JAOO conference

Adapting software for the public cloud

Where's the software going to come from ?

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Session Abstract

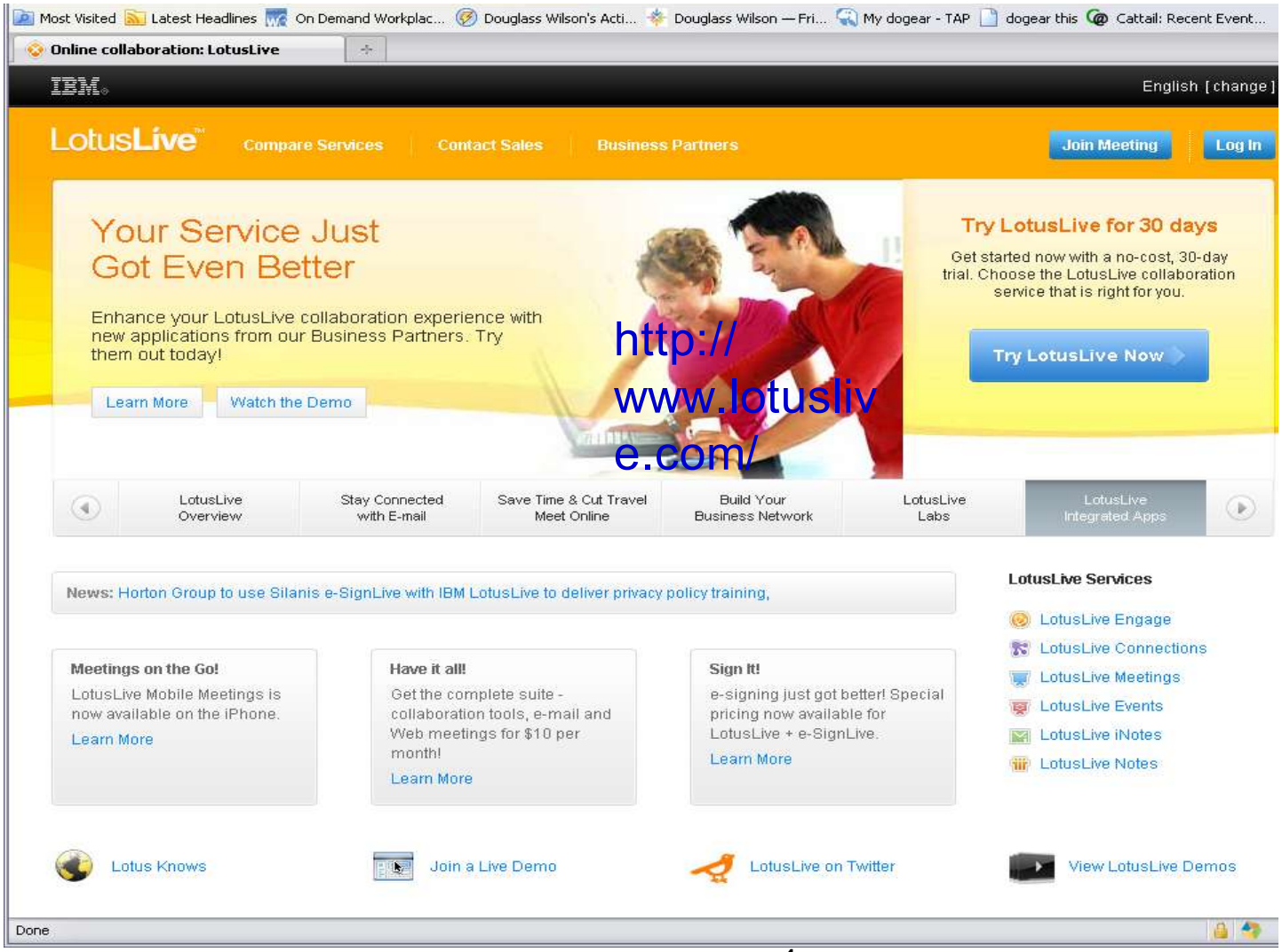
Cloud delivery of IT services, and in particular SaaS promise a sea change to the way business and individuals acquire and use Information Technology. Particularly in SaaS, economies of scale from multi tenant infrastructures, and elastic business models enable more computing at lower prices. But where will the the new breed of cloud applications come from? Some will be "born on the cloud", but far more will be adapted from existing on premise application systems. This paper examines the experiences, challenges and issues encountered as IBM adapted some of our existing Lotus collaboration portfolio applications to a multi tenant cloud deployment.

