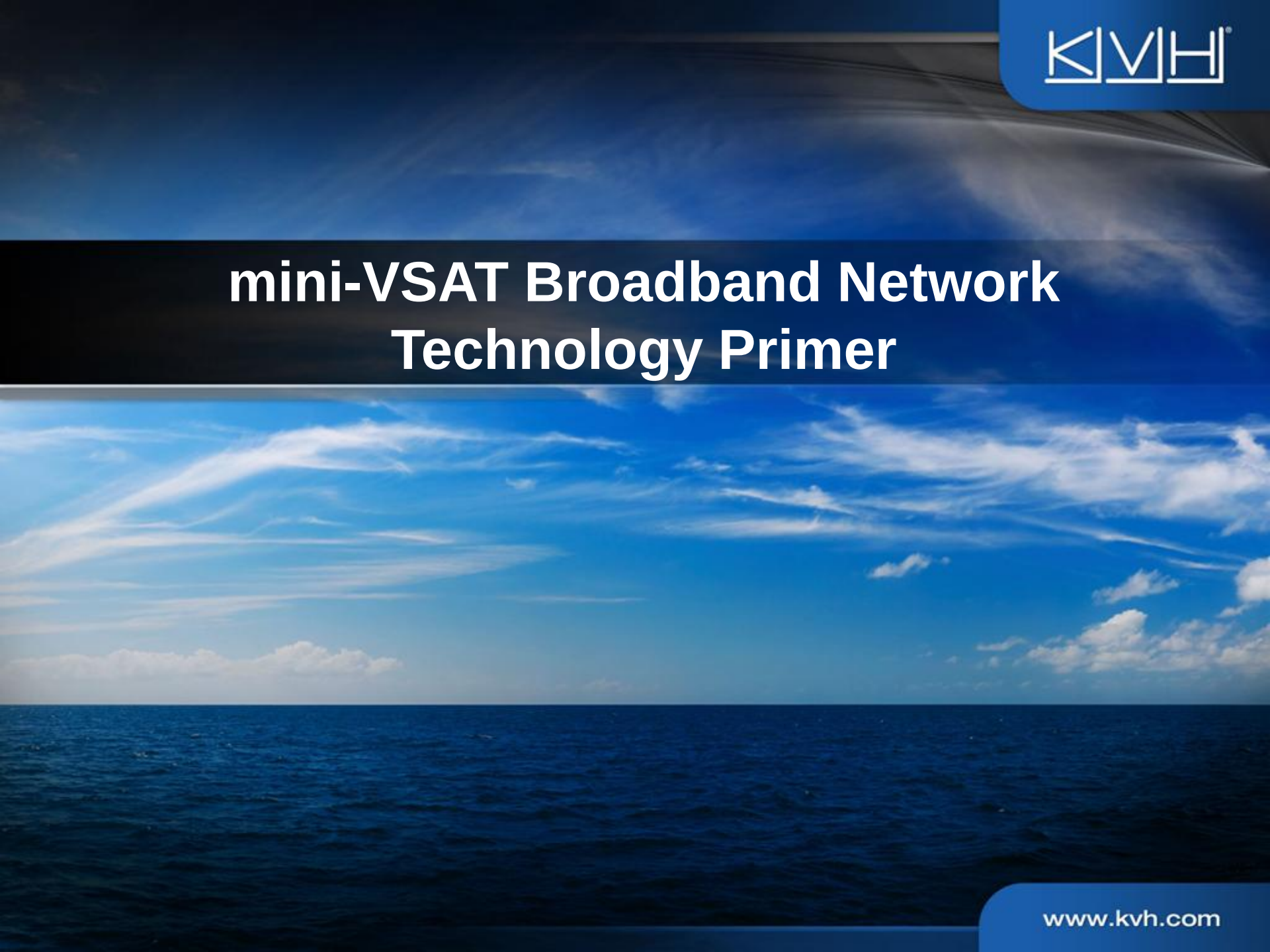
V7IP and V11
Product Introduction

mini-VSAT Broadband Network Technology Primer



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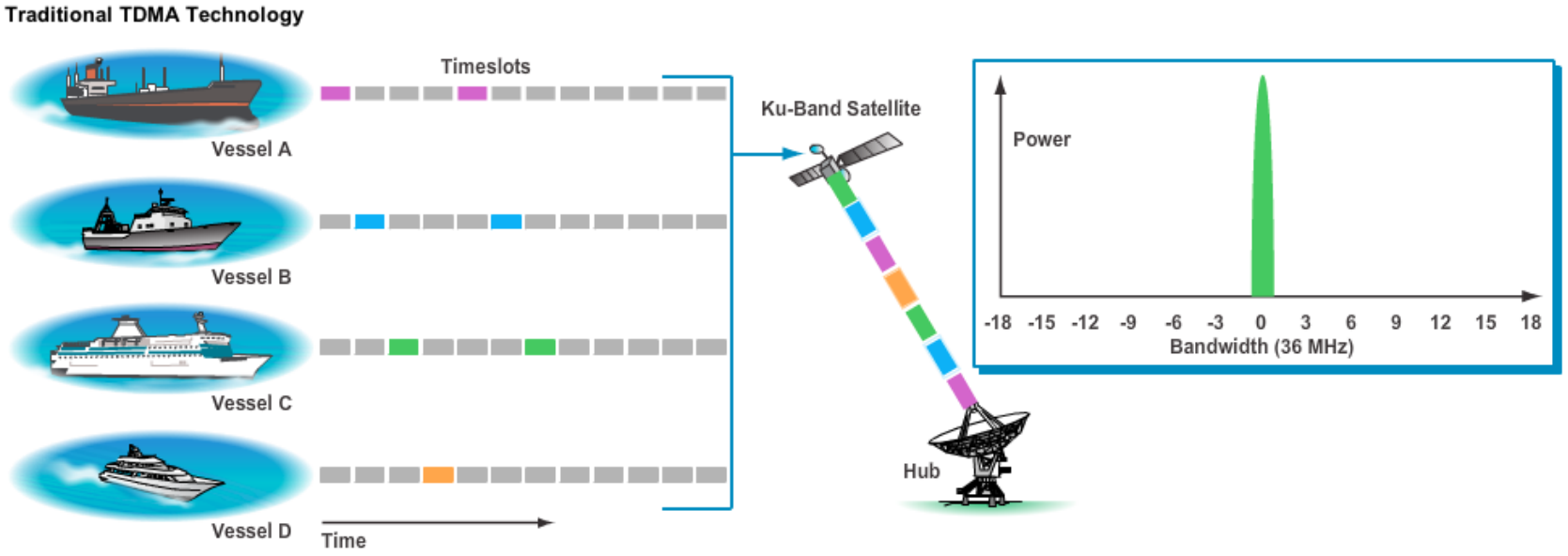
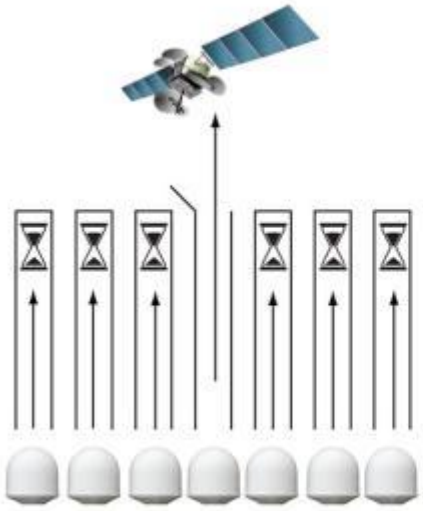
Traditional VSAT Technology

- **Most VSAT systems use variants of the TDMA protocol**
  - TDMA = Time Division Multiple Access
- **One terminal at a time can transmit in a given return link**
- **TDMA systems transmit high power spectral density signals**
- **Antennas need to be large and point very accurately**
  - To avoid adjacent satellite interference
  - Makes terminal hardware expensive

