



NBAStaz

An NBA Statistics Aggregator

Amoruso Marco, Anello Daniele, Farina Francesco, Rinaldi Iolanda

Università degli Studi di Salerno

Prof. G. Costagliola

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Integrazione Dati sul Web

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Outline



1 Introduzione

2 Architettura

3 Fonti

4 Datalog

5 Wrappers

6 Global Schema

7 Queries

8 Riformulazione

9 Tecnologie



1 Introduzione

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Scenario



- Il basket è uno sport ricco di statistiche e media
- La National Basketball Association, *NBA*, è il campionato di basket più seguito al mondo
 - Abbonda di tali informazioni

Problema

- I principali siti che forniscono statistiche sono dispersivi, poco immediati e spesso non mettono a disposizione video

Soluzione



NBAStaz

- L'applicazione proposta aggrega statistiche e contenuti video focalizzando l'attenzione sulle ultime partite giocate
- Permettendo una semplice ed immediata consultazione

Descrizione Funzionale



- 1 Partite:** calendario del giorno e risultati dell'ultima giornata
- 2 Notizie:** ultime notizie dal mondo NBA
- 3 Squadre:** tutte le squadre del campionato
- 4 Squadra:** informazioni della squadra (statistiche, roster, quintetto, migliori giocatori)
- 5 Giocatori:** tutti i giocatori del campionato
- 6 Giocatore:** biografia e statistiche delle ultime partite
- 7 Highlights:** migliori giocatori della stagione e video delle ultime partite
- 8 Classifiche:** classifiche della *regular season* suddivise in East e West Coast



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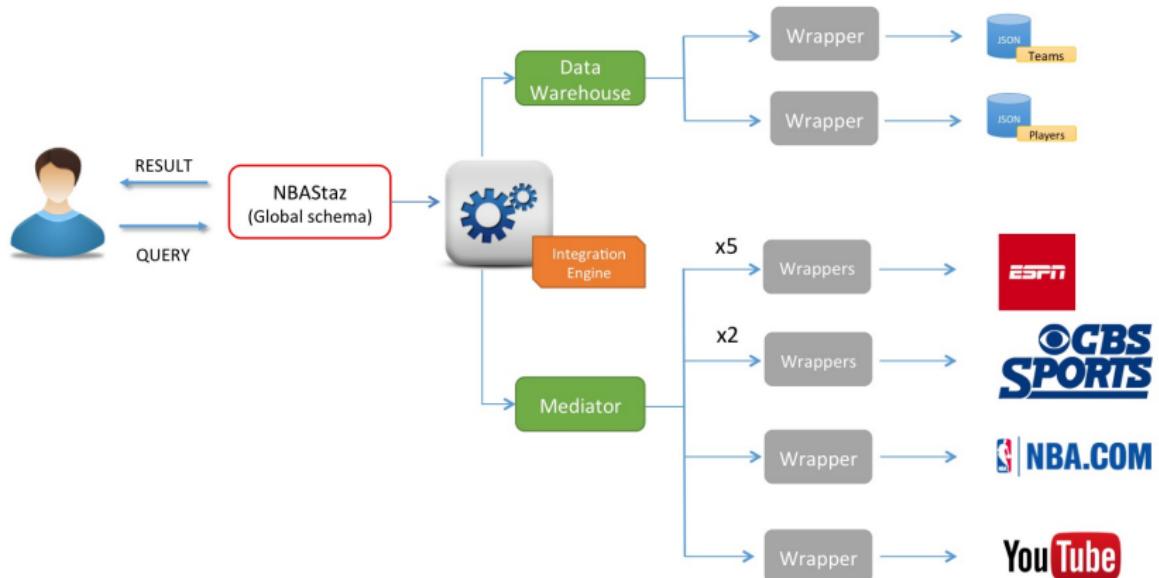
6 Global Schema

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Architettura





- È stata scelta un'architettura ibrida
- Ogni query dell'utente è gestita dall'*Integration Engine* che la indirizza verso
 - il *Mediator*, che si occupa di ricavare le informazioni dinamiche dalle fonti locali
 - la *Data Warehouse*, che si occupa di leggere i dati statici da una base di dati



Motivazioni

- Gestione più efficiente di dati statici e dinamici
- Mediator: le informazioni rimangono nelle fonti e sono ottenute solo in seguito all'interrogazione del sistema
- Data Warehouse: i dati vengono estratti dalle fonti e memorizzati prima dell'avvio del sistema



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- La piattaforma web più nota al mondo che consente la condivisione e la visualizzazione di video in rete
- **Request type:** HTTP GET Request - YTvid.py
- **Parameters:** abbreviazione team
- **Response type:** JSON
- **Information type:** cambio periodico



Sito web dell'emittente televisiva statunitense che trasmette programmi dedicati unicamente allo sport 24 ore su 24.



- **Fonte:** season top players - <http://espn.go.com/nba/statistics>
- **Request type:** HTTP GET Request - `espn_season_top_players.js`
- **Parameters:** nessuno
- **Response type:** JSON
- **Information type:** cambio periodico



- **Fonte:** teams - <http://espn.go.com/nba/teams>
- **Request type:** HTTP GET Request - `espn_teams_players.py`
- **Parameters:** nessuno
- **Response type:** JSON
- **Information type:** statica



- **Fonte:** rosa del team - http://espn.go.com/nba/team/roster/_/name/
- **Request type:** HTTP GET Request - `espn_teams_players.py`, `espn_team.js`
- **Parameters:** nessuno, abbreviazione team
- **Response type:** JSON
- **Information type:** cambio periodico



- **Fonte:** statistiche e leaders del team -
http://espn.go.com/nba/team/stats/_/name/
- **Request type:** HTTP GET Request - espn_team.js
- **Parameters:** abbreviazione team
- **Response type:** JSON
- **Information type:** cambio periodico



- **Fonte:** quintetto base del team - http://espn.go.com/nba/team/depth/_/name/
- **Request type:** HTTP GET Request - `espn_team.js`
- **Parameters:** abbreviazione team
- **Response type:** JSON
- **Information type:** cambio periodico



- **Fonte:** informazioni sul giocatore - http://espn.go.com/nba/player/_/id/{id}/{name-surname}
- **Request type:** HTTP GET Request - `espn_player.js`
- **Parameters:** id del giocatore
- **Response type:** JSON
- **Information type:** cambio periodico



Sito web della divisione sportiva del network americano CBS.



- **Fonte:** prossime partite e risultati partite precedenti -
<http://www.cbssports.com/nba/scoreboard/?date={date}>
- **Request type:** HTTP GET Request - espn_scores_top.js
- **Parameters:** data, formato MM-DD-YYYY
- **Response type:** JSON
- **Information type:** cambio periodico



- **Fonte:** classifiche - <http://www.cbssports.com/nba/standings>
- **Request type:** HTTP GET Request - cbssports_standings.js
- **Parameters:** nessuno
- **Response type:** JSON
- **Information type:** cambio periodico



Sito web ufficiale della National Basketball Association.

- **Fonte:** news - <http://www.nba.com/news/>
- **Request type:** HTTP GET Request - nba_news.js
- **Parameters:** nessuno
- **Response type:** JSON
- **Information type:** cambio periodico

 **NBA.COM/Stats**

Sito web che fornisce le statistiche circa le squadre e i giocatori dell’NBA.

- **Fonte:** logo -
<http://stats.nba.com/media/img/teams/logos/{abbr}.logo.svg>
- **Request type:** HTTP GET Request - `espn_teams_players.py`
- **Parameters:** abbreviazione team
- **Response type:** JSON
- **Information type:** statica



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- **s1.roster**(team_Key, Name, Link, Number, Role, Age, Height, Weight, College, Salary).

