



A case study of

Deploying a world leading centralized VAR (Video Assistant Referee) system in Turkey

THE COMPANY

Türk Telekom, with 177 years of history and formerly state-owned, is the premier integrated telecommunications operator in Turkey. The Türk Telekom Group of companies provide services in all 81 Turkish cities and in the CEE region, Turkey, Caucasus, Middle-East and Asia with the vision of introducing new technologies and accelerating the country's transformation into a globally leading information society.



The Brief

A key part of Türk Telekom's strategy is the rollout of Media Transport Network (MTN), a national media contribution network based on Net Insight solutions.

The first major client of this robust, low latency and highly cost-efficient video transport service is the Turkish Football Federation. Net Insight's Nimbra connects 19 football stadiums to a main central location for a unique, innovative and world leading centralized Video Assistant Referee (VAR) system. The solution also helped Türk Telekom to diversify its business.

The Issue - TFF

Türk Telekom's client, the Turkish Football Federation (TFF), planned to introduce a video assistant referee (VAR) system targeting the 2018-19 season. The VAR technology was to be used in Turkey's top flight Super Lig as well as in the promotion playoffs of the country's second tier league. VAR is already used in Germany, Italy, England and Portugal, and was also successfully employed at the 2018 FIFA World Cup games.

VAR is intended to reduce incorrect referee decisions during games and is used in four match-changing situations; penalties, goals, direct red cards and mistaken identity. For TFF, VAR was also deemed an important innovation to help its candidacy to host the UEFA Euro 2024 tournament.

Aside from looking to be among the first federations to introduce a VAR technology, the TFF had specific reasons for wanting such a system.

Instead of locating the VAR within a small room at each venue – a scenario which typically lacks air conditioning and suffers from high ambient noise – the TFF sought a centralized solution. A hub, ideally located at the federation's headquarters 30km from Istanbul, would house the VAR officials on matchday in greater comfort and away from the intense pressure of fans at a stadium allowing them to better concentrate on the job at hand.

The country's sheer size makes travel between venues a costly and time-consuming affair. A centralized VAR would save the federation the cost of covering the travel and accommodation expense of multiple officials at games throughout the season.

However, existing VAR systems in other countries were conducted out of dedicated VAR facilities housed at the stadia and controlled in custom-built outside broadcast vehicles which travelled to each stadium. Another solution was needed.

The Issue - MTN

Around 2008 Türk Telekom began to reappraise its technology approach to market. It identified broadcast contribution as a market which could be opened up for business if the telco could find a way of convincing broadcasters to switch from the dominant satellite links infrastructure.

"The broadcaster market is historically a niche and closed one to telcos," explains Umut Keten, Senior Architect at Türk Telekom. "We realized that the transition from baseband to IP was bringing both parties – broadcasters and telcos – closer together and offering an opportunity to innovate on both sides. However, existing IP solutions – notably MPLS – were unfit to transport contribution media."

That's because contribution media is highly sensitive to any packet loss, delay and jitter and requires very high bitrates. Uncompressed baseband video HD-SDI requires 1.5 Gbps bitrate carried over IP platforms.

MPLS is not service oriented. There will be packet loss or jitter and this is destructive for broadcast. Not only was the current technology unfit, it means broadcasters are using satellite transmission which is highly inefficient and expensive for them. The enterprise-based VPN bitrate prices are explicitly unfair as the broadcaster, particularly those carrying live sport, only requires a data link at those bitrates usually not more than twice a month from a stadium.



In 2013, an internal team led by Umut Keten proposed the idea and vision for a new Media Transport Network (MTN) to the Türk Telekom board. Two years later the new design of MTN was finished and over the course of 2016-17 a number of proof of concept (PoCs) successfully performed. The solution was ready. All that was needed was a customer and ideally a high profile one with which Türk Telekom could showcase the capabilities of its new video contribution service.

It was quick to act on the news that the TFF was looking to introduce VAR and proposed the MTN solution in 2017.

“TFF told us that they liked the concept provided we could guarantee four nines (99.99%) Service Level Agreements,” says Mr. Keten. “We knew we had the solution.”

The telco conducted two further PoCs demonstrating to TFF the transport of 22 video feeds from one location and the capacity to handle the same volume of traffic from nine locations concurrently – and all within a 50mls round trip.

Türk Telekom signed a deal with the federation in May 2018.

The Solution

Net Insight’s Nimbra platform is at the heart of the Media Transport Network. Without it, Türk Telekom’s innovation would not be possible.

