

## Comparing virtualization and containers

Amit Shah (Red Hat)

### Planck – 3

Containers and Docker are quite the rage, and people are comparing them to traditional virtualization (e.g. with KVM). This talk will dispel some myths, and introduce the concepts of hardware- and operating-system- level virtualization. Will also list pros and cons of both the approaches.

## Collaborative Spelling Dictionary

Ankita Shukla

### Fermi – 3

I developed an extension - Collaborative Spelling Dictionary, during my intern with the Wikimedia Foundation under the Outreach program of Gnome. After my intern, I created issues in the same extension for newbies to fix and guided them constantly giving them an easy and smooth entry into the open source community.

## Who owns my notebook? or why I want to run coreboot on every device

Alexander Couzens

### Einstein – 2

Who controls the hardware owns the hardware! Vendors taking more and more power of our devices with no return for us - the end user. They want to decide what software it runs on the hardware they sell to us. Why? Because of security.

## Legalese.io: smart contracts, dumb lawyers, and you

Wong Meng Weng

### Dalton – 3

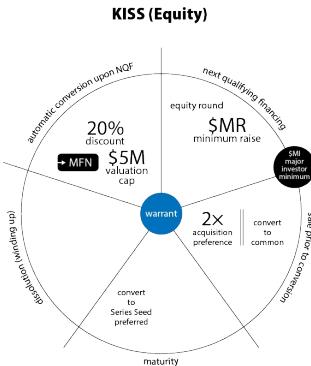
How would you represent legislation, regulations, and contracts as programs?

**YOU ARE HERE**

# LEGALESE.IO

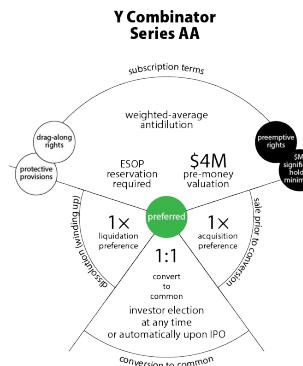
*software is eating law*

an opensource project  
with delusions of becoming a startup



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# Humans use language

**Humans use language  
Dolphins, bonobos, parrots also use language**

**Humans use language  
Dolphins, bonobos, parrots also use language**

**Humans use tools**

**Humans use language**  
**Dolphins, bonobos, parrots also use language**

**Humans use tools**  
**Crows, chimpanzees, sea otters also use tools**

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**Dolphins, bonobos, parrots also use language**

**Humans use tools**  
**Crows, chimpanzees, sea otters also use tools**

**Humans use a language *as a tool***

**Humans use language  
Dolphins, bonobos, parrots also use language**

**Humans use tools  
Crows, chimpanzees, sea otters also use tools**

**Humans use a language *as a tool*  
We win!**

# The Most Highly Evolved Human Animals

**poets**

# The Most Highly Evolved Human Animals

poets  
philosophers

# The Most Highly Evolved Human Animals

**poets  
philosophers  
programmers**

# The Most Highly Evolved Human Animals

**poets  
philosophers  
programmers**

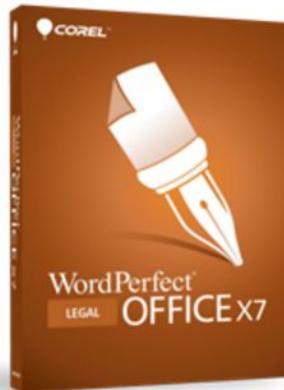
**lawyers**

# The Most Highly Evolved Human Animals



# 20 year old tools ... 200 year old practices

## WordPerfect Office X7 – Legal Edition



FULL

UPGRADE

### Office suite for legal professionals

\$349.99

DOWNLOAD



Download Instructions

- Legal-specific features and tools
- Microsoft Office compatible
- Built-in tools to open, edit and create PDFs
- Table of Authorities software
- eBook Publisher and secure disc burning software

BUY NOW

# 20 year old tools ... 200 year old practices

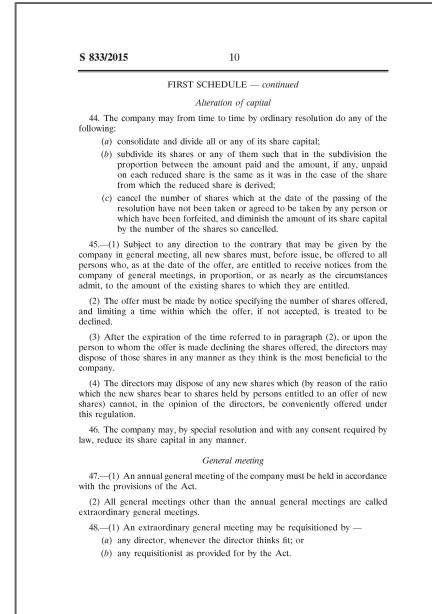
3.1.4 (redemption)	The cliff date is stated as 31 December 2016. We would suggest that the cliff date should be on a business day (31 December is a Saturday), and propose it to be 30 December 2016.
3.1.5 (redemption)	Proposed change: “the number of shares in the Monthly column of the above table shall <u>vest be converted to Unrestricted Shares</u> on the last business day of each month until such time as all Shares are <u>fully vested Unrestricted Shares</u> .
3.2 (redemption)	For consistency, the provisions of the employment/volunteer agreement must entitle the Company to terminate in those “Cause” events which are specified in Clause 3.2 of the Class F Agreement. We have not sighted any employment/volunteer agreement.
3.2.2 (redemption)	Is this Clause 3.2.2 supposed to read continuously from Clause 3.2.1, instead of being a separate sub-clause on its own?
3.3 & 3.4 (redemption)	In Clause 3.3, “Good Reason” is defined to mean termination <u>by the Holder</u> when the Company breaches the employment agreement. However in Clause 3.4, “Termination for Good Reason” becomes an event of termination <u>by the Company</u> without Cause. The definitions need to be tidied up.
4.1 & 4.2 (exercise of redemption right)	As a drafting point - references to the “purchase” or “repurchase” of the Shares should be changed to reflect that the Shares are being redeemed instead of purchased.

