Trustworthy Accounting of Resource Consumption (Some Ideas)

Santosh Shrivastava
School of Computing Science
Newcastle University, UK

(Joint work with Carlos Molina-Jimenez and Nick Cook)

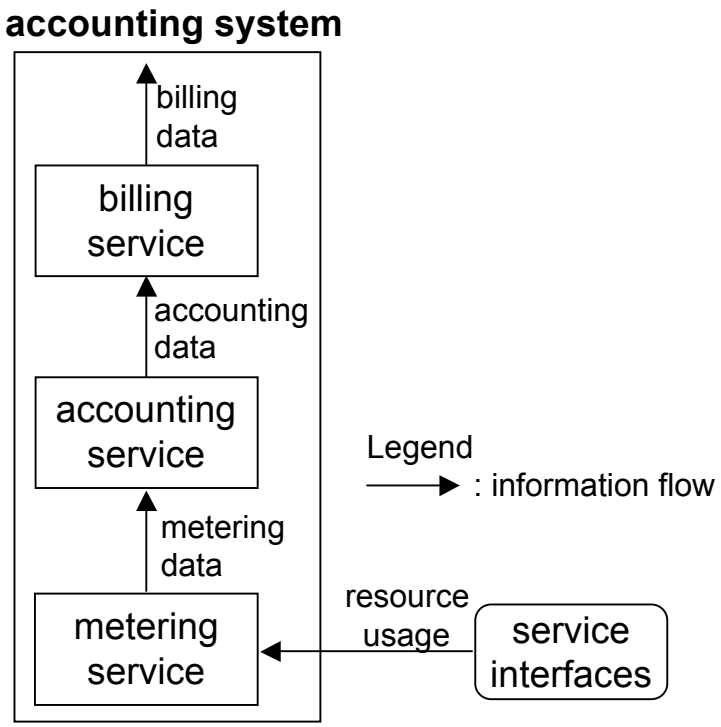
- **Increasing trend towards utility provision of computation, bandwidth, storage**
  - **Service provider handles problems of scale, availability etc.**
  - **Resources consumed on ‘pay-as-you-go’ basis**
- **Security work in this area tends to concentrate on protection**
  - **Access control, confidentiality, integrity etc.**
- **Also need confidence in the accounting process**
  - **Equitable accounting for consumption of pay-per-use resources**

- **Current practice for utility services is *unilateral accounting* based on provider-side metering of resource usage**
  - **Traditional utility services (e.g., gas) often rely on trusted (tamper-resistant) metering**

- **We consider here the feasibility of *bilateral accounting***
  - **Independent metering of usage by consumer and provider**
  - **Minimally do independent consistency check**
  - **Ideally reach binding agreement to outcomes**

Components of resource accounting

- **Resource accounting services**
  - **Metering service collects data on resource usage**
  - **Accounting service uses metering data to compute resource consumption to produce accounting data needed by the billing service**

