USER MANUAL



Manual for Field Data Collection using Smart phone application

Geotagging of Pradhan Mantri Jan Vikas Karyakram(PMJVK) Assets using Geospatial Technologies

National Remote Sensing Centre ISRO, Department of Space, Government of India Hyderabad



July 2022





Manual for Field Data Collection using Smart phone application

NATIONAL REMOTE SENSING CENTRE

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Mobile Software Application for Field Data Collection -BhuvanPMJVK

1. Overview:

The PMJVK (PRADHAN MANTRI JAN VIKAS KARYAKRAM) aims at improving socioeconomic conditions of the minorities and providing basic amenities to them for improving quality of life of the people and reducing imbalance in the identified minority concentration areas. The projects which are taken up under PMJVK relate to creation of infrastructure mainly in the sectors of education, health and skill development, besides innovative schemes for improving the socio-economic and living conditions of minority communities.

The synergy of GIS and web Technology allows access to dynamic geospatial information without burdening the users with complicated and expensive software. Advancements in various technological, scientific, communication and data dissemination fronts should be interested on to a seamless platform to serve the user for effective Asset Management.

Remote sensing technology can play a major role in monitoring such activities. The high resolution satellite data (images) gives large perspective view of the ground situation and it can be monitored at periodic time intervals. Monitoring with satellite data at short time intervals may not be an optimal method to adopt. For such projects, field data collection using smart phone can be a good complementary solution. The collected field attributes with photographs information can be overlaid over the satellite data to give a good perspective of activities in the field.

The field data collection for monitoring activities was traditionally done using a manual approach like visiting field with hard copy form entry, consolidating the collected data at later date involving substantial delay. The recent technological advances in field of mobile devices, web solutions, and network connectivity have made it possible to

design and develop innovative smart phone based solutions for field data collection to replace traditional methods and enhance productivity and data management.

2. Modernized Field Data Collection:

Towards realizing the objective of modernizing the field data collection process for monitoring the activities, the smart phone based application was suitably designed and developed. The application effectively utilizes free and open source technologies and leverages the power of geo-visualization and data management capabilities of the existing Bhuvan platform

The requirements of the solution were envisaged in two parts. 1) A device based software solution to collect field data and send to central servers. 2) A server side software solution to archive received data in centralized storage system, geo-visualization of archived data, provision to review each observation by technical experts on existing Bhuvan platform.

3. Description of developed solution:

The developed software is deployed on Android OS based smart phone. The rich and user friendly Graphical User Interfaces (GUI), which facilitates observer/user to collect data with ease, predominantly reduces data entry errors, reduces data organization and data retrieving difficulties. The collected information can be sent in near real time using GPRS / WiFi facility for analysis at office at near real time. The captured photograph enables user at office to understand and analyze the ground condition in pictorial form. The facilities are provided to send collected data in near real time if internet connectivity is available in field. There is provision to send it later in case of no internet connectivity is available on field.

4. Operating Procedure

This Android App is designed for use in phones with Android 4.4 KitKat or above and with a RAM of more than 2 GB.

The following are screenshots representing the features in the mobile application and step by step working procedure to collect field data using the software.



4.1 Download the app using browser in the android mobile:

Figure 1: Open the browser and type URL to download the app.

The above screenshots in Figure 1 indicates procedure to open browser in the mobile and enter the URL for downloading the BhuvanPMJVK mobile phone application from Bhuvan Portal.

URL:

https://bhuvan-app3.nrsc.gov.in/mobile_app/bhuvan_mobile_app.php?proj_code=167

- Step 1: Indicates icon of browser to open the browser in the smart phone
- Step 2: Entering URL in the browser and click on Go button.
- Step 3: Tap top of smart phone screen and swipe down to open and visualize downloading of app.

Step 4: Once the download completes, Click on apk file to initiate installation

The above screenshots indicate procedure to install the android application in the smart phone.

- Step 1: Starts installation
- Step 2: Completes installation procedure.

