



WaitTime AI
Crowd
Management

WaitTime



Zack Klima

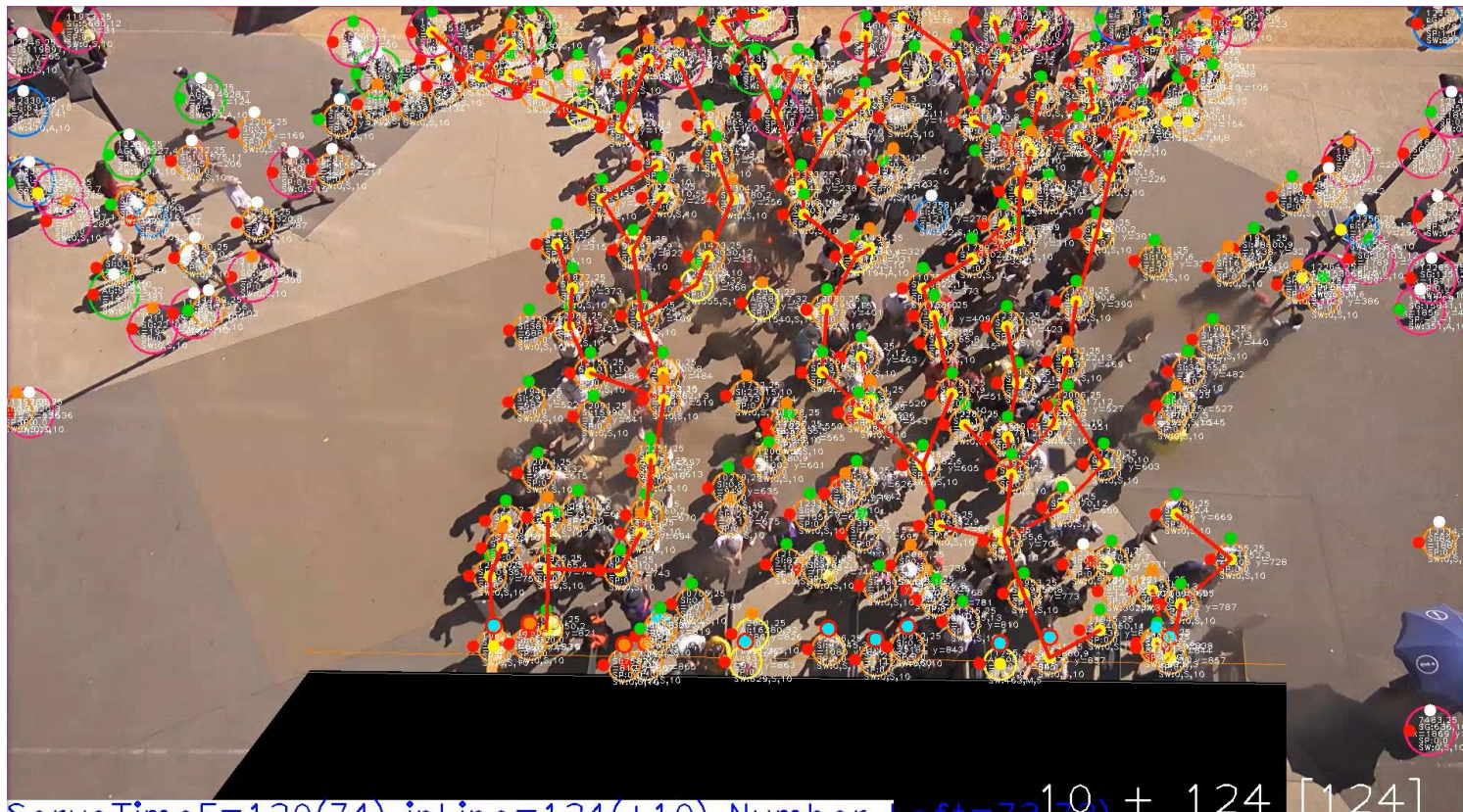
Founder & CEO, WaitTime

1/4. Queueing Algorithm

Real-time API output: # of people in line + rate of service

Solution Applications:

- Sports & Entertainment:
 - Concession lines
 - Restroom lines
 - Retail check out lines
 - Ingress Gates
- Airports:
 - Concession lines
 - Restroom lines
 - Security lines
 - TSA
- Retail:
 - Check out lines
 - Product areas

