



How to Launch a Secure Cloud Initiative: NASA's Jet Propulsion Laboratory

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Session ID: CLD-203

Session Classification: Advanced

RSACONFERENCE2012

Agenda

- Trends from Information Security Media Group's 2012 Cloud Computing Security Survey.
- Case study of NASA's Jet Propulsion Laboratory successful initiatives to plan, pilot and deploy cloud computing offerings.
- Discussion between the presenters and RSA attendees on presentation.





2012 Cloud Security Survey Objectives

- Define the cloud.
- Gauge organizations' top cloud security concerns.
- Identify applications/services users feel comfortable/uncomfortable placing on the cloud.
- Determine user/provider security responsibilities.



2012 Cloud Computing Security Survey



Who Did We Survey

Respondents from 17 sectors from around the globe

IT Security Responsibilities

- 64% Determine strategy
- 52% Establish priorities
- 48% Manage budgets



Understanding Respondents

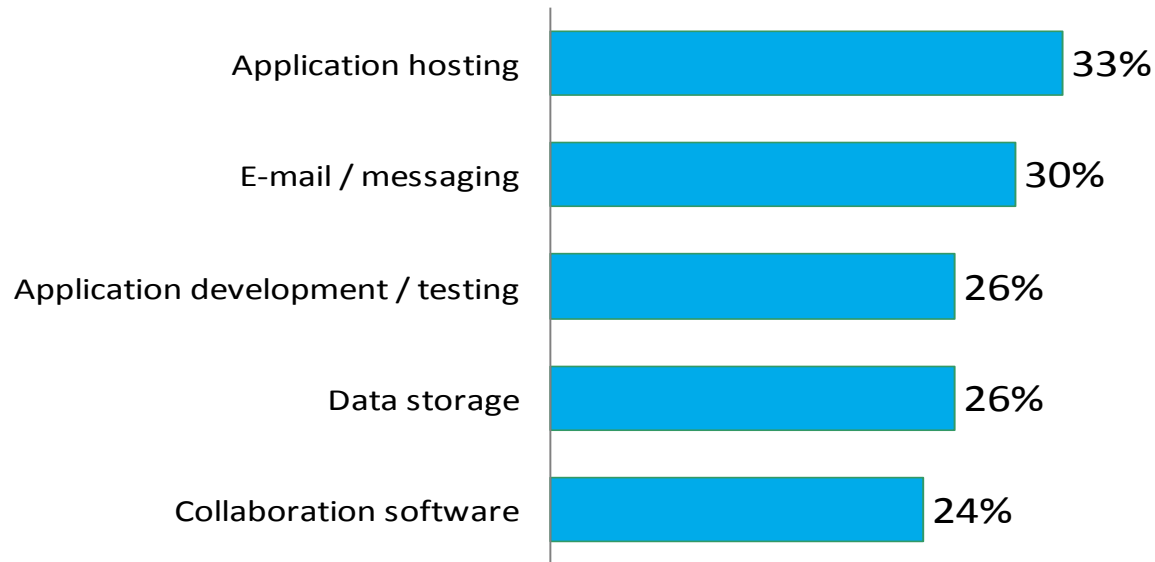
How secure do you view your and your cloud provider's IT? (those answering secure, very secure)

- Own: 62%
- Cloud provider: 40%



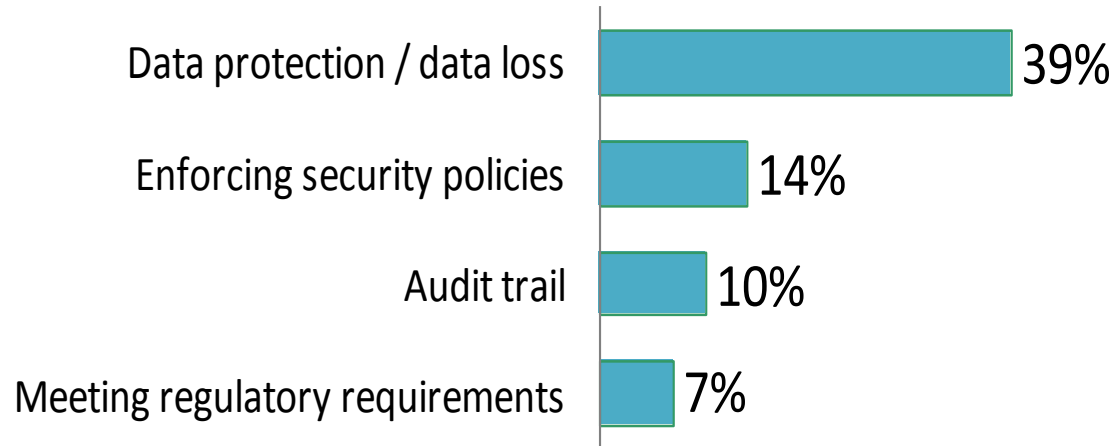
Understanding Respondents

Services deployed or soon to be deployed on cloud:



Cloud Jitters

What's your greatest reservation about cloud computing?



Cloud Jitters

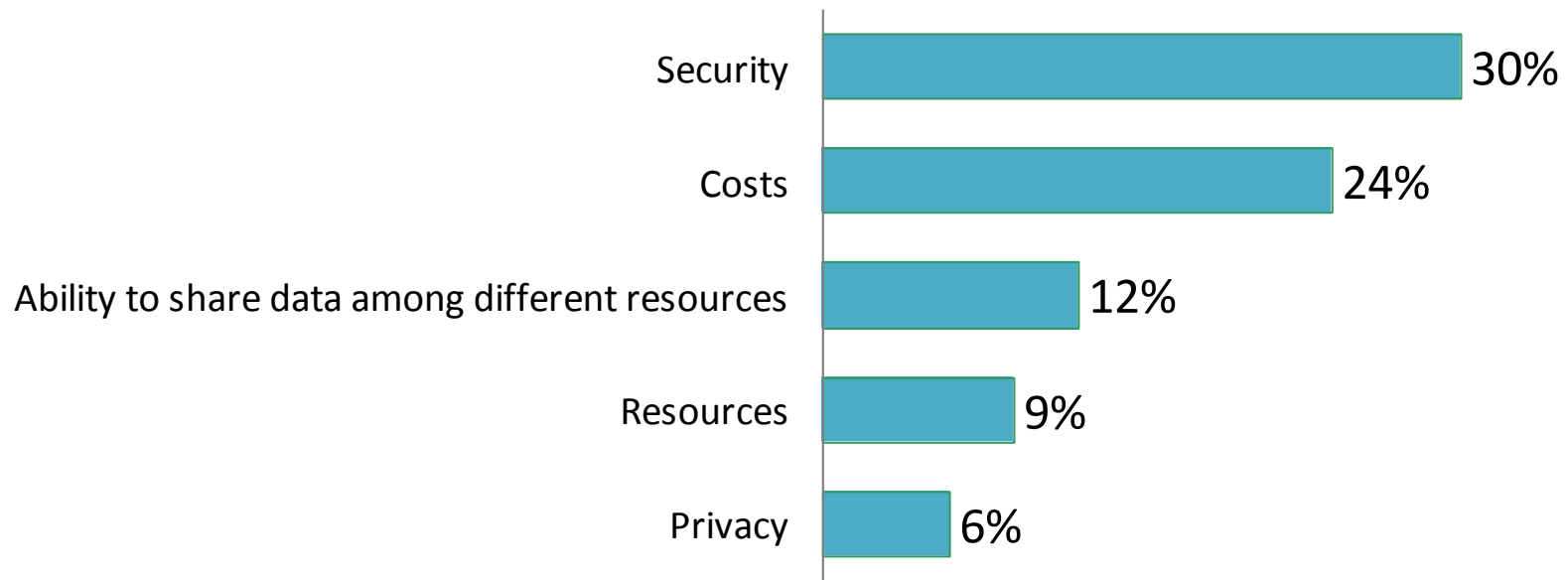
What information do you consider too risky to put on a private cloud?