Figure 2: Installation of the s/w and "BhuvanPMJVK" icon in the smart phone



Open the app and setting up user profile (One Time Activity - OTA): Note: For creating profile one should have the internet connection



Figure3: Open the "BhuvanPMJVK" app & Enter user profile and save

ofile	Profile	Profile
Name of the Facilitator	L	Mobile No
Prashant	9059200346	9059200346
Mobile No	Designation	Designation
9059200346	Engineer	Engineer
Designation	Your Department/Organisation	Select districts
Engineer	NDCO	Bagalkote
Your Department/Organisation	Select State	Gulbarga
NRSC	Karnataka	House
Email	Manipur	naven
prashant_k@nrsc.gov.in	Karnataka	Koppal
State	District	Raichur
Select State	Select districts	Select districts
District	Block/Town	Block/Town
		· · · · · · · · · · · · · · · · · · ·
Block/Town		
	SAVE	SAVE
BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO	BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO	BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO
Select State, Dist	rict, Block from the dropdown and	

Figure4: Filling the User profile – capture user details along with project

Profile	Profile
Mobile No	Mobile No
9059200346	9059200346
Designation	Designation
Engineer	Engineer
Your Department/Organisation	Your Department/Organisation
NRSC	NRSC
Email	Email
prashant_k@nrsc.gov.in	prashant_k@nrsc.gov.in
State	State
Karnataka 🗸	Karnataka 🗸
District	District
Bagalkote	Bagalkote -
Block/Town	Block/Town
Select Block/Town	Bagalkote 👻
Bagalkote	
Jamkhandi , ISRO	BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO

Figure 5: Selection of State , District & watershed name in user profile



Figure 6: Profile Screen

The above screenshots indicate steps to open the BhuvanPMJVK – Mob app, enter the user profile and save.

Step 1:	Click on BhuvanPMJVK – Mob app icon to open the smart phone app
Step 2:	Open the app with provision to enter user's profile
Step 3:	Collect the user parameters
Step 4:	Save the entered parameters
Step 5:	Landed to home page for collection of field data

Note: One should have internet connection for filling up the profile . Once the profile is filled the field data can be collected from the selected state/district/block only. For changing of state/district/block again profile information has to be filled by Clicking profile icon from Home page and click 'Edit' option for editing the profile



Figure 7: Changing of profile details

5. BhuvanPMJVK Mobile app Features and Functionalities :

Features :

- > Auto update software automatically checks for available updates
- Work in both online and offline
- > Send multiple files at a time using Sync Option
- Send Later option
- > Auto Save Option in case of failure or network connectivity
- > Viewing the uploaded data from server



Functionalities:

	The collect page has provision to a) Select watershed activity and
Field Data	sub activity, b) Enter attribute values, c) GPS (Capture location) d)
Collection	Take photographs (2 no's), e) Provision to send collected data, f)
Concetion	Provision to save / send it later (in case of unavailable internet
	connectivity)
Sync	Provision to select one or multiple files and can send to the server
	List all saved and unsent datasets for sending to the server. Using
Manage	this option, user can edit the attributes information and send to the
	server
View	View the submitted datasets to the server
Download	Download the latest assets information for geotagging
Summary	Summary of assets information for that block
Profile	View the user profile information
Logout	Logging out from the application

6. Data collection and Sending to Bhuvan Server:

When the user clicks on BhuvanPMJVK –Mob app icon the s/w opens and the process directly takes to main page, if the user has already provided user profile parameters.

After the Profile is created, it takes us to the main screen where we can select "Field Data" option. In this Page, user needs to select the Project ID

1. Selecting Sector, Project Type and id:

The process of collecting field data starts with selection of the sector, project type and id. The observer must choose appropriate project in the field.