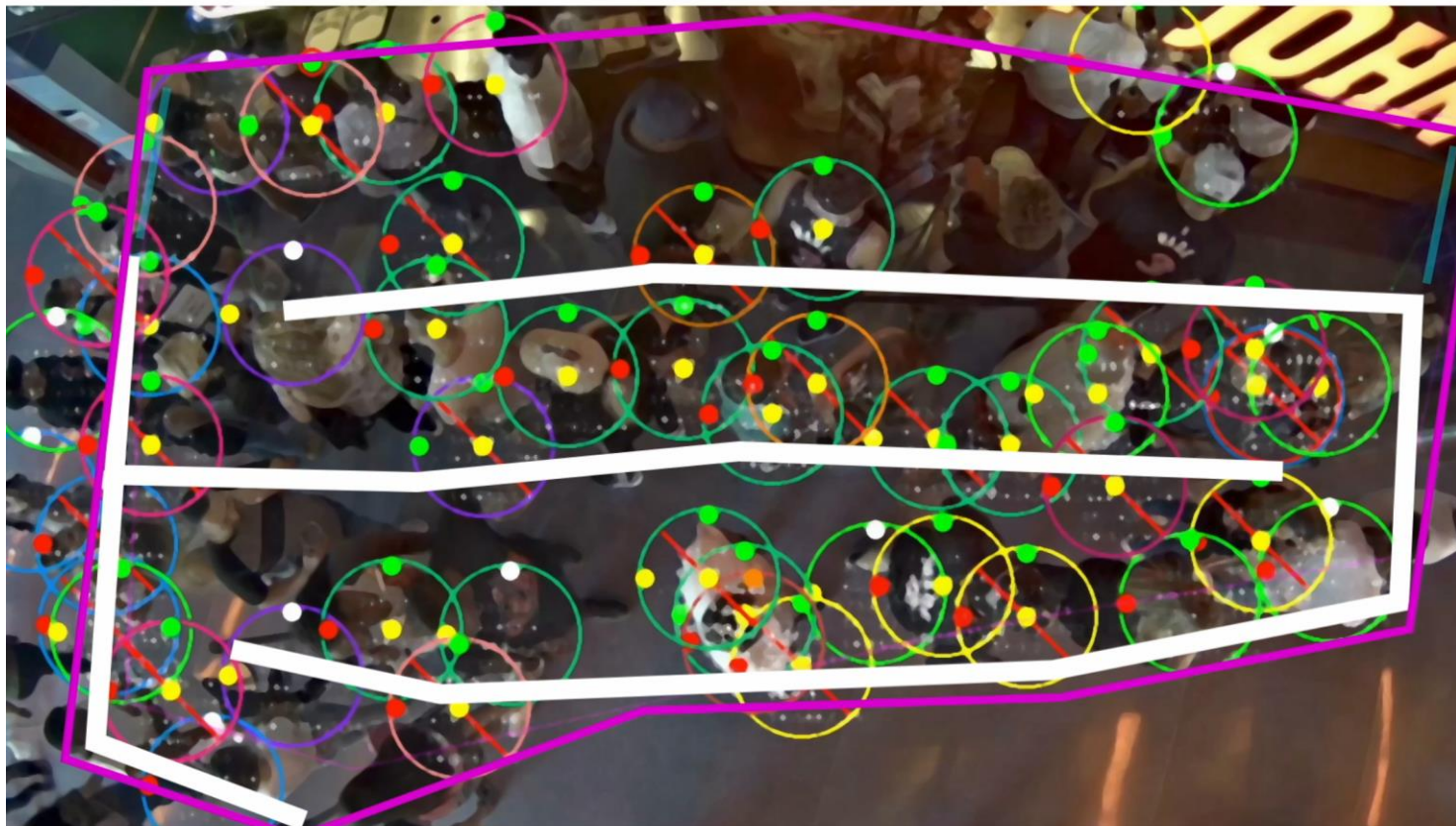


ServeTime = 120 / (71) in line = 124 / (10) Number of people in line = 124 [124]

Real-time API output: # of people in line + rate of service

Solution Applications:

- Sports & Entertainment:
 - Concession lines
 - Restroom lines
 - Retail check out lines
 - Ingress Gates
 - Betting lines
- Airports
 - Concession lines
 - Restroom lines
 - Security lines
 - TSA
 - Cafe lines
- Retail:
 - Check out lines
 - Product areas



Real-time API output: % of occupancy (ex: 40% filled)

Solution Applications:

- Sports & Entertainment:
 - Concession lines
 - Restroom lines
 - Retail check out lines
 - Ingress Gates
 - Betting lines
- Airports
 - Concession lines
 - Restroom lines
 - Security lines
 - TSA
 - Cafe lines
- Retail:
 - Check out lines
 - Product areas
- Smart Campuses:
 - Hot spots
 - Occupancy of areas
- Convention Centers:
 - Cafes
 - Gathering spots
 - Lobbies

