TRANSCRIPT

NOAA Supercomputer Upgrade Virtual Media Briefing

June 28, 2022 at 11 a.m. EDT via GoToWebinar

Hosted by NOAA National Weather Service Public Affairs

Media advisory about briefing:

NOAA to host media briefing on newest weather, climate supercomputers

News release:

U.S. supercomputers for weather and climate forecasts get major bump

0:06

Good morning and welcome. If you are a credentialed reporter and you're here for a media briefing on NOAA's supercomputers, you're in the right place and we're glad you could join us today. I'm Susan Buchanan of NOAA Communications along with my public affairs colleagues, Jasmine Blackwell and Maureen O'Leary, will be facilitating today's webinar for you. This webinar is being recorded, so if you don't consent to being recorded, please disconnect now.

0:35

OK, today, you will hear brief remarks from three speakers with NOAA National Weather Service, followed by the opportunity to ask questions of our experts.

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Today's speakers will be Ken Graham, director of NOAA's National Weather Service, David Michaud, Director of Central Processing for the National Weather Service.

0:57

And Brian Gross, the Director of Environment of the Environmental Modeling Center, which is one of the National Centers for Environmental Prediction at the National Weather Service.

1:08

Just a few notes of housekeeping. At the end of the speaker remarks, if you would like to ask a question during the Q and A session, please raise your hand. You can find the hand raise option on the GoToWebinar control panel located at the right of your screen. Please do not type your question in the question box unless you are having trouble raising your hand.

1:32

But if we need to read your question for you, we're happy to do that.

1:36

I will call on reporters who raise their hands and unmute your line.

1:40

And then to ask a question, please unmute your computer, state your name and affiliation, and then state who you are addressing your question to, if possible.

1:51

Check the chat box for a link to the news release, which Maureen will post there when it goes live on NOAA.gov here shortly. And with that, I'll be back in a few moments to moderate the Q&A session, and Ken please kick us off.

2:09

OK, perfect, thank you, Susan. Appreciate that introduction.

2:13

And, you know, as forecasts become more accurate, and weather and climate events become more extreme, the public needs more detailed forecast information further in advance, and this takes advanced computing, so I'm so thrilled, excited to announce that today at eight AM Eastern Time NOAA National Weather Service but our new upgraded weather and climate supercomputers into operations.

2:38

This advancement in high performance computing gives us three times faster compute speed over our former suitor computers.

2:46

In addition to more storage space and more computing capacity, this is a game changer for NOAA and the state of weather forecasting in the United States.

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I'll turn it over to Dave and Brian here in a little bit to briefly discuss the computers, the modeling improvements coming down the pike, but first, I'd like to just say that this was a huge amount of work that went into this project from contracting to implementation. Everyone involved should be extremely proud of this accomplishment. I'm proud of this team.

3:15

Big-time. Hardware, software, modelers, contracts. I'm just proud how it all came together all to this day, the big day that we have today to make this announcement, this incredible group of people behind this, include our, our folks around NOAA big shout out to the teams at central operations.

3:35

The Environmental Modeling Center, the Office of central processing, the acquisitions and grants office, and countless other developers and support staff, it takes that entire team to come together to make this big big accomplishment. I want to also acknowledge and thank the hard work of teams with our contractor, General Dynamics Information Technology, which designed the computers to our needs and runs the system under a total Managed Service Contract.

4:04

This was a team effort and a big win for the United States, as we continue to invest in science technology, to keep our computing capacity on par with the other leading forecast centers around the world.

4:16

So with that, you could tell my excitement. With that, I'd like to turn it over to Dave Michaud to talk more about the contract and the computers.

4:31

I thank you so much Ken and appreciate all the enthusiasm, and you got me jazzed up just listening to you there.

4:40

As you mentioned, today's marks the culmination of a significant amount of work, since we awarded the weather and climate operational supercomputing contract to General Dynamics Information Technology in February of 2020.

4:58

Under an eight year based contract award, that includes a two year renewal.

5:03

GDIT is delivering a managed high performance computing service to NOAA inclusive of the facilities, supercomputer and associated supercomputing technical support.

5:14

So for us, this provides the platform to manage the development and operation of our weather, water, and climate production suite.

