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Directorate of Information Technology
Government of Maharashtra

As-Is and To-Be Report for Birth and Death Registration

September 2018

Pune Municipal Corporation

pwc

Table of Contents

1. Introduction

1 Introduction

1.1 About the Department/Directorate

Health services are mainly concerned with the wellbeing of general masses. The Directorate of Health Services, Maharashtra is the apex body for registration of births and deaths in the state of Maharashtra. The Director of Health Services is the Chief Registrar for registration of Births and Deaths in the state. The Chief Registrar is assisted by a Deputy Chief Registrar who handles the regular day to day activities. Deputy Chief Registrar's Office in Pune is the designated office for monitoring and managing the registration of births and deaths in the State. District Health Officers have been designated as the district registrars under whom the district functionaries operate. In Rural Areas the Deputy CEO of Zila Parishad and the Block Development Officer (BDO) are designated as the additional district registrar. Gram Sevak and Village Development Officers have been appointed as the registrar. In Urban Areas the Health Officers in Municipal Corporation, Chief Officer in Municipal Council/Nagar Palika, CEO of Cantonment Board and Manager of Ordinance Factory have been designated as the registrars.

The Health Services Department has provided the necessary resources and infrastructure to the functionaries at the rural and urban level. Major Corporations, Municipal Councils and some Gram Panchayats have deployed their own resources.

Registration of Births and Deaths has been taken up on high priority by the state. The Registration functionaries have enforced the registration of births and deaths very effectively.

The consolidation of state level data is being done at Dy. Chief Registrar's office in Pune. The office has a legal team for birth and death related cases.

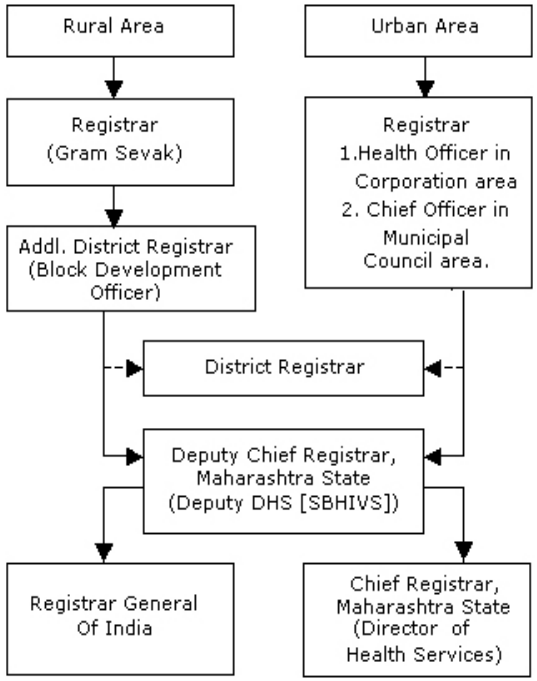


Figure 1 Flow of Rural Area and Urban Area Reporting System

1.2 Brief History of Civil Registration in Pune Municipal Corporation

Civil Registration System in Maharashtra State can be understood by 3 time span viz.

I. The System prior to 1/4/1969

The registration and its monitoring were in the hands of the Revenue and police department, while collection, compilation and preparation of the reports on Vital Statistics, were assigned to the Directorate of Health Services, being a most immediate user of Vital Statistics data. Further the health personnel were very actively helping and also supervising registration activity.

II. The System during 1/4/1969 to 6/2/1976

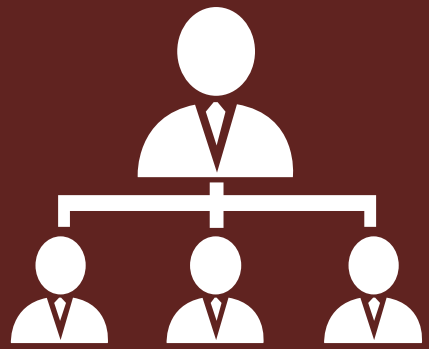
With the formation of Zilla Parishad and in accordance with the provisions of section 45 of the Bombay Village Panchayat Act1958, the registration of Births and Deaths was transferred to the Village Panchayat (VP) in the rural area of the entire State with effect from 1/4/1969. There is no change in urban area. Activity of registration is being carried out by Corporation and Municipal Councils, as previously.

III. The System from 7/2/1976 onwards

Realizing the growing importance of birth and death registration for the planning of socio–economic development, provisions for statutory registration was made in the entire country including Maharashtra under the Central registration of Birth and Death Act 1969, which was made applicable with effect from Apr. 1970 in Maharashtra. The State Rules i.e. The Maharashtra State registration of birth and death Rules 1976 were formed and notified in the Gazette dated 7/2/1978.

As per the guidelines from Government of India, revised rules of Registration of Birth and Death were formed in the year 2000, known as Maharashtra state registration of Birth and death Rules 2000. These rules were enforced starting 1/4/2000.

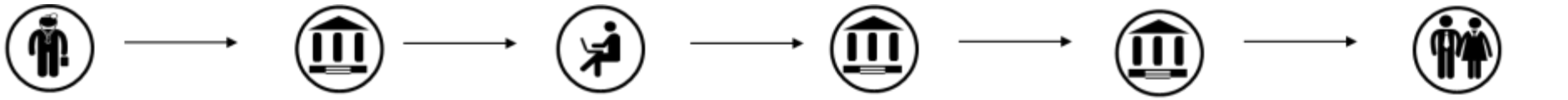
Hence, registration of birth and death was statutory compulsory in all municipal and Corporation areas under the various Acts previously. After the formation of Registration of Birth and Death act 1969, the registration was made compulsory according to the Act 1969 and rules of 1976.



2. Process Mapping

2 Process Mapping

2.1 Process Diagram: Birth Registration in PMC – Institutional Birth Registration



Hospital (Govt. or Private) fill Form 1 and send consolidated Form 1 to Kasba Peth Office.

There is no mandate on who will fill form 1 in Hospitals but generally a nurse would fill Form 1

A clerk in Kasba peth office will receive form 1.

She/He will make entry manually in a register. She/He will also check whether all forms are complete.

Day wise registers/case files are maintained.

Data Entry Officer will fill and submit the Form 1 on BRC System.

Department has hired contractual data entry officers. DEO are not PMC staff.

A Registration Number is generated when the DEO submits Form 1 online.

Upon submission by DEO, the form is received by a Junior Clerk of PMC.

Junior Clerk would accept review the Form 1 against the manual Form 1. He will edit the Form 1 if required and approve the application for Form 1

Upon Approval by the Junior Clerk a birth certificate is generated. A copy of the birth certificate is attached.

Birth Certificate has a QR code which once read would fetch the following details from the PMC server:

- Receipt No
- Certificate No
- Birth Date

Citizen can go to any PMC Citizen Facilitation Center to get a print of Birth Certificate.

First Certificate print is free. Subsequent prints are charged.

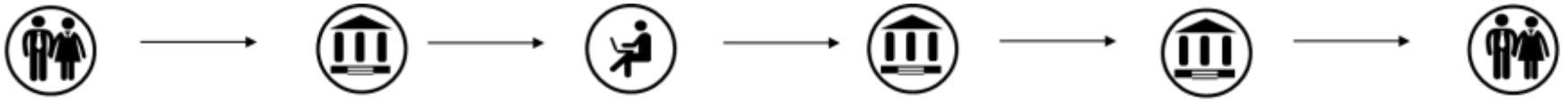
Alternatively, a citizen can take a print of the certificate online.

In case the Hospital is late in registration of birth, clerk will bring it to notice of Deputy Registrar. Deputy Registrar would sign (mention that the application is late). Clerk would then take requisite money from the Hospital Representative and give a receipt for the money.

PMC submits the money to Treasury each day.

		Stakeholder		State of System						
#	Activity	From	To	Current state	System / Entity	System Integrator	Cashless, Paperless, Faceless	Approximate Cost (if available)	Physical Travel Required	Approving Authorities involved
1	Fill Form 1 and send consolidated Form 1 to Kasba Peth Office	Hospitals (Govt. or Private)	Kasba Peth Office	Manual	NA	NA	NA	NA	Yes	Nurse or AnM or Medical Professional
2	Receive Form1, make manual entry, check for completion and maintain registers	Hospitals (Govt. or Private)	Kasba Peth Office	Manual	NA	NA	NA	NA	Yes	Clerk in Kasba Peth Office
3	Filling of Form 1 on BRC system	Data Entry Operator	Junior Clerk	Online	BRC System	Monarch Technologies	NA	NA	No	DEO in Kasba Peth
4	Review by Junior Clerk and Birth Certificate Generation	Junior Clerk	NA	Online	BRC System	Monarch Technologies	NA	NA	No	Junior Clerk
5	Printing of Birth Certificate by Citizen	CFC Clerk	Citizen	Online	BRC System	Monarch Technologies	NA	NA	Yes	NA

2.2 Process Diagram: Birth Registration in PMC – Non-Institutional Birth Registration



Parent come to Kasba Peth with following document:

- Doctor Certificate from local maternity hospital
- Parent ID Proof
- Vaccination Proof (if required)
- Self Declaration

Parent meet Deputy Registrar and take Form 1. Parent fill Form 1 and attach the documentary proofs

Deputy Registrar reviews the application. If satisfactory, She/He signs the Form 1 and sends the form to Data Entry Officer.

Data Entry Officer will fill and submit the Form 1 on BRC System.

Department has hired contractual data entry officers. DEO are not PMC staff.

A Registration Number is generated when the DEO submits Form 1 online.

Upon submission by DEO, the form is received by a Junior Clerk of PMC.

Junior Clerk would accept review the Form 1 against the manual Form 1. He will edit the Form 1 if required and approve the application for Form 1

Upon Approval by the Junior Clerk a birth certificate is generated. A copy of the birth certificate is attached.

Birth Certificate has a QR code which once read would fetch the following details from the PMC server:

- Receipt No
- Certificate No
- Birth Date

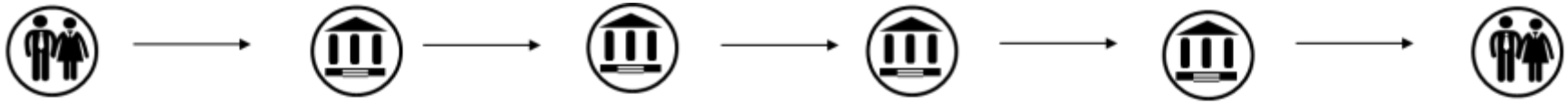
Citizen can go to any PMC Citizen Facilitation Center to get a print of Birth Certificate.

