Arch Rock Corporation

ARCHROCK

Beyond Virtual:

Expanding the Internet
to Interact with the Physical World

Roland Acra
President and CEO

Arch Rock Corporation
# History, Funding and Investors

- Based in San Francisco, CA
- Incorporated in May 2005
- Completed Series A funding in October 2005
- Key Investors:
  - New Enterprise Associates (NEA)
  - Shasta Ventures
  - Intel Capital
- Building on:
  - Pioneering of wireless sensor networks: TinyOS, Motes, TinyDB
  - 10 years of previous research at UC Berkeley and Intel Research
  - 5 years of extensive wireless sensor deployments in the real world

Arch Rock Team

- **Roland Acra – President and CEO**
  - 20 years experience in leading corporations of networking industry
  - CEO at Procket Networks, Senior VP at Cisco Systems, Engineering at 3Com

- **Dr. David Culler – Chairman, Co-Founder and CTO**
  - UC Berkeley Professor and Vice Chair, Founding Director of Intel Research Berkeley
  - National Academy of Engineering, ACM and IEEE Fellow, Presidential Faculty Fellow
  - TinyOS Principal, NOW Principal, Founder AI Arch., TAB Inktomi, TAB ExpertCity

- **Dr. Wei Hong – Co-Founder and VP of Engineering**
  - Key technical lead of sensor networking research at Intel Research Berkeley
  - Enterprise software and database architect at Informix and Peoplesoft

- **Key staff members**
  - UC Berkeley, Intel Research, PlanetLab, Microsoft Research, Intuit

Internet Networking

Enterprise Software

Embedded Systems
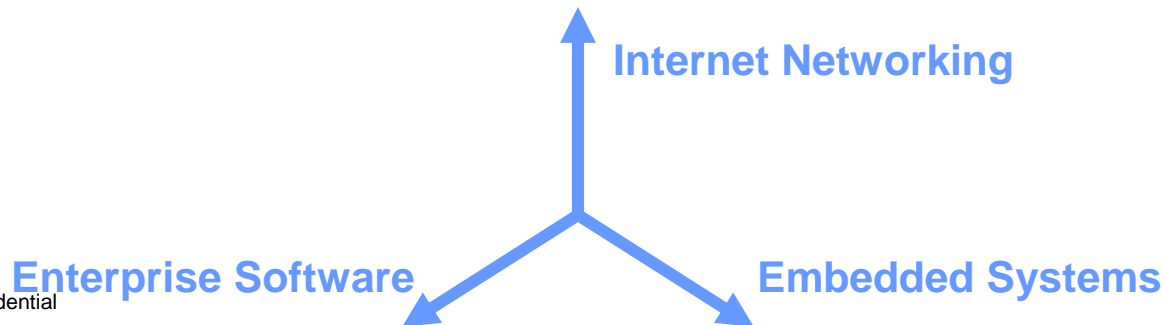
Team Experience and Inventions

- Designed, built, and distributed 3 generations of wireless sensor nodes – "Berkeley motes"
- Invented the leading OS and networking for sensor nets
- Deployed the leading, large-scale sensor net applications
- Created sensor net as a distributed database

Arch Rock Vision

Expand the Internet to harness and act on new information originating in the physical world of matter and space

- Generate new information from sensing the physical world

  - New touch of matter and space through sensing and control
  - Unprecedented reach and cost through wireless networking
  - Longevity through low-power hardware, software and radio

- Expand the Internet to harness and act on new information

  - The Internet is the proven scaleable information architecture
  - Tomorrow's information domain will include the physical world
 - Internet success paradigms must drive the extended architecture

Wireless Sensor Networks Today
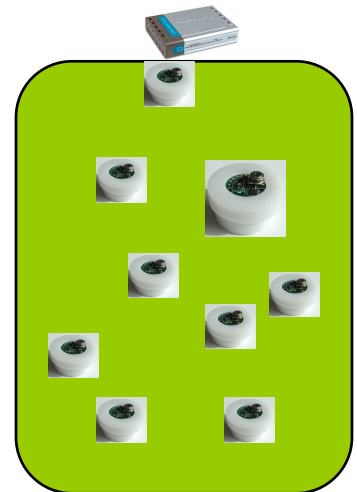
ARCHROCK

- What has been achieved
  - Great improvements over vertically integrated wired instrumentation systems
  - Benefits include: low-cost, flexibility, long life, low power, wireless mesh
  - Pioneered by the team of Arch Rock: TinyOS, Mote hardware, TinyDB

