UrbanConnect

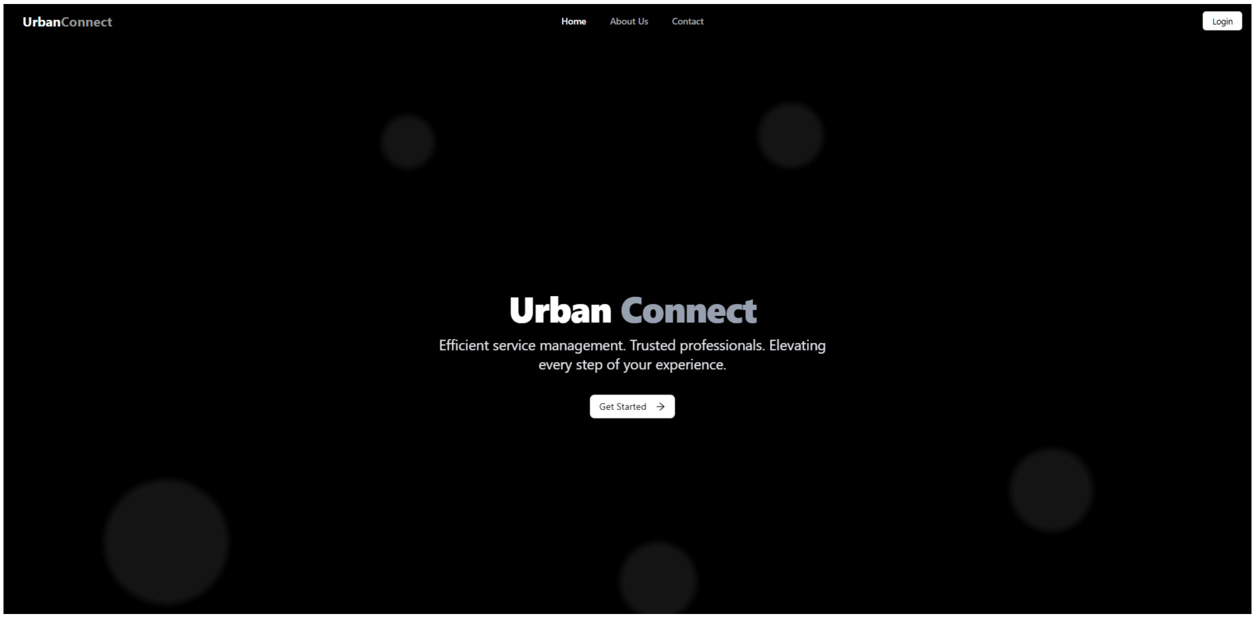
1. Overview

UrbanConnect is engineered as a scalable, secure, and efficient platform for booking home and lifestyle services. The application emphasizes technical robustness—through conflict-free scheduling, real-time updates, strong access control, and a responsive interface—to deliver seamless user and administrative experiences.

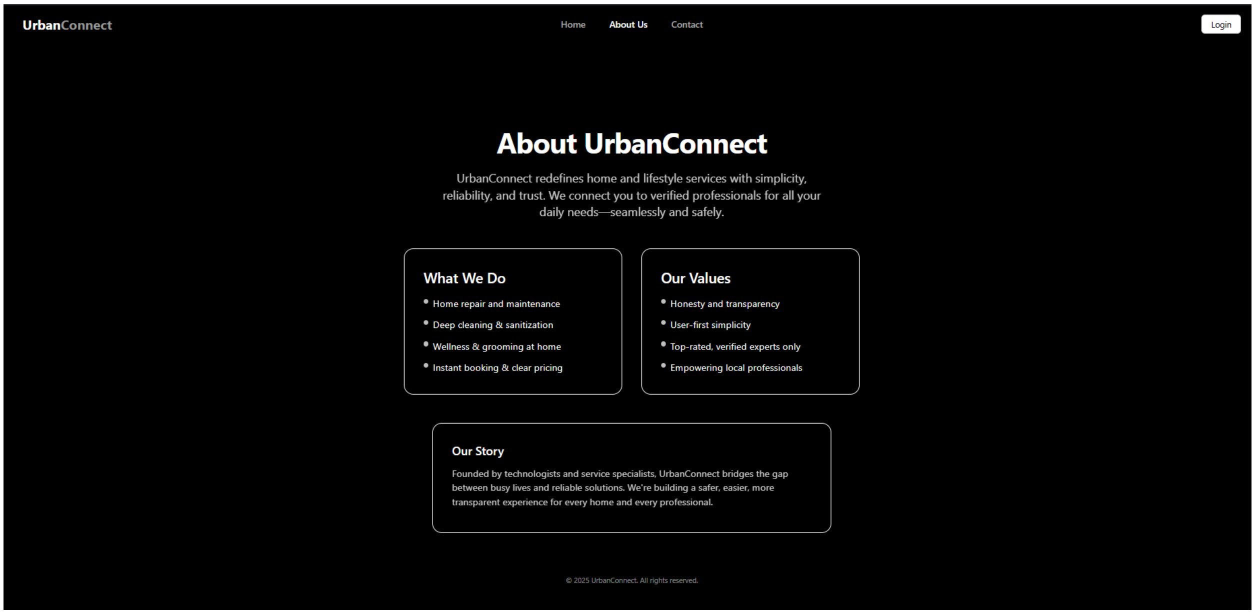
2. Application Features

2.1 Landing & Navigation

- **Navbar Includes:** Home, About Us, Contact Us, Login
- **Navigation Logic:** Simple, top-level menu structure for intuitive user journeys.
- **Landing Experience:** Users are greeted with branding, mission statement, and high-clarity call-to-action.



Efficient service management. Trusted professionals. Elevating every step of your experience.



