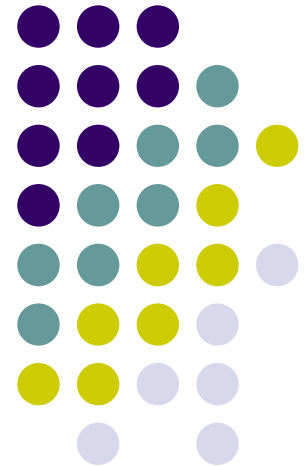


Assurance for Cloud Computing

Robert V. Binder

Chicago Quality Assurance Association

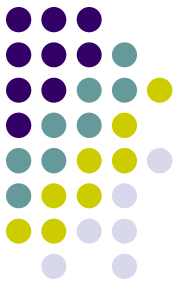
January 27, 2010



Overview



- Weather Report
- Role-Layer Model
- Cloud Assurance Challenges
- Microsoft Protocol Validation
- Spec Explorer Flyby
- Implications for IT Assurance



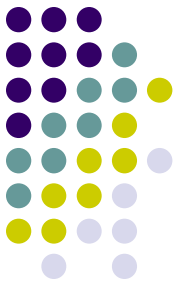
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Weather Report

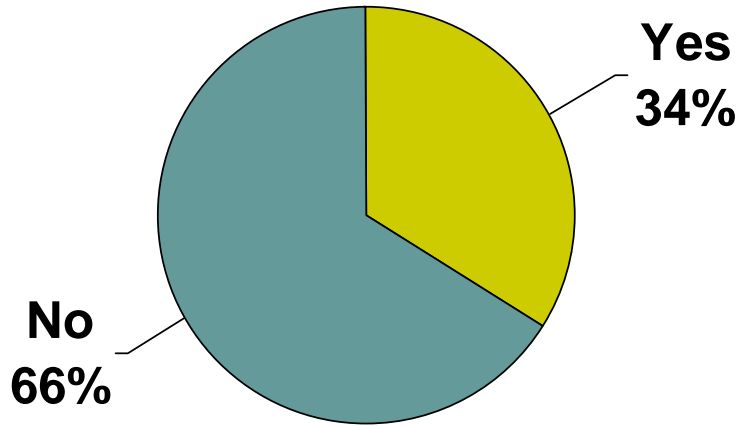


- What is Cloud Computing?
 - SOA, SaaS, Outsourced Infrastructure, Hosted Apps, Web Services, Virtualization, Grid ...
- Economic drivers
 - Rent versus Buy versus Make
 - No operational responsibilities
 - Scalable
 - “No Software”

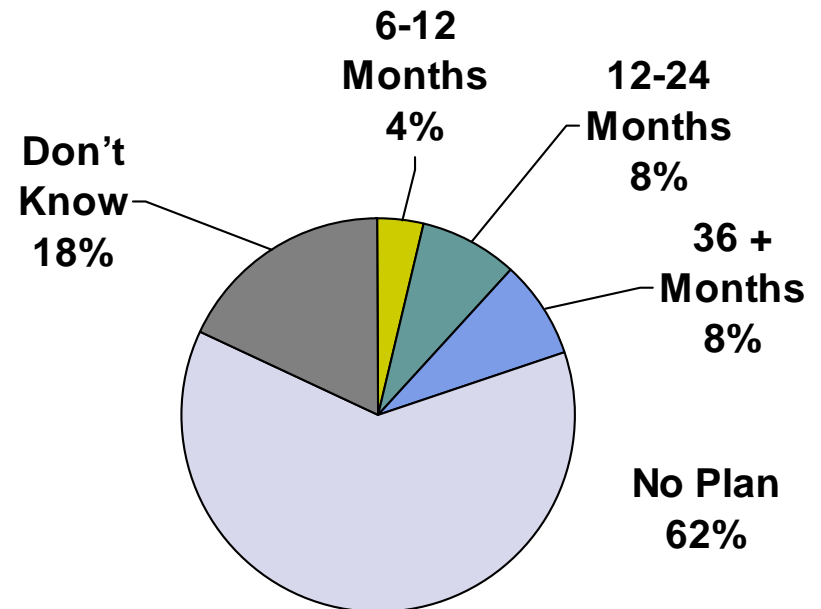
Distant Rumbblings



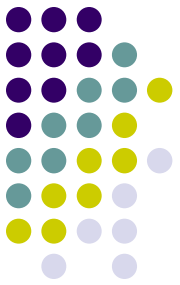
Does your organization currently have a cloud computing strategy?



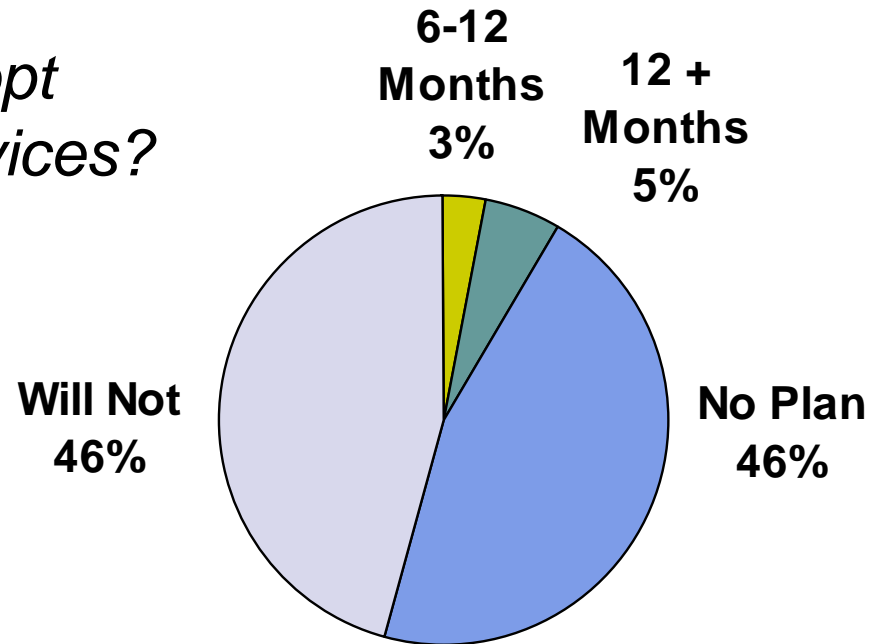
When will you implement cloud computing?



