EXPLORING STEM

Crescent College
Comprehensive
November 2018

Presented by
Brendan Ryan and Ronan Carr

WHO ARE WE?

Brendan Ryan

- From Kilfeacle, Co. Tipperary
- Studied Electronic Engineering in UL
- Software engineer for over 25 years including 8 years with Fujitsu in Japan, currently working for Intel in Shannon

Ronan Carr

- From Ardnacrusha, Co. Clare
- Attended Crescent from 2008-2014
- Studied Electronic & Computer Engineering in UL
- Recent college graduate, currently working for Intel in Shannon

WHY ARE WE HERE?

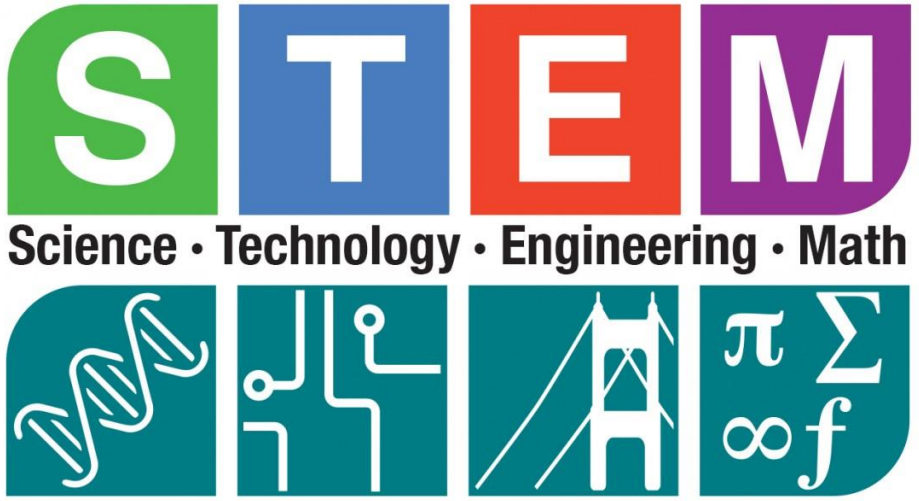
We believe in the importance of **STEM**

Science

Technology

Engineering

Mathematics

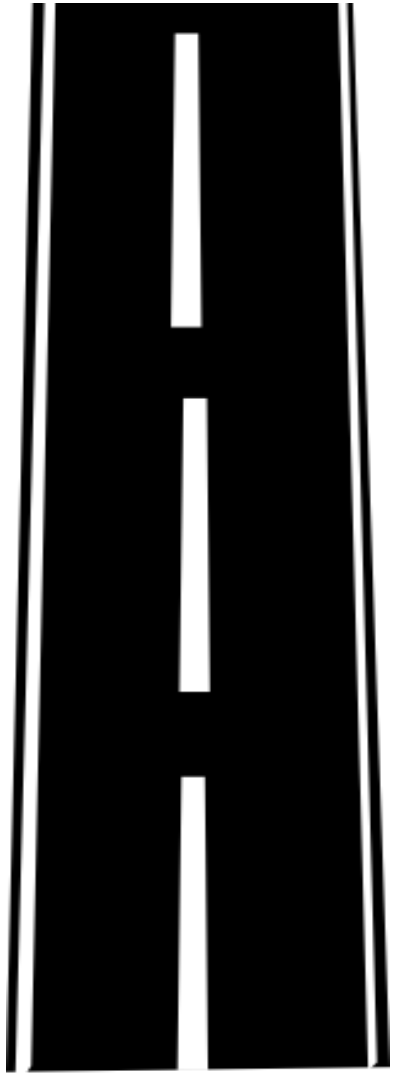


Problem Solving & Critical Thinking is …

- … a vital life skill in the 21st century
- … good for your future job prospects
- … good for the Irish economy and society

