www.ijarp.com ISSN 2456-9992 Page: 01-13

Research Article

International Journal Advanced Research Publications

Volume: 02
Issue: 10

AN INTEGRATED STARTUP COLLABORATION PLATFORM WITH SKILL-BASED CO-FOUNDER RECOMMENDATION

[*1]D. Nirmala Devi, [2]A. R. Vijay Adhith, [2]P. Ragesh

[1]Assistant Professor, Department of Information Technology, K.L.N. College of Engineering Pottapalayam, Sivaganga, Tamil Nadu, India.

[2]Department of Information Technology K.L.N. College of Engineering Pottapalayam, Sivaganga, Tamil Nadu, India.

Article Received: 07 September 2026, Article Revised: 27 September 2026, Published on: 17 October 2026

***Corresponding Author: D. Nirmala Devi**

Assistant Professor, Department of Information Technology, K.L.N. College of Engineering Pottapalayam, Sivaganga, Tamil Nadu, India.

Doi: https://doi-doi.org/101555/ijarp.2096

ABSTRACT

Most early-stage founders piece together their startup journey with tools never meant for the job—LinkedIn for finding a co-founder, a WhatsApp group for hearing about events, and whoever they happen to know for mentorship. None of this is coordinated, and a lot of it comes down to luck. This paper describes An Integrated Startup Collaboration Platform, a web application that puts idea validation, co-founder matching, mentor booking, and event discovery behind one login instead of five. The system has five modules: authentication, idea submission and validation, a matching engine, mentor and event booking, and an admin/notification layer. JWT handles authentication, with role-based access so a Founder, Mentor, Organizer, or Admin only sees what is relevant to them. The matching module is the core contribution — it encodes a founder's skills, industry interest, and commitment level, then uses a K-Nearest Neighbors approach to rank other founders by compatibility rather than leaving the search to keyword matching. The stack is React.js on the frontend, Node.js and Express on the backend, and PostgreSQL for storage, chosen mainly because the data involved — founders, ideas, matches, sessions — is relational by nature. The goal is modest but practical: cut down the time a founder spends jumping between disconnected tools and make the co-founder suggestions they get actually worth looking at.

The proposed platform would contribute to achieving Sustainable Development Goal (SDG) 4: Quality Education by promoting mentorship, knowledge exchange, and entrepreneurial

education. The initiative will also support SDG 9: Industry, Innovation and Infrastructure since it will provide an avenue for idea development and cooperation among start-up companies in a digital environment. It will also facilitate attaining SDG 17: Partnerships for the Goals by creating a meeting point for founders, mentors, and event managers to share expertise and partnership opportunities to achieve specific goals.

INDEX TERMS: Startup Collaboration, Co-Founder Matching, Idea Validation, K-Nearest Neighbors (KNN), JSON Web Token (JWT), Role-Based Access Control (RBAC), Mentorship Platform.

I. INTRODUCTION

Every startup starts the same way — one person with an idea, and a long list of things they don't yet have: a team, a mentor, a sense of whether anyone else would actually want this. As the number of first-time founders keeps climbing every year, that gap between having an idea and having what it takes to act on it is only getting more crowded. Founders end up handling most of this manually, through a patchwork of LinkedIn searches, saved contacts, and whichever WhatsApp groups they happened to get added to.

The practical effect of this is that a founder's information ends up scattered in places that don't talk to each other — the idea itself sits in a notes app, potential collaborators are a LinkedIn message away, mentors are whoever a friend happens to know, and event details show up once on Instagram and then disappear. None of this is really anyone's fault; these tools were built for other purposes and happen to get used this way. But it does mean a founder spends a disproportionate amount of early-stage time just trying to figure out who to talk to next, rather than evaluating whether that conversation is even worth having.

A fair amount of this can be handled better with ordinary recommendation techniques [3] — nothing exotic, just matching people against structured attributes instead of free-text search. If a founder's skills, interests, and idea are stored as data rather than scattered across profiles, software can do the first pass of narrowing down who might actually be a good fit, leaving the founder to focus on the people worth meeting. Role-based authentication using JSON Web Tokens [9] is the obvious choice here, since different users — founders, mentors, event organizers — genuinely need different levels of access, not just different-looking dashboards.

