Cloud Computing
The Gathering Storm
EXECUTIVE SUMMARY

- Cloud Computing is an organizing principle for buyers
- Focus is on faster, cheaper, better applications
- IT will have to enable the company to use outside providers then compete with them to provide services
- New models will emerge to drive growth and reduce costs
- Get educated first, identify pilot opportunities second
- Software as a Service is the short term opportunity, Infrastructure as a Service the long term, Platform as a Service has limited value
The Business of Cloud
WHY CLOUD?

IT has fallen behind the evolution curve of the business...

- Business Agility is Threatened:
  - Of 1,150 global CEO’s, 76% say the ability to adapt will be a key source of strategic advantage in 2009*

- Complexity is growing:
  - CIO’s see complexity as a threat to the very survival of their business

- Operation Costs Exceed HW Costs:
  - CEO’s view growth as a key focus area
  - Operational costs far exceed the budgets for new hardware

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WHY CLOUD?

...resulting in serious challenges for IT today.

- Many applications are proprietary, slow, siloed & exhibit single points of failure but are too expensive to remand
- Complex, heterogeneous infrastructure create resource & data silos and recovery nightmares
- Enterprise data is largely distributed and rife with errors
- Infrastructure resources are highly underutilized
  - PCs/Servers < 10%
  - Storage < 50%
- Change is a cost prohibitive and time consuming process

IT has been driven by cost instead of value!
"Cloud Computing" refers to the on-demand delivery of IT resources via the Internet with pay-as-you-go pricing. Cloud enables rapid access to flexible and low cost IT resources.

Benefits:
- **Low Ongoing Cost:** Reduce your overall IT costs
- **No Upfront Investment:** Replace upfront infrastructure investment with low monthly costs
- **Apps not Ops:** Focus on projects that differentiate your business, not the infrastructure
- **Speed & Agility:** Develop and deploy applications faster
- **Global Reach:** Take your apps global in minutes

Cloud Uses:
- Websites
- Enterprise Applications
- Big Data
- Backup & Storage
- Mobile Apps
- Digital Media

Cloud Ecosystem Breakdown:
- Software as a Service
- Utility / Infrastructure Computing
- Platform as a Service
- Software as a Self Service
- Software +Services
- Service Oriented Architecture
Cloud Computing is a model of how IT should operate as a business!

CHARACTERISTICS

- Accessibility
- Agility
- Service Management
- Flexibility
- User Metering
- Cost Efficiency
- Automation
- Virtualization
DIFFERENT PERSPECTIVES

**Line of Business Executive**
“A buyer centric view of technology where applications are available, through purchase, rental or even development, wherever and whenever.”

**CFO**
“An approach to consume technology in a pay-as-you-go model where consumers only pay for what they use.”

**CIO**
“A comprehensive virtualization model for technology from infrastructure through application delivery.”

**Cloud Computing is ALL of the above!**
EVOLUTION OF CLOUD

Grid Computing
- Solving large problems with Parallel computing
- Made mainstream By Global Alliance

Utility Computing
- Offering computing resources as a metered service
- Introduced in late 1990s

SaaS Computing
- Network-based subscriptions to applications
- Gained momentum in 2001

Cloud Computing
- Next-Generation Internet computing
- Next-Generation Data Centers
WHAT CLOUD IS NOT

It is NOT Network Computing
- Application and Data are not confined to any specific Company’s Server
- No VPN Access
- Encompasses multiple companies, multiple servers and multiple networks

It is NOT Traditional Outsourcing
- Not a contract to host data by 3rd party Hosting Business
- No subcontracting for computing services for specific outside firm
FORTUNE 500’S RAPID ADOPTION

**GE**  - Global procurement hosting 500k suppliers and 100k users in six languages on SaaS platform to manage $55B/yr in spend

**Bechtel**  - Reduced infrastructure cost by 30% in part by achieving 70% server utilization

**Washington DC**  - Google Apps used by 38k employees reducing costs to $50/user per year for email, calendaring, documents, spreadsheets, wikis, and instant messaging

**Eli Lilly**  - Using Amazon Web Services can deploy a new server in 3min vs 50days and a 64-node Linux cluster in 5min vs 100days

**NASDAQ**  - Using Amazon Storage to store 30-80GB/day of trading activity

**Others leaders include Hasbro, ESPN, Major League Baseball, New York Times and British Telecom**
### ON THE CLOUDS

Small and medium businesses are major implementers, though banks are also getting into cloud computing in a small way.