Software development (i.e. coding) is one key component of STEM

MY STEM JOURNEY

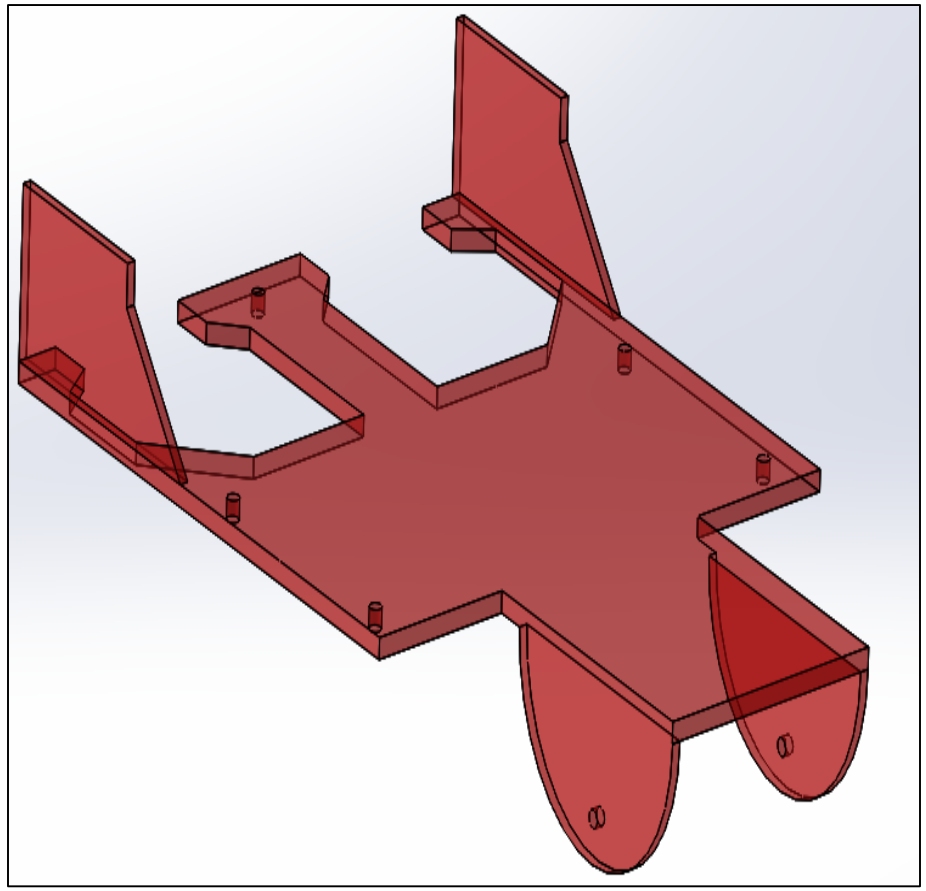


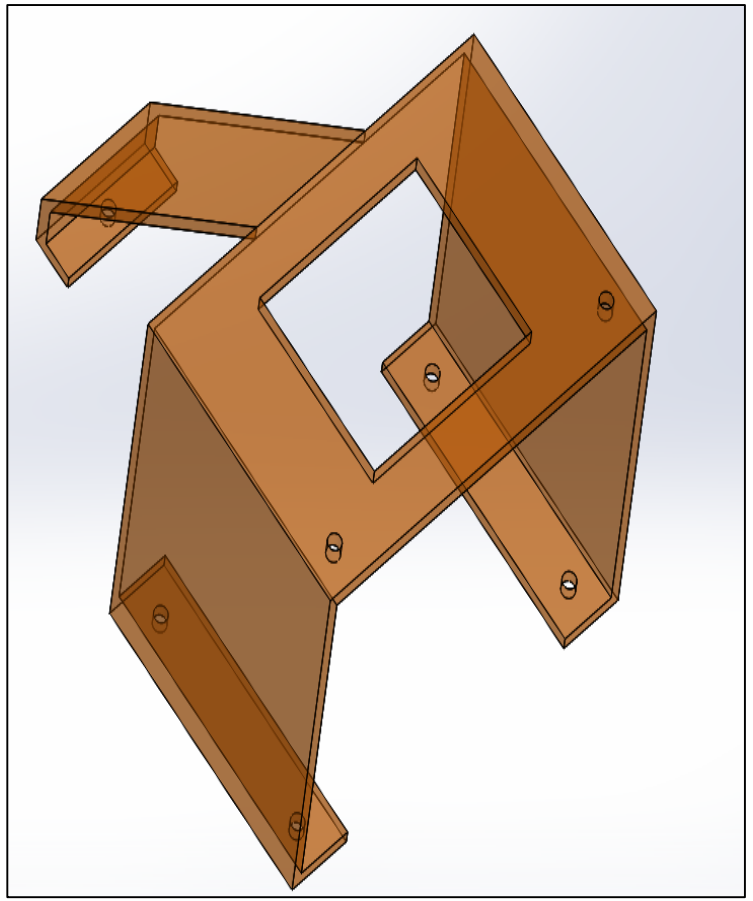
Began at Crescent…

- Loved theoretical & practical subjects

(e.g. physics, mathematics, metalwork, woodwork)

METALWORK…

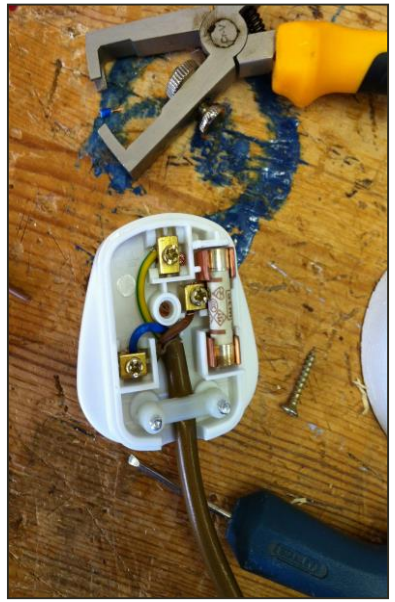


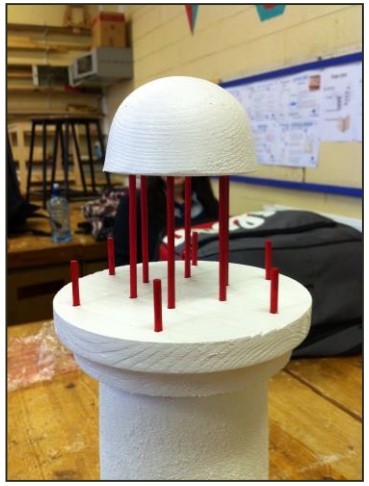


… learning computer aided design (CAD) i.e. SolidWorks

… learning how to operate tools & machinery

WOODWORK...





… learning project management

… learning basic circuitry electronics i.e. wiring a plug

WHICH COLLEGE COURSE?

During transition year I …

- …was determined & researched
- …visited the university info nights
- …asked lecturers questions

Advice: Be proactive = research courses and ask questions!

Advantages

- Tailor your subjects accordingly
- Fulfil requirements
- Points target

WHY ENGINEERING?

I was …

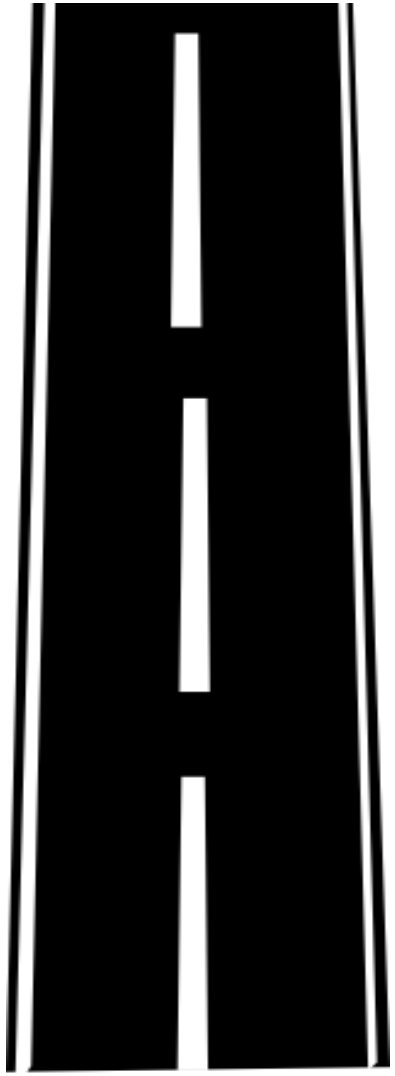
… curious

… enjoyed problem solving & relished challenges

… always interested in technology

Bonus - good opportunities and job prospects

MY STEM JOURNEY



Began at Crescent…

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(e.g. physics, mathematics, metalwork, woodwork)

Continued at university…

- Studied Electronic & Computer Engineering at UL

(e.g. software, hardware)

HARDWARE VS SOFTWARE

WHAT IS COMPUTER HARDWARE?

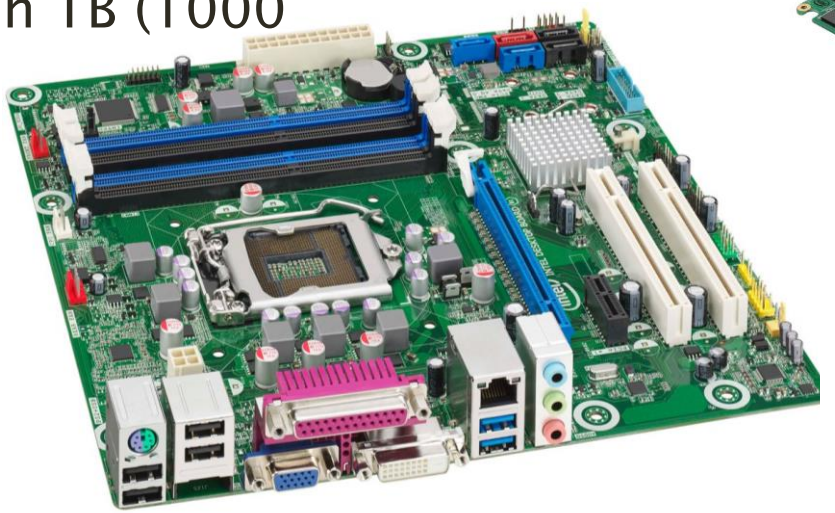
Processor (or CPU)
- Programmable – this is where the software runs!
- Speed measures in GHz

Memory (or DRAM), for short-term "volatile" storage
- Retains data only while computer is powered on
- Size measured in GB, usually 4 or 8GB for a laptop these days

Disk (HDD or SSD), for long-term persistent storage
- Retains data even when computer is powered off
- Size measured in GB (1 billion bytes), or even TB (1000 GB)

Power Supply and/or **Battery**

Input/Output Devices
- Integrated
- Connected via USB, Bluetooth, etc.



WHAT IS SOFTWARE?

