

Introduction to Databases

- I. Overview and logistics (p.1-2)
- II. The Israeli Bank and its Data (p. 3-9)
- III. SEEstat (p. 10-15)
- IV. Interesting Scenarios (p. 16-22)
- V. Homework 1 (p. 23)

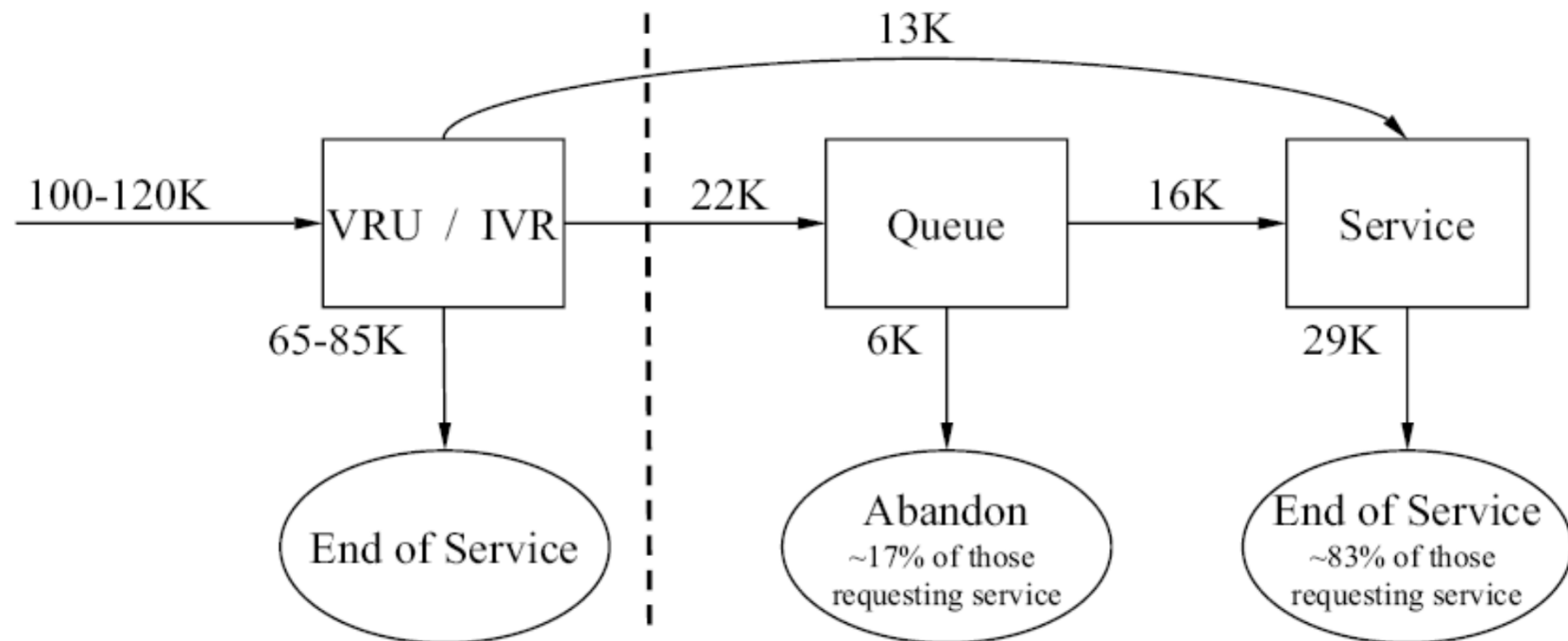
Logistics for Recitation and HW

- TA
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 - Office Hour: Tuesday 13:30-14:30
- Recitation: Monday 11:30-12:30
Thursday 15:30-16:30
- Course website: <http://ie.technion.ac.il/serveng2014S>

Call Center of a Small Israeli Bank

- Extensively used in Homeworks
- General Data
 - 12 months in 1999
 - 13 regular agents, 5 Internet agents, 1 shift-supervisor
 - Working hours: Sun-Thurs, 7am-midnight; Fri 7am-2pm; Sat 8pm-midnight
 - Approximately 100,000–120,000 calls per month
 - Call records
 - **Time stamps:** VRU, queue, service
 - **Service Types:** PS (68%) Routine Services; NE (9%) Stock Transaction; NW (15%) New/potential Customers; IN (5%) Internet Assistance; TT (3%) outbound; PE (0.5%) Foreign Language (English)
 - **Customer Types:** Regular and VIP

Event History of an Incoming Call



- VRU/IVR: Voice Response Unit / Interactive Voice Response
- Units of rates are calls per month

A Data Sample (Automated Call Distributor)

1

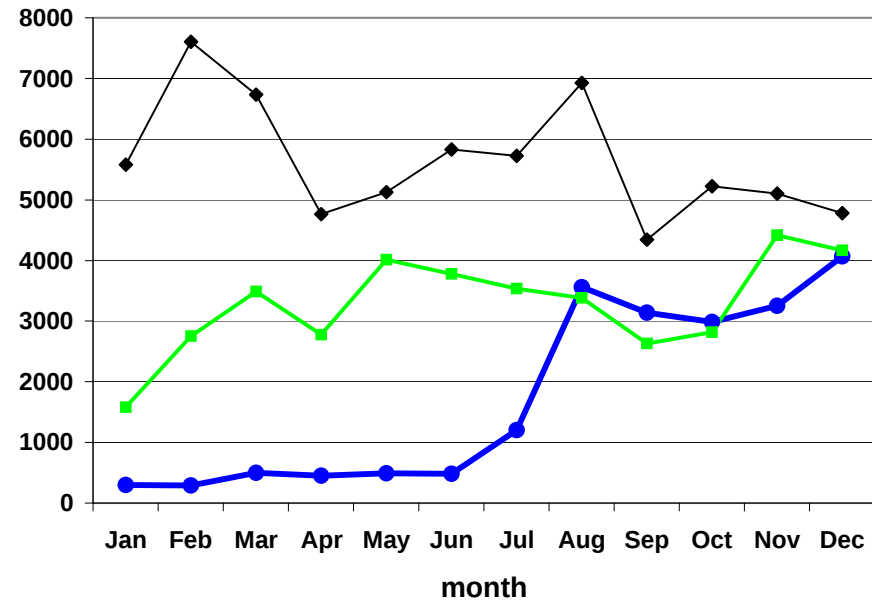
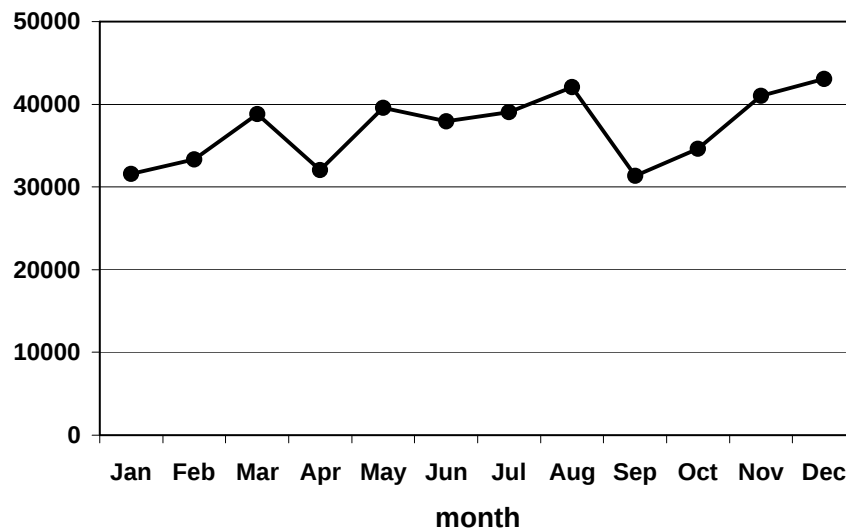
2