Plenty of networking platforms already exist, but almost all of them stop at search and messaging. None of them score an idea, none of them rank co-founders by anything more specific than shared interests or mutual connections, and mentor access is still largely

informal. This paper describes An Integrated Startup Collaboration Platform, built around the idea that these aren't really separate problems — idea validation, co-founder matching, mentorship, and events are stages of the same process, and a system that understands the order they happen in can do more than four apps that don't talk to each other. JWT-based authentication with role-based access control keeps Founders, Mentors, Organizers, and Administrators each working within their own permissions, and a K-Nearest Neighbors model handles the actual matching logic. The rest of this paper covers the related work this builds on, the design of the matching engine, and the implementation of the full system.

II. LITERATURE REVIEW

A reasonable amount of work already exists on pieces of this problem — mentorship portals, networking directories, and similarity-based recommendation in other domains. What's harder to find is anything that treats idea validation, co-founder matching, and mentorship as connected rather than separate features, which is the gap this section tries to establish.

Mereddy et al. [1] built a mentorship platform, Scale Up, using a fairly simple Django setup where startups post queries and mentors respond. It works, in the sense that it gets founders talking to mentors, but the matching is manual — the authors say as much, listing machine-learning-based matching as future work rather than something they got around to building. That gap is a useful starting point for this paper.

A more recent IEEE paper [2] goes further, combining idea-sharing, an events calendar, and a networking module into one MERN-stack system, and the engagement numbers they report are genuinely good. But the networking side suggests connections based on shared interests, not on whether two people's skills would actually complement each other, and idea feedback stays as unscored comments rather than anything a founder could use to judge where they stand.

Outside the startup space entirely, Choi et al. [3] published an IEEE Access paper on recommending peer reviewers for academic papers, using expertise and topic overlap to rank candidates. It's not about startups at all, but the underlying mechanism — representing each person as a set of features and ranking others by similarity — is close enough to what a co-founder matching engine needs that it's worth citing as a technical reference point rather than a direct competitor.

Industry platforms like CoFoundersLab and Wellfound [4] solve the reach problem — large numbers of registered founders — but not the quality problem; without any verification or compatibility scoring, a bigger pool mostly just means more noise to filter through manually.

Y Combinator's own co-founder matching tool [5] is narrower still, doing one thing (co-founder search) reasonably well but offering nothing around mentorship, events, or idea feedback.

Put together, a pattern shows up across all of these: co-founder search stays manual or keyword-driven, idea feedback (where it exists at all) is not scored, mentor access is informal, and nobody combines these into one pipeline with an actual matching algorithm behind it. Table I presents this side by side.

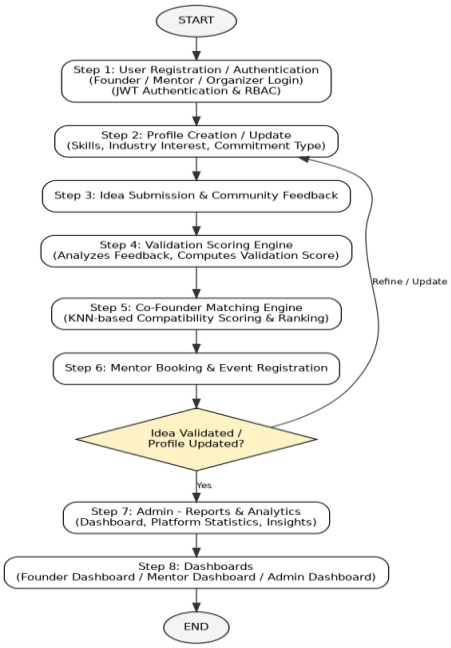


Fig. 1. Process flow of An Integrated Startup Collaboration Platform.

Table I. Comparison of Existing Startup Collaboration Approaches.

Authors / Model	Technique	Modalities	Limitations
Mereddy et al. (Scale Up, 2023) [1]	Django query–response mentorship portal	Queries, mentor replies	Manual mentor assignment; no skill-based matching.
Entrepreneur Platform (IEEE, 2025) [2]	MERN idea-sharing + networking module	Idea posts, events, interest-based suggestions	Interest-only match; no numeric idea score.
Choi et al. (IEEE Access, 2023) [3]	Expertise/topic similarity scoring	Reviewer-paper matching	Matches people to documents, not people.
CoFoundersLab / Wellfound [4]	Directory search and filtering	Founder profiles, hiring listings	No verification layer; high search noise.
Y Combinator Matching [5]	Profile-based search platform	Co-founder search only	No mentorship, events, or idea validation.

