Embedded Linux Conference
Closing Games
(Special Space Edition)

Tim Bird
Principal Software Engineer, Sony Corporation
ELC Program Committee Chair

Space.... the final frontier

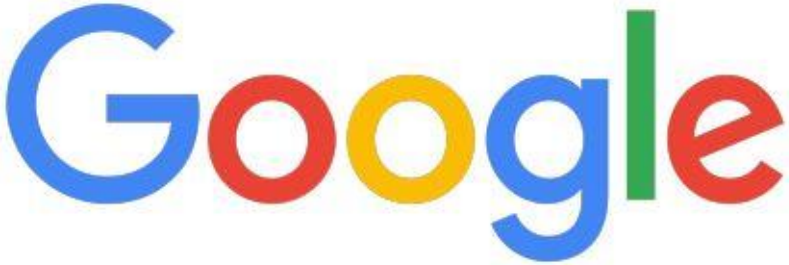
- I have been monitoring Linux in space for a while now
- This last year, I intensified my study
  - Because: Sony had technology in 3 space missions in the last 2 years (including its own satellite)
  - Linux4Space showed up at ELC Europe last year

Thanks are due…

Thanks to everyone who makes this event possible:

- Sponsors

THANK YOU TO OUR DIAMOND SPONSORS



Thanks are due…

Thanks to everyone who makes this event possible:

- Sponsors
- Program committee
  - Frank Rowand, Jeff Osier-Mixon, Kate Stewart, Yoshitake Kobayashi
  - Marta Rybczynska, Thomas Petazzoni, Drew Fustini, Tim Bird

Thanks are due…

Thanks to everyone who makes this event possible:

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- Speakers

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- Room Moderators

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- Attendees

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- Attendees
- Linux Foundation Event Staff

Some Housekeeping

- Speakers – please submit PDF to sched.com site
  - Use “Manage session” on your session page
  - Or, email them to cfp@linuxfoundation.org
  - Don’t make us hunt you down!

- ELC sessions were recorded
  - Are available now (or within a day or two) for all conference attendees via the virtual platform!!
  - Will be on YouTube in 6 to 8 weeks

eLinux Presentations Page

- elinux.org Presentations page will soon be available: https://elinux.org/ELC_Europe_2023_Presentations

- We will put slides and links to videos when they are available
  - Some slides are already there!!

Future events

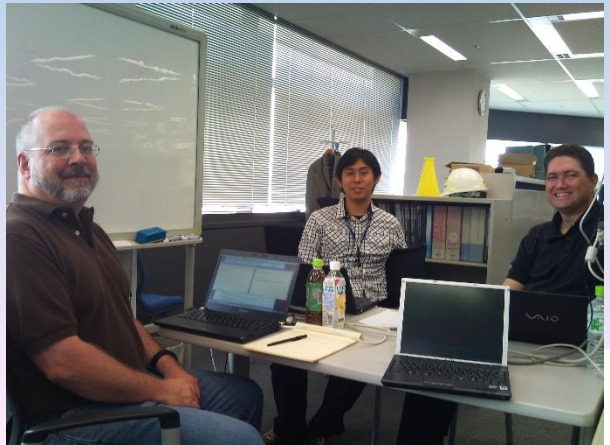
- Embedded Linux Conference 2024
  - Co-located with Open Source Summit North America
  - April 15-19, 2024 in Seattle, Washington, USA
- ELC will be back in Europe in 2025!
  - Part of Embedded Open Source Summit again
  - No details yet, but planning for April/May timing

AND NOW, A TRIBUTE...

AND NOW, A TRIBUTE...
TO FRANK ROWAND

Who Is Frank?

- Retired last year
- Worked at:
  - Sony - Sr. Staff Software Engineer (for 17 years)
  - MontaVista - Early engineer at MontaVista
  - Hewlett Packard (many Realtime operating systems)

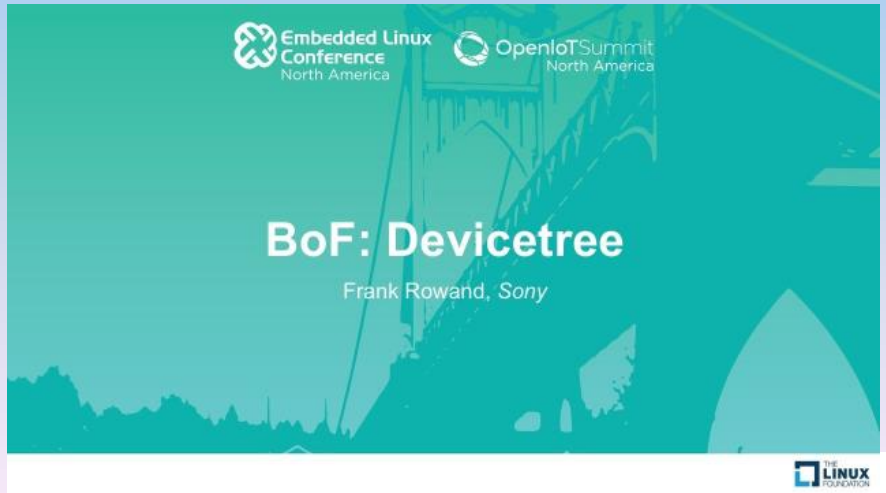


Embedded Linux Conference

- Member of ELC Program Committee
  - Including this year, from retirement!!
  - Creator of the most complex spreadsheet I've ever seen
- Speaker at Embedded Linux Conference

Talks by Frank at ELC(E)

- Adventures In Real-Time Performance Tuning (2008)
- Musings on analysis of measurements of a real-time workload (2009)
- A Survey of Linux Measurement and Diagnostic Toos (2009)
- Identifying Embedded Real-Time Latency Issues: I-Cache and Locks (2010, 2011)
- Real-Time Linux Failure (2010)
- How Linux PREEMPT_RT Works (2011)
- RealTime BOF (2012)
- BOF: Device Tree (many years)



Talks by Frank at ELC(E)

- Using and Understanding the Real-Time Cyclictest Benchmark (2013)
- devicetree: Kernel Internals and Practical Troubleshooting (2014)
- Tutorial: Solving Device Tree Issues (2015, 2016)
- You may be a Linux Kernel Maintainer - and Not Know It! (2019)
- The Static Check Needle in the Warnings Haystack (2019)

Community Involvement

- Strong advocate for Open Source Software (OSS), usage, compliance and contributions
- Previously a member of the Linux PREEMPT-RT project
- Linux kernel maintainer of device tree
- ELC/ELCE Program committee member
- Great friend and colleague


Community
Thanks You for
16 Years of Collaboration
THE LINUX FOUNDATION
EMBEDDED LINUX CONFERENCE
LAUNCHED 2005
Frank Rowand

