Uniwersytet Wrocławski

Rafał Lewandków

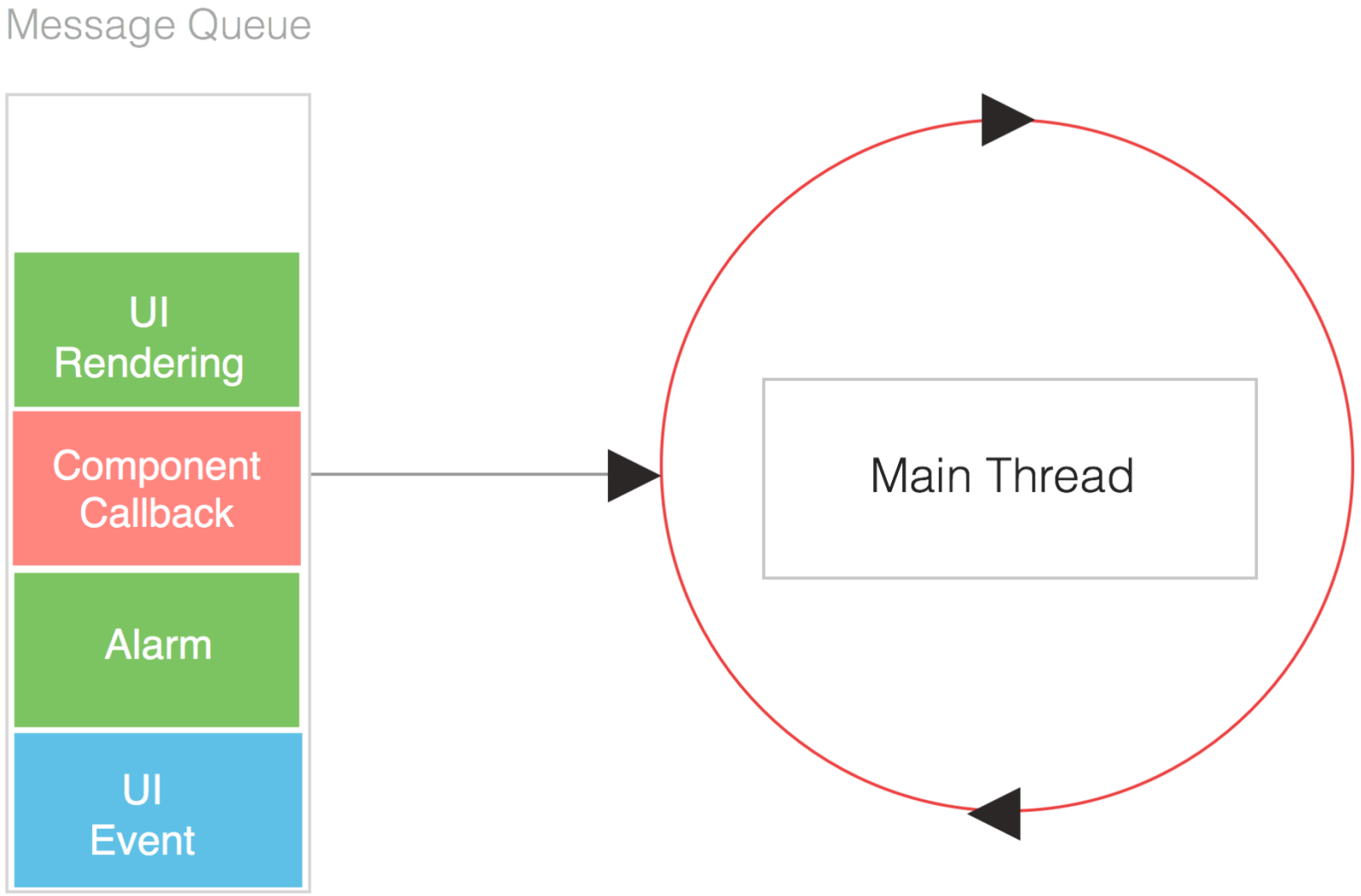
PROGRAMOWANIE URZĄDZEŃ MOBILNYCH

WYKŁAD 9

Strumienie danych

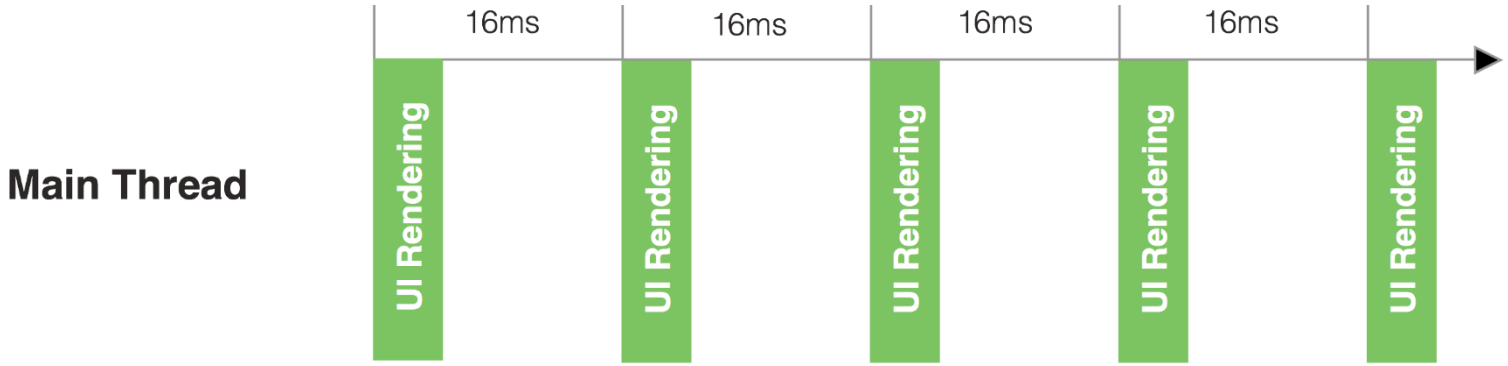
- Asynchroniczne przetwarzanie danych
- Flow
- StateFlow
- SharedFlow

Wątek główny



