

Controllers for Astromechs Ideas to Reality

Michael Erwin



WARNING: This presentation might spoil some of the magic of the Droid room.

Feel Free to Leave...



Overview

 First Astromech Controller

 Classifications of Astromechs

 Why Have Controllers?

 Design Consideration


 Software

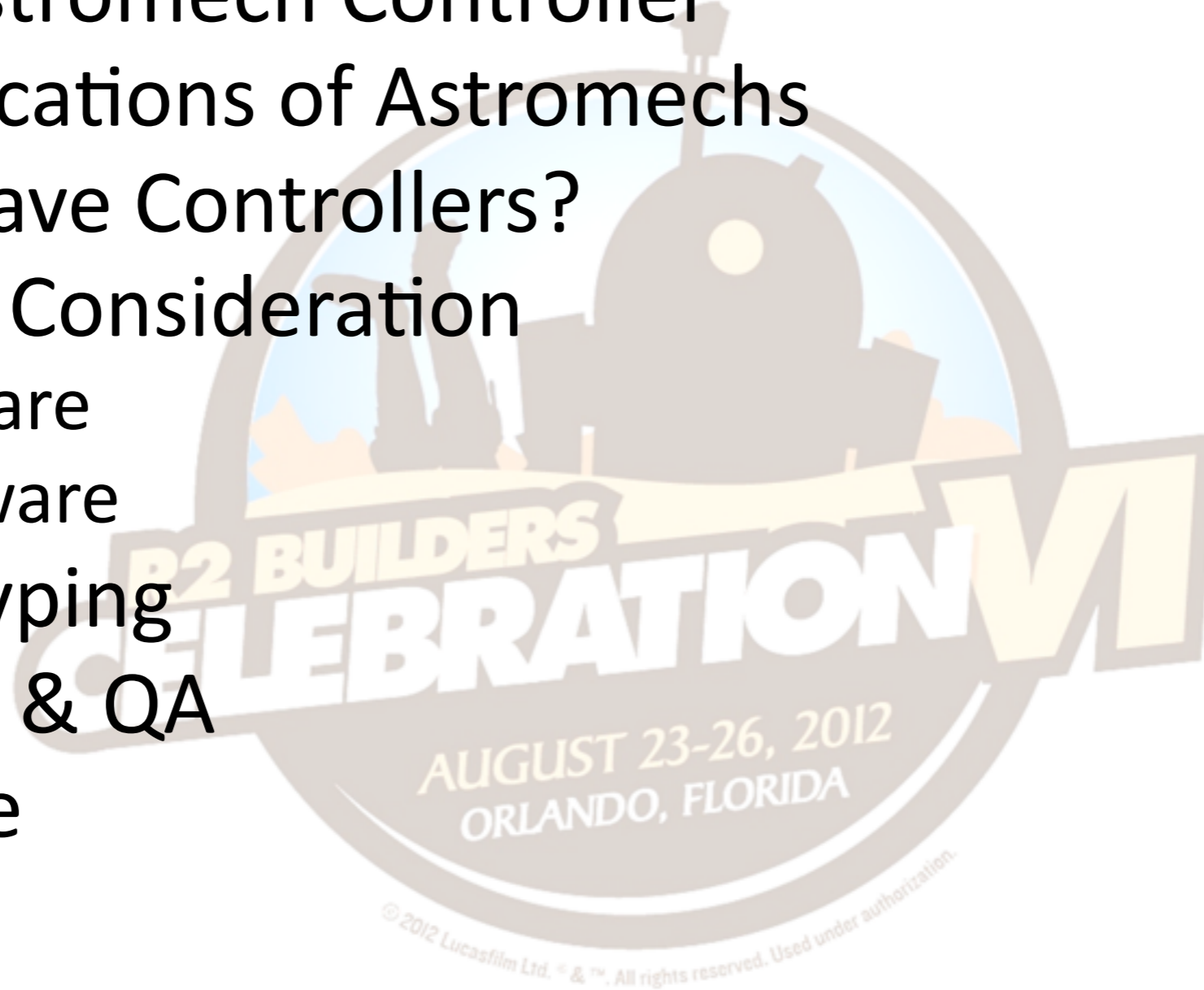
 Hardware

 Prototyping

 Testing & QA

 Release

 Q &A



First Astromech Controller

Kenny

Baker











- On set
- Tunisia

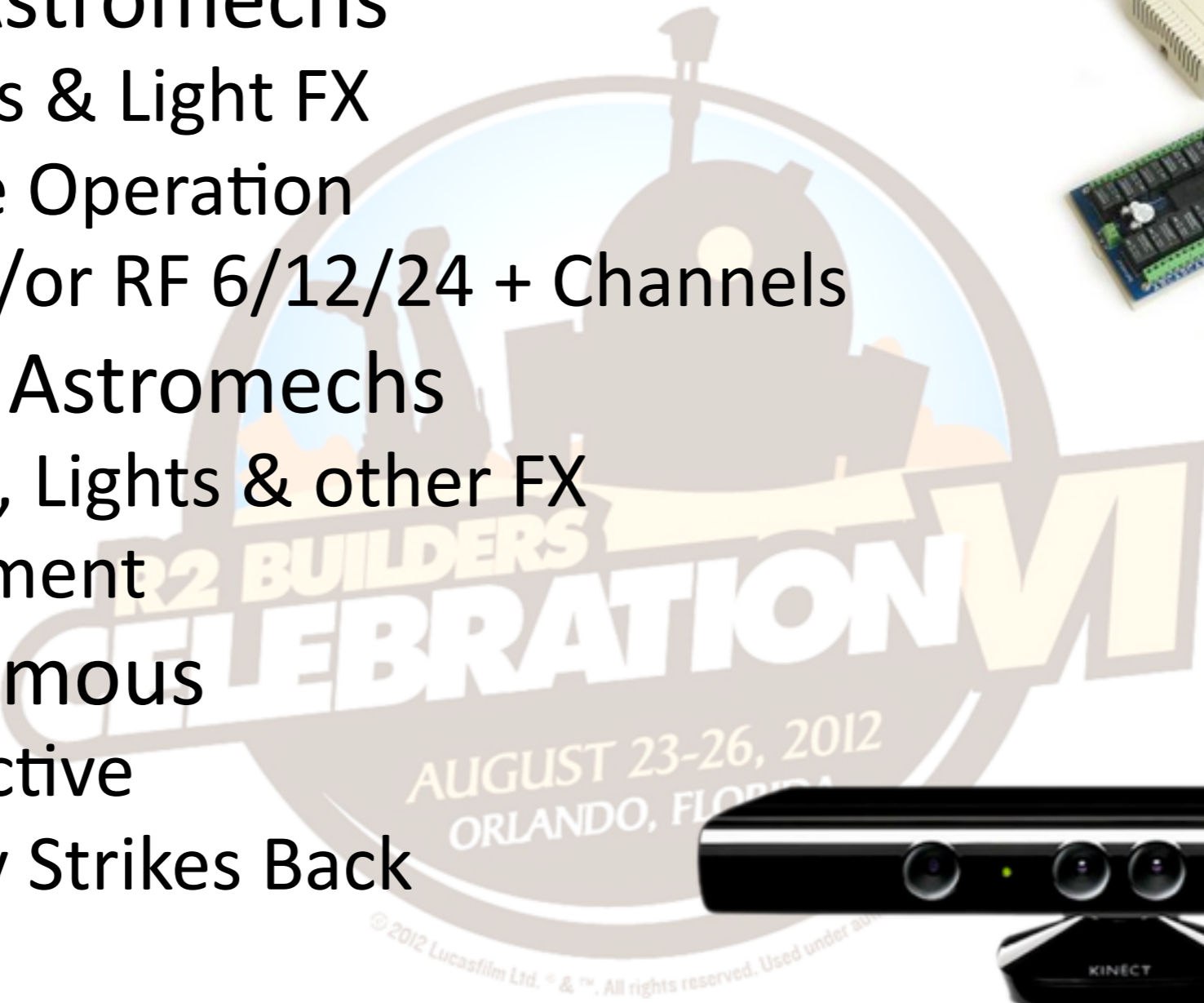


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Main Classifications of Astromechs

-  Static Astromechs
 -  Sounds & Light FX
 -  Simple Operation
 -  IR and/or RF 6/12/24 + Channels
-  Mobile Astromechs
 -  Sound, Lights & other FX
 -  Movement
-  Autonomous
 -  Interactive
 -  Reality Strikes Back



Why Have Controllers?

“Magical Interaction”

 For Control of Course!

 Puppetry

 Interaction

Sound Effects

 Where is Ben Burtt when you need him?

 George wants which sound? When?

 Where is R2 suppose to go?

