

Accountability in Cloud Computing

An Introduction to the Issues, Approaches, and Tools

Nick Papanikolaou, Cloud and Security Lab, HP Labs Europe

np1@hp.com

With special thanks to Nick Wainwright and Siani Pearson, HP Labs




Introduction

- In the context of cloud computing, **accountability** is all about developing a **holistic approach** to achieving trust and security in the cloud, encompassing
 - Legal,
 - Regulatory, and
 - Technicalmechanisms
- In this talk we will give an overview of the subject, emphasising the importance of **international cooperation and consensus on these aspects**

International Frameworks mentioning Accountability

- The notion of accountability appears in several international frameworks:
 - **OECD** Privacy Guidelines (1980)
 - **Canada's** Personal Information Protection and Electronic Documents Act (2000)
 - Asia Pacific Economic Cooperation (**APEC**) Privacy Framework (2005)
 - **European Data Protection Directive 95/46/EC**
 - Also - Outputs of EU Article 29 Working Party
 - **Binding Corporate Rules**

What is Accountability?

ac·count·abil·i·ty  *noun* \ə-,kaʊn-tə-'bi-lə-tē\
Definition of ACCOUNTABILITY  
: 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 of ACCOUNTABILITY
1794

- In the business context, **accountability** is about **complying with measures that give effect to practices articulated in given guidelines**

Definitions of Accountability

- In the context of **corporate data governance**:
 - “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.”

(Galway Project)