Software tells hardware what to do

- The processor is the “programmable” part of the hardware

Processor understands primitive “machine language”

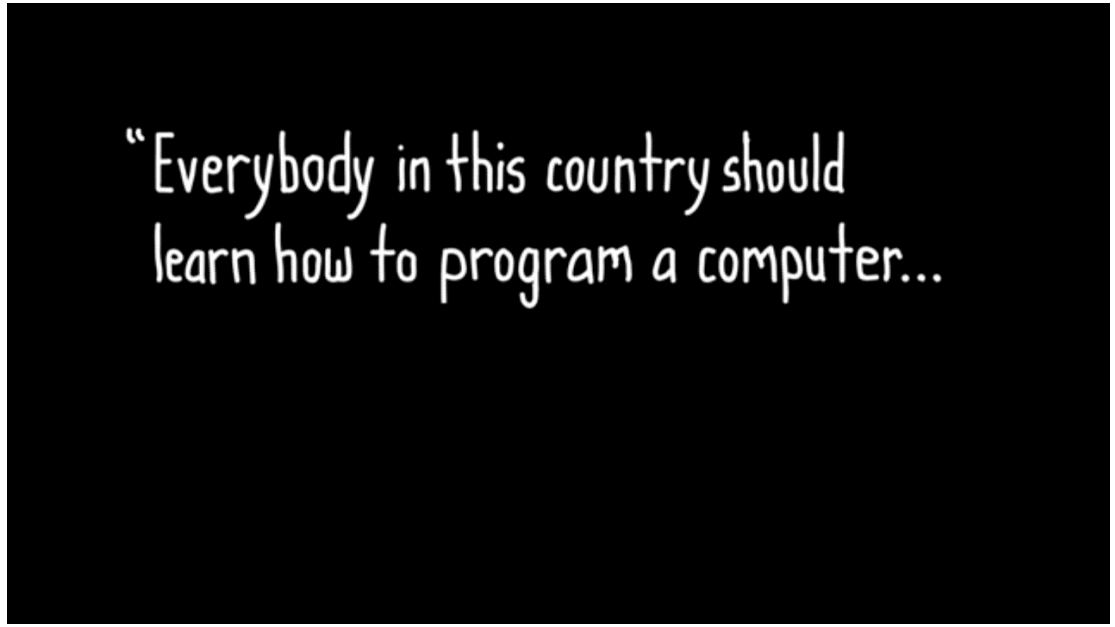
- Load from memory or store to memory or device
- Simple arithmetic operations like add, subtract, multiply, divide
- Branch (jump to a different location)
- Conditional Branch (jump to a different location if a certain condition is true)

With these simple primitives, you can implement any software application!

Most people program computers using higher level coding languages – My job ☺

CODING

WHY CODING? – ITS EVERYWHERE

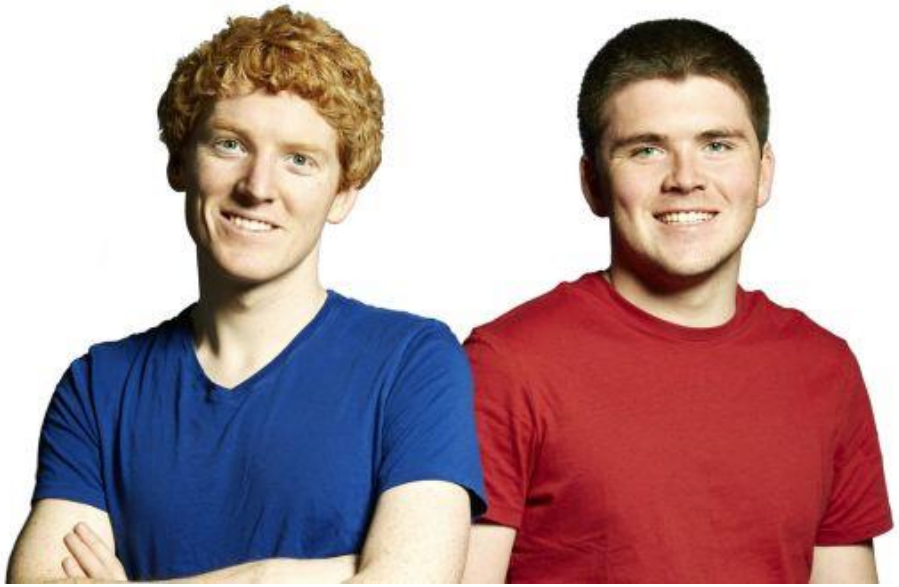


Hear from

- Bill Gates (created Microsoft)
- Jack Dorsey (created Twitter)
- Mark Zuckerberg (created Facebook)
- Will.I.Am (created Black Eyed Peas)
- … and many others

"Computer Coding - What most schools don't teach", The Attorney Depot™, https://www.youtube.com/watch?v=nPblG6ceqOs

ANYONE RECOGNISE THESE GUYS?



Patrick & John Collison

Brothers, from Limerick

Attended Castletroy College

2005: Patrick won the BT Young Scientist and Technology Exhibition, aged 16

2007: Setup Shuppa (pronounced “siopa”), selling software to optimize sales on auction sites like eBay

2008: Sold Shuppa (now Auctomatic) for €3 million

2009: John completed Leaving Cert

2010: Setup Stripe, an online payments company

2016: Stripe valued at €9 billion. Each brother worth €1 billion

The next Irish tech billionaires could be in this room!

OR THIS PAST PUPIL?

