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# UNLEASH THE POWER OF LIMITLESS CONNECTIVITY



**2021 Fall  
Technical Forum**  
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**Internet of Things, Home Networking, Smart Cities, and Emerging Services**

# End to End Telehealth Architecture A Cable Industry Perspective

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**VIRTUAL EXPERIENCE  
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Cable and healthcare industries are crossing paths at many places such as Telehealth and Aging in Place. What does an end-to-end architecture look like for this inter industry opportunity?

- Telehealth and Aging in Place architectural needs
- End to end architecture
  - In-home architectural components
  - Communication infrastructure architecture
  - Back-office service architecture
  - Analytical service architecture
- Conclusions and next steps

## Telecom for Healthcare\* (T4H) opportunity summary



### Aging in Place



### Telehealth

<b>Subscribers (Users)</b>	Older adults (65+), caregivers	Individuals, providers
<b>Stakeholders</b>	Family members, care givers, doctors, service personnel etc.	All family members, providers, (payers)
<b>Needs</b>	Communicating, monitoring, service, support, integration	Communicating, monitoring, integrating with provider systems
<b>Challenges</b>	Ease of use, provider network integration, problem solving	Ease of use, device and EMR integration, remote monitoring,
<b>Telecom opportunity</b>	End to end solution, managed services, provider integration	End to end solution, managed services, provider integration

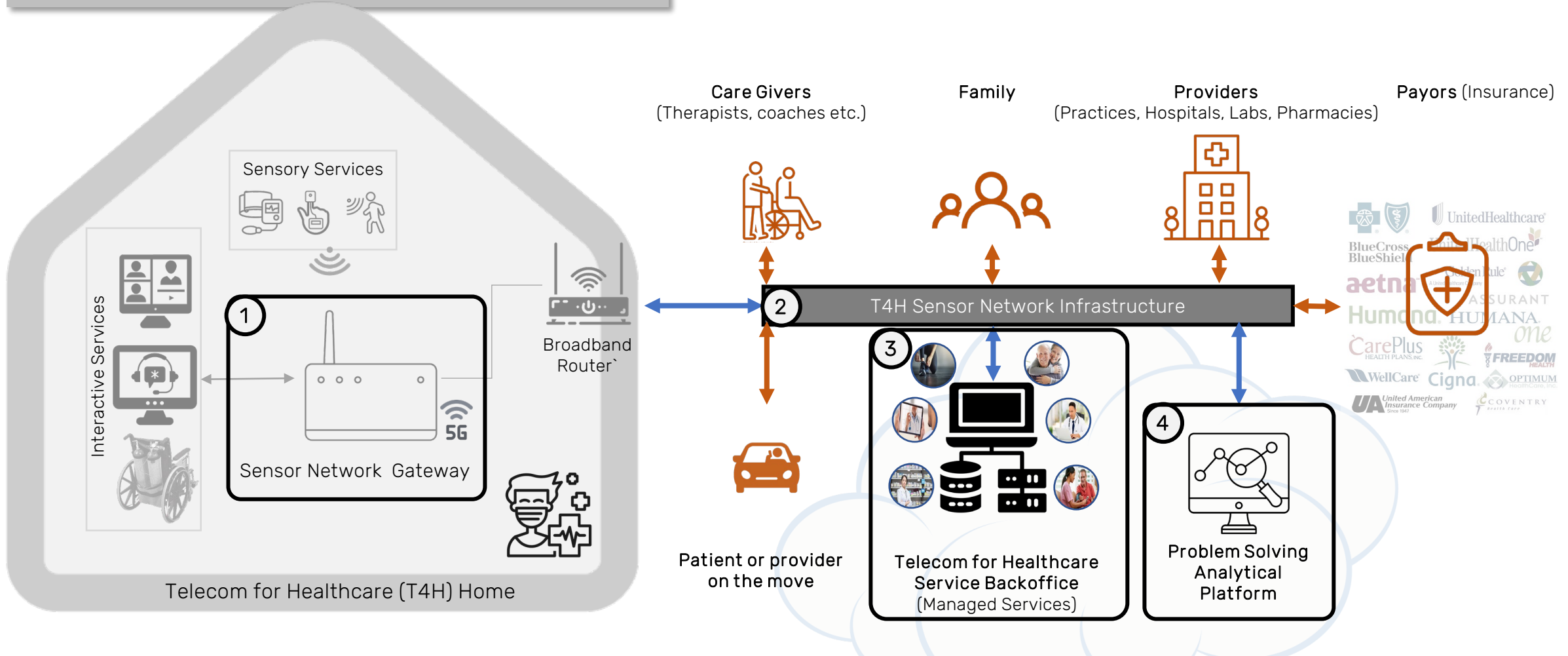
(\* ) Telecom for Healthcare (T4H) includes many healthcare and caregiving use cases such as Aging in Place (AIP) and Telehealth (Refer [here](#))

