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# Dark Clouds, Io\$#!+, and 🌌 [Crystal Ball Emoji]: Projecting Network Anxieties with Alternative Design Metaphors

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**Abstract**

This design inquiry engages concerns set within the frame of network anxieties. Our work projects and engages negative affective dimensions of digital network technologies including anxiety, exhaustion, overstimulation, overload, paranoia, unease, distrust, fear, and creepiness. We do this by designing alternative Internet metaphors and then applying these metaphors to the design of IoT (Internet of Things) technologies to generate speculative design proposals.

**Authors Keywords**

speculative design, IoT, internet of things, Internet metaphors, design, design research

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

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### Introduction: The Internet is a Metaphorical Thing

“The Internet does not exist,” Hito Steryl writes, “because it has no shape. It has no face, just this name that describes everything and nothing at the same time.” (Steryl, 2016, 5). Shapeless and faceless, everywhere and nowhere at once, the Internet must be grasped in metaphorical terms. Judith Donath explains it in more pragmatic terms: “Information is fairly formless, so almost everything we do online we do with some kind of metaphor” (Donath). Internet metaphors offer historical insight into collective visions, hopes, and dreams concerning what the Internet is and might become. We have the spatial metaphor of cyberspace; the topological metaphors of the net and the web; the infrastructural metaphors of an information superhighway and a series of tubes; civic metaphors of a global village or commons; and most recently ecological metaphors of a cloud and an internet of things. Each operates not merely as a way of describing or communicating the Internet but of structuring, selling, and prefiguring it. In this project we depart from these household Internet metaphors to engage in speculative and critical design practices that create and employ alternative design metaphors for understanding, interrogating, and reimagining the Internet.

### Network Anxieties

Our design inquiry is grounded in concerns set within the frame of network anxieties. Our work projects and engages negative affective dimensions of digital networks including anxiety, exhaustion, overstimulation, overload, paranoia, unease, distrust, fear, and creepiness. The selection of work presented here is theoretically informed and inspired particularly by scholarly accounts of surveillance and privacy (Brunton and Nissenbaum, 2015; Browne, 2015; Hu, 2015) and digital overload and addiction (Harper, 2012; Crary, 2013).

When the design and production of digital technology is dominated by incremental improvements and utopian visions of a brighter future (Metahaven, 2010; Dunne and Raby, 2013), we believe there is a need for design to aesthetically engage the shadowy, contradictory, and problematic aspects of technologies. The metaphors and concepts articulated here are designed to operate as antennae and conduits for amplifying and channeling undesirable, uncertain, and ambivalent feelings surrounding digital networks. In some cases they may yield brighter, more realistic visions of desirable futures. In others they help articulate futures that are perhaps best avoided.

### Design Approach

To project and engage network anxieties we adopted a speculative and critical design practice that makes use of design workbooks (Gaver, 2011) and speculative design proposals (Gaver, 2000; Blythe et al, 2015; Lawson et al, 2015; Pierce and Paulos, 2015; Wakkary et al, 2015). Our approach further takes inspiration from the fields of design planning and strategy where the goal is to articulate broader opportunity areas, lay out strategic roadmaps, forecast trends, and use design concepts and examples to plot out emerging landscapes and trajectories. This approach originated with our fascination with visions of IoT (Internet of Things) and cloud computing as depicted in innovation landscapes and product advertisements. We then sought to divert this approach toward critical and speculative ends.

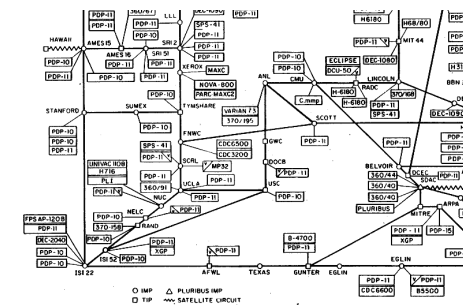
Rather than viewing our alternative metaphors simply as instrumental tools for generating new technologies, we intend for these metaphors, along with the design explorations and concepts that help to articulate them, to be grasped as designs themselves. As specialized speculative design practice, the design of design metaphors should be viewed alongside other design specialities focused on the creation of fundamental design materials and forms, such as the design of typefaces, design methods, and design tools.

### Structure

Here we present a selection of our work from an ongoing series of internal design documents and booklets. The first part of this paper interrogates and expands upon common Internet metaphors. This design inquiry yields a set of alternative design metaphors. The second part of this paper applies these metaphors to a speculative and critical design practice. We present a selection of design explorations and proposals that are inspired and framed by our alternative design metaphors. In order to scope our design work further we apply these metaphors specifically to a set of consumer-facing IoT devices. We conclude by reflecting on the role the alternative design metaphors in terms of conceptual and methodological contributions to design research and speculative practices.

