Facilitating Communal Data Sharing in Public Clouds

Roxana Geambasu
Steve Gribble
Hank Levy

University of Washington

Outline

- Vision: cloud as a platform for sharing code and data
- Why now: favorable cloud technology trends
- CloudViews: convenient, scalable, and efficient data sharing in public clouds

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The Web's Move to Public Clouds

Private datacenters

Web service

Web service

Web service

Web service

Public clouds

(AWS, AppEngine, Azure)

Web service

Web service

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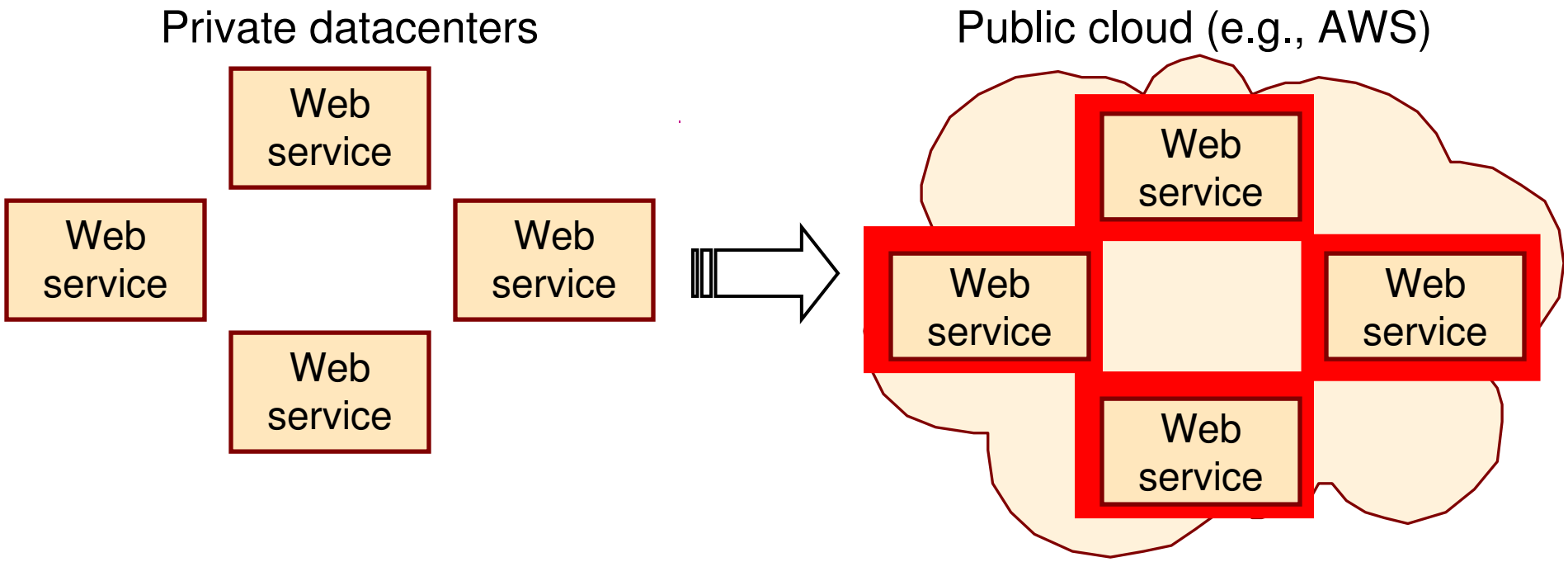
Web service

