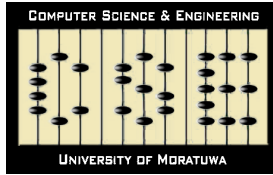


idstack.one

The Decentralized Protocol for Document Verification built on Digital Signatures

<http://www.idstack.one>



idstack^{one}

The Decentralized Protocol for Document Verification built on Digital Signatures

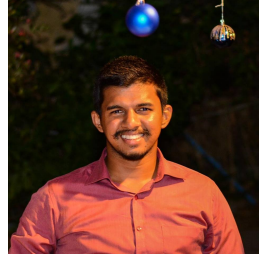
Our Team



Chanaka Lakmal



Sachithra Dangalla



Chamin Wickramaratna



Chandu Herath

Supervisors



Prof. Gihan Dias

PhD (UCD), MSc (UCSB),
BSc Eng. (Hons)
(Moratuwa), MIE (SL),
CEng



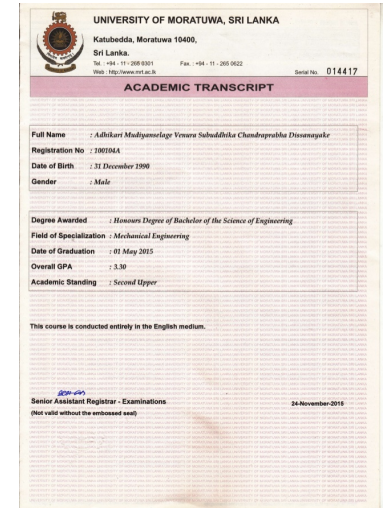
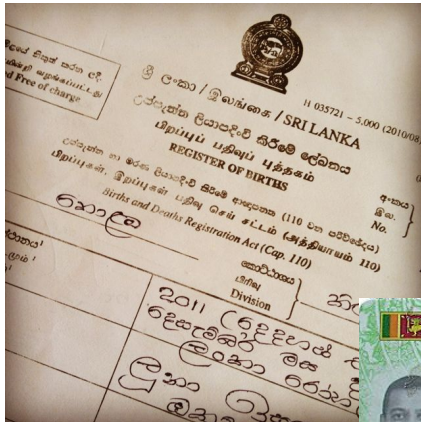
Eng. Dr. Shantha Fernando

PhD (TU Delft), MPhil
(Moratuwa), BSc Eng. (Hons)
(Moratuwa), MIE (SL), MIEE
(UK), CEng

Problem & Motivation

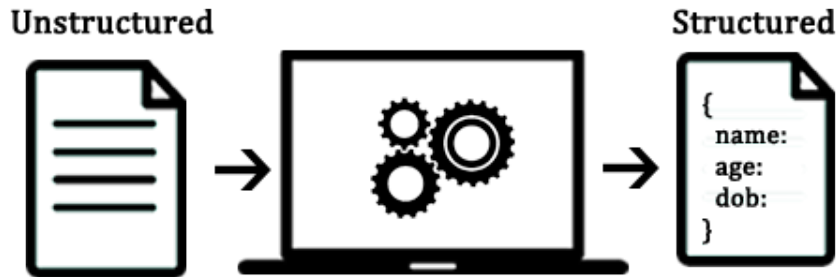
Problem

In countries like Sri Lanka the document verification process is highly based on the **printed copies**.



Problem : 1/4

Documents have **unpredictable layouts** that have raw information and there is **no mechanism** in the current research field to **extract them into common format of machine readable**.



Problem : 2/4

The document is subjected to a **process of verification** by an authority by using a **hand written signature**.

Another verified copy?

The whole process is **repeated**.

Sometimes the **fraudulent activities** that are followed by certain citizens **leading to doubtfulness of the authenticity** of the content.



Problem : 3/4

Non existence of a mechanism in the current research field that can **calculate trustworthiness** of individual document.



Problem : 4/4

Non existence of a mechanism in the current research field that can **calculate correlation** among set of documents belonging to a person.



Motivation

On average, **3.1 days** are added to most processes in order to collect **physical signatures** and eSignatures **reduce document turnaround time by 80%**

Source: AIIM White paper study - <http://www.aiim.org/pdfdocuments/MIWP-DigitalSignatures-2013.pdf>

The Electronic Transactions Act (ETA) No. 19 of 2006 (Section 7) gives **e-signatures the same legal weight as traditional hand-written signatures.**

Source: Electronic Transaction Act, No.19 of 2006 (Section 7)

In last year budgets for the years 2016 and 2017, **the government allocated LKR 15 billion** to implement policy of digitalizing the economy.

Source: Budget Speech 2017, Ministry of Finance

ICTA implement e-Document Attesting System at Ministry of Foreign Affairs

The Information and Communication Technology Agency (ICTA) has taken another step towards creating a digitally-empowered nation by implementing an electronic Document Attesting System (eDAS) at the Ministry of Foreign Affairs (MFA).

Source: <http://www.ft.lk/article/596399/ICTA-implements-e-Document-Attesting-System-at-Ministry-of-Foreign-Affairs> (February 2017)

Motivation



Processing time

12 hours



15 minutes

Error Rates

40%



5%

Source: Accepting E-Documents with E-Signatures, VERITE Research (February 2017)

TABLE 1: TIME TAKEN (IN HOURS) TO COMPLY WITH DOCUMENTATION REQUIREMENTS FOR INTERNATIONAL TRADE

| | To Export | To Import |
|-----------|-----------|-----------|
| Singapore | 4 | 1 |
| UAE | 6 | 37 |
| Malaysia | 10 | 10 |
| Oman | 31 | 24 |
| India | 61 | 67 |
| Pakistan | 62 | 153 |
| Sri Lanka | 76 | 58 |

Source: World Bank, Doing Business Index 2016

Source: The Global Enabling Trade Report 2016, World Economic Forum


Revolutionize

Document Processing

idstack.one

The Decentralized Protocol for Document Verification built on Digital Signatures

Features



| | |
|-------------------|--|
| Extraction | <p>Provide an application to extract data</p> <ul style="list-style-type: none">• from a paper document• from a digital document (PDF) <p>and convert into a Machine Readable (.idstack) format and verify it.</p> |
| Validation | <p>Provide an application to validate and verify a document with the use of digital signatures</p> |
| Confidence score | <p>Provide an application with algorithm to calculate the trustworthiness of individual document</p> |
| Correlation score | <p>Provide an application with algorithm to calculate the correlation among a set of documents</p> |

Design

PDF or Paper Document



Citizens have their **own documents** as PDF or Paper Document.

This is for human beings to look at it.

VS

Machine Readable Document

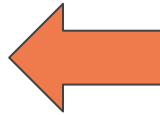


All the documents are converted into **.idstack** format by **IDStack** and given back to the citizen with **Digital Signatures**.

This is for automatically processing by the computers.

Design

```
1 {
2   "meta_data": {
3     "name": "IDStack",
4     "version": "1.0",
5     "document_id": "",
6     "document_type": "",
7     "issuer": {
8       "organization": "",
9       "email": "",
10      "url": ""
11    }
12  },
13  "content": {},
14  "extractor": {
15    "id": "",
16    "signature": {
17      "message_digest": "",
18      "url": ""
19    }
20  },
21  "validators": [
22    {
23      "id": "",
24      "signature": {
25        "message_digest": "",
26        "url": ""
27      },
28      "signed_content": "",
29      "signed_signatures": []
30    }
31  ]
32 }
```



Machine Readable Document

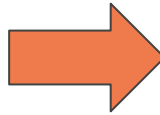


All the documents are converted into `.idstack` format by **IDStack** and given back to the citizen with **Digital Signatures**.

This is for automatically processing by the computers.

Design

```
1 {
2   "meta_data": {
3     "name": "IDStack",
4     "version": "1.0",
5     "document_id": "",
6     "document_type": "",
7     "issuer": {
8       "organization": "",
9       "email": "",
10      "url": ""
11    }
12  },
13  "content": {},
14  "extractor": {
15    "id": "",
16    "signature": {
17      "message_digest": "",
18      "url": ""
19    }
20  },
21  "validators": [
22    {
23      "id": "",
24      "signature": {
25        "message_digest": "",
26        "url": ""
27      },
28      "signed_content": "",
29      "signed_signatures": []
30    }
31  ]
32 }
```



```
1 {
2   "meta_data": {
3     "name": "IDStack",
4     "version": "1.0",
5     "document_id": "a8heEdgg",
6     "document_type": "passport",
7     "issuer": {
8       "organization": "department of immigration and emmigration",
9       "email": "controller@immigration.gov.lk",
10      "url": "http://www.immigration.gov.lk/usr/local/idstack/extractor/cert/pub/9e18a0b3-45cd-41e9-81a2-073e91e0c1b0.cer"
11    }
12  },
13  "content": {
14    "university": "University of Moratuwa",
15    "faculty": "Engineering",
16    "degree": "BSc Eng Hons",
17    "name": {
18      "surname": "Dangalla",
19      "initials": "DADJS"
20    },
21    "index_no": "130094R",
22    "address": {
23      "line1": "9A, De Mel Watta Road, Koswatta",
24      "line2": "Nawala"
25    },
26    "nic": "937741180V"
27  },
28  "extractor": {
29    "id": "b178dad3",
30    "signature": {
31      "message_digest":
32        "MIAGCSqGSIb3DQEHAqCAMIAQAQExDzAMBglghkgBZQMEAgEFADCBgkqhkiG9w0BB
33        wGggCSABIBN3sidW5pdmVyc2l0eSI611VuaXZlcmluZmVudG9wYXR1dZElL",
34      "url": "http://www.mrt.ac.lk/usr/local/idstack/extractor/cert/pub/9e18a0b3-45cd-41e9-81a2-073e91e0c1b0.cer"
35    }
36  },
37  "validators": [
38    {
39      "id": "1Ued5eg",
40      "signature": {
41        "message_digest":
42          "MIIFRjCCBC6gAwIBAgIRAMxtHV1q5YH597HXLW01n14wDQJKoZlIhvcNAQELBQA
43          wg2AXCzAJBgNVBAYTAkdCMRswGQYDVQQIEXJHcmVhdGVyIE1hbmNoZ",
44        "url": "http://idstack.one/gtzKCGE0xH87M9P"
45      },
46      "signed_content": "true",
47      "signed_signatures": []
48    }
49  ]
50 }
```

Design

All the **citizens** are grouped into one of the followings.

