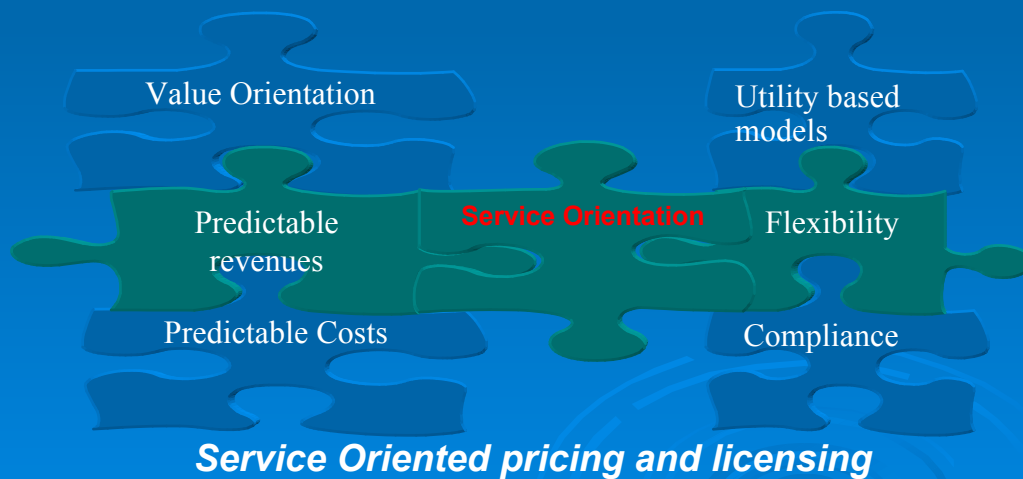



# Pricing and Licensing Issues in Grid Computing

Amit Sharma and Anirban  
Chakrabarti



# Agenda

- Introduction and context setting
  - Pricing and Licensing (P&L)- state of the art
  - Case study of a mature service ecology
  - Service Oriented P&L
  - Architectures for P&L for Grid and Web Services
  - Related Issues
  - Interaction
- 

# Introduction and context setting



# Call for a change...

“Continued low software market growth rates, shift in customer purchasing trends and an increasing interest in alternatives to traditional software business models have set the stage for a potentially disruptive impact on vendor licensing policies and practices.”

- *IDC Report*

Source: The Future of Software Licensing: Software Licensing Under Siege, White Paper by IDC, March 2004, © IDC

# Call for a change...

"You will see an alternate pricing model per user and per processor. And [it will be done] on an annual basis: so much per employee per year."

- *Larry Ellison*

Source: InfoWorld article dated Feb. 06, 2004

# Call for a change...

“companies are going to have to change their business models and their attitudes for how they license their products in a grid world”

*- Ian Baird, chief business architect and VP of marketing,  
Platform Computing*

Source: May. 15, 2004 Issue of CIO Magazine

# Call for a change...

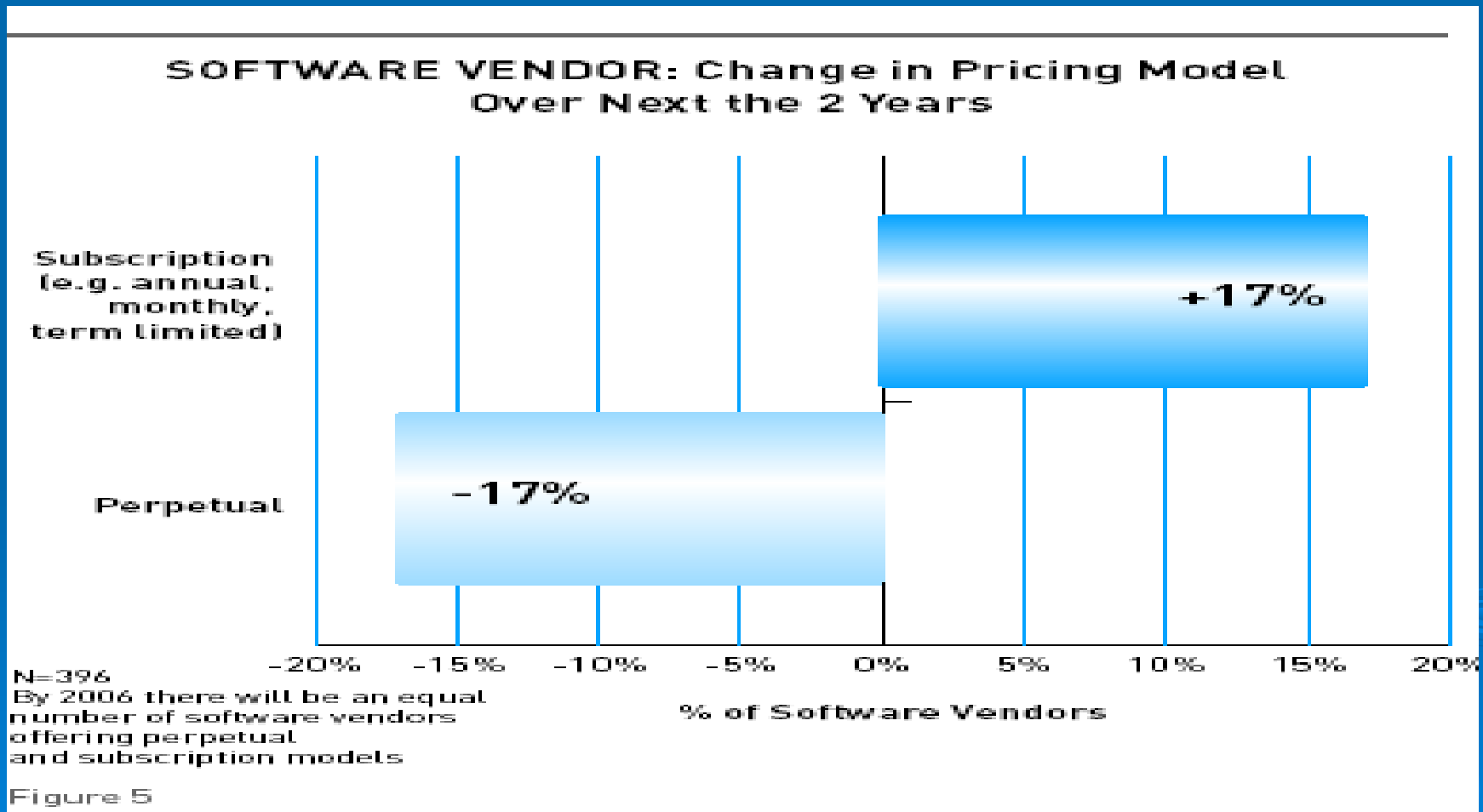
"One of the biggest problems of the grid is accounting...How do you pay for things? How do you set charges?"

