Welcome to the Workshop on Empowering Connectivity: Bridging Space and Earth with DTN

Marco Zennaro, PhD
Science, Technology and Innovation Unit
The Abdus Salam International Centre for Theoretical Physics

The Abdus Salam International Centre for Theoretical Physics

Me and DTN

Delay Tolerant Network on smartphones: Applications for communication challenged areas

Hervé Ntareme
Royal Institute of Technology, KTH
Forum 120, 164 40 Kista
Sweden
+46 8 790 4248
ntareme@kth.se

Marco Zennaro
ICTP – International Centre for Theoretical Physics
Strada Costiera, 34151 Trieste, Italy
+39 328 1214733
mzennaro@ictp.it

Björn Pehrson
Royal Institute of Technology, KTH
Forum 120, 164 40 Kista
Sweden
+46 8 790 4284
bpehrson@kth.se

ABSTRACT

This paper discusses the Delay Tolerant Network (DTN) service and protocol stack and presents an implementation of it on the Android platform that is called "Bytewalla". It allows the use of Android phones for the physical transport of data between network nodes in areas where there are no other links available, or where existing links need to be avoided for security reasons or in case the Internet is shut down by a government authority like it happened in some Arab countries during the spring of 2011.

The implementation of a store and forward messaging application and a Sentinel Surveillance health-care application (SSA) that runs on top of Bytewalla are presented together with a few usage scenarios. Our conclusion is that the integration of DTN links in the general IP-network architecture on mobile phone platform is feasible and will make it easier to integrate DTN applications into communication-challenged areas. To our knowledge our implementation of the bundle protocol is the first on the Android platform.

Categories and Subject Descriptors

C.2.1 [**Network Architecture and Design**]: – Store and forward networks.

General Terms

Design, Reliability, Algorithms

Keywords

via mobile devices that are physically transported between nodes by extending the Internet Protocol suite with the Bundle Protocol [4]. Specifically we implemented the Bundle Protocol (BP) on the Android OS platform.

In some areas, it is cost effective, at least in the shorter term perspective, to organize such physical transport of data rather than to deploy a physical network infrastructure, such as optical fiber cables or broadband wireless links. Moreover, this can provide business opportunities that could attract local entrepreneurs.

Mobile phones are by far the most commonly available mobile device, also in developing regions. According to the International Telecommunication Union (ITU), the total number of mobile phone subscriptions in 2011 is more than five billions [5]. Additionally, smartphones are currently experiencing accelerating rates of adoption worldwide.

The Android platform was chosen to be used in our project due to its openness for application developers and increasing popularity. The applications we targeted are a general store-and-forward E-mail service, and a Sentinel Surveillance Application (SSA) to be used as a basis for health-care applications in our "ICT for Rural Development programme" [6].

The idea of using physical transport links to forward data between nodes in IP-networks is not new. In 2003, mobile Wi-Fi access points and servers were mounted on buses in rural India to transport emails between rural subscribers and the Internet [8]. Experiments with DTN in similar contexts has been explored in the "Sámi Network Connectivity" project, 2004-2006 [9] and in the "Networking for Communication Challenged Communities"

5.1 The Android mobile phone application

The Bytewalla application has two applications to send and receive data bundles from inside the mobile application. Figure 4 illustrates the GUI of the application.

