

Open Innovation Tools for Collaboration

NASA's Toolkit for Innovation using Prizes and Challenges with the Curated Communities

NASA's Center of Excellence for Collaborative Innovation (CoECI)

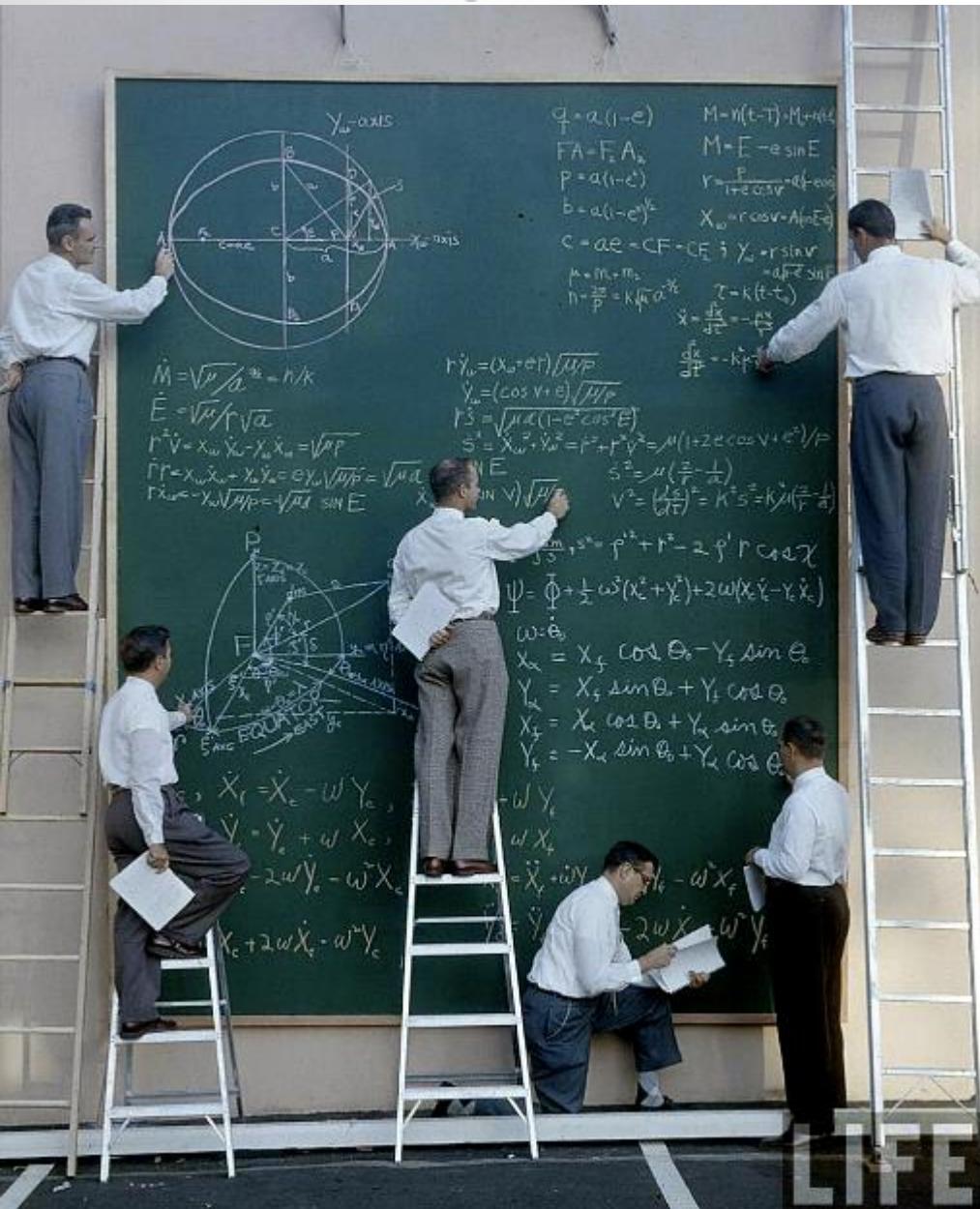
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@NASA_NTL

NASA's Center of Excellence for Collaborative Innovation

- The **Center of Excellence for Collaborative Innovation (CoECI)** is working across NASA and other federal agencies to infuse crowdsourcing methods as set of available tools for engineers and scientists on projects where applicable.
- CoECI has the contracts in place with multiple vendors and works with both users and vendors (formulation, management, performance metrics).
- NEW set of tools in the toolkit for NASA challenge owners
 - NASA@Work** – NASA's Internal Crowd Challenge Platform
 - Innocentive Contract
 - Technology Scouting**
 - Yet.com Contract
 - NASA Tournament Lab (NTL)**
 - NOIS Contract Vendors: Appirio/TopCoder, Common Pool, HeroX, InnoCentive, Kaggle, Luminary Labs, NineSigma, OpenIDEO, Patexia, Tongal
 - Small purchase challenge vendors**
 - GrabCAD, Freelancer, etc. via Gov't Purchase Card
- Other NASA Crowd-Based/Challenge Programs**
 - NASA Centennial Challenges** – Similar to X-Prize competitions
 - SpaceApps & Citizen Science Challenges**





First Things First!

