# On the Variability Secrets of an Online Video Generator

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# Online video generator


Humorous TV show of Canal+ (French television channel)

WILDMOKA

# Online video generator

# Online video generator

# Demo

What are the differences?

- Souvenirs (memories)
- Actors

What is common?

- Structure of the video
- Main character

Product line? Generator?

# Motivation

- Reverse engineer, understand
  - What is the variability and commonality?
  - How is it modeled and implemented?
  - How many variation points? Commonalities? Configurations?
- Pedagogical material
  - Mainstream example
  - Explain advanced concepts
  - Make people aware of variability and product lines
- Re-engineer the Bref generator
  - Helps to understand
  - Interesting pedagogical material as well
  - “Better” configurator?

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FUN !

# Reverse engineering

# Reverse engineering

- Initial observations
  - Playing a lot with the video generator
  - Using the Canal+ and technical expertise of some people in our team

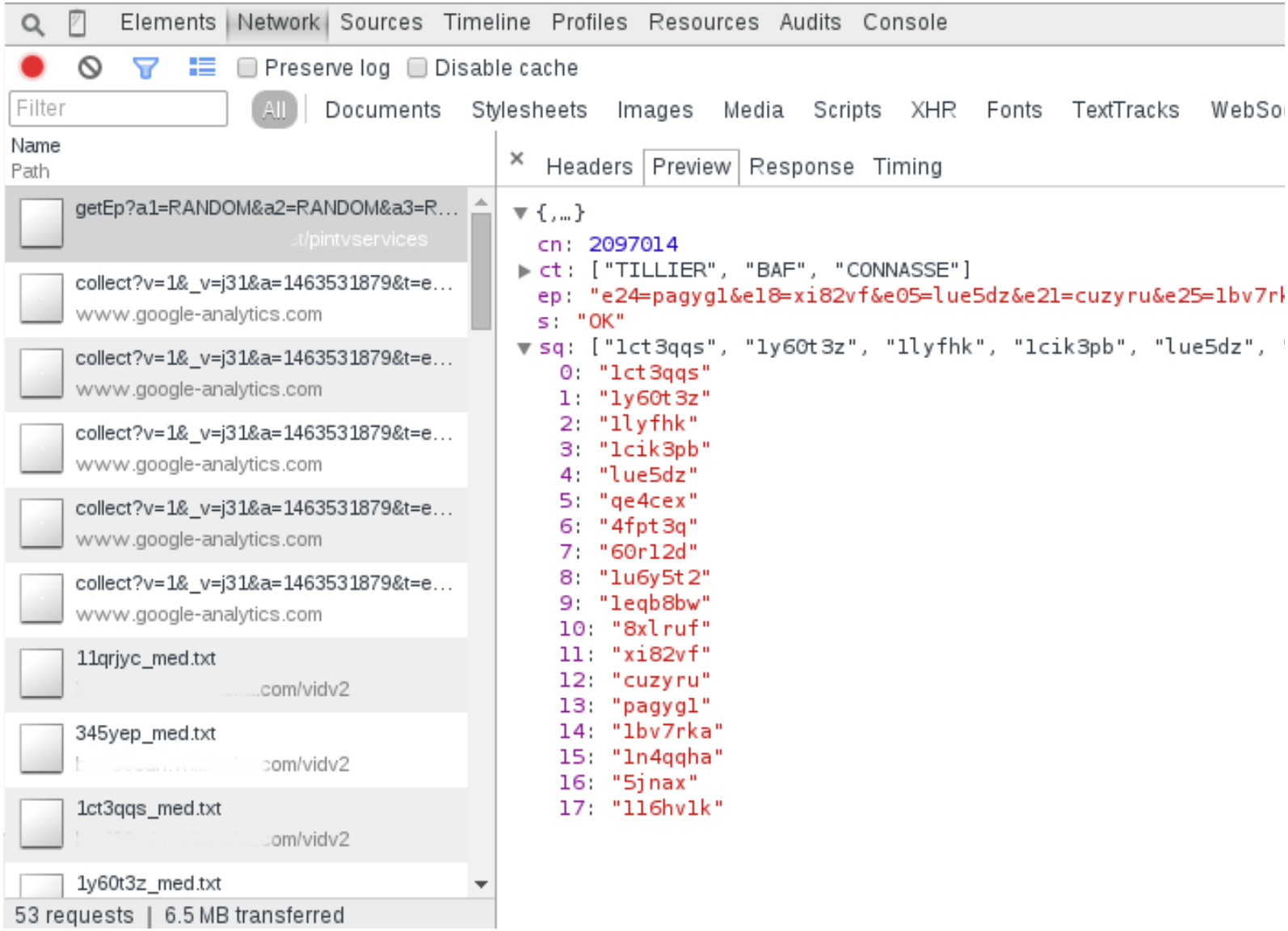
- First approach: a crawler, diff of videos, hack the JS, ...

