

Plano de Ensino – Atividades Remotas Emergenciais – 2020/1

Código	DCC894
Disciplina	Sistemas em Rede
Turma	PG
Professor	Marcos A. M. Vieira

Ementa.

Princípios de arquitetura e design; Rede definida por software; Protocolos de transporte; Rádio definido por software; Internet de tudo; Codificação de rede; Redes sem fio; Distribuição de conteúdo

Programa

Aula	Data	Conteúdo previsto	Modalidade	Interação
1	03/03/2020	Apresentação do curso	Expositiva - presencial	Presencial
2	05/03/2020	Princípios de arquitetura e design;	Expositiva - presencial	Presencial
3	10/03/2020	Princípios de arquitetura e design;	Expositiva - presencial	Presencial
4	12/03/2020	Rede definida por software	Expositiva - presencial	Presencial
5	17/03/2020	Rede definida por software	Síncrona	Reunião virtual
6	07/07/2020	Rede definida por software	Síncrona	Reunião virtual
7	09/07/2020	Rede definida por software	Síncrona	Reunião virtual
8	14/07/2020	Rede definida por software	Síncrona	Reunião virtual
9	16/07/2020	Rede definida por software	Síncrona	Reunião virtual
10	21/07/2020	Rede definida por software	síncrona	Reunião virtual
11	23/07/2020	Rede definida por software	síncrona	Reunião virtual
12	28/07/2020	Protocolos de transporte	síncrona	Reunião virtual
13	30/07/2020	Protocolos de transporte	síncrona	Reunião virtual
14	04/08/2020	Protocolos de transporte	síncrona	Reunião virtual
15	06/08/2020	Seminários	síncrona	Reunião virtual
16	11/08/2020	Seminários	síncrona	Reunião virtual
17	13/08/2020	Seminários	síncrona	Reunião virtual
18	18/08/2020	Protocolos de transporte	síncrona	Reunião virtual
19	20/08/2020	Protocolos de transporte	síncrona	Reunião virtual
20	25/08/2020	Rádio definido por software	síncrona	Reunião virtual
21	27/08/2020	Rádio definido por software	síncrona	Reunião virtual
22	01/09/2020	Internet de tudo	síncrona	Reunião virtual
23	03/09/2020	Internet de tudo	síncrona	Reunião virtual
24	08/09/2020	Internet de tudo	síncrona	Reunião virtual
25	10/09/2020	Codificação de rede	síncrona	Reunião virtual
26	15/09/2020	Redes sem fio	síncrona	Reunião virtual
27	17/09/2020	Redes sem fio	síncrona	Reunião virtual
28	22/09/2020	Redes sem fio	síncrona	Reunião virtual
29	24/09/2020	Distribuição de conteúdo	síncrona	Reunião virtual
30	29/09/2020	Distribuição de conteúdo	síncrona	Reunião virtual

Bibliografia

Artigos:

Reference Material

[PetersonDavie] L. Peterson, B. Davie, *Computer Networks: A Systems Approach*, Morgan-Kaufman, 2003.

[Hanson] M. J. Hanson, *Efficient Reading of Papers in Science and Technology*, 2000. [\[PDF\]](#)

[Keshav07] S. Keshav, *How to Read a Paper*, *ACM Computer Communications Review*, 2007. [\[PDF\]](#)

[Levin] R. Levin, D. Redell, *An Evaluation of the Ninth SOSP Submissions*, *ACM Operating Systems Review*, Vol. 17, No. 3, pp. 35--40, 1983.

[Jamin] S. Jamin, *Paper Reading and Writing Checklists*, May 2003. [\[HTML\]](#)

Architecture and Design Principles

[Clark88] D. D. Clark, *The Design Philosophy of the DARPA Internet Protocols*, *Proceedings of the ACM SIGCOMM Conference on Network Architectures and Protocols*, 1988. [\[PDF\]](#)

[Saltzer84a] J. Saltzer, D. Reed, D. Clark, *End-to-end Arguments in System Design*, *ACM Transactions on Computer Systems*, pp. 195-206, 1984. [\[PDF\]](#)

Software Defined Networking

[SBRC2012] Dorgival Guedes, Luiz Filipe Menezes Vieira, Marcos Menezes Vieira, Henrique Rodrigues, Rogério Vinhal Nunes *Redes Definidas por Software: uma abordagem sistêmica para o desenvolvimento de pesquisas em Redes de Computadores*, *Minicursos do Simpósio Brasileiro de Redes de Computadores-SBRC*, 2012. [\[PDF\]](#)

