My Boss Told me to Transcode in the Cloud
Cloud Platform Benefits

- **Compelling Economics**
  - Scalable, discretionary capacity
  - Eliminate expense of cyclical HW refresh
  - Eliminate or reduce facility costs

- **Agile Development**
  - Reduce development schedules by weeks
  - Rapid prototyping & deployment
  - Inspires developer creativity

- **Application Benefits**
  - Scalable compute platform
  - Massive, available storage
  - Directly connected to the Internet
  - Global access
  - Redundancy
My Boss Told me to Transcode in the Cloud

- Reconsider assumptions about the relative performance of computer subsystems.
- Cloud computing uniquely offers classes of solutions that are otherwise too expensive or impossible.
- New possibilities emerge when you accept a different perspective.
Reconstructing Production Workflows
QUESTION: How to manage I/O to the cloud?

QUESTION: How much does it cost?

QUESTION: Which applications benefit from the cloud?
Managing Mezzanine I/O in the Cloud

- **Storage & I/O are faster at the core**
  - Minimize data movement at the edges with workflow.
  - Further improved by Placement Groups

- **Media Upload**
  - Planning & scheduling are best
  - Simultaneous local and cloud mezzanine store for distribution and backup.
  - Natively integrated internet I/O protocols are faster and more reliable than 3rd party solutions.
  - Acceleration technologies like Aspera and Signiant for low latency transfers in time critical situations.
**Cloud Service Models**

- **IaaS – Infrastructure as a Service**
  - Virtualized hardware resources, including CPU, network, and storage.
  - User applications (purchased or developed) layer onto scalable networks.
  - User definable network components and topology for application optimization.
  - Enables mixed OS environments.
  - Complete application flexibility to support workflow needs.

- **PaaS – Platform as a Service**
  - Access to a programming or runtime environment with scalable compute and data structures.
  - Technology primitives for assembling application specific workflows.
  - Platform development tools for managing and deploying applications.
  - Applications created from the primitives.
  - Multiple workflow operations can be integrated into cloud workflows.

- **SaaS – Software as a Service**
  - SaaS is a simple and quick way for users to access applications.
  - Specific applications, controlled and executed on hosted infrastructure.
  - No user control of application infrastructure.
  - SaaS provider maintains application, versioning and user data.
  - Non-transcoding workflow steps require internet I/O.

- **Service Models & Workflow**
  - Choose a model that supports workflow requirements.
  - Implement applications to minimize data movement.
  - Assure that all required elements are supported (media, metadata, images).
  - Define efficient QC processes for input & output.

- **Specialized**
  - User Experience

# Public and Private Clouds

<table>
<thead>
<tr>
<th></th>
<th>Private On Premise</th>
<th>Managed Private Cloud</th>
<th>Public Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>System provisioning</td>
<td>Weeks</td>
<td>Weeks</td>
<td>Minutes</td>
</tr>
<tr>
<td>Capacity scaling</td>
<td>Weeks</td>
<td>Weeks</td>
<td>Minutes</td>
</tr>
<tr>
<td>Global access</td>
<td>Possible</td>
<td>Possible</td>
<td>Standard</td>
</tr>
<tr>
<td>Power, Cooling</td>
<td>User</td>
<td>Managed</td>
<td>Managed</td>
</tr>
<tr>
<td>I/O access</td>
<td>LAN</td>
<td>LAN/WAN</td>
<td>WAN</td>
</tr>
<tr>
<td>Storage speed</td>
<td>SAN</td>
<td>SAN</td>
<td>Object SSD</td>
</tr>
<tr>
<td>Pricing</td>
<td>Buy</td>
<td>Calendar Rental</td>
<td>Usage Rental</td>
</tr>
<tr>
<td>Security</td>
<td>?</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

[Diagram of Cloud Applications / SaaS, Platform Services, Workload Distribution System, Data Visualization Layer, Cloud Software Environment, Cloud Software Infrastructure, Distributed Computational Resources, Distributed and Heterogeneous Data]
Pricing and Cost

- Multiple evaluations required to obtain a complete financial model
  - Vendor Price model comparison
  - Facility total cost of ownership (TCO)
  - Compare on-premise and cloud costs
Cloud Transcoding Pricing Models