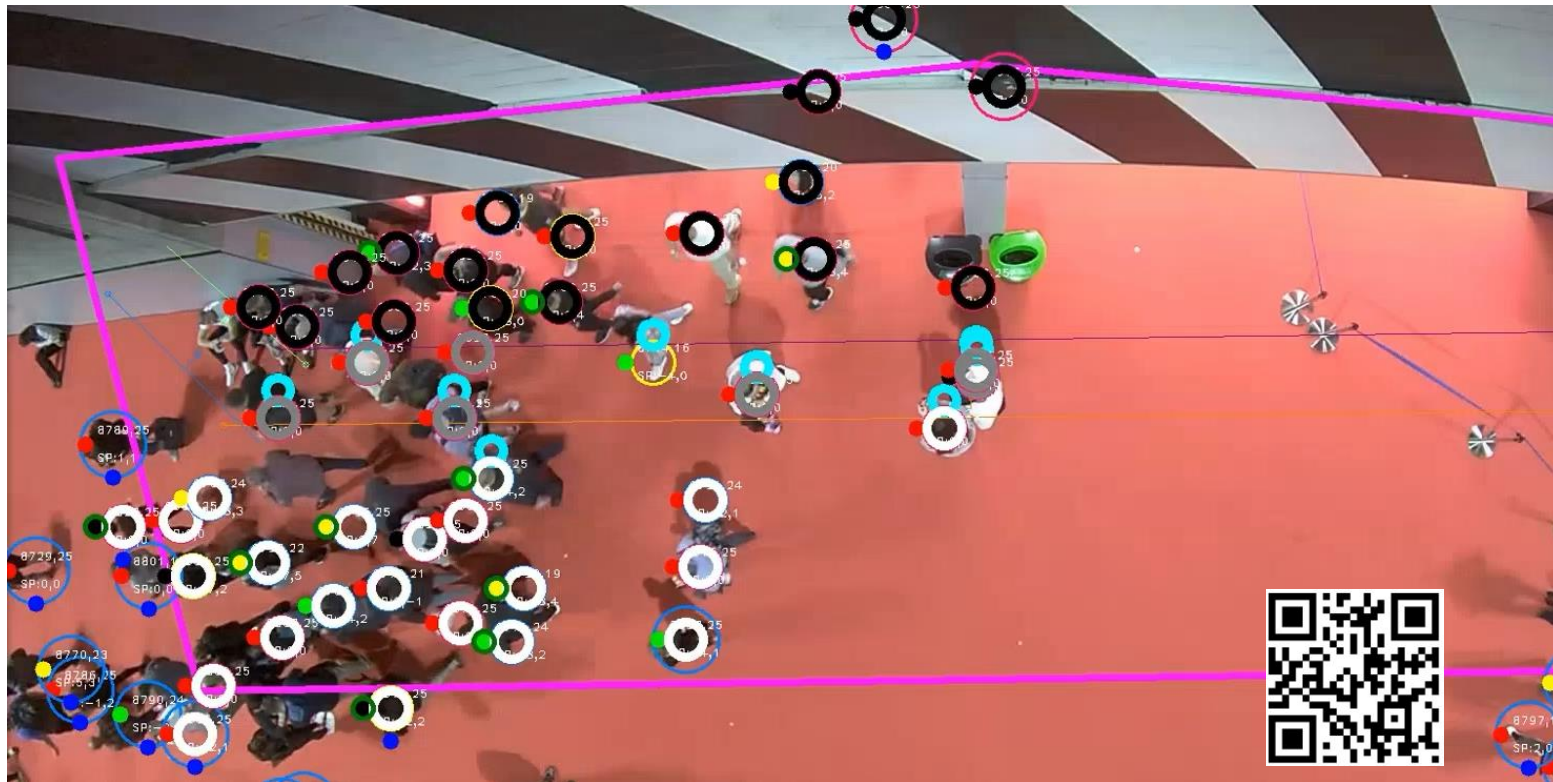


4/4. Entry-Exit Algorithm

Real-time API output: # of people who entered & exited

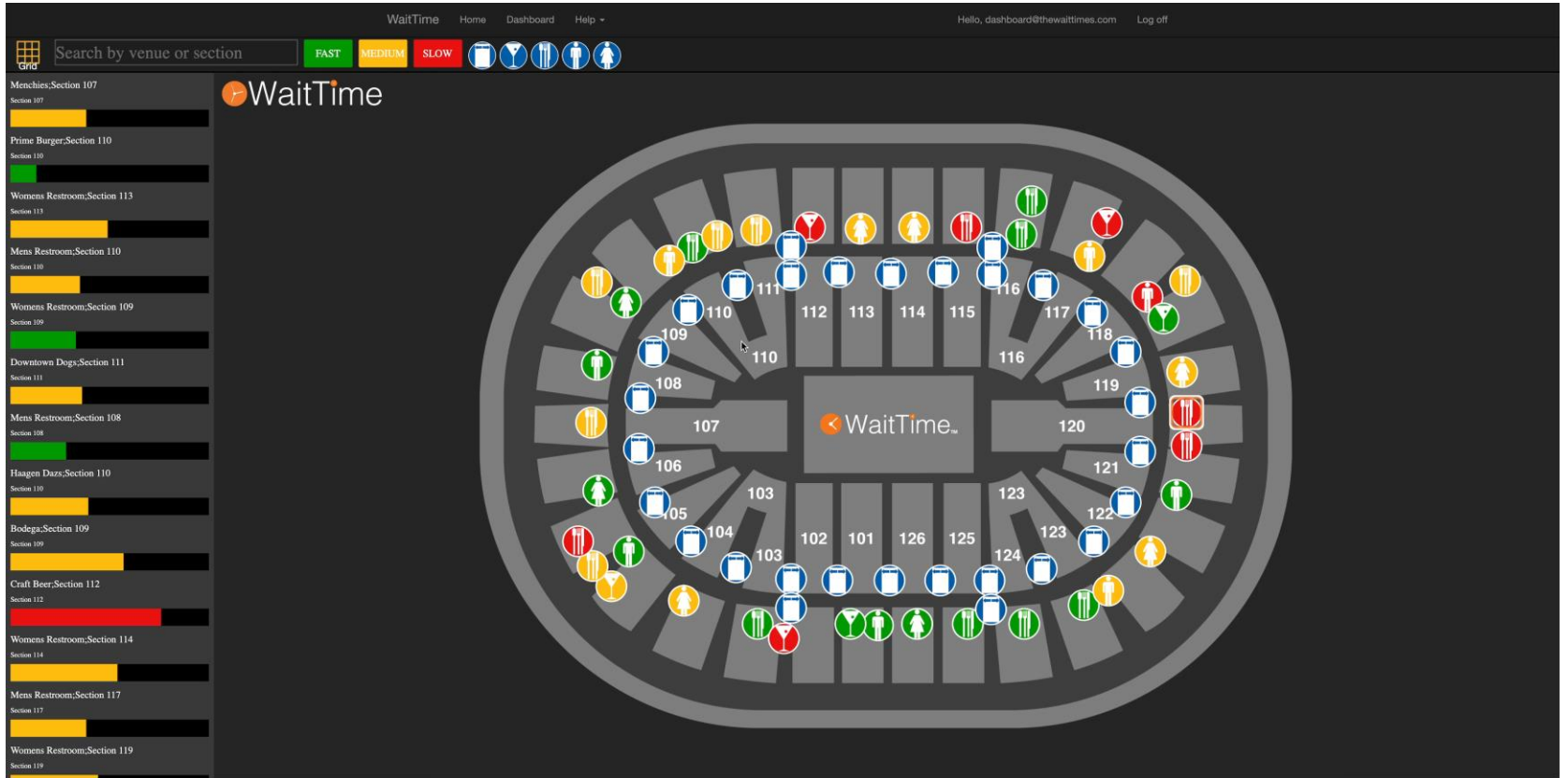
Solution Applications:

