

Personal Connection to the Ocean Via On-line Interactive Experiences

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Abstract

The Ocean Project enhances ocean awareness, education, and action communication strategies with hundreds of zoo, aquarium, museum, and conservation Partners worldwide. The opportunity to increase ocean awareness and action through Internet-based applications expands through standard Web browsers. Even world citizens who live and work in the middle of a continent can feel connected to the ocean through their local watershed that flows to the ocean through a series of streams, rivers, and bays. The Ocean Project is developing a new Watershed-Ocean Initiative through which anyone can click on a virtual on-line globe and visualize watershed characteristics and join local urgent or interesting conservation efforts. Tools already exist to make an interactive experience compelling to the point of suggesting personal action. Organizing data and developing the process for all our Partner aquariums is the key.

We will demonstrate on-line experiences aquarium visitors can access to drive the call to action they've experienced through physical exhibits. Included will be datasets that provide natural resource information, location of Partner aquariums and other educational facilities and organizations, volunteer opportunities, public lectures, and other rewarding experiences to motivate conservation action. A visual watershed-oriented mapping system ties experiences to physical surroundings. The Ocean Project is building a trust management system to coordinate geo-spatial datasets and develop workflows aquariums and their visitors can use for post-visitation experiences. Our aim is to build a community of worldwide aquarium collaborators who will assess and work with us to continuously publish an iterative process that demonstrates successes at the next Congress.

Introduction

Since 1997, the Ocean Project has helped its global network of zoos, aquariums, and museums (ZAMs) effectively educate their millions of visitors about how they can help protect and conserve our ocean planet [1]. More and more our communications impact has been enhanced by electronic-mediated communications that are coordinated through a website at theoceanproject.org. Upon reviewing our website statistics for the year ended June 30, 2008, we found a remarkable change in our visitor behavior. Whereas previously most visitors came in to our site via our front page, more than twice that many (over 60,000 visitors) were visiting our community maps that visually identify where our over 800 Partners are located internationally (see theoceanproject.org/partner/world.php). From the international community map shown in Figure 1, site visitors can query our Partners by country and link to the published websites for each Partner organization.



Figure 1 – The Ocean Project Community Partner Map (by country)

The Ocean Project provides the Partner map with the intent of encouraging our Partners to connect with other Partners in their geographic region, but any world citizen can use the map to find our

Partners in their community or in a community they plan on visiting in the near future. As the number of website visitors ramps upward, we've become increasingly concerned that we are supporting stereotypes that go against our organizational mission. Our international community Partner map:

- continues to promote land formation above and beyond ocean-based formation.
- continues to use political boundaries instead of ecological, natural landmarks for identification.
- continues to suggest a flat world that cuts the Pacific Ocean in two, instead of a spherical world.

These shortcomings have been necessary due to a long history of:

- having our Partner organizations, and their clients, located on the land and not on the sea.
- visualizing data, even natural datum, within political boundaries instead of within watersheds.
- using paper-based communications instead of three-dimensional media.

And these three shortcomings have reduced the quality of the ocean by:

- making the ocean a remote concept for Partners and their visitors on a daily basis.
- managing natural resources, including water, on a state-by-state and country-by-country basis.
- littering the environment with paper and plastic maps instead of recycled electrons.

The Ocean Project has committed to effectively educating Partners and their visitors by addressing any shortcomings reinforced by mass media – technologies are helping us overcome some misunderstandings over time. For example, we are pleased to see that our Partners will have better access to the ocean through the global Ocean Observatories Initiative that constructs a networked infrastructure of science-driven sensor systems to measure the physical, chemical, geological and biological variables in the ocean and seafloor [2] – cameras attached to these networks can provide real-time ocean-based visuals to anyone, anywhere, via the Internet. These technologies can provide ZAMs the opportunity to see the ocean remotely in real-time. We believe ZAM visitors will feel more connected to ocean pictures, video and quantitative data as they form and reinforce their personal connection to the sea – a connection that can be emphasized via visual exhibits within Partner institutions. Thanks to broadly used Web-based maps provided by .com organizations (*mapquest.com, google.com, microsoft.com, etc.*), the general public is becoming used to using on-line maps – a behavioral change that is enhancing any pre-requisite geographical visual literacy.