NASA has some of
the most amazing
employees on the
PLANET!

Tap into that
crowd FIRST!



What Is NASA@work?

A NASA-wide crowdsourcing platform for employees to find technical solutions, new ideas, or expertise using prize-based challenges.

How Can NASA@work Be Used?

Generate new ideas, concepts

Survey NASA for knowledge or expertise

Collect new and creative input

Refine a challenge prior to external crowdsourcing

NASA@work is **FREE** for any NASA projects that want to post a challenge!



My Filters ▾ Go

Open, Eval, Awarded ▾ Deadline ▾ Go

Showing: 82 Status: Open, Eval, Awarded Sort: Deadline

1 2 3 4 5 .. 9

Showing 10 out of 82 listing

Voting Challenge: Name that Feature! #2127

Posted by Rader, Steven N. (JSC-SA511) on May 25, 2015



The initial review and evaluation of the 'NASA@work 2.0: Name that Feature' Challenge have been completed (to see the original challenge write-up, please visit: <https://nasa.innocentive.com/ici/discuss/challenge/2114>). The Challenge Owner received a fantastic response and the NASA@work community now has the opportunity to vote for their favorite submission ideas!

The purpose of this follow-on challenge is to determine the overall winner of the

NASA@work 2.0: Name That Feature Challenge by asking the NASA@work

[Read more...](#)

Ideation, Process Improvements

Edit

View Challenge

Deadline

ON

Following

OFF

Mars EVA Gap Challenge #2118

Posted by Buffington, Jesse A. (JSC-XX111) on Apr 28, 2015



NASA has been working to prioritize our technology development activities that will enable our human exploration of the solar system including possible human missions to Mars. Extra-Vehicular Activities (EVAs) are key to human exploration of the surface of Mars and we are working to better define the gaps in our strategies, architectures, systems and technologies required for surface EVAs and our plans to address such gaps. For this Challenge, we are asking the NASA@work community to help us find any hidden gaps!

Computational / Modeling, Education, Electrical, Engineering, Environmental, Experimental Design, Hardware / Systems / Design, Human Health and System Support, Ideation, Materials, Operations, Process Improvements, Science, Technology Development

Jun 05, 2015

EVAL

16 Solutions Submitted

Create a Challenge

Suggest a Challenge

LEADERBOARD

Recent winners

Lewis, Robert E. (JSC-SA111)[WYLE INTEG. SCI. & ENG.]
Solved: 2
Posts Written: 5

LAUCHNER, ADAM C. (JSC-OZ)[THE BOEING COMPANY]
Solved: 1
Posts Written: 4

Moore, Kevin (JSC-OP)[BARRIOS TECHNOLOGY LTD]
Solved: 2
Posts Written: 14

Schnelderman, Jason S. (JSC-SK)[WYLE INTEG. SCI. & ENG.]
Solved: 1
Posts Written: 4

Hintze, Paul E. (KSC-NEL60)
Solved: 2
Posts Written: 3

Arai, Tatsuya (JSC-XA111)[OCEANEERING SPACE SYSTEMS]
Solved: 1
Posts Written: 3

Dumesnil, Blake (JSC-JETS)[Jacobs Technology, Inc.]
Solved: 1
Posts Written: 3

Verville, Jonathan P. (GSFC-5850)
Solved: 1
Posts Written: 3

5



Cool NASA Experience

**NASA
External
Public
Recognition**



Item Flown in Space

Solver Reward

**NASA@WORK
System**

**Recognition
by Center
Director and
Agency
Management**



**Social Media
Recognition
from
Astronaut**



NASA @NASA · 20h

Congratulations @JohnJames for your winning NASA@work Award #NASA@work #NASA #JohnJamesRocks

**Astronaut
Autographed
Item**



Group On-Call Notification Alternatives

Deep
Space
Human
Spacecraft

Display
Format
Development
System

Lab Equipment
Obsolescence:
Cytometer

Ideas for New
Technology
Demonstration
Prize Competitions

Inflight Calcium Isotope Measurement Device

Protection of the Human from Galactic Cosmic Rays Challenge

Solutions on the
Use of Thorium
Instead of
Uranium

A Durable/
Permanent
Anti-Fog for
the Space
Suit Helmet

Reduce Waste in Space: Creating
Feedstock for Additive
Manufacturing (3D Printing)

Determining Urine
Volume in Microgravity

Hands-On Tutorial for Reed
Solomon Encoding Method

Packing
Foam
Alternatives
Challenge

As Good as Dollars:
Incentives for
NASA@work that
Count!

