

- **Type:** live versus stored (on-demand)
- Paradigm: client-server vs. P2P vs. peer-assisted
- Bit rate: Constant (CBR) vs. Variable (VBR)
- **Content:** copyright vs. public domain vs. user-generated
- Files: one large file vs. many small(er) chunks
- Quality Levels: one vs. many (layering) vs adaptive
- Media: audio vs. video vs. both
- Format: .mpeg vs .jpeg vs .mp4 vs .mov vs .wav ...
- **Resolution:** HD vs SD; desktop vs mobile
- Advertising: before vs. after vs. none
- Application-Layer Protocol: HTTP vs. HTTPS vs. other
- Transport-Layer Protocol: UDP vs. TCP vs. other
- Delivery: unicast vs. multicast vs. broadcast; CDN or not



- IEEE MASCOTS 2017 conference (Banff)
- Keynote speaker: Alex Gutarin
- Slides available on MASCOTS 2017 Web site
- Highlights:
 - Netflix has over 104 million subscribers in 190 countries
 - Netflix accounts for over 30% of peak North America traffic
 - Netflix is not really a technology company (COTS, cloud)
 - CDN for accelerating content delivery (Open Connect)
 - Open Connect Appliance (OCA) provided to ISP or IXP
 - Interesting hardware configurations for their OCA nodes
 - Pre-positioning of content is key (location, popularity)
 - Challenges with Internet delivery (TCP, UDP, security, etc)



- 6-month study of University of Calgary network
- Conducted by MSc student Michel Laterman (2015)
- Paper, slides, and MSc thesis available
- Highlights:
 - YouTube and Netflix are two most popular services
 - YouTube has used HTTPS for many years now
 - Netflix was HTTP at time of our study (HTTPS June 2015)
 - Estimated chunk sizes (25 MB) and response times
 - Top 20 most popular content items (by byte traffic volume)
 - Identified a lot of flux in content popularity
 - Evidence of "binge watching" phenomena
 - U of C could really benefit from proxy cache or CDN node!



- Statefulness: connectionless vs. connection-oriented
- Architecture: client-server vs. P2P vs. other
- Participants: 1-to-1 vs. 1-to-N vs. N-to-1
- **Directionality:** pull vs. push vs. both
- Pattern: one-way vs. two-way (symmetric)
- Duration: transaction-oriented vs session-oriented
- Data Volume: light vs. medium vs. heavy
- Transport-Layer Protocol: TCP vs. UDP vs. other
- **Ports:** static (well-known) vs. dynamic