## High level T4H use cases

- 1 Basic communication between the users and the providers/caregivers
- 2 Seamless communication between the users and stakeholders
- 3 Monitoring the users for health, mobility, fall detection etc.
- 4 Analyze the data and provide relevant notifications to the stakeholders
- 5 Assist the T4H service providers with their accountability claims
- 6 Managed services to support installations, support and services

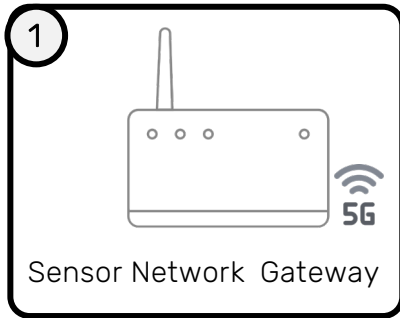
**T4H opportunities such as AIP and Telehealth inherently solve very similar problems that promotes a common architecture**

## DTS's T4H Environment Framework (DTEF\*)



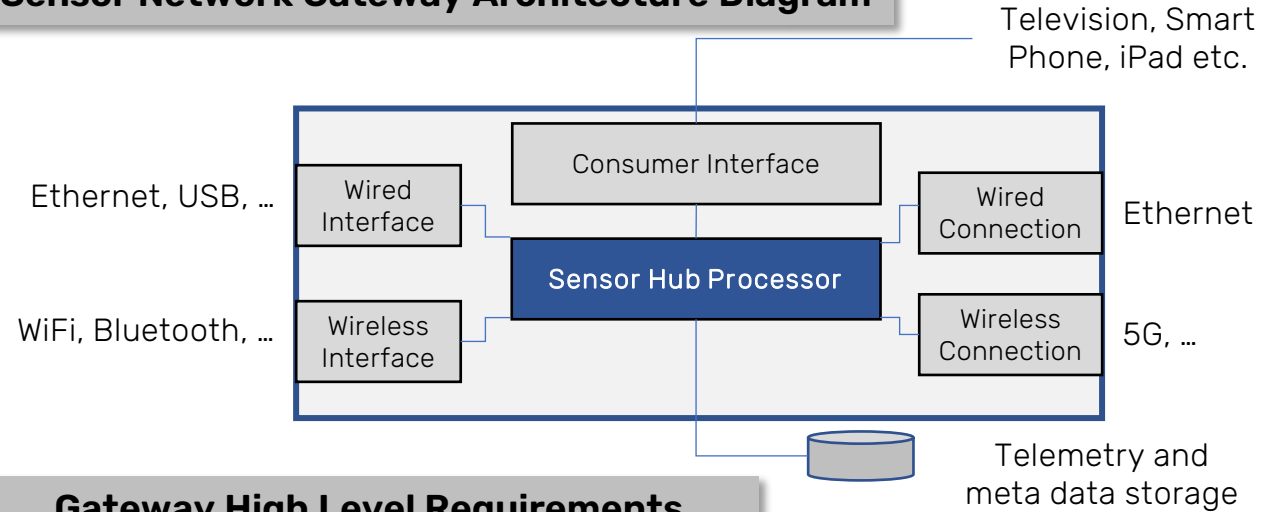
**T4H opportunities such as AIP and Telehealth inherently solve very similar problems that promotes a common architecture**

## T4H Sensor Network Gateway



This is an in-home gateway that **interacts with different T4H devices, collects data and provides reliable communication**

