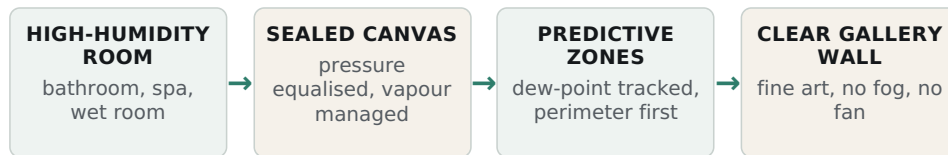


SAGUARO

TURNING THE BATHROOM INTO A GALLERY

A digital art display for the bathroom and the spa: one sealed canvas that equalises its own pressure, manages moisture, and keeps its glass clear — silently, on the room's terms.

From steam to gallery



No fan and no full-surface heating; the glass clears itself, zone by zone.

White Paper

Version 1.0, 2026

Srinivas Kasturi

Contents

Executive summary	3
1. The problem	3
2. The solution	3
3. Under the hood	4
4. Who it serves	4
5. In practice	5
6. Design principles	5
7. How this differs	5
8. Intellectual property	6
9. Roadmap	6
10. Conclusion	6
Appendix A: Glossary	6
Appendix B: Important notices	6

Executive summary

Living with art is a physical experience: a work on a wall, lit by the room, in the proportions its maker intended. The bathroom and the spa, increasingly among the most considered rooms in a home, have been closed to it. Steam fogs the glass, sweeping changes of heat and humidity stress seals, and moisture corrodes the electronics behind them. So digital art stays in the dry rooms, and the wet ones get a blank tile.

Saguaro takes a different approach. It is a digital art display built for exactly those rooms. A sealed canvas keeps liquid water and dust out; a passive vent lets the air inside breathe, so pressure never builds against the seals; a small desiccant takes up the little moisture that breathing admits; and, before fog can form, the glass warms itself in zones — only where condensation threatens, edges first — so the picture stays clear. It does all of this without a fan, so the room stays silent, and it draws far less power than a display that heats its whole face. This paper sets out the problem, the design of the device, the people it serves, and how it differs from what exists today. The methods described here are the subject of a patent application filed by the inventor, Srinivas Kasturi.

1. The problem

A hostile room. A bathroom can reach saturation within minutes of a shower, with the temperature swinging just as fast. It is one of the harshest environments in the home for any electronic device, and the one with the least tolerance for noise or bulk.

Open vents invite the damp. Ordinary screens reject their heat through open-air vents. In a steamy room those same openings let moisture in; as the air cools after a shower it reaches its dew point inside the housing, and condensation forms directly on the electronics, corroding them and shortening their life.

Fog on the glass. When warm, wet air meets the cooler face of a display, it condenses into a white haze that hides the picture exactly when someone is there to look at it.

The industrial answer is ugly and loud. Waterproof enclosures built to outdoor ratings rely on heavy casings and audible cooling fans. They keep water out, but they break the visual calm and the quiet that a work of art, and a bathroom, both ask for.

The mirror answer is fixed and dim. Bathroom media mirrors hide a screen behind grey glass. They are permanent fixtures that cannot float on the wall like a framed print, they limit brightness, and they impose one look on the owner forever.

Across all of these the pattern is the same. The wettest rooms in the house are shut out of digital art, because the screens made for dry walls fail in steam.

2. The solution

Saguaro answers each of these problems with one design: a sealed canvas that manages moisture passively and keeps its own glass clear by anticipating fog rather than fighting it.

2.1 A sealed canvas, not a vented screen

The working parts live inside a core capsule sealed against liquid water and dust to an IP66 rating. There are no open cooling vents for steam to enter.

2.2 A vent that breathes, a desiccant that mops up

A passive pressure-equalisation port carries a breathable membrane of expanded PTFE. It lets air and gas move freely in and out, so the pressure swings of the steam cycle are relieved gently instead of straining the seals or drawing wet air through them. Such a membrane equalises pressure but, by its nature, admits a little water vapour with the air; Saguaro is honest about that and plans for it, taking up the small amount admitted with a replaceable desiccant. The membrane is not asked to do the impossible job of blocking vapour outright.

2.3 Clarity by prediction, not brute force

The front glass carries a transparent, electrically conductive film divided into independently controlled zones. A small controller reads temperature and humidity, works out the dew point, and watches the rate at which humidity is rising. When it sees the tell-tale ramp of a shower starting, it warms only the zones at risk — the cold edges and corners first — holding them one to two degrees above the dew point so fog never forms. Heating only where it is needed uses a fraction of the energy of warming the whole face.

