RADIO NEWSROOM AUTOMATION

SOFTWARE ENGINEERING PROJECT

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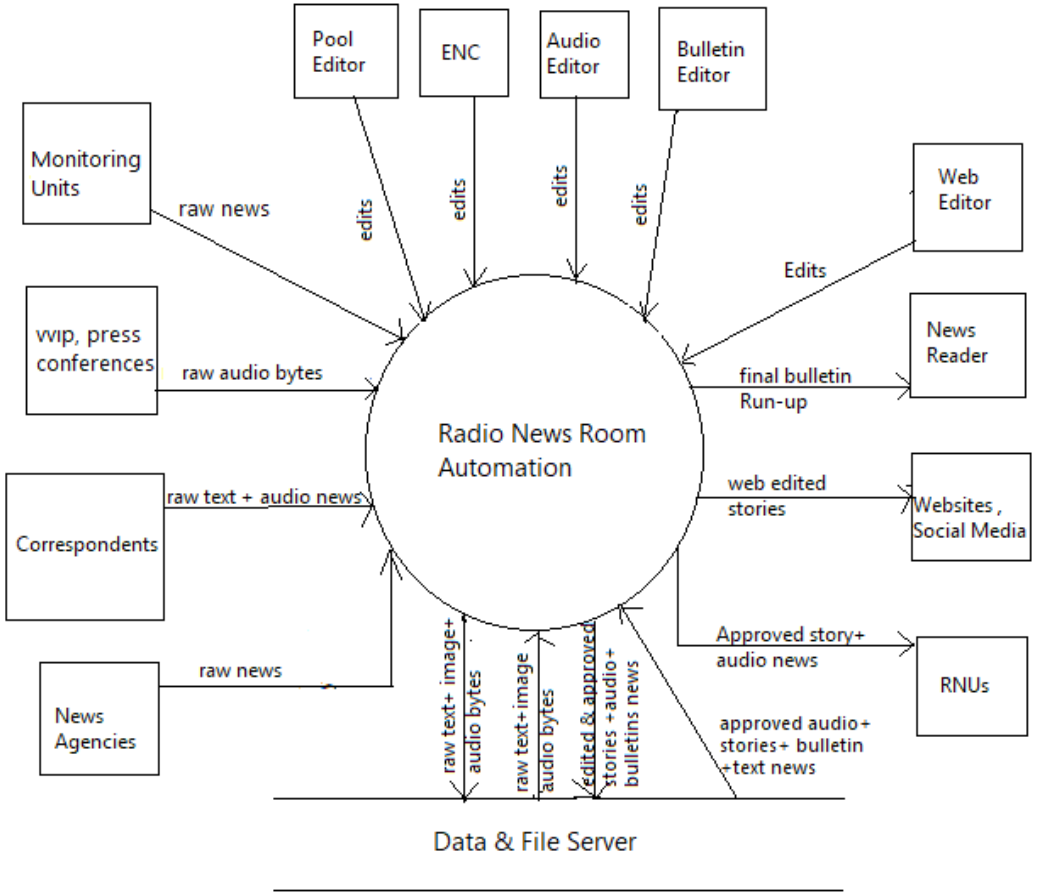
PROBLEM STATEMENT

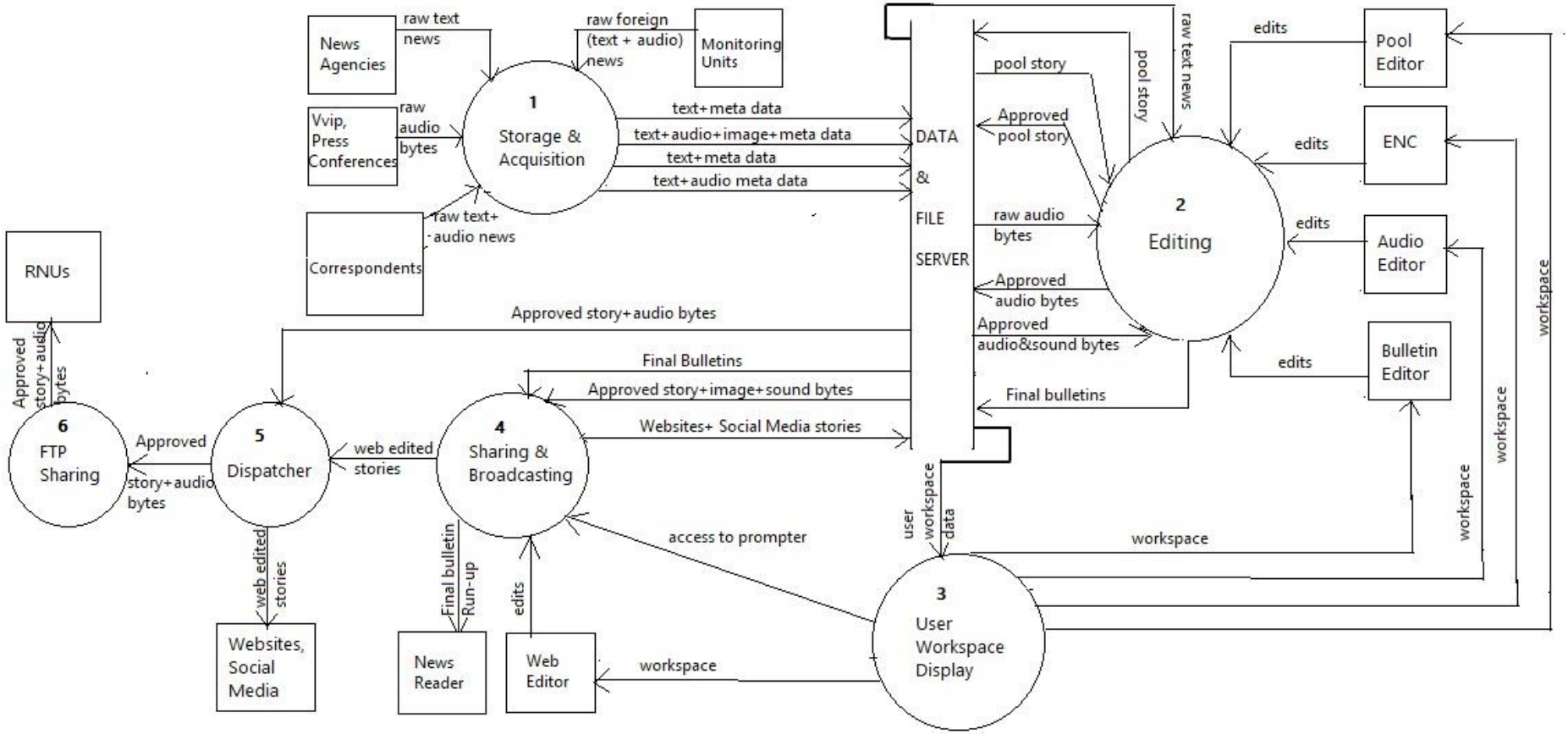
- The purpose of this software is to replace the traditional manual approach to news workflow. The news software provides an integrated automated package which provides the facility of fast, efficient, seamless and paperless news collection, processing/production & transmission, monitoring, logging, data transfer, categorization, secured storage, archiving and news library management.

