

Summit Playbook

22 Makers share their learnings in this epic online event

December 7 to 13, 2019

techexplorations.com/MakerMindMeld

This Playbook is a work in progress.

We will continue to add and update content until the end of the Summit.

As we publish a new version, we will notify you via email.

Version 1.5

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Invite your friend to get a free ticket to the Summit, and earn rewards Earn an income as an affiliate

Why does this document exist?

This document exists so that you, the Maker Mind Meld Summit attendees, have a single reference document.

In this document you will find information about all the Speakers and their presentations.

We have also included a list of resources for each Speaker, to help you learn with the next steps in your learning journey.

In this list, you'll find:

- The Speaker's contact details, social media locations, Github repositories and websites.
- Educational resources that they recommend.
- Links to websites that contains resources that they mentioned in their presentation.
- Links to software or hardware recommended by the Speakers.

If you have purchased the Summit Full Access Pass, thank this Playbook will also contain the Key Learning Points (KLP) of each presentation. This is a summary of the most important points made by the Speaker during the presentation, perfect if you want to quickly review what was said but don't have the time to go through the video or audio again.

About the First Maker Mind Meld Summit

The Maker Mind Meld Summit is the materialization of I dream that I first conceived in 2016, when I attended as a Speaker in a Mini Maker Faire.

It was an awesome experience. Preparing for my talk was an opportunity to think deeply about Technology and Maker Education. Delivering the talk, among the background noise of people experimenting with their gadgets, or talking in excitement about how they finally managed to fix a technical issue, was exhilarating.

I have been a University lecturer for 15 years, and delivered thousands of lectures, but none of that came close to talking about a topic that excites me to a diverse group of people who are also excited by the potential that they might learn something that can help them go on and create their own magic.

The problem: I had to travel for 15,000 kilometers, spend thousands of dollars, and needed to take a lot of time off work.

So, I thought to myself: there's got to be a better way!

Online!

How about I try to organise an online event, like a Mini Maker Faire, in which Makers from all around the world talk about what excites them, and which other Makers, also from all around the world, can attend? No matter where they are, no matter who they are.

As long as they have a computer, and an Internet connection, they can listen and watch fellow Makers talking about their gadgets, their code, their systems, their' thinking processes.

Makers talking about how and why they make magic.

This was exciting.

And I decided to do it.

In December 7, 2019, the first EVER Maker Mind Meld virtual summit will take place. During the summit, you will hear the how and why stories of Makers just like you.

My hope is that their knowledge and drive to create technology magic will inspire you to create your magic, so you can go on and inspire others to create their own magic.

And that is the best way to create a better world :-)

Happy Making!

Peter

About the organizer

Hi, I'm Peter.

I am an online educator and Maker, author of Maker Education Revolution, KiCad Like a Pro, and founder at Tech Explorations.

My mission is to help people learn electronics, programming, printed circuit board design, and lots more.

Most importantly, I want to help as many people as possible to enjoy their technology education adventures.

After a 15 year career as a University Lecturer, I decided to become a Maker, again. Like most of us, as a child, I was curious, and I learned how things worked by experimenting with them (usually, this meant taking them apart knowing that I would lose at least one screw, usually the one that held everything together).

Growing up, I became an Engineer, only to lose my childish curiosity in the name of pursuing a career.

I became a child again once I got my first Arduino. With it, I started creating things, tinkering with components, testing ideas. Even though I was a "career educator", it was only now that I realised how misguided my last 15 years of working as an educator had been. I was partly responsible for destroying the creativity of thousands of students, just like mine had been destroyed in the name of standardised test, rankings, and getting degrees.

At Tech Explorations, my job (if you can call it that) is to learn and to create. I learn what I am curious about, and I create educational content. This content is the record of my learning.

I don't create this content to "teach students". I create content to help people learn things that they want to learn.

At the end of the day, we are all learners, and we learn from each other.

I sincerely hope that through the content I create at Tech Explorations, as many people as possible will be inspired to rekindle their childhood curiosity, learn, and create amazing things.

Special offers and bonuses

Our Speakers, Sponsors and Partners have supported the Maker Mind Meld online Summit with lots of interesting offers and bonuses.

You can find all of them at this page: https://techexplorations.com/st/summit/goodies

Visit this page regularly, as we'll be updating it continuously up to 2 weeks after the Summit.

Mark Wilson: FlipClock

What is this session about?

Flipping pixels is easier than flipping plastic.

Mark created an Arduino version of the classic "Flip clock." In place of motors and gears and split flaps, he created a plausible-looking rendering of a device on a 480x320 pixel LCD shield. The impetus for the project was the challenge of creating a reasonable animation of the flipping action.

The character information is run-length encoded scan lines; omitting some lines creates a tilted look. The LCD interface is an 8-bit parallel one. With direct port-register access and careful coding, even a lowly Uno can achieve pleasing results.

The vivid colors supported by the reasonably sized and priced LCD inspired Mark to play with some additional ways of showing the time, up to the program capacity of the Uno.



About the speaker

During his youth, Mark spent a lot of time coding with his Acorn Electron in BBC BASIC and 6502 Assembly programming languages, including the first of countless Conway's Game of Life implementations.

Inexplicably, he completed an MSc in Physics in '86 but was employed as a professional software developer since graduation.

Mark tinkered a little in electronics but unsatisfactorily so until he discovered the Arduino in 2011 and created the KENBAK-uino.

He enjoys coding and pushing pixels around. And horology. He has made a few clock projects.

Resources

- 1. Flipclock on Hackaday.
- 2. Mark's page on Hackaday.
- 3. <u>The KENBAK-uino project page</u>. And its source code on <u>Github</u>.

- 1. Divide the work that your program/sketch is doing into small units.
- 2. Grow your project incrementally; start with a single, simple, well defined task, and grow from there.
- 3. If you make things as a hobby then relax, take your time and embrace the fact that it's not your job.
- 4. Work on a project that has a good reason to exist and that is useful (like a clock); this will give you the extra motivation you need to keep working on it.
- 5. The hardware does not need to be complicated; combine simple, modular components to create powerful gadgets and concentrate on the software.
- 6. Don't worry about the enclosure; keep it simple.

Richard Kolk – Tracking System Design for a Robot Car using Altair Embed

What is this session about?

In this presentation, Richard will apply the model-based design methodology to develop two tracking control systems for the Makeblock mBot Robot Car using the Altair Embed application. The control systems will be designed, simulated, auto-code generated and tested on the mBot Car. The IR Remote will be used to dynamically switch between the two tracking control algorithms while the mBot Car is running.



About the speaker

Richard Kolk works for Altair Engineering, specializing in the Embed product, formerly named VisSim. His background is in model-based design of automatic control systems. At Altair, he uses the Embed product to model system dynamics, to develop control systems, and, using its automatic C code generator, to run Hardware In the Loop (HIL) performance testing on a variety of microcontrollers. Before joining Altair, he

worked at McDonnell Douglas (now Boeing), the United Technologies Research Center (UTRC), Carrier Air Conditioning, and the Goodrich Wheel and Brake Division (now part of United Technologies). While at McDonnell Douglas, he became interested in model-based design and eventually began using VisSim. At Carrier, Richard's Commercial Controls team embraced the model-based design method, resulting in significantly shorter design cycles with fewer defects in their microcontroller-based control products. Today he enjoys helping Altair Embed customers with their control projects and developing training material for Embed applications.

Resources

1. Altair Embed home page: <u>https://www.altair.com/mbd2019/embed/</u>

- 2. Altair Embed discussion forum: <u>https://forum.altair.com/</u>
- 3. Educational resources from Solid Thinking: https://learn.solidthinking.com/embed-videos/

- 1. The Model Based Design (MBD) Procedure is an efficient, iterative, and repeatable approach to designing embedded system software.
- Hardware In the Loop (HIL) iterations are conducted earlier in the Preliminary Design Phase instead of in the more traditional Engineering Validation Phase (EVP)
- 3. Test Early, Fail Early, Fix Early.
- 4. Aside from being a lot of fun, model based design, is efficient, iterative and repeatable. It's a very good approach for designing any sort of semi-complex to very complex embedded systems. Altair Embed will also generate efficient C++ code for it and provides powerful testing tools.
- 5. The hardware in the loop (HIL) iterations are conducted early during the preliminary design phase instead of in the engineering validation phase, and that results in a couple of key benefits:
 - a. We're more certain that requirements are met earlier.
 - b. You can predict when you're going to be able to enter into service much more accurately.