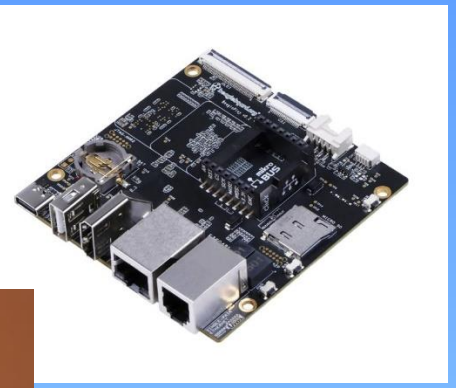
We’re going to play some games

- I like games where everyone has a chance to win
- Types:
  - Skill
  - Luck
- Basic outline:
  - We narrow the contestants down
  - The winners are selected and given a token
  - Start over with everyone re-joining

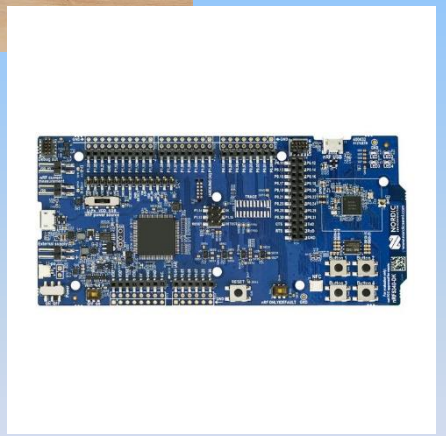
How to play

- Big overview (onsite):
  - Make sure you have cards (of different colors)
  - At the beginning of a round, everyone stands up
  - Hold up a card (or cards) to indicate your answer
  - If you are wrong, sit down
  - Eventually, the people who remain standing win a prize
  - Start over

What is at stake? – Boards!!

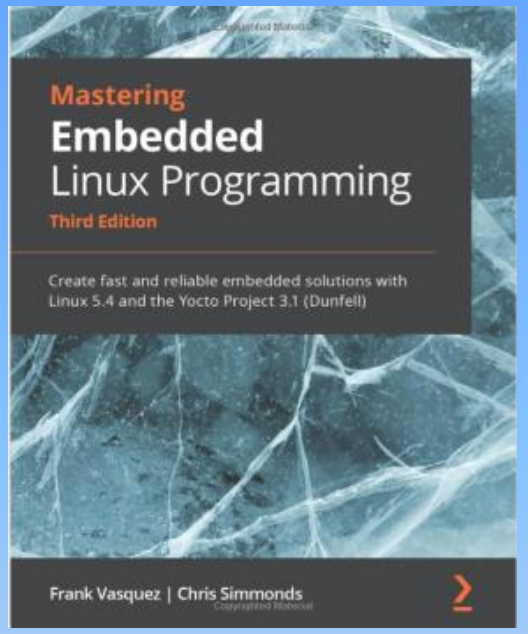


- 2 BeaglePlay boards
  - With BeagleConnect Freedom!!
  - donated by Beagleboard.org Foundation
- 2 SenseCAP indicators
  - donated by SeedStudio
- 2 nRF5340 boards (zephyr dev board)
  - donated by Nordic Semiconductor
- Raspberry Pi 400 personal computer
  - donated by Emlix

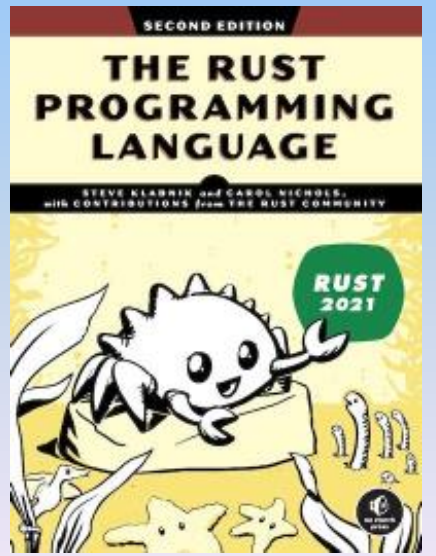


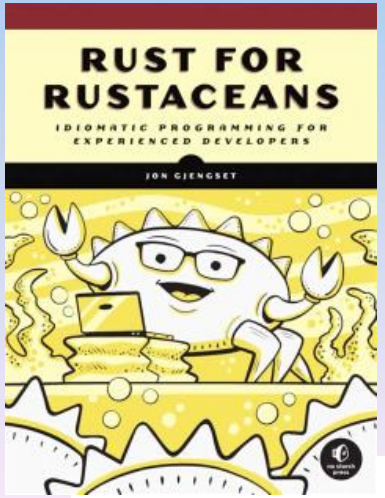
What is at stake? – Books!!

- 4 Mastering Embedded Linux Programming
  - By Chris Simmonds



- 2 Rust Books
  - The Rust Programming Language
  - Rust for Rustaceans
  - Donated by Mind





What is at stake? – More!!

- Gift cards!

- LWN.net subscriptions!

- Souvenirs of Prague!

Our First Game

- Embedded Linux History, Technical, Nerd and Space Trivia

Our First Game

- Embedded Linux History, Technical, Nerd and Space Trivia

Important Disclaimer: This game is NOT fair.

Our First Game

- Embedded Linux History, Technical, Nerd and Space Trivia

Important Disclaimer: This game is NOT fair.

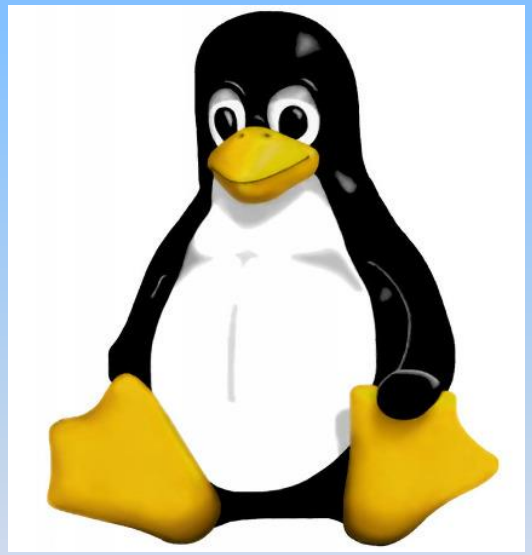
Virtual attendees – I'm sorry, there are no prizes for you this year.

- You might want keep track of how well you did, on your own. Give yourself 1 point for each right answer. Tell us your score in chat at the end. But, alas, there will be no prizes.

Question - 1

The current version of the kernel is:

- Green = 6.4
- Red = 6.5-rc1



Answer

- Green = 6.4

We're in the merge window, so we haven't had any release candidates for the 6.5 release yet.

