



Perspectives on the Concept of Accountability

Nick Papanikolaou

Senior Researcher, Security and Cloud Lab, HP Labs

np1@hp.com

* Joint work with Siani Pearson

Outline of this talk

Topic: What does **accountability** mean? Some perspectives from the literature

1. **Dictionary Definitions and Some Intuition**
2. **The Master List: there are at least 15 interpretations of 'accountability' in the literature**
3. **Accountability at NASA and the Challenger tragedy**
4. **The Accountability Paradox**
5. **Accountability for e-Society**
6. **Formalising Accountability as Audit**
7. **Accountability in IT Protocols**
8. **Accountability in the Cloud**



Groupings/Classification of Previous Work

In the paper:

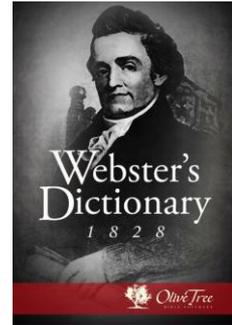
- **High-level definitions**
- **Social Science**
- **Regulatory Frameworks**
- **IT Management**
- **Computer Science**

This talk – a selection of perspectives:

- **Political & Social Science**
- **IT**
- **Audit**
- **Cryptography**
- **Data Protection**
- **Towards accountability in the cloud**



Dictionary Definitions and Some Intuition



Webster's 1828 Dictionary:

ACCOUNTABILITY, n.

1. The state of being liable to answer for one's conduct; liability to give account, and to receive reward or punishment for actions.

The awful idea of accountability.

2. Liability to the payment of money or of damages; responsibility for a trust.

Merriam Webster's Dictionary:

ACCOUNTABILITY, n.

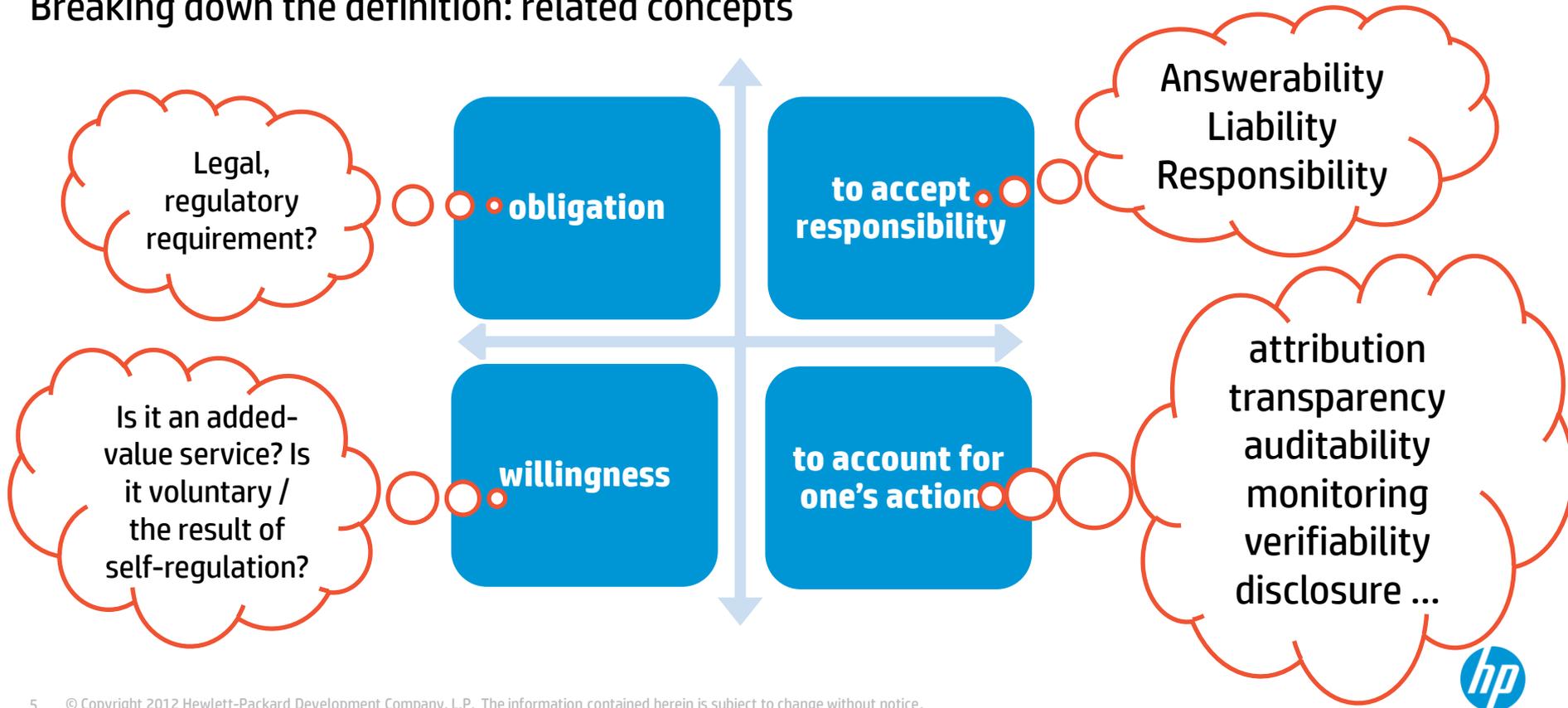
- the quality or state of being [accountable](#); *especially* : an obligation or willingness to accept responsibility or to [account](#) for one's actions <public officials lacking *accountability*>
- First known use: 1770