About UrbanConnect

UrbanConnect redefines home and lifestyle services with simplicity, reliability, and trust. We connect you to verified professionals for all your daily needs—seamlessly and safely.

What We Do

- Home repair and maintenance
- Deep cleaning & sanitization
- Wellness & grooming at home
- Instant booking & clear pricing

Our Values

- Honesty and transparency
- User-first simplicity
- Top-rated, verified experts only
- Empowering local professionals

Our Story

Founded by technologists and service specialists, UrbanConnect bridges the gap between busy lives and reliable solutions. We're building a safer, easier, more transparent experience for every home and every professional.

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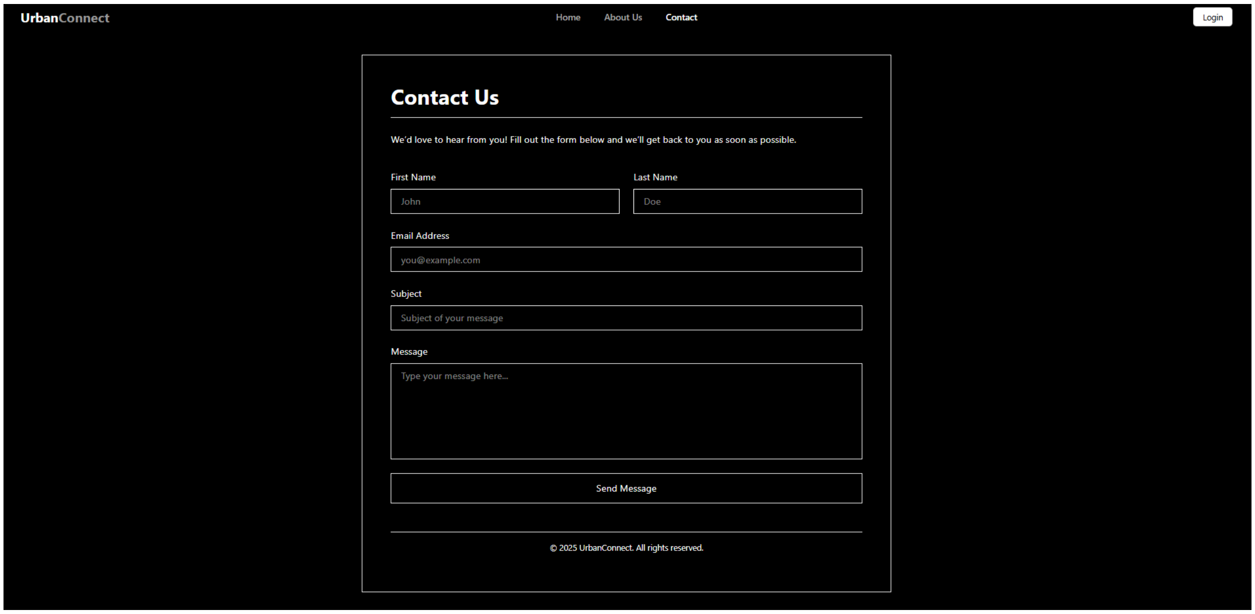

Contact Us

We'd love to hear from you! Fill out the form below and we'll get back to you as soon as possible.

First Name: John

Last Name: Doe

Email Address: you@example.com

Subject: Subject of your message

Message: Type your message here...

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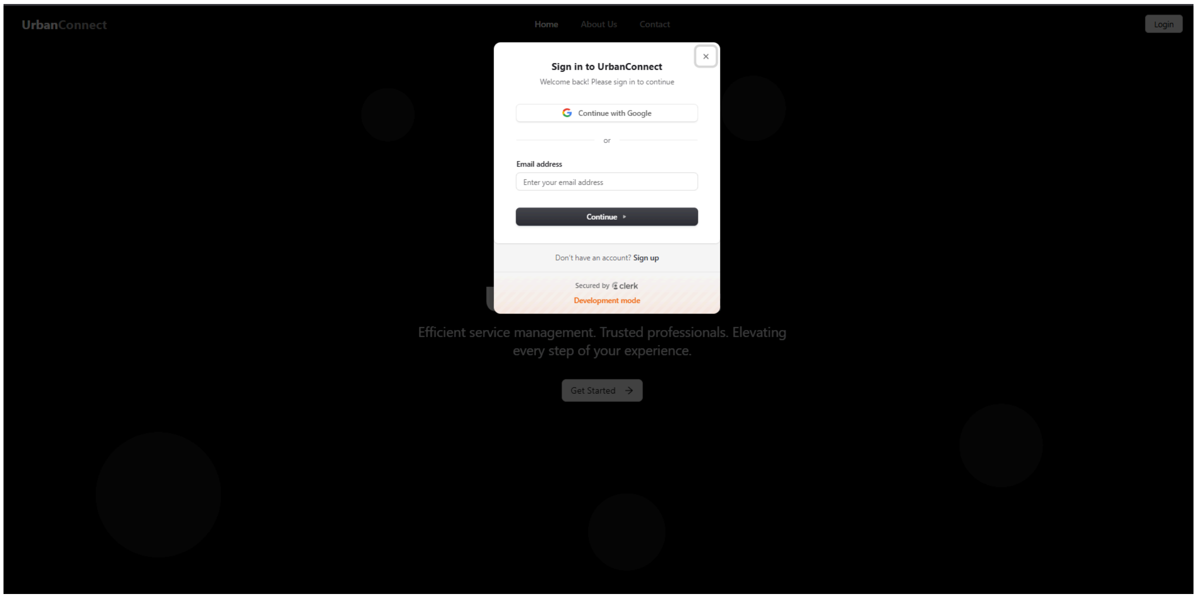
2.2 Authentication & Roles

- **Auth Provider:** Clerk
- **Login Mechanics:** All dashboard and booking routes are protected; access requires successful authentication.
- **First-Time User:** New users on first sign-in are assigned a default 'customer' role.

