

0:0:0.0 --> 0:0:2.280

Sprague, John D (HQ-JD010)

Alright, well, let's get started here.

0:0:5.330 --> 0:0:36.140

Sprague, John D (HQ-JD010)

Me start us off. So good morning and West Coast. Good afternoon. East Coast, and welcome to the 4th Talk in the AM NCA TI series. This ones about grafana. My name is John Sprague. I've been on a detail for over 2 years from O CIO on this amazing program and project and most recently I've I've been the acting data services team lead and previously I was data control officer on this project. I've been announced that since 2009.

0:0:36.320 --> 0:0:49.890

Sprague, John D (HQ-JD010)

And previously I was the deputy Chief Officer Data officer at a Nat NASA. Al Capps is the a MNC program lead. He commissioned these series. I'd like to say thanks again. How are you on?

0:0:52.150 --> 0:0:52.660

Sprague, John D (HQ-JD010)

All right.

0:0:53.210 --> 0:0:59.330

Sprague, John D (HQ-JD010)

Uh, Michelle. Echo is also one of the architects helping put this together. Michelle, anything to say?

0:1:0.480 --> 0:1:2.330

Eshow, Michelle M (ARC-AFS)[SimLabs III Contract Management & Technical Services]

No, thanks, John. Great job on this one.

0:1:3.30 --> 0:1:3.960

Sprague, John D (HQ-JD010)

Yep. Thank you.

0:1:5.280 --> 0:1:19.430

Sprague, John D (HQ-JD010)

So first, I'd just like to say something real quick. My detail boss is on Divya Baldoria and she is the airspace testing and integration lead at AMC, Advanced Air Mobility National Campaign.

0:1:20.810 --> 0:1:35.570

Sprague, John D (HQ-JD010)

She was also an aerospace researcher in the airspace high Density Operations branch at the Aviation Systems Division at NASA Ames Research Center, and if for any of the folks that are not NASA that are on, that's.

0:1:36.300 --> 0:1:40.170

Sprague, John D (HQ-JD010)

Conveniently collate located right up Silicon Valley.

0:1:41.580 --> 0:1:43.350

Sprague, John D (HQ-JD010)

So I'll give you anything to say.

0:1:44.520 --> 0:1:50.940

Bhadoria, Divya (ARC-AFH)

No, thanks, John. Thanks for organizing this next talk in our series. And thanks to Michelle for doing this talk.

0:1:52.320 --> 0:1:53.230

Sprague, John D (HQ-JD010)

Awesome. Thank you.

0:1:54.0 --> 0:1:59.550

Sprague, John D (HQ-JD010)

And now a little bit about our main speaker, Michaela sensate. And.

0:2:0.430 --> 0:2:30.960

Sprague, John D (HQ-JD010)

He is the senior research associate for San Jose State University Research Foundation. He is an aerospace engineer. He enjoys using his coding skills to contribute to the research advance of national campaign for us. He graduated from Polytech University in Turin, Italy in 2010 with a Masters in aerospace engineering. He got a doctorate in systems engineering in 2014 with a focus on design and optimization of space.

0:2:31.30 --> 0:2:52.310

Sprague, John D (HQ-JD010)

This comes he joined the universities Space Research Association USRA post DOC program in 2017 and he started working at Aerospace OPS Lab, which is we call it AOL, on the US traffic management project. UTM, collaborating on real time data visualization and post processing. So thank you so much.

0:2:57.480 --> 0:2:57.850

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Yep.

0:2:53.620 --> 0:2:58.970

Sprague, John D (HQ-JD010)

Michael and I'm gonna, if you'll do the next slide, I'll just knock out a little bit about that.

0:3:1.220 --> 0:3:8.800

Sprague, John D (HQ-JD010)

So as we're starting this talks there, I put in the chat, the website that you can go see the other three.

0:3:10.320 --> 0:3:37.670

Sprague, John D (HQ-JD010)

Series of these talks that we've done on some other very interesting technologies that we use on this program and so please pull that website up, this presentation will be on there when we're done, probably a couple days later. I've already gotten this approved by the strives folks, the the 1676 process and NASA. So it's it's publicly available as soon as we're done with the presentation and posting the recording.

0:3:39.100 --> 0:4:8.950

Sprague, John D (HQ-JD010)

And so just a little bit about the tech talks, we want to engage with the community on types of technologies we're using developing. There are many more planned like the Aerograph user interface and and then there's several others you can see on the site. But we are always looking for more. So if there's another technology we're using for the this program, you know the flying

cars and quadcopter delivery, I was call it. Please let us know shoot an e-mail to me or or text or anything.

0:4:9.130 --> 0:4:11.90

Sprague, John D (HQ-JD010)

So some ground rules for the talk.

0:4:12.750 --> 0:4:41.40

Sprague, John D (HQ-JD010)

As you can see, the answers to the questions maybe in an upcoming slide. So if it can wait, it's OK to wait. But if it's important, go ahead and bring it up and you know we'll we'll try to answer right then we will have some time at the end. These normally go 30 minutes, 45 and then we stop it in an hour. Please mute your mic unless you need to talk. Please keep. I'll keep any parking lot issues in a little piece of paper.

0:4:41.180 --> 0:4:57.450

Sprague, John D (HQ-JD010)

For something that might take a lot of time, I'll, I'll just say, hey, let's talk about this at the end and I'll have it in a parking lot for us. Remember, it's being recorded for NASA and its partners and really for anybody, and posting it online afterwards.

0:4:58.910 --> 0:5:1.800

Sprague, John D (HQ-JD010)

And now, Michelle, will you kick us off?

0:5:2.360 --> 0:5:33.10

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

OK. Thanks a lot for the little introduction. So hi everyone. So this is just like a going to be a little bit overview of what is grafana and it's about one of the tool we use in our lab for visualizing data and monitoring data collection. So I will start basically I will focus on the first part of what is grafana and we will talk about a little bit about past experience and then.