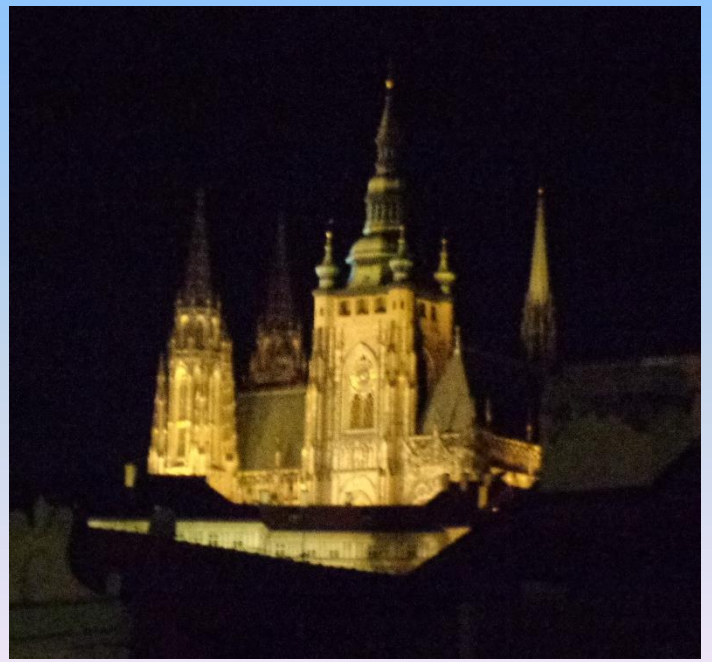
Source:

https://kernel.org/

Question - 2

According to the Guiness Book of World Records, the Prague Castle is the largest ancient castle (by area) in the world.

- Green = True
- Red = False



Answer

- Green = True

The castle’s three courtyards and buildings cover over 70,000 square meters

Source: https://www.guinnessworldrecords.com/world-records/69343-largest-ancient-castle

Question - 3

The cell phone in your pocket has more computing power than the Apollo 11 mission that traveled to the moon and back, including onboard and ground control computers.

- Green = True
- Red = False

Answer

- Green: True

The Apollo guidance computer was little more than a pocket calculator.

The ground-based system was an IBM System/360 Model 75 which clocked in at about 1.2 MIPS

Note that Intel's 8086 processor wasn't released until a decade *after* Apollo 11.

We can send a person to the moon, but I can't order a pizza with my phone!

Question - 4

A company has made prosthetic, robotic arms so that a human can use up to six limbs simultaneously, including their own.

- Green = Reality
- Red = Fiction

Answer

- Green = Reality

The arms are controlled by an AI system that interprets signals from the human.

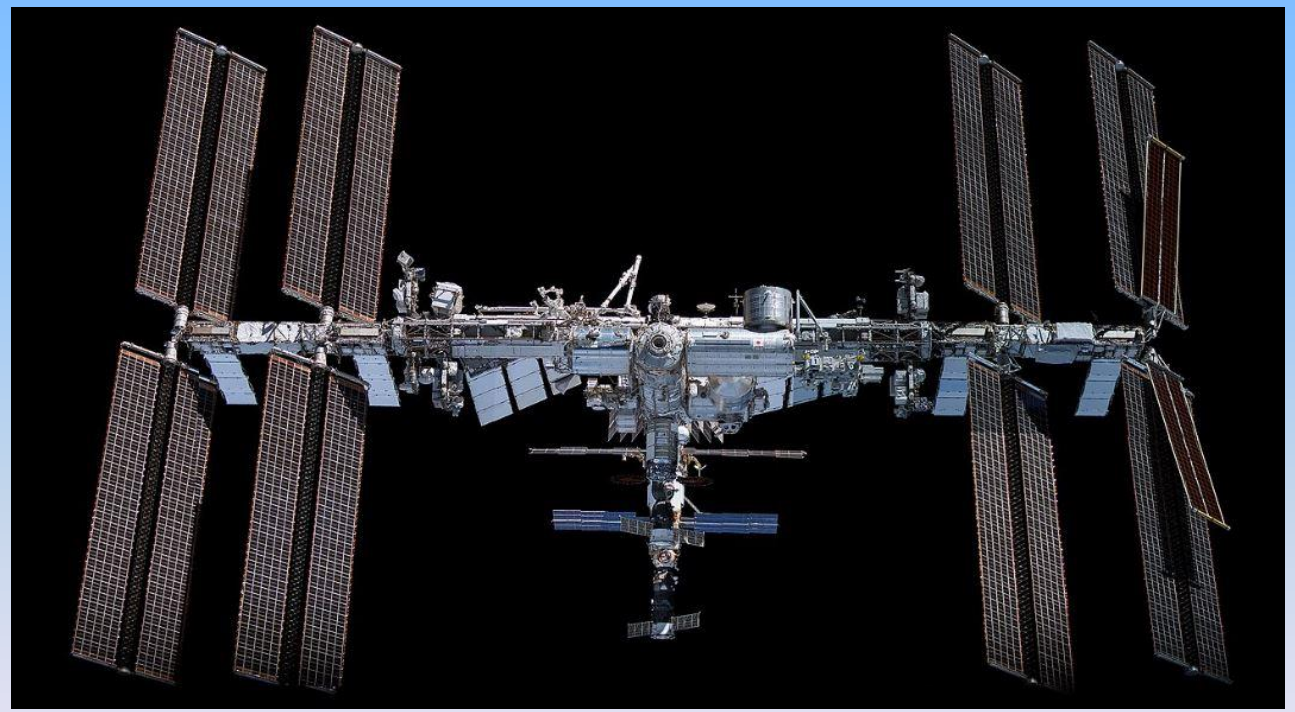
Source:
https://interestingengineering.com/innovation/ai-arms-controlled-by-humans

I, for one, welcome our new robot overlords!

Question - 5

There are now how many processors running Linux in low earth orbit?

