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LOVE WHAT YOU HEAR



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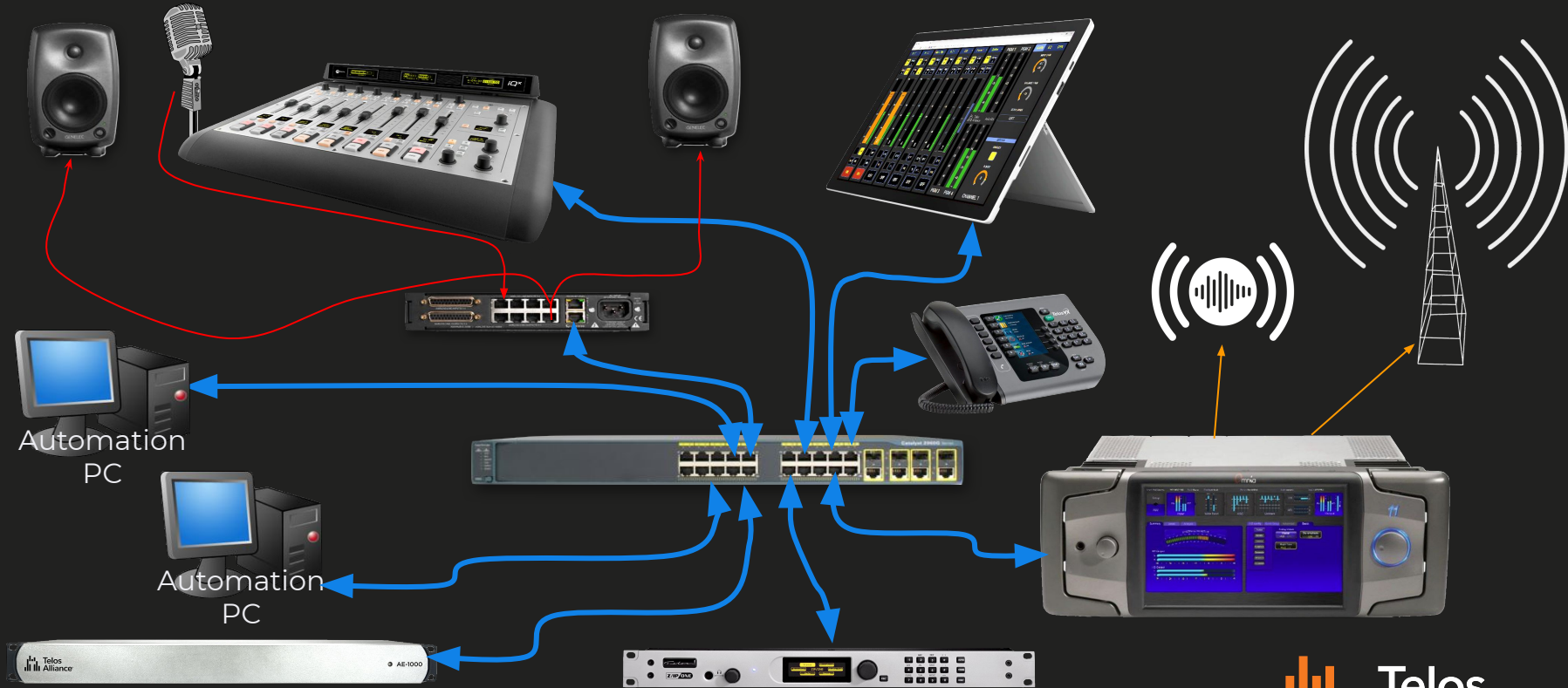
# Practical Virtual and Cloud Broadcast Infrastructure

Kirk A. Harnack  
Telos Alliance

# Console-Centric Studios



# Audio Architecture is Network-Centric

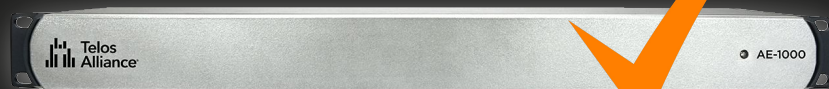




# What Would A Virtual Mixer Look Like?

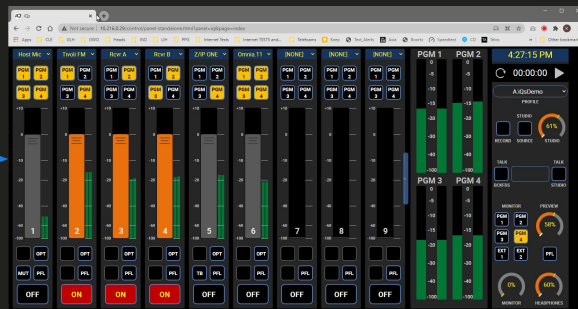


# What Would a Virtual Mixer Look Like?



```
Set a value for 'STUDIO' (Name of Studio): ONAIR
--2021-02-22 19:43:52-- https://gitlab.zephyr.com/devops/docker-
Resolving gitlab.zephyr.com (gitlab.zephyr.com)... 207.89.44.53
Connecting to gitlab.zephyr.com (gitlab.zephyr.com)|207.89.44.53|
HTTP request sent, awaiting response... 200 OK
Length: 280 [text/plain]
Saving to: '/opt/telos/WXYZ/docker-compose.yml'

docker-compose.yml                                100%[=====]
2021-02-22 19:43:53 (56.6 MB/s) - '/opt/telos/WXYZ/docker-compose
Creating iqs-ONAIR ... done
Create an instance of a Telos product from a template [n]: n
axia@ubuntu2004:~$
```



## Controlled by a Web Browser

# Form Factors: Appliance?



## Telos Alliance AE-1000

# Form Factors: Containerized Software?

```
Set a value for 'REPOSITORY' (URL of Docker repository. Leave blank to use default)
Set a value for 'TAG' (Version of software. Leave blank to use default)
Set a value for 'STUDIO' (Name of Studio): ONAIR
--2021-02-22 19:43:52-- https://gitlab.zephyr.com/devops/docker-
Resolving gitlab.zephyr.com (gitlab.zephyr.com)... 207.89.44.53
Connecting to gitlab.zephyr.com (gitlab.zephyr.com)|207.89.44.53|
HTTP request sent, awaiting response... 200 OK
Length: 280 [text/plain]
Saving to: '/opt/telos/WXYZ/docker-compose.yml'

docker-compose.yml          100%[=====]

2021-02-22 19:43:53 (56.6 MB/s) - '/opt/telos/WXYZ/docker-compose.yml'

Creating iqs-ONAIR ... done
Create an instance of a Telos product from a template? [y/n]: n
axia@ubuntu2004:~$
```



## iQs Docker Container for Server Deployment

# Broadcast Applications



- Audio mixing without a physical surface
  - HTML5 browser-based control
- Temporary studio anywhere
- Distributed / remote workforce
- Home studios don't need a purpose-built mixer
- Small studios, desks, even mobile
- Multiple simultaneous users



# Add to Existing Studios



- Add an Axia audio console without buying control surface hardware.
- Add mixing for extra events like sports or holiday programs.
- Monitor and control other cluster stations.

# Create Extra Mixers

- Replace legacy audio consoles.
- Smaller footprint returns desk space.
- Fits in small rooms and on small desks.



# Mix from Any Desk

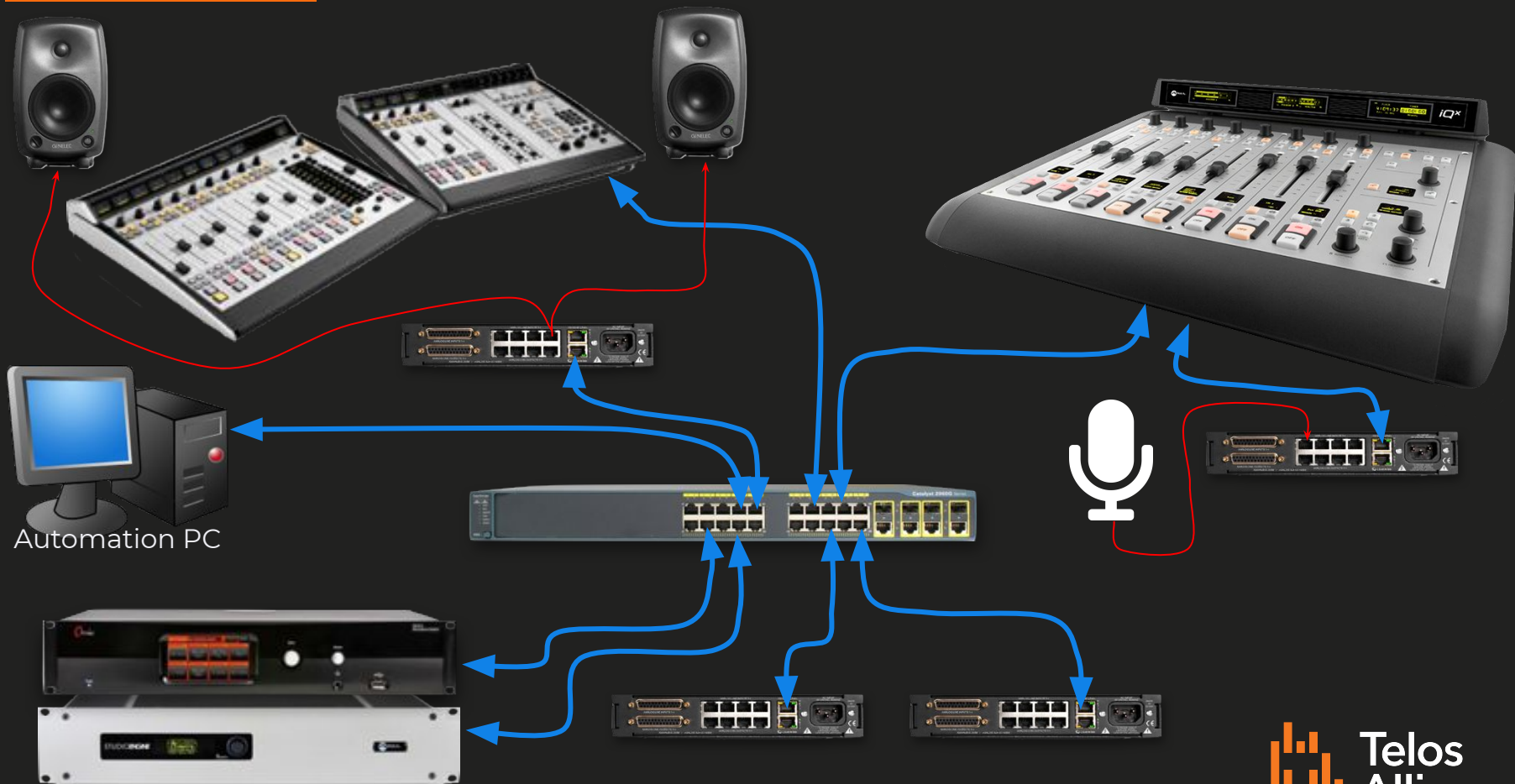


- Use existing office PCs as control surfaces.
- iQs works with touchscreen or mouse.
- Any desktop PC, laptop, tablet or phone controls an Axia iQs mixer.





