Frequently Asked Questions (FAQ)

Organoid Cytomorphic Intelligence Resulting from Convergent Understanding and Information Transfer (O-Circuit) Program

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Revision 2 – 05/12/2026

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General Questions

[Q01]: Are proposers allowed to discuss specifics of their proposal with Lawrence Livermore National Laboratory (LLNL)?

[A]: Offerors should not reach out to LLNL during the solicitation period. Post-awardees may reach out to LLNL (the Government T&E Team) as described in the Program Solicitation (PS).

[Q02]: How does DARPA handle Freedom of Information Act (FOIA) requests, especially when it comes to proposal information?

[A]: Please refer to https://www.darpa.mil/policies/foia for information on how DARPA handles FOIA requests.

[Q03]: Are you steering towards an isolated brain in a bioreactor?

[A]: No, the O-Circuit program does not seek to build a brain.

[Q04]: Is there a path for translating this from a DARPA program and moving it to the warfighter?

[A]: DARPA is always interested in transition, but there are no concrete transition plans at this moment. Program progress will determine the transition pathway.

Program Solicitation (PS) Questions (DARPA-PS-26-28)

Technical

[Q01]: Are there particular aspects of the relatively low complexity of standard neural cultures relative to mammalian or insect brains (e.g., cell number, cell diversity, connectivity patterns, architectural organization, etc.) that could be addressed and which would be favored as solutions?

[A]: No specific enhancements to neural cultures are *a priori* favored as solutions. As described in Section 1.2.1 of the PS, proposals must include clear rationales for why their proposed techniques will dramatically improve Biological Processing Unit (BPU) computational learning and memory capabilities. These rationales should include both the conceptual basis of the improvement (e.g., the cell biology and/or neural architecture that is inducing or maintaining useful plasticity and learning), as well as estimates on how much improvement may be expected from the proposed mechanisms.

[Q02]: Is the program interested in silica-based solutions?

[A]: Purely in silica solutions are out of scope for O-Circuit (see Section 1.2.3 in the PS). Solutions that utilize bio-based sensors and computing but which are supported by silica hardware (e.g. microelectrode arrays for neural I/O) are within bounds, although proposals that maximize biological processing and minimize conventional *in silico* computing (for both TA1 and TA2) will be favored (see Section 1.2.2 in the PS)

[Q03]: For TA2, can a silicon processor interpret the odorant signatures returned by the receptor array and derive a directional output (direction, navigation, etc), or must directional outputs come from the BPU itself?

[A]: As described in the program solicitation (Section 1.2.2), some level of in silico signal processing/decoding can be used as part of the Sense-Compute-Action processing pipeline and should be specified. However, the core information that directs the drone must be provided by the BPU (i.e., raw neural activity patterns that are then processed via an onboard or offboard computer into commands sent to the drone's navigation system).

[Q04]: What is the expected lifetime for the TA2 biological sensor array?

[A]: There is no specific minimum lifetime of the TA2 biological sensor array. For example, swapable module solutions are in scope to address longevity. The only specific requirement is that the array persists for the duration of the Capability Demonstrations (and preparatory training, etc.).

[Q05]: Does TA2 consider only drones for Sense–Compute–Action system evaluation, or can legged robots or other robotic models also be included?

[A]: Details of both the aerial and ground-based drone that will be used for the T&E metrics assessment will be released as part of the Oral Proposal Package instructions. Other platforms can be used by performers during their internal development processes, but only the T&E specified platforms will be used as part of the Capability Demonstrations.

[Q06]: Must the olfactory sensor array be biologically connected to the BPU, or can there be an *in silico* connection between them?

[A]: Electrical (or other artificial) connections between the BPU and the olfactory sensor array are in scope, although solutions are preferred that minimize the *in silico* needs of the approach.

[Q07]: Olfactory receptor binding can be irreversible, are there requirements on how/how often receptor array refreshing should occur/how long lasting the array must be?

[A]: For the gradient descent navigation task, the receptor sensor array must be capable of navigating a dynamic gradient course (see Table 1 in the PS). For testing the full panel of 50-100 odorants there is no specific requirement on how often/how long the receptor array can remain active nor of the refresh rate, although the sensor array/BPU system used to detect the odorant panel must be the same design as that used in the gradient descent navigation task.

[Q08]: How is the Ms. Pac-Man score calculated for metric evaluation? Per-game average, best of N, cumulative session score? How many games constitute a meaningful evaluation?

[A]: The metric (for Phase 1) is an in-game score of 2,200 with 24 hours of memory. The game will be run in real time with normal rules applied. Performers should assess the repeatability of their reported 'Ms. Pac-Man' score and compare it to scoring achieved by an untrained BPU using methods that are experimentally and scientifically valid. More information on BPU metric assessment can be found in Section 1.5.3 of the PS.

