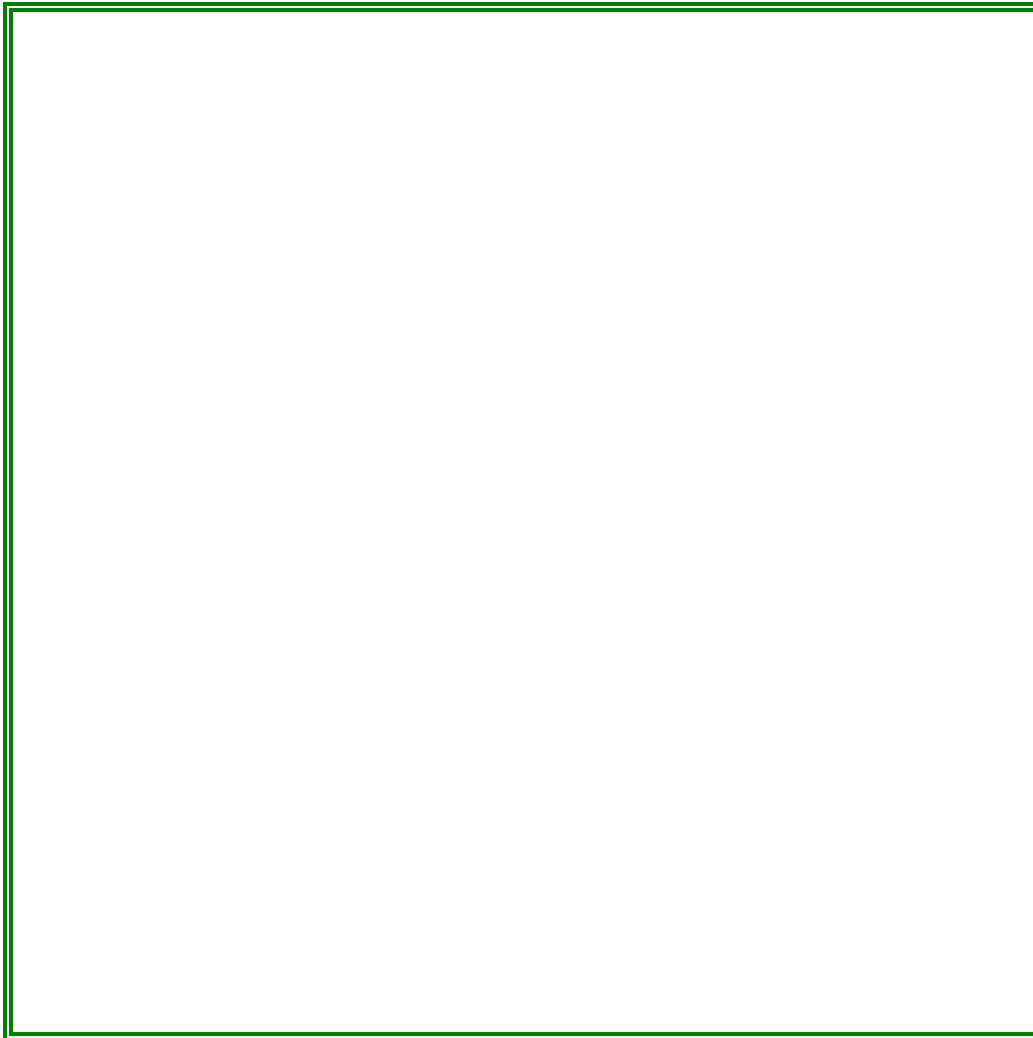


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Sigma



Soro's take wins!

The Breakup

Completing the Digital Food Chain

The table stakes for television broadcasters have always been complying with the rules and regula

Technology early on was such that broadcaste

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restrictions were so that the television receivers, which were much less sophisticated than they are today, could recover those signals. Since broadcasters were provided with a public monopoly, it was deemed that they would be highly regulated.

It was always a given that most broadcasters would never willingly move to new technology unless forced to. Those forces could come from other broadcasters. But usually, those forces were forced upon them from outside the broadcast community. Back when there was a dominant player in the television industry, RCA could force it's broadcasting arm, NBC, to produce shows in color using RCA supplied gear to promote the sales of color television receivers. In the realm of HDTV, we recently saw how Sony started the push to HD. Like RCA could, 60 years ago, in the 80s Sony had enough vertical infrastructure, both a television receiver business, and a broadcast equipment business, to plant the seeds for a grass roots demand for better television resolution.