- *John Hurley, director of grid evaluation and implementation at Boeing*

Grid licensing is an "unresolved problem."

- *Albert Bunshaft, IBM's VP of grid computing sales and business development*

# Subscription licensing becoming popular...

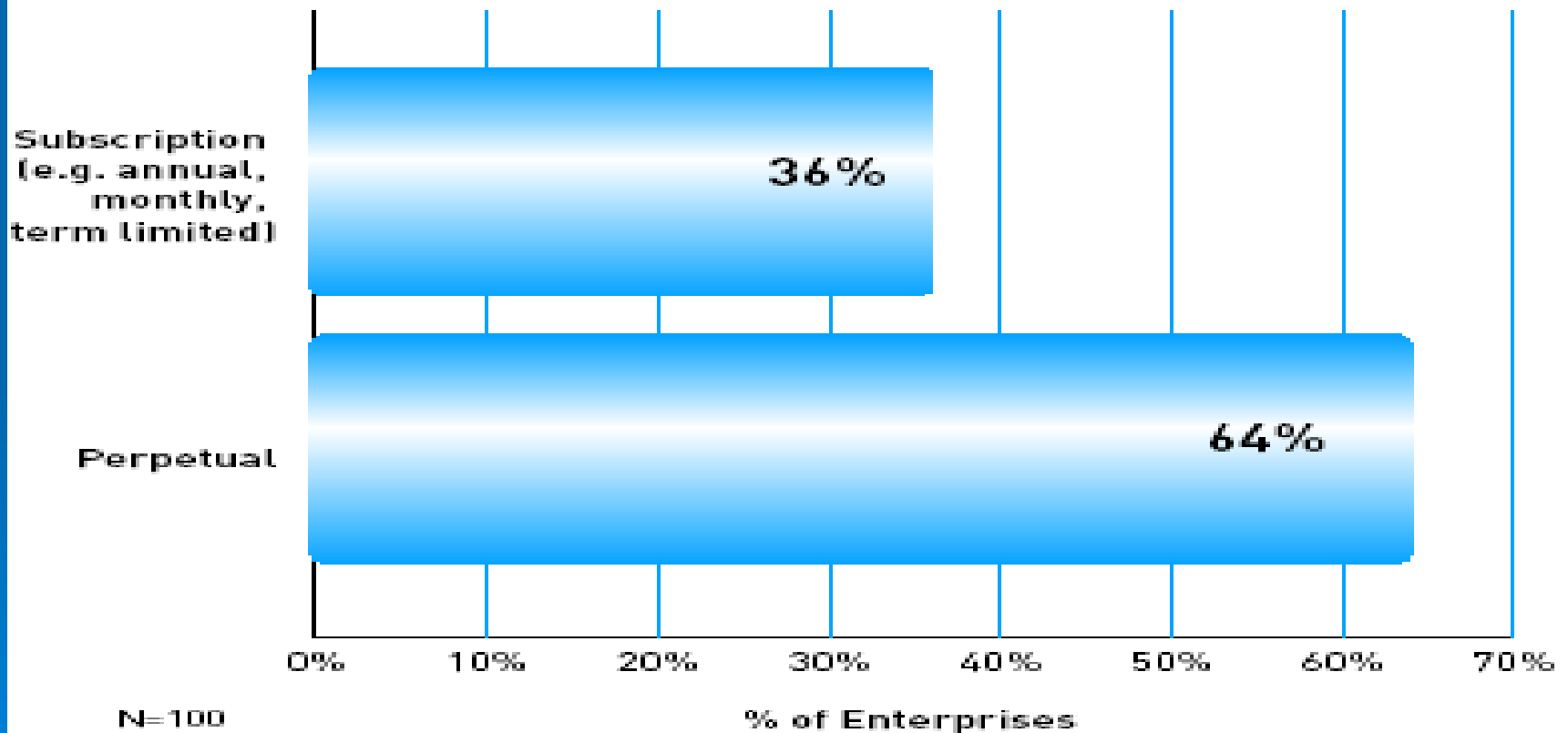


Source: key trends in software pricing and licensing, report sponsored by Macrovision, SoftSummit, SIIA and CELUG

