MSK  Master Key
SP   System parameters
Uid  User’s global unique ID
AccR Access rights of user
TTexp Time Expiry
DID  Data ID
Cert(uid) Certificate signed by GCA
UPL  User Privilege list
M    Data content
CT   Cipher text
TK   Decryption token
CT’  New updated Cipher text
M    set of keys of integer values
d    Set of derived keys
m_k  Master key
Z    Set of integer values
R    Set of roles
r Individual role of an user

\( R_{id} \) Role id

U Set of users

\( U_{id} \) User id

G Grades of users that defines Key structure

g Individual grades of the user

B Set of barriers that defines access structure

\( b_i \) Individuals barrier limits

ti Tokens that is issued to the user

F Set of files

\( c_p \) Cipher text

\( d_b \) Data blocks

\( P_k \) Public key

\( P_{rk} \) Private key

\( w_c \) Newly added content

\( R_{set} \) Related role set

\( SA_{set} \) Set of Administrators

U Set of Users

\( U_{set} \) Set of related users
$P_k$ Public key

$sk_r$ Secret Key

$U_{log}$ User Log

$ID_u$ User ID

$ID_r$ User Role ID

$dec_k$ Decryption key

$Pub_r$ Public role key

CSP Cloud service Provider

CA Cloud Auditor

TPA Third Party Auditor

CAs Central Administrators

SA’s System Administrators

NIST National Institute of Standards and Technology

SigkCA Pair of signature

VerkCA verification key of the GCA

Info U User authorizes credentials

Info AA Attribute authorizes credentials

Uprk Pair of user’s private key

Upuk Pair of user’s private and public key
AAprk  Pair of Attribute authority’s private

AAprk  Pair of Attribute authority’s public key

SignU  Digitally signed User’s authority’s credentials

SignAA Digitally signed User’s credentials

GPKuid Pair of global public of user

GSKuid Pair of secret keys of user

VrKx’aid Version key of revoked user

GCAprk Certificate authority’s private keys

GCApuk Certificate authority’s public keys

SKuid,aid Secret key for User uid

PKk,PKxk Set of public keys and set of public attribute keys

BkUPID Back up ID of Backup data M

BL,AUL Black list and Authorized User list

ABE Attribute Based Encryption

DAC Discretionary Access Control

MAC Mandatory Access Control

RBAC Role Based Access Control

SCFAP Storage Correctness and Fine-grained Access Provision scheme

SAPERM Secured Access Provision with Effective Role Management
**PPODEA**  Privacy Preserving Outsourced Decryption with Enhanced Access Rights

**ISA**  Integrity Security Assurance scheme