https://hvasconcelos.github.io/articles/Offloading-work-from-the-UI-Thread

Wątek główny



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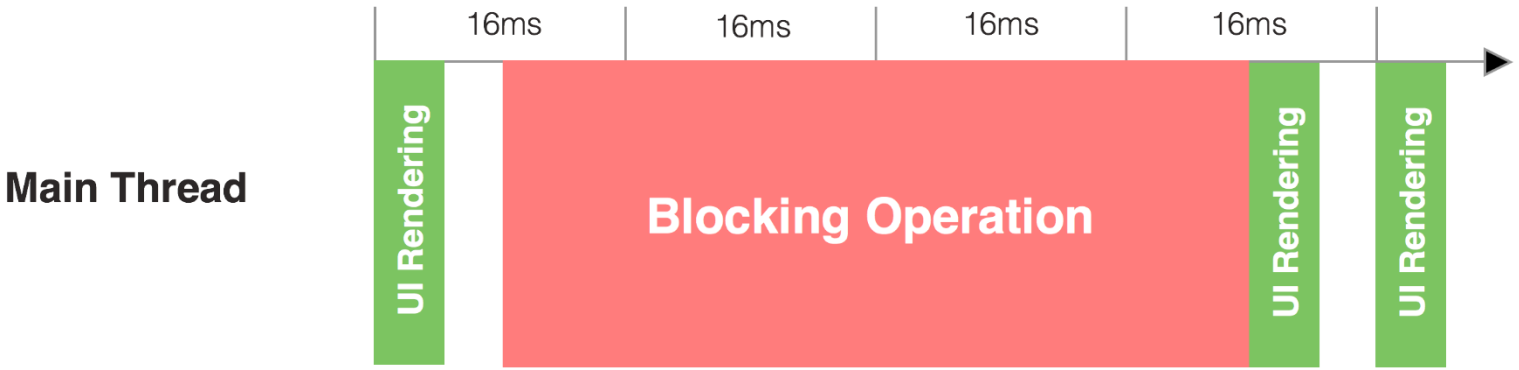

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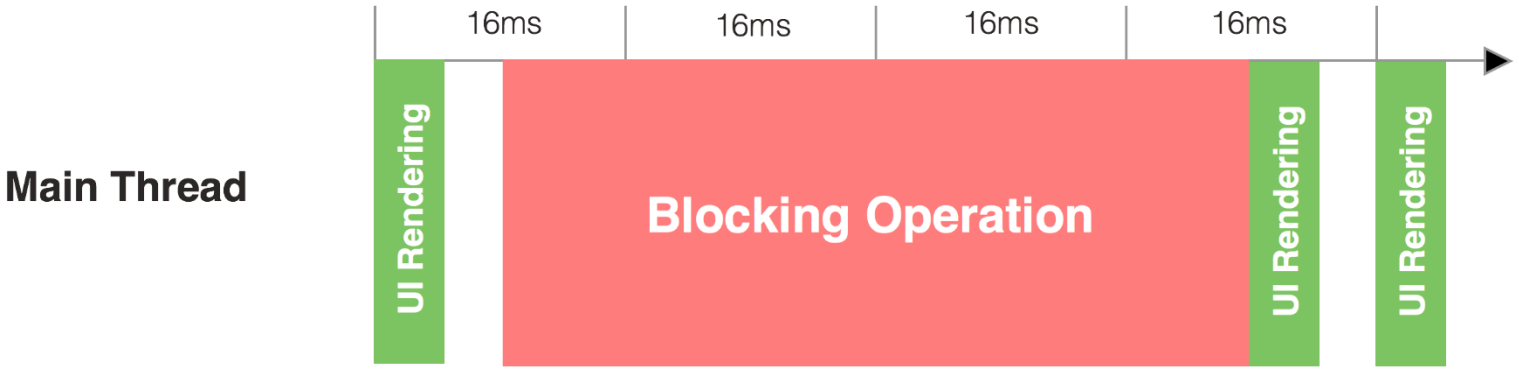

