

画像情報特論 (1)

Advanced Image Information (1)

はじめに

Class Overview

情報理工・情報通信専攻 甲藤二郎

Dept. of Computer Science and Engineering, Jiro Katto

E-Mail: katto@waseda.jp

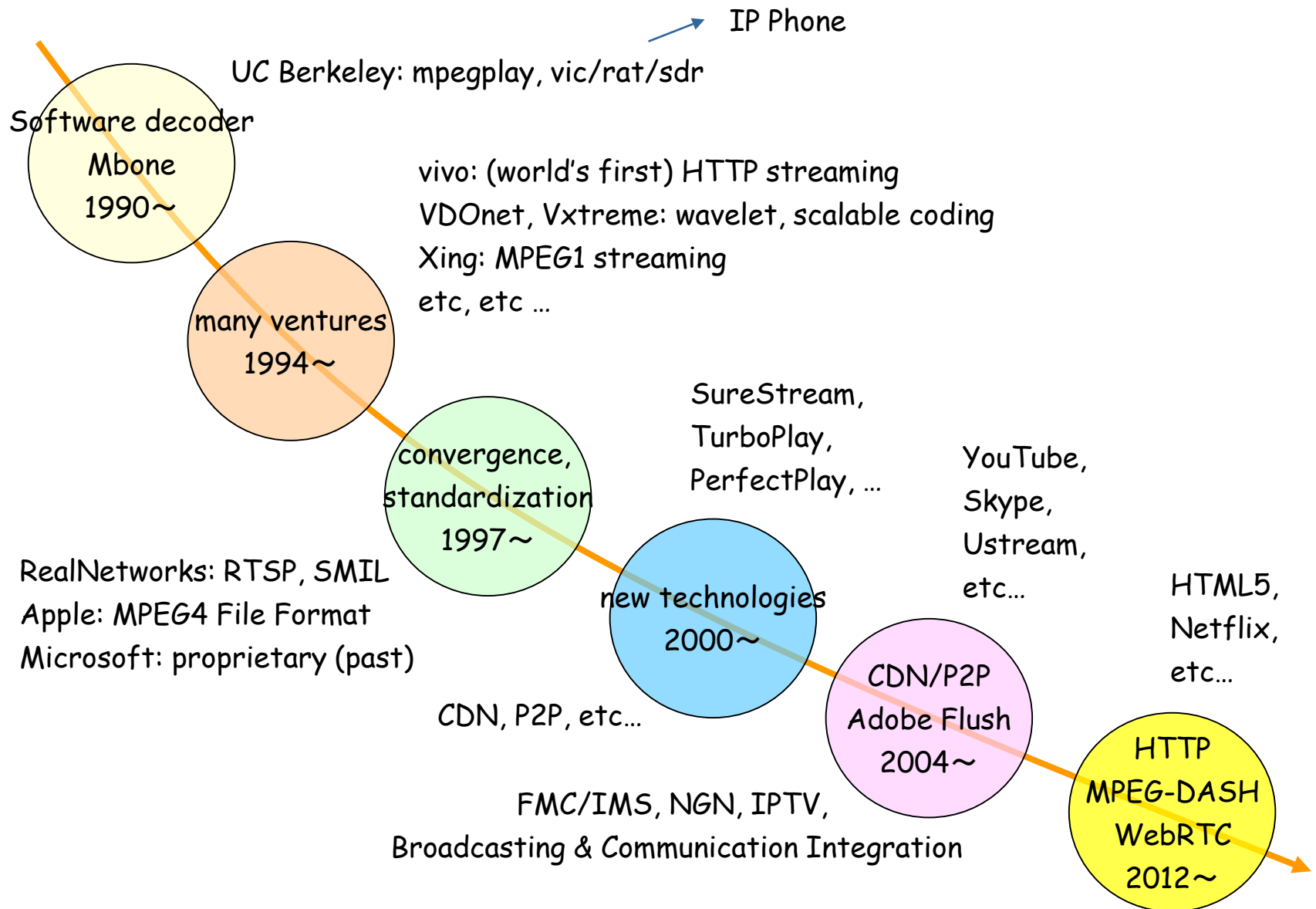
This Year's Schedule

(tentative)

