Your Own Distributed System using Consensus Protocols

Bellagio Casinó roulette multiplayer

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ABSTRACT

This paper provides a sample of a LaTeX document which conforms, somewhat loosely, to the formatting guidelines for ACM SIG Proceedings. It is an *alternate* style which produces a *tighter-looking* paper and was designed in response to concerns expressed, by authors, over page-budgets. It complements the document *Author's (Alternate) Guide to Preparing ACM SIG Proceedings Using LaTeX2$_\epsilon$ and BibTeX*. This source file has been written with the intention of being compiled under LaTeX2$_\epsilon$ and BibTeX.

The developers have tried to include every imaginable sort of "bells and whistles", such as a subtitle, footnotes on title, subtitle and authors, as well as in the text, and every optional component (e.g. Acknowledgments, Additional Authors, Appendices), not to mention examples of equations, theorems, tables and figures.

To make best use of this sample document, run it through LaTeX and BibTeX, and compare this source code with the printed output produced by the dvi file. A compiled PDF version is available on the web page to help you with the 'look and feel'.

1. INTRODUZIONE

Le tecnologie Cloud, esplose in questi ultimi anni, hanno permesso di trasferire il peso della computazione e dell'approvvigionamento delle risorse informatiche verso internet. Perció la rete come strumento di sviluppo oggi offre scenari ampi nella direzione della distribuzione delle risorse e della computazione: la distribuzione, come nel caso che poniamo in esame, deve rappresentare un'avanguardia per lo sviluppo di applicazioni con caratteristiche di scalabilitá e di alta disponibilitá per l'utente finale. Gli sviluppatori utilizzando i servizi cloud possono gestire in maniera semplificata l'immagazzinamento di informazioni e l'elaborazione di molti dati, concentrandosi principalmente sullo sviluppo della loro applicazione piuttosto che nell'utilizzo di un sistema ortodosso e dispendioso come avveniva nel passato. Aziende come Spotify Netflix ed altre sfruttano il servizio cloud per rendere fruibile le loro applicazioni agli utenti di tutto il mondo, ottenendo molteplici consensi. Gli sviluppatori utilizzando i servizi cloud possono gestire in maniera semplificata l'immagazzinamento di informazioni e l'elaborazione di molti dati, concentrandosi principalmente sullo sviluppo della loro applicazione piuttosto che nell'utilizzo di un sistema ortodosso e dispendioso come avveniva nel passato. Aziende come Spotify Netflix ed altre sfruttano il servizio cloud per rendere fruibile le loro applicazioni agli utenti di tutto il mondo, ottenendo molteplici consensi. Molte persone all'interno del mondo non sanno che queste applicazioni sono cosí efficienti proprio perché sfruttano una tecnologia cloud, che per quanto possa agevolare gli utenti e gli sviluppatori, presenta sempre qualche difficoltá da gestire:

1. garantire l'accesso concorrente ad una vasta molteplicitá di utenti.
2. la possibilitá di connettersi da ogni angolo del mondo, senza ledere la qualitá del servizio.
3. la sincronizzazione degli eventi associati ad ogni applicativo.
4. la reperibilitá dei dati.

1.1 Obiettivi

L'obiettivo preposto consiste nell'elaborare un gioco multiplayer che supporta molteplici entitá autonome che si contendono risorse condivise, supporta l'aggiornamento in tempo reale di una qualche forma di stato condiviso, distribuisce su molteplici nodi (eventualmente distribuiti geograficamente) e la scalabiliá. E' proprio con l'obiettivo di rispettare tali punti cardine che abbiamo proceduto nello sviluppo della nostra applicazione distribuita sulla piattaforma Cloud: abbiamo operato nell'intenzione di venire incontro alle esigenze degli utenti, sempre piú abituati ad avere interazioni costanti e ripetute con le applicazioni di uso comune. Il Bellagio Casinó é l'applicazione (accessibile mediante interfaccia Web) da noi proposta che consente agli utenti di giocare ad una versione semplificata di una roulette francese condividendo un unico tavolo di gioco. Tale applicazione permette all'utente di effettuare particolari puntate in base alla propria disponibilitá di credito, sul tavolo condiviso.