0:5:33.110 --> 0:6:3.800

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Future also like kind of use cases and we will also talk about why we use grafana and how we integrate grafana with our system in the second part of the presentation, we will focus more on the architecture. So how we integrate the final inside our system and give you more details about how grafana beclean layer has being integrated in what we developed for the front end layer of.

0:6:3.900 --> 0:6:4.250

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Cortana.

0:6:5.670 --> 0:6:14.770

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So starting with like a little bit of presentation about what is grafana. So I want to just like point out that it's like.

0:6:14.840 --> 0:6:24.320

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Yeah, just like an open source platform. It's a multi platform application web application that they provide already like some sort of.

0:6:25.110 --> 0:6:39.880

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Tools that can be there in customized and then can be built for building interactive visualization dashboard. In particular, it can provide the charts, graph and also like notification system.

0:6:40.260 --> 0:6:52.930

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, all related to data source or data available from from a specific data source. In this case I just like provide a couple of examples of how the interface looks like on the front end side.

0:6:54.770 --> 0:7:24.640

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, we were like at the beginning. Uh, when I start to work at AOL Lab, we were like, looking for something easy to use and something that can be that was helpful for navigating data and in particular, at the beginning it was like more about the browsing data that we collect during the flight test and visualize this data through an easy to use interface. So after a little bit of investigation, we found very helpful kind of interface.

0:7:24.740 --> 0:7:27.490

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

This platform, called Grafana and so we start to.

0:7:28.710 --> 0:7:38.480

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Interact to investigate how can be customized or what is like the potential of these of these of these environment and so and so we start first.

0:7:39.240 --> 0:8:8.780

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh to use it for mostly data, data monitoring and real time visualization, so we extend them the browsing of data from data collecting the past days. Also to visualize data for real time flowing. So we start to use grafana not only then for past collected for that data collecting the past few days but also like for real time feed. We were real time pipeline.

0:8:9.470 --> 0:8:39.920

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And in particular, we start to use it during a UTM project, so who doesn't know UTM is stands for UPS traffic management and it's like one of the first project where we start to use in our lab grafana and it's the first project where we start to customize and then start to collect a little bit of feedback from the end user to understand what is like the specific needs or what are the main feature that could be added to the interface to make like the data collection process.

0:8:40.0 --> 0:9:0.0

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Because smoother and a little bit more like helpful for the data collection process and one of the main things of grafana is that it's capability to be build custom dashboards. So the possibility for the end user also to create or prototype the interface.

0:9:0.750 --> 0:9:21.420

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

From the front end side and everything is like can be used to feed any kind of like also device that support our web browser. Basically in our lab we use grafana mostly for the video world.

One of the video world we have in our room and then also like some of the lab TV monitors we have all around.

0:9:22.220 --> 0:9:33.930

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, the lab. But this is like for example, there are a couple of pictures where some of our like screen has been fed with the dashboard provided by grafana.

0:9:35.10 --> 0:10:4.70

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

We also start to use it on national campaign for like a real time feed and for providing real time feedback on the data that have been that was going to be collected during the flight test. And so to verify the consistency of the data collected and how for example, they involved that partners were providing data to us and at the same time so monitoring like the.

0:10:4.340 --> 0:10:30.720

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The persistence of data in some sort and also like, uh, visualizing it like the quality of the data that I've been collected during the during the process, in particular in our case, we work on the bridging on building, like on developing the bridge between the data source, the data source available from the back end from different kind of data source and also customizing the front end layer with custom dashboards like 2D maps or 3D maps.

0:10:31.330 --> 0:10:46.320

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh graphene is being used, so we've different kind of end user, mostly like researchers in the lab, but also through the interface from also another partners and in one of the last project has been used also for atomics.

0:10:47.110 --> 0:11:16.760

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, which is like a a young subgroup sub project and who doesn't know HTML X is just like stand for eight traffic management exploration and it's one of the projects where we were like being able to use graphene in addition to other visualization tool just to have another option to navigate the data during the flight test. And the main also idea is also to envision like the use of grafana and the plugin that we've developed for GRAFANA also on the next.

0:11:17.420 --> 0:11:20.130

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Future project on which our lab is going to be involved.

0:11:21.300 --> 0:11:42.30

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And afana, uh, going into more details into grafana. Uh basically Grafana is an open source framework and it's based on expandable plugin system where you have like 2 kind of main classes of plugins. One of these plugins is called built. I mean it's a built-in plugins that are.

0:11:43.50 --> 0:11:46.620

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Mostly like official release from the Grafana.

0:11:47.330 --> 0:12:20.180

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh service. They're gonna interface, and it's basically a lot of different kind of it's a set of different plugins that already provide connection for the mostly use database and relational database and non relational database. And in addition to that the user had the possibility to develop its own custom plugins for specific needs. So for example in our case we focus more on the development of 2D maps and 3D maps. So just because it was like some of the.

0:12:20.290 --> 0:12:27.650

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Main feature that we were looking for during the flight test and it was something that was not provided by the official readings Organa.

0:12:28.430 --> 0:12:35.980

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, one of the main thing of this of this application, this interface it is modularity and flexibility so.

0:12:36.50 --> 0:13:5.850

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So each panel each plugin can be reused to create an object inside the dashboard. So you can use these panels to build your own layout for a specific dashboard and in this way you can customize the dashboard and then you can for example reshape the dashboard or change the size of each panel inside each dashboard. We will see more details about that in the next slides and in particular.

0:13:6.430 --> 0:13:15.10

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

We're gonna find a sweet licensed under Apache License version two and uh, it can be basically using two different versions. So you can ask the.

0:13:16.610 --> 0:13:24.40

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

An application on your on your own systems, or ask for or like, look for an account outside.

0:13:25.220 --> 0:13:40.250

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The network itself, in our case we are we decide to go with the our own instantiation of graph file in this way is more easy to have control on the access on the application itself and the you give us more flexibility on our implementation.

0:13:40.970 --> 0:14:10.610

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, on the implementation side, GRAFANA is built on top of the main 2 languages 2 the languages and the main core application is built with GO, and it's all the functions that provide basically the main functionality for the user management and for the management of the plugin system. The other language is mostly like JavaScript and TypeScript, and it's used for both the data source plugin.

