The Hills and Thrills of Academic Life

Alysson Bessani
Outline

• General aspects of the job of a professor
• Two case studies
  • Building and maintaining a system: BFT-SMaRt
  • From research to a startup: DepSky to Vawlt
• Wrap up
Caveats

• My experiences are from my reality
  • I made an effort to make things a bit more general

• Some important topics are missing
  • E.g., Tenure
About me

• University of Lisbon, Faculty of Sciences (since 2007)
  • 12 years as professor

• Past:
  • Visiting professor ECE CMU (2010)
  • Visiting researcher MSR Cambridge (2014)
  • Post-doc researcher at LaSIGE FCUL (2006-2007)

• Education
  • BSc in Computer Science (UEM, 2001)
  • MSc in Electrical Engineering (UFSC 2002)
  • PhD in Electrical Engineering (UFSC 2006)

• Research topics
  • Distributed Systems
  • Dependable and Secure Computing
Academia
Academia

- Highly competitive environment
  - Publishing
  - Funding
  - Impact

- Researchers are high-competition athletes
The main activities of a professor

• Lectures
• Management
• Research

HOW PROFESSORS SPEND THEIR TIME

How they actually spend their time:
- Teaching 59%
- Research 18%
- Service 23%

How departments expect them to spend their time:
- Teaching 20%
- Research 45%
- Service 20%

How Professors would like to spend their time:
- Teaching 20%

Source: Higher Education Research Institute Survey (1999)

“Service” 20%

Don’t tell me what to do

www.phdcomics.com
Lectures

• Number of teaching hours varies a lot
  • 4-12 hours of lectures per week

• Hours/week is not everything
  • Your familiarity with the course
  • Type of the course (undergrad or grad)
  • Number of students

• Teaching is hard only if you don’t like it
  • But grading students is always a pain (at least for me)

• One of the most gratifying aspects of our job
Management

• The many faces of management
  • Management of your grants (budget)
  • Management of your team
  • Academic management
    • From lab director to the university head

• As time passes, you get more and more involved in management

• You cannot say “NO” to everything
  • If good people don’t take leadership positions, they’ll be taken by others
  • Some academics really become managers with time
Research

- WRITING GRANT PROPOSALS
- ADVISING PHD AND MSC STUDENTS
- WRITING PAPERS
Research – Grant Proposals

• You must have money to do research
• According to some, this is the **main job** of a (research) professor
• I disagree!
  • You don’t need a lot of money to do research in CS&E
  • Most money comes with strings attached
  • You can make only a limited number of bets
  • Find projects you really care about, not the ones you find interesting

• You most important resource is TIME
Sometimes, grant proposals get funded 😊
Research – Advising

• By far (in my opinion), the hardest and most rewarding part of the job
  • Hiring good students is difficulty
  • Your students are not you
  • Every student is different
  • Students are not machines
  • Sometimes it simply doesn’t work
  • But when it works, it’s a BLAST!

Your students are your legacy
https://cacm.acm.org/magazines/2009/3/21780-your-students-are-your-legacy

David Patterson, Berkeley
Research – Writing Papers

• **Write the paper**
  • i.e., the professor is “the champion of the paper”

• **Significantly help in writing a paper**
  • Significantly edit the paper
  • Contribute to some of the research

• **Contribute to a paper**
  • Giving directions and ideas
  • Advising the team working on the research

Authoring
What is a successful paper?

- An accepted paper?
- A paper on a top venue?
- An award paper?
- A groundbreaking paper?
- A well-cited paper?

My definition: A paper that people will read and get something from it!
You should not write write-only papers!
A Case Study: BFT-SMaRt

- A feature-complete CFT/BFT replication library written in Java
  - 2005 – “we need BFT in Java, and it should be modular”
  - 2009 – UpRight was published [SOSP’09] and the performance was terrible. **We decided to make BFT-SMaRt**
  - 2011 – Formalized the SMR protocol
  - 2012 – Crash recovery and state transfer
  - 2013 – Wrote the paper about BFT-SMaRt
  - After that – system continued to be maintained

The main contribution of this paper is to fill a gap in the BFT literature by documenting the implementation of a stateful SmaRt consensus primitive in Java; enabling high performance transactions, and simplifying the development of Byzantine fault-tolerant systems.

