



# **Business Service Networks and Beyond**

**Rohit Khare with Jay M. Tenenbaum**

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**First IEEE Workshop on BSNs**

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# “The Promises of B2B”



- Conventional EAI/EDI:
  - requires large investments that only established trading partners can afford
  - only serves to automate existing trading patterns
- Internet Services:
  - promise an “open e-business platform where companies can do business spontaneously with anyone, anywhere, anytime”
  - “companies can build on each other’s services to create new services and link them into industry-transforming, network-centric business models”

# World's Largest B2B Network

**Pantellos**  
Global Utilities

**CORIO**  
APPLICATIONS ON DEMAND™



**TD** BANK FINANCIAL GROUP



**COVISINT**



**NTT Communications**

**comcert**

**swisscom**



**GUESS?**  
www.apparelbuy.com

**SYMIX**

**.commerx.**

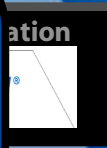
**MOORE**

**Truckxchange**

**Banamex**



**\$2 Trillion of Buying Power Connected**



**Schlumberger**

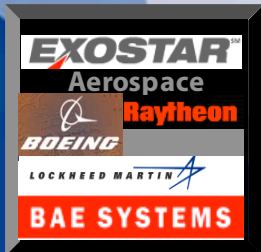
**S ESAMi**  
All Your Business Needs Online

**empactHealth.com**  
enabling healthcare e-commerce



**SIEMENS**

**CITI**  
Citibank



**omnicell.com**

**WELLS FARGO**



**eScout.com**

**CABLE & WIRELESS OPTUS**



**MOVIE MAGIC MARKETPLACE**  
Film and Television

**COMPAQ**

**COMMERCE ONE**



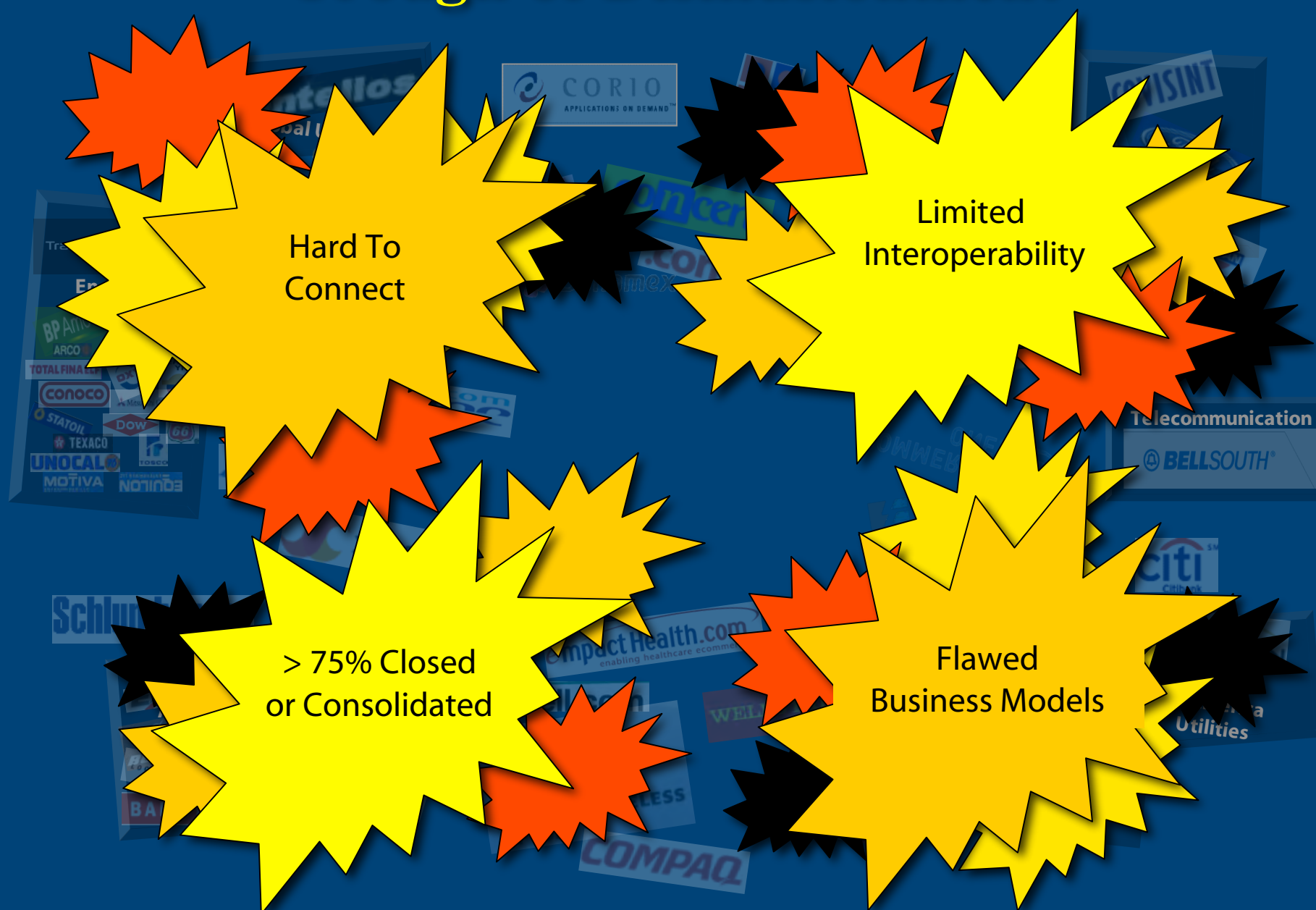
# Trough of Disillusionment

Hard To  
Connect

Limited  
Interoperability

> 75% Closed  
or Consolidated

Flawed  
Business Models





## Why did anyone believe in them?

- **... much less invest untold sums into the “New Economy” of B2B dotcoms?**
- **A: However utopian it may seem, the real world does manage to work this way!**
  - Businesses “do business” with each other almost anyone, almost anytime, and almost anywhere. So shouldn't our software, too?



