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# **“Leap Frog” Technologies for Supply Chain and Information Management**

**Adam Cheyer**

**Program Director, AI Center  
SRI International**

**At the  
JAMPRO Supply Chain Management Symposium  
November 18, 2005**



## Bio – Adam Cheyer

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Adam Cheyer is currently a Program Director in SRI's Artificial Intelligence Center, where he serves as Chief Architect of the CALO/PAL project, an ambitious effort to create a next-generation personal cognitive assistant. Previously, Mr. Cheyer was VP of Engineering at Dejima, a provider of natural interaction technology for mobile applications, and before that, VP of Engineering at Verticalnet, an enterprise software provider. As Senior Scientist and Co-Director of the Computer Human Interaction Center (CHIC) at SRI International, Mr. Cheyer led a multidisciplinary team of researchers exploring web services, distributed knowledge, and pervasive computing.

<http://adam.cheyer.com>



# Agenda

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- Background Context
  - About SRI International
- Information Management Applications
  - Applications to Consumers, Executives, Enterprises, Countries
  - Supply & Value Chain Management
- Information Management Technologies
  - Emerging Trends
  - Coming Revolutions
    - Demonstrations
- Summary

# Who we are

*SRI is a world-leading independent R&D organization*



SRI Headquarters, Menlo Park,  
CA



Sarnoff Corporation, Princeton,  
NJ



SRI – State College, PA



SRI – Tokyo, Japan



SRI – Washington, D.C.

- Founded by Stanford University in 1946
  - A nonprofit corporation
  - Independent in 1970; changed name from Stanford Research Institute to SRI International in 1977
- Sarnoff Corporation acquired in 1987  
**(formerly RCA Laboratories)**
- Combined power of 2,000 staff members
  - More than 1000 with advanced degrees
  - More than 15 offices worldwide
- Consolidated annual revenues of \$300 million

# Our Charter

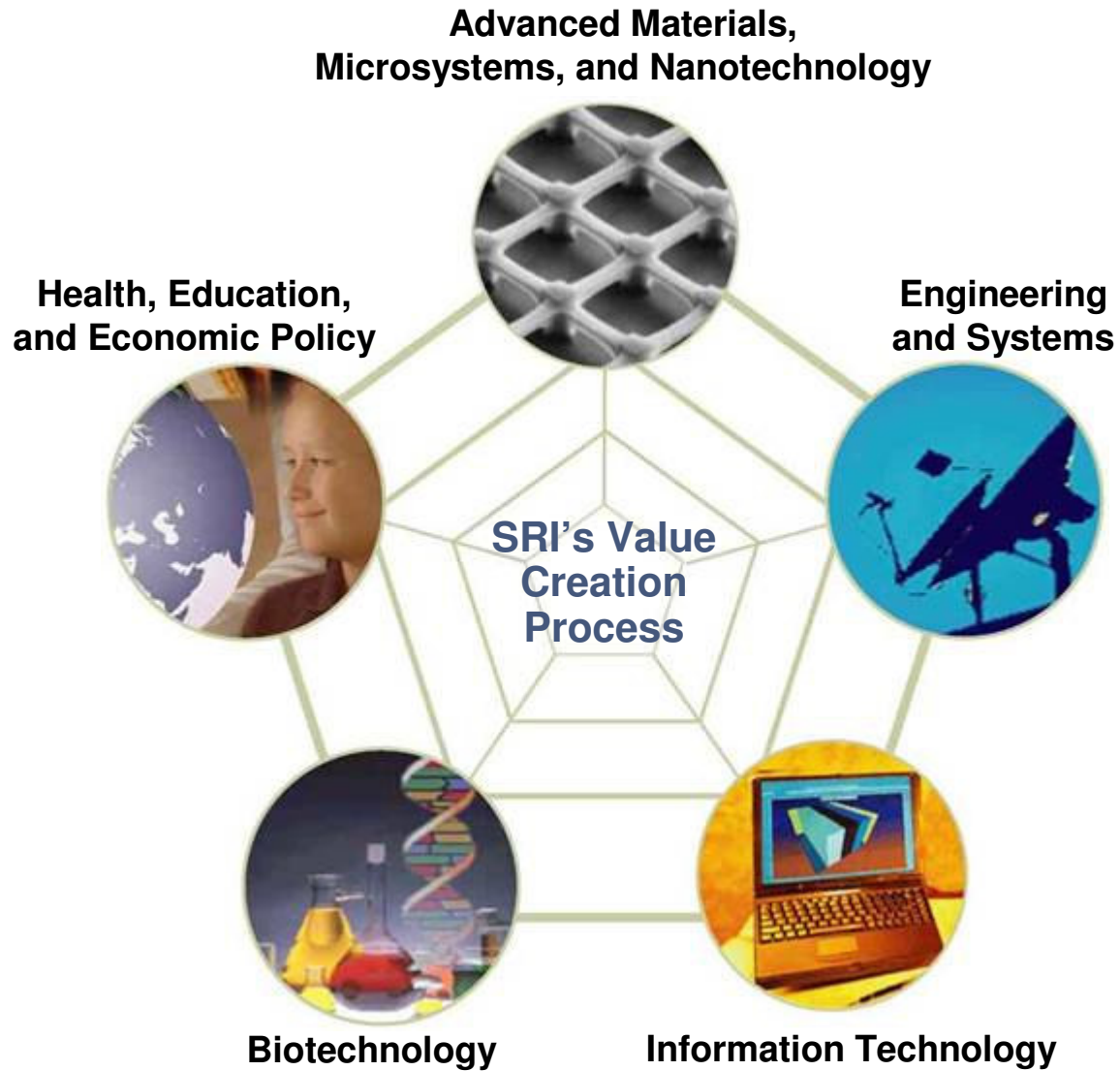
*“To promote and foster the application of science in the development of commerce, trade, and industry  
... the improvement of the general standard of living  
... and the peace and prosperity of mankind.”*

1946 Charter



# Our Technology Areas

*Multidisciplinary teams leverage SRI's core R&D*



# A Deep History of Success in Ventures and Licensing

*Growth opportunities that bring innovations to market*

## Publicly Traded



Surgical robotics



Speech recognition for customer service



Genetic profiling products

## Materials



Electroactive polymers



Ceramics for electronics



Next-generation fuel cells



Portable power systems



Optical network components



Anti-counterfeiting systems

## Information Technology



Digital TV equipment\*



Customer service tools\*



Video-on-demand services\*



Digital TV technologies



Wireless mesh networks



Video enhancement systems



Infrared camera sensors



LCD technology\*



Iris biometric identification\*



Panoramic image editing software\*



Secure content distribution

## Bio/Medical



Drug development



Drug dispensing system



Drug discovery



Medical systems



Disposable hearing aid

## Market Intelligence



Market research services

\*Acquired or merged

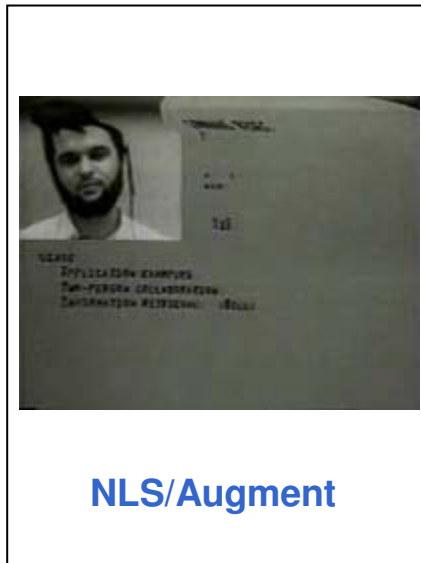
# SRI: Laying the foundation for collaboration, communication, and information management

## Mouse/GUI



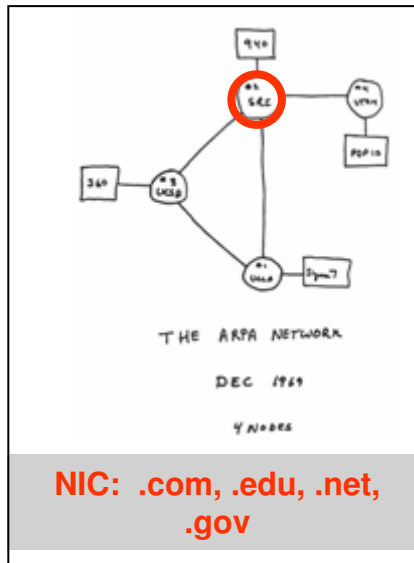
**1962:**  
The first computer mouse

## Collaborative Systems



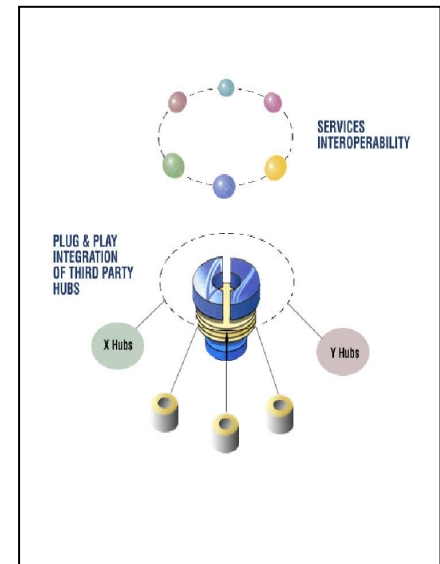
**NLS/Augment**  
**1968:** SRI demonstrated the first shared-screen hyperlinked, multimedia collaboration environment

## Internet



**1969:** Early ARPANET schematic showing SRI as one of the original four nodes

## Intelligent Information Management





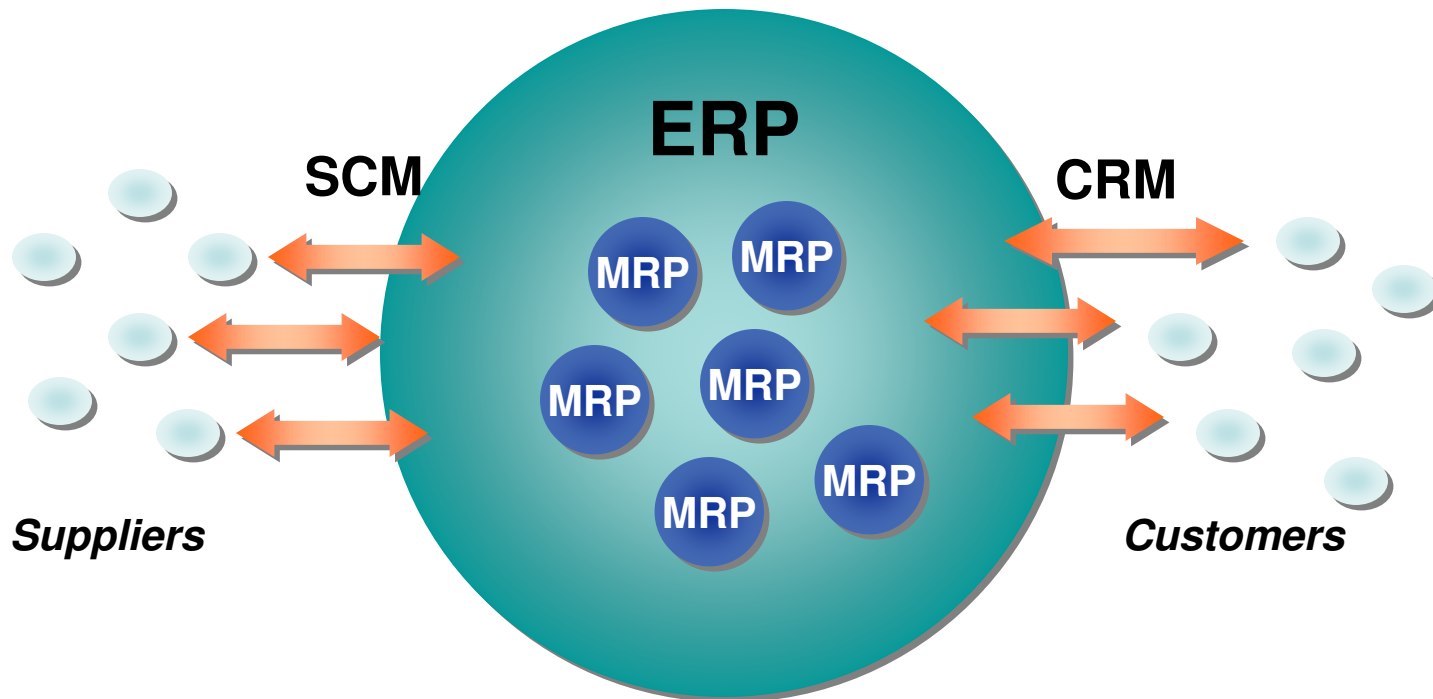
# The Information Era

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- We are entering a new era, based on intelligent, efficient information management
- Disruptive changes (and opportunities) for the ways we
  - Produce information
  - Find information
  - Interpret information
  - Combine information
  - Monitor information
- Who will this affect?
  - Consumers
    - Media, games, entertainment, news
  - Executives & Information Workers
    - Project & company management
  - Businesses
    - Value Chain Management
    - Logistics
  - Countries
- Claim: The entities who understand how information “wants to be” will succeed in the “Information Era”

# The Supply Chain Landscape

*There are two fundamental issues in supply chain. One is in relation to our customers, in terms of being responsive and efficient in that relationship and the other side of it is really optimizing all the costs and asset values that are embedded in the supply chain...*



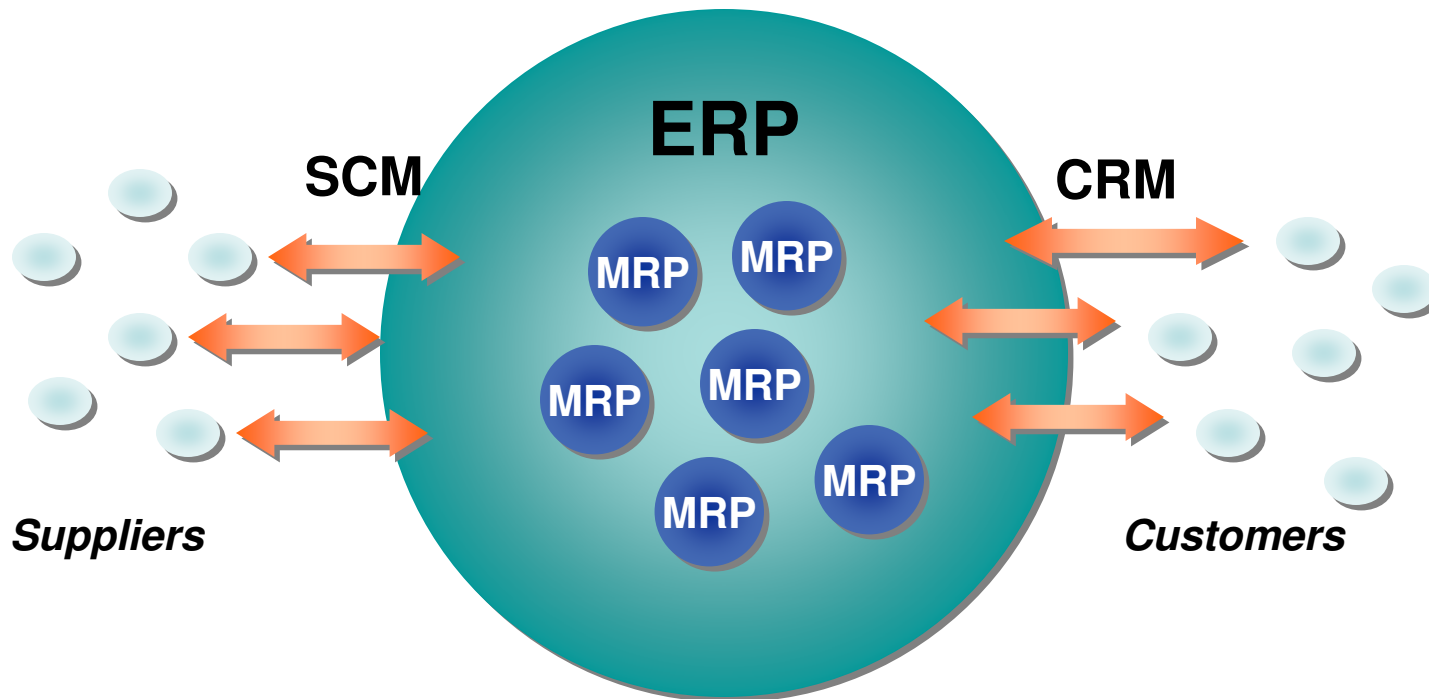
# “Intelligence” for Supply Chain Management