m-w.com

Dictionary Definitions and Some Intuition

Breaking down the definition: related concepts



The Master List

>15 different interpretations in the literature!

- **Answerability**
- **Liability**
- **Responsibility**
- **Transparency**
- **Attribution capability**
- **Ability to provide evidence**
- **Compliance**
- **Controllability**
- **Responsiveness**
- **Disclosure**
- **Non-repudiation (undeniability)**
- **Monitorability**
- **Auditability**
- **Verifiability**
- **Assurance**
- **Remediation**



Accountability at NASA and the Challenger Tragedy

📄 Romzek, B., & Dubnick, M. (1987). Accountability in the public sector: Lessons from the Challenger tragedy. *Public Administration Review*

The NASA Space Shuttle Challenger was launched on January 28, 1986. It was the 25th mission of the Shuttle program and the 9th space exploration mission of the Shuttle program.

- **Accountability:** The contractor for the failed component of the Challenger, Morton Thiokol, was held financially liable.
 - **ECONOMIC:** The contractor was held financially liable to avoid penalty.
 - **POLITICAL:** The contractor was held financially liable to avoid political damage? The defense was that the contractor was not aware of the problem.
 - **BUREAUCRATIC:** responsible for the failure. They have suitable priorities or else take responsibility.
 - **PROFESSIONAL:** individual responsibility to exercise their job duties correctly or face termination.
- Paper gives a definition of public administrator's accountability and how it is all about managing expectations.



The Accountability Paradox

📄 Jos, P., & Tompkins, M. (2004). THE ACCOUNTABILITY PARADOX IN AN AGE OF REINVENTION : The Perennial Problem. *Administration & Society*, 36(3), 255.

“Responsible internal control application of legitimate expectations and accountability demands depends on the selection of the virtues that administrative systems and mechanisms communicate to the public. If these virtues threaten the very values that they are intended to protect, responsible judgment is required.”

Were the rules followed?

TRADEOFFS

Was the end result what we wanted? (even if we had to bend the rules)

Two elements of a compliance-based process:

- Defining rules and procedures
- Employing various means to ensure compliance with these expectations

COMPLIANCE-BASED accountability processes vs. **PERFORMANCE-BASED** accountability processes



Accountability for E-Society

 Lin, K.-J., Zou, J., & Wang, Y. (2010). Accountability Computing for E-society. *2010 24th IEEE International Conference on Advanced Information Networking and Applications*, 34–41.

This paper surveys definitions of accountability and then presents a technical architecture.

Schedler's* definition of accountability:

- **”A is accountable to B when A is obliged to inform B about A’s (past or future) actions and decisions, or justify them and to be punished in the case of misconduct”**

Non-technical means of implementing accountability:

- **Quality management processes in companies**
- **Regulatory compliance**
- **Managerial answerability**

* A. Schedler, L. Diamond, and M. Plattner, *The self-restraining state: power and accountability in new democracies*. Lynne Rienner Pub, 1999.



Accountability for E-Society (cont.)

 Lin, K.-J., Zou, J., & Wang, Y. (2010). Accountability Computing for E-society. *2010 24th IEEE International Conference on Advanced Information Networking and Applications*, 34–41.

