OPUS Projects User Forum
July 12, 2016

Questions submitted prior to the webinar

Question 1

When selecting CORS for a hub/spoke network I spend quite a bit of time ensuring the CORS short term time series matches well to the published position. Some might say I'm obsessive. I have found that carefully selecting these greatly improves the precision of the solutions. Am I correct in selecting CORS this way or am I biasing my survey? As a side note I tend to pick CORS within 100 miles that geometrically surround the survey site (if possible) and often select one very distant CORS (hundreds of miles) to improve tropospheric modeling.

Answer: Taking time to research the CORS station(s) you use as constraints and/or hubs for processing and/or adjusting your data is time well spent. Making sure that the CORS station is reliable, and apparently stable is critical to your data processing. The age of the CORS is also important as older (>3 years of data prior to the last MYCS) means that there is a measured velocity for that station. I do not believe that you are imparting any bias by doing this other than by aligning your post-processed coordinates as best you can with the NSRS. I know it seems counter intuitive, but for processing GNSS data, the distribution of CORS is of little concern. The geometry that matters most is that of the satellites. With that said, when adjusting your data to the NSRS, having a distribution of CORS that reflects best average of the local area helps to insure that your final coordinates are as consistent as possible with the NSRS. Recall that NGS recommends that the distance from project points to the Hub be less than 100 km which, it appears, you already try to do. We also recommend that a distant CORS (100's of km, say 500 or more) be included for tropospheric decorrelation. - Martin
See ftp://geodesy.noaa.gov/pub/opus-projects/OPUS%20Projects%20Processing%20Guidance%20-%201a.pdf

Question 2

Is there a way to remove a CORS Station from a project? Some of the data that I have for one project has a bad XYZ in the header of the RINEX file. This causes OPUS to use 3 CORS Stations in Eastern Europe. I would like to be able to delete these from the project so that I don't have to mark them as do not use each time I process.

Answer: No, there is no way for a user to delete CORS from a project at this time. One can, however, exclude them in session processing. It sounds like the author knows how to do this, but for others, this can be done by unchecking the box to the far left of the line of the undesired mark on the session processing setup form.   If they are not included in the session processing, they will never appear in the network adjustments.

As for the "unwanted" RINEX, OPUS completes an intermediate series of solutions improving the coordinates for the mark each time. If OPUS has selected CORS a hemisphere away, some other issue has occurred. Please send a short description and the file causing the problem to the OPUS team (ngs.opus@noaa.gov). - Schenewerk

Question 3

When you are doing an adjustment is there a way to recall a previous adjustment, make a few changes and run it again with a new name. For example, I have run my Free Adjustment with 1 CORS Station fixed in Latitude, Longitude, and Elevation and am satisfied with the results. Now I want to fix a second point in Horizontal only. I would like to be able to call up free, edit the parameters to fix my second station in Horizontal, save it as FIX_H_2, then run that adjustment, and continue on from there until I have FIX_H_Elep_99 and have fixed all of the known points that I want to hold fixed.

Answer: No, there is no way to initialize the adjustment setup form a previous adjustment at this time.
- Schenewerk

Question 4

What is the practical limit for the size of a project. I have a science project with 250+ days of 24 hour files on a station. When I submitted data to the project, I was sending Zip files containing RINEX files to OPUS about 10 days at a time. At some point, it has overloaded the system and I can get it to process any more data. Have I reached the limit of projects or have I broken it some other way? What is the practical limit for the size of a project. I have a science project with 250+ days of 24 hour files on a station. When I submitted data to the project, I was sending Zip files containing RINEX files to OPUS about 10 days at a time. At some point, it has overloaded the system and I can get it to process any more data. Have I reached the limit of projects or have I broken it some other way?

Answer: As the author implies, there are practical limits for a project to be manipulated in OPUS Projects (see training introductory slide 28 titled "Limitations": ftp://geodesy.noaa.gov/pub/opus-projects/intro.pdf). There is no easy way to explicitly quantify this beyond saying don't let the project's size or complexity grow too large. If a project has more than a few hundred marks + CORS (lots of dots), or a project has more than a few dozen session solutions and network adjustments (lots of lines), the project just cannot display itself. If you think this is going to happen, sub-divide the project into logical pieces by space or time.