Distant Rumbblings

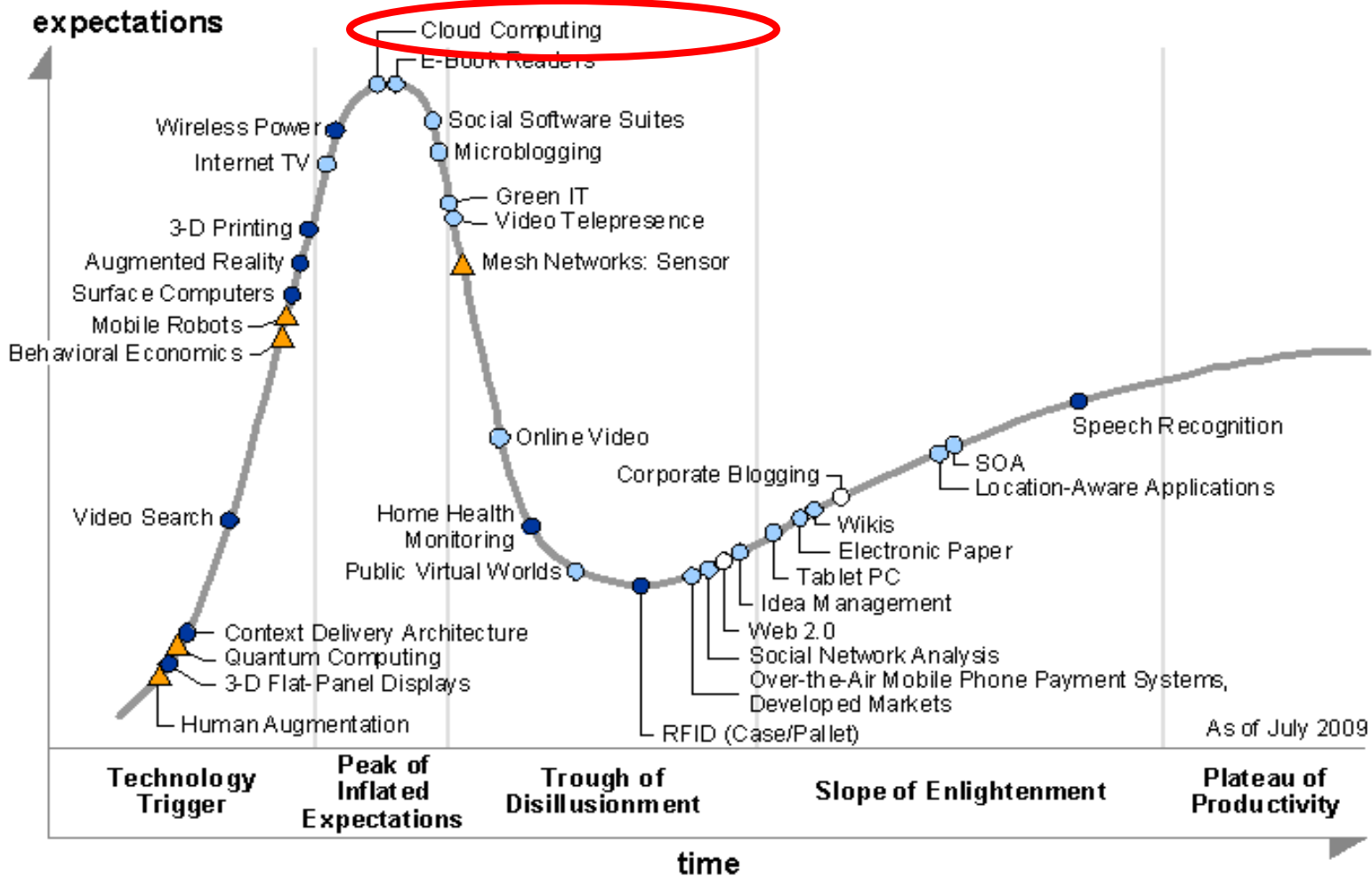
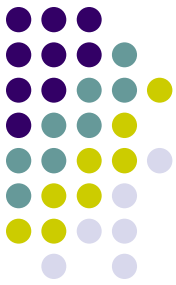


When will you adopt cloud storage services?



Business Users Are Not Ready For Cloud Storage, Forrester. <http://www.networkworld.com/news/2010/012510-cloud-storage-hype.html>

Falling Pressure

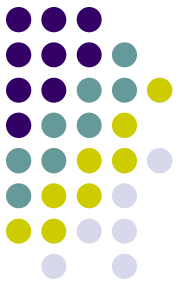


Years to mainstream adoption:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ✗ obsolete before plateau

<http://www.gartner.com/it/page.jsp?id=1124212>, © Gartner Inc. Used by permission.

Excess Water Vapor?



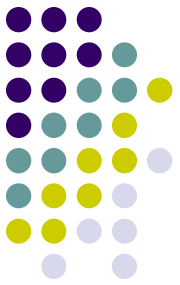
Why Larry Ellison hates Cloud computing

<http://www.youtube.com/watch?v=8UYa6gQC14o>

Forecast: Partly Cloudy

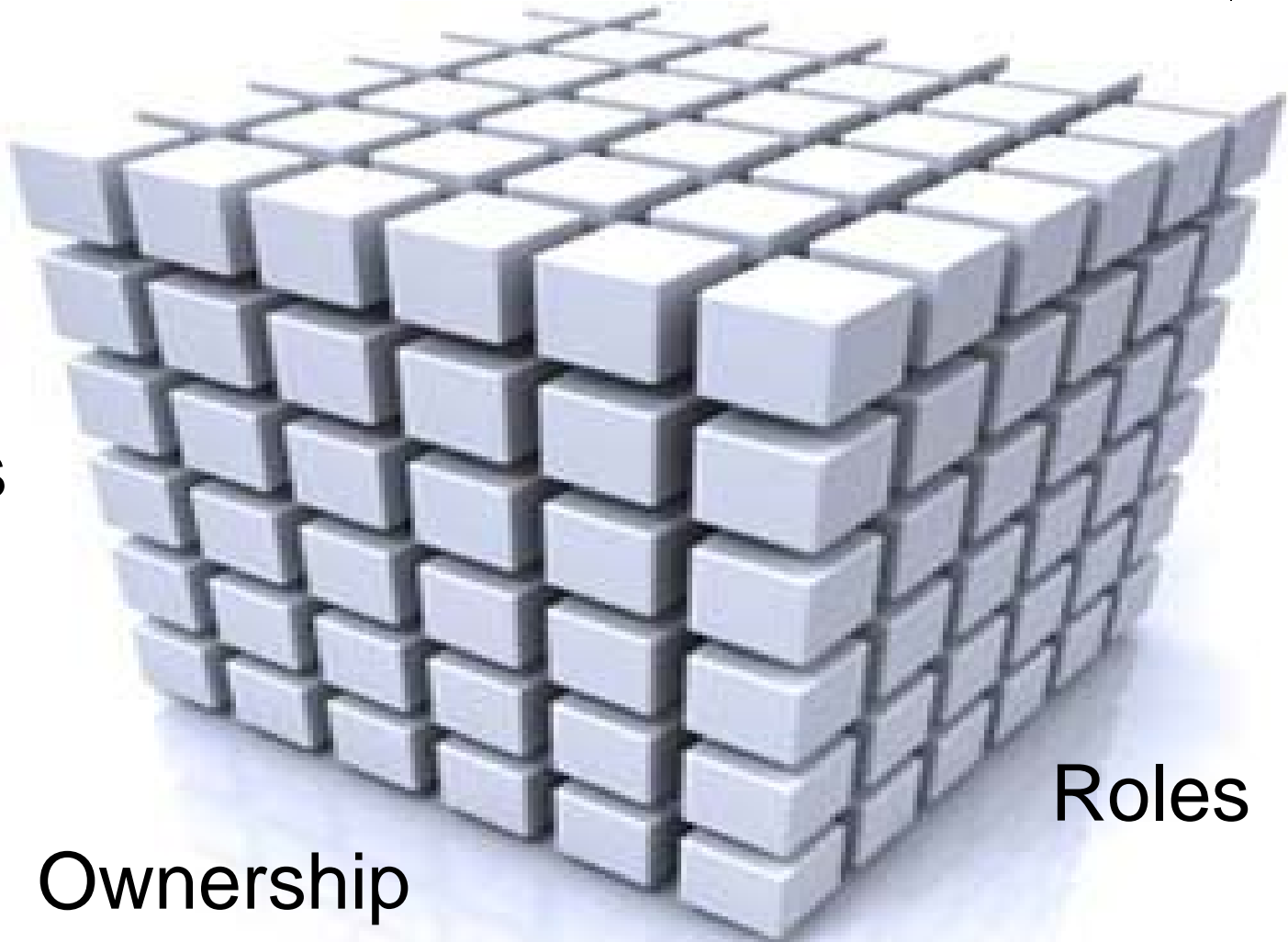
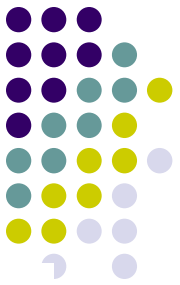


- Despite the hype, fundamental changes
 - Broader market, lower barriers
 - Incremental IT capacity
 - General purpose apps
 - Trends
 - Apps/cycles/storage more like electric power
 - Outsourcing to reduce cost and risk
 - Decentralization, reliance on commons
- Assurance challenges
 - Contract-oriented
 - Ongoing, pre *and* post release



