Icebergs in the Clouds:
the *Other* Risks of Cloud Computing

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position paper:
http://arxiv.org/abs/1203.1979

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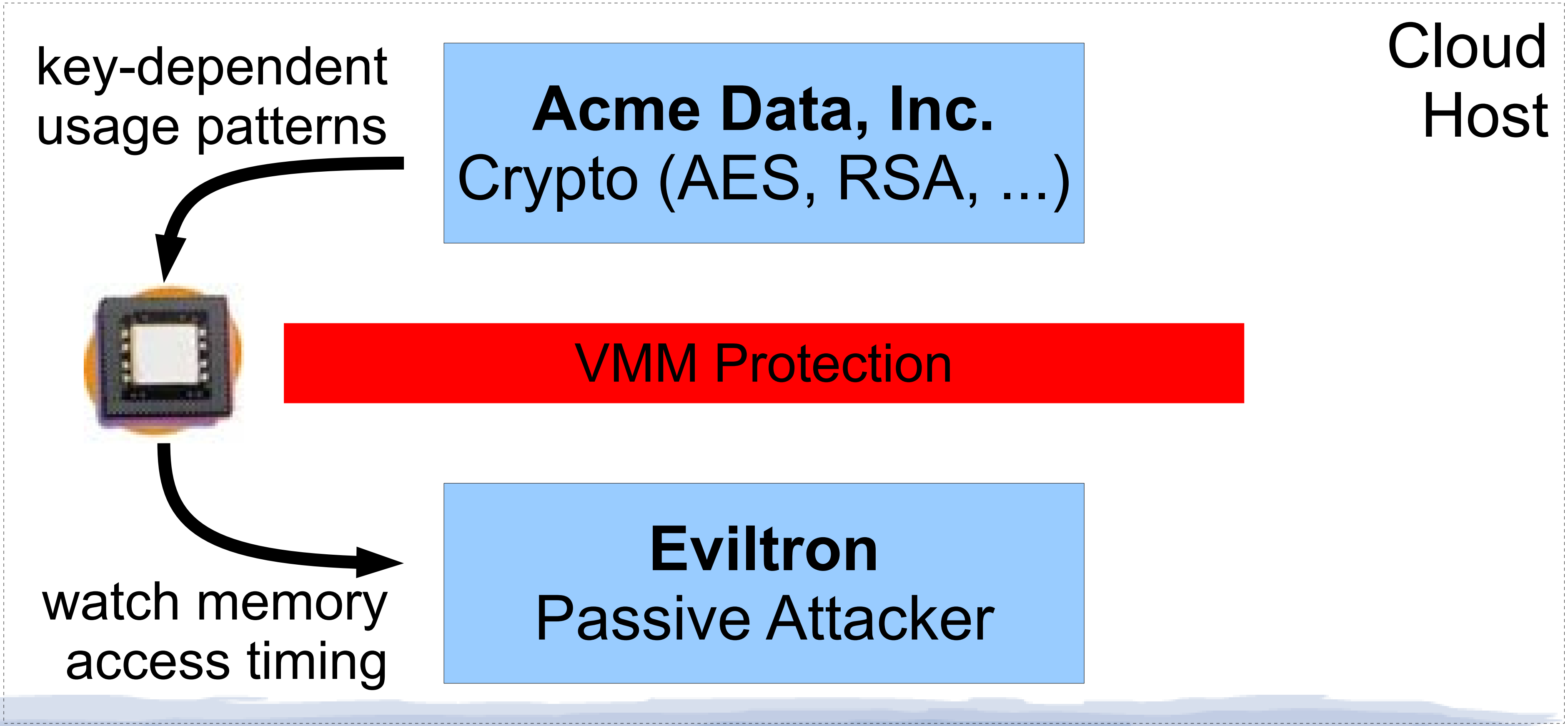
Well-Known, “Immediate” Risks

- Traditional Information Security
  - Security of data
  - Integrity of data, computation
  - Personal privacy
  - Malware defense
  - Availability, reliability
  - …
- Important, plenty more to be done, but *not what this talk is about*

What risks *might* appear that we're not looking at yet/enough?

Four potential risks...

1. Side-Channels



Cloud Host

key-dependent usage patterns

Acme Data, Inc.
Crypto (AES, RSA, ...)