Chris Kelly

From Clarina, Co. Limerick

Crescent past pupil

2014: Cansat participant

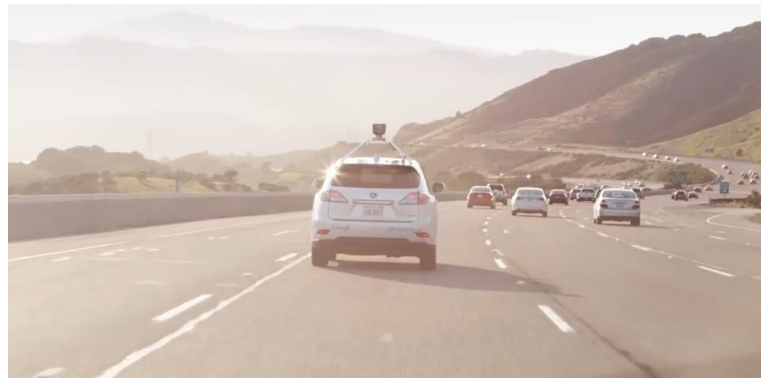
2015: Completed LC

2016: Founded Talamh – agricultural technology

2017: Founded Pinpoint Innovations – Healthcare technology

2017: Winner of Limerick's best young entrepreneur

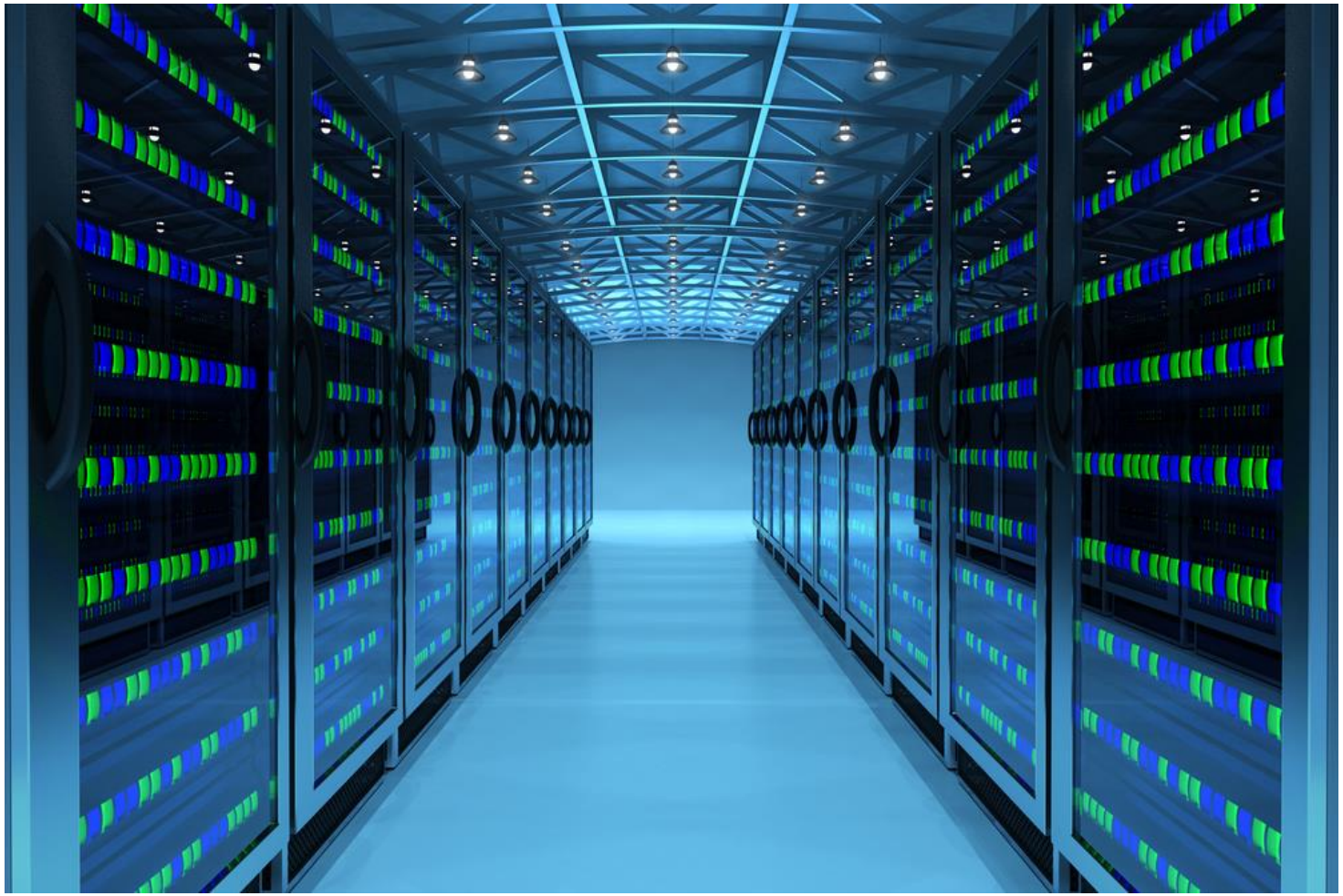
SOFTWARE RUNS ON ALL THESE DEVICES



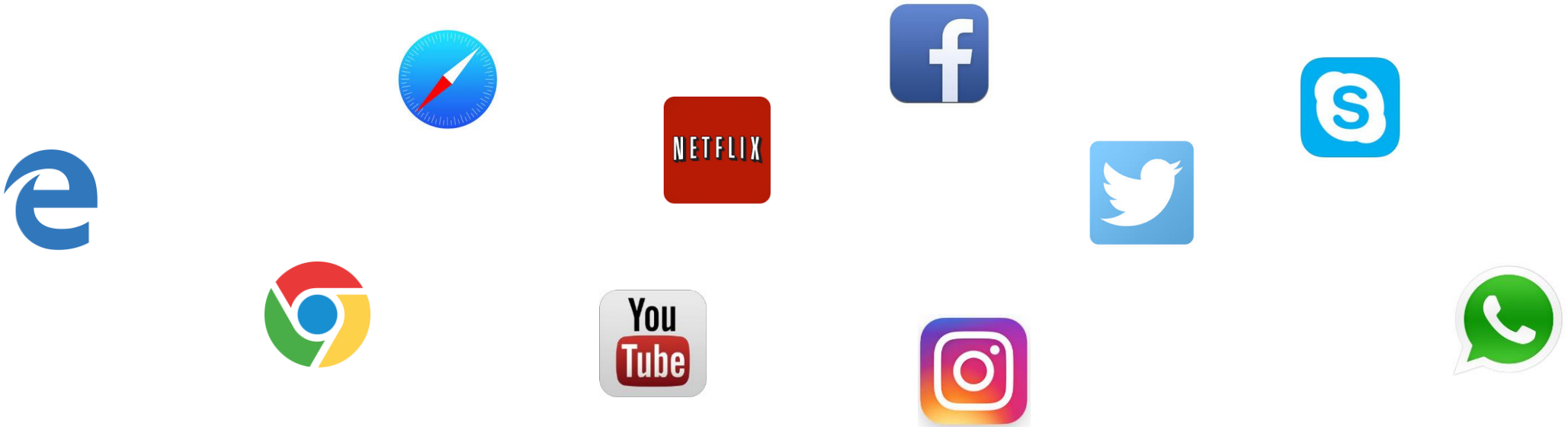
… AND IN THE CLOUD!