5:26

Today, operation's moved from supercomputers in Reston, Virginia, and Orlando, Florida to our newest supercomputers named Dogwood in Manassas, Virginia and Cactus, in Phoenix, Arizona.

5:41

To ensure rapid and reliable fail-over capabilities, Dogwood and Cactus are identical in configuration.

5:48

In addition, these systems are hosted in facilities on opposite sides

5:53

of the country providing greater protection against widespread, singular East Coast events that could potentially impact both of our systems as were configured before today. So this is a great advancement in where we're located.

6:11

Operating at 12 petaflops each or a quadrillion calculations per second with 26 petabytes of storage.

6:19

NOAA has now three times the computing capacity and double the storage capacity as compared to our previous systems.

6:28

And I'm, I'm very excited, these systems are amongst the fastest systems in the world today, currently ranked at number 49 and 50.

6:37

So to put this in perspective, you know, what, what's 12 petaflops?

6:42

So some fun facts, if every person on Earth was provided a handheld calculator and asked to perform calculations continuously every second of every day, it would take about one month to keep up with what each of our supercomputer systems can do in one second.

7:01

So that's, that's what 12 petaflops looks like in practical terms.

7:07

So coupled with NOAA's research and development computer supercomputers in West Virginia, Tennessee, Mississippi and Colorado, which have a combined capacity of 18 petaflops.

7:19

A supercomputing capacity supporting NOAA as New Operational Prediction and Research is now 42 petaflops with billions of weather observations coming into the system, and the equivalent of more than five times the printed Library of Congress smoothing office systems each day.

7:38

There are plenty of logistics that our team tracked to make today happen.

7:44

Our model developers and production analysts have been very hard at work to proudly ensure NOAA’s life-critical

7:51

Model production suite continues to be something our nation's weather enterprise can reliably set its watch too and depend on each day.

8:02

So I, too would like to echo, Ken’s shout out to the people behind this effort.

8:06

We have very impressive computers, no doubt, but we cannot forget that computers are really only as smart as the people who operate them and our teams are world-class and highly dedicated to serving the American public and the weather enterprise.

8:23

With that, I'd like to toss it over to Brian to talk about advancing our modeling capabilities. Brian?

8:30

Hey, thanks, Dave.

8:32

I also wanted to add my gratitude to the incredible team that made this happen today.

8:38

So the new supercomputers enhance computing capacity, storage and interconnect speed.

8:45

These provide the boost that we need to unlock improved forecast model guidance for years to come.

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Generally, improvements will come in four main areas.

8:54

Higher resolution models that better capture small scale features like severe thunderstorms, more realistic model physics that better represent the formation of clouds and precipitation.

9:06

A larger number of individual model simulations to better quantify our confidence in the model's results, and improved use of all those observations we have of the system to better initialize model forecasts.

9:21

All of these ultimately result in improved forecasts and warnings that helped to better protect life and property.

9:28

So the new supercomputers will also allow significant upgrades to specific modeling systems in the coming years.

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This includes a new Hurricane Forecast Model, named the Hurricane Analysis and Forecast System, which is slated to be in operation at the start of the 2023 hurricane season.

9:47

This new model will be used to predict the track and intensity of tropical cyclones, and will replace the Hurricane Weather Research and Forecasting Model or HWRF.

9:57

And the hurricanes in a multi scale ocean-coupled non-hydrostatic Model, or HMON, pending tests and evaluations.

10:07

The hurricane analysis and forecast system, like other applications, based on the unified forecast system, will allow the National Weather Service to quickly utilize innovation developed by its research partners for more accurate forecasts through a simplified set of ensemble based operational applications.

10:26

Additionally, NOAA's Environmental Modeling Center will implement several new applications under the unified forecast system over the next five years, including upgrades to its global and regional modeling systems.

10:38

So that concludes my remarks. Thank you, Dave, thank you, Ken. And I would like to turn it back over to Susan to moderate the Q&A portion of the media briefing.

10:48

Thank you, Brian. And thank you for those great remarks to all three of our speakers. As a reminder, if you have a question, please raise your hand in the control panel to the right of your screen. After I call on you, unmute your microphone, state your name and affiliation, and let us know who you are directing your question to, if possible.