João Alves – Why I created CSEduino

What is this session about?

In this presentation, João tells the story of how he entered the maker world. He describes what the CSEduino is and why he created this project. Lastly, he gives a practical demonstration of creating a CSEduino board in Kicad.



About the speaker

João has been in the IT world for more than two decades.

He is interested in keeping up to date with the latest and greatest technological innovations. He considers himself a Computer Geek and an Open Source evangelist.

João embraced the Makerworld in 2013 as a hobby and has been an active member of altLab since 2013. In 2014, he created an Arduino-Clone called CSEduino as a hobby project to give him a better understanding of how Arduino electronics works.

He likes to tweak with technology that aims to improve the quality of our life. He is interested in programming, electronics, and open-knowledge (a cross between open-source and free knowledge).

Resources

- 1. João's email address: jpralves@gmail.com
- 2. João's Twitter handle: @jpralves
- 3. João's Github page: <u>https://github.com/jpralves</u>
- 4. João's Facebook page: <u>https://www.facebook.com/jpralves</u>

- 5. João's LinkedIn page: <u>https://pt.linkedin.com/in/jpralves</u>
- 6. João's website: https://jpralves.net
- 7. Altlab: <u>https://altlab.org/</u>
- 8. CSEDuino on Hackster: https://www.hackster.io/jpralves/cseduino-a6622f
- 9. CSEDuino on the KiCad website: http://kicad-pcb.org/made-with-kicad/cseduino/

- 1. It's never too late to learn something new.
- 2. You should always challenge yourself to do better. By setting new challenges for yourself, you can be a better person and give back to the community by helping others.
- 3. Use free and open-source (hardware and software) to build things. No need to have proprietary software and hardware to do this.
- 4. KiCad is easy to learn, you don't need to be a rocket scientist.

Jon Evans – How to Start Contributing to Open-source Projects

What is this session about?

You've probably been using open-source software (and maybe even hardware) for a while — you might not even know it! Maybe you've wanted to get involved in an open-source project but weren't sure how. Perhaps you haven't even thought about getting involved before! This talk will give you an understanding of how open-source projects typically work, how you can become a contributor to one, and some best practices for starting your own. Many examples will be taken from the KiCad EDA software project, but the principles explained will apply to a wide variety of software, hardware, and literary projects.



About the speaker

Jon is an electrical engineer and open-source software developer based in Boston, MA. He has eight years of experience designing electronics and firmware for industrial and consumer products, most recently in the 3D printing industry.

He has been a contributor to the KiCad EDA project since 2016 and a member of the lead developer team

since 2018. He has also created a number of smaller open-source projects related to LED art installations.

Resources

- 1. Jon's website: https://craftyjon.com
- 2. Jon's email address: jon@craftyjon.com
- 3. Kicad forums: <u>https://forum.kicad.info/</u>
- 4. Kicad email discussion group: https://groups.io/g/kicad-users/

- 5. Kicad bugs on Launchpad: <u>https://bugs.launchpad.net/kicad</u>
- 6. Example project contributor's guide: <u>http://www.kicad-pcb.org/contribute/developers/</u>
- 7. Report a KiCad bug: <u>http://www.kicad-pcb.org/help/report-a-bug/</u>
- 8. Example project documentation from KiCad: <u>http://www.kicad-pcb.org/contribute/docs-team/</u>
- 9. Choose a license for your open-source project: <u>https://choosealicense.com/</u>

- 1. Licensing of an open-source project seems confusing, but doesn't need to be like that. Consider one of these licenses:
 - a. M.I.T: It's quite permissive and allows you to do all sorts of things with your work. <u>https://opensource.org/licenses/MIT</u>
 - b. GPL: This is more restrictive compared to the MIT license. It controls how people can use your work and specifically whether or not they can take your work and make changes to it and keep those changes to themselves. https://www.gnu.org/licenses/gpl-3.0.en.html
- When you join an existing open source project, you really need to understand how that community works. Take the time to understand how the existing contributors of the project work, how they communicate, how they collaborate. Don't be afraid to ask questions, but try to put yourself in the shoes of the people that are running the project.
- To contribute to an open-source project, you don't need to be a wizard programmer. You can be a wizard in writing documentation or icon design. Understand what you're really good at and use that skill to contribute into a project that you are really excited about.
- 4. Some of the core skills of an open-source contributor:
 - a. Communications
 - b. Research
 - c. Willingness to ask questions
 - d. Empathy
- 5. If you have a project that you want to opensource, start a conversation with potential users of the thing that you've published in whatever forum you find is

useful to that community. Explain why your project is cool, what it did it let you do. Give some people that inspiration to think about.

- 6. Open source contributors are hugely diverse. As a contributor, you must adapt to a project because of what it means for you and the community, especially in the absence of monetary rewards.
- Every open source project is going to be different. There is no one set of rules. So the best thing to do if you want to help a particular project is to spend a little time studying that particular project and absorbing its community and how they interact.
- 8. If you're thinking about starting your own project, have that community mindset. You know, even if your project doesn't take off and build its own community, it's going to be part of this global open source community. And so if you put in that little bit of effort at the beginning to help other people potentially interact with it, then you're making that contribution to the community that much more valuable.

This slide is taken from Jon's presentation:

Documentation

Non-programmers can:

- Create tutorials and other content to help users
- Update documentation as features are added
- Translate documentation
- Create artwork

Example: KiCad Docs Team http://kicad-pcb.org/contribute/docs-team/

Norman Pirollo – Kumiko and the Journey from Hi-Tech to Lo-Tech

What is this session about?

In a series of video clips, Norman describes the traditional Japanese art of creating Kumiko panels. The panels are widely used as both decorative and functional components of furniture, wall panels, and room dividers. The process of creating the intricate wood motifs is an excellent introduction to hand tools used in woodworking. Anyone interested in developing hand to eye coordination and keen on familiarizing themselves with small hand tools will enjoy this process. A successful outcome of the Kumiko process does involve a degree of patience, and this can counter the fast-paced technology-oriented world we inhabit. The tools used in the creation of Kumiko patterns include the most basic of woodworking hand tools, a small backsaw, a bench hook, chisels, a hand plane, and a pencil. The demonstration is practical and features video segments describing the critical steps of the Kumiko process.

In the second part of his presentation, Norman discusses his journey from having a high-tech intensive career to becoming a woodworker. He explains the reasons for this abrupt change in his direction. Although he incorporates computers in his work today, he does this mainly from a user perspective and only minimally so. This segment of the presentation will serve to enlighten people who wish to incorporate a link to a traditional craft into their lives. Through woodworking, the creation of tangible objects is performed using a common resource available to us all. Woodworking can be carried out in the quiet solitude of a hand tool environment, or the use of modern powered tools can be embraced. Woodworking is growing in popularity once again, and this presentation from a passionate woodworker can be an opportunity to understand more about it, its charm, and how it draws people in.



About the speaker

Norman's background is technical, having been educated as a technologist as well as pursuing computer science studies. After a long career with major players in the computer industry, he made a radical shift to a livelihood where working with his hands forms a significant component. Today he creates unique, contemporary styled furniture. As a designer, he acquired education from contemporary artisans and breadth of insight into both the visual and decorative arts. He pursues the design process, from preliminary

sketches to CAD drawings, to making. He authors woodworking related courses, tutorials, books, and a magazine through WoodSkills. He develops woodworking courses to share his woodworking passion, knowledge, and expertise. He has authored four woodworking books with subject matter ranging from his journey to design and making. He maintains a design+build furniture blog at The Refined Edge.

As a maker, Norman enjoys developing new processes and jigs to be able to perform his work more efficiently. In the past years, he has developed a series of small, palm-sized tools to assist at woodworking. Most recently, he designed a project to enhance the safety of table saws. Following a series of advances and setbacks, he finalized an exciting new, anti-kickback technology, and is currently marketing it to manufacturers. For the realization of this project, Norman combined electronics, software, and his knowledge of woodworking.

In his work, Norman also embraces the pursuit of new skills and techniques. Over the past year, he was drawn to the ancient art of Japanese Kumiko, where intricate motifs form small panels. These small panels are then incorporated into larger decorative objects, components of furniture, and room dividers. This skill involves meticulous work with hand tools and a hefty dose of patience.