- **s2.stats_leaders**(team_Key, Id_Player, Name, Link, Games_played, Games_started, Minutes_game, Points_game, Off_rebounds_game, Def_rebounds_game, Rebounds_game, Assists_game, Steals_game, Blocks_game, Turnovers_game, Fouls_game, Assist_turnover, Efficiency, Category, Number, Stat).

- **s3.top_season**(Id, Team_Key, Name, Image, Link, Team_Name, Category, Category_Abbr, Score).

Mediator



- **s4.depth(team_Key, Role, Id, Name, Link).**

- **s5.player(id, Name, Team_Key, Team_Name, Link, Image, Number, Role, Height, Weight, Born, Drafted, College, Experience, Season, Points_Game, Assists_Game, Rebounds_Game, Efficiency, Career_Points_Game, Career_Assists_Game, Career_Rebounds_Game, Salary, Expiration_Salary, Gamelog_Date, Gamelog_Opponent_Team, Gamelog_Link_Opponent_Team, Gamelog_Win_Lose, Gamelog_Result, Gamelog_Min, Gamelog_Field_Goals_Ma, Gamelog_Field_Goal_Percentage, Gamelog_3_Points_Field_Goals_Ma, Gamelog_3_Point_Field_Goal_Percentage, Gamelog_Free_Throws_Ma, Gamelog_Free_Throw_Percentage, Gamelog_Rebounds, Gamelog_Assists, Gamelog_Blocks, Gamelog_Steals, Gamelog_Fouls, Gamelog_Turnovers, Gamelog_Points).**



- **s6.scoreboard**(date, VTeam_Key, Vteam_Name, Vteam_Qtrs, Vteam_Finl, HTeam_Key, Hteam_Name, Hteam_Qtrs, Hteam_Finl, Time).

- **s7.standings**(Team_Key, Team_Name, Wins, Losses, Percentage, Games_Back, Home, Road_Record, Conference_Record, Div_Record, Streak, Last_10_Games).



■ s8.news>Title, Description).



■ s9.highlight(team_Key, Url).



{JSON}

- **s10.teams_dw**(Key, Name, Logo, Abbr, Stats_link, Roster_link, Depth_link).

- **s11.players_dw**(Id, Name, Image, Team_Key, Team_Name, Espn_link).

Data Warehouse Population



- **s12.logo(team_Abbr, Logo).**



- **s13.teams(team_Key, Name, Id, Roster_link, Stats_link, Depth_link).**



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Highlights



Descrizione

- Link al video dei momenti salienti della partita più recente della squadra in input

Link

- <https://www.youtube.com/channel/UC13m7SQqxoAIGXQDguFNvg/videos>

CSSPath

- li.feed-item-container



Highlights

NBA Highlights - YouTube

https://www.youtube.com/channel/UC13m7SQxoxAGXQDg-uFNvg/videos

YouTube IT

Cerca

Che cosa guardare

IL MEGLIO DI YOUTUBE

Popolari su YouTube

Musica

Sport

Giochi

NBA Highlights

Video

Playlist

Canali

Discussione

Informazioni

(HD) Portland Trail Blazers vs Memphis Grizzlies | Full...
182 visualizzazioni • 3 ore fa

(HD) Brooklyn Nets vs Atlanta Hawks | Full...
171 visualizzazioni • 3 ore fa

Top 5 Plays of the Night | April 29, 2015 | NBA...
128 visualizzazioni • 4 ore fa

Analisi pagina

Console

Debugger

Editor still

Prestazioni

Rete

Regole

Calcolate

Caratteri

Regole

Calcolate

Caratteri

```
elemento { inline
}
www-core-vf14jTIND.css:1
.yt-lockup-title a, .yt-lockup:hover a, .yt-lockup:active a, .yt-lockup:meta a, .yt-lockup:visited a, .yt-lockup-description a {
    color: #167AC6;
}
.yt-ui-ellipsis-2 www-core-vf14jTIND.css:1
{
    max-height: 2.6em;
}
.yt-ui-ellipsis www-core-vf14jTIND.css:1
{
    background-color: #FFF;
    display: block;
    line-height: 1.3em;
    overflow: hidden;
    position: relative;
}
```



Descrizione

- Informazioni relative a squadra di casa ed ospite per ogni partita tenutasi nella data in input

Link

- <http://www.cbssports.com/nba/scoreboard/{date}>

CSSPath

- `div.scoreBox > span > table`



Scores: source code

```
$root: 'div.scoreBox > span > table',
vteam: {
    $root: 'tr.awayTeam',
    name: 'td.teamName > div.teamLocation > a',
    logo: 'td.teamName > div.teamLocation > a[href] | getTeam | logofy',
    link: 'td.teamName > div.teamLocation > a[href]',
    abbr: 'td.teamName > div.teamLocation > a[href] | getTeam',
    qtrs: ['td.periodScore'],
    finl: 'td.finalScore'
},
hteam: {
    $root: 'tr.homeTeam',
    name: 'td.teamName > div.teamLocation > a',
    logo: 'td.teamName > div.teamLocation > a[href] | getTeam | logofy',
    link: 'td.teamName > div.teamLocation > a[href]',
    abbr: 'td.teamName > div.teamLocation > a[href] | getTeam',
    qtrs: ['td.periodScore'],
    finl: 'td.finalScore'
}
```



Scores: webpage

NBA Scores - Tue Mar 31, 2... [+ 1](#)

[www.cbssports.com/nba/scoreboard/20150331](#) [Cerca](#)

		FINAL				
	Atlanta (55-19)	28	22	22	23	95
	Detroit (29-45)	33	19	24	29	105
Players of the Game						
ATL - Thabo Sefolosha (Pts: 19, Reb: 5, Ast: 2)						
DET - Andre Drummond (Pts: 22, Reb: 13, Ast: 1)						
BOX SCORE RECAP GAMETRACKER						
		FINAL				
	San Antonio (48-26)	19	28	24	24	95
	Miami (34-40)	20	22	18	21	81
Players of the Game						
IND - George Hill (Pts: 28, Reb: 6, Ast: 3)						
BKN - Brook Lopez (Pts: 24, Reb: 11, Ast: 2)						
BOX SCORE RECAP GAMETRACKER						
		FINAL				
	Golden State (51-13)	18	28	36	28	110
	L.A. Clippers (49-26)	30	23	35	18	106



Descrizione

- Informazioni relative a squadra di casa ed ospite per le partite da tenersi nella data in input

Link

- <http://www.cbssports.com/nba/scoreboard/{date}>

CSSPath

- `div.scoreBox > span > table`

Schedule: source code



```
$root: 'div.scoreBox > span > table',
vteam: {
    $root: 'tr.awayTeam > td.teamName',
    name: 'td.teamName > div.teamLocation > a',
    logo: 'td.teamName > div.teamLocation > a[href] | getTeam | logofy',
    link: 'td.teamName > div.teamLocation > a[href]',
    abbr: 'td.teamName > div.teamLocation > a[href] | getTeam'
},
hteam: {
    $root: 'tr.homeTeam > td.teamName',
    name: 'td.teamName > div.teamLocation > a',
    logo: 'td.teamName > div.teamLocation > a[href] | getTeam | logofy',
    link: 'td.teamName > div.teamLocation > a[href]',
    abbr: 'td.teamName > div.teamLocation > a[href] | getTeam'
},
time: 'tr.gameInfo > td > span > span'
```

Schedule: webpage



NBA Scores - Sun May 03, ... +

www.cbssports.com/nba/scoreboard/20150503 ▾ C Cerca

EASTERN CONFERENCE		WESTERN CONFERENCE	
1:00 PM ET	LINE	3:30 PM ET (ABC)	LINE
Washington	-	Memphis	197.5 O/U
Atlanta	-	Golden State	-9.5