[Q09]: Are you more interested in defining biologically how we use neurocultures?

[A]: It is up to the proposer to define how neurocultures are used, but the response should include how the approach supports achievement of the program metrics.

[Q10]: Does the olfactory receptor have to be alive?

[A]: No. It is only required that the sensing components of the olfactory sensor array be biological (e.g., GPCRs, ion gated channels, two-component systems, etc.), which could either be integrated within a living or non-living cell/material.

[Q11]: What should the interface be between the olfactory sensor array and the BPU? Is there a standardized interface?

[A]: We prefer it to be biological although there is no standardized interface. Please see Section 1.2.2 of the PS for more information.

[Q12]: Can the TA2 sensor array and the BPU be integrated in the same architecture? Or can they be separated?
[A]: They can be separated, although approaches could be strengthened by having them in the same architecture (i.e., biologically integrated)

[Q13]: Is there a power budget for TA2?
[A]: No. However, teams will be expected to report on the life-support system(s) energy usage and dimensions in the end-of-phase reports.

[Q14]: Are there constraints on Animal Subject Research?
[A]: Animal Subject Research (ASR) is within scope of this program and must be approved by the performer's Institutional Animal Care and Use Committee (IACUC) and the US. Army Medical Research & Development Command's Animal Care and Use Review Office (ACURO). IACUC approval is required before submission to ACURO. For more information, please see https://www.darpa.mil/policies/human-animal-research

[Q15]: Who is responsible for building the interface between the performer system and the T&E simulation environment (for TA1) and for the drone (for TA2)? The performer or the T&E team?
[A]: The performer is responsible for building the interface, whether hardware, software, or both, between the performer system and the T&E test environment (TA1) and drone platform (TA2).

[Q16]: Is there a required amount of complexity for the neural system? If so, how is complexity defined? Requirements on the cell type(s)?
[A]: There is no specifically required complexity and no requirements on cell type. Proposers should give rationales for why they believe their approach complexity and cell type selection will be sufficient to achieve the program goals.

[Q17]: What are the bounds of the system for measuring SWaP?
[A]: For TA1, the energy requirement metric is based simply on the nutrients consumed by the BPU. Performers are expected to give readouts on the overall SWaP of the system (for both TA1 and TA2), but there is no specific metric.

[Q18]: Are the BPUs for TA1 and TA2 expected to be different? To have differing levels of complexity or capability?
[A]: The BPUs for TA1 are expected to be advanced from the state-of-the-art (SOA), while the BPUs for TA2 do not have a complexity requirement (i.e., they could be below, at, or advanced from the SOA).

[Q19]: Are multiple cellular cultures that are interconnected potentially in scope?

[A]: Yes, a BPU can be made of multiple cell cultures that are interconnected (e.g., connectoids).

[Q20]: Is there a specific quantification for learning that must be used?
[A]: There is no specific learning quantification. Offerors are expected to propose how they will monitor and track learning, but the ultimate goal of the learning is to show that the BPUs are capable of achieving the program metrics.

[Q21]: For the TA2 navigation task, will there be 3 specific odorants, or 3 specific categories?
[A]: There will be 3 specific odorants (each a single chemical) that will be defined by the T&E team at the onset of the program and they will be from different classes.

[Q22]: Can details of the physical environment planned for the TA2 drone course be released so that simulation environments can be assessed/designed towards it?
[A]: More information about the environment will be released at a later date [in Phase 1].

[Q23]: For the TA1 virtual test environment metrics and Capability Demonstration, are there latency requirements?
[A]: Latency in training paradigms are entirely at the discretion of the proposer, but the metrics evaluations will be run in normal game time.

[Q24]: Will it be necessary to demonstrate that the biology is performing the computation (vs it being achieved by some other aspect of the system)?
[A]: Performers must supply the T&E team with data that shows the BPU is responsible for generating system outputs for both TA1 and TA2. The data shared with the T&E team will be mutually decided upon by performer teams and the T&E team.

[Q25]: For the TA2 drone test, will performers be able to put software on the drone? Are there details of what kind of interface will be available?
[A]: Yes, performers may load custom software onto their drones although this software will likely need to be approved by the T&E team prior to loading onto T&E provided drones for the Capability Demonstration.

[Q26]: Are teams expected to be able to work with both the aerial and the ground-based drone?
[A]: Performers can work with both drone types but during the T&E Capability Demonstrations, performers will only be able to use a single drone platform.