Anyone can play any role at **anytime**.



Owner



Extractor

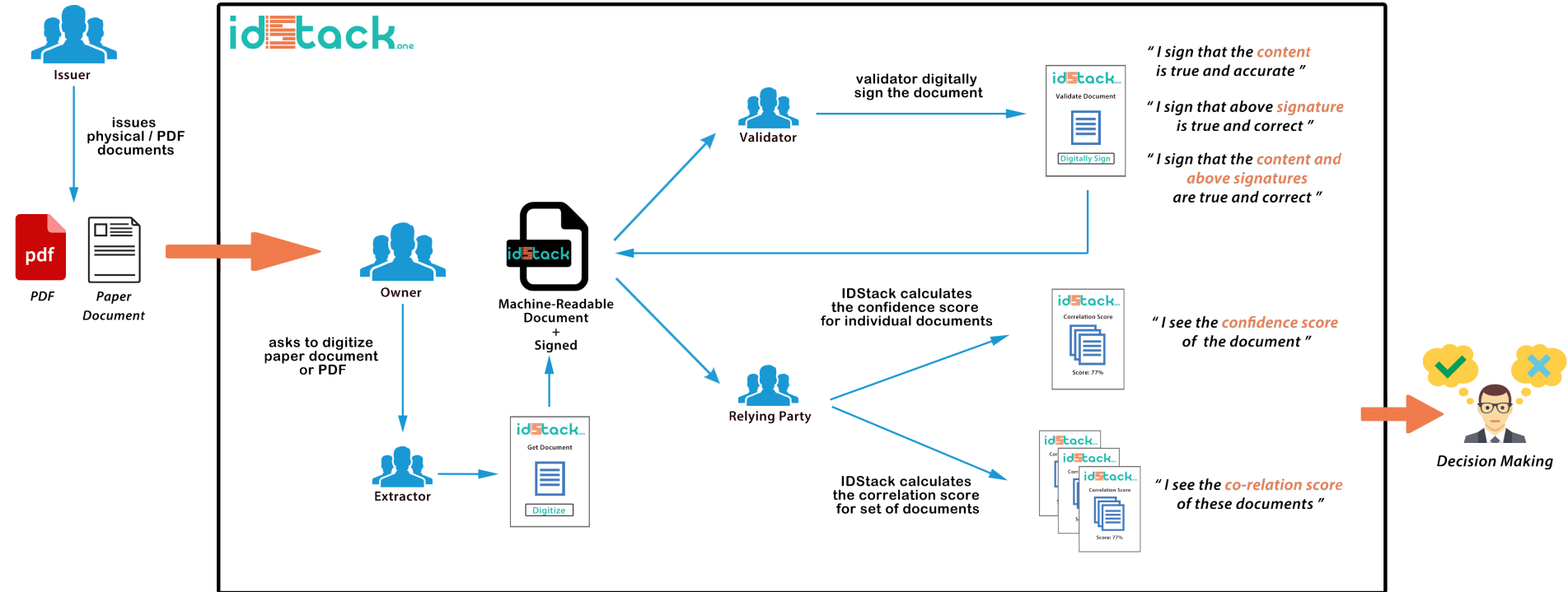


Validator

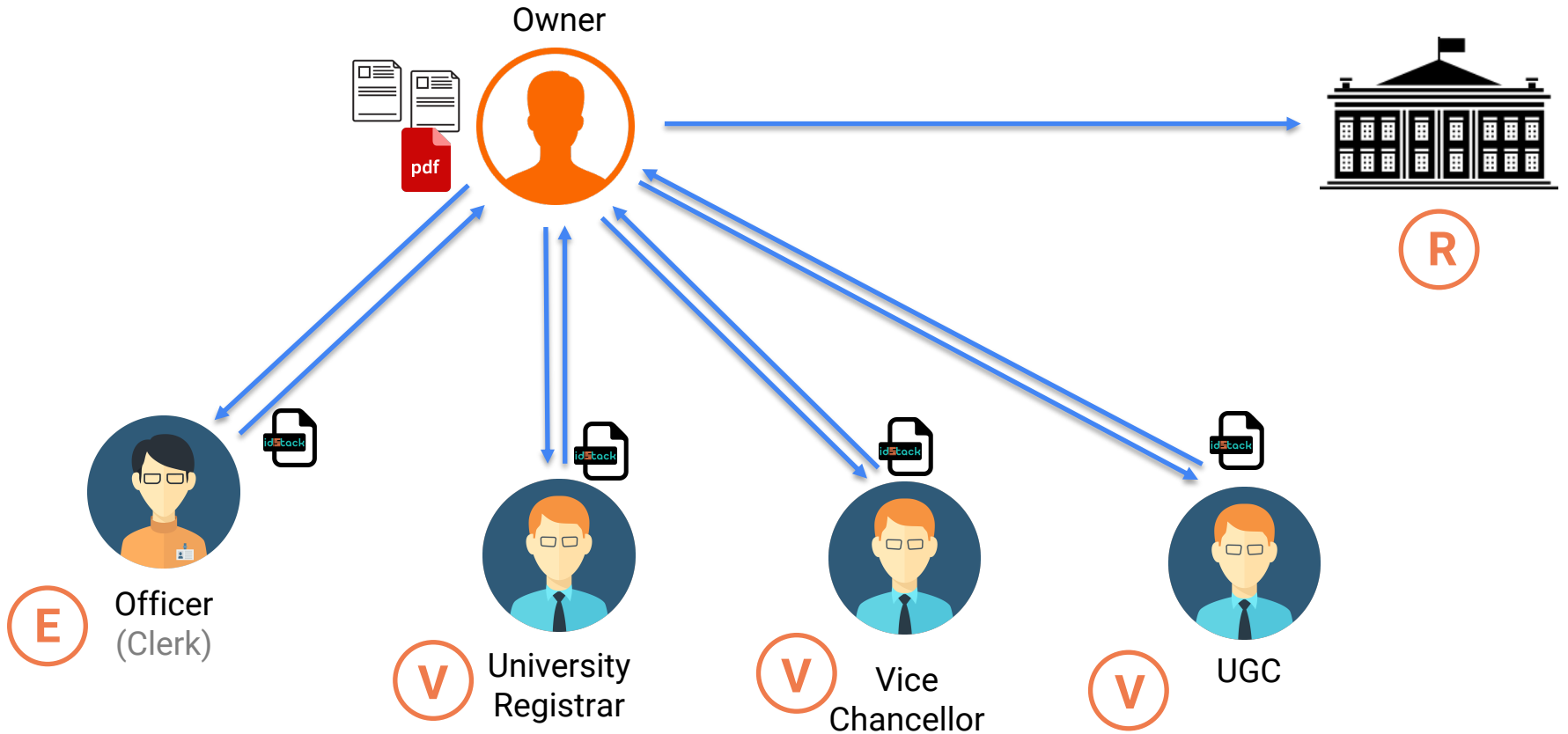


Relying Party

idstack_{one}, The Decentralized Protocol



User Story



Usefulness of Product

CITeS Deployment -



CITeS
Center for IT Services
University of Moratuwa

Issue digitally signed documents

- Transcript
- Degree Certificate
- Result Sheet
- University ID

Resource Person : Mr. Samudaya Nanayakkara

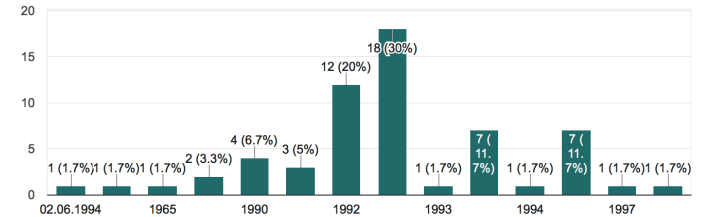
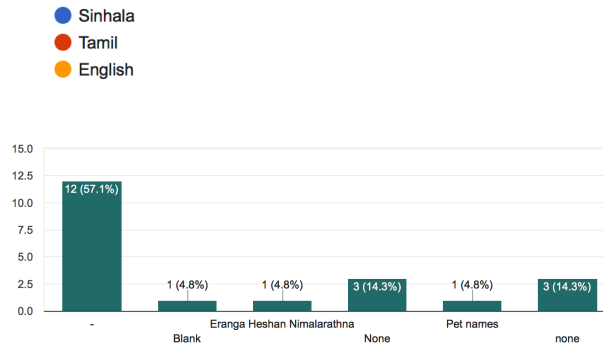
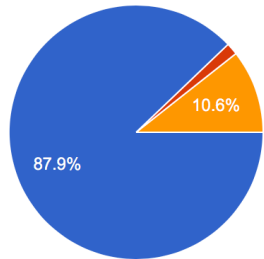
Surveys

1. Digital documents in Sri Lankan industries






- To gather information about the **industry viewpoints** on the use of digital documents

2. Representation of names in personal documents

- To gather information to analyze how an **individual's name differs across his personal documents**.