The late Julius Barnathan, when he was Vice President of Operations & Engineering at ABC claimed that Japan bought forth HDTV because the NTSC TV receiver industry was saturated. They wanted a new market.

The HD purists initially claimed that HDTV should have 30 MHz of bandwidth. Sony soon came to realize that if they were going to make a business out of HD, they were going to have to find another way. In addition, they realized that while analog could provide an avenue to wet the public's appetite, only digital would make the new format viable. Besides Sony, both Panasonic, and Philips had broadcast and consumer television gear for sale. But none had the broadcast distribution channel, namely a television network to promote DTV. But Sony had acquired Sony Pictures (formally Columbia Pictures) in the early 90s, and so it was a content producer with no distribution channel like Disney or Fox. Conversely, Disney nor Fox had broadcast or consumer manufacturing operations. So, no entire food chain to promote DTV.

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Broadcasters themselves had no interest in that new formats had never increased their revenue, at least not initially. Color had not done it, and early standard definition digital wasn't either. Broadcasters would have to re-tool their entire facility for a new digital format. Many facilities in the 90s were starting to go "digital," not islands but complete end to end. But these were standard definition digital systems. While they improved the picture quality, they were not HD. Digital video by itself brought improvements in reliability, flexibility, and was easier to implement piecemeal if need be. Plus, digital video gear had no impactful price difference. From the technical side, digital video was simpler to understand and cope with than analog video.

Not the same with digital audio. Everything about it was more complicated and expensive. Early in the digital television evolution, often the video plant would be digital, but the audio side stayed mostly analog. It wasn't until four and six channel sound became popular that digital audio could begin to pull it's weight. Multiple channels of audio could be embedded into the video bitstream. That meant for much of the audio food chain, you did not need six sets of audio wiring for six-channel audio. This also helped ensure that the video and audio stayed in sync, minimizing lip-sync issues.

So, while on the content creation end the digital revolution was now under full swing, the main bottleneck remained getting an HD signal to the home. Either via over the air transmission, or through a cable system. Cables systems, and viewers, at this stage were into more channels and not ones with better pictures. Bandwidth is a precious resource, and if a cable system was willing to invest in systems that had wider bandwidth, they didn't want to fill that spectrum up with "fatter" HD analog signals.

A number of broadcasters and companies proposed systems, but at the time there was much more synergy between Japanese broadcasters and vendors, namely Sony and Panasonic. The United States electronics industry, which was still in the shadow of Japan, that "Janan. Inc." was afraid they were going to eliminate another

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technology sector. The U.S. folks decided they better do something themselves.

ACATS

In 1980 the Society of Motion Picture and Television Engineers (SMPTE) started taking an interest in HD. Birney Dayton was one of the technical chairs. He co-chaired the working group on HD electronic products from 1980 to 1984 which met in Hollywood. He was the technical chair while Dick Stump from Universal Pictures was the administrative chair. Their result was the SMPTE 240 analog HD standard.

By the mid-80s the FCC decided they needed to get involved, so they formed the Advisory Committee on Advanced Television Service, or ACATS in 1987 to recommend an Advanced TV standard for the U.S.

In 1987 Dayton was tapped to be the chair of ACATS Working Party One (WP1) analysis group. Their job was to filter the 23 HD proponents that were out there at the time, including the ones mentioned above. Larry Thorpe, originally with RCA, now with Sony, was running the economics analysis of this group. Mark Richards of PBS was running the test group. Dayton ended up in a group that was trying to shoot down COFDM. We will look at the COFDM/8-VSB arguments in a bit.

Dayton represented GVG. Although the company was doing nothing at the time towards HD, as we have seen, he thinks that probably the company wanted to create the appearance that the company was doing something. He was running Grass Valley's WaveLink group at the time and his nomination to run WP1 came from Irwin Dorus (Executive VP of Bell Communications Research), so Birney's ATSC role came from the telecom side, not from the broadcast side and likely another reason why GVG's management did not get in the way.