Triggered Motorized Effects

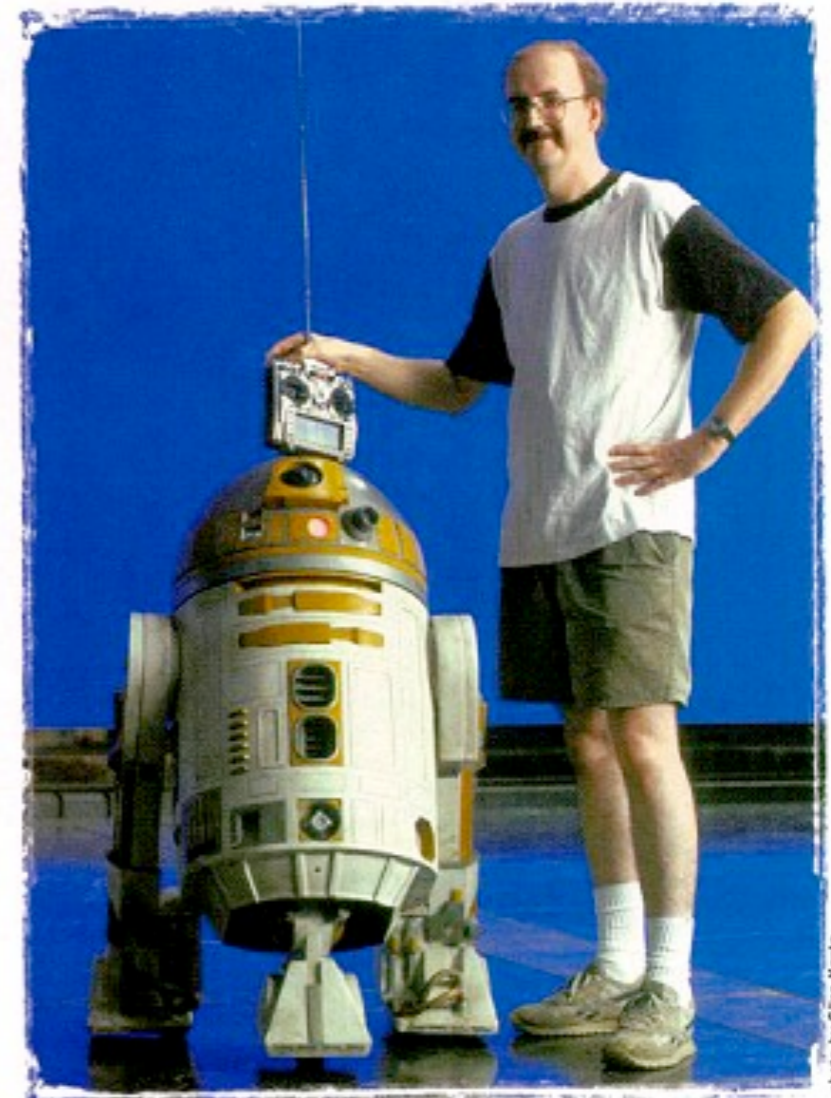
 Dome

 Lights

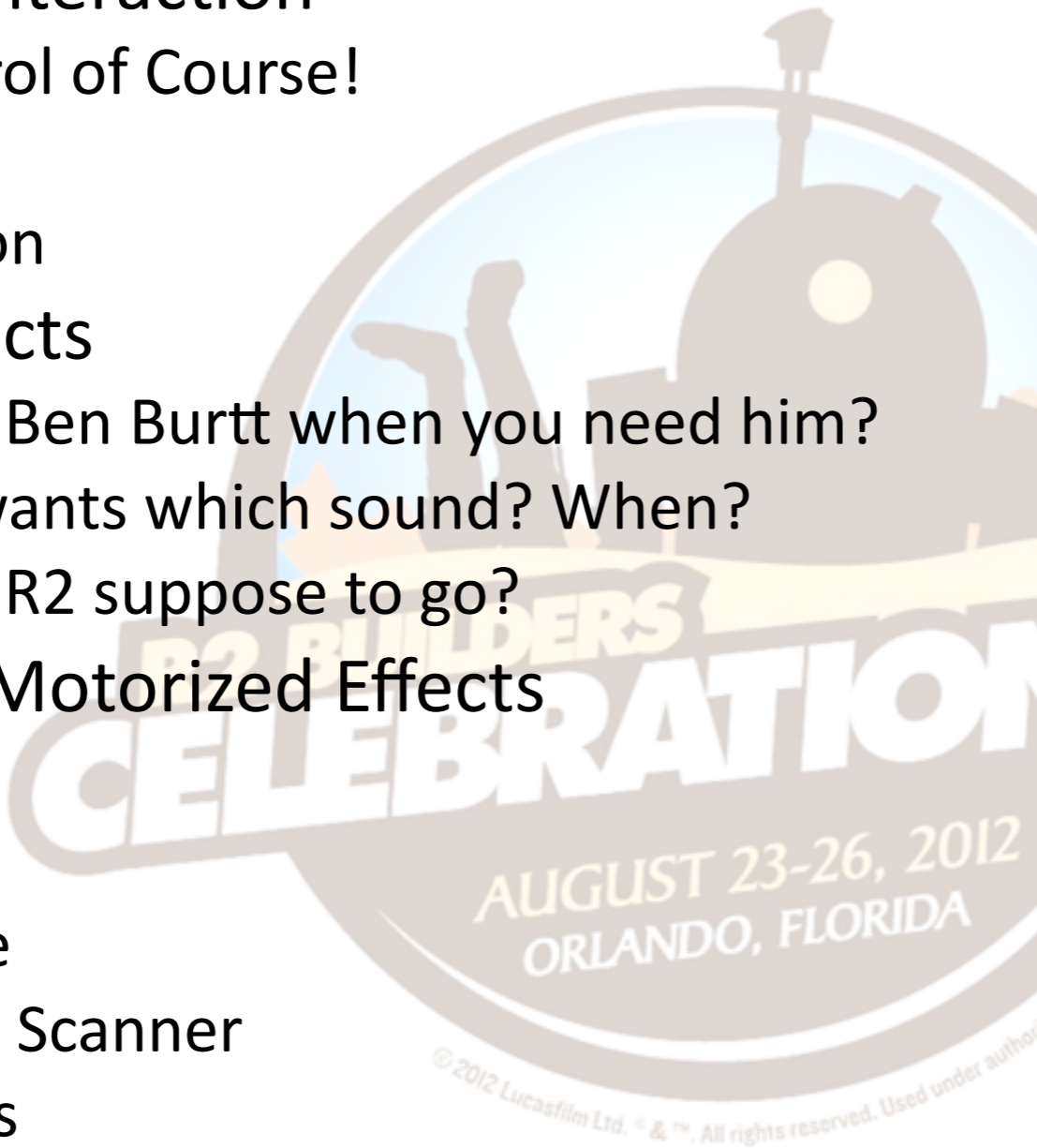
 Periscope

 Life Form Scanner

 CPU Arms



Uncle Don Bies
ILM Droid Wrangler



Droid RC Controllers

