TÉCNICO LISBOA

This is the Title of the Thesis and it is a very Big Title covering More than One Line

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Thesis to obtain the Master of Science Degree in

Computer Science and Engineering

Supervisors: Luis Manuel Antunes Veiga
Prof. Name of the Co-Supervisor

Examination Committee

Chairperson: Prof. Name of the Chairperson
Supervisor: Luis Manuel Antunes Veiga
Member of the Committee: Prof. Name of First Committee Member

Month 20XX

Declaration
I declare that this document is an original work of my own authorship and that it fulfills all the requirements of the Code of Conduct and Good Practices of the Universidade de Lisboa.

Acknowledgments

I would like to thank my parents for their friendship, encouragement and caring over all these years, for always being there for me through thick and thin and without whom this project would not be possible. I would also like to thank my grandparents, aunts, uncles and cousins for their understanding and support throughout all these years.

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I would also like to acknowledge my dissertation supervisors Prof. Some Name and Prof. Some Other Name for their insight, support and sharing of knowledge that has made this Thesis possible.

Last but not least, to all my friends and colleagues that helped me grow as a person and were always there for me during the good and bad times in my life. Thank you.

To each and every one of you – Thank you.

Abstract

Nulla facilisi. In vel sem. Morbi id urna in diam dignissim feugiat. Proin molestie tortor eu velit. Aliquam erat volutpat. Nullam ultrices, diam tempus vulputate egestas, eros pede varius leo, sed imperdiet lectus est ornare odio. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Proin consectetuer velit in dui. Phasellus wisi purus, interdum vitae, rutrum accumsan, viverra in, velit. Sed enim risus, congue non, tristique in, commodo eu, metus. Aenean tortor mi, imperdiet id, gravida eu, posuere eu, felis. Mauris sollicitudin, turpis in hendrerit sodales, lectus ipsum pellentesque ligula, sit amet scelerisque urna nibh ut arcu. Aliquam in lacus. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Nulla placerat aliquam wisi. Mauris viverra odio. Quisque fermentum pulvinar odio. Proin posuere est vitae ligula. Etiam euismod. Cras a eros.

Keywords

Maecenas tempus dictum libero; Donec non tortor in arcu mollis feugiat;Cras rutrum pulvinar tellus.

Resumo

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Palavras Chave

Colaborativo; Codificaçãoo; Conteúdo Multimédia; Comunicação;

Contents

List of Figures

List of Tables

List of Algorithms

Listings

Acronyms

AVC	Advanced Video Coding
CC	Cloud Computing
CDN	Content Distribution Network
CPU	Central Processing Unit
DASH	Dynamic Adaptive Streaming over HTTP
GPRS	General Packet Radio Service
HD	High Definition
HTTP	Hypertext Transfer Protocol
LAN	Local Area Network
LTE	Long Term Evolution
OS	Operating System
SD	Standard Definition
SVC	Scalable Video Coding
UI	User Interface
UMTS	Universal Mobile Telecommunication System
WLAN	Wireless Local Area Network
WWAN	Wireless Wide Area Network

1

Introduction

Contents

Rui Cruz: The examples of techniques, tools, and packages along the document are for you to get familiarized with them. It is advisable to preserve those examples of usage, for reference, by moving the respective blocks of text to the last Chapter of this template (or to a Chapter file that you know you will not use), until you finish your document.

Example of using package `todo` for notes of authors. In this case the author Johnny is calling the attention for something at the specific place in the text.

Johnny pointing out to the place

In this other case, another co-author is commenting on something inline.

Manuel: Inline comment or Note. It can be an extract of some recommended text. “Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Morbi commodo, ipsum sed pharetra gravida, orci magna rhoncus neque, id pulvinar odio lorem non turpis. Nullam sit amet enim. Suspendisse id velit vitae ligula volutpat condimentum. Aliquam erat volutpat. Sed quis velit. Nulla facilisi. Nulla libero. Vivamus pharetra posuere sapien.”

In this other case, another co-author is making a note about the citation for missing some bibliographic record [1–3].

Pete

You should cite also Pellentesque:2014

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Rui Cruz: notice here how to enquote correctly

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This is an example of Tracking ChangesXangesJO (in this case a replacement) by different authors in the document. The Text can additionally be modified by addingPT new text or by deleting wrongMN inadequate text. Author can manipulate changes introduced by each author, as adequateMN intrroduced by other authorsPT.

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1.1 Morbi ipsum ipsum

Pellentesque nibh felis, eleifend id, commodo in, interdum vitae, leo. Praesent mauris cro:SDStandard Definition (SD) and cro:HDHigh Definition (HD) volutpat ligula eget enim cro:WLANWireless Local Area Networks (WLANs) and 3G/4G cro:WWANWireless Wide Area Networks (WWANs).

RC: use of ACRONYMS that are defined in file "Chapters/Thesis-MSc-Aconyms.tex"

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Aliquam erat WLAN volutpat cro:CPUCentral Processing Unit (CPU) mauris nulla fermentum est cro:OSOperating System (OS) Fusce magna mi, porttitor quis, convallis eget, sodales ac, urna. Pellentesque nibh felis, eleifend id, commodo in, interdum vitae, leo. Praesent eu elit. Ut eu ligula. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Maecenas elementum augue nec nisl. Please notice the use of automatic referencig to objects such as Figures, Tables, equations, Algorithms, sections of a document, etc. by using the command `\Cref{ref}` as in this case pointing to Figure 1.1.