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>BUSINESS</th>
<th>APPLICATIONS ON CLOUDS</th>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE Data</td>
<td>Business &amp; support mgmt.</td>
<td>ERP, CRM, HR, sales, project, cash</td>
<td>Has saved upfront and maintenance expense worth in lakhs</td>
</tr>
<tr>
<td>Axis Bank</td>
<td>Banking &amp; financial serv.</td>
<td>Non-core storage infrastructure</td>
<td>Will save on infrastructure cost</td>
</tr>
<tr>
<td>Elbee Express</td>
<td>Courier &amp; delivery</td>
<td>CRM, HR, mailing and delivery</td>
<td>Increased mobility, reduced cost</td>
</tr>
<tr>
<td>ING Vysya</td>
<td>Banking &amp; financial serv.</td>
<td>CRM and lead management</td>
<td>Management cost reduced by 90%</td>
</tr>
<tr>
<td>ISFC</td>
<td>Non-banking financial serv.</td>
<td>Marketing/Relationship mgmt.</td>
<td>Increased flexibility reducing operational expense</td>
</tr>
<tr>
<td>Latent View</td>
<td>Data analysing</td>
<td>CRM and advertising</td>
<td>Reduction in capex by 10% to 20%</td>
</tr>
<tr>
<td>LifeSpring Hospitals</td>
<td>Healthcare</td>
<td>Customer data</td>
<td>Helps in monitoring patients’ records</td>
</tr>
<tr>
<td>Vembu Tecnologies</td>
<td>Software products</td>
<td>Storage and softwares</td>
<td>No server costs</td>
</tr>
</tbody>
</table>

Source: Companies
NEW SERVICES EMERGING EVERY DAY

Data Warehousing & Business Intelligence as a Service

Today companies are challenged to find and build in-house expertise in both technologies, and expertise directly correlates with value. A service would obviate the large investment in people and technology focusing expenditures on results.

Business Process Outsourcing as a Service

Outsourcing business processes requires adoption for the outsourcer or migration for the customer. Service enablement obviates the need for platform changes focusing instead on pushing data through the process in a seamless stream.

Business Continuity & Disaster Recovery as a Service

Clouds break the link between applications and hardware enabling lightening fast responses to outages and disasters without disruption. Billions of dollars spent provisioning “just in case” environments can be saved while improving service.

Entrepreneurs identify new ways to leverage clouds to address corporate headaches
The Technology of Cloud
Three primary models for Cloud Computing have emerged:

- **SaaS (Software as a Service)**
  - Applications, typically available via the browser:
    - Google Apps
    - Salesforce.com

- **PaaS (Platform as a Service)**
  - Hosted application environment for building and deploying cloud applications:
    - Salesforce.com
    - Amazon E2C
    - Microsoft Azure

- **IaaS (Infrastructure as a Service)**
  - Utility computing data center providing on demand server resources:
    - HP Adaptive
    - Rackspace
    - Amazon E2C & S3

*SaaS and IaaS are the key cloud capabilities for 80% of our customers*
3 PRIMARY CLOUD MODELS

SaaS
- Easy first step to adopt alternative desktop office application
- Requires nothing more than a credit card to start
- Will drive home the SOA value proposition

PaaS
- Aimed primarily at small & new companies but models apply to all
- Large companies will benefit as services scale up and model is driven into internal software development tools and processes

IaaS
- Galvanizing approach to Utility Computing to drive high ROA
- Overflow to external provider to avoid cap-ex to meet peaks
- Longer term play due to immature tools and resistance to change
SOFTWARE AS A SERVICE (SaaS)

*SaaS will disrupt the application management functions for both internal IT and outsourcers*

- Applications (word processor, CRM, etc.) or application services (schedule, calendar, etc.) execute in the “cloud” using the interconnectivity of the internet to propagate data
- Custom services are combined with 3\textsuperscript{rd} party commercial services via orchestration (SOA) to create new applications
- Requires investment to build an enabling layer with governance, security and data management functionality
- May require integration with back-office systems
- Pay-as-you-go model
SaaS DEFINITIONS