To better promote ocean awareness and conservation, we want the general public to understand the concept of a watershed. A watershed is an ideal physical community organizer as those located within a watershed share a common relationship to the water contained therein. Water can be a useful organizing concept for showing a connection to the ocean as world citizens imagine their actions affecting local water that then flows into streams, rivers, estuaries, bays, seas, and the ocean. While studies have shown that the typical person on the street has a hard time comprehending the concept of a watershed [3], educators have shown a strong vision for using watersheds for ecological understanding [4]. Through our initiative, we can help our Partners help their visitors understand the watershed concept.

The opportunity to increase ocean awareness and action through Internet-based applications expands through the continually emerging capabilities of standard Web browsers. As a result, we launched a Watershed-Ocean Initiative to provide new Web-based tools through which anyone can click on a virtual on-line globe and visualize watershed characteristics and join local urgent or interesting conservation efforts. Our tool lets the general public view a virtual planet Earth from space and scroll down towards the planet to see the watersheds that make up the landmasses they are perhaps used to seeing demarcated by political boundaries. As they drill down closer to the surface, sub-basins are shown to emphasize the hierarchical nature of watersheds – inviting them to become involved at whatever scale they best feel a personal connection.

Many whole-Earth visualization systems exist already for the rapid download, install, and interact process made available on the Web – Google Earth [5], NASA World Wind [6], Virtual Earth [7] are just three systems that receive a lot of attention in Weblogs and other promotional media. These tools all start off with a view of planet Earth from space – an international visualization that Carl Sagan suggested could change our opinion of ourselves and our relation to each other in powerful ways [8]. But, when used directly upon download, these tools all show the familiar political boundaries we are

all too familiar with – the emphasis is not on presenting natural data layers beyond a satellite view of Earth’s surface. This phenomenon is likely entrenched by the fact that finding natural layers to present for the whole planet is not well coordinated from the ecological address perspective promoted by The Ocean Project and environmental educators [9].

We aim to change perceptions by generating and promoting a well-documented process for building visualization layers for the planet on a watershed-by-watershed basis. These layers are the layers our Partners can use to educate their visitors about personal actions they can take on the behalf of the ocean – the layers can be accessed through high-end exhibits located within a ZAM and reinforced by gracefully degrading versions available from home, library, and school via the Internet. Layers include interactive features that let visitors start the process of personal action (registering for lectures, recreational activities, volunteer opportunities, etc. that increase their personal ocean awareness). Through ZAMs providing a visualization tool, visitors can clearly see the ZAM as a place to foster sense of community and connectedness.

This paper reviews our initiative’s progress to date, details on how to participate, and future plans.

The Ocean Project

The Ocean Project helps its broad network to enhance ocean awareness among the public; change attitudes and behaviors for conservation; increase civic involvement in community conservation activities; and generate regional, national, and international policy-focused action. We provide all of our Partners with cutting edge public opinion and communications research; strategies for effective educational and outreach programs; the latest in ocean and social science; and other helpful resources, information, and strategic opportunities. The Ocean Project has grown from just a handful of North American aquariums into a global network of over 800 zoos, aquariums, museums, conservation organizations, and other interested educational institutions and organizations around the world. Collectively, our Partners conservatively reach over 200 million people. We aim to help significantly promote positive change by working with and through The Ocean Project’s expansive network of Partners, using both face-to-face and electronically mediated communications. The initiative highlighted in this paper is one of our many ongoing projects attempting to promote positive change.

Promoting a Shared Visual Literacy for Conservation

As opposed to the familiar map layout seen in Figure 1, our visualization tool provides two important alternative views of the world as seen in Figure 2. The left image shows a perspective of Earth as seen from space where it is clear the planet is mostly water on the surface. The right image shows the default watershed overlay seen when scrolling in closer to the planet surface. Instead of political boundaries, a Web-based audience accesses a view of natural features that suggests an alternative categorization for communities. These views are better starting views for considering conservation when confronting many of the ecological problems created by non-natural administrative borders.