Offers

You can learn about Kumiko, Woodworking, Furniture Design, Hand Tools, etc. with the supplied WoodSkills <u>Coupon Code</u>. The Coupon will provide a 30% discount to any of my Online Courses and Online Books purchased through <u>http://www.woodskills.com</u>

Resources

- 1. Norman's email: norman@woodskills.com
- 2. Norman's Twitter handle: @pirollodesign
- 3. Norman's Facebook page: <u>https://www.facebook.com/pirollodesign/</u>
- 4. Norman's LinkedIn page: https://ca.linkedin.com/in/norman-pirollo-059b624
- 5. Norman's website: <u>http://www.woodskills.com</u>
- Blog article on the Tech Explorations website: Dynamic Design by Norman Pirollo

 How to adapt an existing design to new criteria and data: <u>https://txplo.re/eaacc</u>
- Stemiverse 0055 Norman Pirollo and the art of woodworking: <u>https://txplo.re/eb278</u>

- 1. Kumiko is one of the best introduction to woodworking hand tools. You don't need to be an advanced woodworker to be able to create Kumiko.
- 2. By learning Kumiko, you develop hand-eye coordination, develop techniques on how to use, chisels, planes, and bench-hooks, which are pretty common in woodworking shops.
- 3. Everything you learn as part of your Kumiko training, you can use in other kinds of woodworking.
- 4. To start with Kumiko, you don't need any power tools. You can purchase the strips of wood from Arts stores.
- 5. Kumiko contains hundreds of patterns that you can learn; this can become a serious long-term woodworking art hobby.

Gil Poznanski – Why Making is important to humanity

What is this session about?

In the last few years, Makers have come together organically to build a new way of sharing and creating skills. Maker Culture has seen Makerspaces, Maker Faires, as well as libraries and schools, adopt these workflows into their communities.

But Making is more than just creating; it is about human learning in its purest form. Watch this presentation to find out why Making is not only a great way to learn new skills but is also interwoven with what it means to be a person and a member of a tribe, adding to a new global creative possibility.

If you are embarking on your Maker journey or attending the summit to share your Maker wisdom, you will get a glimpse of what it means to embrace your inner Maker, and take a look at the bigger picture within Maker Culture.



About the speaker

Gil Poznanski is a creative technologist, Maker, and public speaker who earned the reputation for engaging the public through STEM and Maker programs within the education and public sector. Gil is excited by harnessing technology to enable others to create, make, and express their personal and creative narrative.

Gil has worked for the City of Melbourne and the Department of Education New South Wales as the

Creative Technologies Lead, where he programmed and developed the Makerspace, an interactive environment where people can engage with and create through technology. Gil also has pioneering technology in the classroom, such as telepresence robots and virtual reality, allowing the student to access tools typically limited to high-end technology corporations. Gil has been nicknamed "The Kosher Tony Stark" by those he

has helped, and through his Maker projects, that he documents on YouTube. Gil brings a flair to everything he does and doesn't shy away from the big projects.

Resources

- 1. Gil's (and Jarvis's) email address: <u>Jarvis@thekoshertonystark.com</u>, <u>gil@thekoshertonystark.com</u>
- 2. Gil's Twitter handle: @koshertonystark
- 3. Gil's Facebook page: https://www.facebook.com/thekoshertonystark/
- 4. Gil's LinkedIn page: http://www.linkedin.com/in/gil-poznanski
- 5. Gil's website: http://www.thekoshertonystark.com
- 6. Gil's Makerspace Facebook group (by invitation only): <u>https://goo.gl/4L0397</u>
- 7. Gil Poznanski's YouTube channel: https://www.youtube.com/gilpoznanski
- 8. Gil's Makers Monday Youtube channel: <u>https://goo.gl/accP5d</u>
- 9. Gil's "Building your Makerspace community" ebook free chapter: <u>https://wp.me/P52p6t-Ds</u>
- 10. What is Industry 4.0? Everything you need to know: <u>https://www.techradar.com/news/what-is-industry-40-everything-you-need-to-kn</u> <u>ow</u>
- 11. SpaceX Launch cheering video: <u>https://www.youtube.com/watch?v=6XtD-5L7cLk</u>

- 1. Create and construct something that inspires you.
- 2. Be creative and technical.
- 3. Share what you know, learn for others.
- 4. Change the world for the better.

Karsten Schulz – Making a computer processor with the B4 Kit

What is this session about?

The computer processor is one of the most amazing machines ever invented. Worldwide, billions of them carry out operations silently and efficiently, enabling many of the services that we have come to appreciate in our lives. But how do they work?

Three years ago, Karsten went on a journey to explore the inner workings of a computer processor. He dived deep into the machine, down to the transistor level, and from there built his own processor from scratch. The result is the B4, a 4-bit processor construction kit that demonstrates key computing concepts, including memory, load, store, addition, and subtraction. It can be programmed through physical computer variables or conveniently from a Laptop via the Arduino IDE. It also has a virtual companion, the B4 MyComputerBrain simulator, which runs in a browser.

In this talk, Karsten introduces the critical components of a computer processor and runs a series of interactive experiments that lead to a functional 4-bit processor capable of carrying out basic arithmetic operations.



About the speaker

A/Prof. Karsten Schulz (Ph.D.) embodies STEM as an engineer, scientist, and educator. Karsten holds a Ph.D. in Computer Science and a Bachelor in Electrical Engineering with a focus on Software Engineering. Karsten has been working in the Australian ICT and Digital Technologies space since 1999 in an international R&D leadership position. He has designed a computer processor, builds artificial neural networks,

has 18 patents in his name, and has a passion for making the invisible visible.

Resources

- 1. The Digital Technologies Institute website: <u>https://www.digital-technologies.institute/</u>
- 2. Karsten's email: karsten.schulz@digital-technologies.institute
- 3. The Digital Technologies Institute Facebook page: <u>https://www.facebook.com/digitalTechnologiesInstitute/</u>
- 4. Karsten's LinkedIn page: <u>http://www.linkedin.com/in/karstenaschulz/</u>
- 5. Code: The Hidden Language of Computer Hardware and Software (Developer Best Practices)
 - a. Kindle: https://amzn.to/34APfK9
 - b. Paperback: <u>https://amzn.to/34APfK9</u>
- 6. Explore the Computer Brain: <u>http://mycomputerbrain.net</u>
- 7. Stemiverse Podcast #16, Walking Supercomputers: <u>https://techexplorations.com/podcast/stemiverse-0016-dr-karsten-schulz/</u>

- 1. We can now build a computer processor at home. You don't need a multi-billion dollar fare. You can get yourself a physical experimentation kit or use the simulator and built your own computer computer processor.
- 2. You can actually learn how the machine works deep down and get an appreciation for the amazing job that these computer engineers have done in order to make something that works so beautifully, like a smartphone, for example.
- 3. By designing your own microprocessor, you can gain an appreciation for how code is being turned into actual action in the computer. How that translation works between just a few keystrokes and the machine then doing something,

Benoit Blanchon – Serialization and JSON

What is this session about?

Benoît's presentation is an introduction to JSON for Arduino users. He begins by implementing various serialization techniques to explain why JSON represents the best compromise for most projects. He continues with the implementation of JSON serialization from scratch, and finally, with a demonstration of how a library can be of help.

This presentation is for beginners; you only need to know the basics of Arduino programming and to be able to read simple C++ code. It is a practical course with many actionable code samples and is recommended for anyone who has little experience with Arduino but has never used JSON.



About the speaker

Benoît has been a passionate programmer since childhood. He has a Master's degree in electronics and 15 years of professional experience in software development. He is the creator of ArduinoJson, the most popular library for Arduino. As ArduinoJson testifies, he focuses on clean and efficient code. He is a TDD practitioner and an advocate of software craftsmanship.

Resources

- 1. Benoît's email: makerssummit@benoitblanchon.fr
- 2. Benoît's Twitter handle: @BenoitBlanchon
- 3. Benoît's website: https://blog.benoitblanchon.fr

- 4. Arduino JSON: https://arduinojson.org/
 - a. Use "MMM19" for a discount on the ebook.
- 5. Arduino JSON assistant: https://arduinojson.org/v6/assistant/
- 6. JSON: <u>http://json.org/</u>
- 7. C++ For Arduino: <u>https://cpp4arduino.com/</u>

Key learnings from this session

 To transmit data across the Internet, your program must do serialisation. At the other end, the opposite function takes place: de-serialisation. You can do serialisation and de-serialisation in various ways (the following table is taken from Benoît's presentation):

Format	Payload	CPU	Flexibility	Pain	Recommendation
Custom					Flat structure + isolated project.
JSON					Complex structure. APIs.
XML					Not suitable for embedded projects.
Protocol Buffers					Complex messages + performance. RPC.

