Partnering – Thinking Big
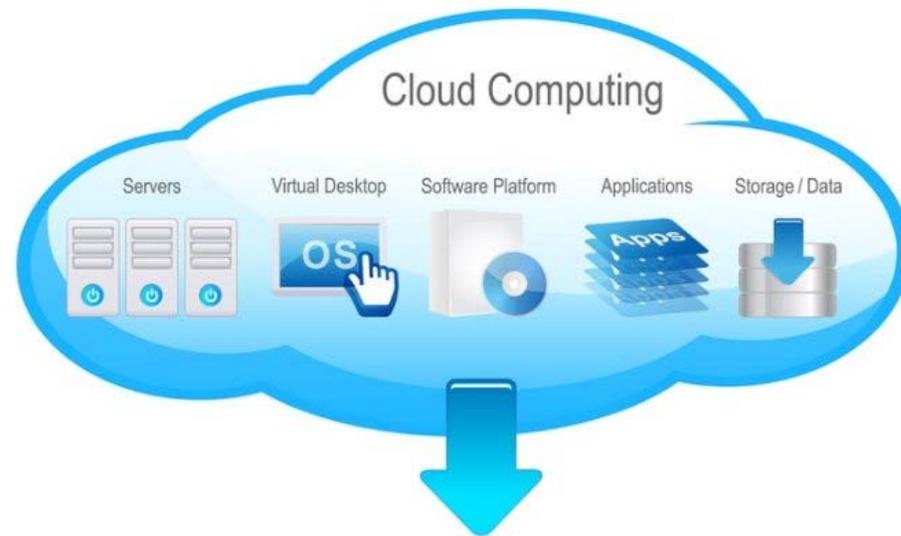
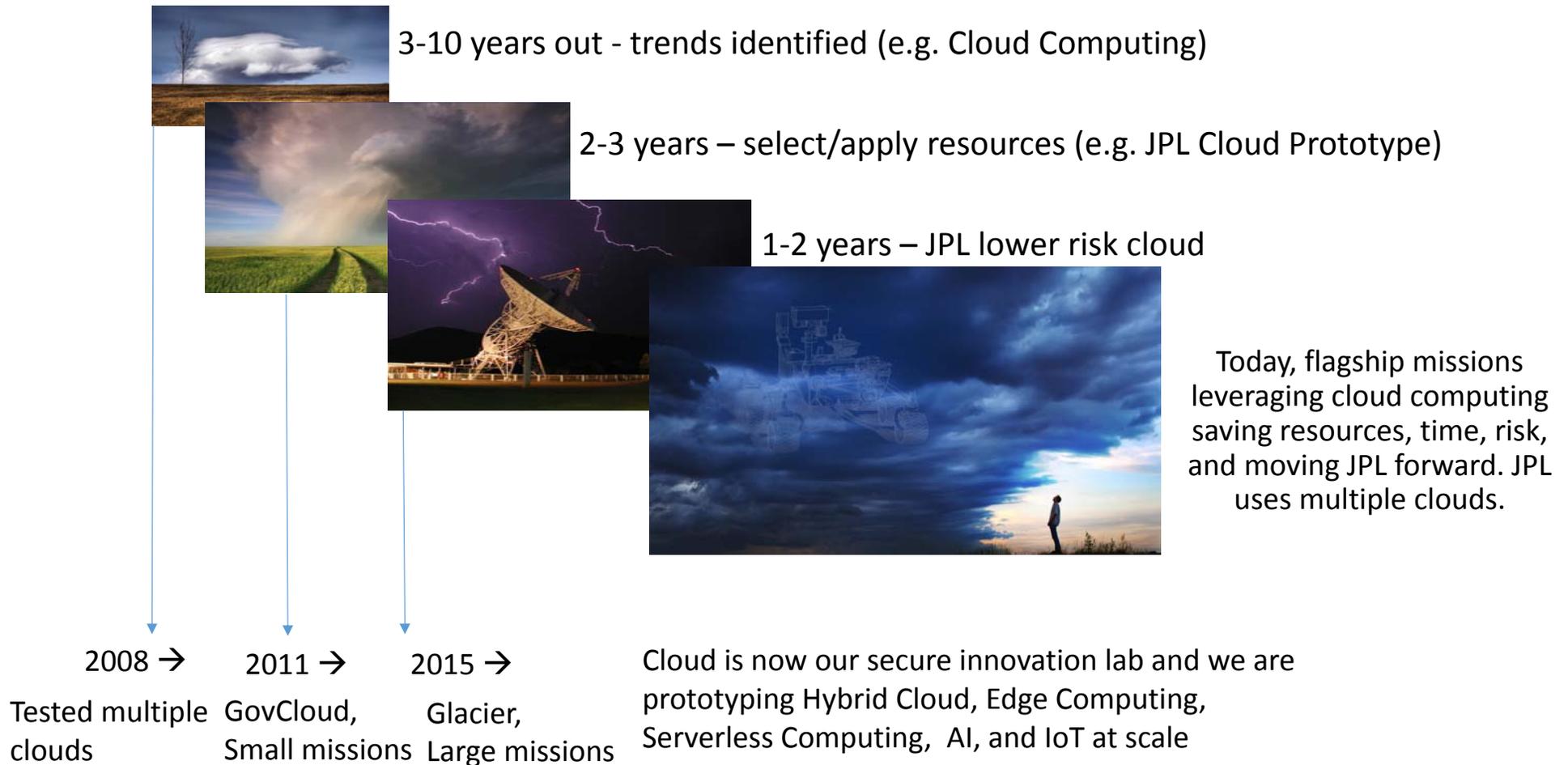Jim Rinaldi, JPL CIO