- What needs to be done
  - Remove barriers to large scale adoption, deployment, application development
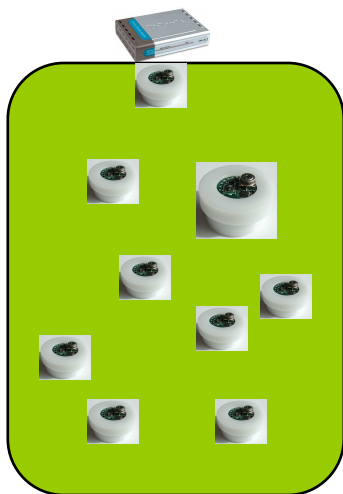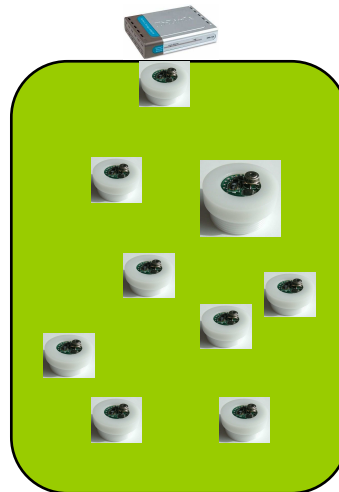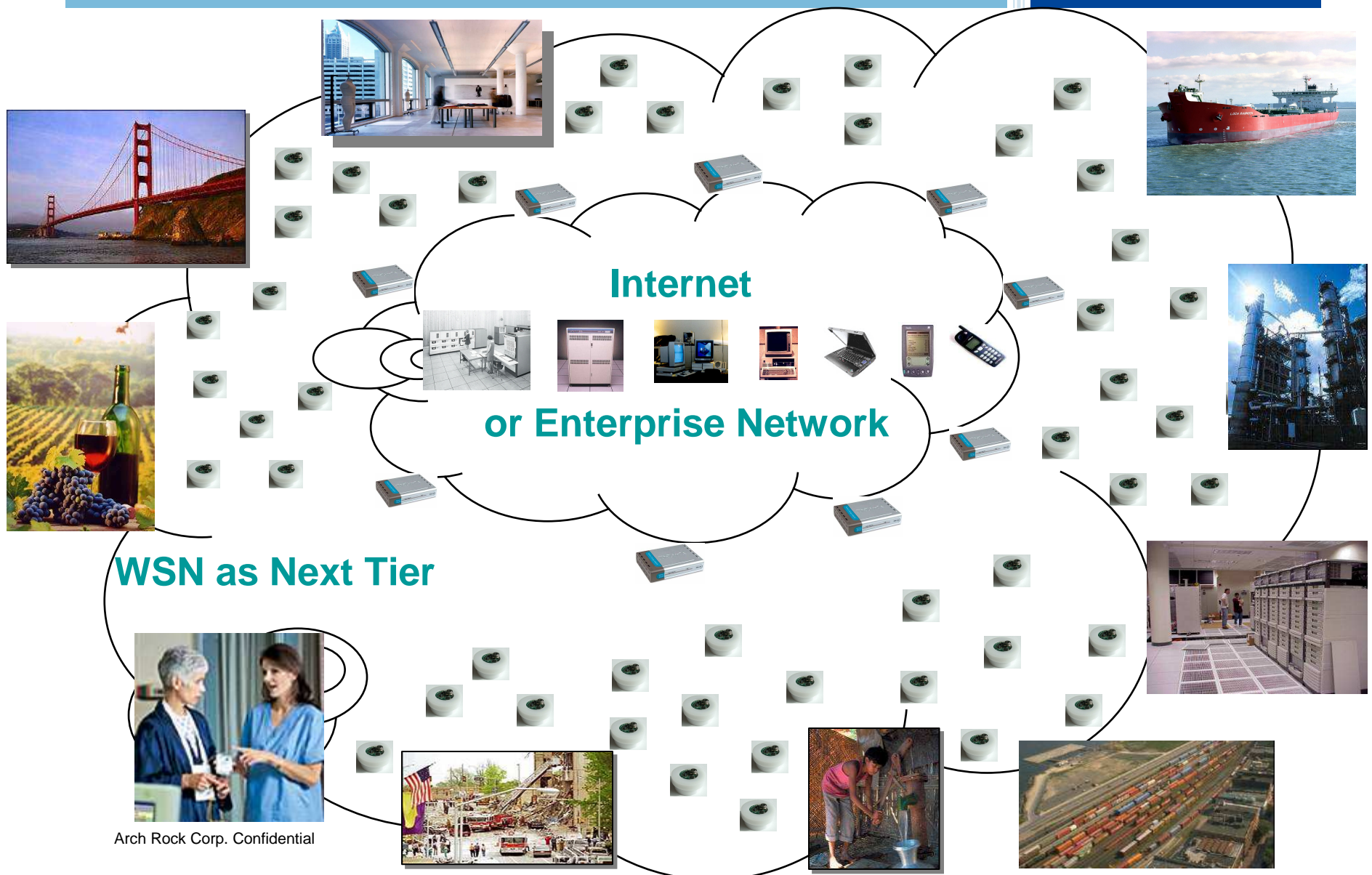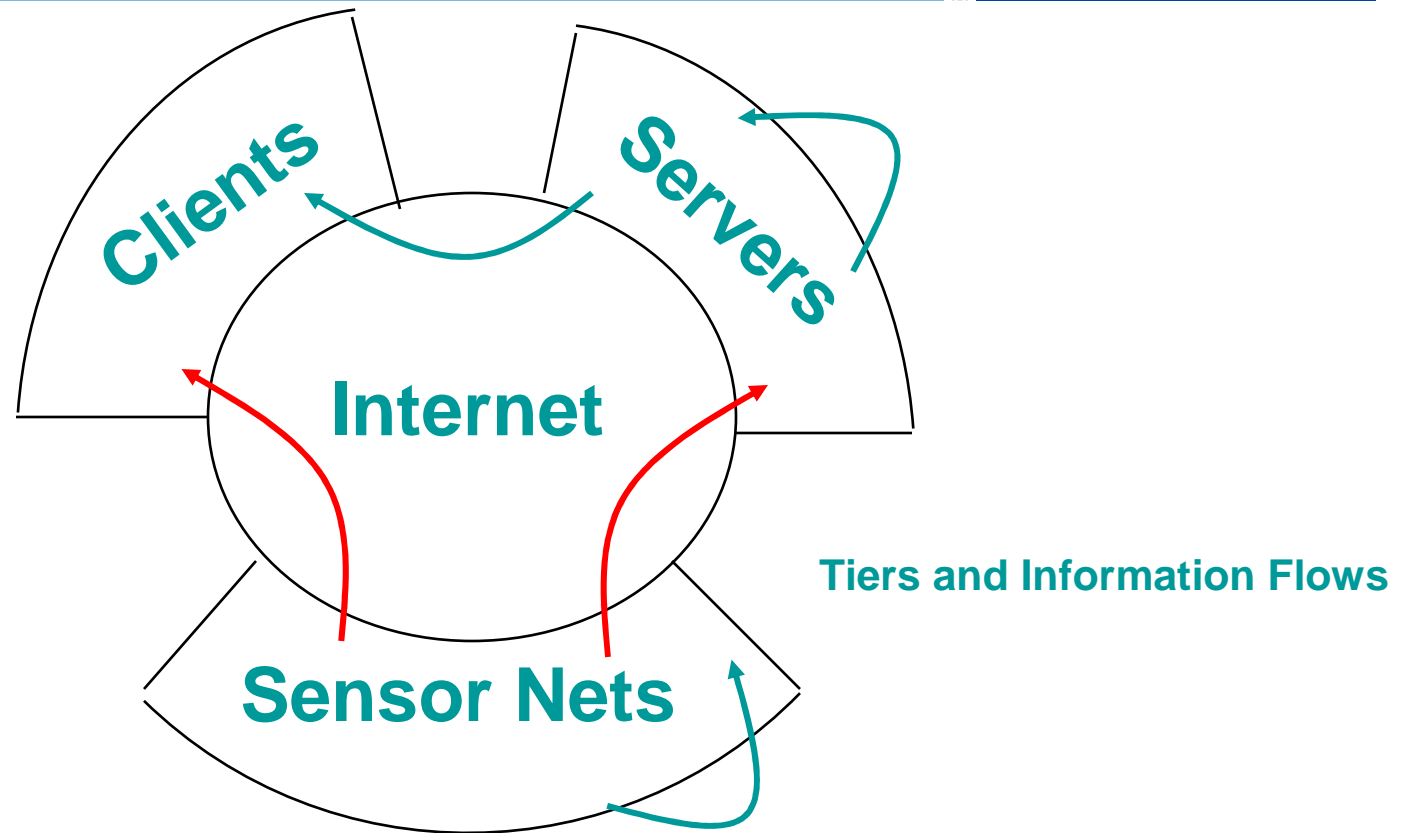
Sensor Network Patch   **Sensor Network Patch**   **Sensor Network Patch**