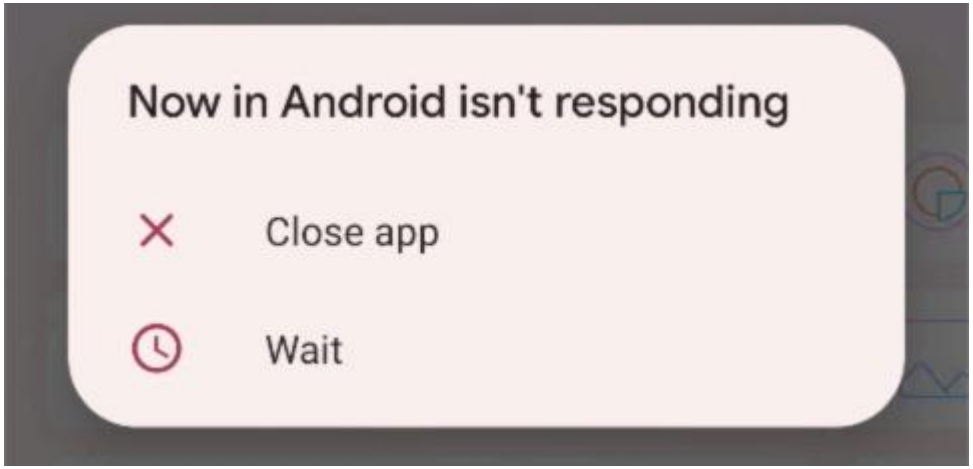

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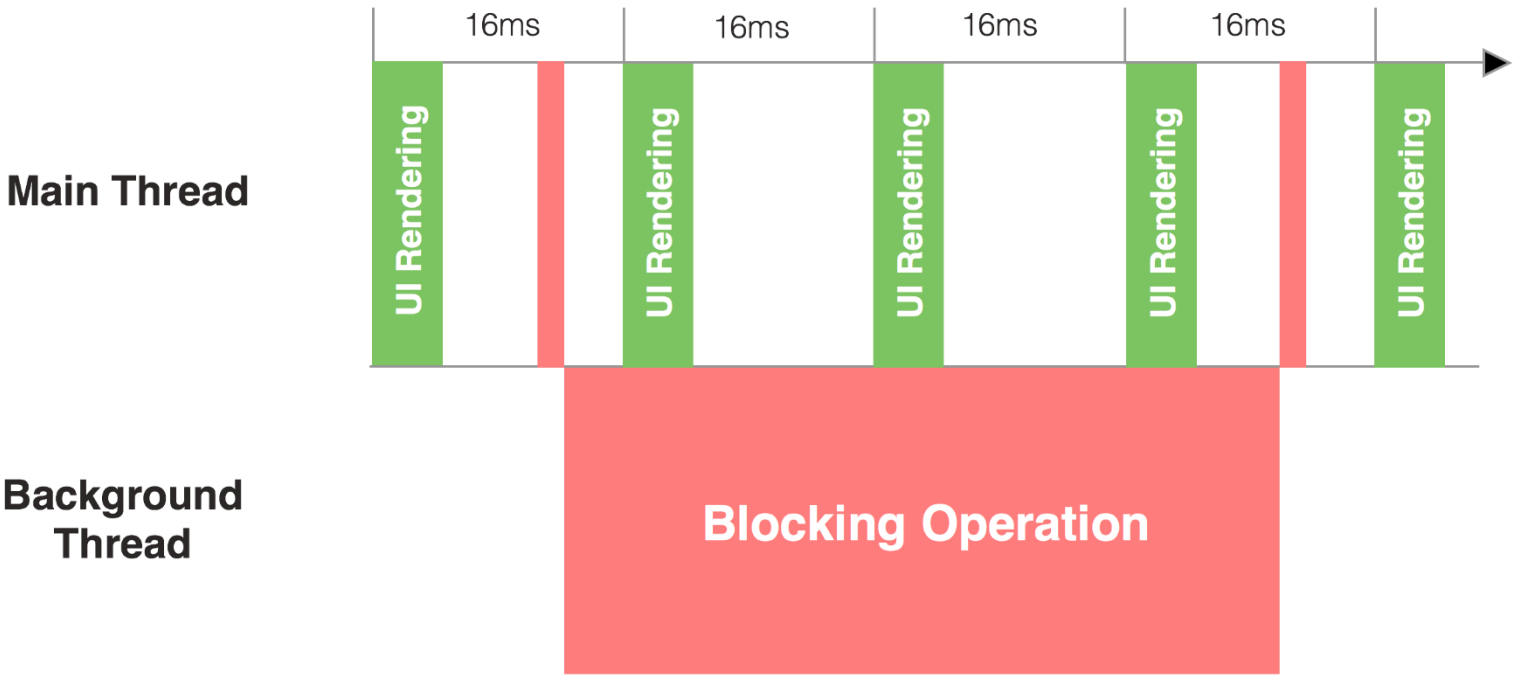
Wątek główny