## Sensor Network Gateway Architecture Diagram

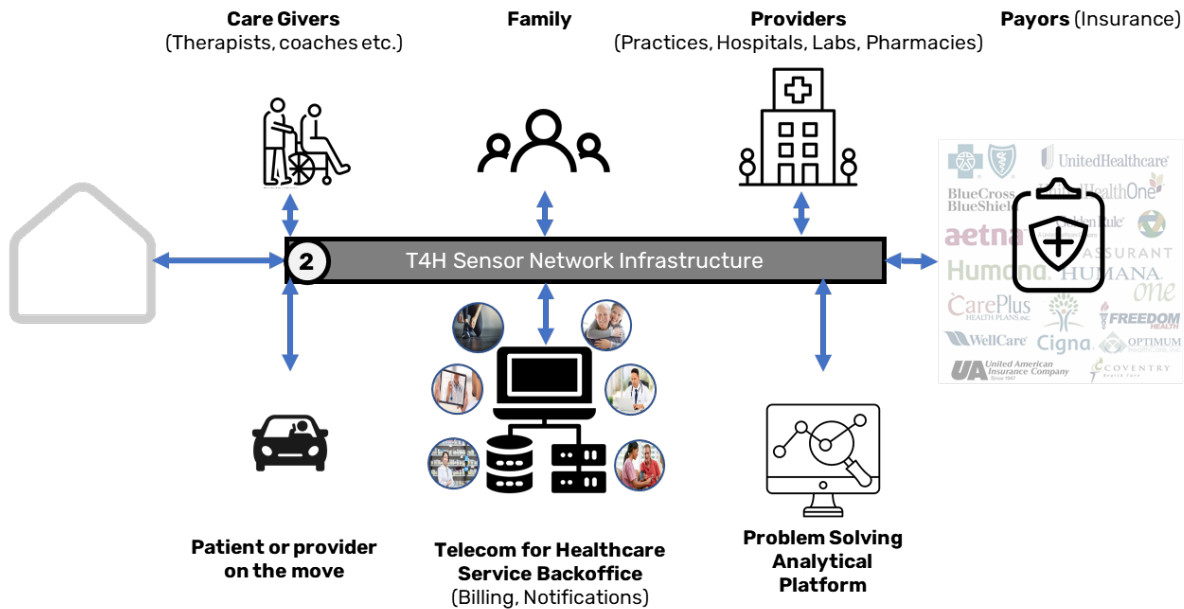


## Gateway High Level Requirements

Consumer If.	Interface to the consumer to access the T4H environment (Smart TVs, Devices, ...)
Wired Ifs.	Interface to connect to the RPM, sensors and communication devices
Wireless Ifs.	Interface to connect to the RPM, sensors and communication devices
Wired Internet	Ethernet connection to communicate with the back-office service infrastructure
Wireless Internet	Wireless connection to provide redundant connectivity to the infrastructure
Storage & Edge Analytics	Temporary storage of the collected data and perform local analysis
Sensor hub processor	Provides IoT bridging functionality in addition to performing all the above functions
Installation	Different self-install versus assisted install capabilities needs to be supported

**T4H sensor gateway is an essential component that interfaces and collects information from different devices at home**

## T4H Sensor Network Infrastructure



The T4H sensor network infrastructure is used for providing **communication** amongst the stakeholders and users, **collecting** the in-home sensor information, providing intelligent **notifications**, and offering T4H **managed services**

## T4H Network Infrastructure Capabilities

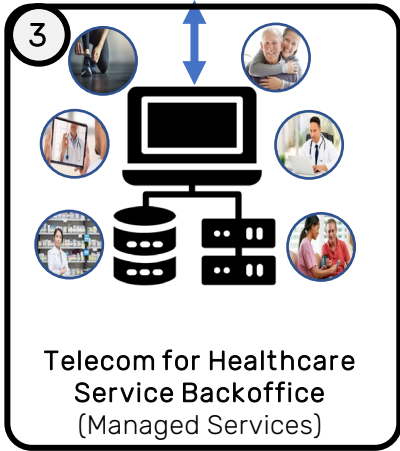
- 2 Unified Communications Infrastructure – Video & audio integration among stakeholders
  - Sensor Monitoring Infrastructure – Collect info. from one-way and interactive sensors
  - Notification Infrastructure – Inform stakeholders & users of the important notifications
- T4H Sensor Network Infrastructure