[BPFabric] Simon Jouet, Dimitrios P. Pezaros, *BPFabric: Data Plane Programmability for Software Defined Networks*, *ACM/IEEE Symposium on Architectures for Networking and Communications*, 2017. [\[PDF\]](#)

[SoftRAN] Aditya Gudipati, Daniel Perry, Li Erran Li, Sachin Katti, *SoftRAN: Software Defined Radio Access Network*, *HotSDN* 13. [\[PDF\]](#)

[Ethanol] Henrique Moura, Gabriel V. C. Bessa, Marcos A. M. Vieira, Daniel F. Macedo, *Ethanol: Software Defined Networking for Dense Wireless Networks*, *IM* 2015. [\[PDF\]](#)

[**OpenSketch**] Minlan Yu, Lavanya Jose, Rui Miao, [Software Defined Traffic Measurement with OpenSketch](#), USENIX Symposium on Networked Systems Design and Implementation (NSDI '13). [\[PDF\]](#)

[**B4**] Jain, Sushant and Kumar, Alok and Mandal, Subhasree and Ong, Joon and Poutievski, Leon and Singh, Arjun and Venkata, Subbaiah and Wanderer, Jim and Zhou, Junlan and Zhu, Min and Zolla, Jon and Hölzle, Urs and Stuart, Stephen and Vahdat, Amin [B4: Experience with a Globally-Deployed Software Defined WAN](#), SIGCOMM, 2013. [\[PDF\]](#)

[**P4**] Pat Bosshart et al., [P4: Programming Protocol-Independent Packet Processors](#), Computer Communication Review, 2014. [\[PDF\]](#)

[**POF**] Haoyu Song, [Protocol-Oblivious Forwarding: Unleash the Power of SDN through a Future-Proof Forwarding Plane](#), HotSDN, 2013. [\[PDF\]](#)

[**DCPortals**] Heitor M. B. Moraes, Marcos A. M. Vieira, and Dorgival Guedes, [Efficient Virtual Network Isolation in Multi-Tenant Data Centers on Commodity Ethernet Switches](#), IFIP Networking 2015. [\[PDF\]](#)

[**RSS++**] Tom Barbette, Georgios P. Katsikas, Gerald Q. Maguire Jr., and Dejan Kostić, [RSS++: load and state-aware receive side scaling](#), CONEXT 2019. [\[PDF\]](#)

Material Supplementar:

[**SDX**] Arpit Gupta, Laurent Vanbever, Muhammad Shahbaz, Sean P. Donovan, Brandon Schlinker, Nick Feamster, Jennifer Rexford, Scott Shenker, Russ Clark, Ethan Katz-Bassett,

[SDX: A Software Defined Internet Exchange](#), SIGCOMM, 2014. [\[PDF\]](#)

[**Ethane**] Martin Casado, Michael J. Freedman, Justin Pettit, Jianying Luo, Natasha Gude, Nick McKeown, Scott Shenker, [Rethinking Enterprise Network Control](#), *IEEE Transactions on Networking*, 2009. [\[PDF\]](#)

[**Erik**] Erik de Britto et al., [Performance Evaluation of OpenFlow Data Planes](#), IM 2017. [\[PDF\]](#)

[**Click Router**] EDDIE KOHLER, ROBERT MORRIS, BENJIE CHEN, JOHN JANNOTTI, and M. FRANS KAASHOEK, [The Click Modular Router](#), *ACM Transactions on Computer Systems*, 2000 [\[PDF\]](#)

Transport Protocols

[**Jacobson**] V. Jacobson, [Congestion Avoidance and Control](#), *ACM Computer Communication Review; Proceedings of the Sigcomm '88 Symposium in Stanford, CA, August, 1988*, Vol. 18, 4, pp. 314--329, 1988. [\[PDF\]](#)

[**ChiuJain**] Dah-Ming Chiu, Raj Jain, [Analysis of the Increase and Decrease Algorithms for Congestion Avoidance in Computer Networks](#), *Computer Networks and ISDN Systems*, 1989. [\[PDF\]](#)

[RFC2001] W. Stevens, TCP Slow Start, Congestion Avoidance, Fast Retransmit, and Fast Recovery Algorithms, *IETF RFC*, 1997[\[RFC\]](#)

[Padhye] J. Padhye, V. Firoiu, D. Towsley, J. Kurose, Modeling TCP Throughput: A Simple Model and its Empirical Validation, *Proceedings of the ACM SIGCOMM Conference on Network Architectures and Protocols*, pp. 303--314, Vancouver, CA, 1998. [\[PDF\]](#)

[Stefan08] Stefan Savage, Neal Cardwell, David Wetherall, and Tom Anderson, TCP Congestion Control with a Misbehaving Receiver, *ACM SIGCOMM Computer Communication* 1999[\[PDF\]](#)

