Designing for Personas That Don't Have a Voice

Reflections on Designing a Mobile Application for Collecting Biodiversity Data

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This case study paper situates insights from designing a mobile application within academic literature advocating for the consideration of non-human stakeholders in the design process. The application, FrogID, was developed as part of a citizen science project to support frog conservation in Australia. FrogID crowdsources the collection of frog calls to build up a national database, which in turn can inform conservation strategies. The paper discusses the use of personas and other design tools to ensure the design solution considers the perspectives of frogs as a non-human stakeholder group and to facilitate interdisciplinary team collaboration. As a broader contribution to the field of interaction design, the paper discusses the responsibility of designers to advocate on behalf of stakeholders that don't have a voice.

CCS Concepts: • **Human-centered computing** → *Interaction design process and methods.*

Additional Key Words and Phrases: Personas, non-human stakeholders, more-than-human participation, life-centred design

1 INTRODUCTION

Personas were first introduced by Cooper [11] as a tool to synthesise user research data in the form of fictional archetype users. Subsequent research studies found personas to be an effective way to communicate user needs with the design team [39], keep the perspective of users and other stakeholders at the forefront throughout the design process [1, 31], guard against basing design decisions on the designer's preferences and biases [39], build empathy for the users [30], and make assumptions explicit [1]. Despite limitations, such as the risk of being considered a "universal fix to issues within the product design process" [31] and potential biases in interpreting personas [30], personas have found widespread application in the design industry.

Design researchers and practitioners have proposed an extension of the personas method to capture the perspectives of non-human stakeholders. For example, Frawley et al. [17] developed animal personas to represent chickens in a study on sustainable food systems. Tomlinson et al. [41] adapted the personas method to capture entire ecosystems in the form of "ecosystemas". Sznel [38] and Lutz [27], drawing on their practice as user experience (UX) designers, proposed non-human personas to capture non-human entities that might be affected by or need to be considered when

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*The design project described in the paper was carried out while the first author worked at IBM Australia.

making design decisions. The non-human persona method along with a non-human persona template has also found its way into a handbook of design methods [39] to support the shift from human-centred to life-centred design [6, 26].

However, to date, the practical application of non-human personas in applied industry contexts has not been documented. Many of the above referenced examples remain hypothetical or are based on student- and research-led design projects. The paper aims to bridge this gap through presenting an industry case study that involved the consideration of a non-human persona. The case study describes the design of a mobile application to crowdsource frog calls. The paper discusses how the persona method (in combination with a scenario map as an additional tool) was used to capture the concerns of frogs as directly impacted stakeholders. We discuss how these concerns captured in the form of design artefacts influenced the direction and final outcome of the project and identify lessons learned to guide the use of non-human personas in future projects. The paper concludes by reflecting on the responsibility of designers to ensure that the voices of those that are not able to speak up on their own are represented in a design process.

2 RELATED WORK

The use of personas in practice has been investigated through several research studies. For example, Chang et al. presented results from an online survey, which found that practitioners use personas in creative ways [8]. This involves instances of "unspoken personas", where a persona "exists undocumented but is still influential to design" [8]. The study also found that even though the literature suggests that personas should be based on user research, in practice, designer's assumptions and experiences inform the characteristics of a persona. As highlighted by Chang et al., this might especially happen when designing for a stakeholder group that is challenging to collect data from (e.g. young children [4]) and in the face of resource limitations – leading designers to create ad-hoc personas [33].

When it comes to considering non-human stakeholders, it is similarly challenging to collect data for creating personas. An approach proposed in the literature is to use secondary data [27, 38, 39, 41], e.g. drawing on scientific reports or reports generated by government departments or wildlife conservation groups. Tomitsch et al. [40] presented a theoretical framework that draws on middle-out engagement [7, 18] as a way to create a coalition that is able to speak on behalf of a non-human stakeholder group. This is akin to the arrangement used in New Zealand, where two nominated guardians – a representative of the New Zealand Government and a representative of the local Māori tribe of Whanganui – are nominated to speak on behalf of the Whanganui River's and protect its health and wellbeing [24].