Optimization

Integration

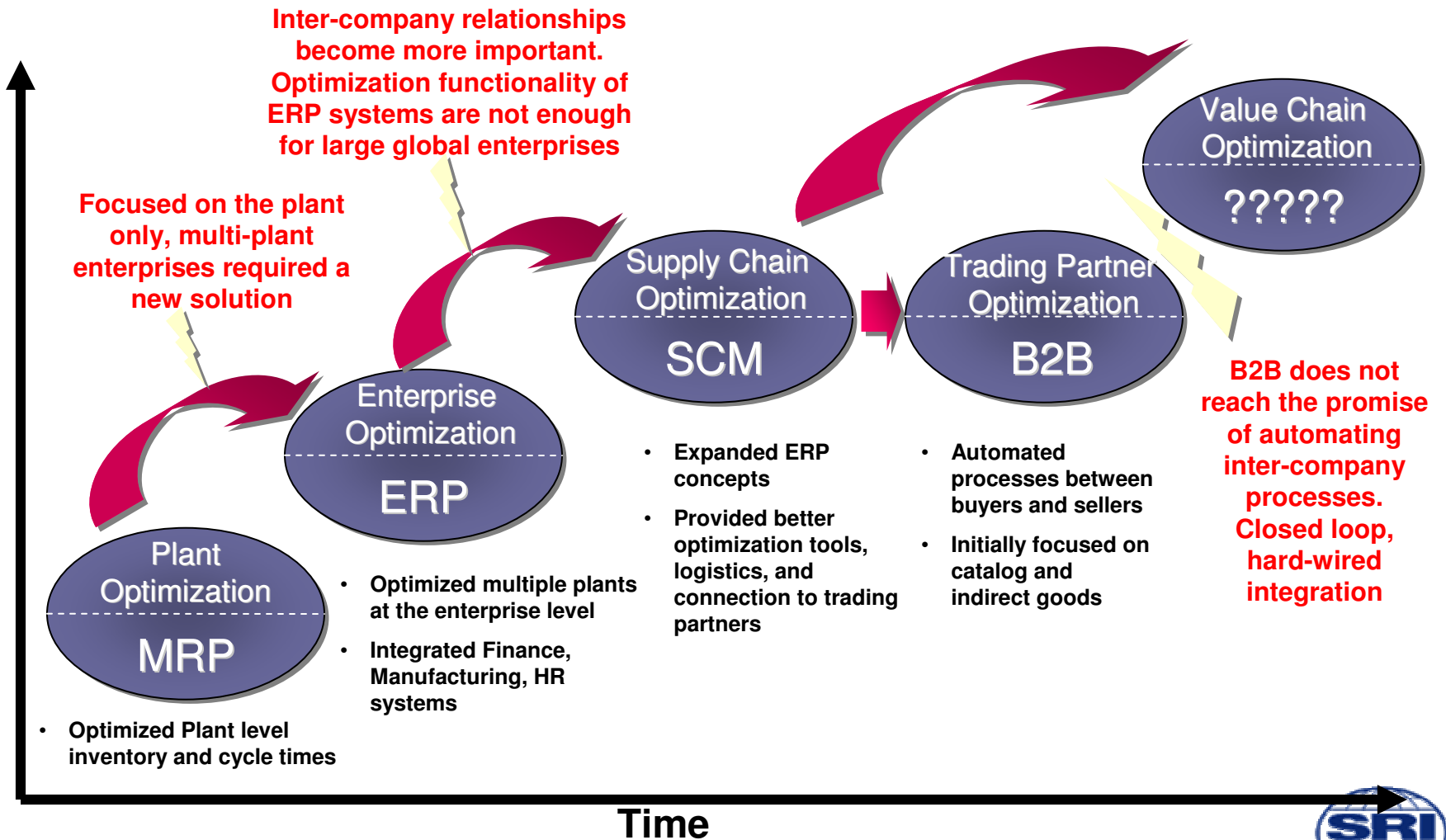
Interface

Planning, Scheduling, Configuration, Event Management, Knowledge representation, Data transformation, Natural Language  
Rules, Learning, Data mining, Information Retrieval, Classification  
Simulation, Business Intelligence



# Technology Driving Change in SCM

*As each wave matured, the applications became stressed as businesses tried to add additional capabilities beyond what the technologies could enable.*



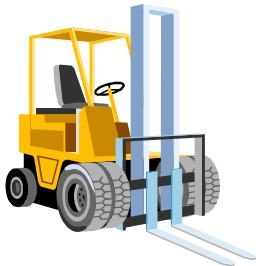
# Understanding What's Coming

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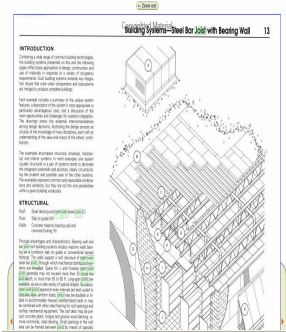
- How to predict technology future of SCM?
  - Look at trends in consumer technology, project to the business market which lags several years
- Emerging Trends
  - Media → Digital
  - Structured Information: Disconnected → Semantically Organized
  - Unstructured Information: Editor → Collaborative Participation
  - Unstructured and Structured Merge
  - Personalization Becomes Ubiquitous
  - Social Networks Takes Off
  - Applications are similarly transformed (Composable/Plugable, Semantic, Collaborative, Personalized, Social)
- Coming revolutions
  - User Interface Breakthroughs
  - Automated Intelligence

# Information: Emerging Trends

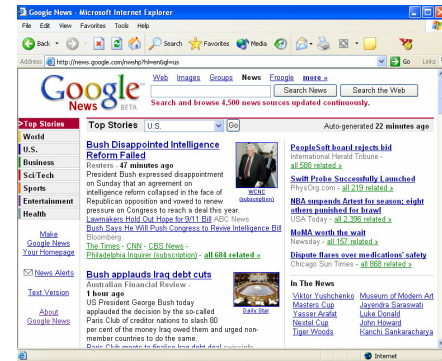
## 1. All Media Becomes Digital



Physical Goods



Books



News



Music



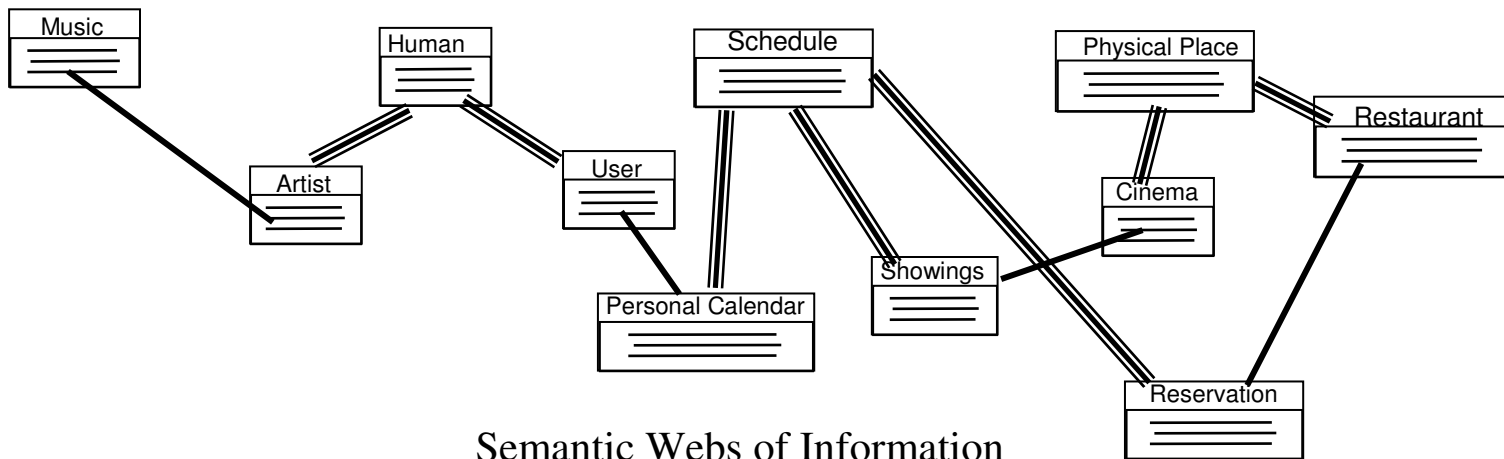
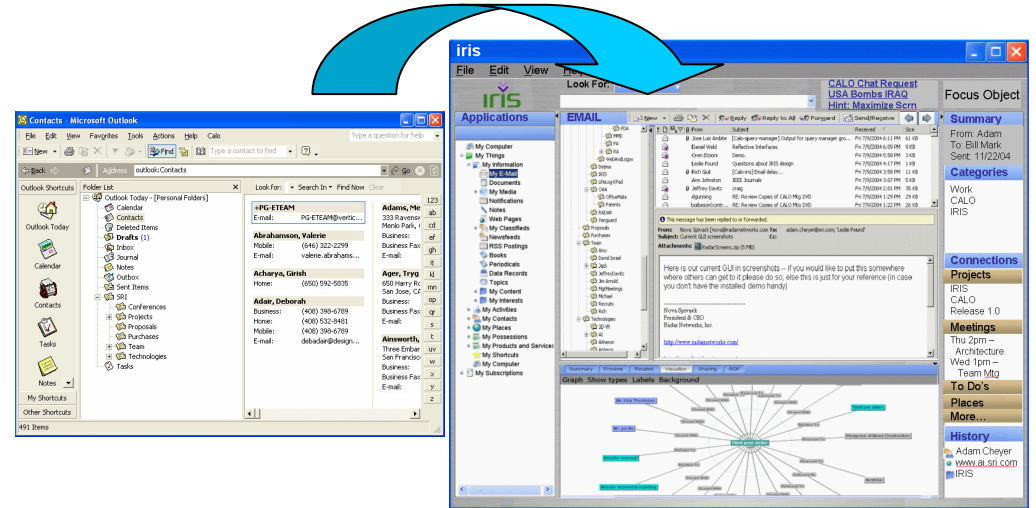
Voice



TV

# Information: Emerging Trends

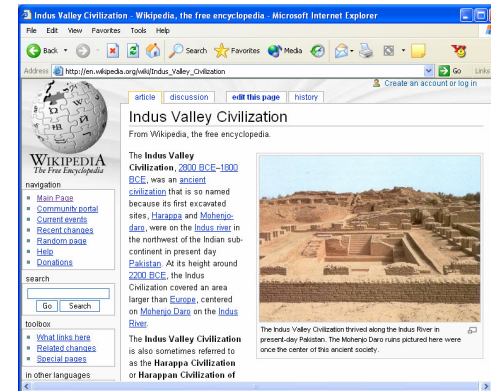
1. All Media Becomes Digital
  2. Structured: Disconnected
- Semantically Organized



Semantic Webs of Information

# Information: Emerging Trends

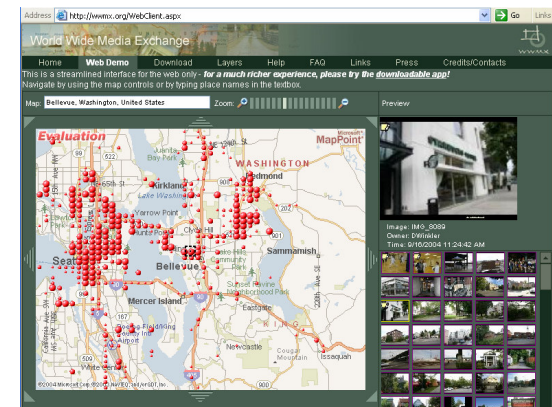
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→ Semantically Organized
3. Unstructured: Editor  
→ Collaborative



Wikis



Blogs

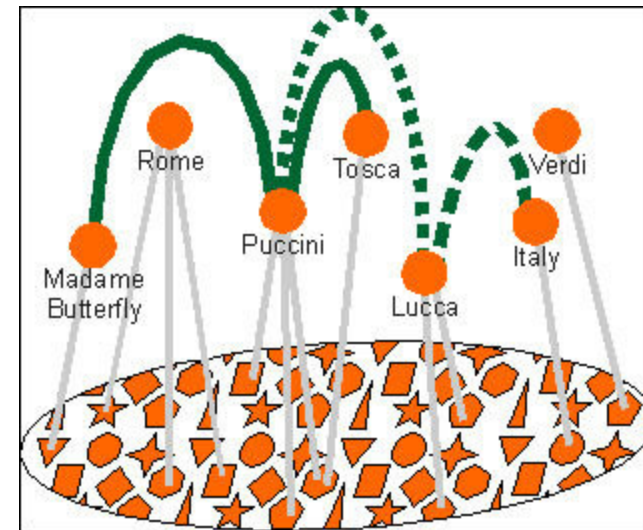


Collaborative Apps



# Information: Emerging Trends

1. All Media Becomes Digital
2. Structured: Disconnected  
→ Semantically Organized
3. Unstructured: Editor  
→ Collaborative
4. Unstructured & Structured  
→ Merge



Topic Maps: collaborative classification

**Personal Profile**

**Ms. Kimberly Watson**  
**Executive Vice President, Marketing**  
 Colgate-Palmolive Company  
 Last Mentioned on 03/01/2004  
[k.watson@colgate.com](mailto:k.watson@colgate.com)

[Send profile...](#)  
[Networking opportunities...](#)  
[Add to folder...](#)  
[Print this profile...](#)

**Additional Current Employment**  
[Colgate-Palmolive Company](#) Executive Vice President, Marketing

**Board Membership and Affiliations**  
 The Gillette Company Board Member  
 Northwest Airlines Corporation Board Member

**Past Employment History**  
[Procter & Gamble](#) VP, Product Marketing  
[Xerox Corporation](#) Senior Marketing Manager  
[McKinsey & Company](#) Marketing Consultant

**Education**  
 Harvard University MBA

**Colgate-Palmolive Company**  
 300 Park Avenue  
 New York, NY 10022  
 Phone: (212) 310-2000  
<http://www.colgate.com>

Colgate-Palmolive is a leading global consumer products company, tightly focused on Oral Care, Personal Care, Household Surface Care, Fabric Care and Pet Nutrition. Colgate sells its products in over 200 countries and territories around the world under such internationally recognized [\(more\)](#)

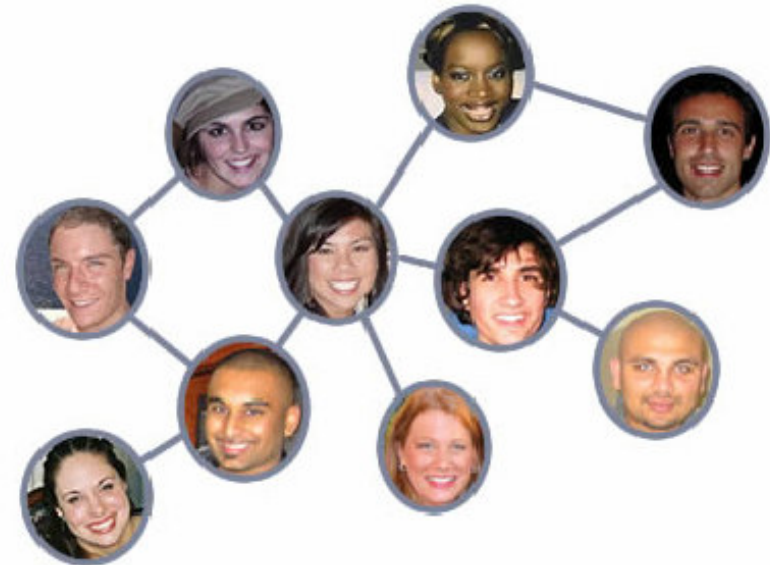
[Find more Colgate-Palmolive employees...](#)

**Procter & Gamble**  
 P.O. Box 599  
 Cincinnati, OH 45201-0599  
 Phone: 1-800-331-3774  
<http://www.pg.com>

Deriving structure from unstructured content

# Information: Emerging Trends

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→ Collaborative
4. Unstructured & Structured  
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- ➔ 5. Social Networking Takes Off



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6. Personalization becomes Ubiquitous



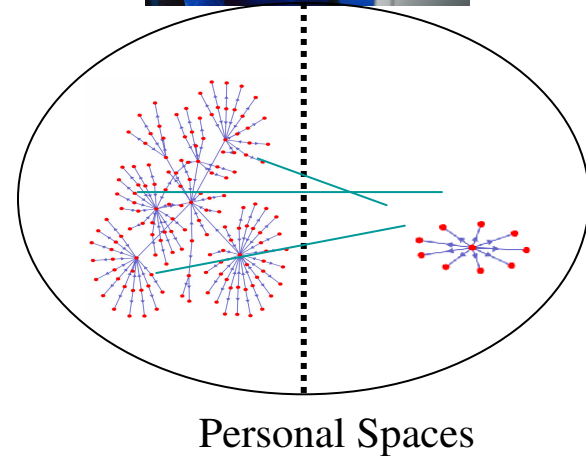
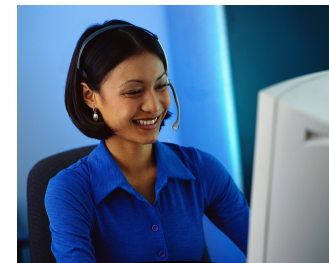
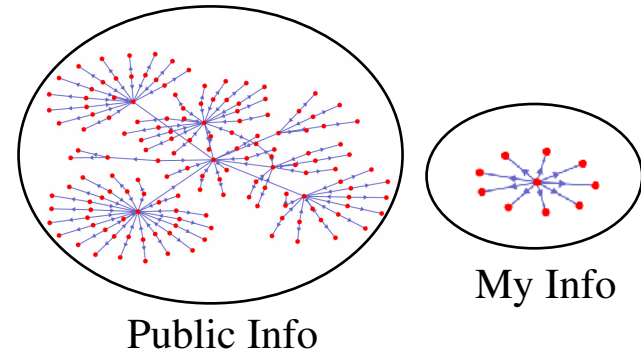
## Customers who bought this item also bought these items:

- [3rd Degree](#) by [James Patterson](#)
- [Bleachers](#) by [John Grisham](#)
- [The Da Vinci Code](#) by [Dan Brown](#)
- [Angels & Demons](#) by [Dan Brown](#)
- [The Narrows: A Novel](#) by [Michael Connelly](#)
- [London Bridges \(Alex Cross Novel\)](#) by [James Patterson](#)

▶ [Explore Similar Items](#): in [Books](#), in [Music](#), and in [DVD](#)

# Information: Emerging Trends

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→ Merge
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6. Personalization becomes Ubiquitous
7. Public & Private Content  
→ Merge

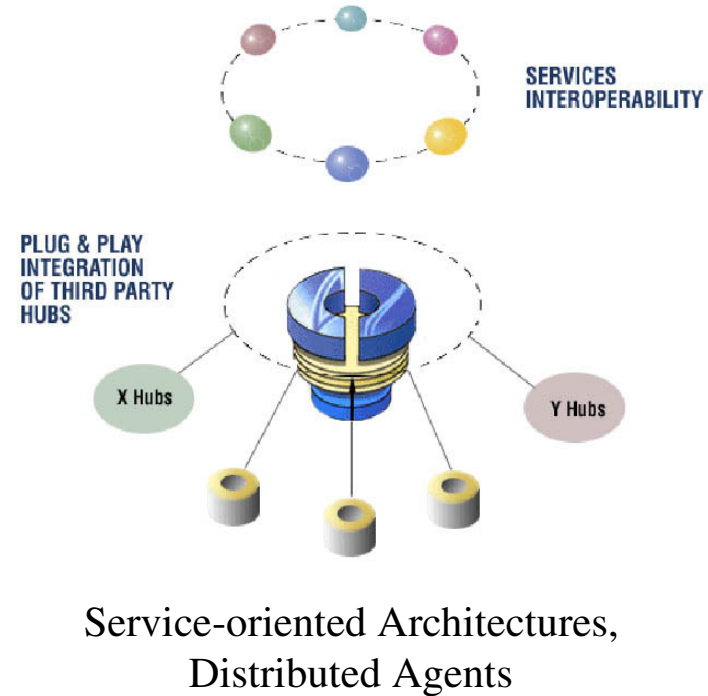


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8. Applications Are Similarly Transformed  
(Composable/Plugable, Semantic, Collaborative, Personalized, Social)