From the talk you will come to understand many aspects of the technical architecture needed to support multi-tenancy self service management and provisioning as well as the techniques we used to allow applications to be developed for both on premise and cloud deployment.

Agenda

- A Shameless Commercial
- Why cloud? And why SaaS?
- It's all about the offering
- Considering the dimensions of the problem
- Some thoughts on realization
- Is there hope?

This presentation based on experiences of building Lotus Live (www.lotuslive.com)



Shameless Commercial

- LotusLive is:
  - Muti Tenant SaaS site that supports business networks and collaboration between many organizations
  - It is built as an integration and adaptation of many of the IBM Lotus portfolio of collaboration products
  - Realized on IBM Cloud Infrastructure

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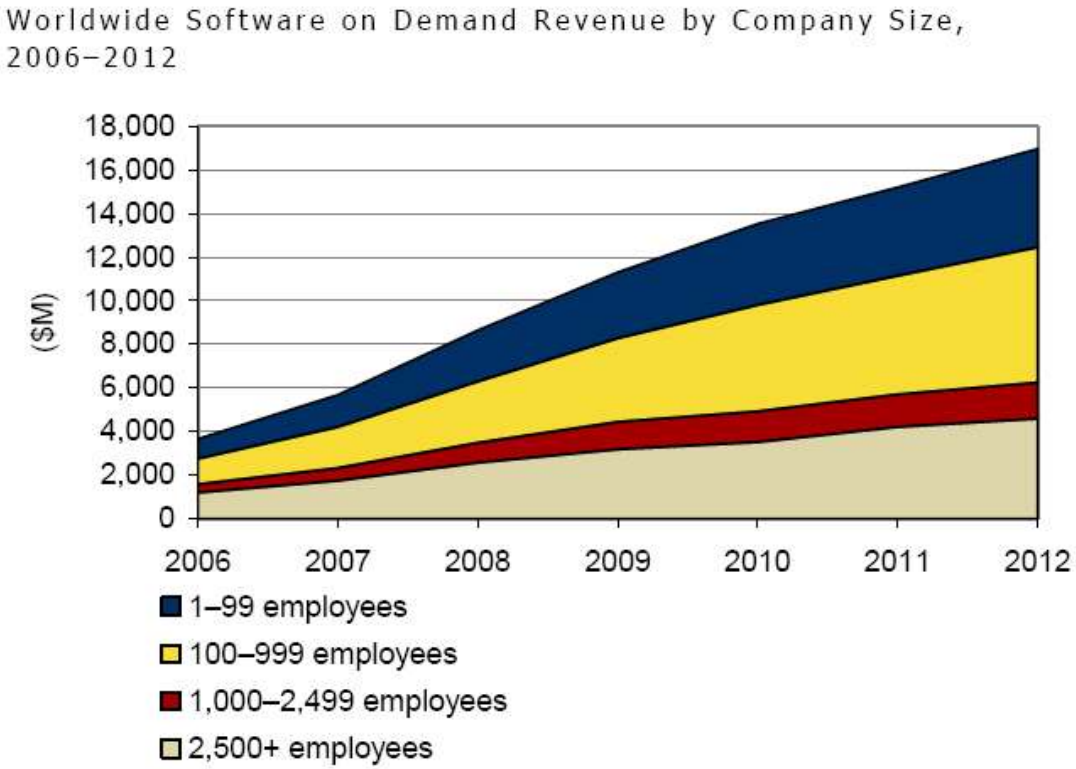
Considering the dimensions of the problem

Cloud-Based Services are growing rapidly

- **Opportunity**
  - $19b by 2012
  - Companies of all sizes
  - CAGR of 20-30%
  - 1/3 opportunity in Collaboration
- **Promises reduced Capital and Operation expenditure**
- **Allows companies to focus on their core competencies**
- **Facilitates cross-boundary communication and collaboration**



Source: IDC, July 2008

Multiple Delivery Models

On-Premise
MANAGED BY IT DEPARTMENT OR PARTNER

Software

- Allows for advanced customization to meet customer needs
- Managed by IT dept
- All data resides local and inside the firewall

Appliance

- Easy to install/maintain
- Managed by customer or partner
- Toolkits available for customization by partner or customer
- All data inside your firewall