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By 1991, ACATS had reduced the number of proposals down to six, which included four all-digital HDTV specifications. ACATS worked closely with the ATSC (Advanced TV Systems Committee), a private organization that was originally founded in 1982. ATSC developed and documented the "Advanced TV" or ATV specifications and were also responsible for including SD formats in the standard for compatibility with computers.

In 1992 Congress voted on and the FCC enacted rules that each existing broadcast station would be paired with a second 6 MHz channel during a transition period, one to continue analog transmission, and a second for digital. By 1993, the digital system proponents (AT&T, Philips, General Instrument, Thomson, MIT, and Sarnoff Research (what was left of RCA)) banded together as the "Grand Alliance" to create a single (ATV) standard.

By this time ACATS had decided that no analog systems would be considered any longer. This was twofold, one technical the other political. Politically, with analog, the Japanese were way ahead of the U.S. Secondly, technically it was believed by many that the only way to make the adopted new standard flexible and robust was with a digital approach. The committee encouraged a merger of best elements of the remaining systems under consideration.

In 1995 the ATSC approved the ACATS ATV Standard, and a year later the FCC did the same.

It should be mentioned that a few broadcasters became proactive early on and collectively setup facilities that acted as "model stations" to test the various technologies. One was called the Model Station, and it was set up in the basement of WRC, an NBC owned station in Washington, D.C. This was the site of the earliest color videotape recording still in existence. Introduced by RCA President Robert W. Sarnoff, it is a recording of the dedication of WRC-TV's Washington studios on May 22, 1958. President Dwight D. Eisenhower spoke at the event; it was the first time a president had been videotaped in color.

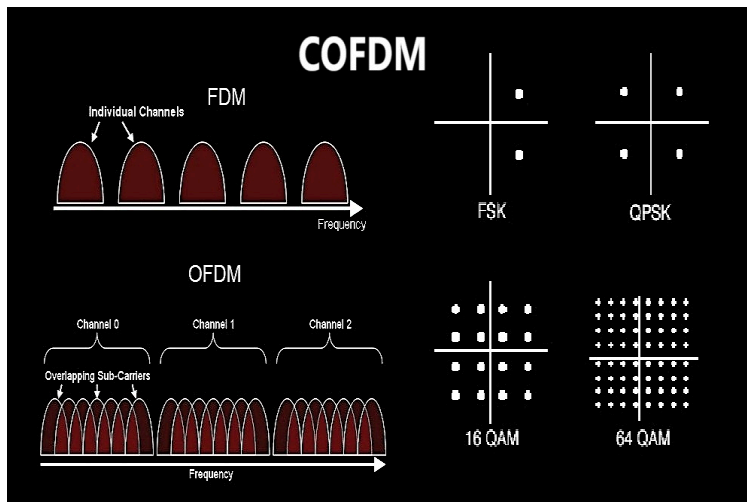
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Two other distinct test facilities existed. The Advanced Television Test Center from 1988 to 1996, and the Advanced Television Technology Center from 1996 to 2003. Both facilities were in Alexandria, Va., in the same building that housed PBS's headquarters. These projects tested the various proposed systems. These were also sponsored by NAB, ABC, CBS, PBS, the Association of Maximum Service Telecasters, and the Association of Independent Television Stations.

VSB versus COFDM

There were two methods proposed for modulating digital media, and other data onto an RF carrier. The first scheme is known as COFDM (Coded Orthogonal Frequency Division Multiplexing). This is a form of Spread Spectrum transmission.

The other contender, 8 bit Vestigial Sideband Modulation, or 8VSB, and it was only possible because of the processing power that became available in the 90s.

