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hue personal
wireless
lighting

Reflections on 10 years of the Philips Hue ecosystem

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Philips Hue - Signify
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Every room
Every day
Every activity

We can connect a bulb to the
internet. **Why would we?**

Unlock light's potential in the home

We are dedicated to making home lighting more enjoyable, personal and inspiring



Entertainment

Ambiance

Everyday well-being

Feel secure

Where we began

Started in 2011 as an internal startup in Philips Lighting.

Lets make people care about lights in their home.



Still 23 people involved at launch with us today!



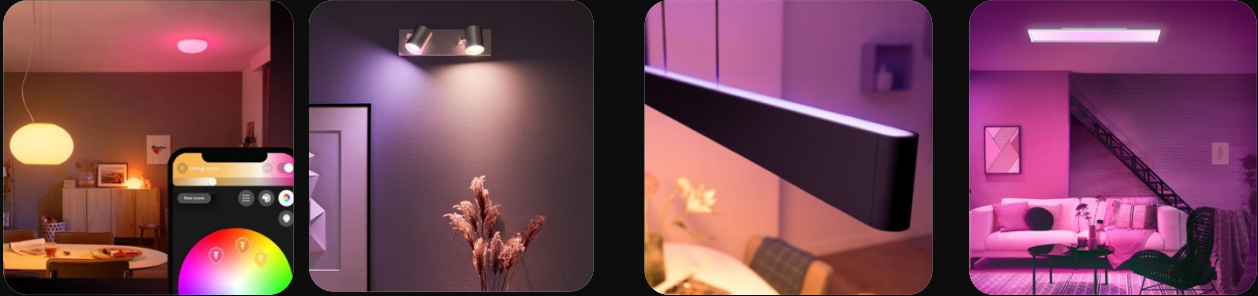
Our Portfolio



Bulbs



Indoor



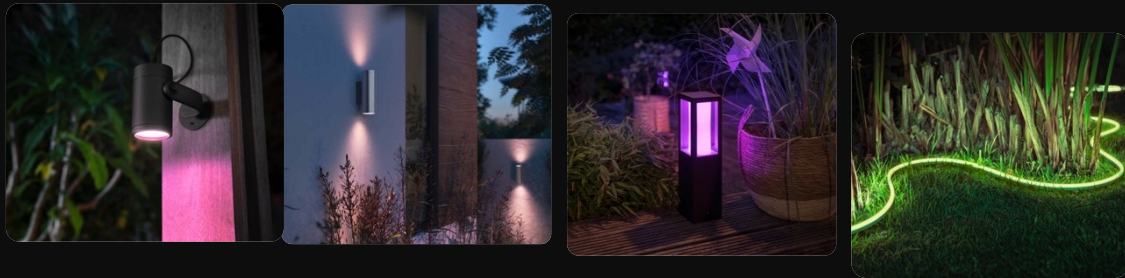
Accessories



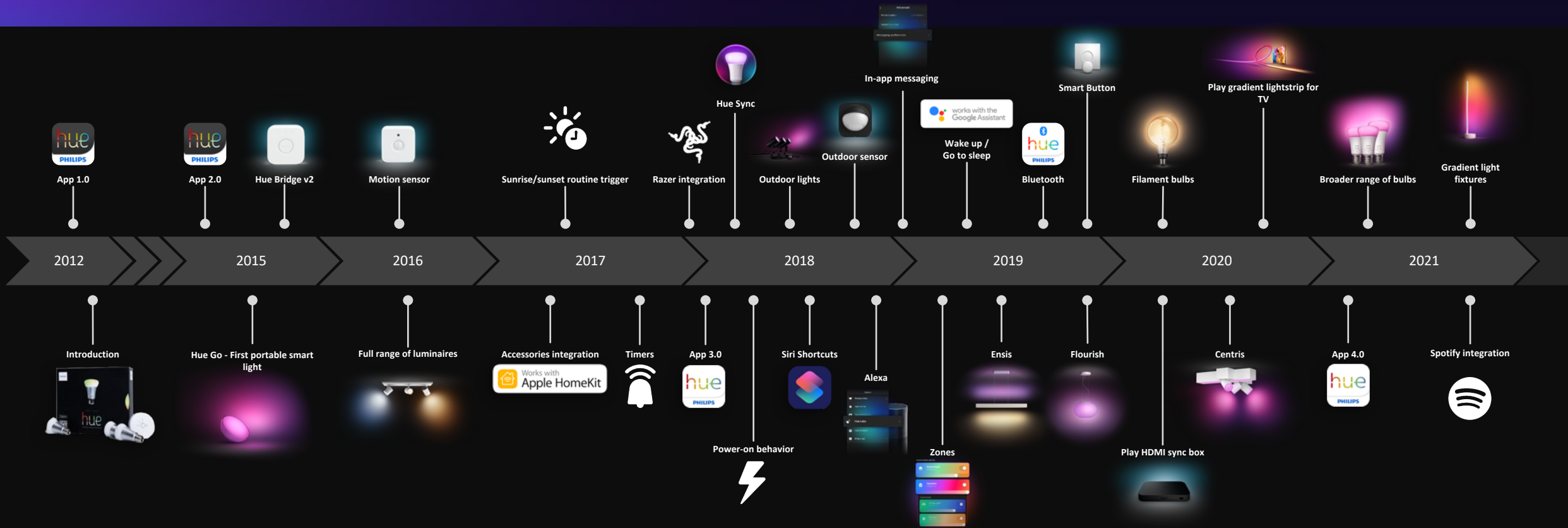
New forms



Outdoor



Always at the front of the innovation



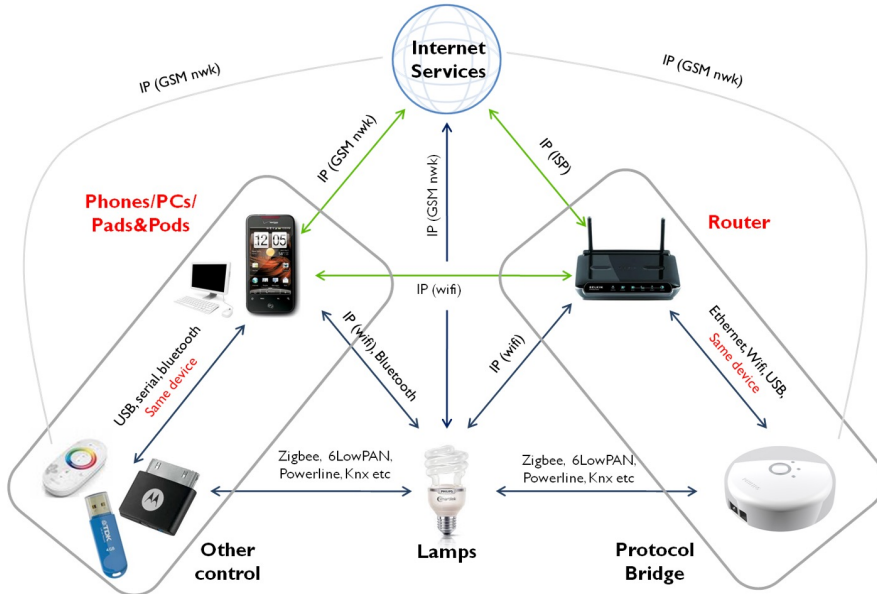
- Continuous in-field innovation.
- Every software innovation rolled out to installed base to drive engagement
- All products forward compatible as one ecosystem

A trip back down memory lane



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Total Lighting System Scope



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Philips Lighting, George Yianni, June 21, 2011

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Recommendation

- **If the ambition is to offer a system which could support the full range of use case and business innovation opportunities then the recommendation is:-**
 - Continue development of the LightLink standard
 - Extend LightLink proposition with an IP bridge and web portal
 - Define architecture and steer consortia such that when 6LowPAN systems have penetrated the market we can make a smooth transition to reduce total system cost.
- **If the ambition is to increase functionality of RC based systems but limit it to smaller room based systems.**
 - Start development of Wifi or Bluetooth Low energy based lighting system.