Network

Data Center



SOFTWARE: OPERATING SYSTEMS, APPLICATIONS, APPS



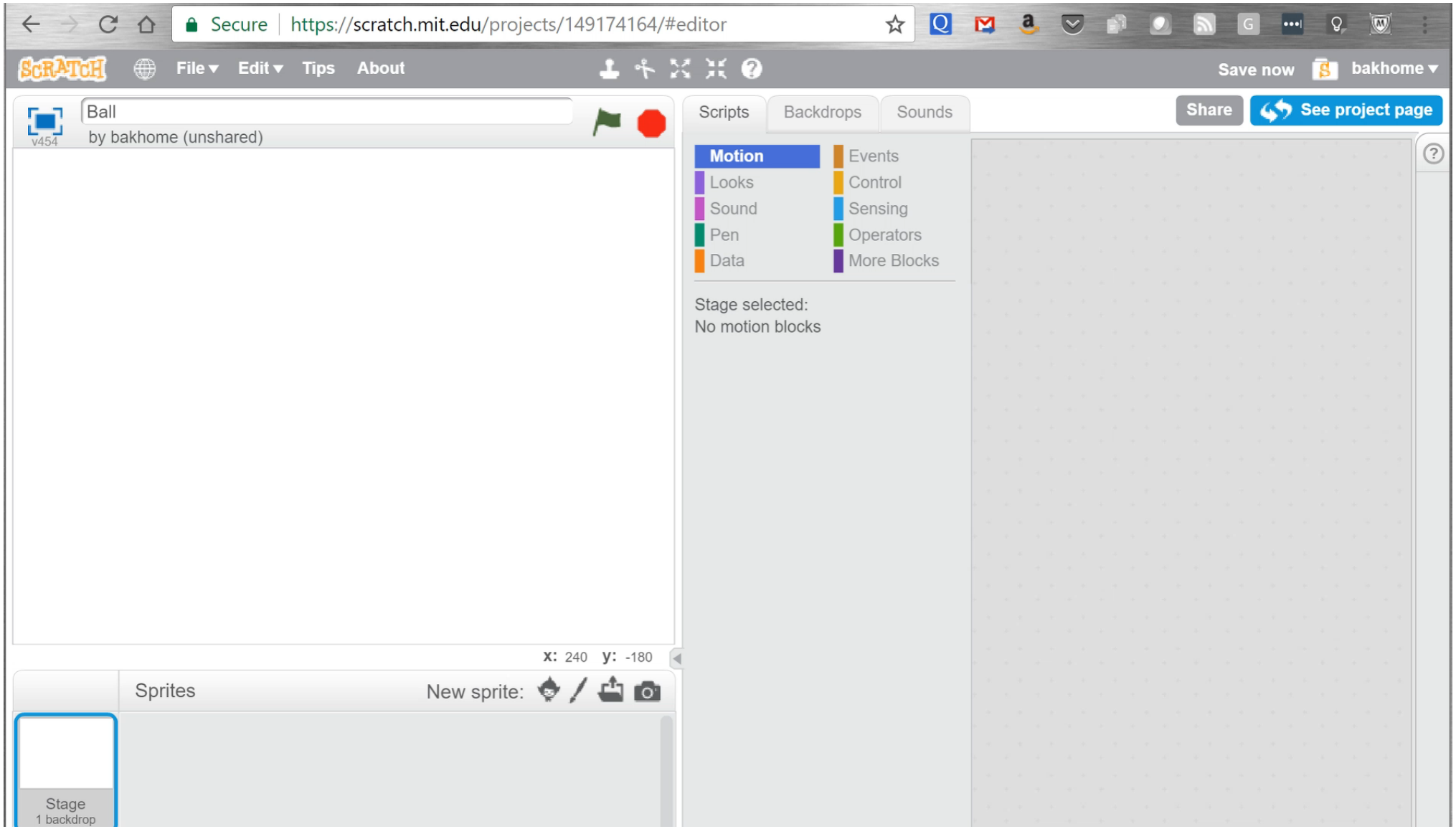
HIGHER LEVEL PROGRAMMING LANGUAGES

Language	Where it's used
Scratch	Visual programming language used for teaching programming
Java	One of the most popular programming languages, used for Android Apps and client-side web applications
Python	Scripting language for web programming and desktop applications
Swift	Used for programming iOS Apps
C	Used for operating systems, server-side applications
C++, C#	
JavaScript	
HTML/CSS	"Hyper Text Markup Language" used for creating web pages, "Cascading Style Sheets"

Not enough time today to teach you a language
Will give examples from Scratch and Java

SCRATCH

VISUAL PROGRAMMING



ANDROID APP DEVELOPMENT WITH JAVA

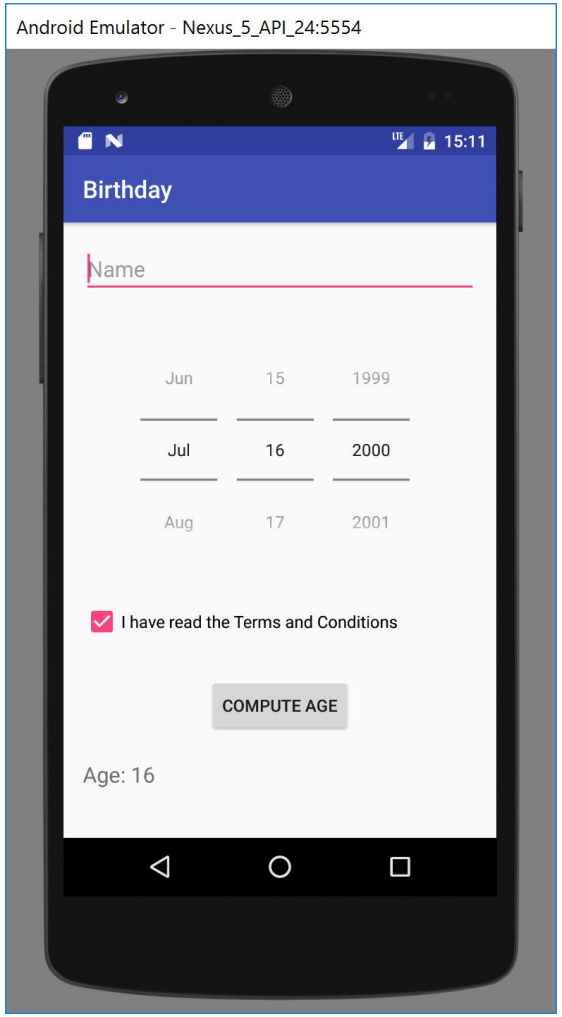
PROGRAMMING GRAPHICAL USER INTERFACES (GUIS)

Elements

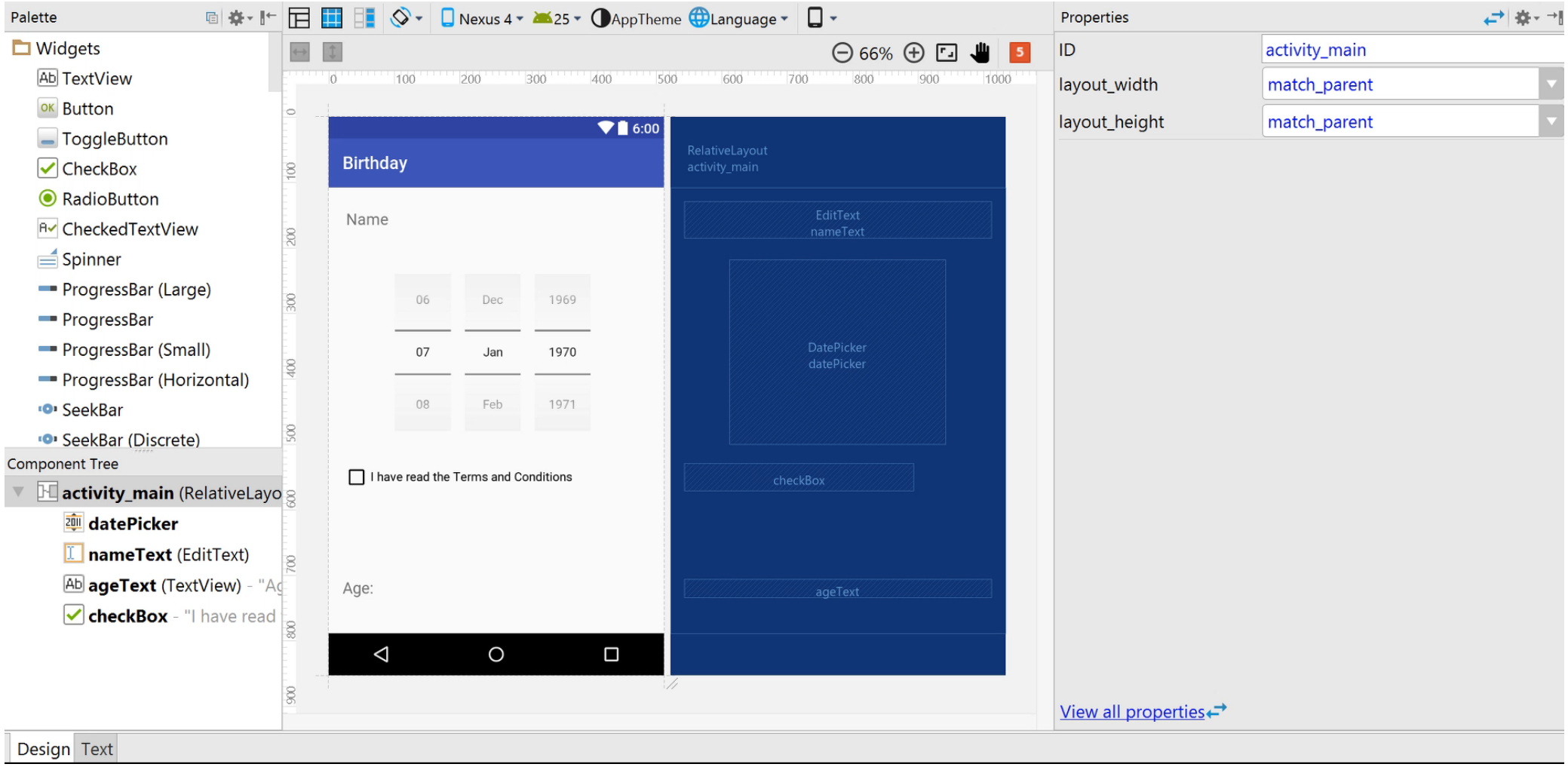
- EditText (for text input)
- DatePicker
- Checkbox
- Button
- TextView (for text output)