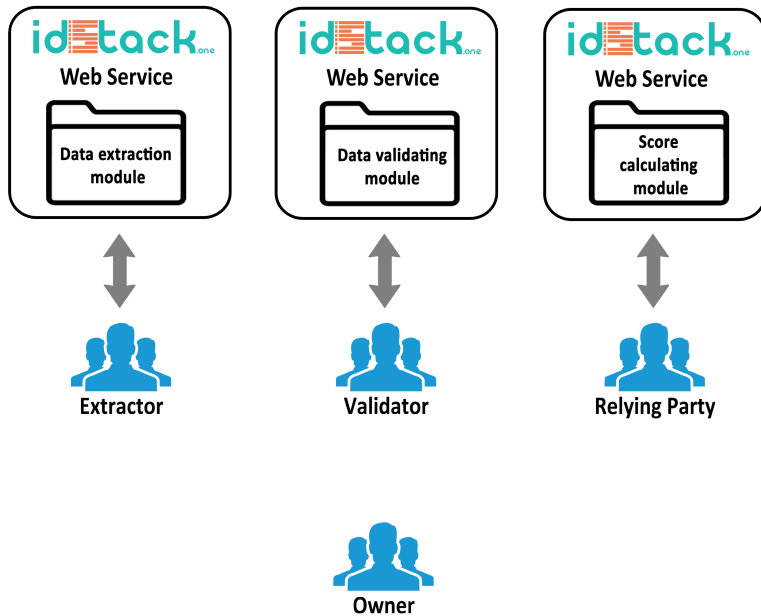


Existing Product Analysis

| | | |
|---------------------------------|---|---|
| <p>Extraction</p> |  | <p>Docparser have came up with method which specific locations inside the pdf document with a point & click system. Then based on regular expressions and pattern recognition, system can automatically fetch data from documents from various sources, extract specific data fields and dispatch the parsed data in real-time.</p> |
| <p>Validation</p> |  | <p>A 20-year eSignature veteran, eSignLive offers both SaaS and an on-premise platform. e-Sign Enterprise has reliably demonstrated the highest-volume scale within the industry.</p> |
| |  | <p>RightSignature is a private-bootstrapped organization that entered the market less than four years ago yet has already established itself as a viable SaaS offering with the extensibility found in more established solutions.</p> |
| |  | <p>DocuSign offers the strongest overall platform capability and the highest marks in sender ease of use, security, extensibility and the critical area of customer success.</p> |
| |  | <p>Adobe EchoSign will serve a majority of expected functional needs for a typical departmental deployment. As the largest company in the space, by total revenue, Adobe bought into the eSignature category with its 2011 purchase of EchoSign.</p> |
| <p>Confidence Score</p> | <p style="text-align: center;">Not available for this domain</p> | |
| <p>Correlation Score</p> | | |

Architecture

Web Service Architecture



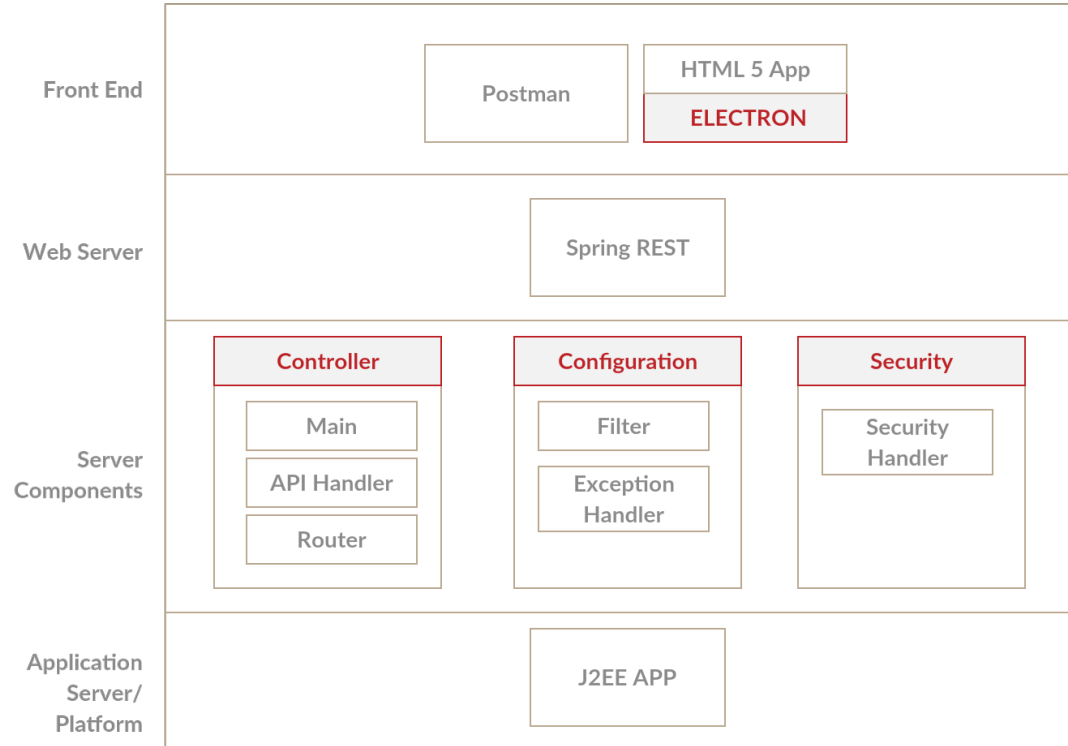
Web Service

Spring Boot REST API with 3 Modules mapped into 3 user roles

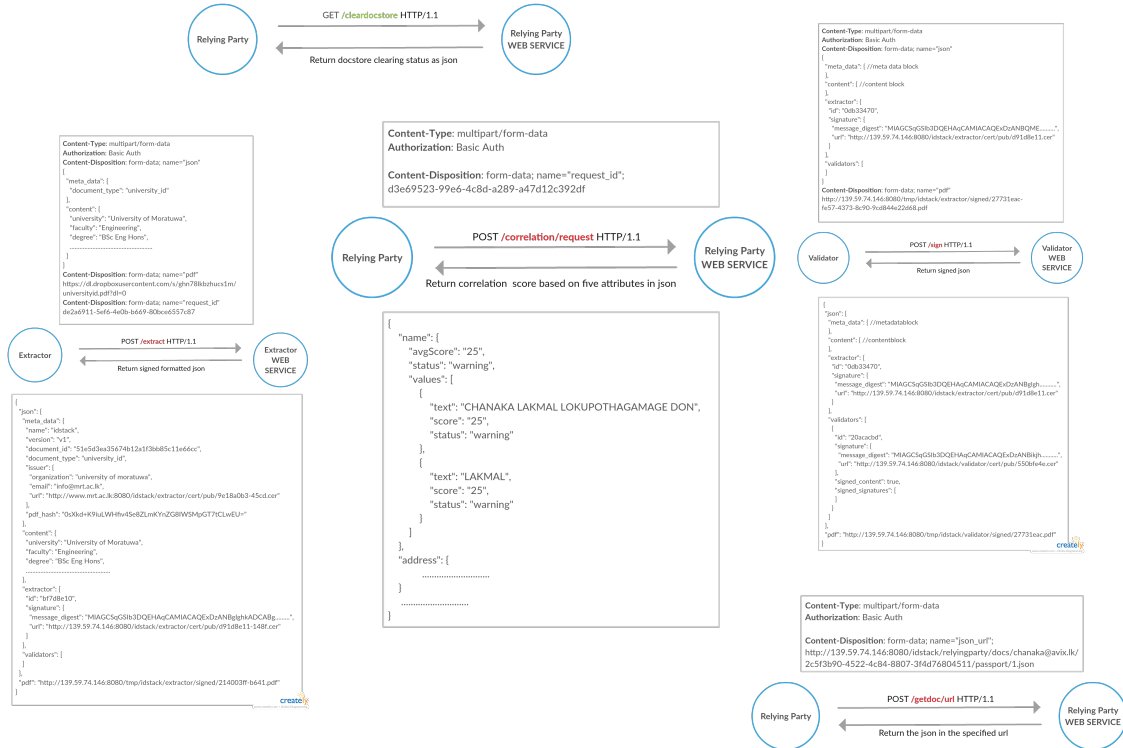
- Data extraction module Extractor
- Data validating module Validator
- Score calculating module Relying Party