2. ARCHITETTURA

In questa sezione verrá descritta nel dettaglio l'architettura progettata sia a livello logico che a livello implementativo descrivendo i servizi Amazon utilizzati e i moduli sviluppati. L'architettura da noi elaborata e proposta é costituita da:

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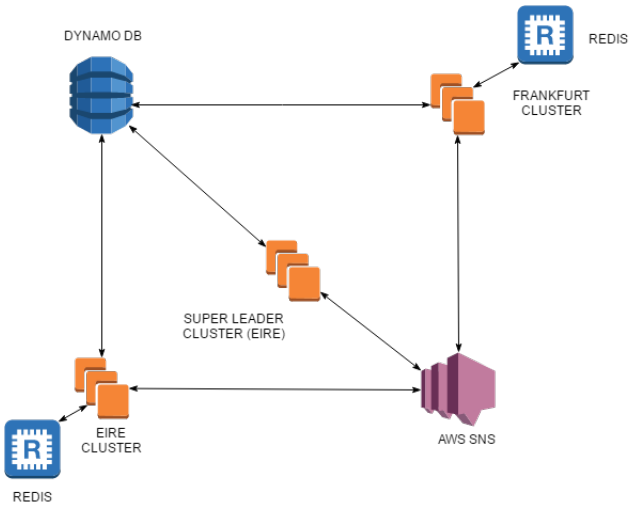

Figure 1: didascalia

- un cluster di istanze EC2 situato nella regione Francoforte.
- due cluster di istanze EC2 situate nella regione Eire.

e sfrutta i servizi AWS:

- SNS per la comunicazione inter-cluster.
- DynamoDB per la persistenza dei dati situato nella regione Eire.
- Redis per supportare la logica del gioco situato sia nella regione Eire che Francoforte.
- LoadBalancer per distribuire il carico.

Abbiamo progettato il nostro sistema con lo scopo di soddisfare il requisito di scalabilitá geografica.Per tale motivo abbiamo distribuito i cluster del nostro sistema nelle due aree geografiche europee. Ció non toglie che tale realizzazione si possa estendere anche all'interno di altre regioni geografiche messe a disposizione da AWS. La motivazione che ci ha spinto a questa scelta é legata a fattori di latenza ma anche economici, riguardanti lo sviluppo dell'applicazione stessa e il testing.

I cluster istanziati sono soggetti ad una gerarchia dettata dalla realizzazione di uno stato condivisibile, che corrisponde alle fasi di gioco dell'applicazione. Pertanto possiamo individuare i cluster di gioco (situati uno in Irlanda e l'altro a Francoforte) ed il cluster di controllo che genera l'avanzamento dello stato e che svolge anche la funzione di login e registrazione (situato in Irlanda)

2.1 Cluster EC2

All'interno di questa sezione andiamo a trattare nel dettaglio quali sono le funzionalitá e le componenti dei Cluster EC2.

2.2 Type Changes and *Special* Characters

We have already seen several typeface changes in this sample. You can indicate italicized words or phrases in your text with the command `\textit`; emboldening with the command `\textbf` and typewriter-style (for instance, for computer code) with `\texttt`. But remember, you do not have to indicate typestyle changes when such changes are part of the *structural* elements of your article; for instance, the heading of this subsection will be in a sans serif[1] typeface, but that is handled by the document class file. Take care with the use of[2] the curly braces in typeface changes; they mark the beginning and end of the text that is to be in the different typeface.

You can use whatever symbols, accented characters, or non-English characters you need anywhere in your document; you can find a complete list of what is available in the *LaTeX User's Guide*[?].

2.3 Math Equations

You may want to display math equations in three distinct styles: inline, numbered or non-numbered display. Each of the three are discussed in the next sections.

2.3.1 *Inline (In-text) Equations*

A formula that appears in the running text is called an inline or in-text formula. It is produced by the **math** environment, which can be invoked with the usual `\begin. . .\end` construction or with the short form `$. . .$`. You can use any of the symbols and structures, from α to ω, available in LaTeX[?]; this section will simply show a few examples of in-text equations in context. Notice how this equation: $\lim_{n\to\infty} x = 0$, set here in in-line math style, looks slightly different when set in display style. (See next section).