E.g.: SmugMug, Xignite, Techout, JungleDisk

The Current Perspective

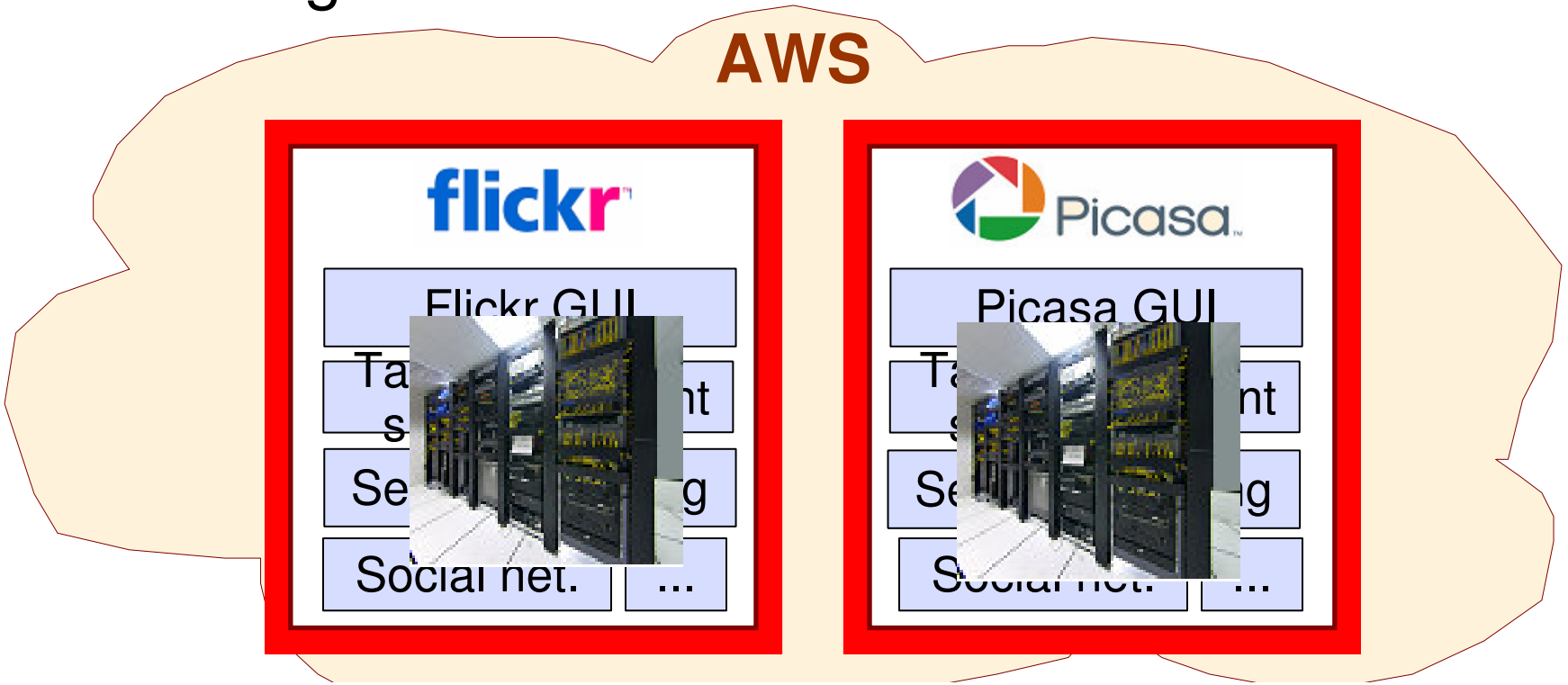
Top concerns have been to:

- Facilitate transition of individual Web services
- Isolate the Web services?