[Q27]: Are there any requirements for actual drone lifetime?
[A]: No but the drone lifetime should be sufficient to enable successful completion of the gradient decent navigation metrics, which will heavily depend on olfactory sensor array/BPU system weight and chemotaxis effectiveness.

[Q28]: How are the performer BPUs expected to interface with the drone platform (both physically and what type of software commands)?

[A]: More information on drone connectivity will be provided by the T&E team at the onset of the program.

[Q29]: For the 10 mWh/day target, is this measured over a full 24-hour cycle including idle periods, or only active compute?

[A]: Yes, the 10 mWh/day target is based on both idle and active compute periods. See Section 1.5.3 of the PS for more information.

[Q30]: If the BPU uses commercially sourced iPSC-derived neurons (not primary tissue, no animal subjects), is ACURO review required?

[A]: ACURO approval will be required for any efforts that qualify as animals subject research, if the research does not qualify as animal subject research ACURO approval will not be required. ACURO approval will be required for any efforts that qualify as animals subject research, which is generally research that requires IACUC approval. If the research does not qualify as animal subject research ACURO approval will not be required.

[Q31]: For the gradient descent test, is the 50m distance measured as straight-line starting distance or path traveled?

[A]: Systems should be able to operate under conditions in which the odorant source (target location) could be up to 50m straight-line distance from the initial position of the drone at demonstration start, although course layouts could vary. More details of the specific T&E test plan will be released during Phase 1 (see Table 2 in the PS).

[Q32]: For TA2, does the BPU need to be fully integrated on a moving robotic platform, or can it be placed offboard and stimulated through wireless communication?

[A]: The TA2 BPUs may be offboard, but solutions where the BPU is onboard will be favored.

[Q33]: How often can the BPU onboard the drone be “fed” or replenished (TA2)?

[A]: It is anticipated that the BPU onboard the drone requires no outside intervention during the metric assessment and Capability Demonstration period. Onboard nutrient replenishment is in scope but technicians manually adding nutrients to the BPU while it is performing the Capability Demonstration is out of scope.

[Q34]: The solicitation emphasizes continuous learning and adaptive processing as key biological advantages. Does the program have a view on whether these properties require continuous embodiment — meaning ongoing sensorimotor coupling between the BPU and its environment — or whether episodic training sessions are

expected to be sufficient for achieving the Phase 2 memory persistence and score targets?

[A]: Offers should motivate the training scheme they plan to use to achieve TA1 metrics, whether that be continuous or episodic training is up to the offerors.

[Q35]: Would including high-throughput deorphanization of receptors for operationally relevant odorants be considered responsive and in scope?

[A]: Yes, so long as this effort is tied to building an olfactory sensory array enabled BPU system.

----------BELOW ADDED IN RIV2----------

[Q36]: During the Proposer's Workshop, the "Daily Energy Consumption" metric (10 mWh) was referenced as having been estimated from energy usage in the human brain as scaled to an approximated 2 million neuron culture. Does this mean there is a limit to the BPU in terms of the number of neurons of which it is composed?

[A]: There is no specific limit in the number of neurons that can be utilized in the BPU. Should a proposed BPU involve neuron populations that exceed 2 million cells, this would be taken into account when evaluating its energy usage relative to the 10 mWh metric.

[Q37]: Can you provide additional explanation/clarification of how odorants will be defined for the purpose of this program, and whether the goal is to detect odorants (i.e., physical/chemical entity that comprises a volatile molecule or mixture of molecules) or odors (i.e., the perceptual/sensory experience when odorant molecules stimulate the olfactory system)? The solicitation refers to odorants as single chemicals and at the same time it emphasizes the detection of categories of chemicals/odorants. We'd like to understand the relevance and relative importance in this program of detecting complex odors that comprise multiple chemicals in varying proportions.

[A]: Odorants are defined as single chemicals and detection of odorants is simply the detection of said chemicals when presented to the BPU systems in a volatized form. The program metrics for TA2 require BPU systems to detect said chemicals one at a time (at a minimum) for Phase 1, but for the Phase 2 gradient descent the BPU system will need to discriminate between a mixture of two chemicals (see Section 1.5.1 of the Program Solicitation).

[Q38]: Is there interest and relevance in this program of having detected odorants/odors mapped into a presumed sensory percept? i.e., is it important to understand how animals or humans will perceive the odor?

[A]: It is not critical to understand how a human (or animal) would naturally perceive the odor, only that the BPU is capable of detecting the goal number of odorants, as well as is capable of accomplishing the gradient search. Proposals that seek to

map odors to sensory perception for the sole purpose of understanding how animals or humans perceive odors are out of scope under this effort.

[Q39]: How will the exemplar odorants/chemicals be specified -- and what will be the corresponding expectations for specifying the 50/100 target odorants?