RC
the correct Name of the float object, in this case a Figure, is determined by the system

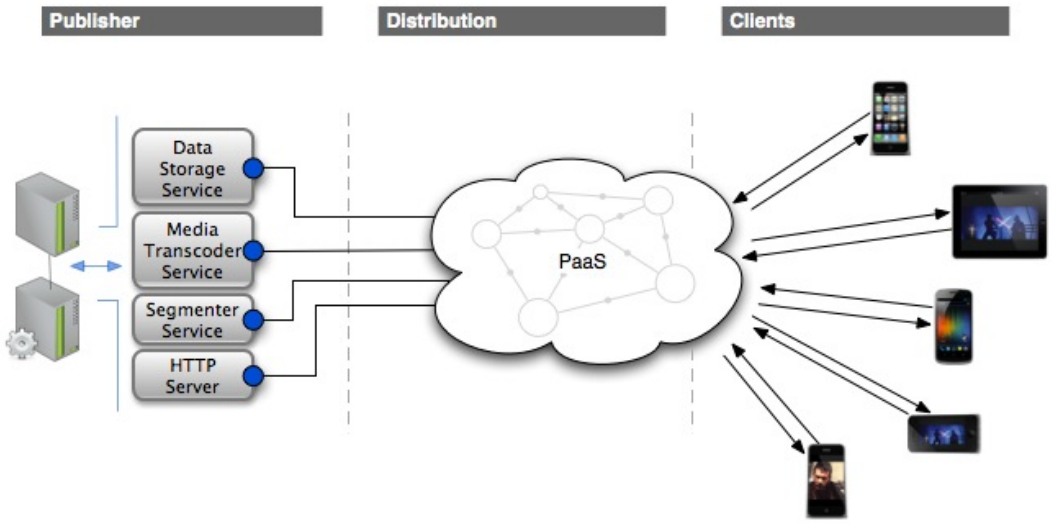

Figure 1.1: Ecosystem

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You can use in-paragraph lists with this construct for: (a) first case; (b) second case; and (c) third case, making the text organized and fluid.

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RC example of use of Glossaries

Notice that mathematics makes extensive use of Formulas which are particularly well rendered in documents produced with LaTeX.

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1.2 Organization of the Document

RC references to doc sections/chapters are automatic

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2

This is the Second Chapter

Contents

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2.1 Traditional Streaming Technologies

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Sed pulvinar, “felis id consectetuer” malesuada, enim nisl mattis elit, a facilisis tortor nibh quis leo Table 2.1.

Table 2.1: Streaming Technologies Comparison

	Dynamic Streaming	Smooth Streaming	HLS
Streaming Protocol	RTMP	HTTP	HTTP
Video Codec	H.264, VP6	H.264	H.264
Audio Codec	AAC, MP3	WMA, AAC	AAC, MP3
Container Format	MP4, FLV,	MP4	MPEG2-TS
iOS	NO	YES	YES
Android	NO	YES	YES

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Table 2.2: A nice Spreadsheet using package “spreadtab”. Notice the calculations.

22	54	76
43	65	108
49	37	86
114	156	270

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Table 2.3: Comparison between today's and target Architectures of Telcos

Today		Target	
Rigid	Each evolutionary requirement involves development of multiple components, interfaces, platforms,etc.	Flexible	It is possible to modify or add new functionalities rapidly.
Slow	Development of a new application takes months or years.	Fast	Development of a new application takes weeks instead of months or years.
Closed	Limited integration with external environments.	Open	It is simple to integrate internal, applications with external entities.
Complex	Heterogeneous technologies, obsolescence, lack,of standards, high redundancy.	Standardised	Use of homogeneous architectural models.
Expensive	High Capex (for new service development) and,high,Opex (to ensure running of IT).	Cost-Effective	Capex and Opex are optimised.

3

This is the Third Chapter

Contents

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3.1 Architecture Design

Example of a Flowchart for a system, in Figure 3.1, created with `https://app.diagrams.net` and then exported as "PDF" crop format (a true vector image that can be scaled to no end, with no pixels or distortion).

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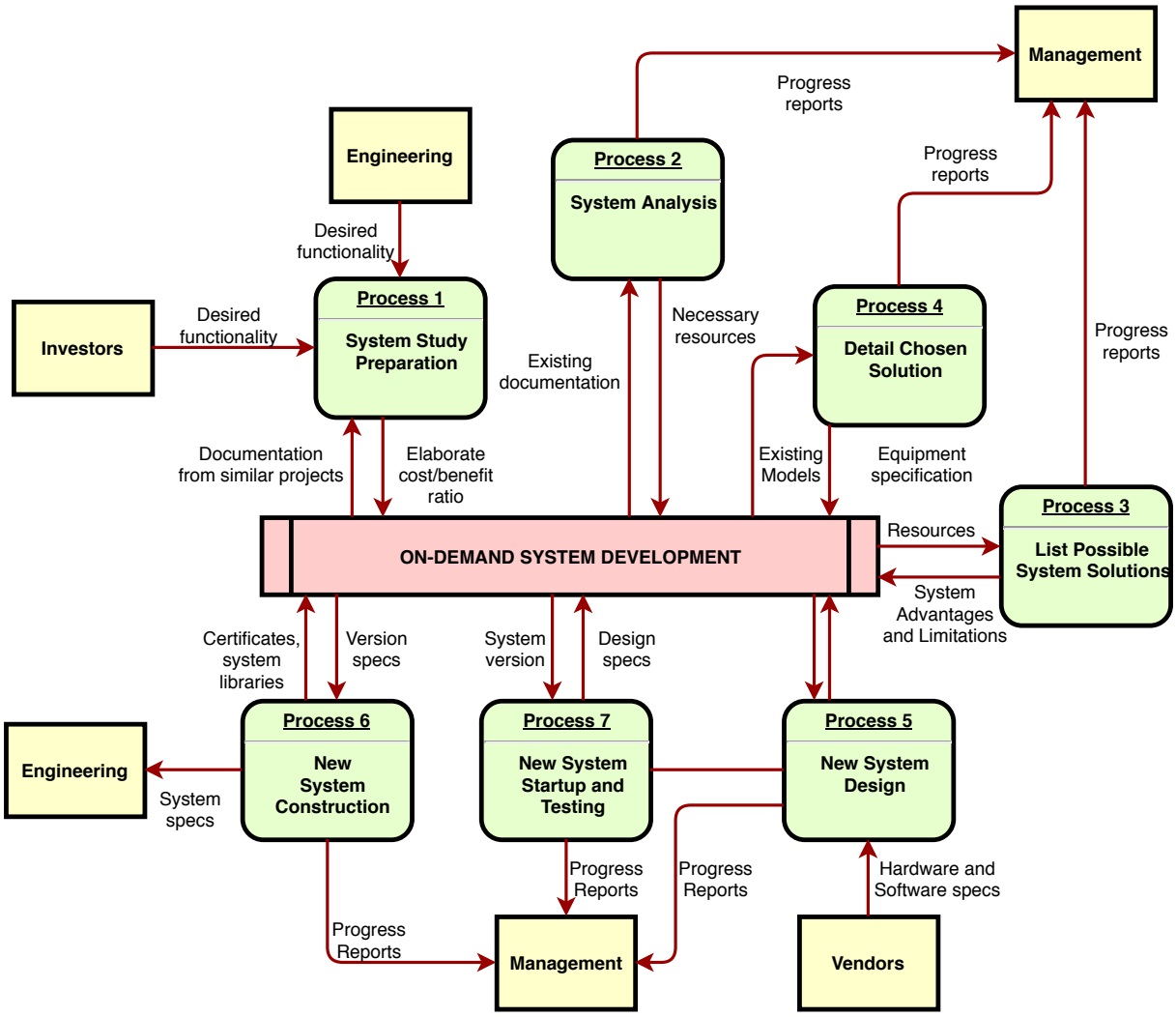