3

call_id	customer_id	priority	type	date	vru_entry	vru_exit	vru_time	q_start	q_exit	q_time	outcome	ser_start	ser_exit	ser_time	server
44749	27644400	2	PS	990901	11:45:33	11:45:39	6	11:45:39	11:46:58	79	AGENT	11:46:57	11:51:00	243	DORIT
44750	12887816	1	PS	990905	14:49:00	14:49:06	6	14:49:06	14:53:00	234	AGENT	14:52:59	14:54:29	90	ROTH
44967	58660291	2	PS	990905	14:58:42	14:58:48	6	14:58:48	15:02:31	223	AGENT	15:02:31	15:04:10	99	ROTH
44968	0	0	NW	990905	15:10:17	15:10:26	9	15:10:26	15:13:19	173	HANG	00:00:00	00:00:00	0	NO_SERVER
44969	63193346	2	PS	990905	15:22:07	15:22:13	6	15:22:13	15:23:21	68	AGENT	15:23:20	15:25:25	125	STEREN
44970	0	0	NW	990905	15:31:33	15:31:47	14	00:00:00	00:00:00	0	AGENT	15:31:45	15:34:16	151	STEREN
44971	41630443	2	PS	990905	15:37:29	15:37:34	5	15:37:34	15:38:20	46	AGENT	15:38:18	15:40:56	158	TOVA
44972	64185333	2	PS	990905	15:44:32	15:44:37	5	15:44:37	15:47:57	200	AGENT	15:47:56	15:49:02	66	TOVA
44973	3.06E+08	1	PS	990905	15:53:05	15:53:11	6	15:53:11	15:56:39	208	AGENT	15:56:38	15:56:47	9	MORIAH
44974	74780917	2	NE	990905	15:59:34	15:59:40	6	15:59:40	16:02:33	173	AGENT	16:02:33	16:26:04	1411	ELI
44975	55920755	2	PS	990905	16:07:46	16:07:51	5	16:07:51	16:08:01	10	HANG	00:00:00	00:00:00	0	NO_SERVER
44976	0	0	NW	990905	16:11:38	16:11:48	10	16:11:48	16:11:50	2	HANG	00:00:00	00:00:00	0	NO_SERVER
44977	33689787	2	PS	990905	16:14:27	16:14:33	6	16:14:33	16:14:54	21	HANG	00:00:00	00:00:00	0	NO_SERVER
44978	23817067	2	PS	990905	16:19:11	16:19:17	6	16:19:17	16:19:39	22	AGENT	16:19:38	16:21:57	139	TOVA
44764	0	0	PS	990901	15:03:26	15:03:36	10	00:00:00	00:00:00	0	AGENT	15:03:35	15:06:36	181	ZOHARI
44765	25219700	2	PS	990901	15:14:46	15:14:51	5	15:14:51	15:15:10	19	AGENT	15:15:09	15:17:00	111	SHARON
44766	0	0	PS	990901	15:25:48	15:26:00	12	00:00:00	00:00:00	0	AGENT	15:25:59	15:28:15	136	ANAT
44767	58859752	2	PS	990901	15:34:57	15:35:03	6	15:35:03	15:35:14	11	AGENT	15:35:13	15:35:15	2	MORIAH
44768	0	0	PS	990901	15:46:30	15:46:39	9	00:00:00	00:00:00	0	AGENT	15:46:38	15:51:51	313	ANAT
44769	78191137	2	PS	990901	15:56:03	15:56:09	6	15:56:09	15:56:28	19	AGENT	15:56:28	15:59:02	154	MORIAH
44770	0	0	PS	990901	16:14:31	16:14:46	15	00:00:00	00:00:00	0	AGENT	16:14:44	16:16:02	78	BENSION
44771	0	0	PS	990901	16:38:59	16:39:12	13	00:00:00	00:00:00	0	AGENT	16:39:11	16:43:35	264	VICKY

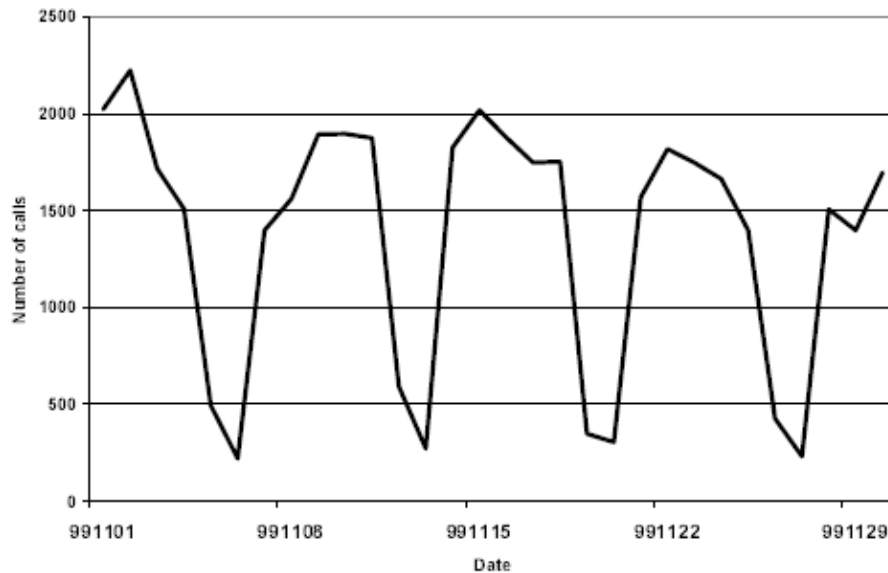
Number of Calls:

Annual Plot with Month as time unit

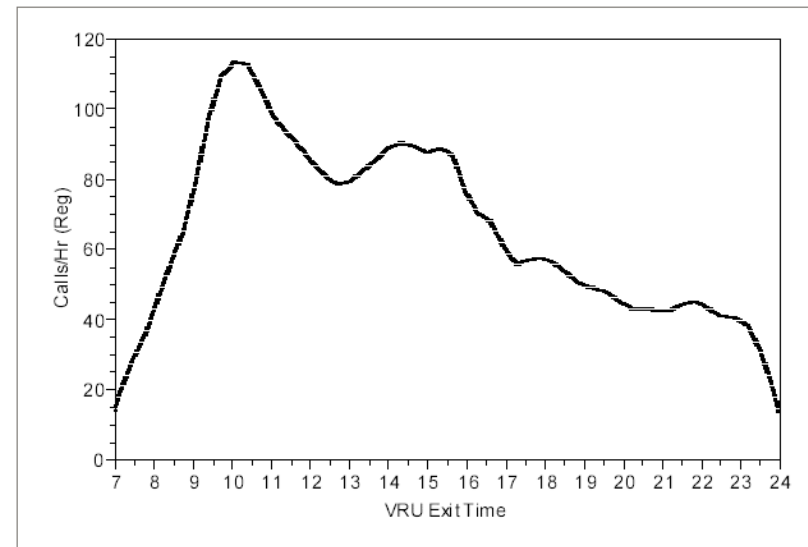


- Decrease in calls in Apr and Sep
 - Due to many holidays in these months
 - Affects staffing and hiring/training schedules
- Number of calls per type
 - IN: Internet assistance
 - NE: Stock transaction
 - NW: New/potential customers