First Certificate print is free. Subsequent prints are charged.

Alternatively, a citizen can take a print of the certificate online.

		Stakeholder		State of System						
#	Activity	From	To	Current state	System / Entity	System Integrator	Cashless, Paperless, Faceless	Approximate Cost (if available)	Physical Travel Required	Approving Authorities involved
1	Filling of Form 1 by Parent	Parent	Deputy Registrar	Manual	NA	NA	NA	NA	Yes	NA
2	Approval of Form1	Deputy Registrar	DEO	Manual	NA	NA	NA	NA	Yes	Deputy Registrar
3	Filling of Form 1 on BRC system	Data Entry Operator	Junior Clerk	Online	BRC System	Monarch Technologies	NA	NA	No	DEO in Kasba Peth
4	Review by Junior Clerk and Birth Certificate Generation	Junior Clerk	NA	Online	BRC System	Monarch Technologies	NA	NA	No	Junior Clerk
5	Printing of Birth Certificate by Citizen	CFC Clerk	Citizen	Online	BRC System	Monarch Technologies	NA	NA	Yes	NA

2.3 Process Diagram: Changes in Birth Registration



Citizens come to Kasba Peth Office for changes in Birth Certificate.

For 15 years and below only parents can get the changes, for 15 and above the child himself can make any changes in the certificate.

Citizen brings ID proof, birth certificate and self declaration. In some cases an affidavit is also asked

They go to the correction department to obtain form for name correction

Correction Department makes a case of name correction. Attaches all documentary proof. If application is satisfactory, She/He approves the application by signing

File is sent to Additional Deputy Registrar who checks the forms and signs if acceptable

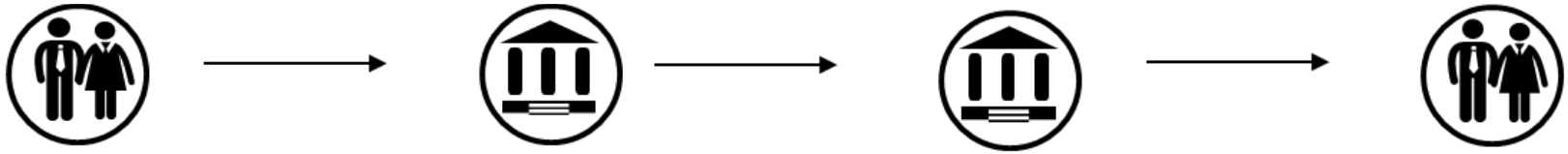
File is sent to Deputy Registrar for signature. If acceptable, she signs

Upon approval by Deputy Registrar, file is sent to PMC clerk who logs into the system, fetches the birth certificate and edits the certificate.

The updated birth certificate is printed and given to citizen from a CFC or citizen can print it online

	Stakeholder			State of System						
#	Activity	From	To	Current state	System / Entity	System Integrator	Cashless, Paperless, Faceless	Approximate Cost (if available)	Physical Travel Required	Approving Authorities involved
1	Application by Parent	Parent	Correction Department Clerk	Manual	NA	NA	NA	NA	Yes	Parent
2	Making of Correction Case	Correction Department	Additional Deputy Registrar	Manual	NA	NA	NA	NA	Yes	Correction Department Clerk
3	Approval of Additional Deputy Registrar	Additional Deputy Registrar	Deputy Registrar	Manual	NA	NA	NA	NA	Yes	Additional Deputy Registrar
4	Approval of Deputy Registrar	Deputy Registrar	PMC Clerk	Manual	NA	NA	NA	NA	Yes	Deputy Registrar
5	Editing by PMC Clerk	PMC Clerk	NA	Online	BRC System	Monarch Technologies	NA	NA	No	PMC Clerk
6	Printing of Birth Certificate by Citizen	CFC Clerk	Citizen	Online	BRC System	Monarch Technologies	NA	NA	Yes	NA

2.4 Process Diagram: Name Inclusion in Birth Certificate



Parents come to Kasba Peth Office for name inclusion in the Birth Certificate

Citizen brings the following documents:

- ID proof of Parents (including Aadhaar)
- Birth certificate

They go to the correction department to get the name included

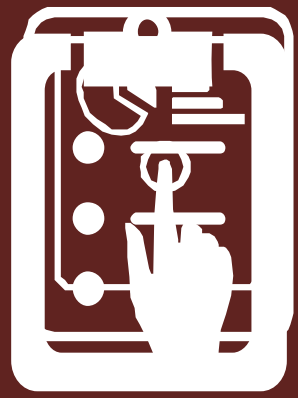
Correction Department makes a case of name inclusion. Attaches all documentary proof.

If application is satisfactory, She/He send the application to Deputy Registrar for approval (signature)

Upon approval by Deputy Registrar, file is sent to PMC clerk who logs into the system, fetches the birth certificate and edits the certificate.

The updated birth certificate is printed and given to citizen from a CFC or citizen can print it online

		Stakeholder		State of System						
#	Activity	From	To	Current state	System / Entity	System Integrator	Cashless, Paperless, Faceless	Approximate Cost (if available)	Physical Travel Required	Approving Authorities involved
1	Application by Parent	Parent	Correction Department Clerk	Manual	NA	NA	NA	NA	Yes	Parent
2	Making of Correction Case	Correction Department	Deputy Registrar	Manual	NA	NA	NA	NA	Yes	Correction Department Clerk
3	Approval of Deputy Registrar	Deputy Registrar	PMC Clerk	Manual	NA	NA	NA	NA	Yes	Deputy Registrar
4	Editing by PMC Clerk	PMC Clerk	NA	Online	BRC System	Monarch Technologies	NA	NA	No	PMC Clerk
5	Printing of Birth Certificate by Citizen	CFC Clerk	Citizen	Online	BRC System	Monarch Technologies	NA	NA	Yes	NA



3. Current Forms and Reports

3 Forms, Reports and Data Tables

3.1 Sample Birth Certificate

2014B0005058

महाराष्ट्र शासन
GOVERNMENT OF MAHARASHTRA
आरोग्य विभाग
HEALTH DEPARTMENT
पुणे महानगरपालिका
PUNE MUNICIPAL CORPORATION

जन्म प्रमाणपत्र
BIRTH CERTIFICATE

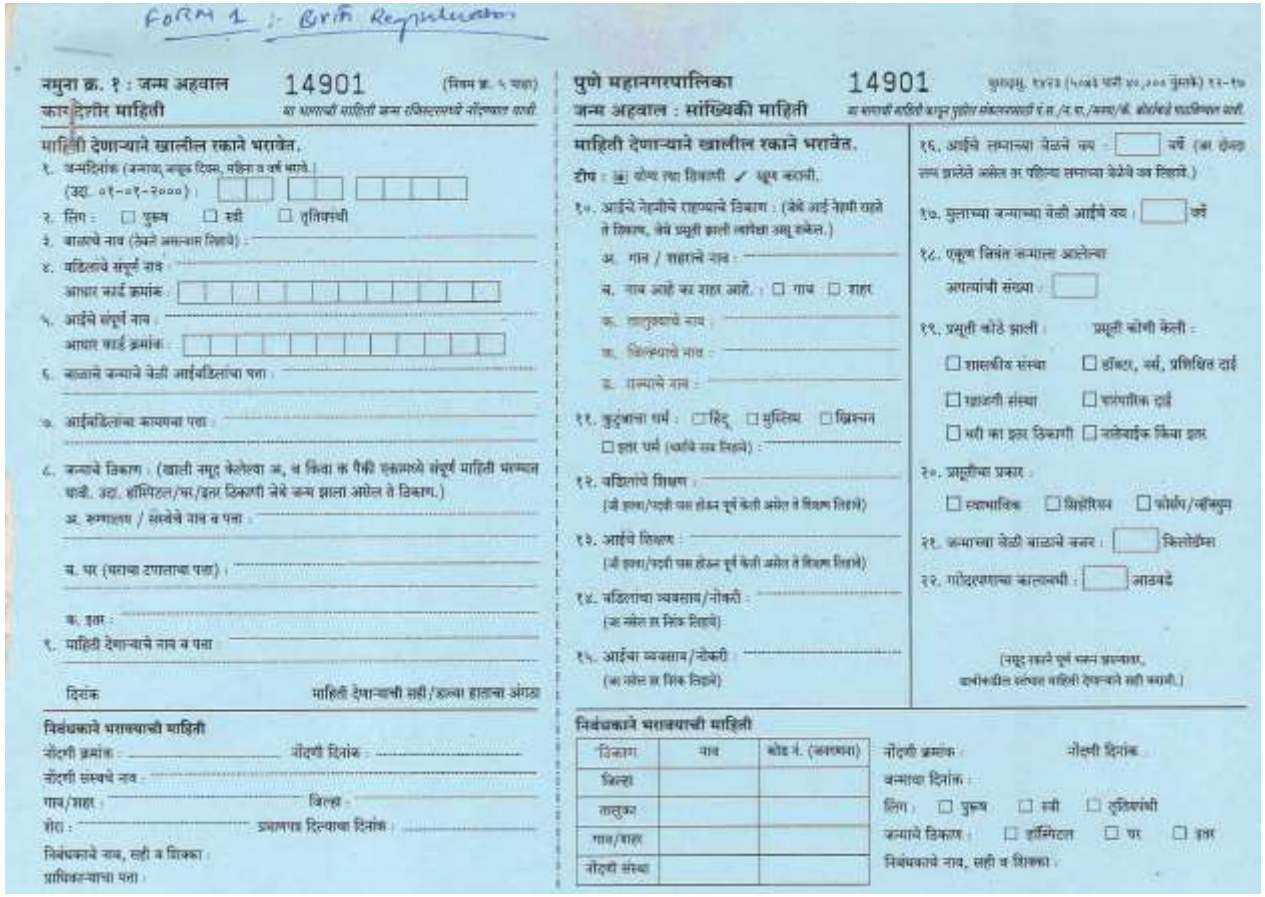
Issued under section 12(1) of the Registration of Birth & Deaths Act., 1969 and Rule 8(1) of the Maharashtra Registration of Birth and Deaths Rules, 2000)

Name of child :
Sex : M Female
Date of Birth :
Place of Birth :
Name of Mother :
Name of Father :
Address of parents at the time of birth of the child :
Permanent address of parents :
Registration No. :
Date of Registration :
Remarks (if any) :
Signature of the issuing authority :
Date of issue :
Address of the issuing authority : Pune Municipal Corporation

This Certificate Having Seal Signature Are Therefore No Need Of Physical Signature

Ensure Registration of Every birth and death.