DATA FLOW DIAGRAM

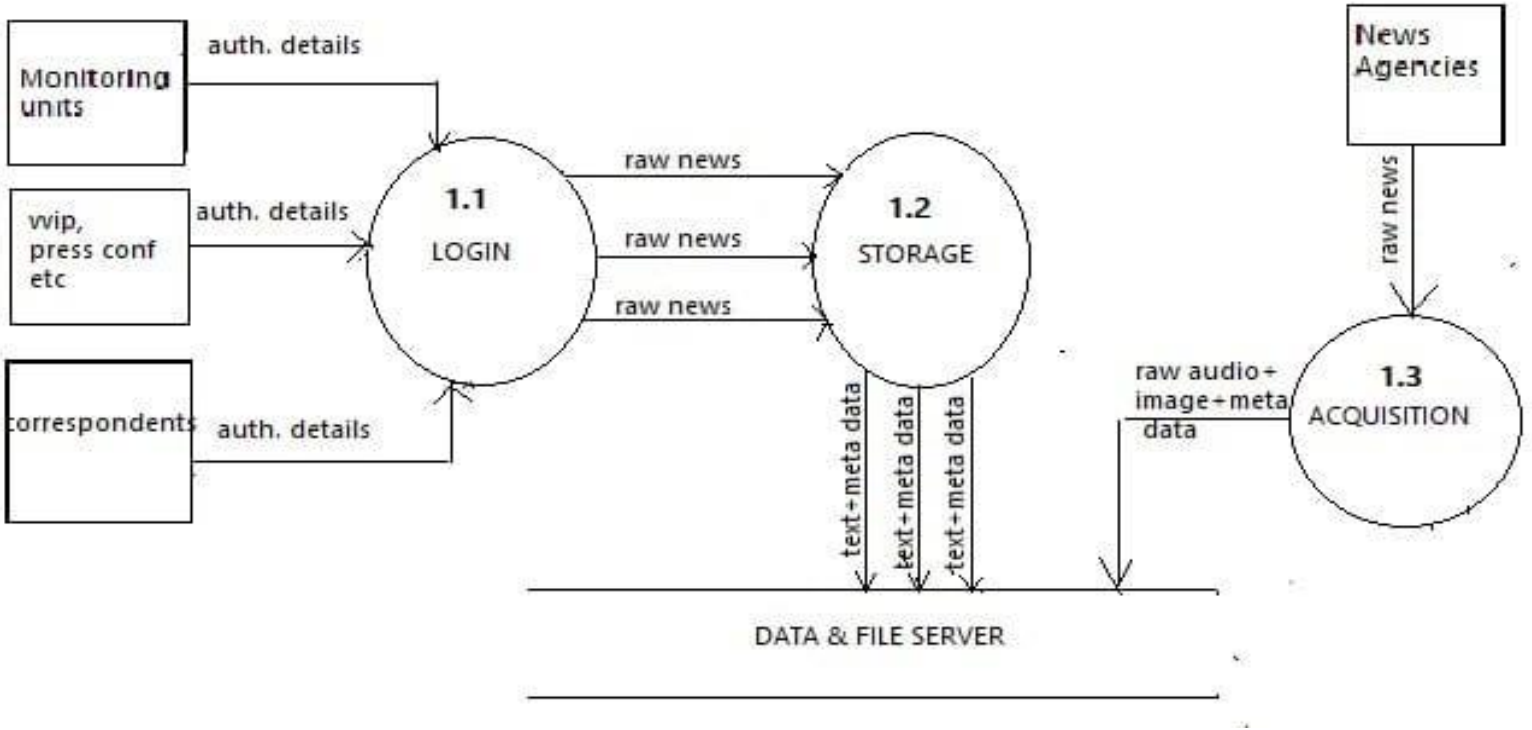
CONTEXT LEVEL



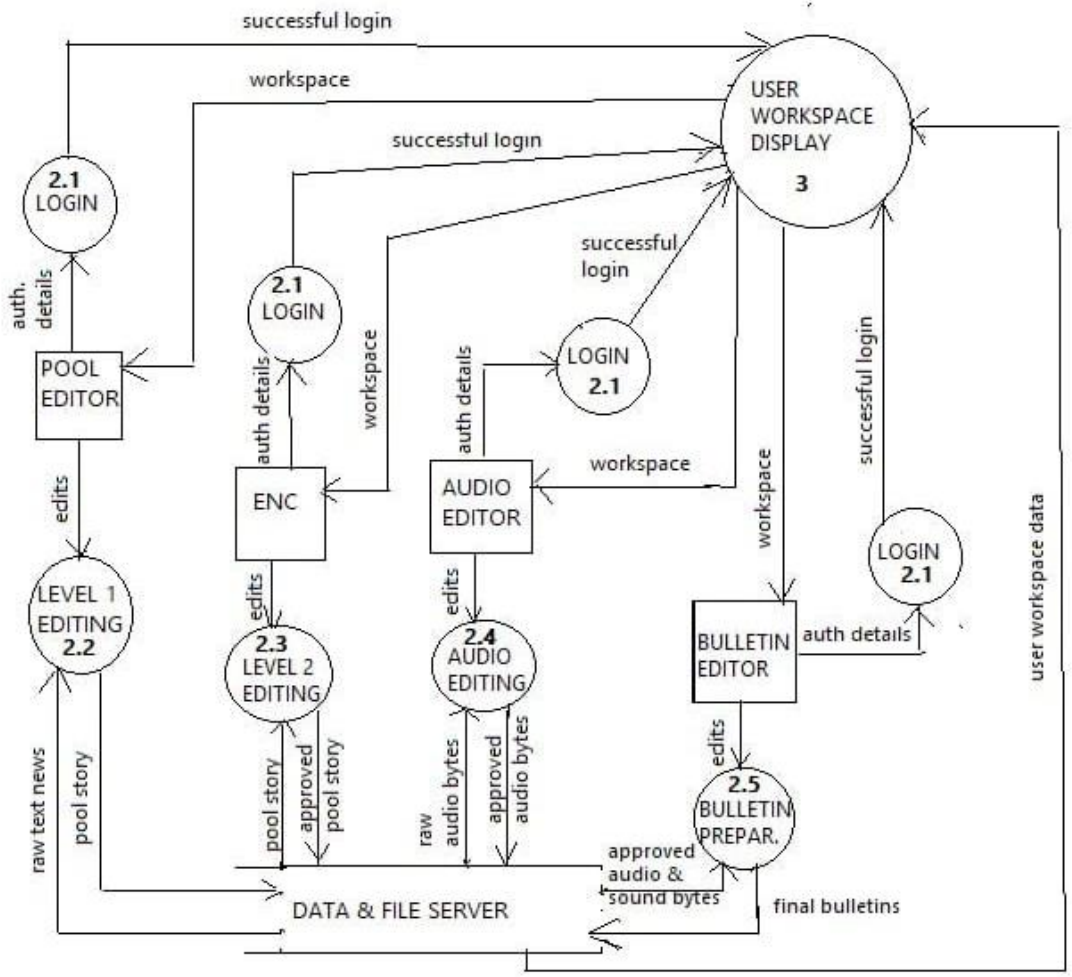
LEVEL 1


News Agencies
raw text news
raw foreign (text + audio) news
Monitoring Units
Vvip, Press Conferences
raw audio bytes
1 Storage & Acquisition
Correspondents
raw text+ audio news
text+meta data
text+audio+image+meta data
text+meta data
text+audio meta data
DATA & FILE SERVER
pool story
pool story
raw text news
Approved pool story
edits
Pool Editor
edits
ENC
2 Editing
raw audio bytes
edits
Audio Editor
Approved audio bytes
Approved audio&sound bytes
edits
Bulletin Editor
Final bulletins
workspace
RNUs
Approved story+audio bytes
Approved story+audio bytes
Final Bulletins
Approved story+image+sound bytes
Websites+ Social Media stories
6 FTP Sharing
Approved story+audio bytes
5 Dispatcher
web edited stories
4 Sharing & Broadcasting
user workspace data
access to prompter
workspace
workspace
workspace
web edited stories
Final bulletin Run-up
edits
3 User Workspace Display
Websites, Social Media
News Reader
Web Editor
workspace