# Virtual Mixing Technology



Automation PC



Automation PC



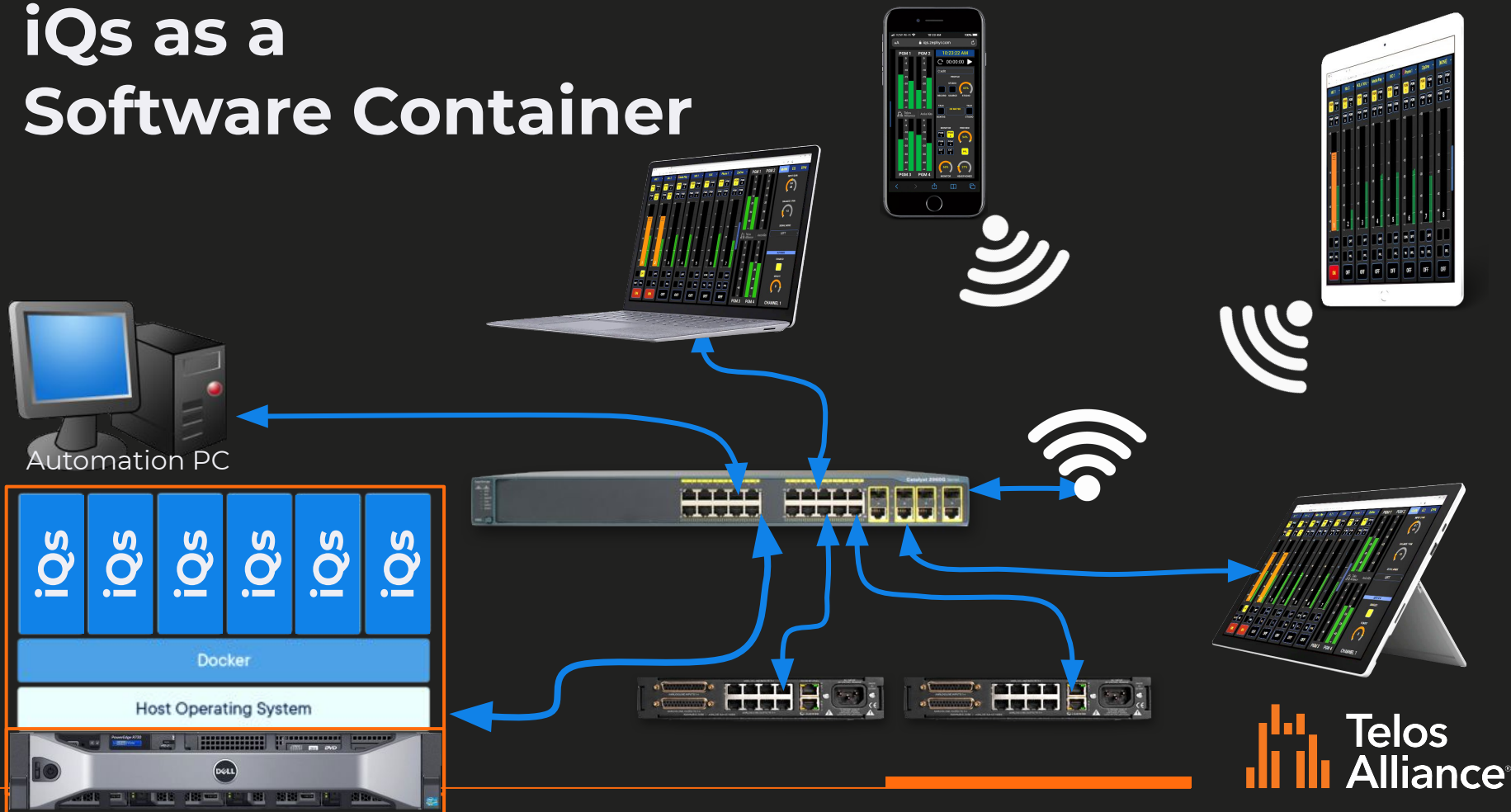




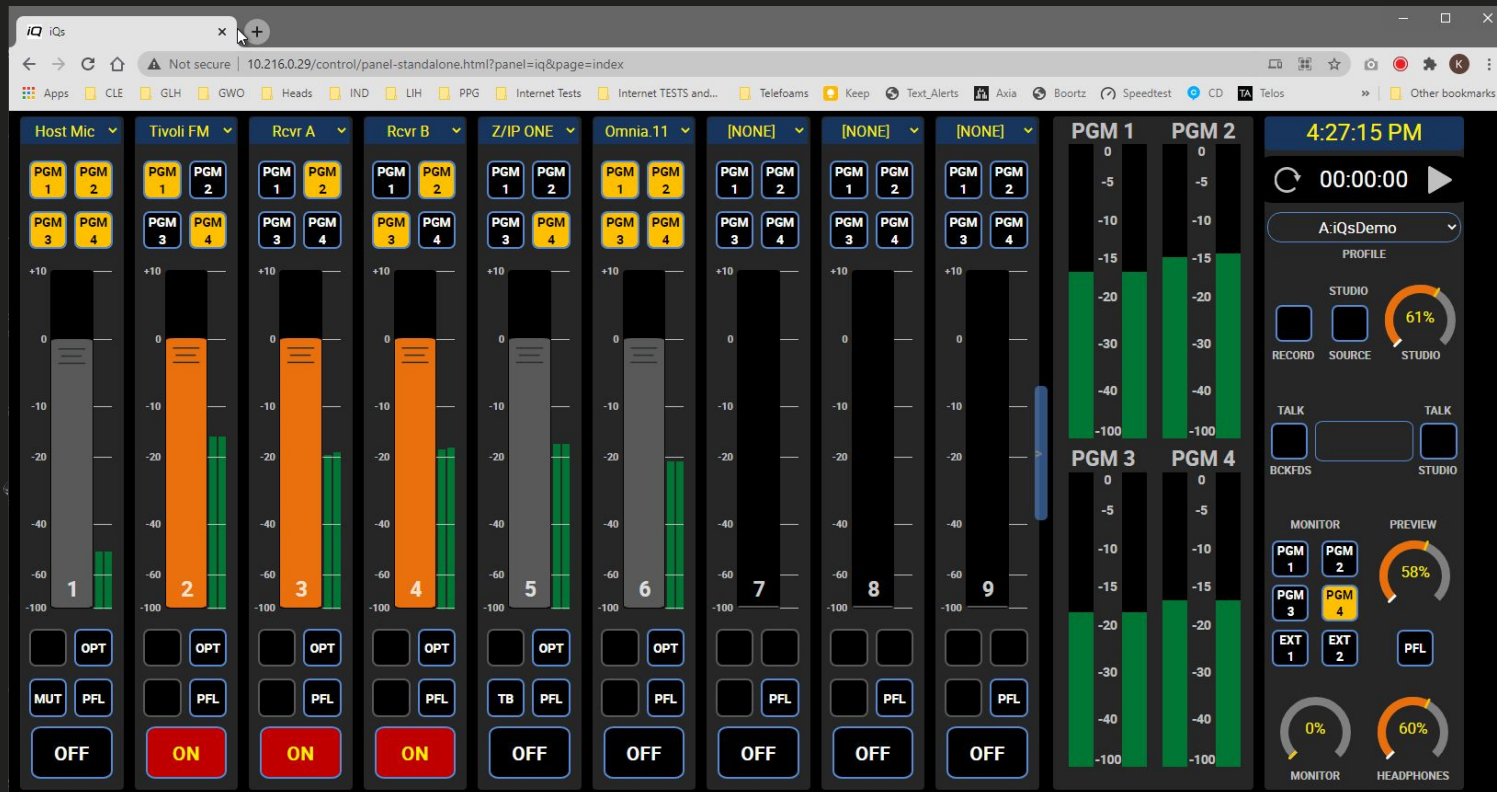
# iQs Installed on the AE-1000



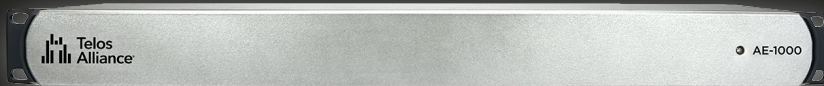
# iQs as a Software Container



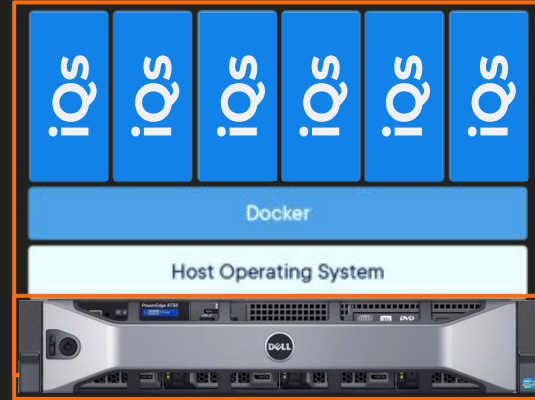
# Axia iQs - Control with Any Modern Browser