Technical definition of accountability for service-oriented architectures:

- ” Accountability in services refers to the obligation that several persons, groups, or organizations assume for the execution and fulfilment of a service. This obligation includes:
 - **answering, providing an explanation or justification, for the execution of that authority** and/or fulfilment of that responsibility;
 - **full disclosure** on the results of that execution and/or fulfilment;
 - undeniable liability for those results (**non-repudiation**); and
 - obtaining **trusted agreement** of accountability from all entities involved in the service who in turn are bound to the obligations set out above.”



Formalising Accountability as Audit

📄 Cederquist, J. G., Corin, R., Dekker, M. A. C., Etalle, S., & Den Hartog, J. I. (2005). An Audit Logic for Accountability. *Sixth IEEE International Workshop on Policies for Distributed Systems and Networks (POLICY'05)*, 34–43.

Technical perspective on accountability – proving that agents in a distributed system really do the things they are supposed to by looking at logs

- The authors have implemented a mathematical logic for **formally describing properties these logs should satisfy** and **proving whether the properties are satisfied by the logs (this is what is understood as ‘auditing’ in this context)**.
- This is a computer science / formal methods approach – a **theorem prover, Twelf**, can be used to actually analyse system designs.



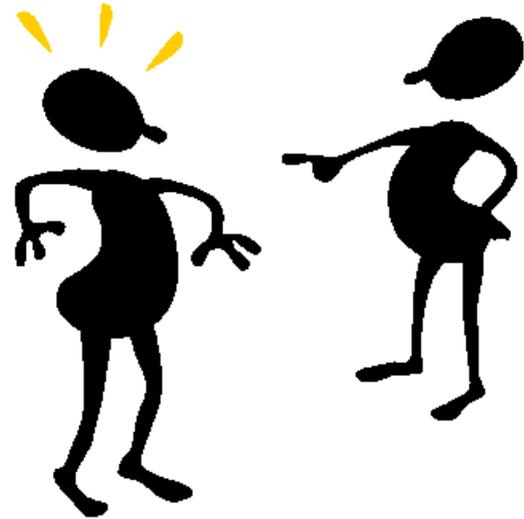
Accountability in IT Protocols

📄 Truderung, T., & Vogt, A. (2010). Accountability: definition and relationship to verifiability. *Proceedings of the 17th ACM conference on Computer and communications security (CCS'10)*.

Technical perspective on accountability – formal definition for crypto applications.

Accountability is defined as the combination of 2 properties:

1. **(fairness)** The judge J (almost) never blames protocol participants who are honest.
2. **(completeness)** If, in a run, some desired goal of the protocol is not met—due to the misbehaviour of one or more protocol participants—then the judge J blames those participants who misbehaved, or at least some of them.



Accountability in the Data Protection Context

The Galway Project definition

Galway Project Definition of Accountability for Personal Data (*this has been revised now)

“**Accountability** is the **obligation to act as a responsible steward** of the personal information of others, **to take responsibility for the protection and appropriate use** of that information **beyond mere legal requirements**, and **to be accountable** for any misuse of that information.”

Other related definitions from

- **OECD**
- **PIPEDA**
- **APEC Privacy Framework**

This implies

- responsibility
- liability (“to be accountable for any misuse”)
- Optional/added value (“beyond mere legal requirements”) – see [slide 5!](#)



Accountability in the Cloud (cont.)

 Pearson, S. (2011). Toward Accountability in the Cloud. *IEEE Internet Computing, Jul/Aug 2011.*

Implementing Accountability in the Cloud

Need to use **preventive controls** (for prospective accountability) and **detective controls** (for retrospective accountability).

Elements of accountability identified in this paper

- **Transparency**
- **Responsibility**
- **Assurance**
- **Remediation**



Summary

Accountability is a rich and diverse notion with many interpretations in different contexts

We have surveyed an selection of previous papers on the subject. Those mentioned in this talk:

- A paper on accountability of public sector officials (cf. NASA)
- A paper on moral dimensions of accountability and the tradeoffs that often enter into play
- A paper surveying enterprise accountability and how it applies in IT/SOA contexts
- A technical paper defining a logic for reasoning about accountability properties
- A technical paper formalising accountability as the ability to blame
- A paper examining enterprise IT accountability and how it can be implemented in cloud scenarios



Thank you

