

VAL_02 Creation of a network of multimodal hubs

Description of the measure and main outcomes expected

This measure aims to establish a network of multimodal hubs in Blasco Ibáñez avenue, one of the main arteries of the city. The goal is to facilitate the seamless and efficient transitions between different transport modes in the hubs created both, along the avenue and in the main connection points to the same.

This effort is part of the broader Blasco Ibáñez redesign project, aimed at enhancing sustainable mobility along this route. The initiative includes an evaluation of the corridor's current transportation services, identifying needs and barriers to encourage modal shift. Building on the gathered insights, the hubs' transportation services will be enhanced, focusing on improving intermodal connections. Particularly, the measure includes the installation of real-time multimodal information panels, ensuring travellers have up-to-date information on available transportation options at each hub.

VAL_02 will deliver a network of multimodal hubs in Blasco Ibañez Avenue. The actuation over each hub includes:

- Improvement of the PT frequency.

- Better connection between PT modes, including the redistribution of the location of the PT stops.

- The deployment of multimodal panels with real-time information on the sustainable and PT mobility offer in the hub, including maps clearly and easily showing the situation of every mobility service.

Preparation of the measure

Blasco Ibáñez avenue is one of the main backbones of the city, connecting the maritime area with the city centre. This is why this axis has been chosen for the implementation of this measure, aimed at creating a network of multimodal hubs to promote the change to more sustainable forms of mobility, both in terms of public transport and active mobility.

When talking about the establishment of a network of multimodal hubs, it's important to understand that a mobility hub transcends mere transit stations. These hubs encompass major transport nodes and their surrounding areas, playing a vital role in the regional transport system as starting points, destinations, or transfer points for a substantial portion of journeys. They serve as pivotal points of connectivity, seamlessly integrating various modes of transportation—from walking and cycling to public transit—while also serving as hubs for communities where people live, work, shop, and engage in recreational activities.

To establish this network of multimodal hubs, three critical factors have been considered:

- Infrastructure: This involves strategically reallocating stops for various modes of transport and ensuring close proximity between them to facilitate rapid mode switching.

- Frequency: Emphasis is placed on ensuring frequent services to promote seamless and efficient intermodality.

- Information provision: Access to real-time and consolidated data on sustainable transport options is crucial for guiding user decisions.

Study of the mobility offer in the implementation area

A study of the service offer in Blasco Ibáñez was carried out to prepare the "Blasco Ibáñez Master Plan" and the "actions to be implemented in Blasco Ibáñez based on the master plan". The objective was to evaluate the current PT offer in the actuation area and to identify gaps and opportunities to improve the service.

The study focused on the merging of bus lanes 31 and 81, since both share a large part of their route, running jointly along the entire Blasco Ibáñez Avenue and the entrance to Ciutat Vella.

Definition of actuation plan to improve connection among PT modes in the hub

As a result of the study of service in Blasco Ibáñez avenue, an actuation plan to improve service offer was established. The actuation plan refers to two relevant aspects:

- The redistribution of the location of the stops for the bus. This study is linked to the construction project being tendered in measure VAL_01. Therefore, the redistribution of PT stops can only be determined once the tender is closed and awarded (end of 2024).
- Regarding the improvement of the PT offer in Blasco Ibáñez, a Master Plan was defined. Line 81 would be converted into an express line from its current origin at the Renfe Cercanías station in Cabanyal or from a new terminus next to the Malvarrosa Hospital, running along Blasco Ibáñez to join Puerta de la Mar through Puente del Real, running along Calle Colón and returning through the centre, crossing Puente de la Exposición, to Blasco Ibáñez again. This line would have different services assigned to it, stopping at half or even a third of the stops it currently makes (those with the highest demand). In order to take advantage of the possibilities of the bus lines and their exploitation as an express line, it is necessary that Blasco Ibáñez Avenue have priority at traffic lights for buses and the section of the street will have to be reformed so that the new express line could improve its commercial speed (VAL_01 and VAL_04).

Selection of locations for the multimodal panels with real-time information form PT services

An analysis of optimal locations for deploying multimodal panels has been conducted jointly by EMT and ETRA. The study focused on identifying areas where centralizing real-time information on diverse and sustainable public transport options was crucial. Criteria considered included:

Public Transport Offer: The panels are essential in areas with extensive and diverse public transport network, where centralized, real-time information is crucial for users seeking sustainable transport options.