2.3.2 *Display Equations*

A numbered display equation – one set off by vertical space from the text and centered horizontally – is produced by the **equation** environment. An unnumbered display equation is produced by the **displaymath** environment.

Again, in either environment, you can use any of the symbols and structures available in LaTeX; this section will just give a couple of examples of display equations in context. First, consider the equation, shown as an inline equation above:

$$\lim_{n\to\infty} x = 0 \tag{1}$$

Notice how it is formatted somewhat differently in the **displaymath** environment. Now, we'll enter an unnumbered equation:

$$\sum_{i=0}^{\infty} x + 1$$

and follow it with another numbered equation:

$$\sum_{i=0}^{\infty} x_i = \int_0^{\pi+2} f \tag{2}$$

just to demonstrate LaTeX's able handling of numbering.

2.4 Citations

Citations to articles [?, ?, ?, ?], conference proceedings [?] or books [?, ?] listed in the Bibliography section of your article will occur throughout the text of your article. You should use BibTeX to automatically produce this bibliography; you simply need to insert one of several citation

[1] A third footnote, here. Let's make this a rather short one to see how it looks.

[2] A fourth, and last, footnote.

Table 1: Frequency of Special Characters

Non-English or Math	Frequency	Comments
Ø	1 in 1,000	For Swedish names
π	1 in 5	Common in math
\$	4 in 5	Used in business
Ψ_1^2	1 in 40,000	Unexplained usage

Figure 2: A sample black and white graphic.

commands with a key of the item cited in the proper location in the `.tex` file [**?**]. The key is a short reference you invent to uniquely identify each work; in this sample document, the key is the first author's surname and a word from the title. This identifying key is included with each item in the `.bib` file for your article.

The details of the construction of the `.bib` file are beyond the scope of this sample document, but more information can be found in the *Author's Guide*, and exhaustive details in the *LaTeX User's Guide*[**?**].

This article shows only the plainest form of the citation command, using `\cite`. This is what is stipulated in the SIGS style specifications. No other citation format is endorsed or supported.

2.5 Tables

Because tables cannot be split across pages, the best placement for them is typically the top of the page nearest their initial cite. To ensure this proper "floating" placement of tables, use the environment **table** to enclose the table's contents and the table caption. The contents of the table itself must go in the **tabular** environment, to be aligned properly in rows and columns, with the desired horizontal and vertical rules. Again, detailed instructions on **tabular** material is found in the *LaTeX User's Guide*.

Immediately following this sentence is the point at which Table 1 is included in the input file; compare the placement of the table here with the table in the printed dvi output of this document.

To set a wider table, which takes up the whole width of the page's live area, use the environment **table*** to enclose the table's contents and the table caption. As with a single-column table, this wide table will "float" to a location deemed more desirable. Immediately following this sentence is the point at which Table 2 is included in the input file; again, it is instructive to compare the placement of the table here with the table in the printed dvi output of this document.

2.6 Figures

Like tables, figures cannot be split across pages; the best placement for them is typically the top or the bottom of the page nearest their initial cite. To ensure this proper "floating" placement of figures, use the environment **figure** to enclose the figure and its caption.

This sample document contains examples of **.eps** files to be displayable with LaTeX. If you work with pdfLaTeX, use files in the **.pdf** format. Note that most modern TeX system will convert **.eps** to **.pdf** for you on the fly. More details on each of these is found in the *Author's Guide*.

As was the case with tables, you may want a figure that spans two columns. To do this, and still to ensure proper

Figure 3: A sample black and white graphic that has been resized with the `includegraphics` command.

"floating" placement of tables, use the environment **figure*** to enclose the figure and its caption. and don't forget to end the environment with figure*, not figure!

2.7 Theorem-like Constructs

Other common constructs that may occur in your article are the forms for logical constructs like theorems, axioms, corollaries and proofs. There are two forms, one produced by the command `\newtheorem` and the other by the command `\newdef`; perhaps the clearest and easiest way to distinguish them is to compare the two in the output of this sample document:

This uses the **theorem** environment, created by the `\newtheorem` command:

THEOREM 1. *Let f be continuous on $[a, b]$. If G is an antiderivative for f on $[a, b]$, then*

$$\int_a^b f(t)dt = G(b) - G(a).$$

The other uses the **definition** environment, created by the `\newdef` command:

Definition 1. If z is irrational, then by e^z we mean the unique number which has logarithm z:

$$\log e^z = z$$

Two lists of constructs that use one of these forms is given in the *Author's Guidelines*.

