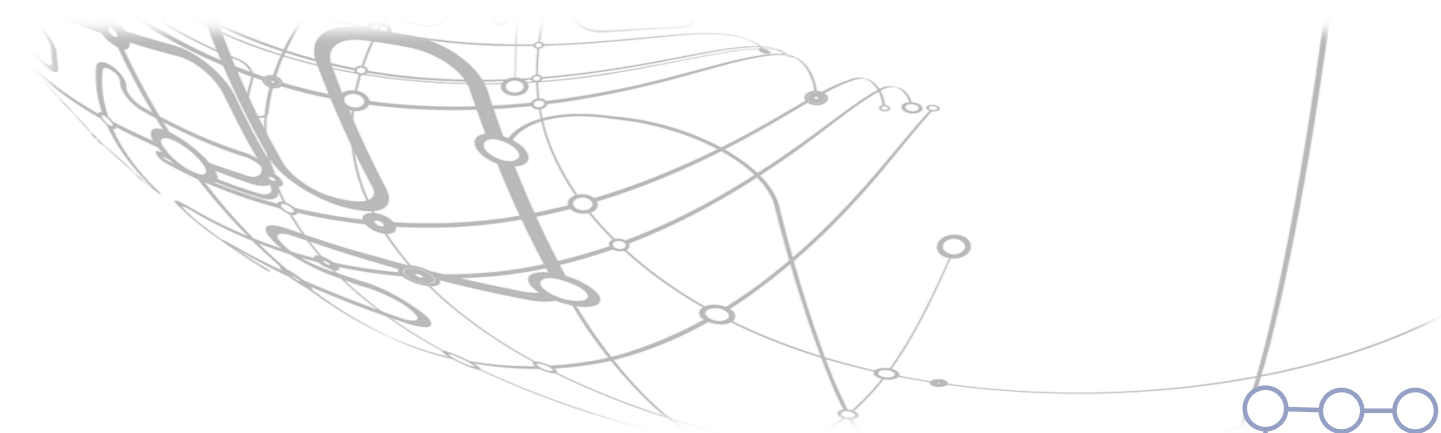# Ad hoc Cloud Computing

Gary McGilvary
Adam Barker
Malcolm Atkinson
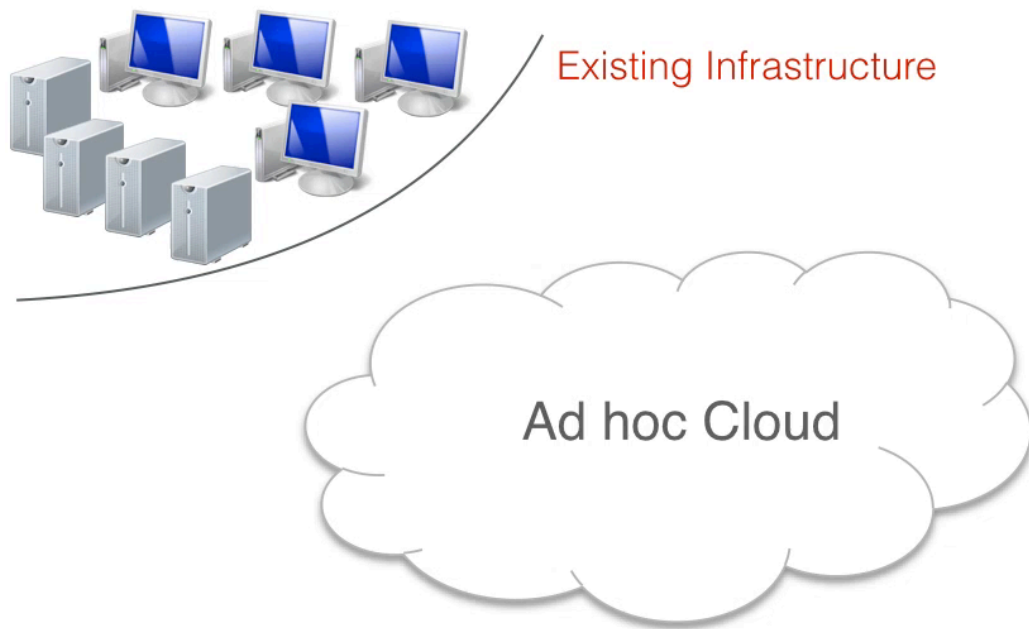
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What is *Ad hoc* Cloud Computing?