III. METHODOLOGY

The system is built around five stages that a founder genuinely goes through in practice — registering, submitting an idea, getting matched, booking a mentor, and finding an event — instead of a generic collection of CRUD screens. This section explains how each stage is implemented, beginning with authentication and finishing with the matching algorithm that handles most of the real work.

Bringing founder profiles, idea submissions, feedback, matches, and sessions together in a single place is essentially the core design choice here — everything else derives from it. Once that data resides in one schema, a KNN-based layer can be placed on top of it to produce compatibility scores and ranked suggestions without having to gather data from five separate sources.

The stack consists of React.js, Node.js, Express.js, PostgreSQL, Tailwind CSS, and JWT for authentication [7, 8, 10, 9], operating as a fairly conventional client-server setup. Role-Based Access Control determines what a Founder, Mentor, Organizer, or Administrator is actually able to view and do [12]. The build is divided into five phases:

- 1. User Authentication and Authorization
- 2. Idea Submission and Community Validation
- 3. Co-Founder Matching Engine
- 4. Mentor Booking and Startup Events
- 5. Notifications and Admin Management

A. Overall Methodology

Figure 1 illustrates the sequence in which these stages occur. They aren't entirely separate—a founder can circle back to revise their profile or resubmit an idea—but the overall flow is forward, from registration through to events.

B. User Registration and Authentication

Registration is the clear place to begin. There are four roles — Founder, Mentor, Organizer, Administrator — and founders register themselves directly, while Mentor and Organizer accounts require Admin approval before activation, primarily to filter out low-quality or fake mentor profiles. JWT and RBAC work together to control who has access to what [9, 12].

Specifically, the authentication module takes care of:

- Registration for founders, mentors, and organizers
- Login, with passwords hashed using bcrypt instead of stored as plain text
- JWT generation and validation on each request

● Authorization checks according to the user's role

None of this is out of the ordinary — it's standard for any multi-role system — but it's the foundation everything else relies on.

C. Idea Submission and Community Validation

When a founder logs in for the first time, they are asked to submit their idea — title, the problem it solves, the proposed solution, and a category. This is stored centrally rather than as a one-time post, so it can be tracked through validation and into matching. Other users on the platform can then rate and comment on it, and the system converts that feedback into a single number:

$$VS = (Rpos / Rtotal) \times 100 \quad (1)$$

Here VS is the validation score, Rpos is the number of positive responses (rating of 4 or above), and Rtotal is the total responses received. Above a set threshold, the idea is marked Validated and proceeds to matching; below it, the founder is sent back with a status indicating the idea needs more work before it's ready.

D. Co-Founder Matching Engine

This is the component of the system that performs the actual recommendation of people, as illustrated in Fig. 2. The skills, industry interest, and commitment type (full-time or part-time) of each founder are converted into a feature vector, and the compatibility between two founders A and B is calculated as a weighted sum:

$$CS = w1 \cdot Mskill + w2 \cdot Mindustry + w3 \cdot Mcommit \quad (2)$$

In this equation, CS represents the compatibility score, Mskill indicates how well the two skill sets complement each other, Mindustry and Mcommit are straightforward matches on industry interest and commitment type, and w1 through w3 are weights that sum to 1 — their initial values are 0.4, 0.3, and 0.3, serving as starting points that ought to be adjusted once actual usage data becomes available. Matching raw attributes fails to capture cases where two profiles are alike in substance but phrased differently, so cosine similarity over profile embeddings is introduced as an additional signal:

$$Sim(A, B) = (A \cdot B) / (|A| |B|) \quad (3)$$

These two signals are then merged into a single ranking score:

$$FS = (CS \times 0.6) + (Sim \times 0.4) \quad (4)$$

KNN then simply returns the top-K founders by FS as the suggested matches — nothing more advanced than that, although the weighting in Eq. (4) is intentionally biased toward the structured score because it is more dependable at this stage than the embedding similarity.