  => complex and heavyweight

- Second approach: analyze HTTP requests and some parts of JS code

  => simpler and scalable

# Reverse engineering



# Reverse engineering

http://.../getEp?a1=RANDOM&a2=RANDOM&a3=RANDOM&

Generate one sequence of videos

"sq": ["ml7ila", "1y60t3z", "1lyfhk", "wqzv0y",
"1xxivi", "1oxnvtu", "lolbe9", "wvo06o",
"1u6y5", "1eqb8bw", "1j9aij7", "nr7jom",
"1jmv1", "1qgn9dh", "1bv7rka", "19ykyyw",
"5znr", "116hv1k"]

ml7ila_med.txt

#EXTINF:05.72,
http://.../ml7ila_med0.ts
#EXTINF:05.96,
http:///../ml7ila_med1.ts
#EXTINF:03.96,
http:///../ml7ila_med2.ts
#EXTINF:02.12,
http://.../ml7ila_med3.ts

# Reverse engineering

- We contacted Wildmoka, the company developing the Bref generator
- Wildomake gave us an offline version of the generator in realistic conditions
  - Server side code is unknown
  - Client side code is obfuscated (JS)
  - Same security mechanisms as in production

# Motivation

- Research questions
  - What is the variability and commonality?
  - How is it modeled and implemented?
  - How many variation points? Commonalities? Configurations?
  - Are we able to reverse engineer and re-engineer a configurator?
- For Wildmoka: audit of the generator without disturbing the running system