Layered Architecture

After analyzing several architectures of world leading web service products,



Web Service Architecture

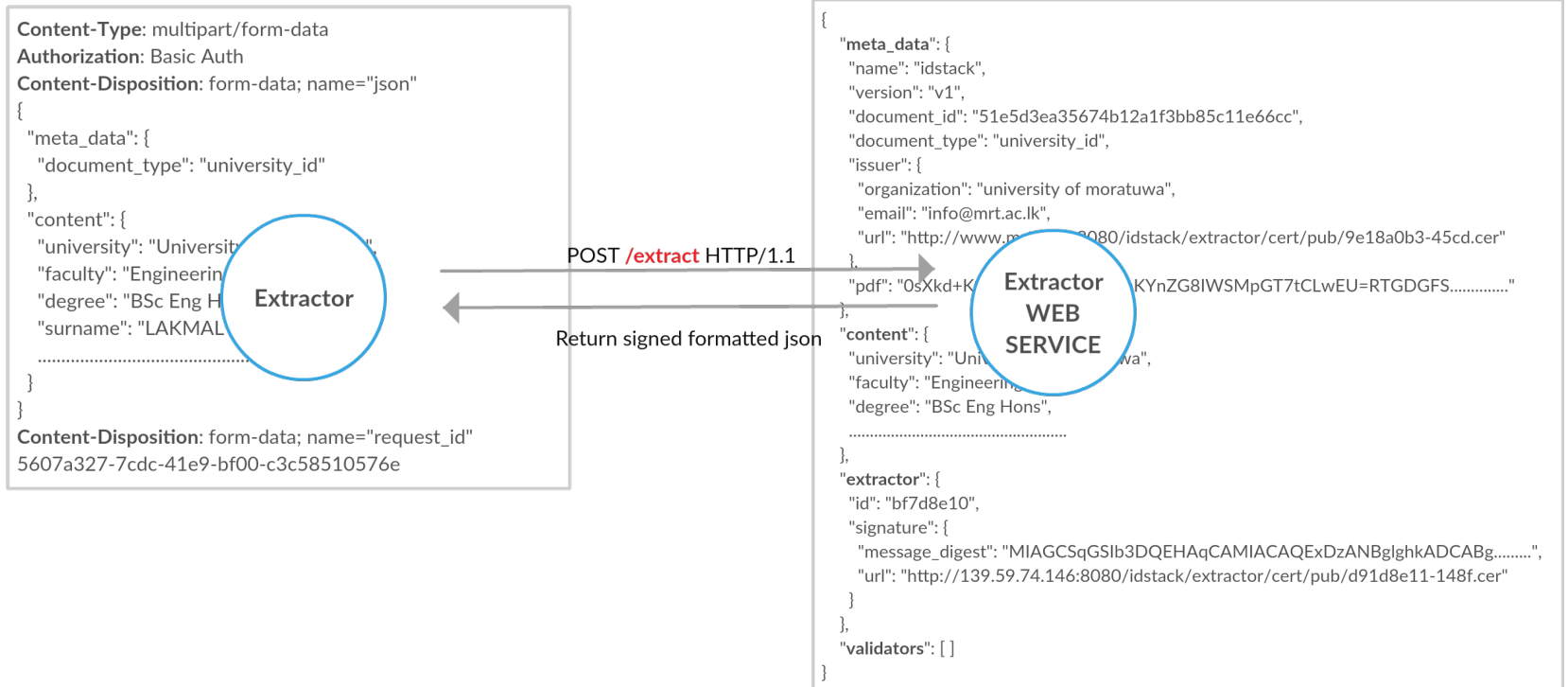


44 - API Requests

- Extractor 14
- Validator 20
- Relying Party 10

<https://idstack.docs.apiary.io>

Architecture

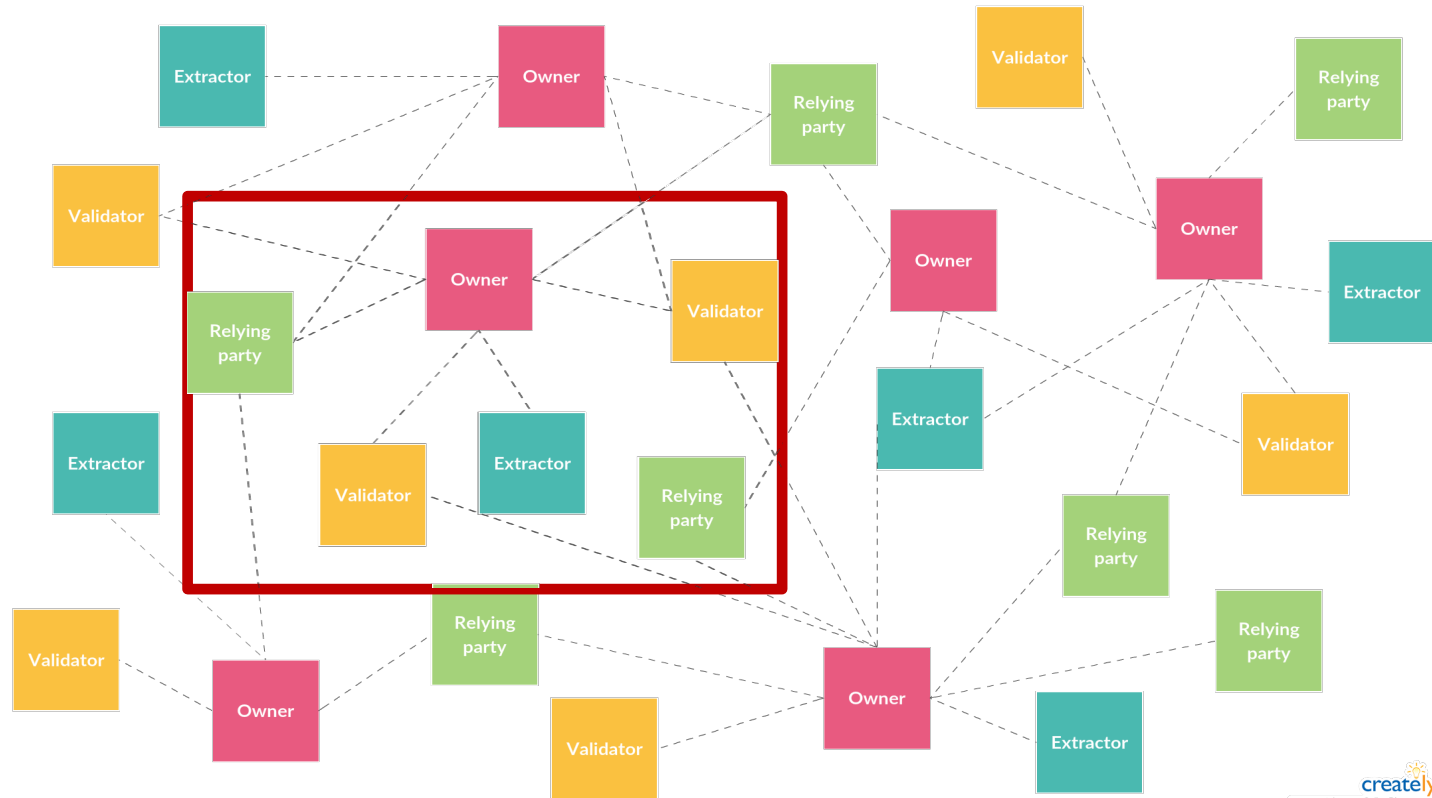


Why JSON ?

| | | | |
|------|---|-----|---|
| JSON | Easily interpreted on client side Compact notation Hierarchical data Light weight RESTful APIs natively support | XML | Bloated Harder to interpret in JavaScript Bit heavyweight (3 times as large as CSV) |
| | | CSV | Does not support hierarchical data Associated overhead of design parsers |

- N. Nurseitov, M. Paulson, R. Reynolds, and C. Izurieta, "Comparison of JSON and XML Data Interchange Formats: A Case Study," *Scenario*, vol. 59715, pp. 1–3, 2009.
- G. Wang, "Improving data transmission in web applications via the translation between XML and JSON," *Proc. - 2011 3rd Int. Conf. Commun. Mob. Comput. C. 2011*, pp. 182–185, 2011.
- D. Crockford, "The application/json Media Type for JavaScript Object Notation (JSON)" pp. 1–10, 2006.
- "Best data format for web scraping : ScrapeHero", *Scrapehero.freshdesk.com*, 2017. [Online]. Available: <https://scrapehero.freshdesk.com/support/solutions/articles/5000008629-data-formats-csv-json-xml-or-sql>. [Accessed: 15- May- 2017].

Decentralized Architecture



Why Decentralized ?