- Harvest resources from *sporadically available, non-exclusive* and *unreliable* infrastructures.
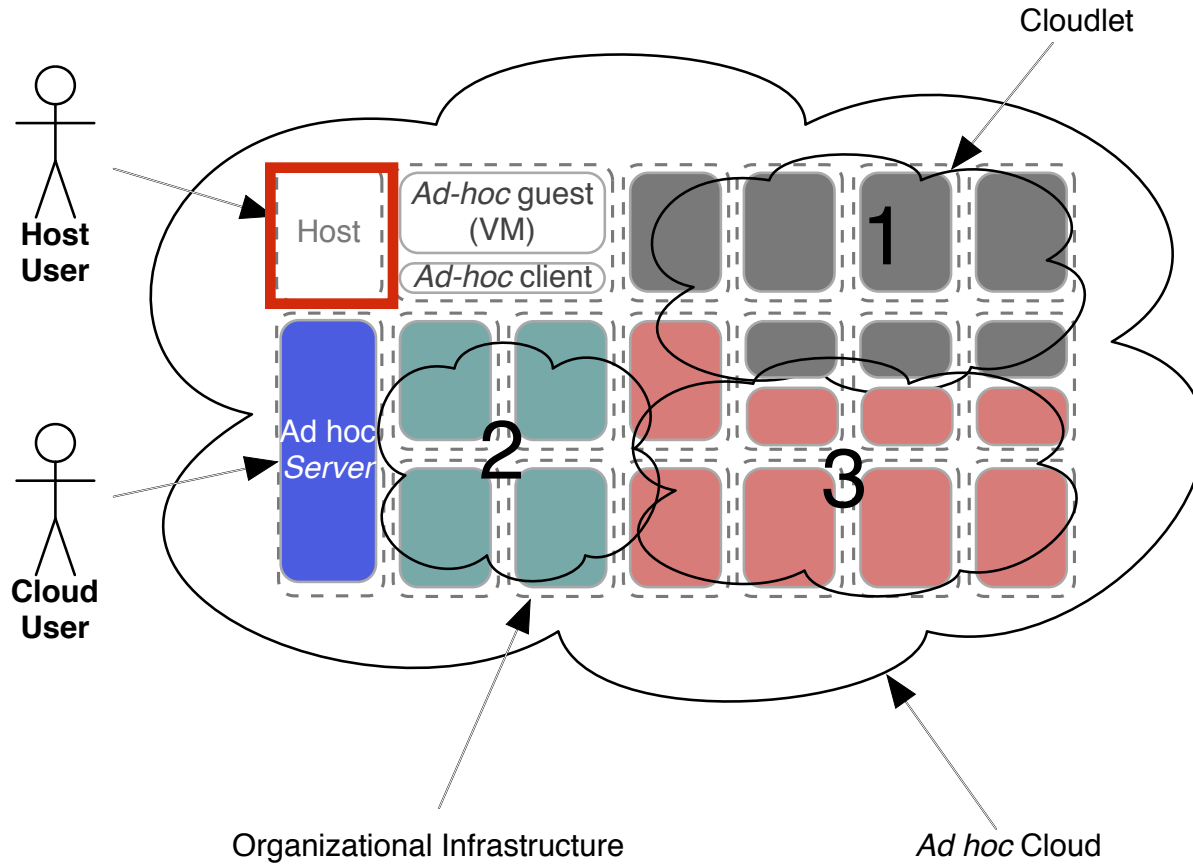

Existing Infrastructure

Ad hoc Cloud

What is *Ad hoc* Cloud Computing?

- Harvest resources from *sporadically available*, *non-exclusive* and *unreliable* infrastructures.

- Cannot migrate to cluster, Grid or cloud (public or private)