Network Anxieties  
Timelines

A first step in our process was to curate examples that induce, project, partially alleviate, or otherwise form a source of network anxieties. News headlines, art exhibitions, academic articles, and white papers are all teeming with network anxieties. We found Internet timelines to be particularly rich sources. Whereas many timelines depicting Internet landmarks and watersheds exude optimism and progress, we sought to write alternative histories from the anxious perspectives of network paranoia, network exhaustion, network distrust, network fatigue, and so on. Here we present one example of an exercise in writing network anxieties timelines through a selection of anxious nodes in the extensive and unfolding grand narrative timeline of the Internet.



An example node of network anxiety: A network diagram of ARPANET, precursor to the Internet. Funded by the US Department of Defense, ARPANET is often hailed as an exemplar of government sponsored public infrastructure development. But here we prioritize its role in rooting the Internet in national defense, policing, and war. We draw lines from ARPANET to contemporary sources of network anxiety such as the leaks which revealed that the Internet was surreptitiously operationalized as a weapon of mass surveillance.

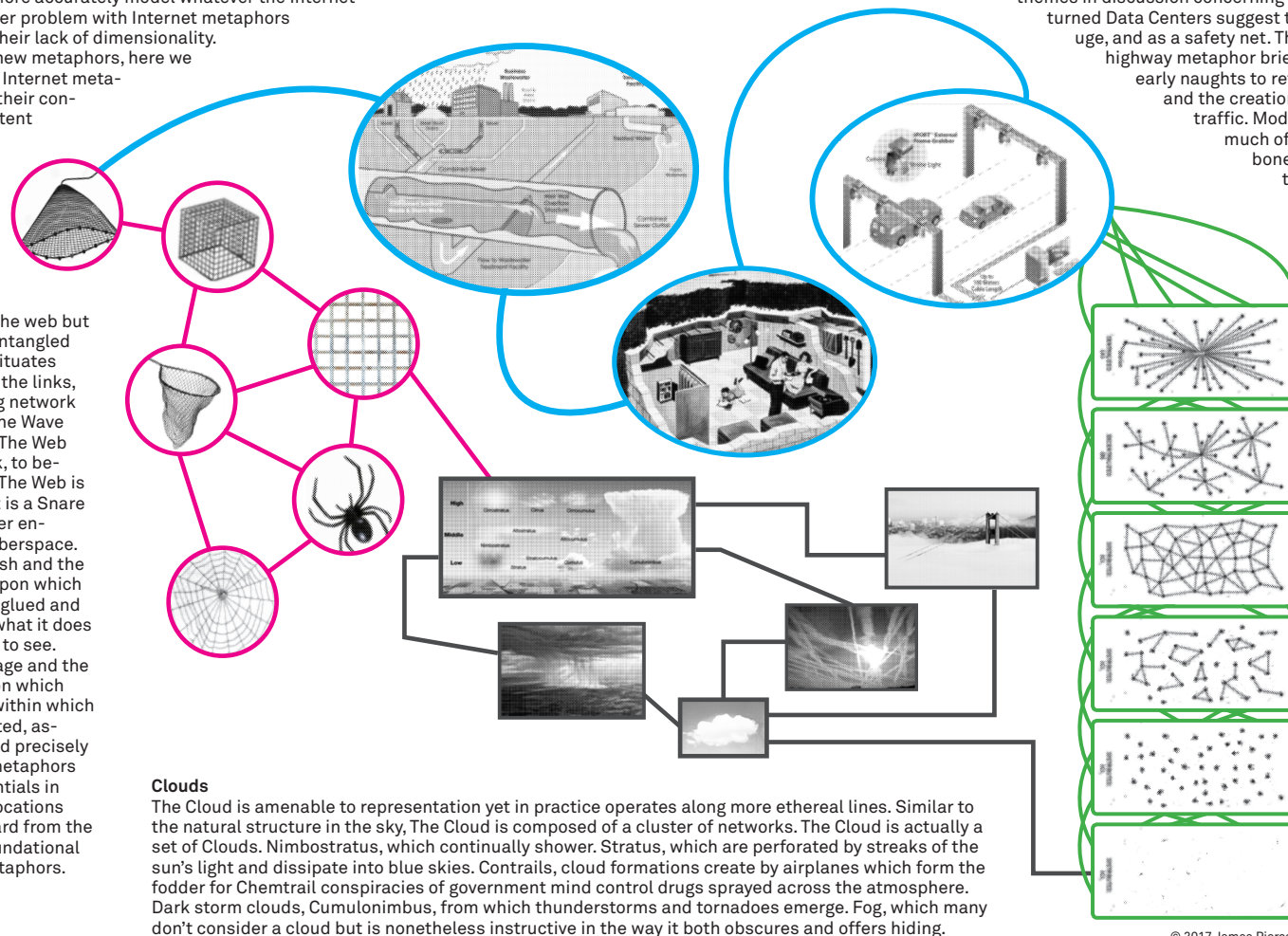


### Mixed and Extended Internet Metaphors

We found that the Internet's dominant metaphors fail to represent the many network anxieties our timelines surfaced. A problem with every Internet metaphor to date that has embedded itself into popular culture is its singular and totalizing nature. The Net is supplanted by The Cloud which gives way to The Internet of Things. Instead we seek metaphorical plurality, which would more accurately model whatever the Internet actually is. Another problem with Internet metaphors is their flatness, their lack of dimensionality. Instead of brand new metaphors, here we unpack dominant Internet metaphors to uncover their contradictions and latent potentials.