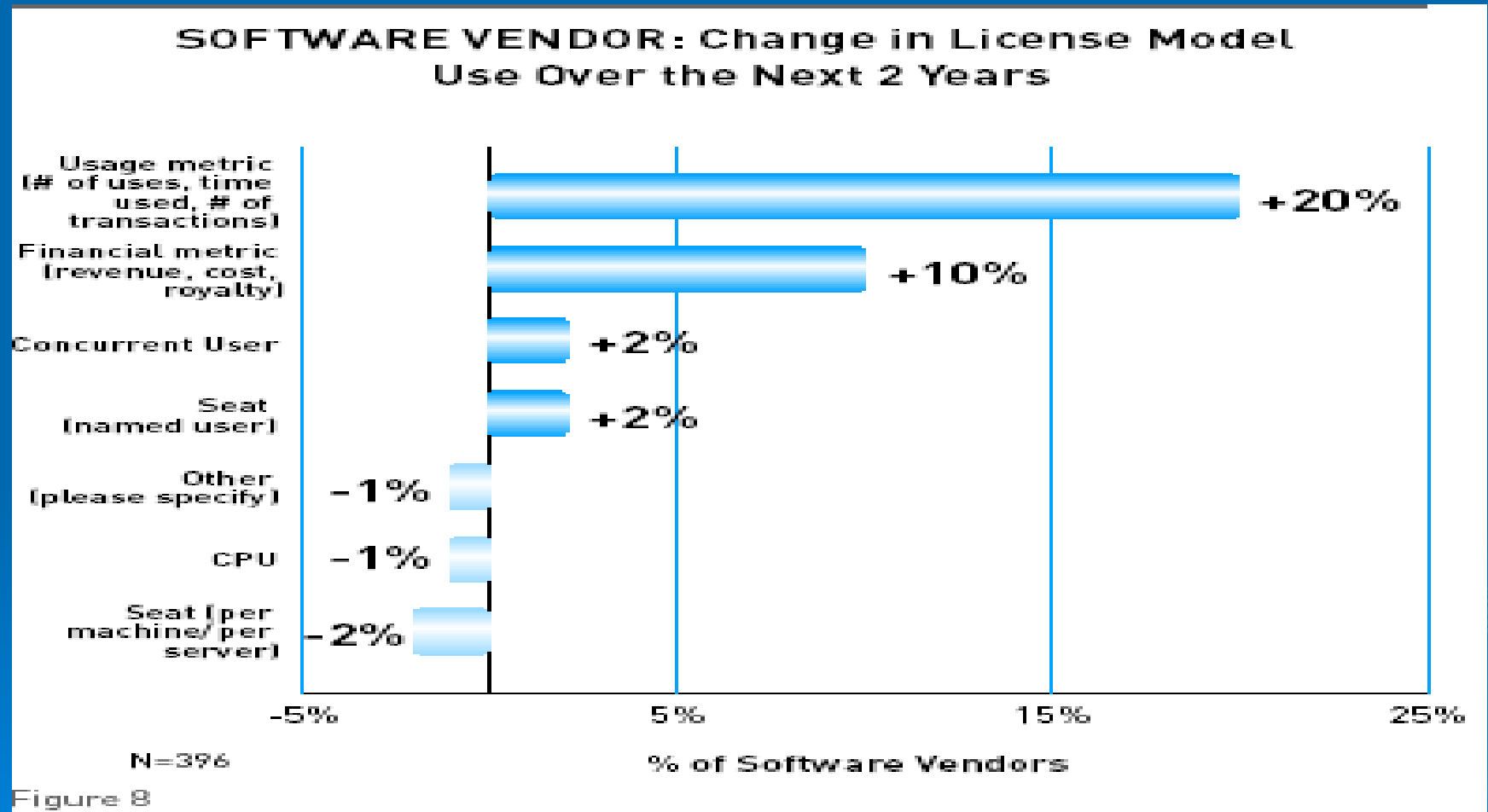


# But enterprises are wary...

## ENTERPRISE: Most Preferred Pricing Model



# Metrics-based licensing models



# License compliance

## SOFTWARE VENDOR: Change in License Method Over the Next 2 Years

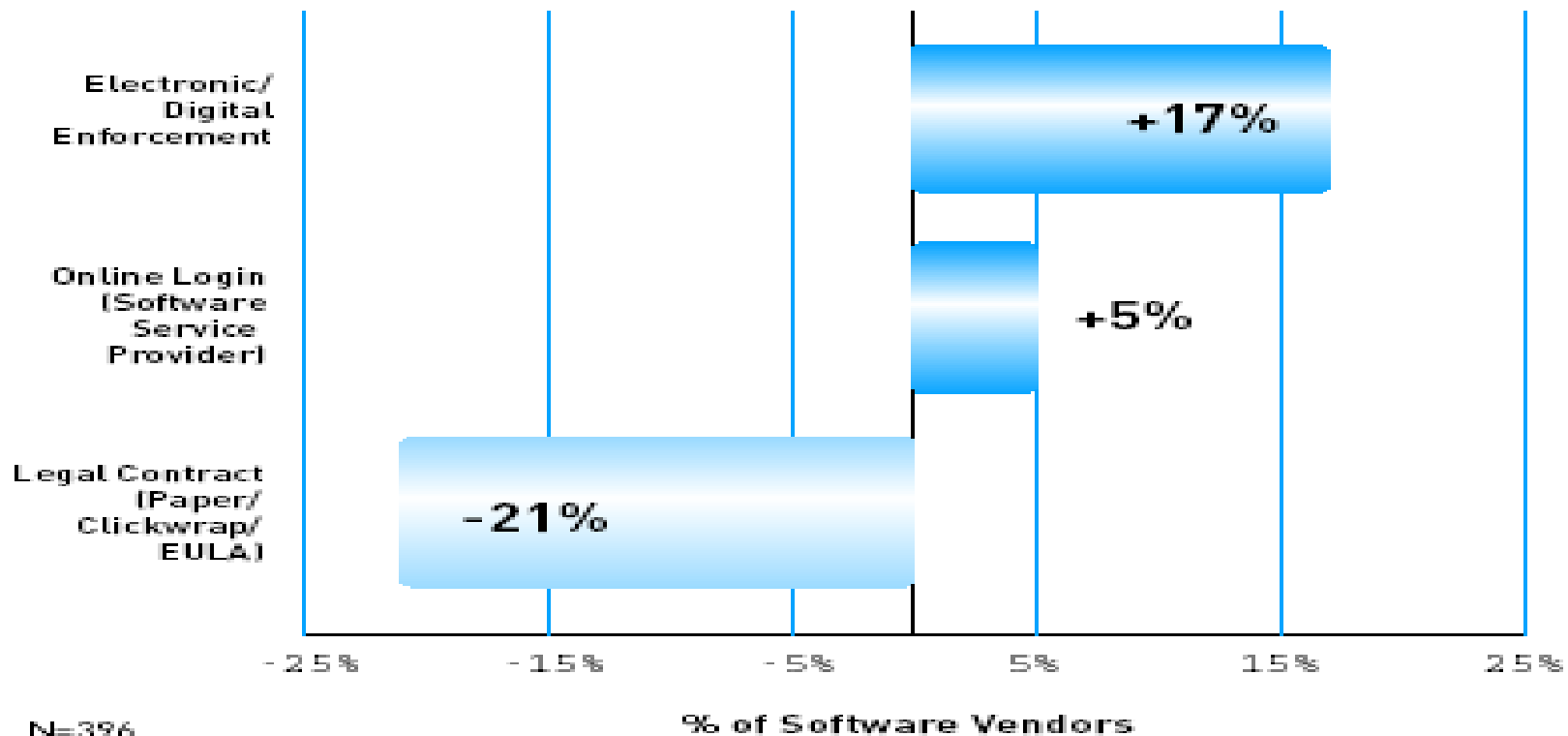


Figure 11

# Other developments...

- Oracle shifts to user based licensing
- Sun's per employee pricing model and per-citizen per year pricing for Java Enterprise System
- IBM Allegro- technology to support provisioning and metering of Web services