4/06	Class overview
4/13	Video Streaming (1)
4/20	Self study (1)
4/27	Video Streaming (2)
5/11	Video Streaming (3)
5/18	Video Streaming (4)
5/25	Video Streaming (5)
6/01	Video Compression (1)
6/08	Video Compression (2)
6/15	Video Compression (3)
6/22	Video Compression (4)
6/29	Image Processing (1)
7/06	Image Processing (2)
7/13	Image Processing (3)
7/20	Final report

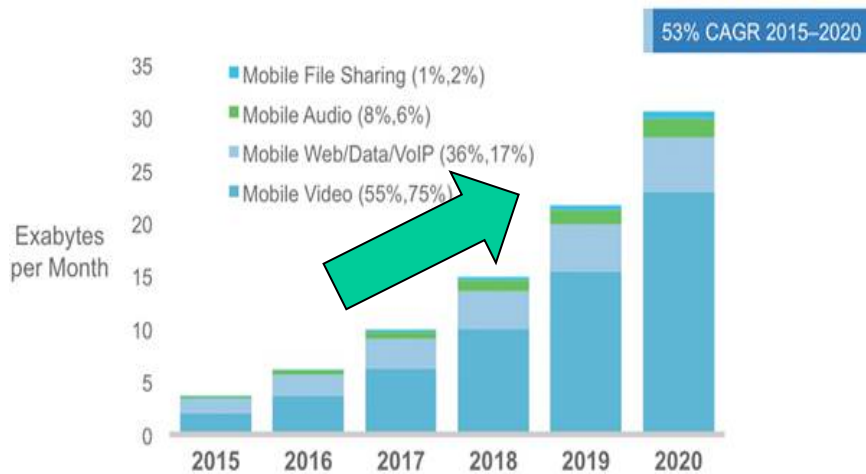
And, additional self studies on CourseN@vi, once or twice

