Implementations of T2

A review of GatesAir customer implementations of DVB-T2 transmission systems

March 2, 2015

ABU Digital Broadcasting Symposium 2015

Featuring GatesAir's

Martyn Horspool

Product Manager,
TV Transmission

GATESAIR

DVB Digital Video Broadcasting

ABU

Connecting What's Next

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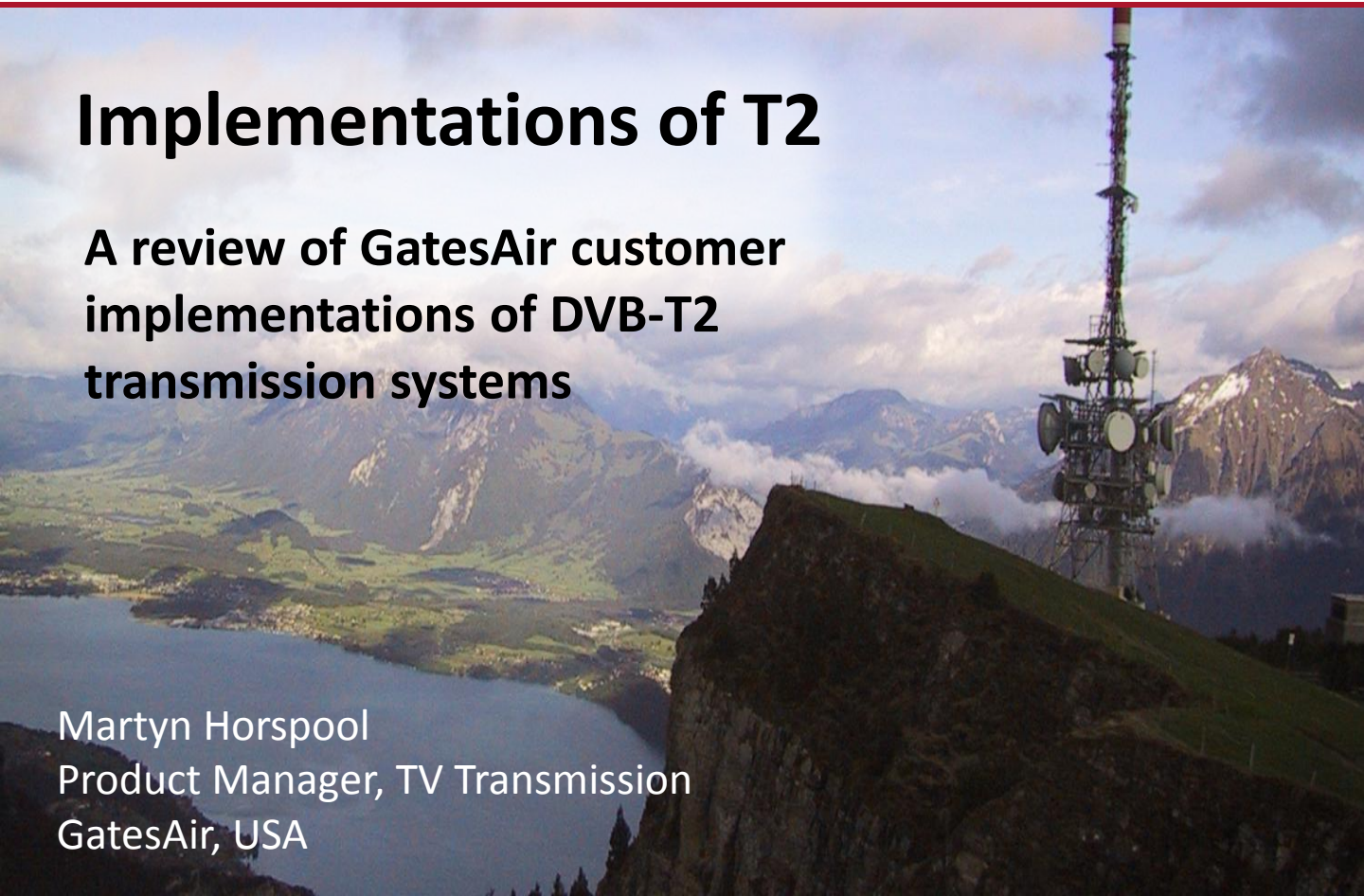
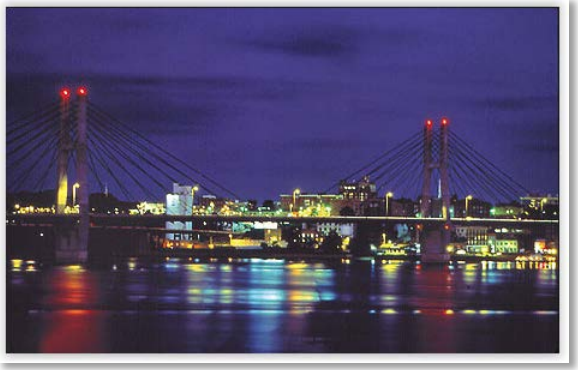