0:14:10.900 --> 0:14:41.70

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And the front end plugin we will see more details about the the panel plugin and data source plugins in the next slides. So the plugin system basically it's grouped or like distinguished between two and three main plugins which is the panel plugins which are the application that

you built for the front end side of the application and the data source plugins which is basically the data source, the plugins that you built for bridging your own data source. So we've gotta find itself.

0:14:41.660 --> 0:14:46.820

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The app plugins is something that we never use, but it's basically just a way that you can finally use to.

0:14:48.280 --> 0:15:3.820

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Bring together both. Uh, the the panel plugins and data source plug in and this is used when you have a very specific kind of data source and you want for example the data model be linked to the data source in a very strict way.

0:15:5.360 --> 0:15:18.270

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh from the front end user side Gryphon is just like a access through the common thread browser and on the user can be basically.

0:15:19.500 --> 0:15:50.120

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Distinguish between three different roles and we have like an admin role viewer role and the editor role, the editor role. The main difference between the editor role and the viewer role is just that the editor role has the possibility to create its own dashboard and we did available data source like different kind of data set or different kind of database or in the viewer instead has only the ability to view some dashboard what without the possibility to.

0:15:50.790 --> 0:15:54.460

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Change any information that available from the dashboard.

0:15:55.490 --> 0:16:18.540

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The graphene itself also come already with uh set of functionality for the user management, so it's possible for the admin to enable disabled user create user. In this way we have the possibility also to manage teams and then in this way it's possible to grant the permission to a specific dashboard to a set of user or to a specific team.

0:16:19.400 --> 0:16:49.190

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh on the editor side, the user has the possibility like it's possible to visualize in the in the picture to create its own dashboard with a drag and drop mechanism, so mentioning so it's basically just like the user once you develop your own front end, the panel you have the possibility to drag and drop your panel inside the dashboard and then you can reshape and change the position of the panel inside the dashboard itself and the same.

0:16:49.310 --> 0:16:51.260

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The same partner can also be used to.

0:16:52.10 --> 0:16:59.200

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh can also be created inside the same dashboard multiple times, so in this way it's possible to.

0:16:59.940 --> 0:17:11.600

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, make a configuration like more useful for the user itself and this speed up a little bit the prototyping process for the user itself.

0:17:13.300 --> 0:17:42.990

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, these lights are provide a little bit of overview of how grafana, uh system is working. So it's just like a an overview of the system. So basically the panel plugins and data source plugins are basically just like a release and deployed on the file system of the GRAFANA server and the deployment process just require once the plugins has been uploaded or updated you just need to refresh the gonna find service and in this way.

0:17:43.370 --> 0:17:45.830

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, all the plugins that have been developed?

0:17:45.950 --> 0:17:53.640

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Ohh, on the development side is like just a start to be available for the front end user.

0:17:55.590 --> 0:18:10.410

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In our case, uh, then I will move forward to show how Griffin is integrated in, in our system. So in particular, we have what is called a monitoring interface, which is like one of the one of the tools that we are using in our lab and.

0:18:11.630 --> 0:18:40.500

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Inside this tool is part of this tool, and in particular in particular this is like the architecture that die level architecture of the system. So we have like 3 main elements which is like the grafana server which is like just like a good. The Grafana service running on one of the one of our machine. Then we have a monitoring back end which is basically the interface that the bridge the.

0:18:40.590 --> 0:19:4.390

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Another source that is available, for example from national campaign with the right format that GRAFANA is looking for in case for example you have a very specific kind of format or data model. This is how Grafana is able to reach or get the information from the pipeline. In particular you can use other for example if data is already available on.

0:19:5.70 --> 0:19:21.620

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Ohh, now kind of relational database that is already one of the uh must use database around there. You don't need to develop your own interface, but in case you have a very specific data models and you want a more control on the data itself.



0:19:22.780 --> 0:19:28.510

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

These are monitoring or these back end applications, so it's what the governor is looking for.

0:19:30.310 --> 0:19:48.150

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The other element is just like a time series database that we use as a service for data persistency, and it's used it's used mostly for all the data that we collect as a time series data like position of the vehicle over time or like the flight state of the back all over time.

0:19:49.470 --> 0:20:13.740

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, for the for the implementation we have for the monitoring back end, the main class or main type of data model that we use for data collection and visualization is based mostly on telemetry flight plan are listed in on the left side of the dashboard and it's telemetry, flight plane, flight state ideas, B data and constraints.

0:20:16.940 --> 0:20:18.460

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Going back to the back end.

0:20:18.690 --> 0:20:25.540

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

You're. So what we implemented or what graphene is looking for is just like.

0:20:25.620 --> 0:20:38.850

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The like a a piece of software that is able to format data in a in a format that is readable from GRAFANA, and in particular grafana provide a way to implement.

0:20:38.930 --> 0:20:59.260

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So or API for implementing these data source and then this data source in our case is being implemented as a JSON Data source where what you need is just like a web service with dedicated endpoints. And in our case we use Python Jango for the main release for national campaign but.

0:21:0.0 --> 0:21:15.900

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, this kind of interface can be implemented also with other technology. What graphene is looking for is just like a specific endpoints. And so we you can use also and we use also in our lab Java Spring boot but also C Websocket with boost.

0:21:17.60 --> 0:21:32.970

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, if, uh, you don't want or you have already like some sort of data source available in other database service, it's not only possible to use your own custom data source, but it's also possible to use other kind of built in release of data source.

0:21:33.690 --> 0:21:59.430

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, which are both relational database or Nosql or time series database. Uh. In our case, we use the one that is like a list of just like few examples of the database that the graph is already

able to read, and in particular I just like we just underline what is like the main database that also we use for integration with grafana in our lab. So mostly my SQL, Postgres and influx DB.  
0:22:0.750 --> 0:22:13.190

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh. So, uh, summer, uh, giving a little bit of summary. So we have like a data source that is providing data in our case during ATI in four the national campaign project we use the API pipeline.