Standings



Descrizione

- Classifica delle 32 squadre suddivisa per conference (Eastern / Western) relativa alla Regular Season dell'anno corrente

Link

- <http://www.cbssports.com/nba/standings>

CSSPath

- `#sortableContent > table > tr.row1, tr.row2`

Standings: source code



```
$root: '#sortableContent > table > tr.row1, tr.row2',
      team: 'td > a',
      logo: 'td > a[href] | nick | logofy',
      link: 'td > a[href]',
      w: 'td:nth-child(2)',
      l: 'td:nth-child(3)',
      pct: 'td:nth-child(4)',
      gb: 'td:nth-child(5)',
      home: 'td:nth-child(6)',
      road: 'td:nth-child(7)',
      conf: 'td:nth-child(8)',
      div: 'td:nth-child(9)',
      streak: 'td:nth-child(10)',
      l10: 'td:nth-child(11)'
```



Standings: webpage

EASTERN CONFERENCE	W	L	PCT	GB	HOME	ROAD	CONF	DIV	STREAK	L10
1 z-Atlanta	60	22	0.732	-	35-6	25-16	38-14	12-4	L3	5-5
2 y-Cleveland	53	29	0.646	7	31-10	22-19	35-17	11-5	W2	7-3
3 x-Chicago	50	32	0.610	10	27-14	23-18	33-19	8-8	W4	7-3
4 y-Toronto	49	33	0.598	11	27-14	22-19	33-19	11-5	W1	7-3
5 x-Washington	46	36	0.561	14	29-12	17-24	30-22	10-6	L2	6-4
6 x-Milwaukee	41	41	0.500	19	23-18	18-23	30-22	7-9	L1	5-5
7 x-Boston	40	42	0.488	20	21-20	19-22	28-24	12-4	W6	8-2
8 x-Brooklyn	38	44	0.463	22	19-22	19-22	24-28	10-6	W1	6-4
o-Indiana	38	44	0.463	22	23-18	15-26	28-24	8-8	L1	7-3
o-Miami	37	45	0.451	23	20-21	17-24	25-27	6-10	W2	4-6
o-Charlotte	33	49	0.402	27	19-22	14-27	25-27	8-8	L6	2-8
o-Detroit	32	50	0.390	28	18-23	14-27	23-29	6-10	W1	4-6
o-Orlando	25	57	0.305	35	13-28	12-29	15-37	4-12	L4	3-7
o-Philadelphia	18	64	0.220	42	12-29	6-35	12-40	2-14	L10	0-10
o-New York	17	65	0.207	43	10-31	7-34	11-41	5-11	L1	3-7



Standings: webpage

WESTERN CONFERENCE	W	L	PCT	GB	HOME	ROAD	CONF	DIV	STREAK	L10
1 z-Golden St.	67	15	0.817	-	39-2	28-13	42-10	13-3	W4	8-2
2 y-Houston	56	26	0.683	11	30-11	26-15	33-19	8-8	W3	7-3
3 x-L.A. Clippers	56	26	0.683	11	30-11	26-15	37-15	12-4	W7	9-1
4 y-Portland	51	31	0.622	16	32-9	19-22	31-21	11-5	L4	4-6
5 x-Memphis	55	27	0.671	12	31-10	24-17	35-17	9-7	W1	5-5
6 x-San Antonio	55	27	0.671	12	33-8	22-19	32-20	8-8	L1	9-1
7 x-Dallas	50	32	0.610	17	27-14	23-18	29-23	7-9	W1	5-5
8 x-New Orleans	45	37	0.549	22	28-13	17-24	29-23	8-8	W2	7-3
o-Oklahoma City	45	37	0.549	22	29-12	16-25	25-27	10-6	W2	4-6
o-Phoenix	39	43	0.476	28	22-19	17-24	21-31	6-10	L5	1-9
o-Utah	38	44	0.463	29	21-20	17-24	23-29	9-7	L1	7-3
o-Denver	30	52	0.366	37	19-22	11-30	19-33	6-10	L2	3-7
o-Sacramento	29	53	0.354	38	18-23	11-30	18-34	7-9	W2	3-7
o-L.A. Lakers	21	61	0.256	46	12-29	9-32	9-43	2-14	L3	2-8
o-Minnesota	16	66	0.195	51	9-32	7-34	7-45	4-12	L12	0-10

Player



Descrizione

- Informazioni personali e riguardanti la carriera di un giocatore il cui id è dato in input

Link

- http://espn.go.com/nba/player/_/id/{id}/{name-surname}

CSSPath

- #content

Player: source code



```

$root: '#content',
    id: '| getID',
    teamID: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > ul.general-info > li:nth-child(3) > a | getTeamID',
    name: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > h1',
    team: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > ul.general-info > li:nth-child(3) > a',
    image: '| getID | imagify',
    num_pos: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > ul.general-info > li:first-child',
    height_weight: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > ul.general-info > li:nth-child(2)',
    born: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > .player-metadata.floatleft > li:nth-child(1) | born',
    drafted: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > .player-metadata.floatleft > li:nth-child(2) | draf_coll',
    college: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > .player-metadata.floatleft > li:nth-child(3) | draf_coll',
    experience: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-bio > .player-metadata.floatleft > li:nth-child(4) | experience',
    season: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > p',
    ppg: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > table.header-stats > tr:first-child > td:nth-child(1)',
    app: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > table.header-stats > tr:first-child > td:nth-child(2)',
    rpg: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > table.header-stats > tr:first-child > td:nth-child(3)',
    per: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > table.header-stats > tr:first-child > td:nth-child(4)',
    career_ppg: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > table.header-stats > tr.career > td:nth-child(1)',
    career_appg: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > table.header-stats > tr.career > td:nth-child(2)',
    career_rpg: '.mod-container.mod-no-header-footer.mod-page-header > div.mod-content > div.player-stats > table.header-stats > tr.career > td:nth-child(3)',
    salary: 'div.bg-opaque > span-2.last > .mod-container.mod-no-footer.mod-open-list.mod-quick-facts > div.mod-content > ul > li > dl > dd > span',
    expiration_salary: 'div.bg-opaque > span-2.last > .mod-container.mod-no-footer.mod-open-list.mod-quick-facts > div.mod-content > ul > li > dl > dd > span',
    gameLog: {
        $root: 'div.bg-opaque > .span-6.last > div.mod-container.mod-table.mod-no-footer:nth-child(3) > div.mod-content > table > tr[class==team]',
        date: ['td:nth-child(1)'],
        opponent_team: ['td:nth-child(2) > ul.game-schedule > li.team-name > a'],
        link_opponent_team: ['td:nth-child(2) > ul.game-schedule > li.team-name > a[href]'],
        win_or_loser: ['td:nth-child(3) > span'],
        result: ['td:nth-child(3) > a'],
        min: ['td:nth-child(4)'],
        fgm_fgat: ['td:nth-child(5)'],
        fg: ['td:nth-child(6)'],
        pm3_pa3: ['td:nth-child(7)'],
        p3: ['td:nth-child(8)'],
        ftm_fta: ['td:nth-child(9)'],
        ft: ['td:nth-child(10)'],
        reb: ['td:nth-child(11)'],
        ast: ['td:nth-child(12)'],
        blk: ['td:nth-child(13)'],
        stl: ['td:nth-child(14)'],
        pf: ['td:nth-child(15)'],
        to: ['td:nth-child(16)'],
        pts: ['td:nth-child(17)']
    }
}