- FlexLM by Macrovision

# Grid technology and problems in P&L

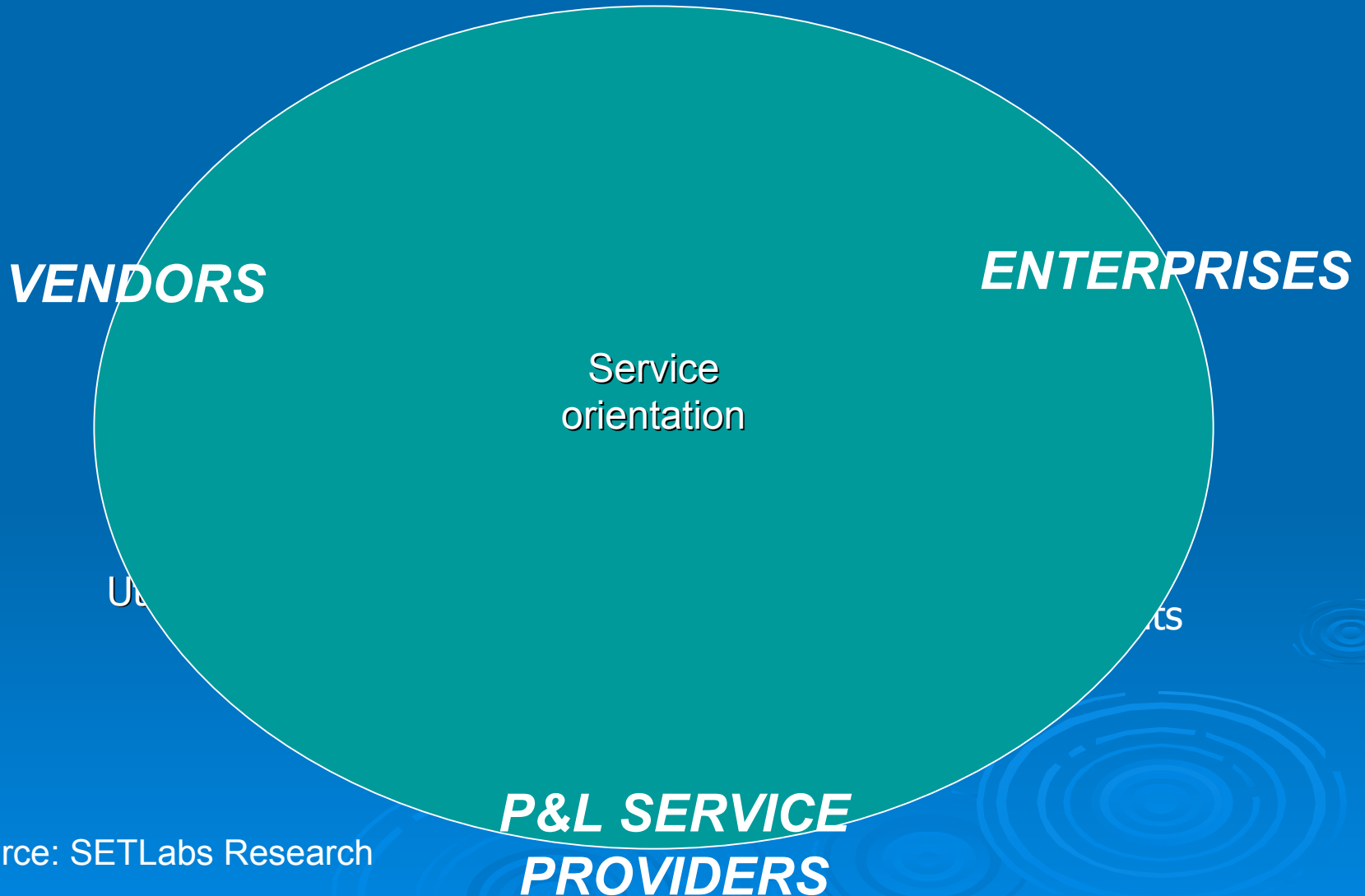
- Case 1- Enterprise ABC:
  - Rearchitecting its enterprise IT around SOA
  - Has to pay upfront for much of the new software, including middleware and application servers
  - Limited subscription based licensing is not attuned to its needs
  - Ends up paying for software it never uses
  - *What ABC wants is a true service-enabling of its resources, and this should reflect in how it pays for the software it uses*