Figure 3.1: System Processes

ipsum et nulla tristique facilisis. Donec eget sem sit amet ligula viverra gravida. Etiam vehicula urna vel turpis.

And here another diagram of a network (Figure 3.2) created with `https://app.diagrams.net` and then exported as “PDF” crop format.

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Web-streaming: The client application should support streaming media using cro:HTTPHypertext Transfer Protocol (HTTP) protocols.

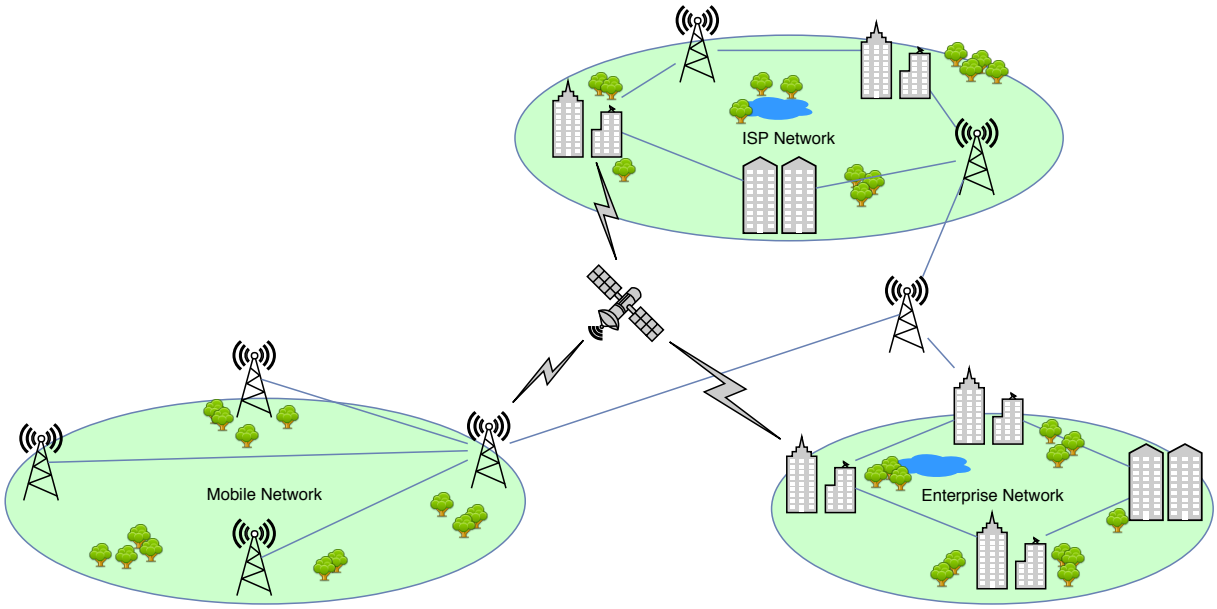

Figure 3.2: Network Diagram

Multi-source streaming: The client application should support multi-source streaming media, i.e., "simultaneous" streaming of media content components from a network, supported/complemented by cro:CDNContent Distribution Network (CDN)/cro:CCCloud Computing (CC) services.

Support content Metadata Description: The client application should support content metadata description in a format similar or compliant with MPEG cro:DASHDynamic Adaptive Streaming over HTTP (DASH) [11].

Scalable and Adaptive Media Contents: The system should support on-demand streaming of scalable and adaptive contents based on SVC.

Heterogenous End-User Devices: The client application should be compatible with current and future generations of end-user devices form factors, irrespective of their performance, screen size and resolution.

Access Network independency: The solution should provide the expected service over different types of access networks supported by the end-user devices, such as Wireless cro:LANLocal Area Networks (LANs) (IEEE 802.11) or cellular data networks such as cro:GPRSGeneral Packet Radio Service (GPRS), cro:UMTSUniversal Mobile Telecommunication System (UMTS), cro:LTELong Term Evolution (LTE), etc.

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3.2 Architecture Design Requirements

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RC

A listing for XML code, with syntax highlighting

Listing 3.1: Example of a MPD file.

```
<?xml version="1.0" encoding="UTF-8"?>
<StreamInfo version="2.0">
    <Clip duration="PT01M0.00S">
        <BaseURL>videos/</BaseURL>
        <Description>svc_1</Description>
        <Representation mimeType="video/SVC" codecs="svc" frameRate="30.00" bandwidth="401.90"
            width="176" height="144" id="L0">
            <BaseURL>svc_1/</BaseURL>
            <SegmentInfo from="0" to="11" duration="PT5.00S">
                <BaseURL>svc_1-L0-</BaseURL>
            </SegmentInfo>
        </Representation>
        <Representation mimeType="video/SVC" codecs="svc" frameRate="30.00"
             bandwidth="1322.60"
            width="352" height="288" id="L1">
            <BaseURL>svc_1/</BaseURL>
            <SegmentInfo from="0" to="11" duration="PT5.00S">
                <BaseURL>svc_1-L1-</BaseURL>
            </SegmentInfo>
        </Representation>
    </Clip>
</StreamInfo>
```

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4

This is the Fourth Chapter

Contents

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4.1 Development Process

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- Technology Research and Related Works
- Requirements Gathering and Study
- Design of the Architecture
- Implementation Process
- Testing and Functional Validation

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4.2 Development Environment

Cras sed ante. Phasellus in massa. Curabitur dolor eros, gravida et, hendrerit ac, cursus non, massa. Aliquam lorem. In hac habitasse platea dictumst. Cras eu mauris Algorithm 4.1. Quisque lacus. Donec ipsum. Nullam vitae sem at nunc pharetra ultricies. Vivamus elit eros, ullamcorper a, adipiscing sit amet, porttitor ut, nibh.