- Sports & Entertainment:
 - Clubs
 - Entry gates
 - Front office
 - Seating capacities
- Airports
 - Security lines
 - TSA throughput
 - Airline lounges
- Retail Malls:
 - Store occupancy
 - Entrances of mall
 - Lease negotiation
- Exhibition Centers:
 - Hall occupancy
 - Building occupancy
- Casinos:
 - Building occupancy
 - Club occupancy
 - Bar occupancy




Real-time Ops Dashboard

iPad, Tablet, Control Room
Eyes in the sky



WaitTime.
SINGLE DAY REPORT

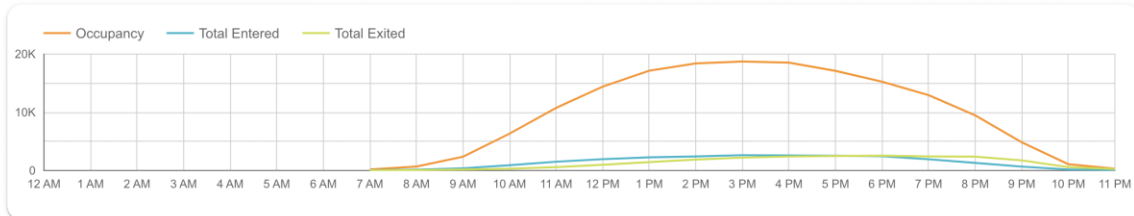
Dec 11, 2021 - Dec 11, 2021



Occupancy
18,725

Total Entered
7,514

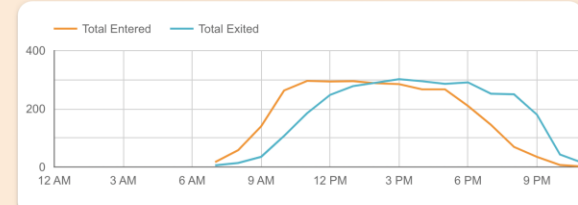
Total Exited
7,229

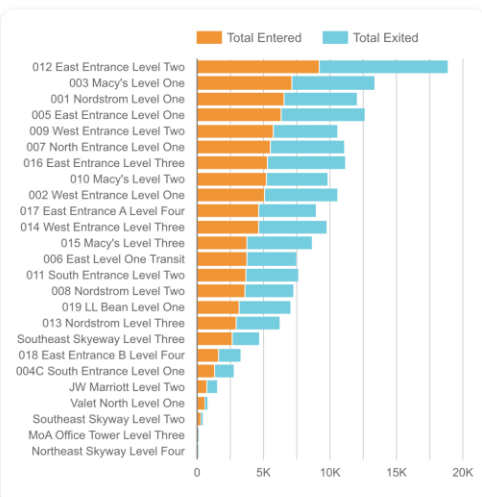


Location	Total Entered	Total Exited
1. 012 East Entrance Level Two	9,198	6,693
2. 003 Macy's Level One	7,109	6,270
3. 001 Nordstrom Level One	6,557	5,487
4. 005 East Entrance Level One	6,337	6,319
5. 009 West Entrance Level Two	5,760	4,840
Grand total	9,198	9,693

1 - 25 / 25 < >

Location: 012 East Entrance Level Two
(1)







Venue: WaitTime Dashboard



NBA Heat vs Timberwolves

Start: 3/12/2022 6:00 PM - End: 3/12/2022 11:29 PM

Bar

Section	Sensor	Description	Group	Avg Wait	Busy Avg	Max Wait
102	3	Goose Island	0	00:31	01:30	03:41
102	4	Bacardi	0	00:49	01:30	04:10
104	7	Bacardi	0	00:45	01:29	04:21
106	11	Grey Goose	0	00:21	00:45	01:56
107	14	Craft Beer	0	00:30	00:45	03:34
111	19	Bacardi	0	00:14	00:45	03:24
113	24	Barefoot Refresh	0	00:11	00:45	03:10
114	25	Red Frog	0	00:13	00:45	02:43
114	27	Bacardi	0	00:14	00:34	01:44
118	35	Bacardi Bar	0	00:26	00:52	02:33
121	44	Bacardi	0	00:30	01:30	04:20
123	47	Craft Beer	0	00:31	01:07	04:02
123	48	Moet and Chandon	0	00:32	01:07	03:10
123	49	Bacardi	0	00:44	01:30	04:13

