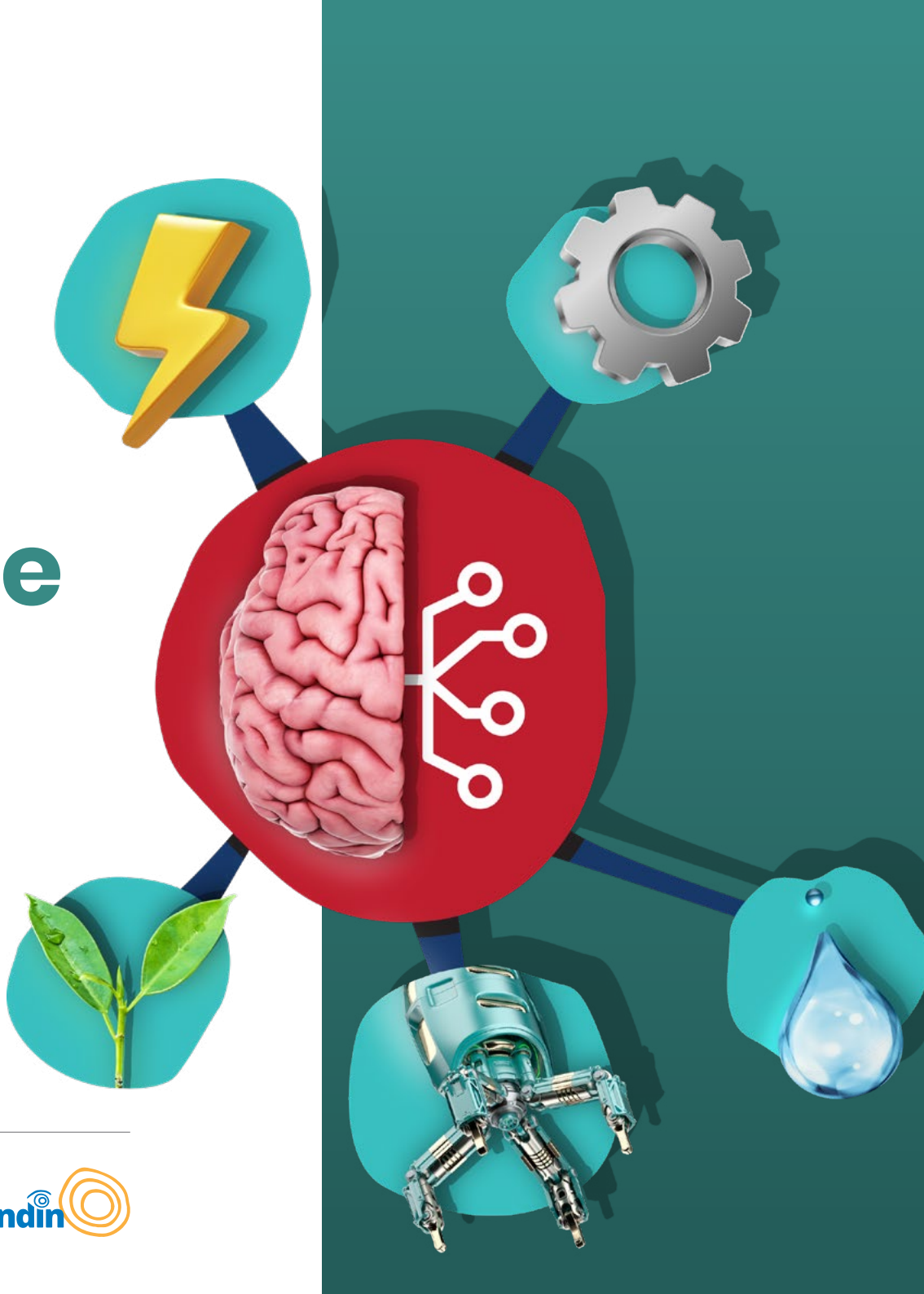
Australian Government

ANSTO
Science. Ingenuity. Sustainability.

ANSTO's National Science Week Hackathon
12-20 August, 2023

Design Mini-Challenge Toolkit

Teacher Edition



NATIONAL SCIENCE WEEK 2023 THEME

Innovation: Powering future industries

national science week

Australian Science Teachers Association

DFGN

nandin

The Design Mini-Challenge can be used by teachers as a stand-alone activity OR as a precursor to **ANSTO's Hackathon event** during National Science Week (Aug 14-19th, 2023).