# Reverse engineering

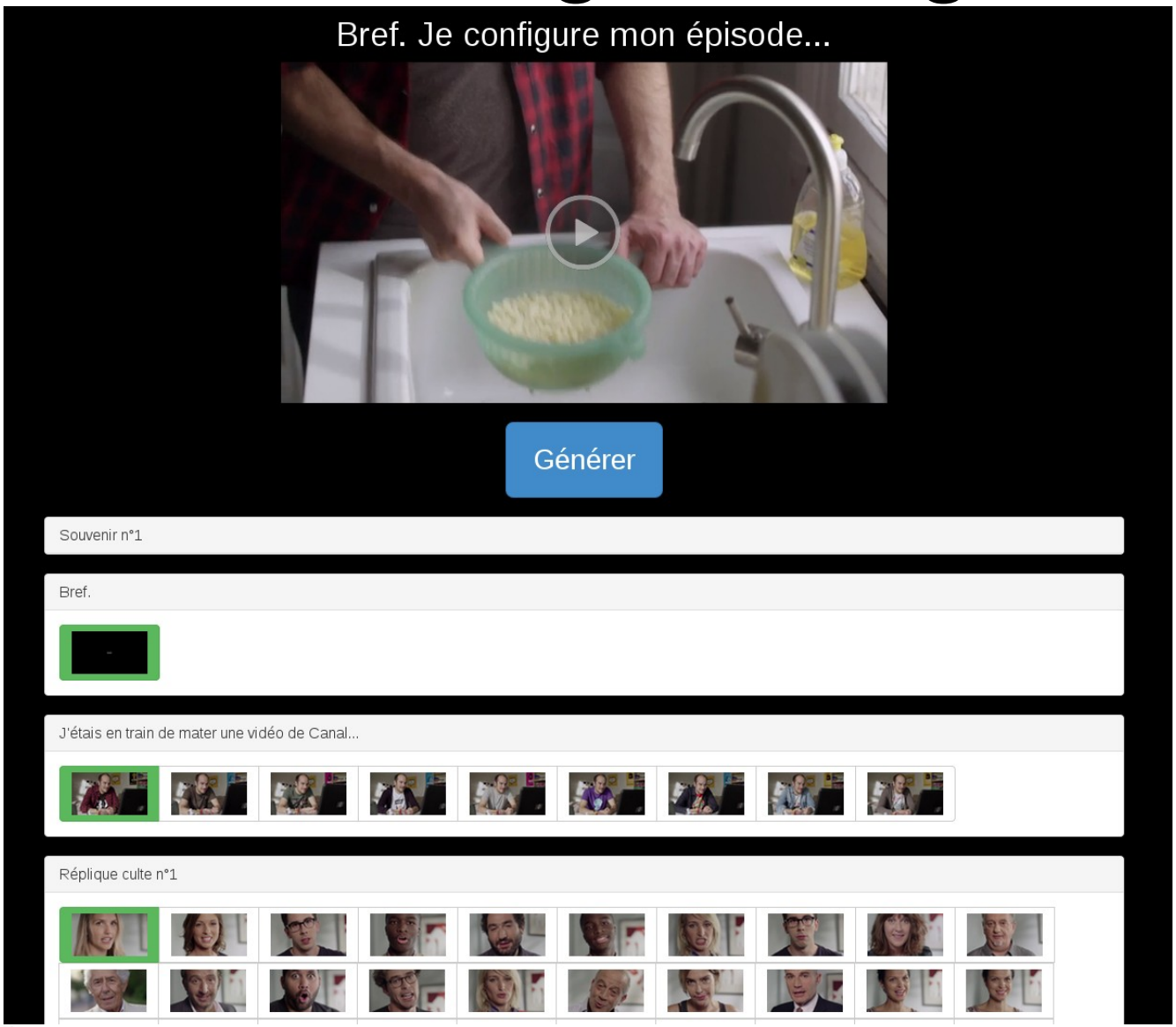
- Wget + curl = 363,281 episodes
- 1 episode = 18 sequences
- 400 alternatives, 1619 video files
- 63 alternatives for the 1st sequence, ...

| Variation Point | VP 1 | VP 2 | VP 3 | VP 4 | VP 5 | VP 6 | VP 7 | VP 8 | VP 9 | VP 10 | VP 11 | VP 12 | VP 13 | VP 14 | VP 15 | VP 16 | VP 17 | VP 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| #Alternatives | 63 | 1 | 9 | 34 | 15 | 25 | 51 | 30 | 2 | 6 | 6 | 12 | 21 | 28 | 6 | 86 | 4 | 1 |

- Soft / hard constraints

# Re-engineering

# Re-engineering



# Re-engineering

- Mainly automated
  - List and download videos
  - Associate video variants to sequences
  - Sequences' thumbnails (ffmpeg)
- 1 week of work for reverse engineering and re-engineering the configurator

An outsider should not be able to do that !

