

**Yaakov (Jonathan) Stein**  
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## Overview

- CTO of a major telecomm vendor, with expertise in:
  - 5G, SDN/NFV, pseudowires, QoS/OAM, MPLS, IPv6, synchronization
  - DSP (speech, software defined radio)
  - algorithms and machine learning
  - IPR (patents - drafting, portfolio and defense; Open Source)
  - interfacing with major service providers
- Active participant in International Standards Organizations (IETF, ITU, MEF), co-chair of IETF TICTOC WG
- Author of major Digital Signal Processing textbook
- BSc. in Mathematics/Physics, MSc. and PhD in theoretical physics (HUJI)
- Israel Defense Award (1992)

## Positions (non-academic) see also [LinkedIn profile](#)

2011-present: **CTO, [RAD Data Communications](#)**, Tel Aviv, Israel

Responsible for: tracking scientific and technological trends, core technology development and demos, designing communications protocols, IPR issues (drafting, portfolio and defense), participation in standards committees (ITU-T, IETF, MEF, etc.), representing RAD in conferences, and [training courses](#)

2016- 2019: **Chairman of the Board, [the Neptune Consortium](#)**

2014-2016: **cofounder, Neptune** - the Israel Consortium for Network Programming - consisting of 10 corporations and 8 academic institutions, researching SDN and NFV approaches to designing service provider networks

2000-2016: **Active participant in Standardization Forums**

**IETF:** Co-chair of [TICTOC](#) WG, Major contributor to [PWE3](#) WG

Coauthor of RFCs 4553, 5087, 5287, 5920, 6310, 7893, and numerous Internet Drafts  
Contributed to RFCs 3916, 4197, 4385, 4733, 4734, 4901, 5244, 5611, 5885, and 6669

**Member** of the Performance Metrics Directorate

**ITU-T:** Editor of Y.1413, Y.1418, Y.1452, Y.1453

Major contributor to Y.1414, Y.1415, Y.1731

1999-2011: **Chief Scientist, and Head of Advanced Technologies Department,**

**[RAD Data Communications](#)**, Tel Aviv, Israel

Responsible for: tracking scientific and technological trends, algorithm development (DSP for speech, fax, modem, telephony, timing recovery over packet networks, packet application classification, service performance estimation and enhancement, telecommunications security), participation in standards committees (IETF, ITU-T, MEF), evaluating IPR and drafting patents, innovation process, and training courses.

1995-1998: **Advanced Technology Manager**

1997-1998: **Digital Signal Processing Manager, Comverse Information Systems**

(Now [Verint Systems](#)) Woodbury, New York

Responsible for the development of advanced modem intercept and speech processing DSP for law enforcement and call center applications  
Developed web-based highly compressed multimedia archive server

- 1998: **Scientific consultant, [Symbol Technologies](#)**, Holtsville, NY  
Developed prototype neural network for classification of bar-code images.
- 1989-1995: **Neural Network Applications Team-Leader, Efrat Future Technology Ltd.**  
(Afterwards **Comverse Technology**) Tel Aviv, Israel  
Developed state-of-the-art *OCR* (Optical Character Recognition) and *ASR* (Automatic Speech Recognition) applications based on neural network and artificial intelligence technologies
- 1986-1995: **Consultant to the Israel Ministry of Defense**  
Advised in the fields of digital signal processing, pattern recognition and applications of artificial neural networks  
1992: *Israel Defense Award* (פרס בטחון ישראל)
- 1980-1985: **Officer in the 8200 unit of the Israel Defense Forces** (rank: Major)  
Research scientist specializing in the exploitation of artificial intelligence techniques in digital signal processing for communications, radar, and command and control systems  
Participated in a large number of projects that were operationally deployed

**Academic** see also [ResearchGate profile](#), [Publications](#), and [Talks](#)

**Author of textbook: *Digital Signal Processing: A Computer Science Perspective***

Published by John Wiley and Sons, August 2000

<http://www.dspcsp.com/> <http://www.amazon.com/exec/obidos/ASIN/0471295469>

2008-2018: **Member of editorial board, [International Journal of Network Management](#)**

1999-now: **Adjunct, Computer Science Department, [Tel Aviv University](#)**

Responsible for the following [courses](#):

- [0368.3464](#): Digital Signal Processing Algorithms and Applications (CS 1<sup>st</sup> degree)
- [0510.7117](#): Fundamentals of 5G Mobile Communications (EE 2<sup>nd</sup> degree)
- [0510.6402](#): Fundamentals of Communications Networks (EE 2<sup>nd</sup> degree)
- [0368.4136](#): Digital Signal Processing for Computer Science Students (CS 2<sup>nd</sup> degree)
- [0368.4338](#): Advanced Seminar in DSP (CS 1<sup>st</sup> and 2<sup>nd</sup> degree)