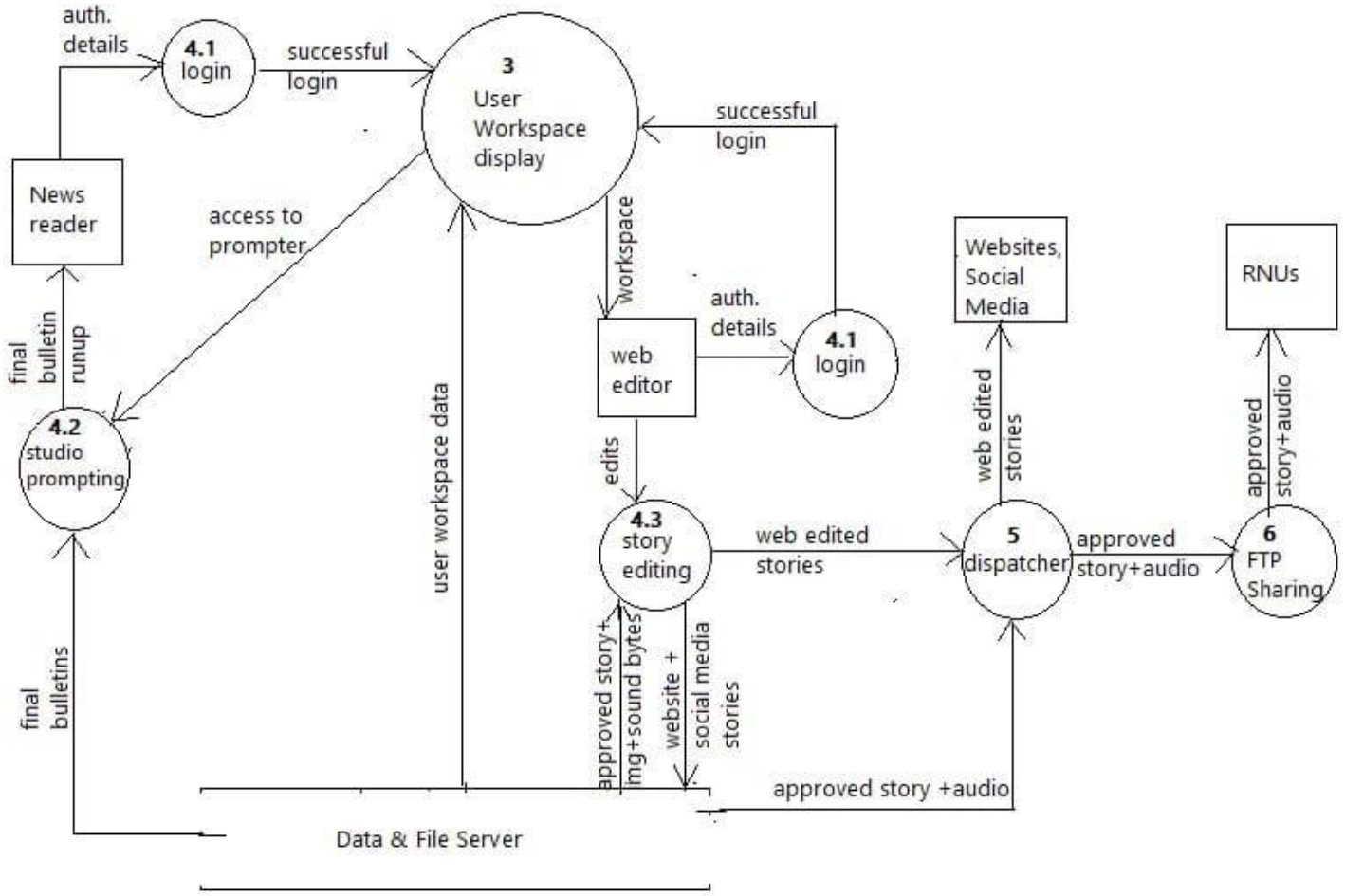
LEVEL 2


Monitoring units
auth. details
vvip, press conf etc
auth. details
correspondents
auth. details
1.1
LOGIN
raw news
raw news
raw news
1.2
STORAGE
text+meta data
text+meta data
text+meta data
DATA & FILE SERVER
News Agencies
raw news
raw audio+ image+meta data
1.3
ACQUISITION

LEVEL 3


successful login
workspace
USER WORKSPACE DISPLAY 3
successful login
2.1 LOGIN
auth. details
POOL EDITOR
edits
LEVEL 1 EDITING 2.2
raw text news
pool story
2.1 LOGIN
auth details
ENC
edits
2.3 LEVEL 2 EDITING
pool story
approved
pool story
workspace
successful login
LOGIN 2.1
auth details
AUDIO EDITOR
edits
2.4 AUDIO EDITING
raw audio bytes
approved
audio bytes
workspace
workspace
BULLETIN EDITOR
auth details
edits
2.5 BULLETIN PREPAR.
approved audio & sound bytes
final bulletins
successful login
LOGIN 2.1
user workspace data
DATA & FILE SERVER

LEVEL 4


auth. details
4.1 login
successful login
3 User Workspace display
successful login
News reader
access to prompter
workspace
auth. details
4.1 login
web editor
Websites, Social Media
RNUs
final bulletin runup
4.2 studio prompting
user workspace data
edits
web edited stories
approved story+audio
4.3 story editing
web edited stories
5 dispatcher
approved story+audio
6 FTP Sharing
approved story+ img+sound bytes
website + social media stories
final bulletins
approved story +audio
Data & File Server

USE CASES

News Collection

- Brief description - It involves ingestion of raw news from sources like news agencies (PTI, ANI, etc), correspondents, unattended phones and pre-recorded/ live press conferences, public events by VVIPs in the form of both text and audio.

- Actors-Correspondents, news agencies, phone, Press conferences, public events, media/TV channels.
- **Flow of events-**
- Raw text news coming in from news agencies first pass through an acquisition server where they are further formatted into a form suitable for storage in the database.
- After going through the acquisition server they are fed into the central database which stores all news data.
- Raw news and sound bytes (audio news) coming in from correspondents and sources like unattended phones and pre-recorded/ live press conferences, public events by VVIPs are directly fed into the central database.