- Green = about 6,400
- Red = about 260,000



Answer

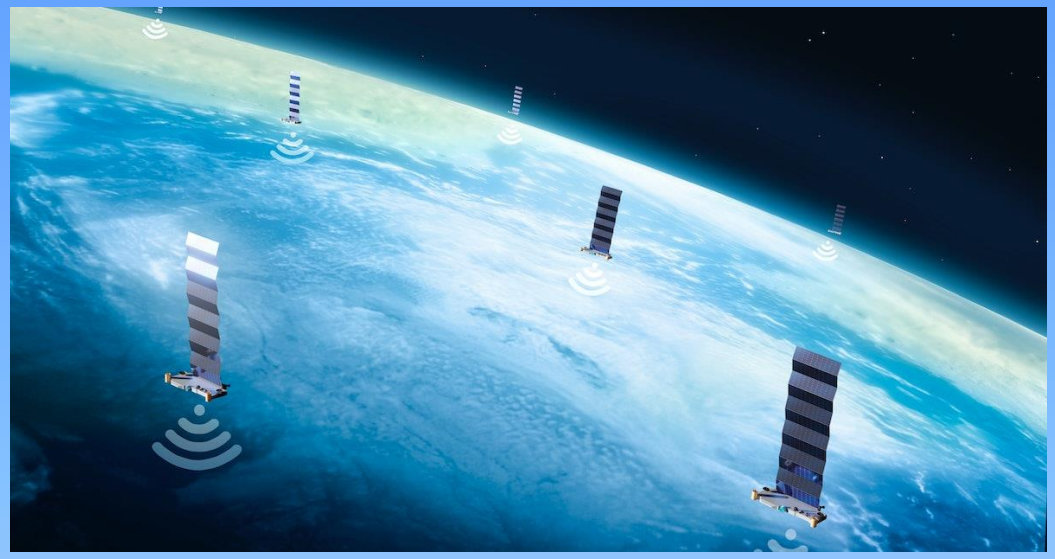
- Red = 260,000

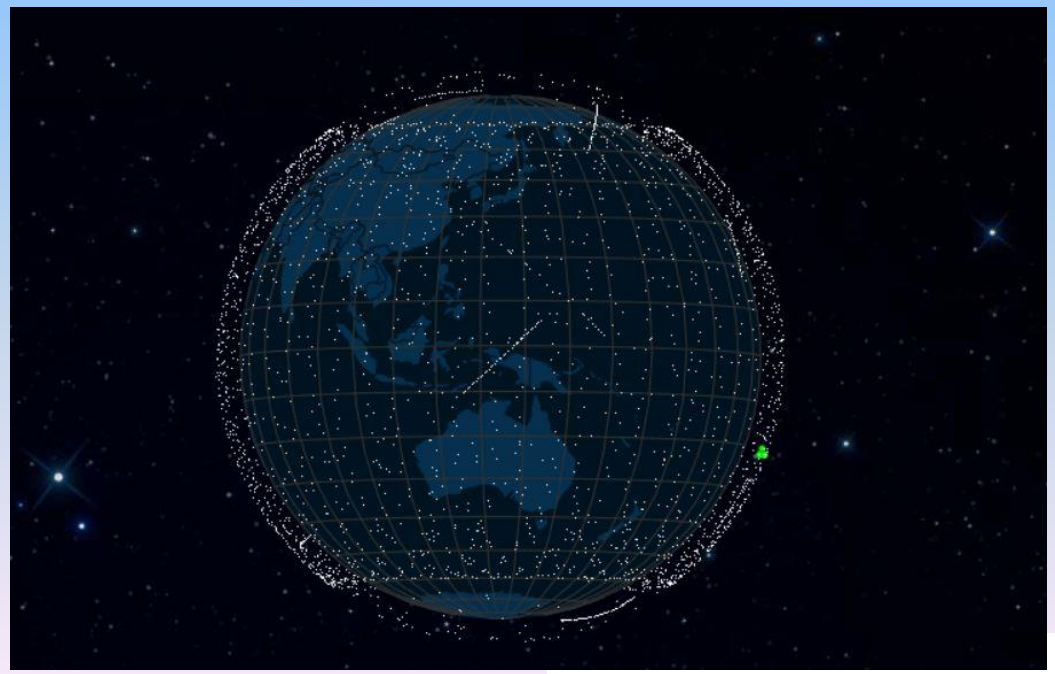
Each StarLink satellite uses 66 Linux processors, and there are now over 4600 in orbit.

Source:

https://spaceflightnow.com/2023/05/04/falcon-9-starlink-5-6-coverage/

Elon Musk should rename the constellation to "SkyNet" when it hits 1 million processors!!





Question - 6

When was ELC Europe last held in Prague?

- Green = 6 years ago
- Red = 5 years ago

Answer

- Green = 6 years ago

ELC Europe was held in Prague in 2017.

Question - 7

A research group announced a processor that could be produced for less than 1 penny per chip. What was their breakthrough?

- Green = the chip was made of plastic
- Red = they reduced the gate count to just over 2000 transistors

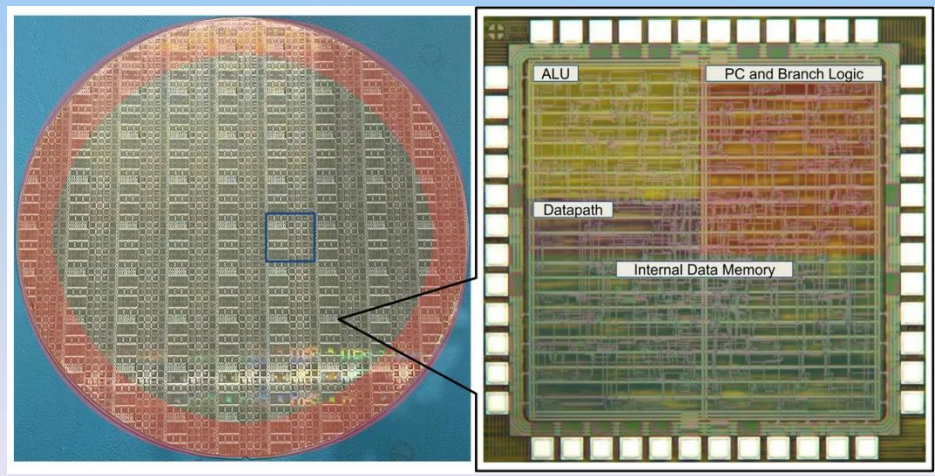
Answer

- Red = They reduced the gate count to just over 2000 transistors

They got rid of pipelines, used 4-bit logic, and re-used blocks of gates for multiple purposes. The substrate was plastic, so the device was flexible, but there have been plastic-based chips before. This is the first one with sufficient yield to potentially break the 1-cent per chip barrier. The final transistor count was 2104.

Source:

- https://spectrum.ieee.org/plastic-microprocessor

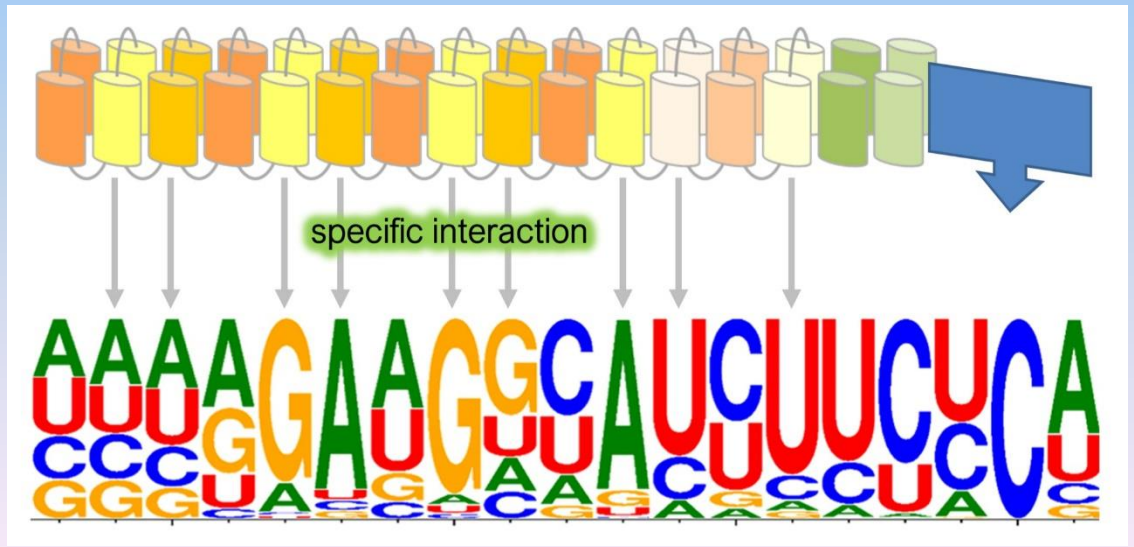


No word yet on when they will finish porting Linux to the processor.

Question - 8

Researchers at the University of Bonn have demonstrated improved RNA error correction by:

- Green = replaying transcription with a chemical “loop”
- Red = inserting moss DNA into human cells



Answer

- Red = inserting moss DNA into human cells

Land plants (including moss), have an RNA repair mechanism that fixes some kinds of mutations better than human DNA.

Source:

- https://www.uni-bonn.de/en/news/203-2022

They are still working out the side effects.

Question - 9

Count Dooku was:

- Green = A Jedi Master
- Red = A Sith Lord
- Green and Red = The hero of the separatist movement!!

Answer

- Green = A Jedi Master
- Red = A Sith Lord
- Green and Red = The hero of the separatist movement!!

All answers are correct!!

Count Dooku was a complex character in the Star Wars Saga.

"It is obvious that this contest cannot be decided by our knowledge of the Force, but by our skills with a lightsaber."

Question - 10

What unfortunate thing happened during the restoration of Prague's famous Astronomical clock?

- Green = One of the restorer's fingers was severed and part of it is still in the machine
- Red = Some images were replaced by a painter with images of his family

Answer

- Red = Some images were replaced by a painter with images of his family

Some of the restored images bore striking resemblances. The owners are considering options to re-restore the original artwork.

Source:

- https://www.theguardian.com/world/2022/jun/02/pragues-orloj-clock-centre-row-artist-amateur-restoration

Question - 11

Nvidia has announced a processor for the automotive sector with an amazing transistor count of:

- Green = about 80 Billion transistors
- Red = about 1.2 Trillion transistors

Answer

- Green = about 80 Billion transistors

The GPU will be used for self-driving and “software defined vehicles”

Source:

- https://techcrunch.com/2022/09/20/nvidia-unveils-drive-thor-one-chip-to-rule-all-software-defined-vehicles/

if you said “1.2 trillion” – please, don’t be ridiculous!!

Question - 12

An artist has recently developed this frightening combination:

- Green = a mouse with a spinning sawblade backpack
- Red = a plant that can control a machete

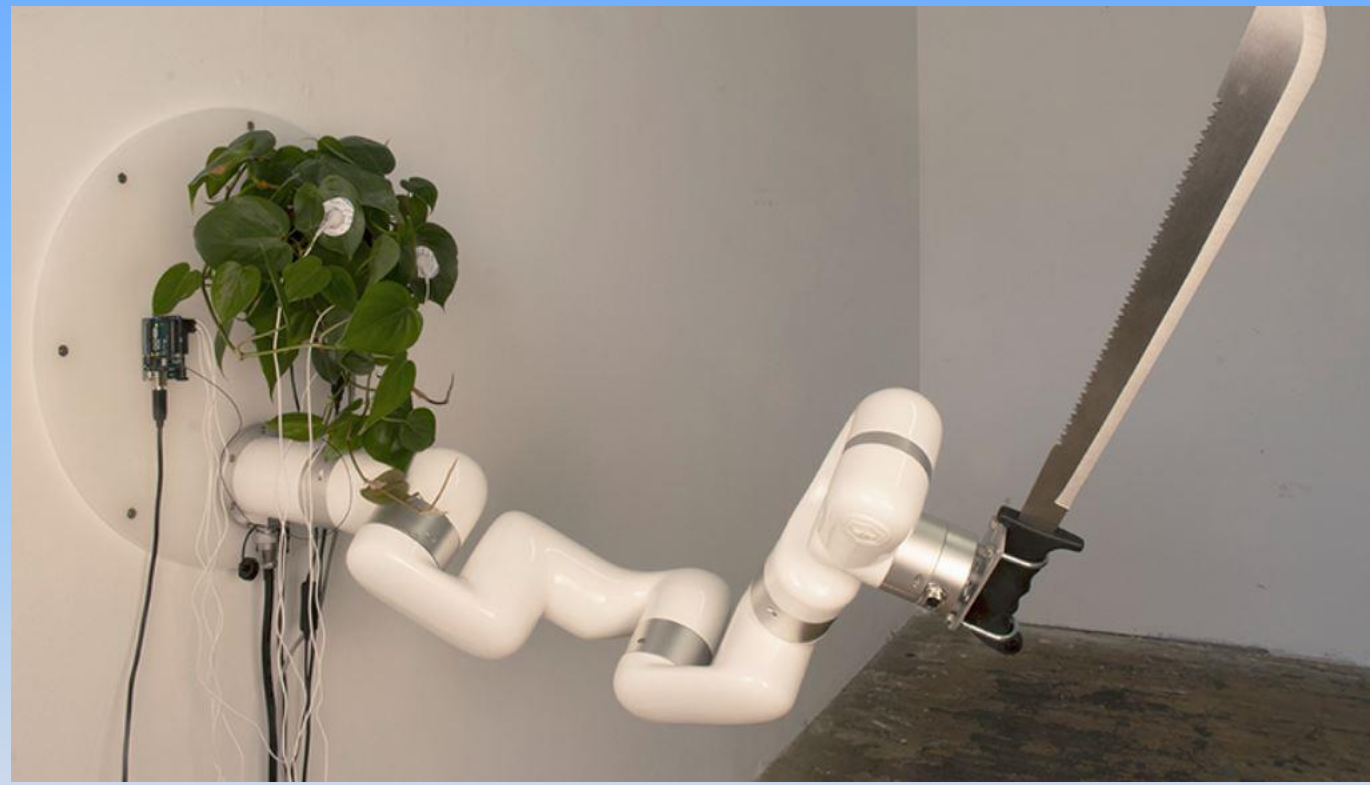
Answer

- Red = a plant that can control a machete

Sensors on the plant control the movement of the blade.