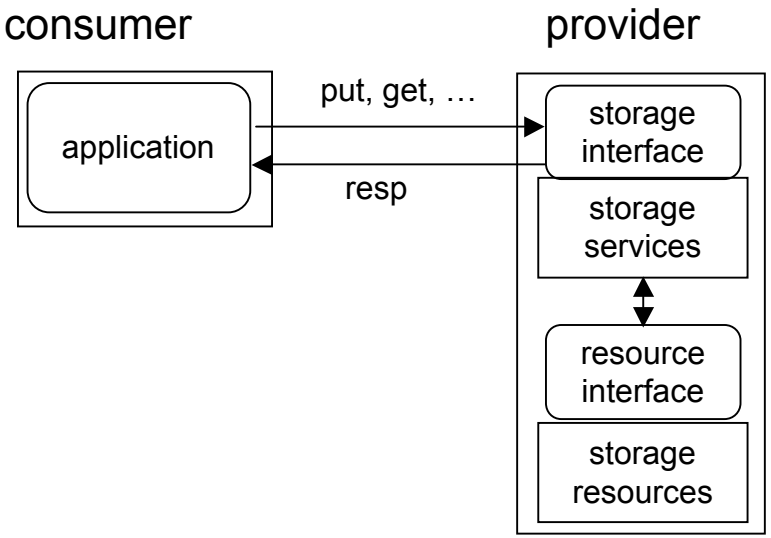


Bilateral Resource Accounting

- **Consumer and provider run their own independent but functionally equivalent component services**
- **Perform bilateral agreement between a pair of component services to produce *trusted outcome***
- **Example:**
  - **perform agreement on independently produced metering data to produce *mutually trusted metering data***
    - » **accounting and billing services can be provided by any of the parties in any combination**
  - **Alternatively,**
  - **perform agreement on independently produced accounting data to produce *mutually trusted accounting data***
    - » **billing service can be provided by any of the parties**