### Webs

One doesn't surf the web but rather becomes entangled in it. The Web habituates the user to follow the links, the vast sprawling network of associations. The Wave wants you to fall. The Web wants you to stick, to become enmeshed. The Web is a Net and The Net is a Snare that keeps the user enmeshed within cyberspace. The Snare is a Mesh and the Mesh is Screen, upon which the user's gaze is glued and which filters out what it does not want the user to see. The Screen is a Cage and the Cage is a Grid upon which everything lives, within which everything is plotted, assigned a value, and precisely monitored. Web metaphors show us the potentials in following the associations that tendrils outward from the Internet's own foundational and dominant metaphors.



### Clouds

The Cloud is amenable to representation yet in practice operates along more ethereal lines. Similar to the natural structure in the sky, The Cloud is composed of a cluster of networks. The Cloud is actually a set of Clouds. Nimbostratus, which continually shower. Stratus, which are perforated by streaks of the sun's light and dissipate into blue skies. Contrails, cloud formations created by airplanes which form the fodder for Chemtrail conspiracies of government mind control drugs sprayed across the atmosphere. Dark storm clouds, Cumulonimbus, from which thunderstorms and tornadoes emerge. Fog, which many don't consider a cloud but is nonetheless instructive in the way it both obscures and offers hiding.

### Tubes

Then-US Senator Ted Stevens was widely ridiculed for referring to the Internet as a Series of Tubes. "The Internet is not something that you just dump something on. It's not a big truck. It's a series of tubes." But the joke was on everyone laughing, because the Internet does actually consist of a series of tubes carrying long-haul fiber optic cables linking together network servers. Before the Internet must be made sense of with metaphor, before it is anything else, the Internet is infrastructure. Tung-Hue Hu has carefully traced how the Internet grew out of older networks including railroad lines, sewers systems, and Cold War bunkers. (Hu, 2015). Hu argues that the sewer can be a useful analogy since waste and contamination have become recurring themes in discussion concerning digital privacy (57). Cold War Bunkers

turned Data Centers suggest the Internet as war apparatus, as refuge, and as a safety net. The mostly defunct Information Superhighway metaphor briefly resurfaced with an update in the early naughts to reflect concerns with Net Neutrality and the creation of Fast and Slow Lanes of Internet traffic. Modern highway system, alongside which much of the Internet's series-of-tubes backbone runs, are equipped with RFID-based toll collection systems. Surveillance cameras, radar guns, and patrol officers enforce payments and speed limits. If the Internet is a Series of Tubes, perhaps it is also a Big Truck cruising along a closely monitored and rigidly enforced toll road.

### Networks

The Internet was made possible through fundamental innovations in network topology. Distributed networks proved to be more resilient and efficient than networks built around a central node. Network researcher Paul Baran famously articulated a proposal for packet switching using distributed communication, aka hot-potato routing, which became a key enabling technology of the Internet today. Network topologies can provide the basis for alternative design metaphors for the Internet. We are particularly attracted to topologies of disconnection, dispersion, and disintegration.

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## The Internet is a [?][?][?][?][?][?]

Thus far we have sought out alternative internet metaphors by looking for nuance within the Internet's existing metaphors. Next we wondered wheremight we look for different metaphors. The new ideogrammatic language of Emoji, invented specifically for the Internet, appeared promising. If the Internet wanted to tell us what it is, in a universal language that all can comprehend, it very well might do so in Emoji.



The Internet is Eye in two ways. First, it demands being looked at. For example, the average person checks their smartphone 46 times per day. Second, the gaze of Internet is unrelenting. Everything we do online is potentially tracked, recorded, and monitored.



The Internet as Hole suggests two opposing interpretations. The Hole might be a place where we chase white rabbits, an alternative reality where we go to escape from the real world. Or the Hole might be reality itself, a place where we seek refuge from the Internet and the digital world. Else, the Hole might simply be where the Internet materially lives: in server farms and fiber optic cables holed away and underground.



The Internet as a Global Village has been exposed as a fraud. It's in the interests of advertisers to create algorithms that keep us all within our own bubbles that reflect who we are and what we buy. Currently the Emoji language has no Bubble emoji, which is perhaps telling. For now, the Medium White Circle emoji will have to suffice.



The Internet of Things promises us a future where everything is connected to the Internet. Coffee makers, refrigerators, even toilets. The Internet as Pile of Poo suggests that instead of offering us things we need and which make the world a better place, the Internet will soon leave our planet trashed, our security contaminated, and our things useless.