	ect Project ID		÷	Select Projec	t ID		÷	Se	lect F	Projec	t ID				
Select Sect	or		Sele	ect Sector			Se	lect Se	ctor						_
Select Sect	or	•	Edu	ucation	Ŧ		Ed	lucatio	ı					•	
Select Proje	ect Type		Sele	ect Project Type			Se	lect Pr	oject T	ype					_
Select Proje	ect Type	•	Sele	ect Project Type	- \		KL Sc sto	ED2013 hool, Ka pried bu	0021/7 niyamt ilding -	- 9 ACI leta Bui Not Yet	Rs (9m Iding i Geota	nx6m) in the f igged	at Gov orm o	rt. Hig f thre	jh e
			Ado	ditional Class Room	s/ Laboratory Room	s	21/	7					•	Q	
			Bicy	ycles								(1m)	
			Sch	hools Buildings											
							В	huvanF ©	MJVK	: 1.0.3	, Bhւ	ıvan -	NRSC	, ISR	0
							B <	huvanF E	MJVK GIF	: 1.0.3	, Bhu	ivan -	NRSC	, ISR	0
							в < 1	huvanF ව	MJVK GIF 3 4	: 1.0.3 \$, Bhu	van - E	NRSC 8	, ISR 9	0 •
							< 1 @	huvanF 2 #	MJVK GIF 3 4 ₹ -	: 1.0.3 \$ 5 &	, Bhu 6 -	van - R 7 +	NRSC 8 () (ISR	0
							B < 1 @ =\<	huvanF 2 #	MJVK GIF 3 4 ₹ _	: 1.0.3 \$ 5 & '	, Bhu 6 -	7 +	NRSC 8 (9)	• • • •
							B < 1 @ =\< ABC	huvanF 2 : # : ,	MJVK GIF 3 4 ₹ _ 12 34	: 1.0.3 5 &	, Bhu 6 -	Jvan - 7 + ;	NRSC 8 (?) 9) ?	● ● ● ● ● ● ●
							B < 1 @ =\< ABC	huvanF 2 : # : ,	MJVK GIF 3 4 ₹ _ "	: 1.0.3 5 &	, Bhu 6 -	7 +	NRSC 8 (2 3 3 4 3 3 4 3 3 4 3 4 3 4 3 4 3 4 3 4	; ISR 9))	• • • •
	Select t	:he Sector	r Pro	ject Type	and Id's f	rom th	В < 1 @ =\< Авс	huvanF 2 : # [‡] , , ▼	MJVK GIF 3 4 ₹ _ 12 34	:1.0.3 5 & '	, Bhu 6 -	Jvan - (2) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	8 (()))	• • • • •

Figure 9: Select appropriate project type/id

The user must select watershed activity from the drop down menu. Once it is selected, the buttons below select option gets activated and additional GUI options with provision to enter appears.

- Step 1: Click on "Select Sector , Project type and id" from dropdown menu
- Once Project is selected, corresponding details will be listed. Click on
- Step 2 : "Select Status of Construction" from dropdown menu
- Step 3 : Based on the present stage of Status of Construction ,Next stages of the attributes will be appeared. Need to fill the attributes information

2. Enter Attribute values:

	10:35 PM :::: 🕏 👳	10:35 PM :== 🗇
← Field Data	← Field Data	← Field Data
High School, Kaniyambeta Building in th	ne	Project Name : additional class room at Urdi
form of three storied building	Project Unique Code : 29524/M08314/	High School Iliyas Nagar
State : KERALA	ED018/04350	Sta' '' '
District : WAYANAD	Project Name : additional class room at Urdu	Dis Mon 10 Jan
Block/Town/Village : PANAMARAM	High School Iliyas Nagar	Blo Blo
	State : Karnataka	Sec < January 2022
Not Started	District : Bagalkote	Pro
Work in Progress 1	Block/Town/Village : Bagalkote	Nui SMTWTFS
	Sector: Education	Uni 1
Work in Progress 2	ProjectType : ACR	Tot 2 3 4 5 6 7 8
Completed 1	Number of Units : 4	9 10 11 12 13 14 15
	Unit Cost: 6.95	16 17 18 19 20 21 22
Completed 2	Total Cost: 27.8	Com 23 24 25 26 27 28 29
		Cons Date 30 31
Status of Construction	Status Of Construction None \rightarrow	Proi
Not Started	Commencement Date Date	appi CANCEL OK
	Construction Completed Date Date	If No, give reason/If Yes, run by
SEND	Project operational/component approved under PMJVK is used? None \rightarrow	BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO
	, IS BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO	

Figure 10: Attribute values

User need to select - Status of construction from drop down menu

"Status of construction:""