The source code is available on GitHub, and the implementation of BFT-SMaRt is maintained as an open-source project.
A Case Study: BFT-SMaRt

- Applications [TDSC'18, DSN'18, ...]
- Weighted Replication [SRDS'15, 19]
- Durability [ATC'13]
- Elasticity [TPDS'17]
- Diversity [Middleware'19]
- Blockchain [DSN'18]
- Confidentiality (to be submitted)
A Case Study: BFT-SMaRt

• Why we decided to invest in a project like that in 2009?
  • It was clear it would be expensive and not very “publishable”

• Some of the reasons at the time:
  • A BFT library will enable cool demos of intr. tolerant services in EU project
  • It is very hard to do this, so there’ll be little (serious) competition
  • If you build it, they’ll come
  • We can do research around it

• What we never predicted? Blockchains
Another Case Study: from DepSky to Vawlt

• 2009: “Is it possible to use a set of cloud storage providers instead of a set of servers to implement a BFT register emulation?”

DepSky: Dependable Cloud-of-Clouds Object Storage
[EuroSys’11, ACM Trans. on Storage 2013]

Availability, Integrity and Confidentiality despite the failure of up to $f$ clouds
Another Case Study: from DepSky to Vawlt

2011: “DepSky is just library, it will be cool to have a cloud-of-clouds file system”
Another Case Study: from DepSky to Vawlt

• 2013: “SCFS requires a coordination service, can we make a cloud-backed file system without having any VM on the cloud?”

Charon
[IEEE TC’19]

+ big data storage and sharing
+ multiple storage locations
+ serverless design
Another Case Study: from DepSky to Vawlt

• 2015: “What’s next? Can we help the user find and manage the multiple clouds it needs?”
Another Case Study: from DepSky to Vawlt

• Two bright students worked with me on SCFS, Charon, and Janus
  • I tried to convince them to do a PhD but failed
  • I convinced them to try our chances on a business ideas competition
  • Got 2nd places in two local competitions (2015, 2016)

• Started working with two potential investors
  • 2016-17: shark tank investors... wanted too much equity
  • 2017-18: another group... not a good fit

• Pitched the project to many investors, no one said no
Another Case Study: from DepSky to Vawlt

• 2018: “Can we really make it a product?”

• [https://vawlt.io](https://vawlt.io)
• Company formally created in 2018
• After a long process, we got a pre-seed investment of €0.5M at Spring of 2019
From Systems Research to a Startup

• Making a product is much harder than making a good demonstrator

• Getting investment is hard
• Getting investment for deep tech is harder
• Getting investment for deep tech without sales is even harder

• Good investors invest in **teams** more than in technology!
  • Don’t be a jerk, listen to others, know what you don’t known
  • Add someone that know about business to the team

• If I had to do that again...
  • I would look first for a potential client and solve a problem it cares about
  • Only after that I would try to go to investors
You can’t control the impact of your research

• Some papers I’m very proud of but that are less impactful
  
  
Conclusion: The Jobs of a Professor

• Scientist (this is what you should learn during your PhD)
• Lecturer
• Manager
• Entrepreneur
• Mentor
• Editor

Looks like a lot...

It is a lot...

Maybe a bit overwhelming

What you might get:

“Freedom & Fulfillment”
Advices much better than mine

• David Patterson – “How to have a bad career”
  https://www.youtube.com/watch?v=Rn1w4MRHIhc

• Randy Pausch – “The last lecture”
  https://www.youtube.com/watch?v=ji5_MqicxSo
Thank you!

- Alysson Bessani
  - anbessani@fc.ul.pt
  - www.di.fc.ul.pt/~bessani