- Intellectual property / trade secrets: 49%
- Credit card: 49%
- Financial: 48%
- State/government secrets: 47%
- Corporate proprietary/sensitive information: 42%
- Health: 41%
- Customer records: 39%
- PPI: 39%



Moving onto the Cloud

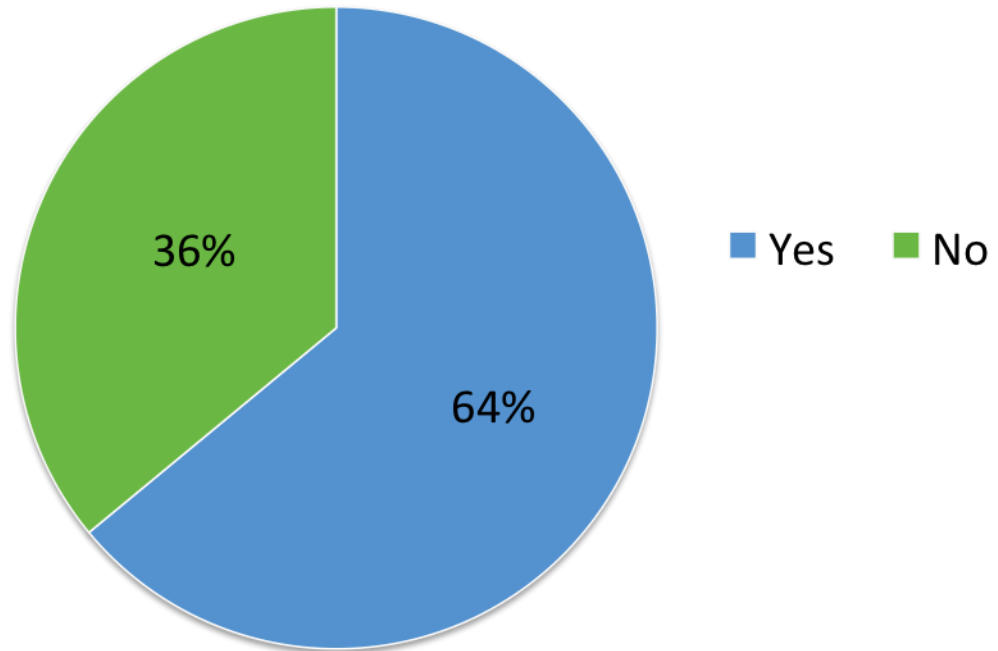
What is the primary factor that goes into deciding whether to deploy cloud computing?



Moving onto the Cloud

Do you employ third-party attestation?

- Yes: 64%
- No: 36%



Moving onto the Cloud

78%

The number of respondents that say its important or very important that their cloud providers' servers to be situated in the users' country.



Moving onto the Cloud

Would you move critical business systems to the cloud?

- No: 33%
- Perhaps, but not within 12 months: 31%
- Yes, one or more critical business systems on the cloud: 18%
- Yes, we plan to move one or more critical business systems to cloud within year: 18%



The Takeaway

- Organizations' approach to cloud computing remains immature.
- Jitters exist about the cloud as a secure computing environment remains.
- Employing the cloud and making it secure is the domain of the IT and IT security organization.
- Despite anxieties, the cloud is happening and IT security professionals recognize they must find ways to make it secure.



Survey Lives On

The 2012 Cloud Security Survey remains open.

If you haven't yet, please take the survey at
www.ismgcorp.com/cloudsurvey2012



Ready for Launch



The 2012 Cloud Security Survey raises topics JPL's CTO Tom Soderstrom is about to address, including:

- Learning from existing, “commodity” cloud initiatives to better deal with providers.
- Surmounting security anxieties cloud computing presents.
- Turning the reality that the cloud is becoming a major computing platform into a tool you can employ securely.



Beyond the Pervasive Cloud: Lessons and the Future



Tom Soderstrom

IT Chief Technology Officer

and

Khawaja Shams

Missions Cloud Expert



NASA Jet Propulsion Laboratory

- JPL is a Federally Funded Research and Development Center (FFRDC) Managed by CalTech for NASA
- NASA's lead center for robotic exploration of the solar system. Have 19 spacecraft and 9 instruments across the solar system and beyond
- \$1.7B contract per year, ~ 5,000 employees; 177 acre facility located in Pasadena, CA, with 670K sq.ft of office space and 900K sq.ft. of labs

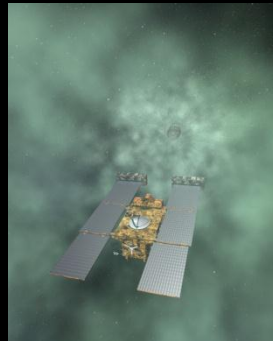


- Manages worldwide Deep Space Network
 - 3 Locations - Goldstone CA, Madrid Spain, Canberra Australia
 - Spacecraft Command & Control - Recording scientific data
- 50+ years experience in spacecraft design, production, operation
- JPL spacecraft have visited all planets in our solar system except Pluto!

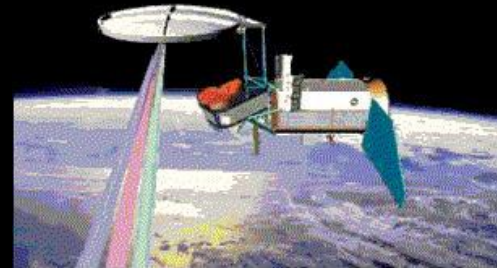
Near Term Mars & Solar System Exploration Events



✓ EPOXI
Comet
Flyby
Nov. 2010



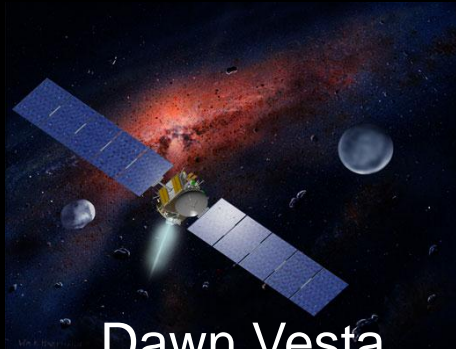
✓ Stardust-
NEXT
Comet Flyby
Feb. 2011



✓ Aquarius
Jun. 2011



✓ Juno
Aug. 2011



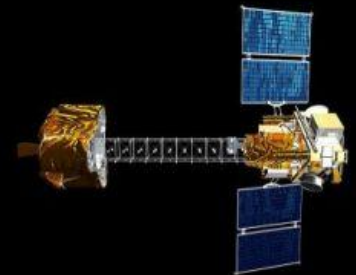
✓ Dawn Vesta
Arrival
Aug. 2011
(Ceres, February
2015)