- *Pre-condition- Data incoming from outside agencies should be Unicode complying.*

News Processing/Editing

- Brief description - The system enforces a 3-level editing before making the news available for final broadcast. Raw text news undergoes editing by pool editors, then the editor in chief. Raw audio news is edited by sound editors. Bulletin editors work on these approved text and audio stories to prepare bulletins.
- Actors- Pool editor, Editor-in-chief (ENC), sound editors, bulletin editor.
- **Flow of events-**

  1. Raw text news is first edited by pool editors of different genres like local, foreign, sports, business, political, etc.
  2. These edited textual news items are then sent for approval to the editor in chief (ENC) who either self-edits them further or sends them back to the pool editors for editing with some remarks.
  3. Once the news item is approved by the ENC, the approved news item is put into the central database.
  4. Raw sound bytes (audio news) undergo editing by sound editors who then put the edited sound bytes back into the database.
  5. The bulletin editor works on the approved stories and sound bytes, as per bulletin duration and finally prepares the bulletin run-up.

- *Pre-condition-The bulletin editor works only upon the approved audio bytes and text news to prepare the bulletin run-up.*
- *Post-condition-The approved news and audio bytes (upon which the bulletin editor works) are stored separately in the database to be shared with the Regional News Units (RNUs).*

News broadcasting and sharing

- Brief desc- Prepared bulletin run-up is scheduled and routed in the prompter for broadcast. Also, approved story pools are shared with Regional News Units (RNUs).

- Actors- news reader, RNUs
- **Flow of events-**

1. The final bulletin run-up prepared by the bulletin editor is routed in the prompter in the News Studio for reading live by the news reader.
1. News readers read these final bulletin run-ups at the time of broadcast.
2. All approved stories and bytes are then pushed into the FTP Server for sharing with RNUs.

Pre-condition- Only news approved by the ENC and its corresponding audio material is broadcasted.

Web publishing

- Brief desc- The social media editors modify the items as per website, twitter, sound cloud, podcast platform.
- Actor- Web editor
- **Flow of events-**

1. The web editor retrieves the approved text and audio news from the database and edits it as per corresponding website, social media platform.
2. The edited news is then uploaded / published on website and social media like twitter, sound cloud, and YouTube.

- *Pre-condition- content has to be approved for web publishing. Web editors can only work on approved story pools. Content has to follow the posting size limit guidelines of the web and social media platform.*

System Monitoring and maintenance

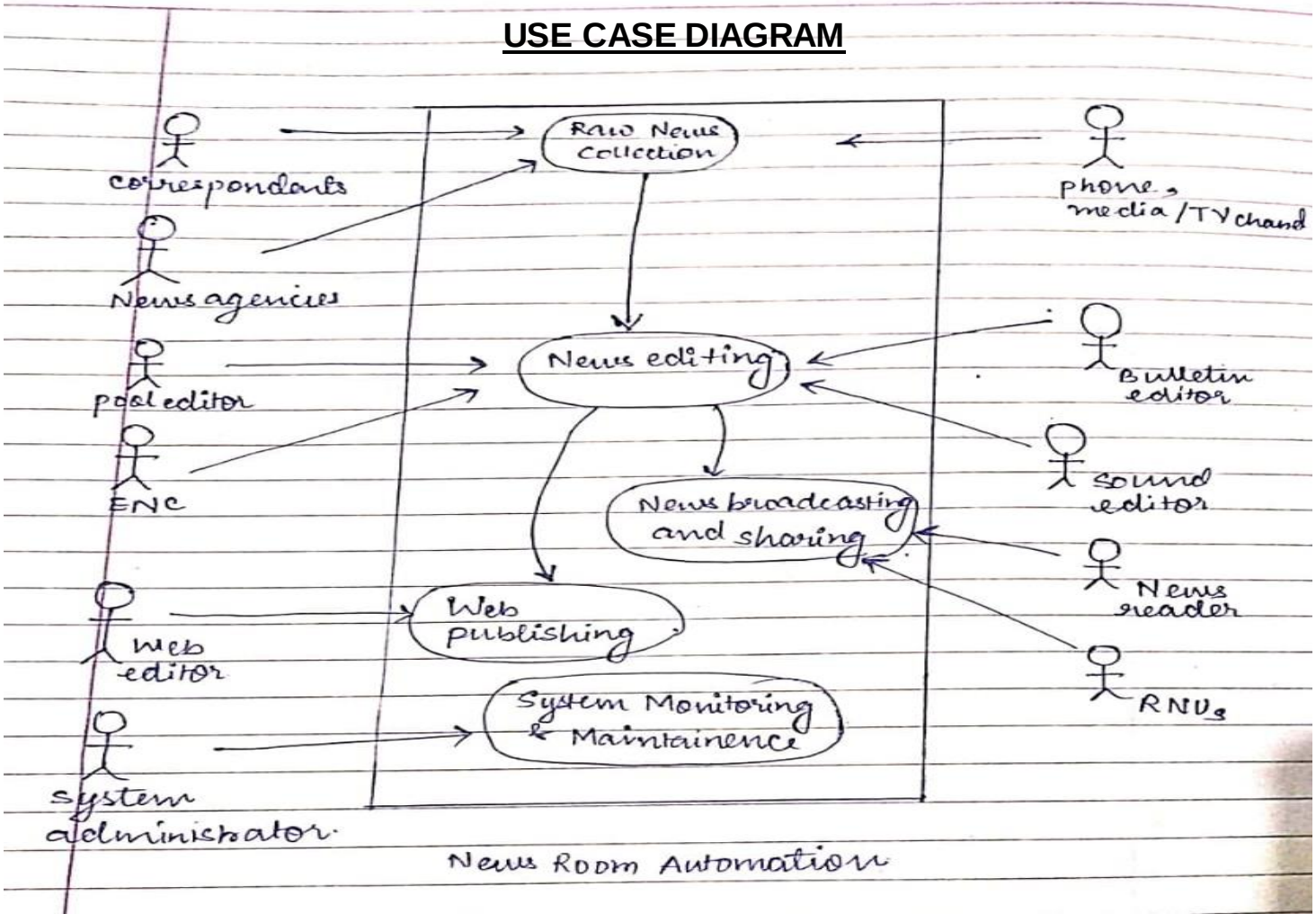
- Brief desc- Administrators handle services like user management, database management, database security and monitoring activity logs.