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Role-Layer Model



Layers

Ownership

Roles

Role-Layer Model

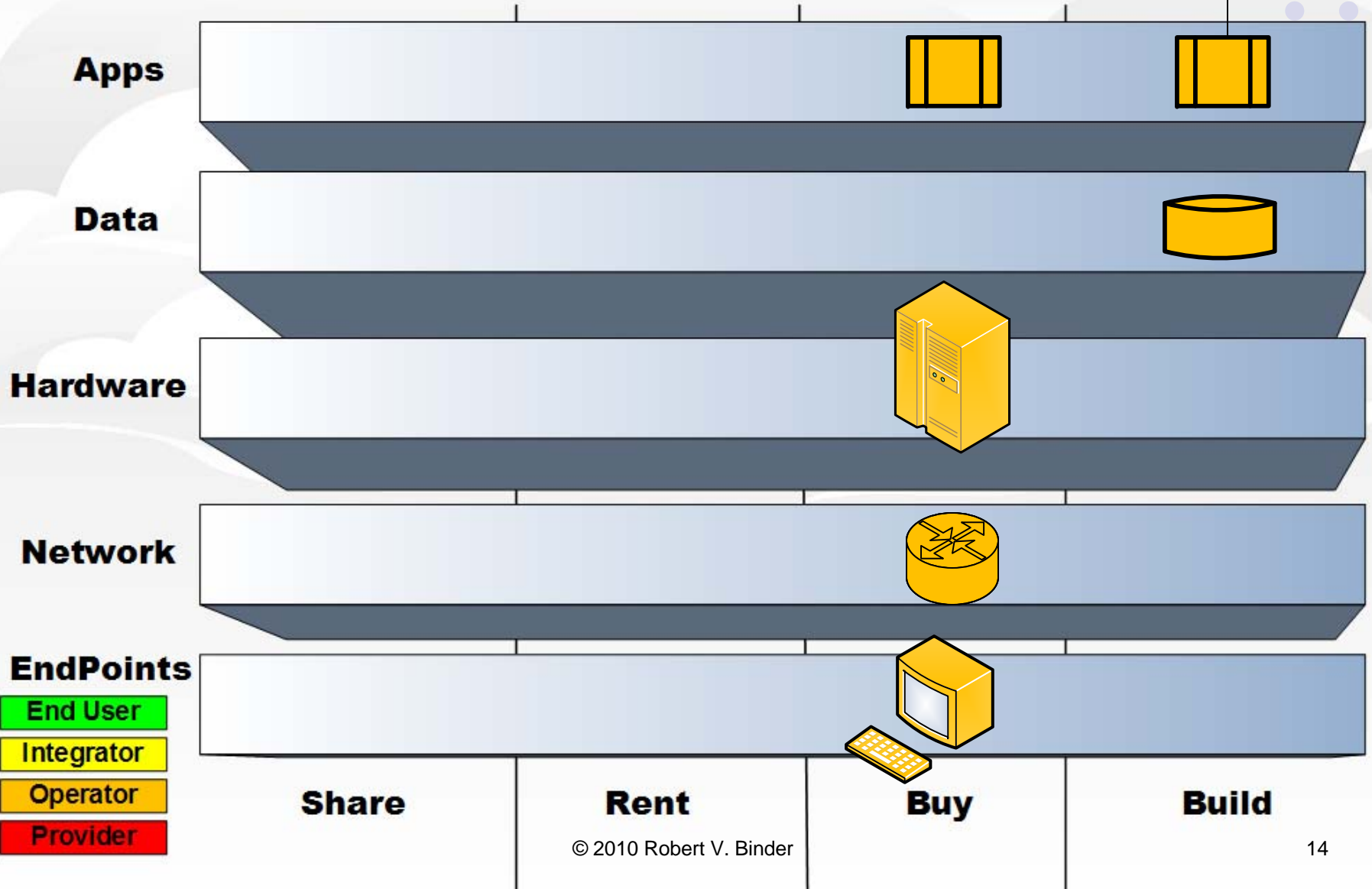


- Layers
 - Endpoint, Network, Apps, Data, Hardware
- Roles – distinct economic entities
 - End User
 - Integrator
 - Provider
 - Operator = Provider + Integrator
- Ownership
 - Share, Rent, Buy, Build