- Increase utilization and return on investment
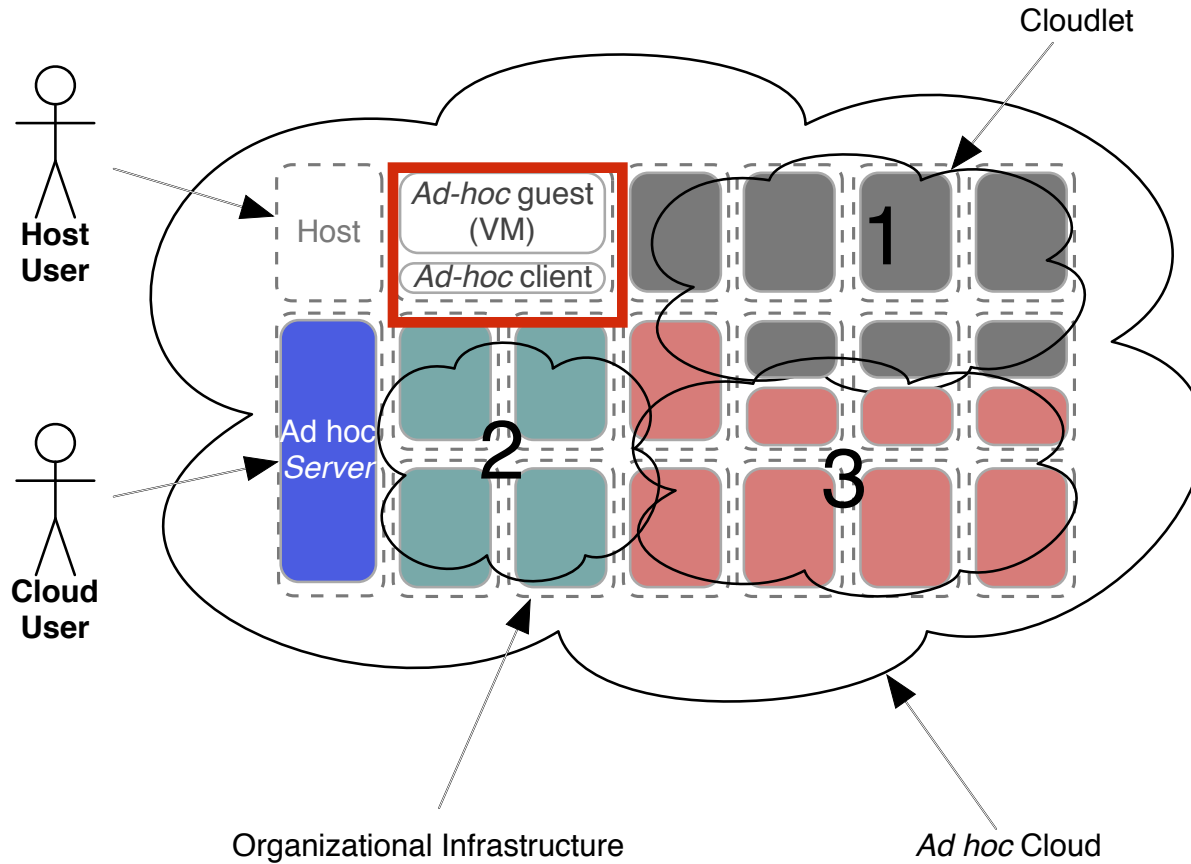
- Combination of many computational models

	Cluster	Grid	Volunteer	Cloud	Ad hoc Cloud
Volunteer resources (non-dedicated)	🟩🟥	🟩🟥	🟩	🟥	🟩
Assumes untrusted hosts	🟥	🟥	🟩	🟥	🟩
Continuity (proactive + distributed)	🟩🟥	🟩🟥	🟥	🟥	🟩
Low Interference	🟩	🟩	🟩🟥	🟥	🟩
Diverse Workloads	🟩	🟩	🟥	🟩	🟩

Ad hoc Cloud Overview

ad hoc hosts: employee workstations, your laptop, etc

Ad hoc Cloud Overview

Cloudlet

Host User

Cloud User

Host

Ad-hoc guest (VM)

Ad-hoc client

1

Ad hoc *Server*

2

3

Organizational Infrastructure

Ad hoc Cloud

ad hoc client: Modified BOINC client; guest control, monitoring...

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Ad hoc Cloud Overview

Cloudlet

Host

Ad-hoc guest (VM)