# Who cares about BSNs, anyway?

- “Three generic buzzwords, shuffled”
  - Business Service Grids
  - Business Service Networks
  - Business Services Network
  - Next-Generation Service Providers
  - Service-Oriented Architecture
  - Web Service Grid
  - Grid Web Services
  - ...
- Without a clear definition, how can industry possibly care about “BSNs”, much less build and use them?



# We've cared for a *long* time...



# CommerceNet's Founding Vision



- **Jay M. Tenenbaum has believed in some form of this vision for over two decades.**
- **CommerceNet has pioneered commercial use of the Internet for over a decade.**
  - First credit-card transaction over the Web
  - First security protocol for the Web
  - First secure Web browser
  - First measurements of Web users
  - First XML common business formats
  - ...





## OK... but who else cares?

- Clearly, the IT industry is in the grip of a much-hyped “Web Services” movement
  - Does that mean we’ve already won?
- But so far, WS has been “introverted”:
  - WS adoption being driven by internal IT architects
  - WS-\* technology stack developed as EAI++
  - Public Web Services have mainly been machine-readable versions of existing website functionality
    - Amazon, eBay, Salesforce, PayPal, Flickr, ...
- Relatively little evidence of industry-wide or cross-industry interoperability

# BSNs Must Be “Extroverted”



- ‘Business services’ are not ‘web services’
  - *FedEx* is a business service!
  - *SetOriginatingZipCode()* is only a web service...
- Business services should become *easier* to reuse than smaller-scale components
  - Expect document-centric protocols, not APIs
  - Expect event-driven interfaces, not ACID RPCs
- We’ll know we’re succeeding when different firms start sharing interfaces
  - Seek pilot projects that connect entire industries

# BSNs Support Decentralization



- The fundamental reason anyone should care about BSNs is the emergence of a decentralized “New Economy”
  - The “New Economy” celebrated dramatic efficiency gains within traditional firm structures
    - “The World’s Largest Bookseller”
    - “The World’s Largest Music Store”
    - ...
  - The “New Economy” is our vision for a world where networks of firms can coalesce in real time to pursue new business opportunities
    - Related to concepts like swarming, social networks, simulations...
    - Formally, decentralization is an inevitable response to fundamental physical and social limitations (latency & agency)

# Overview of this Talk



- *Business Services Networks:  
Delivering the Promises of B2B*
  - Our position paper
- *Decentralizing Web Advertising*
  - A challenge problem beyond today's BSNs



# **BSNs: Delivering the Promises of B2B**

**Based on CN-TR-05-01**



# Our Definition of BSNs

- “Internet business communities where companies collaborate through loosely-coupled business services.”
  - **Community:** It’s made of people...
  - **Collaborate:** It’s not just about transactions...
  - **Loosely-coupled:** It can’t be procedure calls...
  - **Business services:** It can’t stay at machine-level...
- Our definition *presumes* that multiple, independent firms are working as peers

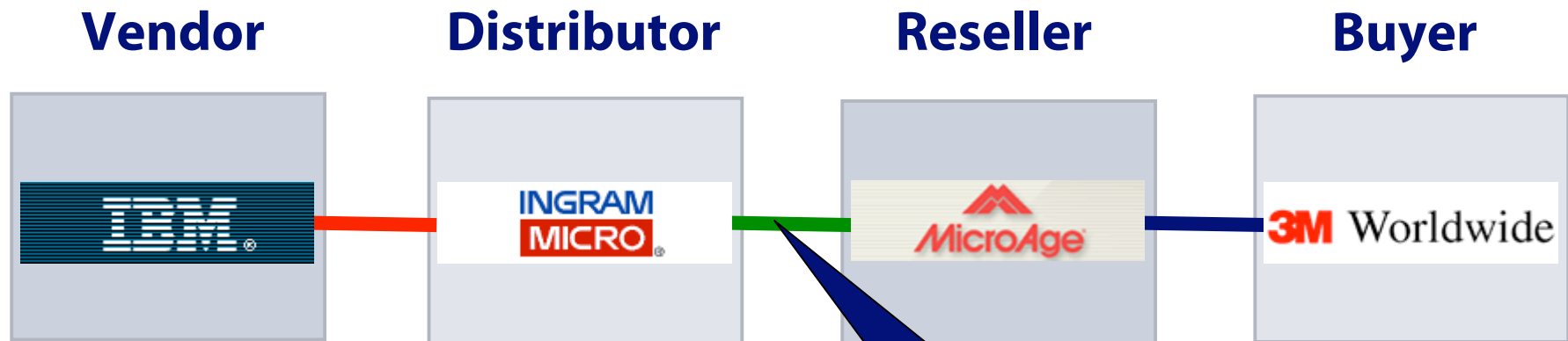




# The Power of BSNs

- BSNs can be public or private
  - ... *but always must be based on open standards*
- BSNs can be broad or narrow
  - *Look for horizontal, vertical, or geographic focus*
- BSNs can grow organically
  - *A single company can start with a single process*
- **BSNs should aspire to interoperate at the scale of business processes**
  - *Because firm-boundaries **are** much larger, and more stable, than any software component interface*