Through documenting a case study that involved responding to the concerns of a non-human stakeholder, the paper also contributes to a broader discourse within the field of human-computer interaction (HCI) – which can be summarised as a call to move away from focusing on the human end-user as the sole stakeholder and to consider the wider social, environmental, and economic context [21]. To a large extent, HCI research and interaction design practice have focused their efforts on addressing human problems with little to no consideration of the natural environment [40].

Shifting the focus from addressing human problems and investigating how technology could instead be designed to respond to environmental challenges, has led to the rise of sustainable HCI as a subdomain with HCI [12]. Early studies focused on technological interventions that might entice people into more sustainable behaviours and support citizen activism [16, 34]. More recently, scholars have called for a more systemic change instead of focusing on individual users [13, 15, 25]. This movement has spurred the development of new paradigms, such as animal-computer interaction [28], more-than-human participation [2, 9] and aesthetics [19], and life-centred design [6, 26]. The case study presented in this paper falls within the domain of sustainable HCI and the above-mentioned new paradigms as it crowdsources conservation data while at the same time exemplifying the consideration of a non-human stakeholder group and documenting the use of a non-human persona in practice.

3 PROJECT BACKGROUND

The FrogID project was led by IBM in partnership with the Australian Museum. The project team involved conservation experts, amphibian biologists, data analysts, developers, and designers (one graphic designer and two UX/UI designers). Being part of an interdisciplinary team, enabled the designers to have direct access to expert knowledge and insights into the behaviour of frogs.

FrogID's aim was to support efforts to identify and protect frog species in Australia. Frogs are considered a highly threatened species as they are impacted by habitat loss, habitat modification, disease, harvesting, and invasive species [10, 36, 37]. The decline of frog populations is a global issue but particularly considered problematic in Australia due to the country's landmass and remoteness [36]. There are about 240 known frog species in Australia and more than 20% are officially classified as threatened. At least four Australian frog species are likely already extinct.

One of the challenges when it comes to conservation strategies is the lack of data about existing species and their distribution. The FrogID project applied a citizen science approach, providing communities with a tool to contribute to identifying frogs across Australia. Previous similar citizen science projects relied on photographs collected by communities. However, the use of photographs has drawbacks as images may not provide sufficient detail to identify the species and may also inadvertently encourage handling of the animal and damage to their habitat [36]. To overcome these limitations, the project implemented an approach that allows anyone to record acoustic data, i.e. male frog advertisement calls [36].

To date, the FrogID app (Figure 1) has been able to record and verify over 600,000 frog observations. This represents a significant improvement compared to the previous process, which involved a small remote team manually recording data. FrogID has empowered a community of 16,000+ FrogID citizen scientists across Australia to contribute to the FrogID dataset, which is an open access biodiversity resource. The recorded data is reviewed and validated by internal experts that are part of the FrogID team. The data reveals information about the number and distribution of species, where and how species are breeding, and the health of the environment.

In addition to launching the FrogID app for iOS and Android smartphones, the wider Australian Museum team behind FrogID also created "FrogID week" as a promotional campaign to raise awareness about frog species extinction and worked with schools to create frog sanctuaries. The objective of this additional campaign was to amplify the message within the community in the week during which most frog species are calling.

4 DESIGN ARTEFACTS

In this section, we first provide a high-level overview of the design process before introducing the personas and a scenario map that were used as design artefacts to capture the perspectives of frogs as non-human stakeholder.

The project started out by implementing IBM's Enterprise Design Thinking process [23], which includes methods for identifying stakeholders and their contexts of use and capturing requirements. This is a process commonly used at IBM for addressing complex problems. Typically, these are human problems faced by banks, airlines, and other large organisations. FrogID presented an unusual project brief that required the design team to adapt new perspectives, approaches, and ways of collaborating.