High Demand Zones: Emphasis was placed on locations with significant passenger traffic, such as near universities, hospitals, football stadiums, and train stations.

The selected deployment sites are illustrated in Fig 27 and detailed below:

Puerta del Mar: This area concentrates 10 bus stops (2255, 2256, 2257, 2253, 2252, 2251, 2250, 2258, 1263, 2281), 2 bike-sharing stations (028, 013), 2 metro station (Colón and Alameda).

Facultats: This area concentrates 5 bus stops (165, 160, 1382, 166, 158), 4 interurban bus stops (5102010106, 5107510108, 5102020204, 5104010119), 4 bike-sharing stations (87, 88, 89, 90), 1 metro station (Facultats).

Plaza Cardenal Vicente Enrique y Tarancón: This area concentrates 7 bus stops (155, 168, 169, 154, 157, 2213, 1057), 7 interurban bus stops (5904210202, 19000010102, 19000010202, 5904210111, 5256150204, 5256100110, 92633201207), 1 bike-sharing stations (092), 1 metro station (Aragón).

Cabanyal station: This area concentrates 5 bus stops (1210, 1409, 1755, 1211, 1768), 1 bike-sharing station (100), 1 metro and tram station (Marítim), 1 train station (Estació del Cabanyal).

Xàtiva station (alternatively to Cabanyal station): This area concentrates 6 bus stops (1858, 2261, 2277, 2278, 2309, 2330), 2 bike-sharing stations (017, 148), 3 metro stations (Xàtiva, Bailén and Plaza España), 1 tram station (Alacant), 1 train station (Estació del Nord).

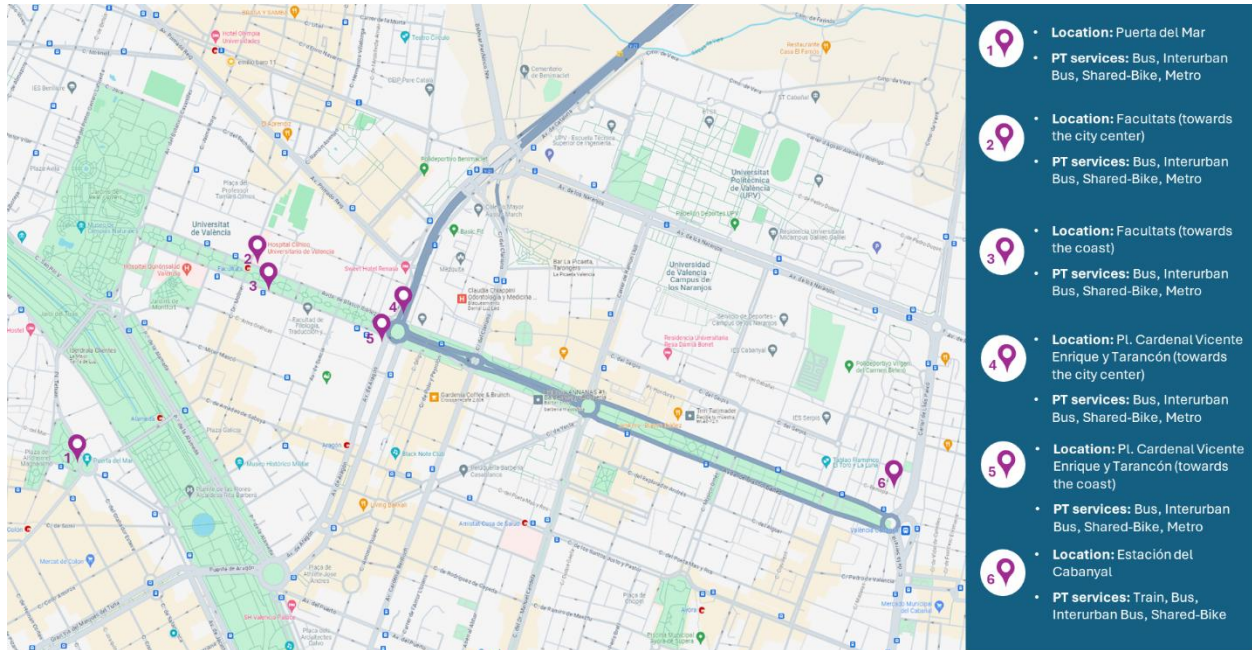


Fig 27. Location of the multimodal panels for VAL_02

Developments around the multimodal panels:

Definition of data and infrastructure requirements for multimodal panels deployment:

After some bilateral discussions between ETRA (which integrates the TFT in the post, develops the digital display interface and integrates the multimodal information), PRIMUR (which supplies the post where the TFT will be integrated) and EMT (the PTO), a list of technical requirements was defined and is presented in Table 3.