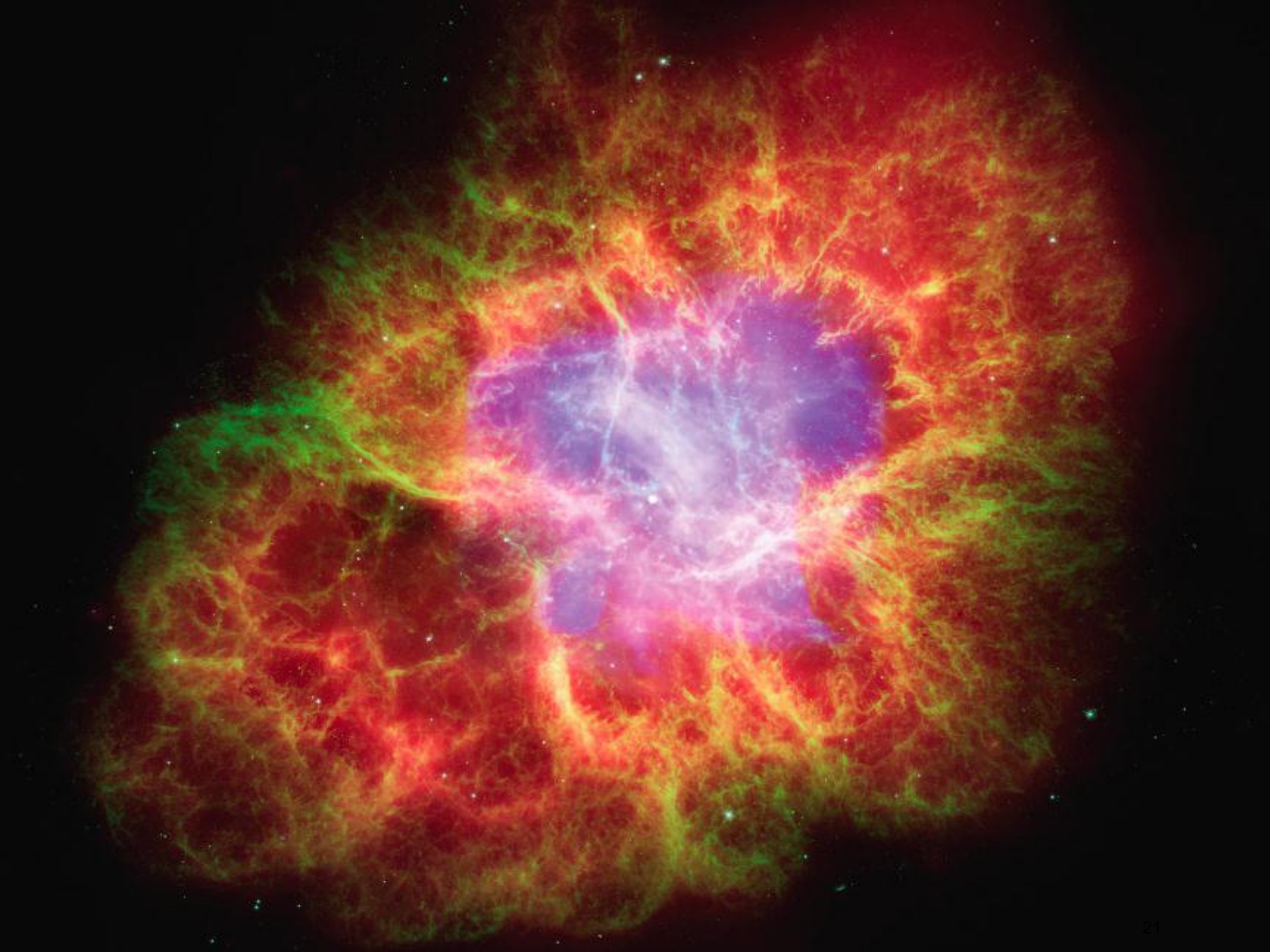
✓ GRAIL
Sep. 2011



✓ Mars Science
Laboratory
Nov. 2011 /
Aug. 2012



NuSTAR
Feb. 2012







Credit Eric Johnson

Industry Trends for the next IT Decade (from JPL's Office of the CIO)

Work with anyone, from anywhere, with any data, using any device, at any time



**Immersive
Visualization
and Interaction**



You've Got Apps



Eco Friendliest



**Extreme
Collaboration Made
Simple**



Human Behavior



Consumer Driven IT



**Refocused
Cyber Security**



Big Data



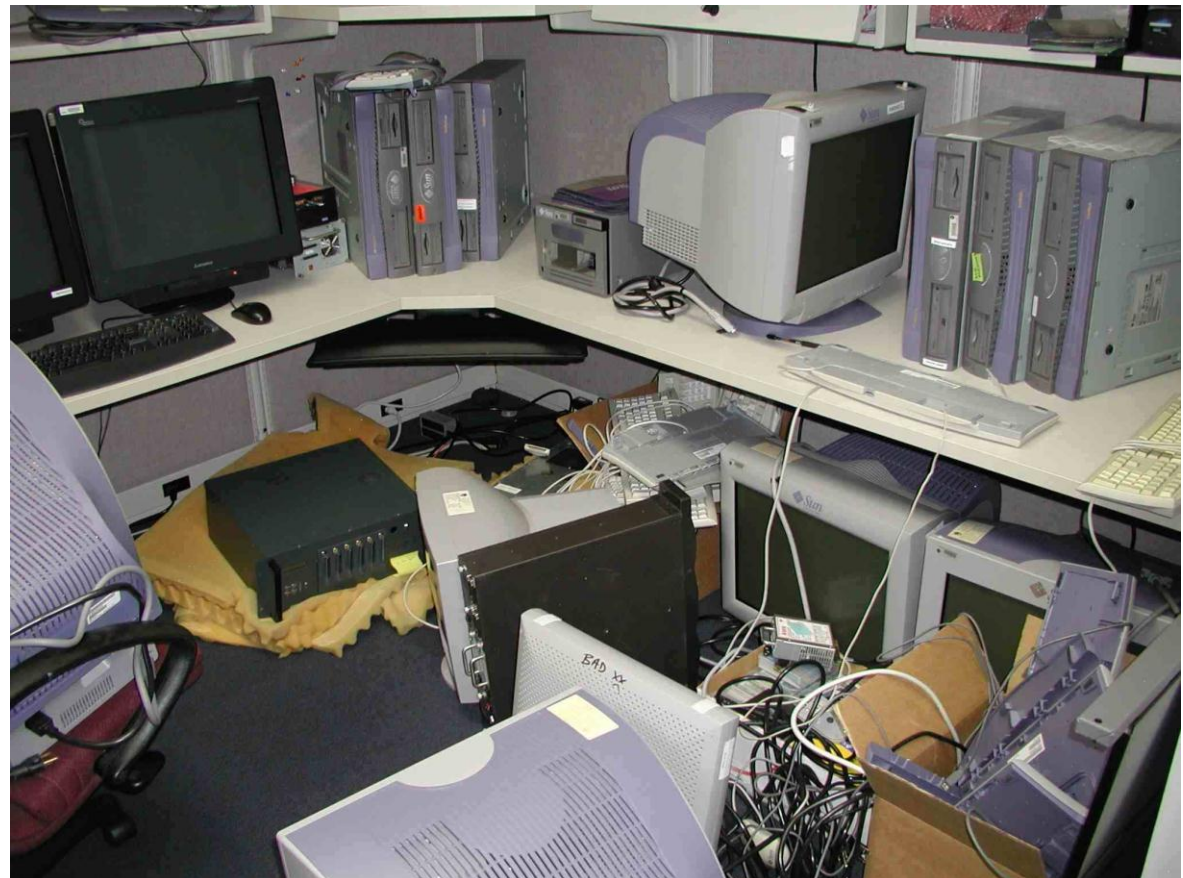
The Pervasive Cloud

➔ Transforming IT into “Innovating Together”

JPL's approach to Cloud Computing

“Go from this...”