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About ANSTO

ANSTO is the home of Australia's nuclear science and technology expertise.

ANSTO leverages great science to deliver big outcomes.

We partner with scientists and engineers and apply new technologies to provide real-world benefits. Our work improves human health, saves lives, builds our industries and protects the environment.

ANSTO is the home of Australia's most significant landmark and national infrastructure for research. Thousands of scientists from industry and academia benefit from gaining access to state-of-the-art instruments every year.

About *nandin*

nandin is ANSTO's Innovation Centre where science and technology entrepreneurs, startups and graduates come together, to challenge, design, innovate and commercialise, creating new jobs in the high-growth industries of tomorrow.

Located in the ANSTO Innovation Precinct in Sydney's south and set amongst Australia's most significant research infrastructure, *nandin* is home to a vibrant community of startups, graduates and industries developing ingenious solutions to solve unmet challenges in our world.

By connecting our community to forward-looking science and technology, *nandin* helps bring deep tech ideas to life.

An innovative waste form technology for the encapsulation and disposal of radioactive waste, known as ANSTO Synroc®. The cost-effective technology minimises environmental impact, and reduces disposal volume.

Design in the classroom

Facilitation is a critical part of design in the classroom. By putting structure and intentionality around the wild creativity of design, we ensure that it is a useful, safe, and welcoming experience for everyone. Some key elements of design facilitation include:

Navigating collaboration in diverse teams by inviting all perspectives to the table, and creating spaces that are conducive to multiple working styles

Removing barriers to divergent thinking by ensuring there is no “conformation to the norm” and welcoming all ideas

Embracing “why” questions to encourage critical thinking and open-ended conversation

Adopting design as a “way of doing” – shifting the culture to encourage learning from mistakes, creativity, teamwork, and psychological safety

Ideas for teachers

The templates from the Design Mini-Challenge – Student Edition can be printed out as a booklet and used to guide the students through the activity

Students can work in small teams or as a whole class group

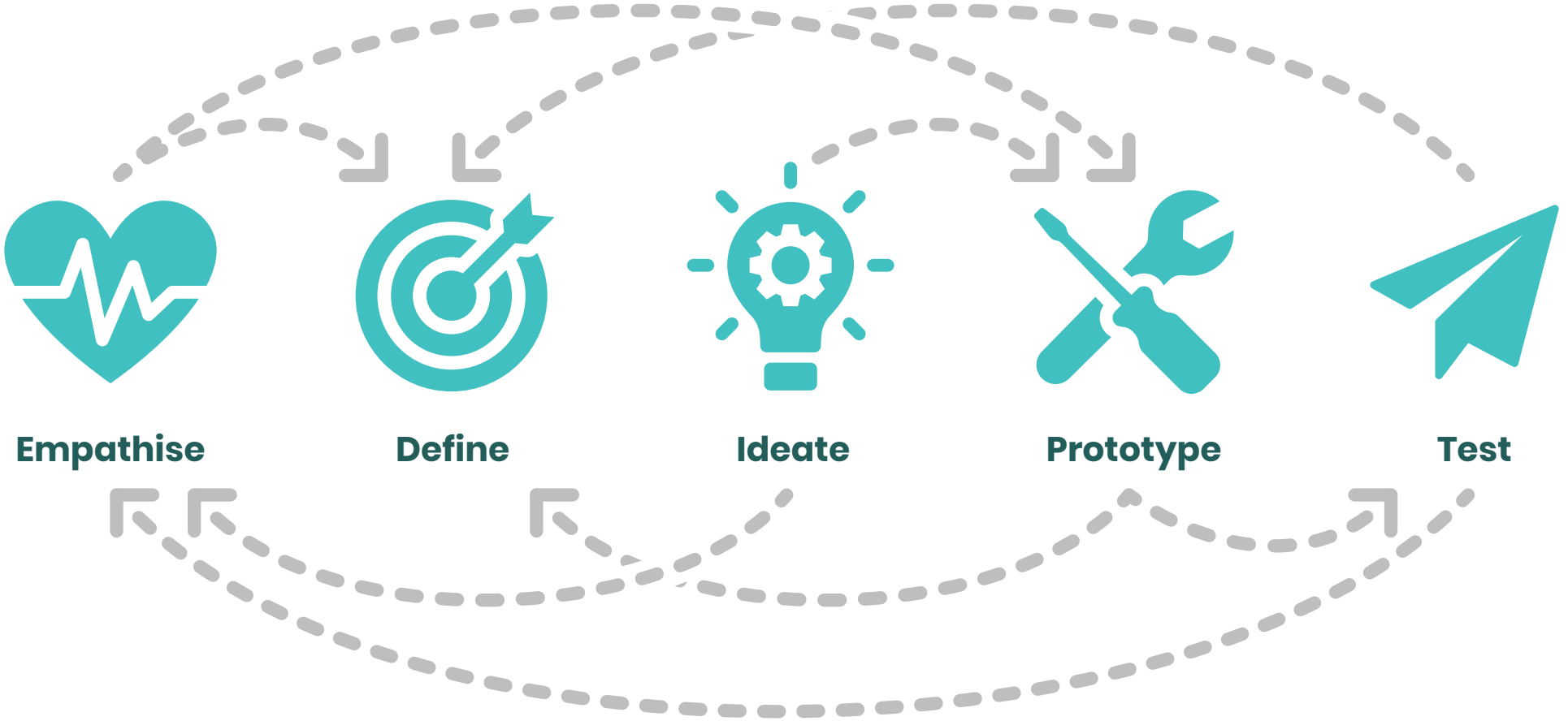
Teachers can use the reference material at the back of this document to introduce the Design Thinking process and give the students some examples