- **Role-Based Access:** Admin-specific routes and controls appear dynamically for admin users.



Sign in to UrbanConnect

Welcome back! Please sign in to continue

Email address

Enter your email address

Don't have an account? Sign up

Secured by clerk

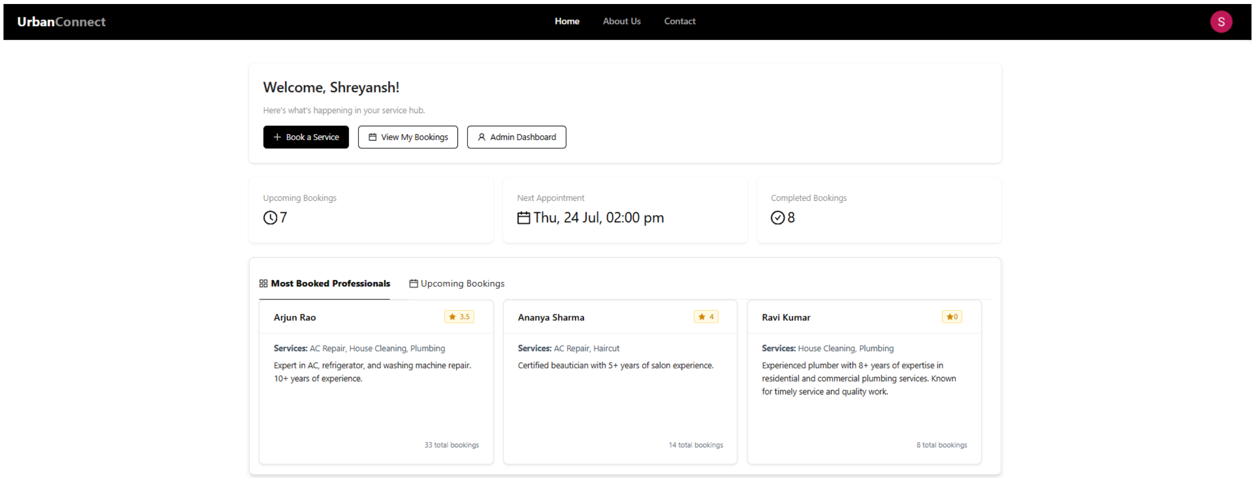
Development mode

Efficient service management. Trusted professionals. Elevating every step of your experience.

2.3 Dashboard Experience

Upon login, users access a structured **dashboard** including:

- **Welcome Banner:** Personalized greeting.
- **Action Buttons:** For booking services, viewing past orders, and accessing admin dashboard (if applicable).
- **Summary Cards:**
    - *Upcoming Appointments:* Next scheduled service.
    - *Completed Bookings:* History of fulfilled bookings with options to give feedback.
    - *Statistics:* Count of past and upcoming bookings.
- **Admin Panel:** Exclusive button visible to admins for advanced controls.



Welcome, Shreyansh!

Here's what's happening in your service hub.

Upcoming Bookings
7

Next Appointment
Thu, 24 Jul, 02:00 pm

Completed Bookings
8

Arjun Rao ★ 3.5

Services: AC Repair, House Cleaning, Plumbing

Expert in AC, refrigerator, and washing machine repair. 10+ years of experience.

33 total bookings

Ananya Sharma ★ 4

Services: AC Repair, Haircut

Certified beautician with 5+ years of salon experience.

14 total bookings

Ravi Kumar ★0

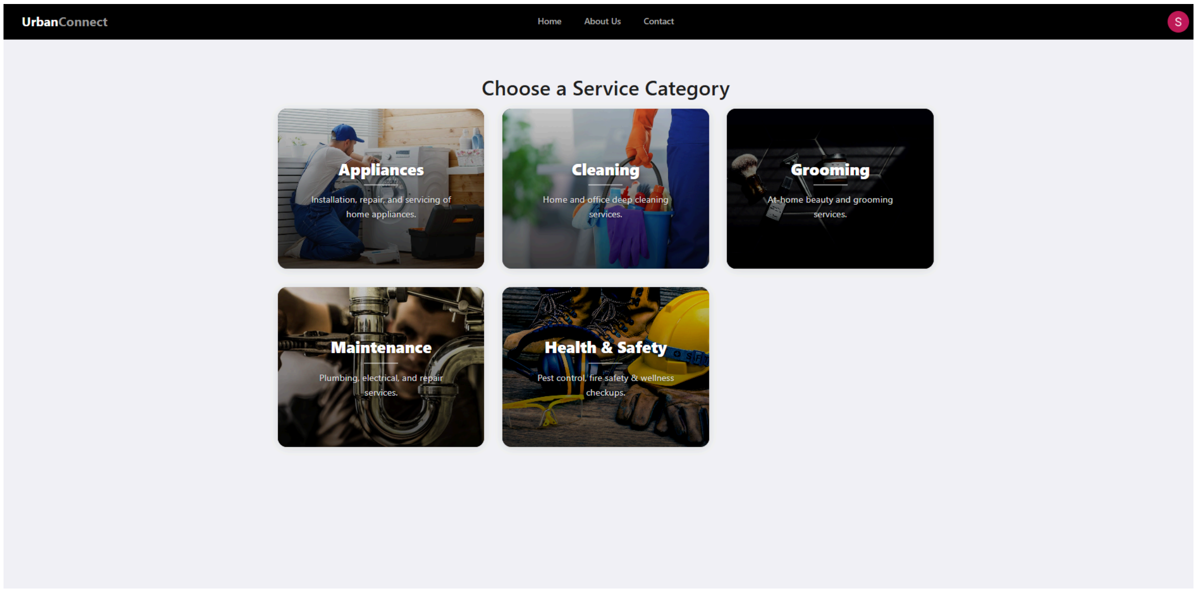
Services: House Cleaning, Plumbing

Experienced plumber with 8+ years of expertise in residential and commercial plumbing services. Known for timely service and quality work.