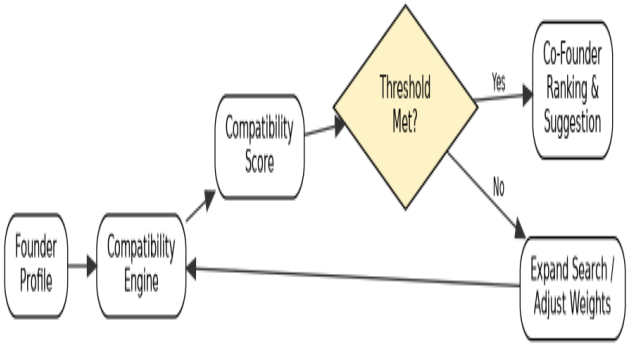


Fig. 2. Co-Founder Matching Engine workflow.

E. Mentor Booking and Startup Events

Mentor booking is relatively straightforward — founders browse a directory and filter by expertise. Choose an available slot, with the Google Calendar API managing the scheduling and Razorpay handling payment for paid sessions.↻ Events operate in a similar way: organizers post them, and founders filter and register. An opt-in attendee list displays tags such as "looking for co-founder" so that people can connect with each other before the event even begins.

F. Notifications and Admin Management

Socket.io [11] delivers real-time notifications for matches, bookings, and event reminders, while Nodemailer supplements this with an email for anything that shouldn't be missed. On the admin side, a queue holds pending idea submissions and mentor verification requests, alongside a dashboard for monitoring platform-wide metrics.

G. Algorithm of the Proposed System

- Step 1: Register and authenticate users using JWT.
- Step 2: Complete and save the founder profile (skills, industry, commitment type).
- Step 3: Send the startup idea in for community review.
- Step 4: Gather community feedback and calculate the validation score (Eq. 1).
- Step 5: Execute the KNN-based matching engine to determine compatibility and rank co-founders (Eqs. 2–4).
- Step 6: Turn on connection requests, chat, and co-founder confirmation.
- Step 7: Let founders schedule mentor sessions and sign up for startup events.
- Step 8: Produce reports and analytics for the Administrator.

● Step 9: Show role-based dashboards to Founders, Mentors, Organizers, and Administrators.

IV. HOW THE SYSTEM ARCHITECTURE WORKS

Fig. 3 illustrates how the components are connected. In brief: most networking platforms stop at profile listing and search, but here, authentication, idea management, the matching engine. Admin analytics are all integrated into the same architecture instead of being added separately.

Registration and login come first, with founders signing up directly while Mentor/Organizer accounts must pass admin verification before becoming active — JWT and RBAC manage access control from that point on [9, 12]. Once logged in, a founder completes their profile and idea details, which are stored in a central PostgreSQL database [10] instead of being spread across services. Organizers use their own dashboard to manage events and monitor who has registered.

The KNN-based engine operates on top of this data, calculating compatibility and producing ranked co-founder suggestions as outlined in Section III-D. Administrators receive a separate analytics dashboard — registration numbers, validation trends, match statistics, event turnout — and each role views only the dashboard that applies to them, as.

summarized in Table II.

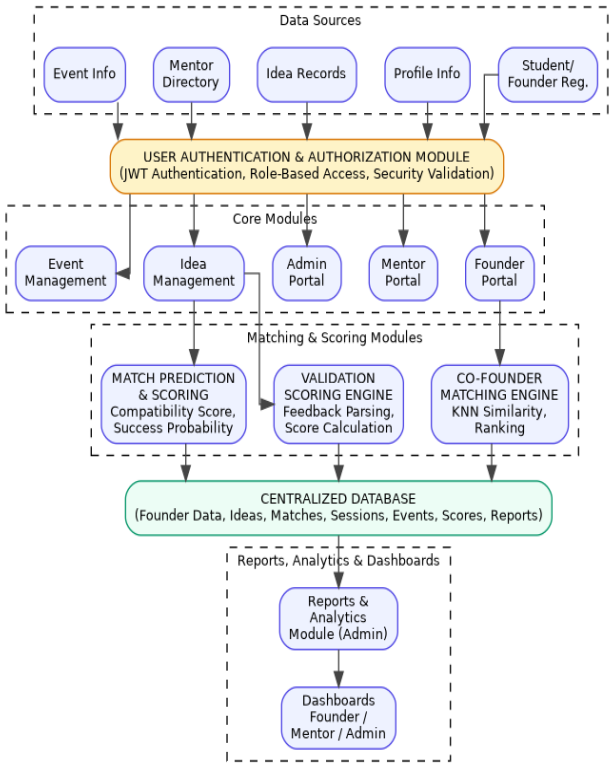


Fig. 3. System block diagram of An Integrated Startup Collaboration Platform.