 Most Popular are Radio Control (RC)

 Off the shelf

 Futaba

 JR

 Hitec

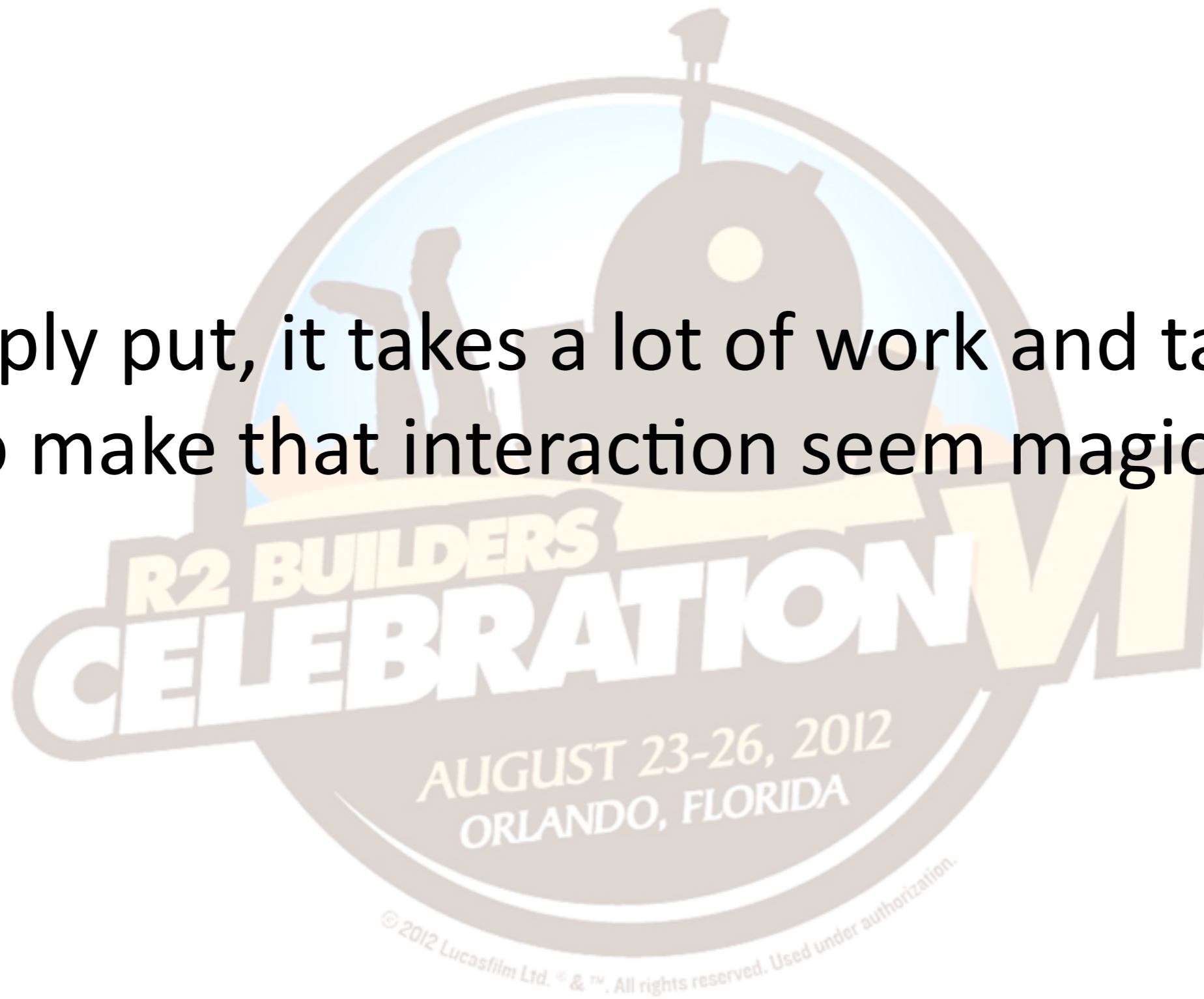
 Spektrum

 Fast & efficient integration into the droids

 We need to drive 3 to 30+ servos or devices!

