HOW (OR HOW NOT) TO WRITE A GOOD SYSTEMS PAPER

- Adopted “An Evaluation of the Ninth SOSP Submissions, Prof. R. Levin and D. D. Redell”
- Partially adopted “How to write a good (systems) paper, Prof. Gernot Heiser”
9th SOSP Review

- PC meeting on March 21, 1983
  - Ten committee members
- Selected 16 papers out of 83 submissions
  - Somewhat lower than in recent years
- It was surprisingly easy to dispose over 80% of papers
  - Most were rejections
- Many of rejected papers exhibited similar weakness
About Reviews

- Reviewers are potluck, even at top conferences
  - Even good papers get rejected, sometimes for wrong reasons
- Rejection is part of life, get used to it
  - Don’t blame reviewers
  - It usually means you didn’t do your job
- Reviewers’ top reasons for rejection
  - I’m not convinced you’re solving a real problem
  - I’m not convinced you’re solving the problem
  - I don’t understand – your paper is too badly written
  - Your paper is just not competitive for (SOSP, OSDI, Eurosys…)
- Papers without a PC “champion” have a hard stand
  - Make sure there’s something which at least one reviewer will think cool
  - Purely incremental work will have a hard stand at top venues
What is “Systems”?

- (Overly?) simplified view of Computer science: theory + systems
- Theorists build theories, models
  - Often get away with theories not good for anything
- Systems folks build stuff
  - Don’t get away with work not good for anything!
- Examples of “systems” work:
  - Operating systems
  - Network systems / distributed systems
  - Database systems
  - Programming systems (PL implementation)
  - Machine-learning systems
  - Etc.
Classes of Papers

- Three categories
  - Presents a real system
    - Global survey of an entire system
    - Selective examination of specific themes embodied in a system
  - Presents a system that is unimplemented but utilizes ideas or techniques that you feel the technical community should know
  - Addresses a topic in the theoretical areas
    - E.g.) Performance modeling or system verification
Criteria for Evaluation of Submissions

- Original ideas
- Reality
- Lessons
- Choices
- Context
- Focus
- Presentation
- Writing style
Ideas, Original Ideas

- A paper has a (one!) main message
  - Understand clearly what the message is
  - Make sure that the readers get it
  - Make sure that it’s an interesting one

- Your message (or idea) must be new
  - You must be familiar with the state of the art research in the area covered by your paper

- Can you state the idea concisely?
  - Try writing each idea down in a paragraph that someone generally versed in the relevant area can understand
  - If you can’t, you don’t understand what your idea
  - If you can, use it in the abstract of the paper
Ideas, Original Ideas

- Be sure to explain why your problem couldn't be solved just as well by previously published techniques.

- Are the ideas significant enough to justify a paper?
  - “I’ve spent two years to build this. you must know how difficult to implement this.” don’t work
  - How innovative and effective is your idea?
  - You must show that your work represents a significant departure from the state of the art
    - All related work should be referenced to show this
    - You should actually read cited material
    - Nightmare scenario: Reviewers read related papers and you didn’t
Comparisons with previous work should be clear and explicit

- You cannot simply say “Our approach differs somewhat from that adopted in the Bagofbits System [3]”
- Be specific “Our virtual memory management approach uses magnetic media rather than punched paper tape as in the BagOfBits system [3], with the expected improvements in transfer rate and janitorial costs”

Implementation experiences supporting or contradicting a previously published paper design are extremely valuable and worthy candidates for publication

- Designs are cheap, but implementations (particularly those based on unsound designs) are expensive
Ideas, Original Ideas

- **Qualification of citations**
  - Recent references show that your research deals with a hot topic
  - Papers with only recent references often "rediscover" (through ignorance) old ideas
  - Personal communications and internal memoranda fail
Reviewers are very skeptical of design-only papers unless there are new ideas of obviously high quality.

Does your paper describe something that has actually been implemented?
- Don’t pretend that your system has been already built when it has not.
- Your reader has a right to know at the outset whether the system under discussion is real or not.