There is one other similar construct environment, which is already set up for you; i.e. you must *not* use a `\newdef` command to create it: the **proof** environment. Here is a example of its use:

PROOF. Suppose on the contrary there exists a real number L such that

$$\lim_{x\to\infty} \frac{f(x)}{g(x)} = L.$$

Then

$$l = \lim_{x\to c} f(x) = \lim_{x\to c} \left[gx \cdot \frac{f(x)}{g(x)} \right] = \lim_{x\to c} g(x) \cdot \lim_{x\to c} \frac{f(x)}{g(x)} = 0 \cdot L = 0,$$

which contradicts our assumption that $l \neq 0$. □

Complete rules about using these environments and using the two different creation commands are in the *Author's Guide*; please consult it for more detailed instructions. If you need to use another construct, not listed therein, which you want to have the same formatting as the Theorem or the Definition[**?**] shown above, use the `\newtheorem` or the `\newdef` command, respectively, to create it.

A *Caveat* for the TeX Expert

Because you have just been given permission to use the `\newdef` command to create a new form, you might think you can use TeX's `\def` to create a new command: *Please refrain from doing this!* Remember that your LaTeX source code is primarily intended to create camera-ready copy, but may be converted to other forms – e.g. HTML. If you inadvertently omit some or all of the `\def`s recompilation will be, to say the least, problematic.

Table 2: Some Typical Commands

Command	A Number	Comments
`\alignauthor`	100	Author alignment
`\numberofauthors`	200	Author enumeration
`\table`	300	For tables
`\table*`	400	For wider tables

Figure 4: A sample black and white graphic that needs to span two columns of text.

Figure 5: A sample black and white graphic that has been resized with the `includegraphics` command.

3. CONCLUSIONS

This paragraph will end the body of this sample document. Remember that you might still have Acknowledgments or Appendices; brief samples of these follow. There is still the Bibliography to deal with; and we will make a disclaimer about that here: with the exception of the reference to the LaTeX book, the citations in this paper are to articles which have nothing to do with the present subject and are used as examples only.

4. ACKNOWLEDGMENTS

This section is optional; it is a location for you to acknowledge grants, funding, editing assistance and what have you. In the present case, for example, the authors would like to thank Gerald Murray of ACM for his help in codifying this *Author's Guide* and the **.cls** and **.tex** files that it describes.

APPENDIX

A. HEADINGS IN APPENDICES

The rules about hierarchical headings discussed above for the body of the article are different in the appendices. In the **appendix** environment, the command **section** is used to indicate the start of each Appendix, with alphabetic order designation (i.e. the first is A, the second B, etc.) and a title (if you include one). So, if you need hierarchical structure *within* an Appendix, start with **subsection** as the highest level. Here is an outline of the body of this document in Appendix-appropriate form:

A.1 Introduction

A.2 The Body of the Paper

A.2.1 Type Changes and Special Characters

A.2.2 Math Equations

Inline (In-text) Equations.

Display Equations.

A.2.3 Citations

A.2.4 Tables

A.2.5 Figures

A.2.6 Theorem-like Constructs

A Caveat for the TEX Expert

A.3 Conclusions

A.4 Acknowledgments

A.5 Additional Authors

This section is inserted by LaTeX; you do not insert it. You just add the names and information in the `\additionalauthors` command at the start of the document.

A.6 References

Generated by bibtex from your .bib file. Run latex, then bibtex, then latex twice (to resolve references) to create the .bbl file. Insert that .bbl file into the .tex source file and comment out the command `\thebibliography`.

B. MORE HELP FOR THE HARDY

The sig-alternate.cls file itself is chock-full of succinct and helpful comments. If you consider yourself a moderately experienced to expert user of LaTeX, you may find reading it useful but please remember not to change it.