RC

Notice the reference to the Algorithm construct

Maecenas adipiscing mollis massa. Nunc ut dui eget nulla venenatis aliquet. Sed luctus posuere justo. Cras vehicula varius turpis. Vivamus eros metus, tristique sit amet, molestie dignissim, malesuada et, urna..

Algorithm 4.1: Time Control Strategy

begin

$nextBitrate \longleftarrow nextDownloadLevel$
$nextBitrate \longleftarrow GetNextBitrate()$
$cpuLoad \longleftarrow GetCpuLoad()$
$bitrateDelta \longleftarrow getBitrateDelta(currentBitrate, nextBitrate)$

if $\underline{bitrateDelta > maxThreshold}$ **then**
  $SetBitrate(nextBitrate)$

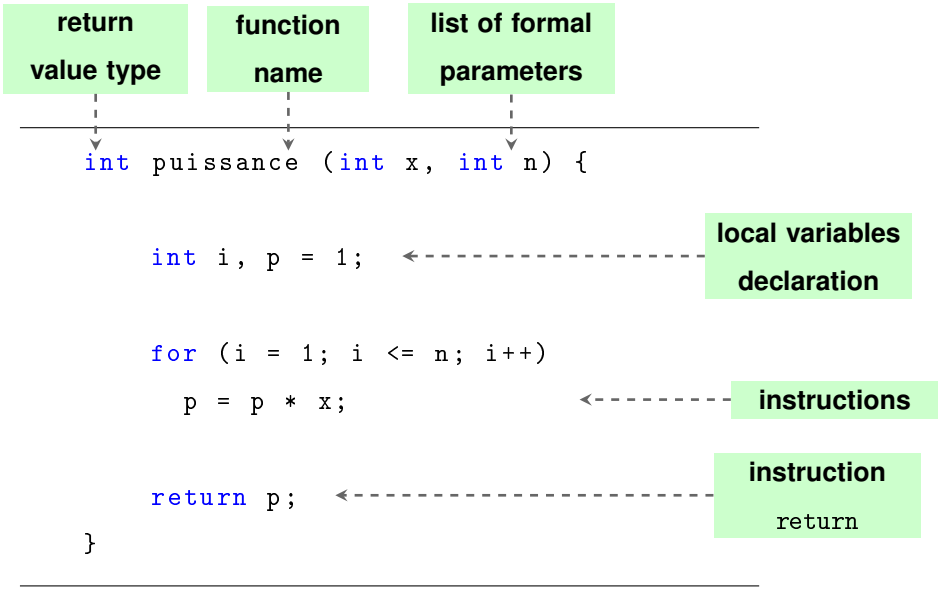
if $\underline{minThreshold < bitrateDelta < maxThreshold}$ **and** $\underline{numAttemps < 2}$ **then**
  $numAttemps \longleftarrow numAttemps + 1$
else if $\underline{minThreshold < bitrateDelta < maxThreshold}$ **and** $\underline{numAttemps = 2}$ **then**
  $numAttemps \longleftarrow 0$
else
  $SetBitrate(nextBitrate)$
if $\underline{0 < bitrateDelta < minThreshold}$ **and** $\underline{numAttemps < 3}$ **then**
  $numAttemps \longleftarrow numAttemps + 1$
else if $\underline{0 < bitrateDelta < minThreshold}$ **and** $\underline{numAttemps = 3}$ **then**
  $SetBitrate(nextBitrate)$

4.3 Client Application

Cras sed ante. Phasellus in massa. Curabitur dolor eros, gravida et, hendrerit ac, cursus non, massa. Aliquam lorem. In hac habitasse platea dictumst. Cras eu mauris. Quisque lacus. Donec ipsum. Nullam vitae sem at nunc pharetra ultricies.

Vivamus elit eros, ullamcorper a, adipiscing sit amet, porttitor ut, nibh. Maecenas adipiscing mollis massa. Nunc ut dui eget nulla venenatis aliquet. Sed luctus posuere justo. Cras vehicula varius turpis. Vivamus eros metus, tristique sit amet, molestie dignissim, malesuada et, urna.

Quisque lacus. Donec ipsum. Nullam vitae sem at nunc pharetra ultricies. Cras vehicula varius turpis.



Listing 4.1: A listing with a Tikz picture overlayed

And here another method (Listing 4.1) for mixing (overlay) a picture with a listing of code.

4.3.1 User Interface

Donec semper turpis sed diam. Sed consequat ligula nec tortor. Integer eget sem. Ut vitae enim eu est vehicula gravida. Morbi ipsum ipsum, porta nec, tempor id, auctor vitae, purus. Pellentesque neque. Nulla luctus erat vitae libero. Integer nec enim. Phasellus aliquam enim et tortor. Quisque aliquet, quam elementum condimentum feugiat, tellus odio consectetuer wisi, vel nonummy sem neque in elit. Curabitur eleifend wisi iaculis ipsum. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. In non velit non ligula laoreet ultrices. Praesent ultricies facilisis nisl. Vivamus luctus elit sit amet mi. Phasellus pellentesque, erat eget elementum volutpat, dolor nisl porta neque, vitae sodales ipsum nibh in ligula. Maecenas mattis pulvinar diam. Curabitur sed leo..