[A]: Exemplar odorants are to be specified by the proposing team as described in Sections 1.2.2 and 4.2 of the Program Solicitation. The complete list of odorants (97 defined by proposer) will be requested of teams invited to provide an Oral Proposal Package (Section 4.4 of the Program Solicitation).

[Q40]: Can you please clarify the metrics that will be used to quantify the detection of odorants? The solicitation mentions the detection of 50 or 100 odorants at 1ppm with 70 or 90% discrimination accuracy. Will this be measured in single odorant assays, in mixtures, or in complex realistic environments?

[A]: Performers will work with the Government T&E team to develop an odorant testing strategy throughout Phase 1 (see Section 1.5.2 of the Program Solicitation). With that said, the notional plan for Phase 1 is to present the olfactory enabled BPU system with odorants one at a time (single odorant assay) and for the BPU system to provide a unique response to each odorant in the panel (discrimination accuracy). Phase 2 is similar, but with an expanded odorant testing panel. In addition, Phase 2 will include 2-odorant gradient descent during the Capability Demonstration, where the BPU system will need to discriminate between a mixture of two chemicals.

[Q41]: The PS calls out that energy consumed by the BPU will be measured. Does this mean that the energy consumed to read and provide stimulus to the signals during tasks should or should not be used when calculating the metric?

[A]: The 10 mWh energy metric includes the direct metabolism of the BPU (i.e. nutrient consumption) during a 24-hour period, which includes processing signals and generating outputs to interact within the game environment.

[Q42]: Will teams need to account for energy and other resources outside of the 10 mWh metric for TA1 BPUs?

[A]: Support system power for incubators, gas exchangers, MEAs, etc. is to be included in milestone reports but there are no metrics governing these system parameters (see Section 1.5.3 of the Program Solicitation).

[Q43]: Is the TA2 BPU system required to be less than the possible 10lb payload limit of drone?

[A]: The 10lb payload limit is only a current estimate of the drone capabilities, aerial and ground systems may vary (e.g., ground systems will likely have a higher limit). Additional drone platform details will be provided to proposers invited to submit an Oral Proposal Package. For the abstract submission stage performers should propose a method (with supporting rationale) on what system they propose would

meet the program metrics and abstracts can highlight whether a 10lb limit would be a concern for evaluating that system. Keep in mind there are no specific SWaP requirements outside of the TA1 Daily Energy Consumption metric and TA2 and performers will be able to choose either an aerial or ground drone.

[Q44]: The solicitation emphasizes continuous learning and adaptive processing as key biological advantages. Does the program have a view on whether these properties require continuous embodiment — meaning ongoing sensorimotor coupling between the BPU and its environment — or whether episodic training sessions are expected to be sufficient for achieving the Phase 2 memory persistence and score targets?

[A]: The program does not have a view on this, but proposals should discuss how their BPU system will be trained to meet program metrics (see Section 1.5.3 of the PS)

[Q45]: Section 1.5.3 specifies that for memory persistence testing, "there must be a gap of time without training (24 hours)" and "it is not required for the BPU to be entirely inactive during this interval." Could DARPA clarify the operational definition of this gap — during the gap, can the BPU continue receiving environmental input from the test environment (e.g., observing untrained gameplay), or must it be isolated from task-relevant inputs?

[A]: During the gap of time without training, the BPU is to not be in its original training environment. How the training environment is defined and any different inputs are defined should be specified by the proposing team with rationale for how such an approach is considered likely to reach the program goals.

[Q46]: Does the BPU system remain powered and maintained (nutrients flowing, temperature controlled) during the TA1 Capability Demonstration inactivity gap, or must it be fully powered down?

[A]: The BPU system can remain powered and maintained during the inactivity gap (time between training and computational memory evaluation).

[Q47]: Is there a minimum required training duration or number of sessions before the TA1 Capability Demonstration inactivity gap begins, or is the training protocol at performer discretion?

[A]: The training protocol is at the discretion of the performing team.

[Q48]: Is TA1 computational memory evaluated on the same game levels used during training?

[A]: Details of the specific TA1 Capability Demonstration evaluation process will be released within month 1 of the program. Notionally, at a minimum the BPU will be evaluated using the ‘Ms. PacMan’ game environment.

[Q49]: Can a performer test multiple BPU architectures in parallel during Phase 1 (e.g., 2D culture, organoid, and centimeter-scale bioprinted constructs) and down-select based on performance, or must the abstract commit to a single architecture?

[A]: Proposed parallel architecture testing plans is in scope. Please refer to Section 1.2.1 of the Program Solicitation for additional details.

