Dept of Computer Science and Information Systems

BSc Final Year Project Form (2015/2016)

1. Proposal

The student should complete parts 1(a), 1(b) and 1(c) below, and then agree the maximum pocket values with the supervisor and put these in part 2(a) below. An electronic version of this form should be uploaded to the Final Year Project page on Moodle no later than **Monday 2nd November 2015**.

(a) Student details

Name:	**Project Type 2 (BUCI025S6)**
Email	

(b) Project details

Title:
Prioritized Internet - Study of Improving Real Time Communications experience across public internet network.

Objectives:

Primary project objective is to assess possibility and recommend the most efficient method of introducing Real Time Communications (RTC) traffic prioritization (QoS) across public internet networks.

Project will:

1. Research current state of QoS on public internet
2. Research of motivational factors of participants of internet infrastructure and services to implement/not implement QoS across their networks and interconnections
3. Research of internet community's needs, want's and don't want's as well as current user experience in both B2B and B2C markets
4. Analyse traffic prioritization protocols to assess their feasibility to perform the QoS network function on large scale.
5. Research governance/enforcement models and assess the benefits and risks associated with each if it's to be used to govern/enforce QoS standards.
6. Conclude whether QoS can and if so – how can it be introduced onto global internet network whilst satisfying infrastructure owner's, content providers and consumers objectives and motivations.

Title:
Prioritized Internet - Study of Improving Real Time Communications experience across public internet network.

Description:

Public internet is defined by some as the "Wild West" of data networks where data packets are not classified nor prioritised based in it's type, importance or resistance to network inefficiencies.

Main inefficiencies of data networks are: latency, jitter (variation in latency), packet loss and limited throughput.

All content-bearing traffic can be classified into three types:

1. Standard (Websites, E-Mail, File Transfer etc),
2. Streaming (YouTube, Spotify, Internet Radio, Broadcasting etc.)
3. Real-Time (Skype, VoIP, Videoconferencing etc.)

The quality of experience when using Real-Time traffic due to it's nature is heavily dependant on the performance of the data network. If type 1 and 2 traffic has technologies such as TCP to correct packet loss or jitter, and type 2 traffic almost always uses buffering to correct all latency, jitter and packet loss, type 3 traffic cannot utilise these protocols as they cannot perform these corrections in real-time and additional time delay introduced would deem the real-time protocol unusable.

Real-Time protocols, Voice over IP to mention one, are becoming increasingly popular in both B2C and B2B markets. Businesses that take great care in ensuring quality of experience are forced to introduce private controlled networks such as MPLS, or otherwise face risks of poor or even unacceptable user experience. Only way to minimise the risks is to prioritise and control the Real-Time traffic end-to-end.

Private controlled data networks that implement traffic prioritisation technologies are proven to work well, however only if both endpoints or central infrastructure are located within the same network. Also these networks are out of reach of consumers in B2C market.

In recent years a trend has emerged to provide real-time services over public internet with infrastructures based in *public cloud* (Skype for Business to mention one), therefore losing end-to-end control and with increased traffic and congestion on the internet (Ericsson Mobility report, Talk Talk traffic analysis) the risk of poor experience is unavoidable.

To address this emerging problem, I would like to research and analyse the reasons why traffic prioritisation technologies have not yet been implemented on public internet. Based on the research and analysis I would like to provide conclusive recommendation to the internet community on best organisational and technical approach to implement sustainable solution to this problem if one can be found.

Though my connections in Telecommunications sector I have access to:

- Multiple senior c-level individuals and their teams at Tier 1, 2 and 3 Internet Service Providers (ISP).
- Multiple Real-Time content (VoIP in particular) providers
- Base of 500+ UK Small and Medium Enterprise management teams. There's a potential for this number to expand shall the research will be sponsored by the ISP's as well.

Also I have access to tools and networks to perform surveys in consumer market.

Method:

First Research Round

Project research will be based on following information:

1. Qualitative data obtained during first interviews with senior management (non-technical) of two or three Internet Service Providers and one or two Real-Time content providers.
   Main objectives are to obtain information on:
   a) Current state of traffic prioritisation or shaping within their internet or internet transit networks or interconnections to other networks or IXP.
   b) Any history of consideration of implementation of QoS on their networks and outcomes.
   c) Motivational, organisational or commercial factors driving decisions for or against implementation of QoS
2. Quantitative data obtained from online surveys in both B2C and B2B market detailing:
   a) Quality of Experience when using Real-Time applications (Skype, VoIP, Hangout)
   b) Level of understanding the importance of traffic prioritisation.
   c) Whether quality of service delivery would affect buying decision.