- Standalone: External applications with little to no required integration
- Back Office: External applications such as sales force automation, customer relationship management and enterprise resource planning which require integration with one or more internal systems
- Component Based: External application components used by internal or external applications to provide functionality through any of several integration methods typically built on a Service Oriented Architecture
**SaaS BENEFITS**

**Strong governance required to prevent lines of business from purchasing application services externally without IT involvement**

**Benefits**
- Speed
- Reduced up-front cost, potential for reduced lifetime cost
- Transfer of some/all support obligations
- Elimination of licensing risk
- Elimination of version compatibility
- Reduced hardware footprint

**Challenges**
- Extension of the security model to the provider (data privacy and ownership)
- Governance and billing management
- Synchronization of client and vendor migrations
- Integrated end-user support
- Scalability
**PLATFORM AS A SERVICE (PaaS)**

*PaaS will disrupt the application development and management functions for internal IT*

- Applications are built in the “cloud” on the platform using a variety of technologies
- Simplifies orchestration of cloud services
- Development, testing, and production environments (servers, storage, bandwidth, etc.) are billed monthly like hosting
- Pay-as-you-go model
- Environments scale up & down at the click of a button
- Concerns include code & data privacy, security and scalability
# PaaS BENEFITS

**Strong governance required to prevent lines of business from building applications without IT involvement**

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pay-as-you-go for development, test, and production environments</td>
<td>• Governance</td>
</tr>
<tr>
<td>• Enables developers to focus on application code</td>
<td>• Tie-in to the vendor</td>
</tr>
<tr>
<td>• Instant global platform</td>
<td>• Extension of the security model to the provider</td>
</tr>
<tr>
<td>• Elimination of H/W dependencies and capacity concerns</td>
<td>• Connectivity</td>
</tr>
<tr>
<td>• Inherent scalability</td>
<td>• Reliance on 3rd party SLA’s</td>
</tr>
<tr>
<td>• Simplified deployment model</td>
<td></td>
</tr>
</tbody>
</table>
IaaS will disrupt the infrastructure management functions for both internal IT and outsourcers

- Compute resources (processors, memory, storage, bandwidth, etc.) are provided in an as-needed, pay-as-you-go model
- Able to provide from single server up to entire data centers
- Creates new opportunities such as Cloud bursting: shifting usage spike traffic to alternate resources
- Infrastructure scales up and down quickly to meet demand
- Built on a utility computing architecture to host a SOA application layer
IaaS DEFINITIONS

- **Cloudbursting**: On demand provisioned external infrastructure (via cloud provider) to handle traffic spikes beyond the ability of internal systems.
- **Internal**: Internal cloud oriented infrastructure with economic and service models competitive with external clouds.
- **Internal with SaaS**: Hybrid model building an internal SaaS model on top of an internal cloud infrastructure to create an internal cloud.
- **Outsourced**: Traditional outsourcing model where infrastructure is migrated to an external cloud.
- **Outsourced with SaaS**: Hybrid model similar to Internal with SaaS but using an outsourced provider.
**IaaS BENEFITS**

**IaaS is the onramp for corporate IT to Cloud Computing!**

**Benefits**

- Systems managed by SLA should equate to fewer breaches
- Higher return on assets through higher utilization
- Reduced cost driven by
  - Less hardware
  - Less floor space from smaller hardware footprint
  - Higher level of automation from fewer administrators
  - Lower power consumption
- Able to match consumption to demand

**Challenges**

- Portability of applications
- Maturity of systems management tools
- Integration across the Cloud boundary
- Extension of internal security models
Solutions and vendors are emerging daily
## Cloud Ecosystem

