

DEVELOPMENT & ENHANCEMENT OF DISTRIBUTION AUTOMATION IN UNICAD ENVIRONMENT

Submitted By
Shruti Nema
14MCEN25



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
INSTITUTE OF TECHNOLOGY
NIRMA UNIVERSITY

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DEVELOPMENT & ENHANCEMENT OF DISTRIBUTION AUTOMATION IN UNICAD ENVIRONMENT

Major Project

Submitted in partial fulfillment of the requirements

for the degree of

Master of Technology in Networking Technologies-Computer Science and Engineering

Submitted By

Shruti Nema

(14MCEN25)

Guided By

Prof.Usha Patel



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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AHMEDABAD-382481

May 2016

Certificate

This is to certify that the major project entitled ”**DEVELOPMENT & ENHANCEMENT OF DISTRIBUTION AUTOMATION IN UNICAD ENVIRONMENT**” submitted by **Shruti Nema(14MCEN25)**, towards the partial fulfillment of the requirements for the award of degree of Master of Technology in Computer Science and Engineering of Nirma University, Ahmedabad, is the record of work carried out by her under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination. The results embodied in this major project part-I, to the best of my knowledge, haven't been submitted to any other university or institution for award of any degree or diploma.

Prof. Usha Patel
Guide & Associate Professor,
CSE Department,
Institute of Technology,
Nirma University, Ahmedabad.

Prof. Gaurang Raval
Associate Professor,
Coordinator M.Tech - NT-CSE
Institute of Technology,
Nirma University, Ahmedabad

Dr. Sanjay Garg
Professor and Head,
CSE Department,
Institute of Technology,
Nirma University, Ahmedabad.

Dr P.N. Tekwani
Director,
Institute of Technology,
Nirma University, Ahmedabad

Statement of Originality

I, **Shruti Nema, 14MCEN25**, give undertaking that the Major Project entitled **”DEVELOPMENT & ENHANCEMENT OF DISTRIBUTION AUTOMATION IN UNICAD ENVIRONMENT”** submitted by me, towards the partial fulfillment of the requirements for the degree of Master of Technology in **Networking Technologies** of Institute of Technology, Nirma University, Ahmedabad, contains no material that has been awarded for any degree or diploma in any university or school in any territory to the best of my knowledge. It is the original work carried out by me and I give assurance that no attempt of plagiarism has been made. It contains no material that is previously published or written, except where reference has been made. I understand that in the event of any similarity found subsequently with any published work or any dissertation work elsewhere; it will result in severe disciplinary action.

Signature of Student

Date:

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Endorsed by
Prof. Usha patel
(Signature of Guide)

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- **Shruti Nema**
14MCEN25

Abstract

This system manages deliveries and distributes IPs to different departments, according to customers requirements. The Distribution Management System not only processes the products according to their media but also manages each and every request using a web interface. The distribution team in the infrastructure Services group is responsible for delivery of products to internal as well as external customers of ST. Requests for delivery of products come in large numbers every day. So we have automated the process. At the starting level, we thought of using Selenium. Selenium automates browsers. Selenium has the support of some of the largest browser vendors who have taken (or are taking) steps to make Selenium a native part of their browser. It is also the core technology in countless other browser automation tools, APIs and frameworks. But lastly we automated the process using the Perl scripts and modules. There are two types of customers:

1.ST Internal Divisions

2.External partner

ST Internal divisions of designers can ask any type of request; it may be web download and transfer products in their repository. There is one more customer called as External Partner, this request made by external customers through internal departments in ST. Finally the delivery will be transfer to external customer through data transfer gateways like SIFT and SFT. Distribution team takes care to process all type of requests. There are several types of methods, used to process different kind of customer Requests. The TRnD department creates libraries which can be reused for present and future projects. Other divisions in ST or external customers who need these libraries for their projects make a request for these libraries on a web interface known as DRT (Distribution Request Tracking). Distribution team takes care to process all the DRT requests. There are several types of methods used to process different kind of DRT.