The results of the two data sets would then be used to:

A. Draw conclusions on first three objectives as defined above
B. Analyse correlation of network supplier's and consumer's experience, motivations and requirements.

Second Research Round

In addition, two additional research activities will be carried out:

1. Analysis of openly defined traffic prioritisation protocols. Feasibility of use of these protocols in public internet networks as well as support of these protocols by ISP equipment manufacturers. Information is widely available online from IETF and manufacturers websites. (objective 4)
2. Research and analysis of standards governance and enforcement models ranging from Self-governed and enforced to strictly licenced. Assessment of feasibility and risks and benefits associated with each of the models. (objective 5)

Findings from results drawn in first round combined with findings in additional two research activities would then be analysed to identify any limitations or challenges that would work for or against implementation of the QoS concept.

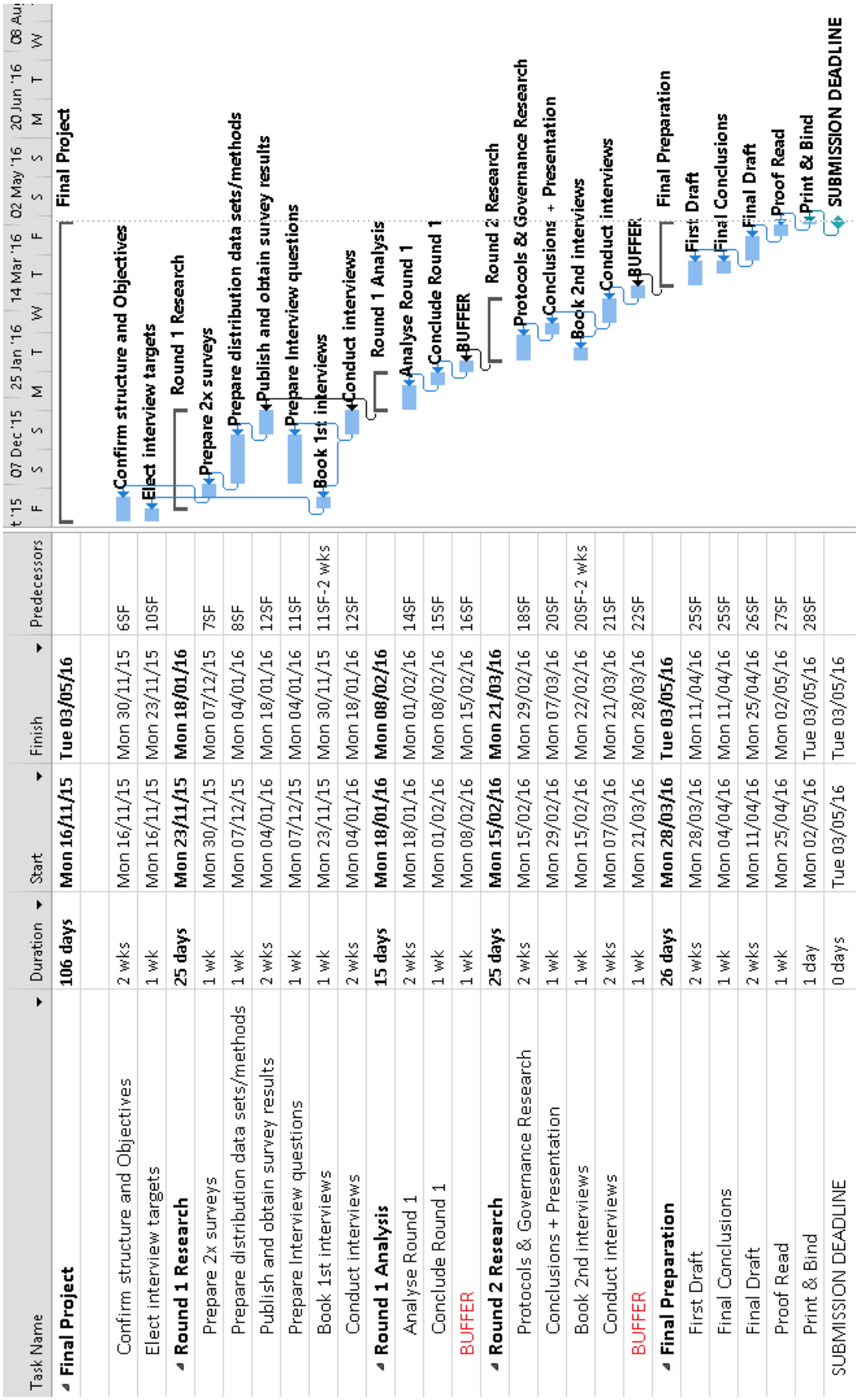
Once the state of feasibility is assessed, it is to be presented to the senior management (technical and non-technical) of ISP's and real-time content providers during second interview to obtain direct feedback.