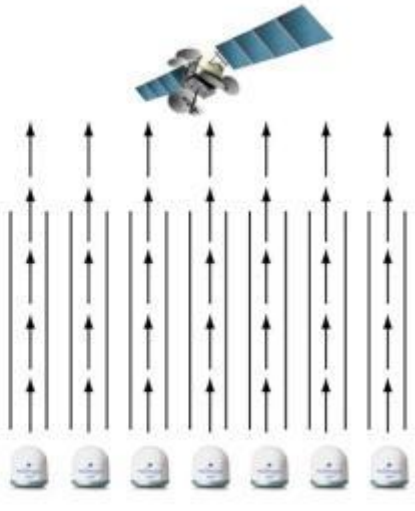


ArcLight Platform – Core Features

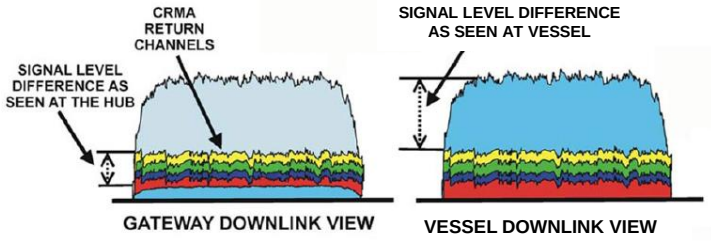
- **Code Reuse Multiple Access (CRMA)**
  - Used for return channel from the vessel terminal to the Hub
  - Spread spectrum variant of CDMA used in billions of cellular phones
- **Paired Carrier Multiple Access (PCMA)**
  - Allows same satellite spectrum to be used for both inbound and outbound data links



TDMA VSAT Systems

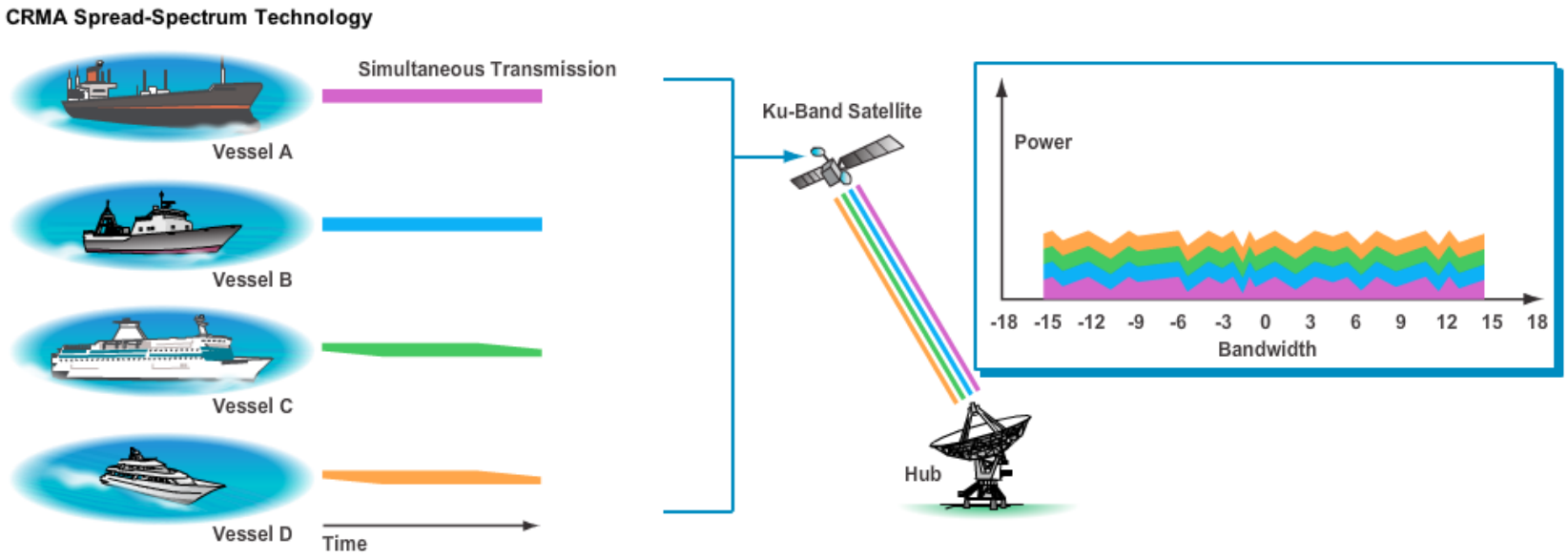


mini-VSAT Broadband Systems



ArcLight Return Link - CRMA

- **Transmitted signal spread over a wide bandwidth**
  - Lowers Power Spectral Density, reducing interference possibility
- **Terminals transmit in bursts when they have outbound data**
  - No timing coordination necessary with the hub
  - Low and consistent latency
- **Terminals can transmit simultaneously**
  - No need to “wait your turn”
  - Reduces contention