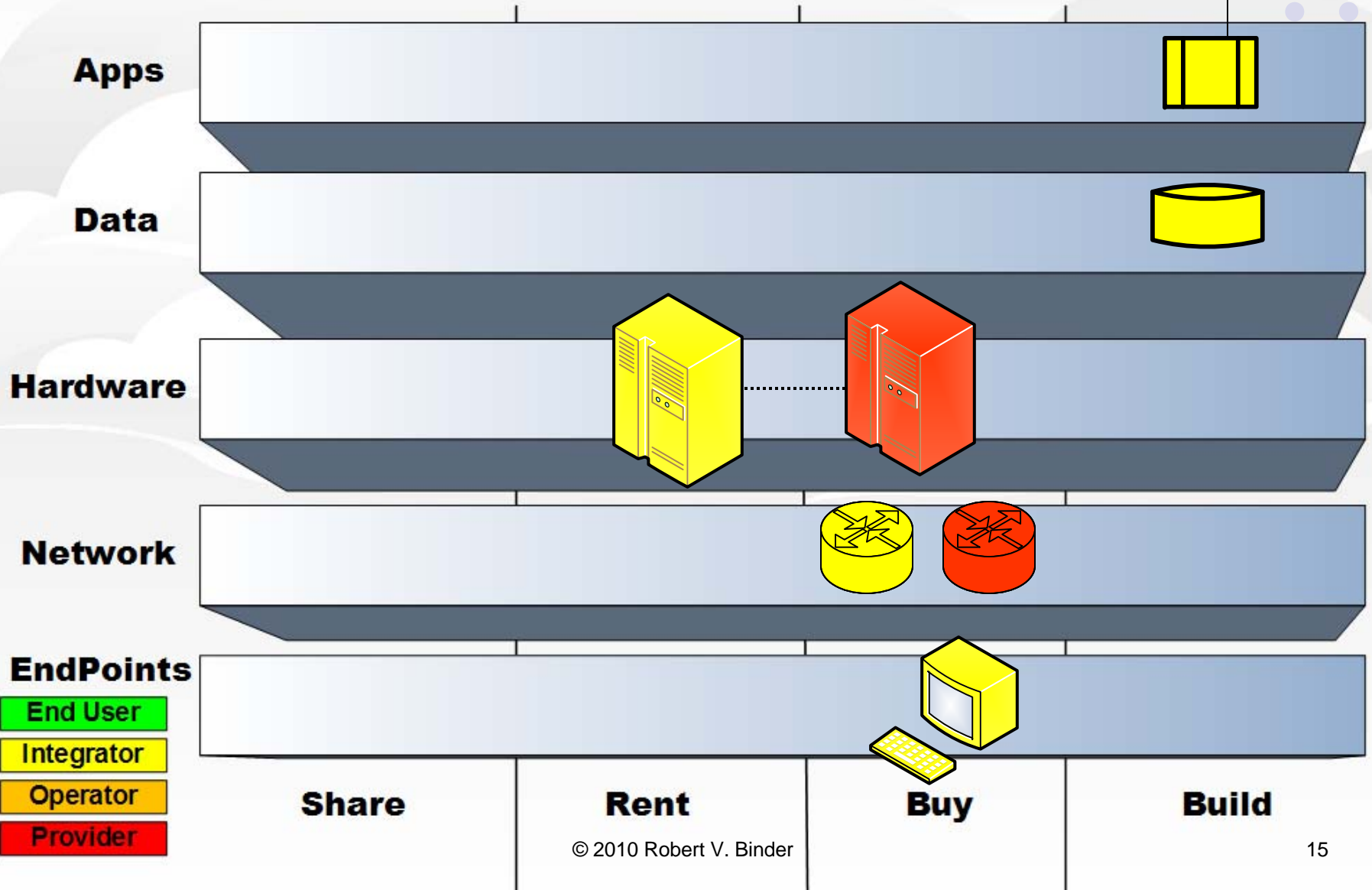
Classic IT



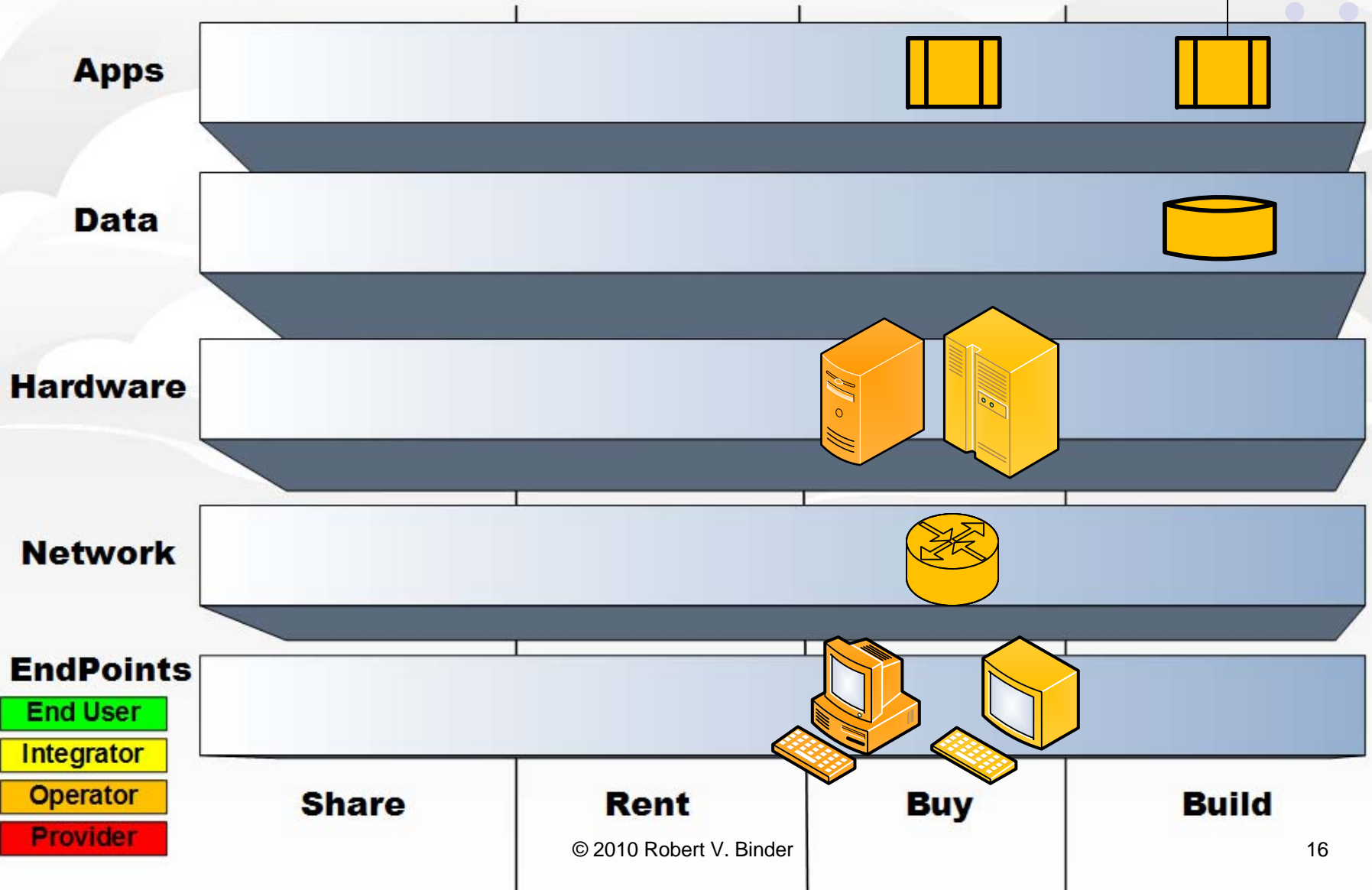
Classic IT, c. 1970



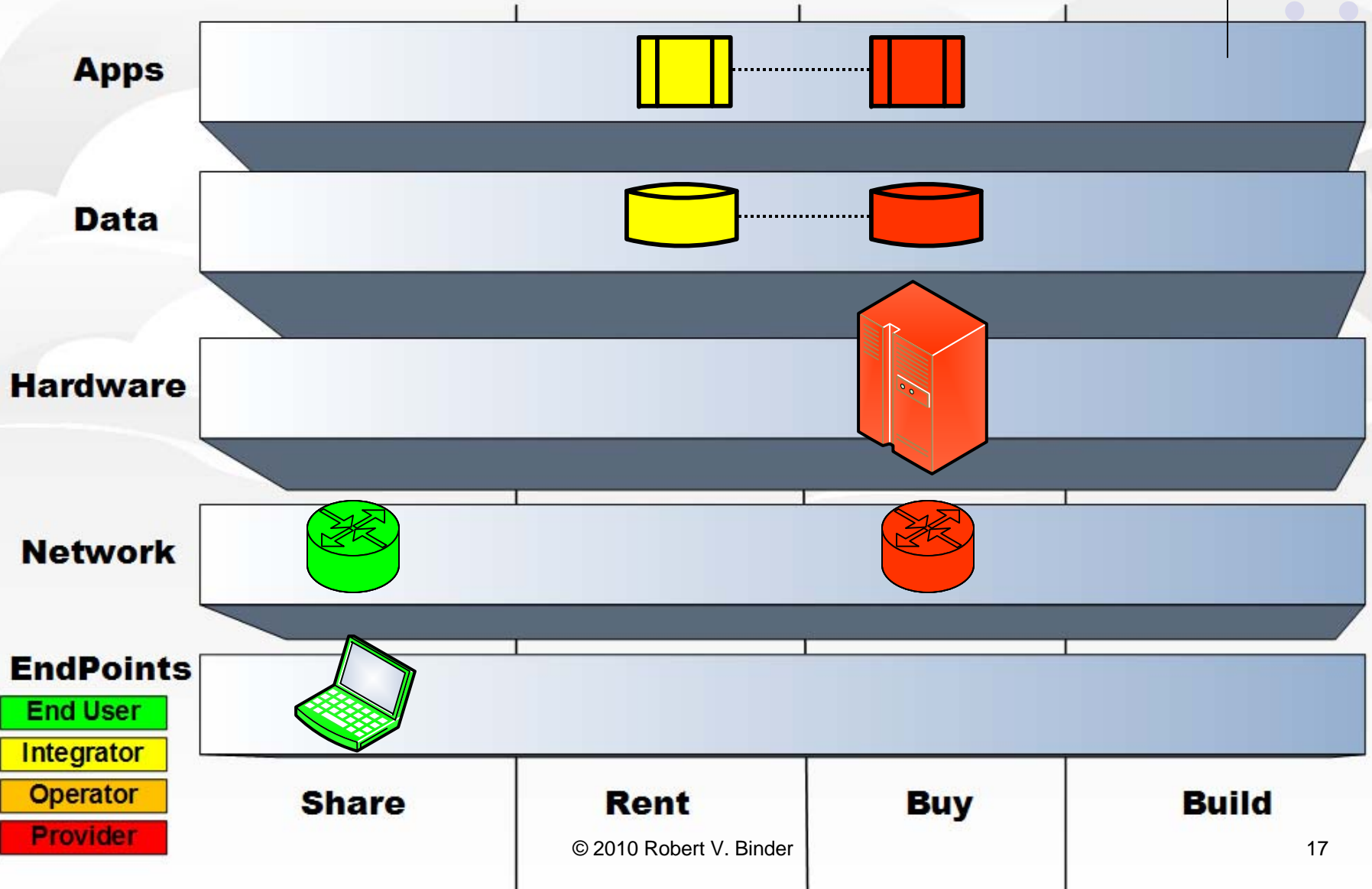
Service Bureau, c.1980



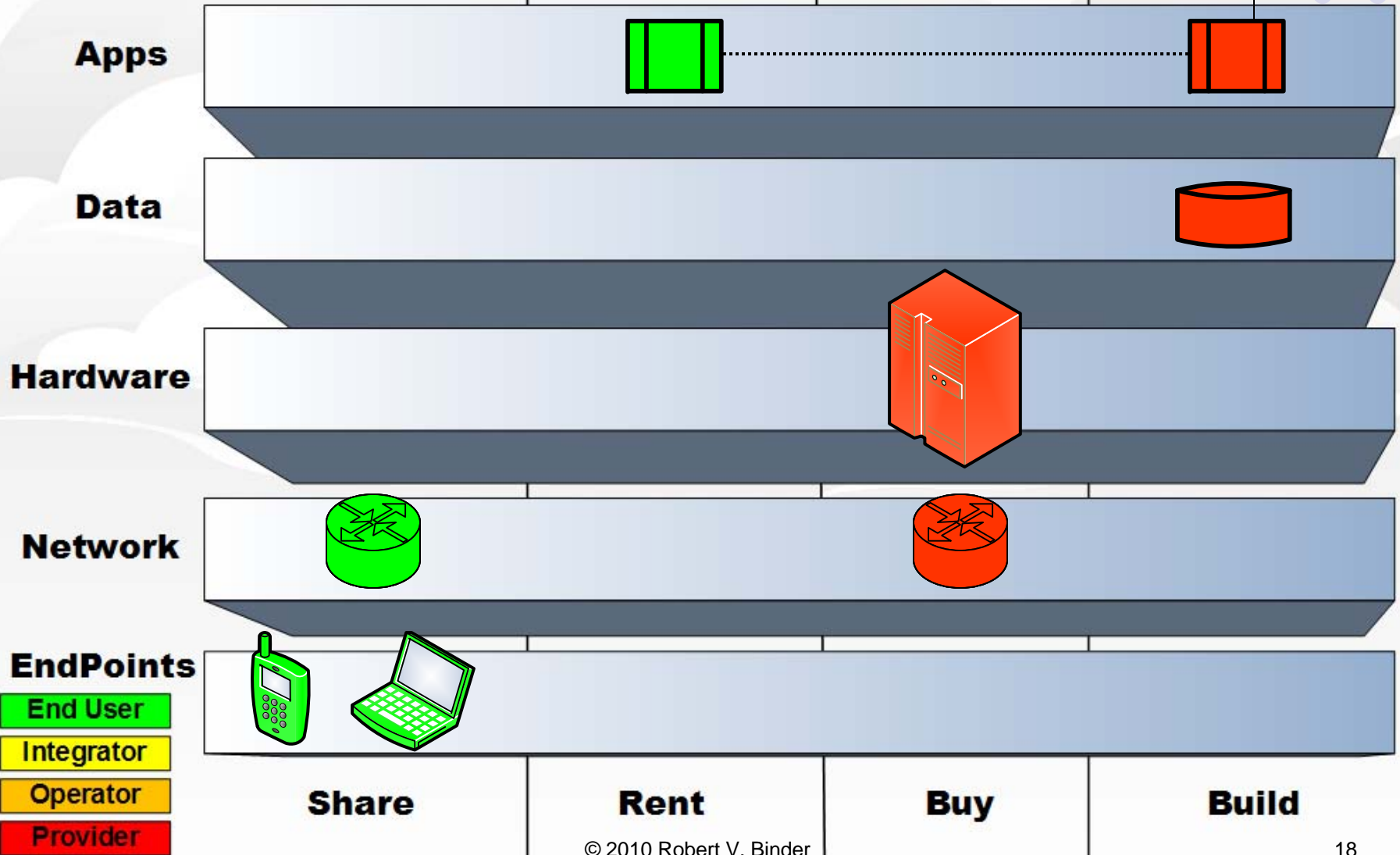
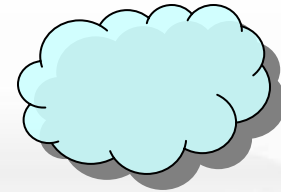
Client/Server, c.1995



