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USE CASES AND SOLUTIONS FOR MIGRATING TO IMT-2020 NETWORKS IN EMERGING MARKETS.

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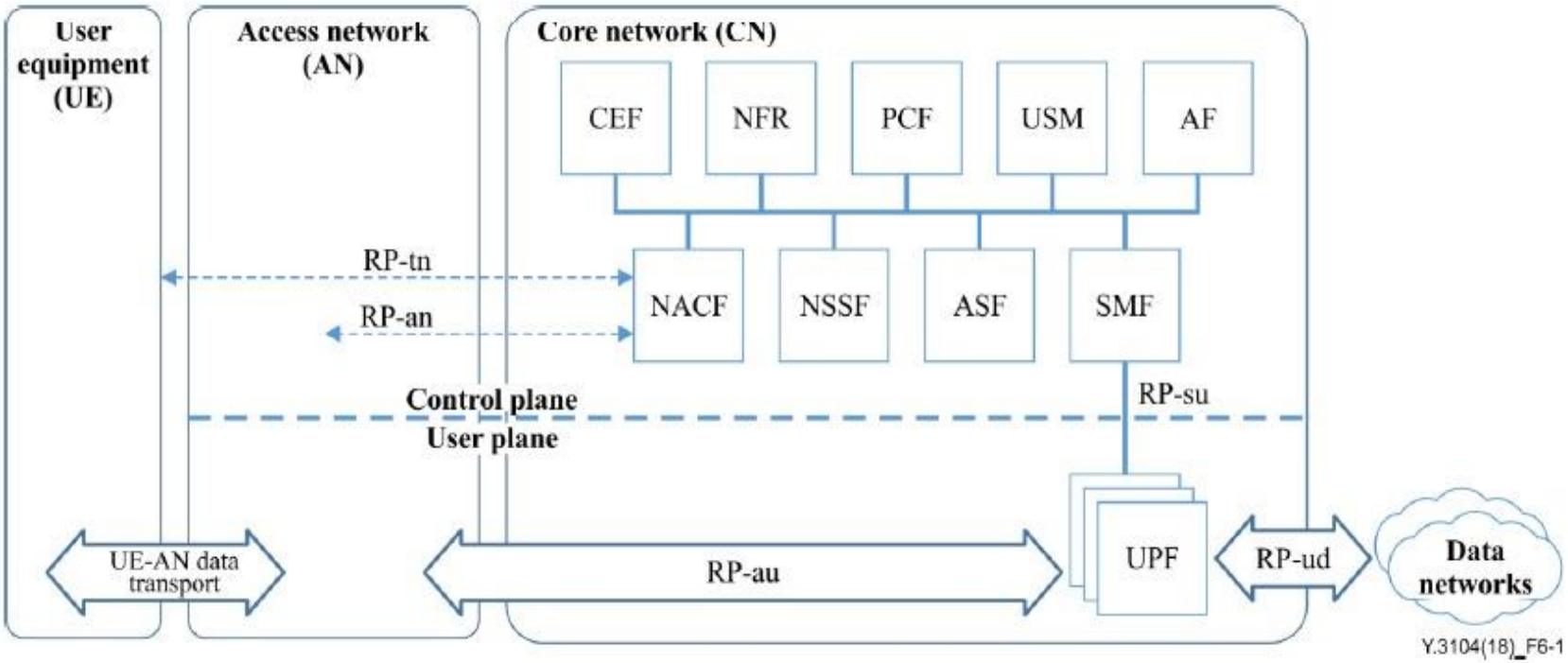
Introduction

- The advent of future networks including IMT-2020 will bring about improvements in all spheres of life, such as IoT (Internet of Things), driverless cars, surveillance systems and healthcare monitoring systems.
- However, in emerging markets, there are challenges such as to meet the requirements of low power consumption, optimal use of resources and maximization of coverage.
- This study discusses use cases on how machine learning can be used as a tool to address these issues.

Background - IMT-2020 Architecture



(AF: application function; CEF: capability exposure function)

Figure from ITU-T Y.3104

Introduction to the Use-Cases

Use Case	Title	Description
1	Energy Saving Based on ML	Analyzes how ML can be used to effectively manage the available energy resources in IMT-2020 networks.
2	Coverage Optimization	Due to the coverage limitations of 5G, UC2 discusses how ML can be used to manage handovers between access nodes efficiently.
3	Distributed, optimized ML in IMT-2020 Networks	UC3 demonstrates how ML operations can be distributed across multiple devices(data parallelization).
4	AI-Based Classroom [Implemented]	Smart classroom that will facilitate the learning process for younger pupils.