Source:

- https://www.designboom.com/design/living-plant-machete-industrial-robot-arm-david-bowen-09-30-2022/



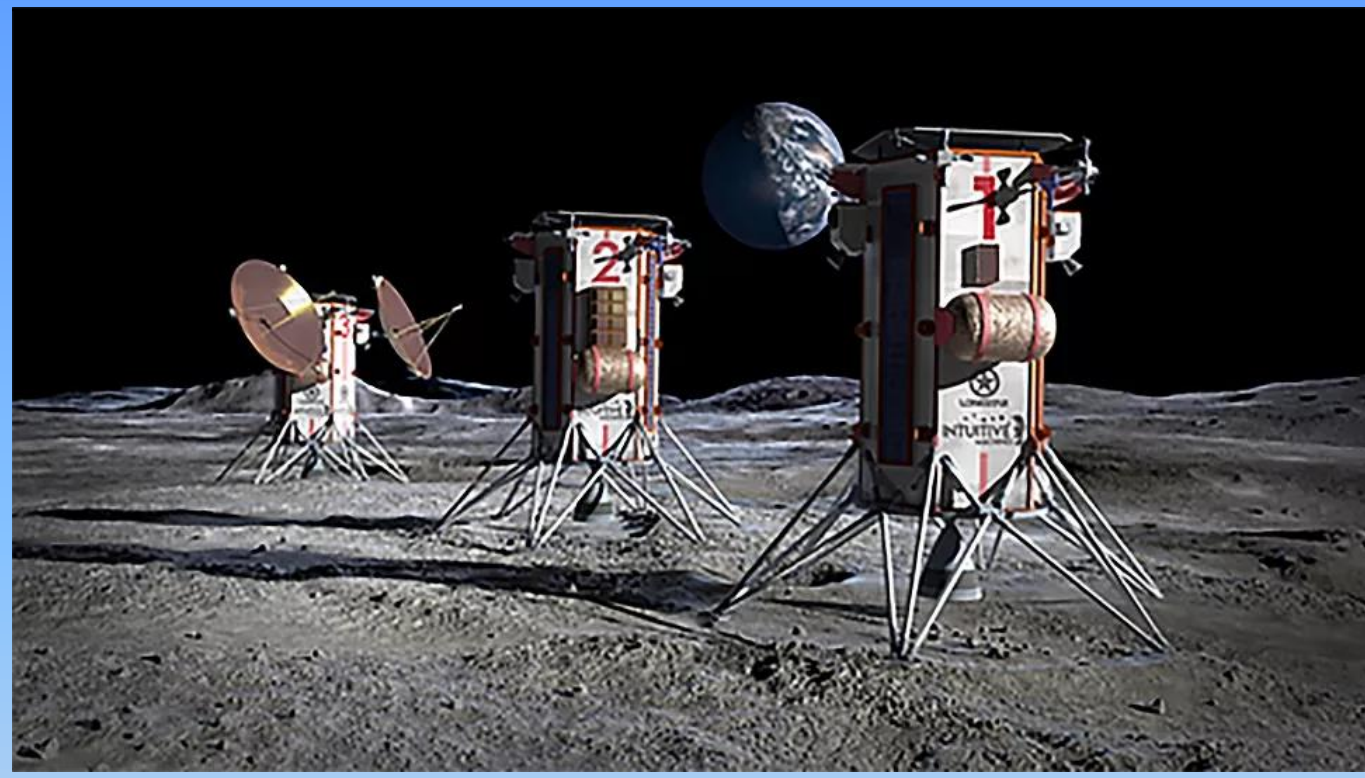
Available soon at a nursery near you!

Question - 13

Tech startup recently announced plans to build a data center where?

- Green = On the moon
- Red = At the bottom of the ocean

Answer



- Green = On the moon

Lonestar Data Holdings plans to delivery prototype hardware to the moon this year (2023).

Source:

- https://gizmodo.com/startup-moves-closer-building-data-centers-moon-1850192177
- https://www.tomshardware.com/news/company-plans-to-put-datacenters-on-the-moon

Physical security is very high there!

Question - 14

Who is Star Wars' greatest villain character?

- Green = Darth Vader
- Red = Darth Maul
- Green and Red = Count Dooku

Answer

- Green and Red= Count Dooku

He has the best lines, is the most refined, is the most complex, is played by Christopher Lee, knows the Jedi's weaknesses, opposed bureaucracy and corruption, is a champion of the people, all while being a powerful Sith Lord, etc.

Source:

- https://screenrant.com/star-wars-count-dooku-best-villain

This is not a matter of opinion, but of objective fact!!
(Also, read the room, people!)

Question - 15

NASA currently plans to use which processor architecture for its High Performance Spaceflight Computer (HPSC) microprocessor?

- Green = ARM
- Red = RISC-V

Answer

- Red = “RISC-V”

“NASA’s JPL (Jet Propulsion Lab) has selected Microchip to design and manufacture the multi-core High Performance Spaceflight Computer (HPSC) microprocessor SoC based on eight RISC-V X280 cores from SiFive..., with four additional RISC-V cores added for general-purpose computing. The project’s operational goal is to develop “flight computing technology that will provide at least 100 times the computational capacity compared to current spaceflight computers.”

Source:

- https://www.eejournal.com/article/nasa-recruits-microchip-sifive-and-risc-v-to-develop-12-core-processor-soc-for-autonomous-space-missions/

Pithy remark goes here!!

Question - 16

An edible rechargeable battery was recently announced by a group of researchers from what European country?

- Green = France
- Red = Italy

Answer

- Red = Italy

Researchers at the Italian Institute of Technology made a battery out of edible materials (including gold and beeswax).

"This example of fully edible rechargeable battery, the first one ever made, would open the doors to new edible electronic applications."

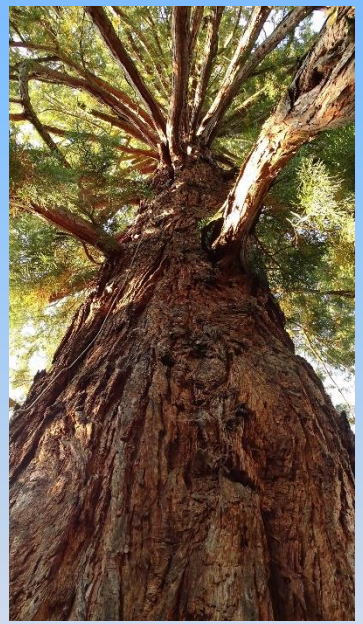
Source:
https://opentalk.iit.it/en/a-rechargeable-battery-made-from-food/

Pithy remark goes here!!