8 total bookings

2.4 Service Booking Workflow

1. **Category Selection:** User chooses a service category (e.g., appliances, cleaning, grooming).



Choose a Service Category

Appliances
Installation, repair, and servicing of home appliances.

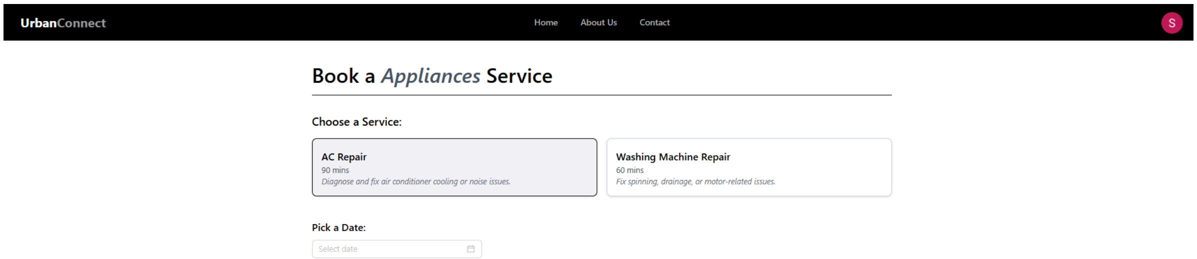
Cleaning
Home and office deep cleaning services.

Grooming
At-home beauty and grooming services.

Maintenance
Plumbing, electrical, and repair services.

Health & Safety
Pest control, fire safety & wellness checkups.

2. **Service Discovery:** Available services within the chosen category are displayed with descriptions and durations.



Book a *Appliances* Service

Choose a Service:

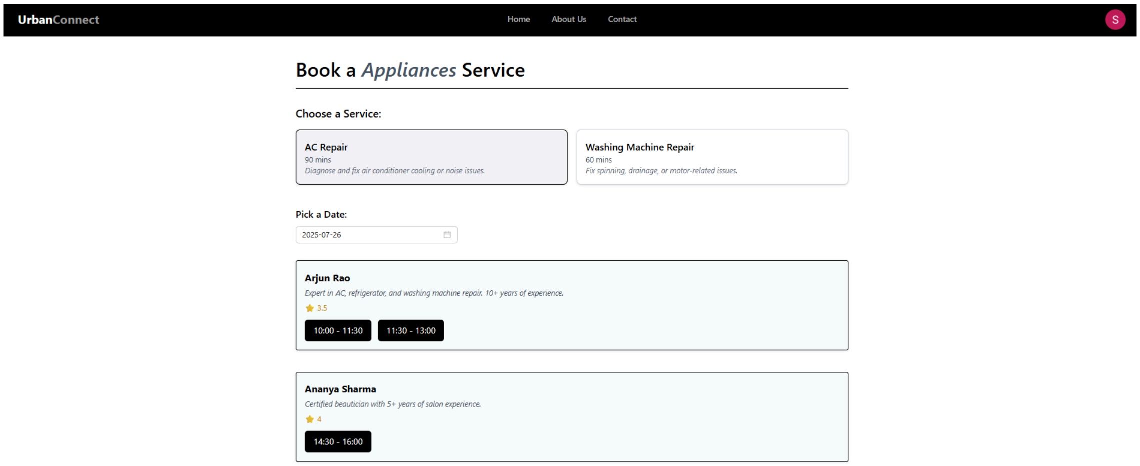
AC Repair
90 mins
Diagnose and fix air conditioner cooling or noise issues.

Washing Machine Repair
60 mins
Fix spinning, drainage, or motor-related issues.

Pick a Date:

Select date

3. **Date & Time Picking:** Past dates are disabled to prevent invalid bookings.
4. **Professional Selection:** Upon service and date selection, the system shows all qualified professionals along with:
   - Available time slots (dynamically generated based on service duration and daily availability from 10:00 to 17:00)
   - Ratings
   - Bio/Description



Book a *Appliances* Service

Choose a Service:

AC Repair
90 mins
Diagnose and fix air conditioner cooling or noise issues.

Washing Machine Repair
60 mins
Fix spinning, drainage, or motor-related issues.

Pick a Date:

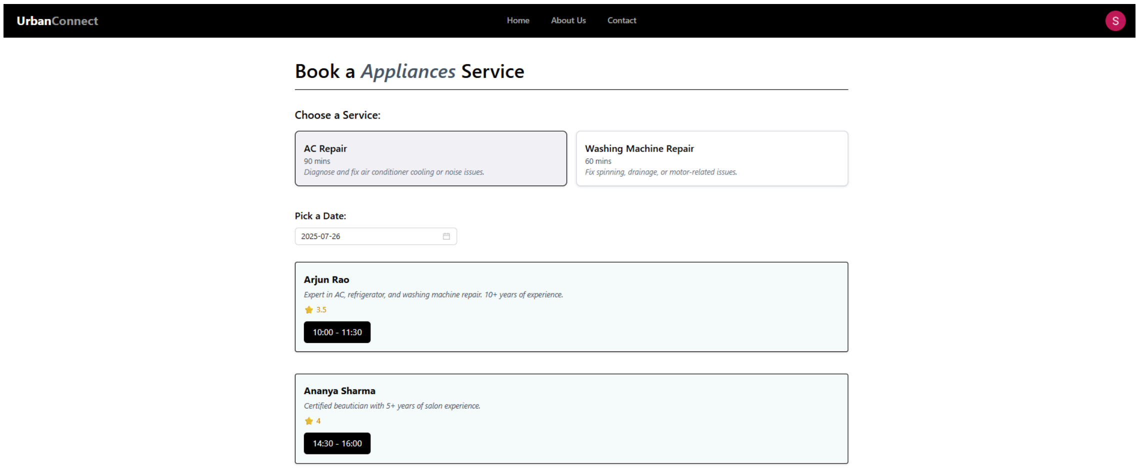
2025-07-26

Arjun Rao
Expert in AC, refrigerator, and washing machine repair. 10+ years of experience.
★ 3.5
10:00 - 11:30 | 11:30 - 13:00