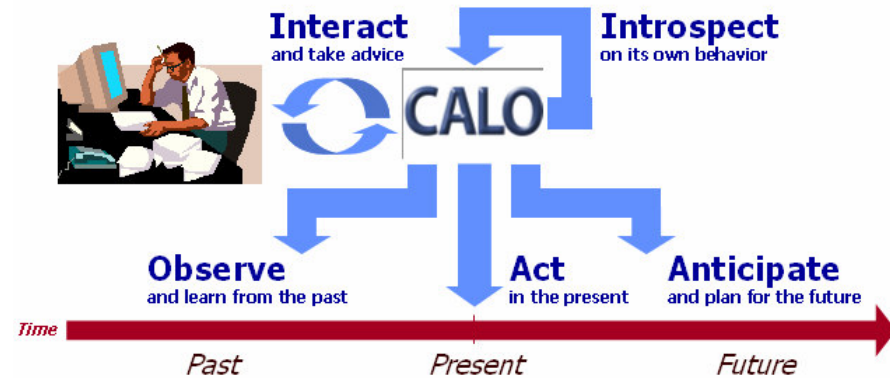
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8. Applications Are Similarly Transformed
9. Usable access is Key



# Information: Emerging Trends

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7. Public & Private Content  
→ Merge
8. Applications Are Similarly Transformed
8. Usable access is Key
10. Intelligent software leverages and organizes information



# 1 – All Media Becomes Digital

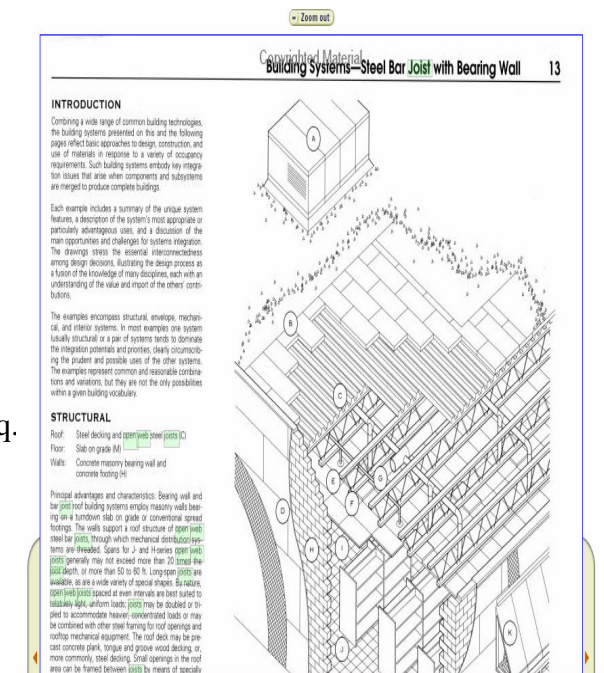
- Books
- News
- Voice
- TV
- Music

## EVIDENCE

- Amazon’s “Search Inside the Book”
  - More than 120,000 books (’03)
- Google Print
  - <http://print.google.com>
  - Digitizing entire Harvard Library (15M vols). Also Oxford, Stanford, Michigan, NY Public Library.

Source: <http://hul.harvard.edu/publications/041213faq>.

- Million book project
  - Goal: by 2005
  - CMU, NSF, Gov India & China
- Factors:
  - Cost: \$10/title to digitize, and falling
  - There are 30 million books that have been published in history. Of that, half are out of copyright. A million books can fit in a terabyte box the size of a bookshelf.



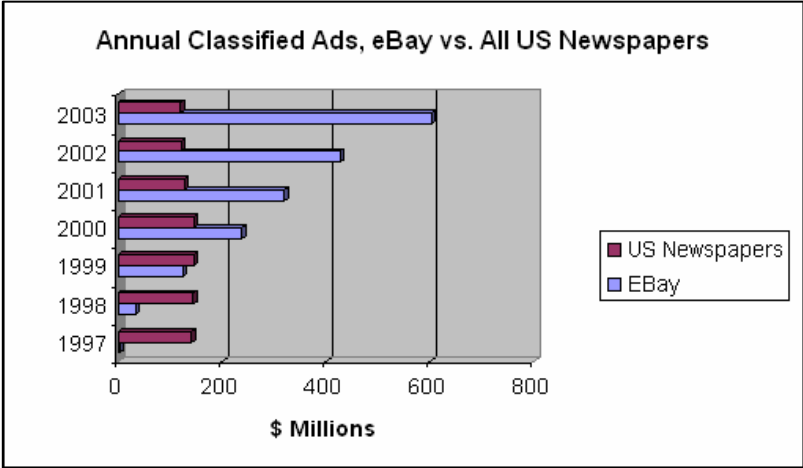
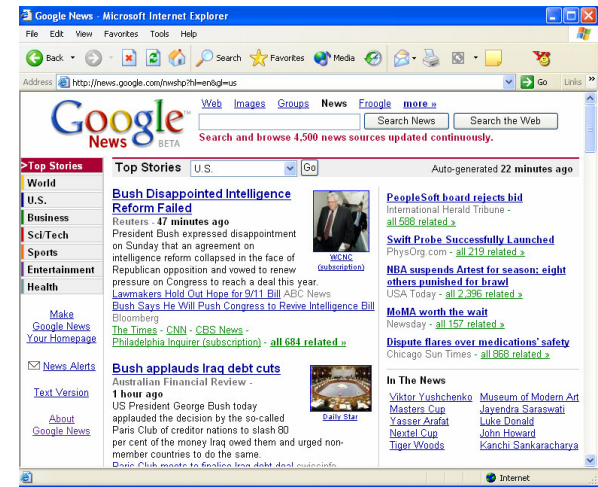


# 1 – All Media Becomes Digital

- Books
- News
- Voice
- TV
- Music

## EVIDENCE

- Google News
  - Editing fully automated by machine!
- Online Presence
  - Every major newspaper now has online presence
- Classified ads now dominated by online



Source: Morgan Stanley



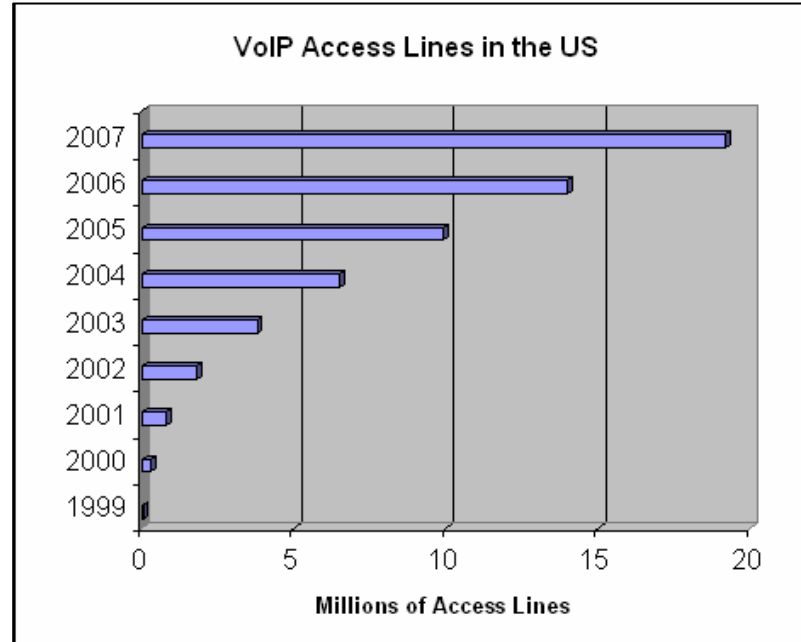
# 1 – All Media Becomes Digital

- Books
- News
- **Voice**
- TV
- Music

## EVIDENCE

- VOIP Growing Fast

**"Skype has 10 million users and is the fastest-growing application online. 7% of Poland's population is already using Skype", a Skype board member said.**



Source: eMarketer, citing data from TIA, Wilkofsky Gruen Associates, May 2004



# 1 – All Media Becomes Digital

- Books
- News
- Voice
- **TV**
- Music

## EVIDENCE

- IPTV Investments

**In 2004, SBC agreed to pay Microsoft \$400 million dollars for software to be used to deliver IPTV services to up to 18 million customers. Separately, SBC is investing over \$4 billion USD in it's network infrastructure to prepare for the rollout.** Source: Wikipedia

- DVR usage growing

**IDC forecasts that worldwide unit shipments will climb to more than 28 million in 2008, a compound annual growth rate (CAGR) of 46.9% between 2003 and 2008**

Source: <http://www.in-sourced.com/article/articleprint/1548/-/1/>

- TV over cellphones: coming

**Disney to launch ESPN-branded cellphone company to deliver live audio and tv**

Source: <http://abcnews.go.com/Business/wireStory?id=349291&CMP=OTC-RSSFeeds0312>



# 1 – All Media Becomes Digital

- Books
- News
- Voice
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## EVIDENCE

### Digital Music: Revenues, Trends, Growth

#### 1) Revenue

2008 Revenue Forecast	
Downloadable Tracks	\$3.19 Billion
Subscriptions	\$1.37 Billion

Forrester Research

#### 2) Demographics

Demographics	
Total Number of US downloaders	44 million *
Percent youth (<23) who have downloaded	50%
Percent adults (> 23) who have downloaded	10%

\* Includes paid and pirated.

Forrester Research

#### 3) Number of Downloads

Apple iTunes	
Annual Downloads (4/03 - 4/04)	70 Million
Weekly Download Rate (5/04)	3.3 million

Apple



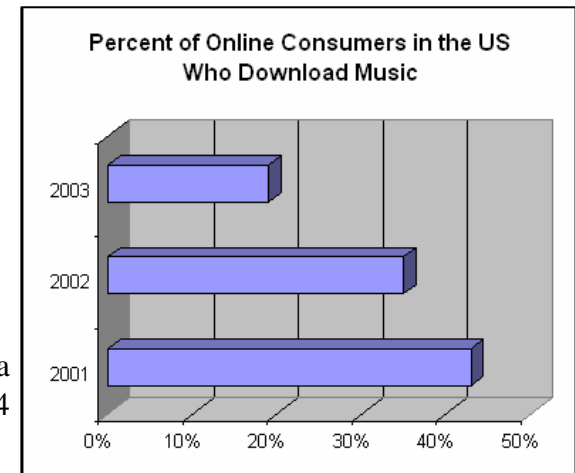
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## EVIDENCE

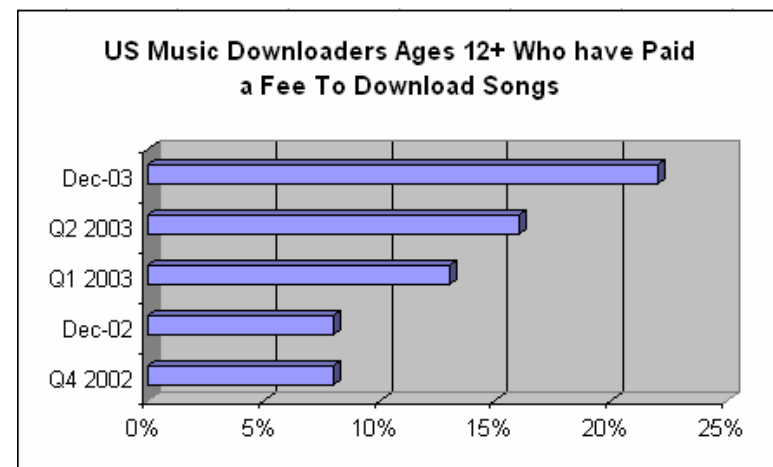
- Illegal Downloads seem to be falling

Source: eMarketer, citing data from Yankee Group, April 2004



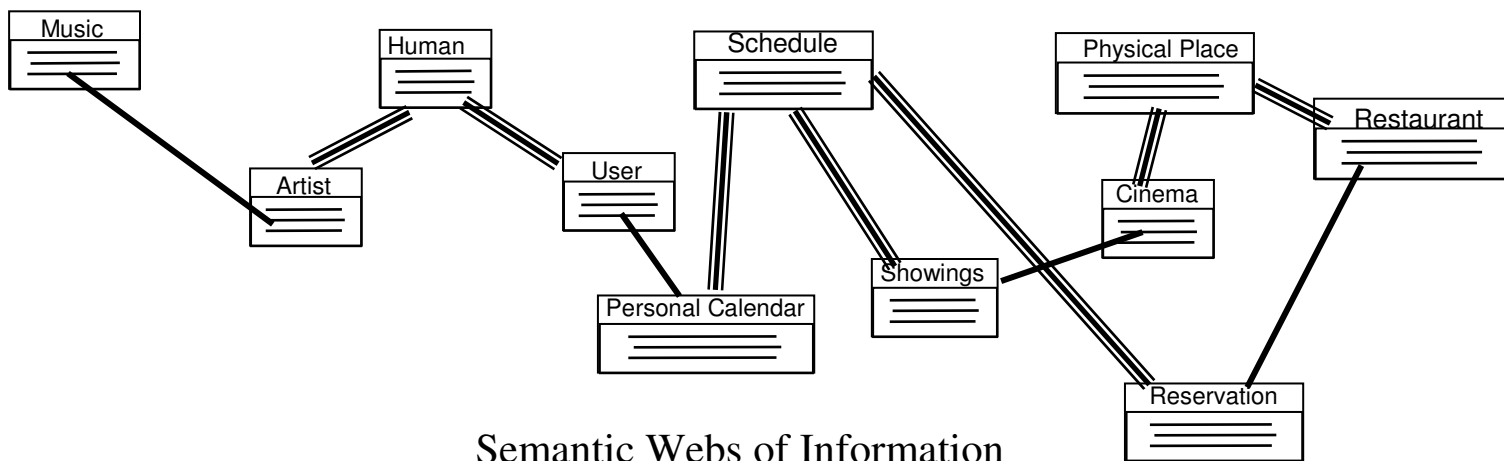
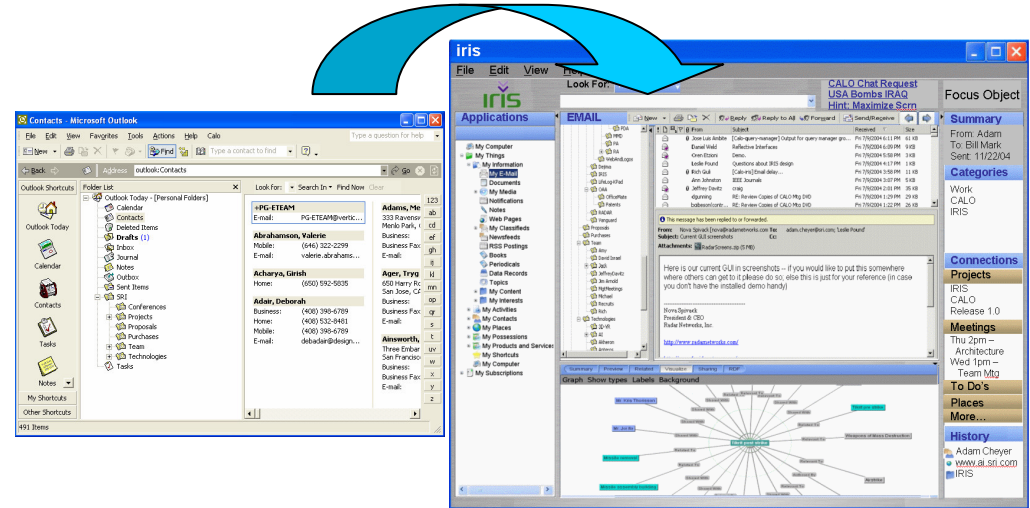
- Fee-based Downloads are rising in nearly inverse proportion

Source: eMarketer, citing data from NPD MusicLab, January 2004



# Information: Emerging Trends

1. All Media Becomes Digital
  2. Structured: Disconnected
- Semantically Organized



Semantic Webs of Information

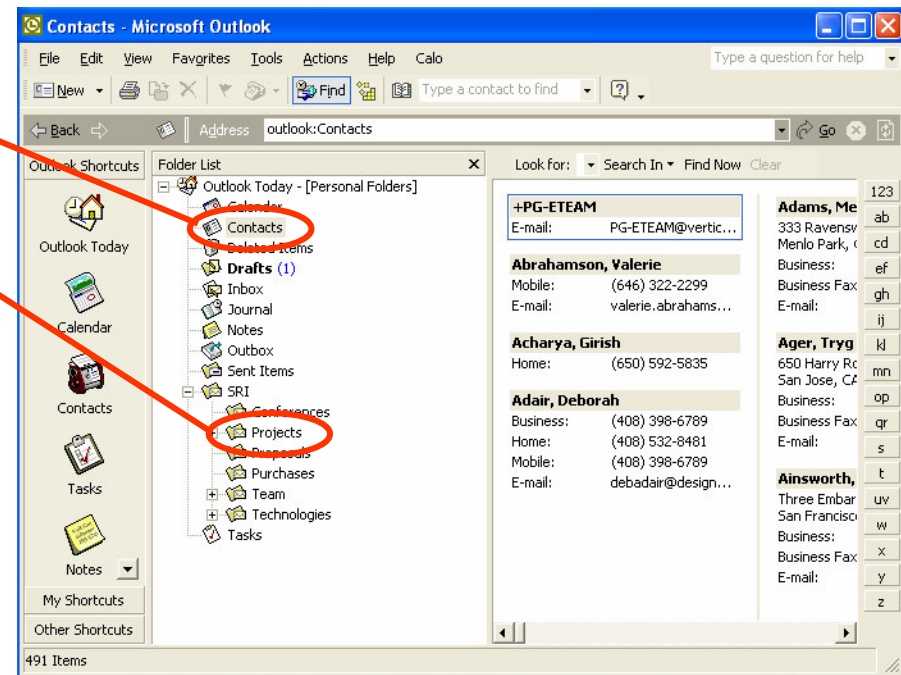
## 2 – Structured: Disconnected → Semantically Organized

- Today's structured information is disconnected

No organization within contacts

Folders can only contain one type (e.g. email)

- Can't query across different kinds of information
  - “Find appointments involving my boss about XYZ task”
- Same for most structured web content



# History of the Semantic Web

- Semantic Web: a universal medium for information exchange, in a manner understandable by machines
- Tim Berner-Lee: original vision of the Web was much more ambitious than today's existing (syntactic) Web:



“... a goal of the Web was that, if the interaction between person and hypertext could be so intuitive that the **machine-readable** information space gave an accurate representation of the state of people's thoughts, interactions, and work patterns, then **machine analysis** could become a very powerful management tool, seeing patterns in our work and facilitating our working together through the typical problems which beset the management of large organizations.”