3.2 Birth Registration Form (Form 1)



FORM 1 : Birth Registration

नमुना क्र. १ : जन्म अहवाल 14901 (नियम क्र. ९ पहा)

काय देणीर माहिती

माहिती देणाऱ्याने खालील रकाने भरावेत.

१. जन्मदिनांक (अक्षरी, अनुक्रमे दिवस, महिना व वर्ष भरावे.)
(उदा. ०१-०१-२०००) :

२. लिंग : ☐ पुरुष ☐ स्त्री ☐ तृतियपंथी

३. बालकाचे नाव (ठेवले असल्यास लिहावे) :

४. वडिलांचे संपूर्ण नाव :
आधार कार्ड क्रमांक :

५. आईचे संपूर्ण नाव :
आधार कार्ड क्रमांक :

६. बालकाने जन्माचे वेळी आईवडिलांचा पत्ता :

७. आईवडिलांचा कायमचा पत्ता :

८. जन्माचे ठिकाण : (खाली नमूद केलेल्या अ, ब किंवा क पैकी एकासमोरे संपूर्ण माहिती भरण्यात यावी. उदा. हॉस्पिटल/घर/इतर ठिकाणी जेथे जन्म झाला असेल ते ठिकाण.)

अ. रुग्णालय / संस्थेचे नाव व पत्ता :

ब. घर (घराचा टणताचा पत्ता) :

क. इतर :

९. माहिती देणाऱ्याचे नाव व पत्ता :

दिनांक माहिती देणाऱ्याची सही/डाव्या हाताचा अंगठा

निबंधकाचे भरावयाची माहिती

नोंदणी क्रमांक : नोंदणी दिनांक :

नोंदणी संस्थेचे नाव :

गाव/शहर : जिल्हा :

तेरा : प्रमाणपत्र दिल्याचा दिनांक :

निबंधकाचे नाव, सही व शिक्का :

प्राधिकाऱ्याचा पत्ता :

पुणे महानगरपालिका 14901

जन्म अहवाल : सांख्यिकी माहिती

माहिती देणाऱ्याने खालील रकाने भरावेत.

टीप : ☒ योग्य त्या ठिकाणी ✓ खूण करावी.

१०. आईचे नेहमीचे राहण्याचे ठिकाण : (जेथे आई नेहमी राहते ते ठिकाण, जेथे प्रसूती झाली त्याबद्दल असू शकेल.)

अ. गाव / शहराचे नाव :

ब. गाव आहे का शहर आहे. : ☐ गाव ☐ शहर

क. तालुक्याचे नाव :

ड. जिल्ह्याचे नाव :

इ. राज्याचे नाव :

११. कुटुंबाचा धर्म : ☐ हिंदू ☐ मुस्लिम ☐ ख्रिश्चन
☐ इतर धर्म (यादीचे नाव लिहावे) :

१२. वडिलांचे शिक्षण :
(जी इयत्ता/पदवी पास होऊन पूर्ण केली असेल ते ठिकाण लिहावे)

१३. आईचे शिक्षण :
(जी इयत्ता/पदवी पास होऊन पूर्ण केली असेल ते ठिकाण लिहावे)

१४. वडिलांचा व्यवसाय/नोकरी :
(जो व्यवसाय ते लिहावे)

१५. आईचा व्यवसाय/नोकरी :
(जो व्यवसाय ते लिहावे)

१६. आईचे लग्नाच्या वेळचे वय : वर्षे (जर दोघांचे लग्न झालेले असेल तर पहिल्या लग्नाच्या वेळेचे वय लिहावे.)

१७. मुलाच्या जन्माच्या वेळी आईचे वय : वर्षे

१८. एकूण जिवंत जन्मास आलेल्या अपत्यांची संख्या :

१९. प्रसूती कोठे झाली : प्रसूती कोणी केली :
☐ शासकीय संस्था ☐ डॉक्टर, नर्स, प्रशिक्षित दाई
☐ खाजगी संस्था ☐ सांपत्तिक दाई
☐ मी का इतर ठिकाणी ☐ नातेवाईक किंवा इतर

२०. प्रसूतीचा प्रकार :
☐ स्वाभाविक ☐ सिझेरियन ☐ फोर्सेप/व्हॅक्युम

२१. जन्माचा वेळी बाळाचे वजन : किलोग्रॅम्स

२२. गर्भदरणाच्या कालावधी : आठवडे

(नमूद रकाने पूर्ण भरून झाल्यावर, वरीलप्रमाणे दर्शवल्या माहिती देणाऱ्याने सही करावी.)

निबंधकाने भरावयाची माहिती

ठिकाण	नाव	कोड नं. (असल्यास)
जिल्हा		
तालुका		
गाव/शहर		
नोंदणी संस्था		

नोंदणी क्रमांक : नोंदणी दिनांक :

जन्माचा दिनांक :

लिंग : ☐ पुरुष ☐ स्त्री ☐ तृतियपंथी

जन्माचे ठिकाण : ☐ हॉस्पिटल ☐ घर ☐ इतर

निबंधकाचे नाव, सही व शिक्का :

3.3 Form for Addition of Name

Addition of Name

पुणे महानगरपालिका – जन्म-मृत्यू नोंदणी कार्यालय

अर्जदाराचे नाव :

पत्ता :

दिनांक :

प्रति,
मा. निबंधक, जन्म-मृत्यू

विषय : जन्म नोंदणीमध्ये बालकाचा पहिला नाव व आडनाव समाविष्ट करणेबाबत.

मी खाली सही करणार, (अर्जदाराचे नाव) श्री./श्रीमती/कु. _____ (नाते) (बालकाचे नाव _____) यांचे पालक / कायदेशीर पालक, बालकाचा जन्म दिनांक _____ रोजी (जन्मस्थळाचे नाव/पत्ता) _____ येथे झाला असून त्याचे/तिचे जन्म नोंदणी करताना नाव लिहिण्यास राहिले आहे. सदर बालकाचा पहिला नाव व आडनाव खालील प्रमाणे लिहिण्यास परवानगी मिळावी, ही विनंती आहे.

बालकाचे नाव देण्याचे असल्यास	मराठी	
	इंग्रजी (Capital Letters)	
बालकाचे आडनाव	मराठी	
	इंग्रजी (Capital Letters)	
आईचे पूर्ण नाव	मराठी	
	इंग्रजी (Capital Letters)	
आईचे आधारकार्ड क्रमांक (असल्यास)		
वडिलांचे पूर्ण नाव	मराठी	
	इंग्रजी (Capital Letters)	
वडिलांचा आधारकार्ड क्रमांक (असल्यास)		
बालकाचा जन्म झाल्याचा दाखला		
अर्ज- नोंदणीचा पावती		

बालकाचे आई व वडिलांचे आधारकार्ड / पालकत्वाचे असलेले ऑफलाईन/ऑनलाईन दाखलीचा छायांकित प्रत पुरावा म्हणून जोडण्यात आली.

या दिलेली माहिती खरी व बरोबर असून त्यामध्ये काहीही चुकीचे नाव / आडनाव / आईचे नाव / वडिलांचे नाव / जन्म ठिकाणे दिसून व पुरावा म्हणून सादर केलेल्या कागदपत्रांमध्ये तफावत आढळून आल्यास, मला कायदेशीर शिक्षा मान्य आहे. मी बालकाचा दिलेला पहिला नोंदणीचा मी करीनी घेतलेला आहे.

अर्जदाराची सही

टीप : अर्जदार हा बालकाचे आई-वडिल असल्यास फक्त आई-वडिलांचे संयुक्त नोंदी आवश्यक आहे.

कार्यालयीन कार्यवाही

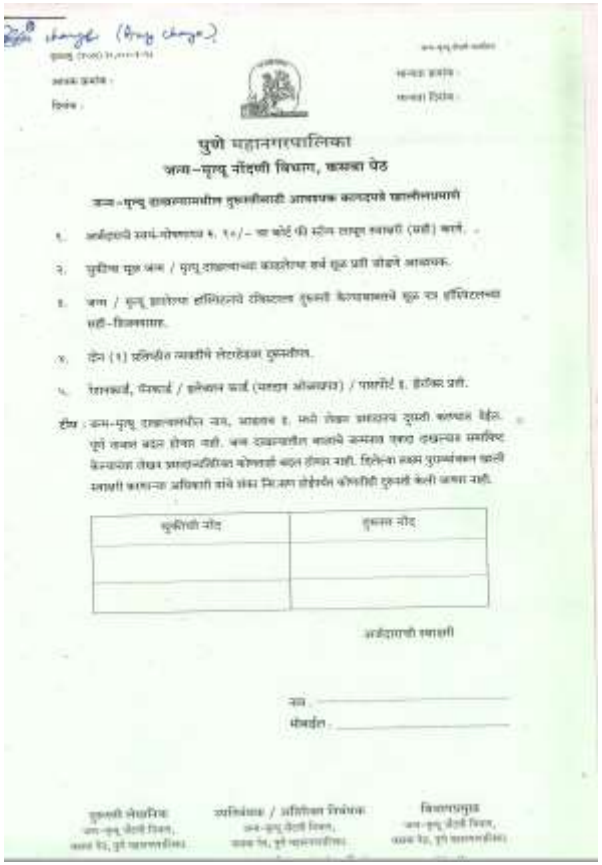
(अर्जदाराचा पावती आणि बालक नोंदणीचा मंजूर नाव खालील)

- अर्जदाराने दिलेल्या माहितीची पडताळणी, जन्म नोंदणी रजिस्टरमध्ये दिनांक अनुक्रमांक नोंदवण्यात आलेली आहे.
- अर्जदाराचा दाखलीचा जन्म प्रमाणपत्र देण्यात आलेले.

दिनांक :

दिनांक : निबंधक, जन्म-मृत्यू

3.4 Form for Changes in the Birth Certificate along with Self Declaration form



पुणे महानगरपालिका
जन्म–मृत्यू नोंदणी विभाग, कसबा पेठ

जन्म–मृत्यू दाखल्यामधील दुरुस्तीसाठी आवश्यक कागदपत्रे खालीलप्रमाणे

१. अर्जदाराने स्वयं-घोषणापत्र रु. १०/- चा कोर्ट फी स्टॅम्प लावून स्वाक्षरी (सही) करणे.

२. सुधारीत मूळ जन्म / मृत्यू दाखल्याच्या कार्यालयाच्या सर्व मूळ प्रती जोडणे आवश्यक.