TDMA vs CRMA Spread Spectrum

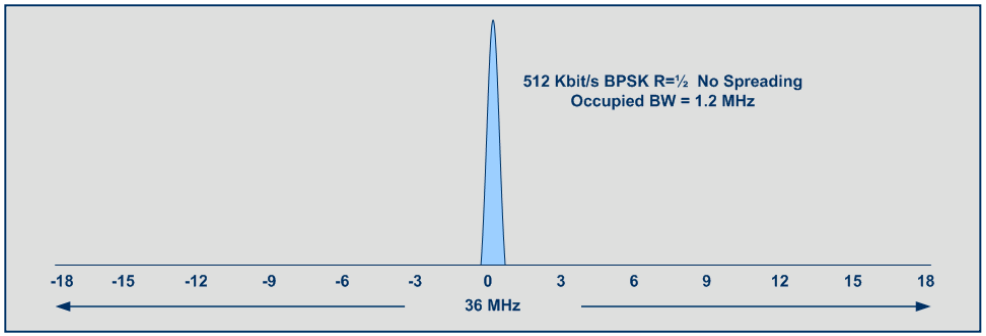
TDMA C-Band
2.4m

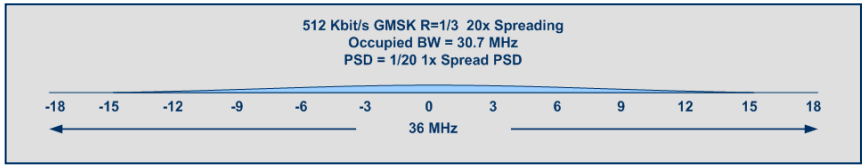
TDMA Ku-Band
1m

Lower Tx power spectral density allows use of smaller antennas

CRMA C-Band
1m

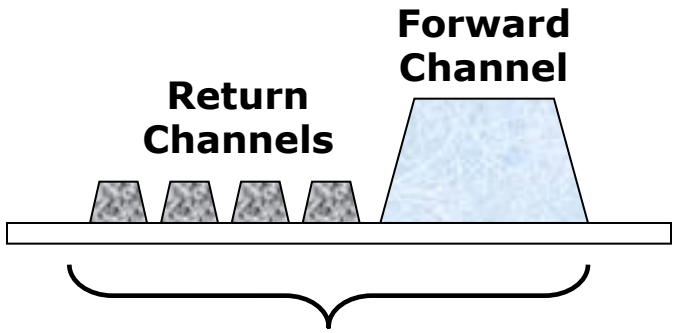
CRMA Ku-Band
37cm and up





PCMA/CRMA Spectrum Efficiency

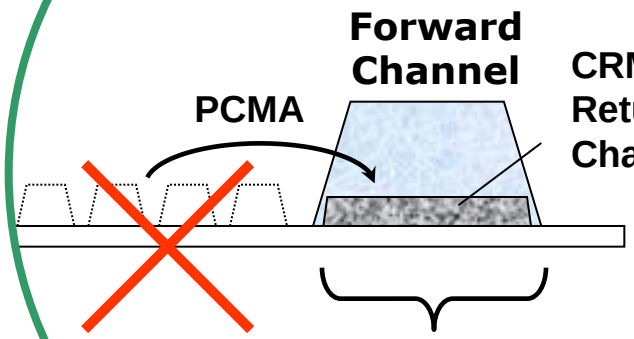
Traditional VSAT



Typical Bandwidth Requirements

Higher Service Costs

Mini-VSAT

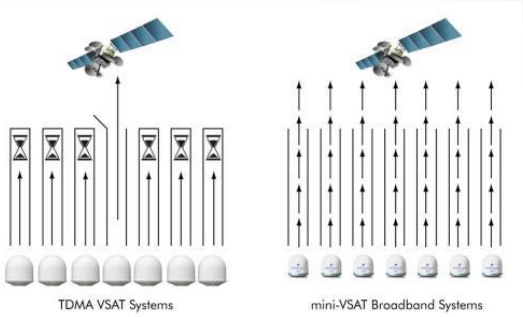


Bandwidth With PCMA

Lower Service Costs

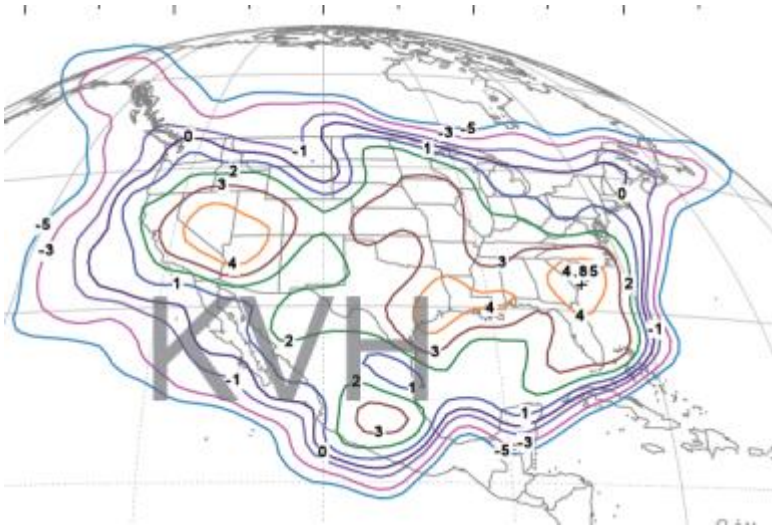
CRMA/PCMA Key Advantages

- **Avoids overhead, delays of reservation or contention schemes**
- **Enables significant equipment cost reductions**
  - Supports small lightweight antennas
  - Relaxes time/frequency accuracy requirements
- **User gets all throughput of supported burst rate**
  - Return links not time shared
  - Only on air when data needs to be sent – Random Access
  - No wasted transponder bandwidth when idle
- **PCMA provides bandwidth cost savings to allow low priced service plans**
- **Designed for mobility**
  - Same technology used in business jets and government surveillance platforms



Sat Link Evolution/Enhancements

- **Adaptive Return Link (ARL) now active on network**
  - Modem RL speed will adapt to conditions
  - RL Speeds from 64kbps to 1mbps
  - Speed will reduce/increase as conditions warrant
    - Weather, blockage, footprint location, etc…
  - Increases overall service availability
  - Controlled from hub based on RL signal quality
- **Forward Link Evolution**
  - VCSM now being rolled out on forward link
    - VCSM = Variable Coding and Spread Modulation
    - Increases transponder efficiency and capacity
  - ACSM – Q2/2013
    - ACSM = Adaptive Coding and Spread Modulation
    - Forward link will adapt to terminal conditions
  - Both combine for high spectrum efficiency and availability
    - Better support for varying antenna sizes from 37cm to 1.1m
    - Average FL capacity increases of ~3x with current satellite spectrum



Product Update

TracPhone V7IP & TracPhone V11

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V7IP and V11 Introduction

- **TracPhone V7IP**
  - All new 3-axis 60cm antenna platform
  - Extended elevation range
  - Dome mounted GPRS support modem

- **TracPhone V11**
  - Breakthrough 3-axis Ku/C-band 1.1m VSAT antenna
  - Automatic satellite switching between satellites and bands
  - Single modem and same mini-VSAT Broadband network
  - C-band overlay for truly global coverage and Ku-band backup
  - Dome mounted GPRS support modem

- **CommBox-ACU (Antenna Control Unit)**
  - Both V7IP and V11 are bundled with the CommBox-ACU
  - IP enabled Functionality
    - Web GUI, WiFi interface
  - Fully integrated hardware platform
  - Integrated CommBox Network Management Platform

V7IP – Antenna Unit

- **3-axis Platform**
  - No keyhole issue at equator
  - All new acquisition & tracking algorithms
  - Antenna has been shipping to select customers for over a year
- **-24 to +119 Degree Elevation Range**
- **Complies with EN 60945**
  - Environmental/Vibration
- **Inmarsat Motion Compliance**
  - Tracking tested to 1.5x Inmarsat Motion
- **Same RF Design as 2-axis V7**
  - Same coverage and service availability maps as V7
- **NMEA-0183 Interface**
  - True or Magnetic heading reference input
  - Improved acquisition time and keyhole tracking
- **Dome mounted GPRS support modem**
  - Access remotely initiated from KVH Technical Support

V7IP Antenna Unit Specs

Abovedecks Equipment	
Antenna Dish Diameter	61 cm (24")
Antenna Unit Diameter x Height	66.3 cm D x 79.2 cm H (26.1" D x 31.2" H)
Antenna Unit Weight	26.1 kg (57.6 lbs)
Antenna Element	Gain (RX-band, min): 35.6 dBi
Elevation/Azimuth Range	-24° to +119° / 720° rotation
Antenna Operating Temperature (Operational)	-30°C to 55°C (-22°F to 131°F)
Antenna Storage Temperature (Survival)	-35°C to 70°C (-31°F to 158°F)
Humidity	IEC 60945; 40°C (104°F), 95% Humidity (non-condensing)
Rain	Precipitation rate of 100L/min, w/wind speeds up to 100 knots
Heading Input	NMEA 0183 magnetic or true heading
Antenna Unit Power	DC; provided by CommBox-ACU
CommBox-ACU to Antenna Unit Communications	14 Conductor Data Cable
RF Cables (customer supplied)	Choose RG-11 for 5-15 m, LMR-400-75 for 16-30 m, or LMR-600-75 for 31-45 m
Remote Support	Integrated GPRS modem for access by KVH technical support