Why can't the project display itself? It's a matter of Internet security. When a user requests a project web page, the web server asks itself, do I have the permission, time and resources to complete this request. If it thinks it does, it then starts talking to the project. When a request for a web page arrives, the project first scans itself to see if the web page instructions must be recreated because something new has happened. For some (but not all) of these happenings, new information must be retrieved or new values computed meaning new web page instructions must be created. If all this takes the web server more than few minutes to complete, it will time out because it fears something nefarious might be going on. Even if the web server does post the web page to the user's browser, the browser must then interpret the instructions to display the web page, retrieve any supporting information, send instructions to Google™ to put mark icons and lines on the map, ask for and get the map, and so on. If the browser has to work on this for more than a minute or so it fears something nefarious might be going on and will start asking if it should terminate or simply stop trying to display the web page. Lastly, and this is increasingly rare with the rapid pace of hardware improvements, but browsers are pretty big programs just in themselves. If the web page data makes the browser bigger than the computer can handle, the computer will terminate the browser. In short, if it takes too long, something in the chain will say "I don't want to do this." - Schenewerk

Question 5
Is there a way to fix the elevation of a CORS Station in the adjustment? Most of our CORS Stations have a 1st or 2nd Order Orthometric Height on the ARP. It seems like the adjustment is just using the published Ellipsoid Height which can be off by a few mm.
Answer: There is no way to constrain the orthometric height for a CORS station that has been introduced to the project through the OPUS upload. I do understand that some CORS have been leveled to, and therefore could be considered as vertical control. One could load CORS data to the project as if the CORS was a project mark. If this is done then that CORS can be treated like any other project mark. - Martin

Question 6
I would like to compute very accurate coordinates for some permanent base stations. What would be the minimum amount of 24 hour files needed to accomplish this. I have several years of data for these stations
Answer: First, we might need to define "very accurate". Second, we might need to define accurate in what sense? Accurate to a specific set of coordinates of local CORS stations? Accurate to the dynamic reference frame, i.e., to include velocities? I would not be comfortable specifying a minimum number of 24 hour files needed. I guess if I had several years of data, I would use all of it, or at least a large percentage that spans the entire period. If I were establishing a new station, then I would continue to collect and process data for at least a month or longer to determine if I had reached a stable position, and that the standard deviation met my criteria. - Martin

Question 7
I would like the ability to Upload data to multiple projects with one submission. I am running what I call a Poor Man's CORS Station at one of our projects. It is an OPUS X90D GPS receiver on a stable mount with a deep cycle battery and a charger. We manually download it once a month or more often if needed. If we are doing a small project in that area and observe on Bench Marks, I would like to be able to load the files from the Bench Marks into my project for the Poor Man's CORS, and into the small project without having to submit it to OPUS twice.
Answer: This request is unlikely to be fulfilled. It makes it too easy to attack our web server. – Schenewerk

Question 8
When uploading data to OPUS Projects without a profile in effect, after the data upload the user is presented with an opportunity to enter a mark description. However, if a profile is in effect, the description page doesn't appear, the user is take directly to the "upload successful" page.
Answer: I was not aware of this issue, but have confirmed it. I'll pass this onto the OPUS team and we'll look into it. As a point of clarification, you should be offered the opportunity to enter a description only once per mark (as identified by the first four characters of the uploaded file name). - Schenewerk

Question 9
How can I delete a mark that has no sessions associated with it? I uploaded a bunch of files from a continuous station using the standard gzip file format, and most of them came into the project with the correct station name. But a few of them were assigned the name "a001" instead. I reassociated these files with the correct mark name, but a001 persists in my project. Not a big deal, but a distraction,

especially for reports.

Answer: First, the inability to remove a mark with no data files associated with it. This is a known issue. A user can delete a mark entirely from the mark's web page, but a user can only access a mark's web page if the mark has data. By transferring all of a mark's data files to other marks, then one cannot later access the mark's web page to delete it. Thus it becomes a "true" zombie.

We anticipated that a mark might have files incorrectly associated it, but assumed that only some of the files would need to be moved. Some would stay and the mark would be renamed appropriately. However, we now realize that there are occasions where folks want to transfer all data files. This is on the todo list but has a low priority.