VMM Protection

Eviltron
Passive Attacker

watch memory access timing

Timing Channels

The cloud *exacerbates* timing channel risks:

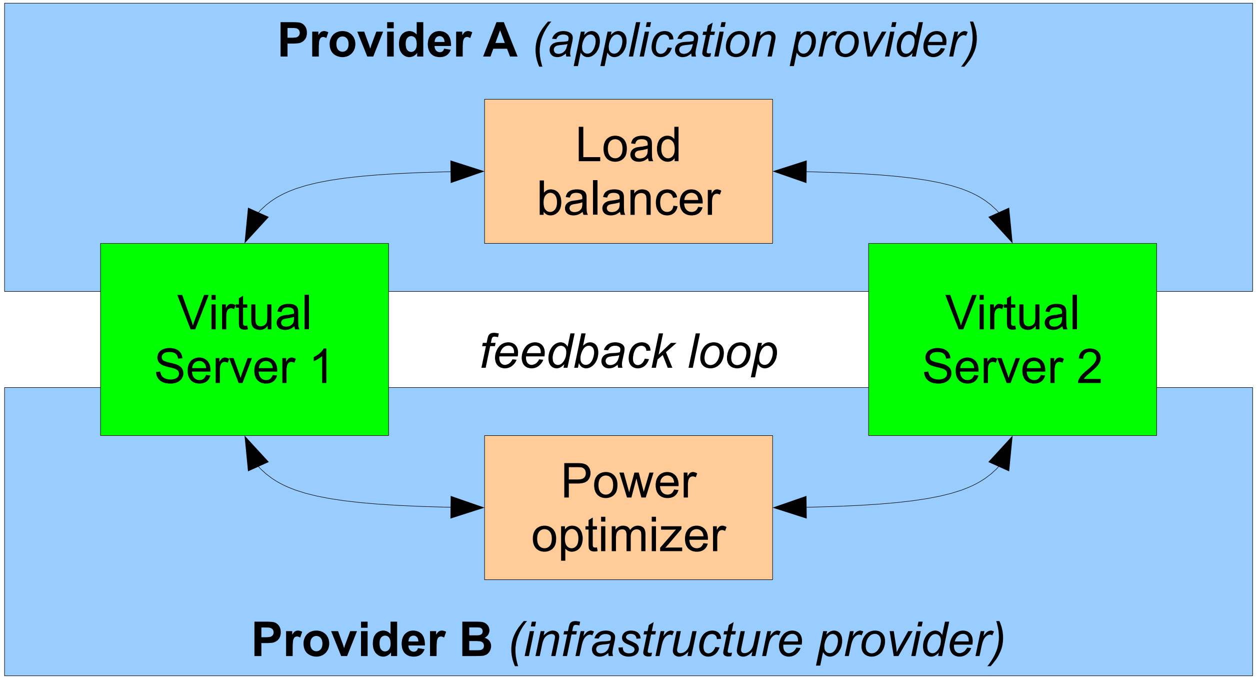
1. Routine co-residency
2. Massive parallelism
3. No intrusion alarms → hard to monitor/detect
4. Partitioning defenses defeat elasticity

“*Determinating Timing Channels in Compute Clouds*” [CCSW '10]

What risks *might* appear that we're not looking at yet/enough?

Four potential risks...

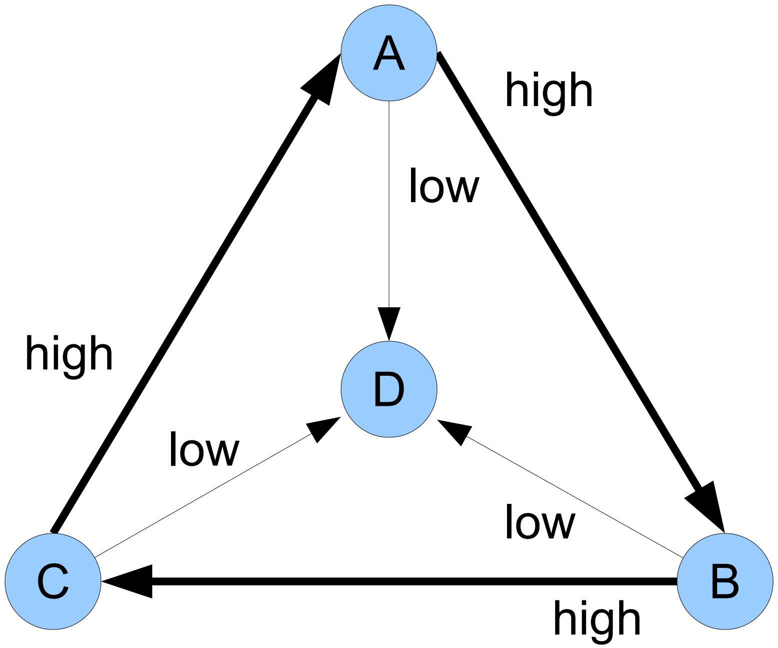
1. Side-Channels
2. Reactive Stability


Provider A *(application provider)*
Load balancer
Virtual Server 1
feedback loop
Virtual Server 2
Power optimizer
Provider B *(infrastructure provider)*

Seen this before?