## T4H Network Infrastructure Details

UCC	<ul style="list-style-type: none"> <li>▪ Video &amp; audio communication with the capabilities to add stakeholders as needed</li> <li>▪ Integrate the UCC infrastructure with consumer devices (TVs, smart devices etc.)</li> <li>▪ Capabilities to provide security communications and privacy to customer data</li> </ul>
Sensor Monitoring	<ul style="list-style-type: none"> <li>▪ E2E Secure communication, HIPAA compliancy and PII/PHI conformance</li> <li>▪ Remote patient monitoring device integration and communication establishment</li> <li>▪ Reliable in-home sensor monitoring and data collection access</li> <li>▪ Rerouting the traffic to the rightful provider or caregiver infrastructure</li> </ul>
Notifications	<ul style="list-style-type: none"> <li>▪ Registering the endpoints (stakeholder, software etc.) to different notifications</li> <li>▪ Send notifications to the registered stakeholders of the specific events</li> <li>▪ Secure notification of the stakeholders and logging infrastructure</li> </ul>

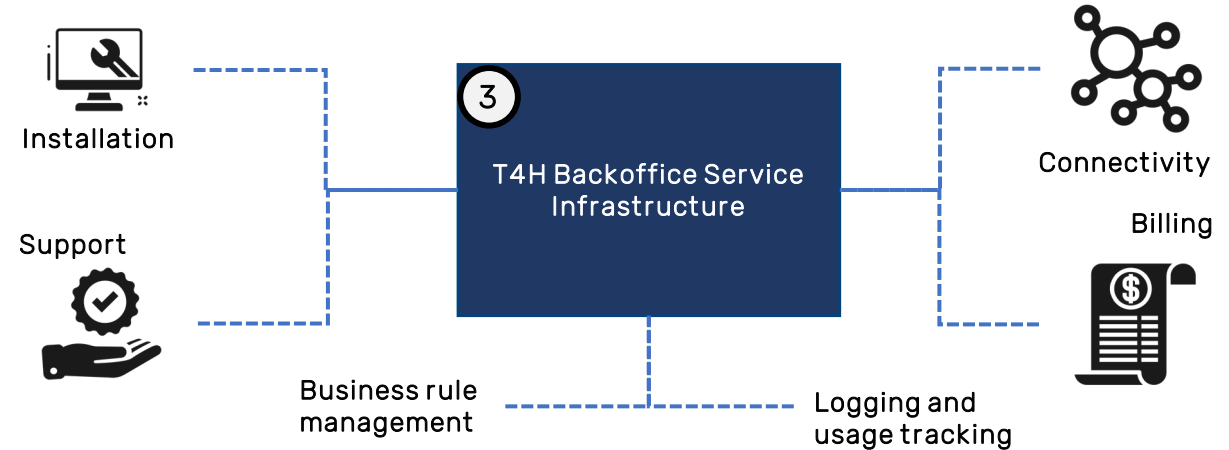
**T4H sensor network infrastructure offers communication, collection and notification bus tuned for secure interactions**

## T4H Service Backoffice



The T4H service back office is used for providing managed T4H services. This includes installation, support, troubleshooting, connectivity management, billing, and more importantly business rule management. Note: The Cable operators have the same infrastructure for managing their existing broadband and other in-home services.

## T4H Service Backoffice Block Diagram



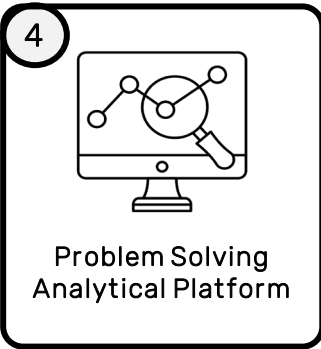
## Service Back Office Details

	Connectivity	Rule Management	Logging	Installation	Support	Billing
<b>Tasks to perform</b>	UCC, In home sensor devices, end to end services	Service, notification, PHI, and other per sub rules	Different T4H related meta data and Telemetry info.	UCC, IoT (Healthcare and non-healthcare devices)	T4H healthcare and non-healthcare services	User and stakeholder service billing and collection
<b>Why Cable operators?</b>	<b>Extensive experience</b> with in-home service mgmt.	Have been <b>managing 70M+ customers</b>	Used to managing <b>tera bytes of customer specific info.</b>	Highly <b>experienced with in home, e2e service installs</b>	Boots on the ground, service management tools and org.	Elaborate <b>systems to offer and manage service models</b>
<b>Capability development for Cable operators</b>	Need to tune the <b>connectivity focus to T4H</b>	<b>Healthcare/wellness</b> related rules	Collect <b>T4H specific</b> data and address the right problems	<b>Repurpose to T4H</b> vertical (RPM, monitoring installs, ...)	Repurpose to manage T4H	Repurpose to manage T4H