Advanced Exercise Concepts for Long-Duration Space Flight

NASA@WORK

Over 16,000 Registered Members
(25% of NASA's 60,000 CS & Contractor Workforce)

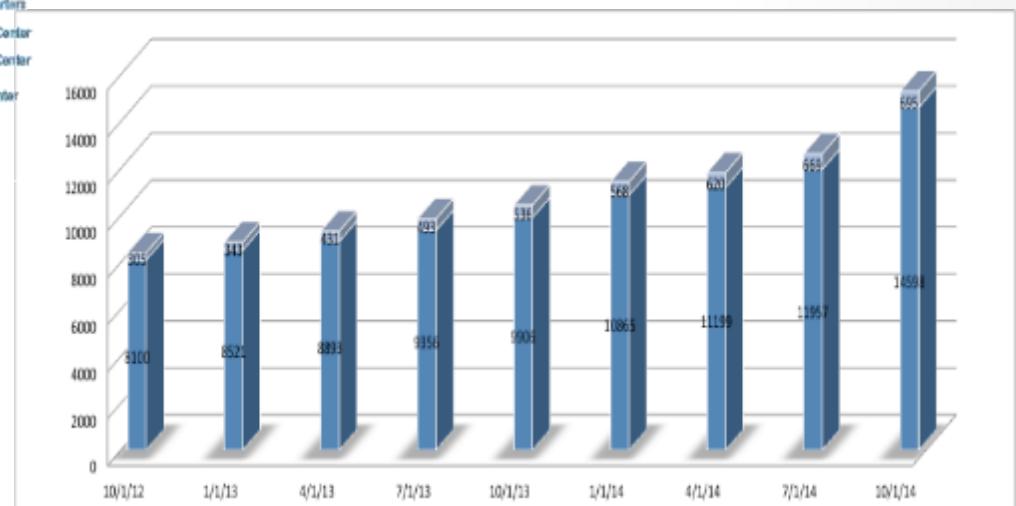
**People that work at
NASA want to make
a difference!**



2-4 Active challenges posted at any one time

New challenge posts every ~2-3 weeks

15-20 Challenges per Year

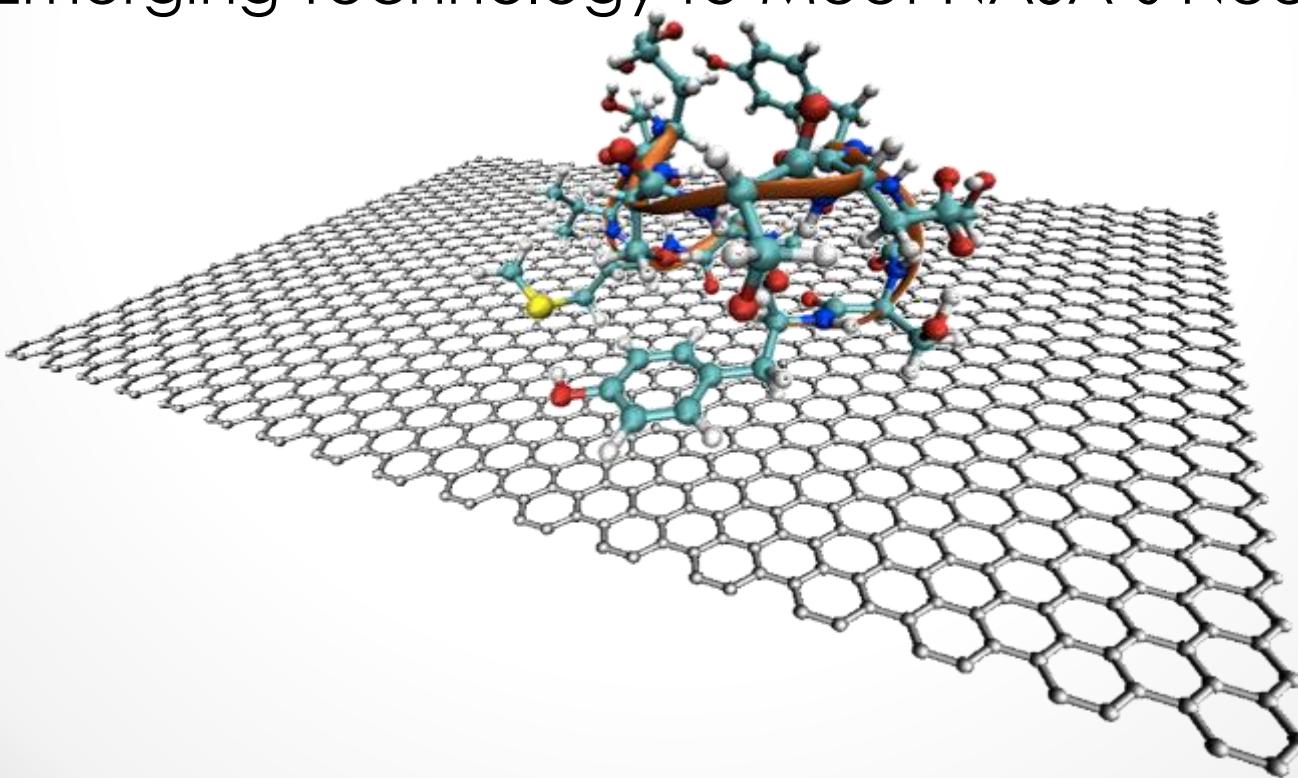


Growth of the NASA@work Community since October 2012 ⁸



Searching for Technologies

Using New Methods to Search for New and Emerging Technology to Meet NASA's Needs





Yet2.com

Provides a “matching” service that finds technologies and solutions from industry, academia, and/or individuals for a given need/challenge.

