TRUST AND ON DEMAND
Enabling Privacy, Security, Transparency, and Accountability in Distributed Systems

MAGIC meeting
September 7, 2005

Outline

- **Where is technology taking us?**

- **What is e-Business on demand?**

- **What privacy issues does it pose?**

- **What technologies can help?**

The Information Explosion Continues…
(Actually, it's accelerating)

Technology Trends

COMPUTING:

- **Chips/$**   **10x in 5 years**
- **Computing power/$**   **10x in 4 years**

STORAGE:

- **Storage/$**   **10x in 6 years**

COMMUNICATIONS:

- **Backbone**   **100x in 5 years**
- **Local loop**   **100x in next 5 years**

Total Amount of Data Connected to The Internet

2001	1 petabyte	$(10^{15}$ bytes)
2006	1 exabyte	$(10^{18}$ bytes)
2010	1 zettabyte	$(10^{21}$ bytes)

The result of:

- **More people spending**

- **More time using**

- **More data-rich applications**

- **More replication and caching of data**

Much More to Come…

The Internet Revolution is <10% complete

- **Number of users**

- **Number of devices**

- **Speed/bandwidth**

- **Amount of content**

- **Number of applications**

Data, Data Everywhere…

- **Video surveillance**

- **E-commerce**

- **Location-dependent services**

- **Customized video on-demand**

- **Video-conferencing**

- **Networked devices**

- **Embedded sensors**

- **Data mining**

Sensors Will Predominate…

100 B

10 B

1 B

100 M

Sensors

Appliances

Computers

1990   2000   2010   2020
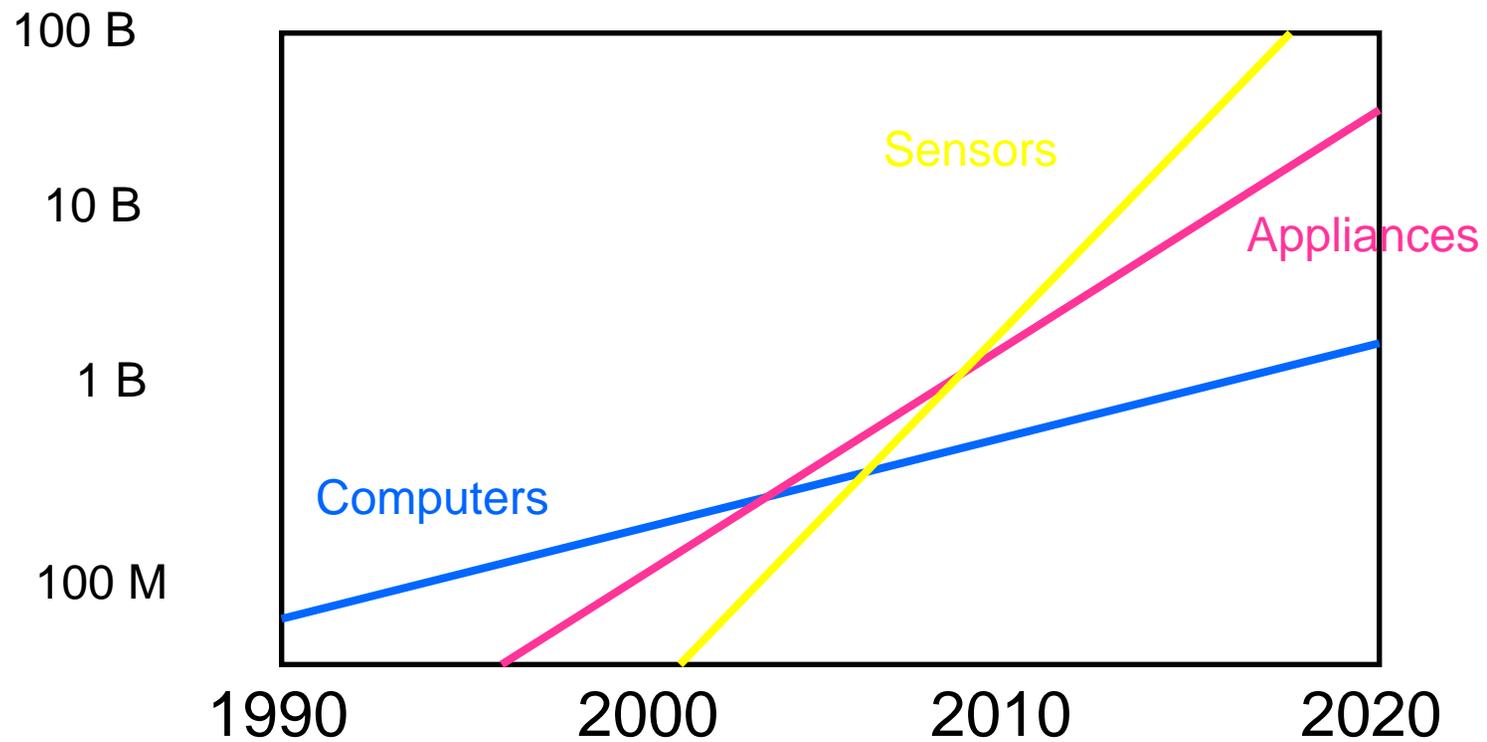
e-Business on Demand