Ad-hoc client

1

Host User

Ad hoc *Server*

2

3

Cloud User

Organizational Infrastructure

Ad hoc Cloud
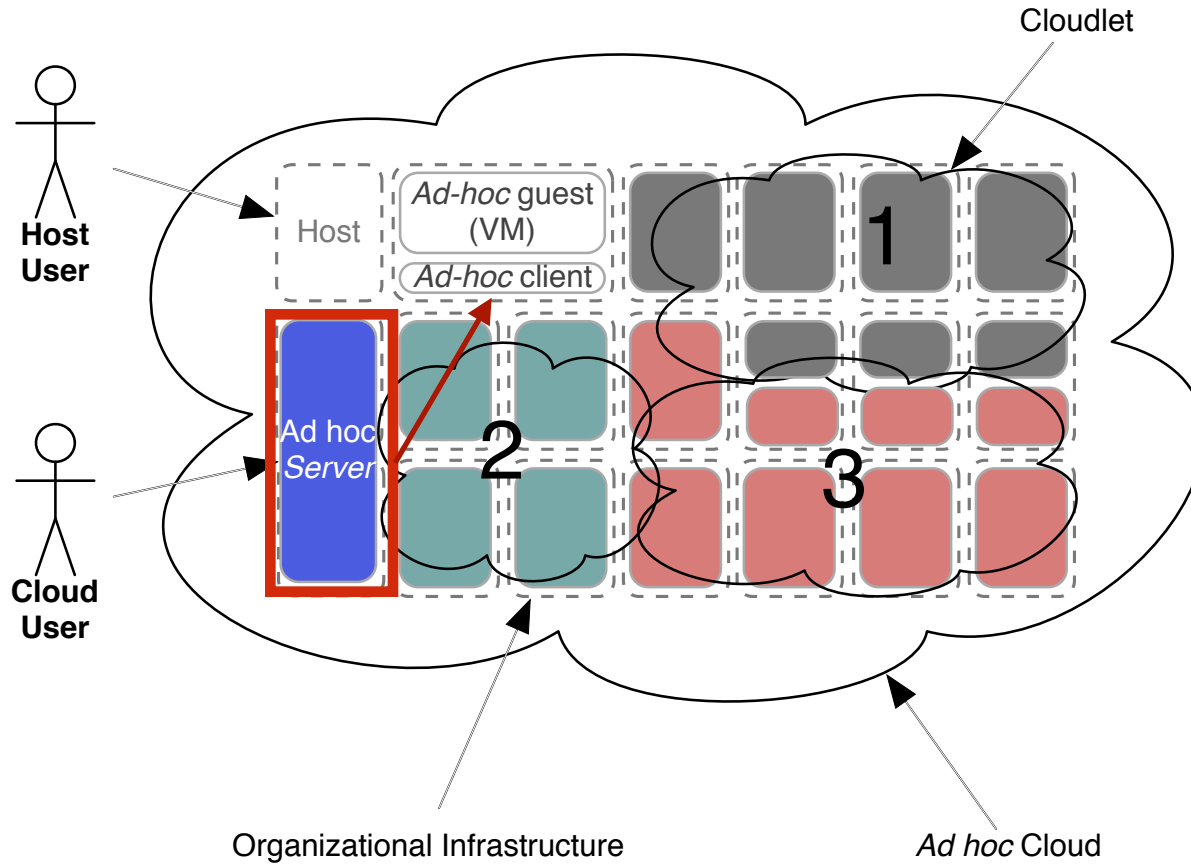
ad hoc server: host, guest, cloudlet and state management