Students can “pitch” their solutions to a judging panel, made up of school staff or community members. If the winning ideas are viable, they could be put into practice

The mini-challenge can be done as an all-day workshop or broken up into smaller sections for students to engage with over several school periods

Teachers can challenge students by applying for **ANSTO’s National Science Week Hackathon**, which is a fast-paced, extended version of the mini-challenge and includes access to Design and Industry mentors and prizes

The design thinking process



> “Through design, science is made visible… design is a process in which creativity and science interact to produce novelty.”

Raymond Willem

Empathise

Understanding your end users

One of the first things you should do before embarking on a design project is **understand your end-users** – who they are, what they do, why they do it, and what they need.

This is not as straightforward as it seems – who you might originally think are your end-users could be completely different to the actual end-user.

End-users are **almost always not the bigger stakeholder**, rather, the person who will handle and use your product. The more research you conduct, the clearer this distinction will be.

Try to approach this stage **without assumptions** or ideas for solutions, as this is just about trying to get to know your users, their experience, their pain points, and their journey. You will start to notice **patterns and themes** that hint at the **problem space** – take note of these "aha" moments.

EMPATHISE

Empathy mapping

Encourage students to use a few different methods to learn about their users if they have the time and access to do so. Remind students that there are likely multiple possible users involved – what is each of their experience like? How are they different/similar?

WHO are our users?	What do they need to **DO**?
What do they **THINK** and **FEEL**?	What do they **SEE**?
What do they **HEAR**?	What do they **SAY**?

EMPATHISE

Personas

Activity tips:

Consider framing persona creation as similar to brainstorming a character for a movie or a story – they have a complex life history, background, needs and feelings.

Consider inviting students to think about extreme characters.

Details

Name:

Age:

Occupation:

Gender:

Image

Sketch or paste a photo of your persona

Quote

Write down a quote that summarises your persona's feelings/experience

“ ”

Background

What is their life story? What was their journey before this moment?

Motivations

What drives your persona? What do they need?

Frustrations

What problems do they experience? How does this impact their life?

Ideal experience

What goals do they have? What would an “ideal” experience look like?

Define

Uncovering the real problem

Many problems might have emerged from your empathise stage, but this is the time to select the **most important** problem for your user.

In the define phase, we make sense of a wicked (complex) **problem space** by learning why it is a problem, and what end-user needs a solution should address.

Remember, this process is **always iterative** – you may need to repeat the define phase a few times before you get to the right problem, or perhaps return to "empathise" to collect more user insights before defining again.

We already have a rough idea about the problem based on the challenge areas, but **this might not be the root problem** – we need to uncover the real problem at stake so we can tackle it effectively and bring real value.

If you can already think of a solution or if there is only one way to solve it, it is probably not the right problem – keep digging.