# Better Tools: issues, diffs, git, pull requests

```
4ff7d46 | * rephrase "registration statement" to "prospectus"
fdce787 | * make participation right optional in IA
2d8bfca | * reduce liability of stockholder
c95e70f | * limitations on disposition not needed in SG.
ed2ba49 | * remove clauses unnecessary for singapore
33f6a96 | * support "Extended Disclosure: TRUE"
32003fb | * bugfix -- use a_left_sidehead
f8ca516 | * new shareholder agreement using RM tags and drags
531cd77 | * include user-generated directors resolutions
e60d6b7 | * add deadlines for submission of financials
```

# It's All Pseudocode

## *the horror, the horror*



# It's All Pseudocode

*the horror, the horror*

45.--(1) Subject to any direction to the contrary that may be given by the company in general meeting, all new shares must, before issue, be offered to all persons who, as at the date of the offer, are entitled to receive notices from the company of general meetings, in proportion, or as nearly as the circumstances admit, to the amount of the existing shares to which they are entitled.

# It's All Pseudocode

*the horror, the horror*

45.--(1) Subject to any direction to the contrary that may be given by the company in general meeting, all new shares must, before issue, be offered to all persons who, as at the date of the offer, are entitled to receive notices from the company of general meetings, in proportion, or as nearly as the circumstances admit, to the amount of the existing shares to which they are entitled.

# It's All Pseudocode

*the horror, the horror*

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# It's All Pseudocode

*the horror, the horror*

```
Subject to any direction to the contrary  
that may be given by the company in general meeting,  
all new shares must (before issue) {  
    be offered -> to all persons  
        who (as at the date of the offer)  
            are (entitled to receive notices  
                from the company  
                of general meetings) {  
        in proportion,  
            or as nearly as the circumstances admit,  
            to the amount of the existing shares  
            to which they are entitled.  
    } }
```

# @mengwong

*Interim Benevolent Dictator*

Perl, Javascript, Prolog, Haskell  
seas.upenn.edu – Bachelor's in Computer Science

- 1995           pobox.com – bootstrapped, acquired
- 2003           RFC4408 (SPF) – global antispam adoption
- 2005           karmasphere.com – VC funded, acquired
- 2012           JFDI.Asia – \$30M portfolio, 70+ investments



JFDI has made 70+ startup investments since 2012

# OMG. So much paperwork.



**24 investments per year  
10 agreements per investment  
5 signatures per agreement  
= 1,200 signatures per year**



***Help. Can you send me a template for...***

*an employment agreement*

*directors' resolutions*

*a stock option plan*

*a service contract*

*a term sheet*

*an NDA*

**?**

# Software in 1996

Want a basic website  
with shopping cart?

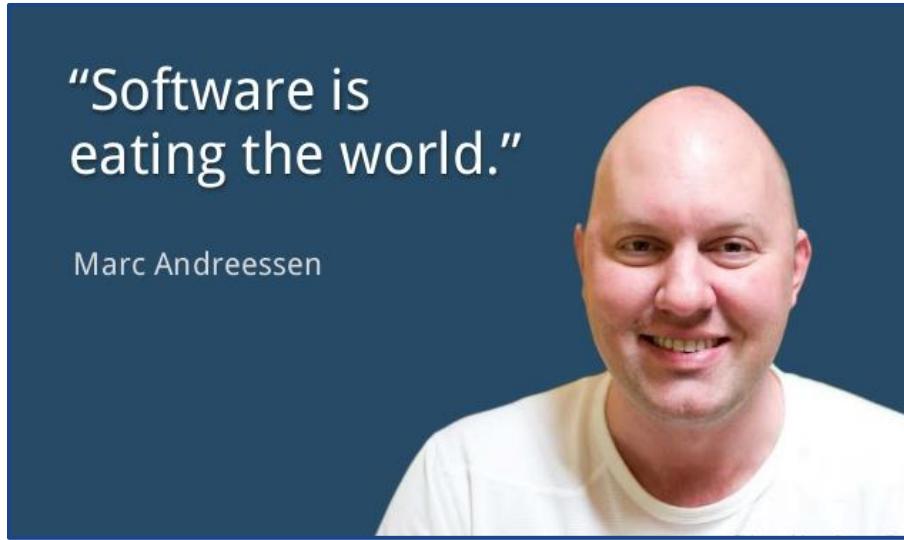
Pay a programmer  
\$10,000.

# Law in 2016

Want a basic  
investment round?

Pay a lawyer  
\$10,000.

# How does a computer scientist look at this problem?



“Software is  
eating the world.”

Marc Andreessen

 **Meng Weng Wong** @mengwong · Jul 24  
I wonder which industries have the most vs least number of computer scientists in them. Doctoring and lawyering, I'm guessing, at the bottom

 **Meng Weng Wong** @mengwong · Jul 24  
Why can't we express contracts, esp. term sheets, in concise JSON, for programmatic expansion into boilerplate? Open standard mini-language!

 **Marc Andreessen**   
@pmarca

 Follow

@mengwong Bingo.

2:53 AM - 24 Jul 2014

 **Meng Weng Wong** @mengwong · Jul 24  
@pmarca m4 was invented in 1977, so wtf, right?. Maybe the sets of programmers vs lawyers are wholly disjoint, so software not eating law?