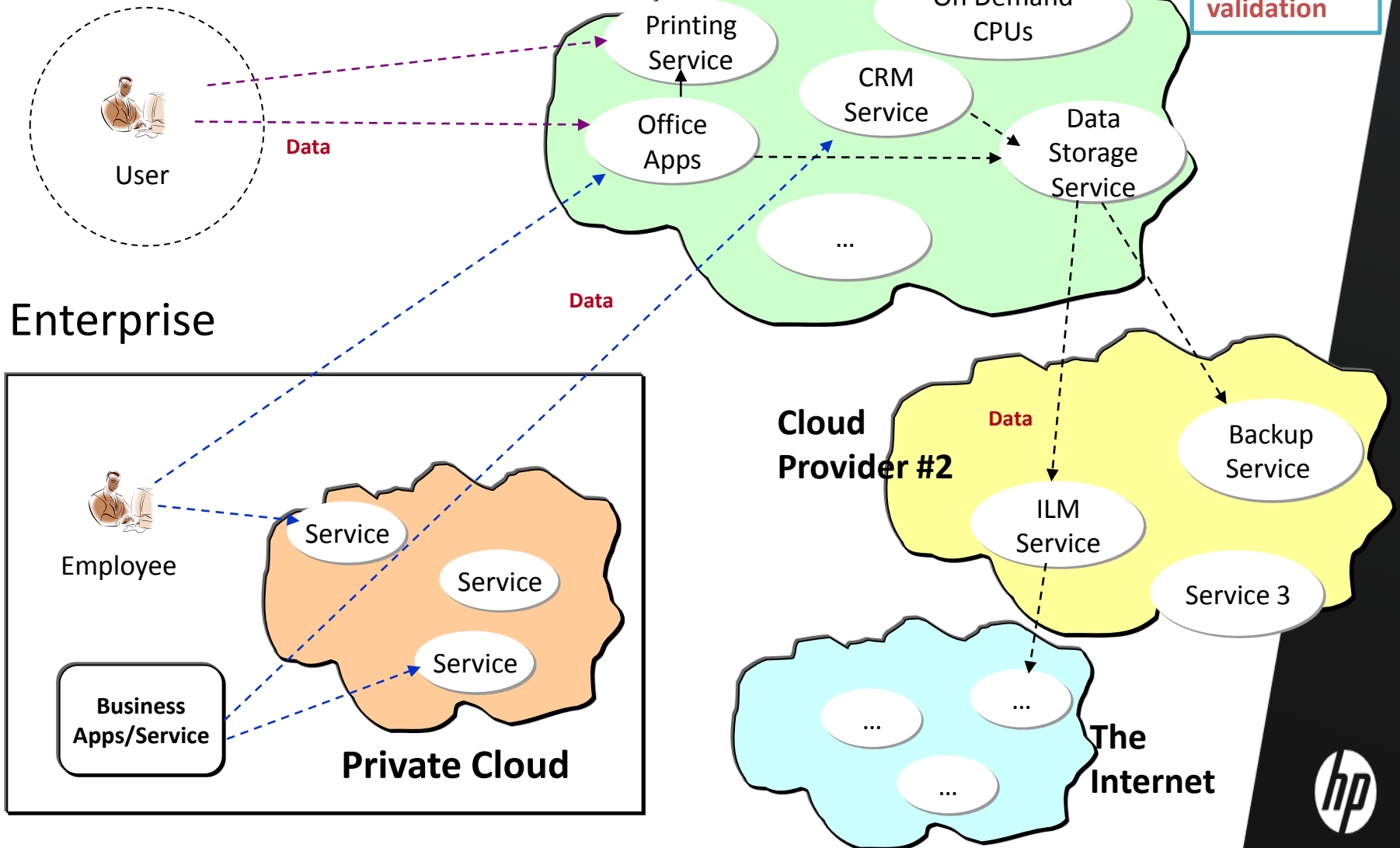
Accountability in the Cloud

- In the context of cloud, accountability is a set of approaches to addresses two key problems:
 - **Lack of consumer trust** in cloud service providers
 - **Difficulty** faced by cloud service providers **with compliance** across geographic boundaries
- Emphasis is on **data protection**, but the notion of accountability encompasses more than just privacy

Barriers to Cloud Adoption

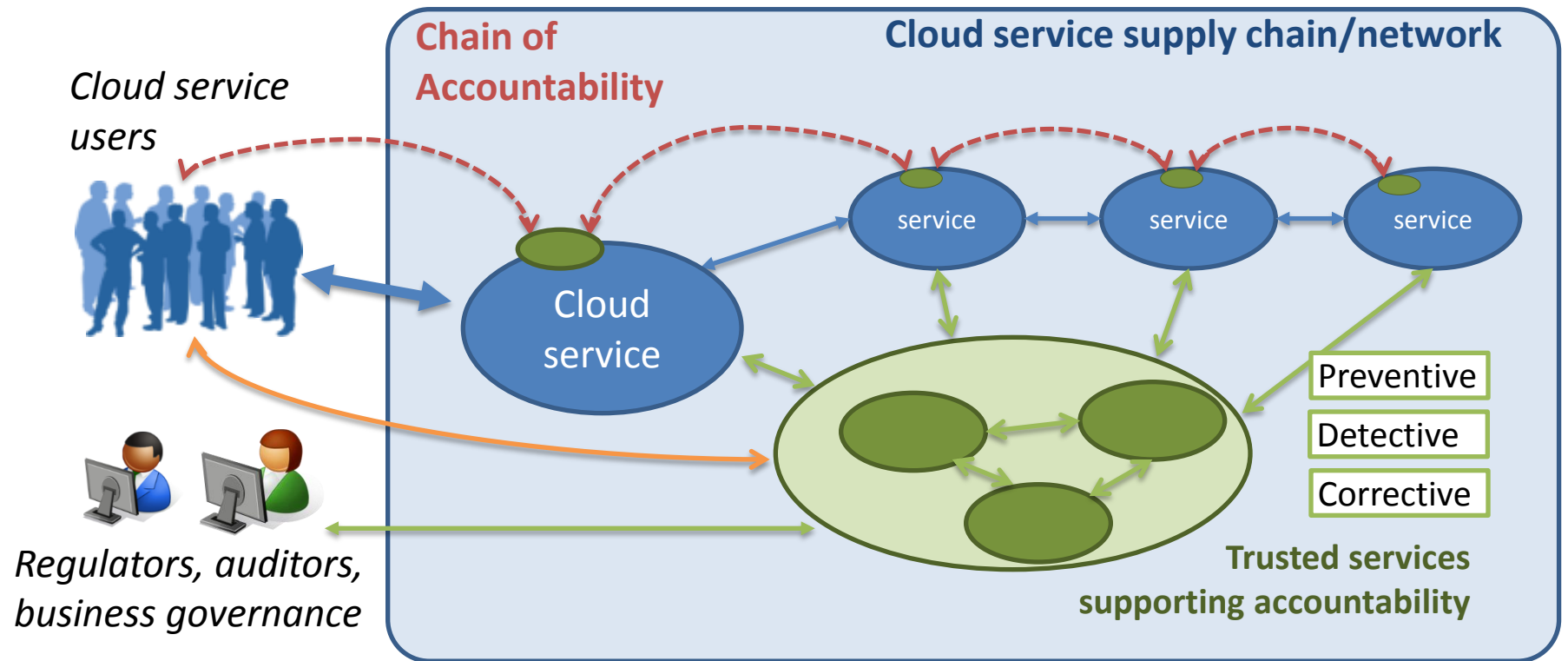
- **Lack of consumer trust in CSPs**
 - End users have increased expectations that companies with which they share their data will handle it responsibly
 - End users perceive a **lack of transparency** and **less control** over their data as it shifts to the cloud
 - Fear that governments might get access to data in their countries
 - How to obtain redress in case of a problem?
- **Difficulty of Compliance for CSPs**
 - Data flows are **global** and **dynamic**
 - **Transborder data flows** – **international agreements**
 - Which courts should preside in case of a problem?