Second, the a001 mark ID. Recall that the RINEX file naming convention requires the first four characters of the file name to be the four-character ID of the mark where the data were collected. OPUS-Projects tries to assign four-character mark IDs reasonably based upon this convention for file names. However, this convention is sometimes broken making it possible to have files that appear to come from one mark but actually belong to another. For example, there are cases where the last four digits of the receiver's serial number, which the receiver always knows, are used if it hasn't been told the mark ID. And, of course, people make mistakes.

If a user has uploaded files to a project (but hasn't accessed the project) and at least two of the files appear to belong to the same location by their OPUS solution positions, but their implied mark IDs names disagree, then OPUS-Projects will assign a "neutral" name starting with a001 (assuming it hasn't already been used. If it has been used, then next will be a002, a003, etc.). - Schenewerk

Question 10
Similarly, I have a session that's basically a duplicate of another. I deleted it on the Sessions page, but it still shows up on the Manager's page.

Answer: There are three types of objects that will be displayed on the project manager's web page:
- ° <u>sessions</u>: these are groups of marks that were occupied simultaneously. No baselines. No processing results. These are defined by OPUS-Projects and can only be modified by the addition/removal of data.
- ° <u>session solutions</u>: as the name states, these are processing solutions of individual sessions. Because each solution is associated with a session, usually the session solution has a similar name to the session. But be careful! The session solution names are just names. You can name sessions now in a way that will confuse you later. It is okay to "play", but don't keep sessions solutions for days to which you upload or plan to upload more data later.
- ° <u>network adjustments</u>: solutions of groups of session solutions. Because of their naming, not really pertinent to this discussion.

How can you tell a session from a session solution?
Session Solution names supersede session names, so you can make it more difficult than it needs to be.
1) Session solutions always have a color coding bar below their names in the "Sessions & Solutions" table at the bottom of the manager's web page.
2) If the "All Session Solutions" option is selected on the manager's page (pull-down menu above-left of the map), only that session solution's baselines are shown when the mouse rolls over a session solution name.

Question 11:
The whole Profile thing is kind of opaque. As I understand it, once I set my profile those parameters are used until I delete it, but since I work with different groups of antennas and CORS, I often need to reset it. But I don't know if it needs resetting if I can't see it, and near as I can tell the interface doesn't show me what parameters are in place. Having to reset it to be sure that it isn't set to the wrong parameters kind of defeats the purpose. Can the interface be altered to display the settings on the upload page?
Answer: First: don't use the profile in OPUS.

Second: It is unlikely that we will act upon your suggestion. Trust me; the OPUS Oversight Committee has talked about this more than anyone would probably believe. Amazingly enough, this involves Internet security.

As the profile works now, we do not allow our web server to write to places (disk space) where we "work" for security reasons. We only allow it to write to a temporary storage directory. So your profile can only be created/modified "after the fact," that is after you've submitted your upload, so another program can check it. We do allow the web server to read from some places where we work so, in principle, we could "pop-up" reminders about your profile but, for this and similar applications, we're not allowed to do so for security reasons. 1) An evil-doer can randomly insert email addresses and when one pops up profile information, he/she/it has confirmed a working email address. 2) An evil-doer can insert email address and know something about you from the information that pops up.

As the profile should work, all these issues go away if we use cookies. We store your information on your computer where security for it is your business and nobody else can get to it unless they can access your computer. But for decades, (I was told) federal agencies were not allowed to use cookies because they were considered intrusive - feds writing something to your disk - even though they were doing it at your request - was verboten. The feds use cookies now (I'm pretty sure), but it is still considered intrusive so (I think) we have to create notifications, reminders and opt-outs and, generally, it is still frowned upon so NGS doesn't use cookies (or haven't so far as I know). - Schenewerk

Question 12
I recall a recommendation not to use the Tri setting over the CORS setting. Can someone elaborate on this? Maybe I'm stuck in terrestrial thinking, but I like to see adjacent stations processed together rather than as a bunch of "sideshots" from different CORS.
Answer: The answer to this question has its roots in the old argument of trivial vs non trivial or dependent vs independent baselines. Remember that for any observation session with n number of receivers, there are n-1 non trivial baselines. The data from each of the n receivers is used to produce those baselines and hence the coordinates of the stations the receivers are sitting on. Using that data again to produce additional baselines would be very similar to locating two points with a total station, then using the inversed distance between them as an observation.
Within the PAGES software that is used to process data in OP, the non trivial vectors are computed as well as the correlations between all stations. So even though you only see the non trivial baselines on your screen, the remaining correlations exist.