• Price per minute of encoded content

• Price per GB of source video

• Pre-purchased capacity

• Price per hour of usage
# Pricing Model Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Method</th>
<th>Monthly</th>
<th>Usage</th>
<th>Encoder</th>
<th>Submit</th>
<th>Workflow</th>
<th>Live</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zencoder</td>
<td>SaaS</td>
<td>Output duration ¹</td>
<td>$2000/Month &lt; 100K minutes out</td>
<td>FFMPEG</td>
<td>GUI, API</td>
<td>Fixed</td>
<td>Yes</td>
</tr>
<tr>
<td>Encoding.com</td>
<td>SaaS</td>
<td>Total data transfer ¹</td>
<td>$400/Month &lt; 100 GB source</td>
<td>FFMPEG + Carbon²</td>
<td>GUI, API, Watch</td>
<td>Fixed</td>
<td>No</td>
</tr>
<tr>
<td>Elemental</td>
<td>SaaS/PaaS</td>
<td>Pre-purchased capacity ³</td>
<td>$2,995/275 hours 5</td>
<td>Elemental (All formats)</td>
<td>GUI, API, Watch</td>
<td>Fixed</td>
<td>Yes</td>
</tr>
<tr>
<td>Telestream</td>
<td>SaaS/PaaS</td>
<td>Hourly usage ⁴</td>
<td>$875/Month</td>
<td>Vantage (All formats)</td>
<td>GUI, API, Watch</td>
<td>User Defined</td>
<td>No</td>
</tr>
</tbody>
</table>

1. Easy cost forecasting
2. Studio Option
3. Highly predictable within agreement
4. User controllable hardware type and scale
5. Elemental data extrapolated from Jan Ozer Streaming Media paper, July, 2014. Numbers are preliminary and subject to change.
Price Comparison Example

- **Zencoder Traction**
  - $200/Month for 100K output minutes
  - $0.03/output minute/layer for overage

- **Encoding.com Studio**
  - $400/Month for 100 GB source
  - $1.80 for each additional GB

- **Elemental**
  - $2,995/275 hours

- **Telestream Vantage Cloud Subscription**
  - $875/Month + $10/running hour

Assumptions: XDcam HD 50 source (22.5 GB/h), 21 layer (7x3) HLS output,
Real-time transcoding for all systems

1. Elemental data extrapolated from Jan Ozer Streaming Media paper, July, 2014. Numbers are preliminary and subject to change.
# Transcoding Total Cost of Ownership (TCO)

## Assumptions

- 10,000 sf facility
- 4 racks
- 16 4U Servers
- Storage
- Networking
- $.07/kWh (6 mo. Avg)

<table>
<thead>
<tr>
<th>Server HW Price</th>
<th>$ 25,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server SW Price</td>
<td>$ 25,000</td>
</tr>
<tr>
<td>Total Price per Server</td>
<td>$ 50,000</td>
</tr>
<tr>
<td>Watts/Server</td>
<td>1600</td>
</tr>
<tr>
<td>RU per server</td>
<td>4</td>
</tr>
<tr>
<td>42U Racks (servers, storage, network)</td>
<td>4</td>
</tr>
<tr>
<td>% RU utilization</td>
<td>76%</td>
</tr>
<tr>
<td>Cloud Transcode Monthly Hrs</td>
<td>25250</td>
</tr>
<tr>
<td>Cloud Transcode Montly Sub.</td>
<td>$ 875</td>
</tr>
<tr>
<td>Full Time AWS Servers</td>
<td>35</td>
</tr>
</tbody>
</table>

## Domain Server
- $ 2.46

## Transcode Server
- $ 12.60

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https://virtualizationandstorage.files.wordpress.com/2014/05/truetco_model_2-1.xls+&cd=9&hl=en&ct=clnk&gl=us
http://199.36.140.204/electricity/monthly/update/end_use.cfm
# Transcoding Total Cost of Ownership (TCO)

## Capex ($M)

<table>
<thead>
<tr>
<th>Data Center</th>
<th>AWS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers + SW</td>
<td>$1.18</td>
<td>$ -</td>
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<tr>
<td>Power infrastructure</td>
<td>$0.94</td>
<td>$ -</td>
</tr>
<tr>
<td>Facility</td>
<td>$5.11</td>
<td>$ -</td>
</tr>
<tr>
<td><strong>Annualized</strong></td>
<td><strong>$0.89</strong></td>
<td>$ -</td>
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</tbody>
</table>

## Opex ($M)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>$0.49</td>
<td>$ -</td>
</tr>
<tr>
<td>Network fees</td>
<td>$0.50</td>
<td>$ -</td>
</tr>
<tr>
<td>Facility expenses</td>
<td>$2.11</td>
<td>$ -</td>
</tr>
<tr>
<td>Server Rental</td>
<td>$ -</td>
<td>$3.98</td>
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<tr>
<td><strong>Total Opex</strong></td>
<td><strong>$3.10</strong></td>
<td><strong>$3.98</strong></td>
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</table>

## Total Annual Expense ($M)

<table>
<thead>
<tr>
<th>Data Center</th>
<th>AWS</th>
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<tr>
<td><strong>Total Annual Expense</strong></td>
<td><strong>$3.99</strong></td>
<td><strong>$3.98</strong></td>
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</tbody>
</table>

- **Server HW Price**: $25,000
- **Server SW Price**: $25,000
- **Total Price per Server**: $50,000
- **Watts/Server**: 1600
- **RU per server**: 4
- **42U Racks (servers, storage, network)**: 4
- **% RU utilization**: 76%
- **Cloud Transcode Monthly Hrs**: 25250
- **Cloud Transcode Monthly Sub.**: $875
- **Full Time AWS Servers**: 35
- **Domain Server**: $2.46
- **Transcode Server**: $12.60

---

https://virtualizationandstorage.files.wordpress.com/2014/05/truetco_model_2-1.xls
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On-Premise Price Comparison

- Assume on-premise configuration as a known starting point.
- Compare existing usage pattern in both environments.
- Identify breakeven usage pattern.
- Consider costs of storage & data transfer.