Wireless Sensor Networks Tomorrow
The Next Internet Tier

Internet

or Enterprise Network

WSN as Next Tier

Wireless Sensor Networks Tomorrow
The Next Internet Tier

Tiers and Information Flows

- Small wireless sensors will be the most common nodes on the Internet
- Arch Rock extends critical Internet success factors into the new tier
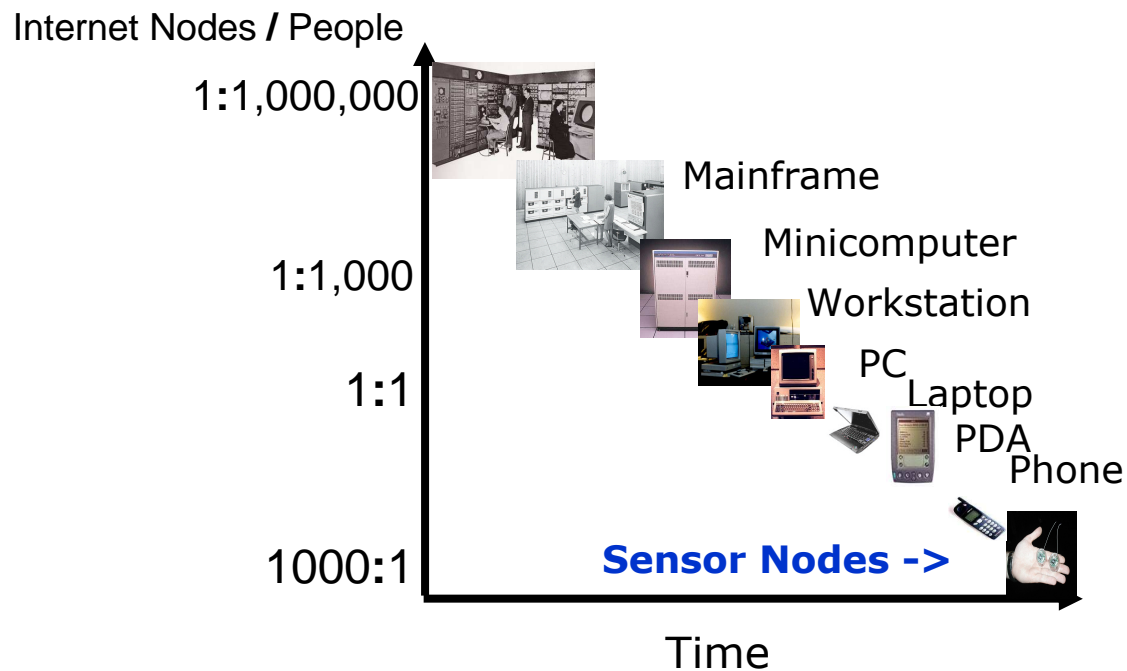- Arch Rock enables scaleable deployment and application development

Wireless Sensors on the Internet
Critical Success Factors

XML / RPC / REST / SOAP / OSGI		Service Oriented Architectures
HTTP / FTP / SNMP		Layered Networking Protocols
TCP / UDP	Edge / Gateway …	
IP		
Ethernet | SONET | 802.11		Low-Power Radios: 802.15.4, …