The Internet as Ghost can be many things. That creepy feeling that somewhat might be stalking your social media profile. A recommendation algorithm that is so uncannily accurate that it must have been listening to you. That video you know you've seen but now can't seem track it down.



The Internet no longer merely lets us search for information. The Internet tells us what we want, what we should do, and who we are. The Internet as Crystal Ball reminds us that the Internet is not yet 100% accurate, but it is actually something more powerful, mysterious, entertaining, and potentially dangerous than perfectly accurate prediction algorithm.

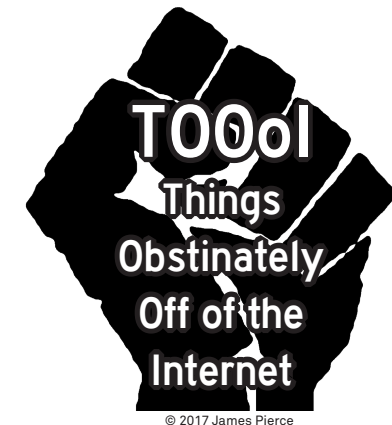
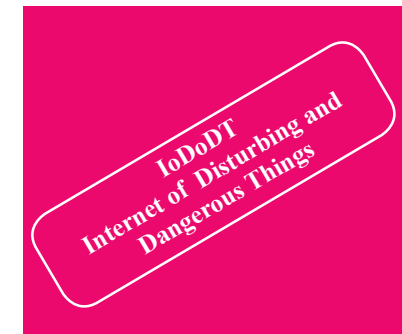
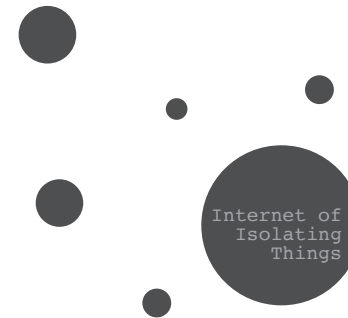
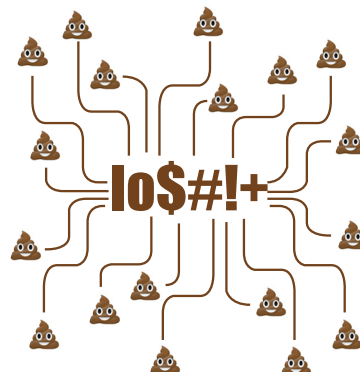
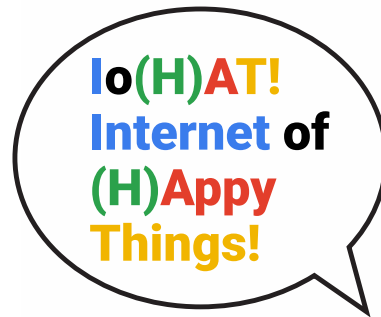


## Io@ (Internet of Acronymic Things)

Technologists are obsessed with acronyms. It is no surprise, then, that the Internet's latest buzz has been packaged into acronymic form. IoT, the Internet of Things, is an outlier as Internet metaphors go. Whereas the earliest Internet metaphors of cyberspace and surfing the web helped people to spatialize and embody the Internet, the IoT vision is based on a sort of network-ification of the existing non-Internet world. Here we present a selection of alternative acronyms for the Internet of Things.



**Io@ Image Collections.** Each of our Io@ acronyms served as a tag for collections of IoT images. Above is a selection of Internet of (H)Appy Things, which exemplifies a positive, optimistic, and entirely anxiety-free vision of the Internet of Things. Yet each can easily be re-tagged otherwise: the smart coffee maker as Io\$#!+, the home camera as IoIST, and the smart fridge as IoUT.