DEFINE

The 5 why's

Activity tips:

Encourage students to ask more detailed questions than just "Why" – let the answer to the previous question frame the detail for the next question (e.g. "why does that happen? Why is access an issue here? Why is that stressful? Etc.)

Starting problem statement:

Why?

Why?

Why?

Why?

Why?

Aha! So the root problem is:

DEFINE

WWWWWH

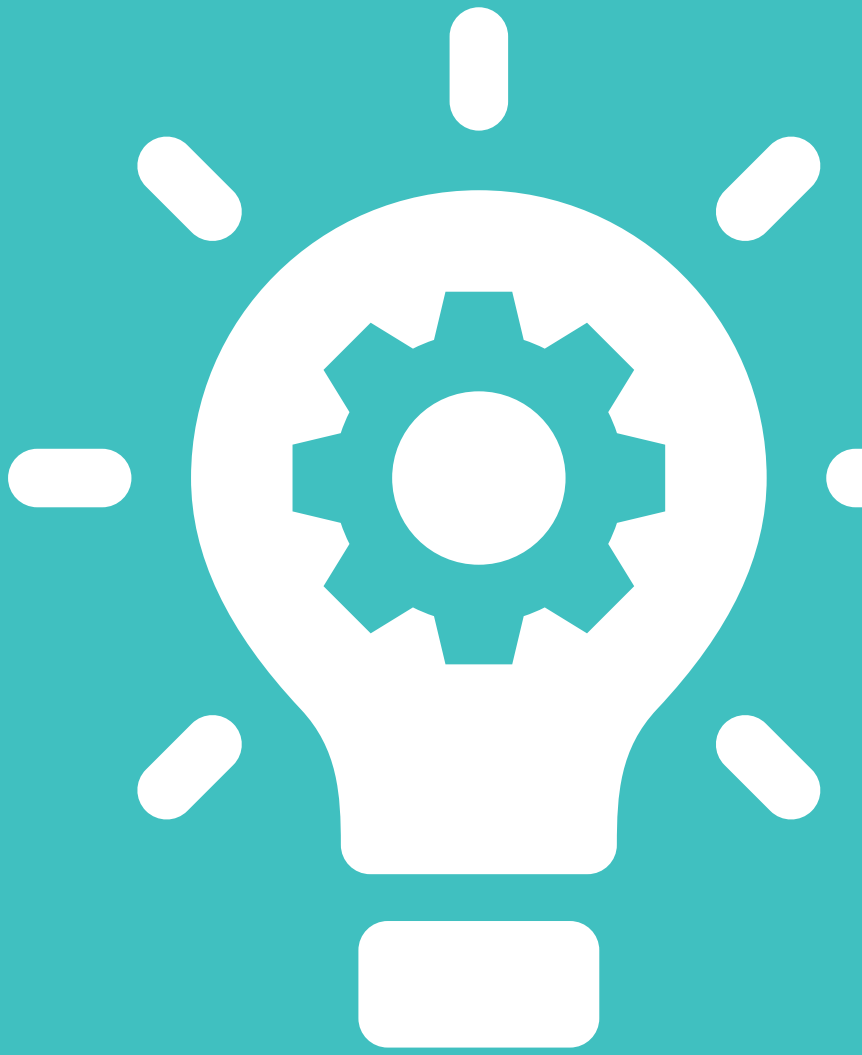
Now that we have a basic idea of what the problem might be, let's consider it from all angles to make sure it is fully uncovered.

WHO is involved?	**WHAT** happens?	**WHEN** does it happen?
WHERE does it happen?	**WHY** does it happen?	**HOW** does it happen?

What does this say about our problem statement? What further information or questions are required?

Ideate

Challenge assumptions and generate ideas



Equipped with your problem statement and your understanding of the end-user, you can now start to **brainstorm ideas**.

Ideation is where you should **think outside the box** and be as **creative** as possible – this is just brainstorming, so the crazier the better. Don't discount any ideas just yet.

An atmosphere of **collaboration and respect** is really important for your team in this phase – avoid phrases like "that won't work" or "we've already tried that".

You can also start to **sort and group ideas** based on their **feasibility**, **importance** to the user, and **relevance** to the problem.

IDEATE

Brainstorming ideas

Activity tips:

Encourage students to write all ideas, even “silly” ones. We don’t want to see blocking language or behaviour, as every idea has potential and this is not the evaluation stage yet.

