# 5 Guaranteed Ways to Fail at Cloud Migration

Dale Alleshouse

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA  15213

**Carnegie Mellon University**
Software Engineering Institute

# 5 Guaranteed Ways to Fail at Cloud Migration

Dale Alleshouse

# Document Markings

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

3

# 5 Guaranteed Ways to Fail at Cloud Migration

Abstract

Unless you've been living under a rock, you've heard about all the benefits of moving to the cloud. While the benefits are certainly legitimate, they aren't as easy to obtain as some literature would lead you to believe. Cloud migration efforts commonly fail to meet expectations. It would be nothing short of hubris to provide a "guaranteed" framework for a successful cloud migration. However, understanding the common causes of failed migrations can help you avoid a similar fate. This talk outlines five guaranteed patterns for failing in the cloud.

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

4

# Agenda

- **The Promise of the Cloud**

- **The Hard Truth About Cloud Migrations**

- **5 Guaranteed Ways to Fail**
    1. Lift, Shift, and Forget…
    2. Never Prototype Anything
    3. Big Bang Migration
    4. Architecture Du Jour
    5. Technology Centric Planning

- **Questions**

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

**5**

# The Promise of the Cloud

- Cloud computing has MANY advantages and represents unparalleled opportunities

- [INSERT BUZZ WORDS HERE]

- The 2019 cloud services market is valued at $214.3 billion[3]
  - Aggressive marketing is expected

Typical Cloud Migration Consultant
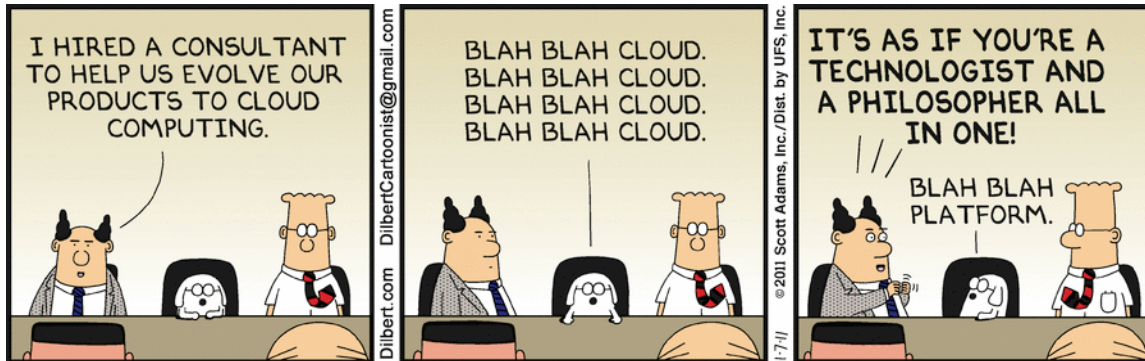


Adams, Scott. Dilbert. January 7, 2011, https://dilbert.com/strip/2011-01-07

# The Hard Truth About Cloud Migration

- The good news
  - All the things you've heard about the cloud are true!
  - And there was great rejoicing…

- Before you uncork the champagne - the bad news
  - While true, it's not easy
  - Cloud computing opportunities aren't easily exploited

- Cloud migration failure rates
  - Between 44%[1] and 57%[2]
  - Failure meaning falling short of pre-defined objectives

- There is no 'easy button' for cloud migration



Myth

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

7

# Can I Improve My Odds?

- ~50% Failure Rate is unnerving…

- On the bright side, You can absolutely improve your odds of success!

- Many of the conference tracks cover what you SHOULD do

- This talk takes the opposite tact by covering things you should NOT do
  - 5 guaranteed ways to fail at cloud migration
  - Gleaned from real-world experience

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

8

# 1. Lift, Shift, and Forget…
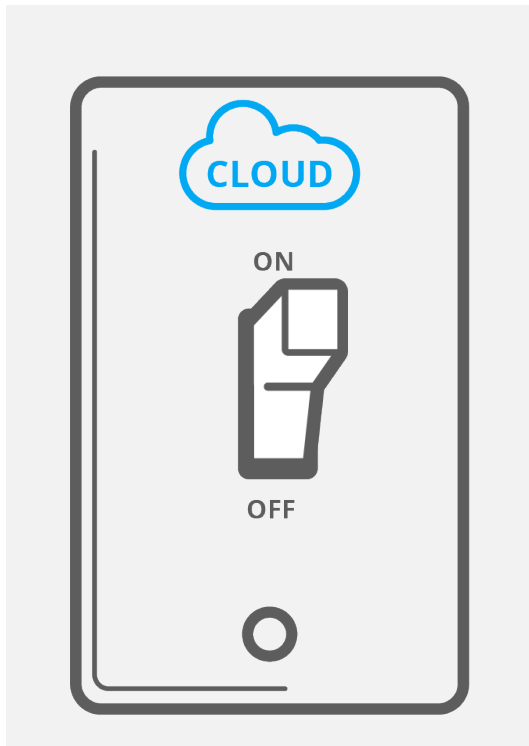


- Lift and Shift In a nutshell
  - Every VM/Server in your data center becomes a IaaS VM hosted in the cloud
  - Networking, VPN, DNS, etc.
- You're In the Cloud! Not really…
  - You just hosted your data center in the cloud
  - Not exploiting cloud computing opportunities
- Most expensive option
- Average cost per cloud VM
  - 1 CPU/1 GB RAM/4 GB HD = ~$11/month[4]
  - 4 CPU/16 GB RAM/32 GB HD = ~$133/month[4]
  - 64 CPU/256 GB RAM/1,600 GB HD ~$4,392/month[4]

