



The HybrEx Model for Confidentiality and Privacy in Cloud Computing

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The Main Question

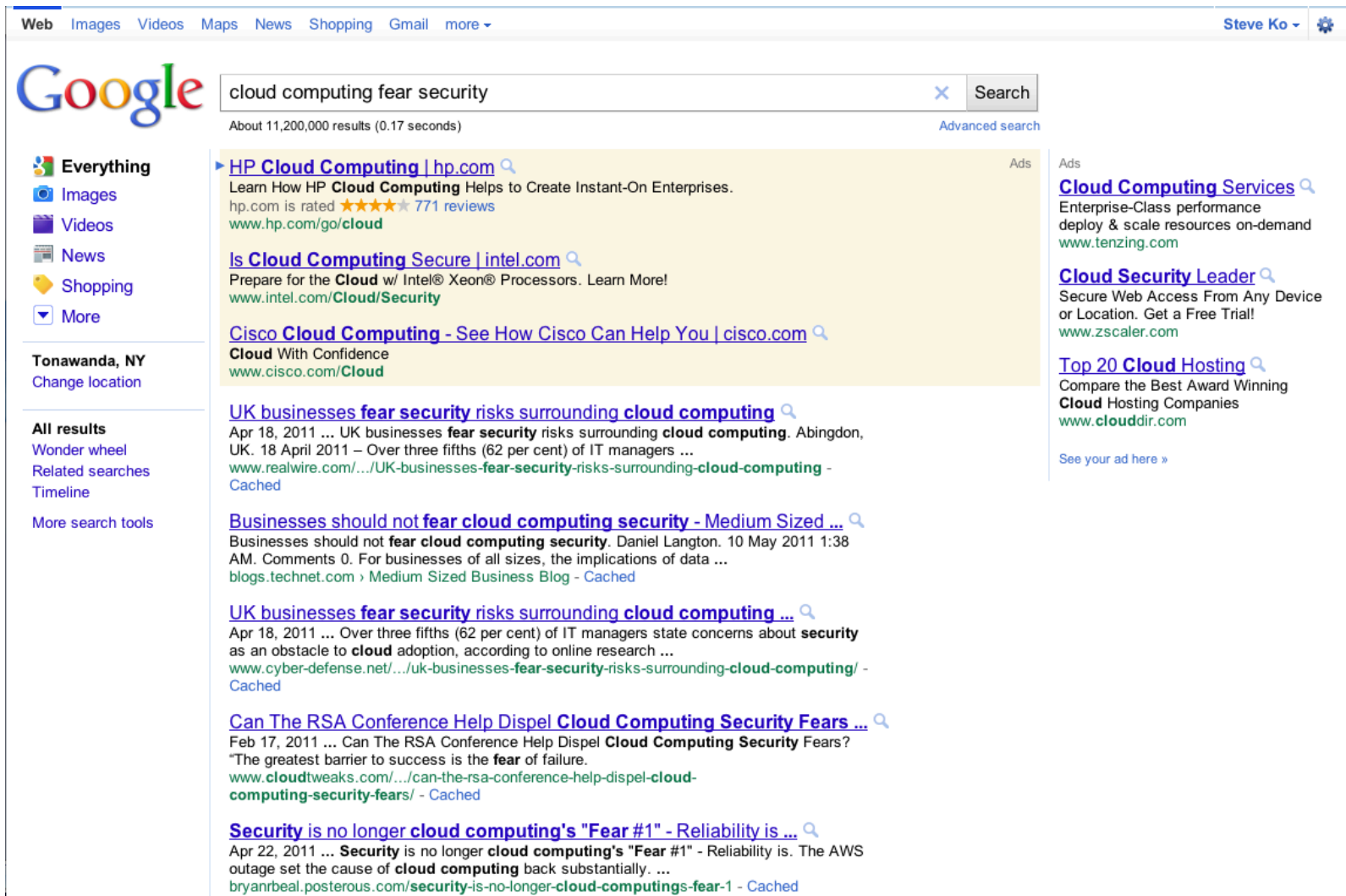
- What if we **don't trust** clouds?

Or more specifically,

- **To what extent** can we utilize clouds with **partial trust**?

Why Explore That Question - I

- Some people just don't trust.