If one were to compute all possible baselines, where that number is represented by n(n-1)/2 the resulting coordinates would be the virtually the same as if only the non-trivial baselines were processed. However, when these vectors are taken to the least squares adjustment, the degrees of freedom has been artificially inflated to reflect n(n-1)/2 measurements. This makes it look like you have many more observations than you really do, and therefore the observation weighting is overly optimistic. The

coordinates would be essentially the same but the statistics would give you more confidence in the answer than was warranted. This could be accounted for within the least squares solution by manipulating the weighting.

The Tri method (Delaunay triangulation) produces neither n-1 nor n(n-1)/2 baselines. Though adjustments done directly out of OP (GPSCOM) on a network processed using Tri will yield acceptable coordinates, baselines computed in this manner will not work within the NGS ADJUST software, which will be replacing GPSCOM in the next version of OP. The next version of OP will not include the Tri network design option. - Martin

Question 13:
I have a procedural / conceptual question. In the session processing we did in class we left the hub station unconstrained and used normal constraints on the surrounding CORS except for the remote COS*[sic]*. Dr. Mader in his Last Advice in "Suggested Guidance for OPUS Projects Processing" states: "Let the data tell you the position, not the Data Base." In that spirit, would it not be better to constrain only one CORS and let the GPS observations determine the orientation and scale of the baselines? Constraining only one CORS would reduce the influence of the Data Base (i.e. the CORS coordinates) on the orientation and scale of the baselines. Connections to the NSRS would then be made in the adjustment phase. Using this scheme, the network adjustment would also confirm the conformance between the reference frame as realized by the satellite coordinates and the reference frame as realized by the CORS.
Answer: Right ideas, but possibly the wrong experiment given the purpose of OPUS.
As the author suggests, because the satellite positions are fixed in this style of processing, the reference frame is (over) specified. Thus, for precise point positioning for example, no mark coordinates constraints need to be provided. However, because the OPUS-Projects processing engine, PAGES, uses double-difference observables, the orientation of the frame is undetermined so additional unknowns, the coordinates of one CORS in the author's experiment, need to be fixed.
In point of fact, many of you do this to look for processing blunders. With these (near) minimal constraints, the marks are free in the solution to find their locations relative to each other and the satellites as the author suggests. If one or more marks diverge significantly from accepted values, a blunder in the processing for that mark is assumed.

However, that experiment is very sensitive to errors in the a priori information about and data from the constrained mark. Almost literally, if the constrained mark's coordinates are in error by, say, 1 cm, all estimate coordinates will be in similarly in error by 1 cm. The CORS coordinates are good, but not perfect so this is a real possibility. Fortunately, because the CORS coordinates were determined in a single adjustment, there is hope for and evidence that those imperfections are random (at least in the network-wide sense). As with any random error, more averages to zero.

Secondly the author's experiment is actually sensing the instantaneous realization of the IGb08. Unmodeled local and global effects come (weakly) into play. Colloquially, the frame "jitters" around a mean, and can include small translations, rotations and tilts of your local network. The transformation from the IGb08 to the NAD 83(2011)/NAVD 88 is based on the long-term mean difference between those frames which cannot account for this "jitter", so the experiment's results will "jitter" too. These "jitters" will "average away" in the final adjustment, but can make quality controlling the session solutions more challenging. One accepted way to try to suppress this "jitter" is to over constrain the problem, i.e. constrain more than one mark.

Perhaps the best bottom line is the information offered in the "OPUS Projects Processing Guidance": if you want to find the local, relative positions between marks, perform a minimally constrained adjustment. However, if you want to find their absolute positions, i.e. propagate the NSRS to marks, carefully evaluate, include and constrain multiple marks to known, published positions in the NSRS. Certainly the latter should be done in the final adjustment, but may have benefits in the session processing - Schenewerk