३. जन्म / मृत्यू झालेल्या हॉस्पिटलचे रजिस्टरला दुरुस्ती केल्याबाबतचे मूळ पत्र हॉस्पिटलच्या सही-शिक्क्यासह.

४. टेन (१) प्रतिज्ञेत व्यक्तीचे लेटरहेडवर दुरुस्तीपत्र.

५. रेशनकार्ड, पॅनकार्ड / इलेक्शन कार्ड (मतदार ओळखपत्र) / पासपोर्ट इ. झेरॉक्स प्रती.

टीप : जन्म-मृत्यू दाखल्यामधील नाव, आडनाव इ. सारखी लेखन असल्यास दुरुस्ती करण्यात येईल. पूर्ण नावात बदल होणार नाही. जन्म दाखल्यातील बाबतचे जन्मस्थळ एकदा दाखल्यात समाविष्ट केल्यानंतर त्यात त्यानंतरच्या कोणत्याही बाबत होणार नाही. हिंदीकरण सक्षम पुराव्यांसह खरी स्वाक्षरी करण्यास अधिकारी यांचे समक्ष निःशुल्क प्रतिज्ञेवर फीमाफीत दुरुस्ती केली जाणार नाही.

चुकीची नोंद	दुरुस्त नोंद

अर्जदाराची स्वाक्षरी

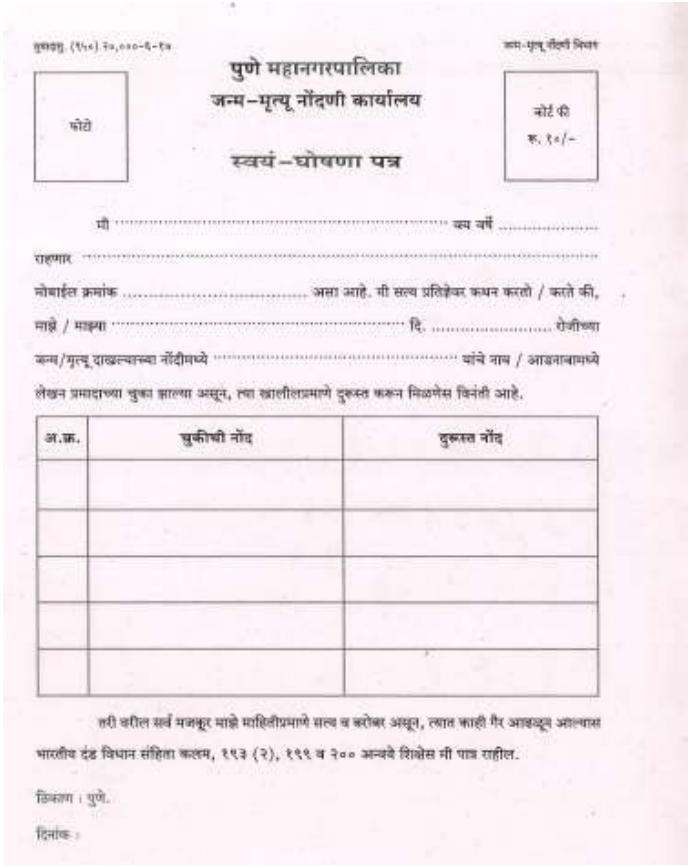
नाव :

मोबाईल :

दुरुस्ती मंजूर/नामंजूर
जन्म-मृत्यू नोंदणी विभाग,
कसबा पेठ, पुणे महानगरपालिका

उपनिबंधक / अतिरिक्त निबंधक
जन्म-मृत्यू नोंदणी विभाग,
कसबा पेठ, पुणे महानगरपालिका

विभागप्रमुख
जन्म-मृत्यू नोंदणी विभाग,
कसबा पेठ, पुणे महानगरपालिका



पुणे महानगरपालिका
जन्म–मृत्यू नोंदणी कार्यालय

फोटो

कोर्ट फी रु. १०/-

स्वयं–घोषणा पत्र

मी ..... वय वर्षे .....

राहणार .....

मोबाईल क्रमांक ..... असा आहे. मी सत्य प्रतिज्ञेवर कथन करतो / करते की,

माझे / माझ्या ..... दि. ..... रोजीच्या

जन्म/मृत्यू दाखल्याच्या नोंदीमध्ये ..... यांचे नाव / आडनावामध्ये

लेखन प्रमादाच्या चुका झाल्या असून, त्या खालीलप्रमाणे दुरुस्त करून मिळणेस विनंती आहे.

अ.क्र.	चुकीची नोंद	दुरुस्त नोंद

तरी वरील सर्व मजकूर माझे माहितीप्रमाणे सत्य व बरोबर असून, त्यात काही गैर आढळून आल्यास भारतीय दंड विधान संहिता कलम, १९३ (२), १९९ व २०० अन्वये शिक्षेस मी पात्र राहील.

ठिकाण : पुणे.

दिनांक :

4. Challenges and Gap Analysis

4 Challenges and Gap Analysis

4.1 Current Challenges

PMC currently used the BRC system for Birth and Death Registrations. This system was developed by Monarch Technologies. By study of the current system and process of Birth and Death Registration, following key challenges have been identified:

Manual Process
Birth and Death Registration process is largely manual in PMC. This leads to inefficiencies and need to maintain paper based records

Centralized Process of Event Registration
The process is highly centralized and citizen needs to come to Kasba Peth Office for obtaining Birth and Death Registration Facilities

Multiple Intermediaries
Multiple levels of approval are required

No Validation of Parent's Record
Current system doesn't validate the credentials of the parent(s) resulting in discrepancies. No Aadhaar based validation of Parent's details.

Security Threat of Birth and Death Records
Currently all the information systems store 'sensitive information' of birth records on a centralized platforms. Centralized databases provide less security as they are prone to attacks, compromised Database Administrator's etc.

No Integration with Digi-Locker
No interoperability with the Digi lockers and Aadhaar systems.

Limited Validation of Birth and Death Records
No online provision for any department to validate the authenticity of the submitted birth certificate

Possibility of a Fake Event Certificate
There is a possibility that the Event certificates may be faked by a malicious party. The Birth Certificates do not have Digital Signature of the approving authority.

No Verification of Duplicates
When a new event is registered, previous events registered are not verified for matching duplicates

4.2 Gap Analysis

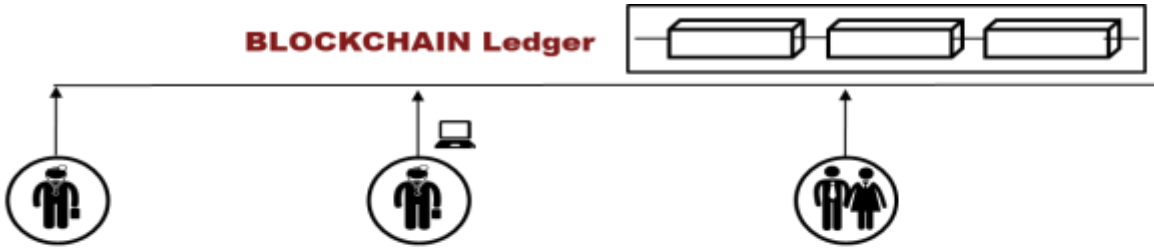
Birth and Death Registration system is a key system for registering events, provide proof of birth and death to citizen and calculation of vital statistics. Thus it is imperative that this system is trustable and tamer-proof. Following are key gaps which should be plugged for a robust births and deaths registration system:

- A tamper proof mechanism for birth registration requests to be raised by the duty Doctors
- Validation of the details by the parent(s)
- A tamper proof record of transactions
- Seamless approval/rejection of the requests by the office of the Registrar
- Digital details modification mechanism
- Digitization of identities
- Online fool proof validation of the birth certificates for departments of the Government
- Digitization of document certification process
- Making the process faceless and paperless

5. To-Be Process Mapping

5 To-Be Process Mapping

5.1 Process Diagram: Institutional Birth Registration Process Mapping



Doctor on Duty
Logs in using his/her mobile based Dapp using unique ID of the doctor issued by medical council.

He/She gets an option to initiate a birth certificate process

Doctor initiates a smart form and records birth information (DoB, time, weight, location etc.).
Parent's biometric are read and eKYC is performed to fetch parent details from Aadhaar.
Doctor signs the form using his digital signature when he submits the form.
Aadhaar of the child is initiated as soon as smart form is submitted. Parent will receive a notification with eID on their mobile phone

Asset – Form1

Parent logs into the network using mobile based or web based Dapp using his Aadhaar.
Parents verify and provide consent.

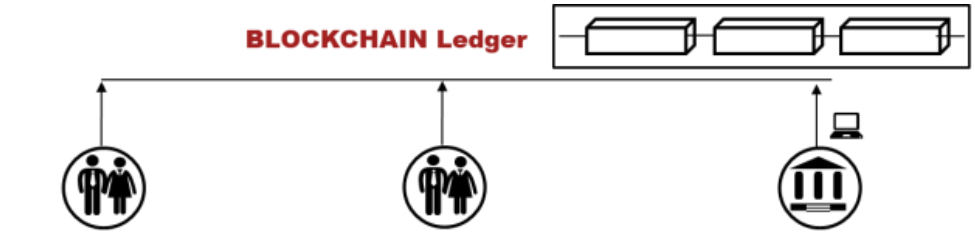
Asset – Parent's verification

A Birth Certificate is generated using digital signature of the Doctor. A unique number called birth certificate number is also generated for each birth certificate which shall uniquely identify the certificate. Hash of birth certificate is stored over blockchain for eternity.

A QR code is embedded on the birth certificate. QR code would fetch information from the blockchain whenever it is read using an authorized Dapp

Asset – Birth Certificate

Blockchain solution can be integrated with Digi-Locker.
Certificate once generated can be stored on Digi-Locker of the parent



Parent can log into their Dapp to and print the Birth Certificate if needed

Parent presents either the manual copy of birth certificate or sends the birth certificate number whenever they want to provide proof of birth of the child

Government department which wants to verify birth certificate of the child, would log-in using their Dapp.

They would read the QR code using the QR code app in the Dapp or enter the birth certificate number to fetch child details.