As a first step, the design team worked with the scientists involved in the project to identify what the key pain points were when it came to identifying frog species. Crowdsourcing was identified as an alternative to the previously used approach, which involved a small group of herpetology experts travelling around Australia to record frog calls. This idea, labelled as "Shazam for frogs", became what the design team evolved into a "hill statement". The term is borrowed
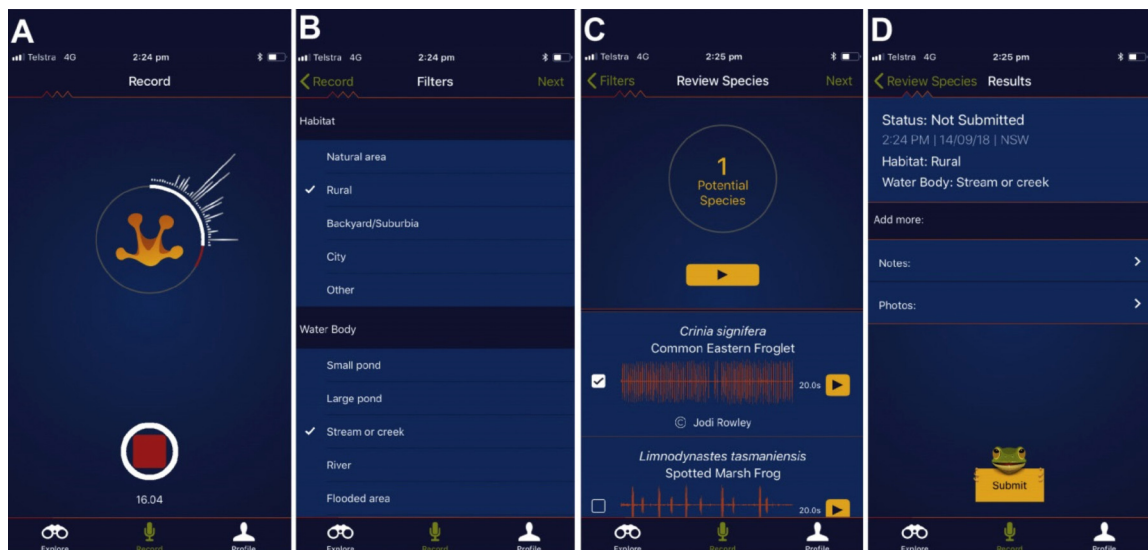
Fig. 1. User interface (UI) of the FrogID app – (A) recording a frog call, (B) selecting the habitat filters, (C) selecting the frog species, and (D) submitting a recording [36].

from the military, where it is used in situations where an army is instructed to capture a hill but not how, as described in IBM Enterprise Design Thinking Field Guide [22]. For the design team, the challenge was to develop the "Shazam for frogs" concept but the team was not told nor restricted on how to achieve this.

To solve this mission, the design team activated the broader interdisciplinary team. As a collaborative activity, the interdisciplinary team went on a field observation study to capture frog calls and to understand the constraints of doing this without disturbing frogs in their natural habitat. This also validated the approach of crowdsourcing the recording of frog calls. Following the field trip, the design team led the discovery, ideation, and delivery of the app, working closely with their interdisciplinary team members.

As part of this process design artefacts, such as personas and scenario maps, were created. Specifically relevant to the focus of this paper, the design team used the persona and scenario map methods to capture the perspectives and current-state experience of relevant stakeholders. The non-human persona (Figure 2[1]), referred to as "Bella" (named after the Litoria bella species, which was discovered in 2016) was developed as an archetype representative of frogs. A second persona to represent the scientists stakeholder group, referred to as "Jodi", was created, capturing how scientists collect frog calls and as part of that process interact with frogs (Figure 3). A future-state persona of a FrogID citizen scientist app user was also developed and used to ensure the app addressed the citizen scientists' goals. All personas followed the process and structure defined by IBM's field guide [22] and internal definition of personas [35]. The human persona included a user attributes, a description, needs, pain points, and behaviours and actions. The description, needs, and pain points elements were adopted for the non-human persona representation, supplemented by the frog's calling period (replacing the user attributes) and information about breeding biology, similar species, and distribution.

The design team collected data about both stakeholder groups through interviews, contextual inquiries, and on-site observations – referred to as "ride alongs". This data was then synthesised and captured in the form of the two personas.