[PCC Vivace] Mo Dong, Tong Meng, Doron Zarchy, Engin Arslan, Yossi Gilad, Brighten Godfrey, Michael Schapira, PCC Vivace: Online-Learning Congestion Control, *NSDI* 2018[\[PDF\]](#)

Seminários

Transport Protocols

[Raicu11] Costin Raiciu, Sebastien Barre, Christopher Pluntke, Adam Greenhalgh, Damon Wischik, and Mark Handley, Improving Datacenter Performance and Robustness with Multipath TCP, *ACM SIGCOMM* 2011[\[PDF\]](#)

[DCTCP] Mohammad Alizadeh et. al., Data Center TCP (DCTCP), *ACM SIGCOMM* 2010 [\[PDF\]](#)

Material Complementar:

[Ha08] Sangtae Ha, Injong Rhee, Lison Xu, CUBIC: A New TCP-Friendly High-Speed TCP Variant, *ACM SIGCOPS Operating System Review* 2013[\[PDF\]](#)

[TCP ex Machina] Keith Winstein and Hari Balakrishnan, TCP ex Machina: Computer-Generated Congestion Control, *ACM SIGCOMM* 2013[\[PDF\]](#)

[RamakrishnanJain] K. K. Ramakrishnan, R. Jain, A Binary Feedback Scheme for Congestion Avoidance in Computer Networks with Connectionless Network Layer, *ACM/IEEE Transactions on Networking*, Vol. 8, No. 2, pp. 158-181, 1990.

[EvolutionTCP] A. Afanasyev, N. Tilley, P. Reiher, and L. Kleinrock, "Host-to-host congestion control for TCP", *IEEE Communication Surveys and Tutorials*, vol. 12, no. 3, pp. 304–342, July 2010.

Software Defined Radio

[SBRC2015] Wendley S. Silva, Jefferson Rayneres S. Cordeiro, Daniel F. Macedo, Marcos A. M. Vieira, Luiz F. M. Vieira, José Marcos S. Nogueira

Introdução a Rádios Definidos por Software com aplicações em GNU Radio, *Minicursos do Simpósio Brasileiro de Redes de Computadores-SBRC*, 2015. [\[PDF\]](#)

Material Complementar:

[IntroGNURadio] A. F. B. Selva, A. L. G. Reis, K. G. Lenzi, L. G. P. Meloni, and S. E. Barbin, *Introduction to the Software-defined Radio Approach*, IEEE Latin America Transactions 2012. [\[PDF\]](#)

[SDR] George Nychis, Thibaud Hottelier, Zhuocheng Yang, Srinivasan Seshan, Peter Steenkiste, *Enabling MAC Protocol Implementations on Software-Defined Radios*, NSDI 2009. [\[PDF\]](#)

[Flavia] I. Tinnirello, G. Bianchi, P. Gallo, D. Garlisi, F. Giuliano, F. Gringoli, *Wireless MAC Processors: Programming MAC Protocols on Commodity Hardware*, INFOCOM, 2012. [\[PDF\]](#)

Internet of Everything

[SBRC2016] Bruno P. Santos, Lucas A. M. Silva, Clayson S. F. S. Celes, João B. Borges Neto, Bruna S. Peres et. al., *Internet das Coisas: da Teoria à Prática*, *Minicursos do Simpósio Brasileiro de Redes de Computadores-SBRC*, 2016. [\[PDF\]](#)

[Nildo] Nildo Ribeiro Jr., Marcos A. M. Vieira, Luiz F. M. Vieira, *Maximizando a Vazão Através de Múltiplos Caminhos em Plataformas com Dois Rádios*, *Simpósio Brasileiro de Redes de Computadores-SBRC*, 2017 [\[PDF\]](#)

[CTP] Omprakash Gnawali, Rodrigo Fonseca, Kyle Jamieson, David Moss, Philip Levis, *Collection Tree Protocol*, Sensys, 2009. [\[PDF\]](#)

[Survey] Juan Antonio Cordero, Jiazi Yi, Thomas Clausen, Emmanuel Baccelli, *Enabling Multihop Communication in Spontaneous Wireless Networks*, Chapter 5, Recent Advances in Networking SIGCOMM eBook, 2013. [\[PDF\]](#)

Material Complementar:

[Bruna] Bruna Peres, Otavio A. de O. Souza, Bruno P. Santos, Edson R. A. Junior, Olga Goussevskaia, Marcos A. M. Vieira, Luiz F. M. Vieira, Antonio A. F. Loureiro, *Matrix: Multihop Address allocation and dynamic any-To-any Routing for 6LoWPAN*, MSWIM 2016. [\[PDF\]](#)