A response to companies' need to:

- **Deal with data explosion**

- **Reduce costs**

- **Improve utilization of IT resources**

- **Improve reliability of systems**

- **Improve security**

What is e-Business on Demand?

Not just being on the Net but being a part of it -- so your company is able to respond with speed to any customer demand, market opportunity or competitive threat
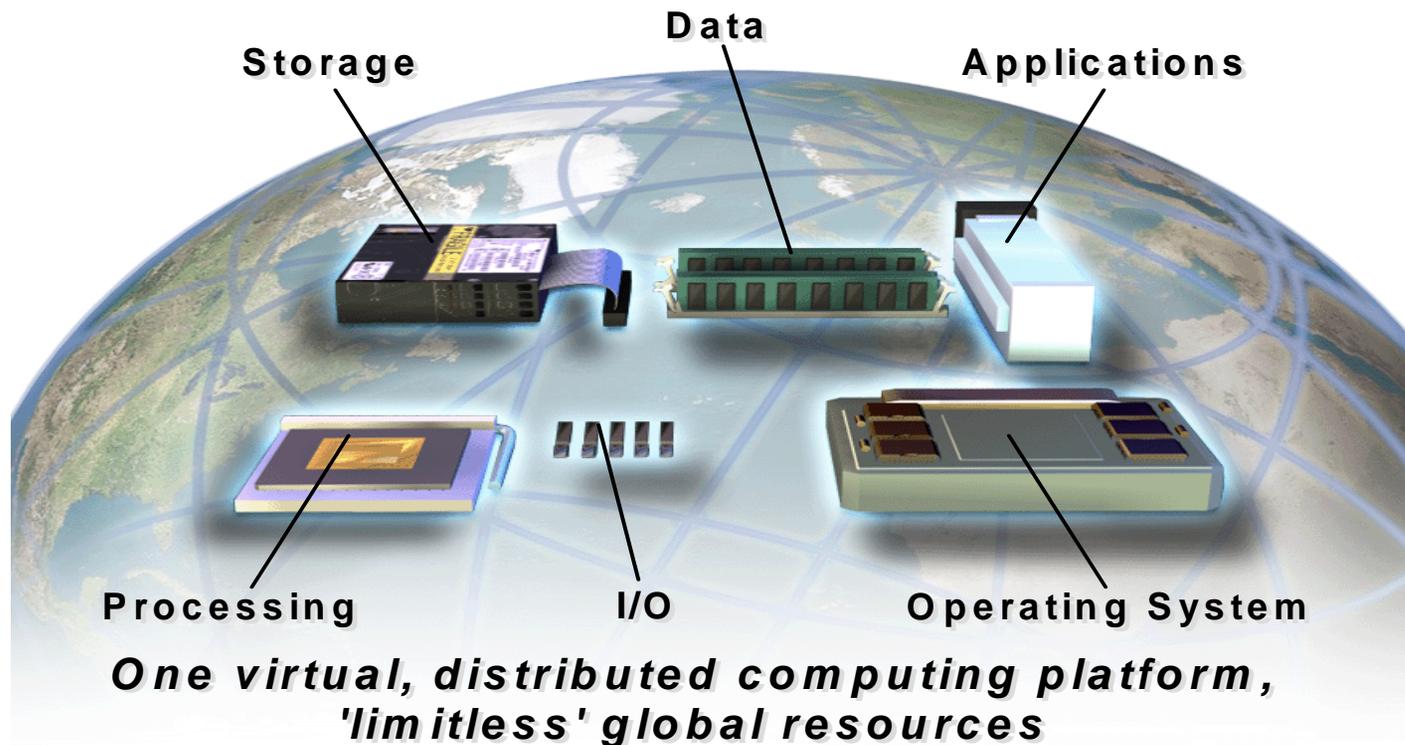
Computing As a Utility