If any citizen reads the QR code using any other QR code reader (not using a Dapp), would see basic information such as name and date of birth only. But when a Government department uses their Dapp to read the QR code, they can access all permitted details of the child from blockchain

5.1.1 Process Reengineering Model

#	Process	Process Model	Process Type	Actors	Actor Type	Assets	Asset Type	Validations	Integration Points

1	Initiation of Birth Registration Form	Action	New Process	Doctor on Duty	Peer Node	Form 1	Digital	Nil	Nil
2	Submission of Form 1	Transaction	Updated	Doctor on Duty	Peer Node	Form 1	Digital	Nil	Nil
3	Approval by Parent	Transaction	New Process	Parent	Normal Node	Parent Approval	Digital	Validation of all fields in the Form 1	Nil
5	Birth Certificate Generation	Transaction	Enhanced	Automatic	Authority	Birth Certificate	Digital	Submission by authenticated doctor and Approval by Parent	Nil
6	Integration of Birth Certificate with Digi-Locker	Action	New Process	Automatic	NA	Birth Certificate	Digital	Nil	Nil
7	Birth Certificate Printing by Parent	Action	New Process	Parents	Normal	Birth Certificate	Digital	Submission by authenticated doctor and Approval by Parent	Nil
8	Birth Certificate Authentication by other Government Departments	Action	New Process	Other Government Departments	Normal	Birth Certificate	Digital	Nil	Nil

5.2 To-Be Process Diagram: Non-Institutional Birth Registration Process Mapping

Parents Log in using their mobile based Dapp using Aadhaar as unique ID

He/She gets an option to initiate a birth certificate process

Parent initiates a smart form and records birth information (DoB, time, weight, location etc.).

Parents submit the form.

Blockchain shall cross verify with other records to eliminate possibility of duplicates etc.

Asset – Form1

AnM or relevant Government Medical Practitioner logs into the network using mobile based or web based Dapp using his/her AnM ID or Practitioner License. AnM or Medical Practitioner verify and provide consent.

AnM/Doctor may ask the parent to visit for verification, if required.

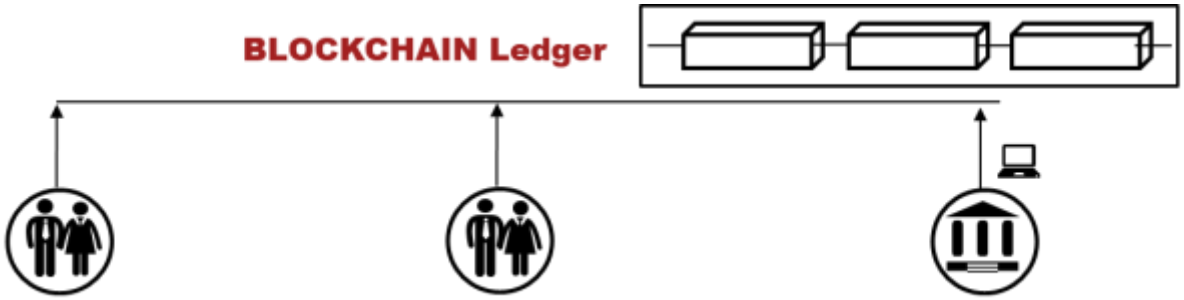
Asset – Parent's verification

A Birth Certificate is generated using digital signature of the AnM/Doctor. A unique number called birth certificate number is also generated for each birth certificate which shall uniquely identify the certificate. Hash of birth certificate is stored over blockchain for eternity.

A QR code is embedded on the birth certificate. QR code would fetch information from the blockchain whenever it is read using an authorized Dapp

Asset – Birth Certificate

Blockchain solution can be integrated with Digi-Locker. Certificate once generated can be stored on Digi-Locker of the parent



Parent can log into their Dapp to and print the Birth Certificate if needed

Parent presents either the manual copy of birth certificate or sends the birth certificate number whenever they want to provide proof of birth of the child

Government department which wants to verify birth certificate of the child, would log-in using their Dapp.

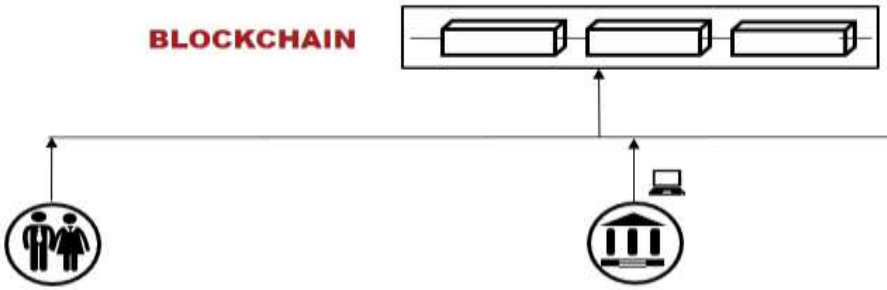
They would read the QR code using the QR code app in the Dapp or enter the birth certificate number to fetch child details.

If any citizen reads the QR code using any other QR code reader (not using a Dapp), would see basic information such as name and date of birth only. But when a Government department uses their Dapp to read the QR code, they can access all permitted details of the child from blockchain

5.2.1 Process Reengineering Model

#	Process	Process Model	Process Type	Actors	Actor Type	Assets	Asset Type	Validations	Integration Points
1	Initiation of Birth Registration Form	Action	New Process	Parents	Peer Node	Form 1	Digital	Nil	Nil
2	Submission of Form 1	Transaction	Updated	Parents	Peer Node	Form 1	Digital	Nil	Nil
3	Approval by Parent	Transaction	New Process	AnM or Government Medical Practitioner	Normal Node	Parent Approval	Digital	Validation of all fields in the Form 1	Nil
5	Birth Certificate Generation	Transaction	Enhanced	AnM or Government Medical Practitioner	Authority	Birth Certificate	Digital	Submission by Aadhaar authenticated Parent and Approval by AnM/Gov Medical Practitioner	Nil
6	Integration of Birth Certificate with Digi-Locker	Action	New Process	Automatic	NA	Birth Certificate	Digital	Nil	Nil
7	Birth Certificate Printing by Parent	Action	New Process	Parents	Normal	Birth Certificate	Digital	Submission by Aadhaar authenticated Parent and Approval by AnM/Gov Medical Practitioner	Nil
8	Birth Certificate Authentication by other Government Departments	Action	New Process	Other Government Departments	Normal	Birth Certificate	Digital	Nil	Nil

5.3 Process Diagram: Change of Name in the Birth Certificate



Parent logs into the dApp using his Aadhaar.

She/He is able to view the child records associated with their ID. He selects the record for which name needs to be modified.

She/he clicks on the button for name change

She/he fills and submits the form for name change providing the relevant information such as child's name.

Asset – Application for Name Inclusion

Registrar receives a notification of the application. He logs-in to the dApp, reviews the application and approves the application for a name change, if found legitimate

Digital signature of the Registrar is captured along with approval

Asset – Registrar's approval

Name of the child is included in the child record and an updated birth certificate for the child (bearing name of the child) is generated.

Asset – Updated Birth Certificate of Child

PwC

5.3.1 Process Reengineering Model

#	Process	Process Model	Process Type	Actors	Actor Type	Assets	Asset Type	Validations	Integration Points
1	Initiation of Name Change Application	Transaction	New Process	Parent	Normal Node	Application for Name Change	Digital	Nil	Nil
2	Approval of Application by AnM/Medical Professional	Action	New Process	AnM/Medical Professional	Authority	Approval or Rejection of Name Change	Digital	Validation of existing child record. Validation of the application form	Nil
3	Change of Name in Birth Certificate	Transaction	New Process	AnM/Medical Professional	Authority	Updated birth	Digital	Nil	Nil

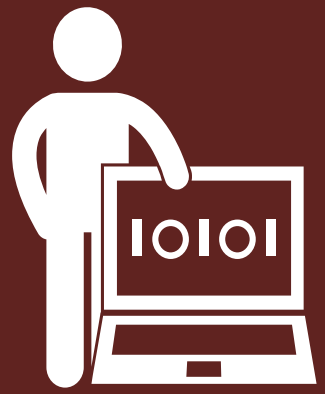
6. Reference Architecture

6 Reference Architecture

Considering the nature of birth registry approval process and the interaction between various stakeholders, we propose the following reference architecture following the principles of modularity, interoperability, traceability, finality, immutability and provenance.

Blockchain is the key component of the proposed reference architecture providing features such as Smart Contracts, Provenance, Distributed Consensus, Finality, Immutability, Decentralized Trust and Traceability which are detailed in the upcoming sections. Blockchain is an append-only distributed ledger, where records are stored in blocks, and blocks form a chain. Every block contains transactions that can be verified by any node in the network.

A central aspect of Blockchain technology is the distributed ledger, which contains a record of all previous transactions. It is called a distributed ledger because it is not stored in a central location, rather it is stored across a network of computers across the world. Key to the operation of a distributed ledger is ensuring the entire network collectively agrees with the contents of the ledger; this is the job of the consensus mechanism.



7. Proposed Blockchain Consensus Models

7 Proposed Blockchain Consensus Models

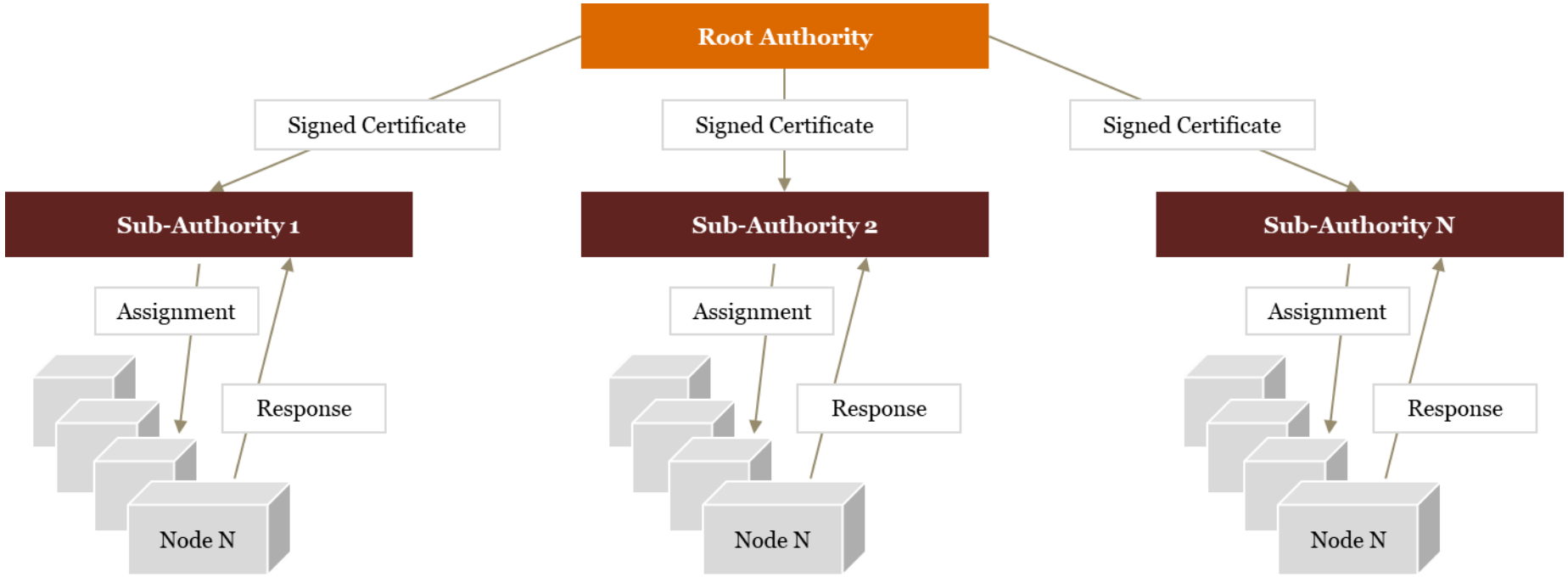
Consensus is procedure to have an accurate Blockchain at every node. Conesus mechanisms are the key features of a Blockchain network that ensures trust and transparency to decision making process. In simpler terms, consensus is a dynamic way of reaching agreement in a group. While voting just settles for a majority rule without any thought for the feelings and well-being of the minority, a consensus on the other hand makes sure that an agreement is reached which could benefit the entire group as a whole. Considering the nature of business processes and the underlying workflows and the task dynamics, we have identified two consensus mechanisms and associated Blockchain Technology platforms to realize the To-Be state business architecture outlined in the earlier sections.