Overall

Peak 1	Peak 2	Peak 3	Peak 4
3/12/2022 7:15:00 PM	3/12/2022 7:48:00 PM	3/12/2022 8:48:00 PM	3/12/2022 9:19:00 PM
Avg Wait	Max Wait	Avg Wait	Max Wait
00:46	03:22	01:51	03:41
01:29	03:39	02:20	03:39
01:06	03:43	01:54	03:43
00:30	01:11	01:01	01:19
00:22	01:56	00:44	01:55
00:44	01:51	01:06	02:22
00:23	02:50	00:23	01:28
00:22	01:30	00:44	01:54
00:23	01:25	00:34	01:18
00:30	01:54	01:01	01:54
00:45	02:29	01:27	02:36
00:46	02:58	01:52	03:11
01:08	03:10	01:05	02:17
00:46	02:39	01:57	03:41

Food

Section	Sensor	Description	Group	Avg Wait	Busy Avg	Max Wait
101	1	Raya	0	00:37	01:14	02:22
101	2	Papa John Bacardi	0	01:21	02:38	05:00
107	13	Haagen Dazs	0	00:46	01:31	05:57
108	15	Mojo Donuts	0	00:28	01:07	03:54
112	21	Downtown Dogs	0	01:53	03:45	07:24
112, CAM	23	Nuts	0	00:15	00:38	02:12
113	25	Papa John's Pizza	0	00:50	01:52	04:04
116	30	Bombay Bistro	0	00:15	00:45	02:21
117	32	Sergios	0	00:31	01:08	03:17
117	33	Sergios	0	00:31	01:08	03:17
119	37	Haagen Dazs	0	00:48	01:31	03:55
119	40	Gyros	0	00:30	01:08	03:01
120	39	Street Corn Kosher Kormer	0	00:43	01:30	04:19
120	41	Ms. Cheedious	0	00:33	00:57	03:13
121	43	Tequeno's	0	00:15	00:45	03:01
124	51	Bodega	0	00:48	01:41	03:48
105	10	Prime Burger Grill	0	30%	46%	78%
108	16	Chicken Cio Bacardi	0	29%	41%	73%
117	34	Prime Burger Grill	0	33%	45%	74%

Overall

Peak 1	Peak 2	Peak 3	Peak 4
3/12/2022 7:15:00 PM	3/12/2022 7:48:00 PM	3/12/2022 8:48:00 PM	3/12/2022 9:19:00 PM
Avg Wait	Max Wait	Avg Wait	Max Wait
01:37	02:13	01:27	02:01
02:45	04:19	03:06	04:19
00:45	01:50	01:50	03:56
01:07	02:44	01:08	02:44
03:27	06:51	05:35	06:51
00:22	01:32	00:23	01:32
01:42	01:10	02:40	01:04
00:23	01:35	00:22	01:42
00:46	02:05	00:45	02:05
00:46	02:05	00:45	02:05
01:09	02:54	01:08	02:54
00:46	01:56	00:23	02:19
01:30	02:46	02:38	03:54
01:07	01:46	00:58	01:46
00:47	03:00	00:45	01:33
01:50	02:31	01:41	02:57
52%	65%	54%	65%
31%	66%	53%	66%
54%	70%	59%	71%

Men

Section	Sensor	Description	Group	Tot Enter	Tot Exit	Max Occ
102	5	Mens	0	0	0	
104	8	Mens	0	00:00	00:00	01:05
109	18	Mens	0	00:00	00:00	01:27
111	20	Mens	0	00:00	00:22	01:36
114	28	Mens	0	00:00	00:22	01:38
116	31	Mens	0	00:00	00:00	01:06
118	36	Mens	0	00:00	00:23	00:52
121	45	Mens	0	00:18	00:23	02:08
123	50	Mens	0	00:17	00:22	01:09

Overall

Peak 1	Peak 2	Peak 3	Peak 4
3/12/2022 7:15:00 PM	3/12/2022 7:48:00 PM	3/12/2022 8:48:00 PM	3/12/2022 9:19:00 PM
Avg Occ	Max Occ	Avg Occ	Max Occ
00:00	00:24	00:00	00:24
00:00	00:22	00:00	00:22
00:00	00:26	00:00	00:26
00:00	00:26	00:00	00:24
00:00	00:00	00:00	00:26
00:00	00:24	00:00	00:26
00:00	00:47	00:22	00:47
00:23	00:51	00:23	00:51

Women

Section	Sensor	Description	Group	Avg Wait	Busy Avg	Max Wait
103	6	Womens	0	00:00	00:22	00:49

Overall

Peak 1	Peak 2	Peak 3	Peak 4
3/12/2022 7:15:00 PM	3/12/2022 7:48:00 PM	3/12/2022 8:48:00 PM	3/12/2022 9:19:00 PM
Avg Wait	Max Wait	Avg Wait	Max Wait
00:00	00:48	00:00	00:48
00:00	00:48	00:00	00:43
00:00	00:48	00:00	00:48
00:00	00:47	00:23	00:45