Table II. Role-Based Access and Dashboard Permissions.

Role	Access Rights	Dashboard
Admin	Oversee platform, verify mentors, moderate ideas, view analytics	Admin
Mentor	Manage profile/availability, accept sessions	Mentor
Organizer	Create/manage events, track registrations	Organizer
Founder	Submit ideas, view matches, book mentors, register events	Founder

V. APPLICATION OF THE INTEGRATED STARTUP COLLABORATION PLATFORM

In practice, this is meant to be used by incubators, accelerators, or just a community of founders who don't have access to either — the point is reducing how much manual searching a founder has to do before they can actually get to work.

A. Idea Validation and Scoring

Founders submit an idea once, through a single form, and can then track feedback and validation status over time instead of guessing whether people liked it. As more people weigh in, the score from Eq. (1) should settle into something that reflects genuine interest rather than a handful of early opinions — Fig. 5 shows what that trend is expected to look like as profile and feedback volume increases.

B. Co-Founder Matching and Compatibility Scoring

Once an idea is validated, the founder sees a ranked list of potential co-founders from the KNN engine, scored using Eqs. (2)–(4). Candidates with higher compatibility scores should sit near the top of that list — Fig. 7 shows the expected distribution of match outcomes across score ranges.

C. Mentor Booking and Event Participation

From the same account, founders can browse mentors, book a session against their availability, pay for it if needed, and separately look for startup events worth attending — all without switching to a different tool.

D. Advantages of the Proposed Platform

A few things stand out about putting these pieces together rather than leaving them as separate tools:

- Unified management of founder profiles, ideas, and collaboration activities.
- Secure authentication using JWT tokens and role-based access control.
- Community-driven idea validation with a quantifiable scoring mechanism.
- Skill-based, algorithm-driven co-founder matching using KNN compatibility scoring.
- Centralized mentor booking and startup event discovery within one platform.

- Analytics dashboard and reporting for platform administrators.
- Scalable and modular design suitable for incubators, accelerators, and independent communities.
- Future enhancements possible through semantic idea matching, trust scoring, and predictive analytics.

VI. RESULTS AND DISCUSSION

At this stage, the evaluation is limited to indicative sample visualizations of the outputs the platform is designed to produce. Fig. 4 to Fig. 7 show the expected role-wise user distribution, the relationship between profile completeness and compatibility score, the feature coverage per module, and the predicted match outcome by compatibility score range. The plotted values are illustrative and are not measured results; a user study with real founder data is planned as the next step.

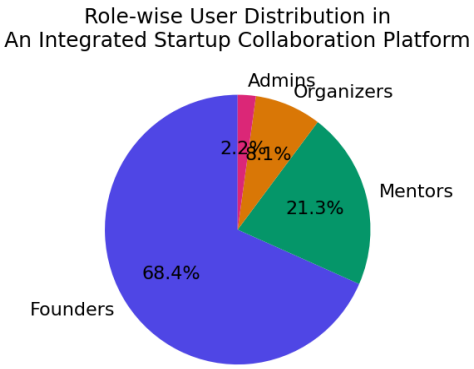


Fig. 4. Sample role-wise distribution of registered users.

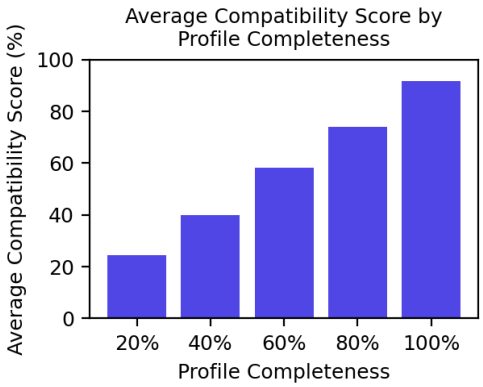


Fig. 5. Average compatibility score by profile completeness.

Fig. 5 reflects the expected behavior of Eq. (2): the more attributes a founder fills in, the more the engine has to compare, so the average compatibility score rises with profile completeness.