2.4 No fan, so it is silent

There is no fan and no moving air anywhere in the device. Moisture is managed by the passive vent and the desiccant, and clarity by the heated zones, so the appliance does its work in complete silence.

2.5 A gallery shell you can change

The sealed core is mechanically separate from the decorative outer frame, which is held on by magnets. A finish can be swapped — gesso white, raw walnut, dark alloy — without ever opening the seal.

2.6 Safe in the splash zone

The device runs only on low-voltage direct current, delivered over a single Power-over-Ethernet line or a 24-volt cable, so there is no mains voltage near water.

3. Under the hood

3.1 The sealed core capsule

A fibre-reinforced composite rear chassis is joined to the front glass by a high-compression fluorosilicone gasket, giving an IP66 seal against liquid and dust. The display, its logic board and the control electronics all live inside.

3.2 The passive equalisation port

The port places the inside of the capsule in gentle gas communication with the room through an ePTFE membrane of 0.2–0.5 micrometre pore size. Air equalises at up to 15 litres an hour while liquid water is held back to a pressure of 50 kPa, and a small labyrinth chamber ahead of the membrane catches any splash or droplets before they reach it.

3.3 The desiccant

A replaceable desiccant cartridge, reached through a sealed screw-cap on the back, takes up the modest amount of vapour the membrane admits between heating cycles, keeping the interior dry over the long term.

3.4 The zones and the predictive loop

The transparent heating film is patterned into independently addressable zones, concentrated along the outer margin where glass runs coldest. The controller computes the dew point in real time and, on detecting the humidity ramp of a shower or bath, drives a pulse-width-modulated current to just the at-risk zones, perimeter first, holding the glass 1.5 to 2.0 °C above the dew point. Showing the picture and keeping it clear run independently of one another.

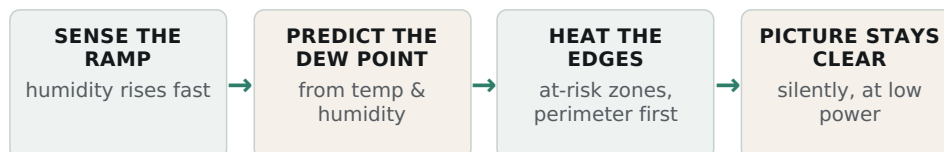
3.5 Keeping cool inside a sealed box

In its preferred form the display is a reflective electrophoretic (e-ink) panel, whose negligible heat suits a sealed volume. A brighter emissive panel can be fitted instead, in which case a graphite sheet spreads its heat to the chassis and the processor steps down its clock if the interior grows too warm.

3.6 Power and the decoupled shell

Low-voltage DC or PoE+ feeds the controller, the display and the heated zones. The magnetic outer shell carries no wiring and can be changed at will. The software is open and self-hosted, so the frame keeps working with no subscription and no cloud dependency.

Figure 1. How a shower is met, before fog can form.



4. Who it serves

Saguaro is for anyone who wants real art on the walls of the rooms that, until now, only ever got tile.

Figure 2. One display for the people and rooms that fine art has skipped.



art in every room,
even the wet ones

the spa as a
gallery

a considered wall,
not a blank tile

clear glass at a
fraction of the
power

4.1 At home

For a collector, Saguaro extends a collection into the one part of the house that has always been off limits, with a frame that looks like a framed print rather than a screen.

4.2 In the spa and the small flat

In a wellness room or a compact bathroom, a single sealed canvas brings the calm of a gallery to a space that has only ever had a mirror, and does it without a sound.

5. In practice

The collector. Anaïs hangs a rotating set of works in the master bathroom. When the morning shower fills the room, the edges of the glass warm a degree or two ahead of the fog, and the picture never clouds. She never thinks about it.

The host. Before guests arrive, Marco runs the spa hot. The frame on the wall holds its image clear through the steam, while the room stays silent — there is no fan to hear over the conversation.

The maker. Priya changes the outer frame from pale oak to dark alloy to suit a redecorated room, lifting it off its magnets and clicking the new one on, without ever breaking the seal.