```

Player: webpage



James Harden Stats, News... +

espn.go.com/nba/player/_id/3992/james-harden

Cerca

James Harden

#13 SG 6' 5", 225 lbs | Houston Rockets

	2014-15 Season	Career
PPG	27.4	19.7
APG	7.0	4.4
RPG	5.7	4.3
PER	26.76	4.3

Go to James Harden ▾

Player Profile Stats Splits Game Log Advanced Stats ▾ Videos Photos Shop ▾

STATS

	GP	MPG	PPG	FGM-FGA	FG%
2014-15 Regular Season	81	36.8	27.4	8.0-18.1	.440
2014-15 Postseason	5	36.0	28.4	8.0-17.2	.465
Career	452	32.3	19.7	5.8-13.1	.444
	3PM-3PA	3P%	FTM-FTA	FT%	RPG
2014-15 Regular Season	2.6-6.9	.375	8.8-10.2	.868	5.7
2014-15 Postseason	2.4-6.2	.387	10.0-10.4	.962	3.8
Career	2.0-5.3	.370	6.1-7.2	.854	4.3
	APG	BLKPG	STLPG	PPFPG	TOPG
2014-15 Regular Season	7.0	0.7	1.9	2.6	4.0
2014-15 Postseason	7.8	0.2	1.2	3.0	3.8
Career	4.4	0.4	1.4	2.5	2.7

Complete Stats ▾

GAME LOG

DATE	OPP	SCORE	MIN	FGM-FGA	FG%	3PM-3PA	3P%	FTM-FTA	FT%	REB	AST	BLK	STL	PF	TO	PTS
Tue 4/28	vs DAL	W 103-94	35	9-19	.474	4-8	.500	6-6	1.000	2	8	1	1	4	6	28
Sun 4/26	@ DAL	L 109-121	36	7-15	.467	1-7	.143	9-9	1.000	5	5	0	2	2	1	24
Fri 4/24	@ DAL	W 130-128	36	15-24	.625	5-7	.714	7-7	1.000	5	9	0	1	4	5	42
Tue 4/21	vs DAL	W 111-99	34	5-17	.294	1-4	.250	13-13	1.000	5	6	0	1	4	4	24
Sat 4/18	vs DAL	W 118-108	39	4-11	.364	1-5	.200	15-17	.882	2	11	0	1	1	3	24

Team Stats



Descrizione

- Statistiche della squadra in input

Link

- http://espn.go.com/nba/team/stats/_/name/{team_abbr}/{team_name}

CSSPath

- `#my-players-table > .mod-container.mod-table > div:nth-child(2) > table > tr[class *=“row”]`



Team Stats: source code

```
$root: '#content',
stats: [
    $root: '#my-players-table > .mod-container.mod-table > div:nth-child(2) > table > tr[class*="row"]',
    name: 'td:nth-child(1) > a',                                // player's name
    id: 'td:nth-child(1) > a[href] | getId',                  // id player
    link: 'td:nth-child(1) > a[href]',                         // link to player
    gp: 'td:nth-child(2)',                                     // Games played
    gs: 'td:nth-child(3)',                                     // Games started
    min: 'td:nth-child(4)',                                    // Minutes per game
    ppg: 'td:nth-child(5)',                                   // Points per game
    offr: 'td:nth-child(6)',                                  // Offensive Rebounds per game
    defr: 'td:nth-child(7)',                                 // Defensive Rebounds per game
    rpg: 'td:nth-child(8)',                                 // Rebounds per game
    apg: 'td:nth-child(9)',                                // Assists per game
    spg: 'td:nth-child(10)',                               // Steals per game
    bpg: 'td:nth-child(11)',                               // Blocks per game
    tpg: 'td:nth-child(12)',                               // Turnovers per game
    fpg: 'td:nth-child(13)',                               // Fouls per game
    ato: 'td:nth-child(14)',                               // Assist to turnover ratio
    per: 'td:nth-child(15)'                                // Player Efficiency Rating
],
record: '#sub-branding > div.sub-title'
```

Team Stats: webpage



Chicago Bulls 2015 Statistics

espn.go.com/nba/team/stats/_/name/chi/chicago-bulls

TOTAL SPLITS

Splits

GAME STATISTICS

PLAYER	GP	GS	MIN	PPG	OFFR	DEFR	RPG	APG	SPG	BPG	TPG	FPG	A/T0
Jimmy Butler, SG	6	6	42.2	24.8	1.3	4.2	5.5	3.8	2.50	0.83	2.3	1.5	1.6
Derrick Rose, PG	6	6	36.7	19.0	0.8	3.5	4.3	6.5	1.50	0.50	4.3	1.8	1.5
Pau Gasol, PF	6	6	34.7	16.3	1.8	10.0	11.8	3.7	0.50	2.33	2.7	2.2	1.4
Mike Dunleavy, SF	6	6	30.2	10.5	0.5	3.5	4.0	3.0	0.67	0.17	1.3	2.8	2.3
Taj Gibson, PF	6	0	21.7	7.2	2.3	3.5	5.8	1.3	0.50	1.17	1.5	1.7	0.9
Joaquin Noah, C	6	6	33.5	6.5	3.1	8.3	11.7	4.3	1.17	1.00	1.5	3.1	2.9
Aaron Brooks, PG	6	0	11.7	5.5	0.3	1.2	1.5	1.0	0.17	0.17	1.0	2.2	1.0
Doug McDermott, SF	1	0	6.0	5.0	1.0	0.0	1.0	0.0	0.00	0.00	1.0	0.0	0.0
Tony Snell, SF	6	0	16.5	4.7	0.2	1.7	1.8	0.7	0.00	0.33	0.8	1.8	0.8
Nikola Mirotic, PF	5	0	16.4	4.6	0.4	2.6	3.0	1.6	0.60	0.40	0.8	1.4	2.0
E'Twaun Moore, SG	1	0	4.0	3.0	0.0	3.0	3.0	0.0	0.00	0.00	0.0	1.0	0.0
Naz Mohammed, C	1	0	7.0	2.0	1.0	0.0	1.0	0.0	0.00	1.00	0.0	0.0	0.0
Kirk Hinrich, SG	4	0	7.3	1.3	0.0	0.3	0.3	0.8	0.25	0.00	0.0	0.5	0.0

Team Leaders



Descrizione

- Migliori giocatori della squadra in input

Link

- http://espn.go.com/nba/team/stats/_/name/{team_abbr}/{team_name}

CSSPath

- `#my-players-table > .mod-container.mod-stat-leaders > div.span-1 > div.mod-container.mod-stat`

Team Leaders: source code



```
$root: '#my-players-table > .mod-container.mod-stat-leaders > div.span-1 > div.mod-container.mod-stat',
category: 'div.mod-header > h4',                                // category like points
name: 'div.mod-content > ul.player-info > li.name > a',      // top player in the category
id: 'div.mod-content > a[href] | getID',                         // id player
link: 'div.mod-content > a[href]',                                // link to top player in the category
number: 'div.mod-content > ul.player-info > li.number',        // number of top player in the category
stat: 'div.mod-content > ul.player-info > li.stat',           // stat of top player in the category
image: 'div.mod-content > a[href] | getID | imagify'          // image of top player in the category
```

Team Leaders: webpage



Chicago Bulls 2015 Statistic... × +

espn.go.com/nba/team/stats/_/name/chi/chicago-bulls

CHICAGO BULLS Chicago Bulls Sign in to personalize

Central Division

Clubhouse Statistics Schedule Roster Depth Transactions Rankings Photos Stadium Tickets Shop

Chicago Bulls Stats - 2014-15

Year: 2014-15 ▾

Regular Postseason

TEAM LEADERS

POINTS	REBOUNDS	ASSISTS	STEALS	BLOCKS
 Jimmy Butler #21 24.8	 Pau Gasol #16 11.8	 Derrick Rose #1 6.5	 Jimmy Butler #21 2.5	 Pau Gasol #16 2.3