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[1]The personas in Figures 2 and 3 and scenario map in Figure 4 were recreated for inclusion in this paper as replicas of the original artefacts.
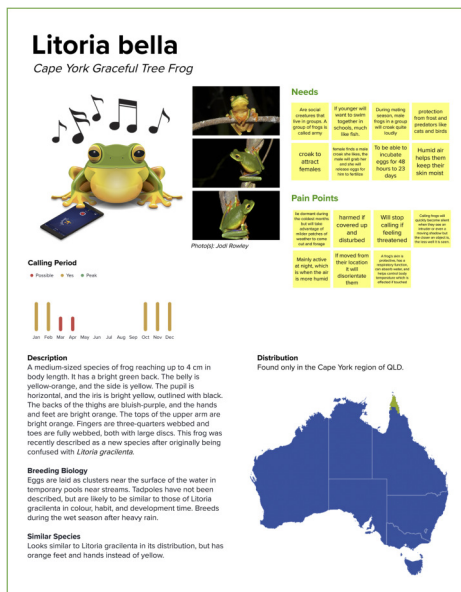
Fig. 2. Persona representation to capture the perspective of frogs as a non-human stakeholder group.
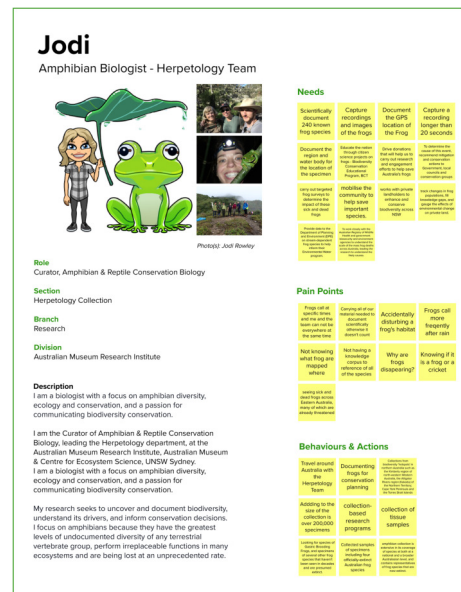

Fig. 3. Scientist persona to capture one of the key human stakeholders.

In the case of the frog persona, this included how the frogs would react to citizen scientists entering their habitat. The personas were developed during the discovery phase to ensure that any subsequent design decisions were anchored in a deep understanding of the relevant stakeholders and their goals and needs. The team also used the personas to ensure that they were solving for the "right problem". To achieve this, the team completed empathy maps from the perspective of the personas. This further contributed to building a better understanding of the stakeholders, including their feelings, values, and behaviours.

To map out the current experience of both personas, the team created current-state flows for both Bella and Jodi represented as an "as-is" scenario map (Figure 4). The map captured and documented a collective understanding of the workflows involved in the process of recording frog calls. By including both personas in one map, the team was able to understand where and how the experiences overlapped. During the ideation process, the scenario map helped to identify the boundaries (i.e. what aspects needed to be considered in the design of the app). The team used the map as a starting point for generating ideas and as an artefact to assess any design decisions and directions.

Both the personas and scenario map were placed on a wall and used as reference points during the daily design team meetings and during meetings with the wider team. Throughout the development of the application the design team actively developed, maintained, and used the personas, to keep their perspectives, goals, and needs at the forefront when making design decisions.