0:22:13.970 --> 0:22:27.680

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And it's one of the uh information that was coming through this pipeline for real time feed. And this data is then processed by monitoring back end, the one we've developed with Python Django and it's a custom data source.

0:22:28.430 --> 0:22:32.400

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And then this data is then made available for the GRAFANA server.

0:22:33.570 --> 0:22:52.690

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, so going more into details, the data source is just like a Websocket data service and it's integrated with the Amazon Kinesis Stream, which is the one that we use for grabbing data from real time feed. And what he's doing the Python client, what is doing is just like using these.

0:22:53.710 --> 0:23:12.870

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Amazon Kinesis Stream consumer to read data from from the stream from the real time buffer and then in this way this data is then made available in the specific format for graph file. So it's just like bridging between the service and the.

0:23:12.950 --> 0:23:42.900

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The stream of data that are available and as I said before, the mean data models that we use was like data models already to telemetry messages, which is like just basically position data about the vehicle during the operation operation, messages that are collecting like the flight plan and flight state for the vehicle at DSB messages which is like one of the example data set that we use. And so we had the possibility to collect data out. So with a ping.

0:23:42.990 --> 0:23:57.340

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Station from real time feed of rather kind of information from the vehicle and also other information related to the constraints or restricted volumes messages. So mostly like geometries and location of these.

0:23:58.20 --> 0:23:59.70

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Of these elements.

0:24:0.850 --> 0:24:23.300

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So with this, with the last slide, we still we're talking about mostly the back end. So we so our work in our lab mostly focus on both the back end layers. So making sure that data are in the

right format, but also we work on the front end layer. So building all the plugins that were needed for.

0:24:23.600 --> 0:24:39.910

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, like visualization on the for the end user, so we in the first part of the project, we start to collect or build like prototype interface and during this process we had the possibility to collect more feedback from the end user and then start to integrate.

0:24:40.720 --> 0:25:4.760

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, more, uh. JavaScript. Mostly visualization tool and library for making the data more usable for the front end side. One of the main things of graphene is that you can embed mostly like any kind of JavaScript library on the front end side. So what we did is just like focus on the specific needs and then build our own.

0:25:5.590 --> 0:25:18.700

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, custom panels for uh for this? Uh, for based on these request. In our case I just listed listed some of the plugins and partner that we implement for the front end side so.

0:25:19.760 --> 0:25:24.370

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

We must leave work on, uh, three and four main JavaScript libraries, which is like.

0:25:24.930 --> 0:25:55.200

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Ohh for the 2D maps we use Mapbox which is the one that we use for visualizing like the two D geometries of the flight plan or the flight trajectory of the vehicle. But we also use Cesium JavaScript library which is like an open source JavaScript library for 3D visualization and so this is the other pattern which we put a little bit of effort and the other partner that we work on the other JavaScript library that we work on was plotline.

0:25:55.540 --> 0:26:25.750

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, that we use mostly for scatterplots or like whether and the rather gram visualization on top of that, we then develop more custom panel, for example for data export and table representation of data on the interface itself. On the right side we can see few examples, but we were we are going through more details in the next slide, but this is just like a few examples of the how the single.

0:26:25.820 --> 0:26:27.580

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Channel look like.

0:26:27.650 --> 0:26:30.690

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Ohh, only because on our side on the front end.

0:26:32.580 --> 0:26:46.290

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, so, uh, for the end user from the front end side. So this is like uh, how grafana look for an

end user that want to start to implement its own dashboard. So this is just to give an example of how.

0:26:47.40 --> 0:27:6.910

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Basically, uh. The Griffin interface looks like and at the beginning when you start to use A and to implement your own dashboard. So you have a basically a plain kind of scratch, kind of plain dashboard space where you can drag and drop your own panel. And this is just like.

0:27:6.990 --> 0:27:36.760

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

A system where on the top right menu you have a different kind of ready available set of comments where you can basically choose some of the. For example the time settings. In particular you can choose the refresh rate for the panel, so this is another interesting interesting feature of grafana. So once you have your data available on the back end layer you can decide.

0:27:37.180 --> 0:28:7.230

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

On the specific need, what is the refresh rate? This is like helpful in case you want to limit the kind of bandwidth or like the kind of load that you have your on your own machine. And so in case for example data are not changing that much over time you can reduce the refresh rate for a specific for a specific data set or in the opposite direction. If you need an either kind of refresh rate you can change the time settings from this range.

0:28:7.310 --> 0:28:33.260

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Same time you can also use the time picker just to select a specific time range in the past. So what do we use it for example going UTM where we need to visualize data like for a specific time range back in time like two or three weeks ago we we have like the possibility to select one specific time range and time slot and visualize data for only that time range.

0:28:35.120 --> 0:28:52.110

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, uh, then I will start to go through some of the visualization panel that we use during UTM and national campaign. So this is just like few example of how the single the single dashboard can be used for. So in this case we use the time series.

0:28:52.190 --> 0:28:55.720

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The visualization for like representing the.

0:28:57.220 --> 0:29:20.910

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The for example, the position that over time, so we were able to monitor real time the altitude profile for a specific vehicle, but also attitude position or longitude position. The speed over time and they can find itself provide already like a set of filters. So through these filters we were able to select for example a specific vehicle and then.

0:29:22.320 --> 0:29:38.150

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

All these data were then being collected from back from the database and visualize on the front

end side. This is like help us to spot any kind of issues or any kind of inconsistency we saw during the flight test or to spot any kind of.

0:29:38.230 --> 0:29:47.0

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So data missing during the data collection process. Another interesting feature is the built in query editor. So.

0:29:48.200 --> 0:30:14.570

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Graphene already provide the a query, so the possibility to build your own query from the front end side so there is no need to from the front end side to build your own kind of comments. So it's already depending on the database available on the schema available for the database. It's possible to customize or to build your own query from the front end side and this is like up to.

0:30:15.250 --> 0:30:36.550

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh build like a specific query in case the data set that you already visualizing is not what you expected. For example, in our case we use the position data to build the distance flown by the vehicle, and this kind of information is built through a query editor on the front end side of the interface.