Martyn Horspool
Product Manager, TV Transmission
GatesAir, USA

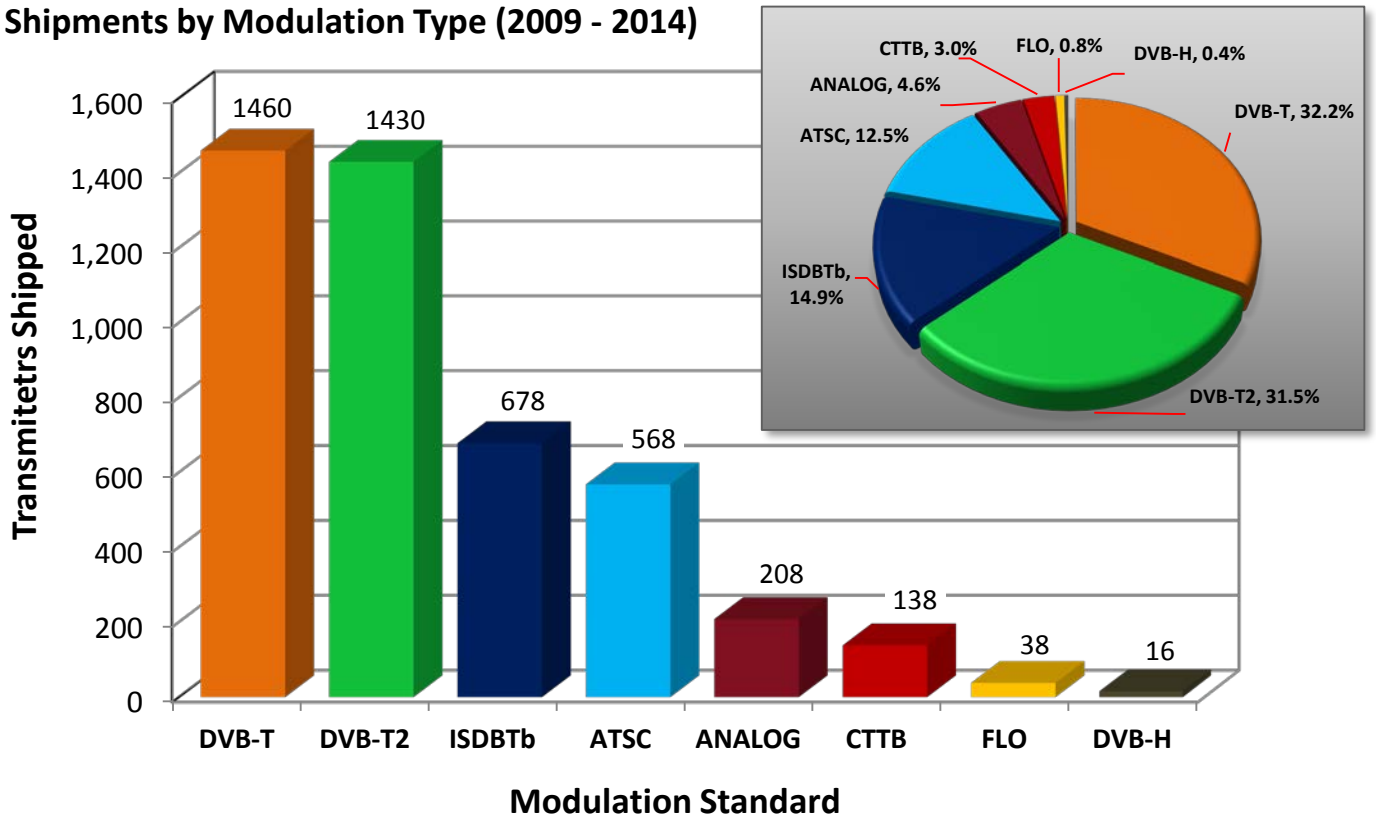
History of GatesAir

- **1922** - Henry C. and Cora B. Gates founded the Gates Radio & Supply Company in Quincy, Ill., to create a job for their son, Parker S. Gates, who was only 15 years old at the time.
- **1950** - Gates Radio had become a major Radio equipment supplier in USA
- **1957** – Harris Corporation acquires Gates Radio
- **2013** – Gores group acquires Harris Broadcast Division
- **2014** – Harris Broadcast splits into two companies – Imagine Communications and GatesAir