Data Reporting

Time & Occupancy Measurement



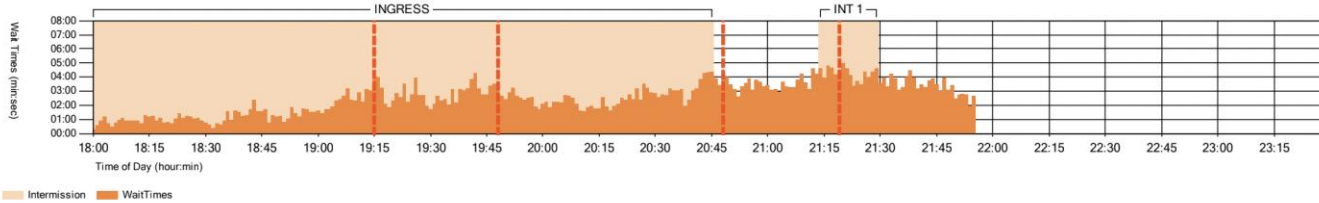
NBA Heat vs Timberwolves

Start: 3/12/2022 6:00 PM - End: 3/12/2022 11:29 PM

Venue: WaitTime Dashboard

Number: 2 - Section: 101 Description: Papa John Bacardi

Stanchion



Peak 1: 03/12/2022 19:15 Peak Wait: 03:48



Peak 2: 03/12/2022 19:48 Peak Wait: 03:19



Peak 3: 03/12/2022 20:48 Peak Wait: 04:12



Peak 4: 03/12/2022 21:19 Peak Wait: 04:32



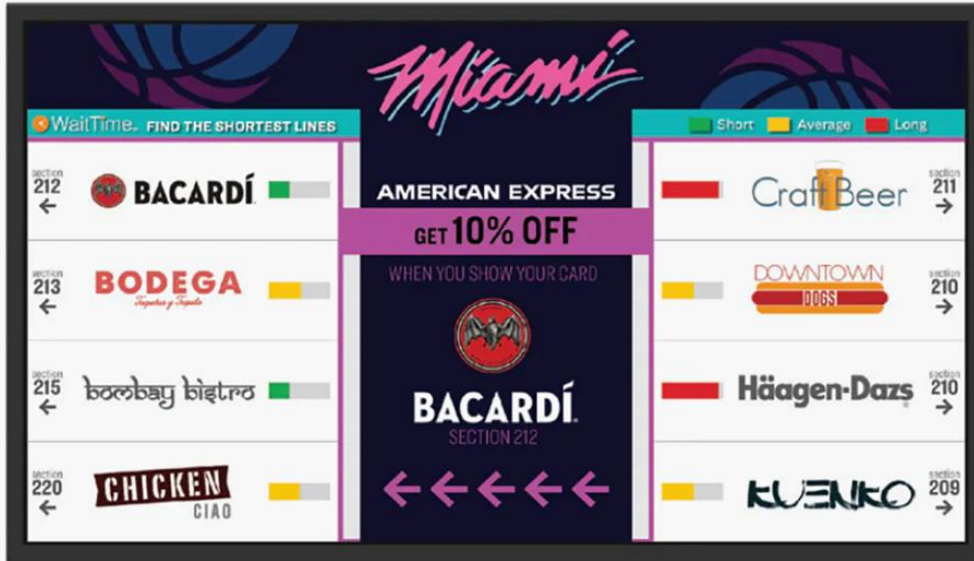
Ingress End: 03/12/2022 20:45 Peak Wait: 04:25



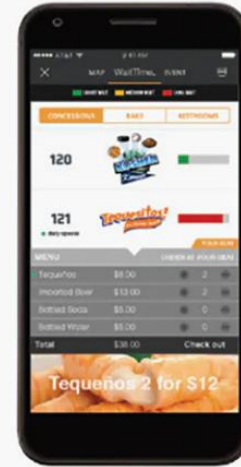
Int 1 End: 03/12/2022 21:29 Peak Wait: 04:38

Guest Experience Platform

Safely navigating around crowds



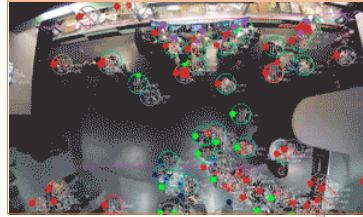
Digital Displays



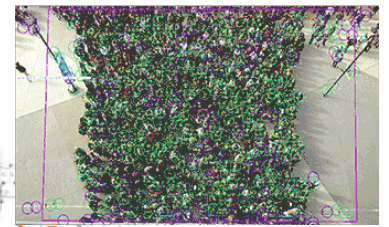
Mobile App

Use Cases

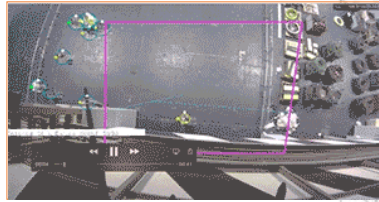
- **Ingress:** Real-time and historical documentation on crowd density at ingress points help guests enter and exit the venue safely and efficiently.
- **Occupancy Tracking:** Track guest foot traffic to manage capacity in real-time as well as define key business metrics like busiest times, average occupancy, and total foot traffic.
- **Queue Monitoring:** Help guests distribute by sharing crowd information in real-time with patrons on digital way-finding. Determine key business metrics like average number of people in line by stand, busiest areas, under utilized areas, and attrition rates.
- **Density:** Monitor crowd densities in areas that have low ceilings, are exterior, or existing cameras.
- **Anonymous Guest Experience Journey:** Collect anonymous data by tracking behavior to align business strategies to actual information rather than assumptions