“The decision to partner with Net Insight was really easy for me,” explains Mr. Keten. “With MPLS, if you want to have a hitless connection, you need to engineer two different routes for the traffic so that if there’s an outage in any part we can guarantee the video feeds. This guarantee is essential to broadcast and a pre-requisite of the Turkish Football Federation’s decision to work with us on this project.”

Creating a hitless connection conventionally over MPLS is possible but at the cost of heavy operational expense. In fact, the OPEX would be so extensive that it would render applications like VAR and shared resources for broadcasters redundant. To overcome that, TT needed a new platform where the routing mechanism is handled by the media network overlaying the MPLS.

Türk Telekom’s media network over MPLS is unique in the world. Its algorithms, patented by Türk Telekom in 2016 for transporting baseband over IP effectively decide which way to route the traffic over the underlying MPLS to guarantee the paths are totally different. Türk Telekom claim this technology delivers 100% of bandwidth, and guarantees zero packet loss. It further states that the delay/jitter rate drops to 0.1% of the network’s original by the minimum-time sampling algorithm.

“We needed an overlay platform and the Nimbra platform is the only device that can do this,” says Mr. Keten.

The telco sited cabinets containing BNC patch panels and a Net Insight Nimbra adjacent to each of the country’s 19 venues. From there, broadcasters can simply plug-in all the camera feeds from the stadium, immediately beginning the transport of feeds over MTN to the MCR.

Regular match-day production in Super Lig involves 24 cameras (increased to 50 or 60 for major fixtures like Champions League) from which the rights holder, payTV operator Digiturk, creates the mixed broadcast. Each of these feeds is taken directly from the camera and routed independently over the network back to the VAR operations hub.

The vital telecoms with which the match referee communicates with the VAR officials is embedded along with the video streams.

The telco further located another module inside each stadium

from which the match referee can monitor all the video feeds of the VAR.

Designed for high-quality media transport over IP, the Nimbra solution supports any format from SD-SDI to 4K/8K Ultra HD, and with optional integrated JPEG2000 compression. It allows Türk Telekom to transport live and file-based content across the same network. With native support for compressed and uncompressed video services, native audio and Carrier Ethernet data services all on the same platform the possibilities are boundless.

The Nimbra’s MSR capabilities for Quality of Service-enabled bidirectional video and Ethernet transport makes the perfect solution for remote production and live event contribution. By providing QoS at full network utilization and a service-centric management that effectively hides the complexities of IP/MPLS provisioning, the Nimbra enables significant OPEX and CAPEX savings for Türk Telekom. Türk Telekom saves further OPEX by not needing to employ an extensive team for management of the operation. Instead the telco can supervise and operate the network from the central hub with fewer personnel and comprehensive system analytics and diagnostics.

If there’s one application where speed is of the essence it Video Assistant Refereeing. Decisions need to be made in minimal time to avoid delaying the action for audiences watching live at home and fans in the stadium. The Net Insight solution transports video and intercom with a round-trip latency of just 50 ms, or 1 frame.

The Results

The first tests for VAR took place in February 2018 with full design and the build out of the network completed in time for the Super Lig’s kick off in July with “zero packet loss” confirms Mr. Keten. “It’s been a big success for the Federation and for us.”

So much so that the IFAB and UEFA Referee Committee has sent representatives to view the VAR system in action.

An immediate benefit to the Turkish Football Federation is cost saving since the federation is just paying for the time the service is in use.

“There’s no need to send an SNG truck,” says Mr. Keten. “No need to pay for expensive satellite transponders. It is pay as you go. It is also helping for a greener environment as less SNG trucks needs to be dispatched.”

That model can be extended for any broadcaster use. “Since MTN can apply the bitrate dynamically, charging per minute, per hour and per day becomes possible. This is far more attractive to broadcasters than paying for fiber they simply never use.”

The plan is that within the year all major venues for live broadcast events from sports, news to politics in Turkey will be equipped with a Nimbra and connected to the MTN network.

“What we’re doing as a telco is unique,” says Mr. Keten. “No one else is doing this and it’s only possible with Nimbra since the technology gives us the confidence to go to market and gives broadcasters the trust in us as a telco to deliver the highest quality, highest reliability at a fraction of the cost.”

“At a time when broadcasters are under pressure from OTT to innovate faster, the opportunity is to make far greater use of the content they already acquire. In sports for instance typically just the main mix feed is seen by viewers when there are fantastic opportunities to enrich production and maximize revenue by making more of the feeds – such as ISOs, player cams and beauty cams – available live from the venue. With MTN and Net Insight broadcasters can now do this easily, robustly and at an affordable price.”

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