V7IP - Other Information

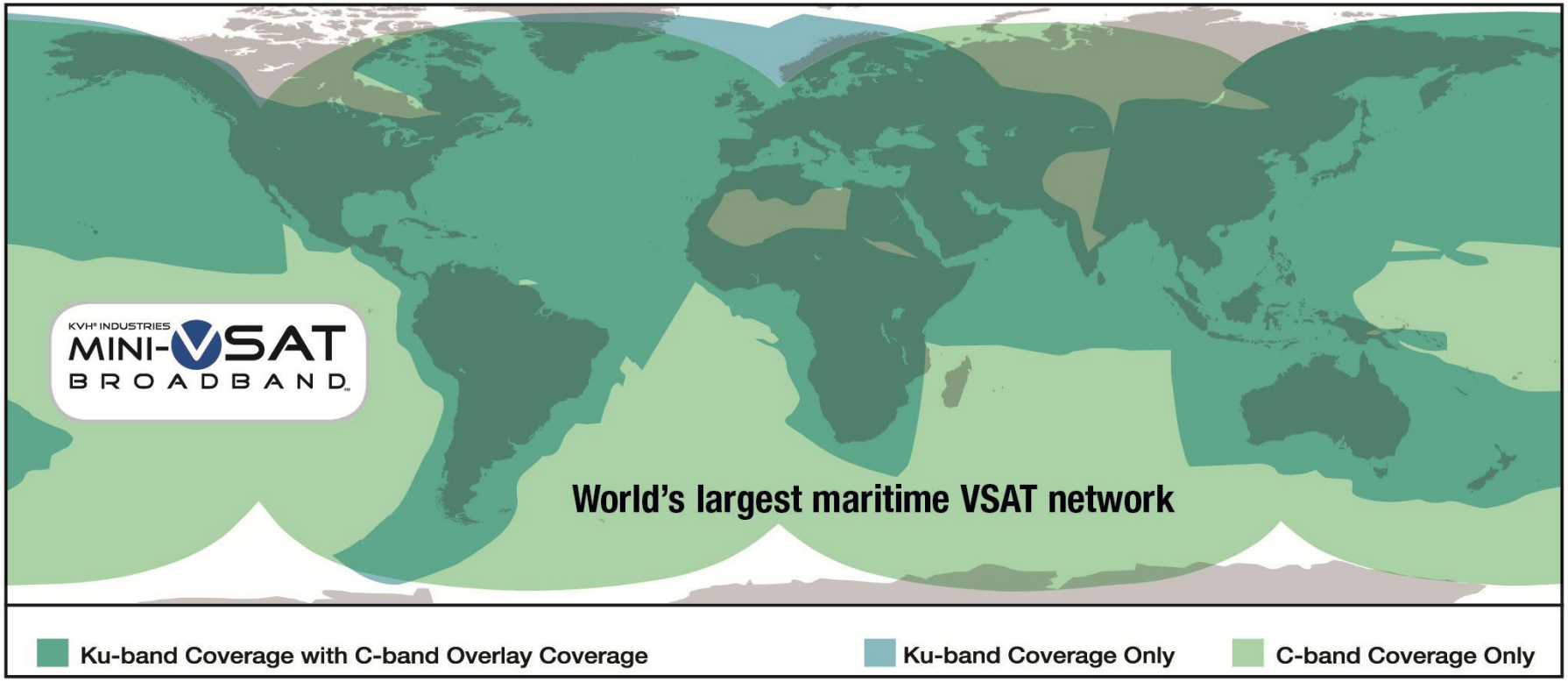
- **Part Numbers**
  - 01-0283-11 TracPhone V7IP SL
  - 01-0283-11NL TracPhone V7IP SL No Labels
  - 01-0283-12 TracPhone V7IP SL with Case
  - 01-0283-12NL TracPhone V7IP SL No Labels with Case
  - 01-0297-11 TracPhone V7IP in M9 w/case
  - 01-0297-12 TracPhone V7IP in M9 w/o case
- **MSRP:**
  - $35,995 – Rack-mountable CommBox-ACU & Modem
  - $36,995– 19” Rack Case-Mounted CommBox-ACU & Modem
- **Availability – Mid September**
- **mini-VSAT Airtime Plans the same as V7**
- **2-axis TracPhone V7**
  - Will continue to be available for TVRO dome matching
  - V7IP promoted to commercial markets exclusively

TracPhone V11

- **Groundbreaking hybrid Ku-band/C-band system**
  - Supports Ku- and C-band mini-VSAT Broadband services
  - Both maritime services only available from KVH
- **Uses Ku-band for high-volume traffic and C-band for coverage gaps**
  - Automatically shifts between services to minimize costs and maximize bandwidth and network access
  - Note: C-Band generally not available/licensed within 125 km of land (200km US)
- **Immediate benefits for operations**
  - Always on, fully redundant, no blockage, no weather outages, true global footprint, unmatched by any other 1 m VSAT
  - Blockage mitigation via multiple satellites = ~100% availability
  - Uninterrupted by bad weather (C-band is lower frequency)
  - Unmatched global footprint that is superior to any other 1 m antenna
  - Licensed for in-port use using Ku-band (C-band is not permitted even for 2.4 m dishes)

Unsurpassed Global Network

mini-VSAT Broadband C/Ku-band Coverage*

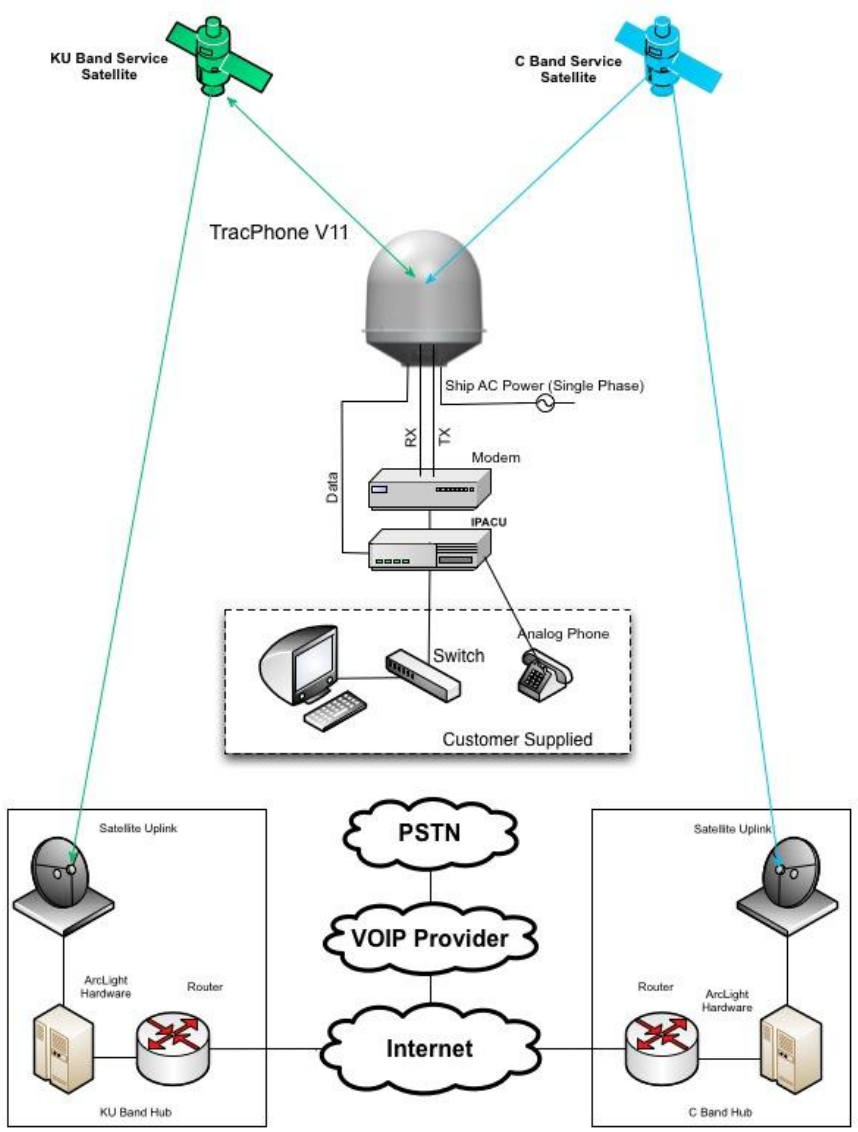


V11 - Antenna Unit

- **3-axis 1.1m platform**
  - Re-uses much of the HD11 TVRO mechanical/electrical design
  - 80% smaller by volume than 2.4m C-Band Antennas
  - Extended elevation range: -24 to +119 degrees
- **Ku-band and C-band support**
  - Automatic switching between satellites and bands
  - Co and Cross Pol C-band satellite support
- **Custom designed C-band RF electronics**
  - LNB, BUC, SSPA, and band switching electronics
- **Amplification/attenuation built in to better support varying cable lengths**
- **Enhanced Ku-band performance over V7**
  - Faster forward and return links available
- **Antenna unit AC powered at dome**
  - AC Power controlled from ACU