Ananya Sharma
Certified beautician with 5+ years of salon experience.
★ 4
14:30 - 16:00

5. **Slot Booking Logic:**

- Time slots are computed by splitting daily availability per service duration.
- When a slot is booked, the system updates the professional's availability, splits the record, and prevents overlapping reservations.



Book a *Appliances* Service

Choose a Service:

AC Repair
90 mins
Diagnose and fix air conditioner cooling or noise issues.

Washing Machine Repair
60 mins
Fix spinning, drainage, or motor-related issues.

Pick a Date:

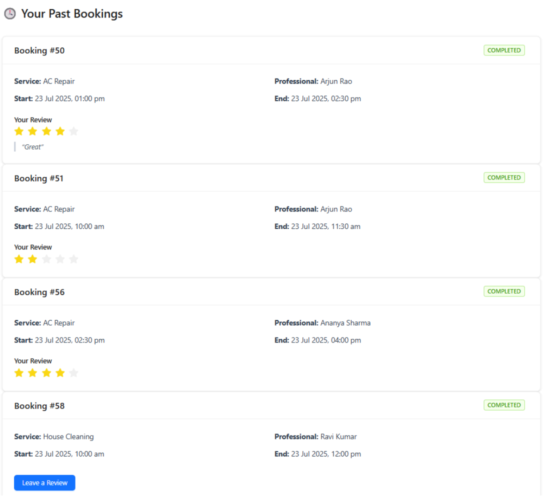
2025-07-26

Arjun Rao
Expert in AC, refrigerator, and washing machine repair. 10+ years of experience.
★ 3.5
10:00 - 11:30

Ananya Sharma
Certified beautician with 5+ years of salon experience.
★ 4
14:30 - 16:00

2.5 Booking Management (View, Cancel, Reschedule)

- **View Past Bookings:** Users access a list with booking ID, service details, date/time, and professional.
- **Leave a Review:** Option to rate and comment post-completion.



Your Past Bookings

Booking #50 COMPLETED

Service: AC Repair **Professional:** Arjun Rao
Start: 23 Jul 2025, 01:00 pm **End:** 23 Jul 2025, 02:30 pm

Your Review
★★★★☆
"Great"

Booking #51 COMPLETED

Service: AC Repair **Professional:** Arjun Rao
Start: 23 Jul 2025, 10:00 am **End:** 23 Jul 2025, 11:30 am

Your Review
★★☆☆☆

Booking #56 COMPLETED

Service: AC Repair **Professional:** Ananya Sharma
Start: 23 Jul 2025, 02:30 pm **End:** 23 Jul 2025, 04:00 pm

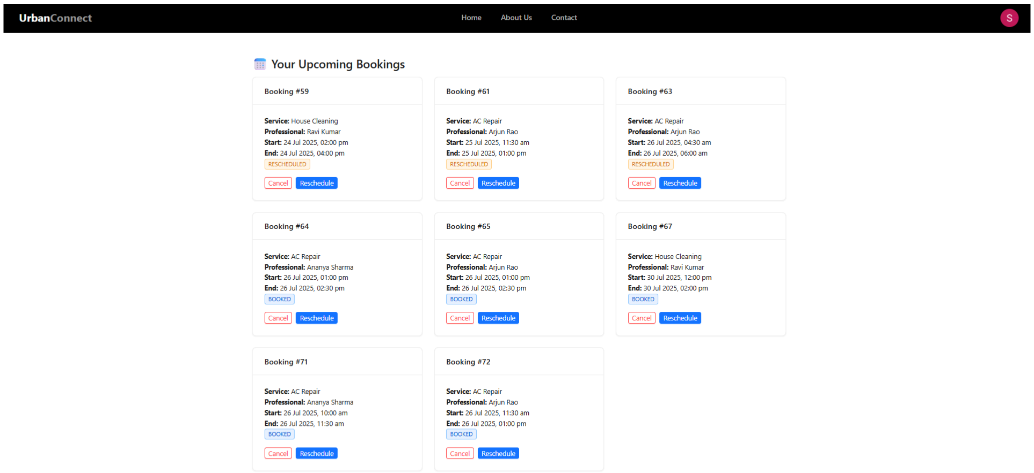
Your Review
★★★★☆

Booking #58 COMPLETED

Service: House Cleaning **Professional:** Ravi Kumar
Start: 23 Jul 2025, 10:00 am **End:** 23 Jul 2025, 12:00 pm

- **Upcoming Bookings:** View, cancel, or reschedule.

- **Cancellation:** Sets appointment status to "CANCELED", excludes from active views.
- **Rescheduling:** Presents available slots for the assigned professional, using the same slot logic as initial booking.