7.1 Proof of Authority

Proof of Authority Time is proposed as the Blockchain Consensus mechanism for integrating the all the stakeholders of the Birth Registry system. It addresses the scalability issues of Proof of Work and the security issues of Proof of Stake consensus mechanisms. Proof of Authority is a modified form of Proof of Stake, where instead of stake with the monetary value, a validator's identity performs the role of stake.

In this context, identity means the correspondence between a validator's personal identification on the platform with officially issued documentation for the same person, i.e. certainty that a validator is exactly who that person represents to be. Just like in Proof of Stake, in Proof of Authority consensus, identity as a form of stake is also scarce. But unlike Proof of Stake, there's only one identity per person. Identity placed at stake can serve as a great equalizer, understood and valued the same by all actors. Individuals whose identity (and reputation by extension) is at stake for the securing of a network are incentivized to preserve the network.

The simplicity of the Proof of Authority consensus comes with the need to ensure independency of validators and the necessity of giving them the means to protect their nodes. But these are the solvable issues. Identity-at-Stake Proof of Authority construct creates an incentive model where acting in the interest of the network is the best course of action a validator can take. Cost-efficiency of such a construct makes it an interesting model for Blockchain consensus.



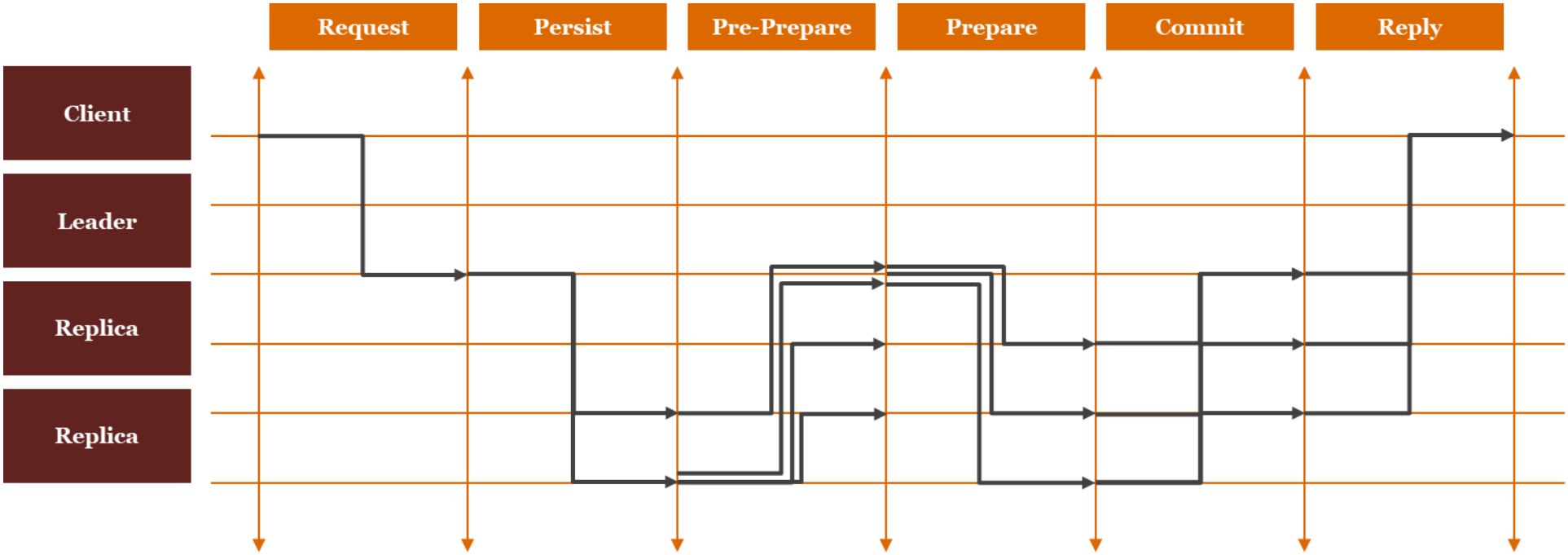
7.2 Practical Byzantine Fault Tolerance (pBFT)

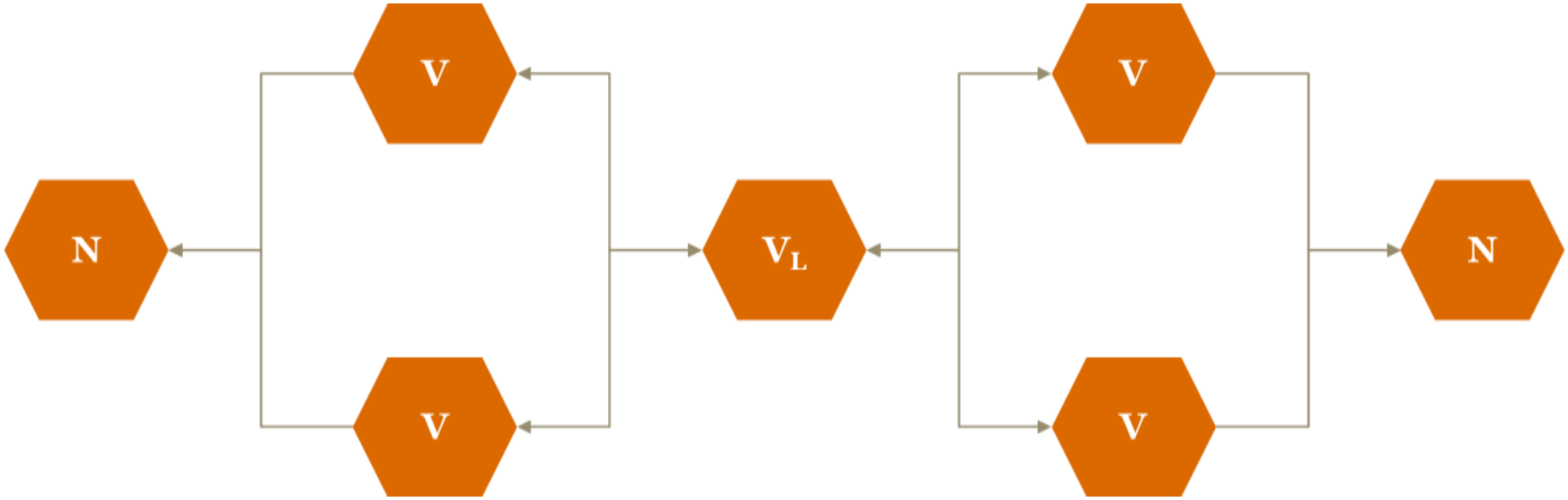
In the context of distributed systems, Byzantine Fault Tolerance is the ability of a distributed computer network to function as desired and correctly reach a sufficient stable state despite malicious elements (nodes) of the system failing or propagating incorrect information to other peers. The objective is to defend against catastrophic system failures by mitigating the influence these malicious nodes have on the expected system behaviour of the network and the right consensus that is reached by the honest nodes in the system. Essentially this is derived from the classical Byzantine Generals' Problem in the theoretical computer science.

pBFT model focuses on providing a practical Byzantine state to the distributed computing architecture through the state machine replication mechanism. pBFT provided fault tolerance from malicious nodes through an assumption that there are independent node failures and manipulated messages propagated by specific, independent nodes. The algorithm is designed to work in asynchronous systems and is optimized to be high-performance with an impressive overhead runtime and only a slight increase in latency.

Essentially, all of the nodes in the pBFT model are ordered in a sequence with one node being the primary node (leader) and the others referred to as the backup nodes. All of the nodes within the system communicate with each other and the goal is for all of the honest nodes to come to an agreement of the state of the system through a majority. Nodes communicate with each other heavily, and not only have to prove that messages came from a specific peer node, but also need to verify that the message was not modified during transmission.

In the following diagram we can see how a four phase commit transaction is executed through pBFT consensus mechanism. As we see in the diagram, in a pBFT model there is a leader in the state machine which will front end the requests and direct the state transition to the rest of the replicated state machines. A client sends a request to invoke a service operation to the primary. The primary multicasts the operation to the backups. Replicas execute the request and reply to the client. The client waits for phase+1 replies from different replicas with the same result, this is the result of the operation.





In the above diagram, VL indicates validating leader, V indicates validating peer and N indicates non-validating peer. Through pBFT consensus mechanism, Blockchain establishes order and fairness in transactions. Following pBFT consensus mechanism, we can map and model the birth registry department business architecture such that Registrar will be the Validating Leader, the Duty Doctors in the institutions could be validating peers and the other stakeholders such as the parent(s) , other Government departments can be the non-validating peers.

8. Proposed Blockchain Node Design

8 Proposed Blockchain Node Design

Nodes design is based on twin criteria of scale and scope. Nodes that requires high computing power and capacity to take part in all transactions in a read, write, execute model are designated as Full Nodes. Nodes that does not require high computing power and capacity to be active approvers and power users for read, write and execute transactions are designated as light nodes. Second criteria for the node design is based on the role of the node in the business process relating to the workflows and the tasks. Birth registry department Registrar's office needs to be the approver. Based on this, in each of the consensus models, these users are designated power user roles and responsibilities.