Distribution RoadMap

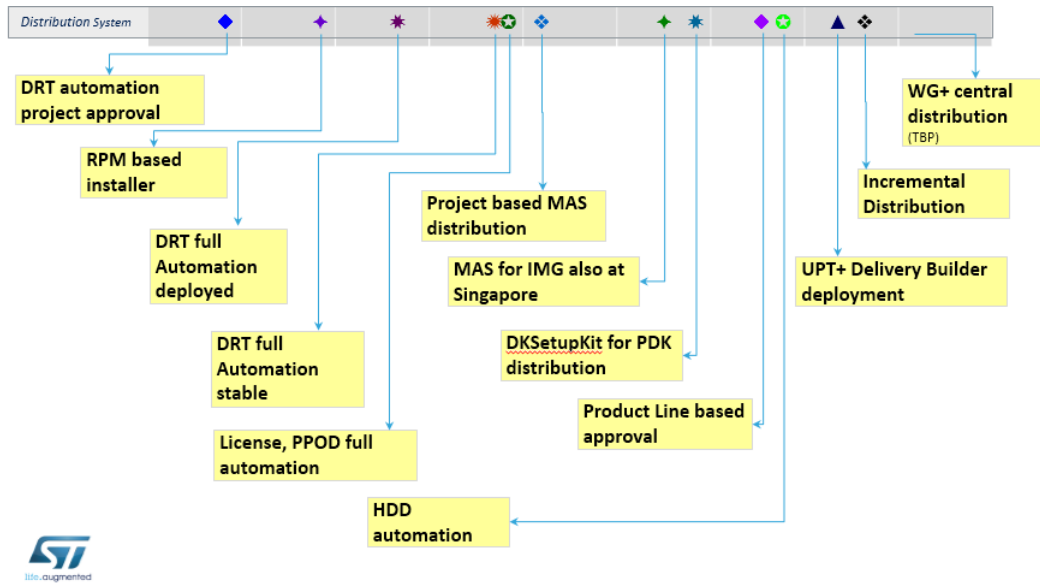


Figure 1: Distribution RoadMap

Abbreviations

DRT	Distribution Record Tracker.
UOLBE	Unicad online Backend.
IP	Intellectual Property.

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Chapter 1

Project Definition and Overview

1.1 Company Profile

STMicroelectronics, Greater Noida, India. STMicroelectronics is an Italian-French electronics and semiconductor manufacturer headquartered in Geneva, Switzerland. STMicroelectronics was formed in June 1987 by the merger of semiconductor companies SGS Microelettronis (SocietGeneraleSemiconductor) of Italy and Thomson Semiconductors, the semiconductor arm of France's Thomson. At the time of the merger the company was known as SGS-THOMSON but took its current name in May 1998 following the withdrawal of Thomson SA as an owner.

ST consists of five product groups. Each group is composed of several divisions or business units. Each division is responsible for the design, industrialization, manufacturing and marketing for its own product portfolio. Operations are assisted by a central Research and Development organization and the local sales offices.

Memory Product Group

Automotive Product Group

Micro, Power and Analog Group

Computer Peripheral Group

Front End Technology and Manufacturing

The Noida site was launched in 1992 to conduct software engineering activities. A silicon design center was inaugurated on 14 February 1995. With 120 employees, it was the largest design center of the company outside Europe at the time. In 2006, the site was shifted to Greater Noida for further expansion. The site hosts mainly design teams. It

is now primarily involved with the design of home video products (Set-Top Box, DVD), GPS and Wireless LAN chips, and accompanying software. World wide Data center support is also transferred to Greater Noida in 2004.

1.2 Project Definition

Automation of the Distribution Management System is done to achieve and enhance features in the processing such as :

- Efficiency
- Reliability
- Robustness
- Fault Tolerance
- High quality

1.2.1 Flow Of DRT

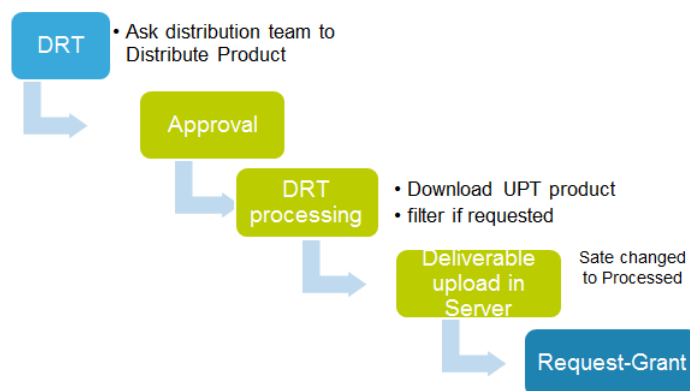


Figure 1.1: DRT Flow Chart

1.2.2 Need of Enhancement

According to the analysis done throughout the functioning of the tools following failure results has been found which need to be fixed accordingly with various methods and implementation. Different reasons comes under different component of Distribution Infrastructure.