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Philips Lighting, George Yianni, June 21, 2011

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Should we have a bridge?



Why a Smartbridge?



Security

The software in the Smartbridge controls which Smartphones and Tablets can act as controllers of the lights and which user accounts can control things via the web. Guarantees your neighbours can't control your lights.

Always connected

Many valuable use cases require control from the internet. This is only possible if a device in the home is always present.

Value add features

A Smartbridge device can act as central controller in the system and improve the user experience by offering features such as scheduling and dynamic effects.

No suitable radio in the home

There is no technology which can offer whole home connectivity already present in home devices. Need a device to send the right messages.

Ease of Use

A Wifi-Zigbee bridge is possible but, Ethernet-Zigbee offers maximum "Plug and Play" ease of use.

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- The Hue bridge is what has allowed us to build an ecosystem which has grown over 10 years and enabled enormous innovation.
- It remains the heart of of hue system as our edge computing resource and network bridge letting us offer reliable, low latency functionality.
- Let us future proof all attached devices with new features and compatibility like matter
- It has been a complexity tradeoff –
 - Extra device needed for building features
 - Central decision taking for multi-device usecases
- Its role for next 10 years will need to evolve as we add additional IP devices beyond lighting.



Why Zigbee?



Why does hue use ZigBee LightLink?



Robust whole home control needs a mesh network

The capability of Zigbee for every device to retransmit allows a whole home to be covered regardless of size or blocking walls.

Global Standard

Zigbee Light Link uses the global 2.4 GHz frequency band and as such can be sold without the regional restrictions imposed on lower frequency technologies.

Open Interoperability

For connected lighting to become widely acceptable it is necessary to arrive at compatible offerings across the industry. Non-compatible lighting devices on store shelves will lead to too much confusion.

Ease of Setup

Zigbee Light Link offers easy out of the box installation. For a gateway system all new lamps can be discovered from a button in the app. For simple remote control systems proximity pairing is available.

Proven Maturity

Zigbee products have been successfully in homes for many years and learnings from this have gone into hardening the Zigbee Light Link specification on which our home lighting products have been based for 2 years.

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- 10 years of interoperability with no end in sight!
 - 3rd party interoperability has been challenging.
 - Have hopped between 3 different chip/stack vendors
- We have extended the standard but also build significantly on top to go beyond without breaking base interoperability.
- Security of decentralized Zigbee has limitations. In retrospect we should have transitioned to bridge as a Zigbee co-ordinator sooner.
- Has taken 10 years to have an open interoperable mesh competitor in Matter over Thread but it still has a way to go on maturity and has performance challenges.

Connected Ready? Hue Bluetooth? Bridges?



hue personal wireless lighting
Different entry points - One Ecosystem



- Since 2016 we offer bridgeless control with a remote.
- Since 2018 we run a combo stack of Zigbee and Bluetooth.
- This lets us offer an easy (but limited) bridgeless entry point to the hue ecosystem which can always be upgraded to the full ecosystem.
- Alexa and Google also directly connect in some “connected ready” bundles but full future proof interoperability is handled by the bridge including Matter for all legacy products.
- Strong device software platform lets us keep that manageable.

Why our own Hue API



Why our own Hue API?



► Hide complexity for App Developers

- No specialist knowledge of lighting networks to build an app.
- Makes controlling a system of lights easy.

► Flexible Source

- We want to be able to build apps that run anywhere. Including from web pages.
- This made us choose an HTTP interface.