Question - 17

Researchers recently demonstrated the first transistor made of:

- Green = wood
- Red = jello

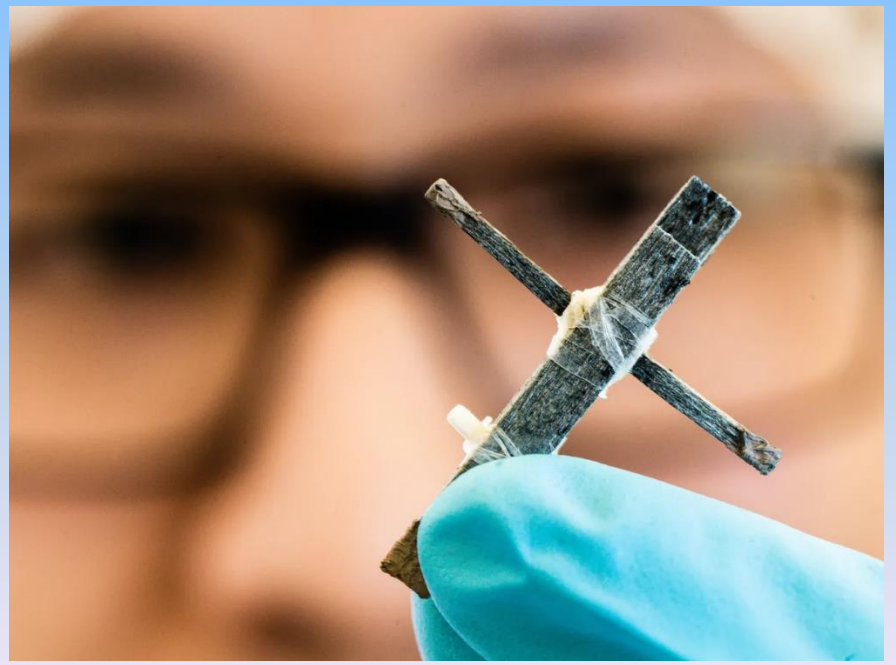


Answer

- Green = wood

Made by a collaboration of researchers through the Wallenberg Wood Science Center, in Sweden, the transistor is 3 centimeters across and switches at less than one hertz.

Source: https://spectrum.ieee.org/wood-transistor



You can use it for a toothpick between cycles!

Question - 18

Paleontologist have recently presented evidence that tyrannosaurus Rex is different than popularly depicted. They found:

- Green = they had opposable talons on their front hands
- Red = they had lips that covered their teeth

What's wrong with this picture?

Answer

- Red = They had lips that covered their teeth

According to a study published in March, the dagger-like teeth of theropod dinosaurs such as *T. rex* would not have been visible when their mouths were closed. Instead, they would have been concealed behind thin, scaly lips.

Source:

- https://www.nature.com/articles/d41586-023-00928-y

Pithy remark goes here!!

Question - 19

Prague has how many inhabitants (just the capital city, not the whole metropolitan area)?

- Green = less than 2 million
- Red =greater than 2 million

Answer

- Green = less than 2 million

1.36 million according to Wikipedia

Question - 20

Ken thompson, inventor of Unix, C, UTF-8, the original 'ed' editor, the first regex implementation, plan 9, and inferno announced in March that he plans to use this operating system from now on:

- Green = MAC OS
- Red = Raspbian

Answer

- Red = Raspbian

At a SCALE Conference this year, during Q&A for a talk he gave, Thompson said: "... even though I've invested a zillion years in Apple, I'm throwing it away, and I'm going to Linux. To Raspbian, in particular."

Source:

- https://www.theregister.com/2023/03/17/ken_thompson_is_a_maccie/

Pithy remark goes here!!

Question - 21

- BusyBox was initially created for MMU-less systems (uClinux)

- Green = True
- Red = False

Answer

- Red: False

BusyBox was created for Debian boot floppies

Floppies were smaller back then (and existed), so this was a valid use case!

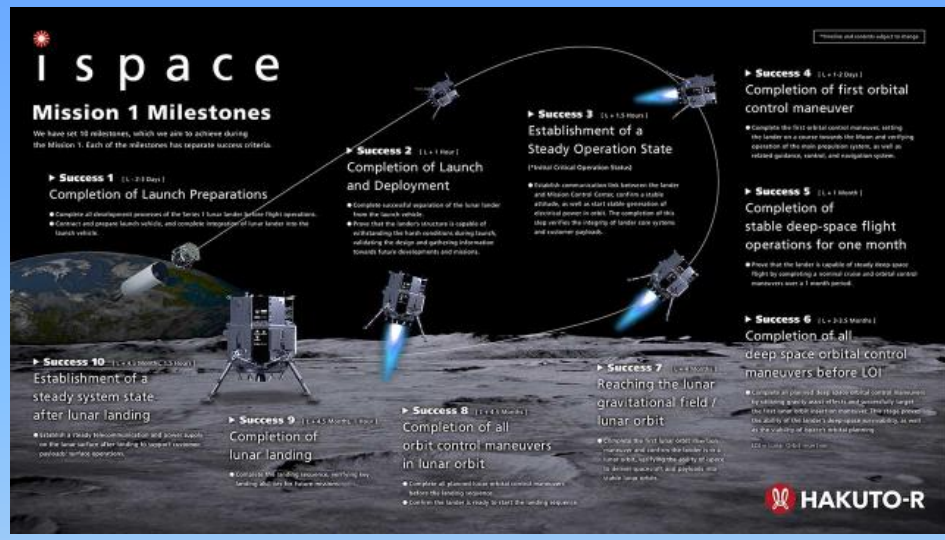
Question - 22

The Hakuto-R lander failed to land on the moon in April, 2023, due to what kind of problem?

- Green = sensor fusion error
- Red = missed realtime deadline

Answer

- Green = sensor fusion error



The lander got confused by a steep crater wall, and started ignoring it's laser altimeter.

Source: https://parabolicarc.com/2023/05/26/ispace-software-error-hakutor-lander-crash-moon/