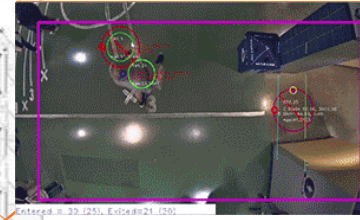
Concessions (Queue)



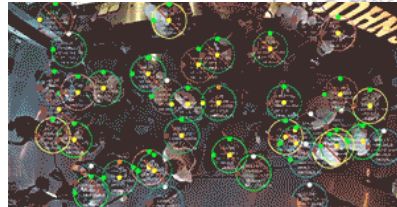
Ingress (Queue)



Gate | Lounge | Merchandise (Entry / Exit)



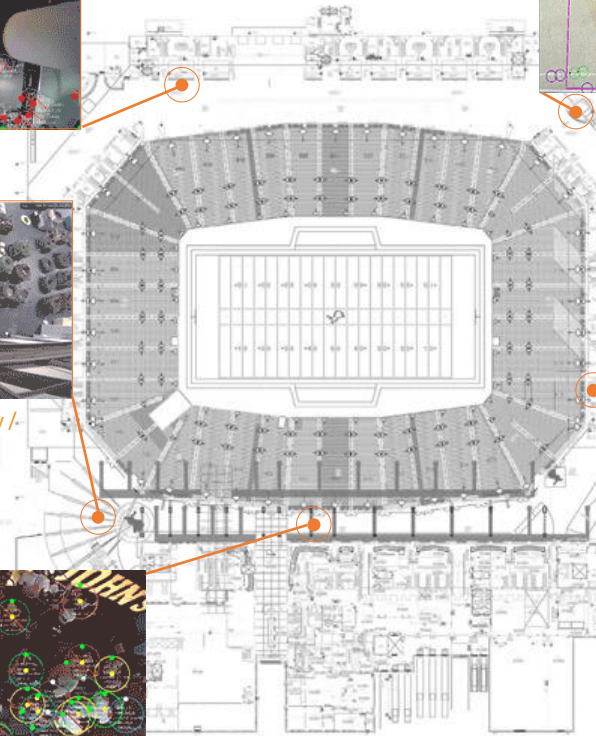
Restrooms (Entry / Exit)

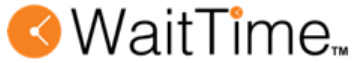


Concession (Stanchion)



Concession (Massing)





Overview

WaitTime is a patented, real-time and historical artificial intelligence software that uses state-of-the-art imaging techniques to monitor crowd behavior in large scale venues

The data generated from WaitTime software leverages operations and guest engagement platforms to enable real-time smart decision making, inform operations management, and engage guests in movement and distribution solutions.

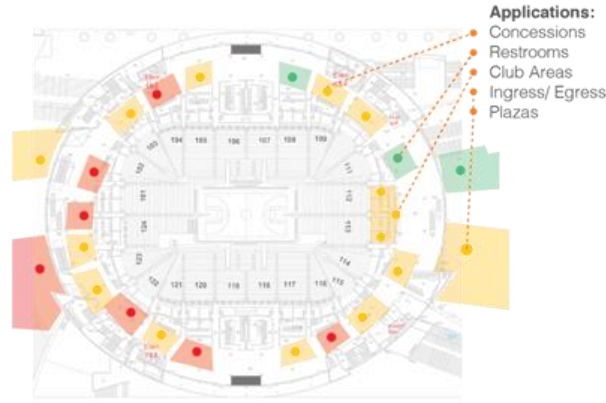
Solutions

- Real-time way-finding on digital displays and mobile to help guests find the shortest lines and least busy spaces resulting in more evenly distributed crowds
- Make real-time smart decisions leveraging the operations dashboard to enable better guest services, security, and business intelligence.
- Historical data provides documentation on crowd conditions resulting in improved services, better business practices, and safer spaces.

Sports and Entertainment | Conference Centers | Campuses | Malls | Airports | Complexes | Public Transportation | Hotels | Return to Work

Software Solutions

Sensors are mounted above where crowds congregate with a variety of applications from crowd control to identifying traffic in sponsored plazas.



The data collected feeds into out guest and operator's platforms....

Algorithms:



Guest Platform

Share real time way-finding and wait-finding with guests.



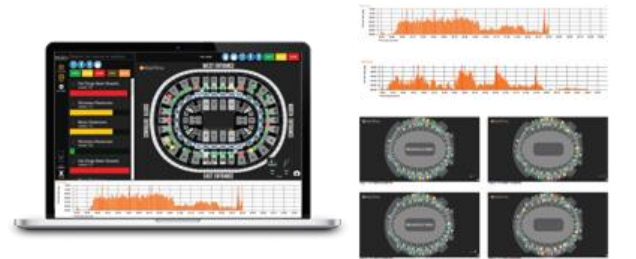
Digital Displays



Mobile App

Operator's Platform

Capture real-time and historical crowding capacities.