Each has properties

- Appearance
- Text
- Function to call on specified events



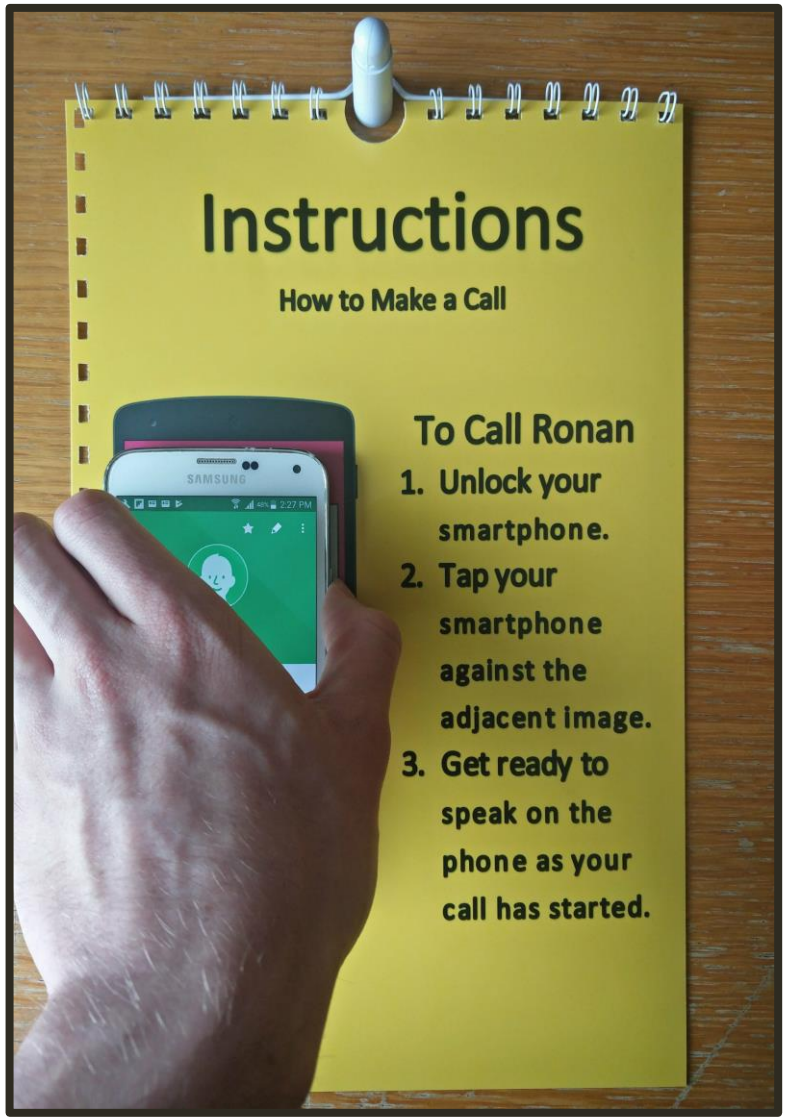
DRAWING THE USER INTERFACE



CODE TO HANDLE BUTTON CLICK

```
public void computeAge(View view) {
    DatePicker datePicker = (DatePicker) findViewById(R.id.datePicker);
    EditText nameText = (EditText) findViewById(R.id.nameText);
    TextView ageText = (TextView) findViewById(R.id.ageText);

    // get date from date picker
    int birthYear = datePicker.getYear();
    int birthMonth = datePicker.getMonth();
    int birthDayOfMonth = datePicker.getDayOfMonth();

    // get current date
    Calendar cal = Calendar.getInstance();
    int currentYear = cal.get(Calendar.YEAR);
    int currentMonth = cal.get(Calendar.MONTH);
    int currentDayOfMonth = cal.get(Calendar.DAY_OF_MONTH);

    int age = currentYear - birthYear;
    String happyBirthayMessage = "";

    if (currentMonth < birthMonth) {
        age--;
    }
    else {
        if (currentMonth == birthMonth) {
            if (currentDayOfMonth < birthDayOfMonth) {
                age--;
            }
            else {
                if (currentDayOfMonth == birthDayOfMonth) {
                    happyBirthayMessage = "\nHappy birthday, " + nameText.getText() + "!";
                }
            }
        }
    }

    ageText.setText("Age: " + Integer.toString(age) + happyBirthayMessage);
}
```