2002-2011: **Adjunct Professor of Computer Engineering, [Jerusalem College of Engineering](#)**

Responsible for the following course:

- [10049](#): [Digital Signal Processing for Software Engineering students](#)

1995-1998: **Adjunct Professor of Computer Science, [Polytechnic University](#)**, Farmingdale, NY

Responsible for the following courses:

- [CS392](#): [DSP for Computer Science students](#)
- [CS661](#): [Artificial Intelligence](#)
- [CS662](#): [Advanced AI](#)
- [CS667](#): [Neural Networks](#)

Developed AI and NN specialties for MSc. students

Lectured to industry on uses of AI and neural networks

1986-1989: **PhD. in theoretical physics -- [Hebrew University of Jerusalem](#)**

Thesis: *Capacity of Neural Network Models*

1978-1979: **MSc. in theoretical physics - Hebrew University of Jerusalem**

Thesis: *Critical Temperature for Superconductivity in the Transition metals*

1974-1977: **BSc. in physics, math and computer science - Hebrew University of Jerusalem**

## Talks and Conferences

- 2019: **Invited speaker:** [MPLS+SDN+NFV World 2019](#) (Paris) [Aggregation/Disaggregation]
- 2018: **Keynote speaker:** [Israel DevCon](#) (Tel Aviv) [Abstraction in the Physical World]
- 2018: **Invited speaker:** [MPLS+SDN+NFV World 2018](#) (Paris) [ABCDE: the NFV Alphabet], and **panelist** [[SDN/NFV Hype or Reality](#), Blockchain]
- 2017: **Speaker:** [MEF17](#) (Orlando) [[QoS for Rich Communications Services](#)]
- 2017: **Invited speaker:** [MPLS+SDN+NFV World 2017](#) (Paris) [Virtual CPE Reality]
- 2016: **Invited speaker:** [MPLS+SDN+NFV World 2016](#) (Paris) [[EvolviNG CPE](#)]
- 2015: **Invited tutorial:** [IETF-93 \(Prague\)](#) [[SDN and NFV](#)]
- 2015: **Speaker:** [UTC Telecom & Technologies 2015](#) (Atlanta) [Migration to Packet Networks]
- 2015: **Speaker:** [Open Tech Israel SDN Symposium](#) (Tel Aviv) [SDN and NFV: The Five Trends]
- 2015: **Invited speaker:** [MPLS and SDN World Conference 2015](#) (Paris) [Lifecycle Assurance with vCPE]
- 2014: **Invited speaker:** [MPLS and SDN World Conference 2014](#) (Paris) [*D-NFV*], and **panelist** [Virtualization]
- 2013: **Invited speaker:** [MPLS and Ethernet World Conference 2013](#) (Paris) [QoSDN], and **panelist** [SDN]
- 2012: **Invited speaker:** [MPLS and Ethernet World Conference 2012](#) (Paris) [Comparing Access Packet-based Technologies [Part1](#), [Part2](#)] and **panelist** [MPLS End-to-End]
- 2011: **Invited speaker:** [MPLS and Ethernet World Conference 2011](#) (Paris) [OAM: Application Driven Evolution]
- 2010: **Invited Speaker:** [Ethernet Wholesale Summit](#) (Paris) [Timing over Packet Networks]
- 2008: **Speaker:** [TI Worldwide Developer Conference](#) [Cellular Backhaul Optimization]
- 2007: **Speaker:** [ITSF-2007](#) [Delivering Better Time-of-Day Using Synchronous Ethernet and 1588]
- 2004: **Invited speaker:** Communications Design Conference (San Francisco)  
<http://www.commdesignconference.com/archive/papers/2004/P826.htm>
- 2001: **Chair and speaker:** Seminar on Access Networks (Kfar HaMaccabiah, Tel Aviv)
- 2001: **Invited speaker:** R&D-2001 [mark-up languages] (Tel Aviv)
- 2000: **xDSL track chair and 1/2-day tutorial:** [DesignCon2000](#) (Santa Clara, California)
- 2000: **Invited speaker:** DSP-2000 [xDSL] (Tel Aviv)
- 2000: **Speaker:** Telecommunications-2000 (Tel Aviv) [Perceptual Speech Quality]
- 1995: **Invited speaker:** 18<sup>th</sup> Convention IEEE Israel [Advances in Speech Recognition]
- 1994: **OCR session chair** at the [12<sup>th</sup> International Conference on Pattern Recognition](#)
- 1993: **Co-chair and organizer** of the [10<sup>th</sup> annual Israel AICVNN conference](#) ([proceedings](#))