Based on the findings and direct feedback final conclusions will be drawn and presented.

Risks

There's a risk that after round one of research no feasible route forward is found. Most likely cause would be ISP's clash of interests and therefore strong motivations not to consider concept of QoS over internet altogether. Shall this risk materialise, round two of research would be irrelevant, and I would endeavour to repeat the interviews with more Tier 1 and 2 ISP's to confirm whether it is a common theme in global ISP market.

Work plan / Timeline



Task Name	Duration	Start	Finish	Predecessors
Final Project	**106 days**	**Mon 16/11/15**	**Tue 03/05/16**	
Confirm structure and Objectives	2 wks	Mon 16/11/15	Mon 30/11/15	6SF
Elect interview targets	1 wk	Mon 16/11/15	Mon 23/11/15	10SF
Round 1 Research	**25 days**	**Mon 23/11/15**	**Mon 18/01/16**	
Prepare 2x surveys	1 wk	Mon 30/11/15	Mon 07/12/15	7SF
Prepare distribution data sets/methods	1 wk	Mon 07/12/15	Mon 04/01/16	8SF
Publish and obtain survey results	2 wks	Mon 04/01/16	Mon 18/01/16	12SF
Prepare Interview questions	1 wk	Mon 07/12/15	Mon 04/01/16	11SF
Book 1st interviews	1 wk	Mon 23/11/15	Mon 30/11/15	11SF-2 wks
Conduct interviews	2 wks	Mon 04/01/16	Mon 18/01/16	12SF
Round 1 Analysis	**15 days**	**Mon 18/01/16**	**Mon 08/02/16**	
Analyse Round 1	2 wks	Mon 18/01/16	Mon 01/02/16	14SF
Conclude Round 1	1 wk	Mon 01/02/16	Mon 08/02/16	15SF
BUFFER	1 wk	Mon 08/02/16	Mon 15/02/16	16SF
Round 2 Research	**25 days**	**Mon 15/02/16**	**Mon 21/03/16**	
Protocols & Governance Research	2 wks	Mon 15/02/16	Mon 29/02/16	18SF
Conclusions + Presentation	1 wk	Mon 29/02/16	Mon 07/03/16	20SF
Book 2nd interviews	1 wk	Mon 15/02/16	Mon 22/02/16	20SF-2 wks
Conduct interviews	2 wks	Mon 07/03/16	Mon 21/03/16	21SF
BUFFER	1 wk	Mon 21/03/16	Mon 28/03/16	22SF
Final Preparation	**26 days**	**Mon 28/03/16**	**Tue 03/05/16**	
First Draft	2 wks	Mon 28/03/16	Mon 11/04/16	25SF
Final Conclusions	1 wk	Mon 04/04/16	Mon 11/04/16	25SF
Final Draft	2 wks	Mon 11/04/16	Mon 25/04/16	26SF
Proof Read	1 wk	Mon 25/04/16	Mon 02/05/16	27SF
Print & Bind	1 day	Mon 02/05/16	Tue 03/05/16	28SF
SUBMISSION DEADLINE	0 days	Tue 03/05/16	Tue 03/05/16	

Title:
Prioritized Internet - Study of Improving Real Time Communications experience across public internet network.
College equipment required:
none

(c) Supervisor details

Name:	**Date agreed: Oct 2015**