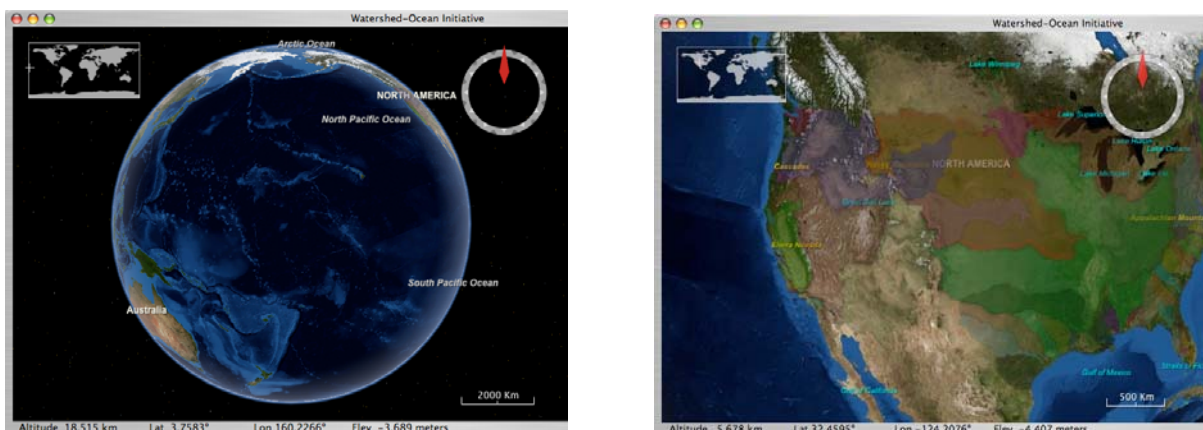


Figure 2 – Natural Views of Planet Earth

Of course those who are unfamiliar with watersheds can access political boundaries layers for reference – all existing data layers can be incorporated into the visuals within our software. The goal is to provide an easy way for our Partners to promote the beginning steps to better visual literacy for conservation, irrespective of a visitor's current visual literacy aptitude.

We then provide the ability to see the personal connection between a location on Earth and the ocean. Figure 3 shows the path to the sea from a location hundreds of kilometers away. This path can be requested at any time within the visualization. ZAM visitors can scroll towards the planet to investigate that pathway or request a different path – by doing so, they learn about their connection to other watersheds above and below their own in the natural flow of water on the planet. Just through a repetitive simple visual query, visitors can learn or verify the fact that well over 90% of the locations on Earth connect to the ocean. We believe this helps those in the middle of continents feel more connected to the ocean. The more connected one feels, the more interested they may be in its health and well-being, as well as feel more connected to all the others who live along the path. By following the path to the sea and varying our altitude from the planet surface, we can see variable scale man-made and natural structures that interact with the path.



Figure 3 – Exploring the Path to the Sea

Only upon gaining a better visual literacy based on watersheds can we promote the full benefit of using them as the basis for building community by identifying all relevant activities within the watershed with which to get involved – with watershed awareness, we can capitalize on the water resource connection to make a suggested social connection among those who live or travel there. After all, watershed-based resource management is hard to argue against [10].

Building Upon Already-proven Technologies

A community approach to proactive watershed management appears to be a likely successful endeavor given the success of other Web-based technologies that are in widespread use today. We are suggesting a Wikipedia model be used for accessing, managing, editing, and processing important data layers within each watershed. We are suggesting that we use a social connection model like the system *amazon.com* uses to connect people to authors and like the system *ebay.com* uses to connect physical goods' sellers to buyers. We are suggesting that we use a socially-mediated quality assessment model like *netflix.com* uses in its movie review and recommendation system. We are suggesting that we use a personal calendaring system like calendaring systems at *google.com* or *yahoo.com* to allow users to track the activities happening within their watershed – better coordinating their volunteer contribution and making notes regarding past and future activities.

We have been working with coordinators in three North American watersheds who have helped us refine a process for community data management – focusing on watershed stream networks and using the Keyhole Markup Language (KML) to author and edit stream and watershed boundary data [11]. KML uses plain text for data storage that enables data editing in a simple text editor. Our website explains KML in a straightforward way for community participation. Similar to updating a Wikipedia Web page to improve upon its content, we allow for data verification out in the physical world and the ability to update a stream network or ridge boundary live on our site. When a change is made, any

registered reviewer of that watershed gets notification of the change – as well as the Ocean Project staff as we get the process started. Community members who are willing to commit to learning available editing tools can use any editor that understands eXtensible Markup Languages (XML) or KML specifically for editing. The Ocean Project will continue to develop and add features to our tool so that edits can be made within the tool. We see our community data management process as relevant to many kinds of watershed-relevant data layers and expect to continue to publish new tutorials on other watershed data contributions going forward. The community, as a whole, will help us identify which data contributions are most relevant to watershed and ocean quality.