Completed 2	Project is operational/functional	attribute values + photo +
	(photographs with the actual	location
	users)	
Completed 1	Project is completed but	attribute values + photo +
	operational (one more visit is	location
	required)	
Work in Progress 2	On completion of structure before	photo + location

	finishing	
Work in Progress 1	At plinth level of Construction	photo + location
Not started	Not started	-

If Status of activity:

a. Not started:

Will have only send option

16:33 🌣 🖻 🕨 🛞 🔛 🚟 🕯 🗖 🖉
← Field Data
Project Unique Code :29538/M08314/ ED018/04229
Project Name : Library under district library centre in MsDP Complex
State : Karnataka
District : Gulbarga
Block/Town/Village : Chittapur
Sector : Education
ProjectType : ACR
Number of Units: 1
Unit Cost : 57.21
Total Cost : 57.21
Status of Construction
Not Started -
SEND
BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO
<

b. Work in progress a or 2:

Location and photo are mandatory

16:33 🌣 🗟 🕨 🎯 🛛 🖾 🖞
← Field Data
Unit Cost : 57.21
Total Cost : 57.21
Status of Construction
Work in Progress
Pick Location Details
Photo Details:
Capture 1 Photo
BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO
<



All fields, Location and photo are mandatory

Here project approved under PMJVK :

If yes : Display "name of the agency"

If No, enter "reason"

16:33 🌣 🖻 🕨 🕲 🔢	4G 🖌 📕 🖡	16:34 🖪 🏟 🗃 🔸	
← Field Data		← Field Data	
Number of Units : 1			
Unit Cost: 57.21		Unit Cost : 57.21	
Total Cost : 57.21		Total Cost : 57.21	
Status of Construction		Status of Construction	
		Completed	-
Completed		Is Project/Component app	roved under
Is Project/Component approved un PMJVK under used?	nder	PMJVK under used?	
Vee	_	No	
165	•	Reason	
Name of the Department/Agency managing the project		Enter reason	
Enter name		Commencement Date	Date
Commencement Date	Date	Construction Completed Date	Date
Construction Completed Date	Date	Has the Project been hande to Line Ministry/Departmen	d over None \rightarrow
Has the Project been handed over to Line Ministry/Department None \rightarrow		No.of ACR sanctioned for th	ne school/
BhuvanDM IV/K · 1.3 Bhuvan - ND		college under PMJVK	an - NRSC ISRO
BildvariPNJVK . 1.3 , Bildvari - NK	30, 13K0-	Dhuvari Pivi J v K. T.S, Diluv	

3. Capture location information:

	Location captured can be updated by click on "Pick Location"	GPS (Capture Location)	Wait till GPS Accuracy info appears and its value reaches 10 meters or below
10:37 PM 📲 😤 🗐		12:17 AM ::::!! 4G 20	12:11 AM 📰 🋜 💷
÷	Field Data	← Field Data	← Field Data
Whe Coll	Whether Girls/Boys School/ Girls School \rightarrow College	Cide Enrollment in School/College	Capacity(No.of students in each class)
Capacity(No.of students in each class)	250	35	
Boy:	ys Enrollment in School/College	Total MinorityStudents in school/college	Boys Enrollment in School/College
Girls	s Enrollment in School/College	Pick Location Details	⁴ Alert Your accuracy is greater than 10m. Current Accuracy is : 47.168
Total 100	I MinorityStudents in school/college	Latitude: 17.35615 Longitude: 78.42031 Accuracy: 6.432 Timestamp: 01/11/22 00:16:05	- ок 100
Pic	Pick Location Details	See Location from Map	Pick Location Details
L		Photo Details:	Photo Details:
B	huvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO	BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO	BhuvanPMJVK : 1.3 , Bhuvan - NRSC, ISRO

Figure 11: Capturing location information

The user must switch on the GPS / Location on his mobile and for this go to Setting >> Location and security >> Enable use GPS satellite and choose location accurate to street level / High accuracy.

To capture the location, the user must go to the centre of the structure / feature under the open sky. If the mobile has GPRS / 3G connectivity, initial tracking of GPS will be fast. The accuracy of the position slowly improves with the time. The user must be **10 meters** or below and click "Pick Location Details" to collect the location details. If the Captured Location is greater than 10 meters, an alert message will be appear.