Cloud Delivered
VENDOR MANAGED

Dedicated Hosted Environment

- Negotiated SLAs
- Monthly pricing available for hosting
- Can leverage toolkits available for customization
- Updates are applied transparently

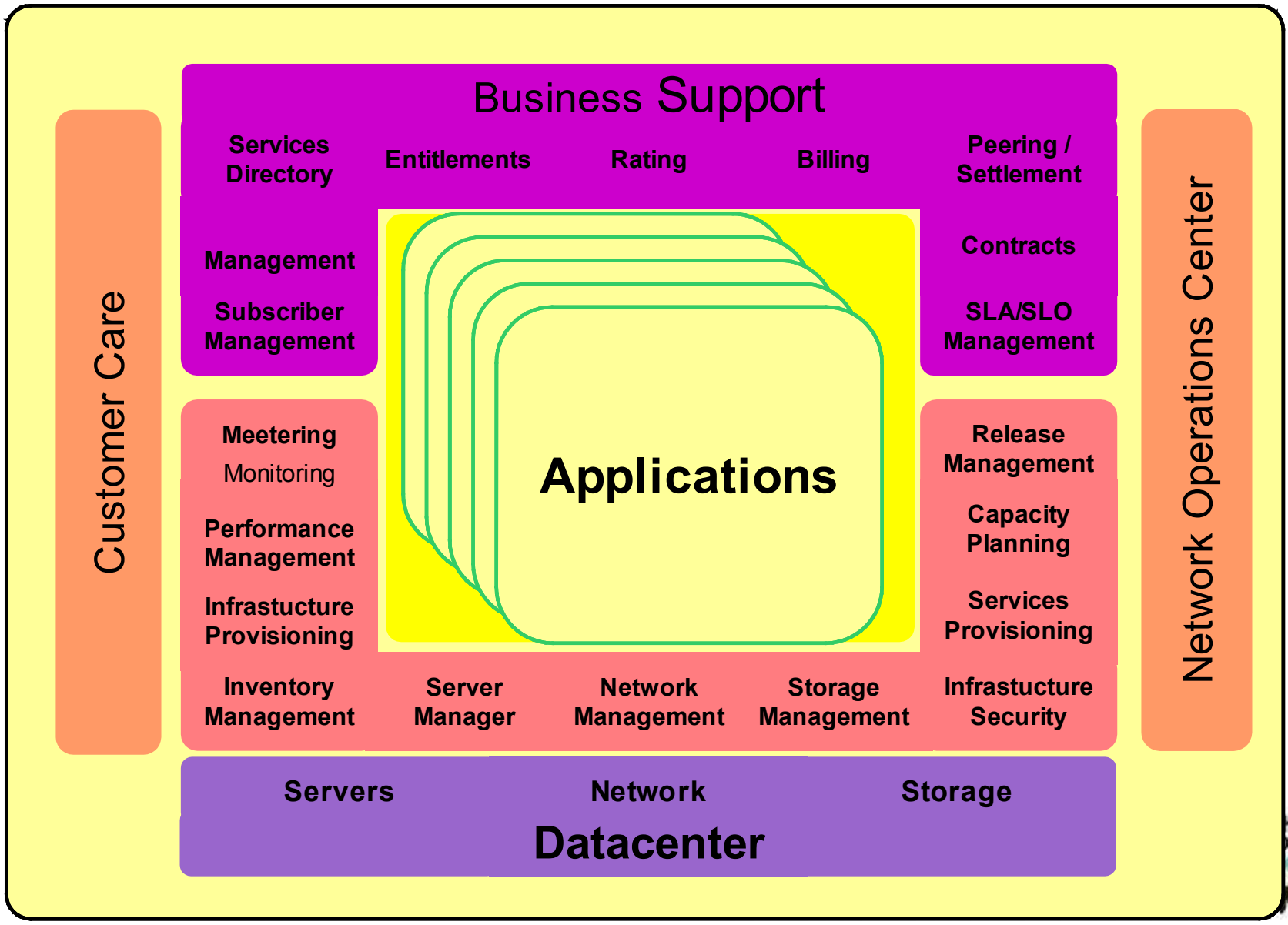
SaaS

- Low cost of entry
- Zero infrastructure – reduced overhead
- Flexible contracts
- Scales to meet customer demand
- Immediate access to the latest innovation

What's different about a SaaS delivery

- Is it not just a hosted version of what I have already? NO !
- Roles that the provider plays that are different
  - You are the System Administrator
  - You are the System Integrator
  - You are responsible for System Operations
    - Operations
    - Monitoring
    - 1st or 2nd Level Customer Support
    - Customer/user Onboarding
    - And so much more !!