### Software as a Service (SaaS)
- Google Apps
- Zoho Office
- Workday
- Microsoft Office Live

### Platform as a Service
- Amazon E2C
- Salesforce.com Force.com
- Google App Engine
- Coghead

### External IaaS
- HP/EDS (TBD)
- IBM Blue Cloud
- Sun Grid
- Joyent

### Internal IaaS
- HP Adaptive Infrastructure as a Service

### Utility Systems Management Tools+
- VMWare
- IBM Tivoli
- Cassatt
- Parallels

### Utility Application Development
- Data Synapse
- Univa UD
- Elasta Cloud Server
- 3tera App Logic

### Other Tools
- Xen
- Zuora
- Aria Systems
- eVapt

- IBM WebSphere XD
- BEA Weblogic Server VE
- Mule
## COMMON CLOUD ARCHITECTURE

### Distributed
- **Clients**
  - Browser
  - Client
  - Mobile Device
  - Remote
- **Applications**
  - Profiles
  - Transaction
  - Batch
  - Real Time
  - Productivity
- **Services**
  - Directory
  - Orchestration
  - Service Monitoring
  - Service Management
- **Integration**
  - MOM
  - RPC
  - ESB
  - TCP Sockets
  - Transaction Management
- **Data**
  - Federated Management
  - RDBMS
  - Flat Files
  - Content Management
  - Security
- **Hardware**
  - Wintel
  - SSD
  - VLAN
  - Linux
  - SAN
  - HP-UX / AIX / Solaris
  - NAS
  - Legacy O/S
  - Tape
  - Optical

### Mainframe
- **Clients**
  - Terminal
  - Browser
- **Applications**
  - Batch
  - Transaction
- **Integration**
  - Transaction Management
  - File Exchange
  - MOM
- **Data**
  - VSAM
  - RDBMS
- **Hardware**
  - Mainframe
  - DASD
  - VLAN
  - Tape
  - Tape

### Security
- AAA
- Identity Mgmt
- Intrusion Detection
- Software Defense
- Perimeter Defense

### System Mgmt
- Network Management
- Admin Console
- Health Monitoring
- Backup

### Hosting Provider
- Hardware
- Support

### Outsourcer
- Application
- Support
CLOUD COMPUTING REFERENCE MODEL

SaaS Cloud
- Application Management
- Data Management
- Service Level Mgmt
- Support
- Billing & Metering
- Security

PaaS Cloud
- Security
- Provisioning
- Billing & Metering

External IaaS Cloud
- Security
- Provisioning
- Billing & Metering

System Mgmt
- Service Level Mgmt
- Health Monitoring
- Provisioning & Orchestration
- Scheduling
- Metering

Clients
- Browser
- Client
- Mobile Device
- Remote

Applications
- Profiles
- Transaction
- Batch
- Productivity
- Real Time
- PaaS

Services
- Directory
- Orchestration
- Service Monitoring
- Service Management

Integration
- MOM
- RPC
- ESB
- TCP Sockets
- Transaction Management
- File Exchange

Data
- Federated Management
- RDBMS
- Flat Files
- Content Management
- Security

Internal IaaS Cloud
- Network Resources
- Data Resources
- Storage Resources
- Memory Resources
- Processor Resources
- Security

Security
- AAA
- Identity Mgmt
- Intrusion Detection
- Software Defense
- Perimeter Defense

Platform Management
- Service Level Mgmt
- Support
Weather patterns

System Mgmt
- Clients
  - Browser
  - Client
  - Mobile Device
  - Remote
- Applications
  - Profiles
  - Transaction
  - Batch
  - Productivity
  - Real Time
  - PaaS
- Services
  - Directory
  - Orchestration
  - Service Monitoring
  - Service Management
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  - MOM
  - RPC
  - ESB
  - TCP Sockets
  - Transaction Management
  - File Exchange
- Data
  - Federated Management
  - RDBMS
  - Flat Files
  - Content Management
  - Security
- Internal IaaS Cloud
  - Network Resources
  - Data Resources
  - Storage Resources
  - Memory Resources
  - Processor Resources
  - Security

Security
- PaaS Cloud
  - Security
  - Provisioning
  - Billing & Metering
- Platform Management
- Service Level Mgmt
- Support

PaaS Cloud
- External IaaS Cloud
  - Security
  - Provisioning
  - Billing & Metering
  - Environment Management
  - Service Level Mgmt
  - Support
Market Opportunity & Approach
**MARKET DISRUPTION**

### People
- Alignment of roles & responsibilities to service delivery
- Staff training
- Reorganization to adopt a service focus
- Update of success metrics
- Knowledge management