4. Map interface on the App:

A map interface is a new feature introduced in this version of the App. On selecting the map button a window opens on the mobile which dynamically shows the current location of the user, as a marker. As the user moves from one location to other, there is also a current location refresh enabled .In case there is no data connection on the mobile, alert message will be appear. A user can use this option if data connection is enabled for accurate location information in field.



5. Take photographs:

Click "Capture Photo" button in the application uses native camera application of the android mobile. This enables user to capture photograph and save. Along with photographs, it also captures latitude, Longitude, accuracy, orientation and time stamp.. A preview of captured photo will be displayed after captured the photo



Figure 12: Take photo using mobile native camera

Note: Taking two photographs is mandatory for each geotag / asset. If at any point only one photograph is taken the system will prompt at the time of sending or saving the geo tag where the second photograph has to be taken.

The user can also reduce the resolution to the lowest possible for optimizing the data transfer load from mobile to Bhuvan server.

6. Provision to send/save collected data:

The send feature of the BhuvanPMJVK app enables user to send collected data to Bhuvan server. This send requires internet/ data connectivity in the field through GPRS /3G/ WiFi. The sent data consist of information depicted and users profile information is also tagged such as user id, observer name, phone number and organization. An alert is displayed once the data is received at Bhuvan server.



Figure 13: Collected data initialized to send to Bhuvan server. Alert message received after data reaching the server

However users can use "Save" the observation details for sending the information later to the server. This data can be sent later to the Bhuvan server as some other details also may be added in the office and then after checking the correctness of the data entered. Thus there is a further chance to edit/ modify the data before sending.

7. Provision to save observation (send later):



Fig 14: Save – option

The "Save" feature of the BhuvanPMJVK app allows user to store collected data in send later location of the mobile. This feature is generally used when mobile data/ internet connectivity is not available in the field. The collected data can be sent when mobile data/ internet connectivity is available in the mobile.



8. Provision to access datasets:

Fig 15: Manage – Edit – option

The datasets feature "Manage" button of the software allows user to access all saved and unsent data. Once user click "Manage" option, saved and unsent data will be listed. Once the datasets is selected, captured information will be displayed. User can edit the attributes information except activity and sub activity. Default location and photo cannot be edited under manage section. So, user can edit the details and send to the server immediately or can use "Save" option for save it. Important feature here is that the user has facility to edit or modify the observed attribute values before sending. The observation also can be deleted, if it is not required in the mobile.



Fig 16 : Edit – Preview option - selected dataset to Edit, Send and Delete

9. Provision to Send All using Sync option :



Fig 17 : Sync – option

If the user wants to send all collected saved/unsent data immediately to Bhuvan server, can use "Sync" Option. Using this option, user can send one or multiple times at a time to server.

10. Viewing the geo-tagged points on Bhuvan Server

The View option of sent datasets enable user to visualize the attribute value of the observation with photographs taken. This is an un-editable feature since the observation is already sent to Bhuvan server

Figure 18: View sent datasets

7. Conclusion

Overall deliberation of this manual is focused on ANDROID Mobile based tools for field truthing protocol. Mobile Smartphone application brings out the importance of precise field data collection for watershed monitoring. Software tools are specially developed to address this aspect as part of monitoring under the project.

Information collection when beamed to central server turns in to a value added service and builds a comprehensive database for evaluation. Satellite image based change detection, coupled with field information helps to evaluate the progress on the ground. Integration of 3 streams of information, namely, Satellite imaging, Mobile smartphone based field information and Geospatial technology would help in unbiased and reliable monitoring of watersheds across the country on a continuous and consistent basis.

Android tool hence enables a comprehensive field truthing of the micro-watershed activities. It can expedite vast field information collection and real time updating on the web portal. This would help decision makers to assess the condition of implementation at the earliest.

FREQUENTLY ASKED QUESTIONS (FAQ'S)

1) From where can I install the mobile application?

Ans: URL - <u>https://bhuvan-</u> app3.nrsc.gov.in/mobile_app/bhuvan_mobile_app.php?proj_code=167

2) Is the BhuvanPMJVK Mobile application available in Google Play store?