# Grid technology and problems in P&L

## ➤ Case 2- Corporation XYZ:

- installing a grid environment for carrying out finite element analysis for crash test simulations
- Problem: distributing applications requires more per-machine licenses than a single installation on a high end machine would
- Composite multi-machine licenses don't satisfy its needs
- The licensing ends up annulling some benefits of adopting grid technology
- *What XYZ wants is a P&L scheme which suits the new paradigms which grid computing exploits*

# The context for P&L changes



Source: SETLabs Research

# P&L- state of the Art





# Definitions

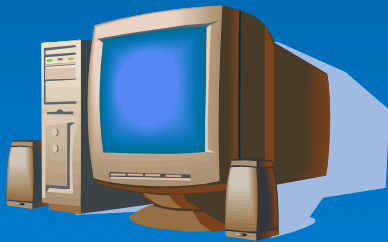
- Pricing- the scheme according to which a product or service is charged for
- Licensing- the terms and conditions agreed between a provider and a consumer that govern the use of a certain resource

# Different Pricing Models

User based

Usage based

Machine/Resource  
based



# Different Licensing Models

## Perpetual licensing

### Features:

- Buy the resource “forever”
- Complete ownership of the resource, once purchased
- Free to use , and sometimes to modify

### Limitations:

- inflexibility of IT infrastructure for buyer
- unpredictability of revenues
- Unpredictability of costs for vendor

# Different Licensing Models

## Subscription based licensing

### Features:

- Subscribe to the resource for a period of time
- Limited ownership and right of use

### Limitations:

- Pay for products/releases/upgrades which may not come
- Pay for modules/components which may not be used

# Case Study: P&L in a mature Service Ecology



# The New York state transport system

- MTA New York City Transit:
  - is one of the most extensive and complex public transportation systems in the world
  - Provides 24-hour-a-day bus and subway service throughout the five boroughs
  - Moves more than six million people a day

*The public transportation system offers us a Service Ecology- a collection of services which provide the same functionality with different Qualities (cost, security, speed, reliability etc.).*

note: information taken from <http://www.ny.com/transportation/>

# The New York state transport system

## ➤ Subway System:

- Metrocards can be bought on a pay-per-ride basis (\$1.50 per ride) or an unlimited ride basis
- With pay-per-ride, you get 11 rides for the price of ten and you can add more money to your card if need be
- With unlimited ride Metrocards, you can get a 30 day card for \$63, a 7 day card for \$17, or a 1 day Fun Pass for only \$4.
- Children under 44" tall ride for free; senior citizens and disabled people ride for a reduced fare.

# The New York state transport system

## ➤ Bus System:

- Exact fare of \$1.50 is required, payable using either coins or a subway token
- Transfers to connecting buses are free, and are usually time stamped to the closest hour.
- All MTA buses are equipped with wheelchair lifts, which allow wheelchair users to board through the rear door.



# The New York state transport system

## ➤ Taxi System:

- serve as a quick and easy means of transportation across Manhattan
- The rates for taxicabs are as follows:
  - Initial fare.....\$2.00
  - Each 1/5 mile (4 blocks).\$0.30
  - Each 1 minute idle.....\$0.20
  - Night surcharge.....\$0.50 (after 8pm until 6am)
  - Additional riders.....FREE
- The Taxi and Limousine commission regulates the taxi system.

# The New York state transport system

- In addition to these standardized Services, NY also offers a number of customizable services
- These include, for example, Cruises and Ferries