https://hvasconcelos.github.io/articles/Offloading-work-from-the-UI-Thread

Wątek główny

- **Network calls**
- **Database queries**
- **Długie obliczenia**
- **Taski działające w tle**

https://hvasconcelos.github.io/articles/Offloading-work-from-the-UI-Thread

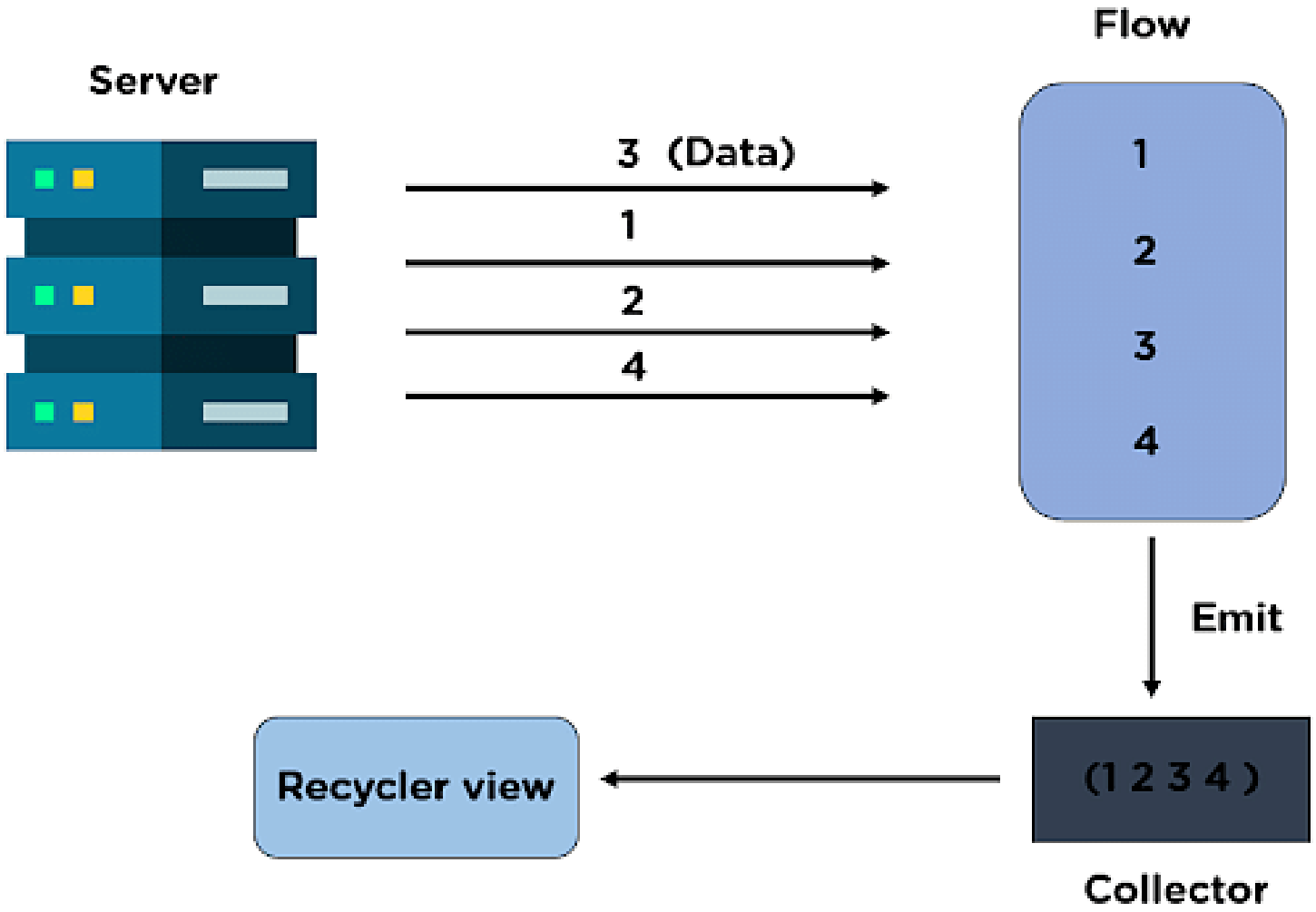
Data stream

Strumienie danych to sekwencje wartości lub zdarzeń, które są emitowane w określonym czasie lub w odpowiedzi na różne zdarzenia.

