

# GITHUB INTEGRATION AND CODE REPOSITORIES

## WHO WE ARE

Systems and Proposal Engineering Company, dba SPEC Innovations was founded in 1993. The company has worked on significant architecture and systems engineering projects for the DoD, DOE, and other government and commercial organizations. Learn more at www.specinnovations.com.

We began the development of Innoslate in 2010 when we found it challenging to do the work we needed to do with the limited tools available at the time. Innoslate was first released in 2012 on the cloud and is currently in version 4.7 as a full lifecycle tool, with integrated Systems Engineering and Program Management capabilities. It uses the open standard, Lifecycle Modeling Language (LML), as its open ontology.

Innoslate currently supports users around the world and is also available on NIPRNET, SIPRNET, and C2S, as well as behind your own firewalls. You can learn more about Innoslate by going to our website, www.innoslate.com.



## INTRODUCTION

This guide explains how to use GitHub with Innoslate to modify and store live code repositories by following code created and used in a lunar rover prototype. GitHub is a web-based platform that allows developers to host, manage, and collaborate on software development projects using version control, issue tracking, and other features. Below discusses each feature of the GitHub interface and how it was used to interact with the code repositories for the lunar rover prototype.

## USE GITHUB INTEGRATED IN INNOSLATE

The GitHub integration in Innoslate provides an interface to exchange information between various users in an Innoslate project. Three actions can be performed to conduct the exchange of information between the two tools. These actions are Issues, Commits, and Pull Requests.

Issues are used to track work in GitHub. They can help the user organize and prioritize work that needs to be done within the current project. Issues can be differentiated using labels, assignees, and milestone relationships.

Commits are the history of a repository throughout development during the project. Commits tell a story through the progression of each repository in a project. Commits can be differentiated using assignees and timestamps. Once a repository has been branched or forked, Pull Requests can be used to update and track its development in a project. The Pull Request is the final touch to tracing any Commits to their related Issues.

## LOGIN TO GITHUB VIEW

A GitHub account along with a specialized token is required at login to access the GitHub View integrated with Innoslate.



GitHub View Login

When the unique token is used to access the GitHub View, any repositories and files attached to that token are opened and listed in the GitHub View dashboard. The figure below is a screenshot of the GitHub View maintained for the Lunar Rover Project.

Repository Dashboard		Bign Col
Innosibilities Private Description Stars: 0 Language JavaScript License: NONE Lant Updated: 5 days ago	ennostate Spectry fromware Description Stars: 0 Language: C++ Letense: NONE Lant Updated: 2 days ago	Private
Specifyligeider-Remaine Private Description Stars: 0 Language: C++ License: NONE Last Updated: 12 days ago	specrytest Oescripton Stars: 0 Language: License: NONE Last Updated: 12 days ago	

#### GitHub Dashboard

There are four code repositories listed for the GitHub View in the Lunar Rover Project. Key features such as programming language, license, and date the repository was last updated are listed for each repository in the GitHub Dashboard.

## VIEW THE REPOSITORY DASHBOARD

Each repository also has its own dashboard to display recent activity and a list of the information exchanged between GitHub and Innoslate. The figure below is a screenshot of the SPECTER Firmware repository in the Lunar Rover Project.

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<u>e</u>	Overview	A - Annalder - Apertechterand -		0 0 0 0 0 0 3000
ation bound	Active Pull Requests	Adventures	Recent Open Issues	
Inum Nat Keganda Control I Control Activity	Town Pol-Mason		All parameters for Lotar and an and a second a second and a second and a second a	
	Committe par Mont			
	Nei estatel watelo activity			
	Record Connells			
	Ner Health committe			

Repository Dashboard

The Innoslate Repository dashboard has widgets to display the following information:

- Number of active Pull Requests
- Number of active Issues
- Recently opened Issues
- Rate of Commits made per week
- Recent Commits

### VIEW THE REPOSITORY DASHBOARD

GitHub Issues can be created in each Innoslate repository by navigating to the 'Issues' tab on the left side panel. When creating a GitHub Issue the following metadata is encouraged to differentiate the Issues: name, description, assignee, and labels. The figure below is a screenshot of the Issue Creation prompt.

eate New Issue		×
Title Type description comment here	Labers No tabers Assigners	8
	No assignees	

#### GitHub Issues Metadata

Once created, the GitHub Issue is stored in Innoslate and cloned to GitHub.