Like electricity, computing cycles, data storage, applications software will be:

- **Provided when and where you need it**

- **Reliable and ubiquitous**

- **Provided on "pay for what you use" basis**

- **Delivered by a Grid of networked systems**

e-Business on Demand Depends On The Grid

Grid Computing

Storage

Data

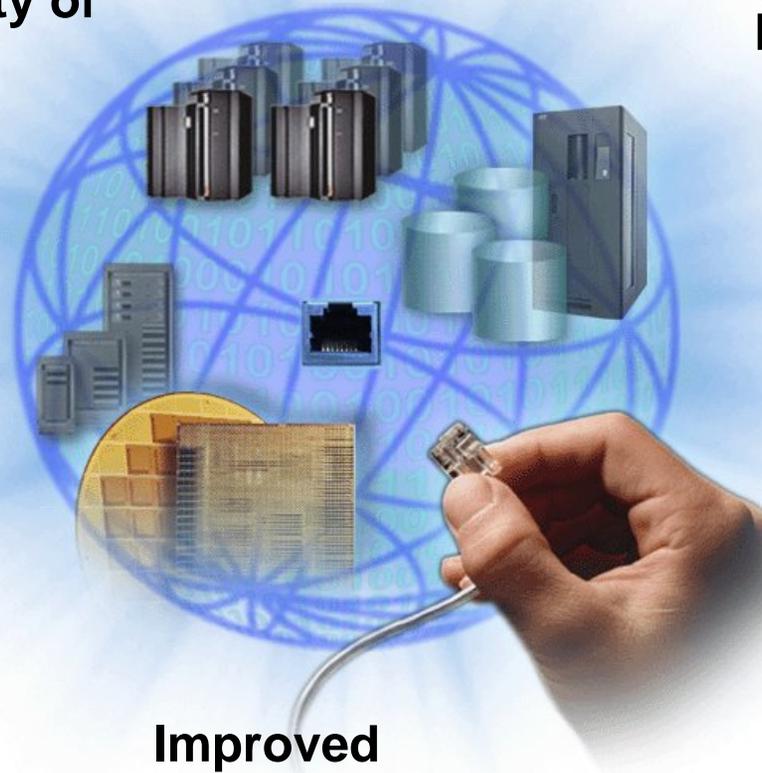Applications

Processing

I/O

Operating System

One virtual, distributed computing platform, 'limitless' global resources

Benefits of Grid Computing

Higher Quality of Service

Increased Efficiency

Increased Productivity

Reduced Complexity

Improved Resiliency

Storage

I/O

Operating System

Processing

Applications

Data

virtual services · virtual services · virtual se

Grid Computing

Distributed Computing Over a Network, Using Open Standards to Enable Heterogeneous Operations

Value Networks

Trust (vertical axis) / Collaboration (horizontal axis)

1 Isolated Operations

2 Select 'Trusted Partners'

3 Value Chain Visibility

4 Industry-Centric Value Web

5 Cross-Industry Value Coalition

Legend
- Core Business
- Subsidiary
- Customer
- Partner/Channel
- Supplier/Outsourcer

Privacy Study Team

Member Name	Role
Harriet Pearson	Receiving Executive
Ross Mauri	Receiving Executive
Matthias Schunter	Study Leader
Michael Nelson	Study Leader
Michael Waidner	Study Leader
Jane Johnson	Study Leader
Chris Bishop	Author
Jeff Jonas	Author
John Karat	Author
Terry Escamilla	Author
Ty Grandison	Author
Contributors	Steven Adler, Calvin Powers, Howard Young, Karen Anders, Dave Armstrong, Linda Betz, …

Findings

- There are serious and legitimate concerns about privacy and security in on demand environments. If these concerns are not addressed, development of on demand business will be delayed
- Specific privacy issues arise from virtualization, Grid computing, pervasive computing, data mining and knowledge discovery, and self-monitoring systems
- There are no "silver bullets." Instead, a number of different technologies and techniques are needed to address privacy concerns at all steps in the collection and use of personal or sensitive data
- Few customers buy privacy-only solutions. Privacy must be addressed as part of a comprehensive data management system built into on demand solutions
- To foster trust and alleviate privacy concerns, it helps to improve transparency of systems so customers can learn what data is collected, how it is used and protected, and who can access it.