Operation's Dashboard

Reporting



"We're using this information to understand the impact of various points of interest, and this information will allow us to not only think about long-term revenue strategies but also understand how to better engage with fans and what is most impactful to them."

Ralph Esquibel, Vice President of Information Technology at the Los Angeles Dodgers



"Our new Wi-Fi solution teamed with WaitTime's crowd and business intelligence is revolutionary. The NEC Group is a data-led business and it is investments like this that help to keep us at the cutting edge of live event innovation."

Ian Taylor, Managing Director for NEC Group Conventions and Exhibitions



In today's market, "data eliminates the risk," said Ken Martin, executive director of global sales at Cisco, adding that crowd-tracking technology could guarantee a high return on investment."

Ken Martin, General Manager and Director of Global Sales in the Sports and Entertainment Solutions Group (SESG) at Cisco



"With the help of WaitTime, Intel and Cisco, we can remove the guesswork about how and where shoppers are spending their time and make real changes to improve shopping experience,"

Aaron Nielsen, Vice President, Information Technology at Mall of American Dream



"Early WaitTime data is indicating that at gates where we have newer scanning devices and metal detectors, wait times to get into the game are shorter,"

Russ Trainor, Senior Vice President of Information Technology for the Denver Broncos

WaitTime



"WaitTime leverages **oneAPI** and **Vtune™** to optimize our patented artificial intelligence. The granular documentation on code hotspots not only allows us to maximize code performance, but also allows us to optimize processing on Intel hardware."

- Dr Thomas Sterling, WaitTime AI Lead

- Granular code documentation and hot spot identification
- Optimized software performance
- Synchronous software to hardware performance

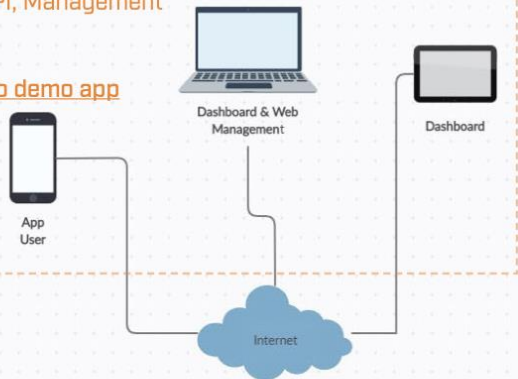


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WaitTime

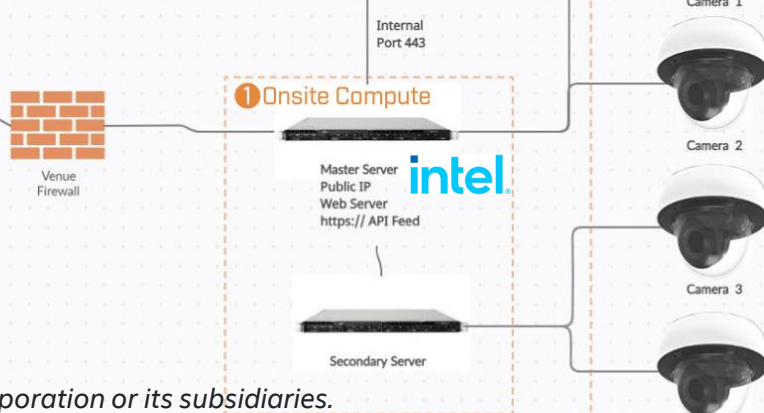
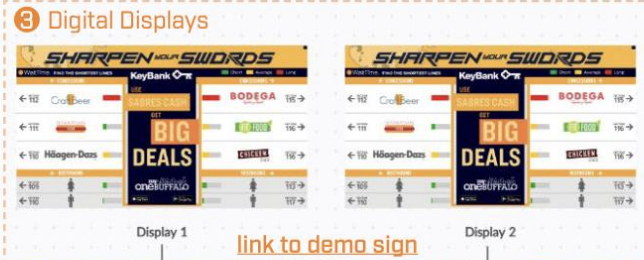
4 API, Management

[link to demo app](#)



Example: 30,000 Seat Sports and Entertainment Venue

- (60) Cameras
- (3) UCS Servers
- (40) CiscoVision Displays
- (1) HTML Mobile Integration
- (1) Operations Platform
- (1) API Feed



Technical Components

- [1] **On site Compute:** Hyperflex, UCS Servers, VM
- Processes camera feeds, hosts WaitTime API, provides html links for digital displays and mobile. Generates reports.
 - 3-4 threads and 800mb memory per camera is normally required and a few threads for the OS to utilize
 - 4 GB memory per cameras
 - VM should be built from one Host that is not sharing resources.
 - System Drive – 128GB with Windows Pro OS with TeamViewer installed for remote access to setup software.
 - Secondary Drive – 1TB for logs, screenshots, end of day reports etc.
 - Third Drive – 1TB for recording of events to calibrate camera settings in our software
 - Server processes feeds from cameras
 - Rule of thumb: 1 server / 45 cameras
 - 1 redundant server for full deployment
- [2] **Cameras:**
- RTSP feeds for monitored areas
 - 1 per monitored queue or threshold
 - Cat5e+ to each camera locations
 - Typically set to 24 frames per second
- [3] **Digital Displays:**
- Real-time html link hosted on WaitTime on site server
- [4] **API, Management:**
- Real-time html link integrated in venue app
 - Management portal accessible via web to control sensor schedule and signage content

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