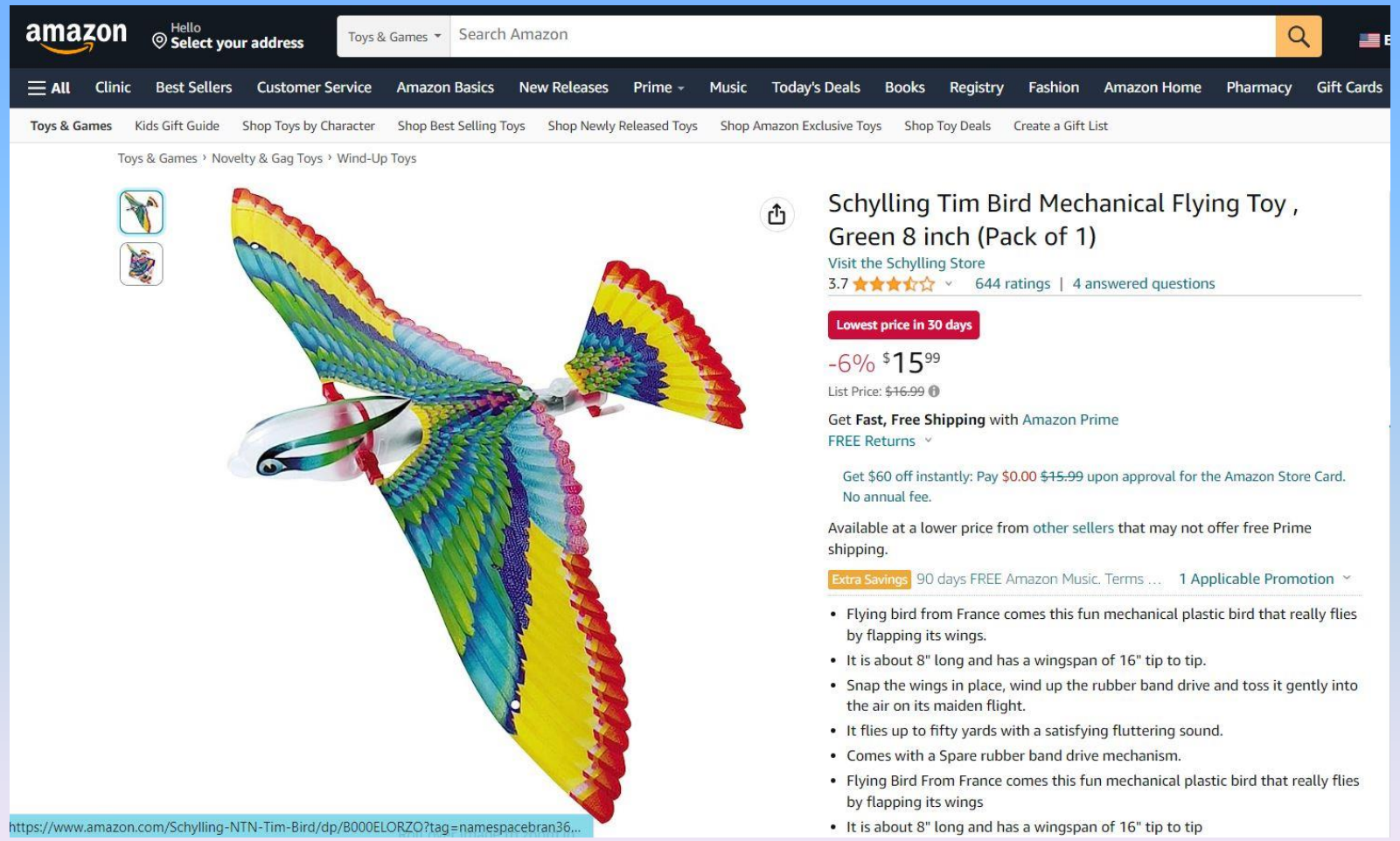
Question – 22b

- Tim Bird can be purchased for less than $15.
  - Green = True
  - Red = False

Answer

- Red = False

It's $15.99 on sale.



Game 1 over
Time for Game 2

Our Second Game

- Rock, Paper, Scissors - against this presentation

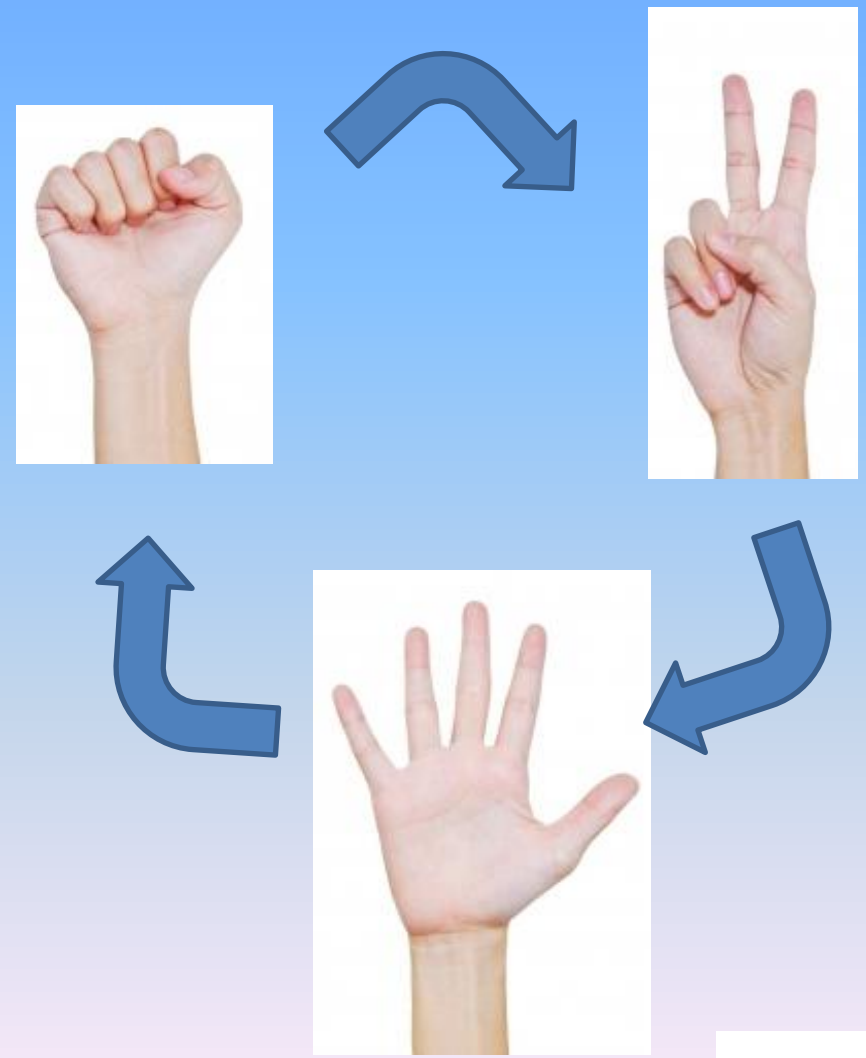
Rock, Paper and Scissors

Picture by Kittikun Atsawintarangkul

Rules

- Rock beats scissors
- Scissors cuts paper
- Paper covers rock

If you beat the presenter you stay in the game.



Game 2 over

Time for some a closing thought...

Final thought – first mistake

- Lesson learned very early in my work with Open Source

Final thought – first mistake

- Lesson learned very early in my work with Open Source

- The community is not “them”
- The community is “us”

Final thought – first mistake

- Lesson learned very early in my work with Open Source

- The community is not “them”
- The community is “us”

- Community is YOU

You are a part of the community,

just by participating!

The future is bright!

Thanks for joining ELC this year!

I hope you learned something new, and had a good time.

I hope to see you all next year!