AIM: to create socially relevant solutions, while using advanced technology of AI/ML.

Use case 4: AI-Based Class Room

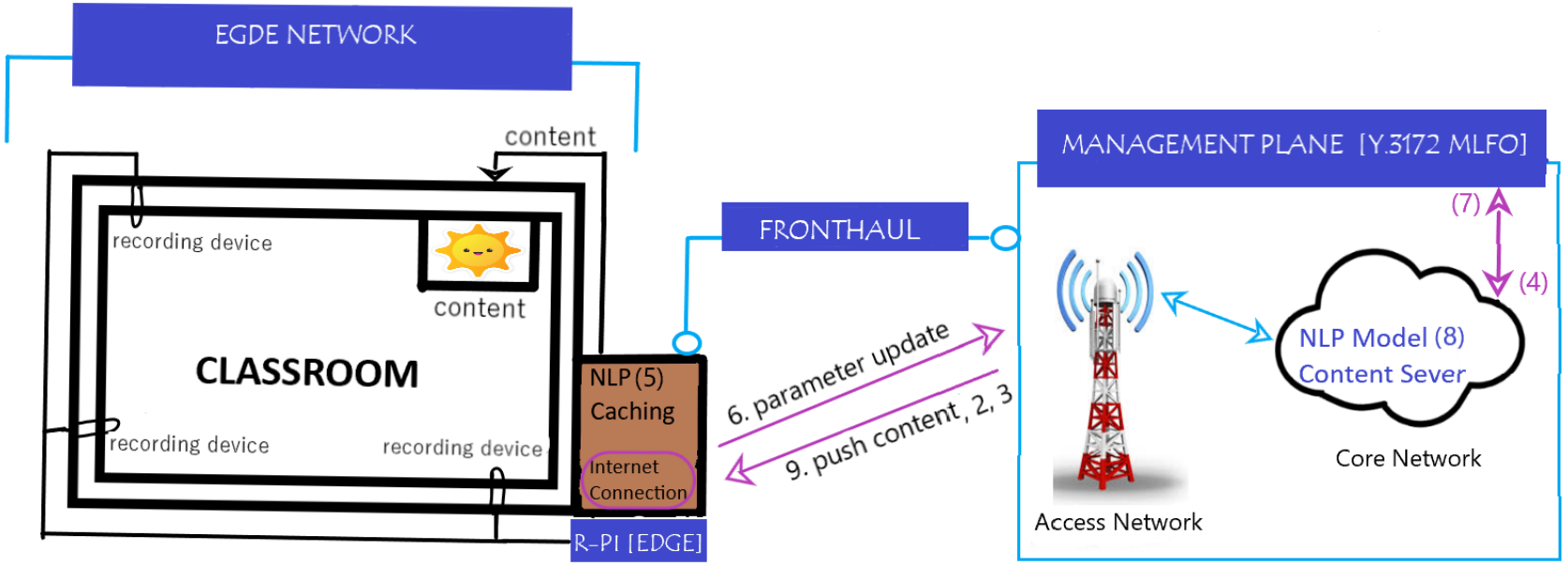
AI based classroom is a smart classroom that leverages the power of ML to facilitate the learning process for younger pupils.