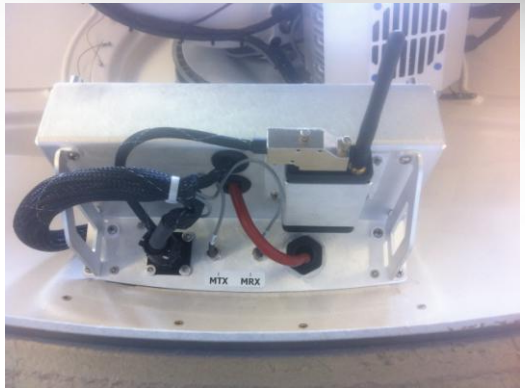
V11 System/Service Architecture

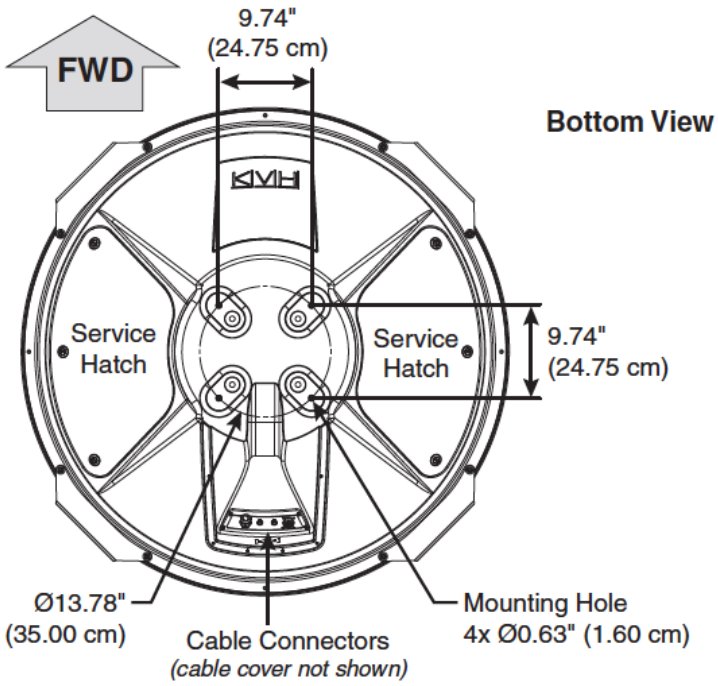
- **Same modem used for C- and Ku-band services**
- **Same terrestrial network architecture as Ku-band network**
- **C-Band satellite locations**
  - 53W: Atlantic Ocean Region
  - 180E: Pacific Ocean Region
  - 64E: Indian Ocean Region
- **Hub Locations**
  - 2 hubs located in California, USA
  - 1 hub located in Germany
- **C-Band Data speeds**
  - Up to 1MBPS Forward Link Initially
  - Up to 256KBPS RL
- **Ku-Band Speeds**
  - Up to 4 MBPS Ku FL speeds
  - Up to 1 MBPS Ku RL speeds



Antenna Installation/Specifications

- **Two service hatches**
  - No need to remove radome during installation
- **4 hoist points for easy lift to vessel**
- **AC power brought directly to antenna dome**
  - 3 wire, 12 or 14 gauge
- **No damage concerns if unit is powered off**
  - Balanced mechanism
  - Motors/gearboxes dampen any movement
- **Tx/Rx RF Cables**
  - LMR-400-75 good up to 100’ (30 m)
  - LMR-600-75 good up to 300’ (90 m)
- **16-conductor Control/Data Cable**
  - Cable is different from V7-3/V7/V3
  - Cable is the same as HD11





V11 – Specifications Summary

Abovedecks Equipment	
Antenna Dish Diameter	1.1 m (42.5")
Antenna Unit Diameter x Height	1.2 m D x 1.4 m H (48.8" D x 57.3" H)
Antenna Unit Weight	102 kg (225 lbs)
Antenna Element	Receive Gain: Ku-band: 40.1 dBi; C-band: 30.0 dBi Transmit Gain: Ku-band: 41.7 dBi; C-band: 33.7 dBi
Elevation/Azimuth Range	-24° to +119° / 720° rotation
Antenna Operating Temperature (Operational)	-30°C to 55°C (-22°F to 131°F)
Antenna Storage Temperature (Survival)	-35°C to 70°C (-31°F to +158°F)
Humidity	IEC 60945; 40°C (104°F), 95% Humidity (non-condensing)
Rain	Precipitation rate of 100L/Min, w/wind speeds up to 100 knots
Heading Input	NMEA 0183 magnetic or true heading
Antenna Unit Power	90-240 VAC, 50-60 Hz auto switching, 650 watts; provided at the dome
CommBox-ACU to Antenna Unit Communications	16 Conductor Data Cable
RF Cables (customer supplied)	75 Ohm – F-Connector Terminations Choose LMR-400-75 for 5.8 to 30.5 m or Choose LMR-600-75 for 30.5 to 91.4 m
Remote Support	Integrated GPRS modem for access by KVH technical support

V11 Other Information

- **Part Numbers**
  - 01-0350-01 TracPhone V11 System with Rack Mountable CommBox-ACU and Modem
  - 01-0350-02 TracPhone V11 System with Case Mounted CommBox-ACU and Modem
  - 01-0350-03 TracPhone V11 System with Rack Mountable CommBox-ACU and Modem (No Labels)
  - 01-0350-04 TracPhone V11 System with Case Mounted CommBox-ACU and Modem (No Labels)
- **MSRP:**
  - $74,995 – Rack-mountable CommBox-ACU & Modem
  - $75,995 – 19” Rack Case-Mounted CommBox-ACU & Modem
- **Availability**
  - Shipping by end of September
- **Ku/C-Band Airtime**
  - Add $1k to existing V7 Fixed rates
  - Also adding “F7” plan
    - 4MBPS/1MBPS - $9995/month

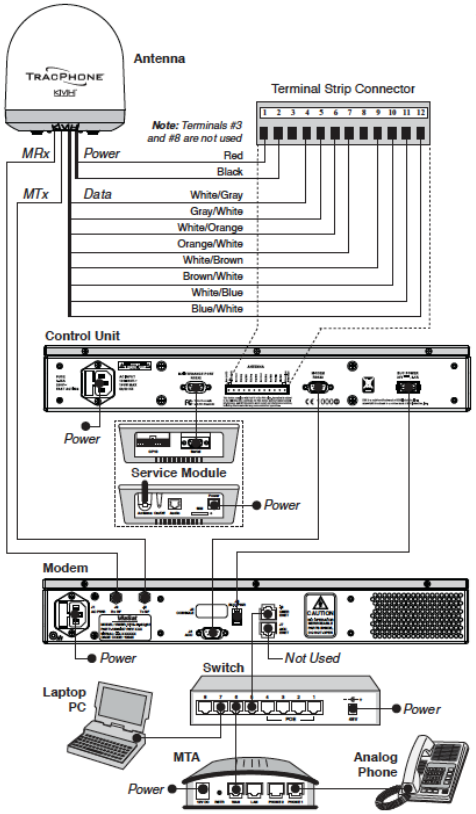
mini-VSAT Broadband Airtime Rate Plan (Mbps shore to ship/ship to shore)	Cost per Month (Ku/C-band service)
F0 (64/64)	$1,995
F1 (128/128)	$2,495
F2 (256/128)	$2,995
F3 (256/256)	$3,495
F4 (512/256)	$3,995
F5 (1024/512)	$5,495
F6 (2048/512)	$6,995

New Product Feature

CommBox-ACU

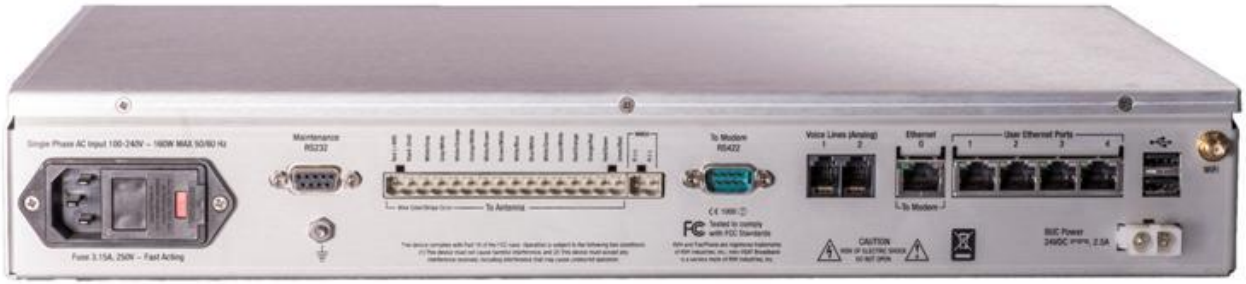
Current TracPhone V7 Below Deck

- **Embedded controller in ACU (no IP connectivity)**
  - RS232 Serial PC based SW Updates only
- **Modular Supporting Systems**
  - MTA (VoIP), Ethernet Switch, GPRS Support Modem
    - Plus their AC/DC power supplies
- **CommBox C2 or R8 an additional hardware add**