- No trusted central party required

Owner is the person involves in keeping documents safe

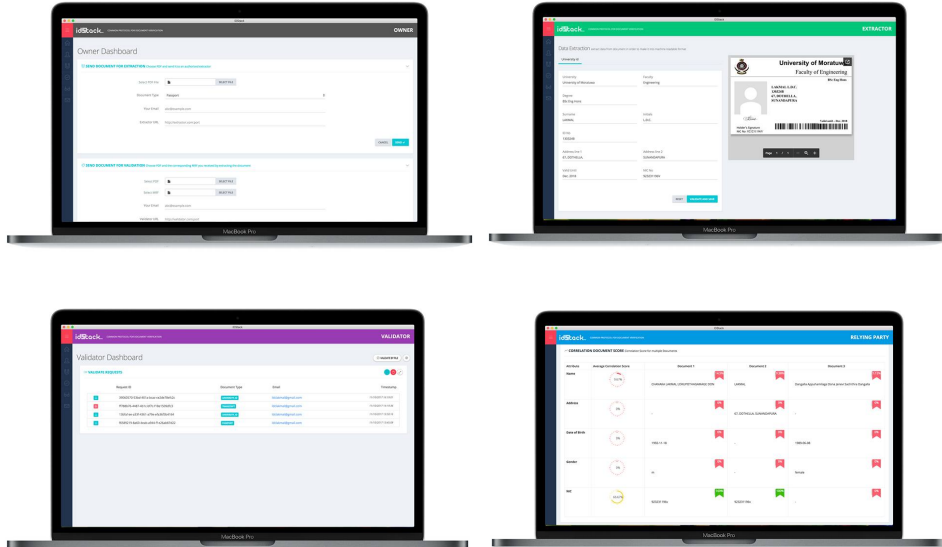
Each organization maintain their own web services

- Avoid central point of failure

Web services acts individually

- *S. Androutsellis-Theotokis and D. Spinellis, "A survey of peer-to-peer file sharing technologies," Athens Univ. Econ., pp. 1–31, 2002.*
- *R. Fisman and R. Gatti, "Decentralization and corruption: Evidence from U.S. federal transfer programs," Public Choice, vol. 113, no. 1–2, pp. 25–35, 2002.*
- *D. Fu, C. M. Ionescu, E.-H. Aghezzaf, and R. De Keyser, "Decentralized and centralized model predictive control to reduce the bullwhip effect in supply chain management," Comput. Ind. Eng., vol. 73, pp. 21–31, 2014.*
- *B. Klagge and R. Martin, "Decentralized versus centralized financial systems: Is there a case for local capital markets?," J. Econ. Geogr., vol. 5, no. 4, pp. 387–421, 2005.*
- *P. Li, "Centralized and Decentralized Lab Approaches Based on Different Virtualization Models," J. Comput. Sci. Coll., vol. 26, no. 2, pp. 263–269, 2010.*

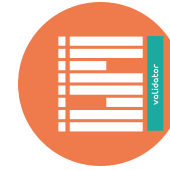
End User Product



4 Cross platform client applications
developed using  ELECTRON



Extractor
Web Service



Validator
Web Service

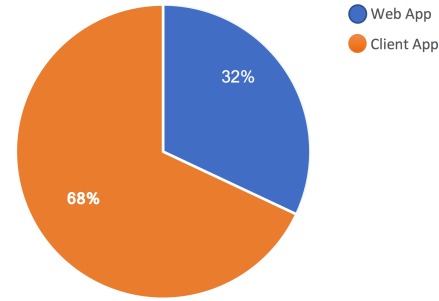


Relying Party
Web Service

3 Web services
developed using  spring

Why Standalone / Desktop App ?

- By the **survey results** people prefer standalone / desktop client app rather than web app



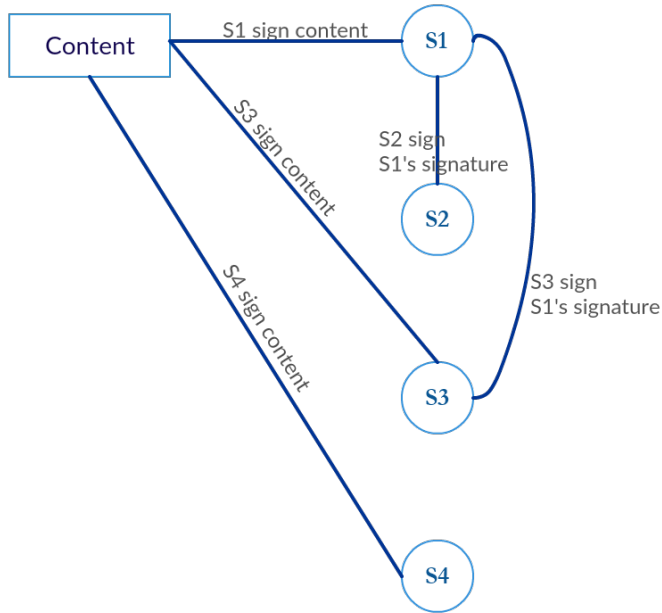
- Speed and performance
- Current research on new trend with **Electron**



- "Why desktop apps are making a comeback – Mathilde Collin – Medium", Medium, 2017. [Online]. Available: <https://medium.com/@collinmathilde/why-desktop-apps-are-making-a-comeback-5b4eb0427647>. [Accessed: 05- Jun- 2017].
- A. Lynch, "Beyond The Browser: From Web Apps To Desktop Apps – Smashing Magazine", Smashingmagazine.com, 2017. [Online]. Available: <https://www.smashingmagazine.com/2017/03/beyond-browser-web-desktop-apps/>. [Accessed: 25- May- 2017].
- K. Finley, "JavaScript Conquered the Web. Now It's Taking Over the Desktop", WIRED, 2017. [Online]. Available: <https://www.wired.com/2016/05/javascript-conquered-web-now-taking-desktop/>. [Accessed: 30- Apr- 2017].

Scoring Algorithms

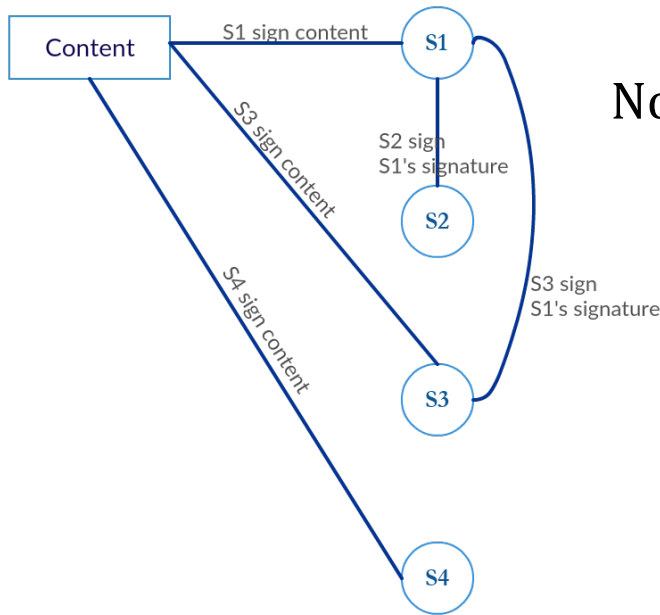
Confidence Score



The signatures on a single document can be considered as a graph where the signers and content are vertices and their signatures are edges.

- F. Wessel, K. Macherey, and H. Ney, "A Comparison of Word Graph and N-Best List Based Confidence Measures," *Eur. Conf. Speech Commun. Technol.*, no. 5, pp. 315–318, 1999.
- V. I. Torvik, M. Weeber, D. R. Swanson, and N. R. Smalheiser, "A probabilistic similarity metric for medline records: A model for author name disambiguation," *J. Am. Soc. Inf. Sci. Technol.*, vol. 56, no. 2, pp. 140–158, 2005.

Confidence Score Contd.



$$\begin{aligned}
 \text{Normalized score} &= \frac{\text{Current situation}}{\text{Best possible situation}} \\
 &= \text{Density of undirected graph} \\
 &= \frac{2E}{V(V-1)}
 \end{aligned}$$

- N. Alon and E. Fischer, "Refining the graph density condition for the existence of almost K -factors," *Ars Comb.*, vol. 52, pp. 296–308, 1999.
- L. Kowalik, "Approximation scheme for lowest outdegree orientation and graph density measures," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 4288 LNCS, pp. 557–566, 2006.

Correlation Score

| Person-Identity based attributes can be divided into 4 categories [1] | | | | |
|---|--------------------------|---|-------------------------|---------------------------------|
| | Space-related attributes | Time-related attributes: | Classifying attributes: | Identification codes: |
| Example | Address, Country, Region | Date of Birth, Date of Issue, Exp. Date | Gender, Marital Status | Passport No, Social Security No |
| Possibility to be updated | High | Very Low | Low | Very Low |
| For FYP scope covering Sri Lankan context we selected 4 attributes | Address | Date of Birth | Gender | NIC |

- B. Lisbach and V. Meyer, *Linguistic identity matching*. Springer, 2013.
- J. W. M. Campbell, "The role of biometrics in ID document issuance," *Keesing's Journal of Documents & Identity*, no. 4, pp. 6–8, 2004.

Correlation Score Contd.

Super Attributes:

1. Name : Partial match
2. Address : Partial match
3. DOB : Exact match
4. Gender : Exact match
5. NIC : Exact match

Other information (with identical keys) are compared using String similarity measures.

- *D. Dessimoz and P. C. Champod, "Multimodal Biometrics for Identity Documents 1 State-of-the-Art Research Report," Most, no. September, 2005.*
- *R. Clarke, "Roger Clarke's 'Id and Authentication Basics'", Rogerclarke.com, 2017. [Online]. Available: <http://www.rogerclarke.com/DV/IdAuthFundas.html>. [Accessed: 20- Aug- 2017].*
- *B. Miller, "Vital signs of identity [biometrics]," IEEE Spectr., vol. 31, no. 2, pp. 22–30, 1994.*

Correlation Score : Name

Name is an important identity measure.