BGP “dispute wheel”

- uncoordinated policies can loop



In the Cloud:

- providers want max usage, profit → *oversubscribe*
- handle overloads → *swap with peers?*

Cloud dispute wheels?

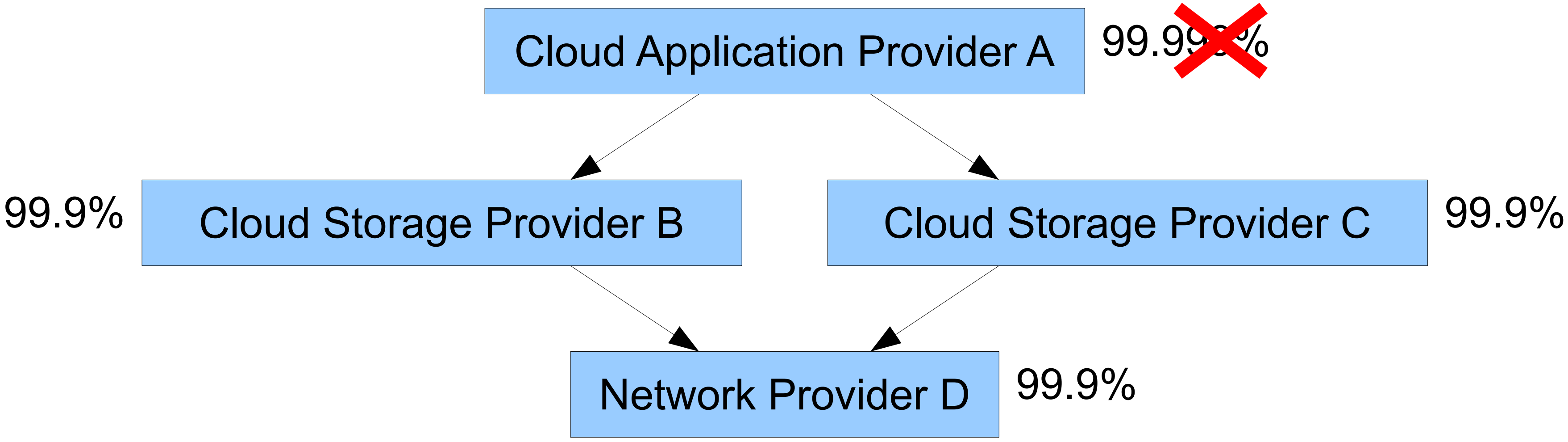
Credit default swaps?

Speculation, bubbles?

What risks *might* appear that we're not looking at yet/enough?

Four potential risks...

1. Side-Channels
2. Reactive Stability
3. Cross-Layer Robustness



Cloud Application Provider A 99.999%

99.9% Cloud Storage Provider B

Cloud Storage Provider C 99.9%

Network Provider D 99.9%

What risks *might* appear that we're not looking at yet/enough?

Four potential risks...