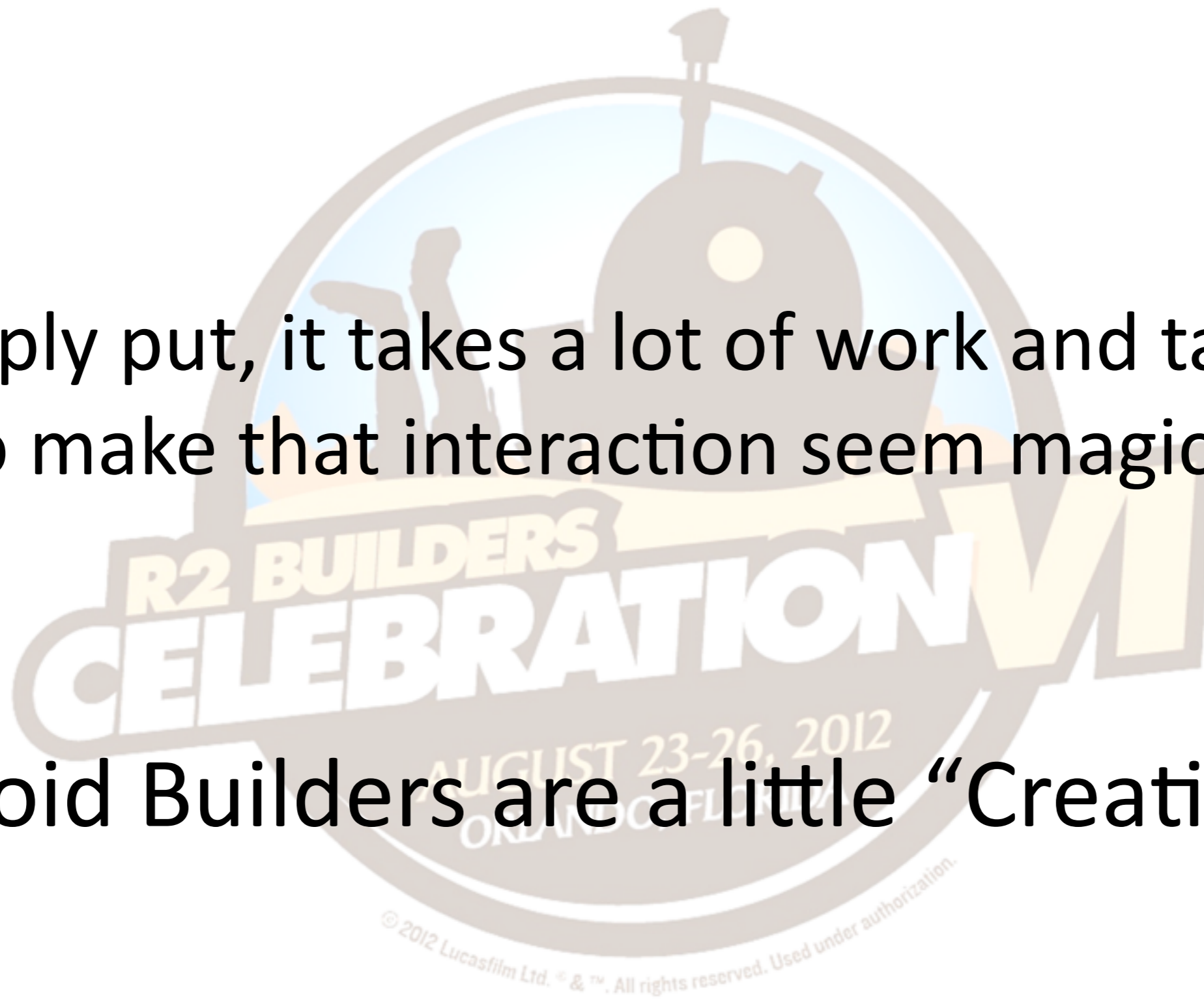


Simply put, it takes a lot of work and talent to make that interaction seem magical.













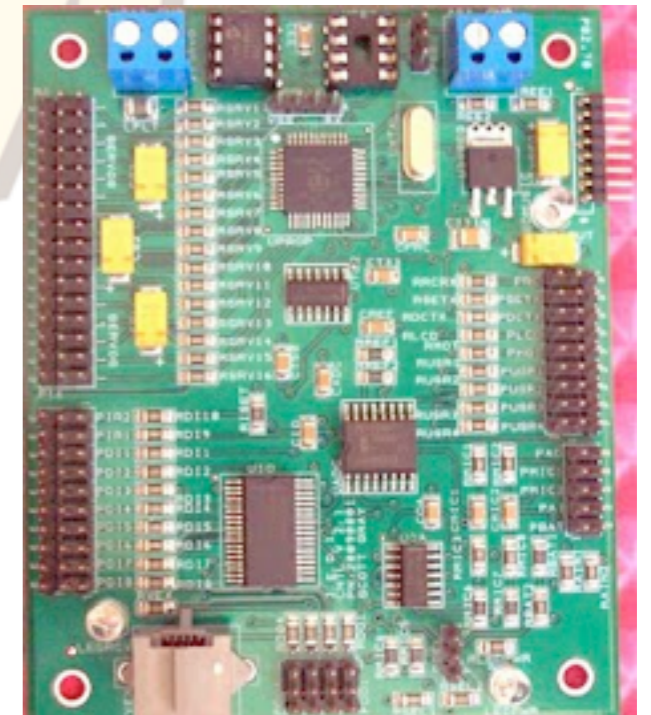
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Droid Builders are a little “Creative”



By the Builders for the Builders

-  Hybrid Customized RC Controllers
 -  Bolt on Additional Functionality
 -  Video Screen
 -  Unlimited possibilities
-  Joystick Enhanced Device Input – J.E.D.I.
 -  Scott Grey (AZSquib)
 -  First real RC Astromech “Controller”
 -  Uses RC Joystick “Strokes”
 -  Allows for FX, Audio, Logics, etc.
 -  JAWA Script Language



By the Builders for the Builders – cont.