5 DISCUSSION

In this section, we reflect on how the non-human persona and scenario map influenced the final design of the FrogID app and how they facilitated collaboration in the interdisciplinary team. The discussion draws on a video that the first
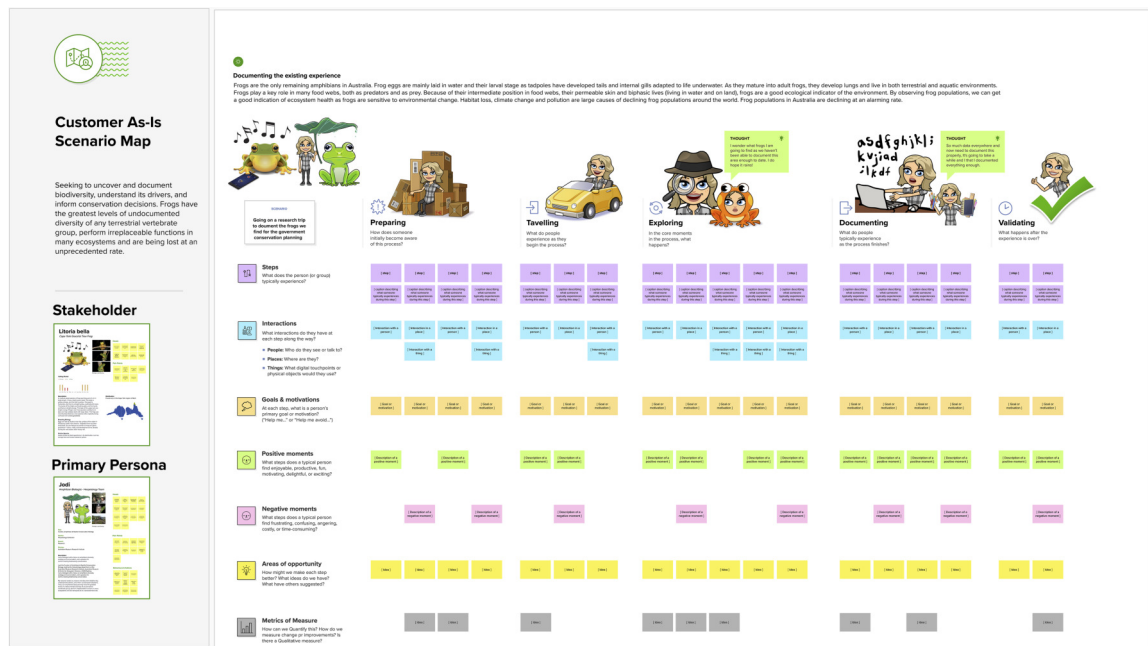
Fig. 4. High-level customer "as-is" scenario map as a representation to capture the perspective of the amphibian biologist interacting with the frogs as the non-human stakeholder group. (Sticky notes show placeholder content for demonstration purposes only.)

author recorded for a government department[2] and the first-hand experience of the first author, who acted as the design lead on the project. We further discuss how and why non-human stakeholders should be considered in interaction design more widely and identify lessons learned for including non-human personas in a design process.

5.1 Considering the perspectives of the non-human stakeholder group

By capturing the perspectives of frogs in the form of a persona and scenario map, the design team was able to refer to those artefacts when making design decisions. For example, a key concern was that frogs stop calling when they feel threatened or disturbed within their natural habitat. This concern led to two design decisions. First, dark colours were used in the user interface to reduce the amount of light emitted from the phone's screen. Second, the app had to be designed in a way that did not inadvertently encourage the citizen scientists to disturb or damage the frog's habitat. To address this, a "safe frogging pledge" was included that each user needed to agree to before they were able to access the application's full functionality.

Another concern that was based on considering frogs as indirect users related to the orientation of the phone. Early on, it was assumed that pointing the microphone towards the frog would enhance the quality of the recording. This hypothesis was documented against the as-is experience and then role-played out in the field through a ride-along observation with the herpetology team. It was found that the orientation of the phone did not have an impact on the quality of the recording. However, having to change the orientation of the phone caused confusion and extended the

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[2]Available at: https://education.nsw.gov.au/public-schools/game-changer-challenge/super-7-innovation-showcase

time it took to record a frog call. As a result, the design team dropped the idea of rotating the screen orientation and replaced the application's original home screen with the recording page (Figure 1).

5.2 Facilitating interdisciplinary team collaboration

Design methods can support collaboration in interdisciplinary teams, including the process of collaboratively developing ideas [3]. Within interdisciplinary teams, personas have been described as a framing device to establish common ground [20]. Both artefacts, the personas and the scenario map, took on a similar role in the FrogID project. Beyond establishing common ground, they enabled the team members to have a shared understanding about the perspectives of frogs as a stakeholder that was not able to directly participate in the design process. In that way, the artefacts served as proxies to represent the perspective of frogs. At the same time, they were a manifestation of the designers' understanding of the non-human species. To that end, the frog persona used a third person form, which is in line with suggestions made in the literature [17, 40] – as a reminder that the non-human persona is grounded in a human perspective. Having the personas and scenario map as a shared interface allowed the conservation and biology experts to point out any gaps. The shared use of the design artefacts within the interdisciplinary team created a sense of ownership. Having the artefacts hung on the wall democratised their evolution as all team members were able to update the artefacts by moving around or adding content via sticky notes.