Includes a 130,000 member community and links to over 16,000 commercial entities.

Very effective (and cost effective) in searching for existing products or development efforts.

Yet2.com Challenges

Non-Invasive Intra-Cranial Pressure Measurement

"Much more than we expected! Very pleasantly surprised that this process exposed so many potential solutions with such wide breadth and depth"

"Learned that we should have revisited technologies that we rejected earlier

81 Leads Identified

63 Rejected

3 High Interest Solutions

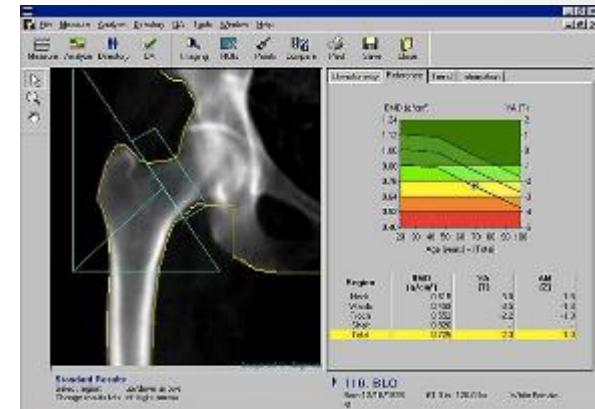
5 Other Interesting Solutions

6 Potential Complementary Technologies

2 Potential Solutions



Bone Density Measurement



Monitoring of Water and Biocides





NASA CoECI's Open Innovation Capabilities



Tech Survey

Enterprise Knowledge Sharing

CAD Design

Big Data

Algorithms

Graphics
Logos
Light SW

Develop an
Innovative Solution

Ideation

Prototyping

IP Search

Develop
Software
Solution

Conceptualization

Videos

Find an
Innovative Solution



NASA CoECI's Open Innovation Toolkit



yet².com

NASA@WORK

GRABCAD
freelancer.com

kaggle

APPIRIO [topcoder]TM

NINE SIGMA

INNOCENTIVE[®]

Patexia.