Your Upcoming Bookings

Booking #59

Service: House Cleaning
Professional: Ravi Kumar
Start: 24 Jul 2025, 02:00 pm
End: 24 Jul 2025, 04:00 pm
RESCHEDULED

Booking #61

Service: AC Repair
Professional: Arjun Rao
Start: 25 Jul 2025, 11:30 am
End: 25 Jul 2025, 01:00 pm
RESCHEDULED

Booking #63

Service: AC Repair
Professional: Arjun Rao
Start: 26 Jul 2025, 04:30 am
End: 26 Jul 2025, 06:00 am
RESCHEDULED

Booking #64

Service: AC Repair
Professional: Ananya Sharma
Start: 26 Jul 2025, 01:00 pm
End: 26 Jul 2025, 02:30 pm
BOOKED

Booking #65

Service: AC Repair
Professional: Arjun Rao
Start: 26 Jul 2025, 01:00 pm
End: 26 Jul 2025, 02:30 pm
BOOKED

Booking #67

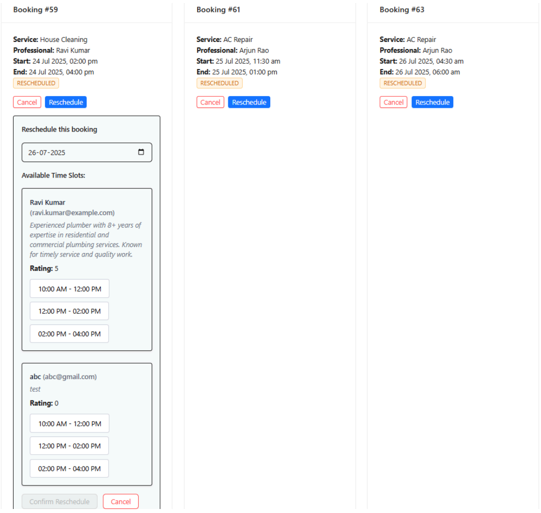
Service: House Cleaning
Professional: Ravi Kumar
Start: 30 Jul 2025, 12:00 pm
End: 30 Jul 2025, 02:00 pm
BOOKED

Booking #71

Service: AC Repair
Professional: Ananya Sharma
Start: 26 Jul 2025, 10:00 am
End: 26 Jul 2025, 11:30 am
BOOKED

Booking #72

Service: AC Repair
Professional: Arjun Rao
Start: 26 Jul 2025, 11:30 am
End: 26 Jul 2025, 01:00 pm
BOOKED



Booking #59

Service: House Cleaning
Professional: Ravi Kumar
Start: 24 Jul 2025, 02:00 pm
End: 24 Jul 2025, 04:00 pm
RESCHEDULED

Reschedule this booking

26-07-2025

Available Time Slots:

Ravi Kumar
(ravi.kumar@example.com)
Experienced plumber with 8+ years of expertise in residential and commercial plumbing services. Known for timely service and quality work.
Rating: 5
10:00 AM - 12:00 PM
12:00 PM - 02:00 PM
02:00 PM - 04:00 PM

abc (abc@gmail.com)
test
Rating: 0
10:00 AM - 12:00 PM
12:00 PM - 02:00 PM
02:00 PM - 04:00 PM

Booking #61

Service: AC Repair
Professional: Arjun Rao
Start: 25 Jul 2025, 11:30 am
End: 25 Jul 2025, 01:00 pm
RESCHEDULED

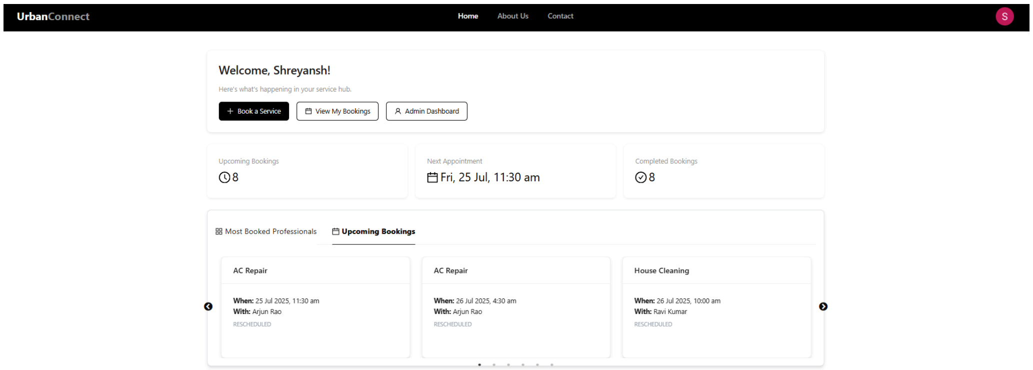
Booking #63

Service: AC Repair
Professional: Arjun Rao
Start: 26 Jul 2025, 04:30 am
End: 26 Jul 2025, 06:00 am
RESCHEDULED

2.6 Reviews & Ratings

- **Submission:** Users rate professionals and leave comments for completed bookings.
- **Storage:** Ratings stored in `professional_reviews`.
- **Aggregation:** Average ratings for each professional are calculated and updated in `professional_details`.

- **Display:** Top professionals ranked by total bookings and ratings; shown on dashboard.



Welcome, Shreyansh!

Here's what's happening in your service hub.

