Cloud Cyber Security: How Hard Can It Be?

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1. Introduction
2. A Possible Approach
3. Weaknesses
4. Future Improvements
5. Conclusion
Cloud Cyber Security: How Hard Can It Be?

1. Introduction

Cloud Computing - A Novel Concept.

Let us take all our important corporate information and run it in somebody else’s computer system.

What could possibly go wrong?
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2. A Possible Approach

Develop a conceptual cloud security assurance model with:

- Declarative Layer
- Operational Layer
- Assurance Layer
- Audit Layer
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2. A Possible Approach

![Diagram of A Declarative Cloud Three-Dimensional Security Matrix]

Fig. 2. A Declarative Cloud Three-Dimensional Security Matrix

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Fig. 3. The Declarative/Operational/Assurance/Audit Layers (see Subsection IV(E) for notes)
3. Weaknesses

1. Definition of security goals
2. Compliance with standards
3. Audit issues
4. Management approach
5. Technical complexity of cloud
6. Lack of responsibility and accountability
7. Measurement and monitoring
8. Management attitude to security
9. Security culture in the company
10. The threat environment
3. Weaknesses

1. Definition of security goals
3. Weaknesses

1. Definition of security goals

Often, company managers have difficulty understanding what their security goals ought to be.
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3. Weaknesses

2. Compliance with standards
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3. Weaknesses

2. Compliance with standards

Compliance with standards is a laudable aim. Since cloud began, over 30 agencies have been working on cloud standards. Despite all this good work, there are currently no complete cloud security standards in existence.
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3. Weaknesses

3. Audit issues

Compliance is often achieved through audit. However, the practical mechanisms frequently deployed to achieve audit place an over reliance on checklists, rather than on carrying out proper due diligence, leading to poor audit quality.
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3. Weaknesses

4. Management approach

Management approaches can generally be grouped into two main categories:

4.1 Managers who work under Agency Theory, and
4.2 Managers who work under Stewardship Theory

It is well known that Agency Theory completely fails to handle the effects of greed, leading to weakness in management goals.
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3. Weaknesses

5. Technical complexity of cloud
3. Weaknesses

5. Technical complexity of cloud

Cloud presents a far more complex environment for companies to operate in. Complexity is not the friend of security. Over the years, cloud has become ever more complex, leading to ever more needless vulnerabilities appearing in cloud systems.
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3. Weaknesses

6. Lack of responsibility and accountability

There is a great tendency for both cloud service providers and cloud users to wriggle out of their responsibilities when it comes to ensuring a high level of cloud security and privacy can be maintained. When no-one stands accountable for their actions, or inactions, this usually impacts adversely on the standard of security being achieved.
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3. Weaknesses

7. Measurement and monitoring
3. Weaknesses

7. Measurement and monitoring

A common weakness in many compromised systems is a singular lack of any measurement and monitoring to ensure systems are behaving as expected. Current estimates suggest that it takes on average 200 days for corporates to realise they have suffered a breach. Proper measurement and monitoring would clearly allow for much faster discovery. In 2018, the EU General Data Protection Regulation will come into force, whereby failure to disclose a breach within 72 hours will result in punitive fines.
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3. Weaknesses

8. Management attitude to security
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3. Weaknesses

8. Management attitude to security

Where management have a poor attitude to security, this tends to filter down through the organisation, leading to the view that “If management don't seem to care, why should we?”
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3. Weaknesses

9. Security culture in the company
3. Weaknesses

9. Security culture in the company

Where management do not seem to care about security, this can lead to the evolution of a poor security culture in the company. A proper level of security depends on both the security culture in the company and the actions of every single employee in the company. Without the right security culture in place, the company effectively aids the attacker to exploit the company much more easily than would otherwise be the case.
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3. Weaknesses

10. The threat environment
3. Weaknesses

10. The threat environment

We can consider 5 main areas of threat:

10.1 State sponsored attack;
10.2 Industrial espionage;
10.3 Hacktivists;
10.4 Professional criminals;
10.5 Amateur hackers.
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3. Weaknesses

10. The threat environment

They work 24/7 365 days a year. Some, such as the state-sponsored actors are exceptionally talented and extremely well resourced. Others, such as hacktivists, are highly motivated. Even amateurs can be highly skilled. It is no longer a question of IF you will be hacked, rather it is simply a question of WHEN!
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3. Weaknesses

11. The Internet of Things
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3. Weaknesses

11. The Internet of Things

To this unhappy list, we can now add the Internet of Things (IoT). The weaknesses of cloud pale into insignificance when we consider the IoT. With up to 50 billion IoT devices forecast to be in use by 2020, no security standards on the horizon, devices riddled with poor or non-existant security, and with full access to our “secure” networks, what could possibly go wrong?
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4. Future Improvements

FAST-CCS?
4. Future Improvements

FAST-CCS?

This could provide a good starting point. Once a breach occurs, the attacker seeks to delete the audit trail, to remove all trace of their visit. Ensuring proper audit and forensic trails are properly maintained can provide a good starting point, especially if the weaknesses from Section 3 are properly addressed.
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4. Future Improvements

Unikernels?
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4. Future Improvements

Unikernels

We can use unikernel solutions to help reduce the complexity of cloud systems in order to make security more effective and simpler to achieve. A useful byproduct is the reduced running costs which can be offered by unikernel systems. Thanks to their minuscule footprint, they might also be adapted for IoT security.
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4. Future Improvements

The Bright Internet
4. Future Improvements

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4. Future Improvements

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4. Future Improvements
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5. Conclusion

What do you think?