Rev. Ronald V. (774)	EE: New Masters Blade	August 6, 2009
Rev. Joseph C. (373)-Affiliate	EE: New Masters Blade	August 6, 2009
Rev. Joseph C. (373)-Affiliate	EE: New Masters Blade	August 6, 2009
Rev. Joseph C. (373)-Affiliate	EE: New Masters Blade	August 6, 2009
Rev. Ronald V. (774)	EE: New Masters Blade	August 6, 2009
Tony (373)-Affiliate	EE: New Masters Blade	August 5, 2009
Kwame S. Shams	Re: New Masters Blade	August 1, 2009
Kwame S. Shams	FW: New Masters Blade	August 1, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	August 5, 2009
Kwame S. Shams	Re: New Masters Blade	August 5, 2009
Bryan (359)	Re: New Masters Blade	August 5, 2009
Bryan (359)	Re: New Masters Blade	August 5, 2009
Jeff (359)	Re: New Masters Blade	August 5, 2009
Bryan (359)	Re: New Masters Blade	August 5, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	August 1, 2009
Kwame S. Shams	Re: New Masters Blade	August 5, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	August 1, 2009
Kwame S. Shams	Re: New Masters Blade	August 1, 2009
Douglas S. (373)	Out of Office: New Masters Blade	August 1, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	August 4, 2009
Margaret H. (373)-Affiliate	EE: New Masters Blade	August 4, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	August 4, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	August 2, 2009
Kwame S. Shams	Re: New Masters Blade	July 31, 2009
Kwame S. Shams	FW: New Masters Blade	July 31, 2009
Chris (373)	EE: New Masters Blade	July 31, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	July 29, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	July 29, 2009
Bryan (359)	Re: New Masters Blade	July 28, 2009
Joseph C. (373)-Affiliate	FW: New Masters Blade	July 28, 2009
Kwame S. Shams	Re: New Masters Blade	July 28, 2009
Joseph C. (373)-Affiliate	EE: New Masters Blade	July 28, 2009
Kwame S. Shams	Re: New Masters Blade	July 28, 2009
John C. (373)	Out of Office: New Masters Blade	July 28, 2009
Douglas S. (373)	Re: New Masters Blade	July 28, 2009
(373)	EE: New Masters Blade	July 28, 2009
Douglas S. (373)	EE: New Masters Blade	July 28, 2009



“... to this
”



“...and this ...”

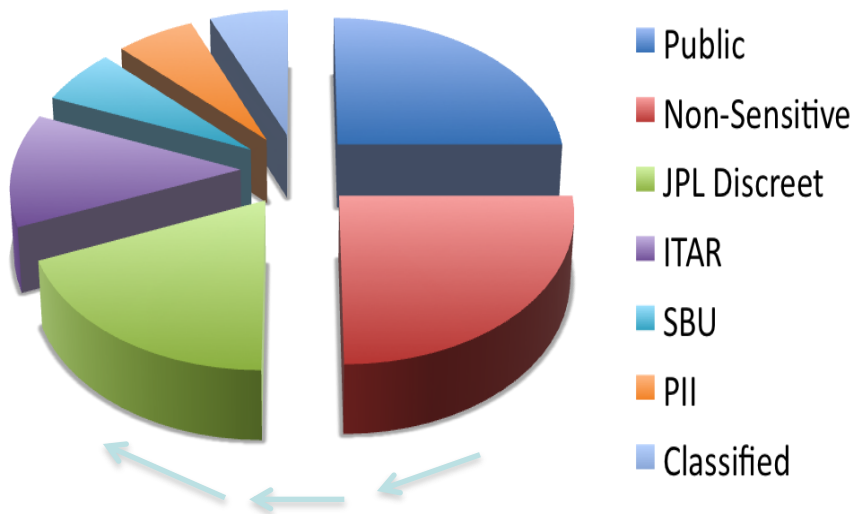


Replace Every Procurement Screen
with a Provisioning Screen.

Jim Rinaldi – JPL CIO

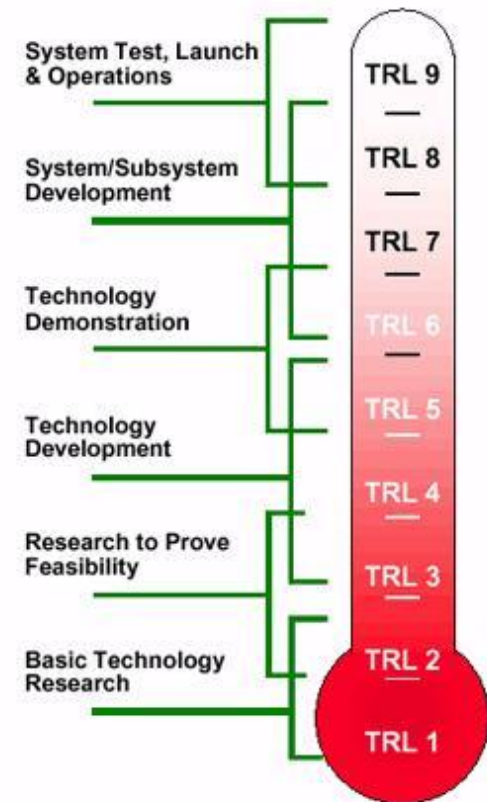
1. Cloud Application Suitability Model (CASM)

2. Wheel of Security



Public and Non-Sensitive data can be accessed
in the Cloud today

3. Cloud Readiness Levels (CRL) (Institution, Apps, Dev)



NASA Technology Readiness Level

http://en.wikipedia.org/wiki/File:NASA_TRL_Meter.jpg

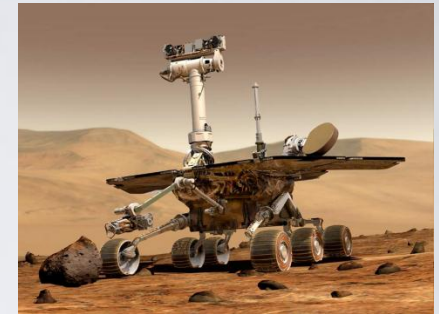
4. Cloud Oriented Architecture (CLOA)