[Q50]: The solicitation encourages novel methods of encoding information to the BPU including electrical, optical, microfluidic, and chemical stimulation. Are there any restrictions on encoding modality at the T&E capability demonstration, or can performers use any modality that interfaces with the simulation?

[A]: There are no restrictions on information encoding methods.

[Q51]: What is the action space the 'Ms. Pac-Man' environment accepts? Standard 4-directional joystick commands plus no-op, or a different control scheme?

[A]: Performers can expect the standard command scheme for 'Ms Pac-Man' will be available as inputs into the virtual test environment.

[Q52]: Will the 'Ms. Pac-Man' environment provide explicit reward or event signals to the performer (e.g., score change events, pellet consumed, ghost contact, life lost), or must performers derive reward from raw game state differentials?

[A]: Details of the virtual test environment will be provided in the first month of the program and awarded TA1 teams will be encouraged to work with the T&E team to ensure the simulated environment meets the needs of the team (See Section 1.4.1 of the Program Solicitation).

[Q53]: What constitutes a single 'Ms. Pac-Man' game for evaluation purposes?

[A]: A single game is notionally defined as playing the game until "game over" (i.e., until the player runs out of lives).

[Q54]: If a BPU culture degrades during a multi-day capability demonstration visit, can the performer substitute a backup culture prepared from the same protocols and training paradigm, or must the demonstrated BPU be the exact culture that was originally trained?

[A]: Current planning would involve a given BPU system being shown to be able to wholly satisfy the metrics as outlined in Sections 1.5.3 and 1.5.4 of the Program Solicitation at the Capability demonstration. Substituting a backup BPU (prepared using the same protocols and training paradigm) in response to damage or other circumstances during the Capability Demonstration would be considered on a case-per-case basis given the circumstances in question.

[Q55]: For TA1 capability demonstrations, must the BPU system be transported to the West Coast T&E site in an operational state, or can performers ship components and reassemble on site?

[A]: BPUs does not necessarily need to be transported in an operational state. Performers will regularly communicate with the T&E team to develop a transportation strategy so the BPU systems can be evaluated at the T&E site, and dry runs for shipping and preparing BPUs at the T&E site will occur in both Phase 1 and Phase 2 (See Section 1.5.2 in the Program Solicitation).

[Q56]: How often can the TA2 BPU onboard the drone be "fed" or replenished?

[A]: There are no parameters governing this so long as the olfactory enabled BPU system can navigate to the target odorant. See Section 1.5.3 and 1.5.4 in the Program Solicitation.

[Q57]: I've had discussions where people propose using flies or a moth's antennae. There was confusion on whether the signal simply has to go into a BPU with chemical fingerprint information. Is that within the scope of the solicitation? Or does it need to come from biological receptors?

[A]: Using biological structures, e.g. fly or moth antennae, as part of/for the TA2 olfactory array to provide chemical identification/fingerprint information to achieve Discrimination Accuracy is in scope for this effort. Please keep in mind though, it is still required for the navigation commands that are generated in response to the information in those chemical identification/fingerprint to come from a BPU and proposals should outline how the odorant sensor array is integrated with a BPU for information processing using biological integration or through an electronic interface (see Section 1.2.2 of the Program Solicitation).

[Q58]: Please clarify whether the same BPU used to detect the 100-odorant library is required to serve as the test article in the flight simulation

[A]: The olfactory enabled BPU used to detect the 100 odorant panel must also provide navigational commands in response to the flight-test odorants.

[Q59]: For a TA1 Architecture abstract, would non-human neural cultures, including rodent-derived cortical and/or hippocampal neural cultures, neural progenitor-derived cultures, organoid-like constructs, assembloids, or connectoids, be considered within scope?

[A]: Neural cultures derived from non-human samples are in scope, including but not limited to rodents and insects.

[Q60]: For a TA1 abstract, should proposers address how the proposed BPU architecture will support future integration with TA2 sensing/action systems?

[A]: Proposers may discuss how their proposed BPU architectures will support future integration with a TA2 sensor array and drone navigation platform but it is not required.

[Q61]: Would a proposal need to include a neural tissue based BPU, or would it be acceptable to focus on building SNNs to run on BPUs?

[A]: A proposal must propose BPU architecture where computation is driven by neural tissue. See Sections 1.2.1 and 1.2.3 of the Program Solicitation for more detail.

[Q62]: Can human iPSC-derived neuronal cultures or dissociated cortical neural networks qualify as BPUs if they demonstrate closed-loop learning and memory, or is DARPA primarily expecting organoids/assembloids/connectoids?

[A]: iPSC-derived neuronal cultures or dissociated cortical neural networks qualify as BPUs. The only BPU constraints is that the computation be driven by neural tissue.