1) Privacy Promise

2) Authentication

3) Authorization

4) Data collection

COLLECTION
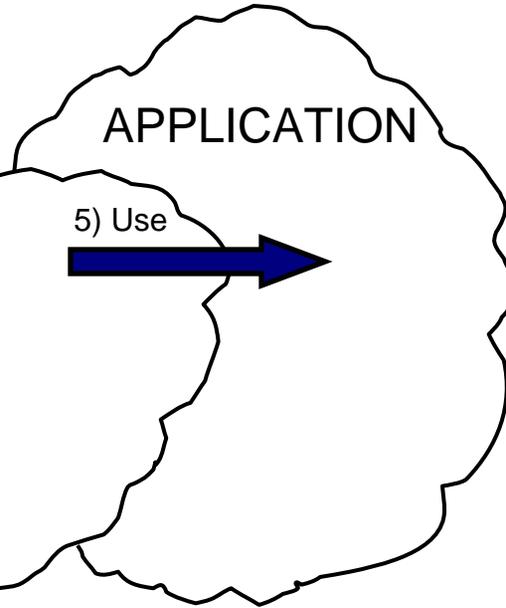
1) Privacy Promise
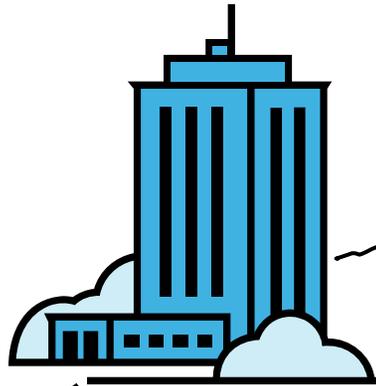
2) Authentication

3) Authorization

4) Data collection

5) Use

COLLECTION

APPLICATION
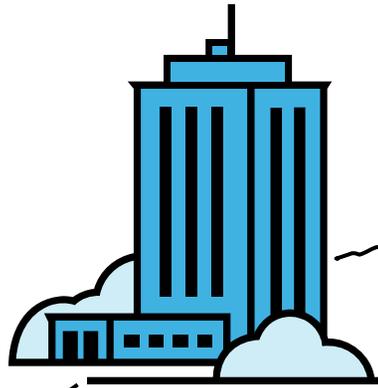
1) Privacy Promise

2) Authentication

3) Authorization

4) Data collection

COLLECTION

APPLICATION

5) Use

6) Store
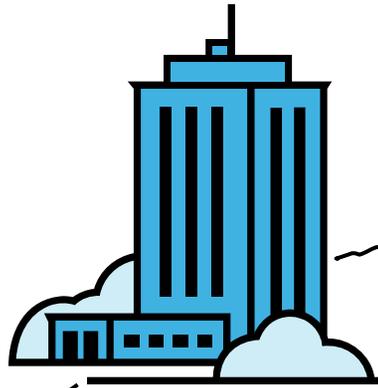Protect
Minimize

STORAGE

1) Privacy Promise

2) Authentication
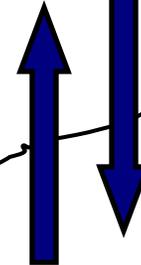
3) Authorization

4) Data collection

COLLECTION

APPLICATION

5) Use

7) Discovery

6) Store
Protect
Minimize
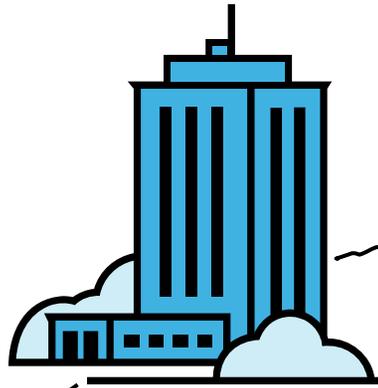
STORAGE

1) Privacy Promise

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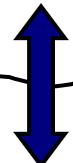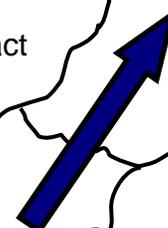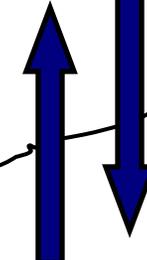
3) Authorization