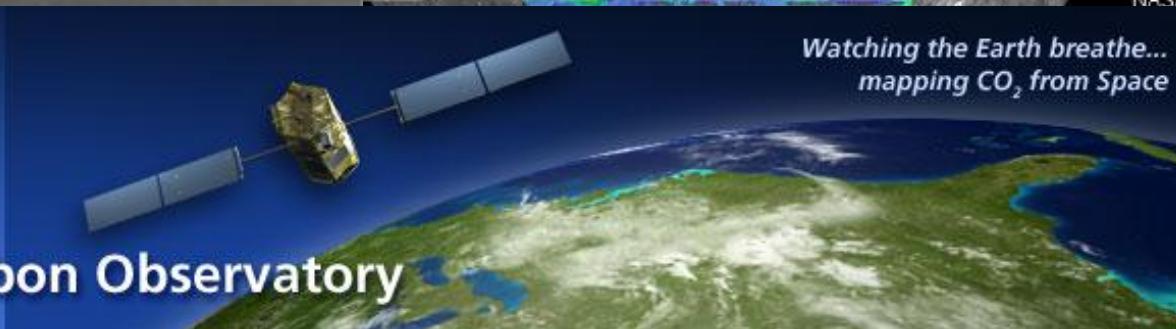
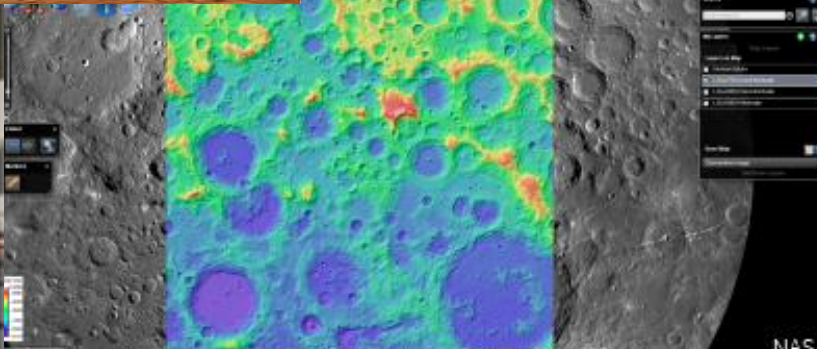
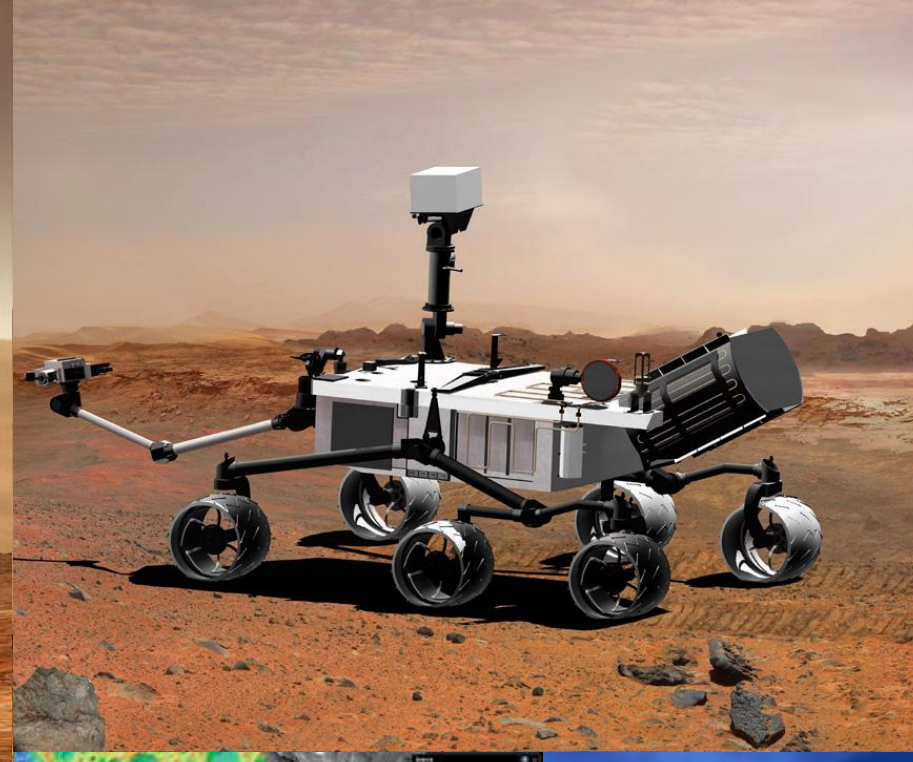
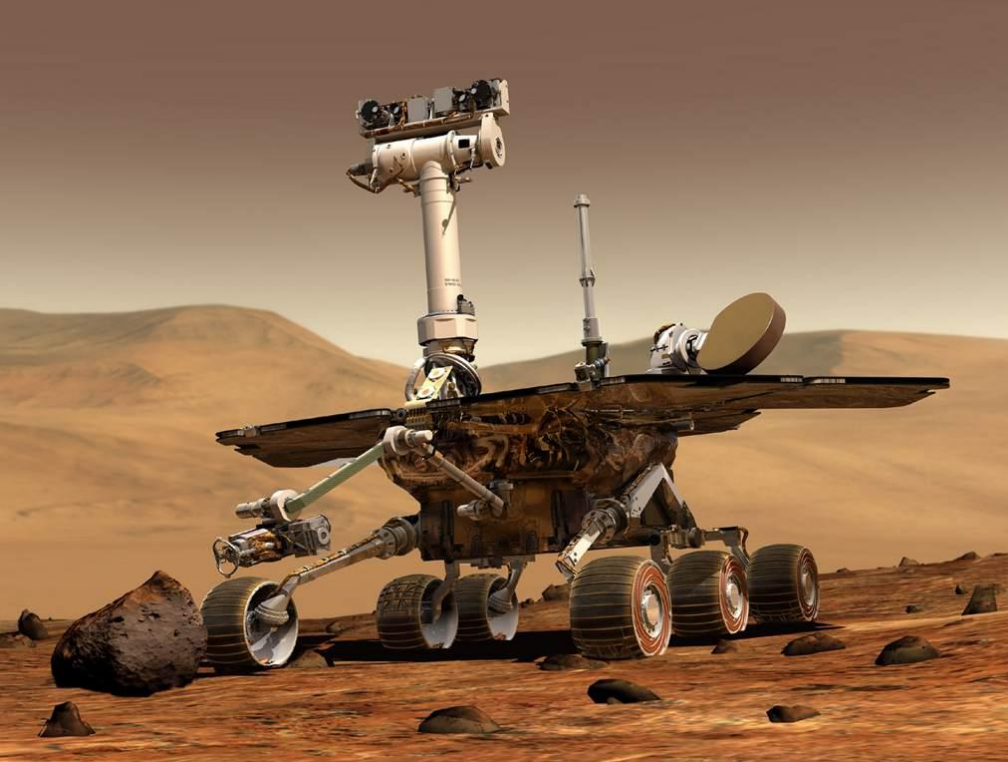
JPL Overcoming Barriers to Cloud Computing



- **Focus on real business problems**
- Early hands-on prototypes in every promising cloud
- Avoid analysis paralysis, but be safe
- Pro-active partnering
- Educate, communicate, influence, elaborate
- **Keep it real**

Cloud Computing is helping or E today and beyond





CLOUD COMPUTING

[Home](#)

GET STARTED

- [Order a Virtual Machine](#)
- [Order Process](#)
- [My Systems](#)
- [Backing Up Systems and Data](#)
- [Learn about the Cloud](#)

CLOUD SECURITY

Understand risk and requirements

- [Cloud Security](#)

CLOUD VIDEOS

- [Public Engagement in the Cloud](#)
- [Mission Systems in the Virtual Private Cloud](#)
- [Operating Securely in the Cloud](#)
- [Lunar Modeling & Mapping Project in the Cloud](#)

DESIGN FOR THE CLOUD

- [JPL Cloud Architecture](#)
- [JPL Cloud Design, Programming Course](#)
- [Textbook: Cloud Application](#)

The Cloud and JPL

The Cloud is an advantageous source of IT resources (processing, storage etc.) to JPL that features

- Rapid provisioning without the need of a procurement
- Capacity on demand
- Elasticity (scale up and scale down as you need)
- Pay only for the resources you use & only when you use them

Cloud resources can replace the need for a dedicated physical server at JPL. They are available on the public Internet and the JPL Intranet. We can help you take advantage of Cloud resources to support your task or project.

Order a Cloud VM, learn about the Cloud at JPL, or connect with other cloud users at JPL by clicking on one of the clouds below.



We understand that JPL users have diverse IT requirements for both their applications and for management and configuration of resources. We have developed two approaches to provisioning Cloud resources to meet these requirements.

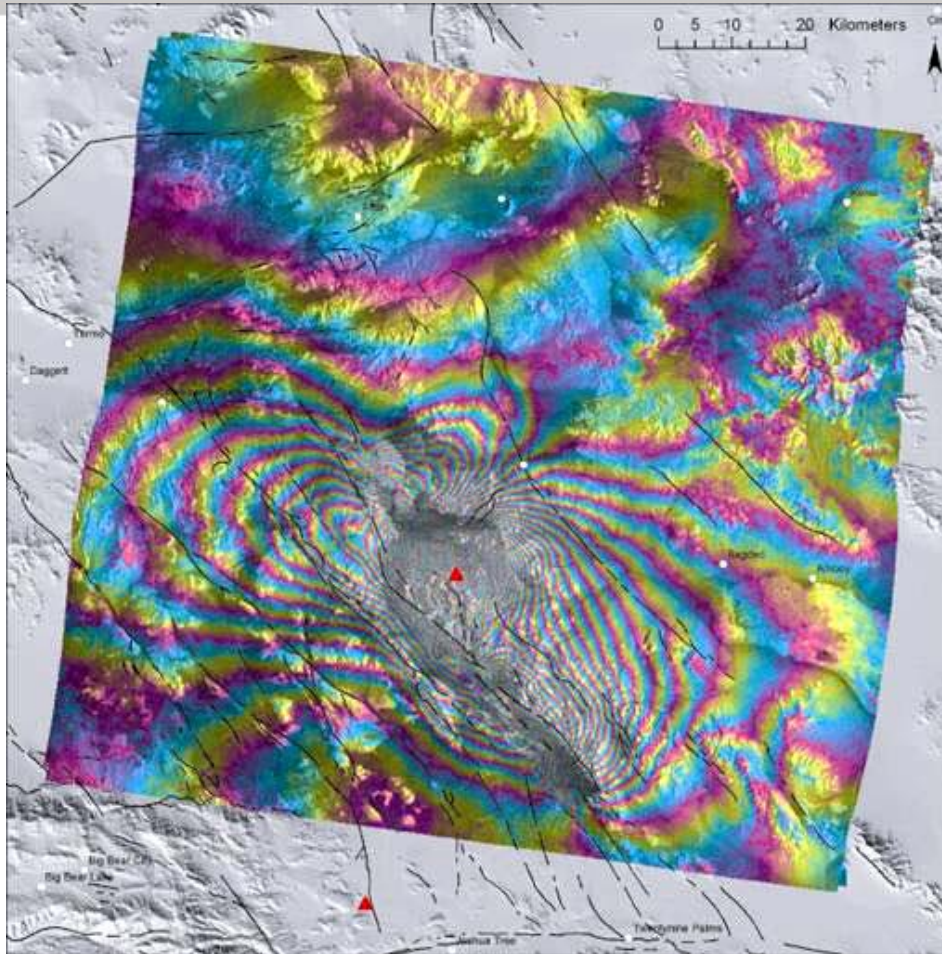
- Routine requests for Cloud resources
 - The [Order a Virtual Machine link](#) will guide you through ordering a Cloud VM and attached storage. You will see a conventional shopping cart. It is probably suitable from most users.
- Power Users and System Administrators
 - In the case of systems that can run on a public network and contain only publicly-releasable data and algorithms, we can offer power users and system administrators direct account access to the management console that controls their resources and offers a larger array of Cloud services such as self-provisioning/de-provisioning, auto-scaling, load-balancing etc. If this is of interest to you, click on the [JPL IT Cloud Computing Consultant link](#) and let us know your requirements.