[Q63]: Can proposers include internal learning assays in addition to 'Ms. Pac-Man' to derisk Phase 1, such as simplified game environments?

[A]: Yes, proposers can include internal learning assays in addition to 'Ms. Pac-Man'. See Sections1.2.1 of the Program Solicitation. Additionally, TA1 teams will work with the Government T&E team throughout the program to ensure the virtual test environment meets the needs of the performing teams.

[Q64]: Section 1.2.1 encourages "novel ideas for creating effective BPU architectures." Given that multiple architectural approaches (e.g., 3D organoids, 2D patterned cultures, assembloids, connectoids, engineered neural sheets) may target the same Phase 1 and 2 metrics, how is "novelty" assessed when more than one approach can meet the metrics? Is differentiation weighted toward biological architecture, training paradigm, decoder design, or other dimensions?

[A]: Proposals will be assessed based on how well an approach, in its entirety, may achieve the defined goals of the O-Circuit program (see Section 4.3 of the Program Solicitation). The encouragement of novel ideas is meant to acknowledge the potential existence of ideas not listed. Novelty is not an evaluation criterion of the program.

[Q65]: For TA1 abstracts specifically, does DARPA expect performers to address scaling and manufacturability of the BPU architecture (e.g., reproducibility across batches, throughput of construct generation, transition pathway to Phase 3 superteam integration), or is Phase 1+2 considered an R&D effort with translational and scaling considerations deferred to Phase 3?

[A]: The aim of Phase 1 and 2 is to develop and refine a protocol for creating and imprinting a BPU with Sense-Compute-Action functions (see Section 1.5.2 of the Program Solicitation). TA1 proposals are encouraged to discuss methods for increasing R&D throughput, which could be important for properly interrogating architecture variations and for post-program BPU manufacturing, but scaling and manufacturability *per se* are not evaluation criteria of the program.

Proposal Submission and Contracting

[Q01]: Can one team propose to both TAs? For combined TA1+TA2 proposals, is there guidance on how such proposals should be strong compared to single-TA proposals?

[A]: Yes. If proposing to both TAs, two separate abstracts should be submitted (one abstract for each TA). One, both, or neither abstract could be selected for an Oral Proposal Submission, so it will be important that each abstract meets the submission requirements provided in the PS. It is up to the offerors to highlight how each abstract complements the other and whether the "whole is greater than the sum of its parts". Each of the two submissions should clearly indicate the identity of the complementary abstract proposal. More instructions will be provided (if necessary) in the call for the Oral Proposal Package instructions should one or both of the abstracts be selected.

[Q02]: If proposing to both TAs, does there need to be an integration aspect?

[A]: No. DARPA does not anticipate forming superteams out of TA1 and TA2 efforts from a single prime performer, although DARPA reserves the right to do so if it is in the best interest of the program.

[Q03]: Can a given institution be part of more than one abstract submission?

[A]: Yes, an entity can be a subcontractor on multiple proposals for the same solicitation, but the entity can only be prime on a single effort (i.e., TA1, TA2, or TA1+TA2 proposals). Entities proposing as subcontractors on multiple teams should consider how they plan to distribute their level of effort across these awards and must ensure that DARPA is not charged twice for any duplicated tasks.

[Q04]: Can individuals or organizations partner?

[A]: Yes. Individuals and organizations can form teams and submit a single abstract per team per TA. Organizations/individuals can submit proposals as primes (one abstract per TA as a prime) or as subcontractors on multiple proposals. If chosen for multiple awards (e.g., as a prime on an award and as a subcontractor on another award or as a subcontractor on multiple awards), a clear path will need to be established to ensure no conflicts are present between the efforts.

[Q05]: Are universities allowed to apply to the O-Circuit program?

[A]: Yes.

[Q06]: Are there budget ranges DARPA considers reasonable for Phase 1 and Phase 2? Is there a not to exceed limit to the proposed budget?

[A]: The total anticipated value for Phase 1 and 2 of this program is $36M. There is no "not to exceed" (NTE) limits to proposals.

[Q07]: Is there an expected number of Phase 1 awards?

[A]: The Government anticipates multiple awards. The number of awards selected depends on the quality of the proposals received.

[Q08]: How does the super teaming match-making work for Phase 3?
[A]: Team integration starts early in Phase 2 – you will be interacting with other teams at that point (workshops) and you can determine how you work together at these touchpoints. Please see Section 1.4.3 of the PS for more information.

[Q09]: We plan to submit an abstract for each TA. Do we need an abstract summary slide per abstract submission?
[A]: Yes. Additionally, the abstract summary slide does not count towards the abstract page limit and should be submitted as a separate document.