4) Data collection

COLLECTION

APPLICATION

5) Use

7) Discovery

9) Disclose

8) Contract

6) Store
Protect
Minimize

PARTNER

8) Contract

STORAGE

9) Disclose

1) Privacy Promise

2) Authentication

3) Authorization

4) Data collection

COLLECTION

APPLICATION

5) Use

10) Track

7) Discovery

9) Disclose

8) Contract

6) Store
Protect
Minimize

PARTNER

8) Contract

STORAGE

9) Disclose

10) Track

10) Track

AUDIT

22
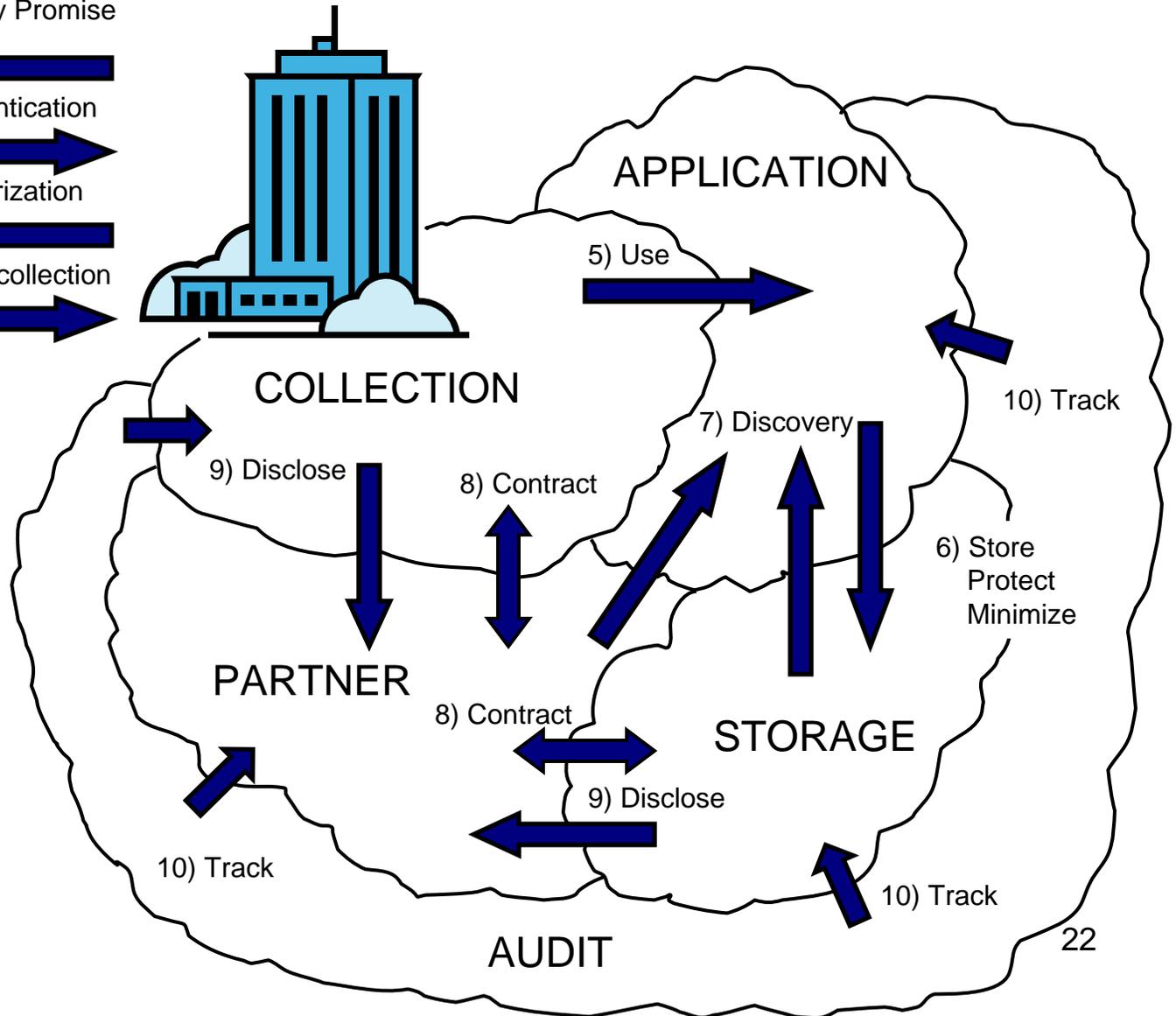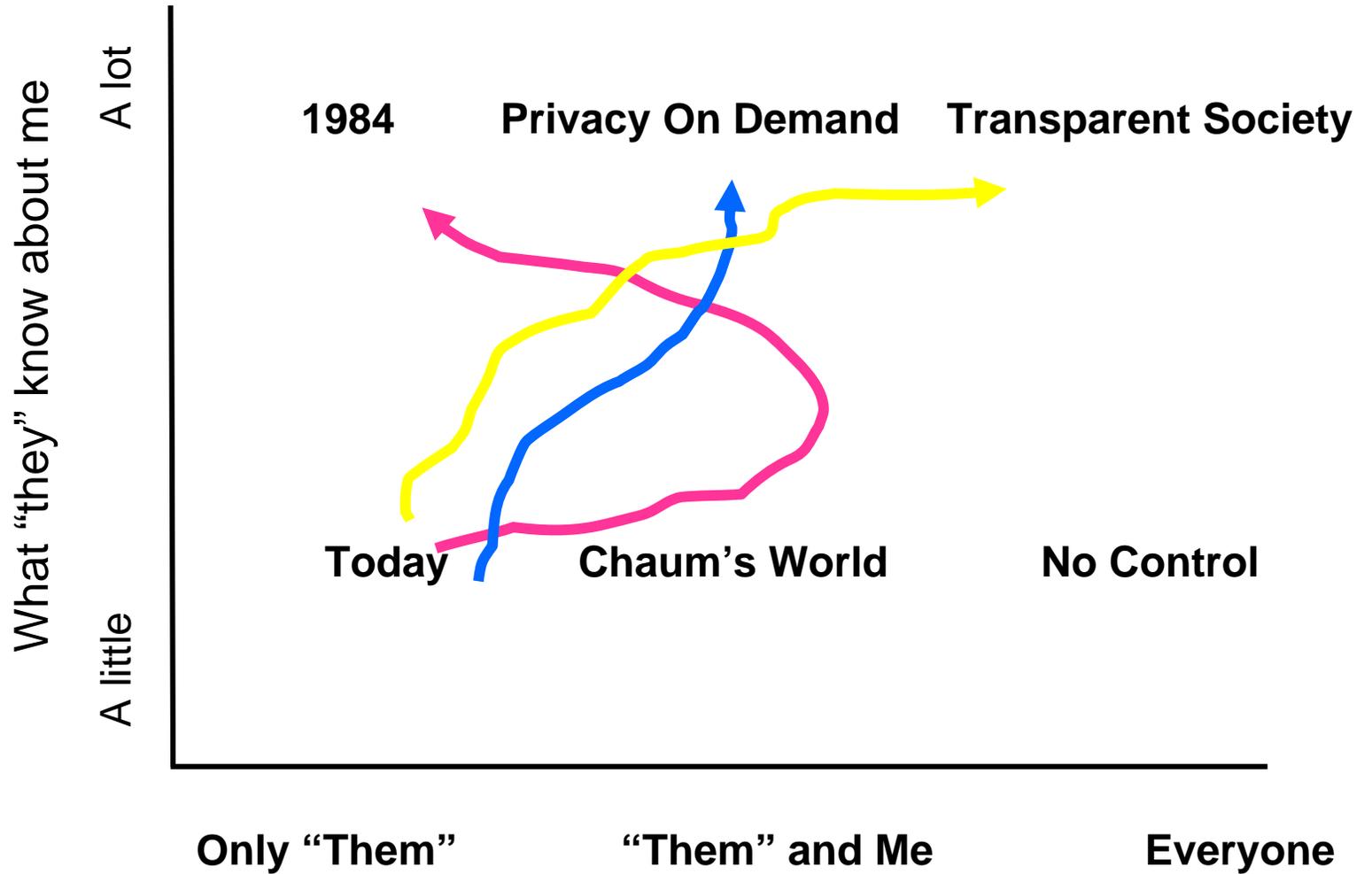
Technologies that can help

- Privacy-enhancing authentication and authorization
- Platform for Privacy Preference
- Direct Anonymous Attestation (from TCG)
- Data minimization
- End-to-end encryption
- Anonymous Resolution
- Privacy and data management metadata (e.g. WS-Policy)

Possible Futures

What "they" know about me

A lot

A little

1984   **Privacy On Demand**   **Transparent Society**

Today   **Chaum's World**   **No Control**

Only "Them"   **"Them" and Me**   **Everyone**

TRANSPARENCY -- Who knows what "they" know about me