Internet → **Sensor Networks**
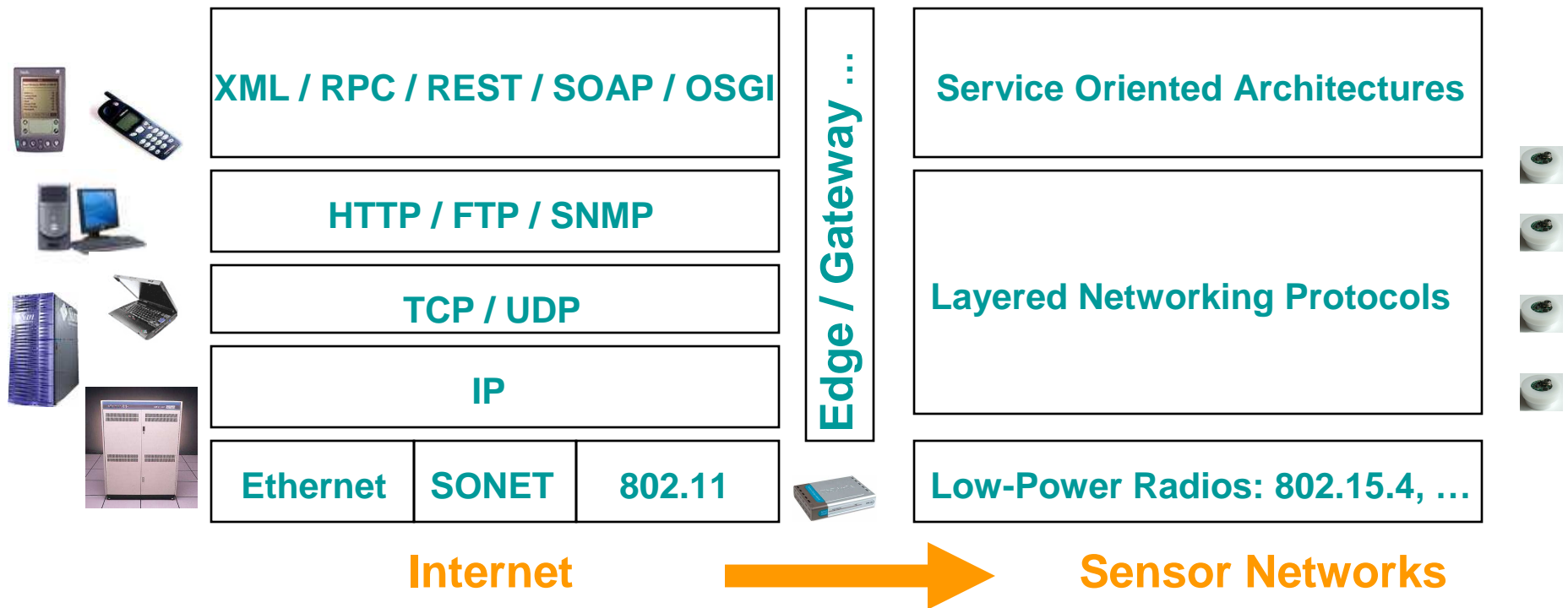
- Diversity and fast innovation in multi-vendor hardware
  - *PCs, Servers, PDAs, Phones*
- Diversity and fast innovation in link technologies
  - *Ethernet, SONET, WiFi, DSL, Cellular*
- Diversity and fast innovation in application models
  - *Client-Server, Peer-to-Peer, Web Services*

-> Portable Operating Systems

-> Layered Networking Protocols

-> Service Oriented Architectures

The Next Internet Tier by Arch Rock

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Internet Nodes **/** People

1**:**1,000,000

Mainframe

Minicomputer

1**:**1,000

Workstation

PC

1**:**1

Laptop

PDA

Phone

Sensor Nodes ->

1000**:**1

Time

- Continuing the evolution of Internet nodes:
  - Today we can connect essentially *everybody*   -> Personal computers, phones
  - Next we will connect essentially *everything*   -> Sensors, actuators, controllers
- Continuing the evolution of Internet content:
  - Today we can access content generated by *humans*   -> Documents, graphics, voice, video
  - Next we will access data originated in the *physical world*   -> Objects, spaces, live organisms