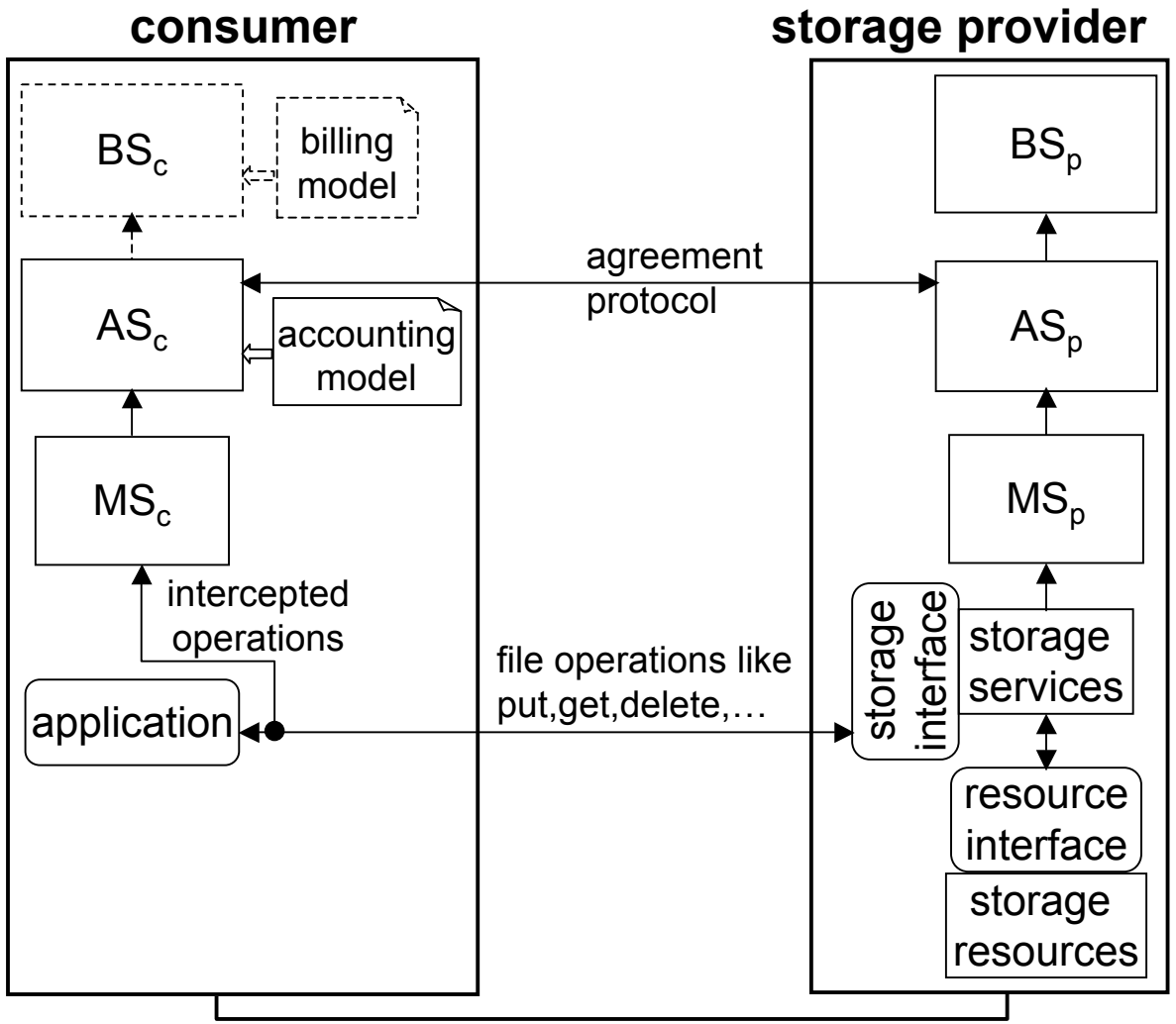
Storage Accounting example

- **Single consumer**
- **Provider charges by:**
  - **storage type, size and number of requests in a time period**
  - **storage used over time**



a) Access from single application.

- **Producing mutually trusted accounting data appears feasible**

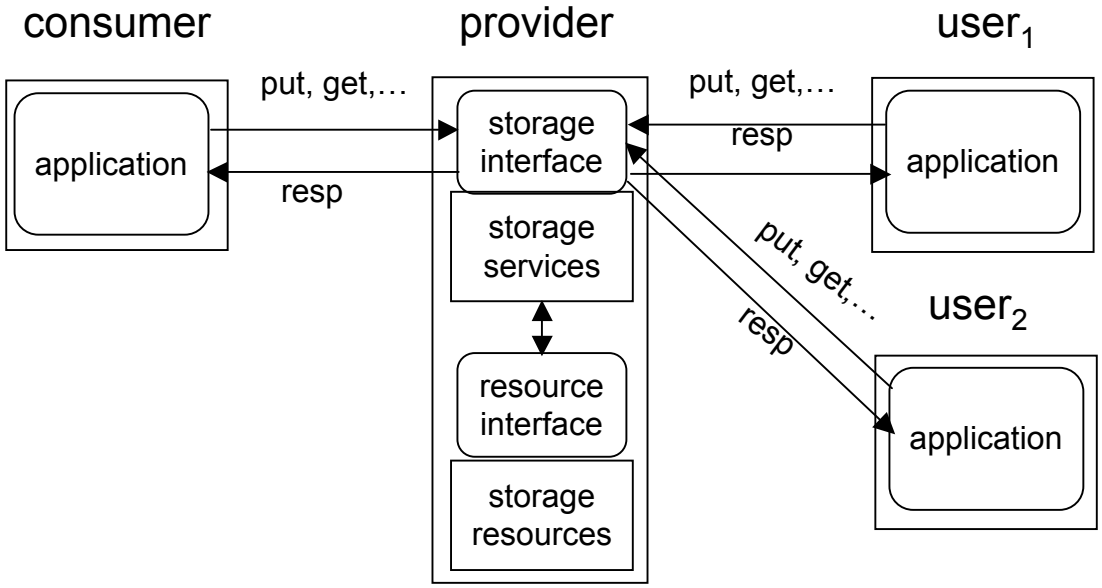


C: consumer

P: provider

BS, AS, MS: billing, accounting, metering service

- **Complications arise in multi-user, multi-application cases**
- **$user_1$, $user_2$,.. access storage service at the consumer's expense**
  - **in general, need facilities for the consumer (provider) to collect metering data directly at provider's (consumer's) site**



b) Access from several applications.

Concluding Remarks

- **Bilateral accounting possible if providers make available**
  - **suitable service interfaces to enable consumer side metering**
  - **reference model (e.g., an accounting model) to enable consumers to estimate resource consumption and charges**
- **Also, need simple procedures for agreement and conflict resolution**
- **And, ability to collect metering data directly at consumer's (provider's) site**

- **For more details, see:**
  - Carlos Molina-Jimenez, Nick Cook and Santosh Shrivastava, "On the Feasibility of Bilaterally Agreed Accounting of Resource Consumption", Springer, LNCS 5472, pp. 270–283, 2009.