It is important to explain how your idea worked out in practice.
Lessons

- What have you learned from the work?
  - If you didn’t learn anything, it is a reasonable bet that your readers won’t either

- What should the readers learn from your paper?
  - Spell out it clearly

- How generally applicable are these lessons?
  - Be sure to state clearly assumptions on which your conclusions rest
  - Don’t generalize from a single example
  - When stating your conclusions, it helps to state the assumptions again
    - The reader may not have seen them for fifteen pages and may have forgotten them. You may have also.
Choices

- What were the alternatives considered at various points, and why were the choices made the way they were?
  - Don’t describe, explain

- Record what you have experienced to make a right choice and what you have learned during that
  - Many papers present a rational argument from initial assumptions all the way to the finished result when, in fact, the result was obtained by an entirely different path and the deductive argument fashioned
    - This kind of "revisionist history" borders on dishonesty and prevents your readers from understanding how research really works
Context

- What are the assumptions on which the work is based?
  - Make sure you get them all
  - It's easy to overlook implicit assumptions
- Are they realistic?
- How sensitive is your work to perturbations of these assumptions?
- Don’t build a tall tower on a fragile assumptions
"Real system" papers are particularly guilty of irrelevant description. Be especially careful when you write the introductory part. Avoid the temptation to describe all major characteristics of your system at the same level of depth. Concentrate instead on the novel or unusual ones that (presumably) will be the focus of the original technical content of the paper. Include just enough material from previously published works to enable your reader to follow your thread of argument. Do not assume that the reader has read every referenced paper within the last week and has them at his fingertips for instant reference. We adopt the definition of transactions from Brown [4], layering it onto files as described by Green [7, 18], with the notions of record and database introduced by Black [10] and White [12] and later modified by Gray [6]. Don't burden your reader unnecessarily with lengthy extracts or paraphrases from cited works.
Presentation

- Repeatedly ask yourself followings
  - Are the ideas organized and presented in a clear and logical way?
  - Are terms defined before they are used?
  - Are forward references kept to a minimum?
    - Give the reader enough information to attach some meaning to the forward-referenced term
  - Have alternate organizations been considered?
  - Was an abstract written first? Does it communicate the important ideas of the paper?

- Reviewer cannot tolerate the omission of important explanation or justification

- Build tension, make reader interested

- Top-down, not bottom-up
Writing Style

- Ask yourself after writing up
  - Is the writing clear and concise?
  - Are words spelled and used correctly?
  - Are the sentences complete and grammatically correct?
  - Are ambiguity, slang, and cuteness avoided?
  - Remember that you are asking a favor of your reviewers

- The best work is useless if you can’t convince the reviewers
  - Reviewers are busy, may have to review 30 papers in 6 weeks
  - They’ll look for reasons to reject — don’t give them any!
Paper Structure and Style
Introduction

- Most important part of the paper
- **The Overture**
  - Explain the problem you’re solving
  - Outline your approach
  - Indicate results/outcomes
  - State contributions
- **General hints for intro**
  - Capture the reader’s interest: sell your idea
  - Be concise: Stay within about one page!
  - Make sure the paper delivers what you promise
Other Parts

- **Background**
  - set the scene in more detail
  - Cite related work as needed, don’t discuss more than necessary
- **Describe problem in detail**
- **Explain solution in detail**
  - Be honest and forthcoming with limitations and assumptions
- **Evaluation**
  - Often largest part
- **Related work**
- **Conclusions**
- **Abstract**
  - Used to steer to the right reviewers!
  - What, Why, Achievement, Implication
Evaluation

- Show that your solution actually works
  - *Progressive*: significant improvements in important situations
  - *Conservative*: no (or insignificant) degradation elsewhere
  - Need both!

- Be careful about the scenarios you benchmark
  - Artificial/construed best cases will be discounted
  - Think of ways in which your approach could fail/deteriorate
  - Go out of your way to be fair, anticipate any skepticism of your work

- Avoid benchmarking crimes
Style and Form

- Write in engaging style, lead reader through the paper
  - Avoid bottom-up structure, present ideas top-down
  - Follow style rules
  - *Use active voice*
- Avoid buzzwords (“novel”, “mobile social supercomputing in cloud”)
- Be mindful of reader’s brain state (which is lossy)
  - *Maintain reader state*
  - Don’t assume every reviewer is expert in your narrow area
  - But don’t think you can hide stuff from reviewers!
- Follow formatting rules
  - Don’t play with margin, baseline skip etc
  - Don’t use microscopic fonts, >40y olds have problems with <8pt font
- Spell-check, proof-read, proof-read
  - Get native speaker to proof-read if you aren’t
  - Get outsider to read it – great way to spot holes before it’s too late!
  - Make a mutual-aid society for peer-review
Machanics

- Use revision control
  - Especially (but not only) when it’s a joint paper
- Don’t use MS Word
  - Doesn’t integrate well with revision control
  - Requires coarse-grain locking, limits concurrency of writing!
  - References are painful, formulae even more so
- Use BibTeX
  - ... but use it correctly