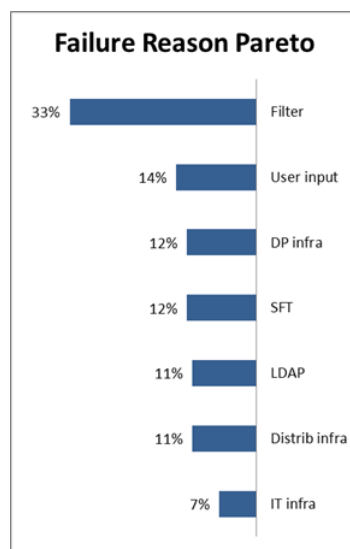


Figure 1.2: Failure Pareto

Chapter 2

Literature Survey

2.1 IP-Intellectual Property

SYSTEM: An electronics system consists of three important components, namely ALU-Processor, Memory and Communication system. ALU-Processor performs the arithmetic and logical calculations while memory provides storage for series of commands and their intermediate results. Communication systems take-in input data and take-out results to the outputs ports. SYSTEM-ON-CHIP (SOC): Due to modern day advancements in Electronics Fabrication and (Computer Aided) Design, a complete system is being realized in single chip/IC by the Semi-Conductor companies. This fact leads to the result of calling the IC as System-on-Chip (or its acronym SOC). Architecture of a SOC depends on its and functionality and specification which in turn is governed by the application where its being used. So, type of ALU, type and size memory used and communication topology is different from Soc to Soc. Hence, in industry, these three (ALU, Memory and Communication) components are designed by independent teams before being integrated. This independent design blocks are called IPs. IP: It is acronym for intellectual property. This IPs are designed to be configurable so that SoC designer can configure it according to the need while integrating it with other IPs.

IPs is classified into two types:

Soft IP: When IP team is asked to provide a Soft IP, then, design team delivers the design (that could be a Processor or Memory or Communication System) in the form a HardWare Description Language (HDL)i.e., in simple can be said as a piece of code or 6 in the form a structured logic gates. Hard IP: When IP team is asked to provide a Hard

IP, then, design team realizes the HDL into actual logic gates. These logic gates are then realized into layout. This layout again is realized into GDS. Layout is graphical format of the logic gates showing them to most abstract level as much as channel, substrate and oxide. GDS is their corresponding text format. Following figure is an example of a layout.

2.2 DRT

DRT stands for Distribution Request Tracker. The TRnD department creates libraries which can be reused for present and future projects. Other divisions in ST or external customers who need these libraries for their projects make a request for these libraries on a web interface known as DRT (Distribution Request Tracking). Distribution team takes care to process all the DRT requests. There are several types of methods used to process different kind of DRT. At present DRTs are being processed by little manual intervention. But this causes wastage of time, depends upon availability of person, involve high risk of manual mistakes and produce inefficient outputs. The objective is to make the things automated to reduce the manual mistakes and produce efficient outputs.

They are as follows states are involved request.

- Submitted
- Assigned
- Pending Approval
- Approved
- Processed
- Failed
- Cancelled

2.2.1 Flow Chart for States

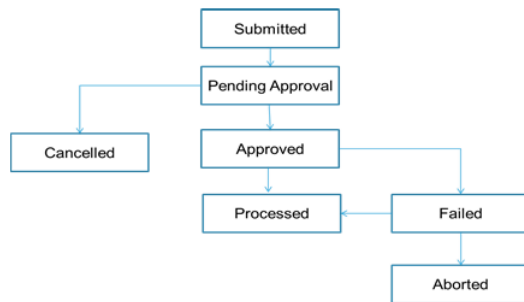


Figure 2.1: Flow Chart for states

2.2.2 Submitted

It is a state where requester request for IPs to deliver. Whenever requester access the Distribution Request page with his/her own credentials, clicks the Request link under New label at left side of the page shown in below screenshot, then requester selects type of request which are already given in dropdown list. When requester clicks next button one form will be open with appropriate information to be entered which are needed for Distribution Team. Distributed IPs are placed by the requester with respect to UPT deliverable labels corresponding with the project name, cc list, downloader list, other required information and user comment.

2.2.3 Assigned

Once requester submits request a mail will be received by distribution team under dedicated mail box. It is just like notification to Distribution Team as new request arrived to process. When request arrives operator analyses then someone from our team will be responsible to handle the request till end of the process.

2.2.4 Pending Approval

When a requester put the request in the DRT , it is now decision based by approval system that this request is in pending approval state. The basic meaning of the state is request is made and approvers are now responsible to approve this request. Every DRT has to passed through this state.

2.2.5 Approved

When the request is correct then it is approved by the approver of that particular request. If the dRT is in this state means the request is ready to be processed.