8.1 Node Design in Proof of Authority Consensus Model

Node Name	Node Design	Node Type	Node Properties	Node Properties
Birth Registry Department - Registrar	Authority	Full Node	Ability to validate transactions and approve / reject registration /modification requests and forms	Mobile / Web Application based Node with Comprehensive Dashboards and Reports and Read, Write, Execute Permission
Duty-Doctors at the hospitals	Normal Node	Light Node	Ability to initiate new registration	Web/Mobile Application based Node with Read, Write Access
Parent	Normal Node	Light Node	Active Role in verifying the details /Requesting the issuance of birth certificates/Ability to initiate modification request	Web Application Node with Read, Write permission
Other department officers	Normal Node	Light Node	Active Role in selected transactions	Web/Mobile Application Node with Read Only permission

8.2 Node Design in Practical Byzantine Fault Tolerance (pBFT) Consensus Model

Node Name	Node Design	Node Type	Node Properties	Node Properties
Birth Registry Department - Registrar	Validating Leader	Full Node	Ability to validate transactions and approve / reject registration /modification requests and forms	Mobile / Web Application based Node with Comprehensive Dashboards and Reports and Read, Write, Execute Permission
Duty-Doctors at the hospitals	Non Validating Peer	Light Node	Ability to initiate new registration	Web Application based Node with Read, Write Access
Parent	Non Validating Peer	Light Node	Active Role in verifying the details /Requesting the issuance of birth certificates/Ability to initiate modification request	Web / Mobile Application based Node with Read, Write permissions
Other department officers	Non Validating Peer	Light Node	Ability to initiate a new transaction	Web/Mobile Application based Node with Read only permissions

9. Proposed Blockchain Data Structure

9 Proposed Blockchain Data Structure

9.1 Blockchain Data Structure for the Proof of Authority Consensus

- **Block Header**
  a. Timestamp
  b. Hash of Previous Block
  c. Hash of Present Block
  d. Merkle Root
  e. Hash of Proof of Authority

- **Block Body: (Key : Value Pair)**
  a. Block number (128 bits)
  b. Event Type; Event Name
  c. Actor Type; Actor Name
  d. Actor : ACL
  e. Asset Type; Asset Name
  f. Asset Address
  g. Link to the Proof of Authority Certificate
  h. Link to the Multi Signatory Wallet

9.2 Blockchain Data Structure for the Practical Byzantine Fault Tolerance Consensus

- Block Header
  - Number
  - Previous Hash
  - Data Hash

- Transaction 1
    - Transaction Proposal
        - Tx-1 Type
        - Version
        - Time Stamp
        - Channel ID
        - Tx ID
        - Epoch
        - Chain Code path
        - Chain Code Name
        - Chain Code Version
        - Chain Code Type
        - Signature
        - Time Out
    - Endorsements
        - Endorser Identity
        - Endorser Signature
    - Proposed Response
        - Proposed Hash
        - Chain code Events
        - Response Status
- Transaction 2
- Transaction 3
- .....
- Transaction N

10. Smart Contracts Definition

10 Smart Contracts Definition

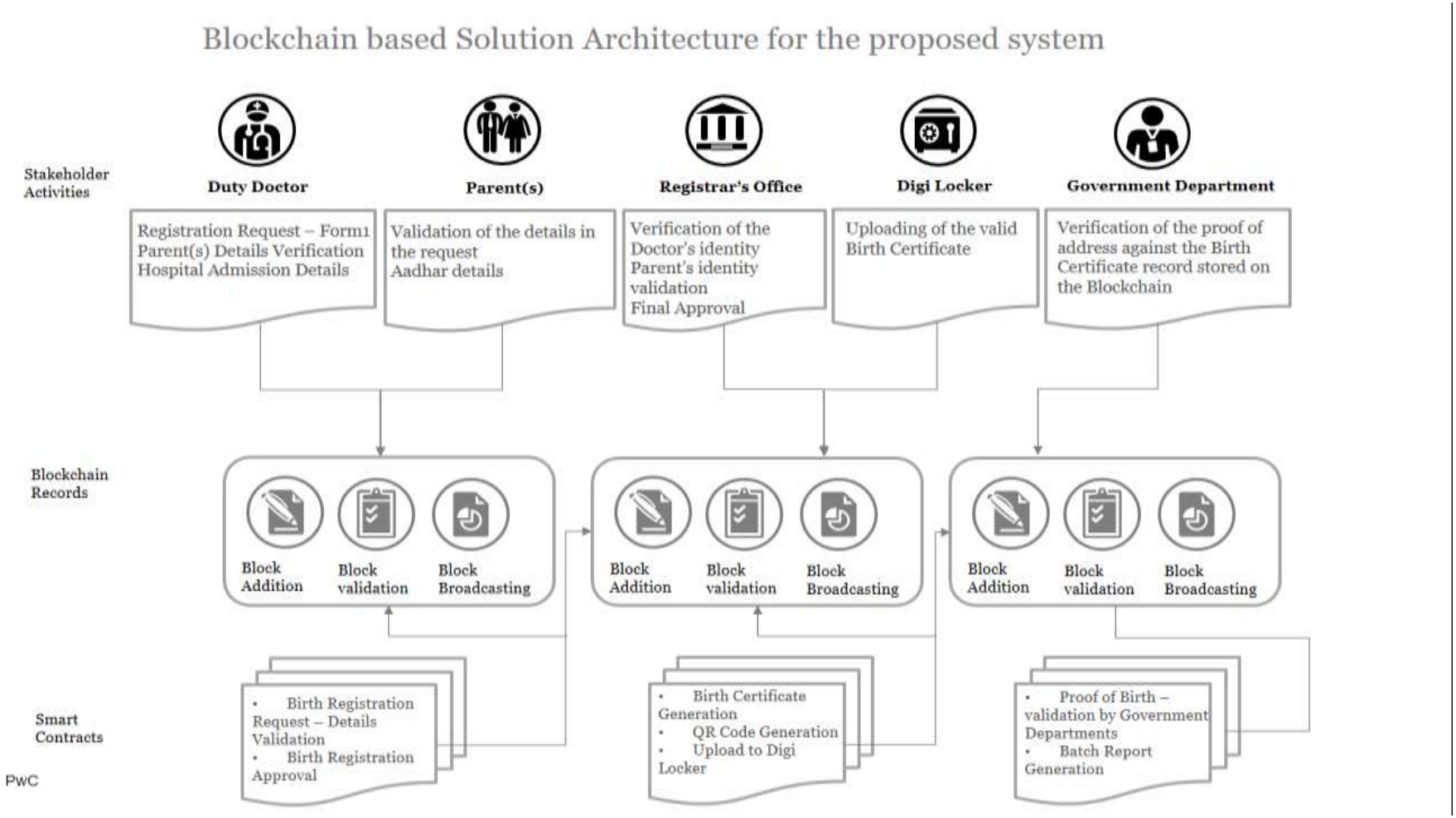
Smart Contracts are the business logic written and executed as autonomous software instructions to implement the entire transactions and activities envisaged on Blockchain. While we transform the institutional birth registry business processes into Blockchain based workflow, following smart contracts will help us to automate and streamline the review of requests, track and trace activities, approval and rejection workflows etc.

Smart Contract Name	Transactions	Triggers	Events	Consensus	State	Message
Birth Registration Request – Details Validation	Validation of Details by the Parent	Birth Registration request initiated by Duty Doctor	Birth of child in a hospital, reporting of the duty doctor identity validation	Approval by Authority / Validating Leader	Parents Identity, Form 1 Place, Date and Time of birth Vital records	Birth Registration Request Form validation Status Alert to the Parent
Birth Registration Request Approval	Approval by Registrar – Birth Registration Department	Birth Registration request Validation by the Parent	Identity of the Duty Doctor Identity of the Parent Validation of the Details by the parent Verification of the details in the form	Approval by Authority / Validating Leader	Parents Identity Duty Doctors Identity Form 1 Details Mother's Hospital Admission Records	Alert to the Registrar's office Birth Registration Request Form -1 Approval Status
Birth Certificate Generation	Approval by Registrar – Birth Registration Department	Birth Registration request approval by the Registrar	Approved Form 1 with the details of the birth received from the institution	Approval by Authority / Validating Leader	Parents Identity Form 1 Approval	Approved Form 1 Approval Status of the registration request Alert to the parent

QR Code Generation	Approval by Registrar – Birth Registration Department	Automatic	Birth certificate generation	Approval by Authority / Validating Leader	QR Code Details	Alert on QR Code Generation Status Alert to Parent
Upload Birth Certificate copy in the User's Digi Locker	Approval by the Parent	Upload request initiated by the Parent	Approved Form 1 Birth Certificate Generation	Approval by Authority / Validating Leader	Approved Form 1 Valid Birth Certificate	Alert to Parent
Birth Details Validation by Governing bodies	Verification of Birth Details	Proof of Birth Validation request by Governing bodies	Approved Form 1 Valid Birth Registration	Approval by Authority / Validating Leader	Valid Birth Certificate	Alert to Parent Alert to Governing body
Batch Report Generation	Approval by Registrar's office	Request initiated by Government Department	Consolidation of the entire activities into a common report	Approval by Authority / Validating Leader	Entire Manufactory Transaction History	Read Only copy of Manufactory Transaction Details