## Standardization Efforts

**Co-chair** of [IETF TICTOC](#) Working Group

Regularly participated in [IETF](#) and [ITU-T](#) meetings

Occasionally participated in [MEF](#), [ETSI](#), [ANSI](#), IP/MPLS (was MFA) Forum, DSL-forum

**IETF:** Coauthor of RFCs 4553, 5087, 5287, 5920, 6310, 7893, and numerous Internet Drafts

Contributed to RFCs 3916, 4197, 4385, 4733, 4734, 4901, 5244, 5611, 5885, and 6669

**ITU-T** Editor of Y.1413, Y.1418, Y.1452, Y.1453; major contributor to Y.1414, Y.1415, Y.1731

## **Selected Publications and Patents** (see also <http://www.dspsp.com/pubs>)

Yaakov Stein, Yuri Gittik and Ron Insler (2020)  
*Transport Network Aspects* book chapter in *5G RAN Architecture* Sasha Sirotkin (ed.)  
John Wiley and Sons, NY, *to be published 2020*

Gabriel Zigelboim, Alon Geva, and Yaakov Stein (August 2019)  
*One-Way Packet Delay Measurement (divisional)*  
[US Patent 10,396,971](#)

Yaakov Stein, Ron Insler, and Alon Geva (July 2018)  
*Triangle Loopback (divisional)*  
[US Patent 10,021,006](#)

Gabriel Zigelboim, Alon Geva, and Yaakov Stein (October 2017)  
*One-Way Packet Delay Measurement*  
[US Patent 9,787,461](#)

YJ. Stein, D. Black, B. Briscoe (June 2016)  
*PW Congestion Considerations*  
[RFC 7893](#)

Yaakov Stein, Ron Insler, and Alon Geva (June 2016, July 2018)  
*Triangle Loopback*  
US patents [9,369,362](#) and [10,021,006](#)

Alon Geva and Yaakov Stein (March 2016)  
*Pluggable Master Clock*  
[US Patent 9,276,689](#)

Yaakov Stein (07/2015)  
*SDN, NFV, and All That*  
[IETF Journal, Volume 11, Issue 1, pp. 11-14](#)

Alon Geva, Gabriel Zigelboim, and Yaakov Stein (March 2015, December 2016)  
*Timing over Packet Demarcation Entity*  
US patents [8,971,356](#) and [9,525,502](#)

Yaakov Stein et al. (July 2013)  
*Accessing Cloud Services*  
[draft-stein-cloud-access-03](#)

N. Sprecher et al. (July 2012)  
*An Overview of the OAM Toolset for MPLS-Based Transport Networks*  
[RFC 6669](#)

Alon Geva, Ehud Malik, and Yaakov Stein (November 2011)  
*High Quality Timing Distribution over DSL without NTR Support*  
US patents [8068430](#) and [8,660,150](#)

M. Aissaoui et al (April 2011)  
*Pseudowire (PW) OAM Message Mapping*  
[RFC 6310](#)

L. Fang et al. (July 2010)  
*Security Framework for MPLS and GMPLS Networks*  
[RFC 5920](#)

Yaakov Stein (April 2009)  
*The Value of Being Linked In*  
[Preprint](#)

A. Vainshtein and YJ. Stein (August 2008)  
*Control Protocol Extensions for the Setup of TDM Pseudowires in MPLS Networks*  
[RFC 5287](#)

Yaakov Stein (editor) (02/2008)  
*Pseudowire layer network*  
[ITU-T Recommendation Y.1418](#)

Yaakov (J) Stein (February 2008)  
*Cellular Backhaul Optimization: Cost effective approaches for Base Station Backhaul*  
[TI Worldwide Developer Conference \(Dallas, TX\) slides](#)

Y(J). Stein, R. Shashoua, R. Insler, and M. Anavi (December 2007)  
*Time Division Multiplexing over IP (TDMoIP)*  
[RFC 5087](#)

Yaakov (J) Stein, Alon Geva, and Gabriel Zigelboim (November 2007)  
*Delivering Better Time-of-Day Using Synchronous Ethernet and 1588*  
[ITSF-2007 \(London\) slides](#)

A. Vainshtein and YJ. Stein (June 2006)  
*Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)*  
[RFC 4553](#)

Yaakov Stein (editor) (03/2006)  
*TDM-IP interworking - User plane interworking*  
[ITU-T Recommendation Y.1453](#)