Number of Calls: **Monthly** and **Daily** Plots

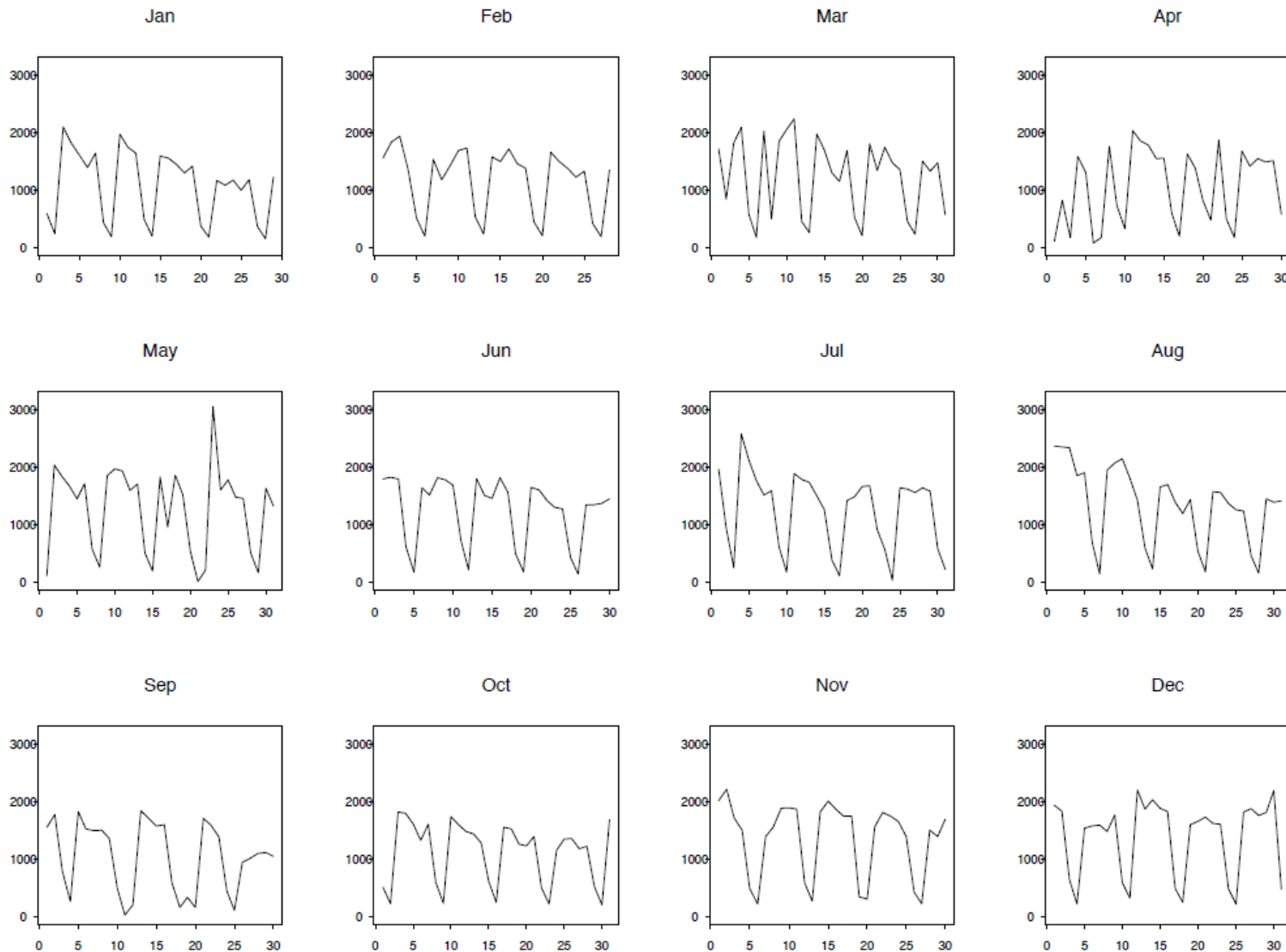


- Calls per day in November
 - Daily resolution
 - Valleys in weekends
 - Used to determine work assignments



- Calls per hour: Weekdays in Nov-Dec
 - Hourly resolution
 - Two peaks at 10AM and 3PM

Number of Calls: 12 Monthly Plots



Debugging Database

- Combinations of VRU, queue and service times

VRU	<0		0				>0				Total
Q	>0		0		>0		0		>0		
SER	0	>0	0	>0	0	>0	0	>0	0	>0	
Jan	11	22	328	2	127	189	1064	13300	2978	13578	31599
Feb	2	23	355	2	55	255	1653	13028	3828	14143	33344
Mar	8	19	608	0	107	419	1380	8647	8420	19193	38801
Apr	6	31	600	2	44	224	1902	8187	5561	15479	32036
May	30	48	558	2	48	268	1601	10870	6913	19215	39553
Jun	4	23	433	1	47	264	1396	14112	4563	17092	37935
Jul	12	34	598	2	55	264	1692	9683	6738	19944	39022
Aug	4	15	547	1	61	124	2602	12966	7151	18607	42078
Sep	4	10	279	0	29	81	1370	16055	2529	11014	31371
Oct	2	2	186	2	19	63	1370	21020	2039	9922	34625
Nov	2	18	408	1	100	174	1463	14771	5338	18744	41019
Dec	3	17	490	0	93	181	1708	13978	6338	20257	43065
Total	88	262	5390	15	785	2506	19201	156617	62396	197188	444448
%	-	0.1	1.2	-	0.2	0.6	4.3	35.2	14	44.4	100

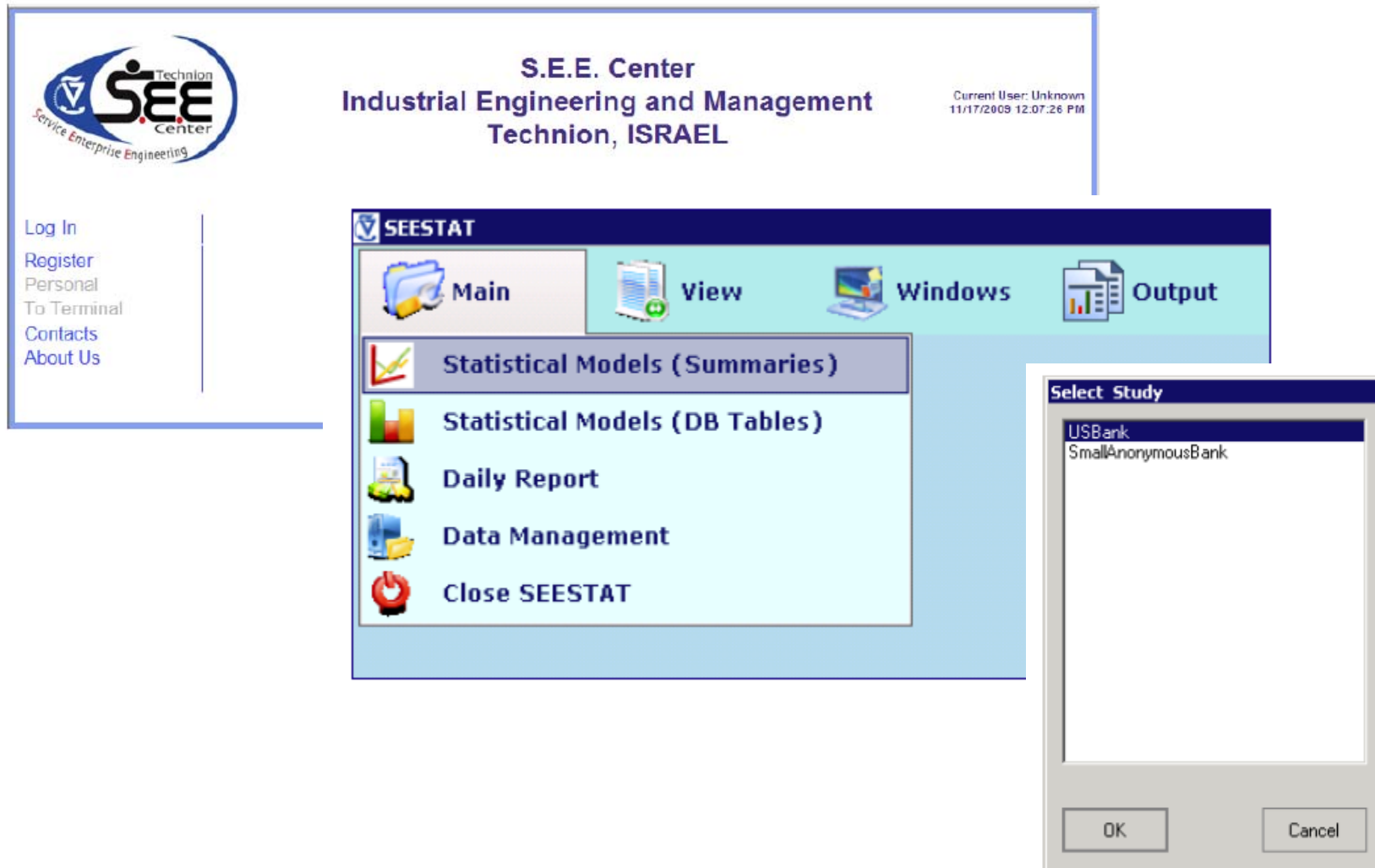
Project DataMOCCA/SEESat



- Data MOodels for Call Center Aalysis
- Service Enterprise Engineering Statistics
- Project Partners: Technion, Wharton, Companies
- Goal: Designing and Implementing a (universal) data-base/data-repository and interface for storing, retrieving, analyzing and displaying Call-by-Call-based data/information
- Enables the Study of:
 - Customers: Wait Time, Abandonment, Retrials
 - Service Providers/Agents: Service Duration, Activity Profile
 - Managers/System: Loads, Queue Lengths, Trends