The screenshot shows a Google search interface with the query "cloud computing fear security". The search results are displayed in a list format, with several entries highlighted in yellow. The left sidebar contains navigation options like "Everything", "Images", "Videos", "News", "Shopping", and "More". The right sidebar shows "Ads" for "Cloud Computing Services", "Cloud Security Leader", and "Top 20 Cloud Hosting".

Web Images Videos Maps News Shopping Gmail more ▾ Steve Ko ▾

Google cloud computing fear security Search

About 11,200,000 results (0.17 seconds) Advanced search

Everything
Images
Videos
News
Shopping
More

Tonawanda, NY
Change location

All results
Wonder wheel
Related searches
Timeline
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Ads

HP Cloud Computing | hp.com
Learn How HP Cloud Computing Helps to Create Instant-On Enterprises.
hp.com is rated ★★★★★ 771 reviews
www.hp.com/go/cloud

Is Cloud Computing Secure | intel.com
Prepare for the Cloud w/ Intel® Xeon® Processors. Learn More!
www.intel.com/Cloud/Security

Cisco Cloud Computing - See How Cisco Can Help You | cisco.com
Cloud With Confidence
www.cisco.com/Cloud

UK businesses fear security risks surrounding cloud computing
Apr 18, 2011 ... UK businesses fear security risks surrounding cloud computing. Abingdon, UK. 18 April 2011 – Over three fifths (62 per cent) of IT managers ...
www.realwire.com/.../UK-businesses-fear-security-risks-surrounding-cloud-computing - Cached

Businesses should not fear cloud computing security - Medium Sized ...
Businesses should not fear cloud computing security. Daniel Langton. 10 May 2011 1:38 AM. Comments 0. For businesses of all sizes, the implications of data ...
blogs.technet.com/.../Medium-Sized-Business-Blog - Cached

UK businesses fear security risks surrounding cloud computing ...
Apr 18, 2011 ... Over three fifths (62 per cent) of IT managers state concerns about security as an obstacle to cloud adoption, according to online research ...
www.cyber-defense.net/.../uk-businesses-fear-security-risks-surrounding-cloud-computing/ - Cached

Can The RSA Conference Help Dispel Cloud Computing Security Fears ...
Feb 17, 2011 ... Can The RSA Conference Help Dispel Cloud Computing Security Fears? "The greatest barrier to success is the fear of failure."
www.cloudtweaks.com/.../can-the-rsa-conference-help-dispel-cloud-computing-security-fears/ - Cached

Security is no longer cloud computing's "Fear #1" - Reliability is ...
Apr 22, 2011 ... Security is no longer cloud computing's "Fear #1" - Reliability is. The AWS outage set the cause of cloud computing back substantially. ...
bryanrbeal.posterous.com/security-is-no-longer-cloud-computings-fear-1 - Cached

Ads

Cloud Computing Services
Enterprise-Class performance
deploy & scale resources on-demand
www.tenzing.com