Team Roster



Descrizione

- Roster completo della squadra in input

Link

- http://espn.go.com/nba/team/roster/_/name/{team_abbr}/{team_name}

CSSPath

- `#my-players-table > .mod-container.mod-table.mod-no-header-footer > .mod-content > table > tr[class*="row"]`

Team Roster: source code



```
$root: '#my-players-table > .mod-container.mod-table.mod-no-header-footer > .mod-content > table > tr[class*="row"]',
name: 'td:nth-child(2) > a',                                // player name
id: 'td:nth-child(2) > a[href] |getID',                      // id player
image: 'td:nth-child(2) > a[href] |getID | imagify',        // image
link: 'td:nth-child(2) > a[href]',                           // link to player
number: 'td:nth-child(1)',                                    // number of player
pos: 'td:nth-child(3)',                                     // position
age: 'td:nth-child(4)',                                     // age
ht: 'td:nth-child(5)',                                     // height
wt: 'td:nth-child(6)',                                     // weight
college: 'td:nth-child(7)',                                 // college
salary: 'td:nth-child(8)'                                   // salary in 2014-2015
```



Team Roster: webpage

Chicago Bulls 2015 Team R... × +

espn.go.com/nba/team/roster/_/name/chi/chicago-bulls

NBA | Home Scores Teams Schedule Stats Standings Playoffs Players More

CHICAGO BULLS Chicago Bulls [Sign in to personalize](#)

Central Division

Clubhouse Statistics Schedule Roster Depth Transactions Rankings Photos Stadium Tickets Shop

Chicago Bulls Roster

NBA Teams

TEAM ROSTER							
NO.	NAME	POS	AGE	HT	WT	COLLEGE	2014-2015 SALARY
41	Cameron Balmout	PF	24	6-9	250	New Mexico	\$507,336
0	Aaron Brooks	PG	30	6-0	161	Oregon	\$915,243
21	Jimmy Butler	SG	25	6-7	220	Marquette	\$2,008,748
34	Mike Dunleavy	SF	34	6-9	230	Duke	\$3,326,235
16	Pau Gasol	PF	34	7-0	250		\$7,128,000
22	Taj Gibson	PF	29	6-9	225	USC	\$8,000,000
12	Kirk Hinrich	SG	34	6-4	190	Kansas	\$2,732,000
3	Doug McDermott	SF	23	6-8	225	Creighton	\$2,277,960
44	Nikola Mirotic	PF	24	6-10	220		\$5,305,000
48	Nazr Mohammed	C	37	6-10	250	Kentucky	\$915,243
55	E'Twaun Moore	SG	26	6-4	191	Purdue	\$948,163
13	Joakim Noah	C	30	6-11	232	Florida	\$12,700,000
1	Derrick Rose	PG	26	6-3	190	Memphis	\$18,862,876
20	Tony Snell	SF	23	6-7	200	New Mexico	\$1,472,400

Team Depth



Descrizione

- Quintetto base della squadra in input

Link

- http://espn.go.com/nba/team/depth/_/name/{team_abbr}/{team_name}

CSSPath

- `#my-players-table > div.nba-visual-dc > ul`

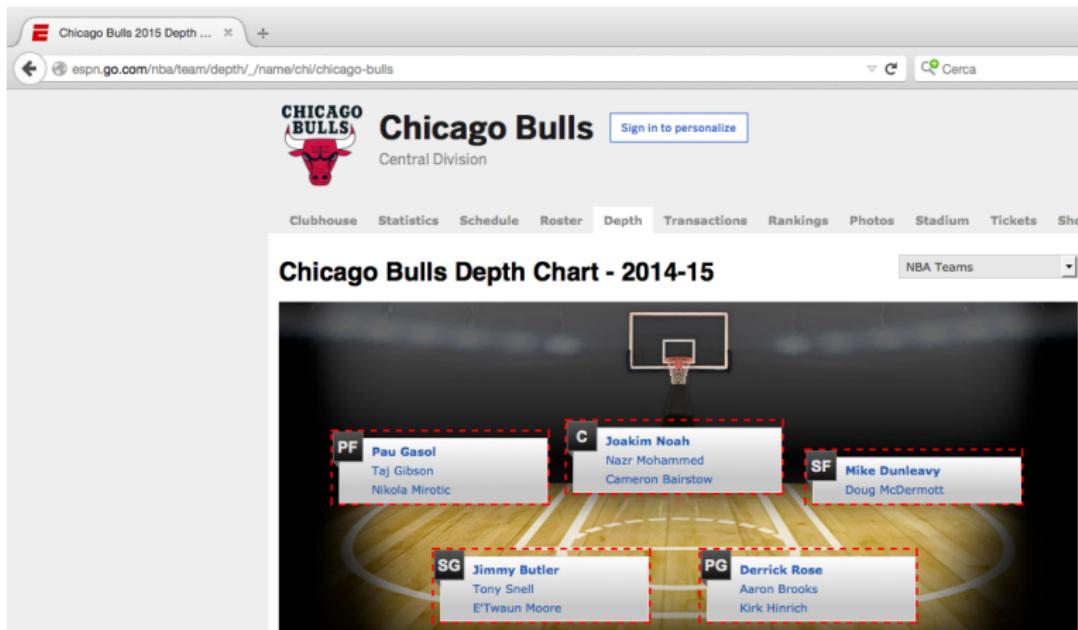
Team Depth: source code



```
$root: '#my-players-table > div.nba-visual-dc > ul',
pos: 'span',
names: ['li > a'],
ids: ['li > a[href] | getID'],
links: ['li > a[href]']

// role
// names of the players in that role
// ids of players
// links to players in that role
```

Team Depth: webpage



The screenshot shows a web browser window for the Chicago Bulls 2015 Depth Chart. The URL is espn.go.com/nba/team/depth/_/name/chi/chicago-bulls. The page title is "Chicago Bulls 2015 Depth ...". The main content is the "Chicago Bulls Depth Chart - 2014-15". The chart is displayed on a basketball court background. It shows five positions with their respective players and roles:

- PF** Pau Gasol
Taj Gibson
Nikola Mirotic
- C** Joakim Noah
Nazr Mohammed
Cameron Bairstow
- SF** Mike Dunleavy
Doug McDermott
- SG** Jimmy Butler
Tony Snell
E'Twaun Moore
- PG** Derrick Rose
Aaron Brooks
Kirk Hinrich

Season Top Players



Descrizione

- Informazioni sui migliori giocatori della corrente Regular Season

Link

- <http://espn.go.com/nba/statistics>

CSSPath

- `#my-players-table > div.span-2 > div > div.mod-content > table`

Season Top Players: source code



```
$root: '#my-players-table > div.span-2 > div> div.mod-content > table',
    category: 'tr > td',
    id: 'tr:nth-child(2) > td:nth-child(2) > a[href] | getID',
    team: 'tr:nth-child(2) > td:nth-child(2) > a[href] | getID | getTeamName',
    abbr_team: 'tr:nth-child(2) > td:nth-child(2) > a[href] | getID | getTeamAbbr',
    abbr_category: 'tr > td:nth-child(2)',
    image_top: 'tr:nth-child(2) > td > a > img[src]',
    player: 'tr:nth-child(2) > td:nth-child(2) > a',
    link_player: 'tr:nth-child(2) > td:nth-child(2) > a[href]',
    score: 'tr:nth-child(2) > td:nth-child(3)'
```