**The cable operators have the right service infrastructure to manage T4H services, need few adjustments to fully adopt it**



## T4H Analytical Platform



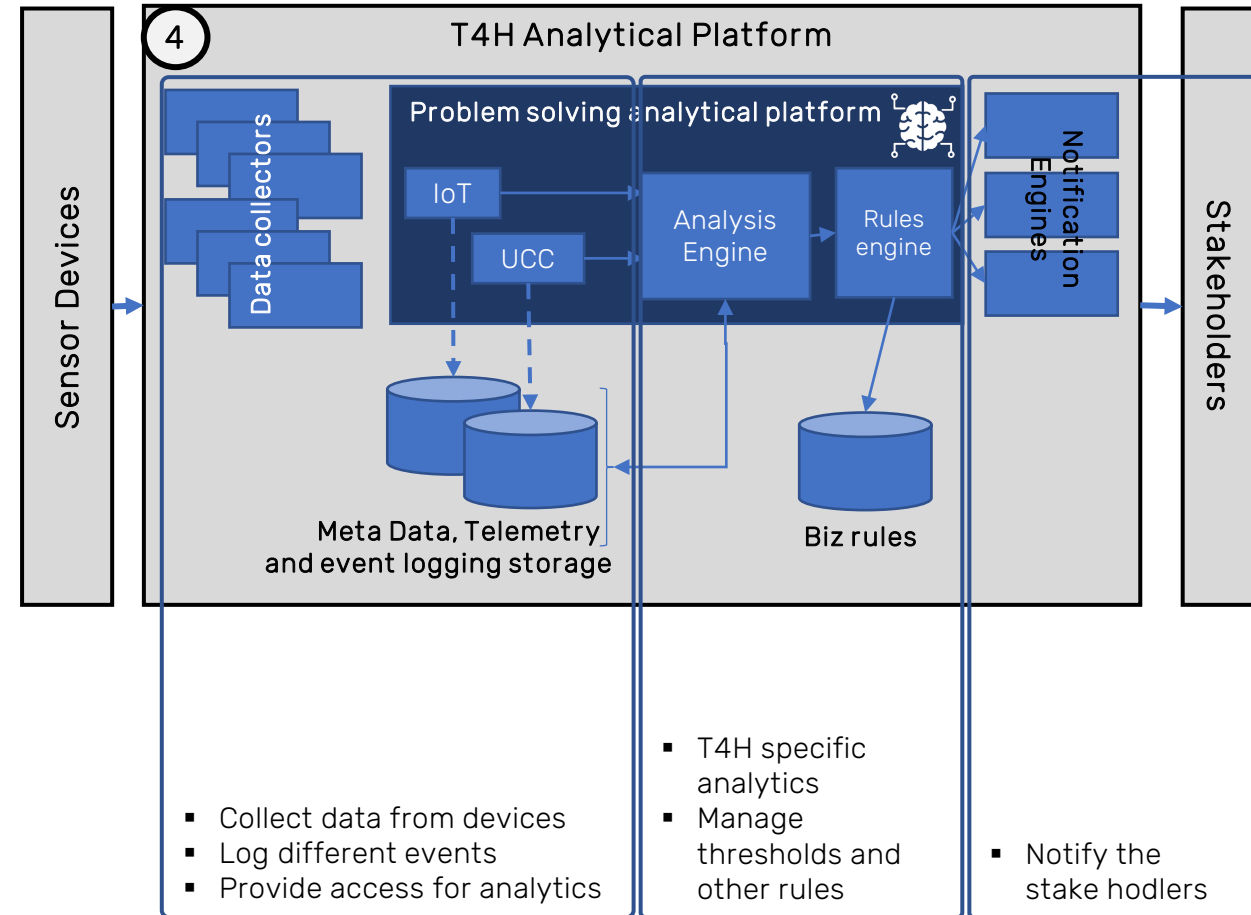
Tuning the analytical platform to meet the needs of the T4H problem space from **collecting the right data\***, providing appropriate analytics to solve the problems, and offering a flexible notification engine to the stakeholders. Such a platform is essential to showcase the capabilities of the cable operators.