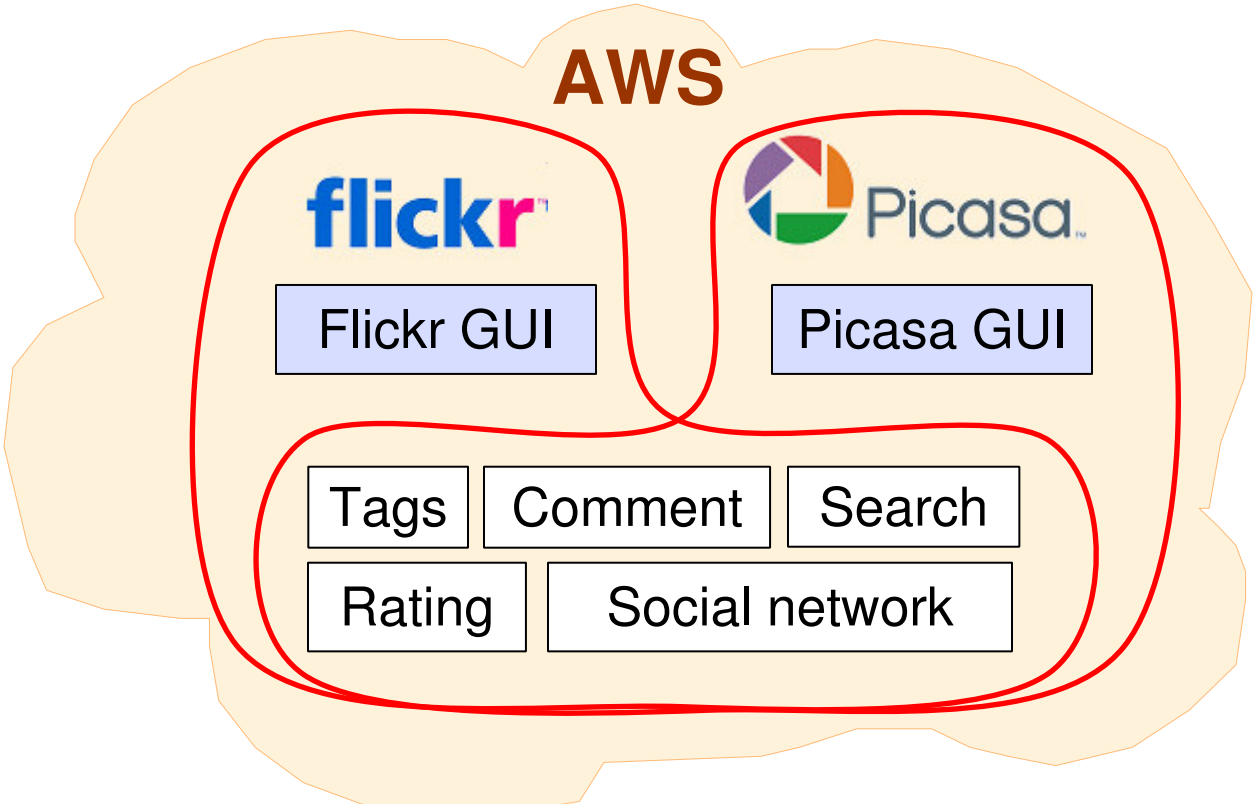
Isolation Leads To Stovepiping

- Web services are siloed
  - Each service implements the entire software stack
  - Many functions are common
- Building scalable services is hard even in the cloud



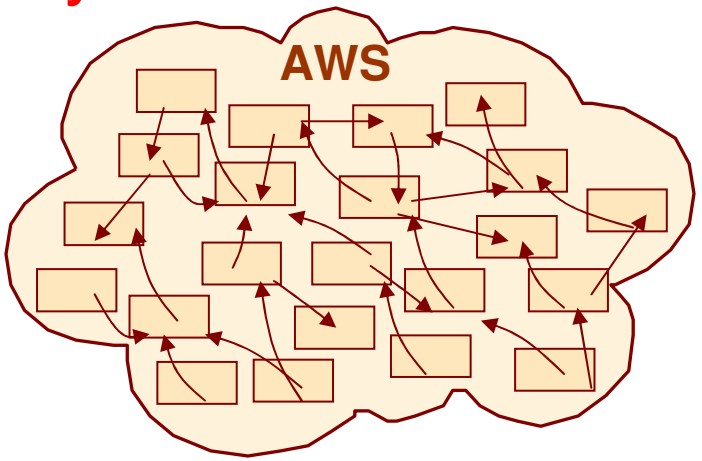
Our Perspective: Cloud as Sharing Platform

- Tens of thousands of co-located Web services
  - Most of the Web might be served from a few clouds
- What if some services rented themselves to others?



Our Vision

- Efficient, scalable service composition should be a primary function in public clouds
- Foresee a rich ecosystem of "utility services"
  - Examples from today: S3, SQS, Map/Reduce; RightScale



- Creating a large-scale service will be as easy as:
  - pick utility services;
  - write scripts to combine them; and
  - add service-specific logic (e.g., GUI).