## **CREATE GITHUB COMMITS**

Each GitHub Commit in Innoslate is a clone of the Commit found in GitHub. Commits can be easily understood as edits made within a file or code in the repository. Metadata that can be added to the Issue in Innoslate includes a description and assignee. Use this information to track the progress made in the repository. Below is a list of the Commits made to the SPECTER User Interface repository.

SPEC Instructions ( NEW Lunie Reserve Dealer 7, Delse 2 Instructive ( spectra in )	Sign Cull
Commits	
Commits	
Added UI for second LIDAR sensor specing converted 3 days ago	771455
Improved HTML formating ysuenestella committed 6 days ago	titivo
Fixed typo in distance ID yourvestella committed 6 days ago	the*fe
Update README ind yourmadete connetted 6 days ago	248175
Subscribed to LIDAR topics poventield committed ti days ago	43445
Changed logs to SPEC. promotedelia committed 10 des age	476824
Added UI for temperature and distance yournabela committed 16 days ago	507
Cleaned up WSL files yournessbella committed 10 days ago	70%72
Added base files yourinsbets committed 10 days ago	cThatr
Initial commit younadadeta committed 10 days ago	701etb

GitHub Commits Metadata

## CREATE GITHUB PULL REQUESTS

GitHub Pull Requests are the final submission of an Issue. Each Pull Request is also a clone from GitHub. Innoslate notifies the user of each Pull Request to allow them to check the GitHub platform for the changes to be approved. Within GitHub, the user can view all the Commits and Issues related to the Pull Request.

If more information is required for the Pull Request, then comments can be added directly in Innoslate. Comments can be used to clarify any confusion in the Pull Request for provided feedback for the assignee or reviewer.

dit parameters for Lidar #5		3
specmj commented 2 days ago	Reviewers	۲
No description provided.	Labels	۲
Comment	Assignees	۲
Type comment here	ii younessbella	9
	Connert	
	Conserved.	1000
		Close

#### GitHub Pull Requests Metadata

## USE GITHUB REPOSITORIES

The two LEO Rover GitHub repositories for developing the prototype's firmware and user interface were cloned by the SPEC team to be modified for this Lunar Rover Project. The LEO Rover's firmware sends messages to components in the prototype using the connection between the processor and the component that performs the specified function. The user interface is used by operators to view and create commands for controlling the rover's actions and receiving diagnostics from the prototype's hardware.

These two cloned repositories for the rover prototype are stored in Innoslate's GitHub View, and they hold all the code to develop SPECTER's firmware and user interface. LEO Rover's default settings were kept for the firmware and user interface.

## MODIFY THE FIRMWARE REPOSITORY

To gather data using SPECTER's lidar, modifications were made to the firmware for recording the distance obstacles from the rover body as well as ambient temperatures. This information is used to provide data and diagnostics of the rover's surrounding area. The following sections step through creating Issues and submitting changes to develop an interface for streaming the above metrics directly to the rover operator.

## ASSIGN THE LIDAR TO THE PROCESSING PORT

First, an Issue was created to alert SPEC's software team of the new feature to be added to the user interface: including the lidar sensor in SPECTER's robot operating system (ROS). The figure below is a screenshot of this Issue.

dar Connection with Robotic Operation System (ROS) #6		>
specmj commented 8 minutes ago	Labels	۲
The Lidar sensor is new external component that will need to be linked to the rover's processing system.	Assignees	٥
Comment	ii younessbella	
Type comment here		
Comment		
		Close

Lidar – ROS GitHub Issue

Once the Issue was published and cloned to the GitHub platform, it was assigned a SPEC software team member for the feature creation. Edits to the code were made in GitHub and submitted as Commits. These Commits exchanged the information from GitHub to Innoslate for publishing.

Commits	
LIDAR Firmware ID identify by the Responsy Pr Processor specing converted to initiates ago	39798

#### Lidar – ROS GitHub Commit

Once the Commit was made to allow SPECTER to communicate and send messages via the firmware, a reviewer from the SPEC software team examined the code written to verify it was ready for publishing. After reviewing the Commit, it was decided the code needed continuing edits and would not be published yet. The figure below displays the reviewer's comment made to disapprove of the Commit.

specmj commented 27 minutes ago	Labels	6
The Lidar sensor is new external component that will need to be linked to the rover's processing system.	Assignees	6
The message outputs too much data and will need to be parsed with better output times. <b>specmj</b> commented a few seconds ago		
omment		
Type comment here		
Com	ment	

Lidar – ROS GitHub Commit Reviewer Feedback

The original writer reviewed the reviewer's comments and continued editing the code to meet SPEC Innovation's software standards. These edits were also submitted as Commits. The figure below highlights the changes made.