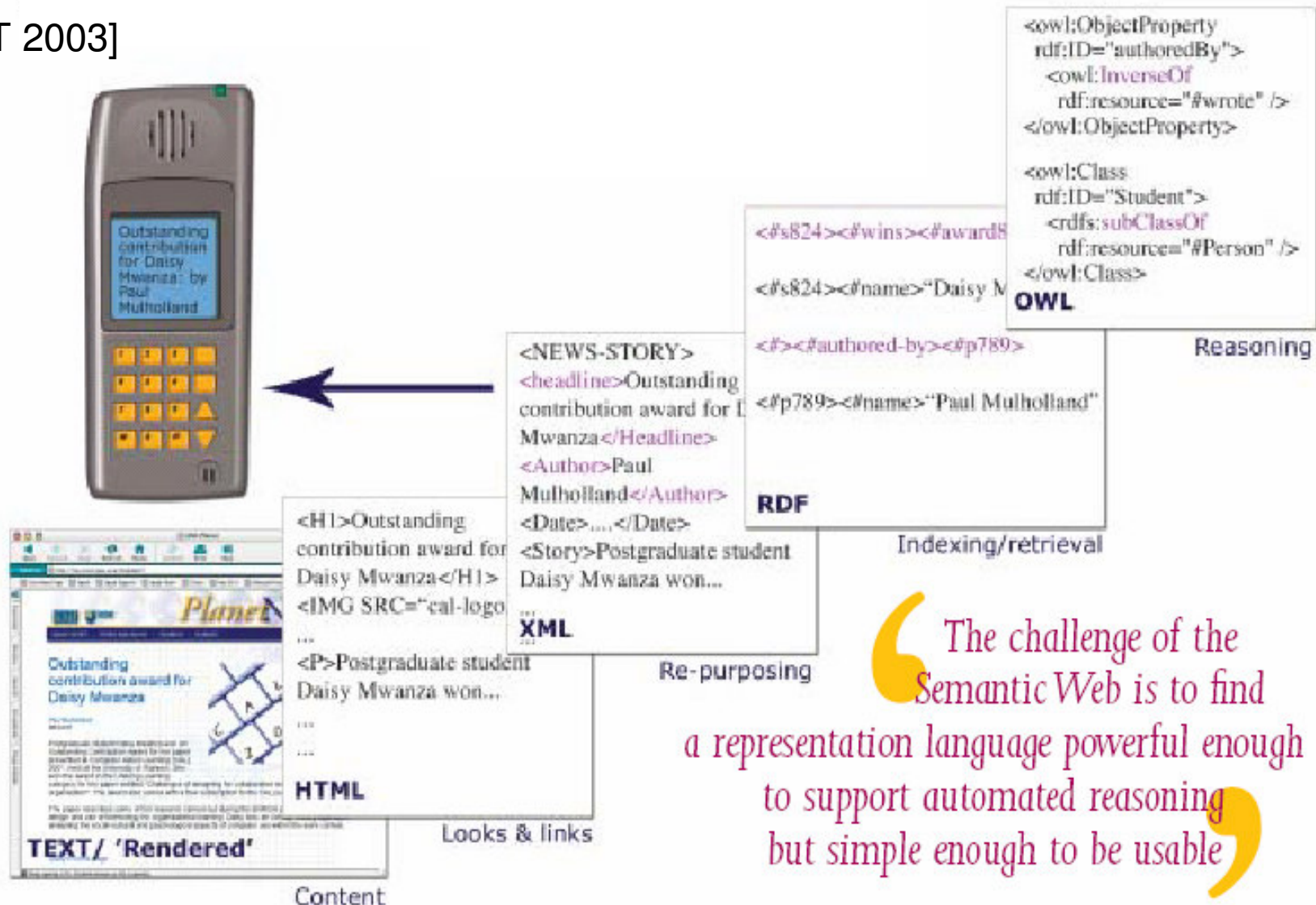
# Elements of the Semantic Web

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- XML: surface syntax for structured documents, no semantics
- RDF: a data model for objects and relations, providing simple semantics
- RDF Schema: vocabulary for describing properties and classes, with hierarchies
- OWL: richer vocabulary for properties and classes, including relations between classes (e.g. disjointness), cardinality (e.g. exactly one), equality, characteristics of properties (e.g. symmetry), enumerated classes

# Challenge of Semantic Web

[AKT 2003]



# Example of Structured Information Management: IRIS

IRIS: “The Clarity Machine”

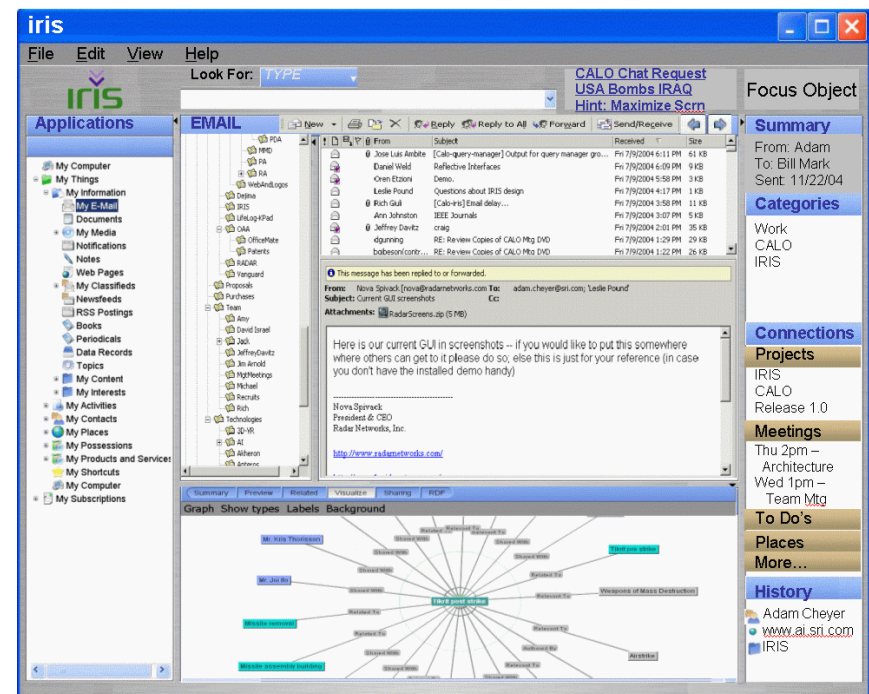
Integrated applications  
(Mail, Files, Web, Data, Calendar,  
Chat, ...)

Add “personal map” across all office  
objects

Knowledge base facilitates  
meaningful search, navigation,  
visualization

Learning capabilities prioritize,  
summarize and relate

Share structured content with  
teammates



**IRIS**

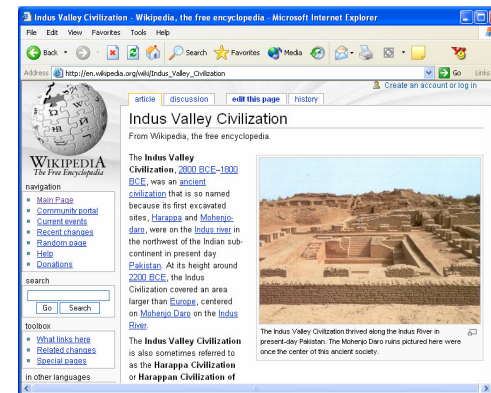
Integrate. Related. Infer. Share.

[www.openiris.org](http://www.openiris.org)

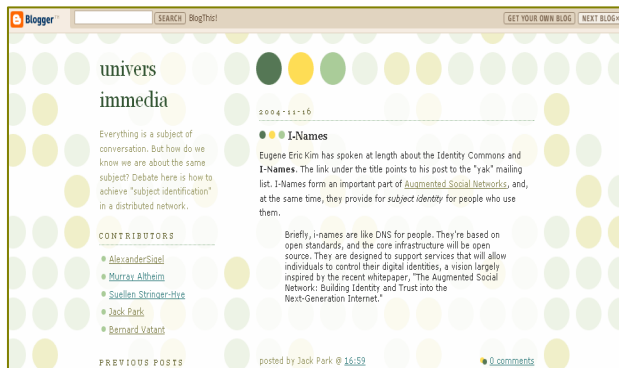


# Information: Emerging Trends

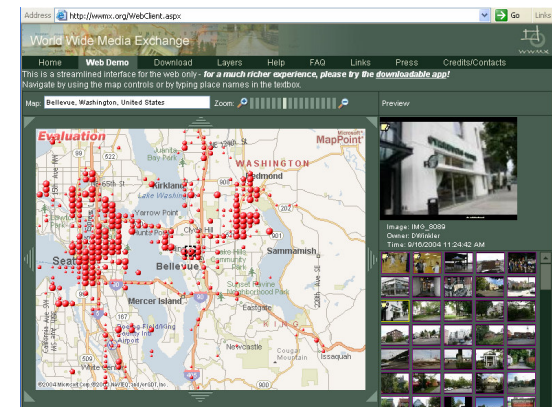
1. All Media Becomes Digital
2. Structured: Disconnected  
→ Semantically Organized
3. Unstructured: Editor  
→ Collaborative



Wikis



Blogs



Collaborative Apps

# 3 – Unstructured: Editor → Collaborative

- Wikis
- Blogs
- WebFeeds
- Collab. Apps
- Content

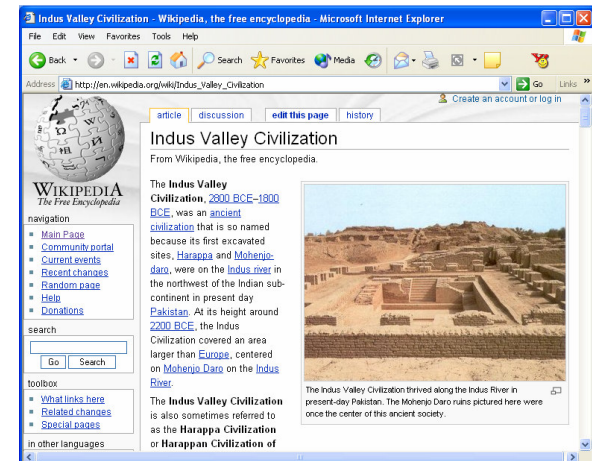
Create an “Architecture of Participation”, and let your customers build your business (c.f. Ebay)



## WIKIS – Editable Web Pages

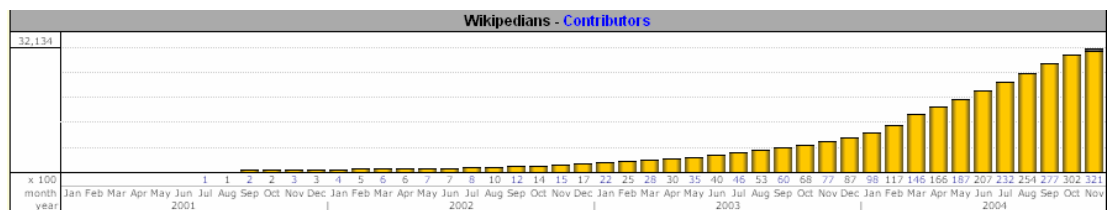
### EVIDENCE

- High-quality information can be constructed by unorganized masses (c.f. Wikipedia)
  - **1.2M articles** (30% En, 14% De)
  - **13.3M page views/day** (6M En, 2M De)
  - **31,134 contributors** (41% En, 22% De)



Contributors, 2001-2004

Source: www.wikipedia.org



# 3 – Unstructured: Editor → Collaborative

- Wikis
- Blogs
- WebFeeds
- Collab. Apps
- Content

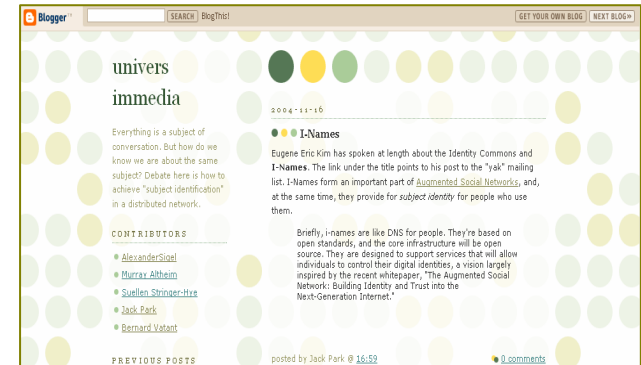
Create an “Architecture of Participation”, and let your customers build your business (c.f. Ebay)

“Blogs” – Web Logs are individual journals (of ideas)

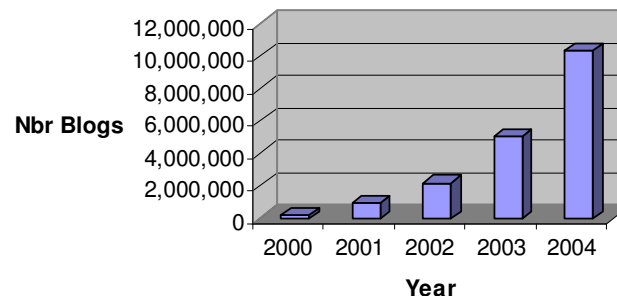
## EVIDENCE

- Blogs becoming a worldwide phenomenon

**“The number of blog postings worldwide has skyrocketed this year -- now it's 4 entries per second.”**



Growth of Hosted Blogs



A Blog:  
<http://universimmedia.blogspot.com>

Source: eMarketer, citing data from Perseus Development Corp, Oct 2003



# 3 – Unstructured: Editor → Collaborative

- Wikis
- Blogs
- WebFeeds
- Collab. Apps
- Content

Create an “Architecture of Participation”, and let your customers build your business (c.f. Ebay)

“Blogs” – Web Logs are individual journals (of ideas)

## Details: Things that make Blogs work

- Push and Pull
  - Create new content
  - Read and comment on the content of other Blogs
  - Comment on other events
- Rich linking
  - HREF links to other content
  - FOAF personal identity and links to friends
  - Trackback links to other blogs (push)
  - Link comments to the specific content commented on
  - Categorical/topical organization
  - Historical archives

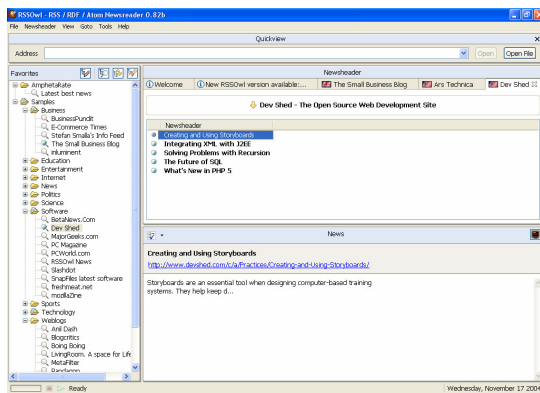


Blogger: A Weblog Portal



# 3 – Unstructured: Editor → Collaborative

- Wikis
- Blogs
- WebFeeds
- Collab. Apps
- Content



A Desktop FeedReader

## WebFeeds – Syndication of Web Content

### Details:

- Syndication – RSS & ATOM Standards
  - Publishing an XML site summary
  - Updated as new content added
  - Many sites syndicate, not just blogs
- Aggregation
  - Collecting and organizing syndications
  - Present in various searchable forms
  - Available to desktop and web-based feed readers
- Federation
  - Bind all content pointed to by syndications into a Topic Map

Feedster indexes over 1 million syndicated sources and adds approximately 5,000 new feeds daily. This includes over 50,000 professionally published sources such as the New York Times, BBC, CNET, IDG, and Wired.