Question 14:
Please discuss the strategy of including in a project a distant CORS for aiding in tropo modeling. Specifically...briefly, what is the processing/computational "mechanism" by which this works?
Answer: The GPS signals are affected by passing through the neutral atmosphere - what we generally call the tropo, short for troposphere which is the densest part of the atmosphere near the surface of the Earth where most of the water vapor resides - in ways that we understand broadly, but never in detail. Therefore, we can use the GPS signals themselves to correct those signals.
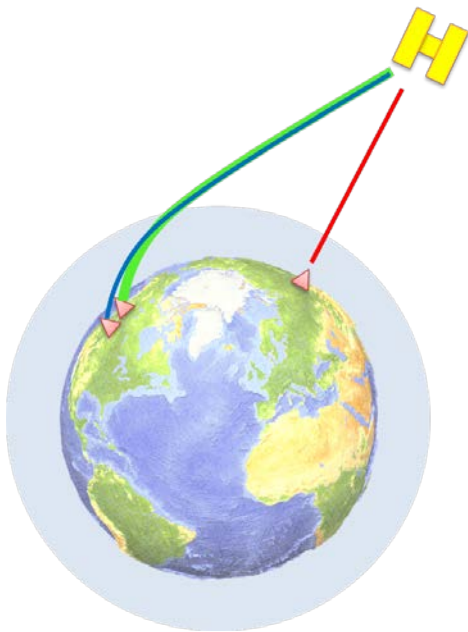
Unfortunately, because of the way OPUS processes the data, one mark relative to another mark, if the tropo effects on the signals from two marks are very similar, it can't tell from the GPS data exactly which mark is suffering which effect. If it guesses wrong, this introduces a systematic error in the results. More formally, we're introducing almost identical rows in the solution matrix whose results cannot be reliably discriminated by the numerical tools in use.

So how can we deal with this? One way is on a case by case basis. But then you, the users, have to understand the circumstances. We don't automate this for you because what might work well for marks up to 20 km apart in the high plains, would only work for marks up to 10 km apart on the coast where there is a chance of much more humidity, or up to only 5 km apart in the mountains where one mark might be down in a valley and the other up on a mountain.

Another way is to include a mark whose tropo effects are guaranteed to be so different from the others that we can always tell where the effects belong (see figure below or "GNSS Background for OPUS-Projects"). There are CORS "everywhere", so just include a distant CORS (see figure below). The scale factor for geometric and atmospheric effects is no more than tens of kilometers, so including a CORS hundreds of kilometers away guarantees that the tropo effects there cannot be so similar as to corrupt the results. In point of fact, the first option mentioned above can work better in some case, but the second works well in all cases. – Schenewerk

- does the benefit result from the "distant CORS" simply being geographically removed/distant from the project OR is it instead from the "distant CORS" (likely) being under different tropo conditions than the project marks? (realizing that distance and differing conditions likely go hand-in-hand)
Both. The tropo at the distant mark is unlikely to be as identical as two marks a few kilometers apart. Even if it is by chance, the path that the signals have to travel through to get to the remote mark (the geometry) must be different. - Schenewerk

- how distant (and perhaps in what direction (e.g. same approximate latitude?)) should the "distant CORS" be from the project area?

The "GNSS Background for OPUS-Projects" suggests >1000 km. That is probably overkill, but certainly > 100 km. Orientation from the project (azimuth) is a secondary concern. - Schenewerk
- how is the "distant CORS" configured in the OP project processing/adjustment (e.g. should it be constrained in processing and unconstrained in adjustment? does it even need to be included in the final adjustment?)

"Suggested Guidance for OPUS Projects Processing" suggests constraining all CORS. In reality, constraining the distant CORS can be considered optional. - Schenewerk
- are there any other considerations in selecting a "distant CORS"?
Know your CORS - not just the distant CORS. CORS are electro-mechanical devices and, therefore, imperfect. All CORS should be evaluated for "good behavior". Don't pick a distant CORS suffering weather conditions in which you would not survey, e.g. in a heavy rain, thunderstorm or heavy snow or ice. - Schenewerk

Questions Submitted During the Webinar

Q: Regarding Q6: Long time spans are problematic because the weighted mean time is used, which "smears" the coordinates. It's not just a project size problem; it's a limitation of GPSCOM. Is there a recommended max time span in OP? I expect the problem will be substantially reduced when/if move to ADJUST with HTDP applied to the vectors. Does all this sound correct?
A: What the author suggests is correct although nothing is quite as simple as we might hope. OPUS-Projects does report the IGS08 coordinates for the non-CORS at the data-weighted mean time, but that is the data-weighted mean time by mark, not for the entire projects. To try to clarify this by example: supposed you have a project that runs from January 1 to December 31. In this project, one mark is occupied the first three days of January only; another is occupied only the last three days of December only. The data-weighted mean epoch for the former will be January 2; for the latter, December 30; not July 1 for both. However, if you have a mark that is occupied the first three days of January and the last three days of December, its data-weighted mean epoch will be July 1.

