Kundan Singh

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INTEREST

Distributed systems, video conferencing, web systems, scalability, reliability, real-time communication.

EDUCATION

- **Columbia University**, Computer Science, PhD. Advisor: Prof. Henning Schulzrinne
- Columbia University, Computer Science, M.S., GPA 4.066 on 4.
- BITS Pilani, Computer Science, B.E., **University Gold Medalist**/Topper. GPA 10 on 10.

EXPERIENCE (25+ years)

- Principal Software Architect (WebRTC), Intermedia Inc., Sunnyvale, CA, 2019-2025 (6+ yrs)
- Lead Architect/Founding Engineer, Koopid Inc (acq. Dialpad), San Ramon, CA, 2016-2019 (3 yrs)
- Senior Research Scientist, Avaya Labs, Santa Clara, CA, 2012-2016 (4+ yrs)
- Before 2012: (senior) software engineering roles at Twilio (1yr), Bittorrent (1yr) Emergent (1yr), 6Connect (1yr), Tokbox (1.5yr), Adobe (1yr), Bell Labs/Lucent (3mo), Columbia University (7yr) Motorola (2yr)

RESEARCH, OPEN SOURCE, ETC

- 25+ refereed (peer reviewed) systems research papers
- 11 US/International patents granted, 4 pending application
- 15+ open source projects, at https://github.com/theintencity and https://blog.kundansingh.com
- Mentored 35+ student projects. Excellent TA award. Mentored several software engineers.

SKILLS, LANGUAGES, TOOLS

- Skilled in many languages: JavaScript, C/C++, Python, Java, Tcl, PHP, ActionScript, Perl.
- Practical experience with many technologies: WebRTC, SIP, VoIP, RTP, RTCP, SDP, XMPP, SOAP, NAT, MobileIP, E911, H.323, H.225.0, Q.931, RTSP, RTMP, RTMFP, MQTT, DHCP, P2P, DHT, Streaming, REST, XML, MCU, SFU, ICE, STUN, TURN, Codecs, MPEG, G711, H.261, H.264, SVC, Simulcast, AVC.
- Worked with many tools and stacks: Apache, Nginx, NodeJS, Angular, PostgreSQL, MySQL, Tomcat, gcc/make, CGI, Servlet, LAMP/WAMP, git, Freeswitch, Janus SFU, Asterix, Cisco router and IP phone, Nortel MCS, Dialogic IP telephony, Flash Player, AIR, Adobe FMS, Red5, OpenSIPS/SER, AWS, EC2, SNS, VPC, Google Cloud, Linux kernel, Windows driver, OSX audio module, Tensorflow, Mediapipe, Quality metrics, Analytics, InfluxDB, KPI, BHCA.

FURTHER READING

- https://blog.kundansingh.com/ - My blog with 90+ technical articles including links to demo videos of my recent WebRTC related projects: EzCall, RTC Helper, and Video-IO.
- https://blog.kundansingh.com/2024/04/what-do-i-do-as-software-architect.html - What do I do as a software architect at various organizations.
- https://blog.kundansingh.com/2016/12/a-journey-through-real-time.html - “A journey through real-time” has description of my earlier projects and professional evolution.

SUMMARY OF STRENGTHS

- Drive projects from start to finish: implementation, cloud deployments, operations, and training.
- Quickly create robust software systems for even complex ideas and inventions.
- Provide technical guidance on emerging area, e.g., critical and objective evaluation of projects.
- Mentor other software engineers and developers in creating high quality software.
- In depth knowledge of and practical experience with audio and video communication technologies for Internet, web, mobile and cloud, SIP, WebRTC, and distributed and network systems.

RECENT INDUSTRY PROJECTS

Intermedia.net Inc: Intermedia specializes in business communication (UC, CC, UCaaS). AnyMeeting is its cloud hosted video conferencing product based on WebRTC. I was responsible for several novel projects in four main areas, most of them from scratch:

1) Architecture, design and implementation of a modern video conferencing system. I transitioned from the previous MCU-based system to new and scalable SFU-based for video paths. My focus was on client side problems and solutions including robust and flexible video layout, simulcast substream selection, and WebRTC-based session negotiation and maintenance in a multi-party video meeting. But I also created the initial server system using a popular open source SFU. I helped scale the system to large meeting support with hundreds of video participants.
2) I single-handedly designed and implemented an in-house quality monitoring and diagnostic tool. It helped diagnose numerous customer complaints, by reducing the average investigation time from several hours or days to merely a few minutes. The quality monitoring part of the project was similar in spirit to the callstats project, but was customized extensively to suit the local needs and media flows.
3) I created a novel labs initiative with proof-of-concept implementations of 15+ innovative features, and many other diagnostic tools to support real-time video conferencing. The projects included end-to-end encryption using WebRTC insertable streams, virtual background using tensorflow, mediapipe, speech recognition for auto-transcript and hands free mode, multiple content sharing, overlaying video on screen for seamless presentation, customized video layouts for certain use cases, and more.
4) I did Identification, implementation and monitoring of key performance metrics including setup latency, system availability, resource usage, and call quality. Unlike the traditional VoIP, such metrics in WebRTC context are a lot more involved, and must incorporate a combination of several other low level metrics.

Koopid Inc: Koopid was started to provide a chatbot driven conversational AI product to enterprises and contact centers. It was acquired by Dialpad. I was responsible for architecture, design and implementation in these main areas from ground up -

1) Cross platform (web + mobile) client application for customer service catering to a range of business use cases, including flexible and pluggable application logic architecture.
2) Graphical drag-and-drop enabled application designers to customize styles as well as dialog workflows between customer and machine, before escalating to an agent. The workflow part was similar in spirit to wit.ai or dialogflow at that time, for creating interactive NLP/ML dialogs.
3) Client-server networking, security, APIs, and real-time voice and video calls using WebRTC.
4) I also helped with bootstrapping a generic as well as customizable agent-side application.

Avaya Labs: Avaya Labs emerged from the renowned Bell-Labs when Avaya spun out of Lucent. As part of the CTO organization, I provided direction and insights into emerging technologies, and applied them to existing and new Avaya products or systems.

1) I was the sole author of 15+ software projects ranging from proof-of-concept implementations to mature cloud hosted systems in areas such as web collaboration, video presence, mobile apps, cloud telephony, enterprise social network, network security, and web video conferencing.
2) I co-authored 9 systems papers in refereed conferences/journals in areas such as WebRTC, SIP, cloud-based systems, web collaboration and cross-platform mobile software development.
3) I generated 9 co-authored patents and/or applications on ideas related to web collaboration, WebRTC, conference user interface, and enterprise cloud collaboration.