Yaakov Stein (editor) (03/2006)  
*Voice trunking over IP networks*  
[ITU-T Recommendation Y.1452](#)

Yaakov Stein and Brian Stroehlein (2006)  
*Using Synchronization over PSN – Does IEEE 1588 Really Make a Difference?*  
NIST-ATIS Workshop on Synchronization in Telecommunication Systems ([WSTS '06](#))

Hugo Silberman, Tsvi Eitane, and Yaakov Stein (December 2004)  
*System and method for extending the range of xDSL services*  
[US Patent 6829246](#)

Yaakov Stein (editor) (03/2004)  
*TDM-MPLS network interworking - User plane interworking*  
[ITU-T Recommendation Y.1413](#)

- Yaakov Stein (2004)  
*The Wonders of Digital Processing* (in Hebrew)  
[Galileo](#), vol 66, Feb 2004
- Yaakov Stein and Eitan Schwartz (2001)  
*An Evolutionary Approach to Transporting Voice and Legacy Data over IP Networks*  
[Carriers world](#), 16/03/2001
- Yaakov Stein (2001)  
*Extension of Telephone Services in an IP Network* (in Chinese)  
China Computer World, Nov. 5, 2001
- Yaakov Stein and Eitan Schwartz (2000)  
*Ever thought about extending circuits over IP?*  
Telecommunications, Nov 2000 pp 89-94
- Yaakov Stein and Eitan Schwartz (2000)  
*TDMoIP: An Evolutionary Approach to Transporting Voice over IP Networks* (in Russian)  
Networks and Communications Systems, Sept 2000 pp 96-101 <http://ccc.ru/magazine>
- J. Y. Stein (2000)  
***Digital Signal Processing - a Computer Science Perspective***  
John Wiley and Sons, NY, ISBN 0471295469  
<http://www.dspsp.com> <http://www.amazon.com/exec/obidos/ASIN/0471295469/>
- J. Y. Stein (2000)  
*TecForum - Tutorial on xDSL*  
DesignCon2000, Santa Clara, California  
<http://www.designcon.com/2000/tecforum.html> - TFA6
- Yaakov Stein (1994)  
*A Review of 'Minimum Classification Error' Training*  
[Efrat Future Technologies Technical Report](#)
- Yaakov Stein (1994)  
*Neurons - Together they do Everything* (in Hebrew)  
[Computers Jan. 1994](#)
- Y. Stein (1993)  
*False Alarm Reduction for ASR and OCR*  
[Proc. 10<sup>th</sup> IAICVNN](#), 195-200.
- Y. Stein (1993)  
*Hyperplane Training of a Hypersphere Classifier*  
[Proc. 10<sup>th</sup> IAICVNN](#), 291-296.
- R. Aloni-Lavi, Y. Metzger and Y. Stein (1992)  
*A BP Variant with Improved Convergence and Generalization*  
International Joint Conference on Neural Networks (Baltimore) I-932 - I-937  
<https://www.amazon.com/exec/obidos/ASIN/0780305590/>

Y. Stein (Dec 1990)  
*Storage Capacity for Neural Network Models* (in Hebrew)  
PhD. Thesis, Hebrew University of Jerusalem - Theoretical Physics

H. Gutfreund and Y. Stein (1990)  
*Capacity of Neural Networks with Discrete Synaptic Couplings*  
[J. Phys. A \(Math. Gen.\) 23, 2613-2630.](#)

H. Gutfreund and Y. Stein (1989)  
*Neural Networks with Discrete Synaptic Couplings*  
[STATPHYS 17 \(Porto Alegre, Brazil\)](#)

H.J. Sommers, A. Crisanti, H. Sompolinsky and Y. Stein (1988)  
*Spectrum of Large Random Asymmetric Matrices*  
[Phys. Rev. Lett. 60, 1895-1898.](#)

Y. Stein (1983)  
*Two Dimensional Euclidean Regression*  
Conference on Computer Mapping (Herzlia, Israel) ([preprint](#))

Y. Stein (1981)  
*A Short Note Concerning Planiversal Solid State Physics*  
[First Symposium on Two-Dimensional Science and Technology](#) (ed. AK Dewdney) 90-91.

Y. Stein (1981)  
*Maxwell's Equations in Two Dimensions*  
[First Symposium on Two-Dimensional Science and Technology](#) (ed. AK Dewdney) 28-33.

Y. Stein (June 1979)  
*Critical Temperature for the Onset of Superconductivity in the Transition Metals* (in Hebrew)  
[MSc. Thesis](#), Hebrew University of Jerusalem - Theoretical Physics