SEESat Interface (Recitation 6)

- <http://seeserver.iem.technion.ac.il/see-terminal>

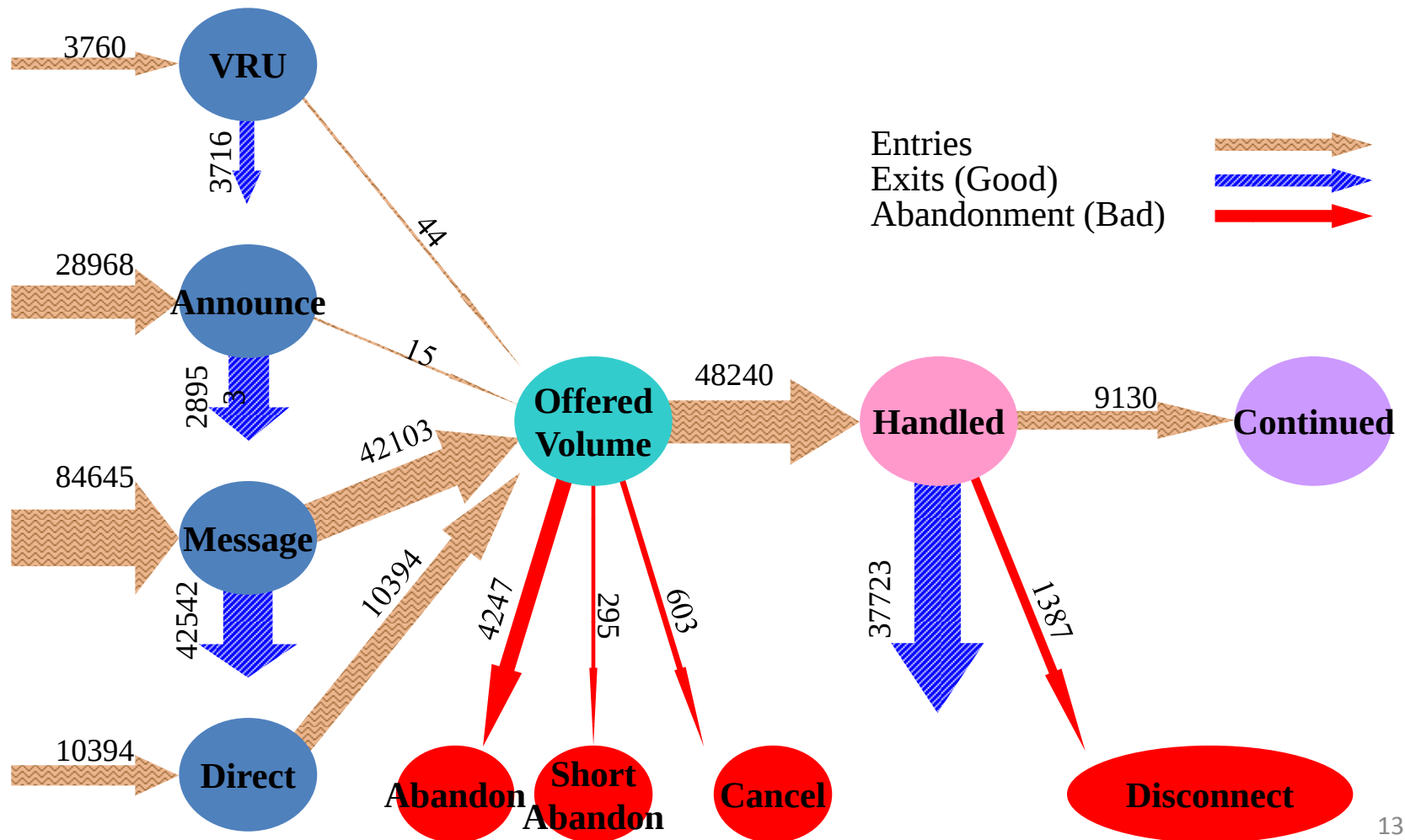


SEESat

- System Components:
 - **Cleaned data**: operational histories of **individual** calls - **export, import**
 - **Daily / monthly / yearly reports and flow-charts** for a complete operational view
 - **Graphs and tables**
 - in customized resolutions (**month, days, hours, minutes, seconds**)
 - for a variety of (pre-designed) **operational measures** (arrival rates, abandonment counts, service- and wait-time distribution, utilization profiles,...), and for **new user-defined** measures
- Currently Four Databases (some public, some for research):
 - US Bank (220/40M calls, 1000 agents, 2.5 years).
 - Israeli Telecom (800 agents, 3.5 years; 55GB; ongoing).
 - Israeli Bank (500 agents, 1.5 years; ongoing).
 - Hospital (from 7 hospitals, 1-4 years, different levels of information)

SEESat: Flow Chart

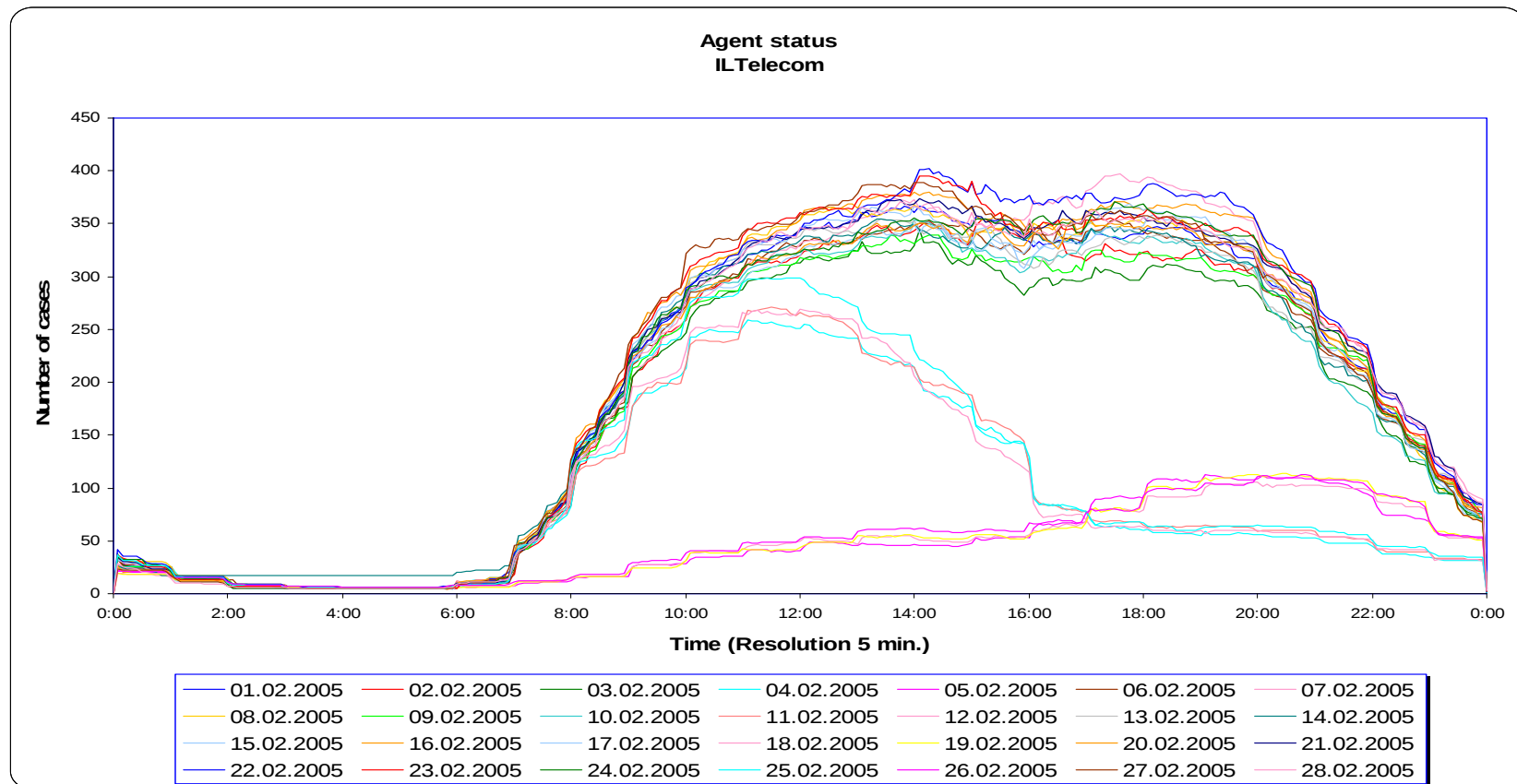
Daily Report of April 13, 2004 – Regular Day



