer Systems 8(1):18-36, February 1990.

> This paper introduced to the systems community a logic-based notation for authentication protocols to precisely describe certificates, delegations, etc. With this precise description a designer can easily reason whether a protocol is correct or not, and avoid the security flaws that have plagued protocols. "Speaks-for" and "says" are now standard tools for system designers.

Fred B. Schneider, *Implementing Fault-Tolerant Services Using the State Machine Approach: a tutorial*, ACM Computing Surveys 22(4):299-319, December 1990.

> The paper that explained how we should think about replication ... a model that turns out to underlie Paxos, Virtual Synchrony, Byzantine replication, and even Transactional 1-Copy Serializability.