# The New York state transport system

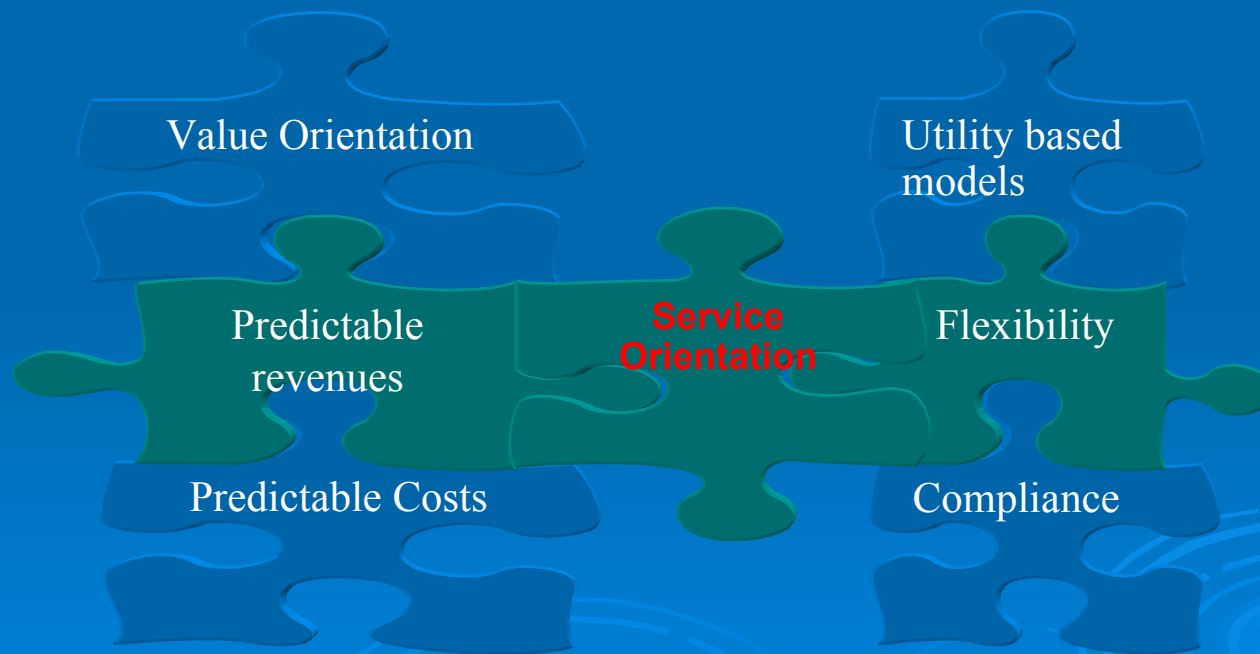
- Learnings about pricing and licensing:
  - Service orientation
  - Flexible licensing of services
  - Utility Based pricing schemes available
  - Independent regulatory bodies for ensuring compliance
  - Measurement and metering of resource consumption
  - Both standardized and customizable options available

# Service Oriented P&L



# Service-oriented pricing and licensing

An evolutionary pricing and licensing approach which takes into account the service oriented nature of modern IT systems.



*Service Oriented pricing and licensing*

# Grid technology and Service Oriented P&L

- Grid technology can be a key driver for Service Oriented P&L because it:
  - virtualizes resources
  - extensively uses service orientation
  - facilitates utility-based models
  - Just doesn't work well with existing P&L schemes

# Grid technology and Service Oriented P&L

- Service Oriented P&L will also accelerate adoption of grid technology because it:
  - Addressed the #1 concern of IT managers in Enterprises- Cost
  - Provides incentive for experimenting with grid initiatives
  - Allows for more and more applications to be run on grid systems

# Service-oriented pricing and licensing

## Features:

- True service orientation of resources
- Cost can reflect the usage, if desired
- Is not bound to a machine or user, but rather to services
- Gives flexibility in P&L options depending on the needs of the customer
- Value Orientation
- Predictable costs
- Predictable revenues
- Compliance
- Metering and measurement




# Service-oriented pricing and licensing

	<b>NY transportation system</b>	<b>Software systems</b>
Perpetual licensing	Owning a car	Purchasing COTS software
Subscription licensing	Monthly passes in public transportation	Installed Capacity based pricing
Usage Based	Point to point ticket	<i>Usage Based pricing</i>

# Implementation



# Architectural components

A teal rectangular box with a white border and a slight 3D effect, containing the text "Monitoring and metering system".

Monitoring and  
metering system

A teal rounded rectangular box with a white border, containing the text "Generic license server".

Generic license  
server


A teal cylindrical box with a white border, representing a data store, containing the text "Data store".

Data store

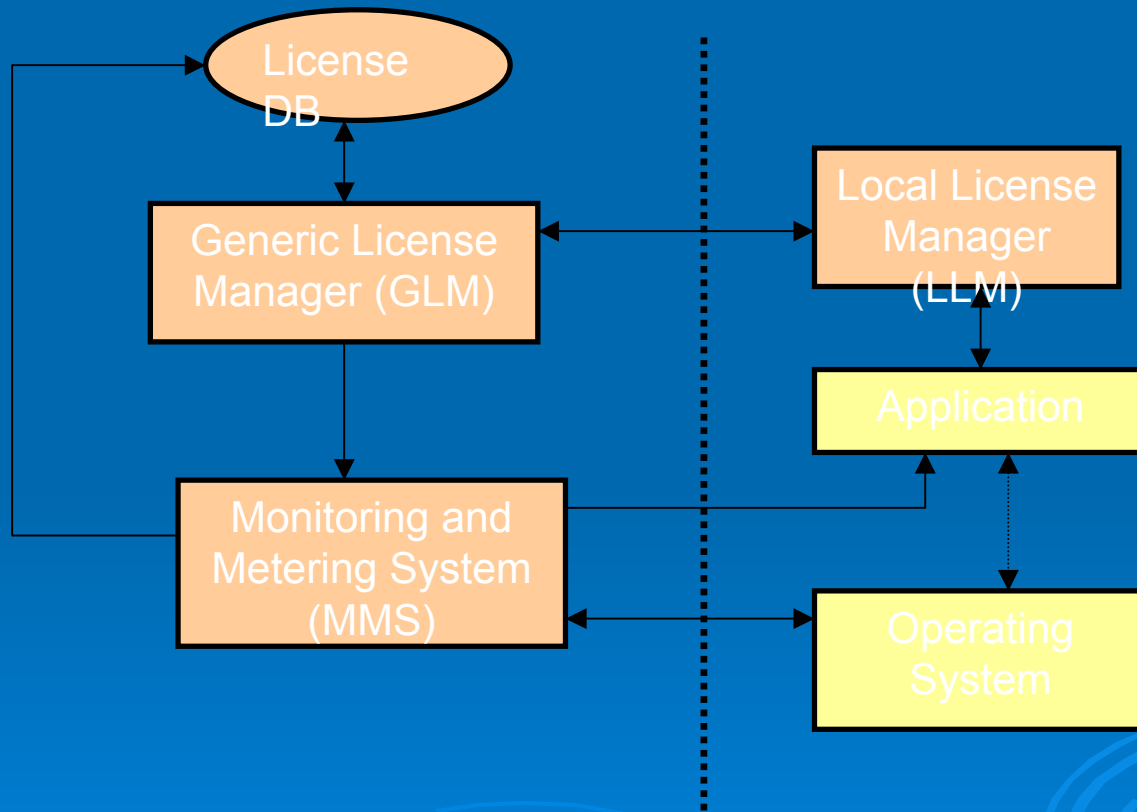
A teal rounded rectangular box with a white border, containing the text "Local infrastructure on machines".