# Example: PC Industry



**\$100,000  
100 days per  
connection!**

# Example: PC Industry

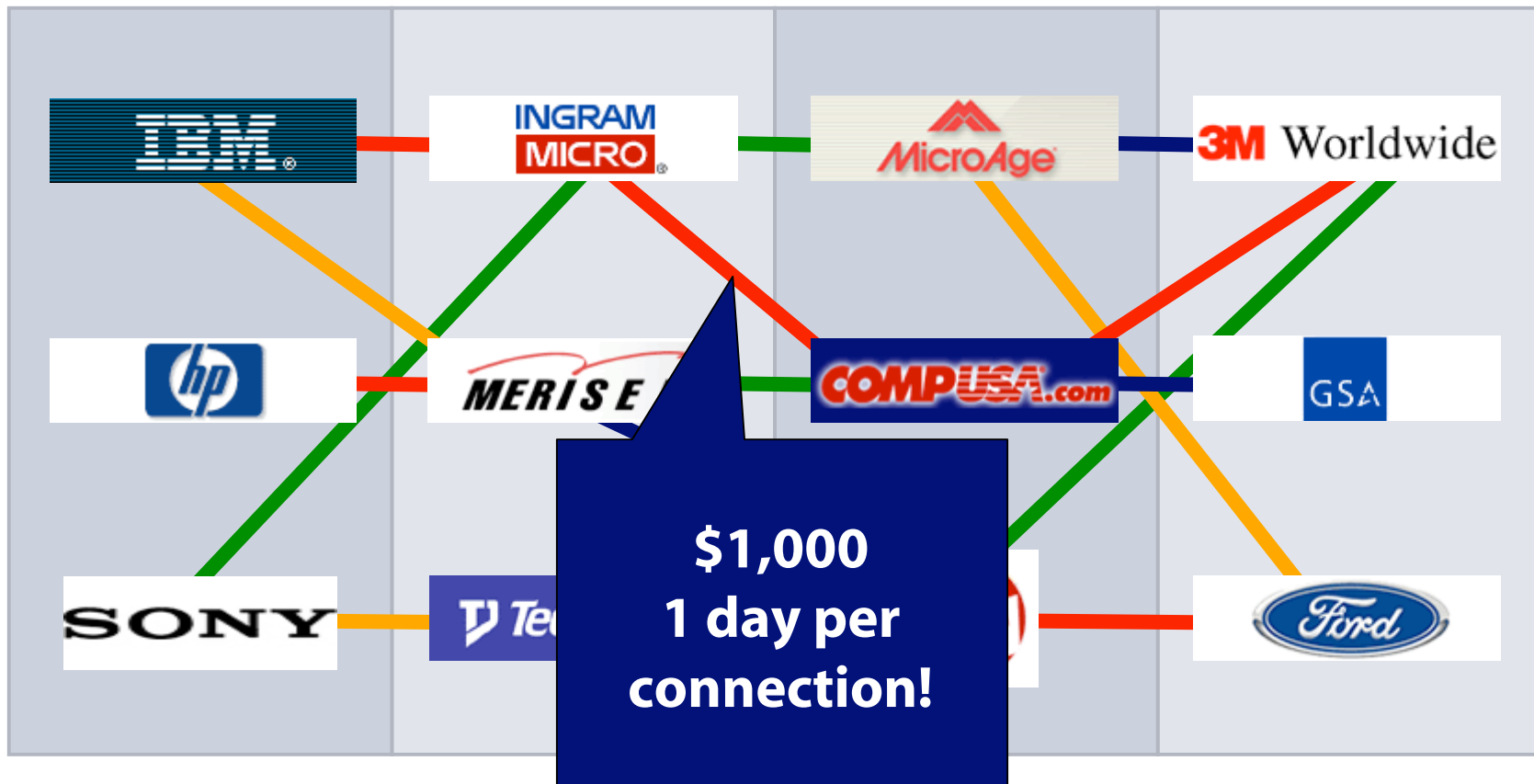


Vendors

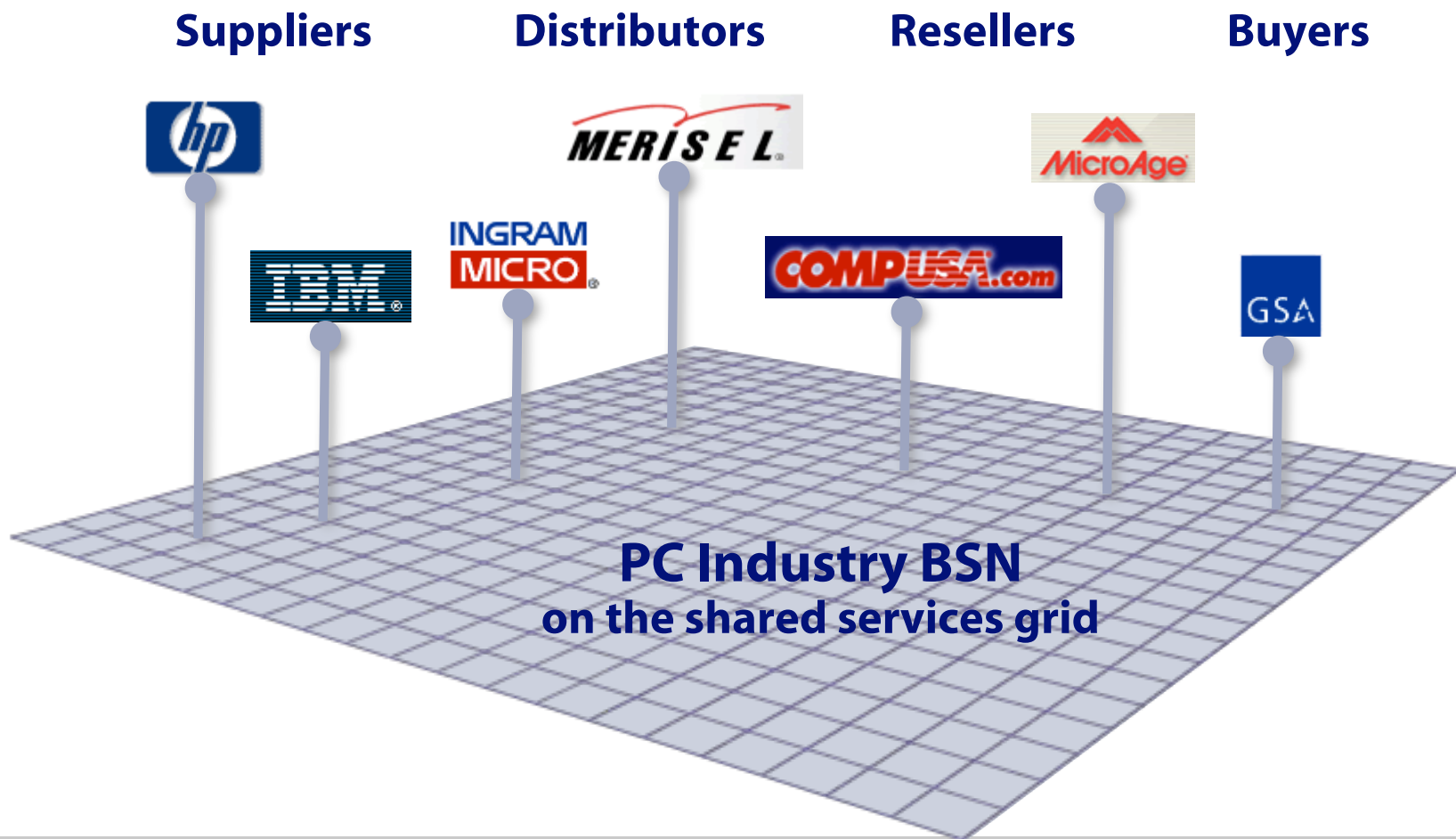
Distributors

Resellers

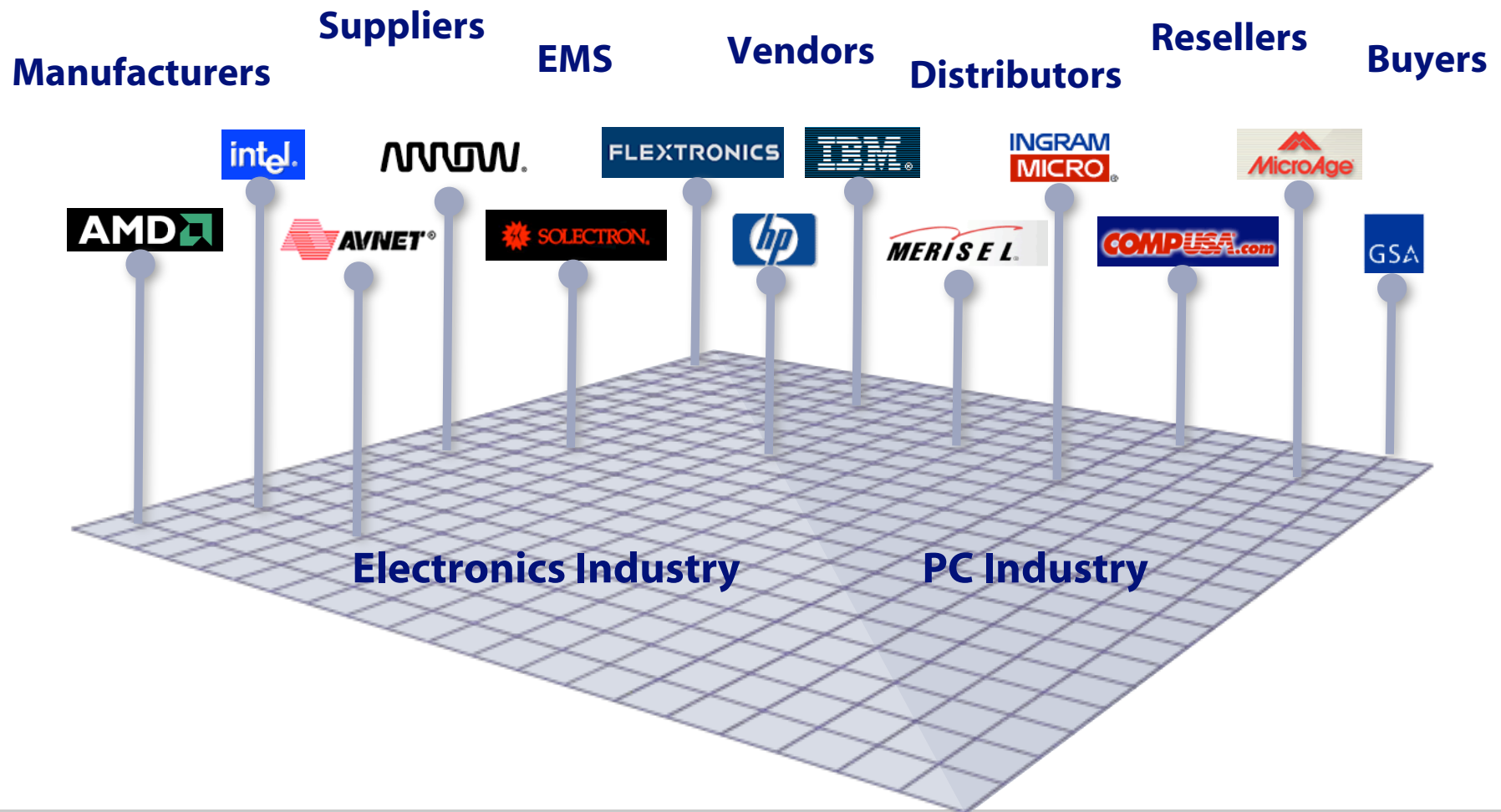
Buyers



# Example: PC Industry BSN (PCnet)



# Example: High Tech BSN





# The Evolution of BSNs

- **From sites to marketplaces to services...**
- BSNs offer four advantages:
  - **Removing integration barriers**
    - SMEs in particular lack resources and skills to tightly integrate
  - **Facilitating organic growth**
    - Registering & discovering services reduces deployment risks
  - **Allowing incremental automation**
    - Paper → web forms → structured documents → scripted agents
  - **Driving plug-and-play commerce**
    - Designed from the outset for Lego<sup>™</sup>-like composability



# BSN Adoption Milestones



- Four market forces driving BSN growth:
  - **Enterprises** will join industry-wide BSNs
  - **Software vendors** will provide BSN-compliant tools, especially as hosted services
  - **Business service providers** will use BSNs as distribution channels
  - BSNs will affiliate with **each other** and legacy business networks

<i>Credit Card Networks</i>	Visa, MasterCard
<i>ATM networks</i>	Plus, Cirrus
<i>Airline reservations networks</i>	Sabre
<i>Interbank payment settlement networks</i>	SWIFT, ACH, FedWire
<i>Stock exchange networks</i>	NYSE, NASDAQ
<i>Public EDI networks</i>	GXS, Sterling
<i>Supply chain management networks</i>	Wal-Mart, Dell, Flextronics, E2open