### On Premise Assumptions

<table>
<thead>
<tr>
<th></th>
<th>Enterprise</th>
<th>Cloud $/Hr</th>
<th>Ratio (C/E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours/day</td>
<td>9.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days/week</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weeks/yr</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transcode Servers</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Server</td>
<td>1</td>
<td></td>
<td></td>
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### Cloud Configuration

<table>
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<td>2.60</td>
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<td></td>
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<td>Hourly SW rate</td>
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### Annual Operating Hours

- 2548

### Annual TC Server Hours

- 10,192

### Summary

- **Capex (3 yr depreciation)**: $99,767 - 
- **Opex**: $44,895 / $145,187
- **Annual Total**: $144,662 / $145,187
- **Hourly Cost**: $56.77 / $56.98

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Cost Conclusions

- Model costs from multiple perspectives to develop a full understanding of the financial landscape.

- Data center costs dominate TCO calculations when considering “all in” cloud operations.

- Cloud cost minimization
  - Build cost management and workflow segmentation strategies into operational model.
  - Calculate “break even” hourly volume to optimize the hybrid mix
  - Automate management of on-demand provisioning.
  - Reserved Instance Pricing (Buy down hourly rate if usage is predictable)
Security Questions

- How specifically would a data breach affect your business?
- How are access and root credentials to systems protected?
- Do you have policies for user and application authentication?
- Do you have the ability to configure a VPN?
- Do you connect with a static IP or are your users roaming?
- Can media be encrypted as part of the workflow?
Application Security Checkpoints

- **Public Facing Services**
  - Object storage
  - Media I/O
  - Application API
  - Virtual Domain API

- **Infrastructure Management**
  - Domain Server
  - Transcode Server
  - Shared DB
  - Shared storage

- **On-Premise**
  - Firewall settings
  - Support method
  - Social hacking
Cloud Friendly Applications

New Services and Businesses

- Content library processing
- Internet Distribution
- World wide access/contribution
- Fast prototype environment
- New project startup
- Discretionary capacity
- Extend on-premise configuration
- Disaster recovery

- Content Library
  (CDN)
  - Well suited to cloud only topology.
Cloud Friendly Applications

New Services and Businesses

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• Internet Distribution
New Services and Businesses

- Content library processing
- Internet Distribution
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- Fast prototype environment
- New project startup
- Discretionary capacity
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- Disaster recovery
Global News Gathering Example

- Citizen journalists with branded smart phone application.
- Notifications alert to local events.
- Metadata enhanced video clips are delivered to object storage.
- Object storage destination is built-in and globally accessible for contributors.
- Media is processed
- Content is shared with all network affiliates and distribution partners.
Global News Gathering Workflow Example

- **Source Characteristics**
  - Format
  - Aspect ratio
  - Orientation
  - Audio track layout
  - Language
  - Metadata elements

- **Normalize the content**
  - Sort
  - Quarantine
  - Output formatting

- **Output QC Process**
  - Automated screen
  - Visual and audible

- **Distributed Contribution**
  - Event driven activity.
  - Integrated automation within an application
  - Content is acquired from many locations simultaneously.
  - Media processing scales as needed.
  - Topology depends on upload file size.
## Getting Started

### Another Technology Arrow in the Quiver

<table>
<thead>
<tr>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain trial software ASAP</td>
</tr>
<tr>
<td>Experiment with CPU/Storage/Transport/Costs</td>
</tr>
<tr>
<td>Experiment with different service models</td>
</tr>
<tr>
<td>Estimate annual source and output volumes</td>
</tr>
<tr>
<td>Determine impact upon on-premise system</td>
</tr>
<tr>
<td>Determine facility impact</td>
</tr>
<tr>
<td>Cost modeling (comparative study)</td>
</tr>
<tr>
<td>Detail cloud workflows and formats</td>
</tr>
<tr>
<td>Develop I/O strategy</td>
</tr>
</tbody>
</table>
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Jim Duval
Director of New Products at Telestream
jimd@telestream.net  |  +1 530 470 5345

- Years of Engineering and Product Management at established and startup companies in the video industry
- Experienced in building products for SNG/ENG news and production, Avid editing, Anystream and Telestream video production automation
- Currently responsible for the Vantage Cloud solution: provisioning cloud technology within automated content production workflows
Thank you!