Local infrastructure  
on machines

# General requirements

- Extensible
  - Manageable
  - Flexible
  - Open and interoperable
- 
- The background features several sets of concentric circles in a lighter shade of blue, resembling ripples in water, positioned in the lower right quadrant of the slide.

# A schematic for the architecture



# Component functions

## ➤ License DB:

- Stores License Certificates
- Stores Metering information (periodically measured system data)
- Stores Monitoring information (information about license usages)
- Exposes information through Web Services and other standard interfaces

# Component functions

## ➤ Generic License Server:

- Provides licenses to applications
- Carries out authentication of users and machines
- Secures against unauthorized access
- Updates MMS with license issuance data, logs etc.

# Component functions

- **Monitoring and Metering System:**
  - Monitors for exceptional conditions raised by the GLS, applications or Operating System.
  - Meters data periodically about usage and system parameters
  - Updates the License DB



# Component functions

- Local License Manager:
  - Brokers with the Generic License Server to get licenses when needed
  - Monitors on local machine for license expiry
  - Reports exceptions to Generic License Server

# Relationship with WS-RF

## ➤ Option 1:

- A resource can have a “usage property” associated with it.
- Standard ways to define, monitor and manage usage property
- Pricing models and licensing schemes will reside in a separate application
- Outside world can talk to the resource using an encapsulating service