2.2.6 Failed

This state can only come after approved state. Whenever there is any problem faced while processing the request then DRT is moved to Failed stage. Then the recovery is done after taking some decision.

2.2.7 Cancelled

Whenever there is some issue related to DRT from requester side then the DRT is cancelled and move to cancelled stage. An when the approver reject the request then it is moved to cancelled stage.

2.2.8 DRT States Page

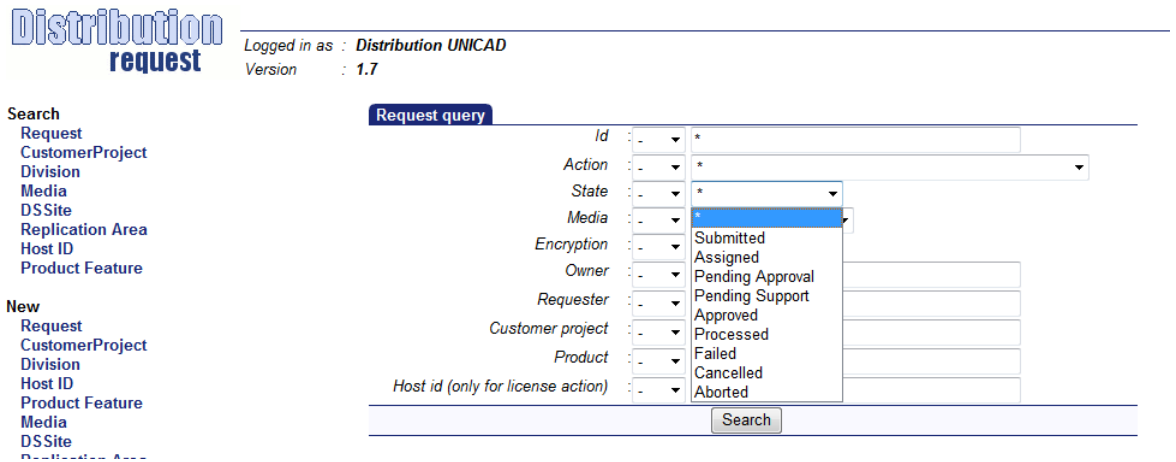


Figure 2.2: Various states of DRT

2.2.9 Distribution Flow



Figure 2.3: Distribution flow

2.3 UOLBEplus

UOLBEplus is backeend tool which process the request. By the help of this tool whole process of distribution delivery is transparent to the requester and customer. UOLBEplus tools work for the following medias .These media is provided according to the requester selection. UOLBEplus plays a very important position of all the component of distribution dashboard. Mainly UOLBEplus works on perl modules and the modules are called according to the details filled in the request.

Medias are defined as follows:

2.3.1 FTP

- The objective of this media is to provide all requested libraries to external company or partner. These libraries are downloaded, packaged and encrypted and then put on SFT server using distribution account.
- To deliver ST products to external customers, we need Request should be approved.
- ST FTP site: used to transfer data

2.3.2 WebgenPlus

- This media is similar to FTP
- In WebGen plus we create a complete tar package of compressed products and deliver it as atomic product on SFT server

2.3.3 Design Sync

- This media, we deliver the libraries on Design sync distribution buffer
- Using UptPlus Grant, Access grant is given to the authorized customers on Design Sync buffer
- Replication infra is used to replicate the data at different area and sites
- Access grant is given to the authorized customers on Design Sync buffer
- User can download the product using Sol+ client at their end or can get it from design sync cache

2.3.4 SOL PLUS

- For this media, we deliver the libraries on Design sync distribution buffer
- DS upt2ds API is used to deliver the libraries on Design sync distribution buffer
- Using UptPlus Grant, Access grant is given to the authorized customers on Design Sync buffer
- User can download the product using Sol+ client at their end

2.3.5 PPOD

- The Objective of this type of delivery is to publish the product in /sw/unicad area
- sw/unicad area is standard repository for products accessed by different divisions of ST
- From where the customer can use the products.