#### Lidar – ROS GitHub Commits

Once the code updates were complete, the reviewer read the new Commits and determined the code to be ready for publishing. The Commits were then submitted as a Pull Request, and the Issue was closed. The figure below is the final comment resolving the Issue.

specmj commented 29 minutes ago	Reviewers	\$
LIDAR FRAME ID has been added to Processor	Labels	0
Comment	and document.	٩
Type comment here	Assignees	0
	Comment	

Lidar – ROS GitHub Pull Request

#### TRANSMIT TEMPERATURE DATA

An Issue was also created for developing an ambient temperature recording to be outputted from the Lidar sensor and displayed in the user interface. The figure below shows this GitHub Issue.

ansmit Temperature Data 🕫		×
specmj commented 3 minutes ago	Labels inflatcoment	0
One of messages that will need to parse and viewed will be temperature data from the lidar sensor.	Assignees	0
(Type comment bere		
	offurnerst .	
		Close

Lidar – Temperature GitHub Issue

Once the Issue was published and cloned to the GitHub platform, it was assigned to a SPEC software team member to be addressed. Any edits to the code were made on the GitHub platform and submitted as Commits to be exchanged with Innoslate. After the Commits were reviewed and approved, the edits were summited as a Pull Request, and the Issue was closed.

Temperature Message will be transmitted to Processor #9		×
specmj commented a few seconds ago	Reviewe	
The temperature data was parsed to be viewed and evaluated for later use.	Labels	() nent
Comment Type comment here	Assignees i younessbella	
	Comment	
		Close

Lidar – Temperature GitHub Pull Request

## **TRANSMIT DISTANCE DATA**

A final Issue was created for developing an output of distance data from the Lidar sensor to create an obstacle avoidance warning on the user interface. The figure below is a screenshot of the Issue created for this feature.

ansmit Distance of Upcoming Obstacles Data #10		3
specmj commented a few seconds ago	Labels enhancement, http://wanted	\$
A message that will need to be parsed and viewed will be distance parameters of an upcoming obstacle.	Assignees	0
Comment	i younessbella	
Type comment here		
Comment		
		Close

#### Lidar – Distance GitHub Issue

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The same processes as mentioned with the other two issues were followed. However, the reviewer noticed the units used for distance parameters were incorrect and needed to be converted to meters. The figure below displays this comment made by the reviewer.

specmj commented 15 minutes ago	Labels enterconnect [actionscore]	\$
A message that will need to be parsed and viewed will be distance parameters of an upcoming obstacle.	Assignees	0
Need to convert the distance parameter units into meters. specmj commented a few seconds ago		
Comment		
Type comment here		
Co	orment	

Lidar – Distance GitHub Commit Reviewer Feedback

Once the SPEC software team member made the edits and pushed the Commit, the Pull Request was submitted, and the Issue was closed.

stance Message of Upcoming Obstacles (in meters) #11		×
specmj commented a few seconds ago	Reviewers No reviewers	\$
The lidar sensor will display a message of the distance of an upcoming obstacle in meters.	Labels No labels	8
Comment Type comment here	Assignees No assignees	\$
Comment		
		Close

Lidar – Distance GitHub Pull Request

## MODIFY THE USER INTERFACE REPOSITORY

SPECTER's user interface allows the operator to view messages received from the prototype's processor. These messages and interface features include:

- Ambient temperature recording
- Distance to obstacles from the rover body's front and rear display
- Warning signal if a certain distance is reached to an obstacle
- The user interface features provide diagnostic feedback to alert the operator of the rover's surrounding environment.