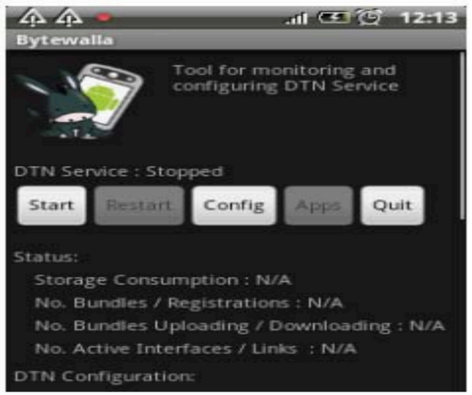


Figure 4: Application example

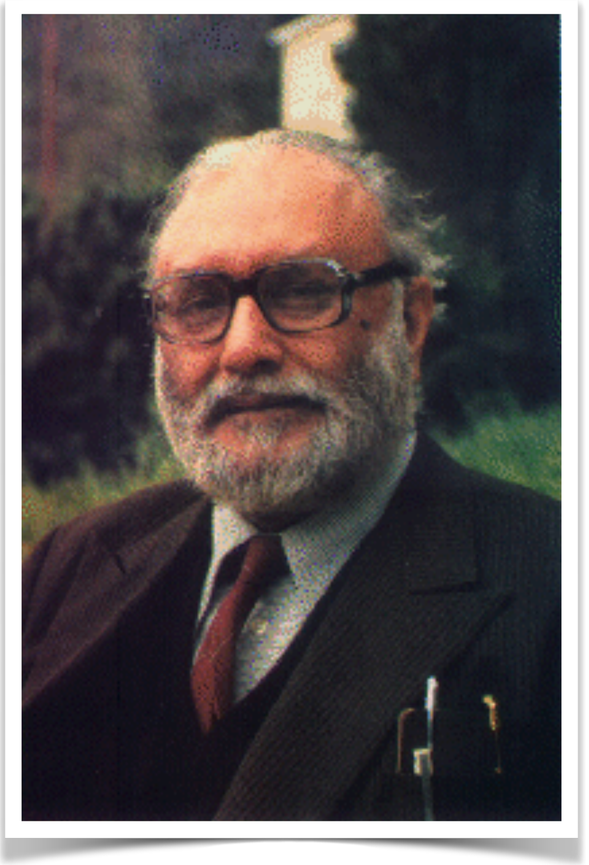
The configuration part consists of four sections:

a. **Storage section:** In this section the user can define the type of the service to be used for storing the bundles which could

- ExtremeCom '11: Proceedings of the 3rd Extreme Conference on Communication: The Amazon Expedition, Article No.: 14, Pages 1 - 6, https://doi.org/10.1145/2414393.2414407

What is the ICTP

- the Abdus Salam International Centre for Theoretical Physics was founded in 1964, by the late **Nobel Laureate Abdus Salam**
- receives the majority of its funding from the Italian government and is administered by the United Nations Educational, Scientific and Cultural Organization (**UNESCO**) and the International Atomic Energy Agency (**IAEA**)



ICTP’s mandate

- The ICTP has the mandate
  - to foster the growth of **advanced research** in physics and mathematics, especially among researchers from developing countries
  - to create an **international forum** for the exchange of scientific information through courses, workshops and seminars

“Scientific Thought is the common heritage of mankind”

ICTP’s statistics

- The ICTP hosts more than **6,000 scientists each year**
  - +60 training activities per year
- More than **150,000 visits since 1964**
  - 60% from developing countries
  - 40% from developed countries
  - **188 nations represented**


Legend
1. Leonardo Building
2. Former SISSA Building
3. Galileo Guest House
4. Enrico Fermi Building
5. Multidisciplinary Laboratory
6. Adriatico Guesthouse
Park route
Underpass
Hotel Riviera
via Grignano
AIRPORT, VENICE
BUS 6/51
shuttle
via Junker
Hotel Mignon
Tunnel
via Beirut
Miramare Railway Station
Park Gate
Miramare Park
Miramare Castle
Scala Diaz
Strada Costiera (S.S.14)
BUS 6
underpass
TRIESTE
Youth Hostel
Hotel
Adriatic Sea

Thanks

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Vint Cerf (Google)

Samo Grasic (IPNSIG)