- a. Custom code: you can craft it for minimal payload overhead and CPU load.
 But, it is an inflexible option as it can't be shared between projects, and can be painful.
- b. JSON: It add some payload overhead, although its not as bad as XML. It requires more CPU processing compared to custom code and is flexible. By far, it is the easiest option to implement.
- c. XML: Avoid at all costs for any embedded project.
- d. Protocol buffers: Offer minimal overhead payload, even better than custom code solutions. They are very flexible, but painful to implement.
- 2. JSON is the best option for data interchange on the Internet in terms of flexibility and implementation pain. For the vast majority of embedded projects, JSON is



 It is worth the effort to understand how pointers, references, and strings work in C++. They are really not that hard, and you will be able to write much better code. Check Chapter 2 in Benoît's book.

Kieran Nolan – Education 3.0 & Open Source learning space design

What is this session about?

In this presentation, which is of interest to learners and educators alike, Kieran talks about the migration from Education 1.0 to Education 3.0 and beyond. He introduces us to the topic of open-source learning space design, focusing on the incredible potential in designing physical-open-spaces that are student-centric, using technologies such as the Blockchain, P2P, and IPFS.



About the speaker

As the education technologist at Wooranna Park Primary School, Kieran Nolan has helped establish the school as a world leader in education technology and future thinking. Students have developed everything from virtual reality games and custom-built computers to fully functioning Cisco networks. They have:

- built their own 3D printed computer lab using Raspberry Pi,
- created their own cryptocurrency,
- voted on hardware and software for the school's open-source STEAM center,
- built their own full nodes for various blockchains,
- and created an educational game that teaches people how to mine Bitcoin.

Students have even created an international Minecraft environment to learn about hardware wallets and financial literacy. These efforts led Wooranna Park Primary School to recently become only the third school outside of the United States to be filmed by the George Lucas Foundation.

Resources

- 1. Kieran's email: kdnolan@gmail.com
- 2. Kieran's Twitter handle: @kieranDnolan
- 3. Kieran's Facebook page: <u>https://deletefacebook.com/</u>
- 4. Kieran's LinkedIn page: https://www.linkedin.com/in/kieran-nolan-a932411a/
- 5. Kieran's website: kdnolan.com
- 6. RocketShoes: https://www.rocketshoes.io/
- 7. IPFS: <u>https://ipfs.io</u>

- 1. Education 3.0 depends on three key concepts:
 - a. Student ownership: students should own the work they create, and have control over it. Today, ownership is by the organisations that own the platforms (universities, schools etc).
 - b. Student agency: students should have a level of autonomy and power to shape their learning environment. Today, students must follow centralised or other curricula in which have have little or no influence.
 - c. Student voice: Students should be able to adapt their education to their unique perspectives. Student voice is closely related to student agency.
- 2. New technologies, such as the Blockchain, and networks, as well new educational/learning paradigms are critical delivering Education 3.0.
- **3**. Education evolution (slide from Kieran's presentation):



Education 1.0 - didactic classroom model



Education 2.0 - flipped classroom/school in the cloud



Education 3.0 - P2P consensus driven content/student centric

4. Evolution of the Web (slide from Kieran's presentation):



Simon Gao – The manufacturing process of a Printed Circuit Board

What is this session about?

What happens to your Gerber files once you submit them to an online PCB manufacturer? In this presentation, Simon Gao will go into the details of the manufacturing process at PCBWay, a full-service Printed Circuit Board manufacturer.

PCBs play a significant role in connecting all functions in a complete electronic product. When electronic products fail, the primary suspect is the PCB. Due to the processing technology of PCBs being relatively complicated, the quality control during PCB production is of vital importance and notably precise.

A lot of makers and electronic enthusiasts are curious about the manufacturing process of a PCB. In his presentation, Simon takes us through each of the 14 distinct steps. From cutting the substrate material into the appropriate shape and size for your board to the final quality control, there's a lot that has to happen to produce a high-quality PCB. There's the pre-treatment, lamination, exposure, development, etching, stripping, and that's only the beginning.

Knowing how PCBs are made in the factory will give you a more in-depth insight into the process which you can use to design PCBs that are easier, cheaper, and better to manufacture.



About the speaker

Simon Gao has majored in Electronics Information Science and Technology and has five-year work experience in the PCB field. In 2015 he worked as an NPI (New Product Introduction) engineer studying the flexible PCB manufacturing process and monitoring the production status of new products. Since 2016 Simon has been the Customer Experience Manager at PCBWay, dealing with client issues daily and reporting problem feedback to the production engineers that helps them improve the quality of products. He also cooperates with YouTubers in shooting factory videos.

Resources

- 1. Simon's email: simon@pcbway.com
- 2. Simon's Twitter handle: @realSimon_Gao
- 3. PCBWay on Facebook: https://www.facebook.com/pcbway
- 4. PSBWay on LinkedIn: <u>https://twitter.com/PCBWayOfficial</u>
- 5. How PCB is manufactured? Printed circuit board Manufacturing Process in PCBWay, https://www.youtube.com/watch?v=_RBDELs5IN4
- How PCB is Made in China PCBWay Factory Tour, <u>https://www.youtube.com/watch?v=_GVk_hEMjzs</u>
- Inside a PCB Soldering Factory in China, <u>https://www.youtube.com/watch?v=24ehoo6RX8w</u>
- 8. The PCBWay website, <u>www.pcbway.com</u>
- 9. PCBWay capabilities, www.pcbway.com/capabilities.html
- 10. Get a PCB manufacturing quote, www.pcbway.com/orderonline.aspx
- 11. PCBWay community, <u>www.pcbway.com/project</u>

- PCB dimensions and the number of layers influence heavily on the cost and speed of manufacturing. PCB manufacturers publish the cost-ideal dimensions on their website. If you can keep your PCBs at or below that size and number of layers, you will have the lowest cost possible. For PCBWay, the ideal dimension is 100mm by 100mm, and 2 layers.
- 2. Avoid irregular shapes. Shapes that are not rectangular will increase the cost of production and result to a lot of material waste.
- 3. Prefer through-hole vias rather than buried and blind vias, because the latter are most costly to produce. Going back to point 1, in a 2-layer PCB, only through-hole vias are available.
- 4. Keep the diameter of holes to sizes larger than 0.3 mm.

- 5. Traces should be at least 6 mil (0.15 mm) apart.
- 6. Hole size has a big impact on the cost of manufacturing a PCB. For example, the difference between a board with 0.3mm and 0.15 mm holes (when everything else is kept equal) can be hundreds of dollars.
- 7. If you want to produce many copies of a small PCB, you should penalise it yourself. In your panelization design, try to avoid slots.
- 8. If you have a good reason (and you know what you are doing) you do not need to heed these guidelines.
Richard Park – Teaching Tools For An Emerging IoT Class

What is this session about?

Professor Richard Park's presentation will be a guided tour of the Internet of Things Fundamentals course he is currently prototyping. Richard's course is an adaptation of the Tech Explorations Raspberry Pi Full Stack Raspbian application, intending to teach IoT concepts by gradually building end-to-end IoT systems. Richard will demonstrate what he's teaching in class this semester and show examples of student projects. Everything he will be teaching will have practical value for the attendees to take to the classroom.

In order for students to learn how technologies work:

- They should have access to powerful tools that operate interchangeably across any of the common computing platforms both real and simulation.
- They should have access to the necessary hardware components at an affordable cost.
- They should have access to content knowledge experts and mentors.
- Technology should be taught with humility. Teaching is learning. Asking good questions is more important than getting the right answers.



About the speaker

Richard Park has been teaching full time for twenty years. He also concurrently taught Secondary Technology Education for eleven years. In these venues, the topics included coding, operating systems, electronics, and multimedia in addition to networking. He currently teaches college-level Computer Information Technology courses. Before his full-time teaching career, Richard was a Cisco Systems Network Academy Area Manager, Apple Computer Systems Engineer, Texas Instruments Technical Instructor, and IBM Mainframe Systems Field Engineer. At Apple Computer, he designed and implemented the technology infrastructure for the Apple Market Center, a predecessor to today's Apple Stores, and co-authored the "Apple][Primer," Apple's first classroom teacher training manual.