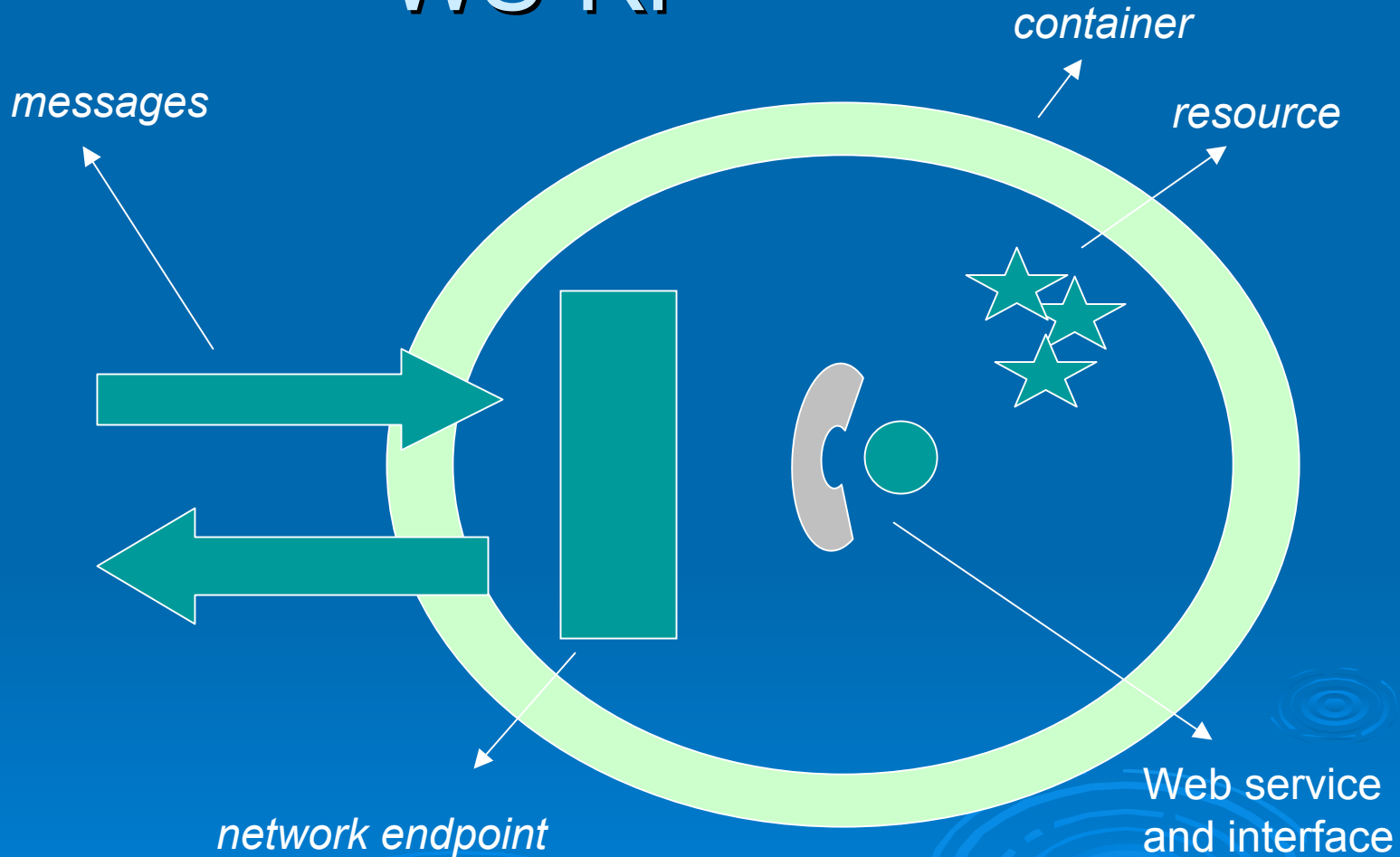
# Relationship with WS-RF

## ➤ Option 2:

- The pool of licenses is modeled as a WS-Resource
- Pricing Scheme modeled as resource properties
- Monitoring and Management of licenses carried out through WS-RF mechanisms

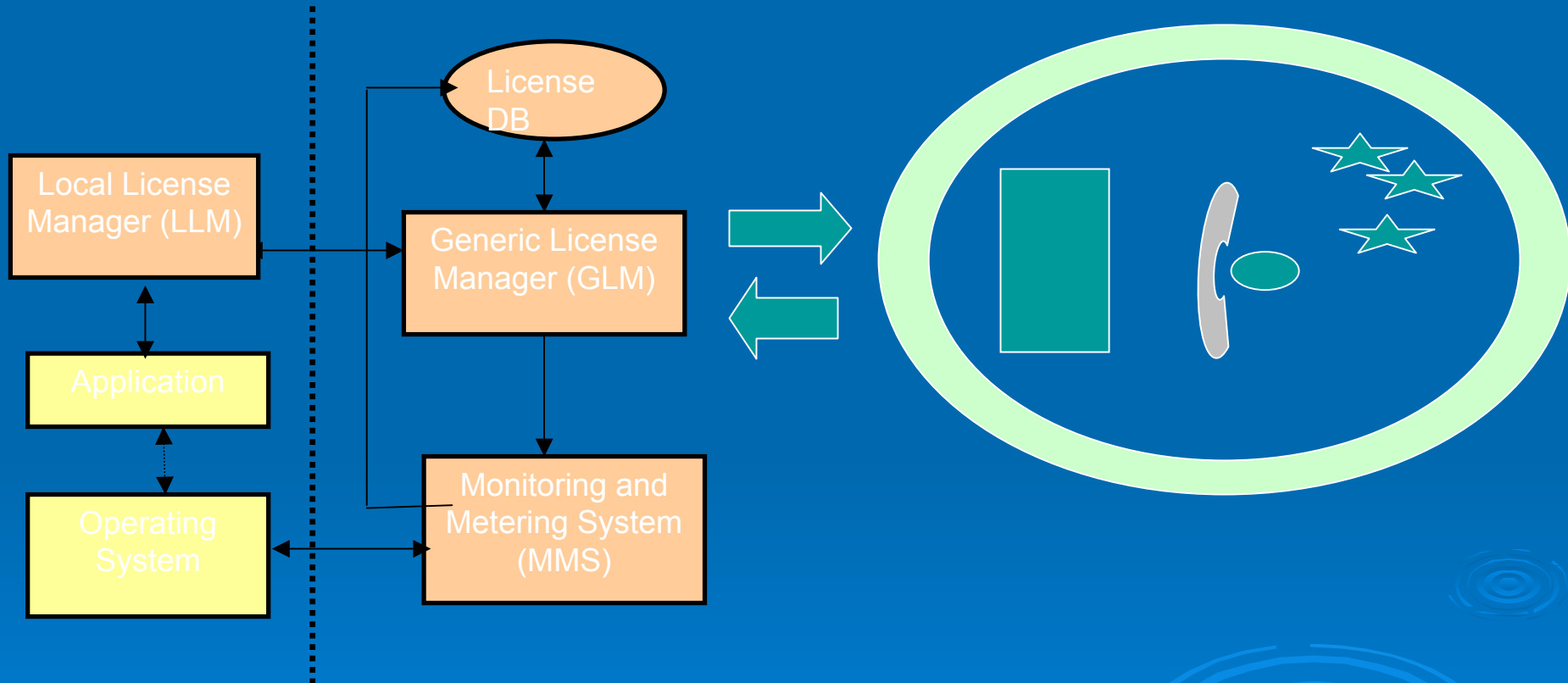
Note: Original suggestion from Ian Foster

# A web service environment and WS-RF



Source: "Modeling Stateful Resources with Web Services"

# P&L integrated



# Issues, Problems and Challenges



# Issues, Problems, Challenges...

- Where does open source fit in?
- Relation to piracy
- More fundamental issues: the distinct nature of software services vis-à-vis “physical” services

# Issues, Problems, Challenges...

- Revenue loss for vendors
- Demonstration of business value for enterprises
- Complexity of licensing schemes
- Awareness and sensitization
- Standardization- why don't we develop our own licensing system?
- Outsourced and hosted apps



# Conclusion

- Pricing and licensing systems imminently need a revision
- They need to be aligned with the service-oriented nature of today's software-intensive systems
- Grid computing has a cardinal relationship with service-oriented P&L

# The road ahead

## ➤ What we can do:

- Develop new pricing models and licensing schemes
- Design architectures which satisfy the conditions of a service-oriented P&L system
- Contribute to the community by developing open-source P&L management systems
- Integrate with WSRF

# Interaction

(questions, criticism, comments,  
feedback)

The background features several sets of concentric circles in a lighter shade of blue, resembling ripples in water, positioned in the lower right and bottom center areas.

# Thanks

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and  
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