► Familiar, easy to learn and modern

- Modelled after popular web interfaces which have active developer communities. E.g. twitter
- Self describing, JSON formatting

► Future proof

- Should easily interface and extend to other IP devices
- RESTful style interface



- API being easy, familiar and accessible was a huge early boost to build our 3rd party ecosystem.
- Driving our own API independently gave us innovation freedom that standards (even if the existed) wouldn't have.
- Some early wrong choices early on that we live with today:-
 - Whitelist keys in URL
 - Non-schema-able API
 - Pure request response – no eventing
 - All API whitelist visible to all clients...
- Issues addressed in v2 of API but we introduced it too late and so effort to port/replicate all functionality and migrate ecosystem is enormous.
- We should have invested in a proper v2 API much sooner

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Why the Hue Cloud?



Why a Web Portal?



Information

To tell our customers about Hue and what it can do.
Give them support

Enable out of home

Control lights when you are away from home, soft security and more.
Allows us to offer great features like geofencing and IFTTT triggers.

Sharing

Enable customers to share what they've created.

Unlimited Resources

The cloud has almost unlimited resources to store information and process things.

Future Proof

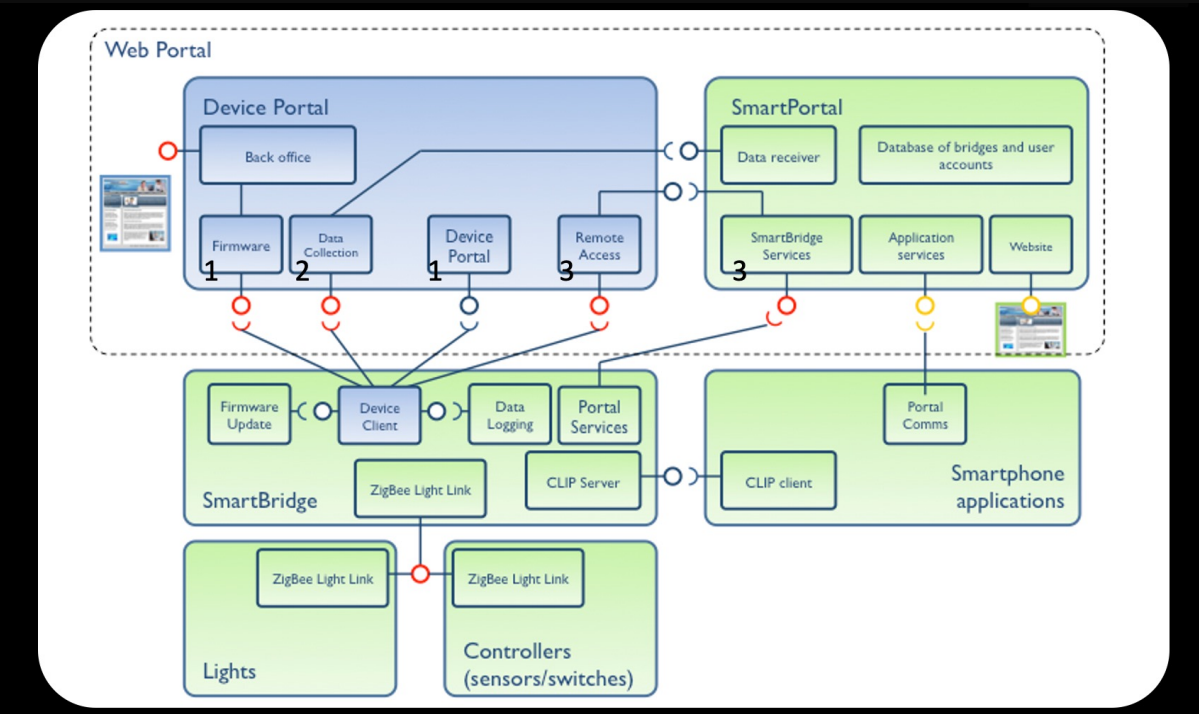
Via our web portal we can keep rolling out new software to all our products with fixes and new features.