 Bob Ross

 DroidCON - May 2011

 Luke's Droid Caller – Verbal Control



 You've got to see it in action



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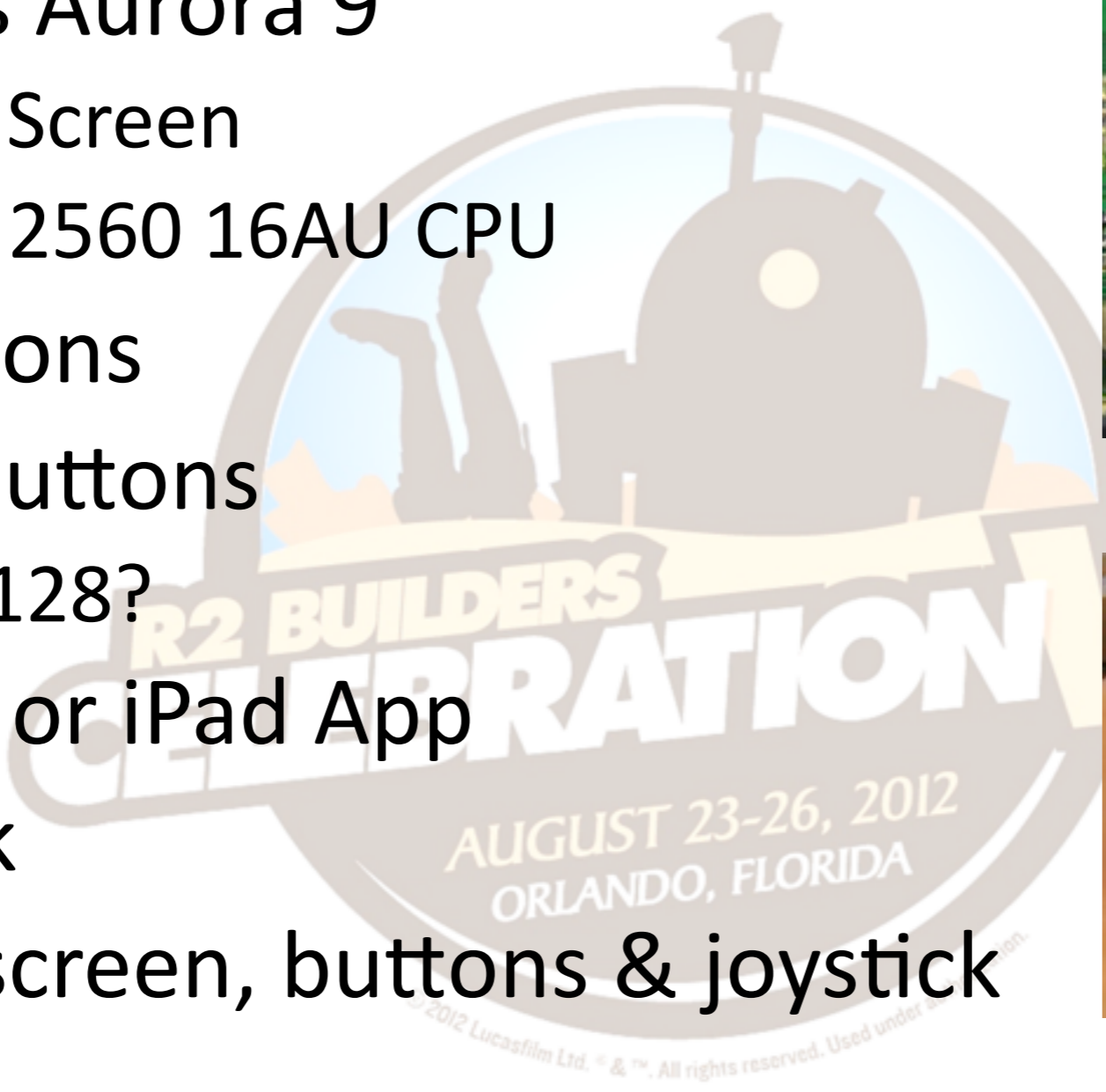
Design Considerations

-  Safe & Fault Tolerant
-  Autonomous Features
-  Easy to use
-  Easy to build
-  Modular, Expandable & Customizable
-  Obsolescence Avoidance
-  Open Source SW & OSHW
-  Creative Commons v3 SA BY
-  FCC Approved
-  Must provide “Magical” feel vs. “Radio Controlled”
 -  Rapid interaction with people
 -  Easy to hide










Prototyping Re-Use

-  Hi-Tec's Aurora 9
-  Touch Screen
-  Atmel 2560 16AU CPU
-  32 Buttons
-  More buttons
-  64 or 128?
-  iPhone or iPad App
-  Joystick
-  Touch screen, buttons & joystick



Testing & Quality Assurance

-  Can anyone build one?
-  Does it take an engineer to operate?
-  Can it be rock solid? Fault Tolerant?
-  Remember the Design Considerations?
-  Need a lot of testing from a variety of testers
-  Those that inspired it, should test it!
-  Investments Required - money & time

















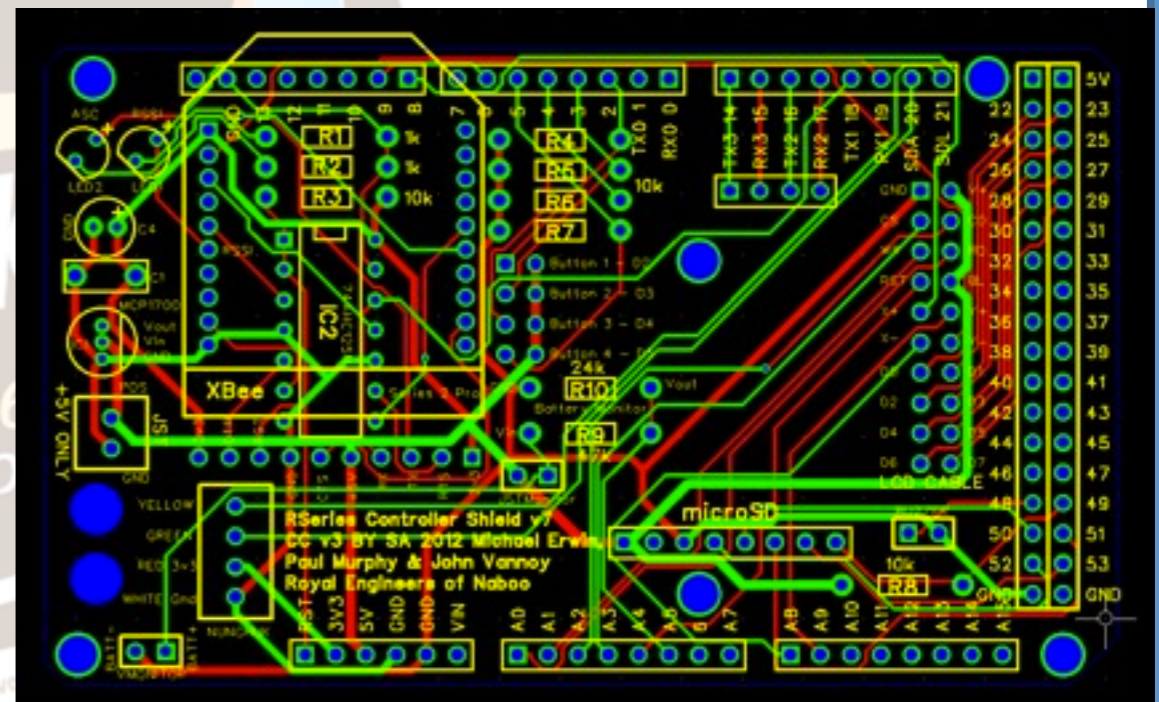
Announces the release of...
