Problem:

Mind-map:

Prototype

Make and break solutions

Prototyping and ideation go hand in hand as you start to **manifest your ideas** in a more **tangible** way.

Prototypes don't have to be polished models – and they usually shouldn't be. They can be sketches, role plays, cardboard cut-outs, wireframes – anything that helps you **communicate concepts** and **receive feedback**. The more prototyping you do, especially low-fidelity prototyping, the less sunken cost you will find further down the track – be it time, resources, or money. Prototyping reveals early issues and tweaks that simply brainstorming ideas cannot.

In an ideal project, prototyping would be a **co-creative process** (i.e. done alongside users) – this may not always be possible, but ideally you will have such a **rich understanding of your users** from the empathise phase that you will still be well equipped to prototype.

Most importantly, a prototype is **not a product**. You will create many prototypes for multiple different ideas before you start to consider the final solution.

PROTOTYPE

Sketching

Activity tips:	Consider inviting the students to sketch more than just their prototype – how is it used? Where is it placed?	Sketches can also be a great visual element to their final pitches.

PROTOTYPE

Planning for prototyping

Use this space to brainstorm what you will need for successful prototyping before making it happen.

What are the key **features** of your idea?	How does your idea solve/address the **problem**?
What **shift in the user journey** do you want your solution to create?	How will you make your idea **tangible**? What types of prototyping will you use? E.g. 3D models, collage, sketches, role-playing, paper/craft prototypes

Test

Bring it to users for feedback

The test phase is all about **end-user feedback**. This is how we understand if our technology has truly solved the problem and met the end-user's needs.

Structured methods for gaining rich feedback are important, as most **users will not always directly communicate** their needs.

This is where you will see the importance of "**fail fast, fail often**" – if you iterate well throughout the design process, you will get early feedback from this stage, and that will allow you to go back and **refine your product**.

Again, in the absence of continual user input, you will have to **keep your "empathise" hat on** and think from the user's perspective. There are also other methods for testing that allow you to **critically evaluate your designs** without necessarily gaining direct external feedback.

TEST

Test Option 1: "The Mini-Pitch"

Three-minute time limit

Who is your user(s)?	**What problem are they experiencing?**
What is your solution?	

TEST

Test Option 2: “Pitch Outline”

Activity tips:

Short and sweet – four minutes is plenty of time for an effective design pitch. Encourage the students to remove unnecessary detail and focus on the value brought to the end-user, showcasing the prototype, and the overall design journey.

Encourage the students to be creative with their pitch – does it have to be a speech? Can it be a role play? Can they ask questions to the audience? Can they show how their prototype works?

Team name:

Members:

School:

Big picture:

What is the problem context? What is the main idea?
What problem statement did you address?

Your end user:

Who is your end user?
How do they experience the problem?

Your solution:

What is your technology/product/service/solution?
How are you prototyping/demonstrating this?

Design journey:

How did you reach your solution? Did you have any pivots?
How did you prototype and test your idea? What did you learn along the way?
You are encouraged to refer to the five stages of the design thinking process.

Future directions/call to action:

What are the future directions for your solution?
How is your solution sustainable?

Case studies and reference material

Design+ Book: an eBook from the Aalto Design Factory that nicely unpacks the fundamentals of design
https://designfactory.aalto.fi/design-plus/

IDEO Design Kit Case Studies: more design examples as well as a good set of (advanced) design methods
https://www.designkit.org/case-studies

Board of Innovation: resources on design thinking templates and tools
https://www.boardofinnovation.com/tools/

Design Thinking: helpful summary/intro article
https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular

Design thinking case studies: a collection of 40 examples across various sectors
https://theaccidentaldesignthinker.com/2017/09/16/40-design-thinking-success-stories/

“VAD”: Case study on the design process for artificial heart patients
https://www.researchgate.net/publication/332448918_Exploring_the_role_of_Design_in_the_context_of_Medical_Device_Innovation

“What’s Next”: case study on design in airports
http://www.samuel-medvedowsky.com/work/whats-next/

“Embrace Baby Carrier” Case Study: more information
https://www.invisionapp.com/inside-design/reimagine-products-empathy/

Miro: great online tool for collaboration, especially design tools (has a lot of templates)
https://miro.com/

Notes

Please consult the Student Edition of the Design Mini-Challenge Toolkit
for printable, blank versions of the templates in this document

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