**Carnegie Mellon University**
Software Engineering Institute

5 Guaranteed Ways to Fail at Cloud Migration
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

9

# 1. Lift, Shift, and Forget…

- Lift and Shift isn't bad; it's a great starting point!
  - Some sources actually recommend Lift and Shift as the default starting point [8]
  - It's often easier to iterate toward cloud native when you're already in the cloud
- Cloud computing is not a switch, it's a dial
- Turn the dial by:
  - Re-platforming
  - Re-architecting to Cloud Native
  - Implementing DevOps
  - Changing organizational culture

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.
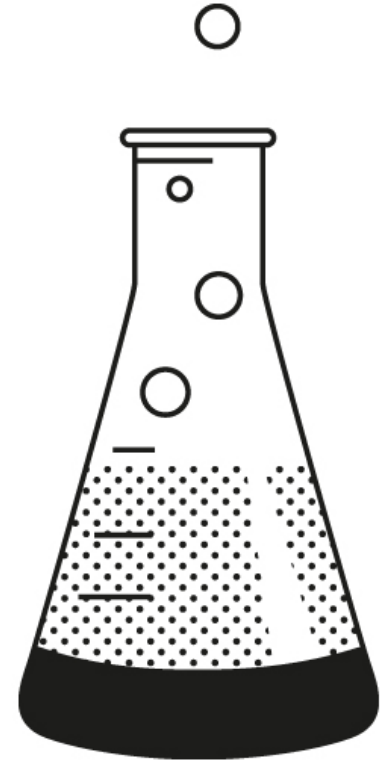
10

# 2.  Never prototype anything

- It's practically a software engineering axiom that things rarely work as excepted
  - "The management question, therefore, is not *whether* to build a pilot system and throw it away. You *will* do that. […] Hence *plan to throw one away; you will, anyhow."* – Fred Brooks[5]
  - Martin Fowler describes this as the "Sacrificial System"[6]
- The case for prototyping
  - Reduce "throw away" effort
  - Validate assumptions early (Fail Fast)
  - Mitigate risk
  - Foster innovation
  - One experiment is worth ten expert opinions

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

11

# 2.    Never prototype anything

- Cloud computing has a clear advantage over traditional systems in this regard

  - Instant access to resources

  - Access to canonical installations

  - Access to expert support

  - Little to no upfront cost

  - Only pay for the duration of the experiment

  - Try before you buy

- There is close to no reason not to prototype/experiment in the cloud

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.
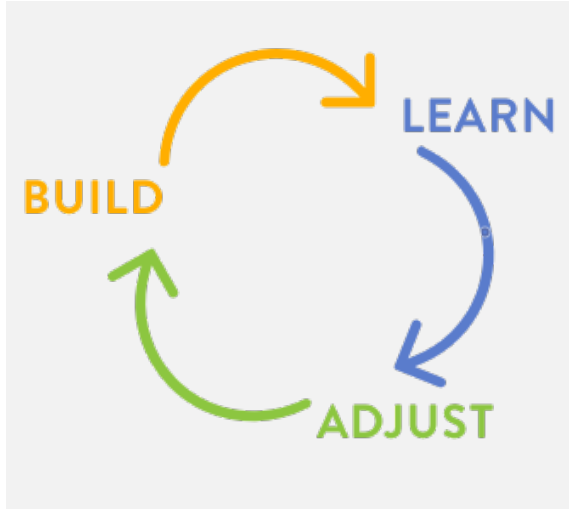
**12**

# 3.    Big Bang Migration

- Big Bang Migration in a nutshell
  - Create an all encompassing migration plan
  - Execute the plan dogmatically
- Most expensive way to fail with longest feedback loop
- Classic "waterfall vs. agile" debate? Not really…
  - Standard "Agile" practices aren't necessary to migrate iteratively
- Start with a small chunk of functionally, migrate it, and use the results to inform the next chuck of migration
- The standard "discipline vs agility" arguments apply, but there are additional considerations for cloud projects

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

13

# 3.    Big Bang Migration



- It's not all or nothing
  - It's sensible to start with a roadmap and business case
  - Remain flexible to exploit new learning
- Cloud specific advantages
  - Gain cloud competency on non-critical components
  - The cloud is dynamic, things change while planning
  - Pivoting is much easier in the cloud
    - Little to no investment in hardware and software licenses
    - PaaS/SaaS eases spinning up new architectures
  - "Sunk Cost Fallacy" aka "Irrational Artifact Attachment"[7] is less likely