The more fundamental issue is that OPUS-Projects does not apply a velocity for non-CORS marks (plate tectonic movement, subsidence, etc.) during the processing. This creates the smearing for occupations repeated over long (many weeks or months) periods that the author mentions. With the assumed zero velocities for non-CORS, the data-weighted mean "averaging" done is a reasonable response, but including a (correct) velocity is better. Thus a potential advantage of ADJUST with HTDP suggested by the author. HTDP will accept measured velocities or apply a velocity model for areas where the NAD 83 is defined. Other reasonable velocity models exist and can be manually input into HTDP. These models almost invariably assume zero vertical velocities, but are otherwise quite good. Is there a recommended max time span in OP? First (except in extraordinary circumstances) occupations or repeated occupations of individual marks spanning up to a few weeks should raise no concerns even if the entire survey project takes much longer. Processing mark occupations of months to years should be undertaken with increasing caution because while the results will be formally correct, they may be increasingly difficult to interpret. - Schenewerk

Q: Should you constrain hub during session processing?

A: Yes. It is not an absolute requirement, but it is our recommendation - with the following exception. There are occasions when the hub that has been selected might not have PUBLISHED coordinates relative to the National Spatial Reference System (NSRS). This could occur for instance due to the distance from ones project/session to the nearest National CORS. Remember that we recommend keeping the hub-to-station distance under 100km. Also remember that we recommend that the same hub be used in all sessions. If these conditions cannot be met, then the alternative is to establish a station with the intent of making it a project hub. NGS often designates these stations as Temporary CORS, as they tend to operate 24/7 during the project. It is imperative that the hub station have high quality data, and as such, these stations are established in a favorable GPS environment to maximize the quality and quantity of data collected. These stations are then used as hubs in the session processing but their coordinates are not constrained since their positions are not published in the NSRS. Instead, the coordinates of one of the surrounding CORS will be used as the constraint. (after its position/stability has been researched) - Martin

Q: When I process a Session and click "Perform Processing", it seems to do the processing twice. I get a series of emails "parseQueuedSessionJob abort". I'll eventually get a solution, but it won't show up on my Manager's Page because it had started reprocessing and I'll finally receive a second email with the session solution. Is this a known bug?

A: This is a known issue. There are some browser versions that, to our web server, appear to "double click". The most recent incidents that I'm aware of were associated with some versions of Internet Explorer™ 10. I thought this issue had cleared with IE 11 and, historically, it is certainly not limited to IE. If this becomes overly burdensome, your only option at this time is to try another browser or a different version of your preferred browser. - Schenewerk

Q: Also when using a profile, one needs to be careful about the HI. If there is an HI in the profile, that takes precedence over any HI entered on the data entry page.

A: I must respectfully disagree. The HI or "ARP Height" entered on the upload page should always be used by OPUS. The same is true for the antenna type. Both Dan and I confirmed this before answering this question. I do recall an OPUS bug report about this, but that was some time ago and has been resolved. - Schenewerk

Q: Why do you always recommend adding a very distant CORS to "improve tropospheric modeling"? This *always* degrades my solution, not improves it.

A: See the response to Question 14 related content. The bottom line is that except in some very special circumstances, some sort of tropospheric modeling must be done to eliminate mark height biases that occur because of unavoidable inaccuracies in the a priori tropospheric model. As we suggest in the answer to Question 14, there are various strategies to deal with this issue, but then you, the users, would have to understand the circumstances breaking the simplicity of the "black box" that is OPUS. We don't automate this for you because it is too variable: what might work well for marks up to 20 km apart in some circumstances wouldn't be appropriate for spacings of even a few km in others. However, one strategy that always works (although, like every "one size fits all" strategy, rarely in the most optimal way possible) is to include a mark whose tropo signal is guaranteed to be different from the marks in you project. This is "easy" to do: just include a distant CORS. – Schenewerk

