Cloud Computing for Spacecraft Operations

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Mark Walker, Integral Systems Inc
Executive Summary

• Cloud computing is a game changer, bringing a fundamental shift in Information Technology Management
  – Lower cost of IT will accelerate innovation
  – This will have a great influence on implementation, procurement, and utilization of ground systems

• The working group consists of:
  – Presentations, demonstrations, and discussions of key principles of cloud computing
  – Discussions of the unique issues with the use of cloud computing to deliver ground systems for spacecraft operations

• The goal: Develop a roadmap for successful migration to a cloud environment in harmonization with the existing systems and processes
Working Group Format

• Review of the state of the art, led by Panelists
• Presentations from cloud providers, ground system providers, and ground system users
• Demonstrations on the use of cloud computing
• Discuss the benefits, challenges, and misconceptions in migrating to a cloud environment
• Brief survey of the participants on the status of their journey to the adaptation of cloud
• Development of a roadmap for successful implementation of the cloud environment
• Identification of the Top 10 things to be considered for a successful implementation of cloud
Key Questions

• Cloud computing for ground systems: what is the state of the art?
• What are the benefits and challenges to embrace cloud computing? What are some misconceptions?
• Which components (work loads) of ground systems are better suited for a cloud environment?
• Which phases of ground system lifecycle (development, testing, production) are well suited for the cloud?
• What are the enablers required for cloud computing in spacecraft operations to become a reality?
• How can cloud computing support harmonization of ground systems?
## Key Participants

### Panelists

<table>
<thead>
<tr>
<th>Justin Boss</th>
<th>Integral Systems, Inc</th>
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<tbody>
<tr>
<td>Ted Hessler</td>
<td>Sirius XM Radio Inc</td>
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<td>Brad Kizzort</td>
<td>Harris Corporation</td>
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<td>Craig Lee</td>
<td>Aerospace Corporation</td>
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<td>Knut Tjonneland</td>
<td>Intelsat</td>
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### Presenters

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<tr>
<th>Doug Barnhart</th>
<th>General Dynamics C4 Systems</th>
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<tr>
<td>Jeremy Jacobsohn</td>
<td>GMV Space Systems, Inc</td>
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<td>Emily Law</td>
<td>NASA JPL</td>
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<td>Bill Lowry</td>
<td>Terremark</td>
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<td>Dan Mandl</td>
<td>NASA GSFC</td>
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### iCORE Demo

**iCORE: A cloud-based framework and incubator**  
Unclassified demo on Amazon EC2 by Nehal Desai, The Aerospace Corporation

### Terremark/ISI Demo

Implementation of Epoch ground control system on Terremark Enterprise cloud  
Demo by Bill Lowry, Terremark and Mark Walker, ISI