Table 3. Multimodal panels deployment (Table of requirements)

| ID | Technical Requirements | Category |
|------------|---|----------------|
| VAL02_TR01 | The information panels must show multimodal information | Data |
| VAL02_TR02 | The information panels should display up-to-date location of the nearest multimodal stations / stops over a map | Data |
| VAL02_TR03 | The system must be protected against water and dust from the outside | Infrastructure |
| VAL02_TR04 | The system should be equipped with a high-resolution colour screen with sufficient luminance and view angle to ensure readability in outdoor environments with acceptable quality | Usability |
| VAL02_TR05 | Internet connectivity for regular updates of the displayed information to ensure accuracy | Performance |
| VAL02_TR06 | Enable remote management capabilities for software updates and troubleshooting | Performance |

| | | |
|------------|--|------------------------|
| VAL02_TR07 | Display several visualizations on the screen without requiring user interaction, ensuring each visualization remains visible long enough for users to comfortably read the information | Usability |
| VAL02_TR08 | The panels should display real-time information about the different transport modalities | Data |
| VAL02_TR09 | The system should be connected to a stable power supply to ensure continuous operation | Performance |
| VAL02_TR10 | The system components should withstand wind loads, vibrations, and other environmental factors, such as extreme temperatures | Performance |
| VAL02_TR11 | Coordinate with transportation agencies, and other stakeholders to ensure the panel meets the needs of all parties involved. | Stakeholder Engagement |
| VAL02_TR12 | The size of the digital display is conditioned by the dimensions of the post provided by PRIMUR. | Infrastructure |

The multimodal panels should integrate real-time information from the public and shared transport services operating in the area of influence of the post. In this regard, the information displayed in the panel will include:

EMT (bus) updated info per line on: Arrival of the incoming bus; Arrival of next bus; Disruptions/ Alerts.

Valenbisi (shared bike) updated info about the nearest stations: Name (and number) of the stations; Available bikes; Distance walking to the station (in meters).

ATMV (interurban bus) updated info per line on: Arrival of the incoming bus; Arrival of next bus; Disruptions/ Alerts.

Metrovalencia (metro and tram) updated info per line on: Arrival of the incoming metro and/or tram; Arrival of next metro and/or tram; Disruptions/ Alerts.

FGV (train) updated info per line on: Departure of the next trains; Disruptions/ Alerts.

Furthermore, a live map will be able to show: Bus, interurban bus, tram and metro locations; Location of the panel; Bus, interurban bus, metro and tram routes and stops; Location of the nearest Valenbisi stations with number of available bikes.

Infrastructure design (Hardware)

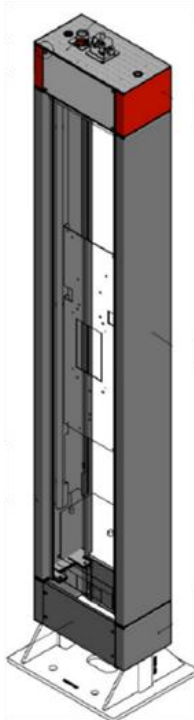


Fig 28. Multimodal information post.

EMT is currently undertaking a total renovation of its bus stops, which includes both bus shelters and posts. PRIMUR, the contracted company, is responsible for supplying the new bus shelters and posts.

The bus stop post has been designed as a backlit monolith with a rectangular section, featuring transparent glass displays that can be opened on two sides to access and update information inside. Due to its capability to accommodate digital screens, it was agreed with EMT to adopt this model of post as the structure for the multimodal information posts (Fig 28). In this case, instead of acting as a bus stop post, it will function as a multimodal information post.