L

LUMINARY
LABS

tongalTM

NASA
Tournament Lab

hero^x

GSA IT Software



Common Pool

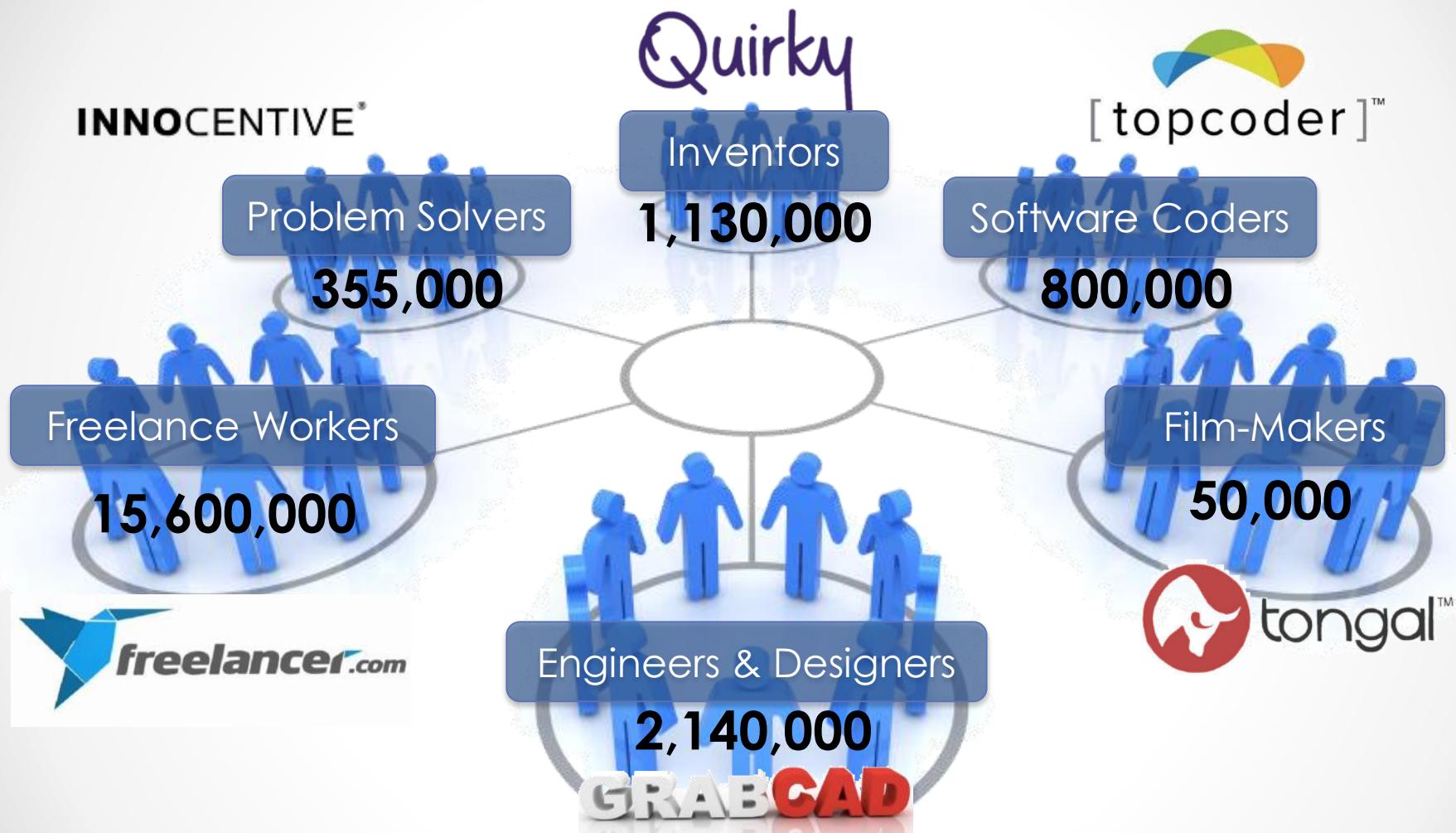
openIDEO

NASA Tournament Lab (NTL) = NASA Open Innovation Services (NOIS) Contract



BACKUP

Networks & Communities



Curated Communities

Well formulated crowd-based platforms actively work to build a community of users that are **passionate enthusiasts**.

Effectively Using Communities

Solve a Problem

Create an Innovative New Solution

Apply an Existing Technology

(in an innovative way)

Find an Existing Solution

(you didn't know existed)

Develop a Product

Access Best Possible Product or Service
(competition winner)

Provide a Service

Access Very Specific Expertise
(found through competition)

Diverse Membership



Innovation from Diversity found via Challenges
(Experience, Context/Perspective, Expertise)

Expert or Domain Focused Membership



High Quality Products/Services
(via Competition to get Best in Domain)

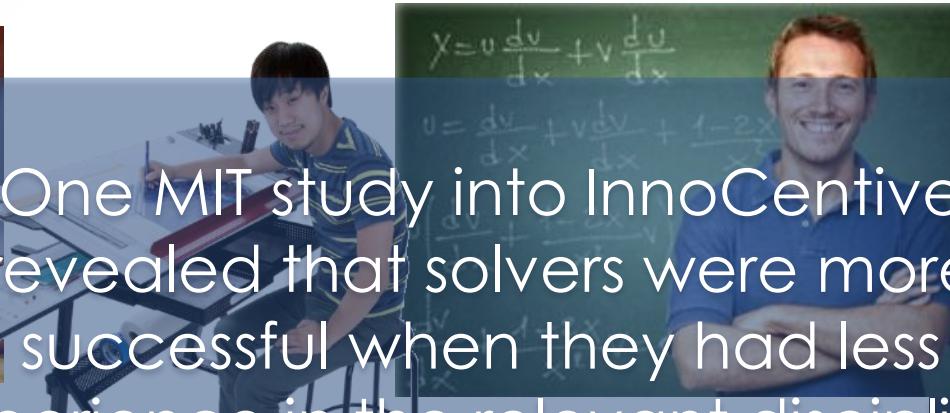


Innovation & Problem Solving

Using Challenges with Diverse Communities to develop unique and innovative approaches to unsolved problems

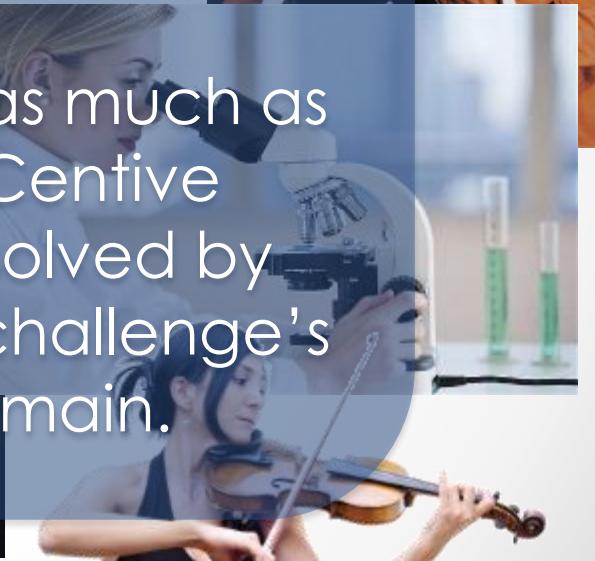
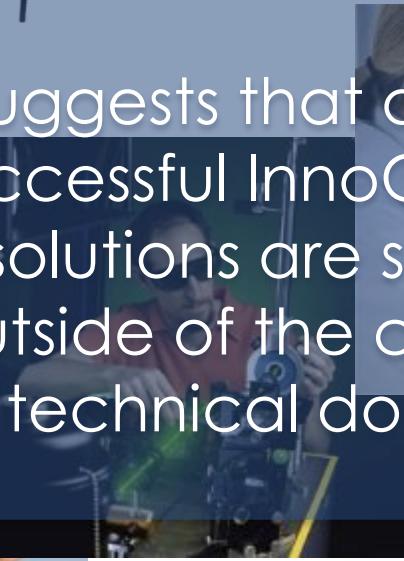


Diversity is the Key to Innovation



One MIT study into InnoCentive revealed that solvers were more successful when they had less experience in the relevant discipline.