History of Video Streaming



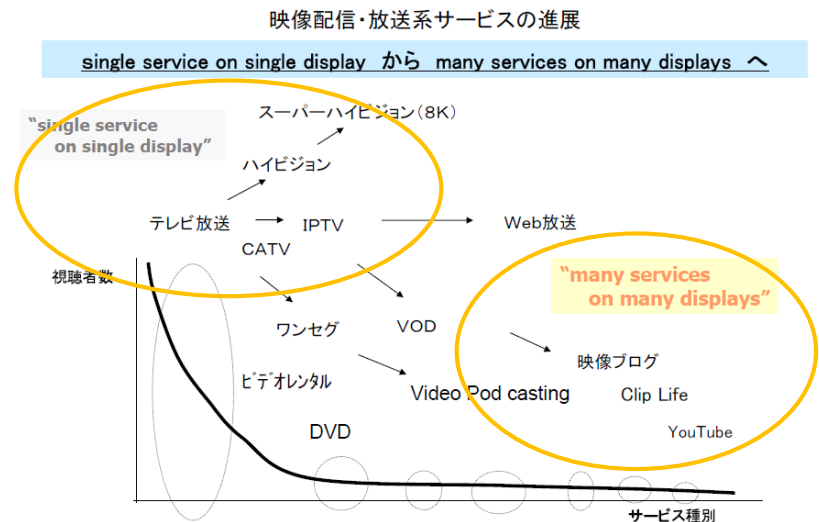
Recent Trends

- Drastic Increase of Video Traffic
 - more than 70%
 - x10 until 2020



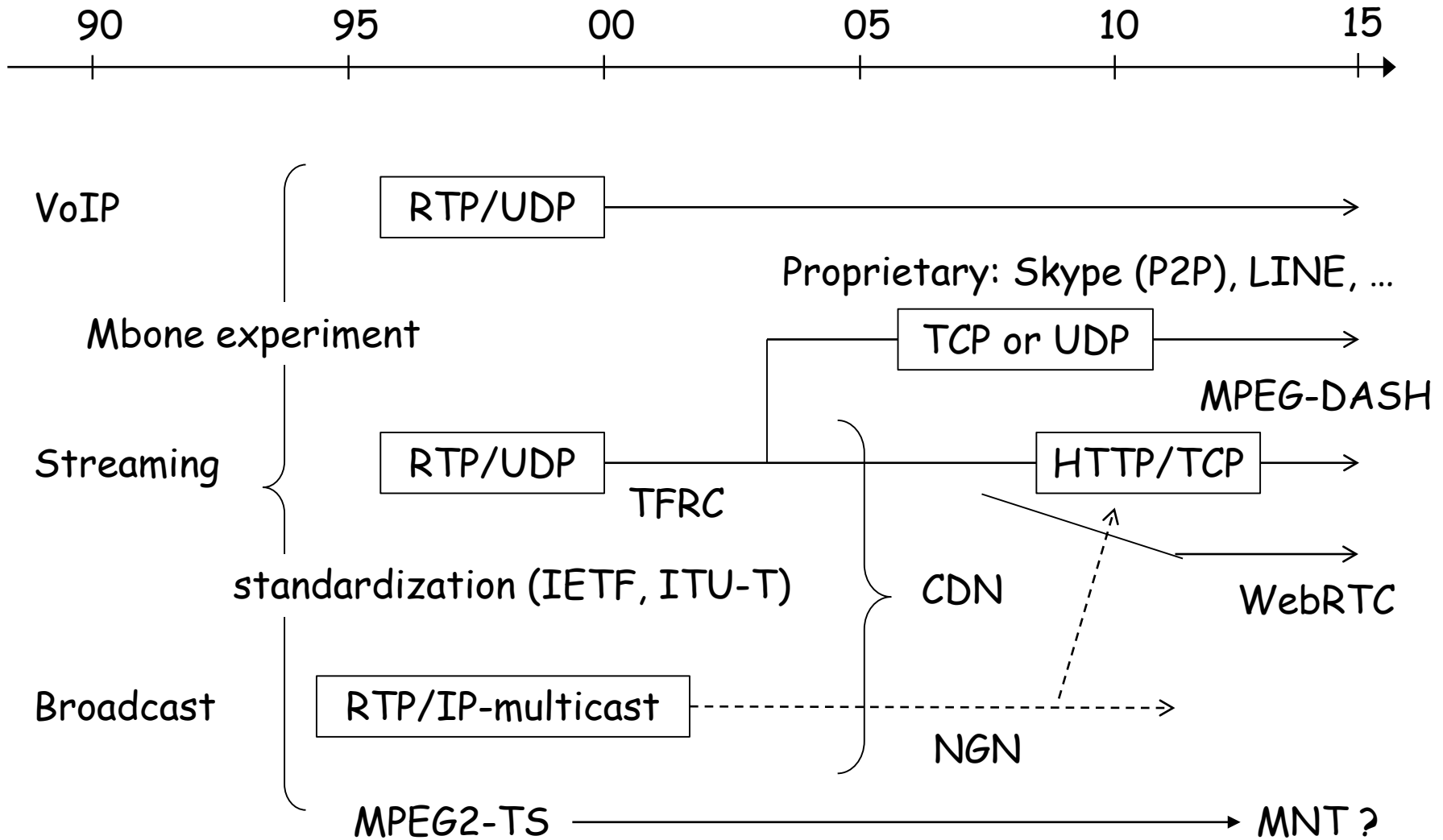
(Cisco VNI, 2016)

- Evolution of Various Video Services
 - higher resolution and personalization



(MIC Report, 2008)