Season Top Players: webpage



2014-2015 NBA Stats and L... +

espn.go.com/nba/statistics

Offensive Leaders		Defensive Leaders	
POINTS	PPG	REBOUNDS	RPG
	1. Stephen Curry, GS 33.8		1. Dwight Howard, HOU 13.8
Stephen Curry	2. Anthony Davis, NO 31.5	Dwight Howard	2. DeAndre Jordan, LAC 13.2
	3. James Harden, HOU 28.4		3. Blake Griffin, LAC 13.2
	4. LeBron James, CLE 27.0		4. Draymond Green, GS 12.8
	5. Monta Ellis, DAL 26.0		5. Pau Gasol, CHI 11.8
Complete Leaders			
ASSISTS	APG	BLOCKS	BLKPG
	1. John Wall, WSH 12.5		1. Dwight Howard, HOU 3.00
John Wall	2. Chris Paul, LAC 8.2	Dwight Howard	2. Anthony Davis, NO 3.00
	3. Jeff Teague, ATL 7.8		3. Timofey Mozgov, CLE 3.00
	4. James Harden, HOU 7.8		4. DeAndre Jordan, LAC 2.83
	5. J.J. Barea, DAL 7.4		5. LaMarcus Aldridge, POR 2.40
Complete Leaders			
FIELD GOAL %	FG%	STEALS	STPG
	1. Marcin Gortat, WSH .744		1. Jimmy Butler, CHI 2.50
Marcin Gortat	2. DeAndre Jordan, LAC .700	Jimmy Butler	2. Draymond Green, GS 2.50
	3. Amir Johnson, TOR .690		3. Tony Allen, MEM 2.40
	4. Courtney Lee, MEM .660		4. Khris Middleton, MIL 2.33
	5. Tyson Chandler, DAL .655		5. LeBron James, CLE 2.25
Complete Leaders			



Descrizione

- Ultime notizie dal mondo NBA

Link

- <http://www.nba.com/news/>

CSSPath

- `#tab1Content > table`

News: source code



```
$root: '#tab1Content > table',
title: 'a',
descr: 'td.nbaNewsInfo > p | removeTrail'
```



News: webpage

News | NBA.com

www.nba.com/news/

Hawks eliminate Nets, display No. 1 seed dominance
May 2, 2015 12:04 AM ET
All that was missing was a ceremonial exchange of draft picks at the end of the third quarter. [Read Full Article](#)

Despite in-season changes, Bucks stabilized for late run
May 1, 2015 9:55 PM ET
Milwaukee Bucks coach Jason Kidd looked ahead to what he sees as a bright future, rather than dwell on the difficult stretch final 48 minutes of this season. [Read Full Article](#)

Payne still making doubters pay for underestimating him
May 1, 2015 3:21 PM ET
Murray State assistant basketball coach William Small was in his office in the fall of 2012 when his phone rang. The caller was Damon Stoudamire, then a University of Memphis assistant, who had just come from a high school game in the city where he watched Skal Labissiere, a future five-star recruit and Kentucky legend, play when he was then playing at Evangelical Christian School. [Read Full Article](#)

Warriors GM Myers selected as NBA Executive of the Year
May 1, 2015 12:43 PM ET
Golden State Warriors general manager Bob Myers has been voted the NBA's executive of the year after assembling a roster that won a franchise-record 67 games and earned the top playoff seed. [Read Full Article](#)

Donovan introduced as Thunder's new coach
May 1, 2015 3:37 PM ET
Billy Donovan says he considers it a privilege to coach Kevin Durant and Russell Westbrook. [Read Full Article](#)

Warriors' Myers wins NBA Executive of the Year Award
May 1, 2015 12:09 PM ET
Golden State Warriors General Manager Bob Myers has been named the 2014-15 NBA Basketball Executive of the Year, the NBA announced today. [Read Full Article](#)

Conley to travel with Grizzlies; playing status unclear
May 1, 2015 4:32 PM ET
Grizzlies point guard Mike Conley will travel with the team for its first two games of the Western Conference semifinals against the Golden State Warriors, but his status for the series is uncertain. [Read Full Article](#)

Parsons has knee surgery; no timetable for return
May 1, 2015 4:26 PM ET
Mavericks forward Chandler Parsons has undergone knee surgery, and there is no timetable for his return. [Read Full Article](#)

Blazers' Lillard receives degree from Weber State
May 1, 2015 4:50 PM ET
Portland Trail Blazers point guard Damian Lillard received his degree from Weber State on Friday morning, three years after entering the NBA. [Read Full Article](#)

Gov. Walker thinking deal for new Bucks arena is "close"
May 1, 2015 12:17 PM ET
Gov. Scott Walker says he thinks a deal to pay for a new arena for the Milwaukee Bucks is "close." [Read Full Article](#)

Data Warehouse Population



Descrizione

- Informazioni su tutti i team
 - Popolamento della base di dati relativa alle squadre
- Per ogni team, informazioni su ogni proprio player
 - Popolamento della base di dati relativa ai player

Links

- <http://espn.go.com/nba/teams>
- http://espn.go.com/nba/team/roster/_/name/{team_abbr}/{team_name}
- http://espn.go.com/nba/player/_/id/{id}/{name-surname}

Data Warehouse Population



Figure: espn_players.json

```
"3992":{  
    "name":"James Harden",  
    "espn":"http://espn.go.com/nba/player/_/id/3992/james-harden",  
    "image":"http://a.espncdn.com/combiner/i?img=/i/headshots/nba/players/full/3992.png&w=350&h=254",  
    "teamAbbr":"rockets",  
    "teamID":17,  
    "teamName":"Houston Rockets",  
    "id":3992  
},
```

Figure: espn_teams.json

```
"rockets":{  
    "stats":"http://espn.go.com/nba/team/stats/_/name/hou/houston-rockets",  
    "roster":"http://espn.go.com/nba/team/roster/_/name/hou/houston-rockets",  
    "depth":"http://espn.go.com/nba/team/depth/_/name/hou/houston-rockets",  
    "abbr":"hou",  
    "team":"Houston Rockets",  
    "logo":"http://stats.nba.com/media/img/teams/logos/HOU_logo.svg",  
    "id":17  
},
```



{JSON}

Descrizione

- Wrapper della base di dati espn_players.json

Operazioni disponibili

- Ricerca player tramite ID
- Lista players
- Link all'immagine del player a partire dal suo ID
- Team d'appartenenza a partire dall'ID di un player
- Abbreviazione team d'appartenenza a partire dall'ID di un player



Playerify: source code

```
var fs = require('fs')

var players

fs.readFile('./bin/data/espn_players.json', 'utf8', function (err, data) {
    if (err) throw err
    players = JSON.parse(data)
})

module.exports = {
    getPlayerByID : function (id){
        if (players.hasOwnProperty(id))
            return players[id]
        return {}
    },
    getPlayers : function(){
        return players
    },
    getImage : function(id){
        if (players.hasOwnProperty(id))
            return players[id].image
        return {}
    },
    getTeamName : function(id){
        if (players.hasOwnProperty(id))
            return players[id].teamName
        return {}
    },
    getTeamAbbr : function(id){
        if (players.hasOwnProperty(id))
            return players[id].teamAbbr
        return {}
    }
}
```



{JSON}

Descrizione

- Wrapper della base di dati espn_teams.json

Operazioni disponibili

- Link al logo a partire dall'abbreviazione della squadra
- Link al logo a partire dal nome della squadra
- ID squadra a partire dall'abbreviazione
- Info team a partire dall'abbreviazione
- Info team a partire dall'ID
- Link alle statistiche del team a partire dall'abbreviazione
- Link al roster del team a partire dall'abbreviazione
- Link alla formazione del team a partire dall'abbreviazione
- Lista di tutte le squadre