"Big Data"

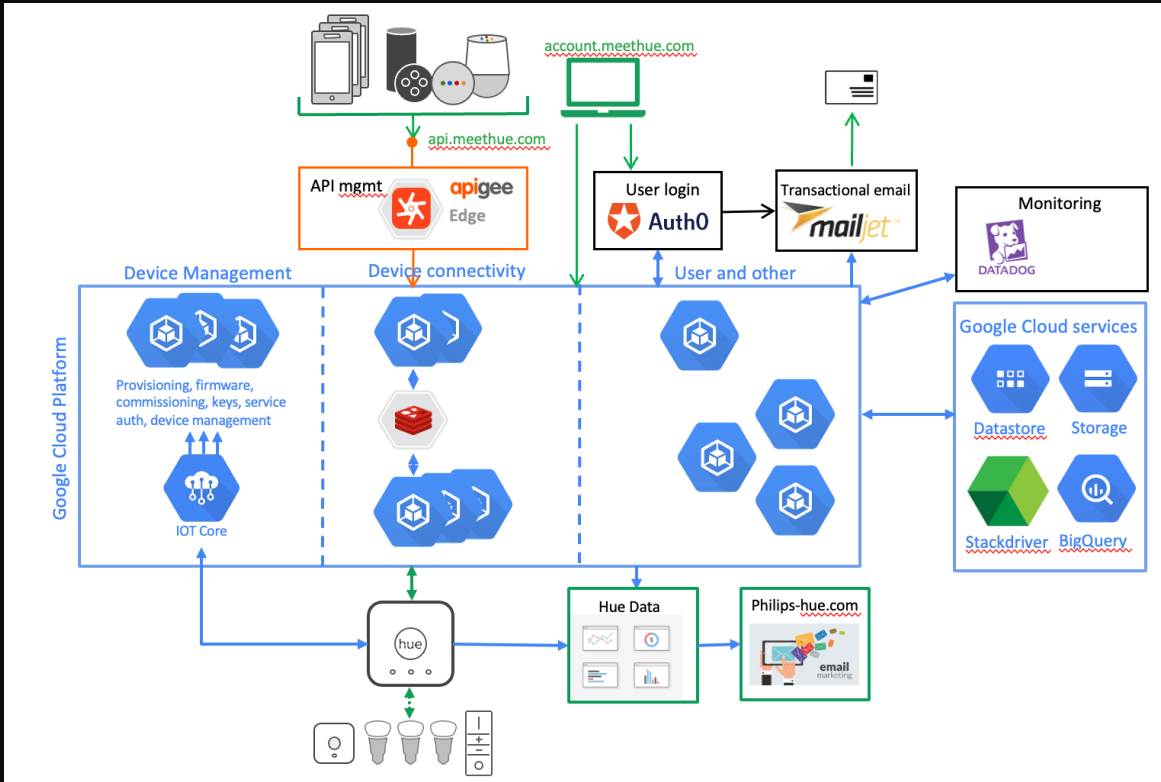
Help our customers see how they are using our system.
Help us improve the system for our customers.

- Laughable to think this was ever a question now
- Hue Cloud has been rewritten and rebroken down countless times over the last 10 years.
 - Pursue lower cost
 - Better latencies
 - Eventing
- We could have made our lives much easier if the cloud had been the only access gateway.
- Under estimated long term importance and scale of cloud access.
- Publishing/sharing user generated content was a mistake.
- Simple model assumptions stick around too long. Account = home = bridge has not been true for a long time.