Upcoming Bookings
8

Next Appointment
Fri, 25 Jul, 11:30 am

Completed Bookings
8

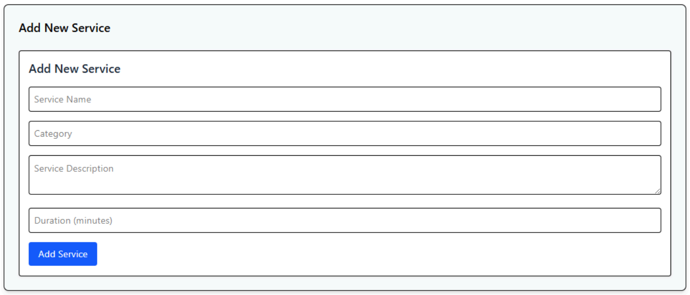
AC Repair
When: 25 Jul 2025, 11:30 am
With: Arjun Rao
RESCHEDULED

AC Repair
When: 26 Jul 2025, 4:30 am
With: Arjun Rao
RESCHEDULED

House Cleaning
When: 26 Jul 2025, 10:00 am
With: Ravi Kumar
RESCHEDULED

2.7 Admin Role & Controls

- **Visibility:** Admin-specific controls and dashboard appear only for users with 'admin' role.
- **Access Control:** Route protection ensures only authorized admins can access management features.



Add New Service

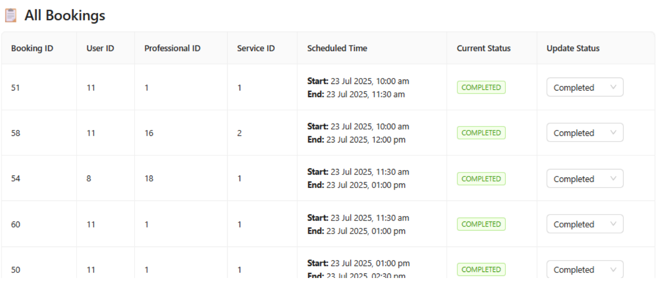
Add New Service

Service Name

Category

Service Description

Duration (minutes)



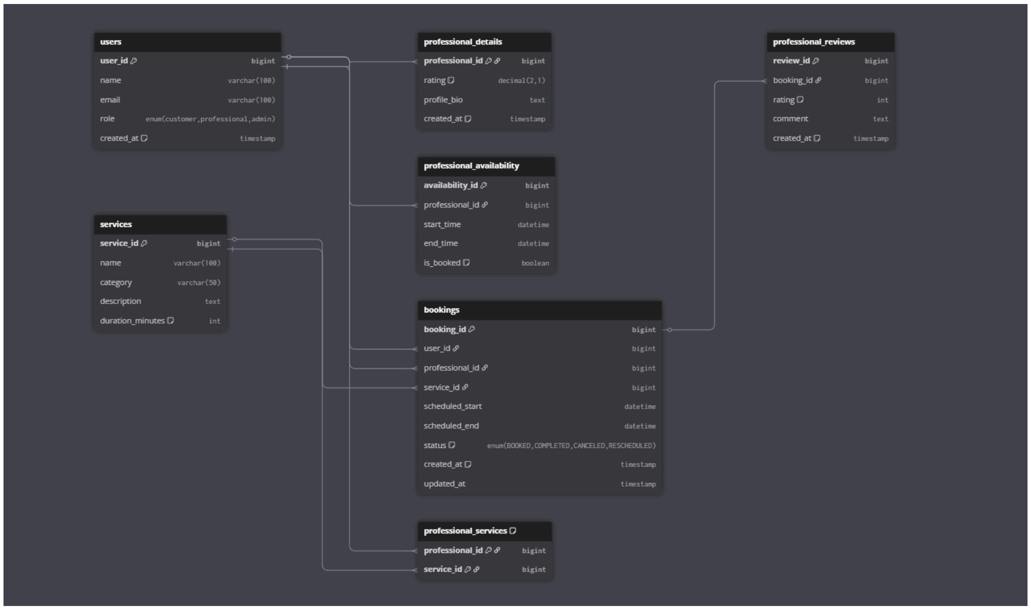
📋 All Bookings

Booking ID	User ID	Professional ID	Service ID	Scheduled Time	Current Status	Update Status
51	11	1	1	**Start:** 23 Jul 2025, 10:00 am **End:** 23 Jul 2025, 11:30 am	COMPLETED	Completed
58	11	16	2	**Start:** 23 Jul 2025, 10:00 am **End:** 23 Jul 2025, 12:00 pm	COMPLETED	Completed
54	8	18	1	**Start:** 23 Jul 2025, 11:30 am **End:** 23 Jul 2025, 01:00 pm	COMPLETED	Completed
60	11	1	1	**Start:** 23 Jul 2025, 11:30 am **End:** 23 Jul 2025, 01:00 pm	COMPLETED	Completed
50	11	1	1	**Start:** 23 Jul 2025, 01:00 pm **End:** 23 Jul 2025, 02:30 pm	COMPLETED	Completed

3. Database & Backend Architecture

3.1 Schema Overview

- **users:** User profile, authentication, and role (customer/professional/admin).
- **professional_details:** Additional info and current rating for professionals.
- **professional_availability:** Tracks professional daily availability and booked slots.
- **bookings:** All booking details, including status (BOOKED, COMPLETED, CANCELED, RESCHEDULED).
- **professional_reviews:** Stores review submissions per booking.
- **services :** Service catalog professional-to-service mapping.
- **professional_services: P**rofessional-to-service mapping.



users	
user_id	bigint
name	varchar(100)
email	varchar(100)
role	enum(customer,professional,admin)
created_at	timestamp

professional_details	
professional_id	bigint
rating	decimal(2,1)
profile_bio	text
created_at	timestamp

professional_reviews	
review_id	bigint
booking_id	bigint
rating	int
comment	text
created_at	timestamp

professional_availability	
availability_id	bigint
professional_id	bigint
start_time	datetime
end_time	datetime
is_booked	boolean

services	
service_id	bigint
name	varchar(100)
category	varchar(50)
description	text
duration_minutes	int

bookings	
booking_id	bigint
user_id	bigint
professional_id	bigint
service_id	bigint
scheduled_start	datetime
scheduled_end	datetime
status	enum(BOOKED,COMPLETED,CANCELED,RESCHEDULED)
created_at	timestamp
updated_at	timestamp

professional_services	
professional_id	bigint
service_id	bigint

4. Security & Access Control

- **Authentication Enforcement:** Protected routes for booking, dashboard, and admin areas.
- **Role-Based Visibility:** UI elements rendered based on authenticated user's role.