# 3 – Unstructured: Editor → Collaborative

## Specialized Collaborative Applications

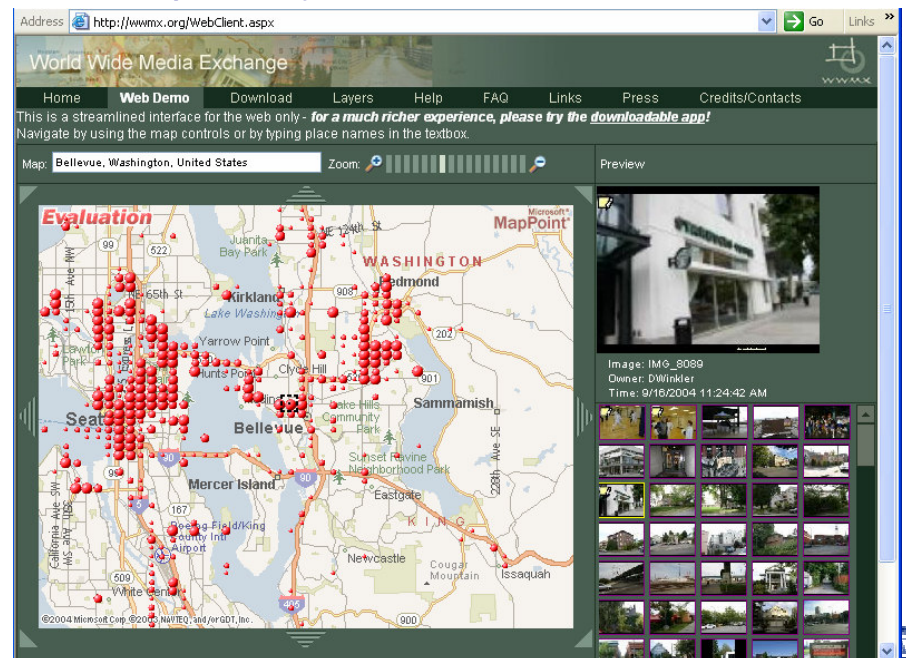
- Wikis
- Blogs
- WebFeeds
- Collab. Apps
- Content

Create an “Architecture of Participation”, and let your customers build your business (c.f. Ebay)

### EVIDENCE

Numerous collaborative apps emerging

Example: WorldWide Media Exchange (<http://wmx.org/>)  
Geolocated Photo Repository



# 3 – Unstructured: Editor → Collaborative

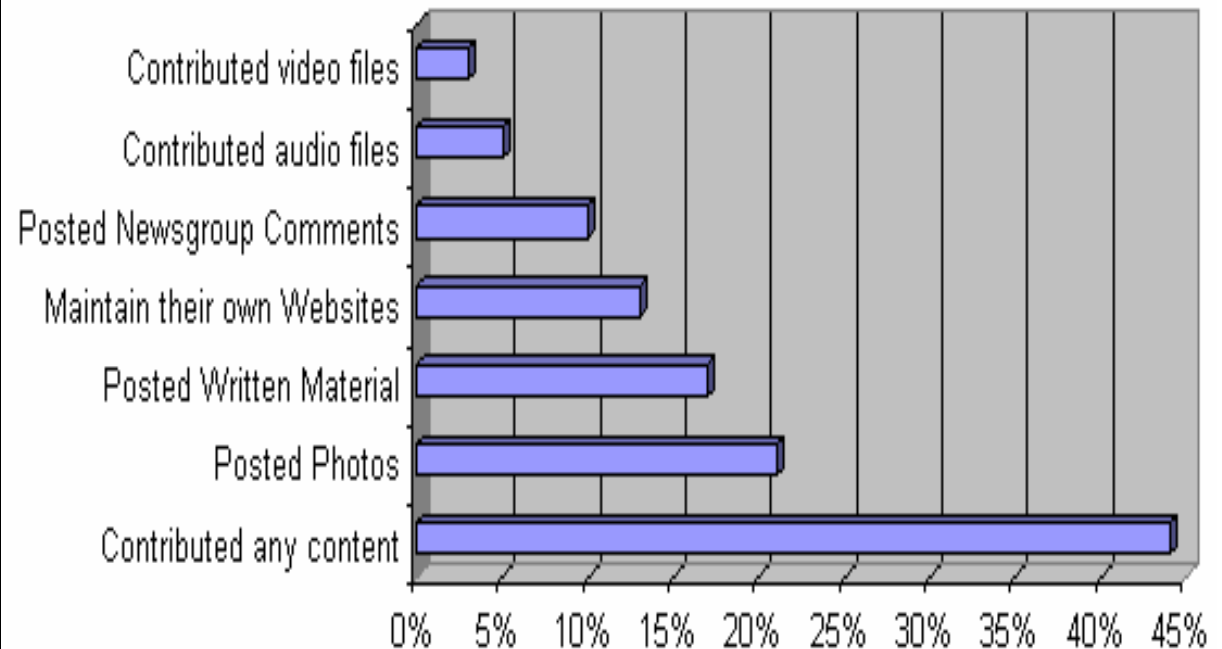
- Wikis
- Blogs
- WebFeeds
- Collab. Apps
- **Content**

Create an “Architecture of Participation”, and let your customers build your business (c.f. Ebay)

## People Want To Contribute

### EVIDENCE

U.S. Adult Internet Users Who Have Contributed Content to the Internet, 2003

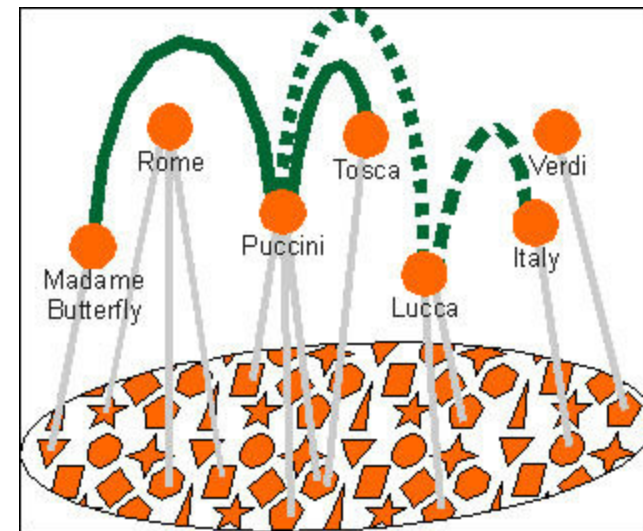


Source: PEW Internet & American Life Project, Feb 2004



# Information: Emerging Trends

1. All Media Becomes Digital
2. Structured: Disconnected  
→ Semantically Organized
3. Unstructured: Editor  
→ Collaborative
- ➔ 4. Unstructured & Structured  
→ Merge



Topic Maps

**Personal Profile**

**Ms. Kimberly Watson**  
**Executive Vice President, Marketing**  
 Colgate-Palmolive Company  
 Last Mentioned on 03/01/2004  
[k.watson@colgate.com](mailto:k.watson@colgate.com)

[Send profile...](#)  
[Networking opportunities...](#)  
[Add to folder...](#)  
[Print this profile...](#)

**Additional Current Employment**  
 Colgate-Palmolive Company Executive Vice President, Marketing

**Board Membership and Affiliations**  
 The Gillette Company Board Member  
 Northwest Airlines Corporation Board Member

**Past Employment History**  
 Procter & Gamble VP, Product Marketing  
 Xerox Corporation Senior Marketing Manager  
 McKinsey & Company Marketing Consultant

**Education**  
 Harvard University MBA

**Colgate-Palmolive Company**  
 300 Park Avenue  
 New York, NY 10022  
 Phone: (212) 310-2000  
<http://www.colgate.com>

Colgate-Palmolive is a leading global consumer products company, tightly focused on Oral Care, Personal Care, Household Surface Care, Fabric Care and Pet Nutrition. Colgate sells its products in over 200 countries and territories around the world under such internationally recognized [\(more\)](#)

[Find more Colgate-Palmolive employees...](#)

**Procter & Gamble**  
 P.O. Box 599  
 Cincinnati, OH 45201-0599  
 Phone: 1-800-331-3774  
<http://www.pg.com>

Deriving structure from unstructured content

# 4 – Structured & Unstructured → Merge

- Collaborative
- Automated

Unstructured and Structured Information will merge, through Automated and Collaborative means

## EVIDENCE

Open Directory – the Definitive Catalog of the Web  
over 4 million sites, 65,623 editors, 590,000+ categories

Flickr – A Collaborative Photo Sharing Site  
Members can categorize photos by adding keywords

## Topic Maps

A Topic Map is a relational structure which resides above other information resources.

A Topic is a binding point for everything that is knowable about a Subject.

XTM – the TopicMap Standard

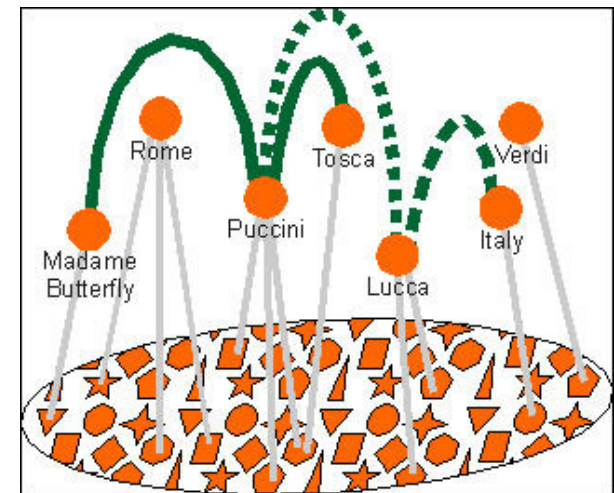


Image from <http://www.ontopia.net/topicmaps/materials/tao.html>



# 4 – Structured & Unstructured → Merge

- Collaborative
- Automated

Unstructured and Structured Information will merge, through Automated and Collaborative means

## EVIDENCE

Automated Information Extraction Technologies Are Maturing

Examples:

Eliyon – 22 million professionals and 1,538,217 companies, with 450,000 new records added monthly

Demo: Citrine

**Personal Profile**

**Ms. Kimberly Watson**  
**Executive Vice President, Marketing**  
Colgate-Palmolive Company  
Last Mentioned on 03/01/2004  
k.watson@colgate.com

[Send profile...](#)  
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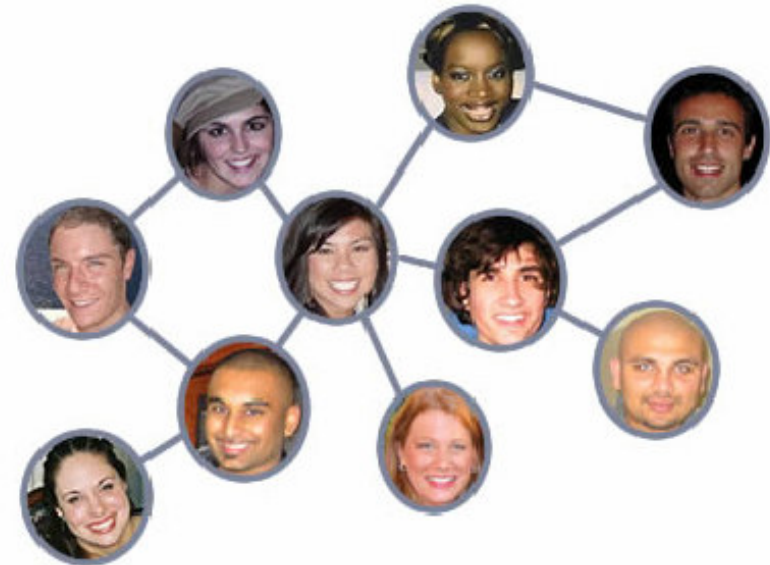
Past Employment History	
<a href="#">Procter &amp; Gamble</a>	VP, Product Marketing
<a href="#">Xerox Corporation</a>	Senior Marketing Manager
<a href="#">McKinsey &amp; Company</a>	Marketing Consultant

Education	
Harvard University	MBA

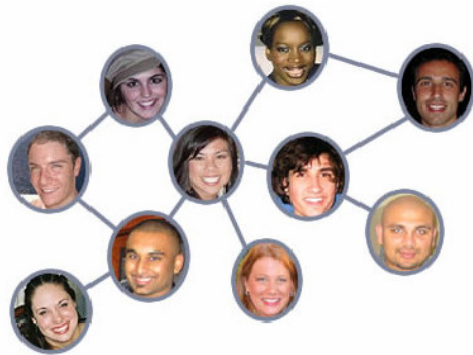


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→ Merge
- ➔ 5. Social Networking Takes Off



# 5 – Social Networking Takes Off



"You would be willing to put your reputation on the line for them, and that is what gives these links real meaning."

## Social Networking – a person's "personal network"

### EVIDENCE

Allows friends to connect with people inside their accepted social circle, allowing for perceived greater sense of security, compared to anonymous

Over 200 social networking sites now available

2003: Friendster, Tribe.net, LinkedIn

2004: Google launches Orkut

Social network Applications:

LinkedIn: Career Development

Friendster: Matchmaking (13M Participants)

Weblogs: StumbleUpon, FriendBlogs

WorldDJ: Electronic music & clubbing social networks

Yelp: search for local services through your friends

AudioScrobbler: social networking for music



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6. Personalization becomes Ubiquitous



## Customers who bought this item also bought these items:

- [3rd Degree](#) by [James Patterson](#)
- [Bleachers](#) by [John Grisham](#)
- [The Da Vinci Code](#) by [Dan Brown](#)
- [Angels & Demons](#) by [Dan Brown](#)
- [The Narrows: A Novel](#) by [Michael Connelly](#)
- [London Bridges \(Alex Cross Novel\)](#) by [James Patterson](#)

▶ [Explore Similar Items](#): in [Books](#), in [Music](#), and in [DVD](#)



# 6 – Personalization becomes Ubiquitous

Over 70% of movies rented from Netflix are based upon recommendations generated from Cinematch.

Jupiter Communications reports that personalization at 25 consumer E-commerce sites increased the number of new customers by 47% in the first year, and revenues by 52%.

Source:

<http://www.ics.uci.edu/~kobsa/papers/2000-UMUAI-kobsa.pdf>



## Customers who bought this item also bought these items:

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► [Explore Similar Items](#): in [Books](#), in [Music](#), and in [DVD](#)

## Recommended for Adam J Cheyer (If you're not Adam J Cheyer, [click here.](#))

### BROWSE RECOMMENDED

#### Recommendations

Your Favorites

[Edit](#)

• [Books](#)

More Stores

Your recommendations are based on [2 items you own](#) and more.

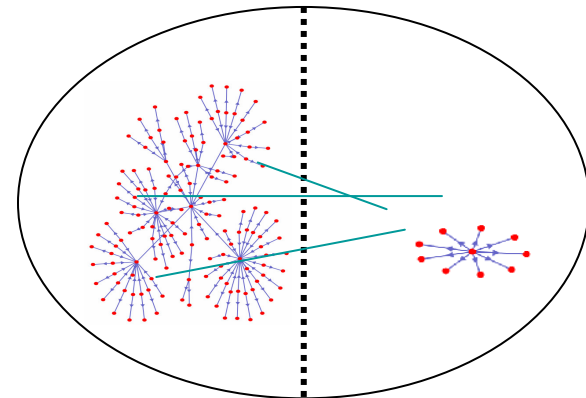
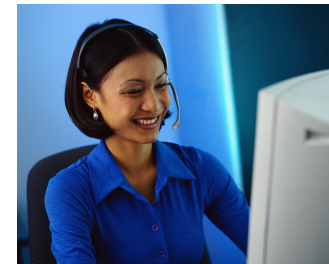
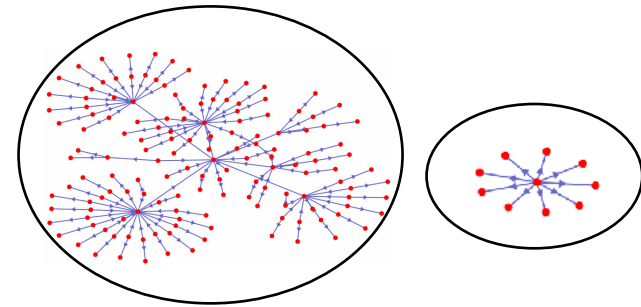
view: [All](#) | [New Releases](#) | [Coming Soon](#) | [Bargains](#)

1.  [Subclassing & Hooking with Visual Basic](#) by Stephen Teilhet

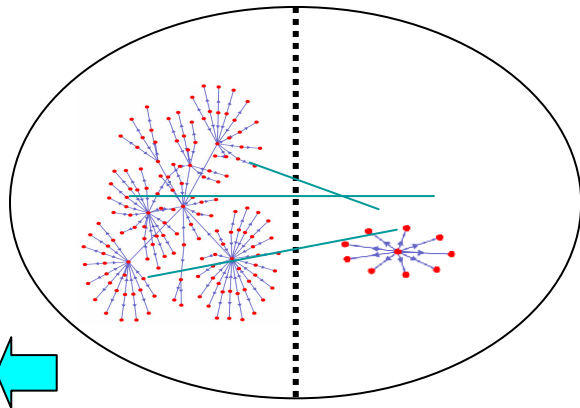
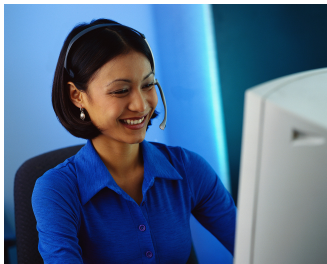
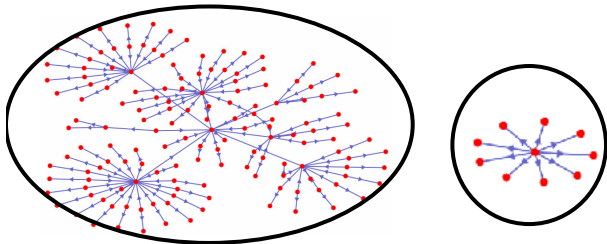


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6. Personalization becomes Ubiquitous
7. Public & Private Content  
→ Merge



# 7 – Public & Private Content → Merge



## EVIDENCE

People are starting to trust hosting of personal information

Email: 67% of email accounts worldwide are hosted  
[Radicati Group]

Sales data: Salesforce.com hosts 12,500 companies

Verticalnet, Siebel: “On Demand” solutions

People are accessing private home data through public channels



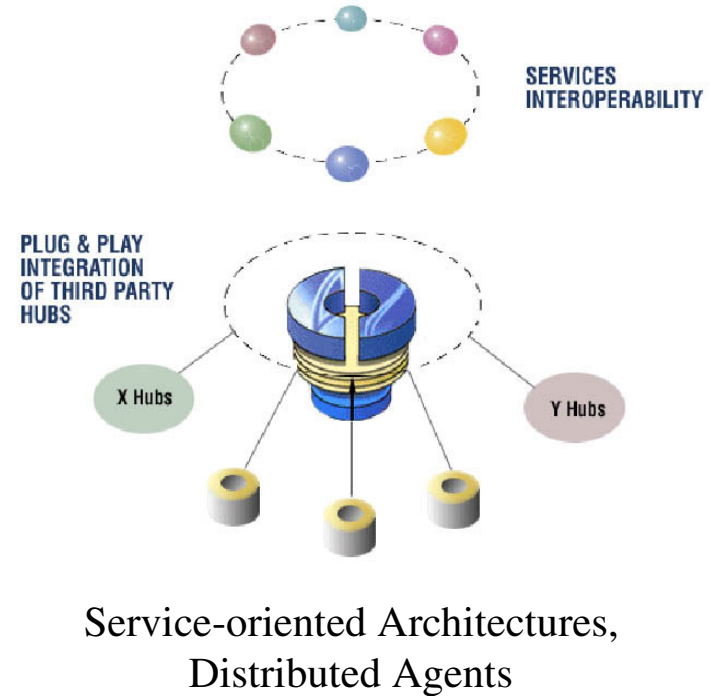
On your PDA: TV, your music collection, home movies, your photos



# Information: Emerging Trends

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- ➔ 8. Applications Are Similarly Transformed  
(Composable/Plugable, Semantic, Collaborative, Personalized, Social)