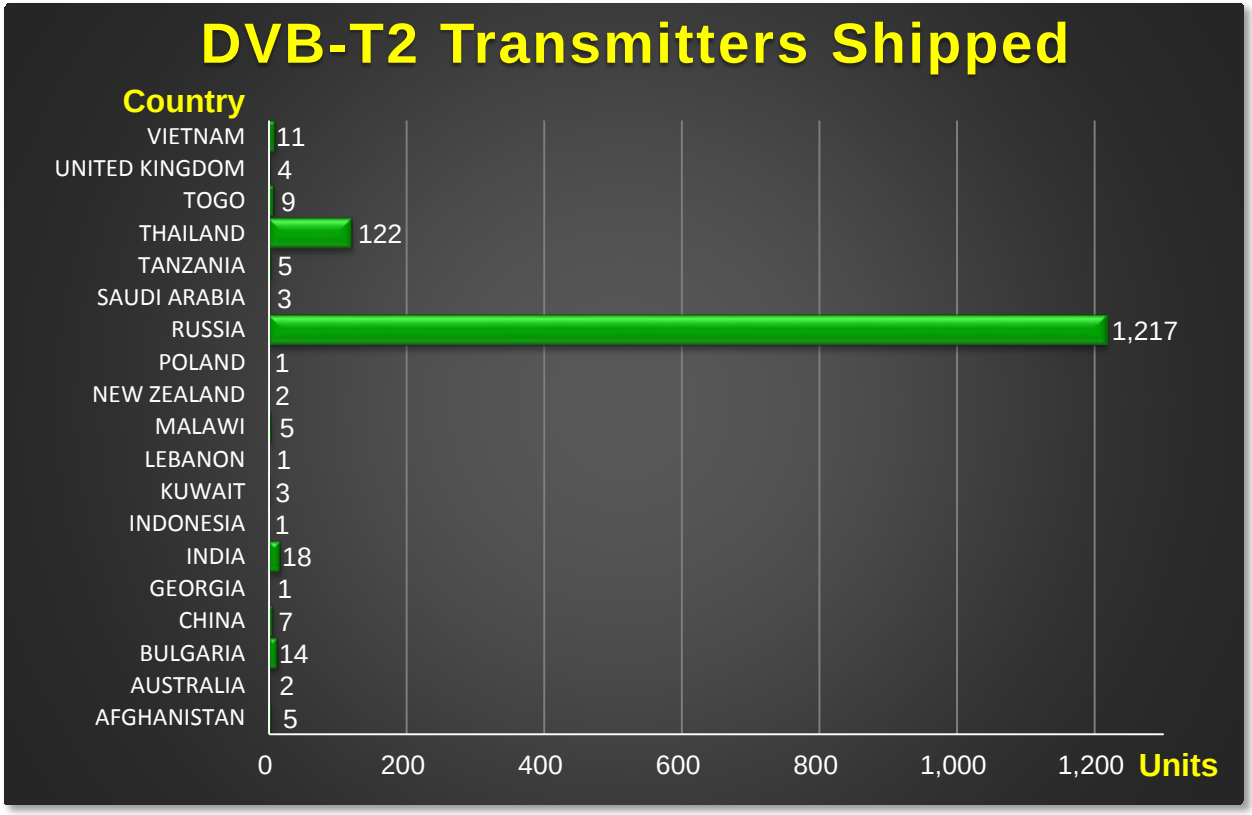


Quincy, Illinois, USA

DTV Modulations Delivered…



GA DVB-T2 Tx Shipments



Selected Countries For Discussion

DVB-T2 in Vietnam

Ha Long Bay, Vietnam

Vietnam - AVG

Truyền hình AnViên

GATESAIR

- AVG (Audio Visual Global / An Viên TV)
  - AVG was officially launched on 11 November 2011
  - Subscription DTT service
  - Direct to DVB-T2 (no analog)
  - 22 regions in operation across Vietnam
  - 3 MUX's per site, currently adding a 4th mux from this year onward to all the 22 sites
  - A total of 67 programs on 3 MUX:
    - SD is at about 1.5Mb/s per program
    - HD unknown (SD & HD decoded quality is "passable")
  - FFT 64QAM, other parameters unknown
    - Indoor reception was planned
  - Claim to have their own T2 encoder
  - Da Nang and Nha Trang have GA transmitters

AVG - DTT Program Packages

North Region 67 Channels

South Region 66 Channels

AVG - Additonal Information

- They provide a large number of programs via DTT in order to compete with cable operators
- AVG have about 500,000 subscribers (estimated)
- AVG has researched and set up a Network Operation Center (NOC) and Network Control Center (NCC)
- The NCC is reported to be the most advanced in South East Asia

Issues:

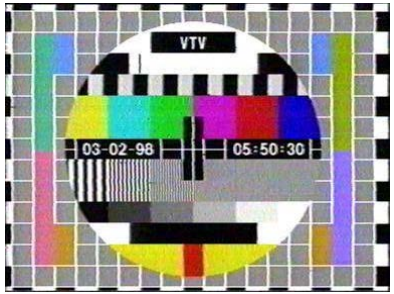
- They expanded very quickly and are facing some budget issues now

AVG's NOC

AVG's NCC

Vietnam Television-

- VTV (Vietnam Television)
  - State-owned free-to-air TV network, HQ in Hanoi
  - 5 DVB-T2 tx sites deployed so far
  - 7 Programs per MUX:
    - 4 SD programs
    - 3 HD programs
  - Total bit rate ~ 30mb/s
  - SD bit rate ~ 1.5Mbs, HD unknown
  - Settings - FFT: 64 QAM, Code rate 3/4, GI 1/16
  - Analog shut off is planned for 2020
    - All 25 GatesAir analog Tx's will be converted to T2 by 2020