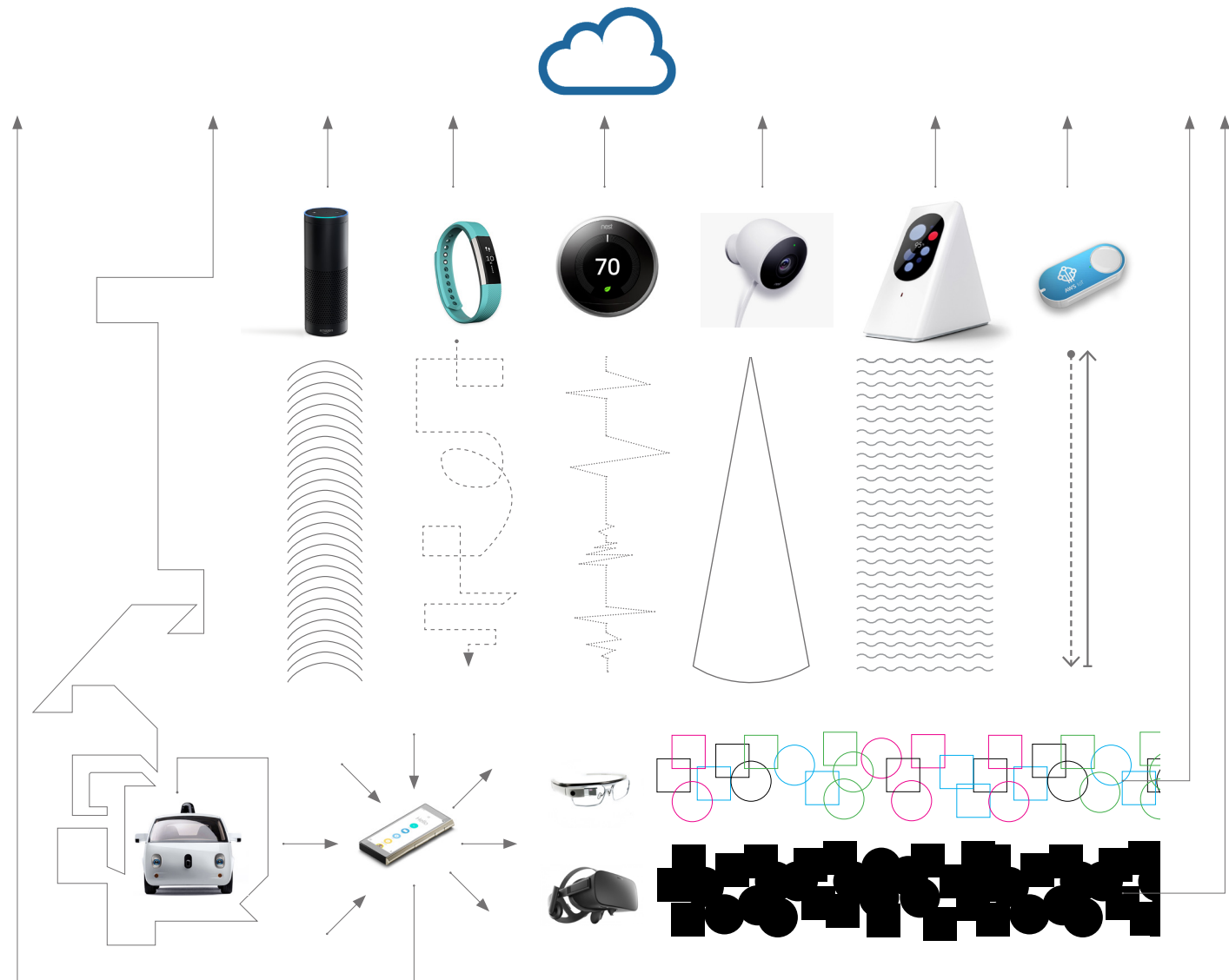
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## Metaphor Applications / Applications Metaphors

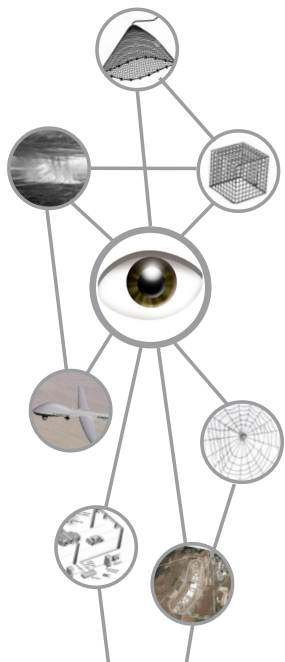
Having articulated a set of alternative design metaphors, we now turn to apply these metaphors within a speculative and critical design practice. Here we set our metaphors within a specific design framing of consumer-facing IoT devices centered upon visions of the Smart Home. These devices include both commonplace IoT devices such as Nest Smart Thermostats and Cameras to emerging ones, such as Google Glass and Driverless Cars.

### IoT Interaction Textures

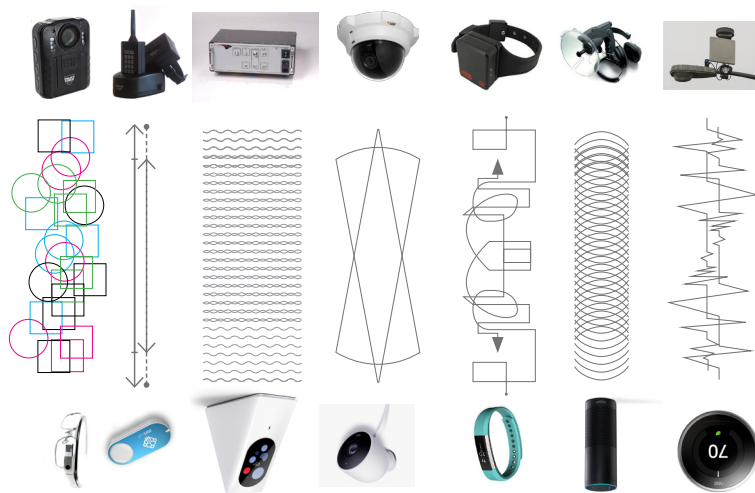
Here we diagrammatically distill *interaction textures* of IoT Smart Home technologies to capture a spectrum of novel interactions and paradigms being proposed and implemented. We began by cataloging IoT devices currently on the market and then expanded out to emerging technologies. Our analysis of these examples yielded several maps that visualize IoT products and service offerings. We think of these as maps as *interactional textures* that function as their own sort of IoT applications metaphors.