### Process
- Project planning
- Capacity planning and compute resource procurement
- Application prioritization
- Developing & managing service levels
- Technology Adoption (PoC, Pilot, Deploy)
- End-user support

### Technology
- Utility Computing architecture
- Identity management
- Data security
- Data management
- Systems management strategy
- Vendor evaluation & implementation

### Strategy
- Defining a Cloud enabled IT strategy
- Budgeting and project funding
- Standards and guidelines
- Reference architectures for SaaS, PaaS, and IaaS
- Enterprise architecture

### Structure
- Governance model
- Defining and implementing controls
- Identifying audit procedures

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**Cloud Computing is a disruptive technology which will transform how IT does business**
A variety of cloud computing usage patterns are emerging from the primary two models of SaaS and IaaS.
MARKET OPPORTUNITY

- Companies will reduce IT operating costs and improve agility
- Next evolutionary step in computing with >30yrs of momentum
- Requires a new way of thinking, new processes, new skills, and new tools
- Enables the business to work around IT departments who are seen as part of the problem
- Clients should consider cloud computing as part of their blueprint refresh, application rationalization, and outsourcing activities
- Client should investigate cloud strategies with their systems management, application and outsourcing vendors

Cloud Computing will meet prime time in the 2010 timeframe and beyond
CLIENT BENEFITS

- Increases business responsiveness
- Accelerates creation of new services via rapid prototyping capabilities
- Reduces acquisition complexity via service oriented approach
- Uses IT resources efficiently via sharing and higher system utilization
- Reduces energy consumption
- Handles new and emerging workloads
- Scales to extreme workloads quickly and easily
- Simplifies IT management
- Platform for collaboration and innovation
- Cultivates skills for next generation workforce
- Ability to overflow workload to external compute resources as needed when internal resources are maxed out
- Adopting in-network redundancy with automated recovery to eliminate disaster recovery risks and costs
- Data as a Service built on the concepts of Master Data Management and the Semantic Web
- Rapid deployment (SaaS) or development (PaaS) to meet the immediate needs of the business
- New models and tools for improving & evolving internal IT

Additional capabilities will emerge as more Cloud Computing gains momentum
Quattrra
Approach
1. Rationalize infrastructure & applications
   • Reduce the complexity by identifying redundant, outdated, or underperforming components and consolidate servers.
2. Define the cloud architecture
   • Create a cloud architecture leveraging SOA for applications, utility computing for infrastructure, and ESB for integration with appropriate standards, governance, and reference architectures
3. Build cost profiles for each application
   • Identify the costs to support, update, and operate each application on a per user basis
4. Identify and assess SaaS alternatives
   • Target SaaS alternatives offering a better economic model than internal hosting. If not available target SOA alternatives.
5. Migrate infrastructure to a cloud bursting model
   • Further consolidate servers from just-in-case to average load provisioning using the internal pool of servers left over or an external IaaS provider to handle peak loads
   • Identify systems management gaps and discuss with vendors

6. Build new applications on a SOA foundation
   • Applications requiring significant development or new applications should be constructed on a SOA foundation with a particular focus on application virtualization

7. Create cloud enablement roadmap for retained applications
   • Define a development roadmap which migrates retained applications to a cloud model through outsourcing (SaaS), replacement (SaaS or SOA), or development (SOA).
QUATTRA’S 3-LEGGED APPROACH

People
- Adopt a service provider mentality
- Inform the business without involving them in issues
- Realign teams to present a unified relationship model to customers

Process
- Provide services with appropriate service levels
- Support the user from their point of view
- Respond quickly, act efficiently

Technology
- Pool technology resources
- Manage the resources to deliver the required service
- Automate wherever possible
- Incorporate technology resources beyond the company data center
**QUATTRA’S CLOUD ENTRY POINTS**