RSeries Open Droid Controller

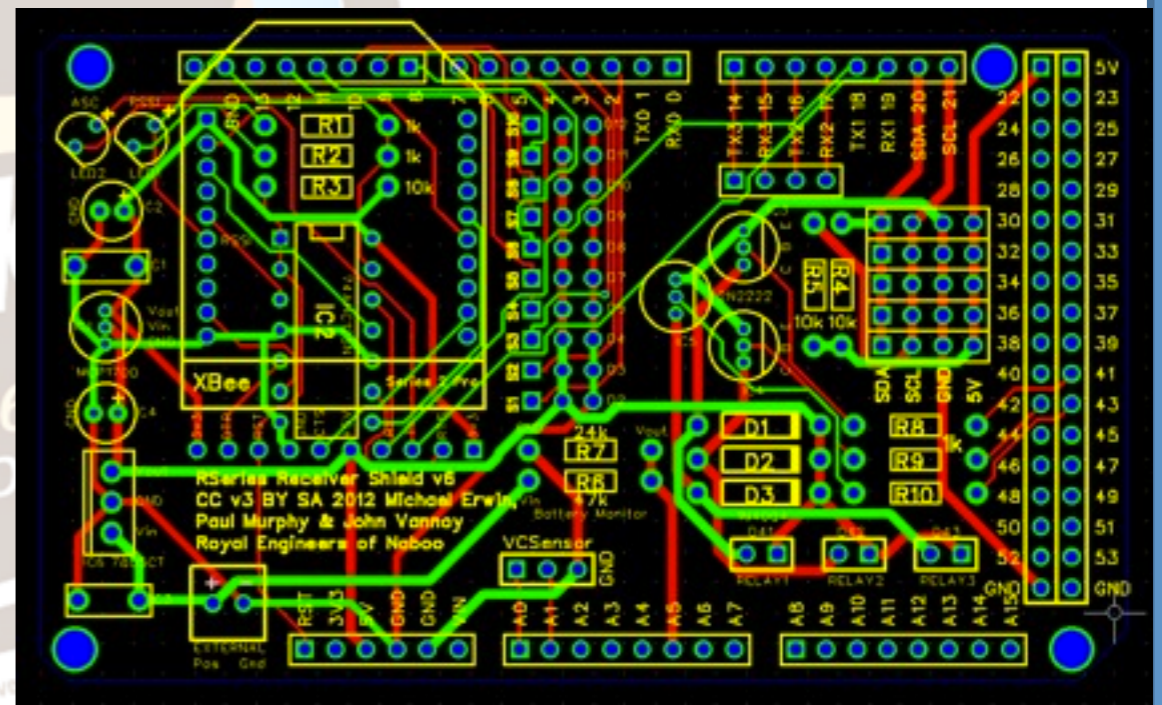


-  Arduino Mega 2560 Shield
-  NunChuck Input (i2c)
 -  Joy X & Joy Y (Motor Control)
 -  Accl X (Dome)
 -  zButton & cButton (FX)
-  2.8" TFT LCD Touch Screen (Optional)
-  Micro SD Card Configuration (Optional)
-  4 Additional Buttons (Optional)
-  850, 2000, 6000 mAh Li-Po (Optional)
-  Modular Charger - USB Micro!
-  Battery Voltage Monitor
-  Warning Buzzer
-  Xbee 2 Pro 2.4Ghz
 -  1.5 Mile Range
 -  FCC Approved
 -  1000s of Droids can co-exist



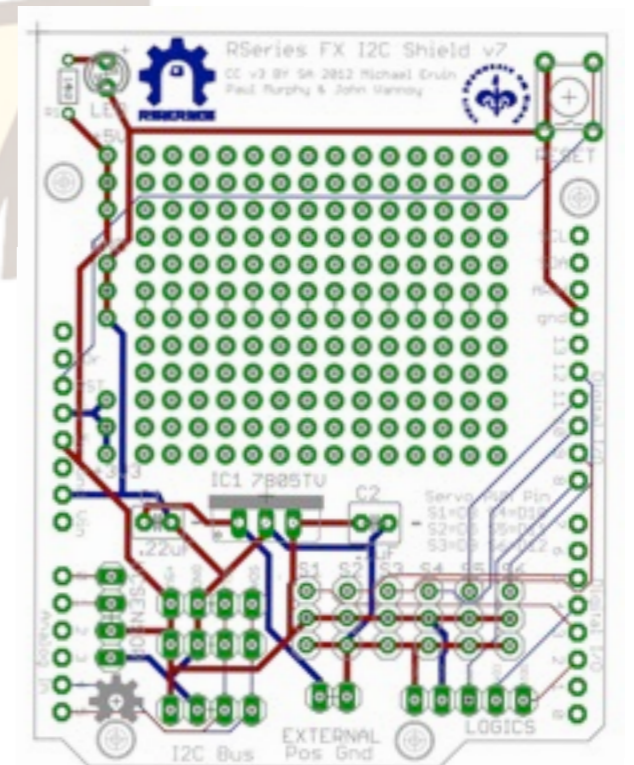
RSeries Droid Receiver

-  Arduino Mega 2560 Shield
-  10 Servos
-  Relay Control (3)
-  i2c FX Bus Connectors (5)
-  2 Serial Ports
-  VC Sensor Input
-  Associate & RSSI LEDs
-  2 Onboard Voltage Regulators
-  3v3 Logic Shift Converter
-  Power Supply Monitor
-  External Power Input
-  Xbee 2 Pro – FCC Approved
 -  Doesn't require removal to program via USB