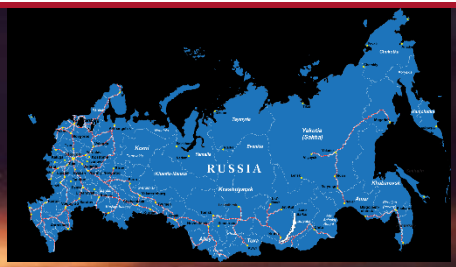
Additional Details on VTV

- Encoder/Head-End Suppliers:
  - Ericsson, Tandberg, Harmonic, Thomson
- Tower & Antenna Information
  - 120m HAAT
  - Antenna type: Polarization: horizontal, gain 10.8 dB at 600 MHz

VTV Terrestrial Channels

- **VTV1** - News and current affairs, broadcast 24/7 hours. VTV1 initially broadcast on September 6, 1970
- **VTV2** - Science, technology and education, broadcast 24/7 hours. VTV2 initially broadcast on January 1, 1989
- **VTV3** - Sports and entertainment, broadcast 24/7 hours. VTV3 was started on March 30, 1995
- **VTV6** - Youth channel, broadcast 24/24. VTV6 started from 8 locations on April 24, 2006. On September 9, 2011 VTV6 HD started as a high definition version of VTV6

DVB-T2 in Russia



Ostankino Tower

Russia – T2 Roll-Out

Russia completes transition to DVB-T2

January 23, 2015

DIGITAL TV EUROPE .net

Russia has completed the transition of its digital broadcasting infrastructure to DVB-T2 and closed down the last of its DVB-T transmitters in Moscow, the Moscow region, Kursk and the Kaliningrad region.

Since 2012, Russian state-owned radio and TV broadcasting organisation RTRS has overseen the transition to DVB-T2 in 16 regions where DVB-T services were launched before a decision was taken to migrate to the newer standard.

According to RTRS, the country's first multiplex is now available to 85.3% of the population via DVB-T2, while the second multiplex can be seen by 48.1%.

Close to 100% complete

Current Status of T2 in Russia

- MUX 1 - All regions are operating
- MUX 2 - Originally planned complete by end of 2015
  - Update: The commercial start of MUX 2 (except for 118 cities and nearby SFN cells) postponed until 2018-2019 - due to budget constraints of the broadcasters who won the rights to be distributed on MUX2
- Analog Switch Off
  - Planned for July 1st 2018. Actual date will be when > 95% people will receive DVB-T2 OTA
  - For most regions likely to be 2019 – for those near the borders – could be as early as 2015

RTRS MUX-1 Details

- MUX-1 Details
  - SFN, multi-PLP (3 PLPs)
  - All PLPs are the same: 64-QAM (rotated), ¾ CR, 8MHz, Total bit rate 33.817724 Mbps
  - 10 TV and 3 Radio programs
  - PLP0 – 8 TV and 2 radio, local ad-splicing only
  - PLP1 – 1 TV and 1 radio, local ad splicing and live broadcast splicing
  - PLP2 – 1 TV, local ad splicing and live broadcast splicing
  - All programs are SD, Video Bitrate is about 2.6-3 Mbit/s

RTRS MUX-2 Details

- MUX-2 Details
  - SFN, Single-PLP, 64-QAM (rotated), ¾ CR, 8MHz, Total bit rate 33.817724 Mbps
  - 10 TV Programs
  - All programs are SD
  - Data rate per program about 2.6-3 Mbit/s
- MUX-3
  - Under discussion

