

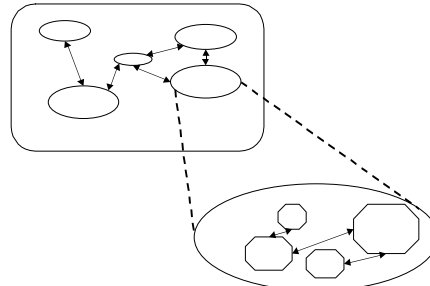
Strategic
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BA 290D, EECS 201, IS 224
Spring 99

Architecture and industry

by
David G. Messerschmitt

Architecture



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Architecture

- Decomposition, functionality, interaction
- Purpose is....
 - Complexity management
 - divide and conquer, separation of concerns, economy of expression, etc.
 - Industrial organization
 - divide and conquer, separation of concerns, etc.
 - Specialization, competition, etc.

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Complexity management

- Divide and conquer
 - Different people, groups, companies can concentrate on different parts
- Separation of concerns
 - They can work as independently as possible
- Economy of expression
 - Their efforts are not unnecessarily repeated

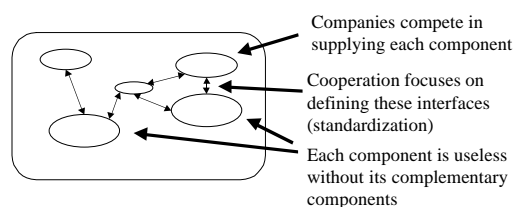
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Industrial organization

- Divide and conquer
 - No one company has to design the whole system
- Separation of concerns
 - Each company can innovate in their own space
- Economy of expression
 - Products can be sold into multiple uses

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Competitors and complementors



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Success hinges on....

- Competitors
 - Identifying who they are
 - Beating them on features, price, quality, etc
- Complementors
 - Knowing when they are needed
 - Choosing the right ones
 - Gaining their cooperation

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This is a minefield....

- Apple in Mac's
 - Marginalized by too few complementors?
- IBM in PC's
 - Marginalized by too many complementors?
- Other examples?

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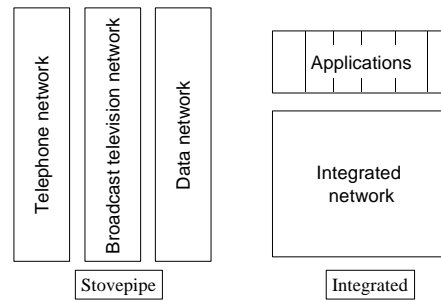
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Stovepipes and integrated layers

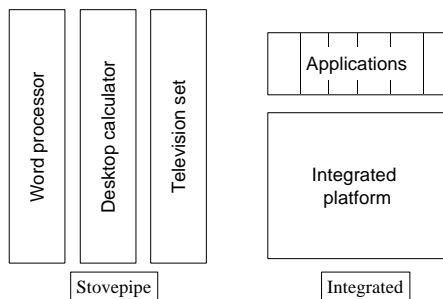
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Two networking architectures



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Two processing architectures



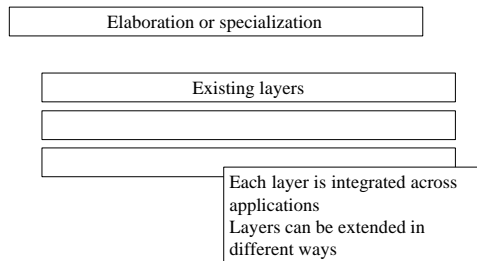
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What decomposition?

- Stovepipes provide their own decomposition
- How to decompose the integrated architecture?

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Layering



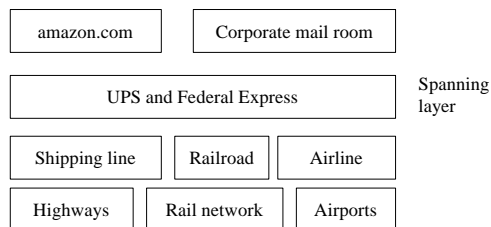
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Features of layering

- Valued added in
 - adding layer for elaboration or specialization
 - emergence in integrating layers
- Competition focuses on each layer
- Layers are complementary

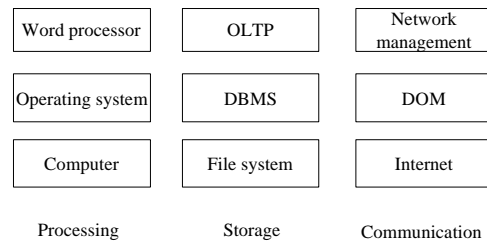
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Not unique to technology



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Examples



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Behind layering

- Economies of scope and scale
- Lower investment for supplier and customer to develop and deploy new applications
- Greater application diversity due to lower barriers to entry
- Specialization of firms => better performance
- Success of startups
- Ability to mix-and-match layers results in greater competition and reduces lock-in
- Integrated multimedia applications

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Spanning layer

- Ubiquitous layer that hides heterogeneity below and above



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Examples of spanning layers

- Internet protocol (IP)
- Windows API
- Distributed object management (DOM)
- eXtended markup language (XML)

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Importance of spanning layer

- New solutions above and below see immediate large market
- Interoperate with one spanning layer rather than n heterogeneous layers
 - Standard trick: reduce n^2 conversions to n using common intermediate form
- May tame some winner-take-all effects

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