MY SOFTWARE PROJECT

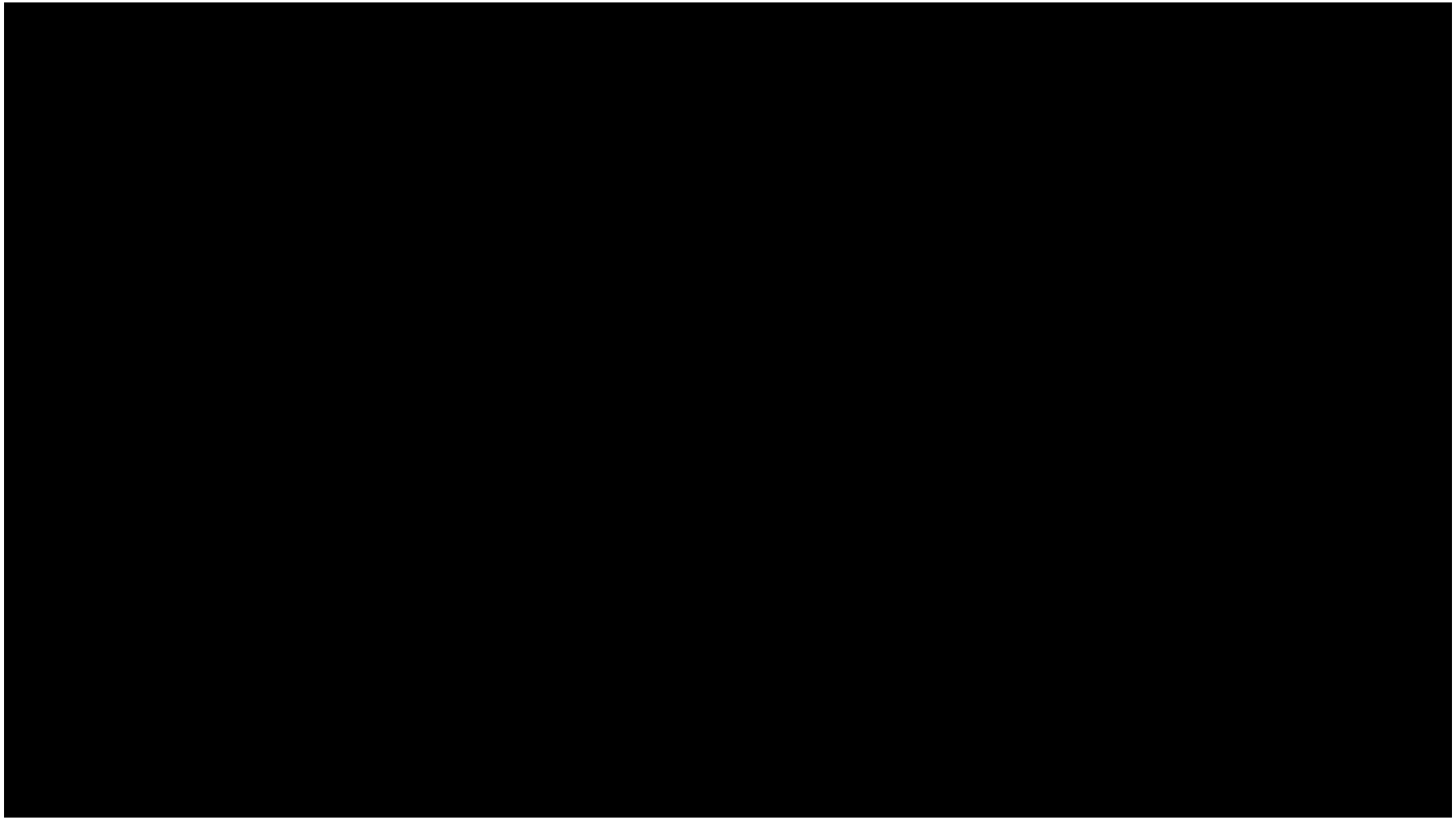



```
Button writePhoneButton = findViewById(R.id.writePhoneButton);
writePhoneButton.setOnClickListener(new View.OnClickListener() {
    public void onClick(View v) {
        Intent intent = new Intent( packageContext: MainActivity.this,
                WritePhoneActivity.class);
        startActivity(intent);
    }
```

```
// Write to tag operation - NDEF payload
@Override
public void onNewIntent(Intent intent) {
    Log.i( tag: "Foreground dispatch", msg: "Discovered tag with intent: " + intent);
    Tag tag = intent.getParcelableExtra(NfcAdapter.EXTRA_TAG);

    byte[] uriField = urlAddress.getBytes(Charset.forName("US-ASCII"));
    byte[] payload = new byte[uriField.length + 1]; // add 1 for the URI Prefix
    payload[0] = 0x05; // prefixes tel: to the URI
    System.arraycopy(uriField, srcPos: 0, payload, destPos: 1, uriField.length); // appends URI to payload
    NdefRecord URIRecord = new NdefRecord(
            NdefRecord.TNF_WELL_KNOWN, NdefRecord.RTD_URI, new byte[0], payload);
    NdefMessage newMessage = new NdefMessage(new NdefRecord[]{URIRecord});
    writeNdefMessageToTag(newMessage, tag);
}
```