November 2, 2017

What Does Cloud Computing Mean to JPL?

- Digital Transformations
- Working with Others
- Out-of-the-box Thinking
- On Demand. Scalable Capacity
- New Technology Options
- New Business Models
- Rapid, Low-risk Experimentation
- Everything as a Service
- ## Changing How We Work

AWS, Microsoft, IBM, ServiceNow, SAAS Vendors, …

Tracking and experimenting with emerging technologies pay dividends for NASA. Example of the Cloud Technology Wave at JPL

3-10 years out - trends identified (e.g. Cloud Computing)

2-3 years – select/apply resources (e.g. JPL Cloud Prototype)

1-2 years – JPL lower risk cloud

Today, flagship missions leveraging cloud computing saving resources, time, risk, and moving JPL forward. JPL uses multiple clouds.

2008 →

Tested multiple clouds

2011 →

GovCloud, Small missions

2015 →

Glacier, Large missions

Cloud is now our secure innovation lab and we are prototyping Hybrid Cloud, Edge Computing, Serverless Computing, AI, and IoT at scale

Challenges in Cloud Computing

- Protecting Legacy
- Adapting New Architecture
- Frequent Changes
- New Tools
- New Cost Models
- Data Management
- Cybersecurity

IoT ONE — Top 8 Cloud Computing Challenges in 2016

	Challenge	Percentage
1	Lack of resource / expertise	32%
2	Security	29%
3	Compliance	26%
4	Managing multiple cloud services	26%
5	Managing costs	26%
6	Complexity of building a private cloud	24%
7	Governance / control	23%
8	Performance	15%

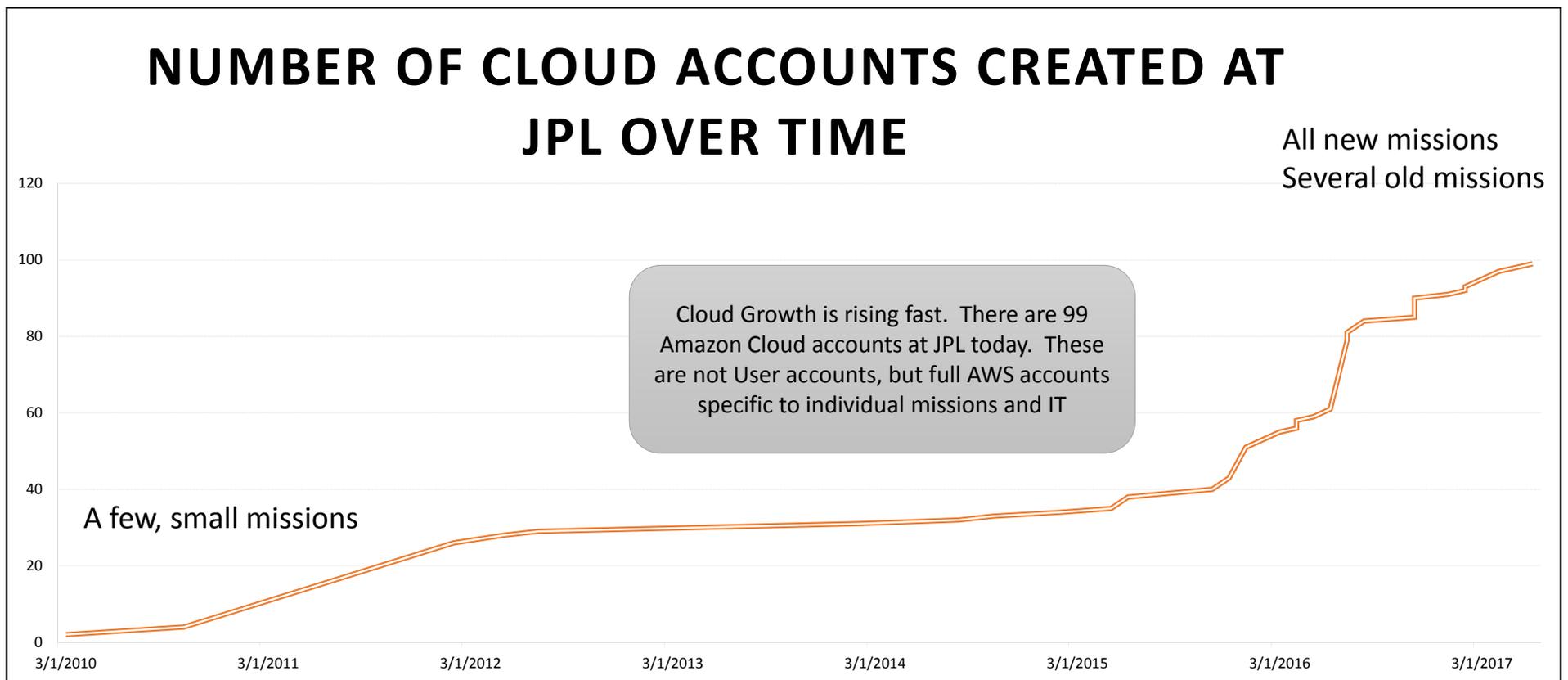Source: RightScale 2016 State of the Cloud Report