----------BELOW ADDED IN RIV2----------

[Q10]: Is Phase 3 included in the $36M budget mentioned in the PS?
[A]: The Phase 3 budget is not included in the $36M Phase 1 and 2 combined budget.

[Q11]: Are there limits on the number of proposals submitted by a single institution (e.g., a university, commercial entity, etc.)?
[A]: There are no institutional limits on the number of proposal submissions.

[Q12]: Do teams need to be finalized before submitting an abstract?
[A]: DARPA does not expect finalized teaming arrangements at the abstract stage of this solicitation. If selected to provide an Oral Proposal Package, a finalized teaming structure and approach will be required (see Section 4.4 of the Program Solicitation).

[Q13]: If submitting TA1 only, is it advantageous to identify potential TA2 teaming partners in the abstract?
[A]: Identifying TA2 teams in TA1 abstracts is not required.

[Q14]: What level of data sharing with TA2 performers is expected, and how will proprietary BPU designs, training algorithms, and biological protocols be protected?
[A]: At a minimum, teams will be expected to share sufficient data to enable superteaming in Phase 3. Review Section 1.4 of the Program Solicitation for more information.

[Q15]: Is DARPA open to proposals led by a startup with academic or industry subcontracts for biologic sensing layer development?
[A]: DARPA is open to all compliant proposals where the teaming structure supports the proposed approach. See Section 3 and 4 of the Program Solicitation for additional details.

Security

[Q01]: Are foreign participants allowed to be on a proposer's team? Are there ITAR considerations?

[A]: Non-U.S. organizations and/or individuals may participate to the extent that such participants comply with any necessary nondisclosure agreements, security regulations, export control laws, and other governing statutes applicable under the circumstances (see the PS for more information). The Government expects that CUI and CTI designation of program information will not be necessary, and that program goals as described in the PS may be met by proposed efforts for fundamental research and nonfundamental research.

[Q02]: Is there a point during the project timeline when DARPA envisions US-only or security clearance limitations?

[A]: O-Circuit is an unclassified program and proposals must be consistent with that status. Currently, there are no plans to designate other classification levels.

----------BELOW ADDED IN RIV2----------

Government Test and Evaluation (T&E)

[Q01]: Are indoor or outdoor test environments anticipated for the T&E site?

[A]: More details regarding the T&E test environment will be released as part of the T&E test plan during Phase 1 (see Table 2 in the PS) but T&E has the option to conduct both indoor and outdoor gradient descent tests.

[Q02]: Will the T&E team provide software updates to the drone and/or virtual test environment at the request of the program performers?

[A]: The program plan is for performer teams to work closely with the T&E teams to refine the drone and computer simulation strategy, and it is recommended that offerors budget for T&E interactions throughout Phase 1 and Phase 2. Please note that, while all requests will be considered, the DARPA team will be the ultimate arbitrator of what updates are made.

[Q03]: Will the T&E team provide culturing facilities on site that the performers can use?

[A]: The T&E team has cell culture facilities and performers will work with the T&E team to develop plans for the Capability Demonstrations occurring at the T&E site during Phase 1 and Phase 2.

[Q04]: What instrumentation or methodology will be used to measure energy consumption at the T&E site?

[A]: More details of the specific T&E test plan will be released during Phase 1 (see Table 2 in the PS).

[Q05]: Will the 'Ms. Pac-Man' virtual test environment be provided as an API, a standalone application, or source code? What input/output interface does the simulation expect from the BPU (data format, latency requirements, refresh rate)?

[A]: More details of the T&E virtual test environment will be released at the onset of the program (see Table 2 of the PS).

[Q06]: Will the T&E evaluation framework include any condition that holds the BPU signal decoder fixed while varying the biological substrate — for example, comparing BPU performance against a matched non-biological passive substrate under identical encoding and decoding parameters? Without this control it may be difficult to determine whether score improvements across phases reflect advances in BPU architecture or advances in decoder optimization.

[A]: The T&E metrics evaluation framework will be provided at the onset the program and performers will have opportunities to work with the T&E team to fine tune the virtual test environment.

----------BELOW ADDED IN RIV2----------

[Q07]: What statistical criteria will be applied when evaluating BPU performance consistency against program metrics at end-of-phase capability demonstrations?

[A]: Performance measurements are to be defined by the performer and "should assess the repeatability of their reported 'Ms. Pac-Man' score and compare to scoring achieved by an untrained BPU." (Section 1.5.3 of the Program Solicitation). The T&E team will work with the performing teams to validate and/or develop BPU performance measurements on a team-by-team basis.

