Class announcements

- Reading for Thursday (Nov 19):
  - Akamai Case
- Database project due Nov 24 (tues)

Student Presentations

Stovepipe vs. Integrated Infrastructure

**Stovepipe architecture**

--- or ---

*Turnkey Solution*

- Single supplier provides all encompassing solution
- (complete with infrastructure)

**Integrated Infrastructure**

- Separate infrastructure that can support many applications

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From stovepipe to layering

**Many applications**

- Application-dependent infrastructure
- Application-independent

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Stovepipe vs. Integrated Infrastructure

- What are some examples of each?
- What are the advantages of each approach?
Vertical Integration vs. Diversification

- A company is vertically integrated when it makes rather than buys the subsystems in its products.
- A diversified company produces products across different industry segments.

Why do customers favor less vertical integration?

- Prefer competition amongst component suppliers
- Mix and match components
- Reduced lock in

Disadvantages??
- Customer needs to integrate components from different suppliers.

Why do customers favor diversification?

- Reduce coordination costs by having to deal with fewer suppliers.

General Trend

- Less Vertical Integration
- More Diversification

Of course there are exceptions...

Today's supplier structure

- Applications
- Frameworks and components
- Middleware
- Infrastructure (network, OS) software
- Equipment (network, computers)
- Semiconductors, components

Standardization
Purpose of a standard?

- Allow products or services from different suppliers or providers to be interoperable

Scope of a standard

Included:
- interfaces (physical, electrical, information)
- architecture (reference model)
- formats and protocols (FAP)
- compliance tests (or process)

Excluded:
- implementation
- (possibly) extensions

Reference model

Decide decomposition of system
- where interfaces fall
Defines the boundaries of competition and ultimately industrial organization
- competition on the same side of an interface
- complementary suppliers on different sides
- hierarchical decomposition at the option of suppliers
- (possibly) optional extensions at option of suppliers

Some issues

Once a standard is set
- becomes possible source of industry lock-in; overcoming that standard requires a major (~10x?) advance
- may lock out some innovation

In recognition, some standards evolve
- IETF, CCITT (modems), MPEG
- backward compatibility

Types of standards

**de jure**
- Sanctioned and actively promoted by some organization with jurisdiction, or by government

**de facto**
- Dominant solution arising out of the market
- Voluntary industry standards body

Industry consortium
Common or best practice

Examples

**de jure**
- GSM, ISDN Telephone interface

**de facto**
- Microsoft Windows API (Application Programming Interface)
- Intel Pentium instruction set
- Voluntary industry standards body
- IEEE (Institute of Electrical and Electronic Engineers)
- IETF (Internet Engineering Task Force)

Industry consortium
- W3C (World Wide Web Consortium)
- SET (Secure Electronic Transactions)
Best practice
- Windowed GUI
The changing process

- As technology and industry move more quickly, the global consensus standards activity has proven too unwieldy
  - e.g. ISO
- "New age" standards activities are more informal, less consensus driven, a little less political, more strategic, smaller groups
  - e.g. OMG, IETF, ATM Forum, WAP

Programmable/extensible approaches for flexibility
  - e.g. XML, Java

Reasons for change

- From government sanction/ownership to market forces
  - Increasing fragmentation
  - Importance of time to market

Greater complexity
  - Less physical/performance constraint for either hardware or software

Lock-in

(Particularly open) standards reduce consumer lock-in
  - Consumers can mix and match complementary products

Increase supplier lock-in
  - Innovation limited by backward compatibility
  - e.g. IP/TCP, x86, Hayes command set

Aside: Network Effects

- The value of owning some products goes up if lots of other people have it too.
  - Examples?
- This phenomenon is called "network effects"
- How do standards influence network effects?

Network effects

Standards can harness network effects to the industry advantage
  - Revenue = (market size) x (market share)

Increases value to customer

Increases competition
  - Only within confines of the standard
  - But forces customer integration or services of a system integrator
Why standards?

*de jure* are customer driven to reduce confusion and cost
*de facto* standards are sometimes the result of positive feedback in network effects

Customers and suppliers like them because they
- increase value
- reduce lock-in

Governments like them because they
- promote competition in some circumstances
- May believe they can be used to national advantage

Approaches

- **Consensus**
  - ISO
- **Collaborative design**
  - MPEG
- **Competitive “bake off”**
  - IETF
- **Coordination of vendors**
  - OMG

Open vs. Proprietary Standards

- Open standard - a standard that is well documented, unencumbered by intellectual property rights and restrictions, and available to any vendor.

  - What are the advantages?
  - What are the disadvantages?