Simplified a phone call & text message
Tap to initiate a call or text

SOFTWARE…CODING

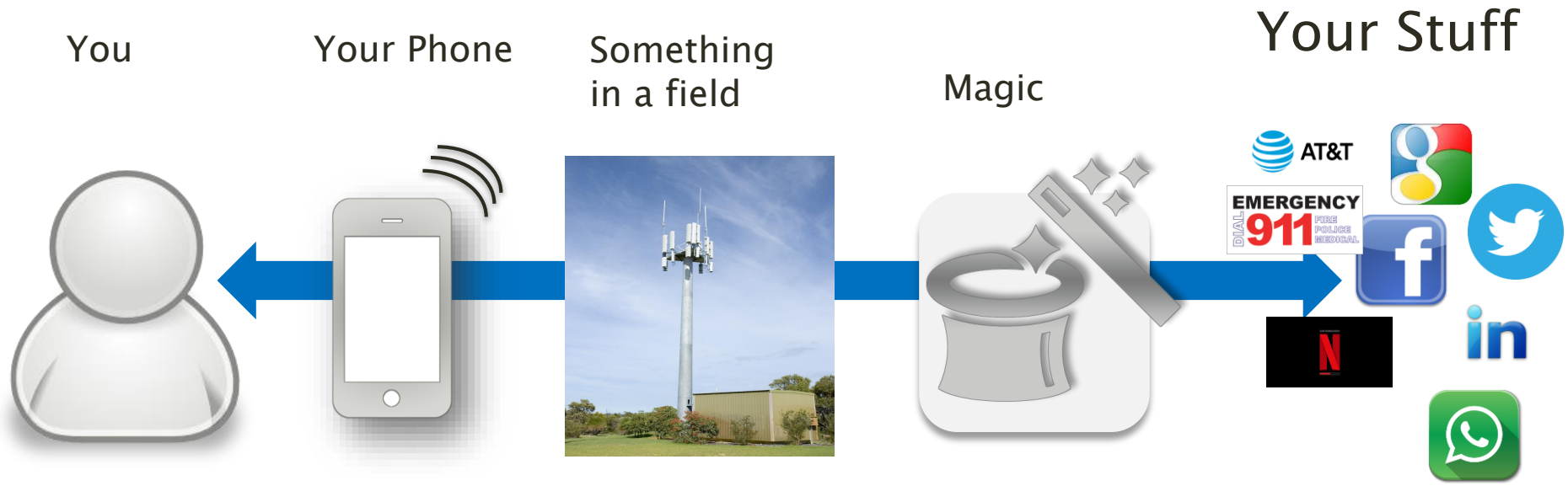


CONNECTIVITY

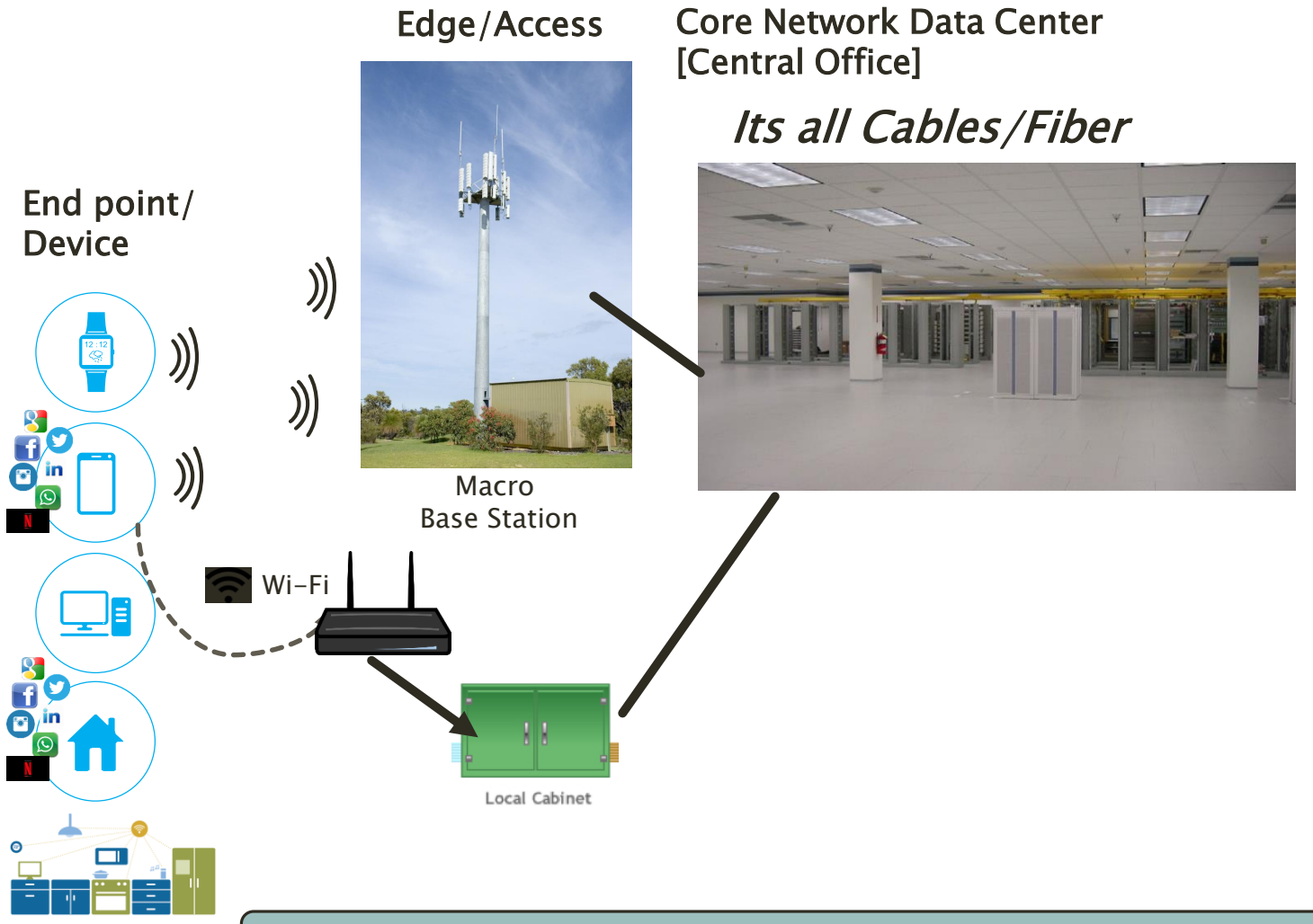
HOW DOES YOUR PHONE'S CONNECTIVITY WORK?

THE VIEW FROM YOUR PHONE

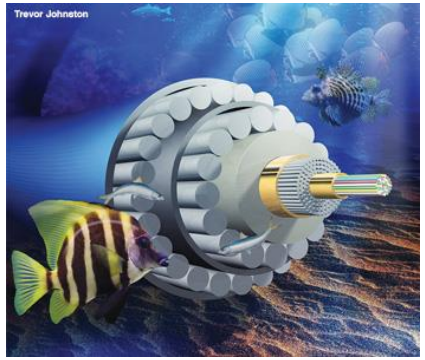
THE VIEW FROM YOUR PHONE



SERVICE PROVIDER NETWORK - SIMPLIFIED

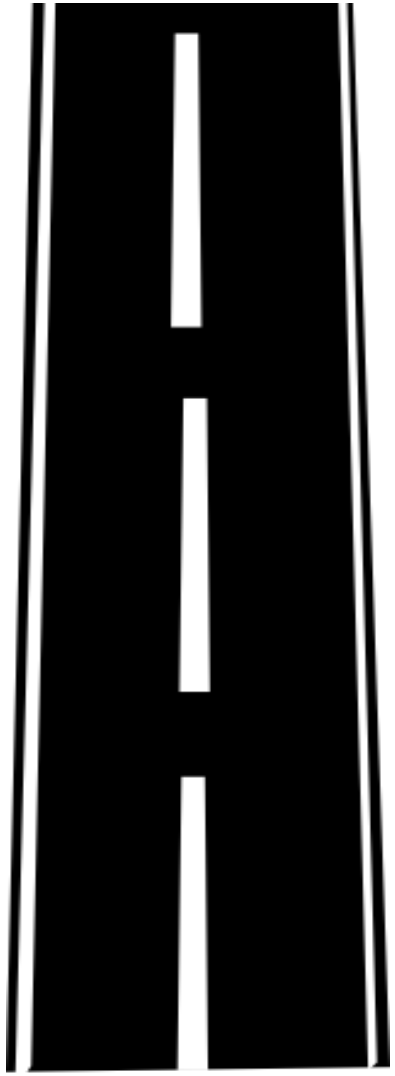


Centralized Data Center



After the Mobile Phone to Base Station – Its all Cables/Fiber

MY STEM JOURNEY



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- Loved theoretical & practical subjects

(e.g. physics, mathematics, metalwork, woodwork)

Continued at university…

- Studied Electronic & Computer Engineering at UL

(e.g. software, hardware)

Continuing as a profession

- Currently working as a graduate software engineer at Intel Shannon

MORE INFORMATION

ONLINE CODING COURSES (BEGINNERS)

Code.org

- https://studio.code.org – courses for beginners
- https://code.org/learn – hour-of-code tutorials for beginners

Code Academy

- https://www.codecademy.com/learn/learn-python-3 – learn Python
- https://www.codecademy.com/learn/javascript – learn Javascript
- https://www.codecademy.com/learn/learn-html-css – learn HTML and CSS
- https://www.codecademy.com/learn/learn-java – learn Java programming

Khan Academy

- https://www.khanacademy.org/computing/computer-programming/programming – using JavaScript
- https://www.khanacademy.org/computing/computer-science/algorithms – computer algorithms
- https://www.khanacademy.org/hourofcode – hour-of-code tutorials

ONLINE CODING COURSES (ADVANCED)

Coursera

NOTE: some Coursera courses may require fee

- https://www.coursera.org/learn/intro-programming - using Scratch
- https://www.coursera.org/learn/python - Python course
- https://www.coursera.org/specializations/java-programming - Java programming course

Lynda.com

- https://www.lynda.com/C-tutorials/C-Essential-Training/164457-2.html - C programming
- https://www.lynda.com/Android-tutorials/Up-Running-Java-Applications/94344-2.html - Java

CODING TOOLS

Scratch

- http://scratch.mit.edu – online tool for coding in Scratch

Python

- https://www.python.org/downloads – download and install Python

Android App Development

- http://appinventor.mit.edu – App Development using Blocks
- https://developer.android.com/studio/index.html – Android Studio Development

iOS App Development (for iPhone and iPad)

- http://www.apple.com/ie/swift/playgrounds – Swift Playgrounds iPad app
- https://developer.apple.com/xcode – Development Environment for iPhone, iPad

VIDEOS TO WATCH

Coding – what most schools don't teach

- https://www.youtube.com/watch?v=mPiGHyIXKtw

BT Young Scientist & Technology Exhibition

- https://www.youtube.com/watch?v=zhXRE6I0g40

Ted Talks on Future Technologies

Ted Talk on Internet of Things

- https://www.youtube.com/watch?v=QaTIt1C5R-M

Ted Talk on Machine Learning

- https://www.ted.com/talks/nick_bostrom_what_happens_when_our_computers_get_smarter_than_we_are

INTEL SHANNON SCHOLARSHIPS

Women in Technology Scholarships

- https://www.intel.ie/content/www/ie/en/women-in-technology-scholarship-program-leixlip.html

Paul Whelan Memorial Scholarship

- Scholarships of €3000 per annum for University of Limerick degree courses "Electronic and Computer Engineering" and "Computer Systems"
- Including co-op placements and summer internships at Intel Shannon

https://newsroom.intel.ie/news-releases/intel-shannon-celebrates-2017-scholarship-recipients

THE LEGAL BIT

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ANY QUESTIONS?