SEESat: Operational Data (1)

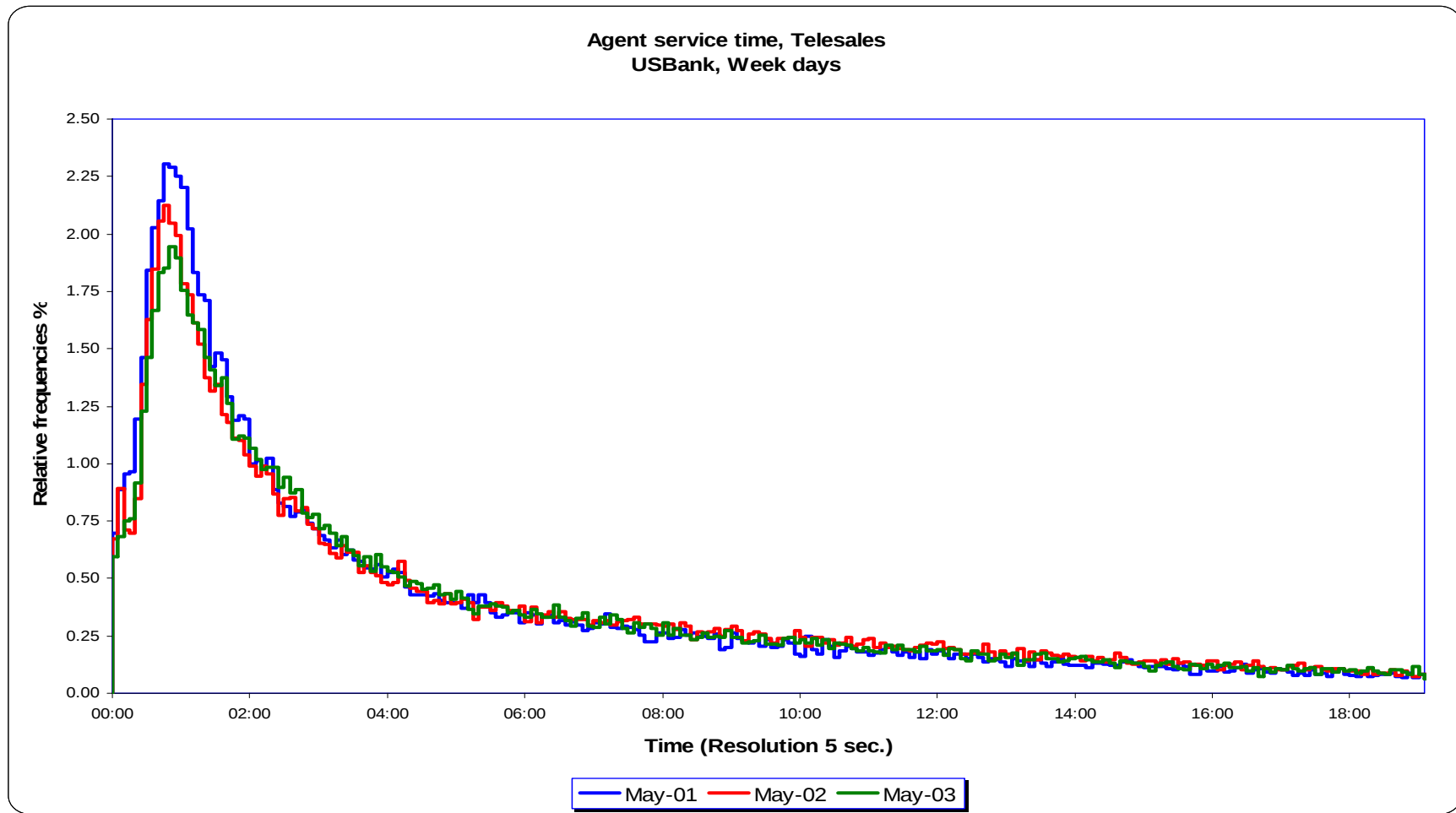
Pre-designed Operational Measures: Arrival Rates, Feb 2005

Daily Reports



SEESat: Operational Data (2)

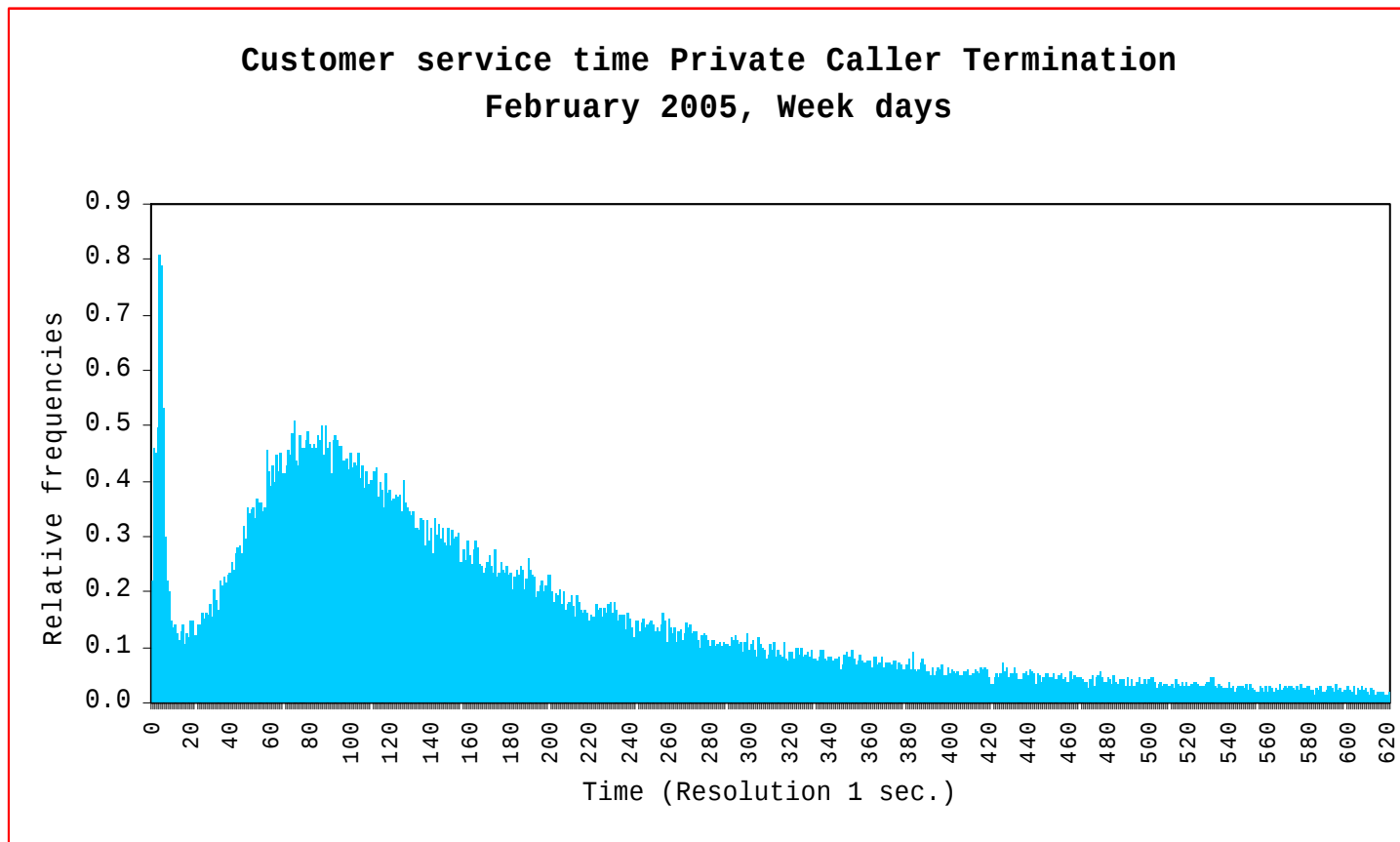
US Bank: **Service Time** Histograms for Telesales, 2001-3