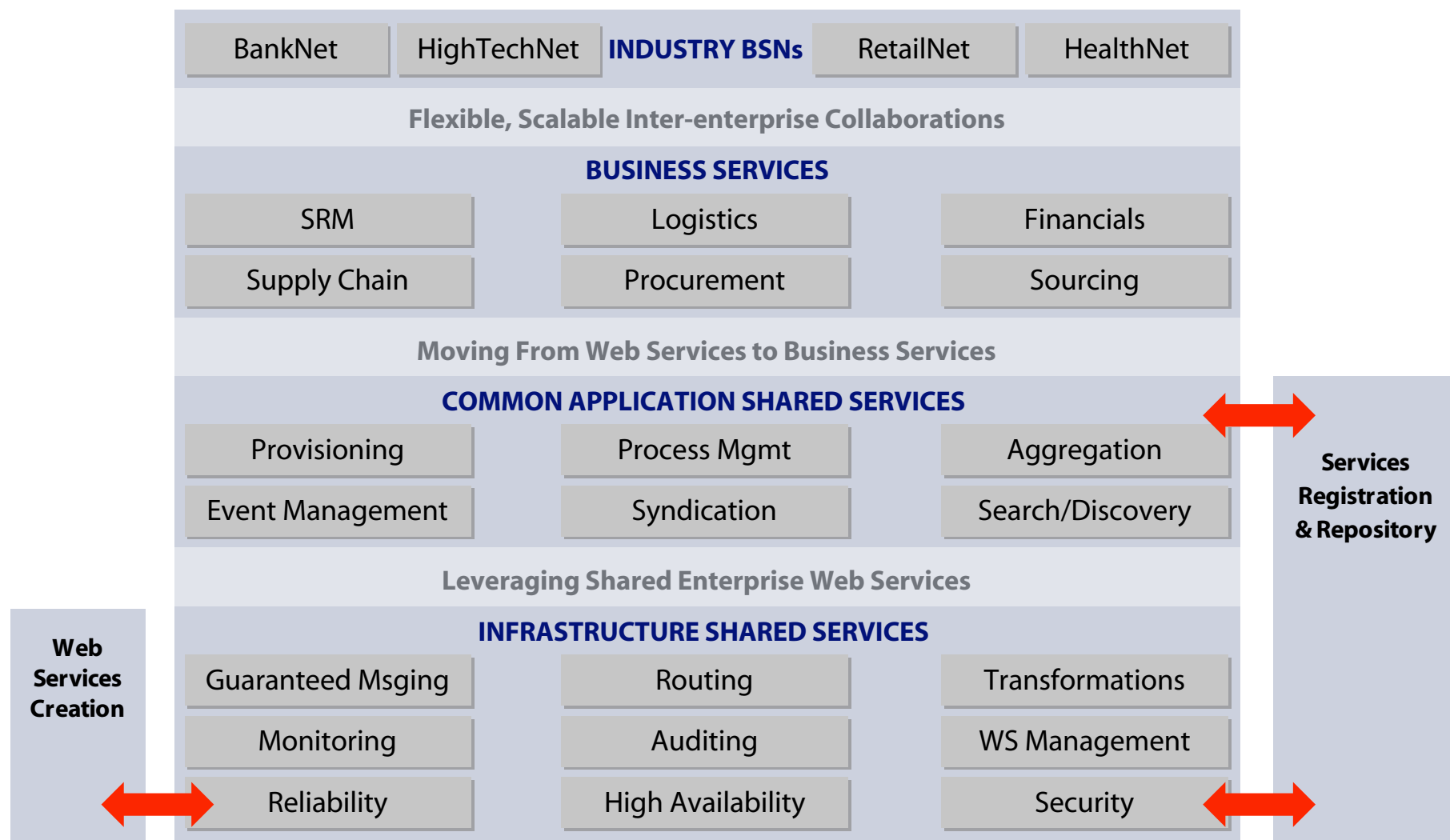
# Technical Foundations of BSNs

- **The enabling technologies for BSNs did not exist until quite recently**
  - Many of the relevant WS-\* specs are still immature
- **“Few organizations are focusing on business level interoperability; they will not magically ‘plug and play’ without that”**
- **CN’s design is *eCo II*, a service-oriented successor to its 1996 *eCo Framework***
  - Self-provisioning onto the CommerceNet is key
  - Not a standards body; goal is to profile & translate



# The eCo II Architectural Stack

Web Services Standards and Protocols – UDDI, WSDL, SOAP, BPEL...



# Realizing the BSN Vision



- **CommerceNet is a unique organization with a 10-year history of accelerating innovation in electronic commerce**
- **We have three guidelines for sponsorship:**
  1. The industry is experiencing significant pain
  2. The industry has Internet initiatives & leaders
  3. No single vendor or 'channel master' dominates
- **Currently investing in startups and pilots:**
  - SupplyFX
  - SmartHealth
  - Webify

# Electronics Quoting (with SupplyFX)



- Electronics industry includes many SMEs
  - Generating competitive quotes for a bill-of-materials (BOM) from several distributors can take a week of back and forth phone and fax
    - Also requires intimate knowledge of product catalogs to map codes
  - Paper-based process also complications supplier-selection policy compliance and performance measurement / spend analysis
    - On both the buyer and distributor side, by the way.
- CN seed-funded a startup to pilot a BSN
  - The first product, QuoteFX, even works with Excel
  - Well over a billion dollars of aggregate quotes
  - Recently closed a Series A venture capital round

# QuoteFX is Part of an Ecosystem



- It's a hosted Web application
  - Charges monthly fees, not a "tax" on volume
  - Works via email, fax, EDI, Excel uploads, and WS
- Complementary service providers
  - Logistics companies interested in shipping leads
  - Banks interested in financing purchases/factoring
- Incremental integration with others
  - Distributors interested in direct connections to ERP
- Platform for more business processes
  - Increasingly used as a sales-force automation tool
  - Looking to expand into inventory, planning, ...