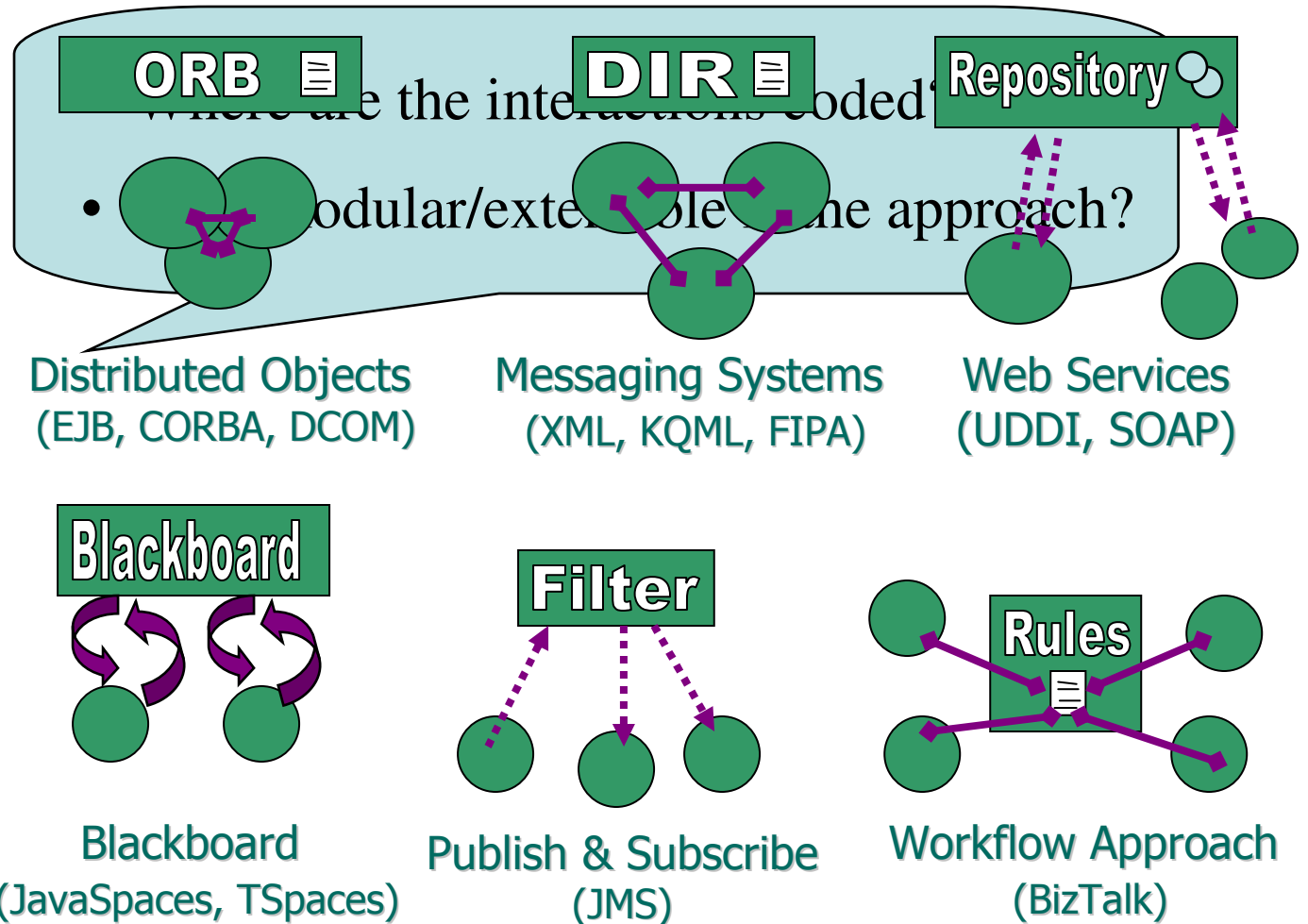


# Distributed Application Integration Approaches

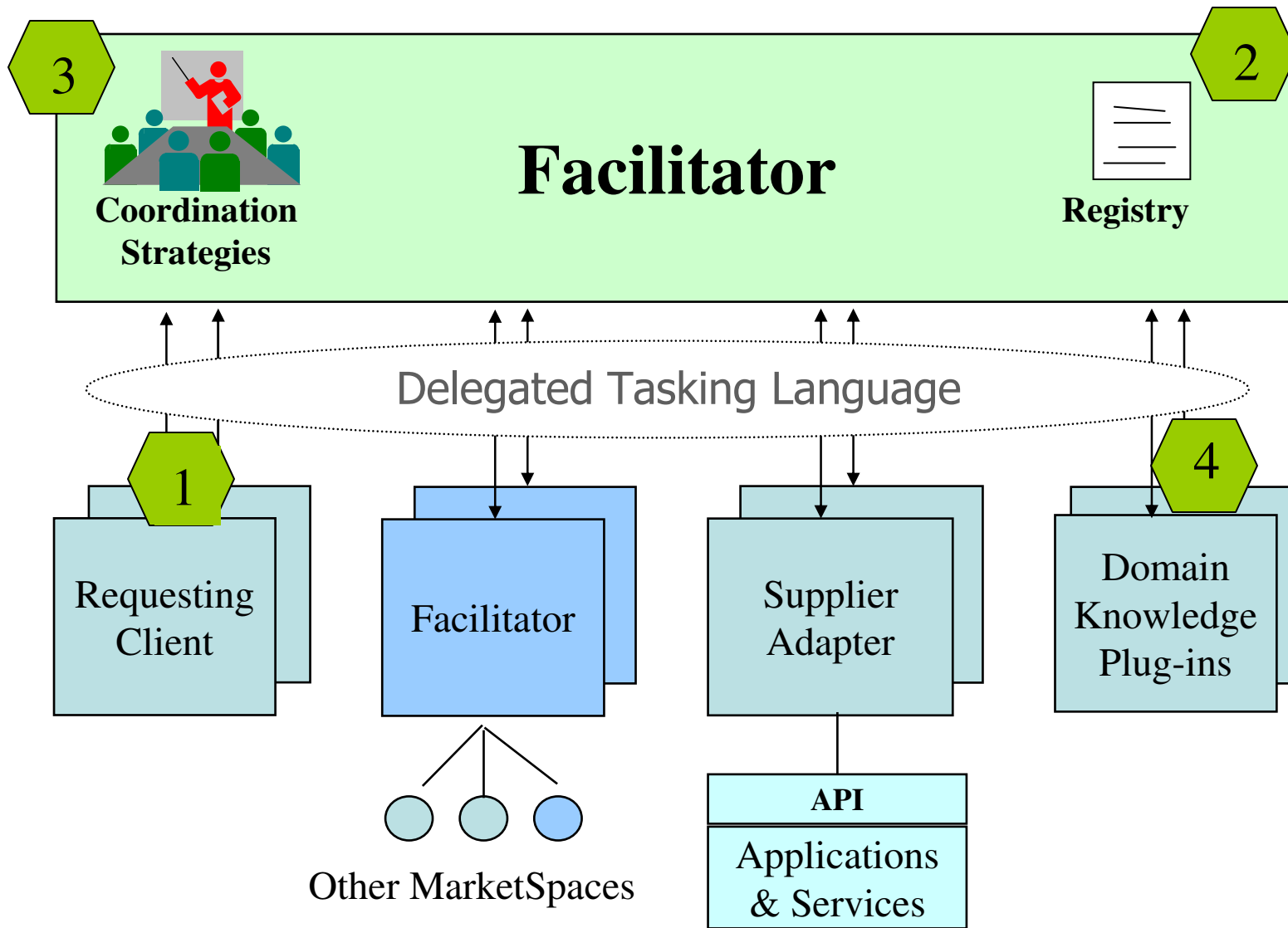
## Two Questions:

Where are the Interactions?

How extensible

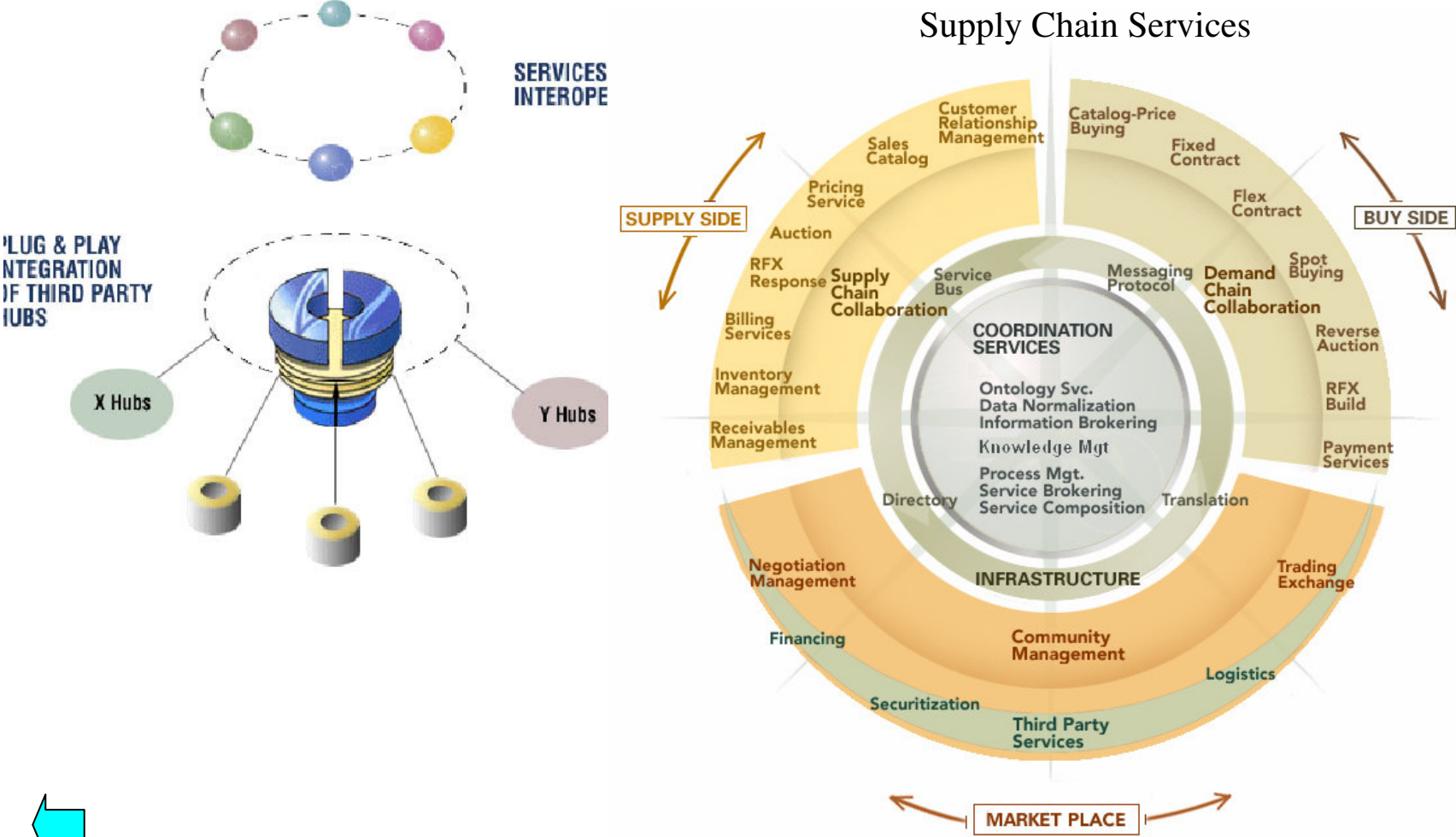


# Delegated Computing: Service Brokering



# 8 – Applications Are Transformed

(Composable/Plugable, Semantic, Collaborative, Personalized, Social)



# Information: Coming Revolution

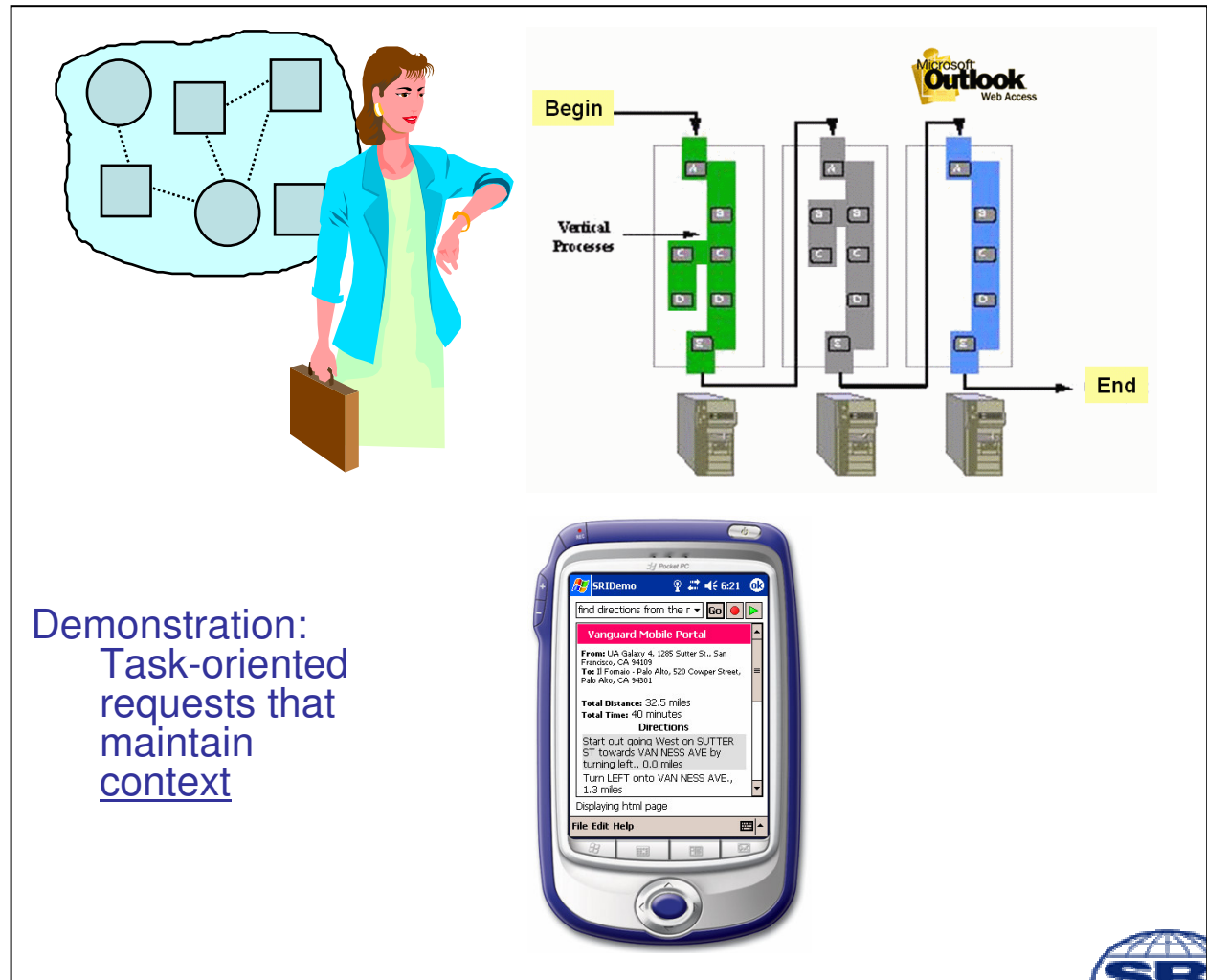
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6. Personalization becomes Ubiquitous
7. Public & Private Content  
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8. Applications Are Similarly Transformed
9. Usable access is Key



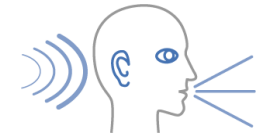


# Elements of Future User Experience

- Ubiquitous Access
- Contextual
- Multimodal
- Collaborative



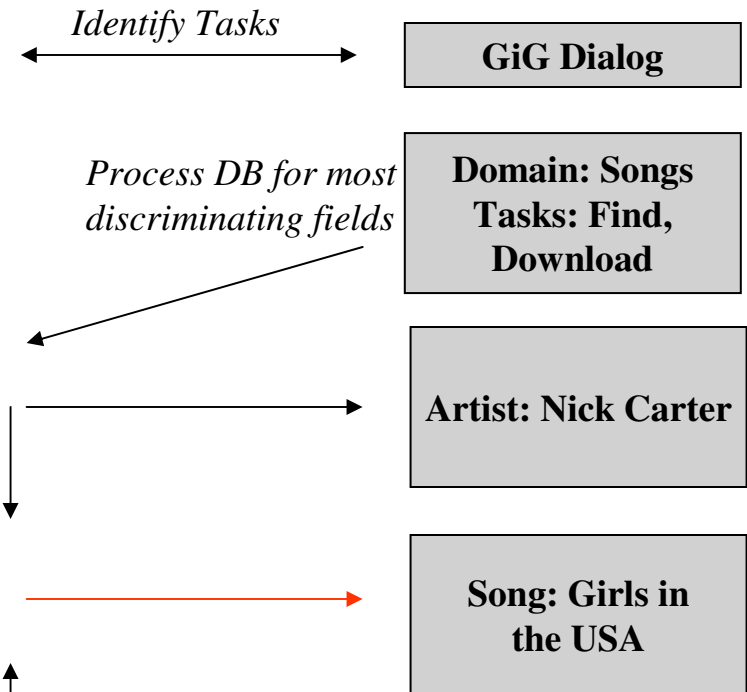
# Coming Revolution: Breakthrough in Speech Recognition



*Better than human performance for  
database lookup  
Scales to 100 Ms records*

Artist	Album	Song	Date	Genre		
①	④	②	⑤	③		
N.C.		ABC				
N.C.		<b>GITUSA</b>				
N.C.		XYZ				