Supporting Composition in Public Clouds

- Lots of challenges:
  - Programming model
  - Efficient and scalable inter-service communication
  - Auditing computation (e.g., for billing)
  - Diagnosing problems in service chains
  - Service-level agreements
  - ...
- This talk addresses one vital type of composition: data-driven composition

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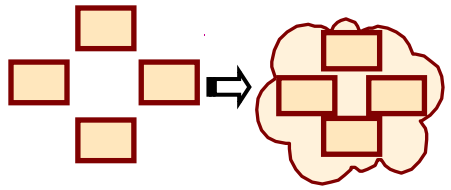
Favorable Cloud Tech. Trends

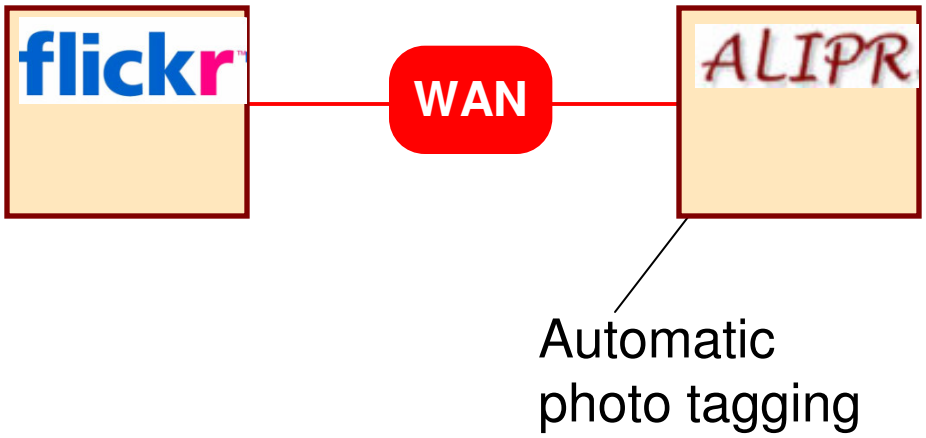


- Sharing was argued for in private-datacenter Web
  - E.g., Web 2.0 mashups, service-oriented architecture

- Two technology features make public clouds ideal for data sharing:
  1. A cheap, high-performance network
  2. A common database

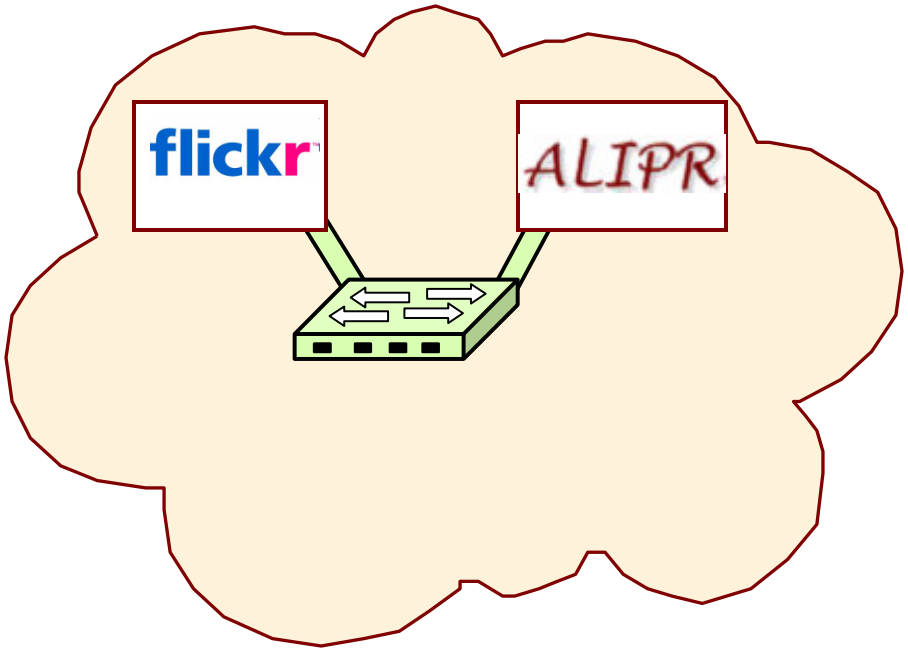
1. The Free and Fast Network

Private datacenters



Expensive, slow
inter-service network

Public cloud (e.g., AWS)