IoT ONE | www.iotone.com | Accelerating the Industrial Internet of Things

We chose to solve the challenges with early visioning and partnering on game-changing technologies
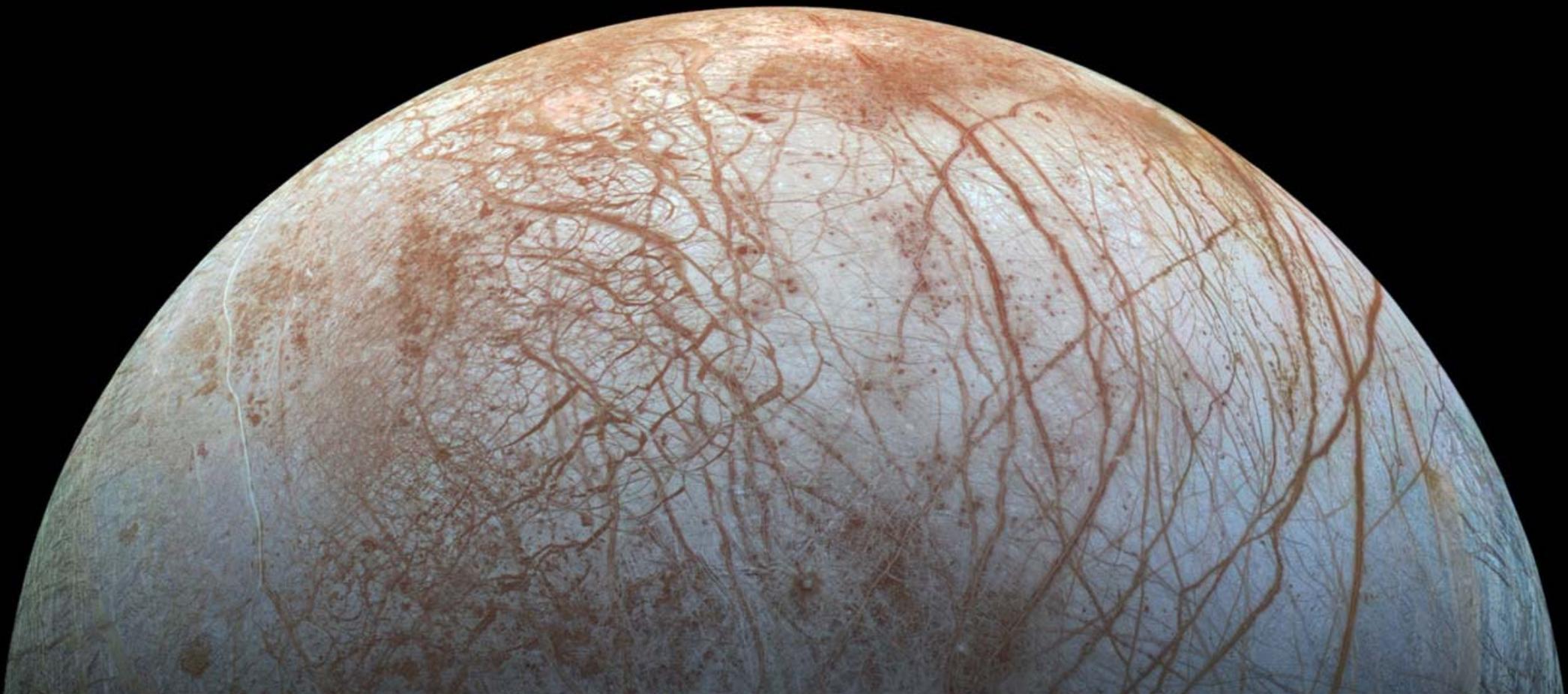- Partners visit frequently and sit on JPL review boards
- JPL and NASA visit partner sites