# Deployment Options



Telos Alliance AE-1000  
with  
Axia iQs Pre-Installed



Axia iQs  
Containerized  
Software



# Axia iQs - Installing the AE-1000 + iQs





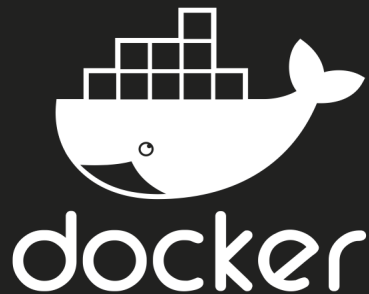
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# Virtual Software Deployment

There are two main server platforms for deployment of software:



Virtual Machines  
(Installed on a Hypervisor)

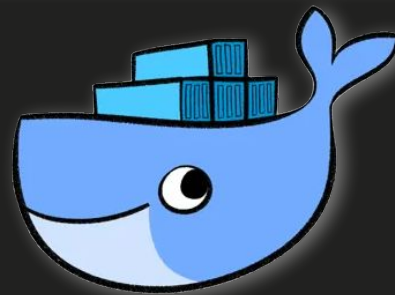
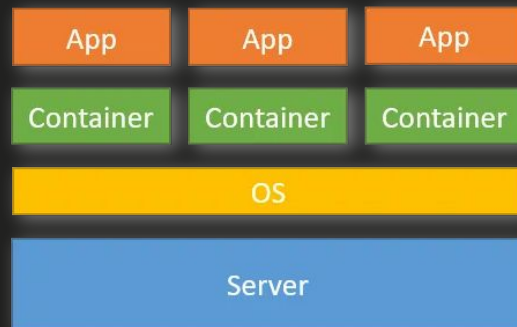


Containerized  
Software

# Containerized Software

## The Future of Computing Services

- Microservices in containers are the industry future trend for software.
- Used by IT-forward-thinking large organizations like Google, Amazon, Visa, PayPal, and Metlife for critical applications.





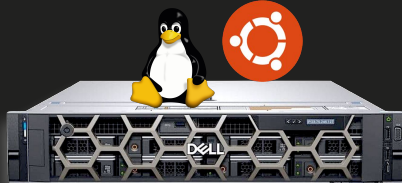
# Docker and Telos Software



Docker Engine  
installed on  
Ubuntu OS



docker



iQs container is  
downloaded  
from Quay



docker

Docker Engine  
installed on  
Ubuntu OS



# Installing the Software Container

- Axia iQs - Virtualized
- Runs as a Docker container on Linux
- Locally, on-prem or in Private or Public Cloud
- Literally installs in minutes







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## Poll Question:

**What is your level of expertise on  
containerized software?**





# Axia iQs - Installation Location

- Axia iQs On-Premises
  - AE-1000 + iQs
  - iQs server deployment
- iQs server deployment in a private data center
- iQs server deployment in a Public Cloud data center, such as AWS.



On-Premises



Private Data Center



Public Cloud

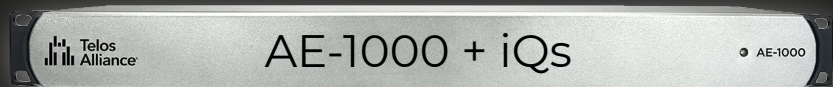
# Key Takeaways

## Axia iQs is a Software Audio Console

- Touchscreen-optimized Audio Mixer GUI in your browser
- Any desktop PC, laptop, tablet or phone controls an Axia iQs mixer.
- Works with touchscreen or mouse.



# Key Takeaways



**iQs**   
Software Container

The logo features a stylized circular icon with a dot in the center, followed by the text "AES67" in blue and "Livewire+" in white with a blue plus sign.



## Axia iQs is a Software Audio Console

- Pre-installed on a Telos Alliance AE-1000 application engine or
- Install as a Docker software container on your own PC/Server hardware.
- Supports Livewire or AES67 source audio.
- Same I/O specs and functionality as Axia iQ-series consoles

# What is VX?

- World's first VoIP system for live production
- Designed for broadcasters
- Multi-line, multi-control room
- Now multi-facility
- Unprecedented control and monitoring
- Produces the best-sounding phone calls
- Supports AoIP standards



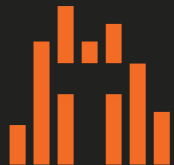
**1523** systems



**36** years experience

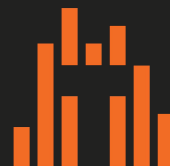


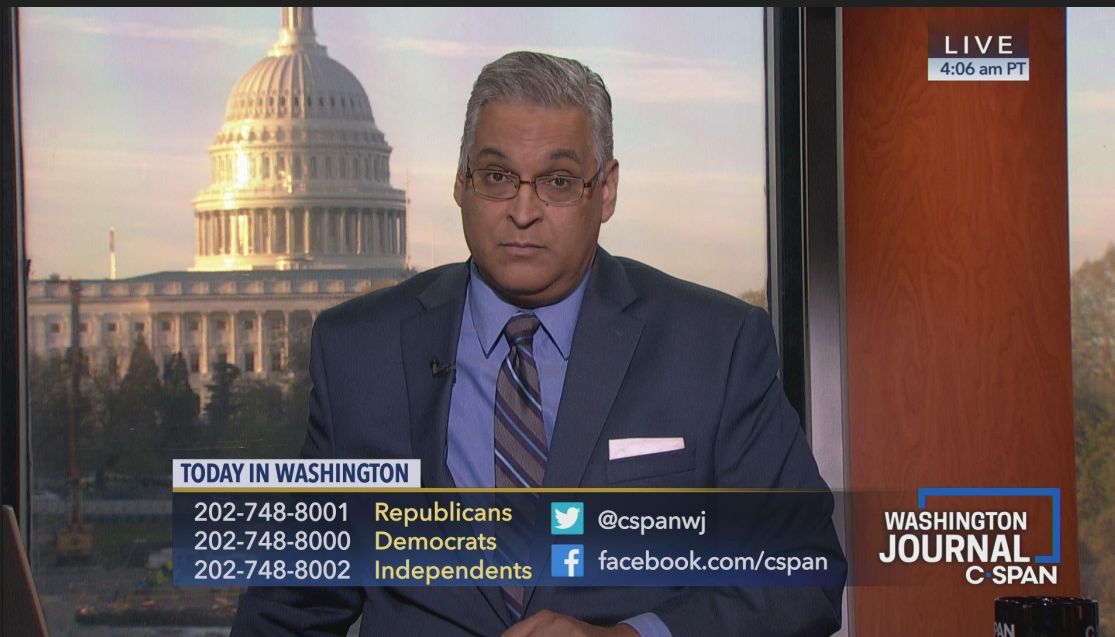
**4** awards won



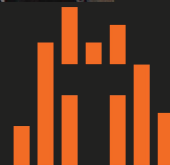
# What is VX?

- Tailor-made workflow
  - VSets
  - Software
  - Axia console modules
  - Pathfinder Core PRO

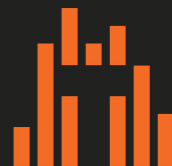




VXs







A-224383

EXCLUSIVE

Josie Maran  
Light Bronze  
Whipped Argan  
Illuminizing  
Body Butter, 8 oz.

Mfr's Suggested Retail  
**\$40.00**

QVC Price  
**\$32.00**

S&H \$5.97



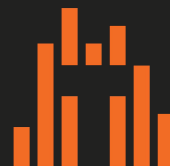
Testimonial Line: 800-395-1601

Text Item# to 78246 (QVCGO)

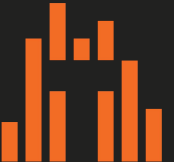
Message and data rates may apply

JOSIE MARAN  
ARGAN OIL COSMETICS

QVCHD







# The current way



# The current way

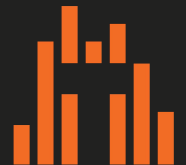




# The current way



# The modern way



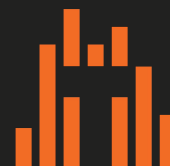


# The modern way

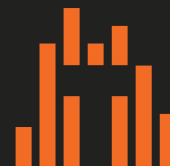
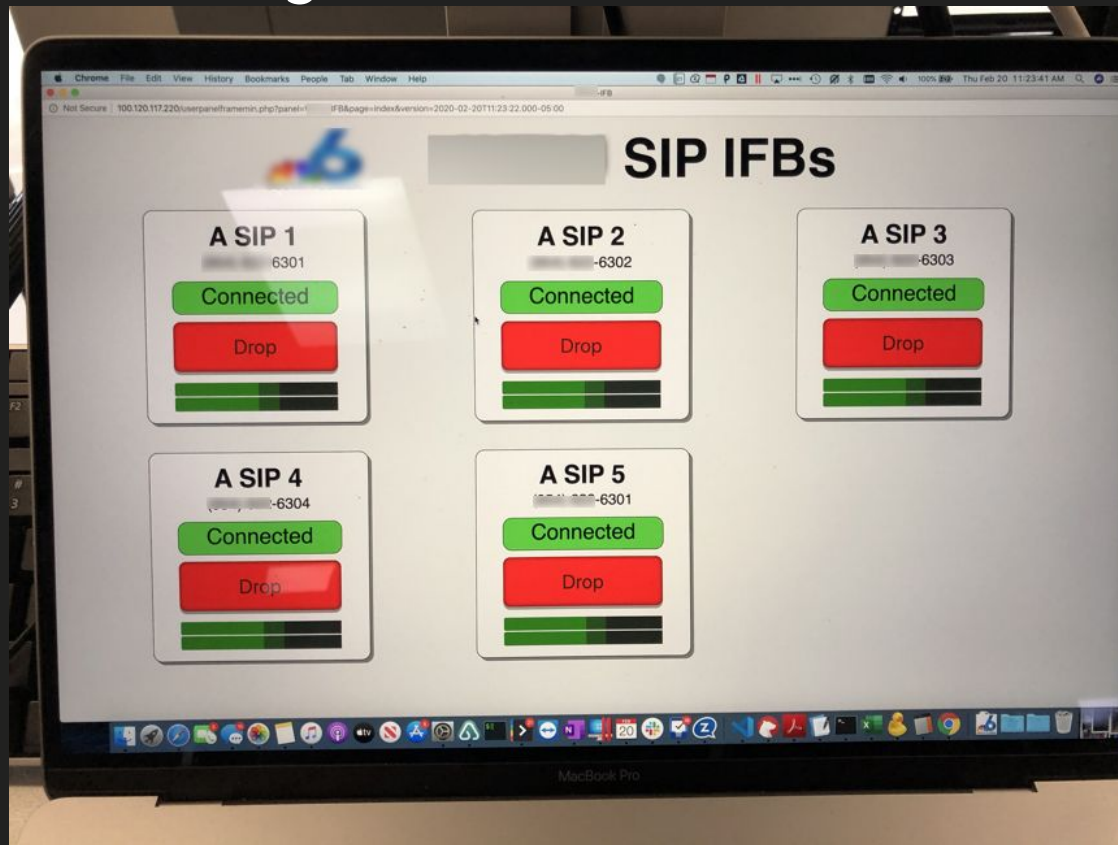
The interface displays a 5x3 grid of IFB routing controls. Each cell contains a 'TO' and 'FROM' level indicator, a name, a 'Previous' dropdown, and 'DROP', 'DIAL', and 'TALK' buttons. A 'Go to IFB Routing' button is in the top right. A numeric keypad with buttons 1-9, \*, 0, #, and a 'CLEAR' button is on the right. A dropdown menu is open over the 'Steve Surprenant' control, showing the following options:

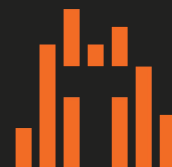
- ✓ Previous
- Other
- None
- Backup Audio
- Aux Send 1
- Aux Send 2
- Aux Send 3
- Aux Send 4
- Clean feed
- Studio A MXM 1
- Studio A MXM 2
- Studio A MXM 3
- Studio A PGM
- Shaun Deskto

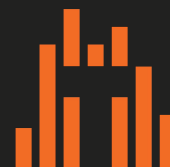
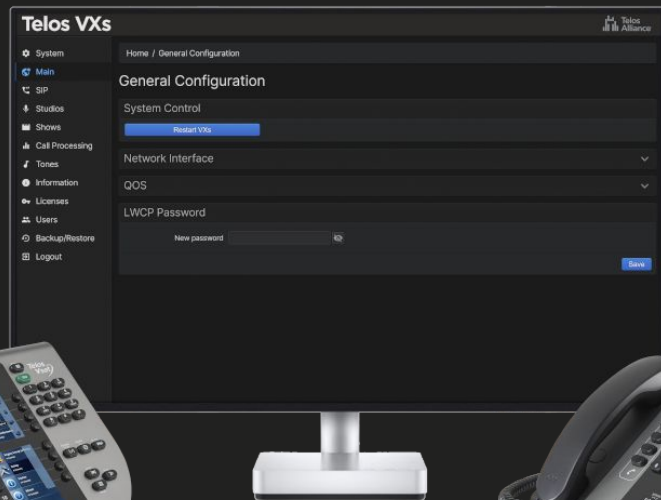
IFB	Studio	Name	TO	FROM	Buttons
IFB 1	Studio A	Shaun Dolan	TO	FROM	DROP, DIAL, TALK
IFB 1	Studio B	Aileen Alt	TO	FROM	DROP, DIAL, TALK
IFB 1	Studio C	Azucena Albano	TO	FROM	DROP, DIAL, TALK
IFB 2	Studio A	Errol Evett	TO	FROM	DROP, DIAL, TALK
IFB 2	Studio B	Sherell Somers	TO	FROM	DROP, DIAL, TALK
IFB 2	Studio C	Coralee Corter	TO	FROM	DROP, DIAL, TALK
IFB 3	Studio A	Previous	TO	FROM	DROP, DIAL, TALK
IFB 3	Studio B	Previous	TO	FROM	DROP, DIAL, TALK
IFB 3	Studio C	Previous	TO	FROM	DROP, DIAL, TALK
IFB 4	Studio A	Previous	TO	FROM	DROP, DIAL, TALK
IFB 4	Studio B	Steve Surprenant	TO	FROM	DROP, DIAL, TALK
IFB 4	Studio C	Previous	TO	FROM	DROP, DIAL, TALK
IFB 5	Studio A	Jefferson Johnson	TO	FROM	DROP, DIAL, TALK
IFB 5	Studio B	Previous	TO	FROM	DROP, DIAL, TALK
IFB 5	Studio C	Nadia Natera	TO	FROM	DROP, DIAL, TALK



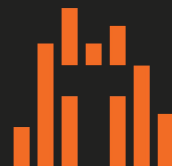
# The modern way





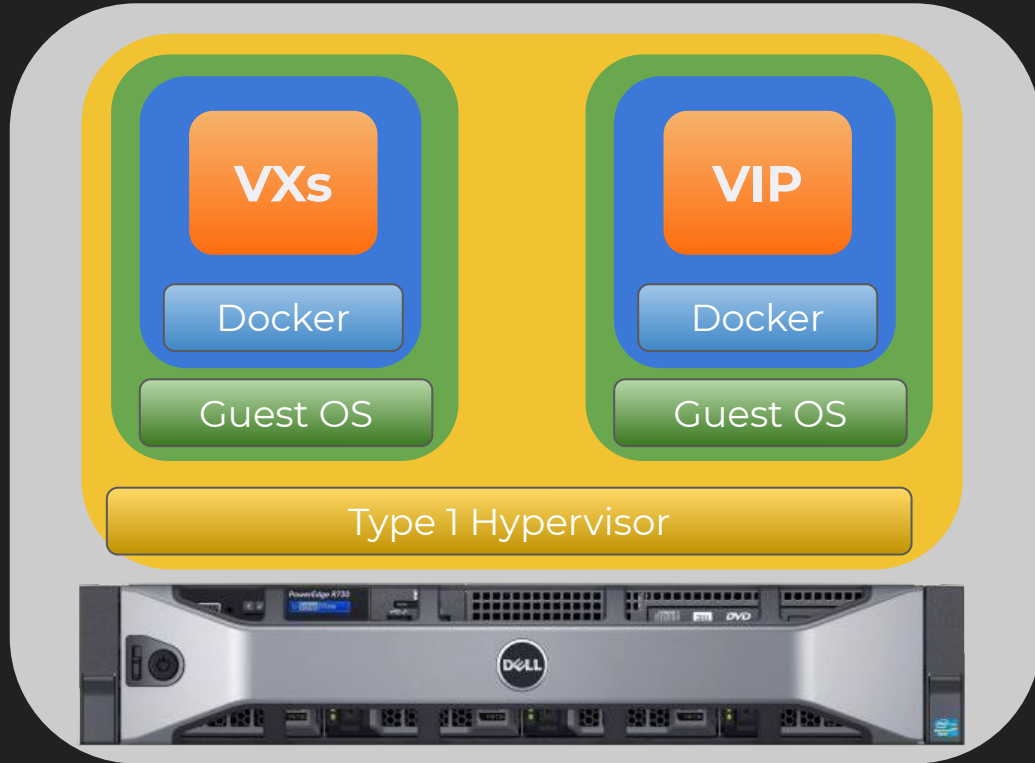


# VXs as Containerized Software

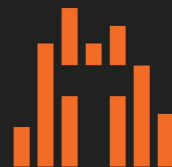
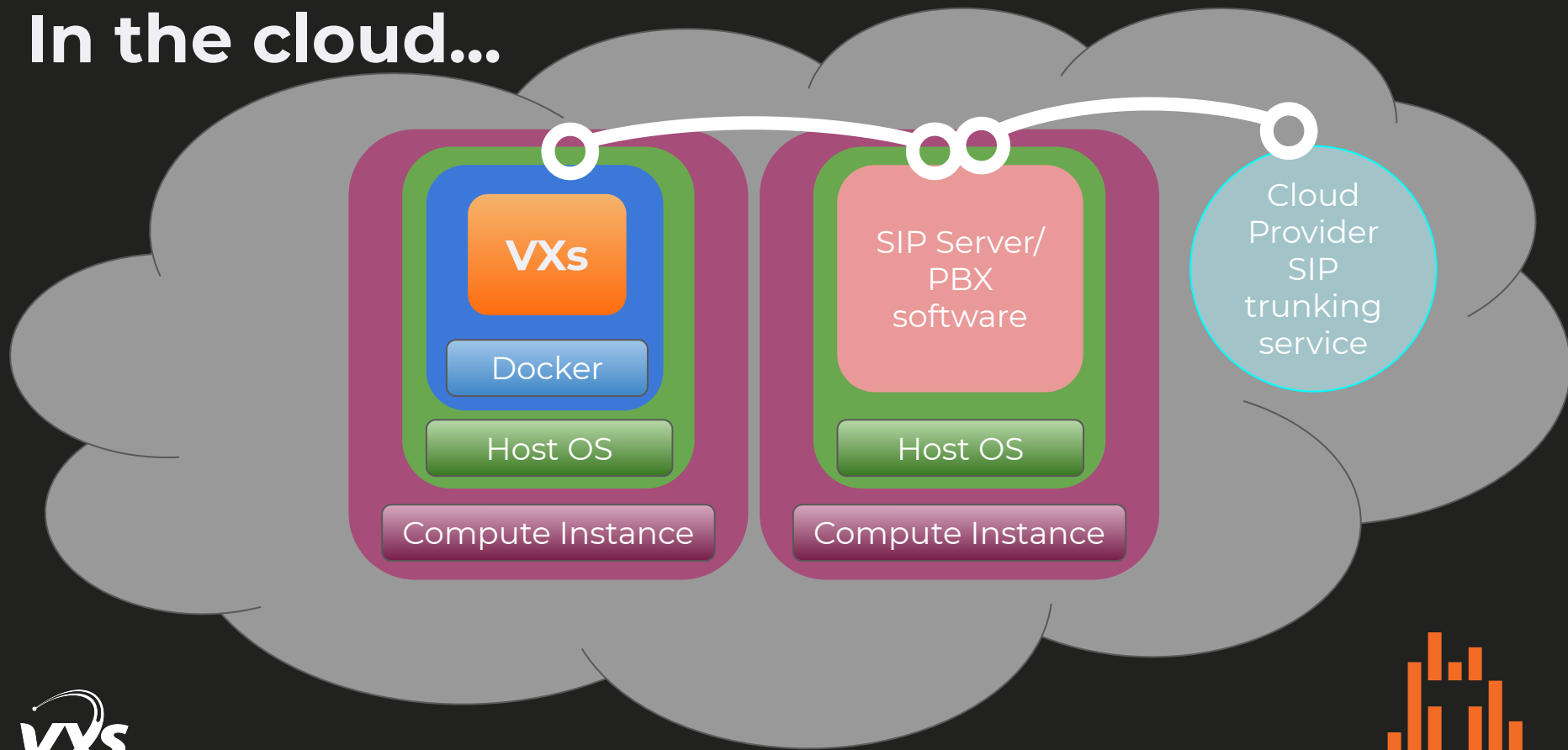




# Adding virtualization...



# In the cloud...



# How do we deploy VXs?



On-Premises



Private Data Center





Public Cloud

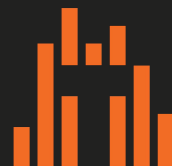
# How do I build a VXs system?