Get Nick Carter's song Girls in the USA

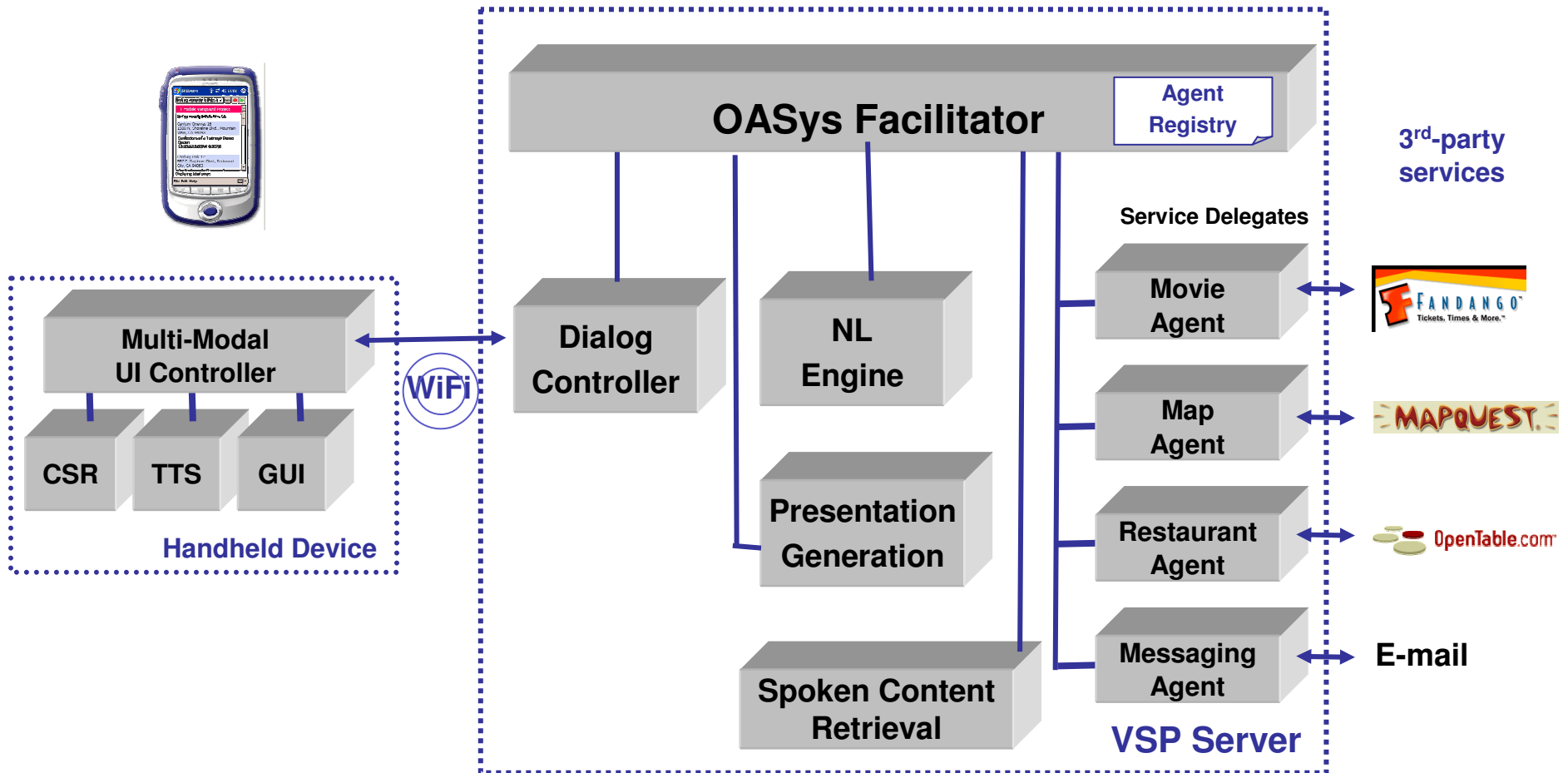


“Secret sauce”

Iterative hypothesis refinement  
Constraint-based optimization  
Prosody interpretation



# Demonstration: Contextual Access to Dynamic Community of Web Services



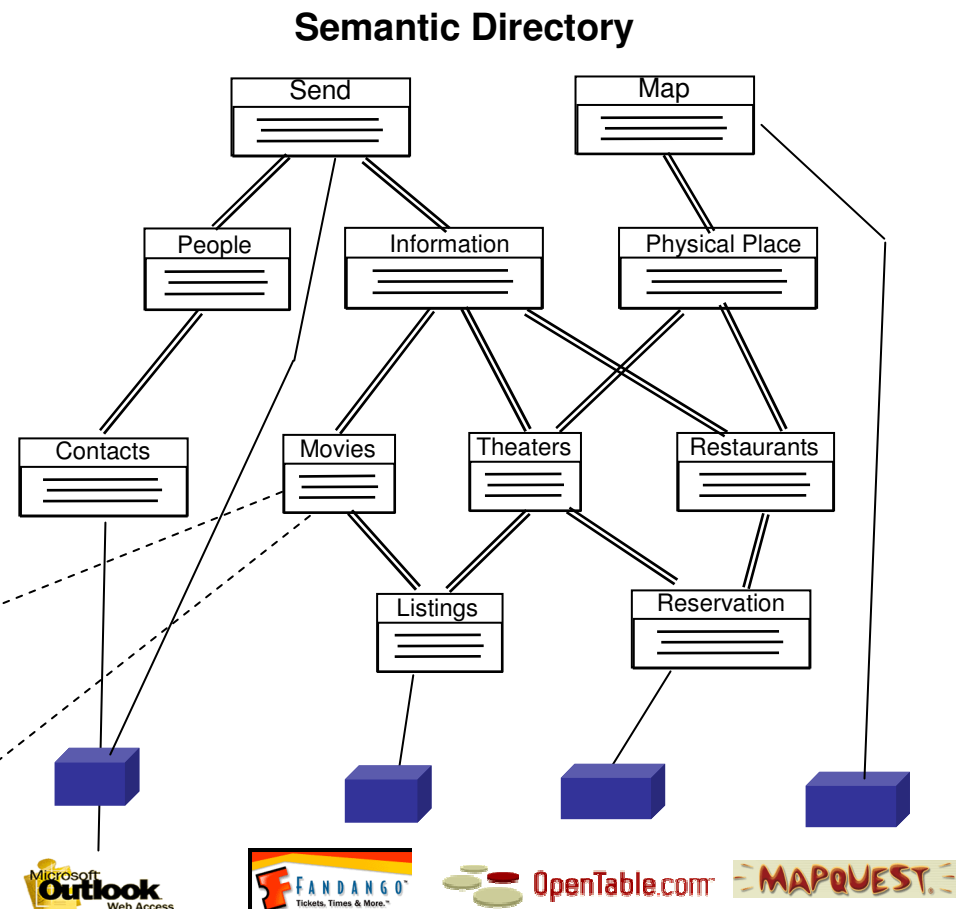
# Defining and Registering New Services

**Step 1:** Add new “knowledge class” (e.g movies) and link it into semantic structure defining the directory

**Step 2:** Define vocabulary for new knowledge class (e.g. “flick”)

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**Step 4:** Users subscribe to services



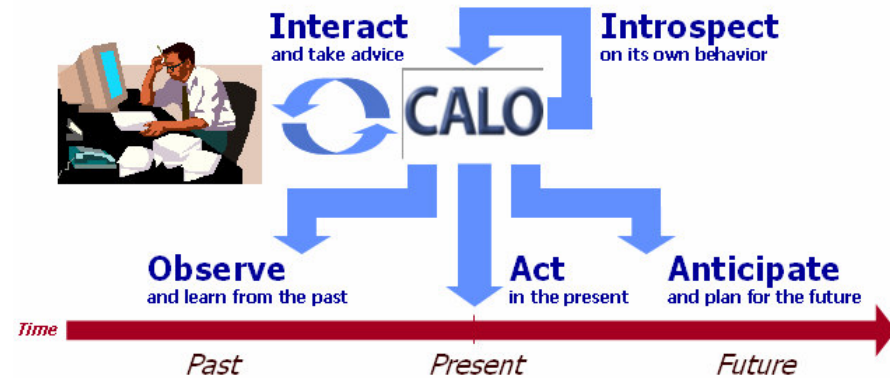
**Movies**

Name	Genre	Rating	Actor	Director
Monster	Drama	R	Theron	Jenkins
Passion	Drama	R	Caviezel	Gibson



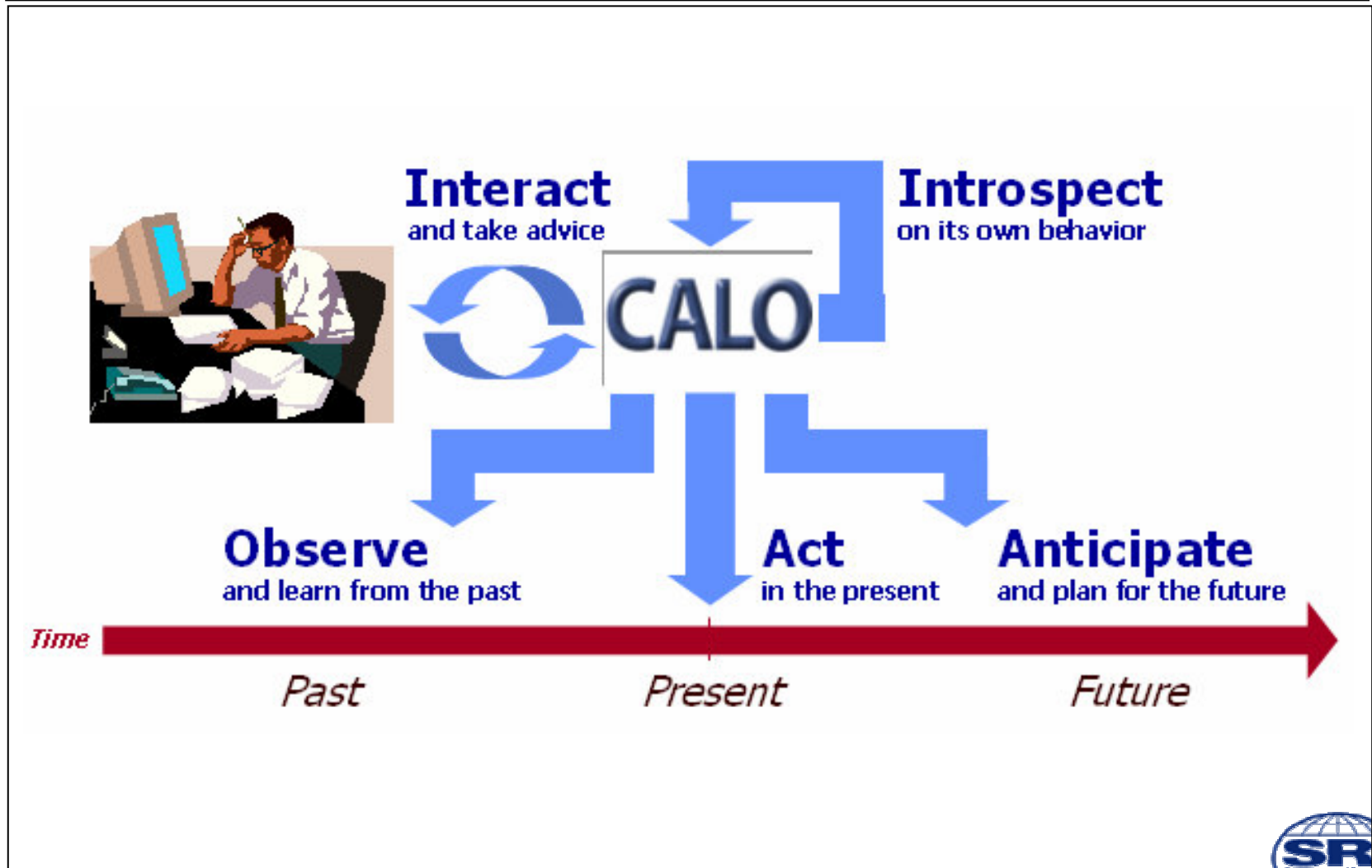
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- ➡ 10. Intelligent learning software leverages and organizes information



# 10 – Intelligent learning software leverages and organizes information

CALO – Cognitive Assistant that Learns and Organizes



# CALO: Cognitive Agent that Learns and Organizes

- DARPA Funding \$160M over 5 years (beginning Yr 3 in Oct)
- SRI Leads 25 Universities and Commercial Labs
- Objective: Build a Personal Assistant that Learns (“in the Wild”)

## New software architecture

Adapt to changing situations without constant reprogramming

## New techniques

Innovations in machine learning, reasoning, perception, and multimodal interaction

## CALO Functions

<b>Organize and Manage Information</b> <ul style="list-style-type: none"><li>– Manage email, documents, web info</li><li>– Organize information by tasks and user activities</li></ul>	<b>Prepare Information Products</b> <ul style="list-style-type: none"><li>– Prepare meeting, event info packages</li><li>– Organize and assemble reports, summaries</li></ul>	<b>Observe and Mediate Interactions</b> <ul style="list-style-type: none"><li>– Monitor meetings, email threads, chat</li><li>– Record meeting discussion, events, actions</li></ul>	<b>Monitor and Manage Tasks</b> <ul style="list-style-type: none"><li>– Organize and monitor task execution</li><li>– Monitor due dates, perform time management</li></ul>	<b>Schedule and Organize in Time</b> <ul style="list-style-type: none"><li>– Schedule meetings, events, tasks</li><li>– Organize task dependencies, preconditions</li></ul>	<b>Acquire, Allocate Resources</b> <ul style="list-style-type: none"><li>– Locate, acquire, allocate resources (equipment, facilities, people) in response to needs</li></ul>
--	---	--	--	---	---

# Summary

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- Disruptive changes coming in the world of information management
  - Extrapolating forward gives some vision of what supply chain technology will be like
- A vision of the future presents opportunity
  - How to leverage strengths?
  - What role(s) to play?



---

**Thank You.**



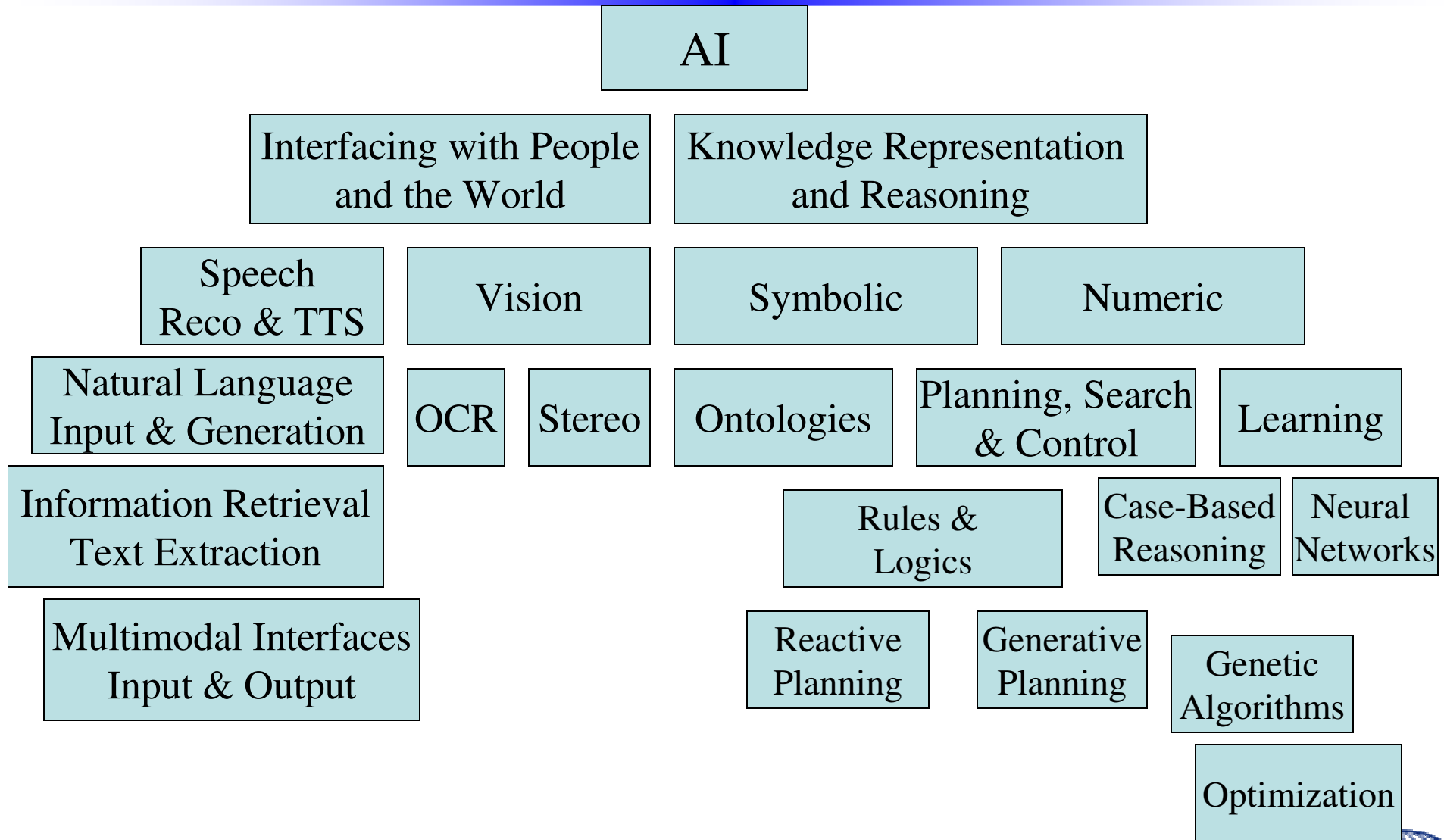
Adam Cheyer  
SRI International  
Program Director  
Cognitive Computing Group  
adam.cheyer@sri.com  
(650) 859-4137  
<http://www.adam.cheyer.com>