0:30:38.450 --> 0:30:55.480

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

This is another example of the two D map that we use inside. The farmer is just like a Mapbox plugin embedded inside Grafana and it's used for visualizing the flight volumes of the vehicle and the trajectory fumes. So far, for example and but.

0:30:55.560 --> 0:31:12.330

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The once you have the main point is that once you have your JavaScript embedded inside this panel, you can then integrate your own custom feature depending on the specific needs on the right side. Instead we have like these small exporting.

0:31:13.250 --> 0:31:37.600

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The tab that we customize for for Grafana where it's possible to also download the specific like the data available from the front end side and so having the possibility to use different kind of formats formats for the trajectory for example and then use it for other external tools in case you want to do post processing or analysis with another external tool.

0:31:39.130 --> 0:31:41.380

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And this is just like how.

0:31:42.460 --> 0:32:11.240

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Other example of the two D map have been used during the national campaign, so we use it for creating like density visualization map during some of the test. Our simulation in the lab or or also doing collection of adsb data using like a big station and adding the possibility to also filter on the front end side some of the data that have been collected in the in the back end so.

0:32:11.470 --> 0:32:42.20

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Data data is not only in addition to the filter that you can have on the back end side. Data can also be filtered on the front end side. So in this case we built just like a feature related to the possibility to change a range of vehicle that we want to visualize with respect to our with respect to a specific position. And then this way it's possible to focus on the specific kind of flight test activity or specific flight that you are interested in and at the same time.

0:32:42.720 --> 0:33:0.410

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The same information have been used from the USB data fit to visualized like the altitude profile and the speed tool. For example monitor how the flight tests were going and if, for example, the requirements for the flight test were matching our expectation.

0:33:2.80 --> 0:33:6.690

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh. In this case, it's just like another, like a couple of the screen shot about.

0:33:6.760 --> 0:33:7.80

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So.

0:33:8.460 --> 0:33:38.530

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Some of the dashboard that we use for multiple operations. So in the in the upper left corner we have how the altitude profile where visualized for multiple operations going on at the same time. And while on the right side it just like a timeline panel that help us to visualize the flight state change over time. In this case we were able to see if the partners or if the people involved during the simulation were like streaming the operation messages in the right.

0:33:38.650 --> 0:34:8.720

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In the right order and with the right. Or if something like or an issue was going on. For example, if the flight today call was like going nonconforming or if there's like a plan or non plan contingency for for the simulation or the test itself on the lower side instead, we have like an example of the single operation panel or dashboard that we use to select a specific flight and then we have like a full dashboard that visualized data only for a specific flight in case.

0:34:8.940 --> 0:34:35.330

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

We want to dig into more details for a specific light in this case, just like provide a summary for the vehicle, for example. In this case we were just like visualizing on the same dashboard position data or also like the update rate for the position itself, the number of position reports and the flight state change over time for this specific flight and in the other one in the other.

0:34:35.400 --> 0:35:5.200

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Like a screenshot we have, I can stand just like a table reporting for each operation the corresponding state. So this is just like a summary table that gives a very quick overview of how the flight tests are performing. So if like some missing data or if the number of position reports were not as expected and all other kind of information that they want to be added to the.

0:35:5.420 --> 0:35:28.630

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

People to the table itself. These are other example of the map that we used to provide like an overview of the flights. So this is just like an example of integrating both 2D map and pie charts and time series visualization on the same dashboard. And this way it's possible to monitor like the.

0:35:29.630 --> 0:35:35.780

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Like they don't going flight test and having like a quick overview of the of the operations.

0:35:37.780 --> 0:35:52.720

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, the same, uh, the same environment is it has been also been used to investigate the possibility to integrate other kind of JavaScript library for doing like whether visualization this kind is just like few example of preliminary.

0:35:52.800 --> 0:35:55.450

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The study cases for.

0:35:56.710 --> 0:36:25.980

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Whether visualization and in particular, we were using plotline library, so we were able to integrate and embed plot like JavaScript library, Instagram Fana and use it for visualizing for example wind speed and wind speed distribution for a specific point in space. And we were like also planning to maybe extend these weather kind of capability and feature for future and next project enhancing like the capability to visualize.

0:36:26.740 --> 0:36:43.450

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The whether itself, which is like one of the main points also of data in particular moving like I had also with the weather visualization. This is another example of how we were just like investigating the capability in this case the 3D viewer of visualizing.

0:36:44.110 --> 0:36:56.800

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Different kind of uh, layer or wind speed for example. This is another field that we were looking to. It's just like the visualization of weed speed, wind speed and direction. And this is just like an example of.

0:36:56.880 --> 0:37:5.90

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So ohh, I'd rather gram another layer for cloud and visualize like on top of the 3D.

0:37:5.820 --> 0:37:32.570

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The 3D viewer and it's the same panel that then can be integrated inside the inside the file. Going into details for one of the main feature of the the plugins that we work on cesium. So we were focusing on enhancing some of the features that are system was already providing and customizing these feature for the specific needs of the flight so.

0:37:32.990 --> 0:37:45.720

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, Susan. Provider already like a very low level kind of graphical feature for building your own graphical or geometries inside the panel. And so in this case we use different kind of.

0:37:46.670 --> 0:38:2.580

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Geometry like surface or areas of visualization just to build like boundaries. For example for constraints but also polylines and other features for visualizing trajectory for a specific vehicle and in particular the same.

0:38:3.540 --> 0:38:33.250

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The same kind of feature can be reused for other kind of geometry that you have like a specific request for. So it's this depends a lot on the flight test for example or the specific needs for for a flight test for example, you need the visualization of a set of well known waypoints for data set you can have the possibility to upload this way points and they have some sort of static 3D visualization feature for the panel.

0:38:33.670 --> 0:38:37.940

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, we were not just like announcing and going through the possibility to.

0:38:38.320 --> 0:38:40.770

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Ohm announced like the 3D.

0:38:41.530 --> 0:38:53.10

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

To determine model for cesium and then using like the the volumes representation of the cesium to customize it for national campaign. So for example the feature related to the.