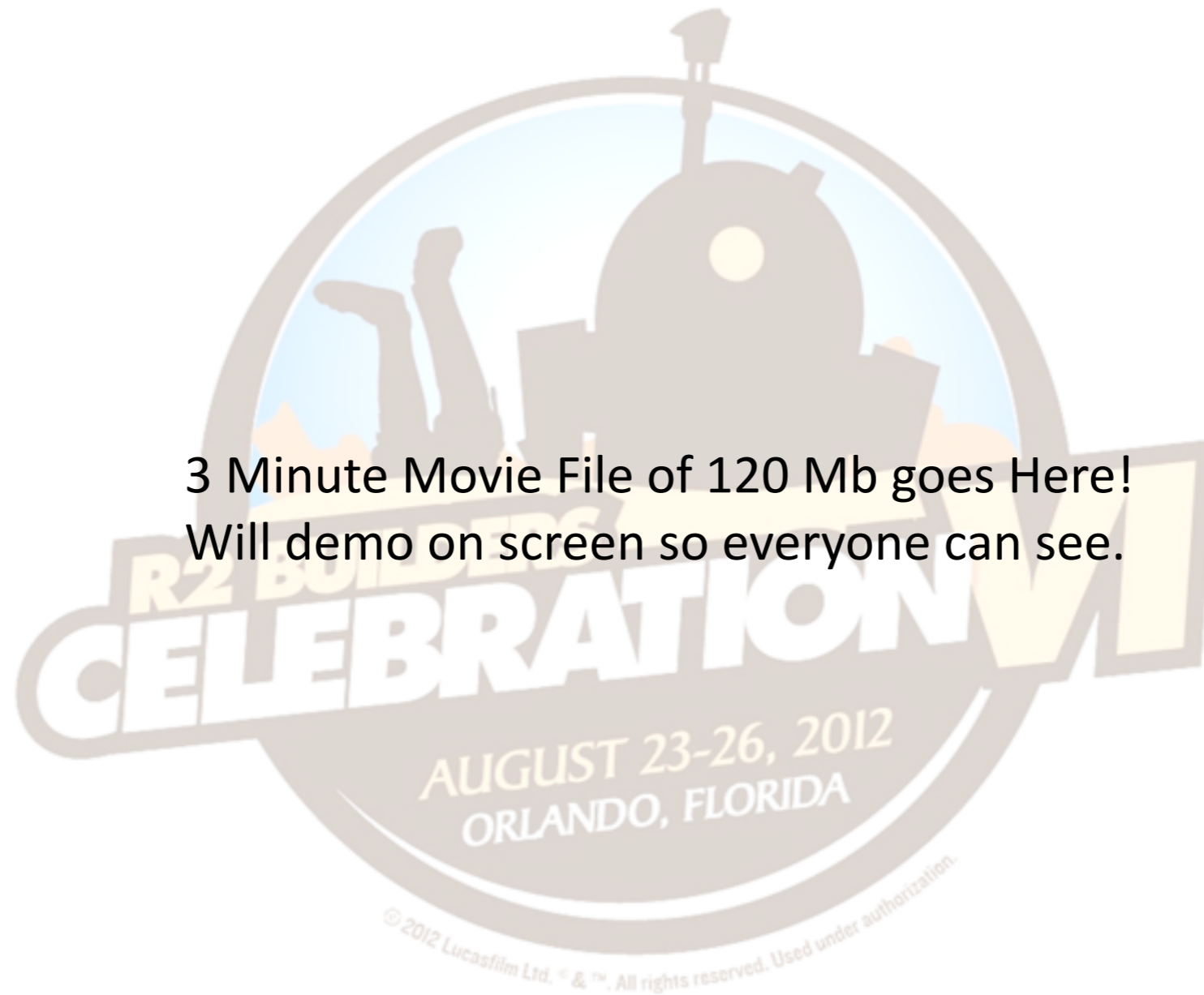
RSeries FX i2c Shield

- 👤 Arduino Uno Shield
- 👤 6 Servos per Module
- 👤 Teeces 7219/7221 Logics Control
- 👤 3 x i2c Bus (2 Headers, 1 Terminal)
- 👤 Voltage & Current Sensor
- 👤 On board 1.5 amp 5v regulator
- 👤 Prototyping Area
- 👤 External Power Input (<30 volt)
- 👤 Stackable with MP3 Modules, etc.
- 👤 127 addressable i2c Module via SW
- 👤 This is the real power of the design!











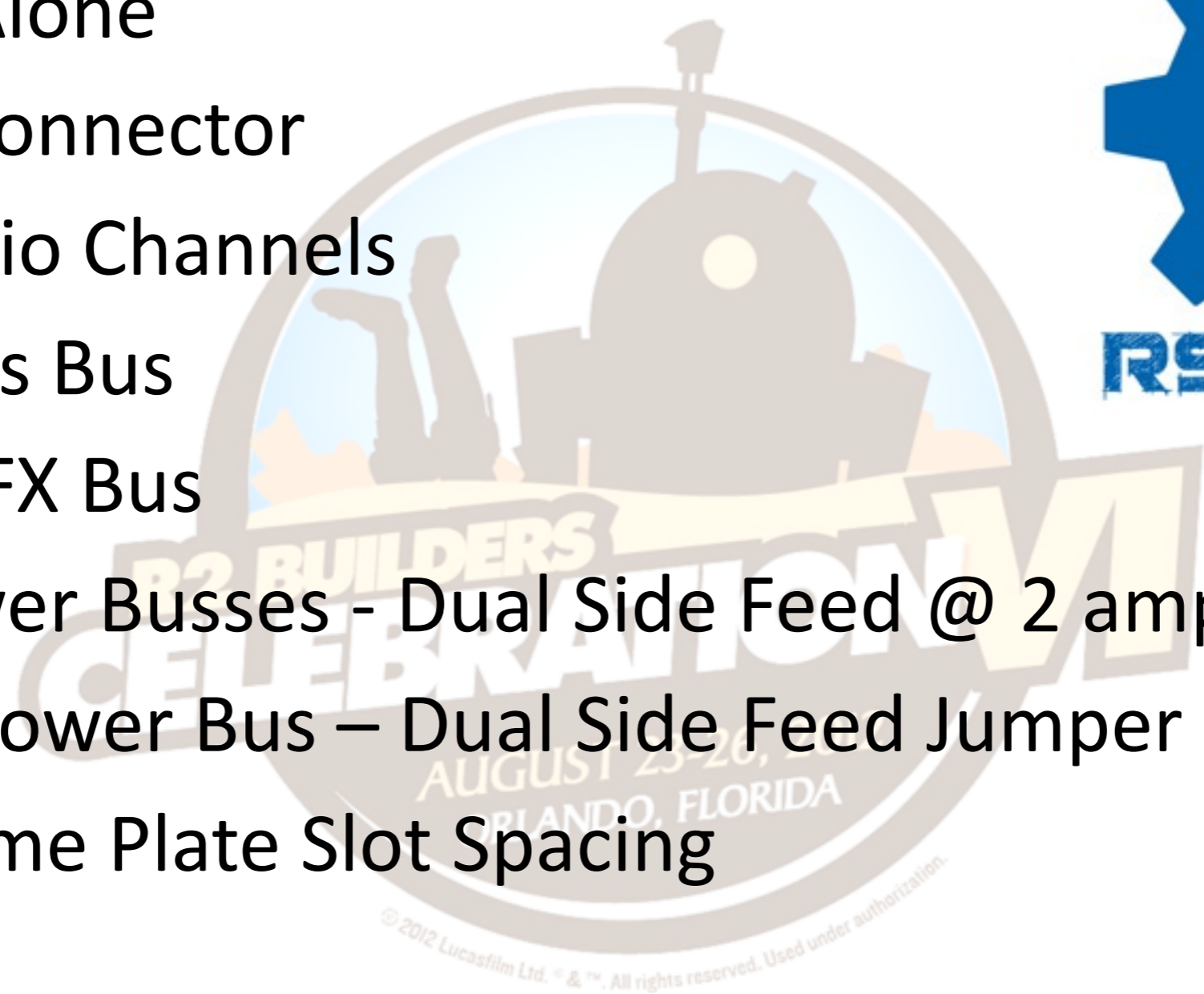
RSeries Demo Time

3 Minute Movie File of 120 Mb goes Here!
Will demo on screen so everyone can see.



RSeries 24 Wire Slip Ring Interface









-  Stand Alone
-  DB25 Connector
-  4 x Audio Channels
-  6 Servos Bus
-  2 x i2c FX Bus
-  2 x Power Busses - Dual Side Feed @ 2 amps
-  Servo Power Bus – Dual Side Feed Jumper Selectable
-  Fits Dome Plate Slot Spacing