 **Marc Andreessen** @pmarca · Jul 24  
@mengwong Big opportunity I think. Just starting: Legalzoom, Judicata. We're looking for a good one.

```
new (require("Legalese"));
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" });
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
    raising: 500000,
    security: "Convertible Note",
    discount: 20,
    liq_pref: 1
}) ;
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
    raising: 500000,
    security: "Convertible Note",
    discount: 20,
    liq_pref: 1
  })
  .investors([{name:"Alice",commitment:400000,email:"alice@example.com"}, {name:"Bob", commitment:100000, email: "bob@example.com"}]);
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
             raising:    500000,
             security:   "Convertible Note",
             discount:   20,
             liq_pref:   1
           })
  .investors([{name:"Alice",commitment:400000,email:"alice@example.com"}, {name:"Bob",commitment:100000,email: "bob@example.com"}])
  .produceDocuments(as:"PDF");
```

```

new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
              raising: 500000,
              security: "Convertible Note",
              discount: 20,
              liq_pref: 1
            })
  .investors([{name:"Alice", commitment:400000, email:"alice@legalese.io"}, {name:"Bob", commitment:100000, email: "bob@legalese.io"}])
  .produceDocuments(as:"PDF");

```

## Term Sheet for Convertible Note Investment

nCinga Pte. Ltd.

This security is offered in reliance on one or more of the exemptions under sections 272(a), 272(b)(i), 274, and 275(i) of the Securities and Futures Act. It is not made in or accompanied by a prospectus that is registered by the Monetary Authority of Singapore. Inasmuch as it is being acquired from the Company in a transaction not involving a public offering, under the Act and other applicable regulations this security may be resold only in certain limited circumstances.

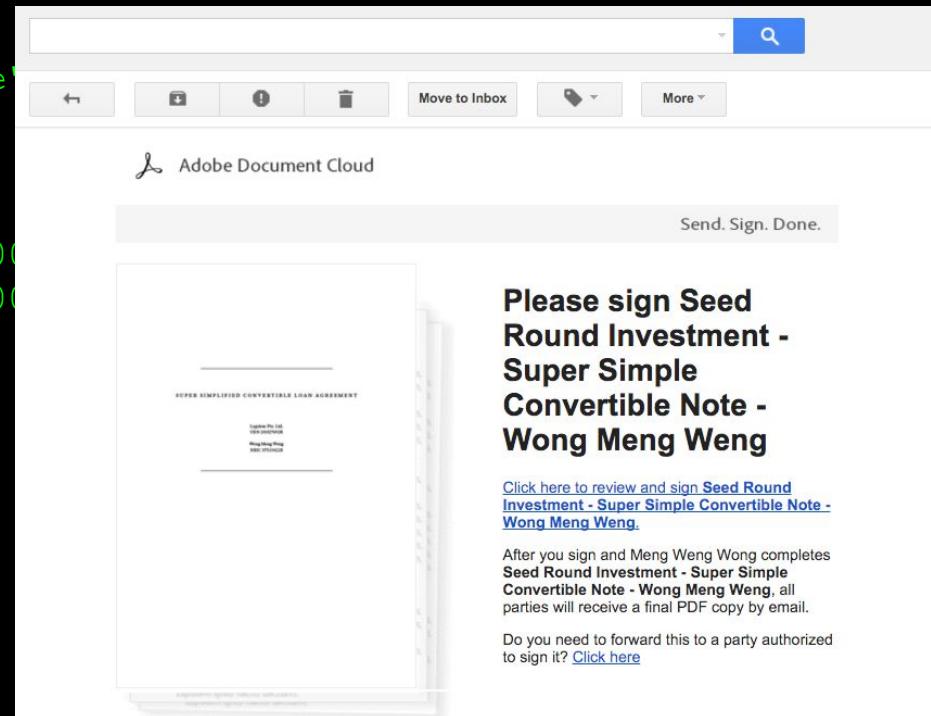
**LEGALESE.IO**

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template save startups  
thousands in legal fees.

16 March 2016 - 6:47 PM SGT  
version 1.5.0

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
             raising: 500000,
             security: "Convertible Note",
             discount: 20,
             liq_pref: 1
           })
  .investors([{name:"Alice", commitment:400000, email:"alice@example.com"}, {name:"Bob", commitment:100000, email: "bob@example.com"}])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
              raising: 500000,
              security: "Convertible Note",
              discount: 20,
              liq_pref: 1
            })
  .investors([{name:"Alice", commitment:4000000},
              {name:"Bob", commitment:1000000}
            ])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```



```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
    raising: 500000,
    security: "Convertible Note",
    discount: 20,
    liq_pref: 1
  })
  .investors([{name:"Alice",commitment:400000,email:"alice@example.com"}, {name:"Bob",commitment:100000,email: "bob@example.com"}])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
             raising:    500000,
             security:   "YC SAFE",
             discount:   20
           })
  .investors([{name:"Alice",commitment:400000,email:"alice@example.com"}, {name:"Bob",commitment:100000,email: "bob@example.com"}])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