The authors have been talking to a wide variety of people in organizations associated with improving watershed quality in our local greater watershed area – the Narragansett Bay watershed area of Rhode Island and Massachusetts in the United States. More than 25 of these organizations promote watershed-conscious activities such as citizen water quality monitoring, bird and water mammal species counts, kayak and canoe paddle adventures, watershed council fundraising events, swim relay fundraising events, zoo environmental awareness days, ocean celebration days, beach and riverside community cleanups, organic gardening clinics, native species awareness lectures, etc. We are working on back-end systems that watershed-oriented communities can use to connect those looking for activities to those who provide them.

The Ocean Project's visualization tool provides layers of point-based icons to identify activities by location and time (color-coded currently) that let interested citizens find opportunities that are local to their daily routines. We want to provide an electronic connectivity kit for sponsoring organizations to use in registering and coordinating citizen participation. Our marketplace model optimism is based on the success of how *amazon.com* connects readers to book opportunities (by genre, price, publication date, etc.) and how *ebay.com* connects sellers of goods (by type of good, price, location, and age) to buyers. We aim to continue development on building the best possible back-end marketplace services given tests in watersheds around the world.

We look to our Partners to promote the process and make tools available in their public venues for handholding visitors through the process. Our Partners benefit by being able to use the system for promoting and managing their own activities that draw upon the conservation message contained in their exhibits. Figure 4 shows a simple example of how a watershed quality activity marketplace works within our tools – a citizen clicks on an educational kayak paddling adventure and uses a Web page form to volunteer their kayak for a watershed council to use to give young children an informative talk on the water.

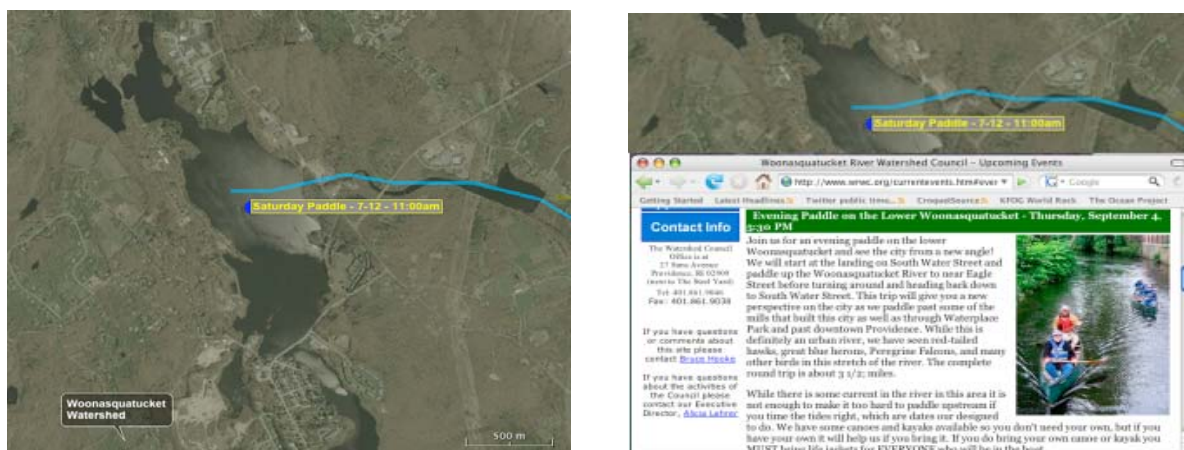


Figure 4 – Finding an Event and Registering for a Volunteer Task

As regular participants in local watershed events, the authors see a wide spectrum of quality and truth in advertising among sponsoring organizations. Our goal is to start providing back-end monitoring systems for watershed communities to use to provide feedback to the organizations that sponsor and put on the events. As our Partners, along with all non-profit watershed councils and government organizations, build awareness about the value of participating in watershed-focused community events, we hope to build a legion of Partner visitors and the general public who will attend events and provide feedback to make the collective experience better for everyone – with the indirect result of

improving watershed quality by changing personal actions.