Amazon Cloud Accounts for Missions and IT

NUMBER OF CLOUD ACCOUNTS CREATED AT JPL OVER TIME

All new missions
Several old missions

Cloud Growth is rising fast. There are 99 Amazon Cloud accounts at JPL today. These are not User accounts, but full AWS accounts specific to individual missions and IT

A few, small missions

120	
100	
80	
60	
40	
20	
0	

3/1/2010 3/1/2011 3/1/2012 3/1/2013 3/1/2014 3/1/2015 3/1/2016 3/1/2017

Partnering with Missions

Curiosity: Did/does Mars house life?

Mars 2020: Our next rover on Mars

Understand the Earth's water in detail with SWOT and NISAR
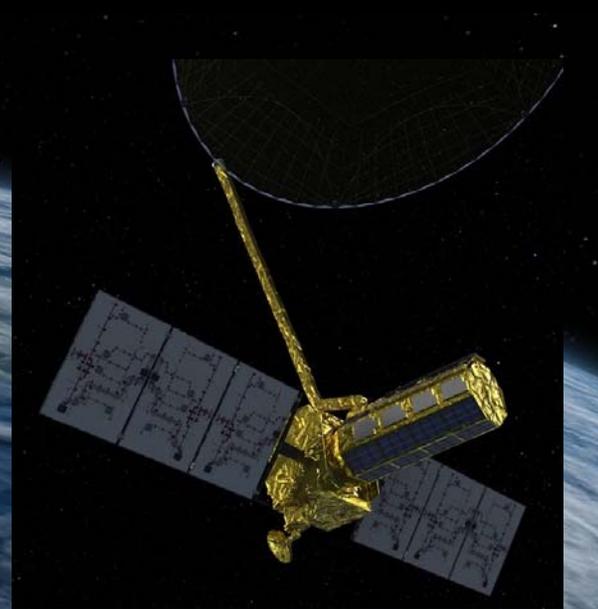
WE WILL COLLECT 100X MORE DATA