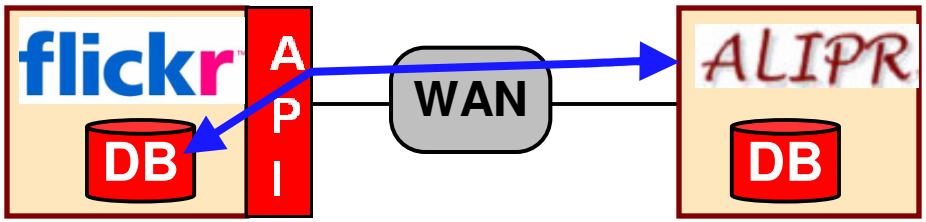


Free, high-speed
parallel network

Opportunity: large-scale, low-delay data sharing for free

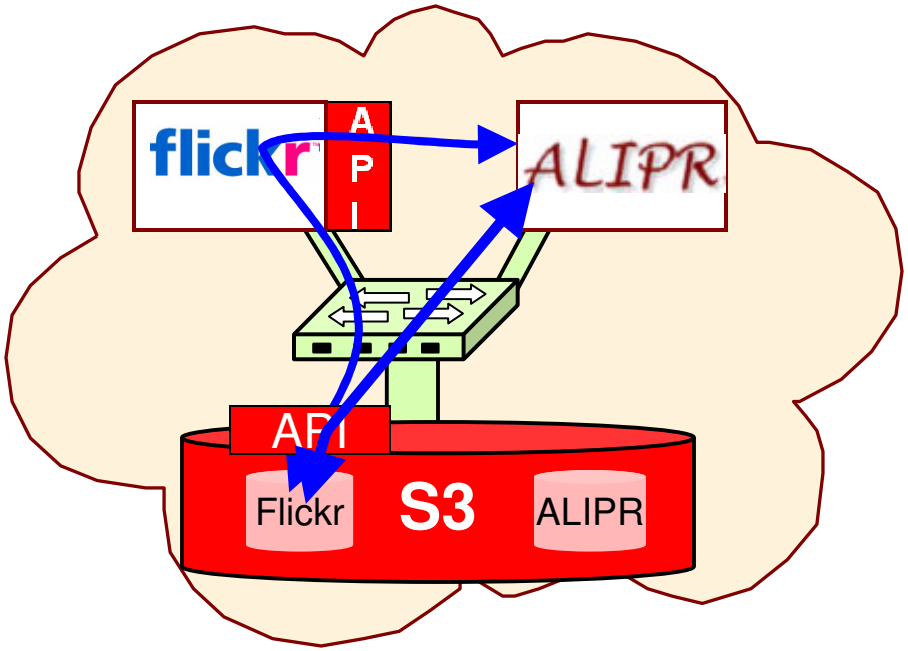
2. The Common Database

Private datacenters



Each service must provide & manage APIs

Public cloud (e.g., AWS)



Common DB can handle data sharing

Opportunity: convenient, effortless data sharing

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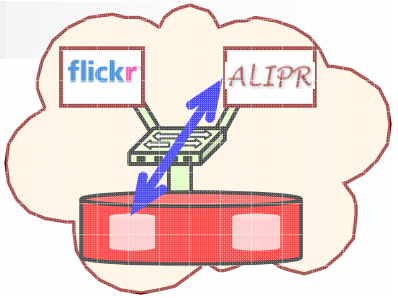
Motivation

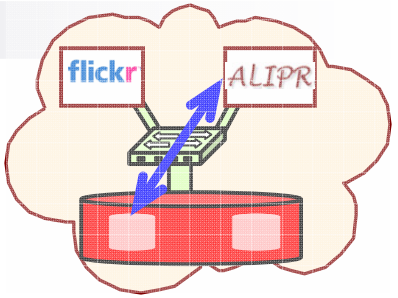


Today's clouds not designed for this type of sharing

- Inappropriate data sharing abstractions
  - E.g., buckets in S3, column families in Bigtable
- Limiting protection mechanisms
  - E.g., ACL sizes in S3 are limited to 100
- Resource allocation when sharing is involved
  - Rely on data partitioning for performance isolation

- What would the DB look like if designed for sharing?