(\* Refer to the T4H Metadata/Telemetry paper from SCTE Expo 2021 [here](#))

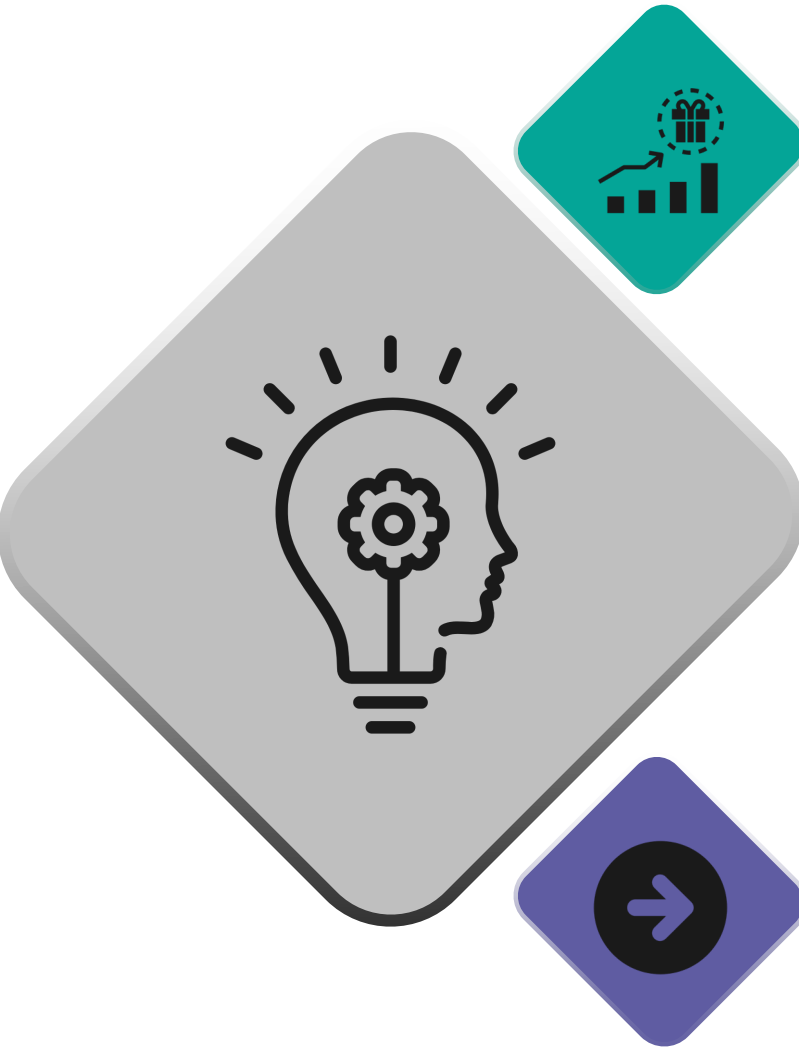
## T4H Analytical Platform Details

Component	Status in MSO	Comments
Data collectors	Existing for IoT and other service info.	Need to repurpose for T4H data
Analysis engine	Existing for IoT engines	Need additional development for T4H
Rules engine	Potentially new function	Need solutioning
Notification engines	Existing with service assurance tools	Need to extend to T4H
Data privacy	Existing for PII	Need to extend to PHI

## T4H Analytical Block Diagram



**Most of the analytical components required for T4H services are already in place for the Cable operators and are being exercised**



## 90% of the T4H components exist in cable operators' networks

- In-home, UCC infrastructure
- Service installation, support
- Purpose driven analytical infrastructure

## Adapt to the needs of T4H

- Integrate the relevant sensor and UCC devices
- Develop back-office services and analytical platform to meet the needs
- Extend the services and support to meet T4H needs

## Take appropriate next steps for T4H opportunity

- Review the business cases and market analysis
- Start transforming the architectural components for the T4H needs
- Build relations with the inter-industry partners for launches



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# Thank You!

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