8

Ad hoc Architecture Interactions

1. Cloud user job

| .exe | data | R.vdi |

2. Register

3. VM and script

4. Job X Details

Host Machine

BOINC

Ad hoc Client

8. Monitor host/guest resources

6. Start VM

5. Configure

7. Get Job X

9.1 Send host/guest status

Ad hoc Server

B O I N C

Virtual Machine

Gary A. McGilvary, Adam Barker, Ashley Lloyd and Malcolm Atkinson. V-BOINC: The Virtualization of BOINC. CCGrid 2013
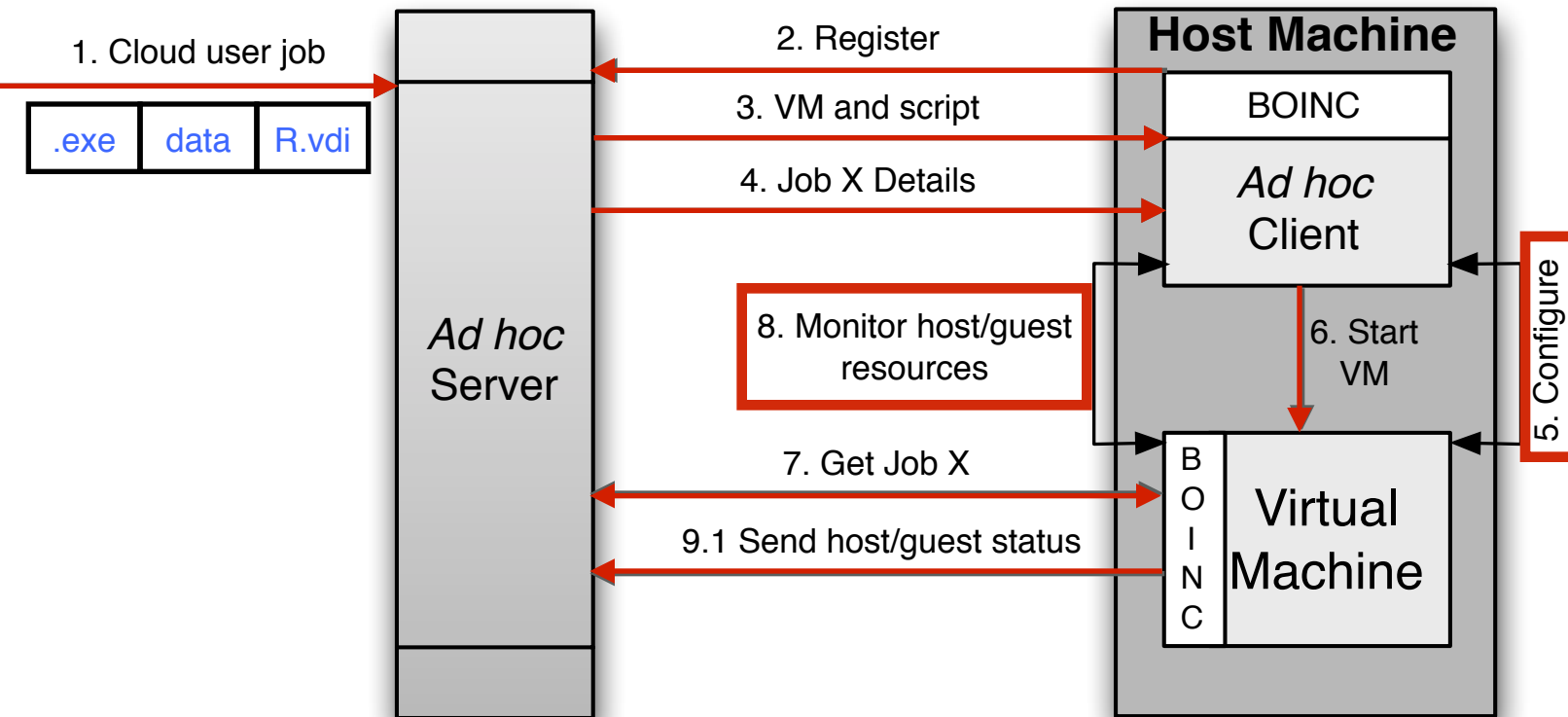
Ad hoc Architecture Interactions