Applications live in a context (platform)



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It's all about the offering

- Unlike a traditional Licensed Program Product (shrink wrap software), the offering for a SaaS is much more multi-dimensional
  - Feature function – of course !
  - How is it offered, and how do you buy,
    - Web based self service, self provisioning , Onboarding services, etc
  - How do users connect
    - Browser via the public internet – common, but not always
    - VPN, or Dedicated Network – common for enterprise
  - What are the Service Level Agreements (SLA') and Service Level Objectives

It's all about the offering

- Other considerations
  - Privacy laws and regulations
  - Geo-political data residency
  - Industry regulatory matters

- Defining the offering characteristics will fundamentally change the technical implementation
  - No new news, it's always about the specification

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Considering the dimensions of the problem

- To adapt existing software to cloud/SaaS deployment and achieve value – 4 major areas design must be addressed
  - Tenancy Model
    - What is the ordinality between your customers and your hardware/software infrastucture
  - Scale
    - How big? World Scale? Multi-Enterprise, Single Enterprise?
  - Reliability
    - How many 9's of availability? Disaster recovery? High availability?
  - Servicability
    - Schedules outages? Patches, Change Management

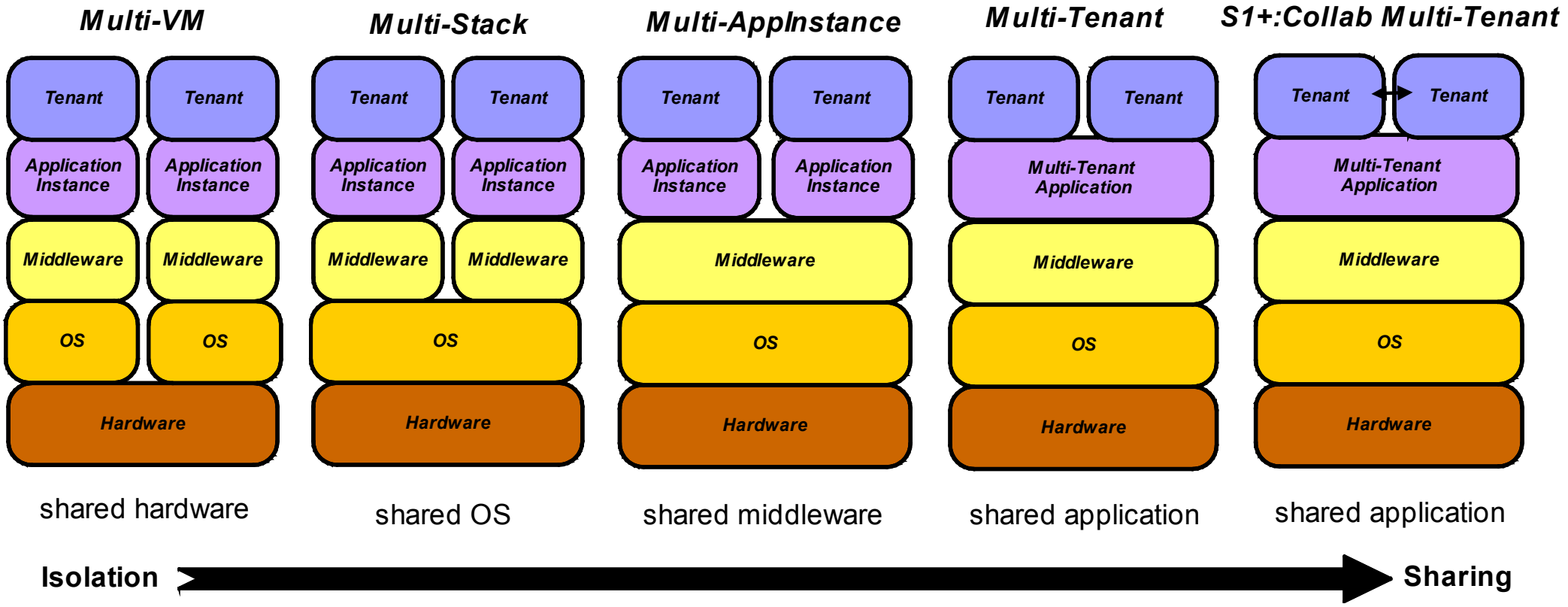
Considerations for Tenancy

- Very connected to the offering and the cost model for the service
- Lowest Cost (True Multi-Tenant) is also the hardest for adapting existing software
  - Most packaged s'ware or existing enterprise s'ware is single tenant, intended to be installed and, customized and configured one time per instance
  - Changing this may be very hard/expensive
- Directory and user model
  - Does it even consider that their might be more then one organization using the same instance?
  - What does onboarding mean?

Multi-Tenant possiblities

- Tenancy is really about the ordinality of customers to instances of:
  - Hardware
  - Middleware
  - Application(s)
- Sharing can progress from:
  - Share Nothing
  - Share Everything
  - The right mix depends on the offering characteristics

Multi-instance single-tenant applications vs. single-instance multi-tenant applications



From Single-tenant to Collab Multi-tenant:

- ❑ Isolation and customization
- ❑ Application Time-to-Market (Cost)
- ❑ Economy of multi-tenancy

Economy of Multi-Tenancy

System Configuration	4 cores and 8 GBytes memory limit for Middleware		
Tenant Characteristics	100 registered users per tenants 5% active user ratio (5 users)		
Active tenant ratio	10%		
	Multi-Stack	**Multi-AppInstance**	**Multi-Tenant**