## **DISPLAY LIDAR DATA**

An Issue was created to develop a display for the Lidar messages on the SPECTER's UI.

ublishing Lidar Messages #1		
specmj commented 10 days ago	Labels entercement, belowership	•
The Lidar will not send messages to be displayed on the LEO's UI	Assignees	۲
Comment	👖 younessbella	
Type comment here		
	-	
Co	nment	
		Clos

UI – Lidar GitHub Issue

Once the Issue was published and cloned to the GitHub platform, it was assigned to a SPEC software team member to be addressed. Edits to the code were made in GitHub and then submitted as Commits to be published on Innoslate. The figure below displays a list of the Commits made in GitHub to create lidar message displays on the user interface.

Commits	
Commits	
Added UI for second LIDAR sensor secon convisted 7 days ago	275488
Improved HTML formatting yournastbetta committed 8 days age	Biles
Fixed type in distance ID younespetia committed 8 days ago	hatha
Update README ind pouresabels committed 10-days ago	2481%
Subscribed to LIDAR topics youressbela committed 11 days ago	dan6
Okanged logo to SPEC yourestatela conventied 11 days age	47628
Added UI for temperature and distance younesated oursmand 11 days ago	Toeth.
Cleared up WSL Bes younesdets convisted 12 days app	799c73
Added Sasie files younesbella converties 12 days ago	cthat
Inibial commit youresstella committed 12 days ago	700400

#### UI – Lidar GitHub Commits

Another SPEC software team member reviewed the Commits and decided the Lidar information needed to be parsed into two categories: Distance of Upcoming Obstacles and Ambient Temperature. The reviewer also recommended adding SPEC's logo to the user interface. The figures below display the comments made by the reviewer on the Commits.

specmj commented 10 days ago		Labels enhancement (any source)	6
The Lidar will not send messages to be displayed on the LEO's UI		Assignees	6
Could the messages be parsed and categorized into temperature & distance. specmj commented a few seconds ago			
Comment			
Type comment here			
	Comment		

#### UI – Lidar GitHub Commit Reviewer Feedback

specmj commented 10 days ago		Labels	
The Lidar will not send messages to be displayed on the LEO's UI		Assignees	6
Could the messages be parsed and categorized into temperature & distance. specmij commented 29 minutes ago			
Add the Innostate Logo to the UI Dashboard. specmj commented a few seconds ago			
Jonmers			
Type comment here			
	Comment		
			_

UI – Lidar GitHub Commit Reviewer Feedback

Once the code was updated and the changes were approved by the reviewer, the Commits were submitted as a Pull Request, and the Issue was closed.

User Interface (UI) Dashboard Modification #4		×
specmj commented a few seconds ago	Reviewers	۲
The UI dashboard will display the lidar information (temperature & distance) and the SPEC logo was added to dashboard.	Labels	0
Comment	enhancement	<u>_</u>
Type comment here	Assignees	۲
Comment		
		Close

UI – Lidar GitHub Pull Request

#### DISPLAY OBSTACLE WARNING MESSAGES

Lastly, an Issue was also created to develop a warning alert display on the rover's UI for when SPECTER's body approaches an obstacle too closely. The figure below displays this Issue.

specmy commented 8 days ago	Labels	
Create a warning signal to alert the user if a certain distance and amplitude constraint is met.	Assignees	6
Comment	III Jourdancest	
Type comment here		
	1	
	Comment	
		~

#### UI – Warning GitHub Issue

Once the Issue was published and cloned to the GitHub platform, it was assigned to a SPEC software team member to be addressed. Any edits to the code were made in GitHub and then submitted as a Commits to be published on Innoslate. The figure below displays a list of the Commits made in GitHub to create warning message displays on the user interface.

Commits		
Commits		
Warning Alert for Obstacles. specing committed a flew seconds age	8403	
Added UII for second LIBAR sensor second committed 6 days ago	77 tudi	
Improved HTML formating younesdels committed to biss ago	m/res	
Foxed type in distance ID yourersbeta committed 5 daws ago	attaat	
Update README.md younespela.commted 11 days ago	248175	
Subscribed to LIDAR topics youriestietis connitted 12 days age	Casti	

#### UI – Warning GitHub Commits

Once the code was updated and the changes approved by the reviewer, the Commits were submitted as a Pull Request, and the Issue was closed.

Add Warning Signal to Rover UI #5		×
specmj commented a few seconds ago	Reviewers	8
Warning Signal will display on the UI dashboard when obstacles are near.	Labels	۲
Comment	enhancement	
Type comment here	Assignees	۹
	Clotherent	
		Close