Service Eng: Interesting Scenarios (1)

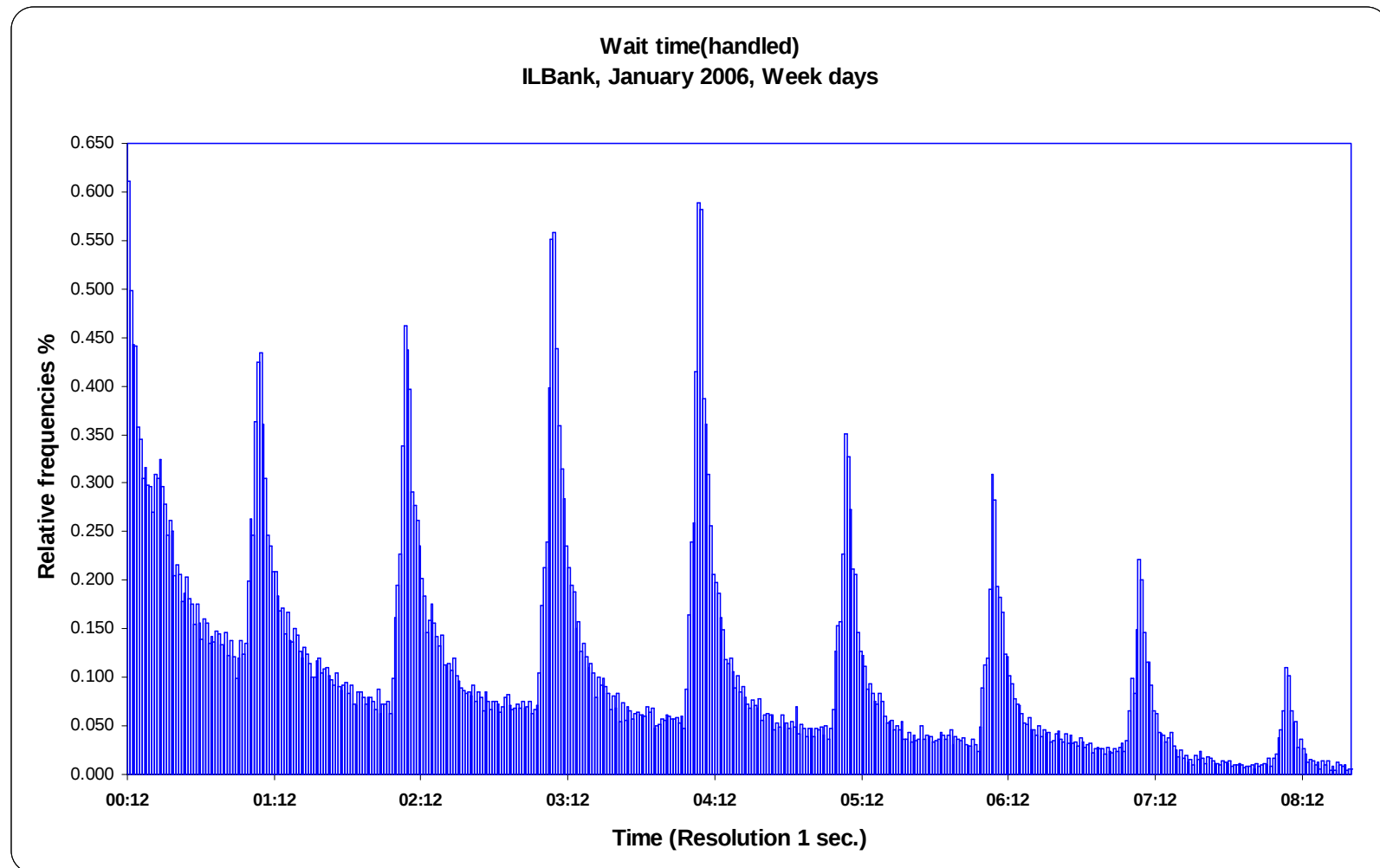
Pre-designed Operational Measures: Service Times

Histograms



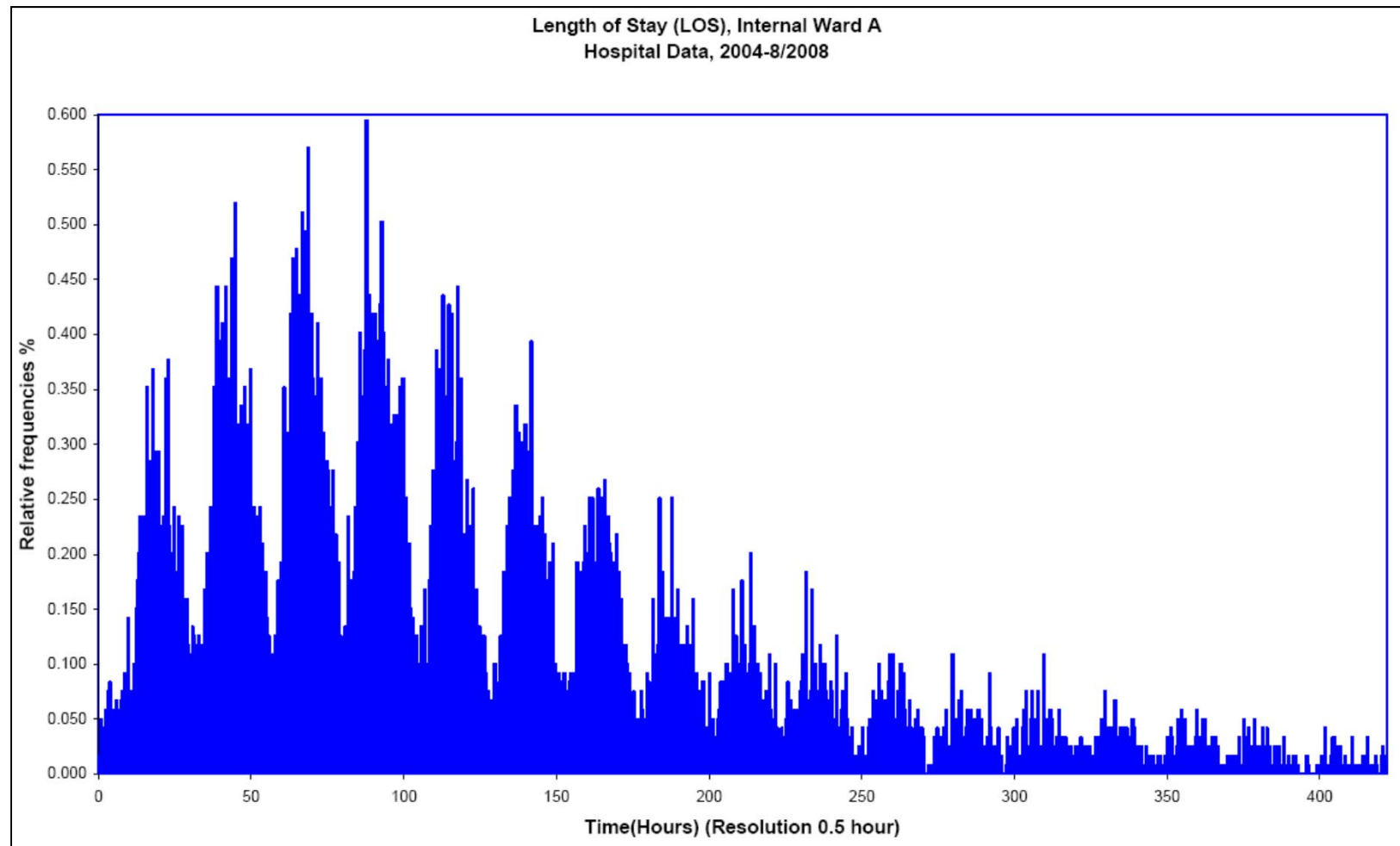
Service Eng: Interesting Scenarios (2)