[6LowPan] Jonathan W. Hui, David E. Culler, *IPv6 in Low-Power Wireless Networks*, In Proceedings of the IEEE, vol. 98, no. 11, pp. 1865-1878, November, 2010. [\[PDF\]](#)

[Henrique] Henrique et al., *Comparação de Políticas de Divisão de Tráfego em Data Center empregando SDN*, SBRC 2017 [\[PDF\]](#)

[Elerson] Elerson Rubens da Silva Santos and Marcos A. M. Vieira and Luiz F. M. Vieira, *Routing IPv6 over wireless networks with low-memory devices*, PIMRC, 2013. [\[PDF\]](#)

[XCTP] Bruno P. Santos and Marcos A. M. Vieira, and Luiz F. M. Vieira, *eXtend Collection Tree Protocol*, WCNC, 2015. [\[PDF\]](#)

[**Glossy**] Federico Ferrari Marco Zimmerling Lothar Thiele Olga Saukh, Efficient Network Flooding and Time Synchronization with Glossy, IPSN, 2011. [\[PDF\]](#)

[**Bus2012**] Federico Ferrari, Marco Zimmerling, Luca Mottola, Lothar Thiele, Low-Power Wireless Bus, Sensys, 2012. [\[PDF\]](#)

Network Coding

[**CodeDrip14**] Nildo Ribeiro Junior, Marcos A. M. Vieira, Luiz F. M. Vieira, Omprakash Gnawali, CodeDrip: Data Dissemination Protocol with Network Coding for Wireless Sensor Networks, In Proceedings of the 11th European conference on Wireless sensor networks (EWSN 2014), 2014. [\[PDF\]](#)

Wireless Networks

[**MACAW**] Vaduvur Bharghavan, Alan J. Demers, Scott Shenker, Lixia Zhang, MACAW: A Media Access Protocol for Wireless LAN's, SIGCOMM, pp. 212-225, 1994. [\[PDF\]](#)

Material Complementar:

[**Aguayo04**] D. Aguayo, J. Bicket, S. Biswas, G. Judd, R. Morris, Link-level Measurements from an 802.11b Mesh Network, Proceedings of the ACM SIGCOMM Conference on Network Architectures and Protocols, Portland, OR, August 2004. [\[PDF\]](#)

[**Jigsaw**] Cheng, Yu-Chung, Bellardo, John, Benko, Peter, Snoeren, Alex C., Voelker, Geoffrey M., Savage, Stefan, Jigsaw: solving the puzzle of enterprise 802.11 analysis, SIGCOMM Comput. Commun. Rev., Vol. 36, No. 4, pp. 39--50, ACM, New York, NY, USA, 2006. [\[PDF\]](#)

[**Wireless No Energy**] Vincent, Aaron Parks, Vamsi Talla, Shyamnath Gollakota, David Wetherall, Joshua R. Smith, Ambient Backscatter: Wireless Communication Out of Thin Air, ACM SIGCOMM 2013. [\[PDF\]](#)

Content Distribution

[**Chord**] Ion Stoica, Robert Morris, David Karger, Frans Kaashoek, Hari Balakrishnan, Chord: A Scalable Peer-To-Peer Lookup Service for Internet Applications, Proceedings of ACM SIGCOMM 2001, pp. 149--160, 2001. [\[PDF\]](#)

Material Complementar:

[**Akamai**] J. Dilley, B. Maggs, J. Parikh, H. Prokop, R. Sitaraman, B. Weihl, Globally Distributed Content Delivery, IEEE Internet Computing, September 2002. [\[PDF\]](#)

[ICN] Fayazbakhsh, Seyed Kaveh and Lin, Yin and Tootoonchian, Amin and Ghodsi, Ali and Koponen, Teemu and Maggs, Bruce and Ng, K.C. and Sekar, Vyas and Shenker, Scott. [Less Pain, Most of the Gain: Incrementally Deployable ICN](#), ACM SIGCOMM 2013. [\[PDF\]](#)

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Material de apoio

Página da disciplina:

<https://homepages.dcc.ufmg.br/~mmvieira/cc/computercommunications.html>

Moodle (slides)

Avaliações

1	Trabalho Prático 1 - remoto	5 pontos	18/07
2	Trabalho Prático 2 - remoto	10 pontos	08/01
3	Seminário – remoto	5 pontos	06,11,13/08
4	Resenhas – remoto	40 pontos	Um por aula
5	Projeto Final - remoto	40 pontos	13/10