Some data suggests that as much as 70% of successful InnoCentive challenge solutions are solved by individuals outside of the challenge's specific technical domain.





MARS Balance MASS Challenge

Winner was Ted
Ground from
Rising Star, Texas
(population 799)



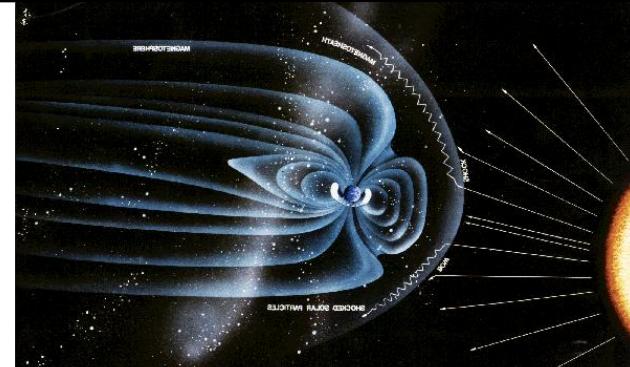
\$20,000 in prizes
Over 2800 registrants
219 Entries

Winning Submission: Barium tracers for atmospheric analysis

Additional InnoCentive Challenges

Galactic Cosmic Ray Mitigation

Finding ways to protect humans from the effects of cosmic galactic rays in deep space.



Non-Invasive Intra-Cranial Pressure Monitoring

Finding methods to monitor the pressure in the human brain that are non-invasive.



Strain Measurement of Vectran and Kevlar Webbing

Seeking improved methods for strain measurement under very specific conditions for inflatable habitat testing.



Algorithm Competitions

Leverage Competition to Optimize Complex
Algorithmic Problems



Case Study

ANTIBODY SEQUENCE ANNOTATION

Winning solution performs 120x faster

Improve on NIH Megablast algorithm
for nucleotide sequence alignment

\$2M+
Multi-year
Development

MEGABLAST

0.72 pts



4.3 hours

FULLTIME
RESOURCE

0.77 pts

360 days

\$120 k

47 min.

TOPCODER
COMMUNITY

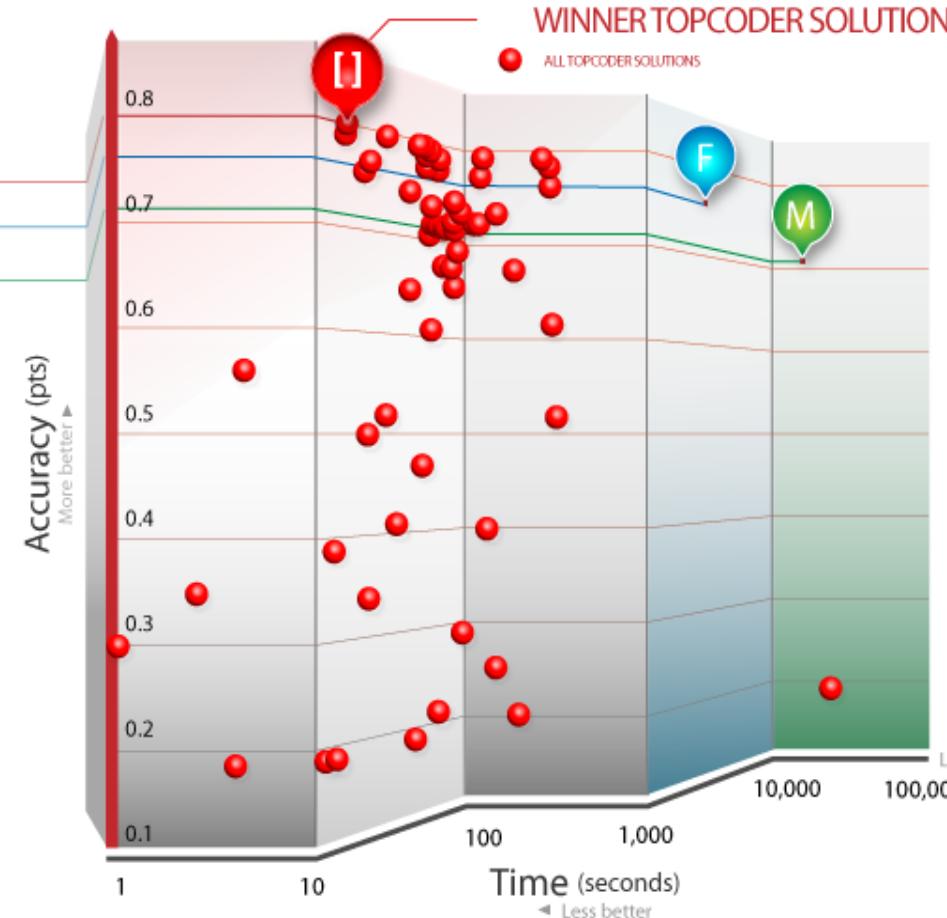
0.80 pts



14 days

\$6 k

16 sec.