Q: Support for Ht Mod type projects? Shorter, directly connected baselines with shorter occupation times. Would probably require OPUS-
A: A project is underway to extend OPUS-Projects to submit results for publication to the Integrated Database. This includes support for activities like Ht Mod and FAA airport surveys; however, whether those extensions will be included in the initial release of this project, scheduled for early 2017, is unclear at this time. This project is informally known as "OP to IDB" and more information is available upon request. - Schenewerk

Q: So maybe the workaround is to upload a non-project data file with the a001 filename, then delete the mark. (This comment was made in response to question 9 above)
A: This is a clever idea, but may not be easily done if you've opted to group data files to marks by "Position". In this case, the OPUS-S solution for the "non-project data file" would have to produce coordinates within the preferred limit for grouping. This idea does suggest two variants:
   1. One could re-upload one of the files originally associated with the a001 mark, but first change the first four characters of its filename so that it doesn't displace the original file now transferred to another mark. Then, as the author implies, mark a001 would have a data file associated with it, its web page could be accessed and the mark, with its bogus data file, deleted from the project.
   2. If no session processing has been performed, one could opt to group data files by "Mark ID" rather than "Position" (see "Mark Co-location Definition" in the project preferences), then upload a file starting with the "a001" string. Here, again, mark a001 would then have a data file associated with it and could be deleted from the project. The project preferences should be reset to grouping by "Position" as a last step. However, be aware that this may result in other unwanted mark IDs, so option 1, if it works, is preferred.
  - Schenewerk

Q: When field crews load stations during field efforts, stations obviously need to be processed with the young ephemeris files. Will there be a way to apply the precise ephemeris to the project/observations at a later date?
A: Yes. If you wait for a day or so to process the baselines (session processing), the rapid ephemeris would be available. If you waited a couple weeks, the final precise ephemeris would be available. The initial OPUS solution, though useful for evaluating the quality of the data and providing an initial position, is not what OPUS-Projects uses for the final solutions. OPUS-Projects will use the results of session processing for the final solutions. So it really does not matter which ephemeris is used for the initial upload, only what is used in the session processing, which can be controlled by how long you wait to do that processing. - Martin

Q: When I upload to OPUS, am [I] locked into the ephemeris that was available at the time, or will OP always use the best available?
A: Yes and yes. For the initial OPUS solution, your data will be processed using the best available ephemeris at that time. The only wat to influence this would be to wait some length of time before uploading the data. Typically the Rapid Precise ephemeris is available within 24 hours and the Final Precise ephemeris is available in 14 days. The ephemeris that is used for processing within OPUS-Projects (session processing) will always be the best available. Within project preferences, one can choose "Precise" or "Best Available". This simply sets a flag condition. If precise is selected, and the final precise ephemeris is not available, the data will be processed using the best available ephemeris, but will flag the solution that it did not meet the project preferences. - Martin

Q: RS for initial mark occupation processing.
A: Allowing OPUS-RS uploads (data files of 15 min to 2 hrs in duration) to proceed into OPUS-Projects is unlikely in the foreseeable future. Although OPUS-RS is very reliable, that reliability imposes additional requirements that are in conflict with the current OPUS-Projects design. There is R&D underway to enable the use of shorter data spans in OPUS-Projects, but near 100% reliability of the results, essential for "black box" tools like OPUS, has not been demonstrated yet; therefore, there is no schedule set for deployment. - Schenewerk

Q: When are you going to link OPUS Projects and OPUS Shared Solutions?
A: There are projects in place in NGS to facilitate publication to the NGS Integrated Database and to OPUS-Sharing. The project facilitating publication to the NGS Integrated Database is scheduled to deploy a beta version (publically available for pubic evaluation and comment) of OPUS-Projects by spring of next year. The project to develop the capability to share solutions is being organized and has no set schedule at this time. - Schenewerk

Q: Is there an API or SDK for uploading to OPUS and OPUS Project using my own program instead of using the OPUS web page?
A: No. You can upload several files simultaneously to OPUS by bundling them in a format such as Zip (https://en.wikipedia.org/wiki/Zip_(file_format)). You still use the web interface, but select the bundled file rather than a single data file. This implies that all the included data must use the same antenna type and ARP height. - Schenewerk

Q: Support for multi-GNSS?
A: Not at this time, and although NGS has activities underway to develop these tools, it will be quite some time before those tools are operationally deployed. - Schenewerk