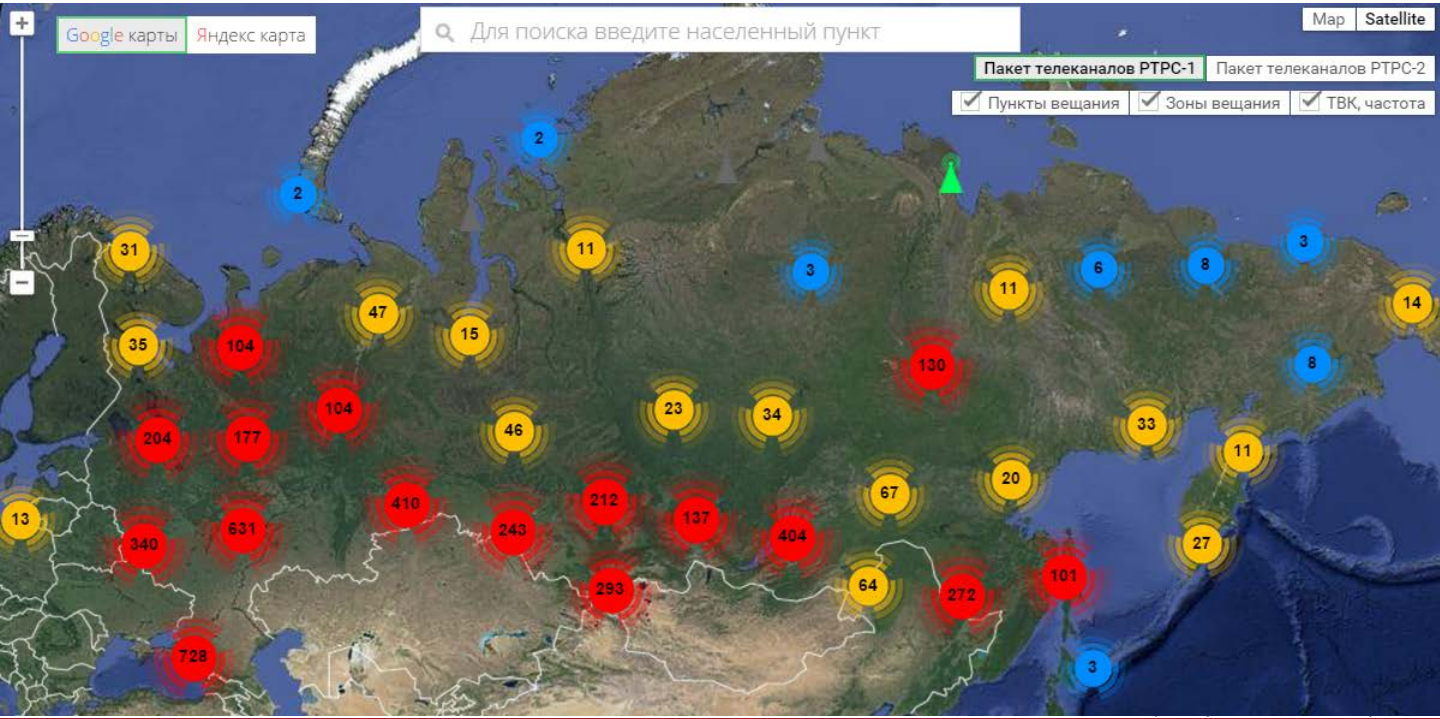
4,956 TV Transmitter Sites…

Transmitter Site Locations

- MUX 1 Sites Shown
- MUX 2 has similar coverage

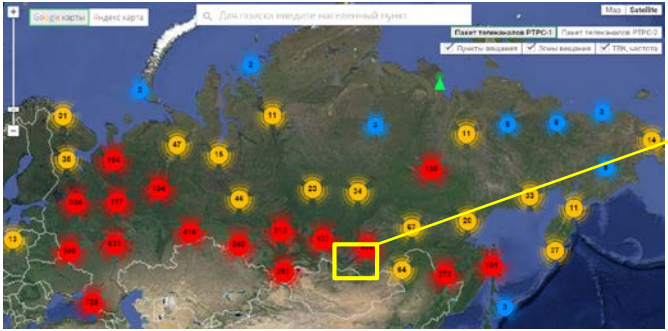
Source: http://xn--p1aadc.xn--p1ai/when/

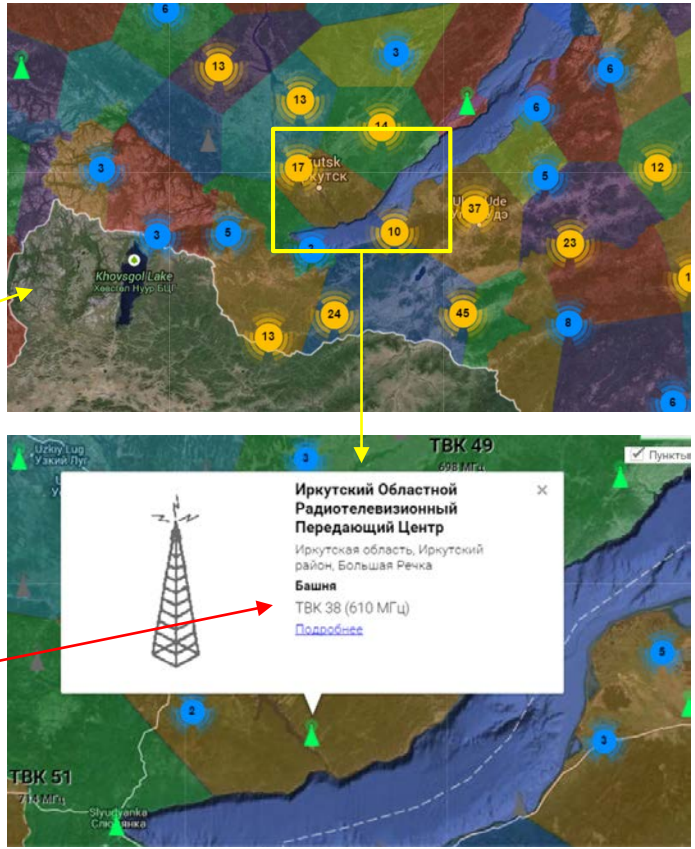
Red dot – more than 100 sites
Yellow dot – between 10 and 100
Blue dot – below 10 sites