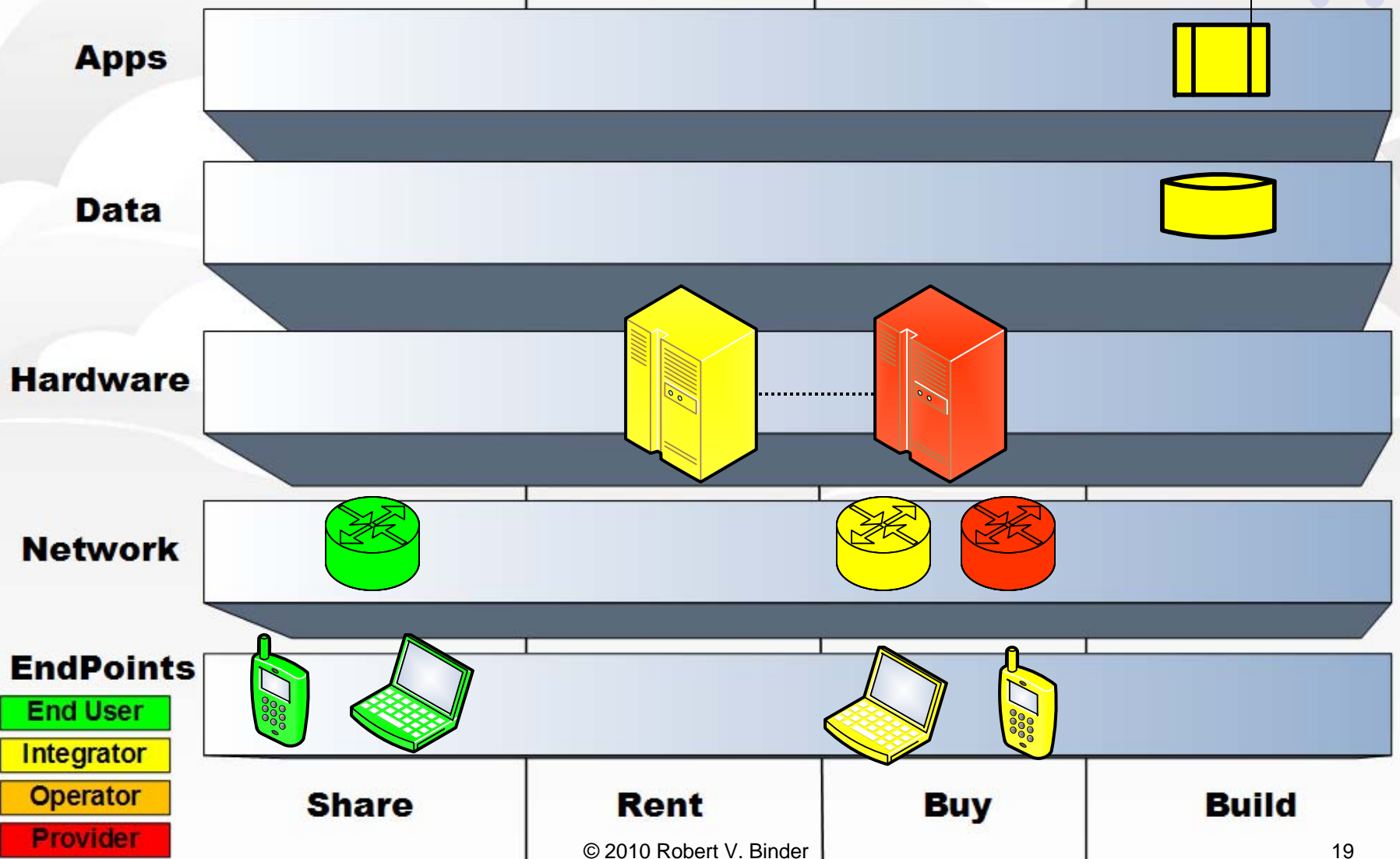
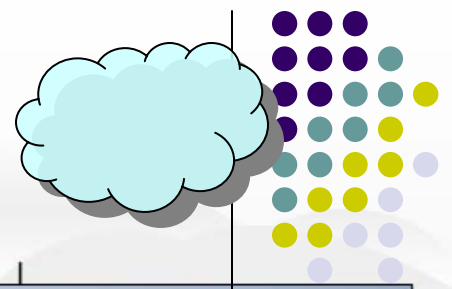
E-Commerce ASP, c. 2002

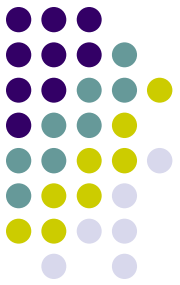


SalesForce.com, c. 2004



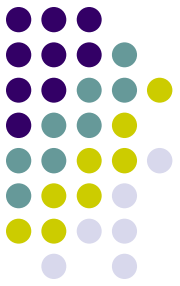
Outsourced Room, c. 2009





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What Should be Assured?