2.3.6 Filter

- Filter is required when confidential data is not to be send to customers
- It is mentioned in DRT request if filter is required for any product
- Filter is generally done for ST external customers
- But if filter is required for ST internal customers the media used is FTP

2.3.7 HDD Media

- HDD media is required when large data in terms of size is to be sent to customer
- When media is HDD, no download of products are automated. Neither the tar package creation is in the flow of automation
- Consolidate creates RPM package and productlist.txt having list of products by reading all XMLs of the corresponding DRT request
- HDD media notifies the operator that the RPM package has been created or failed. Further the operator has to download the products manually thereafter

- The downloaded products are encrypted and transferred to a physical disk
- The disk is sent to customer with the help of external logistics
- Once the data is received by the customer, DRT request is manually moved to Processed state

2.3.8 DRT Media Page

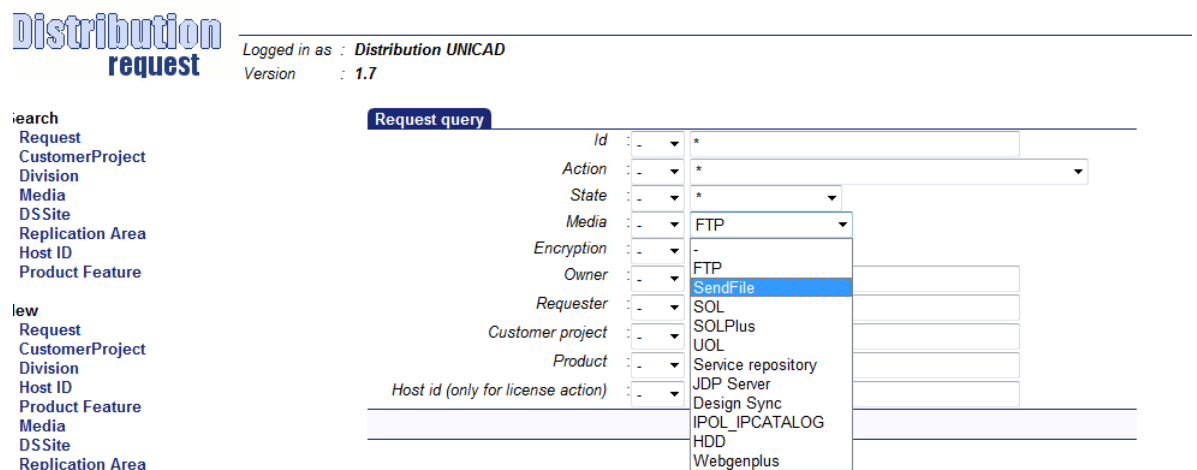


Figure 2.4: Various media of DRT

2.4 Approval System

Approval System is divided into two sub component. One is approval tracker other approval algorithm. Approval Tracker is used by approvers as well as requester to track their request . This tool provide the facility to the approver to approve or reject the request. This tool also provide requester ti view their request state. so overall main functionality of this system is to track the request and approve or reject the request.

The other component is Approval algorithm, this runs in back-end transparent to the requester. This algorithm is used to generate the approver of the submitted request. This component is responsible to move the state form submitted to pending approval or from submitted to auto apporval state.

2.4.1 Approval Dashboard

The screenshot shows a web browser window displaying the 'Approval Request for Id : 12120' page. The page has a header with the company logo and a navigation menu. Below the header, there is a main content area with a title 'Approval Request for Id : 12120' and two buttons: 'Approve' (green) and 'Deny' (red). A note below the buttons states: 'Once Approved/Disapproved, the status can not be changed through Yikpage. Please contact distribution team [distribution.united@st.com] in such case.'

Below this is a section titled 'My Pending Approvals' containing a table with the following data:

ID	Project	Media	Requester	Downloader	Decision
12120	Test	Service_Repository	mahouah	das agnais	Approve Deny
12124	FTP_TEST	FTP	gohak	gohak	Approve Deny
12122	FTP_TEST	FTP	gohak	gohak	Approve Deny
12120	FTP_TEST	FTP	gohak	gohak	Approve Deny
12141	FTP_TEST	FTP	gohak	gohak	Approve Deny
12145	FTP_TEST	FTP	gohak	gohak	Approve Deny
12147	FTP_TEST	FTP	gohak	gohak	Approve Deny

Below the table is another note: 'Once Approved/Disapproved, the status can not be changed through Yikpage. Please contact distribution team [distribution.united@st.com] in such case.'