Interactive Site Map

- Zoomed in detail of each site

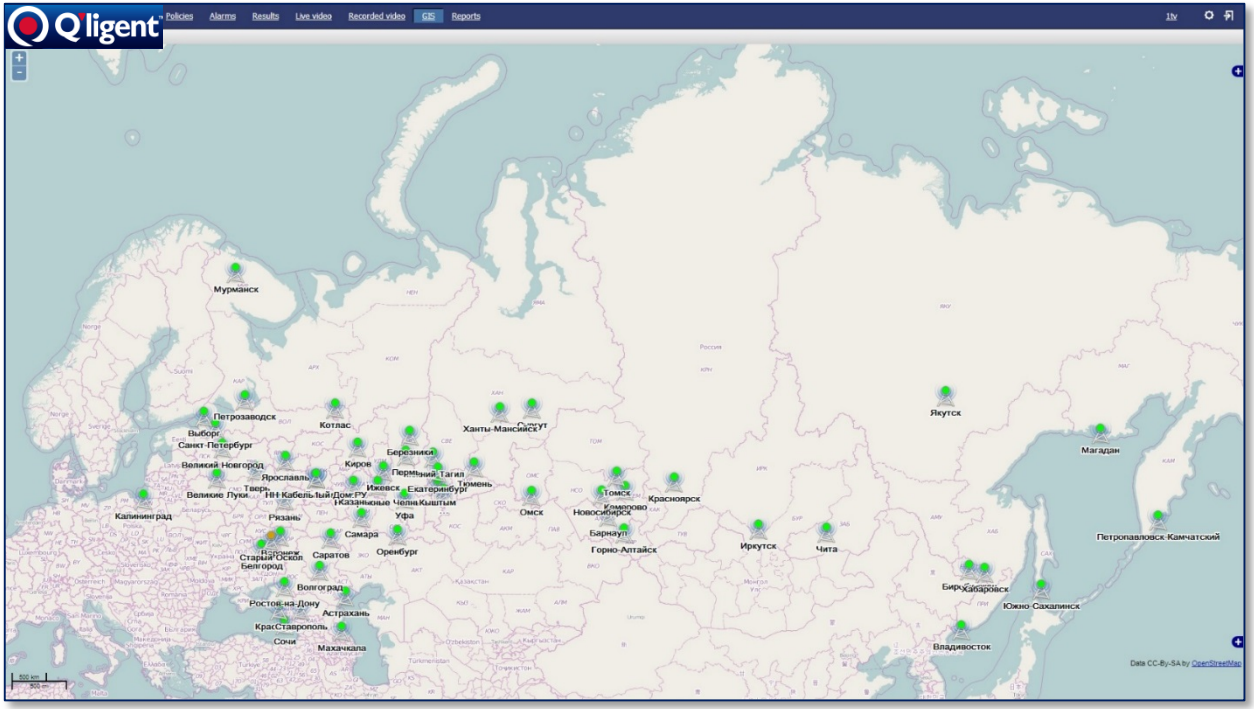




Channel Number and Frequency (MHz)

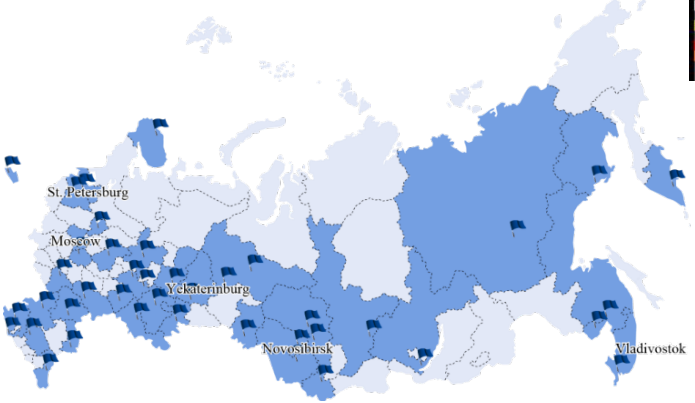
Web-based Control & Monitoring

- Control & Monitoring System used for Nationwide System



Control/Monitoring

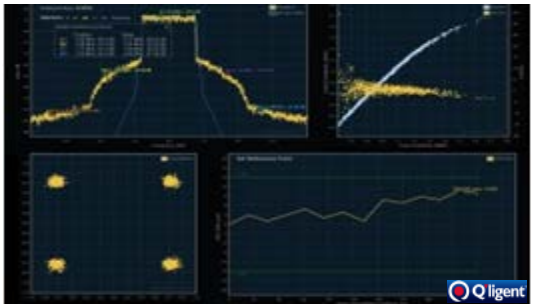
- Two customers of RTRS use the Q'Ligent web based control, monitoring, QoS and content-monitoring system
- Customers are Channel One and VGTRK networks
- Deployed in 60+ regions across Russia
- Covering >80% of Russian territory



- Monitors media service delivery from RF signal and transport stream QoS to video, audio, and metadata QoE verification…
- Monitors channels across the entire country