- Actor- system administrator
- **Events:**

- Database backup.
- Auto-archival and purging of audio/text material/news.
- Creation and deletion of users and granting rights by admin.
- Logging of each and every event about health of the software. Logging of user activity.
- Periodic maintenance of the system hardware and software by admin
- *Pre-condition- Policies have to be devised for database and file backup and auto archival and purging which need to be fed into the system (done by admin)*

- Special requirement- Blank LTO discs for backup

USE CASE DIAGRAM



DATABASE DESIGN

- In this system there are 2 servers:
- Data server
- File server

Due to the large size of each item to be stored, we are keeping the text and audio content of the stories separately in files with auto-generated file numbers on the file server. However, the metadata associated with each file is stored in the database on the data server.

- There is system generation of UNIQUE ITEM ID, TIMESTAMP, FILENAME, FILEPATH in all tables.

DATABASE TABLES

NEWSWIRES

COLUMN NAME	DATATYPE	CONSTRAINTS
ID	INT	PRIMARY KEY
CODE	CHAR(5)	NOT NULL
ITEM_LANGUAGE	VARCHAR(15)	NOT NULL
AGENCY	CHAR(7)	NOT NULL
TITLE	VARCHAR(50)	NOT NULL
CATEGORY	VARCHAR(10)	NOT NULL
KEYWORD	VARCHAR(15)	NOT NULL
PRIORITY	INT	NOT NULL
LOCATION	VARCHAR(15)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

PHONE_IN

COLUMN NAME	DATATYPE	CONSTRAINTS
CORRESPONDENT_ID	INT	PRIMARY KEY, FOREIGN KEY
DATE_TIME	TIMESTAMP	PRIMARY KEY
DURATION	TIME	NOT NULL
LOCATION	VARCHAR(15)	NOT NULL
PRIORITY	INT	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

DATABASE TABLES

SMS

COLUMN NAME	DATATYPE	CONSTRAINTS
SMS_ID	INT	PRIMARY KEY
SENDER_ID	INT	FOREIGN KEY
CONTENT	VARCHAR(150)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
LOCATION	VARCHAR(15)	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

IMAGES

COLUMN NAME	DATATYPE	CONSTRAINTS
IMAGE_ID	INT	PRIMARY KEY
SENDER_ID	INT	FOREIGN KEY
TITLE	VARCHAR(50)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
LOCATION	VARCHAR(15)	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

EMAIL

COLUMN NAME	DATATYPE	CONSTRAINTS
EM_ID	INT	PRIMARY KEY
EMAIL_ID	INT	FOREIGN KEY
SUBJECT	VARCHAR(50)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
LOCATION	VARCHAR(15)	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

DATABASE TABLES

PROGRAMME_AUDIO

COLUMN NAME	DATATYPE	CONSTRAINTS
AUDIO_ID	INT	PRIMARY KEY
LANGUAGE	VARCHAR(15)	NOT NULL
WRITER_ ID	INT	FOREIGN KEY
TITLE	VARCHAR(50)	NOT NULL
OCCASION	VARCHAR(15)	NOT NULL
PLACE	VARCHAR(15)	
MODERATOR	VARCHAR(10)	NOT NULL
DURATION	INT	NOT NULL
PARTICIPANTS	VARCHAR(30)	NOT NULL
PRODUCER	VARCHAR(10)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

PROGRAMME_TEXT

COLUMN NAME	DATATYPE	CONSTRAINTS
ID	INT	PRIMARY KEY
LANGUAGE	VARCHAR(15)	NOT NULL
WRITER_ID	INT	FOREIGN KEY
TITLE	VARCHAR(50)	NOT NULL
OCCASION	VARCHAR(15)	NOT NULL
PLACE	VARCHAR(15)	
DURATION	INT	NOT NULL
PRODUCER	VARCHAR(10)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

DATABASE TABLES

SUBMITTED_NEWS

COLUMN NAME	DATATYPE	CONSTRAINTS
ID	INT	PRIMARY KEY
LANGUAGE	VARCHAR(15)	NOT NULL
TITLE	VARCHAR(50)	NOT NULL
WRITER_ID	INT	FOREIGN KEY
CATEGORY	VARCHAR(10)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

FINAL_NEWS

COLUMN NAME	DATATYPE	CONSTRAINTS
ID	INT	PRIMARY KEY
LANGUAGE	VARCHAR(15)	NOT NULL
TITLE	VARCHAR(50)	NOT NULL
WRITER_ID	INT	FOREIGN KEY
CATEGORY	VARCHAR(10)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

BULLETIN

COLUMN NAME	DATATYPE	CONSTRAINTS
ID	INT	PRIMARY KEY
LANGUAGE	VARCHAR(15)	NOT NULL
TITLE	VARCHAR(50)	
WRITER_ID	INT	FOREIGN KEY
CATEGORY	VARCHAR(10)	NOT NULL
DATE_TIME	TIMESTAMP	NOT NULL
FILENAME	RAW	UNIQUE, NOT NULL
FILEPATH	VARCHAR(100)	NOT NULL