There are many researches conducted for person name disambiguation.

Supervised techniques



Data collection

Real time analysis



Correlation of given documents

- M. Ben Fleischman and E. Hovy, "Multi-Document Person Name Resolution," *ACL 2004 Work. Ref. Resolut. its Appl.*, pp. 1–8, 2004.
- C. Niu, W. Li, and R. K. Srihari, "Weakly Supervised Learning for Cross-document Person Name Disambiguation Supported by Information Extraction," *Proc. 42nd Meet. Assoc. Comput. Linguist. (ACL'04), Main Vol.*, pp. 597–604, 2004.
- V. I. Torvik, M. Weeber, D. R. Swanson, and N. R. Smalheiser, "A probabilistic similarity metric for medline records: A model for author name disambiguation," *J. Am. Soc. Inf. Sci. Technol.*, vol. 56, no. 2, pp. 140–158, 2005.

Correlation Score : Name Contd.

Problems:

1. Sri Lankan names are long and repetitive:
existing name-similarity measuring methodologies can give conflicting results
2. Mostly in Sinhala or Tamil:
translation to English can have variations
3. Different documents represent the name with different attributes and attribute order
4. Non-linguistic typing mistakes
5. People can change their names

Solution:

An algorithm that calculates:

- phonetic similarity
- order of name segments
- string similarity

- *H. Raghavan and J. Allan, "Using soundex codes for indexing names in ASR documents," Proc. Work. Interdiscip. Approaches to Speech Index. Retr. HLT-NAACL 2004., pp. 22–27, 2004.*
- *M. Wieling, E. Margaretha, and J. Nerbonne, "Inducing a measure of phonetic similarity from pronunciation variation," J. Phon., vol. 40, no. 2, pp. 307–314, 2012.*
- *G. Kondrak, "Phonetic alignment and similarity," Comput. Hum., vol. 37, no. 3, pp. 273–291, 2003.*

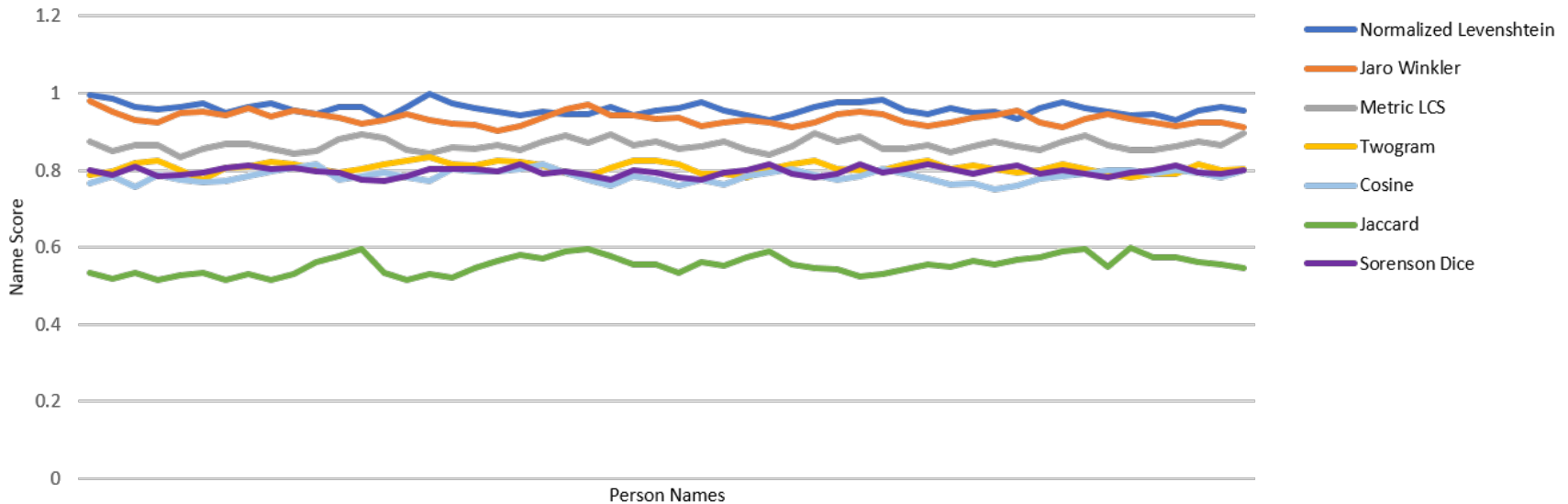
Correlation Score : Name Contd.

| | Document1 | Document2 |
|---|--|--------------------------|
| Example | Ranasinghe Arachchilage Kasun Dhanushka Gayanath Ranasinghe | Kevin Gayanath Ranasinha |
| Phonetic representation | R525 A622 K420 D522 G530 R525 | K870 G530 R525 |
| Identify overlapping name segments | R525 A622 K420 D522 G530 R525 | K870 G530 R525 |
| String similarity | Ranasinghe Arachchilage Kasun Dhanushka Gayanath Ranasinghe | Kevin Gayanath Ranasinha |

$$\text{Pair-wise order Score: } OS_{d_i, d_j, \text{name}} = \frac{\text{Overlapping segments in the same order}}{\text{Unique name segments in } d_i \text{ and } d_j}$$

- G. Kondrak, "N -Gram Similarity and Distance," *Lect. Notes Comput. Sci.*, vol. 3772, pp. 115–126, 2005.
- S. Banerjee and T. Pedersen, "The design, implementation, and use of the Ngram statistics package," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 2588, pp. 370–381, 2003.

Correlation Score : Name Contd.



- *W. Heeringa, "Measuring dialect pronunciation differences using Levenshtein distance," Dissertations.Ub.Rug.Nl, 2004.*

Correlation Score : Name Contd.

| Unique phonetic IDs | Document 1 | Document 2 | String similarity (Normalized Levenshtein) |
|---------------------|--------------|------------|---|
| R525 | Ranasinghe | Ranasinha | 80% |
| A622 | Arachchilage | - | |
| K420 | Kasun | - | |
| D522 | Dhanushka | - | |
| G530 | Gayanath | Gayanath | 100% |
| K870 | - | Kevin | |

Pair-wise String similarity score: $SS_{d_i, d_j, name} = \frac{\sum \text{Levenshtein similarity}}{\text{Unique name segments in } d_i \text{ and } d_j}$

Correlation Score : Name Contd.

| | D1 | D2 | D3 | D4 |
|----|----|----|----|----|
| D1 | - | a | b | d |
| D2 | a | - | c | e |
| D3 | b | c | - | f |
| D4 | d | e | f | - |

$$\text{Total pair-wise score: } CS_{d_i,d_j,name} = \frac{OS_{d_i,d_j,name} + SS_{d_i,d_j,name}}{2}$$

a = Score between D1 & D2
b = Score between D1 & D3
c = Score between D2 & D3 etc.

$$\text{Total document score: } CS_{d_k,name} = \left(\frac{1}{n-1}\right) \sum_{i \neq k}^n CS_{d_k,d_i,name}$$

Final name correlation score of D1 = (a+b+d) / 3

- J. Euzenat and P. Valtchev, "Similarity-based ontology alignment in OWL-Lite," *Processing*, vol. 16, no. C, pp. 333–337, 2004.

Correlation Score : Algorithms

For partially matching attribute, A (Name, Address)

$$\text{Total document score for attribute } A: CS_{d_k, A} = \left(\frac{1}{n-1}\right) \sum_{\substack{i=0 \\ i \neq k}}^n CS_{d_k, d_i, A}$$

For exactly matching attribute, A (DOB, Gender, NIC)