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Centered on the metaphor of the Eye, this sample of design explorations begins by drawing parallels between everyday IoT applications and specialized policing tools for surveillance, violence, and control. The selection of concepts presented here focus on the design of Apps that surface tensions between policing, surveillance, and violence, on the one hand, and (h)appy consumer-facing applications on the other. We are especially interested in how consumer applications function to normalize surveillance and control in everyday life, and on the slippage that occurs between mainstream applications and more specialized and less visible tools.



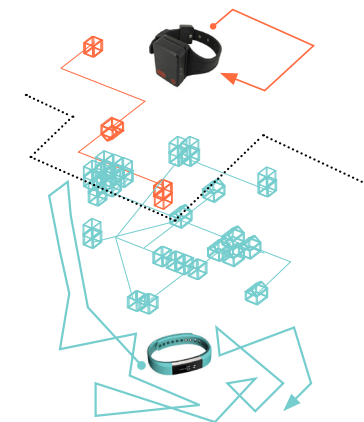
#### Parallel Devices: Smart Homes and Smart Policing

This design exploration pairs common IoT devices with controversial policing tools. Our intention with these pairings is to problematize and defamiliarize everyday and emerging IoT technologies while at the same time identifying opportunities for employing familiar technologies to draw attention to more contested and unsettling ones. For example, The Starry Station wifi router, which emphasizes styling and easy of use, is paired with the StingRay Gemini 3-3, a controversial surveillance device that intercepts cellular communications by pretending to be a cell tower. The Nest Smart Thermostat is paired with ShotSpotter, an environmental sensor that monitors gunshots in public places. The Fitbits activity tracking bracelet is paired with an Electronic Ankle Bracelet used to monitor prisoners, parolees, and individuals sentenced to house arrest.



#### Find My \_\_\_\_\_

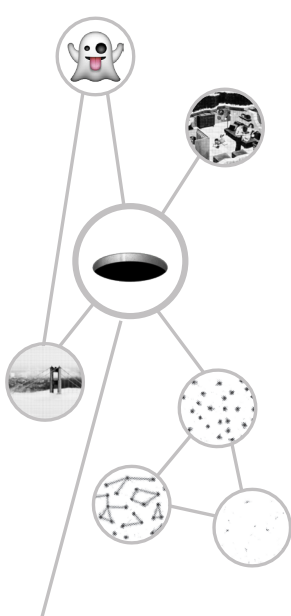
Apple's native app Find My Friends allows people to view the location of friends and contacts in real time and track their movement. In *Find My \_\_\_\_\_* we explore other scenarios for tracking the location and movement of both acquaintances and strangers. Of interest here are the ways in which the marketing of new digital technologies belies other more unpleasant, creepy, and sinister use cases. Also of interest is the banality of everyday surveillance and its normalization through consumer applications.



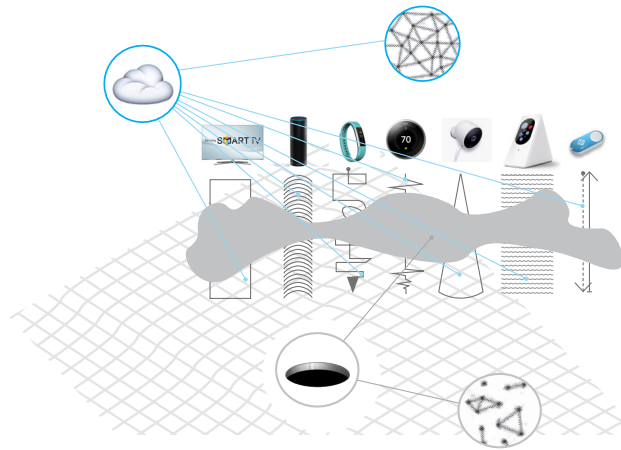
#### Consumer Policing Apps

Building on our pairing of policing and smart home devices we sought to explore consumer-facing policing apps. Our speculative applications are built upon and inspired by functional policing and military technologies including RFID prisoner monitoring, surveillance cameras, gunshot sensors, predictive policing, and signature drone strikes. *Curfew* is a third-party app designed to help parolees and house arrestees comply and avoid incarceration by, for example, keeping appointments, meeting curfews, and staying clear of exclusion zones. *Find Offenders* displays the whereabouts of parolees and house arrestees being monitored with electronic ankle bracelets. *Crimecast* goes a step further than *Find Offenders*, leveraging public data and infrastructure to create forecasts predicting the likelihood of specific forms of criminal activity and terrorism such as robberies, sexual assault, and mass shootings.