11. System Architecture

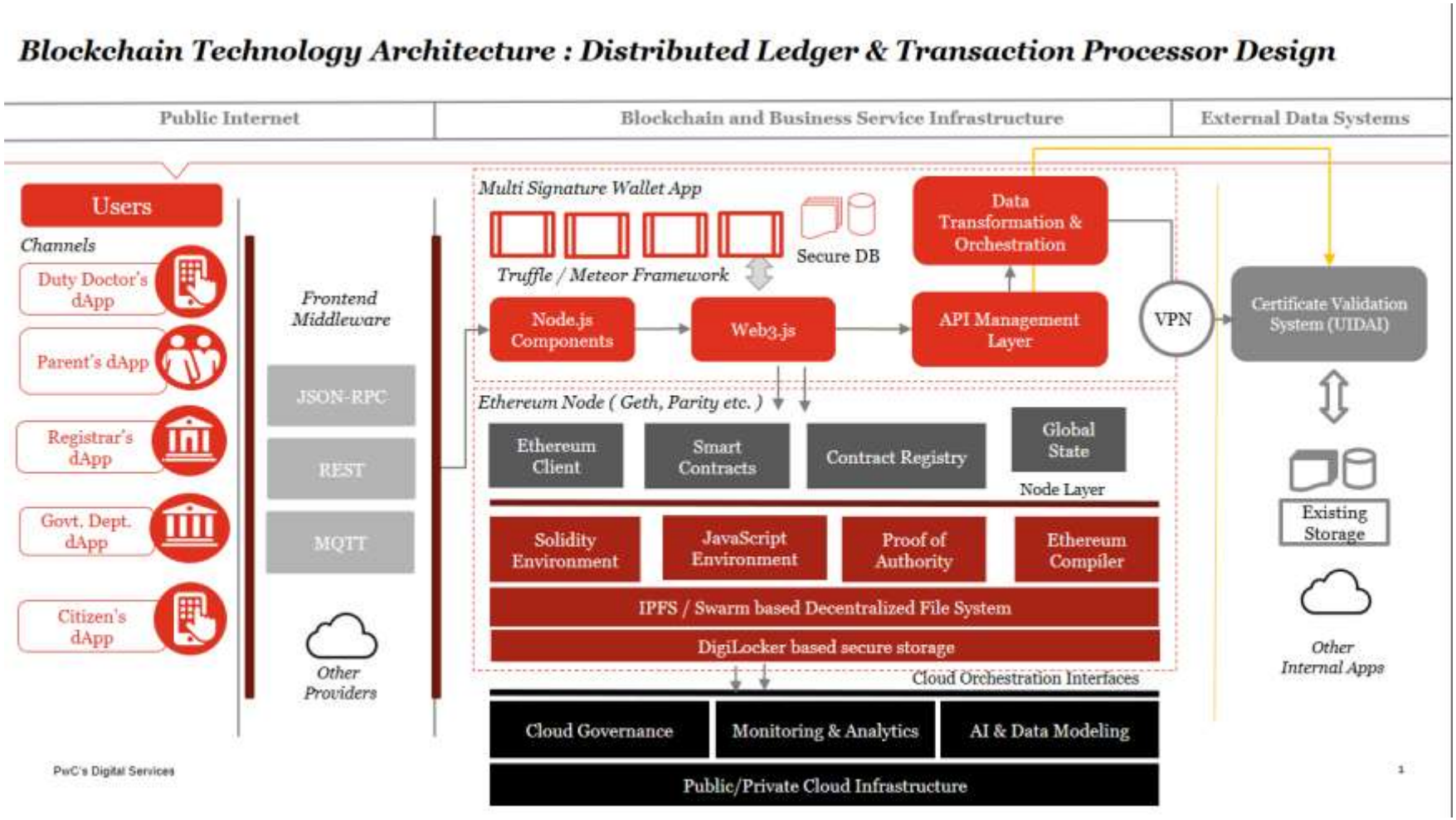
11 System Architecture



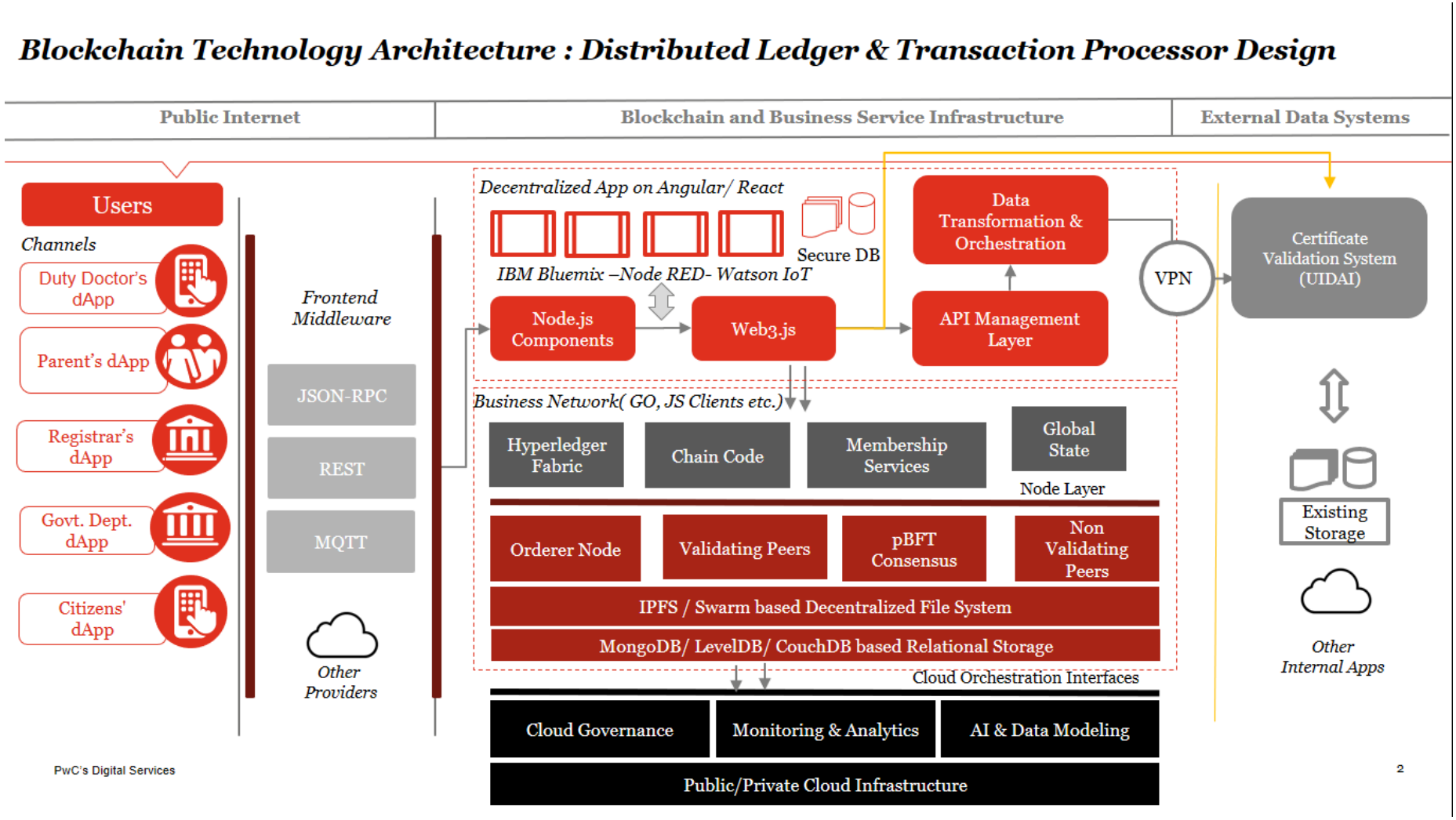
12. Technology Architecture

12 Technology Architecture

12.1 Architecture View based on Proof of Authority Consensus Model

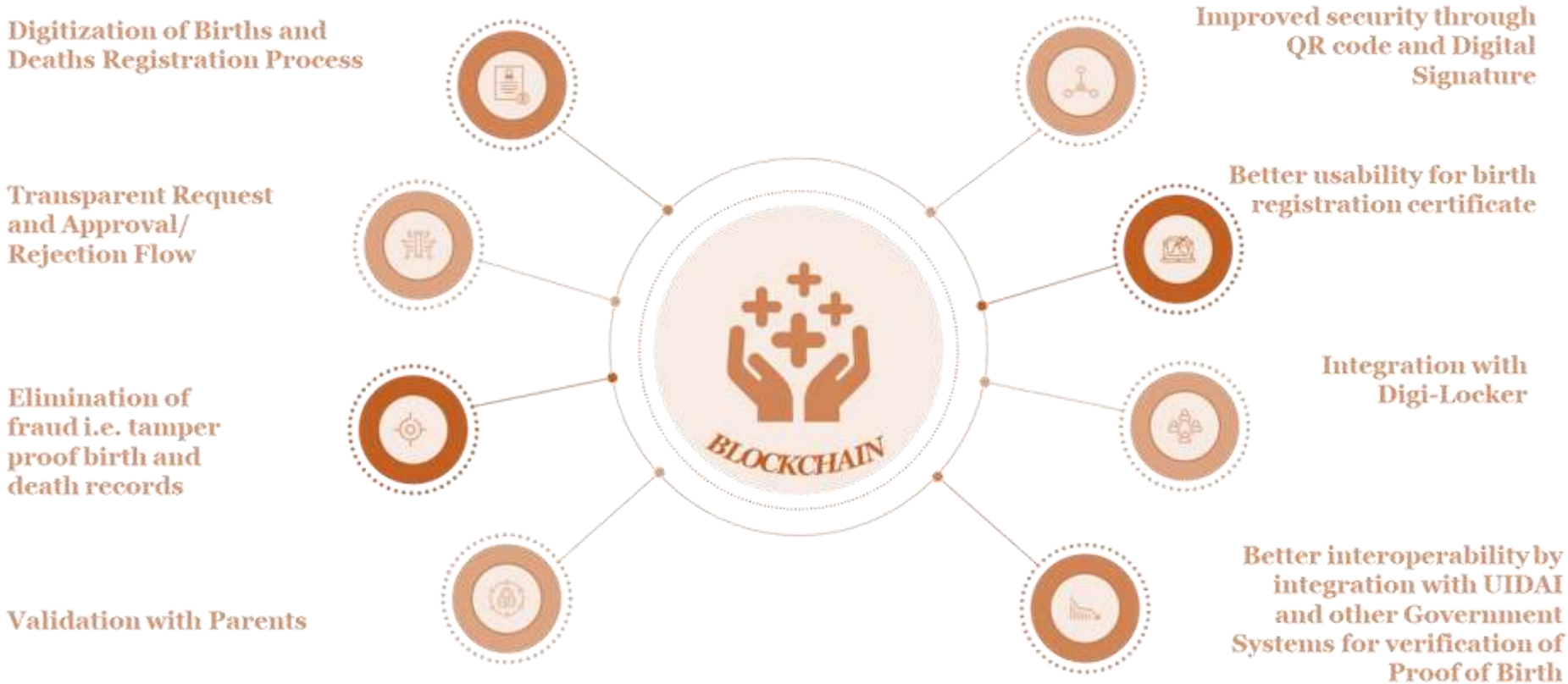


12.2 Architecture View based on practical Byzantine Fault Tolerance Consensus Model



13. Benefits of Blockchain

13 Benefits of Blockchain



Thank you

MA/July 2018-13811