Like those who use the movie rating system at *netflix.com* and the recommendation system to find movies they might like to watch, we aim to provide a watershed-focused activity service to rating and recommending activities within a local watershed. By tying the rating and recommendation system to the marketplace system, we hope to better coordinate activities to build appropriate attendance levels and necessary volunteer expertise to get activities done appropriately for announced watershed quality objectives. We also envision a personal tool that each ZAM visitor can use to manage their personal activity participation effort.

Given the success of the purchasing history tool at *ebay.com* that buyers use to keep track of what they have bought and whom they have bought from, we expect enlightened citizens to want to track their activity experience in a similar manner. Such a tool could work well for school age children who are managing their volunteer activities as part of a school recommended or mandated volunteer program – starting them at an early age so it becomes a natural process in their lives. Although our visualization tools helps citizens locate opportunities and connect to sponsors, the tracking tool allows citizens to keep their data local within their own personal technology – they don't have to share their thoughts or event management process if they are concerned with others using that data inappropriately. Activities can be managed through any activity calendar (*google.com, yahoo.com, microsoft.com, etc.*) that accepts standard event notifications. Figure 5 shows a simple example of how a watershed quality activity management tool would work in conjunction with our tools' marketplace and socially-mediated rating systems.

The screenshot shows the 'The Ocean Project' website interface. At the top, there is a navigation bar with links for 'E-mail Updates', 'Join', 'Donate', 'Contact Us', 'About Us', 'Privacy Policy', and 'Site Map'. A search bar is also present. Below the navigation is a blue banner for the 'Watershed-Ocean Initiative'. The main content area is titled 'My Chosen Activities' and includes search options for 'Opportunities' and 'Committed' activities. A list of 8 items is displayed for the 'Woonasquatucket River Providence' area, sorted by 'Best Match'.

My Chosen Activities

Search Options

Opportunities

Watershed

Items within 200 miles of ZIP/Postal

Committed

This Week

Show Items

See all common keywords

8 items chosen for: Woonasquatucket River Providence

(Save this search)

List View Picture Gallery Sort by: Best Match Customize Display

Title	Organization	Date	Time
Live Audio DJ and VJ Performance	Woonasquatucket River Watershed Council	2008-06-13	9:00 PM - 1:00 AM
Riverside Mills Park Improvement Day	Woonasquatucket River Watershed Council	2008-04-26	9:00 AM - 2:00 PM
Olneyville Shines on the Woonasquatucket River Greenway	Woonasquatucket River Watershed Council	2008-04-24	9:00 AM - 2:00 PM
Woonasquatucket River Cleanup Providence	Narragansett Bay Commission	2008-04-22	9:00 AM - 2:00 PM
Rising Sun Mills Fish Ladder Work	Woonasquatucket River Watershed Council	2008-04-22	10:00 AM - 2:00 PM
Greenway Promotion Ride	Woonasquatucket River Watershed Council	2008-03-26	5:30 PM - 8:30 PM

Figure 5 – A Personal Watershed Quality Activity Management Tool

Figure 6 diagrams how the visualization tool interacts with the other back-end and personal tool systems suggested in this section. Connections are bidirectional in all cases. The system architecture enables expansion in a manner similar to other community action support system architecture that are being developed for local community personal action – for example, a community-wide emergency response system architecture [12].

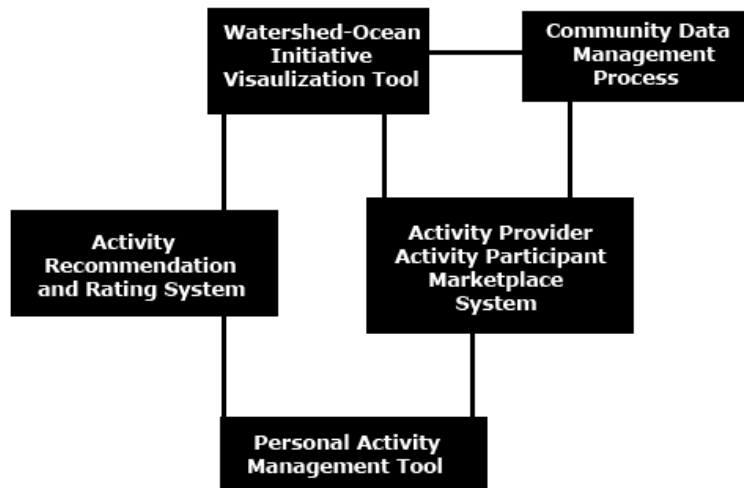


Figure 6 – Visualization Tool Interaction with Other Back-end and Personal Tool Systems