Richard holds AAS, BS, and MS degrees in Electronics Technology, Radio and Television Journalism, and Education from Southern Illinois University, and Texas A&M University. In his nearly 20 years at Apple Computer, he actively participated as the world became interconnected – emerging in a time when networks were open and unencrypted, and just finding their way into the classroom. He wrote the Apple][Primer, one of the first programming and classroom user guides for teachers.

Richard Park was one of the early users of Visicalc, one of the first visual spreadsheet programs for the Apple][and defined much of how modern spreadsheets work. He put this skill into practice at Texas Instruments, where he created a method that revolutionized project job-costing drudgery into a nearly effortless task.

Richard teaches Networking Engineering and related technology courses at the Cisco Academy. He is currently prototyping an IoT Fundamentals course, that he adapted from the Tech Explorations Raspberry Pi Full Stack Raspbian course, to teach IoT concepts by gradually building end-to-end IoT systems.

Resources

- 1. Richard's email: richbpark@gmail.com
- 2. TinkerCAD from Autodesk, <u>https://www.tinkercad.com/</u>
- 3. Create on Arduino.cc: <u>https://create.arduino.cc</u>
- Richard's blog post article on the Tech Explorations website, <u>https://techexplorations.com/blog_understanding-the-python-sqlite3-query-proce</u> <u>ss/</u>
- 5. Richard's Presentation Abstract and Outline: https://txplo.re/7cv
- 6. Richard's Shared Folder: <u>https://txplo.re/03a9f</u>

Key learnings from this session

With technologies such as the Raspberry Pi:

- 1. You have an incredibly powerful system in your fingertips.
- 2. You don't have to answer to anybody.
- 3. You can use it to do exactly what you want to do.
- 4. You have control over your environment.
- 5. You have a place to exercise a level of mastery to discover what you think is important, and prove your own outcomes to your satisfaction, and to share with your peers.

Geoffrey Benton – Makers: Exploring New Technology

What is this session about?

NC machines have been around for a long time but have been costly and, therefore, mainly restricted to businesses. In recent years modern advances have made huge leaps in the low-cost availability of 2D and 3D machines such as router cutters, laser cutters, and 3D printers. Makers have been keen on becoming involved with these new machines and have embraced the technology.

This presentation is about exploring new technology as it becomes available to makers and then taking that new technology wherever you can. Makers who want to go further than downloading files from the internet and making things that have been designed by somebody else will be interested in this discussion. It will appeal to people who want to make something that would otherwise be unavailable to them. Something that they have to think about, design, and then make parts for, and which will stretch their brains to overcome hurdles.

The main focus of the presentation, a practical one that follows the development and ongoing construction of a model Tower Crane, is on 2D Laser Cutter and 3D printer. The marriage of these two technologies takes both of them further than either can go alone.

About the speaker



Geoffrey Leonard Benton, aka Doonie, is mostly a blue-collar worker, a hands-on person with a couple of excursions into running his own business and spending some time as a Member of the Victoria Police. He has worked as a Tool Maker, Maintenance Fitter, and Metal Machinist, and ran a business selling and building garages, carports, sheds, and verandas. He has worked in shops selling power tools and industrial goods and as a truck driver. His hobbies included making things out of wood and building model ships. Then, he retired.

The first thing he did after retiring was to construct a big shed and fit it out with all the tools he had gathered over the years, and afterward, he built a Music Studio for his wife. Today his time is his own.

One day he went to visit a friend who had recently installed some new technology in his shed. His hobby was making Ukuleles, and for that, he wanted to see how this new machine could be useful. It was one of the first Emblaser laser cutters to be released for sale. Doonie was astonished by the accuracy of the cuts the thing made. As a toolmaker, he enjoyed working with tolerances, from fine ones in metal to a lot coarser ones in wood. In that instant, he saw a machine that cut wood accurately to three decimal parts of a millimeter. It changed his life. He soon purchased an Emblaser laser cutter of his own and embarked on a fascinating journey of exploration, learning, and creative revelations. He has since upgraded that machine to the latest Emblaser Core and also added a 3D printer in the workshop. The combination of those two machines has enabled his creativity to expand beyond belief.

Resources

- 1. Geoffrey's email: doonboy@bigpond.com
- 2. Geoffrey's Facebook page: https://www.facebook.com/doonie.benton
- 3. Geoffrey's laser cutter is from Darkly Labs, https://darklylabs.com
- 4. Cut2D Desktop design software, https://www.vectric.com/products/cut2d-desktop
- How to assemble the Emblaser Core laser cutter (presented by Gil Poznanski): <u>https://youtu.be/aqCD10NJS6M</u>



Key learnings from this session

- 1. Do not, under any circumstances, let technology overwhelm you.
- 2. If you hit a hurdle, don't stop a project; put it aside, because it will come to you. You will learn more of whatever it is you are working on. The answer is there. Be patient.
- 3. You've got to learn new stuff all the time. You've got to be actively looking for something new to learn and take it as far as you can.
- 4. Don't be a hermit. Get out there and talk to people, learn from them, be social.

Jorge de Sousa Pires – Time travel in a chase for context!

What is this session about?

Jorge's presentation is a description of a very long time Maker who has always tried and keeps trying to traverse ever-evolving technology, having a continuous wish to develop Society and himself. It is a practical presentation, and several components will be shown, from the 60s up to the present day, from electronics tubes to drones. Younger makers will perhaps find the "How" and "Why" we have come such a long way in the development of Society quite interesting.



About the speaker

Jorge is a retired associate professor. He was a researcher and senior lecturer at Uppsala University. He was also the Research and Education manager of Apple Sweden from 1988 onwards, and in 1996 he joined the Education Team of Apple Europe.

Jorge is fascinated by the power of technology to transform education. He worked at Malmö University in Sweden with the specific goal of improving Computer

Assisted Learning at the University. He is also the author of several books and many peer-reviewed articles in Education and engineering.

Resources

- 1. Jorge's email address: jsp@desousapires.com
- 2. Jorge's LinkedIn page: https://www.linkedin.com/in/jorged4/
- 3. Jorge's website: https://www.desousapires.com/
- 4. Connecting the AR.Drone Quadricopter to Mathematica, <u>https://www.wolfram.com/broadcast/video.php?c=101&v=131</u>
- 5. RADIO GALENA, https://www.youtube.com/watch?v=-kYDiXkP5-g

- 6. Book "Electronics Handbook", by Jorge de Sousa Pires, Studentlitteratur 1989/1990, 800 pages. An integrated source on Analog and Digital Electronics, supported by subsections on: Fundamental Concepts, Personal Computers, Mathematics, Standards, Communication, Music, Etymology, Tables, Computer Pedagogics, History of Science... and much more. Of special mention are the Graphs and Flow diagrams. Makers that have started enjoying the Glorious Electronics Path will find examples that show how to calculate values for resistors, diodes, Zener diodes and more. This book is still available:
 - a. https://www.abebooks.com/book-search/author/pires-jorge-sousa/
 - b. <u>https://www.amazon.co.uk/?k=Electronics+handbook%3A+An+integrated</u> <u>+reference+source+on+analog+and+digital&ref=nb_sb_noss</u>
- 7. Book "Glädjen att veta hur det faktiskt hänger ihop!", by Jorge de Sousa Pires, Studentlitteratur 1998, 450 pages. En associativ bok med förklarande texter med exempel för alla som vill förstå datorn, teven, mobiltelefonen, och samhällsdebatten. English translation: The Joy of understanding how things are interrelated. A textbook for those who want to understand how concepts in the modern world are interrelated and interconnected. The book has been used as a textbook in courses aimed at teacher development (STEM).
- 8. Book: The invisible Computer, by Donald A. Norman, MIT Press 1999. Why good products fail, the personal computer is so complex, and information appliances are the solution. The bible of "Post-PC" thinking Business Week. Very interesting book that explains how to deal with complex mechanisms that really do help managing the vast amounts of data in which we tend to be submerged.
- Book: The Children's machine, Rethinking School in the age of the Computer, by Seymour Papert. HarperCollings Publishers, Inc., 1993. A classical book, still very much valid today when there are many Maker courses for youngsters. Papert was the creator of LOGO language and the author of Mindstorms and a pioneer of Artificial Intelligence. His ideas inspired very interesting learning projects. Some of you might remember the LOGO turtle, a small robot that children could program – a forerunner of all small robots that are embedded in modern toys.
- 10. Mathematica. An awesome piece of software with the wrong name. Mathematica is in the inner workings of Apple Siri. Just ask Siri to solve your equation! While Mathematica, developed by Wolfram Technologies, can do complex Math, it has evolved into an intelligent programming language that can be used by Makers in their projects. Mathematica is available – for free! – on

Raspberry Pi. Free for your to experiment with it, fetching sensor data from the hardware pins. And the same goes for other microprocessors such as Arduino.

