

# Now@ - Content Sharing Application over NDN

## Extended Abstract

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### ABSTRACT

Sharing content has become part of our lives; Twitter for instance, is one of the most popular application in this area with millions of users in the entire world. At the same time, in the recent years, Named-Data Networking has become a promising network infrastructure, with continuous growth and collaborating teams that are working on it. In this paper we describe Now@, aiming to increase the impact of NDN near the end user with an Android application that allows them to exchange data based on their interests. To achieve this goal, we have developed Now@ based on synchronization of data. Now@ can operate on top of NFD Android allowing data exchange via wireless Internet and on top of NDN-Opp allowing data to be exchanged even in the presence of intermittent connectivity.

### CCS CONCEPTS

• Software and its engineering → Software prototyping;

### KEYWORDS

NDN, content sharing, synchronization, Android

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## 1 INTRODUCTION

Since the communication paradigm Named-Data Networking (NDN) [3] was proposed, a lot of research work has been carried out with the intention of exploiting the capabilities of such infrastructure. At the same time, applications such as file sharing and group text messaging have been in constant growth. As a result, ChronoSync [5] was proposed, a library that allows the synchronization of data in distributed systems application over NDN. Although, continuous research has helped to create a more stable NDN network, it is important to create applications that bring value and usability

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from the perspective of the end user such as BOPlish [4], which allows users to share data directly via WebRTC Data Channels. However, contrary to NDN, BOPlish is not supposed to operate on Internet-scale. Therefore, we propose Now@, an open-source Android application able to allow users to share content (e.g. such as text, images and documents) directly over an NDN infrastructure (on top of NDN Android) of opportunistic communication fashion when such infrastructure is absence (on top of NDN-Opp [1]). Now@ allows users to exchange information by using predefined categories that help them to define the interests they want to communicate about. To do this, we use ChronoSync to carry out the transfer and synchronization data between each of the users that uses the application even in condition without internet connectivity. In contrast with applications like ChronoShare and others which also work on top of ChronoSync, Now@ allows users to subscribe to more than one interest at the same time and is available on Google Play Store<sup>1</sup> and GitHub<sup>2</sup>.

In Section 2 the principal components of Now@ and their interactions are presented. Section 3 presents the ways the user can interact with Now@. Finally, Section 4 has information and future work for this project.

## 2 CONTENT SHARING

### 2.1 Software Components

Now@ has been specified based on a modular approach, so it is possible to add new components and allow integration with the NDN Forwarding Daemon (NFD) [2] which is a network forwarder that implements NDN. The modular architecture of Now@ is illustrated in Figure 1.

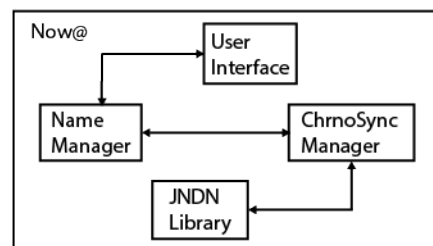


Figure 1: Now@ Infrastructure

<sup>1</sup><https://play.google.com/store/apps/details?id=pt.usulofona.copelabs.now&hl=en>

<sup>2</sup><https://github.com/COPELABS-SITI/NowAt>

The *User Interface* module is used to select the categories that allow subscribing interests for example music, business or restaurants, to the NDN network. This module also allows users to create messages and access to basic configuration.

The *Name Manager* module is used to associate the categories present in User Interface module to prefixes that will be registered in the NDN infrastructure. Also, it allows associating content stored on the mobile device with categories in order to define the type of content and the prefixes that will be used afterwards.

The *ChronoSync Manager* provides control over the different instances of ChronoSync at a certain instant in time. The idea is to reuse the principal functions of ChronoSync with the intention of increasing its potential and allow users to synchronize more than one type of data.

The *jNDN* library, which is a Java client library that enables the use of NDN, is used to create the faces and register the prefixes. Also, this library contains the ChronoSync functionalities.

## 2.2 Main functionalities

Now@ has three principal functionalities as part of its core, which have to be applied to any content that is shared by users; naming, synchronization and communication. In this section we describe the principal tasks performed in each of these.

**2.2.1 Naming.** To carry out the transfer of content in Now@, it is necessary to assign names to it in a way that allows its exchange while limiting it to the interests of the users. Table 1 shows the prefixes used for some of the categories that are available in the application:

Prefix	Category
/ndn/multicast/music/<uuid>	Music
/ndn/multicast/business/<uuid>	Business

**Table 1: Prefix per category.**

As can be seen, the prefixes are divided into four main components, the first specifies the type of infrastructure, the second indicates the strategy to send the data, then the category to which each prefix belongs and finally the UUID, which is the identifier of the application in each of the devices where it is running.

**2.2.2 Data Synchronization.** The data synchronization mechanism relies on ChronoSync, where for each content created, its name is obtained by appending a sequence number after the prefix of its category. As an illustration we have the prefixes shown in Table 2.

Prefix	Sequence number
/ndn/multicast/music/<uuid>/1	1
/ndn/multicast/business/<uuid>/2	2

**Table 2: Prefix with sequence number.**

Once another device subscribes to categories, it requests the content from those.

**2.2.3 Data Communication.** Since Now@ uses naming to communicate data, it is possible to use it on top of NFD Android or NDN-Opp, that means that it is feasible to take advantage of opportunistic networks and share data with intermittent internet

connectivity. The integration with two mechanisms is established in jNDN Library.

## 3 USABILITY

### 3.1 Receive Content

When a user wants to receive content, first of all, he needs to subscribe to the categories he is interested in. Upon receiving new content, ChronoSync delivers it to the ChronoSync Manager module which is responsible to send it to the User Interface module for visualization.

### 3.2 Share Content

When a user wants to share content (text, music, documents), in the UI module, he must select the category in which he wants to share the information. Once the category is selected the user must write the message and send it. At this point, the message is sent to the network.

## 4 CONCLUSION

In this paper we present Now@, an Android application that allows users to exchange data based on their interests via the NDN backbone (on top of NDN Android) or by exploiting existing wireless infrastructure or direct connections (on top of NDN-Opp). Now@ is being tested on the testbed of the European project UMOBILE, testbed that is connected to the NDN global testbed. As a future work we plan to extend Now@ to allow allow users to request just the content they want without receiving all the content that is related to one specific prefix. We are also developing a mechanism to control the usage of the storage space (e.g. eliminate less popular content) that the user allocates to Now@ during the setup phase.

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