Teamify: source code



```

var fs = require('fs')

var teams = JSON.parse(fs.readFileSync('./bin/data/espn_teams.json', 'utf8'))

module.exports =
{
    getLogo : function (abbr){
        var low_split = abbr.toLowerCase().split(' ')
        var k = low_split[low_split.length - 1]
        if (teams.hasOwnProperty(k))
            return teams[k].logo
        return {}
    },
    getLogoByName : function (team){
        for (var k in teams) {
            if (teams.hasOwnProperty(k)) {
                if (teams[k].team == team)
                    return teams[k].logo
            }
        }
    },
    getID : function (abbr){
        var k = abbr.toLowerCase()
        if (teams.hasOwnProperty(k))
            return teams[k].id
        return {}
    },
    getTeamByAbbr : function (abbr){
        var k = abbr.toLowerCase()
        if (teams.hasOwnProperty(k))
            return teams[k]
        return {}
    },
}
    
```

Figure: Teamify

```

getTeamByID : function (id){
    if (id < 1 || id > 30)
        return null
    for (var k in teams) {
        if (teams.hasOwnProperty(k)) {
            if (teams[k].id == id)
                return teams[k]
        }
    }
},
getStats : function (abbr){
    var k = abbr.toLowerCase()
    if (teams.hasOwnProperty(k))
        return teams[k].stats
    return {}
},
getRoster : function(abbr){
    var k = abbr.toLowerCase()
    if (teams.hasOwnProperty(k))
        return teams[k].roster
    return {}
},
getDepth : function(abbr){
    var k = abbr.toLowerCase()
    if (teams.hasOwnProperty(k))
        return teams[k].depth
    return {}
},
getTeams : function(){
    return teams
}
}
    
```

Figure: Teamify (cont.)



1 Introduzione

2 Architettura

3 Fonti

4 Datalog

5 Wrappers

6 Global Schema

7 Queries

8 Riformulazione

9 Tecnologie

Global Schema



- **team**(Key, Name, Abbr, Logo, Stats_link, Roster_link, Depth_link).

- **player**(Id, Team_Key, Name, Link, Image, Number, Role, Age, Height, Weight, Born, Drafted, College, Experience, Season, Career_Points_Game, Career_Assists_Game, Career_Rebounds_Game, Salary, Expiration_Salary).

- **matches**(Date, Vteam_Key, Vteam_Qtrs, Vteam_Finl, Hteam_Key, Hteam_Qtrs, Hteam_Finl, Time, URL_Video).

- **standings**(Team_Key, Wins, Losses, Percentage, Games_Back, Home, Road_Record, Conference_Record, Div_record, Streak, Last_10_games).

Global Schema



- **gamelog**(Id_Player, Date, Opponent_Team, Win_Lose, Result, Minutes, Field_Goals, Field_Goals_Percentage, Point_3_Field_Goals, Point_3_Field_Goals_Percentage, Free_Throws, Free_Throws_Percentage, Rebounds, Assists, Blocks, Steals, Fouls, Turnovers, Points).

- **team_stats**(Team_Key, Id_Player, Games_Played, Games_Started, Minutes_Game, Points_Game, Off_Rebounds_Game, Def_Rebounds_Game, Rebounds_Game, Assist_Game, Steals_Game, Blocks_Game, Turnovers_Game, Fouls_Game, Assist_Turnover, Efficiency).

- **team_leaders**(Team_Key, Id_Player, Category, Score).

- **top_season**(Id, Team_Key, Category, Score).

- **news**(Key, Title, Description).



1 Introduzione

2 Architettura

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Query 1: Roster del team *Houston Rockets*

- q1('rockets', Name, Image, Number, Position, Age, Height, Weight, College, Salary) :- **player**(Id, 'rockets', Name, _, Image, Number, _, Age, Height, Weight, _, _, College, _, _, _, _, _, Salary, _).

Query 2: Classifica Regular Season corrente

- q2(Team_name, Logo, Wins, Losses, Percentage, Streak) :-
standings(Team_Key, Team_name, _, Wins, Losses, Percentage, _, _, _, _, Streak, _), **team**(Team_Key, _, _, Logo, _, _, _).



Query 3: Lista dei player NBA

- q3(Name, Image) :- **player**(_, _, Name, _, Image, _).

Query 4: Partite da giocare nella data in input

- q4(date, Hteam_Key, Vteam_Key, Hteam_Logo, Vteam_Logo, Time) :-
team(Hteam_Key, _, _, Hteam_Logo, _, _, _), **team**(Vteam_Key, _, _, Vteam_Logo, _, _, _), **matches**(date, Vteam_Key, _, _, Hteam_Key, _, _, Time, _).



1 Introduzione

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Mapping GAV - LAV



- **team**(key, Name, Abbr, Logo, Stats_link, Roster_link, Depth_link) :-
s10.teams_dw(key, Name, Abbr, Logo, Stats_link, Roster_link, Depth_link).

- **player**(id, Team_Key, Name, Link, Image, Number, Role, Age, Height, Weight, Born, Drafted, College, Experience, Season, Career_Points_Game, Career_Assists_Game, Career_Rebounds_Game, Salary, Expiration_Salary) :- **s5.player**(id, Name, Team_Key, _, Link, Image, Number, Role, Age, Height, Weight, Born, Drafted, College, Experience, Season, Career_Points_Game, Career_Assists_Game, Career_Rebounds_Game, Salary, Expiration_Salary, ...).

- **matches**(date, Vteam_Key, Vteam_Qtrs, Vteam_Finl, Hteam_Key, Hteam_Qtrs, Hteam_Finl, Time, URL_Video) :- **s6.scoreboard**(date, VTeam_Key, _, Vteam_Qtrs, Vteam_Finl, HTeam_Key, _, Hteam_Qtrs, Hteam_Finl, Time), **s9.highlight**(VTeam_Key, Url_Video).

Mapping GAV - LAV



- **standings**(Team_Key, Wins, Losses, Percentage, Games_Back, Home, Road_Record, Conference_Record, Div_record, Streak, Last_10_games) :-
s7.standings(Team_Key, _, Wins, Losses, Percentage, Games_Back, Home, Road_Record, Conference_Record, Div_Record, Streak, Last_10_Games).

- **gamelog**(id_Player, date, Opponent_team, Win_Lose, Result, Minutes, Field_Goals, Field_Goals_Percentage, Point_3_Field_Goals, Point_3_Field_Goals_Percentage, Free.Throws, Free.Throws_Percentage, Rebounds, Assists, Blocks, Steals, Fouls, Turnovers, Points) :-
s5.player(id_Player, _, Team_Key, date, Opponent_team, Win_Lose, Result, Minutes, Field_Goals, Field_Goals_Percentage, Point_3_Field_Goals, Point_3_Field_Goals_Percentage, Free.Throws, Free.Throws_Percentage, Rebounds, Assists, Blocks, Steals, Fouls, Turnovers, ...).

- **team_leaders**(team_Key, Id_Player, Category, Score) :-
s2.stats_leaders(team_Key, Id_Player, Category, Score, ...), Category\="".

Mapping GAV - LAV



- **team_stats**(team_Key, Id_Player, Games_Played, Games_Started, Minutes_Game, Points_Game, Off_Rebounds_Game, Def_Rebounds_Game, Rebounds_Game, Assist_Game, Steals_Game, Blocks_Game, Turnovers_Game, Fouls_Game, Assist_Turnover, Efficiency) :- **s2.stats_leaders**(team_Key, Id_Player, _, _, Games_played, Games_Started, Minutes_Game, Points_Game, Off_Rebounds_Game, Def_Rebounds_Game, Rebounds_Game, Assists_Game, Steals_Game, Blocks_Game, Turnovers_Game, Fouls_Game, Assist_Turnover, Efficiency, _, _, _).

- **news**(Title, Description) :- **s8.news**(Title, Description).