Cras eu mauris. Quisque lacus. Donec ipsum. Nullam vitae sem at nunc pharetra ultricies. Vivamus elit eros, ullamcorper a, adipiscing sit amet, porttitor ut, nibh. Maecenas adipiscing mollis massa. Nunc ut dui eget nulla venenatis aliquet. Sed luctus posuere justo. Cras vehicula varius turpis.

4.3.2 Vivamus luctus elit sit amet mi

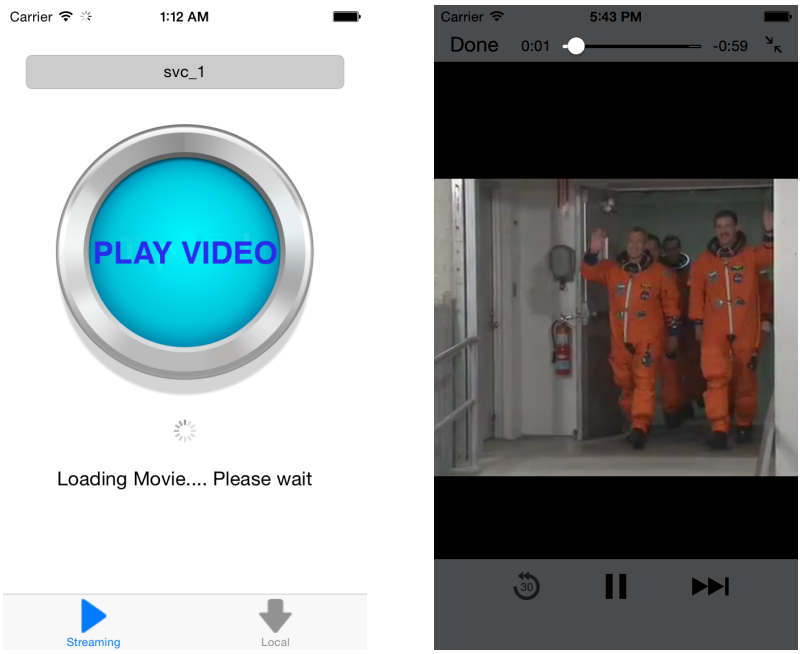
Nulla facilisi. In vel sem. Morbi id urna in diam dignissim feugiat. Proin molestie tortor eu velit. Aliquam erat volutpat. Nullam ultrices, diam tempus vulputate egestas, eros pede varius leo, sed imperdiet lectus est ornare odio. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Proin consectetuer velit in dui. Phasellus wisi purus, interdum vitae, rutrum accumsan, viverra in, velit. Sed enim risus, congue non, tristique in, commodo eu, metus. Aenean tortor mi, imperdiet id, gravida eu, posuere eu, felis.

Mauris sollicitudin, turpis in hendrerit sodales, lectus ipsum pellentesque ligula, sit amet scelerisque

urna nibh ut arcu. Aliquam in lacus.

Figures 4.1(a) and 4.1(b) proin at eros non eros adipiscing mollis.

RC
A figure with Subfigures



(a) Media Loading Window **(b)** Play-out Session UI

Figure 4.1: Complete User Interface

Vestibulum ante ipsum primis in cro:UIUser Interface (UI) faucibus orci luctus et ultrices posuere cubilia Curae; Nulla placerat aliquam wisi. Mauris viverra odio. Quisque fermentum pulvinar odio. Proin posuere est vitae ligula. Etiam euismod. Cras a eros.

5

This is the Fifth Chapter

Contents

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Morbi commodo, ipsum sed pharetra gravida, orci magna rhoncus neque, id pulvinar odio lorem non turpis. Nullam sit amet enim. Suspendisse id velit vitae ligula volutpat condimentum. Aliquam erat volutpat. Sed quis velit. Nulla facilisi. Nulla libero. Vivamus pharetra posuere sapien. Nam consectetuer. Sed aliquam, nunc eget euismod ullamcorper, lectus nunc ullamcorper orci, fermentum bibendum enim nibh eget ipsum. Donec porttitor ligula eu dolor. Maecenas vitae nulla consequat libero cursus venenatis. Nam magna enim, accumsan eu, blandit sed, blandit a, eros.

5.1 Maecenas vitae nulla consequat

Aliquam aliquet, est a ullamcorper condimentum, tellus nulla fringilla elit, a iaculis nulla turpis sed wisi. Fusce volutpat. Etiam sodales ante id nunc. Proin ornare dignissim lacus. Nunc porttitor nunc a sem. Sed sollicitudin velit eu magna. Aliquam erat volutpat. Vivamus ornare est non wisi. Proin vel quam.

Vivamus egestas. Nunc tempor diam vehicula mauris. Nullam sapien eros Figure 5.1, facilisis vel, eleifend non, auctor dapibus, pede.