11:07

Our first question comes from Seth with the Associated Press. Seth, your line is open.

11:17

We can hear you, you're a little bit garbled, but we can.. Better thinking in terms, I guess, would be Brian.

11:28

Can you give a little more specifics in terms of what the average personal experience will get in terms of a better forecast, longer ones?

11:38

If you're talking to hurricanes, I've been talking for hours, 24 extra hours, a warning, people talking pumps or just a daily forecast, how much more accurate, um, In other words, can you translate these into the stuff that we use when we use weather service products, you know, how much better it is for me.

12:04

Our forecasts begin.

12:10

Sure, so, we're always developing the next generation of models.

12:15

And the goal of these models is to always improve the skill that we have in particular metrics for the numerical guidance that we offer.

12:25

So, the first thing to acknowledge, it's important to recognize that model output is not a forecast.

12:31

Forecasts were made by the great people at work in the National Weather Service National Centers and the weather forecast offices.

12:38

And they use the numerical guidance that comes from our models and other models to craft their forecast.

12:45

So, what we're always striving to do is to address shortfalls in the numerical guidance, in sensible weather elements, temperature and precipitation are among the two most important.

12:59

And so, to translate what these new supercomputers will mean for the average American, we're currently developing models that will be able to provide additional lead time in the outbreak of severe weather events.

13:14

And I already mentioned more accurate track and intensity forecasts for hurricanes, both in the ocean and ones that are expected to hit landfall. And we want to have a longer lead time. As you mentioned.

13:28

in Question one, have a longer lead time of when decisions can be made on the ground, based on what the numerical guidance and what those forecasts say, for emergency managers and other stakeholders that consume the National weather Service forecasts.

13:45

I hope that addresses your question.

13:50

OK, thank you, Brian, our next question comes from Dave with fed scoop Dave. Your line is open, please unmute yourself and ask your question.

14:00

Yeah, just following up on that. I'm curious if you can talk a little bit about how you mentioned how the supercomputers stack up against other supercomputers internationally. But how will this make our forecasting? Well, how will our forecasting stack up against other forecasting models, internationally? And will international partners be relying on these models as well?

14:26

So if you can imagine, there is a partnership amongst all of the global weather forecasting agencies, particularly when it comes to model development. We collaborate with folks across the world.

14:42

In model development, we collaborate with the Europeans at the European Center for medium range weather forecasts.

14:51

We collaborate with the UK met office. We have collaborations with Japan, and Korea.

14:55

So it really is a strong, collaborative effort to share innovation, to implement those innovative ideas within our models.

15:06

So, when it comes to any particular model providing the best forecast or a better forecast than others, it's very dependent.

15:16

Every model has its strengths and weaknesses, so it is incumbent upon the people forming the forecast to get as broad of a perspective from as many models as they can in order to formulate their forecast.

15:33

Great. Thanks, Brian. And just as a reminder, if you have a question please raise your hand in the GoToWebinar control panel to the right of your screen. If you're having trouble doing that, you can type your question in the question box and I'll read it for you. And it looks like we have another question here from Seth. Go ahead, Seth, your line is open.

15:55

Thank you, actually two more questions. And let me one of them is the same question. Let me just try this again.

16:02

I want to be able to tell leaders that your specific forecast, whether it is hurricane forecast, of these others, will improve by this much accuracy, or this much of day hours.

16:18

Possibly, give me something like that, and then for Ken, having spent all your, all these many years at the Hurricane Center, knowing, as you most likely heard, almost every day, how much better European my models are, does this: will this catch us up with European models?

16:41

How sick are you with how much better the European models are?

16:50

So, I'll go first and I'll just simply say, we do not know yet how much the track and the intensity.

16:58

Numerical guidance will improve with the hurricane analysis and forecast system.

17:03

That system is still under development and it has a number of gates and tests to undergo before we'll understand how much the forecast of the track and intensity will improve.

17:16

So I can't answer quantitatively your question at this time.

17:22

It's important to make sure that we base our decisions on the evidence that we see before us and the performance of the models.