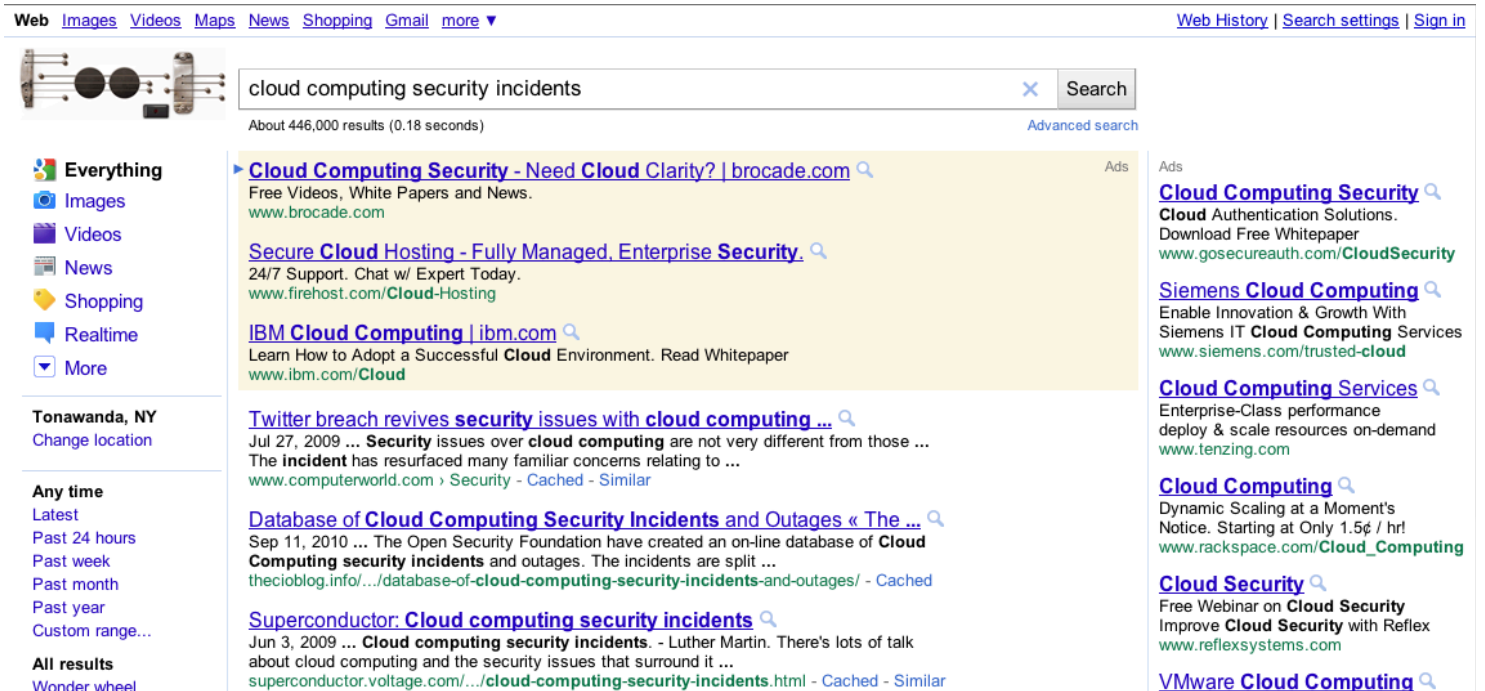
Cloud Security Leader
Secure Web Access From Any Device
or Location. Get a Free Trial!
www.zscaler.com

Top 20 Cloud Hosting
Compare the Best Award Winning
Cloud Hosting Companies
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Why Explore That Question - II

- Threats do exist.
 - Research: A. Armando et al. (ACM FMSE, 2008), T. Ristenpart et al. (ACM CCS, 2009), etc.
 - Media



The screenshot shows a Google search interface with the query "cloud computing security incidents". The search results are displayed in a list format, including several advertisements and organic search results. The left sidebar contains navigation options like "Everything", "Images", "Videos", "News", "Shopping", "Realtime", and "More". The top navigation bar includes links for "Web", "Images", "Videos", "Maps", "News", "Shopping", "Gmail", and "more".

Web Images Videos Maps News Shopping Gmail more ▾ Web History | Search settings | Sign in

cloud computing security incidents

About 446,000 results (0.18 seconds) Advanced search

Everything
Images
Videos
News
Shopping
Realtime
More

Tonawanda, NY
Change location

Any time
Latest
Past 24 hours
Past week
Past month
Past year
Custom range...

All results
Wonder wheel

Cloud Computing Security - Need Cloud Clarity? | brocade.com Ads
Free Videos, White Papers and News.
www.brocade.com

Secure Cloud Hosting - Fully Managed, Enterprise Security.
24/7 Support. Chat w/ Expert Today.
www.firehost.com/Cloud-Hosting

IBM Cloud Computing | ibm.com
Learn How to Adopt a Successful **Cloud** Environment. Read Whitepaper
www.ibm.com/Cloud

Twitter breach revives security issues with cloud computing ...
Jul 27, 2009 ... **Security** issues over **cloud computing** are not very different from those ...
The **incident** has resurfaced many familiar concerns relating to ...
www.computerworld.com > Security - Cached - Similar

Database of Cloud Computing Security Incidents and Outages « The ...
Sep 11, 2010 ... The Open Security Foundation have created an on-line database of **Cloud Computing security incidents** and outages. The incidents are split ...
thecioblog.info/.../database-of-cloud-computing-security-incidents-and-outages/ - Cached

Superconductor: Cloud computing security incidents
Jun 3, 2009 ... **Cloud computing security incidents**. - Luther Martin. There's lots of talk about cloud computing and the security issues that surround it ...
superconductor.voltage.com/.../cloud-computing-security-incidents.html - Cached - Similar