0:38:54.210 --> 0:39:0.220

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Changing the color based on the flight state or having the possibility to change in transparency for.

0:39:1.110 --> 0:39:19.840

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

For the flight volumes, depending on the on the flight state and also the possibility to integrate like 3D models inside the cesium environment depending for example on the class of vehicle that we're flying or on the specific information available from the data source.

0:39:20.490 --> 0:39:43.640

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

In particular, this is other few uh screenshot about the 3D models that we were able to upload inside inside cesium. So these were very helpful also during the collection of adsb data. So we were able to monitor real time data feed from our one of our system with a real time feed of.

0:39:44.360 --> 0:40:10.110

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Plenty USB data and also customizing also the class or the 3D models of the vehicle for depending on the specific class or emitter type of the adsb data collected. This way we're



helpful to have a quick overview of the class type or the specific vehicle if it was like a small aircraft or a similar aircraft or and then you copter flying in the same area.

0:40:11.200 --> 0:40:39.410

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And at the same time, all this information that is collected from the front end side is also available in formats like XML or that can be reused for example with other external tools. In our case we also reuse it to export some of the trajectory of geometry and make it available for example for Google Earth or other maybe enhance set like kind of a desktop application. All we visualize so far it's all released on our web browser. But.

0:40:40.30 --> 0:40:48.0

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

No. All the information that has been collected can be exported and made available for offline, for example application.

0:40:49.620 --> 0:41:14.810

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And uh, so far we talk about mostly like the single panel. So to demand 3D panel, 2D panel, but what is the important thing, I mean the the one of the main benefit of using the file is that then each single panel can be drag and drop inside that one common dashboard. In this case it's one of the main dashboard that we use during one of the last.

0:41:15.500 --> 0:41:44.590

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Test ordering one of the flight test that we did at Armstrong also for national campaign and it's basically one single dashboard that provides the same time a 3D viewer that it's the one that we do we did with Cesium JavaScript library. But in the lower side of the dashboard we just like put a set of other important information for us which is like just the panel with like time series. Regarding the number of flight going on at the same time or like.

0:41:45.450 --> 0:42:9.640

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Single panel viewer for visualizing how many flights are in a specific state in a specific flight state, but also like the altitude profile for each flight and but additional panel can also be added depending on the specific needs. So in this case we added for example the a clock visualization panel just to keep track of the timing for the flight test. But.

0:42:10.20 --> 0:42:19.130

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Any kind of other panel can be also integrated inside this dashboard and the other main things is that all these.

0:42:20.130 --> 0:42:46.200

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

All these dashboards can also be customized real time. So in in case you need to change the layout the the interesting things of grafana is that it doesn't require any restart of the process. So if you need just to change one of the panel or visualize another kind of information on your dashboard, the layout itself can be customized and changed without the need to restart any service.

0:42:46.950 --> 0:42:49.840

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

We've also like uh, live data going on.

0:42:50.620 --> 0:42:54.570

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, in the next slide. Instead, I just like to provide other examples of the.

0:42:56.270 --> 0:43:23.860

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Panel plugin that we use for uh national campaign and it's just like a few example of a 2D map visualizing like the flight trajectory for multiple operation going on in the same area, flying through the same route and the same dashboard will also providing data about the altitude profile and the flight state over time for each single vehicle. And this was like another helpful kind of opportunity for us to.

0:43:24.660 --> 0:43:32.770

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh collect feedback from the end user and work on enhancing the the current capability of the interface.

0:43:34.50 --> 0:43:49.280

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And the team? Yeah, moving like a little bit into more like what is like the security for the attach share with the pipeline or the the phone itself. I will, I will like to give like a little bit of overview of how it's working. So basically.

0:43:50.140 --> 0:44:2.940

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The main the main connection between in the in the use of grafana is just like the connection between the data source or the pipeline and the service and then from the GRAFANA service to the end user.

0:44:3.570 --> 0:44:33.740

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

From the phone service and the end user they mean uh authentication is like a basic authentication provided by GRAFANA, but the same authentication, different kind of levels of authentication can be used for graphing itself. And in our case the system is like hosted on our on our network so it can be accessed only through the VPN or inside the NASA network and the other connection it depends on the data source. So the.

0:44:33.830 --> 0:44:43.20

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The data that is available from the data source to grafana, the authentication system it depends on the data source itself. In our case we use both like.

0:44:44.280 --> 0:45:12.930

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Basic authentication for example, for a Websocket connection for one of our system, but also for example for the anti pipeline that has been used for national campaign, we use the Amazon access key that have been used for access programmatically. The data source from the back

end monitoring application. But that kind of authentication depends a lot on the data source that you use, but from the monitoring side.

0:45:13.230 --> 0:45:16.760

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Then you can implement your own application that.

0:45:18.80 --> 0:45:22.350

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Read from the from the data source. Depending on the specific needs.

0:45:23.200 --> 0:45:53.80

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And I think, yeah, this is with the security slide. I think I finished like these little bit of a work through the GRAFANA. And yeah, I think I must be like on time I hope to not have like talk too much or going to too long with like the presentation. But yes, I just like this is just like a presentation about how we use grafana and what is grafana and then how we integrate to.

0:45:53.170 --> 0:45:55.460

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Meet our specific needs.

0:46:4.170 --> 0:46:4.630

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

OK.

0:45:56.630 --> 0:46:15.200

Sprague, John D (HQ-JD010)

Michaela uh, great job. And I did see some questions in the chat that I'm gonna go through real quick. Hopefully we can get through him. We only have about 10 minutes or so. It first question is, are you able to share the custom panel plugins to other NASA GRAFANA users?

0:46:16.450 --> 0:46:23.240

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, so uh yeah, this is like, uh, one of the considerations that we were taking into account for our system.

0:46:23.780 --> 0:46:24.580

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Umm.

0:46:24.660 --> 0:46:25.10

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh.

0:46:25.110 --> 0:46:25.520

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh.