Cechy:

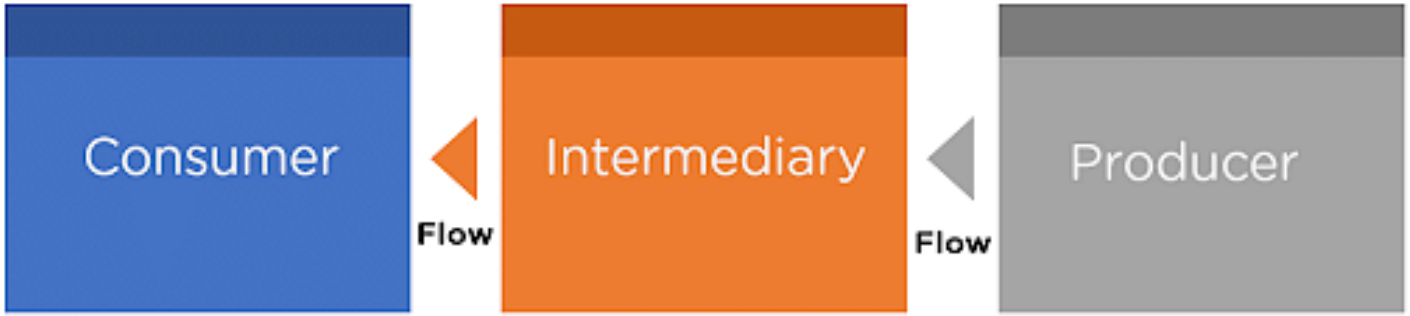
- **Emitowanie wartości**: Strumienie mogą emitować wartości w czasie, jedną po drugiej.
- **Reaktywne odbieranie**: Odbiorcy strumienia mogą reagować na emitowane wartości.
- **Przetwarzanie**: Strumienie mogą być przetwarzane i transformowane za pomocą różnych operacji (filtrowanie, mapowanie itp.)

Flow



https://www.simplilearn.com/tutorials/kotlin-tutorial/an-ultimate-guide-to-kotlin-flows

Flow



https://www.simplilearn.com/tutorials/kotlin-tutorial/an-ultimate-guide-to-kotlin-flows

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Flow


```
object DataProvider {
    val data: List<String> = listOf(
        "pierwszy",
        "drugi",
        "trzeci",
        "czwarty",
        "piąty",
        "szósty",
        "siódmy",
        "ósmy",
        "dziewiąty",
        "dziesiąty",
        "jedenasty",
        "dwunasty",
        "trzynasty",
        "czternasty",
        "piętnasty",
        "szesnasty",
        "siedemnasty",
        "osiemnasty",
        "dziewiętnasty",
        "dwudziesty",
    )
}
```

Flow


```
class WordsViewModel : ViewModel() {
    val wordsFlow = flow{
        var index = 0
        while (index < DataProvider.data.size){
            emit(DataProvider.data[index])
            delay(500L)
            index++
        }
    }
}
```

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Flow + Fragment/Aktywność


```
class WordsViewModel : ViewModel() {
    val wordsFlow = flow{
        var index = 0
        while (index < DataProvider.data.size){
            emit(DataProvider.data[index])
            delay(500L)
            index++
        }
    }
}
```

```
viewLifecycleOwner.lifecycleScope.launch {
    viewLifecycleOwner.repeatOnLifecycle(Lifecycle.State.STARTED){
        viewModel.wordsFlow.collect{ word ->
            binding.wordText.text = word
        }
    }
}
```

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Flow + Compose


```
class WordsViewModel : ViewModel() {
    val wordsFlow = flow{
        var index = 0
        while (index < DataProvider.data.size){
            emit(DataProvider.data[index])
            delay(500L)
            index++
        }
```

```
class MainActivity : ComponentActivity() {
    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContent {
            FlowBasicsComposeTheme {

                val viewModel: WordsViewModel = viewModel()

                val word = viewModel.wordsFlow.collectAsStateWithLifecycle("start")

                Surface(
                    modifier = Modifier.fillMaxSize(),
                    color = MaterialTheme.colorScheme.background
                ) {
                    Column(
                        modifier = Modifier.fillMaxSize(),
                        verticalArrangement = Arrangement.Center,
                        horizontalAlignment = Alignment.CenterHorizontally
                    ){
                        Text(
                            text = word.value, // ustawienie wartości w polu Text
                            fontSize = 56.sp,
                            modifier = Modifier.fillMaxWidth(),
                            textAlign = TextAlign.Center
                        )
```

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Flow vs LiveData

Kotlin Flow	LiveData
• As flow is specific to kotlin language, hence it supports multi-platform.	• Where as LiveData is built only for Android platform, hence it does not supports multi-platform.
• StateFlow requires an initial value	• LiveData does not require any intial value.
• Flow collection is not stopped automatically, but this behaviour can be easily achieved with the repeatOnLifeCycle extension.	• The method observe() from LiveData automatically unregisters the consumer when the view enters the STOPPED state.
• With Flow as return type, room created a new possibility of seamless data integration across the app between database and UI without writing any extra code.	• Lack of seamless data integration across between database and UI especially using Room.
• By using Shared Flow we can avoid fecthing latest values when configuration changes.	• LiveData always fetch latest values when configuration changes it might be bad when we use snack bar for users.