Cloud Computing Security
Cloud Authentication Solutions.
Download Free Whitepaper
www.gosecureauth.com/CloudSecurity

Siemens Cloud Computing
Enable Innovation & Growth With Siemens IT **Cloud Computing** Services
www.siemens.com/trusted-cloud

Cloud Computing Services
Enterprise-Class performance
deploy & scale resources on-demand
www.tenzing.com

Cloud Computing
Dynamic Scaling at a Moment's Notice. Starting at Only 1.5¢ / hr!
www.rackspace.com/Cloud_Computing

Cloud Security
Free Webinar on **Cloud Security**
Improve **Cloud Security** with Reflex
www.reflexsystems.com

VMware Cloud Computing

Why Explore That Question - III

- However, **cloud computing offers benefits.**
- **Elasticity**: dynamic scale-up and down
- **Pay-as-you-go**: less (or no) up-front infra investment
- (Arguably) **better maintenance & availability**
- Etc.



Which Led Us to Wonder...

- Some people don't trust clouds, threats do exist, but there are benefits.
- Can we **still utilize** clouds **without full trust**? If so, **to what extent**?

Clients' Dilemma

- (Typically) forced to choose between extremes



No Trust
No Utilization



Full Trust
Full Utilization

What's in the middle???

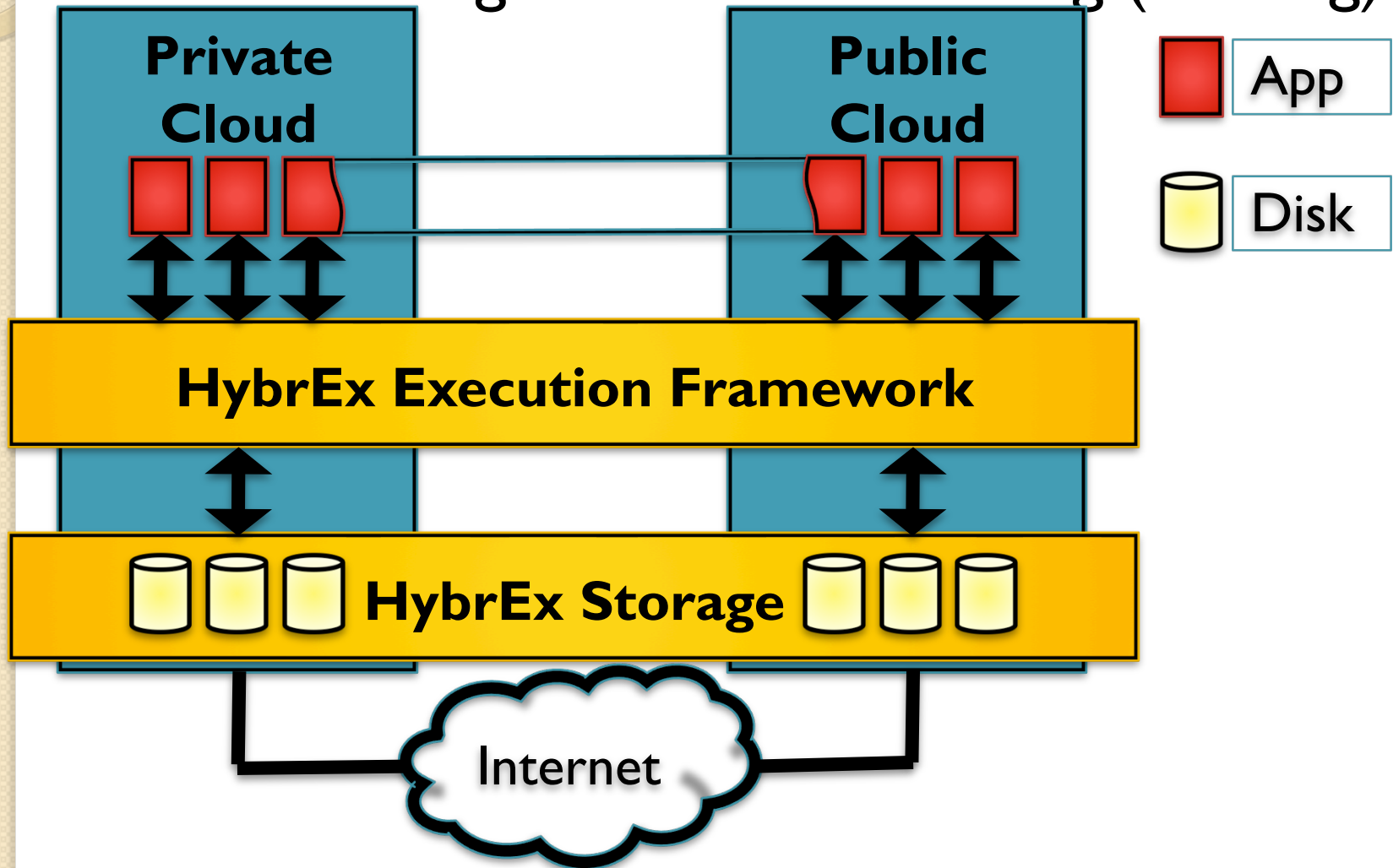


Exploring the Middle

- HybrEx is one (or our very first) attempt.
 - Question: what if the **only concern** is confidential or private **data leakage**? How much can we **still utilize** clouds?

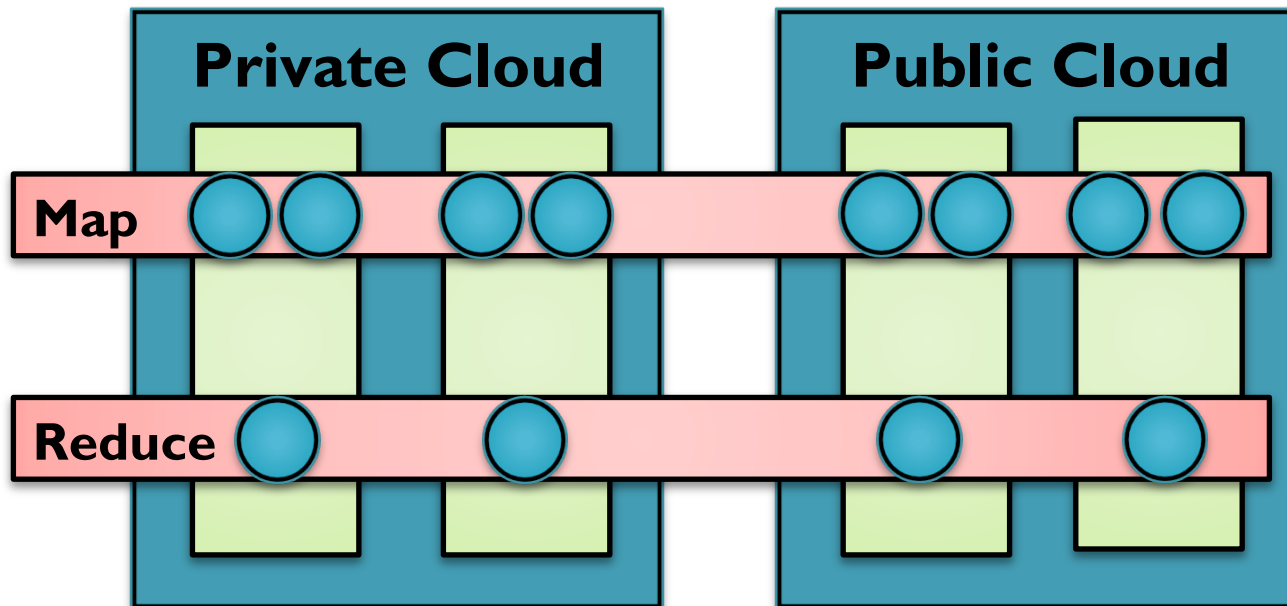
HybrEx Main Idea

- Partitioning & info. flow tracking (tainting)



HybrEx Applied to Bigtable & MapReduce

- Why?
 - **A good start:** popular, relatively easy to partition (massively-parallel)



Challenges (and Solution Ideas)

- Applications
 - Opportunities do exist (e.g., PigLatin & Hive)
- Declassification – how to enable private to public shuffle?
 - New sanitize phase
- Performance – “wide-area MapReduce”
 - Catch: we’re adding resources
 - Localize communication whenever possible
- Integrity checking – how to verify computation correctness
 - Random insertion of “inspection points”

Will Be Waiting for You at the Poster Session

- Please come find me for more details!



No Trust
No Utilization



Full Trust
Full Utilization

What's in the middle???