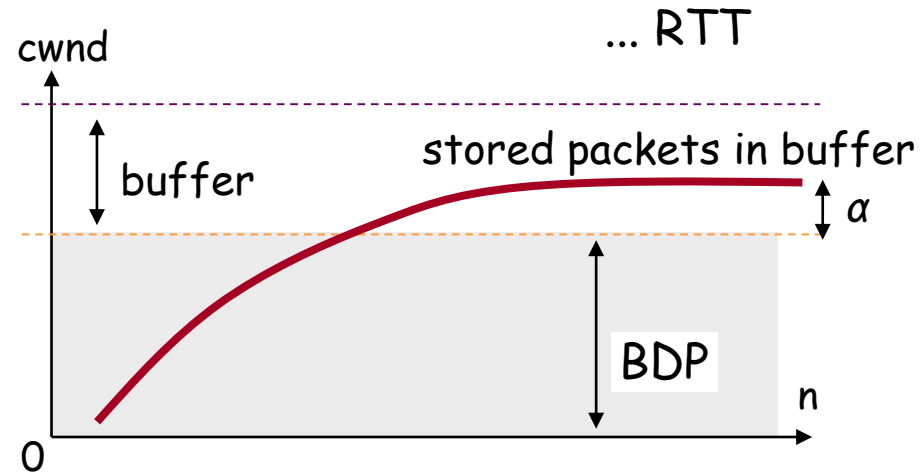
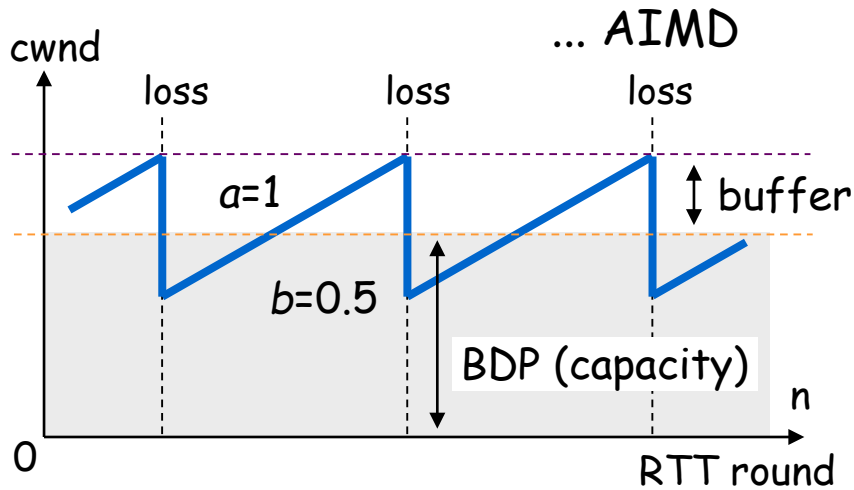
Protocol Transition



Video streaming (1) TCP/IP

■ Loss-driven

■ Delay-driven



TCP-Reno, High-Speed TCP,
TCP-Westwood, CUBIC-TCP, ...