The bottom section is titled 'My Requests' and contains a table with the following data:

Req No	Project	Media	Downloader	Status
12120	FTP_TEST	FTP	gohak	PENDING_SUPPORT
12128	FTP_TEST	FTP	gohak	PENDING_SUPPORT
12122	FTP_TEST	FTP	gohak	PENDING_SUPPORT
12128	FTP_TEST	FTP	gohak	PENDING_SUPPORT

Three callout boxes on the right side of the screenshot provide additional information:

- Approve Specific request**
 - Approve request from approval mail hyperlink
 - This section is empty if tracker is opened directly
- My Pending Approval**
 - Approve all pending request from one page
- My Recent Request**
 - Track recent request
 - Clone your request
 - Track pending approvers
 - Quick access to your request

Figure 2.5: Approval Dashboard

2.4.2 Approval System Effect on DRT

Distribution request | Logged in as : **Distribution UNICAD** | Version : **1.7**

Search

- Request
- CustomerProject
- Division
- Media
- DSSite
- Replication Area
- Host ID
- Product Feature

New

- Request
- CustomerProject
- Division
- Host ID
- Product Feature
- Media
- DSSite
- Replication Area

Request query

Id	:	-	*	<input type="text"/>
Action	:	-	*	<input type="text"/>
State	:	-	*	<input type="text"/>
Media	:	-	*	<input type="text"/>
Encryption	:	-		<input type="text"/>
Owner	:	-		<input type="text"/>
Requester	:	-		<input type="text"/>
Customer project	:	-		<input type="text"/>
Product	:	-		<input type="text"/>
Host id (only for license action)	:	-		<input type="text"/>

Submitted
Assigned
Pending Approval
Pending Support
Approved
Processed
Failed
Cancelled
Aborted

Figure 2.6: Request in pending Approval state

Distribution request | Logged in as : **Distribution UNICAD** | Version : **1.7**

Search

- Request
- CustomerProject
- Division
- Media
- DSSite
- Replication Area
- Host ID
- Product Feature

New

- Request
- CustomerProject
- Division
- Host ID
- Product Feature
- Media
- DSSite
- Replication Area

Request

Id	:	12784
Owner	:	Distribution UNICAD
Requester	:	gaurr
State	:	Approved
Action	:	Send products to specific customer project(s)
PM to notify	:	sharad.gupta@st.com
Product	:	

Figure 2.7: When request is approved

Chapter 3

UOLBEplus Enhancement and Development

3.1 HDD Automation

Requirements: Perl Installation, JDK installation ,replica of project and work area in noida , HDD media is initially manually, but the new system deployed has the feature by which this semi automation. It will create automatic tar of the product. First in GNB xml move to done These done files are copied in noida and then distribute command runs on noida site.

3.2 Filter Enhancement

Filter is the process in which full product is not send,it is filtered according to the specification, some of the libraries are included some are excluded from the IP. It has been found that sometimes it passes without reporting error which is a bug.And also sometimes dpspec downloaded multiple times, so we have resolve these two problems of filter by using below algorithm.Filter.pm is used[1]

3.2.1 Algorithm

- Read the DRT xml
- Download the product
- Download the dpspec if not in install zone,dpspec is downloaded only once.

- Create dynamic filter.csh for every request
- This filter.csh contains how to filter the product
- Check status of pkg filter
- grep the Error if occurs and return failed state otherwise return filter passed

3.3 Optimization of modules

There are modules in which old functionalities are there which is not in use in new version of UOLBEplus tool. In this task I have to study the various modules and clean up them accordingly. Action taken after study and survey.

- Merge some modules
- Truncate module Getmodule.pm
- Optimize consolidate.pm
- Removal of External Structure

3.4 SFT upload Enhancement

SFT is server which is used to upload the IP at three site GNB,ASIA,USA. SFT is used in case of FTP and Webgenplus media. In which site data upload is done is decide by the project.

- Upload is tried twice in case of failure
- Site is now select automatically by projectsite.pm module, Earlier default is GNB for other we have to manually change the upload site
- Search on a algorithm through which we can divide SFT load to avoid SFT hang and HDD delivery

3.5 Removing config Dependency

Config file is used to provide the configuration of the parameters ,apth which should be used by UOLBEplus tool. But it leads to dependency and hard coding for some

parameters like uolbeplus path ,product version,UnicadKerenl,Flexlmkit,Python installation path,SFT path etc. All are moved to environment variables and and manage by envconfig.pm and manage by source.csh.[2]

3.6 Feature for Incremental Delivery

This is the under developing process. This project is to be integrated with UOLBEplus to achieve incremental delivery. Importance of the project: Efficient use of Bandwidth
Smaller data is upload in comaparison to original product.

3.7 Mail Sending Robustness

Mailsender.pm [3]is a module used to sent the mail to the requester, or the down-loaders in case of any response to the delivery. There was a bug in licence media that it moved to process state without sending the message.