The main areas for action regarding the hardware design of the post include:

Integration of a TFT display equipped with the following features:

Size: 15,6"

Resolution: Full HD

Luminance: 1800 cd/m²

Integration of a Raspberry equipped with the following features:

Model: Raspberry Pi 4

RAM: 2 GB

USB Ports: x2 (USB 3.0), x2 (USB 2.0)

Modem 4G

Replacement of the current EMT vinyl at the top of the pole. This area will now display logos representing various modes of transportation (bus, metro, train, bike, etc.) whose information will be showcased on the digital screens.

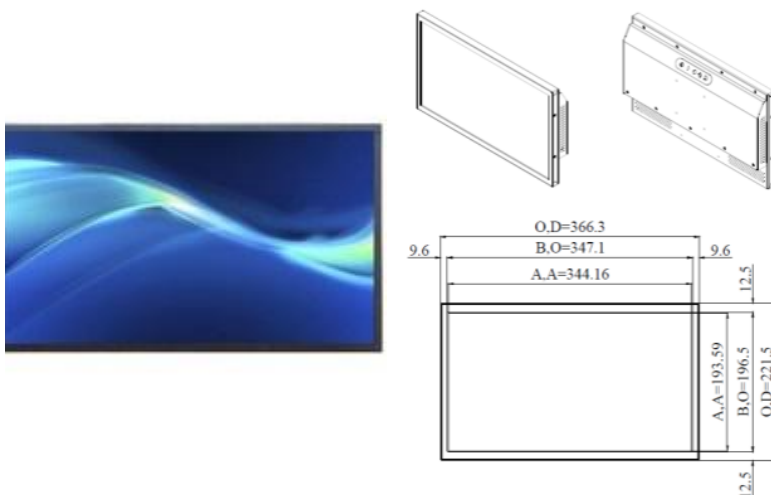


Fig 29. Screen selected to display multimodal information



Fig 30. Raspberry PI model 4 selected to process the multimodal panel information

Agreement with mobility service providers for provision of real-time information

One of the core steps related to the development of the multimodal panels was related to the access to real-time data of the different public and shared transport services offered in the actuation area. ETRA establish contact with different mobility service providers (EMT, ATMV, FGV, Renfe...) in order to identify data sources and establish the basis for the data sharing.

Regarding the integration of static information, data from the following transport operators has been properly integrated: EMT (bus), ATMV (interurban bus), FGV (metro/tram), Renfe (train), Valenbisi



(shared bike). Regarding dynamic information, data from the following transport operators has been properly integrated so far: EMT (bus), Valenbisi (shared bike). Train departures will be obtained from the static GTFS. With respect to interurban buses (ATMV) the real-time information (GTFS-RT) will be integrated once it is available (potentially during 2025). For metro/tram information (FGV) the dynamic information is expected to be retrieved from a webservice (discussion ongoing). However, once the GTFS-RT is available (potentially during 2025), it will be integrated into the panels. Here below the details of the data integration.

Table 4. Data availability from Valencia PTOs

| |
|--|
| Company Name: EMT Type of vehicle: Bus |
| Static info: GTFS GTFS or API URL: https://www.transit.land/feeds/f-ezp8-emptvalencia https://opendata.vlci.valencia.es/dataset/ab058cf8-ad3e-4d9c-ac89-0c6367ecf351/resource/c81b69e6-c082-44dc-acc6-66fc417b4e66/download/google_transit.zip Authentication needed: NO Type of authentication (if so): - Credentials (if so): - |
| Dynamic info: Private access to an API service with estimated arrival times (not standardized yet) API URL: https://apipe.emtvalencia.es/transportes/v1/sae/estimacion Update window time: (in seconds or minutes): 1 second Data format received: (JSON, GeoJSON, ...): GeoJSON |