This set of design concepts is inspired by the Internet as a hole metaphor. Here the hole is envisioned as representing gaps, irregularities, and punctuations in the network topography of the Internet. Hole are antidotes and refuges from the Internet's far-reaching tendrils, unquestioned uniformity and continuity, and ever-watching eye. When the Internet of Things promise to extend cyberspace, the net and the cloud into every facet of physical reality, holes curiously come to symbolize refuge and portals back to reality. What design opportunities lie in the creation of holes in cyberspace, the net, and the cloud?



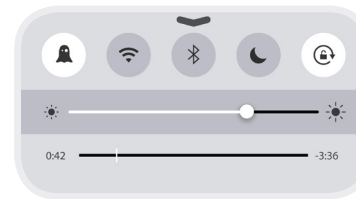
## Holes in the Cloud

Everything in the Internet of Things is active and connected to everything. And everything is connected to the cloud. Holes in the cloud are spaces in which light can shine through. Holes in the net are pockets through which to escape. Holes in cyber-physical space are portals to the original alternative realities. Nothing pings, blinks, or silently tracks its location inside a network hole.



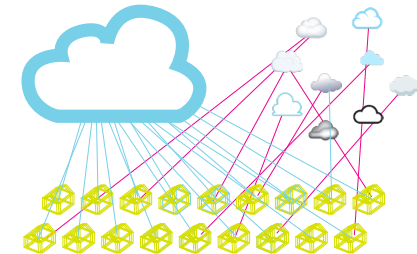
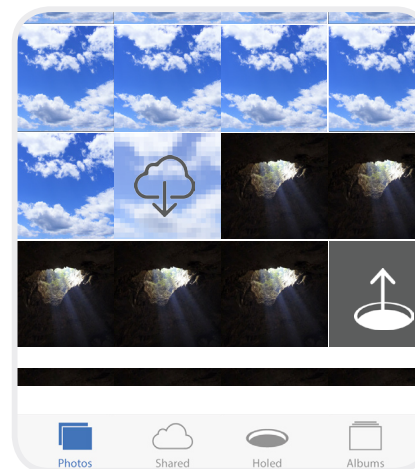
## Hole Data Storage

Sending data to the Cloud has been rendered as simple as pressing a button. But what about hiding, securing, and archiving data elsewhere? Hole Storage offers a simplified route to storing personal data through alternatives to the totalizing and monolithic Cloud. Data Holes can be configured to access and store data through obscured and secure channels. Holes Storage can end in personal external storage devices or local encrypted networks. In addition to its functionality, Hole Storage conceptually works to erode unquestioned faith in the Cloud.



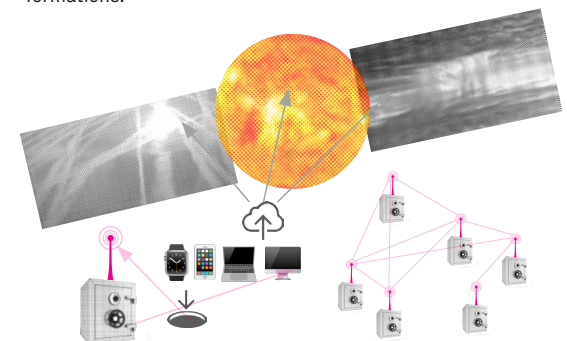
## Ghost Mode

As all personal electronics gain approval for use during flights, airplane mode becomes an historical curiosity. Silent mode, airplane mode's main contender vying for its position, is much too passive. Ghost mode offers nearly invisible, untraceable, and silent digital activity and movement, effectively creating holes in the network cloud. When its etheric existence is probed or threatened, ghost mode responds by introducing entropy back into the network and obfuscation inside the cloud.



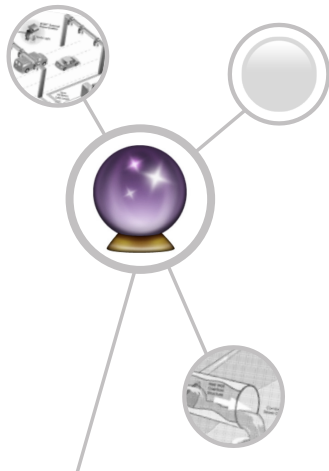
## The Cloud / Many Clouds / A Cloud

The Internet is actually The Internets, a series of networks variously linked and unlinked together. As in Nature, network clouds are varied. They morph and dissipate. Instead of obscuring this reality, our devices might embody more pluralistic cloud metaphors, ones more conducive to the propagation of the holes that must inevitably appear between evolving cloud formations.