# concurrent tenants (footprint/tenant)	**9** → due to memory footprint	**32** → due to memory footprint	**300** → due to performance bottlenecks
# registered tenants	**9** → inactive tenants consume runtime resources	**32** → inactive tenants consume runtime resources	**3,000** →inactive tenants don't consume runtime resources
Scaling Nbr of Tenants	1x	3x	**300x**
MMT Performance Overhead	./.	./.	App level: negligible DB level: 4% warm

Scale

- Scaling needs depend dramatically on choices of tenancy model
  - Up to 2 orders of magnitude difference in scaling requirements for full multi-tenant
  - Typical enterprise applications are designed for 25K – 250K user population
  - Parts of LotusLive today host 12M user
- Scale OUT (as opposed to scale UP) architectures are mandatory
  - Need to leverage redundancy to achieve BOTH costs and reliability models

Reliability

- 99.99% (4 nines) = 4 min / month downtime
- Typically not a problem for enterprise s'ware
  - High Availability is common
    - But perhaps expensive in practice
  - Load balancers, reverse proxy's are common system configuration elements
    - Can drive complexity of configuration or operations
- Disaster recovery needs more thought
  - Can compete with HA solutions for data replication
  - Management of DNS complex
  - Recovery Point Objective typically < 4 hrs
  - Recovery Time Objective typically < 8 hrs

Disaster Recovery Data Replication

- Ideal solution - “multiple writer”
  - Can be achieved via special purpose S'ware/H'ware, but is expensive (3Par)
- Active – Active
  - Typically reserved for HA in primary site
- Active – Stand by
  - Utilize active active replication??
    - Latency (distance) are competing factors
  - Log Shipping
    - Compromises RPO, can be difficult to assure consistency across multiplesystems

Servicability Requirements

- Typical commercial (competitive) requirements are driving “scheduled down time” to a max of 10 – 12 hrs per year, but tending towards 0
- This means, essentially, that all maintenance and upgrades must be accomplished “on the fly”
  - Includes OS Patches, OS & SW upgrades, etc
  - Difficult if the middleware takes an hr (or even ½ hr) to install a new version of your application
- Leads to the conclusion that planning for continuous operations is mandatory

Achieving Servicability (some thoughts)

- It's not just up to the operations team !
  - Servicability needs to be architected in, and, generally is not
- Upgrades to databases and schema's must be upwards compatible
  - And the software needs to treat the db as well
  - “Select * from xxx where yyy is unaceptable
  - Non-destructive data conversions
- Appliction Upgrade/Installation in “parts”
  - Some redundant systems off line for upgrades
  - Needs planning based on system load
  - Nees the software to be tollerant of partial upgrades

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Givens and d'ruthers
(If I got to do it again!)