0:46:26.320 --> 0:46:56.520

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The the idea is just like to uh, make the uh custom like plugins more like a uh like ready like a increase the readiness level for making them available, but it's probably one of the our main objective. But yeah, if like some of the dashboard are very custom for our specific needs. So it

depends on the on the situation where you want to reuse these custom dashboard because they are very related to the data model.

0:46:56.620 --> 0:47:21.730

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

But we are open to work, maybe on also on additional kind of data. I mean to Apple. So in customizing like this plugins but any kind of interest for that can be can be like also answer or I can follow up with that if someone is interested in sharing the I mean if someone is interested in using the custom plugin that we did.

0:47:27.890 --> 0:47:28.290

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Yep.

0:47:30.770 --> 0:47:31.60

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Yeah.

0:47:22.610 --> 0:47:41.120

Sprague, John D (HQ-JD010)

Perfect. Perfect. Thank you. Of anybody out there that wants that, please shoot an e-mail to mckaley and me and we'll take it from there. The next question is Mac. Mapbox provides 3D maps also. What are the advantages of using the cesium over the Mapbox for 3D map displays, kind of like a comparison?

0:47:41.150 --> 0:47:54.320

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Yeah. Yeah. So yeah, this is like a one of the considerations that we took at the beginning. So when we start to implement the 3D panel, it was like 3-4 years ago. So at that time, my box was still not providing a 3D.

0:47:55.340 --> 0:48:9.480

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

A buildings or like 3D interface and what is the main feature of cesium was that at that time was already providing a 3D terrain and it was already providing a zoom, pan and tilt kind of environment?

0:48:9.880 --> 0:48:40.530

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, when I start to look also into Mapbox, was still providing only two D view and the 3D tilt, but with a fixed perspective for the visualization. But in the last few years they implemented a lot of these new feature for the 3D visualization. Also inside the Mapbox and so this is possibly. Yeah. It's potentially also another kind of announcement that we can take into consideration for Mapbox itself. So considering also Mapbox to give option for the end user, so not only providing maybe just like.

0:48:40.620 --> 0:48:47.850

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Resume my thoughts like enhancing the 3D viewer or 3D perspective for for Mapbox itself. So yeah.

0:48:48.610 --> 0:48:55.240

Sprague, John D (HQ-JD010)

Great, great. Thank you. Next question is, do any of these third party libraries require paid licenses?

0:48:56.300 --> 0:49:16.590

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So all these license the Mapbox and cesium, they don't require a paid license. They depends on the also on the end user and how you release them and how or if you get like commercial kind of revenue from from the library itself using.

0:49:19.130 --> 0:49:34.940

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Like the for example the Zoom library you have like a with a free of user account you have like a top kind of maximal request that you can use for getting like the map and the 3D information.

0:49:35.920 --> 0:50:5.490

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And this is like the the basic set with a commercial. There is like a commercial version of the C Zoom for example, that allow you to eat or to ping more information or to host more data from the web. And this case you need you can take advantage of more like complete sets or more complete or a bigger kind of datasets. And these like require a commercial kind of account for that use.

0:50:6.530 --> 0:50:31.290

Sprague, John D (HQ-JD010)

Great. Great answer. Next one is I am also interested if you are using grafana enterprise or the free OS version. We provide graphene as a part of the NASA IT platform, Internet of Things platform I believe, but in order to have full integration with Launchpad to map the two grafana user roles, it seems to be a repaid enterprise license.

0:50:32.240 --> 0:51:2.770

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So yeah, at the moment it's just like we are using the not the commercial version. We are just like a for us. It was like a a starting point to understand how Grafana is behaving and then how collect all this data from the partners just like a supporting tool for what we did. But yeah, like looking forward like also if you depends also on your interest or in your funnel objective to make like the application itself more robust or like.

0:51:2.830 --> 0:51:18.210

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Lost somewhere else or to meet like more specific security requirement in case you make the the value the application public available for example or something. So in this case maybe moving into a commercial solution could be one of the option but yeah.

0:51:18.930 --> 0:51:19.860

Sprague, John D (HQ-JD010)

Excellent. Thank you.

0:51:20.880 --> 0:51:36.900

Sprague, John D (HQ-JD010)

William Uh, Jeremy coops question I will uh send an answer afterwards me and you will get together and do that. So thank you for that question. I will answer that. Next question is what frequency of data can it handle example or samples per second.

0:51:38.310 --> 0:51:38.980

Sprague, John D (HQ-JD010)

It's roughly.

0:51:37.990 --> 0:51:57.900

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

This is a nice questions. Yeah. So this is depends a lot on the data source you have in the back end and the front end. So basically the the nice part of the fun is that is like separating the data source or data generation with the data visualization. So in our case, we so far we've never do.

0:51:59.0 --> 0:52:16.680

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

I kind of load test on the phone, it's on a, it's on our kind of a future test, but you can you can have a refresh rate of a few milliseconds one seconds or if data is like you. If you see like latency you can reduce this.

0:52:16.760 --> 0:52:46.630

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

The kind of amount, but this depends a lot on also on the back end. So sometimes data as they are flowing, it's already ready to use for grafana so you don't need to do post processing and then they can be right away visualized. Sometimes you need a little bit of formatting and so in this case it depends on what technology you use on the back end. So for enhancing the so far so far we use like a Python application which is like behaving pretty well. But if you want to.

0:52:47.370 --> 0:52:59.100

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Enhance or improve like the also the capability or the data processing on the back end to make like the latency lower you can start to move to Java or like C++ to have like.

0:52:59.520 --> 0:53:3.30

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Ohh, faster. Kind of a processing on the on the back end.

0:53:3.860 --> 0:53:16.470

Sprague, John D (HQ-JD010)

Alright. Next question is, is it possible to build custom plugin for ML performance machine learning metric data and visual visualize from grafana front end layer?

0:53:17.290 --> 0:53:22.290

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, yeah, this is one of the things I was like about curiosity looking into, but.

0:53:23.510 --> 0:53:32.230

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Basically yes. So I already knew that grafana out there is used also for monitoring the machine learning kind of training process so.