17:29

So we're always striving to improve those metrics like track and intensity forecast. But at this stage of the development of the hurricane analysis forecast system, I can't give you those.

17:42

And Seth for my part of it, just my experience you look at you look at one hurricane, and you'll see one model perform well, and then the next hurricane and another model will perform well. And the real answer, honestly, is really the ensembles are amazing.

17:57

And, and if you think about looking at all the model data and having this ability with the new supercomputers to run ensembles faster and better, we ensembles most of the time with the humans, looking at that, it could be any individual model in any given time. So the ensembles is what I'm so excited about, being able to blend those together and being able to come up with a solution.

18:23

We're working hard to be able to do that, in the case of hurricanes, get out to seven days. So having the computing power and being able to look at that, reduce some of that error is gonna really help us extend that hurricane forecast with time.

18:41

OK, thank you, Ken, and Brian, for that. I have a question in the question box, which I'll read. This is Jenny with W L R N, Public radio in Miami. Well, these models help better forecast the flood risk of precipitation combined with storm surge and tropical systems. Thank you.

19:09

So that is certainly the intent. Because these systems are coupled systems.

19:14

It's a couple of these modeling systems, like the Hurricane Analysis Forecast System are going to couple the atmosphere with the ocean. So we will have wave predictions. We will have surge predictions the hurricane analysis and forecast this, and it provides the big picture of the hurricane system.

19:32

There are separate modeling systems that will handle inundation and storm surge models. All of these because we're improving the global system because we're improving the hurricane's system.

19:44

These modeling system improvements will reflect on improved forecasts of things like surge as these downstream systems absorb the improvements to their parent models.

20:02

OK, thank you, Brian. We have a hand raised from Michael Phillips with Weather Boy.

20:08

Michael, you're you're unmuted. Go ahead.

20:12

This is Michael Phillips with Weather Boy dot com. My question is for Ken Gram.

20:17

The other technology upgrade described today in recent years. NOAA also upgraded its data collection capabilities to that.

20:24

GOES-R series of weather satellites, as the new director of the National Weather Service. Are there other areas you believe the government should invest in to improve the accuracy of weather and climate forecasts for the public?

20:39

Jeff, I appreciate that question, and know it, and see what Brian says, as well.

20:45

Look, You gotta get data into the model, for the, to get the accuracy. I mean, you gotta get that, that starting point. The more accurate you are, on that starting point, the better the accuracy of the model.

20:57

So you know, a little bit off at the beginning could expand with time. So you think about the data. You think about the satellite data, and recently getting hurricane hunter data into the model. Studies are really showing that that aircraft data has made significant improvements in the track forecast and the intensity forecast with intensity somewhere between 15 to 20%. Increase in the accuracy of that intensity forecast will be aircraft data. So data the answer is you know, we keep looking at being able to have the data get into the system we need to continue to look at that and growing that maintaining what we have. So it's data.

21:36

I think any anybody would, meteorologists would always answer the more data, the better. So Brian, did I answer that, OK?

21:43

And the more data we can get in there, Again, the more accurate the beginning, the more we can get an accurate forecast on the model.

21:50

Every data makes its contribution to not only formulating a better initial condition for the models, but also helping us verify in the end how well we did?

22:01

This is a crucial step in driving where we want to improve our modeling system, so the more data, the better in, in my estimation. It takes some work to get it into the end of the models, through data assimulation. But that's part of our bread and butter.

22:19

OK, thank you. It looks like we have one more question, a follow-up from, let's see. Let me find him again, Dave, with the Fed scoop.

22:30

Your line is open.

22:32

Thanks! Yeah, I wanted to follow up and ask, I know that this is a task order award. And I'm curious if you can talk a little bit about any other task order awards that may be follow ons to this particular award. And, I also know that you awarded this in a bit of a unique way, and that you gave GDIT, a set amount of money and asked them to use all of it to make the system as good as possible. So, I'm curious if, when you come out with further task order awards that they will also be similar in that way.

23:05

Yeah, thank you for that question. So, so, yeah, So, we have a, as you mentioned, the, the overall blanket contract.

23:13

And, then we've done this first task order, award, what, what we've done in previous contracts.