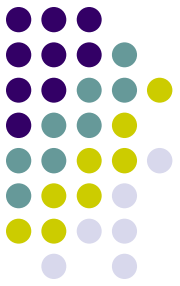
- **Contract between layer owners**
 - Technical specification, not legal T&C
- **Confirm**
 - We're getting what we expect
 - What we expect is adequate
- **Certify**
 - We can meet our commitments
 - Individual
 - Collective (scalable)

Assurance Concerns

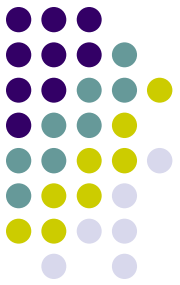


- SLAs
 - Availability, Reliability, Performance
 - Standby Capacity/Scalability
- Security
 - Authentication
 - Access Control
- Features
 - Correct response
 - Data integrity
- Effectiveness/Acceptance
 - ROI, votes, sales

Trust, but Verify

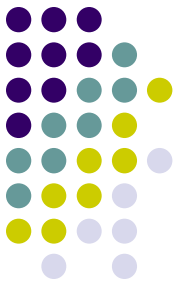


	SLA	Features	Security
End User – Integrator	Confirm	Confirm	Confirm
Integrator – End User	Certify	Certify	Certify
Integrator – Provider	Confirm	Confirm	Confirm
Provider – Integrator	Certify	Certify	Certify



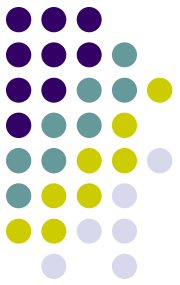
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Microsoft Protocol Validation



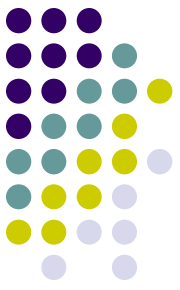
- Relevance for cloud assurance?
 - Huge win for model-based testing
 - Open technology
 - Supports contract-based assurance
 - Protocol validation approach good fit for cloud assurance challenges

Open Specifications Initiative



- EU/US DOJ Decree
 - Microsoft must publish server side details
 - Over 250 protocols (APIs)
- Publish protocols as “Technical Documents” (TD)
 - Open Specifications Initiative
 - www.microsoft.com/openspecifications
 - One TD for each server-side API/service
 - Strict and detailed standards for TD content
- Goal: **interoperability**. TDs must be sufficient for 3rd party to replace or use target API

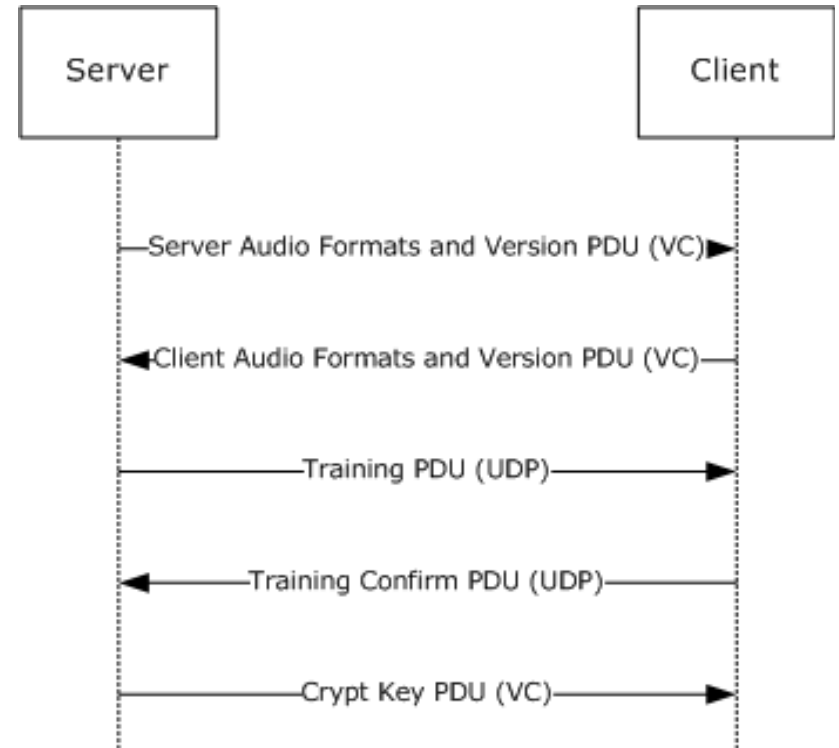
What is a Protocol?



- “Remote Desktop Protocol: Audio Output Virtual Channel Extension”

- Defines Messages

- Defines Behavior



What is a Protocol?



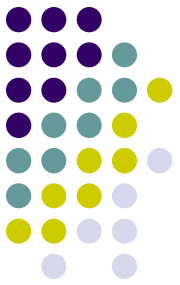
- Remote Desktop Protocol: Audio Output Virtual Channel Extension
- Example message requirement

The Server Audio Formats and Version PDU is a PDU used by the server to send version information and a list of supported audio formats to the client. **This PDU MUST be sent using static virtual channels.**

- Example behavioral requirement

The server may send the Training PDU at any time and during any sequence, not just during the initialization sequence. **The only prerequisite are that version exchange MUST have occurred and that if the client and server are both at least version 6, the server MUST have received a Quality Mode PDU.**

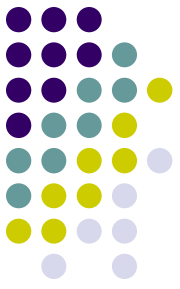
Published TDs on MSDN



MSDN Protocol Library

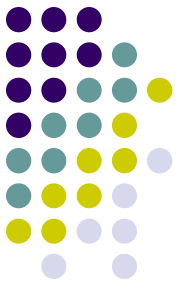
[http://msdn.microsoft.com/en-us/library/cc216513\(Prot.10\).aspx](http://msdn.microsoft.com/en-us/library/cc216513(Prot.10).aspx)

Validation Approach



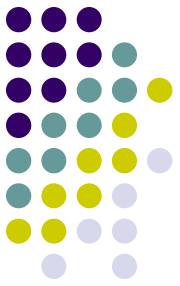
- How to validate TDs?
 - Is the TD sufficient for interoperability?
 - Scrutinize
 - Is the TD accurate?
 - Develop test for each requirement
 - Only check over-the-wire data
- Protocol Engineering Team
 - Reviewers – independent 3rd parties
 - Testers – 3rd party contractor
 - Microsoft development teams write TDs
 - Reviewers and Testers Scrutinize TDs
 - Testers develop Test Suites from the TD

Validation Approach



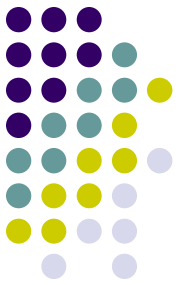
- Extract requirements from TD
- Analyze/model protocol contract
 - Data Structures
 - Method Behavior
 - API Behavior
- Develop adapters to parse/check messages
- Execute test suite
- Write “TD Issue” for any anomaly

Validation Process



- Develop Technical Document
- Study Phase
 - Start requirements extraction
 - Define high level test approach
- Plan Phase
 - Define test model
 - Define test harness
- Design Phase
 - Implement model and drivers
- Final Phase
 - Run test suites, analyze traces
- TDs released to MSDN after passing Final

Requirements Traceability



- TD parsed to extract line-item requirements
- 100s to 1000s per technical document
- Log requirement record when pass conditions met
 - R 562: “The server must return 404 in the reply code when the target URL cannot be found.”