A Continuous Improvement Process

The process of accessing, managing, editing, and processing important data layers within each watershed is more complicated than the process of creating and editing Wikipedia pages. Although our goal is to build intuitive tools and tutorials, we likely need to develop legions of experienced people (or at least one very motivated individual in each watershed) who can perform the necessary data management tasks and teach others to do so as well. As a result, one of the Ocean Project's main contributions to this initiative is made through managing a website devoted to explaining and teaching community data-processing skills [13]. We evolve recommended data-processing processes and demonstrate them as a member of the community – listening to our Partners, their visitors, and volunteers who attempt the process and provide feedback as to its quality and reproducibility.

The Ocean Project takes on the role of a mediator to help promote successful data layers and successful socially mediated processes across watershed communities. Successful data capture, data processing, and data visualization techniques are promoted from within the initiative's tools, but also via explanatory and promotion pages on the initiative's website. By behaving as a central moderator who coordinates the set of tools, we expect to be as successful in empowering communities to improve their watersheds as Linus Torbalds has been in empowering system administrators to build useful software [14], Wikipedia management has been in empowering world citizens to support open information processes [15], or Tim Bernards-Lee has been in empowering people to connect and communicate effectively on the World Wide Web [16]. We count upon having at least two advantages those other information processing coordinators have not had: First, information is geospatially tagged and thus naturally easy to organize with a globe and, second, public opinion studies have shown that most world citizens already have a very strong emotional connection with the ocean [17].

Besides coordinating a focus on the data layers to be made available in our tools, we see the need to coordinate:

- roles and expectations for community-building specialists.
- visualization approaches to presenting data.

- interaction techniques for supporting a train of thought while using tools.
- hierarchical organization of sub-watersheds to aggregate up to a smooth global presentation.
- programming interfaces for connecting subsystems to existing software.

Each of these can be supported by transparent explanations and examples we coordinate on our initiative website. We see a future where our site can provide useful experience for people as part of on-line classes on topics such as communication, geographical mapping, and electronically mediated workflow. These skills are critical to continuous improvement of each component in our architecture of Figure 6.

Conclusion

The Ocean Project works with and through zoos, aquariums, museums, governments, academic institutions, and conservation organizations specifically because of their established position of prominent interface with large numbers of the general public. We believe that interaction, guided by appropriate ocean awareness and conservation messages, is an important opportunity for improving personal action among world citizens. Upon arousing a call to action in the general public, we need a place to go on-line to drive the momentum for becoming more active – as well as a place to share success stories. Our challenge is in making those actions take place in the real world where physical environments are being affected by humanity's collective action. We aim to strike a balance between efficient electronic communications and time outdoors so that the virtual information world we experience excites us to become active in the real world it models.

We wish to demonstrate on-line those experiences aquarium visitors can access to drive the call to action they've experienced through physical exhibits. Upon receiving the call, the ZAM community needs to enable them to participate in a successful community process for improving local watershed quality on behalf of the ocean. Those of us in the ZAM community must manage roles and contributions so that the full spectrum of useful activities take place and are recorded in ways for one watershed community to learn and interact with other watershed communities. To do so, we must provide useful metrics that demonstrate that the activities the general public performs (or refrains from performing) make a difference to watershed and, ultimately, ocean quality. The Ocean Project commits to providing a transparent process by which we all can understand what we are doing and can improve our effort where necessary to be more effective.

We don't want to minimize the variety of data layers that are useful for contemplating watershed and ocean quality. We likely need datasets that provide natural resource and protected area information, location of Partner aquariums and other educational facilities and organizations, volunteer opportunities, advocacy opportunities, and government projects. A useful and effective visual watershed-oriented mapping system ties on-line and off-line experiences to our physical surroundings. Our aim is to build a community of worldwide aquarium collaborators who will work with us to demonstrate the success of this proposed work plan by the time of the next International Aquarium Congress.

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