[Q08]: What instrumentation or methodology will be used to measure energy consumption at the T&E site?

[A]: Details of the specific TA1 Capability Demonstration evaluation process will be released within month 1 of the program.

[Q09]: Can performers propose their own cellular characterization protocols, or will T&E specify required characterization methods and metrics?

[A]: Proposers are to propose their own cellular characterization protocols.

[Q10]: Will performers be required to submit documentation of their TA1 training methodology, stimulation protocols, and BPU characterization data alongside capability demonstration results, or are only the three primary metrics (score, energy, memory persistence) evaluated?

[A]: Performers will be required to document and report on their training methodology, stimulation protocols, etc., cumulating in a prototype protocol that details how the BPU architecture is created and imprinted with a Sense-Compute-Action functionality, as well as providing data to demonstrating progress and addressing program metrics: both independently and in support of the Capability Demonstration. See Sections 1.4.4, 1.5.2, 1.5.3, Table 1 and Table 2 of the Program Solicitation.

[Q11]: Will T&E site facilities include biological support infrastructure (incubators, sterile hoods, media preparation, CO_2 and temperature control) for performers to maintain BPU viability during dry runs and demonstrations, or must performers bring all life support systems?

[A]: Significant equipment will be available at the T&E site, but performers will regularly communicate with the T&E team from the beginning of Phase 1 to develop a strategy for transporting and maintaining the BPU systems at the T&E site. Dry runs for shipping and preparing BPUs at the T&E site will occur in both Phase 1 and Phase 2 (See Section 1.5.2 in the Program Solicitation).

[Q12]: What is the anticipated duration of each capability demonstration visit including dry runs?

[A]: The T&E team will be working with performers and DARPA to develop more detail Capability Demonstration test plans during Phase 1 (see Sections 1.4.5 and 1.5.2 in the Program Solicitation), as well as more details for the dry runs. For budget

planning purposes, performers should plan for the capability demonstrations to run up to 5 days, and similarly should plan for up to 2 days for a dry run

Proposal Abstracts

[Q01]: What are the criteria for evaluation?
[A]: See Section 4.3 of the PS for the Abstract evaluation criteria

[Q02]: Is some amount of preliminary data expected for abstract submissions?
[A]: There are no specific preliminary data requirements for abstracts, although having preliminary data may strengthen a given submission.

[Q03]: How much detail is expected for the abstract budget?
[A]: Only a ROM is expected for the abstract, see Section 4.2 in the PS (and example budget estimate table) for more information.

[Q04]: Can Letters of Support or other relevant documents be included in the abstract submission?
[A]: Yes, non-requested documents can be included in the abstract submission as an appendix. Please note that such 'extra' appendices should not be used as supplements to the existing parts of the abstract (e.g., as additional text for the technical goals) and the extra appendices will be reviewed at the discretion of the review team.

----------BELOW ADDED IN RIV2----------

[Q05]: If submitting both a TA1 and TA2 abstract, how should the budget estimates be developed if there is equipment/people/research overlaps?
[A]: The budget estimate for any given abstract must reflect all the work proposed in that abstract. This is the case even if a TA1 and a TA2 abstract are both being submitted by a given team, i.e. each budget estimate should stand on its own in the case of the other abstract not being selected. Proposers may reference other abstracts and acknowledge equipment/people etc. overlaps if desired. If both abstracts are selected to advance to the OPP stage, the proposer will need to clarify and reconcile budget overlap issues.

[Q06]: When submitting both a TA1 and TA2 abstract, can the team roster and Technical Ability sections be substantially identical across abstract submissions?
[A]: Proposers may repeat wording or whole sections across TA1 and TA2 abstracts where appropriate (see Section 4.2 in the Program Solicitation).

[Q07]: Attachment B references the BAA Tool to submit abstracts, while Section 4.1.f of the PS specifies submission via email to O-Circuit@darpa.mil. Please clarify.
[A]: Abstracts and abstract summary slides are to be submitted to the O-Circuit@darpa.mil email by May 20th, 2026 at 5PM EST.

[Q08]: Do abstracts need to follow the supplied abstract template (Attachment B)?
[A]: Yes, all abstracts must follow the abstract template found in Attachment B

Oral Proposal Package

[Q01]: When will the Oral Presentations take place?

[A]: The specific date will be announced later, but, tentatively, presentations are expected to occur in-person at or near DARPA in mid-July. Oral Proposal Packages are expected to be due in late June.

----------BELOW ADDED IN RIV2----------

[Q02]: Will DARPA expect international applicants to travel to the oral presentation?

[A]: Oral presentations are currently planned as in-person at, or near, DARPA, but DARPA will review requests by international applicants to attend oral presentations virtually.