**Well,
Skywalker,
ignore or resist
the Force at
your own peril**



InSAR Processing



Big Data,
Big Processing,
Big Science!

- 4 hours - 80 machines - 300 GB → 4 TB

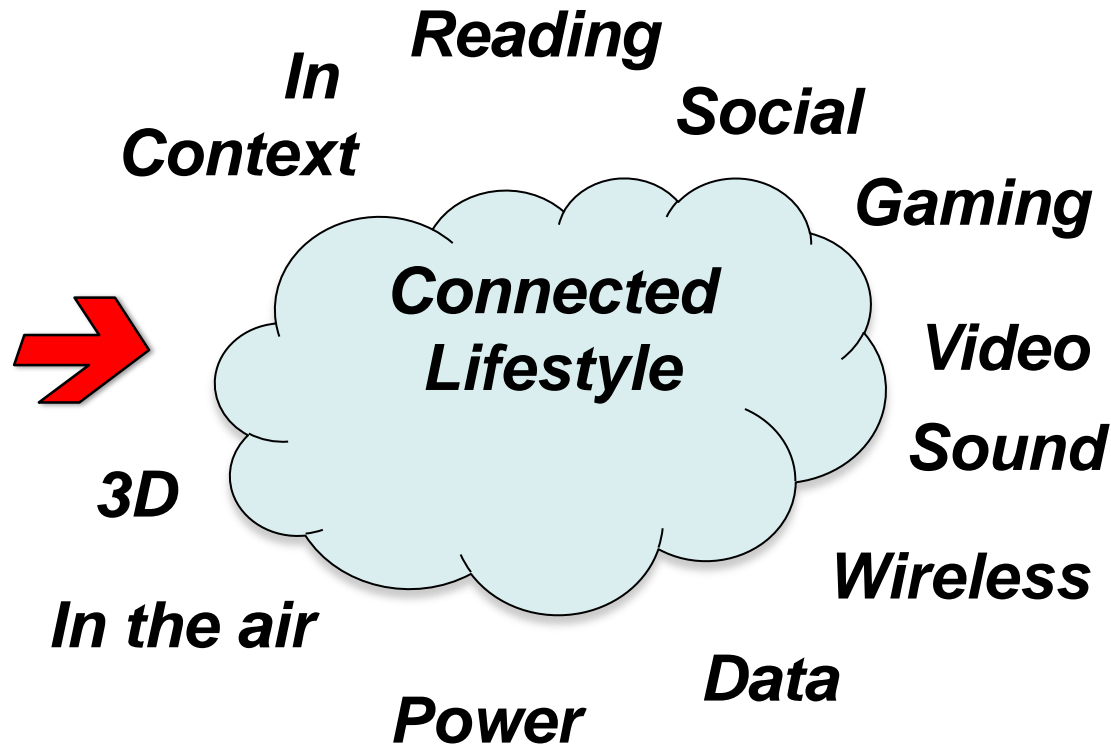
Processing Cost: \$256!



5 Giga-pixels 5

Consumer Driven IT Impacts

Always On



Easy

Anyone

Anytime

Anywhere

Any device

Any content

Any form factor

→ DDSS

Drag + Drop + Sync + Share

The Consumer Cloud is already here





Courtesy Ken & Michelle Dyball/[Getty Images](#)

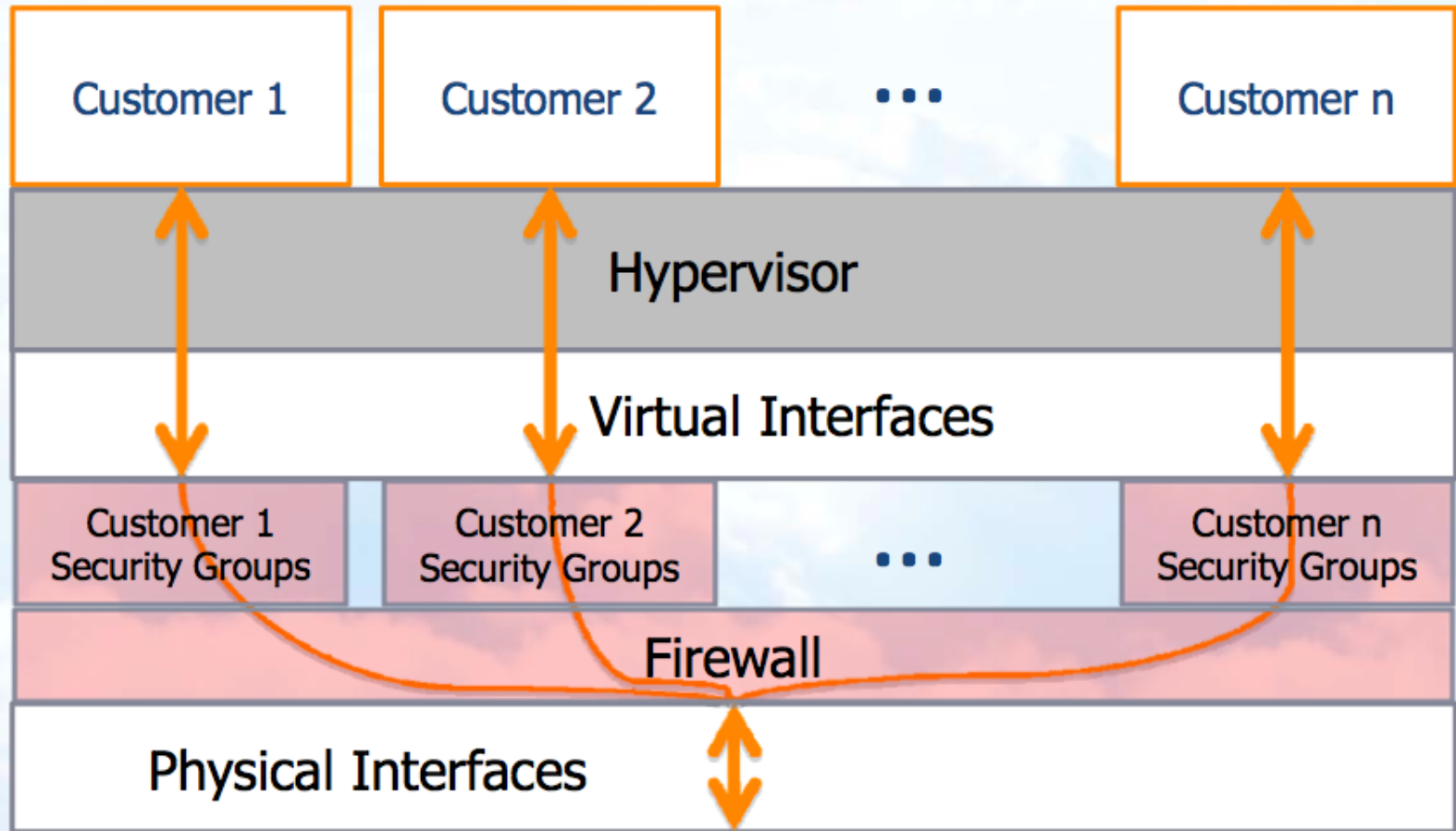
But how on earth can we make it secure?