Data schema (example):

```

{
  "data": [
    {
      "disponible": true,
      "bus": {
        "adaptado": false,
        "numBus": 2202,
        "retraso": 0,
        "distancia": 724
      },
      "desviado": false,
      "itinerario": {
        "codigo": "2",
        "destino": "Cntr.Històric",
        "nombre": "Est.del Nord - Blanqueria",
        "ruta": {
          "codigo": "C1",
          "nombre": "CENTRE HISTÒRIC"
        },
        "nombreCorto": "C1"
      },
      "programado": false,
      "tiempos": {
        "minutos": 3.85836155590587,
        "segundos": 231,
        "fecha": "2024-05-17T12:03:20",
        "salidaViaje": "2024-05-17T11:49:00"
      }
    },
    {
      "disponible": false,
      "bus": null,
      "desviado": false,
      "itinerario": {
        "codigo": "3",
        "destino": "Natzaret",
        "nombre": "Porta de la Mar - Natzaret",
        "ruta": {
          "codigo": "4",
          "nombre": "NATZARET - PL. AJUNTAMENT"
        },
        "nombreCorto": "4"
      },
      "programado": true,
      "tiempos": {
        "minutos": 0,
        "segundos": 0,
        "fecha": "0001-01-01T00:00:00",
        "salidaViaje": "0001-01-01T00:00:00"
      }
    }
  ]
}

```

Company Name: **ATMV (PTA)**
 Type of vehicle: **Peri urban bus**

Static info: **GTFS**
 GTFS or API URL: <https://nap.transportes.gob.es/Files/Detail/1325>
 Authentication needed: **YES**
 Type of authentication (if so): - user/password (registration needed in the *mitma* webpage)
 Credentials (if so): -

Dynamic info: **Not yet available. GTFS-RT potentially available during 2025.**
 API URL: -
 Update window time: (in seconds or minutes): -
 Data format received: (JSON, GeoJSON, ...): -
 Data schema (example): -

Company Name: **FGV**
 Type of vehicle: **Metro / Tram**

Static info: **GTFS**
 GTFS or API URL: <https://nap.transportes.gob.es/Files/Detail/967>
<https://transitfeeds.com/p/ferrocarriles-de-la-generalidad-valenciana/1039>
 Authentication needed: **YES**
 Type of authentication (if so): - user/password (registration needed in the *mitma* webpage)
 Credentials (if so): -

| |
|--|
| <p>Dynamic info: Webservice (discussion ongoing). Once GTFS-RT is available (potentially during 2025), it will be integrated. API URL: - Update window time: (in seconds or minutes): - Data format received: (JSON, GeoJSON, ...): - Data schema (example): -</p> |
| <p>Company Name: RENFE Cercanías Type of vehicle: Train</p> |
| <p>Static info: GTFS GTFS or API URL: https://nap.transportes.gob.es/Files/Detail/929 Authentication needed: YES Type of authentication (if so): - user/password (registration needed in the <i>mitma</i> webpage) Credentials (if so): -</p> |
| <p>Company Name: Valenbisi Type of vehicle: Bike Sharing</p> |
| <p>Static info: Lat-long & capacity of stations and total number of bikes GBFS or API URL: https://api.citybik.es/v2/networks/valenbisi https://valencia.opendatasoft.com/explore/embed/dataset/valenbisi-disponibilitat-valenbisi-dsponibilidad/table/ Authentication needed: NO Type of authentication (if so): - Credentials (if so): -</p> |
| <p>Dynamic info: Availability and status of bikes API URL: https://api.citybik.es/v2/networks/valenbisi https://valencia.opendatasoft.com/explore/embed/dataset/valenbisi-disponibilitat-valenbisi-dsponibilidad/table/ Update window time: (in seconds or minutes): 8-15 minutes Data format received: (JSON, GeoJSON, ...): GeoJSON Data schema:</p> <pre> interface License { name: string; url: string; } interface Location { city: string; country: string; latitude: number; longitude: number; } interface Extra { address: string; banking: boolean; bonus: boolean; has_ebikes: boolean; last_update: string; // Should be a valid date-time string slots: number; status: string; uid: number; } interface Station { empty_slots: number; extra: Extra; free_bikes: number; id: string; latitude: number; longitude: number; name: string; timestamp: string; // Should be a valid date-time string } interface JsonResponse { company: string[]; href: string; id: string; license: License; location: Location; name: string; source: string; stations: Station[]; } </pre> |


Interface design

Following the requirements initially identified, ETRA proceeded with the design of the digital display interface. The integration of the real-time information has been organized in two main screens: One including the list of the available public and shared transport services and real-time information from them (route, ID, time...); and a second screen displaying the live map showing the routes, stops and vehicles positioning (Fig 31).