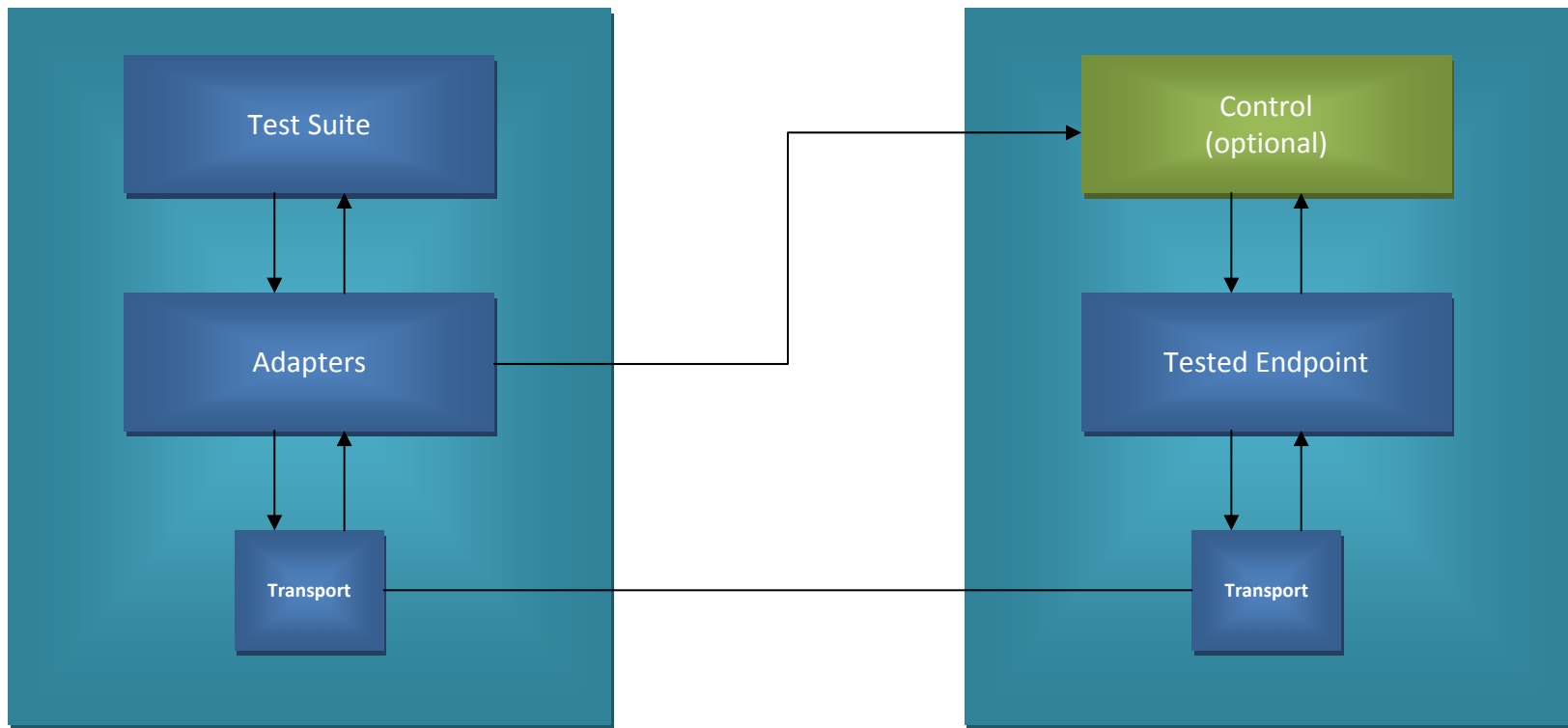
```
Contracts.Requires(ReplyEnabled(replyCode) && badURL(true));
    if replyCode == 404)
    {
        Log(562, "Received 404")
    }
}
```

Typical Test Configuration

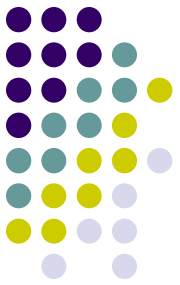


Tester Endpoint

SUT



Productivity

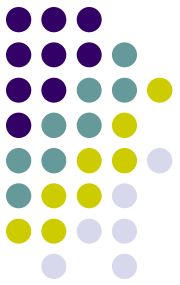


- 100s of third party developers trained in modeling and test development
- On average, MBT takes 42% less time than hand-coding

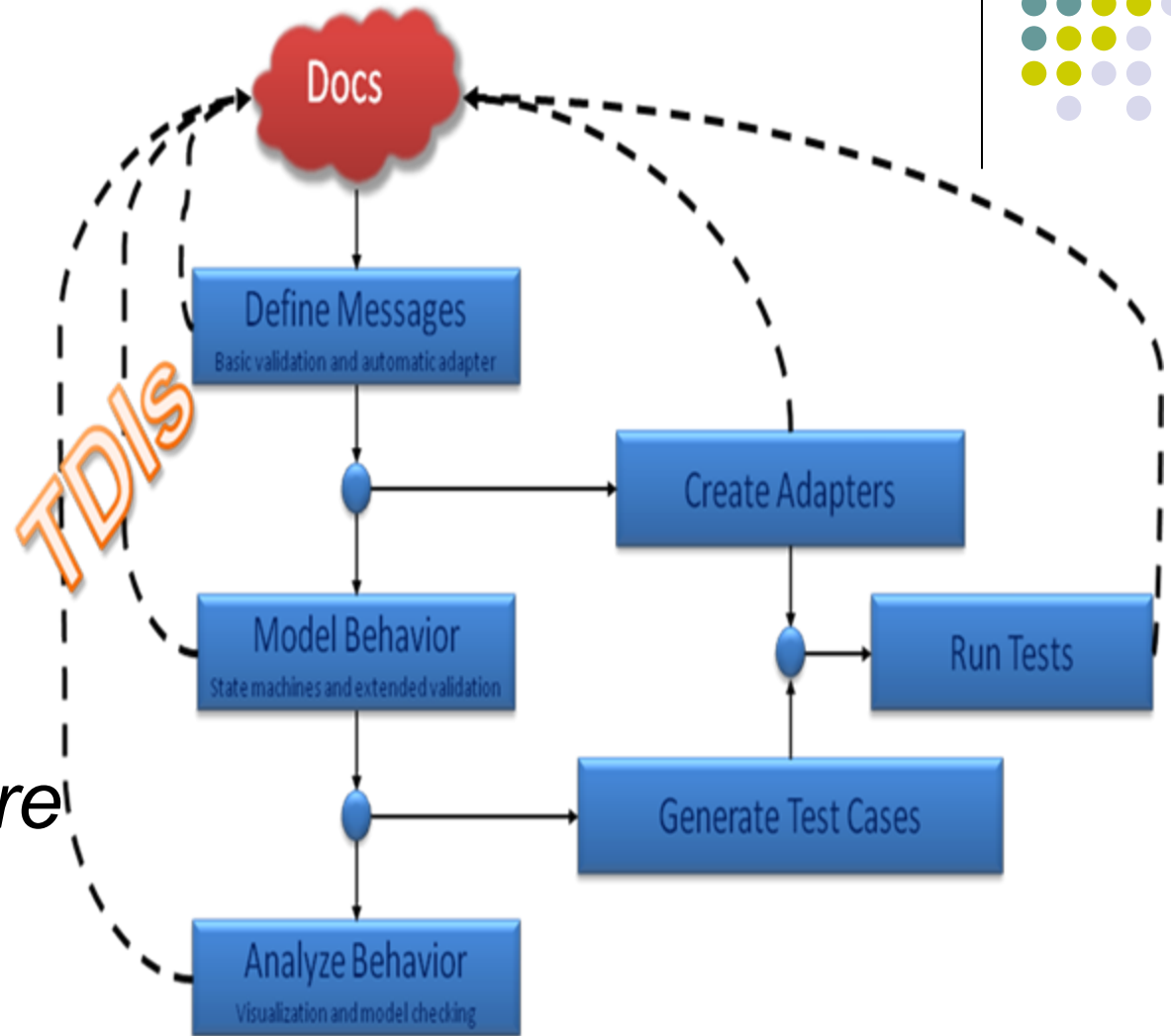
Avg Hours Per Requirement	
Task	
TD review	1.1
Requirement gathering	0.8
Model authoring	0.5
Traditional test coding	0.6
Adapter development	1.2
Test case execution	0.6
Final adjustments	0.3
Total, all phases	5.1

Grieskamp et al. Op cit..

