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SUMMARY

- Extensive background in new technologies for use in the broadcast/media space. Specific areas of experience include:
  - Digital distribution (SVOD, OTT)
  - Mobile video
  - Media file based workflow
  - MPEG splicing
  - Digital cable and IPTV standards (SCTE)
  - UHDTV, 4k, HDR, HFR and Wide Color Gamut
  - Digital Broadcast Standards
  - Live broadcast technology
  - Audio/Video production technology including ST 2110
  - Video compression
  - Advanced audio compression
  - Satellite and Fiber Optic transmission
  - Media technical standards development
  - Expert witness experience
- Leader of major projects. Developer of important new methods now in routine use.
- Advocate for adoption of new technology to improve quality and efficiency
- Team builder and cross-functional guru.
- Media technology experience that spans from production (i.e. novel camera developments) to final delivery (i.e. mobile DTV streaming) with emphasis on the overall ecosystem of TV and Radio production/distribution workflow and delivery.
- Independent advisor and consultant to the broadcast and media space.
- Subject matter expert experience in patent litigation
- Active participant in several standards bodies such as SMPTE, SCTE, ATSC, UHD Alliance, UltraHD Forum, AES

CORE STRENGTHS

- Provide Insights for Senior Executives on the Impact of New Technologies
- Project Management
- New Technology Development and Deployment
- Economic Assessment and Workflow Improvements

Experience Highlights

2020 – present 6P Color Inc, Baylor University

Consultant to a color system design project. Developed a multi-primary approach to conversion between RGB imagery in ACES color space to a new color space. Part of the technical team to develop intellectual property (patents) regarding this new color space. Developed specific algorithms in Mathematica for both the conversion process as well as a novel transfer function. Assisted with the design and development of 4 color projector system and a direct view LED wall using RGB and Cyan

2020/21 – Tennis Channel (Sinclair Broadcast Group)

New facility installation and commissioning for the Tennis Channel in Santa Monica CA including (3) studios, (2) production control rooms, AVID editing system, Master Control, and Central Equipment Room (CER). Facility based on SMPTE ST 2110 design, implementing a complete Video over IP infrastructure. Key responsibilities include critical design review, coordination of vendors including construction, A/V design, wiring installation, equipment and software. Review of specific technical specifications including acoustics, power, HVAC and lighting. Troubleshooting of various technical systems including SCTE 104 triggers, LED monitor walls, LED lighting, ST 2110 audio routing and configurations. Provided enhanced facility documentation for the client.

2019 – Lectronics v. Zaxcom

Engaged by the defendant, Zaxcom, as a subject matter expert in an IPR suit. Reviewed (3) Zaxcom patents on wireless microphone recording as well as prior art patents cited by the plaintiff. Provided both written declarations and oral depositions. All (3) Zaxcom patents were upheld by the IPR board.

2019 – KVCR TV

Provided consulting services to KVCR, the PBS member station in San Bernardino CA during the relocation of their spectrum from UHF to VHF as well as the relocation of the associated FM Station.

2012-present -- Consultant to Fraunhofer

IMT to assist in the adoption and deployment of the MPEG-H Next Generation Audio codec. Key responsibilities include the adoption of MPEG-H in the ATSC 3.0 broadcast standard, SCTE advanced audio codecs, UHD Alliance specifications and UltraHD Forum Guidelines document.

2014 - Sochi Winter Olympics

Commissioned by the Olympic Broadcast Service (OBS) to provide technical support and operational monitoring of a world wide on-line video distribution and mobile player (Olympic

Video Player). Advised OBS on the development of the Olympic Channel, 24/7 OTT service.

2012-2014 – Invenue.tv

Started a company to provide live video to mobile devices at sporting events. Designed physical infrastructure and mobile application to transmit real time video and audio to large audiences at arenas and stadiums. Adapted available mobile DTV dongles to use with personal smart phones and tablets. Pioneered two successful proof of concepts; one at Baylor University's basketball arena, the other at the World Championship of Surfing at Huntington Beach. Developed business plan and presented to several potential partners and investors. Ultimately unable to acquire either funding or partners to further the development.

2011-2012 - FOX Desktop Workflow Evaluation

Developed Proof-of-Concept Desktop Video search and editing program for FOX Sports and Entertainment. Set requirements and performance metrics, organized on-site vendor installations, training and evaluation by production personnel. FOX implemented a desktop/search system that has saved $2MM in production costs/year.