# HealthConnect *(with Webify)*



- Pilot BSN to connect payers & providers
  - US Healthcare has 280K providers, 1.2K payer
  - First service: real-time eligibility verification
  - Next: submit and track claims across insurers
  - Future: support consumer-directed care by billing through to personal Health Savings Accounts
- Goal: “point-of-sale” charge settlement
  - Within the year, doctors will be able to determine who’s covered, for what, and for how much **during** a office visit

# Smart Health (*with Smart Valley*)



- A Regional Health Information Network
  - Pursuant to the National Healthcare Infrastructure Initiative (NHII), regional link-ups are essential
  - Smart Valley is a community action program supported by high-tech and life-science businesses
    - Provided key seed funding for CommerceNet itself, too
- Starts with a specific business problem
  - Clinics that routinely see each other's patients
  - Clinicians who are already inclined to adopt IT
  - A secure hosted Electronic Medical Record is key
  - Eventual expansion to include pharmacies, etc

# Smart Health as a BSN



- Unlike previous initiatives, this BSN can:
  - Reduce the cost of adoption by eliminating any central patient registries in favor of peer-to-peer
  - Encourage widespread participation across both clinical and administrative (payment) processes
  - Enabling appropriate experimentation with data models, security models, storage and networking.
  - Creating a “test bed” for innovative healthcare, integrating monitoring from “bench to bed”
- For more information, see CommerceNet Technical Report 05-03, *Smart Health: A Flexible, Open Path to Community Health Interoperability*



# **Decentralizing Web Advertising**

**A challenge problem beyond  
Today's BSNs**

# BSNs Support Decentralization



- BSNs are what comes after the reign of point-to-point, client/server services.
  - No one party can be in “in charge” of all transactions
  - No one party may even be able to enumerate all the parties involved in providing a service
  - Every party must reserve the right to *disagree*
- The Now Economy
  - What happens when you “blow up the center”?
  - How can we build B2B exchanges without hubs?
  - How can peer-to-peer systems ever stabilize well enough to work?