# Case study for...

- Educational perspective
  - Mainstream example
  - Illustrates several product line concepts (variants, constraints, generator, etc.)
  - Already used at University of Rennes 1

# Case study for...

- Configuration perspective
  - Not just random

    For variation point 9:
  - the first alternative appears in 362,903 configurations
  - the second alternative appears in only 378 configurations (0.1%)

# Case study for...

- Reverse engineering perspective
  - Black box
  - Soft and hard constraints
  - The configuration space is too large for an exhaustive technique

# Case study for...

- Security perspective
  - Basic security mechanisms (IP ban) were implemented
  - We were able to download all the videos which are protected by copyright
  - Our re-engineered configurator “kills” the idea of the original service (no more surprises)

Calls for the development of security mechanisms that hide or protect variability

# Conclusion

Interesting case study

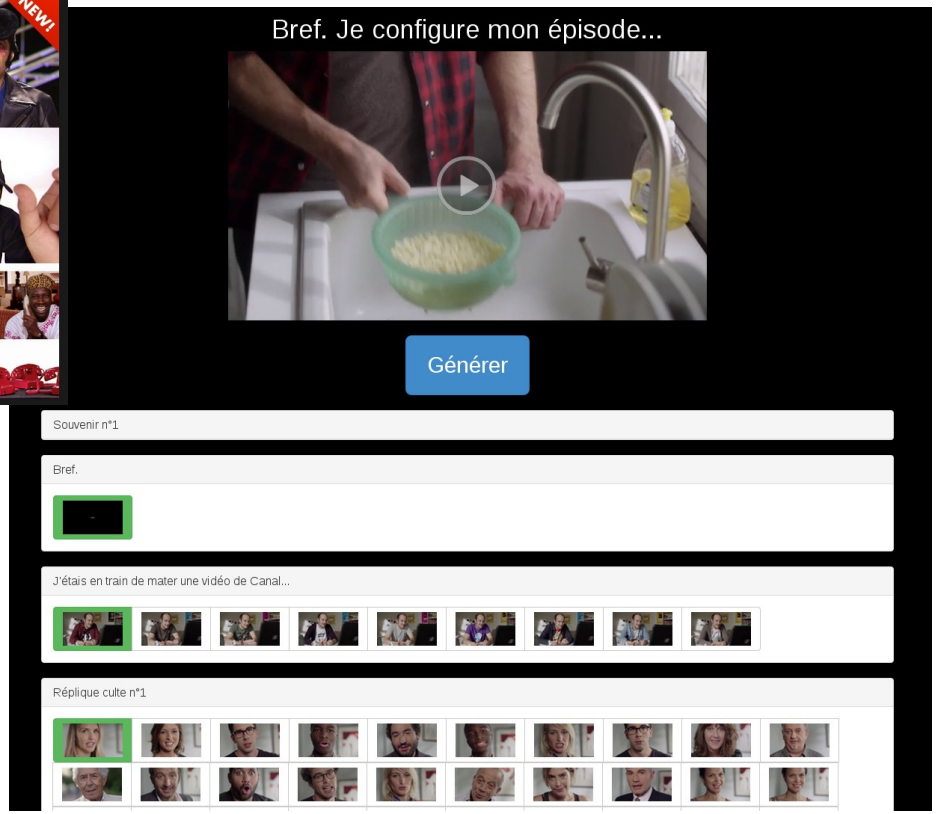
- From an educational perspective
- From a configuration perspective
- From a reverse engineering perspective
- From a security perspective

# Future work

- Ongoing collaboration with Wildmoka
- Validation of our reverse engineering procedure
  - Hard/soft constraints
  - Frequencies
  - Completeness of the video alternatives
  - Minimum number of configurations for an accurate understanding
- How to hide variability for a security purpose?
  - Prevent exhaustive exploration of the configuration space
  - Break variability

# Questions?


ETAPE 2 : CHOISIS 3 BONS SOUVENIRS
JE NE VEUX PAS CHOISIR
LE DÉZAPPING DU BEFORE BEST OF
C'ÉTAIT UN MESSAGE À CARACTÈRE INFORMATIF
CASTING
BURGER QUIZ
La Bande à Fifi
LA BOÎTE À QUESTIONS
NEW!


Bref. Je configure mon épisode...
Générer
Souvenir n°1
Bref.
J'étais en train de mater une vidéo de Canal...
Réplique culte n°1