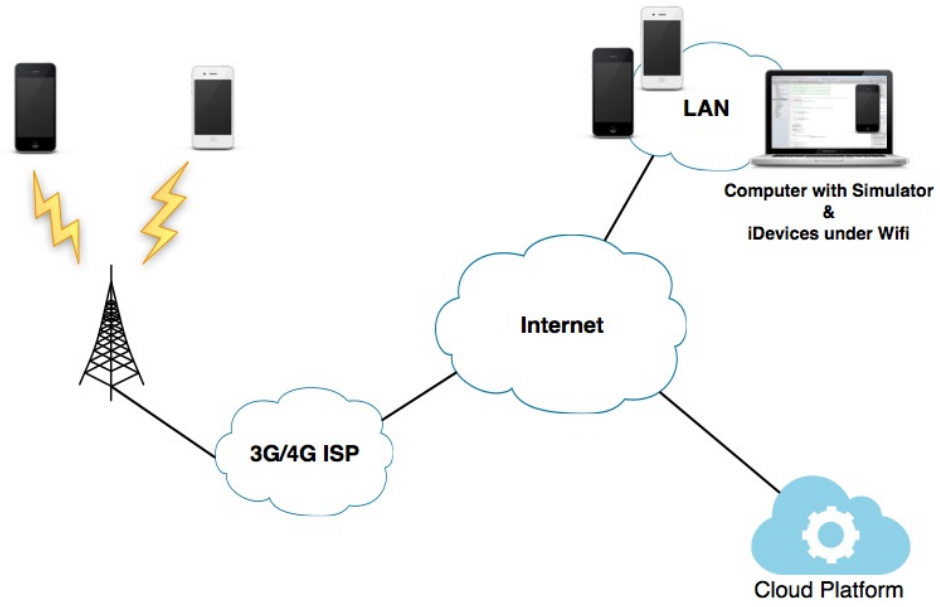


Figure 5.1: Test Environment

Aliquam aliquet, est a ullamcorper condimentum, tellus nulla fringilla elit, a iaculis nulla turpis sed wisi. Fusce volutpat. Etiam sodales ante id nunc. Proin ornare dignissim lacus. Nunc porttitor nunc a sem. Sed sollicitudin velit eu magna. Aliquam erat volutpat. Vivamus egestas. Nunc tempor diam vehicula mauris. Nullam sapien eros, facilisis vel, eleifend non, auctor dapibus, pede Table 5.1 used in the tests. The Network Link Conditioner allows to force/simulate fluctuations in fixed network segments.

Table 5.1: Network Link Conditioner Profiles

Network Profile	Bandwidth	Packets Droped	Delay
Wifi	40 mbps	0%	1 ms
3G	780 kbps	0%	100 ms
Edge	240 kbps	0%	400 ms

Aliquam aliquet, est a ullamcorper condimentum, tellus nulla fringilla elit, a iaculis nulla turpis sed wisi. Fusce volutpat. Etiam sodales ante id nunc. Proin ornare dignissim lacus. Nunc porttitor nunc a sem. Sed sollicitudin velit eu magna. Aliquam erat volutpat. Vivamus ornare est non wisi. Proin vel quam. Vivamus egestas. Nunc tempor diam vehicula mauris. Nullam sapien eros, facilisis vel, eleifend non, auctor dapibus, pede.

5.2 Proin ornare dignissim lacus

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Et “optimistic” nulla dui purus, eleifend vel, consequat non, dictum porta, nulla. Duis ante mi, laoreet ut, commodo eleifend, cursus nec, lorem. Aenean eu est. Etiam imperdiet turpis. Praesent nec augue. Curabitur ligula quam, rutrum id, tempor sed, consequat ac, dui G_j, nec ligula et lorem consequat ullamcorper p ut mauris eu mi mollis luctus j, porttitor ut, Equation (5.1), uctus posuere justo:

N_j Is the number of times peer j has been optimistically unchoked.

n_j Among the N_j unchokes, the number of times that peer j responded with unchoke or supplied segments to peer p.

$C_{r[j]}$ The cooperation ratio of peer j. If peer j never supplied peer p, the information of $C_{r[j]}$ may not be available.

$C_{r(max)}$ The maximum cooperation ratio of peer p’s neighbors, i.e., $C_{r(max)} = max(C_r)$.

$$G_j = \begin{cases} \dfrac{n_j C_{r[j]}}{N_j} & \text{if } n_j > 0 \\ \dfrac{C_{r(max)}}{N_j + 1} & \text{if } n_j = 0 \end{cases} \tag{5.1}$$

Cursus $C_{r(max)}$ conubia nostra, per inceptos hymenaeos j gadipiscing mollis massa $N_j = 0$, unc ut dui eget nulla venenatis aliquet $G_j = C_{r(max)}$.

Vestibulum accumsan eros nec magna. Vestibulum vitae dui. Vestibulum nec ligula et lorem consequat ullamcorper. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Phasellus eget nisl ut elit porta ullamcorper. Maecenas tincidunt velit quis orci. Sed in dui. Nullam ut mauris eu mi mollis luctus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Sed cursus cursus velit. Sed a massa.

Both Figures 5.2(a) and 5.2(b) Phasellus eget nisl ut elit porta “perfect” tincidunt. Class aptent taciti sociosqu ad litora torquent per conubia nostra.

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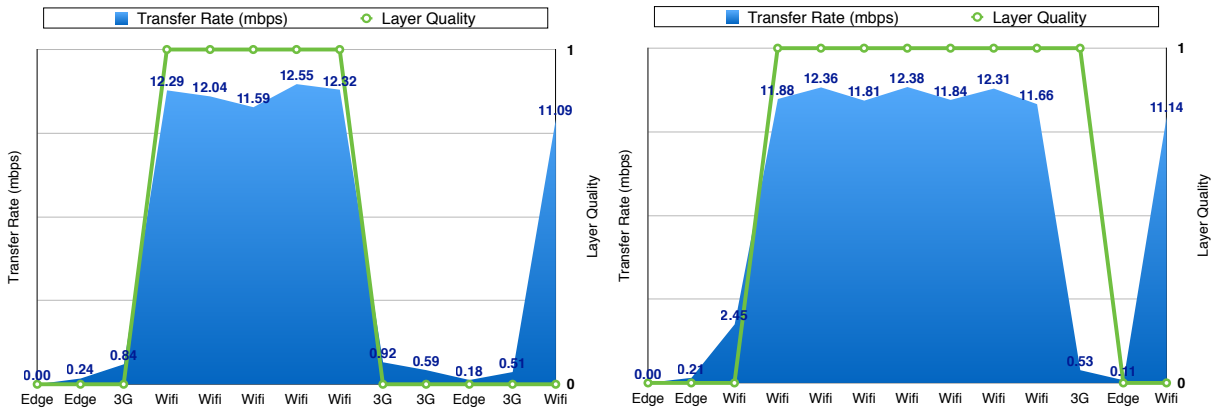

(a) Adaptation System Test 4

(b) Adaptation System Test 5

Figure 5.2: Adaptation System Behavior Test

Sed luctus posuere justo. Cras vehicula varius turpis. Vivamus eros metus, tristique sit amet, molestie dignissim, malesuada et, urna.

6

Conclusion

Contents

Pellentesque vel dui sed orci faucibus iaculis. Suspendisse dictum magna id purus tincidunt rutrum. Nulla congue. Vivamus sit amet lorem posuere dui vulputate ornare. Phasellus mattis sollicitudin ligula. Duis dignissim felis et urna. Integer adipiscing congue metus.