TCP-Vegas, FAST-TCP

BDP/Buffer relationship

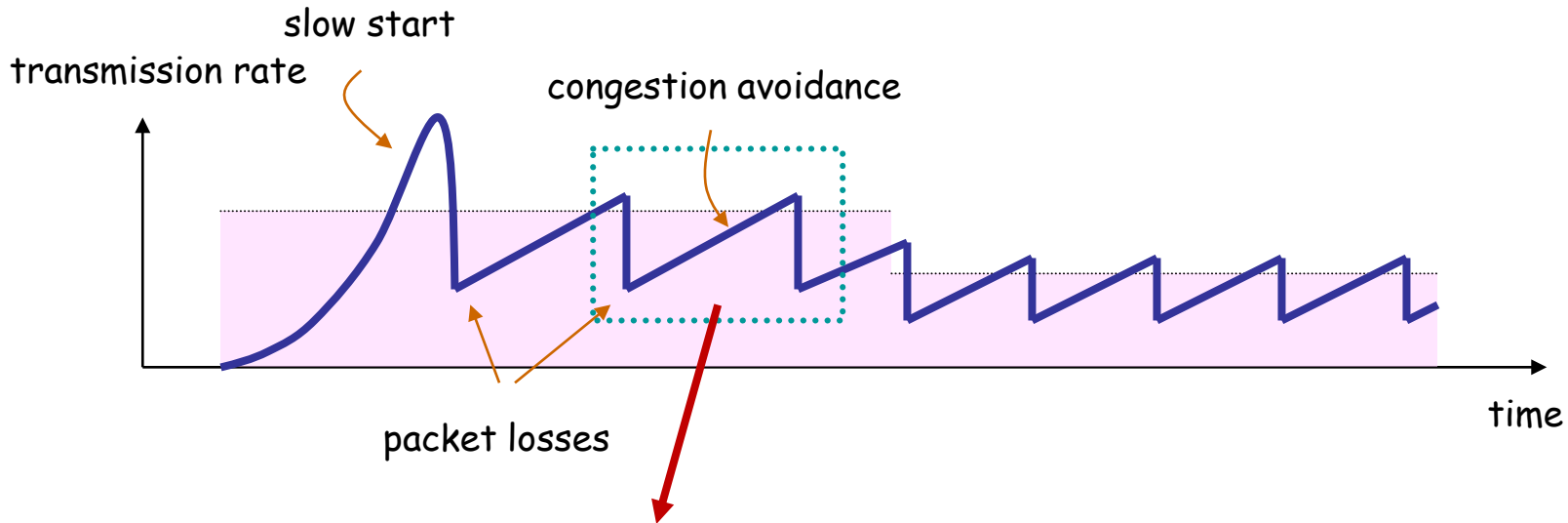
Unfairness by loss-driven TCP

small buffer \rightarrow \times efficiency
large buffer \rightarrow \times delay

\times friendliness

Video streaming (2) TFRC

■ TFRC



Modeling of steady-state
TCP behaviors

$$R = \frac{1}{RTT} \sqrt{\frac{3}{2p}}$$

p: packet loss rate