122

CODERS SUBMITTED

654

SOLUTIONS

89

DIFFERENT APPROACHES TO
SOLVE PROBLEM IDENTIFIED

5

WINNING COUNTRIES
RUSSIA, FRANCE, EGYPT, BELGIUM & US



Source: [topcoder]TM

NASA & PLANETARY RESOURCES ASTEROID DATA HUNTER

15% Improvement!

Over current method of identifying asteroids in the main belt of Asteroids that orbit between Mars & Jupiter

WARNING
0.00155*AU | 233,000km | 500m

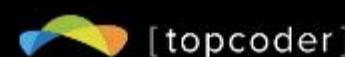


1241 Registrants
625 Solutions Submitted
\$74,124 in Prizes Awarded
Algorithm AND App

Learn more &

download the app at:

topcoder.com/asteroids



Additional Recent Harvard/ TopCoder Algorithm Challenges

Asteroid Tracker

Optimized algorithm for tracking multiple asteroids with an array of antennas.



Earth Science

Developing ideas for tools that use NASA earth science data to help local communities with climate resilience.



Planetary Data System (PDS) - Cassini

Image processing of Saturn rings data to detect possible new satellites or moons.





Using Competitions for Software Development

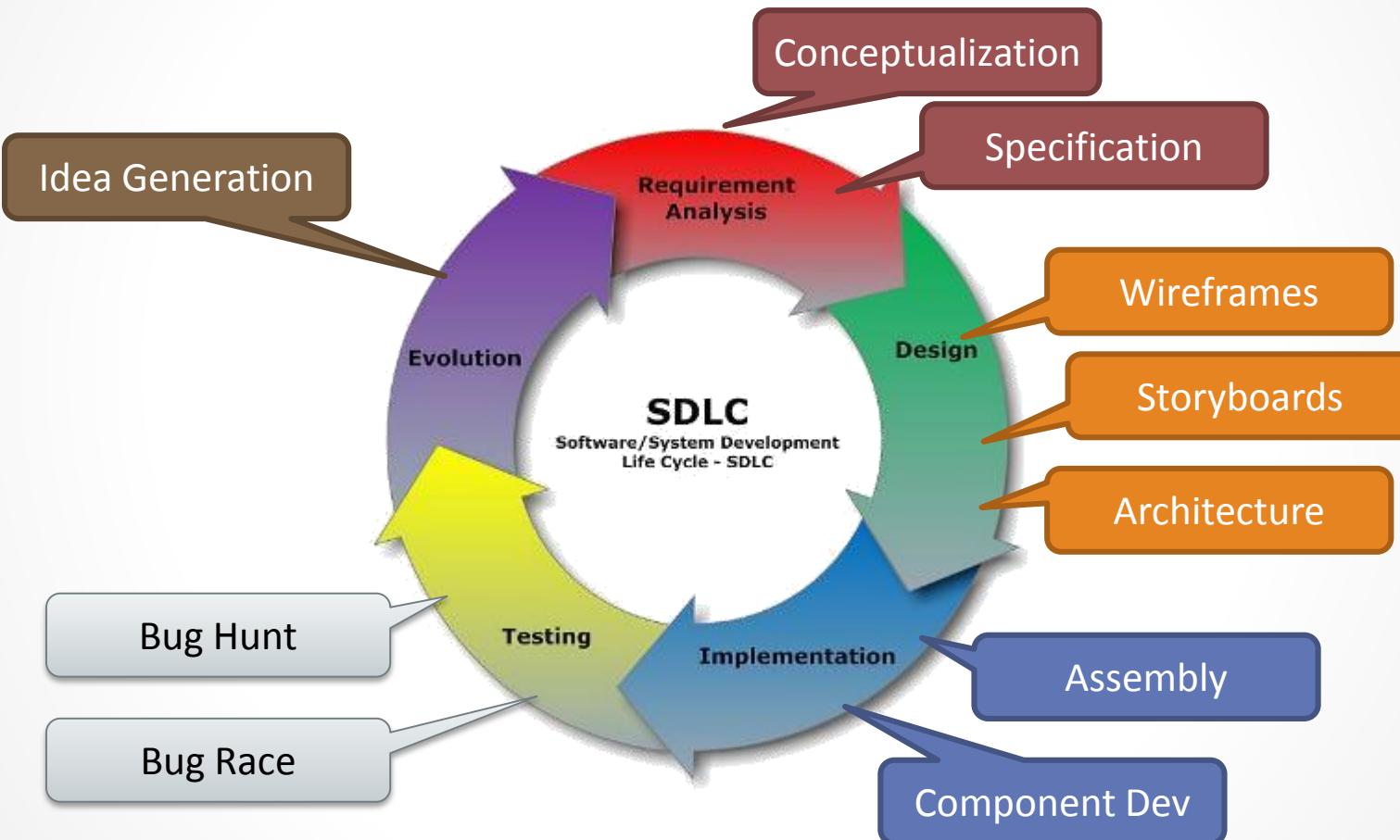
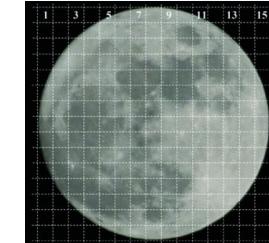


Image Credit: Wikipedia, *Systems development life-cycle*, http://en.wikipedia.org/wiki/Systems_development_life-cycle (as of Mar. 27, 2013, 05:48 GMT).