Rui Cruz
You should always start a Chapter with an introductory text

6.1 Conclusions

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6.2 System Limitations and Future Work

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Sed sollicitudin velit eu magna. Aliquam erat volutpat. Vivamus ornare est non wisi. Proin vel quam. Vivamus egestas. Nunc tempor diam vehicula mauris. Nullam sapien eros, facilisis vel, eleifend non, auctor dapibus, pede.

Bibliography

[1] Apple, *HTTP Live Streaming Overview*, Apple Inc., 1 Infinite Loop, Cupertino, CA 95014, 408-996-1010 U.S., 2011. [Online]. Available: https://developer.apple.com/library/ios/documentation/networkinginternet/conceptual/streamingmediaguide/StreamingMediaGuide.pdf

[2] Adobe HTTP Dynamic Streaming. [Online]. Available: http://www.adobe.com/products/hds-dynamic-streaming.html

[3] Z. Alex. ISS Smooth Streaming Technical Overview. [Online]. Available: http://download.microsoft.com/download/4/2/4/4247C3AA-7105-4764-A8F9-321CB6C765EB/IIS_Smooth_Streaming_Technical_Overview.pdf

[4] Fraunhofer Heinrich-Hertz-Institute, "SVC: Scalable Extension of H.264/AVC," 2013. [Online]. Available: http://www.hhi.fraunhofer.de/de/kompetenzfelder/image-processing/research-groups/image-video-coding/scalable-video-coding/svc-scalable-extension-of-h264avc.html

[5] ISO/IEC, "Information technology – Coding of audio-visual objects – Part 10: Advanced Video Coding," International Organization for Standardization/International Electrotechnical Commission, International Standard ISO/IEC 14496-10:2012, Oct. 2012.

[6] B. MacAulay, A. Felts and Y. Fisher, "IP Streaming of MPEG-4 Native RTP vs MPEG-2 Transport Stream," WHITEPAPER, October 2005. [Online]. Available: http://www.envivio.com/files/white-papers/RTPvsTS-v4.pdf

[7] H. Schwarz, D. Marpe, and T. Wiegand, "Overview of the Scalable Video Coding Extension of the H.264/AVC Standard," *Circuits and Systems for Video Technology, IEEE Transactions on*, vol. 17, no. 9, pp. 1103–1120, 2007.

[8] J. Bankoski, J. Salonen, P. Wilins, and Y. Xu, "VP8 Data Format and Decoding Guide," RFC 6386, IETF, RFC 6386, November 2011. [Online]. Available: http://tools.ietf.org/html/rfc6386

[9] Y.-H. Chiang, P. Huang, and H. Chen, "SVC or MDC? That's the question," in *Embedded Systems for Real-Time Multimedia (ESTIMedia), 2011 9th IEEE Symposium on*, 2011, pp. 76–82.

[10] P. Moscoso, “Interactive Internet TV Architecture Based on Scalable Video Coding,” Master’s thesis, Instituto Superior Técnico, May 2011.

[11] ISO/IEC, “Information technology – Dynamic adaptive streaming over HTTP (DASH) – Part 1: Media presentation description and segment formats,” International Organization for Standardization/International Electrotechnical Commission, International Standard ISO/IEC FCD 23009-1:2012, Apr. 2012.

A

Code of Project

Nulla dui purus, eleifend vel, consequat non, dictum porta, nulla. Duis ante mi, laoreet ut, commodo eleifend, cursus nec, lorem. Aenean eu est. Etiam imperdiet turpis. Praesent nec augue. Curabitur ligula quam, rutrum id, tempor sed, consequat ac, dui. Vestibulum accumsan eros nec magna. Vestibulum vitae dui. Vestibulum nec ligula et lorem consequat ullamcorper.

Listing A.1: Example of a XML file.

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <StreamInfo version="2.0">
3      <Clip duration="PT01M0.00S">
4          <BaseURL>videos/</BaseURL>
5          <Description>svc_1</Description>
6          <Representation mimeType="video/SVC" codecs="svc" frameRate="30.00" bandwidth="401.90"
7              width="176" height="144" id="L0">
8              <BaseURL>svc_1/</BaseURL>
9              <SegmentInfo from="0" to="11" duration="PT5.00S">
10                 <BaseURL>svc_1-L0-</BaseURL>
11             </SegmentInfo>
12         </Representation>
```

```
13          <Representation mimeType="video/SVC" codecs="svc" frameRate="30.00" bandwidth="1322.60"
14              width="352" height="288" id="L1">
15              <BaseURL>svc_1/</BaseURL>
16              <SegmentInfo from="0" to="11" duration="PT5.00S">
17                  <BaseURL>svc_1-L1-</BaseURL>
18              </SegmentInfo>
19          </Representation>
20      </Clip>
21  </StreamInfo>
```

Etiam imperdiet turpis. Praesent nec augue. Curabitur ligula quam, rutrum id, tempor sed, consequat ac, dui. Maecenas tincidunt velit quis orci. Sed in dui. Nullam ut mauris eu mi mollis luctus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Sed cursus cursus velit. Sed a massa. Duis dignissim euismod quam.

Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Phasellus eget nisl ut elit porta ullamcorper. Maecenas tincidunt velit quis orci. Sed in dui. Nullam ut mauris eu mi mollis luctus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos.

This inline MATLAB code `for i=1:3, disp('cool'); end;` uses the `\mcode{}` command.[1]

Nullam ut mauris eu mi mollis luctus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Sed cursus cursus velit. Sed a massa. Duis dignissim euismod quam. Nullam euismod metus ut orci.

Listing A.2: `Matlab Function`

```
1  for i = 1:3
2      if i >= 5 && a ~= b        % literate programming replacement
3          disp('cool');          % comment with some LaTeXin it:  πx^2
4      end
5      [:,ind] = max(vec);
6      x_last = x(1,end) - 1;
7      v(end);
8      ylabel('Voltage (μV)');
9  end
```

Nullam ut mauris eu mi mollis luctus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Sed cursus cursus velit. Sed a massa. Duis dignissim euismod quam. Nullam euismod metus ut orci.

[1] MATLAB Works also in footnotes: `for i=1:3, disp('cool'); end;`

Listing A.3: `function.m`