## 1. Choose your features

- Channels
- Lines
- Acoustic Echo Celler

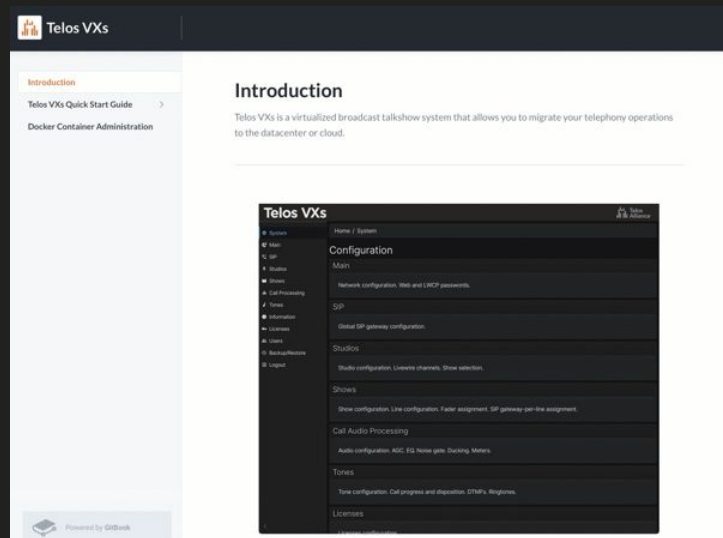
## 2. Choose your purchase method

- Subscription
  -  TelosCare™ PLUS included
- Buyout
  -  TelosCare™ PLUS purchased separately



# What's the installation process like?

1. Receive demo license and review documentation

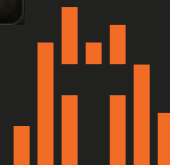




# What's the installation process like?

## 2. Run setup script

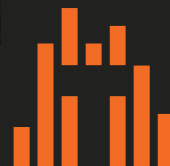
```
ubuntu@telos: ~  
ubuntu@telos:~$  
Setting up ubuntu-fan (0.12.13) ...  
Created symlink /etc/systemd/system/multi-user.target.wants/ubuntu-fan.service →  
/lib/systemd/system/ubuntu-fan.service.  
Processing triggers for systemd (245.4-4ubuntu3.4) ...  
Processing triggers for man-db (2.9.1-1) ...  
Processing triggers for dbus (1.12.16-2ubuntu2.1) ...  
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...  
Checking for Docker... OK Docker version 19.03.8, build  
afac8b7f0  
Checking that Docker is running... NOK Not installed as systemd se  
rvice  
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib  
/systemd/system/docker.service.  
Checking that Docker is running... OK Running  
Checking for Docker Compose... NOK Not found  
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current  
   Dload  Upload  Total   Spent    Left     Speed  
100  633    100  633    0    0  10550      0 --:--:-- --:--:-- --:--:-- 10550  
100 16.7M    100 16.7M    0    0  44.3M      0 --:--:-- --:--:-- --:--:-- 44.3M  
Checking for Docker Compose... OK docker-compose version 1.25  
.5, build 8a1c60f6  
Checking if user is logged in to quay.io... NOK /root/.docker/config.json n  
ot found  
Log in to quay.io? [y/n]: y  
Username: shaun_dolan
```



# What's the installation process like?

## 3. Install VXs container

```
ubuntu@telos: ~  
docker-compose.yml 100%[=====] 259 --.-KB/s in 0s  
2021-04-13 20:43:45 (36.1 MB/s) - '/opt/telos/ptp4l/docker-compose.yml' saved [259/259]  
  
Pulling ptp4l (telosalliance/ptp4l:latest)...  
latest: Pulling from telosalliance/ptp4l  
2746a4a261c9: Pull complete  
4c1d20cdee96: Pull complete  
0d3160e1d0de: Pull complete  
c8e37668deea: Pull complete  
9f7713958510: Pull complete  
a84a20417bf8: Pull complete  
Digest: sha256:3fc52b0dc31682316e84ff3f2aeee61fd90405fa949d841a39a971a4c3c01845  
Status: Downloaded newer image for telosalliance/ptp4l:latest  
Creating ptp4l ... done  
Create an instance of a Telos product from a template? [y/n]: y  
Checking for Docker network 'telosmacvlan'... NOK Not found  
INFO macvlan templates unavailable  
INFO Available product templates  
 0) Precision Time Protocol Daemon for Linux [ptp4l]  
 1) iQs console [iqs]  
 2) Telos VX [vxs]  
Index of product template: |
```



# What's the installation process like?

## 4. Activate demo license

The screenshot shows the 'Telos VXs' web application interface. The left sidebar contains a navigation menu with options: System, Main, SIP, Studios, Shows, Call Processing, Tones, Information, Licenses (highlighted), Users, Backup/Restore, and Logout. The main content area is titled 'Licenses Management' and includes a 'Configuration' section with 'Node name' set to 'Primary Datacenter' and 'Activation' buttons for 'Refresh' and 'Release'. Below this is an 'Add License' section with a 'License' input field and an 'Add' button. At the bottom is a 'Licenses' table showing a single license entry with feature counts and expiration dates. Red arrows with numbers 2, 4, and an unlabeled arrow point to the 'Save' button in the 'Add License' section, the 'Add' button in the 'Licenses' table, and the 'Add' button in the 'Add License' section respectively.

**Telos VXs**

Home / Licenses Management

### Licenses Management

#### Configuration

Node name: Primary Datacenter

Activation: [Refresh](#) [Release](#)

[Save](#)

#### Add License

License:

[Add](#)

#### Licenses

VXS-	Feature Count	Expires
AEC	8 / 8	In 30 day(s)
Hybrids	8 / 8	In 30 day(s)
Lines	16 / 16	In 30 day(s)
SLA	1 / 1	In 30 day(s)

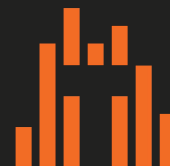
[Remove](#)

2

4

[Save](#)

[Add](#)

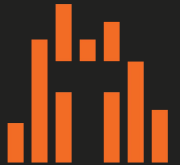


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# Key takeaways

## Telos VXs is a virtualized broadcast VoIP system

- Broadcast industry is changing
- Virtualization lets us adapt
  - Centralization
  - Modern control and monitoring
- Delivered as a Docker-compatible container

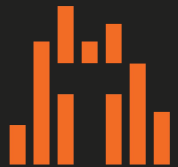


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# Key takeaways

## Telos VXs is a virtualized broadcast VoIP system

- Deployment: on-prem, datacenter, cloud
- Choose your features:
  - Channels
  - Lines
  - Acoustic Echo Cancellor
- Choose your purchase method:
  - Subscription
  - Buyout

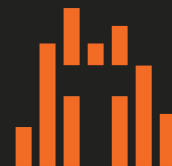
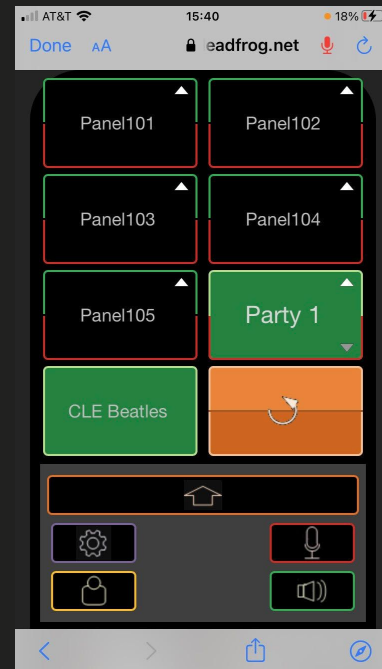




# Virtualized Intercom

FIRST,  
WE **BROKE**  
**THE MATRIX.**  
NOW WE'RE PUTTING  
**INTERCOM IN THE**  
**CLOUD.**

*Telos*  
INFINITY® VIP



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# Matrix-Less Intercom A Different Approach