AI-Based Class Room Contd

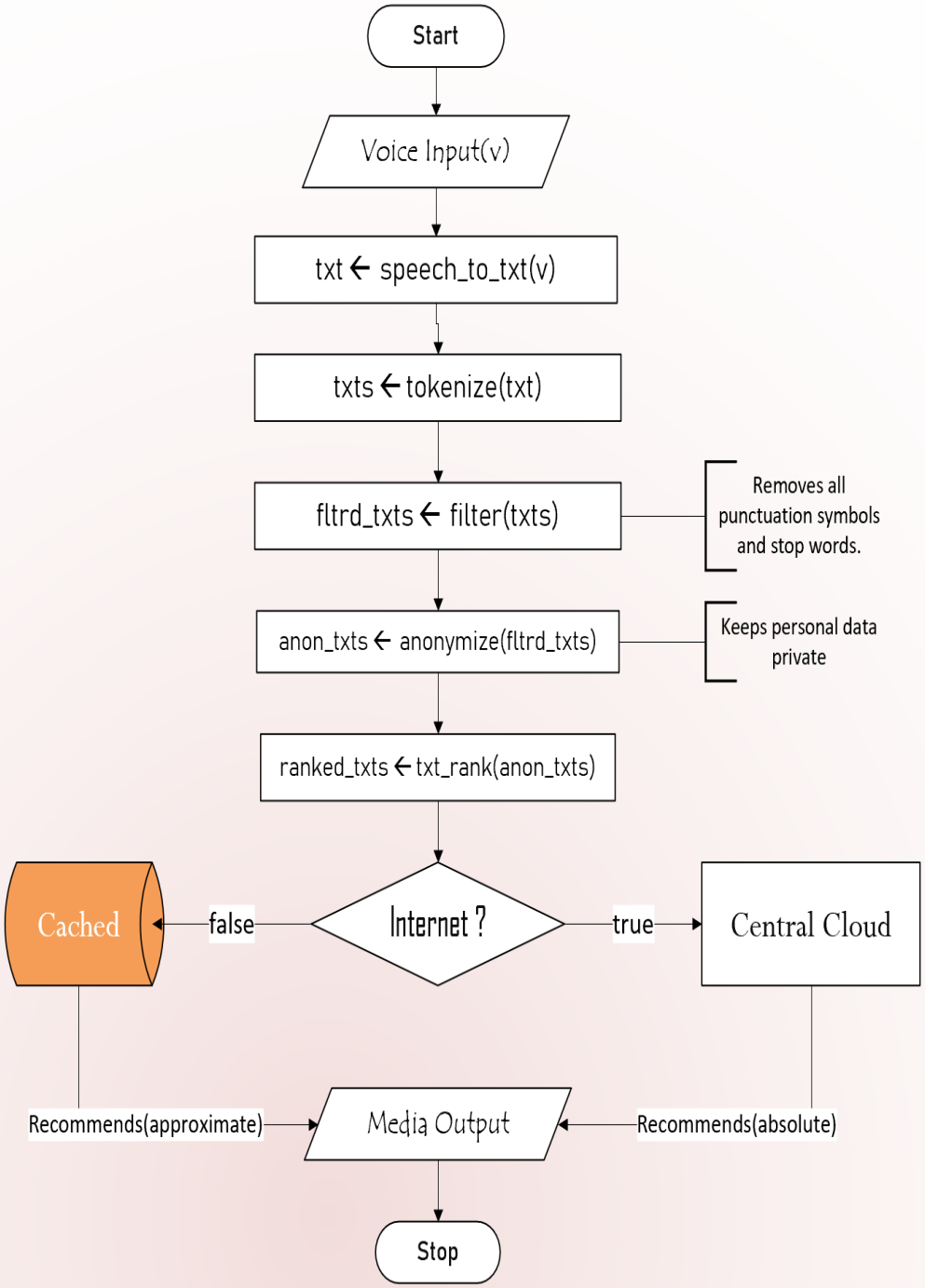
It consists of the following:

- Data collection – Listening devices, record pupils & teacher.
- Data processing – NLP model processes voices at the edge.
- Distributed ML – Periodic reports sent to the central cloud, (cc) while keeping personal data private.
- Content output – CC recommends appropriate media based on model predictions.

AI-Class Overview



AI-C Flow Chart



Open Problems And Suggestions

Problems

- The Speech To Text Conversion (STT) is done using google web speech API on the cloud. Thus, confidentiality is risked. A solution is required that will make STT to be done locally to ensure that all the confidential information within discussions remains within the edge.
- The Carnegie Mellon University, CMUsphinx API (APPENDIX II), which is an offline STT platform has a higher Word Error Rate (WER) compared to the google speech API and Microsoft speech API which are cloud based platforms. (Veton & Gamal, 2017). We experience higher errors because only US and British accents are supported, so as Africans it performed even more poorly.
- The dataset we've used is manually generated by us, thus it is limited and would have certain biases. If we can get data from the classrooms it will improve the performance of the cloud model.

SUGGESTIONS..

References

- Mihalacea, R., & P, T. (2004). *TextRank: Bringing order into Texts.* Retrieved from https://researchgate.net/pulication/200042361.
- Veton, K., & Gamal, B. (2017). Comparing Speech Recognition Systems (Microsoft API, Google. *International Journal of Engineering Research and Application*, 20-24.
- Guangming, L., Yule, X., Jiamei, W., & Zhenling, Y. (2016). Research on Text Classification Based on TextRank. *International Conference on Communications, Information Management and Network Security*.

URL Link to demonstration video of implementation

https://mega.nz/#!EQBkTKjA!Xgmch6RJQjZKr9P3maWNhC3zqQ7hntLQr2YBw5fDTo

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THANKS FOR LISTENING