Trend: Refocused Cyber Security

- Trends: Less control + increased regulation
+ more attacks + increased awareness →
- Need faster solutions despite new challenges:
Cloud Computing,
Mobility,
Personal devices,
Collaboration,
Social Media,
International hacking,
Increased partnering
- Cyber security goes from afterthought to front:
 - ➔ “The buck starts here”
 - ➔ “Protect by enabling”
 - ➔ Partner with IT Security on all projects





SEPARATION OF CONCERN

JPL Hardened Virtual Machine Image

Encrypted File System



System Logging

Host Based Intrusion Detection System (IDS)

Hypervisor based and Hardware Firewalls

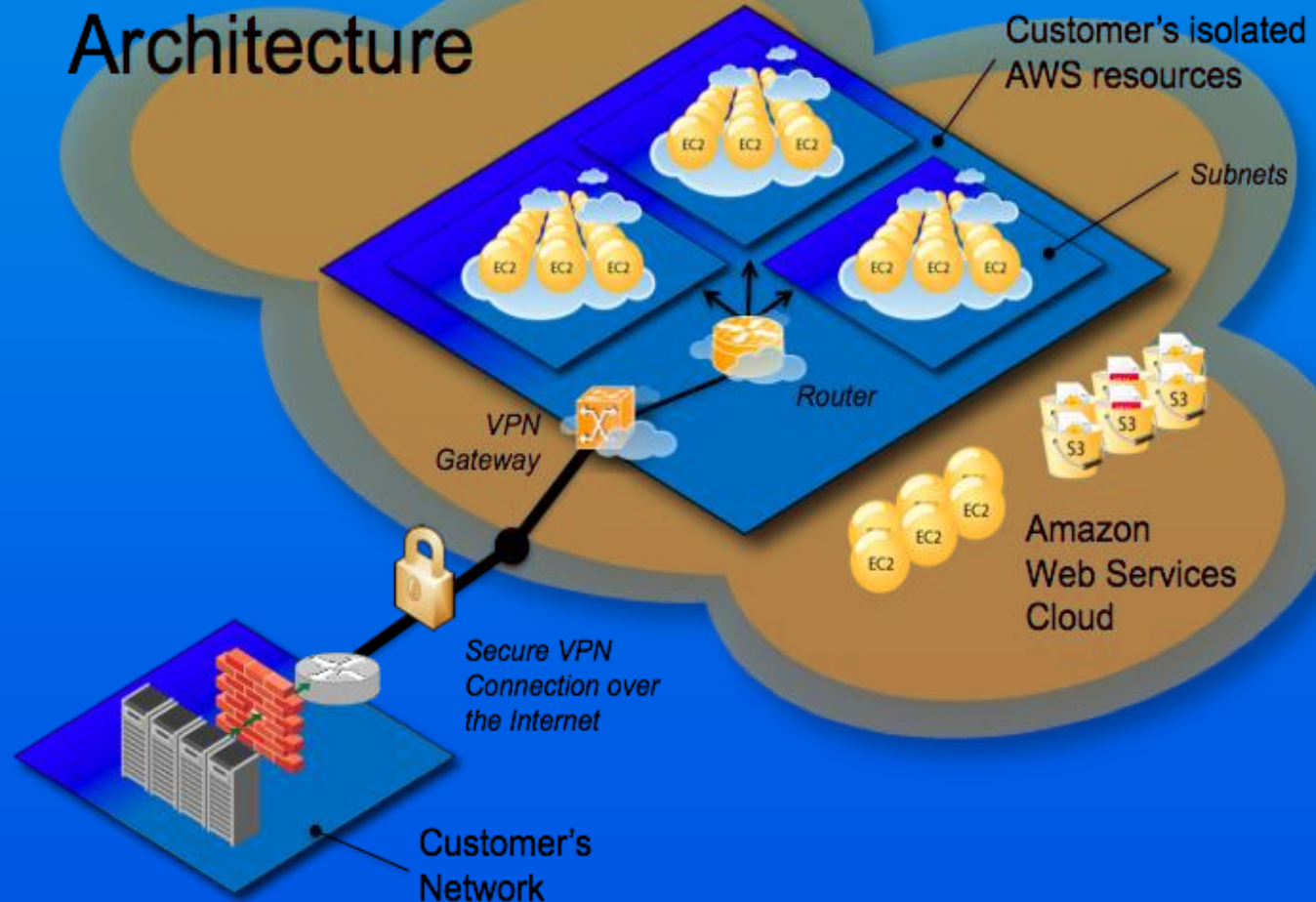


JPL Firewall



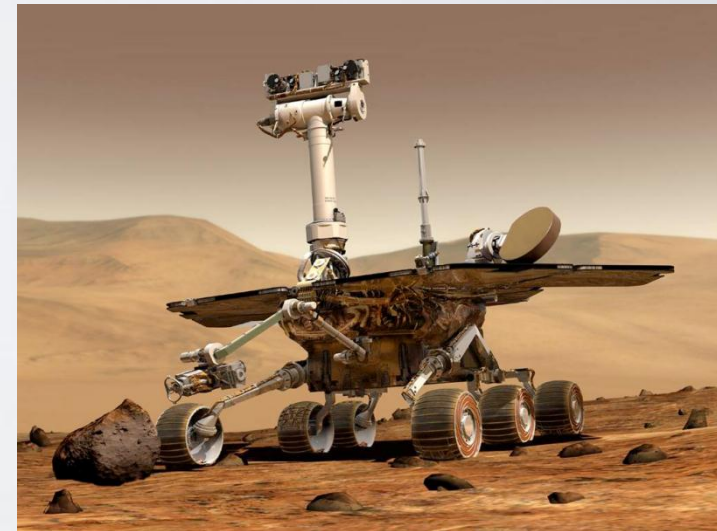
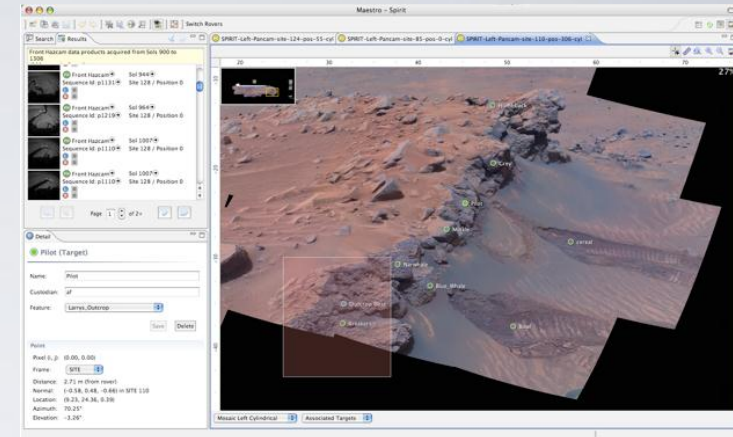
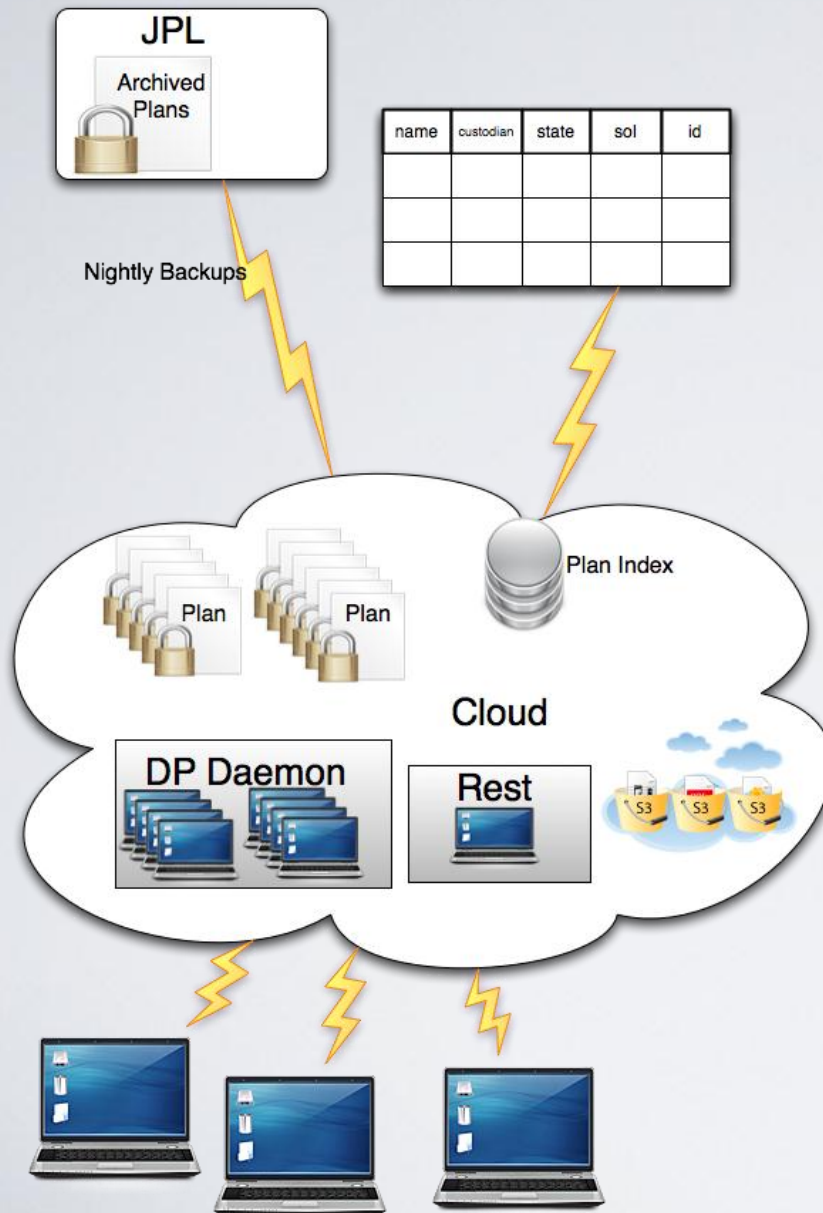
COVERING OUR ASSETS ON CLOUD

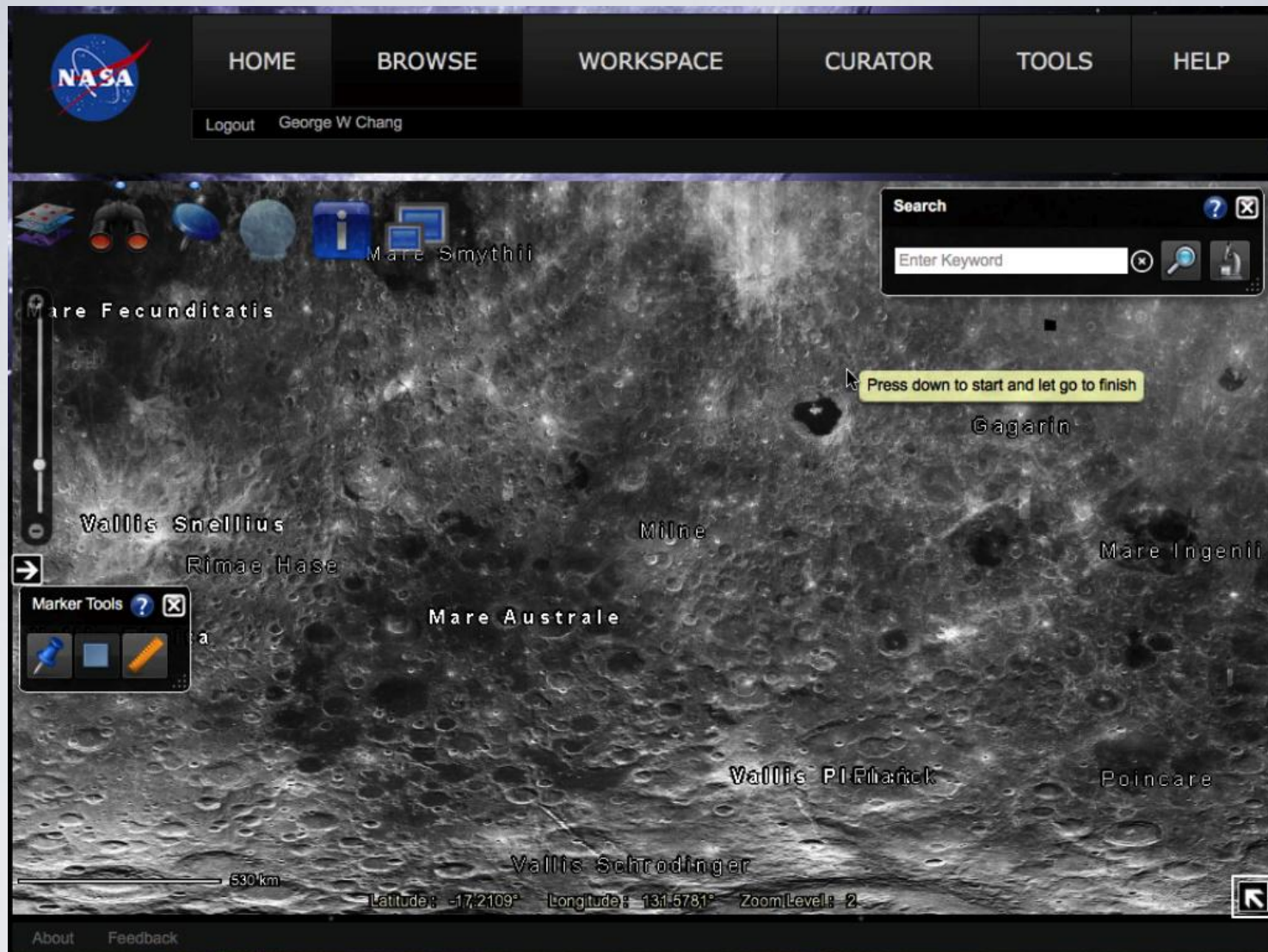
Amazon VPC Architecture



Virtual private cloud

SECURED UPLINK PLANNING





LIVIMP – The future of
computing

So, what's next?



- Applied *Cloud First* strategy
- Partner in the Cloud
- Cloud enables mobile benefits
- Specialized Clouds become the OS
- Evolve Cloud Oriented Architecture (CLOA) and Cloud Application Suitability Model (CASM)
- **I**nnovating **T**ogether is the norm
- **Make it and IT compelling**
- **Take full advantage of the rising tide of the Pervasive Cloud**



- Get started now and learn with low sensitivity data
- Focus on new capabilities
- Prototype under the radar screen
- Communicate it as a business initiative (ROA)
- Partner with everyone
including cross-functional leaders
- Use the 3-floor elevator test
- Expect license agreements
to take time
- Look at the full risk vs. reward
- ***Innovate Together and
Keep it real***



Our New business

DANCING ROBOTS

**Surf the rising tide of
Cloud Computing
in your business**



Thanks for listening