Some Monitoring Capabilities

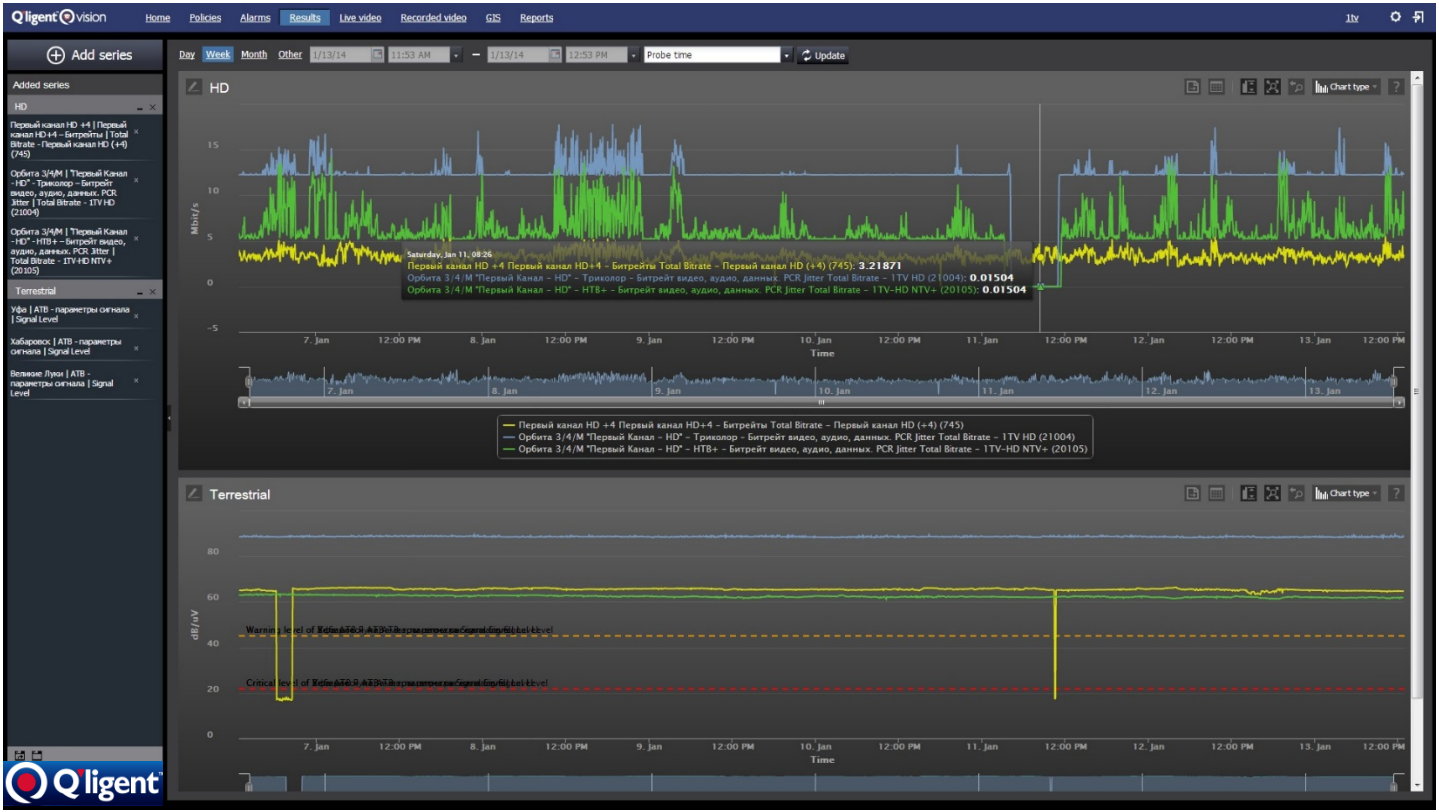
Live Video Monitoring wall of any points monitored with or without decoded Audio Bars and Captions



RF Analysis, spectrum, constellation, group delay, etc. are available for live analysis of remote transmission equipment.

Live Remote Values of any measured system components to verify current system status and readings directly from the probe

Real Time Tracking

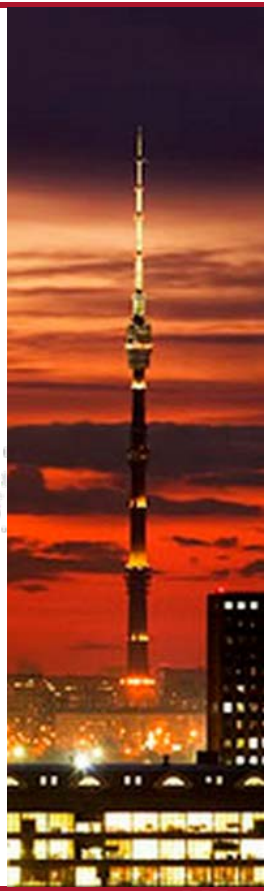


Transmission Equipment

- Transmitters supplied by:
  - GatesAir, Thomson, R&S and local manufacturers (Triada and MART)
- Satellite receivers
  - Harmonic Proview
- Local Head ends are not yet finalized
  - A mix of Harmonic and Thomson
- Local ad-insertion/splicing
  - Qualittech?
- Monitoring, QoS
  - Q'Ligent