```

new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
              raising:    500000,
              security:   "YC SAFE",
              discount:   20
            })
  .investors([{name:"Alice", commitment:400000, email:"alice@legalese.io"}, {name:"Bob", commitment:100000, email: "bob@legalese.io"}])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");

```

## Term Sheet for SAFE Investment

nCinga Pte. Ltd.  
UEN 201308572H

This security is offered in reliance on one or more of the exemptions under sections 272(a)(i), 272(b)(i), 274, and 276(i) of the Securities and Futures Act. It is not made in or accompanied by a prospectus that is registered by the Monetary Authority of Singapore. Inasmuch as it is being acquired from the Company in a transaction not involving a public offering, under the Act and other applicable regulations this security may be resold only in certain limited circumstances.

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templates for startups  
thousands in legal fees.

18 March 2016 11:25 AM SGT  
version 1.3.0

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
             raising:    500000,
             security:   "YC SAFE",
             discount:   20
           })
  .investors([{name:"Alice",commitment:400000,email:"alice@example.com"}, {name:"Bob",commitment:100000,email: "bob@example.com"}])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
             raising:    500000,
             security:   "Series Seed",
             directors: [1,1,1],
             esop:        20
           })
  .investors([{name:"Alice",commitment:400000,email:"alice@example.com"}, {name:"Bob",commitment:100000,email: "bob@example.com"}])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
             raising: 500000,
             security: "Series Seed",
             directors: [1,1,1],
             esop: 20
           })
  .investors([{name:"Alice", commitment:400000, email:"alice@acme.com", phone:"+65 12345678", address:"123 Main St, Singapore"}, {name:"Bob", commitment:100000, email: "bob@acme.com", phone:"+65 98765432", address:"123 Main St, Singapore"}])
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

---

## Term Sheet for Series Seed Investment

nCing Pte Ltd.

---

This security is offered in reliance on one or more of the exemptions under sections 27(2)(i), 27(2)(ii), 27(4), and 27(5)(a) of the Securities and Futures Act. It is not made in or accompanied by a prospectus that is issued by the Monetary Authority of Singapore. Inasmuch as it is being acquired from the Company in a transaction not involving a public offering, under the Act and other applicable regulations this security may be resold only in certain limited circumstances.

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templates save startups  
thousands in legal fees.

16 March 2016 11H AM SGT  
version 1.5.0

# Vision: A World with Less Friction

## *a dogfooding case study*

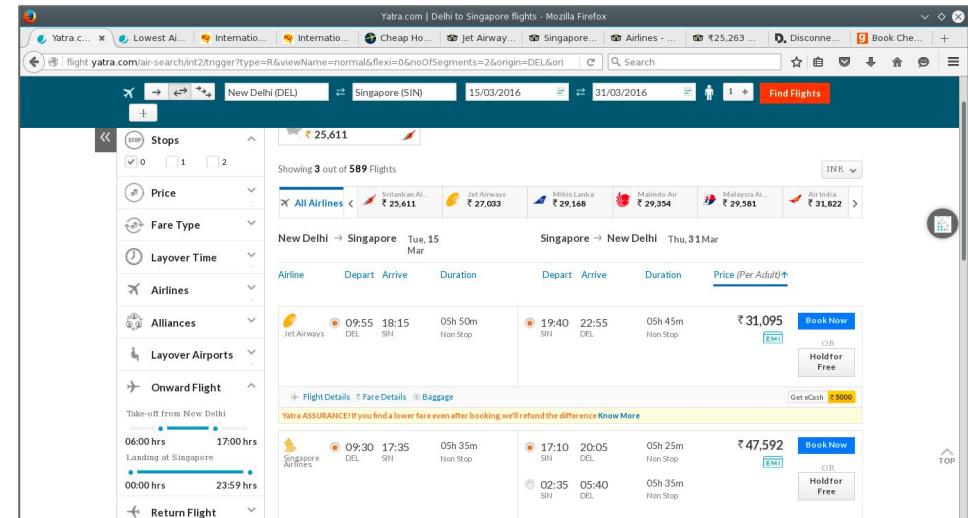
# Vision: A World with Less Friction

## *a dogfooding case study*

Legalese Pte. Ltd. itself:

*“I have no bank account  
and I must pay.”*

**Scenario: Airfare  
reimbursement.**



# Airfare reimbursement without a bank account

Anuj buys a plane ticket.

Meng pays Anuj.

Legalese owes Meng.

# Airfare reimbursement without a bank account

Anuj buys a plane ticket.  
Meng pays Anuj 1.19BTC.  
Legalese owes Meng.

Summary	
Size	226 (bytes)
Received Time	2016-03-04 05:16:11
Estimated Confirmation Time	Very Soon ( <a href="#">High Priority</a> )
Relayed by IP	<a href="#">185.21.217.55 (whois)</a>
Visualize	<a href="#">View Tree Chart</a>
Inputs and Outputs	
Total Input	1.19 BTC
Total Output	1.189887 BTC
Fees	0.000113 BTC
Estimated BTC Transacted	0.00257453 BTC
Scripts	<a href="#">Show scripts &amp; coinbase</a>

# Airfare reimbursement without a bank account

Anuj buys a plane ticket.  
 Meng pays Anuj 1.19BTC.  
 Legalese issues Meng a  
 convertible debt security.

Wong Meng Weng Super Simplified Convertible Loan Agreement 4 March 2016  
 12:57 PM SGT

## CONVERTIBLE LOAN AGREEMENT

THIS AGREEMENT is made on 4 March 2016 between

- (1) Wong Meng Weng (NRIC S7533422B), a citizen of Singapore receiving notices at 5 Chancery Hill Road, Singapore 309644 (the "Investor")
- (2) Legalese Pte. Ltd. (UEN 2015Z2692R), a company incorporated in Singapore with its registered office at 79 Ayer Rajah Crescent, #05-03, Singapore 139955 (the "Company") (collectively, the "Parties").

### WHEREAS:

- (A) The Company is a private company incorporated in Singapore limited by shares.
- (B) The Company wishes to pay a third party, but lacking a bank account relies on the Investor to do so on its behalf.
- (C) When the Investor makes that payment, the Company shall be in his debt.
- (D) The Company presently lacking the funds to repay that debt in cash, the Company is prepared to issue equity to the Investor instead.
- (E) The Investor and the Company desire and wish to enter into this Agreement to regulate the relationship between the Parties.

IT IS HEREBY AGREED as follows:

### 1 DEFINITIONS

- 1.1 In this Agreement, except to the extent that the context otherwise requires, the following terms shall have the meanings set forth below:
- 1.2 *Articles* means the Regulations in the Constitution of the Company.
- 1.3 *Payment to Third-Party* The payment of ₹31,095 to a person named Anuj Gupta (the "Third Party").
- 1.4 *Principal* means \$8700.00, that being agreed as the Singapore Dollar equivalent of the Payment to Third Party.

### 2 CONDITION PRECEDENT

- 2.1 This Agreement shall be effective when the Investor delivers to the Company evidence of the transfer of funds by the Investor to the Third Party as described in "Payment to Third-Party".

### 3 SUBSCRIPTION

- 3.1 The Parties agree to recognize a resulting debt of \$8700.00 (the "Investment Amount") owed by the Company in the form of a convertible promissory note (the "Note") issued by the Company to the Investor.

1 of 5

# Airfare reimbursement without

Anuj buys a plane ticket.  
Meng pays Anuj 1.19BTC.  
Legalese also produces the  
required corporate resolutions  
and sends them for e-signature.

4 March 2016  
12:58 PM SGT

Legalese Pte. Ltd.  
UEN 201527692R  
(Incorporated in the Republic of Singapore)  
(the "Company")

*Directors' resolutions in writing  
passed pursuant to Article 90 of the Company's Constitution*

Legalese Pte. Ltd.  
79 Ayer Rajah Crescent  
#05-03  
Singapore 139955

RESOLVED:—

1 AUTHORITY OF MEMBER SOUGHT

That the approval of the Member of the Company be sought for passing the following resolutions:

1.1 ORDINARY RESOLUTION – AUTHORITY TO ISSUE SECURITIES

That pursuant to Section 161 of the Companies Act (Cap. 50), the Director of the Company be and are hereby authorised and to give the power to the said Director to issue shares and securities to such persons or classes of persons or categories of persons or descriptions of persons or conditions and with such rights and restrictions as they may think fit to impose; and that such authority shall continue in force until the conclusion of the Annual General Meeting commencing next after this date, or the expiration of the period within which the next Annual General Meeting of the Company is required by law to be held, whichever is earlier.

1.2 ORDINARY RESOLUTION – AUTHORITY TO ISSUE SECURITIES IN FUTURE

That the Directors of the Company be and are hereby authorised, pursuant to any executed investment or subscription agreements, to issue and allot equity securities including ordinary or preferred shares in the capital of the Company as needed to fulfil its obligations under such Agreements; and to execute documents and do all other acts necessary to satisfy the aforesaid Agreements; and that such authority shall continue in force under Subsection 161(4) beyond the expiration described in Subsection 161(3).

2 RESOLUTION BY WRITTEN MEANS

That the above resolutions be circulated for passage by written means, under Section 184(6) of the Companies Act (Cap. 50), in lieu of a General Meeting.

3 AUTHORITY TO BIZFILE

That the Corporate Secretary of the Company (being at the time of writing Prima Management Services Pte. Ltd.) and/or its designated agents be authorised to file the Notice of Resolutions electronically with the Accounting and Corporate Regulatory Authority.

DATED THIS: 4 March 2016

1 of 1

# Airfare reimbursement without a bank account

Elapsed time: 10 minutes.

The screenshot shows a Google Sheets document titled "Term Sheet for Private Placement Memorandum". The document is a template for defining investment terms. Key visible data includes:

- Pre-Money Valuation:** \$S1.00
- Amount Raising:** \$S5,000
- Security Type:** Convertible Note
- Document Version:** 1.3.0
- Default Currency:** Singapore Dollars (SGD)
- Investment Agreement Date:** 2016-02-21
- Date of Subscription Agreement:** 2016-02-21
- Third Party Name:** Anuj Gupta
- Third Party Payment Amount:** \$31,095

The document also includes sections for "MINOR TERMS COMMON TO MOST TYPES", "INCLUDE", "CONFIGURATION", and "TERMSHEET". A note at the bottom states: "don't delete this section. You can edit it." The spreadsheet has several rows of empty cells below the main content.



**Code = Law      Law = Code**

Drafting contracts = programming.

Similar notions of design patterns.

Similar reliance on borrowed “libraries.”

Similar methods of logical thinking.

*“In the event a user clicks the mouse” → onClick()*

# Software is eating the world of law

CS concepts & practices infiltrate Legal

Boilerplate Templates → Shared Opensource Libraries

Procedural Paperwork → Dependency Graphs

Agreement Drafting → Compilation

Term sheets → Config files

Track Changes → Git

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
    raising: 500000,
    security: "Series Seed",
    directors: [1,1,1],
    esop: 20,
    reserved: [function(scenario){return scenario.company.borrowing &&
      scenario.company.borrowing>10000}
    ],
  })
  .investors({name:"Alice",commitment:400000,email:"alice@example.com"},{name:"Bob",commitment:100000,email:"bob@example.com"})
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