https://www.google.com/url?sa=i&url=https%3A%2F%2Fblogs.halodoc.io%2Freactive-way-of-mobile-app-development-using-kotlin-flow%2F

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Hot Flow vs Cold Flow

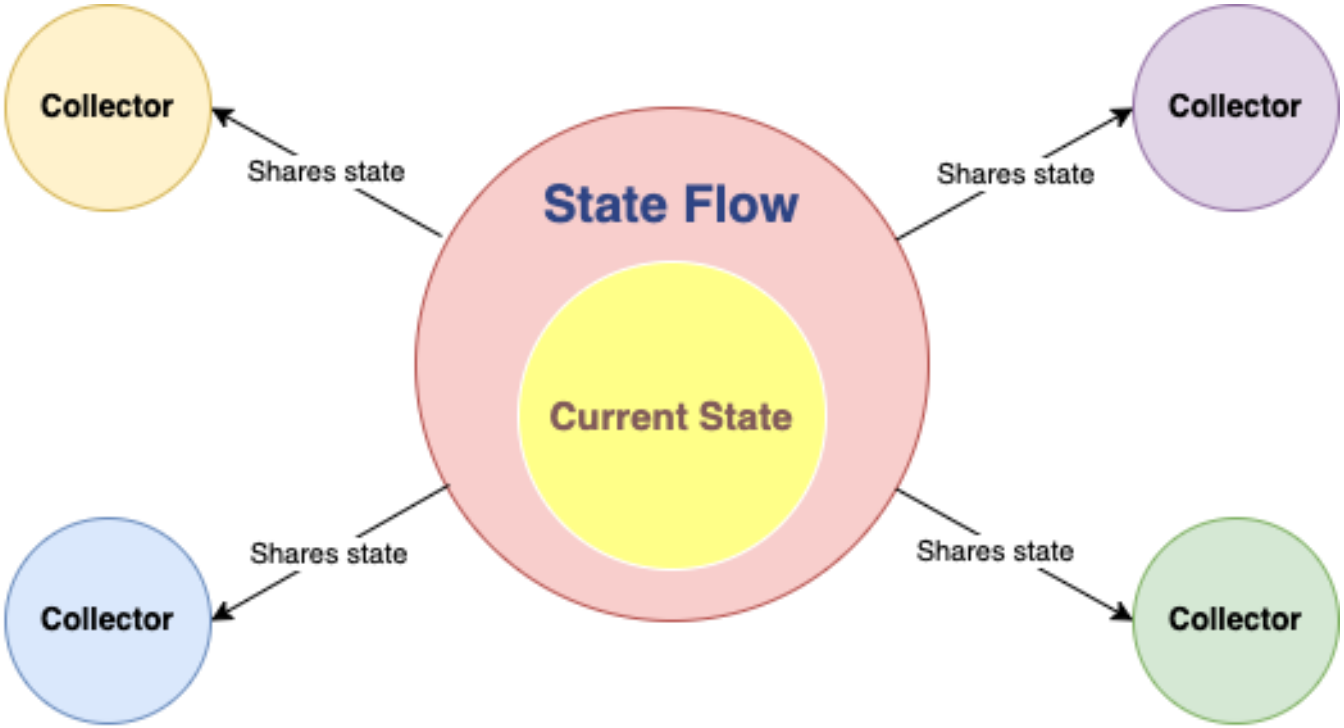
Cold Flow	Hot Flow
It emits data only when there is a collector.	It emits data even when there is no collector.
It does not store data.	It can store data.
It can't have multiple collectors.	It can have multiple collectors.

- **Cold Flow**: Zimny strumień emituje wartości tylko wtedy, gdy istnieje aktywny collector. Każdy collector odbiera emitowane wartości niezależnie, i zaczynają otrzymywać emisje od początku, gdy się zapiszą.
- **Hot Flow**: Gorący strumień emituje wartości niezależnie od tego, czy są aktywni collectors. Może generować wartości nawet wtedy, gdy nie ma subskrybentów. Nowi zbieracze dołączający do gorącego strumienia mogą przegapić emisje, które wystąpiły przed rozpoczęciem ich nasłuchiwania.