Additional Information

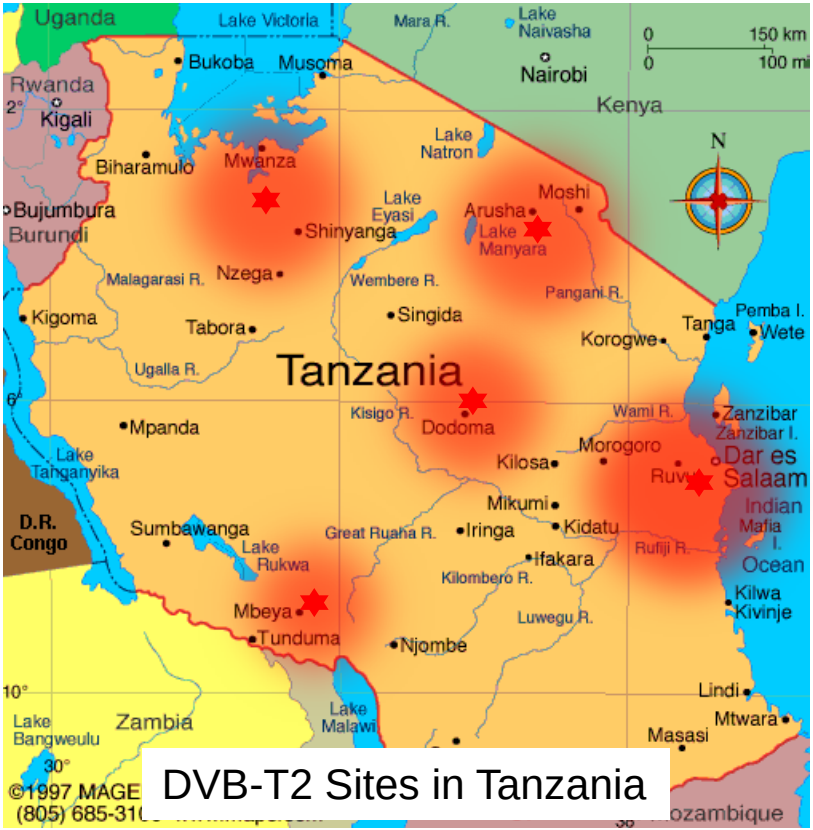
- Number of viewers (January 2015):
  - MUX1 121.8 million people (85.3% of population)
  - MUX2 68.6 million people (48.1% of population)
- SFN reference
  - Currently both GPS and GLONASS used by RTRS
  - Switching to 100% GLONASS reference
- Problems reported (feedback):
  - Signal quality, picture artifacts, problems with TS
  - SFN synchronization issues
  - Bad SAT reception conditions
  - Splicing within SFN networks for local advertising



DVB-T2 in Tanzania

Brief Status for Tanzania

- Only 15% of the country received analog TV
- Analog switched off in Dar es Salaam Dec 31, 2012
- Free-to-air (FTA) currently
- Plan to launch pay TV before the end of the second quarter 2015
- When the pay TV platform is ready, a mix of Free-to-View (FTV) and pay TV channels will be offered



DVB-T2 Sites in Tanzania

Tanzania Site Details

- Operated by Sahara Media Group - So far, 5 Sites for T2 in service
  - Site data:

Site	Target Service Area	Facilities Details			Transmission Site Geographical Details		
		Transmitter Power	Antenna Configuration Gain & Beam Tilt	Tower Height	Latitude	Longitude	Altitude
1	Mwanza	2kW	JUHD 4x4 - 12.0 dBd Tilt 0°	76m	032° 54' 54.02" East	02° 30' 39.50" South	1291m
2	Dar es Salaam	3.4kW	JUHD 8x4 - 15.0 dBd Tilt 0°	81m	039° 04' 46.89" East	06° 54' 14.12" South	308m
3	Arusha	2kW	JUHD 4x4 - 12.0 dBd Tilt 0°	70m	036° 43' 58.78" East	03° 20' 50.75" South	1956m
4	Dodoma	1kW	JUHD 4x4 - 12.0 dBd Tilt 0°	72m	035° 44' 48.70" East	06° 12' 38.62" South	1345m
5	Mbeya	1kW	JUHD 4x4 - 12.0 dBd Tilt 0°	72m	033° 25' 13.50" East	08° 51' 17.62" South	2651m

Summary – Final Points

- 1/3 of GatesAir recently shipped units have been with DVB-T2 modulation
- Many earlier units shipped as T1 or analogue have now been converted over to T2 (Example: MOC, Saudi Arabia)
- For GA, not much happening with T2 Lite (yet):
  - But - Doordarshan (India) have been testing and plan to operate T2 Base + Lite broadcasts
- We have been spending (a **lot** of) time with customers conducting training & workshops on T2. For example:
  - India, Vietnam, Russia, Tunisia, Saudi Arabia, Oman, several African nations
- Most customers/countries are successfully deploying T2 with few issues or problems

Thank You!

Martyn Horspool
Product Manager, TV Transmission
GatesAir www.gatesair.com