CloudViews



Goal:

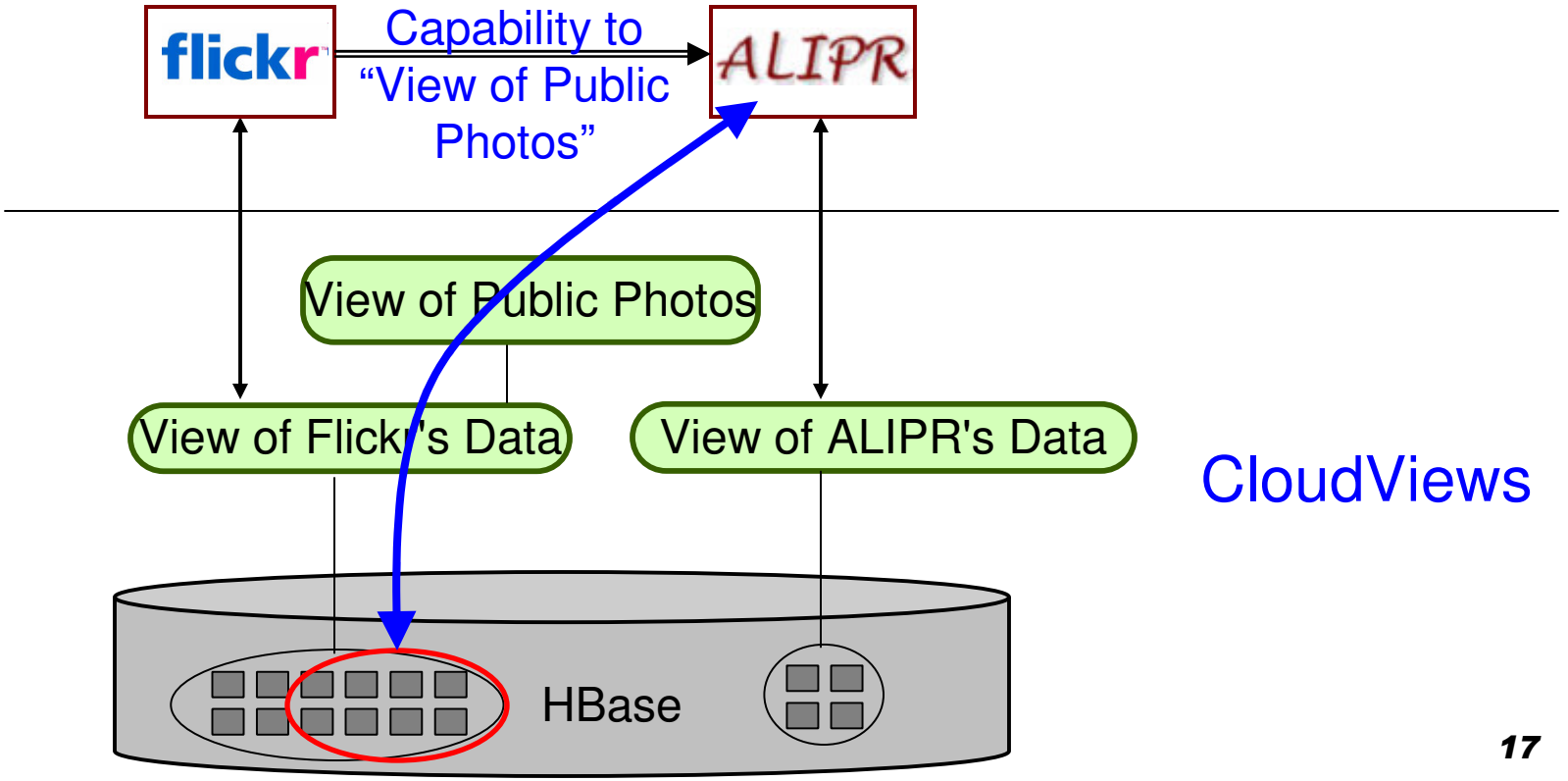
- Leverage cloud trends to facilitate scalable, efficient, protected data sharing

Requirements:

- Flexible and scalable sharing abstraction
  - Must allow expressing of service APIs
- Scalable protection mechanism
  - 10,000s services sharing data with each other
- Fair resource allocation for queries on shared data

CloudViews Overview

- Enhanced DB-style views for sharing
- Capabilities for protection
- Query admission control and QoS for resource allocation



Conclusions

- Today's clouds focus on single services and isolation
- Clouds should nurture large-scale data and code sharing
  - Opens great opportunities for simplifying service creation
  - Enables a rich ecosystem of "utility services" of the future
  - Supported by technology trends
- CloudViews: design cloud DB to take advantage of cloud technologies to support sharing
  - Supports convenient, large-scale, efficient data sharing