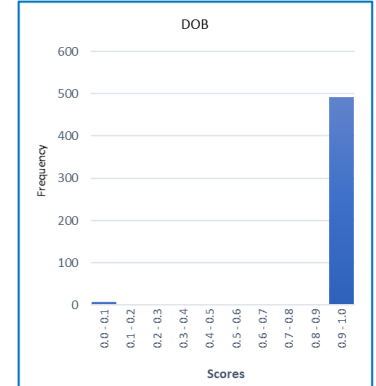
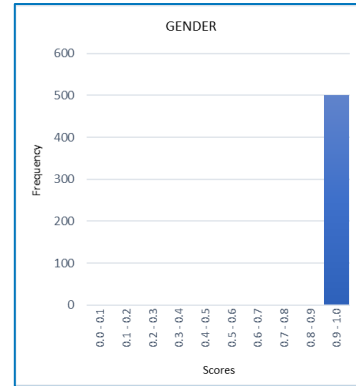
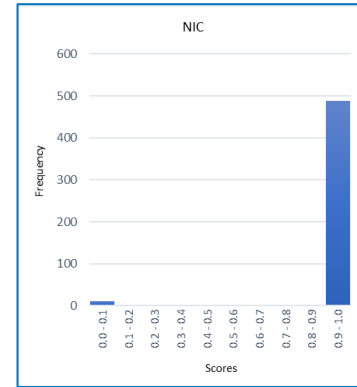
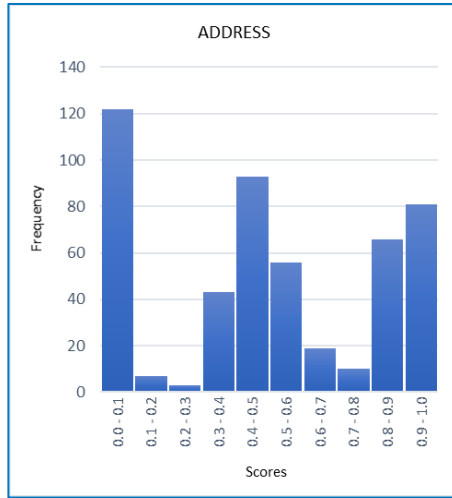
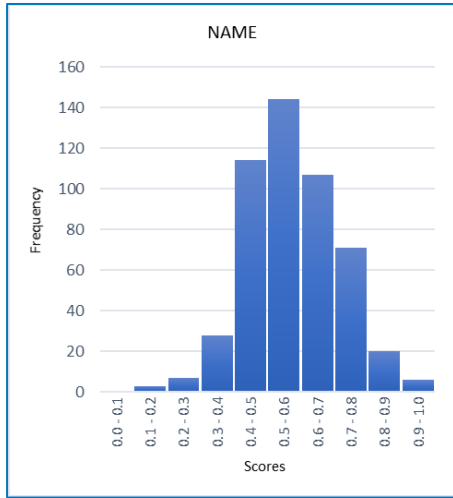
$$\text{Total document score for attribute } A: CS_{d_k, A} = \begin{cases} 1, & A_{d_k} = \text{Candidate}_A \\ 0, & \text{otherwise} \end{cases}$$

Final correlation score of document d_k

$$\text{Total score of document } d_k: CS_{d_k} = \frac{1}{n_A} \sum_i^{n_A} CS_{d_k, A}$$

Correlation Score - Results

Distribution attribute scores of data collected from the survey



Awards



19TH NATIONAL BEST QUALITY ICT AWARDS
NBQSA 2017

Merit Award
(out of 175+ teams)

Publications



Web
Indexing databases

: <http://nitc.lk>
: IEEE

Status

: **PUBLISHED** (in press)



Web
Indexing databases
H-Index
Scopus®

: <http://icact.org>
: IEEE, SCOPUS, EI Compindex, INSPEC
: **22**
: **63rd** among **754** international conferences

Status

: **ACCEPTED**

DEMO

Q & A

Thank You !

Appendix 1

FYP Scope

Input

- Digital PDF & Paper document without OCR

Language

- English

Template

- Use predefined set of templates
(*Student ID, Transcript, Passport*)

Future Work

Input

- Physical Documents with OCR

Language

- Sinhala & Tamil

Appendix 2

A reviewed concept

Blockchain Technology - Bitcoin [1], Ethereum [2]

A concept we use

Digital Signature

Similar products

DocuSign [3], Stampery [4], ShoCard [5], BlockSign [6]

[some use cases]

A product we use

DocParser [7]

[1] S. Nakamoto, "Bitcoin A Peer-to-Peer Electronic Cash System", 2017. [Online]. Available: <https://bitcoin.org/bitcoin.pdf>

[2] "Ethereum Project", Ethereum.org, 2017. [Online]. Available: <https://www.ethereum.org/>.

[3] "Don't settle for less. Choose the #1 eSignature brand.", DocuSign, 2017. [Online]. Available: <https://www.docusign.com>

[4] L. I. C. G. Adán Sánchez de Pedro Crespo, "Stampery Blockchain Timestamping Architecture," [Online]. Available:

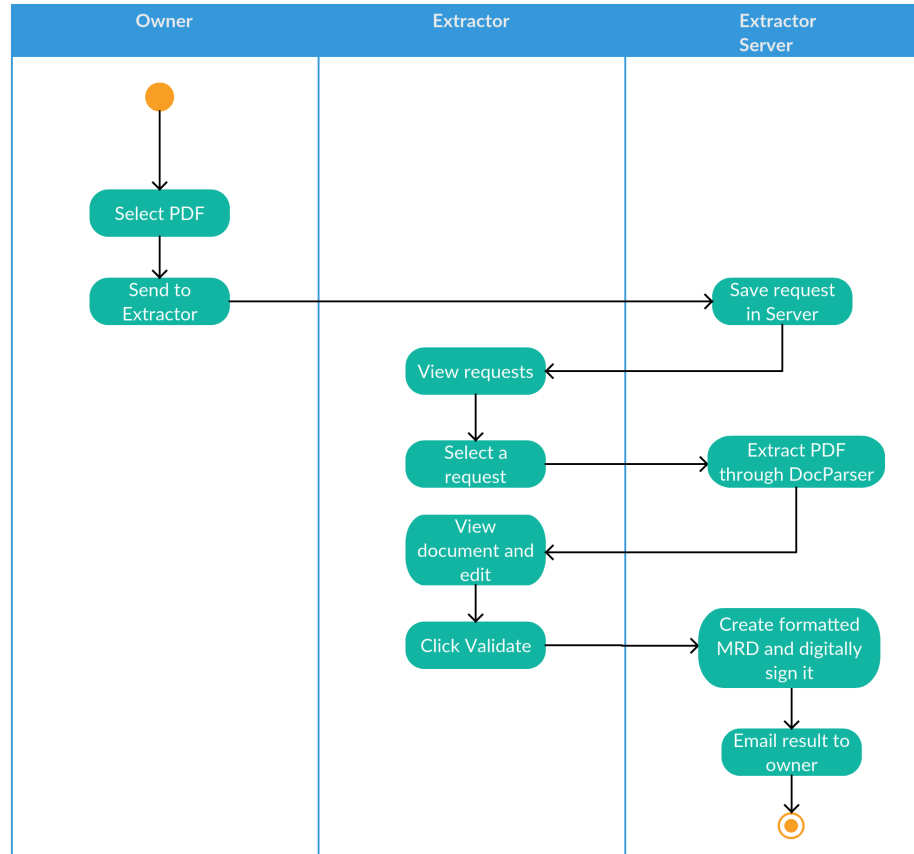
<https://s3.amazonaws.com/stampery-cdn/docs/Stampery-BTA-v5-whitepaper.pdf>.

[5] "ShoCard | Identity for a Mobile World", Shocard.com, 2017. [Online]. Available: <https://shocard.com/>

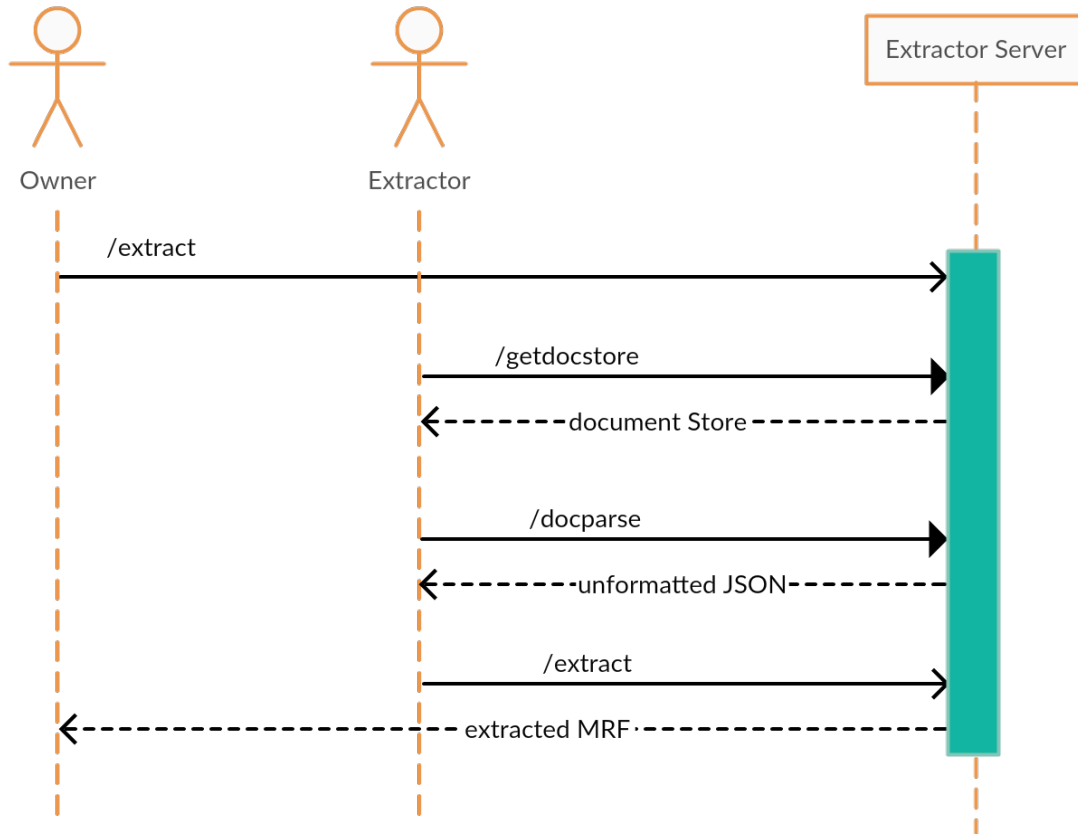
[6] "BlockSign", Blocksign.com, 2017. [Online]. Available: <https://blocksign.com/>