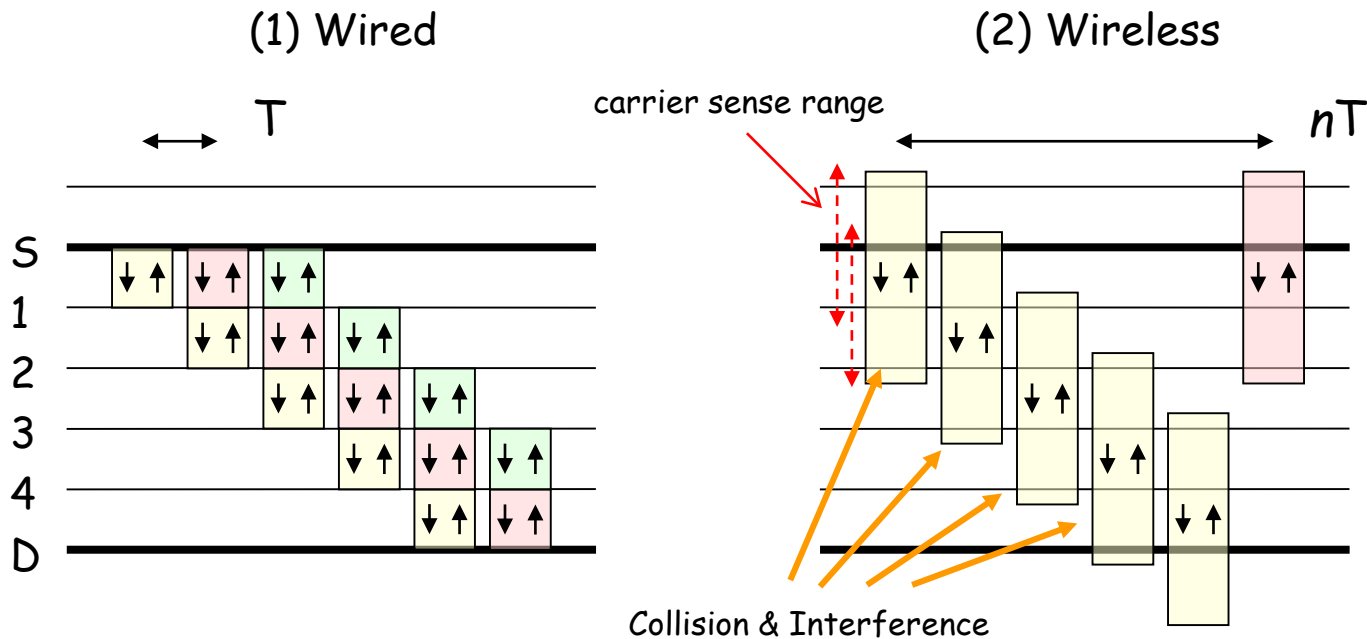
BDP/Buffer relationship

small buffer → × efficiency
large buffer → × delay



Video streaming (3) Wireless

■ Single-Channel Multi-hop Network



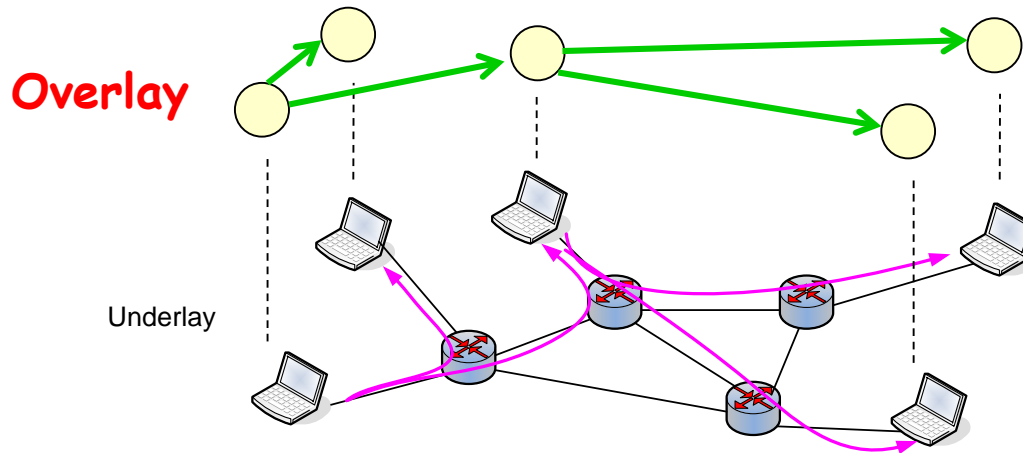
Channel Efficiency = 1



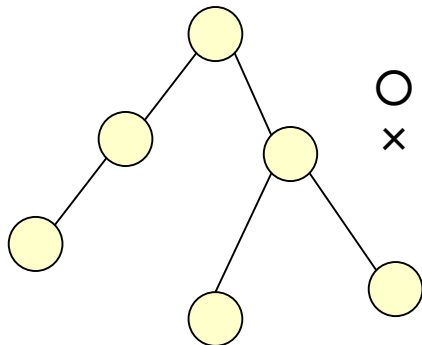
Channel Efficiency = $1/n$
(n : # of multi-hops)