- For the most part, with existing software, the fundamental architecture and middleware choices are already made
  - SQL vs NoSQL
  - Java vs PHP
  - Directory service assumptions
  - Installation and deployment technology
  - Database schema structure
- So, where to start

Where to start ?

- Directory Services
  - Adapt the LDAP directory to provide a “fiction” of multi-tenancy (bindID scopes the view of the directory)
- Databases providing support for multi-tenant
  - Implicit “where tenant in.... “ clause on every row
  - Or, add it yourself, with better understanding of what a Tenant means to your application
- Installation and deployment
  - Virtualization can be your friend
    - Needs more advanced image activation
  - RPM and YUM greatly simplify

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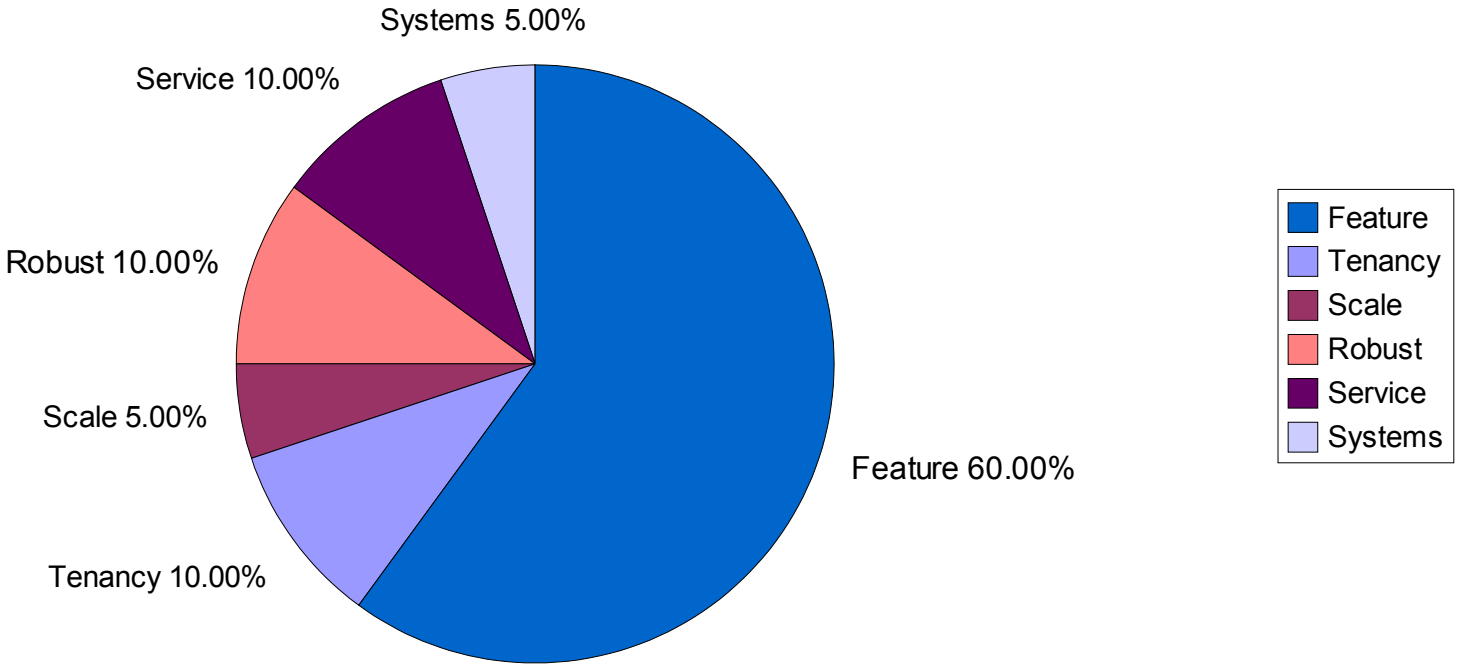
Is There Hope ?

- Yes ! For certain cases
  - Many commercial situations do not demand full mult-tenancy and the scale that that implies
    - Virtualization helps
    - Share – a – lot (but not everything)
  - Looking at overall effort most effort needs to be applied in the areas of Operational Support
    - Servicability
    - Automation of deployment and instantiation

Percentage of Effort for adaptation



Reflects effort to “fix” applications relative to effort to develop

Is There Hope?

- But for full massive multi-tenant

> “If I were trying to go where your trying to go, I wouldn't start from here"

Thank YOU !

Questions and Discussion?

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