---

**NO COSTLY**



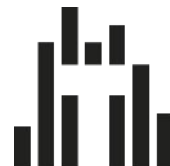
**CENTRAL MATRIX**

# Telos Infinity<sup>®</sup> IP Intercom

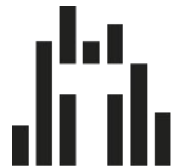
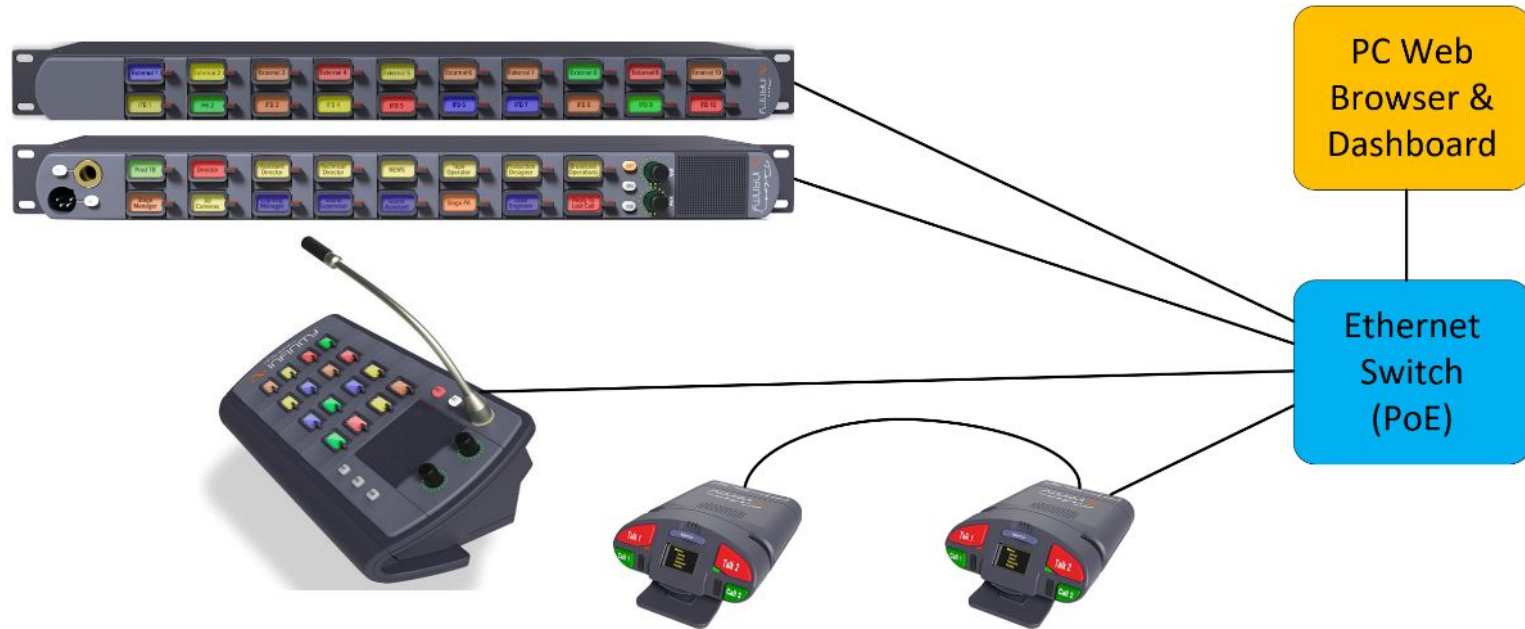


## The AoIP solution that changes everything.

- Voice communication and contribution audio on a single IT backbone
- Matrix-free design allows for infinite scalability
- Livewire+™ AES67 ensures seamless interoperability
- Hardware includes BP-2 & BP-4 Dual/Quad Channel Beltpacks, MP-16 1RU Master Panel, MXP-20 Expansion Panel, and DS-16 Master Desktop Station
- 'Base' Panel versions for lower cost systems
- Telos Infinity Dashboard software provides intuitive configuration and management
- Infinity Link VoIP for remote system deployment over WAN



# Telos Infinity IP Intercom Basic Connectivity





The Product Range

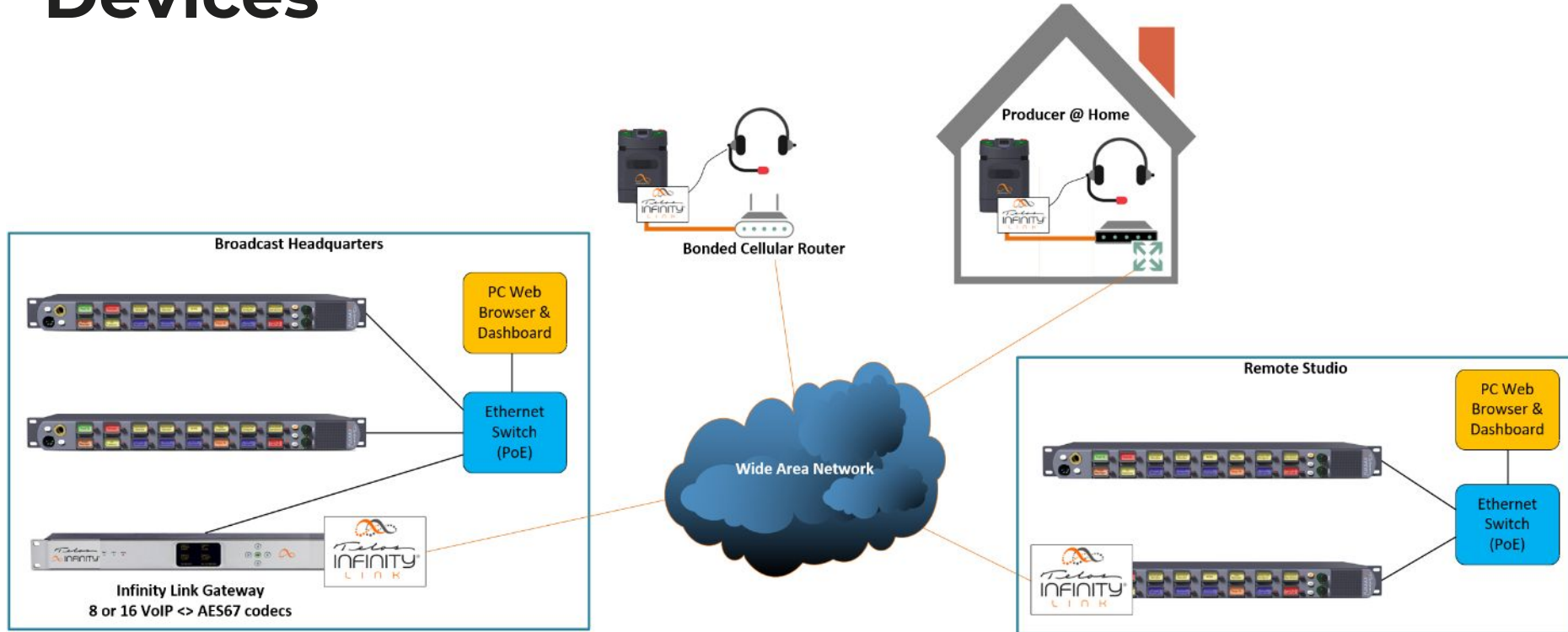
# Infinity Link OPUS VoIP: Gateway 8 / 16

## Infinity Link Device 2 / 4 / 8 VoIP Licenses



# Infinity Link Gateway and Devices

The Product Range





VIP

# Virtual Intercom Platform

Matrix-Less Cloud Communications



# What is Infinity VIP ?

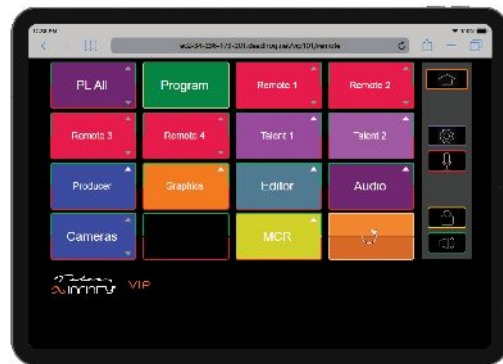
A Cloud-Based Intercom Platform: Delivering a 'soft' version of Telos Infinity IP Intercom to any HTML5 compatible device with onboard audio

- Individual virtual 'panels' running on a Cloud server
- Virtualized Dashboard Config and Management Software
- Virtualized Link VoIP Codec for In Cloud and On Prem 3<sup>rd</sup> Party Connects
- Authentication, Licensing, Server Management, Up-Time Metrics
- Devices accessed via HTML5 browser
- WebRTC, Web Audio & OPUS support