<table>
<thead>
<tr>
<th>External SaaS</th>
<th>External IaaS</th>
<th>PaaS</th>
<th>Internal IaaS</th>
<th>Internal SaaS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Driver</strong></td>
<td><strong>Driver</strong></td>
<td><strong>Driver</strong></td>
<td><strong>Driver</strong></td>
<td><strong>Driver</strong></td>
</tr>
<tr>
<td>- Quickly gain new capabilities</td>
<td>- Cloudbursting – overflowing from internal to external compute resources</td>
<td>- Development of external facing web solutions</td>
<td>- Agility</td>
<td>- Agility</td>
</tr>
<tr>
<td>- Select best in class point solutions with already well defined integration methods (EDI)</td>
<td>- Storage on demand</td>
<td>- Understanding of SaaS application and data models</td>
<td>- Maximize efficiency</td>
<td>- Maximize reuse</td>
</tr>
<tr>
<td>- New compute intensive services</td>
<td><strong>Requires</strong></td>
<td><strong>Requires</strong></td>
<td><strong>Requires</strong></td>
<td><strong>Requires</strong></td>
</tr>
<tr>
<td><strong>Requires</strong></td>
<td>- Scheduler to move jobs to cloud</td>
<td>- Integration to backend systems</td>
<td>- Server virtualization</td>
<td>- Internal IaaS</td>
</tr>
<tr>
<td>- Governance</td>
<td>- Internet bandwidth</td>
<td>- Data security, privacy and ownership</td>
<td>- Service level agreements</td>
<td>- Application virtualization</td>
</tr>
<tr>
<td>- Data security, privacy, and ownership</td>
<td><strong>Challenges</strong></td>
<td><strong>Challenges</strong></td>
<td><strong>Challenges</strong></td>
<td><strong>Challenges</strong></td>
</tr>
<tr>
<td>- 3rd party SLA’s</td>
<td>- Security</td>
<td>- Automated infrastructure provisioning and orchestration</td>
<td>- Integrated systems management suite</td>
<td>- Application monitoring tools</td>
</tr>
<tr>
<td>- Integrated support</td>
<td>- 3rd party SLA’s</td>
<td>- Security</td>
<td>- Application silos</td>
<td>- Application silos</td>
</tr>
</tbody>
</table>

**Cloudbursting is fast emerging as the Cloud Computing killer app!**
QUATTRA’S TECHNOLOGY ROADMAP

- Service oriented architecture infrastructure
- Rapid provisioning of IT resources, massive scaling
- Dynamic service mgmt
- Energy saving via auto workload distribution

- Virtualized infrastructure - increased system utilization
- Unify virtual & physical mgmt
- Promote resource sharing across organization
- Energy saving – maximize effective use

- IT assets & datacenters kept growing
- Desperate system tools
- Inconsistent processes
- Soaring IT and power costs

- Consolidate IT assets & datacenters
- Standardize and centralize management
- Streamline processes with ITIL best practices
- Energy saving - Phase out inefficient HW

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QUATTRA’S IMPLEMENTATION APPROACH

1. Identify opportunities to leverage cloud computing and/or services to lower cost, increase revenue, preserve capital and decrease risk

2. Evaluate the trade-offs, benefits and risks of public v.s. private cloud options in the context of your business, organization/culture, technology and IT operations

3. Focus your cloud plan and investments to accelerate ROI through the expertise of Professional Services

- Business Goals Study
- Business readiness for Cloud Computing
- Cloud Computing Roadmap
- Required SLAs and OLAs
- Vendor Selection
- Financial and Operational attributes
QUATTRA’S IMPLEMENTATION APPROACH

1. Learn
   - Client briefing
   - Technology Workshop
     - Identify candidate pilots
     - Review existing architecture
     - Define target architecture
     - Identify technology gaps
     - Create high-level pilot project plan

2. Pilot
   - Identify required process changes
   - Define requirements
   - Create estimates
   - Define pilot evaluation metrics
   - Create business case
   - Refine target architecture
   - Refine pilot project plan
   - Procure technology
   - Execute pilot
   - Gather metrics and evaluate pilot
   - Create recommendation
   - Update support knowledgebases
   - Update training materials

3. Transform
   - Establish PMO
   - Create change management plan
   - Define target organization structure
   - Build business architecture
   - Define business processes
   - Build technology blueprints incorporating concept
   - Develop roadmap
   - Execute roadmap

Concept realization  Knowledge realization  Benefits realization

ROI Proven

Knowledge realization

Benefits realization