DATABASE TABLES

USERS

COLUMN NAME	DATATYPE	CONSTRAINTS
USER_ID	INT	PRIMARY KEY
USER_NAME	CHAR(20)	NOT NULL
DESIGNATION	CHAR(15)	NOT NULL
EMAIL	VARCHAR(15)	NOT NULL
PHONE_1	INT	NOT NULL
PHONE_2	INT	
PASSWORD	VARCHAR(10)	NOT NULL
ADDRESS	VARCHAR(25)	NOT NULL
DEPARTMENT	VARCHAR(10)	NOT NULL

NEWSWIRES_KEY

COLUMN NAME	DATATYPE	CONSTRAINTS
AGENCY	VARCHAR(30)	NOT NULL
CODE	VARCHAR(7)	PRIMARY KEY
DESCRIPTION	VARCHAR(35)	NOT NULL

DATABASE TABLES

News Wires keywords and their associated description:

Agency Name	Code	Description
Press Trust of India (PTI)	UNKNW	Unknown
	ALLWR	All Wires
	g	PTI General News
	e	Special
	spo	Sports
	NAT	National
	MDS	Madras - Stories
	PWR	Asia - Net press releases
	DEL	Delhi - Stories
	DES	Delhi - Extra special stories
	DCM	Delhi - Commercial stories
	SPD	Delhi - Sports stories
	NRG	Northern region - Stories
	WRG	Western region - Stories
	ERG	Eastern region - Stories
	SRG	Southern region - Stories

DATABASE TABLES

News Wires keywords and their associated description:

Agency Name	Code	Description
Press Trust of India (PTI)	BOM	Bombay - Stories
	BES	Bombay - Extra special stories
	BCM	Bombay - Commercial stories
	SPB	Bombay - Sports stories
	CAL	Calcutta - Stories
	CES	Calcutta - Extra special stories
	CCM	Calcutta - Commercial stories
	SPC	Calcutta - Sports stories
	SPC	Madras - Commercial stories
	SPM	Madras - Sports stories
	FGN	Foreign - Stories
	FES	Foreign - Extra special stories
	FCM	Foreign - Commercial stories
	SPF	Foreign - Sports stories
	FNP	Other news agencies - Pool stories

DATABASE TABLES

News Wires keywords and their associated description:

Agency Name	Code	Description
Asian News International (ANI)	**UNKNW**	**Unknown**
United News of India (UNI)	ALLWR	All Wires
	N	National
	EN	Entertainment
	HE	Health
	IN	International
	RE	Regional
	BU	Budget
	EL	Elections
	SP	Sports
	FN	Foreign

RISK MANAGEMENT

Risk Mitigation, Monitoring and Management Plan (RMMM)

Risk Table:

S.No.	Risks	Category	Probability (%)	Impact	RMMM
1	The existing newsroom system not ready for technological change	BU	40	2	
2	The users of the product may not have technical background	CU	30	3	
3	Budget may be too low	BU	30	3	
4	Project team unable to keep up with schedule	PR	30	3	
5	Larger number of users than planned	PS	30	3	
6	Staff may be inexperienced	ST	20	2	
7	Lack of training on project development tools	DE	20	2	
8	All requirement specifications may not be satisfied	PD	15	2	
9	The models may not be well designed leading to increased cost of reviewing and changes in the code	TR	15	2	
10	Requirements are changed at a later date	PD	15	3	
11	Staff size may be too small	ST	15	3	
12	Complex user interface	TR	15	3	
13	Product performance may not be good	TR	10	1	
14	Product may not be compatible on user devices	TR	10	1	
15	Size estimate is not accurate	PS	10	2	
16	Unable to combine core functionality to additional functionality	TR	10	2	
17	Code built is not flexible to incorporate changes	TR	10	2	
18	Loss of centralized database and file server data due to storage failure	TR	5	1	

CATASTROPHIC	1
CRITICAL	2
MARGINAL	3
NEGLIGIBLE	4

RMMM plans (for risks above cutoff line)

1) The existing newsroom system may not be ready for technological change

i). Mitigation:
- Ensure proper marketing of the product.
- Propagate the importance of this new newsroom automation system through workshops and sessions.
- Hold meetings and conduct demos to make aware of the advantages and the need of the product over the old system.

ii) Monitoring:
- Take feedback after demo sessions to see if the product is well liked by others and if the advantages are worth the project cost.

iii) Management:
- Hold meetings with uninterested groups to know the reason of their reluctance and present them with facts and demos to convince them of the change and the advantages that the new system has over the older existing one.
- Decide whether giving future support to project is feasible and that product is viable or not. If the product is not viable enough then remove support.

2) The users of the system may not have technical background

i) Mitigation:
- Hire people having minimum technical knowledge for the position.
- Provide initial training and technical support to all.

ii) Monitoring:
- Monitor the time spent by each user on the system.

iii) Management:
- Conduct training classes to provide additional training as and when required.
- Provide initial technical support in the early days after system installation.