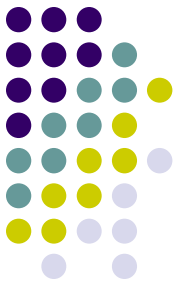
Quality



- Produced ~10,000 “Technical Document Issues”
- Most TDI’s identified *before* tests run

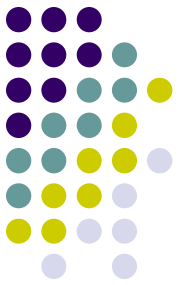


Grieskamp et al. Op cit..



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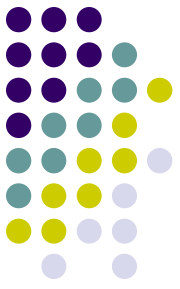
Spec Explorer



- Model-based Testing Tool
 - Extension to Visual Studio
- Model APIs as contracts
 - Guarded update rules for modeled state
 - Define accepting states
- Generates call sequences and data bindings that “explore” model
 - Finds update sequences that lead to accepting state
- Guards and accepters are the “oracle”
- Info and free download

<http://msdn.microsoft.com/en-us/devlabs/ee692301.aspx>

Testing with Spec Explorer



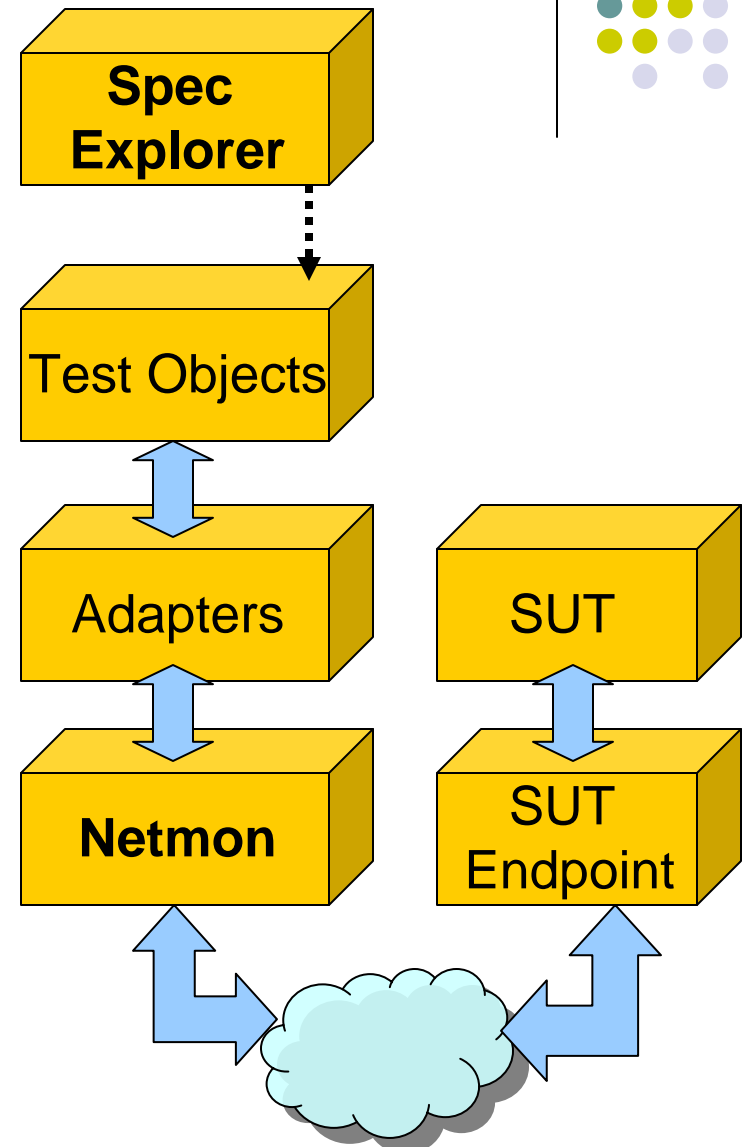
- Analyze system under test, create a model program, representing the entire SUT
- Define parameters for test generation (“cord file”)
- Define behavioral subsets (use cases/scenarios) “machine”
- Explore the model and the machine
- Generate test cases
- Run tests

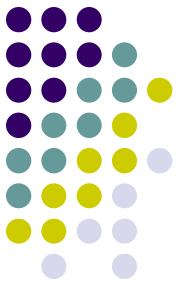


Netmon

- Developed to support protocol testing
- Similar to Wireshark
- Parses all published Microsoft protocols
- Easy to add new parsers
- API supports automated testing
 - Returns parsed messages
- Info and free download

<http://blogs.technet.com/netmon/>





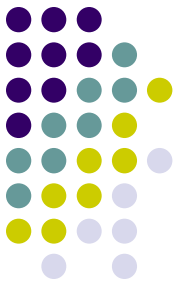
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Testing Cloud Contracts



- Obtain or develop API requirements
 - Amazon Simple Storage Service
 - Google App Engine
 - Many others ...
- Create model program for the contract
 - One method for each message
 - One method for each reply
 - Variables represent behavioral constraints
 - Scenarios

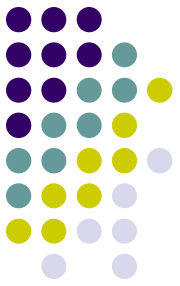
Amazon Simple Storage Spec



Example of a cloud protocol

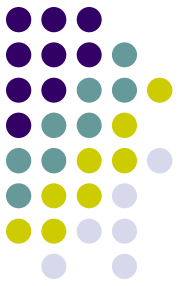
<http://docs.amazonwebservices.com/AmazonS3/latest/>

Performance and Security



- Working on Spec Explorer approach for
 - Performance testing
 - Reliability testing
 - Security assessment

Implications for IT Assurance



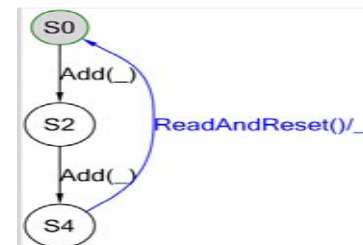
- Use the cloud (on-demand capacity) for testing
- Assess testability of SLA and API contracts early
- Mission-critical apps still need in-house expertise
- Integrators will do less traditional testing
- Integrators have a double role: confirm/certify
- Ongoing monitoring necessary
- Favor providers that can demo contracts

Conclusions

- Despite hype, cloud computing means significant changes for IT and IT Assurance
- Layers, Ownership, Roles
- Confirm or Certify
- Microsoft success shows how to test cloud contracts
- Contract testing viable approach for Providers and Integrators



	SLA	Features	Security
End User – Integrator	Confirm	Confirm	Confirm
Integrator – End User	Certify	Certify	Certify
Integrator – Provider	Confirm	Confirm	Confirm
Provider – Integrator	Certify	Certify	Certify



Thank You!

rvbinder@gmail.com

312 404 5341