- 11. Raspberry Pi and Mathematica. https://magpi.raspberrypi.org/articles/wolfram-mathematica-raspberry-pi
- 12. Arduino and Mathematica. <u>https://www.youtube.com/watch?v=W3P5JF4whgA</u>
- 13. Mathematica has also found its way into controlling devices such as drones. See photo from Wolfram's Yearly Conference in Champaign, USA.



Key learnings from this session

 Find the context of your life, try to see the big picture of Evolution. The old Things are old now and the Things that you find modern today will be old when your children look back at you – "Did you really have keyboards?"

- 2. Engage Making with the Heart and be humble. Ask yourself whether you are becoming a better person by doing "this".
- 3. You do not need an alibi to enjoy every moment of "playing" with any creative technology that shapes the future.
- 4. The higher you stand looking back, the more you can see forward. Look to see what is coming. Then you know where you are going. Or rather, shape the Future!
- 5. Think about where technology is leading us. Where is it leading you? Where is it leading society? Hopefully to a great future, it is your responsibility to shape it with balance and kindness.
- 6. Engage Making with the Heart. Ask if you are becoming a better person by doing "this".
- 7. Enjoy every moment of "playing" with things like Arduinos, Raspberry Pi's, or any creative technology.
- 8. Look at the future to see what is coming. Then you know where you are going.
- 9. Think about where technology is leading us. Where is it leading you? Where is it leading society?

Dal Gemmell – Telcos Aren't the Future. You Are.

What is this session about?

Analysts predict in the next few years a tsunami of 20-30+ billion connected devices. However, the current networking infrastructure is too costly or complicated for IoT devices.

Not satisfied with dominating our phones and computers, telco giants want to own connectivity for everything else; to control how we connect with billions of devices and collect data from our interactions with the everyday world.

What if there was another option? A new kind of open, decentralized wireless network powered by blockchain and built by individuals that delivered range and roaming capabilities similar to cellular without the high cost or battery drain.

In this session, learn how to leverage this new peer-to-peer wireless network to collect data from any IoT device, with a Helium module (or a make-your-own module using off-the-shelf components and the code Helium released under open source licensing) and transfer it to the cloud in minutes.



About the speaker

Dal Gemmell has worked in product marketing and product management leadership roles focused on delivering solutions for a broad target audience, from SMBs to large enterprises, at various cybersecurity companies ranging from startups to Fortune 500's and those in between. His current role as Head of Product Marketing and Planning involves both product marketing, product management, and generally doing whatever's

needed to make Helium, the world's first peer-to-peer wireless network, successful.

Resources

- 1. Dal's email: dal@helium.com
- 2. Dal's Twitter: @jdgemm
- 3. Dal's LinkedIn page: https://www.linkedin.com/in/dalgemmell/
- 4. Helium website: https://helium.com
- 5. Helium's developer resources: https://developer.helium.com/
- 6. Helium console: https://console.helium.com/login
- 7. Requestbin (useful for working with HTTP requests): https://requestbin.com/

Key learnings from this session

- 1. The Internet of Things is being held back by networks that are inadequate for the next generation of IoT devices.
- 2. A new kind of network is required to help connect tomorrow's devices. This network should enable capabilities such as:
 - a. Years of battery life
 - b. Tiny form factor
 - c. Location tracking without cellular
 - d. Long distance radio connectivity
 - e. Non-proprietary technology
 - f. Multi-layered security
 - g. Is ubiquitous.
 - h. Is owned by the people that choose to participate in it.
- 3. The Helium network is the first peer-to-peer wireless network.
- 4. The Helium network is owned by the users who provide the individual access hotspots. These users can earn Heliums (the Network's cryptocurrency) for providing access to other users.
- 5. People that want to participate in the Helium Network, can purchase a Hotspot from Helium, or build one themselves, using hardware that is readily available in the market.
- 6. If you are a developer, and want to create applications that run on the Helium Network, you will find a rich set of documentation, examples, and educational resources on the Helium website.

7. Perhaps for the first time ever, adding an IoT device to the Network is a plug-and-play operation, with almost zero configuration needed.

Jason Long – From Hobby to Pro in Electronics and Embedded Development

What is this session about?

In this presentation, Jason shares many experiences from his life as a product developer to help you understand what it takes to develop electronics commercially. He provides some strategic pointers, and also discusses some of the most critical elements of success; they might not be what you expect!

Whether you're a brand new Maker dabbling in microcontrollers, or a seasoned veteran, there's something for everyone in this talk. The talk references specifically ARM Cortex microcontrollers. Still, the information is meant to apply to any platform you work with. Jason is excited to share his passion and experience with you and hopes you find great value in attending.



About the speaker

Jason is a dad to two wonderful boys and works as an electrical engineer in Calgary, Alberta. He graduated from the Schulich School of Engineering in 2002 and has spent his career in the high-tech electronics industry.

Jason has designed and worked with products ranging from GPS tracking devices to military communications systems. At the same time, he has volunteered nearly

10,000 hours to teaching students about engineering applications and the importance of excellent communication, leadership, and building relationships.

In 1999, Jason started the Embedded in Embedded (EiE) university program while he was still a student, and has continued to run and grow the program ever since. EiE has reached over 2000 students in a dozen universities across Canada and is also growing

in China. In 2010, Jason started his own company, Engenuics Technologies, that specializes in engineering education.

In 2012 he was awarded a prestigious APEGA Summit Award for Mentorship. He continues to devote hundreds of hours each year working to improve engineering education and creating opportunities to connect students and industry. Jason is a P. Eng and also a Senior Member of IEEE and is currently working on a Master's in Engineering specializing in STEM education.

Resources

- 1. Jason's email: jason.long@engenuics.com
- 2. Jason's Twitter handle: @engenuics
- 3. Jason's Facebook page: <u>https://www.facebook.com/Engenuics/</u>
- 4. Jason's LinkedIn page: https://www.linkedin.com/in/jasonrobertlong/
- 5. Jason's website: http://www.embeddedinembedded.com
- 6. Engenuics: <u>https://engenuics.com/</u>
- 7. Embedded in Embedded (Jason's book from Elektor): https://www.elektor.com/embedded-in-embedded

Key learnings from this session

1. Platforms such as the Arduino are great for learning and rapid prototyping, but not sufficient for large scale production without significant customization.



 This stack shows the discrete layers of an embedded design and device. The embedded designer needs to have an understanding of all of them, but depending on their role will need to have deep working knowledge of at least two of these layers.



- 3. These are the good habits of an embedded designer:
 - a. Create a Github account and do all your coding there. Use repositories and branching correctly
 - b. Establish a style guide and coding convention, then follow it religiously
 - c. Design First
 - d. Students: click "build" and are surprised it compiles and runs.
 Professionals: click "build" and are surprised if it doesn't compile and run
 - e. Always find root cause of problems

Simon Monk – micro:bit for Makers

What is this session about?

The BBC micro:bit is a versatile microcontroller board that is widely used in education but is often overlooked by Makers. In this presentation, Simon will introduce the micro:bit and demonstrate some of its features such as built-in sensors, a rudimentary display, and radio hardware, that make it useful to Makers. He will do a live demonstration of writing code for the micro:bit in MakeCode blocks and Python, and present several projects built using the micro:bit.



About the speaker

Simon Monk is a full-time author and maker, mostly writing about electronics for Makers. Some of his better-known books include 'Programming Arduino: Getting Started with Sketches,' 'The Raspberry Pi Cookbook' and 'Hacking Electronics.' He also helps his wife Linda run MonkMakes Ltd, a manufacturer of electronic add-ons and kits for makers and educators. Simon has been an electronics hobbyist since his teens

and has a degree in Computer Science and Cybernetics and a Ph.D. in Software Engineering.