[7] "Docparser - Extract Data From PDF to Excel, JSON and Webhooks", Docparser.com, 2017. [Online]. Available: <https://docparser.com>

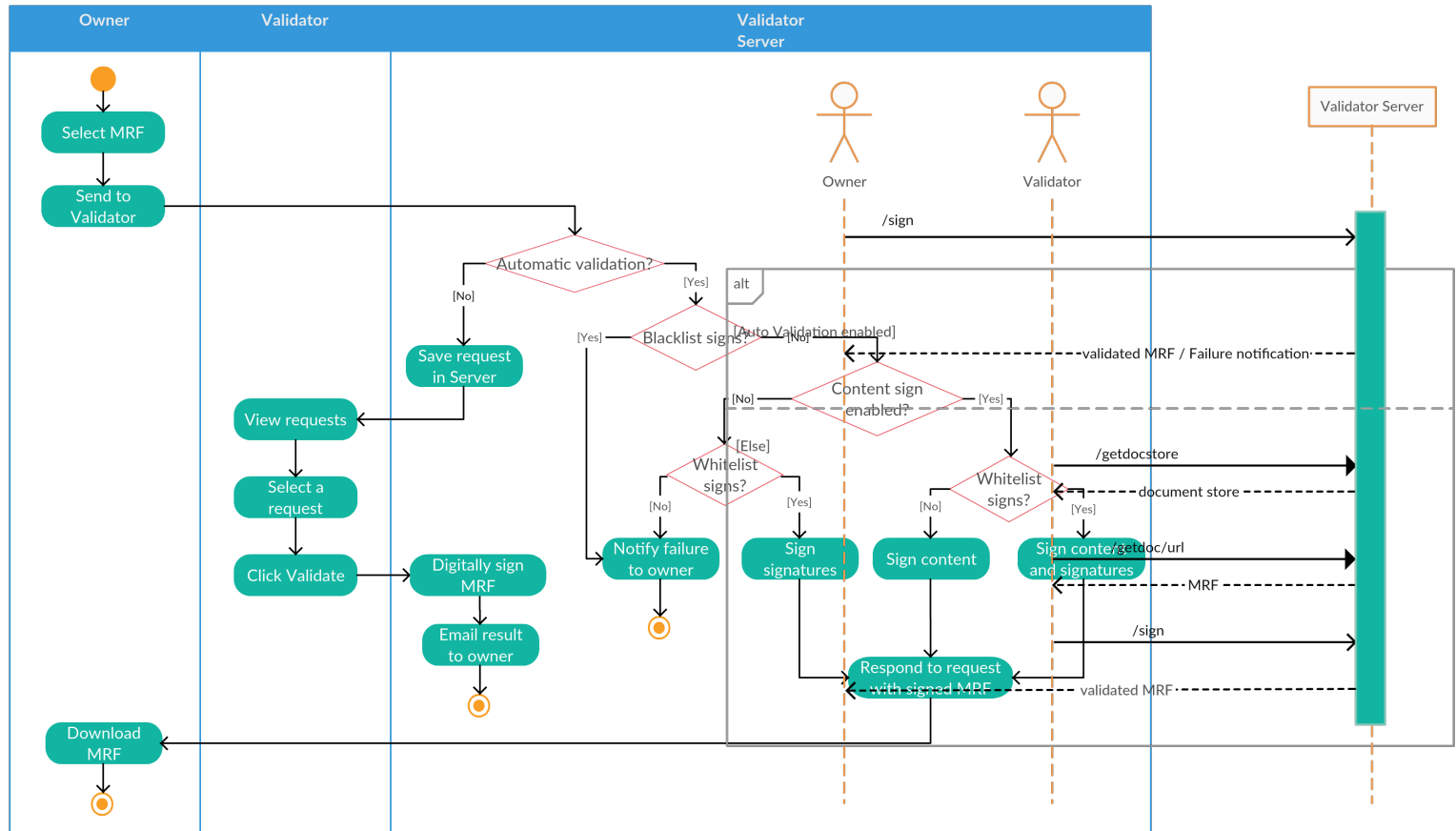
Appendix 3 : Extraction



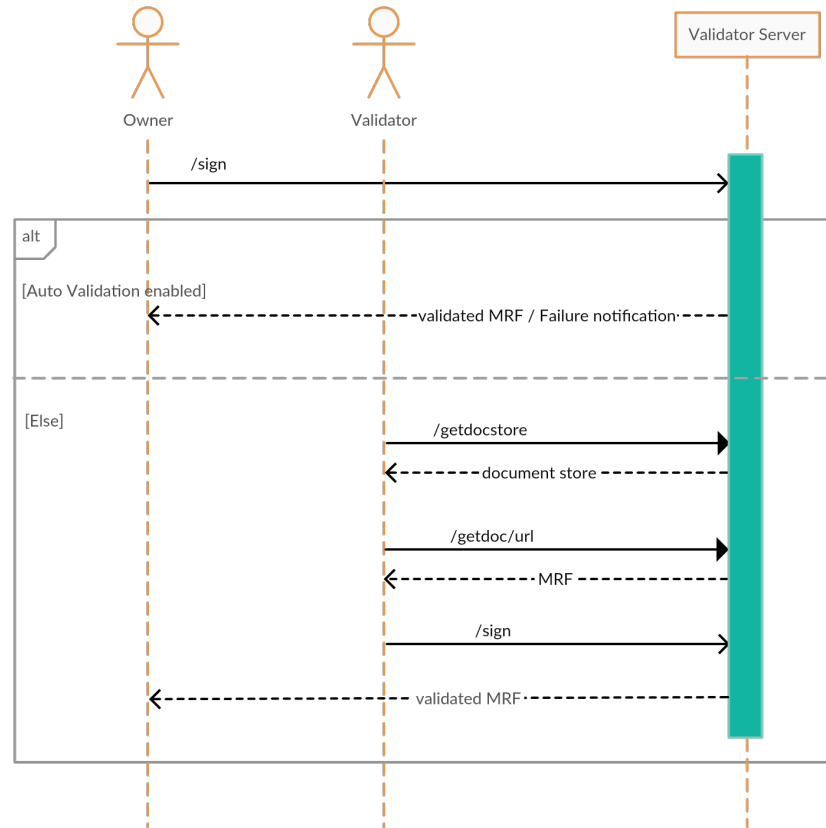
Appendix 4 : Extraction



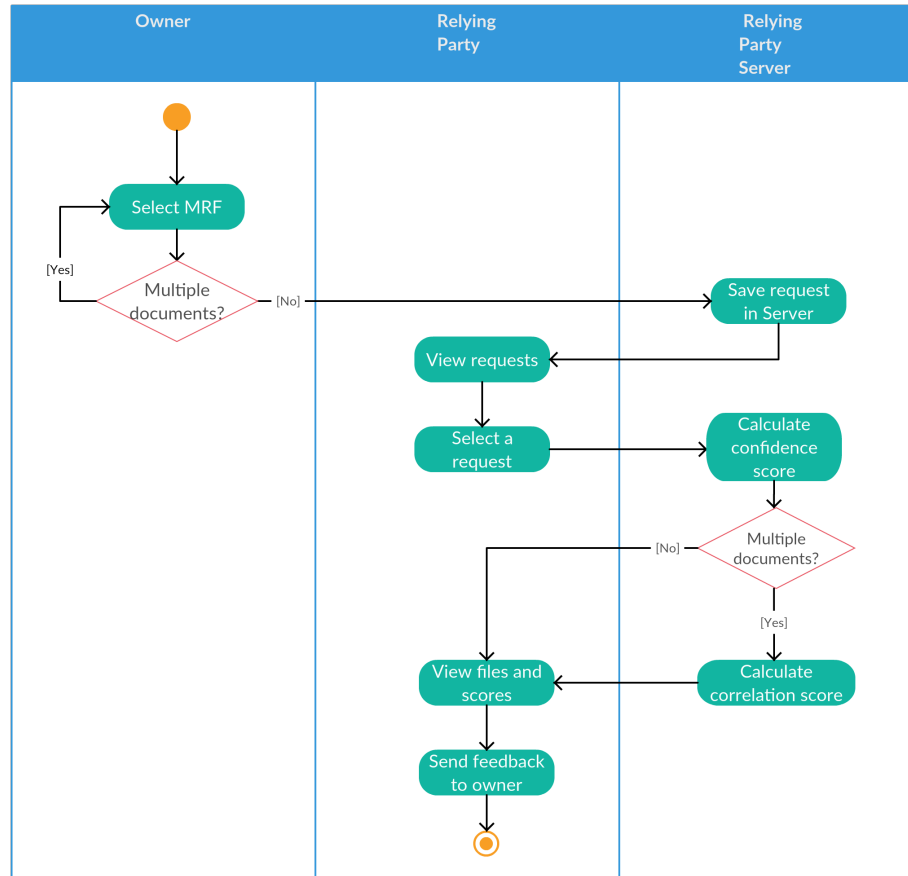
Appendix 5 : Validator



Appendix 6 : Validator



Appendix 7 : Relying Party



Appendix 8 : Relying Party