0:53:33.190 --> 0:54:1.800

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And there is like already JavaScript library that are building their own UI for machine learning. So what you can do is just like build your own custom based on these JavaScript. So embed these JavaScript library inside grafana or build your own. I mean it depends on the level of

details or the level of the data available, accessibility on the data you have and but you can build a time series.

0:54:2.330 --> 0:54:9.830

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

All of the data set of training that is like going through a machine learning process and visualize it on grafana, so it's totally doable.

0:54:25.280 --> 0:54:25.750

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

No.

0:54:25.910 --> 0:54:26.190

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

It.

0:54:30.540 --> 0:54:30.840

Bhadoria, Divya (ARC-AFH)

Uh.

0:54:11.700 --> 0:54:32.210

Sprague, John D (HQ-JD010)

Yeah. And then the next question was how many developers are developers are working on this and I know that, uh, Divya answered. It's just him. It's just you. So been doing a fantastic job with just a one man show there. I heard. Yep, I heard but.

0:54:28.890 --> 0:54:33.50

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Yeah, but yeah. But I mean, I have a. So yeah, but yeah.

0:54:31.980 --> 0:54:43.930

Bhadoria, Divya (ARC-AFH)

Yeah. Michael is speaking briefly talk about very briefly how this work was carried over from UTM and what level of effort was required and how many people worked on it over different times.

0:54:47.500 --> 0:54:49.910

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

So so sorry, I I didn't get the question.

0:55:8.440 --> 0:55:8.740

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Mm-hmm.

0:54:50.990 --> 0:55:15.360

Bhadoria, Divya (ARC-AFH)

Oh, can you just briefly talk, give a brief history of grafana how this was carried over from UTM into national campaign where we are using it right now. And I think people are interested in knowing how many developers, when needed to bring it to the current state that you showed in the talk today. What's the history of this grafana development?

0:55:15.870 --> 0:55:22.620

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, so yeah, it's uh, the history is that when I joined the lab, we were looking for, I was looking for something to visualize data.

0:55:23.100 --> 0:55:50.30

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh to navigate data that we collect during UTM process, do you UTM project for TCL two. So at that moment we were like having like we want some tool that was able to be easy to use and flexible and then we start to we go through different kind of solution it was Kibana and other kind of web-based framework and but among them like the Fano was like more easy to use and then we saw the possibility to have.

0:55:51.570 --> 0:56:1.540

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Like the possibility to use like a flexible kind of a way to cast from or to develop your own plugins. And so I I start them to work on that, to build for the.

0:56:1.780 --> 0:56:25.270

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Uh, pasta kind of data. Not the real time one. And then after that, during UTM project I saw also the possibility that we have already data source available for real time feed and so we had the idea to link the real time feed with grafana. This is how Grafana moved from the beginning as a offline past post event.

0:56:26.510 --> 0:56:43.320

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Tool to a real time to real time tool and from there and then on on UTM project we had the possibility to collect a lot of feedback from the user and then start to increase like the feature available from for the plugins that we do. We did for grafana.

0:56:44.20 --> 0:56:49.180

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

And then, uh, and then after that like the moving to national campaign like a.

0:56:51.120 --> 0:57:3.490

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

We adults like the we just like, have the idea to review some of the feature because they were very helpful during the UTM project to monitor the data collection. And so we this is how we decide to move to.

0:57:4.850 --> 0:57:29.590

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Also the the Grafana Formation from UTM and reuse it also national campaign also because the flexibility to use a web browser interface without the need to install anything just like having web browser and the user account for accessing our system. So this is the process that lead us to reuse our tool from AOL not only from UTM but moving I had in national campaign too.

0:57:31.20 --> 0:57:31.430

Sprague, John D (HQ-JD010)

Great.

0:57:30.500 --> 0:57:32.380

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

For the last part of national company, yeah.



0:57:35.930 --> 0:57:36.340

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

OK.

0:57:33.150 --> 0:57:52.290

Sprague, John D (HQ-JD010)

32nd Warning and just make a comment here Tony and mentioned that Griffin is already in naams for those folks that now. So they wanna use it. It uses app dat which is a fantastic project out of a Johnson, Dave Keldorf and others. I'll put that together and pushed it forward really a great project.

0:57:53.500 --> 0:57:56.280

Sprague, John D (HQ-JD010)

I I I think the rest of the questions, there's a couple more.

0:58:2.160 --> 0:58:2.540

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

No.

0:58:9.970 --> 0:58:10.320

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Yep.

0:57:57.520 --> 0:58:12.390

Sprague, John D (HQ-JD010)

Michelle will go together and and go through those and answer those for the folks, but I wanted to say thank you so much for going through this with everybody. If folks have other questions, please just shoot us an e-mail and we'll we'll answer everything that we can.

0:58:12.870 --> 0:58:16.60

Sprague, John D (HQ-JD010)

Umm. I don't know Devi or anybody else has any other comments.

0:58:17.660 --> 0:58:19.390

Bhadoria, Divya (ARC-AFH)

No, thank you. Great job.

0:58:20.400 --> 0:58:22.970

Sprague, John D (HQ-JD010)

Great job. Yeah. Thank you. Alright.

0:58:22.330 --> 0:58:24.150

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

OK, thanks. OK.

0:58:23.770 --> 0:58:29.40

Sprague, John D (HQ-JD010)

We'll see everybody on the next one, the fifth one coming up in probably the next month or two.

0:58:31.100 --> 0:58:31.570

Sprague, John D (HQ-JD010)

Bye bye.

0:58:31.940 --> 0:58:32.720

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Bye bye bye.

0:58:33.510 --> 0:58:35.70

Gomez, Ashley N. (ARC-TH)

Hi, thank you, Michelle, great job.

0:58:35.990 --> 0:58:36.430

Cencetti, Michele (ARC-TH)[San Jose State University Research Foundation Inc]

Thanks.

0:58:36.340 --> 0:58:38.660

Hoy, Kim P. (ARC-AF)[SimLabs III Contract Management & Technical Services]

Thank you. Great presentation, very.

0:58:40.40 --> 0:58:40.880

Hoy, Kim P. (ARC-AF)[SimLabs III Contract Management & Technical Services]

Informative.