```
new (require("Legalese"))
  .startup({ country: "SG", UEN: "S12345678A" })
  .funding({ valuation: 2500000,
    raising: 500000,
    security: "Series Seed",
    directors: [1,1,1],
    esop: 20,
    reserved: [function(scenario){return scenario.company.borrowing &&
      scenario.company.borrowing>10000},
      function(scenario){return scenario.company.capex &&
      scenario.company.capex > 20000 },
    ],
  })
  .investors({name:"Alice",commitment:400000,email:"alice@example.com"},{name:"Bob",commitment:100000,email: "bob@example.com"})
  .produceDocuments(as:"PDF")
  .sendTo("echosign");
```

# Challenge: Isomorphism

```
Events: ***** L4 SOURCE CODE OUTPUTS LEGALESE *****
'equity financing':{
  upon(parties.company.event.financing.equityIssue ('equityIssue') and
    equityIssue.stage=='primary negotiation complete') {

    company.must(automatically): {
      safe.parties.investors.all(
        company.addObligation(upon(equityIssue.stage=='completion')) {
          .issue(equityIssue.shareClass, quantity:investor.purchaseAmount /
            equityIssue.pricePerShare)
          .to(investor) ('ShareIssue')
        })
    }
  }
}
```

Equity Financing. If there is an Equity Financing before the expiration or termination of this instrument, the Company will automatically issue to the Investor a number of shares of Preferred Stock sold in the Equity Financing equal to the Purchase Amount divided by the price per share of the Preferred Stock.

# Formal Methods FTW

You can't do this in English!