Recent Harvard/TopCoder Software Development Challenges

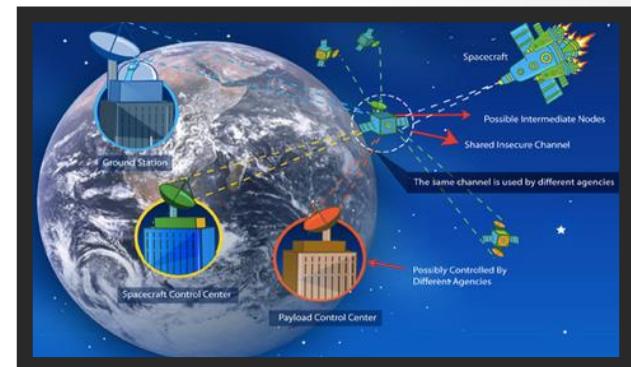
Lunar Mapping and Monitoring Project (LMMP)

Has reduced image processing times from 18 hours to 3 hours.



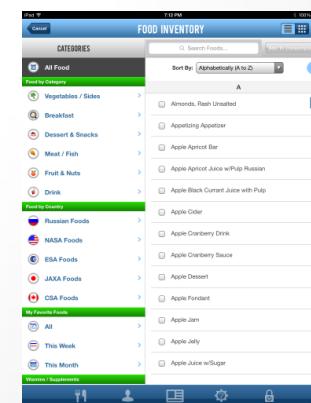
Disruption/Delay Tolerant Network (DTN)

Attempting to solve a problem with distributing security keys in a disrupted/delayed network. Building out the protocol stack.



ISS Food Intake Tracker

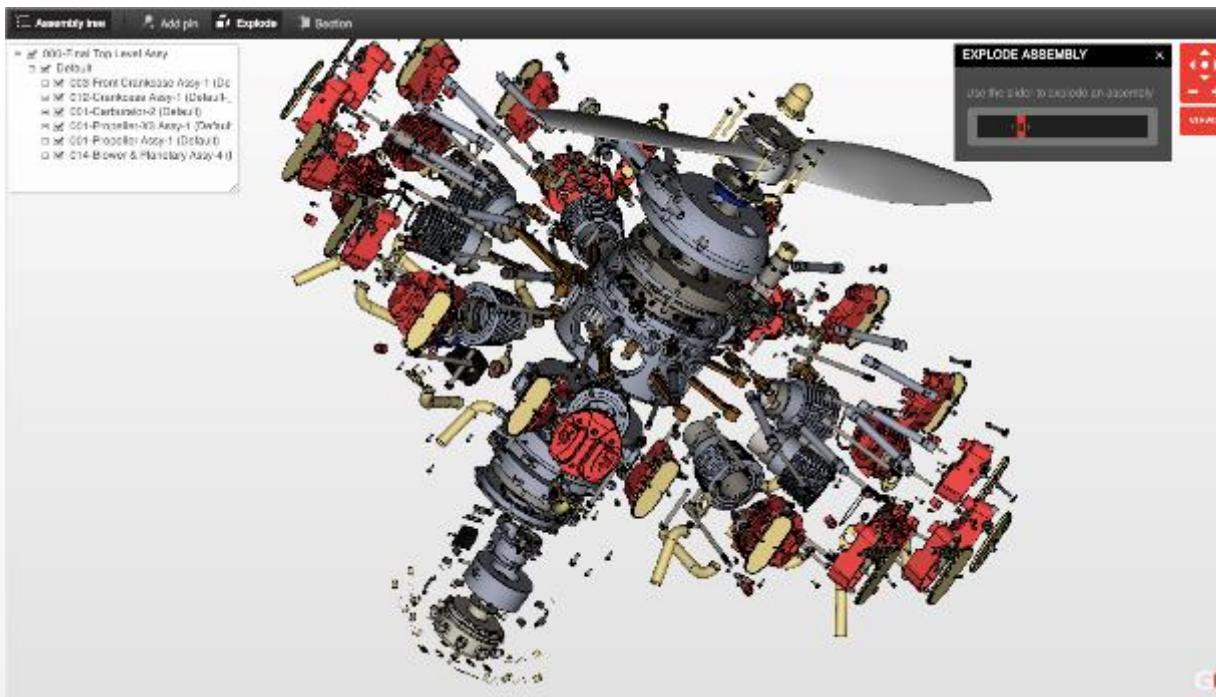
An iPad app designed for the ISS to better track their food intake (featured at the Apple Developers Conference in 2014).





Design Challenges

Leverage Competition to Optimize
Engineering Designs



GrabCAD 30 Day challenge for \$3000: 492 CAD Designs Submitted