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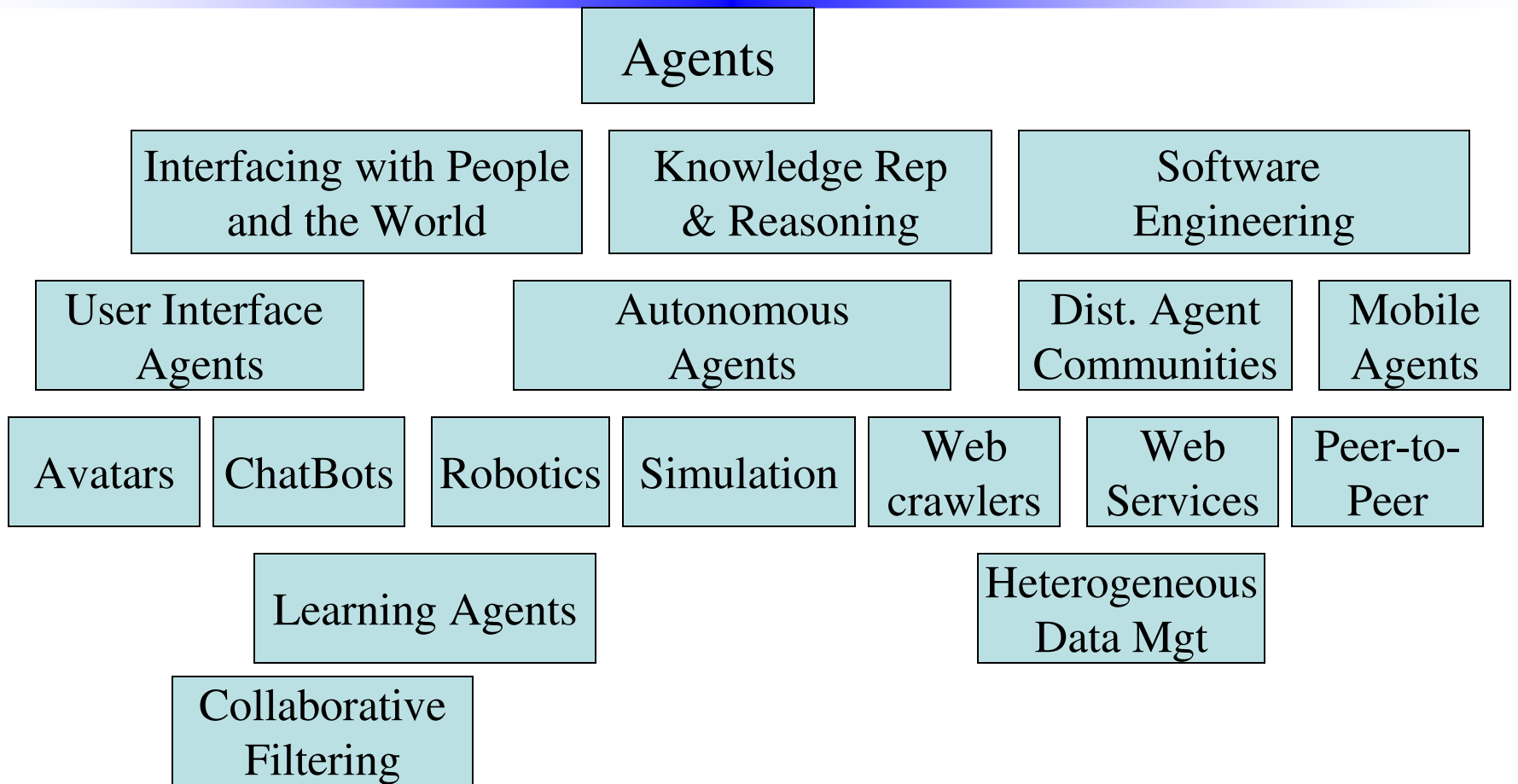
# Backup

# Artificial Intelligence Landscape



Cheyen 2001

# The Agent Landscape



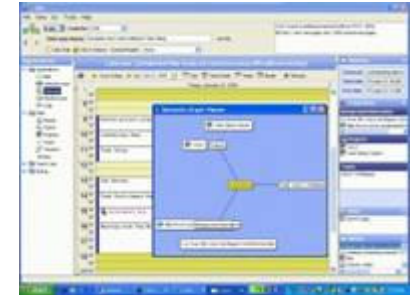
# Interesting Companies: AI/Agents for SCM

- Optimization: ILog powers SC planning, forecasting, routing, scheduling and optimization for companies like SAP, Oracle, I2, etc.
- Configuration: Trilogy manages configuration and translation of products throughout the order lifecycle
- Natural Language: Sybase, iPhrase, and Nuance are creating NL and speech interfaces to enterprise data for CRM and other apps
- Rules: BiosGroup and BlackPearl both offer enterprise products combining modeling, rules, and multi-goal optimization
- Agent & Web Service based enterprise integration
  - Enhanced Workflow: Agentis Software, Action Technologies, iSpheres
  - Facilitated models: HP's Talking Blocks
  - Mobile agents: Electron Economy
  - Ontology-based Integration: Verticalnet, Frictionless Commerce, Unicorn

# **IRIS: Integrate. Relate. Infer. Share.**

- **Need**

- Unified, personalized subscriber experience
- An information integration platform
- An enterprise application for organizing a user's work life



- **Approach**

- An ontology-based knowledge base provides unified, expressive representation of disparate content
- Machine learning automates much of the work of creating a personalized view for the user

- **Benefits**

- User: Better organized, more efficient decision making
- Apps: A coherent view of disparate data
- Vodafone:
  - Ease of use, stickiness to subscribers, increased adoption rates
  - Potential for personalized, individualized portals
  - Targeted advertising and recommended sale
  - Overlays existing infrastructure, legacy systems

# IRIS: Integrate. Relate. Infer. Share.

The screenshot shows the IRIS application window with a search bar containing 'find appointments last week'. Below the search bar, a list of search results is displayed, including emails and tasks related to 'design'. The main content area shows a detailed view of an email with the subject 'CALO LSI design meeting today - 08/11 - Reminder'. The email body contains an agenda for a meeting at 2 p.m. in EJ 228. The right sidebar shows various related information, including 'Related Tasks', 'Related Projects', 'Categories', and 'CALO Suggests'.

Subject	Sen...	Date
[Calo-iris] [BLOG] Maya Design	Jack P...	8/18/2005 8:47...
[Fwd: Dashboard Design Status]	Lesle ...	8/15/2005 3:55...
CALO LSI design meeting today - 08/11 - Reminder	Girish ...	8/11/2005 11:3...
Re: Dashboard Design	Few, ...	8/7/2005 10:38...
CALO LSI design meeting today - 08/11 - Proposal	Girish ...	8/5/2005 12:05...
No CALO LSI design meeting today - 08/04	Girish ...	8/4/2005 11:03...
CALO LSI design meeting today - 08/04 - Proposal	Girish ...	8/1/2005 1:08 PM
CALO LSI design meeting today - 07/28 - Reminder	Girish ...	7/28/2005 1:03...
CALO LSI design meeting today - 07/21 - Reminder	Girish ...	7/21/2005 8:14...

**Subject:** CALO LSI design meeting today - 08/11 - Reminder  
**From:** Girish Acharya <acharya@ai.sri.com>  
**Date:** 8/11/2005 11:39 AM  
**Cc:** Adam Cheyer <adam.cheyer@sri.com>, Colin Evans <evans@ai.sri.com>, Jack Park <park@ai.sri.com>, Steve Hardt <hardt@ai.sri.com>, Ayse Onalan <onalan@ai.sri.com>, Rich Guil <richard.guil@sri.com>, David Dunkley <david.dunkley@sri.com>, James Carpenter <james.carpenter@sri.com>, Kenneth C Nitz <kenneth.nitz@sri.com>, David Martin <martin@ai.sri.com>, Jive Yu <jive.yu@sri.com>, Lynn Voss <loren.voss@sri.com>, Chris Bringham <christopher.bringham@sri.com>, Jason Rickwald <jason.rickwald@sri.com>

We are meeting at 2 p.m. in EJ 228. Please refer to calendar for call in details.

**Agenda:**

- \* Task approach - Girish Acharya
- \* Ever Note demo - interesting UI for To Do - Girish Acharya

---  
 \*/Girish Acharya/\*  
 \*SRI International\*

Extensible set of apps  
 Mail  
 Web  
 Files  
 Calendar  
 ...

Related info  
 People  
 Projects  
 ...

Learning creates structure

NL Query across structure



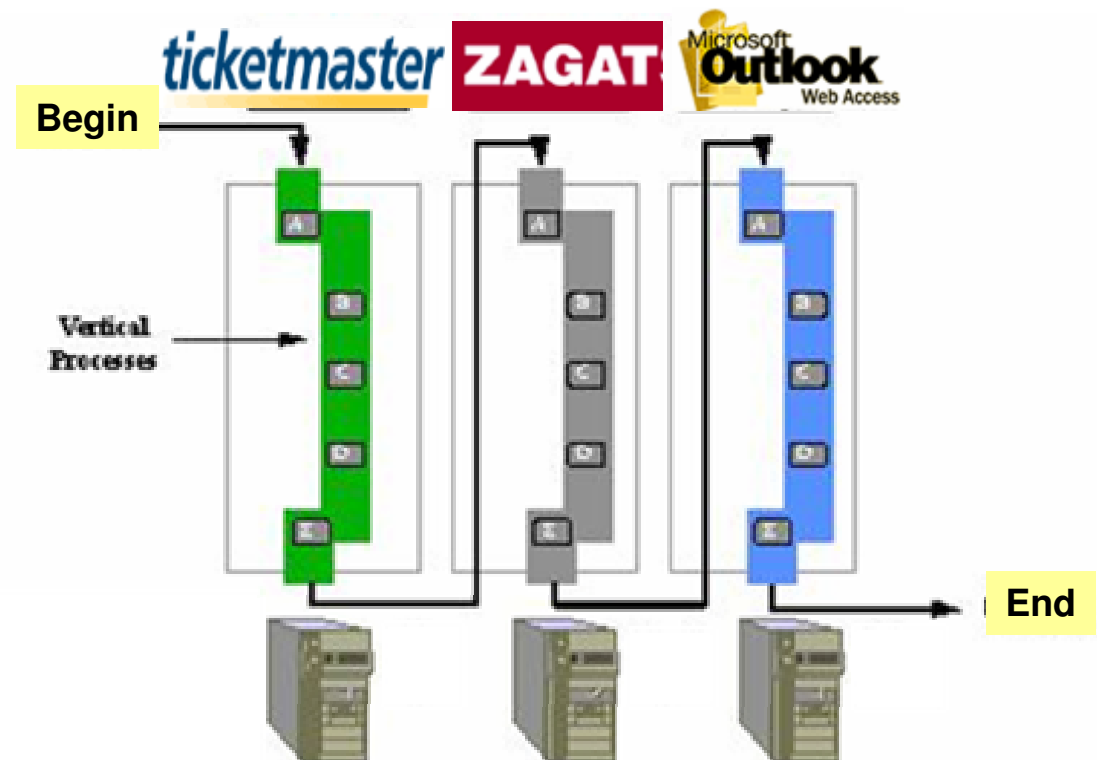
# Pain – Too many clicks to transaction



## Today's services are

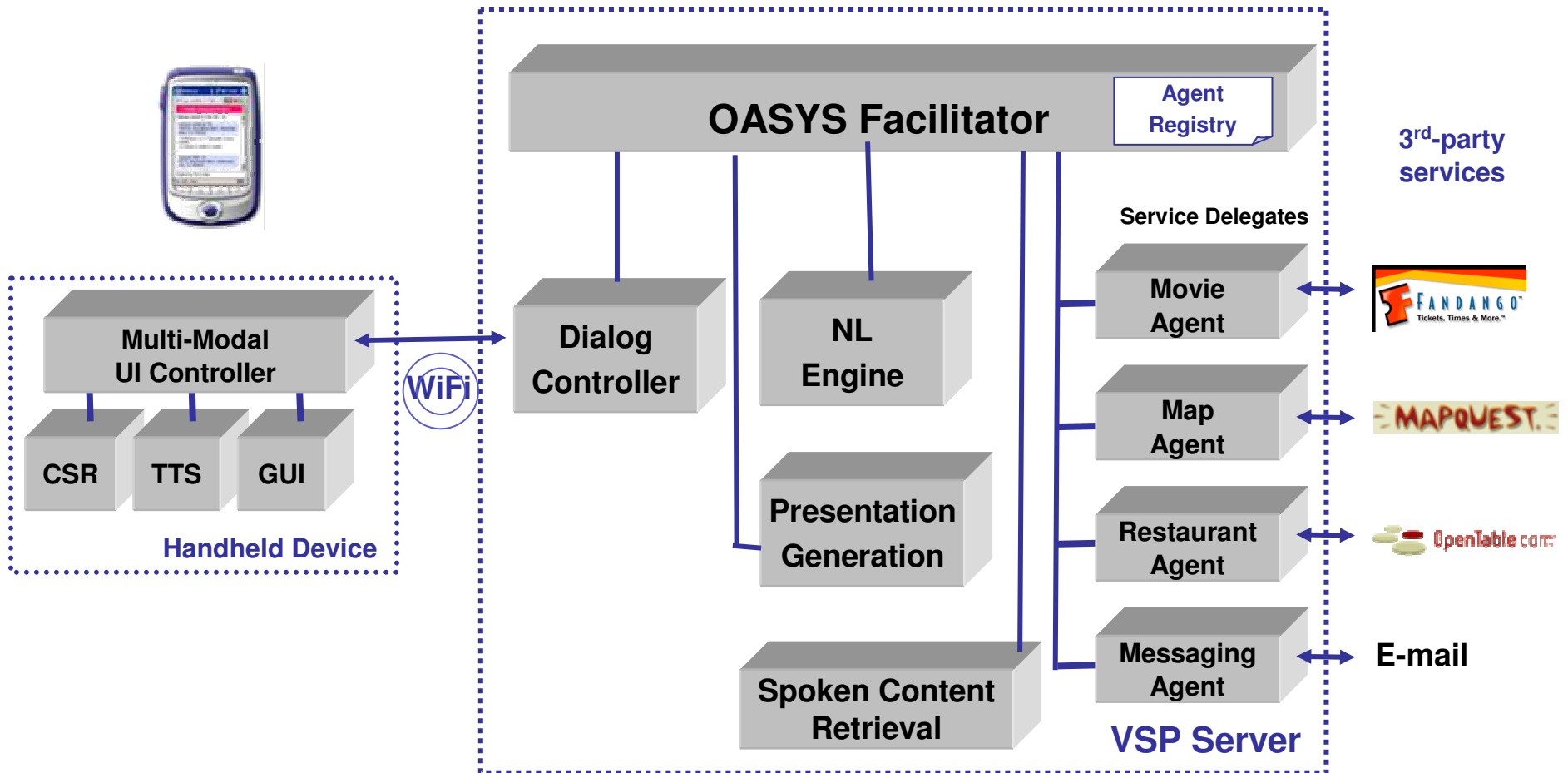
- System (menu) driven
- Stove-piped
- Redundant, requiring similar or overlapping functions
- Time-consuming, even with broadband access

“Schedule dinner and a show with friends”

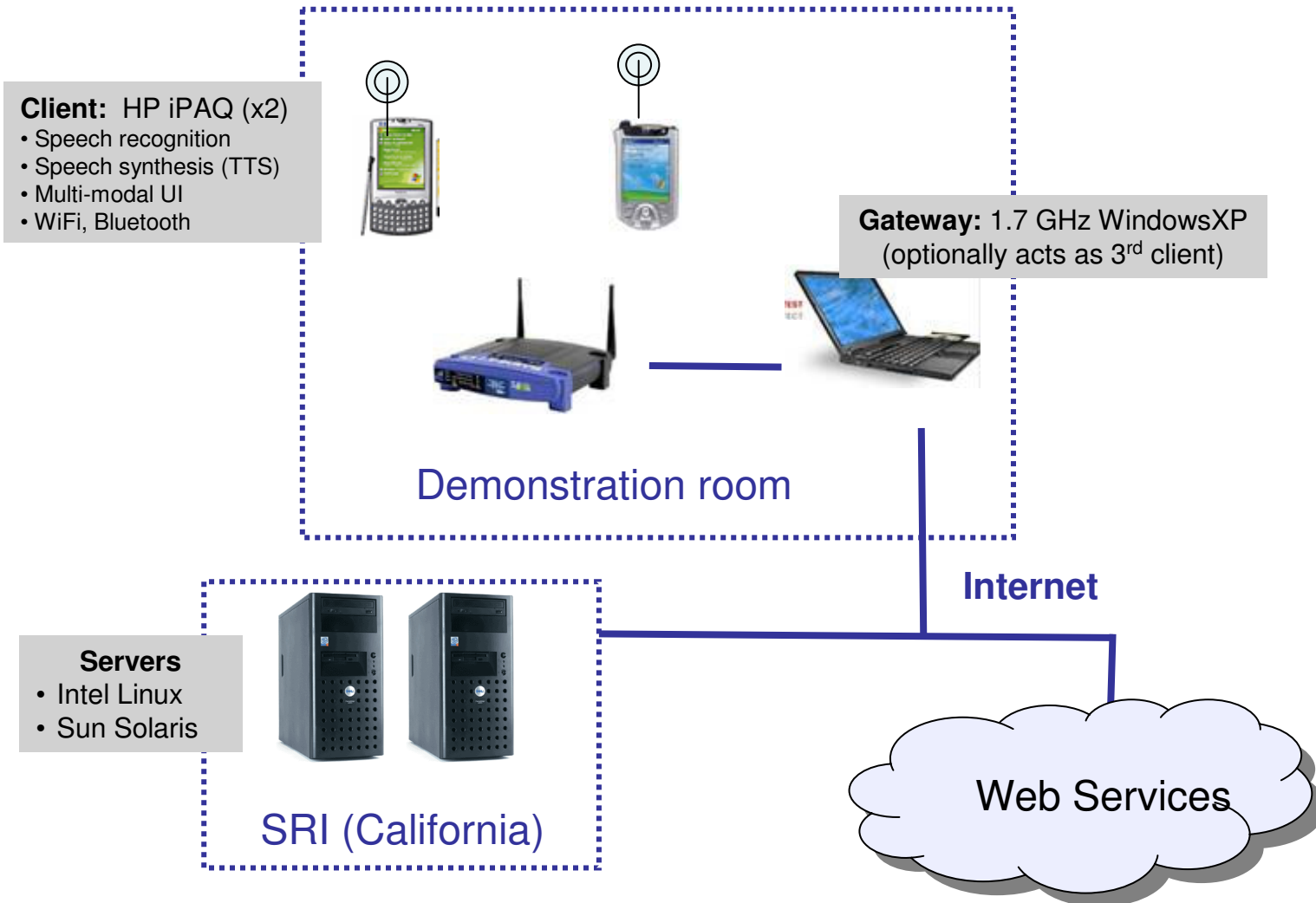




# OASYS Dynamic Service Integration Platform



# Demonstration Equipment



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