Israeli Bank: Histogram of Waiting Time



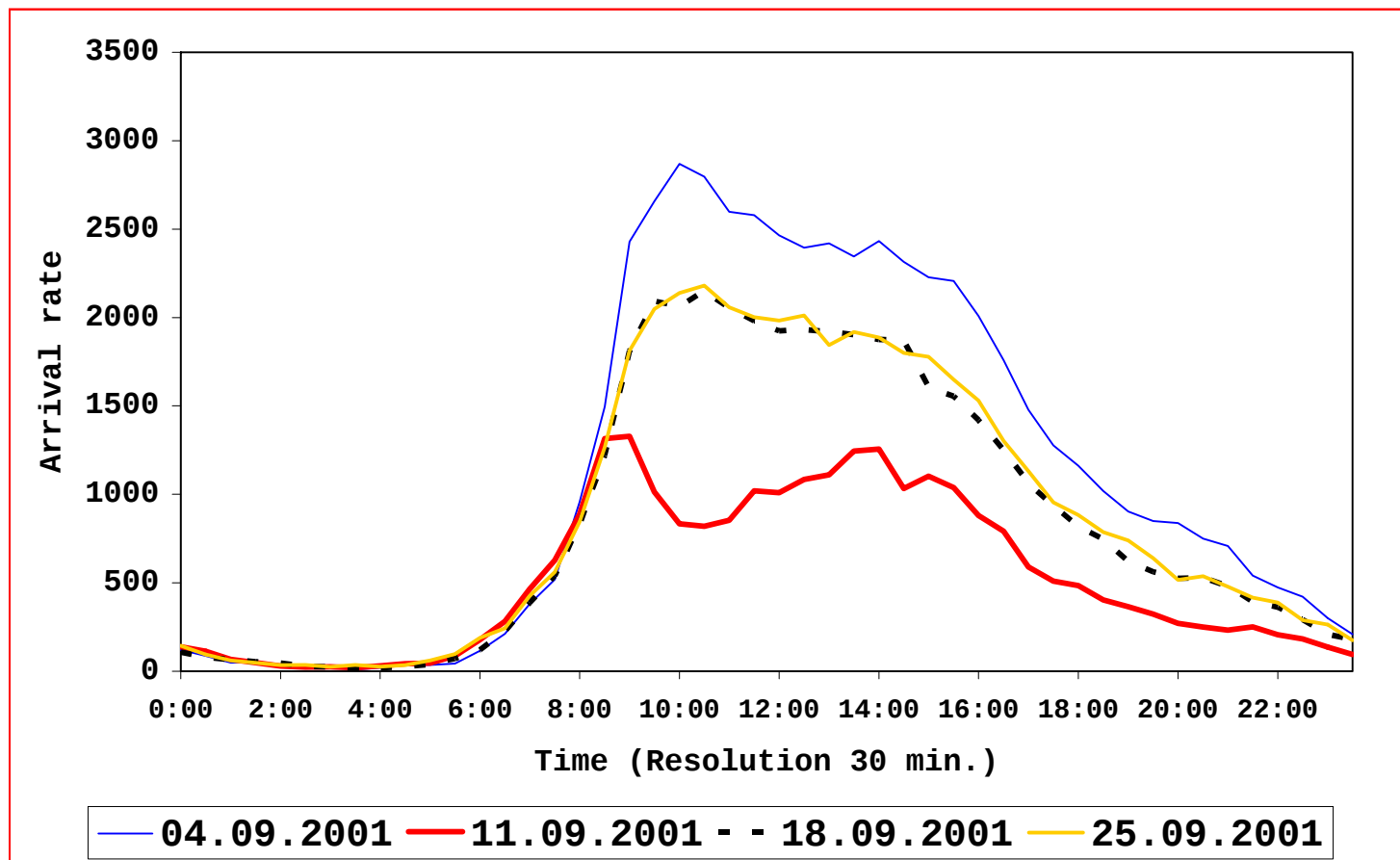
Service Eng: Interesting Scenarios (3)

Hospital Data: Histogram of Length of Stay



Service Eng: Interesting Scenarios (4)

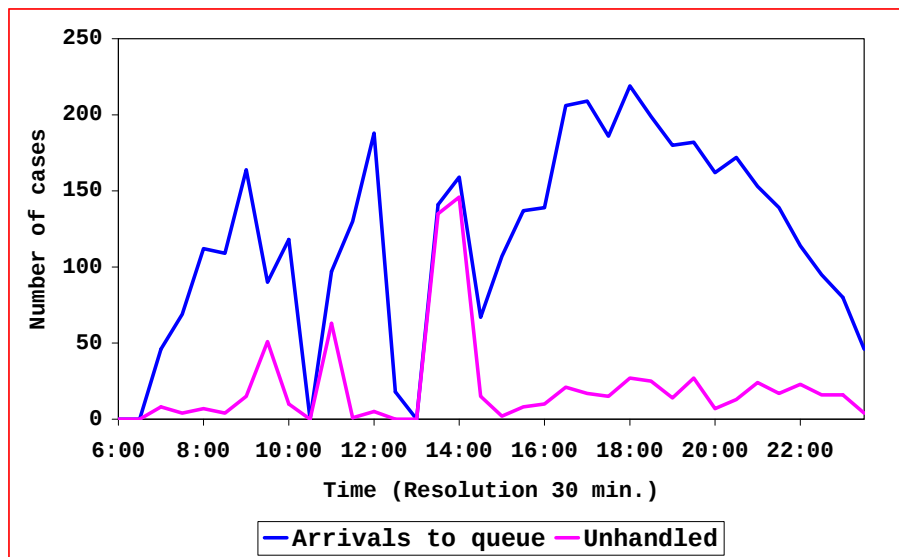
US Bank: Arrival Rates on Tuesdays in September



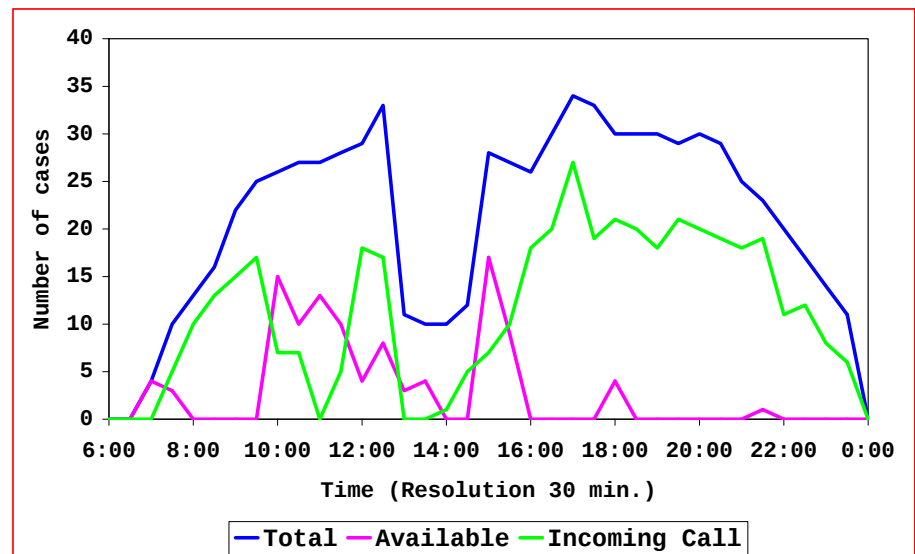
Service Eng: Interesting Scenarios (5)