```
~/non-db-src/l/compiler/sandbox1% 14 mycontract.14 -o pdf
```

Compilation Errors: (run with --force to output anyway)

mycontract failed consistency check at line 52:

mycontract clause 3.1 conflicts with clause 6.2:

**Company, at maturity, automatically performs multiple inconsistent actions.**

Clause 3.1: Company, at maturity, must repay debt to investor in cash.

Clause 6.2: Company, at maturity, must issue common stock to investor.

See mycontract.html#error1 for details

mycontract failed consistency check at line 77:

mycontract clause 9.1.3 violates CompaniesAct clause 161:

**CompaniesAct clause 161 requires prior approval of shareholders for equity issue**

mycontract clause 9.1.3 triggers automatic issue of equity upon conversion

CompaniesAct clause 161 imposes prerequisite ShareholderApproval

mycontract workflow does not include ShareholderApproval

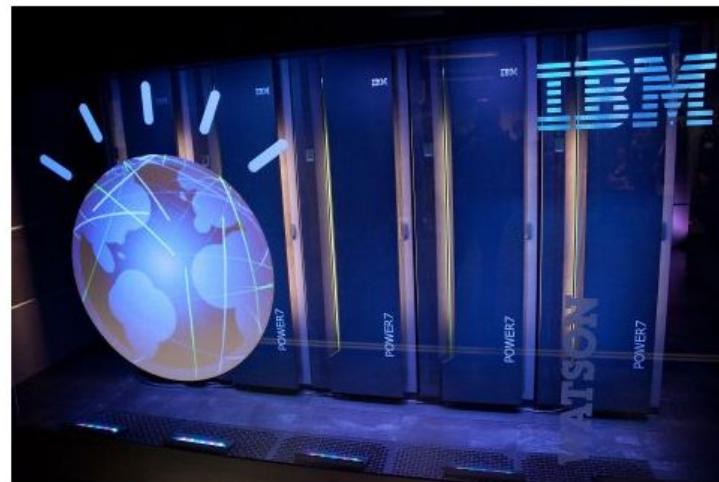
See mycontract.html#error2 for details



# IBM's Watson Supercomputer May Soon Be The Best Doctor In The World

Most people know Watson as IBM's answer to Jeopardy star Ken Jennings. But IBM's aspirations for its artificially intelligent supercomputer are now less quiz show champion and more medical genius.

"Watson, the supercomputer that is now the world Jeopardy champion, basically went to med school after it won Jeopardy," MIT's Andrew McAfee, coauthor of *The Second Machine Age*, said



Ben Hider / Getty Images

# SCIENCE

## Google's self-driving cars have autonomously driven over 1 million miles

EMIL PROTALINSKI JUNE 3, 2015 8:23 AM  
TAGS: AUTONOMOUS, GOOGLE, SELF-DRIVING CAR



Google today announced that its self-driving car project crossed the 1 million mile mark last week. CEO Larry Page originally challenged the team to drive 100,000 miles on public roads, and they have now done that 10-fold, or the equivalent of 75 years of typical U.S. adult driving.

If you're confused at the figure, that's probably because you remember the 1.7 million number revealed last month. That number was for manual and

**Press Releases**

Brazilian Logistics Startup Mandaé Raises USD \$2.5 Million (BRL R\$10 Million) from Qualcomm and Existing Investors

# AlphaGo Wins Final Game In Match Against Champion Go Player

By Philip E. Ross

Posted 15 Mar 2016 | 13:53 GMT

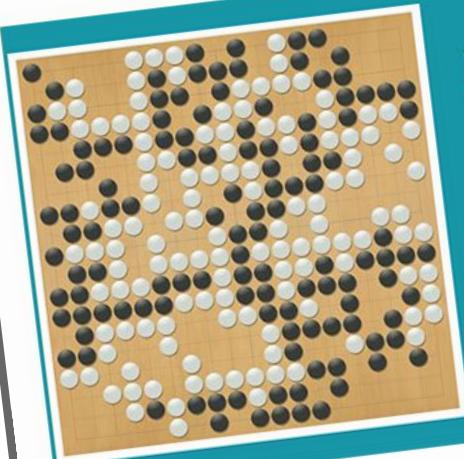


Image: Google

AlphaGo, a largely self-taught Go-playing AI, last night won the fifth and final game in a match held in Seoul, South Korea, against that country's Lee Sedol. It's probably because you remember the 1.7 billion moves it made last month. That number was for manual and

## THE ULTIMATE GO CHALLENGE GAME 5 OF 5

15 MARCH 2016



AlphaGo  
Won 4 of 5



Lee Sedol  
Won 1 of 5

RESULT  
W+ Res

280

NUMBER OF MOVES

2h+

TIME WHITE

2h+

TIME BLACK



Press Releases



Brazilian Logistics Startup Mandaé Raises USD \$2.5 Million (BRL R\$10 Million) from Qualcomm and Existing Investors

## SCIENCE

eonomously driven

# SMOP

*“A Simple Matter of Programming”*

# SMOP

*“A Simple Matter of Programming”*

formalization · isomorphism  
natural language generation  
modal logic · constraints  
specification vs implementation

ARTICLES

# THE BRITISH NATIONALITY ACT AS A LOGIC PROGRAM

1986

*The formalization of legislation and the development of computer systems to assist with legal problem solving provide a rich domain for developing and testing artificial-intelligence technology.*

M. J. SERGOT, F. SADRI, R. A. KOWALSKI, F. KRIWACZEK, P. HAMMOND, and H. T. CORY

There are essentially two kinds of law, *case law*, determined by earlier court decisions, and *statutes*, determined by legislation. Substantial amounts of statutory law are basically definitional in nature and attempt to define more or less precisely some legal relationship or concept. The British Nationality Act 1981 [20] defines British citizenship and is a good example of statutory law. The act embodies all the characteristics of statutes in general: syntactic com-

the accuracy of the implementation and makes the implementation easier to maintain as the legislation changes and as case law evolves to augment the legislation.

Our implementation of the British Nationality Act 1981 was undertaken as an experiment to test the suitability of Prolog logic for expressing and applying legislation. The British Nationality Act 1981 was chosen for this experiment for a number of reasons.

# Deontic $\oplus$ Temporal Calculi for $\mu$ -Logic

$$\begin{array}{c}
 \frac{\Delta(v) = \sigma}{\Delta \vdash v : \sigma} \quad \frac{\text{type}(c) = \sigma}{\Delta \vdash c : \sigma} \quad \frac{\Delta \vdash e_1 : \text{Int} \quad \Delta \vdash e_2 : \text{Int} \quad \text{op} \in \{+, -, *, /\}}{\Delta \vdash e_1 \text{ op } e_2 : \text{Int}} \\
 \\ 
 \frac{\Delta \vdash t : \text{Time} \quad \Delta \vdash e : \text{Int} \quad f \in \{y, m, d\} \quad \text{op} \in \{+, -\}}{\Delta \vdash t \text{ op } e \text{ f : Time}} \quad \frac{\Delta \vdash e : \text{Time} \quad f \in \{y, m, d\}}{\Delta \vdash e \# f : \text{Int}} \\
 \\ 
 \frac{\Delta \vdash r : \text{Resource} \quad \Delta \vdash t : \text{Time} \quad f \in \text{fields}(r)}{\Delta \vdash \#(r, f, t) : \text{Int}} \quad \frac{\Delta \vdash e : \text{Int}}{\Delta \vdash e : \text{Resource}} \\
 \\ 
 \frac{\Delta \vdash e_1 : \rho \quad \Delta \vdash e_2 : \rho}{\Delta \vdash e_1 < e_2 : \text{Boolean}} \quad \frac{\Delta \vdash e_1 : \sigma \quad \Delta \vdash e_2 : \sigma}{\Delta \vdash e_1 = e_2 : \text{Boolean}} \\
 \\ 
 \frac{\Delta \vdash b_1 : \text{Boolean} \quad \Delta \vdash b_2 : \text{Boolean} \quad \text{op} \in \{\text{and}, \text{or}\}}{\Delta \vdash b_1 \text{ op } b_2 : \text{Boolean}} \quad \frac{\Delta \vdash b : \text{Boolean}}{\Delta \vdash \text{not } b : \text{Boolean}}
 \end{array}$$