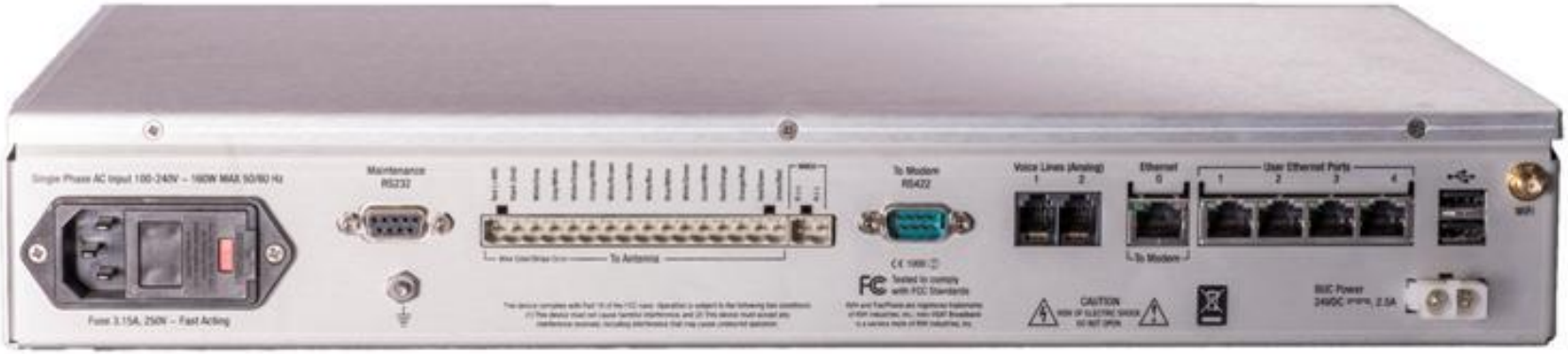
CommBox-ACU Hardware Features

- **All modular parts now integrated into CommBox-ACU**
- **Intel Atom processor SBC running Linux OS**
- **4 Integrated 10/100 Ethernet Ports Available for User**
  - Auto sense for port speed, duplex and host type
  - Independently routable, VLAN trunking supported
- **Integrated 2-Port MTA – 2 RJ11 interfaces**
  - Configurable for crew calling/pre-paid VoIP
- **WiFi Interface**
- **3 USB Interfaces**
  - 1 - Front Panel mounted - SW updates
  - 2 - Future Interface/Device Expansion



CommBox-ACU – Key Functionality

- **Enhanced KVH Tech Support for mini-VSAT Customers**
  - IP Enabled Support for mini-VSAT Terminal Operation
  - SW updates via Web Browser, USB Drive, over the air
  - Configuration and status of entire system available over the air
  - Rolling system log capture and storage
  - Remote support options available over other connection types
- **User web interface for system status and configuration**
- **Platform for delivery of future value added services**
- **Integrated CommBox network management functions**



Main CommBox-ACU Screen

My VSAT Status

Connection Status	No-Transmit Zones	Antenna State	Satellite	Beam
ONLINE Eb/No: 3.3dB	**Transmit Enabled** Transmitting & Receiving Edit Zone Settings	**TRACKING**	**105.0W**	Ku-band **CONUS-1**