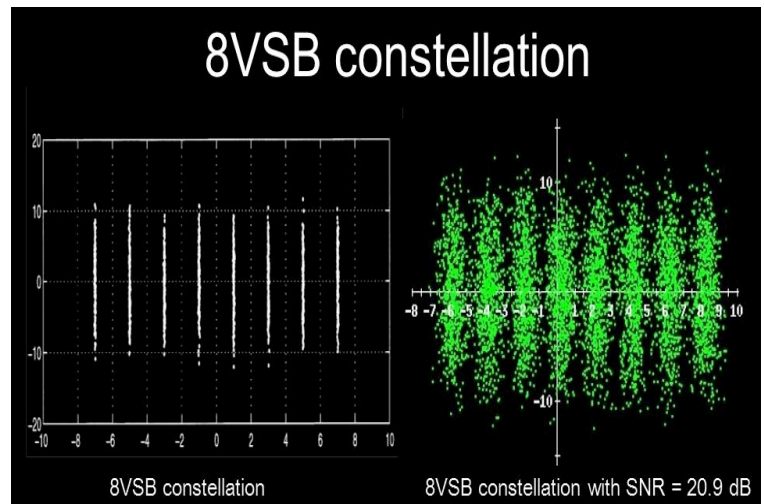


The argument between the two approaches hinged on each having what has been called slim advantages. COFDM is said to have a "urban advantage" as it does better with multi-path, that is signals that are bouncing around urban centers.

8VSB is said to have a "fringe advantage." 8VSB signal transmits more average signal strength and thus coverage out in the hinterlands which would be better for viewers a ways out. Studies indicated that the number of viewers impacted by one method was

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Today the technology has improved so much that regular QAM, the technique used by most modems, is better at throughput today than 8VSB. Smaller semiconductors in use now have less noise. This means denser modulation constellations like 64QAM, and even 256QAM are often better options now. Also, the telecoms like QAM because as it has been how they tend to move signals.



During the ATSC discussions Dell Parks, of Sinclair, and others wanted COFDM. Birney Dayton wanted 8VSB. Later when Dayton was at NVISION, he said they never sold anything to Sinclair as an independent company. Most likely because Birney opposed Parks on ATSC. An interesting note is that a new version of ATSC is being finalized and

Sinclair, which still was pushing for COFDM in the new system, appears to have won this round.

The other early difference of opinions about SD or HD was ATSC's advantage. In 1997 the ATSC standard settled on MPEG-2 for video compression. Both modulation schemes allowed about 20Mbps data rates. With the compression technology of the time, that meant there was enough bit rate to handle a single HD program, or 4 to 6 multiple SD programs depending on the bit rate allotted to the various programs. While Congress pushed for HD, initially over 60% of people thought the key selling point of DTV was more free channels. The rest were divided between HD and the idea of DTV's ability to provide Internet content.

Most viewers claimed they did not care about online, supplemental

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web viewed it then, as today, as a distinctly different activity than viewing television. You usually sit upright, when browsing the web. It is usually an activity done alone. These are attributes most people don't subscribe to while watching television.

Broadcasters were forced to do DTV. To many this meant only a DTV transmitter initially. That made television transmitter companies happy. That left broadcast equipment vendors like Sony, Phillips, Tektronix, not so much. While the average broadcaster was not against DTV, they just did not want to get critically injured by it. Many were hoping for DTV's demise. Cable companies, along with the PC industry were in that camp.

Cable would win if DTV failed, as they were trying to implement some sort of advanced television themselves. The PC industry derived no benefit from DTV, as they were in the early stages of trying to usurp broadcasting.

Going HD

HD eventually opened a lot of new territory. One of the biggest was the replacement of film in the film industry. As late as 2012, seven of the nine Best Picture nominees were shot on Kodak film. However, the move away from film had forced the company to abandon its sponsorship of 3300-seat Kodak Theater that year. Kodak could no longer afford the marketing boost that the Oscars gave it. Digital editing and the fact that almost all commercial screens are using digital projectors have decimated the company's film printing business. At its height, film processing was a 12 billion feet-per-year business, and now it's under a billion. It used to take about 1 million feet to shoot a feature film and 100 million feet to print enough for distribution. Today that business is close to nil.

While HD video today has eliminated film for the most part, movie producers still are going after the total film look. For a couple decades as cinematography moved to

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expectations for common types of equipment, especially cameras. Film has a subjective quality different from traditionally recorded video.