RMMM plans (for risks above cutoff line)

3) The budget and allocated resources may be too low

i) Mitigation:
- Estimate budget using reliable historical data.
- Take the estimated cost of risk handling also into budget consideration.
- Take the estimated cost of error removal and detection into consideration.
- Allocate budget and resources depending on task size of individual teams.

ii) Monitoring:
- Monitor whether all teams are able to produce the work-products without excessive budget drain.
- Monitor any changes in the requirements that may disturb the budget.

iii) Management:
- Re-estimate budget using different techniques
- Analyze the short comings of the budget and take feedback from project team members
- Re-allocate resources to various teams according to their needs

4) Project team unable to keep up with schedule

i) Mitigation:
- Make a realistic schedule.
- Take the software team's experience and skills into consideration when making schedule.

ii) Monitoring:
- Monitor the timeliness of work products.
- Monitor the efficiency of project team.
- Monitor the frequency of missed deadlines.

iii) Management:
- Speak to the software team and get review as to why the deadlines are getting missed.
- Adjust the deadlines according to project team skills.
- Divide the work if required.

RMMM plans (for risks above cutoff line)

5) Larger number of users than planned

i) Mitigation:
(1) Take estimates using reliable historical data.
(2) Estimation should be done using more than one technique.

ii) Monitoring:
(1) Monitor the number of users logging onto the system daily.
(2) Monitor the time spent by each user daily on the system.

iii) Management:
(1) Hardware infrastructure will have to be escalated / improved.
(2) Add load sharing functionality to the software.

TESTING

BOUNDARY VALUE ANALYSIS

- The news stories coming in as input have the exact date in them which is stored by the software to perform further operations. The date input is a triple input with values in the range:-

  1 <= month <= 12

  1 <= day <= 31

  1900 <= year <= 2099
- Valid dated stories are stored, invalid dated stories are discarded.

BOUNDARY VALUE ANALYSIS

Boundary value test cases:-

Test Case	Month	Day	Year	Expected Output
1	6	15	1900	Valid
2	6	15	1901	Valid
3	6	15	2001	Valid
4	6	15	2098	Valid
5	6	15	2099	Valid
6	6	1	2001	Valid
7	6	2	2001	Valid
8	6	30	2001	Valid
9	6	31	2001	Invalid-discarded
10	1	15	2001	Valid
11	2	15	2001	Valid
12	11	15	2001	Valid
13	12	15	2001	Valid

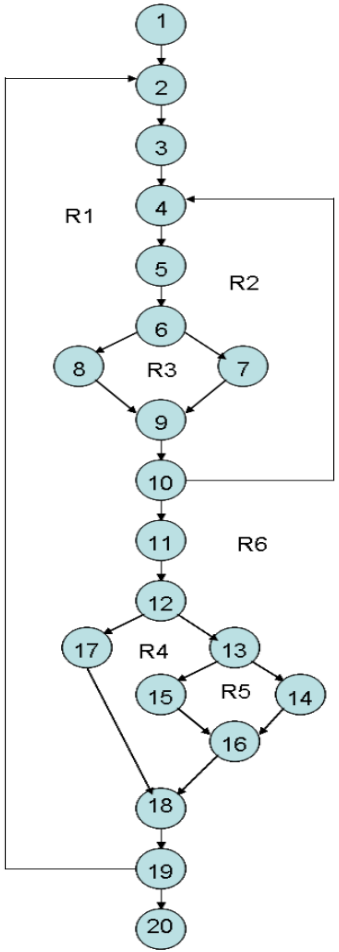
CYCLOMATIC COMPLEXITY

PSEUDO CODE

```
main
Initialize uid, pass to NULL  ------ 1
Initialize lgn, val to FALSE

do while lgn==FALSE  ------ 2
        input uid  //User ID  ------ 3

        do while val==FALSE  ------ 4
                input pass  //password
                val = passlenchecker(pass)  ---- 5
        end do  ------ 10

        lgn = validcred(uid, pass)  ------ 11
end do ------ 19
end main  ------ 20
```

```
passlenchecker (pwd)
        if length(pwd) >= 8  ------ 6
                return TRUE  ------ 7
        else
                print "Incorrect password length! Enter again."  ------ 8
                return FALSE
        End if  ------ 9

validcred (id, pwd)
        if id exists in database file  ------ 12
                if id.password==pwd  ------ 13
                        return TRUE  ------ 14
                else return FALSE  ------ 15
                End if  ------ 16
        else
                print "Incorrect user ID or password! Enter again."  ------ 17
                return FALSE
        End if ------ 18
```

CONTROLFLOWGRAPH



CYCLOMATIC COMPLEXITY CALCULATION:-

3 ways:

- V(G) = No. of regions = **6**
- V(G) = E-N+2 = 24-20+2 = **6**
- V(G) = P+1 = 5+1 = **6**
  (Predicate nodes: 2, 4, 6, 12, 13)

Independent Paths:-

I. 1-2-3-4-5-6-7-9-10-11-12-13-14-16-18-19-20
II. 1-2-3-4-5-6-7-9-10-11-12-13-15-16-18-19-2-3-4-5-6-7-9-10-11-12-13-14-16-18-19-20
III. 1-2-3-4-5-6-7-9-10-11-12-17-18-19-2-3-4-5-6-7-9-10-11-12-13-14-16-18-19-20
IV. 1-2-3-4-5-6-8-9-10-4-5-6-7-9-10-11-12-13-14-16-18-19-20
V. 1-2-3-4-5-6-8-9-10-4-5-6-7-9-10-11-12-13-15-16-18-19-2-3-4-5-6-7-9-10-11-12-13-14-16-18-19-20
VI. 1-2-3-4-5-6-8-9-10-4-5-6-7-9-10-11-12-17-18-19-2-3-4-5-6-7-9-10-11-12-13-14-16-18-19-20


THANK
YOU !