My Phone

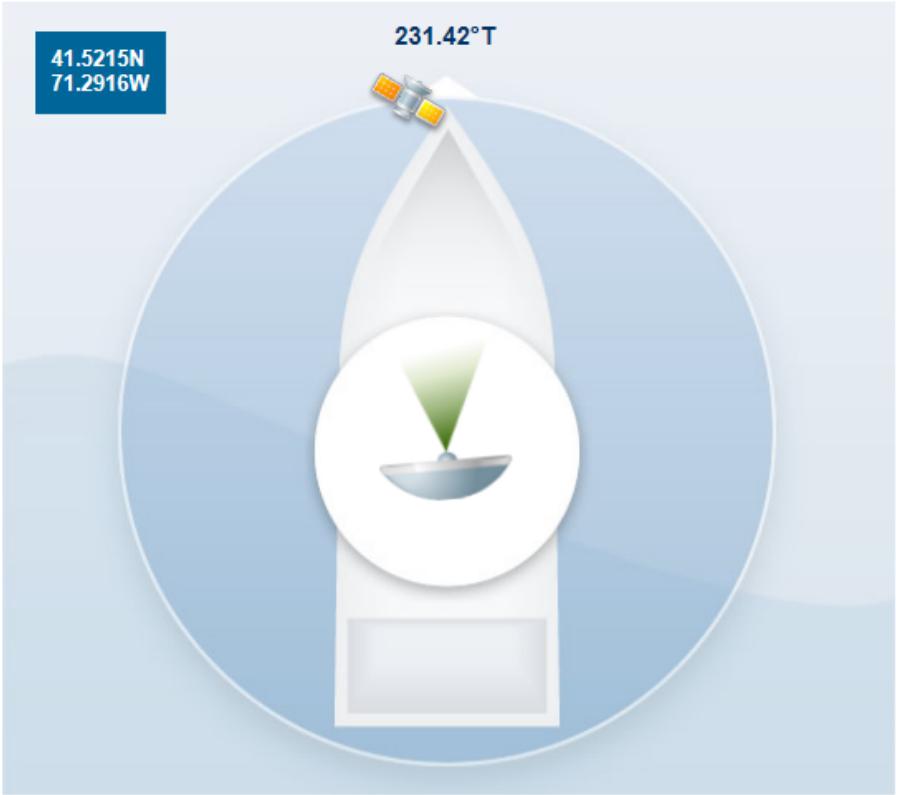
Online & Ready

My Phone Lines

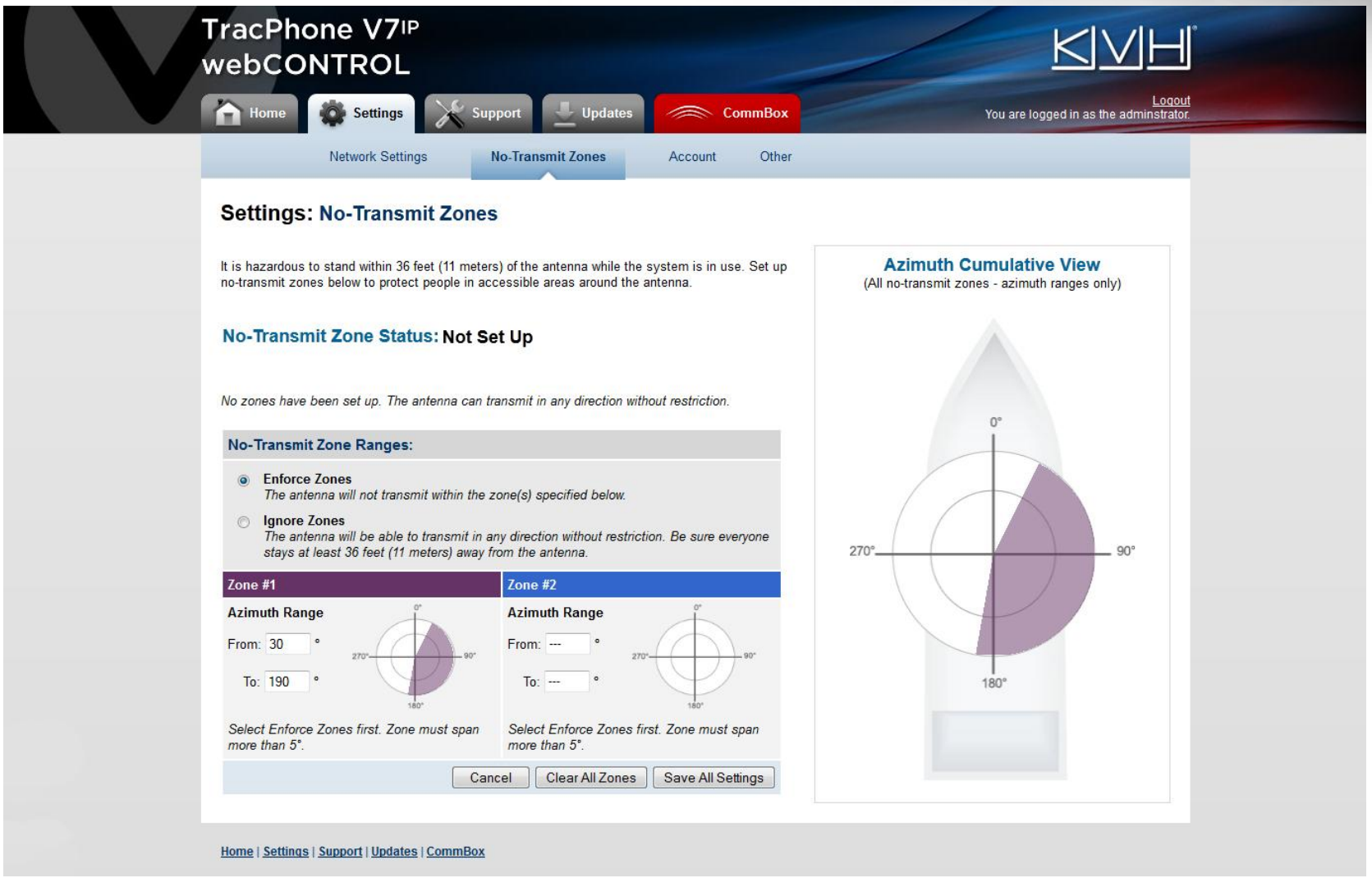
Line 1: Bridge	AVAILABLE
Line 2: Crew Quarters	AVAILABLE

Voicemail Notification
Fast dial tone pulse on handset indicates a new voicemail message.

Real-time Vessel & VSAT Satellite Display

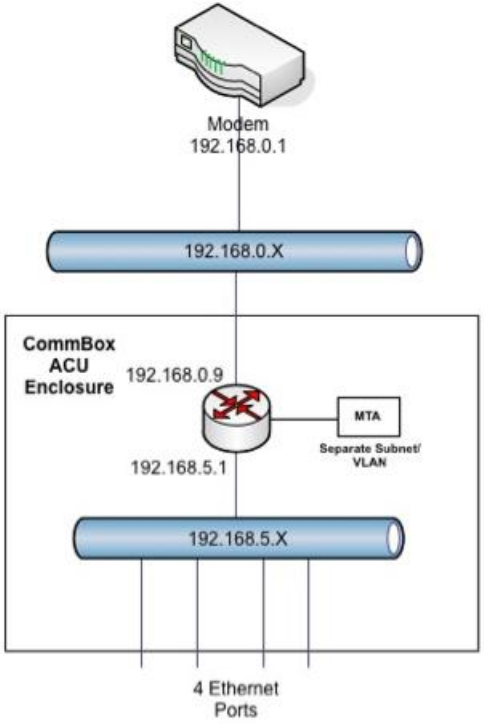


Hazard Zone Configuration



Default CommBox-ACU Net Config

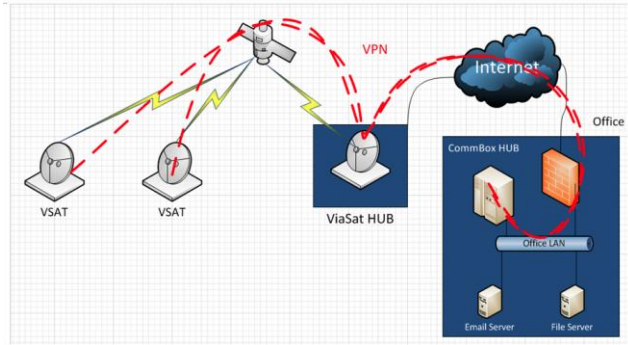
- **Plug and Play Default Configuration**
  - As V7/V3 is today
  - No setup necessary beyond standard service activation
- **CommBox-ACU provides IP assignment & routing**
  - IP address assignment via DHCP
  - IP Subnet: 192.168.5.X/24
- **Fixed satellite side IP for technical support access over the air**
  - Allows easy access by KVH technical support
  - Satellite traffic restricted to CommBox-ACU
- **DNS server/caching - On**
- **Transparent local HTTP/web caching – On**
- **VoIP MTA traffic routed internally and prioritized**



CommBox Services

CommBox Services Overview

- **Fully integrated ship/shore network management system**
  - Supports multiple communications paths off vessel
  - Adds intelligent business integration
  - Serves as the central switching unit
  - Value Added Services available
    - Optimized E-mail
    - Optimized File Delivery
    - Web Caching and Image Compression
    - Pre-Paid/Crew Internet options
  - Services designed primarily for fleet support
- **CommBox Hub**
  - Acts as VPN termination point to enterprise network
  - Enables enterprise extension and other value added services
- **Based on desired services, choice of:**
  - No hub, KVH hosted hub or Private hub



CommBox Service Packages

Standard
(No Hub Required)

- **QuickBasic**
  - Least Cost Routing/Connection Switching
  - VLAN configuration
    - Segmentation of shipside LAN/IP subnets
  - Firewall
  - Local Web and DNS Caching
    - Faster Browsing Experience
    - Less satellite traffic
- **QuickWeb - Standard**
  - Uses shared public web caches
  - Terminal controlled black/whitelist functionality

Enterprise
(Hub Required)

- **Standard Package Services**
- **QuickMail**
  - Roaming Mail Service within Fleet
- **QuickFile**
  - Optimized File Delivery/Synchronization
- **QuickCrew**
  - Roaming Pre-paid crew Internet access
- **QuickWeb - Enterprise**
  - Requires CommBox hub for head end caching and compression
  - Hub controlled black/whitelist functionality
- **Enterprise Extension**
  - VPN setup to enterprise site over mini-VSAT or other carriers

CommBox Services Sales Process

- **CommBox Services designed primarily for commercial/fleet applications**
  - Multiple LANs/IP subnets, connections off the vessel rule sets, enterprise extension, etc
- **Each customer will have differing, unique requirements and configurations**
- **CommBox is highly configurable, and setup quickly becomes complex**
- **Configurations need to be validated, documented, and controlled**
- **As a result, configuration of all CommBox services will be done by KVH as a Professional Service**
- **KVH will be using the following sales process for CommBox-ACU Services**
  - Customer/authorized representative expresses interest in CommBox services
    - Contacts KVH sales or sends e-mail to networkservices@kvh.com
  - KVH Sales Engineer will contact customer, discuss requirements, and associated fees
  - KVH Sales/Applications Engineering will generate design document and formal quote, and send to customer. If acceptable, customer signs quote and work begins
  - In most cases setup will be done over the air to an already provisioned mini-VSAT terminal
  - Applicable one-time and recurring charges will be billed via Airtime billing methods
- **Configuration changes and updates handled as a separate transaction**

CommBox Services Package Pricing

- **Professional Services setup fees charged for consultation, design and system configuration**

Software Bundles			
Part Number	**Description**	**MSRP ($USD)**	**Monthly Fee ($USD)**
35-0011	**Standard Bundle: QuickBasic and QuickWeb** least cost routing, onboard firewall, bandwidth management, web caching, web image compression and ad removal, URL and content filtering	n/a	$95
	First Vessel Set-up Fee[1]	$1,500	n/a
	Each Additional Vessel Set-up Fee	$200/vessel	n/a
35-0012	**Enterprise Bundle: QuickComplete** (includes QuickBasic, QuickWeb, QuickFile, QuickMail, and QuickCrew software modules) – everything in the Standard Bundle plus VPN, automated file transfers, differential synchronization, mail server, webmail client, anti-spam, transmission optimization, anti-virus filters, roaming crew e-mail, and web access accounts	n/a	$195
	First Vessel Set-up Fee[1]	$2,500	n/a
	Each Additional Vessel Set-up Fee	$200/vessel	n/a
Hubs			
Part Number	**Description**	**MSRP ($USD)**	**Monthly Fee ($USD)**
n/a	**KVH-hosted Hub**[2] Hosted on KVH maintained hardware in a KVH datacenter or other KVH maintained location	n/a	$35
72-0473	**CommBox Private Hub**[2] Dual Quad CPU, 6GB RAM, plus Dual Power Supply, RAID 1 with 2X Hot Swap 300GB HDDs	$8,795	$10

[1] Set-up includes Application Engineering time for design, documentation, and remote training of IT personnel at a maximum of 8 hours for the Standard Bundle, and 16 hours for the Enterprise Bundle. Additional work could include site surveys on vessels, training of personnel on ships, travel, and special configurations. Please contact KVH Sales for more information.