Things that make video look like film are the dark areas of a scene. The blacks are much more suppressed in video than in film. Pushing camera gammas (camera transfer function) up to the 60 to 70% range helps. Professional television cameras for the past +50 years have had circuitry that enhances the edges of objects in the scene. This makes the picture look crisper. This circuitry is called enhancement or detail. Minimizing camera detail levels by setting detail threshold at 30 to 40 percent of peak luminance will help achieve the "film look." This means that areas of low light don't have much enhancement while highlight areas do not. Today's cameras can have varying frame rates. Some shoot at the 24-frame film rate. The gain of a camera can be increased to give a film emulsion "noise" look. The BBC reduces chroma levels in the camera to get closer to film color saturation levels. Film also has much less depth of field than video does. Lower lighting levels will create this in video. Kodak at one time claimed HDTV wouldn't equal 35mm film quality until CCDs had around 2 million pixels. Today the highest resolution imagers are over 40 million pixels.

Early HD equipment cost 10 times what today's do. Some early producers of HD programming found that they could not compete with upstarts using drastically cheaper, lighter, and less power-hungry gear. CCD imagers got smaller. Almost to a point where physics got in the way. Smaller CCDs do not allow the same quality of lens for the smaller imager, thus some claim newer HD cameras don't have the resolution that older ones had. This is generally not because of the cameras themselves, but because of smaller imagers called for inferior lens.

DTV Matures

Technology used for DTV created a

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through several evolutionary steps as analog video faded into the past. Each new milestone brought the vendors a temporary bump in sales for these new features, followed by a lag.

Digital over the air started in 1998, and after about 6 years, full scale facilities were designed and deployed. The transmission and distribution went completely digital along with more of the core facility. After another 10 years, the worldwide penetration of HD video was nearing 100% of the available market. While there is some migration up the ladder to 1080p and 4K, some say the industry is in a format stall. Companies like Grass Valley and others in the industry, and the area, found a way to ride out the lag. It helped to watch carefully what the early adopters did and then get ready for the next evolutionary wave. Some of the propulsion came from the end of the last centuries government regulatory policy. It was not based on free market forces, or a strategy to harness them.

Technology applied to the new media formats have provided an opportunity to enter new markets. But conversely it works both ways, as others whose core competencies were related, but separate, are now finding that they can compete in markets once dominated by the traditional television folks.

One governmental action that made this possible was the FCC Telecommunications Act of 1996. While aiding DTV and then HDTV, it made and gave businesses access to increased bandwidth. This led to devices like the iPhone, and others by supercharging cellular, Wi-Fi and data services so in demand today. It also changed the distribution paths for DTV. Now the viewer, maybe now more adroitly called the user, does not need an antenna, or a cable or satellite provider, not even a physical Internet connection if they desire. Increasingly it's not real time video delivery, but asynchronous digital streaming delivery.

Too late too to the Game

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Let's look back at what the Group was doing while NVISION was finding it's legs, and during the tumultuous run up to the end of the century.

GV was in dire straits in 1991 through 1993, at that time GV shipped a bunch of 1.0's products. While digital, SD only, was now part of the Groups offerings, HD was not even on the drawing boards yet. The group was now mainly reacting to outside events and not pioneering on any fronts. Tek was toying with a early video server. When it came to digital technology Tek was ahead of the Group in its implementation. The Group's sales dropped \$17 million in 93 from 92 levels. While it rebounded in 93 it dropped over \$10 million again in 94.

The composite digital 3000 switcher had been launched in 91, followed the next year by the component digital 4000 switcher. It played catch up with digital switchers in 93 and 94 by launching another three digital switchers. Again all SD only.



*Tektronix Profile Server and controller
branded LVS Event Management*

Tek became serious about its own server with the introduction of the Media Pool by Philips in 1994. Video servers were only practical because of digital technology. In 1995 Tek shipped its first server, the



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was marketing their own line of digital video production switchers. Also, in 1994 DirecTV signed on. It was becoming a digital world.

The Tek Video Division designed and introduced the Profile server, but turned it over to the Group in 94 when it combined the two into the Video Network Division.

One bright spot was using the Profile as an editor, and replay device, which NBC helped pioneer in 96. Profiles ran on Microsoft's NT OS.

Finally in 96 the Group released its first digital router, an SD version of the 7000. That year also marked a major advancement in bringing digital to the home, the DVD was introduced.