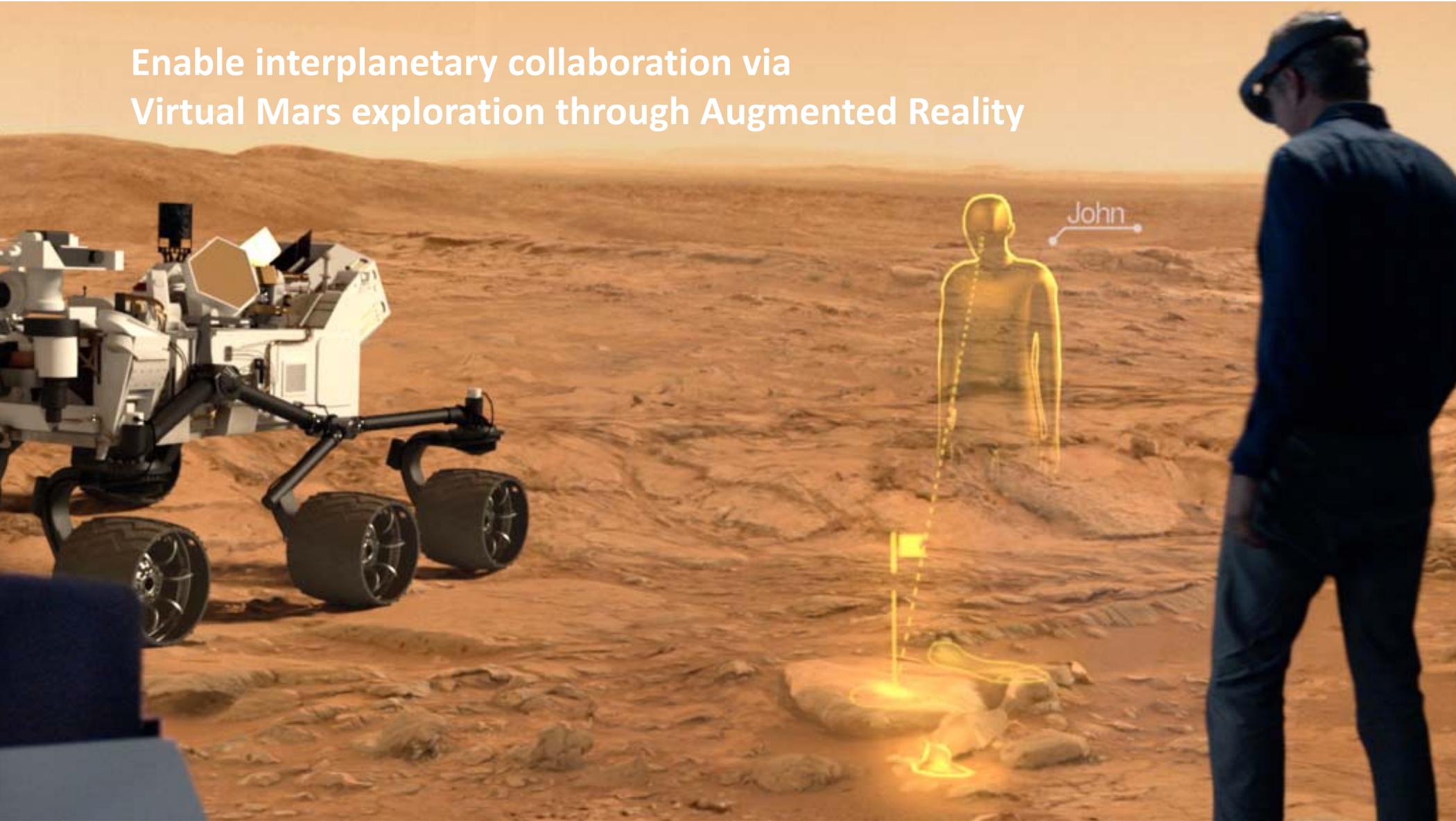|		
SWOT & NISAR 2021		100 TB/DAY
SMAP 2015		
OCO-2 2009		

Enable interplanetary collaboration via
Virtual Mars exploration through Augmented Reality

Prepare for next generation of explorers' ways of working

Increase interest in Space -- and use the lessons learned

"Alexa, enable NASA Mars"
"How cold is Mars?"
"Can people live on Mars?"

. . .

AWS and JPL partnering

Things/Firsts we did together
- AWS to understand enterprise cust.
- Provided many AWS references
- Advice to those interested in cloud
- **GovCloud**
- Glacier and Eon
- Content Distribution (Curiosity)
- Zocalo (now WorkDocs)
- Using Spotmarket for Gov't
- Using Reserved Instances for Gov't
- IoT in the enterprise
- Alexa for the enterprise
- Alexa at Work
- Alexa NASA Mars app
- Greengrass prototype and demo
- Biba (now Chime) beta
- Cybersecurity
- AWS EAR-99 authorization

Things we are doing together
- JPL going all-in in the cloud
- NASA DAACs in AWS
- Evolving Alexa in the enterprise
- Mars 2020 in AWS (3x faster)
- Europa mission in AWS (partners)
- Asteroid Redirect in AWS (partners)
- SWOT/NISAR in AWS (100x bigger)
- Evolving serverless computing
- Evolving enterprise cost models
- ...

Things we could do together
- AI (Augmented Intelligence)
- Automation/robotics/fleet
- IoT
- Evolve Alexa for enterprise use
- AWS as a hub for HPC / GPU
- Edge computing
- Serverless computing
- AWS Professional Services
- Moving Data Centers
- ...

What's our next big thing?

Additional early, promising IoT experiments
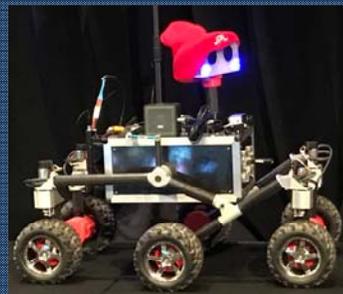

Understand hacking attempts

Combining multiple senses to collaborate on our data

Controlling A/V equipment via voice.

Alexa as Virtual helpdesk and phone

Control robots via voice

As interface to ChatBots "Ask me anything"

Strong Partnerships with our Vendors:

As Critical as the Services they provide

Thank You!