23:21

What would, would be to have the, those stepping stones or those performance enhancements baked in at the front end of the contract.

23:32

So, we would require the, the, the integrator to come in and really guarantee price performance, and we were requiring them to project out 10 years into the future, so, So one of the major things that we did with this contract that was a major change from from previous contracts is that we, we really only

required the integrators to propose this first task order award. And that, that really leaves us open, And I'm, I'm actually really excited about that.

24:09

because I think it leaves us open, to...

24:12

Um, be able to look at what, what are experiences on the existing system?

24:20

Where we need to make improvements and balance in the computing system.

24:24

Or as different sort of, technologies evolve

24:30

We can, we can take advantage of those and not be really kinda strapped to that initial performance guests price performance guests. So in terms of what's coming next, this is the first phase.

24:45

We're really projecting to have a second phase, task order, on this, in the kinda 24 to 25 timeframe, to take care of the back half of the 10 year contract period.

25:00

So what we expect to do with that, we, we've actually left that wide open.

25:04

And so now that we've gone live, the, you know, we can celebrate for a moment and then that great staff that we talked about is really going to now start to dig in and think about kind of what the next steps are.

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And we're going to do that in conjunction with our integrator to ensure that, you know the ideas that we're formulating are consistent with

25:30

With what industry has in store and those trends take advantage of our integrator expertise and their knowledge of the marketplace and then incorporate those into the next ACE system. So, yes, we'll be working hand in hand.

25:47

24/25, kind of timeframe is the next big enhancement to look at.

25:52

Of course, if we have any new requirements that come about that are that are funded, um, That we're asked to do.

26:02

Then the contract does have the flexibility to light up computing enhancements at any moment in the contract.

26:13

Does that address what you're looking for?

26:18

I think he's muted, Dave, so we'll move on and he can certainly raise his hand if he has to follow up. So, let's go to the next. This is Glen, right, with Progressive News Network. Glenn is asking, what is the total cost and how soon before we will see improvements in forecasting?

26:45

So for, for total, per total cost, I'll address that. So, the, the overall contract itself has a ceiling value, kind of an overall value of five hundred and five point two million dollars.

27:00

The initial task order, um, amount is $150 million, which is consistent with the budget that we have available within the program each year, so over a five year period.

27:26

Brian, you guys?

27:28

Yeah, I just wanted to say in terms of the how soon. So if we're successful with the development of the hurricane analysis forecast system, that will be implemented for next summer's hurricane season, so in about a year from now.

27:42

But, even before that, we have upgrades scheduled for air quality, models for our wave prediction systems, both ocean going in and the Great Lakes.

27:55

And some minor upgrades to the global system that we're anticipating in the fall.

27:58

So, you should be seeing, in terms of the numerical guidance that we provide the forecasters, those will start improving in the fall.

28:11

Great, thank you. Let's move on. We have a question from Brandon Miller with CNN weather. Can you speak more to the climate modeling enhancements that this upgrade will bring? How much access will the Climate Modeling Community have versus day-to-day operational weather forecasting aspects?

28:33

So I can take a stab at that. So, as we know, this is a continuum that we're faced with though it has a continuum in terms of timescales for its prediction challenges.

28:46

So, we have the weather timescales.

28:48

We are building, under the unified forecast system a consistent set of modeling applications, They're all coupled, they're all ensemble based.

28:58

and we're anticipating that these new modeling systems will be used to go all the way out to multi-seasonal lead times.

29:11

And then it is at this point where we begin to worry about the climate change aspect and the decadal, and the longer timescales. And that's when you have to account for things in your models like changing greenhouse gas concentrations.

29:26

We don't need to worry about those at the weather scale, but you do need to worry about the climate scale.

29:30

But the goal here is to establish a modeling platform that is consistent across all of these timescales from weather all the way out to climate. And that is the basis of the work that we're doing in NOAA and with our research partners, both with other federal agencies, in the academic sector and even in the private sector.

29:54

OK, Thank you for that, Brian.

29:56

And now, the next question comes from Timothy, with Next Platform. Timothy, your line is open.

30:03

Hey, so, we're in the excess scale arrows. Congratulations, by the way, and getting triple.

30:08

I'm just thinking of, if you were dreaming.