# A Brief Illustration: *Advertising*

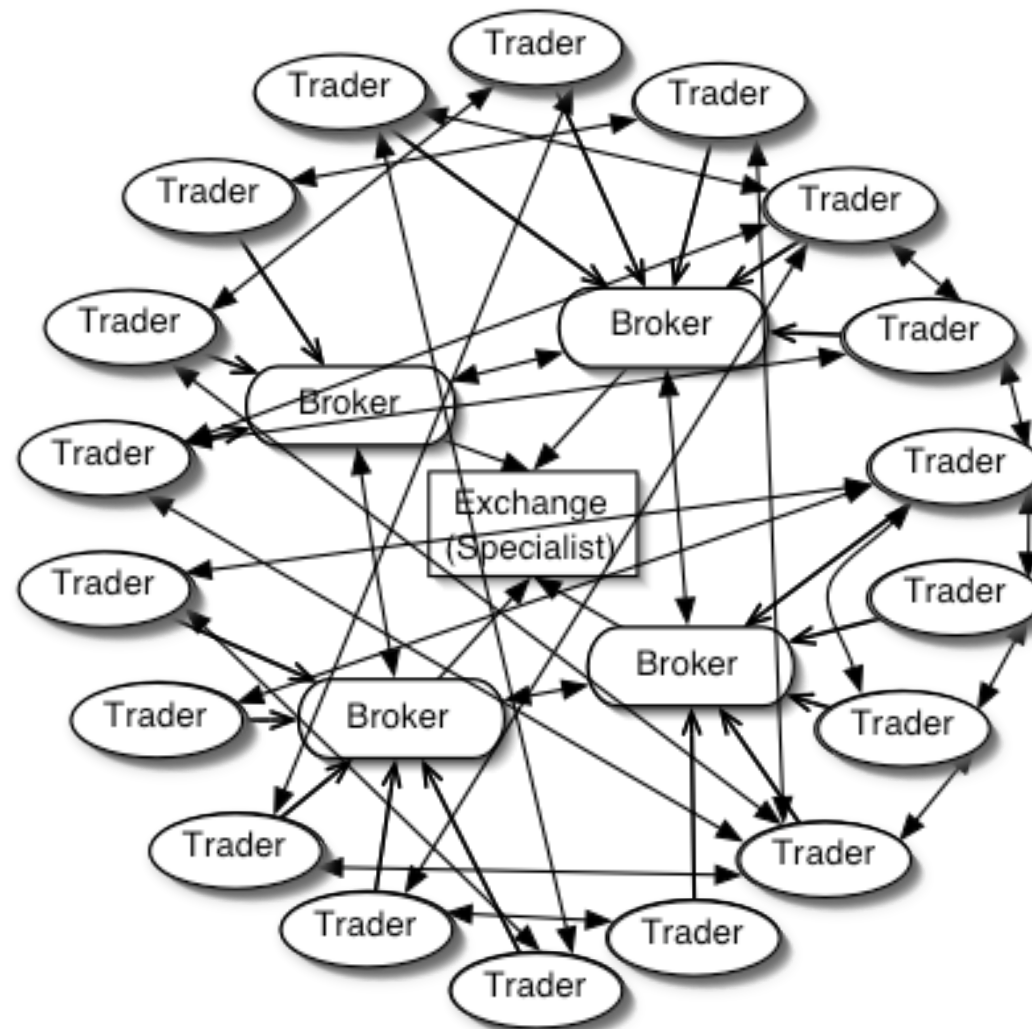
- One of the hottest e-commerce stories is the (re)emergence of Web advertising
  - Overture and Google's keyword ad networks make billions of dollars, a nickel at a time
  - Creating a "place" where myriad diverse advertisers and publishers can meet
    - But they control **who** can advertise
    - and **what** can be advertised and **how**
    - as well as **which** ads go on each page
    - and **how much** they sell for, and their take.
- Regardless of their public WS APIs, these are **not** BSNs... yet



# Our View of Market Evolution

- **Centralized — NYSE**
  - A single server is “in charge” of all transactions
- **Distributed — NASDAQ**
  - Multiple servers coordinate the illusion of a market
- **Decentralized — FOREX**
  - Independent servers form trusted networks
  - No single “correct price” & potential for abuse
  - ... but dramatically more robust & flexible
- Decentralized markets require a new style of software architecture
  - Peer-to-peer, not client/server; Events, not RPCs