```
data Statement = -- First order logic
    Statement :&&: Statement -- and
  | Statement :||: Statement -- or
  | Statement :=>: Statement -- implication
  | Not Statement           -- negation
    -- Temporal modalities
  | At      Time Statement
  | During  Time Time Statement
  | Prior   Time Statement
  | Post    Time Statement
    -- Deontic
  | May     Person Statement
  | Must   Person Statement
  | Happens [EventSpec]
    -- Epistemic
  | Believes Person Statement
  | Knows   Person Statement
    deriving (Show)
```

**Challenge: DSL design and implementation  
(in JS vs Haskell vs Lisp)**

```
~/non-db-src/l/compiler/sandbox1% l4 mycontract.l4 -o pdf
```

Compilation Errors: (run with --force to output anyway)

mycontract failed consistency check at line 52:

mycontract clause 3.1 conflicts with clause 6.2:

**Company, at maturity, automatically performs multiple inconsistent actions.**

Clause 3.1: Company, at maturity, must repay debt to investor in cash.

Clause 6.2: Company, at maturity, must issue common stock to investor.

See mycontract.html#error1 for details

mycontract failed consistency check at line

mycontract clause 9.1.3 violates Companies

**CompaniesAct clause 161 requires prior**

mycontract clause 9.1.3 triggers automa

CompaniesAct clause 161 imposes prerequ

mycontract workflow does not include Sh

See mycontract.html#error2 for details

## Challenge: model checking and automated verification

# Challenge: Natural Language Isomorphism

```
Events: ***** L4 SOURCE CODE OUTPUTS LEGALESE *****/
'equity financing':{
  upon(parties.company.event.financing.equityIssue ('equityIssue') and
    equityIssue.stage=='primary negotiation complete') {

    company.must(automatically): {
      safe.parties.investors.all(
        company.addObligation(upon(equityIssue.stage=='completion')) {
          .issue(equityIssue.shareClass, quantity:investor.purchaseAmount /
            equityIssue.pricePerShare)
          .to(investor) ('ShareIssue')
        })
    }
  }
}
```



Equity Financing. If there is an Equity Financing before the expiration or termination of this instrument, the Company will automatically issue to the Investor a number of shares of Preferred Stock sold in the Equity Financing equal to the Purchase Amount divided by the price per share of the Preferred Stock.

# Challenge: Compilation to Ethereum

```
Events: /****** L4 SOURCE CODE *****/
'equity financing':{
    upon(parties.company.event.financing.equityIssue
('equityIssue') and
        equityIssue.stage=='primary negotiation complete') {

    company.must(automatically):{
        safe.parties.investors.all(
            company.addObligation(upon(equityIssue.
stage=='completion')) {
                .issue(equityIssue.shareClass, quantity:investor.
purchaseAmount / equityIssue.pricePerShare)
                    .to(investor) ('ShareIssue')
            })
        }
    }
}
```