Resources

- 1. Simon's email: simon@monkmakes.com
- 2. Simon's Twitter handle: @simonmonk2
- 3. Simon's website: http://simonmonk.org
- 4. Simon's book with Micro:bit projects: <u>http://simonmonk.org/prog-mb/</u>
- 5. Animatronic Head example: <u>http://www.monkmakes.com/mb_head/</u>
- 6. MicroPython: <u>https://micropython.org/</u>
- 7. The Mu editor: <u>https://codewith.mu/</u>

8. MakeCode editor for the Micro:bit, http://makecode.microbit.org

Key learnings from this session

1. The Micro:bit is good for makers, and you should consider it for your next project.

Why is it good for Makers?

- Pros
 - Cheaper than an Arduino Uno
 - More features and better spec than an Arduino Uno
 - · Easier to get started
- Cons
 - Only 3 GPIO pins without an adapter
 - Alligator clips not to everyone's taste
 - More expensive than an ESP32 board



- 2. The built-in peripherals and the well-designed programming interface and libraries make prototyping a breeze.
- 3. The Micro:bit is an ideal platform for people that are new to Making. The initial "pain" is considerably lower than what you will experience with other platforms.
- 4. The Micro:bit is flexible because of the multiple programming options that are built-in to the platform instead of an afterthought. (languages, programming environment).
- 5. The built-in radio is excellent and very easy to use; it allows you to build applications that combine multiple Micro:bits very easily.
- 6. You can use the built-in display for many things, including for easy debugging.
- 7. You can run Python directly on the Micro:bit, in real-time as you write it. This capability is known as REPL: Read-Evaluate-Print-Loop).

Marco Schwartz – How to Easily Control Projects from Anywhere in the World with aREST

What is this session about?

In this presentation, you will learn how you can use the aREST platform to control your projects from anywhere in the world easily. After an overview of the platform, Marco will do a live demonstration with a simple ESP8266 project. He will demonstrate how to configure it with aREST, how to create a free aREST account, and finally, how to control a simple LED from the cloud.



About the speaker

Marco Schwartz is an entrepreneur and electrical engineer, passionate about the Internet of Things. When he started playing with Arduino & the Raspberry Pi back in 2012, he always ended up frustrated with controlling those platforms remotely from the cloud. There were a few solutions, but they were complex to implement & usually platform-specific.

For the above reason, he decided to create aREST, a

universal, hardware-independent platform to control all your Arduino, Raspberry Pi & ESP8266/ESP32 projects from anywhere in the world. It includes libraries for boards themselves, like Arduino boards, and also server-side code to handle the communications between a server and remote devices. The aREST framework is, of course, completely open-source and free to use. aREST has currently over 10,000 users and has been used for IoT, home automation, robotics, and even industrial applications.

Resources

1. Marco's email: marcolivier.schwartz@gmail.com

- 2. aREST Twitter: @arest_io
- 3. aREST Facebook page: <u>https://www.facebook.com/AREST-1743702995909546/</u>
- 4. aREST
 - a. website: https://arest.io/
 - b. library: https://github.com/marcoschwartz/aREST
 - c. Cloud app: https://cloud.arest.io
 - d. Dashboard: <u>https://dashboard.arest.io</u>
 - e. Status: https://status.arest.io

Key learnings from this session

1. aREST is a set of software components that allows you to easily control boards using RESTful command.

What is aREST?

- A set of software components to easily control boards using RESTful commands
- For example: /digital/7/1
- Works using a wide range of communications type
 - Serial
 - WiFi
 - XBee
 - Bluetooth
 - BLE
- Works both in local mode & cloud mode
- 2. Especially in the prototyping phase of your project, consider using libraries and existing, high-quality, well-tested code. This is particularly important for the networking components of your project, that are particularly hard to implement without detailed knowledge of the networking, security, and other infrastructure technologies.
- 3. With aREST, if you just want to control pins or read their values, you don't actually have to write any code at all.
- 4. aREST is ready for large-scale (industrial-level) deployments, but is also very well suited to small, one or two devices.

- 5. With aREST, you are not confined to specific hardware. It can work with any Arduino, ESP32, Raspberry Pi, and other boards.
- 6. With aREST, you don't even need to setup an account on aRest.io.

Alain Pannetrat – Building a Wired IoT Platform for Makers

What is this session about?

Alain's presentation tells the story of the creation of NoCAN: an Arduino-compatible IoT network based on CAN-bus. In the process, Alain explains what CAN-bus is, and what makes it exciting and useful for your embedded projects.

For many makers, IoT is synonymous with "wireless." Today, there is a wide choice of WiFi or Bluetooth devices that you can use to build amazing projects. But "wireless" is not always the right solution, notably because of battery or signal issues. For these particular cases, OMZLO created NoCAN: an IoT platform based on a set of Arduino compatible nodes connected with a single cable that brings both power and networking. Alain and Peter discuss how to build, connect, and program a NoCAN network, for projects such as plant-watering, lighting control, and environmental sensing.

Embedded system hackers already familiar with bus protocols such as I2C, SPI, or USART often overlook CAN-bus as a solution. Yet, a lot of modern microcontrollers offer CAN-bus out of the box for very cheap, making an interesting choice for reliable communications over distances that can reach hundreds of meters.



About the speaker

Alain Pannetrat is the founder of OMZLO, a company that designs, manufactures, and sells open-source hardware with a focus on wired IoT. He has extensive experience with micro-controllers of the ARM Cortex M0 family, Atmel AVR chips and the Raspberry-Pi. Alain also works as a product manager and researcher for the Cloud Security Alliance. He previously worked as an IT expert for the French data protection authority (CNIL) and as a smartcard security consultant in the banking industry. He holds a Ph.D. in applied cryptography but discovered a passion for electronics the day he bought his first Arduino UNO.

Resources

- 1. Alain's email: <u>omzlo.electronics@gmail.com</u>
- 2. Alain's Twitter handle: @OmzloElec
- 3. Alain's Facebook page: https://www.facebook.com/omzlo
- 4. Alain's website: https://www.omzlo.com
- 5. Alain's Github page: https://github.com/omzlo
- 6. Learn about the NoCAN platform: <u>http://omzlo.com/the-nocan-platform</u>

Key learnings from this session

1. Consider CAN bus for your projects. It is a robust, low cost solution for distributed system applications.



2. CAN comes from the automotive industry, and is an open protocol. You can use it to see what is happening in your car, in real time.

3. When you are building an IoT system, consider the requirements and don't just go for the most popular device. Choose the technology that is most appropriate for your project, including its long-term cost.

	PROs	CONs
ΡοΕ	Speed, IP	Expensive, bulky
I2C / SPI / USART	Free, simple	Limited distance
RS232	Cheap, simple	2 nodes only
RS485	Cheap	Not multimaster
CAN bus	Cheap, reliable	Data rate

4. In NoCAN, data and power are delivered from the same 4 wires. You will not have to worry about batteries and signal strength.



John Teel – 15 Steps to Develop Your New Electronic Hardware Product

What is this session about?

In this presentation, John reviews the 15 steps necessary to go from an initial product idea to a product ready for mass production. He discusses the initial market research, upfront cost estimations, product design process, and prototyping. This presentation is aimed at anyone that wishes to bring a new electronic product to the market. It covers both the entrepreneurial and technical aspects of the process. John includes the development of the electronics as well as the development of the product's enclosure.



About the speaker

John Teel is an electronics design engineer, serial entrepreneur, blogger, and the founder of Predictable Designs and the Hardware Academy. He is also an ARM Innovator and currently specializes in helping entrepreneurs and startups to develop and launch new electronic hardware products successfully.

As a senior design engineer at Texas Instruments (TI), John designed dozens of highly successful electronic microchips. His chip designs can be found in all kinds

of popular electronic devices, including some from Apple and Intel. In fact, you almost certainly own several products with TI microchips inside, and most likely a product or two with one of John's chip designs.

Before starting Predictable Designs, John founded a hardware startup that developed and manufactured a consumer lighting device. The product was sold in hundreds of retail locations across multiple countries. In addition to developing the product, he also oversaw manufacturing in Asia, marketing, trade shows, logistics, financing, and sales. John had, at one point, a team of over 20 sales representatives across the U.S. selling the product.

John has written for leading publications, including Make: magazine, All About Circuits, <u>Hackster.io</u>, Seeed, and <u>Entrepreneur.com</u>.