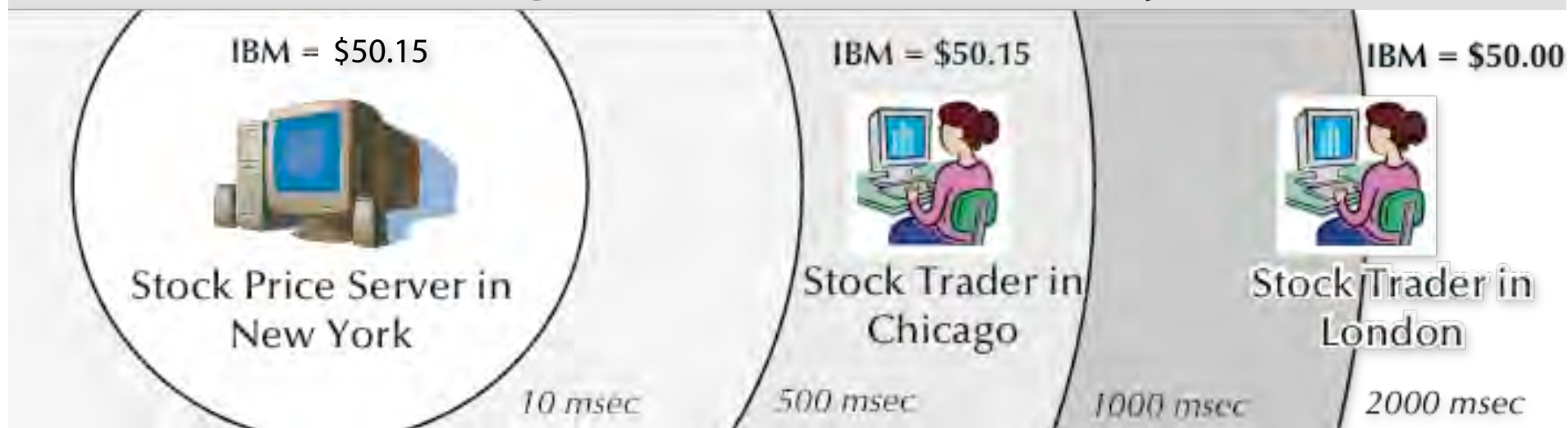
# Types of Marketplaces







# Decentralizing Force #1: Latency



- Latency can make simultaneous agreement *impossible* when it exceeds the rate of change.
  - The “Now Horizon” is an absolute physical constraint:
    - Propagation Delay (speed of light)
    - Bandwidth Limits (entropy)
    - Disconnection (buffering)

## Decentralizing Force #2: Agency

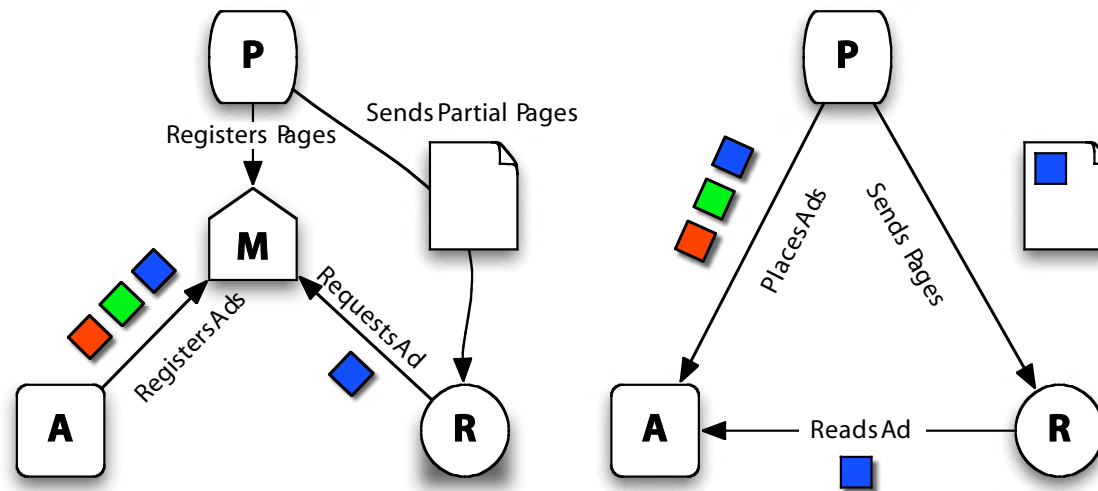


- Political independence is a *social* limit.
- The essence of an organization is the ability to compel its members to obey a decision.
  - “An agency boundary denotes the set of components operating on behalf of a common (human) authority, with the power to establish agreement within that set and the right to disagree beyond it.”
  - Other fields use synonymous terms such as ‘organizational boundary,’ ‘autonomous system,’ or ‘security perimeter.’

# A BSN For Decentralizing Web Ads



- **Today's ad networks are central hubs that intermediate (and charge for) transactions between several distinct players**
  - **Advertisers** want to pay **Publishers** only when **Readers** follow the ad link back to their site:



# BSNs Support Broader Ecosystems



- In the real world, there are many other policies that come into play:
  - Advertisers want to control what kinds of publications they appear in
  - Publishers want to control what kinds of products and services they are seen to advocate
  - Both parties want to prevent fraudulent 'clicks'
- There also are many other participants in the advertising ecosystem:
  - Media Buyers
  - Campaign Scheduling
  - Demographic Analysis ...

# How Can We “Blow Up the Middle”?



- We don't know how to eliminate the centralized ad market bottlenecks yet
  - Would the right ads get to (all) of the right sites?
  - Would more-sophisticated pricing policies apply?
    - Pay-per-click can be seen as selling “options” on ad slots
  - Could automated ad campaign agents stay “under budget” by adjusting supply/prices?
  - How would spammers and deadbeats be detected?
- *Would peer-to-peer real-time markets actually work in practice? And still be economically efficient?*



## **Forecasts & Conclusion**



# Future Research Themes

- The return of AI in the guise of BSNs
  - As open, multi-agency networks, BSNs defeat all the classic optimization techniques of ERP systems
    - We need software that works the way **people** work
  - linear programming  $\Rightarrow$  "taxicab assignment"
  - planning applied to service composition
  - information aggregation through inferencing
  - market signals / prediction
  - massively collaborative data collection
  - reputation management
- Case studies from crisis response — could BSNs reverse Conway's Law?



# Our Key Observations

- BSNs fulfill the promise of B2B:
  - “Every company an Amazon”
- BSNs build on “Web Services”:
  - elevates them to the business level
  - networks them into ecosystems
    - R/T “autonomic” supply webs, information-based medicine, self-optimizing logistics...
- Beyond BSNs: “reverse the arrows” and “blow up the middle”
  - Architectural styles for networks without hubs
  - New ways to organize (networks of) firms