Video streaming (4) CDN, P2P & Cloud

■ Overlay networks

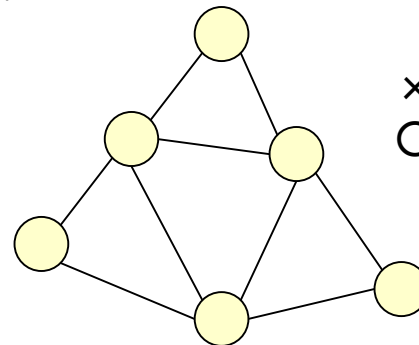


■ tree



○ complexity
× robustness

■ mesh



× complexity
○ robustness

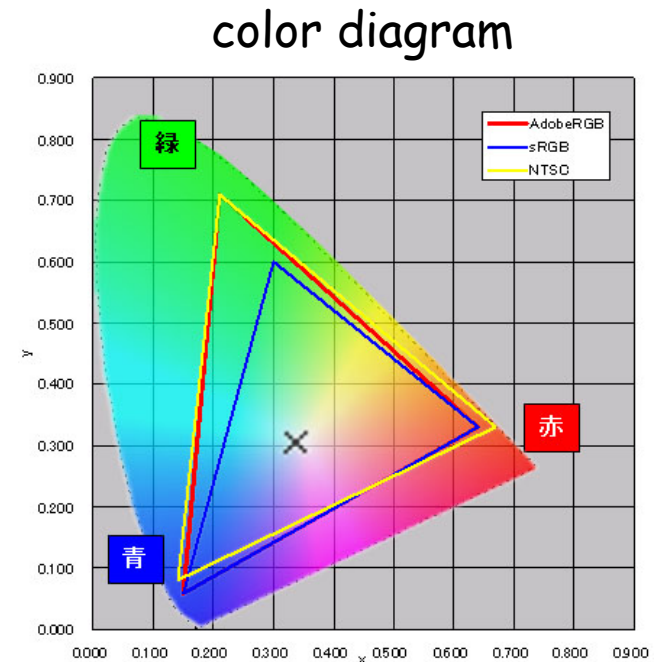
Video Compression: H.265 & Beyond

■ H.265/HEVC

- HEVC: High Efficiency Video Coding
- FVC: Future Video Coding (H.266/FVC)

■ Other topics

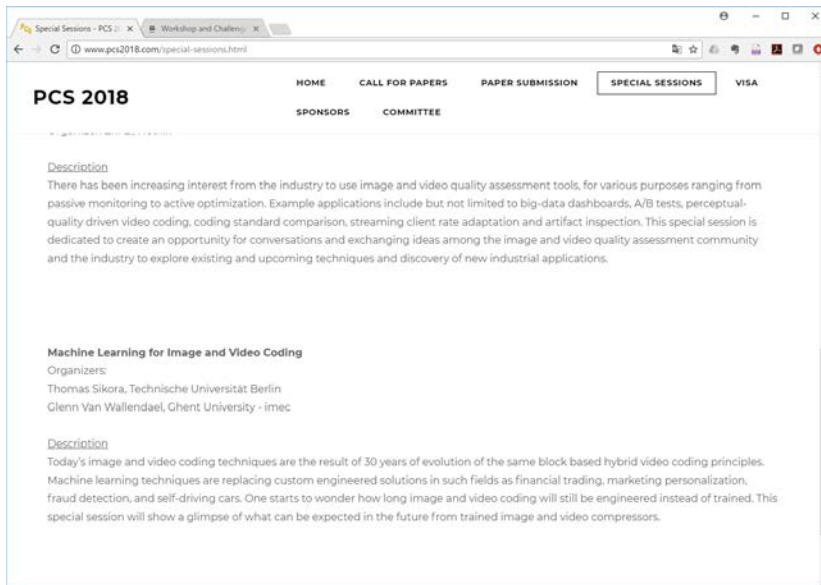
- Higher resolution
 - spatial: U-HDTV
 - temporal: 10,000 frames
- Gamut expansion
- High dynamic range
- 3D / freeviewpoint



Machine Learning in Image/Video Compression

- On-going in these one or two years

PCS 2018 in June



The screenshot shows the PCS 2018 website. The navigation menu includes HOME, CALL FOR PAPERS, PAPER SUBMISSION, SPECIAL SESSIONS (highlighted), and VISA. Below the menu, there is a section for "Machine Learning for Image and Video Coding" with organizers Thomas Sikora and Glenn Van Wallendael. A description of the special session is provided below.

PCS 2018

HOME CALL FOR PAPERS PAPER SUBMISSION **SPECIAL SESSIONS** VISA

SPONSORS COMMITTEE

Description

There has been increasing interest from the industry to use image and video quality assessment tools, for various purposes ranging from passive monitoring to active optimization. Example applications include but not limited to big-data dashboards, A/B tests, perceptual-quality driven video coding, coding standard comparison, streaming client rate adaptation and artifact inspection. This special session is dedicated to create an opportunity for conversations and exchanging ideas among the image and video quality assessment community and the industry to explore existing and upcoming techniques and discovery of new industrial applications.