6. Design principles

- **Manage moisture, don't pretend to exclude it:** the vent equalises pressure and admits a little vapour; a desiccant and heated glass deal with it honestly.
- **Anticipate, don't react:** fog is prevented before it forms, by reading the room rather than waiting for the haze.
- **Heat only where needed:** warming the at-risk zones, not the whole face, keeps the glass clear at a fraction of the power.
- **Silent and low-voltage:** no fan, no moving air, and no mains voltage in the splash zone.
- **Art first, and yours to keep:** a framed object rather than a glowing screen, with an open, self-hosted platform and a swappable gallery shell.
- **Honest about the landscape:** breathable vents, desiccants, transparent heaters and dew-point control already exist — in sealed cameras and in cars. The contribution here is their integration into a sealed, fan-free art display whose glass is heated only where and when condensation threatens.

7. How this differs

The table below sets common approaches today against the design described here. It aims to be fair rather than complete, and the features of other products vary.

Dimension	Common approaches today	Saguaro
Enclosure	Open vents, or glued cavities that stress under thermal cycling	IP66 sealed core with a passive, breathing pressure-equalisation port
Moisture	Claim a perfect vapour barrier and fail, or ignore it	Admit and manage: desiccant buffering plus predictive heating
Anti-fog	Heat the whole surface, continuously, at high power	Predictive, perimeter-first heating of only the at-risk zones
Acoustics	Audible cooling fans	No air mover; completely silent
Frame	Fixed industrial metal, or grey mirror glass	Magnetic, swappable gallery shells
Electrical safety	Mains-voltage AC requiring conduit	Low-voltage DC / Power-over-Ethernet
Ownership	Proprietary, cloud-locked	Open, self-hosted, no subscription

8. Intellectual property

The methods described in this paper — namely a digital art display sealed against liquid water for a high-humidity room; a passive vapour-permeable pressure-equalisation port working together with an internal desiccant to manage the moisture that breathing admits; and a predictive, multi-zone heating of the display's image field that warms only the at-risk zones, perimeter first, to hold the glass just above the dew point, all within an enclosure that carries no air-moving device — are the subject of a patent application filed by Srinivas Kasturi with the United Kingdom Intellectual Property Office. As set out above, the individual building blocks are established in adjacent fields; what is claimed is their integration into a sealed, fan-free art display. This paper describes the device at the level needed to understand it; it does not grant any licence.

9. Roadmap

Phase 1, the core display. A single, well-made sealed canvas with the passive equalisation port, the desiccant, the multi-zone predictive heating, low-voltage power and the magnetic shell.

Phase 2, range. Sizes and finishes from built-in to compact, refinement of the predictive control, and integration with home-automation systems.

Phase 3, reach. Hospitality variants, alternative panel technologies, and developer tooling for the open, self-hosted platform. Dates and scope are indicative and will be confirmed as the project develops.

10. Conclusion

The saguaro holds its water through the dry season and stands where little else can. Saguaro the display does something kindred: it treats the steam and swing of a bathroom not as a fault to be sealed out but as a condition to be read and managed — pressure equalised, moisture buffered, and the glass warmed just where and when it must be. By managing moisture honestly and clearing its own glass in silence, it sets out to put real art on the walls of the wettest rooms in the home, on the room's own terms.

Appendix A: Glossary

Sealed core capsule. The internal container holding the display and electronics, sealed against liquid water and dust — not a vapour-tight vessel.

Pressure-equalisation port. A breathing vent that lets air move in and out to balance pressure across thermal cycles while holding back liquid water.

Vapour-permeable membrane. An expanded-PTFE layer whose microscopic pores pass gas, including some water vapour, while blocking liquid water and dust.

Desiccant buffer. A replaceable cartridge that absorbs the small amount of vapour the membrane admits between heating cycles.

Multi-zone heating film. A transparent conductive coating on the glass, divided into independently controlled zones.

Predictive dew-point control. Computing the dew point and reading the rate of humidity rise so that heating can be applied before fog forms, only where it is needed.

Appendix B: Important notices

This document is for information only and describes intended design and direction. It is not medical advice, nor an offer or solicitation to buy or sell any product, security, token or other instrument, nor a promise of future features, availability or returns, nor legal, financial or investment advice. Any device of this kind would be subject to applicable safety and regulatory requirements, including those governing electrical equipment in wet areas, before sale. Statements about future plans are forward-looking and may change. Trademarks and product names of third parties belong to their respective owners and appear here only for comparison. The methods described are the subject of a pending patent application, and nothing here grants any licence.