# Telos Infinity VIP

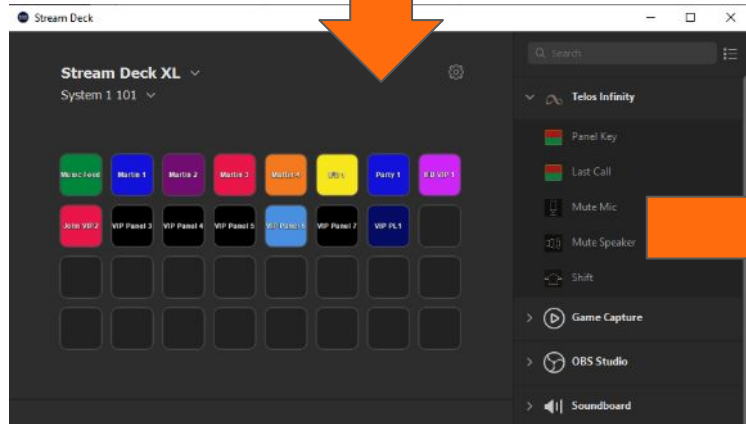
Telos  
INFINITY® | VIP



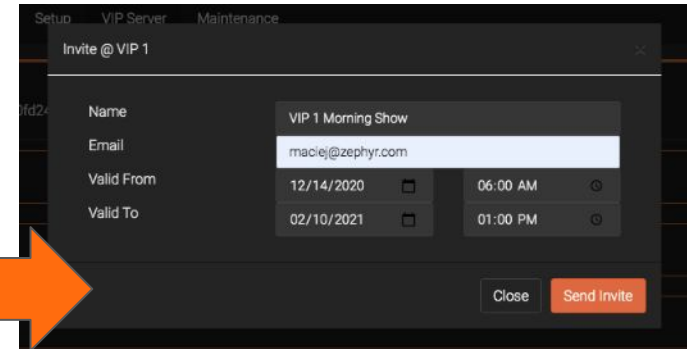
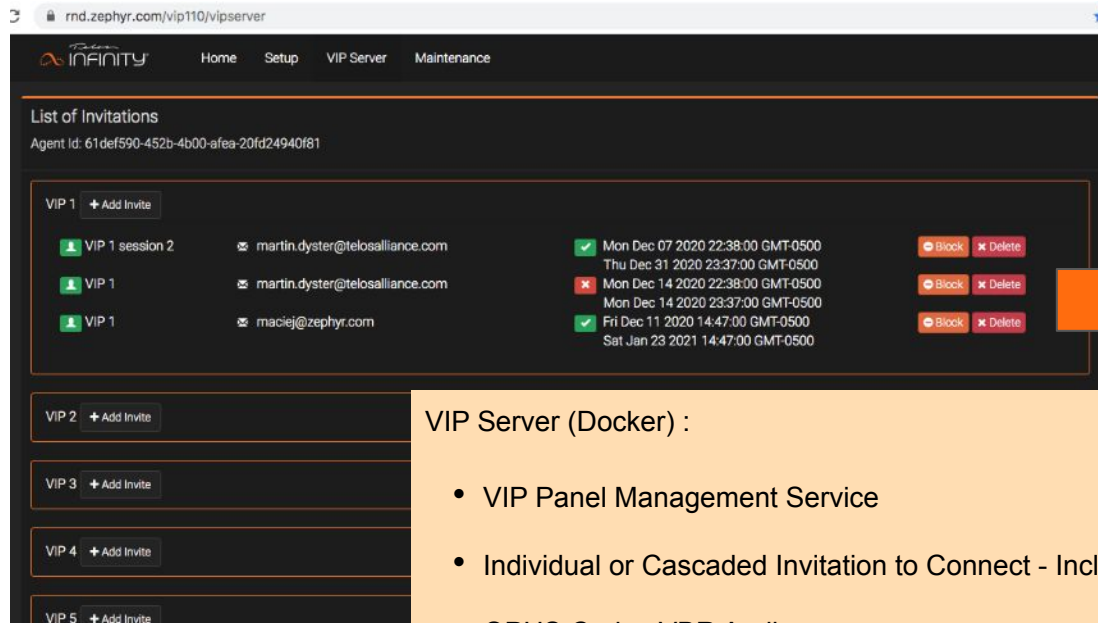
Telos  
Alliance®



# Elgato Stream Deck Plugin



# VIP Server Elements: Infinity Invitations



## VIP Server (Docker) :


- VIP Panel Management Service
- Individual or Cascaded Invitation to Connect - Including WebRTC signaling
- OPUS Codec VBR Audio
- SHA-256 Encryption (default)
- Remote Admin - 'Block' 'Delete' 'Edit'


# VIP Server Elements: Invitation email

LiveNet invite Inbox X

**Telos LiveNet** <invite@telos.live>  
to maciej@zephyr.com

12:35 PM (3 minutes ago) ☆ ↶ ⋮

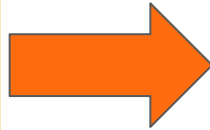
**Telos Alliance**  
LOVE WHAT YOU HEAR

  
**VIP 1 Morning Show**  
VIP Session Info

**Password: ZmVWC8Rf**  
**JOIN NOW**

**VIP Session**

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beacon.telos.live/?c=eyJjb2RlIjoINDQ5YzE5MjA5NDExNGM2YmJkY2MyMTMxNjhm...

## VIP Agent

Telos Alliance

Welcome, VIP 1 Morning Show

To secure this connection please enter the password that you got in the invite email.

⚠



Martin VIP1 | Remote Control: x

ec2-3-230-232-195.deadfrog.net/vip101/remote

Music Feed

Martin 1

Martin 2

Martin 3

Martin 4

IFB 1

Party 1

IFB VIP 1

John VIP2

VIP Panel 3

VIP Panel 4

VIP Panel 5

VIP Panel 6

VIP Panel 7

VIP PL1

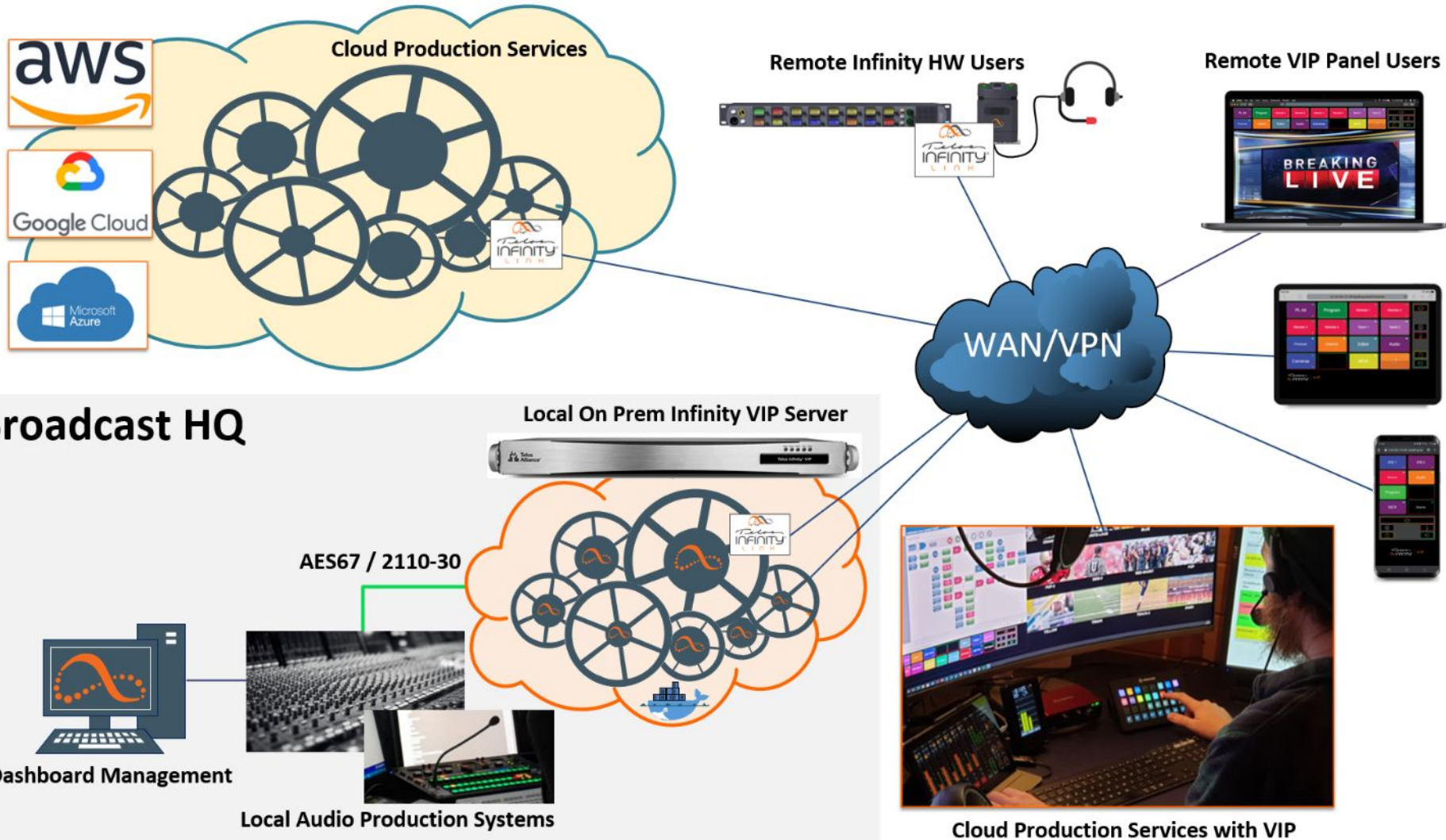
  
  
  
  
  