Hue Cloud then and more recent



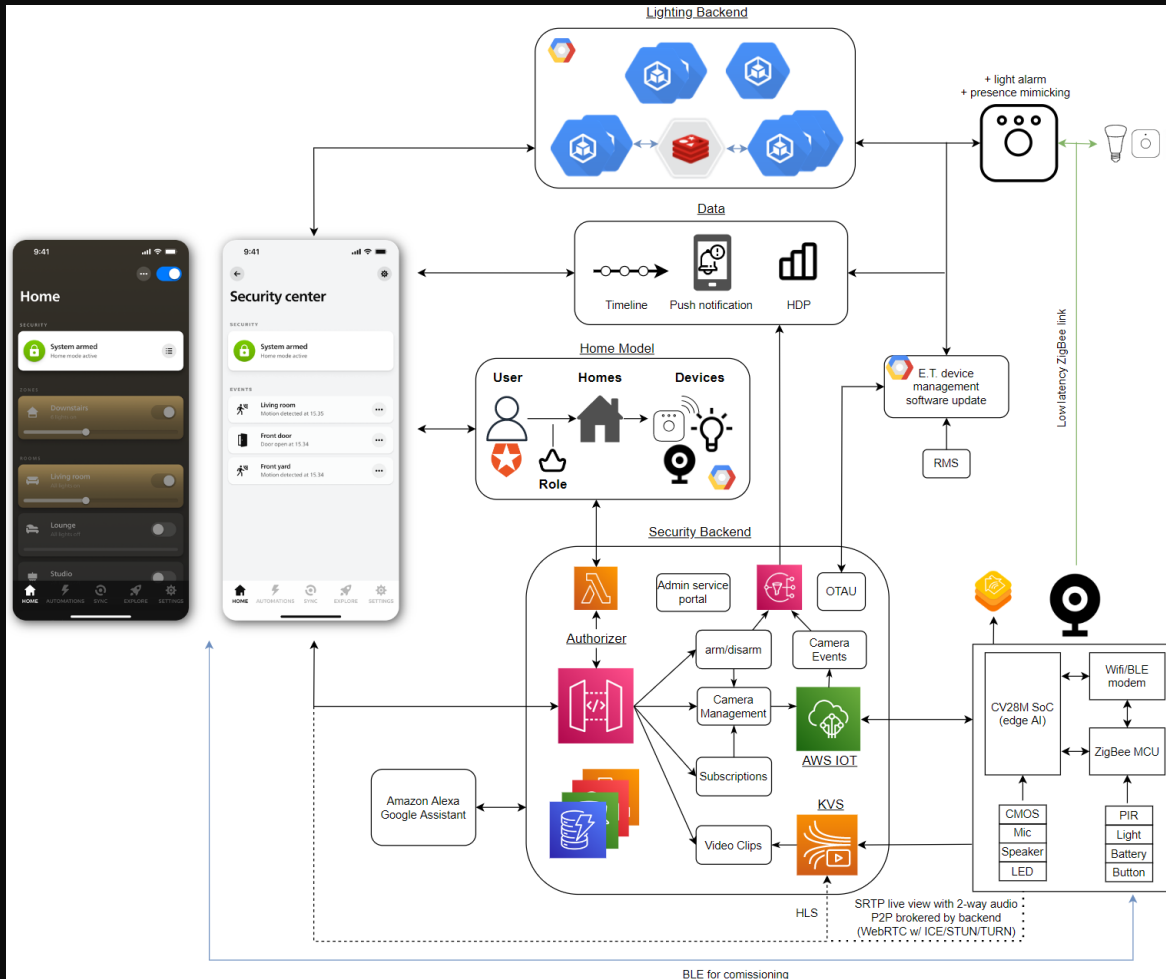
Hue Webportal 2012



Hue Lighting Cloud 2022



Going beyond the bridge as the home



- The transition of the hue ecosystem beyond the bridge as the home has been a long one but new products have acted as a forcing function.
- Key parts of ecosystem data model pulled out of bridge and bridge backend as a shared services across ecosystem.
- Still micro-servicization early on and continuous rewrite of incremental parts puts us in good shape.
- In retrospect we started too late on that transition of productize the account and home.
 - Too many internal services are treated as 3rd party services and build workarounds as a result.
 - Right 1st party cloud APIs are major ongoing challenge and attention point.

Closing thoughts



- An enormous amount has changed in the last 10 years but a lot of key bets have panned out.
- Continuous software updating of everything has allowed us to upgrade ourselves out of most of wrong choices some more expensively than others. By updating everything often it becomes easier.
- We clung to some principles like “local only”, home is a bridge for too long and complexity to move past it with all the innovation of last 10 years is high.
- We are far from finished and the hue ecosystem continues to transform and evolve itself for the next wave of usecases and products.