2010-2012 - Mobile DTV Project

Senior technical team leader in charge of the development and roll out of Mobile DTV for the FOX TV stations. Led development of advanced video encoding system using MPEG 4 AVC Main profile technology, HE-AAC audio encoding, and variable bit rate statistical multiplexing. Managed the specification and procurement of all the mobile transmission equipment including multiplexers, exciters, EPG servers and encryption. Provided technical guidance to the development of the DTV applications including iOS and Android devices.

2008-2010 - MPEG Splicing Phase 2

Led the team at FOX to develop and then deploy the second generation MPEG splicer for the FOX Network affiliates. The second generation splicer includes the abilities to insert real time Emergency Alert text crawls, graphics and emergency announcements. MPEG Splicer still in operation at FOX.

2003-2004 - MPEG Splicing Phase 1

Proposed first use of MPEG splicing for distribution of network programming to FOX affiliates. Headed the design team responsible for the specification of the splicing system. Coordinated with the principle vendors, Thomson/GV and Terayon as well as over 200 FOX affiliate stations on the rollout of the splicing system. Designed and specified a unique control system built by Triveni for the FOX Satellite Operations Center (SOC). MPEG splicer system went on line on September 12th, 2004 with the NFL on FOX in over 70 markets. Completed the deployment to all 203 FOX affiliates by February 2005. Saved Fox TV $100MM in satellite costs over the lifetime of the Splicer.

1996 - Atlanta Olympic Games – Live Super Motion Disk Recorder

Instrumental in the development of the first digital super motion camera system (Panasonic) with hard disk recording (EVS). Deployed 25 super motion systems during the Atlanta Olympic Games. The EVS Super Motion disk recording system has become the industry standard for live broadcast sports production due to the improved efficiency of replays over tape based replay systems.

PROFESSIONAL EXPERIENCE

TMS Consulting, Inc. **2012 - present**

President and CGO

Providing insight to the media and broadcast industry related to new technologies. Currently active in the development of ATSC 3.0 standards, UHD TV, HDR, file based workflow, high frame rate capture and production, and next generation audio codecs. Author of a column in TV Technology discussing impact of new technologies to the TV broadcast industry.

FOX Technology Group, **1997-2012**

EVP & Principle Engineer, Digital Television Technologies and Standards

Senior member of the FOX Technology group responsible for investigating, developing and deploying new technology for the FOX Television Group. Interfaced with senior thought leaders in each business unit to develop an implementation plan for new technologies as well as helped assess the impact to their core businesses. Put together a first class media laboratory and hired key technologists to provide insights on new media technologies and their impact.

1996 Atlanta Olympic Broadcasting, **1993 - 1996**

Head, Broadcasting Engineering

As Head of Broadcast Engineering, responsible for all technical requirements for the Host Broadcast Operations (AOB) including new technologies, control room design, new camera systems, timing and scoring graphics systems, power and video transport.

Advanced Television Test Center**, 1990-1993**

Director of Engineering

Oversaw and managed the development, installation, debug and certification of the HD TV testing systems including the RF test bed, PIXAR Image Computer, HD reference display, HD video tape machines and 5.1 surround audio test equipment.

***ABC Television Network*, 1980-1990**

A/V Systems Engineer, Broadcast Operations and Engineering.

Member of staff in the TV Engineering department. Responsible for the design and installation of major radio and TV facilities.

PROFFESIONAL SOCIETIES

Society of Motion Picture and Television Engineering (SMPTE).

- Fellow Grade
- Past Chair of SMPTE Hollywood
- Past Co-Chair of the SMPTE Annual Technical Conference

Society of Cable Television Engineering (SCTE).

- Member of Digital Video Subcommittee

Audio Engineering Society (AES).

- Member of Audio Guidelines for OTT TV and Video Streaming (AGOTTVS)

Institute of Electrical and Electronic Engineers (IEEE).

Academy of Television Arts and Sciences (ATAS).

- Member of Technical Emmy award committee

Advanced Television Systems Committee (ATSC).

- Member of several Technical Sub Groups in the development of ATSC 3.0

UltraHD Forum

- Chair, Guidelines Working Group

UHD Association

- Member, Technical Working Group

AWARDS

SMPTE David Sarnoff Medal Award for Television Innovation, 2012

NATAS Technical Emmy Award for the FOX Splicing System, 2010

NATAS Technical Emmy Award for the Work on the ATSC HD Digital Transmission Standard, 2009

SMPTE Fellow, 2008

EDUCATION

MS - Electrical Engineering, Columbia University

BS - Electrical Engineering, Columbia University

PE - Professional Engineering License, New York

Cisco Certifications
CCNA Course Part I and Part II

UCLA Extension Courses
Java Programming
Android Programming

FCC First Class Radio Telephone license