Ans: No.

3) Is the mobile App is available for Apple and Windows devices?

Ans: No, the application is currently only available for Android platform.

4) What is the minimum specification required for Android device?

Ans: Android 5 or above, 2GB RAM or above, 8GB local storage or above, GPS sensor with A-GPS facility, 2G/3G/4G and WiFi facility.

5) What to do if there is insufficient storage in my mobile?

Ans: Either change the mobile to one with larger local storage or create space in the local storage by removing other applications.

6) What should I do if I need to change my mobile?

Ans: You need to register again using new mobile.

7) What to do if my mobile get stolen / lost?

Ans: Install mobile App in the new mobile and register again.

8) Can I use the mobile application without 3G?

Ans: Yes, you can use 2G or 4G or WiFi with internet facility.

9) Can the mobile application work without 2G/ 3G/ 4G?

Ans: Yes, Internet is not required to geo-tag an asset but it required to send the captured geotag data. You can connect broadband service at office or home through

WiFi facility and send data.

10. Where do I view the collected asset information and geotags?

Ans: In mobile application – user can click "View "Option to see the submitted data to server . In web - The Asset geotags will be visible on the BhuvanPMJVK portal. RO's can login with the bhuvan username and password and view the Assets geotags in the respective State while the DDM's can login with the bhuvan username and password and view the Asset geotags in the respective District. Any citizen also can view the moderated geotags at National, State and District level.

11. How many pictures can I take for one asset?

Ans: Two pictures are to be mandatorily taken for each asset. No more than two pictures can be uploaded for one asset.

12. What is the GPS Accuracy required?

Ans: Switch on 'High accuracy' mode. The GPS accuracy recommended is less than 10m and most of the new generation mobiles support even less than 5m.

To get the best possible signal, one needs to be prepared to use a bit more battery than normal. It's a necessary sacrifice, and you can always reverse it later when you don't need to use GPS. Enabling this is easy; just follow a couple of steps and you'll be on your way.

Go into android Settings and tap Location and ensure that location services are on. One should be able to toggle it at the top right hand of your screen. It should be green and the button to the right.

Now the first category under Location should be Mode, tap that and make sure it's set to High accuracy. This uses your GPS as well as your Wi-Fi and mobile networks to estimate your location. This will use more battery, but will utilize all available methods to give you the most accurate location possible.

Keep the GPS signal active.

One of the main problems that is encountered when going from one App to another is that the GPS is turned off to save battery. If for example you are navigating and want to take a look at your latest messages, your GPS could be turned off. However it is suggested to keep the GPS signal active.

Refresh your GPS Data.

Sometimes a device will get 'stuck' on certain GPS satellites, even if they're not within range, causing it not to work properly. User may exit the App and open the application again.

If the above doesn't work, probably, one should try with another GPS Android Phone.

13. How far can I move to take the picture after locking the GPS?

Ans: You can move to an extent of covering full asset in the camera. The first photo should represent extent of the work or asset and Second photo should represent intensity of work or show the beneficiary incase of activity is involving an individual beneficiary.

14. What are the multiple ways in which an asset can be geotagged and uploaded?

Ans: The user has to use features provided in the mobile App only to geo-tag an asset.

15. Can I use two mobiles for geo-tagging at the same time?

Ans: Yes, you can do it. But ensure you are not geotagging the same asset with both mobiles.

16. What to do if I get the alert 'Location not enabled'?

Ans: User need to ensure that location in Android setting is switched on, remove the mobile App if it is running in background and restart the mobile App.

17. What happens if there is a communication failure while uploading the data?

An: The mobile App shows the message 'Geotagged information has been uploaded successfully' only after receiving response from Bhuvan Server. If there is any communication failure, the data gets automatically organized in 'Sync/Manage' option and the user can upload it again.

18. Can I change the details of asset from mobile application?

Ans: Yes, Some fields on the mobile App may be edited/ modified when the asset geotags are saved and viewed under the "send later" option.

19.I am facing a few issues with the mobile App. With whom can I raise my doubts?

Ans: Any user may contact their respective higher officials who in turn may report/ send such issues to the Project Team at NRSC.

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