Machine Learning for Image and Video Coding

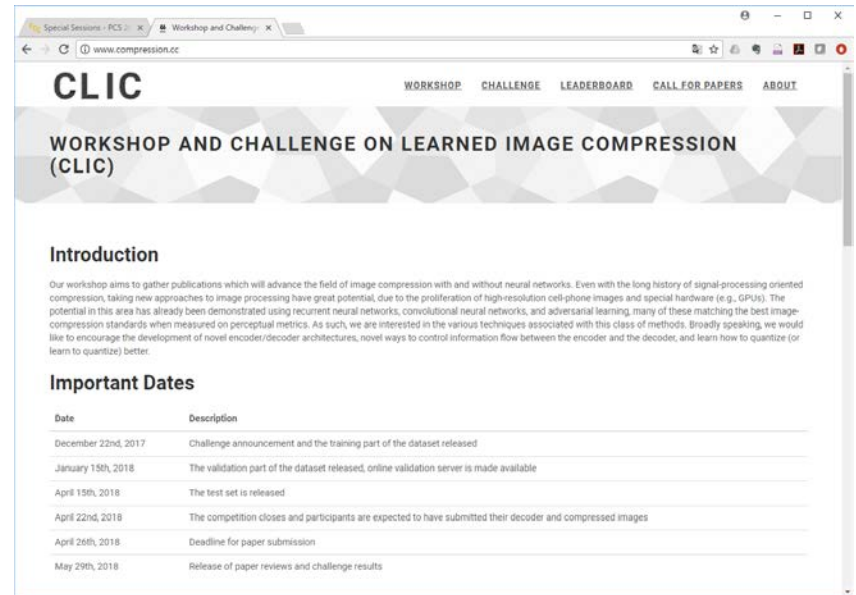
Organizers:
Thomas Sikora, Technische Universität Berlin
Glenn Van Wallendael, Ghent University - imec

Description

Today's image and video coding techniques are the result of 30 years of evolution of the same block based hybrid video coding principles. Machine learning techniques are replacing custom engineered solutions in such fields as financial trading, marketing personalization, fraud detection, and self-driving cars. One starts to wonder how long image and video coding will still be engineered instead of trained. This special session will show a glimpse of what can be expected in the future from trained image and video compressors.

<http://www.pcs2018.com/>

CLIC in CVPR 2018 in June



The screenshot shows the CLIC website. The navigation menu includes WORKSHOP, CHALLENGE, LEADERBOARD, CALL FOR PAPERS, and ABOUT. The main heading is "WORKSHOP AND CHALLENGE ON LEARNED IMAGE COMPRESSION (CLIC)". Below this, there is an "Introduction" section and an "Important Dates" table.

CLIC

WORKSHOP CHALLENGE LEADERBOARD CALL FOR PAPERS ABOUT

WORKSHOP AND CHALLENGE ON LEARNED IMAGE COMPRESSION (CLIC)

Introduction

Our workshop aims to gather publications which will advance the field of image compression with and without neural networks. Even with the long history of signal-processing oriented compression, taking new approaches to image processing have great potential, due to the proliferation of high-resolution cell-phone images and special hardware (e.g. GPUs). The potential in this area has already been demonstrated using recurrent neural networks, convolutional neural networks, and adversarial learning, many of these matching the best image-compression standards when measured on perceptual metrics. As such, we are interested in the various techniques associated with this class of methods. Broadly speaking, we would like to encourage the development of novel encoder/decoder architectures, novel ways to control information flow between the encoder and the decoder, and learn how to quantize (or learn to quantize) better.

Important Dates

Date	Description
December 22nd, 2017	Challenge announcement and the training part of the dataset released
January 15th, 2018	The validation part of the dataset released, online validation server is made available
April 15th, 2018	The test set is released
April 22nd, 2018	The competition closes and participants are expected to have submitted their decoder and compressed images
April 26th, 2018	Deadline for paper submission
May 29th, 2018	Release of paper reviews and challenge results

<http://www.compression.cc/>

Handouts

- Check handouts on CourseN@vi.
- (in April) check class web page
 - <http://www.katto.comm.waseda.ac.jp/~katto/Class/>