Accountable organisations ensure that obligations to protect data are observed by all who process the data, irrespective of where that processing occurs.



Key Differentiators for Accountable Cloud Service Providers

- Business reputation - trustworthiness enhanced
 - Enterprises that are accountable will be perceived as more responsible and
- Business advantage in **going beyond mere legal expectations** and providing **good data stewardship**



Cloud service users:

control and transparency over how their data is used, and support in obtaining redress

Service providers:

techniques to make services more trustworthy, satisfy business policies and allow differentiation

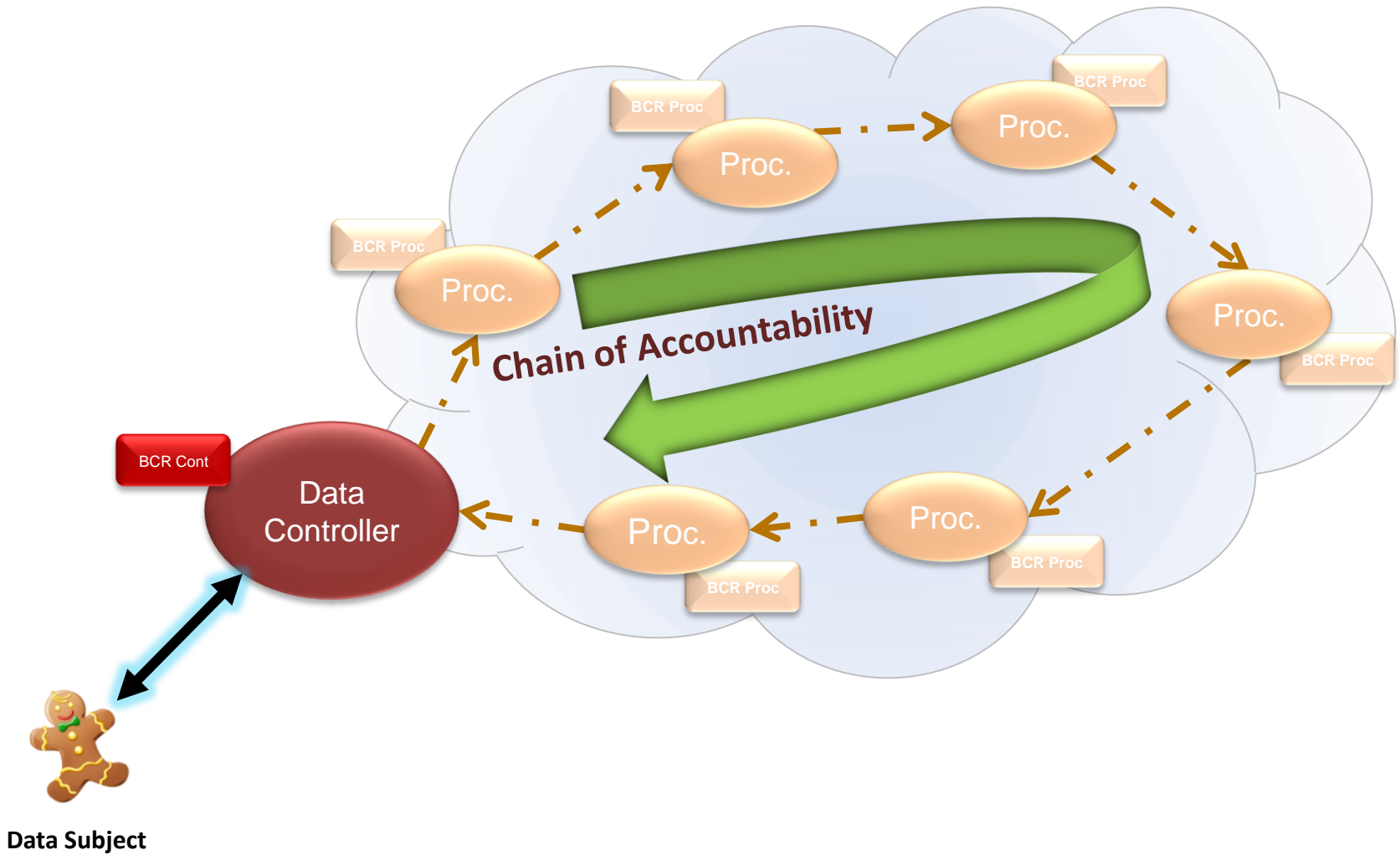
Regulators/auditors:

assurance about compliance with policies and regulations

Solutions: Achieving Organisational Accountability

- Organisational accountability comprises:
 - A company-wide commitment to **conformance with external standards** of responsibility and data stewardship
 - Use of **mechanisms to put privacy policies in effect**
 - Having systems in place for **internal and external oversight**
 - Allowing for **transparency** and individual participation
 - Having means of **remediation** and external enforcement

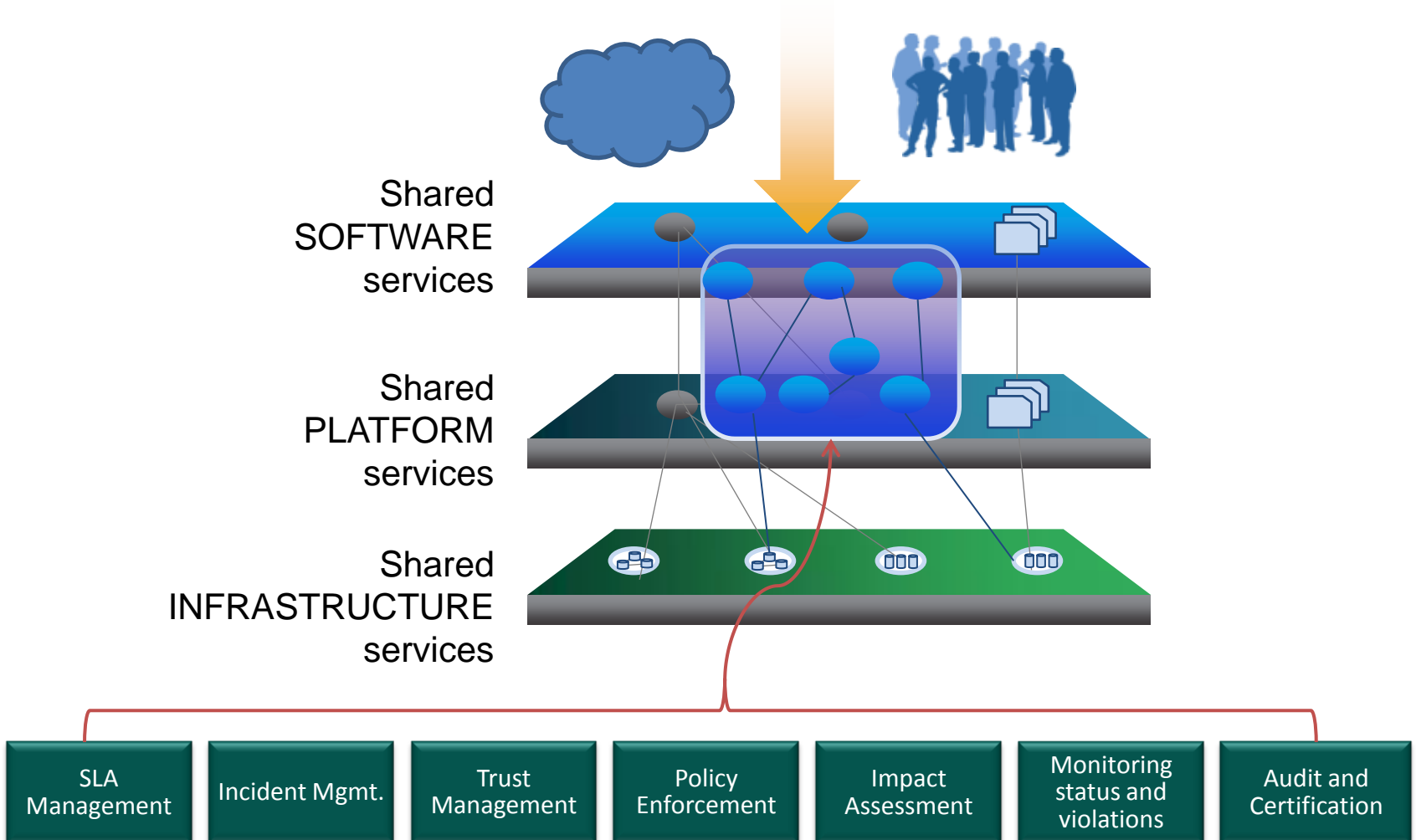
A Vision of Governance Continuity



Who are the Stakeholders?

- Technology-providers
 - Partners
 - Standards groups (CSA, ENISA,...)
- Infrastructure providers
 - Shared infrastructure CSP
- Service providers
 - SMEs: CSPs (data processor), primary service provider using CSPs (data controller)
 - Large companies: data processor, managed services
- Trusted third parties
 - TTP providing certification services
 - Insurance providers
- Service users
 - Auditor
- End users
 - Data subjects
 - Employees
- Regulators etc
 - DPAs
 - EU Commission
- Other intermediaries
 - Consumer groups
 - Brokers

Solutions: Mechanisms for Achieving Accountability in the Cloud



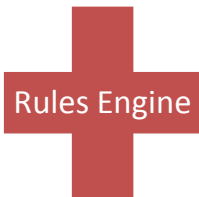
Classes of Technical Mechanisms for Accountability

- **Preventive controls**
 - Risk analysis and decision support tools
 - Policy enforcement mechanisms (access control, obligations, ...)
 - Data Obfuscation
 - Identity management
- **Detective controls**
 - Intrusion detection systems
 - Transaction logs
 - Language frameworks for expressing security properties
 - Verification tools
- **Corrective controls**
 - Incident management plans
 - Dispute resolution methods
 - Other forms or remediation

Related Work at HP Labs: HP Privacy Advisor

Questionnaire

- Project/activity profile
- Detailed compliance questions
- Transborder flows
- Indicators of potential harms



Knowledgebase

- Rules – HP Policies
- Rules – HP Privacy standards & Specifications
- Rules – Country requirements
- Rules – Guidance



Feedback

- Assessment against; HP Policies, Standards, Specifications, country requirements, etc.
- Checklists
- Means to seek help

Related Work at HP Labs

- EnCoRe project (<http://www.encore-project.info>)
 - Focused on policy enforcement for privacy and consent
- Cloud Stewardship Economics Project (<https://www.instisp.org/sslpage.aspx?pid=463>)
- TrustDomains Project (<http://www.cs.ox.ac.uk/projects/TDoms/>)
- Other Projects

Papers on Accountability in the Cloud

- Siani Pearson, “**Toward Accountability in the Cloud**”, View from the Cloud, IEEE Internet Computing, IEEE Computer Society, July/August issue, vol. 15, no. 4, pp. 64-69, 2011.
- Siani Pearson and Nick Wainwright, “**Towards Achieving Accountability in Future Internet Service Provision**”, to appear.
- For more information please email us at
 - siani.pearson@hp.com
 - nick.wainwright@hp.com
 - nick.papanikolaou@hp.com

Opportunities for Collaboration

- Achieving accountability involves stakeholders at many different levels
- International cooperation is essential in order to remove barriers to cloud adoption
- We are interested in collaborations, case studies, further analysis of the issues