- **Auditability:** Booking status changes and role assignments tracked in the database.

Additional Requirements:

1. Manage professional availability and prevent scheduling conflicts:

This project manages professional availability dynamically using the `professional_availability` table, where each record stores a professional's daily availability with attributes such as `professional_id`, `date`, `start_time`, and `end_time` (for example, 10:00 to 17:00). Each service's duration is defined in the `services` table with the attribute `durationMinutes`.

When a user selects a date and a specific service, the system calculates bookable time slots by splitting the professional's available time window into contiguous intervals based on the service's `durationMinutes`. For example, a 90-minute service duration divides the time window into slots like 10:00–11:30, 11:30–13:00, etc.

Once the user books a particular slot (e.g., 12:00–14:00), the `professional_availability` record for that day is updated by splitting the existing availability interval into two new intervals to exclude the booked time slot:

- The original `start_time` and `end_time` (10:00–17:00) are adjusted to two new records with updated `start_time` and `end_time` values — one before the booked slot (10:00–12:00) and one after (14:00–17:00).

Simultaneously, an entry is created in the `bookings` table with attributes such as `booking_id`, `user_id`, `professional_id`, `service_id`, `start_time`, `end_time`, and `status` (set to `"BOOKED"`).

When other users attempt to book a service with the same professional on the same day, the system retrieves the current availability from `professional_availability` and only presents the remaining free slots (excluding those already booked). This ensures that booked intervals do not appear as options, effectively preventing scheduling conflicts.

2. Approaches to scale the system to support thousands of users concurrently:

To scale the system for thousands of concurrent users, the application should be architected using a microservices approach, allowing independent scaling of key components such as booking, user management, and notifications. Containerization with orchestration tools like Kubernetes facilitates automated scaling and resilience. Load balancers distribute incoming traffic evenly across multiple stateless application servers, which store session state externally using caches like Redis to support horizontal scalability. The database layer benefits from read replicas, indexing, query optimization, and sharding to manage growing data volume and avoid bottlenecks. Caching frequently accessed data and serving static assets via CDNs reduce latency and offload backend resources. Real-time updates and conflict prevention leverage distributed locks or atomic transactions to maintain booking integrity under high concurrency. Continuous monitoring and automated infrastructure provisioning ensure the system adapts dynamically to usage patterns, maintaining reliability and performance even at scale.

3. SQL Queries:

Write 2 example SQL queries: one to list upcoming bookings for a user, and another to identify the top 3 most booked professionals.

- List Upcoming bookings for a user:

```
SELECT b.booking_id,
    b.user_id,
    b.professional_id,
    b.service_id,
    b.scheduled_start,
    b.scheduled_end,
    b.status,
    s.name AS service_name,
    p.name AS professional_name
FROM bookings b
    JOIN services s ON b.service_id = s.service_id
    JOIN users p ON b.professional_id = p.user_id
WHERE b.user_id = p_userId
    AND b.scheduled_start > UTC_TIMESTAMP()
    AND b.status IN ('BOOKED', 'RESCHEDULED')
ORDER BY b.scheduled_start ASC;
```

- Identify the top 3 most booked professionals

```
SELECT u.user_id,
    u.name AS professional_name,
    pd.rating,
    pd.profile_bio,
    GROUP_CONCAT(
        DISTINCT s.name
        ORDER BY s.name SEPARATOR ', '
    ) AS services_offered,
    COUNT(b.booking_id) AS total_bookings
FROM users u
    JOIN bookings b ON u.user_id = b.professional_id
    LEFT JOIN professional_reviews r ON b.booking_id = r.booking_id
    LEFT JOIN professional_details pd ON u.user_id = pd.professional_id
    LEFT JOIN professional_services ps ON u.user_id = ps.professional_id
    LEFT JOIN services s ON ps.service_id = s.service_id
WHERE u.role = 'professional'
GROUP BY u.user_id,
    u.name,
    pd.rating,
    pd.profile_bio
ORDER BY total_bookings DESC
LIMIT 3;
```

Challenges faced:

The key challenges in this project revolved around accurate time handling, dynamic slot splitting, and availability checking to prevent scheduling conflicts.

The time zone mismatch—where the application frontend and APIs transmitted times in UTC while the database stored them in IST—had to be resolved by implementing a frontend utility function that consistently converts all UTC times to IST before displaying them to users. This ensured that the backend could operate with standardized UTC timestamps for logic and storage, while the frontend rendered times accurately in the local IST zone, maintaining synchronization and preventing booking confusion.

The issue of splitting professional availability into variable-length booking slots based on service duration had to be addressed by designing a mechanism to dynamically partition each professional's daily availability window (stored in the `professional_availability` table with attributes like `start_time` and `end_time`) into contiguous intervals matching the selected service's `durationMinutes`. When a slot was booked, this availability window was updated by splitting it around the booked interval—creating new availability intervals before and after the booking (for example, splitting 10:00–17:00 into 10:00–12:00 and 14:00–17:00 if 12:00–14:00 was booked)—and updating the records accordingly to reflect accurate current availability.

To prevent overlapping bookings caused by concurrent access, the system relies on querying the `bookings` table to detect any active bookings with statuses `"BOOKED"` or `"RESCHEDULED"` that overlap the requested time slot before confirming a new reservation. By ensuring that only time slots without conflicts are accepted, the system maintains data consistency and helps avoid scheduling clashes.