
Pablo Salva-Garcia, Jose M. Alcaraz-Calero, Ricardo Marco Alaez, Enrique Chirivella-Perez, James Nightingale, Qi Wang*

Email addresses: Pablo.Salva-Garcia@uws.ac.uk, Jose.Alcaraz-Calero@uws.ac.uk, Ricardo.MarcoAlaez@uws.ac.uk, Enrique.Chirivella-Perez@uws.ac.uk, James.Nightingale@uws.ac.uk, Qi.Wang@uws.ac.uk.

*Corresponding author. Tel.: +441418483945

School of Engineering & Computing, University of the West of Scotland, Paisley PA1 2BE, United Kingdom

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ABSTRACT

Ultra-High-Definition (UHD) video applications such as streaming are envisioned as a main driver for the emerging Fifth Generation (5G) mobile networks being developed worldwide. This paper focuses on addressing a major technical challenge in meeting UHD users’ growing expectation for continuous high-quality video delivery in 5G hotspots where congestion is commonplace to occur. A novel 5G-UHD framework is proposed towards achieving adaptive video streaming in this demanding scenario to pave the way for self-optimisation oriented 5G UHD streaming. The architectural design and the video stream optimisation mechanism are described, and the system is prototyped based on a realistic virtualised 5G testbed. Empirical experiments validate the design of the framework and yield a set of insightful performance evaluation results.

1. Introduction

The next-generation, Fifth Generation (5G), mobile networks are emerging from the horizon at an accelerated rate thanks to the intensified global actions on 5G research, development and standardisation in the last few years. In Europe, the European Union (EU) Commission and 5G stakeholders such as telecommunication operators, vendors, service providers, Small and Medium-sized Enterprises (SMEs) and academia have initiated the 5G Infrastructure Public Private Partnership (5G PPP) to advance 5G strategic development in Europe and beyond, in collaboration with other major global 5G initiatives [1]. 5G PPP is coordinating 19 Phase 1 5G projects [2], which were launched in 2015 and cover a full range of key 5G technological areas from new radio spectrum to improved user-facing services to fulfil a set of 5G Key Performance Indicators (KPIs) (e.g., [3][4]) and visions (e.g., [5][6]).

Among these 19 ongoing 5G PPP projects, the SELFNET project [7][8] focuses on cognitive network management taking a self-organising approach for intelligently managing virtualised 5G networks and services. A primary use case of SELFNET is self-optimisation of Ultra-High-
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