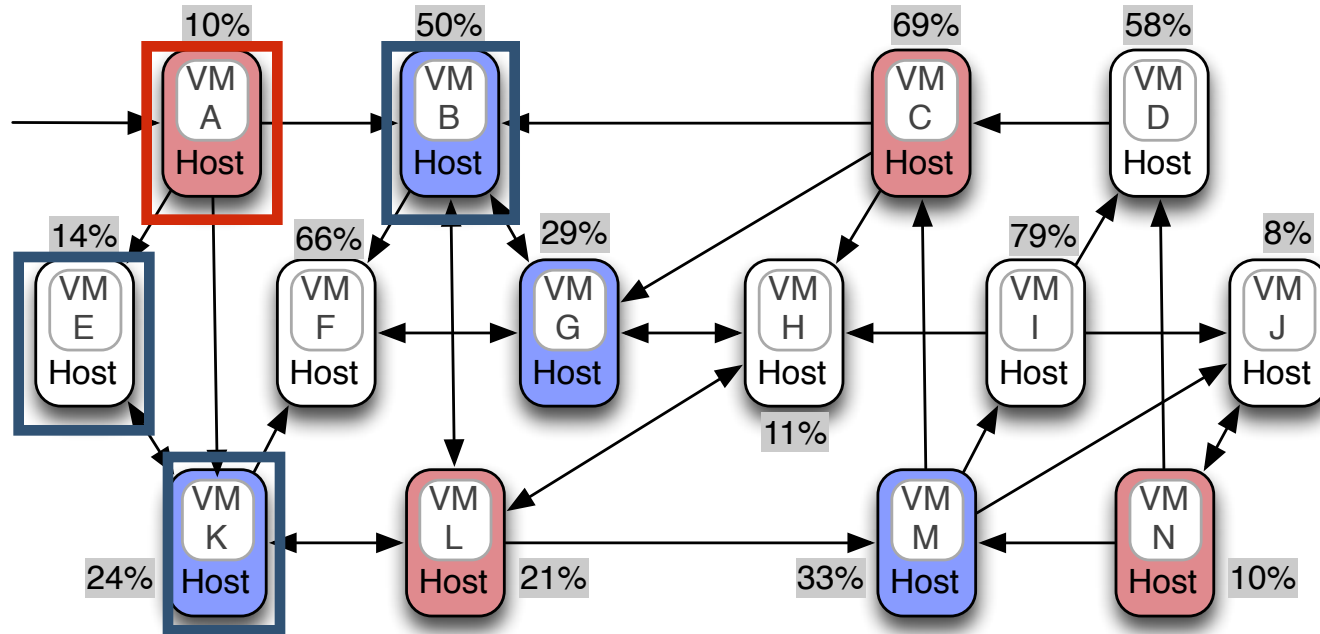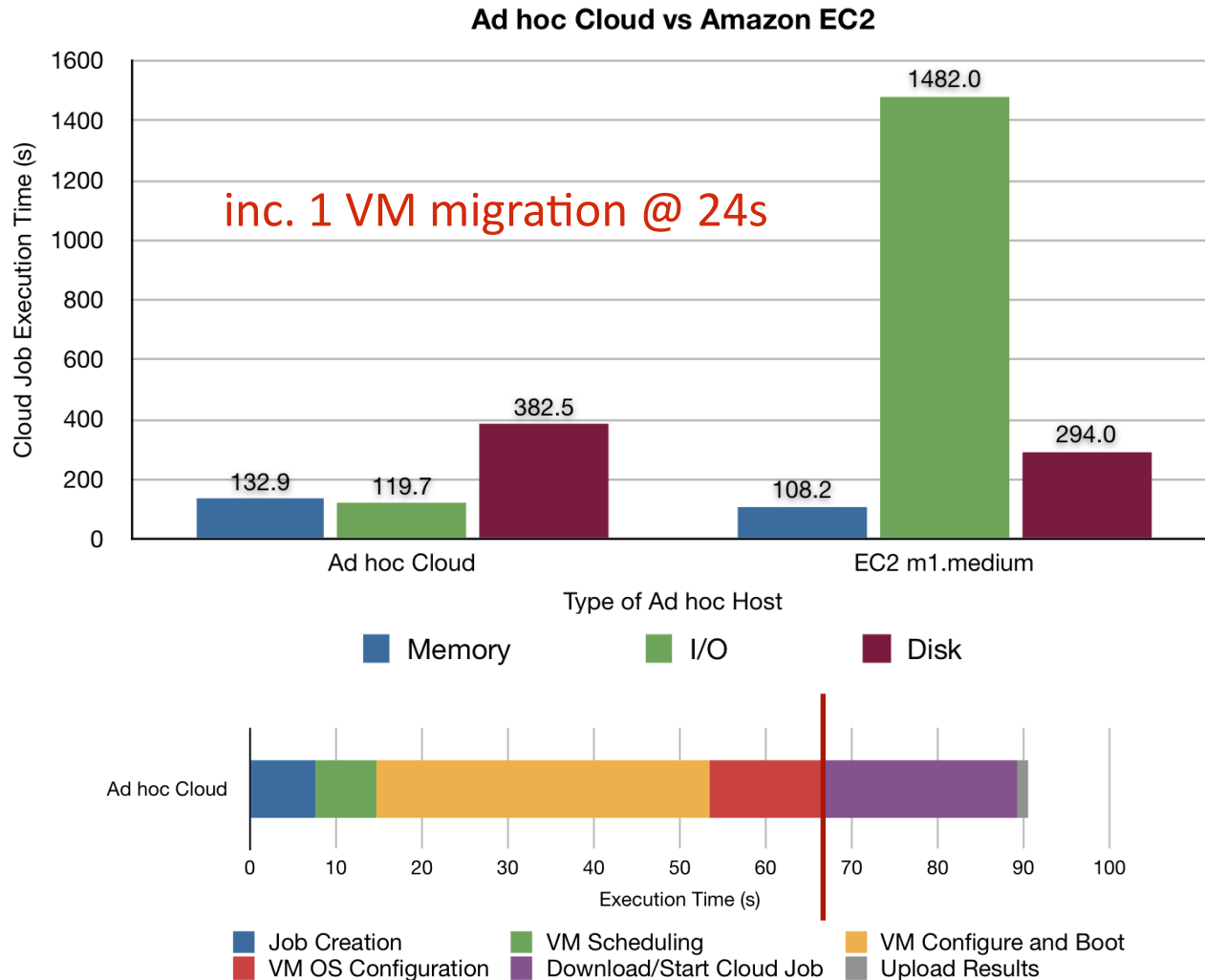# *Ad hoc* Architecture Interactions
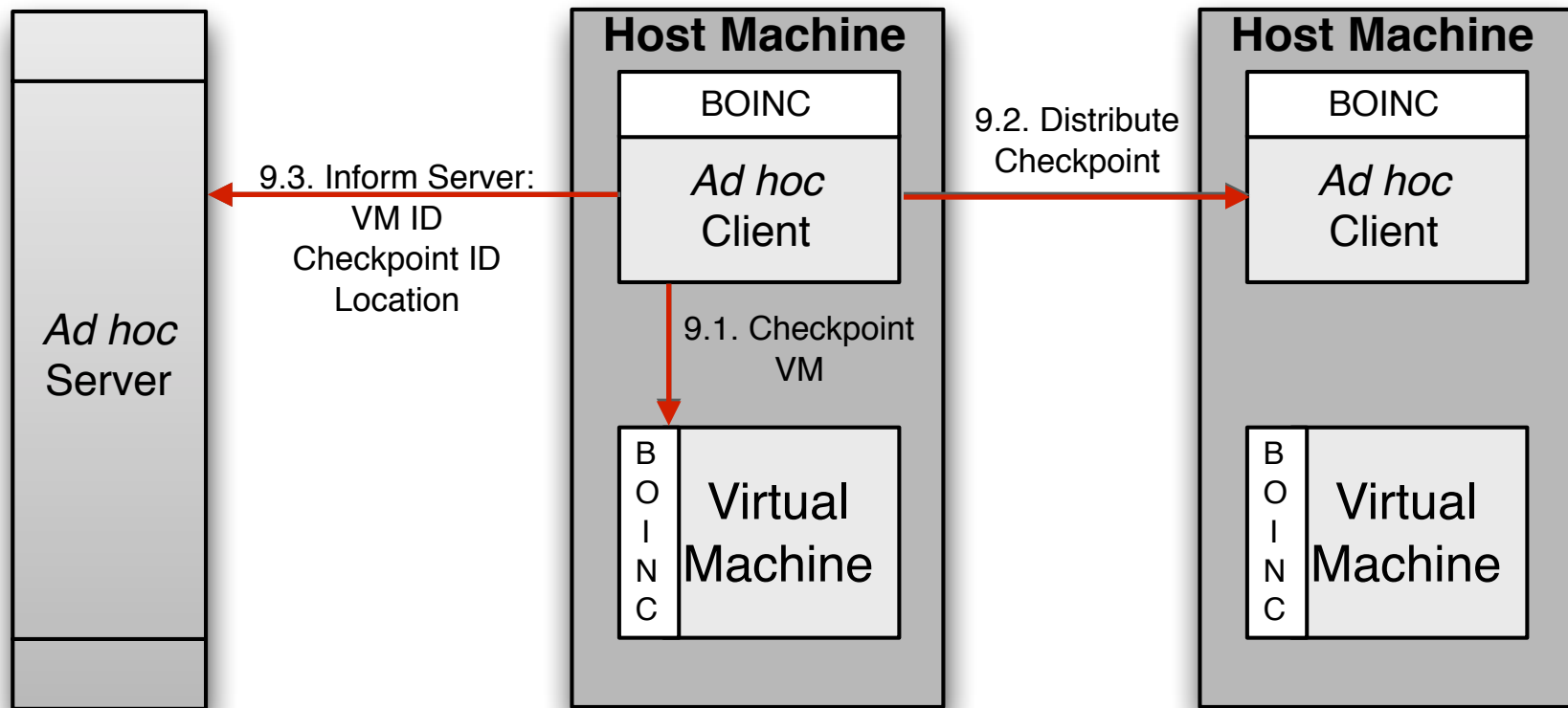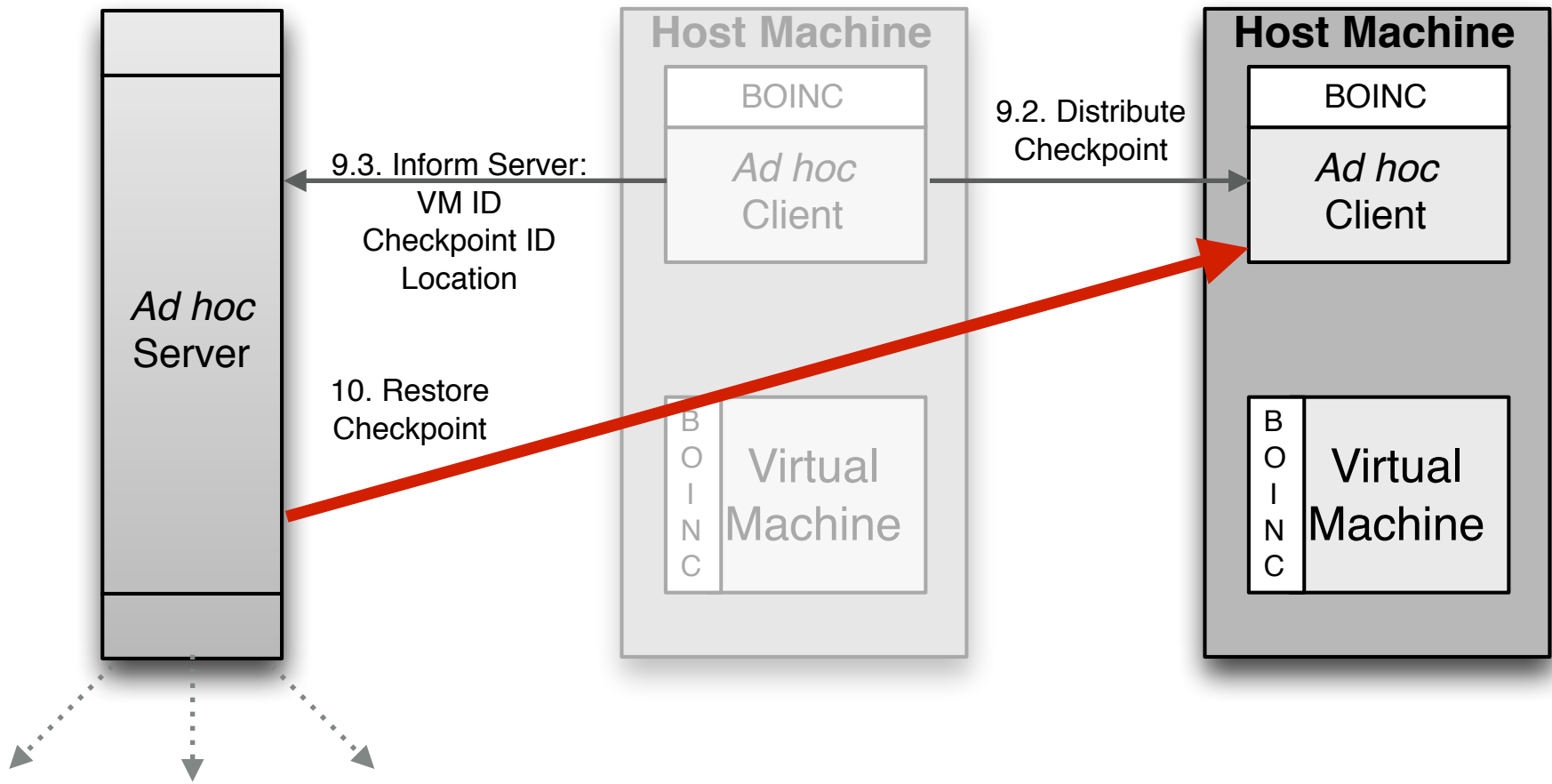
Peer-to-Peer (P2P) Checkpointing

| Failed Virtual Machine | XY% Probability of Failure | Restored Virtual Machine |

$$host\_reliability = \begin{cases} 0 & \text{if } NF = CA \\ 100 & \text{if } NF = 0 \\ (CC/CA) * 100 & \text{otherwise} \end{cases}$$

= 1.6%

NF = the total number of *ad hoc* host and guest failures,

CA = the total number of cloud jobs assigned to the *ad hoc* host,

CC = the total number of cloud jobs completed by the *ad hoc* host.

Preliminary Evaluation

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Preliminary Evaluation

Up to 93.3% reliability

Preliminary Evaluation

Ad hoc Cloud vs Amazon EC2

inc. 1 VM migration @ 24s

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Conclusions

- A new computation model useful in a number of scenarios

- Built on BOINC and V-BOINC. Concepts from Grid, Cloud, etc

- Reliability introduced by P2P checkpointing and distribution

- Suitable for CPU, memory and I/O intensive tasks

- Initial experimentation is promising

- Feasible, reliable and offers reasonable performance!

www.garymcgilvary.co.uk   www.era.lib.ed.ac.uk/handle/1842/9652

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Thank You.

Questions?