Thanks


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King Abdullah University of
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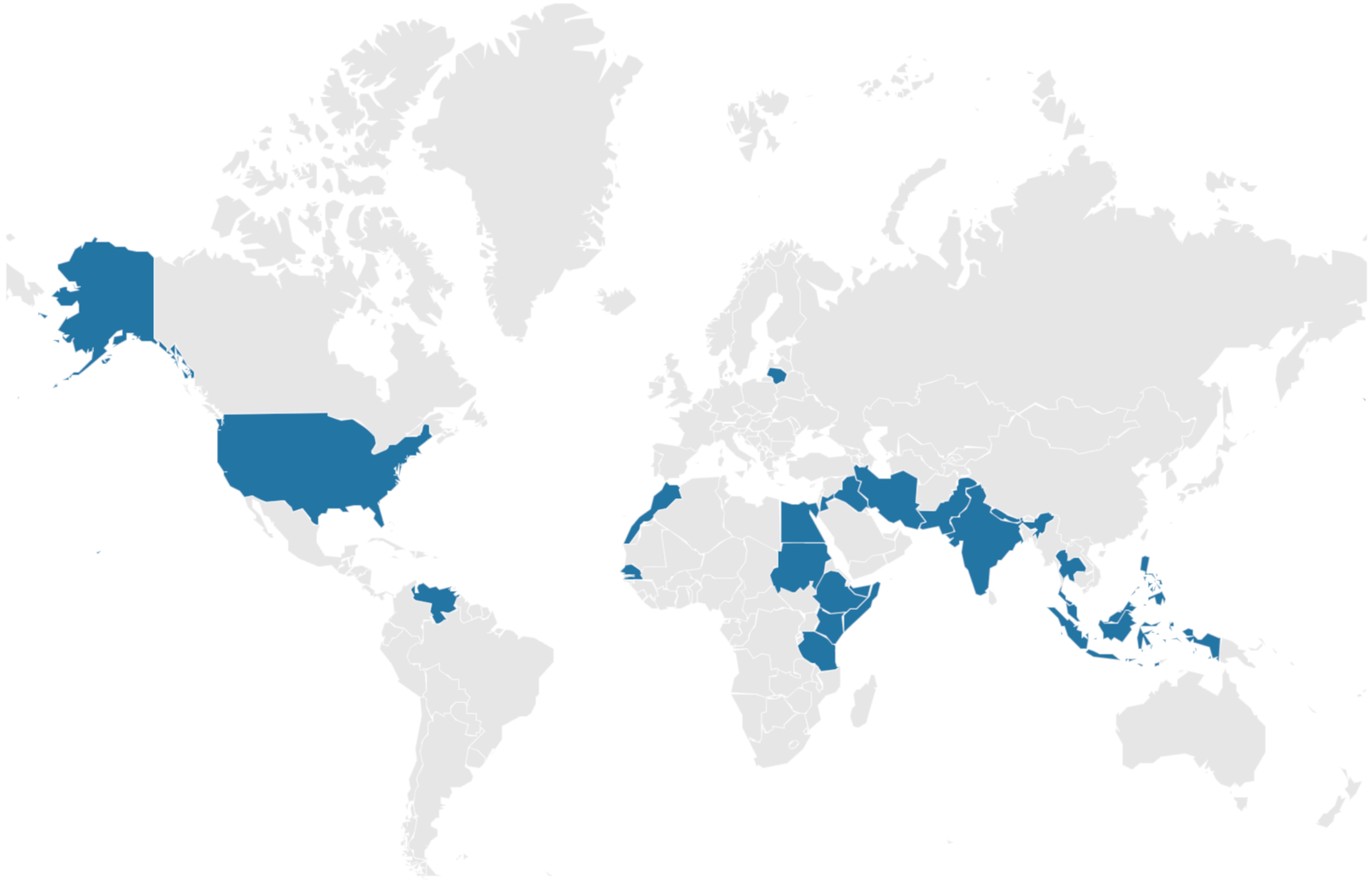
IPNSIG

Participants

27 participants from:

Egypt, Ethiopia, Kenya, Morocco, Senegal, Somalia, Sudan, Tanzania, India, Indonesia, Iran, Iraq, Jordan, Malaysia, Nepal, Pakistan, Philippines, Thailand, Lithuania, Venezuela, USA

Participants



Rules

1) ~~Try to~~ be on time!

2) Attend at least 90% of the lectures + labs to receive the attendance certificate

3) Bring your laptop

4) Feel free to ask questions!

LAB

Wireless Network

use the username and password in your badge

Workshop’s Website:

https://indico.ictp.it/event/10867

News

Welcome Reception **Wednesday** at Adriatico Guesthouse Cafeteria, **7:00 pm**

Group photo will be taken **Wednesday** at **10:00 am.**

Secretariat office is number 115 at the first floor of the Leonardo Building. Extension is 4318.

Medical Office is at the ground floor of the Fermi Building

Case Studies

15 minutes in total
(10 for presentation and 5 for Q&A)

Thursday, 25 September 2025

certificates for all presenters

What about you?

Name
Country
Organization
Interest in DTN / Connectivity