30:12

And budget wasn't an issue because it, obviously is, but what could you do with a lot more computing power?

30:18

Because we obviously have it, but it's just budget constrained. And I'm just going to speak as an American citizen here.

30:25

I'd like us to spend a heck of a lot more money on the weather forecasting because I think the weather's changing faster than your models can keep up as an observation.

30:33

So I want you to keep up, so I think 12 petaflops is great.

30:37

I think 100 petaflops would have been more useful, if, any, any comments on that?

30:48

Being the greedy modeler that I am, I suppose, you know, imagine, imagine a computing platform that allowed you to run a sub kilometer global system that provides you a 10 day forecast in, say, an hour and then you can use that to simulate a number of ensemble members and to get a quantification of your confidence in the forecast.

31:14

These are kind of the idealistic integrations that we can dream of.

31:20

But to think about what it takes to do something like that, just a doubling of horizontal model resolution.

31:28

So right now the global models at 13 kilometers I wanted the global model to have a 6.5 kilometer horizontal resolution.

31:36

I would need eight times the computing that I have right now just in order to deliver the model simulation in the same amount of time that I do today.

31:46

So to get from 13 kilometers down to a one kilometer global model, I can't do that math in my head.

31:53

But you're certainly going to exascale and beyond in terms of the compute power that you need, do something like that. These are expensive modeling systems to run.

32:04

And that's just with today's models.

32:07

But there's a lot we don't understand about how the system works, and that's where our research partners come.

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They also need this level of computing in order to explore the way the Earth's system works.

32:17

And so for us to take what they discover and put them into the operational systems, it requires not only just a team effort in terms of the brainware, but a very, very large computing footprint to get to where I think we want to go.

32:35

OK, thanks for that, Brian. We have one more question in the question box that I'll read. This is from Seth. He's trying to hone in on specific examples.

32:48

of return to taxpayers that they're getting as a result of today's announcement. So he's, he wants to hold you guys to be very specific about changes in the forecast that people can expect as a result of today's announcement. So if you can address that, that would be great.

33:05

If not, we can take that and get back with Seth this afternoon.

33:15

The only thing I would add, is, you think about the the Hurricane Forecast.

33:21

I mean, we talk.

33:22

Know, some of you, and I've talked about it before. We talk in terms of evacuation, but also then not, evacuation is a huge factor. So the accuracy there with track and intensity improvements associated with that.

33:36

You think about not having to evacuate a major city. I think there's gonna be some return on investment there, and that's, you know, time will tell, and we'll get into the accuracy of the model, but I think about that frequently.

33:54

And I'll say, I think I'm going to say flat out upfront. I'm not going to be able to give you a quantitative assessment of what the modeling system that we implement operationally a few years from now is going to be able to achieve because it's still under development.

34:08

That being said, though, there are a couple of areas where I'm really excited that the additional computing capacity is going to let us explore more.

34:16

The first is in moving from deterministic models to ensemble based systems.

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Not only does this give us a quantitative assessment of our confidence in the numerical output and some quantification of the certainty in our numerical guidance, but it also gives, gives the forecaster an ability to assess probabilistically what might happen and to convey that information to the public.

34:42

So so being able to provide probabilistic information to the public through the use of ensemble based modeling systems, I think this is going to be a very exciting change here coming up. To build on that, Brian as well is

35:00

Now when you think about probabilistic, we're not really talking about necessarily saying 20 or 30% chance of something happening, we're talking about providing an educated and scientific reasonable worst-case scenario where there's only a like a 10% exceedance. There's only a 10% chance of this worst-case scenario being exceeded. There's some decision making that could really be taken from that. That, that's a huge thing, that I think we're going to look at when it comes to improvements being able to really look at that ensemble approach and the probabilistic forecast.

35:36

OK, thank you for that, and I see no further questions. So I would like to thank everyone for joining us today, And this concludes the webinar. Remember that the news releases available on NOAA.gov. I believe, Maureen, pop the link into the chat window here for the webinar. If you have further questions, feel free to call or email me. I'm Susan, I'm at (202) 834-5235 susan.buchanan@NOAA .gov. And thanks again. You may disconnect.

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