5.3 Interaction design and environmental concerns

The case of FrogID represents an example, where there is a clear link between the design of the interactive application and its impact on frogs as a non-human stakeholder group. This is similar to the previously proposed animal personas [17] in a research study about free-range animal agriculture – specifically the study focused on chickens and demonstrated how the animal persona can be used when prototyping an online recipe platform. Likewise, the urban furniture case study discussed by Tomitsch et al. [40] focused on possums as non-human "users" from the outset – presenting a clear direction for what kind of non-human persona to consider in the design process.

However, we argue that the non-human persona method can and should be applied in every interaction design process. Interaction designers often falsely believe that their design decisions have no impact on the environment. It may be less obvious compared to designing physical products but even the digital interactions that we design have a hidden impact on the environment. For example, the increased use of digital services like search engines, the reliance on mobile devices and the rise of blockchain and cryptocurrencies has an overwhelming effect on energy use [5, 14] and resource exploitation [32], which in turn might indirectly affect non-human stakeholders.

5.4 Lessons for considering non-human stakeholder groups

Based on the reflective account of the FrogID case study and our review of previous work, we identify the following lessons for HCI researchers and interaction designers:

Connect human and non-human concerns. Through considering the intersecting experiences of human and non-human stakeholders designers can gain deeper insights into some of the issues that need to be addressed. In the FrogID project, connecting both human and non-human personas in the scenario map enabled the design team to identify where their experience intersect and how these interactions might affect the non-human stakeholder.

Look for invisible stakeholder groups. Not all design projects involve an obvious non-human persona. Even in the FrogID project there were likely other invisible non-human stakeholders that may be impacted by the citizen scientists

recording frog calls, such as other species sharing the frog's habitat. Designers can use tools like systems maps to uncover indirectly affected – also referred to as secondary [40] – stakeholder groups. The input from experts is critical not only to help identify those stakeholders but to also decide which ones should be represented as a persona and considered in the design process and how.

Eliminate biases. A common fallacy in design is to make assumptions based on the designer's knowledge and experience, which is one of the risks associated with the use of personas [29]. It is therefore important to look for data that validates assumptions and brings in additional insights, for example, by working with experts. If it is not possible to involve experts in the design process, designers can fall back to reviewing reports and other available data about the identified non-human species. However, it is important to be mindful about the risk of being selective in what reports are considered as this may amplify biases.

Consider additional interventions. Tools like personas and scenario maps can trigger ideas for additional interventions. Designers should use lateral thinking techniques to identify what other opportunities could support addressing the design problem. In the FrogID case study, the design team went beyond designing a mobile application and also created a promotion campaign and other initiatives to increase awareness about species extinction and encourage communities to build habitats for frogs.

Engage all team members. Bringing the concerns of non-human personas into a design process is likely to face resistance from other team members and raise questions about cost-benefit trade-offs [42]. As found in the FrogID case study, making sure that all the members of the wider team (not just the designers) are part of the process, can overcome barriers and ensure that all members have a sense of ownership. To support this, design artefacts should not just be owned by the design team but serve as a shared interface that everyone can contribute to. Justifying the benefit of additional costs remains an opportunity for future studies.

6 CONCLUSION

In this paper, we demonstrated how the use of design tools that capture the concerns, needs, and experiences of non-human stakeholder groups influence design decisions. In the presented industry case study, having a tangible representation of a frog as an archetype representative of the non-human stakeholder group led the design team to iteratively develop the user interface towards a solution that considered both the human user and the perspectives of frogs. The tools also played a valuable role in communicating within the interdisciplinary team, serving as a "common ground" interface between the designers and scientists. To that end, the design team was able to draw on their existing skill set – collecting data, bringing diverse perspectives together, and synthesising these data and perspectives, e.g. in the form of personas and scenario maps.

While this paper demonstrates the use of tools to design for frogs as a non-human persona that is directly affected, the lessons learned can be applied to a wide range of personas that do not have a voice. This includes non-human entities like animals, plants, and ecosystems that represent secondary stakeholder groups – i.e. those that may be invisible and indirectly affected by design decisions. The approach is not limited to non-humans but can equally be used to represent human stakeholder groups that do not have a voice, such as patients that are in a comma, people at the fringes that for political or cultural reasons are not able to participate in research and design sessions, and future generations – those that are not yet born but may be affected by the designs we create and use today. It is the designer's responsibility to ensure that these stakeholder groups are represented and considered in a design process.

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