Chapter 4

Approval System

The approval system starts after assigned state and ends with approved state, it starts once the operator finalizes request made by requester has been correct by checking all parameters are mentioned in the web form and type of request (whether it is filter or non-filter). Selecting media is depends on type of project, for every project there is a corresponding type of media There are a group of people who can approve the type of product. Operator having an excel sheet that contains correlation between type of product and approval group. To get approval from those people operator has to compose a mail with description about request like type of media, products list, and project etc. Here is one example of the composed mail given in below. The approval group given in To list, body contains list of products and link to particular request. Downloaders are nothing but end users, who are requesting privileges of products from owner of the products.

4.1 Part 1 Development

4.1.1 Description

- For auto-approval no mail is send
- If requester in DP operation list , auto approve case External Customer, PPOD, Update License
- TnDP single productline mail is sent to DP operation
- other organization mail is sent to DP operation Internal Customer

- TnDP single productline for internal customer mail is sent to that productline approver
- Only TnDP multiple productline approval mail sent to operation
- Mix of organization approval mail sent to operation
- Single operation mail is sent to approval of that operation
- Requester is in approval list ,auto approve case

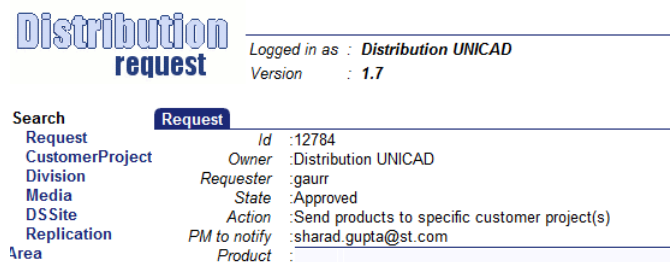


Figure 4.1: When request is approved

4.2 Part 2 Development

4.2.1 Description

In this phase of development approval system will be design to meet new demands of customer and optimize algorithm to meet enhancement as well as customer requirements. In this feature note approval algorithm is designed to achieve division wise approvers so that we can provide product owners right to control access rights to their products directly without any interface

4.2.2 New Features

- Enhancement in approval Template
- New Approval Policy

4.2.3 Enhancement in Approval Template

Internal comment has been added. Internal comment are the comment which is from the requester to the app-rovers of products. This will help app-rovers o know the reason of the products requested purpose.

Distribution request Logged in as : **Distribution UNICAD**
Version : 1.7

Search **Request**

Request	Id	:12784
CustomerProject	Owner	:Distribution UNICAD
Division	Requester	:gaurr
Media	State	:Approved
DSsite	Action	:Send products to specific customer project(s)
Replication	PM to notify	:sharad.gupta@st.com
Area	Product	:

Figure 4.2: When request is approved

4.2.4 New Approval Policy

Approvers were decided based on organization, now multiple mails are sent based on organization for approval of Distribution request.



Figure 4.3: New Approval Policy Flow Chart

Chapter 5

Incremental Delivery Integration in UOLBEplus

5.1 Need Analysis

5.2 Addition in xml

A xml file is generated by DRT after the request is approved. For achieving the incremental project in UOLBEplus below elements are added in the xml file.

- DelivIsUptPlus
- IsIncremental
- BaseDeliverableVersion

5.3 Condition for Delivery to be Incremental

There are some requirements for delivery to be incremental if all these condition satisfy the the delivery is send as incremental delivery.

Deliver incremental if

- If user ready for incremental option in DRT
- Repository is UPTplus
- Another older version has been shipped in past for same unacad name in same DRT project

- Ratio of total file size Diff/same is lower than threshold

5.4 Abstract algorithm

- If Non-incremental delivery
Conventional Delivery
- If Incremental delivery
Call diffget.tcl
download different content file
Get same file log
- Pack above content
- Create RPM Installer with configuration for incremental installation Delivery by SFT

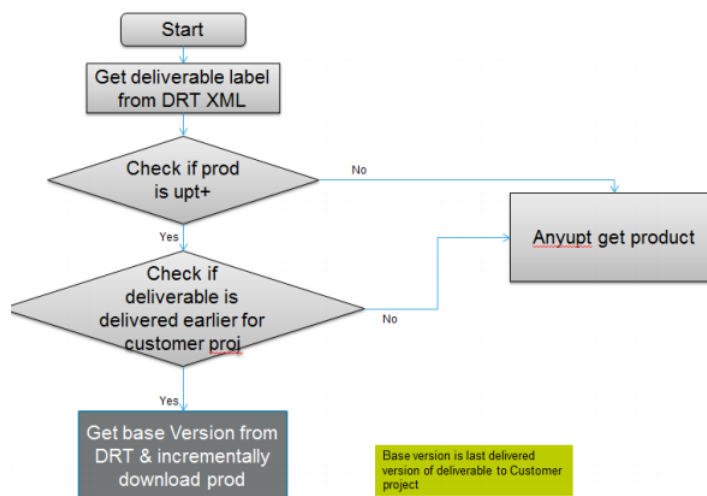


Figure 5.1: Flow Chart for Incremental Download

5.5 Whats New

In this section what will be changes occur at end are concluded.