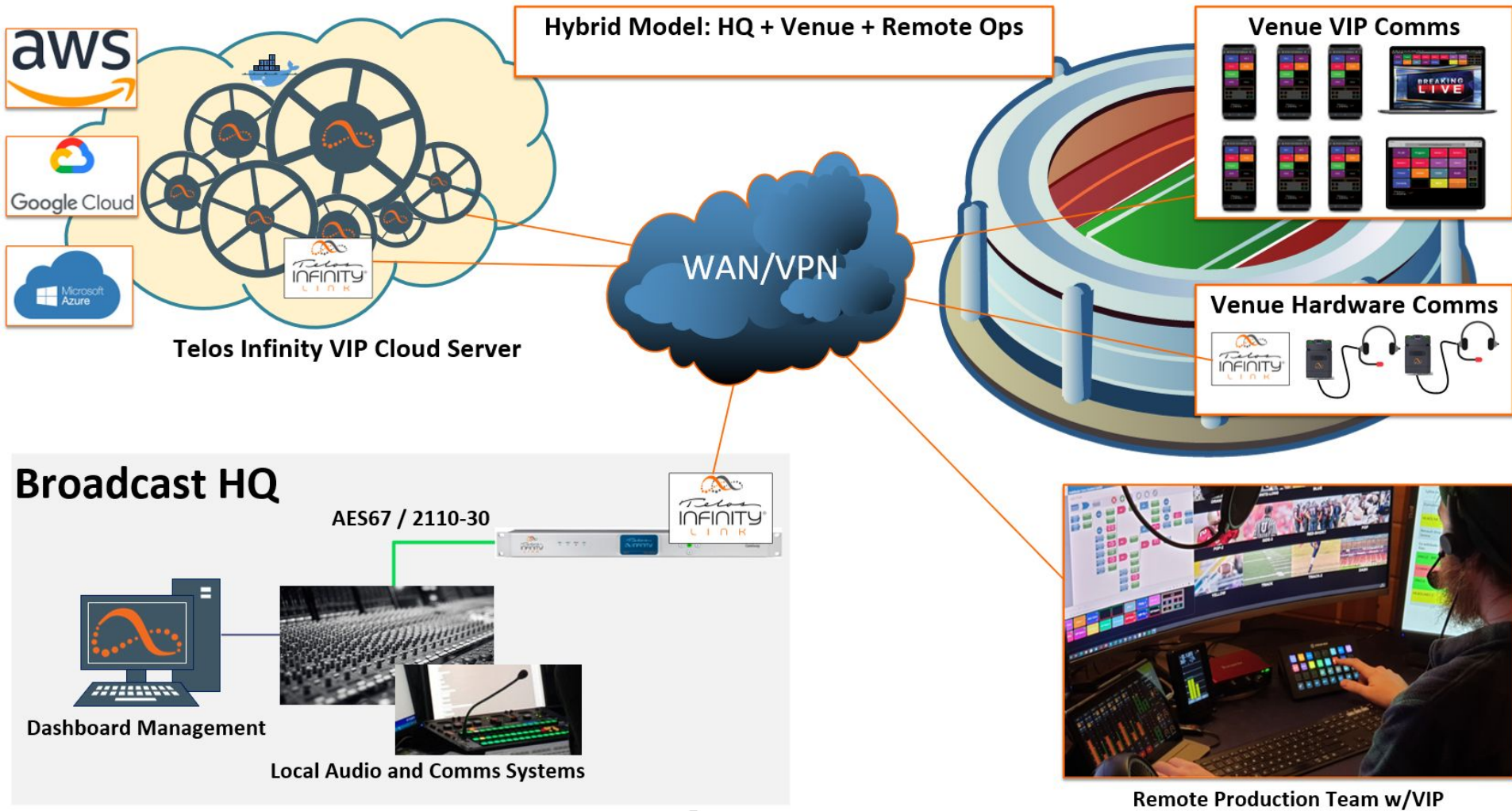

# Deployment Options: Most Common Use Cases

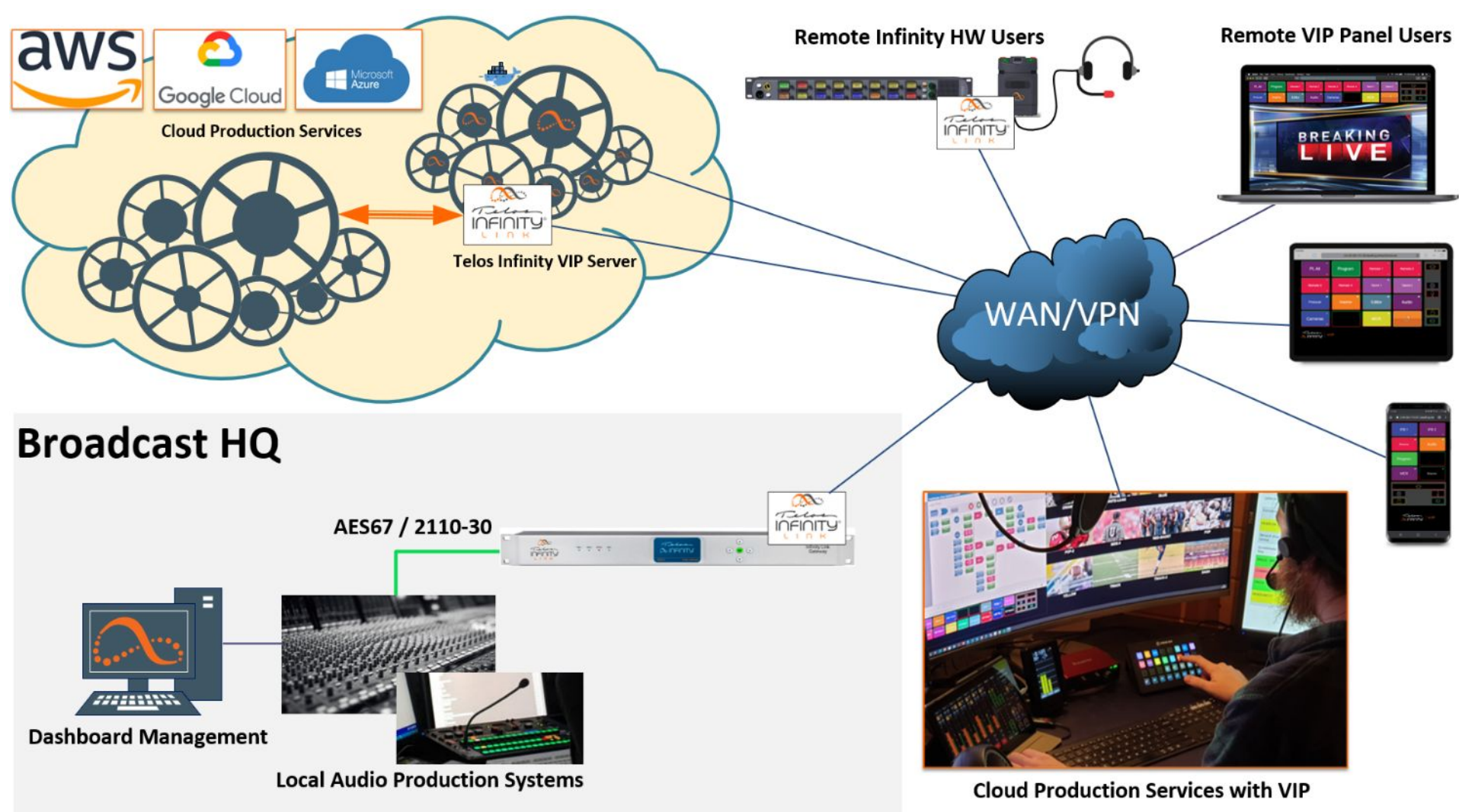
Matrix-Less Cloud Communications













# Broadcaster 1 HQ



Dashboard Management



Local Audio and Comms Systems

AES67 / 2110-30



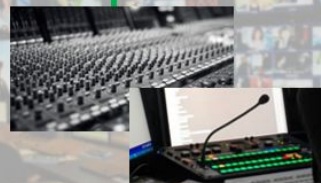
**Multi-Site Model:  
HQ + Affiliates + Remote  
Ops**



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# Affiliate 1



Local Audio and Comms System 1

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# Affiliate 2



Local Audio and Comms System 2

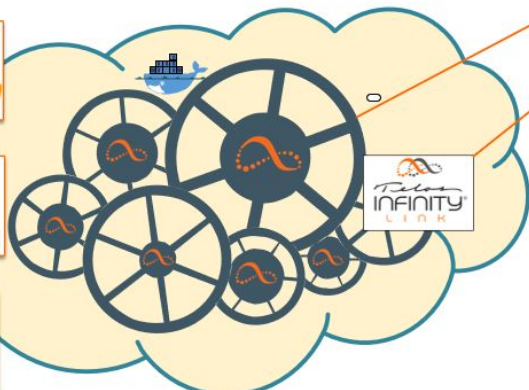
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# Affiliate 3



Local Audio and Comms System 3



Telos Infinity VIP Cloud Server



Remote Users w/VIP

# Broadcast Industry Adoption



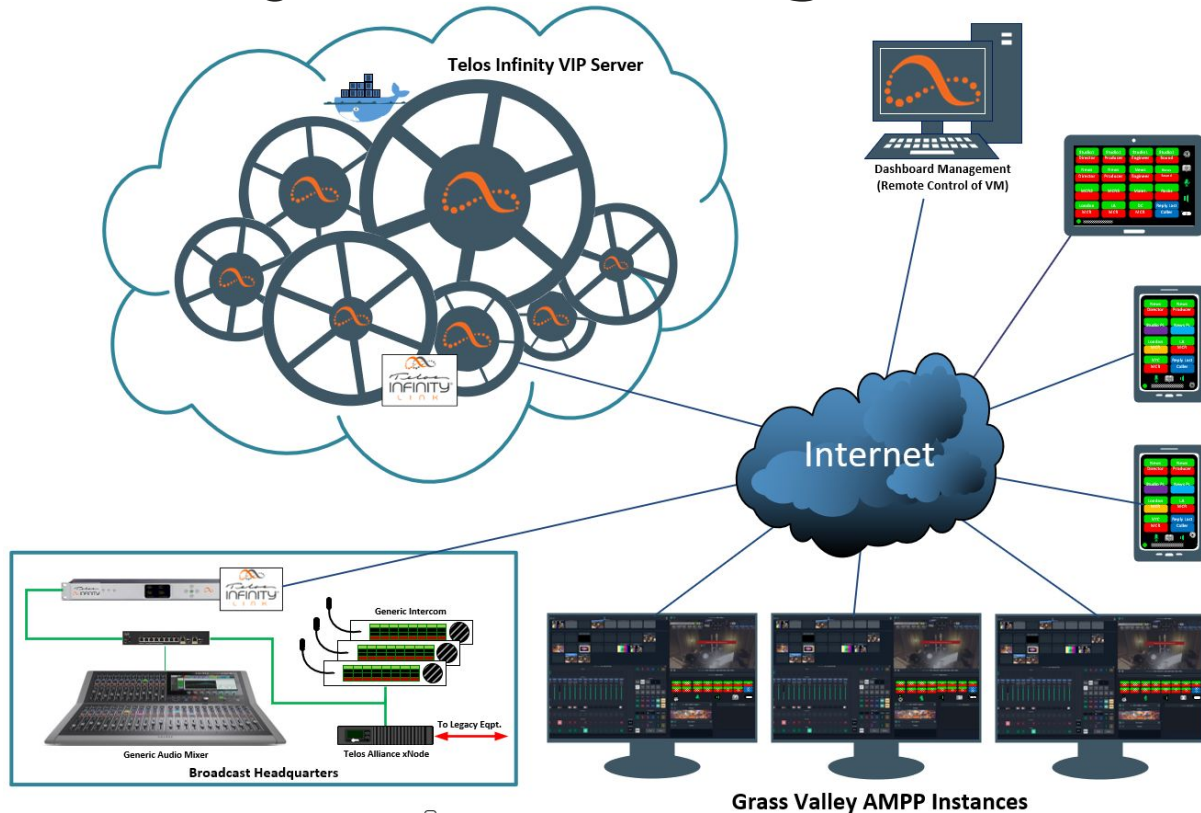
Grass Valley and Telos Alliance  
Partner to Bring Integrated Intercom  
to Cloud Production

# Grass Valley AMPP Integration





# Grass Valley AMPP Integration





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