Mapping LAV - GAV



- **s1.roster**(team_Key, Name, Link, Number, Role, Age, Height, Weight, College, Salary) :- **player**(Id, team_Key, Name, Link, _, Number, Role, Age, Height, Weight, College, Salary, ...).

- **s2.stats_leaders**(team_Key, Id_Player, Name, Link, Games_played, Games_started, Minutes_game, Points_game, Off_rebounds_game, Def_rebounds_game, Rebounds_game, Assists_game, Steals_game, Blocks_game, Turnovers_game, Fouls_game, Assist_turnover, Efficiency, Category, Number, Stat) :- **player**(Id_Player, team_Key, Name, Link, _, Number, ...), (**team_stats**(Team_Key, Id_Player, Games_Played, Games_Started, Minutes_Game, Points_Game, Off_Rebounds_Game, Def_Rebounds_Game, Rebounds_Game, Assist_Game, Steals_Game, Blocks_Game, Turnovers_Game, Fouls_Game, Assist_Turnover, Efficiency) ; **team_leaders**(team_Key, Id_Player, Category, Stat)).

- **s3.top_season**(Id, Team_Key, Name, Image, Link, Team_Name, Category, Score) :- **top_season**(Id, Team_Key, Category, Score), **player**(Id, Team_Key, Name, Link, Image, ...).

- **s4.depth**(team_Key, Role, Id, Name, Link) :- **player**(Id, team_Key, Name, Link, ...).

Mapping LAV - GAV



■ **s5.player**(id, Name, Team_Key, Team_Name, Link, Image, Number, Role, Height, Weight, Born, Drafted, College, Experience, Season, Points_Game, Assists_Game, Rebounds_Game, Efficiency, Career_Points_Game, Career_Assists_Game, Career_Rebounds_Game, Salary, Expiration_Salary, Gamelog_Date, Gamelog_Opponent_Team, Gamelog_Link_Opponent_Team, Gamelog_Win_Lose, Gamelog_Result, Gamelog_Min, Gamelog_Field_Goals_Ma, Gamelog_Field_Goal_Percentage, Gamelog_3_Points_Field_Goals_Ma, Gamelog_3_Point_Field_Goal_Percentage, Gamelog_Free.Throws_Ma, Gamelog_Free.Throw_Percentage, Gamelog_Rebounds, Gamelog_Assists, Gamelog_Blocks, Gamelog_Steals, Gamelog_Fouls, Gamelog_Turnovers, Gamelog_Points) :- **player**(id, Team_Key, Name, Link, Image, Number, Role, Age, Height, Weight, Born, Drafted, College, Experience, Season, Career_Points_Game, Career_Assists_Game, Career_Rebounds_Game, Salary, Expiration_Salary), **gamelog**(id, Gamelog_Date, Gamelog_Opponent_Team, Gamelog_Link_Opponent_Team, Gamelog_Win_Lose, Gamelog_Result, Gamelog_Min, Gamelog_Field_Goals_Ma, Gamelog_Field_Goal_Percentage, Gamelog_3_Points_Field_Goals_Ma, Gamelog_3_Point_Field_Goal_Percentage, Gamelog_Free.Throws_Ma, Gamelog_Free.Throw_Percentage, Gamelog_Rebounds, Gamelog_Assists, Gamelog_Blocks, Gamelog_Steals, Gamelog_Fouls, Gamelog_Turnovers, Gamelog_Points), **team.stats**(Team_Key, id, Points_Game, Assist_Game, Rebounds_Game, Efficiency, . . .).

Mapping LAV - GAV



- **s6.scoreboard**(date, VTeam_Key, Vteam_Name, Vteam_Qtrs,
Vteam_Finl, HTeam_Key, Hteam_Name, Hteam_Qtrs, Hteam_Finl, Time)
:- **matches**(date, Vteam_Key, Vteam_Qtrs, Vteam_Finl, Hteam_Key,
Hteam_Qtrs, Hteam_Finl, Time, _), **team**(VTeam_Key, VTeam_Name, ...),
team(HTeam_Key, HTeam_Name, ...).

- **s7.standings**(Team_Key, Team_name, Wins, Losses, Percentage,
Games_Back, Home, Road_Record, Conference_Record, Div_Record,
Streak, Last_10_Games) :- **standings**(Team_Key, Wins, Losses,
Percentage, Games_Back, Home, Road_Record, Conference_Record,
Div_record, Streak, Last_10_games), **team**(Team_Key, Team_Name, ...).

- **s8.news**(Title, Description) :- **news**(Title, Description).

Mapping LAV - GAV



- **s9.highlight(team_Key, Url) :- matches(_, team_Key, Url, ...).**

- **s10.teams_dw(Key, Name, Logo, Abbr, Stats_link, Roster_link, Depth_link) :- team(Key, Name, Abbr, Logo, Stats_link, Roster_link, Depth_link).**

- **s11.players_dw(Id, Name, Image, Team_Key, Team_Name, Espn_link) :- player(Id, Team_Key, Name, Espn_link, Image), team(Team_Key, Team_Name, ...).**



1 Introduzione

2 Architettura

3 Fonti

4 Datalog

5 Wrappers

6 Global Schema

7 Queries

8 Riformulazione

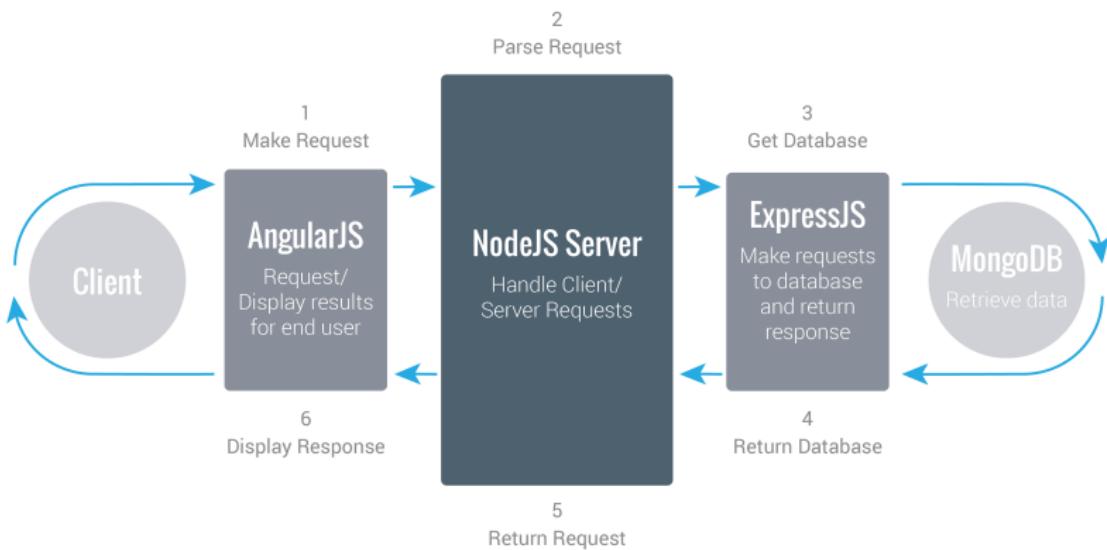
9 Tecnologie



MongoDB, Express, AngularJS, NodeJS

- **MEAN:** equivalente allo stack tecnologico LAMP
- **MongoDB:** NOSQL database
- **Express:** web application framework per NodeJS
- **AngularJS:** MVC framework by Google (integra Twitter Bootstrap)

Interazione Client-Server: REST API



Custom JEAN Stack



JSON, Express, AngularJS, NodeJS

- Non si ha necessità delle funzionalità offerte da un database
- Base di dati simulata da file JSON
- Accesso gestito da opportuni wrapper



Thank You!