- Requester:
New switch in DRT to force non-incremental or let distribution decide

- Delivery mail:

No visual change

Tar content will have diffget.tcl output instead of product tar

The size will be lower than full content

- Installation:

No visual change. Installation method and command remain same

Internally install kit will install differently which is transparent to user

Chapter 6

Split Upload Automation

6.1 Need

- Sometimes delivery size of DRT is greater than threshold of SFT or near to threshold of SFT upload server
- SFT upload server hangs for large deliveries size
- Removing use of manual efforts to split the delivery

6.2 Pre-Conditions

- Media to be FTP for split condition
- Deliverable size must be greater than threshold value
- Removing use of manual efforts to split the delivery

6.3 Analysis of Algorithms

- Knapsack 0/1
- Best Fit Bin Packing Algorithm
- First Fit Bin Packing Algorithm

6.4 Splitting Load Algorithm

The below algorithm is responsible to distribute the loads in different bins in optimized form so that it takes equal time for distribution ,upload and download in client and server side.

- Calculate No. of workdir
 - No. of workdir \$N = workdirSize/upload Threshold
- Create hash containing workdirSize
 - %WorkdirSize
- For \$j = 2 to \$N
 - Make dir workdir\$j
 - Update hash workdirSize
 - \$WorkDirSize->{workdir\$j} = 0
- For each \$P product.tar.gz in workdir
 - Get minimum size workdir \$W
 - newsize = Size of \$P + Size of \$W
 - If newSize < UploadMax
 - Move product from workdir to \$W
 - Update \$W size
 - else
 - Create new workdir\$N+1
 - Move \$P to workdir\$N+1
 - Update hash

Figure 6.1: Algorithm to split

6.5 Parallel Upload

Parallel upload algorithm is responsible to upload parallel in SFT servers .

- For $i = 1$ to N
 - Create `upload i .tsk`
 - Create `upload i .csh`
 - `bsub -J DRTupload i "csh upload i .csh"`
- Submit dependency job
 - `bsub -w ended(DRTupload 1) && ended(DRTupload 2)...&& ended(DRTupload N) "bresume -J DRT.xml"`
- Suspend Current job
- After Completion of upload ,dependency job runs
 - Job Resumed
 - Check status file
 - If status is passed
 - DRT processed
 - Else
 - DRT failed

Figure 6.2

Chapter 7

Conclusion-The survey and Analysis

7.1 Journey of the Distribution system in 2015 (after automation)

- Reduce message failure bug
- New approval system reduce data migration, as productline is used in case of Design Responsibility
- Reduce filter failure

7.2 Direct benefits to customer, ST, DP and PM Community

- As the process is transparent to the user of the tool, for there level everything is ease and fast. At the customer following things are achieved
- Ease of getting, installing and using DP product by partner
- Earn good image of ST products

7.3 Business impact of Major functionalities implemented

- 24x7 service availability (including weekend, holiday)

- Resource saving
- Avoid repetitive job by engineers

7.4 Distribution system Performance

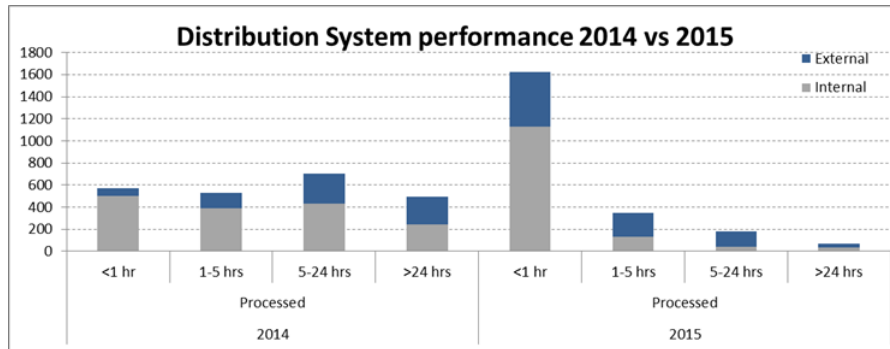


Figure 7.1: Distribution System Performance

Chapter 8

Future Work

- Enhancement in SFT upload threshold
- Merging uptplus and upt
- Replace uptquery with uptplys query
- Unix native mail utility instead of java based mail application

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