```
%   Copyright 2010 The MathWorks, Inc.
function ObjTrack(position)
% #codegen
% First, setup the figure
numPts = 300;              % Process and plot 300 samples
figure;hold;grid;          % Prepare plot window
% Main loop
for idx = 1: numPts
    z = position(:,idx);   % Get the input data
    y = kalmanfilter(z);   % Call Kalman filter to estimate the position
    plot_trajectory(z,y);  % Plot the results
end
hold;
end   % of the function
```

Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Phasellus eget nisl ut elit porta ullamcorper. Maecenas tincidunt velit quis orci. Sed in dui. Nullam ut mauris eu mi mollis luctus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Sed cursus cursus velit. Sed a massa. Duis dignissim euismod quam. Nullam euismod metus ut orci. Vestibulum erat libero, scelerisque et, porttitor et, varius a, leo.

Listing A.4: HTML with CSS Code

```
<!DOCTYPE html>
<html>
  <head>
    <title>Listings Style Test</title>
    <meta charset="UTF-8">
    <style>
      /* CSS Test */
      * {
        padding: 0;
        border: 0;
        margin: 0;
      }
    </style>
    <link rel="stylesheet" href="css/style.css" />
  </head>
```

```
  <header> hey </header>
  <article> this is a article </article>
  <body>
    <!-- Paragraphs are fine -->
    <div id="box">
      <p>
        Hello World
      </p>
      <p>Hello World</p>
      <p id="test">Hello World</p>
      <p></p>
    </div>
    <div>Test</div>
    <!-- HTML script is not consistent -->
    <script src="js/benchmark.js"></script>
    <script>
      function createSquare(x, y) {
        // This is a comment.
        var square = document.createElement('div');
        square.style.width = square.style.height = '50px';
        square.style.backgroundColor = 'blue';

        /*
         * This is another comment.
         */
        square.style.position = 'absolute';
        square.style.left = x + 'px';
        square.style.top = y + 'px';

        var body = document.getElementsByTagName('body')[0];
        body.appendChild(square);
      };

      // Please take a look at +=
      window.addEventListener('mousedown', function(event) {
        // German umlaut test: Berührungspunkt ermitteln
        var x = event.touches[0].pageX;
        var y = event.touches[0].pageY;
```

```
54          var lookAtThis += 1;
55        });
56      </script>
57    </body>
58  </html>
```

Nulla dui purus, eleifend vel, consequat non, dictum porta, nulla. Duis ante mi, laoreet ut, commodo eleifend, cursus nec, lorem. Aenean eu est. Etiam imperdiet turpis. Praesent nec augue. Curabitur ligula quam, rutrum id, tempor sed, consequat ac, dui. Vestibulum accumsan eros nec magna. Vestibulum vitae dui. Vestibulum nec ligula et lorem consequat ullamcorper.

Listing A.5: HTML CSS Javascript Code

```
1
2  @media only screen and (min-width: 768px) and (max-width: 991px) {
3
4    #main {
5      width: 712px;
6      padding: 100px 28px 120px;
7    }
8
9    /* .mono {
10     font-size: 90%;
11   } */
12
13   .cssbtn a {
14     margin-top: 10px;
15     margin-bottom: 10px;
16     width: 60px;
17     height: 60px;
18     font-size: 28px;
19     line-height: 62px;
20   }
```

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Listing A.6: PYTHON Code

```
class TelgramRequestHandler(object):
    def handle(self):
        addr = self.client_address[0]          # Client IP-adress
        telgram = self.request.recv(1024)      # Recieve telgram
        print "From: %s, Received: %s" % (addr, telgram)
        return
```

B

A Large Table

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As Table B.1 shows, the data can be inserted from a file, in the case of a somehow complex structure. Notice the Table footnotes.

Table B.1: Example table

Benchmark: ANN	**#Layers** (1)	**#Nets** (2)	#Nodes* (3) = 8 · (1) · (2)	Critical path (4) = 4 · (1)	**Latency (T_{iter})** (5)
A1	**3–1501**	1	**24–12008**	**12–6004**	4
A2	501	1	4008	2004	**2–2000**
A3	10	**2–1024**	**160–81920**	40	60†
A4	10	50	4000	40	**80–1200**

Benchmark: FFT	**FFT size**‡ (1)	*#Inputs* (2) = $2^{(1)}$	*#Nodes** (3) = 10 · (1) · (2)	*Critical path* (4) = 4 · (1)	**Latency (T_{iter})** (5)
F1	**1–10**	2–1024	**20–102400**	4–40	6–60†
F2	**5**	32	1600	20	**40 – 1500**

Benchmark: Random networks	**#Types** (1)	**#Nodes** (2)	*#Networks* (3)	*Critical path* (4)	**Latency (T_{iter})** (5)
R1	3	10–2000	500	*variable*	(4)
R2	3	50	500	*variable*	(4) × [1; · · · ; 20]

* *Excluding constant nodes.*
† *Value kept proportional to the critical path:* $(5) = (4) * 1.5$.
‡ *A size of x corresponds to a 2^x point FFT.*
Values in bold indicate the parameter being varied.

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And now an example (**??**) of a table that extends to more than one page. Notice the repetition of the Caption (with indication that is continued) and of the Header, as well as the continuation text at the bottom.

An example of a large Table that autofits the size to the page margins is illustrated in Table B.2. Please notice the text size that is shrunken in order fot the table to adjust to the page:

Table B.2: Sample Table.

URL	First Time Visit	Last Time Visit	URL Counts	Value	Reference
https://web.facebook.com/	1521241972	1522351859	177	56640	[facebook-2021]
http://localhost/phpmyadmin/	1518413861	1522075694	24	39312	database-management
https://mail.google.com/mail/u/	1516596003	1522352010	36	33264	Google-Gmail-2021
https://github.com/shawon100	1517215489	1522352266	37	27528	Code-Repository
https://www.youtube.com/	1517229227	1521978502	24	14792	Youtube-video-2021