```
BOOST_AUTO_TEST_CASE(equityFinancing) /* TO SOLIDITY
BYTECODE */
{
    deployRegistrar();
    string name = "abc";
    m_sender = Address(0x123);
    BOOST_REQUIRE(callContractFunctionWithValue
("reserve(string)", m_fee, encodeDyn(name)) ==
encodeArgs());
    BOOST_CHECK(callContractFunction("setContent
(string,bytes32)", u256(0x40), u256(123), u256(name.length()),
name) == encodeArgs());
}
```

# This is an Opensource Project.

# This is Multiple Opensource Projects.

# This is Multiple Opensource Projects.

**DSL specification**  
an open standard.

**DSL compiler**  
opensource software.

**Contracts written in the DSL**  
CC-BY-SA-NC + GPL?

**Templates for natural language localization**  
CC-BY-SA-NC, user contrib

# This is Multiple Opensource Projects.

*law is code*

the same dynamics that make FOSS great  
should also make open legal code great

Law firm = a team of proprietary programmers  
getting paid by the hour  
to write assembly language  
and reinvent the wheel

# Open source contracts

“Github/Wikipedia for legal agreements”  
*because hiring a lawyer just to draft a contract  
is like buying the Britannica just to  
look up the periodic table.*



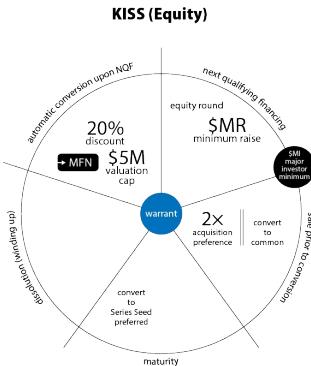
# Open source contracts need tools

1. DSL design and implementation
2. Model checking and formal verification
3. Compilation to natural language
4. Compilation to Ethereum

# LEGALESE.IO

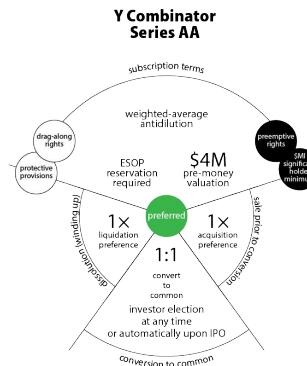
*software is eating law*

an opensource project  
with delusions of becoming a startup  
**@mengwong**



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# Traction

100+ agreements executed

20 startups incorporated + financed

3 law firms keen to contribute (NZ, MY, US)

2 lawyers, 1 law prof, 4 law students

4 crowdfunding sites & angel groups

# Natural Language Generation

## Attempto Controlled English

From Wikipedia, the free encyclopedia

**Attempto Controlled English (ACE)** is a [controlled natural language](#), i.e. a subset of standard [English](#) with a restricted syntax and a restricted semantics described by a small set of construction and interpretation rules.<sup>[1]</sup>

ACE can serve as [knowledge representation](#), [specification](#), and [query language](#), and is intended for professionals who want to use formal notations and formal methods, but may not be familiar with them. Though ACE appears perfectly natural – it can be read and understood by any speaker of English – it is in fact a [formal language](#).

ACE and its related tools have been used in the fields of software specifications, theorem proving, text summaries, ontologies, rules, querying, [medical documentation](#) and planning.

# Natural Language Generation

English

Chinese

German

French

Bahasa Indonesia

# Airfare reimbursement without a bank account

In future, fully automate the process:

```
if paymentObserved(Anuj→Airline)
then pay(Meng→BTC→Anuj) &&
     issue(Legalese→convertibleDebt→Meng)
where issue a→b→c = prereqNotices a→b→c
      && draftAgreements a→b→c
      && signAgreements a→b→c
      && postreqFilings a→b→c
```

# Airfare reimbursement without a bank account

With Ethereum, agency resides in the contract:

```
if paymentObserved(Anuj→Airline)
then pay(Meng→BTC→Anuj) &&
     issue(Legalese→convertibleDebt→Meng)
where issue a→b→c = prereqNotices a→b→c
      && execAgreements a→b→c
      && postreqFilings a→b→c
```

# Opportunity for a full-stack startup.

*Legalese sells directly to end-users, bypassing law firms.*

*Maybe in the future ...*

Every time somebody somewhere  
signs a contract online,  
Legalese.io will make \$1/signature?

# Project Status

Team of 10 developers, researchers, lawyers & law students.

Currently forming an NRF-funded partnership with i<sup>2</sup>r.a-star.edu.sg and with universities (NUS, SMU) for research into formal methods & language generation. In Q3 2016 will raise a \$2m seed round (gov't matched) from angel/seed/corp-venture sources.

Go-to-market for Version One in 2016  
R&D for Version Two, launch in 2017.

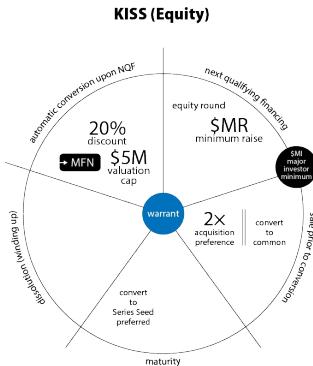
# Freemium Revenue Models

- \$1/signature flat fee?
- Convenience fee for signature workflow management?
- Contract lifecycle management integration with ERP, project management, calendaring.
- “Private repo” fees?
- PDFs are free; .docx costs. LOL
- Change Legalese viral branding to your company’s logo?
- Referral/affiliate fees to law firms; v3.0 legal marketplace?
- Subscription to “service packs” that keep contracts updated as legislation changes?
- Investment agreements free at first; after raise, pay \$1000?
- Industry intelligence services?
- Portfolio management?
- Investor relations? Compliance?

# LEGALESE.IO

*software is eating law*

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