StateFlow	SharedFlow
Cold Flow	Hot Flow

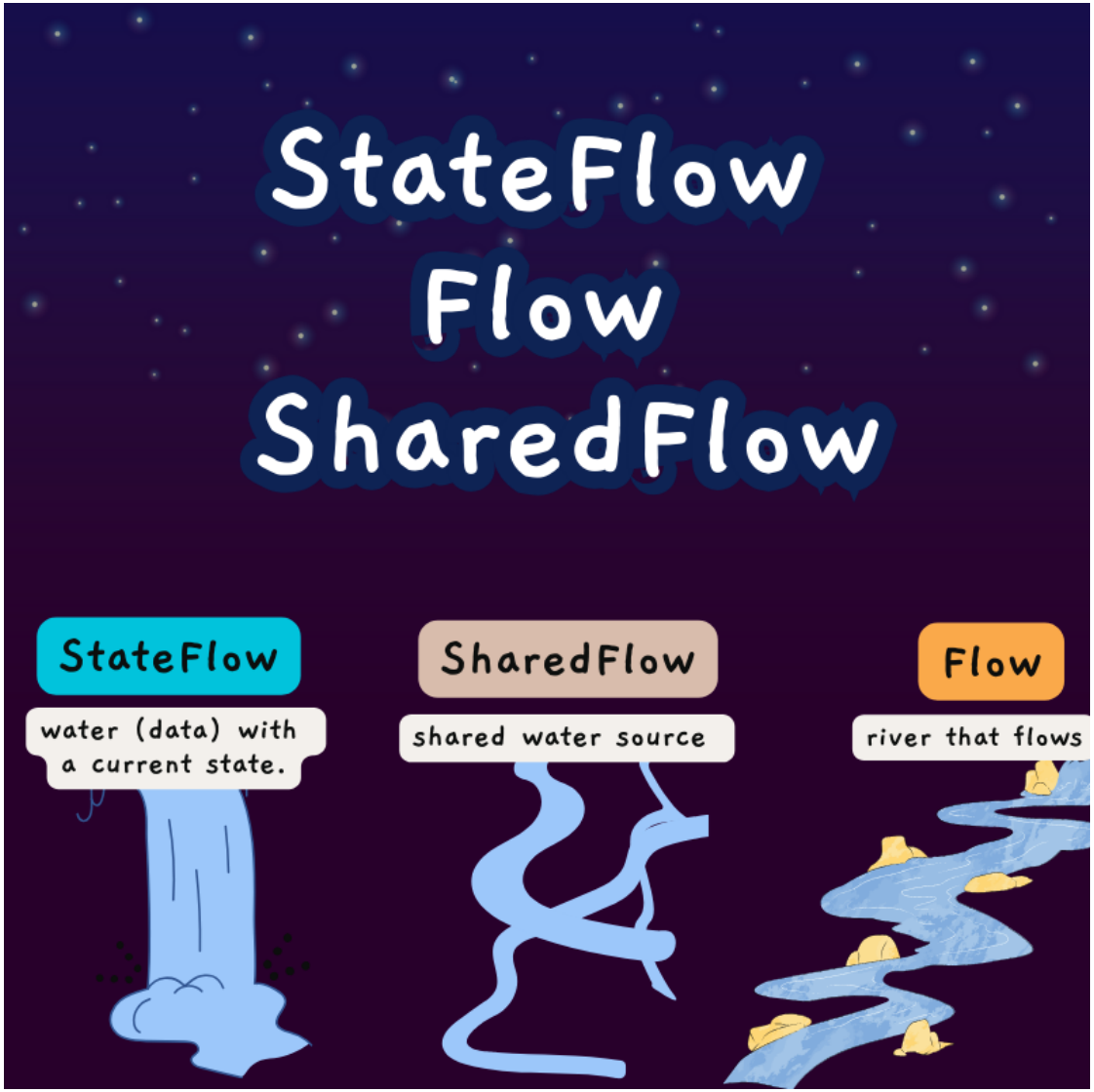
StateFlow

Flow to ogólna koncepcja reprezentująca sekwencję wartości w czasie. StateFlow to specyficzny typ Flow, który reprezentuje wartość z bieżącym stanem.



https://www.google.com/url?sa=i&url=https%3A%2F%2Fmedium.com%2F%40mortitech%2Fsharedflow-vs-stateflow-a-comprehensive-guide-to-kotlin-flows-503576b4de31

StateFlow



https://www.google.com/url?sa=i&url=https%3A%2F%2Fpinarturgut09.medium.com%2Fdifference-between-flow-shared-flow-and-stateflow-in-android-e03b2a3e5ffc