[2] A KVH or Private Hub is required for the CommBox Enterprise Bundle.

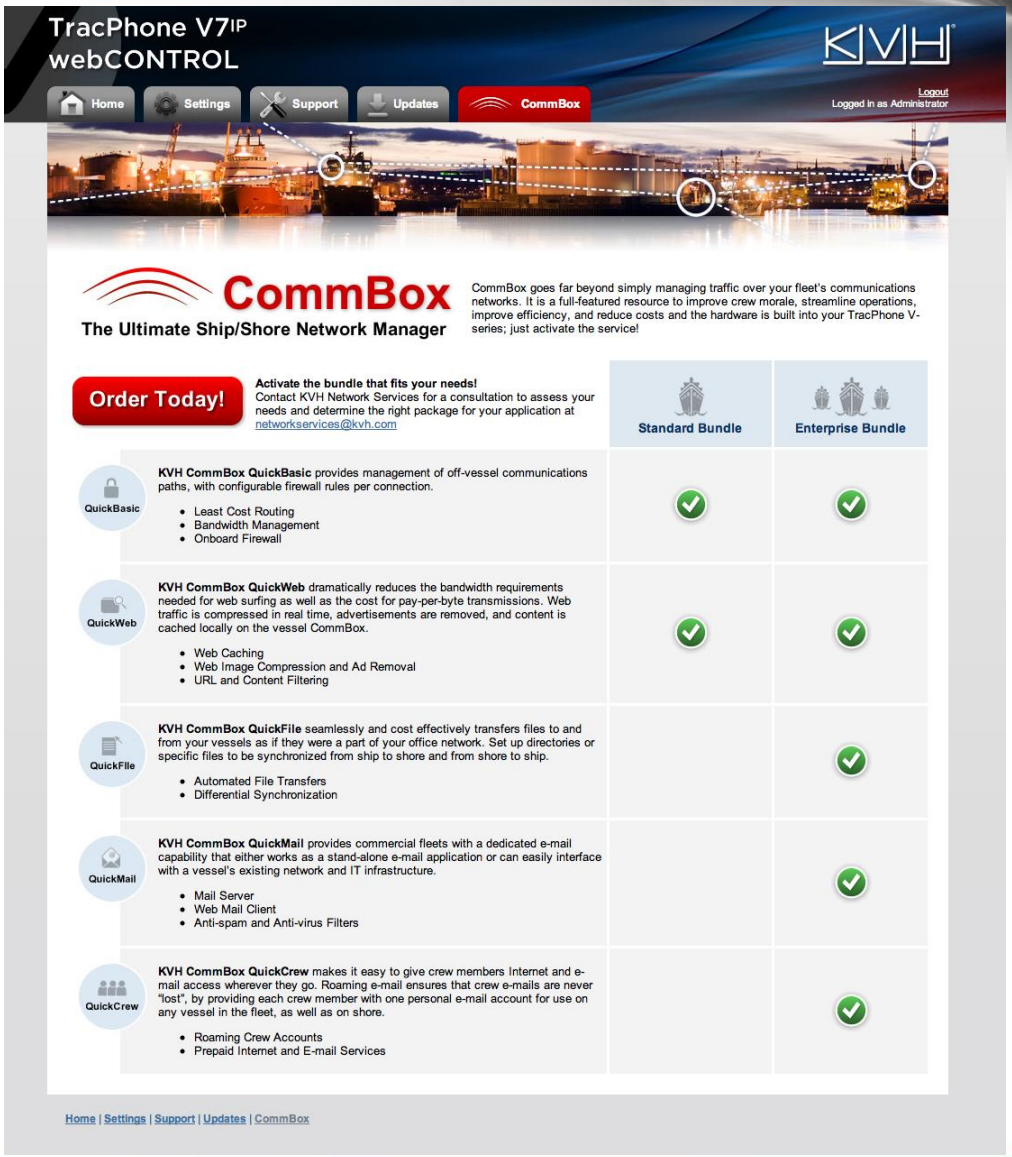
What's included with the fees?

- **One Time Fee provides the following to the customer:**
  - Consult with sales/applications engineer and quote generation
  - Resulting design and implementation of the configuration over the air
  - Integration with onboard terminals
  - Documentation for technical support and customer
- **Monthly fee provides the following to the customer:**
  - CommBox SW updates
  - Tier 1 technical support of the agreed upon configuration
    - Basic troubleshooting of terminal, CommBox-ACU status, reachability to LAN side hosts, etc.
  - Tier 2 technical support-business hours only
  - Blacklist/Whitelist and ad removal database updates
  - Use of shore side QuickWeb caches and compression engines
- **Monthly fee does not provide for:**
  - Configuration changes after initial setup
    - Verification/Test of design change, design/tech support documentation mods, implementation, etc…
- **Support beyond this handled by separate Professional Services contract**

CommBox Tab Behavior

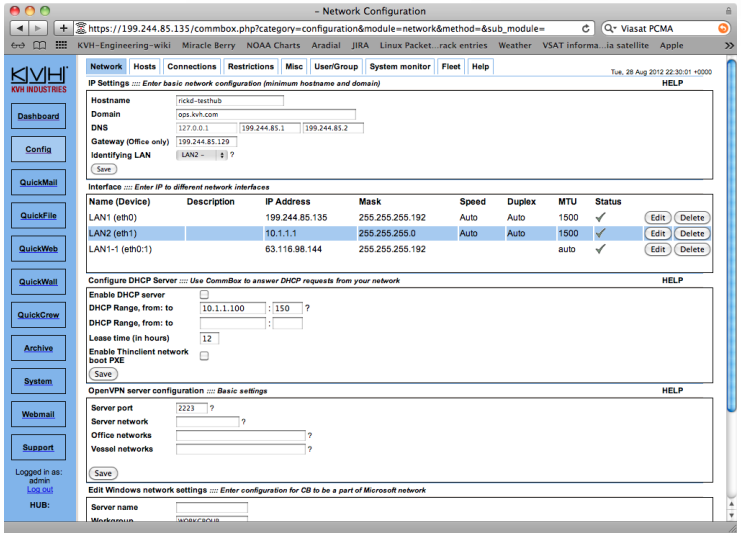
- By default, CommBox Services are disabled. Clicking CommBox tab will show Services Overview

- Once services are configured, below graphic is displayed allowing read-only access to Commbox GUI



SW/GUI Design Approach

- New GUI design to be used for terminal specific and basic IP operation
- CommBox specific functions to be configured via CommBox GUI



V7IP Specific GUI	V7IP Crossover GUI Items	CommBox GUI
Terminal Status/Config	LAN IP Addressing Config	LCR Config
MTA Status	Web Cache Enable/Disable	Connection Status
Terminal SW Updates	DHCP Configuration	VLAN Config
Modem Status		Mail Config
System Error Logging		QuickFile Config
		QuickCrew Config
		QuickWeb Config