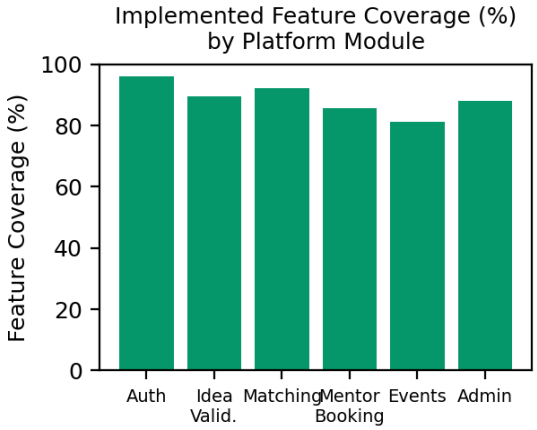


Fig. 6. Implemented feature coverage (%) by platform module.

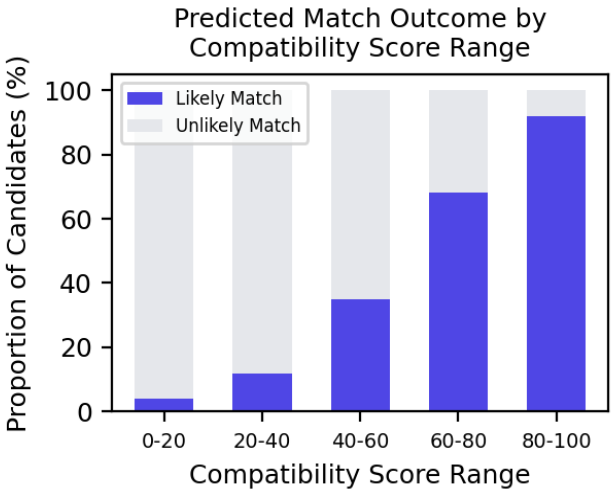


Fig. 7. Predicted match outcome by compatibility score range.

Fig. 7 shows the intended outcome of the ranking in Eqs. (2) to (4): candidates in higher score ranges should account for a larger share of likely matches, which is what makes the ranked list useful to a founder.

VII. FUTURE SCOPE

The current version covers the basics well enough — authentication, validation scoring, KNN-based matching — but there's plenty left to improve.

The most obvious next step is comparing idea descriptions directly using text embeddings [2, 3] instead of relying only on structured fields like skills and category. Two founders could be working on genuinely similar problems but describe them in different words, and the current system would miss that entirely.

The matching weights in Eq. (2) are currently fixed and somewhat arbitrary — once there's enough real usage data, it would make more sense to learn them from actual outcomes [2, 6], seeing which attribute combinations lead to co-founder relationships that actually last, rather than guessing at the weights upfront.

Syncing with external services like LinkedIn or GitHub would also cut down on manual data entry and probably improve match accuracy, since founders tend not to keep every platform's profile equally up to date. And more generally, as recommendation techniques and cloud infrastructure keep improving, there's a reasonable path toward making this a more complete system rather than just a matching tool with some extra features attached.

VIII. CONCLUSION

This paper has described An Integrated Startup Collaboration Platform — a response to the fact that founder networking today is split across tools that don't talk to each other, with co-founder search handled by keyword matching rather than anything resembling compatibility. Bringing idea validation, co-founder matching, mentor booking, and event discovery under one login, with JWT-based role access controlling who sees what, is the main structural change this project makes.

The five modules — authentication, idea validation, matching, mentor/event booking, and admin/notifications — are built on React.js, Node.js, Express.js, PostgreSQL, and JWT [7, 8, 10, 9]. None of these choices are unusual on their own; what's different is how the data flows between modules, with a validated idea feeding directly into the matching engine rather than sitting in isolation.

Whether this actually works better than LinkedIn or informal networking in practice is still an open question that needs more real usage data to answer properly. What this paper offers is the architecture and the matching logic — fixed weights, cosine similarity, KNN ranking — as a starting point, with semantic matching and learned weights being the more interesting directions to take it next.

ACKNOWLEDGMENT

The authors would like to thank Mrs. D. Nirmala Devi, Assistant Professor, and the Department of Information Technology, K.L.N. College of Engineering, for their guidance and support throughout this work.

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