Spinning apart

Towards the end of 1997 it was becoming apparent that the Group was not carrying their weight financially. That year the division lost \$17 million which reduced Tek's earnings by 35 cents per share. On the year, Tek made \$3.48 per share, but it would have been closer to \$4 if it was not for the Group. The only good news was that the division had lost even more, \$27 million in fiscal 1996 on sales of almost \$400 million, so 97 appeared to be a ray of hope. But that did not last long, as the division lost a record amount in 98 and 99.

Tek's Video and Networking Division, essentially Grass Valley's income, had been a drag on per-share earnings. 1995 was the Groups best year at contributing to Tek's bottom line. It was 23.1% of total revenue that year. Over the next two years that percentage fell back to just under 16%. While the whole Video Network Division was racking up record amounts of revenue, almost \$450 million in 97, the Grass Valley lack of contribution was hidden by the fact that the Group's revenues were combined with the Profile server revenues starting in 1995 and no longer broken out separately. In 95 Grass Valley contri

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the bulk of the revenue. In 1997 VND reached its peak at almost \$450 million in revenue. The next year though the floor dropped out from under VND's when it dropped just over \$50 million. But that was greatly surpassed the year after that when \$100 million in revenues from the previous year disappeared.

At the time Tek and analysts said the division needed to improve routine business operations, emphasize product marketing, increase the flow of new products and respond more quickly to technological change, particularly in the video and television industry, before the division could return to profitability.

In September of 98 Jerry Meyer, Tek's then chief executive and chairman, announced plans to streamline the division's product offerings and reduce its cost structure. Those meant layoffs. Which were becoming a tradition towards the end of each fiscal year. He eliminated around 250 positions, or about 16 percent of the division's 1500 strong work force. 30 or 40 were left go in Portland, and about 200 down in Grass Valley. This was indicative of the problems in the Grass Valley video division, versus the relative success of the server group up in Portland. This was billed as an effort to quickly make the division profitable again. The moves resulted in a onetime restructuring charge of \$55 million.

While the Group still had a strong brand name, its video sales had greatly slumped. Tek finally addressed excess inventory issues and pruned obsolete product offerings. Grass Valley trimmed its product roster from 1,700 offerings to around 500. Timothy Thorsteinson was brought in August of that year to replace Lucie Fjeldstad as president of the division in late-August. We looked at that saga in a previous article.

Besides being slow to digital video, the other thing that was happening was the start of high-end systems being replaced by personal computer-based systems, and Tek was not able to compete in that trend. To combat this the Gr

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the bad news, the good news was that they announced HD switching, routing, and modular products. But they were not being shipped yet, and this is when Thorsteinson started his "buy our SD product and we will replace it in the future with HD at no charge" campaign against NVISION as we discussed in a earlier article. This was a valiant effort to keep cash flow up in the present, at the expense of future income.

In a management meeting in early 99 the following conclusions had been reached regarding Grass Valley:

- Hadn't met revenue/profit plan
- Poor forecasting performance
- Deteriorating customer quality
- Non-competitive lead times
- Long development cycle-times (missed several market windows)
- Poor delivery performance
- Slipped engineering schedules
- Excessive rework
- Outflow of key talent
- Lack of experienced management
- Excessive inventory

The bottom line at the meeting was: "Lack of accountability leading to....loss of confidence GVG is a deteriorating asset"

In June of 1999 Tektronix decided it didn't have the resources, nor the patience to fix the above list. Plus, on a larger level the company finally decided to do what Soros, and his group had been pushing for: to break up the company. So, they pulled the plug and announced plans to exit the video business. In addition, Tek decided to form two separate of what publicly traded companies of what remained. One company was comprised of its measurement business, while the other was comprised of its color printing division.

Aug 10, 1999, Tektronix announced it would sell its video content production business, including the Profile servers, to the Grass Valley Group Inc., a California-based investment group, led by Terence Gooding. Tektronix kept a 10% equity stake in the new venture. The Group continued to be

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For a long time Tek had dropped the Group from the Grass Valley name, it became Grass Valley Group again at that time.



The new company had 700 employees worldwide, and annual sales north of \$200 million. At that time 80% of TV signals worldwide passed through GVG products. Gooding served as chairman and CEO of Grass

Valley Group. Tim Thorsteinson, who was Tektronix's video and networking division president, joined the new company as its president.

This is the start of the Grass Valley's 20+ year journey as they wandered from one camp to the next. We pick up that story in the next article.

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