Israeli Call Center

Unhandled Calls on May 24th, 2005

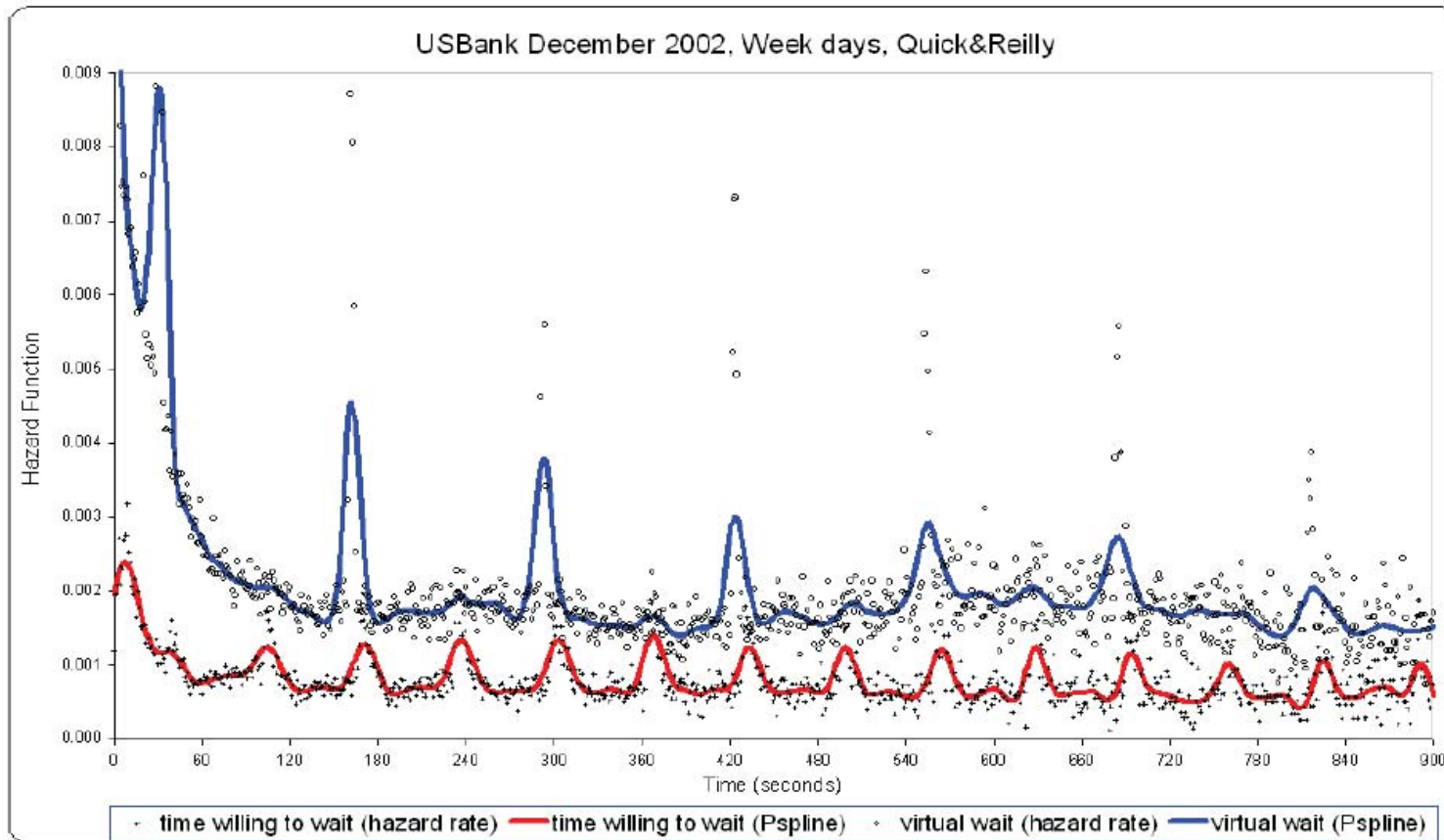


Agents Status on May 24th, 2005



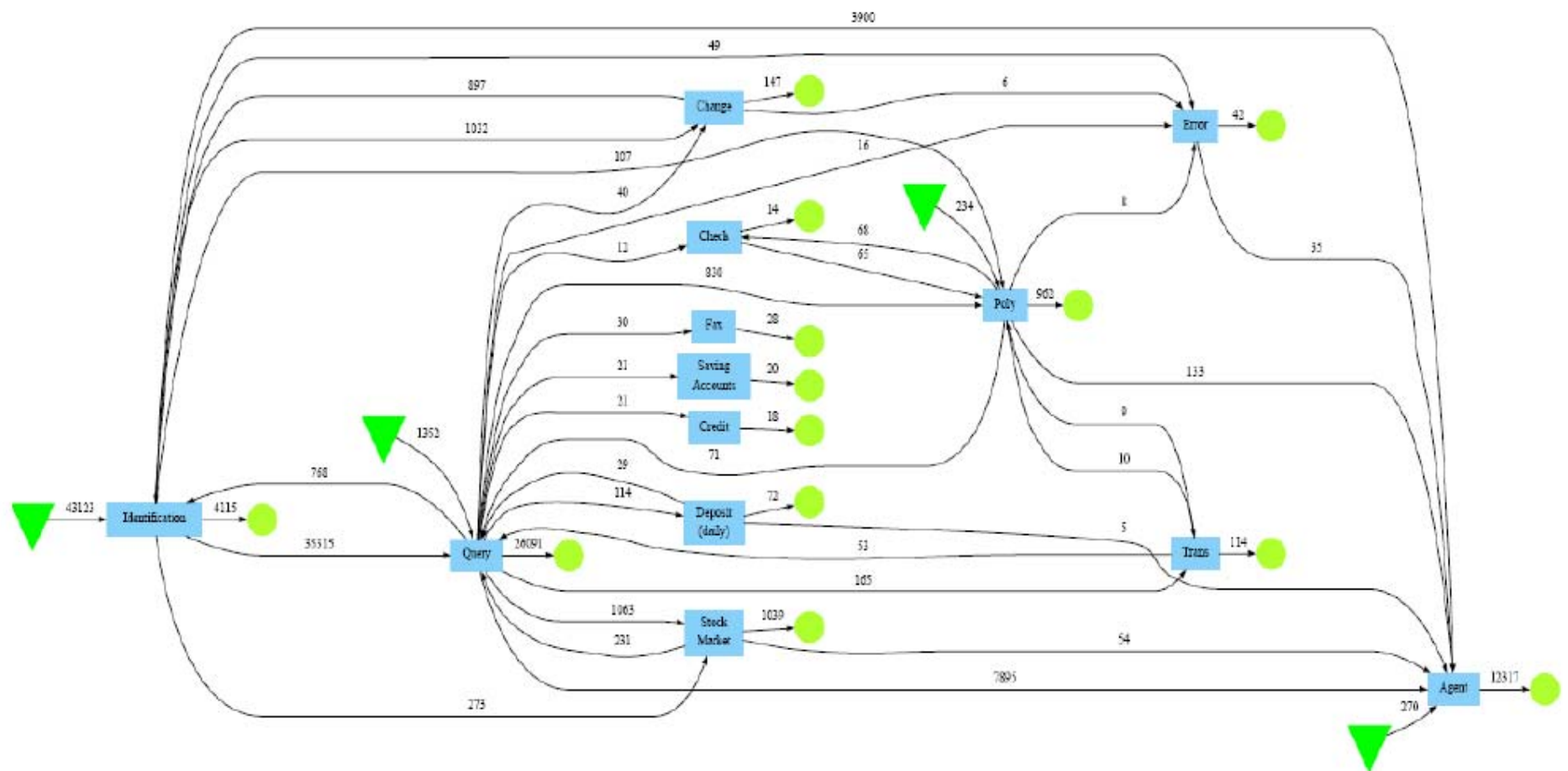
Service Eng: Interesting Scenarios (6)

Psychology + Protocols



Service Eng: Interesting Scenarios (7)

Future features in SEESat – Daily report, customer flows within the IVR



Homework 1

- o 3 parts
- o Due next lecture (24/10/2013).
- o All related materials can be found under the course website: <http://ie.technion.ac.il/serveng2014W>