Open. Together.
DO-160 and Twin lakes Servers

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A worldwide leader, with 64,000 employees, a yearly revenue of 16B $US serving.

We help customers master decisive moments by providing the right information at the right moment.
• Leading provider of circular data center solutions to the hyperscale cloud market: technology, logistics, monetization

• Leading global provider of technology-enabled data center decommissioning services, including data sanitization software and IT asset remarketing

• Manufacturer of Sesame open compute and storage solutions, 1st of its kind suite of recertified and warrantied solutions for global use cases

• Delivering TCO value recovery > $1Billion to date

Redefining and powering LTV (a.k.a. not your grandfather’s ITAD)

Clients We Partner With

Microsoft
Facebook
Dropbox
Apple
Amazon
Oracle
Twitter
Uber
PayPal
Where do we stand …

Computing is everywhere

- Radars improvements (weather and collision prediction)
- Enhanced flight control allowing to build wider aircraft
- Better cabin environment control
- Enhanced in flight entertainment systems
- Higher fuel efficiency
But it didn’t happened in a day

<table>
<thead>
<tr>
<th>Proprietary computing solution</th>
<th>COTS and integration</th>
<th>Open Hardware?</th>
</tr>
</thead>
<tbody>
<tr>
<td>'80s and before</td>
<td>90’s</td>
<td>Next...</td>
</tr>
<tr>
<td>Electro mechanical solution, the pioneer age</td>
<td>Full electrical command</td>
<td>Higher computing power for inflight control</td>
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<tr>
<td></td>
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<td>WiFi, stronger user experience</td>
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<td></td>
<td></td>
<td>Higher computing needs to accelerate fuel efficiency</td>
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</table>
DO-160

- Well known (if you make fly things) and established standard for environmental testing of airborne equipment
- Covers requirements for critical and non critical functions
- Strong constraints which covers requirements from Edge computing with some “slight” adaptations
- COTS solutions exist currently, do not be afraid
# DO-160 Vs OCP specification overview

<table>
<thead>
<tr>
<th>Specification (extract)</th>
<th>RTCA - DO160 G</th>
<th>OCP - Twin Lakes server</th>
<th>Main effects</th>
<th>Design impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation</strong></td>
<td>-40°C/+70°C</td>
<td>+15°C/+50°C</td>
<td>Thermal expansion mismatching failures, cracks</td>
<td>Components, materials &amp; Assembly process</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>-55°C/+70°C</td>
<td>-40°C/+70°C</td>
<td></td>
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<tr>
<td><strong>Survival</strong></td>
<td>2°C/min</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>variation</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Altitude</strong></td>
<td>15 000 ft</td>
<td>6 000 ft</td>
<td>ballooning and radiation effect</td>
<td>Components</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>50°C/95%HR/48h</td>
<td>20% to 90%HR</td>
<td>corrosion, short cut</td>
<td>Design, components, materials &amp; Assembly process</td>
</tr>
<tr>
<td><strong>Mechanical Shocks</strong></td>
<td>6g/11ms/3axes</td>
<td>6g/11ms/3axes</td>
<td>detachments, failures, cracks</td>
<td>Design &amp; Connectors</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>5 to 2000Hz 10g peak/1h/3axes</td>
<td>5 to 500Hz 0,3g/10sweeps/3axes</td>
<td>Fatigue, failures, fretting corrosion</td>
<td>Design &amp; connectors</td>
</tr>
<tr>
<td><strong>Flammability</strong></td>
<td>non propagation of flame</td>
<td>Not specified</td>
<td>Fire propagation</td>
<td>Component and materials</td>
</tr>
</tbody>
</table>
Single socket vs Dual sockets

- In-flight redundancy is key
- Power availability is under massive constraint
- In some cases algorithms predictability and proof are required

Let’s keep things simple and focus on single socket
Twin lakes
What is next and where are the bottlenecks?

• We can probably overcome most of the technical issues
• Open hardware is addressing some of our next challenges
  - Progress on « Moore Law 2.0 » (with power efficiency)
  - Provide trust on Security (through a white box approach)
  - Ensure Long term availability (with Open Source Firmware and schematic/BOM fully released)
  - Reduce costs (NRC and RC through collaboration and volume)
• There is a need to:
  - Build proof of concepts with new hardware
Open issues and progressing together

• Thales is using OCP hardware provided by ITRenew/Sesame.

• This covers part of the supply chain but current OCP partners business goals are not aligned with Aerospace constraints.
  - Low volume, long term availability, etc.

• How to overcome it together?
Call to Action

- Contribute to design ruggedization and standardization
- Join ITRenew Open Hardware lab in the bay area (upcoming meetups)
- Contribute to Open Source Firmware initiative
- Provide hardware for testing and build early prototype

Contact us if you are willing to build adapted designs!
Open. Together.

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