## Data Safes, Sheds, and Bunkers

In turning to the sky, mixed and extended Internet metaphors portend a looming and potentially calamitous networked future. An astrological and meteorologically informed look at the Internet's metaphors forces us to confront network storm clouds (potential ecological and humanitarian disasters), network contrails (potential government conspiracies), and network solar storms (potential data and service erasure). Protection from these figurative dark clouds might come in the form of data safes, sheds, and bunkers. Designed in conjunction with Hole Storage metaphors, data safes enable simple, fast, reliable, and secure routes to connecting to private data safeguarded against natural and human interference and destruction. Small clouds of linked data safes might provide some of the accessibility of the cloud with the security of network holes.



This set of design concepts is inspired by the fusion of search, prediction, and recommendation algorithms with fortune-telling, mind-reading, and prophecy. The concrete and abstract scenarios portrayed here explore ways that algorithms fed through extensive networks of sensors and actuators might partake in forms of recommendation and prediction that become so useful and embedded that they take on their own forms of reality. Digital prediction turns into prophecy which immediately manifests as reality with the click of a button: Prediction algorithms are virtually 100% accurate if what they offer is always irresistible. We are also interested in exploring the limits to what is desirable with respect to prediction and recommendation, as well as the hidden ways in which algorithmic network technologies can work to divide us up into users, segregate us along demographic lines, and control our political and purchasing power and choice.

### Network Scrying and Digital Crystal Balls

Scrying is the art and practice of foretelling the future using a crystal ball or other reflective object or surface (perhaps the black mirrored screen of a smartphone?). Network scrying would be the use of networked algorithmic tools to engage in a practice that mixes prophecy, prediction, decision-making, and manifestation. What is of particular interest to us is the potential for the predictive powers of networks and algorithms to shape actions to the point at which their prophecy is closer to an act of manifesting reality. When Amazon can tell you with 99% accuracy what your next purchase should be, and Google knows what you need to search for before you do, the functional operation of these systems becomes less about predicting the future than actually constructing truth and reality. Some have predicted that the Internet may someday develop enough connections that it evolve into an emergent conscious being. Yet the Internet, and those who own and design it, may be controlling and manifesting reality well before it ever becomes sentient.



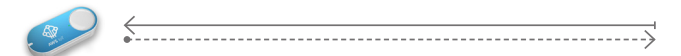
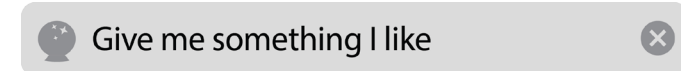
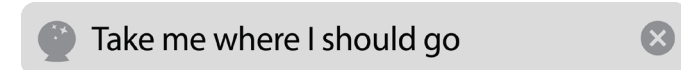
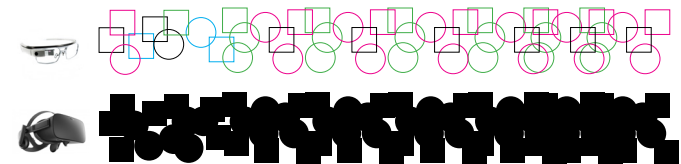
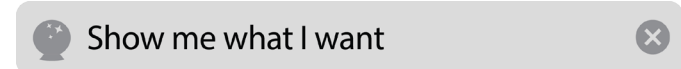
From left to right: Apple iPhone 7 smartphone, Oculus Rift VR headset, The Monolith from Stanley Kubrick's 2001: A Space Odyssey, Intel Server System P4308SC-2MHGC, Black Large Square Emojis as rendered by Apple

### Network Scrying Bubbles

While the metaphor of a global village sought to instill faith that Internet would be bring us all together, the reality is that social media and networked devices work to drive us apart, isolating us each into bubbles of like-minded people, places, things, and activities. Network Scrying coupled with an Internet of Things suggests even greater potentials to continue to segregate users according to what they want, where they go, what they have, and how, and for how long, they live.

### Leaky Crystal Balls

Disastrous consequences could ensue when the pipes and sceptic tanks that carry and store Digital Scrying data burst or are breached. This scenario would lead to unprecedented threats to the privacy of not only our identities in terms of our externalized personal information, but threats to our inner most thoughts and emotions.



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### Conclusion: Designing Alternative Metaphorical Devices

This paper has presented a sample of our work designing alternative Internet metaphors and then applying these metaphors to the design of speculative and critical IoT products and services. These alternative metaphors and design concept are part and parcel of compositions that seek to critically interrogate and expand our visions of what is possible and desirable with respect to network technologies. The design research contributions of this work have been both methodological and conceptual. Conceptually this work contributes a particular set of novel alternative Internet metaphors. We further couple these metaphors with a number of design explorations and proposals. Methodologically we demonstrate an approach of designing alternative Internet metaphors and then show how these metaphors can be applied to speculative and critically oriented design practices. Our work further represents a unique combination of speculative and critical design practice with techniques and goals from design and innovation planning. We think of the design proposals presented here as alternative metaphorical devices whose primary function is to embody alternative metaphors, to help us interrogate the limitations and dominance of current metaphors, and to experience and experiment with the possibility of alternatives.

### Acknowledgments

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