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i2c Secret Sauce

-  Multiple Masters
-  127 Addresses
-  Master to Master Networking
-  Allows for large servo #s
-  125,984 to be exact
-  1,035 a single i2c bus
-  i2c Address Reservation List
-  Easy Expansion & Functionality



i2c Compatible Devices

 Adafruit.com

 DIY Kits

 16 Channel 12bit Servo

 Real Time Clock

 LCD, LED & VC Sensors

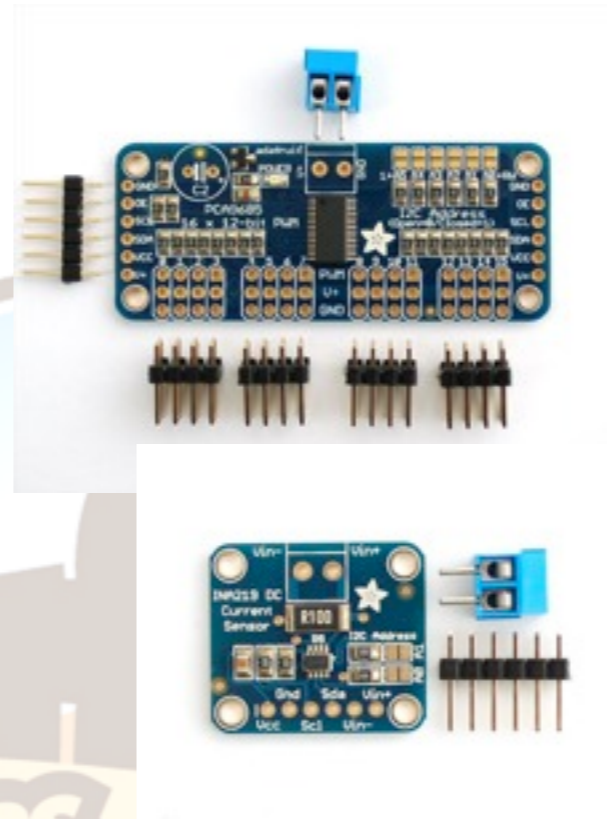
 Sparkfun.com

 BlinkM RGB LEDs

 Expansion Ports

 EEPROM Storage

 Cellular/GPS/SMS











R2 BUILDERS
CELEBRATION VI

AUGUST 23-26, 2012
ORLANDO, FLORIDA

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Additional RSeries Modules

-  Charging Bay Indicator Logics
-  Measures & displays battery stats
-  Fits Com8, JoyMonkey & A&A SK-10
-  A&A SK-11 Data Port Logics
-  Holo Projector GOBO
-  Periscope Logics
-  All files are available on Astromech.net
-  Watch Astromech.net for future enhancements and new modules.



Thank the Maker for...

-  Bob Ross, Scott Grey, Blake Mann & Ben Lewitt @ DroidCon 2011
-  John Vannoy (Teeeces)
-  Paul Murphy (JoyMonkey)
-  Guy Vardaman
-  Chris James
-  Brett Bourbin (Selgus)
-  Greg Tracy (PixelFiend)
-  Cory Pacione (Artoo-De-Dum)
-  Dave Everett & R2 Builders Council



<http://code.google.com/p/rseries-open-control/>

The screenshot shows a web browser window displaying the project page for "rseries-open-control" on Google Project Hosting. The browser's address bar shows the URL "http://code.google.com/p/rseries-open-control/". The page header includes the project name "rseries-open-control" and the subtitle "RSeries Open Controller & Receiver System". Below the header, there are navigation tabs for "Project Home", "Downloads", "Wiki", "Issues", and "Source". The main content area is divided into two columns. The left column contains sections for "Project Information", "Members", "Featured", "Downloads", "Wiki pages", and "Links". The right column contains a detailed description of the project, including requirements, design details, and build information. The browser's address bar and search bar are visible at the top.

Project Information

Recommend this on Google

[Project feeds](#)

Code license
[GNU GPL v3](#)

Content license
[Creative Commons 3.0 BY-SA](#)

Labels
Arduino, R2-D2, Astromech, R2Builders, XBee, Wireless, Touchscreen, Robotics, Nunchuk, rMP3, RogueRobotics, Adafruit, digi, Series2

Members
[joymonkey](#), [jmvan...@gmail.com](#), [michael...@mac.com](#), [gvarda...@gmail.com](#)

Featured

Downloads
[FX2 v4.zip](#)
[RSeries_Controller_v7_CAM.zip](#)
[RSeries_Data_Port_v4_CAM.zip](#)
[RSeries_FX_I2C_Shield_v8.zip](#)
[RSeries_Receiver_v6_CAM.zip](#)
[RSeries_Controller_v038.zip](#)
[RSeries_Receiver_AudioFX1module_v008.zip](#)
[RSeries_Receiver_AudioFX2module_v008.zip](#)
[RSeries_Receiver_v021.zip](#)
[Show all >](#)

Wiki pages
[Controller](#)
[Overview](#)
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Links

External links
[Astromech.net](#)
[R2 Builders Yahoo Group](#)

An Arduino based controller, transmitter and receiver system for Astromech R-Series droids.

Requirements: Arduino IDE 1.0 is required. Digi XBee Series 2 operating API 2 mode, Pro series is optional & encouraged. Series 1 & 2.5 or clones are not supported, however may work with code changes.

Arduino Mega 2560 or better are needed for the Controller and Receiver due to variable memory requirement.

The design is a very modular, RF controller & receiver with optional additional modules. The RSeries receiver can operate as a centralized or distributed depending on your requirements.

The RSeries Controller & Receiver are shields that fit Arduino Mega 2560 [R1](#) to [R3](#), while the I2C FX Module is a Arduino Uno shield for [R1](#) to [R3](#) as well.

The SlipRing Interface, is a stand alone upto 24 Wire SlipRing interface at 2amps to pass signals, (Servo, Audio, I2C & Power) between the Dome & Body of the astromech via the slip ring via DB-25 connectors.

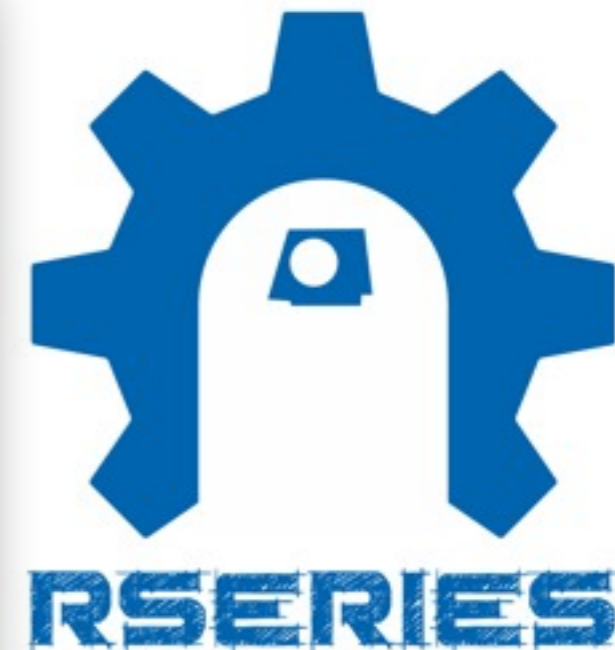
Some may just wish to use Controller/Receiver combination to trigger "Events" or actions in their astromech, and not actually control their droid motive systems.

It is possible to control other RC receivers, i.e. Spektrum & Hitec Aurora, with this effort, however that is currently outside of the scope of this project.

Digi XBee Series 2 are required to be running in API 2 mode.

PCB CAM/Gerber Files are also available for Download for submission to PCB fab houses, and we highly recommend pcb.laen.org.

Build time ranges from 3hrs to 6hrs with all modules.



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