1. Side-Channels
2. Reactive Stability
3. Cross-Layer Robustness
4. *Are We the Bad Guys?*

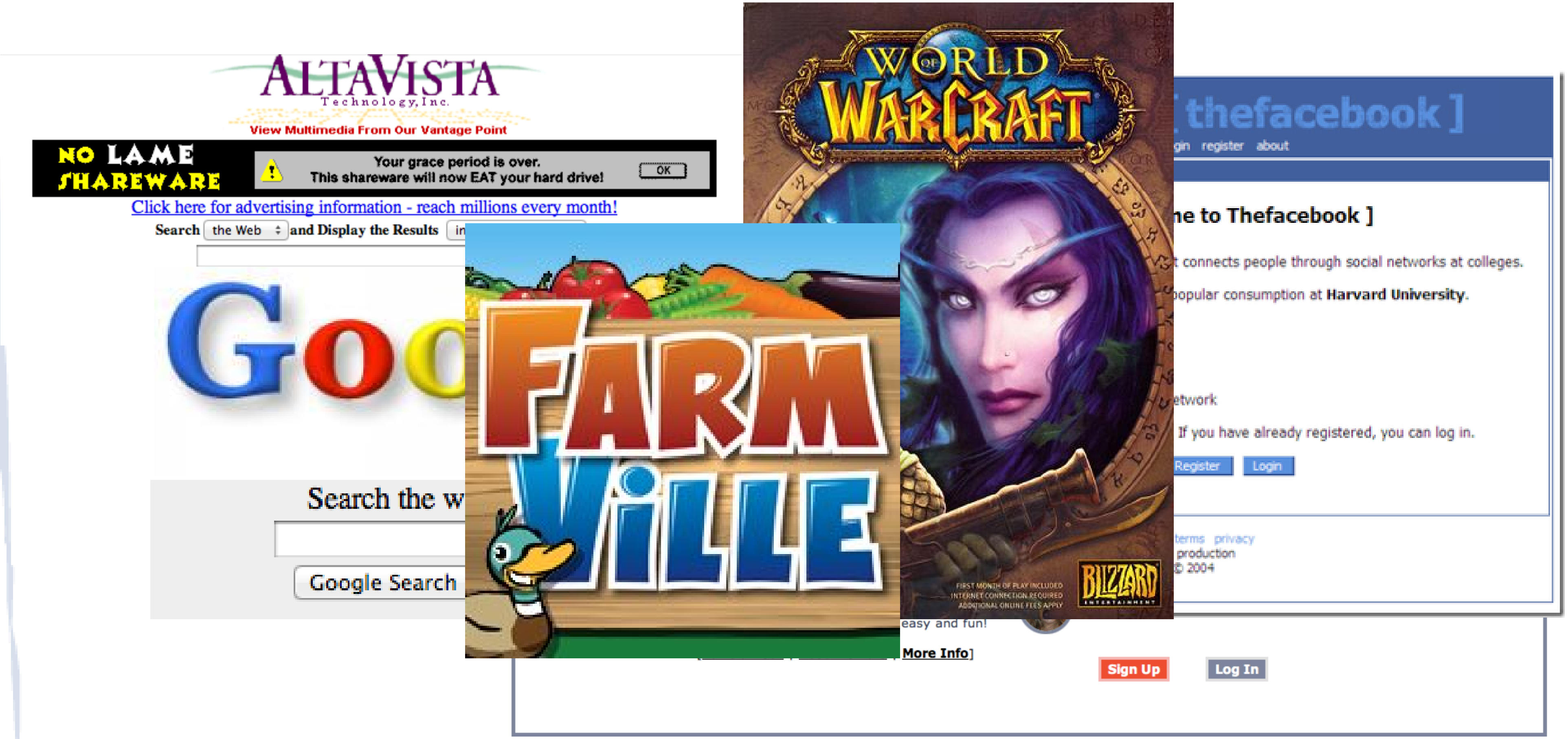
In 1000 years...

Someone will still have a copy of:

THE
ILIAI
OF
HOME
TRANSLATED AND WITH AN INTRODUCTION BY
RICHMOND LATTIMORE
Adam Smith
AN INQUIRY
INTO THE
NATURE AND CAUS
OF THE
WEALTH OF NATION
Volume I
Elibron Classics
STAR WARS
TRILOGY
A NEW HOPE
LET IT BE
PACM
SCORE 24570
LIVES
DOOM
id

In 1000 years...

Will *anyone* still have a usable “copy” of:



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popular consumption at **Harvard University**.

etwork

If you have already registered, you can log in.

production
© 2004

easy and fun!

A Darker Digital Dark Age?

- Many culturally important artifacts are and will *increasingly* be cloud-based apps & services
- *No one* but the app/service provider has code & data necessary to preserve history
  - Does the Library of Congress have a copy of Google 1.0? Facebook 1.0? WoW 1.0?
- What about the blogs, tweets, or email records of the next Homer/Newton/Marx/Einstein?
- *Cloud artifacts are naturally non-preservable*

What risks *might* appear that we're not looking at yet/enough?

Four potential risks...

1. Side-Channels
2. Reactive Stability
3. Cross-Layer Robustness
4. Digital Preservation

...and no doubt not the end of the list!

Conclusion

What are the risks beyond information security?

What could happen if we don't address them?

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