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

14

# 4.    Architecture Du Jour

- Architecture Du Jour in a nutshell
  - Adopt the latest "silver bullet" architecture (currently 12-factor, cloud-native, micro services) as the right and only way
  - THIS IS NOT AN ATTACK on micro services; great pattern when used in an appropriate context
- As far as trendiness, the software industry's only true rival is the fashion industry
- Today's trend is tomorrow's anti-pattern
  - Service Oriented Architecture (SOA)
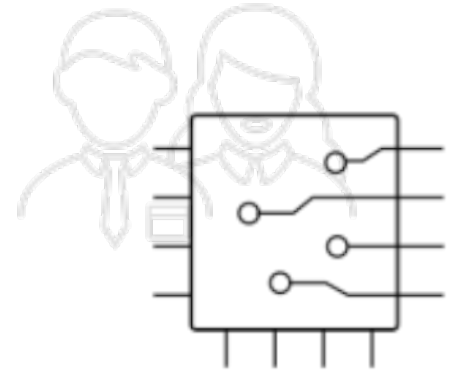  - N-layer Architecture
  - CASE tools



Groovy

# 4.    Architecture Du Jour



- There are no "silver bullet" architectures
  - Cloud computing isn't a panacea
  - The right architecture satisfies your requirements with absolute minimum complexity
  - Supposed anti-patterns may even fit your needs

- Before embarking on a cloud migration, ensure you have appropriate business justification

- After staring a migration, understand there are many valid architectures

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

16

# 5.    Technology-Centric Planning

- Technology-Centric Planning in a nutshell
  - Choose all the right technologies
  - Ignore the people who will be using the technology
  - Assume the technology stands on it's on
- Manifests itself in a few different ways
  - Lack of management support
  - Angst
- Jobs are going to change, people must be ready
- Flexible technology is useless when bureaucracy is a bottle neck

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

17

# 5.    Technology-Centric Planning
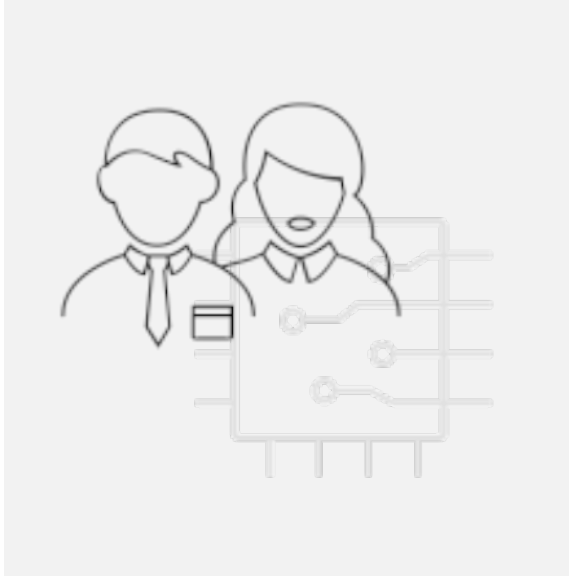
- Mind the politics

- Clear and consistent communication
  - Transparency alleviates angst

- Invest in training the workforce (MOST IMPORTANT)

- The key is culture
  - Continuous improvement
  - Innovation
  - Flexibility
  - Automation
  - Service mindset

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

18

# Conclusion

- Cloud computing represents serious opportunities; however, they aren't easy to exploit

- 5 Guaranteed Ways to Fail at Cloud Migration
    1. Lift, Shift, and Forget
    2. Never Prototype Anything
    3. Big Bang Migration
    4. Architecture Du Jour
    5. Technology-Centric Planning

- Don't miss my workshop, "Hands on Cloud Migration for Managers," tomorrow

- Please don't forget to provide feedback

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

**19**

# Contact Information

**Presenter / Point of Contact**

Dale Alleshouse

MTS - Senior Engineer

Telephone:  +1 412.268.3868

Email: [dealleshouse@sei.cmu.edu](mailto:dealleshouse@sei.cmu.edu)

# References

[1] https://www.nextgov.com/cio-briefing/2016/03/report-almost-half-it-migrations-doomed-fail/126574/

[2] https://www.infopulse.com/blog/7-reasons-why-cloud-migration-strategies-fail/

[3] https://www.gartner.com/en/newsroom/press-releases/2019-04-02-gartner-forecasts-worldwide-public-cloud-revenue-to-g

[4] https://azure.microsoft.com/en-us/pricing/details/virtual-machines/windows/

[5] The Mythical Man-Month: Essays on Software Engineering, Fred Brooks

[6] https://martinfowler.com/bliki/SacrificialArchitecture.html

[7] Building Evolutionary Architectures, Neal Ford, Rebecca Parsons, and Patrick Kua

[8] Ahead in the Cloud, Stephen Orban

**Carnegie Mellon University**
Software Engineering Institute

**5 Guaranteed Ways to Fail at Cloud Migration**
© 2019 Carnegie Mellon University

[DISTRIBUTION STATEMENT A] This material has been approved for public release and unlimited distribution.

21