Resources

- 1. John's email: info@predictabledesigns.com
- 2. John's Twitter handle: @JohnTeelEE
- 3. John's LinkedIn page: https://www.linkedin.com/in/johnteel
- 4. John's website: <u>https://predictabledesigns.com/</u>
- 5. The Hardware Academy: <u>https://thehardwareacademy.com/</u>

Key learnings from this session

- If you want to bring a product to market, do not ignore marketing. In fact, as soon as you decide to develop a product, start with the marketing. Put up a web page, a blog, start creating an audience. This audience will be the most important asset that you have to get feedback and help you create a product that people will actually want.
- 2. "Begin with the end in mind", as Stephen Covey wrote in his classic <u>The 7 Habits</u> of <u>Highly Effective People</u>.
- 3. Involve as many people as you can in order to get feedback: engineers, distributors, end users, and more.
- 4. Don't keep your ideas secret. An idea is worth nothing until it is turned into reality. And to turn an idea into reality, you need to talk to people, tell them about your idea, and listen to their feedback. Use a Non Disclosure Agreement if you are worried about idea theft.

Zafar Iqbal – Making a Turing Machine

What is this session about?

In his presentation, Zafar describes how he made a Turing Machine, a topic that is of interest to anyone fascinated by hardware prototyping, Arduino programming, and computer science. The presentation features a general overview of Zafar's motivations and the workflow he used when building the device, followed by a demonstration using an accompanying online Turing Machine simulator to show how to play and program such a device. Zafar also supplies a worksheet PDF with extra information.





Zafar studied Engineering & Computer Science at Oriel College in Oxford, and Communication Design in Central Saint Martins in London. He has worked for more than 20 years as a programmer in the United Kingdom and Greece, both for large private companies such as ZDNet/CNET and top academic institutions, such as the National Technical University of Athens.

His areas of expertise include cyber-physical hardware and software systems with an emphasis on robust,

modular, secure and scalable software components, "phygital" experiences, image, and video processing, internet applications, and content management systems. He also has extensive teaching/mentoring experience at international events and workshops and has published two scientific papers on programmable modeling environments.

He has used his programming skills on a varied number of science and art projects and performances, and in 2016 he was included in the European Top 50 Maker list. Currently, he writes software for space weather monitoring systems.

Resources

- 1. Zaf's email: mail@zaf.io
- 2. Zaf's website: https://zaf.io/
- 3. What is a Turing Machine? <u>https://en.wikipedia.org/wiki/Turing_machine</u>
- 4. Zaf's interview on the Tech Explorations Podcast: <u>https://techexplorations.com/podcast/tech-explorations-zafar-iqbal-part-1/</u>

Key learnings from this session

- 1. When you have an idea that excites you, you should go for it and try to make it happen. The Turing machine came from this approach.
- 2. Don't worry about perfection when you pursue an idea. What is important is to create a working prototype that proves that your idea is worth pursuing.
- 3. Use what you have. You don't need the best tools, the best materials, etc in order to create a prototype of an exciting project. You can spend a lot of time trying to reach perfection later. The Arduino Turing Machine Mk1 is made of plywood with a few screws to form an enclosure for the Arduino, battery and controls. Some wires are hanging out. Mk2 will be much more refined.
- 4. It is important to reduce the time it takes to iterate through prototypes in order to gain momentum.

Show (enclosure)

- RGB LED Ring
- Potentiometer
- Buttons
- Arduino Fio
- LiPoly Battery
- Piezo Buzzer



Vladimir Mariano – From Design to 3D Printed Part with Fusion 360

What is this session about?

Learn the process of going from idea to physical part using Fusion 360 and a desktop 3D printer. In this presentation, Vladimir will cover the workflow involved in Designing and 3D printing a part. He will guide you in creating a basic and practical 3D model in Fusion 360 and show you the process of preparing the model for 3D printing using Cura - a free and powerful slicing software. By the end of the presentation, you'll have a good understanding of what's involved in going from idea to 3D printed part.

About the speaker



Vladimir Mariano is the co-founder and president of Fairfield County Makers' Guild, an independent makerspace. Vladimir is also the founder of CT Robotics Academy. As an instructor, he specializes in teaching 3D printing, 3D design, electronics, programming, and using Fusion 360. Many of his courses and projects combine the worlds of art and tech. He also teaches several maker-related classes at local libraries and schools. He has a degree in Geology from West Virginia University and

a ROBOTC programming instructor certification from Carnegie Mellon Robotics Academy.

Resources

- 1. Vladimir's email: vladimir@desktopmakes.com
- 2. Vladimir's Twitter handle: @DesktopMakes
- 3. Vladimir's Facebook page: https://www.facebook.com/desktopmakes/
- 4. Vladimir's Linkeln page: https://www.linkedin.com/learning/instructors/vladimir-mariano

- 5. Vladimir's website: https://www.desktopmakes.com/
- 6. Ultimaker Cura (3D printing software): https://ultimaker.com/software/ultimaker-cura
- Fusion 360 (3D design tool, free for personal use): <u>https://www.autodesk.com/campaigns/fusion-360-for-hobbyists</u>

Key learnings from this session

- 1. If you want to get into 3D printing, know that it's a lot of fun. It's a blast!
- 2. You can use your 3D printing knowledge everywhere, let your imagination loose. You can even make your own cookie cutter or print chocolate and pizza.
- 3. Use a 3-button mouse when you design in 3D.
- 4. You must put the time in to learn how to create 3D designs because it is not intuitive from the start.
- 5. Each tool is slightly different to other tools in the same space. Come in with an open mind and adapt to it, instead of fighting it.



Jordan Christman – Getting Started with FPGAs

What is this session about?

In this presentation, Jordan will describe how FPGAs work, and how you can use them in your projects alongside a microcontroller and microprocessor.

FPGAs is a fascinating topic because it entails the design of an integrated circuit using software tools after it has been manufactured and has left the fabricator.

You can program the FPGA hardware chip on your desk and configure what each one of several millions of gates inside the chip does.

There's quite a bit of magic that is happening inside an FPGA, and Jordan will introduce us to this engineering magic.



About the speaker

Jordan is a graduate of the University of Dayton with a Bachelor's degree in Electronic and Computer Engineering Technology. He also graduated from UD with his Master's degree in Electrical Engineering. He currently has a patent pending for an electronic monitoring device.

He has strong knowledge in FPGA (Field Programmable Gate Array) development, Digital Electronics, Circuit Board design, and VHDL design and modeling of

hardware systems.

His focus of study in school was embedded systems, which involve circuit design, firmware development, implementation of computer hardware, and the interfacing of computer operating systems.

His hobbies include mobile application development, layout, and assembly of PCB's (Printed Circuit Boards), computer application programming, and anything related to electrical engineering.

Resources

- 1. Jordan's email: jordanchristman13@gmail.com
- 2. Jordan's LinkedIn page: https://www.linkedin.com/in/jordan-christman-161509b3
- 3. Vivado Design Suite (Software): <u>https://www.xilinx.com/products/design-tools/vivado.html</u>
- 4. Arty development boards: <u>https://store.digilentinc.com/arty</u>
- 5. DE development boards: <u>https://www.terasic.com.tw/cgi-bin/page/archive.pl?Language=English&Categor</u> <u>yNo=163</u>

Key learnings from this session

- When you are working with an FPGA, you are describing hardware. This is very different to how we think about software development. If you are a programmer, approach this subject with an open mind and be prepared to learn a new development and thinking process.
- 2. When you are working with FPGA and a hardware description languages, things don't execute sequentially, or line by line, as they do in a software program.
- FPGAs excel in parallelism, but this does not mean that they are the right solution for every project. Look at the application that you are building and consider if an FPGA makes sense for it.
- 4. It's important to understand where FPGAs excel, and where microcontrollers are a better choice. The table below give a summary of this.

FPGA vs Microcontrollers

Feature	FPGA	Microcontroller
Cost	Typically more expensive than a comparable microcontroller.	In terms of programable functionality, one of the most cost effective solutions.
Power	Typically consume more power than microcontrollers.	Very effective in power management.
Processing Power	Able to perform multiple functions in parallel.	Limited in terms of parallel processing capability.
Design Flexibility	Peripherals are limited by number of gates for specific FPGA.	Less flexible in that only a specific number of peripherals are available.
Design Time	Significantly more than microcontrollers.	Less design time as peripherals are ready to use by writing to several registers.
Other Summit Resources

Our website contains additional resources. Just click on the links below to get to the relevant pages.

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