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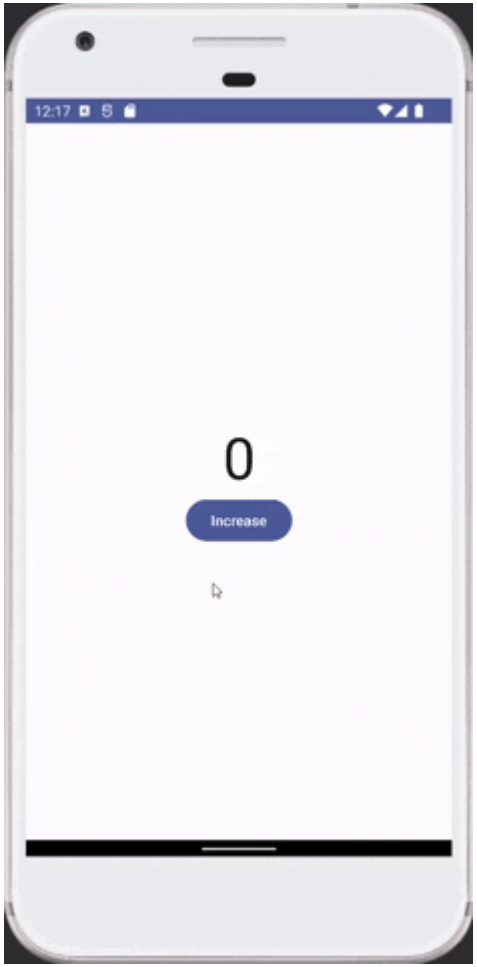
StateFlow




```
class CounterViewModel : ViewModel() {

    private val _stateFlow = MutableStateFlow(0)
    val stateFlow = _stateFlow.asStateFlow()

    fun increase(){
        _stateFlow.value += 1
    }
}
```

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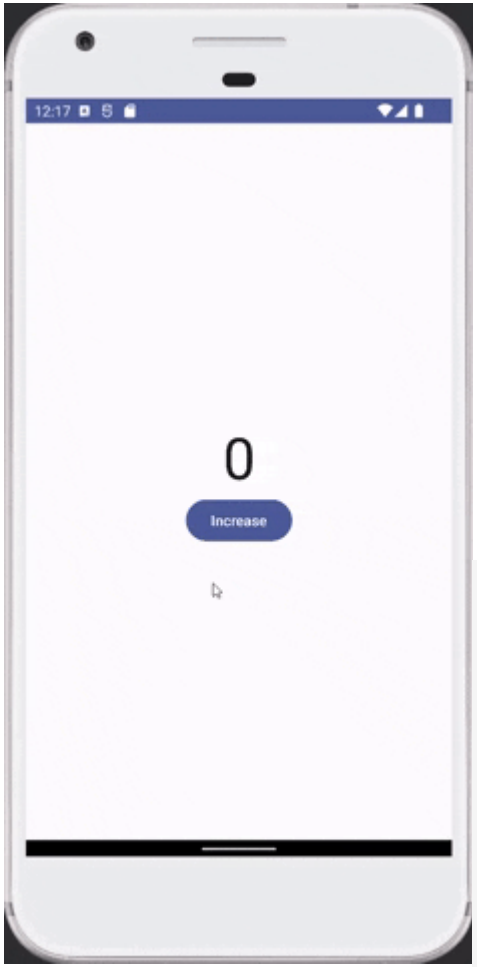
StateFlow + Fragment/Aktywność




```
class CounterViewModel : ViewModel() {

    private val _stateFlow = MutableStateFlow(0)
    val stateFlow = _stateFlow.asStateFlow()

    fun increase(){
        _stateFlow.value += 1
    }
}
```

```
viewLifecycleOwner.lifecycleScope.launch {
    viewLifecycleOwner.repeatOnLifecycle(Lifecycle.State.STARTED){
        viewModel.stateFlow.collectLatest{ counter ->
            binding.counterText.text = counter.toString()
        }
    }
}

binding.increaseButton.setOnClickListener {
    viewModel.increase()
}
```

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StateFlow + Compose


```
class CounterViewModel : ViewModel() {

    private val _stateFlow = MutableStateFlow(0)
    val stateFlow = _stateFlow.asStateFlow()

    fun increase(){
        _stateFlow.value += 1
    }
}
```

```
val viewModel: CounterViewModel = viewModel()  // tworzymy instancję viewmodel
val counter = viewModel.stateFlow.collectAsStateWithLifecycle(0) // tworzymy pole typu State

Surface(
    modifier = Modifier.fillMaxSize(),
    color = MaterialTheme.colorScheme.background
) {
    Column(
        modifier = Modifier.fillMaxSize(),
        verticalArrangement = Arrangement.Center,
        horizontalAlignment = Alignment.CenterHorizontally
    ){
        Text(
            text = counter.value.toString(), // ustawiamy wartość
            fontSize = 56.sp,
            modifier = Modifier.fillMaxWidth(),
            textAlign = TextAlign.Center
        )
        Button(onClick = { viewModel.increase() }) { // Wywołujemy funkcję increase() po naci
            Text(text = "Increase")
        }
    }
}
```

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Flow -> StateFlow

```
class CounterViewModel : ViewModel() {
    private var currentVal = 0

    val counter = flow {
        while (true){
            delay(500L)
            emit(currentVal++)
        }
    }.stateIn(
        viewModelScope,
        SharingStarted.WhileSubscribed(),
        0
    )
}
```