Arrivals / Plaza Cardenal Vicente... 12:53 32° ☀

| Service | Arrival | Next |
|-------------------------------------|---------|--------|
| EMT 12 C.Art.Faller | 3 min | 26 min |
| EMT C3 La Fe | 4 min | 12 min |
| EMT 71 la Llum | 4 min | 21 min |
| EMT 71 Universitats | 4 min | 22 min |
| EMT C3 C. Benlloch | 4 min | 13 min |
| EMT C2 Est. Autobusos | 5 min | 19 min |
| EMT 71 Universitats | 5 min | 23 min |

84 meters

9 

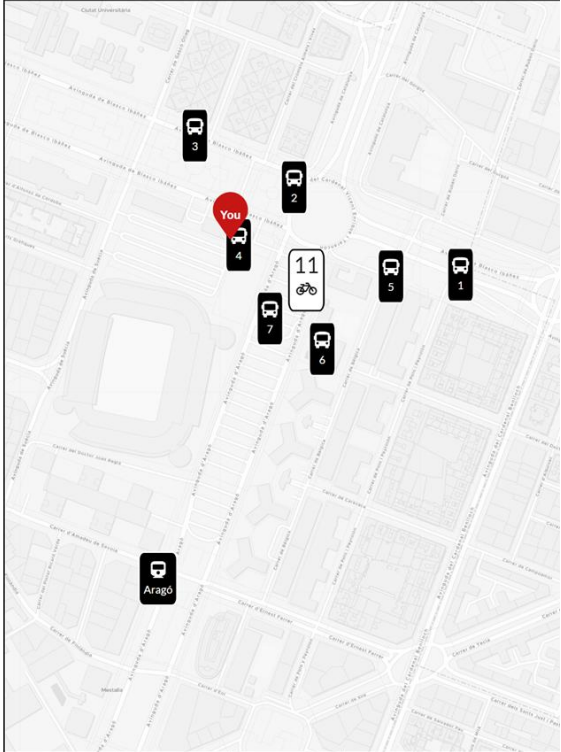
AVAILABLE

Blasco Ibañez - Aragón

Valenbisi 92

| | | | | |
|------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Fri 9 ☀ 32°/24° | Sat 10 ☀ 31°/24° | Sun 11 ☀ 31°/24° | Mon 12 ☀ 30°/25° | Tue 13 ☁ 29°/25° |
|------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|

AJUNTAMENT DE VALÈNCIA 12:48 32° ☀








| | | | | |
|---|---|---|---|---|
|  3 Lines: 10, 12 |  4 Lines: 71, 81, 31, 30 |  5 Lines: 71, 81, 31, 30 |  6 Lines: 93, 12, 10 |  7 Lines: 93, 10, 12 |
|---|---|---|---|---|

Fig 31. Preliminary interface design of the digital panels

Challenges & Mitigations

The main challenges faced during the preparation of this measure relates to the access to real-time information. Currently, EMT systems do not offer GTFS-RT, but instead publish a private API with estimated time of arrival at stops. This service is updated every second and provides not only the estimated time of arrival at a desired stop and bus line, but also the delay and distance to the stop, among other attributes. For the purpose of the measure, the use of this service is sufficient to meet the objectives of receiving real-time information, such as estimates. The same applies to the metro/tram (FGV). GTFS-RT is not yet available, but estimated times can be provided directly by FGV. For these two cases, and also for the interurban bus (ATMV), it is within their plans to have GTFS-RT data during 2025 (some tenders need to be prepared). Once the GTFS-RT is available for any of these operators, it will be integrated into the panel.

The second challenge affects not the preparation of the measure, but its deployment and implementation. Some multimodal panels will be deployed along Blasco Ibañez Avenue. However, this avenue is scheduled for reconstruction throughout the upcoming year (beginning in January 2025 and concluding in December 2025). These construction activities will impact the deployment schedule for some multimodal panels.



To address this challenge, the deployment of the multimodal panels will be phased. Initially, panels will be deployed at Puerta del Mar and Xàtiva to start monitoring their performance and impact. Subsequent deployments will align with the progress of the construction works, ensuring a coordinated rollout.

Next steps towards implementation

By the submission of this report, the design of the multimodal panel is already defined (in terms of both, software and hardware). The next steps to be undertaken include: (1) Purchase of the remaining digital displays and their integration into the posts and; (2) Request of permits to the Municipality to deploy the multimodal panels in the selected locations.